PREKIŲ PIRKIMO-PARDAVIMO SUTARTIES SPECIALIOSIOS SĄLYGOS

Sutarties data		**Sutarties numeris**	

1. SUTARTIES ŠALYS		
1.1. Pirkėjas	1.1.1. Pavadinimas	Valstybinė vartotojų teisių apsaugos tarnyba
	1.1.2. Juridinio asmens kodas	188770044
	1.1.3. Adresas	A. Goštauto g. 12, 01108 Vilnius, Lietuva
	1.1.4. PVM mokėtojo kodas	
	1.1.5. Atsiskaitomoji sąskaita	LT27 4040 0636 1000 0350
	1.1.6. Bankas, banko kodas	Finansų ministerija, kodas 70440
	1.1.7. Telefonas	+370 5 262 6751
	1.1.8. El. paštas	tarnyba@vvtat.lt
	1.1.9. Šalies atstovas	Goda Aleksaitė
	1.1.10. Atstovavimo pagrindas	Valstybinės vartotojų teisių apsaugos tarnybos nuostatai, patvirtinti Lietuvos Respublikos Vyriausybės 2015 m. gruodžio 23 d. nutarimu Nr. 1333 „Dėl Valstybinės vartotojų teisių apsaugos tarnybos nuostatų patvirtinimo“
1.2. Tiekėjas	1.2.1. Pavadinimas	UAB „Arm gate“
	1.2.2. Juridinio asmens kodas	135218757
	1.2.3. Adresas	J. Kubiliaus g. 6-21, LT-08234, Vilnius
	1.2.4. PVM mokėtojo kodas	LT352187515
	1.2.5. Atsiskaitomoji sąskaita	LT82 7300 0100 7443 7059
	1.2.6. Bankas, banko kodas	Swedbank AB, banko kodas 73000
	1.2.7. Telefonas	+370 5 2 879 573
	1.2.8. El. paštas	info@armgate.lt
	1.2.9. Šalies atstovas	Direktorius Žydrūnas Stanius
	1.2.10. Atstovavimo pagrindas	Įmonės įstatai

2. ATSAKINGI ASMENYS	
2.1. Pirkėjo kontaktiniai asmenys, atsakingi už Sutarties vykdymą, Prekių priėmimą, Sąskaitų per informacinę sistemą SABIS priėmimą	Aistė Silkartienė Vedėja Naftos produktų bandymų laboratorija +370 661 71 742 aiste.silkartiene@vvtat.lt Bielskio g. 47B, LT-76148 Šiauliai, Lietuva
2.2. Tiekėjo kontaktiniai asmenys,	Žydrūnas Stanius, direktorius zydrunas@armgate.lt

atsakingi už Sutarties vykdymą	tel. +370 61416157
3. SUTARTIES DALYKAS	
3.1. Sutarties dalykas	Tiekėjas įsipareigoja Sutartyje numatytomis sąlygomis perduoti Pirkėjui Prekes, įrenginį, skirtą aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu (toliau – Prekės). Išsamus Prekių aprašymas ir kiti reikalavimai tiekiamoms Prekėms nustatyti Sutarties priede Nr. [1] „Techninė specifikacija“ (toliau – Techninė specifikacija) ir Sutarties priede Nr. [2] „Pasiūlymas“.
3.2. Pirkimo pavadinimas ir numeris	
3.3. Informacija apie Europos Sąjungos lėšomis finansuojamą projektą arba kitą projektą	Netaikoma
4. PREKIŲ PRISTATYMO TERMINAI IR PREKIŲ PERDAVIMO - PRIĖMIMO TVARKA	
	Tiekėjas Prekes (visą Prekių kiekį) įsipareigoja pristatyti **ne vėliau** kaip iki 2025 m. gruodžio 15 d. nuo Sutarties įsigaliojimo dienos šiuo adresu: Valstybinės vartotojų teisių apsaugos tarnybos Naftos produktų bandymų laboratoriją, adresu V. Bielskio g. 47B, Šiauliai.
4.2. Prekių (ar jų dalies) pristatymo termino pratęsimas	Netaikoma
4.3. Užsakymų teikimo tvarka	Netaikoma
4.4. Dėl minimalios užsakymo vertės / apimties	Netaikoma
4.5. Kartu su Prekėmis pateikiami dokumentai	Kartu su Prekėmis pateikiami šie dokumentai: Prekių perdavimo-priėmimo aktas, įrenginio instrukcija lietuvių kalba, mokymų sertifikatas. Tiekėjui nepateikus nurodytų dokumentų, laikoma, kad Prekės neatitinka Sutartyje nustatytų reikalavimų.
5. SUTARTIES KAINA IR ATSISKAITYMO TVARKA	
5.1. Sutarčiai taikomas kainos apskaičiavimo būdas	Fiksuotos kainos kainodara
5.2. Pradinės Sutarties vertė ir Sutarties kaina, kai taikoma <u>fiksuotos kainos</u> kainodara	Pradinės Sutarties vertė yra 43 898,00 Eur (keturiasdešimt trys tūkstančiai aštuoni šimtai devyniasdešimt aštuoni eurų 00 ct) be pridėtinės vertės mokesčio (toliau – PVM). PVM sudaro 9 218,58 Eur (devyni tūkstančiai du šimtai aštuoniolika eurų 58 ct). Sutarties kaina yra 53 116,58 Eur (penkiasdešimt trys tūkstančiai vienas šimtas šešiolika eurų 58 ct) su PVM. Šioje Sutartyje Pradinės Sutarties vertė yra lygi Tiekėjo pasiūlymo

	kainai be PVM, nurodytai už visą pirkimo dokumentuose ir Sutartyje nurodytą Prekių kiekį ir (ar) apimtį.
5.3. Sutarties kainos / įkainių perskaičiavimas taikant peržiūros taisykles	Sutarties kaina bus perskaičiuojama: 5.3.1. dėl PVM tarifo pasikeitimo.
5.3.1. Sutarties kainos / įkainių peržiūra dėl PVM tarifo pasikeitimo	Jeigu Sutarties vykdymo metu pasikeičia PVM mokėjimą reglamentuojantys teisės aktai, darantys tiesioginę įtaką Tiekėjo tiekiamų Prekių Sutartyje nurodytai kainai / įkainiams, Sutarties kaina / įkainiai perskaičiuojami nekeičiant Prekių kainos / įkainio be PVM. Perskaičiuota Sutarties kaina / Prekių įkainiai įforminami Susitarimu ir turi būti taikomi nuo naujo PVM įvedimo datos (nepriklausomai nuo to, kada pasirašytas Susitarimas).
5.3.2. Sutarties kainos / įkainių peržiūra dėl kitų mokesčių, lemiančių Prekių kainos / įkainių pokytį, pasikeitimo	Netaikoma
5.3.3. Sutarties kainos / įkainių peržiūra dėl kainų lygio pokyčio	Netaikoma
5.3.4. Sutarties kainos / įkainių peržiūra dėl kainų lygio pokyčio pagal Prekių grupių kainų pokyčius	Netaikoma
5.4. Sutarties kainos / įkainių apskaičiavimas taikant kiekio (apimties) keitimo taisykles	Netaikoma
5.5. Atsiskaitymo su Tiekėju terminas ir tvarka	Pirkėjas atsiskaito su Tiekėju ne vėliau kaip per 30 kalendorinių dienų nuo Sąskaitos gavimo dienos. Apmokėjimo sąlygos (pasirinkti reikalingą variantą): 1) įvykdžius visus sutartinius įsipareigojimus, sumokama visa Sutarties kaina.
5.6. Avansas	Netaikoma
5.7. Avanso užtikrinimas	Netaikoma
6. PREKIŲ KOKYBĖ IR GARANTINIAI ĮSIPAREIGOJIMAI	

6.1. Garantinis terminas	Prekėms nustatomas Techninėje specifikacijoje nustatytas garantinis terminas, kuris yra ne trumpesnis kaip 36 mėn. garantinis terminas, skaičiuojamas nuo Prekių perdavimo–priėmimo akto ar Sąskaitos (kai Prekių perdavimo–priėmimo aktas nėra pasirašomas) pasirašymo dienos.
6.2. Garantinė priežiūra	Garantinio termino laikotarpiu nustačius Prekių trūkumų, Tiekėjas turi **ne vėliau kaip** per (48 val. (2 darbo dienas) nuo rašytinės pretenzijos gavimo dienos pašalinti Prekių trūkumus.
6.3. Kokybinių kriterijų įgyvendinimo ir tikrinimo tvarka	Netaikoma
7. SUTARTIES VYKDYMUI PASITELKIAMI SUBTIEKĖJAI	
Sutarties vykdymui pasitelkiami subtiekėjai ir (ar) specialistai	Sutarties vykdymui subtiekėjai ir (ar) specialistai nepasitelkiami.
8. PRIEVOLIŲ PAGAL SUTARTĮ ĮVYKDYMO UŽTIKRINIMAS	
8.1. Prievolių pagal Sutartį įvykdymo užtikrinimas	Prievolių pagal Sutartį įvykdymas užtikrinamas: Netesybomis (delspinigiais, bauda);
8.2. Sutarties įvykdymo užtikrinimo galiojimo terminas	Netaikoma
8.3. Sutarties įvykdymo užtikrinimo pateikimas	Netaikoma
9. ŠALIŲ ATSAKOMYBĖ	
9.1. Pirkėjui taikomos netesybos už mokėjimų pagal Sutartį vėlavimą	Jei Pirkėjas, gavęs tinkamai pateiktą ir užpildytą Sąskaitą, uždelsia atsiskaityti už tinkamai Tiekėjo perduotas kokybiškas Prekes per Sutartyje nurodytą terminą, Tiekėjas nuo kitos nei nustatytas terminas dienos skaičiuoja Pirkėjui 0,02 (dvi šimtosios) procento dydžio delspinigius nuo neapmokėtos sumos be PVM už kiekvieną vėlavimo dieną.
9.2. Tiekėjui taikomos netesybos	9.2.1. Jeigu Tiekėjas vėluoja vykdyti užsakymą, tiekti Prekes ar ištaisyti jų trūkumus arba nevykdo kitų sutartinių įsipareigojimų, Pirkėjas nuo kitos nei nustatytas terminas dienos Tiekėjui skaičiuoja 0,02 (dvi šimtosios) procento dydžio delspinigius už kiekvieną uždelstą dieną nuo laiku neperduotų Prekių ar Prekių, turinčių trūkumų, kainos be PVM. 9.2.2. Jeigu Tiekėjas vėluoja grąžinti dėl Tiekėjui mokėtinos sumos sumažinimo susidariusią permoką pagal Bendrųjų sąlygų 7.4.1.2 punktą, Pirkėjas nuo kitos nei nustatytas terminas dienos Tiekėjui skaičiuoja 0,02 (dvi šimtosios) procento dydžio delspinigius už kiekvieną uždelstą dieną nuo laiku negrąžintos permokos, kainos be PVM. 9.2.3. Tiekėjas privalo sumokėti Pirkėjui netesybas per 30 kalendorinių dienų nuo Pirkėjo pareikalavimo, jeigu netesybų suma nėra išskaitoma iš Tiekėjui mokėtinos sumos.
9.3. Tiekėjui / Pirkėjui taikoma bauda	9.3.1. Nutraukus Sutartį dėl esminio Sutarties pažeidimo, nustatyto Sutarties Specialiosiose sąlygose, mokama 5 (penkių) procentų

nutraukus Sutartį dėl esminio Sutarties pažeidimo ar nepagrįstai nutraukus Sutarties vykdymą ne Sutartyje nustatyta tvarka	dydžio bauda nuo Pradinės Sutarties vertės be PVM, nurodytos Specialiųjų sąlygų 5.2 punkte. 9.3.2. Nepagrįstai nutraukus Sutarties vykdymą ne Sutartyje nustatyta tvarka, mokama 5 (penkių) procentų dydžio bauda nuo Pradinės Sutarties vertės, nurodytos Specialiųjų sąlygų 5.2 punkte.
9.4. Tiekėjui taikoma bauda dėl esamų subtiekėjų ar specialistų pakeitimo / naujų subtiekėjų pasitelkimo nesilaikant Bendrosiose sąlygose nurodytos subtiekėjų ir (ar) specialistų keitimo tvarkos	Netaikoma
9.5. Tiekėjui taikomos baudos dėl aplinkosauginių ir (arba) socialinių kriterijų nesilaikymo	Netaikoma
9.6. Tiekėjui / Pirkėjui taikoma bauda dėl konfidencialumo reikalavimų nesilaikymo	Mokama 5 (penkių) procentų dydžio bauda nuo Pradinės Sutarties vertės be PVM, nurodytos Specialiųjų sąlygų 5.2 punkte.
9.7. Tiekėjui taikomos netesybos dėl pirkimo dokumentuose nustatytų Kokybinių kriterijų nepasiekimo Sutarties vykdymo metu	Netaikoma
9.8. Tiekėjui taikomos netesybos dėl Sutarties įvykdymo užtikrinimo nepratęsimo	Netaikoma
9.9. Tiekėjui taikoma bauda dėl Pirkėjo simbolių, pavadinimo ir ženklo reklamoje ar rinkodaroje naudojimo reikalavimų nesilaikymo bei draudimo naudotis Pirkėjo sukurtais intelektiniais veiklos	Netaikoma

rezultatais nesilaikymo	
9.10. Kitos netesybos	
10. ESMINĖS SUTARTIES SĄLYGOS	
10.1. Esminės Sutarties sąlygos	Netaikoma
10.2. Dideli arba nuolatiniai esminės Sutarties sąlygos vykdymo trūkumai	Netaikoma
11. SUTARTIES GALIOJIMAS IR KEITIMAS	
11.1. Sutarties sudarymas ir įsigaliojimas	Ši Sutartis laikoma sudaryta ir įsigalioja nuo Sutarties pasirašymo dienos (antrosios Šalies pasirašymo dieną). Sutartis galioja iki visiško prievolių įvykdymo (kol bus išnaudota Pradinės Sutarties vertė, bet jos terminas negali būti ilgesnis kaip iki 2026 m. vasario 15 d.
11.2. Sutarties galiojimo termino pratęsimas	Netaikoma
12. SUTARTIES NUTRAUKIMAS	
12.1. Sutarties nutraukimo pagrindai	Sutartis gali būti nutraukiama rašytiniu Šalių susitarimu arba vienašališkai, Bendrosiose sąlygose nustatyta tvarka.
12.2. Esminiai Sutarties pažeidimai	12.2.1. jeigu Tiekėjas nevykdo prisiimtų įsipareigojimų už Sutartyje nustatytą Sutarties kainą / įkainius; 12.2.2. jeigu Tiekėjas pažeidžia Prekių pristatymo terminus ir priskaičiuotų netesybų už vėlavimą suma viršija 20 (dvidešimt) proc. Pradinės sutarties vertės; 12.2.3. Tiekėjas pažeidžia Prekių pristatymo terminus ir dėl Prekių pristatymo vėlavimo Prekės tampa nebereikalingos; 12.2.4. Tiekėjas daugiau kaip 2 (du) kartus pristato Prekes, kurios neatitinka Sutartyje ir (ar) Įstatymuose nustatytų reikalavimų Prekėms; 12.2.5. Tiekėjas pažeidžia šios Sutarties nuostatas, reglamentuojančias konkurenciją, intelektinės nuosavybės ar konfidencialios informacijos valdymą.
13. APLINKOSAUGINIAI IR SOCIALINIAI KRITERIJAI	
13.1. Aplinkosauginių kriterijų nustatymo teisinis pagrindas	Aplinkosauginiai kriterijai Prekėms nustatomi vadovaujantis Aplinkos apsaugos kriterijų taikymo, vykdant žaliuosius pirkimus, tvarkos aprašo, patvirtinto Lietuvos Respublikos aplinkos ministro 2011 m. birželio 28 d. įsakymu Nr. D1-508 „Dėl Aplinkos apsaugos kriterijų taikymo, vykdant žaliuosius pirkimus, tvarkos aprašo patvirtinimo“ (toliau – Tvarkos aprašas) 4.4.4 papunkčiu. Nustačius, kad Tiekėjas šiame papunktyje nustatyto kriterijaus (-jų) nesilaiko, Tiekėjui taikoma Specialiųjų sąlygų 9.5 punkte nurodyto dydžio bauda.
13.2. Su perkamomis Prekėmis susiję socialiniai kriterijai	Netaikoma

14. BENDRŲJŲ SĄLYGŲ PAKEITIMAI IR PAPILDYMAI (jeigu būtina dėl konkretaus Sutarties dalyko specifikos)	
14.1.	(pildyti jei keičiamas Sutarties Bendrųjų sąlygų punktas, jį išdėstant nauja redakcija): Šalys susitaria pakeisti nurodytą Sutarties Bendrųjų sąlygų punktą ir išdėstyti jį nauja redakcija: ____.
14.2.	(pildyti jei papildomos Sutarties Bendrosios sąlygos naujomis nuostatomis): Šalys susitaria papildyti Sutarties Bendrąsias sąlygas nurodytu punktu, tačiau kitų punktų numeracijos nekeisti: _____.
14.3.	(pildyti jei išbraukiamas Sutarties Bendrųjų sąlygų atitinkamas punktas: Šalys susitaria išbraukti nurodytą Sutarties Bendrųjų sąlygų punktą, tačiau kitų punktų numeracijos nekeisti: _____.
14.4.	(pildyti jei nustatomos kitokios nei Sutarties Bendrosiose sąlygose nustatytos nuostatos dėl Prekių intelektinės nuosavybės):
14.5.	Sutarties Bendrosiose sąlygose nurodytos alternatyvios nuostatos (su prierašu „jei taikoma“ ir pan.) taikomos tik tokiu atveju, jeigu jos konkrečiai aprašomos Sutarties Specialiosiose sąlygose.
15. SUTARTIES PRIEDAI	
15.1. Priedas Nr. 1	**Techninė specifikacija**
15.2. Priedas Nr. 2	**Pasiūlymas**
15.3. Priedas Nr. 3	
15.4. Priedas Nr. 4	
15.5. Priedas Nr. 5	

16. ŠALIŲ ATSTOVŲ PARAŠAI	
PIRKĖJAS	**TIEKĖJAS**
Direktorė, Goda Aleksaitė	Direkrorius Žydrūnas Stanius
(parašas)	**(parašas)**

Suvestinė redakcija nuo 2025-05-01

Įsakymas paskelbtas: TAR 2024-02-09, i. k. 2024-02424

VIEŠŲJŲ PIRKIMŲ TARNYBOS
DIREKTORIUS

ĮSAKYMAS
DĖL PREKIŲ VIEŠOJO PIRKIMO–PARDAVIMO SUTARTIES TIPINIŲ SĄLYGŲ PATVIRTINIMO

2024 m. vasario 8 d. Nr. 1S-19
Vilnius

Vadovaudamasis Lietuvos Respublikos viešųjų pirkimų įstatymo 87 straipsnio 1 dalimi:

1. T v i r t i n u pridedamas Prekių viešojo pirkimo–pardavimo sutarties tipines sąlygas:

1.1. Prekių pirkimo–pardavimo sutarties bendrąsias sąlygas;

1.2. Prekių pirkimo–pardavimo sutarties specialiąsias sąlygas.

2. N u s t a t a u, kad:

2.1. Atliekant viešuosius pirkimus neskelbiamų derybų būdu, viešuosius pirkimus, nurodytus Viešųjų pirkimų įstatymo 87 straipsnio 5 dalyje, ir mažos vertės viešuosius pirkimus, šiuo įsakymu patvirtintos Prekių viešojo pirkimo–pardavimo sutarties tipinės sąlygos yra rekomendacinės.

Papunkčio pakeitimai:
Nr. 1S-30, 2024-02-29, paskelbta TAR 2024-02-29, i. k. 2024-03752

2.2. Šiuo įsakymu patvirtintos Prekių viešojo pirkimo–pardavimo sutarties tipinės sąlygos yra taikomos viešojo pirkimo procedūroms, pradėtoms vykdyti nuo 2024 m. kovo 1 d., išskyrus atnaujinto varžymosi procedūras, vykdomas sudarytų preliminariųjų viešojo pirkimo–pardavimo sutarčių pagrindu, bei pirkimo procedūras, vykdomas iki šio įsakymo įsigaliojimo dienos sukurtose dinaminėse pirkimo sistemose.

Direktorius Darius Vedrickas

PATVIRTINTA
Viešųjų pirkimų tarnybos direktoriaus
2024 m. vasario 8 d. įsakymu Nr. 1S-19
(Viešųjų pirkimų tarnybos direktoriaus
2025 m. balandžio 17 d. įsakymo Nr. 1S-51
redakcija)

PREKIŲ PIRKIMO–PARDAVIMO SUTARTIES BENDROSIOS SĄLYGOS

1. PAGRINDINĖS SĄVOKOS IR SUTARTIES AIŠKINIMAS

1.1. Sąvokos

1.1.1. Šioje Sutartyje didžiąja raide rašomos sąvokos turi paskiau nurodytas reikšmes:
1.1.1.1. **Bendrosios sąlygos** – Sutarties dalis, kuri vadinasi „Prekių pirkimo–pardavimo sutarties Bendrosios sąlygos“;
1.1.1.2. **Pirkėjas** – asmuo, kuris Specialiosiose sąlygose yra įvardytas kaip Pirkėjas, įsigyjantis Specialiosiose sąlygose ir Sutarties prieduose nurodytas Prekes;
1.1.1.3. **Pradinės sutarties vertė** – Specialiosiose sąlygose nurodyta vertė be pridėtinės vertės mokesčio (toliau – PVM);
1.1.1.4. **Prekės** – Specialiosiose sąlygose ir Sutarties prieduose nurodytos prekės (prekių pirkimas, nuoma, finansinė nuoma (lizingas), pirkimas išsimokėtinai, numatant jas įsigyti ar to nenumatant), taip pat įsigyjamų prekių pristatymo, montavimo, diegimo ir kitos jų parengimo naudoti paslaugos (toliau – su Prekėmis susijusios paslaugos), jeigu šios paslaugos tik papildo prekių tiekimą, kurias Tiekėjas įsipareigoja tiekti Pirkėjui pagal Sutartį ir galiojančių įstatymų bei kitų teisės aktų reikalavimus;
1.1.1.5. **Prekių perdavimo–priėmimo aktas** – dokumentas, kuriuo Tiekėjas perduoda, o Pirkėjas priima Prekes ir kuriuo Šalys patvirtina, kad pristatytos Prekės atitinka nustatytus reikalavimus. Jeigu Sutartyje yra numatytas Prekių pristatymas dalimis, Prekių perdavimo–priėmimo aktas gali būti sudaromas dėl kiekvienos dalies atskirai;
1.1.1.6. **Prekių trūkumai** – Prekių perdavimo–priėmimo metu ar Prekių garantinio termino galiojimo metu Pirkėjo, ar (ir) trečiųjų asmenų nustatyti Prekių kokybės neatitikimai Sutarties ar (ir) įstatymų bei kitų teisės aktų reikalavimams, Prekių gedimai, paslėpti defektai, veiklos sutrikimai ar pan., dėl kurių Prekių nebūtų galima naudoti tam tikslui, kuriam Pirkėjas (jas) ketino naudoti, arba dėl kurių Prekių naudingumas sumažėtų taip, kad Pirkėjas, apie tuos trūkumus žinodamas, arba apskritai nebūtų tų Prekių pirkęs, arba nebūtų už Prekes mokėjęs tokio dydžio kainą;
1.1.1.7. **Sąskaita** – Tiekėjo išrašoma ir Pirkėjui apmokėjimui pateikiama sąskaita faktūra, PVM sąskaita faktūra ar kitas mokėjimo dokumentas už Tiekėjo perduotas bei Pirkėjo priimtas Prekes. Jeigu Sutartyje yra numatytas Prekių pristatymas dalimis, Sąskaita gali būti pateikiama dėl kiekvienos dalies atskirai;
1.1.1.8. **Specialiosios sąlygos** – Sutarties dalis, kuri vadinasi „Prekių pirkimo-pardavimo sutarties Specialiosios sąlygos“ ir kurioje yra nurodytos konkretaus pirkimo objekto įsigijimą aptariančios sąlygos (tokios kaip Pradinės sutarties vertė, Prekių tiekimo terminai ir pan.) bei kiti konkretūs

duomenys (tokie kaip Šalys, Prekės ir pan.), išvardyti priedai, taip pat nurodyti Bendrųjų sąlygų pakeitimai ir papildymai (jeigu tokie padaryti);
1.1.1.9. **Susitarimas** – tai dokumentas, kurį Šalys sudaro keisdamos Sutarties sąlygas VPĮ leidžiama apimtimi;
1.1.1.10. **Sutarties kaina** – pagal Sutartį Tiekėjui mokėtina suma, įskaitant visus privalomus mokesčius ir išlaidas;
1.1.1.11. **Sutarties sąlygos** – Bendrosios sąlygos ir Specialiosios sąlygos kartu;
1.1.1.12. **Sutartis** – Prekių pirkimo–pardavimo sutartis, kurią sudaro Sutarties sąlygos, Specialiosiose sąlygose išvardyti priedai ir Susitarimai;
1.1.1.13. **Šalis** – Pirkėjas arba Tiekėjas, kiekvienas atskirai, priklausomai nuo konteksto;
1.1.1.14. **Šalys** – Pirkėjas ir Tiekėjas kartu;
1.1.1.15. **Tiekėjas** – asmuo, kuris Specialiosiose sąlygose yra įvardytas kaip Tiekėjas, tiekiantis Specialiosiose sąlygose nurodytas Prekes;
1.1.1.16. **VPĮ** – Lietuvos Respublikos viešųjų pirkimų įstatymas.
1.1.1.17. Kitų Sutartyje didžiąja raide rašomų sąvokų reikšmės yra nurodytos Sutarties tekste.
1.1.1.18. Sutartyje neapibrėžtos sąvokos suprantamos ir aiškinamos taip, kaip jas apibrėžia VPĮ ir kiti įstatymai bei teisės aktai, galiojantys Sutarties sudarymo ir vykdymo metu.
1.1.1.19. Kitos Sutartyje vartojamos sąvokos ir terminai turi bendrinę reikšmę arba artimiausią Sutarties pobūdžiui specialiąją reikšmę, jei Sutartyje nėra nustatyta ir paaiškinta kitokia jų reikšmė.

1.2. Sutarties aiškinimas

1.2.1. Sutartis yra sudaryta ir turi būti aiškinama pagal Lietuvos Respublikos teisės aktus.
1.2.2. Jei Bendrosios sąlygos ir (ar) Specialiosios sąlygos prieštarauja VPĮ ir kitų teisės aktų reikalavimams, taikomos VPĮ ir kitų teisės aktų nuostatos.
1.2.3. Diena Sutartyje reiškia kalendorinę dieną.
1.2.4. Darbo diena Sutartyje reiškia bet kurią dieną, išskyrus šeštadienį, sekmadienį ir švenčių dienas Lietuvoje, nurodytas Lietuvos Respublikos darbo kodekse.
1.2.5. Terminai pagal Sutartį yra skaičiuojami metais, mėnesiais, savaitėmis, darbo dienomis, kalendorinėmis dienomis ir valandomis ir minutėmis.
1.2.6. Kvalifikacija, rėmimasis kitų ūkio subjektų pajėgumais, Prekių apimtis, peržiūra suprantami taip, kaip nustatyta VPĮ bei jį įgyvendinančiuose teisės aktuose.
1.2.7. Jeigu Prekių perdavimo–priėmimo akto, kaip atskiro dokumento, reikalauti neprivaloma, Šalys susitaria, ir tai aiškiai nurodo Specialiosiose sąlygose, Prekių perdavimo–priėmimo aktu laikoma Sąskaita. Tais atvejais, kai išrašoma Sąskaita ir Prekių perdavimo–priėmimo aktas nepasirašomas, Sutarties nuostatos dėl Prekių perdavimo–priėmimo akto išrašymo taikomos ir Sąskaitos išrašymui.
1.2.8. Informuoti, pranešti, įspėti arba atsakyti reiškia pateikti informaciją, pranešimą, įspėjimą arba atsakymą Bendrosiose ir (ar) Specialiosiose sąlygose nustatyta tvarka.
1.2.9. Patvirtinti reiškia pateikti patvirtinimą raštu arba pasirašyti dokumentą be išlygų ar su išlygomis, išskyrus atvejus, kai asmuo, pasirašydamas dokumentą, nurodo, jog atsisako jį patvirtinti.
1.2.10. Jeigu Sutartyje nenurodyta kitaip, žodžiai, vartojami vienaskaitos forma taip pat reiškia ir daugiskaitą ir atvirkščiai, vienos giminės žodžiai apima ir kitos giminės atitinkamus žodžius, žodis asmuo reiškia tiek fizinius, tiek ir juridinius asmenis.

1.2.11. Jeigu Sutartyje nurodyta reikšmė skaičiais ir žodžiais skiriasi, vadovaujamasi žodžiais nurodyta reikšme.
1.2.12. Jei pateikiamos nuorodos į teisės aktus, turi būti taikomos aktualios teisės aktų redakcijos, jeigu nenurodyta kitaip.

1.3. Dokumentų viršenybė

1.3.1. Sutartį sudarantys dokumentai turi būti suprantami kaip papildantys vienas kitą. Bet kokio Sutarties dokumentų sąlygų neatitikimo ar neaiškumo atveju, toks neatitikimas ar neaiškumas pašalinamas dokumentus aiškinant tokia eilės tvarka:
1.3.1.1. Techninė specifikacija;
1.3.1.2. Specialiosios sąlygos;
1.3.1.3. Bendrosios sąlygos;
1.3.1.4. Pirkimo dokumentai (išskyrus techninę specifikaciją);
1.3.1.5. Pasiūlymas;
1.3.1.6. Kiti Specialiosiose sąlygose išvardinti priedai.
1.3.2. Tuo atveju, kai Šalių Susitarimu yra keičiamos Sutarties sąlygos, naujai sutartos Sutarties sąlygos turi viršenybę prieš pakeistąsias.
1.3.3. Jeigu Šalys susitaria dėl Sutarties sąlygų arba priedo papildymo nauja sąlyga, neatitikimo ar neaiškumo atveju tokia sąlyga turi viršenybę atitinkamai kitų Sutarties sąlygų arba kitų to priedo sąlygų atžvilgiu.
1.3.4. Jeigu Šalys susitaria dėl naujo priedo, Šalys turi sutarti dėl naujojo priedo įtraukimo į priedų sąrašą vietos ir jo reikšmės aiškinant Sutartį. Jeigu naujas priedas yra įterpiamas į priedų sąrašą, jam turi būti suteikiamas eilės numeris su viršutiniu indeksu, atsižvelgiant į priedų eiliškumą ir svarbą (pavyzdžiui, priedas Nr. 4^1).

2. SUTARTIES DALYKAS

2.1. Tiekėjas įsipareigoja Sutartyje nustatytomis sąlygomis ir tvarka perduoti Pirkėjui Prekes, atitinkančias Sutartyje nustatytus reikalavimus, o Pirkėjas įsipareigoja priimti Sutarties sąlygas atitinkančias ir tinkamai patiektas Prekes bei sumokėti Tiekėjui Sutartyje nurodytą kainą Sutartyje nustatytomis sąlygomis ir tvarka.
2.2. Šalys, vykdydamos Sutartį, įsipareigoja laikytis visų Sutarties vykdymui taikytinų įstatymų bei kitų teisės aktų reikalavimų. Šalis turi teisę reikalauti, kad kita Šalis įvykdytų visus įstatymų bei kitų teisės aktų reikalavimus, taikomus Sutarties vykdymui. Nė viena iš Sutarties sąlygų nereiškia ir negali būti aiškinama kaip Pirkėjo atsisakymas įstatymuose bei kituose teisės aktuose numatytų ir Sutartimi neaptartų Pirkėjo kitų teisių ir garantijų, susijusių su netinkamu Prekių tiekimu ar jų kokybe, arba kaip Tiekėjo atsisakymas įstatymuose bei kituose teisės aktuose numatytų ir Sutartimi neaptartų Tiekėjo kitų teisių ir garantijų dėl atlyginimo už Prekes gavimo.
2.3. Tiekėjas privalo užtikrinti, kad Prekės atitiktų techninės specifikacijos reikalavimus ir Tiekėjo pasiūlymo sąlygas, būtų kokybiškos, tiekiamos tinkamai ir laiku, laikantis Sutarties sąlygų taip, kad tai labiausiai atitiktų Pirkėjo interesus, pagal geriausius visuotinai pripažįstamus profesinius, techninius standartus ir praktiką, panaudodamas visus reikiamus įgūdžius ir žinias.

3. TIEKĖJAS IR KITI SUTARTIES VYKDYMUI PASITELKIAMI ASMENYS

3.1. Kvalifikacija ir kiti Tiekėjo pasiūlymu prisiimti įsipareigojimai

3.1.1. Tiekėjas atsako už tai, kad visą Sutarties vykdymo laikotarpį Tiekėjas būtų kompetentingas, patikimas ir pajėgus (įskaitant ūkio subjektų, kurių pajėgumais remiasi Tiekėjas, pajėgumus) įvykdyti Sutarties reikalavimus:
3.1.1.1. turėtų teisę verstis ta veikla, kuri yra reikalinga Sutarčiai įvykdyti. Pirkėjui pareikalavus, Tiekėjas turi pateikti dokumentus, įrodančius, kad Sutartį vykdo tik tokią teisę turintys asmenys;
3.1.1.2. atitiktų tiekėjų kvalifikacijai pirkimo dokumentuose nustatytus reikalavimus bei neturėtų pirkimo dokumentuose nustatytų pašalinimo pagrindų;
3.1.1.3. laikytųsi Tiekėjo pasiūlyme nurodytų įsipareigojimų, įskaitant, bet neapsiribojant – atitiktų pasiūlyme nurodytų kriterijų, dėl kurių jo pasiūlymas buvo išrinktas ekonomiškai naudingiausiu (toliau – **Kokybiniai kriterijai**), reikšmes ir parametrus. Šiame papunktyje nurodytų įsipareigojimų laikymosi tikrinimo tvarka nustatoma Specialiosiose sąlygose;
3.1.1.4. užtikrintų nustatytų kokybės vadybos sistemos ir (arba) aplinkos apsaugos vadybos sistemos standartų taikymą, jeigu to reikalaujama pirkimo dokumentuose, ir turėtų tą patvirtinančius dokumentus;
3.1.1.5. atitiktų nacionalinio saugumo interesus bei nebūtų registruotas (nuolat gyvenantis ar turintis pilietybę) nepatikimomis laikomose valstybėse ar teritorijose, jei tokie reikalavimai buvo numatyti pirkimo dokumentuose.
3.1.2. Tuo atveju, kai Tiekėjas yra jungtinės veiklos sutarties pagrindu veikianti tiekėjų grupė, jos nariai Pirkėjui už Sutarties vykdymą atsako solidariai. Jeigu Tiekėjas remiasi ūkio subjektų pajėgumais, siekdamas atitikti finansinio ir ekonominio pajėgumo reikalavimus, Tiekėjas su tokiais ūkio subjektais už Sutarties vykdymą atsako solidariai (jeigu to buvo reikalaujama pirkimo dokumentuose).
3.1.3. Tiekėjas taip pat atsako už tai, kad Tiekėjas, Sutartį tiesiogiai vykdantys subtiekėjai ir specialistai atitiktų jiems įstatymų bei kitų teisės aktų ir (arba) pirkimo dokumentų nustatytus profesinės kvalifikacijos ir kitus reikalavimus bei turėtų teisę verstis ta veikla, kuriai jie pasitelkiami.

3.2. Subtiekėjų bei specialistų pasitelkimas ir keitimas

3.2.1. Tiekėjas įsipareigoja užtikrinti, kad Sutartį vykdys pirkime pasiūlyti ir kvalifikacijos bei kitus pirkimo dokumentuose nustatytus reikalavimus atitinkantys subtiekėjai ir (ar) specialistai. Šių asmenų veiksmai vykdant Sutartį Tiekėjui sukelia tokias pačias pasekmes ir atsakomybę, kaip jo paties veiksmai. Tiekėjas atsako už savo subtiekėjų ir specialistų veiksmus ar neveikimą.
3.2.2. Sutarties vykdymui pasitelkiami subtiekėjai ir (ar) specialistai (jeigu tokie pasitelkiami) nurodomi Specialiosiose sąlygose.
3.2.3. Tiekėjas gali keisti ir (ar) pasitelkti subtiekėjus ir (ar) specialistus šiame Sutarties poskyryje nustatytais atvejais ir tvarka.
3.2.4. Naujas subtiekėjas ar specialistas gali pradėti vykdyti jiems Tiekėjo pavestus įsipareigojimus pagal Sutartį ne anksčiau, nei bus pasirašytas Susitarimas.
3.2.5. Jei Tiekėjas pasitelkia naują subtiekėją arba pakeičia esamą subtiekėją ir (ar) specialistą, negavęs Pirkėjo raštiško sutikimo, arba sutartinius įsipareigojimus pagal Sutartį vykdo subtiekėjai ir (ar) specialistai, neatitinkantys pirkimo dokumentuose nustatytų kvalifikacijos reikalavimų, kokybės vadybos sistemos ir (arba) aplinkos apsaugos vadybos sistemos standartų reikalavimų,

reikalavimų dėl pašalinimo pagrindų nebuvimo, atitikties nacionalinio saugumo interesams bei reikalavimams nebūti registruotu (nuolat gyvenančiu ar turinčiu pilietybę) nepatikimomis laikomose valstybėse ar teritorijose (jei taikoma) ir Tiekėjo pasiūlyme nurodytų sąlygų pirkimo dokumentuose nustatytiems Kokybiniams kriterijams pagrįsti (jei taikoma), Tiekėjui taikoma Specialiosiose sąlygose nustatyto dydžio bauda.

3.2.6. Tiekėjas turi teisę Sutarties vykdymui pasitelkti naujus, Specialiosiose sąlygose nenurodytus subtiekėjus, kurių pajėgumais Tiekėjas nesirėmė pirkimo dokumentuose numatytiems kvalifikacijos reikalavimams pagrįsti.

3.2.7. Sudarius Sutartį, tačiau ne vėliau negu Sutartis pradedama vykdyti, Tiekėjas įsipareigoja Pirkėjui pranešti tuo metu žinomų subtiekėjų, kurių pajėgumais Tiekėjas nesirėmė pirkimo dokumentuose numatytiems kvalifikacijos reikalavimams pagrįsti, pavadinimus, juridinio asmens kodą, kontaktinius duomenis, jų atstovus.

3.2.8. Tiekėjas, bet kuriuo Sutarties vykdymo metu, subtiekėjus, kurių pajėgumais Tiekėjas nesirėmė pirkimo dokumentuose numatytiems kvalifikacijos reikalavimams pagrįsti, gali keisti savo nuožiūra.

3.2.9. Tiekėjas, bet kuriuo Sutarties vykdymo metu, ne vėliau nei prieš 5 (penkias) darbo dienas iki numatomo naujo subtiekėjo, kurio pajėgumais Tiekėjas nesirėmė pirkimo dokumentuose numatytiems kvalifikacijos reikalavimams pagrįsti, pasitelkimo ir (arba) keitimo apie tai privalo informuoti Pirkėją. Pirkėjas (jeigu buvo taikoma pirkimo dokumentuose) turi patikrinti, ar nėra subtiekėjo pašalinimo pagrindų ir subtiekėjo atitiktį nacionalinio saugumo interesams ir reikalavimams nebūti registruotu (nuolat gyvenančiu ar turinčiu pilietybę) nepatikimomis laikomose valstybėse ar teritorijose. Jeigu subtiekėjo padėtis neatitinka bent vieno iš nurodytų reikalavimų, Pirkėjas reikalauja pakeisti šį subtiekėją reikalavimus atitinkančiu subtiekėju. Pirkėjas per 5 (penkias) darbo dienas raštu informuoja Tiekėją apie sutikimą pasitelkti ir (ar) keisti naują subtiekėją, kurio pajėgumais Tiekėjas nesirėmė pirkimo dokumentuose numatytiems kvalifikacijos reikalavimams pagrįsti. Pirkėjui sutikus, Šalys pasirašo Susitarimą, kuris laikomas neatsiejama Sutarties dalimi.

3.2.10. Subtiekėjai, kurių pajėgumais Tiekėjas rėmėsi, kad atitiktų pirkimo dokumentuose nustatytus kvalifikacijos reikalavimus, gali būti keičiami tik šiais atvejais:

3.2.10.1. kai subtiekėjui iškelta bankroto byla, pradėtas bankroto procesas ne teismo tvarka, jis tampa nemokus arba yra nemokumo tikimybė, sustabdo ūkinę veiklą ar kai įstatymuose ir kituose teisės aktuose nustatyta tvarka susidaro analogiška situacija;

3.2.10.2. kai subtiekėjas dėl objektyvių priežasčių (pavyzdžiui, subtiekėjui atsisakius dalyvauti Sutarties vykdyme, nutrūkus teisiniams santykiams su Tiekėju ir pan.) nebegali vykdyti visų ar dalies Sutartyje numatytų įsipareigojimų;

3.2.10.3. Tiekėjas ar subtiekėjas privalo pakeisti subtiekėją, jei paaiškėja, kad jis neatitinka jam pirkimo dokumentuose keliamų reikalavimų.

3.2.11. Tiekėjo (ar subtiekėjų) specialistai, vykdantys Sutartį, gali būti keičiami šiais atvejais:

3.2.11.1. Tiekėjo iniciatyva dėl objektyvių priežasčių (pavyzdžiui, atostogų, ligos, nutrūkus darbo santykiams ir pan.), pateikus duomenis apie numatomą naujai skirti specialistą bei jo kvalifikaciją ir atitiktį kitiems pirkimo dokumentuose keliamiems reikalavimams patvirtinančius dokumentus;

3.2.11.2. Pirkėjo iniciatyva, jei Pirkėjas turi pagrįstų įtarimų, kad Tiekėjo Sutarties vykdymui paskirtas specialistas nekompetentingas vykdyti nustatytas pareigas;

3.2.11.3. Tiekėjas ar subtiekėjas privalo pakeisti specialistą, jei paaiškėja, kad jis neatitinka jam pirkimo dokumentuose keliamų reikalavimų.

3.2.12. Naujas specialistas ir (ar) subtiekėjas Tiekėjo prašymo pakeisti specialistą ir (ar) subtiekėją

pateikimo metu turi atitikti pirkimo dokumentuose specialistui ir (ar) subtiekėjui keliamus reikalavimusir Tiekėjo pasiūlyme nurodytas Kokybinių kriterijų reikšmes.
3.2.13. Tiekėjas privalo ne vėliau nei prieš 5 (penkias) darbo dienas iki numatomo subtiekėjo, kurio pajėgumais Tiekėjas rėmėsi, kad atitiktų pirkimo dokumentuose nustatytus kvalifikacijos reikalavimus, ir (ar) specialisto keitimo pateikti Pirkėjui šiuos dokumentus:
3.2.13.1. argumentuotą rašytinį prašymą pakeisti subtiekėją ir (ar) specialistą, paaiškinant keitimo aplinkybę. Pirkėjas pasilieka teisę paprašyti įrodymų, pagrindžiančių keitimo aplinkybę;
3.2.13.2. naujo subtiekėjo ir (ar) specialisto kvalifikaciją, atitiktį Kokybiniams kriterijams (jei taikoma), reikalaujamiems kokybės vadybos sistemos ir (arba) aplinkos apsaugos vadybos sistemos standartams (jei taikoma), pašalinimo pagrindų nebuvimą ir atitiktį nacionalinio saugumo interesams bei reikalavimams nebūti registruotu (nuolat gyvenančiu ar turinčiu pilietybę) nepatikimomis laikomose valstybėse ar teritorijose (jei taikoma) įrodančius dokumentus pagal Sutarties reikalavimus.
3.2.14. Pirkėjas, gavęs Tiekėjo prašymą su kitais Sutartyje nurodytais dokumentais, per 5 (penkias) darbo dienas įvertina keitimo galimybę ir raštu informuoja Tiekėją apie sutikimą pakeisti subtiekėją, kurio pajėgumais Tiekėjas rėmėsi, kad atitiktų pirkimo dokumentuose nustatytus kvalifikacijos reikalavimus, ir (ar) specialistą. Pirkėjui sutikus, Šalys pasirašo Susitarimą, kuris laikomas neatsiejama Sutarties dalimi.

3.3. Jungtinės veiklos partnerių keitimas

3.3.1. Tiekėjas, vykdantis Sutartį kaip tiekėjų grupė, veikianti jungtinės veiklos sutarties pagrindu, turi teisę atsisakyti jungtinės veiklos partnerio (toliau – Partneris), jei dėl objektyvių ir pagrįstų aplinkybių Partneris nebegali vykdyti Sutarties, įskaitant, bet neapsiribojant atvejais, kai Partneris neatitinka VPĮ ar kitų teisės aktų nuostatų, kelia grėsmę nacionaliniam saugumui, Partneriui pritaikytos tarptautinės sankcijos kaip jos suprantamos Lietuvos Respublikos tarptautinių sankcijų įstatyme (toliau – Sankcijų įstatymas), Partnerio sunki finansinė būklė, lemianti Sutarties nevykdymą ir (ar) atsisakymą ją vykdyti ar atsirado kitos nenumatytos objektyvios priežastys, lemiančios Partnerio pasitraukimą iš jungtinės veiklos sutarties.
3.3.2. Tiekėjas, vykdantis Sutartį kaip tiekėjų grupė, turi teisę pakeisti Partnerį, jei dėl reorganizavimo, restruktūrizavimo ar bankroto procedūrų, pradinio Partnerio teises ir pareigas visiškai arba iš dalies perima kitas Partneris. Toks Partnerio pakeitimas negali lemti kitų esminių Sutarties pakeitimų ir taip negali būti siekiama išvengti VPĮ ir kitų teisės aktų taikymo.
3.3.3. Tiekėjas privalo ne vėliau nei prieš 10 (dešimt) darbo dienų iki numatomo Partnerio keitimo arba atsisakymo pateikti Pirkėjui šiuos dokumentus:
3.3.3.1. argumentuotą prašymą pakeisti Tiekėjo sudėtį ir įrodymus, pagrindžiančius bent vieną Partnerio atsisakymo ar keitimo aplinkybę, nurodytą Sutartyje;
3.3.3.2. naujos jungtinės veiklos sutarties ar esamos jungtinės veiklos sutarties pakeitimo projektą, kuriame, jeigu Partneris pasitraukia, turi būti nurodyta, kad pasitraukiančiojo Partnerio įsipareigojimus visa apimtimi perima pasiliekantysis Partneris ir (ar) naujai pasitelktas Partneris;
3.3.3.3. pasiliekančiojo ar naujai pasitelkiamo Partnerio kvalifikaciją patvirtinančius dokumentus. Visais atvejais pasiliekančiojo Partnerio ar naujai pasitelkto Partnerio kvalifikacija turi būti ne žemesnė nei pasitraukiančiojo Partnerio (atitinkanti pirkimo dokumentuose nustatytus kvalifikacijos reikalavimus, kuriuos atitiko pasitraukiantysis Partneris, ir atitinkanti pasitraukiančiojo Partnerio pasiūlyme nurodytą specialistų kvalifikaciją ir kitas sąlygas pirkimo dokumentuose nustatytiems Kokybiniams kriterijams pagrįsti (jei taikoma). Jei pasitelkiamas

naujas Partneris, taip pat, vadovaujantis pirkimo dokumentuose nurodytais reikalavimais, pateikiami dokumentai, pagrindžiantys pasitelkiamo Partnerio pašalinimo pagrindų nebuvimą ir atitiktį nacionalinio saugumo interesams bei reikalavimams nebūti registruotu (nuolat gyvenančiu ar turinčiu pilietybę) nepatikimomis laikomose valstybėse ar teritorijose (jei taikoma).
3.3.4. Pirkėjas, gavęs Tiekėjo prašymą su kitais Sutartyje nurodytais dokumentais, per 10 (dešimt) darbo dienų įvertina keitimo galimybes ir raštu informuoja Tiekėją apie sutikimą arba apie nesutikimą atsisakyti ar pakeisti Partnerį. Pirkėjui sutikus, Šalys pasirašo Susitarimą, kuris laikomas neatsiejama Sutarties dalimi. Prieš Susitarimo pasirašymą, Pirkėjui pateikiama naujos jungtinės veiklos sutarties ar esamos jungtinės veiklos sutarties pakeitimo kopija arba nuorašas.

3.4. Susitarimai dėl tiesioginio atsiskaitymo su subtiekėjais

3.4.1. Subtiekėjams pageidaujant, Pirkėjas su jais atsiskaitys tiesiogiai. Pirkėjas numato tiesioginio atsiskaitymo galimybę su Sutartyje nurodytais subtiekėjais tokiomis sąlygomis ir tvarka:
3.4.1.1. sudarius Sutartį, Tiekėjas ne vėliau negu Sutartis pradedama vykdyti, įsipareigoja Pirkėjui raštu pateikti tuo metu žinomų subtiekėjų pavadinimus, atstovus ir jų kontaktinius duomenis. Pirkėjas taip pat reikalauja, kad Tiekėjas informuotų apie minėtos informacijos pasikeitimus bei naujų subtiekėjų pasitelkimą visu Sutarties vykdymo metu;
3.4.1.2. Pirkėjas ne vėliau kaip per 3 (tris) darbo dienas nuo Bendrųjų sąlygų 3.4.1.1 papunktyje nurodytos informacijos gavimo dienos raštu informuoja subtiekėjus apie tiesioginio atsiskaitymo galimybę;
3.4.1.3. subtiekėjas, norėdamas pasinaudoti tokia galimybe, raštu pateikia prašymą Pirkėjui. Kai subtiekėjas išreiškia norą pasinaudoti tiesioginio atsiskaitymo galimybe, sudaroma trišalė sutartis tarp Pirkėjo, Tiekėjo ir šio subtiekėjo, kurioje aprašoma tiesioginio atsiskaitymo su subtiekėju tvarka, atsižvelgiant į Sutartyje ir subtiekimo sutartyje nustatytus reikalavimus;
3.4.1.4. tiesioginio atsiskaitymo su subtiekėjais galimybė nekeičia Tiekėjo atsakomybės dėl Sutarties įvykdymo.

4. ŠALIŲ BENDRADARBIAVIMAS

4.1. Šalių bendradarbiavimo pareiga

4.1.1. Vykdydamos Sutartį, Šalys privalo maksimaliai bendradarbiauti ir operatyviai keistis informacija, taip pat pateikti viena kitai rašytinius pranešimus nedelsiant apie tai, kad atsirado ar egzistuoja bet koks įvykis, sąlyga ar aplinkybė, kuri gali paveikti Sutarties vykdymą ar sąlygoti jos pažeidimą.
4.1.2. Šalys įsipareigoja užtikrinti, kad viena kitai teiks dokumentus ir (ar) kitą informaciją, kurie yra būtini Šalių tinkamam įsipareigojimų įvykdymui pagal Sutartį.
4.1.3. Jeigu Šalis susiduria su Sutarties vykdymo kliūtimi, ji turi nedelsdama, bet ne vėliau kaip per 5 (penkias) darbo dienas, įspėti kitą Šalį apie tokias kliūtis ir imtis visų nuo jos priklausančių protingų priemonių toms kliūtims pašalinti.

4.2. Kontaktiniai asmenys

4.2.1. Kiekviena iš Šalių Sutarties sudarymo metu privalo paskirti kontaktinį asmenį, atsakingą už Sutarties vykdymą (pavyzdžiui, Prekių priėmimą, užsakymų teikimą ir gavimą ir kt.), ir nurodyti jų kontaktinius duomenis Specialiosiose sąlygose.
4.2.2. Tuo atveju, kai Šalis nori atšaukti paskirtąjį kontaktinį asmenį ir paskirti kitą asmenį arba nori paskirti kitą asmenį laikinai vykdyti kontaktinio asmens funkcijas kontaktinio asmens laikino negalėjimo vykdyti savo funkcijas laikotarpiu, Šalis privalo iš anksto apie tai informuoti kitą Šalį ir pateikti kitai Šaliai tokio asmens kontaktinius duomenis: vardą, pavardę, el. paštą ir telefono numerį.
4.2.3. Tuo atveju, kai paaiškėja, kad Šalies kontaktinis asmuo laikinai negali vykdyti savo pareigų (dėl ligos, traumos ar kitų nenumatytų priežasčių), Šalis privalo nedelsdama, bet ne vėliau nei kitą darbo dieną, paskirti kitą kontaktinį asmenį laikinai vykdyti kontaktinio asmens funkcijas ir pranešti apie tai kitai Šaliai. Keičiant kontaktinių asmenų funkcijas atliekančius asmenis Susitarimas, vadovaujantis Bendrųjų sąlygų 20.5 punktu, nesudaromas.

5. SUTARTIES VYKDYMO METU PATEIKIAMI DOKUMENTAI

5.1. Jeigu Tiekėjas turi parengti ir (ar) pateikti Pirkėjui Prekių naudojimo instrukcijas, jos turi būti aiškios ir detalios, kad Pirkėjas, vadovaudamasis jomis, galėtų tinkamai naudoti patiektas Prekes.
5.2. Tuo atveju, kai pagal Sutartį turi būti vykdomi mokymai ir (arba) atliekami bandymai, Tiekėjas privalo perduoti Pirkėjui naudojimo instrukcijas prieš tokius mokymus ir (arba) bandymus, o po mokymų ir (arba) bandymų patikslinti ir papildyti naudojimo instrukcijas, atsižvelgdamas į mokymų ir (arba) bandymų eigą ir rezultatus.
5.3. Jei Prekių naudojimui būtiniems dokumentams reikalingas vertimas, su tuo susijusios išlaidos tenka Tiekėjui. Jei Tiekėjas Prekių naudojimui būtinus dokumentus verčia savarankiškai, jis atsako už šių dokumentų vertimo tikslumą.

6. PREKIŲ TIEKIMO PABAIGA IR PREKIŲ PRIĖMIMAS

6.1. Prekių tiekimo pabaiga

6.1.1. Prekių tiekimas laikomas užbaigtu, kai yra įvykdytos visos šios sąlygos:
6.1.1.1. Tiekėjas pristatė visas Prekes pagal Sutarties ir įstatymų bei kitų teisės aktų reikalavimus (ir kai suteiktos visos su Prekėmis susijusios paslaugos, jei to reikalaujama);
6.1.1.2. Tiekėjas perdavė Pirkėjui visą reikalingą dokumentaciją, įskaitant naudojimo instrukcijas, sertifikatus ir garantijas (jei to reikalaujama);
6.1.1.3. Tiekėjas apmokė Pirkėjo personalą, kaip naudoti Prekes (jeigu to reikalaujama);
6.1.1.4. buvo pasirašytas Prekių perdavimo-priėmimo aktas ar Prekių perdavimo–priėmimo aktai, jei numatytas Prekių pristatymas dalimis, ar kitas Sutartyje numatytas dokumentas, nuo kurio pasirašymo laikoma, kad Prekės buvo priimtos;
6.1.1.5. Tiekėjas įvykdė kitas sąlygas, numatytas įstatymuose bei kituose teisės aktuose, Sutartyje ir pasiūlyme, kurios turi būti įvykdytos tam, kad būtų laikoma, jog Prekių tiekimas yra užbaigtas, ir pateikė Pirkėjui tai įrodančius dokumentus.

6.2. Prekių perdavimas–priėmimas

6.2.1. Tiekėjas privalo pristatyti ir perduoti Prekes Pirkėjui, o Pirkėjas privalo kokybiškas ir Sutarties bei įstatymų ir kitų teisės aktų reikalavimus atitinkančias Prekes priimti. Prekės pristatomos Specialiosiose sąlygose nurodytais terminais ir adresu, pristatymą iš anksto suderinus su Pirkėju.
6.2.2. Prekės perduodamos Šalims pasirašant Prekių perdavimo–priėmimo aktą, kuris pasirašomas 2 (dviem) vienodą teisinę galią turinčiais egzemplioriais (išskyrus atvejus, kai Prekių perdavimo–priėmimo aktas pasirašomas saugiu elektroniniu parašu), po vieną kiekvienai Šaliai. Jeigu Prekių perdavimo–priėmimo akto, kaip atskiro dokumento, reikalauti neprivaloma, Šalys susitaria, ir tai aiškiai nurodo Specialiosiose sąlygose, jog Prekių perdavimo–priėmimo aktu laikoma Sąskaita.
6.2.3. Tiekėjui pristačius Prekes, Pirkėjas atlieka jų patikrinimą ir privalo:
6.2.3.1. ne vėliau kaip per 5 (penkias) darbo dienas nuo faktinio Prekių perdavimo priimti Prekes, pasirašydamas Prekių perdavimo–priėmimo aktą; arba
6.2.3.2. priimti Prekes su išlygomis, pasirašydamas Prekių perdavimo–priėmimo aktą ir Prekių patikrinimo metu sudarytą defektų aktą, kuriame Pirkėjas privalo nurodyti per Prekių priėmimą pastebėtus Prekių ar pateikiamų Tiekėjo dokumentų trūkumus ir tų trūkumų pašalinimo tvarką (toliau – **Defektų aktas**); arba
6.2.3.3. atsisakyti priimti Prekes ar jų dalį ir įteikti (arba išsiųsti) Defektų aktą Tiekėjui dėl netinkamų Prekių ar jų dalies.
6.2.4. Prekių perdavimo–priėmimo akte turi būti nurodoma data, kada Tiekėjas pristatė visas Prekes (ar atitinkamą jų dalį, kai Sutartyje numatytas pristatymas dalimis) ir pateikė visus reikiamus dokumentus.
6.2.5. Prekes, neatitinkančias Sutarties, įstatymų bei kitų teisės aktų (jei taikoma) reikalavimų, Tiekėjas privalo atsiimti savo sąskaita per Pirkėjo Defektų akte nustatytą terminą, taip pat Pirkėjo reikalavimu atlyginti tokių Prekių saugojimo išlaidas.
6.2.6. Jeigu nustatoma Prekių trūkumų, kurie nereiškia neatitikimo Sutartyje nustatytiems reikalavimams, ir jų pašalinimas netrukdo Pirkėjui naudotis Prekėmis pagal paskirtį, Pirkėjas gali priimti Prekes su išlygomis, sudaryti Defektų aktą ir nustatyti protingus terminus Tiekėjui pašalinti Prekių trūkumus. Tiekėjas privalo pašalinti Prekių trūkumus per Pirkėjo nurodytus protingus terminus, vadovaudamasis Bendrųjų sąlygų 7.3 poskyriu „Prekių trūkumų šalinimas“. Jeigu Tiekėjas praleidžia Prekių trūkumų pašalinimo terminus, taikomos Bendrųjų sąlygų 7.4 poskyrio „Pirkėjo teisės, Tiekėjui nepašalinus Prekių trūkumų“ nuostatos.
6.2.7. Jeigu Pirkėjas per 5 (penkias) darbo dienas nuo Prekių perdavimo–priėmimo akto gavimo nepateikia (neišsiunčia) Tiekėjui Defektų akto, laikoma, kad Pirkėjas Prekes priėmė ir joms pretenzijų neturi.
6.2.8. Prekių praradimo ar sugadinimo ar atsitiktinio žuvimo rizika Pirkėjui iš Tiekėjo pereina nuo faktinio tokių Prekių priėmimo momento.
6.2.9. Pirkėjas turi teisę naudotis Prekėmis tik po Prekių perdavimo-priėmimo akto pasirašymo.
6.2.10. Jeigu Tiekėjas Prekes pristatė per Specialiosiose sąlygose nustatytą Prekių pristatymo terminą, tačiau jos turi trūkumų ir Tiekėjas šių trūkumų neištaiso iki Specialiosiose sąlygose nurodyto Prekių pristatymo termino pabaigos, Tiekėjui iki tinkamų Prekių pristatymo dienos taikomos Specialiosiose sąlygose nurodyto dydžio netesybos.

7. TIEKĖJO GARANTINIAI ĮSIPAREIGOJIMAI

7.1. Garantiniai terminai (jei taikoma)

7.1.1. Prekėms taikomas teisės aktuose nustatytas ir (ar) gamintojo taikomas garantinis terminas, jeigu Tiekėjo pasiūlyme, techninėje specifikacijoje ar Specialiosiose sąlygose nėra nurodytas kitas garantinis terminas. Jeigu garantinis terminas nėra niekur nustatytas, Prekėms taikomas 24 (dvidešimt keturių) mėnesių garantinis terminas. Garantinis terminas pradedamas skaičiuoti nuo pristatytų Prekių perdavimo–priėmimo akto pasirašymo dienos.
7.1.2. Garantiniai terminai sustabdomi tiek laiko, kiek Pirkėjas negali tinkamai naudoti Prekių dėl nustatytų Prekių trūkumų, už kuriuos atsako Tiekėjas. Jeigu Pirkėjas dėl Prekių trūkumų negali naudoti tik apibrėžtos Prekių dalies, garantiniai terminai sustabdomi tik tokios dalies atžvilgiu.
7.1.3. Tiekėjas neatsako už Prekių trūkumus, kurie atsirado dėl Prekių normalaus susidėvėjimo, jų netinkamo naudojimo ar priežiūros arba Pirkėjo, jo personalo arba trečiųjų asmenų kaltės, su sąlyga, kad nėra Tiekėjo kaltės dėl tokių Prekių trūkumų, Prekių netinkamo naudojimo ar priežiūros.

7.2. Pretenzijos dėl Prekių trūkumų

7.2.1. Pirkėjas, per garantinius terminus nustatęs Prekių trūkumų, turi nedelsdamas, bet ne vėliau nei per 30 (trisdešimt) dienų ir ne vėliau nei iki garantinio termino pabaigos, pareikšti rašytinę pretenziją Tiekėjui ir nustatyti protingus terminus, jeigu jų nėra nustatyta Specialiosiose sąlygose, Prekių trūkumams pašalinti.
7.2.2. Tiekėjas privalo neatlygintinai pašalinti visus Prekių trūkumus, už kuriuos atsako Tiekėjas, per Pirkėjo pretenzijoje nustatytus protingus terminus, jeigu konkretūs terminai nėra nustatyti Specialiosiose sąlygose, kurie skaičiuojami nuo pretenzijos gavimo dienos.
7.2.3. Jei Tiekėjas nepripažįsta Prekių trūkumų, kiekviena iš Šalių gali kreiptis dėl nepriklausomos ekspertizės atlikimo. Jei Tiekėjas ilgiau nei 10 (dešimt) dienų nuo Pirkėjo kreipimosi neatsako arba nepasitelkia nepriklausomo su Pirkėju suderinto (Pirkėjas negali nepagrįstai neduoti pritarimo Tiekėjui pasitelkti siūlomą ekspertą) eksperto ginčui spręsti ar (ir) jei ginčas užtruko ilgiau nei 30 (trisdešimt) dienų nuo Pirkėjo pirmojo kreipimosi, tai Pirkėjas turi teisę savarankiškai kreiptis dėl ekspertizės atlikimo. Tokiu atveju ekspertizės išlaidas padengia:
7.2.3.1. jei Prekės atitinka Sutartyje ir įstatymuose bei kituose teisės aktuose nurodytus reikalavimus – Pirkėjas;
7.2.3.2. jei Prekės neatitinka Sutartyje ir įstatymuose bei kituose teisės aktuose nurodytų reikalavimų – Tiekėjas.
7.2.4. Ekspertizės išvados Šalims yra privalomos.
7.2.5. Pirkėjas nepraranda teisės pareikšti pretenziją dėl Prekių trūkumų, o Tiekėjas turi pareigą neatlygintinai pašalinti visus Prekių trūkumus, nepriklausomai nuo to, ar tie trūkumai galėjo būti nustatyti Prekių perdavimo–priėmimo akto pasirašymo metu.

7.3. Prekių trūkumų šalinimas

7.3.1. Tiekėjas privalo nemokamai pašalinti Prekių trūkumus, sutaisydamas Prekes ar jų dalį arba pakeisdamas Prekę nauja Preke ar jos dalimi.
7.3.2. Pirkėjas privalo suteikti prieigą Tiekėjui atlikti Prekių trūkumų pašalinimą, kad Tiekėjas galėtų atlikti tai per nustatytus terminus. Jei Prekių trūkumai šalinami Prekių naudojimo vietoje, Pirkėjas ir Tiekėjas privalo susitarti dėl Prekių trūkumų šalinimo laiko.
7.3.3. Sutaisytoje Prekių dalyje pakartotinai nustačius Prekių trūkumų, Tiekėjas privalo pakeisti Prekes naujomis kokybiškomis Prekėmis, nebent Pirkėjas raštu sutiktų Prekes dar kartą taisyti.

7.3.4. Pašalinus Prekių trūkumus, garantinis terminas sutaisytajai Prekių daliai ar naujoms Prekėms vėl pradedamas skaičiuoti nuo tinkamai sutaisytų ar pakeistų Prekių (ar jų dalių) perdavimo Pirkėjui dienos.
7.3.5. Jeigu Prekių trūkumų šalinimas gali turėti įtakos Prekių funkcionalumui, Pirkėjas gali pareikalauti Tiekėjo pakartotinai atlikti bandymus, atliktus pagal Sutartį (jei tokie buvo numatyti). Pirkėjas privalo raštu pateikti Tiekėjui tokį reikalavimą per 30 (trisdešimt) dienų po Prekių trūkumų pašalinimo. Tokie bandymai atliekami pagal anksčiau atliktų bandymų sąlygas, išskyrus tai, kad jie visais atvejais turi būti atliekami Tiekėjo rizika ir sąskaita.
7.3.6. Tiekėjas, pašalinęs visus Prekių trūkumus, privalo apie tai informuoti Pirkėją.
7.3.7. Pirkėjas per 5 (penkias) darbo dienas po Tiekėjo pranešimo apie Prekių trūkumų pašalinimą gavimo privalo patikrinti trūkumus, nurodytus Defektų akte arba Pirkėjo pretenzijoje, ir raštu patvirtinti, kurie Prekių trūkumai buvo pašalinti.

7.4. Pirkėjo teisės, Tiekėjui nepašalinus Prekių trūkumų

7.4.1. Jeigu Tiekėjas atsisako pašalinti arba nepašalina Prekių trūkumų per Pirkėjo nustatytus protingus terminus, Pirkėjas turi teisę:
7.4.1.1. pašalinti Prekių trūkumus pats arba pasamdydamas trečiuosius asmenis, iš anksto apie tai informuodamas Tiekėją, ir pareikalauti Tiekėjo atlyginti Prekių ekspertizės bei Prekių trūkumų šalinimo išlaidas ir padengti patirtus nuostolius; arba
7.4.1.2. reikalauti sumažinti Tiekėjui mokėtiną sumą ir grąžinti dėl šios sumos sumažinimo susidariusią permoką per 30 (trisdešimt) dienų nuo Tiekėjui nustatyto termino pašalinti Prekių trūkumus pabaigos, jeigu tai neprieštarauja VPĮ įtvirtintiems principams; arba
7.4.1.3. grąžinti Prekes Tiekėjui ir nemokėti už tokias Prekes ar reikalauti grąžinti už Prekes sumokėtą sumą bei nutraukti Sutartį.
7.4.2. Tiekėjui pagal Sutartį mokėtina suma sumažinama tiek, kiek sumažėja Prekių vertė Pirkėjui dėl Prekių trūkumų, jeigu tokia Prekių vertė gali būti išskaitoma iš bendros Prekių vertės Į Prekių vertės sumažėjimą, be kita ko, įskaičiuojamos Pirkėjo išlaidos Prekių trūkumų įvertinimui ir šalinimui (jeigu tokių Prekių kaina buvo nurodyta pirkimo metu), Pirkėjo esamų ar būsimų išlaidų Prekių eksploatavimui padidėjimas (jeigu tokios išlaidos buvo vertinamos pirkimo metu).
7.4.3. Tiekėjas privalo patenkinti Pirkėjo pagal Bendrųjų sąlygų 7.4.4 punktą pareikštą piniginį reikalavimą per 30 (trisdešimt) dienų arba per ilgesnį Pirkėjo reikalavime nurodytą protingą terminą.
7.4.4. Už vėlavimą pašalinti Prekių trūkumus Pirkėjas privalo reikalauti Tiekėjo sumokėti Specialiosiose sąlygose nustatyto dydžio netesybas.

8. PRISTATYMO TERMINAI

8.1. Pristatymo terminai ir Prekių tiekimo grafikas

8.1.1. Tiekėjas privalo pristatyti Prekes laikydamasis terminų, nurodytų Specialiosiose sąlygose.
8.1.2. Jei taikytina, Pirkėjas privalo ne vėliau kaip per 14 (keturiolika) darbo dienų nuo Sutarties įsigaliojimo arba per kitą pirkimo dokumentuose nurodytą terminą parengti ir pateikti Tiekėjui suderinimui Prekių tiekimo grafiką (toliau – **Grafikas**).
8.1.3. Jei aktualu, Grafike turi būti pažymėta, kurios Prekės gali būti pristatomos lygiagrečiai, o kurios gali būti pristatomos tik numatytu eiliškumu.

8.2. Netesybos už Prekių pristatymo vėlavimą

8.2.1. Jeigu Tiekėjas praleidžia Prekių pristatymo terminus, nustatytus Specialiosiose sąlygose, Tiekėjui iki Prekių pristatymo datos taikomos Specialiosiose sąlygose nurodyto dydžio netesybos.
8.2.2. Tiekėjui praleidus Prekių dalies pristatymo terminą, netesybos skaičiuojamos nuo Prekių dalies pristatymo termino pabaigos (neįskaitytinai) iki Prekių dalies pristatymo datos (įskaitytinai), nustatytos pagal Prekių perdavimo–priėmimo aktus.
8.2.3. Jei Tiekėjui pagal šią Sutartį yra priskaičiuotos netesybos, Pirkėjo už Prekes mokėtina suma mažinama priskaičiuotų netesybų suma. Taip pat Pirkėjas turi teisę priskaičiuotas netesybas vienašališkai išskaičiuoti iš bet kokių Tiekėjui atliekamų mokėjimų teisės aktų nustatyta tvarka, pranešant Tiekėjui raštu apie tokių netesybų įskaitymą.

9. PRIEVOLIŲ PAGAL SUTARTĮ ĮVYKDYMO UŽTIKRINIMO BŪDAI

Šalių prievolių pagal Sutartį įvykdymas yra užtikrinamas Specialiųjų sąlygų 8 skyriuje nurodytais prievolių pagal Sutartį įvykdymo užtikrinimo būdais, Bendrųjų sąlygų 10 skyriuje nustatyta sutartinių įsipareigojimų įvykdymo užtikrinimo tvarka, Bendrųjų sąlygų 12.1.3 punkte nurodytu avanso užtikrinimu (jeigu Specialiosiose sąlygose yra nurodytas avanso dydis ir yra reikalaujama avanso užtikrinimo), Specialiųjų sąlygų 9 skyriuje nurodytomis netesybomis.

10. SUTARTIES ĮVYKDYMO UŽTIKRINIMAS (JEI TAIKOMA)

10.1. Šio skyriaus nuostatos taikomos tuomet, jei Specialiosiose sąlygose numatyta, kad tinkamam Sutarties įvykdymui užtikrinti Tiekėjas turi pateikti banko garantiją arba draudimo bendrovės laidavimo draudimo raštą arba kitą Specialiosiose sąlygose nurodytą sutartinių įsipareigojimų įvykdymo užtikrinimą.
Pastaba. Kai Specialiosiose sąlygose nurodoma, kad Pirkėjas reikalauja pateikti kredito unijos išduotą Sutarties įvykdymo užtikrinimą, šio skyriaus nuostatos taikomos pagal poreikį ir Pirkėjas gali nusimatyti papildomus reikalavimus Specialiosiose sąlygose tokio Sutarties įvykdymo užtikrinimo pateikimui, atitinkančius įstatymų bei kitų teisės aktų nuostatas.
10.2. Tiekėjas privalo pateikti Pirkėjui Specialiosiose sąlygose nurodytos rūšies ir dydžio Sutarties įvykdymo užtikrinimą – pirmo pareikalavimo banko garantiją arba draudimo bendrovės laidavimo draudimo raštą (kartu su draudimo bendrovės laidavimo draudimo raštu turi būti pateiktas ir pasirašytas draudimo liudijimas (polisas) bei dokumentas, įrodantis, kad draudimo įmoka už išduotą laidavimo draudimo raštą yra sumokėta), atitinkantį Bendrųjų sąlygų 10 skyriuje nurodytas sąlygas, per Specialiosiose sąlygose nustatytą terminą (toliau – **Sutarties įvykdymo užtikrinimas**).
10.3. Jei Tiekėjas nepateikia Pirkėjui Sutartyje nustatytos vertės Sutarties įvykdymo užtikrinimo per Sutartyje nustatytą terminą, laikoma, kad Tiekėjas atsisakė sudaryti Sutartį ir Pirkėjas turi teisę VPĮ nustatyta tvarka pasiūlyti sudaryti Sutartį kitam tiekėjui.
10.4. Prieš pateikdamas Sutarties įvykdymo užtikrinimą, Tiekėjas gali prašyti Pirkėjo patvirtinti, kad Pirkėjas sutinka priimti Tiekėjo siūlomą Sutarties įvykdymo užtikrinimą. Tokiu atveju, Pirkėjas privalo atsakyti Tiekėjui ne vėliau kaip per 3 (tris) darbo dienas nuo Tiekėjo prašymo gavimo dienos.

10.5. Sutarties įvykdymo užtikrinime bankas (draudimo bendrovė) privalo neatšaukiamai ir besąlygiškai įsipareigoti ne vėliau kaip per 15 (penkiolika) dienų nuo Pirkėjo raštiško pranešimo apie Tiekėjo Sutartyje nustatytų prievolių pažeidimą, dalinį ar visišką jų nevykdymą arba netinkamą vykdymą gavimo dienos, sumokėti Pirkėjui Sutarties įvykdymo užtikrinime nurodytą sumą, pinigus pervedant į Pirkėjo sąskaitą.
10.6. Sutarties įvykdymo užtikrinime negali būti nurodyta, kad bankas (draudimo bendrovė) atsako tik už tiesioginių nuostolių atlyginimą. Bankas (draudimo bendrovė) neturi teisės reikalauti, kad Pirkėjas pagrįstų savo reikalavimą. Pirkėjas pranešime bankui (draudimo bendrovei) nurodo, kad Sutarties įvykdymo užtikrinimo suma jam priklauso dėl to, kad Tiekėjas iš dalies ar visiškai neįvykdė Sutarties ir (arba) ji buvo nutraukta dėl Tiekėjo kaltės. Pirkėjas neįsipareigoja įrodyti realiai patirtų nuostolių ir Tiekėjas, pasirašydamas Sutartį ir pateikdamas Sutarties įvykdymo užtikrinimą, patvirtina, kad Sutarties įvykdymo užtikrinimo suma laikytina minimaliais neįrodinėjamais Pirkėjo nuostoliais.
10.7. Sutarties įvykdymo užtikrinimas turi įsigalioti ne vėliau negu jo pateikimo Pirkėjui dieną.
10.8. Sutarties įvykdymo užtikrinimo suma turi būti nurodoma ir išmokama eurais.
10.9. Sutarties įvykdymo užtikrinimas turi būti surašytas lietuvių arba kita kalba (esant Pirkėjo prašymui, turi būti pateiktas vertimas į lietuvių kalbą).
10.10. Sutarties įvykdymo užtikrinime nurodytas jo galiojimo terminas turi būti ne trumpesnis nei nurodytas Specialiosiose sąlygose.
10.11. Jeigu Sutarties trukmė yra ilgesnė nei 1 (vieneri) metai, Tiekėjas turi teisę pateikti 1 (vienerius) metus galiojantį Sutarties įvykdymo užtikrinimą, tačiau privalo pratęsti Sutarties įvykdymo užtikrinimo terminą arba pateikti naują Sutarties įvykdymo užtikrinimą ne vėliau kaip prieš 10 (dešimt) darbo dienų iki Sutarties įvykdymo užtikrinimo galiojimo termino pabaigos.
10.12. Jeigu Sutartyje nustatytomis sąlygomis Prekių pristatymo terminas yra pratęsiamas arba nukeliamas dėl Sutarties sustabdymo arba pristatyti Prekes arba taisyti Prekių trūkumus yra vėluojama, Tiekėjas privalo užtikrinti Sutarties įvykdymo užtikrinimo galiojimą visą Sutarties galiojimo laikotarpį ir ne vėliau kaip iki Sutarties įvykdymo užtikrinimo galiojimo termino pabaigos privalo Pirkėjui pateikti naują arba pratęstą Sutarties įvykdymo užtikrinimą.
10.13. Tiekėjui laiku nepratęsus Sutarties įvykdymo užtikrinimo galiojimo termino arba nepateikus naujo Sutarties įvykdymo užtikrinimo, Pirkėjas turi teisę reikalauti Specialiosiose sąlygose nustatyto dydžio netesybų už kiekvieną pradelstą dieną.
10.14. Pirkėjas nepriima Sutarties įvykdymo užtikrinimo ir (ar) laiko jį negaliojančiu, ir (ar) kreipiasi į Tiekėją dėl naujo Sutarties įvykdymo užtikrinimo pateikimo Pirkėjui, o Tiekėjas privalo Sutarties įvykdymo užtikrinimą pateikti per trumpiausiai įmanomą terminą, jei Sutarties įvykdymo užtikrinimas neatitinka Sutartyje keliamų reikalavimų arba Pirkėjas turi informacijos, susijusios su Sutarties įvykdymo užtikrinimą išdavusio banko (draudimo bendrovės) veiklos sustabdymu arba galimu veiklos sustabdymu (įskaitant nemokumą, likvidavimą ar teisinės apsaugos taikymo procedūras).
10.15. Jei Tiekėjas pažeidžia Sutartimi nustatytus įsipareigojimus, dalinai ar visiškai įsipareigojimų nevykdo (ar juos vykdo ne pagal Sutarties sąlygas), Pirkėjas gali pasinaudoti Sutarties įvykdymo užtikrinimu. Tiekėjas, siekdamas toliau vykdyti Sutarties įsipareigojimus, privalo per 10 (dešimt) darbo dienų nuo pranešimo apie Sutarties įvykdymo užtikrinimo sumokėjimą Pirkėjui pranešimo gavimo dienos pateikti Pirkėjui naują Specialiosiose sąlygose nurodyto dydžio Sutarties įvykdymo užtikrinimą.
10.16. Pirkėjas gali pasinaudoti Sutarties įvykdymo užtikrinimu, esant bet kuriai iš žemiau nurodytų aplinkybių:

10.16.1. Tiekėjas neįvykdė, nevykdo arba netinkamai vykdo savo įsipareigojimus pagal Sutartį;
10.16.2. Tiekėjas per protingai nustatytą laikotarpį neįvykdo Pirkėjo nurodymo ištaisyti Prekių trūkumus;
10.16.3. jei dėl bet kokių Tiekėjo veiksmų (veikimo ar neveikimo) Pirkėjas patyrė nuostolius (įskaitant, bet neapribojant, papildomas išlaidas, negautas pajamas ar kitus tiesioginius ir netiesioginius nuostolius, delspinigius ir (arba) baudas (jei tai yra numatyta Specialiosiose sutarties sąlygose);
10.16.4. Tiekėjas be pateisinamos priežasties (ne Sutartyje nustatytais atvejais) vienašališkai nutraukia Sutartį.

11. SUTARTIES KAINA IR JOS PERSKAIČIAVIMAS

11.1. Sutarties kaina, kurią Pirkėjas privalo sumokėti Tiekėjui už faktiškai pristatytas Prekes pagal Sutarties sąlygas, įskaitant visus Susitarimus, yra apskaičiuojama, taikant kainos apskaičiavimo būdą ar būdus, nurodytus Specialiosiose sąlygose.
11.2. Pradinės sutarties vertė yra nurodyta Specialiosiose sąlygose.
11.3. Laikoma, kad į Sutarties kainą yra įtrauktos visos Tiekėjo išlaidos, susijusios su visų Prekių pristatymu, taip pat su tinkamu šioje Sutartyje numatytų kitų Tiekėjo įsipareigojimų įvykdymu, įskaitant draudimus, muitus ir kitokias išlaidas, Tiekėjo patirtas vykdant Sutartyje numatytus įsipareigojimus.
11.4. Sutarties kainos peržiūra atliekama Specialiosiose sąlygose nustatyta tvarka.

12. ATSISKAITYMO TVARKA

12.1. Išankstinis mokėjimas (avansas) (jei taikoma)

12.1.1. Bendrųjų sąlygų 12.1 poskyrio sąlygos taikomos tuo atveju, jei Specialiosiose sąlygose yra nurodyta, kad Tiekėjui mokamas išankstinis mokėjimas (avansas) (toliau – **Avansas**).
12.1.2. Pirkėjas sumoka Tiekėjui ne didesnį kaip Specialiosiose sąlygose nurodyto dydžio Avansą.
12.1.3. Jei Specialiosiose sąlygose to reikalaujama, Tiekėjas, norėdamas gauti Avansą, kreipdamasis dėl Avanso išmokėjimo, ne vėliau kaip per 10 (dešimt) darbo dienų nuo Sutarties įsigaliojimo dienos kartu su išankstinio mokėjimo sąskaita Pirkėjui turi pateikti Avanso užtikrinimą – banko garantiją arba draudimo bendrovės laidavimo draudimo raštą arba kitą sutartinių įsipareigojimų įvykdymo užtikrinimą ne mažesnei kaip Specialiosiose sąlygose prašomo Avanso dydžio sumai (toliau – **Avanso užtikrinimas**).
Pastaba. Kai Specialiosiose sąlygose nurodoma, kad Pirkėjas reikalauja pateikti kredito unijos išduotą Avanso užtikrinimą, šio poskyrio nuostatos taikomos pagal poreikį ir Pirkėjas gali nusimatyti papildomus reikalavimus Specialiosiose sąlygose tokio Avanso užtikrinimo pateikimui, atitinkančius įstatymų bei kitų teisės aktų nuostatas.
12.1.4. Prieš pateikdamas Avanso užtikrinimą, Tiekėjas gali prašyti Pirkėjo patvirtinti, kad Pirkėjas sutinka priimti Tiekėjo siūlomą Avanso užtikrinimą. Tokiu atveju, Pirkėjas privalo atsakyti Tiekėjui ne vėliau kaip per 3 (tris) darbo dienas nuo Tiekėjo prašymo gavimo dienos.
12.1.5. Avanso užtikrinimu bankas (draudimo bendrovė) privalo neatšaukiamai ir besąlygiškai įsipareigoti ne vėliau kaip per 15 (penkiolika) dienų nuo Pirkėjo raštiško pranešimo apie Sutarties neįvykdymą ar Sutarties nutraukimą dėl Tiekėjo kaltės, sumokėti Pirkėjui sumą, neviršijančią išmokėto Avanso sumos ir užtikrinimo sumos, pinigus pervedant į Pirkėjo sąskaitą.

12.1.6. Bankas (draudimo bendrovė) neturi teisės reikalauti, kad Pirkėjas pagrįstų savo reikalavimą. Pirkėjas pranešime bankui (draudimo bendrovei) nurodys, kad Avanso užtikrinimo suma jam priklauso dėl to, kad Tiekėjas iš dalies ar visiškai neįvykdė Sutarties sąlygų ir (arba) ji buvo nutraukta dėl Tiekėjo kaltės ir Tiekėjas negrąžino Avanso.
12.1.7. Avanso užtikrinimo suma turi būti nurodoma ir išmokama eurais.
12.1.8. Avanso užtikrinimas turi būti surašytas lietuvių arba kita kalba (esant Pirkėjo prašymui, turi būti pateiktas vertimas į lietuvių kalbą).
12.1.9. Avanso užtikrinimas, neatitinkantis šiame Sutarties poskyryje nustatytų reikalavimų, nebus priimamas.
12.1.10. Jei Sutarties vykdymo metu Avanso užtikrinimą išdavęs bankas (draudimo bendrovė) negali įvykdyti savo įsipareigojimų, Pirkėjas gali raštu pareikalauti Tiekėjo per 10 (dešimt) darbo dienų pateikti naują Avanso užtikrinimą, tokiomis pačiomis sąlygomis kaip ir ankstesnysis.
12.1.11. Pirkėjas sumoka Tiekėjui avansą per Specialiosiose sąlygose numatytą terminą nuo išankstinio mokėjimo sąskaitos ir Avanso užtikrinimo (jei taikoma) gavimo dienos. Sumokėto avanso suma išskaitoma iš mokėtinos sumos.
12.1.12. Nutraukus Sutartį, Tiekėjas privalo grąžinti Pirkėjui gautą Avansą per 5 (penkias) darbo dienas (jeigu dalis Prekių pristatyta, Pirkėjas jas yra priėmęs ir jomis gali naudotis pagal paskirtį – grąžinama ta Avanso dalis, kuri viršija Pirkėjo priimtų Prekių kainą). Jei Tiekėjas negrąžina gauto Avanso, Pirkėjas pasinaudoja Avanso užtikrinimu (jei taikoma). Tais atvejais, jei nebuvo taikytas Bendrųjų sąlygų 12.1.3 punktas, Tiekėjas turi sumokėti Specialiosiose sąlygose nurodyto dydžio netesybas, skaičiuojamas nuo grąžintinos Avanso sumos už laikotarpį nuo Avanso išmokėjimo iki jo grąžinimo.

12.2. Mokėjimų tvarka

12.2.1. Tiekėjas išrašo Sąskaitą tik Šalims pasirašius Prekių perdavimo–priėmimo aktą, jeigu kitaip nenumatyta Specialiosiose sąlygose:
12.2.1.1. elektroninę sąskaitą faktūrą, atitinkančią Europos elektroninių sąskaitų faktūrų standartą, kurio nuoroda paskelbta 2017 m. spalio 16 d. Komisijos įgyvendinimo sprendime (ES) 2017/1870 dėl nuorodos į Europos elektroninių sąskaitų faktūrų standartą ir sintaksių sąrašo paskelbimo pagal Europos Parlamento ir Tarybos direktyvą 2014/55/ES (toliau – **Europos elektroninių sąskaitų faktūrų standartas**), Tiekėjas gali pateikti pasirinktomis priemonėmis;
12.2.1.2. Europos elektroninių sąskaitų faktūrų standarto neatitinkančią elektroninę sąskaitą faktūrą Tiekėjas gali teikti tik naudodamasis Sąskaitų administravimo bendrosios informacinės sistemos (toliau – **SABIS**) priemonėmis.
12.2.2. Pirkėjas elektronines sąskaitas faktūras priima ir apdoroja naudodamasis informacinės sistemos SABIS priemonėmis, išskyrus jeigu mobilizacijos, karo ar nepaprastosios padėties atveju yra informacinės sistemos SABIS pažeidimų, dėl kurių negalimas Pirkėjo ir Tiekėjo bendravimas ir keitimasis informacija naudojantis SABIS.
12.2.3. Išankstinio mokėjimo sąskaitas (jeigu Specialiosiose sąlygose yra numatytas Avanso mokėjimas) Tiekėjas privalo pateikti šiame Sutarties poskyryje nustatyta tvarka.
12.2.4. Pirkėjas atlieka mokėjimus už Prekes Specialiosiose sąlygose nustatytais terminais.
12.2.5. Už mokėjimų pagal Sutartį vėlavimus, Pirkėjui taikomos netesybos Specialiosiose sąlygose nustatyta tvarka.
12.2.6. Jei Prekės pristatomos dalimis, aukščiau nurodyta atsiskaitymo tvarka galioja kiekvienai tokiai daliai, jei Specialiosiose sąlygose nenustatyta kitaip.

12.2.7. Jeigu Šalys sudaro trišalį susitarimą su subtiekėju, Pirkėjas privalo pervesti subtiekėjui mokėtiną sumą į subtiekėjo banko sąskaitą, nurodytą trišaliame susitarime, o likutį pervesti į Tiekėjo banko sąskaitą po to, kai pagal Sutarties ir trišalio susitarimo reikalavimus sudaromas pristatytų Prekių perdavimo–priėmimo aktas ir Tiekėjas pateikia Sąskaitą už Prekes Pirkėjui.

12.3. Kiti atsiskaitymo klausimai

12.3.1. Pirkėjas privalo pervesti mokėjimus Tiekėjui į Tiekėjo banko sąskaitą, nurodytą Specialiosiose sąlygose.
12.3.2. Pirkėjas turi teisę sumas, gautinas iš Tiekėjo, išskaityti iš mokėjimų Tiekėjui pagal Sutartį (vienašališkai daryti įskaitymus). Dėl šios priežasties Tiekėjas neturi teisės perleisti arba įkeisti reikalavimo teisių į gautinas pagal Sutartį sumas tretiesiems asmenims arba kitaip jomis disponuoti be Pirkėjo sutikimo.
12.3.3. Visi mokėjimai pagal Sutartį atliekami eurais.
12.3.4. Už pavėluotus mokėjimus pagal Sutartį mokančioji Šalis privalo sumokėti kitai Šaliai Specialiosiose sąlygose nurodyto dydžio netesybas.

13. KONFIDENCIALI INFORMACIJA

13.1. Šalys įsipareigoja laikytis konfidencialumo ir be kitos Šalies rašytinio sutikimo neatskleisti tos Šalies informacijos, nurodytos kaip konfidencialios, jokiems Šalies darbuotojams, su Šalimi susijusiems ar kitiems tretiesiems asmenims, kuriems nėra būtina šią informaciją naudoti jų darbo tikslais, išskyrus žemiau nurodytus atvejus.
13.2. Šalis turi teisę atskleisti kitos Šalies konfidencialią informaciją šiais atvejais:
13.2.1. konfidencialios informacijos atskleidimas yra būtinas tinkamam Šalies teisių ar pareigų pagal Sutartį įgyvendinimui – tačiau tokiu atveju informaciją galima atskleisti tik ta apimtimi, kiek tai yra reikalinga sutartinių teisių ar pareigų įgyvendinimui, ir tik tokiems tretiesiems asmenims, kuriems būtina, su sąlyga, kad konfidencialią informaciją gaunantys tretieji asmenys prisiima tokius pačius konfidencialumo įsipareigojimus, kokie yra nustatyti šioje Sutartyje. Jeigu tretieji asmenys atskleidžia konfidencialią informaciją, Šalis atsako už jų veiksmus kaip už savo;
13.2.2. konfidencialią informaciją yra būtina atskleisti pagal įstatymų bei kitų teisės aktų reikalavimus, įskaitant atvejus, kai to reikalauja viešojo administravimo subjektai, taip, kaip jie apibrėžti Lietuvos Respublikos viešojo administravimo įstatyme.
13.3. Prieš atskleisdama konfidencialią informaciją, Šalis privalo informuoti kitą Šalį (tiek, kiek tai nedraudžiama pagal įstatymus bei kitus teisės aktus) apie būtinybę arba gautą viešojo administravimo subjekto reikalavimą atskleisti konfidencialią informaciją ir imtis protingų priemonių, siekdama užtikrinti atskleistos informacijos konfidencialumą.
13.4. Šalis atsako:
13.4.1. už bet kokį neteisėtą, įskaitant atsitiktinį, kitos Šalies konfidencialios informacijos ar bet kurios jos dalies atskleidimą ar perdavimą arba konfidencialios informacijos neteisėtą naudojimą;
13.4.2. už tai, kad nesiėmė visų protingų veiksmų, kad išsaugotų ir apsaugotų kitos Šalies konfidencialią informaciją ar bet kurią jos dalį, užkirstų kelią tolesniam jos neteisėtam atskleidimui, perdavimui ar naudojimui.
13.5. Šalis nepagrįstai atskleidusi kitos Šalies konfidencialią informaciją privalo sumokėti kitai Šaliai Specialiosiose sąlygose nurodyto dydžio baudą.

14. ASMENS DUOMENŲ APSAUGA

14.1. Šalys įsipareigoja užtikrinti asmens duomenų saugumą bei asmens duomenų tvarkymą vykdyti teisėtai, vadovaujantis 2016 m. balandžio 27 d. priimto Europos Parlamento ir Tarybos reglamento (ES) 2016/679 dėl fizinių asmenų apsaugos tvarkant asmens duomenis ir dėl laisvo tokių duomenų judėjimo ir kuriuo panaikinama Direktyva 95/46/EB (Bendrasis duomenų apsaugos reglamentas) ir kitų teisės aktų, reglamentuojančių asmens duomenų tvarkymą, nuostatomis.
14.2. Šalys patvirtina, kad jeigu siekiant užtikrinti tinkamą Sutarties vykdymą bus tvarkomi asmens duomenys, Šalys įsipareigoja sudaryti atskirą susitarimą dėl duomenų tvarkymo, kuriuo nustato duomenų tvarkymo dalyką ir trukmę, duomenų tvarkymo pobūdį ir tikslą, asmens duomenų rūšis ir duomenų subjektų kategorijas bei duomenų valdytojo prievoles ir teises.

15. INTELEKTINĖ NUOSAVYBĖ

15.1. Visi rezultatai ir su jais susijusios teisės, įgytos vykdant Sutartį, įskaitant intelektinės nuosavybės teises, išskyrus asmenines neturtines teises į intelektinės veiklos rezultatus, yra Pirkėjo nuosavybė, pereinanti Pirkėjui nuo Prekių perdavimo–priėmimo momento be jokių apribojimų, kurią Pirkėjas gali naudoti, publikuoti, perleisti ar perduoti be atskiro Tiekėjo sutikimo tretiesiems asmenims, jei Specialiosiose sąlygose nenumatyta kitaip ar intelektinės nuosavybės teisės negali būti perduodamos nuosavybės teise dėl Prekių pobūdžio ar (ir) Prekių gamintojo išimtinių teisių, patentų ir kt.
15.2. Tiekėjas įsipareigoja atlyginti nuostolius Pirkėjui dėl bet kokių reikalavimų, kylančių dėl intelektinės nuosavybės teisių, įskaitant, bet neapsiribojant, dėl patento, prekių ženklo, pramoninio dizaino savininko (naudotojo) teisės (registruojamos arba ne), teisės, kylančios iš paraiškų bet kurioms minėtoms teisėms įregistruoti, autoriaus teisės, duomenų bazių gamintojų (*sui generis*) teisės, firmų, įmonių, organizacijų, verslo pavadinimų ar vardų savininkų ir kitos panašios teisės ar įsipareigojimai, nepriklausomai nuo to, ar jie registruoti Lietuvos Respublikoje, ar kitose šalyse, ar neregistruotini, kaip numatyta Sutartyje, išskyrus atvejus, kai toks pažeidimas atsiranda dėl Pirkėjo kaltės.
15.3. Tiekėjas neturi teisės be išankstinio rašytinio Pirkėjo sutikimo naudoti Pirkėjo simbolių, pavadinimo ir ženklo reklamoje, rinkodaroje, taip pat naudotis Pirkėjo sukurtais intelektiniais veiklos rezultatais. Pažeidus reikalavimą, Tiekėjui taikoma Specialiosiose sąlygose nurodyta bauda.

16. PAREIŠKIMAI IR GARANTIJOS

16.1. Kiekviena iš Šalių pareiškia ir garantuoja kitai Šaliai, kad:
16.1.1. yra teisėtai priimti ir galioja visi būtini sprendimai, gauti leidimai bei sutikimai, taip pat teisėtai atlikti ir galioja kiti teisiniai veiksmai, reikalingi Sutarties sudarymui, galiojimui ir vykdymui;
16.1.2. sudarydama Sutartį, Šalis neviršija savo kompetencijos ir nepažeidžia jai taikomų įstatymų bei kitų teisės aktų, teismo ar arbitražo teismo sprendimų, administracinių aktų, sutarčių ar kitų prievolių pagal taikomą privatinę teisę, viešąją teisę, Europos Sąjungos teisę arba tarptautinę teisę;
16.1.3. Šalies atstovas turi visus reikiamus įgaliojimus sudaryti ir įvykdyti Sutartį. Šalies atstovas, sudarydamas ir pasirašydamas Sutartį, nepažeidžia Šalies įstatų, nuostatų ir kitų vidaus

dokumentų, Šalies valdymo ir kitų organų ir (ar) kreditorių teisių ir teisėtų interesų, sudarydamas Sutartį jis Šalies ir Šalies organų narių, kreditorių atžvilgiu veikia sąžiningai ir protingai;
16.1.4. Šalis įvertino visas aplinkybes, turinčias esminės reikšmės Sutarties sudarymui ir jos vykdymui. Nė viena iš Sutartyje nurodytų sąlygų ir aplinkybių neturi neigiamos įtakos Šalies valiai sudaryti Sutartį tokiomis sąlygomis, kurios nurodytos Sutartyje, ir vykdyti iš Sutarties kylančius įsipareigojimus;
16.1.5. Sutartis sudaroma vadovaujantis sąžiningumo, protingumo, teisingumo ir Šalių lygiateisiškumo principais, nenaudojant apgaulės ar spaudimo. Šalys atskleidė viena kitai visą joms žinomą informaciją, turinčią esminės reikšmės Sutarties sudarymui ir jos vykdymui;
16.1.6. visi Šalies pareiškimai ir garantijos yra išsamūs ir nepalieka nutylėtų jokių aplinkybių, kurios darytų šiuos pareiškimus ar garantijas neteisingais.
16.2. Tiekėjas papildomai pareiškia ir garantuoja Pirkėjui, kad Tiekėjas, subtiekėjai, jungtinės veiklos partneriai ir specialistai turi galiojančius ir teisėtus visus įstatymuose bei kituose teisės aktuose numatytus leidimus, licencijas, atestatus, teisės pripažinimo dokumentus, reikalingus vykdant Sutartį.
16.3. Tiekėjas pareiškia, kad parduodamų Prekių disponavimo, valdymo ir naudojimosi teisės nėra apribotos ir jokie tretieji asmenys neturi pretenzijų į Sutartimi perduodamas Prekes (įkeitimai, areštai ar pan.).
16.4. Tiekėjas įsipareigoja vykdant Sutartį laikytis aplinkos apsaugos, socialinės ir darbo teisės įpareigojimų, nustatytų Europos Sąjungos ir nacionalinėje teisėje, kolektyvinėse sutartyse ir VPĮ 5 priede nurodytose tarptautinėse konvencijose.

17. BENDRIEJI ATSAKOMYBĖS KLAUSIMAI

17.1. Netesybų sumokėjimas už vėlavimą ar pareigų pagal Sutartį pažeidimą neatleidžia Šalies nuo Sutartyje numatytų jos pareigų vykdymo.
17.2. Netesybų sumokėjimas ir (ar) Sutarties įvykdymo užtikrinimo gavimas nepanaikina Šalies teisės reikalauti, kad kita Šalis kompensuotų jos patirtus nuostolius. Šioje Sutartyje nustatytos netesybos yra laikomos minimaliais, neįrodinėtinais Šalių nuostoliais. Kiekviena iš Šalių turi teisę gauti iš kitos Šalies nuostolių, atsiradusių dėl kitos Šalies netinkamo įsipareigojimų pagal Sutartį vykdymo ar nevykdymo, neviršijant Pradinės sutarties vertės, jei teisės aktai nenumato, kad privalo būti kompensuota didesnė suma. Šiame punkte numatytas atsakomybės ribojimas netaikomas, jei žala atsirado dėl konfidencialumo įsipareigojimų, asmens duomenų apsaugą reglamentuojančių teisės aktų ar intelektinės nuosavybės teisių pažeidimo.
17.3. Tuo atveju, jei paaiškėja, kad kuris nors iš šioje Sutartyje pateiktų pareiškimų ar garantijų buvo iš esmės neteisingas, melagingas ar klaidinantis, Šalis pažeidėja nukentėjusiai Šaliai privalo atlyginti visus nuostolius, kuriuos nukentėjusioji Šalis patyrė dėl tokio neteisingo, melagingo ar klaidinančio pareiškimo ar garantijos.
17.4. Šioje Sutartyje numatytos teisių gynybos priemonės neapriboja Šalių teisės pasinaudoti kitomis teisėtomis teisių gynybos priemonėmis.
17.5. Atsakomybės apribojimai pagal Sutartį netaikomi, kai žala padaroma tyčia arba dėl didelio neatsargumo, padaroma neturtinė žala, sužalojama sveikata ar atimama gyvybė, taip pat kai padaroma žala (nuostoliai) tretiesiems asmenims, įskaitant atvejus, jeigu vienos Šalies padarytą žalą tretiesiems asmenims atlygina kita Šalis.

17.6. Pasibaigus Sutarties galiojimui, Šalys neatleidžiamos nuo atsakomybės už Sutarties pažeidimą. Pasibaigus Sutarties galiojimui, Šalys nepraranda teisės reikalauti atlyginti dėl Sutarties nevykdymo patirtus nuostolius bei sumokėti netesybas.
17.7. Jeigu Sutartis nutraukiama dėl esminio Sutarties pažeidimo pagal Bendrųjų sąlygų 22.2.1 papunktį ir (ar) Tiekėjas esminę Sutarties sąlygą, nurodytą Specialiųjų sąlygų 10 skyriuje, vykdo su dideliais ar nuolatiniais trūkumais, Tiekėjas įtraukiamas į nepatikimų tiekėjų sąrašą VPĮ 91 straipsnyje nustatyta tvarka. Atvejai, kuomet laikoma, kad esminė Sutarties sąlyga vykdoma su dideliais arba nuolatiniai trūkumais nurodyti Specialiųjų sąlygų 10 skyriuje. Esminės Sutarties sąlygos vykdymas su dideliais arba nuolatiniais trūkumais gali būti pripažįstamas ir kitais, Specialiosiose sąlygose nenurodytais, atvejais, įvertinus konkrečias esminės Sutarties sąlygos netinkamo vykdymo aplinkybes.

18. NENUGALIMA JĖGA (FORCE MAJEURE)

18.1. Atsakomybė pagal Sutartį netaikoma, taip pat Šalys gali būti visiškai ar iš dalies atleistos nuo civilinės atsakomybės šiais pagrindais:
18.1.1. dėl nenugalimos jėgos (*force majeure*) – taikomos Lietuvos Respublikos civilinio kodekso 6.212 straipsnio ir Lietuvos Respublikos Vyriausybės 1996 m. liepos 15 d. nutarimu Nr. 840 „Dėl Atleidimo nuo atsakomybės esant nenugalimos jėgos (*force majeure*) aplinkybėms taisyklių patvirtinimo" patvirtintų taisyklių nuostatos;
18.1.2. dėl Europos Sąjungos valstybių veiksmų – kai prievolę pagal Sutartį įvykdyti neįmanoma dėl privalomų ir nenumatytų Europos Sąjungos valstybės institucijų veiksmų (aktų), kurių Šalys neturėjo teisės ginčyti ir šie veiksmai negalėjo būti iš anksto numatyti.
18.2. Šalis, prašanti ją atleisti nuo atsakomybės, privalo pranešti kitai Šaliai apie nenugalimos jėgos aplinkybes nedelsiant, bet ne vėliau kaip per 5 (penkias) dienas nuo tokių aplinkybių atsiradimo ar paaiškėjimo, pateikdama įrodymus, kad ji ėmėsi visų pagrįstų atsargumo priemonių ir dėjo visas pastangas, kad sumažintų išlaidas ar neigiamas pasekmes, taip pat pranešti galimą įsipareigojimų įvykdymo terminą. Šalis taip pat turi pateikti kitai Šaliai atitinkamą pranešimą, kai išnyksta įsipareigojimų nevykdymo pagrindas.
18.3. Pagrindas atleisti Šalį nuo atsakomybės atsiranda nuo nenugalimos jėgos aplinkybių atsiradimo momento arba, jeigu laiku nebuvo pateiktas pranešimas, nuo pranešimo pateikimo momento. Jeigu Šalis laiku neišsiunčia pranešimo arba neinformuoja, ji privalo kompensuoti kitai Šaliai žalą, kurią ši patyrė dėl laiku nepateikto pranešimo arba dėl to, kad nebuvo jokio pranešimo.
18.4. Jeigu nenugalimos jėgos (*force majeure*) aplinkybės tęsiasi ilgiau negu 1 (vieną) mėnesį nuo pranešimo apie jas gavimo dienos, bet kuri Šalis gali nutraukti Sutartį apie tai pranešusi kitai šaliai prieš 5 (penkias) darbo dienas. Nenugalima jėga nelaikoma tai, kad Šalis neturi reikiamų finansinių išteklių arba skolininko kontrahentai pažeidžia savo prievoles, arba skolininkas pažeidžia savo prievoles kontrahentams.

19. SUTARTIES NUOSTATŲ NEGALIOJIMAS

19.1. Jeigu kuri nors Sutarties nuostata yra arba tampa dalinai ar pilnai negaliojanti, Šalys privalo kuo skubiau sudaryti Susitarimą, ir juo pakeisti negaliojančią nuostatą kita nuostata, kuri, kiek tai yra įmanoma, turėtų tokį patį ekonominį ir teisinį efektą, kokio buvo siekta susitariant dėl negaliojančios Sutarties nuostatos. Tokia negaliojanti nuostata nedaro negaliojančiomis kitų

Sutarties nuostatų, jeigu tai nepažeidžia įstatymų bei kitų teisės aktų ir galima daryti prielaidą, kad Sutartis būtų buvusi teisėtai sudaryta ir neįtraukus nuostatos, kuri yra negaliojanti.
19.2. Jeigu Specialiosiose sąlygose numatytas Bendrųjų sąlygų nuostatos pakeitimas yra arba tampa dalinai ar pilnai negaliojantis, negali būti taikoma tos Bendrųjų sąlygų nuostatos redakcija, buvusi iki pakeitimo. Tokiu atveju Šalys privalo veikti pagal Bendrųjų sąlygų 19.1 punktą.

20. SUTARTIES PAKEITIMAI

20.1. Sutarties sąlygos Sutarties galiojimo laikotarpiu negali būti keičiamos, išskyrus tokias Sutarties sąlygas, kurių keitimas numatytas Sutartyje ir (ar) galimas vadovaujantis VPĮ nuostatomis.
20.2. Sutarties pakeitimai įforminami Šalims sudarant Susitarimą.
20.3. Šalis, inicijuojanti Susitarimą, privalo pateikti kitai Šaliai pranešimą dėl Sutarties pakeitimo bei pagrindimą dėl to, jog yra faktinis ir teisinis pagrindas sudaryti Susitarimą. Kita Šalis per 5 (penkias) darbo dienas (arba per kitą Šalių raštu sutartą terminą) privalo išanalizuoti ir įvertinti gautą informaciją, pateikti savo pastabas ir pasiūlymus, pagrįstus Sutarties arba imperatyviomis įstatymų bei kitų teisės aktų nuostatomis.
20.4. Susitarimai įsigalioja nuo jų sudarymo, jei Susitarime nenurodyta kitaip. Susitarimą Pirkėjas privalo paviešinti VPĮ 33 ir 86 straipsniuose nustatyta tvarka.
20.5. Specialiosiose sąlygose nurodytų duomenų apie kontaktinius asmenis bei rekvizitų pasikeitimas nelaikomas Sutarties pakeitimu (išskyrus Tiekėjo, jungtinės veiklos Partnerio, subtiekėjo ar specialisto pakeitimą kitu asmeniu) ir Šalis turi pakeisti tuos duomenis vienašališkai, informuodama apie tai kitą Šalį. Bet kuriuo atveju Sutarties pakeitimu negali būti iš esmės keičiama Sutartis.

21. SUTARTIES SUSTABDYMAS

21.1. Nesant Tiekėjo kaltės ir esant aplinkybėms, kurių Sutarties Šalis negalėjo numatyti Sutarties sudarymo metu, dėl kurių Sutarties Šalis negali vykdyti savo sutartinių įsipareigojimų ir (arba) esant kitoms nenumatytoms aplinkybėms, Sutarties šalys turi teisę inicijuoti Prekių (jų dalies) tiekimo sustabdymą iki atitinkamų aplinkybių pasibaigimo.
21.2. Prekių (jų dalies) tiekimas gali būti stabdomas esant bent vienai iš šių aplinkybių:
21.2.1. esant Bendrųjų sąlygų 18 skyriuje numatytoms nenugalimos jėgos aplinkybėms, sutartinių įsipareigojimų vykdymo terminai stabdomi nuo kliūties atsiradimo momento arba jeigu apie ją nėra laiku pranešta, nuo pranešimo momento ir atnaujinami, kai minėtos aplinkybės nebetrukdo vykdyti Sutarties;
21.2.2. Pirkėjas Sutartyje nurodyta tvarka negali priimti Prekių (pavyzdžiui, nebaigta įrengti patalpa, kurioje turi būti įmontuojamos Prekės), o Tiekėjas dėl to negali vykdyti Sutarties;
21.2.3. dėl nenumatytų prekių, paslaugų ir (ar) darbų, susijusių su perkamu objektu, kurių poreikis paaiškėjo tik vykdant Sutartį;
21.2.4. ne dėl Pirkėjo kaltės vėluoja kitos Pirkėjo pirkimo sutarties, turinčios tiesioginės įtakos šiai Sutarčiai, vykdymas;
21.2.5. esant įrodymais pagrįstoms kliūtims ar trukdymams, sukeltiems Tiekėjui kitų trečiųjų asmenų ne dėl Tiekėjo ne laiku ar netinkamai pagal Sutarties sąlygas ir tvarką įvykdytų sutartinių įsipareigojimų;

21.2.6. pasikeitus galiojančiam teisės aktui ar įsigaliojus naujam teisės aktui, kuris turi įtakos šios Sutarties vykdymui;
21.2.7. sutartinių įsipareigojimų stabdymo būtinybė atsirado dėl sustabdyto / perskirstyto / negauto ir panašiai Pirkėjo Prekių pirkimui skirto finansavimo arba finansavimo trūkumo;
21.2.8. dėl teisminių (arbitražinių) ginčų su Pirkėju ar trečiaisiais asmenimis, kurių dalykas yra tiesiogiai susijęs su Sutarties vykdymu.
21.3. Jei Prekių (jų dalies) tiekimo stabdymas atliekamas dėl Bendrųjų sąlygų 21.2 punkte nurodytų aplinkybių ir tęsiasi ne ilgiau kaip 3 (tris) mėnesius, toks stabdymas laikomas Sutarties keitimu joje numatytomis sąlygomis ir įforminamas Sutarties 21.6 punkte nustatyta tvarka.
21.4. Jei Prekių (jų dalies) stabdymas vykdomas dėl kitų aplinkybių, nenurodytų Bendrųjų sąlygų 21.2 punkte ar (ir) Bendrųjų sąlygų 21.2 punkte nurodytos aplinkybės tęsiasi ilgiau nei 3 (tris) mėnesius ir (ar) nesilaikant šiame skyriuje nustatytos tvarkos, tai laikoma Sutarties keitimu, kuris turi būti atliekamas, vadovaujantis VPĮ nuostatomis ir įforminamas Sutarties 21.6 punkte nustatyta tvarka.
21.5. Sutartinių įsipareigojimų vykdymas gali būti stabdomas tik Sutarties galiojimo laikotarpiu tokia tvarka:
21.5.1. Atsiradus aplinkybėms, dėl kurių Tiekėjas negali vykdyti sutartinių įsipareigojimų, Tiekėjas apie tai nedelsdamas privalo informuoti Pirkėją. Tiekėjo rašytiniame prašyme turi būti nurodyta stabdymo aplinkybė (Bendrųjų sąlygų 21.2 punktas) ir aplinkybės atsiradimą bei galimą terminą pagrindžiantys argumentai, objektyvūs faktai ir įrodymai. Pirkėjas, įvertinęs prašymą, ne vėliau kaip per 3 (tris) darbo dienas raštu informuoja Tiekėją apie priimtą sprendimą dėl sutartinių įsipareigojimų vykdymo stabdymo. Tiekėjui nepateikus konkrečių argumentų, faktų, pagrįstų įrodymais, Pirkėjas turi teisę raštu atsisakyti patvirtinti stabdymą.
21.5.2. Pirkėjui raštu informavus Tiekėją ir pateikus jam argumentuotą paaiškinimą, dėl kokių aplinkybių ir kuriam terminui yra būtina stabdyti sutartinių įsipareigojimų vykdymo terminą, Tiekėjas ne vėliau kaip per 3 (tris) darbo dienas raštu informuoja Pirkėją ir patvirtina, kad sutinka su stabdymu. Tiekėjas turi teisę prieštarauti sutartinių įsipareigojimų vykdymo stabdymui tik tuo atveju, jei Tiekėjas savo sąskaita ir jėgomis gali pašalinti atsiradusias aplinkybes, dėl kurių kilo būtinybė stabdyti sutartinių įsipareigojimų vykdymą.
21.5.3. Tiekėjas, gavęs Pirkėjo raštišką pranešimą apie stabdymą, privalo nedelsiant, bet ne vėliau kaip per 3 (tris) darbo dienas po patvirtinimo išsiuntimo Pirkėjui dienos, sustabdyti sutartinių įsipareigojimų ar jų dalies vykdymą. Jei sutartinių įsipareigojimų ar jų dalies vykdymas sustabdytas, Šalys negali vykdyti jokių jiems pagal Sutartį ar Sutarties dalį priskirtų įsipareigojimų.
21.6. Šalys sutartinių įsipareigojimų vykdymo stabdymą įformina rašytiniu susitarimu, nurodant priežastis ir sustabdymo terminą, bei pridedant dokumentus, patvirtinančius sustabdymo pagrindą, ir patvirtina Šalių įgaliotų atstovų parašais. Tokie susitarimai yra neatskiriama Sutarties dalis.
21.7. Sutartinių įsipareigojimų vykdymas stabdomas ne ilgesniam kaip konkrečios, pagrįstos aplinkybės egzistavimo laikotarpiui.
21.8. Šalys susitaria, kad sutartinių įsipareigojimų vykdymo sustabdymo terminas į Sutarties vykdymo terminą nėra įskaičiuojamas, jo metu sutartiniai įsipareigojimai nevykdomi ir už šį periodą Pirkėjas Tiekėjui nemoka jokių mokėjimų, baudų ar prastovų.
21.9. Jeigu Sutartyje numatytų prievolių įvykdymo terminai buvo sustabdyti Sutartyje nustatytais pagrindais, jie atnaujinami pasibaigus sustabdymą lėmusioms aplinkybėms arba Šalių susitarime nurodytam terminui, priklausomai nuo to, kuris įvyksta anksčiau. Tuo atveju, jeigu Sutartyje numatytų prievolių įvykdymo terminai atnaujinami anksčiau negu pasibaigia Šalių susitarime

nurodytas sustabdymo terminas, Šalys Sutartyje numatytų prievolių įvykdymo terminų atnaujinimo datą įformina raštu.
21.10. Atnaujinus Sutarties vykdymą, neįvykdytų prievolių (jų dalies) įvykdymo terminai ir Sutarties galiojimas nukeliami tokiam terminui, kiek buvo likę laiko jų įvykdymui (Sutarties galiojimui) jų sustabdymo metu.
21.11. Jei sutartinių įsipareigojimų vykdymas buvo sustabdytas ilgesniam nei 3 (trijų) mėnesių laikotarpiui, praėjus šiam terminui, viena Šalis gali rašytiniu pranešimu kitos Šalies pareikalauti atnaujinti Sutarties vykdymą. Šaliai be pagrįstų aplinkybių neatnaujinus Sutarties vykdymo per 10 (dešimt) dienų nuo atitinkamo kreipimosi, kita Šalis gali nutraukti Sutartį, apie tai įspėjusi kitą Šalį prieš 10 (dešimt) dienų.

22. SUTARTIES NUTRAUKIMAS

Sutartis gali būti nutraukiama VPĮ 90 straipsnyje ir Sutartyje numatytais atvejais, įskaitant galimybę nutraukti Sutartį Šalių susitarimu.

22.1. Pretenzijos dėl Sutarties pažeidimų

22.1.1. Jeigu Šalis pažeidžia Sutartį arba įstatymus bei kitus teisės aktus, kita Šalis turi teisę pareikšti jai rašytinę pretenziją, nurodyti, kokią Sutarties ar įstatymų bei kitų teisės aktų nuostatą ir kokiu būdu kita Šalis pažeidė bei nustatyti protingą terminą ištaisyti pažeidimą.
22.1.2. Pretenziją gavusi Šalis privalo nedelsdama, bet ne vėliau nei per 5 (penkias) darbo dienas, atsakyti į pretenziją ir nurodyti, kokių priemonių imsis siekdama ištaisyti pažeidimą per pretenzijoje nustatytą terminą arba motyvuotai pasiūlyti kitą pagrįstą terminą. Tiekėjo teisė siūlyti kitą terminą nelaikoma Pirkėjo pareiga tą terminą priimti. Pretenziją gavusios Šalies pasiūlytasis terminas pakeičia terminą, nurodytą pretenzijoje, tik jeigu kita Šalis jį patvirtina.

22.2. Sutarties nutraukimas Pirkėjo iniciatyva

22.2.1. Pirkėjas vienašališkai nutraukia Sutartį, įspėjęs Tiekėją raštu prieš ne trumpesnį nei 5 (penkių) dienų terminą, jeigu Tiekėjas padaro esminį Sutarties pažeidimą, nurodytą Specialiosiose sąlygose ar Sutarties pažeidimą, kuris atitinka esminio Sutarties pažeidimo požymius, nurodytus Lietuvos Respublikos civiliniame kodekse, ir, gavęs Pirkėjo pretenziją, per pretenzijoje nurodytą terminą neištaiso pažeidimo.
22.2.2. Pirkėjas turi teisę vienašališkai nutraukti Sutartį ar jos dalį raštu įspėjęs Tiekėją prieš ne trumpesnį nei 10 (dešimties) dienų terminą, jeigu:
22.2.2.1. Tiekėjui yra iškelta bankroto byla, pradėtas bankroto procesas ne teismo tvarka, jis tampa nemokus arba yra nemokumo tikimybė, sustabdo ūkinę veiklą ar susidaro įstatymuose ir kituose teisės aktuose nustatyta tvarka analogiška situacija;
22.2.2.2. Tiekėjo padėtis pasikeičia ir jis atitinka pirkimo dokumentuose nustatytą pašalinimo pagrindą;
22.2.2.3. pasikeičia teisės aktai, susiję su Sutarties objektu, Sutarties vykdymu, ar su Pirkėjo vykdoma veikla, kuriai buvo sudaryta Sutartis, ir dėl tokių pakeitimų Pirkėjas nusprendžia nutraukti Sutartį;
22.2.2.4. Pirkėjas nusprendžia nebevykdyti veiklos, kurios vykdymui Sutartimi įsigyjamos Prekės ir Sutarties poreikis išnyksta;

22.2.2.5. Pirkėjo valdymo organas priima sprendimą, dėl kurio Sutarties poreikis išnyksta;
22.2.2.6. pasikeičia (pablogėja) Pirkėjo finansinė padėtis ar Pirkėjas negauna arba netenka finansavimo ir dėl šios priežasties nusprendžia nutraukti Sutartį;
22.2.2.7. keičiasi Pirkėjo organizacinė struktūra – juridinis statusas, pobūdis ar valdymo struktūra ir tai gali turėti įtakos tinkamam Sutarties įvykdymui arba Sutarties poreikiui;
22.2.2.8. nebelieka perkamų Prekių poreikio;
22.2.2.9. Pirkėjas iš pirkimų priežiūrą atliekančių institucijų gauna nurodymą ar rekomendaciją nutraukti Sutartį;
22.2.2.10. Tiekėjas vėluoja pateikti Sutarties įvykdymo užtikrinimo pratęsimą ilgiau kaip 10 (dešimt) darbo dienų nuo paskutinio Sutarties įvykdymo užtikrinimo galiojimo termino pabaigos arba atsisako jį pateikti;
22.2.2.11. Tiekėjas atsisako pašalinti arba nepašalina Prekių trūkumų per Pirkėjo nustatytus protingus terminus;
22.2.2.12. Tiekėjas pažeidžia Sutartį arba įstatymus bei kitus teisės aktus ir per Pirkėjo rašytinėje pretenzijoje nurodytą terminą neištaiso pažeidimo;
22.2.2.13. Lietuvos Respublikos Vyriausybė Nacionaliniam saugumui užtikrinti svarbių objektų apsaugos įstatymo nustatyta tvarka priima sprendimą, patvirtinantį, kad Sutartis neatitinka nacionalinio saugumo interesų (taikoma, jeigu Pirkėjas veikia srityse, kurios laikomos nacionaliniam saugumui užtikrinti strategiškai svarbių ūkio sektorių dalimi, ar yra laikomas esminiu subjektu);
22.2.2.14. paaiškėja VPĮ 37 straipsnio 8 dalyje ir (ar) 47 straipsnio 8 dalyje nurodytos aplinkybės.
22.2.3. Sutartis laikoma niekine ir negaliojančia, jei nustatoma, kad Sutarties vykdymas prieštarauja Lietuvos Respublikoje įgyvendinamoms privalomoms tarptautinėms sankcijoms, kaip tai apibrėžta Sankcijų įstatyme ir kituose tarptautiniuose, Europos Sąjungos ir Lietuvos Respublikos teisės aktuose (bent vienai iš taikomų sankcijų). Sutarties negaliojimo momentas nustatomas vadovaujantis minėtu įstatymu.
22.2.4. Pirkėjas nedelsiant, bet ne vėliau kaip per 5 (penkias) dienas, vienašališkai nutraukia Sutartį arba sustabdo jos vykdymą privalomų tarptautinių sankcijų, kaip tai apibrėžta Sankcijų įstatyme ir kituose tarptautiniuose, Europos Sąjungos ir Lietuvos Respublikos teisės aktuose, įgyvendinimo laikotarpiui, apie tai įspėjęs Tiekėją raštu, jei Sutartis įsigaliojo iki šių tarptautinių sankcijų Lietuvos Respublikoje įgyvendinimo nustatymo. Draudžiama prisiimti naujas prievoles pagal Sutartį, kurių vykdymas prieštarautų Lietuvos Respublikoje įgyvendinamoms tarptautinėms sankcijoms.
22.2.5. Jei Sutartis nutraukiama dėl Tiekėjo esminio Sutarties pažeidimo ar Tiekėjui nepagrįstai nutraukus Sutarties vykdymą ne Sutartyje nustatyta tvarka, ir jeigu Specialiosiose sąlygose nėra numatyta, kad tinkamas Sutarties įvykdymas yra užtikrinamas Sutarties įvykdymo užtikrinimu, Tiekėjas įsipareigoja sumokėti Pirkėjui Specialiosiose sąlygose nurodyto dydžio baudą ir atlyginti nuostolius, susijusius su Sutarties nutraukimu. Jeigu Specialiosiose sąlygose yra numatyta, kad tinkamas Sutarties įvykdymas yra užtikrinamas Sutarties įvykdymo užtikrinimu, Tiekėjas įsipareigoja Pirkėjui sumokėti likusią dalį Specialiosiose sąlygose nurodyto dydžio baudos ir atlyginti nuostolius, susijusius su Sutarties nutraukimu, kiek jų nepadengia Sutarties įvykdymo užtikrinimas. Pirkėjui pareiškus reikalavimą atlyginti patirtus nuostolius, baudos suma įskaitoma į nuostolių atlyginimą.
22.2.6. Pirkėjas turi teisę vienašališkai nutraukti Sutartį ir kitais Specialiosiose sąlygose (jei taikoma) ir įstatymuose bei kituose teisės aktuose įtvirtintais atvejais.

22.2.7. Sutartis laikoma nutraukta kitą dieną po to, kai pasibaigia įspėjimo apie Sutarties nutraukimą terminas.
22.2.8. Tais atvejais, kai Tiekėjas pašalina pažeidimą ar išnyksta aplinkybės, dėl kurių buvo inicijuota Sutarties nutraukimo procedūra, Sutartis negali būti nutraukiama ir įspėjimas apie Sutarties nutraukimą netenka galios, jei Tiekėjas pateikia informaciją apie pažeidimo pašalinimą ar išnykusias aplinkybes, dėl kurių buvo inicijuota Sutarties nutraukimo procedūra.

22.3. Sutarties nutraukimas Tiekėjo iniciatyva

22.3.1. Tiekėjas turi teisę vienašališkai nutraukti Sutartį, įspėjęs Pirkėją raštu prieš ne trumpesnį nei 30 (trisdešimties) dienų terminą, jeigu Pirkėjas pažeidžia atsiskaitymo su Tiekėju terminus (išskyrus atvejus, kai Pirkėjas naudojasi savo teise sulaikyti mokėjimus), ir Pirkėjo skola Tiekėjui viršija 20 (dvidešimt) proc. Pradinės sutarties vertės ir Pirkėjas, gavęs Tiekėjo pretenziją, per 30 (trisdešimt) dienų nesumoka Tiekėjui mokėtinų sumų.
22.3.2. Tiekėjas turi teisę vienašališkai nutraukti Sutartį, įspėjęs Pirkėją raštu prieš ne trumpesnį nei 10 (dešimties) dienų terminą, jeigu:
22.3.2.1. Pirkėjui yra iškelta bankroto byla, pradėtas procesas dėl bankroto ne teismo tvarka, jis tampa nemokus arba yra nemokumo tikimybė, Pirkėjas sustabdo veiklą, arba įstatymuose ir kituose teisės aktuose numatyta tvarka susidaro analogiška situacija;
22.3.2.2. Pirkėjas pažeidžia Sutartį arba įstatymus bei kitus teisės aktus ir per Tiekėjo rašytinėje pretenzijoje nurodytą terminą neištaiso pažeidimo, išskyrus Bendrųjų sąlygų 22.3.1 punkte nustatytą atvejį.
22.3.3. Jeigu Bendrųjų sąlygų 22.3.1 punkte nurodytos aplinkybės yra susijusios tik su atskira dalimi arba atskiru Susitarimu, Tiekėjas turi teisę nutraukti Sutartį tik tos dalies atžvilgiu arba nutraukti tik tokį Susitarimą.
22.3.4. Tiekėjas turi teisę vienašališkai nutraukti Sutartį ir kitais įstatymuose bei kituose teisės aktuose įtvirtintais atvejais.
22.3.5. Jei Sutartis nutraukiama dėl Pirkėjo esminio Sutarties pažeidimo ar Pirkėjui nepagrįstai nutraukus Sutarties vykdymą ne Sutartyje nustatyta tvarka, Pirkėjas įsipareigoja sumokėti Tiekėjui Specialiosiose sąlygose nurodyto dydžio baudą ir atlyginti nuostolius, susijusius su Sutarties nutraukimu.
22.3.6. Sutartis laikoma nutraukta kitą dieną po to, kai pasibaigia įspėjimo apie Sutarties nutraukimą terminas.
22.3.7. Tais atvejais, kai per įspėjimo apie Sutarties nutraukimą terminą Pirkėjas pašalina pažeidimą arba išnyksta aplinkybės, dėl kurių buvo inicijuota Sutarties nutraukimo procedūra, Sutartis negali būti nutraukiama ir įspėjimas apie Sutarties nutraukimą netenka galios, jei Pirkėjas pateikia informaciją apie pažeidimo pašalinimą ar išnykusias aplinkybes, dėl kurių buvo inicijuota Sutarties nutraukimo procedūra.

22.4. Šalių teisės ir pareigos Sutarties nutraukimo atveju

22.4.1. Sutarties nutraukimas neturi įtakos ginčų nagrinėjimo tvarką nustatančių Sutarties sąlygų ir kitų Sutarties sąlygų, kurios pagal savo esmę lieka galioti ir po Sutarties nutraukimo, galiojimui.
22.4.2. Nutraukus Sutartį, Šalys privalo:
22.4.2.1. įsitikinti, jog iki Sutarties nutraukimo dienos pristatytos Prekės ir kiti atlikti veiksmai atitinka Sutarties reikalavimus ir Šalys dėl to viena kitai nebereikš pretenzijų;

22.4.2.2. atsiskaityti už iki Sutarties nutraukimo pristatytas Prekes, atitinkančias Sutarties reikalavimus;
22.4.2.3. per 10 (dešimt) dienų nuo pranešimo apie Sutarties nutraukimą gavimo dienos ar Susitarimo dėl Sutarties nutraukimo sudarymo dienos perduoti viena kitai visus dokumentus, kuriuos buvo būtina perduoti pagal Sutarties nuostatas.

23. PREKIŲ MODELIO AR GAMINTOJO KEITIMAS

23.1. Tiekėjas turi teisę keisti Prekių modelį ir (ar) gamintoją, jei yra visos toliau nurodytos sąlygos:
23.1.1. jei Tiekėjo pasiūlyme nurodytos Prekės nebegaminamos ar iš esmės sutriko jų tiekimas ir gautas gamintojo patvirtinimas ir (ar) Prekės, jų gamintojas kelia grėsmę nacionaliniam saugumui ir (ar) Prekių tiekimas prieštarauja Lietuvos Respublikoje įgyvendinamoms privalomoms tarptautinėms sankcijoms, kaip tai apibrėžta Sankcijų įstatyme ir (ar) Prekės, jų sudedamosios dalys ar (ir) gamintojas neatitinka VPĮ 45 straipsnio 2^1 dalies nuostatų;
23.1.2. jei keičiamos Prekės visiškai atitinka visus pirkimo dokumentų reikalavimus, yra ne prastesnės, o lygiavertės ar geresnės kokybės nei Tiekėjo pasiūlyme nurodytos Prekės ir Tiekėjas pateikia tai patvirtinančius dokumentus. Jeigu pirkimo procedūrų metu Tiekėjas buvo pateikęs Prekių pavyzdžius, pristatomos Prekės turi būti ne prastesnės kokybės nei pateikti pavyzdžiai;
23.1.3. jei Tiekėjas, ne vėliau kaip prieš 10 (dešimt) dienų iki numatomo Prekių keitimo, pateikė Pirkėjui rašytinį prašymą su keitimą pagrindžiančiais dokumentais bei gavo Pirkėjo rašytinį sutikimą. Pirkėjas turi teisę nesutikti su Prekės keitimu ir turi teisę nutraukti Sutartį, jei Tiekėjas nepateikė įrodymų ar jų pateikimas nepagrindžia keičiamos Prekės atitikimo pirkimo dokumentams ir lygiavertiškumo ar geresnės kokybės nei Sutartyje nurodytos Prekės;
23.1.4. Šalys sudarė rašytinį Susitarimą prie Sutarties dėl Prekių keitimo.
23.2. Šiame Bendrųjų sąlygų skyriuje nurodytu atveju Prekės turi būti pristatytos už ne didesnę nei pasiūlyme nurodytą kainą.

24. BENDRAVIMO TVARKA IR KALBA

24.1. Sutartis sudaroma lietuvių kalba. Jeigu Sutartis ar kuris nors ją sudarantis dokumentas sudaromas kita kalba arba išverčiamas į kitą kalbą, visais atvejais autentišku laikomas tik lietuvių kalba parengtas Sutarties tekstas (jei yra neatitikimų, pirmenybė teikiama lietuvių kalba parengtam tekstui).
24.2. Jeigu Šalis praneša kitai Šaliai apie savo naujus kontaktinius duomenis, tai po to, kai kita Šalis gauna tokį pranešimą, ji visus remiantis Sutartimi siunčiamus pranešimus ir informaciją turi siųsti pagal naujuosius kontaktinius duomenis. Jei Šalis nepraneša apie kontaktinių duomenų pasikeitimą arba kol kita Šalis negauna tokio pranešimo, pranešimo išsiuntimas pagal paskutinius Šaliai žinomus kontaktinius duomenis laikomas tinkamu.
24.3. Jeigu pranešimas yra įteikiamas asmeniškai arba siunčiamas paštu ar per kurjerį, jis turi būti įteikiamas pasirašytinai ir laikomas gautu gavimo patvirtinime nurodytą dieną.
24.4. Jeigu pranešimas siunčiamas el. paštu, laikoma, kad Šalis jį gavo kitą darbo dieną.
24.5. Jeigu pranešimas siunčiamas keliais skirtingais būdais, laikoma, kad gavėjas jį gavo tada, kai jis gavo pirmesnįjį pranešimą.

25. PRETENZIJOS IR GINČŲ SPRENDIMAS

25.1. Bet kokie ginčai, nesutarimai ar reikalavimai, kylantys iš Sutarties arba susiję su Sutartimi, jos pažeidimu, nutraukimu ar galiojimu, visų pirma privalo būti sprendžiami derybomis tarp Šalių vadovų arba jų įgaliotų asmenų.
25.2. Jeigu Šalys neišsprendžia ginčo derybų būdu tuomet toks ginčas, nesutarimas ar reikalavimas, kylantis iš šios Sutarties arba susijęs su ja ar jos pažeidimu, nutraukimu arba negaliojimu, yra galutinai sprendžiamas Lietuvos Respublikos teismuose Lietuvos Respublikos įstatymuose nustatyta tvarka.
25.3. Kilę ginčai nesudaro pagrindo Šalims atsisakyti vykdyti savo prievoles pagal Sutartį.

Priedų pakeitimai:

Tipine prekiu sutartis_specialiosios salygos, nauja redakcija pagal 1S-51
Priedo pakeitimai:
Nr. 1S-51, 2025-04-17, paskelbta TAR 2025-04-18, i. k. 2025-06846

Pakeitimai:

1.
Viešųjų pirkimų tarnyba, Įsakymas
Nr. 1S-30, 2024-02-29, paskelbta TAR 2024-02-29, i. k. 2024-03752
Dėl Viešųjų pirkimų tarnybos direktoriaus 2024 m. vasario 8 d. įsakymo Nr. 1S-19 „Dėl Prekių viešojo pirkimo–pardavimo sutarties tipinių sąlygų patvirtinimo“ pakeitimo

2.
Viešųjų pirkimų tarnyba, Įsakymas
Nr. 1S-51, 2025-04-17, paskelbta TAR 2025-04-18, i. k. 2025-06846
Dėl Viešųjų pirkimų tarnybos direktoriaus 2024 m. vasario 8 d. įsakymo Nr. 1S-19 „Dėl Prekių viešojo pirkimo – pardavimo sutarties tipinių sąlygų patvirtinimo“ pakeitimo

Įrenginio, skirto aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu pirkimas

TECHNINĖ SPECIFIKACIJA

1. Valstybinė vartotojų teisių apsaugos tarnyba numato įsigyti įrenginį Naftos produktų bandymų laboratorijai.

2. Pirkimo objektas: įrenginys, skirtas aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu. Metodas: LST EN 12916 „Naftos produktai. Aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymas. Efektyviosios skysčių chromatografijos metodas, naudojant lūžio rodiklio detektorių“.

3. Prietaisas turi būti naujas, nenaudotas ir pristatytas į Valstybinės vartotojų teisių apsaugos tarnybos Naftos produktų bandymų laboratoriją, adresu V. Bielskio g. 47B, Šiauliai iki 2025 m. gruodžio 15 d.

4. Lentelėje pateikiami reikalavimai aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui naudojamas įrenginiui:

Eil. Nr.	Rodiklis	Reikšmė
1.	Paskirtis	Dyzelino bandiniuose aromatinių angliavandenilių tipų nustatymas.
2.	Konfigūracija	Stalinis, kompaktiškas.
3.	Pritaikymas	Sistema privalo būti pilnai sukonfigūruota ir pritaikyta aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu LST EN 12916 ir pateiktas gamintojo paruoštas taikymo aprašymas arba patvirtinimas.
4.	Analizės rėžimai	Kokybinis, kiekybinis, pusiau kiekybinis.
Eliuentų tiekimo prietaisas (siurblys)		
5.	Eliuentų tiekimo prietaisas (siurblys)	Privaloma binarinė arba izokratinė pompa. Nudujinami visi eliuento kanalai
6.	Srauto kontrolė	Ne mažiau kaip dvi stūmoklių kameros.
7.	Srauto nustatymo intervalas	Ne mažiau kaip nuo 0,001 ml/min iki 5 ml/min.
8.	Maksimalus slėgis	Ne mažiau kaip 400 bar visame reikalaujamame srauto intervale.
9.	Eliuentų spūdumo kompensavimas	Privalomas, automatinis.
10.	Srauto tikslumas	Ne daugiau nei ± 1,0 %.
Automatinė mėginių įvedimo sistema		
11.	Automatinis skystų mėginių įvedimo įrenginys	Privalomas.
12.	Injektoriaus talpa	Pritaikytas darbui su 2 ml (± 10%) chromatografiniais indeliais. Autosamplerio talpa ne mažesnė kaip 100 chromatografinių indelių.
13.	Injekcijos tūrio diapazonas	Ne mažiau kaip nuo 0,1 iki 100 µl.
14.	Palaikomas slėgis	Ne mažesnis nei 400 bar.

15.	Adatos praplovimas	Privalomas. Adatos praplovimo sistema turi naudoti švarų tirpalą adatos praplovimui po kiekvienos injekcijos. Tirpalas su kuriuo adata kontaktuoja negali būti naudojamas adatos praplovimui pakartotinai.
16.	Injekcijos preciziškumas	Ne didesnis nei 0,25 % RSD
Kolonėlių termostatas:		
17.	Kolonėlių termostatas	Privalomas, termoelektrinis arba oro cirkuliacijos temperatūros palaikymas.
18.	Termostatavimo temperatūra	Termostato palaikomos temperatūros intervalas ne siauresnis nei nuo 10°C žemiau kambario temperatūros iki +80°C. Temperatūros nustatymo žingsnis ne didesnis nei 1°C.
19.	Temperatūros stabilumas	Ne daugiau nei ± 1°C.
20.	Talpinamų kolonėlių skaičius	Ne mažiau kaip 2 (dvi) 30 cm ilgio kolonėlės su prieškolonėmis.
21.	Integruotas vožtuvas	Kolonėlių termostatas privalo kontroliuojamoje temperatūrinėje zonoje integruoti ir valdyti ne mažiau nei 2 pozicijų/6 angų vožtuvą, palaikantį nei mažesnei nei 400 bar slėgį, kolonėlių praplovimo (backflush) funkcijai atlikti.
22.	Dalelių filtras	Privalomas, 0,45 µm arba mažesnio poringumo mikrofiltro.
Lūžio indekso (*Refractive index*) detektorius		
23.	Detektorius	Privalomas lūžio indekso detektorius valdomas per programinę įrangą.
24.	Triukšmo lygis	Ne prastesnis nei $2,5 \cdot 10^{-9}$ RIU.
25.	Detektoriaus signalo stabilumas	Ne didesnis nei $200 \cdot 10^{-9}$ RIU/h.
26.	Duomenų surinkimo dažnis	Ne mažesnis nei 40 Hz.
27.	Lūžio indekso intervalas	Ne siauresnis nei nuo 1,00 iki 1,70 RIU.
28.	Mėginio kiuvetės tūris	Ne didesnis nei 10 µl.
Valdymas		
29.	Komplektacija	Privalomas kompiuteris su monitoriumi pilnai atitinkantis programinės įrangos gamintojo reikalavimus.
30.	Spausdintuvas	Privalomas didelio spausdinimo greičio spausdintuvas spausdinantis ne mažiau nei 15 lapų per 1 minutę.
Programinė įranga		
31.	Taikomoji programa	Taikomoji programa visų chromatografo funkcijų programiniam valdymui, chromatografijos duomenų surinkimui, analizei, ataskaitų generavimui, duomenų saugojimui ir ataskaitų kūrimui.
32.	Multiparametrinė paieška	Būtina, pagal datą, operatoriaus vardą, mėginio aprašymą, mėginio numerį ir kt.
33.	Papildomos funkcijos	Privaloma turėti ataskaitų šablonų kūrimo ir koregavimo funkciją ir skaičiavimų pagal vartotojo nurodytą formulę funkciją.
Bendrieji reikalavimai		

34.	Maitinimas	220-240 V, 50 Hz.
35.	Aplinkos temperatūra	4-35 °C.
Papildomi reikalavimai		
36.	Kartu su prietaisu privaloma pateikti	Privaloma pateikti ne mažiau nei 1000 vnt. 2 ml indelių bandinių matavimui. Su įranga privaloma pateikti skirtingų pamatinių paliudytų medžiagų tirpalus kalibracinių kreivių sudarymui pagal standartizuotą metodą LST EN 12916. Privalomos, mobilios fazės talpos su specialiais chromatografiniais kamščiais (3 vnt.) Pateikti atliekų surinkimo talpą su specialiu kamščiu, prijungiančiu sistemos atliekų nutekėjimo žarneles, ir su filtru, absorbuojančiu į atliekas patekusių tirpiklių garus. Privaloma pateikti atsargines analitines kolonėles naudojamas įrenginyje dirbančiame pagal metodą LST EN 12916 (2 vnt.).
37.	Dokumentacija	Įrenginio darbo instrukcija lietuvių kalba.
38.	Įrangos pristatymas ir instaliacija	Privalomi, naudotojo nurodytu adresu.
39.	Bandinio analizės rezultatų ataskaitos paruošimo funkcija	Privaloma.
40.	Apmokymai	Apmokymas (lietuvių kalba) darbo vietoje dirbti su įrenginiu.
41.	Papildomi reikalavimai	Tiekėjas privalo būti įrangos gamintojas arba oficialus siūlomos įrangos atstovas, turėti gamintojo apmokytą serviso personalą bei užtikrinti įrangos aptarnavimą garantiniu/pogarantiniu periodu.
42.	Papildomi reikalavimai	Tiekėjas privalo atlikti siūlomo prietaiso instaliaciją vartojimo vietoje, įvedimą į eksploataciją, darbo metodo kūrimą, adaptaciją, derinimą, kalibracinių kreivių kūrimą, ataskaitos formos kūrimą. Privalomi detalūs apmokymai perkančiosios organizacijos darbuotojams darbui su pateikiamu prietaisu.
43.	Garantija ir techninis aptarnavimas	Siūlomam prietaisui privaloma suteikti ne trumpesnę nei 36 mėn. garantiją skaičiuojant nuo prekių perdavimo-priėmimo akto pasirašymo dienos. Garantinės priežiūros laikotarpiu garantuojamas nemokamų nesusinaudojančių atsarginių dalių tiekimas ir nemokami remonto darbai. Į kainą privalo būti įskaičiuotos įrangos transportavimo į laboratoriją (adresu V. Bielskio 47B, Šiauliai), instaliacijos, vartotojų apmokymo darbo vietoje paslaugos, techninio garantinio aptarnavimo paslaugos. Garantinio gedimo metu serviso reakcijos laikas privalo būti užtikrinamas ne ilgiau kaip per 48 val. (2 darbo dienas) nuo pranešimo gavimo.
44.	Techninis palaikymas	Tiekėjas privalo užtikrinti konsultacijas darbui su įranga bei einamojo aptarnavimo paslaugų tiekimą garantiniu periodu.

45.	Aplinkosauginiai reikalavimai	Komplekte esančioms prekėms pagaminti turi būti sunaudojama mažiau gamtos išteklių ir (ar) sudėtyje yra pakartotinai panaudotų ir (ar) perdirbtų medžiagų. Be to prekė turi būti tvirta, ilgaamžė, funkcionali, ji ar jos sudedamosios dalys tinka naudoti daug kartų ir (ar) lengvai pataisomos, ir (ar) pakeičiamos. Kompiuterinei įrangai taikomi Aplinkos apsaugos kriterijų taikymo, vykdant žaliuosius pirkimus, tvarkos aprašo Produktų, kurių viešiesiems pirkimams ir pirkimams taikytini minimalūs aplinkos apsaugos kriterijai, sąrašo IV skyriaus reikalavimai.

Pirkimo objektui taikomi Lietuvos Respublikos viešųjų pirkimų įstatymo 37 str. 9 dalies reikalavimai susiję su nacionaliniu saugumu*. Tiekėjas privalo įrodyti, kad siūlomos prekės nekelia grėsmės nacionaliniam saugumui, nėra toliau nurodytų aplinkybių:

1) prekių gamintojas ar jį kontroliuojantis asmuo yra registruoti (jeigu gamintojas ar jį kontroliuojantis asmuo yra fizinis asmuo – nuolat gyvenantis ar turintis pilietybę) VPĮ 92 straipsnio 14 dalyje numatytame sąraše nurodytose valstybėse ar teritorijose;

2) paslaugų (garantija ir techninis aptarnavimas) teikimas būtų vykdomas iš VPĮ 92 straipsnio 14 dalyje numatytame sąraše nurodytų valstybių ar teritorijų.

Perkančioji organizacija pasiūlymo atitikčiai LR viešųjų pirkimų įstatymo 37 straipsnio 9 dalies reikalavimams patvirtinti iš tiekėjo reikalauja KARTU SU PASIŪLYMU PATEIKTI užpildytą pirkimo dokumentą „Nacionalinio saugumo reikalavimų atitikties deklaracija“, o iš ekonomiškai naudingiausią pasiūlymą pateikusio tiekėjo reikalaus pateikti (kartu su pasiūlymu šių dokumentų tiekėjas pateikti neturi) – vieną ar kelis šiuos dokumentus: juridinio asmens vadovo patvirtintą juridinio asmens steigimo dokumentų kopiją, Juridinių asmenų registro išplėstinį išrašą su istorija, Juridinių asmenų dalyvių informacinės sistemos išrašą, asmens tapatybę patvirtinančio dokumento (tapatybės kortelės ar paso) kopiją, leidimo verstis atitinkama ūkine veikla patvirtinančio dokumento (pavyzdžiui, verslo liudijimo, individualios veiklos pažymėjimo ir pan.) kopiją, pažymą apie deklaruotą gyvenamąją vietą arba atitinkamus valstybės narės ar trečiosios šalies dokumentus, ar kitus perkančiajai organizacijai priimtinus dokumentus.**

Pastabos:

*Jeigu prekių gamintojas ar paslaugų teikėjas ar jį kontroliuojantis asmuo yra nacionaliniam saugumui užtikrinti svarbi įmonė, valstybės įmonė, savivaldybės įmonė, taip pat valstybės valdoma bendrovė ir jų dukterinės bendrovės, išvardytos Nacionaliniam saugumui užtikrinti svarbių objektų apsaugos įstatyme, šiems subjektams aukščiau nurodytas reikalavimas (VPĮ 37 straipsnio 9 dalis) yra netaikomas.

**Dokumentai, kuriuose nenurodytas jų galiojimo terminas, turi būti išduoti ar atspausdinti iš informacinės sistemos ne anksčiau kaip likus 3 mėnesiams iki tos dienos, kurią perkančiosios organizacijos prašymu tiekėjas turi pateikti dokumentus.

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ARMGATE

Įrenginio, skirto aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu pirkimas

Valstybinė vartotojų teisių apsaugos tarnybai
Teikiama CVP IS priemonėmis

2025-10-01
(Data, Nr. 2510/01)

Vilnius
(Vieta)

1 lentelė. Tiekėjo rekvizitai:

Tiekėjo pavadinimas ir kodas	*Arm Gate, UAB (kodas 135218757)*
Tiekėjo adresas	*J. Kubiliaus g. 6-21, Vilnius, 08234 Vilniaus m. sav.*
PVM mokėtojo kodas	*LT352187515*
Bankas ir sąskaitos numeris	*LT827300010074437059* *Swedbank AB*
Telefono Nr., internetinis puslapis, el. paštas	*tel. 8 5 2879573,* *info@armgate.lt*
Asmens, pateikusio pasiūlymą CVP IS priemonėmis, vardas, pavardė, pareigos[1]	*Žydrūnas Stanius, direktorius*

2 lentelė. Su pasiūlymu pateikiami dokumentai:

Eil. Nr.	Pateikto dokumento pavadinimas	Ar dokumente yra konfidenciali* informacija	Jeigu taip, kokiu pagrindu atitinkamas dokumentas yra konfidencialus?	Lapų skaičius
1.	Ši pasiūlymo forma	Ne		....
2.	EBVPD	Taip	Asmens duomenų dalis	14
3.	Deklaracija dėl nacionalinio saugumo	Taip	Asmens duomenų dalis	2
4.	Tiekėjo deklaracija	Taip	Asmens duomenų dalis	2
5.	Deklaracija dėl žaliųjų kriterijų	Taip	Asmens duomenų dalis	1
6.	Gamintojo atstovavimo raštas	Taip	Asmens duomenų dalis	1
7.	Gamintojo raštas *Statement.pdf*	Taip	Komercinė informacija	1

***** Informacija, nurodyta VPĮ 20 straipsnio 2 dalies 1, 2, 3, 4 punktuose negali būti nurodoma ir nebus laikoma konfidencialia. Tiekėjas gali nurodyti, kuri informacijos dalis pasiūlyme yra konfidenciali. Tiekėjo su pasiūlymu teikiamų dokumentų informacijos konfidencialumas gali būti nustatomas tik pagrįstais atvejais. Jeigu kils abejonių dėl tiekėjo pasiūlyme nurodytos informacijos konfidencialumo, Komisija prašys tiekėją per nurodytą terminą, kuris negali būti trumpesnis kaip 3 darbo dienos, pagrįsti jos konfidencialumą. Jei tokia informacija pasiūlyme nebus nurodyta, Komisija laikys, kad bet kuri pasiūlyme pateikta informacija nėra konfidenciali, išskyrus informaciją, kurią atskleidus būtų pažeisti Tiekėjo įsipareigojimai pagal su trečiaisiais asmenimis sudarytas sutartis.

3 lentelė. Informacija apie rėmimąsi kitų subjektų pajėgumais. Vykdant pirkimo sutartį bus pasitelkiami šie ūkio subjektai *(Dėl kiekvieno iš ūkio subjektų, kurių pajėgumais remiamasi, tiekėjas turi pateikti atskirą, tų ūkio subjektų tinkamai užpildytą ir pasirašytą EBVPD formą su informacija, kurios reikalaujama).*

Eil. Nr.	Ūkio subjekto (-ų), kvazisubtiekėjo[2], trečiojo asmens[3], kurių pajėgumais remiamasi, pavadinimas (-ai)	Ūkio subjektas pasitelkiamas, siekiant atitikti kvalifikacijos reikalavimą *(Tiekėjas nurodo reikalavimo Nr. pagal SS)*	Pirkimo sutarties dalis, kuriai vykdyti pasitelkiamas ūkio subjektas, EUR arba proc.	Koks pateikiamas įrodymas dėl išteklių prieinamumo[4]
1.	....	....		....
2.	....	....		....

1 Jeigu pasiūlymą pasirašo ne tiekėjo vadovas, pasiūlyme pateikiama įgaliojimo skaitmeninė kopija.
2 Taikoma, jei kvalifikacijai įrodyti tiekėjas pasitelkia kvazisubtiekėjus, kurie pasiūlymo pateikimo metu nėra tiekėjo darbuotojai, tačiau jie bus įdarbinti laimėjimo ir Sutarties sudarymo atveju.
3 Taikoma, jeigu kvalifikacijai atitikti tiekėjas naudosis Tiekėjo kvalifikacijos reikalavimų nustatymo metodikos 8.3 punkte nurodytų trečiųjų asmenų, kurie tiesiogiai aktyviai, savo veiksmais neprisidės prie pirkimo vykdytojo poreikio įsigyti pirkimo objektą tenkinimo, priemonėmis.
4 Tiekėjas turi pateikti įrodymą (nurodytą BS 7.2 punkte), kuriame nurodoma, kuo ir kokia dalimi bus remiamasi kitų ūkio subjektų pajėgumais ir patvirtinantį, kad tiekėjas jų pajėgumais, priemonėmis galės naudotis visą sutarties vykdymo laikotarpį.

4 lentelė. Informacija apie subtiekėjus (jeigu žinoma):

Eil. Nr.	Subtiekėjo (-ų)[5], kurio (-ių) pajėgumais tiekėjas nesiremia, pavadinimas (-ai), kontaktiniai duomenys ir jų atstovai	Nurodoma, kokius sutartinius įsipareigojimus vykdys	Apimtis EUR arba proc.
1.	....	....	....
2.	....	....	....

5 Lentelė. Tiekėjo pasiūlymas, pagal „2 VVTAT PD SS“ 7 skyriaus reikalavimus:

Kriterijus	Atitikimas ir pridedami dokumentai
Antras kriterijus (T1) – Darbinio slėgio stebėjimo ir korekcijos funkcija	Sistema **turi** automatinę slėgio stebėjimo funkciją, kai esant padidintiems svyravimams automatiškai stabdo analizę, atlieka techninį tirpiklio pakeitimą pompoje dideliu srautu (angl. purge), ir pakartotinai atlieka sustabdyto mėginio analizę. *2,3,5 psl. Recovery.pdf*
Trečias kriterijus (T2) – Kolonėlių apsauginis srauto didinimo valdymas	**Yra** automatinė laipsninio srauto didinimo funkcija, aktyvuojama įjungus sistemos siurblius, kuri saugo kolonėlę nuo žalingų slėgio šuolių ir viršslėgio, atsižvelgdama į termostato temperatūrą. *1, 2 psl. FlowPilot.pdf*
Ketvirtas kriterijus (T3) – Lūžio indekso detektoriaus automatinio paruošimo darbui funkcija	**Yra** funkcionalumas - lūžio indekso detektoriaus paruošimas darbui – lyginamosios kiuvetės praplovimas ir užpildymas mobilia faze, optinis sistemos balansavimas ir signalo nulinės vertės nustatymas atliekamas visiškai automatiškai vieno mygtuko paspaudimu, be įrankių ar mechaninio detalių reguliavimo. *1 psl. Statement.pdf* *38, 168 psl. RID20A.pdf*

6 lentelė. Techniniai reikalavimai tiekėjui:

[5] **Subtiekėjo pasitelkimas nekeičia tiekėjo atsakomybės dėl numatomos sudaryti Sutarties įvykdymo, todėl bet kokiu atveju tiekėjas pilnai prisiima atsakomybę už subtiekėjų veiklą vykdant sutartį**

Reikalavimas	Atitikimas ir pridedami dokumentai
Tiekėjas turi būti įrenginio, skirto aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu gamintoju arba būti įgaliotas siūlomos įrangos gamintojo atstovas arba turi būti sudaręs atitinkamą sutartį su kitu ūkio subjektu, turinčiu teisę parduoti siūlomą įrangą ir atlikti siūlomos įrangos garantinį remontą. Tiekėjas **turi pateikti** dokumentą, patvirtinantį, kad tiekėjas yra siūlomos įrangos gamintojas (pateikiama tiekėjo pažyma), ar įgaliotas siūlomos įrangos gamintojo atstovas (pateikiami oficialų atstovavimą patvirtinantys dokumentai) ar yra sudaręs atitinkamą sutartį su kitu ūkio subjektu, turinčiu gamintojo suteiktą teisę ir turi garantinio remonto atlikimo galimybę (pateikiama tiekėjo pažyma ar gamintojo išduotas dokumentas, patvirtinantis įgaliojimą atlikti įrangos garantinį remontą, o jei sudaryta sutartis su ūkio subjektu, turinčiu gamintojo įgaliojimą, pateikiamas ūkio subjektui gamintojo išduotas įgaliojimas bei sutartis su tuo ūkio subjektu).	*Shimadzu_igaliojimas_EN_2024_signNGA.pdf*

7 Lentelė. Tiekėjo techninis pasiūlymas:

Eil. Nr.	Aprašymas	Minimalūs reikalavimai	Siūlomos įrangos techniniai rodikliai*
1.	**Aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui naudojamo įrenginio Gamintojas, modelis:**		
2.	Paskirtis	Dyzelino bandiniuose aromatinių angliavandenilių tipų nustatymas.	Dyzelino bandiniuose aromatinių angliavandenilių tipų nustatymas. *1psl. Statement.pdf*
3.	Konfigūracija	Stalinis, kompaktiškas.	Stalinis ir kompaktiškas https://www.shimadzu.com/an/products/liquid-chromatography/hplcuhplc/nexera-series/features.html#anchor_2
4.	Pritaikymas	Sistema privalo būti pilnai sukonfigūruota ir pritaikyta aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu LST EN 12916 ir pateiktas gamintojo paruoštas taikymo aprašymas arba patvirtinimas.	Sistema pilnai sukonfigūruota ir pritaikyta aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu LST EN 12916 ir pateiktas gamintojo paruoštas taikymo patvirtinimas. *1 psl. Statement.pdf*
5.	Analizės rėžimai	Kokybinis, kiekybinis, pusiau kiekybinis.	Analizės režimai- kokybinis, kiekybinis, pusiau kiekybinis. *1 psl. Statement.pdf*

Eliuentų tiekimo prietaisas (siurblys)			
6.	Eliuentų tiekimo prietaisas (siurblys)	Privaloma binarinė arba izokratinė pompa. Nudujinami visi eliuento kanalai	Izokratinė pompa. Nudujinami visi eliuento kanalai izokratinė pompa. Nudujinami visi eliuento kanalai. *3 psl. Nexera_b.pdf*
7.	Srauto kontrolė	Ne mažiau kaip dvi stūmoklių kameros.	Dvi stūmoklių kameros *3 psl. Nexera_b.pdf*
8.	Srauto nustatymo intervalas	Ne mažiau kaip nuo 0,001 ml/min iki 5 ml/min.	Nuo 0,0001 ml/min iki 5,0000 ml/min *3 psl. Nexera_b.pdf*
9.	Maksimalus slėgis	Ne mažiau kaip 400 bar visame reikalaujamame srauto intervale.	440 bar visame reikalaujamame srauto intervale *3 psl. Nexera_b.pdf*
10.	Eliuentų spūdumo kompensavimas	Privalomas, automatinis.	Yra eliuentų spūdumo kompensavimo funkcija *43 psl LC40D_IM.pdf*
11.	Srauto tikslumas	Ne daugiau nei ± 1,0 %.	Srauto tikslumas mažiau nei ± 1,0 %. *3 psl. Nexera_b.pdf*
Automatinė mėginių įvedimo sistema			
12.	Automatinis skystų mėginių įvedimo įrenginys	Privalomas.	Įtrauktas *4 psl. Nexera_b.pdf*
13.	Injektoriaus talpa	Pritaikytas darbui su 2 ml (± 10%) chromatografiniais indeliais. Autosamplerio talpa ne mažesnė kaip 100 chromatografinių indelių.	Pritaikytas darbui su 2 ml (± 10%) chromatografiniais indeliais. Autosamplerio talpa 162 chromatografiniai indeliai. *4 psl. Nexera_b.pdf* *1psl. Statement.pdf*
14.	Injekcijos tūrio diapazonas	Ne mažiau kaip nuo 0,1 iki 100 µl.	Nuo 0,01 iki 2000 µl *4 psl. Nexera_b.pdf*
15.	Palaikomas slėgis	Ne mažesnis nei 400 bar.	Palaikomas slėgis 440 bar *4 psl. Nexera_b.pdf*
16.	Adatos praplovimas	Privalomas. Adatos praplovimo sistema turi naudoti švarų tirpalą adatos praplovimui po kiekvienos injekcijos. Tirpalas su kuriuo adata kontaktuoja negali būti naudojamas adatos praplovimui pakartotinai.	Adatos praplovimo sistema naudoja švarų tirpalą adatos praplovimui po kiekvienos injekcijos. Tirpalas su kuriuo adata kontaktuoja nėra naudojamas adatos praplovimui pakartotinai. 4 psl. Nexera_b.pdf *1psl. Statement.pdf*
17.	Injekcijos preciziškumas	Ne didesnis nei 0,25 % RSD	Mažesnis nei 0,25 % RSD *4 psl. Nexera_b.pdf*
Kolonėlių termostatas:			
18.	Kolonėlių termostatas	Privalomas, termoelektrinis arba oro cirkuliacijos temperatūros palaikymas.	Oro cirkuliacijos temperatūros palaikymas 4 psl. Nexera_b.pdf
19.	Termostatavimo temperatūra	Termostato palaikomos temperatūros intervalas ne siauresnis nei nuo 10°C žemiau kambario temperatūros iki +80°C. Temperatūros nustatymo žingsnis ne didesnis nei 1°C.	Termostato palaikomos temperatūros intervalas nuo 10°C žemiau kambario temperatūros iki +85°C.

			Temperatūros nustatymo žingsnis 0,1°C. *4 psl. Nexera_b.pdf*
20.	Temperatūros stabilumas	Ne daugiau nei ± 1°C.	Temperatūros stabilumas 0,1 °C *4 psl. Nexera_b.pdf* *26 psl. CTO40S_IM.pdf*
21.	Talpinamų kolonėlių skaičius	Ne mažiau kaip 2 (dvi) 30 cm ilgio kolonėlės su prieškolonėmis.	2 (dvi) 30 cm ilgio kolonėlės su prieškolonėmis. *4 psl. Nexera_b.pdf* *1 psl. Statement.pdf*
22.	Integruotas vožtuvas	Kolonėlių termostatas privalo kontroliuojamoje temperatūrinėje zonoje integruoti ir valdyti ne mažiau nei 2 pozicijų/6 angų vožtuvą, palaikantį nei mažesnei nei 400 bar slėgį, kolonėlių praplovimo (backflush) funkcijai atlikti.	Kolonėlių termostate integruotas ir valdomas 2 pozicijų/6 angų vožtuvas, palaikantis 440 bar slėgį, tinkamas kolonėlių praplovimo (backflush) funkcijai atlikti. *8 psl. Nexera_b.pdf* *1 psl. Statement.pdf*
23.	Dalelių filtras	Privalomas, 0,45 µm arba mažesnio poringumo mikrofiltro.	Įtrauktas 0,2 µm poringumo mikrofiltras. Restek, UltraShield UHPLC PreColumn Filter, 0,2 µm https://www.restek.com/global/en/p/25810?srsltid=AfmBOop2W6UpHr1DVYLNS5xj1xDaLJUiMJqaRfT3zJIaiwXYk0v-jYVd
Lūžio indekso (*Refractive index*) detektorius			
24.	Detektorius	Privalomas lūžio indekso detektorius valdomas per programinę įrangą.	Įtrauktas lūžio indekso detektorius valdomas per programinę įrangą.. 6 psl. Nexera_b.pdf 1psl. Statement.pdf
25.	Triukšmo lygis	Ne prastesnis nei 2,5 ·10^{-9} RIU.	Ne prastesnis nei 2,5 ·10^{-9} RIU. 6 psl. Nexera_b.pdf
26.	Detektoriaus signalo stabilumas	Ne didesnis nei 200 · 10^{-9} RIU/h.	Ne didesnis nei 100 · 10^{-9} RIU/h. 6 psl. Nexera_b.pdf
27.	Duomenų surinkimo dažnis	Ne mažesnis nei 40 Hz.	Duomenų surinkimo dažnis iki 50 Hz. 6 psl. Nexera_b.pdf
28.	Lūžio indekso intervalas	Ne siauresnis nei nuo 1,00 iki 1,70 RIU.	Nuo 1,00 iki 1,75 RIU 6 psl. Nexera_b.pdf
29.	Mėginio kiuvetės tūris	Ne didesnis nei 10 µl.	Kiuvetės tūris – 9 µl *168 psl. RID20A_IM.pdf*

* Tiekėjas turi įrašyti tikslius gamintojų ir modelių pavadinimus, rodiklių reikšmes, patvirtinančias atitikimą techninės specifikacijos reikalavimams, ir pateikti tai patvirtinančius gamintojo dokumentus, t. y. katalogus ar katalogų dalis, ar kitus gamintojo patvirtintus dokumentus (nurodant dokumento pavadinimą bei jo puslapį, kuriame pateikiama informacija apie atitinkamą siūlomą rodiklį, arba (ir) pateikti tikslias nuorodas į oficialią gamintojo interneto svetainę (viešai skelbiamą informaciją). Informacija pateiktuose gamintojo dokumentuose arba viešai skelbiama informacija turi būti pakankama, kad perkančioji organizacija galėtų įvertinti siūlomų prekių atitikimą pirkimo dokumentų techninės specifikacijos reikalavimams.
Techniniai siūlomo pirkimo objekto parametrai, kiti su pirkimo objektu susiję techniniai duomenys gali būti pateikiami anglų kalba.

8 Lentelė. Tiekėjo techninis pasiūlymas (susijusi įranga):

Įrangos rūšis	**Siūlomos įranga***
Programinė įranga	
Gamintojas, modelis *(nurodo tiekėjas)*	Shimadzu, LabSolutions

Kompiuteris su monitoriumi	
Gamintojas, modelis *(nurodo tiekėjas)*	Kompiuteris: Dell, Slim ECS1250, Monitorius: Dell, S2425H
Spausdintuvas	
Gamintojas, modelis *(nurodo tiekėjas)*	HP, LaserJet Pro 3002dn, 33 puslapiai/min

* Tiekėjas turi įrašyti tikslius gamintojų ir modelių pavadinimus, rodiklių reikšmes, patvirtinančias atitikimą techninės specifikacijos reikalavimams.

9 lentelė. Tiekėjo finansinis pasiūlymas:

Pavadinimas	Kaina, EUR be PVM*
Įrenginys su priedais, skirtas aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu (komplektas)	43 898,00
Bendra pasiūlymo kaina, EUR su PVM:	53 116,58

***Į kainą turi būti įskaičiuota PVM, kiti mokesčiai bei visos kitos išlaidos. Tiekėjas turi nurodyti kainą EUR be PVM ir EUR su PVM, jei jis yra PVM mokėtojas arba tik EUR be PVM, jei teikėjas yra ne PVM mokėtojas. Kaina nurodoma ne daugiau kaip 2 skaitmenų po kablelio tikslumu.**

Taikomas PVM dydis (%):	*21 %*
PVM lengvatos/nemokėjimo teisinis pagrindas (jei taikoma):	*[Pildo tiekėjas]*
Pasiūlymo kaina žodžiais:	*Penkiasdešimt trys tūkstančiai šimtas šešiolika eurų 58 ct*

Patvirtiname, kad atidžiai perskaitėme visus sąlygų, techninės specifikacijos reikalavimus ir įsipareigojame jų laikytis vykdydami sutartį jeigu teisės aktų nustatyta tvarka būsime pripažinti laimėtoju. Taip pat įsipareigojame laikytis ir kitų Lietuvos Respublikoje galiojančių pirkimo objektui bei viešojo pirkimo sutarčiai taikomų teisės aktų reikalavimų. Šis pasiūlymas galioja 5 mėnesius nuo pasiūlymų pateikimo termino pabaigos. Taip pat, patvirtinu, kad dokumentų skaitmeninės kopijos ir elektroninėmis priemonėmis pateikti duomenys yra tikri.

Direktorius	*	Žydrūnas Stanius
(Tiekėjo arba jo įgalioto asmens pareigų pavadinimas)	(Parašas)	(Vardas, pavardė)

* Teikdamas pasiūlymą tiekėjas privalo pasirašyti šią pasiūlymo formą „1 VVTAT PD BS“ 15.1 punkte nustatyta tvarka.

C190-E227

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Technical Report

Fully Automated Workflow for HPLC Analysis Using Automatic Startup with FlowPilot Function

- Analytical Intelligence Part 3 -

Takayuki Kihara[1], Davide Vecchietti[1]

Abstract:

An appropriate start-up procedure, a warm-up of the LC system and a specific System Suitability Test (SST) are critical steps before any analytical LC session in order to ensure high data quality in terms of reproducibility, accuracy, etc., and to reduce maintenance costs (e.g. by prolonging the lifetime of analytical columns). These procedures are often time-consuming for operators, and, if not performed properly, can lead to the loss of data and the waste of time and resources due to the need for re-analysis. In this report, we explain the ways in which we have improved and completely automated system startup and SST through a combination of different technologies.

Keywords: Intelligent start-up, Intelligent shut-down, System Suitability Test, FlowPilot

1. Automation of Entire Analytical Procedures

The Nexera LC system is equipped with various technologies that allow enhanced automation of all routine operations within the analytical workflow.

Intelligent start-up includes both the FlowPilot function (See section 2). It can be coupled with the warm-up function and scheduled depending on the user requirements. The system can also be evaluated automatically using the automatic SST function (See section 4). Scheduled shutdown automatically turns off the system and switches it to power-saving mode when all analytical operations are complete.

The combination of these functions allows the user to fully automate an entire analytical cycle: Shutdown -> Start-up -> SST -> Analysis -> Results report -> Shutdown (Fig. 1).

2. Intelligent Start-up with FlowPilot

It is well known that pressure shock can affect column performance by reducing column lifetime and leading to channeling, which results in peak-splitting in the corresponding chromatogram.

In order to avoid this issue, operators usually need to start up the system by slowly increasing flow rate, waiting for column pressure to stabilize and finally setting the flow rate for analysis. Nexera solvent delivery units use the FlowPilot function to fully automate all these steps by synchronizing flow ramping and oven temperature stabilization, (Fig. 2):

T2

1. Flow rate is set to 50% of the flow rate for analysis and the oven is turned on.
2. Flow rate remains constant until the column oven reaches the set temperature.
3. Flow rate starts increasing toward the set value once the column oven reaches the set temperature.

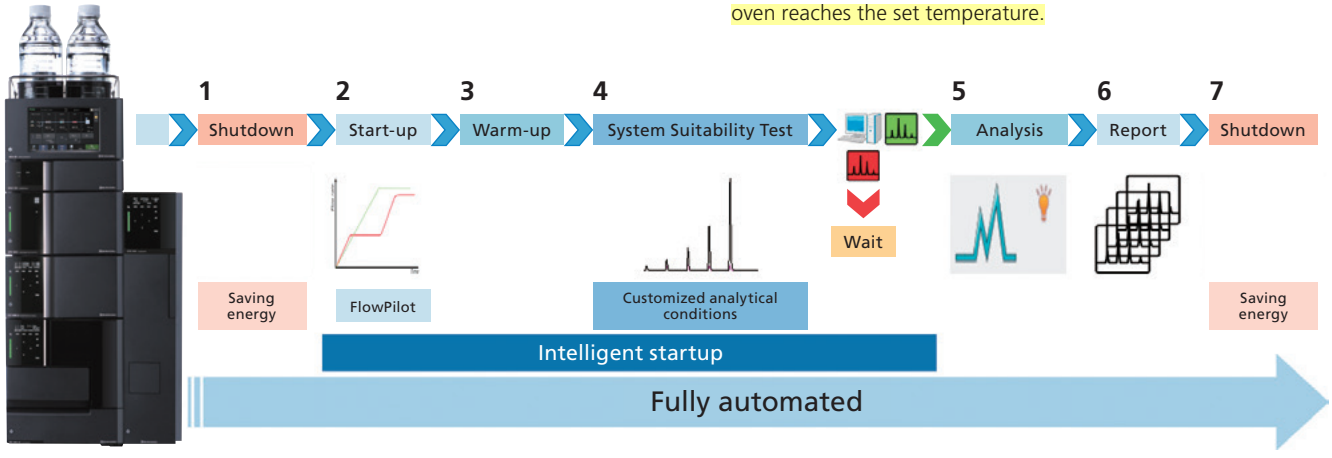

Fig. 1 Workflow diagram showing the fully-automated operation achievable with Nexera LC systems

1 Analytical & Measuring Instrument Division Life Science Business Department LC Business Unit

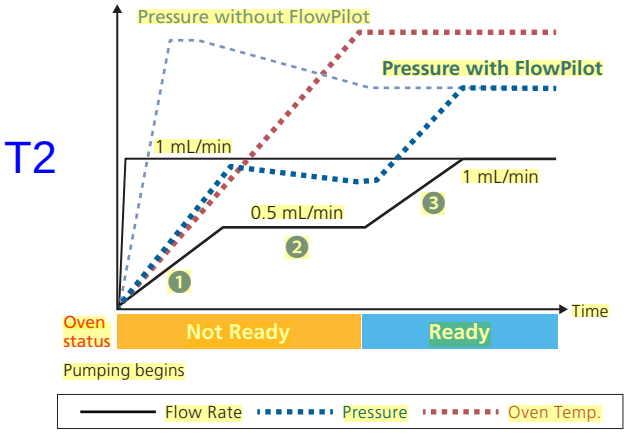

Fig. 2 Diagram of system pressure profile during start-up with the FlowPilot function

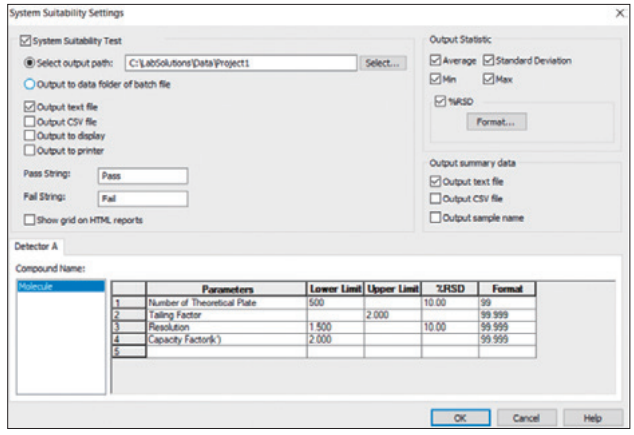

Fig. 3 System Suitability Test - example of 4 user-selected "pass/fail" criteria

3. System Suitability Test

SST are used to verify that the chromatography system is adequate for the intended analysis. The tests are based on the concept that the equipment, electronics, analytical operations, and samples analyzed constitute an integrated system that can be evaluated as such.

SST is mandatory in USP, FDA, and EP standards to check and ensure the ongoing performance of analytical systems. Nevertheless, several different parameters can be evaluated depending on the system and the analytical conditions. For this reason, there is a growing demand for a degree of flexibility in the set-up of SST parameters and possibilities for their customization in modern LC systems.

4. Fully-automated SST

SST parameters are embedded in the analytical method file. This means that users can easily create an SST with specific analytical conditions, in which selected parameters are evaluated (e.g. number of theoretical plates, tailing factor, resolution, capacity factor *k* ; see Fig. 3). After creating the SST, it is possible to choose when to run the SST during a batch analysis (at the beginning, after analysis of some samples or at the end of the batch).

Once the SST is complete, a "pass" or "fail" result is issued depending on the previously-selected criteria, and this result will then trigger specific actions based on user preferences (see Fig. 4).

Fig. 4 shows an example where the user has selected a batch composed of 4 samples for calibration and 7 unknown samples. By customizing SST parameters, it is possible to inject the SST sample after warm-up; in the case of a "pass" result, the analysis of the batch will continue with subsequent samples (both calibration and unknown samples).

In the case of a "fail" result, a blank is injected and the SST is repeated. A second "fail" will trigger the suspension of the batch processing and the instrument will be automatically put into standby mode. If the user has selected automatic shutdown, the instrument will be put into power-saving mode at the end of the batch.

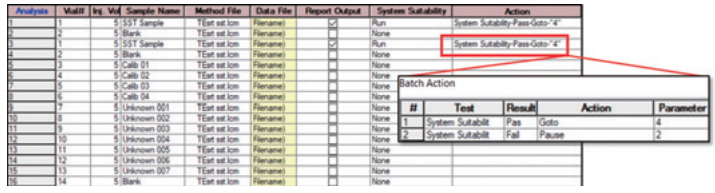

Fig. 4 System Suitability Test during batch analysis creation

5. Conclusions

- The Intelligent Start-up and FlowPilot functions can be used to automate routine procedures related to system start-up and warm-up prior to analysis.
- The user can select SST parameters for a method to fully automate the validation of a batch session, saving time and ensuring high reliability of analytical results.
- By using the shutdown function after sample analysis has been completed, a series of analysis workflows can be fully automated.

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Shimadzu Corporation
www.shimadzu.com/an/

228-92320H
Sep. 2023

Solvent Delivery Module for Shimadzu
Ultra High Performance Liquid Chromatograph

LC-40D X3
LC-40D XS
LC-40D XSi
LC-40D XR
LC-40D
LC-40i

Instruction Manual

Read this manual thoroughly before you use the product.
Keep this manual for future reference.

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Introduction

Read this Instruction Manual thoroughly before using the product.

Thank you for purchasing this product.

This instruction manual describes the basic operation, and accessories and options for this product. Read this manual thoroughly before using the product and operate the product in accordance with the instructions in this manual.

The following instruction manuals are included with the product in booklet form or in PDF format. The PDF documentation is on the instruction manual DVD-ROM (Part No. 228-92350-41).

Document Name	Document No.	Description
Instruction Manual (PDF)	228-92320	This instruction manual.
System Guide (PDF)	228-92352	This manual provides details on how to use the system: system performance optimization, analysis procedure, troubleshooting, validation, installation, etc.
Safety Guideline (Booklet)	228-92326	Describes the precaution instructions to ensure safe operation.

Read "Safety Guideline" thoroughly before using the product.

"Safety Guideline" describes the information about the warranty, after-sales service, safety instructions and precautions to ensure safe operation of the instrument. Keep this manual for future reference.

Important

- If the user or usage location changes, ensure that this Instruction Manual is always kept together with the product.
- If this manual or a product warning label is lost or damaged, immediately contact your Shimadzu representative to request a replacement.
- To ensure safe operation, read the accompanying booklet "Safety Guideline" before using the product.
- To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, re-installation (after the product is moved), or repair is required.

Original version is approved in English.

Notice

- Information in this manual is subject to change without notice and does not represent a commitment on the part of the vendor.
- Any errors or omissions which may have occurred in this manual despite the utmost care taken in its production will be corrected as soon as possible, although not necessarily immediately after detection.
-
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Indications Used in This Manual

Precaution symbols are indicated using the following conventions:

Indication	Meaning
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

The following symbols are used in this manual:

Indication	Meaning
Prohibition	Indicates an action that must not be performed.
Instruction	Indicates an action that must be performed.
Hint	Indicates information provided to improve product performance.
Reference	Indicates the location of related reference information.

Electromagnetic Compatibility

Descriptions in this section apply only to the following models:

- 228-65002-58 LC-40D
- 228-65000-58 LC-40D XR
- 228-65077-58 LC-40D XS
- 228-65080-58 LC-40D XSi
- 228-65076-58 LC-40D X3
- 228-65013-58 LC-40i

This product complies with European standard EN61326, class B for electromagnetic interference (Emissions) and industrial electromagnetic environment (Immunity).

■ EN55011 Emissions (Electromagnetic Interference)

This is a class B product. When this product causes an electromagnetic disturbance to devices being used near this product, create an appropriate distance between those devices and this product in order to eliminate the disturbance.

Contents

5 Technical Information

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1 Overview

This instrument is a liquid delivery unit for high-performance liquid chromatography using a double plunger reciprocating-type pump developed to improve the precision and sensitivity of analysis.
LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D is a parallel-type double plunger reciprocating-type pump, and LC-40i is a serial-type double plunger reciprocating-type pump.

1.1 Features

■ Low Flow Pulsation and Pulsation Period Enable Precise Delivery

By reducing the discharge volume per plunger stroke to the microvolume level (10 µL), and applying high-speed drive, the flow pulsation and pulsation period have been reduced to levels significantly lower than those for other instruments.

■ Choice of Gradient Modes and Control Options

LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D/LC-40i can be used in both low- and high- pressure gradient modes.
The high-pressure gradient mode uses two pumps and is highly accurate with minimal time lag. In low-pressure gradient mode, a single pump unit plus the gradient unit provides a low cost option to combine up to four solvents.
There are three gradient modes available: fast LC mode or normal mode under control of the system controller, and normal mode under control of the instrument.
The fast LC mode for binary high-pressure gradient delivery supports ultra high speed high separation analysis with minimized gradient control steps.

■ Automatic Plunger Rinsing

An automatic rinsing kit is provided as standard for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR and an optional part for LC-40D/LC-40i. It can rinse the plunger in the back of the plunger seal. When high-salt-concentration buffer solutions are used, in particular, it prevents premature seal failure due to crystallization, extending the service life of plunger seals.

■ HIgh-pressure Flow is Available

LC-40D X3 and LC-40D XS/LC-40D XSi enable ultra high pressure solvent delivery up to 130 MPa and 105 MPa, respectively, supporting ultra fast high separation analysis in combination with Shim-pack XR-ODS III or other ultra fast high separation columns. For LC-40D XR, high-pressure solvent delivery up to 70 MPa is possible so high speed high separation analysis is supported in combination with Shim-pack XR-ODS II columns.

1.2 Component Parts

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

No.	Part Name	Part No.	Q'ty	Remark
-	Main Unit LC-40D X3 LC-40D XS LC-40D XSi LC-40D XR LC-40D LC-40i	-	1	
-	Safety Guideline (Booklet)*1	228-92327	1	
-	Instruction manual/ System Guide (CD-ROM)*2	228-92350-41	1	
-	Bottle, 250 mL	228-74372	1	LC-40D X3/LC-40D XS/ LC-40D XSi/LC-40D XR only
1	Suction Filter Assy	228-45708-91	1	Including a tube, stainless (LC-40D X3/LC-40D XS/ LC-40D XR/LC-40D only)
		228-39181-94	1	Including a tube, caramic (LC-40D XSi only)
		228-39181-41	1	Including a tube, ceramic (LC-40i only)
2	REMOTE CABLE ASSY	228-28253-91	1	
3	DRAIN TUBE SI(L1000)	228-25162-03	1	
4	STOP JOINT ASSY,B,D	228-46054-91	1	LC-40D X3/LC-40D XS/LC-40D XSi/ LC-40D XR/LC-40D only
	STOP JOINT ASSY,T	228-46054-92	1	LC-40i only
	SYRINGE TUBE ASSY,B,D	228-46055-91	1	LC-40D X3/LC-40D XS/LC-40D XSi/ LC-40D XR/LC-40D only
	SYRINGE TUBE ASSY,T	228-46055-92	1	LC-40i only
5	SYRINGE,SS-20ESZ	228-66048	1	
	NEEDLE ASSY,FOR SYRINGE	228-18216-91	1	
6	CLAMP,M9120	046-05522-02	1	
7	DRAIN ADAPTER	228-42204	1	
8	STANDARD OUT DRAIN	228-42205	1	
9	CTO OUT DRAIN	228-42206	1	
10	STRAIGHT JOINT	228-28163	1	
11	FITTING,L-TYPE 1253	035-61561-12	1	
12	CAP	228-79093	4	LC-40D XSi only

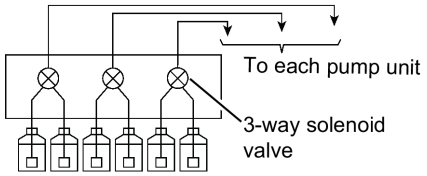
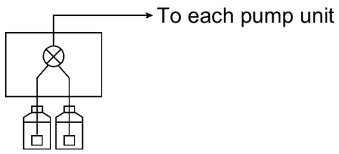
*1 It contains cautions for use regarding the instrument.

*2 The paper based Instruction manual (228-92320) /System Guide (228-92352) are available for a fee.

1.3 Optional Parts

Optional units available for this instrument are listed below.
For information about other optional units listed below, contact your Shimadzu representative.

■ Common Options for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D/LC-40i

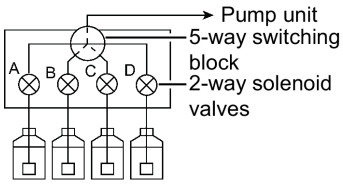
No.	Option	Part No.	Features
1	Degassing Unit (5 flow lines) DGU-405	228-65019-58	Degasses mobile phase by passing it through special tubing made of resin film, thereby reducing the pressure surrounding the tubing. It can separately degas up to 5 flow lines. Connected to pump unit.
2	Degassing Unit (3 flow lines) DGU-403	228-65018-58	Same as above, but able to separately degas up to 3 flow lines.
3	Flow Channel Selection Valve FCV-11AL	228-65611-58	• Switches between up to 2 liquids of mobile phase (for example, switches between mobile phase and rinse solution). • Performs switching for up to 3 lines. **NOTE** For use with the LC-40D XSi/LC-40i, replace the suction filter with a ceramic suction filter (228-25079-91). 
4	Flow Channel Selection Valve FCV-11ALS	228-65610-58	• Switches between up to 2 liquids (for example, switches between mobile phase and rinse solution) or two mobile phases. • Performs switching for a single line. **NOTE** For use with the LC-40D XSi/LC-40i, replace the suction filter with a ceramic suction filter (228-25079-91). 

No.	Option	Part No.	Features
5	Reservoir switching valve	228-65017-58	• Switches between 2 liquids (for example, switches between mobile phase and rinse solution) or two mobile phases. • Installed inside of the instrument. NOTE For use with the LC-40D XSi/LC-40i, replace the suction filter with a ceramic suction filter (228-25079-91).
6	CBM-40 LITE	228-65501-58	CBM-40 LITE system controller can be installed inside of the instrument.
7	Tool Kit	228-57647-43	Kit containing the necessary tools for preparation, inspection, and maintenance.
8	Column holder	228-35655-94	For use if the column is installed on the instrument.

■ Common Options for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D

No.	Option	Part No.	Features
9	RINSING PUMP XR	228-39625-42	The rinsing pump kit is intended for continuously rinsing the back part of the plunger seal with rinsing solution. The rinsing volume can be selected.

■ Common Options for LC-40D X3/LC-40D XS/LC-40D XR/LC-40D

No.	Option	Part No.	Features
10	Low pressure gradient kit	228-65016-58	Switches between up to 4 liquids of low-pressure gradient or mobile phase. It also can be used for auto rinsing of column flow lines. Installed inside of the instrument. 
11	Mixer installation kit (MR40 LPGE, to be built in)	(w/ mixer recognition device) 228-65020-41	Gradient mixer (40 µL internal capacity) exclusively for low-pressure gradient analysis. Fixed inside of the instrument.
12	Mixer MR40 LPGE (fixed inside column oven)	(w/o mixer recognition device) 228-45210-41	Gradient mixer (40 µL internal capacity) exclusively for low-pressure gradient analysis. It can be installed inside of the CTO-40S/CTO-40C.
13	Mixer MR300 LPGE	(w/ mixer recognition device) 228-72653-42 (w/o mixer recognition device) 228-45210-42	Gradient mixer (300 µL internal capacity) exclusively for low-pressure gradient analysis. It can be installed inside of the CTO-40S/CTO-40C. This option can be used for solvents that are hard to mix, such as TFA (trifluoroacetic acid), or for reducing the baseline fluctuation of the photo diode array detector.
14	Gradient Mixer for High-Pressure Gradient Analysis	Reference "Gradient Mixer for High-Pressure Gradient Analysis" P.13	
15	SUS Pipe (0.3×600)	228-53184-54	Plumbing for the pump outlet. ID 0.3 mm ×600 mm, Bended
16	SUS Pipe HP (0.3×1,000)	228-53184-96	Plumbing for the pump outlet. ID 0.3 mm ×1000 mm

■ Common Options for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR

No.	Option	Part No.	Features
17	Plunger Seal GFP	228-52711-94	The lifetime of the plunger seals under conditions where organic solvent is delivered. The maximum available pressure is 44 MPa. When using a non-polar organic solvent such as hexane or a solvent of alkyl sulfonic acid with TFA, use the standard plunger seal.

■ Common Options for LC-40D X3/LC-40D XS

No.	Option	Part No.	Features
18	MAINTENANCE KIT,LC-40D X3/XS	228-53265-45	A set of consumable parts and plumbing parts for LC-40D X3/LC-40D XS. Reference "Maintenance Kit for LC-40D X3/LC-40D XS (Parts No. 228-53265-45)" P.174

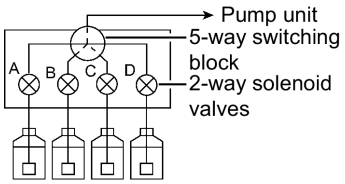
■ Common Options for LC-40D XR/LC-40D

No.	Option	Part No.	Features
19	Mixer SUS316L ASSY	(w/ mixer recognition device) 228-72654-41 (w/o mixer recognition device) 228-45093-93	Gradient Mixer with excellent gradient performance. Capacity can be varies in 3 stages. It can be used for solvents that are hard to mix, such as TFA (trifluoroacetic acid).

■ Common Options for LC-40D/LC-40i

No.	Option	Part No.	Features
20	Bottle,250 mL	228-74372	Rinse solution bottle (capacity 250 mL)
21	INJECTOR HOLDER, 20A	228-35659-92	Plate for installing manual injectors on the instrument
	Manual Injector		
22	Non-metal manual injector 9725i type	228-32650-93	Maximum withstand pressure is 35 MPa.

■ Common Options for LC-40D XSi/LC-40i

No.	Option	Part No.	Features
23	Low pressure gradient kit INERT	228-65082-58	Switches between up to 4 liquids of low-pressure gradient or mobile phase. It also can be used for auto rinsing of column flow lines. Installed inside of the instrument. 

■ Options for LC-40D XR

No.	Option	Part No.	Features
24	MAINTENANCE KIT, LC-40D XR	228-45593-49	A set of consumable parts and plumbing parts. Reference "Maintenance Kit for LC-40D XR (Parts No. 228-45593-49)" P.174

■ Options for LC-40D

No.	Option		Part No.	Features
25	MAINTENANCE KIT, LC-40D		228-45593-50	A set of consumable parts and plumbing parts. Reference "Maintenance Kit for LC-40D (Parts No. 228-45593-50)" P.175
26	WASHING PUMP SEAL KIT		228-56201-41	For continuous automatic rinsing of the back side of the plunger seal, using a rinse solution. Used when system uses high-salt-concentration buffer solution.
27	Plunger Seal (polyethylene)		228-32628-91	Utilized when a nonpolarized organic solvent like hexane or a solvent of alkyl sulfonic acid with TFA added is used.
	Manual Injector			
28	❶	Injector for general analysis 7725 type	228-32210-91	Maximum withstand pressure is 35 MPa.
29	❷	Injector for general analysis 7725i type	228-32210-93	
30	❸	Semi micro injector 8125 type	228-23200-91	

■ Options for LC-40D XSi

No.	Option	Part No.	Features
31	MAINTENANCE KIT, LC-40D XSi	228-53265-47	A set of consumable parts and plumbing parts for LC-40D XSi. ▶▶ Reference "Maintenance Kit for LC-40D XSi (Parts No. 228-53265-47)" P.175
32	Mixer installation kit INERT (MR40 LPGE, to be built in)	228-65020-43	Gradient mixer (40 µL internal capacity) exclusively for low-pressure gradient analysis. Fixed inside of the instrument.
33	Mixer MR40 LPGE INERT (fixed inside column oven)	(w/ mixer recognition device) 228-65081-43	Gradient mixer (40 µL internal capacity) exclusively for low-pressure gradient analysis. It can be installed inside of the CTO-40S/CTO-40C.
34	Mixer MR300 LPGE INERT	(w/ mixer recognition device) 228-65081-44	Gradient mixer (300 µL internal capacity) exclusively for low-pressure gradient analysis. It can be installed inside of the CTO-40S/CTO-40C. This option can be used for solvents that are hard to mix, such as TFA (trifluoroacetic acid), or for reducing the baseline fluctuation of the photo diode array detector.
35	PEEK lined SS tube (0.3×600)	228-74346-46	Plumbing for the pump outlet. ID 0.3 mm×600 mm
36	PEEK lined SS tube (0.3×1,200)	228-74346-52	Plumbing for the pump outlet. ID 0.3 mm×1200 mm

■ Options for LC-40i

No.	Option	Part No.	Features
37	Mixer PEEK ASSY	(w/ mixer recognition device) 228-72654-42 (w/o mixer recognition device) 228-45093-92	Gradient Mixer with excellent gradient performance. Capacity can be varies in 2 stages.
38	WASHING PUMP SEAL KIT, 40I	228-56201-43	For continuous automatic rinsing of the back side of the plunger seal, using a rinse solution. Used when system uses high-salt-concentration buffer solution. (For LC-40i only)
39	Tool Kit, 40I	228-79997-41	Kit containing the necessary tools for preparation, inspection, and maintenance. (For LC-40i only)

■ Compatibility Table of Options

No.	Option	Part No.	40D X3	40D XS	40D XSi	40D XR	40D	40i
1	Degassing Unit (5 flow lines) DGU-405	228-65019-58	✓	✓	✓	✓	✓	✓
2	Degassing Unit (3 flow lines) DGU-403	228-65018-58	✓	✓	✓	✓	✓	✓
3	Flow Channel Selection Valve FCV-11AL	228-65611-58	✓	✓	✓	✓	✓	✓
4	Flow Channel Selection Valve FCV-11ALS	228-65610-58	✓	✓	✓	✓	✓	✓
5	Reservoir switching valve	228-65017-58	✓	✓	✓	✓	✓	✓
6	CBM-40 LITE	228-65501-58	✓	✓	✓	✓	✓	✓
7	Tool Kit	228-57647-43	✓	✓	✓	✓	✓	✓
8	Column holder	228-35655-94	✓	✓	✓	✓	✓	✓
9	RINSING PUMP XR	228-39625-42	✓	✓	✓	✓	✓	
10	Low pressure gradient kit	228-65016-58	✓	✓		✓	✓	
11	Mixer installation kit (MR40 LPGE, to be built in)	(w/ mixer recognition device) 228-65020-41	✓	✓	✓	✓	✓	
12	Mixer MR40 LPGE (fixed inside column oven)	(w/o mixer recognition device) 228-45210-41	✓	✓		✓	✓	
13	Mixer MR300 LPGE	(w/ mixer recognition device) 228-72653-42 (w/o mixer recognition device) 228-45210-42	✓	✓		✓	✓	
14	Gradient Mixer for High-Pressure Gradient Analysis	Reference "Gradient Mixer for High-Pressure Gradient Analysis" P.13						
15	SUS Pipe (0.3×600)	228-53184-54	✓	✓		✓	✓	
16	SUS Pipe HP (0.3×1000)	228-53184-96	✓	✓		✓	✓	
17	Plunger Seal GFP	228-52711-94	✓	✓	✓	✓		
18	MAINTENANCE KIT, LC-40D X3/XS	228-53265-45	✓	✓				

No.	Option	Part No.	40D X3	40D XS	40D XSi	40D XR	40D	40i
19	Mixer SUS316L ASSY	(w/ mixer recognition device) 228-72654-41 (w/o mixer recognition device) 228-45093-93				✓	✓	
20	Bottle, 250 mL	228-74372					✓	✓
21	INJECTOR HOLDER, 20A	228-35659-92					✓	✓
22	Non-metal manual injector 9725i type	228-32650-93					✓	✓
23	Low pressure gradient kit INERT	228-65082-58			✓			✓
24	MAINTENANCE KIT, LC-40D XR	228-45593-49				✓		
25	MAINTENANCE KIT, LC-40D	228-45593-50					✓	
26	WASHING PUMP SEAL KIT	228-56201-41					✓	
27	Plunger Seal (polyethylene)	228-32628-91					✓	
28	Injector for general analysis 7725 type	228-32210-91					✓	
29	Injector for general analysis 7725i type	228-32210-93					✓	
30	Semi micro injector 8125 type	228-23200-91					✓	
31	MAINTENANCE KIT, LC-40D XSi	228-53265-47			✓			
32	Mixer installation kit INERT (MR40 LPGE, to be built in)	228-65020-43			✓			
33	Mixer MR40 LPGE INERT (fixed inside column oven)	(w/ mixer recognition device) 228-65081-43			✓			
34	Mixer MR300 LPGE INERT	(w/ mixer recognition device) 228-65081-44			✓			
35	PEEK lined SS tube (0.3×600)	228-74346-46			✓			
36	PEEK lined SS tube (0.3×1200)	228-74346-52			✓			

No.	Option	Part No.	40D X3	40D XS	40D XSi	40D XR	40D	40i
37	Mixer PEEK ASSY	(w/ mixer recognition device) 228-72654-42 (w/o mixer recognition device) 228-45093-92						✓
38	WASHING PUMP SEAL KIT, 40I	228-56201-43						✓
39	Tool Kit, 40I	228-79997-41						✓

■ Gradient Mixer for High-Pressure Gradient Analysis

The following gradient mixers for high-pressure gradient analysis are available for high performance liquid chromatographs.

Only Gradient Mixer (For LC-40D X3/LC-40D XS/LC-40D XR/LC-40D)

Part Name	Part No.
MIXER,MR 20 µL	(w/ mixer recognition device) 228-72652-41 (w/o mixer recognition device) 228-45209-41
MIXER,MR 40 µL	(w/ mixer recognition device) 228-72652-42 (w/o mixer recognition device) 228-45209-42
MIXER,MR 100 µL	(w/ mixer recognition device) 228-72652-43 (w/o mixer recognition device) 228-45209-43
MIXER,MR 180 µL II	(w/ mixer recognition device) 228-72652-44 (w/o mixer recognition device) 228-45209-44

Only Gradient Mixer (For LC-40D XSi)

Part Name	Part No.
MIXER,MR 20 µL	(w/ mixer recognition device) 228-65081-41
MIXER,MR 180 µL II	(w/ mixer recognition device) 228-65081-42

Mixers described above are packaged in a set (For LC-40D X3/LC-40D XS/LC-40D XR/LC-40D)

Part Name	Part No.
Set of Two Mixers MR 40 µL and MR 180 µL II	228-45292-41
Set of Two Mixers MR 100 µL and MR 180 µL II	228-45292-42
Set of Three Mixers MR 40 µL, MR 100 µL and MR 180 µL II	228-45292-43

Recommended Mixers

The table below lists the mixers with the smallest volume among mixers that can be used in individual combinations of detectors and mobile phases.

		Mobile Phase		
		Solvent Containing Trifluoroacetic Acid (TFA)	Solvent Containing Formic Acid, Acetic Acid, etc.	Water (Including Buffer Solution), Organic Solvent, or Its Solvent Mixture
Detector	Photo Diode Array Detector	MR 180 µL II	MR 180 µL II	MR 180 µL II
	UV Detector *	MR 180 µL II (MR 180 µL)	MR 100 µL (MR 180 µL)	MR 40 µL (MR 180 µL)
	LCMS, LCMSMS	-	MR 20 µL	MR 20 µL

* Values in () are for LC -40D XSi

Using a mixer with a volume smaller than the recommendation shown above may cause excessive fluctuation of the baseline.
When connecting multiple detectors, use a mixer with the largest volume among the applicable mixers. For example, if using a Photo Diode Array and an LC/MS, the MR 180 µL II mixer is recommended.
A larger than recommended mixer can be used to improve mixing performance, but will also increase the gradient delay volume.

■ Automatic Rinsing Kit

The plunger can be rinsed with the automatic rinsing kit at the back part of the plunger seal. LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR has the automatic rinsing kit as standard. For LC-40D/LC-40i, the automatic rinsing kit is optional. When using buffer solution, be sure to attach the automatic rinsing kit.
See the table below for the necessity of the automatic rinsing kit and rinsing solution.

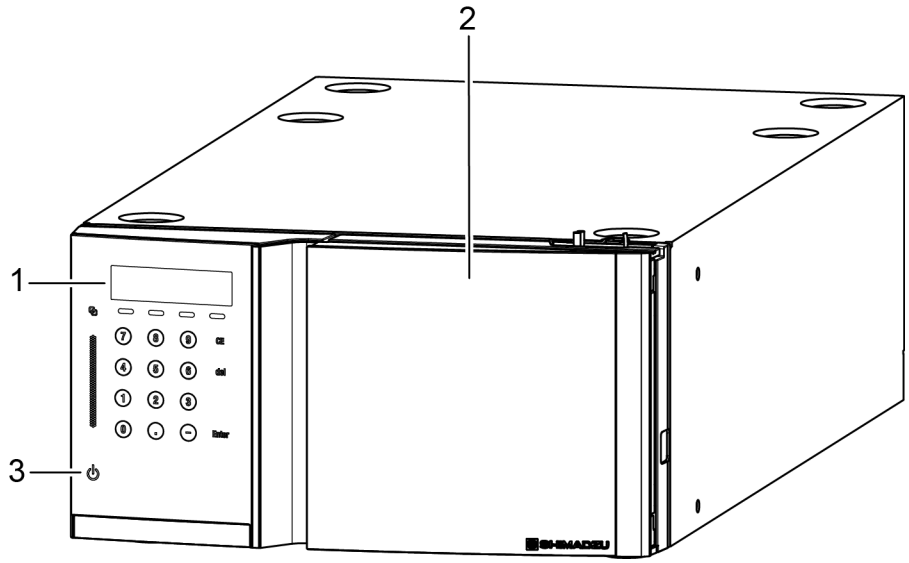
Mobile Phase	LC-40D X3/LC-40D XS/ LC-40D XSi/LC-40D XR		LC-40D/LC-40i	
	Necessity	Recommended Rinsing Solution	Necessity	Recommended Rinsing Solution
Buffer Solution	Necessary	10 % 2-propanol water	Necessary	Water
Normal-phase solvent such as hexane	Not necessary	-	Not necessary	-
Other Solutions	Necessary	10 % 2-propanol water	Not specified	Water (10 % 2-propanol is also acceptable)

Necessary: The rinsing kit is necessary.
Not specified: The rinsing kit is not necessary (but can be used).
Not necessary: The rinsing kit should not be used.

NOTE
- For the application system, refer to the instruction manual of the application system.
- If the rinse solution is dirty, replace with new solution. If getting significantly dirty, replace with new solution once a day. Even if it does not appear dirty, replace with new solution once a week.
  If using distilled water as rinsing solution, replace it once a day.

2 Parts Identification and Function

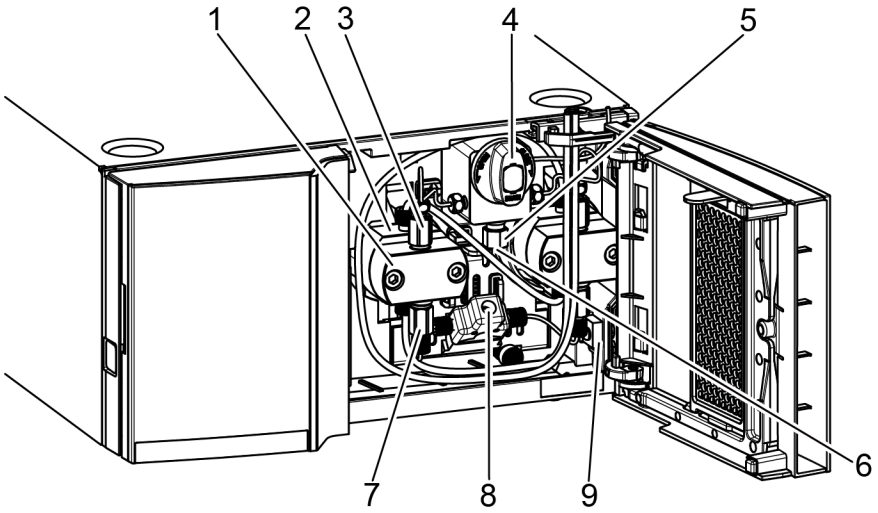
2.1 Front



No.	Name	Description
1	Operation Panel	Configure or operate the instrument with the operation keys. Touching the center part on the operation panel displays the operation keys.
2	Front Cover	This is the cover for the flow line.
3	(Power button)	Switches ON/OFF the power. When the power is ON, the switch illuminates in white, and when the power is OFF, the switch illuminates in orange. Even when the power is OFF, the standby current is fed to the instrument. For the main power, see "2.3 Back" P.18. Note that, with a system controller SCL-40/CBM-40/CBM-40lite connected, the switch does not illuminate and the operation to the switch is ignored by default setting. Reference "Setting the Power Button《POWER BUTTON》" P.51

2.2 Behind Front Cover

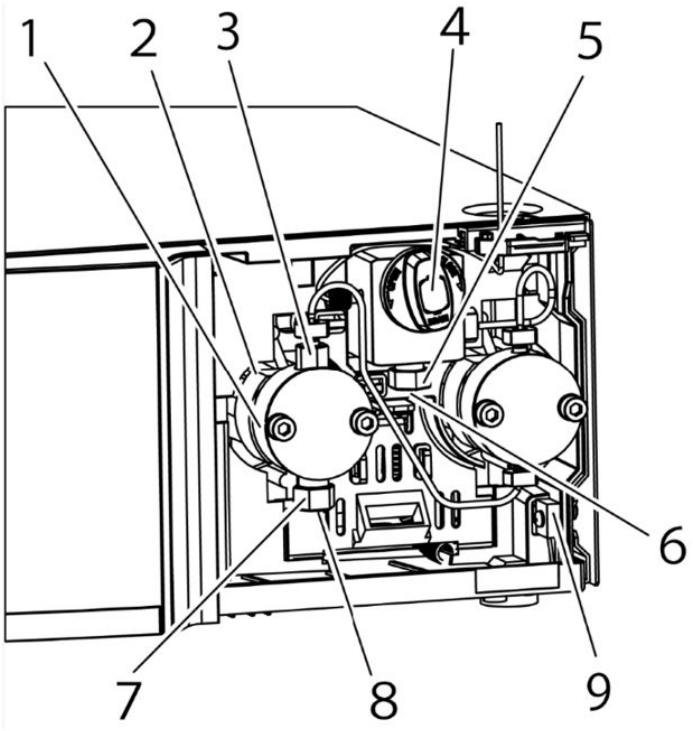
■ LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D



No.	Name	Description
1	Pump Head*1	The plunger inside it reciprocates to deliver solvent.
2	Head Holder*1	It has the rinsing flow path of the plunger inside. The pump head is attached to this part.
3	Check Valve OUT*1	A check valve on the outlet side.
4	Drain Valve	It is used to replace mobile phase solvent or remove air from the flow path. It has an internal pressure sensor.
5	Line Filter	A column protection filter for removing contaminants from mobile phase solvent.
6	Pump Outlet	A connection port of the tube connected to the autosampler/manual injector.
7	Check Valve IN*1	A check valve on the inlet side.
8	Pump Inlet	A connection port of the tube from the suction filter.
9	Leak Sensor	It detects liquid leaks. If the leak sensor detects a leak, delivery automatically stops, causing an alarm and message on the display. ERROR LEAK DETECTED

*1 This is common to the right and left pump heads.

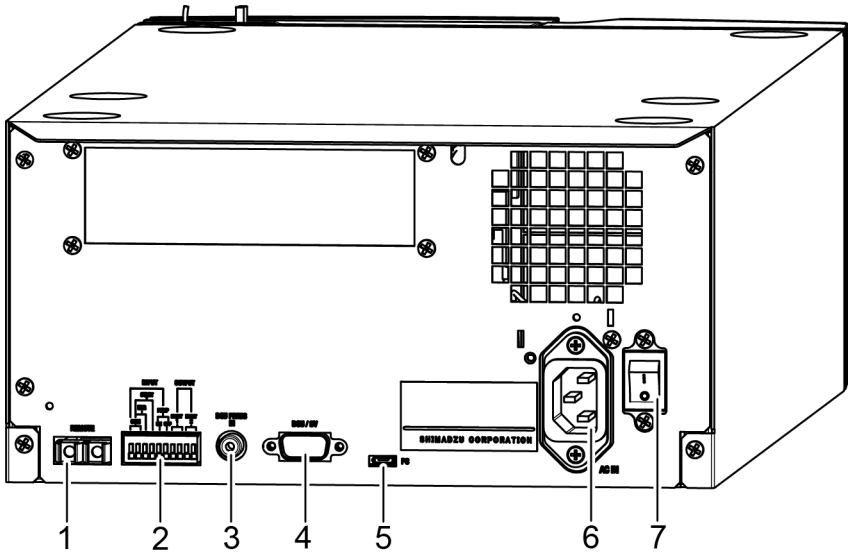
■ LC-40i



No.	Name	Description
1	Pump Head	The plunger inside it reciprocates to deliver solvent.
2	Head Holder*1	It has the rinsing flow path of the plunger inside. The pump head is attached to this part.
3	Check Valve OUT	A check valve on the outlet side.
4	Drain Valve	It is used to replace mobile phase solvent or remove air from the flow path. It has an internal pressure sensor.
5	Line Filter	A column protection filter for removing contaminants from mobile phase solvent.
6	Pump Outlet	A connection port of the tube connected to the autosampler/manual injector.
7	Check Valve IN	A check valve on the inlet side. This also functions as a connection port for the tube from the suction filter.
8	Pump Inlet	A connection port of the tube from the suction filter.
9	Leak Sensor	It detects liquid leaks. If the leak sensor detects a leak, delivery automatically stops, causing an alarm and message on the display. ERROR LEAK DETECTED

*1 This is common to the right and left pump heads.

2.3 Back



No.	Name	Description
1	[REMOTE] Connector	A connector for connecting the system controller.
2	External Input/Output Terminals	Connect to external equipment.
3	[DGU PRESS IN] Connector	To input the pressure signal from the external degassing unit.
4	[DGU/SV] Connector	A connector for connecting a flow path switching valve (FCV series), rinsing pump, or degassing unit.
5	[PC] Connector	A connector for service personnel. Normally unused.
6	Power Cord Connector	Connect the power cord.
7	Main Power Switch	It turns ON/OFF the power to the instrument. Normally keep it on.*1

*1 Normally use ⏻ (power button) of the operation panel or system controller to turn ON/OFF the power. If the system controller is connected and the main power switch is on, the user can use ⏻ (power button) of the system controller to turn ON/OFF the power from the front of the instrument. If the instrument is not used for a long time, turn off the main power switch. Before turning off the main power switch, be sure to turn OFF the power using the power button.

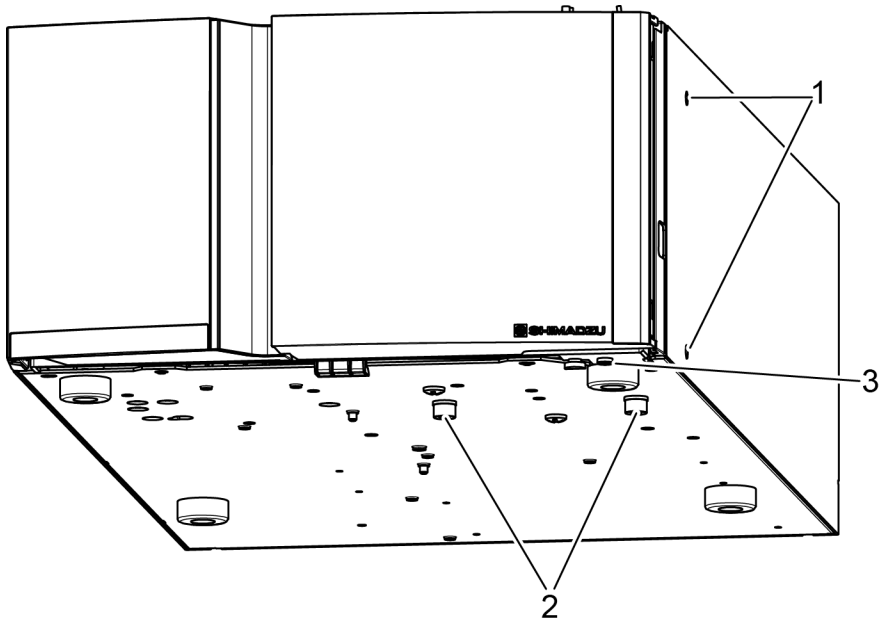
Reference "2.5 Name and Functions of the Operation Panel" P.20

⚠ CAUTION

Instruction

Electrical outlet must be connected to the power supply earth leakage breaker.
A short circuit can lead to a major accident such as equipment failure or building fire.

2.4 Right Side and Bottom

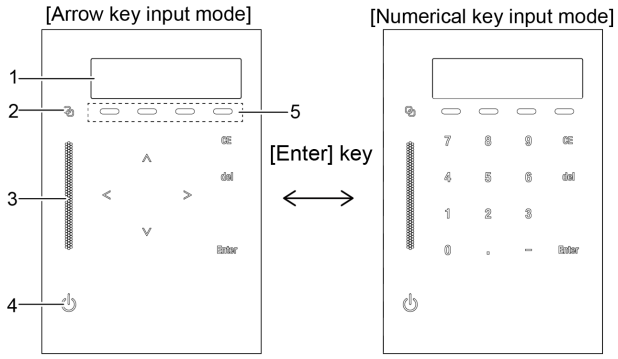


No.	Name	Description
1	Mixer Mounting Holes	Used to install mixer and column holder.
2	Shipping Screws (Red)	To prevent damage during transportation. LC-40D X3, LC-40D XS and LC-40D XSi have three screws, and LC-40D XR, LC-40D and LC-40i have two screws. NOTE Remove before installation.
3	Leakage Drain Outlet	Connect the provided drain tubing.

2.5 Name and Functions of the Operation Panel

This instrument is controlled through the keypad of the operation area. The display area allows verification of the instrument status.
The operation area has two input modes: [Arrow key input mode] to enable screen transfer, and [Numerical key input mode] to enable value input.
Pressing [Enter] switches between these input modes.

> **NOTE** When turning off the main power switch on the back of the instrument after changing the parameters via panel operation, be sure to turn OFF the power with the power button at the front of the instrument, and turn off the main power switch. Otherwise, some of the changed parameters may return to their original values.



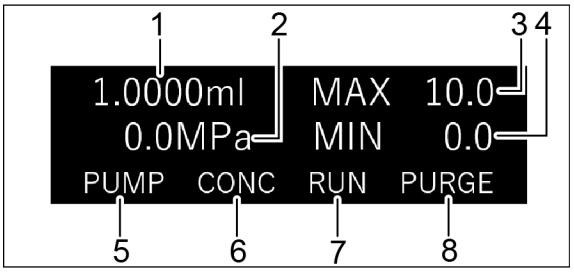
No.	Name	Description
1	Display Area	Displays various screens and settings.
2	Link LED	Illuminates when controlled by the system controller.
3	Status LED	• Green: analysis ready • Red: error • Blue: analysis in progress (The indicator lights in green when CBM-20A is connected.) • Yellow: preparation for analysis in progress (The indicator normally lights in yellow while no solvent is delivered.) • Orange: sleep
4	(Power Button)*1	Switches ON/OFF the power. • To turn the power ON: Press and hold the power button for at least 3 seconds. • To turn the power OFF: Holding down the power button 3 seconds or more displays the confirmation screen as shown below. Holding it down again 1 second turns off the power. Press [CE] to cancel the operation. POWER : SHUTDOWN CE : CANCEL
5	Direct Key	Delivery start/stop, gradient concentration setting, timeprogram start and purge can be performed directly.

*1 The button cannot be used by default setting if the instrument is connected with the systemcontroller SCL-40.
If SCL-40 is connected, pressing the power button of SCL-40 turns off the power of the entire system.
If CBM-40 or CBM-40lite is used, pressing the power button of the pump turns off the power of the entire system.
Note, however, that the following will apply in the case of a system with multiple pumps.
- When using CBM-40lite: The system power can be turned off using the power button of the pump where CBM-40lite is built in.
- When using CBM-40: The system power can be turned off using the power button of the pump with the lowest optical link number.

Reference "Setting the Power Button《POWER BUTTON》" P.51

2.5.1 Display Area

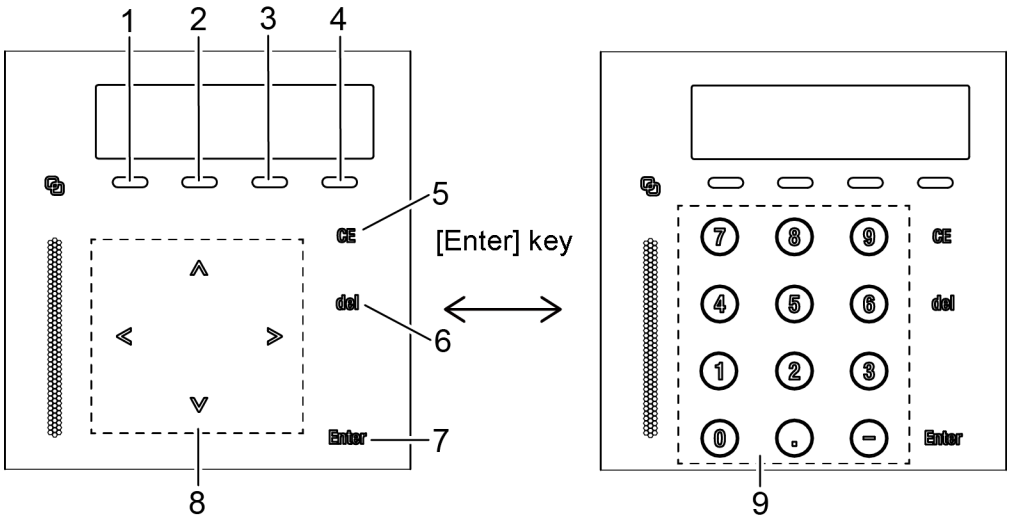
In this section the display on the initial screen is described.



No.	Name	Function
1	Flow/Press	In the constant flow delivery mode, the set flow rate (mL/min) is displayed. (Only for LC-40D XR/LC-40D/LC-40i) In the constant pressure delivery mode, the set pressure is displayed in the pressure unit set with the [PRESSURE UNIT] auxiliary function.
2	Pressure	Displays reading measured by pressure sensor, in units set with the [PRESSURE UNIT] auxiliary function.
3	P.MAX	The maximum pressure is displayed in the pressure unit set with the [PRESSURE UNIT] auxiliary function.
4	P.MIN	The minimum pressure is displayed in the pressure unit set with the [PRESSURE UNIT] auxiliary function.
5	PUMP	Highlighted during pump operation.
6	CONC	Highlighted in the low-pressure gradient mode or blinks in the high-speed LC mode.
7	RUN	Highlighted during execution of a time program or in the high-speed LC mode.
8	PURGE	Highlighted during purging.

2.5.2 Operation Area

Use the keys on the front to operate or configure the instrument. When you touch the key, the status LED lights up and accepts input.



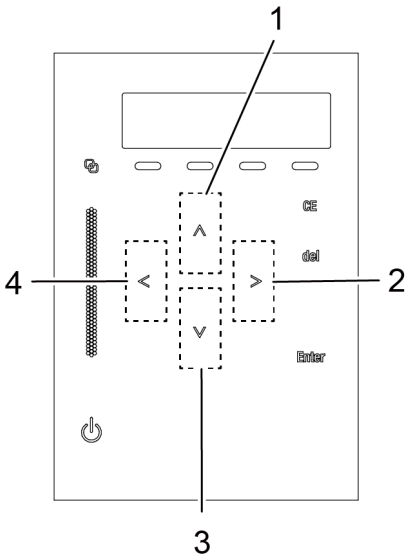
No.	Key	Name	Function
1	[PUMP]	Pump Key	Starts or stops the pump.
2	[CONC]	Concentration Key	Sets liquid concentrations in gradient analysis.
3	[RUN]	Run Key	Starts or stops a time program. (Key operation is ignored if a time program is not configured.)
4	[PURGE]	Purge Key	Starts or stops purging. Purging stops automatically 3 minutes after it begins. [PUMP] can also be used to stop purging. Purging time can be set with the [PURGE TIME] auxiliary function. **Hint** Refer "3.8 Delivery in the Low-Pressure Gradient Mode" P.94 for the operation method on low-pressure gradient mode.
5	[CE]	Clear Key	This key is used for the following; • To initialize the screen • To clear the values input up to that time while entering the values. • To clear error message and cancel alarms.
6	[del]	Delete Key	Use in the following cases. • To delete input values. • To delete a line of the displayed time program while creating it.
7	[Enter]	Enter Key	Confirms input values of the setting items
8	[↑][→] [↓][←]	Arrow Keys	Moves the cursor or switches the screen
9	[·] to [9]	Numeric Keys	Inputs values for the setting items.

No.	Key	Name	Function
10	[-]	Minus Key	No use

Regarding the acceptable part of the arrow keys on the touch panel.

When operating the arrow keys, it responds by touching the part including the upper and lower range of each key indication on the operation panel.

No.	Description
1	Acceptable part of [↑] key input.
2	Acceptable part of [→] key input.
3	Acceptable part of [↓] key input.
4	Acceptable part of [←] key input.



3 Operation

3.1 Settings for the Basic Operation

Before operating this instrument, it is necessary to set the flow rate and the pressure limit to protect flow line parts such as columns.

See the product specifications before use.

Reference "5.1.1 LC-40D X3/LC-40D XS/LC-40D XSi Specifications" P.163
"5.1.2 LC-40D XR/LC-40D/LC-40i Specifications" P.164

3.1.1 Prior to Key Operation

Touching the central part of the operation panel displays the operation keys that the user can operate.

3.1.2 Setting Flow Rate

The following is the basic procedure for setting a flow rate [FLOW].

1 **Displays the initial screen (the screen that is displayed when the power is turned ON).**

If the initial screen is not displayed, press [CE] to display the initial screen.

2 **Press [Enter].**

The cursor blinks at the input position indicating that the flow rate [FLOW] can be input.

3 **Input the flow rate with the numeric keypad and press [Enter].**

The flow rate [FLOW] is set and the display returns to the initial screen.

Hint To cancel the input value, press [CE].

3.1.3 Setting Compressibility

1 **Press [→] twice on the initial screen.**

The FUNCTION setting group is displayed.

2 **Move the cursor to [PARAMETER], and press [→].**

The PARAMETER setting group is displayed.

3 **Press [↓] several times until [COMP] (compressibility correction) is displayed in the screen and press [Enter].**

The cursor blinks at the input position indicating that the compressibility [COMP] can be input.

4 **Input the compressibility [COMP] for the solvent to be used (0.45 for water) with the numeric keypad.**

Reference "Setting the compressibility of solvent《COMP》" P.43

3.1.4 Setting Maximum Pressure Limit

The maximum pressure limit is the pressure in the flow line that may not be exceeded.

If pressure exceeds the maximum limit, pumping stops automatically, and the error message will be displayed with the alarm sound.

■ Setting Procedure

The following is an example to set the maximum pressure [P.MAX] to 15.0 MPa.

1 **Press [→] three times on the initial screen.**

The PARAMETER setting group is displayed.

2 **Press [Enter].**

The cursor blinks at the input position indicating that [P.MAX] can be input.

3 **Press [1], [5], [.], [0] and [Enter].**
The maximum pressure is set to 15.0 MPa.

NOTE The allowable maximum pressure is 130 MPa for LC-40D X3, 105 MPa for LC-40D XS and LC-40D XSi, 70 MPa for LC-40D XR, 44 MPa for LC-40D, and 30 MPa (aqueous solvents)/22 MPa (organic solvents) for LC-40i. When connecting the instrument with other equipment, set the maximum pressure to the lowest allowable maximum pressure of the equipment.

Reference "Setting the maximum pressure limit during pumping《P.MAX》" P.41

3.1.5 Setting Minimum Pressure Limit

The purpose of the minimum pressure limit is to prevent a pressure drop which can occur as a result of the following situations:

- When the mobile phase runs out, air will be pumped through the flow lines resulting in a pressure drop.
- When a leak occurs in the flow lines, a pressure drop may be observed.

If the pressure is lower than the minimum pressure limit after one minute during pumping, the flow stops automatically.

Then the error message will be displayed with the alarm sound.

■ Setting example

The following is an example to set the minimum pressure [P.MIN] to 2.0 MPa.

1 **Press [→] three times on the initial screen.**
The PARAMETER setting group is displayed.

2 **Press [↓] once and on the [P.MIN] screen, press [Enter].**
The cursor blinks at the input position indicating that [P.MIN] can be input.

3 **Press [2], [.], [0] and [Enter].**

The minimum pressure is set to 2.0 MPa.

NOTE If [P.MIN] is set to "0", solvent delivery will not stop and an alarm will not sound even if the pressure has dropped. The minimum pressure can be set to 130 MPa max. for LC-40D X3, 105 MPa max. for LC-40D XS and LC-40D XSi, 60 MPa max. for LC-40D XR, 40 MPa max. for LC-40D, and 30 MPa max. (aqueous solvents)/22 MPa max. (organic solvents) for LC-40i.

Reference "Setting the minimum pressure during delivery《P.MIN》" P.42

3.2 Operation

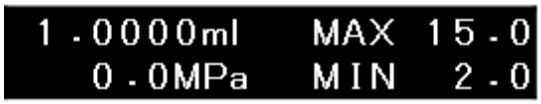
There are two basic operating modes; one is in constant flow delivery mode and the other is in constant pressure delivery mode.

3.2.1 Operation in Constant Flow Delivery Mode

1 **Turn the drain valve knob clockwise as far as possible to close the drain valve.**

2 **Press [CE].**
The initial screen is displayed.

3 **Press [Enter] once and set the flow rate to be delivered.**



Hint To set 1 mL/min, press [1] and [Enter].

4 **Press [PUMP], and then [ENTER].**
[PUMP] on the display is highlighted and the pump starts operation.

5 **Check that the pump outlet pressure is increasing on the pressure indication display.**

6 **To stop operation, press [PUMP], and then [ENTER].**
[PUMP] on the display stops being highlighted and the pump stops operation.

⚠ CAUTION

Instruction

Close the drain valve when not draining through the drain path.
If the drain valve is left opened, a pressure difference may cause the mobile phase solvent to flow out of the drain outlet.

3.2.2 Operation in Constant Pressure Delivery Mode

This function is available only for LC-40D XR, LC-40D and LC-40i.

1 **Turn the drain valve knob clockwise as far as possible to close the drain valve.**

2 **Press [→] twice on the initial screen.**

The FUNCTION setting group is displayed.

3 **Press [↓] once, move the cursor to [CONTROL] and press [→].**

The CONTROL setting group is displayed.

4 **Press [↓] twice and on the [MODE CHANGE] screen, press [Enter].**

The numeric keypad becomes active allowing the user to input numbers.

5 **Press [1] and [Enter].**

The delivery mode changes from the constant flow delivery mode to the constant pressure delivery mode.

Reference "Switching the delivery mode《MODE CHANGE》(Only for LC-40D XR/LC-40D/LC-40i)" P.50

6 **After changing the mode, press [CE] once.**

The initial screen of the constant pressure delivery mode is displayed.

7 **Press [Enter].**

[press] becomes ready to accept input.

8 **Set the pressure with the numeric keypad.**

Hint To set 2.0 MPa, press [2], [.], [0] and [Enter].

9 **Press [PUMP], and then [ENTER].**

[PUMP] on the display is highlighted and the pump starts operation.

10 **Observe that the pump outlet pressure rises and pressure display stabilizes at about 2.0 MPa.**

Hint While monitoring the pressure, increase the flow rate until the pressure reaches the set value. If increasing the flow rate does not increase the pressure, stop increasing the flow rate at 1 mL/min.

11 **To stop operation, press [PUMP], and then [ENTER].**

[PUMP] on the display stops being highlighted and the pump stops operation.

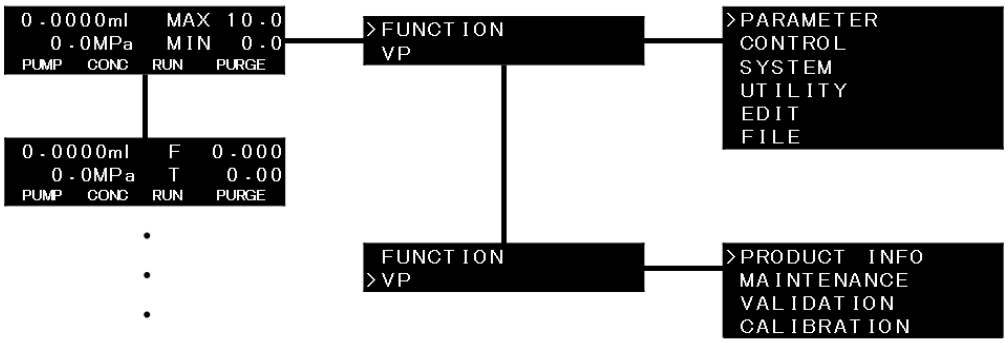
3.3 Types of Screens

Turning ON the power displays the initial screen.

By pressing the [↓] and [→] arrows on the initial screen, the screen can be switched from the initial screen to one of three screens below:

Displays Screen	Description
Monitor screen	View the status of the instrument. Reference "3.4 Monitoring Screens" P.32
Auxiliary functions screen	Configure various parameter settings and perform operations. Reference "3.5 Auxiliary Functions Screen (FUNCTION)" P.36
VP function screen	Supports the validation of the instrument with functions for viewing and checking instrument information. Reference "3.6 VP Functions Screen" P.61

Pressing [→] on the initial screen displays the screen to select the auxiliary functions screen [FUNCTION] or VP functions screen [VP]. Move the cursor to the desired option with [↓] or [↑] and press [→] to display the screen. Press [CE] to return to the initial screen.



3.4 Monitoring Screens

This section describes the monitoring screens.

Press [↓] on the initial screen to show the various types of information.

Name	Description	Reference
MONITOR FLOW/TIME	To show the actual flow rate during delivery. The elapsed time is shown while a time program runs.	P.32
MONITOR ID/SV	To show the pump ID and the flow path of the flow path switching valve.	P.32
CONDITION	To show the Auto-Diagnostics result when Auto-Diagnostics is on. The delivery status of the pump is shown when Auto-Diagnostics is off. ▶▶ Reference "Turning on/off Auto-Diagnostics《AUTO DIAGNOSTICS》" P.84 Hint • Auto-Diagnostics can cause a warning when a delivery failure is detected. • This screen is not shown in the constant pressure delivery mode.	P.33
DEGAS PRESSURE	To show the vacuum pressure of the degassing unit.	P.35
PC/WS*1	To show the status of the connection between the instrument and the PC/WS.	P.35

*1 Shown only when CBM-40/CBM-40lite is connected.

■ Monitoring Program Elapsed Time《MONITOR FLOW/TIME》

On the right side of the first line, the flow rate actually delivered is displayed in real time when the instrument is in the constant pressure delivery mode or while the flow rate is gradually increased with the [FLOW SLOPE] function. The elapsed time is displayed on the right side of the second line while a time program runs.

▶▶ Reference "Setting the time to reach the set flow rate after the start of delivery《FLOW SLOPE》"

■ Displaying the pump ID and the port of the flow path switching valve connected to the instrument during remote control《MONITOR ID/SV》

When the system controller is connected, one of the pump connection addresses (A, B, C, or D) of the system controller is displayed on the lower left side of the screen.

On the right side of the screen, the open ports of the flow path switching valve connected to the instrument are displayed. In the previous figure, the flow path of the internal valve is set to port A, and for the external FCV-11AL, port 1 is set to A (left side), port 2 is set to A (left side), and port 3 is set to B (right side). The connection address of the system controller is set to A. When the low-pressure gradient valve is used, the set ports open only during delivery. While delivery is stopped, the screen displays "OFF".

The display shown in the figure to the right is when the FCV-11ALS is connected.

■ Displays of Condition《CONDITION》

The screen displays a delivery status Auto-Diagnostics result during analysis when the Auto-Diagnostics function is on. This screen is not displayed in the constant pressure delivery mode.

Reference "Switching the delivery mode《MODE CHANGE》(Only for LC-40D XR/LC-40D/LC-40i)" P.50

Display	Auto-Diagnostics Status	
Diag Off	The delivery status is not being judged. This is displayed while delivery is stopped or when not being analysed etc.	1.0000ml Diag Off
Diag Monitoring	Judgment of the delivery status is in progress.	1.0000ml Diag Monitoring
Diag NotDetected	Delivery failure was not detected.	1.0000ml Diag NotDetected
Diag Detected	Delivery failure was detected.	1.0000ml Diag Detected

NOTE Auto-Diagnostics issues a warning if a pulse exceeds a specific threshold.
Note that very slight pressure variation may not be detected.

The table shows a guideline of the conditions under which the Auto-Diagnostics function can correctly detect a delivery failure.

Item	Specification
Pumping Methods	Constant flow pumping Reference "Switching the delivery mode《MODE CHANGE》(Only for LC-40D XR/LC-40D/LC-40i)" P.50
Flow Rate	0.1 to 2 mL/min * Pumps should satisfy the above flow rate range in the high -pressure gradient mode.
Delivery Pressure	LC-40D X3: 5 to 130 MPa LC-40D XS/LC-40D XSi: 5 to 105 MPa LC-40D XR: 5 to 70 MPa LC-40D: 5 to 44 MPa LC-40i: 5 to 30 MPa
Pumping Modes	Isocratic, two-solvent high-pressure gradient, two-solvent low-pressure gradient

NOTE The Auto-Diagnostics function may not work in case of a significant pressure decrease, such as when a large bubble enters the pump head. For this reason, set the lower pressure limit P.MIN when using the function.

When Auto-Diagnostics is off, change in the pump pressure is detected and a delivery status is displayed.

Display	Delivery Status
Press Stable	Delivery is stable.
Press Dec Left	The pressure of the pump head that is on the left when viewed from the front is decreasing during discharge.
Press Dec Right	The pressure of the pump head that is on the right when viewed from the front is decreasing during discharge.
Press Increase	The pressure is at least 10 % higher than that 5 minutes ago.
Press Decrease	The pressure is at least 10 % lower than that 5 minutes ago.

NOTE [Press Increase] and [Press Decrease] are also displayed during normal operation, such as when the pumps start and stop.

(For LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

If [Press Dec Right] is displayed, it may indicate one of the following:

- Air remains inside the right pump head.
- There is a leak in the right pump head's seal.
- The right pump head's inlet check valve or the left pump head's outlet check valve are not operating properly.

If [Press Dec Left] is displayed, it may indicate that conditions described above have occurred for the left pump head.

(For LC-40i)

If [Press Dec Right] is displayed, it may indicate one of the following:

- Air remains inside the right pump head.
- There is a leak in the right pump head's seal.
- The left pump head's outlet check valve is not operating properly.

If [Press Dec Left] is displayed, it may indicate one of the following:

- Air remains inside the left pump head.
- There is a leak in the left pump head's seal.
- The left pump head's inlet check valve is not operating properly.

Reference "Turning on/off Auto-Diagnostics《AUTO DIAGNOSTICS》" P.84

■ Monitoring Vacuum Pressure in Degassing Unit《DEGAS PRESSURE》

The screen displays the vacuum pressure of the degassing unit connected to the instrument.

- [(OK)] is displayed when the vacuum pressure is at a normal value.
- [(NG)] is displayed when the vacuum pressure is at an abnormal value.

[Disconnected] is displayed when a degassing unit is not connected.

■ Displaying the status of connection with PC/WS《PC/WS》

The screen displays the status of connection with a PC/WS.

[Connected] is displayed when the instrument is connected with a PC/WS.

This screen is displayed only when the CBM-40/CBM-40lite is connected.

[Disconnected] is displayed when the instrument is not connected with a PC/WS.

3.5 Auxiliary Functions Screen (FUNCTION)

The auxiliary functions screen has six setting groups. Switch the groups with [↑] or [↓] and press [→] to enter the screen of the desired setting group. Press [CE] to return to the initial screen.

Setting Group Name	Description
PARAMETER	The group allows the user to set analysis parameters.
CONTROL	The group enables specific operation.
SYSTEM	The group allows the user to set parameters related to the system such as parameters of connection with external equipment.
UTILITY	The group allows the user to set parameters not related to the analysis result such as display and buzzer parameters.
EDIT	Time programs can be edited.
FILE	Created time programs can be selected, copied, or deleted.

3.5.1 Auxiliary Functions (FUNCTION) List

■ [PARAMETER] settings group

Name	Description	Remark	Ref.
P.MAX	Sets the maximum pressure limit for solvent delivery.	Initial value: 10 Set value: (LC-40D X3) 1.0 to 130.0 MPa (LC-40D XS/LC-40D XSi) 1.0 to 105.0 MPa (LC-40D XR) 1.0 to 70.0 MPa (LC-40D) 1.0 to 44.0 MPa (LC-40i) Aqueous solvents: 1.0 to 30.0 MPa Organic solvents: 1.0 to 22.0 MPa	P.41
P.MIN	Sets the minimum pressure limit for solvent delivery.	Initial value: 0 Set value: (LC-40D X3) 0 to 130.0 MPa (LC-40D XS/LC-40D XSi) 0 to 105.0 MPa (LC-40D XR) 0 to 60.0 MPa (LC-40D) 0 to 40.0 MPa (LC-40i) Aqueous solvents: 0 to 30.0 MPa Organic solvents: 0 to 22.0 MPa	P.42
COMP	Makes fine adjustment of compressibility correction of solvent.	Initial value: 0.45 Set value: 0.00 to 3.00	P.43

Name	Description	Remark		Ref.
INT.SV PORT	Sets the port of the internal low-pressure gradient kit or mobile phase switching valve.	Initial value: 1 Set value: 1: A 2: B 3: C 4: D		P.44
EXT.SV PORT CH1/CH2/CH3	Sets the port of the mobile phase switching valve FCV-11AL/FCV-11ALS connected to the SV connector on the back of the instrument.	Initial value: 1 Set value: 1: A 2: B		P.45
EVENT1	Sets the relay contact output 1.	Initial value: 0 Set value: 0: Off 1: On		P.45
EVENT2	Sets the relay contact output 2.	Initial value: 0 Set value: 0: Off 1: On		P.45
LPGE CYCLE	Sets the low-pressure gradient operation mode.	Initial value: 0 Set value: 0: Standard mode 2: 2-cycle mode 4: 4-cycle mode 8: 8-cycle mode	(For LC-40i) Initial value: 0 Set value: 0: Standard mode 4: 4-cycle mode 8: 8-cycle mode 16: 16-cycle mode	P.46
PRESSURE RANGE*1	Switches the settable range of the upper pressure limiter.	Initial value: 0 Set value: 0: 1.0 to 22.0 MPa 1: 1.0 to 30.0 MPa		P.47
PURGE TIME	Sets a purge execution time.	Initial value: 3 Set value: 1 to 20 minutes		P.47
PURGE FLOW	Sets a purge flow rate.	Initial value: 4.0 Set value: 0.1 to 10.0 mL/min	(For LC-40i) Initial value: 4.0 Set value: 0.1 to 5.0 mL/min	P.47
PURGE P.MAX	Sets maximum pressure limit at purging.	Initial value: 10.0 Set value: 1.0 to 10.0 MPa		P.48
RINSING OPERATE*2	Sets the delivery amount of the optional rinsing pump when the pump is used.	Initial value: 0 (OFF) Set value: 0 to 4		P.48
FLOW SLOPE	Sets the time to reach the set flow rate during delivery.	Initial value: 0 Set value: 0 to 30.00 minutes		P.49

*1 LC-40i only

*2 LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D only

■ [CONTROL] settings group

Name	Description	Remark	Ref.
PLUNGER SET	Moves the plunger position. Replace the plunger or the plunger seal.	Initial value: 0 Set value: 0: Stop 1: L 2: R 3: M	P.49
ZERO ADJUST	Performs zero adjustment of pressure screen.	-	P.49
MODE CHANGE	(Only for LC-40D XR/LC-40D/ LC-40i) Switches between the constant flow delivery mode and the constant pressure delivery mode.	Initial value: 0 Set value: 0: Constant flow 1: Constant pressure	P.50

■ [SYSTEM] setting group

Name	Description	Remark	Ref.
LOCAL MODE	Selects independent operation or control via system controller.	Initial value: 0 Set value: 0: Remote 1: Local	P.50
LINK ADDRESS	Sets address of the instrument for control via system controller.	Initial value: 4 Set value: 1 to 12	P.50
POWER BUTTON	Sets whether to enable individual operation from the power button on the front of the instrument even when connected to the system controller SCL-40/CBM-40/CBM-40lite.	Initial value: 0 Set value: 0: CBM 1: Module	P.51
CONTROLLER LINK	Selects the type of the connected system controller.	Initial value: 1 Set value: 0: Int 1: Ext	P.52
SELECT EVENT1	Uses the [EVENT1] output as a start signal of a time program.	Initial value: 0 Set value: 0: EVENT 1: Start	P.52
SELECT EVENT2	Uses the [EVENT2] output as a stop signal of external equipment in case of an error.	Initial value: 0 Set value: 0: EVENT 1: Error	P.52
PUMP CONFIG (SYS)	Input values according to the system used.	Initial value: 1 Set value: 1: Standard 4: Low-pressure gradient mode	P.53
SYSTEM PROTECT	Reduces the flow rate without stopping the pumping when the pressure exceeds the P.MAX value.	Initial value: 0 Set value: 0: Clear 1: Set	P.53
WAIT PURGE MODE	Displays the status that prompts purging on the LabSolutions/SCL-40 screen.	Initial value: 0 Set value: 0: Ready 1: Wait	P.54

Name	Description	Remark	Ref.
EXT.SV TYPE	Sets a type of reservoir switching valve connected to the SV connector on the back of the instrument.	Initial value: 0 Set value: 0: - 1: 11AL 2: 11ALS	P.54
EXT.SV SERIAL	Input the serial number of the mobile phase switching valve connected to the SV connector on the back of the instrument.	Initial value: - Set value: -	P.54
EXT.SV CHANNEL	Sets the flow path of the reservoir switching valve connected to the SV connector on the back of the instrument.	Initial value: 0 Set value: 0 to 3	P.54
PRESSURE UNIT	Sets the unit of the displayed pressure.	Initial value: 0 Set value: 0: MPa 1: kgf/cm^2 2: bar 3: psi	P.55
INNER VOLUME	Input the tube volume.	Initial value: 0 Set value: 0 to 9999.9	P.56

■ [UTILITY] setting group

Name	Description	Remark	Ref.
KEY CLOSE	Disables the key input.	-	P.58
BRIGHTNESS	Sets the brightness of display screen.	Initial value: 4 Set value: 1 to 4	P.58
BEEP MODE	Sets the operation of buzzer.	Initial value: 0 Set value: 0: ON 1: Alarm 2: OFF	P.58
VOLUME	Sets the buzzer volume.	Initial value: 2 Set value: 1 to 3	P.58
DISP OFF TIME	The operation panel turns off after the time set here elapses.	Initial value: 1 Set value: 0 to 10 min	P.58
DIRECT KEY MODE	Specifies whether to display the confirmation screen when the direct key is operated.	Initial value: 0 Set value: 0: Confirm 1: Direct	P.59

■ [EDIT] group

Use this group to create a time program. For details, see "3.7 Creating Time Program" P.85.

■ [FILE] operation group

Name	Description	Remark	Ref.
FILE NUMBER	Selects a program file No.	Initial value: 0 Set value: 0 to 9	P.60
FILE COPY	Copies a file.	Initial value: 0 Set value: 0 to 9	P.60
FILE DELETE	Deletes a time program from a file.	-	P.60

About files:

The instrument can store up to 10 files of flow rate and other parameter values, and time programs in memory. File No. 0 to 9 are assigned to each file. The auxiliary functions except [INT.SV PORT] and [EXT.SV PORT] are common functions.
Use [FILE NUMBER] of the file operation group to switch the files.

3.5.2 [PARAMETER] Setting Group

This setting group is relevant to solvent delivery parameters.

■ Setting the maximum pressure limit during pumping 《P.MAX》

When the delivery pressure exceeds the set value, an error will occur and stop delivery.

Input the value with the numeric keypad and press [Enter].

Setting Range						Setting Step
LC-40D X3	LC-40D XS /LC-40D XSi	LC-40D XR	LC-40D	LC-40i		
				Aqueous Solvents	Organic Solvents	
1.0 to 130.0 MPa	1.0 to 105.0 MPa	1.0 to 70.0 MPa	1.0 to 44.0 MPa	1.0 to 30.0 MPa	1.0 to 22.0 MPa	0.1 MPa
10 to 1326 kgf/cm^2	10 to 1071 kgf/cm^2	10 to 714 kgf/cm^2	10 to 449 kgf/cm^2	10 to 306 kgf/cm^2	10 to 224 kgf/cm^2	1 kgf/cm^2
10 to 1300 bar	10 to 1050 bar	10 to 700 bar	10 to 440 bar	10 to 300 bar	10 to 220 bar	1 bar
142 to 19000 psi	142 to 15235 psi	142 to 10157 psi	142 to 6388 psi	142 to 4353 psi	142 to 3186 psi	1 psi

1 kgf/cm^2 = 0.098 MPa = 0.98 bar = 14.2 psi

■ Setting the minimum pressure during delivery《P.MIN》

When the delivery pressure falls below the set value for a specific time, an error will occur and stop delivery.

Input the value with the numeric keypad and press [Enter].

Setting Range						Setting Step
LC-40D X3	LC-40D XS /LC-40D XSi	LC-40D XR	LC-40D	LC-40i		
				Aqueous Solvents	Organic Solvents	
0 to 130.0 MPa	0 to 105.0 MPa	0 to 60.0 MPa	0 to 40.0 MPa	0 to 30.0 MPa	0 to 22.0 MPa	0.1 MPa
0 to 1326 kgf/cm^2	0 to 1071 kgf/cm^2	0 to 612 kgf/cm^2	0 to 408 kgf/cm^2	0 to 306 kgf/cm^2	0 to 224 kgf/cm^2	1 kgf/cm^2
0 to 1300 bar	0 to 1050 bar	0 to 600 bar	0 to 400 bar	0 to 300 bar	0 to 220 bar	1 bar
0 to 19000 psi	0 to 15235 psi	0 to 8706 psi	0 to 5805 psi	0 to 4353 psi	0 to 3186 psi	1 psi

1 kgf/cm^2 = 0.098 MPa = 0.98 bar = 14.2 psi

■ Setting the compressibility of solvent《COMP》

Although the instrument corrects the compressibility to suppress pulse increase caused by the effect of the compressibility of the solvent, setting a compressibility suitable for the solvent used enables more accurate correction.
Input the compressibility $(GPa)^{-1}$ with the numeric keypad and press [Enter]. The initial value is 0.45.

10

10

Mobile Phase	compressibility $(GPa)^{-1}$
Water	0.45
Acetonitrile	1.20
Methanol	1.25
Ethanol	1.20
2-propanol	1.20
Hexane	1.60
Heptane	1.25
Cyclohexane	1.25
Ethyl Acetate	1.10
Chloroform	1.10
Benzene	1.00

Single solvent

Set the compressibility according to the table.

Mixture of water and organic solvent

If the concentration of the organic solvent is 50 % or less, "0.45" is recommended for the compressibility of water. If the concentration is more than 50 %, make the value closer to the compressibility of organic solvent according to the mixture ratio.

Example) When the ratio between water and acetonitrile is 50 : 50, set "0.45".

When the ratio between water and acetonitrile is 30 : 70, set "0.75".

In other cases or when rigorous adjustment is required

1 **Connect a resistance tube (or column) that can create pressure similar to the desired delivery pressure at 1.0 mL/min or less and wait until delivery becomes stable.**

2 **While monitoring fluctuation on the pressure monitor of the instrument, gradually increase the set value of [COMP] from 0.45 in 0.05 increments to find the COMP value with the minimum fluctuation on the pressure monitor.**

In the low-pressure gradient mode, the setting screen will be as shown in the figure.
Press [→] to enter the [COMP A] (mobile phase A compressibility) setting screen.
Press [↓] or [↑] to set the compressibilitys of the four solvents (A, B, C, and D).
Solvents are delivered at the compressibility optimized according to the set mixture ratio.

When both the low-pressure gradient kit and FCV-11AL/FCV-11ALS are used, compressibility setting screens for eight solvents, or [COMP A1], [COMP A2], [COMP B1], [COMP B2], etc are displayed. Set the compressibility for the flow path used.

Press [CE] to return to the initial screen.

Reference "3.8 Delivery in the Low-Pressure Gradient Mode" P.94

■ Setting the port of the internal solenoid valve《INT.SV PORT》

Select the mobile phase port used for delivery when the optional low-pressure gradient kit is used as a mobile phase switching valve or when the internal reservoir switching valve is used. Input the value (the set value in the table) of the desired mobile phase port with the numeric keypad and press [Enter].

(Default screen)

(Screen for low-pressure gradient kit)

Solenoid Valve Type	Set value	Mobile Phase Port
Low-Pressure Gradient Kit	1	Solvent A
	2	Solvent B
	3	Solvent C
	4	Solvent D
Reservoir Switching Valve	1	Solvent A
	2	Solvent B

Hint The value cannot be input if the instrument has no internal solenoid valve.

■ Setting the flow path of the mobile phase switching valve connected to the back of the instrument《EXT.SV PORT CH1 / CH2 / CH3》

Select the mobile phase port used for delivery when the optional mobile phase switching valve FCV-11AL/FCV-11ALS is used.

Input the value (the set value in the table) of the desired mobile phase port with the numeric keypad and press [Enter]. Set all channels of FCV that are used. When using FCV-11ALS, set CH1 only.

Solenoid Valve Type	Set value	Mobile Phase Port
Reservoir Switching Valve FCV-11AL/FCV-11ALS	1	Switching the channel to side A (left side)
	2	Switching the channel to side B (right side)

NOTE Before setting EXT.SV PORT, input a value in [EXT.SV TYPE] to select the solenoid valve to be used. Without a solenoid valve selected, the user cannot input the port value.

Reference "Selecting the type of external solenoid valve《EXT.SV TYPE》" P.54

■ Setting the EVENT1 output terminal《EVENT1》

Set "ON" (close) / "OFF" (open) of the [EVENT1] output (relay contact) on the back of the instrument.

Set Value	EVENT1 Output
0	Relay 1 OFF
1	Relay 1 ON

■ Setting the EVENT2 output terminal《EVENT2》

Set "ON" (close) / "OFF" (open) of the [EVENT2] output (relay contact) on the back of the instrument.

Set Value	EVENT2 Output
0	Relay 2 OFF
1	Relay 2 ON

■ Setting the low-pressure gradient mode《LPGE CYCLE》

Set the operation mode of low-pressure gradient.

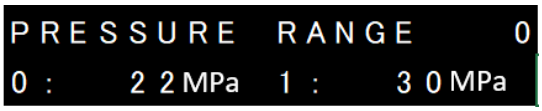
(For LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

Set Value	Low-Pressure Gradient Mode
0 (Standard)	The mode is automatically selected according to the flow rate. 2.0000 mL/min or less: 4-cycle mode 2.0001 mL/min or more: 8-cycle mode
2	2-cycle mode Select this mode when using a low-capacity mixer with 300 µL or less internal capacity. In any other mode, concentration will be more uneven resulting in a wavier baseline on the detector.
4	4-cycle mode This mode is suitable for a mixer with approximately 0.5 mL internal capacity.
8	8-cycle mode This mode is suitable for a mixer with a 1.5 mL or higher internal capacity.

(For LC-40i)

Set Value	Low-Pressure Gradient Mode
0 (Standard)	The mode is automatically selected according to the flow rate. 2.0000 mL/min or less: 8-cycle mode 2.0001 mL/min or more: 16-cycle mode
4	4-cycle mode Select this mode if you want to improve the density resolution in low-flow gradient analysis.
8	8-cycle mode This mode is suitable for a mixer with approximately 0.4 mL internal capacity.
16	16-cycle mode This mode is suitable for a mixer with a 1.6 mL or higher internal capacity.

■ Setting the settable range of the maximum pressure limit《PRESSURE RANGE》



Although the maximum pressure limit (P.MAX) for LC-40i is 1.0 to 30.0 MPa for aqueous solvents and 1.0 to 22.0 MPa for organic solvents, the default setting range is defined to 1.0 to 22.0 MPa for safety.
When using an aqueous solvent at 22.0 MPa or higher pressure, switch the P.MAX value to 1.0 to 30.0 MPa using this parameter.

Set Value	Settable Range of Maximum Pressure Limit
0	1.0 to 22.0 MPa
1	1.0 to 30.0 MPa

⚠ CAUTION

Instruction

When using organic solvents, be sure to set the value to 0 (P.MAX range of 1.0 to 22.0 MPa).

Plumbing parts may be damaged if they are applied with 22 MPa or higher pressure during pumping of organic solvents.

■ Setting the purging time《PURGE TIME》

Set the purging time.

The value can be set in the range from 1 minute to 20 minutes in one minute increments.

■ Setting the purging flow rate《PURGE FLOW》

Set the purging flow rate. This setting is effective for both purging with the [PURGE] operation in the instrument and auto purging with the system controller.

The value can be set in the range from 0.1 mL/min to 10.0 mL/min for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D, 0.1 to 5.0 mL/min for LC-40i in 0.1 mL/min increments.

NOTE The flow rate set here is approximate for replacing the mobile phase in the pump.

■ Setting the maximum pressure during purging《PURGE P.MAX》

Set the maximum pressure during auto purging.

For a purging operation started by the [PURGE] key of the instrument, the maximum pressure limit function works at 2.0 MPa and displays the error shown in the figure as well as stopping delivery.

Setting Range	Setting Step
1.0 to 10.0 MPa	0.1 MPa
10 to 102 kgf/cm^2	1 kgf/cm^2
10 to 100 bar	1 bar
142 to 1451 psi	1 psi

1 kgf/cm^2 = 0.098 MPa = 0.98 bar = 14.2 psi

■ Setting the delivery amount of the rinsing pump《RINSING OPERATE》

Set the delivery amount of the optional rinsing pump. (LC-40i is not supported.)

During delivery or purging operation, if the setting is "standard", the rinsing pump starts with 6-second delivery and then delivers rinsing solution for 2 seconds at intervals of 1 minute. The other settings double or triple the 2-second delivery time.

The user can set the delivery amount to one of the four levels below.
Selecting "0" disables the rinsing pump.
Based on the delivery amount per hour in the following table, prepare necessary the amount of the rinse solution for the analysis time.

NOTE
- The delivery amount in the table is approximate for rinsing.
- Select "0" when not using the rinsing pump.

Hint
- The approximate delivery amount necessary for replacing the rinse solution in the rinsing flow path is approximately 10 mL.
- To replace the rinse solution in the rinsing flow path, select "4" and operate the pump approximately 3 minutes.

Set Value	Delivery Amount per Hour (mL/h)	Remark
0	0	The rinsing pump is disabled.
1	30	Half of standard
2	60	Standard
3	120	Twofold amount of standard
4	240	Fourfold amount of standard

■ Setting the time to reach the set flow rate after the start of delivery《FLOW SLOPE》

Set the time to reach the set flow rate after the start of delivery.

The value can be set in the range from 0 minutes to 30.00 minutes in 0.01 minute increments.

Selecting "0" disables this function.

3.5.3 [CONTROL] Setting Group

■ Setting the plunger stop position《PLUNGER SET》

Set the plunger stop position. This setting is used for maintenance.

[PUMP] on the display is highlighted and the plunger starts moving. [PUMP] on the display stops being highlighted after the plunger finishes moving.

Set Value	Function
0	The plunger stops moving.
1	The plunger on the left when viewed from the front is retracted. In this state, the left pump head is removed.
2	The plunger on the right when viewed from the front is retracted. In this state, the right pump head is removed.
3	The plunger stops at the middle position.

■ Zero adjustment of pressure sensor《ZERO ADJUST》

Set the reference value for the zero point of the pressure sensor.

1 **Open the drain valve to remove pressure completely.**

2 **Press [Enter].**

■ Switching the delivery mode《MODE CHANGE》(Only for LC-40D XR/LC-40D/LC-40i)

Switch between the constant flow delivery mode and the constant pressure delivery mode.

NOTE Stop the pump before switching the delivery mode. Switching the delivery mode while the pump is operating is not possible.

3.5.4 [SYSTEM] Setting Group

This group is relevant to the system configuration such as connection with external equipment.

■ Selecting the local/remote mode《LOCAL MODE》

When the system controller is connected, the user can select whether to operate the instrument independently or with the system controller.

Set Value	Mode	Function
0	Remote	The instrument is operated with the system controller.
1	Local	The instrument is operated independently (local mode).

■ Setting the link address《LINK ADDRESS》

Set the address (channel No.) used to connect with the system controller.

Address	Function
1 to 12	A channel number for connecting with the system controller

■ Setting the Power Button《POWER BUTTON》

Sets the power button on the front of the instrument.
Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	Operation of the power button from the instrument is disabled according to the control of the system controller only. (Initial value)
1	In addition to being controlled by the system controller, it is also possible to turn off the power individually from the instrument.

Hint When the instrument is connected to the system controller SCL-40/CBM-40, the power control of the instrument follows the system controller, and the shutdown and startup functions operate from the system controller throughout the system.

NOTE

- If you turn off the power to the instrument individually with the setting [1], the connection to the system controller will also be lost. Therefore, the system startup function does not turn on the instrument. you need to turn the power on again by pressing and holding the power button on the instrument. The system shutdown function is still enabled with setting [1]. However, if the power is turned off by the shutdown function, turning on the power by pressing the power button of the instrument is disabled, and the system must be started up from the system controller.
- If the [OPERATION MODE] is set to [1] and connected as LC-30AD/LC-20ADXR/LC-20AD, the power control function by the system controller is not available. Therefore, you can always operate the power button of the instrument regardless of the setting of this function.
- This function is not available on pumps that meet the following conditions because the power button functions as the power button for the entire system.
  ・Pumps with an integrated CBM-40lite
  ・The pump with the lowest optical link number among the pumps connected to the CBM-40

Reference "Setting the link address《LINK ADDRESS》" P.50
"Setting the operation mode《OPERATION MODE》" P.75

■ Setting the link destination of the system controller《CONTROLLER LINK》

Select the type of the connected system controller.

Set Value	Function
0	The instrument is internally connected to CBM-40lite (optional).
1	The instrument is connected to an external system controller (SCL-40, CBM-40, etc.) via an optical cable connected to the [REMOTE] connector.

Installing CBM-40lite in the instrument and setting the link destination of the system controller to internal connection causes the link address to be set to "5" with [LINK ADDRESS] displayed as shown in the figure.

■ Setting the function of the EVENT1 output terminal《SELECT EVENT1》

Set the mode of controlling external equipment via the [EVENT1] output (relay 1).

Set Value	Function
0	The relay contact is controlled with the [EVENT1] set value.
1	The relay contact 1 [EVENT1] is used as a start signal of a time program.

NOTE If the SELECT EVENT1 function is used, the corresponding EVENT parameter is disabled.

■ Setting the function of the EVENT2 output terminal《SELECT EVENT2》

Set the mode of controlling external equipment via the [EVENT2] output (relay 2).

Set Value	Function
0	The relay contact is controlled with the [EVENT2] set value.
1	The relay contact 2 [EVENT2] is used as an error output signal.

NOTE If the SELECT EVENT2 function is used, the corresponding EVENT parameter is disabled.

■ Setting the system parameter《PUMP CONFIG (SYS)》

Input values according to the status of the system used.

Set Value	Function
1	The instrument is controlled independently or with external equipment
4	The instrument is used as a low-pressure gradient system

NOTE The system functions normally only with the above values. Values other than the above cannot be set.

Setting the set value to "4" (low-pressure gradient system) highlights [CONC] on the display allowing the user to set a concentration.

■ Setting the system protection《SYSTEM PROTECT》

When [P.MAX] is active, the flow rate is reduced in increments of a half rate while delivery is continued until the pressure falls below [P.MAX].

Set Value	Function
0	Do not use system protection.
1	Use system protection.

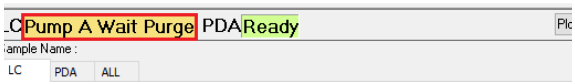
Hint To clear a [P.MAX] error, press [CE]. The alarm stops and the flow rate returns to that before the error.

■ Displaying the status that prompts purging《WAIT PURGE MODE》

When the instrument is powered on or generates an error, the status that prompts purging is displayed on the LabSolutions and SCL-40 screens so that analysis can be started in stable system condition.

Set Value	Function
0	Do not display the status that prompts purging on the LabSolutions/SCL-40 screens.
1	Display the status that prompts purging on the LabSolutions/SCL-40 screens.

Hint When this setting is set to 1, the status is displayed on LabSolutions/SCL-40 as shown in the figure. Analysis is started after this status is canceled.



■ Selecting the type of external solenoid valve《EXT.SV TYPE》

Select the type of flow switching valve (optional) connected to the [SV] connector on the back of the instrument.

Set Value	Function
0	Do not use FCV.
1	Use FCV-11AL.
2	Use FCV-11ALS.

Hint After changing EXT.SV TYPE, enter the serial number of the solenoid valve unit in EXT.SV SERIAL.

Reference "Inputting the serial number of the external flow path switching valve《EXT.SV SERIAL》" P.54

■ Inputting the serial number of the external flow path switching valve《EXT.SV SERIAL》

Input the serial number of the flow path switching valve connected to the SV connector on the back of the instrument.

■ Selecting the flow path of the solenoid valve unit《EXT.SV CHANNEL》

Input correspondence between ports A to D of the low-pressure gradient kit and the valves of FCV-11AL/FCV-11ALS when the optional low-pressure gradient kit and FCV-11AL/FCV-11ALS are used together.

For FCV-11AL

Input "0" for a flow path that does not pass through FCV-11AL. Values 1 to 3 are automatically assigned to the other flow paths. Connect the flow paths that pass through FCV-11AL so that the relation A < B < C < D is satisfied.

For FCV-11ALS

The user can input "0" or "1". For a port passing through FCV-11ALS, input "1".

Set Value	Port
0	The port does not pass through a flow path of FCV-11AL/FCV-11ALS.
1	The port is connected to flow path 1 of FCV-11AL/FCV-11ALS.
2	The port is connected to flow path 2 of FCV-11AL.
3	The port is connected to flow path 3 of FCV-11AL.

Hint In the previous figure, port A of the low-pressure gradient kit is connected to flow path 1 of FCV-11AL, port B to flow path 2, and port C to flow path 3. The flow path of port D does not pass through the FCV-11AL.

NOTE The values can be input only when the low-pressure gradient kit and FCV-11AL/FCV-11ALS are used together.

Reference "Setting the system parameter《PUMP CONFIG (SYS)》" P.53
"Selecting the type of external solenoid valve《EXT.SV TYPE》" P.54

■ Setting the unit of the displayed pressure《PRESSURE UNIT》

Set the unit of the displayed pressure.

Set Value	Unit of Displayed Value
0	MPa
1	kgf/cm^2
2	bar
3	psi

1 kgf/cm^2 = 0.098 MPa = 0.98 bar = 14.2 psi

■ Inputting the tube volume《INNER VOLUME》

Inputting a value in a low-pressure gradient system enables the system controller to calculate the system volume. Refer to the table to input an appropriate value according to the tubes used.

Input "0" in any mode other than the low-pressure gradient mode.

For LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D

Tubing Between Solenoid Valve and Pump Inlet	Tubing Between Pump Outlet and Mixer Inlet	Set Value
Standard tube (OUT tube, 310 mm)	Tubing (ID 0.3 × 600)	200 µL
	Tubing (ID 0.3 × 300)	180 µL
Tube for buffer solution (OUT tube, 400 mm)	Tubing (ID 0.3 × 600)	355 µL
	Tubing (ID 0.3 × 300)	335 µL
Use the Mixer installation kit (228-65020-41, -43)	Tubing in Mixer installation kit	0 µL

Hint

- The values above are intended when using the mixer recognition device. When the mixer recognition device is not used, add the capacity depending on the mixer.
  The column oven automatically recognise the capacity of the mixer when using the mixer recognition device.
- The values above are intended for the recommended tubes. When using a tube not listed above, increase or decrease the capacity depending on the tube.

Example

1) Use the standard tube + Tubing (ID 0.3 x 600) + Mixer MR40 LPGE (without the mixer recognition device)

→Set value: 240 (200 L (from the table above) + 40 µL (mixer capacity))

2) Using the tube for buffer solution + Tubing (ID 0.3 x 600) + Mixer MR40 LPGE (with the mixer recognition device)

→Set value: 355 (from the table above) (The capacity of the mixer will be automatically recognised by the column oven)

3) Use the mixer instllation kit (without the mixer recognition device)

→Set value: 40 (0 µL (from the table above) + 40 µL (mixer capacity))

For LC-40i

Tubing Between Solenoid Valve and Pump Inlet	Tubing Between Pump Outlet and Mixer Inlet	Set Value
Standard tube (OUT tube, 310 mm)	Tubing (ID 0.25 × 600)	190 µL
Tube for buffer solution (OUT tube, 400 mm)	Tubing (ID 0.25 × 600)	345 µL

Hint

- The values above are intended when using the mixer recognition device. When the mixer recognition device is not used, add the capacity depending on the mixer.
  The column oven automatically recognise the capacity of the mixer when using the mixer recognition device.
- The length of tubing above is an Example. When using a tube not listed above, decrease the capacity depending on the tube.
  Refer to the calculation examples below as needed.

Example

1) Use the standard tube + Tubing (ID 0.25 x 600) + 0.4 mL PEEK Mixer LPGE (without the mixer recognition device)

→Set value: 240 = 160 µL (volume of Standard tube) + 30 µL (volume of Tubing (ID 0.25 x 600)) + 400 µL (mixer capacity)

2) Using the tube for buffer solution + Tubing (ID 0.25 x 600) + 0.4 mL PEEK Mixer LPGE (with the mixer recognition device)

→Set value: 345 (from the table above) (The capacity of the mixer will be automatically recognised by the column oven)

3) Use the standard tube + Tubing (ID 0.25 x 300) + 1.6 mL PEEK Mixer LPGE (without the mixer recognition device)

→Set value: 1775 = 160 µL (volume of Standard tube) + 15 µL (volume of Tubing (ID 0.25 x 600)) + 1600 µL (mixer capacity)

3.5.5 [UTILITY] Setting Group

This setting group is relevant to the display monitor.

■ Disables the key entry《KEY CLOSE》

Press [Enter] to disable key input.
From this point, keypad input is disabled.

Hint To release this function, press [Enter] while pressing [CE].

■ Setting the brightness of display screen《BRIGHTNESS》

Sets the brightness of the display screen.
The value range is 1 to 4, and 4 is the brightest.

■ Setting the operation of buzzer《BEEP MODE》

Sets the buzzer sound.

Set Value	Function
0	The key input sound, as well as the alarm sound to go off when an error occurs, are activated. (Default setting)
1	Only the alarm sound that goes off when an error occurs is activated.
2	All the buzzer sounds are deactivated.

■ Setting the operation of buzzer volume《VOLUME》

Set the buzzer sound level. A larger setting value increases the sound level.

■ Setting the time to turn off the operation panel automatically《DISP OFF TIME》

Sets the time elapsed before the operation panel automatically turns to the sleep mode, when no operations are performed on the instrument.

The setting range is from 0 to 10 (min), in which the step can be set by minute.
If 0 (min) is input, the operation panel remains on.

> **NOTE** Setting "0" minutes causes the display screen to be always on. If the display screen is always on, some dots frequently lighting will deteriorate in brightness in a shorter time.

Hint The light does not go off while purging executed by pressing the [PURGE] key of the instrument.

■ Setting the direct keys《DIRECT KEY MODE》

To prevent unintended operation, a confirmation screen can be displayed when a direct key ([PUMP], [RUN], or [PURGE]) is pressed.

For example, setting this function to "0" (Confirm) and then pressing [PUMP] displays the confirmation screen shown in the figure. Pressing [Enter] starts the operation.

Hint When the optional low-pressure gradient kit or reservoir switching valve is installed inside, pressing [PURGE] when starting purging does not display the confirmation screen. The confirmation screen, however, is displayed when purging is stopped.

3.5.6 [FILE] Operation Group

This group is relevant to analysis file operation.

■ Specifying the file number《FILE NUMBER》

The instrument allows the user to create and store a maximum of ten time programs. The program files can be selected with the parameter.

Hint Select the file number from 0 to 9.

Input the file number with the numeric keypad and press [Enter].

■ Specifying the file copy destination《FILE COPY》

The program content of the currently selected file (indicated by the number of [FILE NUMBER] above) is copied to the file of a specified number.

Input a file number with the numeric keypad and press [Enter].

■ Deleting a file《FILE DELETE》

The time program of the currently selected file is deleted.

Press [Enter].

3.6 VP Functions Screen

The VP functions screen has four setting groups. Switch the groups with [↑] or [↓] and press [→] to enter the screen of the desired setting group. Press [CE] to return to the initial screen.

Setting Group Name	Description
PRODUCT INFO	The group is relevant to information of the instrument.
MAINTENANCE	The group is relevant to maintenance of the instrument.
VALIDATION	The group allows the user to check whether the instrument is operating correctly.
CALIBRATION	The group is for calibration of the instrument.

3.6.1 List of VP Functions

■ Product information group [PRODUCT INFO]

Name	Function	Ref.
SERIAL NUMBER	Displays the serial number of the instrument.	P.63
S/W ID	Displays the S/W version number.	P.63

■ Maintenance information group [MAINTENANCE]

Name	Function	Ref.
TOTAL OP TIME	Displays the total operation time of the instrument.	P.63
L SEAL USED	Displays or reset the total delivery amount of the currently used plunger seal and the delivery amount that requires replacement (for the left seal).	P.63
R SEAL USED	Displays or reset the total delivery amount of the currently used plunger seal and the delivery amount that requires replacement (for the right seal).	P.64
MOBILE PHASE*1	Displays the remaining amount of mobile phase and set an amount.	P.64
ALARM LEVEL	Specifies a threshold to cause an alarm of low mobile phase level.	P.64
PART REPLACEMENT	Input the part number of the replaced part when replacing the part.	P.65
MAINTENANCE LOG	Displays the maintenance log.	P.65
OPERATION LOG	Displays the log of password change, parameter reset, etc.	P.65
ERROR LOG	Displays the error log.	P.66
DGU OP TIME	Displays or reset the operation time of the degassing unit connected to the instrument.	P.66

*1 Normally one solvent can be set for the mobile phase level monitoring function. Only in the low-pressure gradient mode, four solvents (A to D) can be set.

■ Validation support information group [VALIDATION]

Name	Function	Ref.
DATE	Displays or set the date.	P.67
TIME	Displays or set the time.	P.67
MEMORY CHECK	Checks ROM/RAM.	P.68
LEAK SENSOR CHECK	Checks operation of the leak sensor.	P.68
PULSE CHECK	Checks the pulse.	P.69
FLOW CHECK	Checks the flow rate.	P.70
PRESS LIMIT CHECK	Checks that the maximum and minimum pressure functions work correctly.	P.74

■ Calibration support information group [CALIBRATION]

Name	Function	Ref.
Input PASSWORD*1	Input a password.	P.75
OPERATION MODE	Selects an operation mode.	P.75
DATE FORMAT	Changes the displayed order of year, month and day.	P.76
INITIALIZE PARAM	Initializes parameters.	P.76
PARAMETER LOCK	To prohibit change of parameters.	P.77
PARTS MGMT TOOL	Sets the usage of the parts management tool.	P.77
PASSWORD SETTING	Changes the password.	P.78
CBM PARAMETER	Displays or set the parameters of the connected system controller.	P.79
LEAK THOLD	Sets the operation level of the leak sensor.	P.82
FLOW COMP FACTOR	Input the flow rate correction parameter (ALPHA).	P.83
PRESS COMP FACTOR	Input a pressure sensor sensitivity correction factor.	P.83
PLUNGER SEAL	Sets the time to replace the plunger seal.	P.83
P.MAX OVERRIDE	Sets override of the maximum pressure.	P.83
SV SELECT	Selects a mobile phase switching valve to be used in the compatible mode.	P.84
AUTO DIAGNOSTICS	Turns on/off Auto-Diagnostics.	P.84

*1 In the calibration support group, an invalid password prevents the user from going further than [OPERATION MODE] even if the user presses [Enter].

3.6.2 Product Information Group (PRODUCT INFO)

The group is relevant to information of the instrument.

■ Showing the serial number 《SERIAL NUMBER》

Displays the serial number of the instrument.

■ Displaying the S/W version number 《S/W ID》

The screen displays the S/W name (model name) and version.

3.6.3 Maintenance Information Group (MAINTENANCE)

The group is relevant to maintenance information of the instrument.

■ Showing the total operation time 《TOTAL OP TIME》

Displays the total cumulative operating time of the instrument.

■ Displaying the delivery amount of the left plunger seal 《L SEAL USED》

The screen displays the total delivery amount of the currently used plunger seal and the delivery amount that requires replacement (unit: L).

If the parts management tool (PARTS MGMT TOOL) is not used, press [del] after replacing the seal. The total delivery amount is reset to "0" and the reset date is recorded in the maintenance log.

Hint

- The plunger seal on the left when viewed from the front is shown as "L".
- When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL. For the operation procedure, refer to the PARTS MGMT TOOL instruction manual.

■ Displaying the delivery amount of the right plunger seal《R SEAL USED》

The screen displays the total delivery amount of the currently used plunger seal and the delivery amount that requires replacement (unit: L).

If the parts management tool (PARTS MGMT TOOL) is not used, press [del] after replacing the seal. The total delivery amount is reset to "0" and the reset date is recorded in the maintenance log.

Hint

- The plunger seal on the right when viewed from the front is shown as "R".
- When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL. For the operation procedure, refer to the PARTS MGMT TOOL instruction manual.

■ Displaying and setting the remaining amount of mobile phase《MOBILE PHASE》

The screen displays the remaining amount and set amount of the current mobile phase.

When replacing the mobile phase, input the set amount of the mobile phase in the unit of mL and press [Enter].

The remaining amount is automatically calculated when solvent is delivered.

Normally only one solvent is supported. In the low-pressure gradient mode, four solvents (A to D) are supported.

A1, A2, B1, B2 etc. are shown if the low-pressure gradient kit and external mobile phase switching valve are used together.

■ Setting a threshold to cause an alarm of low mobile phase level《ALARM LEVEL》

The warning screen is displayed when the mobile phase level has fallen to the set percentage. Note that delivery continues.

Input the set value with the numeric keypad and press [Enter]. Setting the value to 0 % disables the low mobile phase level alarm.

■ Inputting a replacement part number《PART REPLACEMENT》

When the parts management tool (PARTS MGMT TOOL) is not used, input the part number when replacing a general part.

The input part number is stored in the maintenance log.

Hint When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL.
For the operation procedure, refer to the PARTS MGMT TOOL instruction manual.

Reference "Displaying the maintenance log《MAINTENANCE LOG》" P.65

■ Displaying the maintenance log《MAINTENANCE LOG》

This displays twenty records of previously replaced parts with the dates of their replacement. After press [→], press [↓] several times to display the replaced parts in order.

The figure shows an example that part number 228-48249-96 was replaced on April 1, 2019.

The table shows the messages displayed in the second row of a maintenance log.

Message	Description	Ref.
L SEAL REPLACED	The left plunger seal was replaced.	P.63
R SEAL REPLACED	The right plunger seal was replaced.	P.64
P/N: XXX-XXXXX-XX	The displayed part number was replaced.	P.65
DGU OP TIME: ******	The setting value (******) was entered in DGU OP TIME.	P.66

■ Displaying the operation log《OPERATION LOG》

This displays ten records of previous modifications such as password change and parameter reset with the dates of the modifications. After press [→], press [↓] several times to display the operation log records in order.

The figure shows an example that the password was changed on April 1, 2019.

The table shows the messages displayed in the second row of a maintenance log.

Message	Description	Ref.
INITIALIZE PARAM	The parameters were initialized.	P.76
PARAM LOCK ON	The parameter lock function was turned ON.	P.77
PARAM LOCK OFF	The parameter lock function was turned OFF.	
PARAM LOGIN	When the parameter lock function was ON, a user entered the password and moved on to the next screen.	
CHANGE PASSWORD	The password was changed.	P.78
USE PARTS MGMT	The PARTS MGMT TOOL was set to "Use".	P.77
NOT USE PARTS MGMT	The PARTS MGMT TOOL was set to "NotUse".	

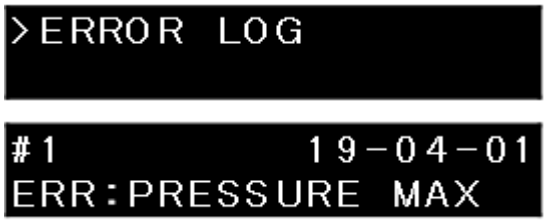
■ Displaying the error log《ERROR LOG》

This displays ten records of previous errors with the dates of the errors.

After press [→], press [↓] several times to display the error log records in order.

The figure shows an example that a maximum pressure error occurred on April 1, 2019.

For the messages displayed in [ERROR LOG], refer to the System Guide.



▶▶ Reference System Guide "5.4 Error Log List"

■ Displaying the operation time of the degassing unit《DGU OP TIME》

The screen displays the operation time of the degassing unit connected to the instrument.

When the operation time is input, count of the operation time of the degassing unit starts from the input time. The input set value is stored in the maintenance log.

If [999999 h] is set, the display shows "******" and the operation time will not be counted.

NOTE

- To activate this function, supply power from the instrument to the degassing unit and make sure that the pressure signal cable is connected correctly. If more than one pump is used, be sure to connect the power cable and pressure signal cable to the same pump. For how to connect, refer to the System Guide.
- The shutdown function of SCL-40/CBM-40/CBM-40lite, or LC-Workstation can stop the degassing unit. For details, refer to the instruction manual of the system controller or LC-Workstation.
- Approximate time to replace the vacuum pump of the degassing unit is 3 years or 8000 hours of operation time. Contact your Shimadzu representative if you need to replace the vacuum pump.

3.6.4 Validation Support Information Group (VALIDATION)

The group allows the user to check whether the equipment is operating correctly.

■ Entering date《DATE》

This allows the user to view or input the date in this screen. The value is reset to the default "00-00-00" if the power switch on the back is turned off. The value is transmitted when the system controller is connected for control.
To delete the input value, press [del].

Hint The figure is an example of April 1, 2019.

■ Entering time《TIME》

This allows the user to view or input the time in this screen. The value returns to the initial value "00:00:00" when the power is turned off. The value is transmitted when the system controller is connected for control.
To delete the input value, press [del].

Hint The figure is an example of 3:01:01 p.m.

■ Checking the memory《MEMORY CHECK》

Runs the memory check on ROM and RAM.
Pressing [Enter] starts the memory check.
After the check, the result is displayed.

■ Checking the leak sensor《LEAK SENSOR CHECK》

Performs the operation test for the leak sensor.

1 **Use a syringe filled with water to wet the sensor unit at the bottom of the leak sensor.**

2 **Wait about 10 seconds and then press [Enter].**
If the sensor detects a leakage, [Good] will be shown.
If not, [No Good] will be shown.

3 **Press [CE].**
The result display will be cleared.
If the result is [No Good], adjust the detection level with [LEAK THOLD] function in the Calibration Support Group.

Reference "Setting the operation level of leak sensor《LEAK THOLD》" P.82

NOTE After wetting and testing the leak sensor, wipe away the water on the tray completely. When wiping away the water, do not apply pressure to the leak sensor, the sensitivity decreases if the sensor unit touches the wall.

Reference "4.16 Cleaning of the Leak Tray" P.161

■ Checking the pulse《PULSE CHECK》

When checking operation, connect a resistance tube to the pump outlet to create 5 MPa to 10 MPa pressure at 1 mL/min during delivery.

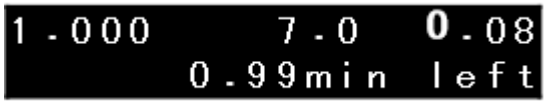
1 **Press [Enter].**

2 **Set the acceptance criterion (MPa) of pressure variation (pulse).**

Input the set value with the numeric keypad and press [Enter]. Start delivery at 1 mL/min.
The value range is 0.05 to 1.00 MPa.

Hint When setting 0.20 MPa as the acceptance criterion, input a value as shown in the figure.

The measurement starts after 1 minute during pumping. During measurement, the set flow rate (1 mL/min), measured pressure, pressure variation, and remaining time are displayed.



After measurement, the panel displays the measured pressure variation with pass or fail, and then the results and the measurement date and time are stored in the memory of the instrument.

NOTE Before measurement, make sure that the compressibility correction parameter of the solvent is correctly set.

Reference "Setting the compressibility of solvent《COMP》" P.43

■ Checking the flow rate《FLOW CHECK》

When checking operation, connect a resistance tube to the pump outlet to create 5 MPa to 10 MPa pressure during delivery.
According to your measurement method, measure the flow rate by following the instructions below.

Set Value	Measurement Method
0	The flow rate is measured based on the time that was required to deliver the specified volume. (volumetric method)
1	The flow rate is measured based on the weight of water delivered in the specified time. (gravimetric method)
2	A flow meter is used for measurement

NOTE Before measurement, make sure that the compressibility correction parameter of the solvent is correctly set.

Reference "Setting the compressibility of solvent《COMP》" P.43

To use the volumetric method

1 **Set the flow rate and start delivery.**

2 **After confirming the delivery stabilizes, measure the time required for the solvent to accumulate to 5 mL in a measuring flask.**

3 **In the [FLOW CHECK] screen, press [Enter].**

4 **In the measurement method selection screen, input "0".**

5 **Input the measured flow rate.**
The value can be set between 0.1 mL/min and 3.0 mL/min.

6 **Set the acceptance criterion of the flow rate accuracy in "ML".**

The value can be set between 0.001 mL and 1.000 mL.

Hint For example, if the set flow rate is 1 mL/min and the criterion is ±2 %, input 0.02 mL.

7 **Input the measurement time (seconds).**

The flow rate accuracy (%) and pass/fail result are displayed.

To use the gravimetric method

1 **Measure the weight (g) before delivery.**

2 **Set the flow rate and start delivery.**

3 **After confirming the delivery stabilizes, accumulate water in a measuring flask for a specific time.**

4 **Measure the weight (g) before delivery.**

5 **In the [FLOW CHECK] screen, press [Enter].**

6 **In the measurement method selection screen, input "1".**

7 **Input the measured flow rate.**

The value can be set between 0.1 mL/min and 3.0 mL/min.

8 **Set the acceptance criterion of the flow rate accuracy in mL.**

The value can be set between 0.001 mL and 1.000 mL.

Hint For example, if the set flow rate is 1 mL/min and the criterion is ±2 %, input 0.02 mL.

9 **Input the weight (g) measured before delivery.**

10 **Input the measurement time (seconds).**

11 **Input the weight (g) measured after delivery.**

The flow rate accuracy (%) and pass/fail result are displayed.

To use a flow meter

1 **Set the flow rate and start delivery.**

2 **After confirming the delivery stabilizes, measure the flow rate.**

3 **In the [FLOW CHECK] screen, press [Enter].**

4 **In the measurement method selection screen, input "2".**

5 **Input the measured flow rate.**

The value can be set between 0.1 mL/min and 3.0 mL/min.

6 **Set the acceptance criterion of the flow rate accuracy in mL.**

The value can be set between 0.001 mL and 1.000 mL.

Hint For example, if the set flow rate is 1 mL/min and the criterion is ±2 %, input 0.02 mL.

7 **Input the flow rate measured with a flow meter.**

The flow rate accuracy (%) and pass/fail result are displayed.

■ Checking operation of the maximum and minimum pressure functions 《PRESS LIMIT CHECK》

When checking operation, connect a resistance tube to the pump outlet to create 5 MPa to 10 MPa pressure at 1 mL/min during delivery.

1 **Press [Enter].**

Start delivery at 1 mL/min. The pressure is monitored for 1 minute and the maximum pressure (P.MAX) and minimum pressure (P.MIN) are automatically set.

Then the flow rate is automatically set to 1.5 mL/min and 0.5 mL/min, and whether the P.MAX and P.MIN functions work correctly is checked.

The result is displayed after checking is completed.

3.6.5 Calibration Support Information Group (CALIBRATION)

The group is for calibration of the instrument.

NOTE The instrument is tuned before shipment. Do not modify values unnecessarily.

■ Inputting the password《Input PASSWORD》

The password must be input by the system administrator.

Input the five-digit numbers by using the numeric keypad, and press [Enter].

Hint Be sure to input the five numbers. The default password is [00000].
When the password matches, the [OPERATION MODE] screen below appears on the screen.
If the password does not match, the user cannot go further.

■ Setting the operation mode《OPERATION MODE》

For LC-40D X3/LC-40D XS/LC-40D XR/LC-40D

Set the value according to the connected system controller.

Input the value by using the numeric keypad, and press [Enter].

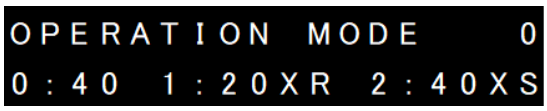
Set Value	System Controller			
	LC-40D X3	LC-40D XS	LC-40D XR	LC-40D
0	CBM-40/CBM-40lite			
	Identified and operated as LC-40D X3.	Identified and operated as LC-40D XS.	Identified and operated as LC-40D XR.	Identified and operated as LC-40D.
1*1	CBM-20A/CBM-20Alite			
	Identified and operated as LC-30AD.	Identified and operated as LC-20ADXR.	Identified and operated as LC-20ADXR.	Identified and operated as LC-20AD.

*1 Select it when the system controller or workstation does not support LC-40D X3/LC-40D XS/LC-40D XR/LC-40D.

For LC-40D XSi/LC-40i

Set the value according to the connected system controller.

Input the value by using the numeric keypad, and press [Enter].



For LC-40D XSi

For LC-40i

Set Value	System Controller	
	LC-40D XSi	LC-40i
0	CBM-40/CBM-40lite	
	Identified and operated as LC-40D XSi.	Identified and operated as LC-40i.
1*1	CBM-20A/CBM-20Alite	
	Identified and operated as LC-20ADXR.	Identified and operated as LC-20AD.
2*1	CBM-40/CBM-40lite	
	Identified and operated as LC-40D XS.	Identified and operated as LC-40D.

*1 Select it when the system controller or workstation does not support LC-40D XSi and LC-40i.

■ Changing the displayed order of year, month and day《DATE FORMAT》

Change the displayed order of year, month and day.

Input the value by using the numeric keypad, and press [Enter].

Set value	Display
0	Year, month, and day (YMD)
1	Day, month, and year (DMY)
2	Month, day, and year (MDY)

■ Initializing the parameters《INITIALIZE PARAM》

Initialize the parameters and the time programs.

Press [Enter] to return to the default values of the parameters and to delete the time programs.

After the parameter initialization completes, the instrument is automatically restarted.

■ Setting the parameter lock《PARAMETER LOCK》

This prevents users other than the administrator from changing parameters except the flow rate by prohibiting screen transition to the auxiliary functions screen and VP functions screen.

If [1] (On) is set, a password input screen is displayed when the user enters the setting screen. If the user modifies the setting or inputs the password to enter the setting screen, the operation is recorded in the operation log.

Reference "Displaying the operation log《OPERATION LOG》" P.65

■ Setting the usage of the parts management tool《PARTS MGMT TOOL》

Sets the usage of the parts management tool.

For details on the parts management tool (PARTS MGMT TOOL), refer to the PARTS MGMT TOOL instruction manual.

Set value	Description
0	Do not use PARTS MGMT TOOL.
1	Use PARTS MGMT TOOL.

When the setting is changed, the change is recorded in the operation log.

Reference "Displaying the operation log《OPERATION LOG》" P.65

■ Changing the password《PASSWORD SETTING》

Enables to change the password.

1 **Press [Enter].**
The input screen is displayed.

2 **Input the five-digit number by using the numeric keypad, and press [Enter].**

3 **To confirm, input the same password that was input in step 2 again.**
When the input is completed and the password is changed, the message "PASSWORD CHANGED" is displayed. Then, the password change is recorded in the operation log.
If the password input is not correct, the message "PASSWORD WRONG" is displayed. At this stage, the password has not been changed yet.

4 **Press [Enter] to return to the title screen.**

■ Showing/setting CBM parameter《CBM PARAMETER》

This allows the user to view or set the parameters of SCL-40/CBM-40/CBM-40lite that controls the instrument.

Press [→] to enter the CBM parameter setting screen.

Press [↓] or [↑] several times to select the desired item.

Pressing [←] at an item in the screen returns the display to the screen as shown in the figure.

Hint If SCL-40/CBM-40/CBM-40lite is not connected (it is not set the link address), pressing [→] does not bring the user to the CBM parameter setting screen.
When using CBM-40lite, set [CONTROLLER LINK] to "0" (Int).

Reference "Setting the link address《LINK ADDRESS》" P.50
"Setting the link destination of the system controller《CONTROLLER LINK》" P.52

List of CBM Parameters

Display	Description
SERIAL NUMBER	Displays the serial No. of CBM.
S/W ID	Displays the program version No. of CBM.
INTERFACE	Sets the transmitting protocol to data processing unit.
ETHERNET SPEED	Sets the transmitting speed of Ethernet.*1
USE GATEWAY	Sets usage of default gateway or DHCP server.*1
IP ADDRESS	Sets IP address of CBM.*1
SUBNET MASK	Sets subnet mask.*1
DEFAULT GATEWAY	Sets default gateway.*1, *2
TRS MODE	Select the communication distribution when connecting to an LC workstation or a Chromatopac.

*1 Available only to show, when not allowed to change on SCL-40/CBM-40/CBM-40lite.

*2 Not available when [USE GATEWAY] is set to "Do not use Default Gateway".

NOTE Each parameter is activated after the system controller is restarted.

Reference Refer to SCL-40/CBM-40/CBM-40lite instruction manual for details of each parameter.

Showing the serial number《SERIAL NUMBER》

Displays the serial number of the system controller which controls the instrument.

Showing the S/W version number《S/W ID》

Displays the S/W name (the same name as the model name) and version of CBM which controls the instrument.

Setting the transmitting protocol to data processing unit《INTERFACE》

Sets the transmitting protocol between the data processing unit and the system controller which controls the instrument.

Enter the value using the numeric keypad and press [Enter].

Set Value	Transmitting Protocol
0	To connect with optical cable.
1	To connect with serial transmission. (RS-232C)
2	To connect with Ethernet.

Setting the transmitting speed of Ethernet《ETHERNET SPEED》

Sets transmitting speed of the system controller Ethernet which controls the instrument.

Enter the value using the numeric keypad and press [Enter].

Set Value	Transmitting Speed
0	Auto Detect
1	10 Mbps, Half Duplex
2	10 Mbps, Full Duplex
3	100 Mbps, Half Duplex
4	100 Mbps, Full Duplex

Setting the usage of default gateway or DHCP server《USE GATEWAY》

Sets usage of default gateway or DHCP server of the system controller which controls the instrument.

Enter the value using the numeric keypad and press [Enter].

Set Value	Description
0	Do not use Default Gateway.
1	Use Default Gateway.
2	Automatic acquisition of IP address from DHCP server.

Setting IP address《IP ADDRESS》

Sets IP address of the controller which controls the instrument.

Enter the value using the numeric keypad and press [Enter].

Setting the subnet mask《SUBNET MASK》

Sets subnet mask of the controller which controls the instrument.

Enter the value using the numeric keypad and press [Enter].

Setting the default gateway《DEFAULT GATEWAY》

Sets the default gateway of the controller which controls the instrument.

Enter the value using the numeric keypad and press [Enter].

Setting the transmission mode《TRS MODE》

Select the communication distribution when the controller is connected to an LC workstation.

Enter the value using the numeric keypad and press [Enter].

Set Value	Description
0	Connects in manual setting at the system controller.
2	Can not be used.
3	Connects to LCsolution/LabSolutions.

NOTE Do not set values other than the set value above. Otherwise the instrument will not work properly.

■ Setting the operation level of leak sensor《LEAK THOLD》

Enables to set the threshold value for the leak sensor.

When an error occurs in the leak sensor check, set the value again.

NOTE Calibration of the leak sensor must be performed by the system administrator. The leak sensor detects liquid drops when the mobile phase leaks from the plunger seal or tubes. When the sensor output value exceeds the predetermined "threshold," the sensor issues an error and stops pumping.

1 **Dip the sensor unit at the bottom of the leak sensor into water.**

Upon detection of water, the leak sensor value (Actual Level) in the screen increases.

2 **Read the maximum value of the leak sensor value (Actual Level).**

Example) The maximum value here is "160".

3 **Wipe off the water near the leak sensor.**

The leak sensor value (Actual Value) will decrease.

NOTE When wiping away the water, do not apply pressure to the sensor unit of the leak sensor. The sensitivity decreases if the sensor unit touches the instrument wall surface.

4 **Calculate the threshold of the leak sensor based on the value read in step 2.**

Formula to calculate the leak sensor threshold:
Threshold = (Max. value-100)×0.7+100
Example) The value obtained here is "142".

5 **Press [Enter], input the value obtained in step 4, and press [Enter].**

The new "threshold" is stored.

■ Setting the flow rate correction parameter (ALPHA) 《FLOW COMP FACTOR》

This allows the user to set the flow rate correction parameter.

- Correct the flow rate if it is incorrect.
- To increase the flow rate, input the value obtained by adding the increment (%) to the current value.
- To reduce the flow rate, input the value obtained by subtracting the decrement from the current value.

For example, the measured flow rate is 1.45 % less than the set flow rate and the current flow rate correction parameter is 5.00, calculate 5.00 + 1.45 = 6.45 and input the result to increase the actual flow rate by approximately 1.45 %.

■ Setting the pressure sensor sensitivity correction factor 《PRESS COMP FACTOR》

This allows the user to set the pressure sensor sensitivity correction factor.

Reset the value when the pressure sensor is replaced. Of the numbers on the data label of the pressure sensor, input PRS-1[XX.XX] in [1:] and PRS-5[XX.XX] in [5:].

■ Setting the time to replace the plunger seal 《PLUNGER SEAL》

This allows the user to set the time to replace the plunger seal (unit: L).

Reference "Displaying the delivery amount of the left plunger seal 《L SEAL USED》 " P.63
"Displaying the delivery amount of the right plunger seal 《R SEAL USED》 " P.64

■ Selecting how to set the maximum pressure 《P.MAX OVERRIDE》 (LC-40D XS/LC-40D XSi/LC-40D XR only)

This allows the user to set the maximum pressure with keys on the pump even if [OPERATION MODE] is set to "1" and the instrument is controlled with the system controller.

If [OPERATION MODE] is set to "0", the set value will be "0".

Reference "Setting the operation mode 《OPERATION MODE》 " P.75

Set Value	Setting Method
0	To set the value with the system controller.
1	To set the value on the pump.

■ Selecting the flow path switching valve《SV SELECT》

This allows the user to select the valve to use when [OPERATION MODE] is set to "1" (compatible mode) and the instrument is controlled with the system controller.

Hint In the compatible mode, only the internal flow path switching valve, low-pressure gradient kit, or FCV-11AL/FCV-11ALS is available. Users need to choose which valve to use.

Set Value	Setting Method
0	The internal flow path switching valve or low-pressure gradient kit is used.
1	FCV-11AL/FCV-11ALS is used.

Reference "Setting the operation mode《OPERATION MODE》" P.75

■ Turning on/off Auto-Diagnostics《AUTO DIAGNOSTICS》

This allows the user to turn on/off Auto-Diagnostics.

Set Value	Setting Method
0	Auto-Diagnostics is off.
1	Auto-Diagnostics is on.

Reference "Displays of Condition《CONDITION》" P.33

3.7 Creating Time Program

The instrument can run a time program with a flow rate and other parameters. A created time program is saved in a file. Check for file numbers in use before creating a time program.

See "Specifying the file number《FILE NUMBER》" P.60 of the auxiliary function to view or specify file numbers.

3.7.1 Time Program Command List

The commands for the time program are listed below.

Com-mand	Description	Setting Range	Remark	Ref.
FLOW	Sets flow rate (Available only in constant flow solvent delivery mode)	0 to 10.0000 mL/min (other than LC-40i)	Minimum unit: 0.0001 mL/min	P.28
		0 to 5.0000 mL/min (only for LC-40i)		
PRESS	Sets delivery pressure. (Available only in constant pressure solvent delivery mode. This can be set only for LC-40D XR/LC-40D/LC-40i.)	(LC-40D XR) 1.0 to 60.0 MPa 10 to 612 kgf/cm^2 10 to 600 bar 142 to 8706 psi	Minimum units: 0.1 MPa 1 kgf/cm^2 1 bar 1 psi	P.29
		(LC-40D) 1.0 to 30.0 MPa 10 to 306 kgf/cm^2 10 to 300 bar 142 to 4353 psi	Minimum units: 0.1 MPa 1 kgf/cm^2 1 bar 1 psi	
		(LC-40i, Aqueous solvents) 1.0 to 30.0 MPa 10 to 306 kgf/cm^2 10 to 300 bar 142 to 4353 psi	Minimum units: 0.1 MPa 1 kgf/cm^2 1 bar 1 psi	
		(LC-40i, Organic solvents) 1.0 to 30.0 MPa 10 to 224 kgf/cm^2 10 to 220 bar 142 to 3186 psi		
BCONC	Specifies concentration of mobile phase B Only active when [PUMP CONFIG(SYS)] = 4[*1]	0 to 100 %	Minimum unit: 0.1 %	[*2]
CCONC	Specifies concentration of mobile phase C Only active when [PUMP CONFIG(SYS)] = 4[*1]	0 to100 %[*2]	Minimum unit: 0.1 %	

Com-mand	Description	Setting Range	Remark	Ref.
DCONC	Specifies concentration of mobile phase D Only active when [PUMP CONFIG(SYS)] = 4*1	0 to100 %*2	Minimum unit: 0.1 %	
INT.SV	Opens or closes the solenoid valve of the low-pressure gradient unit or internal reservoir switching valve (optional)	1, 2, 3, 4	-	P.43
EXT.SV	Opens or closes the solenoid valve of FCV-11AL/FCV-11ALS (optional)	0, 1, 2, 3, 12, 13, 23, 123	Each numeric character represents the channels 1, 2, and 3 of FCV-11AL/FCV-11ALS. Input a setting value of the valves to be switched to side B.	P.45
EVENT	Sets ON/OFF of the event output (relay contact) on the back of the instrument	0, 1, 2, 12	0: EVENT1 and EVENT2 are set to OFF. 1: EVENT1 is set to ON. 2: EVENT2 is set to ON. 12: EVENT1 and EVENT2 are set to ON.	P.45
LOOP	Repeats program	0 to 255 * 0 means 256 times.	-	P.92
STOP	Stops program	N/A	-	P.92
GOTO	Switches to other programs (up to 10 files)	0 to 9	-	P.93

*1 "Setting the system parameter《PUMP CONFIG (SYS)》" P.53

*2 The total of the settings for [BCONC], [CCONC], [DCONC] may not exceed 100 %.
That is: [BCONC] + [CCONC] + [DCONC] ≤ 100.
The concentration of mobile phase A will be the value subtracted from the total value of the other concentrations from 100 (%).,
For example: Concentration A = 100 – ([BCONC] + [CCONC] + [DCONC])

Reference "3.7.4 Creating a Low-Pressure Gradient Program" P.90

3.7.2 Time Program Setting Screen

To create a time program, access the edit screen as described below.

1 **Press [CE].**

The initial screen is displayed.

2 **Press [→] twice.**

The auxiliary functions screen [FUNCTION] is displayed.

3 **Press [↓] several times until [EDIT] is displayed in the screen, move the cursor to [EDIT], and press [→].**

The time program editing screen is displayed. The figure shows an example of a time program that has ten steps already created and 310 steps left available.

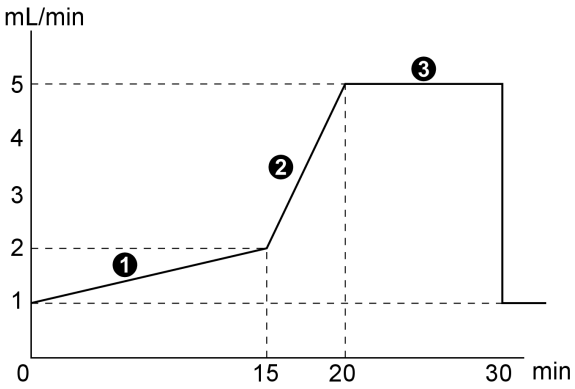
Display	Description
USED	The number of created steps in the selected file
LEFT	The number of steps left available

4 **Press [Enter] again to edit steps of the time program.**

Displays	Description
TIME	Time (minute) that elapsed from the start of the step
FUNC	Command name
VALUE	Set value

3.7.3 Creating a Time Program

The table below shows an example of a time program that changes the flow rate as shown in the figure (initial flow rate: 1 mL/min).



Step	TIME (minute) Setting	FUNC Command Option	VALUE(mL/min) Input a Command Value
❶	15.00	FLOW	2.0000
❷	20.00	FLOW	5.0000
❸	30.00	STOP	-

1 **Displays the time program setting screen.**

Reference "3.7.2 Time Program Setting Screen" P.86

2 **Press [Enter].**

The time (minute) setting screen is displayed.

To set step 1

3 **Press [1], [5], and [Enter].**

4 **Press [Enter].**

The [FLOW] command is selected, which enables the user to input the flow rate.

5 **Press [2] and [Enter].**

The flow rate is set to 2 mL/min and editing step 1 is completed.

To set step 2

6 **Press [2], [0], and [Enter] to set the time.**

7 **Press [Enter].**

The [FLOW] command is selected, which enables the user to input the flow rate.

8 **Press [5] and [Enter] to set the flow rate.**

To set step 3

9 **Press [3], [0], and [Enter].**

10 **Press [↓] several times until [STOP] is displayed in the command selection screen.**

11 **Press [Enter].**

12 **Press [CE] to save the time program. Then the initial screen is displayed.**

Hint When inputting multiple steps, the user does not need to input the data in order of time because they are automatically sorted.

3.7.4 Creating a Low-Pressure Gradient Program

Setting the concentrations of solvents B, C, and D at individual time points in a time program can change the concentrations of solvents A, B, C, and D with time.

The concentration of solvent A in this case will be as below.

Solvent A (%) = 100 (%) - Solvent B (BCONC) (%) - Solvent C (CCONC) (%) - Solvent D (DCONC) (%)

Note that the solvent B (BCONC), solvent C (CCONC), and solvent D (DCONC) parameters can be set in the range from 0 % to 100 % with the minimum unit of 0.1 %.

■ Example of time program setting

1 **Displays the time program setting screen.**

Reference "3.7 Creating Time Program" P.85

2 **Press [Enter] and input the time with the numeric keypad.**

3 **Press [↓] several times until [BCONC] is displayed in the setting screen.**

Hint Press [↓] several times in the same manner to display [CCONC] and [DCONC].

4 **Move the cursor to [BCONC] and press [Enter].**

The [BCONC] command is selected, which enables the user to set the solvent B concentration.

5 **Input the concentration with the numeric keypad and press [Enter].**

3.7.5 Deleting a Step

To delete a step, display it and press [del].

See the following example of deleting the first step of the program created in "3.7.3 Creating a Time Program" P.88.

1 **In the same manner as creating the program, display the desired step.**

Hint To display the second or subsequent lines, press [↓] several times until the desired step is displayed.

2 **Press [del].**

The first step of the program is deleted and the second step is displayed.

3.7.6 Starting and Stopping a Time Program

■ Starting a Time Program

To start a time program after setting it, perform the following.

Press [RUN] to start the program.

[RUN] on the display is highlighted.

■ Stopping a Time Program

There are two ways to stop the program.

- Forcibly stopping a program being executed

Press [RUN] to stop the program.
[RUN] on the display stops being highlighted and the program stops.

- Stopping a program with the [STOP] command

Reference "Setting a [STOP] command for a time program《STOP》" P.92

3.7.7 Commands Used for Time Programs Only

This section explains about the commands that can be set for time programs only.

■ Setting a loop count for a time program《LOOP》

A [LOOP] command can repeat a program the specified number of times.

Settings shown in the table repeat steps ❶ and ❷ three times at intervals of 30 minutes.

Step	TIME (Minute)	FUNC	VALUE (mL/min)
❶	15.00	FLOW	2.0000
❷	20.00	FLOW	5.0000
❸	30.00	LOOP	3

NOTE

- After [LOOP] is repeated the specified number of times, the program automatically stops. The way the program stops differs depending on whether there is a [GOTO] command after the [LOOP] command.
  When there is a [GOTO] command,
  the value at the end of LOOP is retained until the time point of a [GOTO] command and then the program stops before the [GOTO] command is executed.
  When there is not a [GOTO] command,
  the program stops at the end of [LOOP].
- Steps other than a [GOTO] command that are set after the [LOOP] command are ignored.
- The [LOOP] command can be set to a maximum of 255. Note that if it is set to "0", LOOP is executed 256 times.

■ Setting a [STOP] command for a time program《STOP》

This allows the user to set the time to stop a time program. Input the time in the last step of a time program and press [↓] several times until [STOP] is displayed.

Press [Enter] to set a [STOP] command.

NOTE In the following cases, do not set a [STOP] command at the end of the program.

❶ When the time program is executed continuously
❷ When the program files are linked through a [GOTO] command

Reference "Setting switchover to the next file《GOTO》" P.93

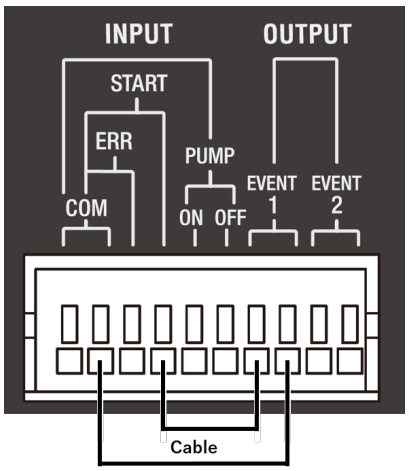
■ Setting switchover to the next file《GOTO》

A [GOTO] command switches the processing from the current file to the next specified file.

After the processing is switched to the destination file, the instrument waits in the initial screen of the destination file. To re-run the program stopping after execution of a [GOTO] command, perform the following steps 1 to 6.

1 **Insert the event cables into the "external I/O terminals" as shown in the figure.**

Reference "3.10.2 Connection of Remote Cable" P.100



2 **Add the next step to the time program of the file from which the processing is switched.**

❶ Input the time that is a little earlier than that of the [GOTO] command.
❷ Display [EVENT].
❸ Set the value to "0".

3 **Press [CE] to finish creating the time program.**

4 **Select the file number to be started next.**

Reference "Specifying the file number《FILE NUMBER》" P.60

5 **Set the EVENT output terminal of the destination file selected in step 4 to "1".**

Reference "Setting the EVENT1 output terminal《EVENT1》" P.45

6 Select the preceding file number again.

3.8 Delivery in the Low-Pressure Gradient Mode

3.8.1 Set Value

1 Input "4" in the [PUMP CONFIG(SYS)] of [SYSTEM] setting group.

Reference "Setting the system parameter《PUMP CONFIG (SYS)》" P.53

2 Set the [P.MAX] and [P.MIN] of [PARAMETER] setting group.

Reference "Setting the maximum pressure limit during pumping《P.MAX》" P.41
"Setting the minimum pressure during delivery《P.MIN》" P.42

3.8.2 Preparation for Delivery

1 Press [Enter] once on the initial screen.

2 Input a flow rate as the [FLOW] set value with the numeric keypad.

3 Set solvent concentrations.

1 Press [CONC].
The concentration setting screen is displayed.

2 Input the solvent B concentration (%) and press [Enter].

3 Input the solvent C and D concentrations (%).
The concentration of solvent A in this case will be as below.

Solvent A concentration (%) = 100 (%) - Solvent B concentration (%) - Solvent C concentration (%) - Solvent D concentration (%)

For example, when setting the solvent A to D concentrations to 25%, input values as shown in the figure.

4 Set the compressibility.

1 Displays [COMP] of [PARAMETER] setting group.

2 Press [→].
The compressibility setting screen is displayed.
Press [↓] several times to display the [COMP B], [COMP C], and [COMP D] setting screens.

3 Set the compressibilitys of solvents A to D.
When using FCV-11AL/FCV-11ALS together, the setting screen is displayed as shown in the figure.

Hint Of the flow paths connected to port A of the low-pressure gradient valve, the one connected to side A (left side) of FCV-11AL/FCV-11ALS is A1 and the other connected to side B (right side) is A2.

5 Purge flow paths.

1 Open the drain valve.

2 Press [PURGE].
The flow path selection screen is displayed.

3 Select the flow path to purge with the numeric keypad and press [Enter].
[PUMP] on the display is highlighted and purging starts.

Set Value	Description
0	Solvent is purged at the concentration set on the concentration setting screen.
1	Solvent A is purged.
2	Solvent B is purged.
3	Solvent C is purged.
4	Solvent D is purged.

If FCV-11AL/FCV-11ALS and the low-pressure gradient valve are used together, the setting screen will be as shown in the figure.

Set Value	Description
0	Solvent is purged at the concentration set on the concentration setting screen.
1	Solvent A1 is purged.
2	Solvent B1 is purged.
3	Solvent C1 is purged.
4	Solvent D1 is purged.
5	Solvent A2 is purged.
6	Solvent B2 is purged.
7	Solvent C2 is purged.
8	Solvent D2 is purged.

Hint Of the flow paths connected to port A of the low-pressure gradient valve, the one connected to side A of FCV-11AL/FCV-11ALS is A1 and the other connected to side B is A2.

6 Close the drain valve and start delivery.

3.9 Connection with the System Controller or Workstation

3.9.1 Setting the Instrument

To control the instrument from SCL-40/CBM-40/CBM-40lite, set the parameters as follows:

Setting Parameter	Set Value	Remark
LOCAL MODE	0: Remote	▶▶ Reference "Selecting the local/remote mode《LOCAL MODE》" P.50
LINK ADDRESS	Link address	▶▶ Reference "Setting the link address《LINK ADDRESS》" P.50
CONTROLLER LINK	0: Int 1: Ext	▶▶ Reference "Setting the link destination of the system controller《CONTROLLER LINK》" P.52
OPERATION MODE	(LC-40D X3) 0: 40D X3*1 1: 30AD*2 (LC-40D XSi) 0: 40D XSi*3 1: 20ADXR*4 2: 40D XS*5 (LC-40D XS) 0: 40D XS*5 1: 20ADXR*4 (LC-40D XR) 0: 40D XR*6 1: 20ADXR*4 (LC-40D) 0: 40D*7 1: 20AD*8 (LC-40i) 0：40i*9 1：20AD*8 2：40D*7	*1 Identified and operated as LC-40D X3. *2 Identified and operated as LC-30AD. *3 Identified and operated as LC-40D XSi. *4 Identified and operated as LC-20ADXR. *5 Identified and operated as LC-40D XS. *6 Identified and operated as LC-40D XR. *7 Identified and operated as LC-40D. *8 Identified and operated as LC-20AD. *9 Identified and operated as LC-40i. ▶▶ Reference "Setting the operation mode《OPERATION MODE》" P.75

3.9.2 Basic Parameters

A max. of 4 pump units can be connected to SCL-40/CBM-40/CBM-40lite. SCL-40/CBM-40/CBM-40lite can set flow rate (pressure), maximum pressure limit, minimum pressure limit, solenoid valves, pumping ON/OFF, time program, etc., and can control binary and ternary high-pressure gradient analysis depending on the system configuration. Also, by combining the SIL-40 series autosampler, the auto purging function is available. For details, refer to the SCL-40/CBM-40/CBM-40lite Instruction Manual.

3.9.3 Notes on Operation

■ LC-40D XS/LC-40D XSi/LC-40D XR

If LC-40D XS/LC-40D XSi/LC-40D XR is used with [OPERATION MODE] set to "1" (20ADXR), it operates in the LC-20ADXR compatible mode with the following restriction.

1) The maximum delivery pressure is 66.0 MPa.

The limit can be raised up to 105.0 MPa for LC-40D XS/LC-40D XSi, and 70.0 MPa for LC-40D XR, on the pump using the [P.MAX OVERRIDE] function.

Reference "Selecting how to set the maximum pressure《P.MAX OVERRIDE》 (LC-40D XS/LC-40D XSi/LC-40D XR only)" P.83

■ LC-40i

- The LC-40i may be difficult to remove air bubbles during purging or liquid delivery. If necessary, please execute manually purge with a syringe.
  For more information on manual purging, refer to Nexera System Guide.
- If LC-40i is used with [OPERATION MODE] set to "1" (20AD) or "2" (40D), it operates in the LC-20AD/LC-40D compatible mode with the following restriction.

1) The maximum delivery volume is 5.0 mL/min. If a value which is out of specification is set from LabSolutions or the system controller, the entered setting value will be ignored, and the maximum delivery volume setting will not be changed.

2) For the upper limit of the delivery pressure follows the specification of the LC-40i. If a value which is out of specification is set from LabSolutions or the system controller, the entered setting value will be ignored, and the maximum delivery volume setting will not be changed.

3) The low-pressure gradient operating mode is as follows depending on the compatible mode setting.

For LC-20AD compatible mode : The low-pressure gradient operation mode can be set only on the unit. It cannot be set from LabSolutions or the system controller.
For LC-40D compatible mode : The low-pressure gradient operating mode operates with the value of the compatibility setting which is automatically calculated based on the value set by LabSolutions or the system controller.
Example) Setting 4-cycle mode from LabSolutions or the system controller → LC-40i operates in the 8-cycle mode.

3.10 Connection to External Input/Output Terminals

The external input/output terminals are connected to an event output device or other external devices with a provided event cable.

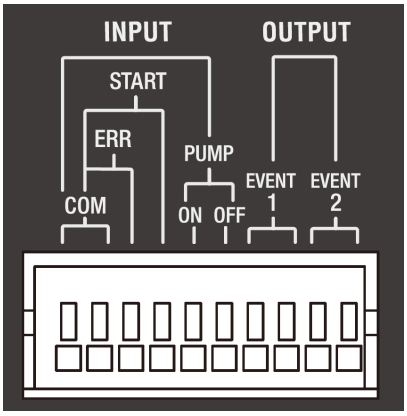
Details of the terminal and wiring are described as follows.

⚠ WARNING

Instruction

Before connecting the cable, turn OFF the power and unplug the instrument.
Use only the specified cable.
Connect as specified.
Otherwise, fire, electric shock, or malfunction may occur.

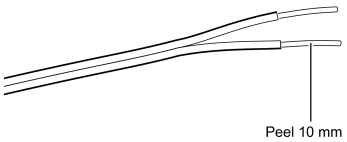
3.10.1 External Input/Output Terminals



Signals	Description	Remark
EVENT1	Relay contact outputs. They can be turned on/off with a program or the set values of the [EVENT] auxiliary function.	The rated values of the relay contacts are 30 V DC and 1 A.
EVENT2		
PUMP ON	The pump is started with an external contact signal.	The signals and the COMMON terminal are short-circuited through contacts of external equipment and thus operation is controlled. The short-circuit time (tc) should satisfy the following. 0.5 sec<tc<10 sec
PUMP OFF	The pump is stopped with an external contact signal.	
START	A time program of the instrument is started with an external contact signal. If a start signal is received while a time program is in progress, a time program starts from 0 minutes.	
ERR	Sets the instrument to the error detection status by the external error signal.	
COM	Common terminal for [PUMP ON], [PUMP OFF], [START] and [ERR].	

3.10.2 Connection of Remote Cable

1 **Peel about 10 mm from the cable end.**



Hint This preparation is not necessary for the supplied event cable.

2 **If the cable core is a single wire, insert it as is into the terminal hole.**

If the cable core is a twisted wire, twist the end tightly and insert it into the terminal hole while holding down the button of the terminal with a flathead screwdriver. When pulling out the cable, hold down the button of the terminal as well.

NOTE The instrument is provided with one remote cable set (228-28253-91). To connect the cable to the terminal for 3 circuits or more, additionally prepare a cable or use a cable as follows:

- Cable with single wire: φ0.4 to φ1.2 (AWG26 to 16)
- Cable with stranded wire: 0.3 mm^2 to 1.25 mm^2 (AWG22 to 16), diameter of single wire of φ0.18 or thicker

To prevent disconnection, the cable with stranded wire is recommended.

NOTE When using the [EVENT1] or [EVENT2] signal, set [EVENT1] or [EVENT2] and [SELECT EVENT1] or [SELECT EVENT2].

Reference "Setting the EVENT1 output terminal《EVENT1》" P.45
"Setting the EVENT2 output terminal《EVENT2》" P.45
"Setting the function of the EVENT1 output terminal《SELECT EVENT1》" P.52
"Setting the function of the EVENT2 output terminal《SELECT EVENT2》" P.52

4 Maintenance

4.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use. It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.
For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠ WARNING

Be sure to power OFF the instrument and pull out the plug from the power supply before inspection/maintenance unless otherwise instructed.
Fire, electric shock or malfunction may occur.

⚠ CAUTION

For parts replacement, use parts and tools listed in "1.2 Component Parts" and "5.2 Maintenance Parts".
If any other parts or tools are used, part damage, injury, and malfunction may occur.

Never remove the cover.
This may cause injury or a malfunction of the device.
Contact your Shimadzu representative if the main cover must be removed.

4.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase in the flow lines with water.
- Wipe away any dirt from the front panel and the main cover.
- Remove the right panel cover and filter holder before starting the work. Release the tubes bound at the front right from the tube holder to prevent them from interfering with the work.
  Return them after completing the work.

Reference "4.2 Removing the Right Panel Cover and the Filter Holder" P.104

4.1.2 List of Periodic Inspection and Maintenance

NOTE The maintenance and replacement periods listed in this table are presented only as guidelines. These are not guarantee periods.
These will vary depending on usage conditions.

<table>
<tr><th>Inspection/Maintenance Item</th><th>Replacement Periods</th><th>Remark</th><th>Ref.</th></tr>
<tr><td>Replacement of Plunger Seal</td><td>1 year</td><td>
• Sealing efficiency decreases when seals are worn.
• As a guideline, seals should be replaced after delivery of the respective volumes listed below. (VP fuction, [L(R)SEAL USED], shows the total delivered volume.)
(LC-40D X3/LC-40D XS/LC-40D XSi)
<table>
<tr><th>Pumping Pressure</th><th>Total Delivery</th></tr>
<tr><td>80 MPa (816 kgf/cm^2)</td><td>30 L</td></tr>
</table>
Repeating high-pressure (above 100 MPa) and low-pressure (below 10 MPa) pumping could shorten the service life of seals.
(LC-40D XR)
<table>
<tr><th>Pumping Pressure</th><th>Total Delivery</th></tr>
<tr><td>30 MPa (306 kgf/cm^2)</td><td>60 L</td></tr>
<tr><td>60 MPa (612 kgf/cm^2)</td><td>30 L</td></tr>
</table>
Repeating high-pressure (above 60 MPa) and low-pressure (below 10 MPa) pumping could shorten the service life of seals.
(LC-40D/LC-40i)
<table>
<tr><th>Pumping Pressure</th><th>Total Delivery</th></tr>
<tr><td>10 MPa (102 kgf/cm^2)</td><td>90 L</td></tr>
<tr><td>30 MPa (306 kgf/cm^2)</td><td>30 L</td></tr>
</table>
</td><td>P.118
P.125</td></tr>
<tr><td>Inspection (Replacement) of Plunger</td><td>1 year</td><td>Replace the plunger seal and the diaphragm when the plunger is replaced.</td><td rowspan="2">P.137</td></tr>
<tr><td>Inspection (Replacement) of Diaphragm</td><td>1 year</td><td>-</td></tr>
</table>

Inspection/Maintenance Item	Replacement Periods	Remark	Ref.
Inspection (Replacement) of Outlet Check Valve	1 year	-	P.150
Inspection (Replacement) of Inlet Check Valve	1 year	-	P.150
Inspection (Replacement) of Line Filter	2 Years	Replace when particulates in mobile phase clog the filter.	P.152 P.154
Inspection (Replacement) of Suction Filter	2 Years	Replace when particulates in mobile phase clog the filter.	P.157
Replacement of Drain Valve	3 Years	Replace when there is a fluid leak from the drain valve.	P.158
Replacement of Air Filter (for Right Panel)	1 year	-	P.159
Replacement of Air Filter (for FAN)	1 year	Contact your Shimadzu representative.	-
Pump ASSY lubrication	3 Years	Contact your Shimadzu representative.	-
Replacement of Fuse	3 Years	Contact your Shimadzu representative.	-
Cleaning of the Automatic Rinsing Kit	1 year	-	P.162
Replacement of Pump Head	(2 Years)	Pumping mobile phase mixtures containing acids such as trifluoroacetic acid or formic acid can cause leakage due to internal damage in the pump head. In such cases, replace the pump head every two years, as a general guideline. (Pump heads do not need to be replaced if only mobile phases without added acid are pumped.)	-

4.1.3 Check after Inspection and Maintenance

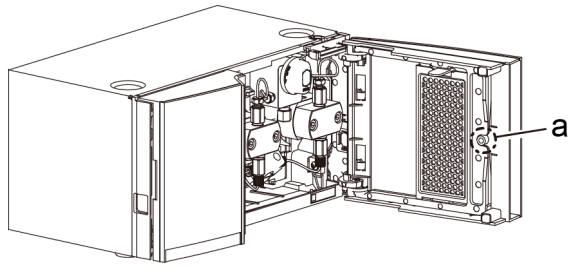
After inspection and maintenance, check any leakage during pumping.

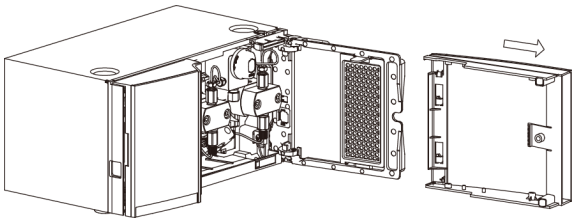
4.2 Removing the Right Panel Cover and the Filter Holder

1 **Open the right panel.**

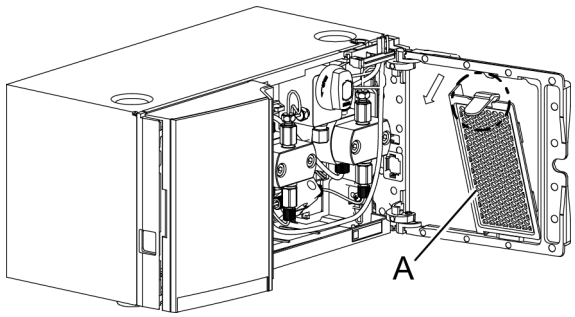
2 **Remove the right panel cover.**

While lightly pressing the cylinder-shaped projection (a) inside the right panel cover, slide the cover to the front.





3 **While pressing the knob at the top of the filter holder (A), remove it toward the front.**



4.3 Attaching/Removing the Pump Heads

This section will explain how to attach and remove the right-side pump head.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002
Allen wrench (M5)	1	086-03805
Syringe	1	046-00038-01
Syringe needle	1	228-18216-91
Wrench, 40I (Only for LC-40i)	1	228-79981

■ Removing the pump heads

1 **Perform either of the following to prevent the mobile phase solvent from flowing out of the suction tube or pump head when removing the tubes around the pump.**

- Place the reservoir bottle at a position lower than the pump inlet.
- Empty the reservoir bottle and suction tube of the mobile phase solvent, loosen the bushing of the suction filter, and remove it from the pump inlet.

2 **Press [CE] to display the initial screen.**

3 **Press [→] twice.**
The FUNCTION group is displayed.

4 **Press [↓] once, move the cursor to [CONTROL], and press [→].**

5 **Press [Enter].**
The cursor blinks at the input position.

6 **Press [2] and [Enter]. (To replace the left plunger seal, press [1] and [Enter].)**

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference "Setting the plunger stop position《PLUNGER SET》" P.49

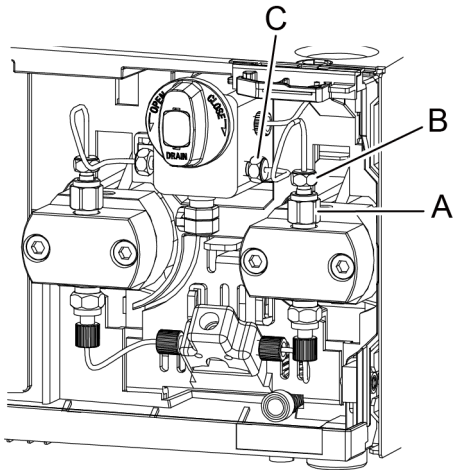
In the conditions, remove the right pump head. When attaching the right pump head, perform steps 2 to 6 as well.

7 **Follow the instructions below to remove the tubing.**

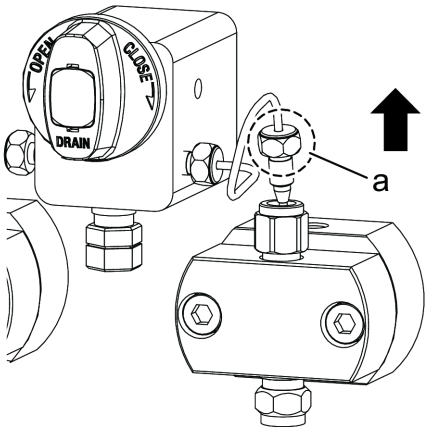
(LC-40D X3/LC-40D XS)

1 While holding the check valve OUT (A) with a 10-mm wrench, loosen the check valve OUT side male nut (B) of the SUS pipe R with an 8-mm wrench.

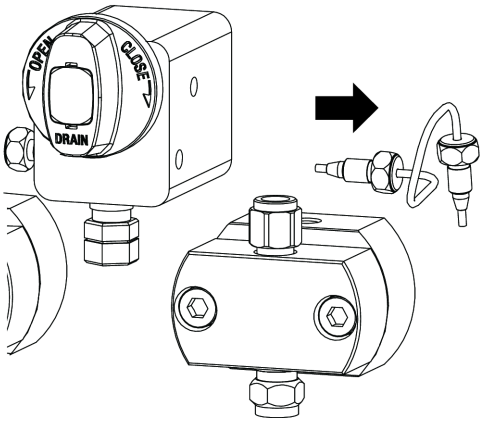
2 Loosen the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.



3 Hold the check valve OUT side male nut ("a" in the figure) of the SUS pipe R and then slightly lift and pull out the SUS pipe R.



4 Pull the SUS pipe R to the right to remove it.

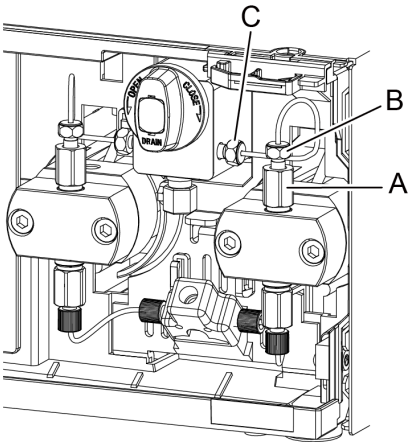


Hint Though the orientation is opposite to the right one (SUS pipe R), remove the left tube (SUS pipe L) in the same procedure.

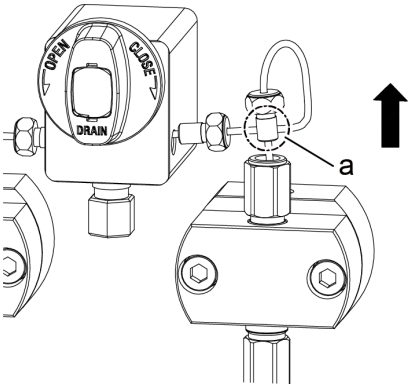
(LC-40D XR/LC-40D)

1 While holding the check valve OUT (A) with a 10-mm wrench, loosen the check valve OUT side male nut (B) of the SUS pipe R with an 8-mm wrench.

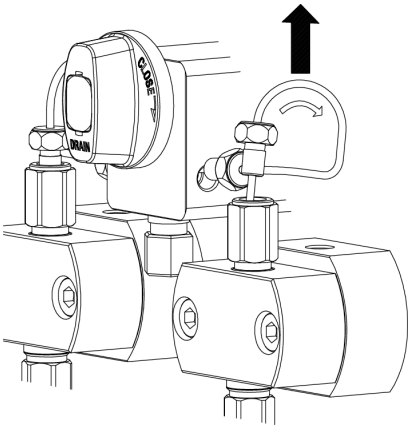
2 Loosen the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.



3 Hold the check valve OUT side male nut ("a" in the figure) of the SUS pipe R and then slightly lift and pull out the SUS pipe R.



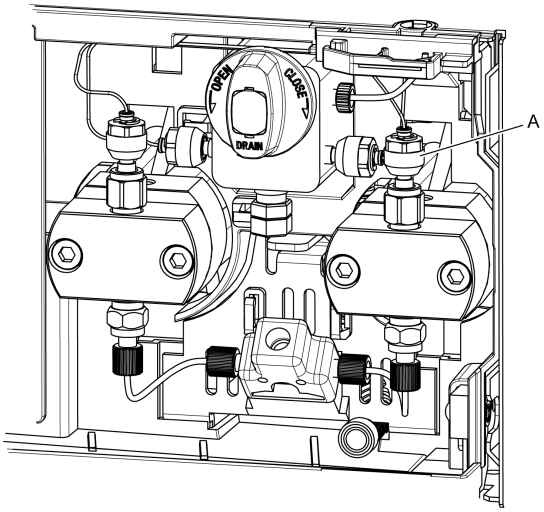
4 Slightly lean backwards the SUS pipe R to pull it out upward.



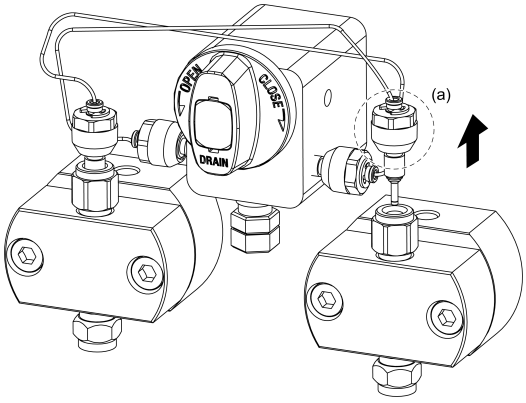
Hint Though the orientation is opposite to the right one (SUS pipe R), remove the left tube (SUS pipe L) in the same procedure.

(LC-40D XSi)

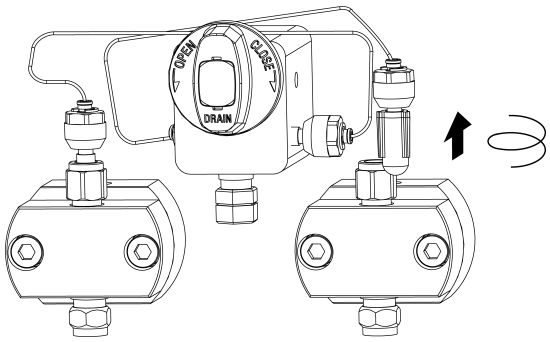
1 Loosen the the check valve OUT side male nut (A) of the PEEK lined SS tube R with an 10-mm wrench.



2 Hold the male nut ("a" in the figure) of the PEEK lined SS tube R and then slightly lift the PEEK lined SS tube R.



3 Attach the cap to the tip of the male nut of the PEEK lined SS tube by screwing with hands.



Hint

- This cap is included in the accessories.
- Though the orientation is opposite to the right one (PEEK lined SS tube R), remove the left tube (PEEK lined SS tube L) and attach the cap by screwing with hands in the same procedure.

⚠ CAUTION

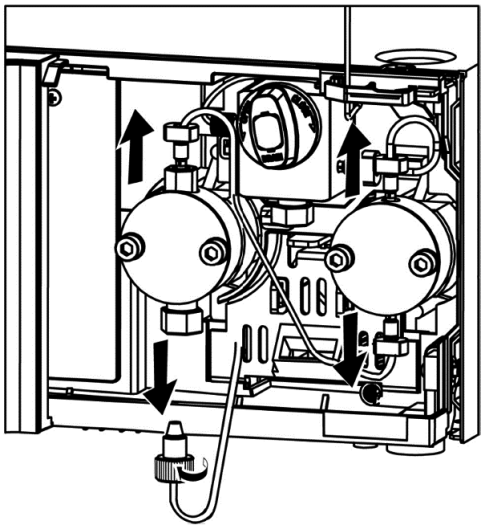
Instruction

When removing the PEEK lined SS tube, be sure to attach a cap to protect the tip.

Replace the piping if the end of the PEEK lined SS tube is damaged, causing leakage or clogging.

(LC-40i)

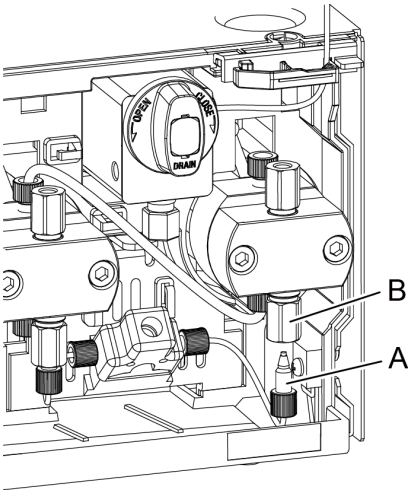
1 Remove the PEEK tubes and suction tubing connected to the top and bottom of the right and left pump heads and the pressure sensor.



NOTE

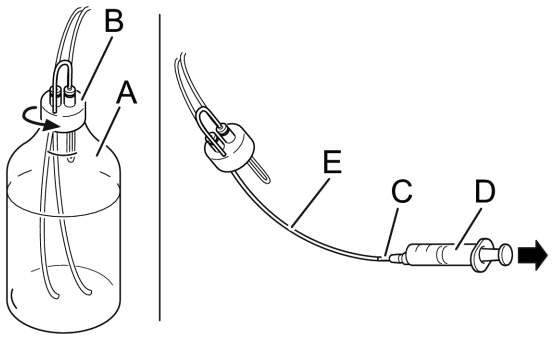
- Loosen and remove the bush on the check valve IN side by hand.
- Loosen and remove the male nut on the PEEK tube with the 40I wrench.
- To remove the PEEK tube at the top of the left pump head, fix the check valve OUT with a 10 mm wrench not to loosen check valve OUT, and loosen the male nut of the PEEK tube with the 40I wrench.

8 **(For LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D) Loosen the male nut PEEK (A) of the inlet tube by hand and remove it from the check valve IN (B).**



9 If the seal rinsing kit is attached, remove the cap (B) of the seal rinsing kit from the rinse solution bottle (A).

10 Attach the syringe needle (C) to the end of the outlet FEP tubing (E) (upward U-shape), and use the syringe (D) to suction out the rinse fluid from the rinse flow line.

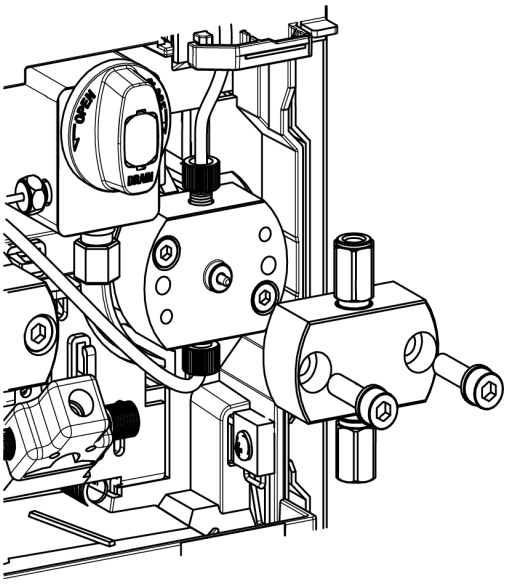


11 Place the removed cap (B) and rinse solution bottle on the reservoir tray on the top of the instrument.

12 **Follow the instructions below to remove the pump head.**

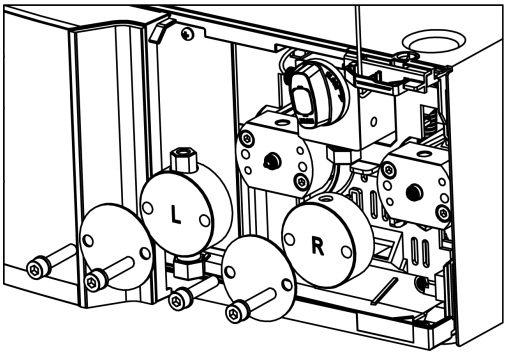
(LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

Gradually loosen the 2 hexagonal socket screws using an Allen wrench (M5) by alternating between the left and right screw, and remove the pump head.



(LC-40i)

Gradually loosen the 2 hexagonal socket screws using an Allen wrench (M5) by alternating between the left and right screws, and remove the pump heads and head plates.



⚠ CAUTION

Instruction

Gently pull the pump head horizontally along the plunger.

The plunger may be damaged if the pump head is forcefully removed.

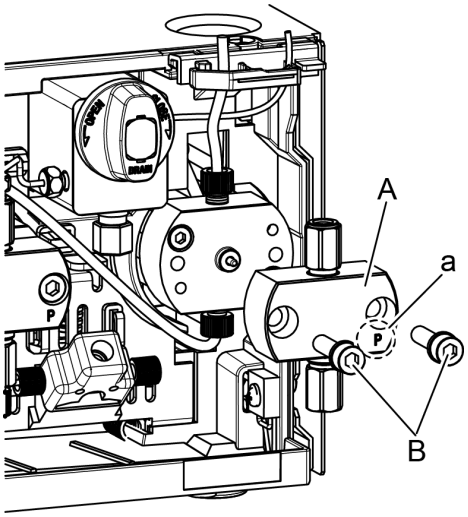
■ Attaching the pump head

1 **Set the plunger position by following steps 2 to 6 in "Removing the pump heads" P.105.**

2 **Follow the instructions below to attach the pump head.**

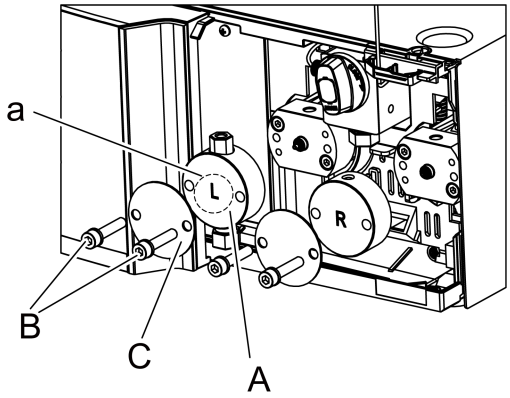
(LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

Hold the pump head with the mark (a) coming at the bottom right, tighten the 2 hexagonal socket screws (B) with an Allen wrench (M5) by tightening the right and left screws alternately, and attach the pump head (A).



(LC-40i)

Hold the pump head so that the vertical direction of mark (a) is correct, place the head plate (C) on top of it, and align the holes with the holes of the pump head (A). Then, tighten the 2 hexagonal socket screws (B) with an Allen wrench (M5) to attach the pump head (A) and head plate (C).



⚠ CAUTION

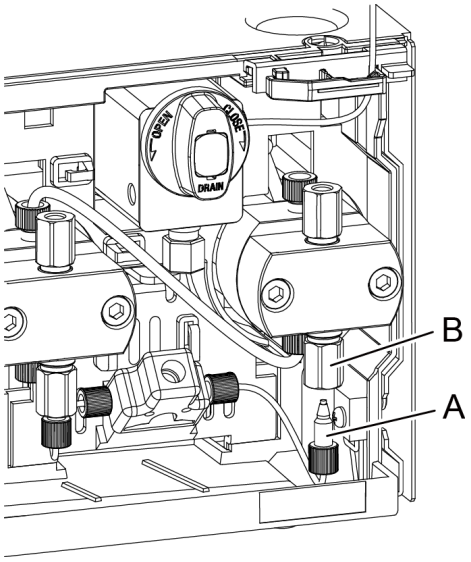
Instruction

Gently inset the pump head horizontally along the plunger.

The plunger may be damaged if the pump head is forcefully inserted.

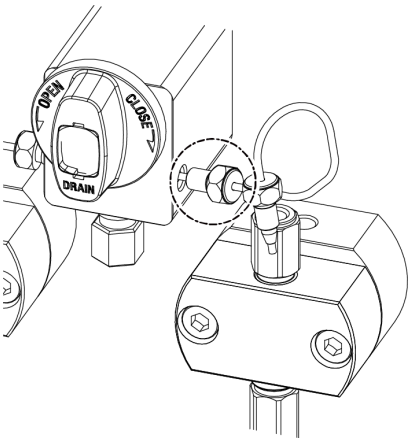
NOTE Tighten the left and right hexagonal socket screws 90 degrees at a time, and then firmly tighten using the long side of the Allen wrench.

3 **(LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D) Tighten the male nut PEEK (A) of the inlet tube to the inlet check valve (B) by hand.**

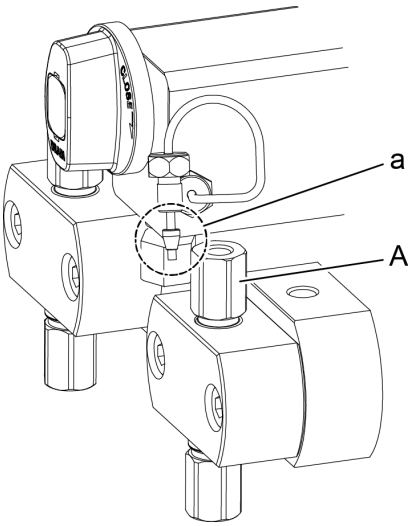


4 **Follow the instructions below to attach the tubing.**
(LC-40D X3/LC-40D XS/LC-40D XR/LC-40D)

1 Insert the end of the SUS pipe R into the hole of the pressure sensor.

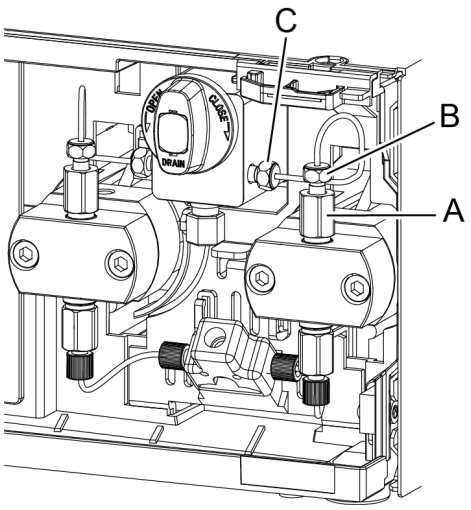


2 Hold the check valve side end of the SUS pipe R ("a" in the figure) and then insert the male nut into the check valve OUT (A).



3 While holding the check valve OUT (A) with a 10-mm wrench, tighten the SUS pipe R male nut on the check valve OUT side with an 8-mm wrench (B).

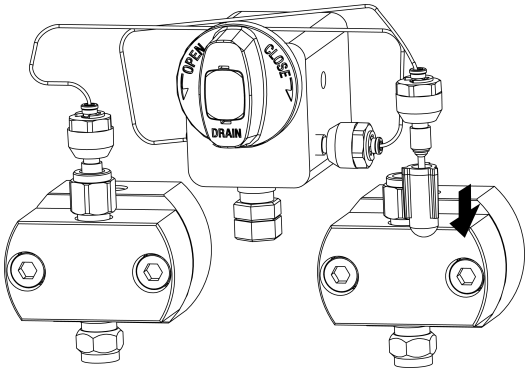
4 Tighten the pressure sensor side male nut (C) of the SUS pipe R with an 8-mm wrench.



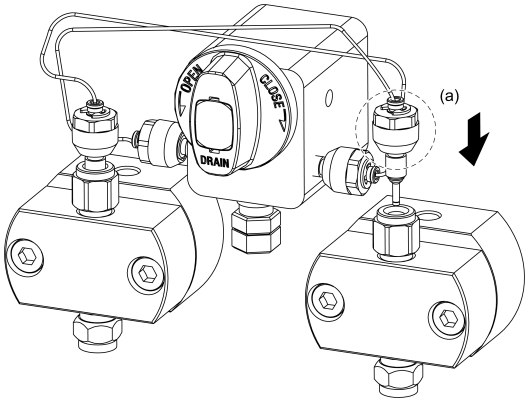
Hint Though the orientation is opposite to the right one (SUS pipe R), attach the left tube (SUS pipe L) in the same procedure.

(LC-40D XSi)

1 Loosen the cap attached to the tip of PEEK lined SS tube R by hand and remove it.



2 Hold the male nut of PEEK lined SS tube R ("a" in the figure) and insert it straight into the check valve OUT from above.



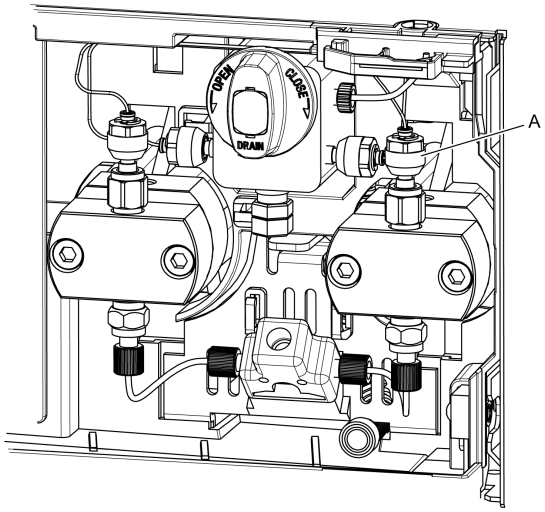
⚠ CAUTION

Instruction

When attaching the PEEK lined SS tube, make sure that the end of the PEEK lined SS tube does NOT touch other parts such as the threaded part of the check valve OUT.

Replace the piping if the end of the PEEK lined SS tube is damaged, causing leakage or clogging.

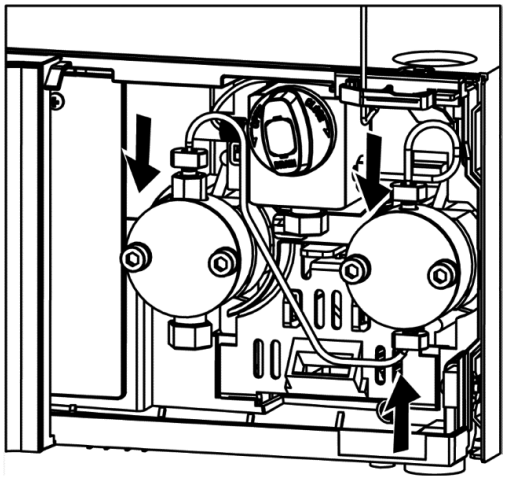
3 Tighten the male nut (A) of the PEEK lined SS tube R with an 10-mm wrench until it clicks twice.



Hint Though the orientation is opposite to the right one (PEEK lined SS tube R), attach the left tube (PEEK lined SS tube L) in the same procedure.

(LC-40i)

1 Attach the PEEK tubes to the top and bottom of the right and left pump heads and to the pressure sensor, and tighten them with the 40I wrench.

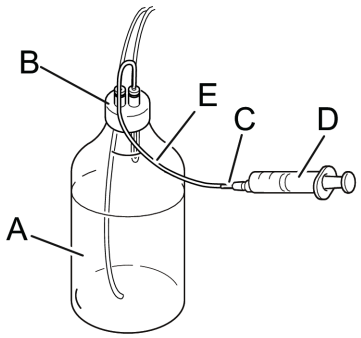


NOTE
- When tightening the male nut, tighten it by hand until it is secured, then tighten it further with the 40I wrench by about 120° (about 180° for a new male nut).
- To attach the PEEK tube at the top of the left pump head, tighten the male nut while holding the check valve OUT with a 10 mm wrench.
- When attaching the PEEK tube, hold down the PEEK tube not to rotate with the mail nut.

2 Attach the bush of the suction tubing to the check valve IN.

NOTE When attaching the suction tubing, turn the fitting while pressing the tubing into the check valve IN.

5 Attach the original rinsing kit cap (B) to the rinse solution bottle (A), and then remove the outlet FEP tubing (E) (upward U-shape) from the rinse solution bottle.



6 Attach the syringe needle (C) to the end of the FEP tubing (E) (upward U-shape), and use the syringe (D) to suction out the rinse solution from the rinse flow line.

7 Return the rinsing kit to the reservoir tray.

4.4 Replacing the Plunger Seal of LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR

A plunger seal and backup ring are attached inside the left and right pump heads. The following section will explain the method for replacing the plunger seal and backup ring on the right side (when viewed from the front).

Necessary tools

Part Name	Quantity	Part No.
wrench (8 mm and 10 mm)	2	086-03002
Allen wrench (M5)	1	086-03805
Seal Installer/Remover	1	228-62458-41

Necessary parts

Part Name	Part Type	Part No.
Plunger Seal (UHP) (supplied with backup ring)	Consumable part	228-52711-93
CAP	Component part	228-79093 (LC-40D XSi)

4.4.1 Replacing the Plunger Seal and Backup Ring

1 **Remove the pump head, pipe, and inlet tube by following the instructions in "Removing the pump heads" P.105.**

2 **Perform the following steps to replace the plunger seal and backup ring.**

The plunger seal and the backup ring are installed inside the pump head. Use the provided seal installer/remover to remove them.

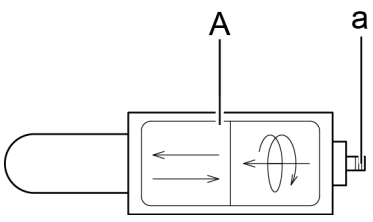
⚠ CAUTION

Prohibition

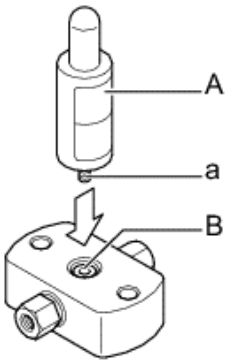
Do NOT drop the seal installer/remover when using it.

Seal installer/remover may be damaged.

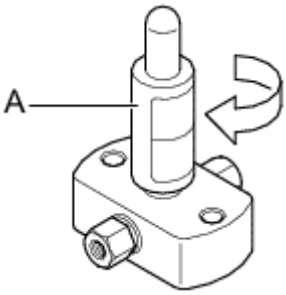
1 Wipe off the threaded tip on the metal part (a) of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



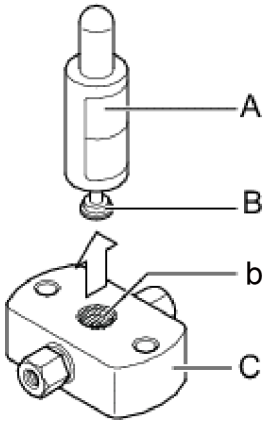
2 With the metal part (a) of the seal installer/remover (A) facing downward, insert the seal installer/remover (A) vertically into the backup ring (B).



3 Turn the seal installer/remover (A) 180 degrees to 360 degrees clockwise.

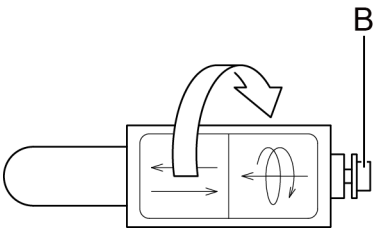


4 Pull out the seal installer/remover (A) upward.
The backup ring (B) will come off from the plunger seal hole (b) of the pump head (C).



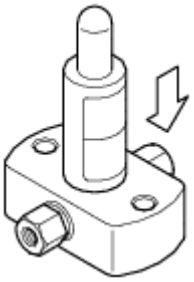
> NOTE If the backup ring is still stuck, return to step 3 and turn the seal installer/remover 180 degrees more, then retry this step.

5 Grip the backup ring (B) with two fingers and turn the seal installer/remover counterclockwise, then remove the backup ring from the seal installer/remover.

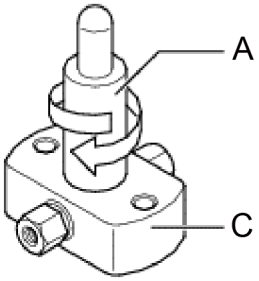


6 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

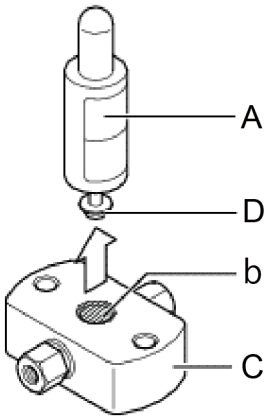
7 With the metal part of the seal installer/remover facing downward, place the seal installer/remover vertically above the plunger seal and push it slightly into the seal.



8 Turn the seal installer/remover (A) clockwise until it comes into contact with the pump head (C).

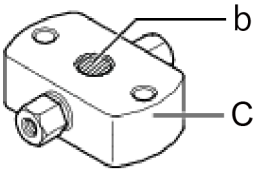


9 Pull out the seal installer/remover (A) upward.
The plunger seal (D) will come off from the plunger seal hole (b) of the pump head (C).



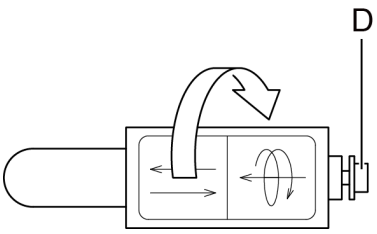
10 Place the pump head into a clean beaker containing 2-propanol, and clean it for 10 minutes using an ultrasonic bath.

11 Use a piece of wiping paper soaked in 2-propanol to wipe the plunger attachment portion (b) inside the pump head (C).



NOTE
- If seal material adheres to the plunger attachment portion of the pump head, the airtightness cannot be maintained.
- If any scratches are found on the plunger attachment portion of the pump head, replace the pump head.

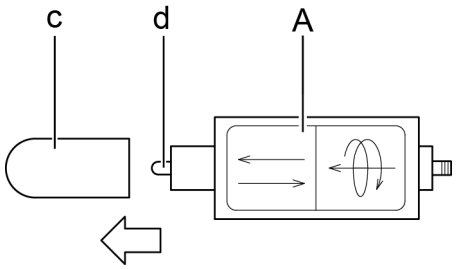
12 Grip the plunger seal (D) with two fingers and turn the seal installer/remover counterclockwise, then remove the plunger seal from the seal installer/remover.



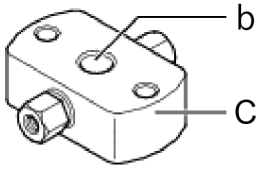
13 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

14 Remove the cap (c) from the seal installer/remover (A).

15 Wipe off the white protrusion (d) and the surrounding area of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



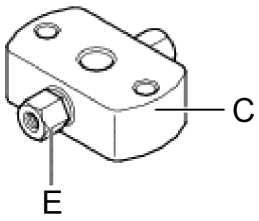
16 Put some drops of 2-propanol in the plunger seal hole (b) of the pump head (C) while paying attention to spillage of 2-propanol.



⚠ CAUTION

Prohibition

Before putting in 2-propanol, screw the check valves (E) into the pump head (C) so that 2-propanol does not leak from the holes for the check valve.

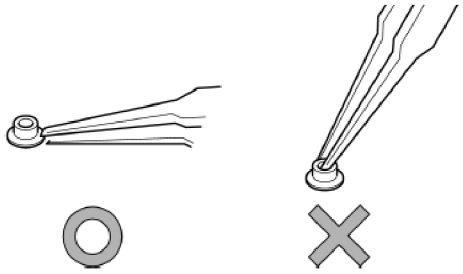


17 Soak a new plunger seal and a new backup ring in 2-propanol in a clean beaker.

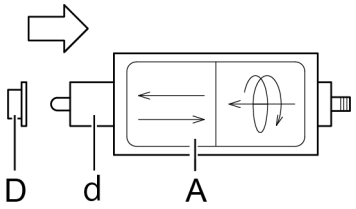
⚠ CAUTION

Prohibition

When gripping the plunger seal with tweezers, do NOT touch the internal hole surface. Also, to prevent damage, do NOT grip the plunger seal and the backup ring tightly with tweezers.



18 Take the new plunger seal (D) out of the beaker and put it on the white protrusion (d) of the seal installer/remover (A).

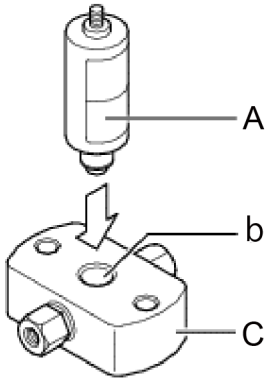


⚠ CAUTION

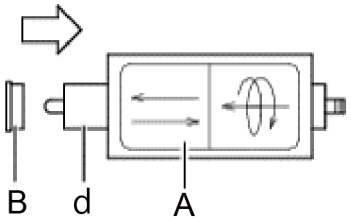
Instruction

Be sure that the plunger seal is moistened with 2-propanol when putting it on the seal installer/remover.

19 Insert the seal installer/remover (A) vertically all the way into the plunger seal hole (b) of the pump head (B) and slowly pull out the seal installer/remover upward. The plunger seal will be installed in the pump head.



20 Take the new backup ring (B) out of the beaker and, with the smaller diameter side facing the seal installer/remover (A), put the backup ring on the white protrusion (d).

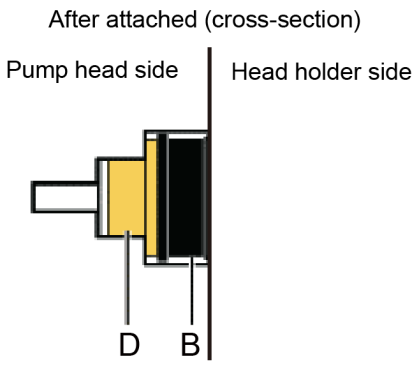


⚠ CAUTION

Instruction

Be sure to attach the backup ring with the correct orientation.

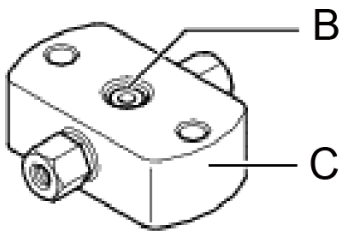
When the backup ring (B) is attached correctly to the pump head, the larger diameter side comes into contact with the plunger seal (D).



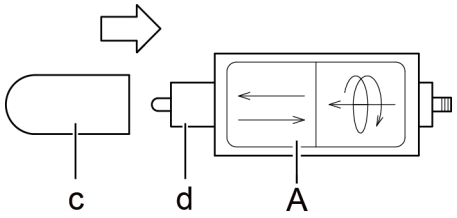
Instruction

Be sure that the backup ring is moistened with 2-propanol when putting it on the seal installer/remover.

21 Insert the seal installer/remover vertically all the way into the plunger seal and slowly pull out the seal installer/remover upward. The new backup ring (B) will be installed into the pump head (C).



22 Put the cap (c) on the white protrusion (d) of the seal installer/remover.



3 **Attach the pump head, SUS pipe, and inlet tube by following the instructions in "Attaching the pump head" P.113.**

4.4.2 Resetting the Delivery Amount

1 **Display the [MAINTENANCE] information group of the VP function.**

Reference "3.3 Types of Screens" P.31

2 **Press [↓] several times until [R SEAL USED] is displayed.**

3 **Press [del].**

The delivery amount of the plunger seal before replacement is reset and the reset date is recorded in the maintenance log.

Reference "Displaying the delivery amount of the right plunger seal《R SEAL USED》" P.64

NOTE When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL.

Hint To replace the left plunger seal, display [L SEAL USED] and press [del].

4.4.3 Check after Replacement

After replacing the plunger seal, check the following:

- Is the pumping (pressure) stable?
- Is fluid leaking from the gap between the pump head and the head holder?
- Is fluid leaking from the rinse flow line?

NOTE If the above occurs even after replacing the plunger seal, it is possible that there are scratches on the surface of the plunger. If there are scratches on the plunger, replace it with a new plunger.

Reference "4.6 Replacing the Plunger Seal of LC-40i" P.130

4.5 Replacing the Plunger Seal of LC-40D

Plunger seals are attached inside the left and right pump heads. The following section will explain the method for replacing the plunger seal on the right side (when viewed from the front).

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002
Allen wrench (M5)	1	086-03805
Seal Installer/Remover	1	228-62458-41

Necessary parts

Part Name	Part Type	Part No.
Plunger Seal GFP ID2	Consumable part	228-35146

4.5.1 Replacing the Plunger Seal

1 **Remove the pump head, SUS pipe, and inlet tube by following the instructions in "Removing the pump heads" P.105.**

2 **Perform the following steps to replace the plunger seal.**

The plunger seal is installed inside the pump head. Use the provided seal installer/remover to remove them.

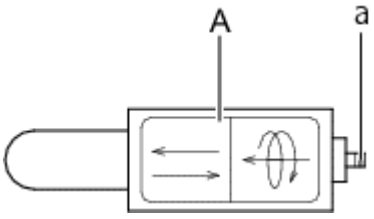
⚠ CAUTION

Prohibition

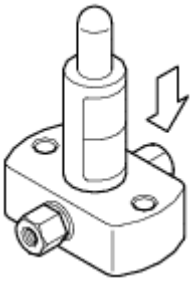
Do NOT drop the seal installer/remover when using it.

Seal installer/remover may be damaged.

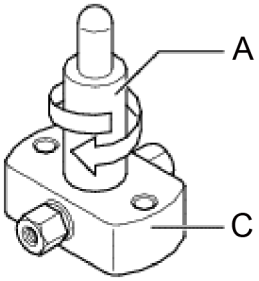
1 Wipe off the threaded tip on the metal part (a) of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



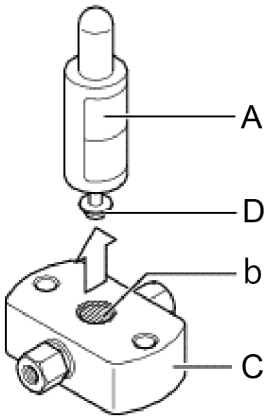
2 With the metal part of the seal installer/remover facing downward, place the seal installer/remover vertically above the plunger seal and push it slightly into the seal.



3 Turn the seal installer/remover (A) clockwise until it comes into contact with the pump head (C).

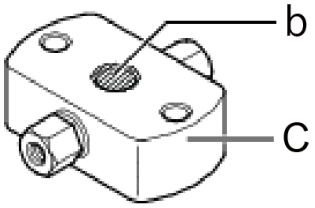


4 Pull out the seal installer/remover (A) upward.
The plunger seal (D) will come off from the plunger seal hole (b) of the pump head (C).



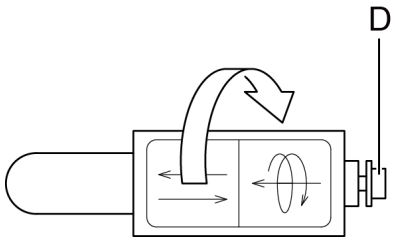
5 Place the pump head into a clean beaker containing 2-propanol, and clean it for 10 minutes using an ultrasonic bath.

6 Use a piece of wiping paper soaked in 2-propanol to wipe the plunger attachment portion (b) inside the pump head (C).



NOTE
- If seal material adheres to the plunger attachment portion of the pump head, the airtightness cannot be maintained.
- If any scratches are found on the plunger attachment portion of the pump head, replace the pump head.

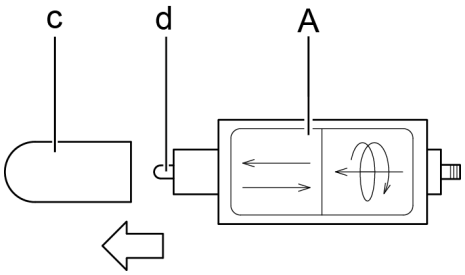
7 Grip the plunger seal (D) with two fingers and turn the seal installer/remover counterclockwise, then remove the plunger seal from the seal installer/remover.



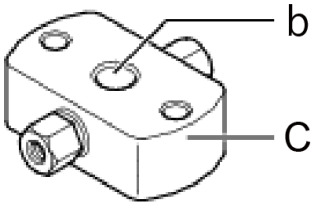
8 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

9 Remove the cap (C) from the seal installer/remover (A).

10 Wipe off the white protrusion (d) and the surrounding area of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



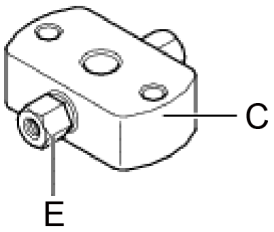
11 Put some drops of 2-propanol in the plunger seal hole (b) of the pump head (C) while paying attention to spillage of 2-propanol.



⚠ CAUTION

Instruction

Before putting in 2-propanol, screw the check valves (A) into the pump head (C) so that 2-propanol does not leak from the holes for the check valve.

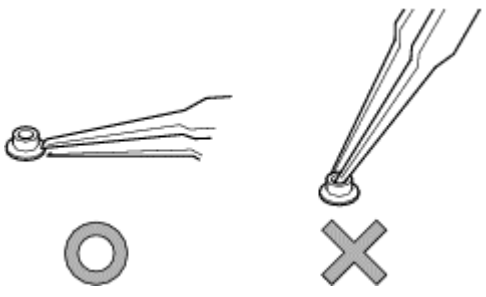


12 Soak a new plunger seal in 2-propanol in a clean beaker.

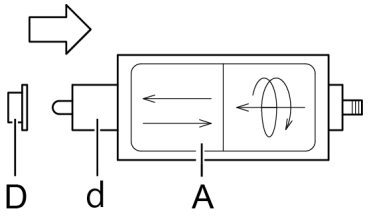
⚠ CAUTION

Prohibition

When gripping the plunger seal with tweezers, do NOT touch the internal hole surface. Also, to prevent damage, do NOT grip the plunger seal and the backup ring tightly with tweezers.



13 Take the new plunger seal (D) out of the beaker and put it on the white protrusion (d) of the seal installer/remover (A).

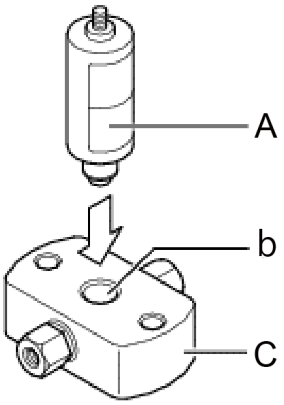


⚠ CAUTION

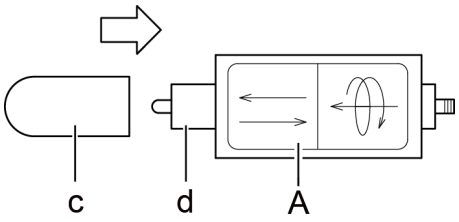
Instruction

Be sure that the plunger seal is moistened with 2-propanol when putting it on the seal installer/remover.

14 Insert the seal installer/remover (A) vertically all the way into the plunger seal hole (b) of the pump head (C) and slowly pull out the seal installer/remover upward. The plunger seal will be installed in the pump head.



15 Put the cap (c) on the white protrusion (d) of the seal installer/remover (A).



3 **Attach the pump head, SUS pipe, and inlet tube by following the instructions in "Attaching the pump head" P.113.**

4.5.2 Resetting the Delivery Amount

1 **Display the [MAINTENANCE] information group of the VP function.**

Reference "3.3 Types of Screens" P.31

2 **Press [↓] several times until [R SEAL USED] is displayed.**

3 **Press [del].**

The delivery amount of the plunger seal before replacement is reset and the reset date is recorded in the maintenance log.

Reference "Displaying the delivery amount of the right plunger seal《R SEAL USED》" P.64

NOTE When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL.

Hint To replace the left plunger seal, display [L SEAL USED] and press [del].

4.5.3 Checking After Replacement

Check the following after replacing the plunger seal.

- Is the pumping (pressure) stable?
- Is fluid leaking from the gap between the pump head and the head holder?
- Is fluid leaking from the rinse flow line?

NOTE If the above occurs even after replacing the plunger seal, it is possible that there are scratches on the surface of the plunger. If there are scratches on the plunger, replace it with a new plunger.

Reference "4.7.2 Cleaning and Inspection (Replacement) of the Plunger and the Diaphragm" P.140

4.6 Replacing the Plunger Seal of LC-40i

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	1	086-03002
Wrench, 40I	1	228-79981
Allen wrench (M5)	1	086-03805
Seal Installer/Remover	1	228-70835-41

Necessary parts

Part Name	Part Type	Part No.
Plunger Seal	Consumable part	228-78510

4.6.1 Replacing the Plunger Seal

A plunger seal is attached inside the left and right pump heads. The following section will explain the method for replacing the plunger seal on the left side (when viewed from the front).

1 **Remove the pump head and tubing by following the instructions in "Removing the pump heads" P.105.**

2 **Perform the following steps to replace the plunger seal.**

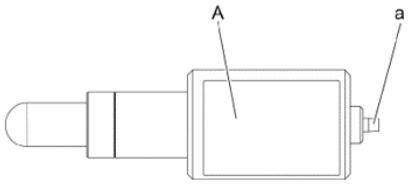
The plunger seal and the backup ring are installed inside the pump head. Use the provided seal installer/remover to remove them. Work on a hard surface when replacing the plunger seal.

⚠ CAUTION

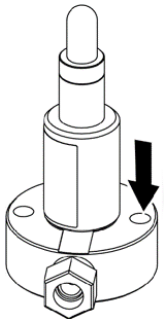
Instruction

Do NOT drop the seal installer/remover when using it.
Otherwise, seal installer/remover may be damaged.

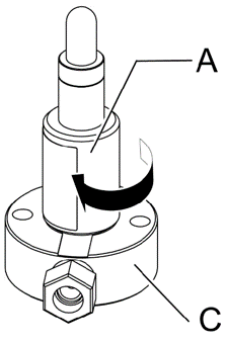
1 Wipe off the threaded tip on the metal part (a) of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



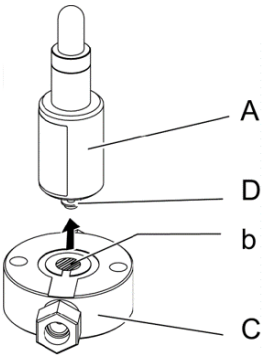
2 With the metal part of the seal installer/remover facing downward, place the seal installer/remover vertically above the plunger seal and push it slightly into the seal.



3 Turn the seal installer/remover (A) clockwise until it comes into contact with the pump head (C).



4 Pull out the seal installer/remover (A) upward.
The plunger seal (D) will come off from the plunger seal hole (b) of the pump head (C).



5 Remove the O-ring left on the plunger seal hole (b) with tweezers.

⚠ CAUTION

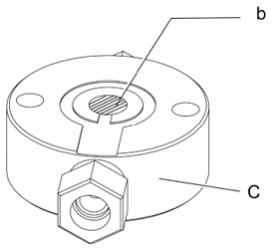
Prohibition

When removing the O-ring, be careful not to make any scratches on the plunger seal hole.

Any scratches on the part may cause a delivery failure.

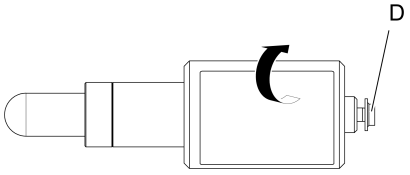
6 Place the pump head into a clean beaker containing 2-propanol, and clean it for 10 minutes using an ultrasonic bath.

7 Use a piece of wiping paper soaked in 2-propanol to wipe the plunger attachment portion (b) inside the pump head (C).



NOTE
- If seal material adheres to the plunger attachment portion of the pump head, the airtightness cannot be maintained.
- If any scratches are found on the plunger attachment portion of the pump head, replace the pump head.

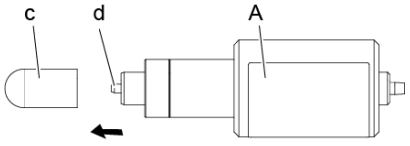
8 Grip the plunger seal (D) with two fingers and turn the seal installer/remover counterclockwise, then remove the plunger seal from the seal installer/remover.



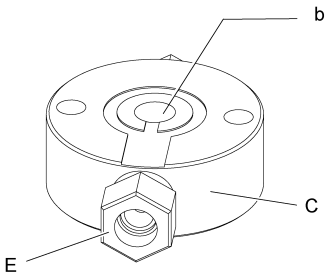
9 Wipe off the threaded tip on the metal part of the seal installer/remover with a wiping paper soaked in 2-propanol.

10 Remove the cap (c) from the seal installer/remover (A).

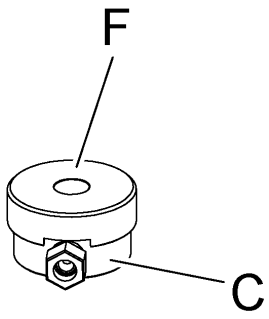
11 Wipe off the white protrusion (d) and the surrounding area of the seal installer/remover (A) with a wiping paper soaked in 2-propanol.



12 Screw the check valve (E) into the pump head (C) and Put some drops of 2-propanol in the plunger seal hole (b) of the pump head (C) while paying attention to spillage of 2-propanol.



13 Place the seal guide (F) over the pump head (C).

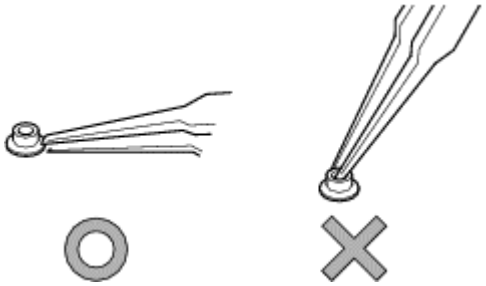


14 Soak a new plunger seal in 2-propanol in a clean beaker.

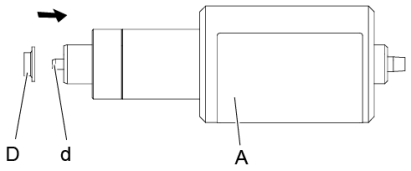
⚠ CAUTION

Prohibition

When gripping the plunger seal with tweezers, do NOT touch the internal hole surface or O-ring.
Also, to prevent damage, do NOT grip the plunger seal tightly with tweezers.
Any scratches may cause liquid leakage.



15 Take the new plunger seal (D) out of the beaker and put it on the white protrusion (d) of the seal installer/remover (A).



⚠ CAUTION

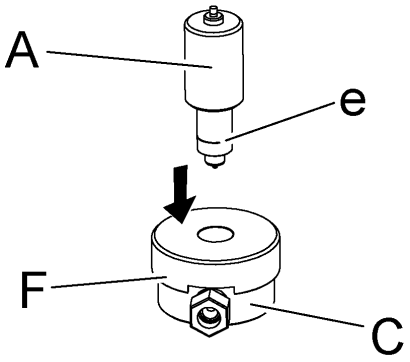
Instruction

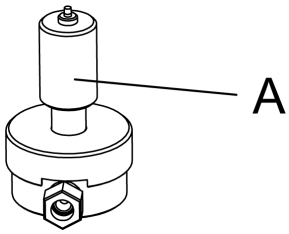
Be sure that the plunger seal is moistened with 2-propanol when putting it on the seal installer/remover.

16 Slowly insert the seal installer/remover (A) into the hole of the seal guide (F) until resistance is felt.

17 Fix the pump head (C) by hand and gently shake the seal guide (F) to align the hole of the seal guide with the hole in the center of the pump head.

18 Confirm that the line of the seal installer/remover is hidden with the seal guide.



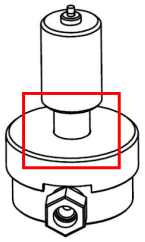


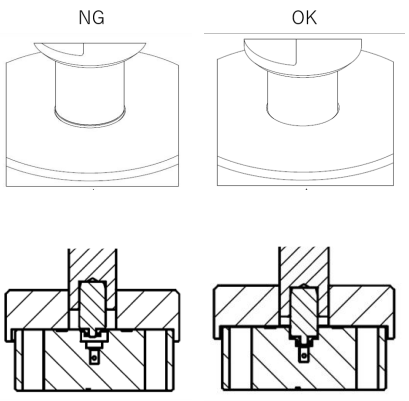
⚠ CAUTION

Instruction

Be sure to confirm that the line of the seal installer/remover is hidden with the seal guide.

Forcibly inserting the part while the line is still visible may lead to a delivery failure.

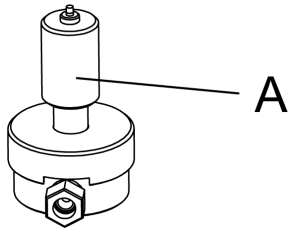




The seal is in the upper left.

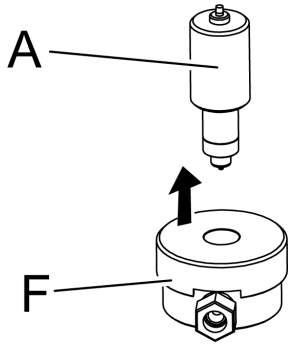
The seal is in the correct position.

19 Press in the seal installer/remover (A) with both hands.

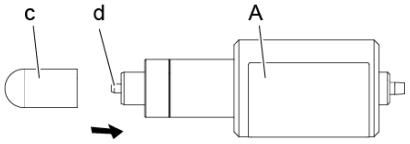


Hint Use both hands and push strongly in the seal installer/remover.

20 Slowly pull the seal installer/remover (A) and the seal guide (F) upward in that order.



21 Put the cap (c) on the white protrusion (d) of the seal installer/remover (A).



4.6.2 Resetting the Delivery Amount

1 **Display the [MAINTENANCE] information group of the VP function.**

Reference "3.3 Types of Screens" P.31

2 **Press [↓] several times until [L SEAL USED] is displayed.**

3 **Press [del].**

The delivery amount of the plunger seal before replacement is reset and the reset date is recorded in the maintenance log.

Reference "Displaying the delivery amount of the right plunger seal《R SEAL USED》" P.64

NOTE When PARTS MGMT TOOL is active, the delivery amount cannot be reset on the operation panel. Reset it from PARTS MGMT TOOL.

Hint To replace the right plunger seal, display [R SEAL USED] and press [del].

4.6.3 Checking After Replacement

Check the following after replacing the plunger seal.

- Is the pumping (pressure) stable?
- Is fluid leaking from the gap between the pump head and the head holder?
- Is fluid leaking from the rinse flow line?

NOTE If the above occurs even after replacing the plunger seal, it is possible that there are scratches on the surface of the plunger. If there are scratches on the plunger, replace it with a new plunger.

Reference "4.7.2 Cleaning and Inspection (Replacement) of the Plunger and the Diaphragm" P.140

4.7 Cleaning/Inspecting (Replacing) the Plunger and Diaphragm

A plunger and a diaphragm are attached to the left and right pump body. The following section will explain the method for cleaning/inspecting (replacing) the plunger and the diaphragm on the right side (when viewed from the front).

When replacing the plunger, be sure to also replace the plunger seal and the diaphragm.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002
Wrench, 40I (For LC-40i only)	1	228-79981
Allen wrench M4	1	086-03804
Allen wrench M5	1	086-03805
Box driver	1	228-28767-91
Diaphragm jig	1	228-54852
Plunger press plate	1	228-70388

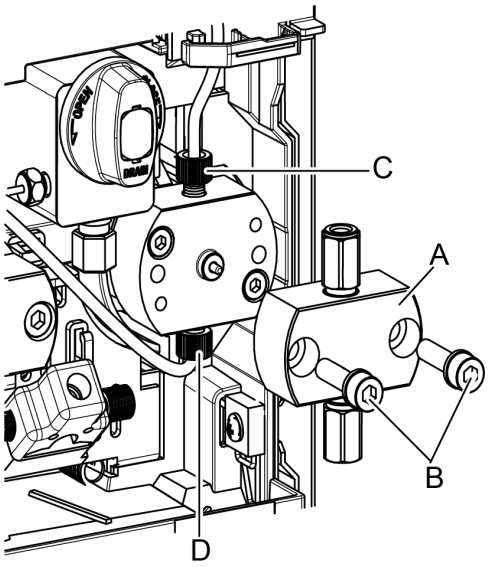
Necessary parts

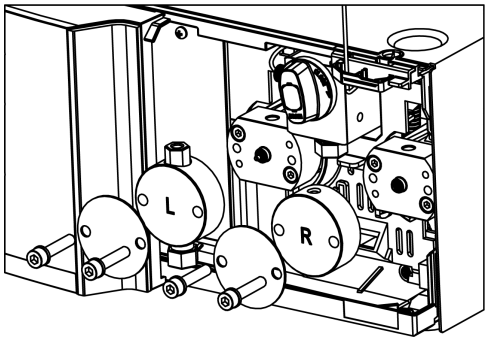
Target model	Part Name	Part Type	Part No.	Remark
LC-40D X3 LC-40D XS LC-40D XSi LC-40D XR	Plunger Holder Assy	Consumable part	228-52069-44	Supplied with a diaphragm
LC-40D LC-40i			228-35281-97	

4.7.1 Removing the Pump Head and the Head Holder

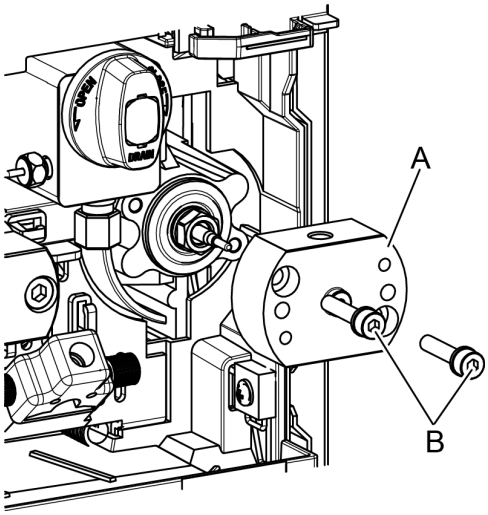
1 Remove the pump head and pipe by following the instructions in "Removing the pump heads" P.105.

2 Loosen the head holder top and bottom fittings (C and D), and remove the rinse tube.





3 Gradually loosen the 2 hexagonal socket screws (B) of the head holder (A) using an Allen wrench (M4) by alternating between the left and right screw.



4 **Remove the head holder.**

⚠ CAUTION

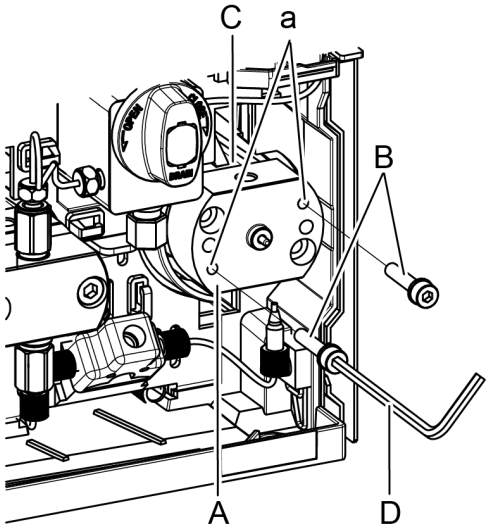
Instruction

Gently pull the head holder horizontally along the plunger.
If the head holder is not removed carefully, the plunger may become damaged.

■ In the case the head holder is difficult to remove

Insert into the head holder M4 bolt hole (a) the 2 hexagonal socket screws (B) that were removed, and tighten the left and right sides gradually using an Allen wrench (M4) (D).

The head holder (A) can be loosened by pushing the pump body (C) using the 2 hexagonal socket screws (B).



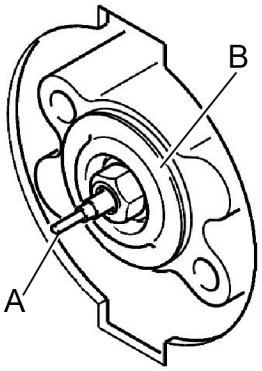
4.7.2 Cleaning and Inspection (Replacement) of the Plunger and the Diaphragm

NOTE When replacing the plunger, be sure to replace the plunger seal and the diaphragms.

1 **Perform the following steps to clean or inspect (replace) the plunger and diaphragm.**

1 Using a wiping paper soaked with 2-propanol to remove any portion of the seal or dirt attached to the plunger (A).

NOTE If seal material adheres to the surface, the airtightness cannot be maintained.



2 Check that there are no visible scratches on the plunger (A) or the diaphragm (B).

- If scratches are found through visual inspection, replace with a new plunger. Proceed to the next step 3.
- If no scratches are found through visual inspection, proceed to step 2.

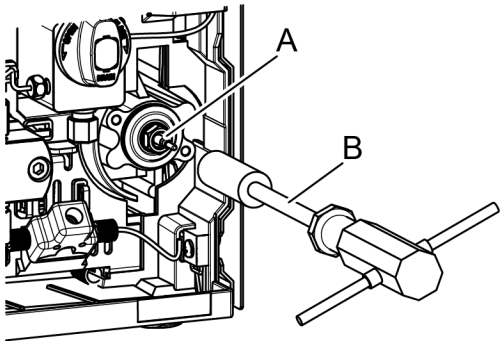
⚠ CAUTION

Prohibition

Do NOT allow foreign particles or crystals into the head holder.

Foreign particles from the mobile phase solution or crystals from the buffer solution getting into the head holder may cause scratches on the surface of the plunger.

3 Insert the box driver (B) into the plunger holder (A), then rotate counter-clockwise to remove it.



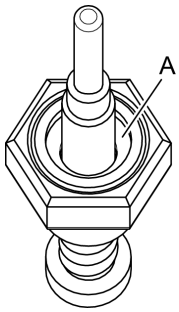
⚠ CAUTION

Instruction

Gently insert the box driver into the plunger.

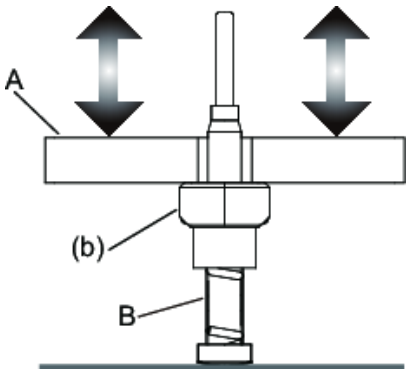
The plunger may become damaged if the box driver is forcefully inserted.

4 (For LC-40D/LC-40i) Place a few drops of water on the O-ring (A) of a new plunger holder and get it wet.

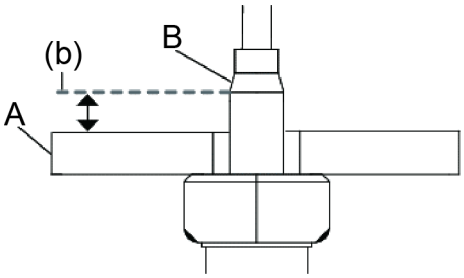


NOTE Pay attention NOT to damage the O-ring by the tip of the syringe.

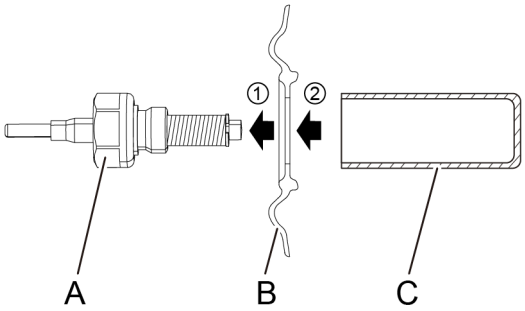
5 (For LC-40D/LC-40i) Slide up and down the bush (b) on the plunger holder (B) approximately 10 times, using a plunger press plate (A). Please continue it till the bush moves smoothly.



NOTE Push down the plunger press plate (A) to lower than the bevel (b) of the plunger holder (B). Please wipe out the residual water behind the bushing when the operation completed.

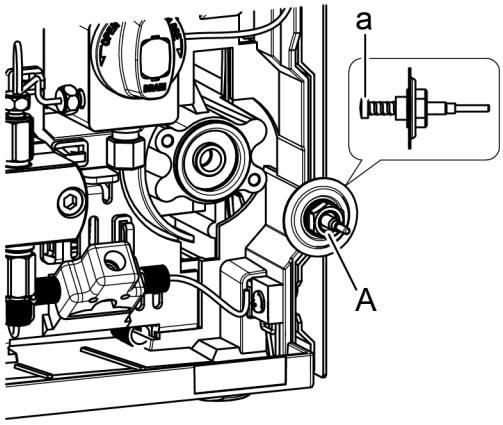


6 Attach a new diaphragm (B) to the new plunger holder (A) using the diaphragm jig (C).



NOTE Confirm the direction of the diaphragm when attaching.

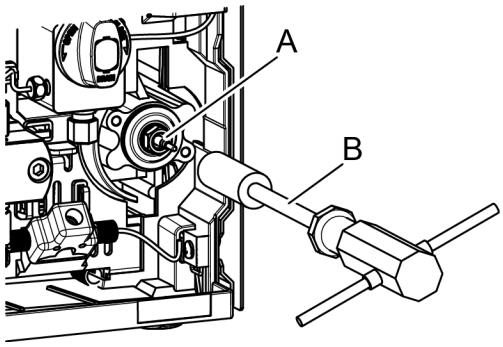
7 After applying the grease (black: approximately 5 mm square size) provided with the plunger holder ASSY to the rear end surface of the plunger (a), insert the plunger holder (A) to which the diaphragm was attached in Procedure 6 into the pump body.



NOTE
- Be careful not to get any grease on the diaphragm or the body.
- Attach the diaphragm so that it will not become detached from the plunger holder. If the diaphragm becomes detached, wipe away any grease and perform from Procedure 6 again.

8 Tighten the plunger holder (A) using the box driver (B).

9 Pinch the end of the plunger with your two fingers, move it up, down, right, left, clockwise, and counterclockwise five times each so that the grease applied to the rear end of the plunger holder can spread evenly. Then wipe off the plunger surface with wiper paper soaked in 2-propanol to clean it.

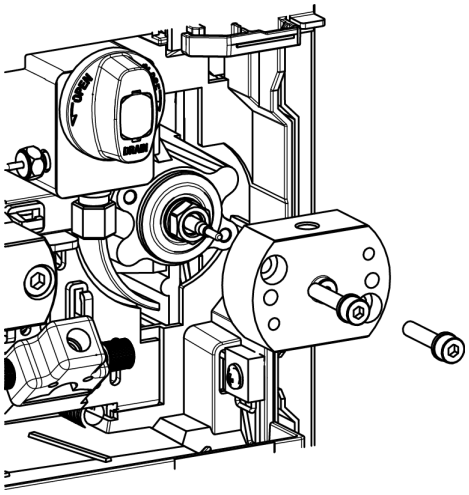


2 **In the [PLUNGER SET] screen of the control setting group, press [2] and [Enter]. (To replace the left plunger, press [1] and [Enter].)**

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference "Setting the plunger stop position《PLUNGER SET》" P.49

3 **Attach the head holder to the pump body.**



⚠ CAUTION

Instruction

Slowly push in the head holder along the plunger.

Pushing in the head holder forcibly may break the plunger.

4 **Attach the 2 hexagonal socket screws to the head holder and tighten them with an Allen wrench.**

NOTE Tighten the right and left hexagon socket screws alternately in 90° increments. Finally hold the longer part of the hex wrench and tighten them securely.

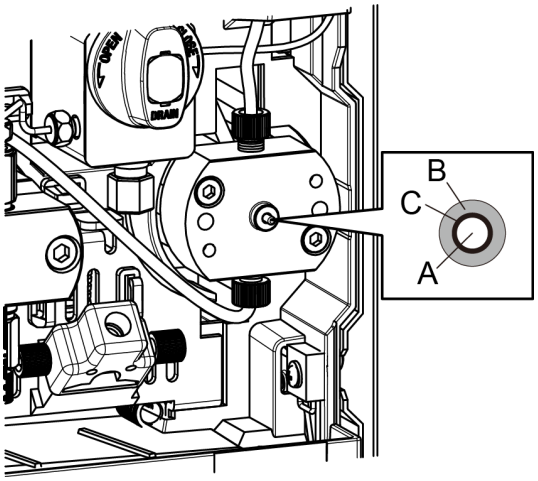
5 **Attach rinse tubes to the top and bottom of the head holder.**

6 **In the [PLUNGER SET] screen, press [1] and [Enter].**
(To replace the left plunger, press [2] and [Enter].)

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the frontmost position.

Reference "Setting the plunger stop position《PLUNGER SET》" P.49

7 **Pinch the end of the plunger that is projecting from the head holder with your fingers and adjust its position to make the gap (C) around the plunger (A) inside the hole of the projection (B) of the head holder even. While keeping the plunger in place, wipe off the plunger surface with clean wiper paper soaked in 2-propanol.**



⚠ CAUTION

Instruction

Move the plunger gently.

Moving the plunger too abruptly could scratch the plunger surface or cause it to break off.

8 **In the [PLUNGER SET] screen, press [2] and [Enter]. (To attach the left plunger seal, backup ring and pump head, press [1] and [Enter].)**

[PUMP] on the display is highlighted and after a while stops being highlighted. The right plunger is now at the backmost position.

Reference "Setting the plunger stop position《PLUNGER SET》" P.49

9 **Attach the pump head and pipe, and set the seal rinsing kit back in place by following the instructions in "Attaching the pump head" P.113.**

4.8 Rinsing the Check Valve

This section will explain how to pump 2-propanol to rinse the check valve.

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002

Necessary parts

Part Name	Part Type	Part No.	Quantity
RESISTANCE TUBE,COIL FOR CLEANING	Replacement part	228-57908-41	1

1 **Replace the solvent in the reservoir bottle with 2-propanol.**

⚠ CAUTION

Prohibition

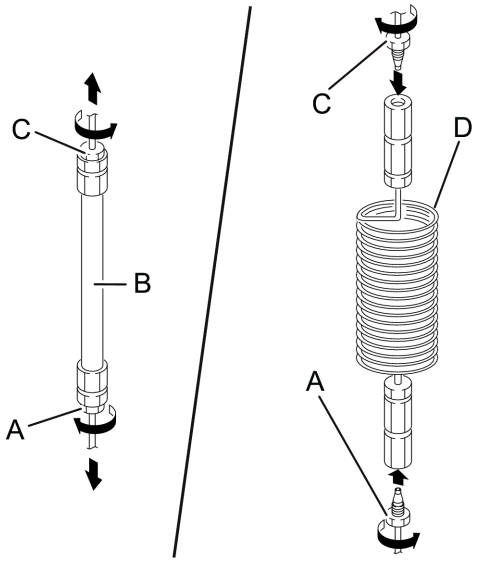
After using buffer solution as the mobile phase, do NOT replace with an organic solvent such as 2-propanol without first replacing with water.

When using a buffer solution in the reservoir bottle, replace with distilled water or purified water, and after pumping at least 20 mL into the instrument, replace with new 2-propanol. If the buffer solution is directly replaced with 2-propanol, crystals will be precipitated, which can cause damage to the plunger seal or cause problems with the check valve.

▶▶ Reference System Guide "Precautions When Replacing the Mobile Phase"

2 **Loosen the male nuts (A and C) on the column inlet and outlet with an 8-mm wrench and then remove the column (B) from the flow path.**

3 **Attach the male nut (A and C) of the column inlet and outlet that was removed to the resistor tube (D), and tighten it with an 8 mm wrench.**



4 **Press [CE] to display the initial screen.**

5 **Press [Enter] once.**

The cursor blinks at the [FLOW] input position.

6 **Press [2], [.], [0] and [Enter].**

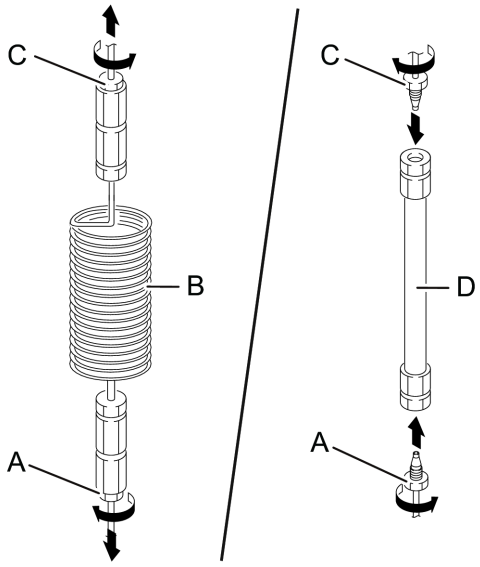
[FLOW] is set to "2.0000" and confirmed.

7 **Press [PUMP].**

[PUMP] on the display is highlighted and delivery of 2-propanol starts at 2 mL/min. Continue delivery at least 1 hour.

8 **Loosen the male nut (A and C) of the resistor tube inlet and outlet with an 8 mm wrench, and remove the resistor tube (B) from the flow line.**

9 **Attach the removed male nut (A and C) of the resistor tube inlet and outlet to the column (D) with an 8 mm wrench and tighten it with the 8 mm wrench.**



10 **Replace the solvent in reservoir bottle with the original mobile phase.**

Reference System Guide "Precautions When Replacing the Mobile Phase"

11 **Insert the suction filter into reservoir bottle.**

4.9 Performing an Ultrasonic Cleaning of the Check Valve

4.9.1 LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D

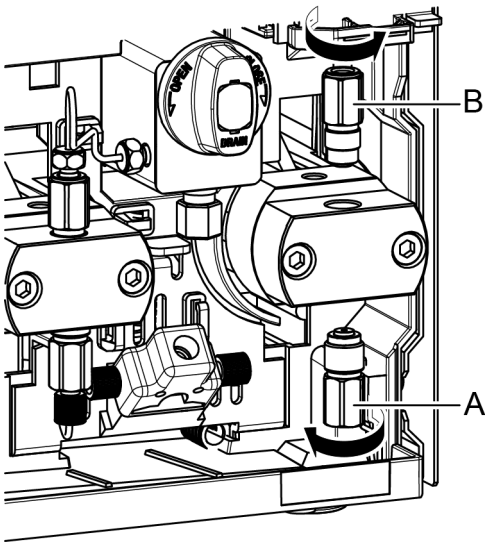
Check valves are attached to the left and right pump heads. The following section will explain the method for performing an ultrasonic cleaning of the check valves on the right side (when viewed from the front).

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002

1 **Remove the pipe and inlet tube by following the instructions in "Removing the pump heads" P.105.**

2 **Use a 10 mm wrench to remove the inlet check valve (A) and the outlet check valve (B).**



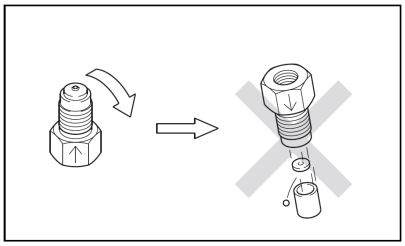
⚠ CAUTION

Prohibition

Never disassemble the check valve.
Performance cannot be guaranteed if disassembled.

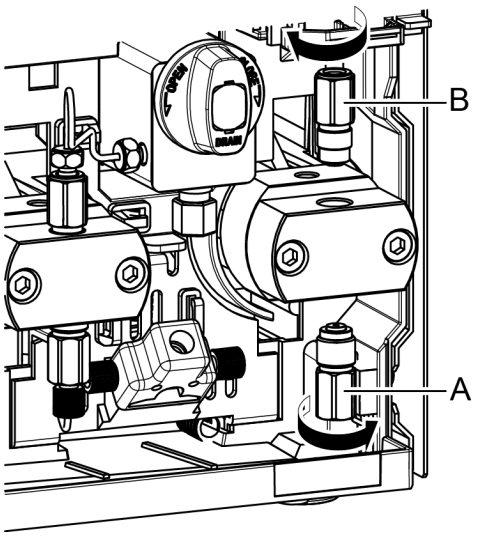
Prohibition

(For LC-40D X3/LC-40D XS/LC-40D XSi) Do NOT turn the inlet check valve (A) upside down.
If you do, the internal parts will fall out.



3 **Immerse the inlet check valve (A) and outlet check valve (B) into 2-propanol, and clean for 5 minutes using an ultrasonic bath.**

4 **Rotate the inlet check valve (A) and the outlet check valve (B) clockwise to attach them to the pump head, and after tightening by hand, use a 10 mm wrench to tighten them as follows.**



- Inlet check valve
  - LC-40D X3/LC-40D XS/LC-40D XSi: Hand tightening and 120° with wrench
  - LC-40D XR/LC-40D: Hand tightening and 90° with wrench
- Outlet check valve
  - LC-40D X3/LC-40D XS/LC-40D XSi: Hand tightening and 60 to 90° with wrench
  - LC-40D XR/LC-40D: Hand tightening and 90° with wrench

5 **Attach the pipe, and inlet tube by following the instructions in "Attaching the pump head" P.113.**

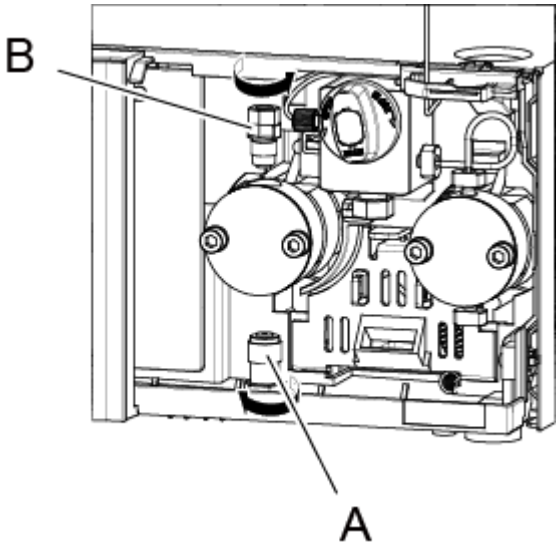
4.9.2 LC-40i

Necessary tools

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	1	086-03002
Wrench (13 mm and 17 mm)	1	086-03047-10
Wrench, 40I	1	228-79981

1 **Remove the pipe by following the instructions in "Removing the pump heads" P.105.**

2 **Use a 10 mm or 17 mm wrench to remove the inlet check valve (A) and the outlet check valve (B).**



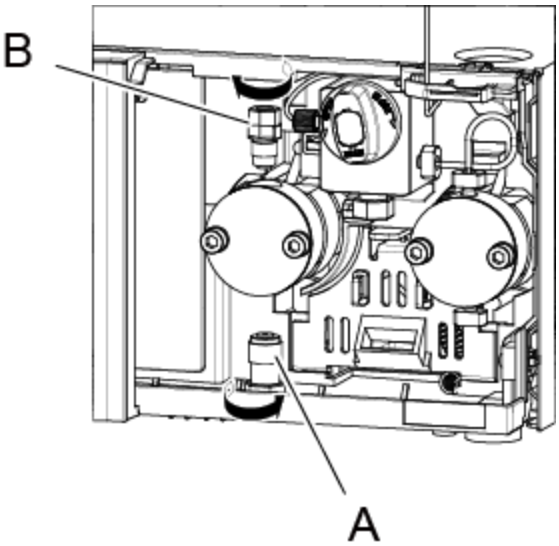
⚠ CAUTION

Prohibition

Never disassemble the check valve.
Performance cannot be guaranteed if disassembled.

3 **Immerse the inlet check valve (A) and outlet check valve (B) into 2-propanol, and clean for 5 minutes using an ultrasonic bath.**

4 **Attach the inlet check valve (A) and outlet check valve (B) to the pump head, and after tightening by hand, tighten them by 60° to 90° with a wrench.**



5 **Attach the pipe by following the instructions in "Attaching the pump head" P.113.**

4.10 Inspecting (Replacing) the Check Valve

For LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D, check valves are attached to the left and right pump heads. The following section will explain the method for inspecting (replacing) the check valves on the right side (when viewed from the front).

Necessary tools (for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002

Necessary tools (for LC-40i)

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	1	086-03002
Wrench (13 mm and 17 mm)	1	086-03047-10
Wrench, 40I	1	228-79981

Necessary parts

Target Model	Part Name	Part Type	Part No.
LC-40D X3 LC-40D XS	Inlet check valve ASSY	Consumable parts	228-52964-42
LC-40D XR LC-40D			228-48249-96
LC-40D XSi			228-52964-44
LC-40D XR LC-40D	Inlet check valve ASSY, 2 pieces		228-48249-97
LC-40i	Inlet check valve ASSY		228-61830-41
LC-40D X3 LC-40D XS	Outlet Check Valve ASSY		228-53334-96
LC-40D XR LC-40D			228-45705-43
LC-40D XSi			228-53334-99
LC-40i			228-32798-91

1 Check the pumping stability.

Reference "Checking the pulse《PULSE CHECK》" P.69

If the result of the system check is "Pass", it is considered normal.

If the result of the system check is "Fail", perform "4.8 Rinsing the Check Valve" P.145 or "4.9 Performing an Ultrasonic Cleaning of the Check Valve" P.147, and then check the pumping stability again. If the pumping (pressure) is still unstable, proceed to the following procedure to remove the check valve and replace it with a new one.

2 **Remove the check valve and install a new one by following the instructions in "4.9 Performing an Ultrasonic Cleaning of the Check Valve" P.147.**

3 **Attach the pipe by following the instructions in "Attaching the pump head" P.113.**

4 **Turn the drain valve counterclockwise to open it.**

5 **Press [Enter] once.**
The cursor blinks at the [FLOW] input position.

6 **Press [2], [.], [0], and [Enter].**
[FLOW] is set to "2.0000" and confirmed.

7 **Press [PUMP].**
[PUMP] on the display is highlighted and the solvent flows out of the drain tube. There is no problem with the valve if the solvent continues to flow out.

4.11 Inspecting the Line Filter/Frit (for LC-40i)

Necessary tools (for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

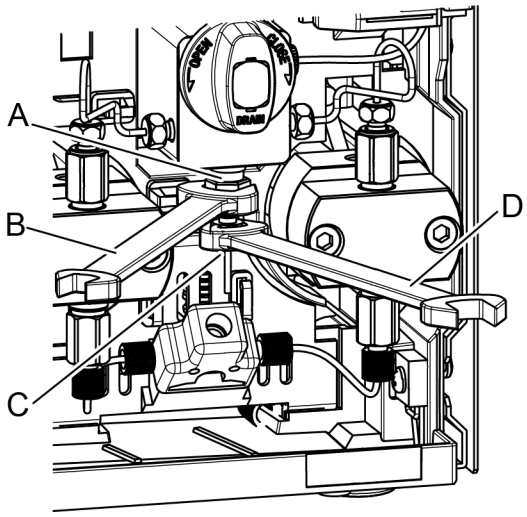
Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002

Necessary tools (for LC-40i)

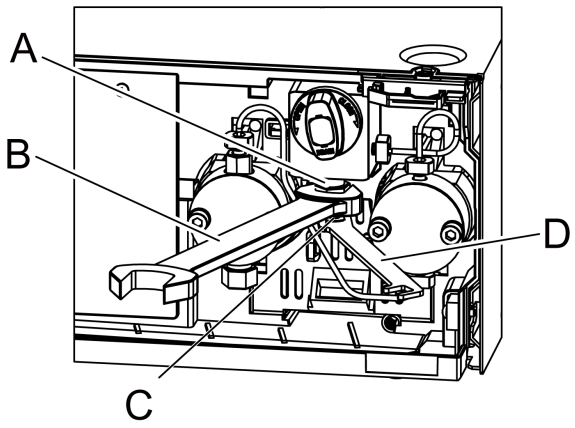
Part Name	Quantity	Part No.
Wrench (13 mm and 17 mm)	1	086-03047-10
Wrench, 40I	1	228-79981

1 **Follow the instructions below to remove the pump outlet tube.**

(LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)
Fix the line filter (A) with a 10 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with an 8 mm wrench (D) to remove it.



(LC-40i)
Fix the line filter (A) with a 13 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with a 40I wrench (D) to remove it.



2 **Pour water into a reservoir bottle and set the flow rate to 1 mL/min.**

3 **In a no load state, pump water at a rate of 1 mL/min.**

- If the pressure is 0.3 MPa or less, it is considered normal.
- If the pressure is more than 0.3 MPa, replace the line filter.

NOTE

Do NOT use the PEEK frit (Part No. 228-48607-91) or the PAT frit (Part No. 228-32744, discontinued) for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR because they may be damaged during high pressure pumping.

- Rinsing method when a ghost peak is generated (for other than LC-40i)
  When a mobile phase such as trifluoroacetic acid is used, a ghost peak may be generated from the line filter. In this case, perform the following procedure to rinse the line filter.
  1) Deliver 17% phosphoric acid solution at a flow rate of 1 mL/min for about 30 minutes. (Pumping pressure: 1 MPa to 5 MPa)
  2) Deliver purified water at a flow rate of 10 mL/min for about 30 minutes. (Pumping pressure: 1 MPa to 5 MPa)
- Note for ion chromatography
  Normally for ion chromatography, PEEK resin tubing is used; however, with LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR, pumping at a high pressure may cause PEEK resin tubing to be damaged. Do NOT use LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR for ion chromatography.

4.12 Replacing the Line Filter/Frit (for LC-40i)

Necessary tools (for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D)

Part Name	Quantity	Part No.
Wrench (8 mm and 10 mm)	2	086-03002

Necessary tools (for LC-40i)

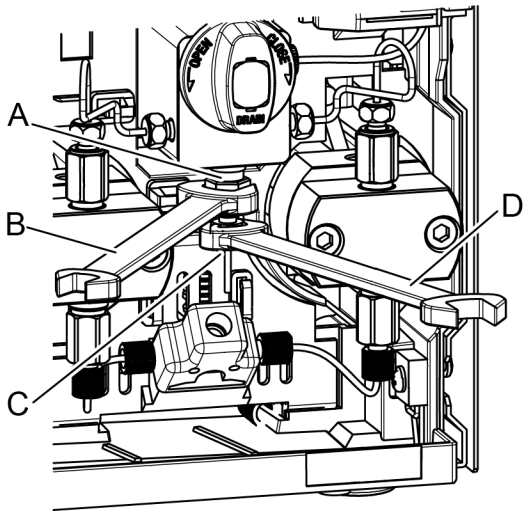
Part Name	Quantity	Part No.
Wrench (13 mm and 17 mm)	1	086-03047-10
Wrench, 40I	1	228-79981

Necessary parts

Target Model	Part Name	Part Type	Part No.
LC-40D X3 LC-40D XS	Line Filter	Consumable part	228-57501-92
LC-40D XSi			228-70796-42
LC-40D XR LC-40D			228-35871-96
LC-40i	Frit		228-48607-91

4.12.1 LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D

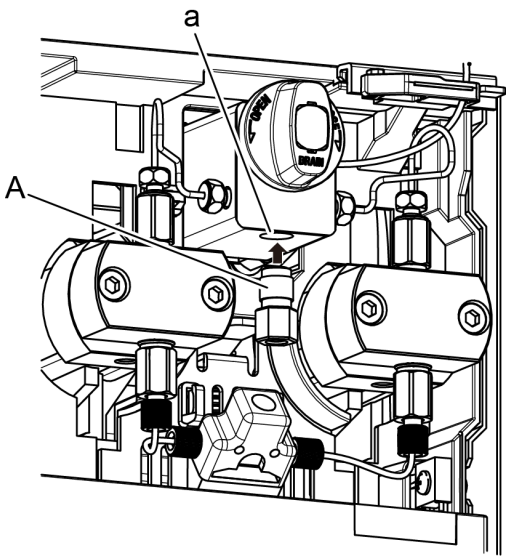
1 **Fix the line filter (A) with a 10 mm wrench (B) and loosen the male nut (C) of the pump outlet tube with an 8 mm wrench (D) to remove it.**



2 Loosen the line filter (A) with 10 mm wrench to remove it.

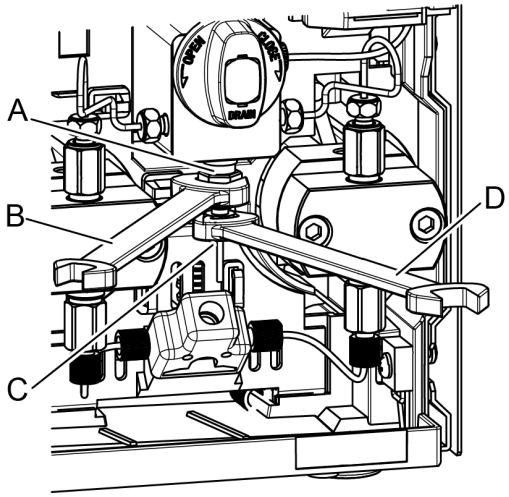
3 Use a cotton swab, etc., to wipe away any dirt from the line filter port (a).

4 Attach the new line filter (A) to the line filter port (a) by hand, and tighten it 45° using a 10 mm wrench.



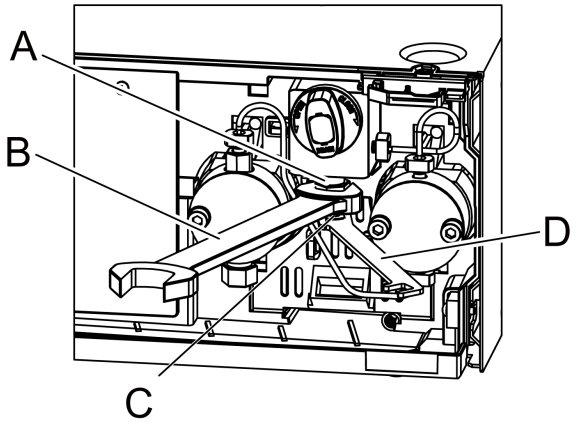
5 Attach the male nut (C) of the pump outlet tube to the line filter (A) by hand.

6 Fix the line filter (A) with a 10 mm wrench (B) and tighten the male nut (C) of the pump outlet tube with an 8 mm wrench (D).



4.12.2 LC-40i

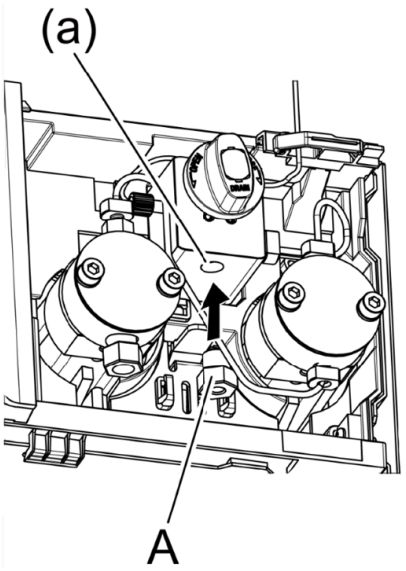
1 While holding the line filter (A) with a 13 mm wrench (B), loosen the male nut (C) of the pump outlet tube with the 40I wrench (D) to remove it.



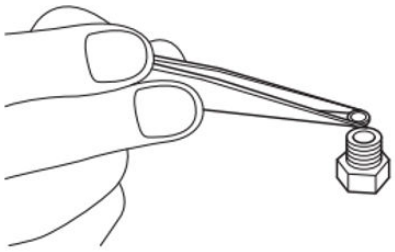
2 Loosen the line filter (A) with a 13 mm wrench to remove it, and remove the frit with tweezers.

3 Use a cotton swab, etc., to wipe away any dirt from the line filter port (a).

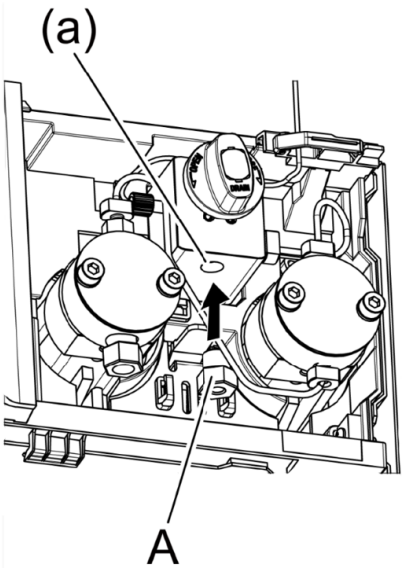
4 Moisten a new frit with 2-propanol.



5 Place the frit moistened with 2-propanol with tweezers on the housing of the line filter.



6 Screw in the line filter (A) to the line filter port (a) by hand until it is secured, and tighten it by 60° to 90° with a 13 mm wrench.



7 **Tighten the male nut of the PEEK tube by hand until it is secured, and further tighten it by about 120° (about 180° for a new ferrule) with the 40I wrench.**

⚠ CAUTION

Prohibition

Do NOT tighten the line filter with excessive force.

Doing so may damage the screw part of the line filter or the frit.

Prohibition

Do NOT tighten the male nut with excessive force.

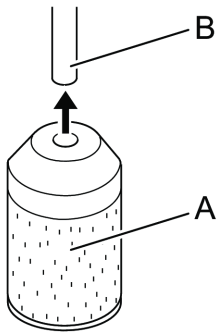
Doing so may damage the screw part of the male nut or significantly deform the ferrule and cause liquid leakage.

4.13 Cleaning/Replacing the Suction Filter

Necessary Parts

Target Model	Part Name	Part Type	Part No.	Quantity
LC-40D X3 LC-40D XS LC-40D XR LC-40D	Filter Element	Consumable part	228-45707-91	1
LC-40D XSi LC-40i			228-25079-91	

1 **Pull the suction filter (A) from the suction tubing (B).**



2 **Place the suction filter into a clean container with 2-propanol, and clean it for 5 minutes using an ultrasonic bath.**

⚠ CAUTION

Prohibition

After using the buffer solution as the mobile phase, do NOT replace with an organic solvent such as 2-propanol without first replacing with water.

When using a buffer solution, replace it with distilled water or purified water, and after pumping at least 20 mL into the instrument, replace it with new 2-propanol. If the buffer solution is directly replaced with 2-propanol, crystals will be precipitated, which can cause damage to the plunger seal or cause problems with the check valve.

Reference System Guide "Precautions When Replacing the Mobile Phase"

3 **Insert the suction tubing (A) into the suction filter (B).**

4 **Replace the solvent in reservoir bottle A with water, and place the suction tubing back into the bottle.**

5 **Press [CE] to display the initial screen.**

6 **Deliver water at 1 mL/min for 10 minutes.**

7 **Check for air bubbles inside the suction tubing.**

Replace the suction filter if air bubbles are present.

4.14 Replacing the Drain Valve

Necessary tools

Part Name	Quantity	Part No.
Phillips screwdriver	1	-

Necessary parts

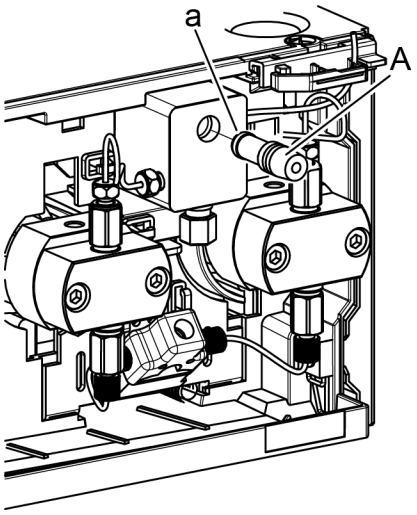
Applicable Model	Part Name	Part Type	Part No.
LC-40D X3 LC-40D XS LC-40D XR	DRAIN VALVE ASSY	Replacement part	228-51229-93
LC-40D XSi			228-51229-94
LC-40D			228-45574-95
LC-40i			228-70751-41

1 **Rotate the drain valve ASSY counter-clockwise at least 3 complete rotations and pull it off straight.**

NOTE Check that there is nothing wrong with the hole.

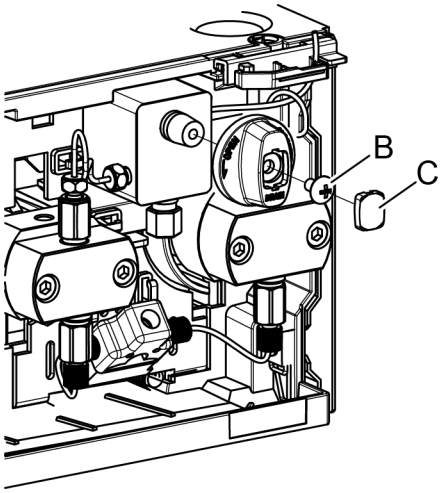
2 **Wet the seal portion (a) of the new drain valve ASSY (A) with 2-propanol, etc., and insert it into the hole.**

NOTE If the drain valve ASSY is forcefully inserted or is not inserted straight, the seal portion may become deformed, resulting in leakage.



3 **Tighten the drain valve ASSY clockwise.**

4 **After tightening the drain valve ASSY, attach the knob using the screw (B) so that it is vertical, and then attach the cap (C).**



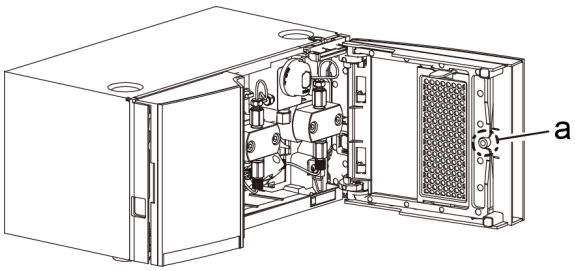
4.15 Replacing the Air Filter (Right Panel)

This section explains about replacement on the air filter of the right panel.

Necessary parts

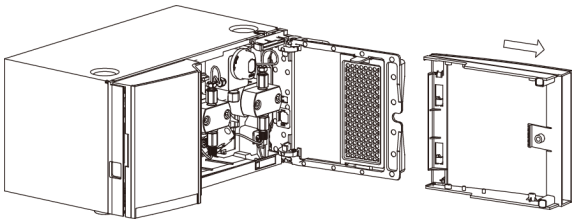
Applicable Model	Part Name	Part Type	Part No.
LC-40D X3 LC-40D XS LC-40D XSi LC-40D XR LC-40D LC-40i	Air Filter Element, Non Woven, for Right Panel	Consumable part	228-53924-06

1 **Open the right panel.**

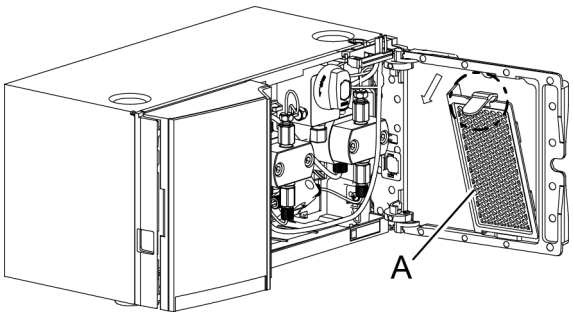


2 **Remove the right panel cover.**

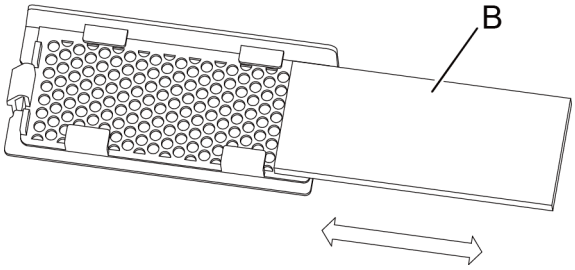
While lightly pressing the cylinder-shaped projection (a) inside the right panel cover, slide the cover to the front.



3 **While pressing the knob at the top of the filter holder (A), remove it toward the front.**



4 **Slide the air filter (B) to attach/remove it.**



4.16 Cleaning of the Leak Tray

> **NOTE** If a leak occurred, wipe off the leak in the leak tray completely as below. Leak of mobile phase solution used as buffer solution may dry and crystallize, clogging the leak tray. If the leak tray is contaminated by such crystallized buffer solution, wipe off the leak tray with wiper paper soaked in water in the same manner as below.

1 **Wipe off leak around the leak sensor or on the leak tray completely with wiper paper.**

> **NOTE**
> - Do not bend or pull the leak sensor.
> - If there is contamination such as crystallized buffer solution, wipe it off with wiper paper soaked in water.

4.17 Cleaning the Exterior

If the exterior of the instrument is dirty, clean it with a dry soft cloth or tissue paper. If it is very dirty, clean it as below.

1 **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**

2 **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

> **NOTE** Do not leave the exterior wet and do not use alcohol or thinner for cleaning. Doing so may cause rust or discoloration.

4.18 Cleaning of the Automatic Rinsing Kit

Necessary parts

Part Name	Part Type	Part No.	Quantity
WASHING PUMP SEAL KIT	Replacement part	228-56201-41	1
WASHING PUMP SEAL KIT (LC-40i only)		228-56201-43	

NOTE If the 10% 2-propanol water in the rinse solution bottle is dirty, replace with new solution. If getting significantly dirty, replace with new solution once a day. Even if it does not appear dirty, replace with new solution once a week.

1 **Remove the rinse cap of the automatic rinsing kit from the rinse solution bottle.**

2 **Pour distilled water into the rinse solution botte and clean the inside of the rinse solution bottle using a brush, etc.**

3 **Pour distilled water into the rinse solution bottle and rinse the inside of the rinse solution bottle for about 5 minutes using an ultrasonic bath.**

4 **Pour new 10% 2-propanol water into the rinse solution bottle, and return the cap and rinse solution bottle back to their original positions.**

Reference System Guide 2.9 "Replacing the Rinse Solution in the Solvent Delivery Pump Automatic Seal Rinsing Kit"

5 **Replace the rinse tube if the inside is dirty.**

5 Technical Information

5.1 Specifications

5.1.1 LC-40D X3/LC-40D XS/LC-40D XSi Specifications

Item		Specification	
		LC-40D X3	LC-40D XS/LC-40D XSi
Pump Type		Micro-volume double plunger pump (approx. 10 µL/stroke)	
Pumping Methods		Constant flow pumping and constant pressure pumping	
Allowable Maximum Pressure		130 MPa	105 MPa
Constant Flow Pumping	Flow Rate Setting Range	0.0001 to 10.0000 mL/min	
	Maximum Delivery Pressure	130 MPa (0.0001 to 3.0000 mL/min) 80 MPa (5.0000 mL/min) 22 MPa (10.0000 mL/min)	105 MPa (0.0001 to 3.0000 mL/min) 80 MPa (5.0000mL/min) 22 MPa (10.0000mL/min)
	Flow Rate Accuracy	±1 % (1 mL/min when water is pumped at 80 MPa, with water and room temperature constant between 20 to 30 °C)	
	Flow Rate Precision	Larger value of either 0.06 % RSD or 0.02 min SD	
Pressure Display Accuracy		Larger value of either ±2 % or ±2.4 MPa	
Suction Filter		10 µm	
Line Filter		5 µm	
Time Program		Commands for flow rate, pressure, [LOOP] (for program repetition), 320 steps (total of 10 program files)	

*1 When water is pumped at 10 to 40 MPa, with water and room temperature constant between 20 to 30 °C.

*2 When water is pumped at 40 to 60 MPa, with water and room temperature constant between 20 to 30 °C.

5.1.2 LC-40D XR/LC-40D/LC-40i Specifications

Item		Specification			
		LC-40D XR	LC-40D	LC-40i	
Pump Type		Micro-volume parallel-type double plunger pump (approx. 10 µL/stroke)		Micro-volume serial-type double plunger pump (approx. 10 µL/stroke)	
Pumping Methods		Constant flow pumping and constant pressure pumping			
Allowable Maximum Pressure		70 MPa	44 MPa	30 MPa	
Constant Flow Pumping	Flow Rate Setting Range	0.0001 to 10.0000 mL/min		0.0001 to 5.0000 mL/min	
	Maximum Delivery Pressure	70 MPa (0.0001 to 3.0000 mL/min) 44 MPa (3.0001 to 5.0000 mL/min) 22 MPa (5.0001 to 10.0000 mL/min)	44 MPa (0.0001 to 5.0000 mL/min) 22 MPa (5.0001 to 10.0000 mL/min)	(For aqueous solvent mobile phase) 30 MPa (0.0001 to 4.0000 mL/min) 15 MPa (4.0001 to 5.0000 mL/min)	(For organic solvent mobile phase) 22 MPa (0.0001 to 4.0000 mL/min) 15 MPa (4.0001 to 5.0000 mL/min)
	Flow Rate Accuracy	Larger value of either ±1 % or ±2 µL/min (0.01 to 3 mL/min) Larger value of either ±2 % or ±2 µL/min (0.01 to 3 mL/min)	Larger value of either ±1 % or ±2 µL/min (0.01 to 2 mL/min) ±2 % (2 to 5 mL/min)	Larger value of either ±2 % or ±2 µL/min (1 mL/min, 7MPa, water, and room temperature is 20～30℃ and constant.)	
	Flow Rate Precision	No more than the large value calculated with either 0.06 % RSD or 0.02 min SD			
Constant Pressure Pumping	Pressure Setting Range	1.0 to 60 MPa (in steps of 0.1 MPa)	1.0 to 40 MPa (in steps of 0.1 MPa)	(For aqueous solvent mobile phase) 1.0 to 28 MPa (in steps of 0.1 MPa)	(For organic solvent mobile phase) 1.0 to 20 MPa (in steps of 0.1 MPa)
	Pressure Accuracy	Larger value of either ±10 % or 1.5 MPa	Larger value of either ±10 % or 1.0 MPa		
Pressure Display Accuracy		Larger value of either ±2 % or ±1.0 MPa	Larger value of either ±2 % or ±0.5 MPa		
Suction Filter		10 µm		15 µm	
Line Filter		5 µm		2 µm	

Item	Specification		
	LC-40D XR	LC-40D	LC-40i
Time Program	Commands for flow rate, pressure, [EVENT], [LOOP] (for program repetition), 320 steps (total of 10 program files)		

5.1.3 High-Pressure Gradient System

■ High-pressure gradient system controlled by system controller (SCL-40/CBM-40/CBM-40lite)

Item	Specification			
	LC-40D X3/LC-40D XS/ LC-40D XSi	LC-40D XR	LC-40D	LC-40i
Number of Solvents Mixed	2 or 3			
Gradient Profile	Step, linear and exponential functions (Only when controlled by LC workstation) possible at multiple levels			
Maximum Program Steps	400 steps (total of 20 program files)			
Program Duration	0.01 to 9999.90 minutes (in steps of 0.01 minutes)			
Range of Set Concentrations	0 % to 100 % (in steps of 0.1 %)			
Concentration Accuracy*1	±0.5 % (1 mL/min, 80 MPa)	±0.5 % (0.05 to 3 mL/min, 1 to 40 MPa)	±0.5 % (0.2 to 2 mL/min) ±1.0 % (2 to 5 mL/min)	±1.0 % (0.2 to 2 mL/min) ±2.0 % (2 to 5 mL/min)
Flow Rate Possible	0.0001 to 10 mL/min			0.0001 to 5.0 mL/min

*1 For binary gradient with water/caffeine solution

5.1.4 Low-Pressure Gradient System

■ Low-pressure gradient system controlled by system controller (SCL-40/CBM-40/CBM-40lite)

Item	Specification	
	LC-40D X3/LC-40D XS/LC-40D XSi/ LC-40D XR/LC-40D	LC-40i
Number of Solvents Mixed	Max. 4	
Gradient Profile	Step, linear and exponential functions (Only when controlled by LC workstation) possible at multiple levels	
Maximum Program Steps	400 steps (total of 20 program files)	
Program Duration	0.01 to 9999.90 minutes (in steps of 0.01 minutes)	
Range of Set Concentrations	0 % to 100 % (in steps of 0.1 %)	
Concentration Accuracy	±0.5 % (1 mL/min, 10 MPa) (for binary gradient with water/caffeine solution)	±1.0 % (1 mL/min, 10 MPa) (for binary gradient with water/caffeine solution)
Flow Rate Possible	0.0001 to 10 mL/min	0.0001 to 5 mL/min

■ Low-pressure gradient system controlled by pump unit (LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D/LC-40i)

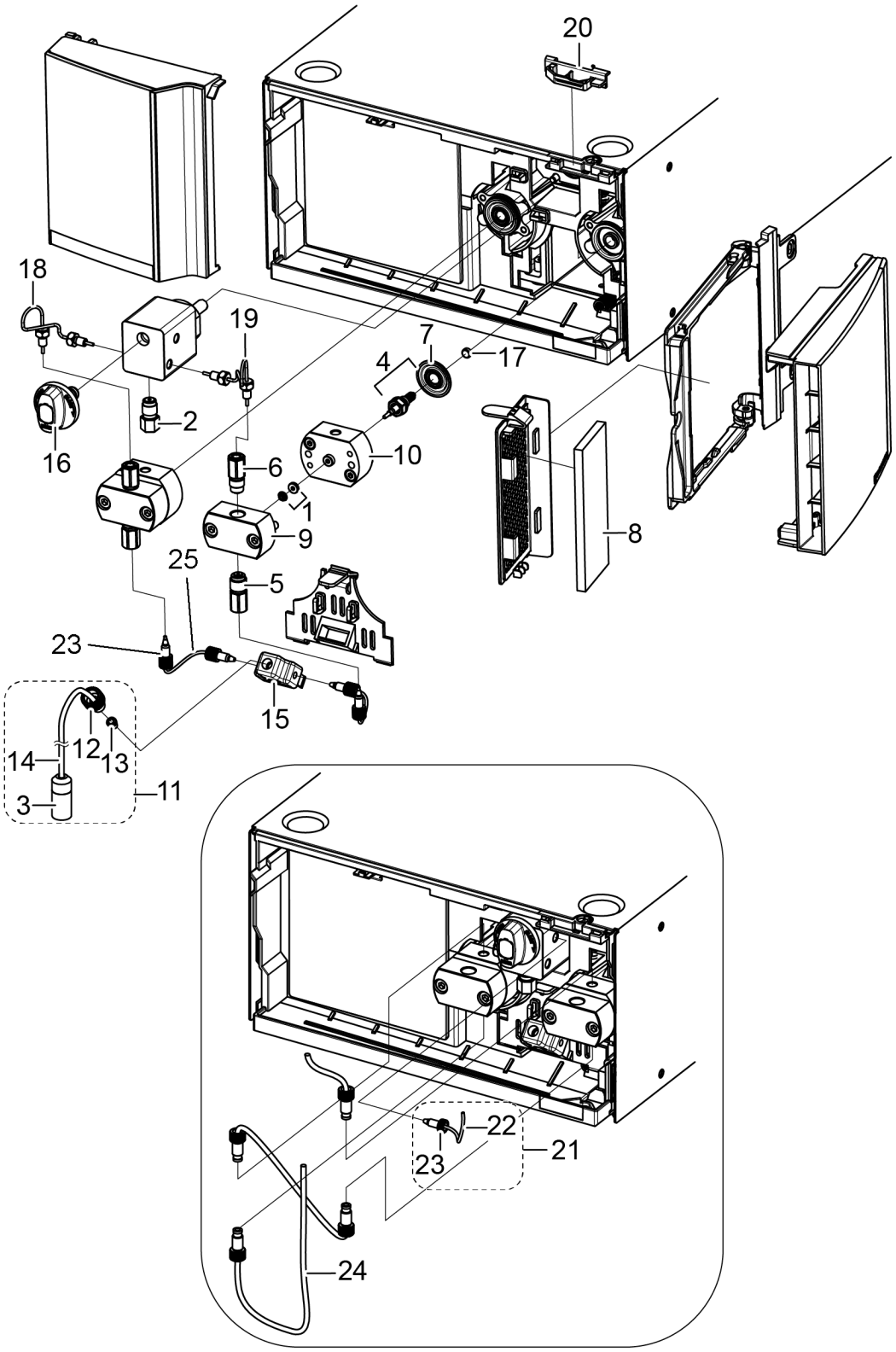
Item	Specification	
	LC-40D X3/LC-40D XS/LC-40D XSi/ LC-40D XR/LC-40D	LC-40i
Number of Solvents Mixed	Max. 4	
Gradient Profile	Step and linear are possible at multiple levels	
Maximum Program Steps	320 steps (total of 10 program files)	
Program Duration	0.01 to 9999.90 minutes (in 0.01 minutes steps)	
Range of Set Concentrations	0 % to 100 % (in steps of 0.1 %)	
Concentration Accuracy	±0.5 % (1 mL/min, 10 MPa) (for binary gradient with water/caffeine solution)	±1.0 % (1 mL/min, 10 MPa) (for binary gradient with water/caffeine solution)
Flow Rate Possible	0.0001 to 10 mL/min	0.0001 to 5 mL/min

5.1.5 Other Specifications

Item		Specification					
		LC-40D X3	LC-40D XS	LC-40D XSi	LC-40D XR	LC-40D	LC-40i
Liquid-Contacting Part Materials		SUS316L, PEEK, ruby, sapphire, HastelloyC, PE		Titanium, Titanium alloy, nickel alloy, PEEK, ruby, sapphire, Hastelloy C, PE	SUS316L, PEEK, ruby, sapphire, Hastelloy C, PE	SUS316L, PEEK, ruby, sapphire, Hastelloy C, PTFE	PEEK, perfluo-roelasto-mer, ruby, sapphire, PTFE
Operating Temperature Range		4 °C to 35 °C					
Humidity Range		20 % to 85 %					
Available pH Range		1 to 14					
Dimensions		W260 mm ´ H140 mm ´ D500 mm (Excluding protruding parts)					
Mass		12kg			10 kg		
Power Supply	Power Supply Voltage (indicated on the instrument)	100 V AC to 240 V AC * Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.					
	Power Consumption	150 VA					
	Frequency	50/60 Hz					
	Rated Breaking Capacity	50 A * Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.					
Installation Environment (IEC)		Installation Category Ⅱ, Pollution Degree 2, Altitude 2000 m max. Install indoors.					
Plunger Rinsing Line		Automatic rinsing kit as standard equipment				Optional	
Pressure Limiter Operations		Upper/lower limits can be set					
Error Display		Exist (Error display and stop at the time of malfunction)					

5.2 Maintenance Parts

5.2.1 Maintenance Parts for LC-40D X3/LC-40D XS/LC-40D XSi/LC-40D XR/LC-40D



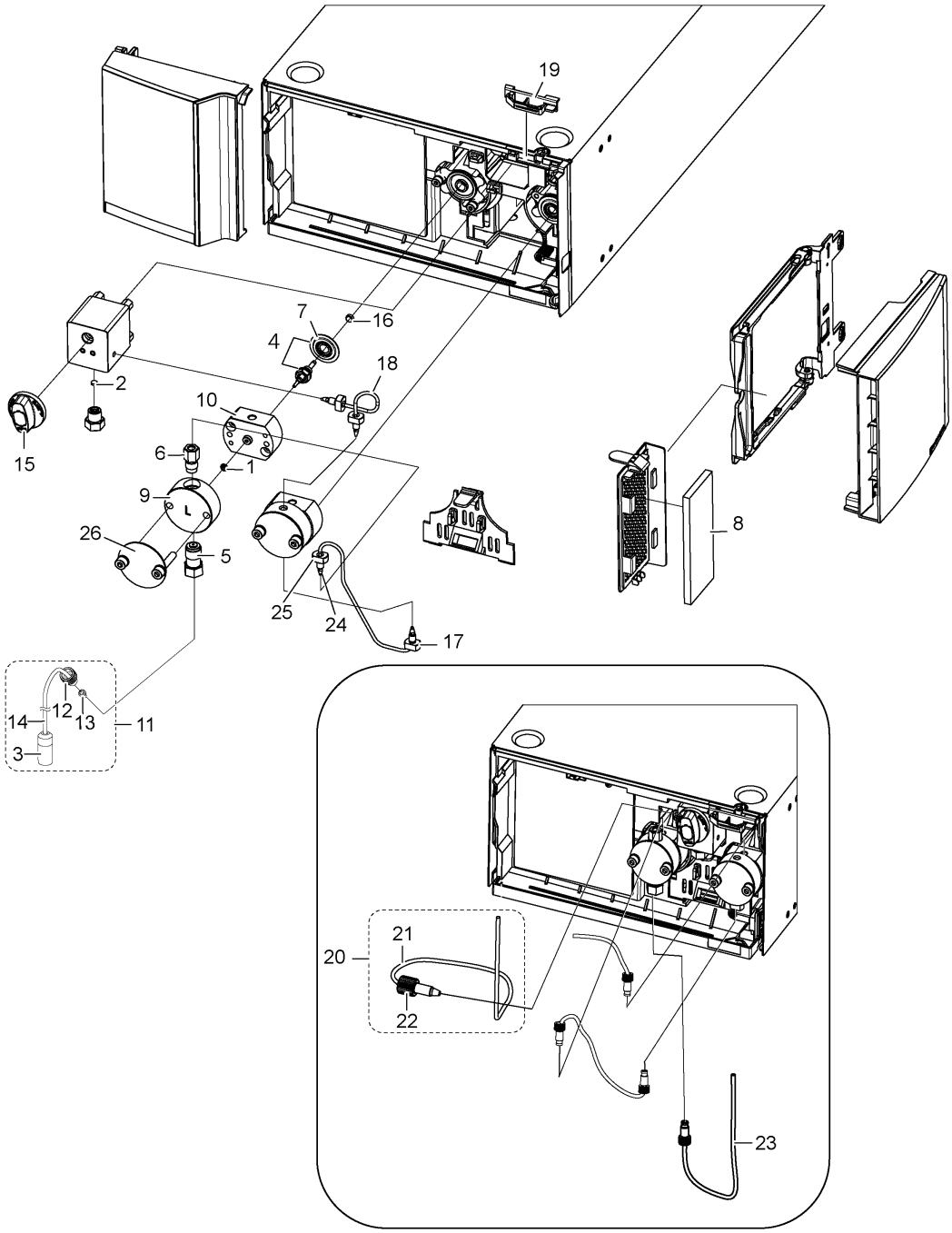
■ Consumable Parts

No.	Part Name	Part No.	Remarks
1	PLUNGER SEAL	228-52711-93	Seal for pump head, with backup ring, for LC-40D X3/ LC-40D XS/LC-40D XSi/LC-40D XR
		228-35146	Seal for pump head, for LC-40D
2	Line Filter ASSY	228-57501-92	LC-40D X3/LC-40D XS
		228-35871-96	LC-40D XR/LC-40D
		228-70796-42	LC-40D XSi
3	Suction filter (Filter body only)	228-45707-91	LC-40D X3/LC-40D XS/ LC-40D XR/LC-40D
		228-25079-91	LC-40D XSi
4	Plunger Holder ASSY	228-52069-44	For LC-40D X3/LC-40D XS/ LC-40D XSi/LC-40D XR, with diaphragm
		228-35281-97	For LC-40D, with diaphragm
5	Inlet Check Valve ASSY	228-52964-42	LC-40D X3/LC-40D XS
		228-52964-44	LC-40D XSi
		228-48249-96	LC-40D XR/LC-40D
	Inlet Check Valve ASSY, 2 pieces	228-48249-97	LC-40D XR/LC-40D
6	Outlet Check Valve ASSY	228-53334-96	LC-40D X3/LC-40D XS
		228-53334-99	LC-40D XSi
		228-45705-43	LC-40D XR/LC-40D
7	DIAPHRAGM 2PCS	228-55272-41	
8	AIR FILTER FOR RIGHT PANEL	228-53924-06	Filter only

■ Replacement Parts

No.	Part Name	Part No.	Remarks
9	PUMP HEAD	228-55230-45	For LC-40D X3/LC-40D XS/ LC-40D XR
		228-55230-48	For LC-40D XSi
		228-34541-01	For LC-40D
10	HEAD HOLDER,2030	228-38022-01	For LC-40D X3/LC-40D XS/ LC-40D XR/LC-40D
		228-70701	For LC-40D XSi
11	Suction Filter ASSY	228-45708-91	For LC-40D X3/LC-40D XS/ LC-40D XR/LC-40D
		228-39181-94	For LC-40D XSi
12	PEEK Bush Fitting 3	228-39084	For suction filter
13	FERRULE,3.0F-T	228-12493	For suction filter
14	FEP TUBE 3.0 (O.D.)×1.5(I.D.)	670-10321-05	For suction filter
15	INLET BLOCK PEEK	228-47518	Pump inlet
16	DRAIN VALVE ASSY	228-51229-93	For LC-40D X3/LC-40D XS/ LC-40D XR
		228-51339-94	For LC-40D XSi
		228-45574-95	For LC-40D
17	THRUST	228-34469	
18	SUS PIPE L	228-70472-01	For the left pump head of LC-40D X3/LC-40D XS
		228-70026-01	For the left pump head of LC-40D XR/LC-40D
	PEEK lined SS tube L	228-70807-41	For the left pump head of LC-40D XSi
19	SUS PIPE R	228-70472-02	For the right pump head of LC-40D X3/LC-40D XS
		228-70026-02	For the right pump head of LC-40D XR/LC-40D
	PEEK lined SS tube R	228-70807-42	For the right pump head of LC-40D XSi
20	TUBE HOLDER	228-70044	
21	DRAIN TUBE ASSY	228-25495-93	
22	ETFE TUBE 1.6 (O.D.)×1.0(I.D.)	228-18495-03	For the drain tube
23	MALE NUT 1.6 PEEK	228-35403	For plumbing between the inlet block and the check valve and the drain tube
24	FEP TUBE 3.0 (O.D.)×1.5(I.D.)	670-10321-05	
25	ETFE TUBE 1.6 (O.D.)×0.8(I.D.)	228-18495-01	For use between the inlet block and the check valve

5.2.2 Maintenance Parts for LC-40i



■ Consumable Parts

No.	Part Name	Part No.	Remarks
1	PLUNGER SEAL, O-RING	228-78510	Seal for pump head, for LC-40i
2	Frit (for line filter)	228-48607-91	Frit for line filter, for LC-40i
3	Suction filter (Filter body only)	228-25079-91	For LC-40i (Common to LC-40D XSi)
4	Plunger Holder ASSY	228-35281-97	For LC-40i, with diaphragm
5	Inlet Check Valve ASSY	228-61830-41	For LC-40i
6	Outlet Check Valve ASSY	228-32798-91	For LC-40i
7	DIAPHRAGM 2PCS	228-55272-41	
8	AIR FILTER FOR RIGHT PANEL	228-53924-06	Filter only

■ Replacement Parts

No.	Part Name	Part No.	Remarks
9	PUMP HEAD	228-78525-02	Left pump head for LC-40i
		228-78526-02	Right pump head for LC-40i
10	HEAD HOLDER	228-38022-01	For LC-40i (Common with LC-40D X3/LC-40D XS/LC-40D XR/LC-40D)
11	Suction Filter ASSY	228-39181-41	For LC-40i
12	PEEK Bush Fitting 3	228-39084	For suction filter
13	FERRULE,3.0F-T	228-12493	For suction filter
14	FEP TUBE 3.0 (O.D.)×1.5(I.D.)	670-10321-05	For suction filter
15	DRAIN VALVE ASSY	228-70751-41	For LC-40i
16	THRUST	228-34469	
17	PEEK TUBE ASSY, 1-2	228-78533-41	For connecting the left and right pump heads of LC-40i Only tube, Bended (w/o male nuts and ferrules)
18	PEEK TUBE ASSY, 2	228-78533-42	For connecting the right pump head and the pressure sensor of LC-40i Only tube, Bended (w/o male nuts and ferrules)
19	TUBE HOLDER	228-70044	
20	DRAIN TUBE ASSY	228-25495-93	
21	ETFE TUBE 1.6 (O.D.)×1.0(I.D.)	228-18495-03	
22	MALE NUT 1.6MN PEEK	228-35403	
23	FEP TUBE 3.0 (O.D.)×2.0(I.D.)	670-10321-03	
24	MALE NUT 1.6MN-2 PEEK	228-33213	For PEEK tube ASSY
25	FERRULE 1.6F PEEK	228-33513-91	For PEEK tube ASSY (3PCs)
26	PUMP HEAD PLATE	228-78527	

5.2.3 Maintenance Kit

A set of consumable parts is provided as Maintenance Kit

■ Maintenance Kit for LC-40D X3/LC-40D XS (Parts No. 228-53265-45)

Part Name	Part No.	Quantity	Remarks
PLUNGER SEAL,BACKUP RING UHP	228-52711-93	2	With backup ring
Line Filter ASSY	228-57501-92	1	
Suction Filter ASSY	228-45708-91	1	
Plunger Holder ASSY	228-52069-44	2	With diaphragm
Inlet Check Valve ASSY	228-52964-42	2	
Outlet Check Valve ASSY	228-53334-96	2	
Air Filter for Right Panel	228-53924-06	1	

■ Maintenance Kit for LC-40D XR (Parts No. 228-45593-49)

Part Name	Part No.	Quantity	Remarks
PLUNGER SEAL,BACKUP RING UHP	228-52711-93	2	With backup ring
Line Filter ASSY	228-35871-96	1	
Suction Filter ASSY	228-45708-91	1	
Plunger ASSY	228-52069-44	2	With diaphragm
FERRULE 1.6F 316L	228-16000-10	2	
MALE NUT 1.6MN	228-16001	2	
SUS316LTP 0.3	228-50579-91	1	0.3 mm (I.D.) × 2 m. With ferrules and male nuts (2 pieces).
Inlet Check Valve ASSY	228-48249-96	2	
Outlet Check Valve ASSY	228-45705-43	2	

■ Maintenance Kit for LC-40D (Parts No. 228-45593-50)

Part Name	Part No.	Quantity	Remarks
Plunger Seal, 42455	228-35146	2	
Line Filter ASSY	228-35871-96	1	
Suction Filter ASSY	228-45708-91	1	
Plunger Holder ASSY	228-35281-97	2	With diaphragm
FERRULE 1.6F 316L	228-16000-10	2	
MALE NUT 1.6MN	228-16001	2	
SUS316LTP 0.3	228-50579-91	1	0.3 mm (I.D.) × 2 m. With ferrules and male nuts (2 pieces).
Inlet Check Valve ASSY	228-48249-96	2	
Outlet Check Valve ASSY	228-45705-43	2	

■ Maintenance Kit for LC-40D XSi (Parts No. 228-53265-47)

Part Name	Part No.	Quantity	Remarks
PLUNGER SEAL,BACKUP RING UHP	228-52711-93	2	With backup ring
Line Filter ASSY	228-70796-42	1	
Suction Filter ASSY	228-39181-94	1	
Plunger Holder ASSY	228-52069-44	2	With diaphragm
Inlet Check Valve ASSY	228-52964-44	2	
Outlet Check Valve ASSY	228-53334-99	2	
Air Filter for Right Panel	228-53924-06	1	

■ Maintenance Kit for LC-40i

The maintenance kit for LC -40i is not prepared, so please purchase the necessary parts separately.

Index

C196-E095C

SHIMADZU
Excellence in Science

Ultra High Performance Liquid Chromatograph

Nexera series

Specifications

System Configuration

UV-VIS Detector
SPD-40/40V

Photodiode Array (PDA) Detector
SPD-M40

Baseline stability and linearity have been improved, and stability remains even under fluctuating temperatures.
The PDA detector is equipped with a UV cut-off filter to improve the quantitation accuracy of photodegradable compounds. The cell and lamp are traceable via individual IDs.

Solvent Delivery Pump
LC-40 series

In addition to the four parallel double plunger models based on the maximum pressure limit, the XR and X3 models have a dual pump that reduces gradient delay volume and enables an ultra-fast high-pressure gradient. Other pumping environments (low-pressure gradient, mobile phase blending) can also be provided.

Autosampler
SIL-40 series

The autosampler boasts ultra-low carryover, less than 0.0003% (under specified conditions). Its ultra-fast injection cycle and auto pretreatment functions also contribute to more efficient analysis. The optional dual-injection system consists of two separate injection ports and flow lines, enabling different analyses to be carried out simultaneously.

Plate Changer

The installation area has been greatly reduced to 170 mm. It is possible to load up to 7 racks of 1.5 mL vials or 14 microtiter plates. Up to 3 plate changers can be connected, allowing up to 44 MTPs with up to 16896 samples to be loaded at once (using 384-well MTPs).

Mobile Phase Monitor
MPM-40 (Optional)

The monitoring device can be placed in the reservoir tray. The volume of liquid remaining in each mobile phase bottle is measured in real time and can be checked from a PC or mobile device. Before a batch analysis is started, the amount of mobile phase required is calculated and a warning is displayed if the amount remaining is insufficient.

System Controller
SCL-40, CBM-40/40lite

The SCL-40 system controller features a touch panel and allows the user to control the instrument and carry out analysis preparation directly without the need for a PC. A graphical UI makes the controller easy to use.

Degassing Unit
DGU-403/405

3-channel and 5-channel types available. Since the degassing unit is built into the LC-40B X3 pump, a separate unit is not required.

Column Oven
CTO-40 series

The circulation oven has a slim 130 mm model (maximum temperature: 85°C) and a standard 260 mm model (maximum temperature: 100°C).
Both are able to accommodate a 300 mm column and have connection ports for CMD or mixer ID recognition. Active preheater tubing is available as an option.

Specifications

SCL-40

CBM-40

System Controller

	SCL-40	CBM-40	CBM-40lite
Monitor	Touch panel LabSolutions™ Web monitor	LabSolutions Web monitor	LabSolutions Web monitor
Connectable unit	Solvent delivery unit: Max. 4, Autosampler: 1, Column oven: Max. 4, Detector: Max. 2, etc.		
Number of connectable units	8 (Using option: 12)		4 (Excluding built-in solvent delivery unit)
Event input/output	Input: 1, output: 2		
Analog board	Up to two channels (option)	Up to one channel (option)	—
Communication	Ethernet		
Reservoir tray	Built-in	—	
Dimensions [mm], weight	W 260 × D 500 × H 140, 6 kg	W 260 × D 500 × H 72, 5 kg	—
Operating temperature range	4 to 35°C		
Power supply	AC 100–240 V, 50 VA, 50/60 Hz		Supplied from solvent delivery unit

LC-40B XR

LC-40B X3

Solvent Delivery Pump

	LC-40D	LC-40D XR LC-40B XR	LC-40D XS	LC-40D X3 LC-40B X3
Pumping method	Parallel-type double plunger (approx. 10 µL/1 stroke)			
Allowable maximum pressure	44 MPa	70 MPa	105 MPa	130 MPa
Flow rate settings range	0.0001 – 5.0000 mL/min (1.0 – 44 MPa) 5.0001 – 10.0000 mL/min (1.0 – 22 MPa)	0.0001 – 3.0000 mL/min (1.0 – 70 MPa) 3.0001 – 5.0000 mL/min (1.0 – 44 MPa) 5.0001 – 10.0000 mL/min (1.0 – 22 MPa)	0.0001 – 3.0000 mL/min (1.0 – 105 MPa) 3.0001 – 5.0000 mL/min (1.0 – 80 MPa) 5.0001 – 10.0000 mL/min (1.0 – 22 MPa)	0.0001 – 3.0000 mL/min (1.0 – 130 MPa) 3.0001 – 5.0000 mL/min (1.0 – 80 MPa) 5.0001 – 10.0000 mL/min (1.0 – 22 MPa)
Flow rate accuracy	≤ ± 1% or ± 2 µL/min, whichever greater (under specified conditions)		≤ ± 1% (under specified conditions)	
Flow rate precision	≤ 0.06% RSD or 0.02 minSD, whichever greater			
Gradient mode	High-pressure gradient (2 or 3 solvents) Quaternary low-pressure gradient	High-pressure gradient (2 solvents (LC-40B XR standard) or 3 solvents) Quaternary low-pressure gradient (Only available for LC-40D XR)	High-pressure gradient (2 or 3 solvents) Quaternary low-pressure gradient	High-pressure gradient (2 solvents (LC-40B X3 standard) or 3 solvents) Quaternary low-pressure gradient (Only available for LC-40D X3)
Gradient range of set concentrations	0 to 100% (0.1% step)			
Gradient concentration accuracy	± 0.5% (under specified conditions)			
Wetted materials	SUS316L, Hastelloy® C, PEEK, PTFE, Sapphire, Ruby	SUS316L, Hastelloy C, PEEK, PE, Sapphire, Ruby		
Available pH range	1 to 14			
Automatic rinsing kit	Option	Standard equipment		
Degassing unit	1 unit connectable	LC-40D XR: 1 unit connectable LC-40B XR: 2 units connectable	1 unit connectable	LC-40D X3: 1 unit connectable LC-40B X3: pre-installed (5 port built-in), 1 unit connectable
Dimensions [mm]	W 260 × D 500 × H 140			LC-40D X3: W 260 × D 500 × H 140 LC-40B X3: W 260 × D 500 × H 210
Weight	10 kg	LC-40D XR: 10 kg LC-40B XR: 13 kg	12 kg	LC-40D X3: 12 kg LC-40B X3: 21 kg
Operating temperature range	4 to 35°C			
Power supply	AC 100–240 V, 50/60 Hz			
	150 VA	LC-40D XR: 150 VA LC-40B XR: 180 VA	150 VA	LC-40D X3: 150 VA LC-40B X3: 180 VA

DGU-403

Degassing Unit

	DGU-403	DGU-405
Number of degassed solvents	3	5
Degassed flow line capacity	400 µL/1 line	
Dimensions [mm], weight	W 260 × D 500 × H 72, 4 kg	
Operating temperature range	4 to 35°C	
Power supply	Supplied from solvent delivery unit	

Autosampler

SIL-40C XR

		SIL-40 SIL-40C	SIL-40 XR SIL-40C XR	SIL-40C XS	SIL-40C X3
Injection method		Total-volume Injection (standard), loop injection (optional)			
Allowable maximum pressure		44 MPa	80 MPa	105 MPa	130 MPa
Injection volume		0.01 to 100 µL	0.01 to 50 µL		
		0.01 to 2000 µL (optional)			
Injection volume accuracy		≤ ± 1% (5 µL injection, n = 20)			
Linearity		≥ 0.9999			
Injection cycle time		≤ 6.7 seconds (under specified conditions)			
Samples for processing		288 (microtiter plate, 96 well × 3 plates), 1152 (microtiter plate, 384 well × 3 plates) 252 (1 mL sample vial, 84 × 3 plates), 162 (1.5 mL sample vial, 54 × 3 plates), 84 (4 mL sample vial, 28 × 3 plates), 36 (10 mL sample vial, 12 × 3 plates), 72 (1.5 mL micro tube, 24 × 3 plates)			
Injection volume reproducibility		RSD ≤ 1.0% (0.5 to 0.9 µL), RSD ≤ 0.5% (1.0 to 1.9 µL), RSD ≤ 0.25% (2.0 to 4.9 µL), RSD ≤ 0.15% (More than 5.0 µL), RSD < 0.5% (typically, 0.5 µL), RSD < 0.25% (typically, 1.0 µL)			
Carryover		≤ 0.0025% (without rinse) ≤ 0.0005% (with rinse, typically) (under specified conditions)	≤ 0.0015% (without rinse) ≤ 0.0003% (with rinse, typically) (under specified conditions)		
Dip rinsing outside the needle and injection port rinsing		Standard equipment			
Pumping rinse outside the needle		Option	Standard equipment		
Internal rinsing (3 dil)		Option			Standard equipment
Sample cooler		SIL-40: None SIL-40C: Standard equipment (Air-circulation temperature control type)	SIL-40 XR: None SIL-40C XR: Standard equipment (Air-circulation temperature control type)	Standard equipment (Air-circulation temperature control type)	
Sample cooler temperature setting range		4 to 45°C (Room temperature needs to be less than 30°C and humidity needs to be less than 70% to set 4°C)			
Sample cooler temperature accuracy		± 2°C (sensor position ± 0.5°C)			
Wetted material		SUS316L, DLC, PEEK, GFP, PTFE, FEP, ETFE, sapphire, ceramics, PPS, FFKM			
Available pH range		1 to 14			
Dimensions [mm], weight		W 260 × D 500 × H 280 (SIL-40C/40C XR/40C XS/40C X3: Protrusion adds 140 mm to the depth)			
		SIL-40: 17 kg SIL-40C: 24 kg	SIL-40 XR: 17 kg SIL-40C XR: 24 kg	24 kg	
Operating temperature range		4 to 35°C			
Power supply	Cooler model	AC 100–240 V, 400 VA, 50/60 Hz			
	Non cooler model	AC 100–240 V,150 VA, 50/60 Hz		—	

Plate Changer

		PLATE CHANGER
Samples for processing (includes two plates of autosampler)	1 PLATE CHANGER	1536 (microtiter plate, 96 well × 16 plates), 864 (deep-well plate, 96 well × 9 plates) 6144 (microtiter plate, 384 well × 16 plates), 3456 (deep-well plate, 384 well × 9 plates) 756 (1 mL sample vial, 84 × 9 plates), 486 (1.5 mL sample vial, 54 × 9 plates) 252 (4 mL sample vial, 28 × 9 plates), 108 (10 mL sample vial, 12 × 9 plates)
	3 PLATE CHANGERS	4224 (microtiter plate, 96 well × 44 plates), 2208 (deep-well plate, 96 well × 23 plates) 16896 (microtiter plate, 384 well × 44 plates), 8832 (deep-well plate, 384 well × 23 plates) 1932 (1 mL sample vial, 84 × 23 plates), 1242 (1.5 mL sample vial, 54 × 23 plates) 644 (4 mL sample vial, 28 × 23 plates), 276 (10 mL sample vial, 12 × 23 plates)
Sample cooler temperature setting range		Air-circulation temperature control type, 4 to 45°C (Room temperature needs to be less than 30°C and humidity needs to be less than 70% to set 4°C)
Dimensions [mm], weight		W 170 × D 500 × H 560 (Protrusion adds 140 mm to the depth), 26 kg
Operating temperature range		4 to 35°C
Power supply		AC 100–240 V, 400 VA, 50/60 Hz

Column Oven

CTO-40C CTO-40S

	CTO-40C	CTO-40S
Temperature control type	Forced air circulation	
Cooling Method	Electronic cooling	
Temperature control range	Room temperature – 10°C to 100°C	Room temperature – 10°C to 85°C
Temperature accuracy	± 0.5°C	± 0.8°C
Temperature precision	± 0.05°C	± 0.1°C
Containable column size and number	Up to 250 mm L. column × 6 or 300 mm L. column × 3	Up to 100 mm L. column × 6 or 300 mm L. column × 3
Dimensions [mm], weight	W 260 × D 500 × H 415, 21 kg	W 130 × D 500 × H 553, 15 kg
Operating temperature range	4 to 35°C	
Power supply	AC 100–120 V / 220–240 V (Automatic switching), 400 VA, 50/60 Hz	AC 100–240 V, 300 VA, 50/60 Hz

UV-VIS Detector

SPD-40V

	SPD-40	SPD-40V
Light source	Deuterium (D_2) lamp	Deuterium (D_2) lamp, tungsten lamp
Wavelength range	190 to 700 nm	190 to 1000 nm
Bandwidth	8 nm	
Wavelength accuracy	≤ ± 1 nm	
Wavelength reproducibility	≤ ± 0.1 nm	
Drift	≤ 0.1×10^{-3} of AU/h (under specified conditions)	
Noise	Single wavelength mode: ≤ 4.0×10^{-6} AU, Dual wavelength mode: ≤ 10.0×10^{-6} AU (under specified conditions)	
Linearity	2.5 AU (under specified conditions)	
Standard flow cell	Optical path length: 10 mm, Cell volume: 12 µL, Pressure: 12 MPa Material of wetted parts: SUS316L, PFA, quartz, PEEK	
Sampling rate	19 to 50°C, 1°C Step	
Cell temperature control range	Max. 100 Hz (Single wavelength mode)	
Optional flow cell	UHPLC cell (optical path length: 10 mm, cell volume: 8 µL, equipped with temperature control function) Semi-micro cell (optical path length: 5 mm, cell volume: 2.5 µL, equipped with temperature control function) Conventional cell (optical path length: 10 mm, cell volume: 12 µL, equipped with temperature control function) Inert cell (optical path length: 10 mm, cell volume: 12 µL, equipped with temperature control function) Preparative cell (optical path length: 0.1/0.2/0.5 mm, cell volume: 0.8/1.6/4.0 µL) Micro flow cell (optical path length: 3 mm, cell volume: 0.21 µL) Maximum pressure cell (optical path length: 10 mm, cell volume: 12 µL)	
Available pH range	1 to 13 (Cell quartz might be damaged by a mobile phase of pH >10.)	
Dimensions [mm], weight	W 260 × D 500 × H 140, 11 kg	
Operating temperature range	4 to 35°C	
Power supply	AC 100–240 V, 150 VA, 50/60 Hz	

Photodiode Array Detector

SPD-M40

	SPD-M40
Light source	Deuterium (D_2) lamp, Tungsten lamp
Number of diode elements	1024
Wavelength range	190 to 800 nm
Wavelength accuracy	≤ ± 1 nm
Wavelength reproducibility	≤ ± 0.1 nm
Slit width	1.2 nm, 8 nm
Spectral resolution	≤ ± 1.4 nm
Drift	≤ 0.4×10^{-3} of AU/h (under specified conditions)
Noise	≤ 4.5×10^{-6} AU (under specified conditions)
Linearity	2.5 AU (under specified conditions)
Standard flow cell	Optical path length: 10 mm, Cell volume: 12 µL, Pressure: 12 MPa Material of wetted parts: SUS316L, PFA, quartz, PEEK
Sampling rate	Max. 100 Hz
Cell temperature control range	19 to 50°C, 1°C Step
Optional flow cell	UHPLC cell (optical path length: 10 mm, cell volume: 8 µL, equipped with temperature control function) Semi-micro cell (optical path length: 5 mm, cell volume: 2.5 µL, equipped with temperature control function) Conventional cell (optical path length: 10 mm, cell volume: 12 µL, equipped with temperature control function) Inert cell (optical path length: 10 mm, cell volume: 12 µL, equipped with temperature control function) Preparative cell (optical path length: 0.1/0.2/0.5 mm, cell volume: 0.8/1.6/4.0 µL, equipped) Micro flow cell (optical path length: 3 mm, cell volume: 0.21 µL) Maximum pressure cell (optical path length: 10 mm, cell volume: 12 µL)
Available pH range	1 to 13 (Cell quartz might be damaged by a mobile phase pH >10.)
Dimensions [mm], weight	W 260 × D 500 × H 140, 10 kg
Operating temperature range	4 to 35°C
Power supply	AC 100–240 V, 180 VA, 50/60 Hz

Capillary cell type Photodiode Array Detector

	SPD-M30A
Light source	Deuterium (D_2) lamp
Number of diode elements	1024
Wavelength range	190 to 700 nm
Wavelength accuracy	≤ ± 1 nm
Wavelength reproducibility	≤ ± 0.1 nm
Slit width	1 nm, 8 nm
Spectral resolution	≤ 1.4 nm
Drift	≤ 0.5×10^{-3} AU/h (under specified conditions)
Noise	≤ 4.0×10^{-6} AU (under specified conditions)
Linearity	2.0 AU (under specified conditions)
Cell	Standard cell: Optical path length: 10 mm, Capacity: 1 µL, Pressure: 8 MPa Optional high-sensitivity cell: Optical path length: 85 mm, Capacity: 9 µL, Pressure: 8 MPa
Sampling rate	Max. 200 Hz
Dimensions [mm], weight	W 260 × D 500 × H 140, 12 kg
Operating temperature range	4 to 35°C
Power supply	AC 100–240 V, 150 VA, 50/60 Hz

Spectrofluorometric Detector

	RF-20A	RF-20Axs
Light source	Xenon lamp	Xenon lamp Low-pressure mercury lamp (to check wavelength accuracy)
Wavelength range	200 to 650 nm	200 to 750 nm
Spectral bandwidth	20 nm	
Wavelength accuracy	± 2 nm	
Wavelength precision	± 0.2 nm	
S/N	Water Raman peak S/N ≥1200 Low background S/N ≥ 9000	Water Raman peak S/N ≥ 2000 Low background S/N ≥ 12000
Range of cell temperature control	—	Room temperature – 10°C to 40°C, 1°C step
Cell	Standard conventional cell: volume 12 µL, maximum pressure 2 MPa Optional semi-micro cell: volume 3 µL, maximum pressure 2 MPa	
Sampling rate	Max. 100 Hz (Single wavelength mode)	
Function	Simultaneous measurement of four wavelengths, Wavelength scanning	
Dimensions [mm], weight	W 260 × D 500 × H 210, 16 kg	W 260 × D 500 × H 210, 18 kg
Operating temperature range	4 to 35°C	
Power supply	AC 100–240 V, 400 VA, 50/60 Hz	

Differential Refractive Index Detector

	RID-20A
Measurement range	1 to 1.75 RIU
Noise	≤ 2.5×10^{-9} RIU
Drift	≤ 1×10^{-7} RIU/h
Range	A mode: 0.01×10^{-6} to 500×10^{-6} RIU P, L-mode: 1×10^{-6} to 5000×10^{-6} RIU
Response	0.05 to 10 sec, 10 steps
Polarity – Change	Available
Zero adjustment	Auto zero, Optical zero, Fine zero
Maximum flow rate	20 mL/min (150 mL/min in option)
Range of cell temperature control	30 to 60°C
Cell	Volume 9 µL, Maximum pressure 2 MPa
Sampling rate	Max. 50 Hz
Dimensions [mm], weight	W 260 × D 420 × H 140, 12 kg
Operating temperature range	4 to 35°C
Power supply	AC 100–240 V, 150 VA, 50/60 Hz

Conductivity Detector

	CDD-10Avp
Cell volume	0.25 µL
Cell constant	25 µS·cm^{-1}
Material of wetted parts	PEEK, SUS316
Maximum use pressure	2.9 MPa (30 kgf/cm^2)
Response	0.05 to 10 s, 10 steps
Sampling rate	Max. 50 Hz
Zero adjustment	Auto-zero function, Baseline-shifting function
Dimensions [mm], weight	W 260 × D 420 × H 140, 6 kg
Operating temperature range	4 to 35°C
Power supply	AC 100–240 V, 250 VA, 50/60 Hz

Evaporative Light-Scattering Detector

	ELSD-LT III
Nebulizing method	Siphon Splitting
Light source	High Power Laser
Detection element	Photodiode
Evaporation temperature set range	Room temperature –100°C
Gas nebulizer	Nitrogen or air*
Gas consumption	3 L/min (max)
Mobile phase flow rate range	0.2 to 2.0 mL/min
Supply gas pressure	300 – 450 kPa (Standard setting: 350 kPa)
Connecting to HPLC system	USB/RS-232C → Connect to PC (No A/D board is required)
Dimensions [mm], weight	W 250 × D 530 × H 330, 15.5 kg
Operating temperature range	4 to 35°C
Operation humidity range	20 to 85%
Power supply	AC 100–240 V, 1.2 A, 50/60 Hz

*Requires a gas supply source, such as an air compressor, nitrogen generator and gas piping.

[Note] • Please use a regulator with filter (option) in order to remove small foreign matters in the gas.
• Please make sure that nitrogen or air doesn't contain oil, dust, or moisture when you use nitrogen generator and/or air compressor.
• Please use the instrument in a room with exhaust facilities.

Optional accessories

Solvent Delivery Unit

Part Name		P/N	Description
Low-pressure gradient unit		228-65016-58	Low-pressure gradient unit for LC-40D/40D XR/40D XS/40D X3
Reservoir selection valve		228-65017-58	Two-solvent switching unit to be incorporated in solvent delivery unit
FCV-11AL		228-65611-58	The mobile phase switching valve of 3 flow lines that connects to solvent delivery unit (external)
FCV-11ALS		228-65610-58	The mobile phase switching valve of 1 flow line that connects to solvent delivery unit (external)
Automatic rinsing kit		228-56201-41	Automatic rinsing kit for plunger seal cleaning
Mixer	MR 20 µL	228-72652-41	High-efficiency mixer for high-pressure gradient system (volume 20 µL)
	MR 40 µL	228-72652-42	High-efficiency mixer for high-pressure gradient system (volume 40 µL)
	MR 100 µL	228-72652-43	High-efficiency mixer for high-pressure gradient system (volume 100 µL)
	MR 180 µL	228-72652-44	High-efficiency mixer for high-pressure gradient system (volume 180 µL)
	MR 40 µL LPGE	228-65020-41	High-efficiency mixer for low-pressure gradient system (volume 40 µL)
	MR 300 µL LPGE	228-72653-42	High-efficiency mixer for low-pressure gradient system (volume 300 µL)

Autosampler

Part Name		P/N	Description
Sample loop	50 µL	228-63132-44	Sample loop for 50 µL injection (standard configuration of SIL-40 XR/40C XR/40C XS/40C X3)
	100 µL	228-63132-45	Sample loop for 100 µL injection (standard configuration of SIL-40/40C)
	500 µL	228-45405-45	Sample loop to increase the injection volume up to 500 µL (Connect sample loop 100 µL (228-63132-45))
	2000 µL	228-45405-46	Sample loop to increase the injection volume up to 2 mL (Connect sample loop 100 µL (228-63132-45))
Dual-injection kit		228-72568-41, -42	Tubing kits for dual injection (228-72568-41 is for CTO-40S and 228-72568-42 is for CTO-40C)
Sample loop for loop injection	5 µL	228-71759-42	Sample loop for loop injection mode (volume 5 µL)
	20 µL	228-71759-43	Sample loop for loop injection mode (volume 20 µL)
	50 µL	228-71759-44	Sample loop for loop injection mode (volume 50 µL)
Sample plate	1.5 mL	228-71762-46	Plate for 1.5 mL sample vial (54)
	1 mL	228-71762-42	Plate for 1 mL sample vial (84)
	4 mL	228-71762-43	Plate for 4 mL sample vial (28)
	10 mL	228-71762-44	Plate for 10 mL sample vial (12)
Identification labels	For 96-well microplates	228-71840-41	Identification label affixed to the 96-well microtiter plate (100 set)
	For 96-well deep-well plates	228-71840-42	Identification label affixed to the 96-well deep-well plate (100 set)
	For 384-well microplates	228-71840-43	Identification label affixed to the 384-well microtiter plate (100 set)
	For 384-well deep-well plates	228-71840-44	Identification label affixed to the 384-well deep-well plate (100 set)

Column Oven

Part Name		P/N	Description
Active pre-heater		228-72084-41	Pre-heater device for thermostatting mobile phase before the column inlet
FCV kits	For CTO-40S	228-72438-41	This is a kit for attaching a flow line switching valve to CTO-40S
	For CTO-40C	228-72589-41	This is a kit for attaching a flow line switching valve to CTO-40C
Two FCV tubing kits	ID 0.3	228-72437-41	Tubing kit to connect the flow line switching valve and columns
	ID 0.1	228-72437-42	
Six FCV tubing kits	ID 0.3	228-72437-43	
	ID 0.1	228-72437-44	
Nexlock™ SS (with fitting)	ID 0.1 mm × 600 mm	228-62544-11	Finger-tight high-pressure fitting
	ID 0.3 mm × 600 mm	228-62544-22	

UV Detector / PDA Detector

Part Name	P/N	Description
UHPLC cell	228-64724-41 (PDA), -42 (UV)	Flow cell for high-speed analysis (volume 8 µL)
Semi-micro cell	228-64725-41 (PDA), -42 (UV)	Flow cell for semi-micro analysis (volume 2.5 µL)
Conventional cell	228-68250-41 (PDA), -42 (UV)	Flow cell with the same cell volume (12 µL) as standard cell of SPD-20A and SPD-M20A
Inert cell	228-64728-41 (PDA), -42 (UV)	Inert-type flow cell with metal-less wetted parts
Preparative cell	228-64727-41 (PDA), -42 (UV)	Preparative flow cell with variable optical path length
Micro flow cell	228-64737-41 (PDA), -42 (UV)	Flow cell for micro analysis (volume 0.21 µL)
Maximum pressure cell	228-64726-41 (PDA), -42 (UV)	High-pressure resisting flow cell for Nexera™ UC
Solvent recycle valve	228-56808-42 (UV)	Valve to recycle mobile phase by attaching to SPD-40/40V

Others

Part Name	P/N	Description
Mobile phase monitor (controller)	228-65525-58	MPM-40 controller to monitor remaining mobile phase in real-time Up to six bottle holders can be connected (228-65526-58, set of two)
Power outlet unit 6P	228-65523-42 (socket type B) 228-65523-43 (socket type D) 228-65523-46 (socket type I) 228-65523-58 (socket type F)	Power tap to turn off the main power of the instrument completely at one time. Switches can be installed in front of the reservoir tray. It provides six outlets.
Power outlet unit 2PS	228-65524-46 (for China) 228-65524-58 (for other than China)	Outlet to supply power to main units that need to be connected to service outlets, such as SIL-10A and FRC-10A. It provides two outlets.
Tubing kit A, ID 0.3 for high-pressure GE	228-70254-41	Tubing kits for high-pressure gradient system. Column inlet tubing ID 0.3 mm
Tubing kit B, ID 0.1 for high-pressure GE	228-70254-42	Tubing kits for high-pressure gradient system. Column inlet tubing ID 0.1 mm
Tubing kit C, ID 0.3 for low-pressure GE	228-70254-43	Tubing kits for low-pressure gradient system. Column inlet tubing ID 0.3 mm
Tubing kit D, ID 0.1 for low-pressure GE	228-70254-44	Tubing kits for low-pressure gradient system. Column inlet tubing ID 0.1 mm
Cable kit A	228-70247-41	Optical link cable kit, 600 mm × 1 pc, 800 mm × 1 pc
Cable kit B	228-70247-42	Optical link cable kit, 600 mm × 2 pcs, 800 mm × 1 pc
Cable kit C	228-70247-43	Optical link cable kit, 600 mm × 3 pcs, 800 mm × 1 pc
Cable kit D	228-70247-44	Optical link cable kit, 600 mm × 4 pcs, 800 mm × 1 pc
Reservoir tray	228-65508-58	Reservoir tray for up to 8 bottles (1L)
AD board	228-55519-41	Board for analog–digital conversion. It takes in detector signals as analog signals.
Optical cable connector expansion board	228-70481-41	The board to expand the number of optical cable connector channels to 12ch from 8ch (standard) by attaching to SCL-40/CBM-40

Valve

Part Name	P/N	Description
FCV-DR	228-65602-58	Drive unit and control board for incorporating valve into CTOs (1 FCV valve is required separately)
FCV-0206	228-65603-58	2-position 6-port valve (Maximum pressure: 44 MPa)
FCV-0607	228-65604-58	6-position 7-port valve (Maximum pressure: 44 MPa)
FCV-0206H	228-65607-58	2-position 6-port valve (Maximum pressure: 80 MPa)
FCV-0607H	228-65608-58	6-position 7-port valve (Maximum pressure: 80 MPa)
FCV-0206H3	228-65624-58	2-position 6-port valve (Maximum pressure: 130 MPa)
FCV-0607H3	228-65625-58	6-position 7-port valve (Maximum pressure: 130 MPa)

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Novel Function of Auto-diagnostics and Auto-recovery for Detecting Air Bubble Trapped in LC Solvent Delivery Pump

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Novel Function of Auto-diagnostics and Auto-recovery for Detecting Air Bubble Trapped in LC Solvent Delivery Pump

1. Introduction

In order to improve productivity in modern analysis laboratories, it is essential to reduce analysis time and maximize throughput through regular maintenance. One issue to be resolved is the interruption of analysis due to unforeseeable problems. An example of this is air bubbles in the flow line, which can cause shifts in retention times, pulsating baselines, and unexpected changes in peak shapes. In this poster presentation, we introduce the effectiveness of auto-diagnostics and auto-recovery functions in detecting and resolving this problem automatically. In addition, we also describe the algorithm for air bubbles detection. These functions minimize system downtime due to air bubbles and contribute to the optimization of laboratory productivity.

ANALYTICAL INTELLIGENCE

2. Bubble Formation in Flow Lines

The amount of gas that a liquid can absorb depends on several factors, such as the pressure and temperature gradients, and the nature and type of the liquid and gas (see reference). Gas bubbles are produced in a liquid when the amount of dissolved gas in a solution exceeds the saturated solubility (supersaturation). Usually, the bubbles are removed through the degassing unit. However, in rare cases, they can appear in the flow line of an HPLC / UHPLC and reach the pump. These bubbles can cause shifts in retention times, pulsating baselines, unexpected changes in peak areas, and irregular peak shapes. This can dramatically affect the analytical results due to inaccuracies, poor precision, or inability to distinguish between trace amounts of analytes and the baseline. It also prevents the identification of analytes that are close to their detection limits.

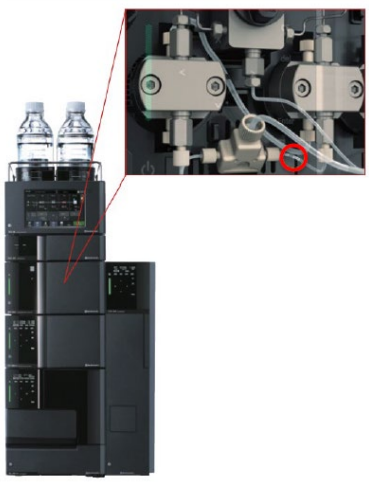

Fig.1. Diagram of the Nexera™ solvent delivery unit flow lines T1

3. Auto-diagnostics and Auto-recovery T1

3-1. Overview

Air bubbles can appear in HPLC/UHPLC systems when air has not been removed from the mobile phase, when room temperature varies dramatically or surfactants are added to the mobile phase. When air bubbles are encountered, they require the presence of an operator to be dealt with. The operator will usually remove bubbles by stopping the analysis in progress and purging the flow lines. When the instrument is running unattended (e.g. at night), undetected air bubbles within flowlines can affect a large number of analysis samples, resulting in data loss and time-consuming re-runs.

Auto-diagnostics and auto-recovery functions prevent data loss and waste of samples by automatically detecting abnormal pressure variations triggered by air bubbles within the system and performing corrective actions such as flow line purging until the system regains normal operational status (Fig. 2). T1

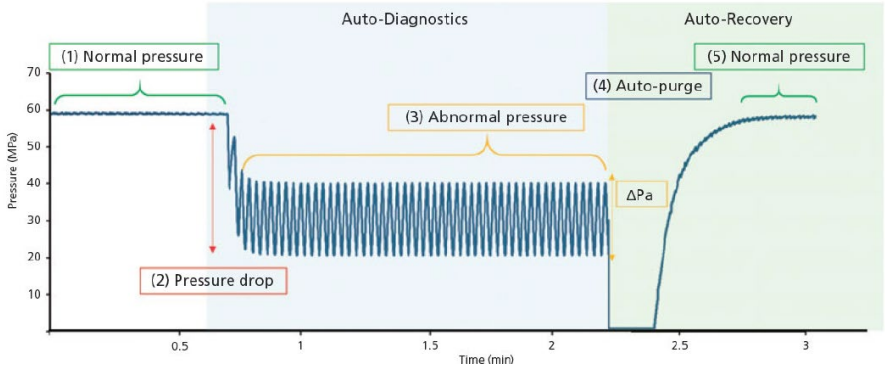

Fig. 2 Pressure changes during auto-diagnostics and auto-recovery
The time spent in each phase can vary depending on analytical conditions and user-defined settings.

3-2. Sequence of Auto-diagnostics and Auto-recovery

Auto-diagnostic and auto-recovery functions are based on a specific algorithm providing the following capabilities. When air bubbles appear in the system, the pressure will drop (Fig. 2, stage 2), and this abnormal pressure will continue (Fig. 2, stage 3). If the new pressure variability ΔPa is abnormal compared to the reference value, the auto-recovery function will be triggered.

In this case, all the subsequent analyses are temporarily suspended. An auto-purge is performed in order to remove any air bubbles from the flow lines (Fig.2, stage 4) and a column rinse is performed. After the auto-recovery process, the pressure profile is checked and compared to the reference values. If pressure variability is normal, the system will return automatically to analysis mode and resume all analyses in the queue.

After auto-recovery, the user can choose to start the interrupted analysis again or to skip this and start from the next line of the batch.

4. Bubble Detection Algorithm

4-1. Mechanism of solvent delivery and pressure drop by air bubble

Our solvent delivery pump adopts a cam driven and parallel dual plunger system. It delivers solvent by operating the left and right plungers alternately (Fig. 3). When air bubbles are formed and reach one side of the pump head, as compared with the normal case, the pressure drops at the timing of the discharge operation of the air trapped side. Thus, we can detect air bubbles by comparing the difference in the amount of periodical pressure change between operation cycles of the two plungers (Fig. 4).

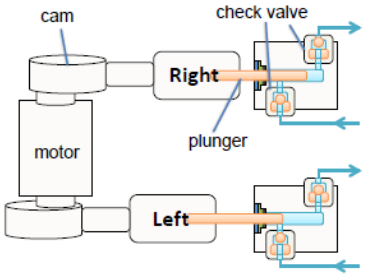

Fig. 3 Overview of solvent delivery mechanism

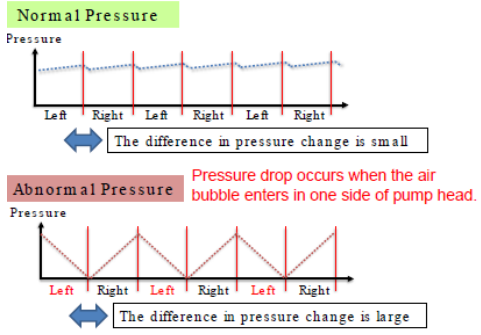

Fig. 4 Overview of air bubble detection

Eq. 1 shows the formula for detecting the air bubble. L1, L2, R1, and R2 represent the pressure values when the left plunger starts and finishes discharging, and when the right plunger starts and finishes discharging, respectively. The threshold value ΔPTh is determined based on experimental data.

$$\Delta P_{Th} \leq \frac{|(L_2 - L_1) - (R_2 - R_1)|}{2} \qquad \text{Eq. (1)}$$

4. Bubble Detection Algorithm

4-2. Distinguishing normal pressure change from the pressure drop caused by an air bubble

Fig. 5 shows the actual experimental data. It shows a case where air bubbles reach the left flow line. The blue line represents L1, the blue dotted line represents L2, the red line represents R1, and the red dotted line represents R2. It can be seen that the pressure decreases at the timing of the discharge operation on the left side, and recovers at the timing of the discharge operation on the right side.
In addition, there are various cases where the pressure changes during the analysis. For example, pressure change occurs at the moment of injecting sample or during gradient analysis, and these must be regarded as a normal pressure change. In order to specifically detect the pressure changes by air bubbles, we check not only the threshold value of Eq. 1 but also the direction of the pressure change synchronized with the two plungers movement. By combining these concepts, we realized a stable air bubble detection. T1

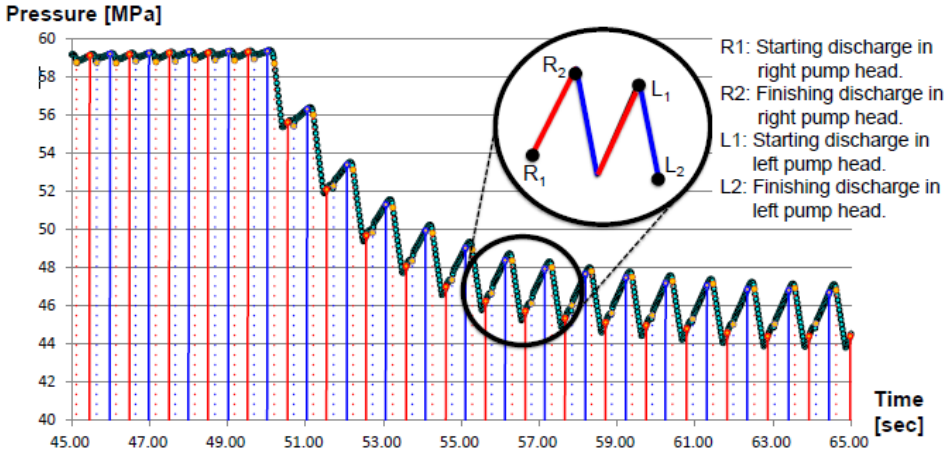

Fig. 5 Pressure transition when air bubbles are trapped in left pump head
(Flow rate : 1 mL/min, Pressure : 60 Mpa, Solvent : Water, Amount of air bubble : 5 µL)

Novel Function of Auto-diagnostics and Auto-recovery for Detecting Air Bubble Trapped in LC Solvent Delivery Pump

5. Conclusions

- Auto-diagnostics works for automatic detection of air bubbles that appeared in the flow line, and the auto-recovery function allows the system to return to a normal condition.
- Auto-diagnostics function realized stable air bubble detection by using an algorithm based on the solvent delivery method.
- These functions are fully automatic and do not require any human intervention, resulting in increased overall analytical efficiency.

References

- S.R. Bakalyar, M.P.T Bradley, and R. Honganen, J. Chromatogr., 158, 277-293 (1978).
- Kagaku Binran, Kiso-hen II 8.7 Yokaido (General Chemistry Handbook, Fundamentals vol. II, 8.7 Solubility), edited by the Chemical Society of Japan, published by Maruzen Co. Ltd. (1984)

First Edition: August, 2021

SHIMADZU

Shimadzu Corporation
www.shimadzu.com/an/

228-90221B
Feb. 2017

Differential Refractive Index Detector
for Shimadzu High Performance Liquid Chromatograph

RID-20A

Instruction Manual

Read this manual thoroughly before you use the product.
Keep this manual for future reference.

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Before Using This product

Introduction

Read this Instruction Manual thoroughly before using the product.

Thank you for purchasing this product.
This manual describes the installation, operation, hardware validation, usage cautions, and details of the accessories.
Read this manual thoroughly before using the product and operate the product in accordance with the instructions in this manual.
After reading this instruction manual, keep it in a safe place for future reference.

IMPORTANT	• If the user or usage location changes, ensure that this Instruction Manual is always kept together with the product. • If this manual or a product warning label is lost or damaged, immediately contact your Shimadzu representative to request a replacement. • To ensure safe operation, read "Safety Instructions" thoroughly before using the product. • To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, re-installation (after the product is moved), or repair is required.

Notice

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Warranty and After-Sales Service

Warranty

1. Period:

Please contact your Shimadzu representative for information about the period of this warranty.

2. Description:

If a product/part failure occurs for reasons attributable to Shimadzu during the warranty period, Shimadzu will repair or replace the product/part free of charge. However, in the case of products which are usually available on the market only for a short time, such as personal computers and their peripherals/parts, Shimadzu may not be able to provide identical replacement products.

3. Limitation of Liability:

1) In no event will Shimadzu be liable for any lost revenue, profit or data, or for special, indirect, consequential, incidental or punitive damages, however caused regardless of the theory of liability, arising out of or related to the use of or inability to use the product, even if Shimadzu has been advised of the possibility of such damage.
2) In no event will Shimadzu's liability to you, whether in contract, tort (including negligence), or otherwise, exceed the amount you paid for the product.

4. Exceptions:

Failures caused by the following are excluded from the warranty, even if they occur during the warranty period.

1) Improper product handling
2) Repairs or modifications performed by parties other than Shimadzu or Shimadzu designated companies
3) Product use in combination with hardware or software other than that designated by Shimadzu
4) Computer viruses leading to device failures and damage to data and software, including the product's basic software
5) Power failures, including power outages and sudden voltage drops, leading to device failures and damage to data and software, including the product's basic software
6) Turning OFF the product without following the proper shutdown procedure leading to device failures and damage to data and software, including the product's basic software
7) Reasons unrelated to the product itself
8) Product use in harsh environments, such as those subject to high temperatures or humidity levels, corrosive gases, or strong vibrations

9) Fires, earthquakes, or any other act of nature, contamination by radioactive or hazardous substances, or any other force majeure event, including wars, riots, and crimes
10) Product movement or transportation after installation
11) Consumable items
Recording media such as floppy disks and CD-ROMs are considered consumable items.

* If there is a document such as a warranty provided with the product, or there is a separate contract agreed upon that includes warranty conditions, the provisions of those documents shall apply.

After-Sales Service

If any problem occurs with this product, perform an inspection and take appropriate corrective action as described in "6 Troubleshooting" of this manual.
If the problem persists, or the symptoms are not covered in the troubleshooting section, contact your Shimadzu representative.

Replacement Parts Availability

Replacement parts for this product will be available for a period of seven (7) years after the product is discontinued. Thereafter, such parts may cease to be available. Note, however, that the availability of parts not manufactured by Shimadzu shall be determined by the relevant manufacturers.

Hardware Validation

Each LC component and the entire LC system should be checked periodically to ensure that they function normally, or the analysis data may not be reliable.
To this end, it is necessary to carry out periodic hardware validation and keep the records. This is called "hardware validation".
There are two types of hardware validation, "component validation" and "system validation".
The component validation is for checking that the individual components of the system function normally.
The system validation is for checking that the system comprised of several components functions normally.
Before shipment from the factory, this instrument was throughly inspected, and the results are summarized in the inspection results accompanying the instrument. To inspect the instrument performance after installation, repeat the Hardware Validation as described in "7 Hardware Validation".
☞ "7 Hardware Validation" P.107

Hardware Validation Contract

This is a contract under which a qualified Shimadzu-approved engineer carries out periodic "component validation" and "system validation", and provides "inspection results".
Details of the contract can be obtained from your Shimadzu representative.

Safety Instructions

- To ensure safe operation of the instrument, read the Safety Instructions section carefully before use.
- Observe all of the WARNINGS and CAUTIONS described in this section. They are extremely important for safety.
- In this instruction manual, warnings and cautions are indicated using the following conventions:

⚠**WARNING**	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
⚠**CAUTION**	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

■ Application Precautions

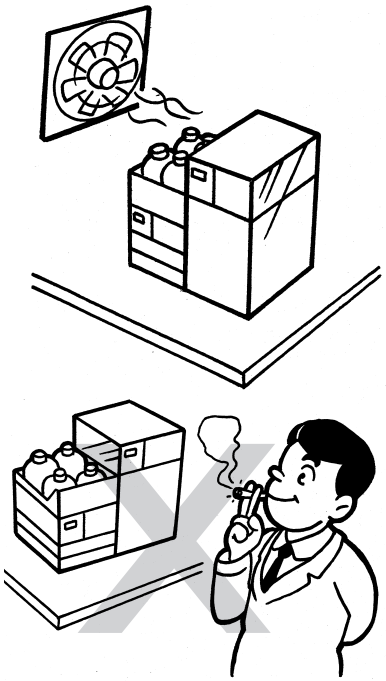
⚠WARNING

- This instrument is a Differential Refractive Index Detector (RID) for use with a high-performance liquid chromatography system.
  Use this instrument ONLY for the intended purpose.

  Using this instrument for any other purpose could cause accidents.

■ Installation Site Precautions

⚠WARNING



- The solvents used in high-performance liquid chromatograph are flammable and toxic. The room where the instrument is installed should be well ventilated.

  Otherwise, the solvents could cause poisoning or ignite and cause a fire.

- High-performance liquid chromatograph uses large amounts of flammable organic solvents. Use of open flame in the vicinity of this instrument must be strictly prohibited. Also, do not install the instrument in the same room with equipment that emits or could emit sparks.

  Sparks could cause a fire.

  Provide fire extinguishers for use in case of fire.

- Provide protective equipment near the instrument.

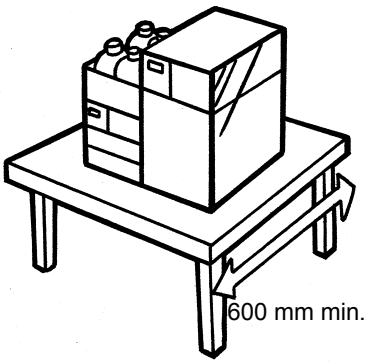
  If solvent gets into your eyes or comes in contact with your skin, it must be flushed away immediately. Provide equipment, such as eye wash stations and safety showers, as close to the instrument as possible.

⚠CAUTION

- This instrument weighs 12 kg. During installation, consider the entire weight combined with other LC components.

  The lab table on which this instrument is installed should be strong enough to support the total weight of the LC system. It should be level, stable and have depth of at least 600 mm.

  Otherwise, the instrument could tip over or fall off the table.



- The distance between the rear of the instrument and the wall must be at least 100 mm.

  Otherwise, air cooling by the fan or heat release from slits becomes insufficient, and the instrument may overheat and performance may decrease.

- Avoid installation sites that are exposed to corrosive gases or excessive dust.

  Otherwise, the instrument performance cannot be maintained, and it may shorten the service life of the instrument.

■ Installation Precautions

To use this instrument safely, contact your Shimadzu service representatives for installation and adjustment or re-installment after moving the instrument.

⚠WARNING

- Take measures to prevent the instrument from falling in the event of an earthquake or other disaster.

  Strong vibrations could cause the instrument to fall over, resulting in personal injury.

- The power supply voltages and power consumptions of this instrument are listed below.
  Connect the instrument to a power supply of the voltage indicated and use a power cord suitable for the power supply voltage.

  Otherwise, fire or electric shock could result.

  If the power supply voltage is unstable or the capacity is insufficient, the instrument will not function well.

  Check that the power supply voltage is stable and that its current capacity is sufficient to operate all the components of the system.

Part No.	Power Supply Voltage*1 (indicated on the instrument)	Power Consumption	Frequency	Rated Breaking Capacity*2
228-45104-41 228-45104-42 228-45104-46 228-45104-48 228-45104-58	100 V AC to 240 V AC (100-240 V ~)	150 VA	50 / 60 Hz	35 A

*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
*2 Connect the power supply to an outlet with a circuit breaker that cuts the power when it is below this current capacity.

- Connect it to ground.

  Grounding is necessary to prevent electric shock in the event of an accident or electrical discharge. It is also important for ensuring stable operation.

- Be sure to ground this instrument in order to prevent electrical shock and to ensure stable operation.

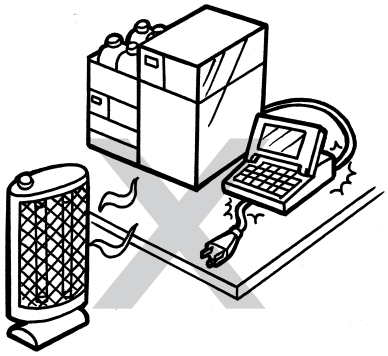
  This instrument can be grounded by connecting the provided three-line power plug to a three-line outlet with a ground terminal.

⚠WARNING

- Do not place heavy objects on the power cord, and keep any hot items away.

  Otherwise, the cord may be damaged, resulting in fire, electrical shock or malfunction.

  If the cord becomes damaged, contact your Shimadzu representative immediately.

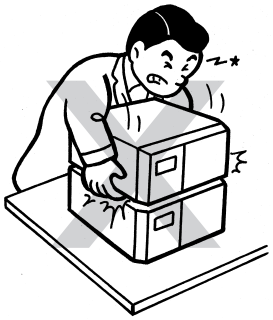


- Do not modify the cord in any way. Do not bend it excessively or pull on it.

  Otherwise, the cord may be damaged, resulting in fire or electrical shock.

  If the cord becomes damaged, contact your Shimadzu representative immediately.

⚠CAUTION



- When installing the instrument, exercise care not to pinch your fingers between the system components.

  as this could result in personal injury.

- When opening or closing the doors, exercise care not to pinch your fingers.

  as this could result in personal injury.

- When carrying the instrument, do not hold the opening at the front.

  Otherwise, the opening on the front of the instrument may break or come off.

■ Precautions for Operation

⚠WARNING

- Take thorough measures to prevent buildup of static electricity.

  ☞"Static Electricity Precautions" P.XII

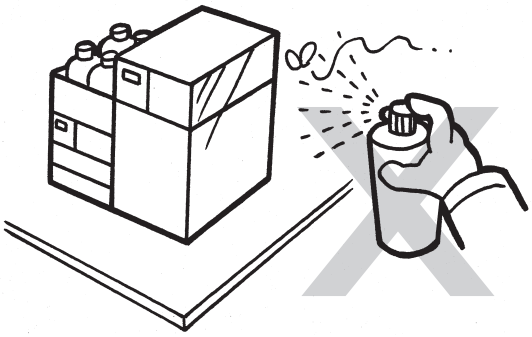
  Static electricity could result in fires or explosions.

- When handling solvents or samples, always wear protective gloves and protective goggles.

  If solvent gets into the eyes, blindness could result.

  Should solvent get into your eyes, flush immediately with large amounts of water and get medical attention.

- Always wear protective gloves when handling any toxic or biologically infectious samples.



- Never use a cracked reservoir bottle.

  If a helium degassing unit is used, pressure is exerted on the reservoir bottles. It could break the reservoir bottles and cause personal injury.

- Do not use flammable sprays (hair sprays, insecticide sprays, etc.) near this instrument.

  They could ignite and cause a fire.

- When using this instrument with an OA equipment such as a PC, exercise care not to spill any liquid on it.

■ Precautions for Instrument Inspection, Maintenance, Adjustment and Care

⚠WARNING

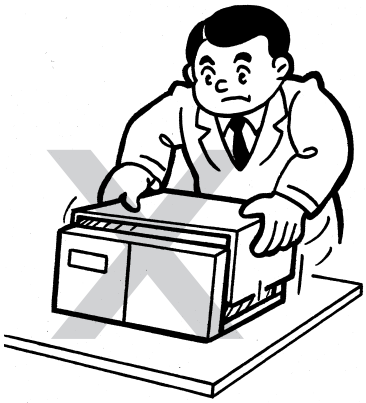
- Unplug the instrument before inspection, maintenance, or parts replacement.

  Otherwise, electrical shock or short-circuit accidents could occur.

- Never remove the main cover.

  Otherwise, personal injury or malfunction may occur.

  The main cover does not need to be removed for routine maintenance, inspection and adjustment. Have your Shimadzu representative perform any repairs requiring removal of the main cover.



- The fuse of this instrument is mounted inside. Call your Shimadzu service representatives for fuse replacement.

- If the power cord plug gets dusty, remove the plug from the power outlet and wipe away the dust with a dry cloth.

  If dust is allowed to accumulate, fire could result.

- When replacing parts, use only the parts listed in "1.4 Component Parts" or "9.3 Maintenance Parts".

  If any parts other than those mentioned are used, personal injury or malfunction may occur.

- If any water gets onto the instrument, wipe it away immediately to prevent rust. Never use alcohol or thinner solvents for cleaning the instrument.

  These can cause rusting and discoloration.

- Dispose of the waste liquid properly and in accordance with the instruction by your administrative department.

■Emergency Measures

⚠WARNING

When abnormality such as burnt odor is detected, follow the procedures below:

Procedure

1. Turn the power of the main unit OFF.
2. Remove the power cable on the rear of the instrument.

When using it again, check the instrument and, if necessary, contact your Shimadzu service representatives.

■Power Outages

⚠CAUTION

When a power outage occurs, follow the procedures below:

Procedure

1. Turn the power of the main unit OFF.
2. After the recovery of the power, check "■ Installation Precautions" P.VII and "■ Precautions for Operation" P.IX to restart the instrument as usual.

Maintenance, Inspection and Adjustment

Daily inspection, periodic inspections and adjustment are required to maintain the performance of the instrument and obtain correct measurement data over a long period of time.

For information on routine inspection, maintenance, and replacement parts, see "8 Maintenance" of this manual.

- Contact your Shimadzu representative or Shimadzu service representatives for periodic inspections and maintenance.
- Use the replacement cycle of the parts needing periodic replacement as a guide.
- Depending on the operating environment and the frequency of use, the replacement cycle can be shorter.

Static Electricity Precautions

Liquid chromatograph (LC) uses flammable organic solvent(s) in the mobile phase. Operators must be constantly on guard against accidents involving fire or explosion. Devising preventative measures for static can be difficult, because the symptoms before an accident vary and can be hard to detect, since such accidents occur as a result of several simultaneous coincidences.

Preparative isolation LC systems are also often used where large amounts of flammable substances are present. The major cause of these accidents is static electricity. Thus, an accident can produce large scale damage.

Recommended methods for preventing static electricity accidents are provided below. Take thorough safety measures based on this information.

■ Typical Cause of Static Electricity Accidents

Static electricity accidents are generally caused by this sequence of events:

Generation of static electricity

↓

Accumulation of static electricity

↓

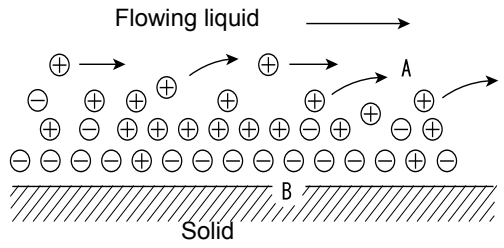
Release of energy through electrical discharge

↓

Ignition of flammable substances

When liquid is passed through thin tubing at high flow rates, as in liquid chromatograph, the electrostatic charges of the flowing matter generate static electricity.

Generation of Static Electricity by a Liquid Flowing over a Solid

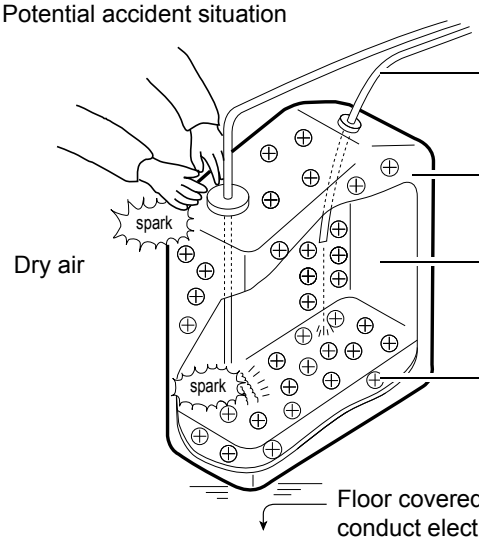


A: Charges move with flow of liquid.
B: Immobile charges, fixed to surface of solid.

If electrostatically charged liquid accumulates in an electrically insulated container, the charge will gradually increase, and can eventually reach several thousand volts.

If this happens and an electrical conductor is brought within a certain distance of the container, electrical discharge will occur, releasing thermal energy which will ignite any flammable gas of sufficient density in the vicinity.

Potential accident situation



Liquid flowing through thin tubing at high rate.
* Air bubbles in liquid facilitate generation of static electricity.

Insulated container of polyethylene, etc.

Flammable gas present in container.

Flammable organic solvent with large electrostatic charge.

Floor covered with rubber, etc., cannot conduct electricity away.

■ Preventing Static Electricity Accidents

The best way to prevent static electricity accidents is simply to prevent the occurrence and accumulation of electrostatic charges.

⚠CAUTION

- It is important to take multiple preventive measures simultaneously.
- In particular, if using a large amounts of flammable solvents in a large container, carry out preventative measures 1, 2, and 3 on the following pages.

Preventative Measure 1

Use a metal container for the waste liquid, and ground the container.

This ensures that the electrical charges of the container and liquid pass to the ground.

Accessories for this measure

1)	Grounding wire with clip	Part No. S228-21353-91
2)	18 Liter metal container	Part No. S038-00044
3)	4 Liter metal container	Part No. S038-00043-01

⚠CAUTION

- Be sure to ground the metal waste container properly.

  Even when a metal container is used, if the grounding wire is not properly attached or connected to the ground, static electricity can build up in the container

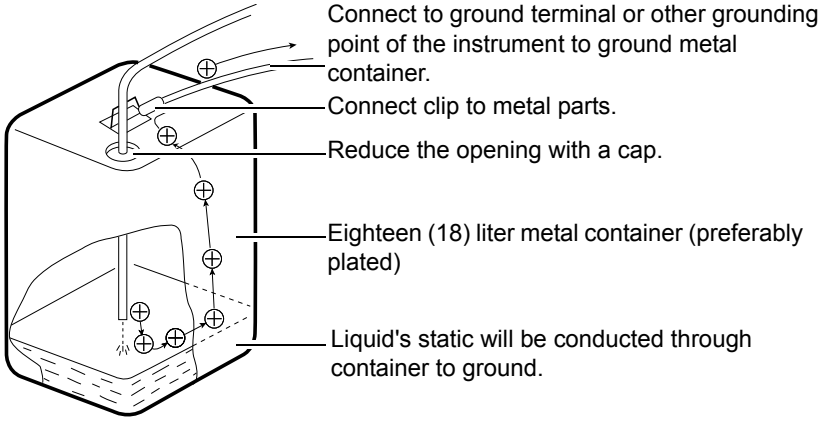
- After grounding the metal container, use a tester to verify that electricity is conducted to the ground.

  Some metal containers have surfaces that are laminated or oxidized. Such containers may not conduct electricity.

- If the liquid to be drained into the waste container is virtually non-conductive (10^{-10} S/m or less), it will be necessary to add properly conductive, and therefore safe, liquid to the tank.

  This conductive liquid may be added beforehand.

Countermeasure Against Static Electricity for the Container



Preventative Measure 2

Narrow the opening of the waste container in order to keep the sparks that kindle outside the waste can from getting inside.

Accessories for this measure

Caps for 18 liter or 4 liter containers (with three ϕ3 holes)

Part No. S228-21354-91

Preventative Measure 3

Keep electrostatically charged objects, including the human body, away from the waste liquid container.

To prevent electrostatic charging of the human body, take the following precautions:

- Wear anti-static clothing and shoes.
- Ground the human body with anti-static wrist straps. For safety, the wrist strap should be connected to the ground using an intervening resistor of about 1 MΩ.
- Spread anti-static matting or the like on the floor, to make the floor conductive.

⚠CAUTION

- Persons who have not taken anti-static precautions should touch some grounded metal object before coming near the waste liquid container, in order to drain static charges.

Preventative Measure 4

Use tubing with an inner diameter of at least ϕ2 mm for drain lines with high flow rates.

⚠CAUTION

- Periodically check the tubing connections for leaks.

  Air bubbles in liquid can multiply the electrostatic charge by a factor of 20, 30 or more.

Preventative Measure 5

If it is not possible to use a conductive waste liquid container, take the following precautions:

- Ensure that the end of the inflow tubing is always submerged inside the container. Also, place some type of grounded metal object, such as a ground wire connected to the instrument, into the liquid.

⚠CAUTION

The above precaution will be ineffective for liquid with low conductivity (10^{-10} S/m max.) liquids.

- Use as small a container as possible to minimize damage in the event of fire.
- Keep the room at a proper humidity.

  Ambient humidity exceeding 65 % will prevent static.

Reference 1

Anti-static equipment (anti-static clothing, shoes and matting) and charge measurement equipment (potentiometer) are sold by specialty manufacturers.

Precautions for Mobile Phase Solvent Selection and Use

⚠CAUTION

- When pumping with high pressure, do not use resin parts on high-pressure tubing.

  Otherwise, the tubing may be damaged or the tubing junctions may be disjointed, and the solvent may scatter. When using resin parts as high-pressure tubing, pay attention to the pressure tolerance of each part.

- If PEEK resin parts are used in the plumbing, do not use the following solvents.
  As they can weaken the PEEK resin, which could result in a plumbing burst and the solvents may scatter.

  Concentrated sulfuric acid, concentrated nitric acid, dichloroacetic acid, acetone*, tetrahydrofuran (THF), dichloromethane, chloroform, dimethyl sulfoxide (DMSO), fluorinated organic solvents such as hexafluoroisopropanol (HFIP).

* Briefly using a weak solution of less than 0.5 % acetone in water (e.g. in order to check gradient performance) will not present problems.

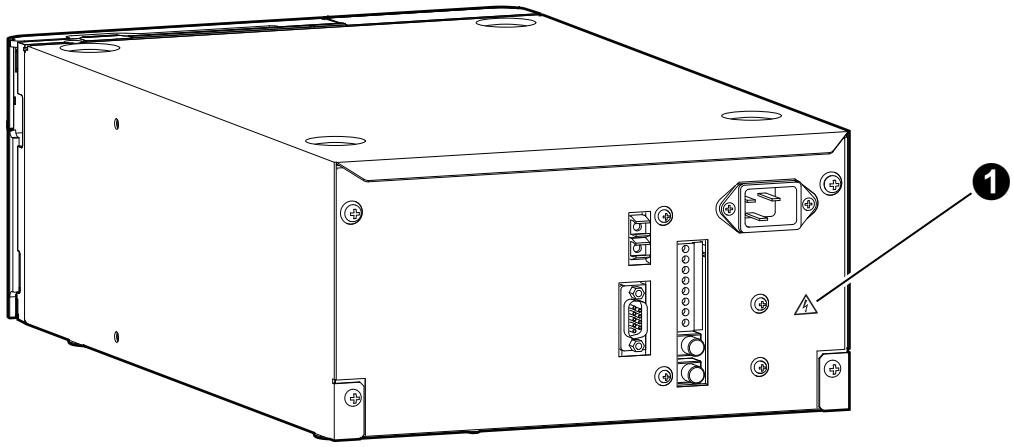
NOTE

- Use only HPLC grade or comparable mobile phase solvents, and filter it with a filter (0.45 μm mesh or finer) before use to remove particulates and foreign matter.
- If the wetted material of an instrument contains stainless steel, avoid, as much as possible, using solvents containing halogen ions such as KCl, NaCl and NH_4Cl or solvents that generate halogen ions in certain reactions. Halogen ions can corrode the stainless steel material (SUS316L) used in the plumbing. If such mobile phases must be used, clean all flow lines thoroughly with distilled water immediately after analysis.
- When SPD or a similar UV detector is used for high-sensitivity analysis, be sure to use HPLC grade mobile phase solvents that have a low absorptivity of UV rays.
- Always degas the mobile phase solvent,
  as air bubbles may tend to form during solvent mixing or during temperature or pressure changes. Air bubbles may cause pump malfunctions and detector signal noise.
- Before using mobile phase solvents, understand its characteristics such as boiling point, ignition point and viscosity.
  ☞"9.5 Mobile Phase Characteristics" P.173
- Depending on the type of the mobile phase, quarts used in the flow cell can be damaged and permeability characteristic can change, if a solution of pH 10 or higher is used for a long period of time. After using such mobile phase, pump purified water for HPLC through the flow cell to flush it.
- A mobile phase with a low dielectric constant, such as hexane, requires special precautions. Its insulating properties can cause static electricity to collect in the waste liquid container. Use a metal waste liquid container and ground it.

Warning Labels

For safety operation, warning labels are affixed to where special attention is required.
If any of these labels peel off or are damaged, obtain replacements from Shimadzu Corporation.

Rear of the Instrument



No.	Warning Label	Description
❶		(Part No.: S037-72999-04) The cover should be removed by authorized service personnel only, because this operation may cause an electric shock.

Disposing of the Product

To dispose of this product, commission an industrial waste disposer, following the local regulation of your region. To dispose of insulating material waste, put it in a plastic bag and seal it, and commission an industrial waste disposer with a license to process glass waste, concrete waste and pottery waste.

Action for Environment (WEEE)

To all users of Shimadzu equipment in the European Union:

WEEE Mark

Equipment marked with this symbol indicates that it was sold on or after 13th August 2005, which means it should not be disposed of with general household waste. Note that our equipment is for industrial/professional use only.

Contact Shimadzu service representative when the equipment has reached the end of its life. They will advise you regarding the equipment take-back.

With your co-operation we are aiming to reduce contamination from waste electronic and electrical equipment and preserve natural resources through re-use and recycling.
Do not hesitate to ask Shimadzu service representative if you require further information.

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Contents

Chapter 1 Overview and Configuration

Chapter 2 Parts Identification and Function

Chapter 3 Preparation

Chapter 4 Basic Operation

Chapter 5 Application Operation

Chapter 8 Maintenance

Chapter 9 Technical Information

Index

1

Overview and Configuration

Contents

1.1 Overview

The Shimadzu RID-20A is a high-performance, easy-to-use differential refractive index detector for use with a high-performance liquid chromatography system.

The RID-20A carries out the following measurements:

- High sensitivity analysis (A mode)
- Semi preparative isolation (P mode)
- Large-scale preparative isolation (L mode: when the option device is installed)

1.2 Features

- Adaptive to various applications

The unique quadrant photodiode is adopted to provide a wide dynamic range. This instrument can be adaptive to the processes from high sensitivity analysis to preparative isolation of high concentration samples with a single unit.

- Excellent stability

The dual temperature control structure is adopted for the optical system, and the thermal design is improved to provide better baseline stability. This instrument is stabilized in a short period of time after turning on the power, streamlining analysis works.

- Improved usability

This instrument has the autopurge function and VP functions, with which the usability is improved from the conventional model.

1.3 Measurement Principle and Internal Flow Line of the Instrument

1.3.1 Measurement Principle

■ Optical System

The figure below shows the optical system of this instrument. The light emitted from the lamp passes through the slit, and passes through the flow cell as parallel beam. The light is then reflected by the mirror, passes through the flow cell again, and a slit image is formed on the photodiode.

The flow cell consists of two parts, the sample side and the reference side. When the refractive index of the cell in the sample side changes, the slit image formed on the photodiode moves horizontally in proportion to the difference in refractive index.

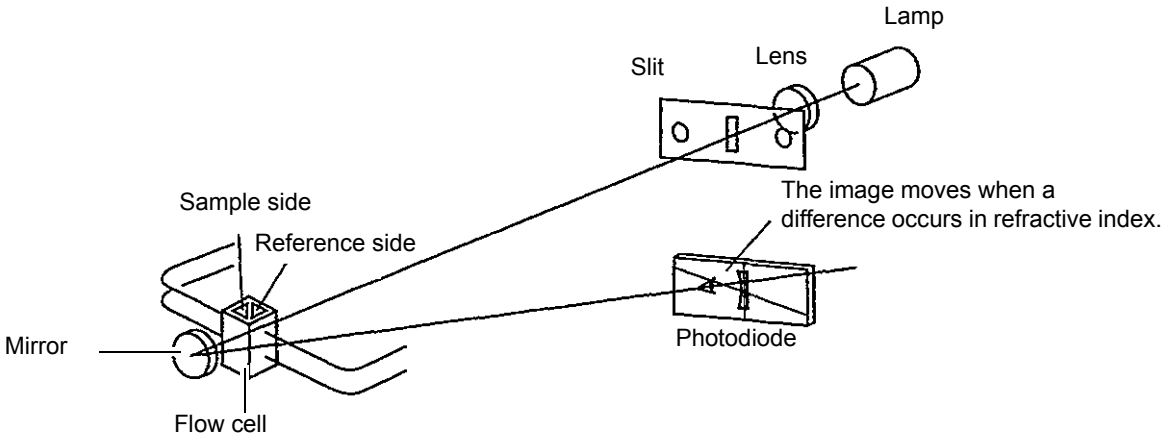


Fig.1.1

- Photodiode

The photodiode of this instrument is divided into four parts. By using the left and right, or top and bottom parts of the photodiode according to the measurement mode, this instrument can be adaptive to the processes from high sensitivity analysis to preparative isolation of a high concentration sample with a single unit.

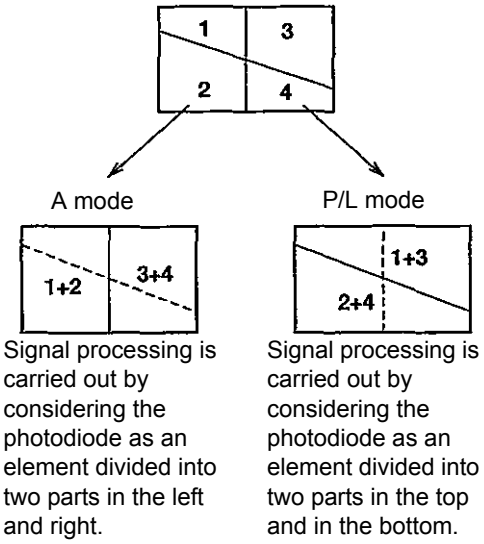


Fig.1.2

■ Measurement Mode

There are three measurement modes with this instrument. By using the measurement modes, this instrument can be adaptive to various samples and analytical purposes.

Measurement mode	Function	Measurement range [μRIU]	Max. flow rate [mL/min]
High sensitivity analysis (A mode)	Used for a standard analysis.	500 max.	20
Semi preparative isolation (P mode)	Used for analysis of high concentration samples. Can analyze samples concentrated 10 times higher than that in A mode.	5000 max.	20
Large-scale preparative isolation (L mode, Only when the optional instrument is installed)	Used for analysis of high flow-rate or high concentration samples. This mode is only available when the optional flow selection block is installed. Although the measurement range is the same as that in P mode, fluid can be pumped at 150 mL/ min.	5000 max.	150

- High sensitivity analysis (A mode)

The left and right parts of the photodiode are treated as one light receiving element, respectively.
When the sample passes through the flow cell, the refractive index of the cell changes, and the slit image formed on the photodiode moves horizontally. As a result, the incident light intensity on the photodiode varies between the left and right parts.
The difference in refractive index is measured based on the variation in light intensity between the left and right parts.

$$RI \propto (A-B)/(A+B)$$

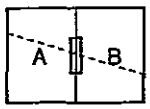


Fig.1.3

- Semi preparative isolation (P mode)

The top and bottom parts of the photodiode are treated as one light receiving element, respectively. The boundary between the top and bottom parts is slanted off the horizontal. When the sample passes through the flow cell, the refractive index of the cell changes, and the slit image formed on the photodiode moves horizontally. As a result, the incident light intensity on the photodiode varies between the top and bottom parts.
The difference in refractive index is measured based on the variation in light intensity between the top and bottom parts.
In the high sensitivity analysis (A mode), when the image is moved across the boundary located in the center of the photodiode, the balance in light intensity does not vary any more, therefore, the refractive index cannot be measured. However, in the semi preparative isolation (P mode), it can be measured.
In the semi preparative isolation (P mode), samples with higher concentration than the high sensitivity analysis (A mode) can be measured.
The amount of change in the balance of light intensity to the change in refractive index is approximately 1/20 of that of A mode.

$$RI \propto (A-B)/(A+B)$$

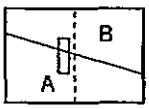


Fig.1.4

- Large-scale preparative isolation (L-mode: when the optional device is installed)

In the same manner as the semi preparative isolation (P mode), the top and bottom parts of the photodiode are treated as one light receiving element, respectively.
In the large-scale preparative isolation (L mode), the reference-side flow line is used for samples. Therefore, the image formed on the photodiode moves in the reverse direction to other modes. When measurement is carried out in the large-scale preparative isolation (L mode), the polarity is reversed automatically.

$$RI \propto (A-B)/(A+B)$$

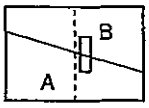


Fig.1.5

NOTE

In the subsequent pages of this document, measurement modes are represented as follows:

Measurement mode	Representation
High sensitivity analysis	A mode
Semi preparative isolation	P mode
Large-scale preparative isolation	L mode

1.3.2 Flow Line

The flow line of this instrument is as follows:

The flow line is switched by the solenoid valve according to the operation, such as "fluid replacement before measurement", "measurement", and "flow line cleaning after measurement".

■ Fluid Replacement (purge)

Before measurement, fill the reference side and sample side of the flow cell with the mobile phase.

Press (**purge**) to switch the flow line of the solenoid valve, and the mobile phase flows through the flow line of this instrument in the order of "inlet port → sample side of the flow cell → solenoid valve → reference side of the flow cell → outlet port". This will fill the reference side and sample side of the flow cell with the same mobile phase. To end the fluid replacement, press (**purge**) again.

- Fluid replacement flow line in A mode and P mode

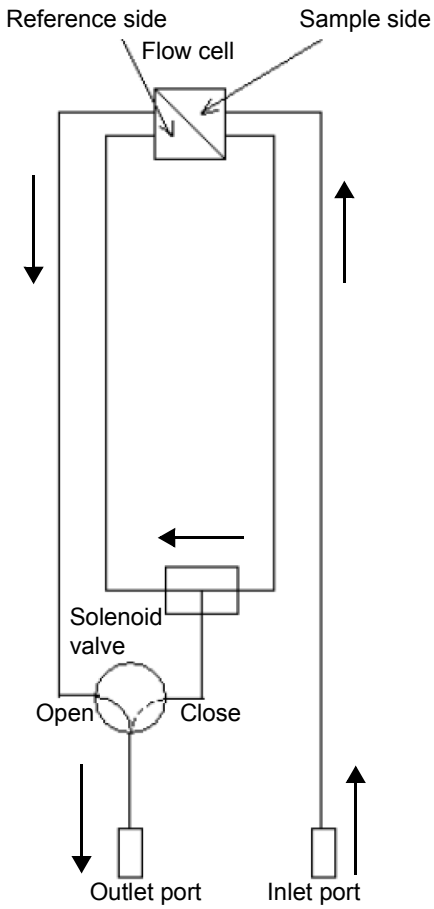


Fig.1.6

- Fluid replacement flow line in L mode

In L mode, the flow line that is used in the reference side in other modes is used as the sample.

This mode is only available when the optional flow selection block is installed.

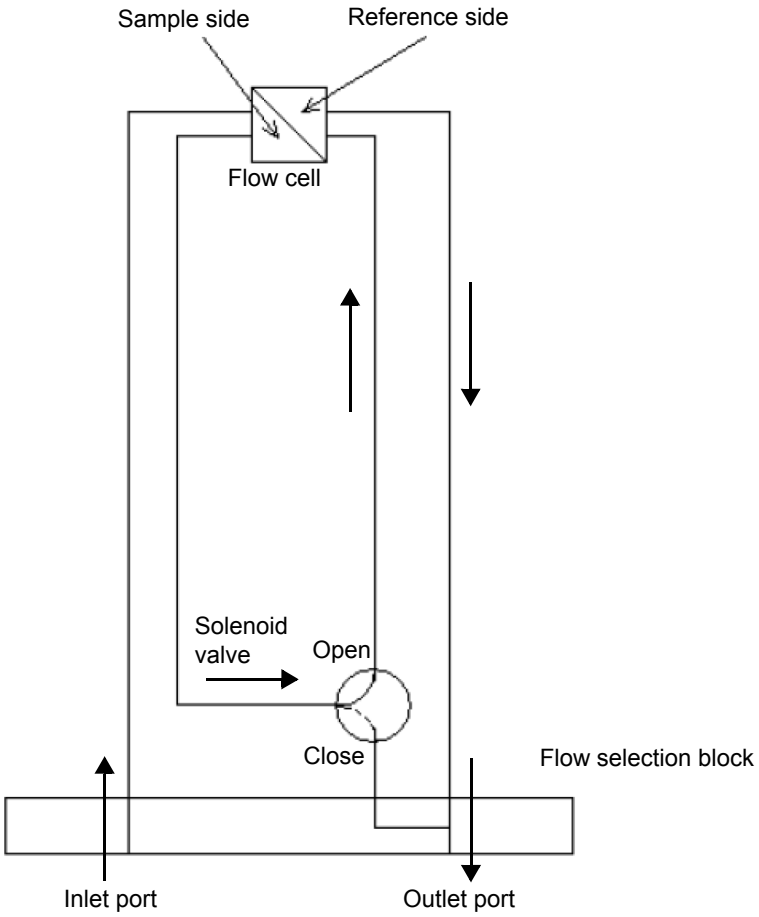


Fig.1.7

■ Measurement

After the fluid replacement, carry out measurement by passing the mobile phase which contains the sample through the sample side of the flow cell. In the measurement flow line, the mobile phase flows through the flow line of this instrument in the order of "inlet port → sample side of the flow cell → outlet port".

- Measurement flow line in A mode and P mode

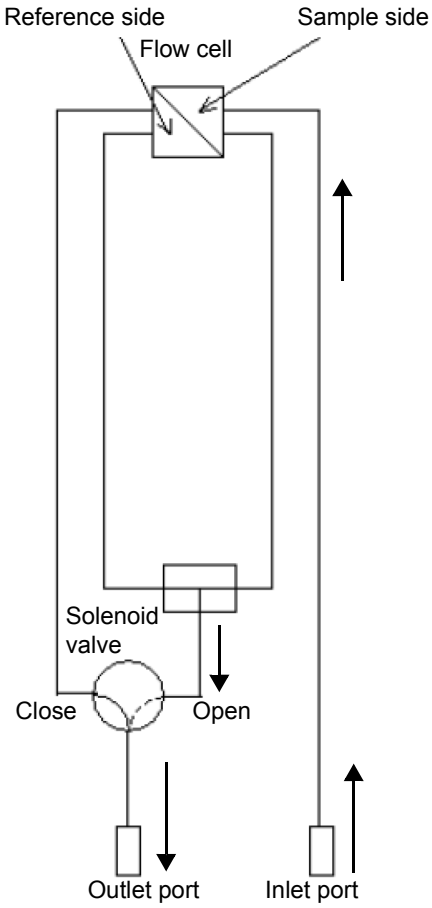


Fig.1.8

- Measurement flow line in L mode

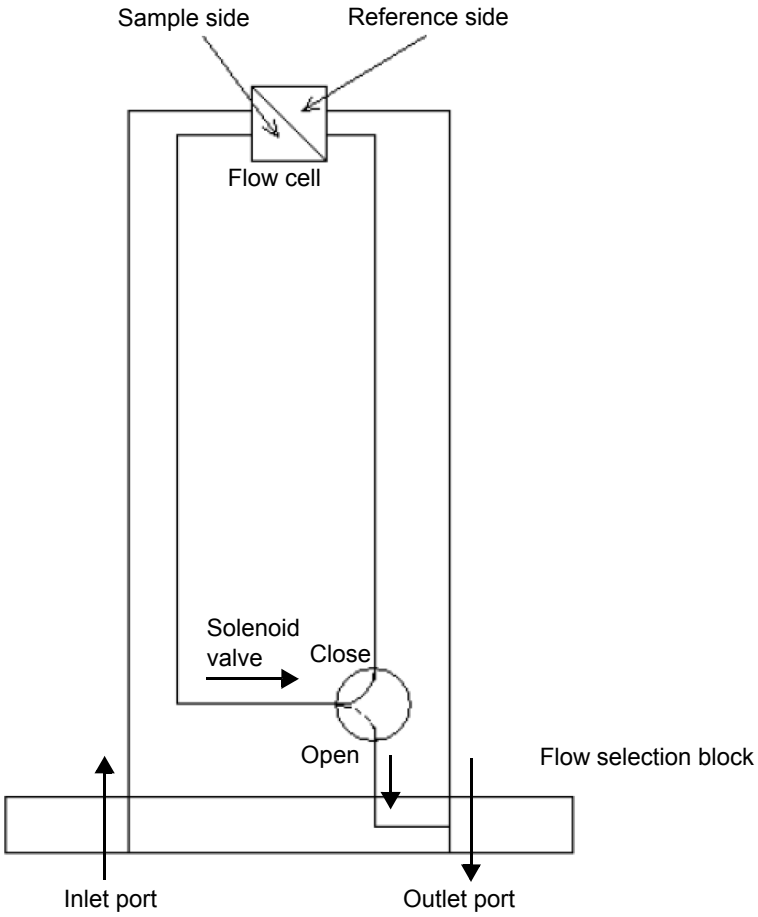


Fig.1.9

■ Cleaning

When cleaning the flow line, turn the solenoid valve ON to switch to the "fluid replacement flow line" and clean the entire flow line.

☞ "8.2 Cleaning Flow Line" P.135

1.4 Component Parts

This instrument consists of the following parts: Check the parts against this list after unpacking.

Part Name	Part No.	Quantity	Remarks
Main unit RID-20A	–	1	–
Instruction manual	S228-90221	1	–
Power cord (for 100 V, 120 V)	S071-60821-08 S071-60831-01	1	100 V, 120 V
Power cord (for 220-240 V)	S071-60825-51	1	220-240 V
Signal cable	S228-39306-91	2	The signal cable is for INTEGRATOR and RECORDER.
Event cable	S228-28253-91	1	–
Optical cable	S070-92025-51	1	–
Syringe	S046-00017-01	1	–
Syringe adapter	S228-15672-91	1	–
Male nut PEEK	S228-18565	5	–
Coupling 1.6C-0.4	S228-16004-13	1	–
SUS tube (Outer diameter 1.6 mm × inner diameter 0.3 mm)	S228-34940-92	1	0.5 m, plumbing for the column to the inlet port
SUS tube (Outer diameter 1.6 mm × inner diameter 0.5 mm)	S228-34940-93	1	0.5 m, plumbing for the column to the inlet port
ETFE tube (Outer diameter 1.6 mm × inner diameter 0.3 mm)	S228-18495-06	1	1 m, plumbing for outlet port
ETFE tube (Outer diameter 1.6 mm × inner diameter 0.5 mm)	S228-18495-04	1	1 m, plumbing for outlet port
ETFE tube (Outer diameter 1.6 mm × inner diameter 0.8 mm)	S228-18495-01	1	1 m, plumbing for outlet port
ETFE tubing, (Outer diameter 1.6 mm × inner diameter 1.0 mm)	S228-18495-03	1	2 m, plumbing for outlet port
Drain OUT	S228-42205	1	Leakage drain plumbing
Drain CTO	S228-42206	1	Leakage drain plumbing
Straight tubing connector	S228-28163	1	Leakage drain plumbing
Drain adapter	S228-42204	1	Leakage drain plumbing
Silicone tubing	S228-25162-03	1	1 m, leakage drain plumbing
Lock catch	S037-60177-05	1	Clip with adhesive seal for securing tubing

1.5 Optional Parts

Part Name	Part No.	Remarks
Relief valve	S228-33615-91	Relieves the pressure when an excessive back pressure is applied to the detector in order to prevent damage to the solenoid valve and flow cell.
Flow selection block	S228-34102-94	An optional part used to switch the flow line inside of the detector for large volume flow. Measurement at maximum 150 mL/min can be carried out using this option. This is used in the large-scale preparative isolation mode or parallel flow mode. Shimadzu service personnel will install it.
Solvent recycling valve kit (for RID)	S228-45080-42	For recycling the mobile phase solvent. Operate via this instrument.

2

Parts Identification and Function

Contents

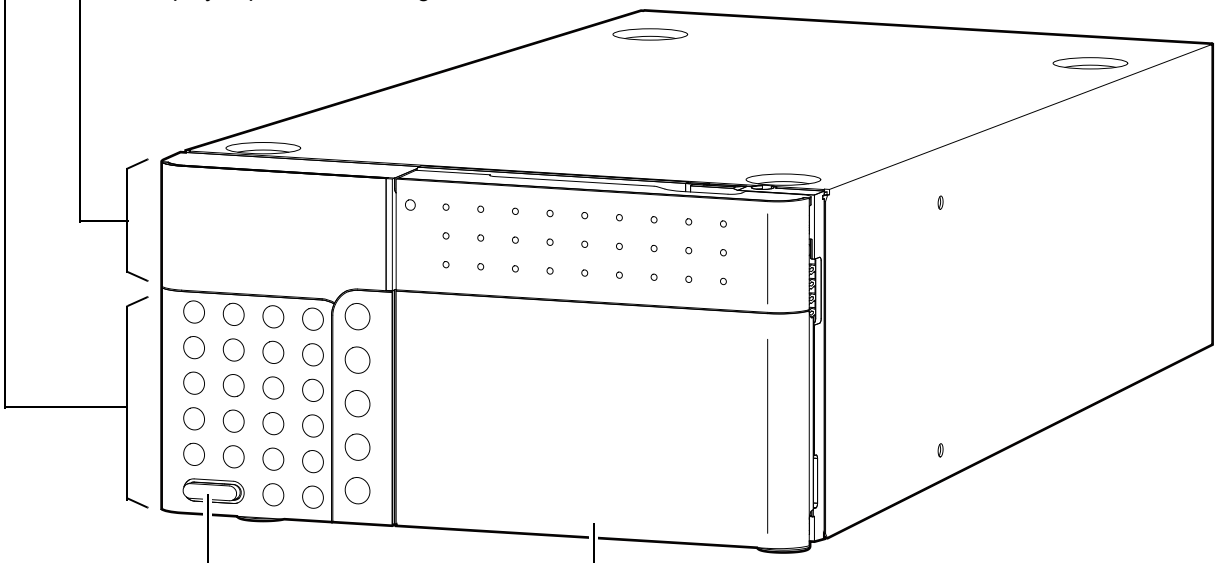
2.1 Front View

Keypad

To operate and configure settings.
Press (⁞⁞) to show the operation keys.

Display panel

Comprises the display screen and LED indicators, and displays operational settings.

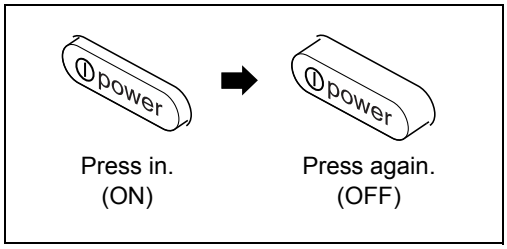


Front cover

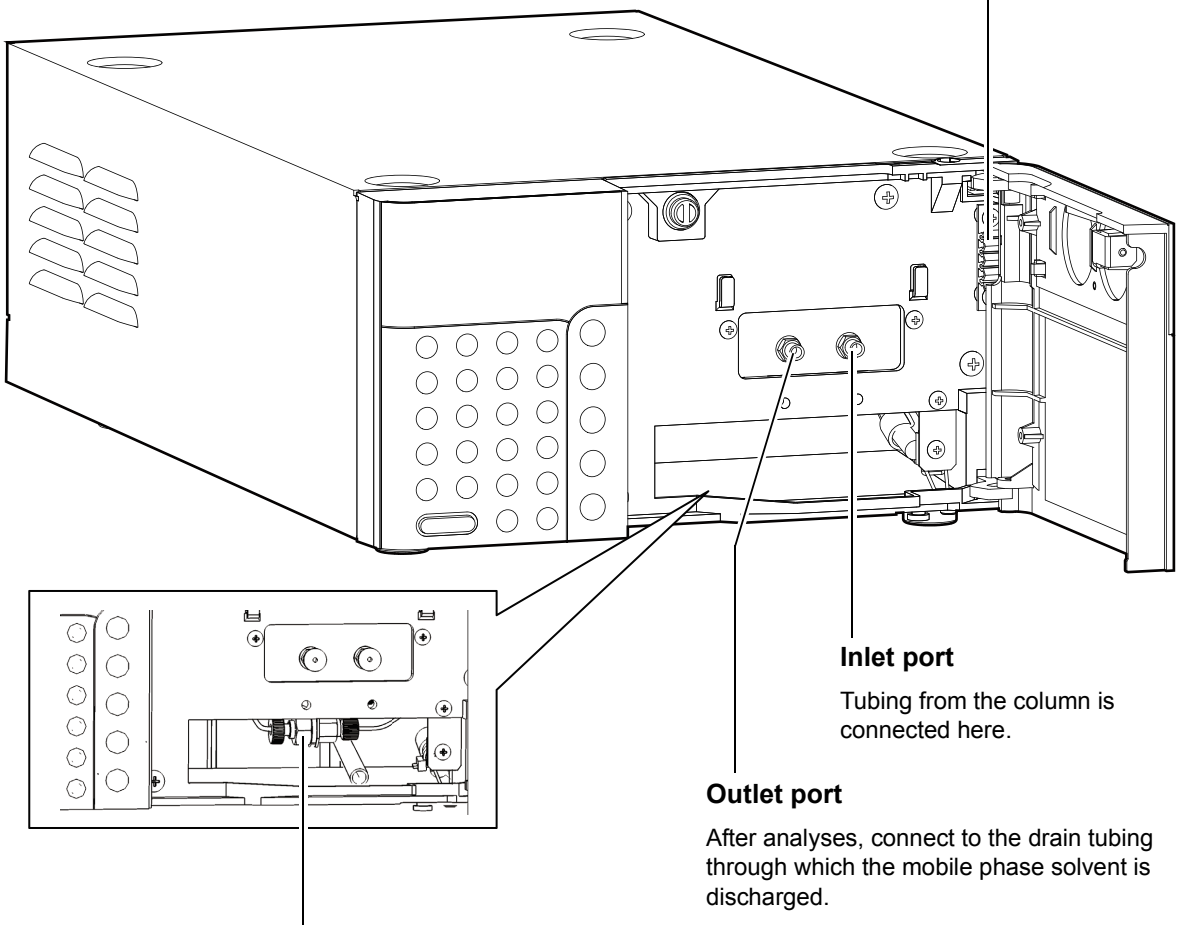
Open the cover to attach tubing.
Must be closed during analysis.

Power switch

To switch the power ON/OFF.
Press the switch in to turn the power ON. Press again to turn the power OFF.



2.2 Top, Left Side, Behind Front Cover



Tubing clamp

Secures the tubing that is fitted to the flow cell.

Inlet port

Tubing from the column is connected here.

Outlet port

After analyses, connect to the drain tubing through which the mobile phase solvent is discharged.

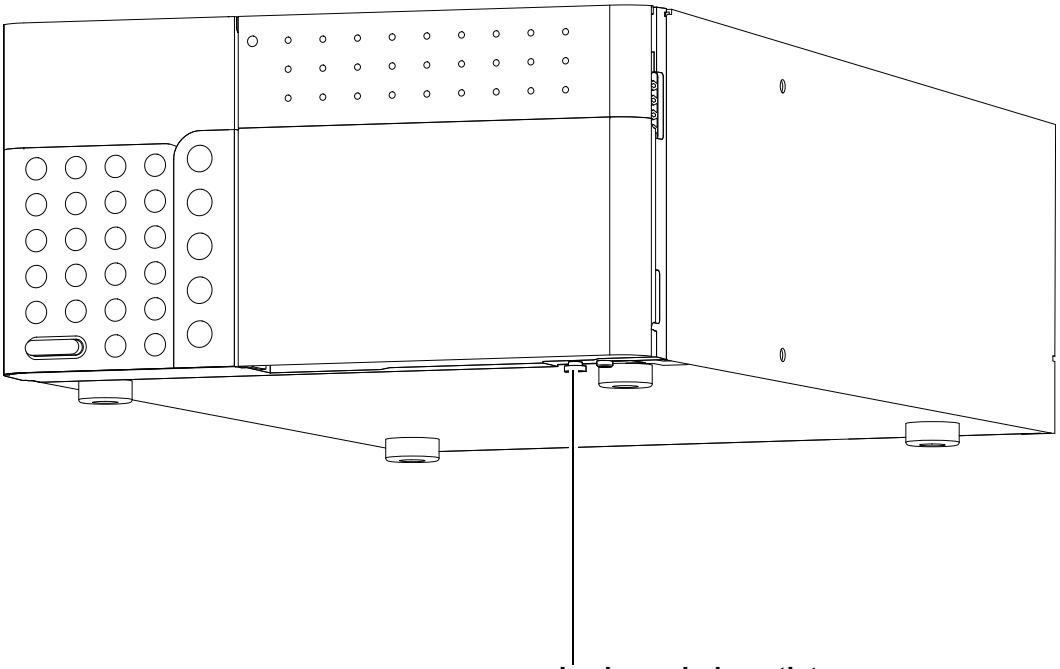
Pressure fuse

When an excessive back pressure is applied to the instrument, the pressure fuse tubing comes off to release back pressure and protect the instrument.

⚠CAUTION

Disconnected pressure fuse tubing can only be reconnected by Shimadzu service personnel. Contact your Shimadzu representative.

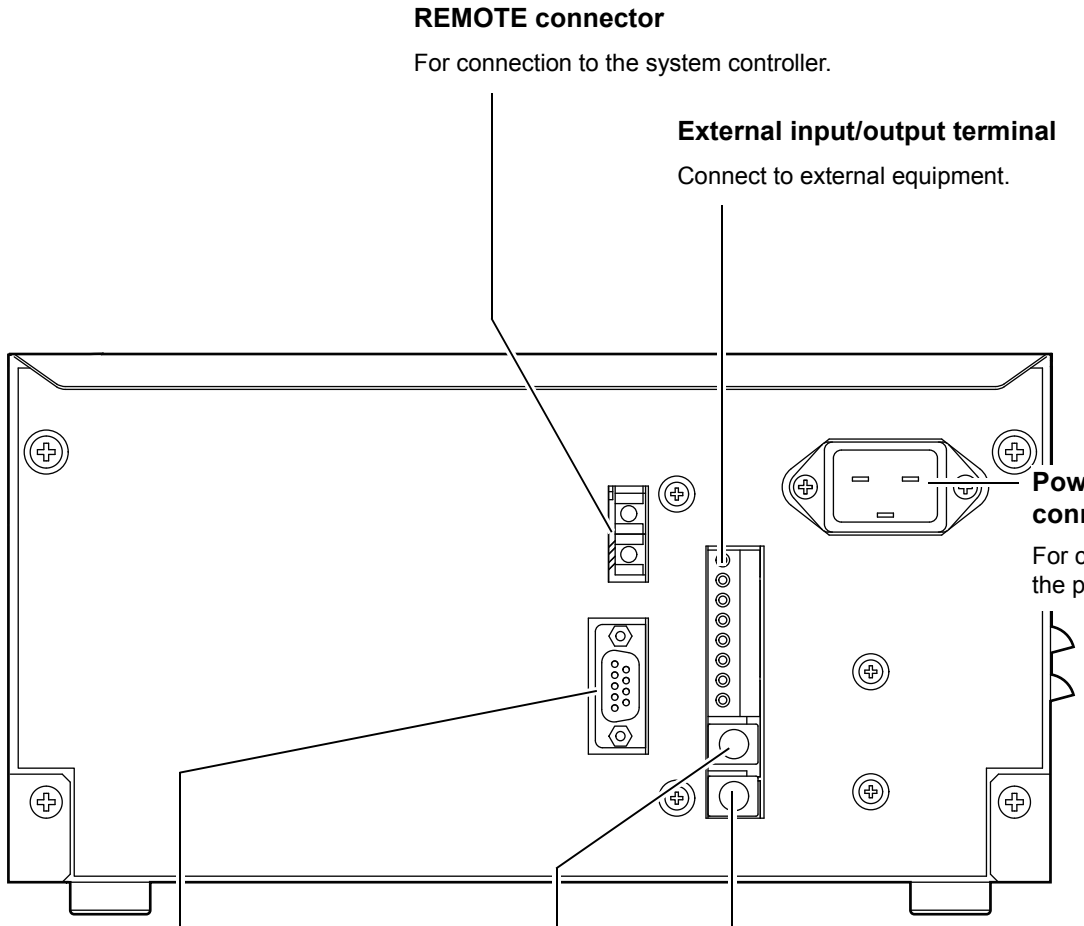
2.3 Right Side and Base Panel



Leakage drain outlet

Liquid which is discharged from the drain outlet is led to the unit of LC-20A / LC-30A series that is installed under this instrument.

2.4 Rear View



⚠WARNING

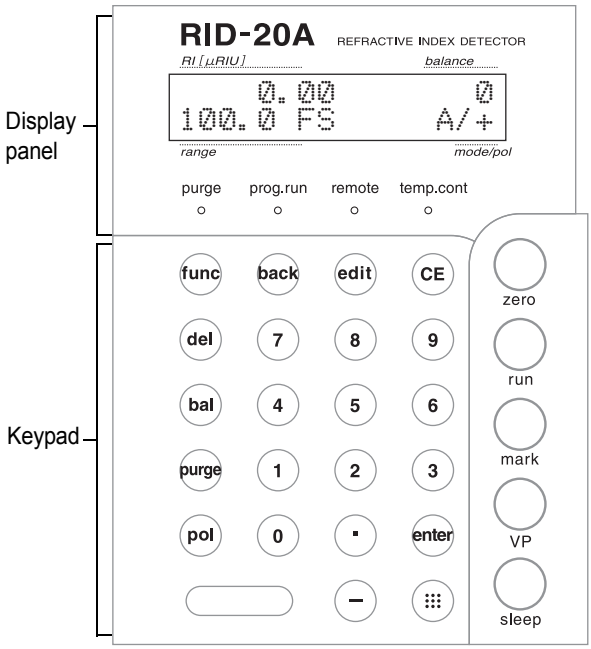
The fuse is mounted inside. For replacement, contact your Shimadzu representative.

2.5 Names and Functions of Displays and Keypad

This instrument is controlled through the keypad.
The display allows verification of the instrument status.

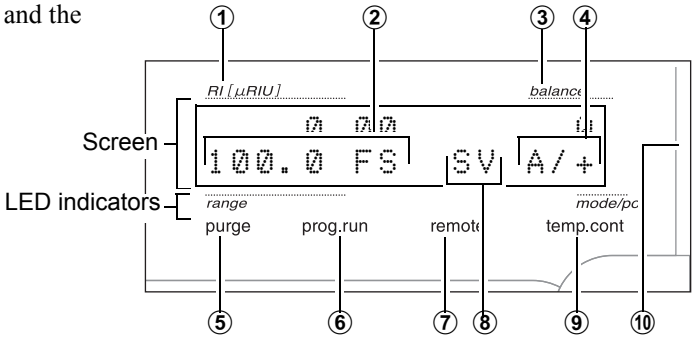
NOTE

The display panel may become hot when in use.



2.5.1 Display Panel

The display panel consists of a display screen and LED indicators. Names and functions of the display screen and the indicators are given below.

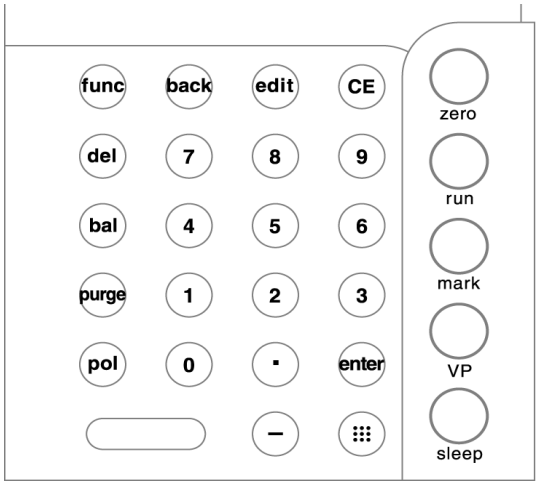


No.	Display or Indicator	Function
①	Refractive index value	Displays the refractive index value (unit: μRIU).
②	Output range	Displays full scale value (record range) (in μRIU/10 mV FS) of the measurement value that is output to the RECORDER connector. Can also display full scale value (in μRIU/V FS) of the measurement value that is output to INTEGRATOR terminals through the VP function. • "OVER" is displayed if the output of the RECORDER/INTGERATOR connector has exceeded the scale limit. • "SHORT" is displayed if [RANGE] of the PARAMETER group is set to 0 and the output of the RECORDER connector is set to 0 V.

No.	Display or Indicator	Function
③	Balance	Displays the light position on the photodiode. * "OVER" is displayed when the balance is disrupted due to drift or others. In this case, press the bal key to adjust the balance. * "OVER" may also be displayed when the peak of chromatogram is detected. This is not a problem, and the balance does not need to be adjusted.
④	Measurement mode/pol	Displays the measurement mode in use and the pol setting. In the reversed polarity mode, "-" is displayed. * If the light intensity (TOTAL EN) falls below 5500 or exceeds 9000, "EN.ALRM" is displayed in this field. ☞ "6.1 Troubleshooting and Corrective Actions" P.102
⑤	Purge lamp	Lights up when the flow line is switched to fluid replacement flow line (purge flow line). It will be off when the flow line is switched to the measurement flow line.
⑥	Time program lamp	Lights up when time program is being executed.
⑦	Remote mode lamp	Continue to light up while the instrument is controlled by the system controller.
⑧	Solvent recycling valve	"SV" is displayed when the solvent recycling valve is on (waste side). Nothing is displayed if the mobile phase is being recycled.
⑨	Optical system unit temperature control lamp	Lights up when the optical system unit temperature is being controlled. Blinks when the temperature is outside the ±0.1 °C of the set temperature.
⑩	Status indicator	Lights up green when the power is ON. Lights up red when an error occurs. Lights up orange in the sleep mode.

2.5.2 Keypad

The 27 keys on the front side are used to operate the instrument and set parameters. The keys are grouped into two categories as described below.



■ Keys Operable at Anytime

Key	Name	Function
⁞⁞	Display key	Press this key to show the operation keys.
zero	Zero key	Adjusts zero position of the baseline. The baseline of the integrator output and recorder output is returned to the zero position set in ITG OFS (☞P.60) and REC OFS (☞P.61) of the parameter setting group.
run	Run key	Starts or ends the time program.
mark	Marker key	Draws a mark on recorder chart paper. Has no effect on integrator output.
VP	VP key	Moves to the VP menu from the initial screen.
sleep	Sleep key	Enters the sleep mode (the illumination of the display screen and operation key is turned off, and the operation keys are deactivated). However, the measurement operation continues. Press the key again to exit the sleep mode.

■ Keys Operable by Pressing the Display Key ⁞⁞

Key	Name	Function
edit	Edit key	Moves to the edit screen of the time program edit mode from the initial screen.
bal	Balance key	Adjusts the balance.
pol	Polarity key	Switches the output polarity of the recorder. In the negative (-) polarity, "-" is displayed in the initial screen.
purge	Purge key	Used for fluid replacement or cleaning the flow line.
· to 9	Numeric keypad	Enters numeric values.
enter	Enter key	Validates entries.

Key	Name	Function
CE	Clear key	Used for the following cases: • Returns to the initial screen. • Cancels values input since (enter) was last pressed. • Clears the display and alarm in error display. * Critical errors caused by the instrument failure, etc. may not be cleared.
del	Delete key	Deletes an individual line of the time program displayed on the time program edit screen.
func	Function Key	Moves to the auxiliary function setting screen. Forwards the display item.
back	Back key	Reverses the display item.
—	Minus key	Enters a negative number.

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3

Preparation

Contents

3.1 Operating Precautions

■ Precautions before Operation

Pay attention to the following for stable measurement.

The refractive index of the solvent varies greatly by temperature, amount of air dissolved, pressure, etc. A change in temperature, amount of dissolved gas, and back pressure of the detector are detected as signal changes (drift, swell, or noise of baseline) of the differential refractive index detector. It is important to maintain a steady solvent condition using the following methods for stable analysis.

- Ensure the device is subject to minimal room temperature fluctuations.
- Degas the mobile phase to reduce the amount of dissolved gas.
- Increase the inner diameter of the piping in the outlet side of the detector to reduce back pressure.
- For a solvent, such as THF, the properties of which may change over time unless a stabilizing agent is present, use one that contains a stabilizing agent.

Also, consider the following for the installation location.

- There should be no vibration.
- Avoid direct sunlight.
- Air currents from heating or air conditioning equipment should not be directed at the instrument.

Type of Degassing Unit

The degassing unit is roughly divided into two types (see the table below). Since the hermetically sealing pressurized helium type is less affected by room temperature fluctuations, more stable measurement can be carried out in a high sensitivity analysis.

Type	Degassing unit model	Influence of room temperature fluctuation	Description
Hermetically sealing pressurized helium type	DGU-10B	Small	An He cylinder is required. The degassing capacity does not depend on the flow rate.
Membrane method	DGU-20A3R DGU-20A5R	Slightly large	The degassing capacity depends on the capacity of the degassing unit. * Cut the end of the suction tube included in the pump by approximately 10 cm and connect the degassing chambers in series using the ferrule and fitting included in the degassing unit to improve the degassing performance.

To avoid problems due to air bubbles

Pay attention to the following to avoid problems due to air bubbles.

- If the pump suctions air bubbles, lightly degas the solvent using an ultrasonic bath. If the problem recurs, the suction filter may be contaminated. In this case, clean with ultrasonic wave or replace the suction filter.
- If it is difficult to remove air bubbles from aqueous solvent, clean the flow line using a solvent with high interfacial wettability such as methanol and acetone.
- If air bubbles continue to appear when replacing water-based solvent with organic solvent or vice versa, degas a small amount of solvent to be replaced using an aspirator or other devices, and fill the flow line with the degassed solvent. Once the flow line is filled with solvent that is free from air bubbles, air bubbles are less likely to appear again.

Use a suitable flow rate that matches the outlet tubing so that the back pressure does not exceed the withstanding pressure for this instrument.

If the back pressure exceeds the withstanding pressure for this instrument, the solenoid valve or cell may be damaged. The following shows an example of combination between the flow rate and the outlet tubing when water (25 °C) is used in the mobile phase.

If this instrument is used at a high flow rate or there is a risk that the tubing is clogged, use a separately available relief valve (optional) in order to prevent the detector from being damaged by back pressure.

- If fluid is discharged to the waste bottle without connecting the fraction collector FRC-10A to the downstream of this instrument

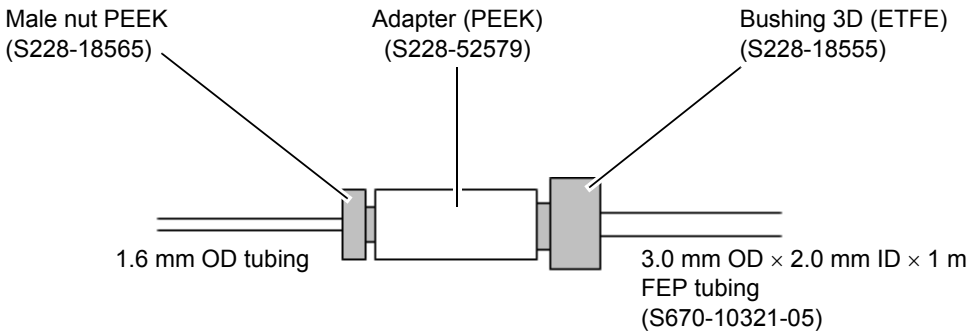
Flow Rate and Dimensions of Outlet Tubing (Inner Diameter × Length)

Flow rate	Without degassing	With degassing
Up to 1 mL/min	0.3 mm ID × 1 m	1.0 mm ID × 1 m
Up to 10 mL/min	0.5 mm ID × 1 m	
Up to 50 mL/min	0.8 mm ID × 1 m	
Up to 150 mL/min	1.0 mm ID × 1 m	

For the "Without degassing" method in the above table, tubing with a small inner diameter is used in the outlet, and minimal back pressure is applied, so that air bubbles will not form in the cell. Under this condition, the baseline tends to change by the change by according to dissolved gas or back pressure. Therefore, it is recommended that the degassing unit be used to reduce the amount of dissolved gas and that the outlet piping be changed to that which does not generate back pressure, as shown in the "With degassing" method. In particular, degassing is necessity for general analysis to be carried out at 3 mL/min or less.

To extend the outlet tubing:

- When the flow rate is less than 20 mL/min, use 1.0 mm ID × 1 m long tubing.
- When the flow rate is 20 mL/min or more, connect 3.0 mm OD × 2.0 mm ID × 1 m long tubing via a conversion adapter (see the figure below).



- If the fraction collector FRC-10A is connected to the downstream of this instrument

  When Fraction collector FRC-10A is used, directly connect its inlet tube to the outlet port of this instrument. The maximum flow rate varies depending on the preparative isolation head of the FRC-10A or type of tubing.

  To reduce diffusion in the peak, the capacity of the tubing that connects this instrument to the nozzle tip of the fraction collector must be minimized. Cut the piping as necessary.

Types of Fraction Collector Head and Maximum Flow Rates in RID (Inner Diameter × Length)

Fraction collector head Type	Fraction collector head without valve (No valve due to preparative isolation of minute amounts)	Fraction collector head with valve		
		When changing the piping for low flow-rate	Standard condition	At large flow rate
FRC inlet piping (RID to FRC)	0.3 mm ID × 1 m	0.3 mm ID × 1 m	0.8 mm ID × 1 m	1.0 mm ID × 1 m
FRC outlet tubing (FRC to drain)	None	A 1.6 mm OD × 1.0 mm ID tube that is connected to the FRC valve outlet is converted into a 3.0 mm OD × 2.0 mm ID tube on the other end.		
Maximum allowable flow rate	1 mL/min	1 mL/min	50 mL/min	150 mL/min

If another manufacturer's fraction collector is used, make sure that the back pressure that is applied by the connection of the fraction collector does not exceed the withstanding pressure of the detector.

In such cases, in addition to the resistance in the flow line of the fraction collector, the pressure fluctuation that occurs when the preparative isolation valve is switched must also be considered.

■ Precautions during Operation

Always close the front cover during measurement.

Opening or closing the front cover during analysis will cause the baseline to fluctuate. The noise or drift level may increase if the front cover is open.

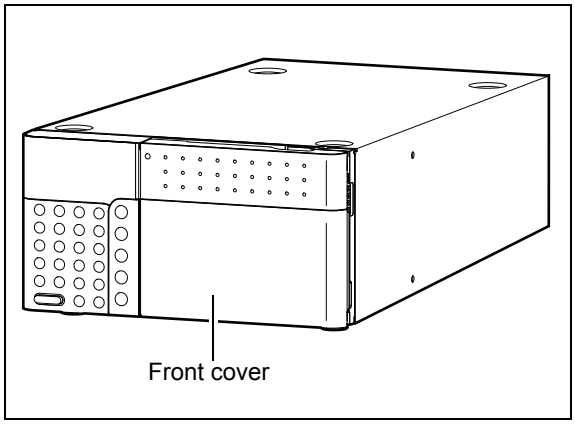


Fig. 3.1

When replacing the fluid in L mode, set the flow rate of the pump to 1 mL/min.

If you press (purge) to change to the fluid replacement flow line when a large volume of solution is pumped in L mode, the solenoid valve and flow cell may be damaged. In order to prevent this problem, the following message appears when you press (purge) in L mode.

```
CHECK FLOW
Check and Enter
```

After changing the pump flow rate to 1 mL/min, press (enter).

■ Precautions after Operation

Dusty or clogged flow cells are the most frequent cause of problems in this instrument.

- After analyzing a highly concentrated sample, flush the flow cell thoroughly, using plenty of mobile phase.
- When a buffer solution is used as the mobile phase, turn the solenoid valve ON and OFF several times after completing analysis, and fill the sample side and reference side flow lines with water. Buffer solutions crystallize upon evaporation, and can cloud the flow cell or clog the flow line. Also, the crystal damages the seal portion of the solenoid valve, and causes failure.

3.2 Turning Power ON/OFF

1 Press the power switch ON.
The power is turned on.
Press the switch again to turn OFF the power.

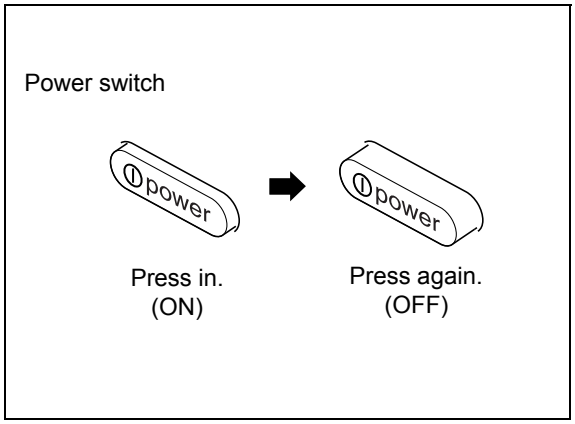
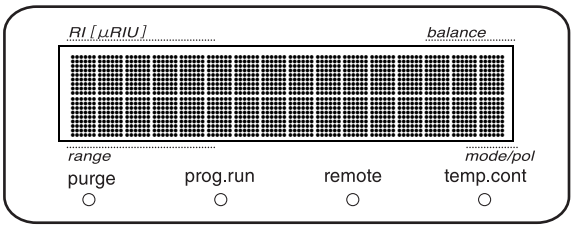
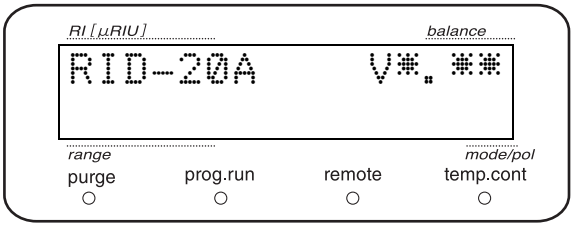


Fig. 3.2

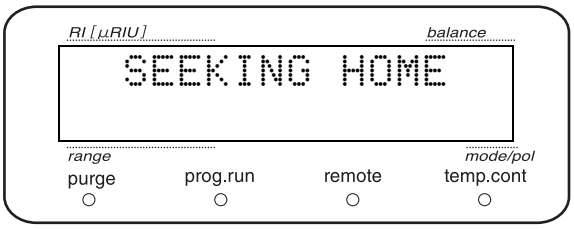
2 Turning the power switch ON will turn on all LED indicators, and the screen on the right is displayed.



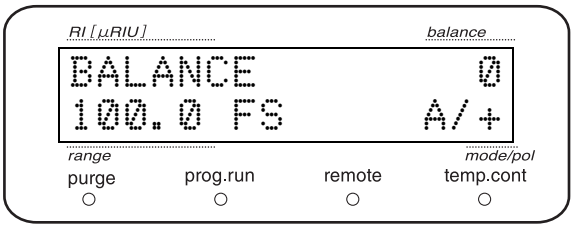
3 The memory portion is checked automatically, and the control program version is displayed.
[V*.* *] in the example screens below represents the ROM version.



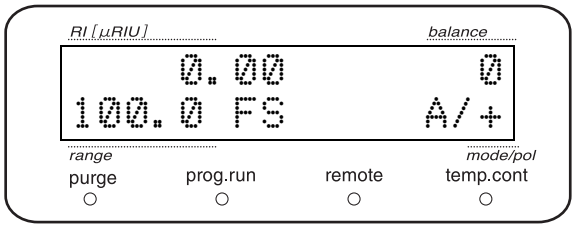
4 Drive the zero glass motor to move the zero glass to the home position.



5 After the zero glass is moved to the home position, adjust the optical balance.



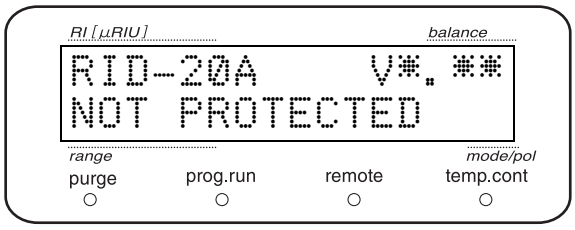
6 If no error is detected, the initial screen is displayed.



■ Example of Error Message

If an alarm sounds and the "NOT PROTECTED" message is displayed on the screen:

Press **CE** to clear the alarm. When this message is displayed, the time program, along with [RESPONSE] and certain other parameters, will be initialized (replaced with default values).



If any other error message is displayed:

☞ "6.2 Measures against Error Messages" P.104

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4

Basic Operation

Contents

4.1 Setting the Measurement Mode

There are the following three measurement modes in this instrument. By using the measurement modes, this instrument can be adaptive to various samples and analytical purposes.

Measurement mode	Function	Measurement range [μRIU]	Max. flow rate [mL/min]
High sensitivity analysis (A mode)	Used for a standard analysis.	500 max.	20
Semi preparative isolation (P mode)	Used for analysis of high concentration samples. Can analyze samples concentrated 10 times higher than that in A mode.	5000 max.	20
Large-scale preparative isolation (L mode, Only when the optional instrument is installed)	Used for analysis of high flow-rate or high concentration samples. This mode is only available when the optional flow selection block is installed. Although the measurement range is the same as that in P mode, fluid can be pumped at 150 mL/min.	5000 max.	150

NOTE

Although the measurement range can be extended in P mode and L mode, the baseline noise level increases.

⚠CAUTION

- When measuring in L mode, always install the optional flow selection block, and switch the tubing.

  If measurement is carried out in L mode without installing the flow selection block, the solenoid valve or cell may be damaged.

☞ "Connecting the Tubing" P.33

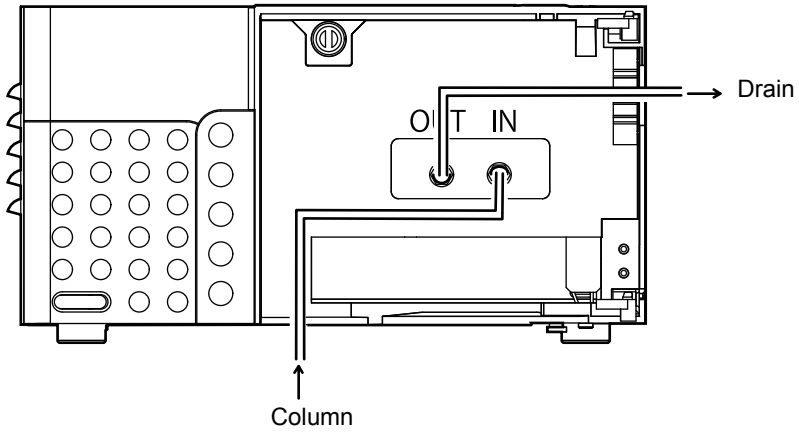
4.1.1 Connecting the Tubing

Connect the tubing according to the measurement mode, referring to the figure.

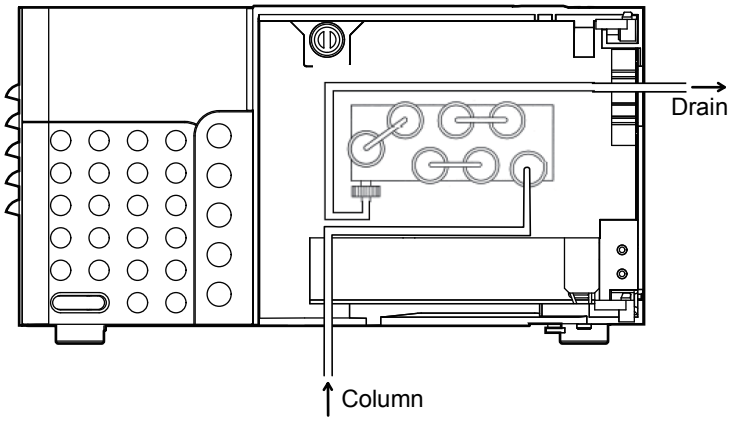
NOTE

- Connect the tubing according to the measurement mode. Otherwise, the analysis may not be carried out accurately.

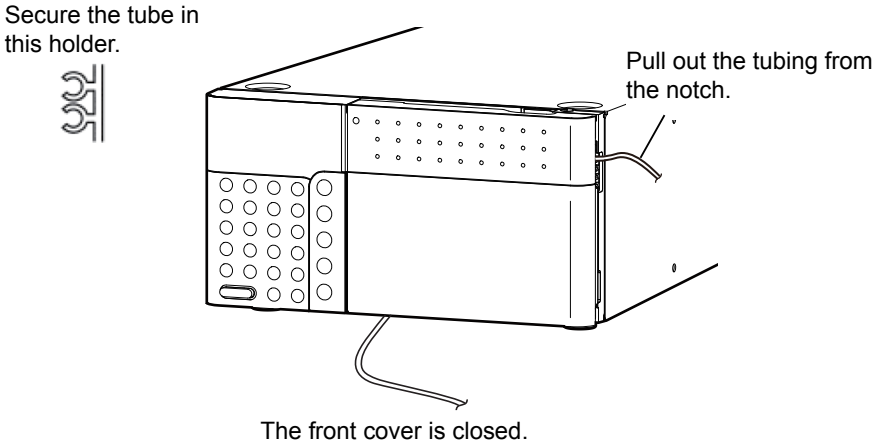
A mode, P mode



L mode



Secure the tubing in the tube holder, and keep the front cover closed during analysis.

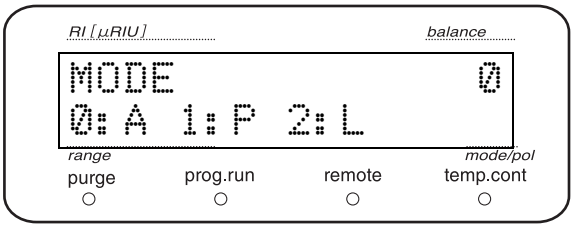


4.1.2 Setting the Measurement Mode

Set the measurement mode as follows:

1 Press **func** to open the [MODE] setting screen in the [PARAMETER] menu, and set the mode.

* If the measurement mode is changed, the optical balance is adjusted automatically.

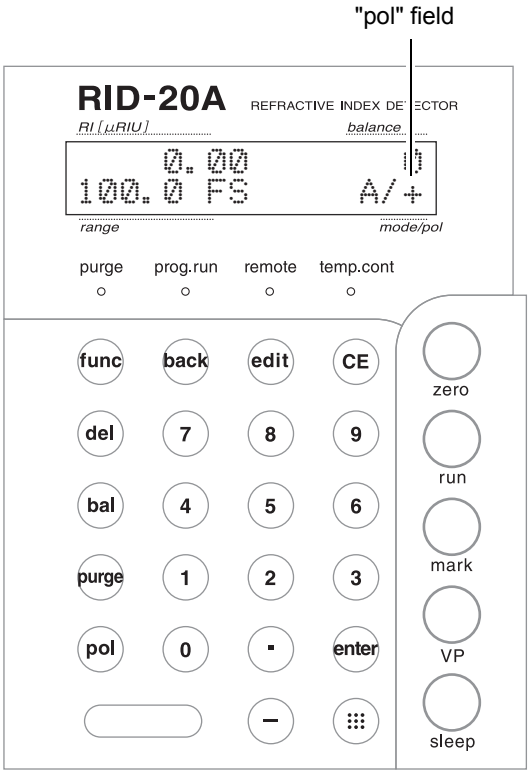


Set value	Measurement mode
0	A mode
1	P mode
2	L mode (only when the optional instrument is installed)

4.2 Setting the Polarity (pol)

When analyzing a sample which exhibits lower refractive index in the sample side than that of the reference side, the peak is output in the negative side in the measurement result. In this case, switch the polarity so that the peak is output in the positive side. In the negative (-) polarity, "-" is displayed in the "pol" field of the initial screen.

1 Press **pol**.
The polarity is switched and "-" is displayed in the "pol" field.
* Press **pol** again to switch back the polarity, and "+" is displayed in the "pol" field.



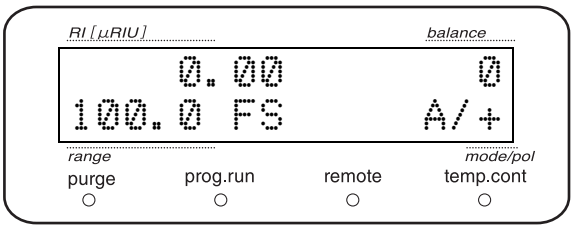
4.3 Setting the Temperature of the Measuring Section

Set the temperature of the measuring section.

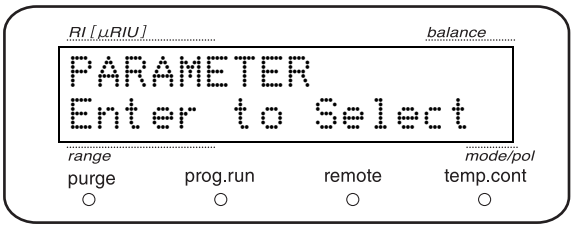
NOTE

- When the flow rate is 3 mL/min or more, turn OFF the temperature control.
- Set the temperature to room temperature +12 °C or more.

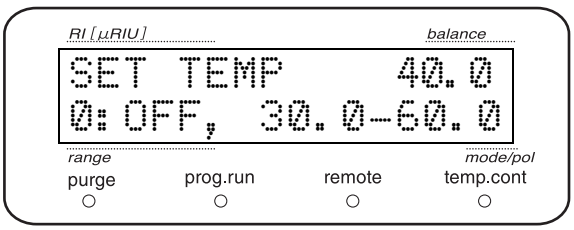
1 Press **CE**.
Initial screen is displayed.



2 Press **func**.
"PARAMETER" is displayed.



3 Press **enter** to enter the [PARAMETER] menu.
Press **func** repeatedly until "SET TEMP" is displayed.



4 Enter a set value using the numeric keypad and press **enter**. This completes the temperature setting.

* The current temperature setting can be checked on the [ACT TEMP] screen of the MONITER group.

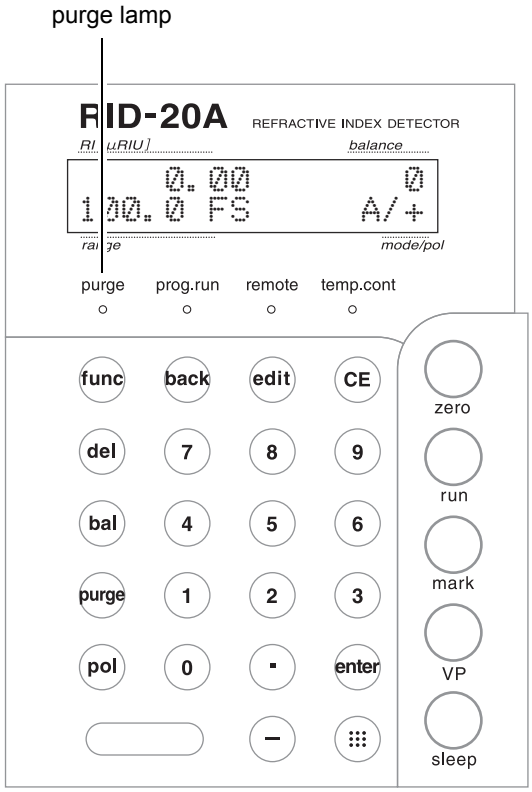
4.4 Replacing the Fluid (Purge)

Prior to analysis, fill the flow line of this instrument with mobile phase. Pump the fluid at 1 mL/min.
There are two methods of fluid replacement. One is to use the operation keys in the front face of the instrument, and other is to use the autopurge function.

☞ "1.3.2 Flow Line" P.7

4.4.1 Using the Operation Key

1 Press **purge**.
The solenoid valve turns ON, and the flow line is switched to the fluid replacement flow line. During the purge, the purge lamp lights up. Pump the fluid for about 20 minutes in this condition, to replace the fluid in the reference cell.



NOTE

During the fluid replacement, press **purge** several times to turn ON/OFF the solenoid valve, to remove air bubbles in the cell. This will also help to effectively replace the old mobile phase accumulated in the solenoid valve.

⚠CAUTION

If you press **purge** to change to the fluid replacement flow line when a large volume of solution is pumped in L mode, the solenoid valve and flow cell may be damaged. In order to prevent this problem, the following message appears when you press **purge** in L mode.

```
CHECK FLOW
Check and Enter
```

After changing the pump flow rate to 1 mL/min, press **enter**.

2 After the fluid replacement is complete, press (**purge**). The solenoid valve turns OFF, and the flow line is switched to the measurement flow line. The purge lamp goes off.

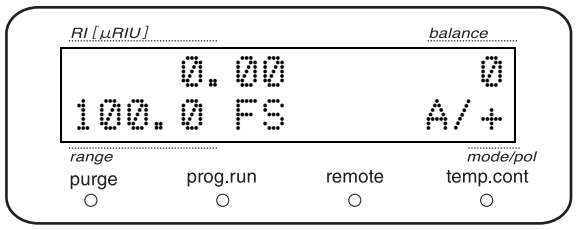
NOTE

If the flow line is not filled with mobile phase completely, the drift becomes large, and longer time is required until the baseline is stabilized.

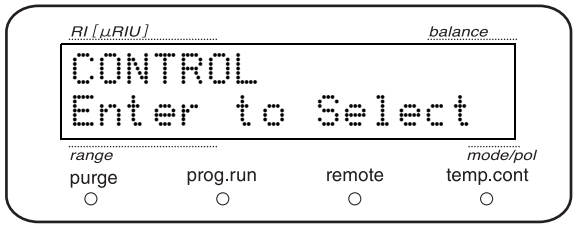
4.4.2 How to Carry Out the Autopurge

The autopurge replaces fluid while opening/closing the solenoid valve.
Purging is performed for 20 minutes while the solenoid valve is turned ON/OFF 30 times every five seconds.* T3
Then the solenoid valve is turned OFF and the balance is adjusted automatically.
* The duration of purge can be changed.

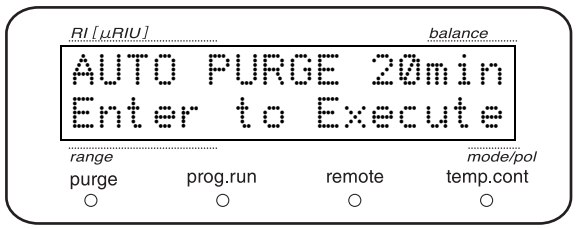
1 Press (**CE**).
Initial screen is displayed.



2 Press (**func**) twice.
"CONTROL" is displayed.



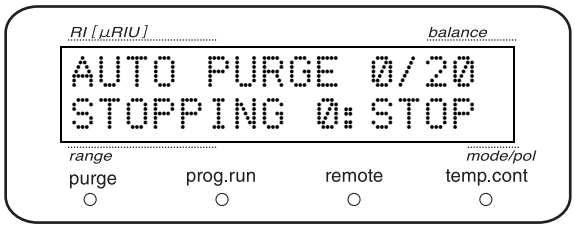
3 Press (**enter**).
"AUTO PURGE" is displayed.



4 Press (**enter**) to start the autopurge.

■ To Stop the Autopurge

1 While the autopurge is running, enter (0) and press (enter).
"STOPPING" is displayed.



4.5 Adjusting the Balance

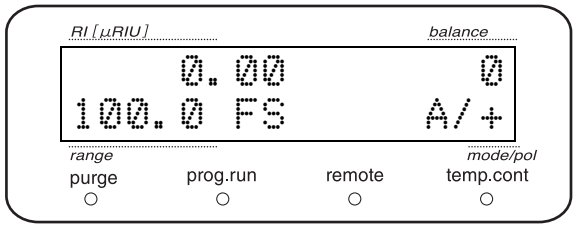
Adjust the position so that the light emitted from the flow cell forms an image in an appropriate location of the photodiode.

☞ "1.3.1 Measurement Principle" P.3

NOTE

Make sure the flow cell is free from air bubbles.

1 Press **bal**.
The position is adjusted so that the light image comes to an appropriate position on the photodiode.



NOTE

If balance adjustment has failed, "OVER" is displayed in the "balance" field. Air bubbles in the flow cell or insufficient purge may be the cause. After carrying out the purge sufficiently, adjust the balance again.

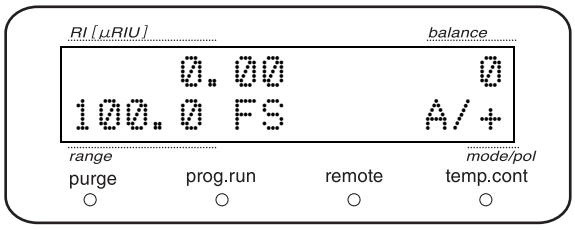
4.6 Setting the Analog Output Terminal

This instrument has two signal output connectors, INTEGRATOR connector and RECORDER connector. A Chromatopac or variable range recorder can be connected to either of the two connectors, however, a Chromatopac should normally be connected to the INTEGRATOR connector. On the other hand, a fixed range recorder is connected to the RECORDER connector.

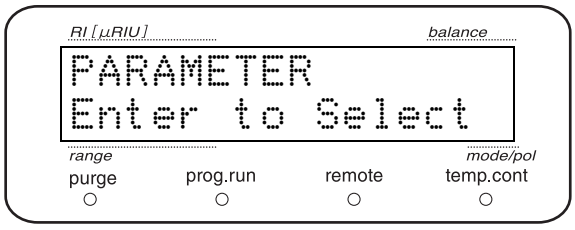
4.6.1 Adjusting the Zero Position of the Recorder

To use a recorder, the zero position must be adjusted before measurement.
Connect the recorder to the RECORDER connector, and adjust as follows:

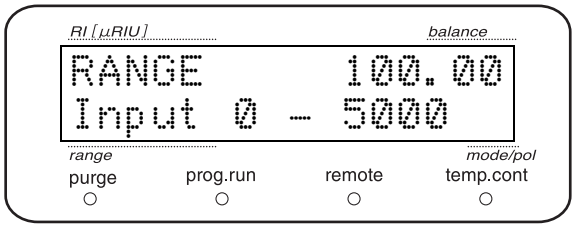
1 Press (CE).
Initial screen is displayed.



2 Press (func).
"PARAMETER" is displayed.



3 Press (enter) to enter the [PARAMETER] menu.
Press (func) repeatedly until "RANGE" is displayed.



4 Enter (0) and press (enter).
The output range of the RECORDER connector is set to "0", and 0 V is output to the RECORDER connector.

5 Using the recorder's pen position adjusting knob, move the pen to the desired 0 or baseline level.

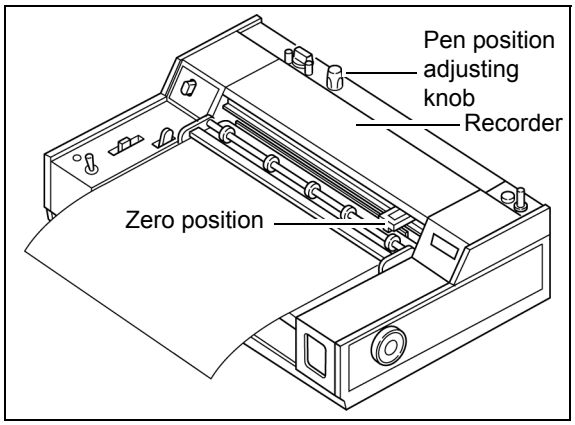
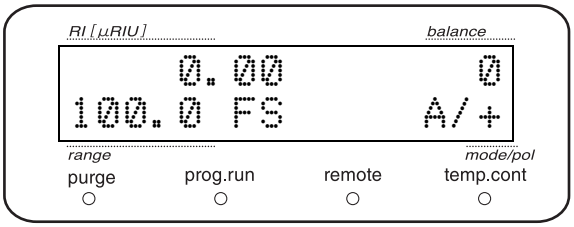


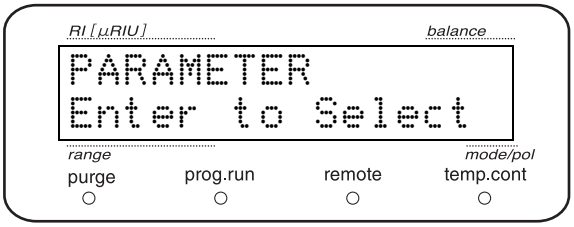
Fig. 4.1

To offset the baseline from the adjusted position, carry out steps 1 to 4 below.

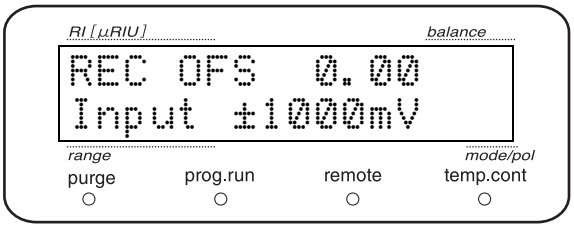
1 Press **CE**.
Initial screen is displayed.



2 Press **func**.
"PARAMETER" is displayed.



3 Press **enter** to enter the PARAMETER group. Press **func** repeatedly until "REC OFS" is displayed.



4 Enter a set value using the numeric keypad and press **enter**.

Pressing **enter** will restore the baseline that was set in step 4.

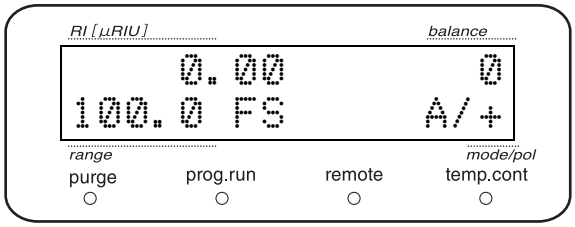
4.6.2 Setting the Output Range

Set the output range of the RECORDER connector.

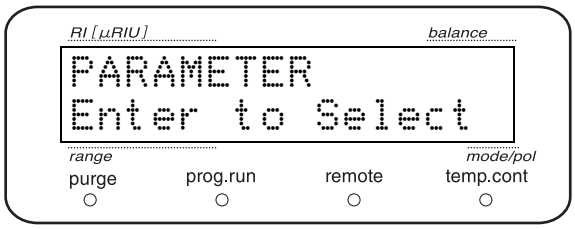
■ When a Recorder is Used

The output range is set at about 120 % of the expected peak height. This will produce a chromatogram with peak height of about 80 % of the recorder's full scale.

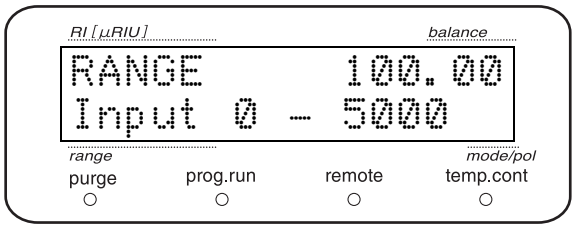
1 Press **CE**.
Initial screen is displayed.



2 Press **func**.
"PARAMETER" is displayed.



3 Press **func** repeatedly until "RANGE" is displayed.



4 Enter a set value from the numeric keyboard and press **enter**.
(Unit μRIU/10mV F.S.)

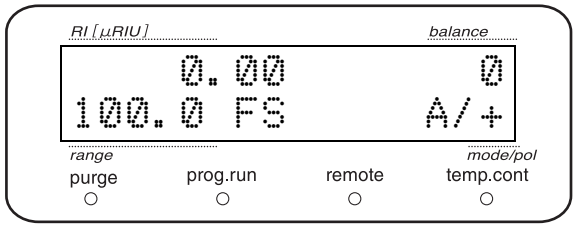
■ When a Chromatopac is Used

Connect a Chromatopac to the INTEGRATOR connector.

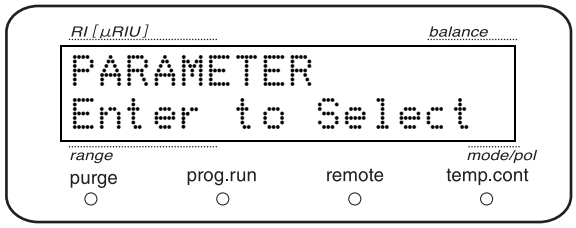
The output range using a Chromatopac is generally set in [ATTEN] of the Chromatopac. It is necessary to make approximate range setting on the detector, since the detector's dynamic range is extremely wide.

Perform this setting in the [AUX RANGE] screen.

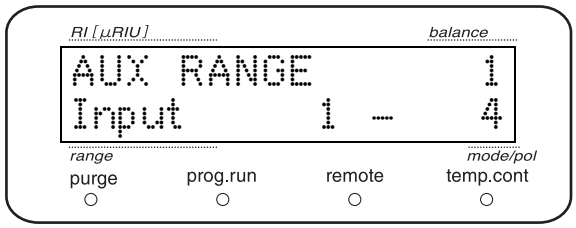
1 Press **CE**.
Initial screen is displayed.



2 Press **func**.
"PARAMETER" is displayed.



3 Press **enter** to enter the PARAMETER group. Press **func** repeatedly until "AUX RANGE" is displayed.



4 Enter a set value using the numeric keypad and press **enter**.

The relationship between the values set for AUX RANGE and the INTEGRATOR terminal output is shown in the table below.

AUX RANGE set value	INTEGRATOR terminal output [μRIU/1V F.S.]
1	100
2	1000
3	10000
4	250

The following table shows the full scale of Chromatopac plotting calculated from the AUX RANGE value and the ATTEN value of Chromatopac (in μRIU).

	AUX RANGE			
ATTEN	1	2	3	4
0	0.1	1	10	0.25
1	0.2	2	20	0.5
2	0.4	4	40	1
3	0.8	8	80	2
4	1.6	16	160	4
5	3.2	32	320	8
6	6.4	64	640	16
7	12.8	128	1280	32
8	25.6	256	2560	64
9	51.2	512	5120	128
10	102.4	1024	10240	256

Example: The full-scale of plotting is 128 μRIU when AUX RANGE = 2, and Chromatopac ATTEN = 7.

4.6.3 Setting Response

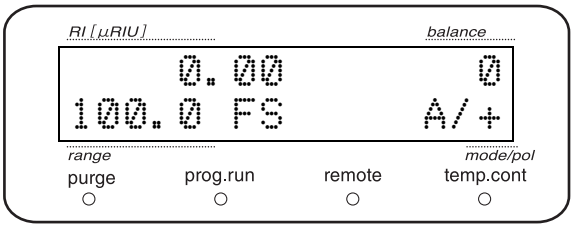
This instrument uses a digital noise filter to improve the signal-to-noise (S/N) ratio. Reducing the response value of the digital noise filter improves responsiveness. However, the noise level increases. Increasing the response value decreases responsiveness. However, the noise level decreases.

The response of this instrument can be set to 11 levels from "0" to "10".

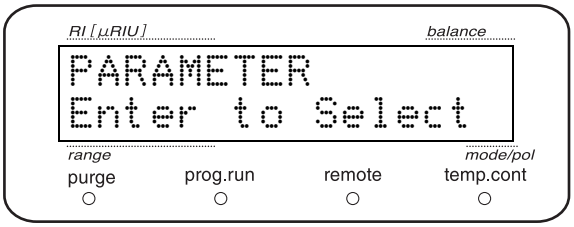
The response values and the corresponding time constants for an analog filter are shown in the table below.

Response set value	Time constant of the corresponding analog CR filter	Minimum peak width at half-height
0	No filtering	0.08 sec min.
1	0.05 sec	0.2 sec min.
2	0.1 sec	0.4 sec min.
3	0.5 sec (FAST)	2.2 sec min.
4	1.0 sec	4.8 sec min.
5	1.5 sec (STD)	7.2 sec min.
6	3.0 sec (SLOW)	13 sec min.
7	6.0 sec	26 sec min.
8	8.0 sec	36 sec min.
9	10.0 sec	45 sec min.
10	2.0 sec	9 sec min.

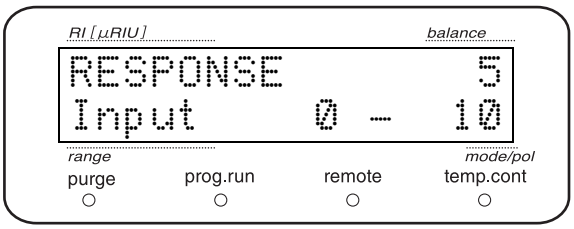
1 Press **CE**.
Initial screen is displayed.



2 Press **func**.
"PARAMETER" is displayed.



3 Press **enter**.
"RESPONSE" is displayed.



4 Enter a set value using the numeric keypad and press **enter**.

5

Application Operation

Contents

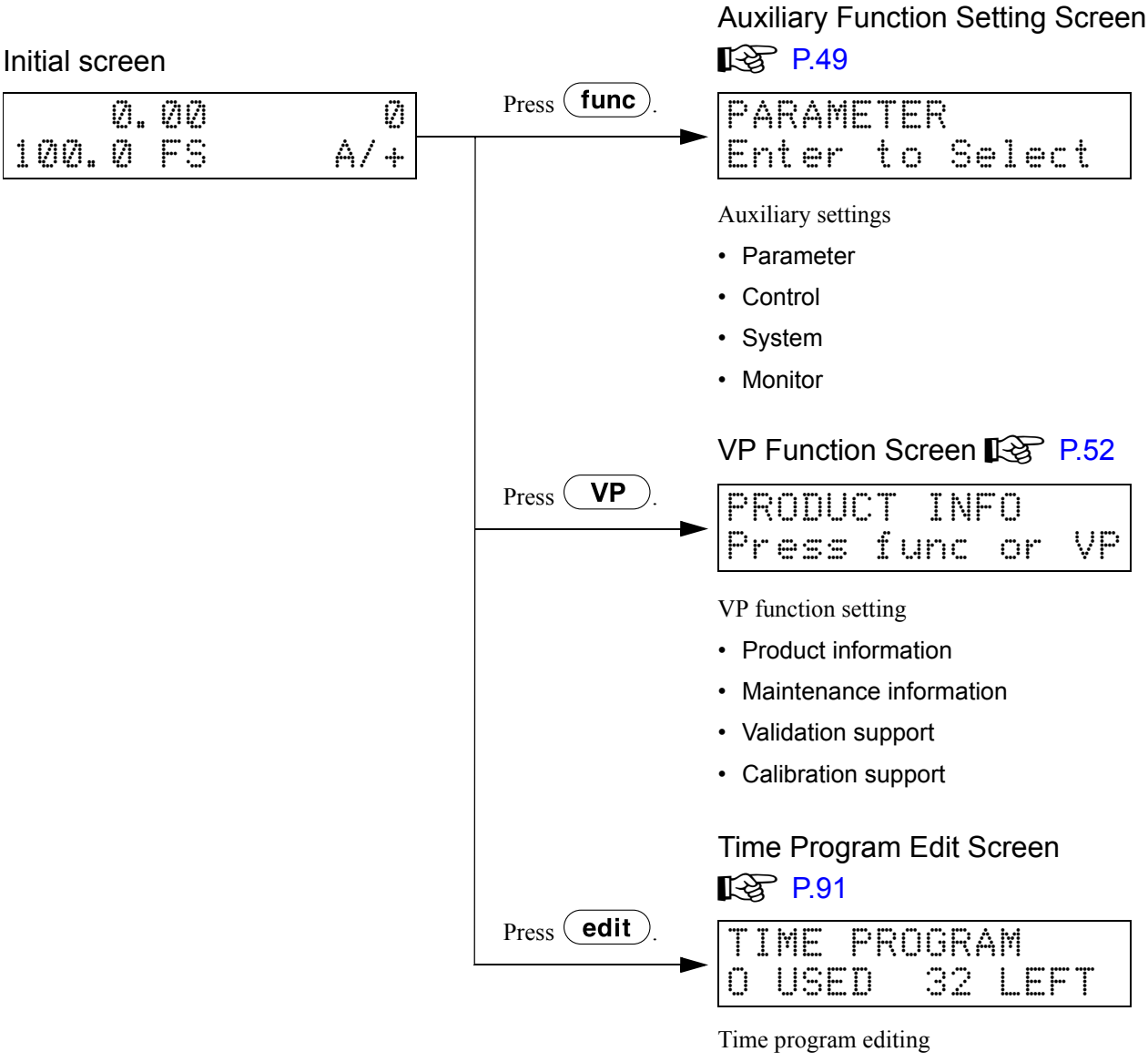
5.1 Types and Explanations of Display Screens

5.1.1 Types of Display Screens

Turn the power ON to display the initial screen.

Pressing (func), (VP), and (edit) on the initial screen displays the following three types of screens, respectively.

- Auxiliary Function Setting Screen
- VP Function Screen
- Time Program Edit Screen



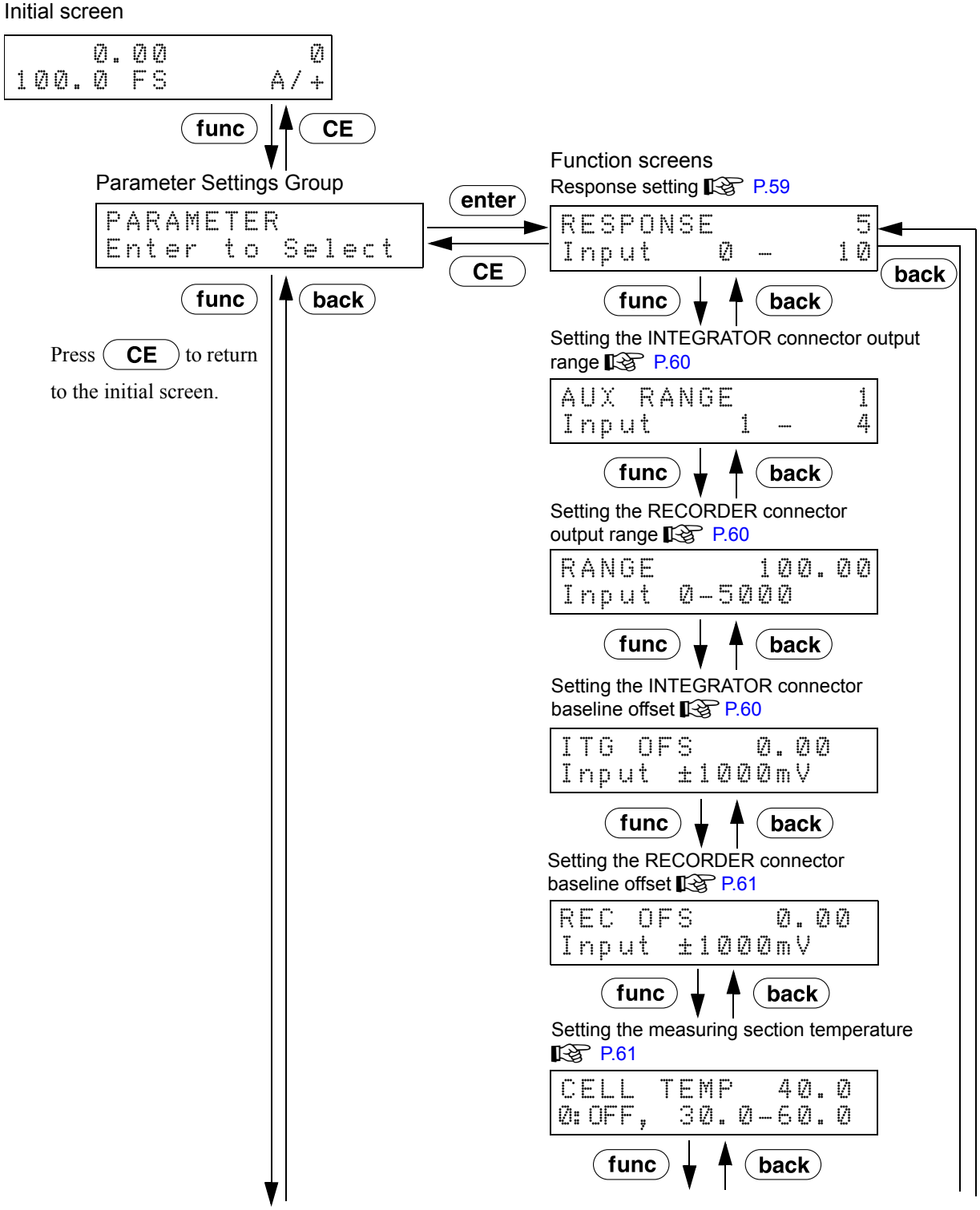
5.1.2 Auxiliary Function Setting Screen

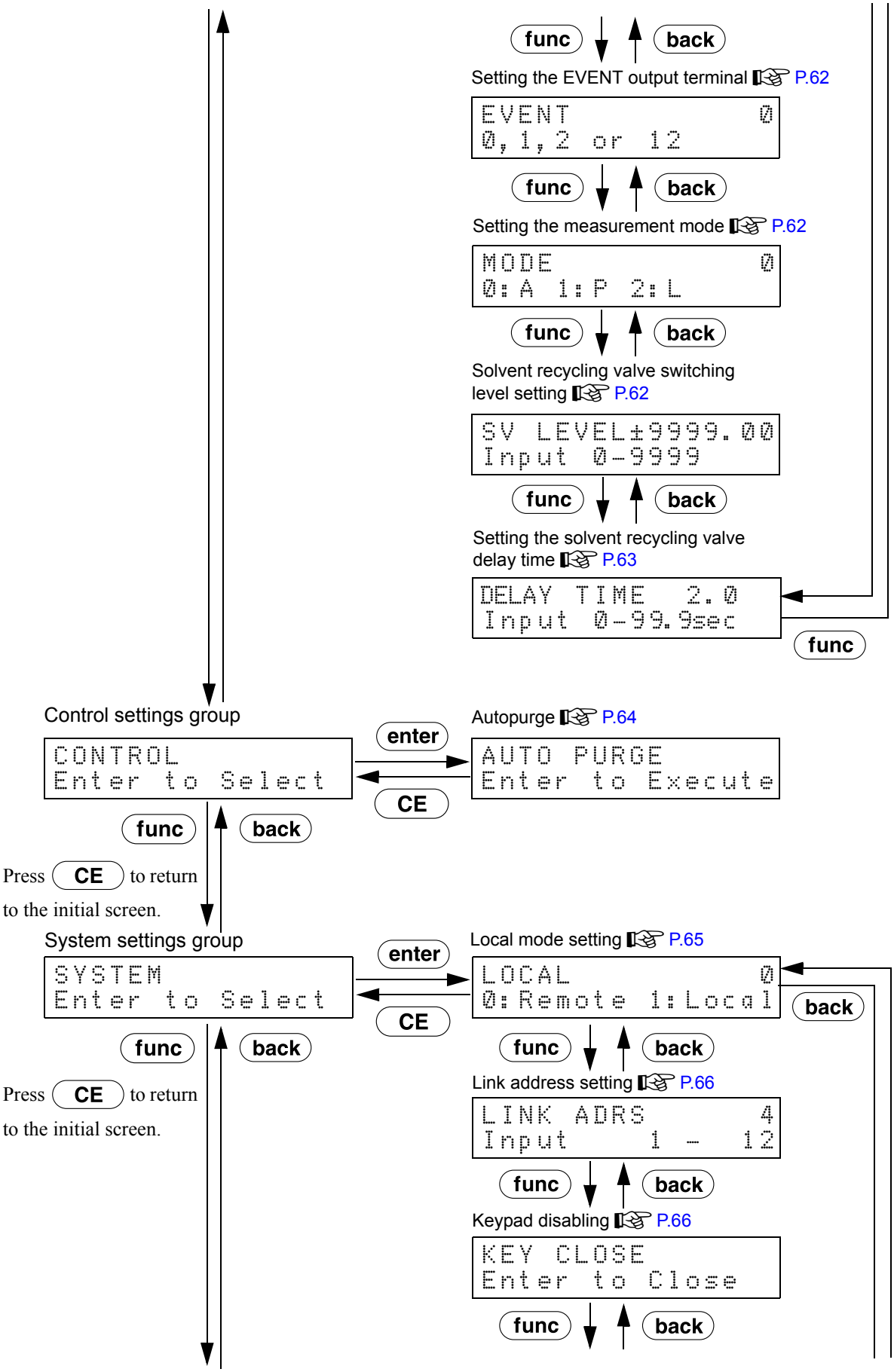
This section describes the auxiliary function setting screens using the flow diagrams.

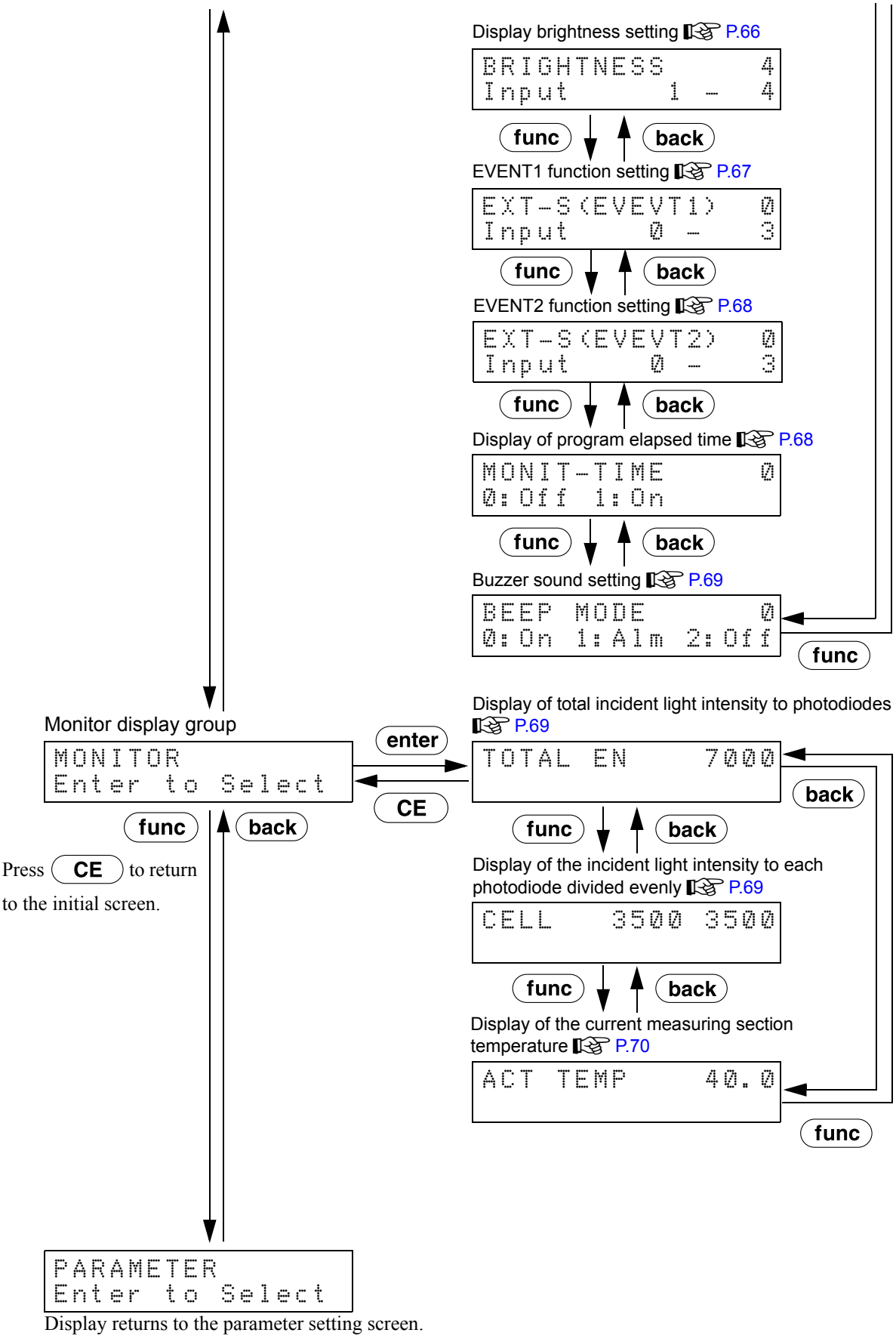
Press **func** on each screen to display the following screen. Press **back** to return to the previous screen.

Press **enter** on each auxiliary function setting screen to display the corresponding function screen.

Press **CE** to return to the initial screen.




func
back
Setting the EVENT output terminal P.62
EVENT 0
0, 1, 2 or 12
Setting the measurement mode P.62
MODE 0
0: A 1: P 2: L
Solvent recycling valve switching level setting P.62
SV LEVEL±9999.00
Input 0–9999
Setting the solvent recycling valve delay time P.63
DELAY TIME 2.0
Input 0–99.9sec
Control settings group
CONTROL
Enter to Select
enter
CE
Autopurge P.64
AUTO PURGE
Enter to Execute
Press CE to return to the initial screen.
System settings group
SYSTEM
Enter to Select
Local mode setting P.65
LOCAL 0
0: Remote 1: Local
Link address setting P.66
LINK ADRS 4
Input 1 – 12
Keypad disabling P.66
KEY CLOSE
Enter to Close


Display brightness setting P.66
BRIGHTNESS 4
Input 1 – 4
func
back
EVENT1 function setting P.67
EXT-S(EVEVT1) 0
Input 0 – 3
func
back
EVENT2 function setting P.68
EXT-S(EVEVT2) 0
Input 0 – 3
func
back
Display of program elapsed time P.68
MONIT-TIME 0
0:Off 1:On
func
back
Buzzer sound setting P.69
BEEP MODE 0
0:On 1:Alm 2:Off
func
Monitor display group
MONITOR
Enter to Select
enter
CE
func
back
Press CE to return to the initial screen.
Display of total incident light intensity to photodiodes P.69
TOTAL EN 7000
back
func
back
Display of the incident light intensity to each photodiode divided evenly P.69
CELL 3500 3500
func
back
Display of the current measuring section temperature P.70
ACT TEMP 40.0
func
PARAMETER
Enter to Select
Display returns to the parameter setting screen.

5.1.3 VP Function Screen

This section describes the VP function screens using the following flow diagrams.

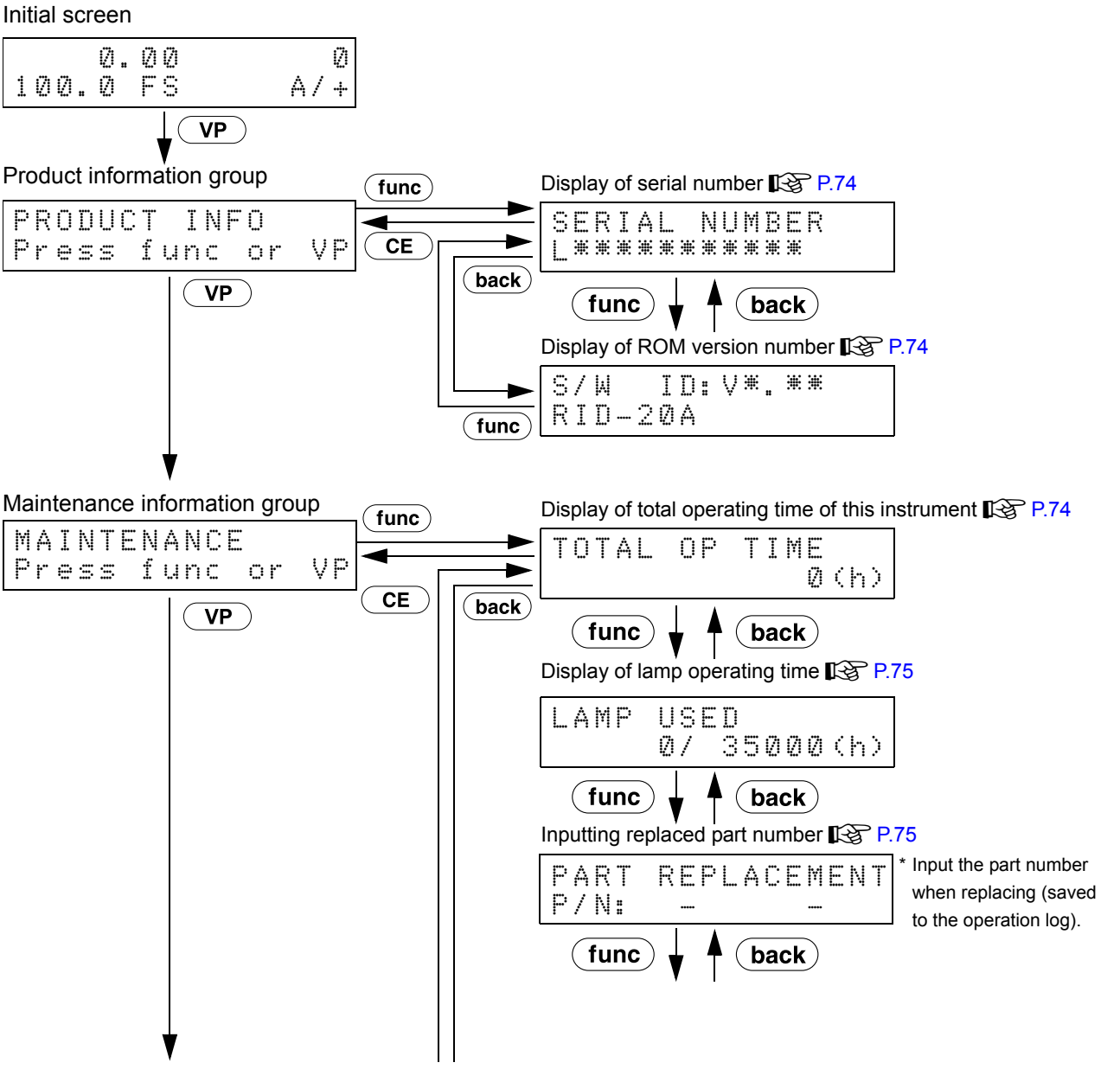
VP function includes the four types of Product information group, Maintenance information group, Validation support group, and Calibration support group.

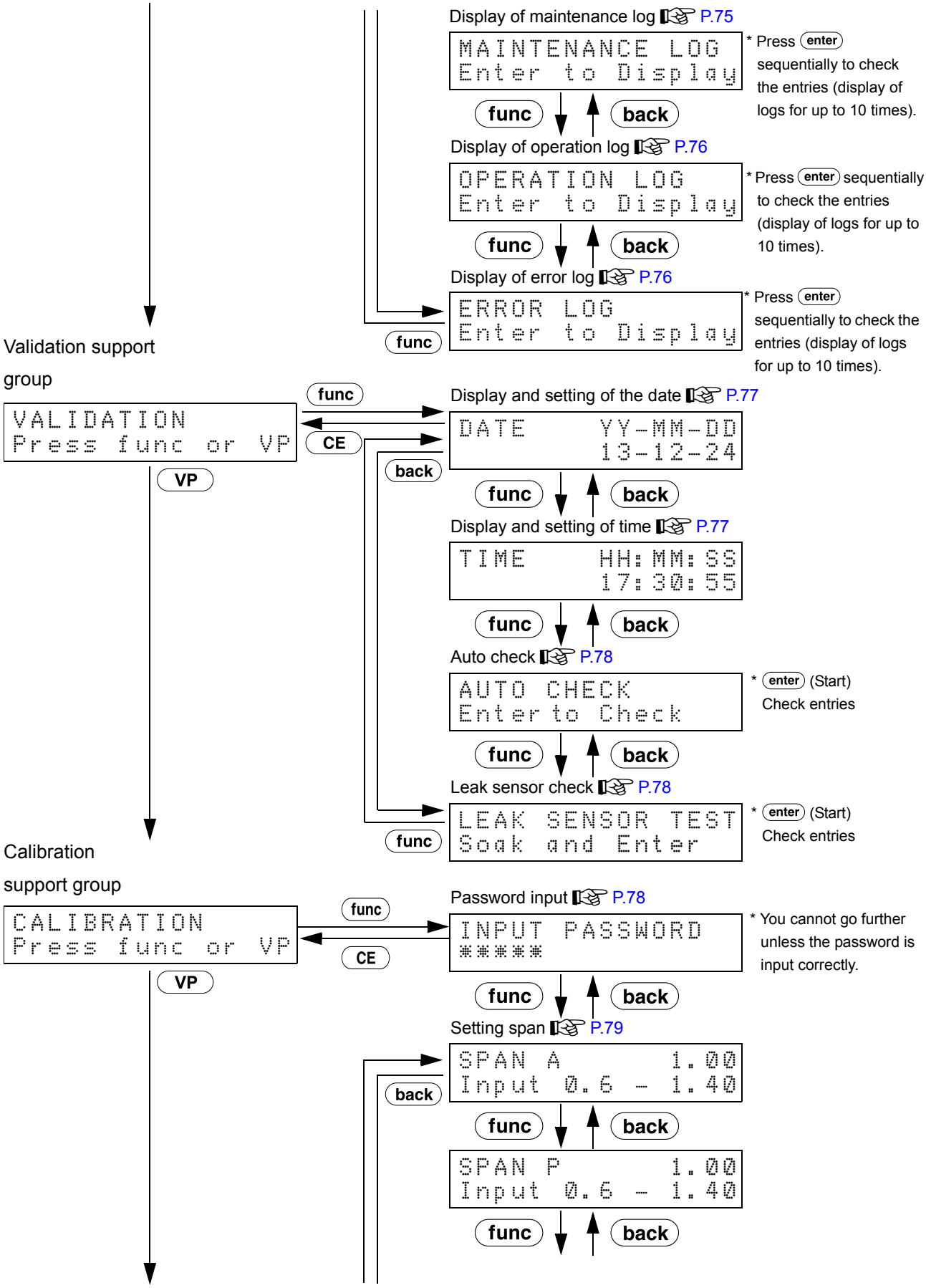
Every time **VP** is pressed on the initial screen, each group screen is displayed alternately.

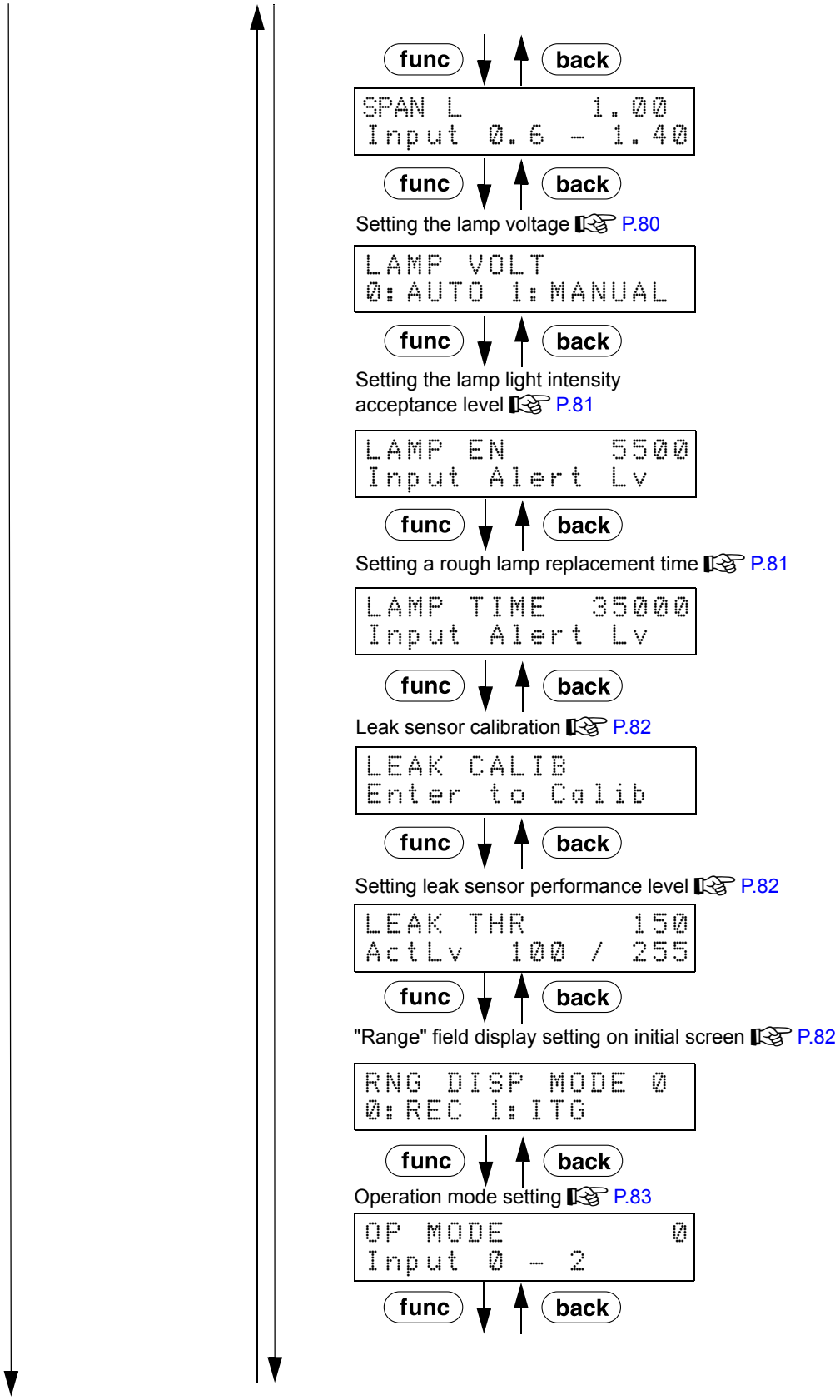
Press **CE** to return from each group screen to the initial screen.

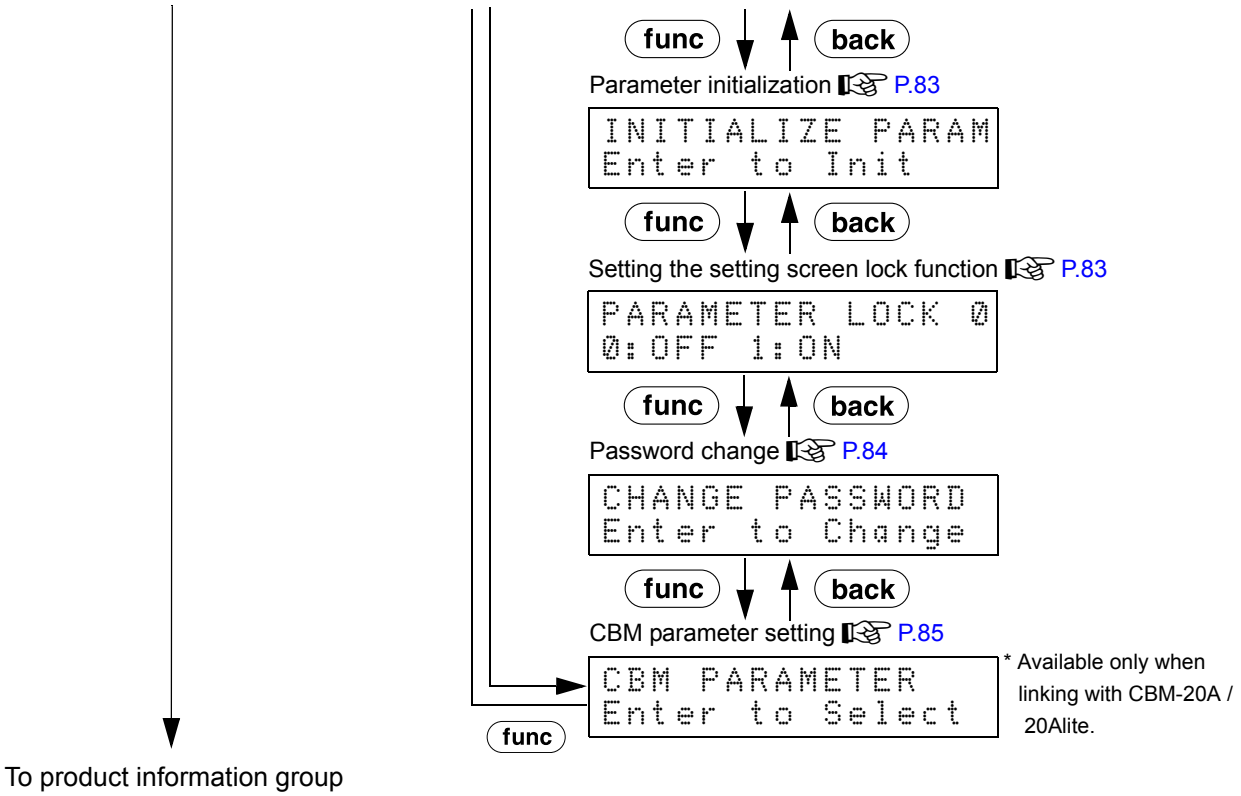
If you press **func** or **back** on the setting screen in each group, the next screen or previous screen in each group is respectively displayed.

Press **CE** on the setting screen in a group to return the display to the group screen.




Display of maintenance log P.75
MAINTENANCE LOG
Enter to Display
* Press enter sequentially to check the entries (display of logs for up to 10 times).
func
back
Display of operation log P.76
OPERATION LOG
Enter to Display
* Press enter sequentially to check the entries (display of logs for up to 10 times).
Display of error log P.76
ERROR LOG
Enter to Display
* Press enter sequentially to check the entries (display of logs for up to 10 times).
Validation support group
VALIDATION
Press func or VP
VP
CE
Display and setting of the date P.77
DATE YY-MM-DD
13-12-24
Display and setting of time P.77
TIME HH:MM:SS
17:30:55
Auto check P.78
AUTO CHECK
Enter to Check
* enter (Start) Check entries
Leak sensor check P.78
LEAK SENSOR TEST
Soak and Enter
* enter (Start) Check entries
Calibration support group
CALIBRATION
Press func or VP
Password input P.78
INPUT PASSWORD
*****
* You cannot go further unless the password is input correctly.
Setting span P.79
SPAN A 1.00
Input 0.6 - 1.40
SPAN P 1.00
Input 0.6 - 1.40


func
back
SPAN L 1.00
Input 0.6 - 1.40
func
back
Setting the lamp voltage P.80
LAMP VOLT
0:AUTO 1:MANUAL
func
back
Setting the lamp light intensity acceptance level P.81
LAMP EN 5500
Input Alert Lv
func
back
Setting a rough lamp replacement time P.81
LAMP TIME 35000
Input Alert Lv
func
back
Leak sensor calibration P.82
LEAK CALIB
Enter to Calib
func
back
Setting leak sensor performance level P.82
LEAK THR 150
ActLv 100 / 255
func
back
"Range" field display setting on initial screen P.82
RNG DISP MODE 0
0:REC 1:ITG
func
back
Operation mode setting P.83
OP MODE 0
Input 0 - 2
func
back


func
back
Parameter initialization P.83
INITIALIZE PARAM
Enter to Init
func
back
Setting the setting screen lock function P.83
PARAMETER LOCK 0
0:OFF 1:ON
func
back
Password change P.84
CHANGE PASSWORD
Enter to Change
func
back
CBM parameter setting P.85
CBM PARAMETER
Enter to Select
* Available only when linking with CBM-20A / 20Alite.
func
To product information group

5.2 Setting Auxiliary Functions

The auxiliary functions comprises the four groups, Parameter Setting, Control, System Setting and Monitor Display.

5.2.1 List of Auxiliary Functions

The following tables show the list of auxiliary functions.

☞ "5.1.2 Auxiliary Function Setting Screen" P.49

■ Parameter Settings Group

Name	Operation	Function	Page
RESPONSE	Numeric keypad	Sets response speed.	P.59
AUX RANGE	Numeric keypad	Sets output range of the INTEGRATOR connector.	P.60
RANGE	Numeric keypad	Set the output range of the RECORDER connector.	P.60
ITG OFS	Numeric keypad	Sets baseline offset of the INTEGRATOR connector.	P.60
REC OFS	Numeric keypad	Sets baseline offset of the RECORDER connector.	P.61
CELL TEMP	Numeric keypad	Set the temperature of the measuring section.	P.61
EVENT	Numeric keypad	Sets operation of the EVENT output terminal.	P.62
MODE	Numeric keypad	Sets measurement mode.	P.62
SV LEVEL	Numeric keypad	Sets the solvent recycling valve switching level.	P.62
DELAY TIME	Numeric keypad	Sets solvent recycling valve delay time.	P.63

■ Control Settings Group

Name	Operation	Function	Page
AUTO PURGE	(enter) key	Carry out the autopurge.	P.64

* Operation in the table head shows the types of operation described below.

Display : Check the screen display.

(enter) key : Press (enter) to execute its function.

Numeric keypad : Enter a value by pressing (▪) - (9), and validate the input value by pressing (enter).

■ System Settings Group

Name	Operation	Function	Page
LOCAL	Numeric keypad	Selects control by system controller or local control for this instrument.	P.65
LINK ADRS	Numeric keypad	Sets address when controlling this instrument from the system controller.	P.66
KEY CLOSE	enter key	Disables key input.	P.66
BRIGHTNESS	Numeric keypad	Sets display panel brightness.	P.66
EXT-S (EVENT1)	Numeric keypad	Sets operation of the EVENT1 output terminal.	P.67
EXT-S (EVENT2)	Numeric keypad	Sets operation of the EVENT2 output terminal.	P.68
MONIT-TIME	Numeric keypad	Selects display or hide of time program elapsed time.	P.68
BEEP MODE	Numeric keypad	Sets buzzer sound.	P.69

■ Monitor Display Group

Name	Operation	Function	Page
TOTAL EN	Display	Displays total incident light intensity to the photodiode.	P.69
CELL	Display	Displays the incident light intensity to each photodiode divided evenly.	P.69
ACT TEMP	Display	Displays the current temperature of the measuring section.	P.70

* Operation in the table head shows the types of operation described below.

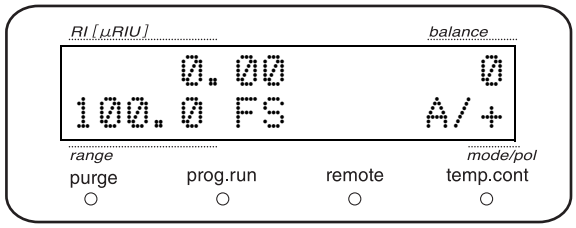
Display : Check the screen display.

enter key : Press enter to execute its function.

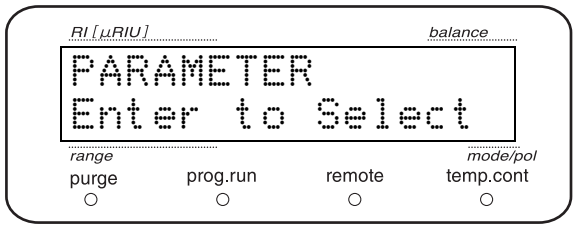
Numeric keypad : Enter a value by pressing ▪ - 9, and validate the input value by pressing enter .

5.2.2 Displaying Auxiliary Function Screen

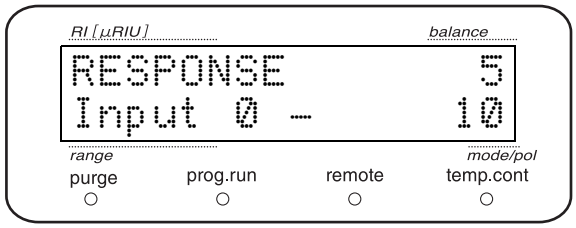
1 Press **CE**.
Initial screen is displayed.



2 Press **func** sequentially.
Auxiliary function groups are displayed in the order of "PARAMETER" → "CONTROL" → "SYSTEM" → "MONITOR".



3 Select the desired auxiliary function group and press **enter**.
The first item in the selected group appears.

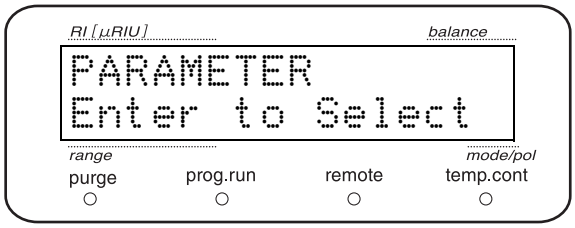


4 Alternatively, press **func** or **back** sequentially to select the item to be set.

5 Press **CE** to return to the group screen.
Press **CE** again to return to the initial screen.

5.2.3 Parameter Settings Group

This is the group for parameter setting.

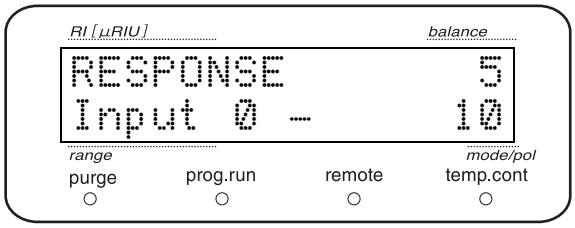


■ Setting Response «RESPONSE»

Sets response

☞ "4.6.3 Setting Response" P.45

Enter a set value using the numeric keypad and press **enter**.



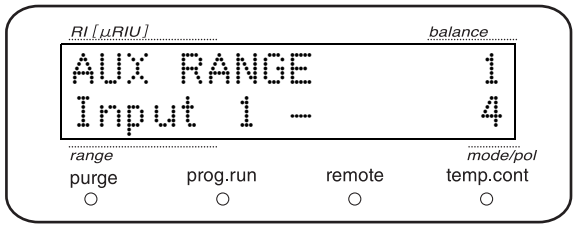
Response set value	Corresponding time constant of the analog CR filter
0	No filtering
1	0.05 sec
2	0.1 sec
3	0.5 sec
4	1.0 sec
5	1.5 sec
6	3.0 sec
7	6.0 sec
8	8.0 sec
9	10.0 sec
10	2.0 sec

■ Setting Output Range of the INTEGRATOR Connector «AUX RANGE»

Sets output range of the INTEGRATOR connector.

☞ "4.6.2 Setting the Output Range" P.43

Enter a set value using the numeric keypad and press enter.



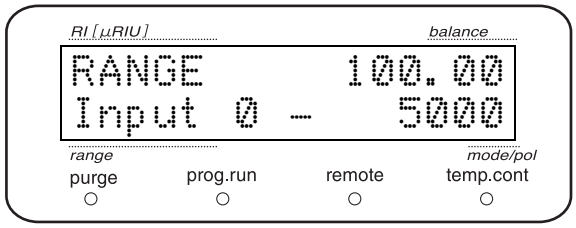
Set value	Output range (Unit: µRIU/V)
1	100
2	1000
3	10000
4	250

■ Setting Output Range of the RECORDER Connector «RANGE»

Set the output range of the RECORDER connector.

☞ "4.6.2 Setting the Output Range" P.43

Enter a set value using the numeric keypad and press enter.



Setting Range (Unit: µRIU/10 mVF.S.)
0.00 to 5000

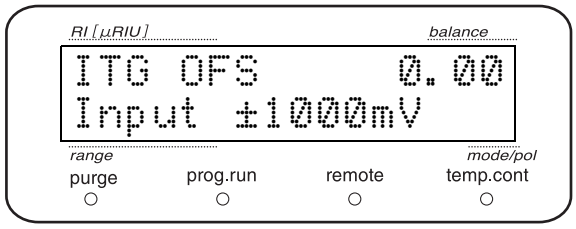
*If you select "0", output of the RECORDER connector becomes 0 V.

■ Setting Baseline Offset of the INTEGRATOR Connector «ITG OFS»

Sets baseline offset of the INTEGRATOR connector.

☞ "4.6.1 Adjusting the Zero Position of the Recorder" P.41

Enter a set value using the numeric keypad and press enter.



Setting Range (Unit: mV)
-1000 to 1000

NOTE

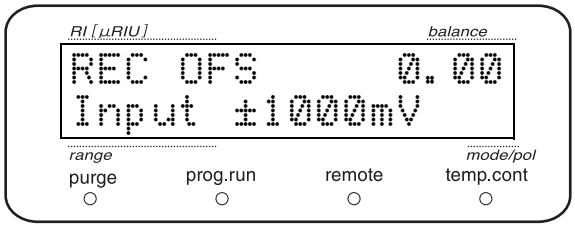
Although you can input the baseline offset in the range of -1000 to 1000 mV, actual output range of the INTEGRATOR connector is from -10 to 1000 mV. When the output voltage after the offset is below -10 mV, actual output becomes equal to the value when -10 mV is selected for the limit.

■ Setting Baseline Offset of the RECORDER Connector «REC OFS»

Sets baseline offset of the RECORDER connector.

☞ "4.6.1 Adjusting the Zero Position of the Recorder" P.41

Enter a set value using the numeric keypad and press **enter**.



Setting Range (Unit: mV)
-1000 to 1000

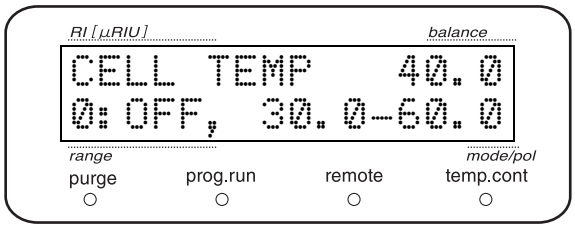
NOTE

Although you can input the baseline offset in the range of -1000 to 1000 mV, actual output range of RECORDER connector is from -10 to 1000 mV. When the output voltage after the offset is below -10 mV, actual output becomes equal to the value when -10 mV is selected for the limit.

■ Setting Temperature of Measuring Section «CELL TEMP»

Set the temperature of the measuring section.

Enter a set value using the numeric keypad and press **enter**.



Set value	Setting
0	Temperature control is turned OFF.
30 to 60 °C	Temperature is controlled to the set value.

NOTE

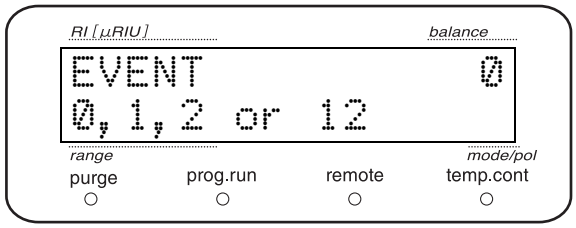
When the flow rate is 3 mL/min or more, turn OFF the temperature control. When it is below 3 mL/min, set the temperature to the room temperature +12 °C minimum.

■ Setting the EVENT Output Terminal «EVENT»

Sets ON (close)/ OFF (open) of the EVENT output terminal (relay contact) located on the rear side of this instrument.

☞ "5.7 Connecting to External Equipment Using External Input/Output Terminal" P.98

Enter a set value using the numeric keypad and press **enter**.

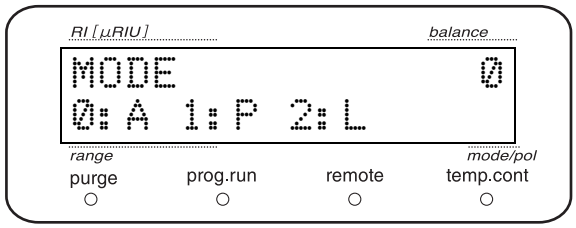


Set value	EVENT1	EVENT2
0	OFF	OFF
1	ON	OFF
2	OFF	ON
12	ON	ON

■ Setting Measurement Mode «MODE»

Sets measurement mode.

Enter a set value from the numeric keyboard and press **enter**.

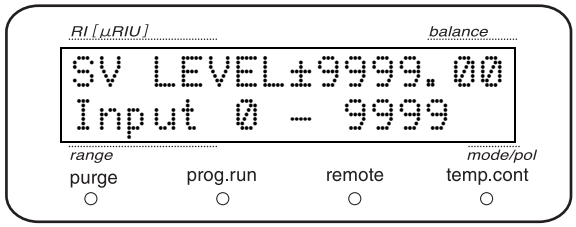


Set value	Mode
0	A
1	P
2	L

■ Setting the Solvent Recycling Valve Switching Level «SV LEVEL»

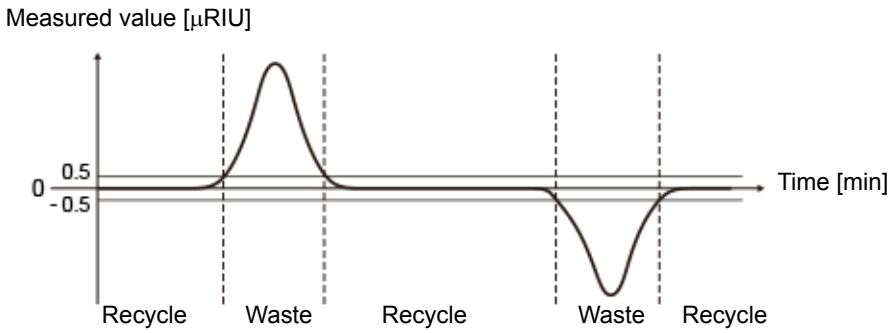
Sets the solvent recycling valve switching level.

Enter a set value from the numeric keyboard and press **enter**.



Setting Range (Unit: μRIU)
0 to 9999

When the measured value (refraction index) is in the range of -0.5 to 0.5, for example, if you select 0.5 for the set value, the solvent recycling valve will be in the recycling position. If the measured value is outside the above range (when it is below -0.5 or above 0.5), the solvent recycling value is switched to the waste liquid side.



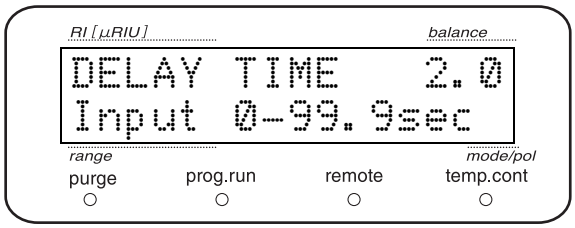
* Above figure shows the case when DELAY TIME is 0 sec.

* When the solvent recycling valve is not used or the recycling position is constantly maintained, set "9999.00".
* When you want to constantly maintain the waste position, set "0".

■ Setting Delay Time of the Solvent Recycling Valve «DELAY TIME»

Sets the delay time to be inserted when the solvent recycling valve is switched from the waste liquid side to the recycling side.

This set value is determined by the flow rate and piping capacity from the detector to the recycle valve.

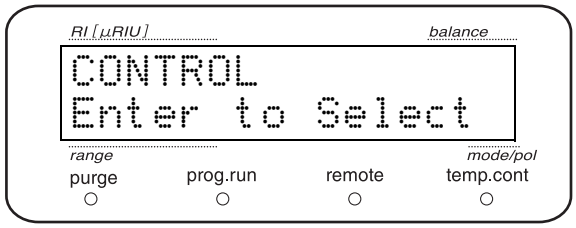


Setting Range (Unit: sec)
0 to 99.9

* Switching the solvent recycling valve from the recycling side to the waste liquid side takes place instantly without insertion of delay time.

5.2.4 Control Settings Group

This is the group for controlling this instrument.



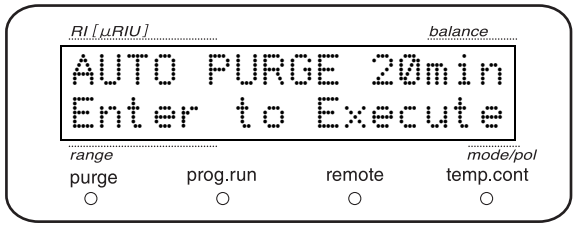
■ Carrying Out Autopurge «AUTO PURGE»

Sets the duration of autopurge.

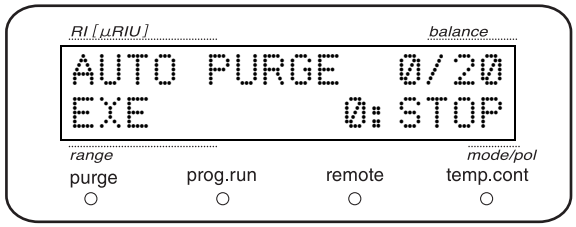
Press (**enter**) to start the autopurge.

The following operations are carried out in the autopurge.

1 Switches the solenoid valve ON and OFF every 5 seconds.



2 If the switching frequency reaches 30, the autopurge waits for the set time to elapse while maintaining the solenoid valve in the ON position (fluid replacement flow line remains as is).



3 When the set time is reached, the fluid replacement flow line is automatically switched to the measurement flow line.

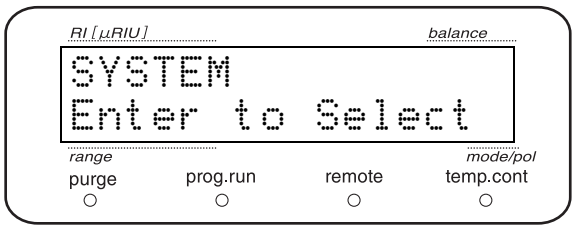
4 The balance is adjusted automatically.

NOTE

- Be sure to carry out the above operation while pumping is turned on.
- If the fluid replacement flow line is switched while a large volume of solution is pumped in L mode, the solenoid valve and flow cell may be damaged. In order to prevent such accidents, the message "CHECK FLOW" is displayed in L mode prior to execution. After changing the tubing pump flow rate to 1 mL/min, press **enter**.

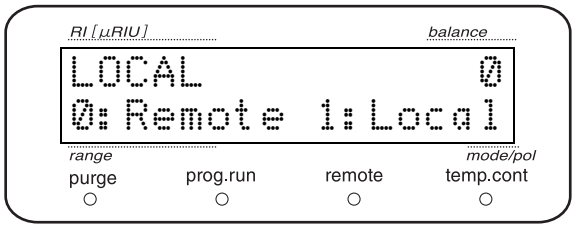
5.2.5 System Settings Group

This is the group for system settings.



■ Setting Local Mode «LOCAL»

When this instrument is connected to the system controller, sets whether the instrument is to be controlled remotely from the system controller or locally on its own (local mode).
Enter a set value using the numeric keyboard and press **enter**.



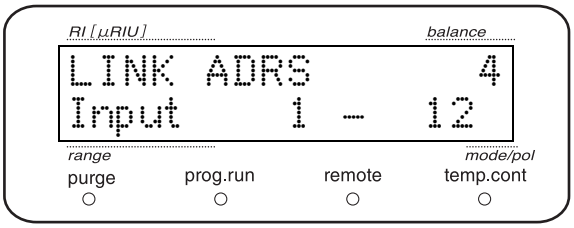
Set value	Mode	Function
0	Remote	Operate via system controller.
1	Local	Operate independently (in local mode).

■ Setting Link Address «LINK ADRS»

Sets the link address (channel number) to be used when this instrument is connected to system controller.

Enter a set value from the numeric keyboard and press **enter**.

☞ "■ Connection to the System Controller" P.164

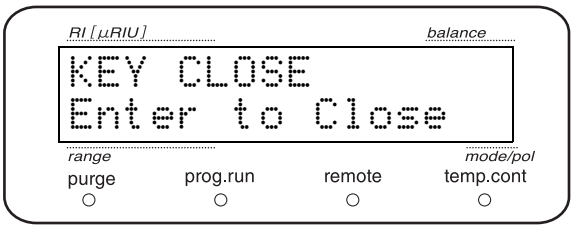


■ Disabling Key Input «KEY CLOSE»

Press to prohibit the keypad entry.

Press **enter** on the screen shown on the right to disable the key input.

To enable the key input, press **del** and **CE** at the same time.

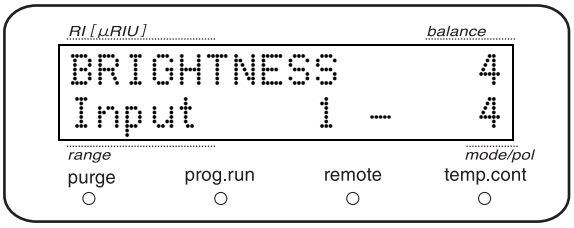


■ Adjusting Brightness of the Operation Panel Screen «BRIGHTNESS»

Adjusts brightness of the operation panel screen in four levels.

Enter a set value using the numeric keyboard and press **enter**.

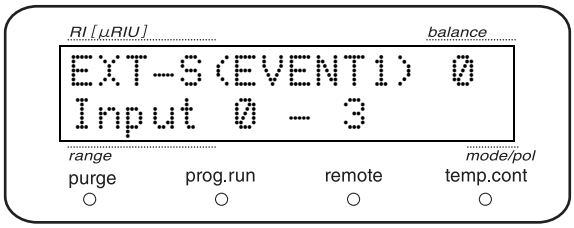
Set value	Brightness level
1	25 %
2	50 %
3	75 %
4	100 %



■ Setting Function of the EVENT1 Output Terminal «EXT-S (EVENT1)»

Sets the function of the EVENT1 output terminal.

Enter a set value using the numeric keyboard and press **enter**.



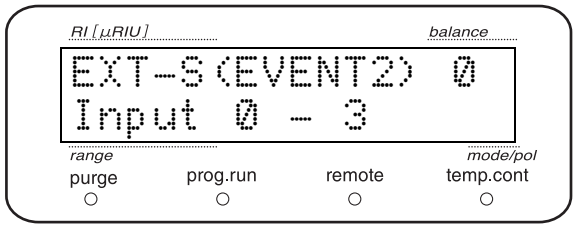
Set value	Set value
0	"EVENT" setting in Parameter Settings Group is enabled.
1	Used as the start signal output of the time program. * After the time program is started, the output is turned ON for 0.6 second.
2	The out is turned ON when an error is detected.
3	In accordance with the setting in "SV LEVEL" and "DELAY TIME", the output is turned ON when the valve is in the recycling position, and it is turned OFF when the valve is in the waste liquid position. * When a solvent recycling valve that is not included in the standard option is used.

☞ "5.7 Connecting to External Equipment Using External Input/Output Terminal" P.98

■ Setting Function for the EVENT2 Output Terminal «EXT-S (EVENT2)»

Sets the function for the EVENT2 output terminal.

Enter a set value using the numeric keyboard and press **enter**.



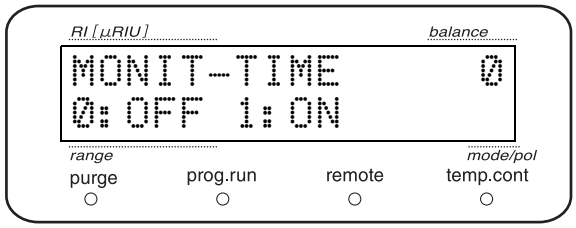
Set value	Set value
0	"EVENT" setting in Parameter Settings Group is enabled.
1	Used as the start signal output of the time program. * After the time program is started, the output is turned ON for 0.6 second.
2	The out is turned ON when an error is detected.
3	In accordance with the setting in "SV LEVEL" and "DELAY TIME", the output is turned ON when the valve is in the recycling position, and it is turned OFF when the valve is in the waste liquid position. * When a solvent recycling valve that is not included in the standard option is used.

☞ "5.7 Connecting to External Equipment Using External Input/Output Terminal" P.98

■ Displaying Program Elapsed Time «MONIT-TIME»

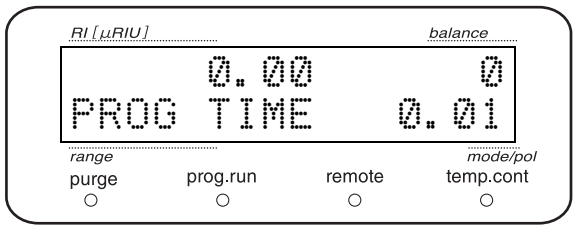
Displays the elapsed time for the time program from its start on the initial screen.

Enter a set value using the numeric keypad and press **enter**.



Set value	Function
0	Elapsed time for the time program is not displayed.
1	Elapsed time for the time program is displayed.

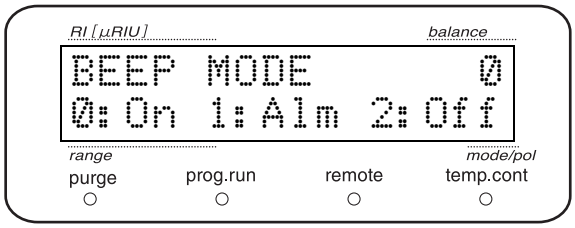
If you set "1", the screen shown on the right is displayed as long as the time program is run.



■ Setting Buzzer Sound «BEEP MODE»

Sets buzzer sound.

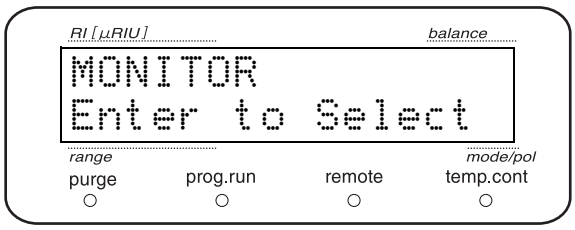
Enter a set value using the numeric keypad and press **enter**.



Set value	Control mode
0	Buzzer is sounded when key entry is enabled and an error is detected.
1	Buzzer is sounded only when an error is detected. Buzzer is not sounded when key entry is enabled.
2	Buzzer is not sounded.

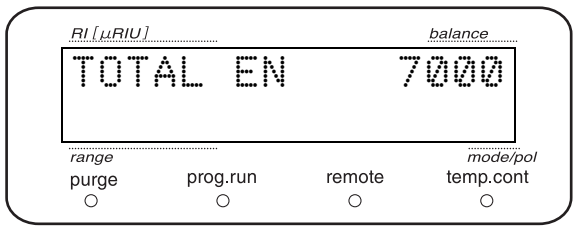
5.2.6 Monitor Display Group

This is the group for monitor setting.



■ Displaying Total Incident Light Intensity to Photodiode «TOTAL EN»

Displays total incident light intensity to the photodiode.

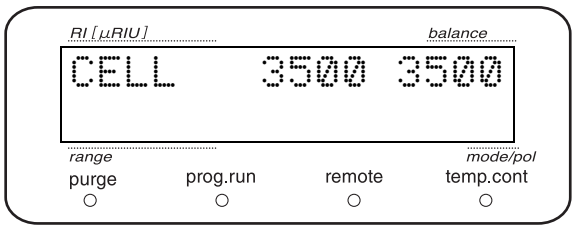


■ Displays the Incident Light Intensity to Each Photodiode Divided Evenly «CELL»

Displays the incident light intensity to each photodiode divided evenly.

☞ "1.3.1 Measurement Principle" P.3

In A mode

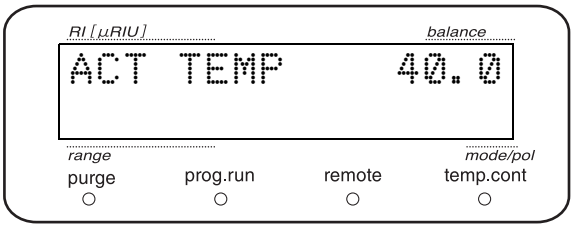


NOTE

In A mode, the incident light intensity to each diode is almost the same. However, the volume somewhat differs between the two in P/L mode.

■ Displaying Temperature of the Measuring Section «ACT TEMP»

Displays the current temperature of the measuring section.



5.3 Setting VP Function

VP functions support the validation of this instrument by displaying the instrument information and using the check function.

VP functions comprise the four groups, Product Information, Maintenance Information, Validation Support and Calibration Support.

5.3.1 List of VP Functions

The VP functions are listed in the tables below.

☞ "5.1.3 VP Function Screen" P.52

■ Product Information Group

Name	Operation	Function	Page
SERIAL NUMBER	Display	Displays the serial numbers of this instrument.	P.74
S/W ID: V*.**	Display	Displays unit names and ROM versions of this instrument.	P.74

■ Maintenance Information Group

Name	Operation	Function	Page
TOTAL OP TIME	Display	Shows the total operating time of this instrument.	P.74
LAMP USED	Display	Displays lighting time of the lamp and lighting time-based rough replacement time.	P.75
PART REPLACEMENT	Numeric keypad	Enter part numbers of replacement parts employed in maintenance.	P.75
MAINTENANCE LOG	Display	Displays maintenance log.	P.75
OPERATION LOG	Display	Displays operation log.	P.76
ERROR LOG	Display	Displays error log.	P.76

* Operation in the table head shows the types of operation described below.

Display : Check the screen display.

enter key : Press enter to execute its function.

Numeric keypad : Enter a value by pressing ▪ - 9, and validate the input value by pressing enter.

■ Validation Support Group

Name	Operation	Function	Page
DATE	Numeric keypad	Sets and displays the date.	P.77
TIME	Numeric keypad	Sets and displays the time.	P.77
AUTO CHECK	enter key	Checks memory and light intensity.	P.78
LEAK SENSOR TEST	enter key	Checks the leak sensor.	P.78

■ Calibration Support Group

Name	Operation	Function	Page
INPUT PASSWORD*	Numeric keypad	Input the password.	P.78
SPAN A	Numeric keypad	Sets correction value in A mode.	P.79
SPAN P	Numeric keypad	Sets correction value in P mode.	P.79
SPAN L	Numeric keypad	Sets correction value in L mode.	P.79
LAMP VOLT	Numeric keypad	Sets lamp voltage.	P.80
LAMP EN	Numeric keypad	Sets the lamp light intensity acceptance level.	P.81
LAMP TIME	Numeric keypad	Sets lamp lighting time-based rough replacement time.	P.81
LEAK CALIB	enter key	Calibrates the leak sensor.	P.82
LEAK THR	Numeric keypad	Sets leak sensor operation level.	P.82
RNG DISP MODE	Numeric keypad	Selects items to be displayed in the "range" field of the initial screen.	P.82
OP MODE	Numeric keypad	Select operation mode.	P.83
INITIALIZE PARAM	enter key	Initializes parameters.	P.83
PARAMETER LOCK	Numeric keypad	Locks the setting screen.	P.83
CHANGE PASSWORD	enter key	Sets and changes password.	P.84
CBM PARAMETER	Numeric keypad enter key	Sets and displays CBM parameters. They are displayed when linked to CBM-20A.	P.85

* Concerning VP functions in Calibration Support Group, pressing func does not bring you further than SPAN A if the password entered is not correct.

* Operation in the table head shows the types of operation described below.

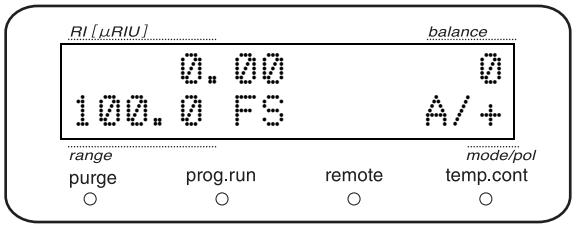
Display : Check the screen display.

enter key : Press enter to execute its function.

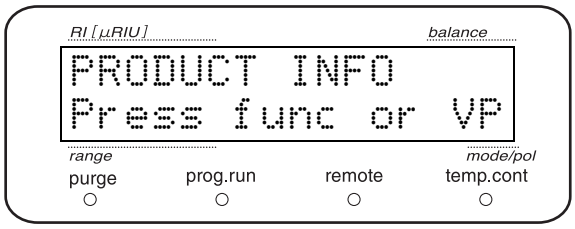
Numeric keypad : Enter a value by pressing ▪ - 9, and validate the input value by pressing enter .

5.3.2 Displaying VP Function Screen

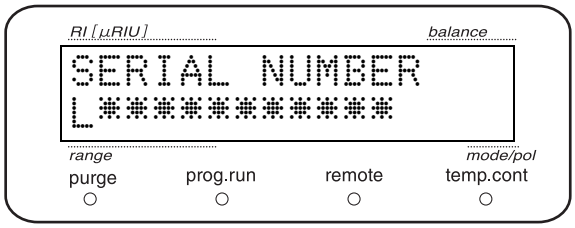
1 Press **CE**.
Initial screen is displayed.



2 Press **VP** to select the desired Group.
VP function groups are displayed in the order of "PRODUCT INFO", → "MAINTENANCE", → "VALIDATION" → "CALIBRATION".



3 Press **func** to display the first item in the selected group.

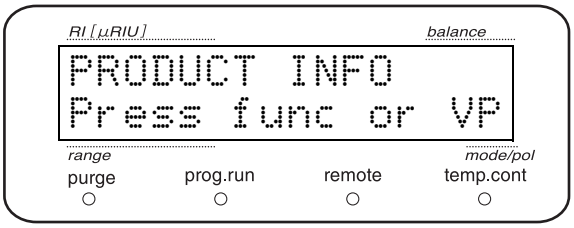


4 Alternatively, press **func** or **back** sequentially until the desired item in the group appears.

5 Press **CE** to return to the group screen.
Press **CE** again to return to the initial screen.

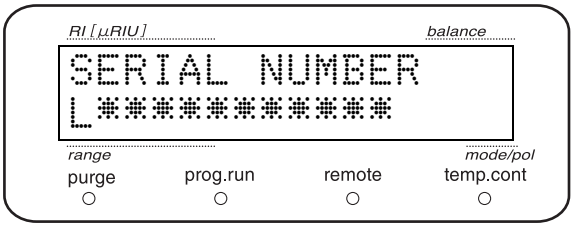
5.3.3 Product Information Group

This group provides information about the instrument.



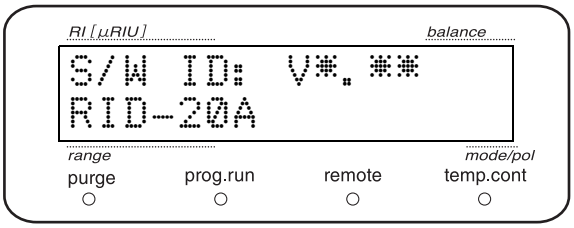
■ Displaying Serial Number «SERIAL NUMBER»

Displays the serial numbers of this instrument.



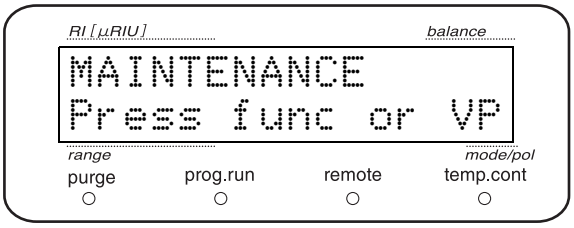
■ Displaying ROM Version Number «S/W ID»

Shows the name of software (same as the model name) and version.



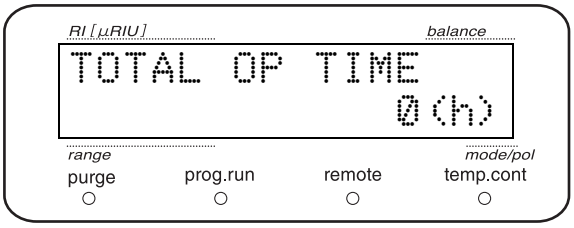
5.3.4 Maintenance Information Group

This is the group for maintenance information.



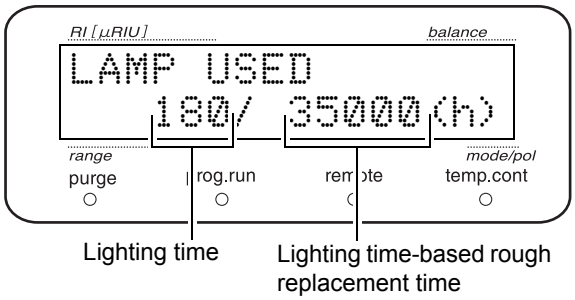
■ Displaying Total Operating Time of this Instrument «TOTAL OP TIME»

Shows the total operating time of this instrument.



■ Displaying Lamp Lighting Time and the Lighting Time-Based Rough Replacement Time «LAMP USED»

Displays lighting time of the lamp and lighting time-based rough replacement time.

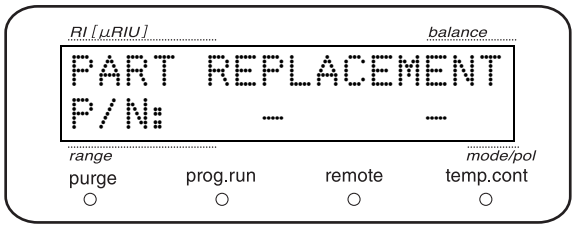


■ Entering Replacement Part Number «PART REPLACEMENT»

Enter part numbers of replacement parts employed in maintenance

Entered part number is recorded in the maintenance log.

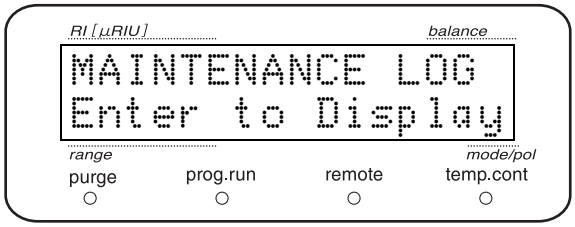
* Shimadzu service personnel can enter part numbers.



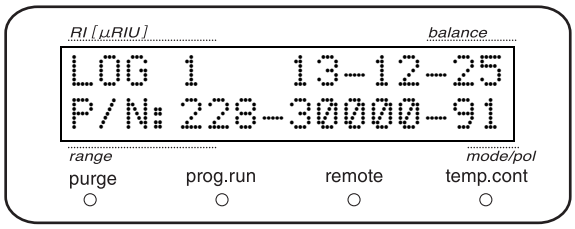
■ Displaying Maintenance Log «MAINTENANCE LOG»

Displays replacement parts and replacement time for the past 10 operations.

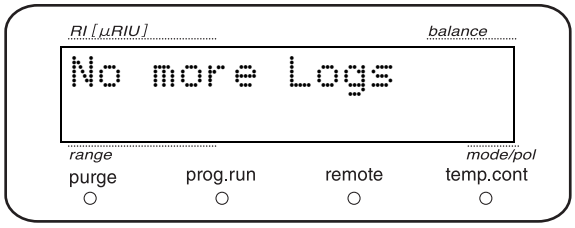
Press **enter** repeatedly to sequentially display replacement parts and replacement times.



The screen shown on the right indicates that "Part number 228-30000-91 was replaced on December 25th, 2013."

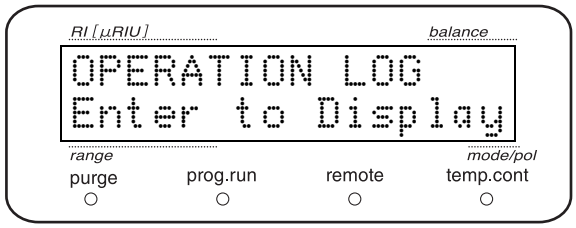


When the number of maintenance logs is less than 10, the screen shown on the right is displayed after the last log. Press **CE** to return to the item title screen.

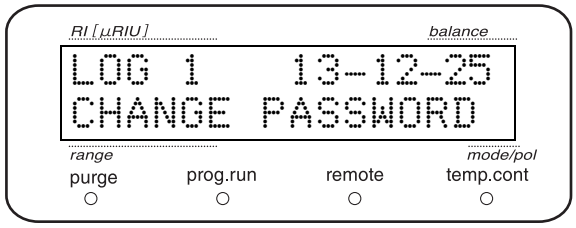


■ Displaying Operation Log «OPERATION LOG»

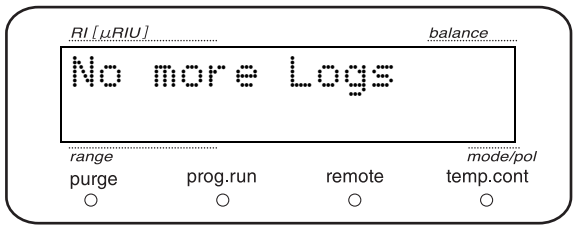
Displays the timing and content of the password setting and parameter initialization form up to the past 10 times. Press **enter** repeatedly to sequentially display the operation logs.



The screen shown on the right indicates that "Password was revised on December 25th, 2013."

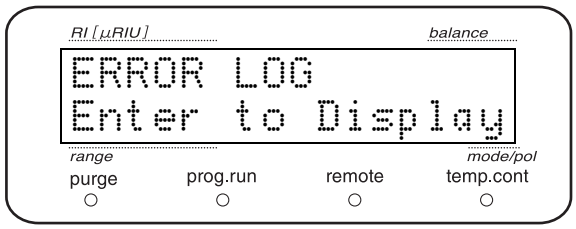


When the number of operation logs is less than 10, the screen shown on the right is displayed after the last log. Press **CE** to return to the item title screen.

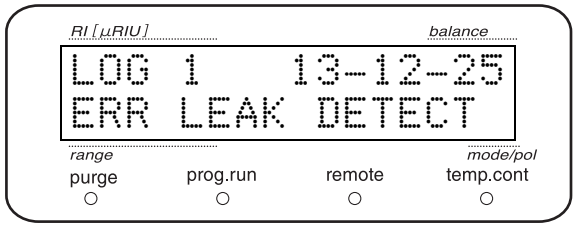


■ Displaying Error Log «ERROR LOG»

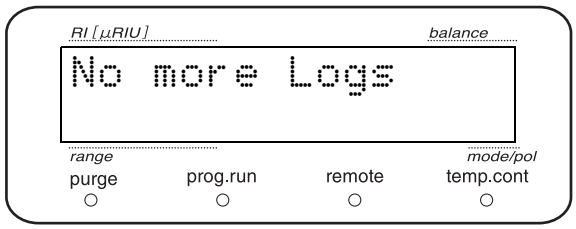
Displays the error content and detection timing from up the past 10 times. Press **enter** repeatedly to sequentially display the error logs.



The screen shown on the right indicates that "Leak value detection error occurred on December 25th, 2013."

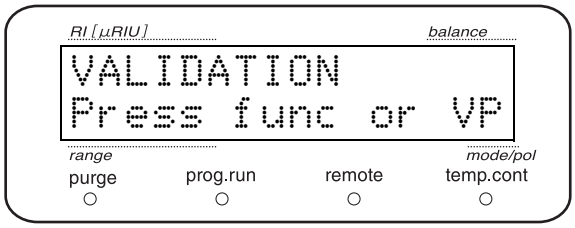


When the number of errors is less than 10, the screen shown on the right is displayed after the last log. Press **CE** to return to the item title screen.



5.3.5 Validation Support Group

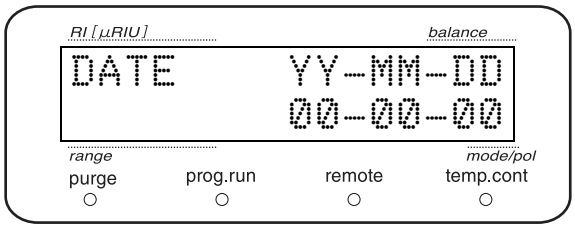
This is the group for checking whether this instrument is running correctly.



■ Entering the Date «DATE»

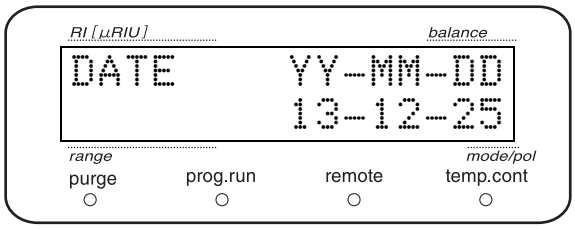
Shows/enters the date. However, if the power is turned OFF, the initial value "00-00-00" is restored. When controlling this instrument from the system controller, the value is transmitted at the connection.

Date



Example: Input for December 25th, 2013

1 Enter the year, month and day from the numeric keypad in this order.
For the year, enter the last two digits of the western calendar. Also, enter the month and day in two digits.

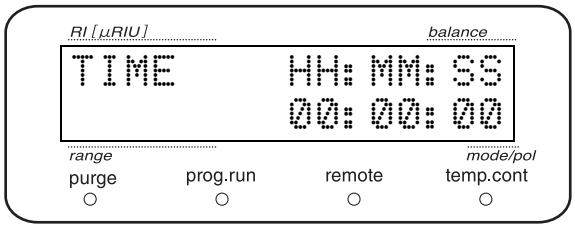


2 Press (**enter**).

■ Entering the Time «TIME»

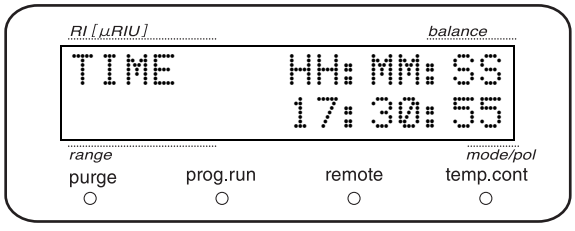
Shows/enters the time. However, if the power is turned OFF, the initial value "00:00:00" is restored. When controlling this instrument from the system controller, the value is transmitted at the connection.

Time



Example: Entering 5:30:55 p.m.

1 Enter the hour, minute and second from the numeric keypad in this order. Enter the time in hours, minutes and seconds according to the 24-hour format.



2 Press (**enter**).

■ Checking Memory and Light Intensity «AUTO CHECK»

A series for the following items are continuous.

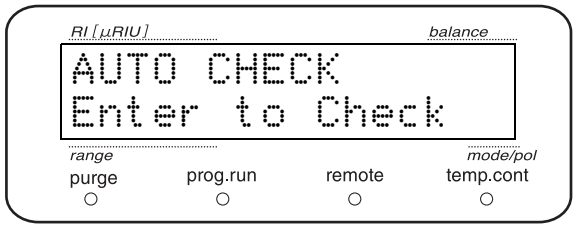
- Memory check (1)
- Light intensity check (2)
- Lamp operating time check (2)

When every item is acceptable, "CHECK GOOD" is displayed after the test.

When item (1) is unacceptable, "CHECK NO GOOD" is displayed.

When any of items (2) is unacceptable, "CHECK WARNING" is displayed for the item.

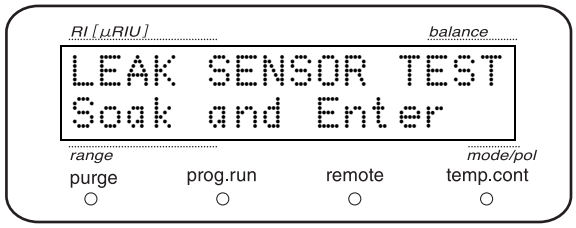
* The standard values used in this check are the values set in "LAMP EN" and "LAMP TIME" of the CALIBRATION group.



■ Checking the Leak Sensor «LEAK SENSOR TEST»

Checks operation of the leak sensor.

☞ "7.4.8 Check Leak Sensor" P.121

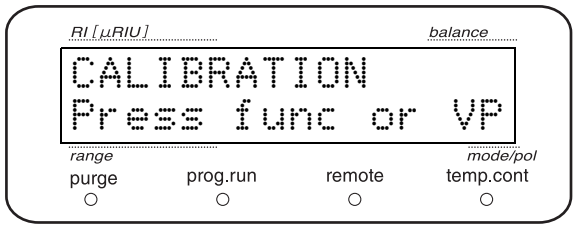


5.3.6 Calibration Support Group

This is the group for calibrating this instrument.

NOTE

This instrument is adjusted when it is shipped. Do not change values unnecessarily.



■ Entering Password «INPUT PASSWORD»

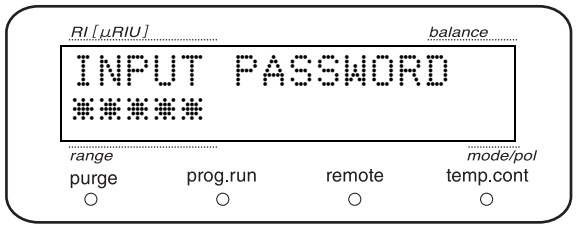
You must input the password to enter into the CALIBRATION group.

You can enter into the CALIBRATION group only when the correct password is input.

The password must be entered by the system administrator.

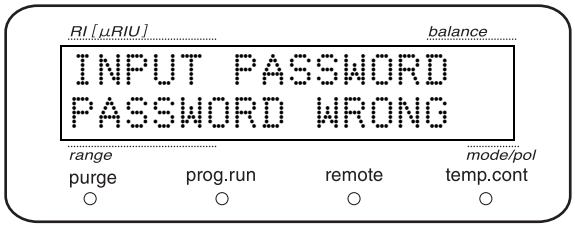
Enter a five-digit number using the numeric keypad and press **enter**.

- The default password is "00000".



If the entered password does not correspond to the specified one, the screen shown on the right appears, preventing you from advancing to the item setting screen.

If the entered password is not identical

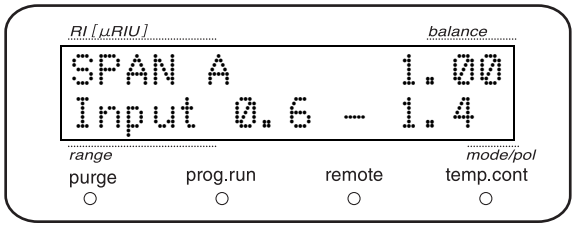


■ Setting the A mode Correction Value «SPAN A»

Correct the output value of this instrument by checking whether it produces the expected measurement value when analyzing a sample with a known refraction index. Input and set the value obtained in"7.4.7 Span Check" P.118 from this screen.

Enter a set value using the numeric keyboard and press **enter**.

At this point, a factory default value is input.

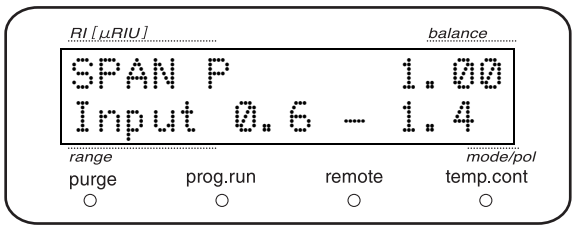


Setting Range
0.6 to 1.4

■ Setting the P Mode Correction Value «SPAN P»

Set the correction value in P mode.

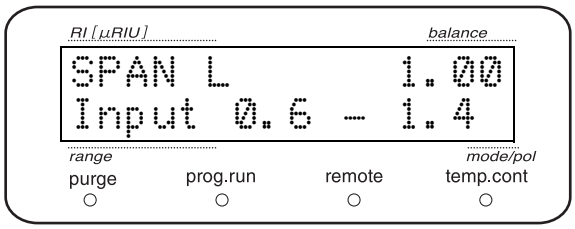
At this point, a factory default value is input.



■ Setting the L Mode Correction Value «SPAN L»

Set the correction value in L mode.

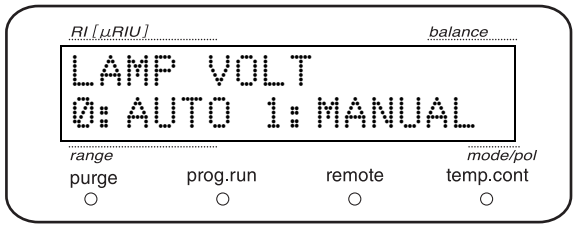
At this point, a factory default value is input.



■ Setting Lamp Voltage «LAMP VOLT»

Sets lamp voltage.

Changing the lamp voltages changes the incident light intensity to the photodiode. The lamp voltage is normally set so that TOTAL EN value becomes 7000 to 7200. Although the value adjusted at shipment is set on the instrument, resetting is required when gradual decrease in the light intensity is observed due to aged deterioration of the lamp,



In the selection menu on the screen:

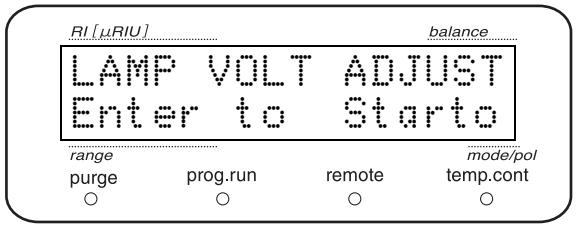
- If you select "0", an optimum lamp voltage is automatically set.
- If you select "1", you can set the lamp voltage value directly.

When "0: AUTO" is selected

If you select "0: AUTO", the screen shown on the right is displayed.

Press (enter) to start the lamp voltage adjustment operation.

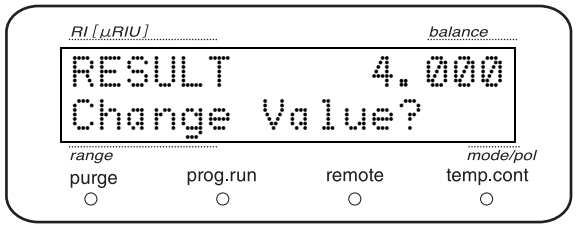
* Be sure to purge sufficiently before starting the lamp voltage adjustment. If air bubbles exist in the flow cell, the lamp voltage cannot be adjusted correctly.



After automatic adjustment is completed, the adjusted lamp voltage is displayed.

When changing the voltage, press (enter).

When not changing the voltage, press (CE).



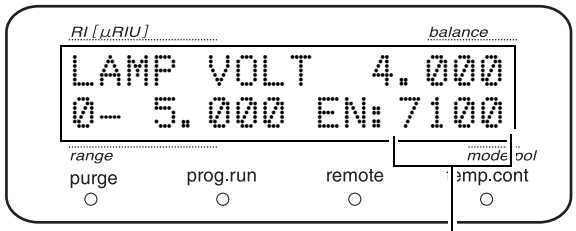
* If "RESULT NG" is displayed, it indicates that the automatic adjustment has failed because of air bubbles in the flow cell.

When "1:MANUAL" is selected

If you select "1: MANUAL", the screen shown on the right is displayed.

Set the lamp voltage using the numeric keypad and (enter).

Range of set value (V)
0 to 5.000



Current TOTAL EN value

NOTE

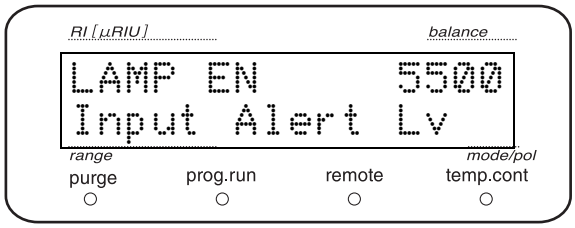
When the light intensity does not reach 7000 even though the lamp voltage is set to 5 V, bubbles may be inside the flow cell, the flow cell may be dirty, or the lamp may have deteriorated. If the lamp intensity does not reach 7000 or higher even after purging or cleaning the flow line, contact your Shimadzu representative.

■ Setting the Lamp Light Intensity Acceptance Level «LAMP EN»

Set the threshold for the lamp energy (light intensity) check to be performed during a system check.

Enter a set value using the numeric keypad and press **enter**.

Setting Range	Default
1 to 9000	5500

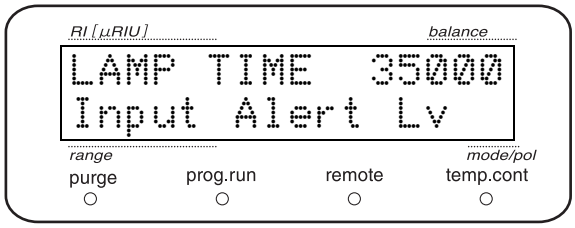


■ Setting a Lamp Lighting Time-Based Rough Replacement Time «LAMP TIME»

Sets lamp lighting time-based rough replacement time.

Enter a set value using the numeric keypad and press **enter**.

Setting Range	Default
1 to 999999	35000



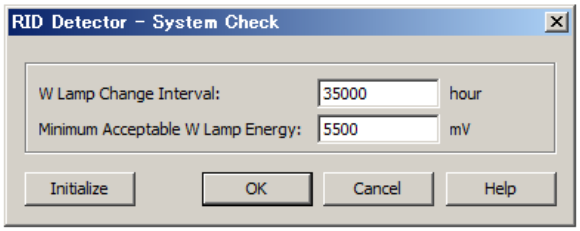
NOTE

When a sticker indicating "LED MOUNTING" is attached to the right side of the instrument, the light source is LED and the average service life of the lamp is 35,000 hours. If the "LED MOUNTING" sticker is not attached, the light source is a tungsten lamp and the average service life of the lamp is 20,000 hours. Set a value according to the actual light source.

NOTE

When connecting the instrument to a workstation, configure the "LAMP EN" (lamp light intensity acceptance level) and "LAMP TIME" (lamp lighting time-based rough replacement time) settings on the setting screen of the workstation instead of on the instrument itself.

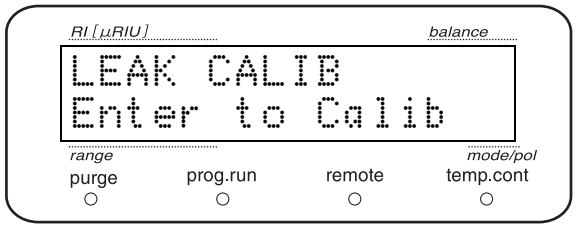
When using LabSolutions ([Instrument] → [System configuration] → [RID-20A] → [System Check])



■ Calibrating the Leak Sensor «LEAK CALIB»

Calibrates the leak sensor.

After checking that the leak sensor is dry and has not comes in contact with the resin panel wall, turn on the instrument power and wait for three minutes or more, then press **enter**.



NOTE

This operation is necessary when a leak sensor is replaced.

After calibrating the leak sensor, reset its operation level as described in the next section.

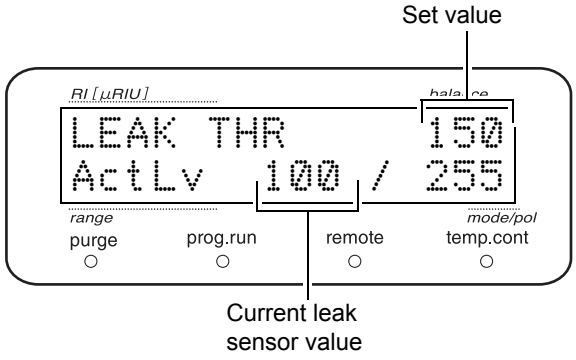
■ Setting Leak Sensor Operation Level «LEAK THR»

Set the leak sensor operation level (threshold).

Enter a set value using the numeric keypad and press **enter**. If the current value of the leak sensor goes beyond the set value, a leak error warning occurs.

At this point, a factory default value is input.

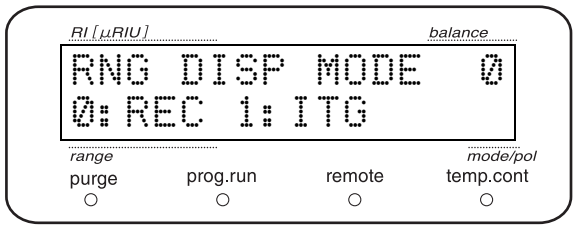
Setting Range
0 to 255



■ Selecting a Display Mode in the "range" Field of the Initial Screen «RNG DISP MODE»

Selects items to be displayed in the "range" field of the initial screen.

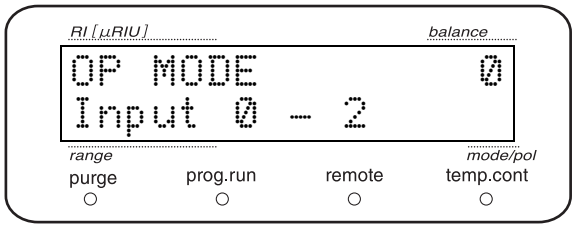
Set value	Content of display
0	Display full-scale setting for the recorder (setting in "RANGE")
1	Display full-scale setting for the integrator (setting in "AUX RANGE")



■ Selecting an Operation Mode «OP MODE»

Set the operation mode for this instrument according to the connected system controller or workstation.

Enter a set value using the numeric keypad and press **enter**.



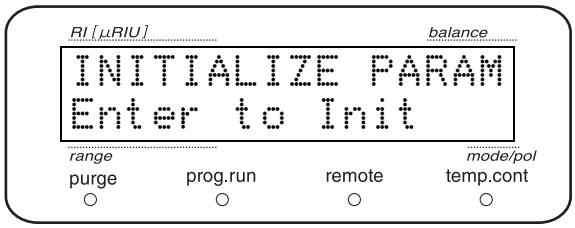
Set value	Operation mode
0	The instrument is recognized as RID-20A.
1	The instrument is recognized as RID-10A.
2	In case of connecting to Shimadzu LC Driver Pack for Waters Empower Software (Version 4.04 or later), the instrument is recognized as RID-20A (PAC mode).

☞ "5.6.3 Precautions for Operation" P.97

■ Initializing parameters «INITIALIZE PARAM»

The auxiliary function setting parameters and time program are initialized.

Press **enter** to start the initialization.



* This operation is recorded in the operation log as "INITIALIZED PARAM".

■ Locking the Setting Screen «PARAMETER LOCK»

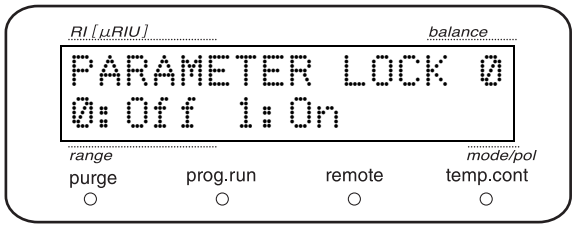
Locks switching the screen to the auxiliary function setting screen and VP function screen to disable the instrument parameter change by any one except the administrator.

If you select "1: On" for this function, the password input screen appears before the initial screen switches to various setting screens.

You can advance to the setting screens when you enter the correct password.

* However, you can display the MONITOR group without the password.

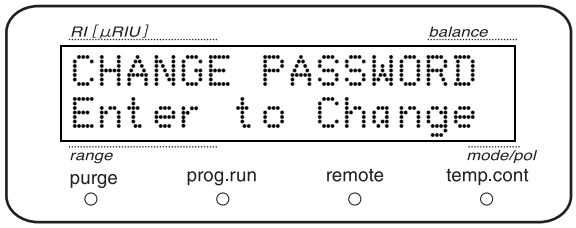
If you changed the setting for this function (PARAM LOCK ON/OFF) or advanced to a setting screen using the password (PARAM LOGIN), your operation is recorded in the operation log.



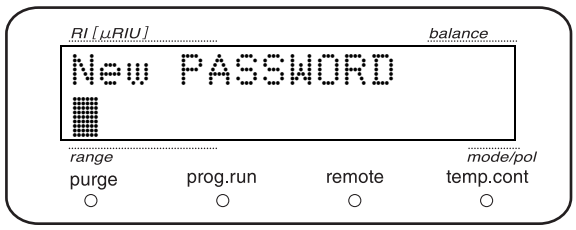
■ Changing Password «CHANGE PASSWORD»

Changes password.

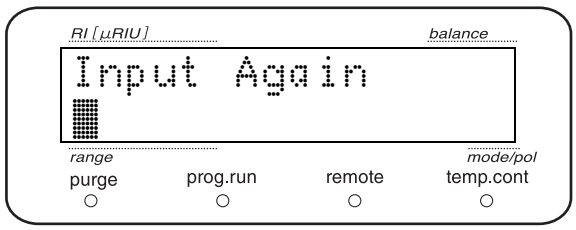
1 Press **enter**.
The input screen appears.



2 Enter a five-digit number using the numeric keypad and press **enter** .

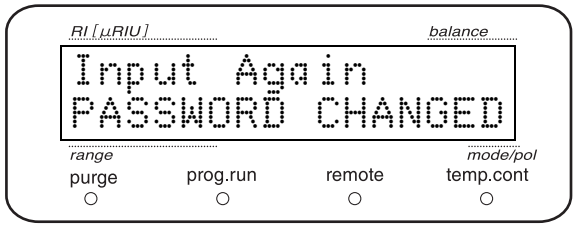


3 For the confirmation, input the password you have entered in the step 2 again.



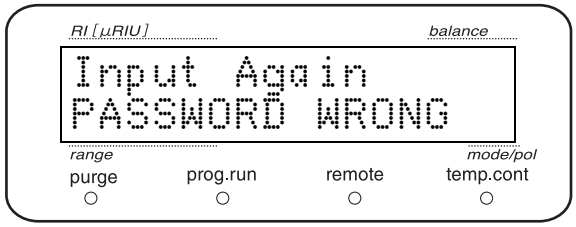
4 If you change the password after entering it, the screen shown on the right is displayed.

When the entered password is identical



If you enter the wrong password, the screen shown on the right is displayed. In this case, the password newly entered is not registered.

If the entered password is not identical



5 Press **enter** to return to the item title screen.

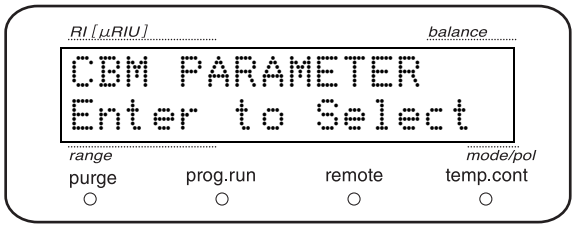
NOTE

Record the new password in a secure place.

■ Displaying and Setting CBM Parameter «CBM PARAMETER»

It is displayed when CBM-20A/20Alite is connected.

Press **enter** to display and set items in "5.3.7 Displaying and Setting CBM Parameter (Calibration Support Group)" P.86.



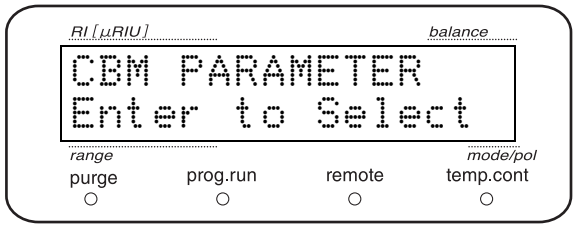
5.3.7 Displaying and Setting CBM Parameter (Calibration Support Group)

Display and set parameters of CBM-20A/20Alite that control this instrument.

Press **enter** to move to the CBM parameter setting screen.

Alternatively, press **func** or **back** sequentially to select the item to be set.

If you press **CE** in each item, you will return to the screen shown on the right.



NOTE

When this instrument is not connected to CBM-20A/20Alite or when "OP MODE" is set to 10 A mode, pressing **enter** does not move you to the CBM parameter setting screen.

List of CBM parameters

Name	Function	Page
SERIAL NUMBER	Displays serial number of CBM.	P.87
S/W ID	Displays version number of the CBM program.	P.87
INTERFACE	Sets the protocol for communication with the data processor.	P.87
ETHERNET SPEED	Sets the transmitting speed of ethernet. *1	P.88
USE GATEWAY	Sets use/non-use of default gateway. *1	P.88
IP ADDRESS	Sets the IP address of CBM. *1	P.88
SUBNET MASK	Sets subnet mask. *1	P.88
DEFAULT GATEWAY	Sets default gateway. *1*2	P.89
TRS MODE	Selects the counterpart device when the connecting LC workstation or Chromatopac to this instrument.	P.89

*1 If "Ban on Change" is set on CBM-20A/20Alite, you can only display them and cannot conduct any changes.

*2 If "Not use default gateway" is selected, the parameter setting is unavailable.

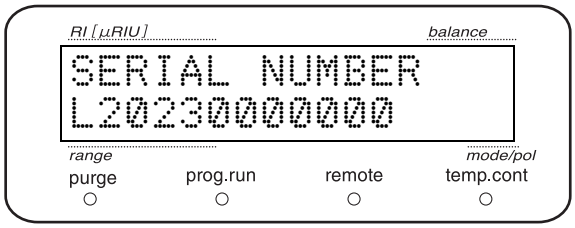
NOTE

A set parameter is enabled only after CBM power is turned on again.

For details of the parameters, refer to the instruction manual of CBM-20A/20Alite.

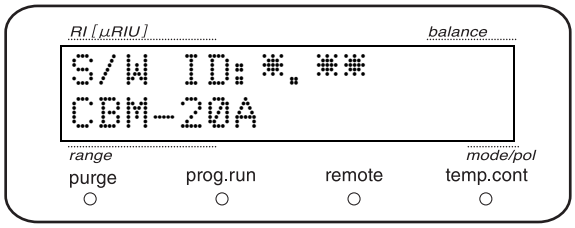
■ Displaying Serial Number «SERIAL NUMBER»

Displays the serial numbers of CBM.



■ Displaying S/W Version Number «S/W ID»

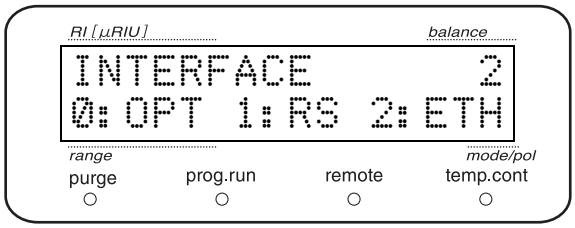
Displays the version number and model name of the CBM.



■ Setting the Protocol for Communication with the Data Processor «INTERFACE»

Sets the communication protocol between CBM and the data processor.

Enter a set value using the numeric keypad and press **enter**.

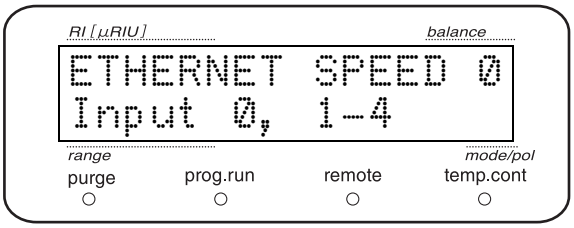


Set value	Communication protocol
0	To connect with optical cable
1	To connect with serial communication (RS-232C)
2	To connect with Ethernet

■ Setting Ethernet Communication Speed «ETHERNET SPEED»

Sets Ethernet communication speed of CBM.

Enter a set value using the numeric keypad and press **enter**.

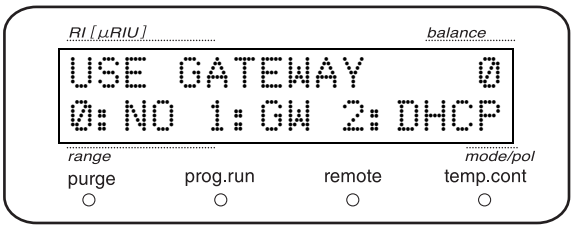


Set value	Communication speed
0	Auto Detect
1	10 Mbps, Half Duplex
2	10 Mbps, Full Duplex
3	100 Mbps, Half Duplex
4	100 Mbps, Full Duplex

■ Setting use/Non-Use of Default Gateway «USE GATEWAY»

Sets to use/non-use of CBM default gateway.

Enter a set value using the numeric keypad and press **enter**.

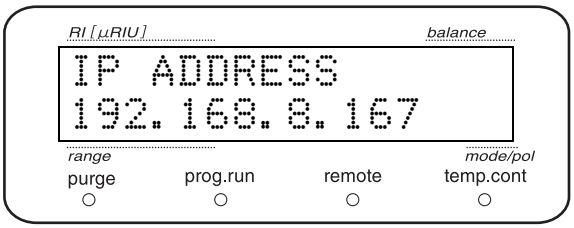


Set value	Default gateway
0	Does not use default gateway.
1	Uses default gateway.
2	Uses the DHCP server.

■ Setting IP Address «IP ADDRESS»

Sets the IP address of CBM.

Enter a set value using the numeric keypad and press **enter**.



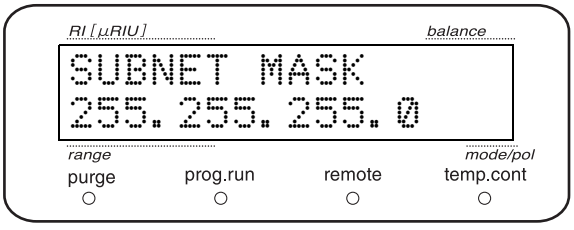
NOTE

Consult the network administrator for the value to be set.

■ Setting Subnet Mask «SUBNET MASK»

Sets the subnet mask of CBM.

Enter a set value using the numeric keypad and press **enter**.



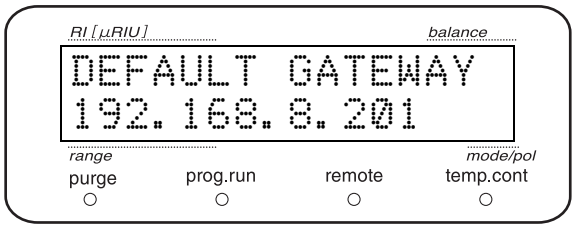
NOTE

Consult the network administrator for the value to be set.

■ Setting Default Gateway «DEFAULT GATEWAY»

Sets the default gateway of CBM, which controls this instrument.

Enter a set value using the numeric keypad and press **enter**.



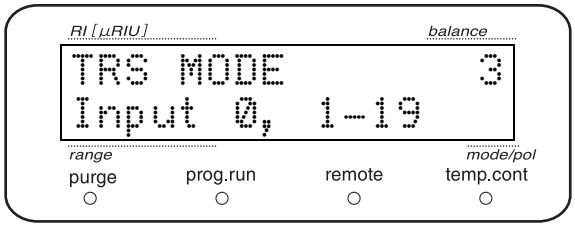
NOTE

Consult the network administrator for the value to be set.

■ Setting Communication Mode «TRS MODE»

Select the counterpart instrument when the connecting LC workstation or Chromatopac to this instrument.

Enter a set value using the numeric keypad and press **enter**.



Set value	Content
0	To connect through manual setting on CBM
2	To connect to CLASS-VP
3	To connect to LCsolution (Default)
11	To connect to C-R8A
12	To connect to C-R7A/C-R5A
13	To connect to C-R4A
14	To connect to C-R6A (Without extended ROM board)
15	To connect to C-R6A (With extended ROM board)

NOTE

Do not set any value other than the above. Otherwise, this instrument will not operate normally.

5.4 Creating Time Program

Parameters for the response and output range set on this instrument can be run using the time program. A created time program is saved after the power is turned OFF.

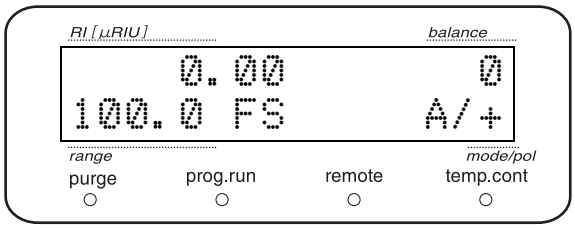
5.4.1 List of Commands Usable for Time Program

Command	Function	Setting Range
ZERO	Adjusts zero position of the recorder.	–
MARK	Marks the point in time when the recorder output is carried out.	–
RANG	Sets the output range.	0.00 to 5000
RESP	Sets the response.	0 to 10
EVENT	Sets operation of the EVENT output terminal.	0: Turns EVENT1 and 2 OFF 1: Turns EVENT1 ON 2: Turns EVENT2 ON 12: Turns EVENT1 and 2 ON
POL	Sets the polarity (polarity of output).	0: + 1: -
PURG	Switches to the purge flow line to start purge. *When using this command in L mode, the flow rate must be 1 mL/min or less. When carrying out the purge based on the time program, note that it switches to the purge flow line without displaying the check screen of [CHECK FLOW].	–
PG.E	Restores the analysis flow line to end the purge.	–
BAL	Adjusts the balance.	–
SVL	Sets the solvent recycling valve switching level.	0.00 to 9999
LOOP	Sets repeat count for the time program.	0 to 255 *"0" sets 256 times
STOP	Ends the time program.	–

5.4.2 Time Program Edit Screen

When creating a time program, set necessary parameters on the time program edit screen.

1 Press **CE**.
Initial screen is displayed.

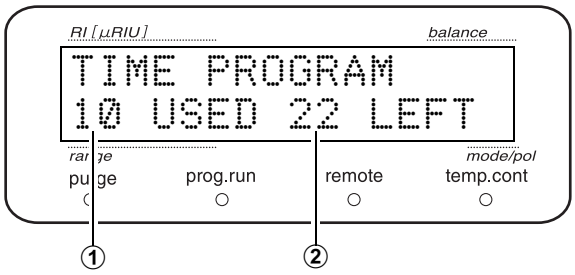


2 Press **edit**.
Number of steps for the time program is displayed.

① Number of steps already set

② Number of steps remaining

The screen shown on the right indicates that 10 steps have been set for the time program and 22 steps remain for the setting.



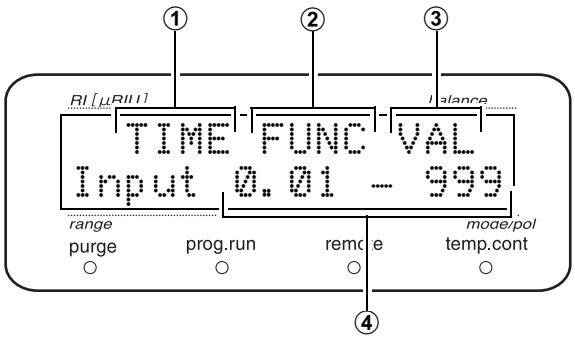
3 Press **enter**.
The time program edit screen is displayed.

① Command execution time (in minutes)

② Name of the executed command

③ Set value

④ Setting Range



■ Creating a Typical Time Program

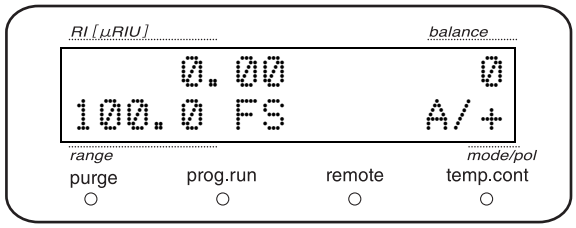
In this time example, negative (-) polarity is set for 5 minutes after the start of the time program and it ends 10 minutes after the start of the time program.

Step	TIME (minute)	Command	Set value
1	5.00	POL	1
2	10.00	STOP	–

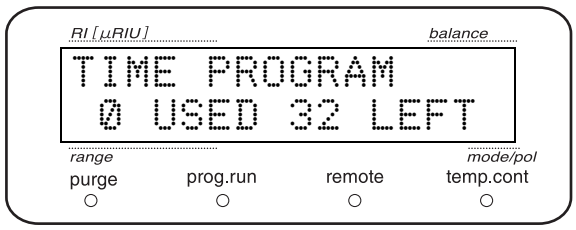
NOTE

- When setting several steps, it does not need to set them in time since they are rearranged automatically.
- Be sure to set "STOP" at the end of the time program except when running it endlessly.

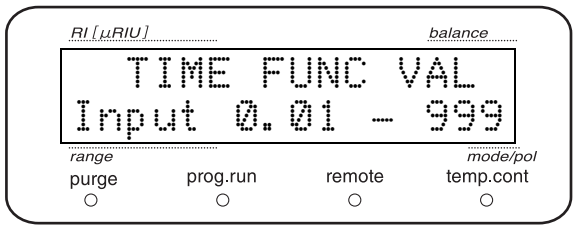
1 Press **CE**.
Initial screen is displayed.



2 Press **edit**.
Number of steps of the time program is displayed.



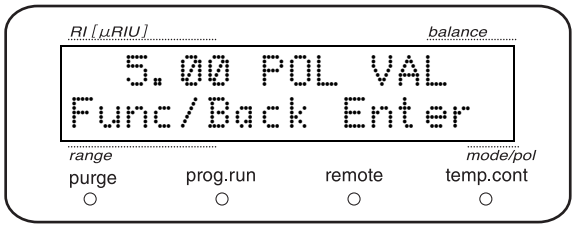
3 Press **enter**.
The screen for setting "TIME" is displayed.



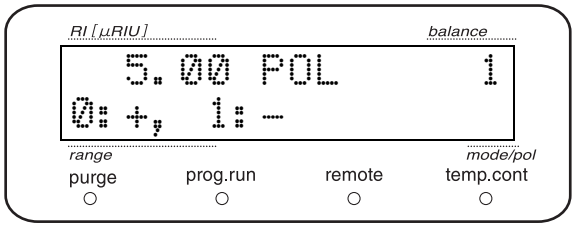
4 Press **5** and **enter**.

5 Press (func) repeatedly until "POL" is displayed, then press (enter).

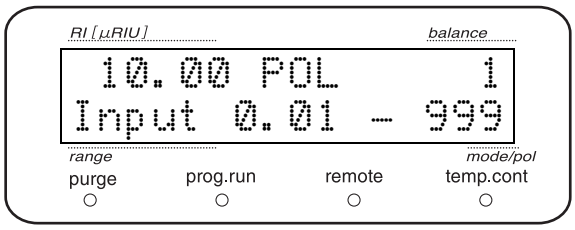
* When selecting a command, pressing (back) displays the previous command.



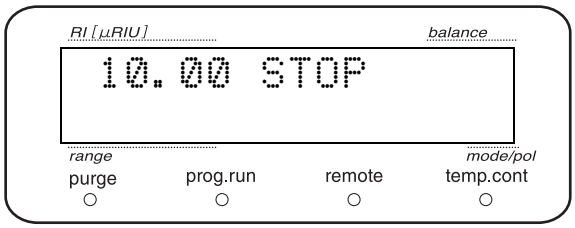
6 To input the set value of pol, press (1) and (enter).



7 To input the time, press (1), (0) and (enter).



8 Press (func) repeatedly until "STOP" is displayed, then press (enter) to validate it.



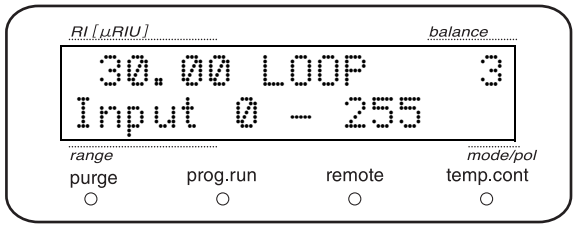
9 Press (CE).
This ends the time program creation.

10 Press (CE).
The time program is saved and it returns to the initial screen.

The time program in the example had 2 steps. In the same procedure, you can set up to 32 steps.

5.4.3 Setting Repeat Count of Time Program «LOOP»

Using "LOOP" allows repeating the time program for the specified numbers.



If you employ the setting shown in the table to the right, you can repeat steps 1 and 2, 10 times in three-minute cycles.
Set "LOOP" at the end of the program.

Step	TIME	FUNC	VALUE
1	0.10	PURG	-
2	2.00	PG.E	-
3	3.00	LOOP	10

NOTE

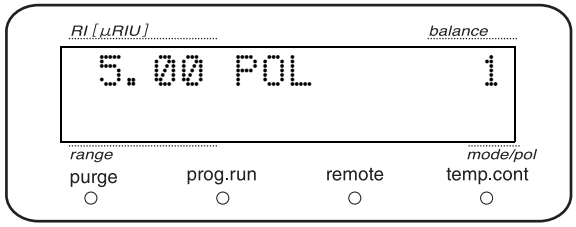
- You can set "LOOP" up to 255 times. However, when "0" is set, LOOP is continued up to 256 times.
- Even if a time program is set to succeed "LOOP", it is not executed. The time program stops at the end of "LOOP".

5.4.4 Deleting Steps

Delete unnecessary steps from a time program.

1 Display the step to be deleted.

* When deleting the steps after the second step, press **enter** repeatedly until the desired step is displayed.



2 Press **del**.

The displayed step is deleted.

When the next step is set, that step is displayed.

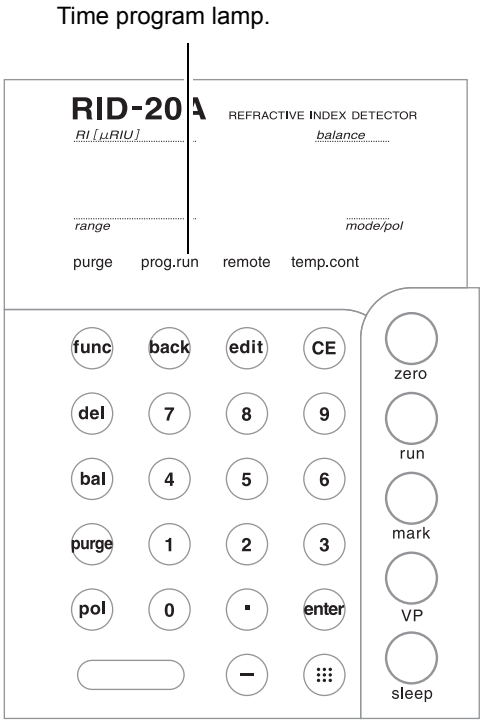
5.4.5 Starting a Time Program

There are the following two ways to start a time program.

- Press run.
- Enter the contact signal to the external input/output terminal.

☞ "5.7 Connecting to External Equipment Using External Input/Output Terminal" P.98

The time program lamp on the display panel is lit up and the time program starts.



NOTE

If you change a set value while a time program is run, the new value remains effective only up to the end of the time program. After the time program ends, the new set value is replaced with the one that had been set prior to execution of the time program.

5.4.6 Ending a Time Program «STOP»

There are the following three ways to end a time program.

- Forcibly end a currently running time program by pressing run.
- Forcibly end a currently running time program by entering the contact signal to the external input/output terminal.

☞ "5.7 Connecting to External Equipment Using External Input/Output Terminal" P.98

- End a time program using "STOP" command in the program.

☞ "■ Creating a Typical Time Program" P.92

5.5 Connect to System Controller CBM-20A or CBM-20Alite

5.5.1 Setting this Instrument

Employ the following setting when controlling this instrument from the system controller CBM-20A/20Alite.

Command	Set value	Page
LOCAL	0: Remote	☞ "■ Setting Local Mode «LOCAL»" P.65
ADRS	Link address	☞ "■ Setting Link Address «LINK ADRS»" P.66
OP MODE	0: 20A	☞ "■ Selecting an Operation Mode «OP MODE»" P.83

5.5.2 Basic Parameters

The following setting and controlling are available from CBM-20A/20Alite. For more details, refer to the instruction manual of CBM-20A/20Alite.

- Setting the measurement mode
- Response setting
- Setting the INTEGRATOR connector output range
- Setting the RECORDER connector output range
- Temperature setting of the measuring section
- Setting polarity
- Parameters for the solvent recycling valve
- Time program

5.6 Connecting to System Controller SCL-10Avp or SCL-10A

5.6.1 Setting this Instrument

Employ the following setting when controlling this instrument from the system controller SCL-10Avp/10A.

Command	Set value	Page
LOCAL	0: Remote	☞ "■ Setting Local Mode «LOCAL»" P.65
ADRS	Link address	☞ "■ Setting Link Address «LINK ADRS»" P.66
OP MODE	1: 10A	☞ "■ Selecting an Operation Mode «OP MODE»" P.83

5.6.2 Basic Parameters

The following setting and controls are available from SCL-10Avp/10A. For more details, refer to the instruction manual for SCL-10Avp/10A.

- Setting the measurement mode
- Response setting
- Setting polarity
- Setting the INTEGRATOR connector output range
- Setting the RECORDER connector output range
- Temperature setting of the measuring section
- Time program

5.6.3 Precautions for Operation

When using this instrument after connecting to SCL-10Avp or SCL-10A, this instrument is subject to the following restrictions since it functions as RID-10A.

- Setting response "0: No filtering" becomes unavailable.
- Setting the parameters of the solvent recycling valve from the system controller is not available. Set them from this instrument.
- Use of "Setting switching level of the solvent recycling valve (SVL command)" by the time program of the system controller is disabled.

5.7 Connecting to External Equipment Using External Input/Output Terminal

"External input/output terminal" is used for connecting to the external equipment for event output via the attached event cable.

⚠WARNING

- Before starting wiring, turn this instrument power OFF and disconnect the power plug from the outlet.
- Do not use any wiring cable other than what is specified.
- Connect as specified.

  Otherwise, fire hazards, electric shock, or malfunction may result.

5.7.1 External Input/Output Terminal

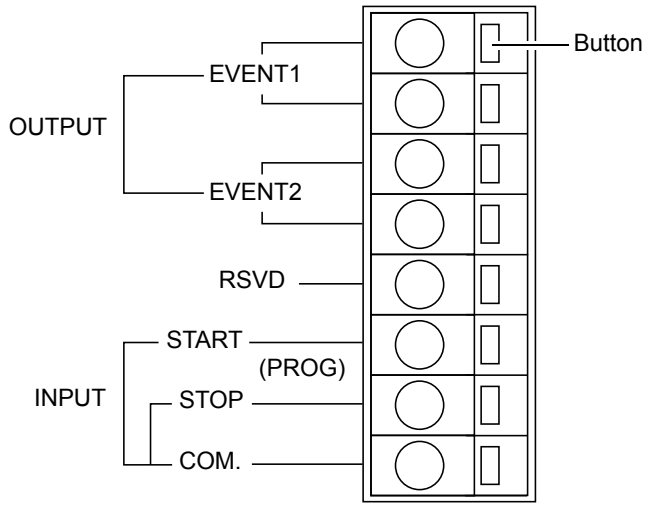


Fig.5.1

Signal	Description	Remarks
EVENT1 (Output)	Relay contact output. It is turned ON or OFF according to the set time program or EVENT of Auxiliary Function.	Rating of relay contact is DC30 V/1A.
EVENT2 (Output)		
RSVD	Not available. Do not connect anything to this terminal.	
PROG. START (Input)	Starts the time program for this instrument according to the external contact signal.	Contact for the external equipment controls short circuit between these signals and the COMMON terminal. Duration for shorting (tc) should be as follows. 0.5 sec < tc < 10 sec
PROG. STOP (Input)	Stops the time program for this instrument according to the external contact signal.	
COMMON	COMMON terminal for input.	

5.7.2 Wiring

1 At the tip, peel off cladding to be connected about 10 mm. It is not necessary for provided event cable.

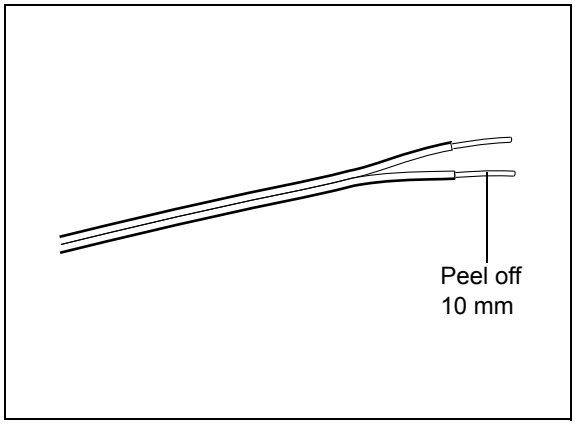


Fig. 5.2

2 When the cable has a single core, insert it into the terminal hole as is.
When the cable has stranded cores, twist them at the tip of the cable, and insert them into the terminal hole using a fine flat-head screwdriver while pressing the button on the terminal.
When removing the cable, pull it out while pressing the button of the terminal.

NOTE

Although a single event cable is attached to this instrument, the following cables must be used when connecting to a terminal with two or more circuits.

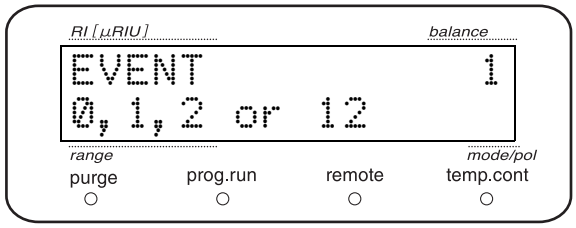
- Solid wire: ϕ 0.4 to ϕ 1.2 (AWG26 to 16)
- Stranded wire: 0.3 mm^2 to 1.25 mm^2 (AWG22 to 16) Solid wire diameter ϕ 0.18 minimum

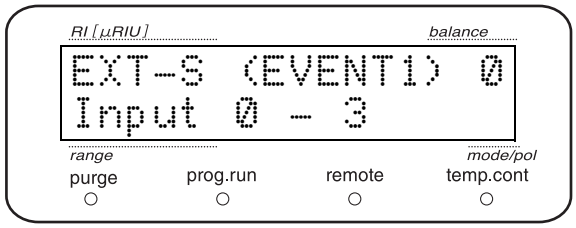
In order to prevent breaking, the cable used must have stranded wire.

NOTE

When using the EVENT1 or EVENT2 signal, set [EVENT] and [EXT-S (EVENT1)], [EXT-S (EVENT2)] of the auxiliary function.

☞ "■ Setting the EVENT Output Terminal «EVENT»" P.62
"■ Setting Function of the EVENT1 Output Terminal «EXT-S (EVENT1)»" P.67





6

Troubleshooting

Contents

6.1 Troubleshooting and Corrective Actions

This section describes the Possible causes of problems that can arise from Symptoms, and the Corrective Actions to be taken to eliminate the causes. For more detailed procedures, see the "Page" column in the following table.
If the problem cannot be resolved even after taking Corrective Actions described in the table, or if there are problems not included in the table, contact your Shimadzu representative.

Symptoms	Possible Causes	Corrective Actions	Page
Power does not turn on even after power switching is set to the ON position.	Power plug is disconnected.	• Connect plug correctly.	P.143
	Power cord internal wires are cut.	• Replace with a new cord of the same type.	P.11
	Power supply does not meet specifications for this instrument.	• Use power supply that meets specifications for this instrument.	P.143
	Fuse is blown.	• As the fuse is mounted inside the instrument, Shimadzu service personnel will replace it if it is blown. Contact your Shimadzu representative.	–
Recorder baseline does not change.	The range is set to "0".	• Set appropriate value for [RANGE].	P.41
	The lamp is turned off.	• Make sure the correct voltage is set in the "LAMP VOLT" field.	P.80
	The recorder output has exceeded the scale limit.	• Press (zero). Reset the recorder to the zero position.	P.20
 Transient spiking  Sawtooth baseline noise  Continuous spiking	Air bubbles are flowing through the flow line.	• Locate the position where air bubbles occur in the analysis system. (Loosened pipe joints, etc.)	–
		• Degas the mobile phase solvent. If degassing fails, change the outlet tubing and apply 0.1 MPa to 0.2 MPa back-pressure.	P.24
 Continuous spiking  Spiking occurring at every stroke of the pump	Air bubbles remain in the flow cell.	• Melt air bubbles by pumping the degassed solvent.	P.24
		• If it is difficult to remove air bubbles from aqueous solvent, flow a solvent that has a high interfacial wettability such as methanol and acetone to the line.	–

Symptoms	Possible Causes	Corrective Actions	Page
 Drift  Excessive noise  Swell	The flow cell (sample cell or reference cell) is dirty.	• Flow cleaning solution appropriate for the causative agent. * If buffer solution is used for analysis, the salt may be precipitated. Flow water. * If organic solvent is used for analysis, clean the flow line using 2-propanol, acetone, THF, etc.	P.135
	If this phenomenon is eliminated when you stop to pump solvents, a device other than this instrument is attributed to the problem.	• Check the mobile phase solvent and mobile phase flow line. * If THF without stabilizing agent is used, a change in the mobile phase may show as the baseline fluctuation.	P.24
	Insufficient purge	• Purge the flow line.	P.37
 Baseline wanders	There is a strong air current blowing on the instrument.	• Place a screen so that the air current does not hit the instrument directly. • Change the location of the instrument. • Close the front panel of the instrument.	–
 Noise occurs corresponding to the pump stroke	Mobile phase solvent pulsation.	• Eliminate pump pulsation with a damper. • Use a pulsation absorption device.	–

6.2 Measures against Error Messages

This instrument has a self-diagnostic function, and it sounds the buzzer and displays an error message if a problem occurs.
The following explains the possible causes and actions to take if an error message is displayed.

NOTE

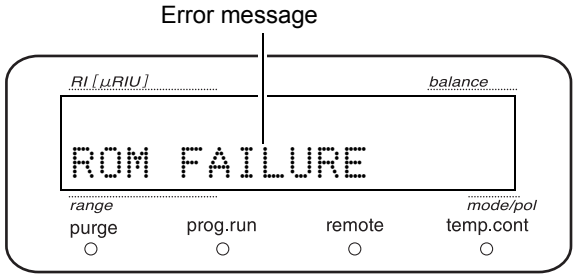
The "Type" column indicates each error message type.

Fatal: The instrument stops operation. The error message cannot be cleared even when you press **CE**.

Alarm: The instrument stops operation. Press **CE** to clear the error message.

Warning: The instrument does not stop operation. Press **CE** to clear the error message.

Message: A message is displayed according to the operation. The message is cleared automatically after several seconds.



Error message	Type	Cause and Action
ROM FAILURE (ROM error)	Fatal	Cause: The ROM has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
RAM FAILURE (RAM error)	Fatal	Cause: The RAM has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
ERR ZG HOME POS (Zero glass home position sensor error)	Fatal	Cause: The zero glass home position sensor has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
ERR OVER HEAT(I) (Overheating)	Fatal	Cause: This message is displayed when the measuring section (inner side) has overheated. Action: Turn the power switch OFF, and contact your Shimadzu representative.

Error message	Type	Cause and Action
ERR OVER HEAT(O) (Overheating)	Fatal	Cause: This message is displayed when the measuring section (outer side) has overheated. Action: Turn the power switch OFF, and contact your Shimadzu representative.
ERR TEMP SENS(I)	Fatal	Cause: The temperature sensor (inner side) has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
ERR TEMP SENS(O)	Fatal	Cause: The temperature sensor (outer side) has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
ERR LEAK SENS	Fatal	Cause: The leakage sensor has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
ERR No.****	Fatal	Cause: The PCB or other circuit has failed. Action: Turn the power switch OFF, and contact your Shimadzu representative.
NOT PROTECTED (Set value loss error)	Alarm	Cause: While the power switch was turned ON, the previously used parameters or time program was lost. Action: Press CE to clear the error, and set up the parameters or time program again.
ERR LEAK DETECT (Leakage error)	Warning	Cause: Fluid leakage was detected. Action: Check the flow line for leakage, and wipe off the liquid around the leakage sensor.
KEY CLOSED (Keypad disabled)	Message	Cause: Although the key input was disabled by the [KEY CLOSE] setting, a key was pressed. Action: Cancel the [KEY CLOSE] setting. ☞ "■ Disabling Key Input «KEY CLOSE»" P.66

Error message	Type	Cause and Action
CHECK FLOW	–	Cause: If you press (purge) to change to the fluid replacement flow line when a large volume of solution is pumped in L mode, the solenoid valve and flow cell may be damaged. Therefore, this message is displayed when you press (purge).
		Action: After changing the pump flow rate to 1 mL/min, press (enter).

The following messages may also appear on the initial screen of the instrument.
This table describes the possible causes and corrective actions for each message.

Symptoms	Possible Causes	Corrective Actions	Page
"OVER" is displayed in the "range" field of the initial screen.	The recorder output has exceeded the scale limit.	• Press (zero).	P.20
"OVER" is displayed in the "balance" field of the initial screen.	Optical balance is shifted.	• Press (bal) to balance the optical system. * "OVER" may be displayed when peak of chromatogram is detected. This is not a problem. In this case, you need not balance the optical system. * Air bubbles may have entered in flow line and the optical balance may be shifted. Purge the flow line and balance the optical system.	P.40
"EN.ALRM" is displayed in the "mode/pol" field of the initial screen.	The incident light intensity to the photodiode is insufficient. * The total light intensity (TOTAL EN) is less than 5500.	• Air bubbles may have entered in the flow cell (sample cell or reference cell). Purge the flow line.	P.37
		• The flow cell may be dirty. Clean the flow cell.	P.135
		• The light intensity may have dropped due to deterioration of the lamp. Increase the lamp voltage.	P.80
	The incident light intensity to the photodiode is excessive. * The total light intensity (TOTAL EN) is over 9000.	• The set lamp voltage may be too high. Lower the lamp voltage.	P.80

NOTE

The lamp light intensity (the TOTAL EN value) gradually drops as the lamp deteriorates. The detector performance may be impaired if the light intensity drops excessively. Make sure that the light intensity is at least 5500. The optimum light intensity is 7000 to 7200, and can be adjusted using the LAMP VOLT setting.

7

Hardware Validation

This chapter 12describes periodical inspection procedures to be used to check that the instrument and its components function normally in order to ensure the reliability of the analysis data.

Contents

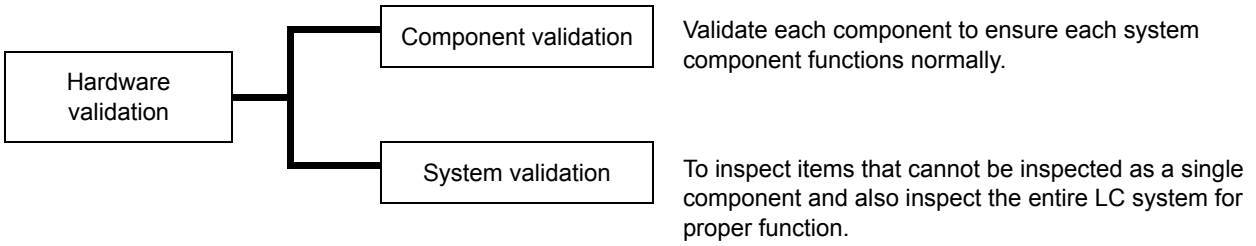
7.1 Overview of Hardware Validation

7.1.1 Hardware Validation

Hardware validation examines whether or not the LC system runs accurately and is suitable for the intended analysis, and documents the examination results. The performance of the LC system deteriorates with age, reflecting the wear of consumable parts. Hardware validation must therefore be performed periodically from the time of installation until the system is retired. Although validation aspects related to analysis, such as method validation and system suitability tests should also be performed, hardware validation is a prerequisite for these items.

7.1.2 Types of Hardware Validation

A High-Performance Liquid Chromatograph consists of several LC components such as pump(s), autosampler, column oven, and detector(s). For this reason, hardware validation is divided into the inspection of individual components and system validation as a whole.



Although the inspection results at the time of production are attached to our product, this chapter describes the guidelines for inspection procedures and criterion value for both the instrument components and system that the customer can use to validate its performance. Refer to each the instruction manual for each component for operational protocol of that specific component.

7.2 Implementation of Hardware Validation

7.2.1 Periodic Inspection

Component and system validation must be performed at installation and every 6 to 12 months, as the performance of an LC instrument changes with age. It is also important to perform maintenance such as replacement of consumables in advance of hardware validation.

7.2.2 Daily Inspection

Daily inspection of the components and HPLC system examine the condition of maintenance parts to ensure a high level of analysis data reliability. Items such as column deterioration and mobile phase adjustment are examined during system suitability tests.

7.2.3 Inspection during Maintenance

After any maintenance, component performance must be re-validated. The type of validation depends on the actual work done. If the maintenance inspection cannot be performed solely by the specific component validation, system validation is required.

NOTE

Maintenance information and results of hardware validation must be recorded and kept for future reference.

7.3 Precautions for Validation

7.3.1 Environment

Instrument performance may be affected by abrupt changes in ambient temperature such as drafts from heating and air conditioning vents.
Inspect the instrument in a room where the temperature change is within 2 °C. Also, avoid places where the air currents from an air-conditioner blow on the instrument.

7.3.2 Installation Location of the Instrument

The installation site is very important for ensuring correct validation. The site should satisfy the following conditions:

⚠ WARNING

- Provide ample ventilation with no fire sources in vicinity

  When flammable or toxic solvents are used as the mobile phase, the room must be properly ventilated.
  When flammable solvents are used, open flame or other fire sources must be strictly prohibited.

⚠ CAUTION

- Avoid dust or corrosive gas

  Avoid installation sites that are exposed to corrosive gases or excessive dust. Otherwise, the instrument life shortens and its performance is not maintained.

- Noise and Electromagnetic Interference

  Do not install the instrument near equipment that generates strong magnetic fields. If the power supply line is subject to high electrical noise, use a commercially-available power surge protector.

- Provide adequate installation surface and space

  This instrument weighs 12 kg. During installation, consider the entire weight combined with other LC components. The lab table on which this instrument is installed should be strong enough to support the total weight of the LC system. It should be level, stable and have depth of at least 600 mm. Otherwise, the instrument could tip over or fall off the table. When components are installed side by side, keep a space of at least 30 mm between the components.

- Regulate room temperature and humidity

  The room temperature should be between 4 and 35 °C, with minimal temperature variations throughout the course of a day. Keep the humidity within 20 % to 85 %.

- Position instrument properly in the room

  Install the instrument in a location where it is free from vibration and away from sunlight, and heat/air conditioning drafts.

7.4 Component (Detector) Validation

7.4.1 Items Required for Validation

■ Standard Reagents for Validation

A list of standard reagents required for component validation is shown below. The standard reagents can be purchased from Shimadzu or prepared by the customer.

Standard sample	Part No.	Description
Aqueous glycerol solution (0.872 mg/L)	S228-32996-05	Used for inspection of the span for the differential refractive index detector.

■ Implement

A list of the implement required for hardware validation is shown below.

Implement	Part No.	Description
Syringe	S046-00001 or S046-00038-01	Used for inspection of the span for the differential refractive index detector.
Syringe adapter	S228-15672-91	Same as above.
Coupling 1.6C-0.4	S228-16004-13	Same as above.
Male nut PEEK	S228-18565	Same as above.
Plug	S228-16006	Used for inspection of drift/noise for the differential refractive index detector.

■ Inspection Items

The following lists the inspection items.

No.	Inspection Items	Outline
7.4.2	The display check and self-diagnosis of memory, etc.	Check the display, LED indicators, memories (ROM and RAM), and drive section (such as motors).
7.4.3	Firmware Version Check	Check the version of firmware.
7.4.4	Check of light source use time	Check the amount of time the light source has been used.
7.4.5	Check of the lamp light intensity	Check the lamp light intensity.
7.4.6	Check of the temperature control function	Check that the temperature control function operates normally.
7.4.7	Span check	Use the known sample, check that the refractive index is measured accurately.
7.4.8	Leak sensor check	Check the leak sensor operation.
7.4.9	Drift / Noise Check	Check that the drift and noise values satisfy the criteria. * This validation is not required in operations other than high sensitivity analysis and similar cases where drift or noise affects quantitative values.

7.4.2 Display Check and Self-Diagnosis of Memory and Others

■ Objective

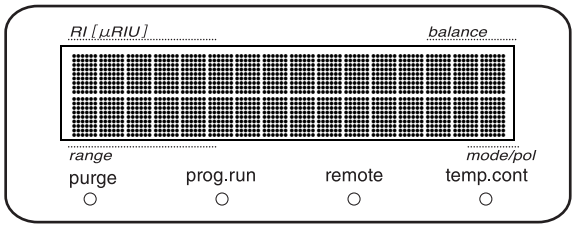
Check the display and LED indicators operations.

Also, check the self-diagnostic result of memories (ROM and RAM) and drive section (such as motors) that are executed when the instrument starts up.

■ Inspection Procedure

1 Turn the power switch ON.

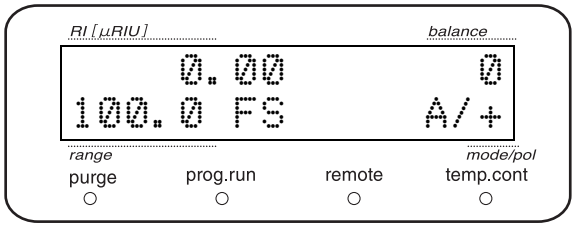
2 Make sure that all dots light up on the screen and all key panel LEDs light up immediately after power is turned on.



CHECK CRITERIA: All dots and LED indicators must light up on the screen.

Then, the self-diagnosis for memories (ROM and RAM) starts, and the drive section (motors) is initialized automatically.

If the initial screen is displayed, both memories and drive section operate normally.



CHECK CRITERIA: The initial screen must appear without an error.

NOTE

If the check criteria is not satisfied

The hardware may have failed. Turn the Power switch OFF, and contact your Shimadzu representative.

7.4.3 Check Firmware Version

■ Objective

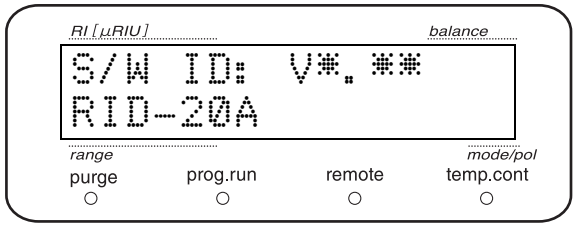
Check the version of firmware.

■ Inspection Procedure

1 Call the [S/W ID] screen of the [PRODUCT INFO] group.

The version number is displayed.

☞ "■ Displaying ROM Version Number «S/W ID»" P.74



CHECK CRITERIA: Version number appears.
The number is same as the administrated one.

7.4.4 Check Lamp ON Time

■ Objective

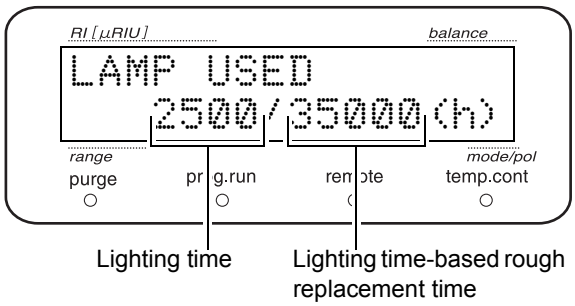
Check the lamp lighting time.

■ Inspection Procedure

1 Call the [LAMP USED] screen for the [MAINTENANCE] group.

The lamp lighting time and the lighting time-based rough replacement time are displayed.

☞ "■ Setting a Lamp Lighting Time-Based Rough Replacement Time «LAMP TIME»" P.81



CHECK CRITERIA: The lamp lighting time must not exceed 35000 hours.

NOTE

If the check criteria is not satisfied

If you use the lamp longer than its service life, the lamp may go off and a measurement may fail. Replace the lamp at certain intervals. When you replace the lamp, contact your Shimadzu representative.

NOTE

When a sticker indicating "LED MOUNTING" is attached to the right side of the instrument, the light source is LED and the average service life of the lamp is 35,000 hours.

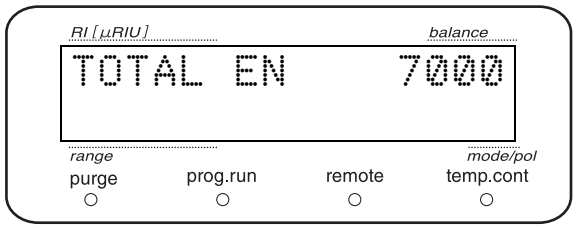
If the "LED MOUNTING" sticker is not attached, the light source is a tungsten lamp and the average service life of the lamp is 20,000 hours. Set a value according to the actual light source.

7.4.5 Check of Lamp Light Intensity

Check the lamp light intensity.

1 Purge the flow cell with a plenty of water.

2 Press (bal) and adjust the balance.



3 Call the [TOTAL EN] screen of the [MONITOR] group.

4 Check the numerical value (light intensity of the lamp) displayed on the screen.

CHECK CRITERIA: The TOTAL EN value must be 5500 or more.

NOTE

If the check criteria is not satisfied

Clean the flow cell with the water. If the problem continues, increase the [LAMP VOLT] value so that the light intensity becomes 5500 or more. The optimum light intensity is 7000 to 7200.

NOTE

The lamp light intensity (the TOTAL EN value) gradually drops as the lamp deteriorates. The detector performance may be impaired if the light intensity drops excessively. Periodically check the light intensity and make sure that the light intensity is at least 5500. The optimum light intensity is 7000 to 7200, and can be adjusted using the LAMP VOLT setting.

7.4.6 Check of Temperature Control

■ Objective

Check that the temperature control of the instrument functions normally.

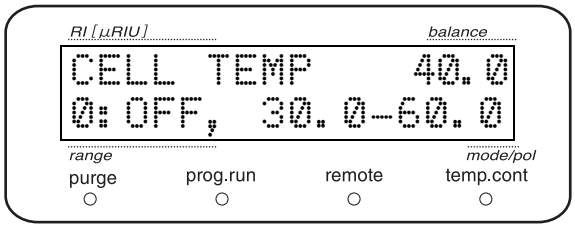
You can check this function while pumping the fluid. However, keep the flow rate below 3 mL/min that the instrument can control.

■ Inspection Procedure

1 Call the [CELL TEMP] screen of the [PARAMETER] group.

Set the temperature to 40.0 °C.

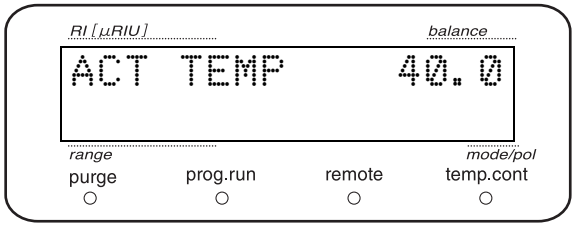
* If the room temperature is 28 °C or higher, set the control temperature to room temperature + 12 °C or higher.



2 Call [ACT TEMP] of the [MONITOR] group.

The current temperature of the measuring section is displayed.

Wait until the control temperature becomes stable.



CHECK CRITERIA: The [ACT TEMP] value must be within [SET TEMP] ±0.1 °C.

7.4.7 Span Check

■ Objective

Use the known sample, check that the refractive index is measured accurately.

Start this inspection by selecting the measurement mode (A, P, or L mode) that is used for actual analysis. You do not need to select a measurement mode that is not used for actual analysis.

Necessary parts	Quantity	Description
Purified water (distilled water or ion-exchanged water)	50 mL	The refractive index of water changes according to the temperature and the amount of dissolved gas. Therefore, use an air-saturated water with a temperature almost equal to the room temperature. (Put the purified water in a container, tighten the container cover slightly, leave it in the test room, then use it for the test.)
Standard sample for the reflective index measurement	10 mL	Aqueous glycerol solution, 0.872 g/L (S228-32996-05) How to create solution: Dissolve the 43.6 g glycerin (USP grade glycerin) into the air-saturated purified water to get the 1-liter solution. Then, dilute the solution to 50 times using the purified water.
Syringe and its adapter	One each	Accessories

Parameter settings on the instrument

Parameter	Set value	Description
CELL TEMP	40 °C	If the room temperature exceeds 28 °C, set this value to room temperature + 12 °C.
pol (Polarity)	+	
Measurement mode	A, P, or L	Check and adjust the span in each measurement mode that is actually used for analysis.

■ Inspection Procedure

Start this inspection only after the temperature control has been stabled.

1 Feed the purified water into the inlet port of the instrument using the syringe and adapter. During this time, press (purge) to flow the purified water to the reference side of the flow cell as well. Exercise care that air bubbles do not enter into the flow line.

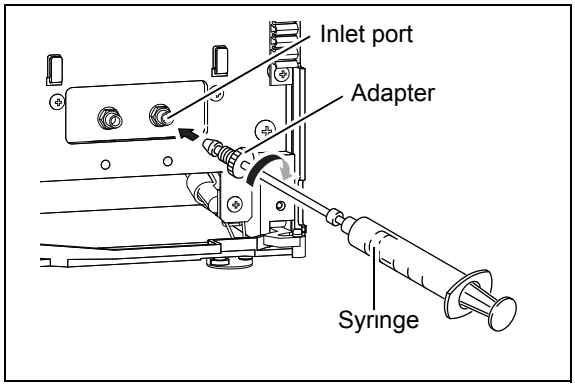


Fig. 7.1

2 After replacing the fluid with the purified water at the sample side and reference side of the flow cell, press (purge) again to end the fluid replacement.

3 Press (bal) to adjust the balance.
Wait until the baseline becomes stable.

4 When the baseline becomes stable, press (zero) and record the baseline level when the cell is filled with the purified water (the value displayed in the "RI" field of the initial screen).

5 Take the standard sample for more than a half of the syringe, and clean the syringe with water. After flushing, dispose of the fluid in the syringe.

6 Feed approximately 3 mL of the standard sample into the inlet port of the instrument. Then, hold the syringe until the baseline becomes stable. When the baseline becomes stable, record the measured value (the value displayed in the "RI" field of the initial screen).

7 Calculate the difference between the baseline level of purified water and the standard sample.

CHECK CRITERIA: It must be within 100 ± 5.0 µRIU.

NOTE

If the check criteria is not satisfied

If the refractive index does not meet the check criteria, set the span coefficient as follows.

1 Determine the span coefficient using the following expression.

How to calculate the span coefficient

$$\text{Current SPAN value} \times \frac{100\ (\mu\text{RIU})}{\text{Actually measured refractive index}\ (\mu\text{RIU})} = \text{New SPAN coefficient}$$

Example:

In A mode

•SPAN A value before inspection: 0.90

* The value displayed in "■ Setting the A mode Correction Value «SPAN A»" P.79

•Refractive index during inspection: 102.4 (μRIU)

$$0.90 \times \frac{100\ (\mu\text{RIU})}{102.4\ (\mu\text{RIU})} \fallingdotseq 0.88$$

2 Set the SPAN value you have obtained in the above step, to "■ Setting the A mode Correction Value «SPAN A»" P.79.

NOTE

Check the span and calculate the span coefficient in each measurement mode. Do not set the SPAN A value that you have calculated in A mode to SPAN P or SPAN L. If you wish to set SPAN P, check the span and calculate the span coefficient in P mode.

7.4.8 Check Leak Sensor

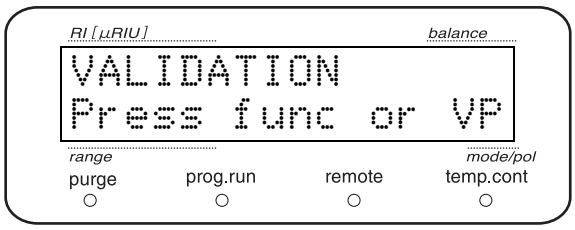
■ Objective

Check the leak sensor operation.

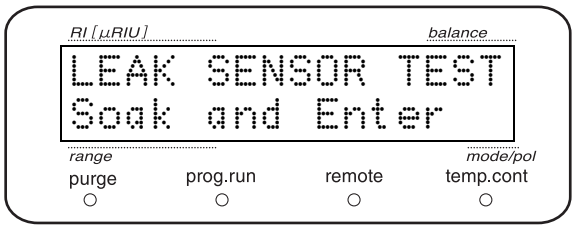
☞ "■ Checking the Leak Sensor «LEAK SENSOR TEST»" P.78

■ Inspection Procedure

1 Press **VP** three times on the initial screen.
"VALIDATION" is displayed.



2 Repeatedly press **func** until "LEAK SENSOR TEST" is displayed.



3 Use a syringe filled with water to wet the thermosensor at the bottom of the leak sensor.

NOTE

Exercise care not to bend the leak sensor during the test. (Exercise care not to let the leak sensor come in contact with the instrument's leak tray.)

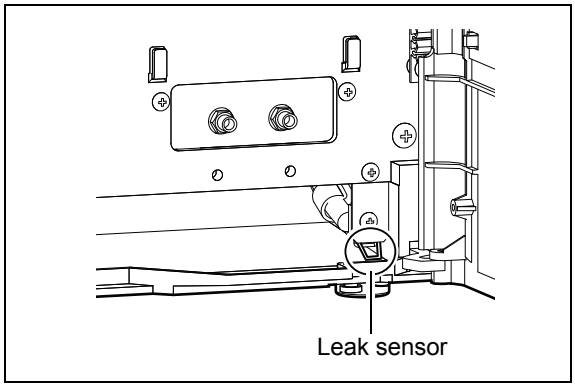
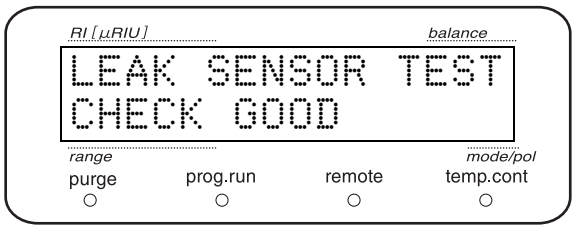


Fig. 7.2

4 When approximately 10 seconds have elapsed, press **enter**.



CHECK CRITERIA: The "CHECK GOOD" message must appear on the display.

NOTE

After the test is complete, wipe off any water around the leak sensor.

7.4.9 Drift and Noise Measurement

■ Objective

The following describes how to measure the drift and noise based on the ASTM (E1303-89) standard. This product has been inspected according to this method at the factory before shipment. This validation is not required in operations other than high sensitivity analysis and similar cases where drift or noise affects quantitative values. To measure the noise and drift, follow the steps below.

Necessary parts	Quantity	Description
Purified water (distilled water or ion-exchanged water)	100 mL	The refractive index of water varies depending on the water temperature and amount of dissolved gas. For the inspection, use purified water (distilled water or ion-exchanged water) that is air-saturated in the temperature of the test room. To saturate purified water with air, feed the purified water into a container, slightly close the container cover, and place it in the test room for several hours.
Syringe and its adapter	One each	Accessories
Plug	2 pieces	Plug mounted on the inlet or outlet port of the instrument (S228-16006)
Data processor (such as LC workstation and Chromatopac)	1	–

NOTE

The temperature change must be within 2 °C during inspection.

■ Inspection Procedure

1 Feed the purified water into the inlet port of the instrument using a syringe.
During this time, press **purge** to flow the purified water to the reference side of the flow cell as well. Exercise care that air bubbles do not enter into the flow line.

2 Close the inlet and output ports of the instrument using the plugs.

3 Set the instrument parameters as follows.

Parameter	Set value	Description
CELL TEMP	40 °C	If the room temperature exceeds 28 °C, set this value to room temperature + 12 °C.
pol (Polarity)	+	–
MODE	A	Analysis mode
RESPONSE	5	Equivalent to 1.5-sec time constant

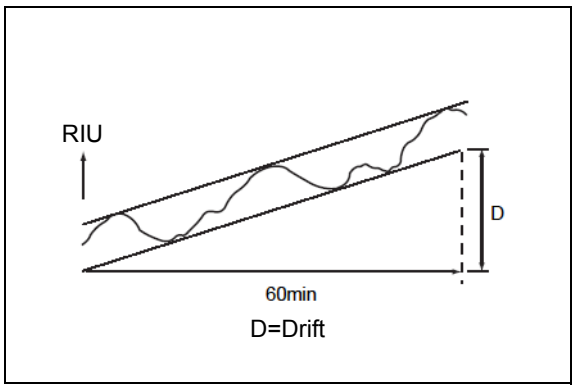
4 When the control temperature enters within ±1 °C, press **bal** to adjust the balance.

5 After that, wait for two or more hours. Then, start the drift and noise test.

Drift measurement

Record the baseline for 60 minutes using the data processor, and calculate the displacement amount of the baseline.

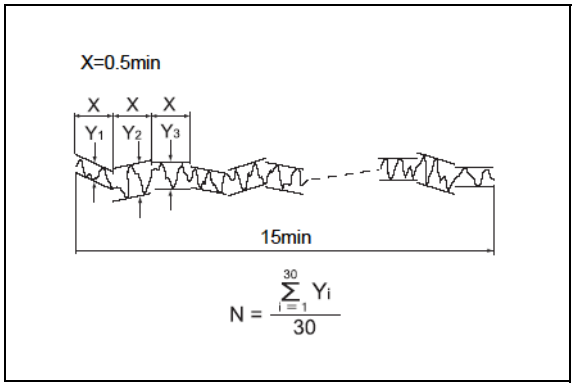
- When recording the data using the Chromatopac:
  Set the [AUX RANGE] to "4: 250 μRIU/V" on the instrument, and set the [ATTEN] to "4" on the Chromatopac. The full scale of INTEGRATOR output becomes 4 μRIUFS. Press the [Plot] key to start recording, and read the values as follows.



- For C-R8A and CR-7Aplus, 14.0 mm on the chart corresponds to 1/10 of the full-scale value.
- For C-R7A, 15.0 mm on the chart corresponds to 1/10 of full-scale value.
- For C-R4A, 16.0 mm on the chart in A4 size mode corresponds to 1/10 of full-scale value.
- For C-R5A and C-R6A, 13.5 mm on the chart corresponds to 1/10 of full-scale value.

Noise measurement

Measure the baseline for 15 minutes.
Break the 15-minute baseline recording into 0.5-minute intervals along the time axis. For each interval, draw a set of parallel lines that most closely encloses the span of the baseline noise.
Along the absorbance axis, measure the width between the parallel lines for each interval, and calculate the average for all intervals as the noise value.



- When recording the data using the Chromatopac:
  Set the [AUX RANGE] to "4: 250 μRIU/V" on the instrument, and set [ATTEN] to "1" on the Chromatopac.
  The full scale of INTEGRATOR output becomes 0.25 μRIUFS.

- For C-R8A and CR-7Aplus, 14.0 mm on the chart corresponds to 1/10 of the full-scale value.
- For C-R7A, 15.0 mm on the chart corresponds to 1/10 of full-scale value.
- For C-R4A, 16.0 mm on the chart in A4 size mode corresponds to 1/10 of full-scale value.
- For C-R5A and C-R6A, 13.5 mm on the chart corresponds to 1/10 of full-scale value.

CHECK CRITERIA: Drift: Must be 0.5 μRIU/h max.
Noise: Must be 0.01 μRIU max.

NOTE

For the criterion value that have been in use, it is most realistic to set criteria according to the particular analysis sensitivity required. The following Reference information section describes how to set up the acceptance criteria.

[Reference information]
An acceptable noise level for analysis data of satisfactory accuracy depends on the analysis sensitivity required.
Specifically, provided that the signal-to-noise (S/N) ratio of the peaks of interest is sufficiently high, a high noise level will not significantly affect the accuracy of analysis data. For that reason, it is advisable to determine the S/N ratio required for the lowest quantitative value to set a realistic noise level criterion value, considering the reliability of the quantitative value obtained through the particular analysis.

① Determine the heights, S (= signal), of the peaks of interest from a chromatogram, and use them to calculate S for the lowest concentration of interest.

② Set the required S/N ratio.

③ The required noise level (noise level acceptance criterion, N) is derived using the following equation:

$$N = \frac{\text{Values for S at low concentration, obtained in ①}}{\text{S/N ratio at low concentration, set in ②}}$$

Example:Suppose signals (S) for peak heights of 500 μRIU are obtained during analysis of a control sample of concentration 100. Then, if the concentrations of the constituents of interest in the samples analyzed range from 1 to 100, the peak height (S) at the lowest concentration (concentration of 1) will be 5 μRIU. In this case, it is desirable to have a S/N ratio of 20 or more at the lowest concentration. Accordingly, the criterion noise level should be set at N = 5/20 = 0.25 μRIU.

* Generally speaking, S/N ratios of 10 or less should be avoided, since they will cause decreased reproducibility of peaks (peak area C.V. values).

7.5 System Validation

- The LC system comprises many individual components. System validation is used to confirm the function of each component as well as the performance of the entire system. It is subject to direct verification under conditions that conform to the intended use, and with system variations the performance of components on which measurement in isolation is impossible, and the performance of the system, are inspected.
- The standard system validation procedure described in this document is used to determine whether the LC system is functioning normally. This procedure constitutes the basis of the LC system capability inspection.
- System validation is performed at installation, and periodically thereafter. If a problem occurs during operation, system validation may be performed to determine whether the problem is in the LC system or in the analysis method.
- If the LC system passes the system validation, it can be assumed that the LC system is normal and that the problem lies in the particular analysis method or conditions being used.
- If the LC system does not pass the system validation, it may be assumed that there is an abnormality in the LC system, and component validation must be performed to identify the malfunctioning component(s).

7.5.1 Validating Isocratic LC system

■ Objective

An analysis is performed on the LC system under the validation, and the retention time and peak area are obtained for each peak. The data is then examined to check for repeatability.

Reproducible data validates the system. Generally, the system being validated consists of a minimum of the following components: pump, column oven, autosampler, detector, system controller and data processor.

■ Items Required for Validation

Part Name	Description
Mobile phase	Water-to-methanol = 7:3 * Both the water (distilled) and the methanol should be HPLC grade.
Column	Shim-pack VP-ODS (Part No. S228-34937-91), LUNA C18(2) (Part No. 00F-4252-E0). An equivalent ODS column may also be used. Particle size 5 μm, ID 4.6 mm × Length 150 mm
Sample	250 mg/L Caffeine solution (S228-45725-06) <Preparation> Weigh 250 mg of anhydrous caffeine, and dissolve it into the purified water to have the total amount of 1-litter solvent.
Water	HPLC grade, or equivalent
2-propanol	HPLC grade, or equivalent
Coupling 1.6C-0.4	S228-16004-13
Male nut PEEK	S228-18565

■ Checking and Preparing the LC System

1 Check all the wiring connections in the LC system. Refer to individual component instruction manuals for details. If a Chromatopac is used, it should be connected to the detector with the signal cable connector provided with the Chromatopac, and the signal cable should then be connected to the integrator terminal of the detector.

* If the system normally uses Chromatopac or LC workstation, the connections used for regular analysis will be satisfactory.

2 Check the LC system tubing. Ensure that the tubing between the autosampler outlet and the column inlet, the column outlet and the detector inlet, has an I.D. of less than 0.3 mm, and is shorter than 300 mm. Keep the liquid volume that is not in the column as low as possible.

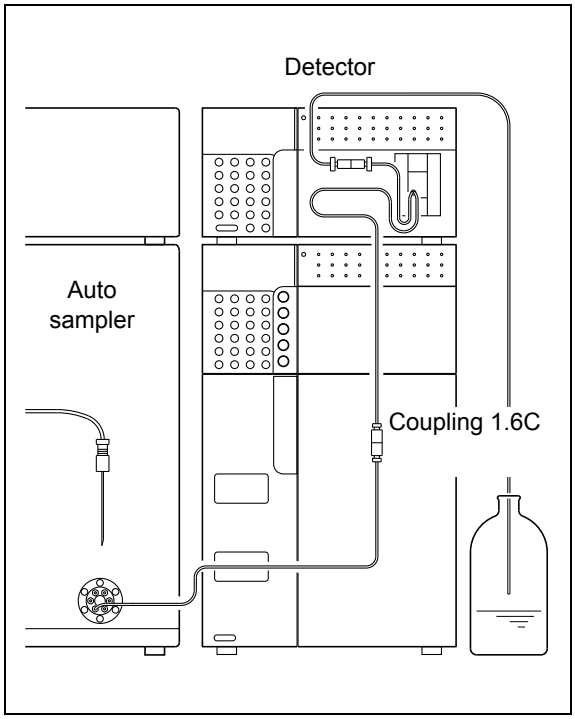


Fig. 7.3

3 Clean the flow lines according to the usage of the LC system.
Do not connect columns when cleaning the flow line. Connect the column inlet and outlet tubes directly with coupling 1.6C ("Fig. 7.3"), and clean the flow lines as follows.

< For a new system >
Clean the flow lines using 2-propanol, then using water at a rate of 2 mL/min for 10 minutes in each case.

When using a mobile phase with a low polarity solvent, such as hexane, in the current system
Clean the flow lines using 2-propanol, then using water at a rate of 2 mL/min for 10 minutes in each case.

When using a mixture of aqueous solution and organic solvent as mobile phase, or when using water plus an organic solvent miscible with water (methanol, acetonitrile, etc.)
Clean the flow lines using pumping water at a rate of 2 mL/min for 10 minutes.

4 When cleaning is finished, pour the mobile phase into the reservoir bottle, and reconnect the column with the LC system ("Fig. 7.4"). Also, feed water into the reservoir bottle and use it instead of the cleaning solution for the autosampler.

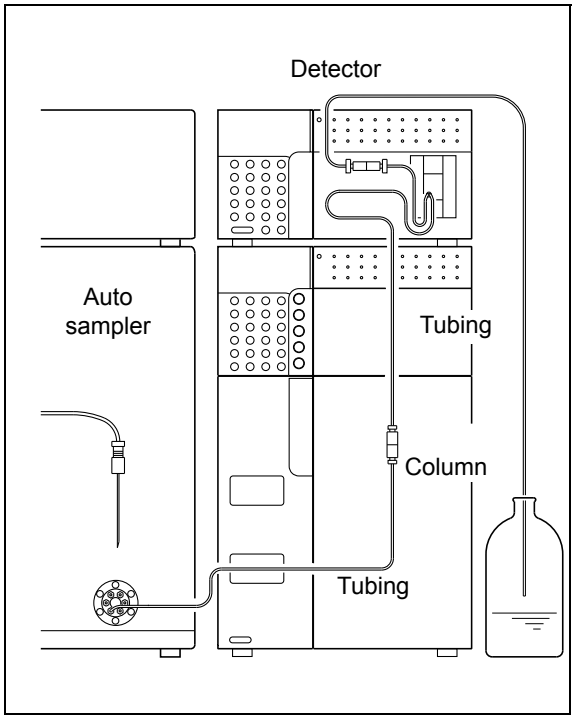
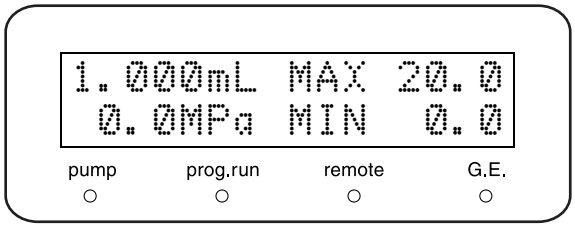


Fig. 7.4

■ Inspection Procedure

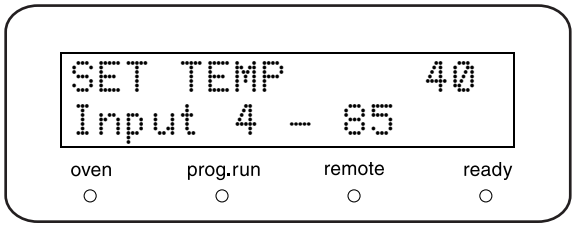
1 Set the pumping flow rate to 1 mL/min.
Refer to the pump's instruction manual for setting procedures.

Pump's display screen



2 Set the column oven temperature to 40 °C.
Refer to the column oven's instruction manual for setting procedures.

Column oven's display screen



3 Press (pump) of the pump and (oven) of the column oven to start pumping and temperature control. Verify that liquid flows through the detector outlet tubing, and that there are no leaks from any of the connections.

4 Set the detector parameters.
☞ "■ Parameter Settings for Validation" P.131
Refer to the detector's instruction manual for setting procedures.

5 Set the autosampler parameters.
☞ "■ Parameter Settings for Validation" P.131
Refer to the autosampler instruction manual for parameter setup.

6 Set the data processor parameters.

☞ "■ Parameter Settings for Validation" P.131

Refer to the data processor's instruction manual for setting procedures.

7 Monitor the baseline.

When the baseline has stabilized, press **zero** on the detector. Then, inject 10 µL of the mobile phase to check that no peaks are observed.

8 Inject 10 µL of the test sample six times, and analyze the data obtained.

9 From the peak data obtained from the six analysis, derive the relative standard deviation (coefficient of variation) of the retention time and peak area ("Fig. 7.5").

RSD(C.V.) value $= (SD/\overline{X}) \times 100$

$$SD = \sqrt{\frac{\sum_{i=1}^{n}(Xi-\overline{X})^2}{n-1}}$$

$\overline{X} = (X1 + X2 \ldots Xn - 1 + Xn)/n$

n	: Number of analyses
X1…Xn	: Retention time (or areas) of each peak
$\overline{X}$	: Average
SD	: Standard deviation
RSD	: Relative standard deviation
C.V.	: Coefficient of variation

Fig. 7.5

■ Parameter Settings for Validation

The parameters to be set for each device when starting the measurement are shown below.

• Pumps.....	Flow rate	1 mL/min
	P.Max	20.0 MPa
• Column oven	Oven temperature	40 °C
• Time program	6.00 STOP	
• Autosampler	SAMPLING SPEED	5 μL/s
• Detector	MODE	Select the mode that is actually used.
	AUX RNG	2 (1000 μRIU/V)
	RESPONSE	5 (1.5 sec)
• Data processor	WIDTH	5
	DRIFT	0
	T.DBL	1000
	ATTEN	10 (1,024 μRIU FS)
	SLOPE	1000
	MIN.AREA	100000
	STOP.TM	5

* Use the default values for other parameters.
* If devices such as the manual injector have the loop injection system and if the loop capacity is 20 μL or less, load the test sample, which is approximately 5 times larger than the loop capacity, and analyze it in the full-loop system.

CHECK CRITERIA: The relative standard deviation (coefficient of variation) of each item must satisfy the following criteria.
Retention time: 0.5 % max.
Peak area: 2.0 % max.

7.6 If Validation Fails

Should the system fail to satisfy any of the system validation check criteria, or should a component fail to satisfy any of the component validation check criteria, proceed as follows.

Check whether any consumable items have reached the end of their service life: The cause of failure to satisfy check criteria could be a consumable part that is no longer usable. Check consumable parts and replace them if necessary.
Perform troubleshooting: A minor problem (such as air bubbles) may have caused the system to fail the criteria. Perform troubleshooting as described in 6.1 to check for such problems, and take action to eliminate any problems found. For troubleshooting procedures of other system components, refer to the applicable instruction manuals.
If a cause cannot be determined, contact your Shimadzu representative: If you are unable to determine the cause of the failure, or if you are unclear about troubleshooting or corrective action procedures, contact your Shimadzu representative.

8

Maintenance

Contents

8.1 Periodic Inspections and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use.

It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.

For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠WARNING

- Unless the instructions here specify otherwise, be sure to turn OFF the power and unplug the instrument prior to performing inspections and maintenance.

  Otherwise, fire, electric shock, or malfunction could result.

⚠CAUTION

- When replacing parts, use only the parts listed in "1.4 Component Parts" or "9.3 Maintenance Parts".

  If any other parts are used, injury or malfunction may occur.

- Never remove the main cover.

  Otherwise, personal injury or malfunction may occur.

  Contact your Shimadzu representative to remove the main cover.

8.1.1 Prior to Inspections and Maintenance

- Replace the mobile phase solvent in the flow lines with water.
- Wipe away any dirt from the front panel and the main cover.
- Wipe away any dirt from the keypad, if any, using tissue paper or a soft cloth moistened with water.

8.1.2 Post-Inspections/Maintenance Leakage Check

After inspections and maintenance, check for any leakage during pumping.

☞ "6.1 Troubleshooting and Corrective Actions" P.102

8.2 Cleaning Flow Line

If the flow cell and tubing are contaminated, the baseline may be unstable. Also, the baseline noise may increase due to the pump pulsation. Clean the flow line in the following steps.

Necessary parts

Part Name	Part No.	Quantity
Syringe	S046-00017-01	1 unit
Syringe adapter	S228-15672-91	1 unit
Purified water (distilled water or ion-exchanged water)	–	100 mL
Acetone	–	50 mL
0.1N nitric acid	–	50 mL

⚠WARNING

- Never mix the nitric acid with an organic solvent.

  Doing so may produce an explosive substance. Exercise care when processing waste liquid.

1 Inject acetone into the inlet port of the instrument, and clean the flow line on the sample side.

2 During this time, press **purge** to clean the reference side of flow cell.

3 Similarly, clean the flow line using purified water.

4 Similarly, clean the flow line using 0.1N nitric acid.

5 Thoroughly wash away both dirt and nitric acid using purified water.

6 Replace with mobile phase.

NOTE

If the mobile phase used for analysis is not miscible with water, replace the flow line with acetone again. Then, replace it with the mobile phase.

8.3 Span Adjustment

Make sure that the correct refractive index is detected. If there is an error, calibrate it by setting the SPAN value.
Check the span and set the SPAN value as specified in "7.4.7 Span Check" P.118.

8.4 Cleaning Instrument Surface

If the instrument cover or front panel becomes dirty, wipe it clean with a soft dry cloth or tissue paper.
If the instrument surface is very dirty, clean it as follows.

1 Dip a piece of cloth in a dilute neutral detergent and twist firmly to remove excess liquid. Use this cloth to scrub the soiled area of the exterior surface of the instrument.

2 Dip a piece of cloth into water and twist firmly to remove excess liquid. Use this cloth to wipe away all the remaining detergent. Use a dry cloth to remove all moisture from the exterior surface of the instrument.

NOTE

Do not allow any water to remain on the instrument surface, and do not use alcohol or thinner-type solvents to clean the surfaces.
These can cause rusting and discoloration.

9

Technical Information

Contents

9.1 Installation

9.1.1 Installation Site

■ Suitable Sites and Preparation

To ensure safe operation, install the instrument in a suitable location that satisfies the following conditions.

⚠WARNING

- Keep the room well ventilated.

  The solvents used in the HPLC system are often flammable and toxic. It may be hazardous, or may cause fire.

- No fire sources used near the instrument

  The solvents used in HPLC are often flammable. Therefore, the use of open flame where the instrument is installed must be strictly prohibited. Also, do not install in the same room with equipment that emits or could potentially emit sparks.

- Fire extinguishers permanently available

  Have fire extinguishers permanently available in case of fire.

- Protective equipment provided near the instrument

  If solvent gets into your eyes or on your skin, flush it away immediately.
  Provide equipment, such as eye wash stations and safety showers, as close to the instrument as possible.

⚠CAUTION

- Avoid dust or corrosive gas

  To ensure a long service life of the instrument and preserve its performance levels, avoid installing it in places subject to large amounts of dust or corrosive gas.

- Do not install the instrument near equipment that generates strong magnetic fields.

  To ensure proper operation, do not install the instrument in places subject to strong magnetic fields.
  If the power supply line is subject to high electrical noise, install a surge protector.

- Install the instrument in a location that satisfies the following conditions to preserve the performance:

  •The room temperature is between 4 and 35 °C, with minimal temperature variations throughout the course of a day.
  •Air currents from heating or air conditioning equipment are not directed on the instrument.
  •Sunlight does not shine directly on the instrument.
  •There is no vibration.
  •The humidity stays between 20 % to 85 %.
  •Place without condensation

■ Installation Space

⚠CAUTION

- This instrument weighs 12 kg. During installation, consider the entire weight combined with other LC components.

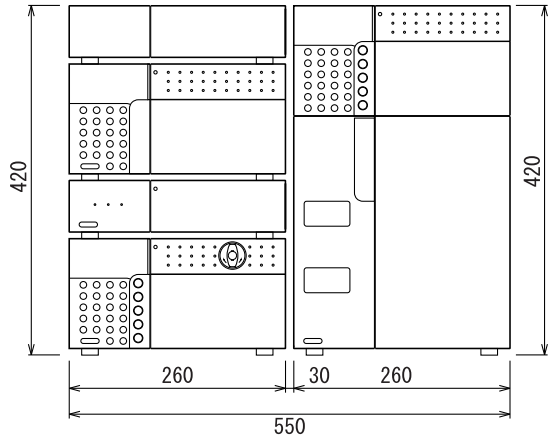
  The lab table on which this instrument is installed should be strong enough to support the total weight of the LC system. It should be level, stable and have depth of at least 600 mm.
  Otherwise, the instrument could tip over or fall off the table.

- Keep at least 100 mm between the rear of the instrument and the wall.

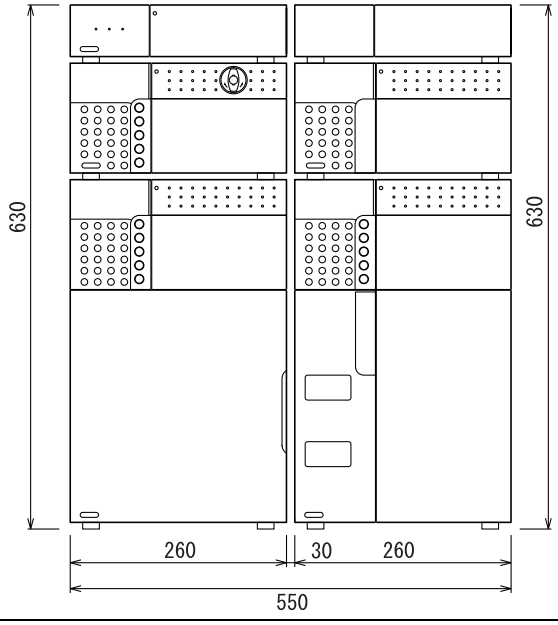
  This allows for sufficient air circulation to provide cooling and prevent the instrument from overheating and impairing the performance.

Typical system configurations and required installation spaces are shown in the figures below.

●System 1
(with the manual injector)



●System 2 (with the autosampler)



(Unit: mm)

Fig.9.1

9.1.2 Installation

■ Installation

This instrument can be stacked together with other devices, and they can be used as a system.

For installation examples, see:

☞ "9.4 Introduction of Shimadzu High-Performance Liquid Chromatography System" P.171

NOTE

In order to achieve the most sensitive and precise detection, set the detector up near the column oven.

It is standard to place it on top of the column oven.

⚠ CAUTION

- Use caution to avoid pinching your fingers between the components.

  When the LC-20A series components are stacked on each other, the clearance between the components is only 5 mm.

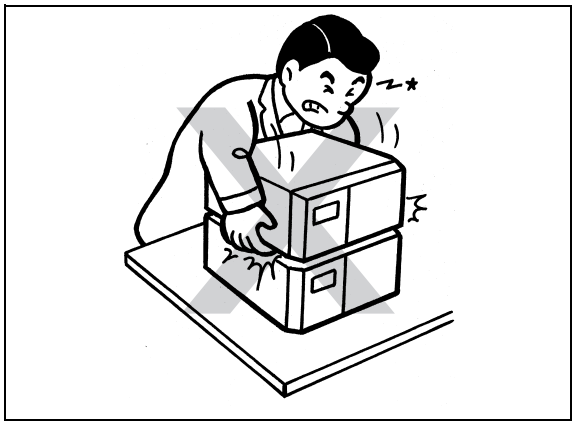


Fig. 9.2

■ Stacking Brackets

The use of commercially available safety brackets is recommended. These brackets limit the possibility of the instrument falling off the lab table during an earthquake or similar event. Various grades of stacking brackets are available.

Fasten the instrument firmly in place by attaching safety brackets to both the right and left sides.
For more details, contact your Shimadzu representative.
Fig. 9.3 gives an example of safety bracket application.

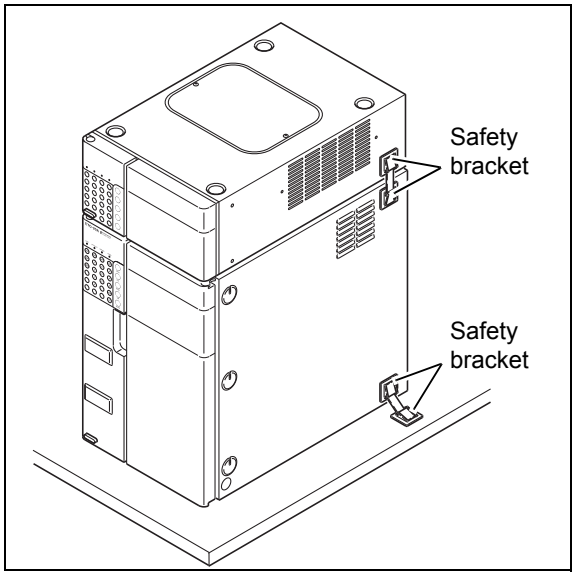


Fig. 9.3

9.1.3 Power Connection

The following table shows the electrical voltage, power consumption, and frequency.

Part No.	Power Supply Voltage *1 (indicated on the instrument)	Power Consumption	Frequency	Rated Breaking Capacity *2
228-45104-41 228-45104-42 228-45104-46 228-45104-48 228-45104-58	100 V AC to 240 V AC (100-240 V ~)	150 VA	50/60 Hz	35 A

*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.

*2 Connect the power supply to an outlet with a circuit breaker that interrupts the supply if the current capacity is less than the above.

Verify that the power outlet to be used for connection has sufficient capacity. If capacity is insufficient, a power outage or voltage drop can occur, affecting not only this instrument but other instruments connected to the same power supply.

■ Connection to Power Outlet

⚠WARNING

- Handle the power cords with care.

  Observe the following precautions to avoid power cord damage, fire, electric shock, or instrument malfunction.

  - •Do not place heavy objects on the cord.
  - •Keep hot items away from the cord.
  - •Do not modify the cord.
  - •Do not bend the cord excessively or pull on it.
  - •To unplug the instrument, pull the plug itself, NOT the cord.

  If the power cord is damaged, contact your Shimadzu representative.

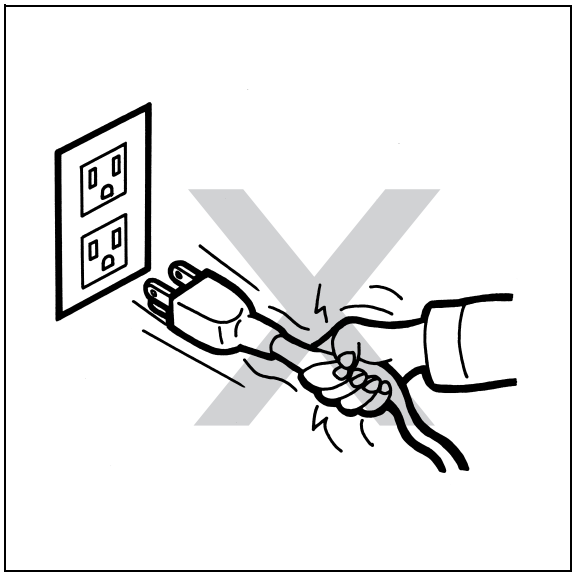


Fig. 9.4

⚠CAUTION

- Before plugging in the instrument, make sure that the power switch is turned OFF.

1 Insert the connector end of the power cord into the power cord connector at the rear of the instrument.

2 Insert the plug side of the power cord into the power supply outlet.

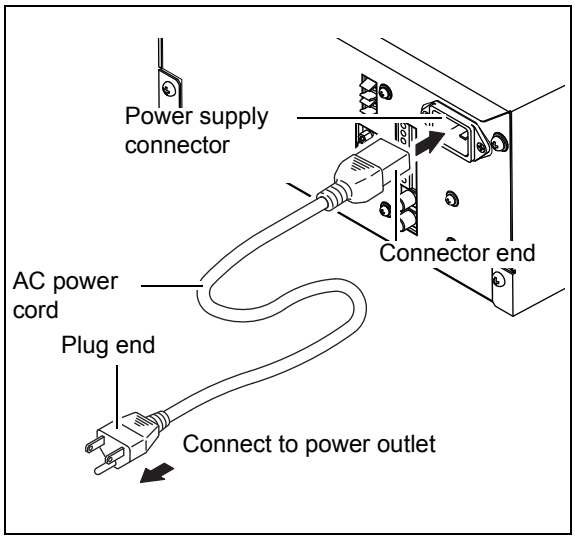


Fig. 9.5

9

■ Grounding

> ⚠WARNING
>
> Be sure to ground this cable in order to prevent electrical shock and to ensure stable operation of the instrument. This device can be grounded by connecting the provided three-line power plug to the three-line outlet with a ground terminal.

9.1.4 Prior to Plumbing

Many different types of tubing and connectors are used to plumb the instrument at installation. It is necessary to cut tubings and mount connectors prior to the plumbing. The following describes instructions and precautions for preparations.

■ Types of Tubing and Connectors

The tubing and connectors used for plumbing are made of stainless steel (SUS) or resin as follows.

Stainless steel (SUS)

- SUS tubing ϕ1.6
- 1.6MN male nut
- 1.6MN, W6 male nut
- Ferrules 1.6F

Resin

- FEP tube, PTFE tube, ETFE tube, and PEEK tube, PE transparent tube and others
- Male nut PEEK
- PEEK ferrules
- PTFE ferrules

> ⚠ **CAUTION**
>
> Always use resin tubes under pressure below 20 MPa. Otherwise, the tubing may be disconnected when pumping liquid.

■ Cutting Tubing

Cut provided tubing to the proper lengths for installation.

> ⚠ **CAUTION**
>
> - Make the cut surface at right angle.
>
> Otherwise, dead volume will be created and may cause chromatographic peak broadening.
> - Make sure that the inner diameter of the SUS tubing is not deformed.
>
> Otherwise, the tubing may be clogged.

Cutting SUS Tubing

1 Position the provided file (for cutting SUS tubing, part No. S670-18928-02) diagonally against the tubing, and cut up around the tubing.

* Cut up the tubing so that the cut surface is at a right angle.

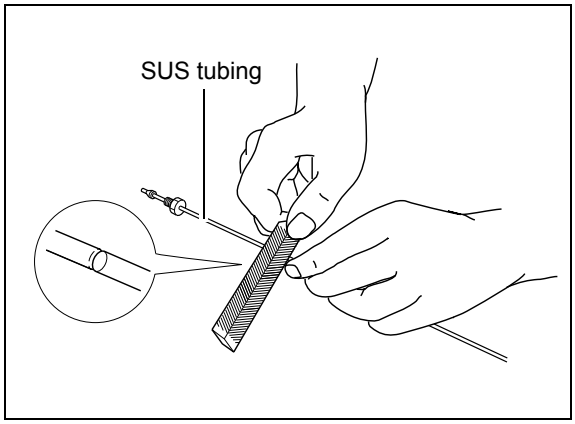


Fig. 9.6

2 Holding the SUS tubing at equal distances from the cut line, bend it up and down and from side to side to break off.

3 File the cut surface of the tubing to make it smooth and straight.

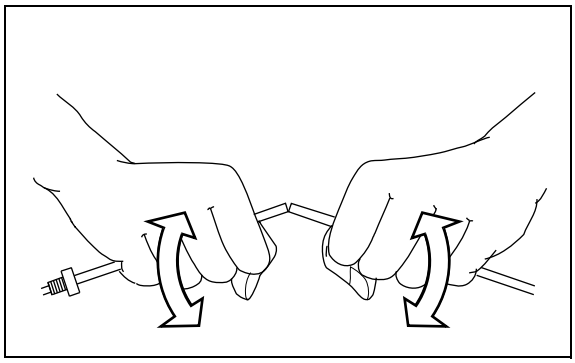


Fig. 9.7

Cutting Resin Tubing

Cut off the resin tubing at a right angle using a cutter.

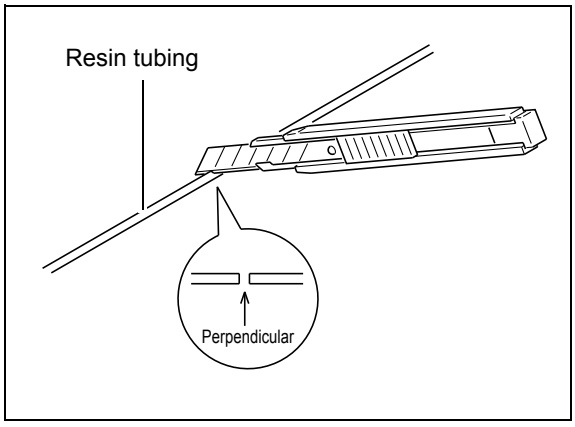


Fig. 9.8

■ Connecting Tubing

1 Mount a male nut and a ferrule to the tubing.

⚠CAUTION

- Install stainless steel male nuts and ferrules on SUS tubing, and resin nuts and ferrules on resin tubing.

  If resin male nuts and ferrules are mounted on SUS tubing, the tubing will be disconnected and a leakage may occur.

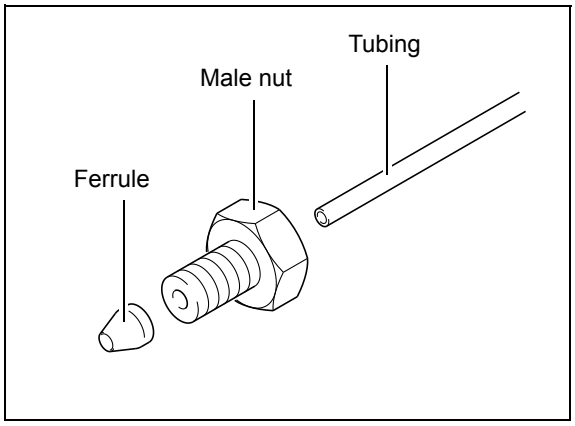


Fig. 9.9

2 Insert the end of the tubing, with the ferrule on it, into the appropriate opening. Then tighten the male nut.

The ferrule will be secured on the tubing.

⚠CAUTION

- Insert the tubing completely into the opening, until it butts against the end of the opening.

  Otherwise, dead volume will be created and may cause chromatographic peak broadening.

- Do not overtighten the male nut.

  Otherwise, the threads will be damaged.

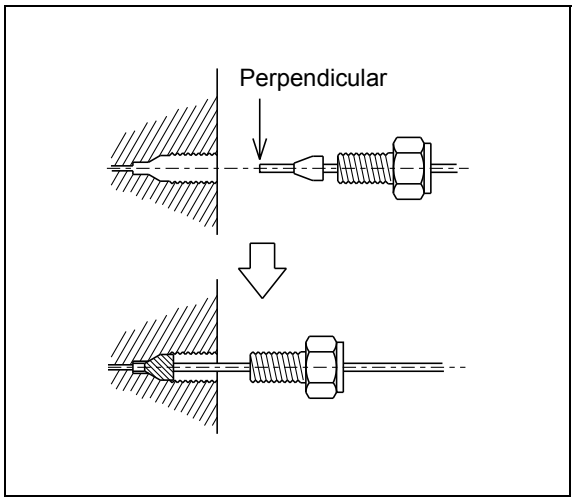


Fig. 9.10

NOTE

When connecting the PEEK tubing using SUS ferrule and mail nuts, tighten the male nuts using a wrench with the following torque.

- For male nuts having an outer diameter of 6 mm: First tighten the nuts by hand, then tighten them with approximately 120° using a wrench.
- For male nuts having an outer diameter of 8 mm: First tighten the nuts by hand, then tighten them with approximately 90° using a wrench.

For confirmation, pull the PEEK tubing with your hand to check that the tubing is not disconnected.

- For SUS male nuts:
  Use the wrench provided to unscrew and screw in the plugs.
  If a nut is to be connected to a union or other part that is not secured, use a second wrench to secure the union.
- For a resin male nut:
  Tighten and loosen the nut by hand.

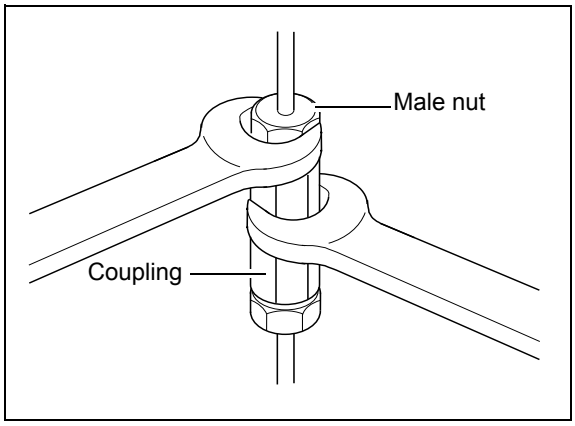


Fig. 9.11

3 Loosen and move the male nut slightly to verify that the ferrule is secured on the tubing.

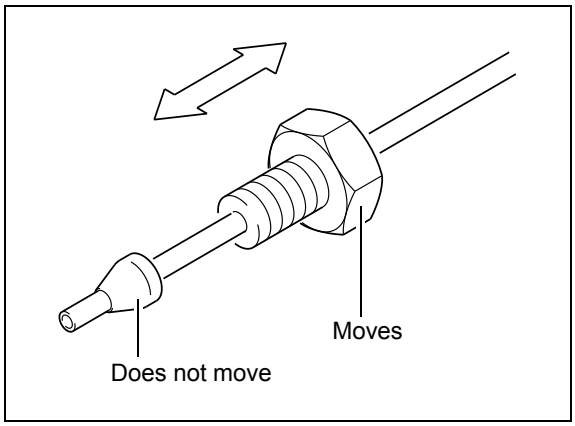


Fig. 9.12

■ Protective Plugs

Inlets and outlets of the instrument are fitted with protective plugs (bushings, stop plugs, caps and similar items) to keep out dirt and dust during shipment.

When the instrument is not connected to other LC system components, replace the protective plugs. Otherwise, dirt and dust may cause clogging of the instrument.

Remove the protective plugs of parts that are connected, and keep them so they will not get lost.

NOTE

- For SUS protective plugs:
  Use the wrench provided to unscrew and screw in the plugs.
- For resin plugs:
  Remove and replace the plugs by hand.

9.1.5 Tubing Instrument

⚠CAUTION

- Before plumbing, turn OFF the power supply to all the components and unplug them.
- For plumbing, use the appropriate parts listed in "1.4 Component Parts".
- Connect only the tubing described in the instructions.

  Otherwise, personal injury or equipment failure may occur.

The necessary plumbing is as follows:

- Tubing at inlet port: Tubing that carries the mobile phase solvent from the column outlet to the instrument.
- Tubing at outlet port: Tubing that drains away the analyzed mobile phase.
- Leakage drain tubing: If a fluid leaks in the instrument, it drops to the bottom stage and drained to outside through this tubing.

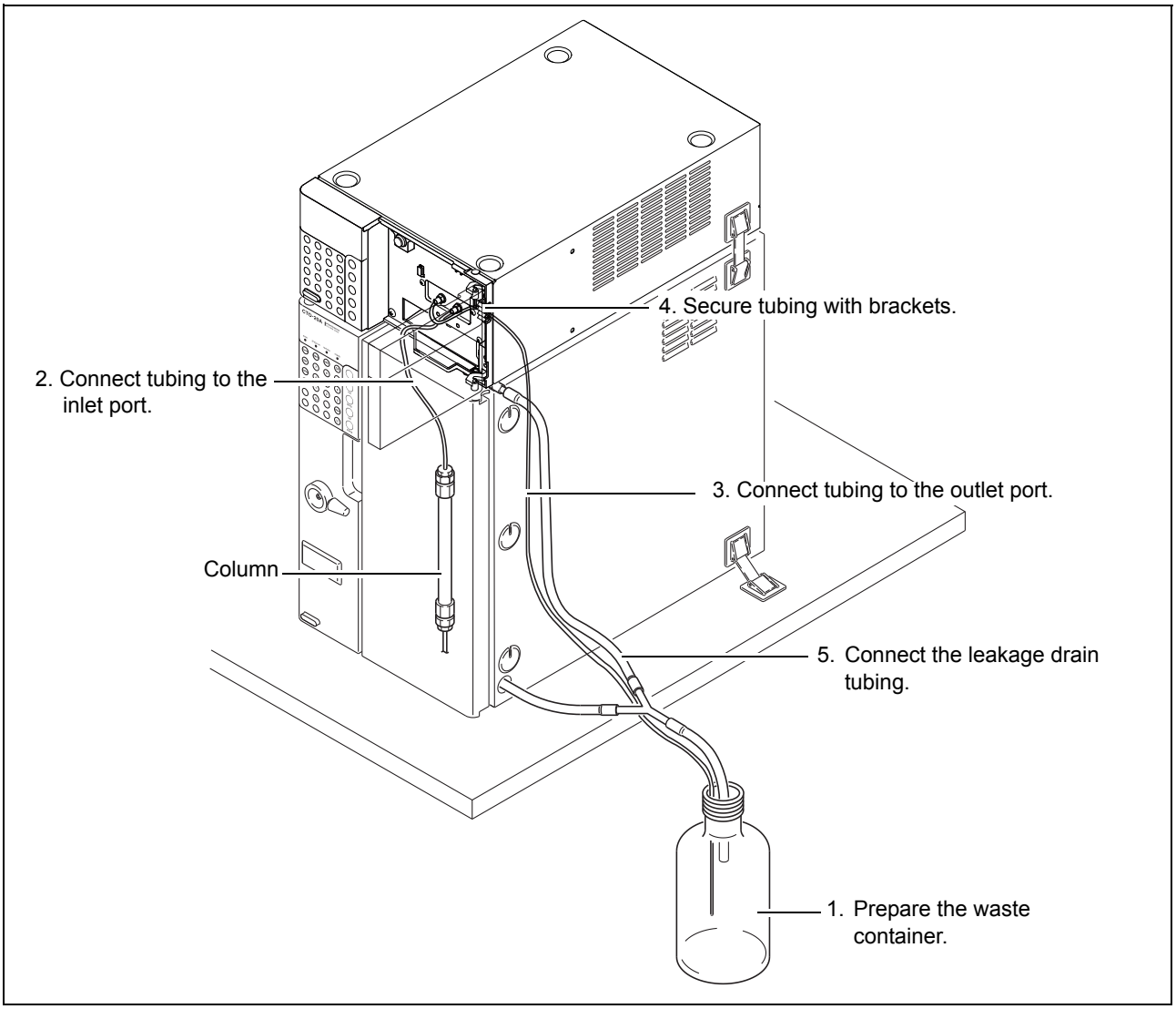


Fig.9.13

■ Preparing the Waste Container

Before connecting the plumbing, prepare a glass or metal waste container.

⚠WARNING

- Do not use cracked or damaged bottles.

  They could break.

⚠CAUTION

- When using a mobile phase solvent with a low dielectric constant, such as hexane, prepare a metal waste container and ground it securely.

  Otherwise, static electricity may be collected in the waste container, which is dangerous.

- The waste container must be positioned lower than the instrument (for example, on the floor).

  If it is positioned higher than the instrument, liquid will not drain, and will leak from the connections.

■ Tubing at the Inlet Port

1 Open the front cover.

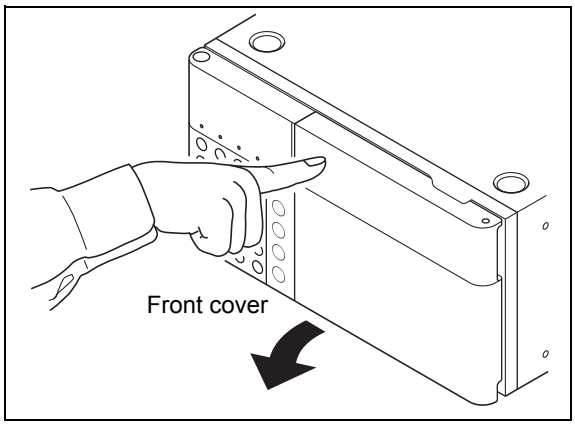


Fig. 9.14

2 Cut the SUS tubing provided (50 cm long) to a length appropriate for connecting the column outlet and the cell inlet tubing.

3 Mount the male nuts at both ends of the tubing.

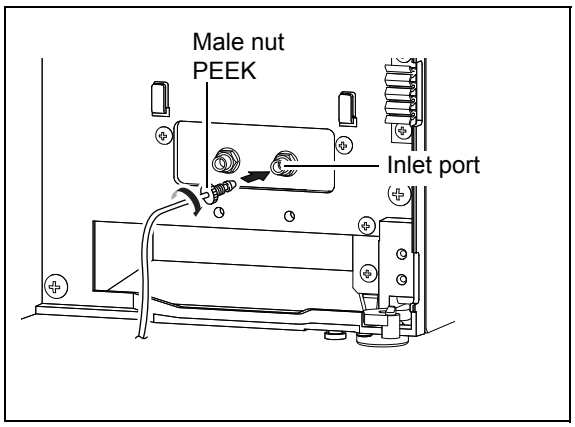


Fig. 9.15

4 Remove the stop plug from the column outlet.

5 Connect the tubing between the column outlet port and the detector inlet port, and secure the tubing using male nuts.

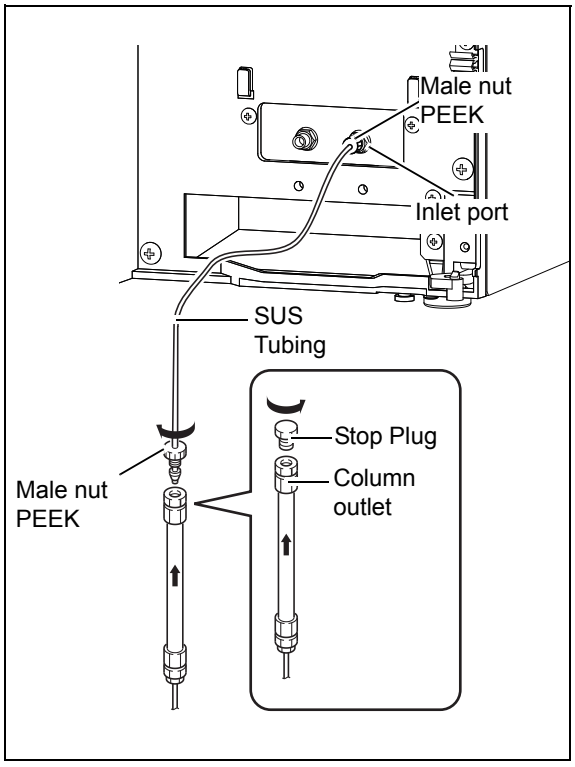


Fig. 9.16

■ Precautions when Using the PEEK Resin Tubing

⚠CAUTION

- Solvents that cannot be used

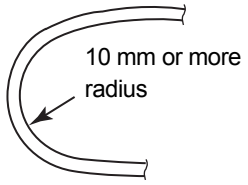
  Do not use any of the solvents below, as the stress cracking they can cause will greatly weaken the PEEK resin.

  Concentrated sulfuric acid, concentrated nitric acid, dichloroacetic acid, acetone*, tetrahydrofuran (THF), dichloromethane, chloroform, dimethyl sulfoxide (DMSO), fluorinated organic solvents such as hexafluoroisopropanol (HFIP).

  * Briefly using a weak solution of less than 0.5 % acetone in water (e.g. in order to check gradient performance) will present no problems.

- If the PEEK tubing must be bent, bend it at a radius of 10 mm or more.

  Bending the PEEK tubing through a small bend radius weakens the strength of the bent section. Moreover, position the tubing as naturally as possible, without forcing it to bend or fastening it in place.



- Be careful not to damage the surface when cutting the tubing.

  Damage to the surface of the PEEK tubing can also decrease its strength.

- When pumping solvent with high pressure, do not use resin parts on high-pressure tubing.

  Otherwise, it could damage the tubing or disjoint the tubing junctions and scatter the solvent. When using resin parts, pay attention to the pressure tolerance of each part.

■ Tubing at Outlet Port

1 Fit a male nut PEEK onto one of the ends of the tubing for plumbing provided (2 m).

2 Tighten the male nut PEEK into the outlet port.

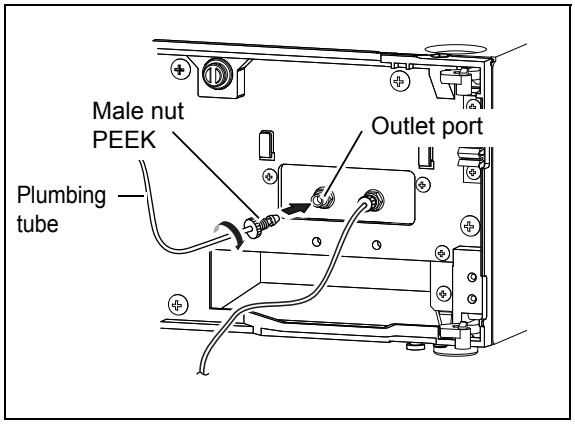


Fig. 9.17

3 Put the other end of the tube into the waste container.

NOTE

To ensure a smooth flow of liquid, put the tubing into the container with its end pointing downward.

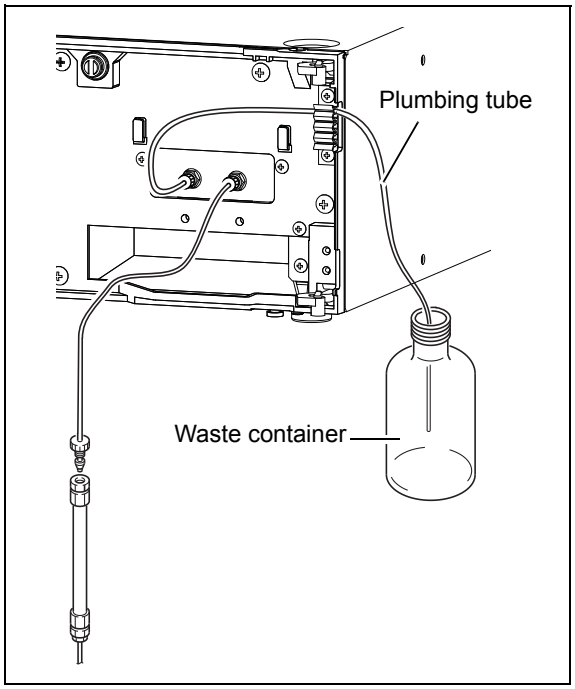


Fig. 9.18

■ Securing Tubing

1 Place the drain tube in the groove of the tube holder.

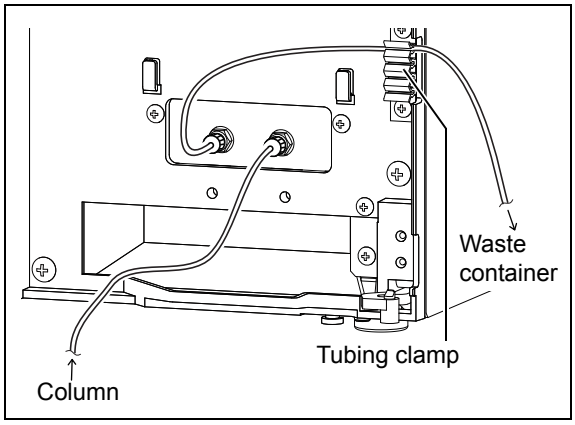


Fig. 9.19

2 Close the front door.

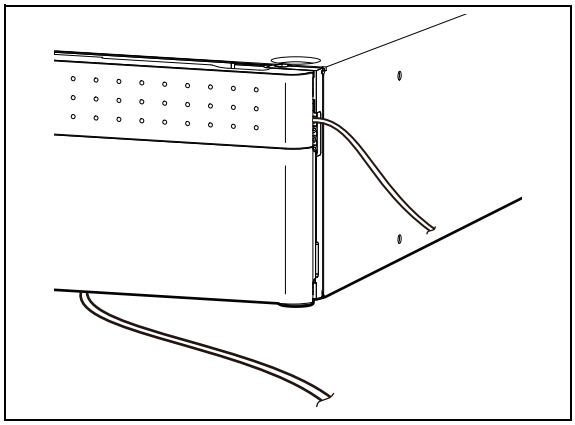


Fig. 9.20

■ Connecting the Leakage Drain Tubing

This instrument is designed so that if leaks occur internally (except the column oven), the leaked liquid flows down to the lowest level of the instrument and is drained into the waste container.

The procedure for connecting leakage drain tubing is given below.

Apart from the waste container and L-joint, all parts indicated in the figure on the right are provided with the instrument. The L-joint is provided with the solvent delivery module.

NOTE

- For connecting, cut a silicone tubing into the length in which both of the cut parts will not sag.
- Exercise care not to dip the silicon tube end into the waste container fluid. Otherwise, the fluid may not flow.

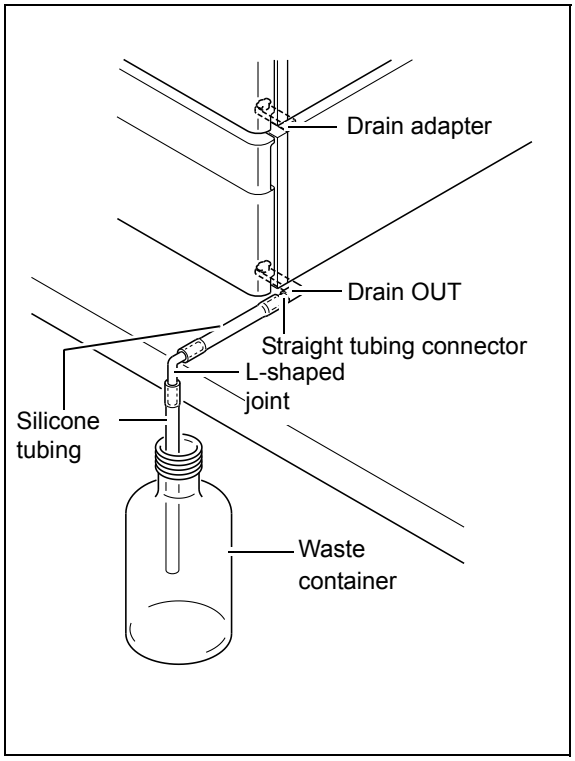


Fig. 9.21

Bottom of Instrument

1 Insert the drain OUT, STD into leakage drain outlet from the front of the instrument.

2 Turn the drain OUT, STD counterclockwise 45 ° to secure.
The drain OUT, STD is secured.

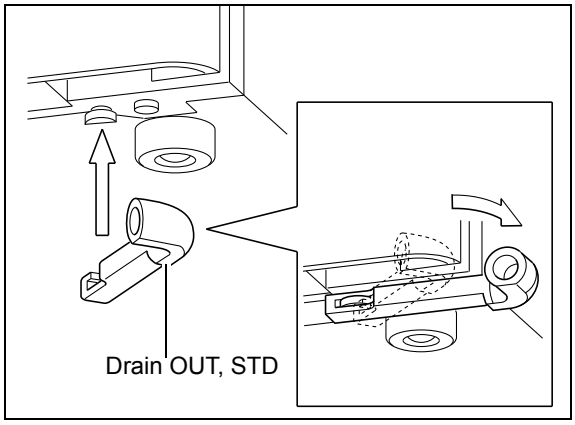


Fig. 9.22

3 Connect one end of the silicone tubing to the drain OUT, STD using a straight tubing connector.

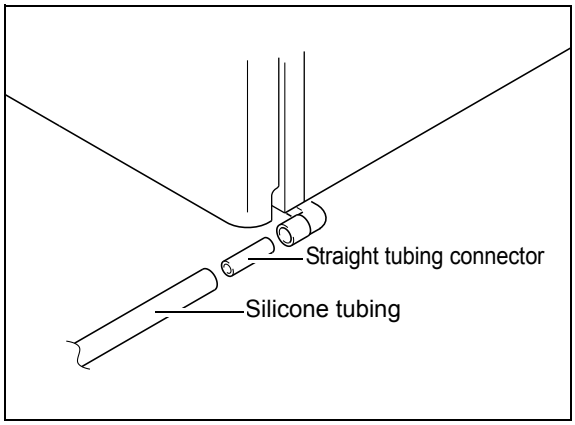


Fig. 9.23

4 Cut the silicone tubing at the edge of the table, and connect an L-joint. Let the L-joint head downward like the figure on the right and connect the other cut part of the silicone tubing.

5 Insert the other end of the silicone tubing into the waste container.

* To ensure a smooth flow of liquid, insert the silicone tubing into the container with its tip pointing downward.

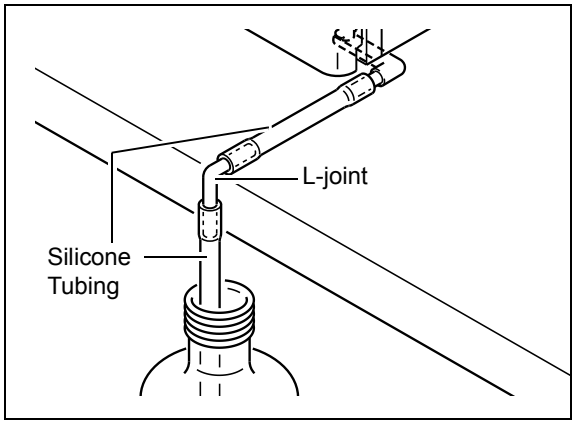


Fig. 9.24

Second instrument from bottom

NOTE

Leaks from the column oven are drained separately (refer to column oven Instruction Manual.). If any components are installed on top of the column oven, carry out the same procedure described in "Installation on Top of the Column Oven" on the next page.

1 Insert the drain adapter into the position shown in the illustration, and slide it on the instrument of bottom.

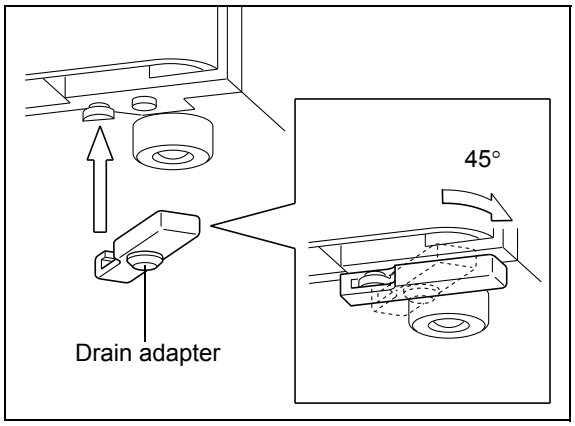


Fig. 9.25

2 The drain adapter connects the drain outlet to the Cross-section of connection parts leakage hole of the bottom unit.

3 Pour some water onto a spot near the drain outlet of the top unit, and verify that the water flows to the waste container.

Cross-Sectional View of Connection Part

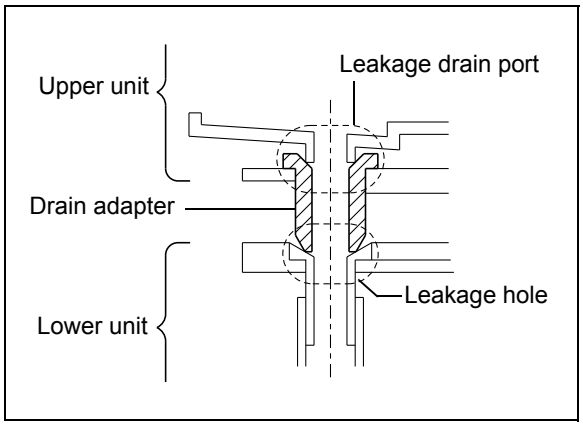


Fig. 9.26

Installation on Top of the Column Oven

NOTE

When the bottom unit has no leakage hole (Fig. 9.26), carry out the same procedure described below.

1 Insert the drain OUT, CTO into leakage drain outlet from the front of the instrument.

2 Turn the drain OUT, CTO counterclockwise 45° to secure.
The drain OUT, CTO is secured.

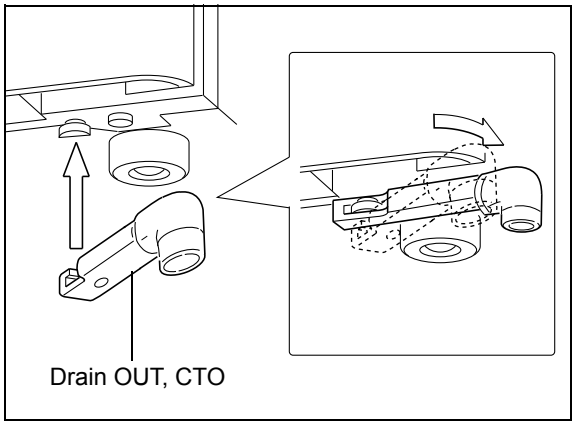


Fig. 9.27

3 Connect one end of the silicone tubing to the drain OUT, CTO using a straight tubing connector.

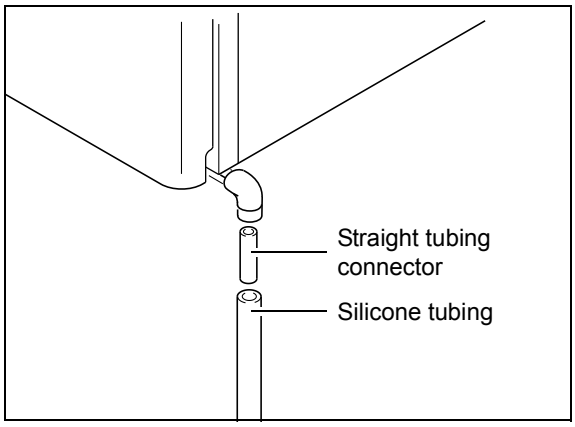


Fig. 9.28

4 Insert the other end of the silicone tubing into the waste container.

☞ "9.1.5 Tubing Instrument" P.149

NOTE

- To ensure a smooth flow of liquid, insert the silicone tubing into the container with its tip pointing downward.
- Exercise care not to dip the silicon tube end into the waste container fluid. Otherwise, the fluid may not flow.

9

■ Front Cover Installation

1 After plumbing, install the front door of the instrument.

2 Close the front door.

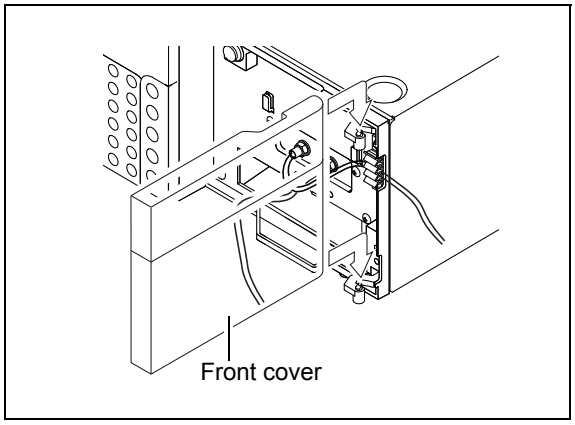


Fig. 9.29

9.1.6 Cabling Instrument

⚠WARNING

- Before starting cabling, turn OFF the power supply to all the components and unplug them.
- Use specified cables only.
- Do not perform any other than the indicated wiring operations.

  Otherwise, fire hazards, electric shock, or malfunction may result.

■ Connectors

- REMOTE connector: For connection to the system controller
- INTEGRATOR connector (Chromatopac output connector): For connection to Chromatopac (integrator)
- RECORDER connector (Recorder output connector): For connection to the recorder.
- External input/output terminals: For connection to external devices

☞ "5.7Connecting to External Equipment Using External Input/ Output Terminal" P.98

Use the connectors above needed for the system. Connection instructions are provided on the following pages.

■ Optical Cable Connection

The optical cable provided with this instrument is a two-way assembly for both transmission and reception of signals, and is connected to the REMOTE connector.

Instructions and precautions for connecting the optical cable are provided below.

1 Before connection, remove the cap from the connection channel to be used.

⚠CAUTION

- The plugs on the REMOTE connectors prevent dirt or dust from getting into the connector. If the REMOTE connector is not used, leave the protective plug on it.

  Otherwise, dirt and dust may cause a communication failure of the instrument. When a plug is removed, keep it in a safe place for future use.

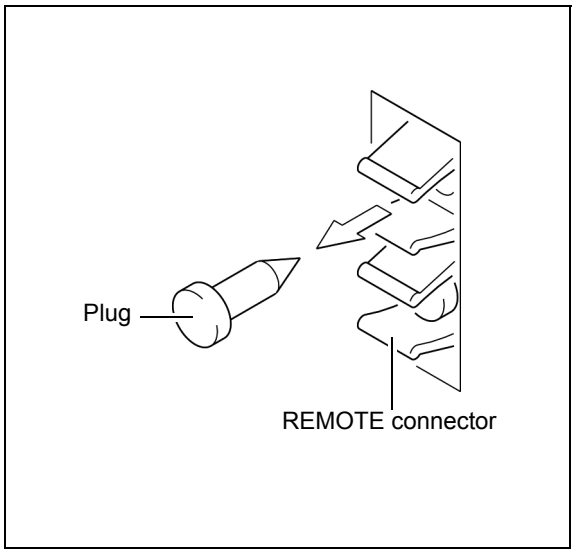


Fig. 9.30

2 Insert the optical cable plug into the REMOTE connector until it clicks into place.

⚠CAUTION

- Make sure there is no dirt or dust on the plug.

  Dirt or dust will get inside the REMOTE connector.

- Do not insert the plug across two different channels of the optical connector.

  Failure to follow the above precautions could result in malfunction or communication problems.

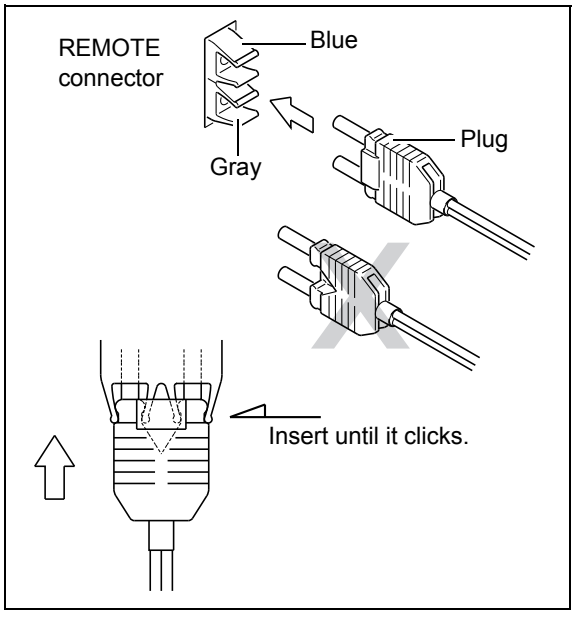


Fig. 9.31

⚠CAUTION

- Do not bend the optical cable less than 35 mm in radius.
- When inserting and removing the plug, grip the plug itself, not the cable.
- Do not bend the cable where it joins the plug.

Failure to follow the above precautions could result in damage to the plug or a broken wire in the cable.

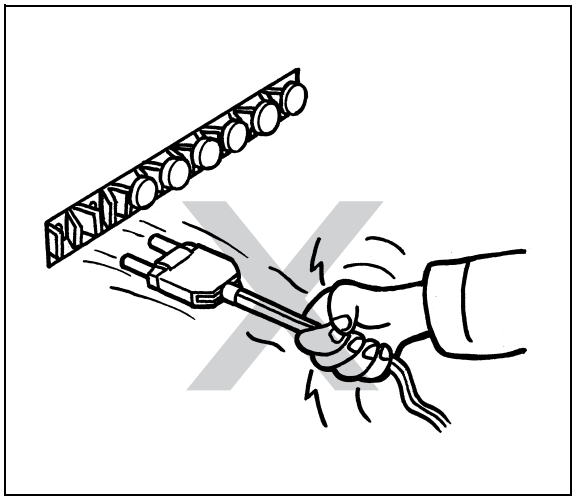


Fig. 9.32

■ Connection to the System Controller

1 Connect an optical cable between the REMOTE connector of the instrument and the REMOTE connector of the system controller (see "■ Optical Cable Connection" P.162).

* Generally, use any of channels 3 to 8 of the REMOTE connector of the system controller.

2 Plug the power cord into the socket, and turn the power switch ON.

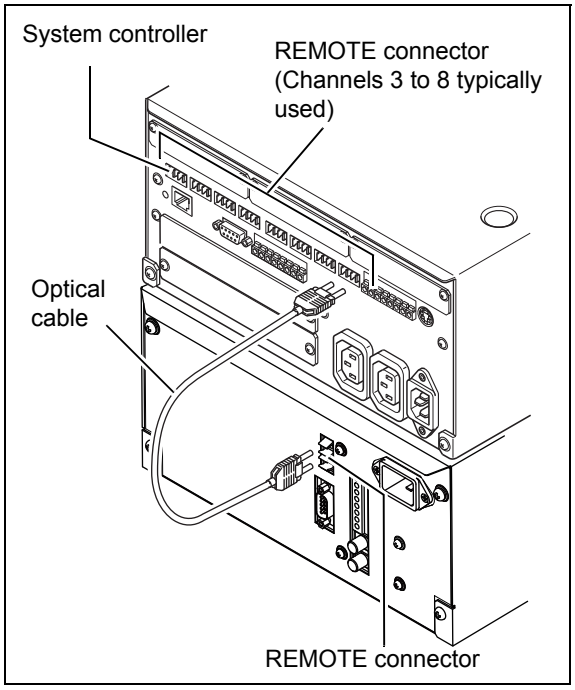
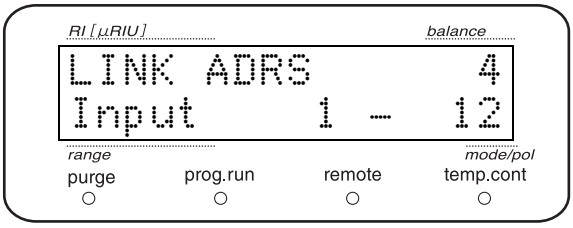


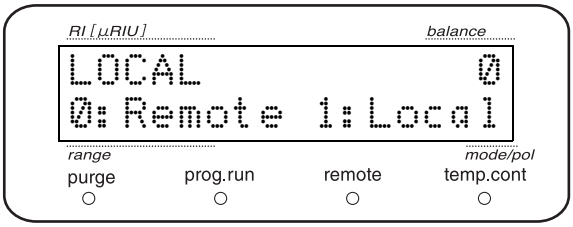
Fig. 9.33

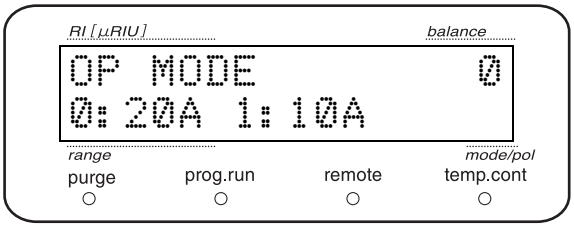
3 Set the [LINK ADRS], [LOCAL] and [OP MODE] parameters.

☞ "■ Setting Link Address «LINK ADRS»" P.66
"■ Setting Local Mode «LOCAL»" P.65
"■ Selecting an Operation Mode «OP MODE»" P.83

- LINK ADRS
  Enter a connection channel number for the system controller.
- LOCAL
  Enter value "0" (for remote control mode).
- OP MODE
  Select an operation mode according to the system controller to be connected.







■ Connection to Chromatopac

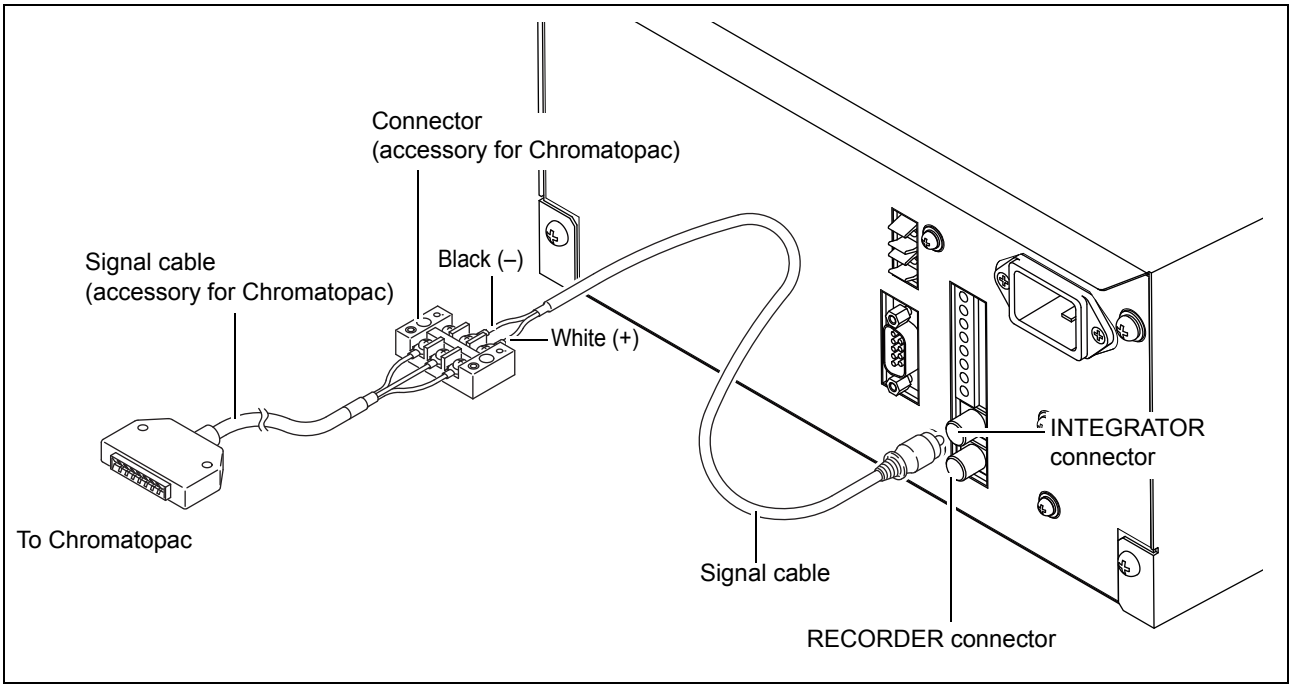


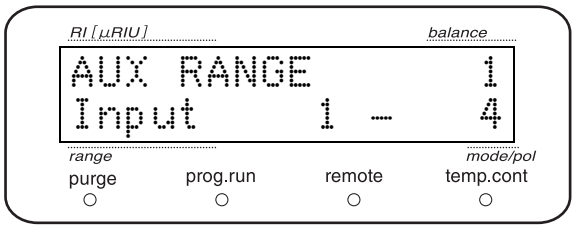
Fig.9.34

1 Plug the signal cable (provided) into the INTEGRATOR connector. Then connect the instrument to the Chromatopac as shown in the figure above.

2 Plug the power cord into the socket, and turn the power switch ON.

3 Set the AUX RANGE auxiliary function parameter.

☞ "■ Setting Output Range of the INTEGRATOR Connector «AUX RANGE»" P.60



■ Connection to the Recorder

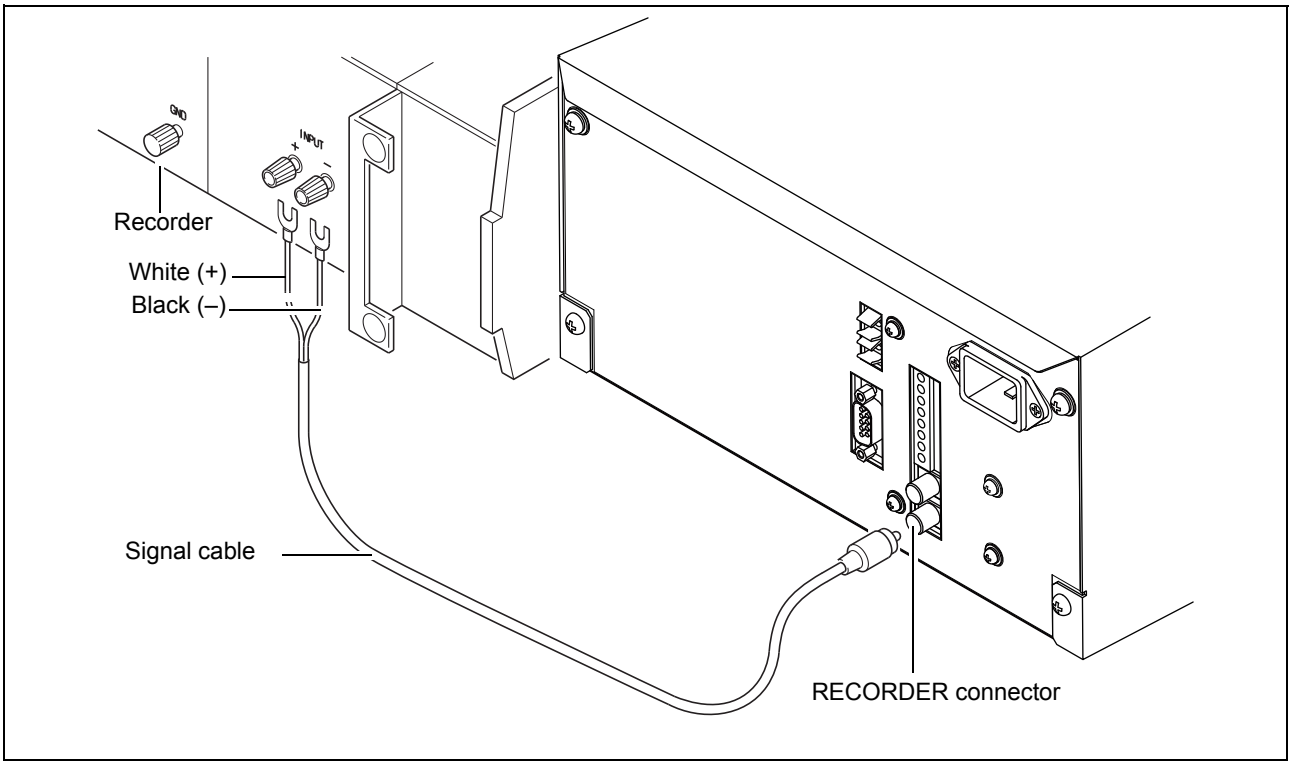


Fig.9.35

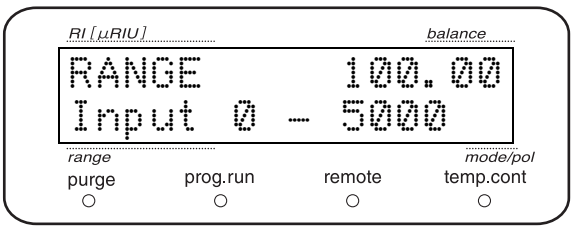
1 Plug the signal cable (provided) into the RECORDER connector.

2 Connect the other end of the signal cable to the recorder terminal.

3 Plug the power cord into the socket, and turn the power switch ON.

4 Set the RANGE auxiliary function parameter.

☞ "■ Setting Output Range of the RECORDER Connector «RANGE»" P.60



■ Connection of the (Optional) Solvent Recycling Valve

1 Insert the solvent recycling valve plug into the SV connector.

2 Tighten the plug screws.

3 Plug the power cord into the socket, and turn the power switch ON.

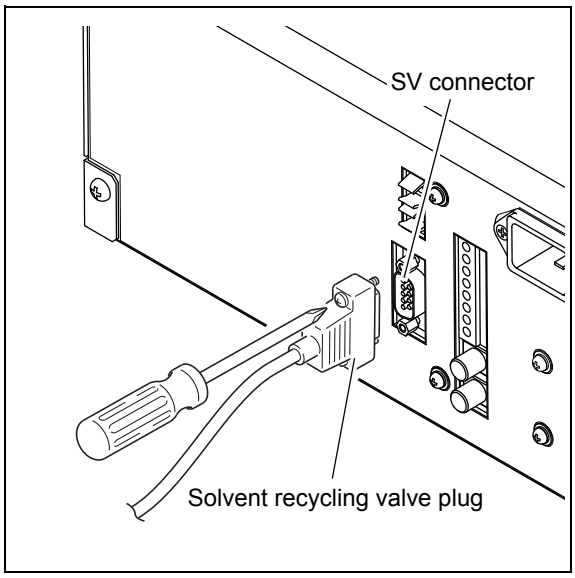
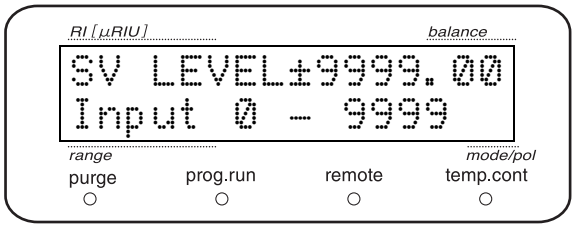
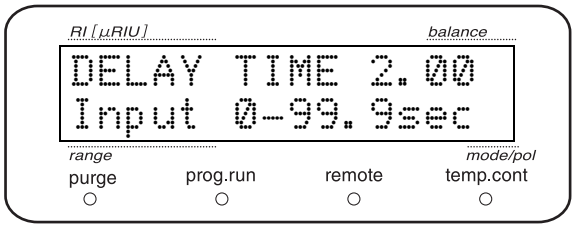


Fig. 9.36

4 Set the SV LEVEL and DELAY TIME auxiliary function parameters.





9

9.2 Specifications

Item		Description
Measuring method		Deflection
Light source		LED
Refractive index range		1 to 1.75 RIU
Range	A mode	0.01 to 500 μRIU
	P/L mode	1 to 5000 μRIU
Linearity	A mode	500 μRIU
	P/L mode	5000 μRIU
Noise Level		0.0025 μRIU max. (when filled with water, time constant 3.0 sec, room temperature 25 °C, and A mode)
Drift		0.1 μRIU/h max. (when filled with water, time constant 3.0 sec, room temperature 25 °C, and A mode)
Max. flow rate	A/P mode	20 mL/min
	L mode	150 mL/min (Optional flow selection block is required.)
Pressure resistance	Detector	0.4 MPa
	Flow cell	1.9 MPa
Detector internal capacity		From inlet port to center of flow cell: 69 μL From center of flow cell to outlet port: 361 μL (Flow cell capacity: 9 μL)
Flow line switch		Solenoid valve (Pressure resistance: 0.4 MPa)
Wetting part material		Stainless steel (SUS 316L), PTFE, quartz, Al2O3, ETFE * Relief valve option: Stainless steel (SUS316), FFKM
pH range		1 to 13 (Depending on the type of the mobile phase, quarts used in the flow cell can be damaged and permeability characteristic can change, if a solution of pH 10 or higher is used for a long period of time.)
Temperature setting for the measuring section		30 to 60 °C (0.1 °C step), OFF
Zero adjustment		- Optical balance (optically zero) - Auto zero function - Baseline shift function (recorder/integrator output)
Polarity setting		Possible
Response setting		Time constant: Any of the following 11 options is selectable: No filtering, 0.05, 0.1, 0.5, 1.0, 1.5, 2.0, 3.0, 6.0, 8.0, 10.0 seconds

<table>
<tr><th colspan="2">Item</th><th>Description</th></tr>
<tr><td colspan="2">Time program function</td><td>Available in detector or by system controller</td></tr>
<tr><td rowspan="2"></td><td>Supported functions</td><td>Auto zero, mark, range setting, response, event, polarity, purge "Start"/"End", balance, recycle valve threshold, loop, stop</td></tr>
<tr><td>Max. number of steps</td><td>32</td></tr>
<tr><td rowspan="2">Output</td><td>Output for recorder</td><td>10 mV</td></tr>
<tr><td>Output for integrator</td><td>1 V (Can be set to 100, 1000, 10000, or 250 μRIU/V)</td></tr>
<tr><td colspan="2">Mass</td><td>12 kg</td></tr>
<tr><td colspan="2">Dimensions</td><td>H 260 mm × V 140 mm × D 420 mm</td></tr>
<tr><td colspan="2">Operating temperature range</td><td>4 to 35 °C</td></tr>
<tr><td colspan="2">Power supply</td><td>
<table>
<tr><th>Part No.</th><th>Power Supply Voltage *1 (indicated on the instrument)</th><th>Power Consumption</th><th>Frequency</th><th>Rated Breaking Capacity *2</th></tr>
<tr><td>228-45104-41
228-45104-42
228-45104-46
228-45104-48
228-45104-58</td><td>100 V AC to 240 V AC (100-240 V ~)</td><td>150 VA</td><td>50/60 Hz</td><td>35 A</td></tr>
</table>
* "~" that is indicated on the instrument (for example, 240 V) means the current (AC) voltage.
*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
*2 Connect the power cord for the instrument to an outlet equipped with a circuit breaker that interrupts the supply if the current capacity becomes lower than the above.
</td></tr>
<tr><td colspan="2">Installation environment (IEC)</td><td>Install the instrument in a room that satisfies installation category II, contamination degree 2, and altitude 2,000 meters max.</td></tr>
</table>

9.3 Maintenance Parts

9.3.1 Consumable Parts

Part Name	Part No.	Description
Lamp	S228-63385-41	The lamp is LED. The average service life of the lamp is 35,000 hours. The warranty period is one year from the day of installation. For replacement, contact your Shimadzu representative.

9.3.2 Replacement Parts

Part Name	Part No.	Description
Tubing clamp	S228-24276	For attaching plumbing tube
Right panel assembly	S228-59137-41	

9.4 Introduction of Shimadzu High-Performance Liquid Chromatography System

This section provides an example of system configuration, along with descriptions of the operations of the various components.

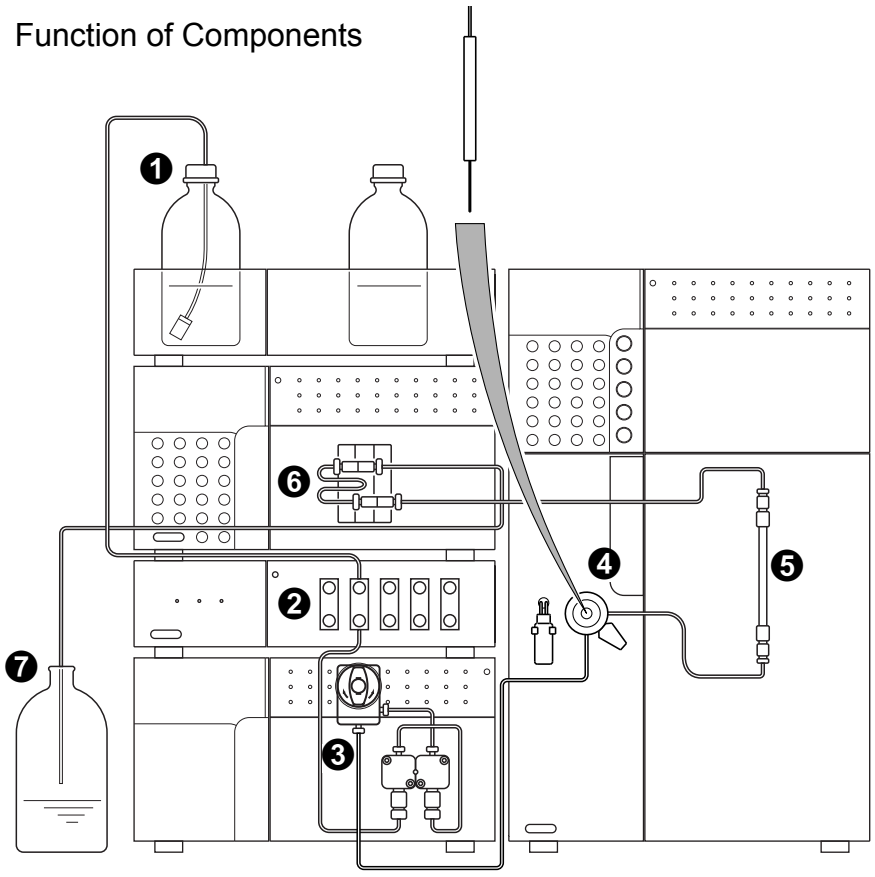
9.4.1 Example of a Simple (Isocratic) System

This is controlled by each device. This is a simple system composed of the minimum number of components for stable analysis.

■ Solvent Flow

❶ Reservoir bottle
↓
❷ Degassing unit
↓
❸ Solvent delivery module
↓
❹ Manual injector
↓
❺ Column
↓
❻ Detector
↓
❼ Waste container

■ Function of Components



❶ Mobile phase solvent is drawn out of the reservoir bottles and pumped through the tubing by the solvent delivery module.

❷ The degassing unit removes dissolved air from the mobile phase solvent, preventing air bubbles and consequent rise, drift or other baseline irregularities caused by dissolved air.

❸ The solvent delivery module sends the mobile phase solvent through the manual injector, column and detector, in that order, and finally into the waste container.

❹ Samples are injected into the system by the manual injector, using a syringe.

❺ In the column, the components are separated by means of the mutual interactions of the mobile phase solvent and the column packing (stationary phase).

❻ The detector detects the components separated in the column, and sends the signal data to the Chromatopac and the PC.

❼ Mobile phase from the detector drains into the waste container.

9.5 Mobile Phase Characteristics

	(1) Solvent (*) η ≤ 0.5cp, B.P. > 45 °C (**) η ≤ 0.5cp, B.P. < 45 °C	(2) Source	(3) UV Cutoff	(4) R.I.25°	Boiling Point (°C)	Viscosity (cP,25°C)	(5) p'	(6) e°a	(7) Water Solubility %W in 20°C Solvent	(8) Dielectric Constant e20	(9) p'+ 0.25e
1	FC-78(*) FC-75 (Fluorescent solvent) FC-43	(LC specific)	210 nm 210 (opaque 210 max.)	1.267 1.276 1.291	50 102 174	0.4 0.8 2.6	< -2 < -2 < -2	-.25 -.25 -.25		1.88 1.86 1.9	p' and Dielect. const (Function proportional to strength)
2	Isooctane (*) (2, 2, 4-tri methylpentane)	LC	197	1.389	99	0.47	0.1	0.01	0.011	1.94	0.1
3	n-Heptane(*)	LC	195	1.385	98	0.40	0.2	0.01	0.010	1.92	0.5
4	n-Hexane(*)	LC	190	1.372	69	0.30	0.1	0.01	0.010	1.88	0.5
5	n-Pentane(**)	LC	195	1.355	36	0.22	0.0	0.00	0.010	1.84	0.5
6	Cyclohexane	LC	200	1.423	81	0.90	-0.2	0.04	0.012	2.02	0.5
7	Cyclopentane(*)	LC	200	1.404	49	0.42	-0.2	0.05	0.014	1.97	0.6
8	l-Chlorobutane(*)	LC	220	1.400	78	0.42	1.0	0.26		7.4	2.8
9	Carbon disulfide	LC	380	1.624	46	0.34	0.3	0.15	0.005	2.64	1.7
10	2-Chloropropane(**)	LC	230	1.375	36	0.30	1.2	0.29		9.82	3.7
11	Carbon tetrachloride	LC	265	1.457	77	0.90	1.6	0.18	0.008	2.24	2.3
12	n-Butyl ether		220	1.397	142	0.64	2.1	0.25	0.19	2.8	2.4
13	Triethylamine			1.398	89	0.36	1.9	0.54		2.4	2.4
14	Bromoethane(*)			1.421	38	0.38	2.0	0.35		9.4	4.3
15	i-Propyl ether(*)		220	1.365	68	0.38	2.4	0.28	0.62	3.9	3.2
16	Toluene	LC	285	1.494	110	0.55	2.4	0.29	0.046	2.4	2.9
17	p-Xylene		290	1.493	138	0.60	2.5	0.26		2.3	3.0
18	Chlorobenzene			1.521	132	0.75	2.7	0.30		5.6	4.1
19	Bromobenzene			1.557	156	1.04	2.7	0.32		5.4	4.1
20	Iodobenzene						2.8	0.35			
21	Phenyl ether			1.580	258	3.3	3.4			3.7	3.7
22	Phenetole			1.505	170	1.14	3.3			4.2	4.9
23	Ethyl ether(**)	LC	218	1.350	35	0.24	2.8	0.38	1.3	4.3	4.0
24	Benzene	LC	280	1.498	80	0.60	2.7	0.32	0.058	2.3	3.6
25	Tricresy phosphate										
26	Ethyl iodide			1.510	72	0.57	2.2			7.8	4.2
27	n-Octanol		205	1.427	195	7.3	3.4	0.5	3.9	10.3	5.8
28	Fluorobenzene			1.46	85	0.55	3.1			5.4	4.6
29	Benzylether			1.538	288	4.5	4.1				
30	Methylene chloride(**)	LC	233	1.421	40	0.41	3.1	0.42	0.17	8.9	5.6
31	Anisole			1.514	154	0.9	3.8			4.3	4.6
32	i-Pentanol			1.405	130	3.5	3.7	0.61	9.2	14.7	7.3
33	1,2-Dichloroethane	LC	228	1.442	83	0.78	3.5	0.44	0.16	10.4	6.3
34	t-Butanol			1.385	82	3.6	4.1	0.7	miscible	12.5	

	(1) Solvent (*) η ≤ 0.5cp, B.P. > 45 °C (**) η ≤ 0.5cp, B.P. < 45 °C	(2) Source	(3) UV Cutoff	(4) R.I.25°	Boiling Point (°C)	Viscosity (cP,25°C)	(5) p'	(6) e°a	(7) Water Solubility %W in20°C Solvent	(8) Dielectric Constant e20	(9) p'+ 0.25e
35	n-Butanol	LC	210	1.397	118	2.6	3.9	0.7	20.1	17.5	8.3
36	n-Propanol	LC	240	1.385	97	1.9	4.0	0.82	miscible	20.3	
37	Tetrahydrofuran(*)	LC	212	1.405	66	0.46	4.0	0.57	miscible	7.6	
38	Propylamine(*)			1.385	48	0.35	4.2		miscible	5.3	
39	Ethylacetate(*)	LC	256	1.370	77	0.43	4.4	0.58	8.8	6.0	5.8
40	i-Propanol	LC	205	1.384	82	1.9	3.9	0.82	miscible	20.3	
41	Chloroform(*)	LC	245	1.443	61	0.53	4.1	0.40	0.072	4.8	5.6
42	Acetophenone			1.532	202	1.64	4.8			17.4	8.7
43	Methylethyl	LC	329	1.376	80	0.38	4.7	0.51	23.4	18.3	9.1
44	Cyclohexanone			1.450	156	2.0	4.7			18.3	9.1
45	Nitrobenzene			1.550	211	1.8	4.4			34.8	13.2
46	Benzonitrile			1.536	191	1.2	4.8			25.2	10.9
47	Dioxane	LC	215	1.420	101	1.2	4.8		miscible	2.2	
48	Tetramethyl urea	LC	265	1.449	175		6.0	0.56		23.0	10.7
49	Quinoline			1.625	237	3.4	5.0			9.0	7.4
50	Pyridine			1.507	115	0.88	5.3		miscible	12.4	
51	Nitroethane		380	1.390	114	0.64	5.2		0.9		
52	Acetone(*) Benzyl alcohol	LC	330	1.356 1.538	56 205	0.30 5.5	5.1 5.7	0.71	miscible	13.1	8.8
53	Tetramethyl guanidine						6.1	0.6			
54	Methoxyethanol	LC	210	1.400	125	1.60	5.5		miscible	19.9	
55	Tris(cyanoethoxy) propane	GC					6.6	0.56			
56	Propylene carbonate	LC					6.1				
57	Ethanol	LC	210	1.359	78	10.8	4.3		miscible	24.6	
58	Oxydipropionitrile	GC					6.8				
59	Aniline			1.584	184	3.77	6.3			6.9	8.1
60	Acetic acid			1.370	118	1.1	6.0		miscible	6.2	
61	Acetonitrile(*)	LC	190	1.341	82	0.34	5.8		miscible	37.5	
62	N,N-dimethylaceta-mide	LC	268	1.436	166	0.78	6.5	0.88		37.8	
63	Dimethylformamide	LC	268	1.428	153	0.80	6.4			36.7	
64	Dimethylsulfoxide	LC	268	1.477	189	2.00	7.2	0.62	miscible	4.7	
65	N-methyl-2-pyrolidone	LC	285	1.468	202	1.67	6.7			32	
66	Hexamethyl phosphoric acid triamide			1.457	233	3	7.4	0.65		30	
67	Methanol(*)	LC	205	1.326	65	0.54	5.1		miscible	32.7	
68	Nitromethane		380	1.380	101	0.61	6.0		2.1		
69	m-Cresol			1.540	202	14	7.4			11.8	10.0
70	N-methylformamide			1.447	182	1.65	6.0		miscible	182	
71	Ethylene glycol			1.431	182	16.5	6.9		miscible	37.7	
72	Formamide			1.447	210	3.3	9.6		miscible	111	
73	Water	LC		1.333	100	0.89	10.2			80	

(1) An asterisk (*) indicates solvents most suitable for LC, with low boiling points (>45 °C) and low viscosity (<0.5cP). Double asterisks (**) indicates solvents with a very low viscosity and boiling point.

(2) LC in the "Source" column indicates that a grade of solvent specifically for the LC is commercially available from companies such as the following:
Burdick & Jackson, Baker Chemical, Mallinckrodt Chemical, Fischer Scientific, Waters Associate, Manufacturing Chemists, Inc.
GC in the "Source" column indicates that a solvent is used as a stationary phase for gas chromatography, and can be purchased from companies selling GC columns and stationary phases. (These solvents are used as stationary phase in liquid-to-liquid LC.)

(3) UV Cutoff: The wavelength (nm) below which the solvent becomes opaque.

(4) R.I.25: Refractive index at 25 °C.

(5) p: Polarity parameter of the mobile phase.

(6) e°a: Mobile phase's strength parameter in relation to liquid-to-solid adsorption in alumina.

(7) Water Solubility $\%^{W}$ $in^{20°C}$ Solvent: Water solubility (%W) at 20 °C of the mobile phase used in liquid-to-solid adsorption.

(8) Dielectric Constant e^{20} indicates the dielectric constant.

(9) p'+0.25e consisting of p' (proportional to solvent strength) plus the dielectric constant, in ion chromatography.

Source: A.M.Krstulovic, *P.R.Brown: Reversed-Phase High-Performance Liquid Chromatography,* Wiley Interscience (1982)

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Index

P

R

S

T

U

V

W

Z

SHIMADZU

228-92372D

Column Oven
For Shimadzu Ultra High Performance Liquid Chromatograph

CTO-40S

Instruction Manual

Read this manual thoroughly before you use the product.
Keep this manual for future reference.

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Introduction

Read this Instruction Manual thoroughly before using the product.

Thank you for purchasing this product.

This instruction manual describes the basic operation, and accessories and options for this product. Read this manual thoroughly before using the product and operate the product in accordance with the instructions in this manual.
The following instruction manuals are included with the product.

Document Name	Document No.	Description
Instruction Manual (PDF)	228-92372	This instruction manual.
System Guide (PDF)	228-92352	This manual provides details on how to use the system: system performance optimization, analysis procedure, troubleshooting, validation, installation, etc.
Safety Guideline (Booklet/PDF)	228-92326	This manual describes the precaution instructions to ensure safe operation.

Read "Safety Guideline" thoroughly before using the product.
"Safety Guideline" describes the information about the warranty, after-sales service, safety instructions and precautions to ensure safe operation of the instrument.

Keep this manual for future reference.

IMPORTANT

- If the user or usage location changes, ensure that the manual is always kept together with the product.
- If any manual or a product warning label is lost or damaged, immediately contact your Shimadzu representative to request a replacement.
- To ensure safe operation, read the accompanying booklet "Safety Guideline" before using the product.
- To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, re-installation (after the product is moved), or repair is required.

Original version is approved in English.

Notice

- Information in this manual is subject to change without notice and does not represent a commitment on the part of the vendor.
- Any errors or omissions which may have occurred in this manual despite the utmost care taken in its production will be corrected as soon as possible, although not necessarily immediately after detection.
-
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Indications Used in This Manual

Precaution symbols are indicated using the following conventions:

Indication	Meaning
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

The following symbols are used in this manual:

Indication	Meaning
Prohibition	Indicates an action that must not be performed.
Instruction	Indicates an action that must be performed.
Hint	Indicates information provided to improve product performance.
Reference	Indicates the location of related reference information.

Electromagnetic Compatibility

Descriptions in this section apply only to the following model:

• 228-65201-58 CTO-40S

This product complies with European standard EN61326, class B for electromagnetic interference (Emissions) and industrial electromagnetic environment (Immunity).

■ EN55011 Emissions (Electromagnetic Interference)

This is a class B product. When this product causes an electromagnetic disturbance to devices being used near this product, create an appropriate distance between those devices and this product in order to eliminate the disturbance.

Contents

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1 Overview

The Shimadzu CTO-40S column oven was developed to maintain the temperature of the LC system column and flow lines at a constant temperature, in order to provide heightened analysis reproducibility and separation performance. The oven is an air-circulated thermostatic chamber for the Shimadzu High Performance Liquid Chromatography system.
Excluding the thermostatic chamber, the other instruments necessary for high performance liquid chromatography such as a solvent delivery unit, autosampler, detector, and system controller are sold separately.
For instruments that suit your purpose of use, contact your Shimadzu representative.

1.1 Features

■ In addition to columns, the thermostatic chamber allows installation of flow line parts in it including a manual injector, mixer, and automatic column switch valves.

The main purpose of this column oven is to keep the column temperature constant. The thermostatic chamber can store flow line parts in it including a manual injector, mixer, and automatic column switch valves as well as columns. Installing these in the oven isolates them from the influence of ambient temperature and makes for more stable analysis. Shorter plumbing distances also reduce dead volume in the flow lines.

■ Time program functions are available for setting the temperature even in standalone use.

The oven has a built-in CPU, allowing the set temperature to be controlled by a time program, even when the oven is controlled locally. Use of a system controller (SCL-40 etc.) permits finer control, like starting analysis when temperature stabilizes and stopping analysis when leaks or problems are detected.

■ The automatic speed control of the air circulation fan provides a stable temperature control.

The speed of the air circulation fan is automatically controlled based on the temperature setting. At high temperatures, the air circulation ratio is increased to keep the temperature constant, and at temperatures close to the ambient temperature, the air circulation ratio is decreased to suppress heat generation due to the air circulation. The fan speed is controlled so as to remain constant even when there are fluctuations in the power supply. This enables stable temperature control.

■ The built-in thermal fuse and leak sensor ensure safety.

To ensure safe use, the thermal fuse cuts off the power to the heater if the temperature rises abnormally. In addition, if some liquid leaks inside, the gas sensor (flammable organic solvent) or liquid leak sensor (aqueous solvent) issues an error to automatically stop temperature control.

1.2 Component Parts

This instrument consists of the standard parts listed below. Check the parts against this list after unpacking.

No.	Part Name	Part No.	Q'ty	Remark
-	Main Unit CTO-40S	-	1	-
-	Safety Guideline (Booklet)	228-92326	1	Contains cautions for use regarding the instrument.
-	Instruction Manual/ System Guide (CD-ROM)	228-92350-41	1	The paper based Instruction Manual (228-92372) and System Guide (228-92352) are available for a fee.
1	Drain Tube	228-25162-03	1	▶▶ Reference System Guide "7 Installation"
2	Drain elbow tube	228-72552	1	
3	Column Bracket	228-72009	1	
4	Knurled screw	228-63758	1	
5	Rubber column clamp	228-72586	2	
6	Plug	038-01214-12	1	
7	Connection kit	228-72584-41	1	

1.3 Optional Parts

Optional parts which can be added to the column oven are listed below.
For information about other optional units listed below, contact your Shimadzu representative.
For optional parts for the whole LC system, refer to System Guide. For columns, refer to Shimadzu's column catalog.

■ Parts for the oven

Option	Part No.	Features
Active preheater	228-72084-41	The preheating unit heats the mobile phase before it enters columns by independent heating control. The unit controls the temperature gradient in columns so that sharp peaks are obtained.
Column clamp B5 *1	228-15617-91	Can fix one column with an outer diameter of 6.5 mm to 9.5 mm. (Metal)
Column clamp B8 *1	228-15617-92	Can fix one column with an outer diameter of 9.5 mm to 12.7 mm. (Metal)
Stand	228-72391-41	The stand prevents the instrument from falling over when the instrument is used alone.
REMOTE CABLE	228-28253-91	Used for connection of an external device.

*1 If three or more rubber column clamps of standard accessories are installed and used at an operation temperature of 60 °C or higher, the temperature distribution inside the oven deteriorates

and the analysis result may be affected. For additional column clamps, use the optional metal ones listed above, not the standard rubber ones.

Reference Sytem Guide [2.4.1 Set to column into column oven]

■ CMD (Column Management Device)

The device stores information on a column and is capable of managing the column in combination with the database of a PC workstation. One CMD chip is required for each column. For details, refer to the instruction manual of the LabSolutions chromatography data system.

NOTE When connecting a mixer detection device, the CMD cannot be used for column management.

Option	Part No.	Features
CMD (Column Management Device)	228-37281-41	The device is stored colmun-related infomation. One CMD chip is required for each column.
CMD cable type-L	228-72550	The cable connects a CMD chip with the instrument. One cable is required for each instrument.

■ Automatic column switch valve

Two valves can be installed with one on the upper part and the other on the lower part.

Option	Part No.	Features
FCV-0206	228-65603-58	The valve with two positions and six ports automatically switches between two columns. The withstand pressure is 44 MPa.
FCV-0206H	228-65607-58	The valve with two positions and six ports automatically switches between two columns. The withstand pressure is 80 MPa.
FCV-0206H3	228-65624-58	The valve with two positions and six ports automatically switches between two columns. The withstand pressure is 130 MPa.
FCV-0206H2i	228-65630-58	The valve with two positions and six ports automatically switches between two columns. The withstand pressure is 105 MPa. This is an inert specification that does not use stainless steel or other metals for the flow line material.
FCV-0607	228-65604-58	The valve with six positions and seven ports automatically switches between six columns. The withstand pressure is 44 MPa.
FCV-0607H	228-65608-58	The valve with six positions and seven ports automatically switches between six columns. The withstand pressure is 80 MPa.
FCV-0607H3	228-65625-58	The valve with six positions and seven ports automatically switches between six columns. The withstand pressure is 130 MPa.

Option	Part No.	Features
FCV-0607H2i	228-65631-58	The valve with six positions and seven ports automatically switches between six columns. The withstand pressure is 105 MPa. This is an inert specification that does not use stainless steel or other metals for the flow line material.
FCV-DR	228-65602-58	The unit drives the previously listed valves. (One unit is required for each valve.)
FCV-36AH	228-45206-41	The valve with two positions and ten ports automatically switches between two columns. The withstand pressure is 100 MPa. (Including the driving unit)
Manifold	228-72436-41	The part joins tubes of column outlets to enable one valve to switch between columns. PEEK resin and stainless steel are used for wetted parts. ▶▶ Reference Safety Guideline "5. Precautions for Mobile Phase Selection and Use"
FCV installation kit (CTO-40S)	228-72438-41	The common installation kit is required for installing the previously listed valves in the instrument. (One unit is required for each valve.)
FCV tubing two-piece kit (ID 0.3)	228-72437-41	The tubing kit is required for installing two columns.
FCV tubing two-piece kit (ID 0.1)	228-72437-42	The tubing kit is required for installing two columns.
FCV tubing two-piece kit (ID 0.1 300 mm Nexlock)	228-72437-49	The tubing kit is required for installing two columns. (This Nexlock tubing comes with finger tight fittings.)
Two-piece set of PEEK lined SS tube for FCV (ID 0.1 300 mm)	228-72437-52	The tubing kit is required for installing two columns. (This is an inert specification that does not use stainless steel or other metals for the flow line material.)
FCV tubing six-piece kit (ID 0.3)	228-72437-43	The tubing kit is required for installing two to six columns.
FCV tubing six-piece kit (ID 0.1)	228-72437-44	The tubing kit is required for installing two to six columns.
FCV tubing six-piece kit (ID 0.1 300 mm Nexlock)	228-72437-50	The tubing kit is required for installing two to six columns. (This Nexlock tubing comes with finger tight fittings.)
Six-piece set of PEEK lined SS tube for FCV (ID 0.1 300 mm)	228-72437-53	The tubing kit is required for installing two to six columns. (This is an inert specification that does not use stainless steel or other metals for the flow line material.)

■ Gradient mixer

The instrument can store one of the following mixers coming with a mixer detection device.
For how to select a mixer, refer to System Guide.
Connecting a mixer detection device to the instrument requires a separate L-shaped CMD cable.

> **NOTE** When connecting a CMD (column management device), the mixer detection device cannot be connected.

Option	Part No.	Features
MIXER SUS316L ASSY (With a mixer detection device)	228-72654-41	The general-purpose mixer, where stainless steel is used for the wetted part material, is intended for both high and low pressure gradient analysis. The capacity can switch between three settings of 0.5 mL, 1.7 mL, and 2.6 mL.
MIXER PEEK (With a mixer detection device)	228-72654-42	The non-metal gradient mixer does not contain any metal as a material in its parts that come in contact with liquid. The capacity can switch between two settings of 0.4 mL and 1.6 mL. The mixer can be used for both high and low pressure gradient analysis.
MIXER MR 20 µL (With a mixer detection device)	228-72652-41	The mixer is intended exclusively for high pressure gradient analysis with high performance and a small internal capacity of 20 µL, where stainless steel is used for the wetted part material.
MIXER MR 40 µL (With a mixer detection device)	228-72652-42	The mixer is intended exclusively for high pressure gradient analysis with high performance and a small internal capacity of 40 µL, where stainless steel is used for the wetted part material.
MIXER MR 100 µL (With a mixer detection device)	228-72652-43	The mixer is intended exclusively for high pressure gradient analysis with high performance and a small internal capacity of 100 µL, where stainless steel is used for the wetted part material.
MIXER MR 180 µL II (With a mixer detection device)	228-72652-44	The mixer is intended exclusively for high pressure gradient analysis with high performance and a small internal capacity of 180 µL, where stainless steel is used for the wetted part material.
MIXER MR 20 µL INERT (With a mixer detection device)	228-65081-41	The mixer is intended exclusively for high pressure gradient analysis with high performance and a small internal capacity of 20 µL, where a high corrosion resistance metal is used for the wetted part material.
MIXER MR 180 µL INERT (With a mixer detection device)	228-65081-42	The mixer is intended exclusively for high pressure gradient analysis with high performance and a small internal capacity of 180 µL, where a high corrosion resistance metal is used for the wetted part material.

Option	Part No.	Features
MIXER MR 300 LPGE (With a mixer detection device)	228-72653-42	The high performance mixer is intended exclusively for low pressure gradient analysis with an internal capacity of 300 µL, where stainless steel is used for the wetted part material.
MIXER MR 40 LPGE INERT (With a mixer detection device)	228-65081-43	The high performance mixer is intended exclusively for low pressure gradient analysis with an internal capacity of 40 µL, where a high corrosion resistance metal is used for the wetted part material.
MIXER MR 300 LPGE INERT (With a mixer detection device)	228-65081-44	The high performance mixer is intended exclusively for low pressure gradient analysis with an internal capacity of 300 µL, where a high corrosion resistance metal is used for the wetted part material.

■ Manual injector

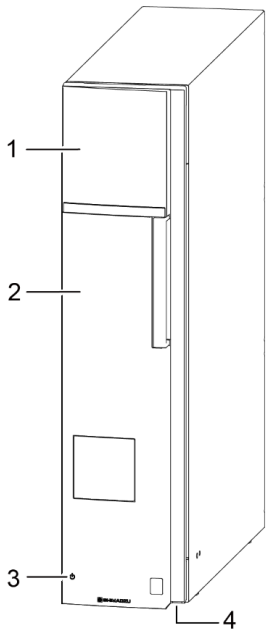
Option	Part No.	Features
Injector for general analysis 7725	228-32210-91	The manual injector is intended for general analysis. The standard sample loop has a volume of 20 µL.
Injector for general analysis 7725i	228-32210-93	The manual injector consists of the 7725-type injector above and a position sensing switch. This injector can send signals synchronized with sample injection to the system controller.
Semi micro injector 8125	228-23200-91	The manual injector is intended for semi-micro columns. The standard sample loop has a volume of 5 µL. This injector has a built-in position sensing switch and can send signals synchronized with sample injection to the system controller.
Non-metal manual injector 9725i	228-32650-93	The injector does not contain any metal as a material in its parts that come in contact with liquid. The maximum operating temperature is 60 °C. With a position sensing switch, this injector can send signals synchronized with sample injection to the system controller.
Manual injector installation kit *1 *2	228-35659-92	The kit is required for installing the manual injectors on the right side of the instrument.

*1 If the manual injector is installed, the right side of the instrument needs space of 100 mm to avoid the handle part of the manual injector.

*2 The sheet metal to be mounted on the back of the instrument securing the left side units can only accommodate the LC-40 series pumps, SPD-40/SPD-40V, and SPD-M40 at its unit heights 2, 3, and 4. It cannot secure other units, such as the SIL-40 series, SCL/CBM-40, LC-20 series, or LC-30 series. In such cases, the Stand (P/N:228-72391-41) is necessary.

2 Parts Identification and Function

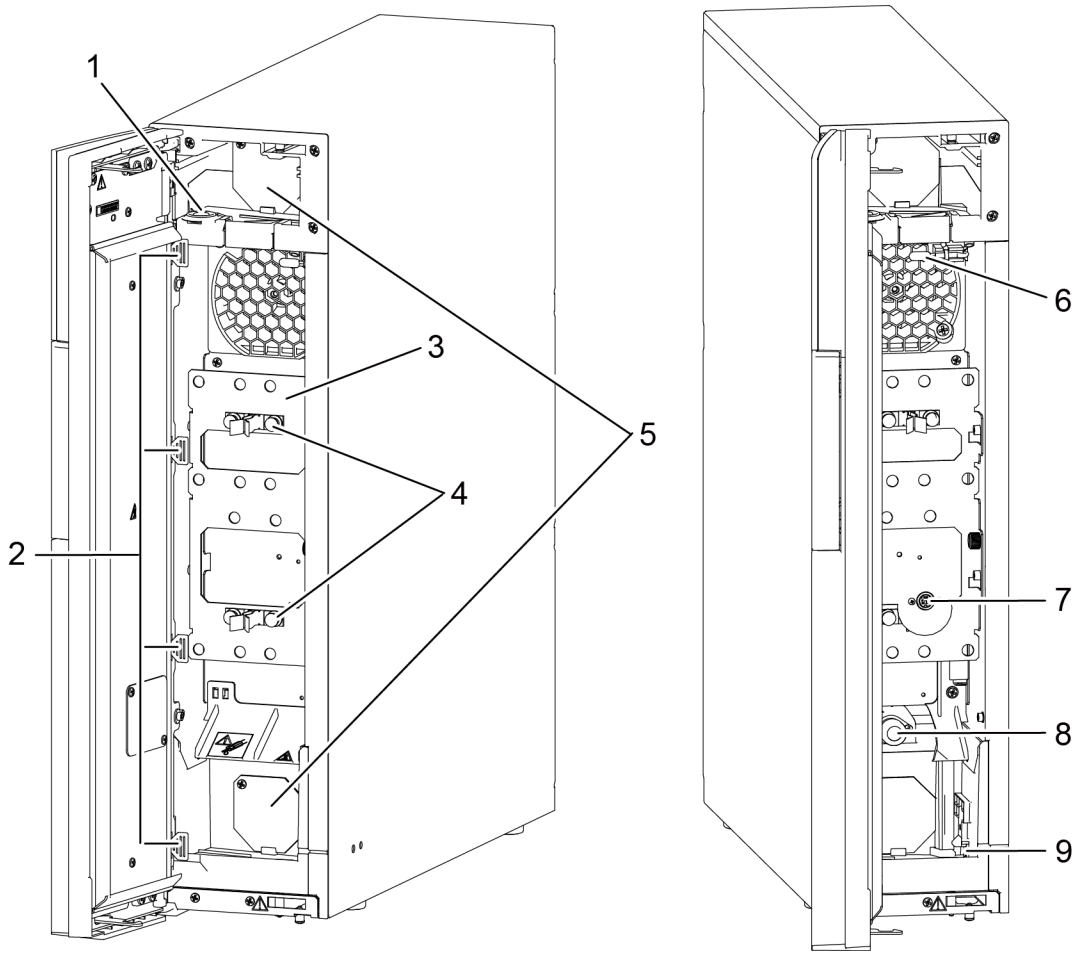
2.1 Front



No.	Name	Function
1	Operation panel	Configure or operate the instrument with the operation keys. Touching any other point than the display area on the operation panel displays the operation keys.
2	Door	The door of the column temperature control part. Open the door when setting a column.
3	(Power button)	Switches ON/OFF the power. When the power is ON, the switch illuminates in white, and when the power is OFF, the switch illuminates in orange. Even when the power is OFF, the standby current is fed to the instrument. For the main power, see "2.3 Back" P.9. Note that, with a system controller SCL-40/CBM-40/CBM-40lite connected, the switch does not illuminate and the operation to the switch is ignored by default setting. Reference "Setting the Power Button《POWER BUTTON》" P.24
4	Drain hole	The hole on the bottom of the instrument drains dew water and mobile phase leaking inside.

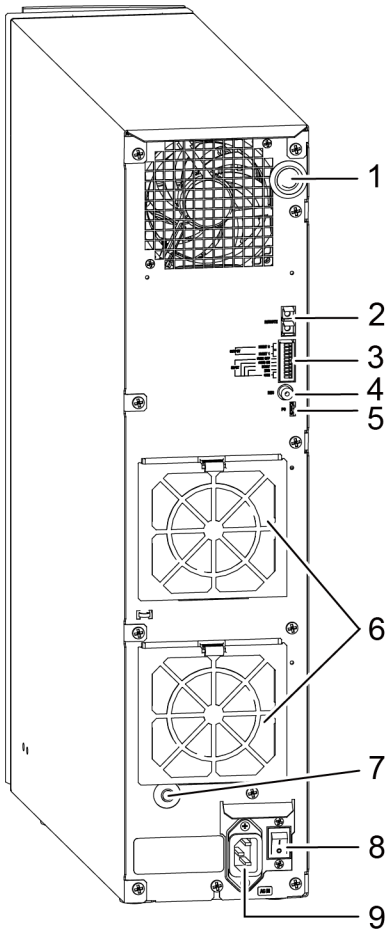
NOTE The door has a built-in sensor. Opening the door during temperature control causes the control to be stopped and the [DOOR] indicator on the display area to blink. Closing the door causes the temperature control to be resumed.

2.2 Interior



No.	Name	Function
1	External-device hole cap	Used for attaching the cell of an electric conductivity detector.
2	Tube cap	Removing the caps allows inserting tubes.
3	Column bracket	Used for fixing columns.
4	Column clamp	Used for fixing tubes.
5	Automatic column switch valve (optional) installation part	Allows installation of the optional automatic column switch valves.
6	Thermosensor	The sensor is for temperature measurement.
7	[CMD] connector	The connector is for a column management device (CMD) (optional).
8	Gas sensor	The sensor detects organic solvent vapors.
9	Liquid leak sensor	The sensor detects leakage of aqueous solvent.

2.3 Back



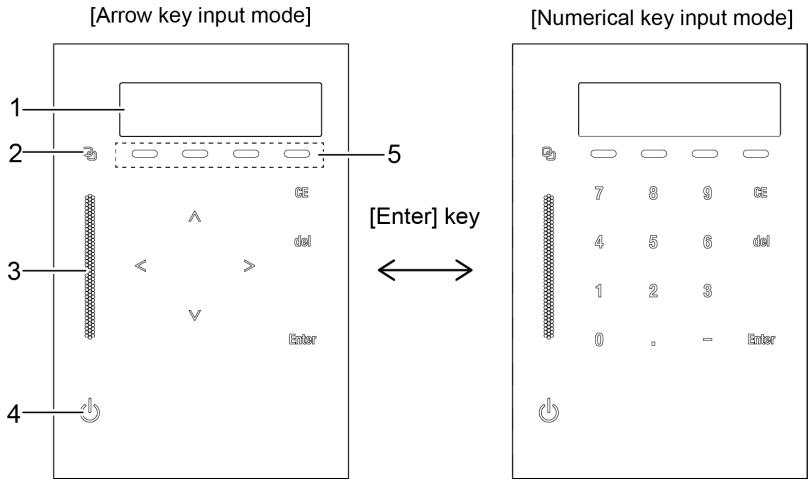
No.	Name	Function
1	External-device hole cap	Used for attaching the CDD cell of a CDD detector.
2	[REMOTE] connector	Connect to the system controller.
3	External input/output terminals	Connect to external equipment.
4	[REC] connector	The connector outputs the signal of column oven temperature (100 °C/mV).
5	[PC] connector	Connector for service personnel. Normally, this is not used.
6	Air filter	Prevents dust from entering the instrument.
7	External-device hole cap	Used for attaching an external device.
8	Main power switch	It turns on/off the power to the instrument.*1
9	Power cord connector	Connect the power cord.

*1 Normally use ⏻ (power button) of the operation panel or system controller to turn ON/OFF the power. If the system controller is connected and the main power switch is on, the user can use ⏻ (power button) of the system controller to turn ON/OFF the power from the front of the instrument. If the instrument is not used for a long time, turn off the main power switch. Before turning off the main power switch, be sure to turn OFF the power using the power button.

2.4 Name and Functions of the Operation Panel

This instrument is controlled through the keypad of the operation area. The display area allows verification of the instrument status.
The operation area has two input modes: [Arrow key input mode] to enable screen transfer, and [Numerical key input mode] to enable value input.
In a screen where the numeric keys are available, pressing [Enter] switches the operation area between the modes.

> **NOTE** When turning off the main power switch on the back of the instrument after changing the parameters via panel operation, be sure to turn OFF the power with the power button at the front of the instrument, and turn off the main power switch. Otherwise, some of the changed parameters may return to their original values.



No.	Name	Description
1	Display area	Displays various screens and settings. Reference "2.4.1 Display Area" P.12
2	Link LED	Illuminates when controlled by the system controller.
3	Status LED	• Blue: analysis in progress • Green: analysis ready (Temperature control stabilized) • Yellow: preparation for analysis in progress (Temperature control yet to be stabilized) • Red: error • Orange: sleep mode

No.	Name	Description
4	(Power button) *1	Switches ON/OFF the power. • To turn the power ON: Press and hold the power button for at least 3 seconds. • To turn the power OFF: Holding down the power button 3 seconds or more displays the confirmation screen. Holding it down again 1 second turns off the power. The button cannot be used by default setting if the instrument is connected with the system controller SCL-40/CBM-40/CBM-40lite. **Hint** If the system controller SCL-40 is connected, pressing the power button of SCL-40 turns off the power of the entire system. When a CBM-40 or CBM-40lite is used, pressing the power button of the solvent delivery unit having a CBM in it turns off the power to the whole system. "Setting the Power Button《POWER BUTTON》" P.24
5	Direct key	Temperature control start/stop, and time program start/stop can be performed directly. Reference "2.4.2 Operation Area" P.13

*1 There is the power button in the lower left in the front of this instrument, not on the operation panel.

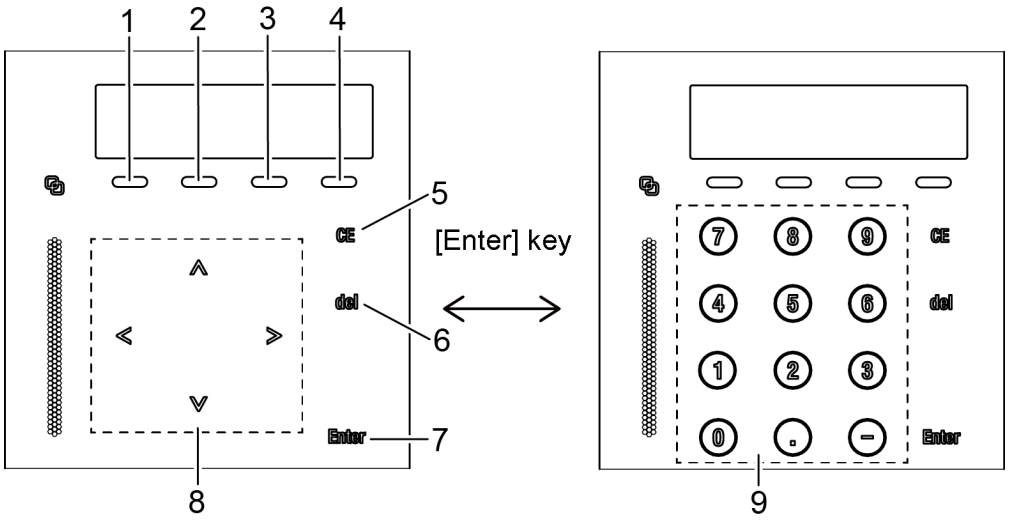
2.4.1 Display Area

In this section the display on the initial screen is described.

Display	Function
SET	Displays the setting temperature.
ACTUAL	Displays the current operation temperature in the oven.
T.MAX	Displays the upper limit value of the temperature.
OVEN	When the oven temperature is in adjustment, the word [OVEN] is highlighted. The direct key under the display enables to start or stop the temperature control, thus pressing it while the temperature control is stopped starts the adjustment, and pressing it while the adjustment is activated stops the adjustment.
READY / WAIT	Once the temperature control is completed and stabilized, the word [READY] is highlighted. While the temperature control is in preparation, [WAIT] blinks. While the temperature control is stopped, nothing is displayed. **Hint** Users can change the condition to display [READY]. "Setting the temperature ready check《READY CHECK》" P.26
RUN	Highlighted during execution of a time program. The direct key under the indicator starts or stops a time program.
DOOR	Blinks when the front door of the oven unit is opened. When the door is open, the temperature control is paused. **NOTE** When the oven temperature is 60 °C or higher, a warning message is displayed. Closing the door clears the warning message and resumes the temperature control.

2.4.2 Operation Area

Use the keys on the front to operate or configure the instrument. When you touch the key, the status LED lights up and accepts input.

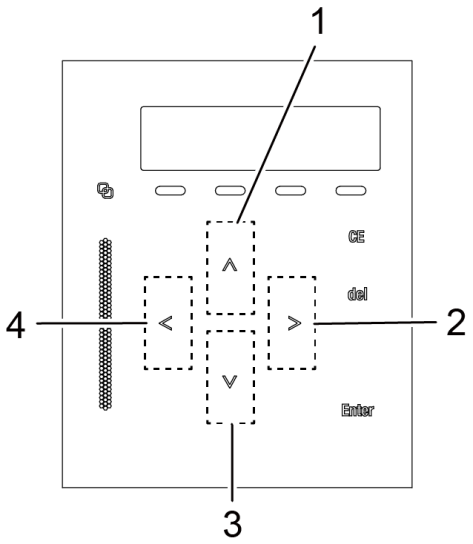


No.	Key	Name	Function
1	[OVEN]	Oven key	Starts or stops the temperature control.
2	—	—	Not used.
3	[RUN]	Run key	Starts or stops a time program. **Hint** When a system controller is connected or no time program is set, operation to [RUN] is ignored.
4	—	—	Not used.
5	[CE]	Clear key	This key is used for the following. • To initialize the screen. • To clear the values input up to that time while entering the values. • To clear error message and cancel alarms.
6	[del]	Delete key	This key is used for the following. • To delete input values. • To delete a line of the displayed time program while creating it.
7	[Enter]	Enter key	Confirms input values of the setting items.
8	[↑][→] [↓][←]	Arrow keys	Switches the display screen.
9	[·] to [9]	Numeric keys	Inputs values for the setting items.

Regarding the acceptable part of the arrow keys on the touch panel.

When operating the arrow keys, it responds by touching the part including the upper and lower range of each key indication on the operation panel.

No.	Description
1	Acceptable part of [↑] key input.
2	Acceptable part of [→] key input.
3	Acceptable part of [↓] key input.
4	Acceptable part of [←] key input.



3 Operation

3.1 Settings for the Basic Operation

Operating the instrument requires setting the column temperature and the upper temperature limit to protect the columns. See the product specifications before use.

Reference "5.1 Specifications" P.63

3.1.1 Prior to Key Operation

Touching the operation area of the operation panel displays the operation keys that allow the user to perform key operation.

3.1.2 Temperature Control Operation

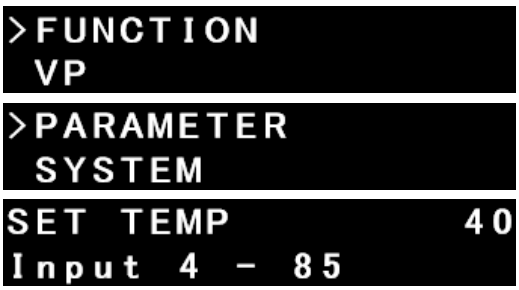
The following is an example operation procedure. The operation temperature of 55 °C and an upper temperature limit of 70 °C are used in this example.

1 **Display the initial screen (the screen that is displayed when the power is turned ON).**

Hint If the initial screen is not displayed, press [CE] to display the initial screen.

2 **Press [→] three times.**

The [PARAMETER] setting group of the [FUNCTION] setting group is selected and then the [SET TEMP] screen is displayed.



3 **Press [Enter].**

The cursor starts blinking and activates the numeric keypad. Now the values can be entered.

4 **Set the operating temperature to 55 °C by using the numeric keypad, and press [Enter].**

The operating temperature is fixed to 55 °C.

Hint To cancel the input value, press [CE].

5 **Press [↓] once and on the [T.MAX] screen, press [Enter].**

The cursor starts blinking and activates the numeric keypad. Now the values can be entered.

6 **Set the temperature to 70 °C by using the numeric keypad, and press [Enter].**

The upper temperature limit is fixed to 70 °C.

Hint In case the actual temperature exceeds the upper temperature limit (T. MAX) during temperature control, [ERR OVER T.MAX] appears in the screen and the temperature control stops. Pressing [CE] clears the error.

7 **Press [CE] to return to the initial screen.**

Once the setting is complete, the operating temperature is displayed in the initial screen.

Hint Pressing the [←] key 3 times also returns to the initial screen.

8 **Press [OVEN].**

Pressing the direct key under the [OVEN] indicator displays the confirmation screen.

NOTE Pressing the [CE] key in the confirmation screen or not operating the screen for a few seconds causes the panel to display the previous screen without the temperature control started.

Hint Users can change the setting so that temperature control is started by only pressing [OVEN] without the confirmation screen displayed.

Reference "Setting the direct key mode《DIRECT KEY MODE》" P.29

9 **Press [Enter].**

[OVEN] highlights the word "OVEN" by inverting the colors, and the oven temperature (ACTUAL) approaches the set temperature.

When the oven temperature becomes stable, the display changes from [WAIT] to [READY].

Hint To stop the temperature control, press [OVEN]. The confirmation screen is displayed. Pressing [Enter] returns the display to the original state and the temperature control stops.

NOTE Beware of burns when the operating temperature is high (approx. 60 °C or higher).

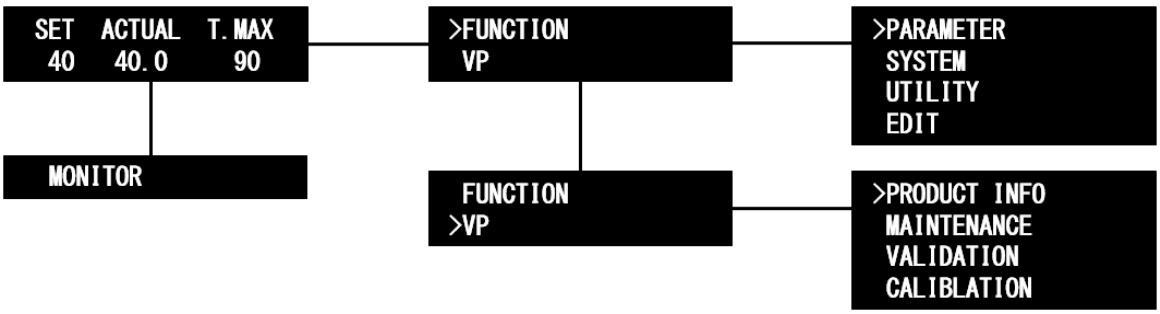
3.2 Types of Screens

Turning ON the power displays the initial screen.

By pressing the [↓] and [→] keys on the initial screen, the screen can be switched from the initial screen to one of three screens below:

Display Screen	Description
Monitor screen	Displays the status of the instrument. Reference "3.3 Monitoring Screens" P.19
Auxiliary functions screen	Configure various parameter settings and perform operations. Reference "3.4.1 Auxiliary Functions (FUNCTION) List" P.20
VP function screen	Support the validation of the instrument with functions for displaying and checking instrument information. Reference "3.5 VP Functions Screen" P.30

Pressing [→] on the initial screen displays the screen to select the auxiliary functions screen [FUNCTION] or VP functions screen [VP]. Move the cursor to the desired option with [↓] or [↑] and press [→] to display the screen. Press [CE] to return to the initial screen.



3.3 Monitoring Screens

This section describes the monitoring screens.

Press [↓] on the initial screen to show the various types of information.

Name	Description	Reference
ROOM	Displays the room temperature.	P.19
RV1, RV2	Displays the flow line of automatic column switch valve.	P.19
TIME	Displays the time that elapsed after a time program was started.	P.19
LEAK SENSOR LEVEL	Displays the detected values of the liquid leak sensor and the gas sensor.	P.19

■ Displaying the room temperature《ROOM》

Displays the room temperature (°C).

■ Displaying the flow line of automatic column switch valve《RV1,RV2》

The panel displays the flow lines of automatic column switch valves when they are installed.

Hint [RV1] indicates the flow line of the valve installed on the lower part of the instrument and [RV2] the one of the valve installed on the upper part. Without a valve installed, "-" is displayed.

■ Displaying the program elapsed time《TIME》

While a time program is running, the panel displays the time that elapsed after the program was started.

■ Displaying the detected concentration values of the liquid leak sensor and the gas sensor《LEAK SENSOR LEVEL》

Displays the detected concentration values of the liquid leak sensor and the gas sensor.

Display	Description
Liq	Displays the detected value of the liquid leak sensor.
Gas	Displays the detected value of the gas sensor.

3.4 Auxiliary Functions Screen (FUNCTION)

The auxiliary function has four setting groups. Switch the groups with [↑] or [↓] and press [→] to enter the screen of the desired setting group. Press [CE] to return to the initial screen.

Setting Group Name	Description
PARAMETER	The group allows the user to set analysis parameters.
SYSTEM	The group allows the user to set parameters related to the entire system operation and parameters of connection with external equipment.
UTILITY	The group allows the user to set parameters not related to the analysis result such as parameters of display and buzzer.
EDIT	Time programs can be edited.

3.4.1 Auxiliary Functions (FUNCTION) List

■ [PARAMETER] setting group

Name	Description	Remark	Ref.
SET TEMP	Sets the operating temperature.	Initial value: 40 Set value: 4 to 85 °C	P.23
T.MAX	Sets the upper temperature.	Initial value: 90 Set value: 5 to 90 °C	P.23
EVENT1	Sets the relay contact output 1.	Initial value: 0 Set value: 0: Off 1: On	P.23
EVENT2	Sets the relay contact output 2.	Initial value: 0 Set value: 0: Off 1: On	P.23
VALVE1 (LOWER)	Sets the flow line of the automatic column switch valve 1 (at the lower part).	Initial value: 1 Set value: 2-position valve: 0 to 1 6-position valve: 1 to 6	P.23
VALVE2 (UPPER)	Sets the flow line of the automatic column switch valve 2 (at the upper part).	Initial value: 1 Set value: 2-position valve: 0 to 1 6-position valve: 1 to 6	P.23

■ [SYSTEM] setting group

Name	Description	Remark	Ref.
LOCAL MODE	Selects independent operation or control via system controller.	Initial value: 0 Set value: 0: Remote 1: Local	P.24
LINK ADDRESS	Sets address of the instrument for control via system controller.	Initial value: 6 Set value: 1 to 12	P.24
POWER BUTTON	Sets whether to enable individual operation from the power button on the front of the instrument even when connected to the system controller SCL-40/CBM-40.	Initial value: 0 Set value: 0: CBM 1: Module	P.24
SELECT EVENT1	Use the [EVENT1] output as a start signal of a time program.	Initial value: 0 Set value: 0: Event 1: Start	P.25
SELECT EVENT2	Use the [EVENT2] output as a stop signal of external equipment in case of an error.	Initial value: 0 Set value: 0: Event 1: Error	P.25
READY CHECK	Sets whether to wait for displaying [READY] until the oven temperature stabilizes at the set temperature or not.	Initial value: 1 Set value: 0: Off 1: On	P.26
READY RANGE	Sets the ready range. When the oven temperature is within this range (°C), it is considered to be at the set temperature.	Initial value: 1.0 Set value: 0.1 to 1.0 °C	P.26
WAIT TIME	Sets the time (min) to elapse since the oven temperature reaches the set temperature range until [READY] is displayed.	Initial value: 5 Set value: 0 to 10 minutes	P.26
FAN SPEED	Selects a rotation speed of the fan inside the oven.	Initial value: 0 Set value: 0 to 3	P.26
ACTIVE PREHEATER	Sets the active preheater (optional).	Initial value: 0 Set value: 0: Off 1: On	P.27
MIXER VOL	Displays or sets the volume of the connected gradient mixer (optional).	-	P.27

■ [UTILITY] setting group

Name	Description	Remark	Ref.
KEY CLOSE	Disables the key input.	-	P.28
BRIGHTNESS	Sets the brightness of display screen.	Initial value: 4 Set value: 1 to 4	P.28
BEEP MODE	Sets the operation of buzzer.	Initial value: 0 Set value: 0: ON 1: Alarm 2: OFF	P.28
VOLUME	Sets the buzzer volume.	Initial value: 2 Set value: 1 to 3	P.28
DISP OFF TIME	The operation panel turns into the sleep mode after the time set here elapses.	Initial value: 1 Set value: 0 to 10 min	P.29
DIRECT KEY MODE	Specifies whether to display the confirmation screen when the direct key is operated.	Initial value: 0 Set value: 0: Display 1: Do not display	P.29

■ [EDIT] group

Use this group to create a time program.

Reference "3.6 Creating Time Program" P.42

3.4.2 [PARAMETER] Setting Group

This setting group is relevant to analysis parameters.

■ Setting the operating temperature《SET TEMP》

Input the value (temperature) with the numeric keypad and press [Enter].

■ Setting the upper temperature《T.MAX》

Input the value with the numeric keypad and press [Enter].

■ Setting the EVENT1 output terminal《EVENT1》

■ Setting the EVENT2 output terminal《EVENT2》

Sets "ON" (close)/"OFF" (open) of the [EVENT1] and [EVENT2] output (relay contact) on the back of the instrument.

Input the value with the numeric keypad and press [Enter].

Set Value	EVENT1 and EVENT2 Output
0	Relay OFF
1	Relay ON

■ Setting the flow line of the automatic column switch valve 1 (at the lower part)《VALVE1 (LOWER)》

■ Setting the flow line of the automatic column switch valve 2 (at the upper part)《VALVE2 (UPPER)》

Input the value with the numeric keypad and press [Enter].

Hint The instrument automatically recognizes whether the valves are installed and what type of valve they are. When no automatic column switch valve is installed, the panel displays [Not Installed].

3.4.3 [SYSTEM] Setting Group

The group allows configuring external device connection and analysis system operation as a whole.

■ Selecting the local mode《LOCAL MODE》

When the system controller is connected, the user can select whether to operate the instrument independently or with the system controller.

Input the value with the numeric keypad and press [Enter].

Set Value	Mode	Function
0	Remote	The instrument is operated with the system controller. (Initial value)
1	Local	The instrument is operated independently (local mode).

■ Setting the link address《LINK ADDRESS》

Sets the address (channel No.) used to connect with the system controller.

Input the value with the numeric keypad and press [Enter].

■ Setting the Power Button《POWER BUTTON》

Sets the power button on the front of the instrument.

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	Operation of the power button from the instrument is disabled according to the control of the system controller only. (Initial value)
1	In addition to being controlled by the system controller, it is also possible to turn off the power individually from the instrument.

Hint When the instrument is connected to the system controller SCL-40/CBM-40, the power control of the instrument follows the system controller, and the shutdown and startup functions operate from the system controller throughout the system.

NOTE If you turn off the power to the instrument individually with the setting [1], the connection to the system controller will also be lost. Therefore, the system startup function does not turn on the instrument. you need to turn the power on again by pressing and holding the power button on the instrument. The system shutdown function is still enabled with setting [1]. However, if the power is turned off by the shutdown function, turning on the power by pressing the power button of the instrument is disabled, and the system must be started up from the system controller.

NOTE If the [OPERATION MODE] is set to [1] and connected as CTO-20AC, the power control function by the system controller is not available. Therefore, you can always operate the power button of the instrument regardless of the setting of this function.

Reference "Setting the operation mode《OPERATION MODE》" P.38

■ Setting the function of the EVENT1 output terminal《SELECT EVENT1》

Sets the control mode of the [EVENT1] output (relay 1).

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	The EVENT1 output is controlled with the [EVENT1] set value.
1	The EVENT1 output is used as a start signal of a time program.

NOTE If the [SELECT EVENT1] function is used, the corresponding [EVENT1] parameter is disabled.

■ Setting the function of the EVENT2 output terminal《SELECT EVENT2》

Sets the control mode of the [EVENT2] output (relay 2).

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	The EVENT2 output is controlled with the [EVENT2] set value.
1	The EVENT2 output is used as an error output signal.

NOTE If the [SELECT EVENT2] function is used, the corresponding [EVENT2] parameter is disabled.

■ Setting the temperature ready check《READY CHECK》

Sets whether to wait for displaying [READY] until the oven temperature stabilizes at the set temperature or not.

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	Always displays [READY] regardless of ON/OFF of temperature control, [READY RANGE], or [WAIT TIME].
1	Waits until temperature control stabilizes according to [READY RANGE] and [WAIT TIME].

■ Setting the stable temperature range《READY RANGE》

20

Sets the temperature range (°C) to determine that the oven temperature has reached the set temperature.

When the oven temperature is within this range, it is considered to have reached the set temperature.

Input the value with the numeric keypad and press [Enter].

■ Setting the wait time to display READY《WAIT TIME》

Sets the time (min) to elapse since the oven temperature reaches the set temperature range until [READY] is displayed.

Input the value with the numeric keypad and press [Enter].

NOTE Setting the time to "0" causes [READY] to be displayed immediately after the temperature reaches the range specified by [READY RANGE].

■ Setting the fan rotation speed《FAN SPEED》

Sets the rotation speed of the stirring fan inside the oven.

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	Auto: Automatic control (Initial value) Automatically determines the rotation speed according to the set temperature and the ambient temperature. Normally, this setting is used.
1	Low: Provides a better cooling performance when the set temperature is lower than the ambient temperature.
2	Medium

Set Value	Function
3*1	High: Reduces dispersion in temperature inside the oven when the set temperature is high.

*1 For analysis systems with an electric conductivity detector or differential refractometer which are susceptible to wind inside the oven, it is recommended to use the setting "3: High".

■ Setting the active preheater 《ACTIVE PREHEATER》

Sets the active preheater (optional).

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	Stops controlling the active preheater.
1	Controls the active preheater (Initial value).

Hint Setting the value to "1" causes the temperature of the active preheater to be controlled to the set temperature of the oven. Note that turning OFF the temperature control of the oven stops the temperature control of the active preheater.

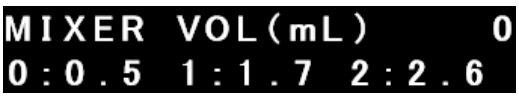
Hint When the active preheater is not installed, the panel displays [Not Installed].

■ Displaying and setting the volume of a mixer 《MIXER VOL》

When a mixer information device is connected, the panel displays the volume of the mixer.

When a variable-volume mixer is connected, the panel displays the screen to select a volume of the mixer.

Input the value with the numeric keypad and press [Enter].



Hint A mixer volume is used for calculating the gradient delay time of the analysis system.

Hint When no mixer information device is connected, the panel displays [Not Identify].

NOTE CTO-20AC compatible mode does not support any mixer information devices.

Reference "3.7.3 Limitations of Compatible Mode" P.49

3.4.4 [UTILITY] Setting Group

This setting group is relevant to the display monitor.

■ Disabling the key entry《KEY CLOSE》

Press [Enter] to disable key input.
From this point, keypad input is disabled.

Hint To cancel this function, press [Enter] while pressing [CE].

■ Setting the brightness of display screen《BRIGHTNESS》

Sets the brightness of the display screen.
Input the value with the numeric keypad and press [Enter].
The value range is 1 to 4. A larger setting value increases the brightness.

■ Setting the operation of buzzer《BEEP MODE》

Sets the buzzer sound.
Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	The key input sound, as well as the alarm sound to go off when an error occurs, are activated. (Initial value)
1	Only the alarm sound that goes off when an error occurs is activated.
2	All the buzzer sounds are deactivated.

■ Setting the buzzer volume《VOLUME》

Sets the buzzer sound level. A larger setting value increases the sound level.
Input the value with the numeric keypad and press [Enter].

■ Setting the wait time to sleep mode《DISP OFF TIME》

Sets the time to elapse before the operation panel automatically turns into the sleep mode, when no operations are performed on the instrument.

Input the value with the numeric keypad and press [Enter].

The setting range is from 0 to 10 (min), in which the step can be set by minute.

If 0 (min) is input, the operation panel does not turn into the sleep mode.

> **NOTE** Setting "0" minutes causes the display screen to be always on. If the display screen is always on, some dots frequently lighting will deteriorate in brightness in a shorter time.

■ Setting the direct key mode《DIRECT KEY MODE》

Specifies whether to display the confirmation screen when the direct key is operated.

Input the value with the numeric keypad and press [Enter].

Set Value	Function
0	Displays the confirmation screen. (Initial value).
1	The relevant operation is immediately executed without the confirmation screen displayed.

Hint Displaying the confirmation screen helps prevent improper operations.

3.5 VP Functions Screen

The VP functions screen has four setting groups. Switch the groups with [↑] or [↓] and press [Enter] to enter the screen of the desired setting group. Press [CE] to return to the initial screen.

Setting Group Name	Description
PRODUCT INFO	The group is relevant to information of the instrument.
MAINTENANCE	The group is relevant to maintenance of the instrument.
VALIDATION	The group allows the user to check whether the instrument is operating correctly.
CALIBRATION	The group is for calibration of the instrument.

3.5.1 List of VP Functions

■ Product information group [PRODUCT INFO]

Name	Function	Ref.
SERIAL NUMBER	Displays the serial number of the instrument.	P.31
Version	Displays the version number.	P.31

■ Maintenance information group [MAINTENANCE]

Name	Function	Ref.
TOTAL OP TIME	Displays the total operation time of the instrument.	P.32
VALVE1 ROTOR USED VALVE2 ROTOR USED	Displays and resets the number of uses and estimated replacement time of the rotor seals of the automatic column switch valves installed.	P.32
VALVE1 STATOR USED VALVE2 STATOR USED	Displays and resets the number of uses and estimated replacement time of the stator seals of the automatic column switch valves installed.	P.33
PART REPLACEMENT	Enter the new part after replacing an old part.	P.33
MAINTENANCE LOG	Displays the maintenance log.	P.34
OPERATION LOG	Displays the log of password change, parameter reset, etc.	P.34
ERROR LOG	Displays the error log.	P.34

■ Validation support information group [VALIDATION]

Name	Function	Ref.
DATE	Displays and sets the date.	P.35
TIME	Displays and sets the time.	P.35
MEMORY CHECK	Runs the memory (ROM/RAM) check.	P.35

Name	Function	Ref.
LEAK SENSOR CHECK	Runs the leak sensor check.	P.36
GAS SENSOR CHECK	Runs the gas sensor check.	P.36
TEMPERATURE CHECK	Checks the precision and accuracy of temperature control.	P.37

■ Calibration support information group [CALIBRATION]

Name	Function	Ref.
Input PASSWORD*1	Input a password.	P.37
OPERATION MODE	Selects an operation mode.	P.38
DATE FORMAT	Changes the displayed order of year, month and day.	P.38
INITIALIZE PARAM	Initializes parameters.	P.38
PARAMETER LOCK	Prohibits change of parameters.	P.38
PARTS MGMT TOOL	Sets the usage of the parts management tool.	P.39
PASSWORD SETTING	Changes the password.	P.39
LEAK THOLD	Sets the operation level of the leak sensor.	P.40
GAS SENS CALIB	Runs the gas sensor calibration.	P.40
TEMP1 CALIB	Runs the 1st-point temperature calibration.	P.40
TEMP2 CALIB	Runs the 2nd-point temperature calibration.	P.40
VALVE1 ROTOR VALVE2 ROTOR	Sets the estimated replacement time of the rotor seals of the automatic column switch valves installed.	P.40
VALVE1 STATOR VALVE2 STATOR	Sets the estimated replacement time of the stator seals of the automatic column switch valves installed.	P.41

*1 In the calibration support group, an invalid password prevents the user from going further than [OPERATION MODE] even if the user presses [Enter].

3.5.2 Product Information Group (PRODUCT INFO)

The group is relevant to information of the instrument.

■ Displaying the serial number《SERIAL NUMBER》

Displays the serial number of the instrument.

■ Displaying the version number《Version》

Displays the instrument name (model name) and version.

3.5.3 Maintenance Information Group (MAINTENANCE)

The group is relevant to maintenance information of the instrument.

■ Displaying the total operation time《TOTAL OP TIME》

Displays the total cumulative operating time of the instrument.

■ Displaying the number of uses of the rotor seals of the automatic column switch valves 《VALVE1 ROTOR USED》 《VALVE2 ROTOR USED》

Displays the number of uses and estimated replacement time of the rotor seals of the automatic column switch valves installed.

After replacing the rotor of a valve, press [del]. This resets the number of uses to "0" and then the reset date is recorded in a maintenance log.

Hint [VALVE1] indicates the valve installed on the lower part of the instrument and [VALVE2] the one installed on the upper part.
When an automatic column switch valve is not installed, the panel does not display the corresponding data.

Hint For a valve for LC-30A series or earlier (FCV-xxAH), the number is increased every time the flow line is switched.
For a valve for LC-40 series, the number is increased every time the position is rotated by an angle equivalent to 120° (0 -> 1 -> 0 in case of 2-position valves and 1 -> 3 or 1 -> 2 -> 1 in case of 6-position valves).

NOTE For a valve for LC-40 series, if the Parts Management Tool is used, users cannot reset the number of uses with the operation panel. Reset it through the tool. If you wish to manage the data directly with the instrument without using Parts Utility, some settings need changing.

Reference "Setting the usage of parts management tool《PARTS MGMT TOOL》" P.39

■ Displaying the number of uses of the stator seals of the automatic column switch valves 《VALVE1 STATOR USED》 《VALVE2 STATOR USED》

Displays the number of uses and estimated replacement time of the stator seals of the automatic column switch valves installed.

After replacing the stator of a valve, press [del]. This resets the number of uses to "0" and then the reset date is recorded in a maintenance log.

Hint [VALVE1] indicates the valve installed on the lower part of the instrument and [VALVE2] the one installed on the upper part.
When an automatic column switch valve is not installed, the panel does not display the corresponding data.

Hint For a valve for LC-30A series or earlier (FCV-xxAH), the number of uses of the stator seals can not be managed by users and not displayed on the display panel.

NOTE If the Parts Management Tool is used, users cannot reset the number of uses with the operation panel. Reset it through the tool. If you wish to manage the data directly with the instrument without using Parts Utility, some settings need changing.

Reference "Setting the usage of parts management tool《PARTS MGMT TOOL》" P.39

■ Inputting a replacement part number 《PART REPLACEMENT》

Input a part number when replacing a general part.

Pressing [Enter] and inputting a part number with the numeric keypad saves the data in a maintenance log.

NOTE If the Parts Management Tool is used, users cannot input a part number with the operation panel. Use Parts Utility. If you wish to manage the data directly with the instrument without using Parts Utility, some settings need changing.

Reference "Setting the usage of parts management tool《PARTS MGMT TOOL》" P.39

■ Displaying the maintenance log《MAINTENANCE LOG》

Displays twenty records of previously replaced parts with the dates of their replacement.

After pressing [→], press [↓] several times to display the replaced parts in order.

The example indicates that the rotor seal of the automatic column switch valve 1 was replaced on May 12, 2018.

■ Displaying the operation log《OPERATION LOG》

Displays ten records of previous modifications such as password change and parameter reset with the dates of the modifications.

After pressing [→], press [↓] several times to display the operation log records in order.

The example indicates that the password was changed on May 12, 2018.

■ Displaying the error log《ERROR LOG》

Displays ten records of previous errors with the dates of the errors.

After pressing [→], press [↓] several times to display the error log records in order.

The example indicates that the upper temperature limit error of error code [0x940B] occurred on May 12, 2018.

3.5.4 Validation Support Information Group (VALIDATION)

The group allows the user to check whether the equipment is operating correctly.

■ Entering date《DATE》

This allows the user to view or input the date in this screen.

Press [Enter] and input a date in the order of year, month, and day with the numeric keypad.

Hint You can change the display order of year, month, and day.

Reference "Changing the displayed order of year, month and day《DATE FORMAT》" P.38

Hint When the instrument is controlled by a system controller, the date is automatically transmitted during link-up.
The date display returns to the initial value [00-00-00] when the power is turned OFF.
When the power is OFF by using (power button), the setting is not returned.

■ Entering time《TIME》

This allows the user to view or input the time in this screen.

Press [Enter] and input a time in the order of hour, minute, and second in two digits with the numeric keypad.

Hint When the instrument is controlled by a system controller, the time is automatically transmitted during link-up.
The time display returns to the initial value [00:00:00] when the power is turned OFF.
When the power is OFF by using (power button), the setting is not returned.

■ Checking the memory《MEMORY CHECK》

Runs the memory check on ROM and RAM.

Pressing [Enter] starts the memory check.

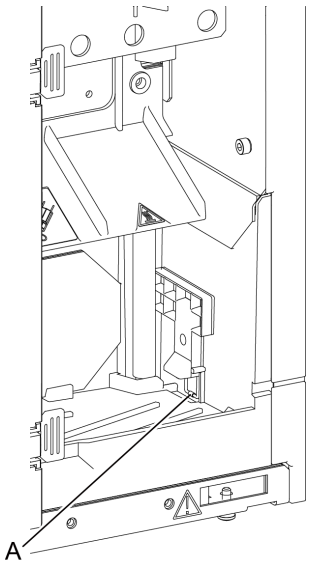
After the check, the result is displayed.

■ Checking the leak sensor《LEAK SENSOR CHECK》

Runs the liquid leak sensor check.

```
LEAK SENSOR CHECK
Soak and Enter
```

By using a syringe, soak the sensor unit at the bottom of the leak sensor (A) in water, and press [Enter].



Hint Use the syringe (part No. 228-66048) attached to the liquid delivery unit, etc.

Wait for approximately 30 seconds at maximum. The diagnosis result is displayed.

Reference In case of [NO GOOD], see "4.4 Leak Sensor Calibration" P.59.

```
LEAK SENSOR CHECK
Checking ...
```

```
LEAK SENSOR CHECK
SENSOR GOOD
```

NOTE After dampening the leak sensor for a check purpose, completely wipe off moisture. When wiping off moisture, do not press the leak sensor. When a sensor unit touches a wall, the sensor sensitivity is lowered.

Reference "4.5 Cleaning the Leak Tray" P.60.

■ Checking the gas sensor《GAS SENSOR CHECK》

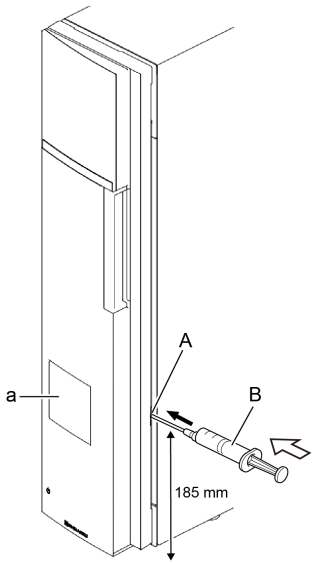
Runs the gas sensor check.

```
GAS SENSOR CHECK
Inject and Enter
```

Before the check, make the temperature become stable by 40 °C.

NOTE Heat up in the chamber so that ethanol may tend to volatilize.

With the microsyringe (B), inject approximately 100 µL of ethanol at approximately 185 mm above the oven base (refer to the top side of the cover (a) of the position on the door) through the gap (A) between the door gasket and the body, and press [Enter].



Hint Use a micro syringe which has a capacity of 100 µL (Part No. 670-12554-04 ,etc.).

NOTE Be careful not to damage the door gasket when inserting the microsyringe.

Wait for approximately 30 seconds at maximum. The diagnosis result is displayed.

Reference In case of [NO GOOD], see "4.3 Gas Sensor Calibration" P.57.

■ Checking the temperature control accuracy《TEMPERATURE CHECK》

Reference System Guide "4 Hardware Validation"

3.5.5 Calibration Support Information Group (CALIBRATION)

The group is for calibration of the instrument.

NOTE The instrument is tuned before shipment. Do not modify values unnecessarily.

■ Inputting the password《Input PASSWORD》

The password must be input by the system administrator.

Input the five-digit numbers by using the numeric keypad, and press [Enter].

Hint Be sure to input the five numbers. The default password is [00000].
When the password matches, the [OPERATION MODE] screen below appears on the screen. If the password does not match, the user cannot go further.

■ Setting the operation mode《OPERATION MODE》

Sets the value according to the connected system controller.

Input the value with the numeric keypad and press [Enter].

Set Value	System Controller
0	SCL-40/CBM-40/CBM-40lite Identified and operated as CTO-40S.
1*1	CBM-20A/CBM-20Alite Identified and operated as CTO-20AC.

*1 Select it when the system controller or workstation does not support CTO-40S.

■ Changing the displayed order of year, month and day《DATE FORMAT》

Changes the displayed order of year, month and day.

Input the value with the numeric keypad and press [Enter].

Set Value	Format
0	Year, month, and day (YMD)
1	Day, month, and year (DMY)
2	Month, day, and year (MDY)

■ Initializing the parameters《INITIALIZE PARAM》

Pressing [Enter] initializes the setting parameters.

After the parameter initialization is completed, the instrument is automatically restarted.

■ Setting the parameter lock《PARAMETER LOCK》

To allow the parameter change only to the system administrator, the screen access to the auxiliary function setting screen and the VP functions screen are locked.

When this function is set to [1:On], the password screen is displayed before access to the setting screens. When this setting is changed or inputting the password releases the lock to access the setting screen, such operation is recorded in the operation log.

▶▶ Reference "Displaying the operation log《OPERATION LOG》" P.34

■ Setting the usage of parts management tool《PARTS MGMT TOOL》

Sets the usage of the parts management tool.

The default setting is [1:Use]. When this function is set to [0:NotUse], the manegement of parts like LC-20/30 series is possibel. However the traceability of parts cannot be unitarily managed.

Reference System Guide "Parts Management Tool"

When the setting is changed, the change is recorded in the operation log.

Reference "Displaying the operation log《OPERATION LOG》" P.34

■ Changing the password《PASSWORD SETTING》

Enables change to the password.

1 **Press [Enter].**

The input screen is displayed.

2 **Input the five-digit numbers by using the numeric keypad, and press [Enter].**

3 **To confirm, input the same password that was input in the step 2 again.**

When the input is completed and the password is changed, "PASSWORD CHANGED" is displayed.

Hint If the password input is not correct, "PASSWORD WRONG" is displayed. At this stage, the password has not been changed yet.

4 **Press [Enter].**

The initial screen is displayed.

■ Setting the operation level of leak sensor《LEAK THOLD》

Sets the threshold value of the leak sensor.

Input the value with the numeric keypad and press [Enter].

Adjust it when a leak sensor check results in a fail.

Reference "4.4 Leak Sensor Calibration" P.59

■ Calibrating the gas sensor《GAS SENS CALIB》

Runs the gas sensor calibration.

Adjust it when a gas sensor check results in a fail.

Reference "4.3 Gas Sensor Calibration" P.57

■ Calibrating the first-point temperature《TEMP1 CALIB》

Runs the 1st-point temperature calibration.

Reference "4.2 Temperature Accuracy Calibration" P.54

■ Calibrating the second-point temperature《TEMP2 CALIB》

Runs the 2nd-point temperature calibration.

Reference "4.2 Temperature Accuracy Calibration" P.54

■ Setting the estimated replacement time of the rotor seals of the automatic column switch valves《VALVE1 ROTOR》《VALVE2 ROTOR》

Sets the estimated replacement time of the rotor seals of the automatic column switch valves installed.

Input the value with the numeric keypad and press [Enter].

Hint [VALVE1] indicates the valve installed on the lower part of the instrument and [VALVE2] the one installed on the upper part.
When an automatic column switch valve is not installed, the panel does not display the corresponding data.

■ Setting the estimated replacement time of the stator seals of the automatic column switch valves《VALVE1 STATOR》《VALVE2 STATOR》

Sets the estimated replacement time of the stator seals of the automatic column switch valves installed.

Input the value with the numeric keypad and press [Enter].

Hint [VALVE1] indicates the valve installed on the lower part of the instrument and [VALVE2] the one installed on the upper part.
When an automatic column switch valve is not installed, the panel does not display the corresponding data.
For a valve for LC-30A series or earlier (FCV-xxAH), the number of uses of the stator seals can not be managed and not displayed.

3.6 Creating Time Program

The instrument allows users to run a time program with such parameters as temperature settings, start/stop of temperature control, and flow line settings of automatic column switch valves.

Users can create a time program of a maximum of 100 steps, which remains stored even after the power is turned off.

3.6.1 Time Program Command List

The commands for the time program are listed below.

<table>
<tr><th>Command</th><th>Description</th><th>Setting Range</th><th>Remark</th><th>Ref.</th></tr>
<tr><td>TEMP</td><td>Sets the temperature (It changes in steps.)</td><td>4 to 85 °C</td><td>Causes the temperature to immediately change to a specified temperature when the specified time comes.</td><td>P.44</td></tr>
<tr><td>TEMP.L</td><td>Sets the temperature (It changes linearly.)</td><td>4 to 85 °C</td><td>Causes the temperature to gradually change to a specified temperature until the specified time.</td><td>P.44</td></tr>
<tr><td>ON</td><td>Turns on the temperature control.</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>OFF</td><td>Turns off the temperature control.</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>EVENT</td><td>Turns on/off the event output.</td><td>0, 1, 2, 12</td><td><table><tr><th>Set Value</th><th>EVENT 1</th><th>EVENT 2</th></tr><tr><td>0</td><td>OFF</td><td>OFF</td></tr><tr><td>1</td><td>ON</td><td>OFF</td></tr><tr><td>2</td><td>OFF</td><td>ON</td></tr><tr><td>12</td><td>ON</td><td>ON</td></tr></table></td><td>-</td></tr>
<tr><td>VALVE1</td><td>Sets the flow line of the automatic column switch valve 1.</td><td rowspan="2">0 to 1 or 1 to 6</td><td rowspan="2">The setting range depends on what type of valve is installed.</td><td>-</td></tr>
<tr><td>VALVE2</td><td>Sets the flow line of the automatic column switch valve 2.</td><td>-</td></tr>
<tr><td>LOOP</td><td>Repeats a program the specified number of times from the first step.</td><td>0 to 255</td><td>The program is stopped after repeating the specified number of times. (Setting the value to "0" causes 256 repetitions.)</td><td>P.48</td></tr>
<tr><td>STOP</td><td>Stops the program.</td><td>-</td><td>-</td><td>P.48</td></tr>
</table>

3.6.2 Time Program Setting Screen

To create a time program, access the edit screen as described below.

1 **Press [CE].**
The initial screen is deisplayed.

2 **Press [→] twice.**
The auxiliary functions screen [FUNCTION] is displayed.

3 **Press [↓] several times until [EDIT] is displayed in the screen.**
Move the cursor to [EDIT].

Hint Pressing [↑] changes the menu in the reverse order.

4 **Press [→].**
The panel displays the number of steps of the time program.

Hint The panel displays the number of steps already set as [USED] and the number of steps yet to be set as [LEFT].
The example in the figure indicates that 10 steps are already set and the remaining 90 steps can be added to the program.

5 **Press [↓] or [↑].**
The panel displays the time program already created.

The numerator in the lower line indicates the number of the step that is already set and the denominator the number of steps that can be added to the program.

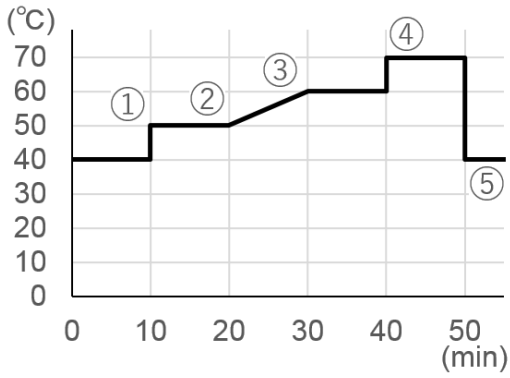
Hint Pressing [↓] or [↑] repeatedly allows displaying other steps.
When there is no step created in a time program, pressing [↓] or [↑] does not change the screen.
Pressing [del] in the screen allows deleting the step displayed.

6 **Press [Enter].**
This displays the time program setting screen.

3.6.3 Creating a Time Program

As an example, this section describes how to create a time program that changes the operating temperature as shown in the figure.

Set the temperature setting to 40 °C in advance and configure the program according to the table below.



Step	TIME (minutes)	FUNC (command)	VALUE (set value)
①	10.00	TEMP	50 °C
②	20.00	TEMP	50 °C
③	30.00	TEMP.L	60 °C
④	40.00	TEMP	70 °C
⑤	50.00	STOP	-

1 **Display the time program setting screen.**

Reference "3.6.2 Time Program Setting Screen" P.43

To set step 1

2 **Press [1], [0], and [Enter].**

This displays the command selection screen with the cursor at the [TEMP] command.

3 **Press [Enter].**

This selects the [TEMP] command and then displays the temperature setting input screen.

Hint The command selection screen allows selecting another command with [↓] or [↑].

4 **Press [5], [0], and [Enter].**

This sets the temperature setting to 50 °C and finishes setting step 1.

Hint If you input an incorrect value, press [del] in the screen, which allows deleting one step.

To set step 2

5 **Press [Enter].**
This displays the time program setting screen again.

6 **Press [2], [0], [Enter], [Enter], [5], [0], and [Enter].**
Set step 2 in the same way as step 1.

To set step 3

7 **Press [Enter].**
This displays the time program setting screen.

8 **Press [3], [0], and [Enter].**
This displays the command selection screen with the cursor at the [TEMP] command.

9 **Press [↓].**
This changes the command to [TEMP.L].

10 **Press [Enter].**
This selects the [TEMP.L] command and then displays the temperature setting input screen.

11 **Press [6], [0], and [Enter].**
This finishes setting step 3.

To set step 4

12 **Press [Enter].**
This displays the time program setting screen.

13 **Set step 4.**

Hint Set it in the same way as step 1.

To set step 5

14 **Press [Enter].**
This displays the time program setting screen.

15 **Press [5], [0], and [Enter].**
This displays the command selection screen with the cursor at the [TEMP] command.

16 **Press [↓] repeatedly until the [STOP] command is displayed.**

Hint [↑] changes the command in the reverse order.

17 **Press [Enter].**
This finishes setting step 5 and therefore setting all the steps.

NOTE When inputting multiple steps, the user does not need to input the data in order of time because they are automatically sorted.

3.6.4 Deleting a Step

To delete a step, display it and press [del].
See the following example of deleting the first step of the program created in "3.6.3 Creating a Time Program" P.44.

1 **In the same manner as creating the program, display the desired step.**

Hint To delete step 2 or a subsequent step, press [↓] or [↑] repeatedly until the desired step is displayed.

2 **Press [del].**
This deletes the first step of the program and moves the second step up to the first step.

3.6.5 Starting and Stopping a Time Program

■ Starting a time program

Pressing the direct key under the [RUN] indicator highlights the [RUN] indicator and then starts the program.

Hint The monitoring screen allows checking how much time has elapsed after the program was started.

Reference "Displaying the program elapsed time《TIME》" P.19

■ Stopping a time program

There are three ways to stop the program.

- Press [RUN] again while the program is running to force it to stop.
- Use the [STOP] command to stop the program at a specified time.
- Use the [LOOP] command to stop the program after repeating it a specified number of times.

The highlight is removed from the [RUN] indicator and the program is stopped.

NOTE After the program is stopped, the settings are set back to the original values before the program was started.

3.6.6 Special Commands Used in Time Programs

This section explains special commands used in time programs.

■ Setting a loop count for a time program 《LOOP》

Repeats a program a specified number of times.

The settings in the following table allows repeating steps 1 and 2 on a 50-minute cycle three times.

Step	TIME	FUNC	VALUE
1	10.00	VALVE1	2
2	30.00	VALVE1	3
3	50.00	LOOP	3

NOTE

- If [VALVE1] is set to "1" before the time program is started, the operation of valve 1 switches in the order of 1 -> 2 -> 3 -> 1 -> 2 -> 3 -> 1 -> 2 -> 3 -> 1 over 150 minutes before the program is stopped. While the [LOOP] command is repeating the cycle, the value is set back to the initial value "1" every time the cycle is repeated. After the program is stopped, the setting is set back to the original value before the program was started.
- The time program is stopped after the cycle is repeated the number of times specified by the [LOOP] command. Steps that follow the [LOOP] command are not executed.
- Setting the [LOOP] command setting value to "0" causes the cycle to be repeated 256 times.

■ Stopping a time program 《STOP》

Stops a time program at a specified time as the last step of the program.

NOTE Running a time program that has no step of the [STOP] or [LOOP] command causes the program to keep running endlessly even after the command at the last step is executed.

3.7 Connection with the System Controller

3.7.1 Setting the Instrument

To control the instrument from the system controller SCL-40/CBM-40/CBM-40lite, set the parameters as follows:

Setting Parameter	Set Value	Reference
LOCAL MODE	0 : Remote	▶▶ Reference "Selecting the local mode 《LOCAL MODE》" P.24
LINK ADDRESS	Link address	▶▶ Reference "Setting the link address 《LINK ADDRESS》" P.24
OPERATION MODE	0 : 40S*1 1 : 20AC*2	▶▶ Reference "Setting the operation mode 《OPERATION MODE》" P.38

*1 Causes the system controller to identify the instrument as CTO-40S. This setting should be used normally.

*2 Causes the system controller to identify the instrument as CTO-20AC. Use this setting when connecting the instrument to a system controller or workstation incompatible with LC-40 series.

3.7.2 Basic Parameters

SCL-40, CBM-40, and CBM-40lite can connect to a maximum of four column ovens. The system controllers configure the settings such as the operating temperature, upper temperature limit, automatic column switch valves 1 and 2, ON/OFF of temperature control, and time program. Additionally, the workstations support column management functions. For details, refer to the instruction manuals of the system controllers and workstations.

3.7.3 Limitations of Compatible Mode

Setting [OPERATION MODE] to "1" enables the instrument to operate as CTO-20AC so that the system controllers and workstations incompatible with LC-40 series can control the instrument. This mode, however, has the following limitations.

1) Automatic column switch valve

The instrument manages automatic column switch valves as [VALVE1 (lower)] and [VALVE2 (upper)] while CTO-20AC manages [RV.L (left)] and [RV.R (right)].

Consider VALVE1 as RV.L and VALVE2 as RV.R when configuring the settings.

2) Power management functions

The mode does not allow system controllers to manage the power. Even when the instrument is connected to a system controller, the power button on the front of the instrument is enabled and users need to turn on/off the power by hand with the button.

3.8 Connection to External Input/Output Terminals

The external input/output terminals are connected to an event output device or the other external devices with an optional remote cable.

Details of remote cable signals and wiring are described below.

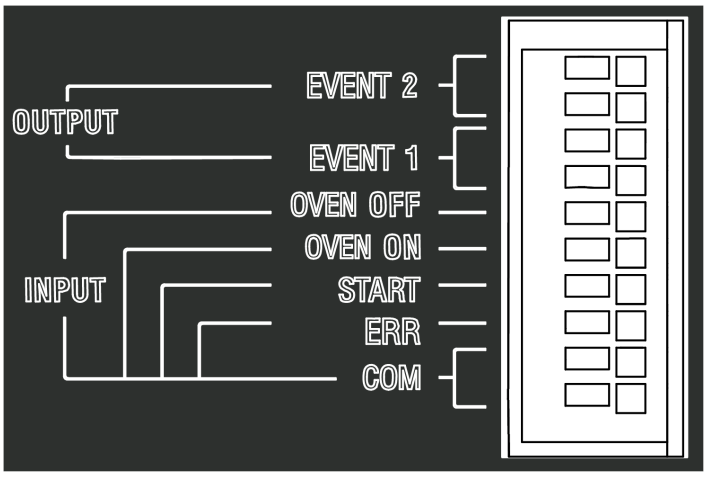
⚠ WARNING

Instruction

- Before connecting the cable, turn OFF the power and unplug the instrument.
- Use only the specified cable.
- Connect as specified.

Otherwise, fire, electric shock, or malfunction may occur.

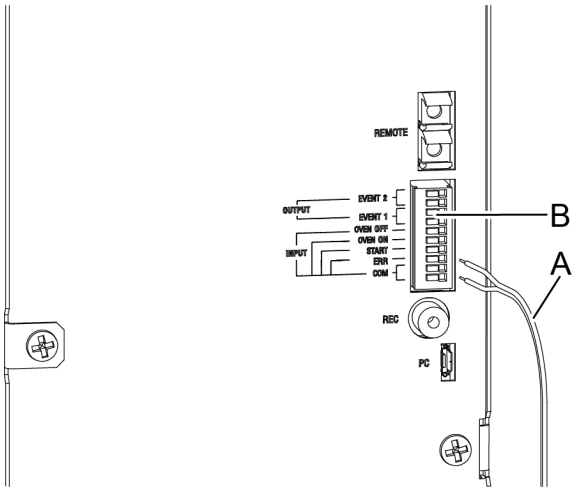
3.8.1 External Input/Output Terminals



Signal Name	Description	Remark
EVENT2	Relay contact outputs. They can be turned on/off with a time program or the set values of the [EVENT] auxiliary function.	The rated values of the relay contacts are 30 VDC and 0.2 A.
EVENT1		
OVEN OFF	The external contact signal stops the temperature control of the instrument.	The signals and the COMMON terminal are short-circuited through contacts of external equipment and thus operation is controlled. The short-circuit time (tc) should satisfy the following. 0.5 sec < tc < 10 sec
OVEN ON	The external contact signal starts the temperature control of the instrument.	
START	A time program of the instrument is started with an external contact signal. If a start signal is received while a time program is in progress, a time program starts from 0 minutes.	
ERR	The instrument is set to the error detection status by receiving the external error signal.	
COM	COMMON terminal for [OVEN ON], [OVEN OFF], [START] and [ERR].	

3.8.2 Connection of Remote Cable

1 **Insert the optional remote cable (A) into the external input/output terminals (B).**



NOTE When connecting two or more circuits to the terminals, purchase additional options or use the wires shown below.

- Cable with single wire: φ0.4 to φ1.2 (AWG26 to 16)
- Cable with stranded wire: 0.3 mm^2 to 1.25 mm^2 (AWG22 to 16), diameter of single wire of φ0.18 or thicker

To prevent disconnection, the cable with stranded wire is recommended.

NOTE When using the [EVENT1] or [EVENT2] signal, set [EVENT1] or [EVENT2] and [SELECT EVENT1] or [SELECT EVENT2] in the auxiliary functions.

Reference "Setting the EVENT1 output terminal《EVENT1》" P.23
"Setting the EVENT2 output terminal《EVENT2》" P.23
"Setting the function of the EVENT1 output terminal《SELECT EVENT1》" P.25
"Setting the function of the EVENT2 output terminal《SELECT EVENT2》" P.25

4 Maintenance

4.1 Periodic Inspection and Maintenance

It is necessary to perform periodic inspections of this instrument to ensure its safe use. It is possible to have these periodic inspections performed by Shimadzu service personnel on a contractual basis.
For information regarding the maintenance inspection contract, contact your Shimadzu representative.

⚠ WARNING

Be sure to turn OFF the power to the rear of the instrument and pull out the plug from the power supply before inspection/maintenance unless otherwise instructed.

Otherwise, fire, electric shock or malfunction may occur.

⚠ CAUTION

Never remove the cover.

This may cause injury or a malfunction of the device. Contact your Shimadzu representative if the main cover must be removed.

For parts replacement, use parts and tools listed in "1.2 Component Parts" and "5.2 Maintenance Parts".

If any other parts or tools are used, part damage, injury, and malfunction may occur.

4.1.1 Prior to Inspection and Maintenance

- Replace the mobile phase solvent in the flow lines with water.
- Wipe away any dirt from the doors and the main cover.
- Wipe away any dirt from the control pannel with tissue paper or a soft cloth moistened with water.

4.1.2 List of Periodic Inspection and Maintenance

NOTE The maintenance and replacement periods listed in this table are presented only as guidelines. These are not guarantee periods.
These will vary depending on usage conditions.

Inspection/ Maintenance Item	1 Year	2 Years	3 Years	Remark	Ref.
Air filter replacement	✓				P.61

4.1.3 Check After Inspection and Maintenance

After inspection and maintenance, check any leakage during pumping.

4.2 Temperature Accuracy Calibration

Re-calibration is required if the temperature accuracy of [TEMPERATURE CHECK] fails the temperature control function test of the component validation.

Reference "Checking the temperature control accuracy《TEMPERATURE CHECK》" P.37

1-point calibration or 2-point calibration can be performed at any temperature. If the oven is always to be used at the same temperature, 1-point calibration at that temperature is sufficient. If the oven is to be used at a wide range of temperatures, 2-point calibration is recommended.
The first calibration temperature must be no greater than 60 °C and the second calibration temperature must be at least 20 °C higher than the first calibration temperature. Before delivery, the CTO-40S is calibrated at 25 °C and 60 °C respectively. The procedure for performing temperature calibration at 25 °C and 60 °C is described below.

NOTE The temperature accuracy calibration must be performed by the system administrator.

NOTE To calibrate the temperature accuracy, turn ON [READY CHECK], and set [READY RANGE] to [0.1] °C and [WAIT TIME] to [10] minutes.

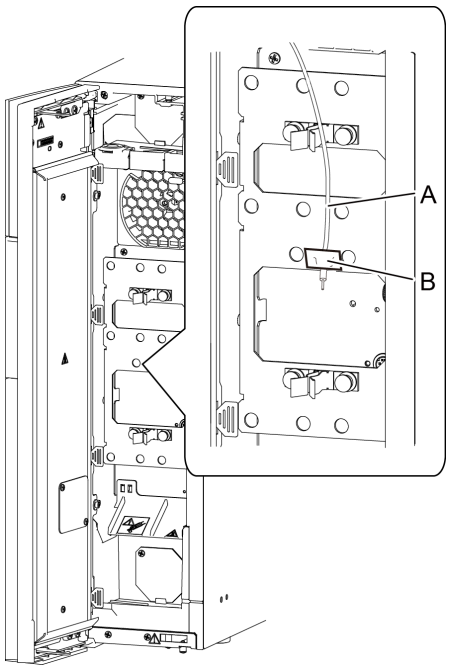
Reference "Setting the temperature ready check《READY CHECK》" P.26
"Setting the stable temperature range《READY RANGE》" P.26
"Setting the wait time to display READY《WAIT TIME》" P.26

■ Preparation

1 **Fix the thermocouple of the thermometer for calibration at the place specified in the figure.**

Fix the thermocouple (A) of the thermometer at the place on the column bracket specified in the figure with a 1 cm^2 piece of aluminum tape (B).

NOTE Use the thermometer for calibration and thermocouple that were calibrated in advance by the separately specified method.



■ 1st point of calibration

2 **Perform temperature control at the first calibration temperature (25 °C) and wait until [READY] is displayed.**

3 **Press [→] on the initial screen.**

Hint If the initial screen is not displayed, press [CE] to display the initial screen.

4 **Press [↓] once, move the cursor to [VP] and press [→].**

5 **Press [↓] several times, move the cursor to [CALIBRATION] and press [→].**

6 **Input the password.**

7 **Press [↓] several times until [TEMP1 CALIB :] is displayed.**

Hint As the temperature has been set to 25 °C, [TEMP1 CALIB : 25.0] is displayed.

8 **Press [Enter].**

Hint Pressing [Enter] without [READY] displays [Oven Not Ready], in which this screen cannot be reached.

9 **Read the thermometer for calibration and input the measured value with the numeric keypad before pressing [Enter].**

This completes the first point of calibration.

Hint If the temperature measured by the instrument differs by 10 °C or more from the one inputted as a calibration temperature, the accuracy cannot be calibrated.

This completes the procedure for 1st point calibration.

■ 2nd point of calibration

10 **Change the temperature setting to the temperature for the second calibration point (60 °C) and wait until [READY] is displayed.**

11 **Display the [CALIBRATION] group in the same way as steps 3 to 6.**

12 **Press [↓] several times until [TEMP2 CALIB :] is displayed.**

Hint As the temperature has been set to 60 °C, [TEMP2 CALIB : 60.0] is displayed.

13 **Press [Enter].**

NOTE This screen is not displayed in the following cases:

- Pressing [Enter] without [READY] displayed causes [Oven Not Ready] to be displayed.
- If the temperature setting is not higher than the temperature for the first calibration point by at least 20 °C, [Out-of-range temp.] is displayed.

14 **Read the thermometer for calibration and input the measured value with the numeric keypad before pressing [Enter].**

This completes the second point of calibration.

Hint If the temperature measured by the instrument differs by 10 °C or more from the one inputted as a calibration temperature, the accuracy cannot be calibrated.

This completes the calibration of temperature accuracy.
The calibration result is stored even when the power of the instrument is turned to OFF.

4.3 Gas Sensor Calibration

Re-calibration is required if the result of [GAS SENSOR CHECK] fails the component validation.

Reference "Checking the gas sensor《GAS SENSOR CHECK》" P.36

NOTE The gas sensor calibration must be performed by the system administrator.
The gas sensor detects volatile gas generated from leaked organic solvents when the tubing such as a column causes a leakage.
When the output value from the sensor exceeds the level set at "threshold value", an error occurs and temperature control stops.
The gas sensor is influenced by the concentration of organic solvent gas around the instrument. Be sure to perform sensitivity adjustment in a well-ventilated room with clean air.

1 **Perform the temperature control at the set temperature (40 °C), and wait until [READY] is displayed.**

2 **Press [→] on the initial screen.**

Hint If the initial screen is not displayed, press [CE] to display the initial screen.

3 **Press [↓] once, move the cursor to [VP] and press [→].**

4 **Press [↓] several times, move the cursor to [CALIBRATION] and press [→].**

5 **Input the password.**

6 **Press [↓] several times until [GAS SENS CALIB] is displayed.**

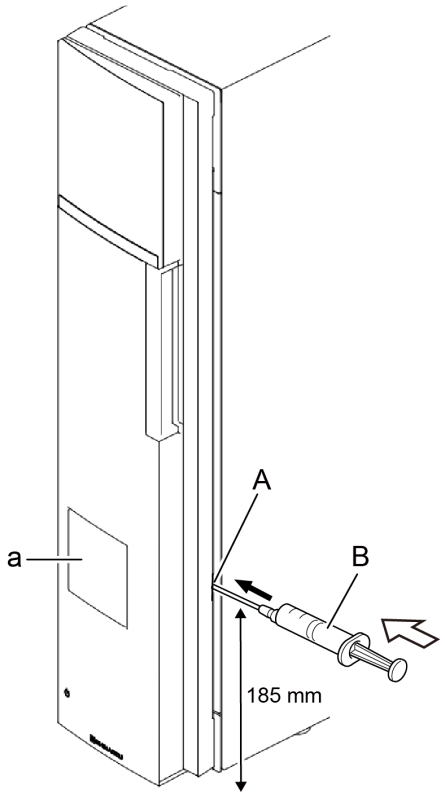
7 **Press [Enter].**
[GAS SENS LVL (the value of the gas sensor)] is displayed.

Hint You can cancel calibration by pressing [CE] on the screen in step 7-10.

8 **Press [Enter].**
The gas sensor value at a dry state is corrected to 6500.

9 **With the microsyringe (B), inject approximately 50 µL of ethanol at approximately 185 mm above the oven base (refer to the top side of the cover (a) of the position on the door) through the gap (A) between the door gasket and the body.**

NOTE Be careful not to damage the door gasket when inserting the microsyringe.



10 **Increase in the gas sensor value is detected and then a calibration value is automatically calculated.**

Hint [D:] shows the value measured in a dry state and [W:] the value measured when ethanol was detected.
If a regular sensor is calibrated correctly, the D value will be 4,500 - 13,000 and the W value will be more than 1,500 greater than the D value. (A larger W value is better.)
You can cancel calibration by pressing [CE] on this screen.

11 **Press [Enter].**
The calibration is completed.

4.4 Leak Sensor Calibration

Re-calibration is required if the result of [LEAK SENSOR CHECK] fails the component validation.

Reference "Checking the leak sensor《LEAK SENSOR CHECK》" P.36

NOTE The leak sensor calibration must be performed by the system administrator.
The leak sensor detects leaked mobile phase when the tubing such as a column causes the leakage.
When the output value from the sensor exceeds the level set at "threshold value", an error occurs and temperature control stops.

1 **Press [→] on the initial screen.**

Hint If the initial screen is not displayed, press [CE] to display the initial screen.

2 **Press [↓] once, move the cursor to [VP] and press [→].**

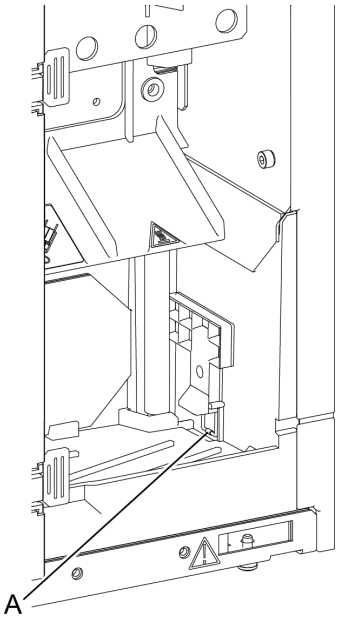
3 **Press [↓] several times, move the cursor to [CALIBRATION] and press [→].**

4 **Input the password.**

5 **Press [↓] several times until [LEAK THOLD] is displayed.**

6 **Soak the sensor unit (A) at the bottom of the leak sensor in water.**

The leak sensor value (Actual Level) increases by detecting water.



7 **Read the maximum value of the leak sensor value (Actual Level).**

Example: Here, the maximum value is [160].

8 **Wipe off the moisture around the leak sensor.**

The leak sensor value (Actual Level) decreases.

> NOTE When wiping off moisture, do not press the leak sensor. When a sensor unit touches a wall, the sensor sensitivity is lowered.

9 **From the value read in step 7, calculate the threshold value of the leak sensor.**

How to obtain the leak sensor threshold:
(Maximum value-100) × 0.7 + 100
In the example screen here, [142] is calculated.

10 **Press [Enter], input the value calculated in the step 9, and press [Enter].**

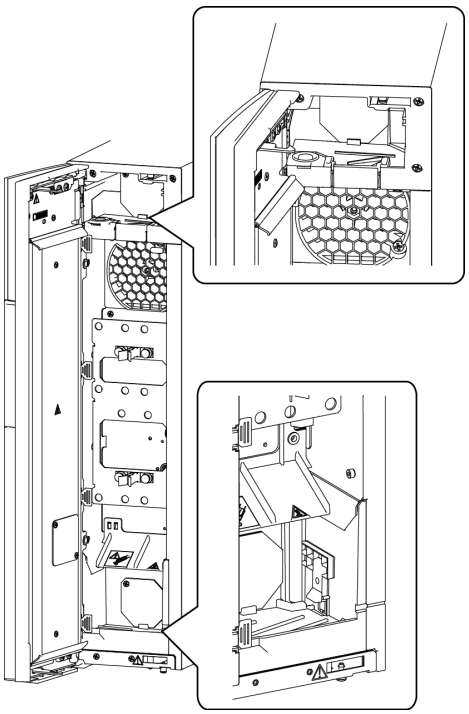
The new "threshold value" is saved.

4.5 Cleaning the Leak Tray

> NOTE If leak occurred, wipe off leak in the leak tray completely as below.
> Leak of mobile phase solution used as buffer solution may dry and crystallize, clogging the leak tray. If the leak tray is contaminated by such crystallized buffer solution, wipe off the leak tray with wiper paper soaked in water in the same manner as below.

1 **Wipe off leak around the leak sensor or on the leak tray completely with wiper paper.**

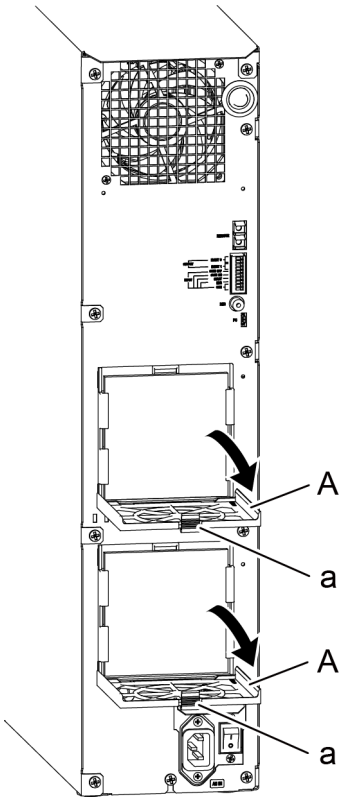
> NOTE Do not bend or pull the leak sensor.
> If there is contamination such as crystallized buffer solution, wipe it off with wiper paper soaked in water.



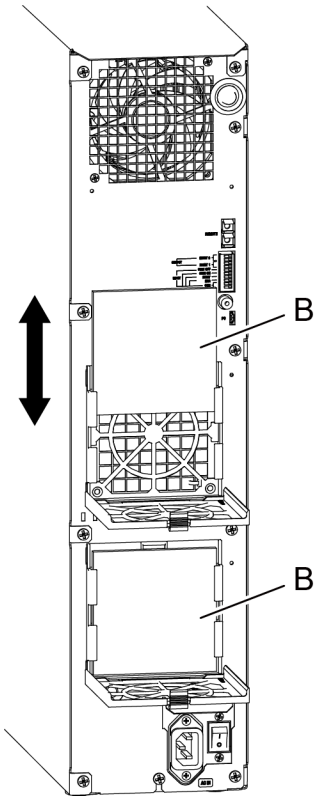
4.6 Replacing the Air Filter

This section explains how to replace the air filter on the back of the instrument.

1 **While holding down the knob (a) on the top of the filter holder (A) on the back, open the cover of the holder.**



2 **Slide the air filter (B) up or down to remove or attach it.**



4.7 Cleaning the Exterior

If the exterior of the instrument is dirty, clean it with a dry soft cloth or tissue paper. If it is very dirty, clean it as below.

1 **Clean with a cloth soaked in diluted neutral detergent and wrung tightly.**

2 **Wipe off detergent with a cloth soaked in water and wrung tightly and then wipe off water with a dry cloth.**

NOTE Do not leave the exterior wet and do not use alcohol or thinner for cleaning. Doing so may cause rust or discoloration.

5 Technical Information

5.1 Specifications

The performance data given below is based at room temperature of 25 °C.

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Type</td><td>Air circulation</td></tr>
<tr><td>Temperature control range</td><td>(Room temperature* - 10 °C) to (85 °C)
* Room temperature means the ambient temperature at the CTO-40S.</td></tr>
<tr><td>Temperature setting range</td><td>4 °C to 85 °C in 1 °C steps</td></tr>
<tr><td>Temperature control precision</td><td>0.2 °C (± 0.1 °C)</td></tr>
<tr><td>Ambient temperature range</td><td>4 °C to 35 °C</td></tr>
<tr><td>Size and number of columns stored</td><td>Six columns up to 100 mm or three 100 mm to 300 mm columns</td></tr>
<tr><td>Safety measures</td><td>• Upper temperature limit can be set to prevent inadvertent accidents.
• Equipped with the thermal fuse to prevent overheating at breakage
• Incorporating the gas sensor
• Incorporating the liquid leak sensor</td></tr>
<tr><td>Time program functions</td><td>Change the temperature setting (in steps or linearly), start or stop temperature control, change the flow lines of automatic column switch valves, and repeat a program, 100 steps, 0.01 to 999.99 min</td></tr>
<tr><td>Dimensions*2</td><td>W 130 mm × H 553 mm × D 500 mm (Excluding a protrusion)</td></tr>
<tr><td>Mass</td><td>15 kg</td></tr>
<tr><td>Power Supply</td><td>
<table>
<tr><th>Part No.</th><th>Power Supply Voltage*1 (indicated on the instrument)</th><th>Power Con-sump-tion</th><th>Fre-quency</th><th>Rated Breaking Capacity*2</th></tr>
<tr><td>228-65201-58</td><td>100-240 VAC (100-240 V~)</td><td>300 VA</td><td>50/60 Hz</td><td>50 A</td></tr>
</table>
*1 Mains supply voltage fluctuations are not to exceed 10 % of the nominal supply voltage.
*2 Connect the instrument to a power outlet that is equipped with a circuit breaker that shuts off the current at the described value or less.
</td></tr>
<tr><td>Installation Environment (IEC)</td><td>Installation Category II, Pollution Degree 2,
Altitude 2000 m or lower
Install inside the room.</td></tr>
</table>

5.2 Maintenance Parts

5.2.1 Consumable Parts

Part Name	Part No.	Remarks
Air filter	228-72570	Filter only

5.2.2 Replacement Parts

Part Name	Part No.	Remarks
Filter holder	228-70070	
Tube cap	228-72024	The tube hole cap
Injector hole cover	228-72042	

Index

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DETALŪS METADUOMENYS	
Dokumento sudarytojas (-ai)	Valstybinė vartotojų teisių apsaugos tarnyba 188770044, Vilniaus g. 25, 01402 Vilnius Valstybinė vartotojų teisių apsaugos tarnyba 188770044, Vilnius, Vilniaus g. 25-6, LT-01402 UAB "ARM GATE" 135218757, Vilnius, J. Kubiliaus g. 6, LT-08234
Dokumento pavadinimas (antraštė)	SUTARTIS (Įrenginio, skirto aromatinių angliavandenilių tipų vidutiniuose distiliatuose nustatymui, efektyviosios skysčių chromatografijos metodu pirkimas)
Dokumento registracijos data ir numeris	2025-11-07 Nr. 25-73
Dokumento gavimo data ir dokumento gavimo registracijos numeris	–
Dokumento specifikacijos identifikavimo žymuo	ADOC-V1.0
Parašo paskirtis	Pasirašymas
Parašą sukūrusio asmens vardas, pavardė ir pareigos	Goda Aleksaitė, Direktorė
Sertifikatas išduotas	GODA ALEKSAITĖ LT
Parašo sukūrimo data ir laikas	2025-10-31 10:42:24 (GMT+02:00)
Parašo formatas	XAdES-X-L
Laiko žymoje nurodytas laikas	2025-10-31 10:42:44 (GMT+02:00)
Informacija apie sertifikavimo paslaugų teikėją	EID-SK 2016, AS Sertifitseerimiskeskus EE
Sertifikato galiojimo laikas	2022-09-09 12:12:33 – 2027-09-08 23:59:59
Parašo paskirtis	Pasirašymas
Parašą sukūrusio asmens vardas, pavardė ir pareigos	ŽYDRŪNAS STANIUS, atstovas, UAB "ARM GATE"
Sertifikatas išduotas	ŽYDRŪNAS STANIUS LT
Parašo sukūrimo data ir laikas	2025-11-07 13:05:06 (GMT+02:00)
Parašo formatas	XAdES-X-L
Laiko žymoje nurodytas laikas	2025-11-07 13:05:23 (GMT+02:00)
Informacija apie sertifikavimo paslaugų teikėją	EID-SK 2016, AS Sertifitseerimiskeskus EE
Sertifikato galiojimo laikas	2023-06-20 17:25:00 – 2028-06-18 23:59:59
Informacija apie būdus, naudotus metaduomenų vientisumui užtikrinti	"Registravimas" paskirties metaduomenų vientisumas užtikrintas naudojant "RCSC IssuingCA-2, VI Registru Centras - i.k. 124110246 LT" išduotą sertifikatą "DBSIS, Informatikos ir ryšių departamentas prie Lietuvos Respublikos vidaus reikalų ministerijos, į.k.188774822 LT", sertifikatas galioja nuo 2025-05-16 11:31:08 iki 2028-05-15 11:31:08
Pagrindinio dokumento priedų skaičius	9
Pagrindinio dokumento pridedamų dokumentų skaičius	–
Pridedamo dokumento sudarytojas (-ai)	–
Pridedamo dokumento pavadinimas (antraštė)	–
Pridedamo dokumento registracijos data ir numeris	–
Programinės įrangos, kuria naudojantis sudarytas elektroninis dokumentas, pavadinimas	DBSIS, versija 3.5.85.4
Informacija apie elektroninio dokumento ir elektroninio (-ių) parašo (-ų) tikrinimą (tikrinimo data)	Metaduomuo „Priskirtos bylos (tomo) indeksas“ turi būti nurodytas Visi dokumente esantys elektroniniai parašai galioja (2025-11-10 11:15:46)
Paieškos nuoroda	–
Papildomi metaduomenys	Nuorašą suformavo 2025-11-10 11:15:47 DBSIS