

Clean air system

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

CKD clean air system

CKD clean air system removes impurity in compressed air effectively and economically.

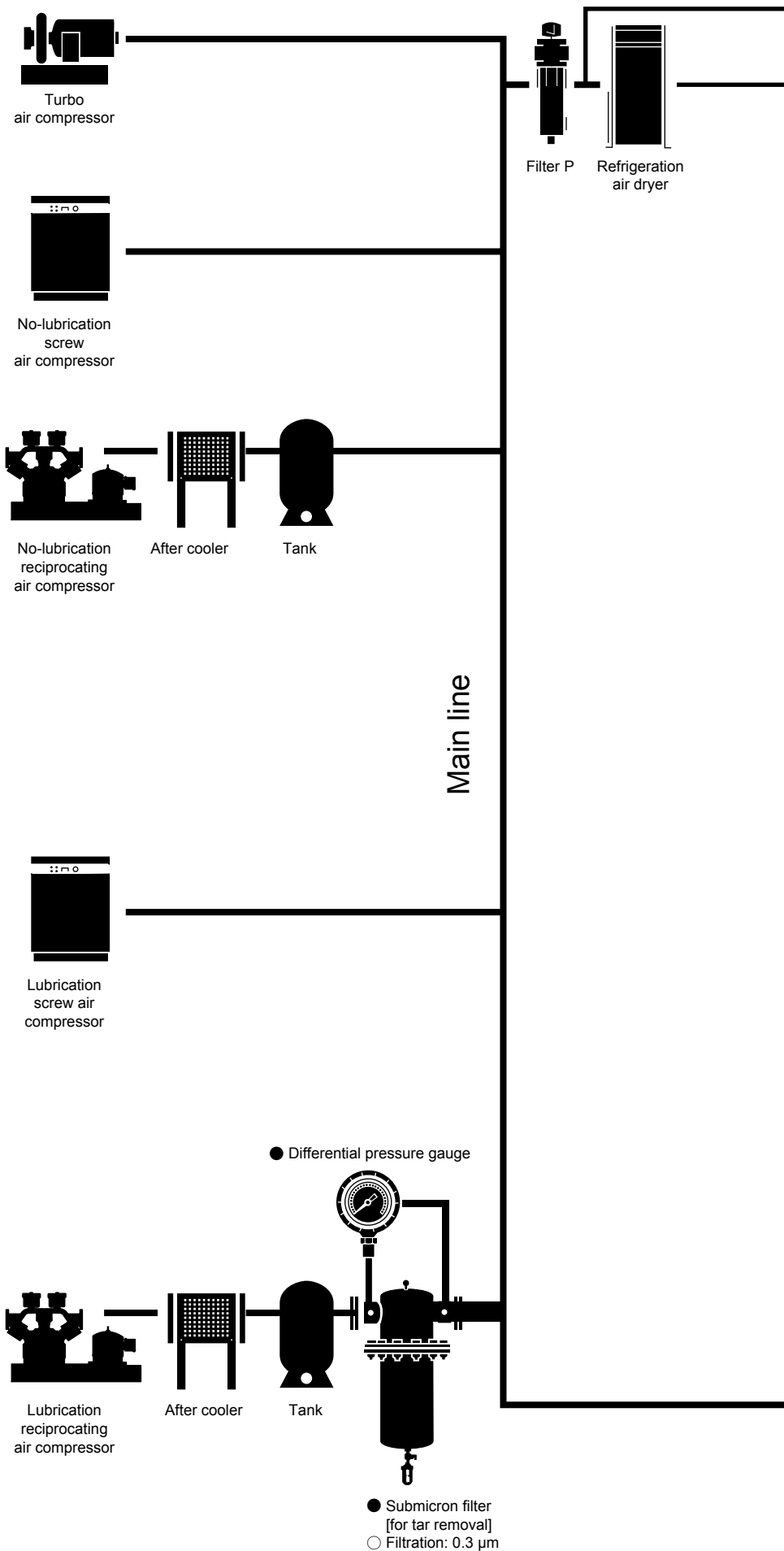
Diverse clean air system is available per industry or application to solve any annoying issues caused by compressed air.

CKD clean air system

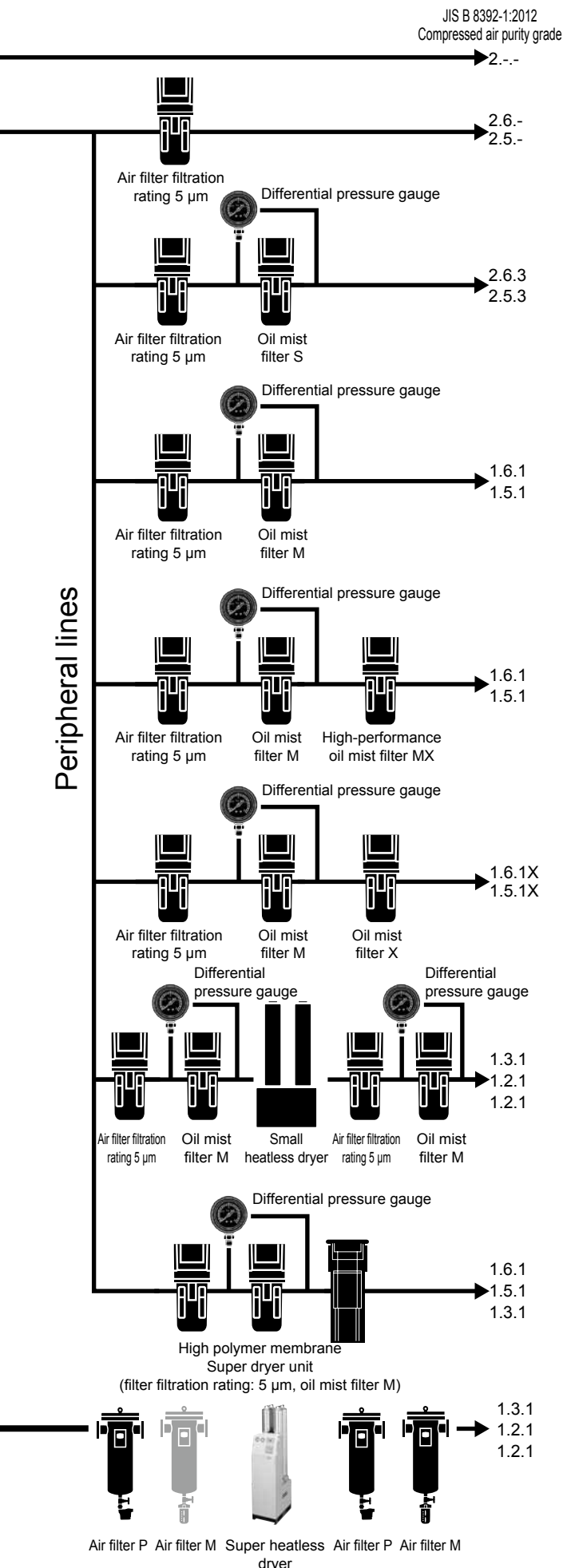
An air compressor is normally used to make compressed air by compressing the atmosphere. The compressed air will be highly contaminated with a high content of impurities such as water vapor and small particles too small to see which were originally in the ambient air, but now in high concentrations in proportion to the compression ratio. In some types of lubrication air compressor, lubricant is oxidized by compression heat or frictional heat to form oil oxide, or may generate solid substance such as carbon and tar, etc.

Oil-free air compressors will also generate carbon particles. These factors make the compressed air more contaminated.

To remove the impurities in the compressed air, CKD's clean air systems offer an effective and inexpensive means by arranging the components suitably for a specific application, including a submicron filter to remove tar and carbon, a dryer to remove water vapor, and an oil mist filter to remove oil oxides and odor.



Clean air system



JIS B 8392-1:2012 Compressed air purity grade	Impurities in compressed air				Applications
	Solid applications (Nominal)	Moisture	Secondary side oil conc. (21°C)	Odor	
2.-.-	1 µm	-	-	-	Removing water drip/coarse dust · Construction, civil engineering machines · Air for cleaning (dry air not required)
2.6.3	0.3 µm	Pressure dew point 10°C	0.5 mg/m ³	-	General dry air · Air tool · Air drill/air screw driver · Air grinder · Labor saving devices and components/pneumatic jigs and tools · Air chuck/air vice · Precision part cleaning air blow
2.5.3		Pressure dew point 7°C			
1.6.1	0.01 µm	Pressure dew point 10°C	0.01 mg/m ³	-	Oil-free dry clean air · Instrumentation · Measurement · Logic control · Luxury painting · Precision mining industry
1.5.1		Pressure dew point 7°C			
1.6.1	0.01 µm	Pressure dew point 10°C	0.001 mg/m ³	-	Ultra-oil-free dry clean air · Precise measurement · Luxury painting
1.5.1		Pressure dew point 7°C			
1.6.1	0.01 µm	Pressure dew point 10°C	0.003 mg/m ³	None	Odorless air · Food industry · Pharmaceutical industry · Stirring/transportation/dry · Packing/brewing air
1.5.1		Pressure dew point 7°C			
1.3.1	0.01 µm	Pressure dew point -20°C	0.01 mg/m ³	-	Ultra dry air · Drying computer rooms · Drying furnace gas · Ozone generator · Drying the insulation gas of a high-voltage generator · Drying the air supply of a high-voltage breaker · Central control instrumentation
1.2.1		Pressure dew point -40°C			
1.2.1		Pressure dew point -60°C			

*1: The system No. is based on the class below.

X in the table below indicates odor removal. "-" indicates no specification.

*2: The table shows the highest compressed air quality grade that can be achieved by the CKD clean air system. The grade varies depending on the condition at the filter inlet.

JIS B 8392-1:2012 Compressed air purity grade

Grade	Solid particle			Humidity and moisture		Oil
	Max. No. of particles per 1 m ³ for particle diameter d (µm)			Pressure dew point	Water concentration Cw	
	0.1 < d ≤ 0.5	0.5 < d ≤ 1.0	1.0 < d ≤ 5.0	°C	g/m ³	Total oil concentration mg/m ³
0	Conditions stricter than Grade 1 to be specified by user or supplier.					
1	≤ 20,000	≤ 400	≤ 10	-	≤ -70	≤ 0.01
2	≤ 400,000	≤ 6,000	≤ 100	-	≤ -40	≤ 0.1
3	-	≤ 90,000	≤ 1,000	-	≤ -20	≤ 1
4	-	-	≤ 10,000	-	≤ +3	≤ 5
5	-	-	≤ 100,000	-	≤ +7	-
6	-	-	-	0 < Cp ≤ 5	≤ +10	-
7	-	-	-	5 < Cp ≤ 10	-	Cw ≤ 0.5
8	-	-	-	-	-	0.5 < Cw ≤ 5
9	-	-	-	-	-	5 < Cw ≤ 10
X	-	-	-	Cp > 10	-	Cw > 10

JIS B 8392-1:2003 has been revised to JIS B 8392-1:2012.

For example,

What is Grade 1:2:1?

- Solid particles 0.1 to 0.5 µm are 20,000 particles or less, 0.5 to 1.0 µm are 400 particles or less, and 1.0 to 5.0 µm are 10 particles or less
- Pressure dew point -40°C or less
- Oil concentration 0.01 mg/m³ or less.









⚠ Precautions for system selection

- *1: If your conditions are different, refer to the specifications in the catalog to select a model.
- *2: Use anti-rust processed materials for piping (zinc plated pipe, lining pipe or stainless steel pipe). Use stainless steel pipes for ultra dry air.
- *3: Always degrease the piping after oil mist filter before use.
- *4: Always install the main pipe with a 1/100 slope.
- *5: Install a filter immediately before the equipment to be used to remove contaminants caused in piping.

Series variation

F.R.L. unit (Combination)

[Combination]

	Series	Combination/application						Model No.	
		F	R	L	W		M		
		Filter	Regulator	Lubricator	Filter/ regulator	Reverse filter/regulator	Oil mist filter		
Modular design (Rotary actuator F.R.L.)	● F.R.L. combination P1=0.7 MPa P2=0.5 MPa ΔP = 0.1 MPa 	F1000-W	R1000-W	L1000-W				C1000-W	
		F2000-W	R2000-W	L3000-W				C2000-W	
		F3000-W	R2000-W	L3000-W				C2500-W	
		F3000-W	R3000-W	L3000-W				C3000-W	
		F4000-W	R4000-W	L4000-W				C4000-W	
		F6000-W	R6000-W	L8000-W				C6500-W	
		F8000-W	R8000-W	L8000-W				C8000-W	
	● W.L. combination P1=0.7 MPa P2=0.5 MPa ΔP = 0.1 MPa 			L1000-W	W1000-W			C1010-W	
				L3000-W	W2000-W			C2010-W	
				L3000-W	W3000-W			C3010-W	
				L4000-W	W4000-W			C4010-W	
				L8000-W	W8000-W			C8010-W	
	● F.R. combination P1=0.7 MPa P2=0.5 MPa ΔP = 0.1 MPa 	F1000-W	R1000-W					C1020-W	
		F2000-W	R2000-W					C2020-W	
		F3000-W	R2000-W					C2520-W	
		F3000-W	R3000-W					C3020-W	
		F4000-W	R4000-W					C4020-W	
		F6000-W	R6000-W					C6020-W	
		F8000-W	R8000-W					C8020-W	
	● F.M.R. combination P1=0.7 MPa 	F1000-W	R1000-W				M1000-W	C1030-W	
		F2000-W	R2000-W				M2000-W	C2030-W	
		F3000-W	R2000-W				M3000-W	C2530-W	
		F3000-W	R3000-W				M3000-W	C3030-W	
		F4000-W	R4000-W				M4000-W	C4030-W	
		F6000-W	R6000-W				M6000-W	C6030-W	
		F8000-W	R8000-W				M8000-W	C8030-W	
	● W.M. combination P2=0.7 MPa 				W1000-W		M1000-W	C1040-W	
					W2000-W		M2000-W	C2040-W	
					W3000-W		M3000-W	C3040-W	
					W4000-W		M4000-W	C4040-W	
					W8000-W		M8000-W	C8040-W	
	● R.M. combination P2=0.7 MPa 		R1000-W				M1000-W	C1050-W	
			R2000-W				M2000-W	C2050-W	
			R2000-W				M3000-W	C2550-W	
			R3000-W				M3000-W	C3050-W	
			R4000-W				M4000-W	C4050-W	
			R6000-W				M6000-W	C6050-W	
			R8000-W				M8000-W	C8050-W	
	● F.M. combination P1=0.7 MPa 	F1000-W					M1000-W	C1060-W	
		F2000-W					M2000-W	C2060-W	
		F3000-W					M3000-W	C3060-W	
		F4000-W					M4000-W	C4060-W	
		F6000-W					M6000-W	C6060-W	
		F8000-W					M8000-W	C8060-W	
	● F.F.M. combination P1=0.7 MPa 	F3000-W(5 μm) F3000-W(0.3 μm)					M3000-W	C3070-W	
		F4000-W(5 μm) F4000-W(0.3 μm)					M4000-W	C4070-W	
		F6000-W(5 μm) F6000-W(0.3 μm)					M6000-W	C6070-W	
		F8000-W(5 μm) F8000-W(0.3 μm)					M8000-W	C8070-W	

F.R.L. unit

Combination series variation

* P1 = primary pressure P2 = secondary pressure ΔP = differential pressure

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.45/0.63	32
					●	●							1.2/1.7	
					●	●							1.2/1.7	
					●	●							1.28/1.75	
					●	●	●	● Note					1.43/2.4/3.0	
								●	●				4.5/5.0	
								●	●				7.0/7.5	
				●	●								0.45/0.63	40
					●	●							1.2/1.7	
					●	●							1.28/1.75	
					●	●	●	● Note					1.43/2.4/3.0	
								●	●				7/7.5	
				●	●								0.77/1.1	46
					●	●							1.75/2.5	
					●	●							1.75/2.5	
					●	●							2.0/2.6	
					●	●	●	● Note					2.5/4.4/5.0	
								●	●				7/7.7	
								●	●				10	
				●	●								0.15	52
					●	●							0.25	
					●	●							0.36	
					●	●							0.36	
					●	●	●	● Note					0.825	
								●	●				1.27	
								●	●				2.6	
				●	●								0.15	58
					●	●							0.25	
					●	●							0.36	
					●	●	●	● Note					0.825	
								●	●				2.6	
				●	●								0.15	64
					●	●							0.25	
					●	●							0.36	
					●	●							0.36	
					●	●	●	● Note					0.825	
								●	●				1.27	
								●	●				2.6	
				●	●								0.15	70
					●	●							0.25	
					●	●							0.36	
					●	●	●	● Note					0.825	
								●	●				1.27	
								●	●				2.6	
					●	●							0.225	76
					●	●	●	● Note					0.5	
								●	●				0.8	
								●	●				1.1	









Note: Pipe adaptor is mounted.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Series variation

F.R.L. unit

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneur
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

	Series	Model No.	Combination/application					Combination option/application					
			F	R	L	W	M	D	S	P	V	K	
			Filter	Regulator	Lubricator	Filter/ regulator	Oil mist filter	Distributor	Pressure switch		Shut-off valve		
	● F.R.L. combination	C1000-W	F1000-W	R1000-W	L1000-W			D101-W	P1100-W		V1000-W		
		C2000-W	F2000-W	R2000-W	L3000-W			D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C2500-W	F3000-W	R2000-W	L3000-W			D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C3000-W	F3000-W	R3000-W	L3000-W			D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C4000-W	F4000-W	R4000-W	L4000-W			D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		*5 C4000-20-W	F4000-W	R4000-W	L4000-W			D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C6500-W	F6000-W	R6000-W	L8000-W			D801-W	P8100-W			V6010-W	
		C8000-W	F8000-W	R8000-W	L8000-W			D801-W	P8100-W			V6010-W	
	● W.L. combination	C1010-W			L1000-W	W1000-W			P1100-W		V1000-W		
		C2010-W			L3000-W	W2000-W			P4100-W	P4000-W	V3000-W	V3010-W	
		C3010-W			L3000-W	W3000-W			P4100-W	P4000-W	V3000-W	V3010-W	
		C4010-W			L4000-W	W4000-W			P4100-W	P4000-W	V3000-W	V3010-W	
		*5 C4010-20-W			L4000-W	W4000-W			P4100-W	P4000-W	V3000-W	V3010-W	
		C8010-W			L8000-W	W8000-W			P8100-W			V6010-W	
	● F.R. combination	C1020-W	F1000-W	R1000-W				D101-W	P1100-W		V1000-W		
		C2020-W	F2000-W	R2000-W				D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C2520-W	F3000-W	R2000-W				D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C3020-W	F3000-W	R3000-W				D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C4020-W	F4000-W	R4000-W				D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		*5 C4020-20-W	F4000-W	R4000-W				D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C6020-W	F6000-W	R6000-W				D801-W	P8100-W			V6010-W	
		C8020-W	F8000-W	R8000-W				D801-W	P8100-W			V6010-W	
	● F.M.R. combination	C1030-W	F1000-W	R1000-W			M1000-W	D101-W	P1100-W		V1000-W		
		C2030-W	F2000-W	R2000-W			M2000-W	D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C2530-W	F3000-W	R2000-W			M3000-W	D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C3030-W	F3000-W	R3000-W			M3000-W	D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C4030-W	F4000-W	R4000-W			M4000-W	D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		*5 C4030-20-W	F4000-W	R4000-W			M4000-W	D401-W	P4100-W	P4000-W	V3000-W	V3010-W	
		C6030-W	F6000-W	R6000-W			M6000-W	D801-W	P8100-W			V6010-W	
		C8030-W	F8000-W	R8000-W			M8000-W	D801-W	P8100-W			V6010-W	
	● W.M. combination	C1040-W				W1000-W	M1000-W		P1100-W		V1000-W		
		C2040-W				W2000-W	M2000-W		P4100-W	P4000-W	V3000-W	V3010-W	
		C3040-W				W3000-W	M3000-W		P4100-W	P4000-W	V3000-W	V3010-W	
		C4040-W				W4000-W	M4000-W		P4100-W	P4000-W	V3000-W	V3010-W	
		*5 C4040-20-W				W4000-W	M4000-W		P4100-W	P4000-W	V3000-W	V3010-W	
		C8040-W				W8000-W	M8000-W		P8100-W			V6010-W	
	● R.M. combination	C1050-W		R1000-W			M1000-W						
		C2050-W		R2000-W			M2000-W						
		C2550-W		R2000-W			M3000-W						
		C3050-W		R3000-W			M3000-W						
		C4050-W		R4000-W			M4000-W						
		*5 C4050-20-W		R4000-W			M4000-W						
		C6050-W		R6000-W			M6000-W						
		C8050-W		R8000-W			M8000-W						
	● F.M. combination	C1060-W	F1000-W				M1000-W						
		C2060-W	F2000-W				M2000-W						
		C3060-W	F3000-W				M3000-W						
		C4060-W	F4000-W				M4000-W						
		*5 C4060-20-W	F4000-W				M4000-W						
		C6060-W	F6000-W				M6000-W						
		C8060-W	F8000-W				M8000-W						
	● F.F.M. combination	C3070-W	F3000-W(5 μm) F3000-W(0.3 μm)				M3000-W						
		C4070-W	F4000-W(5 μm) F4000-W(0.3 μm)				M4000-W						
		*5 C4070-20-W	F4000-W(5 μm) F4000-W(0.3 μm)				M4000-W						
		C6070-W	F6000-W(5 μm) F6000-W(0.3 μm)				M6000-W						
		C8070-W	F8000-W(5 μm) F8000-W(0.3 μm)				M8000-W						

Series variation

F.R.L. unit (Other related products/attachments)

	Combination option list (U□□□□)																	Combination position
	D	S	P	V	K	DS	DP	DV	DK	DSV	DSK	DPV	DPK	SV	SK	PV	PK	
	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>				<input type="radio"/>				
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
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		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>									<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
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		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>									<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
		<input type="radio"/>			<input type="radio"/>									<input type="radio"/>			<input type="radio"/>	

*1: Two T-brackets are included with the combination option.

*2: The T type bracket installation position changes depending on the combination.

*3: T type bracket standard installation position is on the inner side of the end product of each combination.

Note that if the pipe adaptor is combined on the end, the bracket is installed on the inner side of the product past the pipe adaptor.

*4: Use custom combination specifications to change the bracket installation position and for combinations other than combination options.

*5: The pipe adaptor set A400-20-W is assembled on both ends of the C40*0-20-W (port size Rc 3/4).

For products other than the pipe adaptor, the port size is "15" (Rc 1/2).


*6: Only the upward branch direction is available for option "D".

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending






Series variation

F.R.L. unit (Combination, filter/regulator)


[Combination]

Separated	Series name	Compatible product(s)	Model No.	
	<ul style="list-style-type: none"> F.R.L. kit P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa 	Set (with accessory)	K60570	

[Filter/regulator]

Series	Compatible product(s)						Model No.		
	F	R	L	W Rotary actuator		M			
	Filter	Regulator	Lubricator	Filter/ regulator	Reverse filter/regulator	Oil mist filter			
Modular design (Rotary actuator F.R.L.)	● Filter/regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa					●		WB500 (small)	
								W1000-W	
								W2000-W	
								W3000-W	
								W4000-W	
								W8000-W	
	● Filter/regulator flame-resistant series P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa					●		W3000-G4	
								W4000-G4	
								W8000-G4	
	● Reverse filter/regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa						●	W1100-W	
								W2100-W	
								W3100-W	
								W4100-W	
	● Reverse filter/regulator flame-resistant series P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa						●	W8100-W	
								W3100-G4	
								W4100-G4	
● Filter/regulator outdoor series P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa							W8100-G4		
					●		WW4000		
							WW8000		

Series	Compatible product(s)						Model No.	
	F	R	L	W Rotary actuator		M		
	Filter	Regulator	Lubricator	Filter/ regulator	Reverse filter/regulator	Oil mist filter		
● Compact filter/regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa	Push-in fitting and mounting bracket integrated						WB500	

Series	Compatible product(s)						Model No.	
	F	R	L	W Rotary actuator		M		
	Filter	Regulator	Lubricator	Filter/ regulator	Reverse filter/regulator	Oil mist filter		
<div>● 7000 Series</div> <div>P1=0.7 MPa</div> <div>P2=0.5 MPa</div> <div>△P = 0.1 MPa</div> <div></div>	Filter and regulator integrated filtration rating 5 μm						B7019-*C	

F.R.L. unit

Combination, filter/regulator series variation

* P1 = primary pressure P2 = secondary pressure ΔP = differential pressure

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.2/0.3	336

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
	●	●											0.08/0.18	314
				●	●								0.83/1.15	80
					●	●							1.5/2.0	
					●	●	●						2.15/2.43/2.43	
					●	●	●						2.5/4.35/4.75	
								●	●				10	
					●	●							2.15/2.43	178
					●	●	●						2.5/4.35/4.75	
								●	●				10	
				●	●								0.83/1.15	88
					●	●							1.5/2.0	
					●	●	●						2.15/2.43/2.43	
					●	●	●						2.5/4.35/4.75	
								●	●				10.0	
					●	●							2.15/2.43	184
					●	●	●						2.5/4.35/4.75	
								●	●				10.0	
					●	●	●						2.5/4.35/4.75	250
								●	●				10	

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
	●	●											0.08/0.18	314

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.5/0.9	338

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Series variation

F.R.L. unit (Filter)

[Filter]

Series		Compatible product(s)						Model No.	
		F Filter	R Regulator	L Lubricator	W Regulator Filter/ regulator Reverse filter/regulator		M Oil mist filter		
Modular design	● Filter P1=0.7 MPa △P = 0.02 MPa	●						F1000-W F2000-W F3000-W F4000-W F6000-W F8000-W	
	● Filter/flame-resistant series P1=0.7 MPa △P = 0.02 MPa	●						F3000-G4 F4000-G4 F8000-G4	
	● Filter/medium pressure series P1=1.3 MPa △P = 0.02 MPa	●						FM3000-W FM4000-W FM6000-W FM8000-W	
	● Filter/outdoor series P1=0.7 MPa △P = 0.02 MPa	●						FW4000 FW8000	
Series		Compatible product(s)						Model No.	
		F Filter	R Regulator	L Lubricator	W Regulator Filter/ regulator Reverse filter/regulator		M Oil mist filter		
Clean-room	● Inline clean filter P1=0.7 MPa △P = 0.03 MPa	●						FCS500 FCS1000	
Series		Compatible product(s)						Model No.	
Inline filter	● Inline filter P1=0.7 MPa △P = 0.02 MPa	Inline push-in fitting, for both positive and negative pressures						FSL100 FSL200 FSL500	
Series name		Compatible product(s)						Model No.	
Separated	● Air filter P1=0.7 MPa △P = 0.02 MPa	Wide variation Filtration rating 5 μm						A1019-*C 1138-*E 1126-*E	
	● Heavy duty air filter P1=0.7 MPa △P = 0.002 MPa	High moisture removal type Filtration rating 5 μm						A1338 1326	
	● Submicron air filter P1=0.7 MPa △P = 0.01 MPa	Tar removing Filtration rating 0.3 μm						1138-*C-EY A1338-*C-Y 1126-*C-EY 1326-*C-Y	
	● Micro alescero micro naught P1=0.7 MPa △P = 0.01 MPa	Oil removing Oil removing ratio 0.1 PPMW/W						1219-2C 1238-6C 1226-8C 1126J-*C	
	● Micro alescero micro naught P1=0.7 MPa △P = 0.01 MPa	For deodorizing						1238-6C-X 1226-8C-X 1226J-*C-X	

F.R.L. unit

Filter series variation

* P1 = primary pressure P2 = secondary pressure ΔP = differential pressure










	Port size												Max. flow rate m³/min (reference)	Page		
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2				
				●	●								0.46/0.61	96		
					●	●							1.3/1.7			
					●	●							1.23/1.5			
					●	●	●						1.32/2.14/3.0			
								●	●				5.6/6.2			
								●	●				6.4/6.8			
					●	●							1.23/1.5	192		
					●	●	●						5.6/6.2			
								●	●				6.4/6.8			
					●	●	●						1.6/2.0	222		
					●	●							1.9/2.8/3.8			
								●	●				6.7/8.1			
								●	●				8.1/9.0			
					●	●	●						1.32/2.14/3.0	254		
								●	●				6.4/6.8			
	Port size													Max. flow rate m³/min (reference)	Page	
	φ4	φ6	φ8	φ10	φ12	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2			2
	●	●	●			●	●								0.05 (φ4, φ6, 1/8) / 0.08 (φ8, 1/4)	470
			●	●	●		●	●							0.3 to 0.4	474
	Port size													Max. flow rate m³/min (reference)	Page	
	φ4	φ6	φ8	φ10	φ12	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2			2
	●	●													0.07/0.10	332
	●	●													0.08/0.14	
		●	●	●											0.18/0.36/0.44	
	Port size													Max. flow rate m³/min (reference)	Page	
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2				
				●	●										0.55/0.7	340
								●	●						5.5/7.0	370
										●	●	●			18/21/25	
								●	●						1.55	374
										●	●	●			5.8	
								●	●						1.55	376
								●	●						1.55	
										●	●	●			4.9	
										●	●	●			4.9	
					●										0.056	342
								●							1.27	378
									●						2.49	
											●	●			4.8	
								●							1.27	380
									●						2.49	
											●	●			4.8	

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrescR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrescCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Series variation

F.R.L. unit (Oil mist filter)

[Oil mist filter]

Series	Compatible product(s)						Model No.	
	F Filter	R Regulator	L Lubricator	W Rotary actuator Filter/ regulator	Reverse filter/regulator	M Oil mist filter		
● Oil mist filter (S type) P1=0.7 MPa ΔP = 0.01 MPa · Filtration: 0.3 μm · Secondary side oil concentration 0.5 mg/m ³ 						●	M1000-W*-S M2000-W*-S M3000-W*-S M4000-W*-S M6000-W*-S M8000-W*-S	
● Oil mist filter (M type) P1=0.7 MPa ΔP = 0.01 MPa · Filtration: 0.01 μm · Secondary side oil concentration 0.01 mg/m ³ 						●	M1000-W M2000-W M3000-W M4000-W M6000-W M8000-W	
● Oil mist filter (X type) P1=0.7 MPa ΔP = 0.01 MPa · Filtration rating: suction by activated charcoal · Secondary side oil concentration 0.003 mg/m ³ 						●	M1000-W*-X M2000-W*-X M3000-W*-X M4000-W*-X M6000-W*-X M8000-W*-X	
● High-performance oil mist filter P1=0.7 MPa ΔP = 0.01 MPa · Filtration: 0.01 μm · Secondary side oil concentration 0.001 mg/m ³ 						●	MX1000-W MX3000-W MX4000-W MX6000-W MX8000-W	
● Oil mist filter medium pressure (S type) P1=1.4 MPa ΔP = 0.01 MPa · Filtration: 0.3 μm · Secondary side oil concentration 0.5 mg/m ³ 						●	MM3000-W*-S MM4000-W*-S MM6000-W*-S MM8000-W*-S	
● Oil mist filter medium pressure (M type) P1=1.4 MPa ΔP = 0.01 MPa · Filtration: 0.01 μm · Secondary side oil concentration 0.01 mg/m ³ 						●	MM3000-W MM4000-W MM6000-W MM8000-W	
● Oil mist filter medium pressure (X type) P1=1.4 MPa ΔP = 0.01 MPa · Filtration rating: suction by activated charcoal · Secondary side oil concentration 0.003 mg/m ³ 						●	MM3000-W*-X MM4000-W*-X MM6000-W*-X MM8000-W*-X	
● Oil mist filter outdoor (S type) P1=0.7 MPa ΔP = 0.01 MPa · Filtration: 0.3 μm · Secondary side oil concentration 0.5 mg/m ³ 						●	MW4000-S MW8000-S	
● Oil mist filter outdoor (M type) P1=0.7 MPa ΔP = 0.01 MPa · Filtration: 0.01 μm · Secondary side oil concentration 0.01 mg/m ³ 						●	MW4000-M MW8000-S	

Modular design

F.R.L. unit

Oil mist filter series variation

* P1 = primary pressure P2 = secondary pressure ΔP = differential pressure

	Port size												Max. flow rate m³/min	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.15	106
					●	●							0.31	
					●	●							0.45	
					●	●	●						1	
								●	●				1.4	
								●	●				2.9	
				●	●								0.15	106
					●	●							0.25	
					●	●							0.36	
					●	●	●						0.825	
								●	●				1.27	
								●	●				2.6	
				●	●								0.15	106
					●	●							0.36	
					●	●							0.45	
					●	●	●						1.0	
								●	●				1.4	
								●	●				2.9	
				●	●								0.075	116
					●	●							0.18	
					●	●	●						0.37	
								●	●				0.67	
								●	●				1.48	228
					●	●							0.61	
					●	●	●						1.37	
								●	●				1.92	
								●	●				3.98	228
					●	●							0.49	
					●	●	●						1.13	
								●	●				1.74	
								●	●				3.56	228
					●	●							0.61	
					●	●	●						1.37	
								●	●				1.92	
								●	●				3.98	258
					●	●	●						0.825	
								●	●				2.6	258
					●	●	●						1	
								●	●				2.9	258

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Series variation

F.R.L. unit (Regulator)

[Regulator]

Series		Compatible product(s)						Model No.	
		F	R		L	W Regulator			
		Filter	Regulator	Reverse regulator	Lubricator	Filter/regulator	Reverse filter/regulator	Oil mist filter	
Modular design	● Regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						R1000-W R2000-W R3000-W R4000-W R6000-W R8000-W
	● Regulator/flame-resistant series P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						R3000-G4 R4000-G4 R8000-G4
	● Regulator oil-prohibition series P1=0.7 MPa P2=0.5 MPa		●						RN3000-W RN4000-W RN8000
	● Regulator medium pressure series P1=1.6MPa P2=0.5 MPa		●						RM3000-W RM4000-W
	● Regulator/outdoor series P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						RW4000 RW8000
	● Reverse regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa			●					R1100-W R2100-W R3100-W R4100-W R6100-W R8100-W
	● Regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						RA800 RB500
	● Block manifold regulator		●						MNRB500A MNRB500B
	● Regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						RJB500
	● Block manifold regulator		●						MNRJB500A MNRJB500B
Clean-room	● Clean regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						RC2000
	● Clean regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa		●						2619

[Electro pneumatic regulator]

Refer to page 506 for the series variation of electro pneumatic regulators.

F.R.L. unit

Regulator series variation

* P1 = primary pressure P2 = secondary pressure ΔP = differential pressure






	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.77/1.35	124
					●	●							1.75/2.5	
					●	●							2.0/2.6	
					●	●	●						2.5/4.4/5.0	
								●	●				7/7.7	
								●	●				14.0/11.0	
					●	●							2.0/2.6	200
					●	●	●						2.5/4.4/5.0	
								●	●				14.0/11.0	
					●	●							1.6/2.6	214
					●	●	●						2.4/3.0/3.0	
								●	●				4.5/6	
					●	●							2.0	234
					●	●	●						3.0	
					●	●	●						2.5/4.4/5.0	262
								●	●				14.0/11.0	
				●	●								0.77/1.35	132
					●	●							1.75/2.5	
					●	●							2.0/2.6	
					●	●	●						2.5/4.4/5.0	
								●	●				7/7.7	
								●	●				14.0/11.0	
				●	●								0.35	308
	●	●											0.1/0.2	312
	●	●	●										0.1/0.2	318
	●	●											0.1/0.2	
	●	●											0.06/0.08	416
	●	●	●										0.06/0.08	418
	●	●											0.06/0.08	
					●	●	●						0.8	492
				●	●								0.18/0.18	496

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending


Series variation



F.R.L. unit (Regulator/lubricator)

[Regulator]

	Series name	Compatible product(s)	Model No.	
Separated	<ul style="list-style-type: none"> Regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa 	Extensive models	B2019-*C	
			2215-*C	
	<ul style="list-style-type: none"> Reverse regulator P1=0.7 MPa P2=0.5 MPa △P = 0.1 MPa 	Check valve integrated, no by-pass circuit required	2419-*C	
			2415-*C	
	<ul style="list-style-type: none"> Dial air regulator P1=0.7 MPa P2=0.5 MPa 	With setting dial	2302-*C	
			2303-*C	
			2304-*C	
	<ul style="list-style-type: none"> Remote dial air regulator P1=0.7 MPa P2=0.5 MPa 	For remote control	2302-*C-R	
			2303-*C-R	
			2304-*C-R	
	<ul style="list-style-type: none"> Relief valve Set pressure 0.7 MPa, pressure rise 0.08 MPa 	For maintaining the set pressure	B6061-*C	

[Lubricator]

	Series	Compatible product(s)							Model No.	
		F	R		L	W		M		
		Filter	Regulator	Reverse regulator	Lubricator	Filter/regulator	Reverse filter/regulator	Oil mist filter		
Modular design	<ul style="list-style-type: none"> Lubricator P1=0.5 MPa △P = 0.3 MPa 				●				L1000-W	
									L3000-W	
									L4000-W	
									L8000-W	

	Series name	Compatible product(s)	Model No.	
Separated	<ul style="list-style-type: none"> Lubricator econo-mist P1=0.5 MPa △P = 0.03 MPa 	Supplies fine oil mist	A3019-*C	
			3003E-*C	
			3004E-*C	
	<ul style="list-style-type: none"> Lubricator auto-fill 	Automatic supply	3003E-*C-V	

* P1 = primary pressure P2 = secondary pressure ΔP = differential pressure

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.5	344
								●	●	●			14	384
				●	●								0.5	346
								●	●	●			14	388
					●	●	●	●					3.0	390
								●	●	●			10.0	
											●	●	30.0	
					●	●	●	●					3.0	393
								●	●	●			10.0/30.0	
											●	●	30	
				●	●								0.15	348

* P1 = primary pressure ΔP 2 = differential pressure

	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.55/0.7	140
					●	●							1.1/2.25	
					●	●	●						1/1.7/2.7	
								●	●				6.3/10.0	





	Port size												Max. flow rate m ³ /min (reference)	Page
	φ4	φ6	φ8	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
				●	●								0.1/0.4	350
								●	●				3.5/4.0	396
										●	●	●	15/20	
								●	●				3.5/4.0	400

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending







Series variation

F.R.L. unit (Other related products)

[Shut-off valve]

Series name	Compatible product(s)	Model No.	
● Shut-off valve 	Preventing accidents due to residual pressure in pneumatic lines.	V1000-W V3000-W	
● Shut-off valve with keyhole (OSHA compliant)	Preventing accidents due to residual pressure in pneumatic lines.	V3010-W V6010-W	
● Quick valve 	2- and 3-port valves are available.	2QV 3QV	
● Slow start valve 	Ensuring safety when starting and stopping	V3301-W V3321-W	
● 3-port solenoid valve with spool position detection 	Spool position detection for reliable open/close detection Module connection also allows double cutoff	SNP	

[Other related products]

Series name	Compatible product(s)	Model No.	
● Clean exhaust filter 	Provide direct exhaust within a clean room	FAC10 FAC100 FAC200 FAC300	
● Exhaust cleaner 	For exhaust, improving the environment	FA331-10A FA431-15A FA531-20A FA631-25A FA731-40A FA831-50A	
● Drain discharger 	Automatic drain Heavy duty drain Tank drain	DT3000/4000-W DB1000/3000 5100-4C	
● Moisture indicator (P1 = 0.7 MPa)	For dew point monitor of desiccant dryer	6119-2C	
● Air pressure switch 	Setting accuracy within ±0.02 MPa	APE-8T APE-8N APE-8F P4000-W P*100-W APS	
● Pressure gauge 	Low-profile pressure gauge ideal for embedding in devices Pressure gauge with safety marker Pressure gauge with limit marker General-use pressure gauge Pressure gauge for panel mounting Pressure gauge with switch Miniature pressure gauge Compact round pressure gauge Vacuum pressure gauge	G401 G40D G45D G49D/G59D G53D G52D G29D G39D VG41D	
● Differential pressure gauge 	Air filter life measuring	GA400-8-P02	

	Port size															Max. flow rate	Page
	φ4	φ6	φ8	φ10	φ12	1/16	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
							●	●									154
								●	●	●							
								●	●	●							
											●	●					157
	●	●	●	●	●		●	●	●	●							160
	●	●	●	●	●		●	●	●	●							
								●	●	●							168
								●	●	●							
									●	●	●						171

	Port size															Max. flow rate	Page
	φ4	φ6	φ8	φ10	φ12	1/16	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2		
		●					●	●								10	480
							●	●	●	●						100	
									●	●						200	
									●	●						600	
									●	●						0.3	694
										●						0.6	
											●					1	
												●				3	
														●		6	
															●	10	
									●	●							1716
										●	●	●					1724
										●							1732
								●								0.05	305
								●									1040
								●									
								●									
								●	●	●	●	●					148
								●	●	●	●	●					150
								●									1044
																0 to 0.4 MPa 0 to 1.0 MPa	290
								●	●							0 to 1.0 MPa 0 to 0.4 MPa	291
								●	●							0 to 0.2 MPa 0 to 0.4 MPa 0 to 1.0 MPa	292
								●	●							0 to 0.2 MPa 0 to 0.4 MPa 0 to 1.0 MPa 0 to 2.0 MPa	293
								●	●							0 to 0.2 MPa 0 to 0.4 MPa 0 to 1.0 MPa	296
								●								0 to 1.0 MPa	298
						●	●									0 to 1.0 MPa	300
							●									0 to 0.4 MPa 0 to 1.0 MPa	301
							●									-100 to 0 kPa	302
								●									304

F.R.L. Combination

Reading the Properties Table

1. Combination, filter regulator, and regulator flow characteristics

The flow characteristics table indicates changes (pressure drop) in the set secondary pressure in regard to the changes (air flow) in the amount of air consumed on the secondary side.

When the primary side is 0.7 MPa and the secondary pressure is set with an air flow of "0", the secondary pressure fluctuation and limit flow for a specified air flow can be confirmed.

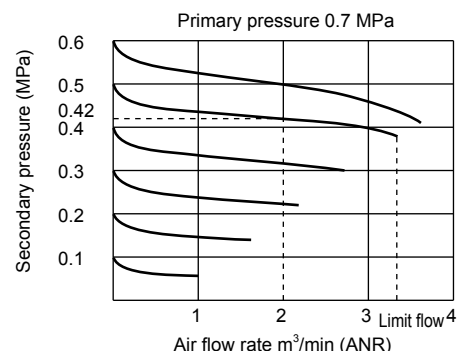
1) Finding the pressure fluctuation

If secondary pressure is 0.5 MPa and air flow is 2 m³/min, secondary pressure is 0.42 MPa.

Using the flow characteristics table, draw a perpendicular line at an air flow of 2 m³/min. Then draw a horizontal line along the 0.5 MPa flow curve and read off the secondary pressure where the lines intersect.

2) Finding the limit flow rate

Straight down from the right end of the flow curve at an air flow of 3.6 m³/min. is the limit flow rate.



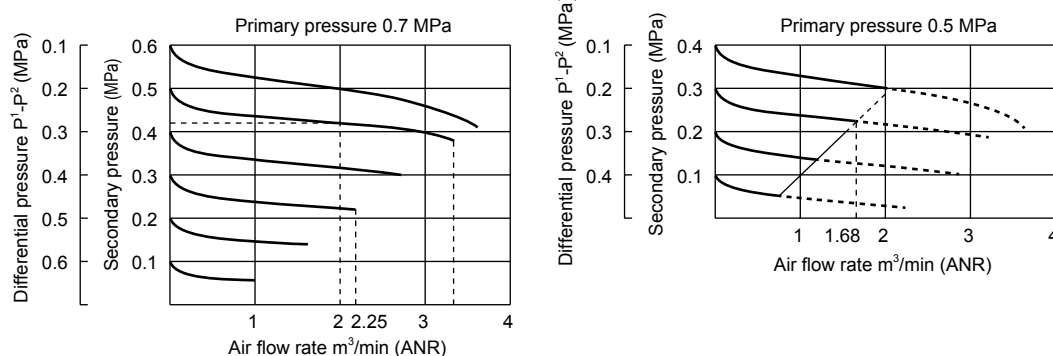
Notes

- 1) The actuator's working flow rate should be within 0.1 MPa of the regulator pressure drop.
- 2) The limit flow greatly changes depending on the pipe's effective section area (piping inner diameter, pipe length, etc.). Graphs in the catalog are all measured using steel pipe according to JIS B8372-1.
- 3) Keep differential pressure between primary and secondary sides to 0.1 MPa or more during use.

2. Approximate characteristics when primary side pressures of combination, filter regulator, and regulator flow characteristics differ from the catalog value (primary side pressure 0.7 MPa)

Using the catalog flow characteristics table (primary pressure 0.7 MPa) and a flow curve in which the pressure difference of primary and secondary set pressure is the same, variations in the secondary pressure for the required primary pressure are estimated.

Example) Flow rate properties for which the primary pressure is 0.5 MPa, use 0.4, 0.3, 0.2, and 0.1 MPa flow curves for the secondary pressure catalog values (primary pressure of 0.7 MPa) of 0.6, 0.5, 0.4, and 0.3 MPa, respectively.



The limit flow rate varies with the absolute pressure ratio of the primary pressure. An approximate value is calculated using the following formula:

$$Q = Q_0 \times \frac{P_1 + 0.1}{0.8}$$

Q_0 = Each secondary pressure limit flow rate for the catalog primary pressure of 0.7 MPa

Q = Approximate limit flow rate m³/min

P_1 = Required primary side pressure MPa

Example) The approximate limit flow rate at the primary side pressure 0.5 MPa and secondary side pressure 0.3 MPa is:

$$Q = 2.25 \times \frac{0.5 + 0.1}{0.8} = 1.68 (\text{m}^3/\text{min})$$

Q_0 can be obtained by reading the limit flow rate at the secondary side pressure 0.3 MPa in the catalog.

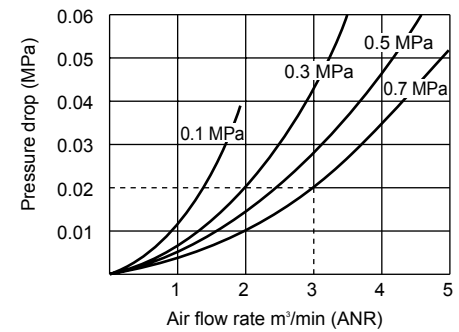
3. Air filter flow characteristics

The flow characteristics table indicates the pressure drop (pressure loss on primary and secondary sides of the air filter) at the air filter for air consumed (air flow) on the secondary side.

The pressure drop is shown for air flow for 0.1, 0.3, 0.5, or 0.7 MPa primary pressure.

Example) If air flow is 3.0 m³/min at primary pressure of 0.7 MPa, pressure drops 0.02 MPa (secondary pressure is 0.68 MPa).

Read the pressure drop by drawing a vertical line from air flow 3.0 m³/min and drawing a horizontal line where it intersects the primary pressure 0.7 MPa curve.

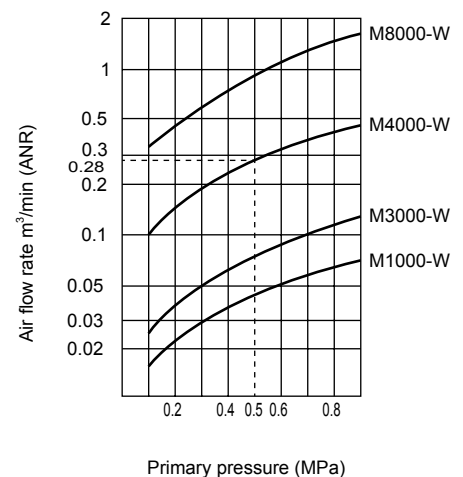


4. Oil mist filter and Y element air filter flow characteristics

Flow characteristics indicate the max. air consumption (air flow rate) corresponding to the primary side working pressure that allows oil and tar removal. If the product is used at an air flow higher than that indicated, oil and tar within the specified value will not be removed.

Example) When using the M4000-W with a primary pressure of 0.5 MPa, max. air flow is 0.28 m³/min.

Read max. air flow by drawing a vertical line from primary pressure 0.5 MPa, and drawing a horizontal line where it crosses the working product curve.



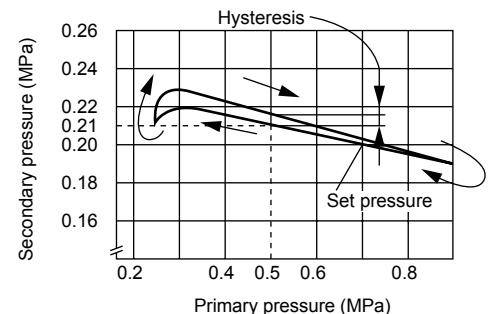
5. Regulator pressure characteristics

The pressure characteristics table shows changes in secondary set pressure for changes in primary pressure.

Primary pressure is, for example, set to 0.7 MPa, secondary set pressure to 0.2 MPa, and air consumption to 25 ℓ/min (atmosphere release thanks to use of φ1 orifice). Changes in secondary set pressure when primary pressure drops to 0.25 MPa, rises to 0.9 MPa, then returns to the original 0.7 MPa are shown.

Example) Secondary set pressure rises to 0.21 MPa when primary pressure changes to 0.5 MPa.

Read secondary pressure by drawing a vertical line from primary pressure 0.5 MPa and drawing a horizontal line where it intersects the pressure characteristics curve.



Hysteresis causes pressure difference when the primary pressure rises and falls.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/other
Jnt/tube
AirUnt
PrecsCompn
Mech/ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

F.R.L. Combination

Reading the Properties Table

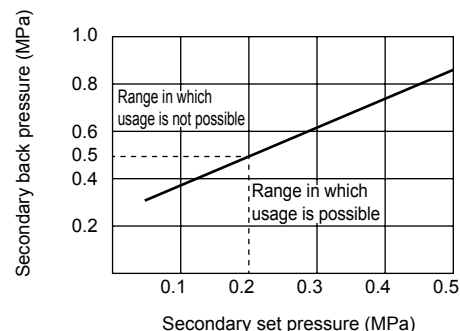
6. Set pressure range for reverse regulator back pressure

The properties table indicates the limit of secondary back pressure (secondary rise in pressure) enabling reversal (exhaust of regulator secondary pressure to the primary side) of the secondary set pressure.

Example) This indicates that reversal is possible if secondary back pressure is 0.5 MPa or less when set pressure is 0.2 MPa.

Read secondary back pressure by drawing a vertical line from set pressure 0.2 MPa and drawing a horizontal line where it intersects the curve.

The area below the curve is reversible.

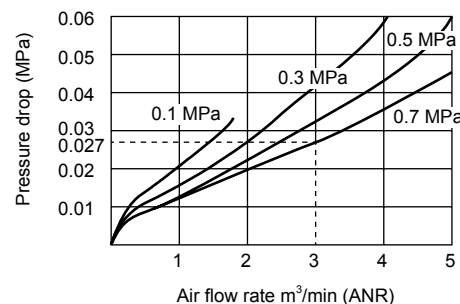


7. Lubricator flow characteristics

The flow characteristics table shows the pressure drop (primary and secondary pressure difference) at each primary pressure of the air flow.

Example) If air flow is 3 m³/min at primary pressure of 0.7 MPa, pressure drops 0.027 MPa (secondary pressure is 0.673 MPa).

Read the pressure drop by drawing a vertical line from air flow 3.0 m³/min and drawing a horizontal line where it intersects the primary pressure 0.7 MPa curve.

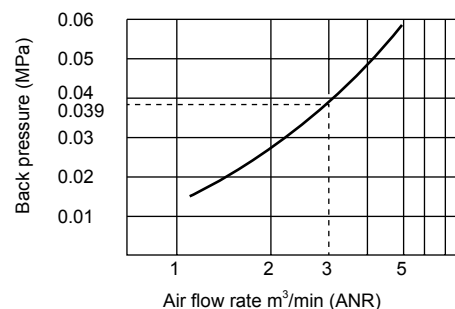


8. Exhaust cleaner flow characteristics

The flow characteristics table indicates back pressure applied to the IN side of the exhaust cleaner for the processing flow rate. If the product is used with a processing flow rate higher than that indicated, silencing and oil mist collection within the specified value will not be attained.

Example) When processing flow rate is 3 m³/min, 0.039 MPa back pressure is generated at the exhaust cleaner IN side.

Read back pressure by drawing a vertical line from flow 2 m³/min and drawing a horizontal line where it intersects the curve.



Through proportional control and systematization, it supports FA/FMS.

Realizes highly advanced electronic control.

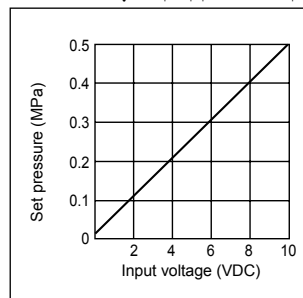
Proportional control technology

This technology attains an output and flow rate proportional to the input voltage (current), with linearly proportional input and output. Using this technology expands applications of conventional ON-OFF control pneumatic components to enable continuous analog control.

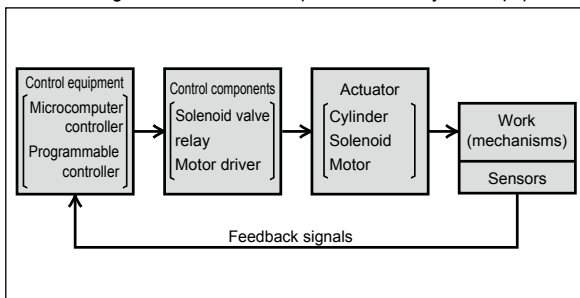
Advanced applications are possible

Proportional pressure controls enable the pneumatic cylinder's speed, thrust, position, etc., to be freely controlled. Continuous high accuracy variable device control, remote pressure setting of pneumatic lines, and use in FA and FMS are accurately realized.

● Static characteristics diagram of output for proportional control valve input



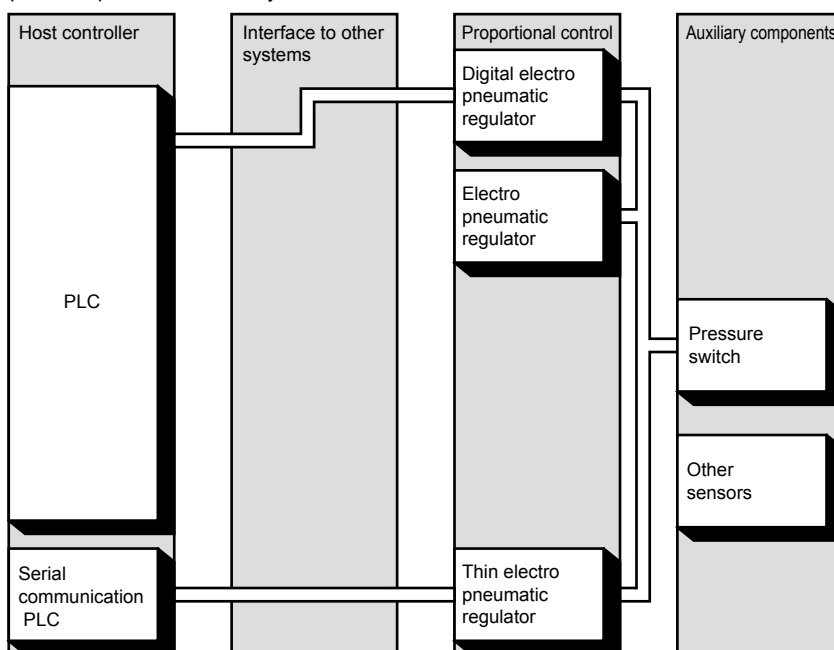
● Block diagram of control concept for machinery and equipment



Proportional pressure control system

The proportional pressure control system includes an interface that connects with the host controller (programmable controller, etc.), the regulator and proportional valve that conduct proportional control, and the pressure switch that also functions as the system sensor. These can be used in combination or independently based on the purpose and application.

● Proportional pressure control system



● Pressure proportional applications

- Spot welding gun pressure control
- Grinder pressure control
- Tension control of paper, cloth or film, etc.
- Balancer and lifter pressure control
- Die cushion control for press
- Air brake pressure control
- Robot handling force control
- Fluid and powder flow rate control using pneumatic pressure

● Flow rate proportional control applications

- Cylinder and pneumatic motor speed/rotation speed control
- Cylinder positioning control
- Various applications using air flow rate control (e.g.: Temperature control of film, aluminum foil, etc.)

Needs field

- Continuous
- Flexible
- Soft touch
- Detailed
- Precise
- Fine

⚠ Read the safety precautions before use.

An expansion of products for increased application possibilities

● Electro pneumatic regulator

● Pressure switch

● Semiconductor manufacturing

● Paint and gas industries

● Chemical/powder

● Food processing

● Transportation/precision

● Pulp/paper-making

● Textile industry

Applicable field

Control field

Line-up

● FA

● FMS

● Control relying on operator's experience

● Higher control

● Tensile control

● Pressurization control

● Tension control

● Blow control

● Remote control

● Variable air pressure
continuous control








● Air flow rate
continuous control

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Series variation

Electro pneumatic regulator

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneur
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Control method	Model		Wiring method				Port size				Input signal						
			Terminal block	D sub-connector	Serial transmission	FA connector	M5	Rc1/4	Rc3/8	Push-in φ4	Push-in φ6	0 to 10 VDC	0 to 5 VDC	4 to 20 mA		Parallel 10 bit	0 to 20 mA
Solenoid valve	EVD-1000		Functions include pressure and error display and direct memory. The 10-bit parallel model has been added to the input signal.			●					●	●	●	●			
	EVD-3000		Functions include pressure and error display and direct memory. The 10-bit parallel model has been added to the input signal. Larger flow rate than EVD-1000.			●					●	●	●	●			
	EVR		Feedback control with semiconductor pressure sensor and electronic control circuit is used. This electro pneumatic regulator allows continuous and precise control of air pressure by electrical signal.								●	●	●				
	EV2100V		Feedback control with semiconductor pressure sensor and electronic control circuit is used. This electro pneumatic regulator allows continuous and precise control of vacuum pressure by electric signal.								●	●	●			●	
	EVS2		Smaller than conventional models. Body takeout cable is used for this pneumatic proportional pilot valve to achieve ultimate convenience and space saving.								●	●	●	●		●	
	EVL		Compact electro pneumatic regulator for low pressure that enables flexible and high-precision proportional control from 0 kPa to 50 kPa.								●	●	●				
	MEVT		Reduced wiring thin shape. Ultimate space saving thanks to the manifold. Thin electro pneumatic regulator with higher accuracy and responsivity than conventional mechanisms.		●	●	●				●	●	●	●	●		

Electro pneumatic regulator

Series variation

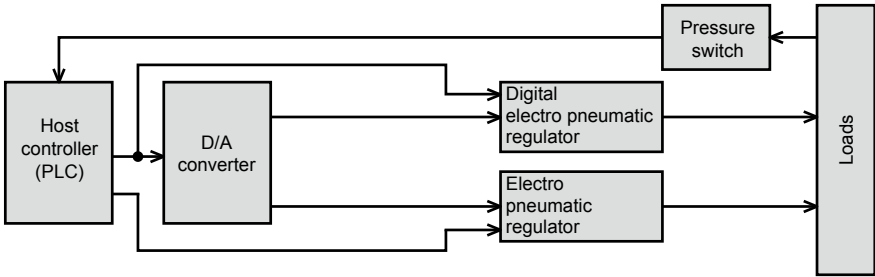
◎: Optimum
○: Usable

	Pressure control range						Step response (No load)			Max. flow rate (ℓ/min (ANR))											Linearity (% F.S.)				Hysteresis (% F.S.)				Applications				Page
	-101.3 to 0 kPa	0 to 50 kPa	0 to 100 kPa	0 to 200 kPa	0 to 500 kPa	0 to 900 kPa	0.1 s or less	0.2 s or less	0.6 s or less	2	6	8	100	120	150	400	500	700	800	1500	±0.3 or less	±0.5 or less	±1.5 or less	±2.5 or less	0.3 or less	0.4 or less	0.5 or less	1.0 or less	Pilot pressure control	Tension	Push pressure	Blow	
			●		●	●		●								●					●								◎	◎	◎		512
			●		●	●		●												●	●						●		◎	◎	◎		516
			●	●	●	●		●											●		●				●				◎	◎	◎		538
	●							●					●	●								●					●					◎	551
			●		●		●			●		●									●					●		◎	○	○			548
		●						●					●								●					●				◎			556
			●		●		●			●	●										●					●		◎	○	○			564

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/other
Jnt/tube
AirUnt
PrecsCompn
Mech/ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Basic system functions

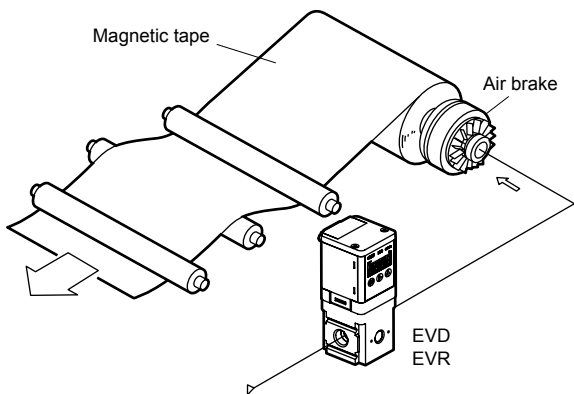
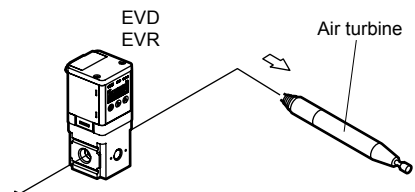
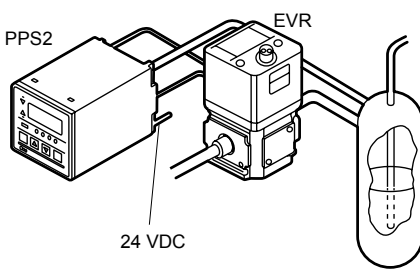
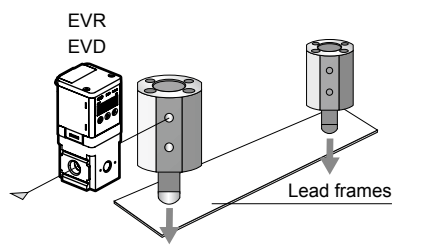
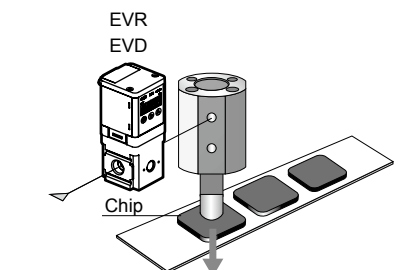
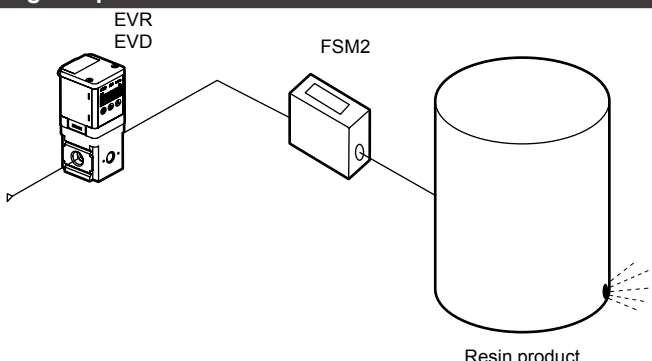
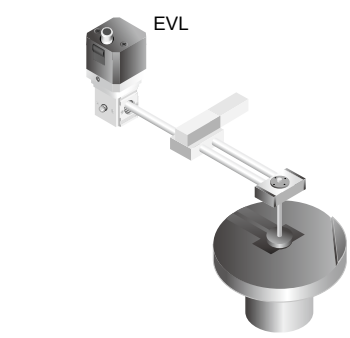
Pneumatic proportional control components attain an output and flow rate proportional to the input voltage or current. The input voltage and output pressure/flow rate must be linearly proportional. To achieve this, the pressure and flow rate are varied with electric signals, and an electric controller enables variable continuous control. When used as a system, the circuit is configured so signals from the host controller are converted to 0 to 10 VDC signals, etc., by the D/A converter (interface). These signals operate the proportional control valve via the controller, controlling the thrust and speed of each actuator, etc. When needed, highly accurate control is possible through feedback with sensors.



System application examples

● Fluid discharge control	● Chemical liquid drip prevention control	● Micro position control
● Fluid pressure control	● Balancer tension control	● Grinding force control

System application examples

<p>● Tension control using air brakes</p> 	<p>● Air turbine speed control</p> 	
<p>● Applications for fluid pressure feeding</p> 	<p>● Fixing lead frames, etc.</p> 	<p>● Chip component assembly</p> 
<p>● Leakage inspection</p> 	<p>● CMP equipment</p> 	

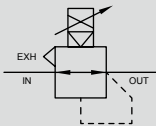
F.R.L
F (Filtr)
R (Reg)
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Shutoff
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MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending



Low pressure electro pneumatic regulator

EVL Series

JIS symbol



Specifications

Overview

This low-pressure electro pneumatic regulator EVL Series is the first compact electro-pneumatic regulator for low pressure that enables flexible and highly precise proportional control from 0 kPa to 50 kPa.

Features

- Low pressure
Low pressure control from 0 to 50 kPa.
- High precision control
Hysteresis 0.5% F.S. or less
Resolution 0.2% F.S. or less
- Easy wiring
- Grease free flow path

Descriptions		EVL-1050			
Working fluid		Clean compressed air (JIS B 8392-1: 2012 (ISO 8573-1: 2010) [1:3:2] or equivalent)			
Max. working pressure		160 kPa (≈23 psi, 1.6 bar)			
Min. working pressure		140 kPa (≈20 psi, 1.4 bar)			
Proof pressure	Inlet	240 kPa (≈35 psi, 2.4 bar)			
	Pressure side	100 kPa (≈15 psi, 1 bar)			
Pressure control range		0 (≈0 psi, 0 bar) to 50 kPa (≈7.2 psi, 0.5 bar)			
Power supply voltage		24 VDC ± 10% (stabilized power supply with ripple rate 1% or less)			
Current consumption		0.1 A or less (0.6 A rush current when power is ON)			
Input signal (input impedance)		0 to 10 VDC (20 kΩ)	0 to 5 VDC (10 kΩ)	4 to 20 mA DC or 1 to 5 VDC (250 Ω) *4	10 kΩ variable resistance or 0 to 10 VDC (20 kΩ)
Analog output		1±0.1 to 5±0.1 VDC (none for 10 kΩ variable resistance input)			
Accuracy *1	Hysteresis	0.5% F.S. or less			
	Linearity	±0.5% F.S. or less			
	Resolution	0.2% F.S. or less			
	Repeatability	0.5% F.S. or less			
Temperature characteristics	Zero point fluctuation	0.15% F.S./°C or less			
	Span fluctuation	0.07% F.S./°C or less			
Max. flow rate		100 l/min(ANR) *2			
Step response		0.6 s or less (no load) *3			
Vibration resistance		98 m/s ² or less (JIS C0040)			
Air consumption		4 l/min(ANR)			
Ambient temperature		5 (41°F) to 50 (122°F)°C			
Mounting orientation		Free			
Degree of protection		IP64 or equivalent (body), IP67 (cable connector) *5			
Port size	IN/OUT port	Rc1/4			
	EXH port	φ4.3 *6			
	Pilot exhaust port (R)	M3			
	Bleed port				
Weight		315 g			

*1: The characteristics above are: 24.0 ±0.1 VDC power supply voltage, no load, 25 ±3°C ambient temperature, within the primary side working pressure, and 10% to 100% control pressure. In addition, when the secondary side is a closed circuit, pressure fluctuations will occur if the product is used for blowing or for similar applications.

*2: Values at 160 kPa working pressure and 50 kPa control pressure.

*3: Working pressure: 160kPa, step amount: 50% F.S. → 100% F.S.
50% F.S. → 60% F.S.
50% F.S. → 40% F.S.

*4: When used with a signal voltage of 1 to 5 VDC, 4 to 20 mA of current flows into the EV interior from the signal source. Check the specifications of the signal source before using it.

*5: The degree of protection of body IP64 is applied only when installed with facing connector upward.

*6: EXH port is open to the atmosphere. If piping is necessary, select “-E1” exhaust option.

How to order

EVL - **1050** - **0** **08** - **C11** **E1** **L11**

A Input signal

B Option

Code	Content
A Input signal	
0	0 to 10 V
1	0 to 5 V
2	4 to 20 mA or 1 to 5 VDC
3	10 kΩ variable resistance or 0 to 10 V
B Option	
Cable option	
Blank	None
C11	1 m attached
C13	3 m attached
Exhaust option	
Blank	None
E1 *1	φ8 push-in fitting
Bracket option attached	
Blank	None
B1 *1	Floor mounted
B11	Floor mounted for exhaust fitting
L11	Wall mounted

⚠ Precautions for model No. selection

*1: "E1" exhaust option and "B1" floor mounted cannot be selected together.

● Discrete option model No.

(1) Cable/exhaust option

EV2000 - C11

Code	Content
C11	Cable 1 m
C13	Cable 3 m
E1	φ8 push-in fitting

(2) Bracket option

EVD - B1

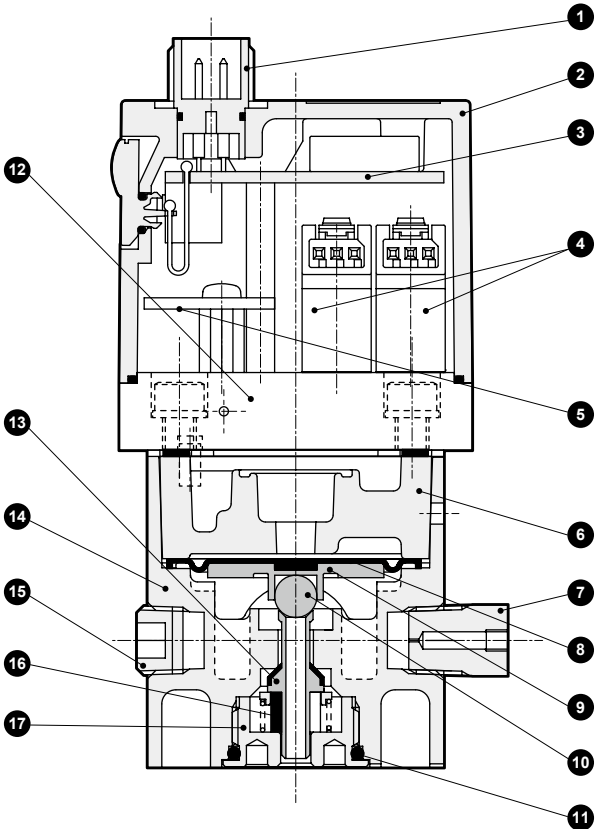
Code	Content
B1	Floor mounted

EVL - B11

Code	Content
B11	Floor mounted for exhaust fitting
L11	Wall mounted

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/
PTFE FRL
Outdrs FR
F.R.L
(Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/
other
Jnt/tube
AirUnt
PrecsCompn
Mech/
ElecPresSw
ContactSW
AirSens
PresSW
Cool
AirFloSens/
Contr
WaterRtSens
TotAirSys
(Total Air)
TotAirSys
(Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg
etc
Ending

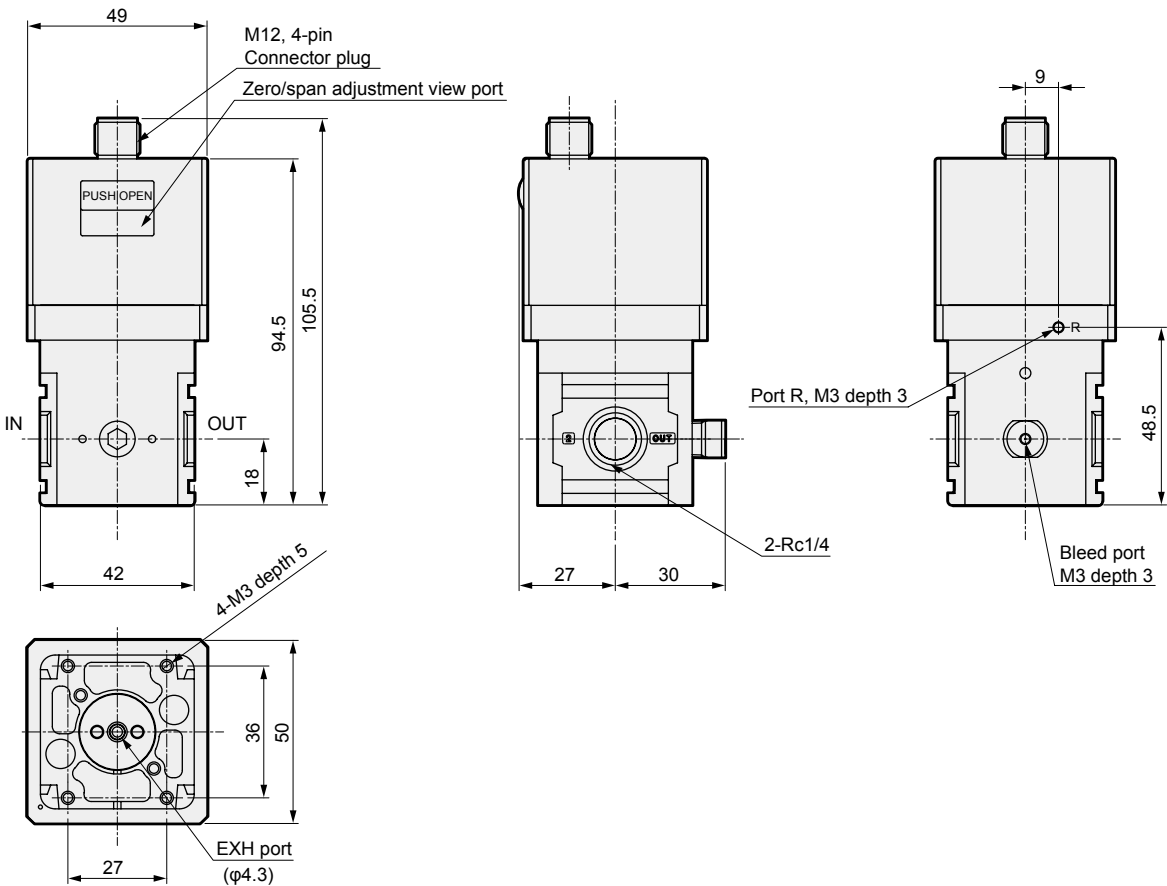
F.R.L Internal structure and parts list



No.	Part name	Material
1	Connector plug	
2	Housing	ABS resin
3	Controller board	
4	3-way valve	
5	Pressure sensor	
6	Pilot body	Aluminum alloy
7	Orifice	Stainless steel
8	Diaphragm	Special nitrile rubber
9	Relief seat	Aluminum alloy
10	Steel ball (exhaust valve)	Stainless steel
11	O-ring	Fluoro rubber
12	Valve base	Aluminum alloy
13	Valve (air supply valve)	Special nitrile rubber, stainless steel
14	Body	Aluminum alloy
15	Plug	Steel, nickeling
16	Bottom rubber	Silicone rubber
17	Bottom plug	Copper alloy, electroless nickeling

Cannot be disassembled

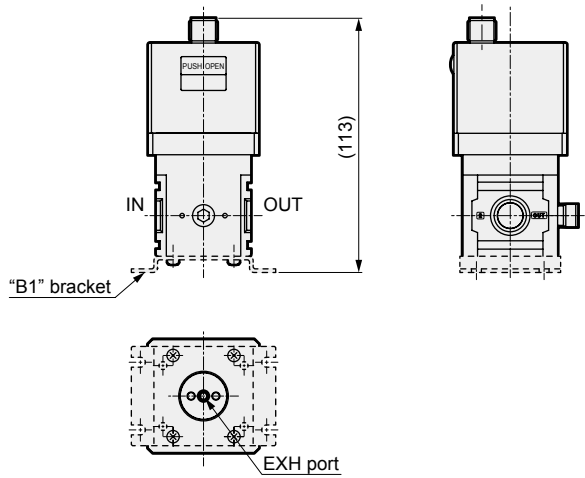
Dimensions



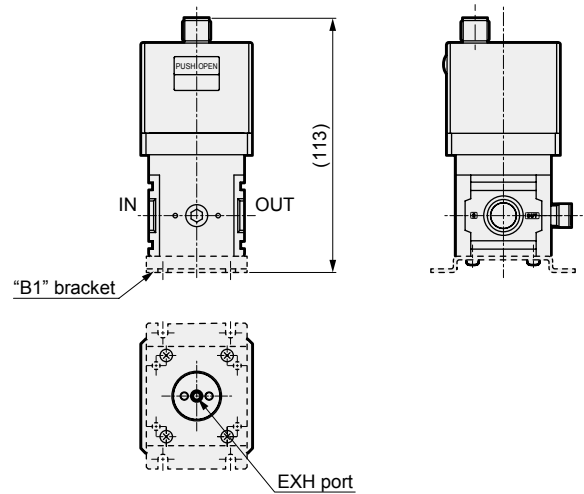
Dimensions with options

● Floor mounted bracket (-B1)

· Lateral mounting (in the piping direction)

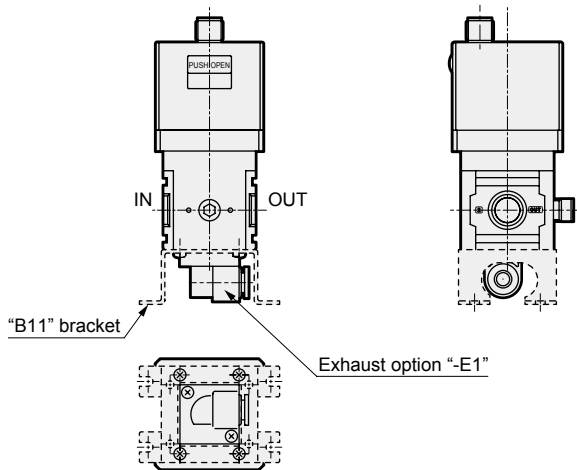


· Longitudinal mounting (in the depth direction)

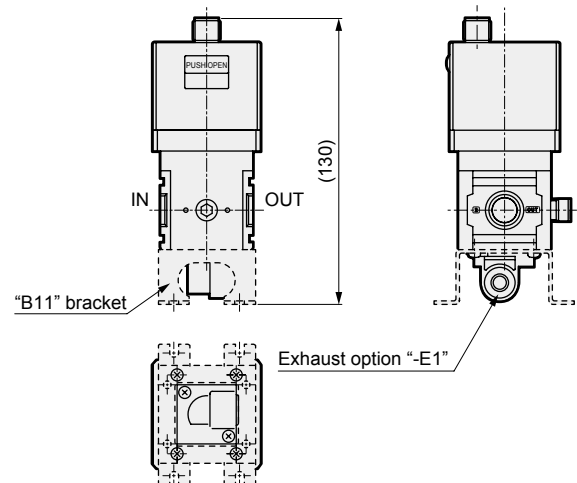


● Floor mounted bracket for exhaust fitting (-B11)

· Lateral mounting (in the piping direction)



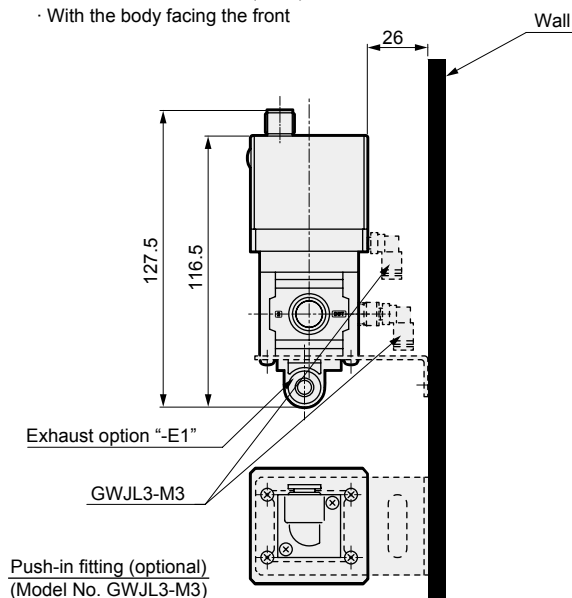
· Longitudinal mounting (in the depth direction)



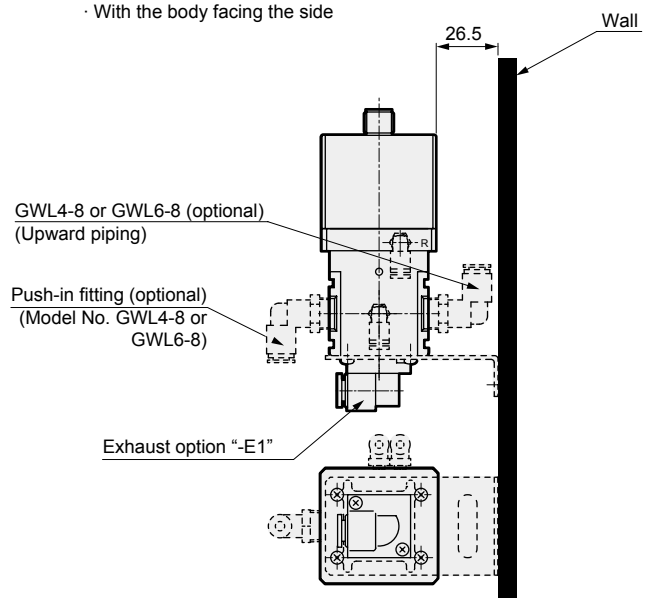
Note: Pull out the exhaust tube from the through hole when mounting the bracket laterally.

● Wall mounted bracket (-L11)

· With the body facing the front



· With the body facing the side

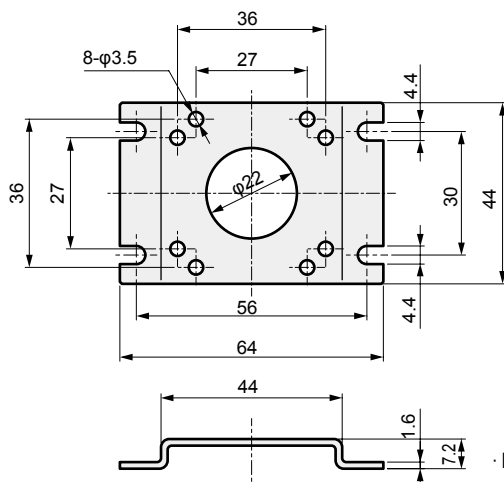


F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRISens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Optional dimensions

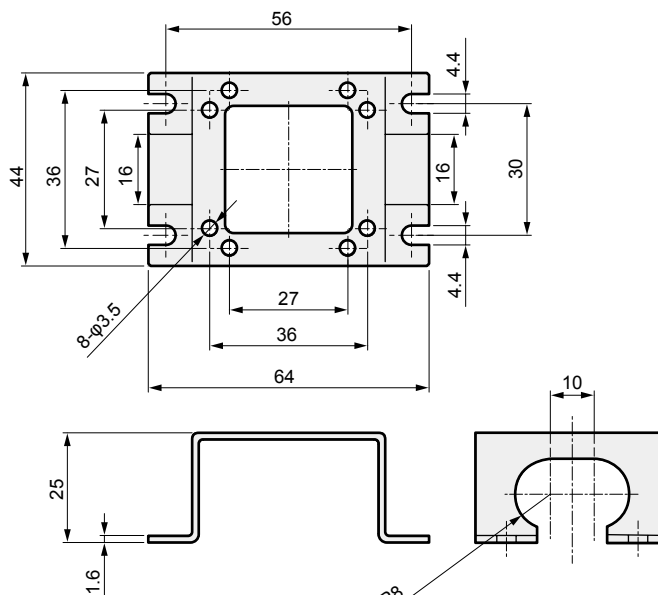
● Bracket option (-B1, -B11, -L11)

· Floor mounted bracket (-B1)



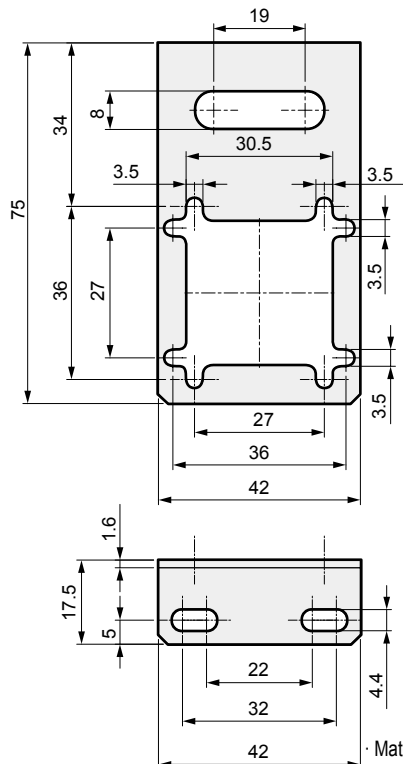
· Material: SPCC
Ni plated
· Weight: 32 g

· Floor mounted for exhaust fitting (-B11)



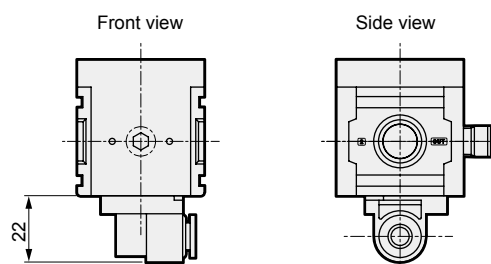
· Material: SPCC
Ni plated
· Weight: 32 g

· Wall mounted (-L11)



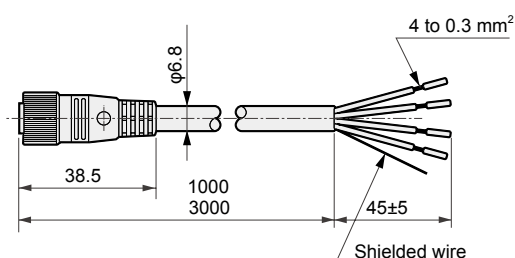
· Material: SPCC
· Treatment: Ni plating
· Weight: 31 g

● With φ8 push-in fitting (-E1)



· Weight: 13 g

● Cable option



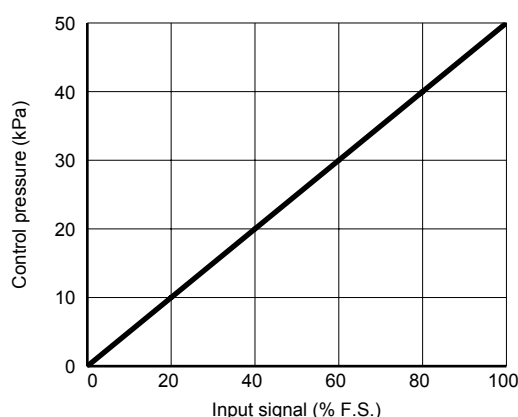
-C1* Shield/cable/connector

* Pin NO.	Insulator color	Applications	Type of input signal				Weight g
			0 to 10 V	0 to 5 V	4 to 20 mA 1 to 5 V	10 kΩVR (0 to 10 V)	
1	Red	Power supply ⊕	24 V				C11:79 C13:212
2	Green	—	Analog output 1 to 5 V			VR input terminal	
3	Black	Common	0 V			VR input terminal 0 V	
4	White	Input signal	0 to 10 V	0 to 5 V	4 to 20 mA 1 to 5 V	VR output terminal (0 to 10 V)	

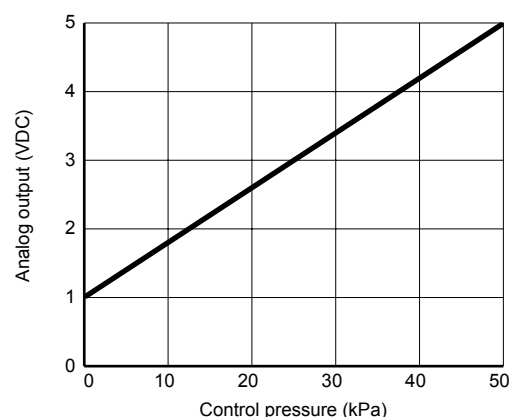
If a cable connector is not used, the following recommended cable sockets can be used. Use a shielded wire cable.

Screw fixing type ELW1KA4012 Correns (Hirschmann)
Straight (solder) XS2C-D421 OMRON
L type (solder) XS2C-D422 OMRON

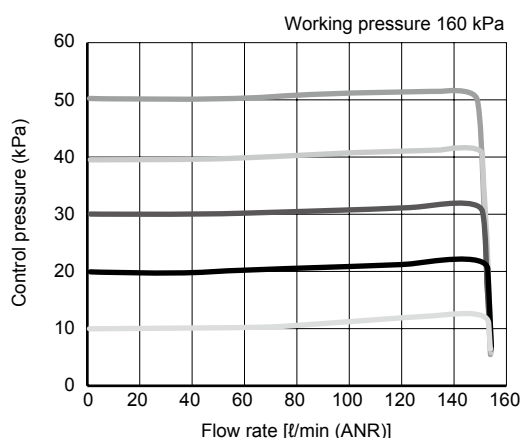
I/O characteristics



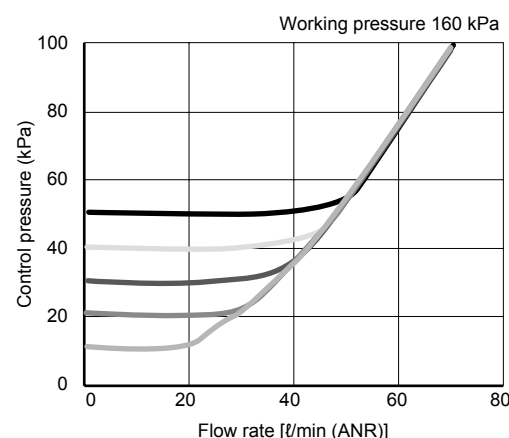
Analog output



Flow characteristics



Relief characteristics



Safety precautions

CAUTION

- This product uses the constant bleed method. Do not plug the bleed port during use.
 - If common exhaust is necessary, select “-E1” exhaust option. In addition to the EXH port, discharge from the bleed port and pilot exhaust port (R) together.
Note that “-B1” bracket cannot be selected in this case.
 - Keep the supply pressure between 140 kPa and 160 kPa to ensure high accuracy.
 - Applying an input signal outside the specifications shown in the table below will cause unnecessary operation of the solenoid valve, resulting in shorter service life and deteriorated performance. Keep the signal within the specifications.
- | 0 to 10V | 0 to 5 V | 4 to 20 mA |
|---------------------------------|--------------------------------|-----------------------------------|
| Less than 0 V
Exceeding 10 V | Less than 0 V
Exceeding 5 V | Less than 4 mA
Exceeding 20 mA |
- When mounting the unit on the wall (with the body facing the front) and attaching fittings to the bleed port and pilot exhaust port, use GWJL3-M3.
 - When mounting the unit on the wall (with the body facing the side), use GWL4-8 or GWL6-8 fitting on the wall side. Also, piping should be in an upward direction.
 - If particles must be eliminated, install a filter (e.g., FCS1000 Series) on the secondary side of EVL.

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F (Filtr)
R (Reg)
L (Lub)
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Oil-ProhR
MedPresFR
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Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending



Safety Precautions

Be sure to read this section before use.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
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FimResistFR
Oil-ProhR
MedPresFR
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ContactSW
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Cool
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Contr
WaterRtSens
TotAirSys
(Total Air)
TotAirSys
(Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg
etc
Ending

Product-specific cautions: Electro pneumatic regulator

Design/selection

CAUTION

■ Response is affected by working pressure and load volume. Also fluctuation of the working pressure affects the secondary side control pressure. If reproducibility with stable responsiveness is required, install a regulator in the preceding stage.

■ Take the following countermeasures to prevent malfunction caused by noise.

- Install a line filter in the AC power supply line.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- Keep wiring to devices separate from strong magnetic fields.
- Connect wiring to proportional pressure controls with a shield wire.
- Ground the shield wire on the power supply side. Note that the shielding wire for the serial transmission communication cable must be treated based on communication system specifications.

■ When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test under actual working conditions, or contact CKD before using this method.

■ When selecting the dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■ This product has moving parts due to its operation and structure, the accuracy, etc., of which can change over time. Before use, evaluate the part in the system. Depending on the operation frequency, use this product as a periodic maintenance part, etc.

■ Working conditions for CE compliance
CKD electro pneumatic regulators (EVD, EVR, EV, EVS2 and MEVT Series) conform to the EMC Directive and CE standard. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:

- Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line, paired to assess the product's performance.
 - This product is not equipped with surge protection. Implement surge protection measures on the system side.

Mounting, installation and adjustment

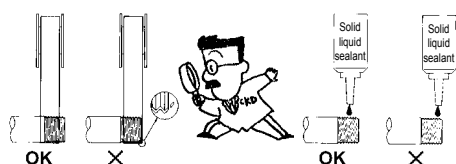
CAUTION

■ Do not use the product where the product is exposed to direct sunlight or may come in contact with water, oil, etc.

■ Sufficiently flush the piping with air before connecting to proportional pressure controls. Prevent pipe from catching on parts of the sealing tape when piping.

■ Mount the product as indicated in the product-specific cautions.

■ When connecting pipes, wrap sealing tape in the opposite direction to the threading, from the inside position to within 2 mm from the pipe end.



- If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the pneumatic components, causing failures.

■ Correct pressure control is not possible if the exhaust port is plugged. Release this port to the atmosphere.

■ Use appropriate torque to tighten the pipes when connecting them.

- The purpose is to prevent air leakage and damage to bolts.
- First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

[Recommended tightening torque]

Port thread	Tightening torque N·m
M5	1 to 1.5
Rc1/4	6 to 8
Rc3/8	13 to 15



■ Tighten with an appropriate torque when using CKD cable option M12 connector. Recommended tightening torque: 0.4 to 0.49 N·m

Use/maintenance

CAUTION

■ Do not disassemble the product. Doing so may cause product failure. Operation after disassembly cannot be guaranteed.

■ Do not use with the cover and housing removed.

- An electronic circuit board is assembled inside. Using the product with the cover or housing removed could result in unexpected accidents or trouble.

Product-specific cautions: EVD Series

Design/selection

⚠ WARNING

- Understand the characteristics of compressed air before designing a pneumatic circuit.
 - The same functions as mechanical, hydraulic, and electrical methods cannot be anticipated.
 - The product cannot be used for immediate stopping and holding in case of emergency stop.
 - Pop-out, air discharge, or leakage due to air compression and expansion may occur.
 - Design the circuit so that compressed air in the system is exhausted.
- Confirm before use that the product will withstand the working environment.
 - This product cannot be used in an atmosphere containing corrosive gas, chemical liquids, solvents, water or steam. If water, oil, or metal chips (spatter or cutting chips, etc.) could come in contact with the product, provide appropriate protection.
 - A gauge pressure sensor is built in. To protect the sensor, do not seal the product, and make sure that air can be introduced.
 - This product cannot be used in an explosive gas atmosphere.
- Pay attention to the electric circuit during emergency stop and to the cylinder operation during power outages.
- Install a “pressure switch” and “shut-off valve” on the device’s compressed air supply side.
 - The pressure switch will disable operation until the set pressure is reached. The shut-off valve releases compressed air into the pneumatic pressure circuit to prevent accidents caused by operation of pneumatic components under residual pressure.
- If the regulator is left with the power OFF and the primary pressure applied, the secondary pressure could rise to the primary pressure level. Due to the structure, a small amount of air is consumed from the EXH port when the secondary pressure is generated. Set the primary regulator to 0 or use a valve on the primary side to shut off the supply source when not using the regulator.

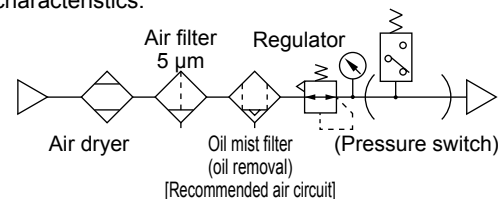
⚠ CAUTION

- Indicate the maintenance conditions in the device’s instruction manual.
 - The product’s performance may drop too low to maintain an appropriate safety level depending on usage conditions, working environment and maintenance status. With correct maintenance, the product functions can be used to the fullest.
 1. Control of supplied compressed air pressure
 2. Control of pneumatic filter
 3. Control of compressed air leakage at piping connections
 4. Operational status control
 5. Control of current consumption
- Use a constant voltage power supply.
- Check for leakage current to avoid malfunction caused by leakage current from other fluid control components.
 - When using a programmable controller, etc., leakage current may affect the electro pneumatic regulator and cause malfunction.

24 VDC

1.8 mA or less

- Response is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.
- Take the following countermeasures to prevent malfunction caused by noise.
 - Install a line filter in the AC power supply line.
 - Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
 - Keep wiring to device separate from strong magnetic fields.
 - Connect wiring to device with a shield wire.
 - Ground the shield wire on the power supply side.
 - Keep the power supply cable as short as possible.
 - Do not share power with an inverter or components causing motor noise, etc.
 - Do not lay the power wire, signal wire, and other power cables in parallel.
- When the current input is wired, the power ground and signal common are shared.
 - When driving several electro pneumatic regulators with one PLC and D/A unit, depending on the D/A unit circuit, wiring could prevent the correct signal from being input. Contact the PLC manufacturer.
- The current input can be used with an input signal of 1 to 5 V. However, because input impedance is small (250 Ω) when compared to other voltage input, use an appropriate voltage generator.
- Poor air quality will cause poor characteristics and adversely affect the durability.
- Use clean dry air of JIS B 8392-1:2012 (ISO 8573-1: 2010) [1:3:2] or equivalent.
 - For the pneumatic source, always supply clean air, from which solids, moisture and oils have been sufficiently removed with a dryer, air filter and oil mist filter. Do not use lubricated air as it will adversely affect the characteristics.



- When the secondary pressure is lowered with an input signal, etc., the secondary air passes through the product and is discharged from the EXH port. Contamination on the secondary piping and on the inside of the load will have an adverse effect on the characteristics, etc.. Thus, keep the inside of the piping as clean as possible.
- If power is turned OFF under pressure, secondary pressure is held.
 - To discharge pressure, lower set pressure with an input signal and then turn OFF, or use a shut-off valve, etc. This holding state is not guaranteed for extended periods of time.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

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PrecsR
VacF/R
Clean FR
ElecPneR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Design/selection

⚠ CAUTION

■ Primary pressure:

- For 100 kPa pressure specifications, make sure that the pressure is not less than “set secondary pressure + 50 kPa”.
- For 500/900 kPa pressure specifications, make sure that the pressure is not less than the “set secondary pressure + 100 kPa”.
- Product life is shortened if primary pressure is not supplied for a long period while power is ON. Avoid this type of usage.

■ When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test under actual working conditions, or contact CKD before using this method.

■ When selecting the dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■ Working environment

Do not use the product where the product is exposed to direct sunlight or may come in contact with water, oil, etc. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body. Consult with CKD on specifications for use outside the designated specifications or for special applications.

■ Drip-proof environments

The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

■ Apply a signal to offset the residual pressure (1% F.S. or equivalent) in the waiting status where the input signal is set to 0 MPa. If an offset signal is not applied, unnecessary operation of the solenoid valve will occur, resulting in shorter service life.

■ Even when pressure is set to 0 MPa at 1% F.S. or less of max. control pressure, secondary pressure is not completely released. If precise 0 MPa is required, bleed the secondary side or install a 3-way valve on the secondary side to switch the secondary side to atmospheric pressure.

■ The processing performance of EVD-1000 Series is intended for small control targets. If pressure rises and falls frequently with large secondary side load capacity or with long piping to the control target, reducing the pressure will take a long time and the service life may become shorter since load is applied to the diaphragm and other exhaust side components.
In such applications, use EVD-3000 Series with higher supply and exhaust port performance.

Mounting, installation and adjustment

⚠ DANGER

Installation

■ Use power supply voltage and output within the specified voltage. Using voltage that exceeds the specified voltage could cause malfunctions, controller damage, electrical shock, or fire.
Do not use any load that exceeds the rated output. Otherwise, output damage or fire may result.

⚠ WARNING

Wiring

■ Check the connector pin and cable conductor wire color when wiring. Incorrect connections could cause damage, failures, or malfunctions. Check the wire color against instructions and precautions before wiring.

■ Ensure that wires are properly insulated. Check that wires do not come into contact with other circuits, that no ground faults occur, and that the insulator between terminals is not defective. Overcurrent could damage the product.

■ Use a stabilized DC power supply within the specified rating that has been insulated from the AC power supply. A non-insulated power supply could result in electrical shock. If power is not stabilized, the peak value could exceed the rating and damage the product or reduce precision.

■ Stop the control device and equipment and turn power OFF before wiring. Starting operation suddenly could cause unpredictable and dangerous operation. Conduct an energized test with control devices and equipment stopped. Be sure to discharge any accumulated electrostatic charge among personnel, tools, or equipment before and during work. Connect and wire bending resistant material, such as robot wire material for movable sections.

■ Do not use at levels exceeding the power supply voltage range. The product could rupture or burn if voltage exceeding the working range is applied or if an AC power supply (100 VAC) is applied.

■ Do not short-circuit the load. Failure to observe this could result in rupture or burning.

Mounting, installation and adjustment

CAUTION

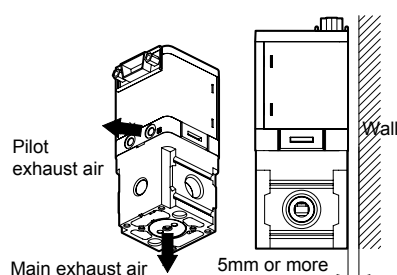
Installation

■ Mounting orientation

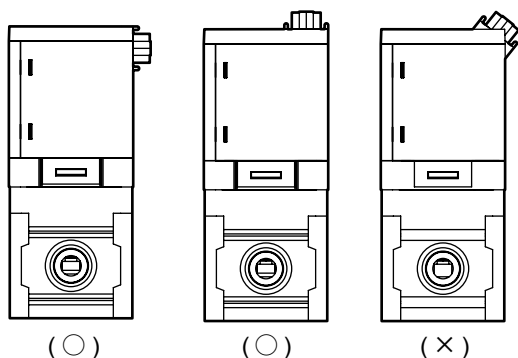
There are no restrictions to the mounting direction or mounting attitude, but provide sufficient space around the product for operation, mounting, removal, wiring and piping work.

■ Install a pneumatic filter just before the pneumatic component in the circuit.

■ Install so that the exhaust port is not blocked and provide sufficient space for exhaust. When mounting this product, do not use a mounting method that relies on support from the piping.



■ The D sub-connector's rotating mechanism is not designed for use in moving applications. Keep it facing upward or sideways (not obliquely) when using. If the cable may move, fix the cable or connector.



CAUTION

Piping

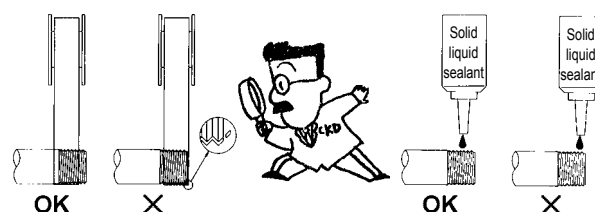
■ Do not remove the port seal until just before piping the product.

- Removing the dust-proof seal of the piping port before the piping work starts could allow foreign matter to enter from the port seal and cause failure or misoperation.

■ Sufficiently flush the piping with air before connecting. Prevent pipe from catching on parts of the sealing tape when piping.

■ When connecting pipes, wrap sealing tape in the opposite direction to the threading, from the inside position to within 2 mm from the pipe end.

- If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the pneumatic components, causing failures.



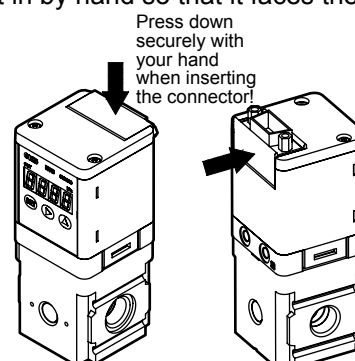
Wiring

■ The optional shield cable connector is a shielded wire.

- Insulate wires that are not being used so that they do not come into contact with other wires, including shielded wires. Unintended connection to the ground, etc., could cause malfunction or damage the product.

■ Insert and fit the D sub-connector securely on the back.

■ The D sub-connector has a 90° rotating mechanism. When fitting the D sub-connector, press it in by hand so that it faces the top or side.



■ Correct pressure control is not possible if the exhaust port is plugged. Release this port to the atmosphere.

■ Use appropriate torque to tighten the pipes when connecting them.

- The purpose is to prevent air leakage and damage to bolts.
- First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

■ The wiring part is mounted to the body with two hooks on the side of the housing. Be careful not to apply excessive force to the housing since doing so may cause the hooks to disengage and be damaged.

(Recommended tightening torque)

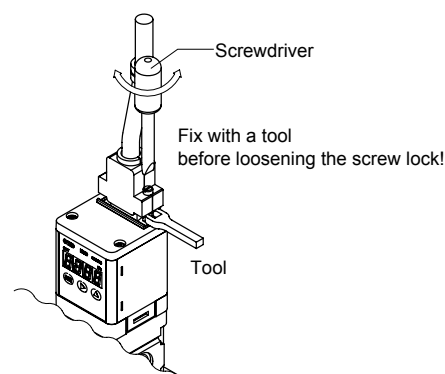
Port thread	Tightening torque N·m
Rc1/4	6 to 8
Rc3/8	13 to 15

F.R.L
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L (Lub)
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MedPresFR
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Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRISens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

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ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Mounting, installation and adjustment

- When supplying compressed air after connecting pipes, do not suddenly apply high pressure.
- Before supplying compressed air after connecting pipes, check that there are no air leaks at any pipe connections.
 - Apply a leakage detection agent on pipe connections with a brush, and check for air leaks.
- Lock the D sub-connector so that it will not be dislocated. Before loosening the lock, fix the fixing block with a tool, etc.



Use/maintenance

⚠ WARNING

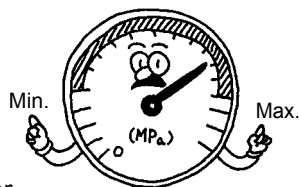
- Do not supply anything other than compressed air.
- Use clean compressed air that does not contain corrosive gases.
- Use oil-free clean dry air of JIS B 8392-1:2012 (ISO 8573-1: 2010) [1:3:2] or equivalent.
- Before conducting maintenance, turn the power OFF, stop the supply of compressed air and make sure that there is no residual pressure.
 - Observe the conditions to ensure safety.

⚠ CAUTION

- Conduct daily inspections and regular inspections to ensure that maintenance control is done correctly.
 - If maintenance is not correctly managed, the product's functions could deteriorate markedly and lead to a shortened service life, faults and accidents.

1. Control of supplied compressed air pressure

- Is the set pressure supplied? Does the pressure gauge indicate the set pressure while the equipment is operating?



2. Control of pneumatics filter

- Is the drain correctly discharged?
Is the bowl or element clean enough to use?

3. Control of compressed air leaks from piping connections

- Is the state of the connection, especially at movable sections, normal? Leakage in piping could cause incorrect operation.

4. Operational status control

- Are operations delayed? Is exhaust normal?

5. Control of pneumatic actuator operation

- Is operation smooth? Is the end stop state normal?
Is coupling with the load normal?

- If abnormal operation occurs, turn power and pneumatic source OFF immediately and stop use.
- Use this product within the working pressure.
- Immediately after power is turned ON, this product does not start pressure control for approximately 2 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.
- When changing the output set value, turn OFF the equipment first in order to prevent unexpected operation in the control system equipment.
- Regularly inspect the product at least once a year to check that it operates correctly.
 - This product uses a small solenoid valve as an actuator. The service life may change depending on the frequency of operation triggered by pressure switching, the working conditions, etc.
- The term of warranty is set as one year or 3,000,000 repeated operations, whichever is earlier, so use this as an inspection guideline.
 - * The conditions for the 3,000,000 operations listed in the term of warranty are as follows. When repeatedly applying a stepped input signal which causes the control pressure to rise from zero to the maximum control pressure. The working air quality in this case shall be clean compressed air from the recommended air circuit. The secondary side load capacity shall be 300 cm³.
- The case is made of resin. Do not use solvent, alcohol or detergent in cleaning, or resin could absorb it. There is a risk of affecting the resin. Wipe off dirt with a rag soaked in a diluted neutral detergent solution and wrung out well.

Product-specific cautions: EVR Series

Design/selection

⚠ WARNING

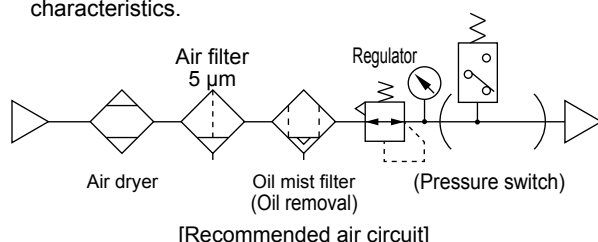
- If the regulator is left with the power OFF and the primary pressure applied, the secondary pressure could rise to the primary pressure level. If this poses a safety hazard, take system safety measures using a valve on the primary side or secondary side, etc.

⚠ CAUTION

- Poor air quality will worsen the characteristics and adversely affect the durability.

- Use clean dry air of JIS B 8392-1:2012 [1:3:2] or equivalent.

- For the pneumatic source, always supply clean air, from which solids, moisture and oil have been sufficiently removed with a dryer, air filter and oil mist filter. Do not use lubricated air as it will adversely affect the characteristics.



- When secondary pressure is lowered with an input signal, etc., secondary air passes through the EV and is discharged from the exhaust port (EXH port or R port). Contamination on the secondary piping and on the inside of the load will have an adverse effect on the characteristics, etc., Thus, keep the inside of the piping as clean as possible.
- If power is turned OFF under pressure, secondary pressure is held.
 - To discharge pressure, lower set pressure with an input signal and then turn OFF, or use a shut-off valve, etc. This holding state is not guaranteed for extended periods of time.
- Primary pressure must be over "Setting secondary pressure + max. control pressure x 0.1".
 - In particular, with the secondary side pressure set within a range up to 12% F.S., if the primary pressure is not supplied for long periods, the product service life will be shortened and its characteristics will deteriorate. Avoid this type of usage.
- Do not leave the product non-pressurized with power and input signals applied. Product life and properties could be reduced.
- The product cannot control 1% F.S. or less input signal.
 - The exhaust port (port R) should be open to the atmosphere to discharge air.

- Applying an input signal outside the specifications shown in the table below will cause unnecessary operation of the solenoid valve, resulting in shorter service life and deteriorated performance. Keep the signal within the specifications.

0 to 10 V	0 to 5 V	4 to 20 mA
Less than 0 V Exceeding 10 V	Less than 0 V Exceeding 5 V	Less than 4 mA Exceeding 20 mA

- Apply a signal to offset the residual pressure (5 kPa or equivalent) in the standby status where the input signal is set to 0 kPa. If an offset signal is not applied, unnecessary operation of the solenoid valve will occur, resulting in shorter service life.

- When the current input is wired, the power ground and signal common are shared.

- When driving several EV units with one PLC and D/A unit, depending on the D/A unit circuit, wiring could prevent the correct signal from being input. Contact the PLC manufacturer.

- The current input can be used with an input signal of 1 to 5 VDC. However, because input impedance is small (250 Ω) when compared to other voltage input, use an appropriate voltage generator.

- Due to the structure of EVR, a small amount of air is consumed from the EXH port when secondary pressure is generated.

- EVR-2509 Series has IN1 and IN2 supply ports on the body right and left, respectively. If the port is not used, be sure to plug it.

- Drip-proof environments

Refer to the specifications of each product to check the degree of protection before use. You cannot use the product if it does not satisfy the requirements of your use environment.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
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TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

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Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

Mounting, installation and adjustment

- **Mounting orientation**
There are no restrictions to the mounting direction or orientation, but provide sufficient space for exhausting from the exhaust port.

Use/maintenance

⚠ CAUTION

- Regularly inspect the product at least once a year to check that it operates correctly.
 - This product uses a small solenoid valve as an actuator. The service life may change depending on the frequency of operation triggered by pressure switching, the working conditions, etc.

- The term of warranty is set as one year or 3,000,000 repeated operations, whichever comes first, so use this as an inspection guideline.
 - * The conditions for the 3,000,000 operations listed in the term of warranty are as follows.
When the input signal which causes the set pressure to rise from zero to the max. control pressure is repeatedly applied in steps. Secondary side load capacity: 15 cm³.

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LgFRL
PrecsR
VacF/R
Clean FR
ElecPneUR
AirBoost
SpdContr
Silncr
CheckV/
other
Jnt/tube
AirUnt
PresCompn
Mech/
ElecPresSw
ContactSW
AirSens
PresSW
Cool
AirFloSens/
Contr
WaterRtSens
TotAirSys
(Total Air)
TotAirSys
(Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg
etc
Ending

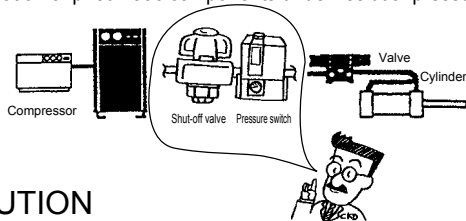
Product-specific cautions: Thin electro pneumatic regulator MEVT Series

Design/selection

Circuit design

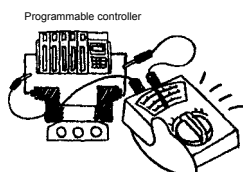
WARNING

- Understand the characteristics of compressed air before designing a pneumatic circuit.
 - The same functions as the mechanical, hydraulic, and electrical methods cannot be anticipated if instantaneous stopping and holding are required during an emergency stop.
 - Pop-out, air discharge, or leakage due to air compression and expansion may occur.
- Confirm before use that the product will withstand the working environment.
 - This product cannot be used in an atmosphere containing corrosive gases, chemical liquids, solvents, water, vapor or ozone. If water, oil, or metal chips (spatter or cutting chips, etc.) could come in contact with the product, provide appropriate protection.
 - This product cannot be used in an explosive gas atmosphere.
- Pay attention to the electric circuit during emergency stop and to the cylinder operation during power outages.
- Install a “pressure switch” and “shut-off valve” on the device’s compressed air supply side.
 - The pressure switch will disable operation until the set pressure is reached. The shut-off valve releases compressed air into the pneumatic pressure circuit to prevent accidents caused by operation of pneumatic components under residual pressure.



CAUTION

- Indicate the maintenance conditions in the device’s instruction manual.
 - The product’s performance may drop too low to maintain an appropriate safety level depending on usage conditions, working environment and maintenance status. With correct maintenance, the product functions can be used to the fullest.
- Use a constant voltage power supply.
- Set the input signal within the specifications.
 - Applying a signal exceeding the range could have adverse effects on the life and properties. Avoid this type of usage.
- Apply a signal to offset the residual pressure (EVT100: 2 kPa, EVT500: 10 kPa or equivalent) in the waiting status where the input signal is set to 0 MPa. If an offset signal is not applied, unnecessary operation of the solenoid valve will occur, resulting in shorter service life.
- Check for leakage current to avoid malfunction caused by leakage current from other fluid control components. When using a programmable controller, etc., leakage current could cause the EVT to malfunction.



24 VDC

1.8 mA or less

- Take the following countermeasures to prevent malfunction caused by noise.
 - Insert a line filter in the AC power supply line.
 - Use a surge suppressor, such as a CR or diode, on the inductive load (solenoid valve, relay, etc.), to remove noise from the source.
 - Separate the wiring to the MEVT from electrical lines with strong current.
 - Use the designated wire material for the serial transmission line.
 - If operation may be affected by noise, wire the power supply independently for each manifold when possible.
 - Keep the power supply cable as short as possible.
 - Do not share power with an inverter or components causing motor noise, etc.
 - Do not lay the power wire, signal wire, and other power cables in parallel.

Precautions for wiring

- When wiring the common terminal block and D sub-connector, the power supply gland and signal common are shared. When driving several EVT units with one PLC and D/A unit, depending on the D/A unit circuit, wiring could prevent the correct signal from being input. Contact the PLC manufacturer. When using a shielded wire, connect to the gland on the power supply side.
- This regulator cannot be used with a cylinder having a large leakage rate, such as an air bearing cylinder.
 - When using for blowing applications or when back pressure is applied on the secondary side, it is not possible to maintain the set pressure. A loud thrumming sound will be generated and service life will be shortened. Avoid this type of usage.
- Residual pressure of 2 kPa or less (EVT100) or 10 kPa or less (EVT500) is generated even when the input signal is set to 0%. If 0 MPa is required, install a three-way valve on the secondary side or release into to the atmosphere, etc.

CAUTION

- Install valves on the primary side and secondary side as necessary.
 - If the regulator is left with the power OFF and the primary pressure applied, the secondary pressure could rise to the primary pressure level. If this poses a safety hazard, take system safety measures using a valve on the primary side or secondary side, etc.
- Working environment

Do not use the product where the product is exposed to direct sunlight or may come in contact with water, oil, etc. Consult with CKD on specifications for use outside the designated specifications or for special applications.

 - Ambient temperature
 - If used in an environment with a temperature higher than 50°C or lower than 5°C
 - Vibration/impact
 - Do not use this product in an environment exposed to vibrations of 50 m/s² and over or impacts of 300 m/s² and over.
- Pressure accuracy is affected by temperature characteristics and heat generated when energized. The more manifold stations there are, the greater the effect. Provide sufficient standby time (30 minutes or more after energizing) if you need to obtain a more stable pressure.

■ Drip-proof environments

The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

■ Working conditions for CE compliance

MEVT conforms to the EMC Directive and CE standard. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:

Conditions

- Use a power cable shorter than 3 m.

Mounting, installation and adjustment

Installation

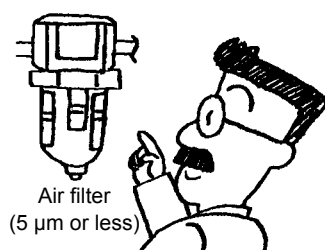
⚠ WARNING

- Do not install the MEVT by supporting it with pipes.
 - Mount and fix the MEVT body.
- Do not wash the MEVT with water or solvent, or paint the body.
 - Otherwise some resin parts may be damaged.

Paint could plug the exhaust port and result in malfunctions.

⚠ CAUTION

- Secure sufficient space around the MEVT for installation, removal, wiring, and piping work.
- Install a pneumatic filter just before the pneumatic component in the circuit.
- Response is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the preceding stage.



■ Mounting orientation

- The MEVT is mounted on a DIN rail. If the manifold's total weight exceeds 1 kg, or when using the MEVT in an environment with vibration or impact, fix the DIN rails on the mounting surface with a pitch of 50 to 100 mm. Check that there are no problems with installation.
- Although there is no restriction in mounting direction and orientation, attention should be paid to loose mounting screws caused by resonance due to vibration that may cause the manifold to fall off during operation.
- Mounting and removal method of MEVT

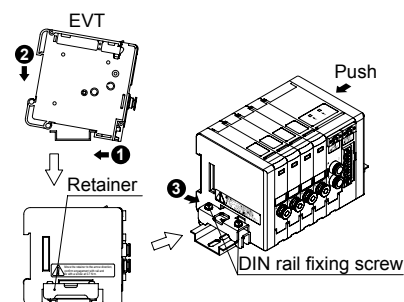
Removal

Loosen the four DIN rail set screws (two each on the left and right).

Installation

 1. Engage the jaws with the DIN rail in order from (1) to (2).
 2. Press the retainer in the direction of (3).
 3. Hold down the blocks so that there is no gap between them and fix the DIN rail with the set screws. (recommended tightening torque 0.6 to 0.8 N·m).

Note: If the retainer jaws are not securely engaged, air could leak or the product could fall. Check that these jaws are secure.



Piping

⚠ CAUTION

- Do not remove the MEVT packaging until just before piping.
 - If the package is removed before connecting pipes, foreign matter could enter the EVT from the piping port and result in fault or malfunction.
- Always flush just before piping pneumatic components.
 - Any foreign matter that has entered during piping must not enter the EVT.
- Connect piping so that connections are not dislocated by equipment movement, vibration, or tension.
- The exhaust port (port R) should be open to the atmosphere to discharge air appropriately.



- Do not narrow the EVT exhaust port (R) to a smaller one than the connected pipe port size.

Air may be taken in at the EVT exhaust port (R) due to valving element operation, causing foreign matter around the exhaust port (R) to enter the inside. Foreign matter may also enter when the exhaust port (R) is pointed upwards. Install a silencer and/or make the exhaust port (R) open downward.

- The actuator will not operate correctly if the exhaust air is not discharged smoothly. In the case of a manifold, exhaust air may prevent other EVT's normal operation.

- When supplying compressed air after connecting pipes, do not suddenly apply high pressure.

- The pipe connection could dislocate, causing the pipe tube to fly out, leading to accidents.
- CAUTION: If compressed air is supplied too slowly, sealing pressure may not be generated depending on the internal sealing mechanism of the EVT and may cause air leakage.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FmResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/
PTFE FRL
Outdrs FR
F.R.L
(Related)
CompFRL
LgFRL
PresSR
VacFR/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/
other
Jnt/tube
AirUnt
PresCompn
Mech/
ElecPresSw
ContactSW
AirSens
PresSW
Cool
AirFloSens/
Contr
WaterRtSens
TotAirSys
(Total Air)
TotAirSys
(Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg
etc
Ending

■ Before supplying compressed air after connecting pipes, check that there are no air leaks at any pipe connections.

- Apply a leakage detection agent on pipe connections with a brush, and check for air leaks.

■ Observe the following precautions when using nylon tubes or urethane tubes for piping material.

- Use flame-resistant tubes they could come in contact with spatter.

■ Piping connections

- Compatible tube
Use a CKD specified tube.
Soft nylon (F-1500 Series)
Urethane (U-9500 Series)
When using a commercially available tube, check external dimension accuracy, thickness, and hardness. Use an urethane tube with a hardness of 93° or more (rubber hardness scale). If a tube that does not satisfy the diameter accuracy or hardness is used, the chucking force may decrease or the tube may come off or be difficult to insert.

Tube dimensions

O.D.	mm	I.D. mm	
		Nylon	Urethane
φ4		φ2.5	φ2
φ6		φ4	φ4

Tolerance of outer diameter

Soft/hard nylon	±0.1 mm
Urethane φ4, φ6	+0.1 mm
	-0.15 mm

- Bending radius of tube

The tube's bending radius must be larger than the min. bending radius. (Otherwise, dislocation or leakage could result)

Bore size	Min. bending radius mm	
	Nylon	Urethane
φ4	10	10
φ6	20	20

- Min. tube length

As a guideline, the output port (A) tube length should have a capacity of 1 cc and over.

(Otherwise, vibration may result.)

Bore size	Min. length mm	
	Nylon	Urethane
φ4	200	320
φ6	80	80

- Cutting the tube

Use a tube knife (AZ1200), and cut at a right angle to the axis. Air could leak if a tube cut diagonally is inserted.

- Tube connection state

From the end of the fitting, provide a straight section that is as long as the O.D. of the tube being used, and avoid sudden bends in the piping at the fitting insertion port. Check that the tube's tensile strength in the lateral direction does not exceed 40 N.

- Compatible blanking plug

Use a CKD specified blanking plug.

Blanking plug GWP□-B Series

Use/maintenance

Air Quality

⚠ WARNING

■ Do not supply anything other than compressed air.

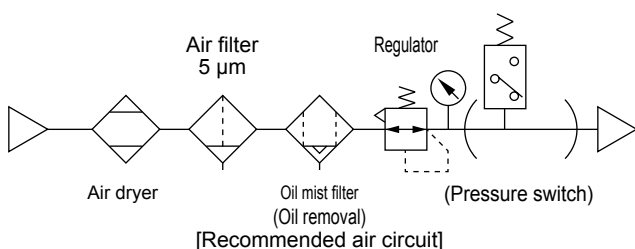
■ Use clean compressed air that does not contain corrosive gases.

■ Use clean dry air of JIS B 8392-1:2012 (ISO 8573-1: 2010) [1:3:2] or equivalent.

⚠ CAUTION

■ Poor air quality will worsen the characteristics and adversely affect the durability.

- For the pneumatic source, always supply clean air, from which solids, moisture and oil have been sufficiently removed with air dryer, filter and oil mist filter.



- If the secondary side pressure is reduced, air on the secondary side will pass through the EVT interior and exit from the exhaust port (R). Contamination on the secondary piping and on the inside of the load will have an adverse effect on the characteristics, etc., Thus, keep the inside of the piping as clean as possible.

- Pneumatic components must be disassembled and assembled by qualified personnel.

Personnel involved in this step must have passed the Pneumatic Pressure Skill Test Class 2 or higher.

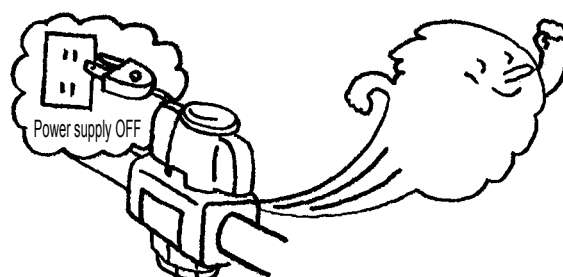
- Read the relevant product instruction manual thoroughly and fully familiarize yourself with the task before disassembling or assembling the pneumatic components.

Use/maintenance

⚠ WARNING

■ Before conducting maintenance, turn the power OFF, stop the supply of compressed air and make sure that there is no residual pressure.

- Observe the conditions to ensure safety.

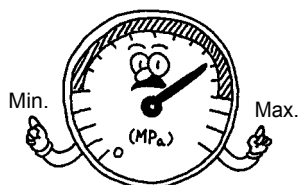


CAUTION

- To ensure that maintenance control is done correctly, conduct daily inspections and regular inspections.
 - If maintenance is not correctly managed, the product's functions could deteriorate markedly and lead to a shortened service life, faults and accidents.

1. Control of supplied compressed air pressure

- Is the set pressure supplied? Does the pressure gauge indicate the set pressure while the equipment is operating?



2. Control of pneumatics filter

- Is the drain correctly discharged?
Is the bowl or element clean enough to use?

3. Control of compressed air leaks from piping connections

- Is the state of the connection, especially at movable sections, normal?

4. EVT Operational status control

Are operations delayed? Is exhaust normal?

5. Control of pneumatic actuator operation

- Is operation smooth? Is the end stop state normal?
Is coupling with the load normal?

- Regularly inspect the product at least once a year to check that it operates correctly.

- This product uses a small solenoid valve as an actuator. The service life may change depending on the frequency of operation triggered by pressure switching, the working conditions, etc.

The term of warranty is set as one year or 1,000,000 repeated operations, whichever comes first, so use this as an inspection guideline.

* The conditions for the 1,000,000 operations listed in the term of warranty are as follows.

When repeatedly applying a stepped input signal which causes the control pressure to rise from zero to the maximum control pressure. The working air quality in this case shall be clean compressed air from the recommended air circuit. The secondary side load capacity shall be 15cm³.

Others

CAUTION

- Do not disassemble the product. Doing so may cause product failure.

Operation after disassembly cannot be guaranteed.

- If power is turned OFF under pressure, control pressure is held.

To discharge pressure, lower set pressure and turn power OFF, or use a shut-off valve, etc. This holding state is not guaranteed for a long periods.

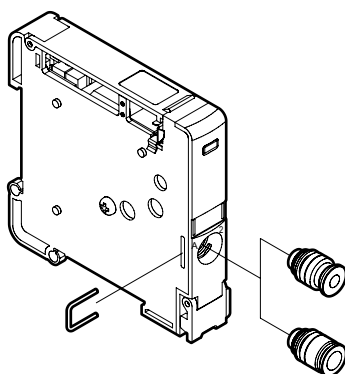
- Check that supply pressure does not drop to less than the "Setting secondary pressure + max. control pressure x 0.1". If primary side supply pressure is not supplied for long periods and when the secondary side control pressure is set greater than 0 MPa to 12% F.S., a loud thrumming sound will be generated and service life will be shortened. Avoid this type of usage.

- When using the EVT Series, if there is leakage in the secondary piping, vibration could occur. Securely pipe the system so that there is no leakage. Otherwise the set pressure cannot be maintained, causing a large buzzing noise and resulting in a shorter service life.

How to replace the cartridge fitting

CAUTION

Check procedures before changing the push-in fitting size. If installed incorrectly, air leakage could occur.



- (1) Remove the stopper pin with a screwdriver.
- (2) Remove the fitting.
* Check that the filter is not removed when replacing the fitting.
- (3) Insert the replacement fitting vertically to the end.
- (4) Insert the stopper pin. Pull on the fitting to confirm that it is properly installed.

Model No. of cartridge push-in fitting

Model	Part name	Model No.
EVT	φ4 straight	4G1-JOINT-C4
	φ6 straight	4G1-JOINT-C6

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FmResistFR
Oil-ProhR
MedPresFR
No Cu/PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/other
Jnt/tube
AirUnt
PrecsCompn
Mech/ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FmResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneur
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

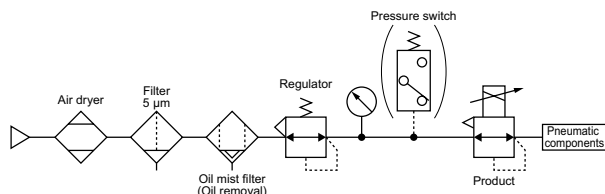
Product-specific cautions: EVS2 Series

Design/selection

CAUTION

- Poor air quality will worsen the characteristics and adversely affect the durability.

- The pneumatic source should use clean compressed air obtained by removing solid particles, moisture and oil from the fluid using air dryers, filters and oil mist filters.
(JIS B8392-1: 2012 (ISO 8573-1: 2010) [1:3:2])



If the control pressure is reduced, air on the secondary side will pass through inside the product and exit from the exhaust port (port R). Contamination on the secondary piping and on the inside of the load will have an adverse effect on the characteristics, etc. Thus, keep the inside of the piping as clean as possible.

- If the regulator is left with the power OFF and the primary pressure applied, the secondary pressure could rise to the primary pressure level. If this poses a safety hazard, take system safety measures using a valve on the primary side or secondary side, etc.

- If power is turned OFF under pressure, control pressure is held.
 - To discharge pressure, lower set pressure and turn power OFF, or use a shut-off valve, etc.
This holding state is not guaranteed for extended periods of time.
- The working pressure is applied to supply the specified pressure for the control pressure. Ensure that the working pressure stays within the specified range.
 - Especially when the control pressure has been set to from 0% F.S. to 12% F.S. and the working pressure is not supplied. If the working pressure becomes near or lower than the control pressure, unnecessary operation of the solenoid valve will occur resulting in a shorter service life.
- Control of this product will not be possible if the input signal range is only set from 0% F.S. to 1% F.S.
- Applying an input signal outside the specifications will cause unnecessary operation of the solenoid valve, resulting in shorter service life and deteriorated performance. Keep the signal within the specifications.

Mounting, installation and adjustment

CAUTION

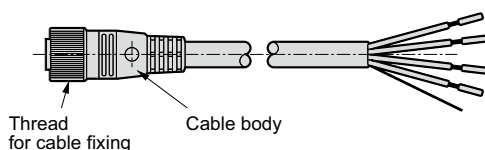
- The exhaust port (port R) should be open to the atmosphere to discharge air.
- Min. tube length
As a guideline, the output port (A) pipe length should have a capacity of 1 cc and over. (Failure to do so could result in vibration)
(For reference) Tube size $\phi 4$: Min. 320 mm
Tube size $\phi 6$: Min. 80 mm
- Do not use the product if there is leakage on the secondary side, the secondary side is open for blowing, or the secondary side is open to the atmosphere. Otherwise the set pressure cannot be maintained, causing a loud buzzing noise and resulting in a shorter service life.

- In the wiring of the product, the ground line of the power supply serves as the signal common line. When driving several EVS2 units with one PC and D/A unit, depending on the D/A unit circuit, wiring could prevent the correct signal from being output. Consult with the PC manufacturer.
- The optional shielded cable connector is a 4-conductor shield wire.
When not using the green wire (for analog output), insulate it to prevent it from contacting with other wires (including shielded wires).

Use/maintenance

⚠ CAUTION

- The optional shielded cable connector is a 4-conductor shield wire.
- When not using the green special wire (for monitor output, etc.) for the EVS2 Series, insulate it to prevent it from contacting other wires (including shielded wires). Unintended connection to the ground, etc., could cause malfunction or damage to the product.
Also, the wiring must be kept away from noise sources such as an intense electric fields. Otherwise an external induction noise added to the analog output will cause product damage.
 - The shielded wire on the body of the EVS2 Series is connected to the green wire of the optional shielded cable connector. Connect the green wire and shielded wire to the ground line of the power supply.
- When connecting the shielded cable connector, keep the cable body stable and fasten the cable fixing screw by hand. If the cable is not kept stable, the connector on the product body side will turn and may be damaged.



- Regularly inspect the product at least once a year to check that it operates correctly.
 - This product uses a small solenoid valve as an actuator. The service life may change depending on the frequency of operation triggered by pressure switching, the working conditions, etc.
- The term of warranty is set as one year or 3,000,000 repeated operations, whichever comes first, so use this as an inspection guideline.
 - * The conditions for the 3,000,000 operations listed in the term of warranty are as follows. When repeatedly applying a stepped input signal which causes the control pressure to rise from zero to the maximum control pressure. The air quality must be clean compressed air from the recommended air circuit and the secondary side load capacity is to be 15 cm³ for the EVS2 Series.

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FmResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneuR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PrecsCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending

MEMO

F.R.L
F
R
L
Pressure SW
Shut-off valve
Slow start valve
Flame-resistant FR
Oil-prohibited R
Medium pressure FR
Copper and PTFE free FRL
Outdoors FR
FRL (Related products)
Compact FRL
Large FRL
Precision R
Vacuum F/R
Clean FR
Electro pneumatic R
Air booster
Speed Controller
Silencer
Check valves/others
Fittings/tubes
Air unit
Precision components
Mechanical Electronic pressure SW
Contact Over contact continuous SW
Air sensor
Pressure SW for coolant
Flow sensor for air controller
Flow rate sensor for water
Total air systems (Total Air)
Total air systems (Gamma)
Refrigeration air dryer
Desiccant type dryer
High polymer membrane dryer
Main line filter
Drain Discharger, etc.
Ending