

azbil

Digital Mass Flow Controller

Model F4Q

High-speed response, low pressure loss, high accuracy, and a wealth of functions



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Azbil Corporation
Advanced Automation Company

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: <https://www.azbil.com>

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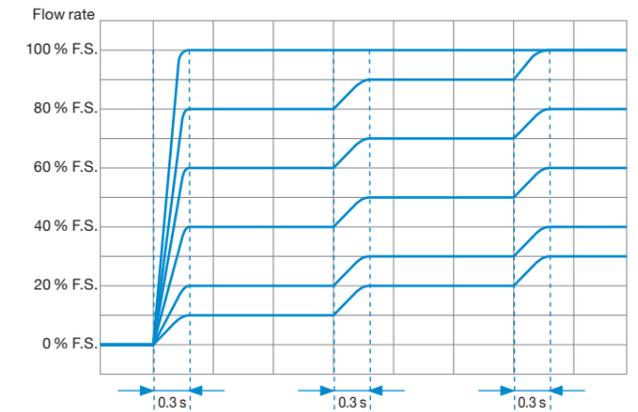
Advanced high-speed response, low pressure loss, and high-accuracy digital mass flow controllers

- Large LED and liquid crystal displays show control status at a glance
- Higher accuracy in a wide range of flow rates
- New functions to solve problems with flow rate control



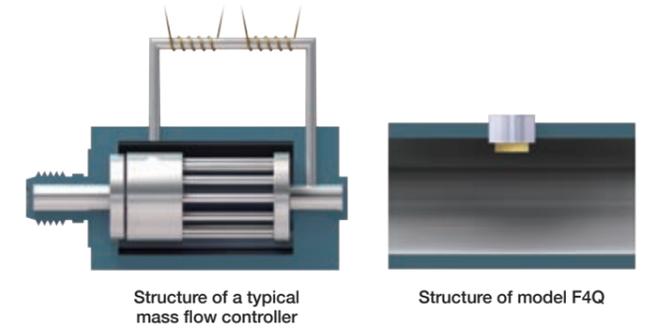
High-speed response of 0.3 seconds over a wide range of flow rates

Response is fast whether starting control with a fully closed valve or changing the settings. Even when the flow rates of multiple gases are changed at the same time, their ratio can be retained.



Low-differential pressure structure allows control of low-pressure gas

The pressure loss on a straight flow path is low, so this controller can control low-pressure gas (e.g., fuel gas).

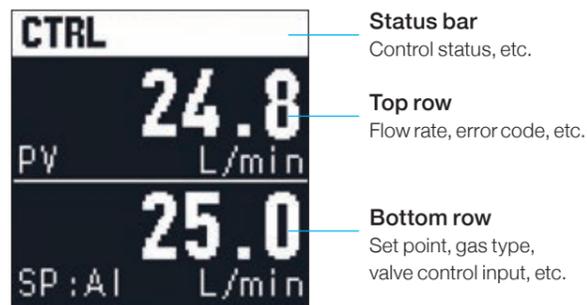


Understand the status of control at a glance

The color and state (e.g., flashing) of the LED indicator show the control status.



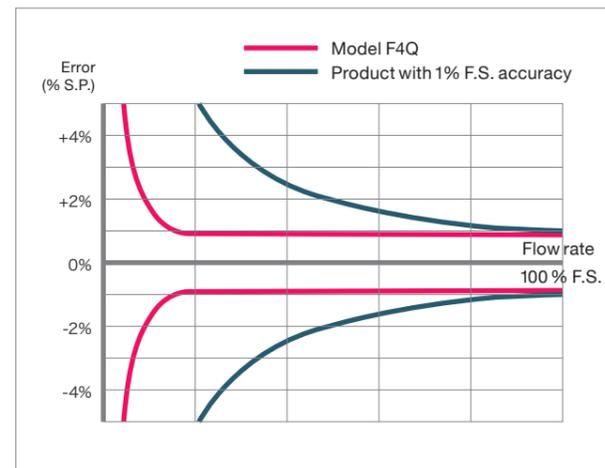
With the information-rich LCD, you understand the control status in detail.



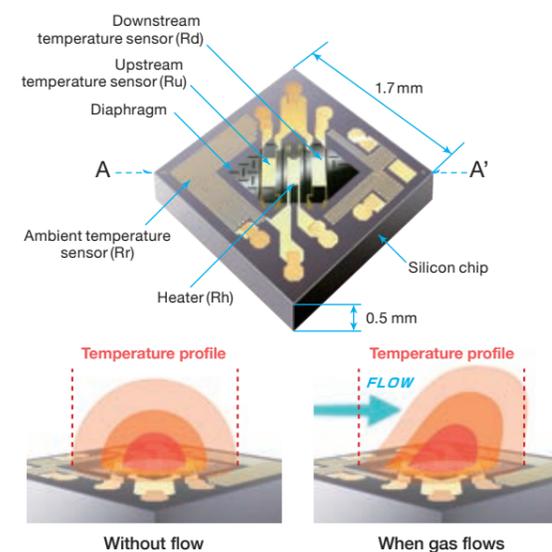
- Status bar**
Control status, etc.
- Top row**
Flow rate, error code, etc.
- Bottom row**
Set point, gas type, valve control input, etc.

Accuracy of 1 % S.P. in a wide range of flow rates

High-accuracy control for high and low flow rates. Great for applications where the flow rate set point changes significantly.



High-speed micro thermal flow sensor with low differential pressure



When there is no gas flow, the temperature distribution around the heater is symmetrical. When gas starts to flow the temperature upstream of the heater decreases and the temperature downstream of the heater increases, distorting the symmetry of the temperature distribution. The temperature sensor detects this temperature difference to calculate the speed of the flow.



Straight flow path with low pressure loss

The gas comes into direct contact with the micro thermal flow sensor which has an extremely small thermal capacity. This makes instantaneous detection of flow rate changes possible, even when the flow speed is very low. The result is high-speed response over a wide range of flow rates, with only low pressure loss in the straight flow path.

Easy-to-read display in any installation orientation

The display can be rotated to suit the installation orientation. The control key layout also changes based on the display orientation.



Greater resistance to environmental conditions

Strong metal connectors and a structure with no gaps give it margin when the controller is used in a dusty environment.



Fine adjustment of control

The PID settings make fine adjustment of control possible. You can adjust for control that prioritizes response or control that prioritizes stability, whichever suits the application.

※ Even without PID adjustment, the controller satisfies the response specified in the specifications.



Separate display unit models for flexible installation layout

Models with a separate display unit can be installed in an easy-to-see location while the unit itself is in a place where pipe connections are easy. The separate display unit models can also be installed in any orientation.



Usable in a wide temperature range, from -10 to +60 °C

The controller can be used in a cold room in winter or near a hot industrial furnace. Even when the temperature changes greatly, its effect on the measured values is minimal.



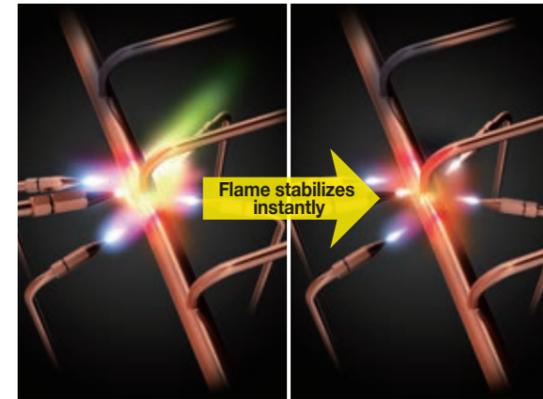
Even without external power, settings can be changed from the PC loader

Power for the controller can be supplied through the USB cable of the PC loader, so settings of the controller can be changed even when it is not otherwise powered.

※ Flow control is not possible when power is supplied from a USB cable.

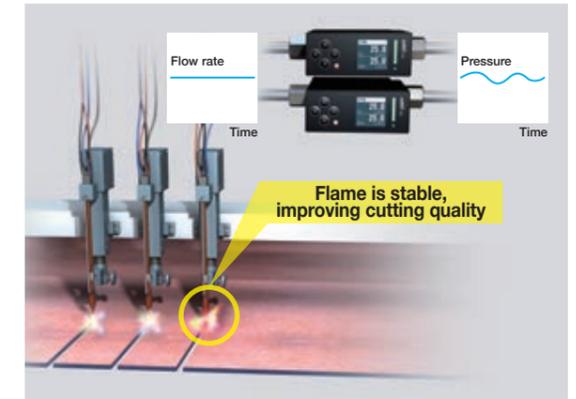


Sample applications



Brazing and burner work

Thanks to high-speed response, when the flame intensity is changed, the flame instantaneously stabilizes, contributing to stable product quality and reduced takt time.



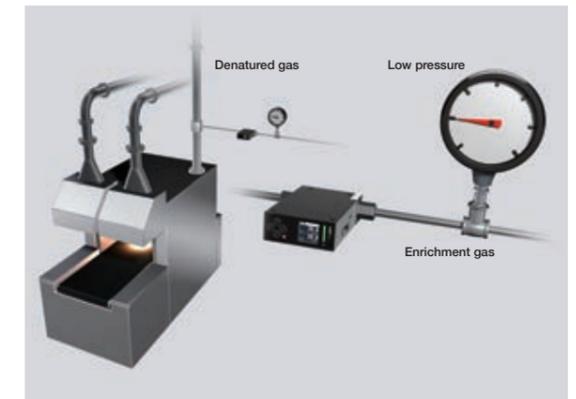
Gas cutting

Thanks to high-speed response, even when the source pressure changes, there is very little effect on the flow rate. The flame remains stable, which improves the cutting quality.



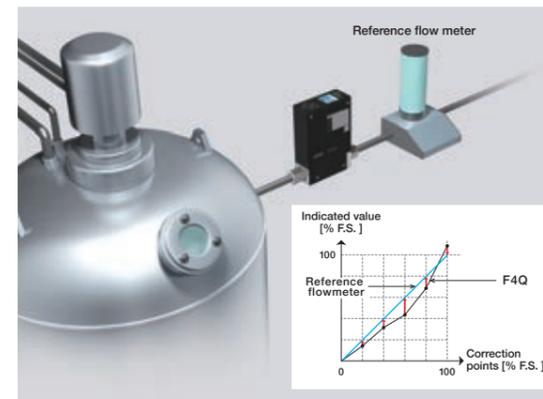
Baking furnace for MLCCs

The operating temperature range is a wide -10 to 60 °C and the effect of ambient temperature changes on flow rate control is small. A stable atmosphere in the furnace also helps to stabilize the quality of baking.



Gas carburizing furnace

Thanks to low pressure loss, model F4Q can control the flow rate of low-pressure enrichment gas, which is not possible with typical mass flow controllers. Better control of the atmosphere in the furnace can stabilize the quality of carburization.



Culture apparatus

The multiple-point flow rate correction function makes matching to a reference flowmeter possible during onsite calibration. It is not necessary to send the controller to the manufacturer for calibration, so costs can be cut and delivery schedules can be shortened.



Experiments

With an AC adapter, the controller can be powered from a wall socket, eliminating the need for troublesome wiring. Operation, monitoring, and data logging from a PC can be done using the PC loader. An experimental environment can be set up in a short period of time.

Control flow rate ranges according to gas type

● Models with fluororubber gasket

Models	F4Q9200	F4Q9500	F4Q0002	F4Q0005	F4Q0020	F4Q0050 (length: 90 mm)
	Control flow rate ranges (mL/min)		Control flow rate ranges (L/min)			
Air, nitrogen	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Oxygen	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Argon	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Carbon dioxide	1.2 to 120	3 to 300	0.012 to 1.2	0.03 to 3	0.12 to 12	0.3 to 30
City gas (45 MJ/m ³)	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Methane (100 %)	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Propane (100 %)	0.6 to 60	1.6 to 160	0.006 to 0.6	0.016 to 1.6	0.06 to 6	0.16 to 16
Butane (100 %)	0.5 to 50	1.2 to 120	0.004 to 0.4	0.012 to 1.2	0.04 to 4	0.1 to 10

● Models with EPDM gasket

Models	F4Q9200	F4Q9500	F4Q0002	F4Q0005	F4Q0020	F4Q0050 (length: 90 mm)
	Control flow rate ranges (mL/min)		Control flow rate ranges (L/min)			
Acetylene (C ₂ H ₂)	2 to 120	5 to 300	0.02 to 1.2	0.05 to 3	0.2 to 12	0.5 to 30
Ammonia (NH ₃)	3 to 160	7 to 400	0.03 to 1.6	0.07 to 4	0.3 to 16	0.7 to 40
Air, nitrogen	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Oxygen	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Argon	2 to 200	5 to 500	0.02 to 2	0.05 to 5	0.2 to 20	0.5 to 50
Carbon dioxide	1.2 to 120	3 to 300	0.012 to 1.2	0.03 to 3	0.12 to 12	0.3 to 30

* The control flow rate ranges and display resolution can be changed. (E.g., for F4Q9200, depending on the decimal place setting, from 2 to 200 mL/min, or from 2.000 to 200.000 mL/min.)

● Supported gas types

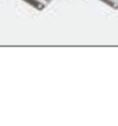
Best: recommended, OK: usable

	O-ring material	Gas types					
		Air	Oxygen	Argon	Carbon dioxide	City gas	Methane (100 %)
F4Q with fluororubber gasket	Fluororubber	Best	Best	Best	Best	Best	Best
F4Q with EPDM rubber gasket	Ethylene propylene rubber	OK		OK	OK		

	O-ring material	Gas types					
		Propane (100 %)	Butane (100 %)	Acetylene (C ₂ H ₂)	Ammonia (NH ₃)	Hydrogen	Helium
F4Q with fluororubber gasket	Fluororubber	Best	Best			OK (Excluding model F4Q0050)	OK
F4Q with EPDM rubber gasket	Ethylene propylene rubber			Best	Best		

* For gases other than the above, please contact Azbil Corporation.

Optional parts (sold separately)

Item	Model No.	Appearance	Application
Dedicated cable with half-pitch connector (2 m)	F9Y4QHP2		20-core cable assembly for controller power and signal connections
Dedicated cable with half-pitch connector (5 m)	F9Y4QHP5		
MQV-F4Q conversion harness	F9Y4QA1		Conversion harness for connecting a 20-core flat cable for model MQV to the F4Q
AC adapter	81446957-001		AC adapter for supplying power from a commercial power outlet to the controller. Use in combination with a harness (F9Y4QA2).
Conversion harness for AC adapter	F9Y4QA2		A conversion harness for supplying power to the controller using an optional AC adapter (81446957-001)
Mounting bracket for 90 mm controller	F9Y4QB1		Bracket for installing a controller with a length of 90 mm
Mounting bracket for 150 mm controller	F9Y4QB2		Bracket for installing a controller with a length of 150 mm

Selection Guide

● 90 mm models with fluororubber gasket

Basic model No.	Standard flow rate range				Type	Flow path material	Piping method	Gas type	Comm. type	O-ring material	Option 1	Option 2	Option 3	Suffix	Description
	F	4	Q												
	9	2	0	0											2 to 200 mL/min (normal) *1
	9	5	0	0											5 to 500 mL/min (normal) *1
	0	0	0	2											0.02 to 2 L/min (normal) *1
	0	0	0	5											0.05 to 5 L/min (normal) *1
	0	0	2	0											0.2 to 20 L/min (normal) *1
	0	0	5	0											0.5 to 50 L/min (normal) *1
					B										Integrated display
					C										Separate display
						6									SUS316
							T								Rc 1/4"
							S								1/4" Swagelok joint *2
							V								1/4" VCR joint *2
							U								9/16-18 UNF
								N							Air, nitrogen *3
									1						RS-485 comm. (CPL/ModbusRTU selectable)
										0					Fluororubber
											0				None
												0			None
													0		With inspection certificate
														Y	With inspection certificate + traceability
														0	Product version

● 90 mm models with EPDM gasket

Basic model No.	Standard flow rate range				Type	Flow path material	Piping method	Gas type	Comm. type	O-ring material	Option 1	Option 2	Option 3	Suffix	Description
	F	4	Q												
	9	2	0	0											2 to 200 mL/min (normal) *1
	9	5	0	0											5 to 500 mL/min (normal) *1
	0	0	0	2											0.02 to 2 L/min (normal) *1
	0	0	0	5											0.05 to 5 L/min (normal) *1
	0	0	2	0											0.2 to 20 L/min (normal) *1
	0	0	5	0											0.5 to 50 L/min (normal) *1
					B										Integrated display
					C										Separate display
						6									SUS316
							T								Rc 1/4"
							S								1/4" Swagelok joint *2
								N							Air, nitrogen *3
									1						RS-485 comm. (CPL/ModbusRTU selectable)
										E					EPDM *4
											0				None
												0			None
													0		With inspection certificate
														Y	With inspection certificate + traceability
														0	Product version

*1. The control flow rate ranges are for air and nitrogen. "mL/min (normal)" and "L/min (normal)" indicate the volumetric flow rate (mL/min and L/min) converted to 0 °C and one atmosphere of pressure (101.3 kPa [abs]).

*2. Before connecting with Swagelok or VCR joints, read the precautions in the instructions from the joint manufacturer.

*3. The controller can be used for gases other than air and nitrogen by changing the setting. The controllable flow rate range varies depending on the gas type. For details, refer to "Control flow rate ranges according to gas type" on page 05.

*4. A controller with an EPDM gasket can only be used for the gases listed below. Otherwise, the sealing characteristics may be degraded. Supported gases: air, nitrogen, argon, carbon dioxide, ammonia, and acetylene

Specifications

● 90 mm models with fluororubber gasket (for details, refer to CP-SP-1461E)

Model No.	F4Q9200	F4Q9500	F4Q0002	F4Q0005	F4Q0020	F4Q0050
Valve type	Proportional solenoid valve, normally closed when de-energized (N.C.)					
Standard full-scale flow rate (air, nitrogen) *1	200 mL/min	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min
Gas type *2	Air, nitrogen, oxygen, argon, carbon dioxide, city gas (45 MJ/m ³), methane (100 %), propane (100 %), butane (100 %)					
Control	Control range	1 to 100 % F.S.				
	Response *3	0.3 s for S.P. ± 2 % F.S. (typ.)				
	Accuracy (under reference conditions) (Q = flow rate) *4	±1 % S.P. (40≤Q≤100 %) ±0.4 % F.S. (1≤Q<40 %)		±1 % S.P. (15≤Q≤100 %) ±0.15 % F.S. (1≤Q<15 %)		
Pressure	Standard differential pressure	200 kPa (inlet pressure: 200 kPa [gauge], outlet pressure: 0 kPa [gauge])				
	Operating differential pressure range *5	50 to 300 kPa	5 to 300 kPa	50 to 300 kPa	5 to 300 kPa	50 to 300 kPa
	Allowable inlet pressure	0.5 MPa (gauge)				
	Pressure resistance	1 MPa (gauge)				
Operating conditions Ambient operating temperature	-10 to 60 °C					
External leakage	1 × 10 ⁻⁸ Pa·m ³ /s (He) (O-ring leakage is not included)					
Analog I/O	Input types	DC 0 to 5 V, 1 to 5 V, 4 to 20 mA (selectable)				
	Output types	DC 0 to 5 V, 1 to 5 V, 4 to 20 mA (selectable)				
Digital I/O	Digital inputs	3 (SP number selection, operation mode selection, flow rate zero correction execution, gas type setting selection, SP ramp control gradient selection, alarm reset, etc.)				
	Digital outputs	3 (Totalization pulse output, control state ON, full open ON, full closed ON, error ON, etc.)				
Communications *6	(1) USB 2.0, (2) RS-485 comm. (3-wire system, CPL or ModbusRTU selectable by setting)					
Power	Rating	24 V DC, current consumption 300 mA max.				
	Isolation	The power circuit is isolated from the input/output circuits.				
Main material of gas-contacting parts *7	SUS316, Teflon, fluororubber					
Mounting orientation *8	Horizontal (but top panel must not face downward) or vertical					
IP (protection) rating *9	IP40					
Standards compliance	EN61326-1, EN61326-2-3					

● 90 mm models with EPDM rubber gasket (for details, refer to CP-SP-1461E)

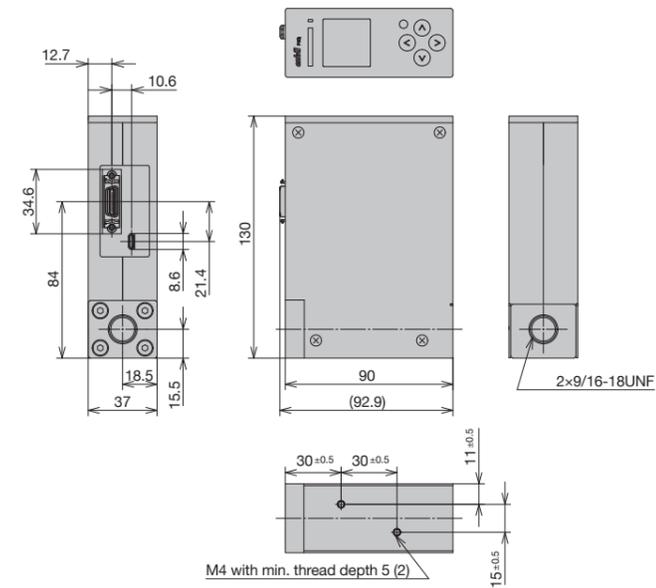
Model No.	F4Q9200	F4Q9500	F4Q0002	F4Q0005	F4Q0020	F4Q0050
Valve type	Proportional solenoid valve, normally closed when de-energized (N.C.)					
Standard full-scale flow rate (air, nitrogen) *1	200 mL/min	500 mL/min	2 L/min	5 L/min	20 L/min	50 L/min
Gas type *2	Air, nitrogen, oxygen, argon, carbon dioxide, acetylene, ammonia					
Control	Control range	1 to 100 % F.S.				
	Response *3	0.3 s for S.P. ± 2 % F.S. (typ.)				
	Accuracy (under reference conditions) (Q = flow rate) *4	±1 % S.P. (40≤Q≤100 %) ±0.4 % F.S. (1≤Q<40 %)		±1 % S.P. (15≤Q≤100 %) ±0.15 % F.S. (1≤Q<15 %)		
Pressure	Standard differential pressure	200 kPa (inlet pressure: 200 kPa [gauge], outlet pressure: 0 kPa [gauge])				
	Operating differential pressure range *5	50 to 300kPa	5 to 300kPa	50 to 300kPa	5 to 300kPa	50 to 300kPa
	Allowable inlet pressure	0.5 MPa (gauge)				
	Pressure resistance	1 MPa (gauge)				
Operating conditions Ambient operating temperature	-10 to 60 °C					
External leakage	1 × 10 ⁻⁸ Pa·m ³ /s (He) (O-ring leakage is not included)					
Analog I/O	Input types	DC 0 to 5 V, 1 to 5 V, 4 to 20 mA (selectable)				
	Output types	DC 0 to 5 V, 1 to 5 V, 4 to 20 mA (selectable)				
Digital I/O	Digital inputs	3 (SP number selection, operation mode selection, flow rate zero correction execution, gas type setting selection, SP ramp control gradient selection, alarm reset, etc.)				
	Digital outputs	3 (Totalization pulse output, control state ON, full open ON, full closed ON, error ON, etc.)				
Communications *6	(1) USB 2.0, (2) RS-485 comm. (3-wire system, CPL or ModbusRTU selectable by setting)					
Power	Rating	24 V DC, current consumption 300 mA max.				
	Isolation	The power circuit is isolated from the input/output circuits.				
Main material of gas-contacting parts *7	SUS316, Teflon, EPDM					
Mounting orientation *8	Horizontal (but top panel must not face downward) or vertical					
IP (protection) rating *9	IP40					
Standards compliance	EN61326-1, EN61326-2-3					

*1. "mL/min" and "L/min" indicate the volumetric flow rate per minute converted to 0 °C and 101.325 kPa (one atmosphere). The controllable flow rate range varies depending on the gas type. Refer to "Control flow rate ranges by gas type" on page 05. *2. Gas must be dry, without corrosive components like chlorine, sulfur, and acid. It also must be clean, without dust or oil mist. *3. Value at the standard differential pressure. *4. Instrument error compared with our equipment under reference conditions. Reference conditions: ● Fluid: air. ● Inlet pressure: standard differential pressure ± 15 kPa (gauge). ● Outlet pressure: atmospheric pressure. ● Ambient temperature: 23 ± 2 °C. ● Gas temperature: same as ambient temperature. ● Operation mode: control. ● Vibration/pulsation: none. ● Warm-up time: at least 2 hours at ambient temperature, plus at least 30 minutes after power-on. ● Installation orientation: horizontal with display facing upward. ● Straight pipe length: no specific conditions. *5. The controller is operable even when the operating differential pressure is lower than the low limit, but the controllable flow rate range is smaller in that case. *6. USB 2.0 is used to connect Azbil's PC loader software. Micro USB Type-B (length 2 m max.) is supported. *7. The gas-contacting parts have been degreased. *8. When installed vertically, the measured values have an error which can be corrected by configuring the controller. Refer to the Digital Mass Flow Controller Model F4Q Detailed User's Manual (CP-SP-1461E) and the Digital Mass Flow Controller Model F4Q User's Manual for RS-485 Communication Functions (CP-SP-1458E). *9. Only for the connection to the connector.

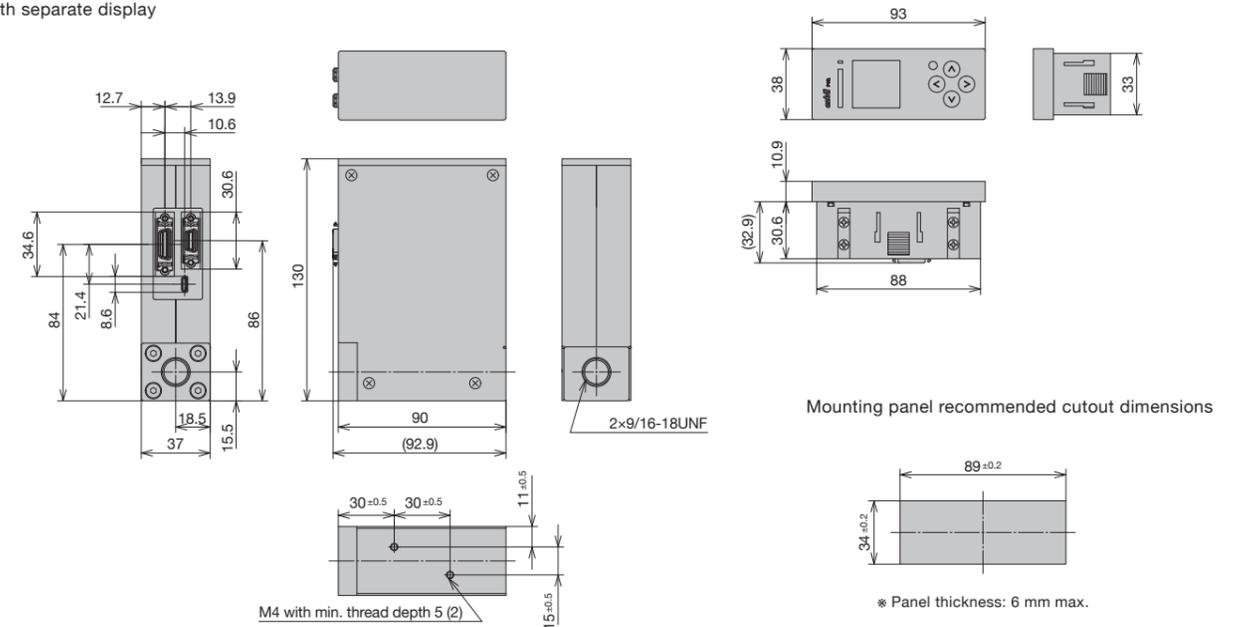
External Dimensions Unit: mm

● 90 mm models with fluororubber gasket or EPDM rubber gasket

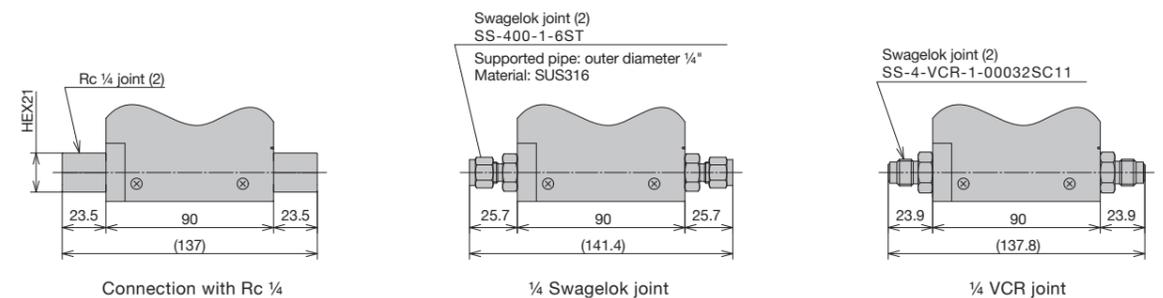
With integrated display



With separate display



Common to the integrated display and separate display types



Tolerance unless otherwise specified: ±1

