Flow Controller for Water

RoHS

For the stepless control of water flow rate in proportion to electrical signals

New IO-Link

IP65

Flow rate control accuracy
±5% F.S.

Response time
10 s or less

Parts in contact with fluid: Grease-free

New
Rated control flow rate range: A 5 to 40 (L/min) specification has been added.

Variations

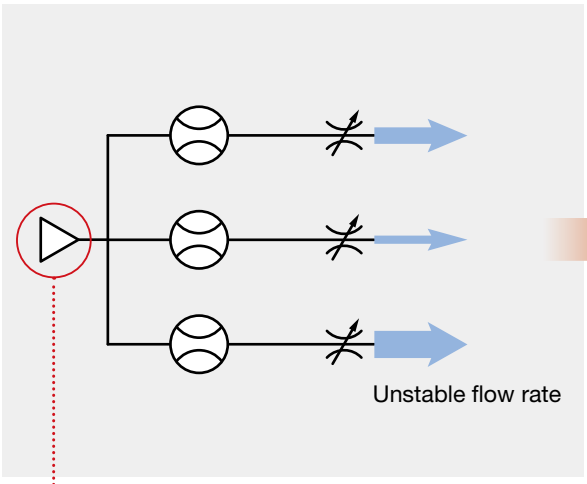
Series	Rated control flow rate range [L/min] 0.5 – 2 – 4 – 5 – 16 – 40	Port size 3/8	1/2	3/4
FC3W504	0.5 to 4	●	–	–
FC3W520	2 to 16	●	●	–
New FC3W540	5 to 40	–	●	●

***FC3W* Series**

SMC

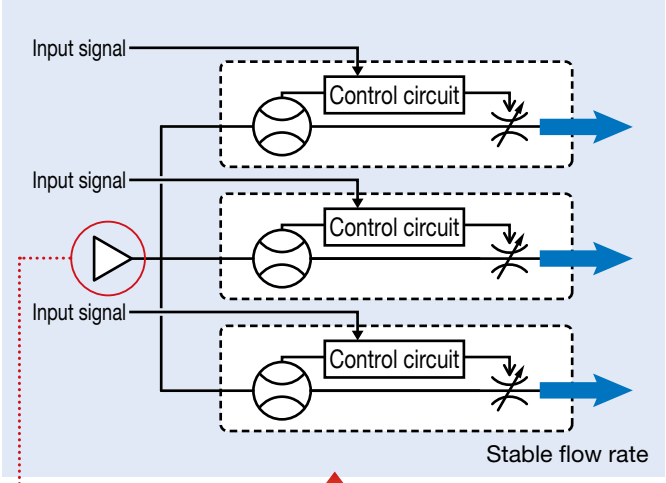
CAT.ES100-160B

With manual valve control, when the upstream pressure changes, the flow rate of each line becomes unstable, making adjustment difficult.

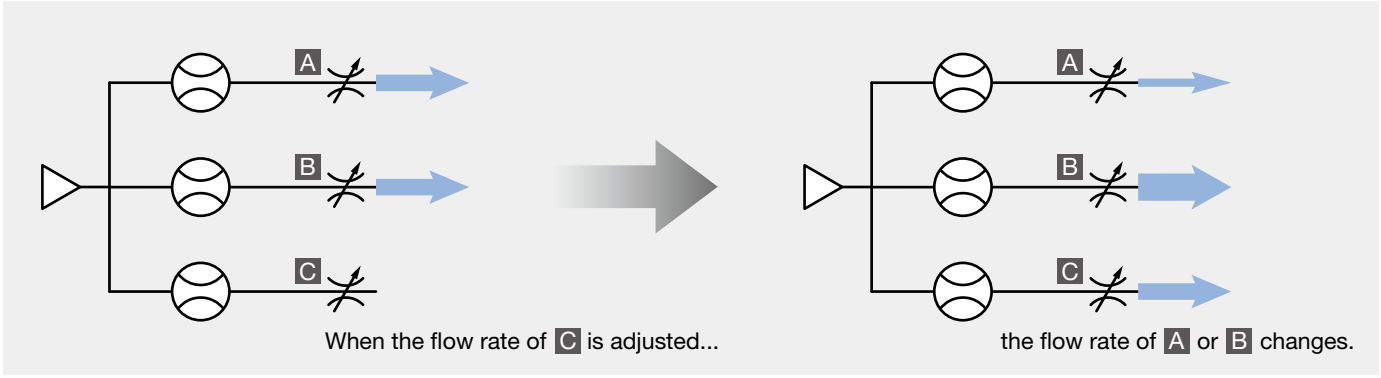


With an FC3W

The flow rate of each line is adjusted to a stable value when the upstream pressure changes.

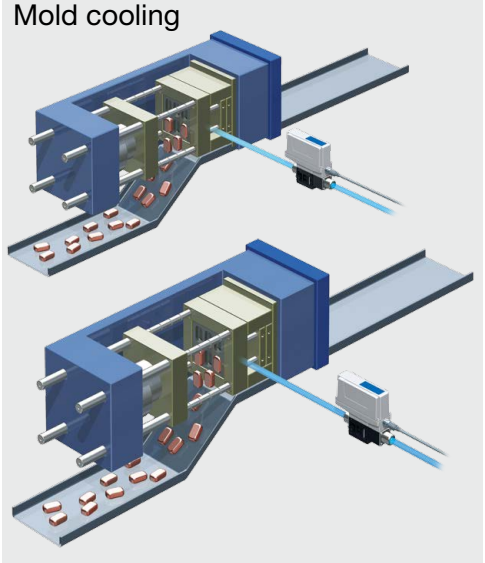


It's difficult to adjust the flow rate settings of multiple lines.

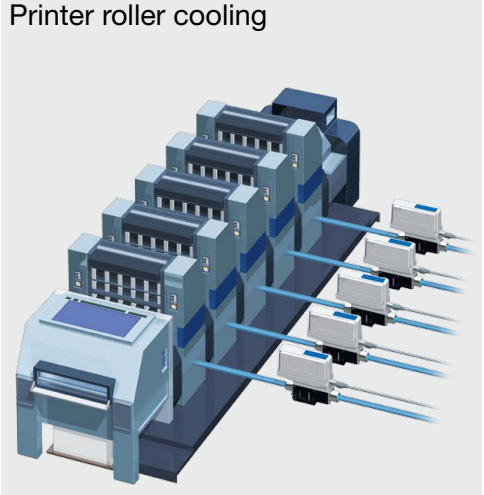


Application Examples

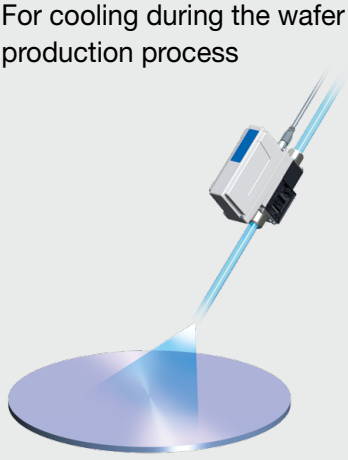
Mold cooling



Printer roller cooling

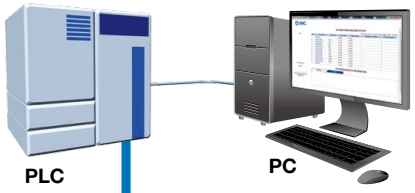


For cooling during the wafer production process



New IO-Link Compatible FC3W5□-□□-L□-□□

Visualization of operation/equipment status/Remote monitoring and control by communication



Configuration File (IODD File*1)

· Manufacturer · Product part no.

*1 IODD File:
IODD is an abbreviation of IO Device Description. This file is necessary for setting the device and connecting it to a master. Save the IODD file on the PC to be used to set the device prior to use.

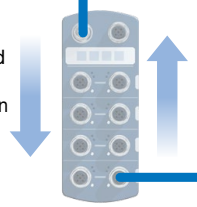
IO-Link

IO-Link is an open communication interface technology between the sensor/actuator and the I/O terminal that is an international standard, IEC 61131-9.

Device settings can be set by the master.

- Flow rate command value
- Valve opening position command value
- Control mode, etc.

Fieldbus



IO-Link Master

Read the device data.

- Measured flow rate value, Valve opening position
- Control status (Control mode, control completed/not completed, etc.)
- Device information (Product part number, serial number, etc.)
- Normal or abnormal device status, etc.

IO-Link Compatible Device FC3W5□-L

Port class B compliant

* When using a port class A IO-Link master, use the Y branch connector described on page 12.

- Visualizes control and equipment status, and enables remote control and monitoring by communication
- Equipped with a valve opening position control mode providing direct command of the valve opening position (amount of restriction) (IO-Link compatible models only)
- Implement various status diagnostic bits in the process data.
  It is possible to obtain the control completion status and component error status in real-time based on information in the cyclic (periodic) process data.

Input Process Data

Bit offset	Item	Note	
0 to 1	Control mode	0: Control stop	1: Flow control 2: Valve opening position control 3: Return to origin
2	Flow control completed	0: Not completed	1: Completed
3	Valve opening position control completed	0: Not completed	1: Completed
7	Origin detection	0: Not detected	1: Detected (Valve opening position control available)
8	Measurement diagnosis	0: Within the rated flow	1: Out of range (Measured flow rate value out of rated flow range)
9	Output PD diagnosis	0: Within the range	1: Out of range (Output process data out of range)
10	Insufficient flow rate	0: Normal	1: Insufficient flow rate
11	Lifespan diagnosis	0: Normal	1. Exceeded lifespan judgment threshold
14	Error (Other than system error)	0: Error not generated	1: Error generated
15	System error	0: Error not generated	1: Error generated
16 to 31	Valve opening position	Signed 16 bit	
32 to 47	Measured flow rate value	Signed 16 bit	

Error description
· Outside of power supply voltage range · Over current · Out of control · Insufficient flow rate · IO-Link master version error
· Abnormal internal electronic circuit

Bit offset	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
Item	Measured flow rate value (Signed 16 bit)															

Bit offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Item	Valve opening position (Signed 16 bit)															

Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	System error	Error	Reservation		Lifespan diagnosis	Insufficient flow rate	Output PD diagnosis	Measurement diagnosis	Origin detection	Reservation			Valve opening position control completed	Flow control completed	Control mode	

Output Process Data

Bit offset	Item	Note
0 to 1	Control mode	0: Control stop mode 1: Flow control mode 2: Valve opening position control mode 3: Return to origin mode
16 to 31	Valve opening position command value	Signed 16 bit
32 to 47	Flow rate command value	Signed 16 bit

Bit offset	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
Item	Flow rate command value (Signed 16 bit)															

Bit offset	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Item	Valve opening position command value (Signed 16 bit)															

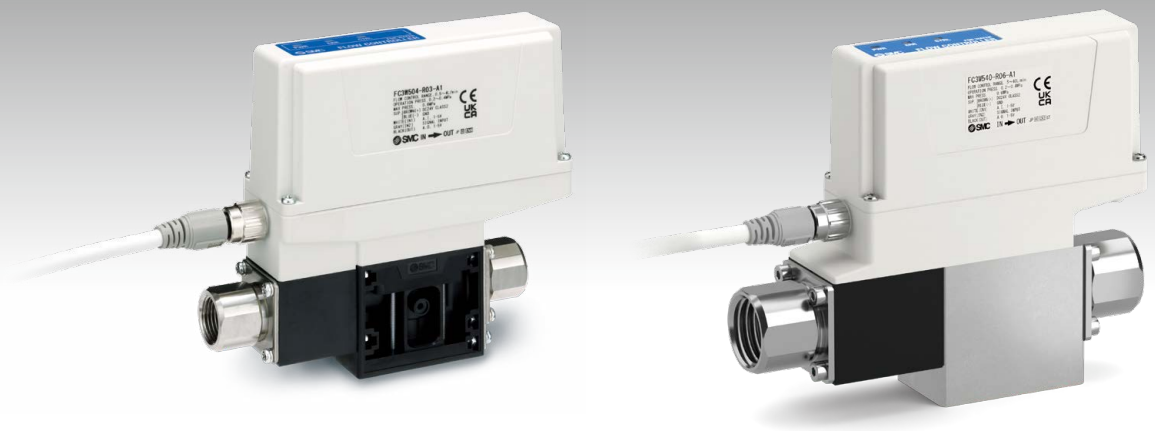
Bit offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Item	Reservation														Control mode	

* Variation of Control Modes (Bit offset 0, 1)

Bit offset 1	Bit offset 0	Control mode	Description
0	0	Control stop	The valve opening position is fixed to its current position, regardless of the command value.
0	1	Flow control	The device is controlled using the flow rate command value (corresponding to the rated control flow rate).
1	0	Valve opening position control	The device is controlled using the valve opening position command value (corresponding to a valve opening position of between 0 to 100%).
1	1	Return to origin	Returns the valve opening position to the origin position (which can be set to either fully closed or fully open), regardless of the command value

CONTENTS

Flow Controller for Water *FC3W Series*



How to Order ····· p. 4

Specifications ····· p. 5

Flow Rate Command Input and Control Flow Rate ····· p. 7

Control Flow Rate and Analog Output ····· p. 7

Pressure Loss ····· p. 7

Internal Circuits and Wiring Examples ····· p. 8

Construction: Parts in Contact with Fluid ····· p. 8

Dimensions ····· p. 9

Accessories ····· p. 11

List of Functions, Product Operating Life, and Water Hammer ····· p. 14

Safety Instructions ····· Back cover

Flow Controller for Water
FC3W Series

How to Order

FC3W5 [04] – [R] [03] – [A1] [C] – [R] [Z]

Rated control flow rate range

Symbol	Rated control flow rate range
04	0.5 to 4 L/min
20	2 to 16 L/min
40	5 to 40 L/min

Thread type

Symbol	Thread type
R	Rc
N	NPT
F	G

Port size

Symbol	Port size	Rated control flow rate range		
		04	20	40
03	3/8	●	●	–
04	1/2	–	●	●
06	3/4	–	–	●

Input/Output specifications

Symbol	IN1	IN2	OUT1
A1	Voltage 1 to 5 V	External input (Control stop)	Voltage 1 to 5 V
A2	Current 4 to 20 mA		Current 4 to 20 mA
A3	Voltage 0 to 10 V		Voltage 0 to 10 V
L	IO-Link		

Operation manual/ Calibration certificate

Symbol	Description	
	Operation manual	Calibration certificate
Y	Without	Without
Z	With	Without
T	Without	With
K	With	With

∗ The certificate is in both English and Japanese.

Option 2 (Bracket)

Symbol	Bracket
R	With bracket∗1
N	None

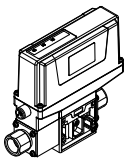
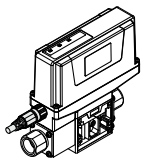
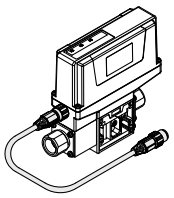
∗1 The bracket is shipped together with the product but does not come assembled.

Option 1 (Lead wire)

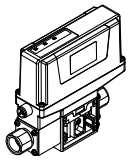
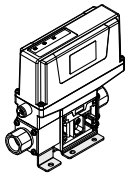
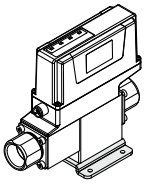
Symbol	Accessory cable
C	Lead wire with M12 connector (3 m, 5 cores)
Q	Lead wire with M12-M12 connector (3 m, 5 cores)∗1
N	None

∗1 The lead wire has an M12 (socket) connector on one side and an M12 (plug) connector on the other side.

Option 1 (Lead wire)

N	C	Q
None 	Lead wire with M12 connector (3 m, 5 cores) **ZS-53-A** 	Lead wire with M12-M12 connector (3 m, 5 cores) **ZS-53-D** 

Option 2 (Bracket)

N	R	
None 	For the FC3W504 and FC3W520  **ZS-54-A** The bracket and 6 tapping screws (3 x 8 L) are included with the product.	For the FC3W540  **ZS-54-B** The bracket and 4 screws (M4 x 8 L) are included with the product.

Specifications

Analog Input/Output Type (FC3W5□-□□-A1/A2/A3□-□□)

Model			Analog input/output type		
			FC3W504	**FC3W520**	**FC3W540**
Fluid	**Applicable fluid**		Water		
	Fluid temperature range		0 to 50°C (No freezing or condensation)		
Flow	**Flow rate detection method**		Karman vortex		
	Rated control flow rate range∗1		0.5 to 4.0 L/min	2.0 to 16.0 L/min	5.0 to 40.0 L/min
	Leakage when fully closed∗2		0.4 L/min or less	1.0 L/min or less	2.0 L/min or less
Control	**Control accuracy**∗3		±5% F.S.		
	Control dead band∗4		Within ±2% F.S. of the flow rate command value		
	Repeatability		±3% F.S.		
	Temperature characteristics		±5% F.S. (0 to 50°C, 25°C reference)		
	Settling time∗5		10 s or less within ±5% F.S. of flow command		
	Operation when power is cut off∗6		Maintains valve opening position		
Pressure	**Operating pressure range**∗7		0.2 to 0.4 MPa		
	Min. operating differential pressure		0.2 MPa		
	Proof pressure		0.6 MPa		
Analog input∗8 **(Flow rate command)**	**Voltage**	**Input type**	1 to 5 VDC/0 to 10 VDC		
		Input impedance	Approx. 1 kΩ		
	Current	**Input type**	4 to 20 mA DC		
		Input impedance	250 Ω or less		
Analog output (Flow rate output)	**Voltage**	**Output type**	1 to 5 VDC/0 to 10 VDC		
		Output impedance	Approx. 1 kΩ		
	Current	**Output type**	4 to 20 mA DC		
		Load impedance	50 to 600 Ω		
External input (Control stop input)	**Input type**		Non-voltage input (0.4 V or less), Input time: 30 ms or more		
	Operation		Flow rate control operation stop (maintains valve opening position)		
Electrical	**Power supply voltage**		24 VDC ±10%		
	Current consumption∗9		0.1 A or less (at control stop/at control settling) 0.5 A or less (during control operation)		
Indicator LED			PWR (Green): Power status display ERR (Red): Error status display CTRL (Green): Control status display		
Environmental resistance	**Enclosure**		IP65		
	Operating temperature range		0 to 50°C (No freezing or condensation)		
	Operating humidity range		Operating/Stored: 35 to 85% RH (No condensation)		
	Withstand voltage		1000 VAC for 1 min between terminals and housing		
	Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing		
Standards			CE/UKCA marking		
Materials of parts in contact with fluid			Fluororubber, Stainless steel 304, Stainless steel 303, PP + PE, POM, PPS		
Piping			3/8 (Rc, NPT, G)	3/8, 1/2 (Rc, NPT, G)	1/2, 3/4 (Rc, NPT, G)
Weight		**Body**	Approx. 480 g	Approx. 500 g	Approx. 1330 g
		Bracket	Approx. 50 g		Approx. 110 g
		Lead wire (3 m)	Approx. 180 g		

∗1 Outside the rated control flow rate range, operation may become unstable.
∗2 This product is not suitable for applications in which the flow rate needs to be at exactly 0.
If it is necessary to completely shut off the flow rate, install a stop valve, etc. separately.
∗3 Includes a control dead band (±2% F.S.)
∗4 Control operation is stopped when the control flow rate is ±2% F.S. of the flow rate command value (control dead band).
∗5 Operating pressure: 0.3 MPa, Flow rate command value: Changes from 0% to 100% in steps
The settling time may be longer in other operating conditions.
∗6 When the power is turned OFF, the control valve operation is stopped to maintain the valve opening position.
∗7 Outside the operating pressure range, normal control operation may not be possible.
∗8 When the analog input terminal is open (no signal is input), the valve is fully closed.
∗9 If there is an abnormal control operation, such as when there is no supply pressure, the supply current may exceed the specification value.
∗ Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

Specifications

IO-Link Type (FC3W5□-□□-L□-□□)

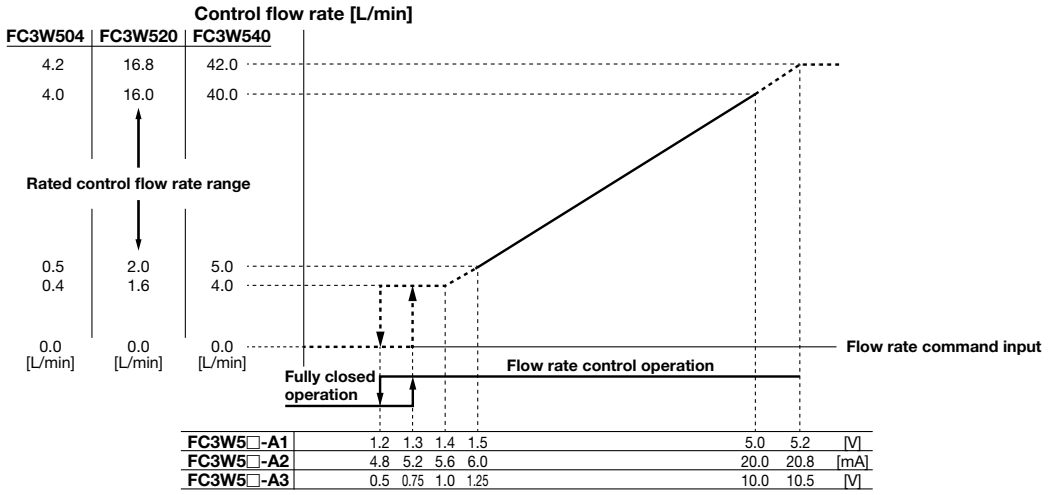
Model			IO-Link type		
			FC3W504	**FC3W520**	**FC3W540**
Fluid	**Applicable fluid**		Water		
	Fluid temperature range		0 to 50°C (No freezing or condensation)		
Flow	**Flow rate detection method**		Karman vortex		
	Rated control flow rate range∗1		0.5 to 4.0 L/min	2.0 to 16.0 L/min	5.0 to 40.0 L/min
	Leakage when fully closed∗2		0.4 L/min or less	1.0 L/min or less	2.0 L/min or less
Control	**Control accuracy**∗3		±5% F.S.		
	Control dead band∗4		Within ±0 to 10% F.S. of the flow rate command value (Default: ±2% F.S., Variable)		
	Repeatability		±3% F.S.		
	Temperature characteristics		±5% F.S. (0 to 50°C, 25°C reference)		
	Settling time∗5		10 s or less within ±5% F.S. of flow command		
	Operation when power is cut off∗6		Maintains valve opening position		
Pressure	**Operating pressure range**∗7		0.2 to 0.4 MPa		
	Min. operating differential pressure		0.2 MPa		
	Proof pressure		0.6 MPa		
Electrical	**Power supply voltage**		L+: 24 VDC ±10% (Control power supply) 2L+: 24 VDC ±10% (Valve driving power supply)		
	Current consumption∗8	**At control stop/at control settling**	L+: 0.06 A or less (Control power supply) 2L+: 0.02 A or less (Valve driving power supply)		
		During control	L+: 0.06 A or less (Control power supply) 2L+: 0.5 A or less (Valve driving power supply)		
Indicator LED			PWR (Green): Power status display ERR (Red): Error status display CTRL (Green): Control status display IO-Link (Green): Communication status display		
Environmental resistance	**Enclosure**		IP65		
	Operating temperature range		0 to 50°C (No freezing or condensation)		
	Operating humidity range		Operating/Stored: 35 to 85% RH (No condensation)		
	Withstand voltage		1000 VAC for 1 min between terminals and housing		
	Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing		
Standards			CE/UKCA marking		
Materials of parts in contact with fluid			Fluororubber, Stainless steel 304, Stainless steel 303, PP + PE, POM, PPS		
Piping			3/8 (Rc, NPT, G)	3/8, 1/2 (Rc, NPT, G)	1/2, 3/4 (Rc, NPT, G)
Weight		**Body**	Approx. 480 g	Approx. 500 g	Approx. 1330 g
		Bracket	Approx. 50 g		Approx. 110 g
		Lead wire (3 m)	Approx. 180 g		

∗1 Outside the rated control flow rate range, operation may become unstable.
∗2 This product is not suitable for applications in which the flow rate needs to be at exactly 0.
If it is necessary to completely shut off the flow rate, install a stop valve, etc. separately.
∗3 Includes a control dead band (±2% F.S.)
∗4 Control operation is stopped when the control flow rate falls within the range of the flow rate command value ±control dead band.
∗5 Operating pressure: 0.3 MPa, Flow rate command value: Changes from 0% to 100% in steps
The settling time may be longer in other operating conditions.
∗6 When the power is turned OFF, the control valve operation is stopped to maintain the valve opening position.
∗7 Outside the operating pressure range, normal control operation may not be possible.
∗8 If there is an abnormal control operation, such as when there is no supply pressure, the supply current may exceed the specification value.
∗ Products with tiny scratches, marks, or display color or brightness variations which do not affect the performance of the product are verified as conforming products.

Communication	**IO-Link type**	Device
	IO-Link version	V1.1
	Communication speed	COM2 (38.4 kbps)
	Port	Class B
	Configuration file	IODD file∗1
	Minimum cycle time	5.7 ms
	Process data length	Input data: 6 bytes Output data: 6 bytes
	On request data communication	Supported
	Data storage function	Supported
	Event function	Supported
	Vendor ID	131 (0x0083)
	Device ID	FC3W504-□□-L□-□□: 0x02DF (735) FC3W520-□□-L□-□□: 0x02E0 (736) FC3W540-□□-L□-□□: 0x02E1 (737)

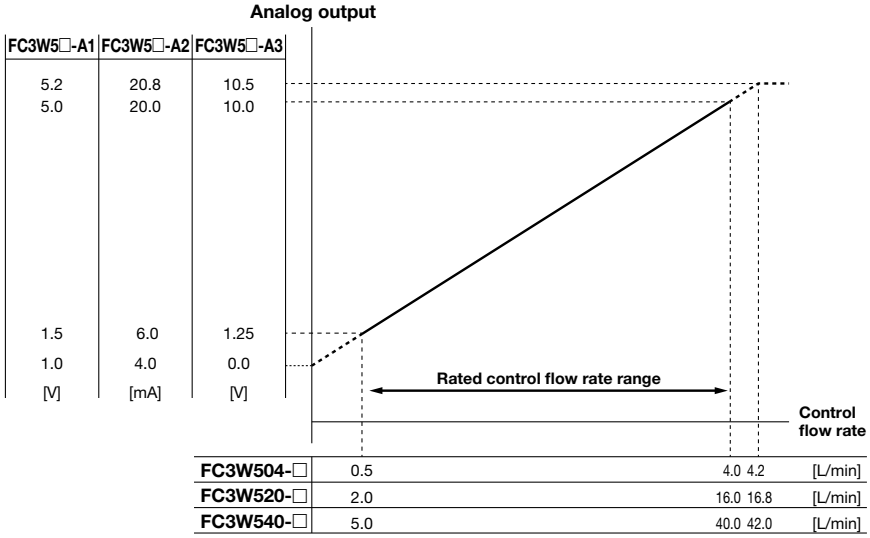
∗1 The configuration file can be downloaded from the SMC website: https://www.smcworld.com

Flow Rate Command Input and Control Flow Rate



FC3W5□-A1	1.2	1.3	1.4	1.5		5.0	5.2	[V]
FC3W5□-A2	4.8	5.2	5.6	6.0		20.0	20.8	[mA]
FC3W5□-A3	0.5	0.75	1.0	1.25		10.0	10.5	[V]

Control Flow Rate and Analog Output

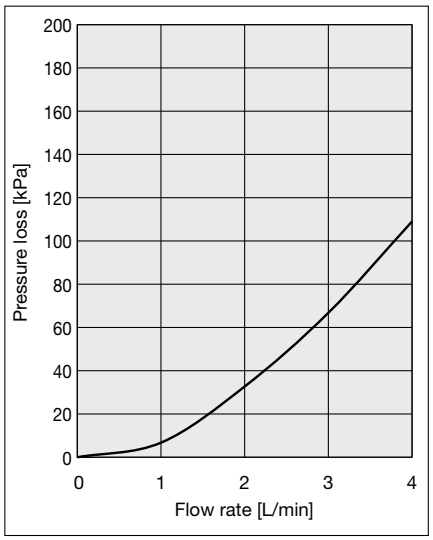


FC3W504-□	0.5	4.0	4.2	[L/min]
FC3W520-□	2.0	16.0	16.8	[L/min]
FC3W540-□	5.0	40.0	42.0	[L/min]

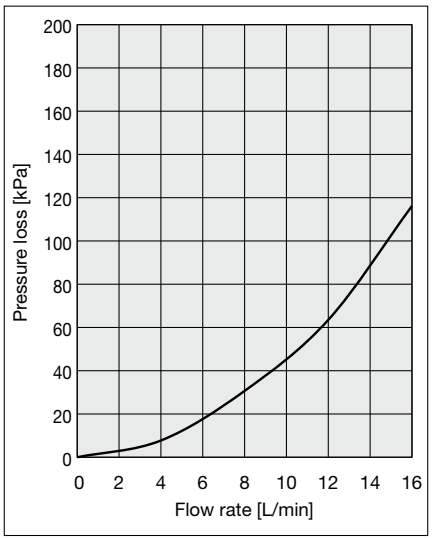
* When using 0-10 V output (model A3), keep the current flowing into the analog output wire below 20 uA. If a current higher than 20 uA flows, large errors may occur in the output area of approx. 0.5 V or less.

Pressure Loss

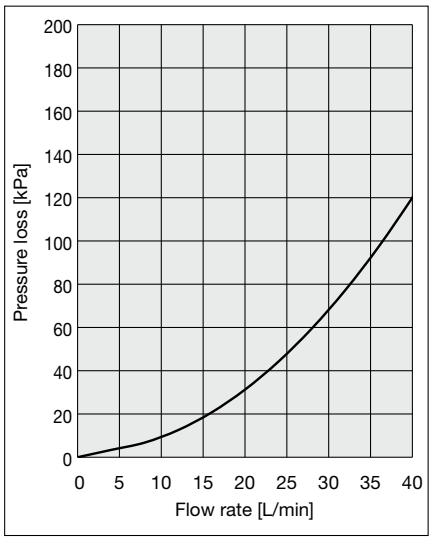
FC3W504-□



FC3W520-□

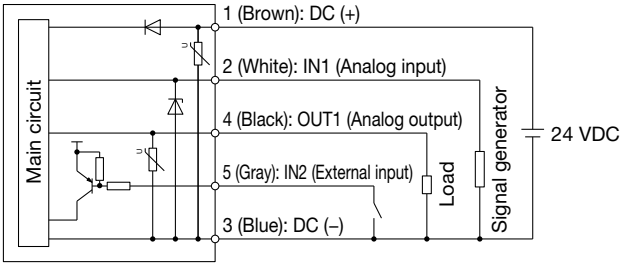


FC3W540-□



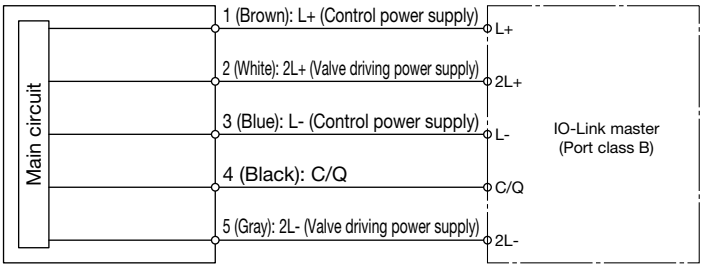
Internal Circuits and Wiring Examples

Analog input/output type (FC3W5□-□□-A1/A2/A3□-□□)



Model	IN1 (Analog input)	IN2 (External input)	OUT1 (Analog output)
FC3W5□-□□-A1□-□□	1-5 V	Voltage input below 0.4 V: Control stopped (maintains valve opening position) Open: Control start	1-5 V
FC3W5□-□□-A2□-□□	4-20 mA		4-20 mA
FC3W5□-□□-A3□-□□	0-10 V		0-10 V

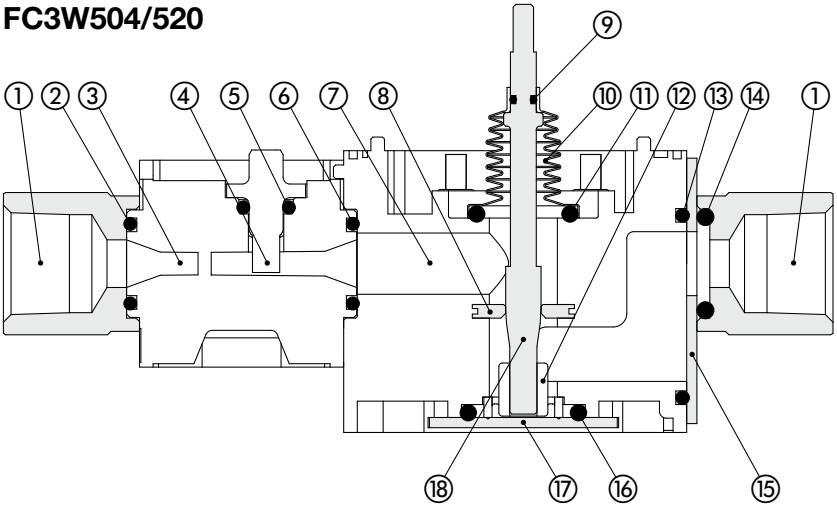
IO-Link type (FC3W5□-□□-L□-□□)



* When using a port class A IO-Link master, use the Y branch connector described on page 12.

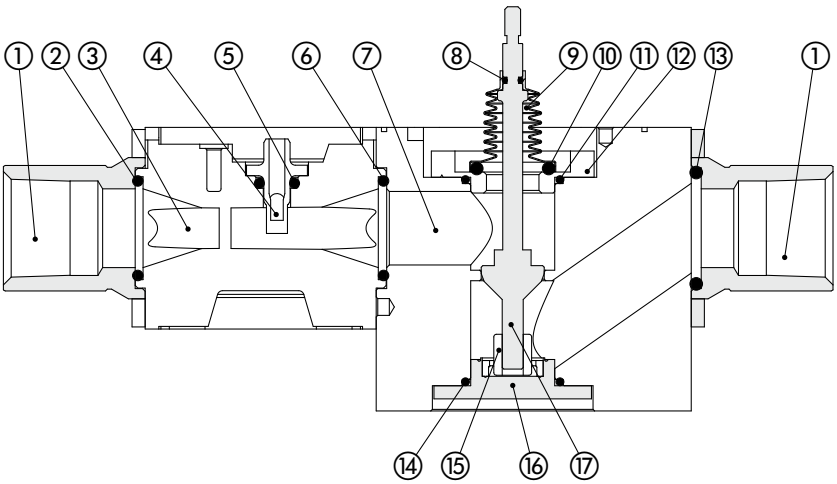
Construction: Parts in Contact with Fluid

FC3W504/520



No.	Description	Material
1	**Fitting for piping**	Stainless steel 304
2	**O-ring**	Fluororubber
3	**Sensor body**	PPS
4	**Sensor**	PPS
5	**O-ring**	Fluororubber
6	**O-ring**	Fluororubber
7	**Control valve body**	PPS
8	**Orifice**	Stainless steel 303
9	**O-ring**	Fluororubber
10	**Bellows**	PP + PE
11	**O-ring**	Fluororubber
12	**Needle guide**	POM
13	**O-ring**	Fluororubber
14	**O-ring**	Fluororubber
15	**Piping plate**	Stainless steel 304
16	**O-ring**	Fluororubber
17	**Bottom plate**	Stainless steel 304
18	**Needle**	Stainless steel 304

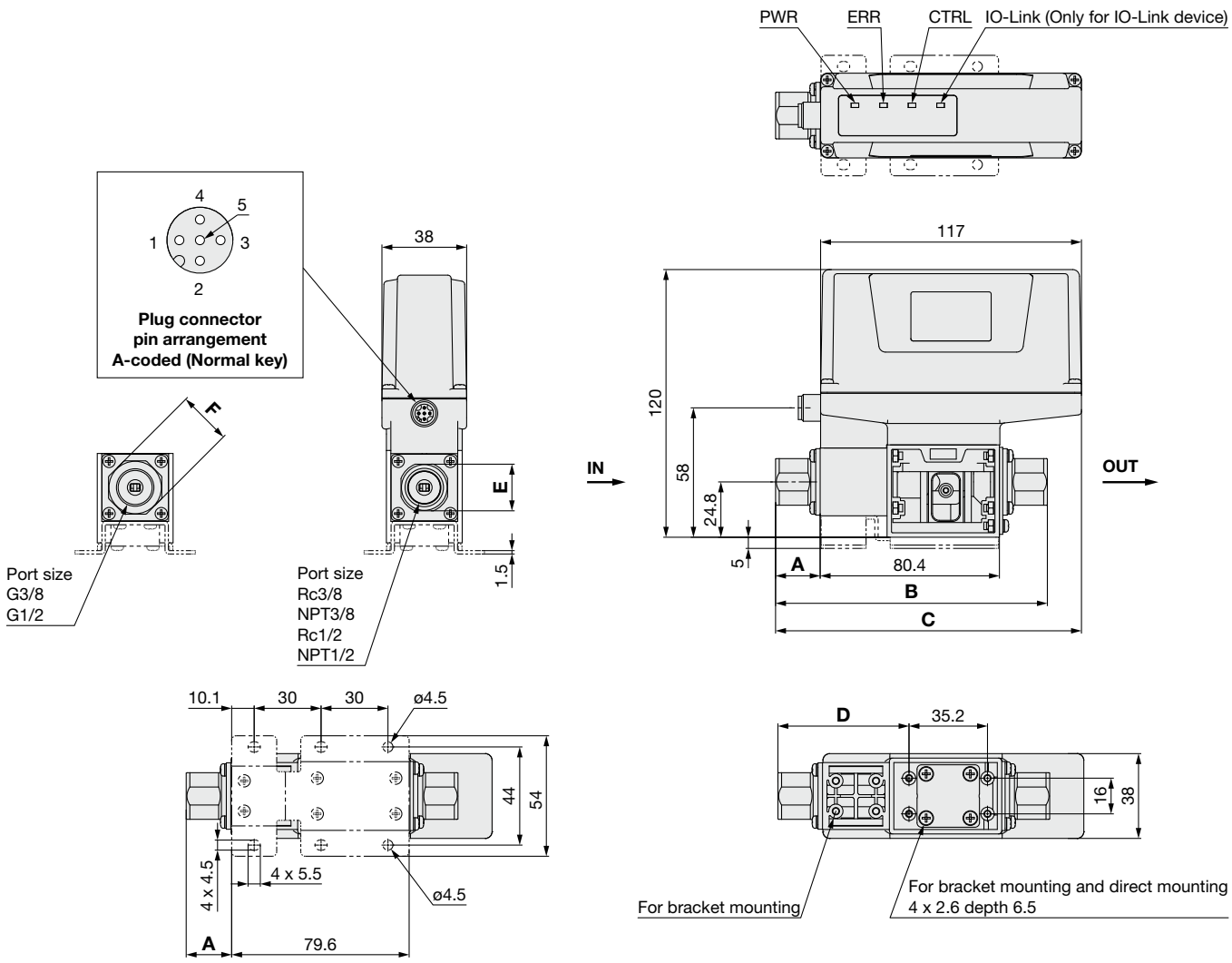
FC3W540

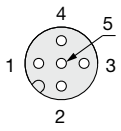


No.	Description	Material
1	**Fitting for piping**	Stainless steel 304
2	**O-ring**	Fluororubber
3	**Sensor body**	PPS
4	**Sensor**	PPS
5	**O-ring**	Fluororubber
6	**O-ring**	Fluororubber
7	**Control valve body**	Stainless steel 304
8	**O-ring**	Fluororubber
9	**Bellows**	PP + PE
10	**O-ring**	Fluororubber
11	**O-ring**	Fluororubber
12	**Spacer**	Stainless steel 304
13	**O-ring**	Fluororubber
14	**O-ring**	Fluororubber
15	**Needle guide**	POM
16	**Bottom plate**	Stainless steel 304
17	**Needle**	Stainless steel 304

Dimensions

FC3W504/520





Plug connector pin arrangement A-coded (Normal key)

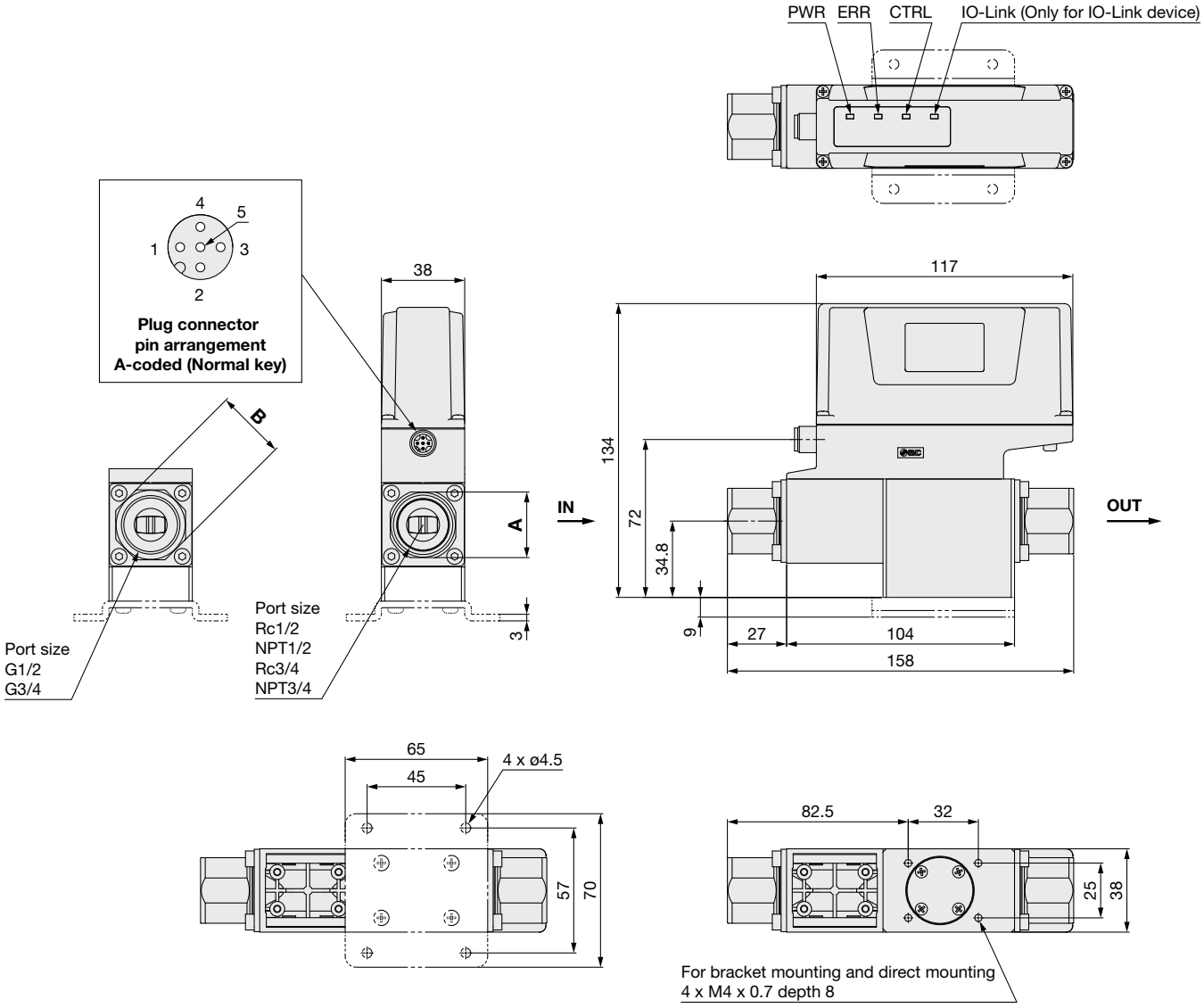
Pin no.	Wire color	Analog input/output type **FC3W5□-□□-A1/A2/A3□-□□**		IO-Link type **FC3W5□-□□-L□-□□**	
		Description	Function	Description	Function
1	Brown	DC (+)	Power supply +24 V	L+	Control power supply +24 V
2	White	IN1	Analog input	2L+	Valve driving power supply +24 V
3	Blue	DC (–)	Power supply 0 V	L-	Control power supply 0 V
4	Black	OUT1	Analog output	C/Q	IO-Link communication data
5	Gray	IN2	External input	2L-	Valve driving power supply 0 V

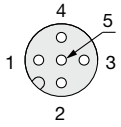
[mm]

Model	Port size	A	B	C	D	E	F
FC3W504-R03-□	Rc3/8	20	121.9	137.2	58.8	20.9	–
FC3W504-N03-□	NPT3/8	20	121.9	137.2	58.8	20.9	–
FC3W504-F03-□	G3/8	20	121.9	137.2	58.8	–	23.9
FC3W520-R03-□	Rc3/8	24	129.9	141.2	62.8	20.9	–
FC3W520-N03-□	NPT3/8	24	129.9	141.2	62.8	20.9	–
FC3W520-F03-□	G3/8	24	129.9	141.2	62.8	–	23.9
FC3W520-R04-□	Rc1/2	24	129.9	141.2	62.8	23.9	–
FC3W520-N04-□	NPT1/2	24	129.9	141.2	62.8	23.9	–
FC3W520-F04-□	G1/2	24	129.9	141.2	62.8	–	26.9

Dimensions

FC3W540





Plug connector pin arrangement A-coded (Normal key)

Pin no.	Wire color	Analog input/output type **FC3W5□-□□-A1/A2/A3□-□□**		IO-Link type **FC3W5□-□□-L□-□□**	
		Description	Function	Description	Function
1	Brown	DC (+)	Power supply +24 V	L+	Control power supply +24 V
2	White	IN1	Analog input	2L+	Valve driving power supply +24 V
3	Blue	DC (–)	Power supply 0 V	L-	Control power supply 0 V
4	Black	OUT1	Analog output	C/Q	IO-Link communication data
5	Gray	IN2	External input	2L-	Valve driving power supply 0 V

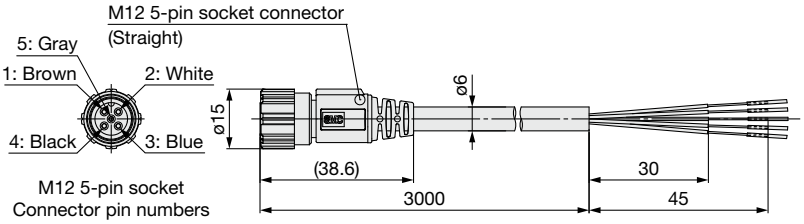
[mm]

Model	Port size	**A**	**B**
FC3W540-R04-□	Rc1/2	23.9	—
FC3W540-N04-□	NPT1/2	23.9	—
FC3W540-F04-□	G1/2	—	26.9
FC3W540-R06-□	Rc3/4	29.9	—
FC3W540-N06-□	NPT3/4	29.9	—
FC3W540-F06-□	G3/4	—	31.9

Accessories

① Cable

ZS-53-A

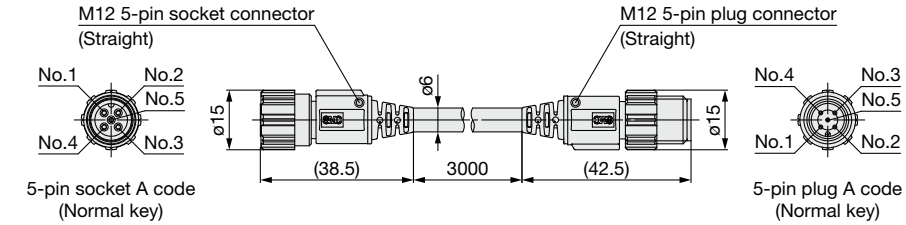


Cable material specifications

Conductor	**Nominal cross section**	AWG21
Insulator	**O.D.**	Approx. 1.60 mm
	Colors	Brown, Gray, White, Black, Blue
Sheath	**Material**	Oil-resistant PVC
Outer diameter		ø6

② Cable

ZS-53-D



Cable material specifications

Conductor	**Nominal cross section**	AWG21
Insulator	**O.D.**	Approx. 1.60 mm
	Colors	Brown, Gray, White, Black, Blue
Sheath	**Material**	Oil-resistant PVC
Outer diameter		ø6

③ Cable

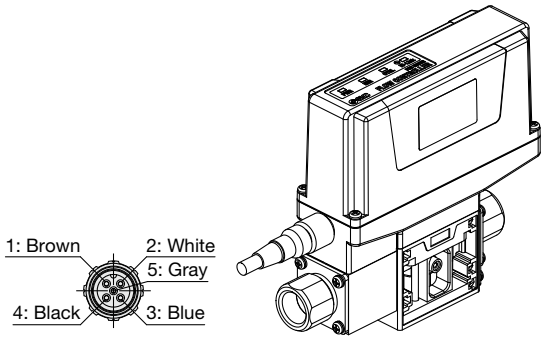
EX500-AP 050 - S

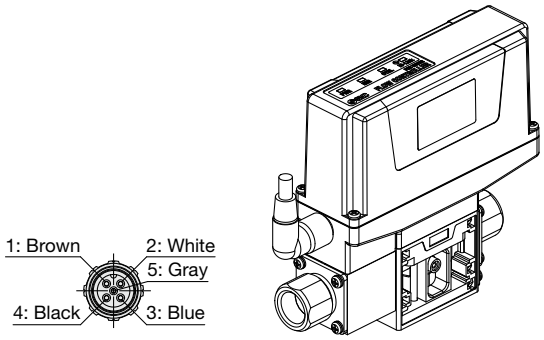
Cable length (L)

010	1000 mm
050	5000 mm

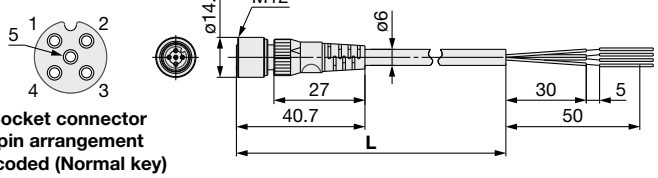
Connector specification

S	Straight
A	Angled





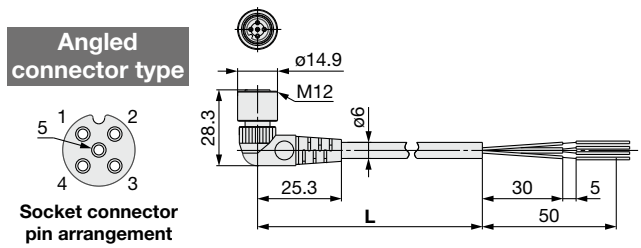
Straight connector type



Socket connector pin arrangement A-coded (Normal key)

Item	Specifications
Cable O.D.	ø6 mm
Conductor nominal cross section	0.3 mm²/AWG22
Wire O.D. (Including insulator)	1.5 mm
Min. bending radius (Fixed)	40 mm

Angled connector type



Socket connector pin arrangement A-coded (Normal key)

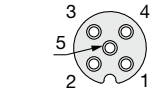
Item	Specifications
Cable O.D.	ø6 mm
Conductor nominal cross section	0.3 mm²/AWG22
Wire O.D. (Including insulator)	1.5 mm
Min. bending radius (Fixed)	40 mm

④ Cable

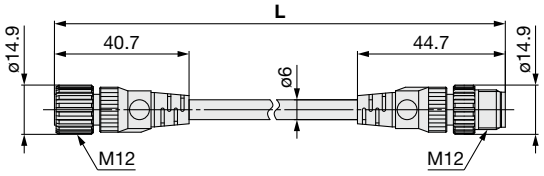
EX9-AC 005 -SSPS (With connectors on both sides (Socket/Plug))

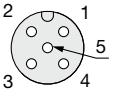
Cable length (L)

005	500 mm
010	1000 mm
020	2000 mm
030	3000 mm
050	5000 mm
100	10000 mm

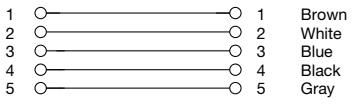


Socket connector pin arrangement
A-coded (Normal key)





Plug connector pin arrangement
A-coded (Normal key)



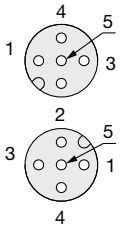
Connections

Item	Specifications
Cable O.D.	ø6 mm
Conductor nominal cross section	0.3 mm²/AWG22
Wire O.D. (Including conductor)	1.5 mm
Min. bending radius (Fixed)	40 mm

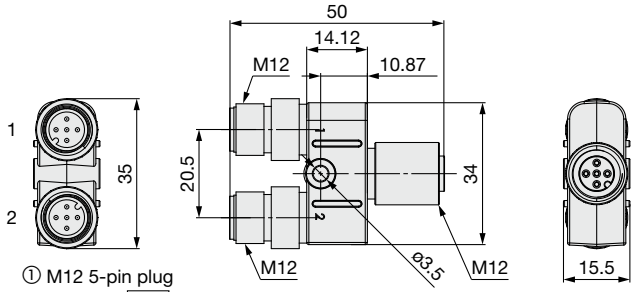
⑤ Y Branch Connector

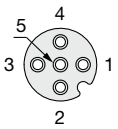
EX9-ACY02-S

This connector is used to supply valve driving power by branching the IO-Link communication cable when a port class A IO-Link master is used.



Plug connector pin arrangement A-coded (Normal key)



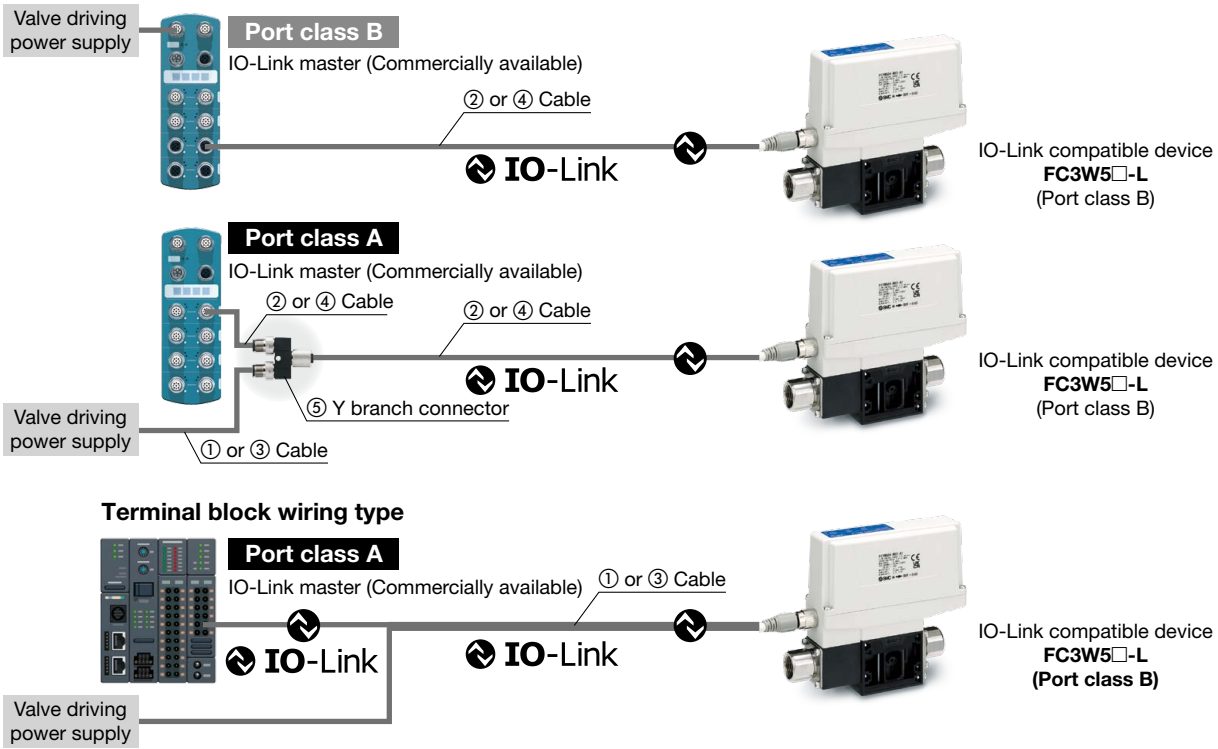


Socket connector pin arrangement A-coded (Normal key)

Valve driving power supply cable side pin arrangement when using a branch connector

1	—	Unused
2	2L+	24 V for valve driving
3	—	Unused
4	—	Unused
5	2L-	0 V for valve driving

IO-Link compatible device connection examples

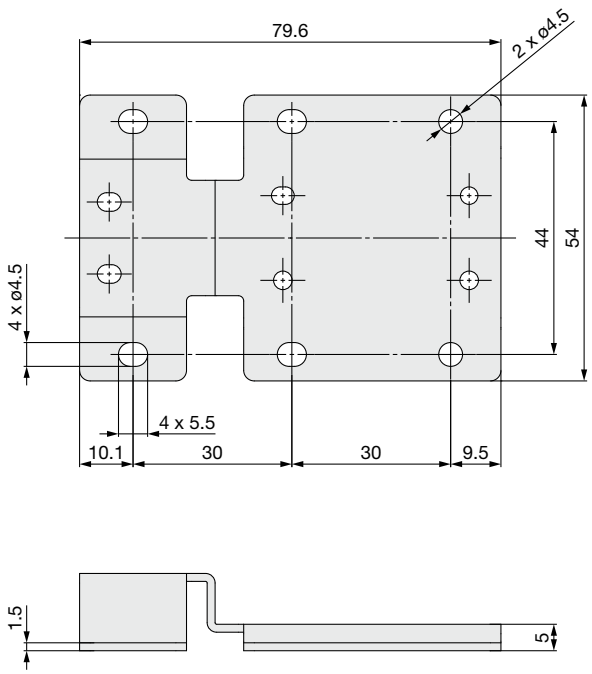


Terminal block wiring type

⑥ Bracket

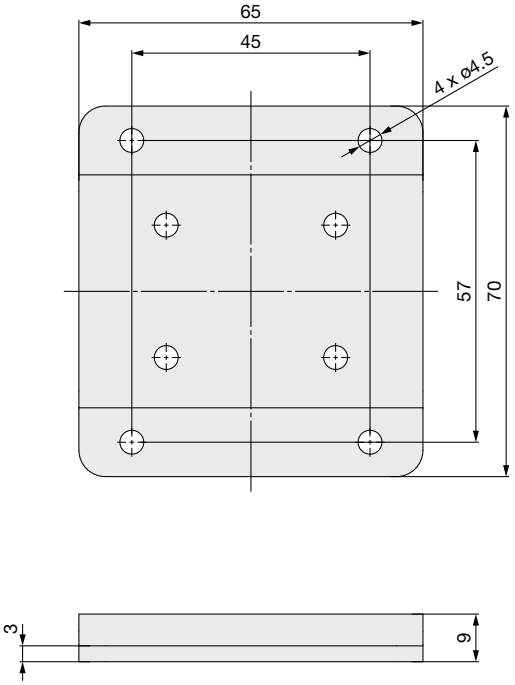
ZS-54-A (For the FC3W504 and FC3W520)

6 tapping screws (3 x 8 L) are included with the product.



ZS-54-B (For the FC3W540)

4 mounting screws (M4 x 8 L) are included with the product.



FC3W Series
List of Functions, Product Operating Life, and Water Hammer

Functions

■ Analog input function (Flow rate command)
Allows for the control of the flow rate according to the analog voltage/current flow rate command

■ Analog output function (Flow rate output)
Allows for the output of the analog voltage/current corresponding to the current control flow rate value

■ IO-Link (FC3W□-L)
Visualizes control and equipment status, and enables remote control and monitoring by communication

■ External input function (Control stop input)
Allows for the valve opening position to be immediately maintained via external input
This prevents the valve body from fully opening when the flow supply is cut off, such as when the pump is stopped or when the valve is shut off, thus shortening the control settling time when the pump is restarted.
In addition, as repeated unnecessary valve operation can be prevented, it will lead to an improvement in product life.

■ LED display function
This product features a built-in power status display LED, error display LED, control status display LED, and IO-Link communication status display LED.

Operating Life

Operating life under the following conditions

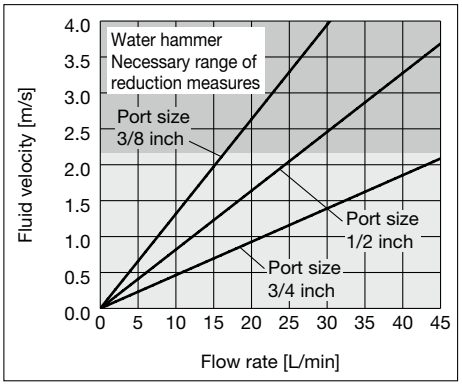
FC3W504, 520: 1 [million operations]
FC3W540: 0.5 [million operations]

Target operation	Full stroke opening and closing operations (one-way operation x 1)
Ambient temperature	20 to 25 [°C]
Fluid temperature	20 to 25 [°C]
Water quality	Clear water

Water Hammer (Reference Data)

Rapid shutting on the out side of product may result in product damage due to water hammer.
When flow velocity in piping is within the graph below, take the following measures to reduce it.

<Measures to reduce water hammer>
- Select a thick piping diameter.
- Turn control flow rate with a small amount of FC3W before shutting down.
- Keep piping as short as possible.
- Install a water hammer relieving valve.
- Use a flexible material for piping (such as a rubber hose) and an accumulator that can absorb impact pressure.



⚠ Caution

In the state where the flow rate is insufficient for the control flow rate (such as when the valve is shut or the pump is stopped), the control valve in the product fully opens.
As a result, the flow rate settling time at the time of control restart may be longer, or the operating life may be shortened if such an operation is performed repeatedly. This may be caused by the valve shutting, the pump stopping, etc.
We recommend turning OFF the power to the product prior to stopping the water flow or fixing (maintaining) the opening position of the control valve using the external input function (control stop input).
When starting flow control, supply water before turning ON the power or releasing the external input (control start) so that the product can start flow control.

⚠ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution," "Warning"** or **"Danger."** They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1), and other safety regulations.

⚠ Danger : **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

⚠ Warning: **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ Caution: **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

⚠ Caution

SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.
Use in non-manufacturing industries is not allowed.
Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country. The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".
Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

*2) **Suction cups (Vacuum pads) are excluded from this 1 year warranty.**
A suction cup (vacuum pad) is a consumable part, so it is warranted for a year after it is delivered.
Also, even within the warranty period, the wear of a product due to the use of the suction cup (vacuum pad) or failure due to the deterioration of rubber material are not allowed by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Revision History

Edition B
* Rated control flow rate range: A 5 to 40 (L/min) specification has been added.
* An IO-Link compatible type has been added.
* The number of pages has been increased from 12 to 16.

⚠ Safety Instructions	Be sure to read the "Handling Precautions for SMC Products" (M-E03-3) and "Operation Manual" before use.