

Combinations

● 650 series combination



● 750 series combination



● 900 series combination



Filters and Mist Filters



● Options

- Non-ion specification
- Bowl specification:
Nylon bowls
- Drain cock specification:
Drain cock with fitting
Auto drain type drain cock

Modules

D module for bracket-combined use



R module



Regulators



RN650
RN651
RN652



RN900
RN902

● Options

Pressure gauge with built-in switch



Pressure gauge



Pressure gauge
for low pressure



Digital pressure
gauge with built-in
sensor



Embedded pressure
gauge

Modules

D module for bracket-
combined use



R module



Lubricators



LN650
LN651



LN900
LN901
LN902

● Options

- Non-ion specification
- Lubricator specification:
 - Micro lubricator
 - Machine lubricator
- Bowl specification:
 - Nylon bowls
- Drain cock specification:
 - Drain cock with fitting
 - Screw type drain cock









List of Equipment Combination

Body size		650 series						900 series										
Model		FN650	RN650	RN651	RN652	LN650	LN651	FN900	FN901	RN900	RN902	LN900	LN901	LN902	MF800	MF1000	MMF600	MMF800
650 series	FN650	8-65F	8-90ND				8-65F	8-90ND				8-65F	8-90ND					
	RN650	8-65ND	8-90DT				8-65ND	8-90DT				8-65T	8-90DT					
	RN651	8-65T	8-90DS				8-65T	8-90DS				8-65S	8-90DS					
	RN652	8-65DT						8-65DT	8-90R ^{Note}									
	LN650	8-65S						8-65S	8-90M ^{Note}									
	LN651	8-65DS						8-65DS										
900 series	FN900							8-65F	8-90ND				8-65F	8-90ND				
	FN901	8-65F	8-90ND				8-65F	8-90ND				8-65F	8-90ND					
	RN900	8-65ND	8-90DT				8-65ND	8-90DT				8-65T	8-90DT					
	RN902	8-65T	8-90DS				8-65T	8-90DS				8-65S	8-90DS					
	LN900	8-65DT	8-90R ^{Note}				8-65DT	8-90R ^{Note}				8-90R ^{Note}						
	LN901	8-65S	8-90M ^{Note}				8-65S	8-90M ^{Note}				8-90M ^{Note}						
	LN902	8-65DS						8-65DS										
	MF800							8-90ND	8-90R ^{Note}				8-65F	8-90ND				
	MF1000	8-65T	8-90R ^{Note}				8-90DT	8-90M ^{Note}				8-65T	8-90DT					
	MMF600	8-65S		8-90M ^{Note}				8-90DS				8-65S	8-90DS					
MMF800																		

Note: Only for RN900 and RN902. For connection with RN900 or RN902, modules other than 8-90R and 8-90M cannot be used. These also cannot be used to connect modules other than RN900 and RN902 to each other.

List of Module Adapter Types

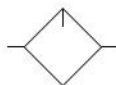
For 650, 900 series

Module and adapter	F module	D module	T module	
	F	ND	T	DT
Body size	 (For modules only)	 (Brackets for combined use)	 (Branch piping)	 (Brackets for combined use with branch piping)
65 (650 series)	8-65F	8-65ND	8-65T	8-65DT
90 (900 series)		8-90ND		8-90DT
Modules and adapters	R module	M module	S adapter	
	R	M	S	DS
Body size	 (For regulator only)	 (For supporting regulator piping only)	 (Port connection)	 (Brackets for combined use with piping connection)
65 (650 series)	—	—	8-65S	8-65DS
90 (900 series)	8-90R	8-90M		8-90DS

LUBRICATORS

LN650, LN651, LN900, LN901, LN902

Symbol

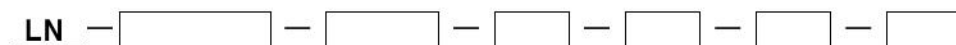


F.R.L. LARGE FLOW SERIES

Specifications

Item	Series Type Model	650 series		900 series		
		Standard	Micro lubricator	Standard	Micro lubricator	Machine lubricator
		LN650	LN651	LN900	LN901	LN902
Media		Air or non-corrosive gas				
Port size	Rc	3/4, 1				
Max. operating pressure	MPa [psi.]	0.97 [141]			0.3 [44]	
Proof pressure	MPa [psi.]	1.47 [213]				
Operating temperature range	°C [°F]	5~60 [41~140]				
Oil capacity	cc [in. ³]	160 [9.8]				
Recommended lubrication		Turbine oil Class 1 [ISO VG32]				
Lubrication method		Total lubrication	Selective lubrication	Total lubrication	Selective lubrication	Selective lubrication
Min. flow rate for dripping oil	ℓ./min [ft ³ /min] (ANR)	20 [0.71]	70 [2.47]	155 [5.47]	185 [6.53]	14 [0.49]
Mass	kg [lb.]	0.64 [1.4]		1.3 [2.9]		1.4 [3.1]
Materials	Body	Aluminum die-casting				
	Bowl	Polycarbonate				
	Damper	Urethane rubber				
Standard attachments		Bowl guard				

Order Codes



Lubricator

Body model
 650 — 06 08 — Standard specification
 900 — 06 08 — Standard specification
 651 — 06 08 — Micro lubricator
 901 — 06 08 — Micro lubricator
 902 — 06 08 — Machine lubricator

Port size
 Rc3/4 Rc1

Non-ion specification
 Blank — Standard specification
 NCU — Non-ion specification

Bracket specification
 Blank — No bracket
 B — With bracket^(*)

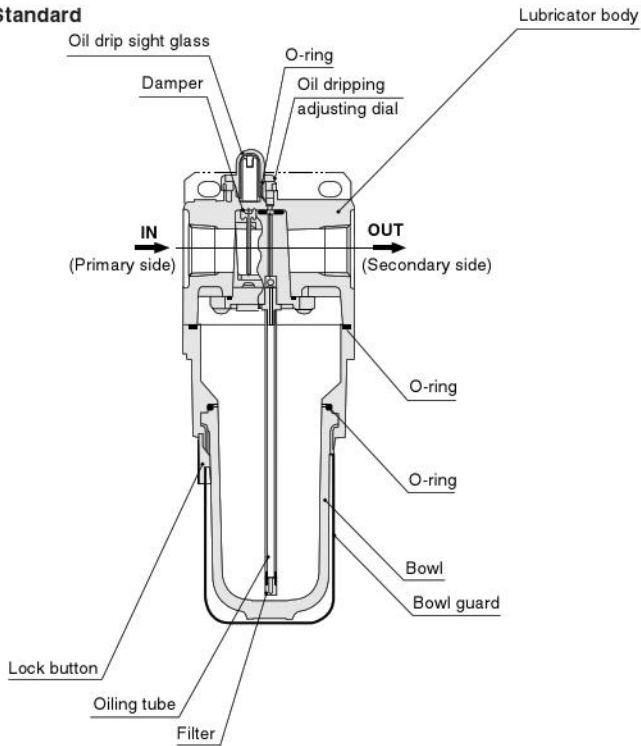
Note: For the bracket order codes and dimensions, see p.151 ~ 152.

Drain cock specification
 Blank — Drain cock
 D — Screw type drain cock
 F2 — Drain cock with fitting

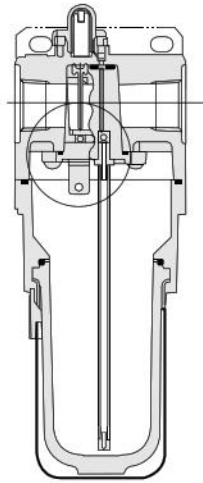
Bowl specification
 Blank — Standard specification (Polycarbonate)
 N — Nylon bowl

Inner Construction

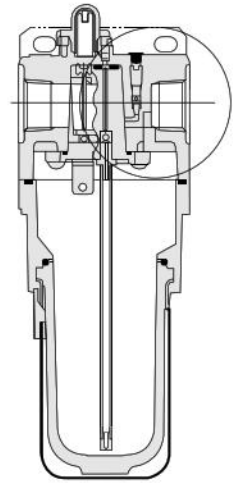
● Standard



● Micro lubricator



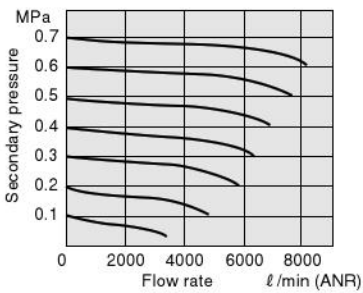
● Machine lubricator



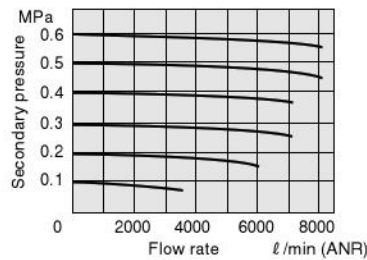
Note: Circled areas show the section that vary from the standard model.

Flow Rate Characteristics

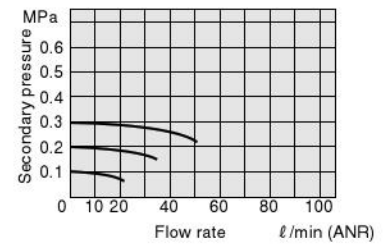
● LN650 ● LN651



● LN900 ● LN901



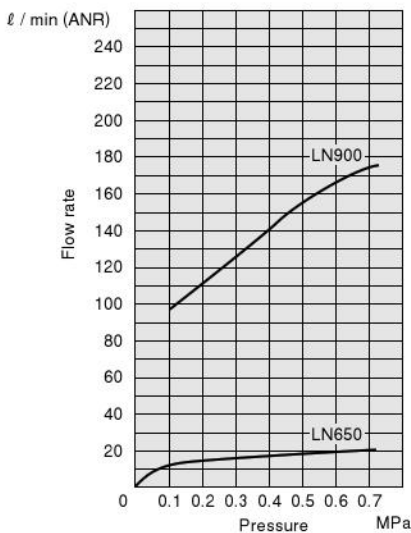
● LN902



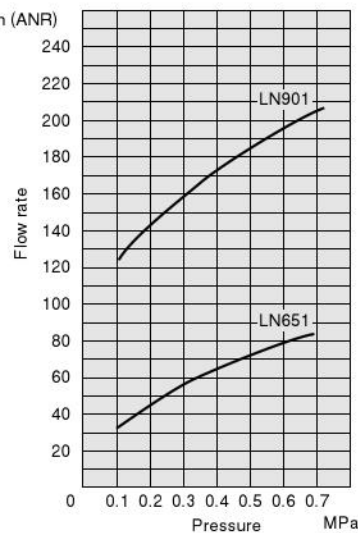
1MPa = 145psi. 1 ℓ/min = 0.0353ft.³/min.

Minimum Flow Rate for Dripping Oil

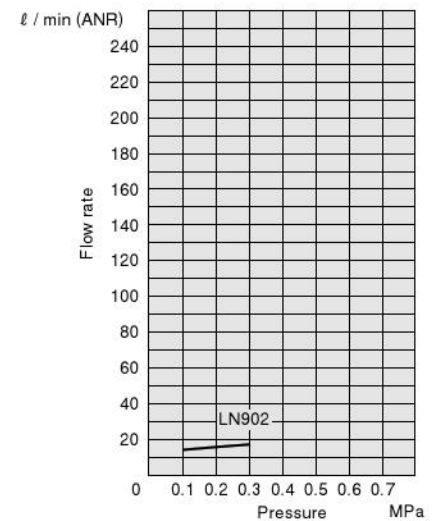
● Standard



● Micro lubricator



● Machine lubricator



1MPa = 145psi. 1 ℓ/min = 0.0353ft.³/min.

Dimensions of Lubricators (mm)

- LN650
- LN651

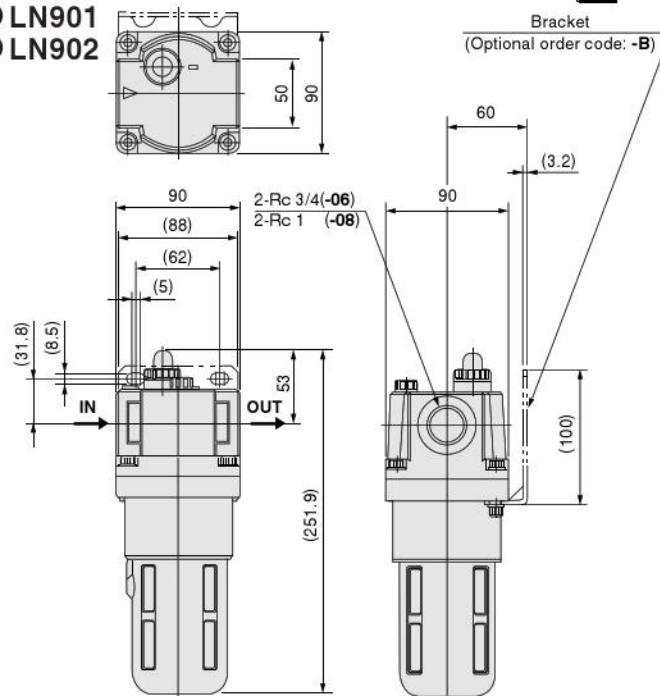
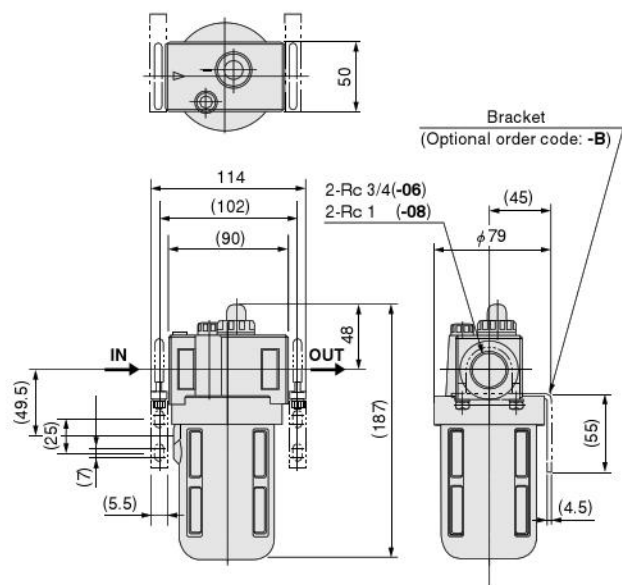


LN650

- LN900
- LN901
- LN902



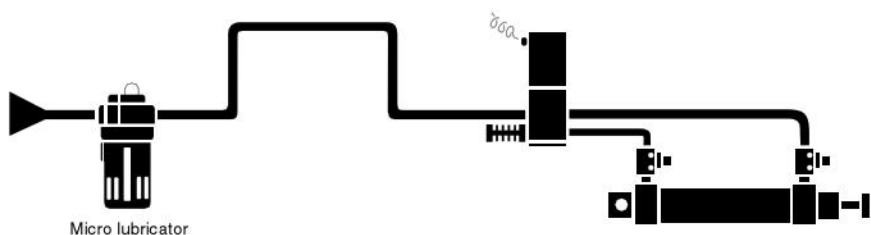
LN900



System Upgrade Using a Micro Lubricator

The Micro Lubricator uses a pipe and nozzle to generate an oil mist inside the bowl, and supplies only the most finely microscopic mist to delivery side.

The micro mist is carried easily on the air flow, to ensure faster, more assured lubrication. This method is effective even when the piping distance to the actuator is unusually far or piping is subject to complex twists and turns, or when the actuator is mounted in a high position.



System Upgrade Using a Machine Lubricator (LN-902)

Machine lubricators are dedicated devices used in lubrication lines to supply a fine oil mist of $2\mu\text{m}$ or less to the sliding or wearing areas of bearings, gears, chains, cams, and slide parts in all types of machine tools.

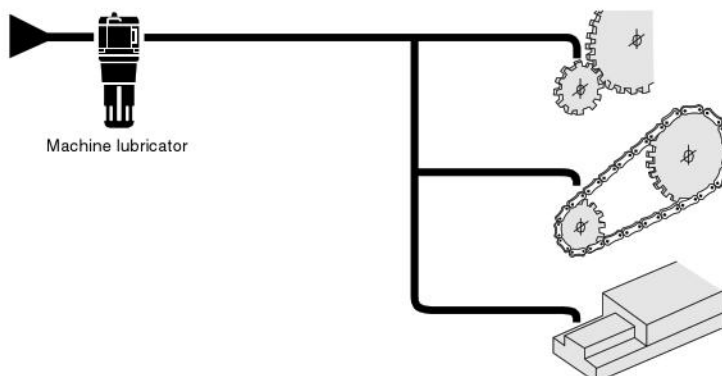
With just the right amount of oil being continuously lubricated, the system effectively cools, lubricates, and cleans the sliding and wearing areas, extending the machine's operating life.

Air is used at 0.3MPa [44psi.] and 60 l/min [2.1ft³/min] (ANR) or less, which means that these devices cannot be directly used in pneumatic equipment that are based on air as the energy source. Because the carried oil mist is a fine, dry fog, it can easily supply oil through long piping distances to the areas requiring oil without adhering to the inner walls of the piping, a situation that ordinary lubricators cannot handle. For more effective lubrication, however, consideration should be given to the prevention of turbulence in the air lines due to installation of fittings, etc., and the piping should be installed as straight as possible.

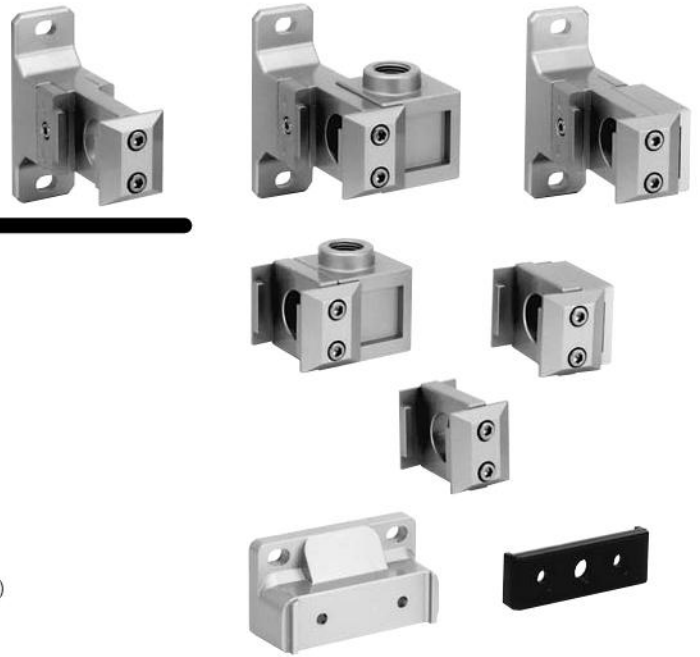
To ensure that the lubrication oil adheres to the area being required, a lubrication nozzle is needed to convert the carried oil mist (dry fog) into a wet mist that adheres more easily.

The lubrication nozzle can be built directly into the mechanical devices that directly supply oil. For machining or manufacturing, see the orifice dimensions table to the right for nozzle dimensions corresponding to the oil supply volume.

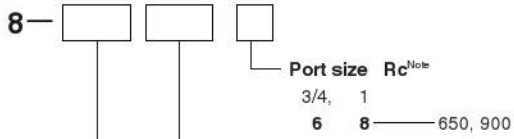
mm [in.]				
Lubrication amount cc [in ³]/H	Number of drops Drops/H	ϕ d	ℓ	Nozzle dimension
0.3 [0.018]	150	0.7 [0.028]	4 [0.16]	<p>Note: Outward appearance is not limited to configuration shown here.</p>
0.6 [0.036]	300	1.0 [0.039]	6 [0.24]	
0.9 [0.055]	450	1.2 [0.047]	8 [0.31]	
2.4 [0.146]	900	1.6 [0.063]	10 [0.39]	



MODULES AND ADAPTERS



Order Codes



Module and adapter









- F — F module
- ND — D module for bracket-combined use
- T — T module
- DT — T module for bracket-combined use
- R — R module (For regulator only)
- M — Piping supporting type M module (For regulator only)
- S — S adapter
- DS — S adapter module

Body size

- 65 — For 650 series
- 90 — For 900 series

Note: Port size selection is not allowed for F module (F), D module for bracket-combined use (ND), R module (R), and piping supporting type M module (M).

Model List

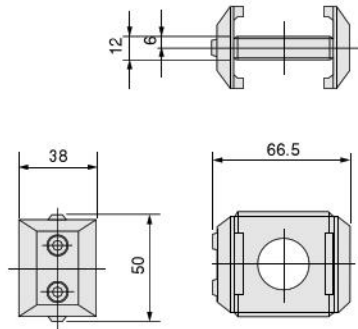
Modules and adapters	F module	D module	T module	
	F	ND	T	DT
Body size	 (For modules only)	 (Brackets for combined use)	 (Branch piping)	 (Brackets for combined use with branch piping)
65	8-65F ● Applicable model FN650 RN650, RN651, RN652 LN650, LN651 FN900, FN901 LN900, LN901, LN902	8-65ND ● Applicable model CN650, CY650, CN750 FN650 RN650, RN651, RN652 LN650, LN651 FN900, FN901, LN900, LN901, LN902	8-65T ● Applicable model FN650 RN650, RN651, RN652 LN650, LN651 FN900, FN901 LN900, LN901, LN902	8-65DT ● Applicable model FN650 RN650, RN651, RN652 LN650, LN651 FN900, FN901 LN900, LN901, LN902
90		8-90ND ● Applicable model CZ650 MF800, MF1000 MMF600, MMF800		8-90DT ● Applicable model MF800, MF1000 MMF600, MMF800
Modules and adapters	R module	M module	S adapter	
	R	M	S	DS
Body size	 (For regulator only)	 (For supporting regulator piping only)	 (Port connection)	 (Brackets for combined use with piping connection)
65	—	—	8-65S ● Applicable model FN650 RN650, RN651, RN652 LN650, LN651 FN900, FN901 LN900, LN901, LN902	8-65DS ● Applicable model FN650 RN650, RN651, RN652 LN650, LN651 FN900, FN901 LN900, LN901, LN902
90	8-90R ● Applicable model CN900 CY900 CZ900 RN900, RN902	8-90M ● Applicable model RN900, RN902		8-90DS ● Applicable model MF800, MF1000 MMF600, MMF800

Remark: The applicable models shown in the tables are typical examples. For details, see p.125.

Dimensions of F Module (mm)

● 8-65F

CAD Frl_mod

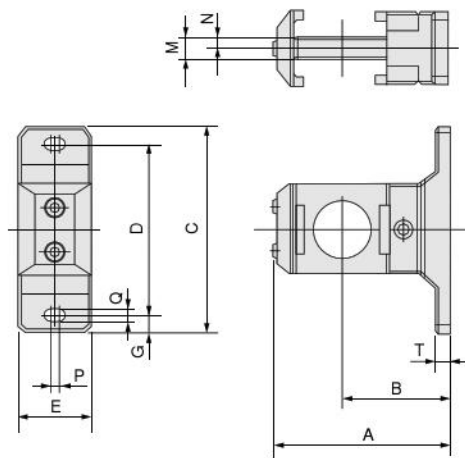


Dimensions of D Module for Bracket-combined Use (mm)

● 8-65ND

● 8-90ND

CAD Frl_mod

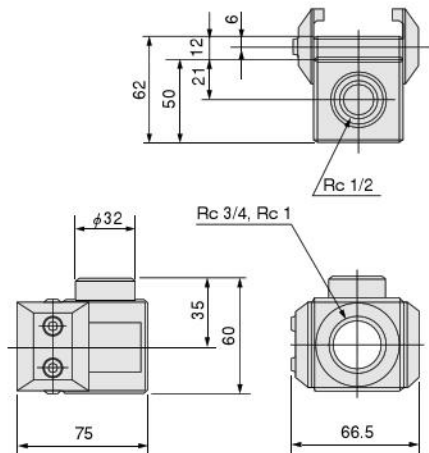


Model	A	B	C	D	E	G	M	N	P	Q	T
8-65ND	94	60	110	90	38	10	12	6	4	9	8
8-90ND	111	77	110	90	38	10	12	6	4	9	7

Dimensions of T Module (mm)

● 8-65T

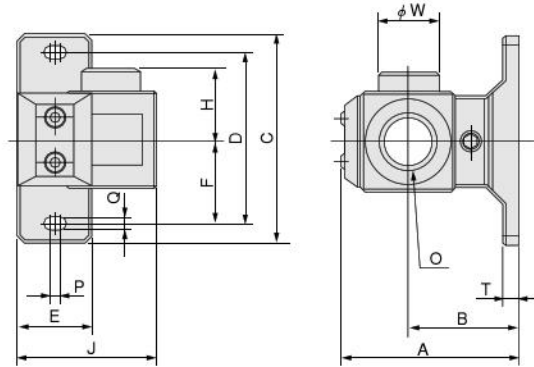
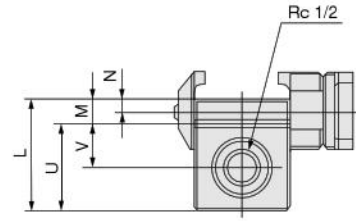
CAD Frl_mod



Dimensions of T Module for Bracket-combined Use (mm)

- 8-65DT
- 8-90DT

CAD FrL_mod6

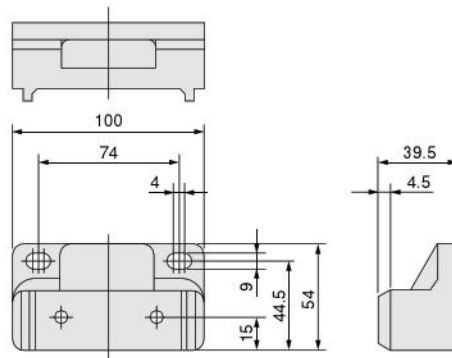


Model	A	B	C	D	E	F	H	J	L	M	N	O	P	Q	T	U	V	φW
8-65DT	94	60	110	90	38	45	35	75	62	12	6	Rc3/4 Rc1	4	9	8	50	21	32
8-90DT	111	77	110	90	38	45	35	75	62	12	6	Rc3/4 Rc1	4	9	7	50	21	32

Dimensions of R Module (For Regulator Only) (mm)

- 8-90R

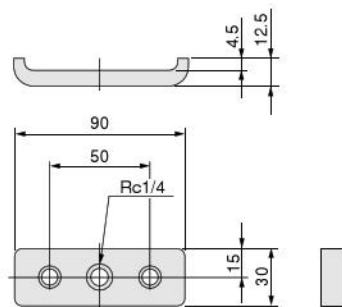
CAD FrL_mod6



Dimensions of Piping Supporting Type M Module (mm)

- 8-90M

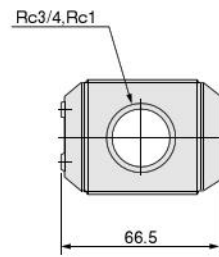
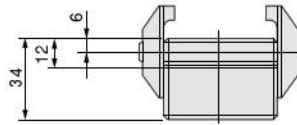
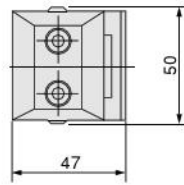
CAD FrL_mod6



Dimensions of S Adapter (mm)

● 8-65S

CAD Frl_mod5

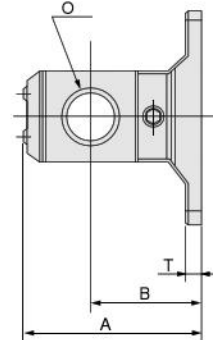
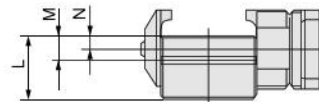
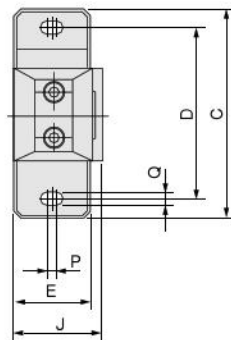


Dimensions of S Adapter Module (mm)

● 8-65DS

● 8-90DS

CAD Frl_mod



Model	A	B	C	D	E	J	L	M	N	O	P	Q	T
8-65DS	94	60	110	90	38	47	34	12	6	Rc3/4 Rc1	4	9	8
8-90DS	111	77	110	90	38	47	34	12	6	Rc3/4 Rc1	4	9	7

BRACKETS



Bracket Models and Applicable Component

Component type		Bracket model	Remark
Air filters	FN650	8-65B ^{Note}	Piping supporting type, optional
	FN900	8-90A	Body supporting type, optional
Mist filters	MF800	8-80A	Body supporting type, optional
	MF1000		
Micro mist filters	MMF600	8-80A	Body supporting type, optional
	MMF800		
Regulators	RN650	8-65	Standard
	RN900	8-90	
Lubricators	LN650	8-65B ^{Note}	Piping supporting type, optional
	LN900	8-90A	Body supporting type, optional

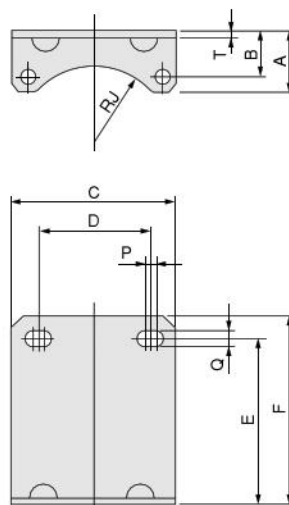
Note: Pipe supporting type brackets (8-65B) are sold in a set of two brackets.

Dimensions of Brackets (mm)

■ For air filters, mist filters, micro mist filters, and lubricators

● 8-80A

● 8-90A



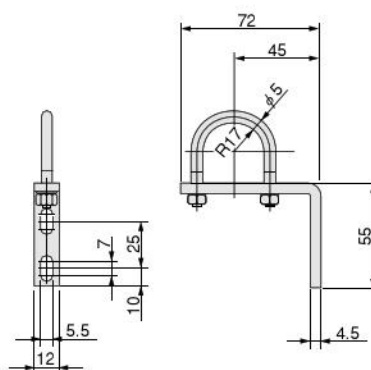
Model	A	B	C	D	E	F	RJ	P	Q	T	Applicable model
8-80A	50	32	108	80	70	80	47	5	8.5	3.2	MF800, MF1000, MMF600, MMF800
8-90A	31	23	88	62	90	100	42	5	8.5	3.2	FN900, FN901, LN900, LN901, LN902

■ For air filters and lubricators

● 8-65B Note



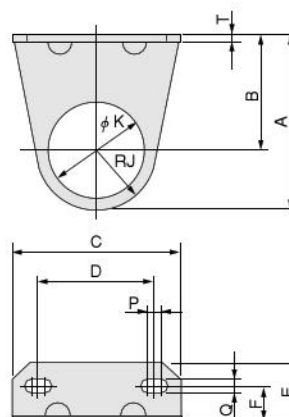
Note: Pipe supporting type brackets (8-65B) are sold in a set of two brackets.



■ For regulators

● 8-65

● 8-90



Model	A	B	C	D	E	F	RJ	φ K	P	Q	T	Applicable model
8-65	72.5	45	70	45	30	20	27.5	45	5	8.5	3.2	RN650, RN651, RN652
8-90	91	60	86	60	30	20	31	52.5	5	8.5	3.2	RN900, RN902

Handling Instructions and Precautions



F.R.L. Combinations

Installation location

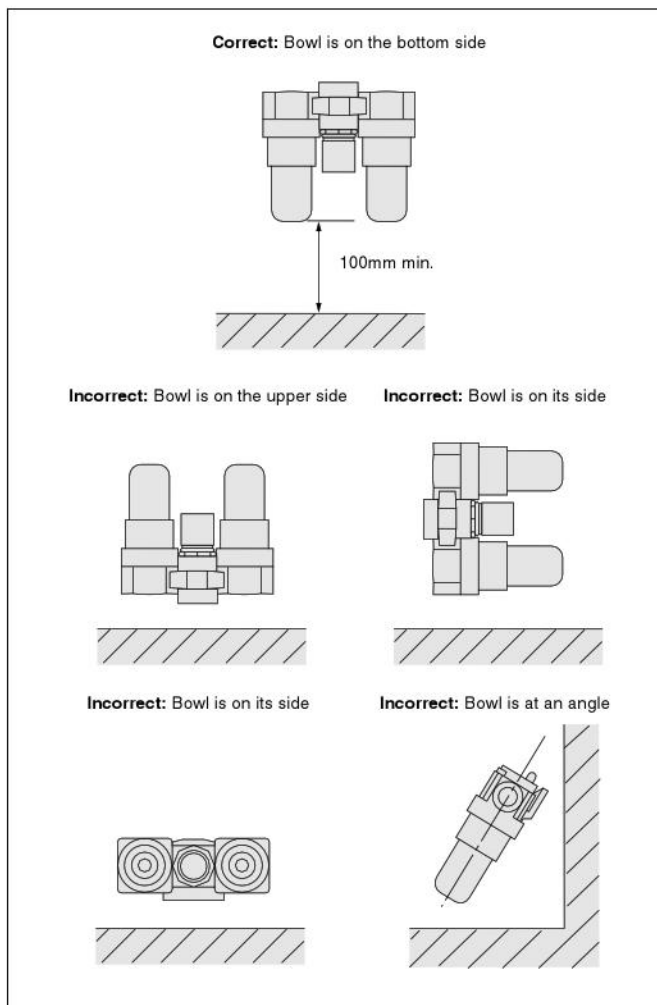
1. Install in locations where the ambient temperature is between 5 ~ 60°C [41 ~ 140°F].
2. The product cannot be used when the media or the ambient atmosphere contains any of the substances listed below.
Organic solvents, phosphate ester type hydraulic oil, sulphur dioxide, chlorine gas, acids, or alkali, etc.
3. Avoid installation in locations subject to vibrations greater than 9.8m/s² [1G].

Mounting method

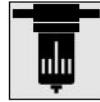
Mount in a vertical position, with the piping connections on the top and the bowl on the bottom.

(If using regulators as single units, any mounting direction is acceptable.)

Leave enough space underneath the bowl to allow easy access for draining collected liquid, and replacement of the filter element.



- Notes:
1. Do not perform any machining on the body of the unit before or during mounting work. Its functions could be damaged.
 2. Use air for the media.
 3. Do not allow operating pressure to exceed a maximum of 0.97MPa [141psi].
 4. If using in locations subject to dripping water, dripping oil, etc., or to large amounts of dust, use something to cover and protect the unit.



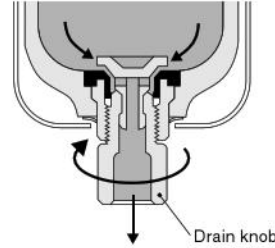
Air Filter and Lubricator

Drain cock

● Screw type

(Air filter Standard Order code: -A)
(Lubricator Order code: -D)

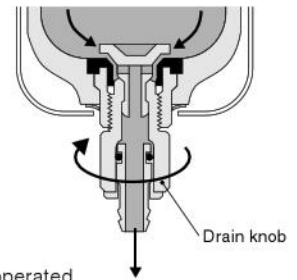
Rotating the drain knob to the left opens the drain port, and the collected liquid is expelled.



● With fitting

(Air filter Order code: -F1)
(Lubricator Order code: -F2)

Rotating the drain knob to the left opens the drain port, and the collected liquid is expelled.

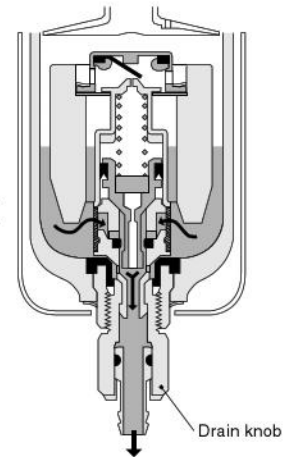


Caution: The drain knob should be operated using fingertips.

● Auto drain type

(Air filter Order code: -A)

When a certain volume of collected liquid has accumulated, or when the pressure inside the bowl has fallen to less than 0.02MPa [3psi.], the collected liquid is automatically expelled. The collected liquid may also be expelled manually by turning the drain knob to the left.



1. In the auto drain, air is exhausted from the drain port until the supply pressure reaches 0.15MPa [22psi.]. This is normal, and even rotating the drain knob in this situation will not prevent the air from bleeding out.
(If the time required for the supply pressure to rise to 0.15MPa [22psi.] seems too long, consult us.)
2. The drain knob should be operated using fingertips.
3. If attaching a tube to the fitting, use a nylon tube with inner diameter of 6mm [0.236in.]. Do not let the tube bend in the area near the fitting connection.
4. The fitting can be rotated freely in any direction. As a result, the tube does not need to be removed even when manually draining the collected liquid.

When placing orders for replacement of pressure gauges, see the table below.

Model	Optional order code	Sold separately	Module sold separately
650 750	G1A	G1-40	—
	GS1A	GS1-50-DL	
	GS1B	GS1-50-AL	
	GS1C	GS1-50-DL-T	
900	GS1D	GS1-50-AL-T	8-90M (with bolt)
	G1A	G1-40	
	GS1A	GS1-50-DL	
	GS1B	GS1-50-AL	
	GS1C	GS1-50-DL-T	
	GS1D	GSS1-50-AL-T	

Remark: If switching between G1A and GS1□, module (8-90M) is not required.