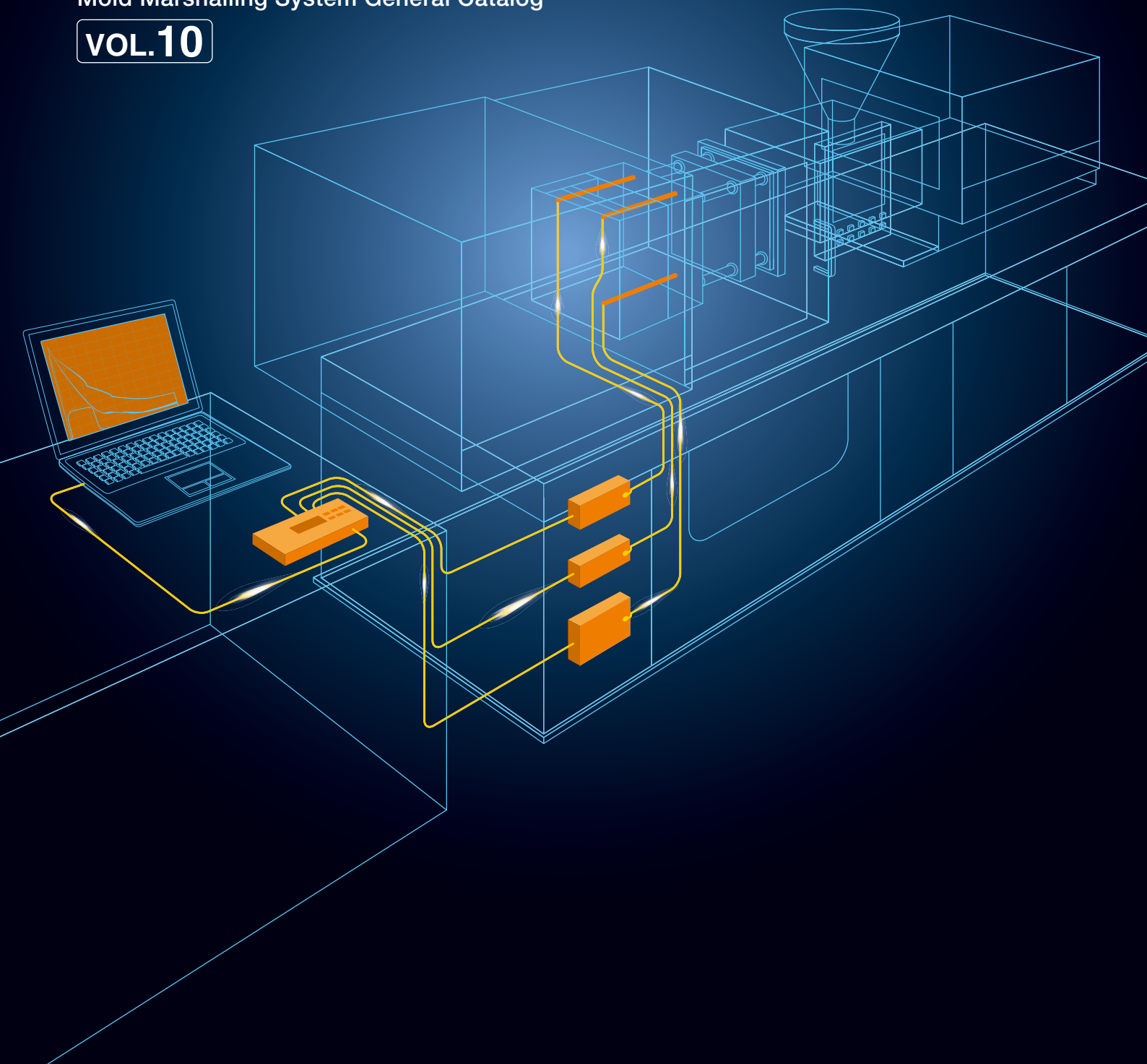
Futaba

In-mold Measuring System

MOLD MARSHALLING SYSTEM

Mold Marshalling System General Catalog

VOL.10



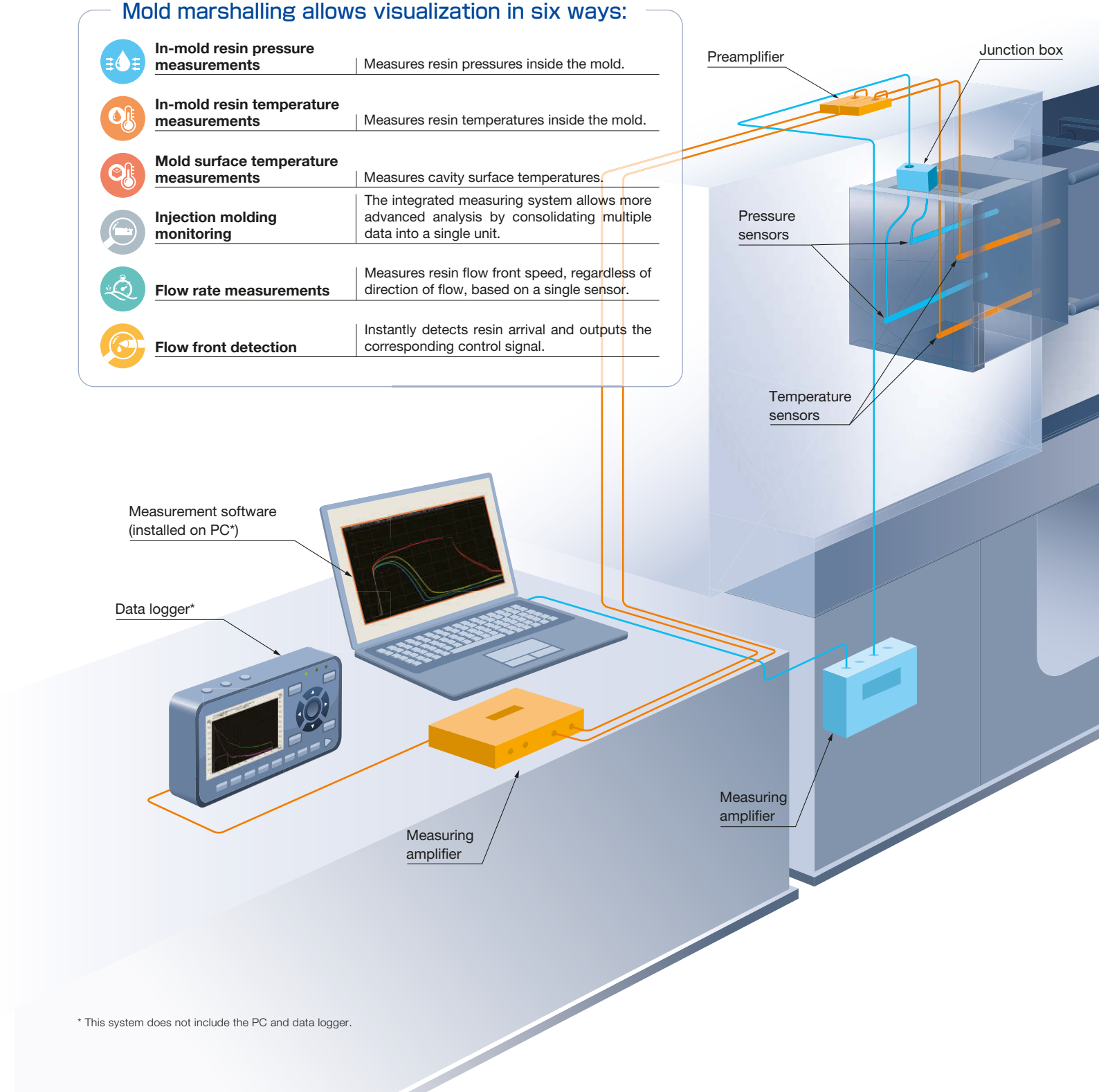
Visualizing inside molds

Measuring system improves injection molding quality and reduces costs

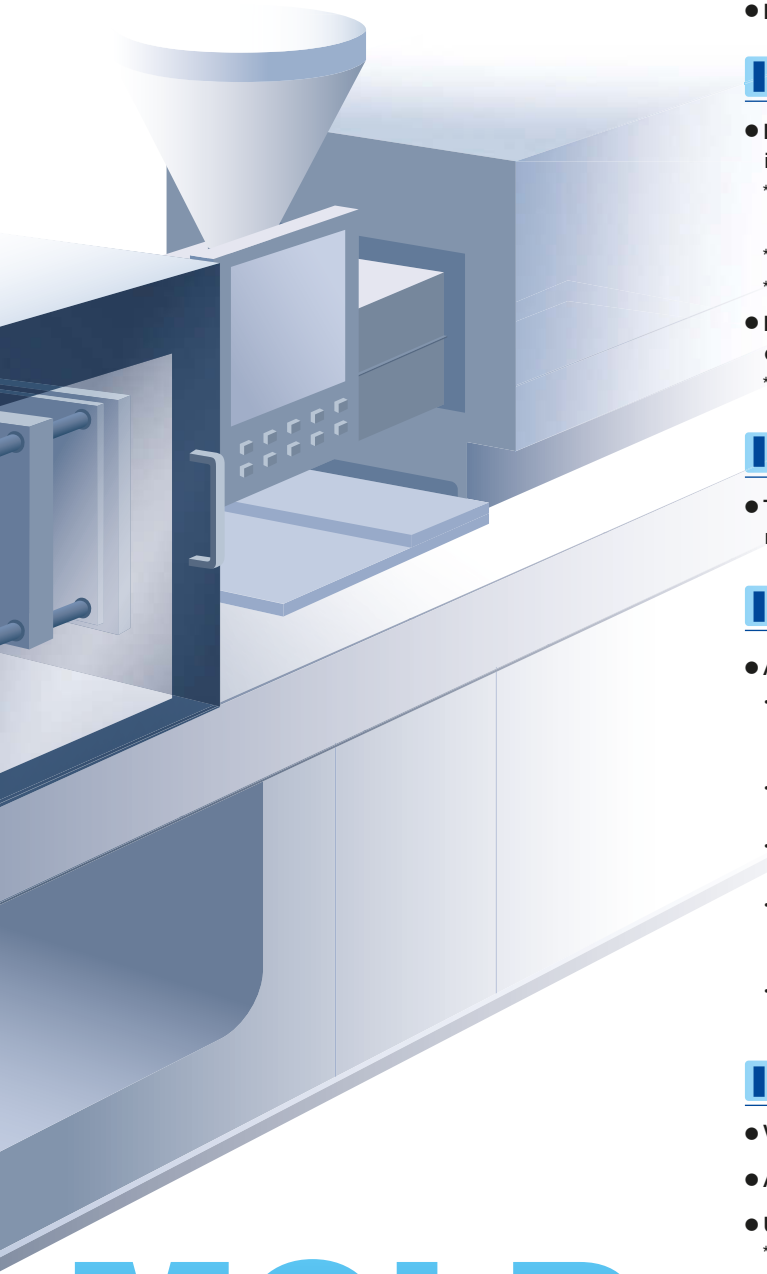
The mold marshalling system is an injection molding measuring system that uses sensors and special-purpose amplifiers installed inside a mold to convert the behavior of the resin inside the mold (the mold itself previously regarded as something of a black box) into a signal or voltage. The system outputs this signal or voltage in real time to a PC or measuring instruments. This digitized data has a wide range of uses. It can be used to set optimal molding parameters, automatically screen for defective products, control quality, and evaluate molds.

Mold marshalling allows visualization in six ways:

In-mold resin pressure measurements	Measures resin pressures inside the mold.
In-mold resin temperature measurements	Measures resin temperatures inside the mold.
Mold surface temperature measurements	Measures cavity surface temperatures.
Injection molding monitoring	The integrated measuring system allows more advanced analysis by consolidating multiple data into a single unit.
Flow rate measurements	Measures resin flow front speed, regardless of direction of flow, based on a single sensor.
Flow front detection	Instantly detects resin arrival and outputs the corresponding control signal.



* This system does not include the PC and data logger.



Low cost

- More affordable than comparable in-mold sensors

Simple

- No special machining is required to install the ejector pin type sensors inside the mold.
  * A slot must be machined to route the sensor cable if the ejector plate has counterbored specifications.
  * Flush-mount type sensors require machining for mounting.
  * Button-type sensors require machining for mounting.
- Dedicated measurement software is provided along with product for easy measurement of pressure and temperature inside the mold.
  * For amplifiers MPS08B, MVS08 and MFS02S with dedicated software

Compact

- The sensor features compact dimensions for easy installation inside the mold.

Functional

- Allows simultaneous measurement at multiple points.
  - MPS08B resin pressure measuring amplifier:
    8-point simultaneous measurement
    (measurement at up to 32 points)
  - MPV04 resin pressure measuring amplifier:
    4-point simultaneous measurement
  - EPT001 resin temperature measuring amplifier:
    4-point simultaneous measurement
  - MVS08 injection molding monitoring system:
    8-point simultaneous measurement
    (measurement at up to 24 points)
  - MFS02 flow rate measuring amplifier:
    2-point simultaneous measurement

Wide range of functions

- Variations can be monitored for each molding cycle.
- Allows real-time screening for defective products.
- Use standard spreadsheet applications to analyze saved waveforms.
  * For amplifiers MPS08B, MVS08 and MFS02 with dedicated software

MOLD MARSHALLING SYSTEM

Futaba

MOLD MARSHALLING SYSTEM VOL.10

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Repairs

Please contact your nearest Futaba sales office. In some cases, it may not be possible to repair equipment. We will indicate what services are available based on an inspection. (Price quotes will reflect actual circumstances.)

Advantages

**The mold marshalling system provides a wide range of data on the mold interior to increase molding precision.
This section describes the specific parameters measured by each system and the advantages provided.**

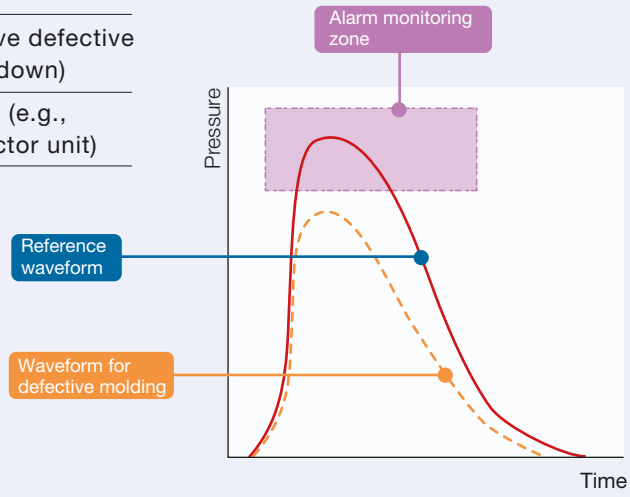
Pressure measuring system

Molded product defect detection

Alarm signals based on fluctuations from reference waveforms are used to detect molding defects like short shots and overpacking.

■ Typical response to defect detection

- Preventing ejection of consecutive defective products (molding machine shutdown)
- Screening for defective products (e.g., automatic screening using extractor unit)



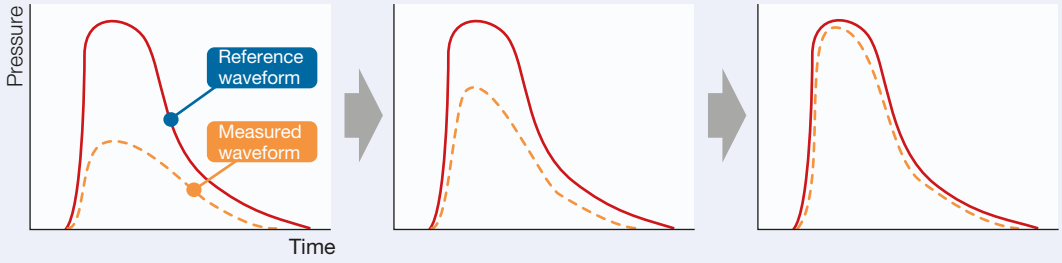
Pressure measuring system

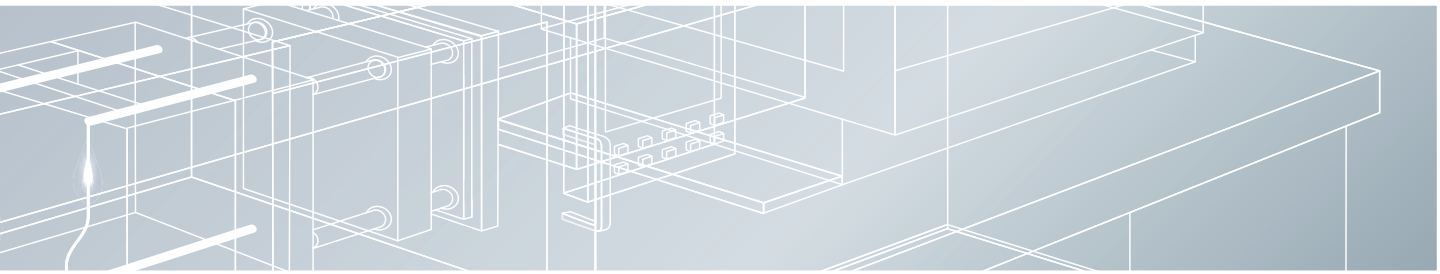
Setting molding parameters after changes in molding machine or molding location

Reference waveforms corresponding to conforming products can be saved and later applied for producing molded products of identical quality.

■ Typical changes in conditions

- After transferring production overseas
- After changes in molding machine (different manufacturer, capacity, type)
- After changes in the environment (different factory, outsourcing)





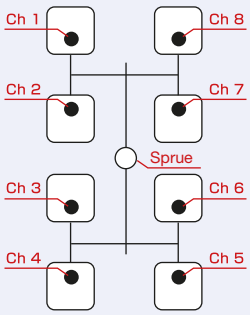
Pressure measuring system

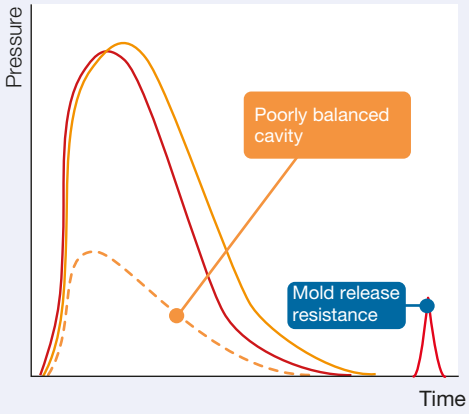
Mold structural and flow analysis

Analyzing the pressure and time taken for the resin to reach the sensor makes it possible to confirm the integrity of the mold.

■ Details confirmed by flow analysis

- Runner and gate balance confirmation
- Confirmation after runner/gate modification
- Verification of flow analysis results
- Confirmation of mold release resistance





Pressure measuring system

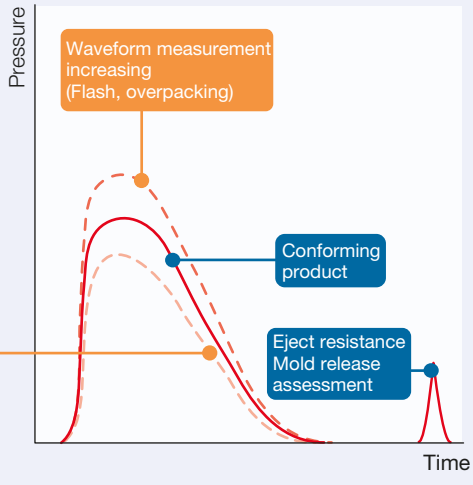
In-mold pressure waveform and confirmation of correlation to molding defect

Comparing pressure waveforms against the reference waveform for conforming products makes it possible to predict molding defects.

■ Defects that can be predicted from pressure waveform

- Waveform measurement
  - Increasing ⇒ Flash, overpacking
  - Decreasing ⇒ Short shots, sink marks
- Eject waveform
  - Large ⇒ High mold release resistance
  - Small ⇒ Low mold release resistance

* See page 115 for details.



Advantages

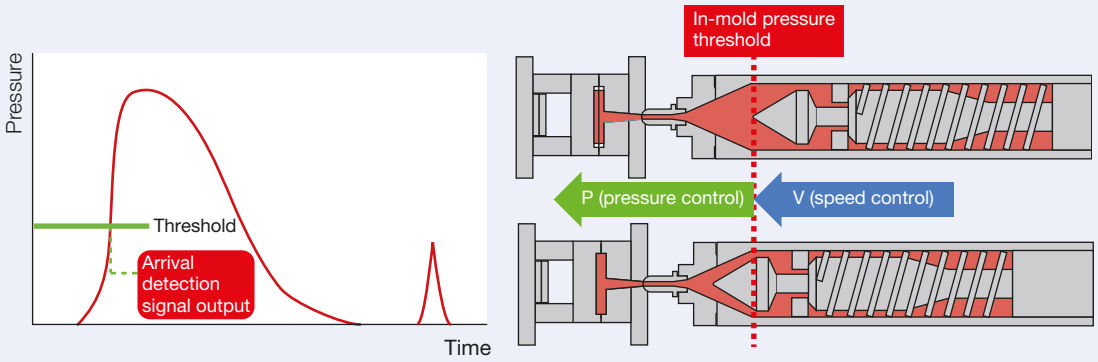
Pressure measuring system

Controlling external devices based on in-mold pressure

Setting threshold values for in-mold pressure allows control signals to be output to external devices.

■ **Example of V-P transfer control using in-mold pressure**

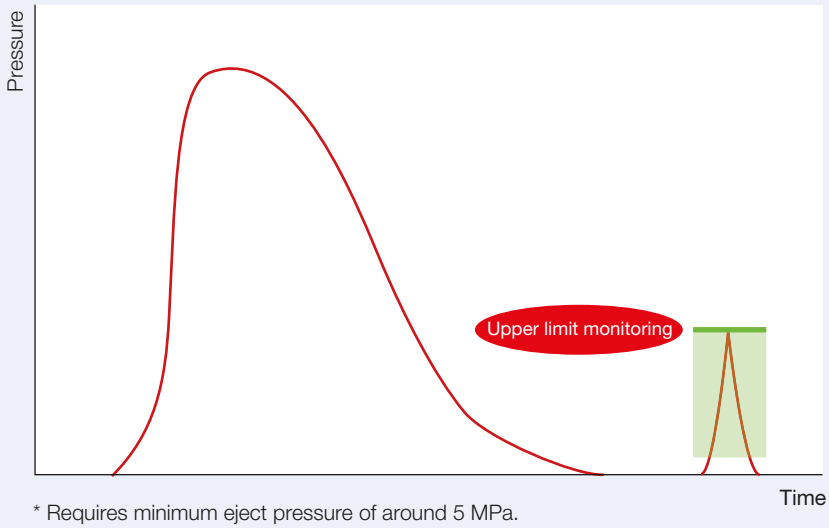
Reduces weight variations for each shot for more consistent molding quality.



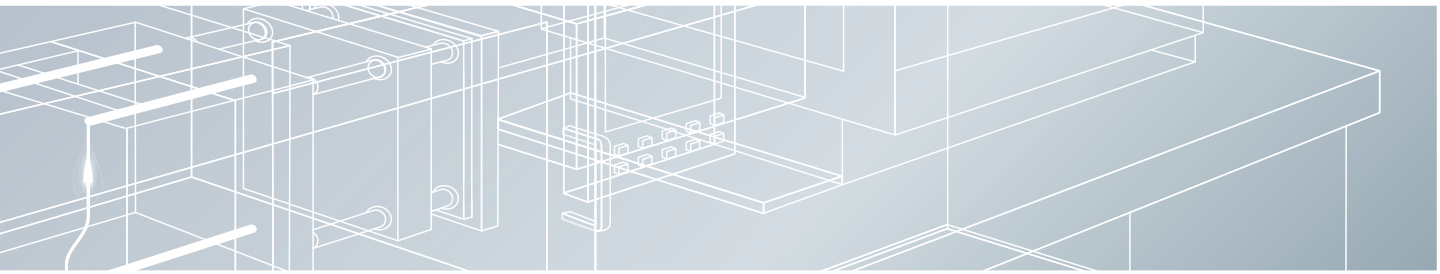
Pressure measuring system

Mold maintenance timing assessment

Alarm signals can be output by monitoring for increased eject pressure on the ejector pin due to resin tar buildup or other factors.



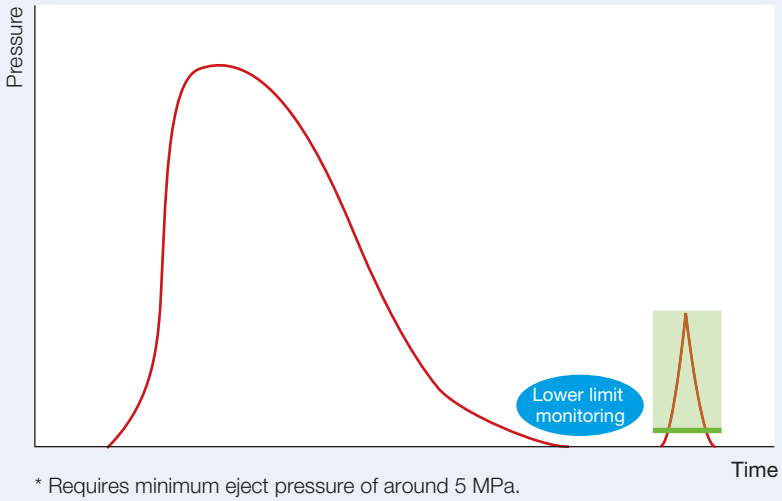
* Requires minimum eject pressure of around 5 MPa.



Pressure measuring system

Preventing mold damage due to cavity sticking

Alarm signals can be output by monitoring for reduced eject pressure when a product becomes stuck in the cavity (fixed side).



* Requires minimum eject pressure of around 5 MPa.

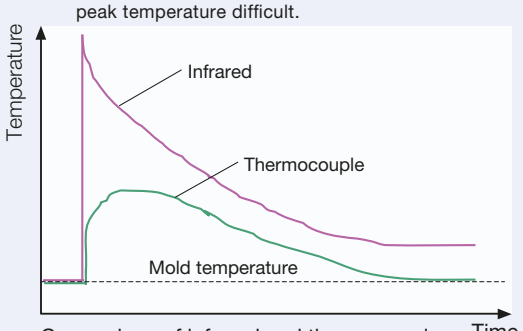
Resin temperature measuring system

Optimizing resin temperatures and other molding parameters

Allows accurate grasp of resin temperatures inside the mold.

■ High-speed response: Measurements in 8 ms (63.2% response)

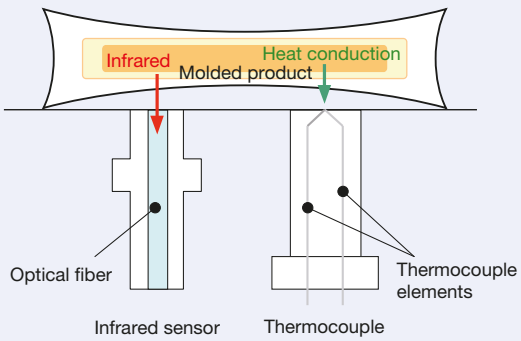
The system makes it possible to track rapidly changing resin temperatures inside the mold. In contrast, standard thermocouples feature response times on the order of several seconds, a performance lag that makes measurements of peak temperature difficult.



Comparison of infrared and thermocouple waveforms
(compared using identical mold interior)

■ Noncontact temperature measurement (optical fiber infrared method)

In contrast to thermocouples and other contact sensors, noncontact sensing allows measurements of molded product temperature even when the resin contracts away from the sensor tip. Temperatures are accurately measured throughout the resin inflow, pressure holding, cooling, and mold opening phases.



Advantages

Mold surface temperature measuring system

Reducing numbers of discarded shots

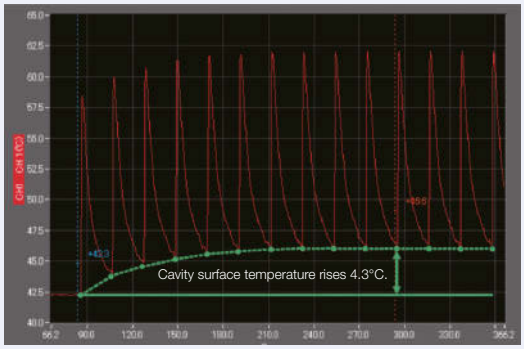
Enables decision-making based on data from molding start until the mold temperature stabilizes to minimize discarded shots (i.e., reduce resin waste), reducing environmental burdens.
For example, at a plant where the first 30 shots after starting molding are customarily discarded, the ability to determine that the mold temperature has stabilized after 15 shots makes it possible to reduce the number of discarded shots.

■ Molding conditions

Molded product size:	70×40
Resin:	PP
Temperature controller temperature setting:	40°C (cartridge heater)

■ Details deducible from waveforms

- Cavity surface temperature before the resin arrives rises 4.3°C from 42.3°C for the first 10 shots to 46.6°C.
- Confirms temperature difference of 2.3°C to 6.6°C between the temperature controller temperature setting and the temperature measured close to the cavity.

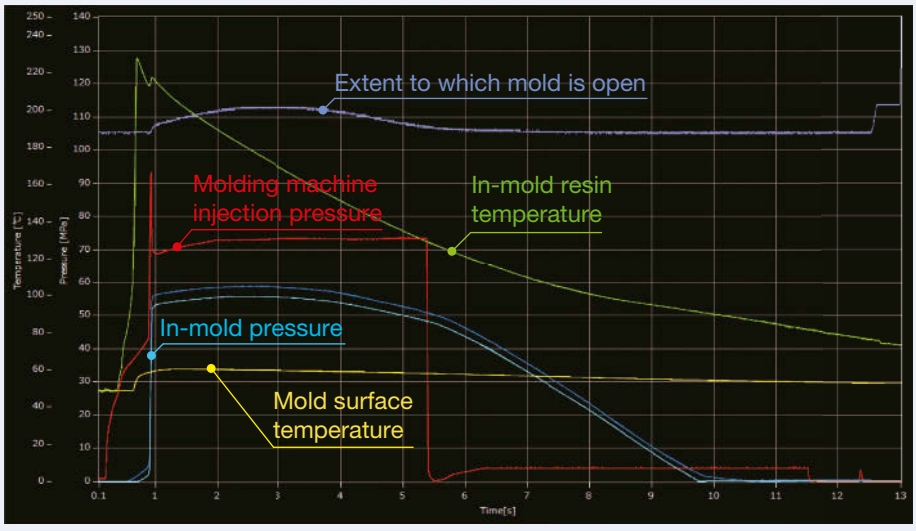


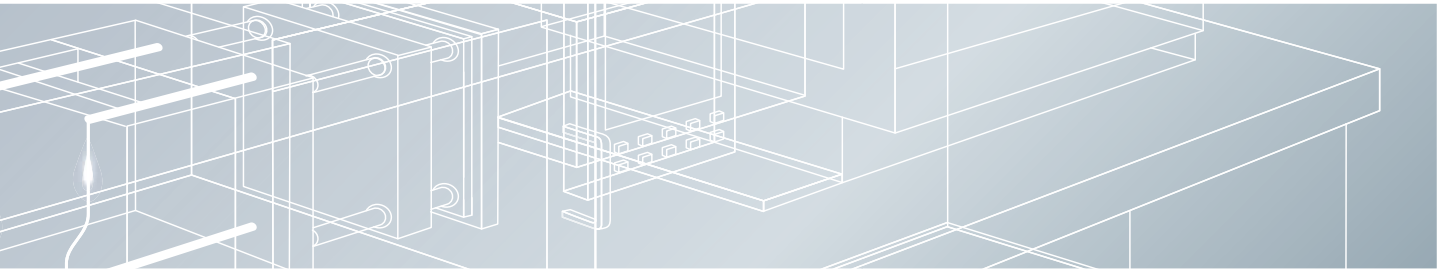
Measured waveform

Injection molding monitoring system

Multi-faceted analysis integrating multiple sources of information

In addition to in-mold pressure, in-mold resin temperature, and mold surface temperature, information can be acquired from other manufacturers' measuring devices, the injection molding machine, and other external devices and displayed simultaneously on the same time axis.



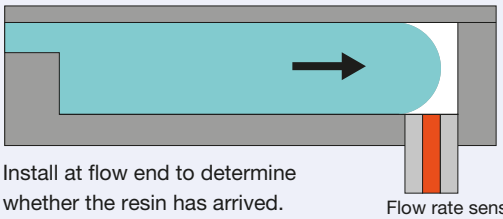


Flow rate measuring system

Visual defect detection and mold maintenance timing detection

Benefits expected from flow rate sensors

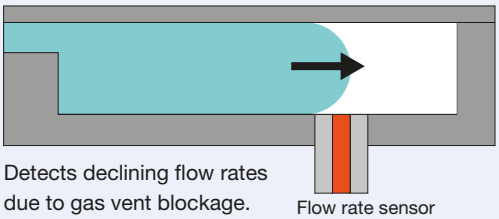
■ Short shot detection (on/off)



Install at flow end to determine whether the resin has arrived.

Flow rate sensor

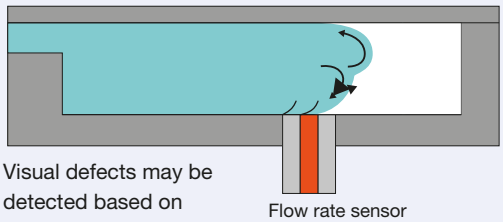
■ Mold maintenance timing detection



Detects declining flow rates due to gas vent blockage.

Flow rate sensor

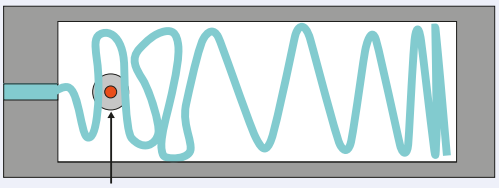
■ Detection of visual defects such as silver streaks and flow marks



Visual defects may be detected based on variations in behavior and state of the resin surface.

Flow rate sensor

■ Detection of visual defects such as jetting



Flow rate sensor

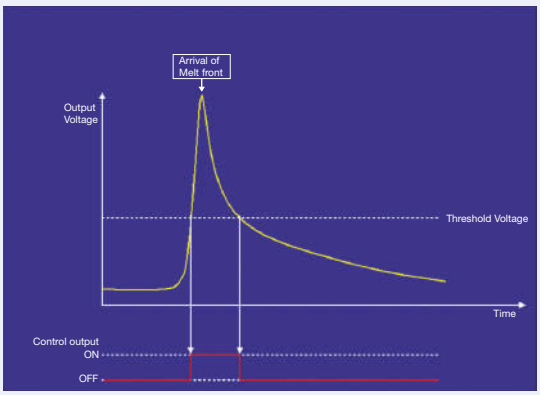
Jetting results in clearly different waveforms.

Flow front detection system

V-P transfer timing control

(Controlling flow length using infrared output as a V-P transfer control signal)

Variations in V-P transfer position caused by component wear in parts such as molding machine screws can be controlled steadily based on the passage of resin over sensor tips as triggers.



Screen showing typical signal operation

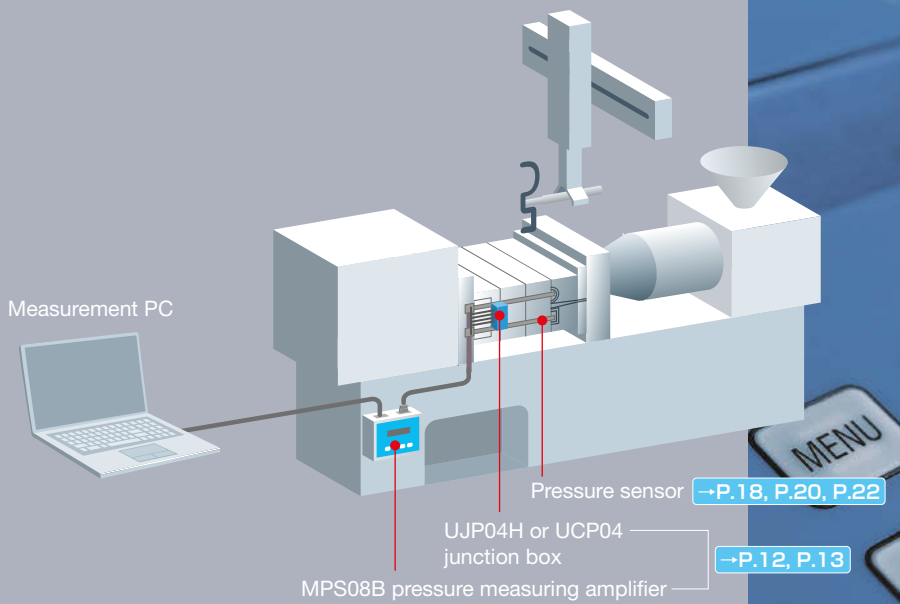
Reproducing V-P transfer position variation

Molded product sample

Sensor location

In-mold Resin Pressure Measuring System

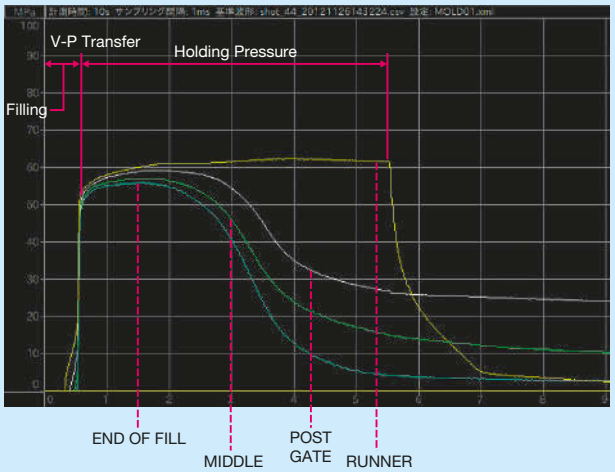
Allows real-time monitoring of pressures inside the mold. This can be used, after saving reference waveforms for conforming products, for defect detection and setting molding parameters using alarm signals based on waveform fluctuations.



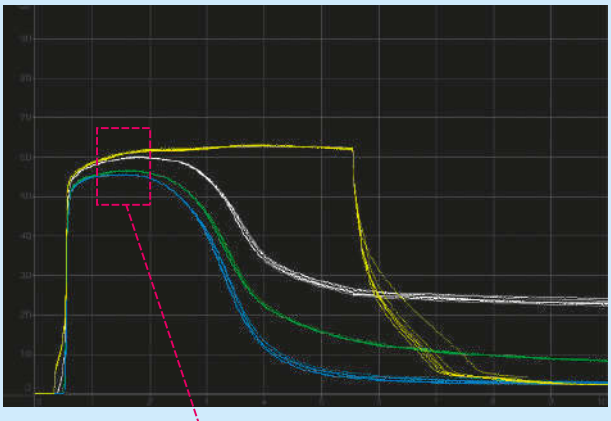
Measured waveforms

Pressures inside the mold can be monitored in real time via the waveform display viewed in the dedicated measurement software.
Waveforms for conforming products can be saved as reference waveforms for use in setting molding parameters, even for different molding setups.
Alarm monitoring zones can be set to effectively monitor for defects such as short shots and overpacking during mass production.

Reference waveform and in-mold pressure waveforms



Overlaid pressure waveforms



An alarm monitoring zone can be set near the peak pressure to detect short shot defects.

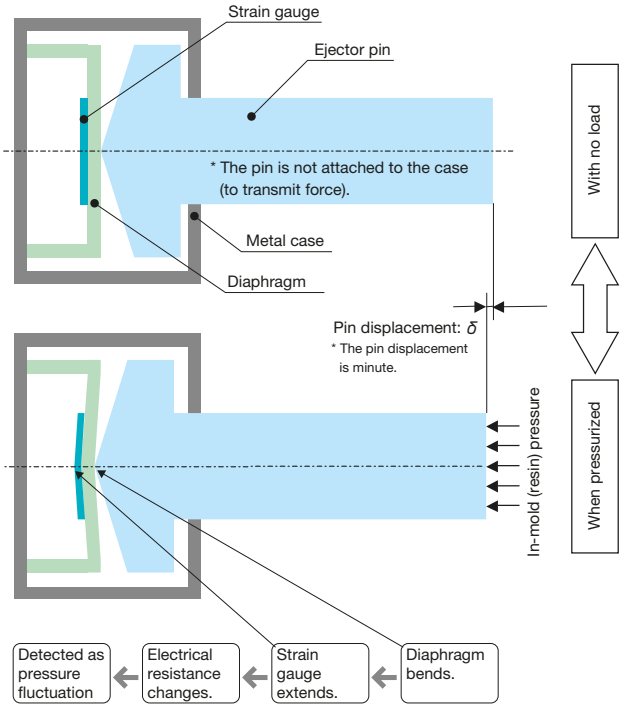
[System configuration diagram]

- MPS08B pressure measuring amplifier set → P.24
- MPV04S pressure measuring amplifier → P.15
- MPS01A inline pressure measuring unit → P.26

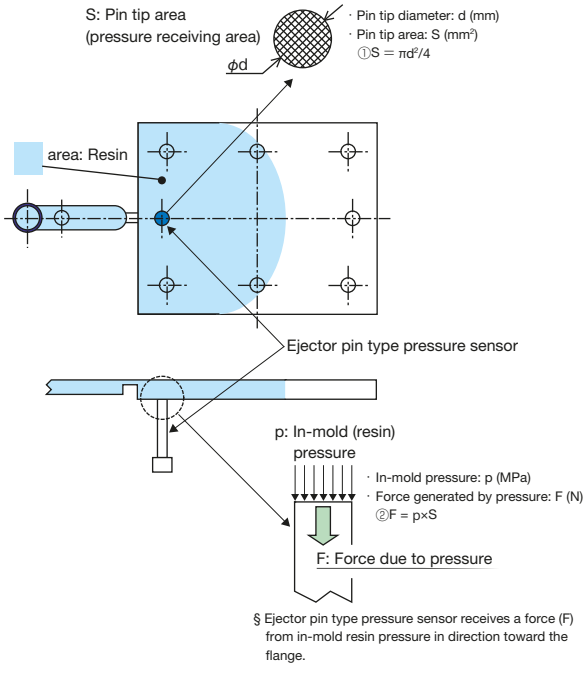
Measuring principles

The resin pressure inside a mold acts on a strain gauge via an ejector pin, generating an electrical signal, which is then arithmetically processed by a measuring amplifier.
The results of this arithmetic processing are displayed as a pressure waveform via the dedicated software.

◎Measuring principles (schematic diagram)

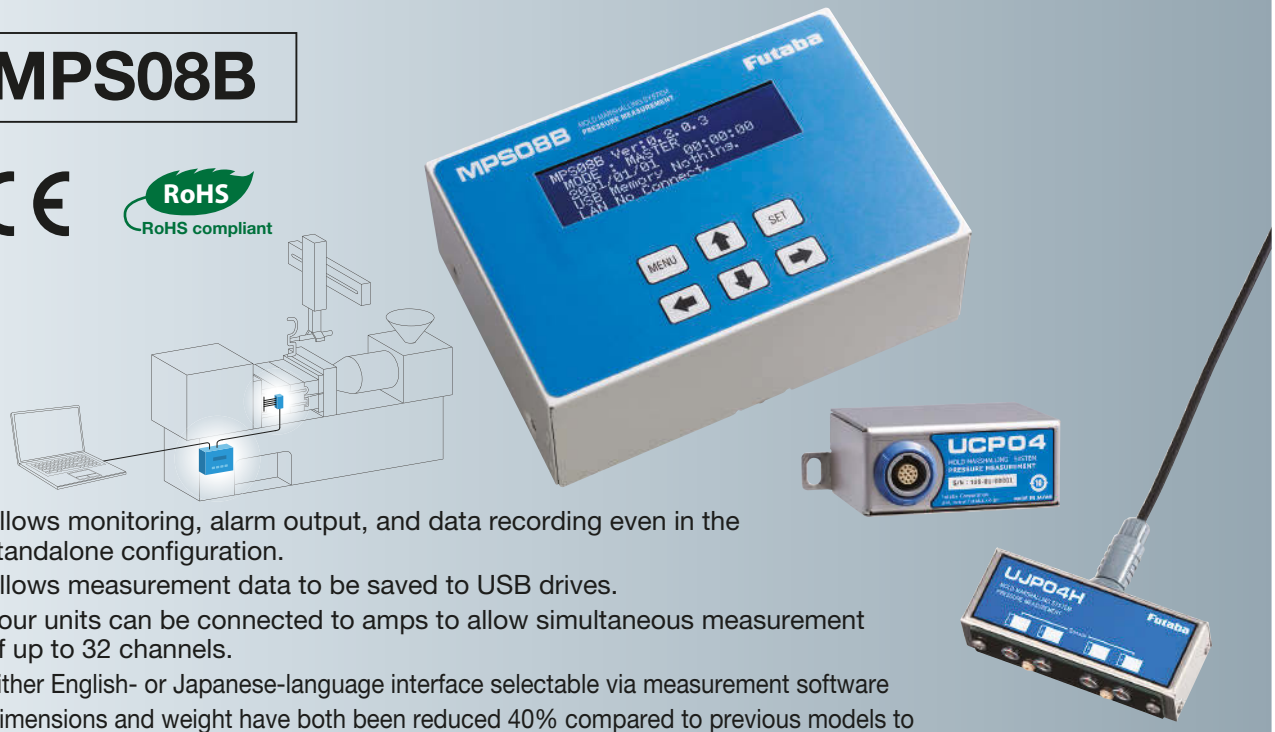


◎Force acting on sensor



Pressure measuring amplifier

MPS08B



- Allows monitoring, alarm output, and data recording even in the standalone configuration.
- Allows measurement data to be saved to USB drives.
- Four units can be connected to amps to allow simultaneous measurement of up to 32 channels.
- Either English- or Japanese-language interface selectable via measurement software
- Dimensions and weight have both been reduced 40% compared to previous models to allow attachment with magnets.
- RS485 interface supports Modbus communications.

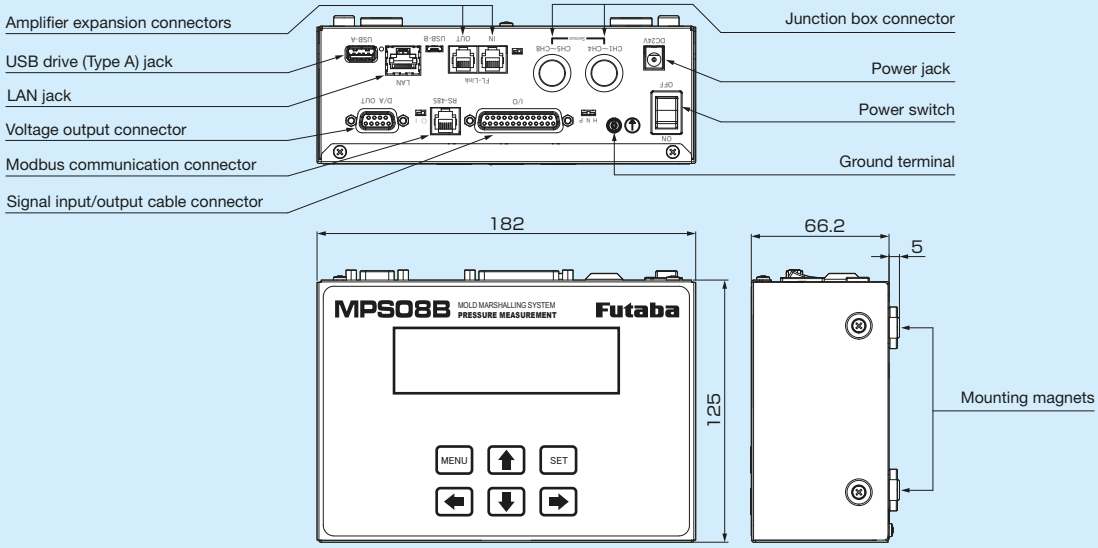
Specifications

MPS08B pressure measuring amplifier set

Product code	Standard set	MPS08BL-S or MPS08BR-S or MPS08BC-S
	Junction box with cable storage space set	MPS08BU-S
Number of measurement points		4 (expandable to 8 per unit: addition of one junction box; up to 32 points with 4 units connected)
Measurement range		0 to 200 MPa*1
Analog voltage output	Output voltage	0.0 V to 10.0 V (20 MPa/V)
	Impedance	100 Ω
Accuracy		±2% F.S.
Display units		MPa, kgf/cm^2, psi, bar
Sampling interval		1 ms/2 ms/5 ms/10 ms/20 ms/50 ms/100 ms/200 ms/500 ms/1,000 ms
Sampling period		Max. 120 s/240 s/600 s/1,200 s/2,400 s/6,000 s/12,000 s/24,000 s/60,000 s/120,000 s (in sampling interval order)
Resolution		0.01 MPa
Control signal	Input	10 points: Contact input (switchable between NPN open collector and PNP open collector)
	Output	10 points: photorelay (a contact)
Measurement data saving	With PC connected	Saved to data storage for connected PC (including measurement conditions and alarm conditions)
	With USB drive connected	Saved to USB drive regardless of PC connection
Power supply specifications	Power supply	24 V DC (dedicated AC adapter, input 100 V to 240 V AC)
	Maximum power consumption	10 W
Environmental resistance	Operating temperatures	Amplifier main unit: 0°C to 50°C; heat resistant junction box: not to exceed 120°C; heat resistant junction cable: not to exceed 105°C
	Operating humidity	35% to 85% RH (no condensation)
Weight		Amplifier itself: approx. 1,150 g; set total: approx. 2,400 g
Accessories		Heat resistant junction box (1) or junction box with cable storage space (1); heat resistant junction cable (3 m) (1); AC adapter, signal input/output cable (3 m), LAN cable (2 m), measurement software
Recommended hardware (installation PC) operating environment *System does not include measurement PC.		Operating system: Windows 8 (32 bit/64 bit), Windows 8.1 (32 bit/64 bit), Windows 10 (32 bit/64 bit) Processor: Intel CPU Core i5 or better; minimum memory: 4 GB Other: Ethernet port; .NET Framework 4.8 or higher installed

*1 The upper limit measurement range will vary depending on the sensor measurement range.

External dimensions



UJP04H heat resistant junction box

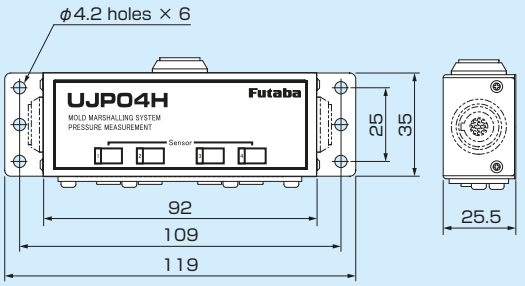
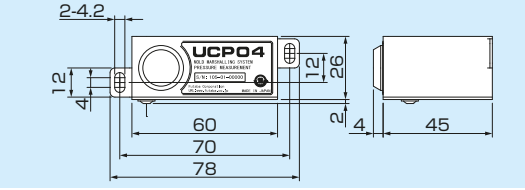


*Diagram shows model with connector located in the center (UJP04H-C).

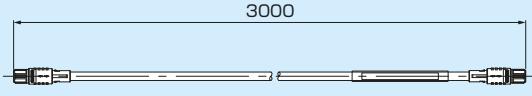
Product code	Connector position left	UJP04H-L (Set product code: MPS08BL-S)
	Connector position right	UJP04H-R (Set product code: MPS08BR-S)
	Connector position center	UJP04H-C (Set product code: MPS08BC-S)
Number of sensor connections		4
Operating temperatures		Mold temperatures not to exceed 120°C
Weight		Approx. 150 g

UCP04 junction box with cable storage space



Product code	UCP04
Number of sensor connections	4
Operating temperatures	Mold temperatures not to exceed 120°C
Weight	Approx. 85g

WJP0430HB heat resistant junction cable



Product code	WJP0430HB
Operating temperatures	Mold temperatures not to exceed 105°C

Voltage output cable (available separately)

This cable (3 m) is used to transfer the pressure values measured for each channel as analog voltages to a data logger, molding machine, or other external device. When expanding or linking multiple amplifiers, a separate cable is required for each additional MPS08.

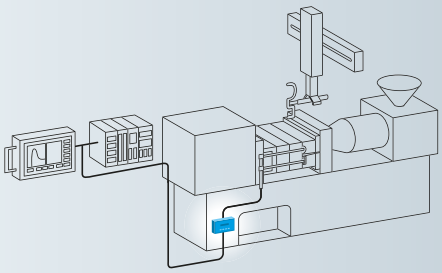
Product name	Product code
Voltage output cable	WCI0830-V-D9P-Y N-MPS08B

Pressure measuring amplifier

MPV04 (Analog voltage output type)

CE *1

RoHS compliant



- CE compliant*1 pressure measuring amplifier (model MPV04)
- Allows simultaneous measurement of four channels with a single unit.
- Outputs a voltage of 5 V per 100 MPa for use in conjunction with general measuring devices and controllers.
- Compact and lightweight for easy mounting

*1 Must be used in conjunction with SSE series or SSB series pressure sensors.

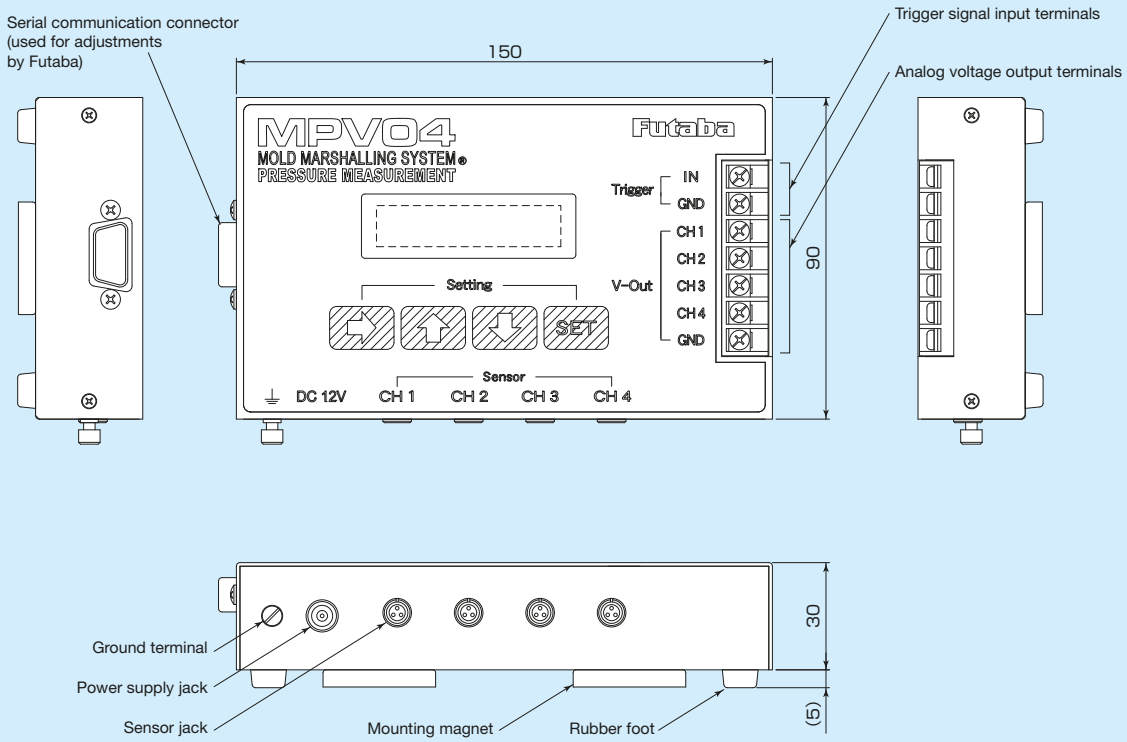
Specifications

MPV04S pressure measuring amplifier set

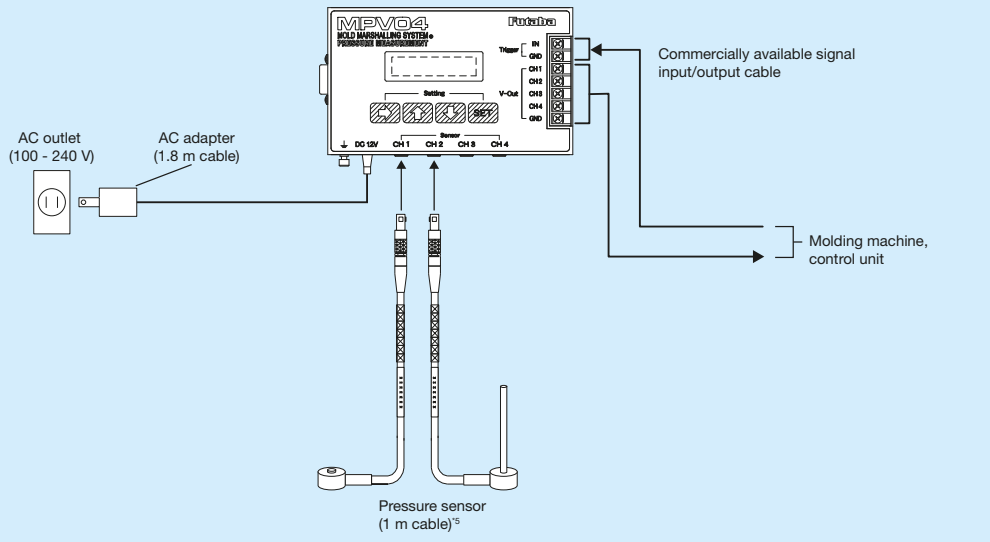
Product code		MPV04S
Number of measurement points		4
Analog voltage output	Output voltage	0.0 V to 10.0 V (20 MPa/V)*2
	Impedance	100 Ω
Accuracy		±2% F.S.
Sampling interval*3		1 ms
Measurement range		0 MPa to 200 MPa*4
Power supply specifications	Power supply	12 V DC (dedicated AC adapter, input 100 V to 240 V AC)
	Maximum power consumption	3.7 W
Environmental resistance	Operating temperatures	0°C to +50°C
	Operating humidity	35% to 85% RH (no condensation)
Weight		Approx. 510 g
Accessories		AC adapter

*2 The output voltage of 5 V corresponds to an in-mold resin pressure of 100 MPa.
*3 Interval for measuring data: 1 ms (1/1,000 second) means the acquisition of 1,000 data items per second.
*4 The upper limit measurement range will vary depending on the pressure sensor measurement range.

External dimensions



System configuration diagram

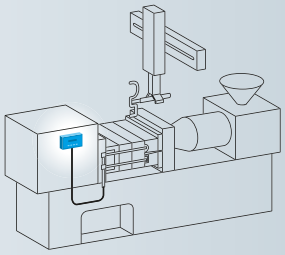


*5 Products with customer-specified cable lengths are also available. (→ pages 19 and 21)

Inline pressure measuring unit

MPS01A (Inline pressure measuring unit)

RoHS compliant



- Low-cost inline type
- Incorporates a clear and easy to read digital display, even in busy production facilities.
- Includes range of functions beyond standard defect detection.
- Supports RS485 communication for remote monitoring.

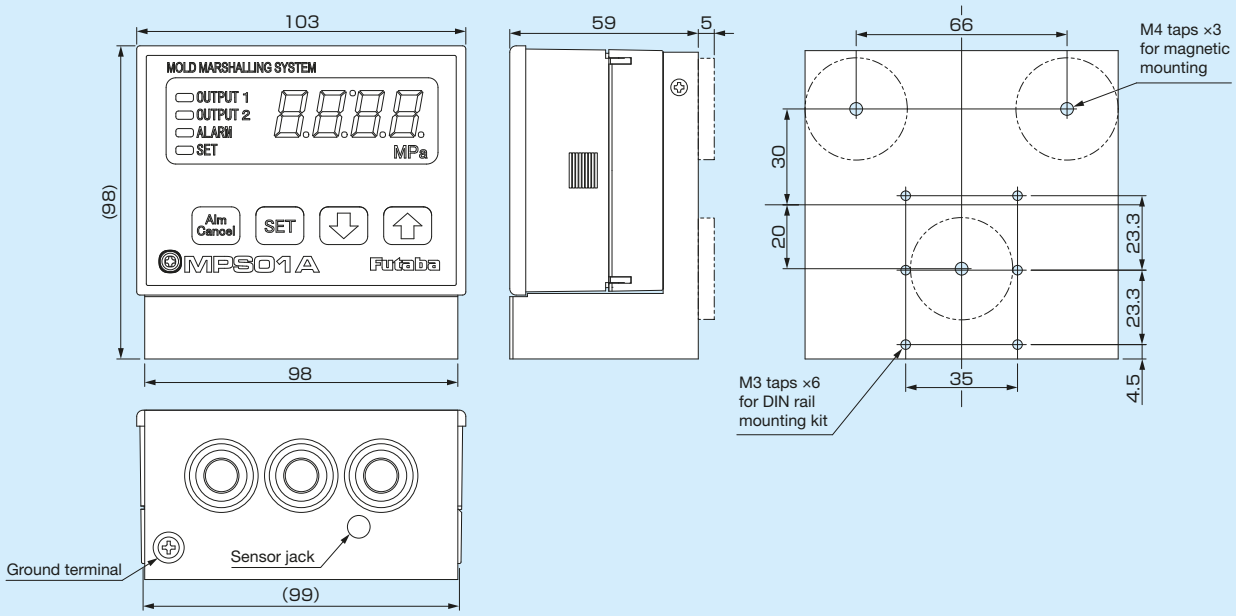
Specifications

MPS01A inline pressure measuring unit

Product code		MPS01A
Number of measurement points		1
Analog voltage output	Output voltage	0.0 V to 10.0 V (20 MPa/V)*1
	Impedance	100 Ω
Accuracy		±2% F.S.
Control input (trigger/alarm cancel)		Nonvoltage contact input
Control output (alarm)		NPN open collector, max. 100 mA (up to 30 V)
Sampling interval*2		1 ms
Sampling period*3		Max. 600 s
Resolution		0.1 MPa
Measurement range		0 MPa to 200 MPa*4
Power supply specifications	Power supply	24 V DC (power supply available separately)
	Maximum power consumption	2.4 W
Environmental resistance	Operating temperatures	0°C to +50°C
	Operating humidity	35% to 85% RH (no condensation)
Weight		Approx. 500 g
Accessories		–

*1 The output voltage of 5 V corresponds to an in-mold resin pressure of 100 MPa.
*2 Interval for measuring data: 1 ms (1/1,000 second) means the acquisition of 1,000 data items per second.
*3 The time period for which data can be measured
*4 The upper limit measurement range depends on sensor measurement range.

External dimensions



Functions

Displays **three different pressure readouts**.

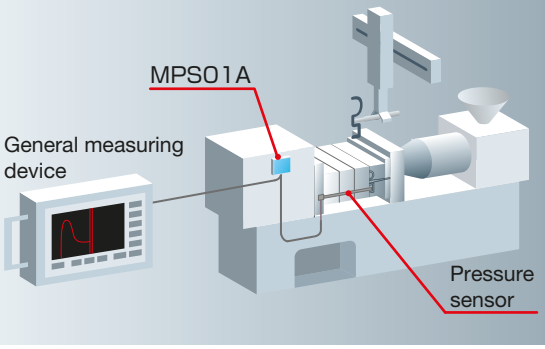
Incorporates easy-to-read **digital display** for operators in busy production facilities.

[Available pressure readouts]

1. Peak pressure .... Displays the maximum pressure value for each shot.
2. Pressure after t seconds....Displays the pressure value at a specified time in seconds.
3. Eject pressure..... Displays the maximum pressure value within a specified time range in seconds.

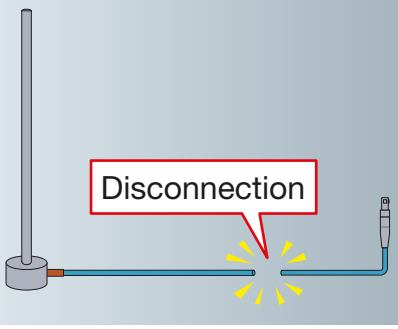
[How do I view waveform data?]

An analog voltage signal (waveform data) can be output to allow viewing of **waveform data** on your own general measuring device connected to the MPS01A. (Waveforms are output at 20 MPa/V.)



[Self-diagnostic function]

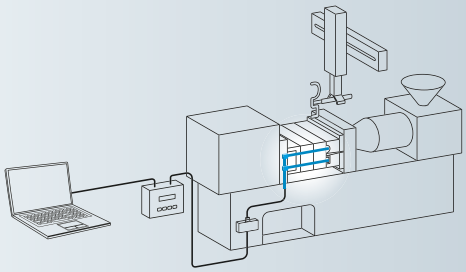
Problems such as sensor cable disconnection, connector poor connection, and strain gauge abnormalities are **self-diagnosed** and displayed as errors. This allows **rapid detection of unforeseen problems**, even without monitoring the pressure waveform.



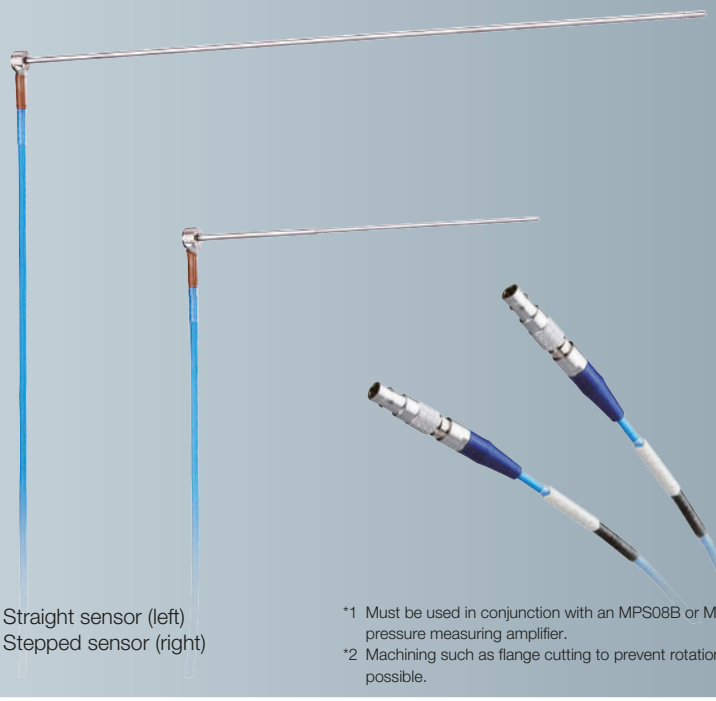
Ejector pin type SSE series

CE *1

RoHS compliant



- Ejector pin configuration allows exchange with existing ejector pins*2
- The pin can be cut off if required to suit the mold.
- The overall length of the pin can be specified to order.



Straight sensor (left)
Stepped sensor (right)

*1 Must be used in conjunction with an MPS08B or MPV04 pressure measuring amplifier.
*2 Machining such as flange cutting to prevent rotation is not possible.

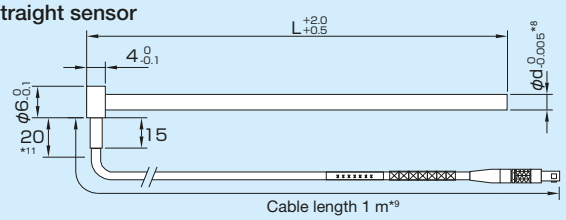
Specifications

Product code		SSE series (→ page 32)						
Rated capacity	Tip diameter	ϕ0.8	ϕ1.0	ϕ1.2	ϕ1.5	ϕ2.0	ϕ2.5	ϕ3.0
	Units: N	50.3	78.5	113.1	176.7	314.2	490.9	706.9
Rating		100 MPa						
Recommended measurement range		0 MPa to 100 MPa						
Ejector pin section stroke (guideline)	At rated capacity*3	0.050 mm	0.040 mm	0.040 mm	0.055 mm	0.073 mm	0.080 mm	0.076 mm
Permitted overload		100 MPa						
Material		Ejector pin SKH51*4 (hardness: HRC 58 to 60)						
Pressure detection element		Strain gauge						
Nonlinearity (during pressurization)*5		±2.0% F.S.						
Operating temperature range		Mold temperature not to exceed 150°C (excluding pin tip)						
Sensitivity fluctuation*6		Max. 0.05% F.S./°C						
Cable		3-core PTFE shield cable (ϕ2.5), minimum bending radius 24 mm						

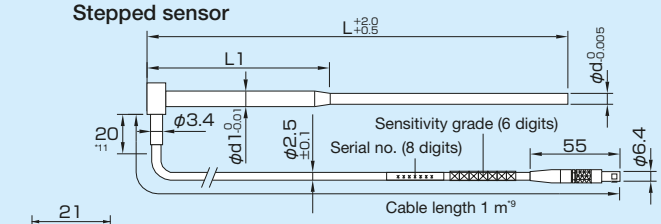
*3 Indicates deflection on the protruding side under the rated capacity load.
*4 SSEEJ-3.0×400 is SKD61. Hardness 900 HV minimum (nitride treated after tempering) (→ page 32)
*5/6 Explanation of terms on page 115

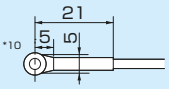
External dimensions

Straight sensor



Stepped sensor





*8 ϕd tolerance for SSEEJ-03.0×400 is -0.01 mm to -0.02 mm.
*9 Products with customer-specified cable lengths are also available.
*10 Dimension from cable to flange
*11 Bending prohibited for this section

Mounting method (for mounting in spacer type molds)

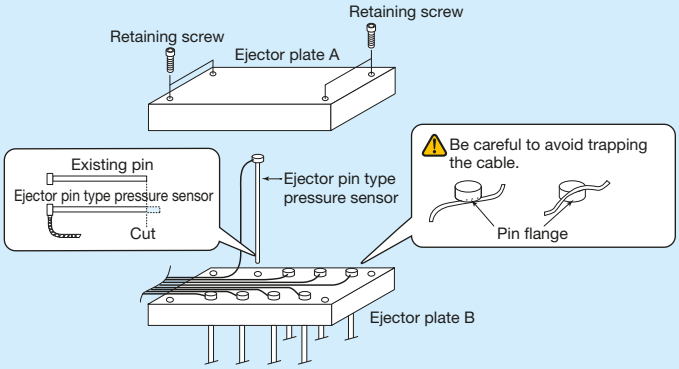
STEP 1 Loosen the retaining screws, remove ejector plate A, and remove the ejector pin from the location to be measured.

STEP 2 Cut the pin tip of the ejector pin type pressure sensor to match the length of the ejector pin removed.

Be careful here to avoid apply any force to the sensor flange where the leads protrude. Additionally, safeguard the sensor flange from exposure to water.

STEP 3 Insert the ejector pin type pressure sensor into the ejector pin hole at the location to be measured. Be careful here to avoid trapping the sensor cable.

Note: Check to confirm that the pin moves smoothly along the axial direction once mounted. Note that friction may prevent accurate measurements.
Take appropriate precautions to keep resin from adhering to the pin and pin mounting hole.

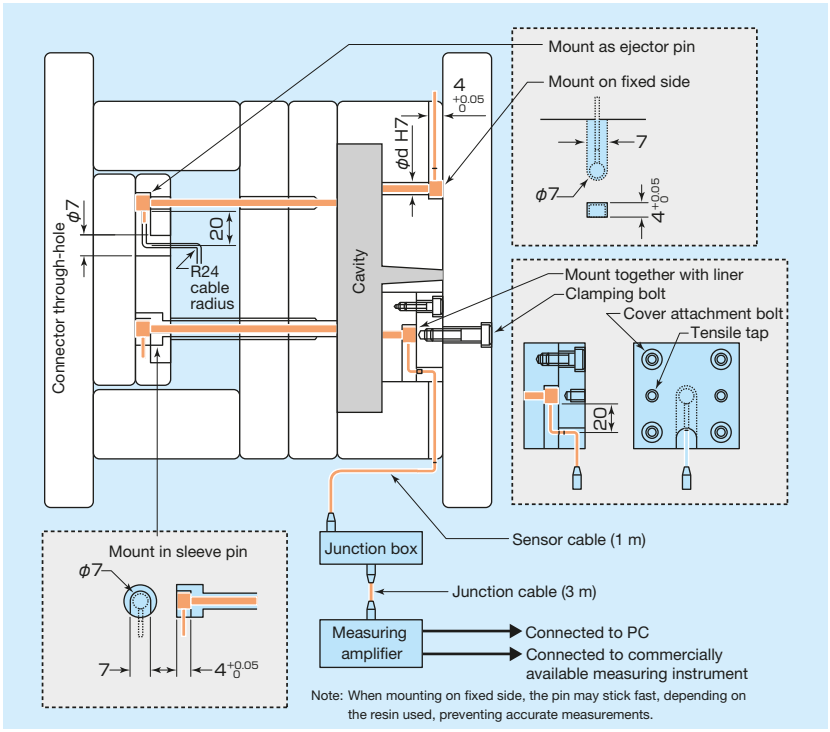


Mounting example

Machining procedures and component sizes not indicated on the drawing should be designed by the customer to suit the specifications of the actual mold.

Order-made sensors

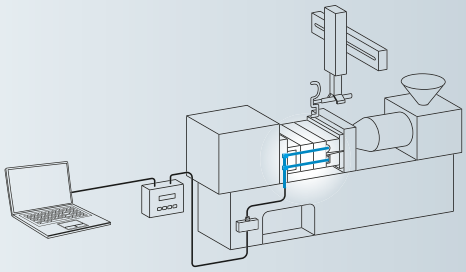
Sensors with customer-specified pin diameters, pin lengths, and step lengths are available.
Please contact your nearest Futaba sales office.
(Specifications will be determined based on consultations.)
It may not be possible to offer products for certain specifications.



Note: When mounting on fixed side, the pin may stick fast, depending on the resin used, preventing accurate measurements.

Button type SSB series

CE *1 RoHS compliant



- This is installed immediately below the ejector pin for measurement; allows existing ejector pins to be used unchanged.
- This can also be used with small-diameter pins, square pins, irregular profile tip pins, and flange cut pins (applications for which the ejector pin type sensors cannot be used).

*1 Must be used in conjunction with an MPS08B or MPV04 pressure measuring amplifier.

Specifications

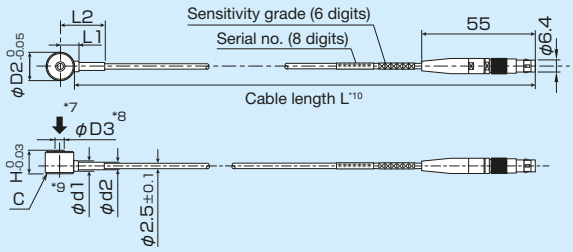
Product code	SSB050N08×06	SSB200N08×06	SSB01KN08×06	SSB050N08×06H	SSB200N08×06H	SSB01KN08×06H	SSB04KN10×08H*5	SSB16KN12×10H*5
Rated capacity	50 N	200 N	1 kN	50 N	200 N	1 kN	4 kN	16 kN
Recommended measurement range	12.5 N to 50 N	50 N to 200 N	200 N to 1 kN	12.5 N to 50 N	50 N to 200 N	200 N to 1 kN	1 kN to 4 kN	4 kN to 16 kN
Protruding side stroke (guideline)*2 at rated capacity	0.02 mm							
Permitted overload	75 N	300 N	1.5 kN	75 N	300 N	1.5 kN	6 kN	24 kN
Material	Main unit SUS630 (hardness: HRC 40 maximum)							
Pressure detection element	Strain gauge							
Nonlinearity*3	±2.0% F.S.							
Operating temperature range	Mold temperature not to exceed 150°C			Mold temperature not to exceed 200°C				
Sensitivity fluctuation*4	0.05% F.S./°C max			-0.03% F.S./°C max				
Cable	3-core PTFE shield cable (ϕ2.5), minimum bending radius 24 mm							

*2 Indicates deflection on the protruding side under the rated capacity load.

*3/4 Explanation of terms on page 115

*5 Download the latest version of the measurement software from "Mold/industrial production equipment, in-mold measuring system, latest software download" on our web-site to connect to the MPS08 and MPV04 pressure measuring amplifiers.
For details, please contact your nearest Futaba sales office.

External dimensions



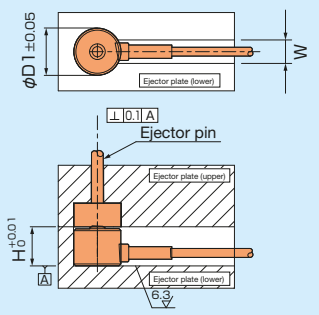
Dimensions table

Rated capacity	D2	D3	H	L1	L2	d1	d2	L	C
50 N/200 N/1 kN	8	2	6	9	19	3.9	3.4	1000	C0.2
50 N/200 N/1 kN (heat resistant)	8	2	6	9	18	4.3	3.8	1000	C0.2
4 kN	10	4	8	10	21	4.5	3.8	2000	C0.5
16 kN	12	4	10	11	22	4.5	3.8	2000	C0.5

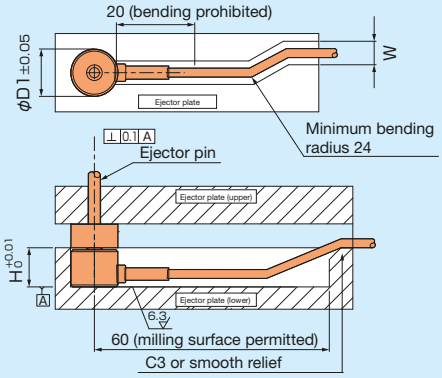
7 Loading direction: The arrow in the diagram indicates the positive load direction.
*8 The height of the protruding section is 0.5 mm for all types.
*9 This sensor supports loads via the case outer circumference. Do not use the rear cover to support a load; it is not designed to withstand loads.
*10 Products with customer-specified cable lengths are also available.

Mounting example

Ejector plate specifications Counterbored type



Ejector plate specifications Spacer type

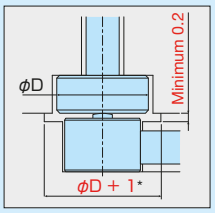


Dimensions table

Rated capacity	D1	H	W
50 N/200 N/1 kN	8.1	6	5
50 N/200 N/1 kN (heat resistant)	8.1	6	5
4 kN	10.1	8	6
16 kN	12.1	10	6

Note 1: Mount so that the sensor protruding side is in contact with the ejector pin.
Note 2: Install with the sensor aligned with the ejector pin.
Note 3: Counterbore as shown in the diagram on the right if the ejector pin flange diameter exceeds the sensor outer diameter.

* Determine the value after accounting for the diameter of the ejector pin and clamping bolt relief hole.



Sensor selection method

STEP 1 Calculate the load acting on the sensor. **STEP 2** Select the corresponding product code from the product code selection table.

Selection example

Load (N) = Pressure-receiving area (mm²) × expected in-mold pressure (MPa)

[Example ①] Straight ejector pin		[Example ②] Square ejector pin	
Tip diameter	Φ1.2 mm	Tip width	0.8 mm
Pressure-receiving area	1.13 mm²	Tip length	4.2 mm
Expected in-mold pressure	120 MPa	Pressure-receiving area	3.36 mm²
Load	**135.6 N**	Expected in-mold pressure	180 MPa
Select SSB200N08×06 from the table on the right.		Load	**604.8 N**
		Select SSB01KN08×06 from the table on the right.	

Product code selection table

Applicable load (N)	Product code
12.5 to 50	SSB050N08×06(H)
50 to 200	SSB200N08×06(H)
200 to 1,000	SSB01KN08×06(H)
1,000 to 4,000	SSB04KN10×08H
4,000 to 16,000	SSB16KN12×10H

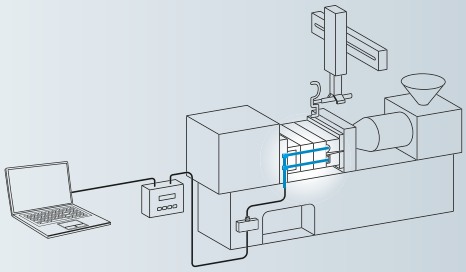
* The suffix "H" indicates special order products capable of withstanding 200°C (see page 20).

Sensor selection look-up table You can also select products from the following table:

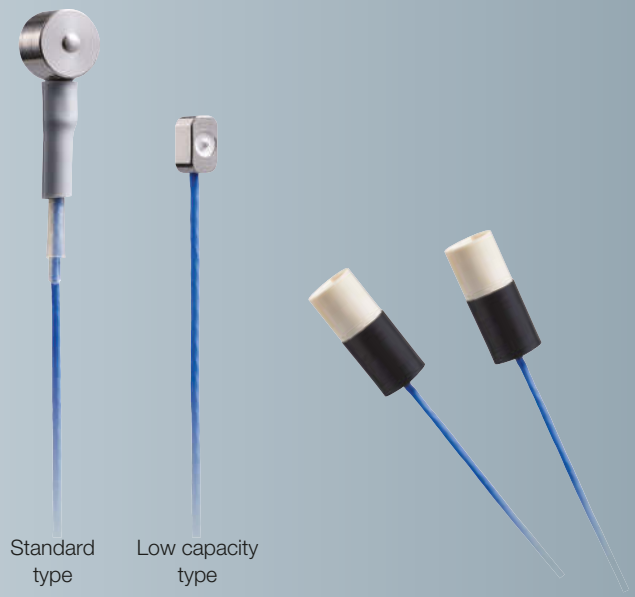
Tip diameter		φ0.5	φ0.6	φ0.8	φ1.0	φ1.2	φ1.5	φ2.0	φ2.5	φ3.0	φ4.0
Pressure-receiving area [mm²]		0.20	0.28	0.50	0.79	1.13	1.77	3.14	4.91	7.07	12.57
Expected in-mold pressure	50 MPa		SSB050N	SSB050N	SSB050N	SSB200N	SSB200N	SSB200N	SSB01KN	SSB01KN	SSB01KN
	100 MPa	SSB050N	SSB050N	SSB200N	SSB200N	SSB200N	SSB200N	SSB01KN	SSB01KN	SSB01KN	SSB04KN
	200 MPa	SSB050N	SSB200N	SSB200N	SSB200N	SSB01KN	SSB01KN	SSB01KN	SSB01KN	SSB04KN	SSB04KN
Tip diameter		φ5.0	φ6.0	φ7.0	φ8.0	φ9.0	φ10.0	φ11.0	φ12.0	φ13.0	φ14.0
Pressure-receiving area [mm²]		19.63	28.27	38.48	50.27	63.62	78.54	95.03	113.10	132.73	153.94
Expected in-mold pressure	50 MPa	SSB01KN	SSB04KN	SSB04KN	SSB04KN	SSB04KN	SSB04KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN
	100 MPa	SSB04KN	SSB04KN	SSB04KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN
	200 MPa	SSB04KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN	SSB16KN				

Button type For junction boxes with cable storage space SCB series

CE ※1 RoHS RoHS compliant



- Cables can be stored inside the junction box.
- This is installed immediately below the ejector pin to enable measurements; allows use of existing ejector pins unchanged.
- This can also be used with small-diameter pins, square pins, irregular profile tip pins, and flange cut pins (applications for which ejector pin type sensors cannot be used).
- Compatible with MPS08B amplifiers



Standard type　Low capacity type

*1 Must be used with an MPS08B pressure measuring amplifier.

Specifications

Type	Low capacity type		Standard type				
Product code	SCB010N03.5X06.0 N03.5*5	SCB050N03.5X06.0 N03.5*5	SCB050N08X06H	SCB200N08X06H	SCB01KN08X06H	SCB04KN10X08H*5	SCB16KN12X10H*5
Rated capacity	10 N	50 N	50 N	200 N	1 kN	4 kN	16 kN
Recommended measurement range	5 to 10 N	25 to 50 N	12.5 to 50 N	50 to 200 N	200 to 1 kN	1 k to 4 kN	4 k to 16 kN
Projecting side stroke (guideline)*2 at rated capacity	0.014 mm		0.02 mm				
Permitted overload	15 N	75 N	75 N	300 N	1.5 kN	6 kN	24 kN
Material	Main unit SUS630 (hardness: 40HRC)						
Pressure detection element	Strain gauge						
Nonlinearity*3	±2.0% F.S.						
Operating temperature	Mold temperature not to exceed 150°C		Mold temperature not to exceed 200°C				
Sensitivity fluctuation*4	0.05% F.S./°C max		-0.03% F.S./°C max				
Cable	3-core PTFE shield cable (ϕ1.1), minimum bending radius 10 mm						

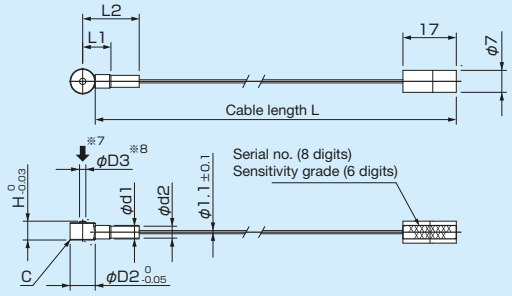
*2 Indicates deflection on the projecting side under the rated capacity load.

*3/4 Explanation of terms on page 115

*5 Download Ver.11.10.60 or later of the measurement software from "Mold/industrial production equipment, in-mold measuring system, latest software download" on our web-site to connect to the MPS08 pressure measuring amplifier. Download Ver.0.4.1.0 or later for the MPS08B pressure measuring amplifier.

External dimensions

Standard type

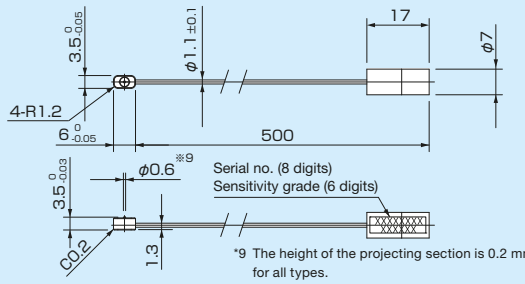


Dimensions table

Rated capacity	D2	D3	H	L1	L2	d1	d2	L	C
50 N/200 N/1 kN	8	2	6	8	13	4.2	3.4	1000	C0.2
4 kN	10	4	8	11	16	4.5	3.4	1000	C0.5
16 kN	12	4	10	12	17	4.5	3.4	1000	C0.5

*6 Loading direction: The arrow in the diagram indicates the positive load direction.
*7 The height of the projecting section is 0.5 mm for all types.
*8 This sensor supports loads via the case outer circumference. Do not use the rear cover to support loads; it is not designed to withstand loads.

Low capacity type (heat resistant up to 150°C)



*9 The height of the projecting section is 0.2 mm for all types.

Method for selecting low capacity sensors

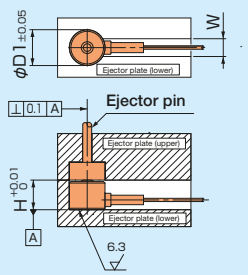
Tip diameter		φ0.3	φ0.5	φ0.6	φ0.8	φ1.0
Pressure receiving area [mm²]		0.07	0.20	0.28	0.50	0.79
Expected in-mold pressure	50 MPa		SCB010N		SCB050N	SCB050N
	100 MPa	SCB010N		SCB050N		
	150 MPa		SCB050N	SCB050N		

Note 1: This is a low capacity sensor. Take care when handling to avoid it being damaged, e.g., during mold assembly, when a load greater than the permitted overload may be applied.
Note 2: This sensor consists of a chassis measuring 0.5 mm thick around the outer circumference, which bears the load of the resin filling the interior. Handle with care. The chassis has minimal load bearing capacity; applying excessive pressure may cause the chassis to fail.
Note 3: For more information on selecting the SCB050N08 × 06H to SCB16KN12 × 10H, refer to page 21.

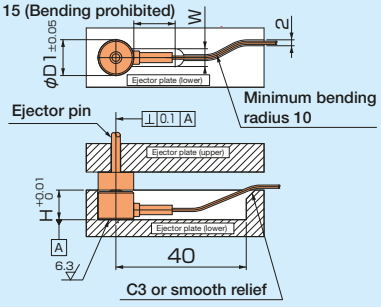
Mounting example

Standard type

Ejector plate specifications
Counterbored type



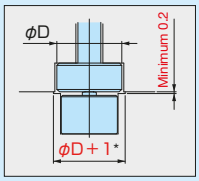
Ejector plate specifications
Spacer type
15 (Bending prohibited)



Dimensions table

Rated capacity	D1	H	W
50 N/200 N/1 kN	8.1	6	5
4 kN	10.1	8	6
16 kN	12.1	10	6

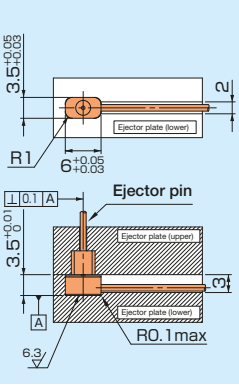
Note 1: Mount so that the sensor protruding side is in contact with the ejector pin.
Note 2: Install with the sensor aligned with the ejector pin.
Note 3: Counterbore as shown in the diagram on the right if the ejector pin flange diameter exceeds the sensor outer diameter.



* Determine the value after accounting for the diameter of the ejector pin and clamping bolt relief hole.

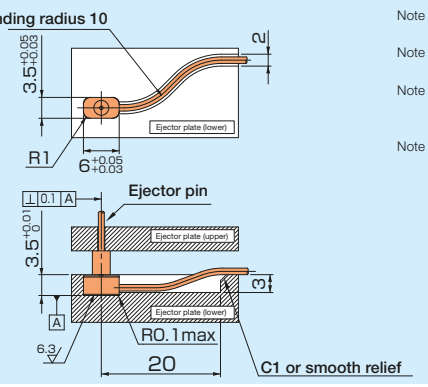
Low capacity type (heat resistant up to 150°C)

Ejector plate specifications
Counterbored type

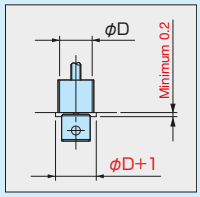


Ejector plate specifications
Spacer type

Minimum bending radius 10



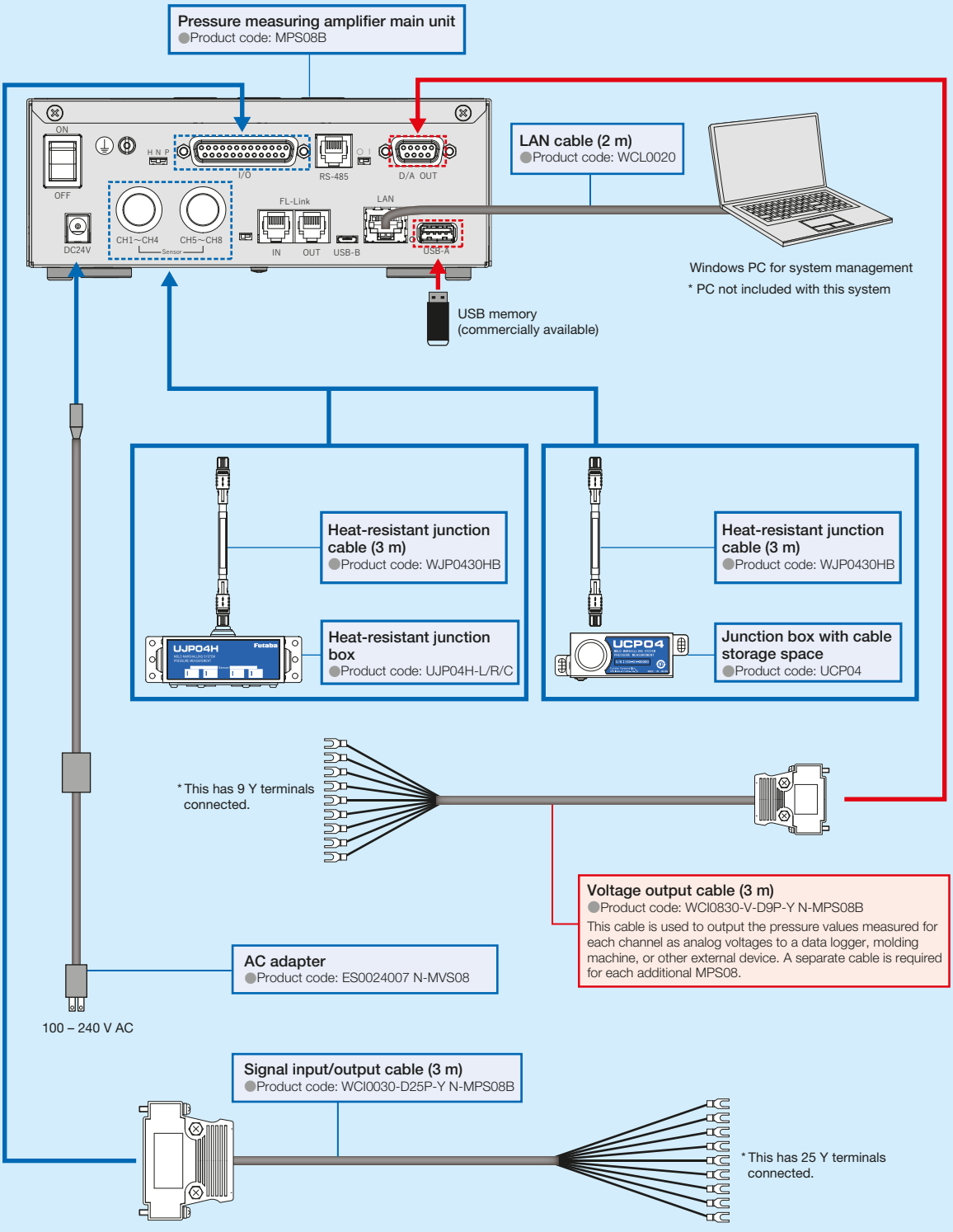
Note 1: Mount so that the sensor projecting side is in contact with the rear of the flange part of the ejector pin.
Note 2: Position the upper and lower ejector plates so that there is less than ±0.2 difference between the ejector pin and the sensor centers.
Note 3: Applying a load greater than the permitted overload can result in damage. Work carefully when assembling the mold.
Note 4: The interior of the sensor chassis (outer circumference 0.5 mm) is filled with resin. The chassis has minimal load bearing capacity and may fail if excessive pressure is applied.
Note 5: Counterbore as shown in the diagram on the right if the ejector pin flange diameter exceeds the sensor outer circumference.



System configuration diagram

System configuration diagram for MPS08B-S pressure measuring amplifier set

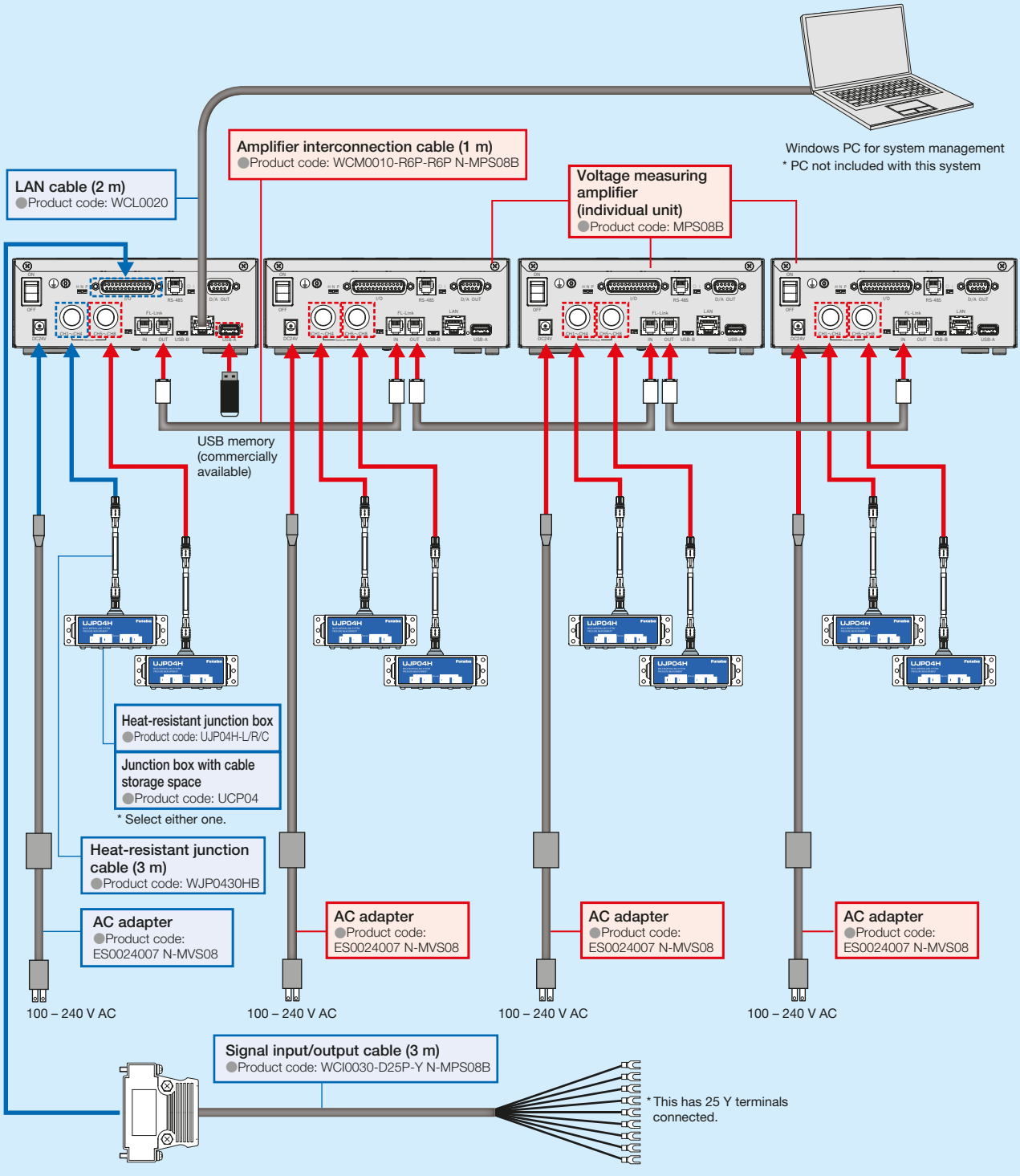
The MPS08B□-S pressure measuring amplifier set contains the items in blue boxes.
Items in red boxes are sold separately.



Connection diagram for MPS08B pressure measuring amplifier expansion

Up to four pressure measuring amplifiers can be connected using the amplifier interconnection cable (available separately) for simultaneous measurement of up to 32 channels.

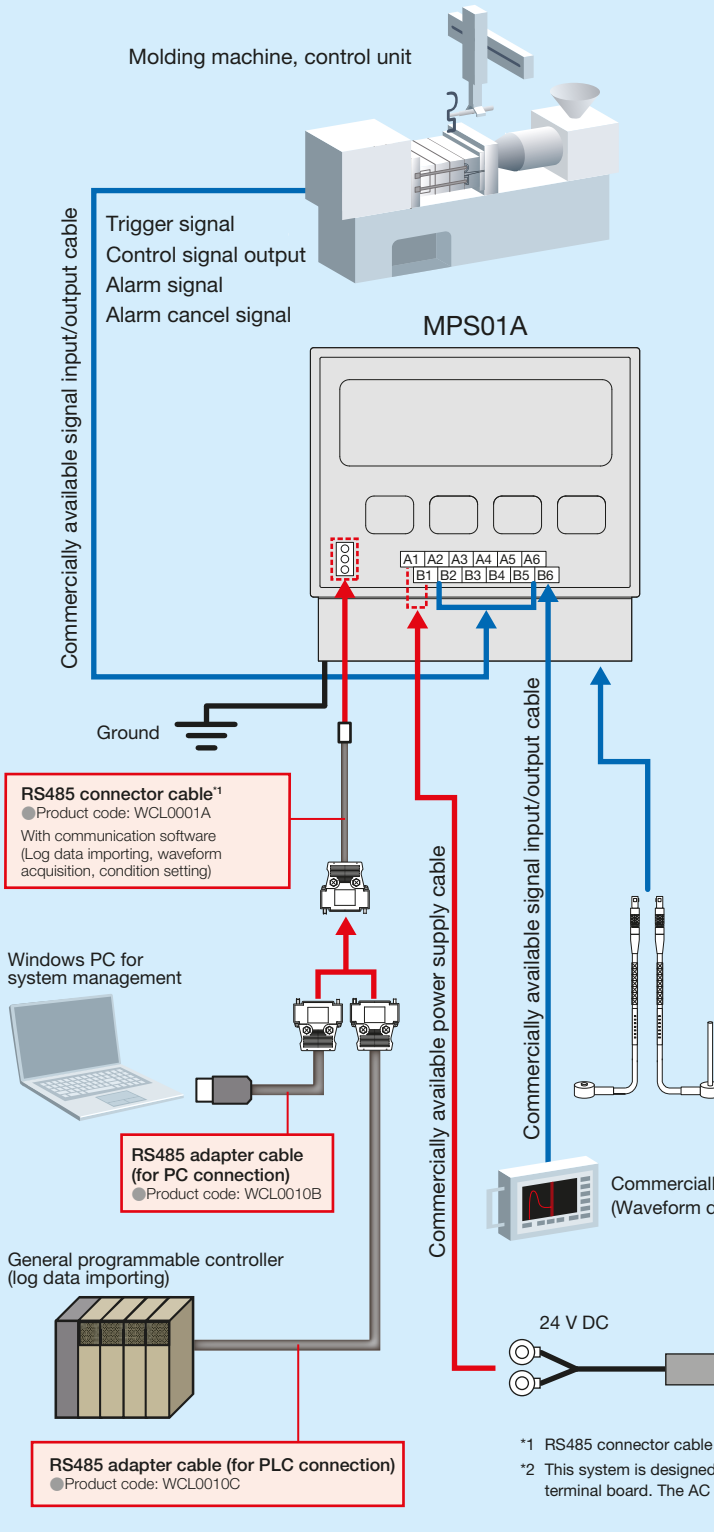
* The MPS08B□-S pressure measuring amplifier set contains the five items in blue boxes.
* A separate amplifier interconnection cable is required for each additional amplifier.
* One set consisting of a junction box and a junction cable is required for every four channels.
* Each amplifier requires an AC adapter.
* A separate voltage output cable (3 m) is required for each MPS08B added.



System configuration diagram

System configuration diagram for MPS01A pressure measuring unit

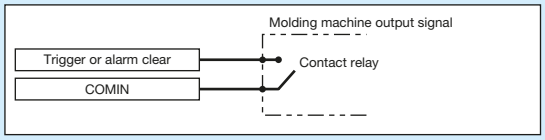
Note that the MPS01A pressure measuring unit does not include the four items indicated by red boxes. These are available separately.



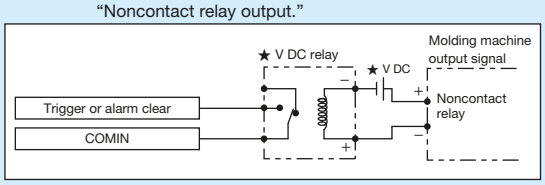
Terminal board pin connection

No.	Signal	Remarks
B1	+24 V	Control power supply
A1	0 V	Control power supply
B2	Trigger input	
A2	Alarm cancel	
B3	Input COM	COM common with B2 and A2
A3	Control signal	
B4	Alarm output 1	
A4	Alarm output 2	
B5	Alarm output 3	
A5	Output COM	COM common with A3, A4, B4, and B5
B6	Analog voltage output (+)	
A6	Analog voltage output (-)	

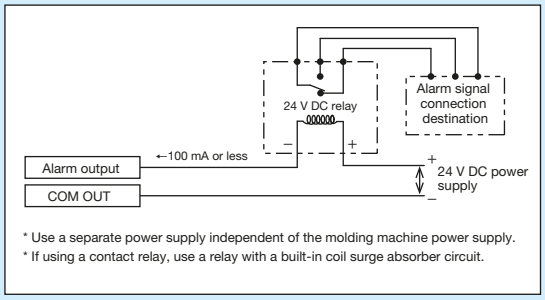
Example 1: The output from the connected molding machine is "Contact relay output."



Example 2: The output from the connected molding machine is "Noncontact relay output."



Example 3: "24 V DC power supply" and "4 V DC relay"



* Use a separate power supply independent of the molding machine power supply.
* If using a contact relay, use a relay with a built-in coil surge absorber circuit.

*1 RS485 connector cable and communication software are sold as a set.

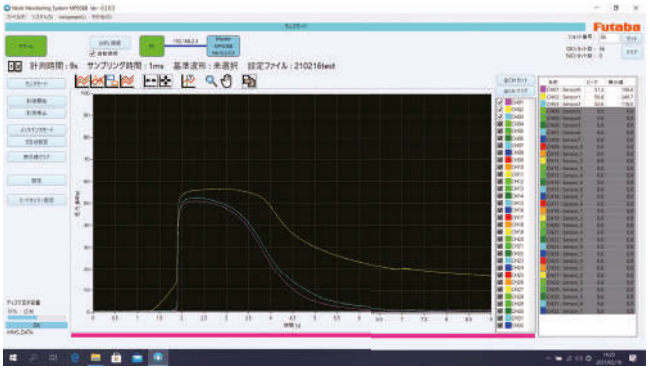
*2 This system is designed to be powered from a standard control power supply (24 V DC) via the terminal board. The AC adapter is not sold as part of the set.

Measurement software functions

* Provided with MPS08B only

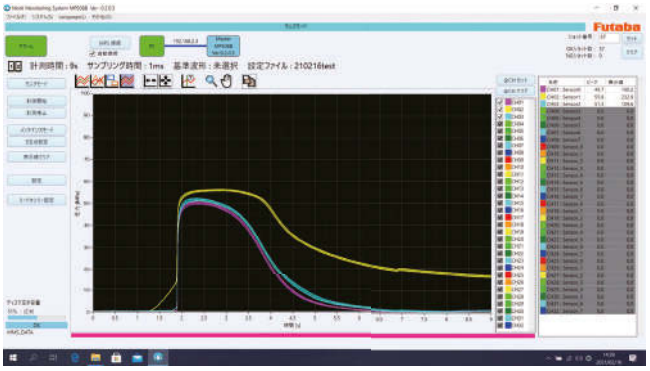
Reference waveform display

The automatically saved pressure data can be viewed on the measurement screen. Waveforms can be overlaid on the screen during measurement to allow visual confirmation of pressure changes when setting molding parameters, pressure variations during mass production, and pressure fluctuations when molding parameters have been altered.



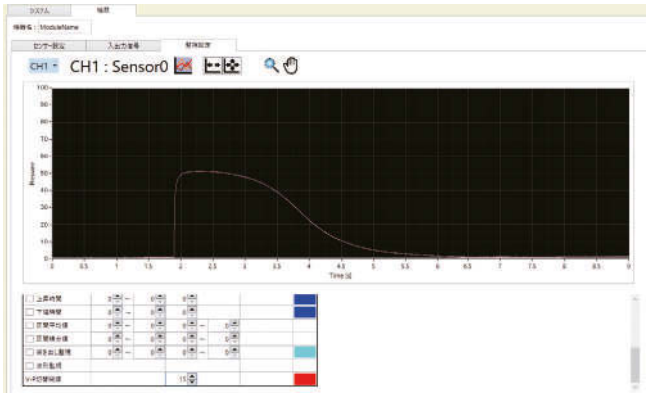
Waveform overlaid display

Press the hide/display overlaid waveforms button on the toolbar to allow waveform overlays for up to 99 cycles.
Variations in the waveforms inside the mold can be checked in real time, allowing visual confirmation of the transition from molding start to stabilized molding.



Control signal output

The molding machine and other external devices can be controlled by setting threshold values for individual measurements.
Voltage signals are output if these values are exceeded.
The signals are output using photorelays, allowing a variety of controls including V-P switching.



Measurement software functions

* Provided with MPS08B only

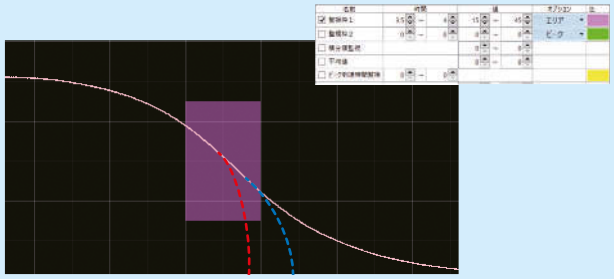
Alarm signal output

Multiple monitoring zones can be set based on the reference waveform. If the waveform is outside the monitoring zone, the amplifier outputs an alarm signal, which can be linked to an unloading machine to automatically screen for defective products, significantly reducing the time required for product inspections. (The following thirteen parameters can be monitored for each channel.)

① Area pressure monitoring

[Blue broken curve: OK / Red broken curve: Alarm]

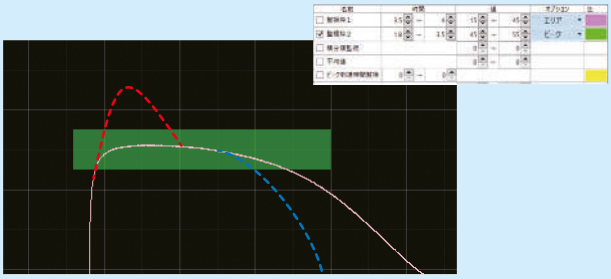
Monitors whether all measurements are within the preset pressure range over the specified monitoring timeframe.



② Peak pressure monitoring

[Blue broken curve: OK / Red broken curve: Alarm]

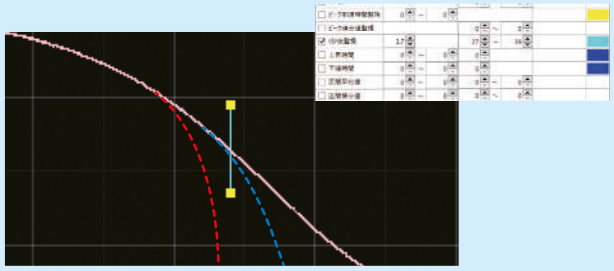
Monitors whether the maximum pressure (peak pressure) value falls within the preset pressure range over the specified monitoring timeframe.



③ Monitoring after t seconds

[Blue broken curve: OK / Red broken curve: Alarm]

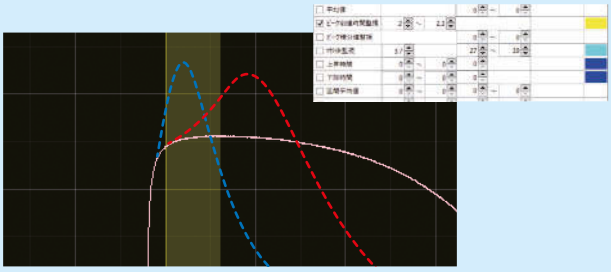
Monitors whether the pressure value falls within the preset pressure range after the specified time period.



④ Peak pressure arrival time monitoring

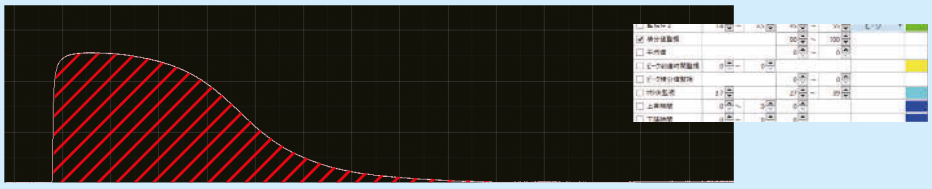
[Blue broken curve: OK / Red broken curve: Alarm]

Monitors whether the maximum pressure (peak pressure) value during the measurement time falls within the specified monitoring timeframe.



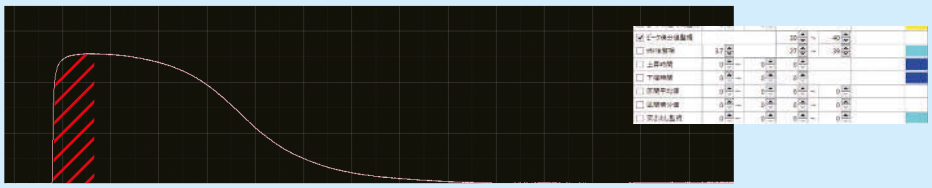
⑤ Integral monitoring

Monitors whether the area enclosed by the pressure waveform and time axis (area shaded in red) falls within the specified integral range.



⑥ Peak integral monitoring

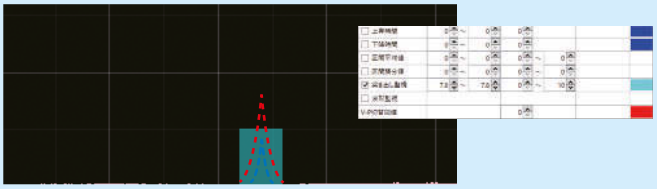
Monitors whether the integral (area shaded in red) up to the maximum pressure (peak pressure) value falls within the specified integral range over the measurement timeframe.



⑦ Eject pressure monitoring

[Blue waveform: OK/Red waveform: Alarm]

Monitors whether the ejection pressure within the set monitoring time range is within the specified pressure range.
*Requires ejection pressure of around 5 MPa.



* Other functions include average value monitoring, rising time monitoring, falling time monitoring, section average monitoring, section integral value monitoring, and waveform monitoring.

Saved data types

Data can be saved as “configuration files,” “waveform data,” or “numerical data,” as shown in the following table.
Saved data can be displayed in tabular or graph form using commercially available spreadsheet applications, allowing it to be used effectively as quality control data.

<table>
<tr><th>Data type</th><th>Item</th><th>Extension</th><th>Destination folder (default for Windows 10)</th><th>Remarks</th></tr>
<tr><td>Configuration file</td><td>Parameter settings</td><td>.xml</td><td>(folder in which .exe file is saved) / Settings</td><td>● Setting parameters for measurement and monitoring. Used by selecting from within a folder on the PC and saving in the amplifier</td></tr>
<tr><td>Waveform data</td><td>Pressure waveform</td><td>.csv</td><td>(folder in which .exe file is saved)/ MMS_DATA/configFileName_yyyymmdd folder</td><td>● Saved separately by shot number
● This can be loaded as reference waveform data in MPS08B software.
● Data can be loaded into spreadsheet applications for editing.</td></tr>
<tr><td>Numerical data (monitoring items)</td><td><table><tr><th>Indication</th><th>Meaning</th></tr><tr><td>DateTime</td><td>Time at which measurement begins</td></tr><tr><td>interval</td><td>Trigger interval</td></tr><tr><td>Shot</td><td>Shot number</td></tr><tr><td>Result</td><td>Alarm evaluation result</td></tr><tr><td>CH**_error</td><td>Alarm evaluation details</td></tr><tr><td>integral</td><td>Integral</td></tr><tr><td>peak</td><td>Peak value</td></tr><tr><td>peak_integral</td><td>Peak integral value</td></tr><tr><td>peak_time</td><td>Peak arrival time</td></tr><tr><td>section_average</td><td>Section average value</td></tr><tr><td>setion_integral</td><td>Section integral value</td></tr><tr><td>pointMonitor</td><td>Monitoring after t seconds</td></tr><tr><td>eject_Monitor</td><td>Eject monitoring</td></tr><tr><td>RisingTime</td><td>Rising time</td></tr><tr><td>FallingTime</td><td>Falling time</td></tr></table></td><td>.csv</td><td>(folder in which .exe file is saved) / MMS_DATA / configFileName_yyyymmdd folder</td><td>● Saved separately by date
● This data can be loaded into spreadsheet applications for editing.
● Alarm evaluation details (the monitoring item causing the abnormality if an abnormality is detected) are recorded using the codes shown in the table left (refer to the instruction manual for more information).</td></tr>
</table>

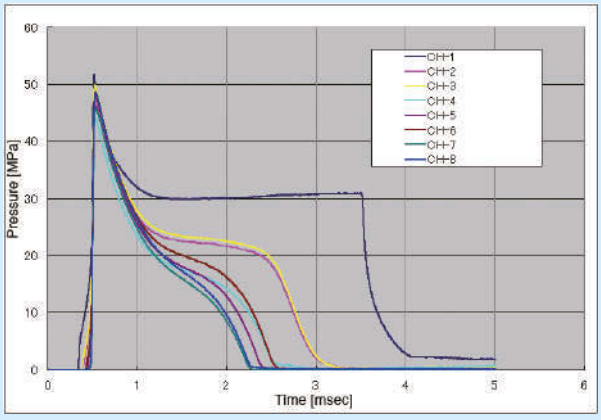
Example of use with spreadsheet applications

The pressure waveform saved in CSV format can be displayed in tabular or graph form using spreadsheet applications as shown below.

Tabular form

Time (sec)	CH-1 (MPa)	CH-2 (MPa)	CH-3 (MPa)	CH-4 (MPa)	CH-5 (MPa)	CH-6 (MPa)	CH-7 (MPa)	CH-8 (MPa)
0.488	20	13	14	8.5	6.9	9.3	3.2	3.6
0.489	20.4	13.6	14.6	9.2	7.5	10	4	4.5
0.49	21	14.4	15.4	10	8.4	10.8	5.1	5.7
0.491	21.8	15.3	16.3	11	9.4	11.9	6.3	7
0.492	22.7	16.4	17.5	12.1	10.6	13.1	7.9	8.7
0.493	23.8	17.6	18.8	13.4	12.1	14.5	9.7	10.6
0.494	25	19	20.3	14.9	13.7	16.1	11.7	12.7
0.495	26.4	20.6	21.9	16.4	15.5	17.9	13.8	14.9
0.496	27.9	22.2	23.5	18	17.3	19.6	15.9	17
0.497	29.5	23.8	25.2	19.6	19	21.4	17.8	19.1
0.498	31.1	25.4	26.9	21.2	20.8	23.1	19.8	21.1
0.499	32.6	27	28.6	22.8	22.4	24.9	21.7	23
0.5	34.2	28.6	30.2	24.3	24.1	26.6	23.4	24.8
0.501	35.7	30.1	31.7	25.7	25.6	28.2	24.9	26.5
0.502	37.2	31.6	33.3	27.1	27.1	29.7	26.4	28.1

Graph form



Product list

Pressure measuring amplifier units

Product name	Product code	Remarks
Standard pressure measuring amplifier set (Heat resistant junction box, left connector)	MPS08BL-S	[Accessories] Heat resistant junction box (1) or junction box with cable storage space (1); heat resistant junction cable (3 m) (1); AC adapter, measurement software; signal input/output cable (3 m); LAN cable (2 m) [Heat resistant junction cable 5 m set] Product code: Example: MPS08BL-S P-5M * The suffix "P-5M" is appended to the product codes at left.
Standard pressure measuring amplifier set (Heat resistant junction box, right connector)	MPS08BR-S	
Standard pressure measuring amplifier set (Heat resistant junction box, central connector)	MPS08BC-S	
Pressure measuring amplifier Junction box with cable storage space set	MPS08BU-S	
Pressure measuring amplifier single unit	MPS08B	
Pressure measuring amplifier set (analog voltage output type)	MPV04S	[Accessory] AC adapter
Pressure measuring amplifier (analog voltage output type)	MPV04	
Inline pressure measuring unit	MPS01A	

Accessories

Product name	Product code	Applicable product	Remarks
Heat-resistant junction box	UJP04H	MPS08B pressure measuring amplifier	
Junction box with cable storage space	UCP04		
Heat-resistant junction cable (3 m)	WJP0430HB		3 m junction cable for heat resistant junction boxes
Heat-resistant junction cable (5 m)	WJP0450HB		5 m junction cable for AM heat resistant junction boxes
AC adapter	ES0024007 N-MVS08		This is the same adapter as for MVS08.
Signal input/output cable (3 m)	WCI0030-D25P-Y N-MPS08B		
LAN cable (2 m)	WCL0020		
Measurement software (Windows)	PPSB		

Product name	Product code	Applicable product	Remarks
Voltage output cable (3 m)	WCI0830-V-D9P-Y N-MPS08B	MPS08B pressure measuring amplifier	Cable used to output pressure values measured for each channel as analog voltages to a data logger, molding machine, or other external device. A separate cable is required for each additional MPS08B.
Amplifier interconnection cable (1 m)	WCM0010-R6P-R6P N-MPS08B		These are the cables required for additional amplifiers when measuring 9 to 32 points. A cable is needed for each additional amplifier.
Tester connector cable (1 m)	ATCS		
Heat-resistant junction box mounting magnets (2 pc set)	AMUJPH		
Junction box connector dust cap	ADUJP		
Pressure sensor adapter for EPS series	ACAE01		
AC adapter	ES0012001	MPV04 pressure measuring amplifier	
RS485 connector cable (with communication software)	WCL0001A N-MPS01	MPS01A pressure measuring unit	
RS485 adapter cable (for PC connection)	WCL0010B N-MPS01		
RS485 adapter cable (for PLC connection)	WCL0010C N-MPS01		
Mounting magnets (3 pc set)	AMMPS01		
DIN rail mounting kit (with bolts)	ARMPS01		
AC adapter (cable length 3.6 m)	ES0024003 N-MPS01		The MPS01A can receive control power (24 V DC) from the terminal board.
Sensor extension cable (1 m)	WSP0110A	Pressure sensors Ejector pin type SSE series Button type SSB series	Cable color: Black Cable diameter: 3.2 mm ±0.3 mm Cable heat resistance: 105°C Observed attenuation factor(*1) WSP0110A: 0.30% ±0.1% WSP0120A: 0.40% ±0.1% WSP0140A: 0.60% ±0.1%
Sensor extension cable (2 m)	WSP0120A		
Sensor extension cable (4 m)	WSP0140A		
Gauge plug for button type SSB series	SSBD08×06	Pressure sensors Button type SSB series Rated capacity 50 N to 1 kN	Used to plug sensor mounting hole after removing sensor * Incompatible with 4 kN or 16 kN rated capacity models

*1 Depending on length, extension cables are subject to attenuation.

Product list

Pressure sensors - Ejector pin type

Type	Tip diameter **ϕd** (mm)	Step section diameter **ϕd1** (mm)	Step section length **L1** (mm)	Overall length **L** (mm)	Product code
Stepped pin	0.8	2.0	60	100	SSEBQ-00.8×100
			50	150	SSEBQ-00.8×150
	1.0	2.0	40	100	SSEBQ-01.0×100
			50	150	SSEBQ-01.0×150
	1.2	2.0	40	100	SSEBQ-01.2×100
			50	150	SSEBQ-01.2×150
	1.5	2.0	40	100	SSEBQ-01.5×100
			50	150	SSEBQ-01.5×150
Straight pin	2.0	—		200	SSEEQ-02.0×200
	2.5	—		200	SSEEQ-02.5×200
	3.0	—		250	SSEEQ-03.0×250
				400	SSEEJ-03.0×400

Pressure sensors - Ejector pin type, customer-specified overall length

Type	Tip diameter **ϕd** (mm)	Step section diameter **ϕd1** (mm)	Step section length **L1** (mm)	Customer-specified overall length **L** (mm)		Product code	
				Minimum	Maximum		
Stepped pin	0.8	2.0	60	75	100	SSEBQL-00.8 ×○○○.○○	N060
			50	65	150		N050
	1.0	2.0	40	55	100	SSEBQL-01.0 ×○○○.○○	N040
			50	65	150		N050
	1.2	2.0	40	55	100	SSEBQL-01.2 ×○○○.○○	N040
			50	65	150		N050
	1.5	2.0	40	55	100	SSEBQL-01.5 ×○○○.○○	N040
			50	65	150		N050
Straight pin	2.0	—		25	200	SSEEQL-02.0×○○○.○○	
	2.5	—		25	200	SSEEQL-02.5×○○○.○○	
	3.0	—		25	250	SSEEQL-03.0×○○○.○○	
				25	400	SSEEJL-03.0×○○○.○○	

* For SSEEJL-03.0×○○○.○○, material: SKD61, ϕd tolerance: -0.01 mm to -0.02 mm
* Overall length L tolerance: 0 mm to +0.02 mm, or 0 mm to +0.05 mm for overall length of 200 mm or greater

Pressure sensors - Button type

Type	Rated capacity (N)	Recommended measurement range (N)	Operating temperature range	Product code
Button	50	12.5 to 50	Mold temperature not to exceed 150°C	SSB050N08×06
	200	50 to 200		SSB200N08×06
	1,000	200 to 1,000		SSB01KN08×06
	50	12.5 to 50	Mold temperature not to exceed 200°C	SSB050N08×06H
	200	50 to 200		SSB200N08×06H
	1,000	200 to 1,000		SSB01KN08×06H
	4,000	1,000 to 4,000		SSB04KN10×08H
	16,000	4,000 to 16,000		SSB16KN12×10H

Pressure sensors Button type junction box with cable storage space

Type	Rated capacity (N)	Recommended measurement range (N)	Operating temperature	Product code	
Low capacity	10	5 to 10	Mold temperature not to exceed 150°C	SCB010N03.5×06.0	N03.5
	50	25 to 50		SCB050N03.5×06.0	N03.5
Standard	50	12.5 to 50	not to exceed 200°C	SCB050N08×06H	
	200	50 to 200		SCB200N08×06H	
	1 k	200 to 1 k		SCB01KN08×06H	
	4 k	1 k to 4 k		SCB04KN10×08H	
	16 k	4 k to 16 k		SCB16KN12×10H	

Sleeve pins

Sleeve pins can be used for compatibility with pins with diameters ranging from 5 mm to 12 mm.

* Eject (mold release) resistance cannot be measured when using pin sleeves.

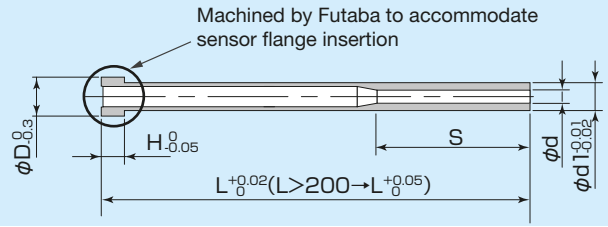
Product code: EPSSVP-○○.○×○○○.○○
d1 L

* Specify the L dimension to match overall sensor length.

Material: SKD61 + nitride treatment

Compatible sensors: SSEEJL-03.0× ○○○. ○○

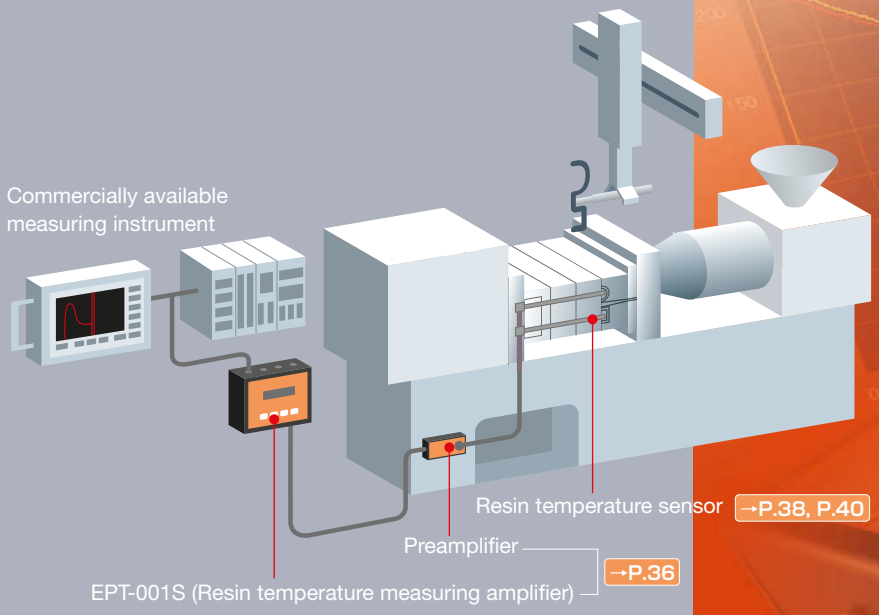
External dimensions



d1 (mm)	5	6	7	8	9	10	12
d (mm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
D (mm)	9	10	11	13	14	15	17
H (mm)	6	6	6	8	8	8	8
S (mm)	30						
L (mm)	75 to 400						

In-mold Resin Temperature Measuring System

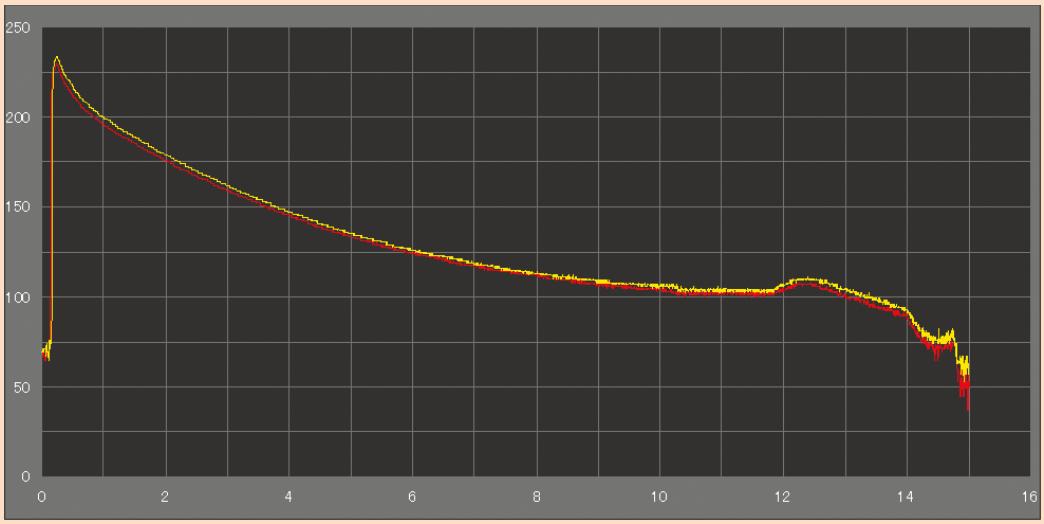
Enables real-time monitoring of resin temperatures inside the mold.



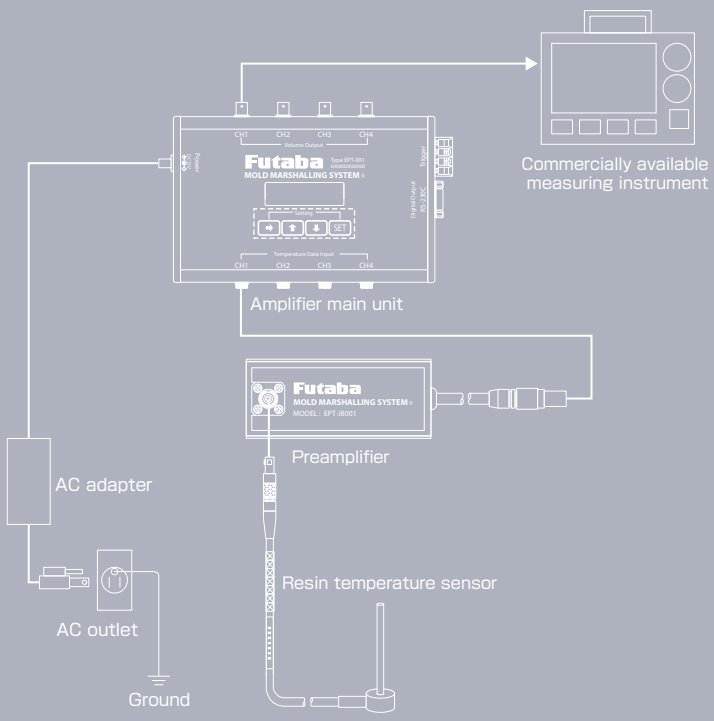
Measured waveforms

Resin temperatures inside the mold can be monitored in real time as waveforms displayed on commercially available measuring instruments or data loggers.
A rapid response of 8 ms is achieved using an optical fiber infrared system that tracks rapidly changing resin temperature fluctuations inside the mold. This is highly effective for optimizing parameters like holding pressure, cooling conditions, nozzle temperature, mold temperature, molded product removal temperature, and molding cycle.

Mold temperature waveform

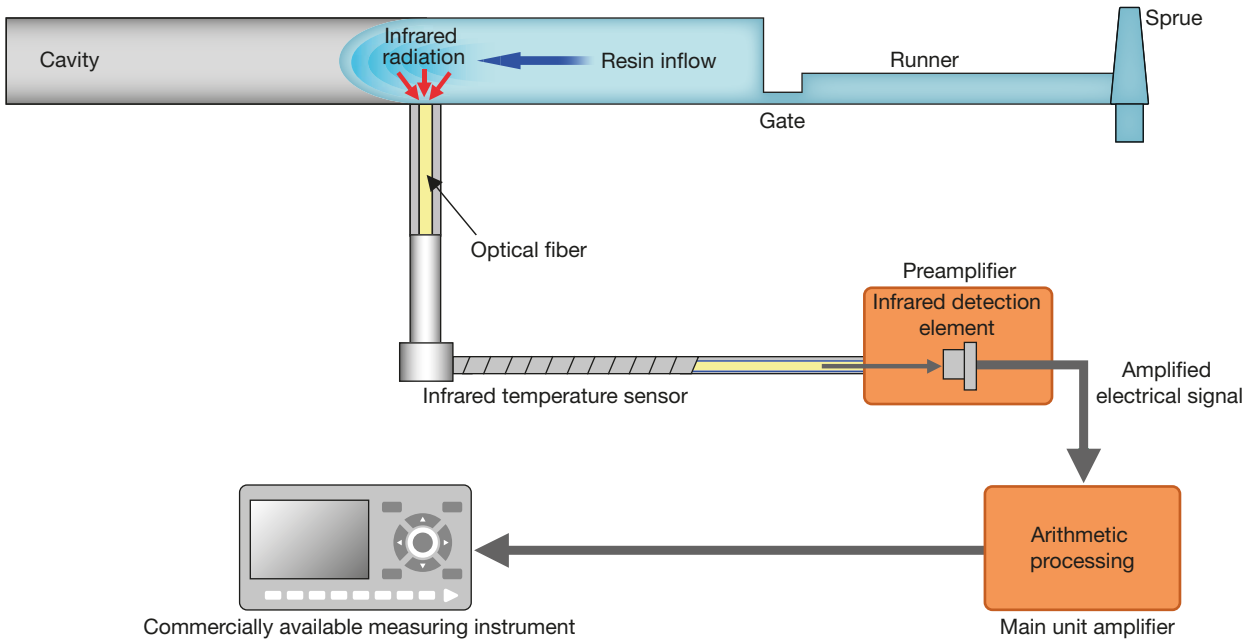


[System configuration diagram]



Measuring principles

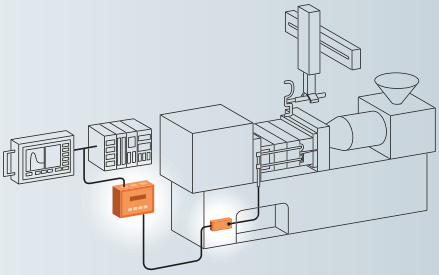
The infrared radiation emitted by the resin is conducted via optical fiber to the preamplifier, where it is converted into an electrical signal.
After conversion, it is arithmetically processed by the amplifier and output as a temperature signal.



Resin temperature measuring amplifier

EPT-001

RoHS compliant



- Allows simultaneous measurement of four channels with a single unit.
- Outputs a voltage of 1 V per 100°C for use in conjunction with general measuring devices and controllers.
- 1 ms sampling rate supports high-speed filling.
- Specially developed sensor sensitivity adjustment system eliminates need for troublesome calibrations.

Specifications

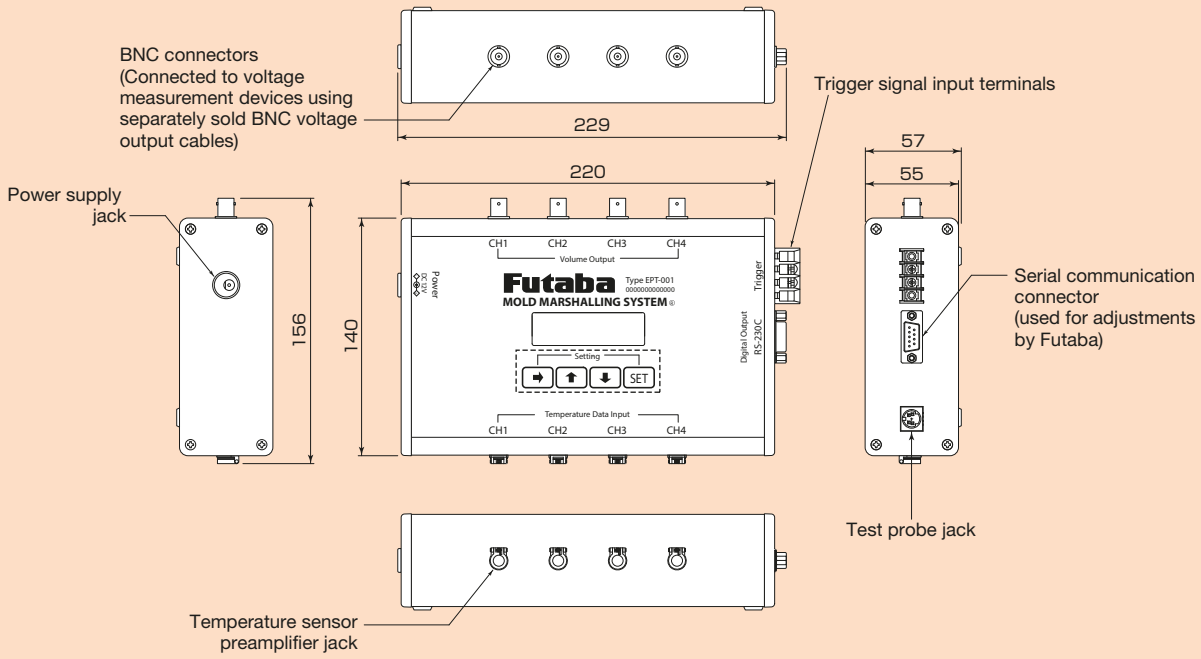
Main unit amplifier

Product code		EPT-001S
Number of measurement points		4
Analog voltage output	Output voltage	1 V output per 100°C
	Impedance	100 Ω
Accuracy		±2% F.S.
Sampling interval*2		1 ms
Measurement range		60°C to 430°C*1
Power supply specifications	Power supply	12 V DC (dedicated AC adapter, input 100 V AC)
	Maximum power consumption	10 W
Environmental resistance	Operating temperature	10°C to 40°C
	Operating humidity	35% to 85% RH (no condensation)
	Vibration resistance	10 Hz to 55 Hz double amplitude 1.5 mm for 2 hours each along X ,Y, Z axes
Sensor sensitivity setting		Input using key switches on panel
Weight		Approx. 800 g
Accessories		AC adapter

*1 60°C to 430°C for ejector pin type resin temperature sensor (EPSSZL), 60°C to 390°C for flush-mount type resin temperature sensor (EPSSZT)

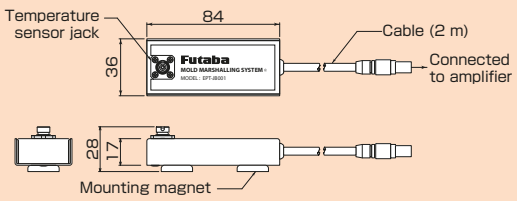
*2 Interval for measuring data: 1 ms (1/1,000 seconds) means the acquisition of 1,000 data items per second.

External dimensions



Case material: Aluminum

Preamplifier



Case material: Aluminum

Preamplifier

Product code		EPT-JB001
Sensor input	compatible sensors	Resin temperature sensor (Futaba EPSSZL/EPSSZT series)
Communication cable length		2 m
Mounting method		Installed using two underside magnets
Environmental resistance	Operating temperature	10°C to 40°C
	Operating humidity	35% to 85% RH (no condensation)
	Vibration resistance	10 Hz to 55 Hz double amplitude 1.5 mm for 2 hours each along X ,Y, Z axes

* One preamplifier (available separately) is required for each sensor.

BNC voltage output cable

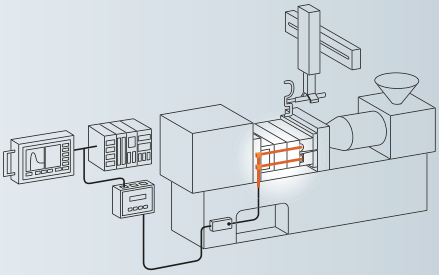
This cable is used to transfer values measured for each channel as analog voltages to a data logger, molding machine, or other external device.

Product name	Product code
BNC voltage output cable (1 m)	EPT-VC01M
BNC voltage output cable (2 m)	EPT-VC02M

Resin temperature sensors

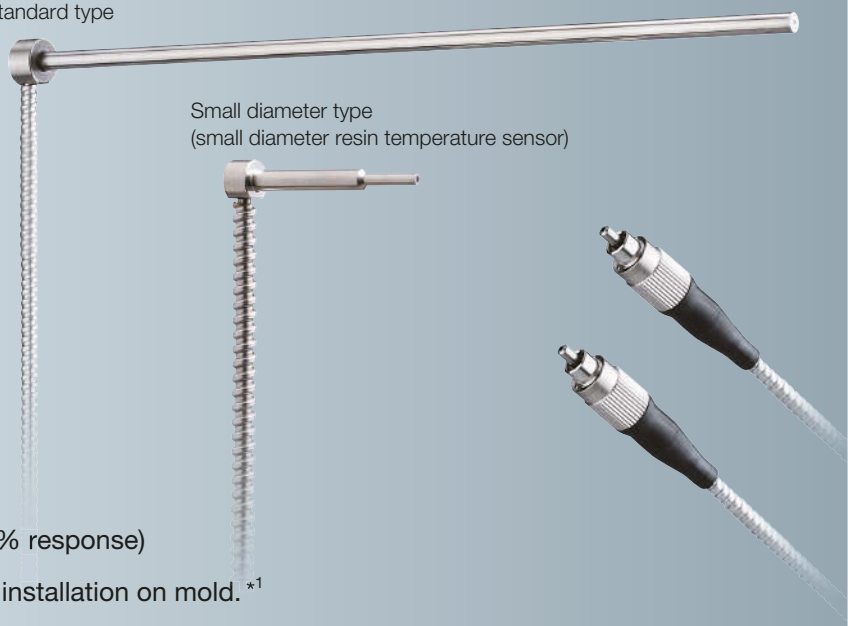
Ejector pin type EPSSZL series

RoHS compliant



Standard type

Small diameter type
(small diameter resin temperature sensor)



- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- Ejector pin configuration allows easy installation on mold. *1
- Capable of measuring resin temperatures from 60°C to 430°C

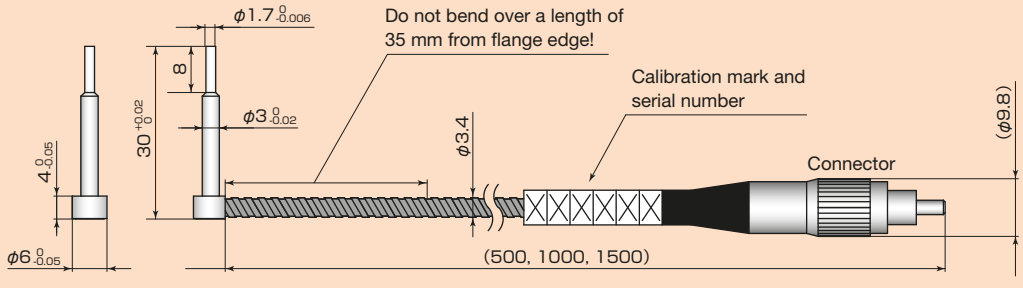
*1 Machining such as flange cutting to prevent rotation is not possible.

Specifications

Type		Small diameter type	Standard type
Product code		EPSSZLB series (→ P.43)	EPSSZL series (→ P.43)
Pin diameter		ϕ1.7	ϕ3*1, ϕ4
Pin material	Overall length 30 mm	SUS630 H900 (hardness: HRC 40 or greater)	SUS630 (hardness: HRC 38 or less)
	Overall length 60 mm to 220 mm		SKD61 (hardness: 900 HV minimum, nitride treated after tempering)
Temperature detection method		Infrared detection (using optical fiber)	
Measurement range (amplifier model EPT-001S)		60 to 430°C	
Operating temperature range		Not to exceed 100°C (mold temperature)*2	Not to exceed 150°C (mold temperature)*2
Withstand pressure		150 MPa or less	
Cable (With stainless steel protective tube, minimum bending radius of 50 mm)		External diameter 3.4 mm	

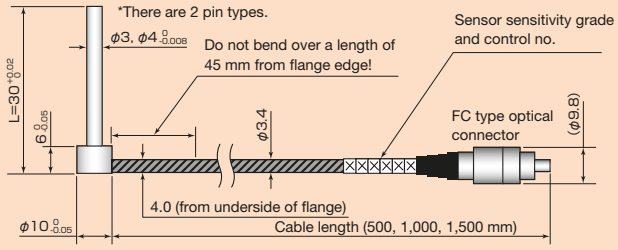
*1 ϕ3 available only with overall length of 30 mm
*2 Excluding pin tip

External dimensions Small diameter EPSSZLB series (small diameter resin temperature sensor)

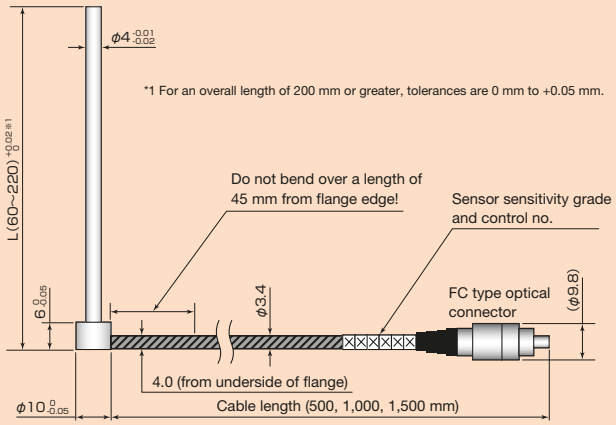


External dimensions Standard EPSSZL series

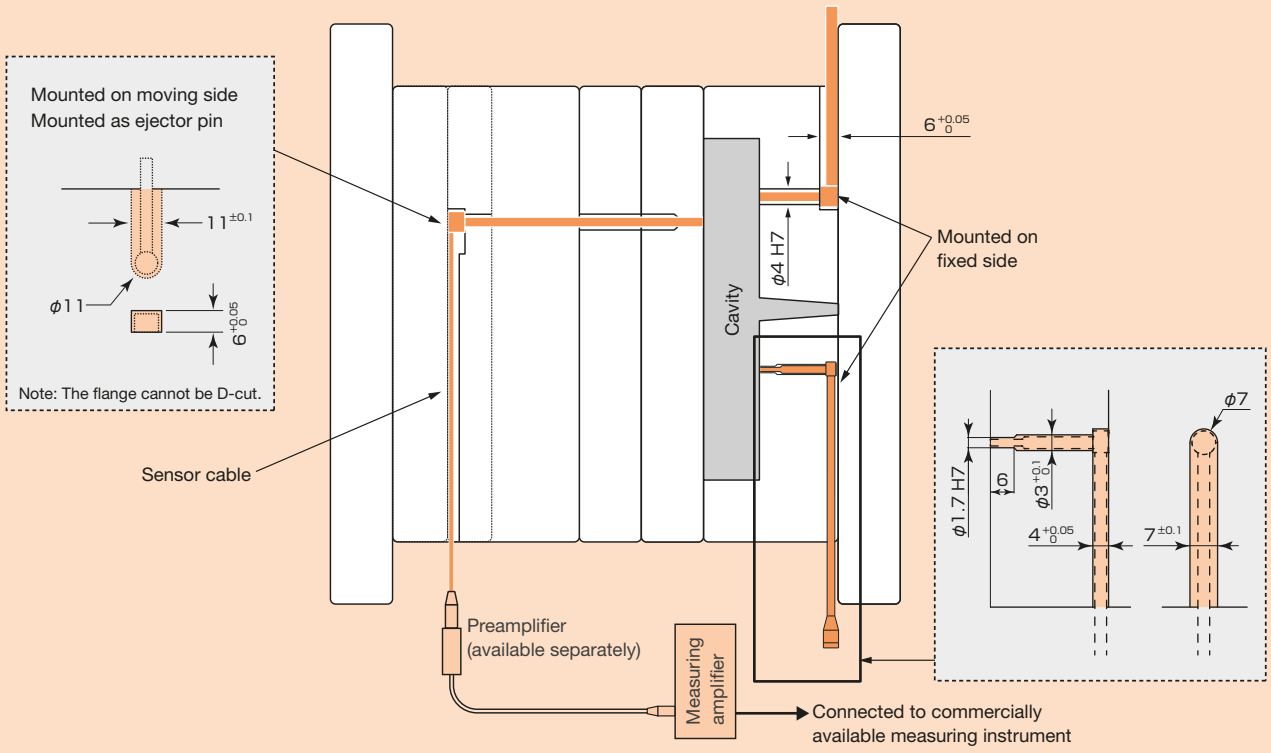
Overall length 30 mm type



Customer-specified overall length type (60 mm to 220 mm)

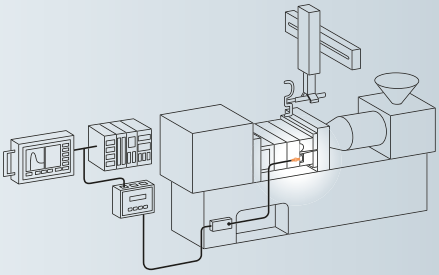


Mounting example



Flush-mount type EPSSZT series

RoHS compliant

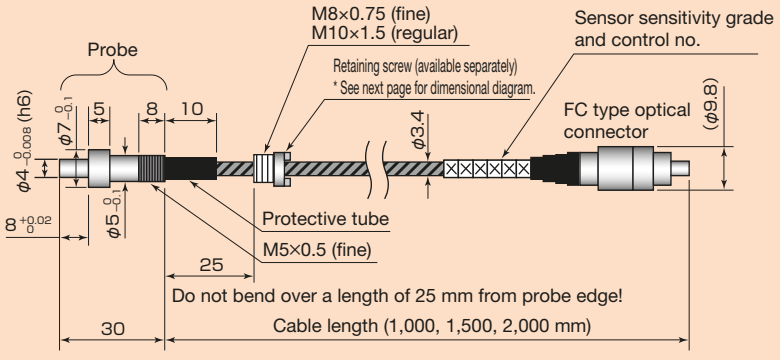


- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- The flush-mount type provides wide latitude in sensor mounting position.
- Capable of measuring resin temperatures from 60°C to 390°C

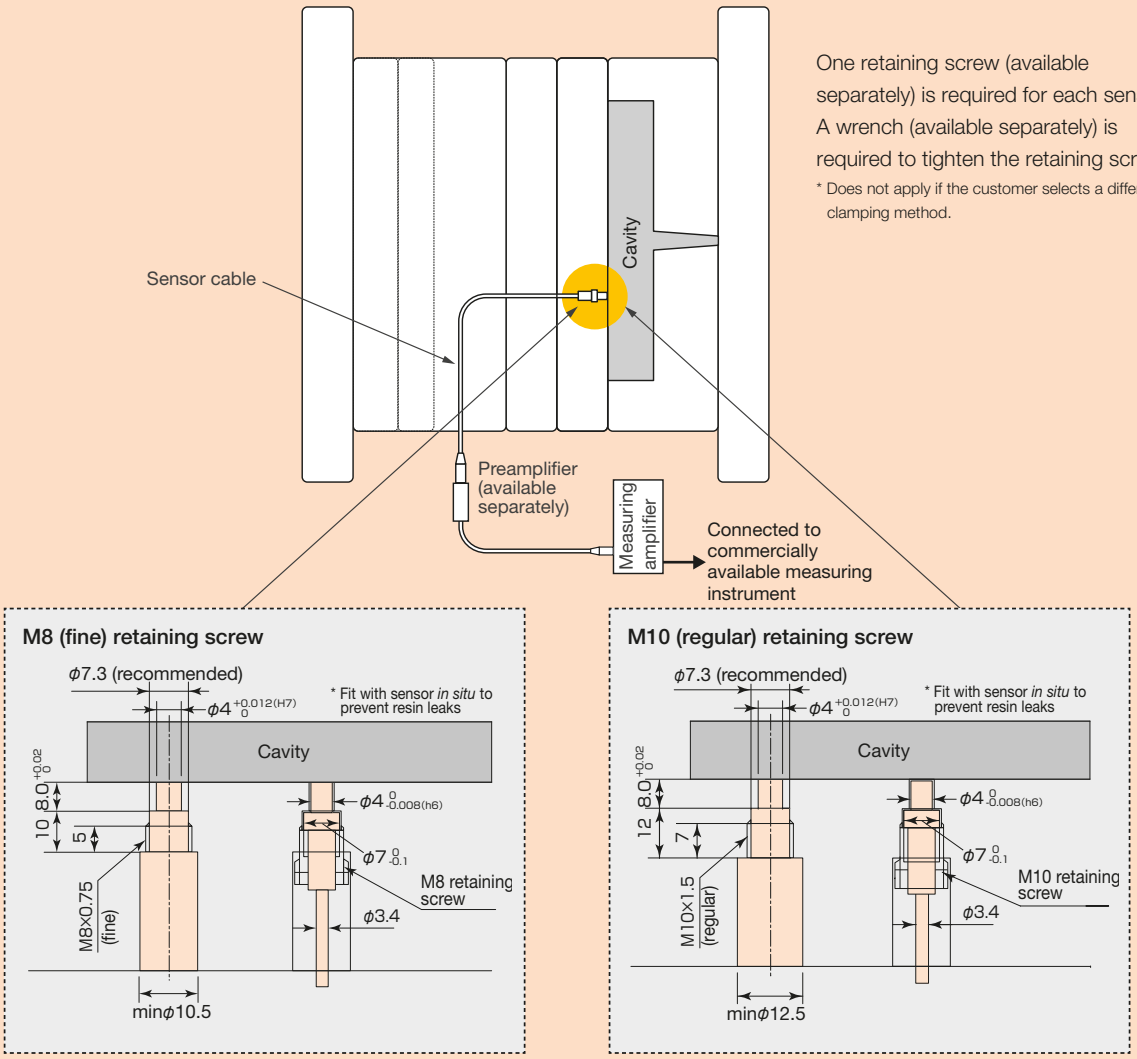
Specifications

Product code	EPSSZT series (→ page 43)
Probe diameter	ϕ4
Probe material	SUS630 (hardness: HRC 38 maximum)
Temperature detection method	Infrared detection (using optical fiber)
Measurement range (amplifier model EPT-001S)	60°C to 390°C
Operating temperature range	Mold temperature not to exceed 150°C (excluding pin tip)
Withstand pressure	150 MPa maximum
Cable	With stainless steel protective tube (outer diameter 3.7 mm), minimum bending radius 50 mm

External dimensions



Mounting example

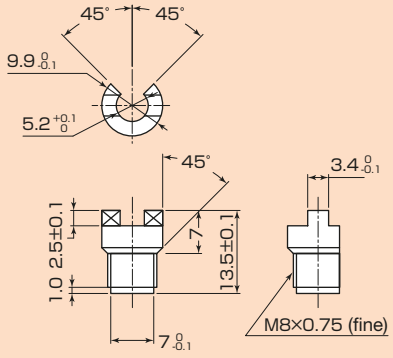


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

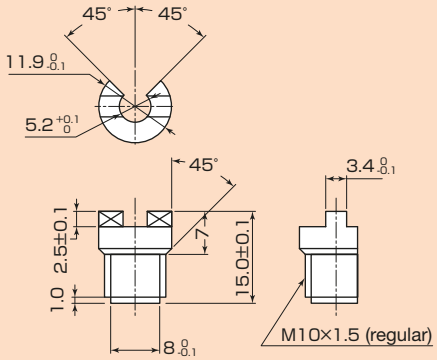
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



M10 (regular)



Product list

Resin temperature measuring amplifier

Product name	Product code	Remarks
Resin temperature measuring amplifier	EPT-001S	[Accessory] AC adapter
Preamplifier	EPT-JB001	
AC adapter	EPT-ACA	

Accessories

Product name	Product code	Applicable product	Remarks
BNC voltage output cable (1 m)	EPT-VC01M	EPT-001 resin temperature measuring amplifier	The cable is used to output values measured for each channel as analog voltages to a data logger, molding machine, or other external device.
BNC voltage output cable (2 m)	EPT-VC02M		
Retaining screw M8×0.75 (fine)	EPSSZT-M8	Resin temperature sensors Flush-mount type EPSSZT series	Material: SUS303 Select M8×0.75 (fine) or M10×1.5 (regular). One retaining screw is required per sensor.
Retaining screw M10×1.5 (regular)	EPSSZT-M10		
Sensor securing wrench	EPSSZT-FXWR		Material: SUS303 Used to tighten retaining screws or remove sensors stuck due to tar buildup; compatible with both fine and regular retaining screws.
Sensor removal wrench	EPSSZT-PLWR		
Resin temperature sensor test probe	ATPZ01	Resin temperature sensors Ejector pin type EPSSZL series Resin temperature sensors Flush-mount type EPSSZT series	The ATPZ01 is used to easily check for resin temperature sensor abnormalities. EPSSZLB series of small diameter resin temperature sensors not supported

Small diameter resin temperature sensors

Product name	Type	Tip diameter ϕ (mm)	Step section diameter ϕ (mm)	Step section length (mm)	OAL (mm)	Product code
Stepped pin type Overall length 30 mm Cable length 0.5 m	Stepped pin	1.7	3	22	30	EPSSZLB-01.7×030 N050
Stepped pin type Overall length 30 mm Cable length 1.0m						EPSSZLB-01.7×030 N100
Stepped pin type Overall length 30 mm Cable length 1.5m						EPSSZLB-01.7×030 N150

Resin temperature sensors - Ejector pin type (overall length 30 mm type)

Product name	Tip diameter ϕd (mm)	Product code
Ejector pin type, overall length 30 mm Cable length 0.5 m	3.0	EPSSZL-03.0×030 N050
Ejector pin type, overall length 30 mm Cable length 1.0 m		EPSSZL-03.0×030 N100
Ejector pin type, overall length 30 mm Cable length 1.5 m		EPSSZL-03.0×030 N150
Ejector pin type, overall length 30 mm Cable length 0.5 m	4.0	EPSSZL-04.0×030 N050
Ejector pin type, overall length 30 mm Cable length 1.0 m		EPSSZL-04.0×030 N100
Ejector pin type, overall length 30 mm Cable length 1.5 m		EPSSZL-04.0×030 N150

Resin temperature sensors - Ejector pin type (customer-specified overall length: 60 mm to 220 mm)

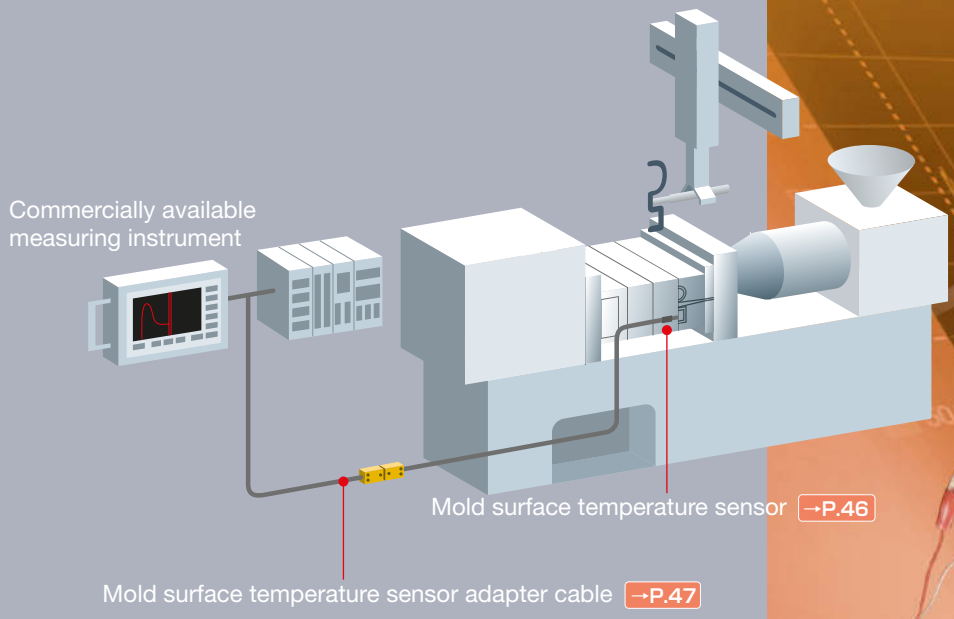
Product name	Tip diameter ϕd (mm)	Product code
Ejector pin type, customer-specified overall length Cable length 0.5 m	4.0	EPSSZL-04.0×○○○.○○ N050
Ejector pin type, customer-specified overall length Cable length 1.0 m		EPSSZL-04.0×○○○.○○ N100
Ejector pin type, customer-specified overall length Cable length 1.5 m		EPSSZL-04.0×○○○.○○ N150

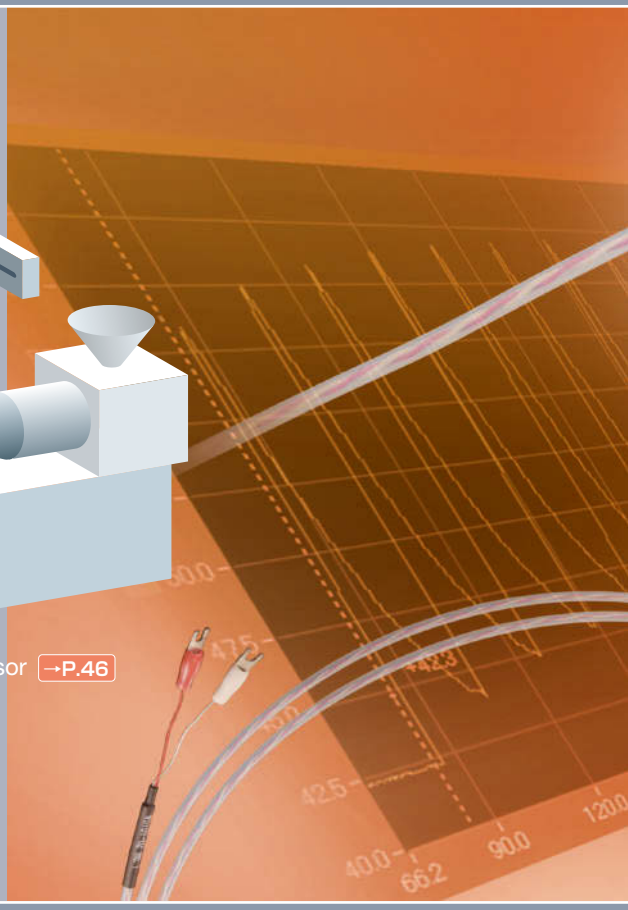
Resin temperature sensors - Flush-mount type

Product name	Tip diameter ϕd (mm)	Product code
Flush-mount type, cable length 1.0 m	4.0	EPSSZT-04.0×030 N100
Flush-mount type, cable length 1.5 m		EPSSZT-04.0×030 N150
Flush-mount type, cable length 2.0 m		EPSSZT-04.0×030 N200

Mold Surface Temperature Measuring System

Allows easy, accurate measurement of cavity surface temperatures, a key parameter in injection molding.





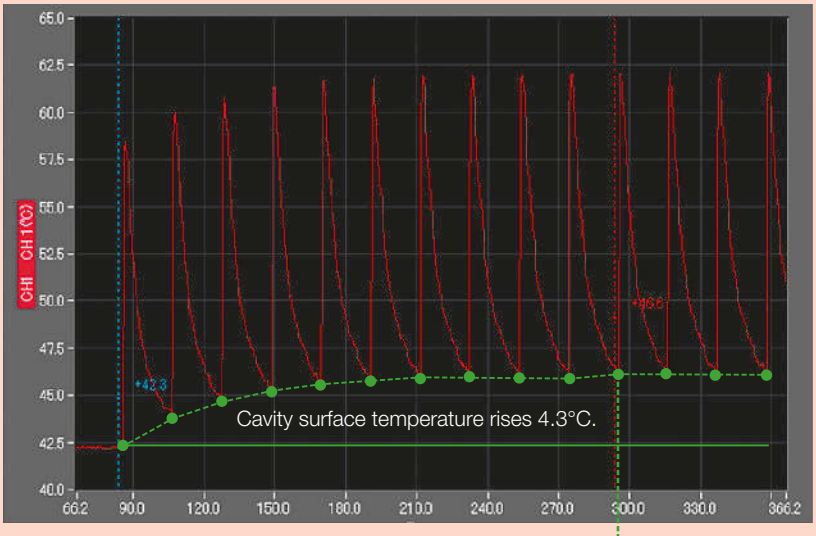
Measured waveforms

Allows real-time monitoring of temperatures close to the mold cavity, which are displayed as waveforms using commercially available measuring instruments or data loggers.
This can be used to improve molding quality and efficiency—for example, by determining optimal temperature settings for resin hardening, minimizing the number of discarded shots at the start of molding, and checking mold temperature distributions when molding multiple parts simultaneously.

Mold surface temperature measurement waveform

Molding conditions

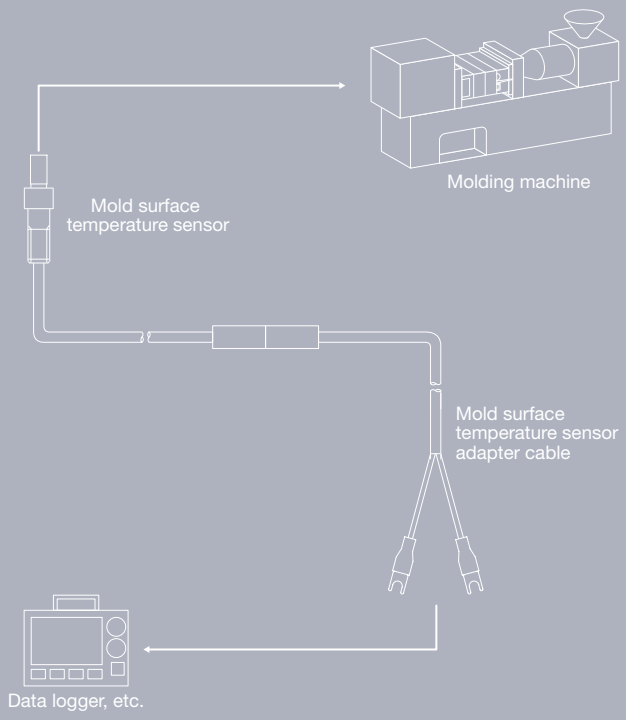
Molded product size: 70 × 40
Resin: PP
Temperature controller temperature setting: 40°C (cartridge heater)



Cavity temperature rises 4.3°C from 42.3°C for the first 10 shots to 46.6°C before stabilizing.

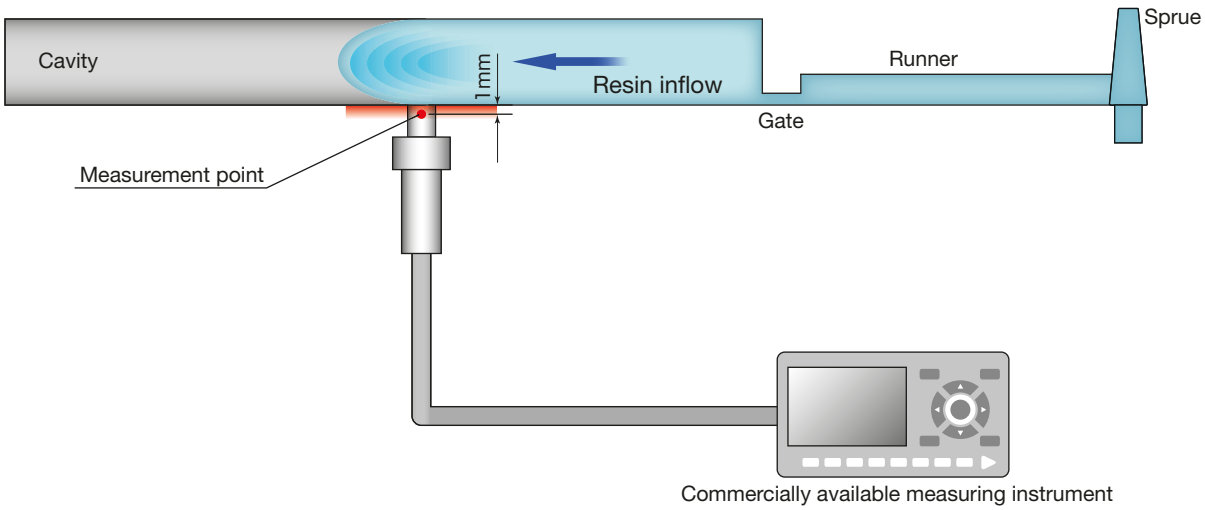
A temperature difference of 2.3°C to 6.6°C is confirmed between the temperature controller temperature setting and the temperature measured close to the cavity.

[System configuration diagram]



Measuring principles

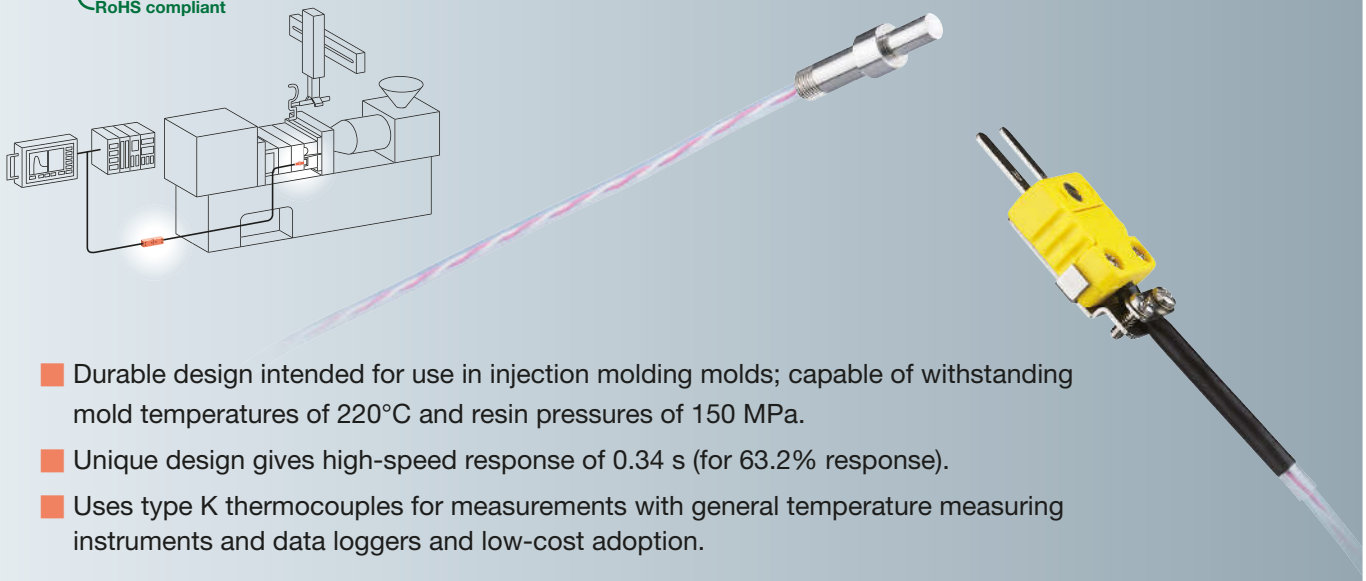
A contact for detecting temperature is located within 1 mm of the sensor tip. Installed flush with the cavity surface, the sensor measures the temperature embedded in the mold side 1 mm from the cavity surface.



Mold surface temperature sensor

STF04.0×08.0×026

RoHS compliant

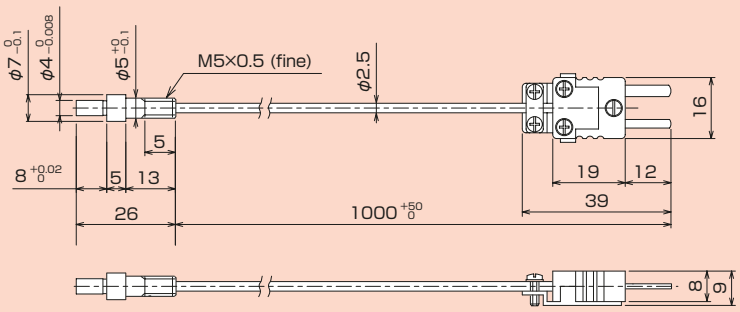


- Durable design intended for use in injection molding molds; capable of withstanding mold temperatures of 220°C and resin pressures of 150 MPa.
- Unique design gives high-speed response of 0.34 s (for 63.2% response).
- Uses type K thermocouples for measurements with general temperature measuring instruments and data loggers and low-cost adoption.

Specifications

Product code	STF04.0×08.0×026
Probe diameter	ϕ4
Probe material	SUS630 (hardness: HRC 38 maximum)
Temperature detection method	Thermocouple, grounded type
Type	K class 1
Operating temperature range	Mold temperature not to exceed 220°C
Withstand pressure	150 MPa maximum
Cable	Teflon tube (external diameter 2.5 mm), minimum bending radius 10 mm

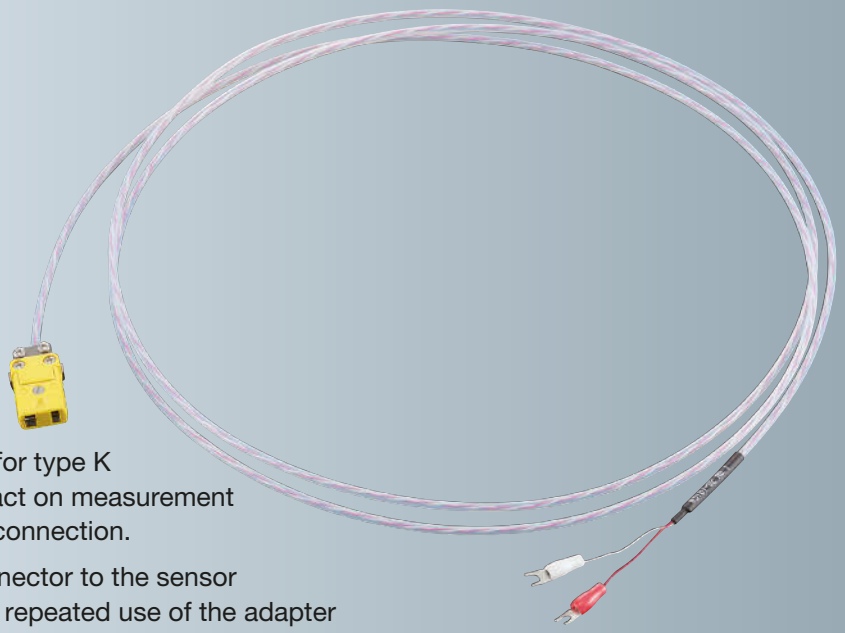
External dimensions



* Connect to measuring instrument with Y terminals using the mold surface temperature sensor adapter cable.
* Fitted with a Marlin male thermocouple connector (1260-K)

Mold surface temperature sensor adapter cable

RoHS compliant

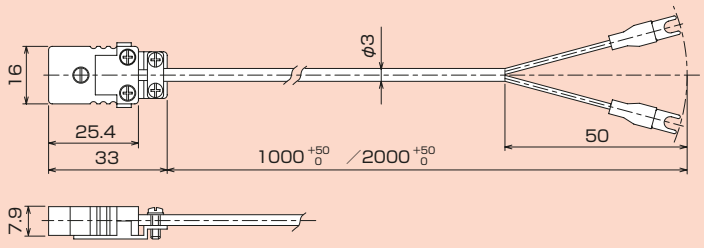


- Features dedicated connectors for type K thermocouples, eliminating impact on measurement accuracy due to connection/disconnection.
- Can be separated using the connector to the sensor embedded in the mold, allowing repeated use of the adapter cable.

Specifications

Product code	Cable length 1 m	WST0110
	Cable length 2 m	WST0120
Cable material		Teflon tube (external diameter 3 mm)
Operating temperature range		Maximum 150°C

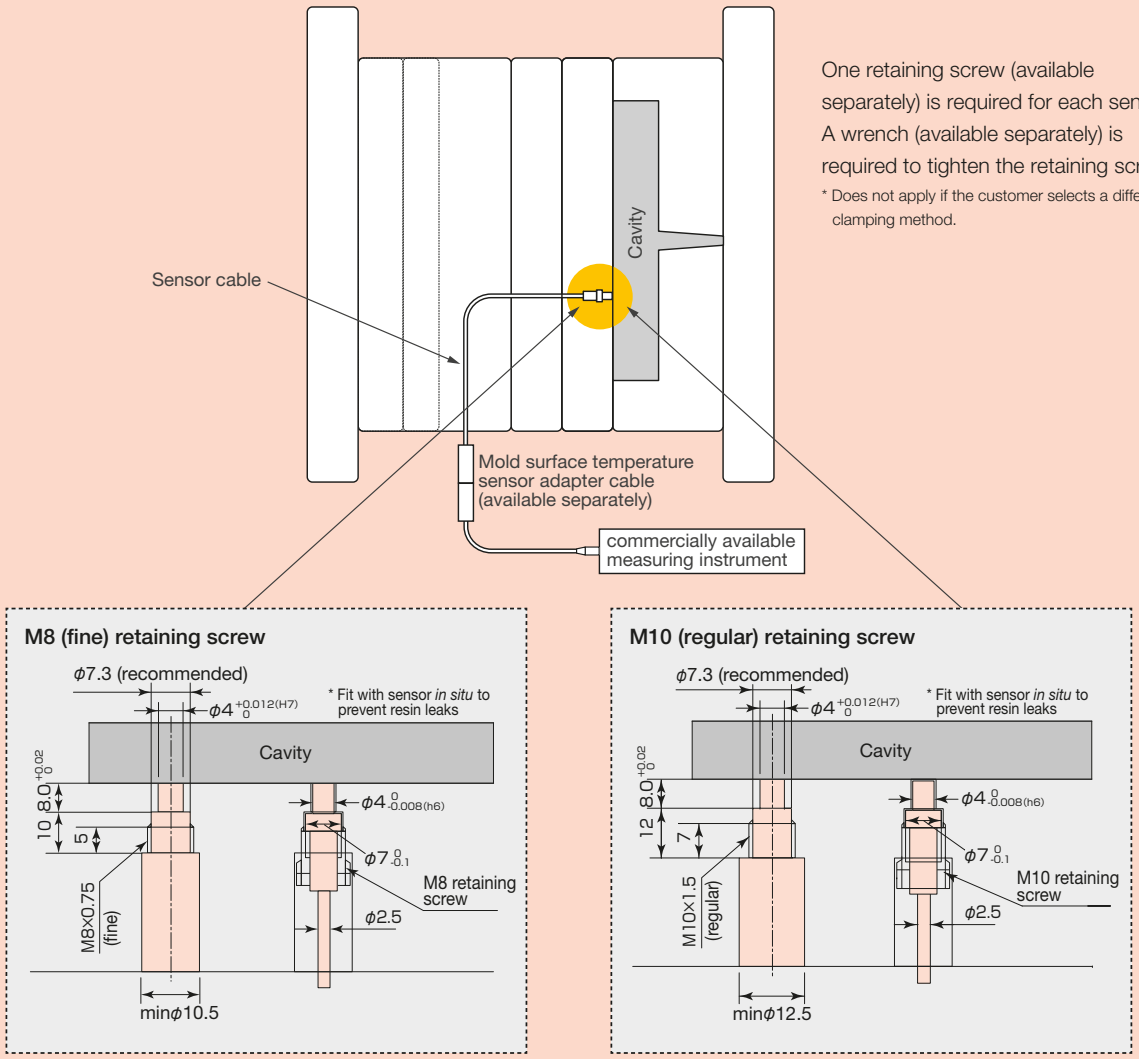
External dimensions



* The Y terminals are of the M3 type with an internal width of 3.2 mm.
* Available in 1 m or 2 m cable length
* Fitted with a Marlin female thermocouple connector (1210-K)

Mold surface temperature sensor

Mounting example

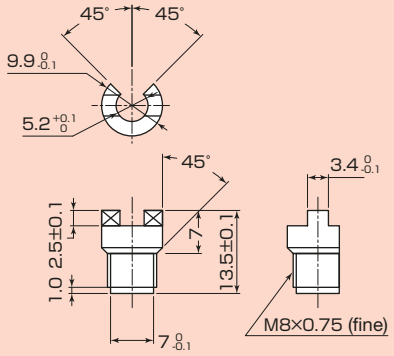


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

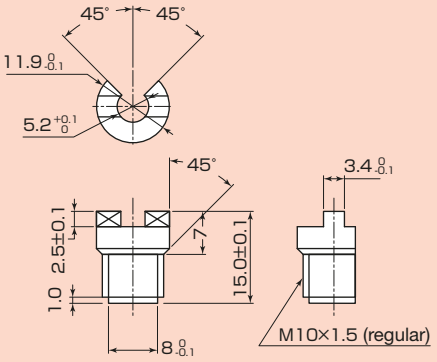
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



M10 (regular)



Product list

Mold surface temperature sensor

Product name	Product code
Mold surface temperature sensor	STF04.0×08.0×026
Mold surface temperature sensor adapter cable (1 m)	WST0110
Mold surface temperature sensor adapter cable (2 m)	WST0120

Accessories

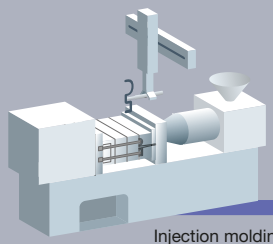
Product name	Product code	Applicable product	Remarks
Retaining screw M8×0.75 (fine)	EPSSZT-M8	STF mold surface temperature sensor	Material: SUS303 Select M8×0.75 (fine) or M10×1.5 (regular). One retaining screw is required per sensor.
Retaining screw M10×1.5 (regular)	EPSSZT-M10		
Sensor securing wrench	EPSSZT-FXWR		Material: SUS303 Used to tighten retaining screws or remove sensors stuck due to tar buildup; compatible with both fine and regular retaining screws.
Sensor removal wrench	EPSSZT-PLWR		

Injection Molding Monitoring System

This integrated measuring system allows more sophisticated analysis by displaying, in addition to in-mold pressure, in-mold resin temperature, and mold surface temperature, information from external devices—for example, molding machine injection pressure—on a single PC.

Connecting three units allows up to 24 points to be measured simultaneously.

Allows monitoring, alarm output, and measurement data recording even with a stand-alone configuration.



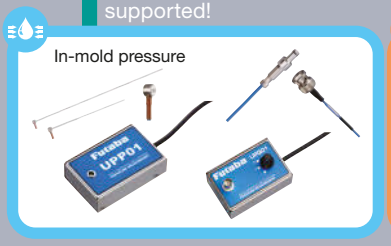
Information can also be acquired from external devices.

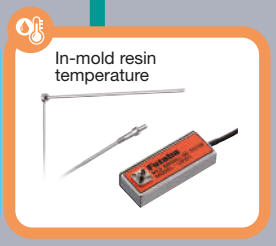
Injection molding machine

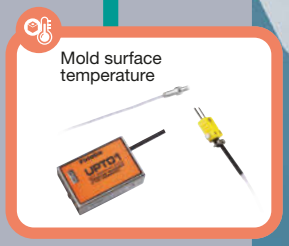
Injection Molding Monitoring System MVS08

Measurement PC

Direct pressure sensors supported!



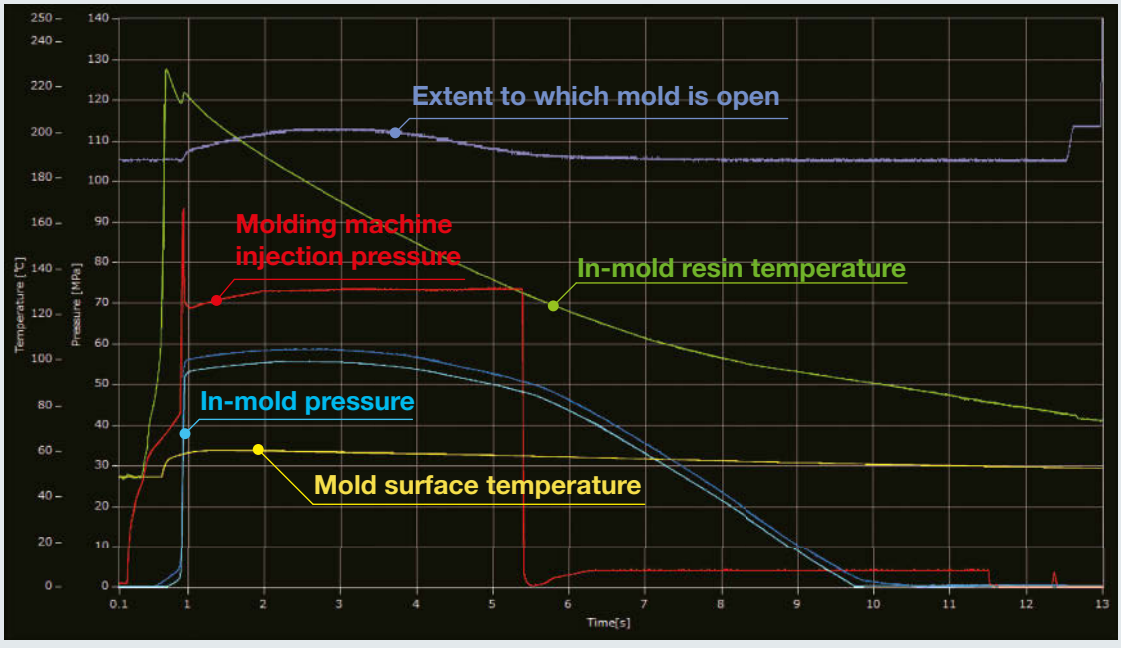




Measured waveforms

In addition to in-mold pressure, in-mold resin temperature, and mold surface temperature, information can be acquired from other manufacturers' measuring devices and the injection molding machine and displayed simultaneously on the same time axis to allow more sophisticated analysis. The waveforms displayed feature alarm signal output and measurement data recording functions based on monitoring zone setting to allow use for mass production monitoring as well.

Injection molding monitoring system measured waveforms

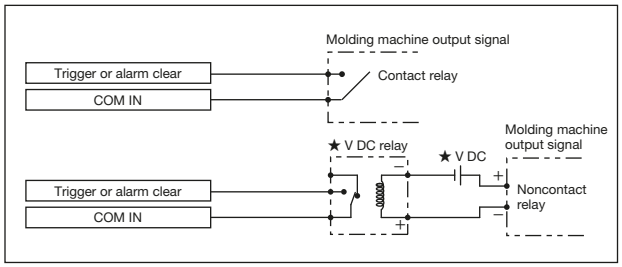


[System configuration diagram]

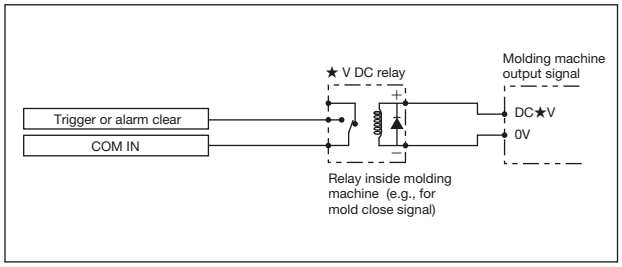
Input/output signal connections

Input signal circuit specifications (trigger signal, alarm clear signal)

Example 1: The output from the connected molding machine is “Relay output.”
Example in which the input signal is connected when the molding machine output signal is a contact output

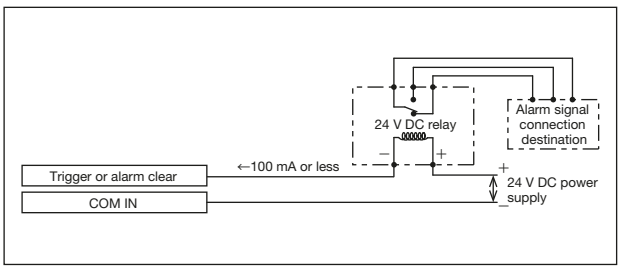


Example 2: The output from the connected molding machine is “Voltage output.” Connect using a relay to suit the output voltage of the molding machine output signal. (If using a contact relay, use a relay with a built-in coil surge absorber circuit.)
Example in which the input signal is connected using a relay when the molding machine output signal is ★ V DC (on/off) output



Output signal circuit specifications (alarm output)

Example 1: Connect using a 24 V DC power supply and a 24 V DC relay. (If using a contact relay, use a relay with a built-in coil surge absorber circuit.)



Injection molding monitoring system

MVS08

RoHS compliant

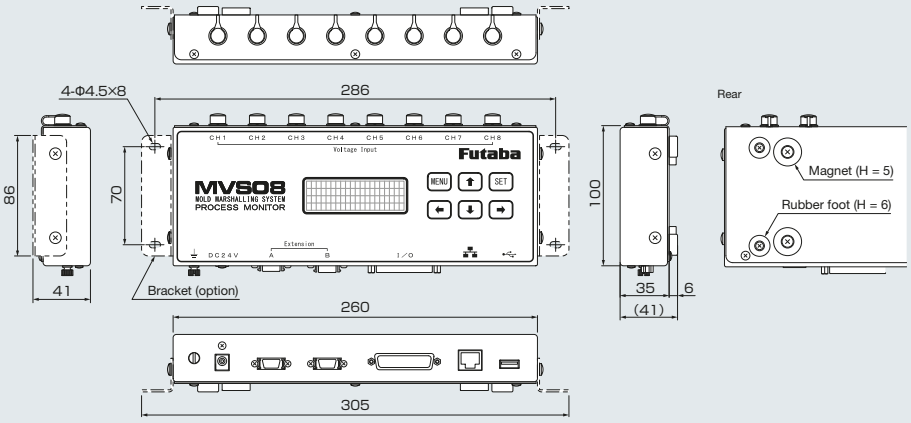
- Allows acquisition of information from external devices as analog voltages in addition to in-mold pressure, in-mold resin temperature, and mold surface temperature.
- Includes dedicated measurement software to easily display data on a combined time axis.
- Includes functions for overlaid display, alarm monitoring zone setting, and control signal output.
- Three units can be connected together for simultaneous measurement of up to 24 channels.
- Allows monitoring, alarm output, and data recording even with a stand-alone configuration.
- The measurement software supports switching between displaying Japanese, English, Chinese, and Korean.

Specifications

MVS08A-S injection molding monitoring system set

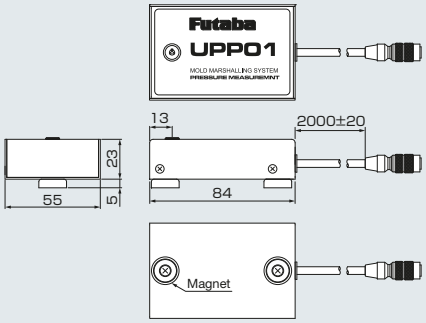
Product code		MVS08A-S
Number of measurement points		8 (up to 24 with three units connected)
Compatible sensors		Resin pressure: SSB series, SSE series (preamplifier sold separately) Resin temperature: EPSSZL series, EPSSZT series (preamplifier sold separately) Mold surface temperature: STF series (requires commercially available signal converter) Other: Measuring devices with output between 0 V and 10 V
Measurement range		0 V to 10 V
Accuracy		±0.25% F.S. (voltage)
Display units		Pressure: MPa, kg/cm^2, psi, bar; Temperature: °C, °F, K; Position: mm, inch Load: kgf, N, lbf; Speed: mm/s; Flow rate: L/min
Sampling interval		1 ms / 5 ms / 10 ms / 50 ms / 100 ms / 500 ms / 1,000 ms
Sampling period		Max. 120 s / 600 s / 1,200 s / 6,000 s / 12,000 s / 60,000 s / 120,000 s (in sampling interval order)
Resolution (typical)		Pressure: 0.1 MPa; Temperature: 1°C (16-bit AD converter)
Control signal	Input	10 points: Nonvoltage contact input
	Output	10 points: NPN open collector
Measurement data saving	With PC connected	Saved to data storage for connected PC (including measurement conditions and alarm conditions)
	Stand-alone	Saved to connected USB drive (including measurement conditions and alarm conditions)
ower supply	Power supply	24 V DC (dedicated AC adapter, input 100 V to 240 V AC, 50/60 Hz)
	Maximum power consumption	50 W
Environmental resistance	Operating temperature	0°C to 50°C
	Operating humidity	35% to 85% RH (no condensation)
Weight		Approx. 1,100 g
Accessorie		Injection molding monitoring system main unit (×1), measurement software (CD-R), LAN cable (2 m), AC adapter (3.2 m), signal input/output cable (3 m)
Recommended measurement PC specifications * System does not include measurement PC.		Operating system (Japanese language compatible): Windows 7 (32 bit/64 bit), Windows 8 (32 bit/64 bit), Windows 8.1 (32 bit/64 bit), Windows 10 (32 bit/64 bit) Processor: Intel CPU Core i5 or higher Required memory: 4 GB or more Other: Ethernet port, .NET Framework 4.0 or higher installed

External dimensions



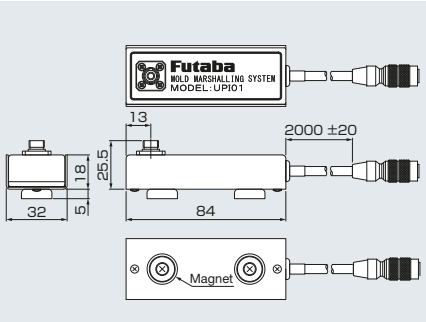
Preamplifier

UPP01A pressure preamplifier for the MVS08



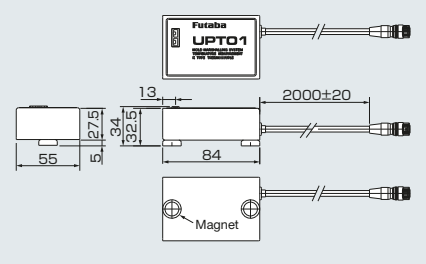
Product code		UPP01A
Number of measurement points		1
Compatible sensors		SSE series SSB series
Measurement range		SSE series: 0 MPa to 100 MPa SSB series: 12.5 kN to 16 kN
Accuracy		±2%F.S.
Mounting method		Installed using two underside magnets
Cable length		2 m
Weight		Approx. 300 g
Environmental resistance	Operating temperature	10°C to 50°C
	Operating humidity	35% to 85% RH (no condensation)

UPI01A resin temperature preamplifier for the MVS08



Product code		UPI01A
Number of measurement points		1
Compatible sensors		EPSSZL series EPSSZT series
Measurement range		EPSSZL series: 60°C to 430°C EPSSZT series: 60°C to 390°C
Accuracy		±2% F.S. (±8.6°C)
Mounting method		Installed using two underside magnets
Cable length		2 m
Weight		Approx. 200 g
Environmental resistance	Operating temperature	10°C to 40°C
	Operating humidity	35% to 85% RH (no condensation)

UPT01A mold surface temperature preamplifier for MVS08

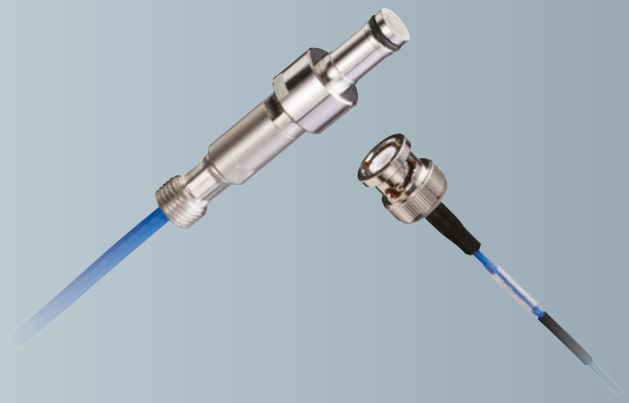


Product code		UPT01A
Number of measurement points		1
Compatible sensors		STF04.0×08.0×026
Measurement range		0 to 400°C
Accuracy		±2.0 (response within 34 msec)
Mounting method		Installed using two underside magnets
Cable length		2 m
Weight		Approx. 300 g
Environmental resistance	Operating temperature	0°C to 40°C
	Operating humidity	35% to 85% RH (no condensation)

Direct pressure sensors

SPF04.0×08.0×030

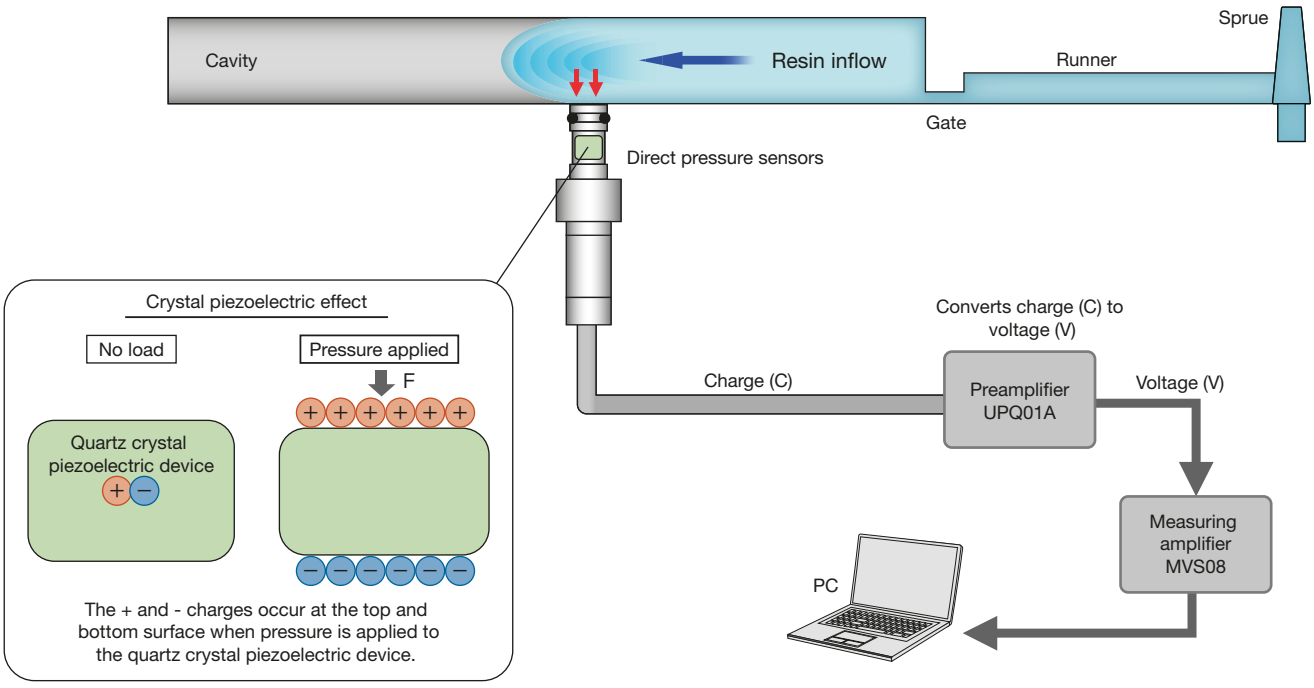
RoHS compliant



- Capable of accurately measuring pressure inside a mold (nonlinearity ±1.0% F.S.)
- Flush mounting type lets users mount the sensor in various positions

Measuring principles

Direct pressure sensors operate on the crystal piezoelectric effect.
A sensor installed on the surface of the cavity is acted upon by the pressure of the resin, which leads to a charge (C) being generated by the quartz crystal piezoelectric device located at the tip of the sensor.
This charge is converted to a voltage (V) by the UPQ01 preamplifier, then displayed on the MVS08 Injection Molding Monitoring System as a pressure waveform.

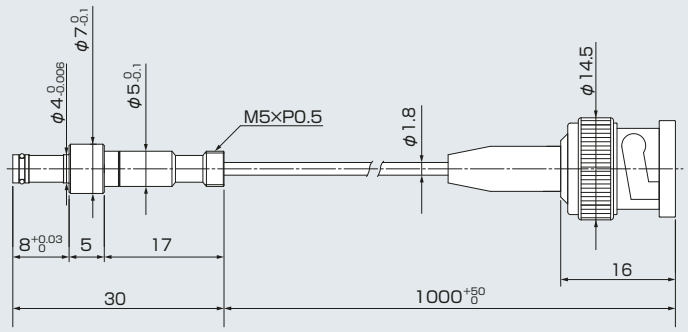


Specifications

Direct pressure sensor

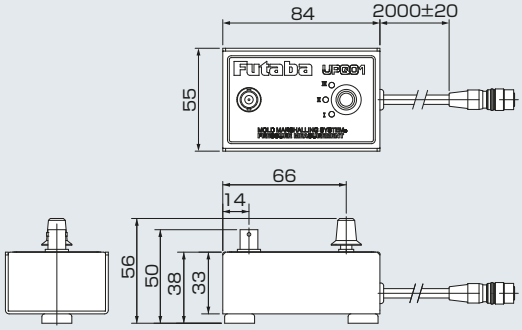
Product code	SPF04.0×08.0×030
Rated capacity	150 MPa
Permitted overload	200 MPa
Sensitivity	-20 pC/MPa
Nonlinearity	±1.0% F.S.
Operating temperature	Mold temperature not to exceed 200°C
Insulation resistance	$10^{13}\Omega$ (25°C)

External dimensions



Preamplifier

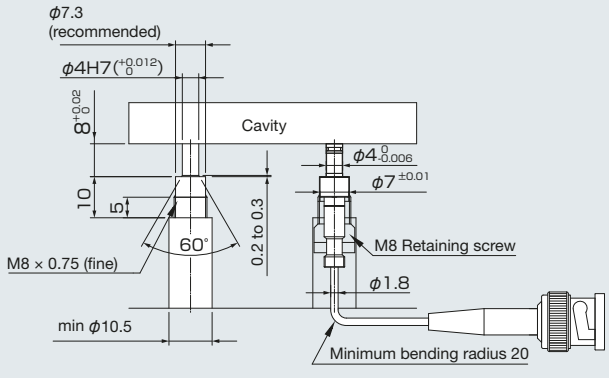
Direct pressure preamplifier for MVS08



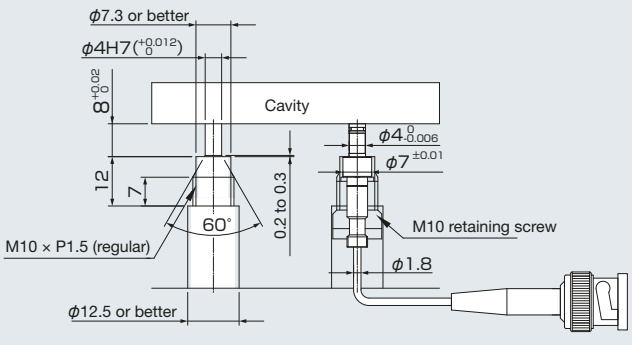
Product code		UPQ01A
Number of measurement points		1
Applicable sensors		SPF04.0 × 08.0 × 030
Input range		I: -20 pC/MPa, II: spare, III: spare (three-step switching)
Input charge		I: 0 to -4,000 pC, II: spare, III: spare
Output voltage		0 to +10 V
Accuracy		±1.5% F.S.
Mounting method		Installed using two underside magnets
Cable length		2 m
Weight		Approx. 350 g
Environmental resistance	Operating temperature	10 to 50°C
	Operating humidity	35% to 85% RH (no condensation)

Mounting example

M8 (fine) retaining screw



M10 (regular) retaining screw



Mold open measurement sensor

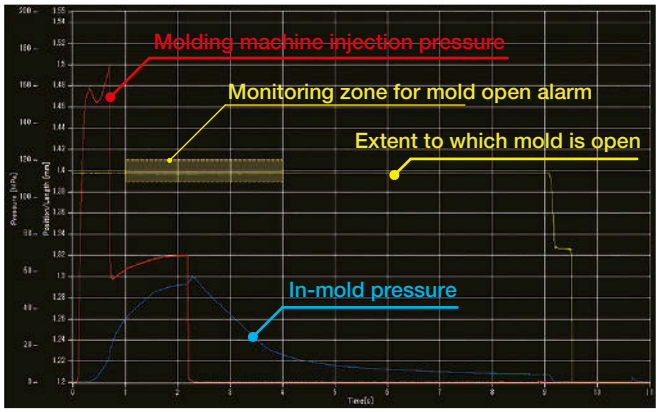
MEL series

RoHS compliant

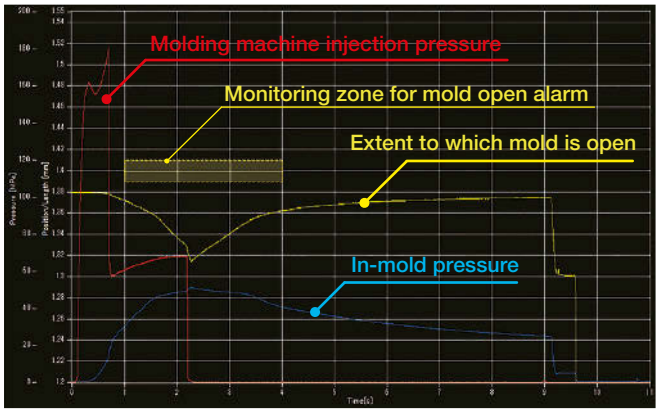
- Allows micron order measurement of mold separation at the parting line.
- Magnetic induction allows remarkably accurate measurements, even at high temperatures.
- Suitable for embedding in the molds of injection molding machines, presses, etc.

Measured waveforms

[Normal waveform]



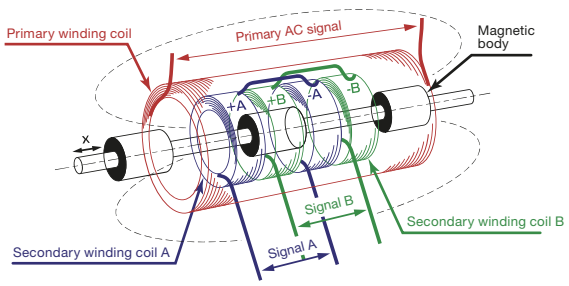
[Abnormal waveform]



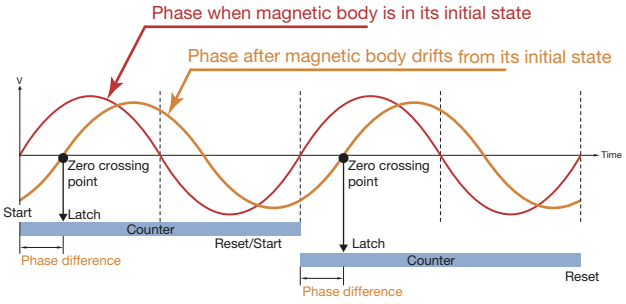
Measuring principles

The sensor consists of a conversion circuit section, primary winding coil, secondary winding coil, and magnetic body moving through the coils.
Energizing the primary AC signal based on the primary winding coil generates an AC magnetic field. The induction output is detected from the positioning of the two coils and three magnetic bodies within the AC magnetic field, and the phase difference compared to the initial state is measured.

[Configuration]



[Calculation method]



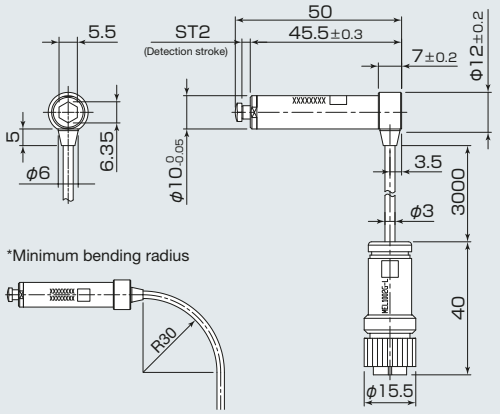
Specifications

Product code	L type	MEL1002G-L
	SF type	MEL1002G-SF
Detection stroke		2 mm
Repetition accuracy		±2 μm
Linearity accuracy		20 μm
Resolution		1 μm
Impact resistance		100 G
Vibration resistance		20 Hz/5G to 150 Hz/5G
Durability		3,000,000 times
Enclosure rating		IP40
Operating temperatures		0°C to +150°C
Operating humidity		15 to 85%RH (no condensation)
Storage temperatures		-20°C to +80°C
Storage humidity		15 to 85%RH (no condensation)
Cable length/Connector		3 m/R04P8M (6.8) 8P (Tajimi Electronics)
Weight (including cables and connectors)		Approx. 100 g

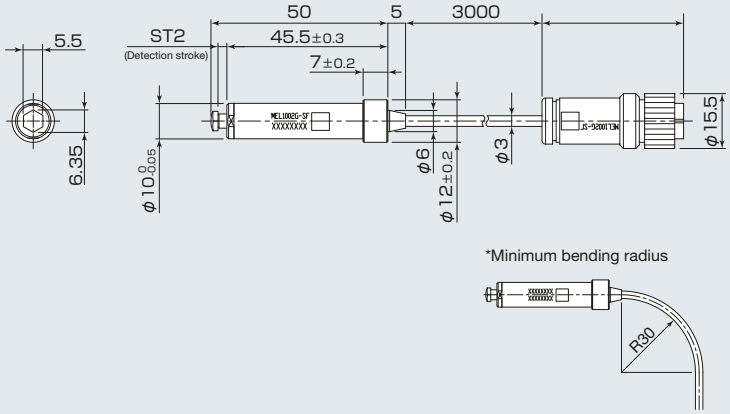
*Repetition accuracy is the value at 20℃ using Futaba testing apparatus.
*Linearity accuracy is the value following calibration with sensor embedded in the mold.
Please contact a Futaba representative if the intended applications do not include embedding.
*The resolution is the value assuming use of the MPD200F mold open preamplifier.

External dimensions

L type

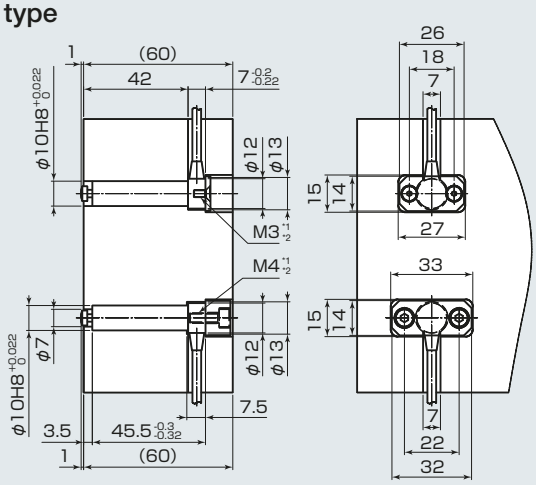


SF type



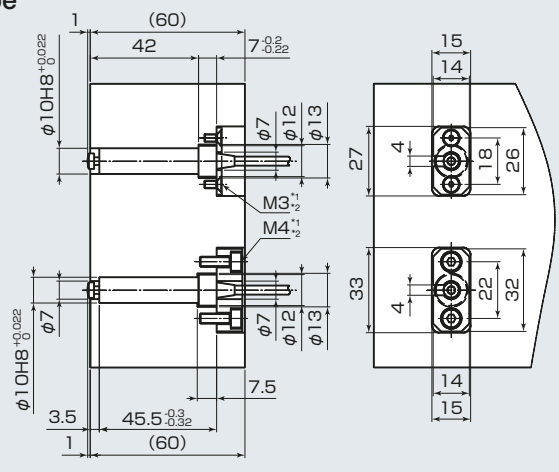
Mounting example

L type



*1 Note that up to 0.42 mm may remain between the retaining plate and the installation surface. This does not indicate a defect or a problem.
*2 Tighten the screws evenly so that the sensor is not inclined.

SF type

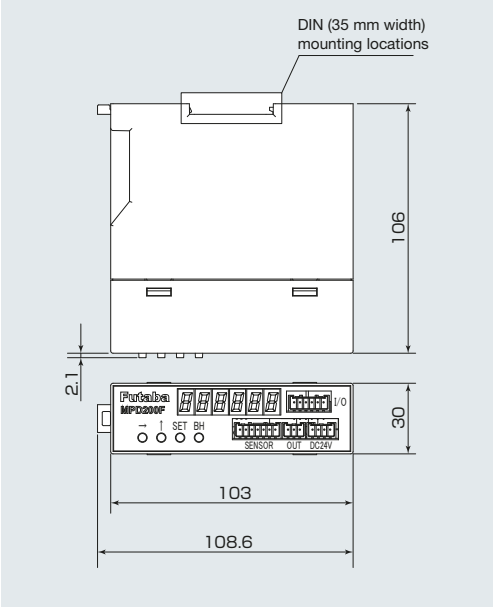


*1 Note that up to 0.42 mm may remain between the retaining plate and the installation surface. This does not indicate a defect or a problem.
*2 Tighten the screws evenly so that the sensor is not inclined.

Mold open measurement sensor

Preamplifier

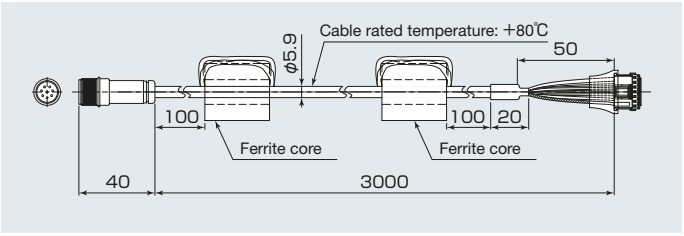
MPD200F mold open preamplifier for MVS08



Product code			MPD200F
Power supply	Power supply voltage		24 V DC ±10% ripple 100 mV
	Consumption current		0.25 A or less (at 24 V DC)
Analog output	Voltage	Range	-5 to +5 V, -10 to +10 V, 0 to +10 V, 0 to +5 V
		Load impedance	10 kΩ or more
	Current	Range	4 to 20 mA, 0 to 20 mA, 0 to 24 mA
		Load impedance	250 Ω or less
Data update interval			102.4 μs
Resolution of 7-segment display			13 bitFS [at 1 μm increments]
Operating temperatures			0°C to +55°C (-25°C to +85°C for storage)
Operating humidity			35% to 85%RH
Insulation resistance			100 MΩ or more (measured using DV250V insulation resistance meter) Between charging section group and FG
Connection method			With connectors (power, output, I/O line)
Mounting method			Screws, DIN rail mounting
External dimensions			103 × 106 × 30 mm (excluding DIN mounting section, connectors, and switch projections)
Weight			160 g

Sensor extension cable <3 m>

Cable for connecting the mold open measurement sensor and mold open preamplifier (one required for each measurement point).



Sensor extension cable

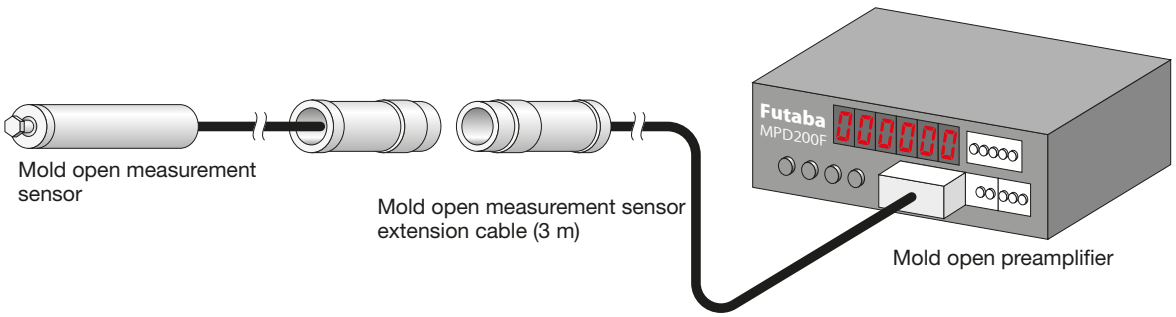
Product code	WSP6S06-1559-003

MVS08 connection cable

Cable for connecting the mold open preamplifier and MVS08 (one required for each measurement point).

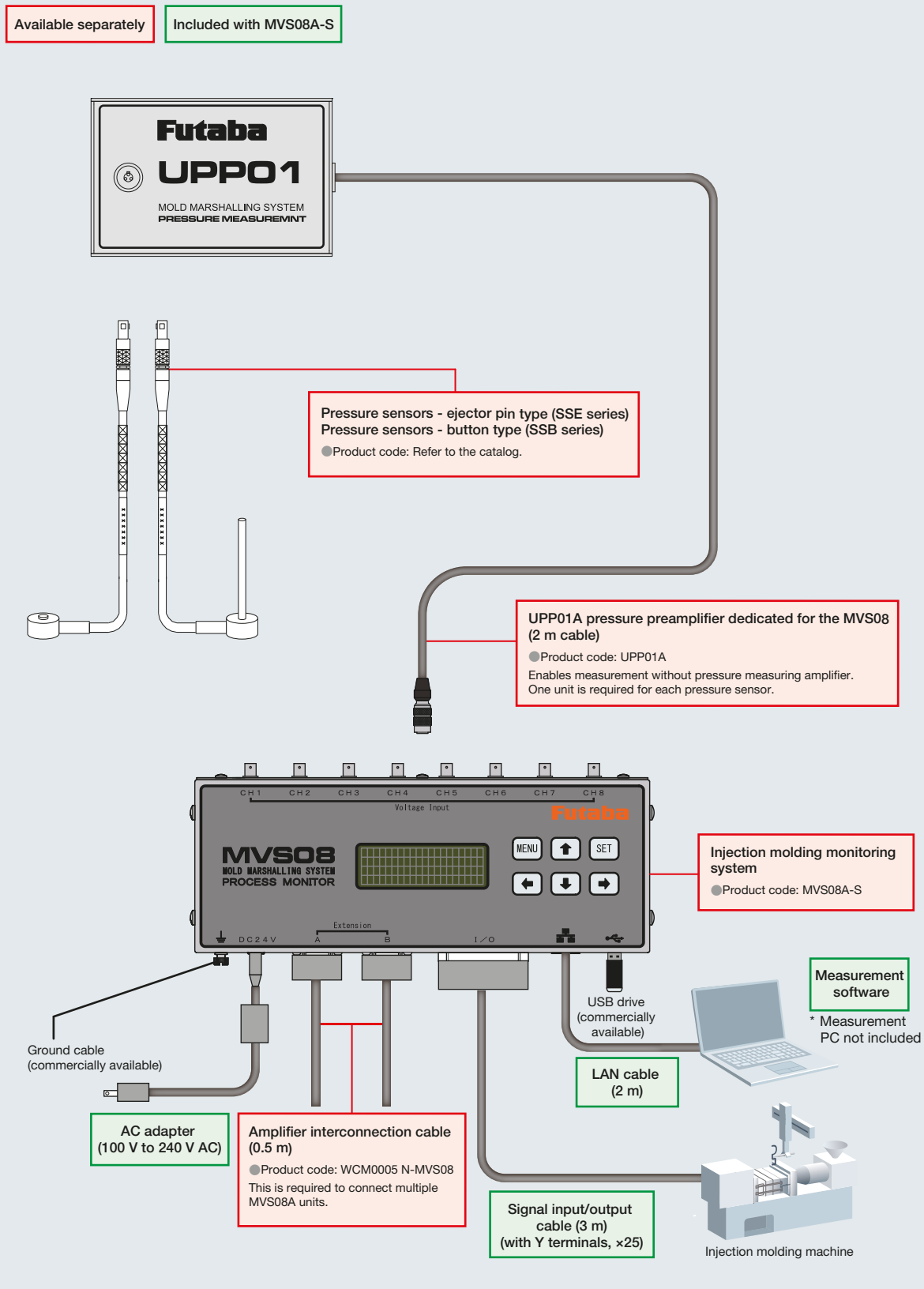
Product name	Product code
MVS08 connection cable	WCI0130-MPD200F N-MVS08

Example of system configuration



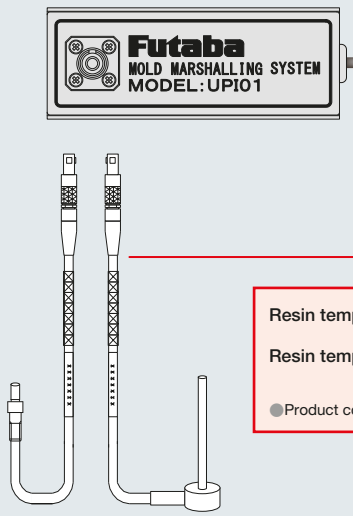
System configuration diagram

System configuration diagram for MVS08A-S injection molding monitoring system and UPP01A pressure preamplifier for the MVS08



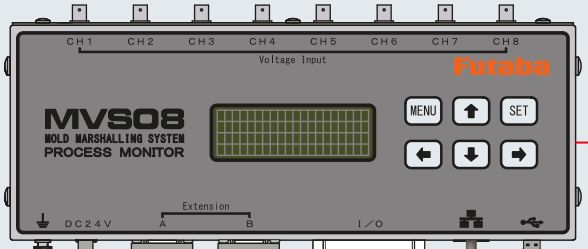
System configuration diagram for MVS08A-S injection molding monitoring system and UPI01A resin temperature preamplifier for the MVS08

Available separately | Included with MVS08A-S



Resin temperature sensors - ejector pin type (EPSSZL series)
Resin temperature sensors - flush-mount type (EPSSZT series)
●Product code: Refer to the catalog.

UPI01A resin temperature preamplifier dedicated for the MVS08 (2 m cable)
●Product code: UPI01A
Enables measurement without EPT-001 resin temperature measuring amplifier.
One unit is required for each resin temperature sensor.



Injection molding monitoring system
●Product code: MVS08A-S

Measurement software
* Measurement PC not included

USB drive (commercially available)

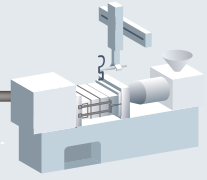
LAN cable (2 m)

Ground cable (commercially available)

AC adapter (100 V to 240 V AC)

Amplifier interconnection cable (0.5 m)
●Product code: WCM0005 N-MVS08
This is required to connect multiple MVS08A units.

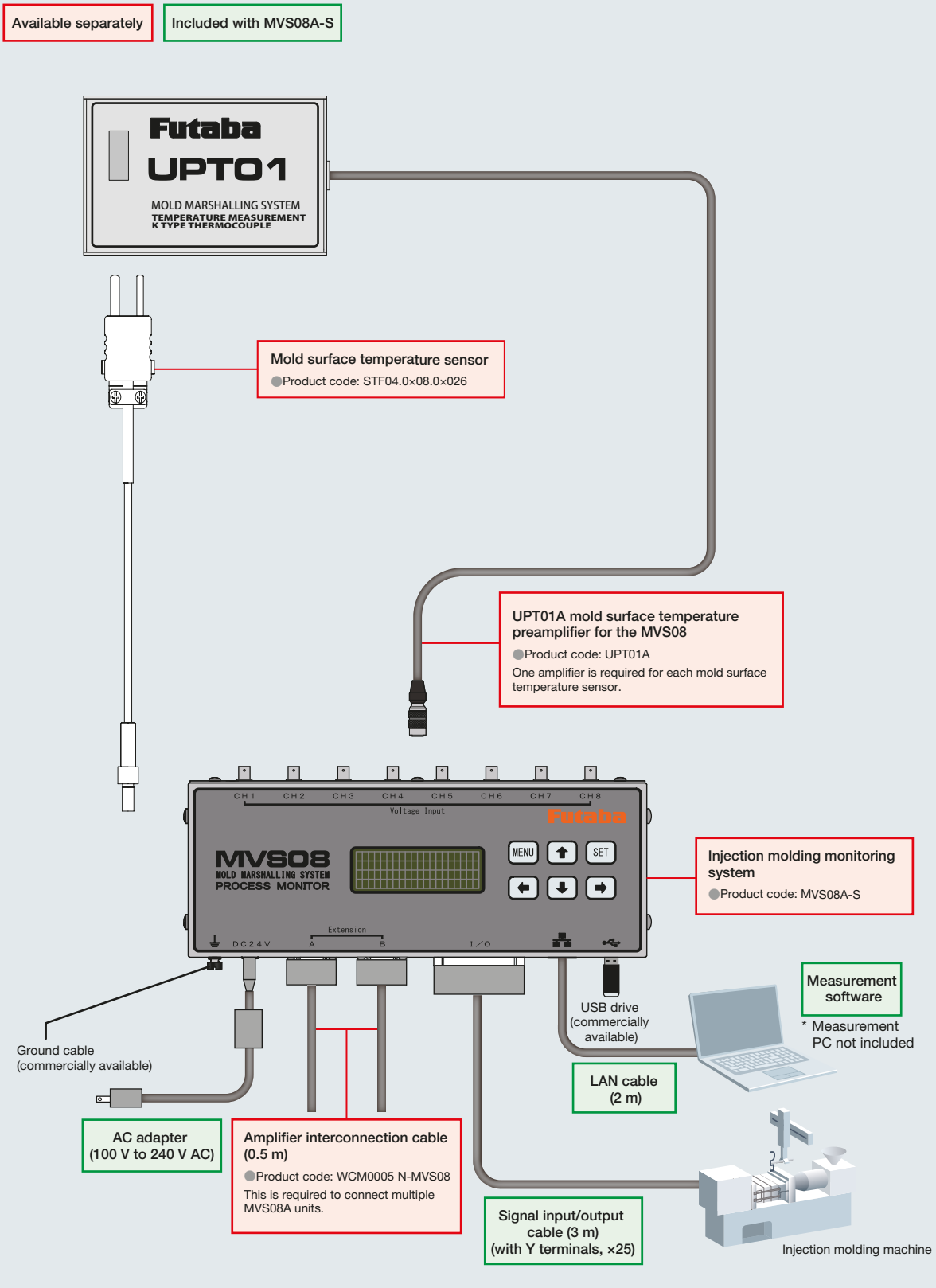
Signal input/output cable (3 m) (with Y terminals, ×25)



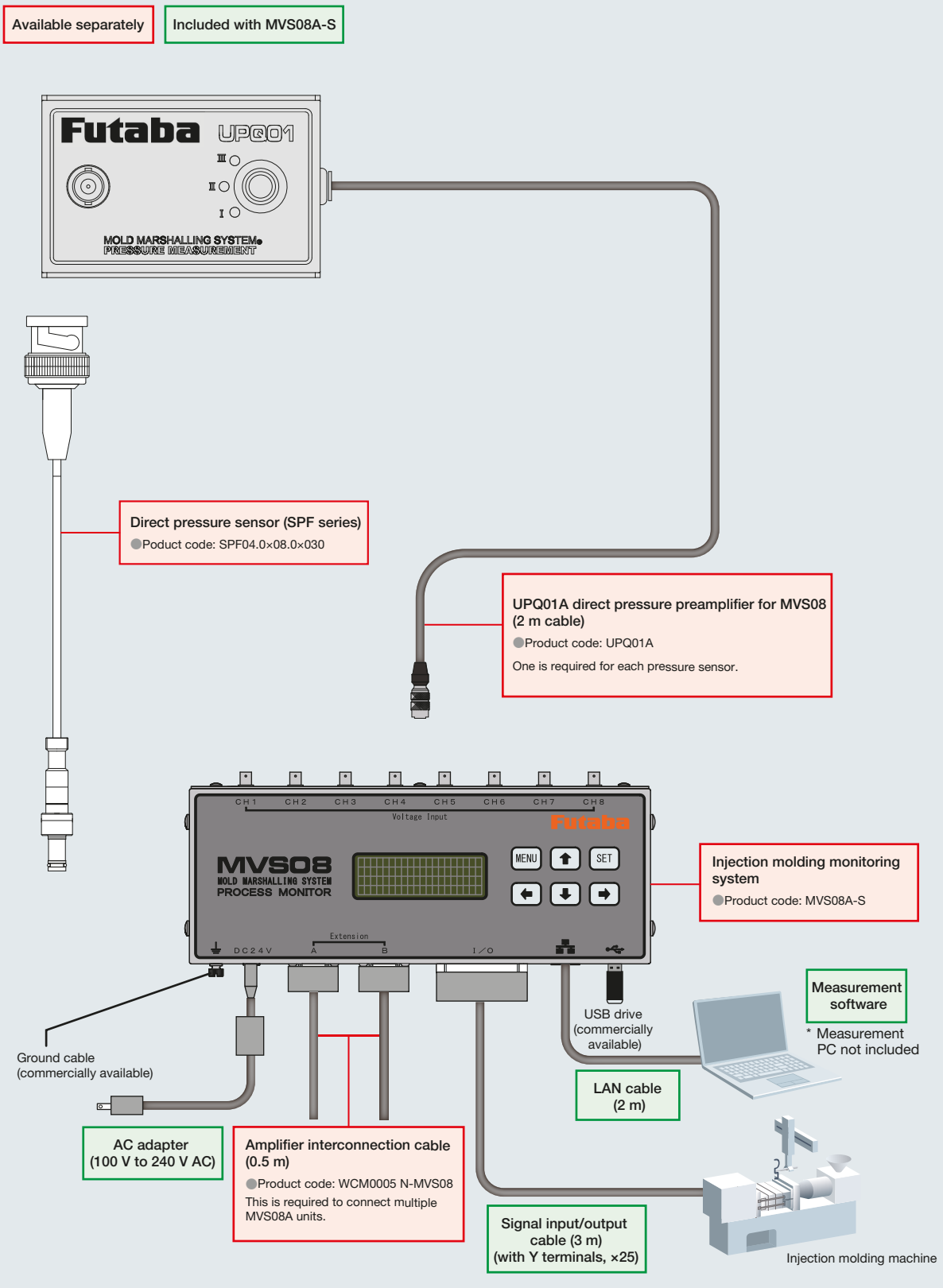
Injection molding machine

System configuration diagram

System configuration diagram for UPT01A mold surface temperature preamplifier for MVS08 and MVS08A-S injection molding monitoring system

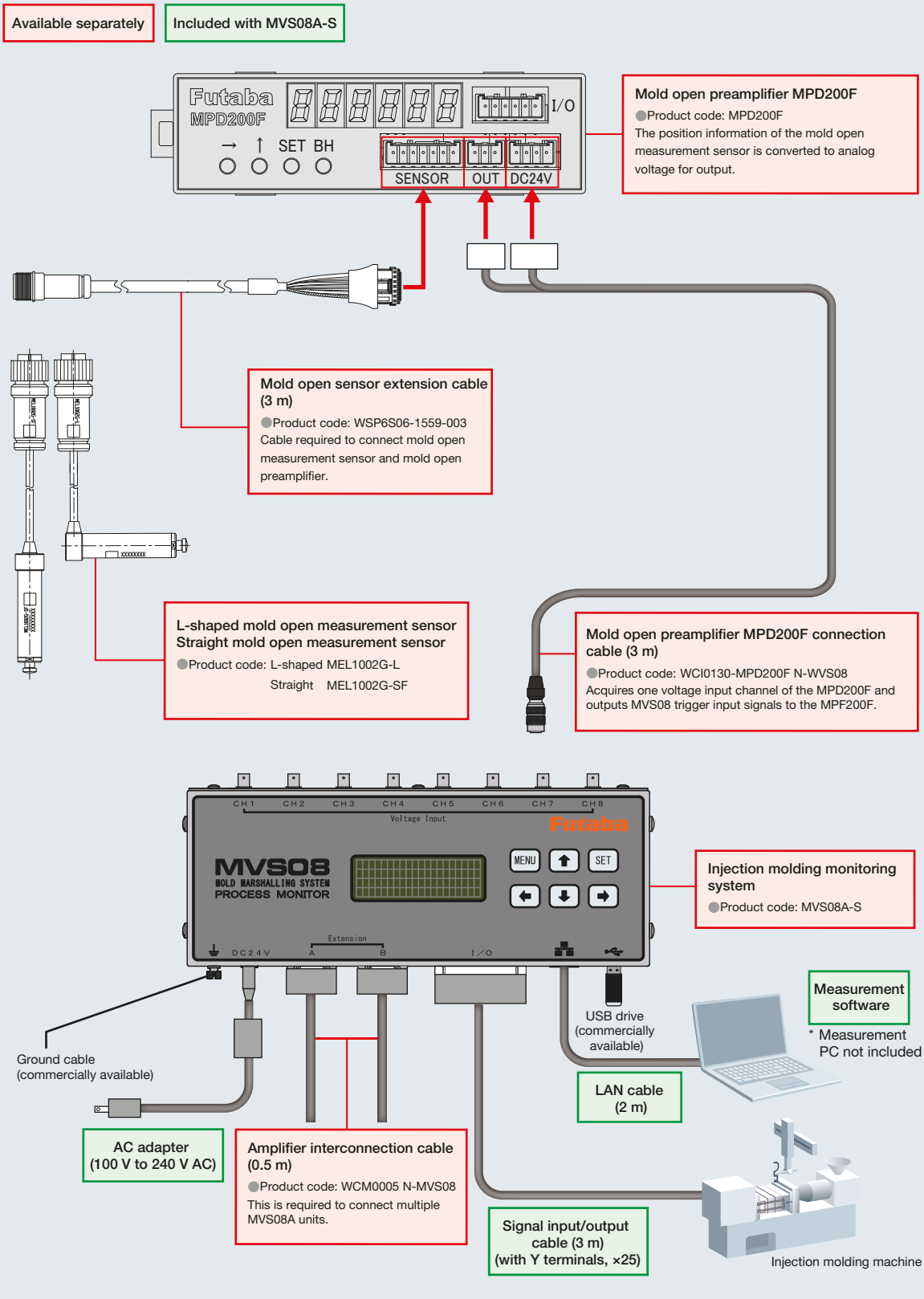


System configuration diagram for SPF direct pressure sensor, UPQ01A direct pressure preamplifier for MVS08 and MVS08A-S injection molding monitoring system

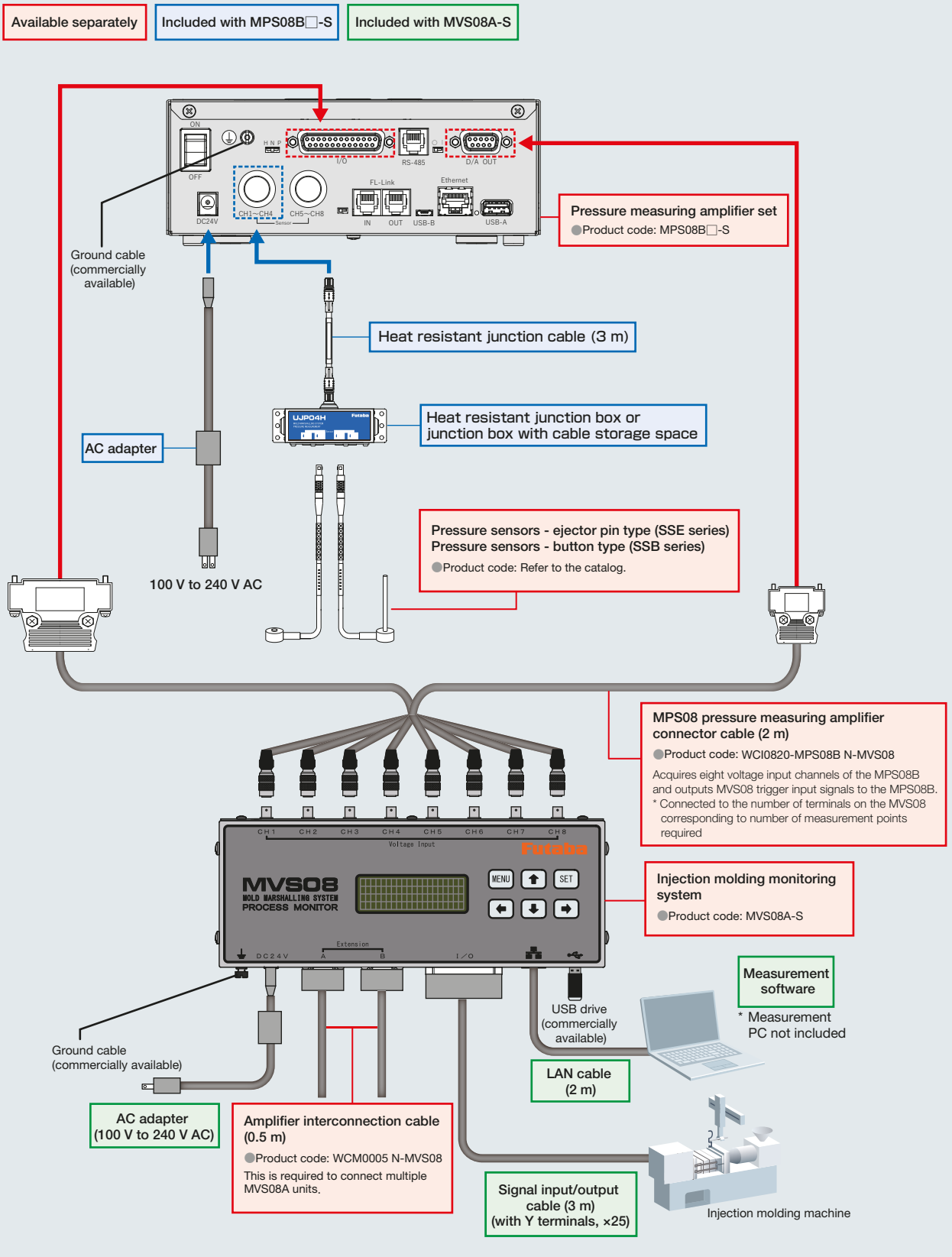


System configuration diagram

System configuration diagram for MEL series mold open sensor, MPD200F mold open preamplifier for MVS08, and MVS08A-S injection molding monitoring system

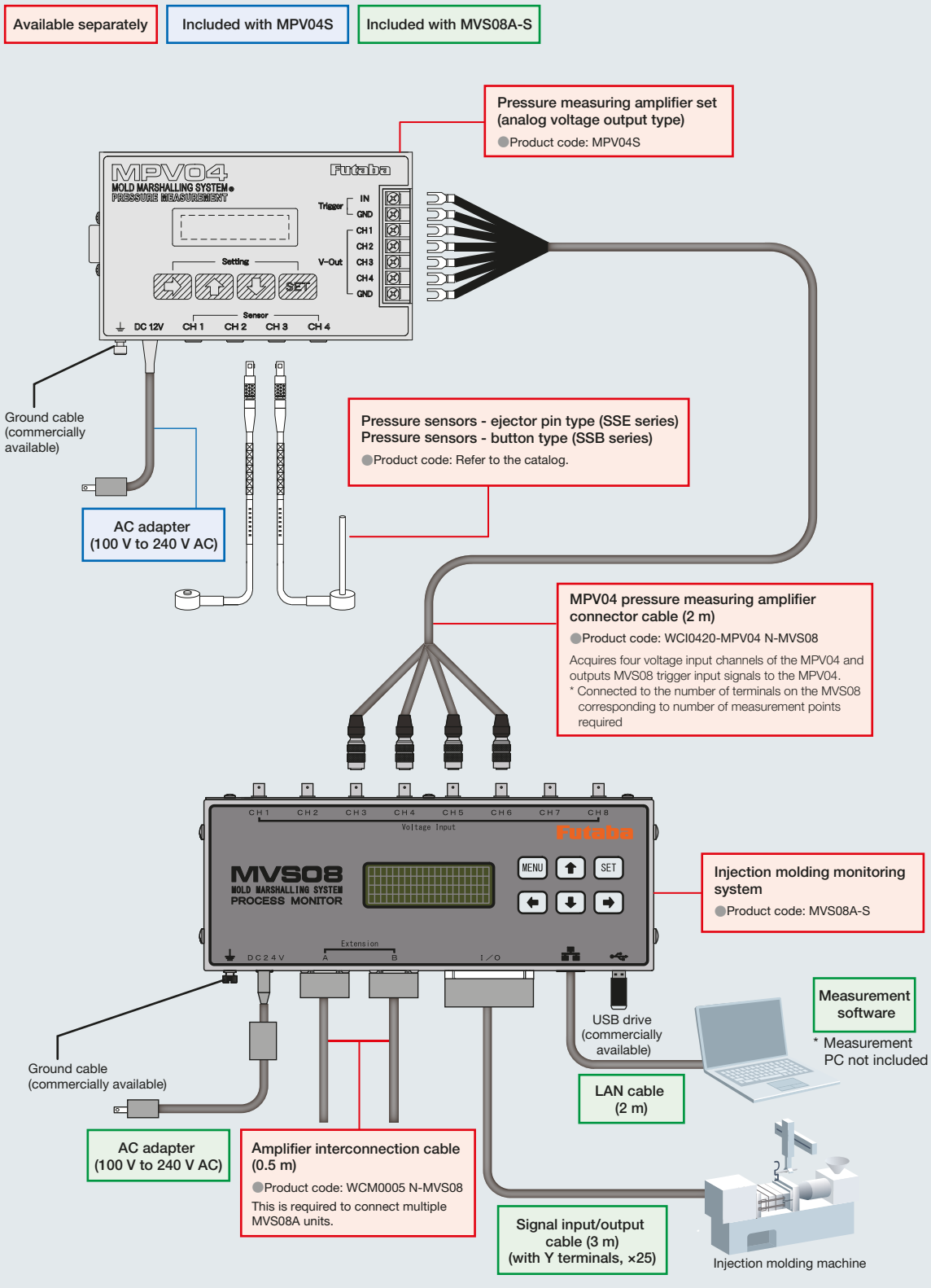


System configuration diagram for MVS08A-S injection molding monitoring system and MPS08B□-S pressure measuring amplifier set

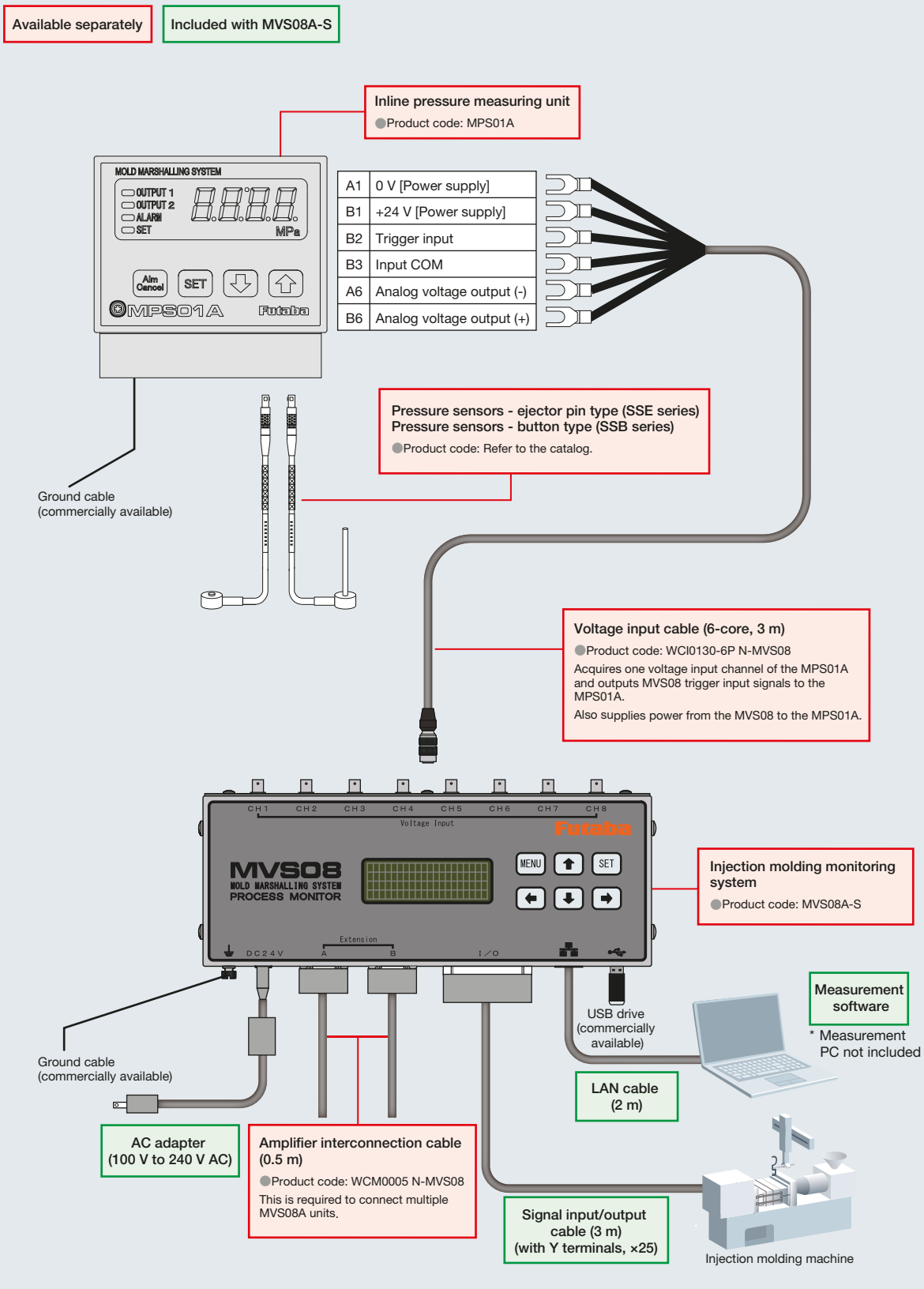


System configuration diagram

System configuration diagram for MVS08A-S injection molding monitoring system and MPV04S pressure measuring amplifier

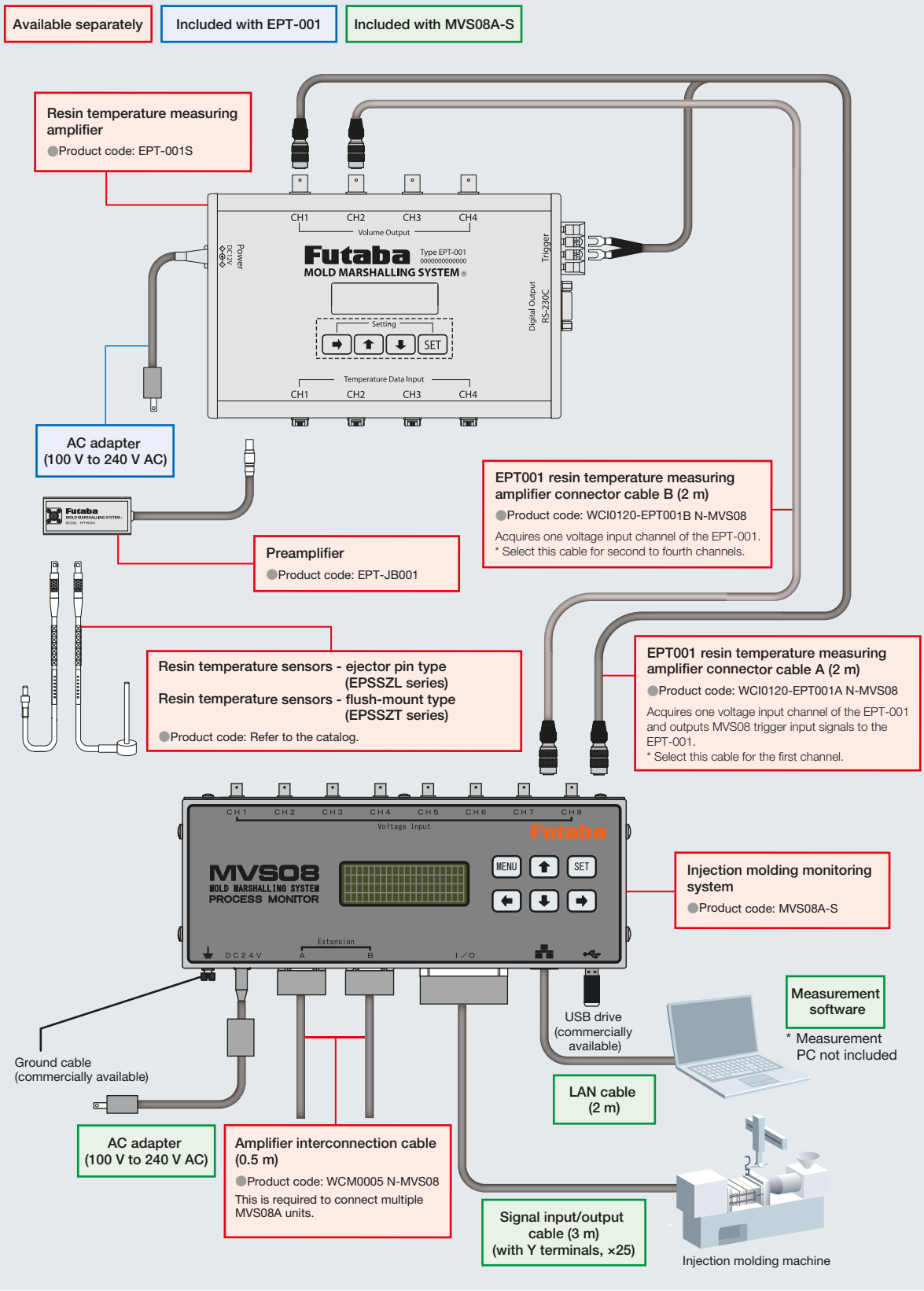


System configuration diagram for MVS08A-S injection molding monitoring system and MPS01A inline pressure measuring unit



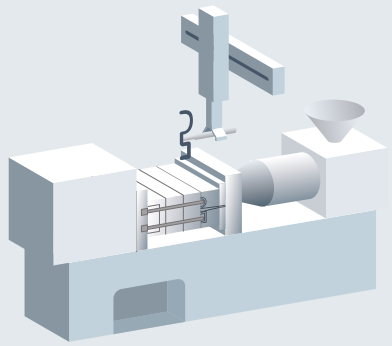
System configuration diagram

System configuration diagram for MVS08A-S injection molding monitoring system and EPT-001S resin temperature measuring amplifier



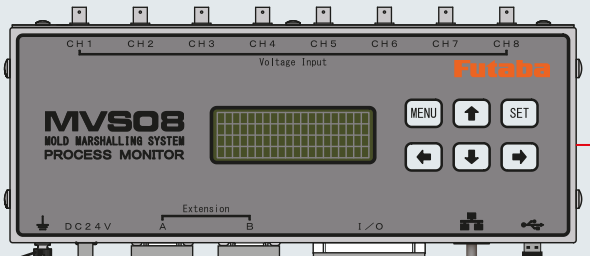
System configuration diagram for MVS08A-S injection molding monitoring system and molding machine/other measuring device

Available separately | Included with MVS08A-S



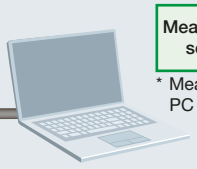
Molding machine or other measuring device

Voltage input cable (2-core, 3 m)
●Product code: WCI0130-2P N-MVS08
Acquires one voltage input channel of an injection molding machine or other measuring device.



Injection molding monitoring system
●Product code: MVS08A-S

Measurement software
* Measurement PC not included



USB drive (commercially available)

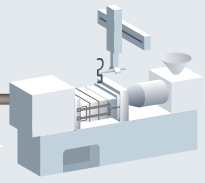
Ground cable (commercially available)

LAN cable (2 m)

AC adapter (100 V to 240 V AC)

Amplifier interconnection cable (0.5 m)
●Product code: WCM0005 N-MVS08
This is required to connect multiple MVS08A units.

Signal input/output cable (3 m) (with Y terminals, ×25)



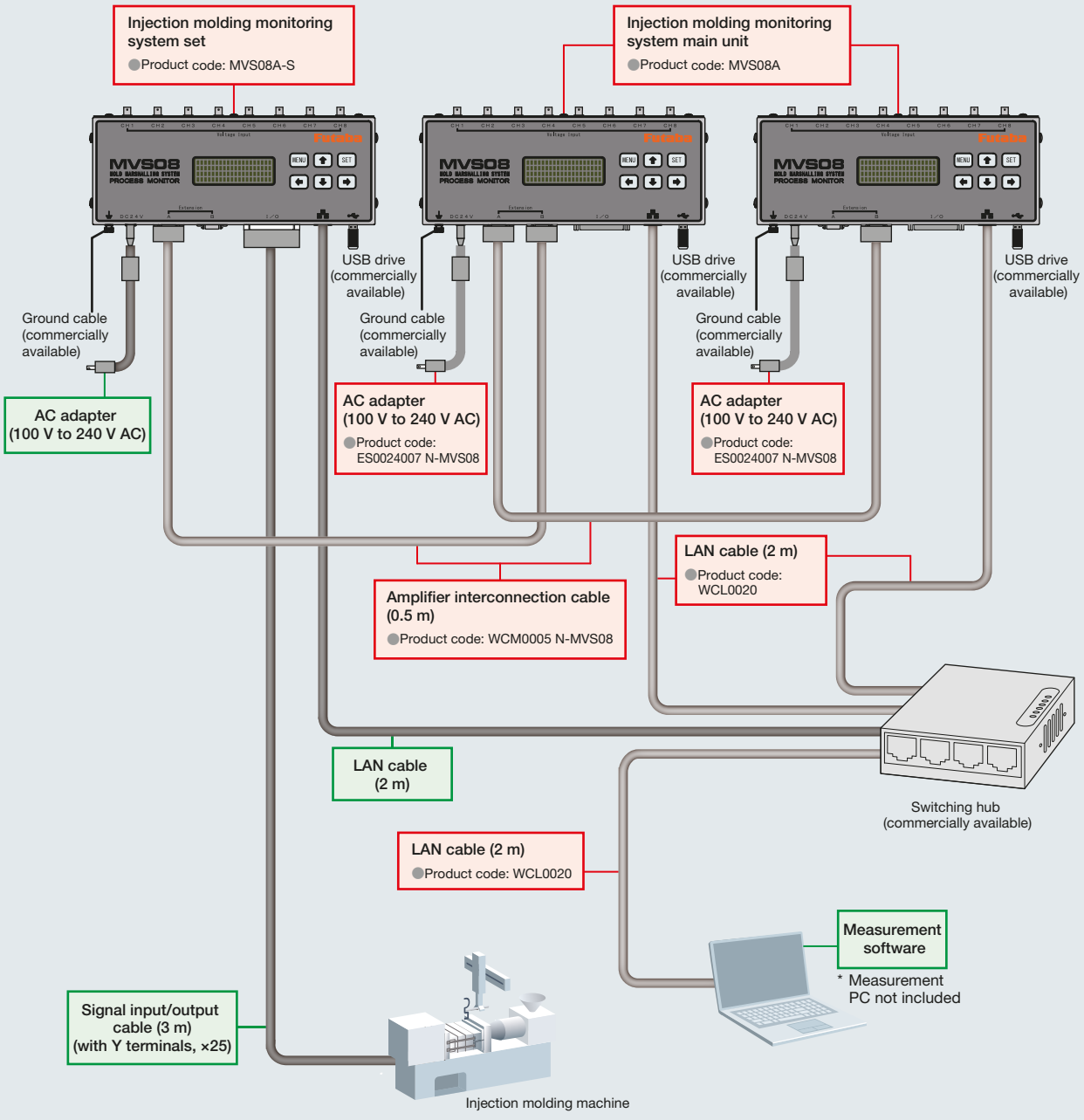
Injection molding machine

System configuration diagram

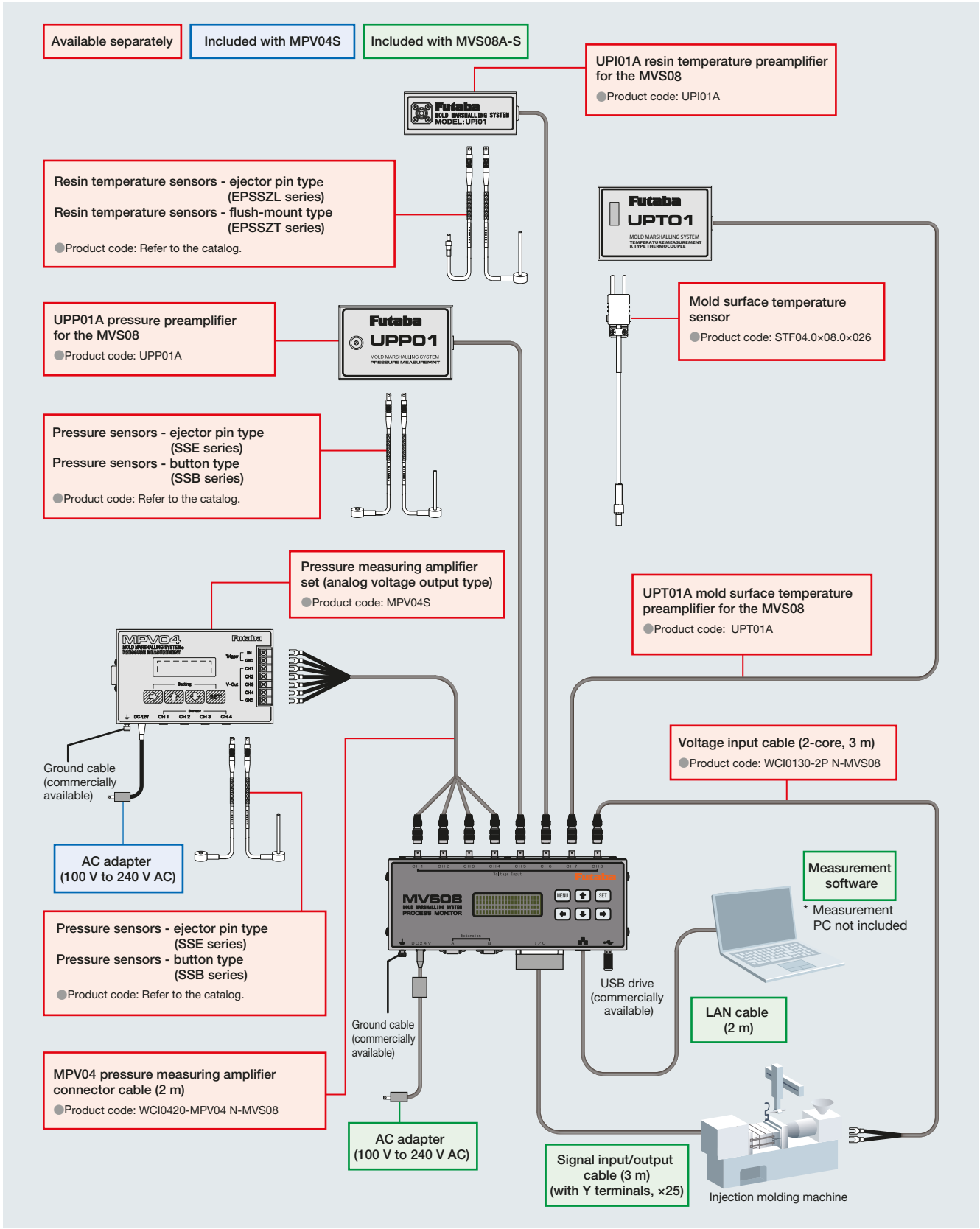
System configuration diagram for MVS08A-S injection molding monitoring system expansion

Available separately | Included with MVS08A-S

* Purchase the injection molding monitoring system set for the first set and the injection molding monitoring system main unit + AC adapter + LAN cable (one more than the number of additional units) for the second and third sets.
* A USB drive is required for each injection molding monitoring system main unit to save measurement data.
* The measurement software allows settings and measurement for up to three units.



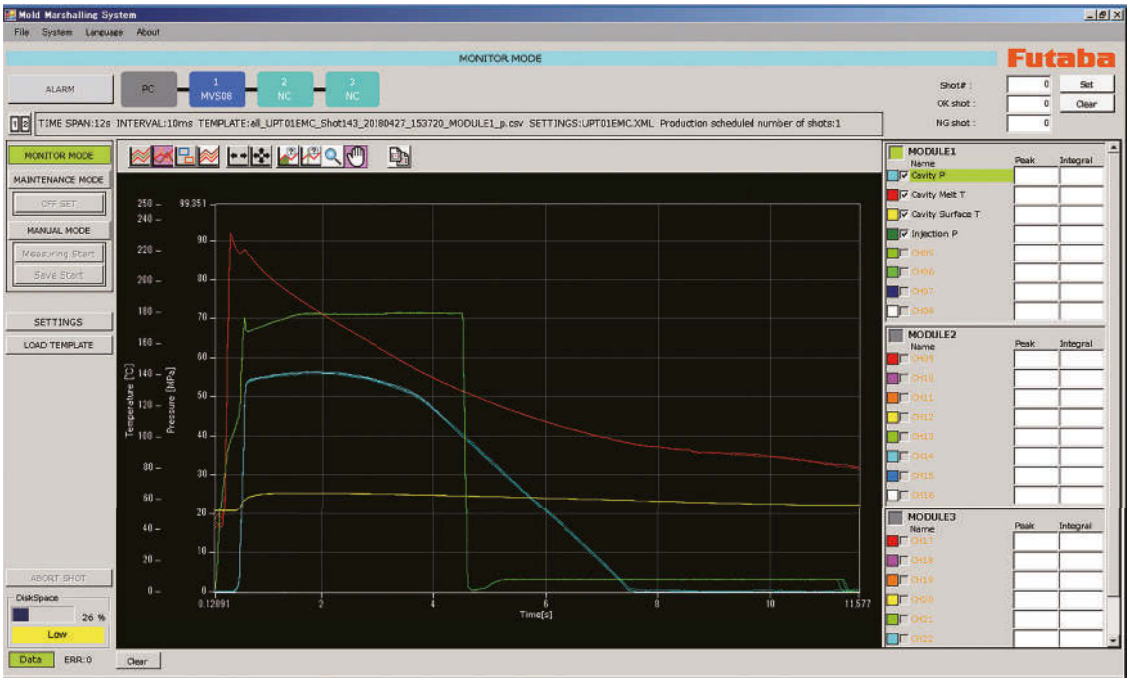
System configuration example (five in-mold pressure points, one in-mold resin temperature point, one mold surface temperature point, one injection molding machine point)



Measurement software functions

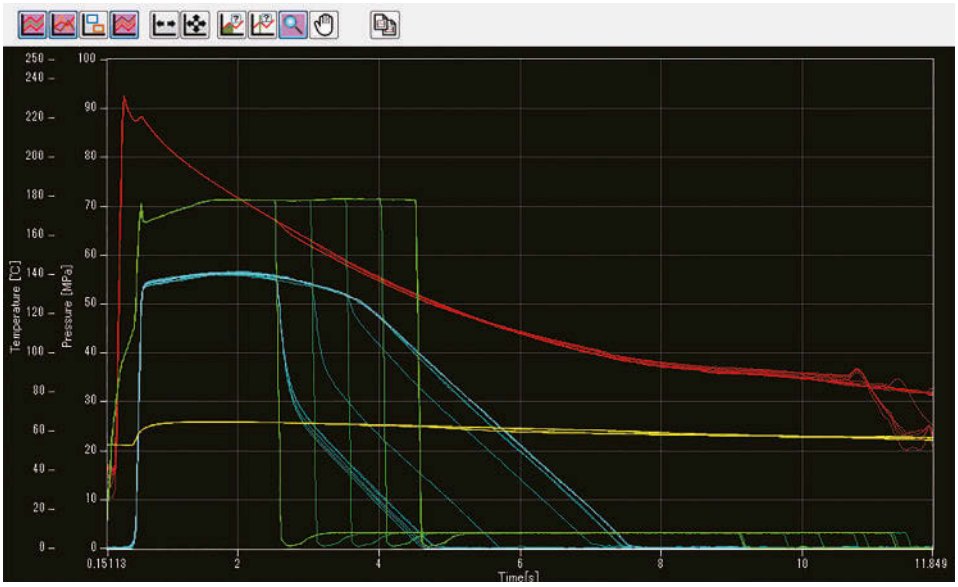
Reference waveform display

Press the LOAD TEMPLATE button to display various automatically saved waveform data on the measurement screen. Waveforms can be overlaid on the screen during measurement to allow visual confirmation of measurement changes when setting or altering molding parameters.



Waveform overlaid display

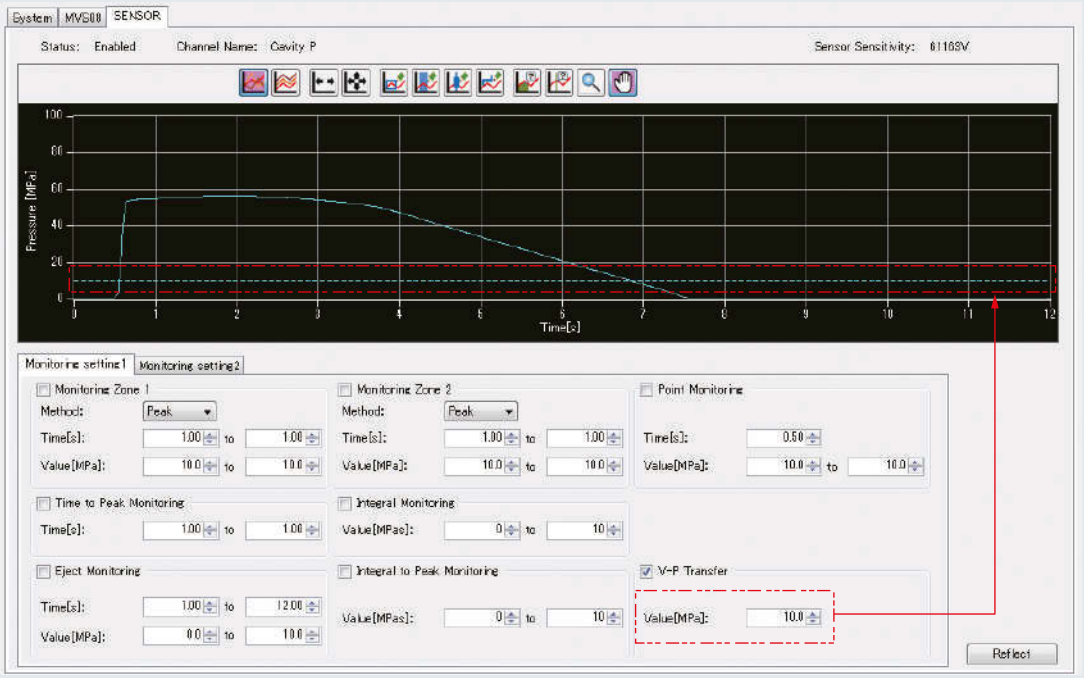
Press the hide/display overlaid waveforms button on the toolbar to display overlaid waveforms for up to 99 cycles. Variations in the waveforms can be checked in real time for each shot, allowing visual confirmation of the transition from molding start to stabilized molding.



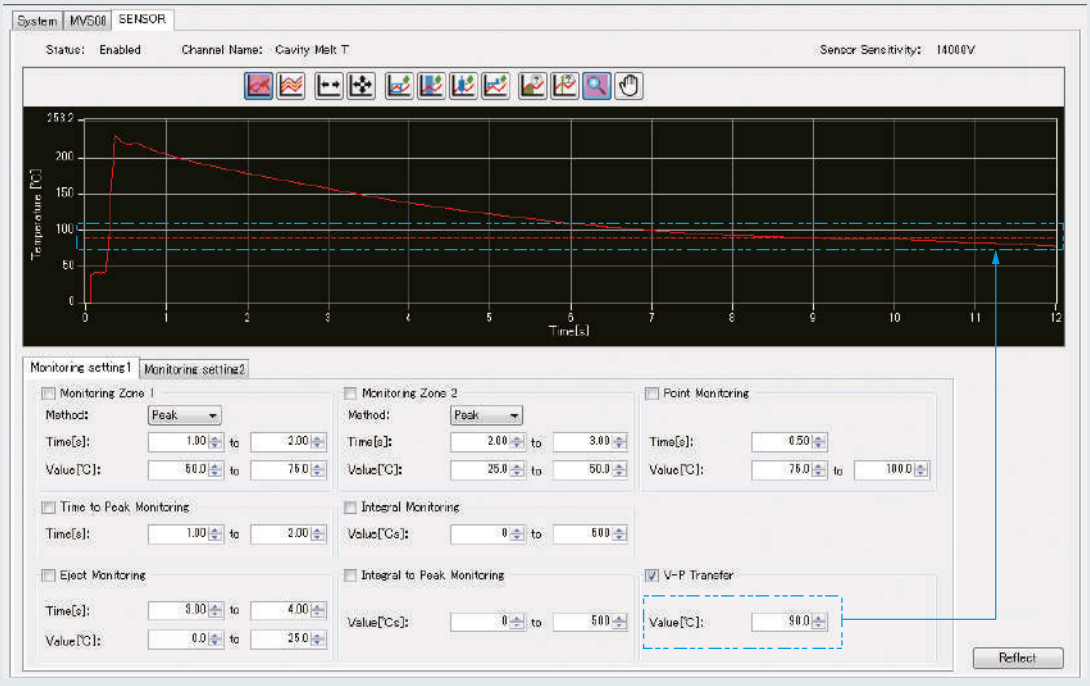
Control signal output

The molding machine and other external devices can be controlled by setting threshold values for individual measurements and outputting voltage signals when these values are exceeded.
The signals are output using an NPN open collector, allowing control of V-P transfer and other operations.

[Setting example for in-mold pressure waveform]



[Setting example for resin temperature waveform]



Measurement software functions

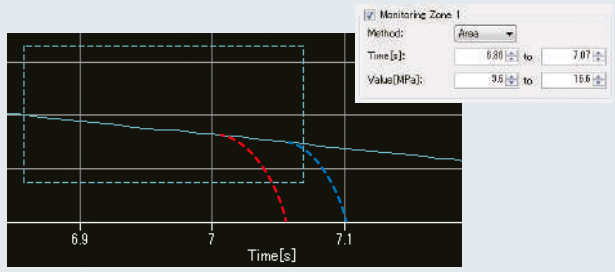
Alarm signal output

Multiple monitoring zones can be set based on the reference waveform. If the waveform falls outside the monitoring zone, the amplifier outputs an alarm signal, which can be linked to an unloading machine to automatically screen for defective molded products. This significantly reduces the time required for product inspections.
(12 monitoring settings are possible for each channel).

① Area pressure monitoring

[Blue broken curve: OK / Red broken curve: Alarm]

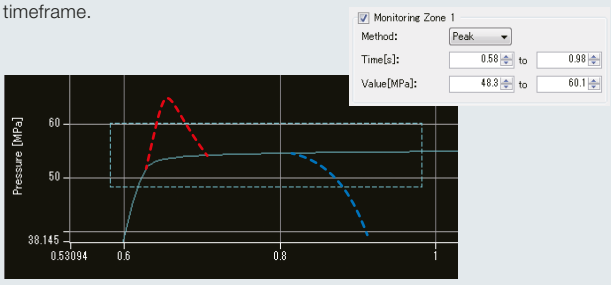
Monitors whether all measurements are within the preset pressure range over the specified monitoring timeframe.



② Peak pressure monitoring

[Blue broken curve: OK / Red broken curve: Alarm]

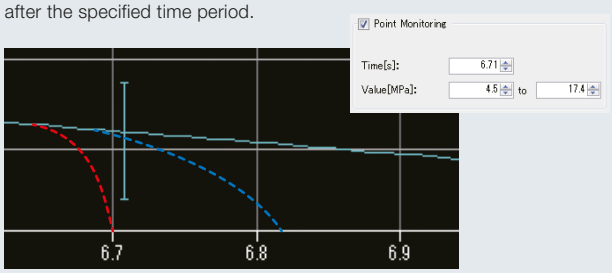
Monitors whether the maximum pressure (peak pressure) value lies within the preset pressure range over the specified monitoring timeframe.



③ Monitoring after t seconds

[Blue broken curve: OK / Red broken curve: Alarm]

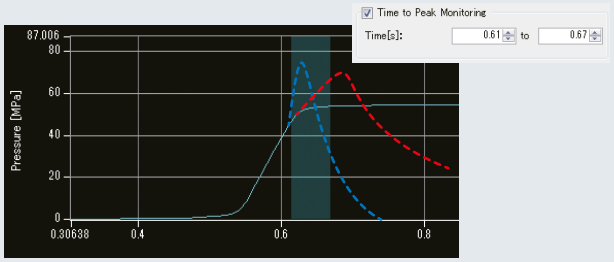
Monitors whether the pressure value lies within the preset pressure range after the specified time period.



④ Peak pressure arrival time monitoring

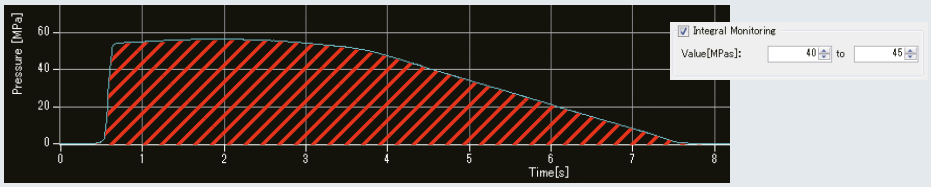
[Blue broken curve: OK / Red broken curve: Alarm]

Monitors whether the maximum pressure (peak pressure) value during the measurement time lies within the specified monitoring timeframe.



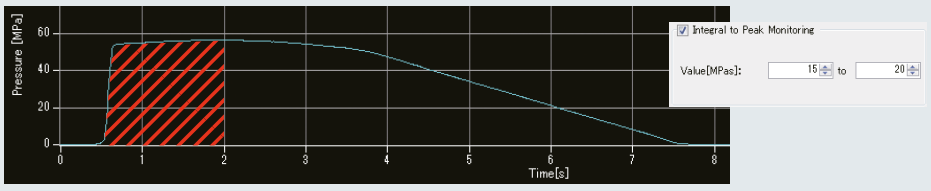
⑤ Integral monitoring

Monitors whether the area enclosed by the pressure waveform and time axis (area shaded in red) lies within the specified range of the integral.



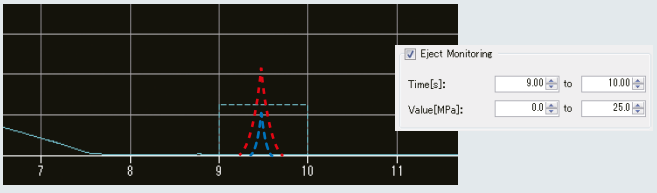
⑥ Peak integral monitoring

Monitors whether the integral (area shaded in red) up to the maximum pressure (peak pressure) value lies within the specified range of the integral over the measurement timeframe.



⑦ Eject pressure monitoring

Monitors whether the eject pressure lies within the preset pressure range over the specified monitoring timeframe.
* Requires eject pressure of around 5 MPa.



* Other functions include rising time monitoring, falling time monitoring, average values monitoring, section average monitoring, and section integral value monitoring.

Saved data types

Data can be saved as “configuration files,” “waveform data,” or “numerical data,” as shown in the following table. Saved data can be displayed in tabular or graph form using commercially available spreadsheet applications for effective use as quality control data.

<table>
<tr><th>Data type</th><th colspan="2">Item</th><th>Extension</th><th>Destination folder (default for Windows 7)</th><th>Remarks</th></tr>
<tr><td>Configuration file</td><td colspan="2">Parameter settings</td><td>.xml</td><td>C:/Documents and settings/Username/ MMS_Settings</td><td>● Setting parameters for measurement and monitoring. This is used by selecting from within a folder on the PC and saving in the amplifier.</td></tr>
<tr><td>Waveform data</td><td colspan="2">Pressure waveform</td><td>.csv</td><td>C:/Documents and settings/Username/ MMS_DATA/Date folder</td><td>● Saved separately by shot number
● This can be loaded as reference waveform data in MPS08 software.
● Data can be loaded into spreadsheet applications for editing.</td></tr>
<tr><td rowspan="6">Numerical data (monitoring items)</td><td>Saved time and date (Time)</td><td>Peak arrival time (Time at Peak)</td><td rowspan="6">.csv</td><td rowspan="6">C:/Documents and settings/Username/ MMS_DATA/Date folder</td><td rowspan="6">● Saved separately by date
● The data can be loaded into spreadsheet applications for editing.
● Alarm evaluation details (the monitoring item causing the abnormality if an abnormality is detected) are recorded using the codes shown in the following table:
<table>
<tr><th>Code</th><th>Meaning</th></tr>
<tr><td>Blank</td><td>No alarm</td></tr>
<tr><td>Z1</td><td>Monitoring zone 1 evaluation</td></tr>
<tr><td>Z2</td><td>Monitoring zone 2 evaluation</td></tr>
<tr><td>PT</td><td>Peak arrival time evaluation</td></tr>
<tr><td>T</td><td>Evaluation of pressure value after t seconds</td></tr>
<tr><td>I</td><td>Integral evaluation</td></tr>
<tr><td>P1</td><td>Peak integral evaluation</td></tr>
</table></td></tr>
<tr><td>Trigger interval (Interval)</td><td>Pressure after t seconds (Value at point)</td></tr>
<tr><td>Shot number (Shot)</td><td>Eject pressure (Peak over eject)</td></tr>
<tr><td>Alarm evaluation result (Result)</td><td>Integral (Integral)</td></tr>
<tr><td>Alarm evaluation details (CHX_Result)</td><td>Peak integral (Integral to peak)</td></tr>
<tr><td>Peak value (Peak)</td><td></td></tr>
</table>

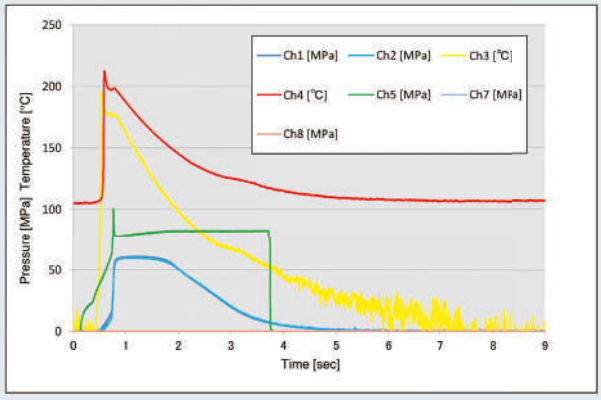
Example of use with spreadsheet applications

Pressure waveforms saved in CSV format can be displayed in tabular or graph form using spreadsheet applications as shown below.

Tabular form example

Time (sec)	CH-1 (Mpa)	CH-2 (Mpa)	CH-3 (℃)	CH-4 (℃)	CH-5 (Mpa)	CH-6 (Mpa)	CH-7 (Mpa)
0	0.54	0.6	0	105	0	0	0
0.001	0.35	0.34	0	105.1	0	0.08	0.08
0.002	0.28	0.29	0	105.1	0	0.01	0.02
0.003	0.34	0.36	0	105.1	0	0.02	0.01
0.004	0.37	0.47	0.5	105	0	0	0
0.005	0.4	0.5	2.5	105.1	0	0	0
0.006	0.22	0.47	3.2	105.1	0	0	0
0.007	0.29	0.55	3.1	105	0	0	0
0.008	0.31	0.46	2.4	105.1	0	0	0
0.009	0.3	0.44	1.8	105.1	0	0	0
0.01	0.3	0.43	1.7	105	0	0	0
0.011	0.19	0.22	1.8	105.1	0	0	0
0.012	0.15	0.12	3.7	105.1	0	0	0
0.013	0.13	0.25	5.2	104.1	0	0	0
0.014	0.21	0.07	6.9	105.1	0	0.04	0.05
0.015	0.16	0.18	6	105	0	0	0
0.016	0.22	0.33	5.6	104.1	0	0	0
0.017	0.68	0.67	3.4	105	0	0	0
0.018	0.41	0.4	1.8	104.1	0	0.04	0.04
0.019	1.06	1.09	0.1	104.1	0	0	0
0.02	0.22	0.14	0	105.1	0	0	0
0.021	0.21	0.21	0	105.1	0	0	0

Graph form example



Product list

Injection molding monitoring system, preamplifiers

Product name	Product code	Remarks
Injection molding monitoring system set	MVS08A-S	[Accessories] Injection molding monitoring system main unit (×1), AC adapter (3.2 m), LAN cable (2 m), signal input/output cable (3 m), measurement software
Injection molding monitoring system main unit	MVS08A	

* Refer to the corresponding measuring system pages for information on use when connected to other measuring systems.

Measurement sensor for MVS08

Product name	Product code	Remarks
Direct pressure sensor for MVS08	SPF04.0×08.0×030	UPQ01A is required.
L-shaped mold open measurement sensor for MVS08	MEL1002G-L	MPD200F is required.
Straight mold open measurement sensor for MVS08	MEL1002G-SF	MPD200F is required.

*Refer to the corresponding measuring system pages for information on use when connected to other measuring systems.

Preamplifier for MVS08

Product name	Product code	Remarks
Pressure preamplifier for MVS08	UPP01A	1 point measurement (one required for each measurement point).
Resin temperature preamplifier for MVS08	UPI01A	1 point measurement (one required for each measurement point).
Mold surface temperature preamplifier for MVS08	UPT01A	1 point measurement (one required for each measurement point).
Direct pressure preamplifier for MVS08	UPQ01A	1 point measurement (one required for each measurement point).
Mold open preamplifier for MVS08	MPD200F	1 point measurement (one required for each measurement point).

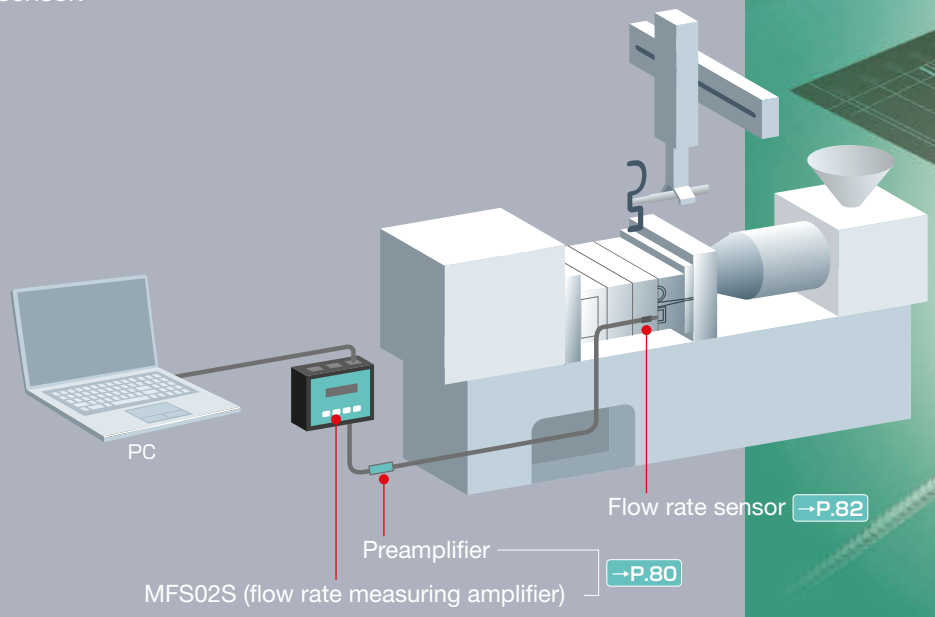
*Refer to the corresponding measuring system pages for information on use when connected to other measuring systems.

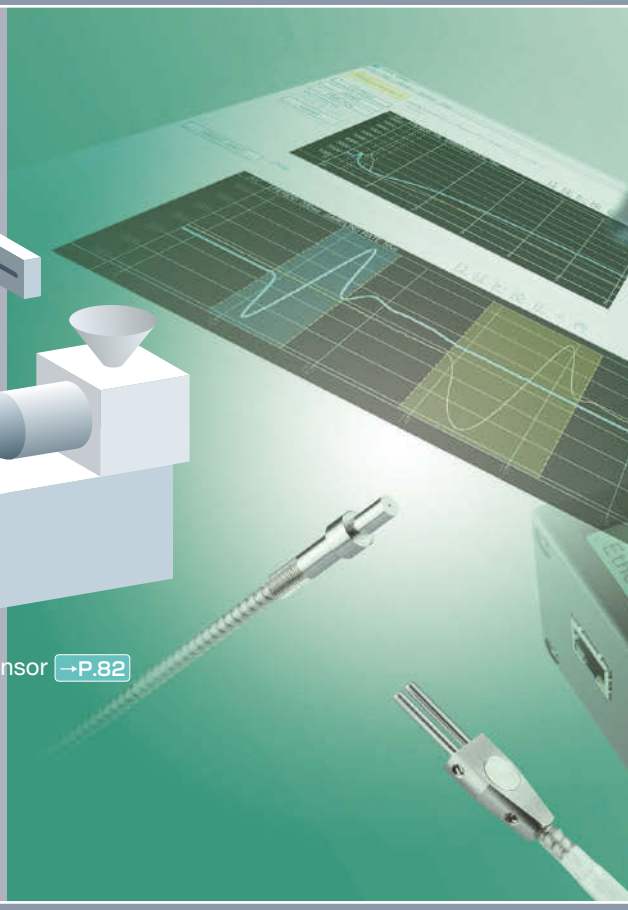
Accessories

Product name	Product code	Applicable product	Remarks
AC adapter (3.2 m)	ES0024007 N-MVS08	MVS08 injection molding monitoring system main unit	
Signal input/output cable (3 m)	WCI0030 N-MVS08		
LAN cable (2 m)	WCL0020		
Measurement software	PVS N-MVS08		
Amplifier interconnection cable (0.5 m)	WCM0005 N-MVS08		
Voltage input cable (2-core, 3 m)	WCI0130-2P N-MVS08	For connection to injection molding machine or external device	
Voltage input cable (4-core, 3 m)	WCI0130-4P N-MVS08	STF mold surface temperature sensor	
Voltage input cable (6-core, 3 m)	WCI0130-6P N-MVS08	MPS01A pressure measuring unit	
MPS08B pressure measuring amplifier connector cable (2 m)	WCI0820-MPS08B N-MVS08	MPS08B pressure measuring amplifier	
MPV04 pressure measuring amplifier connector cable (2 m)	WCI0420-MPV04 N-MVS08	MPV04 pressure measuring amplifier	
EPT001 resin temperature measuring amplifier connector cable A (2 m)	WCI0120-EPT001A N-MVS08	EPT-001 resin temperature measuring amplifier	Select Cable A for 1st channel and Cable B for second and subsequent channels.
EPT001 resin temperature measuring amplifier connector cable B (2 m)	WCI0120-EPT001B N-MVS08		
ATPZ01 test probe connector cable (2 m)	WCI0120-ATPZ01 N-MVS08	ATPZ resin temperature sensor test probe	The ATPZ01 is a unit for easily checking resin temperature sensor abnormalities.
Mold open measurement sensor extension cable (3 m)	WSP6S06-1559-003		Cable for connecting the mold open measurement sensor and mold open preamplifier (one required for each measurement point).
Mold open preamplifier MPD200F connection cable (3 m)	WCI0130-MPD200F N-MVS08		Cable for connecting mold open preamplifier and MVS08 (one required for each measurement point)
MVS08 bolt retaining brackets (set of 2) (Material: SUS304)	ABMVS08	MVS08 injection molding monitoring system main unit	
Preamplifier extension cable (1 m)	WCP0110 N-MVS08	Pressure preamplifier For UPP01 Resin temperature preamplifier For UPI01 Mold surface temperature preamplifier For UPT01 Direct pressure preamplifier For UPQ01	
Preamplifier extension cable (2 m)	WCP0120 N-MVS08		
Preamplifier extension cable (4 m)	WCP0140 N-MVS08		

Flow Rate Measuring System

Allows easy measurement of the flow front speed of the resin inside the mold, regardless of flow direction, using a single sensor.

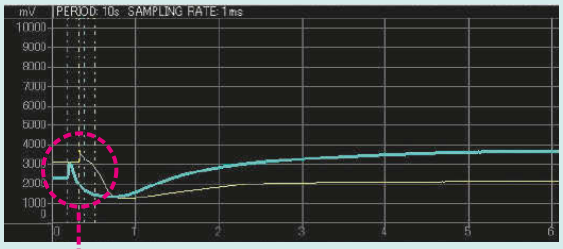




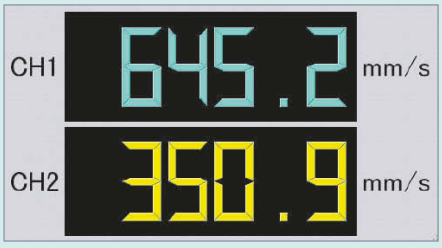
Measured waveforms

Allows real-time monitoring of the flow front speed of the resin inside the mold by displaying as waveforms using dedicated measurement software.
Helps improve the accuracy of CAE (flow analysis); evaluates the effectiveness of air and gas bleeding to predict mold maintenance intervals and other applications.

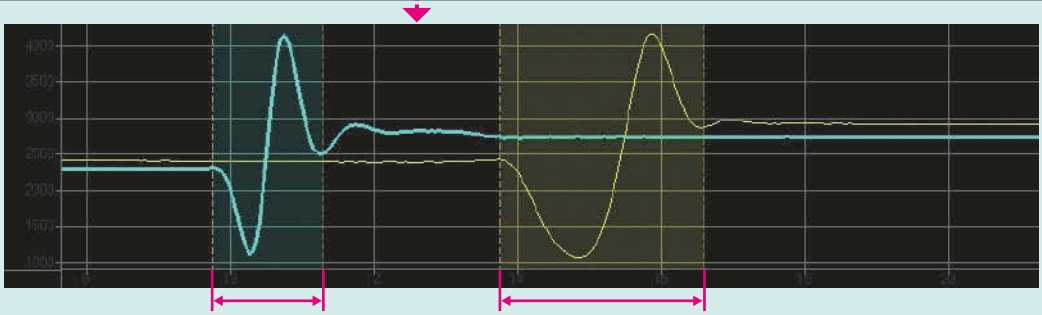
Flow rate waveform



Flow front speed



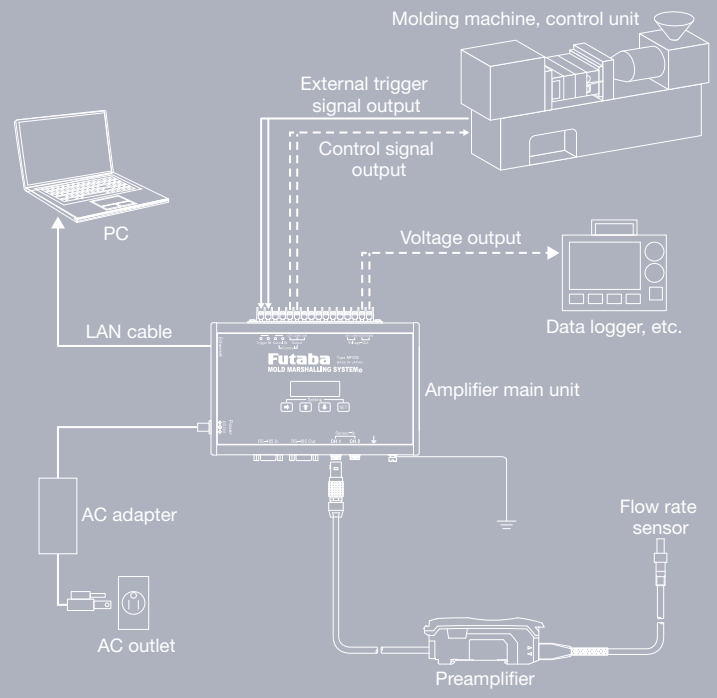
Flow front passage waveform



Short intervals along time axis indicates fast flow rates.

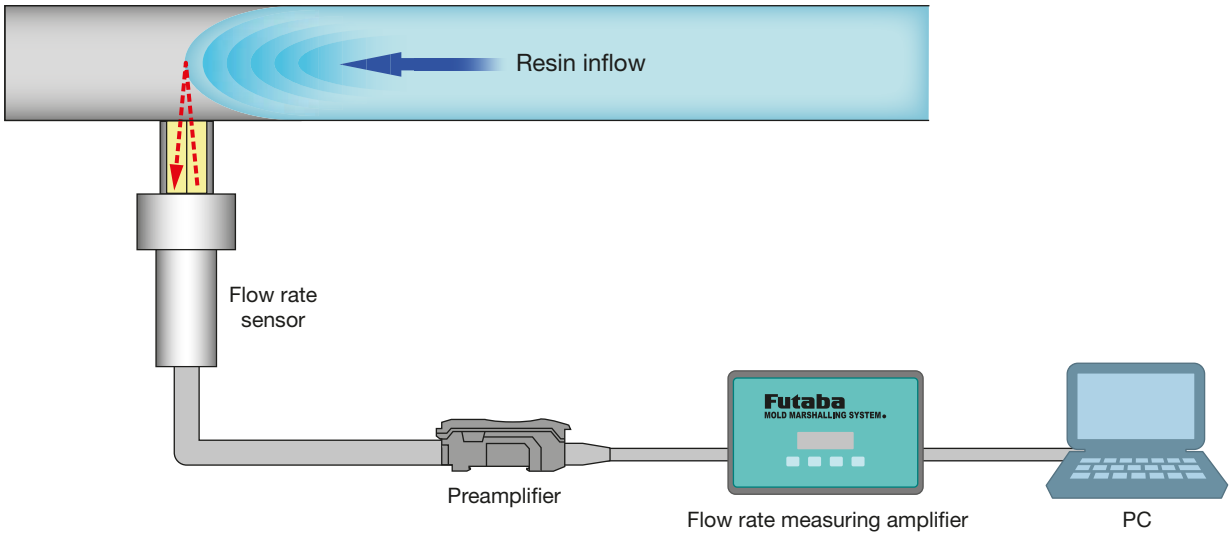
Long intervals along time axis indicates slow flow rates.

[System configuration diagram]



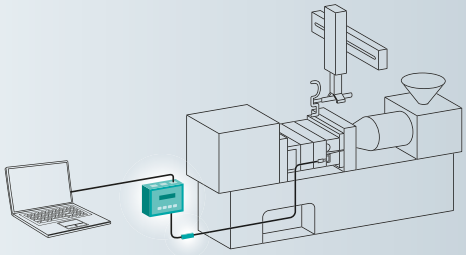
Measuring principles

Radiates visible light onto resin to detect reflected light.
The detected reflected light is converted into electrical signals by the preamplifier, after which dedicated measurement software calculates flow front speeds.



Flow rate measuring amplifier

MFS02



- Allows simultaneous measurement of two channels with a single unit.
- Waveforms can be displayed in real time on a PC. All measured waveforms can be saved to the PC. Enables review of past measurement results when changes are detected.

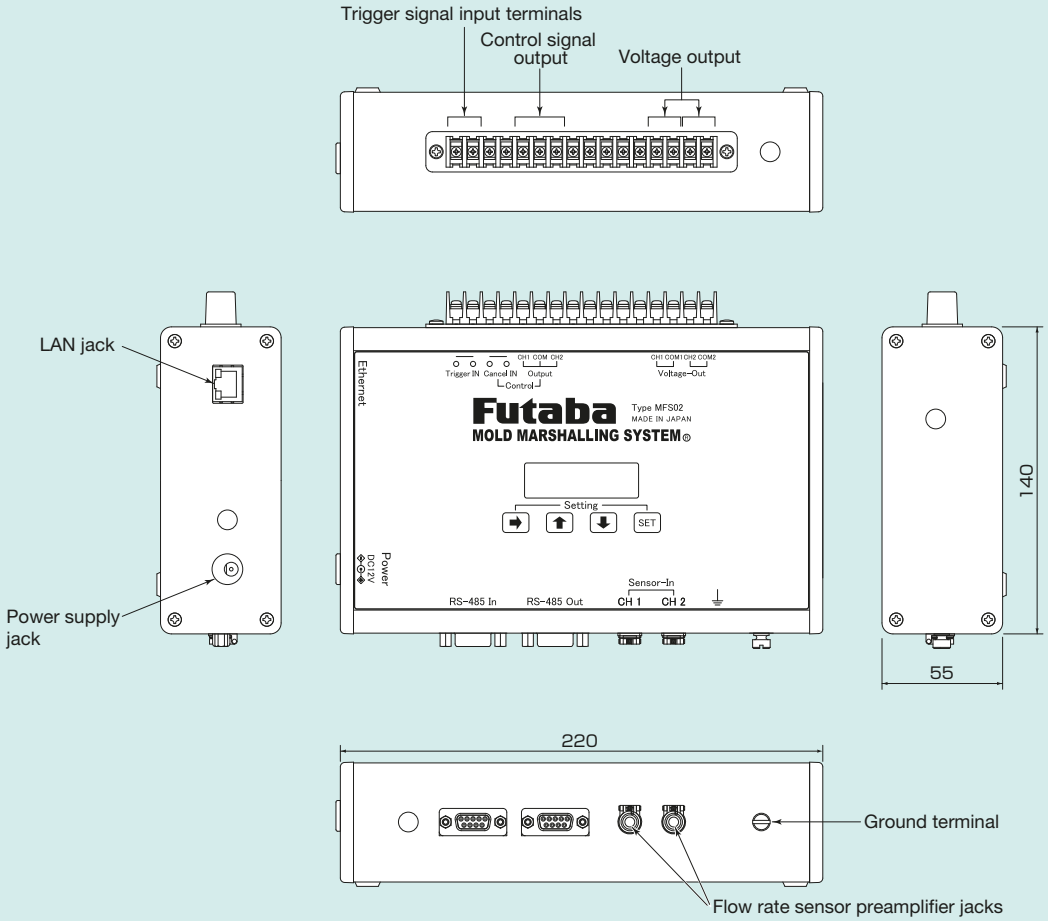
Specifications

MFS02S flow rate measuring amplifier

Product code		MFS02S
Number of measurement points		2
Analog voltage output	Output voltage	0 V to 10 V
	Impedance	100 Ω
Sampling interval[*4]		1 ms / 5 ms / 10 ms / 20 ms
Sampling period[*5]		Max. 120 s
Measurement range		10 mm/s to 1,000 mm/s[*1]
Power supply specifications	Power supply	12 V DC (dedicated AC adapter, input 100 V AC)
	Maximum power consumption	5.2 W
Environmental resistance	Operating temperature	0°C to +50°C
	Operating humidity	35% to 85% RH (no condensation)
Weight		Approx. 1,000 g
Accessories		AC adapter, LAN cable, software, mounting magnets (×4)
Recommended hardware (PC) specifications		Processor: Intel Core II Duo CPU or higher Required memory: minimum 1 GB

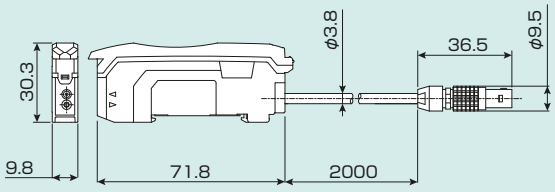
*1 The range of flow rate measurements will vary depending on product thickness (t). The range quoted here is for t = 1.
*2 One preamplifier and flow rate sensor (not included) are required for each measurement point.
*3 A PC (not included) is required for this measuring system.
*4 Interval for measuring data. 1 ms (1/1,000 seconds) means the acquisition of 1,000 data items per second.
*5 The time period for which data can be measured

External dimensions



Preamplifier

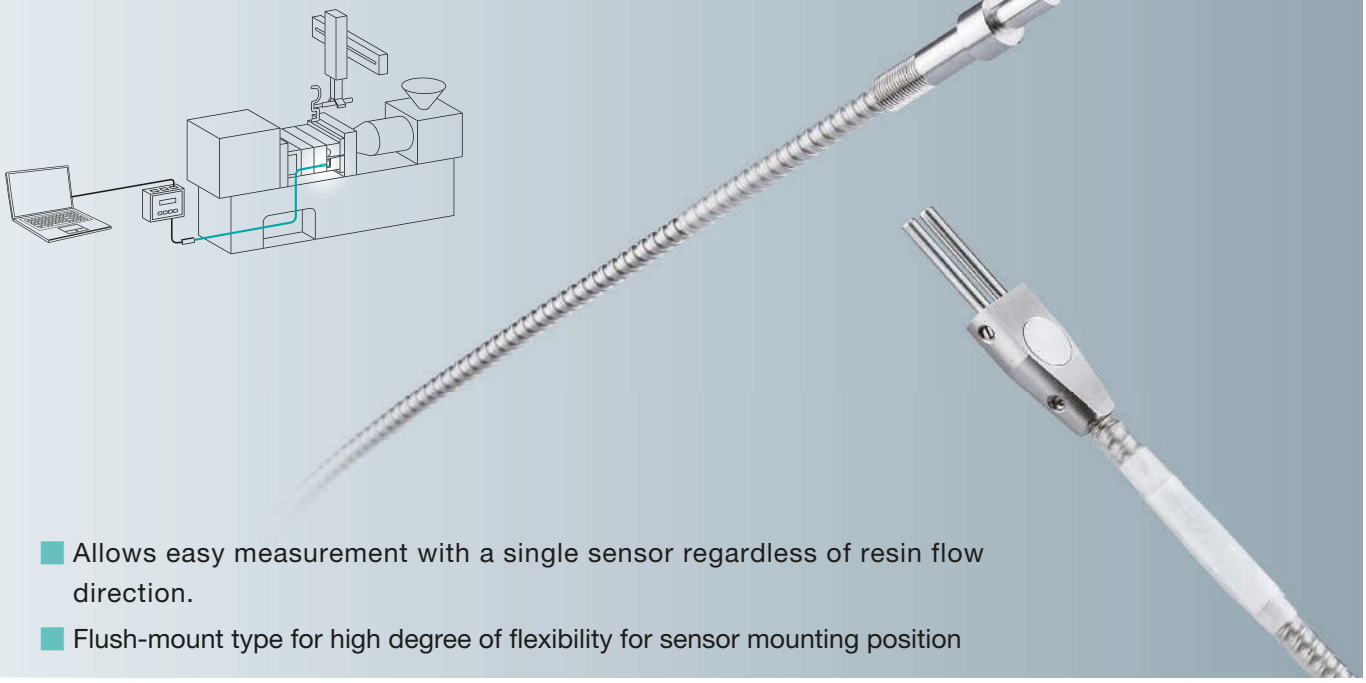
Product code	UPV01



Flow rate sensor

SMF04.0×08.0×026

RoHS compliant

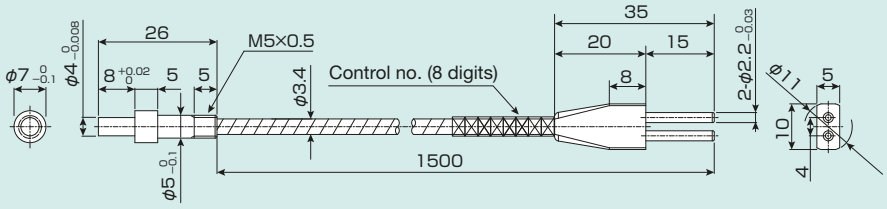


- Allows easy measurement with a single sensor regardless of resin flow direction.
- Flush-mount type for high degree of flexibility for sensor mounting position

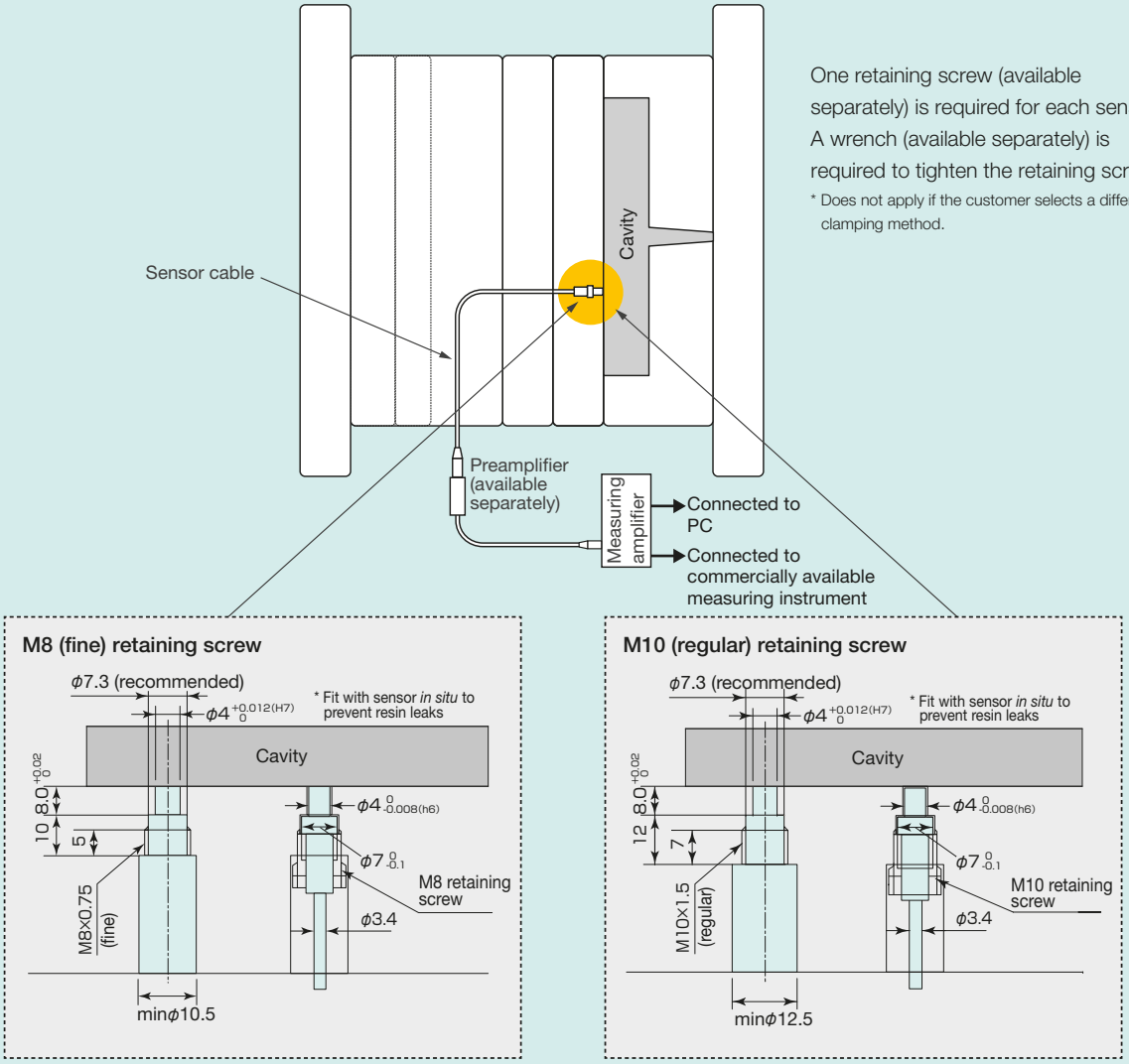
Specifications

Product code	SMF04.0×08.0×026
Probe material	SUS630 (hardness: HRC 38 maximum)
Operating temperature range	Mold temperature not to exceed 150°C
Withstand pressure	150 MPa maximum
Cable	With stainless-steel protective tube (outer diameter 3.4 mm), minimum bending radius 50 mm

External dimensions



Mounting example

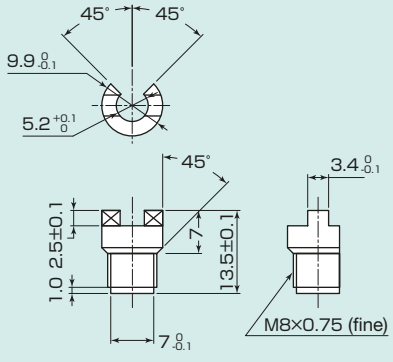


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

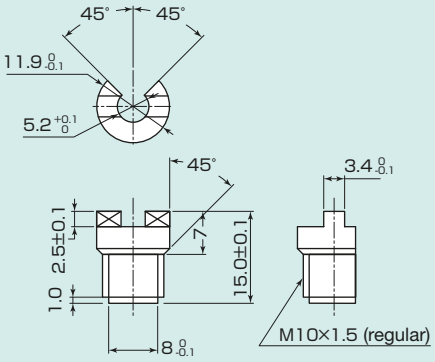
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



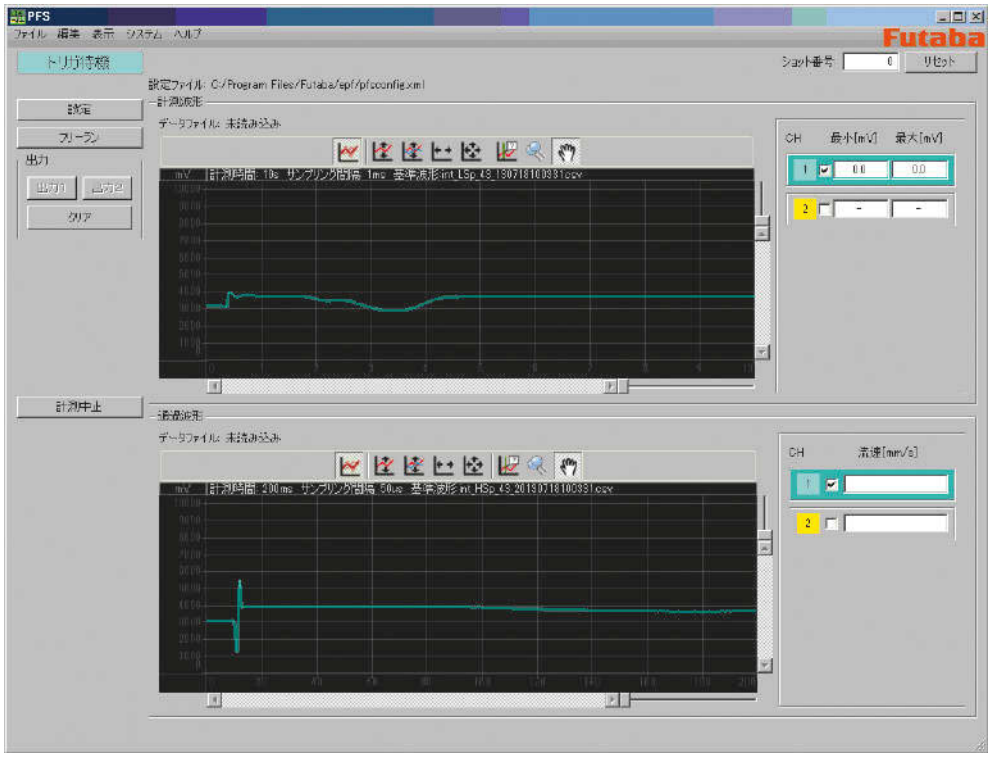
M10 (regular)



Measurement software functions

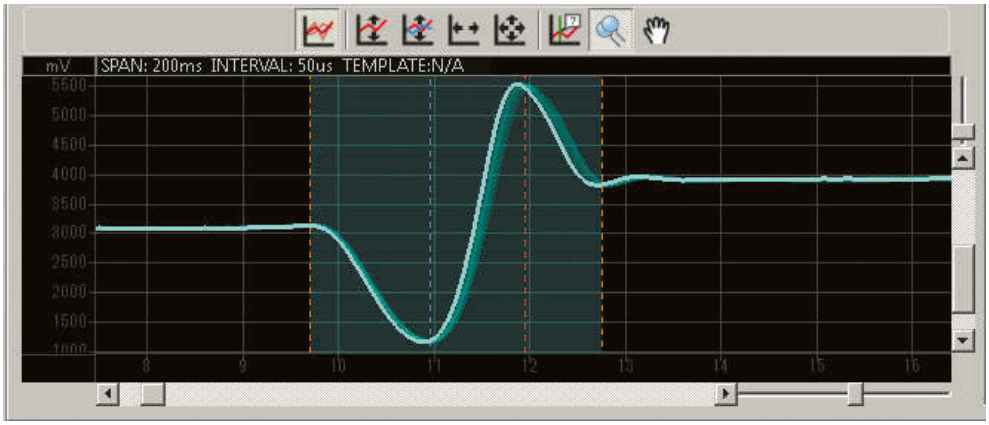
Reference waveform display

Opening a measurement data file displays the automatically saved flow rate waveforms on the measurement screen. Waveforms can be overlaid on the screen during measurement to allow visual confirmation of flow rate changes when setting molding parameters, flow rate variations during mass production, and flow rate fluctuations after altering molding conditions.



Waveform overlaid display

Waveforms for each molding cycle can be overlaid for up to 99 cycles on the display setting screen. Variations in waveforms inside the mold are displayed in real time.



Saved data types

This software allows data to be saved as “configuration files,” “waveform data,” or “numerical data.”

Data type	Item	Extension	Destination folder (default setting)	Remarks
Configuration file	Parameter settings	.xml	C:/Program Files/Futaba/pfs	●Setting parameters or measurement Used by selecting from within a folder containing the saved files on the PC.
Waveform data	Measured waveform (LSp) Passing waveform (HSp)	.csv	C:/Users/Username/My Documents/MMS_DATA/Date folder	●Saved separately by shot number ●Can be loaded as reference waveform data on the PFS software. ●Data can be loaded into spreadsheet software for editing.
Numerical data (monitoring items)	Peak file (Peak)	.csv	C:/Users/Username/My Documents/MMS_DATA/Date folder	●A file is created once a day. ●Saved separately by date ●Data can be loaded into spreadsheet software for editing.

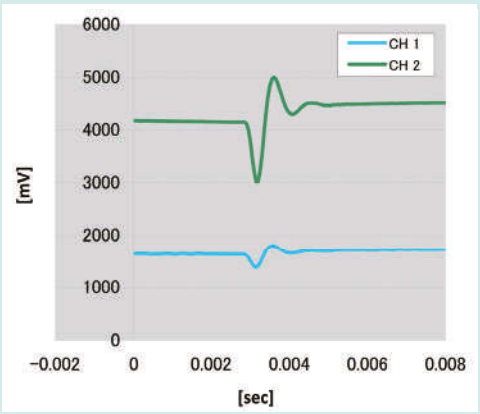
Example of use with spreadsheet software

As shown below, flow rate waveforms saved in CSV format can be displayed in tabular or graph form in spreadsheet software.

Tabular form example

Time (sec)	CH 1 (mV)	CH 2 (mV)
0.00285	1623.63	4150.64
0.0029	1603.49	4120.73
0.00295	1566.26	4005.98
0.003	1503.39	3789.9
0.00305	1442.35	3479.83
0.0031	1392.3	3200.27
0.00315	1377.65	3019.59
0.0032	1403.28	3021.42
0.00325	1461.27	3219.8
0.0033	1546.73	3537.2
0.00335	1626.69	3947.38
0.0034	1699.32	4308.73
0.00345	1748.76	4627.97
0.0035	1780.5	4833.06
0.00355	1794.54	4958.8
0.0036	1793.32	4996.64
0.00365	1778.67	4966.73
0.0037	1757.31	4887.38
0.00375	1732.89	4771.41
0.0038	1706.04	4657.88
0.00385	1685.28	4540.68
0.0039	1667.58	4443.02
0.00395	1657.21	4366.72
0.004	1649.88	4323.99

Graph form example



Product list

Flow rate measuring amplifiers/sensor

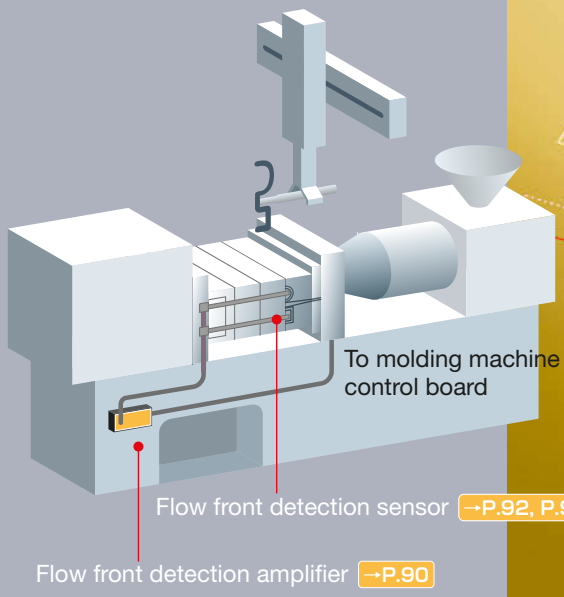
Product name	Product code
Flow rate measuring amplifier	MFS02S
Preamplifier	UPV01
Flow rate sensor	SMF04.0×08.0×026

Accessories

Product name	Product code	Applicable product	Remarks
Retaining screw M8×0.75 (fine)	EPSSZT-M8	Flow rate sensors SMF series	Material: SUS303 Select M8×0.75 (fine) or M10×1.5 (regular). One retaining screw is required per sensor.
Retaining screw M10×1.5 (regular)	EPSSZT-M10		
Sensor securing wrench	EPSSZT-FXWR		Material: SUS303 Used to tighten retaining screws or remove sensors stuck due to tar buildup; compatible with both fine and regular retaining screws.
Sensor removal wrench	EPSSZT-PLWR		

Flow Front Detection System

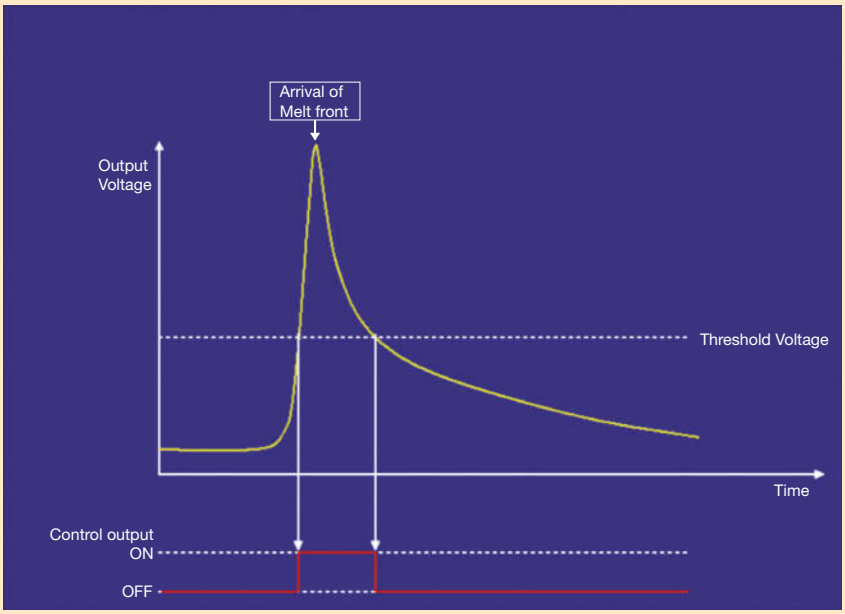
Combined with 8 ms (63.2% response) high-speed response sensors, the system detects resin arrival immediately and outputs a control signal.



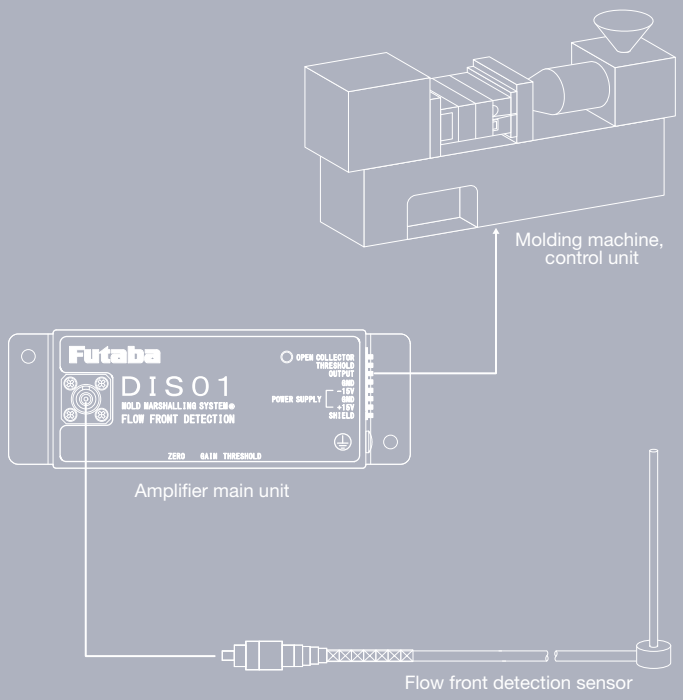
Measured waveforms

Location at the end of the molded product allows use in controlling V-P transfer timing and detecting short shots.

Operation signal diagram

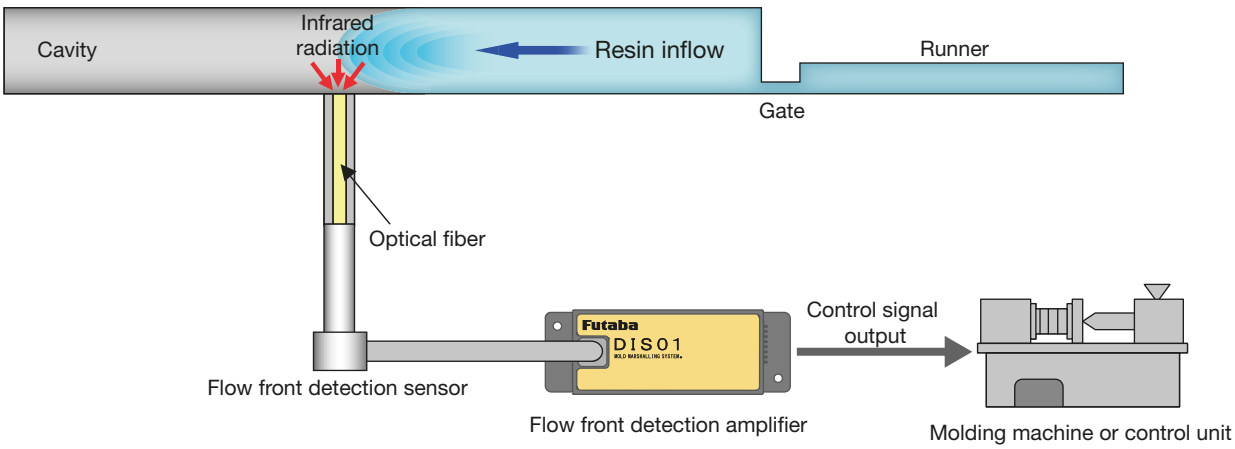


[System configuration diagram]



Measuring principles

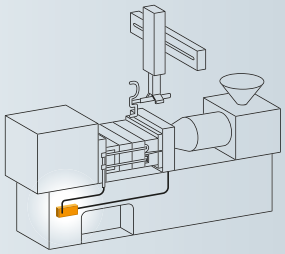
The arrival of the resin flow front is detected instantly using infrared light.
The LED lamp lights up at the same time as signal output from the open collector.

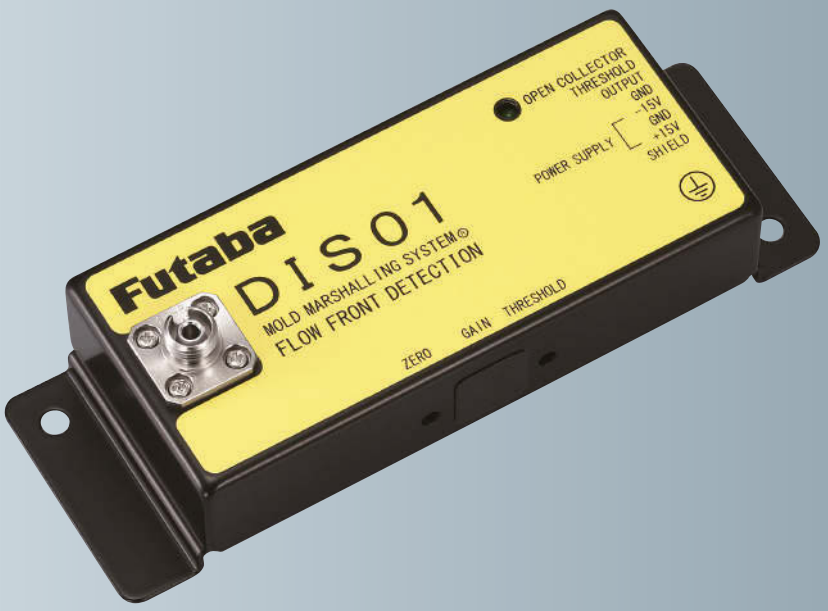


Flow front detection amplifier

DIS01

RoHS compliant





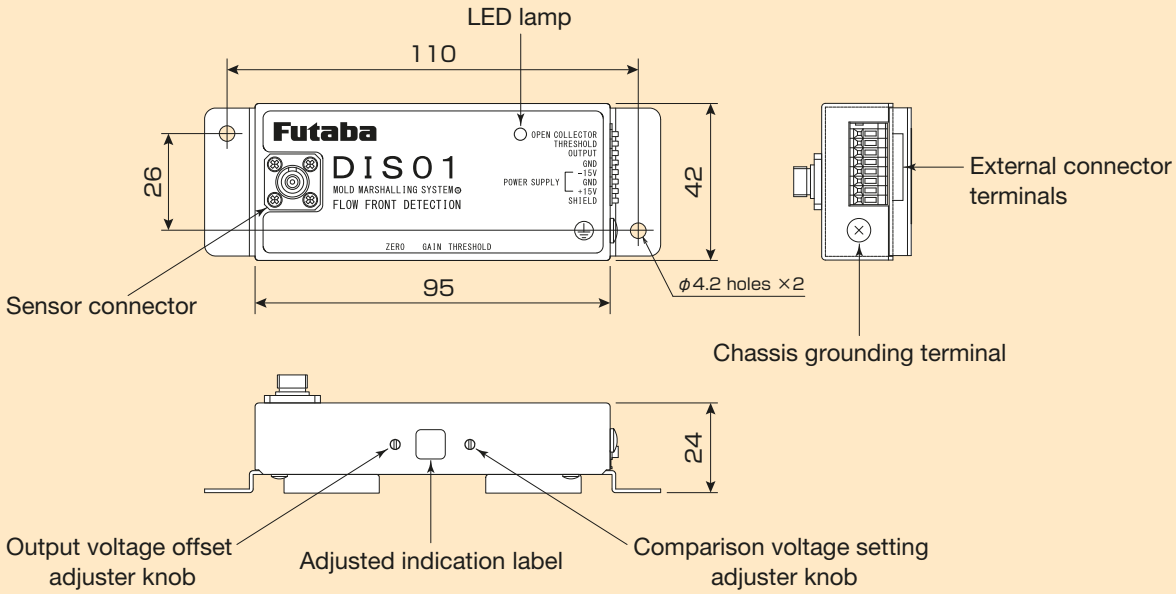
- Infrared detection system resistant to disturbance offers high noise resistance.
- Threshold for outputting control signals can be adjusted between 0 V and 13 V.

Specifications

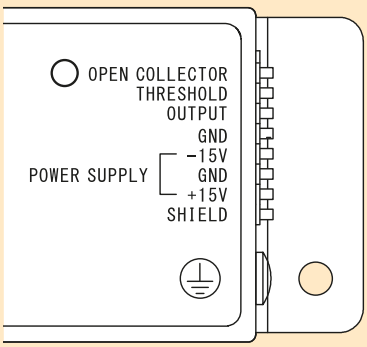
Product code	DIS01
Power supply voltage	±15 V DC, 1.5 W maximum
Control output	0 V to 13 V
Adjustment output	0 V to 13 V
Control signal output	NPN open collector, withstand voltage 50 V, maximum current 100 mA
Operating temperature range	10°C to 40°C
Mounting method	Magnets or screws (M4)
Weight	Approx. 0.2 kg

* Does not include power supply cables or screws.

External dimensions



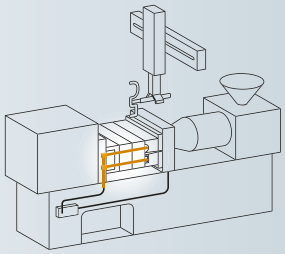
External connector terminals

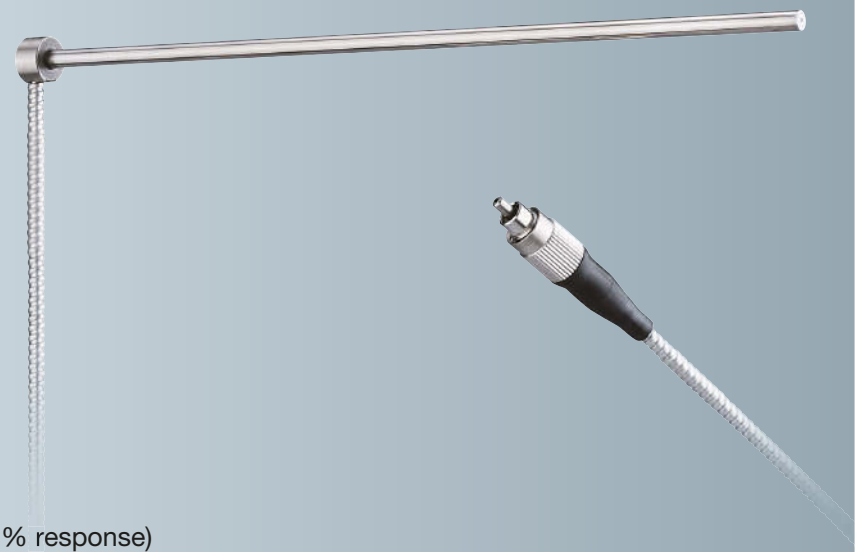


Signal name	Input/output	Details
OPEN COLLECTOR	Output	Comparison voltage signal (open collector)
THRESHOLD	Output	Comparison voltage output (no buffer)
OUTPUT	Output	Analog output
GND	Output	Ground
–15V	Input	Negative power supply input (-15 V ±5%)
GND	Input	Ground
+15V	Input	Positive power supply input (+15 V ±5%)
SHIELD	—	(Connected internally to ground)

Ejector pin type DISSZL series

RoHS compliant





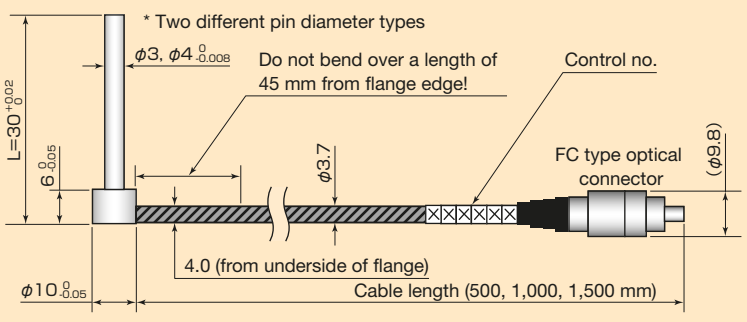
- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- Ejector pin configuration allows easy installation on mold.*1

*1 Machining such as flange cutting to prevent rotation is not possible.

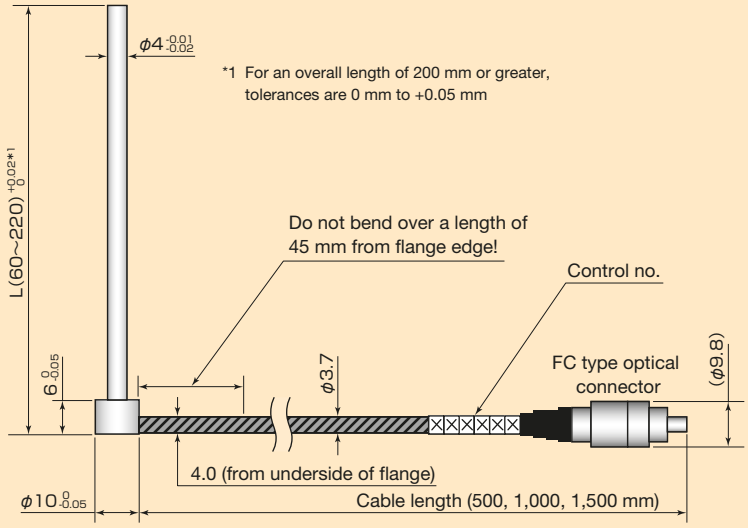
Specifications

Product code		DISSZL series (→ page 96)
Pin diameter		ϕ3 or ϕ4 (ϕ3 for L = 30 mm only)
Pin material	Overall length 30 mm type	SUS630 (hardness: HRC 38 maximum)
	Overall length 60 mm to 220 mm	SKD61 (hardness: 900 HV minimum, nitride treated after tempering)
Temperature detection method		Infrared detection (using optical fiber)
Operating temperature range		Mold temperature not to exceed 150°C (excluding pin tip)
Withstand pressure		150 MPa maximum
Cable		With stainless steel protective tube (outer diameter 3.7 mm), minimum bending radius 50 mm

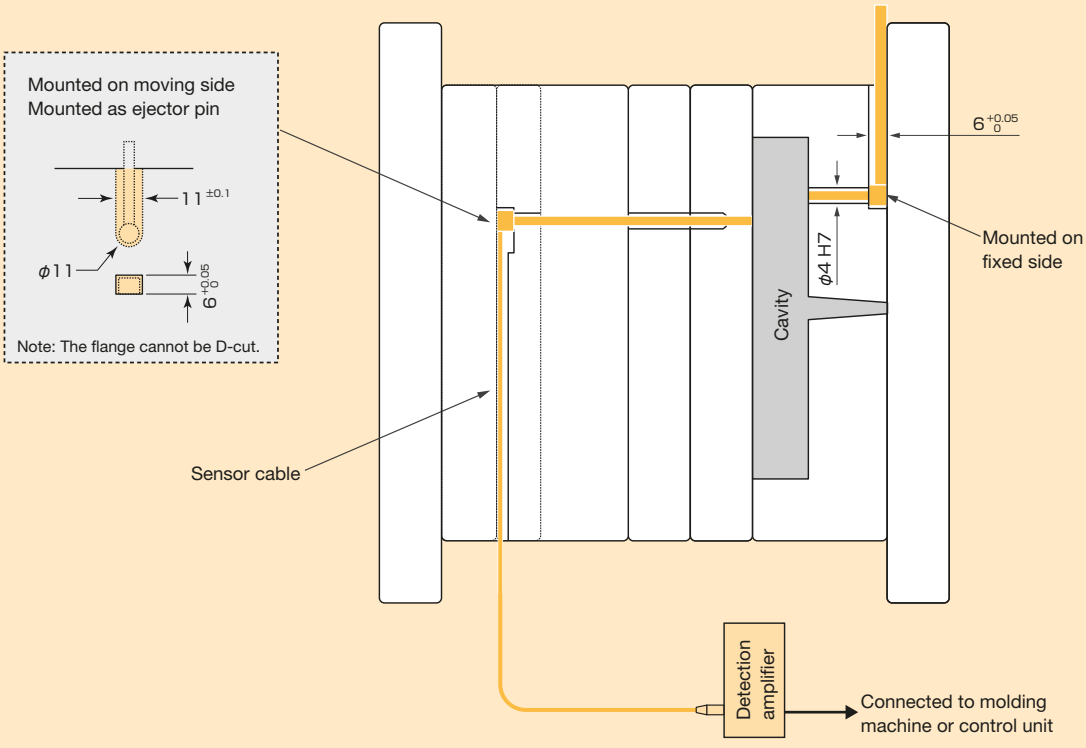
External dimensions Overall length 30 mm type



External dimensions Customer-specified overall length type (60 mm to 220 mm)

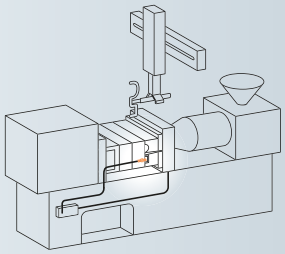


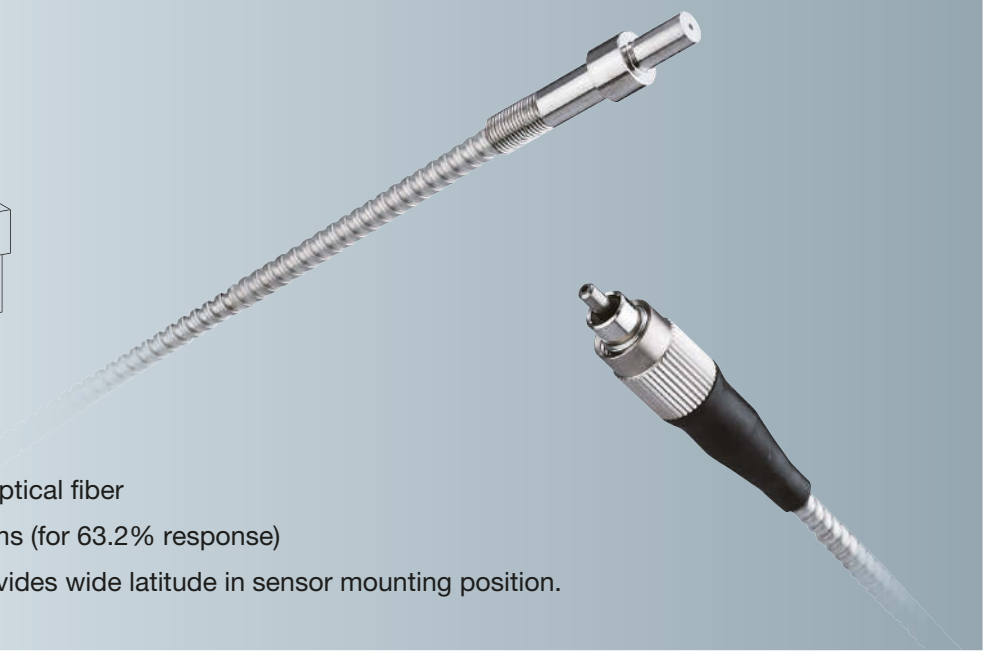
Mounting example



Flush-mount type DISSZT series

RoHS compliant



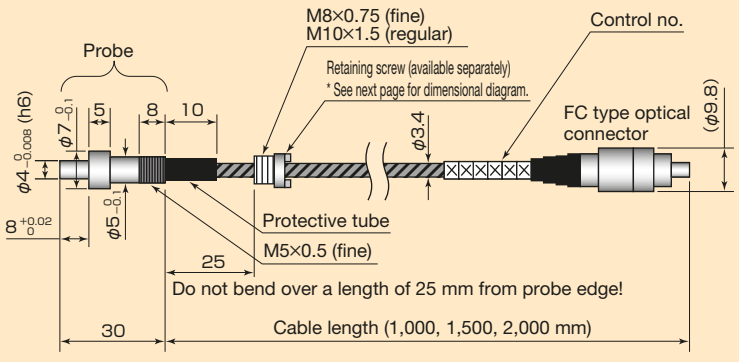


- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- The flush-mount type provides wide latitude in sensor mounting position.

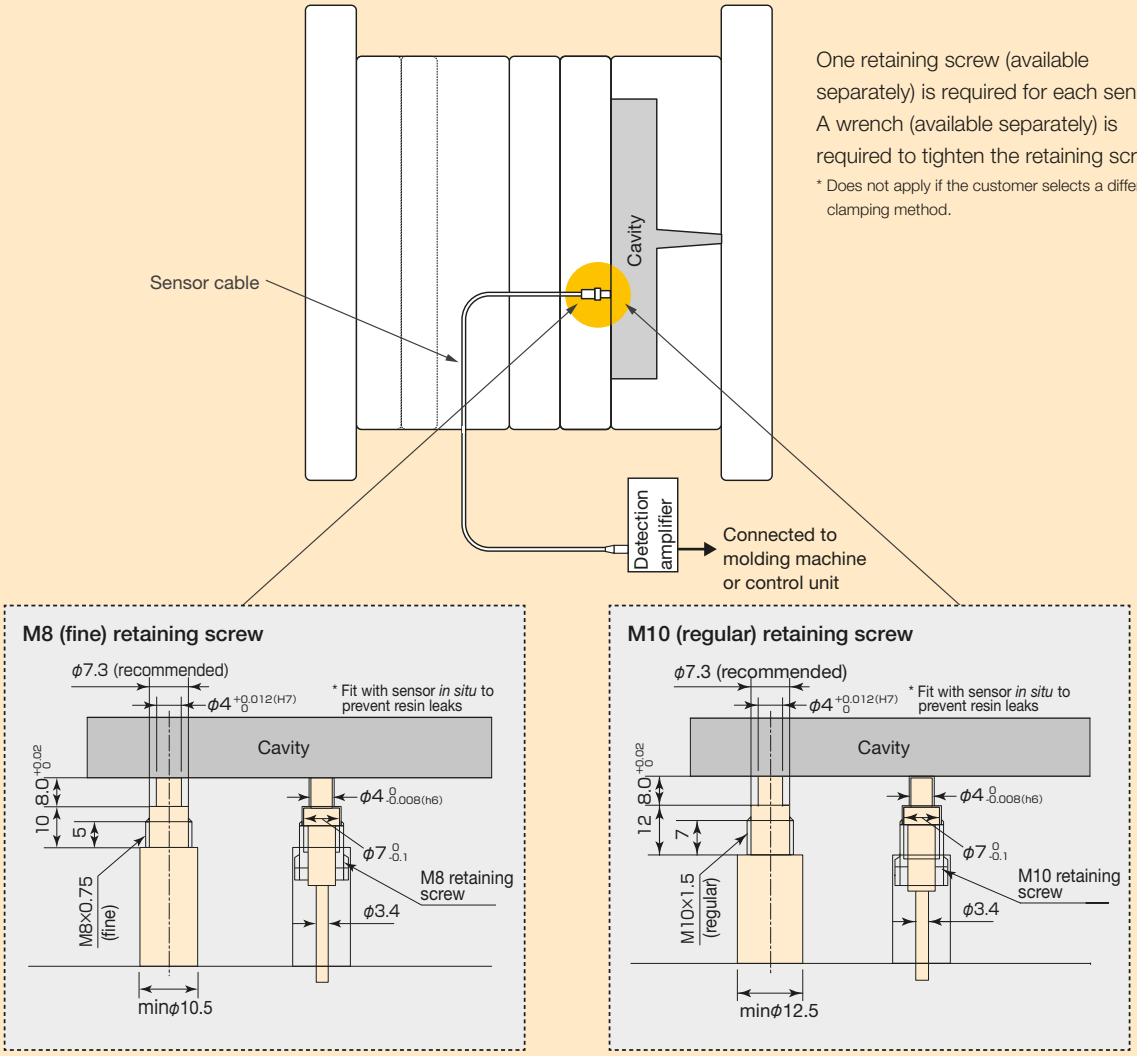
Specifications

Product code	DISSZT series (→ page 96)
Probe diameter	ϕ4
Probe material	SUS630 (hardness: HRC 38 maximum)
Temperature detection method	Infrared detection (using optical fiber)
Operating temperature range	Mold temperature not to exceed 150°C (excluding pin tip)
Withstand pressure	150 MPa maximum
Cable	With stainless steel protective tube (outer diameter 3.7 mm), minimum bending radius 50 mm

External dimensions



Mounting example

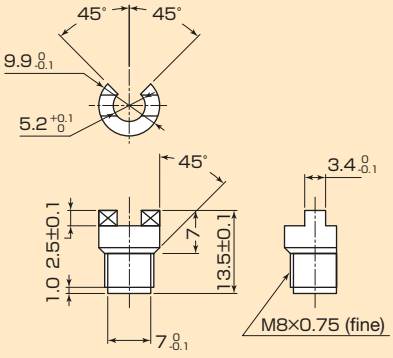


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

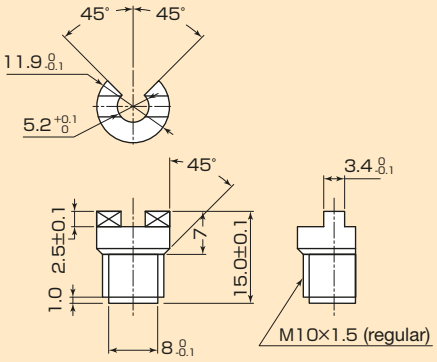
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



M10 (regular)



Product list

Flow front detection amplifier

Product name	Product code
Flow rate measuring amplifier	DIS01

Flow front detection sensors - Ejector pin type (overall length 30 mm type)

Product name	Tip diameter ϕd (mm)	Product code
Ejector pin type, overall length 30 mm Cable length 0.5 m	3.0	DISSZL-03.0×030 N050
Ejector pin type, overall length 30 mm Cable length 1.0 m		DISSZL-03.0×030 N100
Ejector pin type, overall length 30 mm Cable length 1.5 m		DISSZL-03.0×030 N150
Ejector pin type, overall length 30 mm Cable length 0.5 m	4.0	DISSZL-04.0×030 N050
Ejector pin type, overall length 30 mm Cable length 1.0 m		DISSZL-04.0×030 N100
Ejector pin type, overall length 30 mm Cable length 1.5 m		DISSZL-04.0×030 N150

Flow front detection sensors - Ejector pin type (customer-specified overall length 60 mm to 220 mm type)

Product name	Tip diameter ϕd (mm)	Product code
Ejector pin type, customer-specified overall length Cable length 0.5 m	4.0	DISSZL-04.0×○○○.○○ N050
Ejector pin type, customer-specified overall length Cable length 1.0 m		DISSZL-04.0×○○○.○○ N100
Ejector pin type, customer-specified overall length Cable length 1.5 m		DISSZL-04.0×○○○.○○ N150

Flow front detection sensors - Flush-mount type

Product name	Tip diameter ϕd (mm)	Product code
Flush-mount type, cable length 1.0 m	4.0	DISSZT-04.0×030 N100
Flush-mount type, cable length 1.5 m		DISSZT-04.0×030 N150
Flush-mount type, cable length 2.0 m		DISSZT-04.0×030 N200

Accessories

Product name	Product code	Applicable product	Remarks
Retaining screw M8×0.75 (fine)	EPSSZT-M8	Flow front detection sensors Flush-mount type DISSZT series	Material: SUS303 Select M8×0.75 (fine) or M10×1.5 (regular). One retaining screw is required per sensor.
Retaining screw M10×1.5 (regular)	EPSSZT-M10		
Sensor securing wrench	EPSSZT-FXWR		Material: SUS303 Used to tighten retaining screws or remove sensors stuck due to tar buildup; compatible with both fine and regular retaining screws.
Sensor removal wrench	EPSSZT-PLWR		

Reference Information

FUTABA Sensing School

This course of instruction teaches the basic of in-mold measuring systems using testing molds and electronic molding machines. Attendees learn about pressure waveforms, how to reproduce the quality of molded products using pressure waveforms, and methods for setting alarm monitors.

Overview

In addition to training for operating in-mold measuring systems, trainees also acquire real-world techniques for actual molding situations. For mold measuring systems used overseas, we offer training in reproducing molding conditions in a transferred mold from pressure waveforms, as well as, access to support from our international offices and affiliates.

Targets	(1) Companies that have adopted an MMS or are considering introducing one (2) Customers planning to take an MMS to an overseas location (3) Training for new recruits, development of MMS instructors on location (4) Tertiary students and others (laboratory) (5) Individuals involved with injection molding but with little experience with in-mold measurements (6) Individuals wishing to learn the basics of in-mold measurement
Location	Chosei Precision Machine Technology Center, Futaba Corporation
Address	1080 Yabutsuka, Chosei-mura, Chosei, Chiba Prefecture 299-4395, Japan
Attendees	1 company (three people) per day of lessons*1
Cost	Free
Dates of classes	Shown on our website

*1 Lessons are conducted on a one-to-one basis. No classes are held with trainees from other companies.

Curriculum

Pressure measuring course

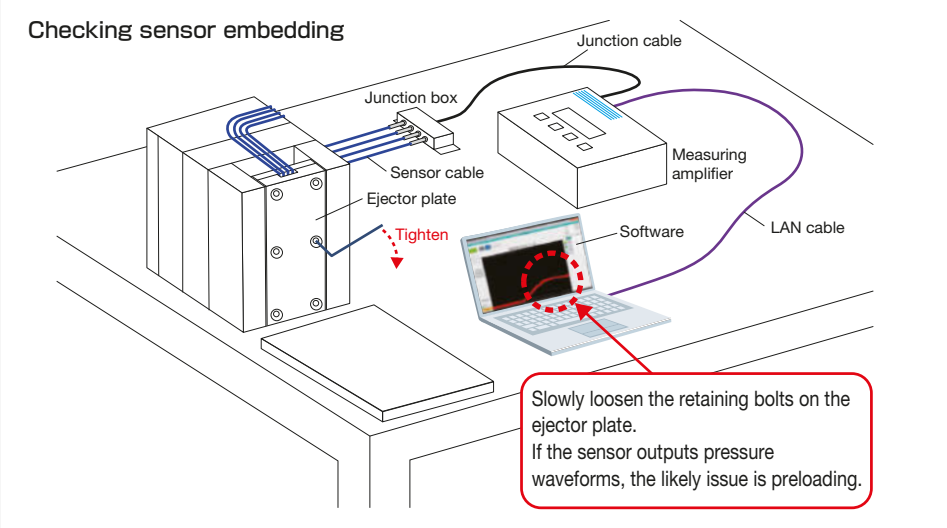
Classroom (3 hours)	Practical (3 hours)*1
(1) Significance and purpose of measurement (2) Pressure measurement basics: selecting sensors, installation location, signal wiring (3) Using sensors: understanding waveforms, extracting molding conditions, mold monitoring (4) Preparing for initial trials and thereafter (5) Measurement software and an explanation of software functions (6) Troubleshooting (7) Repairs, maintenance, calibration	(1) Preparing for measurement (2) Embedding the sensor, wiring the measurement system (3) Observing and analyzing waveforms (4) Methods for reproducing quality by matching waveforms (5) Methods for setting alarm monitors*2

*1 Our instructors will handle heavy objects and operate molding machines.
*2 Instruction will involve actual test molds and electronic molding machines.

Example of real-world lessons and lesson flow

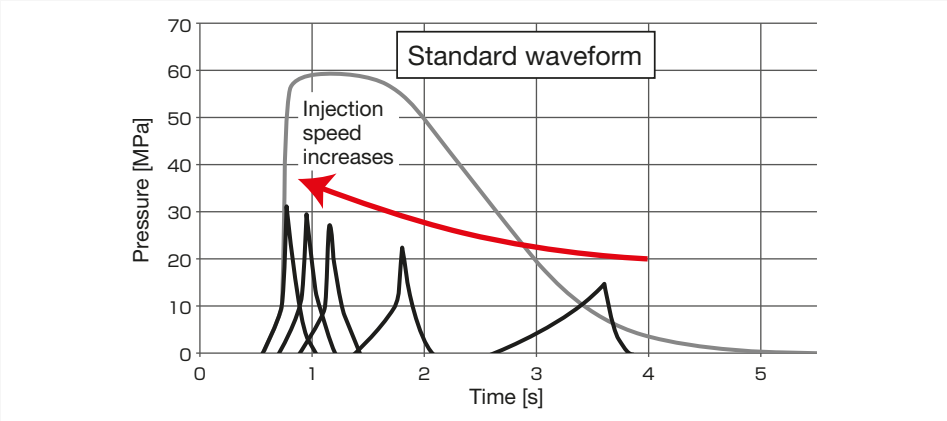
Recommended methods for checking when embedding pressure sensors in molds

Bench testing helps eliminate problems, like failure to obtain waveforms. Beginners unfamiliar with in-mold measurement or personnel located at overseas plant where support is difficult to obtain can learn these and other important skills for real-world use.



Reproducing quality matching waveforms using a rectangular test mold

One method for reproducing molded products involves reproducing pressure waveforms. Good quality can be achieved by matching waveforms on different molding machines. This method is suitable when gathering the conditions required for mass production.

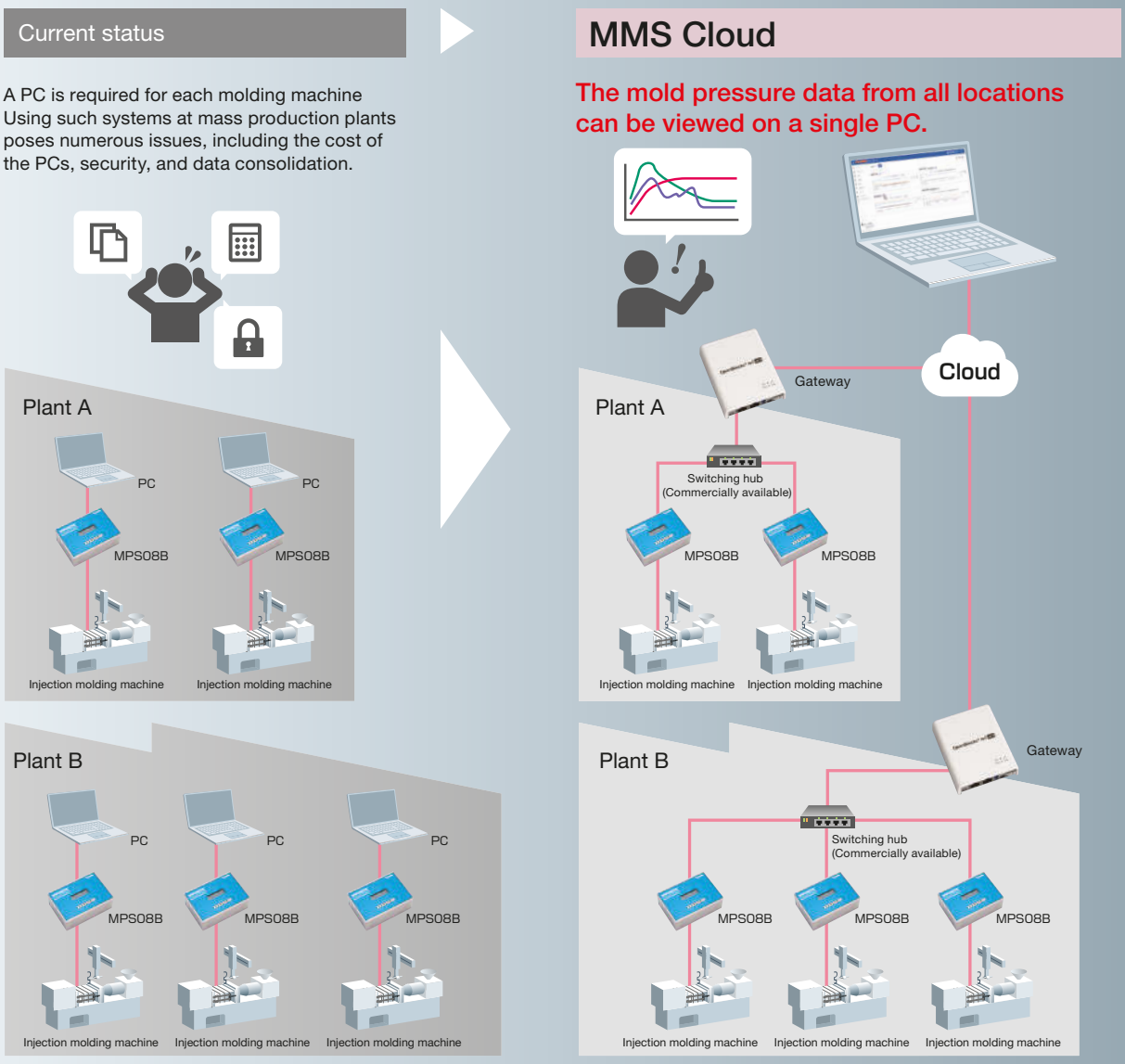


Lesson flow

You can apply to attend our classes online at our website.
(1) Use the "Futaba Sensing School" application form on our website to apply.
(2) We will contact you with details about dates, etc., using the contact details you provide.

MMS Cloud - IoT Cloud Service for In-mold Measuring Systems

Accumulate measurement data in the cloud and view the data in real-time whenever and wherever you want.



Building a smart factory where pressure data for multiple molds can be managed centrally, even without a PC

- Internal mold pressures are important indicators in the quality control of molded products. Mold pressures can now be managed centrally.
- This makes it possible to perform tasks such as traceability management, improving the precision of inspections, eliminating the release of defective items, and optimizing the entire process.
- Removing PCs from the plant improves plant security by eliminating PC theft and preventing data removal.

Allows systems to be configured cost-effectively using existing amplifiers

- Allows systems to be configured simply by connecting existing MPS08B pressure measuring amplifiers to a dedicated gateway.
- Allows accumulatio of cloud measurement data for four MPS08B units with one gateway, or for 10 MPS08B units with three gateways.

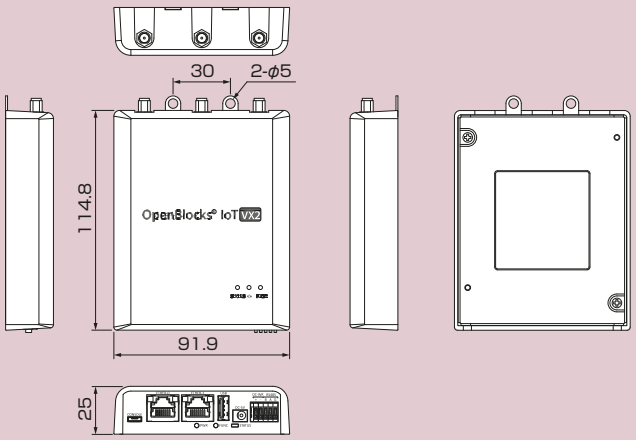
Gateway

Specifications

Product code		CG01
Wired interface		Ethernet 10BASE-T/100BASE-TX/1000BASE-T × 2
Security		TPM2.0 (Trusted Platform Module)
Weight		160 g (not including accessories)
Power source		Supplied via DC-Jack: 4.75 to 5.25 V DC Supplied via Wide DC: 10 to 48 V DC*1
Operating conditions	During operation	Temperature: -20°C to +60°C/Humidity: 20% to 80%Rh (no condensation)*2
	Storage	Temperature: -30°C to +70°C/Humidity: 20% to 90%Rh (no condensation)
Power consumption	During high load	AC adapter 9.0 W (16.9 VA)/Wide DC (48 V) 7.5 W (not including external base power)
	When idling	AC adapter 5.5 W (11.2 VA)/Wide DC (48 V) 4.0 W
Environmental protection		Complies with RoHS Directive
Certification (WLAN/BT)		JATE/TELEC
OS		Debian GNU/Linux (64-bit)
Accessories		USB Type A microUSB cable × 1, AC adapter × 1, heat dissipating installation bracket (with retaining screws) × 1

*1 To use this function, connect an external noise filter (SNR-10-223-T (COSEL) or equivalent).
*2 Attach the included heat dissipating installation bracket if this product is installed in an environment where ambient temperatures exceed 40°C.

External dimensions

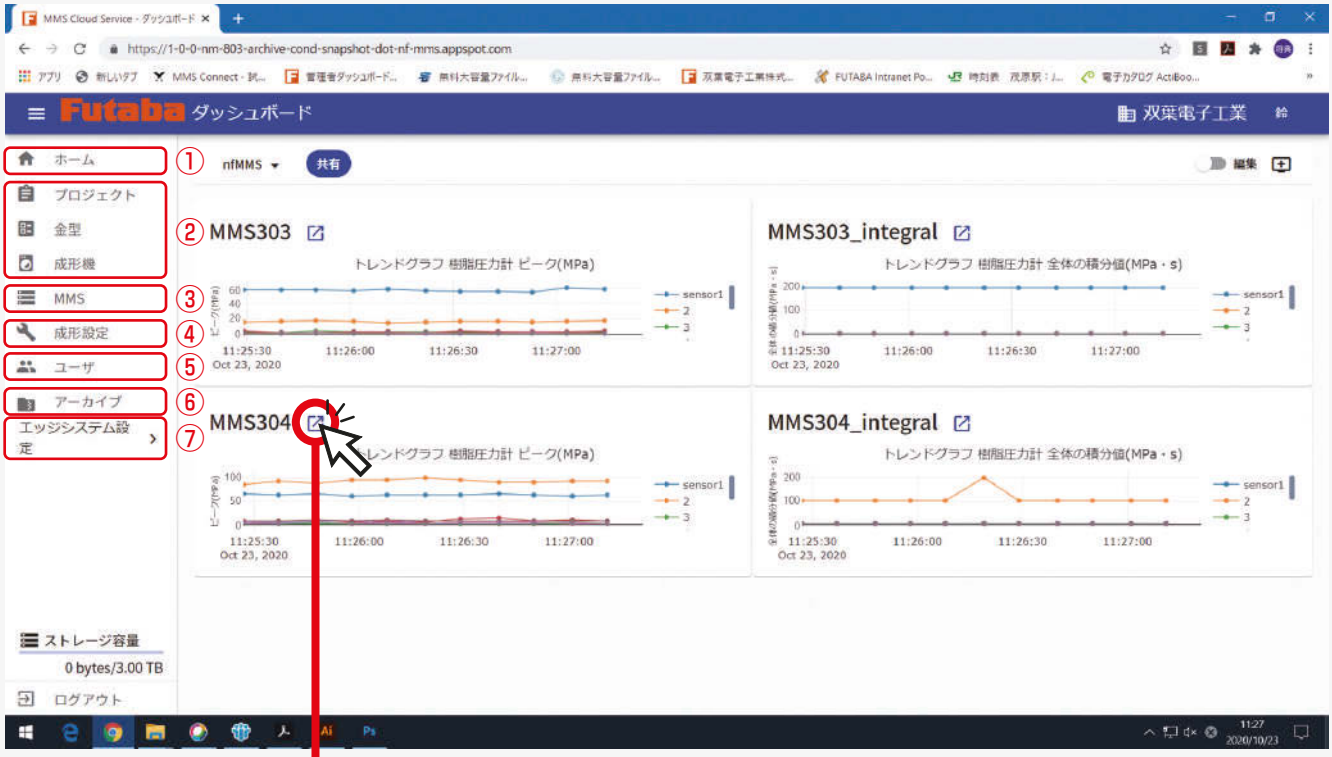


Monitoring screen

Dashboard

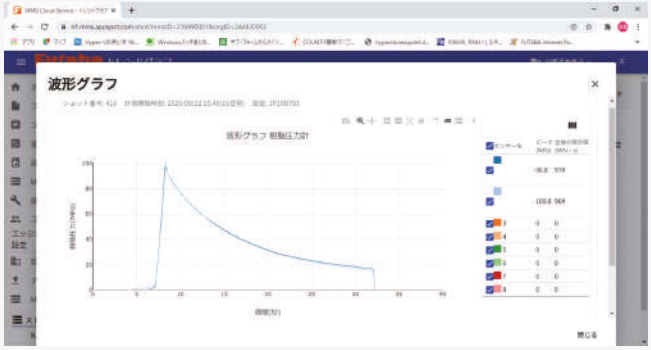
Menu

① The top-level menu provides an overview of mold status from dashboards across various pages.。
② These menus allow you to register and manage different projects, molds, and injection molding machines. Trend graphs and waveform graphs can be viewed for each menu.
③ This menu allows you to register and manage measuring amplifiers. View operational status lists, trend graphs, and waveform graphs for each measuring amplifier.
④ This menu allows you to make associations between the items set in ② and ③. View trend graphs and waveform graphs for measurement data based on the details set.
⑤ This menu allows you to register and manage user accounts.
⑥ This menu allows you to download measurement data in csv format.
⑦ This menu allows you to register and manage the CG01 dedicated gateway.

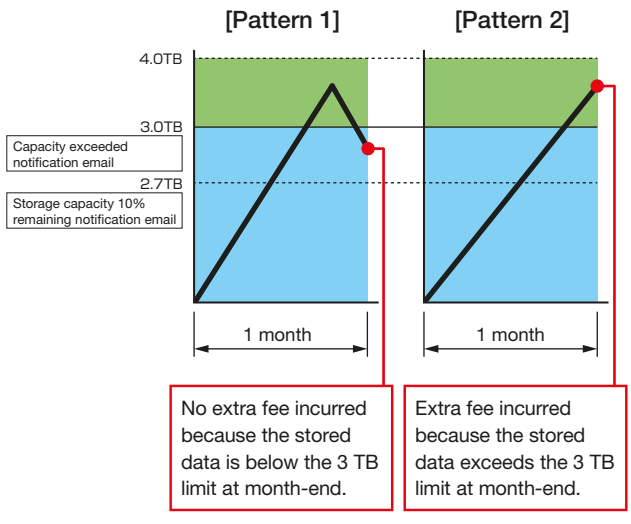


[Trend graph]

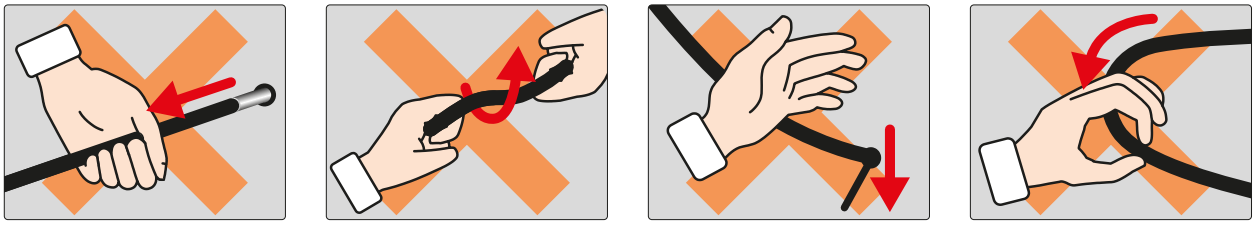
[Waveform graph]



Price list

Product name	Product code	Applicable product	Remarks
Gateway	CG01	Pressure measuring amplifier for MPS08B	● This device is required to gather and convert measurement data from the MPS08B pressure measuring amplifier and to connect to the MMS Cloud from the intranet. Access to the MMS Cloud requires purchase of the product. ● To connect to the MMS Cloud, a contract is required for initial settings, and to pay for cloud usage and software maintenance. ● The gateway provides one LAN port. A separately available switching hub (commercially available) is required if two or more pressure measuring amplifiers are connected to a gateway. ● Four MPS08B units can be connected to one gateway. Up to 10 MPS08B units can be connected via three gateways. ● An additional fee is required if more than 10 MPS08B units are to be connected.
Initial setting fee	Via contract		● This is the initial setting fee required to make the settings for the dedicated gateway, pressure measuring amplifier, and cloud software. A contract is required in order to use the MMS Cloud.
MMS Cloud usage fee, software maintenance fee	Via contract		● A contract is required in order to use the MMS Cloud. ● Each contract includes five accounts (1 admin and 4 users). Up to five additional accounts can be added for an additional fee. ● As a guide, 3 TB of storage capacity can store data for 10 injection molding machines, a sampling frequency of 1 ms, sampling time of 120 s, interval of 5 s, using 24 sensors, for 24-hour molding over three months. When the stored data reaches 3 TB, the data must be downloaded to free up space. ● If the data exceeds the storage capacity, an additional fee applies (see the chart below). 

Sensor usage precautions



Do not pull! Do not twist! Do not drop! Do not bend excessively!

1. Pulling or twisting on cables may damage them.
2. Provide sufficient slack when connecting the connector cables to safeguard the connector from excessive force. Pulling on or subjecting the cables to excessive force may result in failure, interrupted measurements, or abnormal measurement values.
3. Take care never to allow current to pass through the sensor itself.
4. Do not disassemble. Doing so will adversely affect performance and safety.
5. Dispose of in an environmentally friendly manner.

Applicable products

- Pressure sensors - ejector pin type SSE series
- Pressure sensors - button type SSB series
- Resin temperature sensors - ejector pin type EPSSZL series
- Resin temperature sensors - flush-mount type EPSSZT series
- STF mold surface temperature sensor
- SMF flow rate sensor
- Flow front detection sensors - ejector pin type DISSZL series
- Flow front detection sensors - flush-mount type DISSZT series

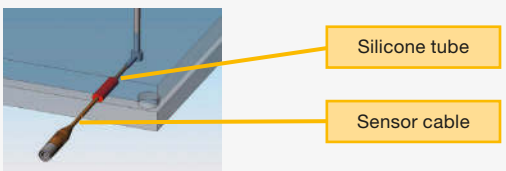
Pressure sensors

[Applicable products] Pressure sensors - ejector pin type SSE series
Pressure sensors - button type SSB series

Installation and measurements

1. The ejector pin type can be used for ejecting in the same way as regular ejector pins.
2. Do not connect to devices other than Futaba MPS08 and MPV04 pressure measuring amplifiers.
3. The output sensitivity must be set to obtain accurate measurements. Refer to the pressure measuring amplifier instruction manual for information on setting output sensitivity. (* Even pins of identical diameters may have different sensitivity grades.)
4. The sensor unit can withstand temperatures of up to 150°C. The sensor must be cooled if it is exposed to higher temperatures. Always use within the specified operating temperature range.
5. Ejector pin type sensors are capable of measuring pressures up to 100 MPa. Pressures beyond this may damage the sensor or deform the pin.
6. Do not subject button type sensors to pressures exceeding the rated measurement range capacity. Pressures beyond this may result in damage or deformation.
7. The minimum bending radius for the cables is 24 mm. Bending cables at a tighter radius may damage the cables.
8. To install cables, we recommend inserting the packing (the silicone tube included) between the spacer type ejector plates to secure cables. (See the figure below.)

[Recommended mounting method for ejector pin type]



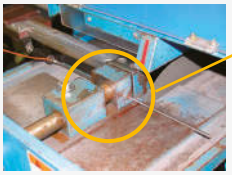
Pressure sensor - ejector pin type machining

* Pressure sensors - ejector pin type SSE series only

9. The pin can be cut to the same length as a regular ejector pin. The pin must be cut perpendicular to the pin axis; the pin rotates with respect to the flange section.

10. The sensor unit (flange section) is not waterproof. We recommend dry cutting and dry polishing (grinding); if grease or swarf affecting resin gets inside the sensor, it may result in short-circuiting and damage.

11. Clamp the pin section when machining. Clamping the sensor unit (flange section) may cause deformation, damaging the interior, and resulting in incorrect measurements. Also, be careful to avoid subjecting the sensor unit to excessive vibrations. The sensor unit is built in the flange section; it is impossible to cut the flange.



Cutting

Pin section clamping

Grinding

12. Never use a sander or grinder to cut or adjust the length of the pin. Doing so may damage the sensor unit.

Using a grinder

Using a sander

13. Never machine the side of the pin beyond cutting the tip. Doing so may damage or reduce the service life of the sensor unit.

14. Ejector pin type resin pressure sensors are designed so that the pin will move in the axial direction (compression direction) when subjected to pressure. The following table shows the guideline stroke for loads corresponding to a pressure of 100 MPa. If the molded product cannot be convex, set the length to the guideline stroke as shown in the following table.

[Typical measurements]

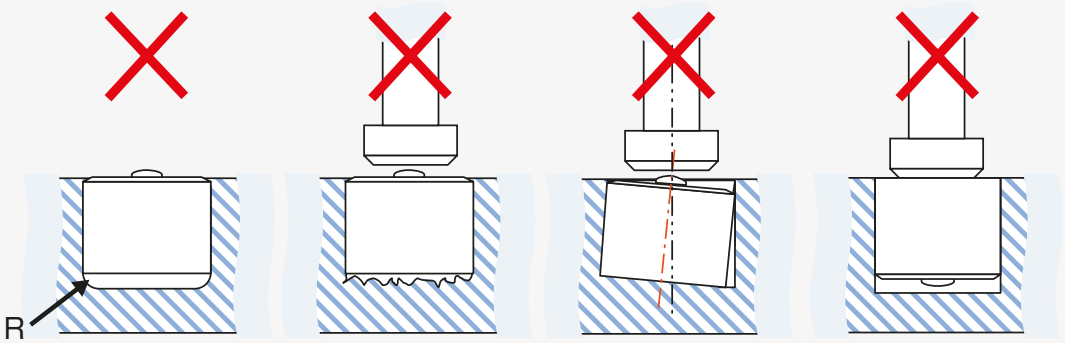
Pin diameter [mm]	ϕ0.8	ϕ1.0	ϕ1.2	ϕ1.5	ϕ2.0	ϕ2.5	ϕ3.0
Load equivalent to 100 MPa [kgf]	5.13	8.01	11.5	18.0	32.0	50.1	72.1
Stroke [mm]	0.050	0.040	0.040	0.055	0.073	0.080	0.076

* Displacement of sensor unit

Pressure sensor - button type mounting

* Pressure sensors - button type SSB series only

15. Note the following when installing button type pressure sensors:



Do not machine the bottom with rounded edges.

The machined underside must be smooth.

Install perpendicular to the pin shaft.

Do not mount the sensor upside down.

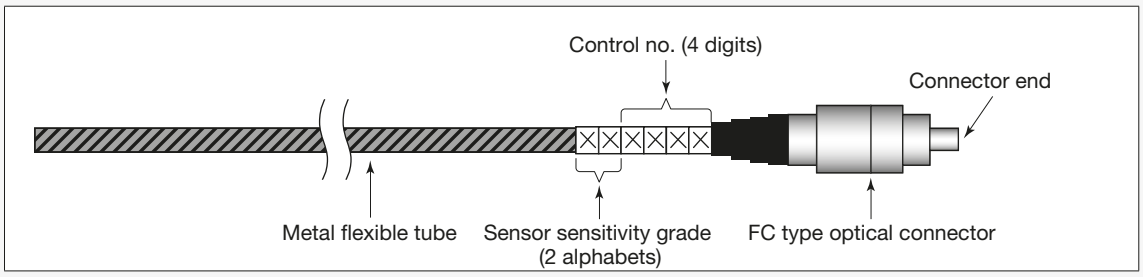
Resin temperature sensors

[Applicable products] Resin temperature sensors - ejector pin type EPSSZL series
Resin temperature sensors - flush-mount type EPSSZT series

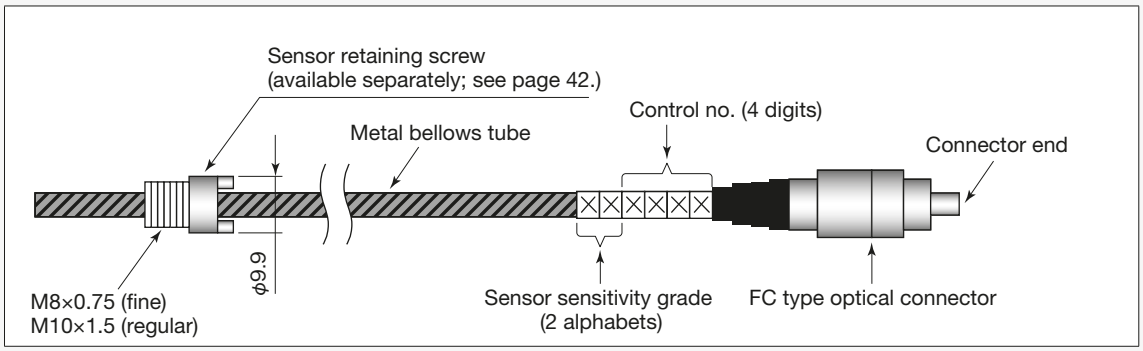
Installation and measurements

1. The ejector pin type can be used for ejecting in the same way as regular ejector pins.
2. Take care not to drop the sensor, as it contains quartz fiber.
3. The sensor unit can withstand temperatures of up to 150°C.
4. Sensors are capable of withstanding pressures up to 150 MPa. Loads beyond this may damage the sensor.
5. The minimum bending radius for the cables is 50 mm. Bending cables to a tighter radius may damage the cables.
6. The output sensitivity must be set to obtain accurate measurements. Refer to the EPT001S resin temperature measuring amplifier instruction manual for information on setting output sensitivity. (* Even pins of identical diameters may have different sensitivity grades.)
7. Fouling at the ends of the connectors will affect sensor sensitivity. Remove any fouling with a soft cloth.

[Ejector pin type resin temperature sensor sensitivity grade marking location]



[Flush-mount type resin temperature sensor sensitivity grade marking location]



Machining

8. Never perform additional machining of the pin. Doing so may damage the fiber inside.

Mold surface temperature sensor [Applicable products] STF mold surface temperature sensor

Installation and measurements

1. The sensor unit can withstand temperatures of up to 220°C.
2. Sensors are capable of withstanding pressures up to 150 MPa. Loads beyond this may damage the sensor.
3. The minimum bending radius for the cables is 10 mm. Bending cables to a tighter radius may damage the cables.

Machining

4. Never perform additional machining of the pin. Doing so may damage the thermocouple measuring unit.

Flow rate sensor [Applicable products] SMF flow rate sensor

Installation and measurements

1. Take care not to drop the sensor, as it contains quartz fiber.
2. The sensor unit can withstand temperatures of up to 150°C.
3. Sensors are capable of withstanding pressures up to 150 MPa. Loads beyond this may damage the sensor.
4. The minimum bending radius for the cables is 50 mm. Bending cables to a tighter radius may damage the cables.
5. Fouling at the ends of the connectors will affect sensor sensitivity. Remove any fouling with a soft cloth.

Machining

6. Never perform additional machining of the pin. Doing so may damage the fiber inside.

Flow front detection sensors [Applicable products] Flow front detection sensors - ejector pin type DISSZL series, Flow front detection sensors - flush-mount type DISSZT series

Installation and measurements

1. Take care not to drop the sensor, as it contains quartz fiber.
2. The sensor unit can withstand temperatures of up to 150°C.
3. Sensors are capable of withstanding pressures up to 150 MPa. Loads beyond this may damage the sensor.
4. The minimum bending radius for the cables is 50 mm. Bending cables to a tighter radius may damage the cables.
5. Fouling at the ends of the connectors will affect sensor sensitivity. Remove any fouling with a soft cloth.

Machining

6. Never perform additional machining of the pin. Doing so may damage the fiber inside.

In-mold resin pressure measuring system Q&A

MPS08B pressure measuring amplifier

Q1. What are the specific advantages offered by higher noise resistance?

A1. Higher noise resistance prevents malfunctions and adverse effects on the pressure measuring amplifiers and pressure sensors due to electromagnetic noise from electrical equipment and other devices nearby. This makes it possible to obtain consistent measurements, which in turn helps improve traceability management.

Q2. How should multiple amplifiers be connected to allow simultaneous measurement of 24 channels?

A2. Use the amplifier interconnection cables (available separately) to connect multiple amplifiers. The corresponding number of junction boxes and junction cables are also required. (Cable product code: WCM0010-R6P-R6P N-MPS08B catalog page 31)

Q3. Is it possible to edit waveform data imported to a PC?

A3. Waveform data is saved as CSV files on the connected PC and can be displayed in graph form.

Q4. What is the purpose of the LAN port? Is wireless LAN connection possible?

A4. The amplifier is connected to the PC directly using a LAN cable. The LAN connection is used for high-speed communications. Wireless connection is not available.

Q5. What are the typical volumes of the data obtained?

A5. The volume of the waveform data will vary depending on sampling rate and measurement time.
Refer to the table below.

(Units: kB)

Measurement time / Sampling rate	30 seconds	60 seconds	120 seconds
1 ms	704	1,407	3,050
5 ms	141	282	617
10 ms	71	142	297
20 ms	36	71	142

Q6. What happens when the PC runs out of available disk space?

A6. The pressure waveform will appear on the measurement screen. Once the hard disk capacity falls below the set available capacity, the “Available disk space” indication on the measurement screen will turn red. No data can be saved thereafter. We recommend transferring data elsewhere at frequent intervals.

Q7. Can I use a commercially available LAN cable?

A7. Yes. (Depending on length, the cable may be susceptible to noise effects.)

Q8. Can I view waveforms on the molding machine monitor?

A8. Yes. The MPS08B also provides an analog voltage output. If the molding machine has an interface for inputting an analog voltage and the machine is capable of displaying these values on the monitor, it can also display waveforms.

Q9. Why is a trigger signal input to the amplifier required?

A9. The data is managed and monitored for each molding cycle shot. A trigger signal is input at the start of each shot. Zero resetting is also performed simultaneously to cancel temperature drift.

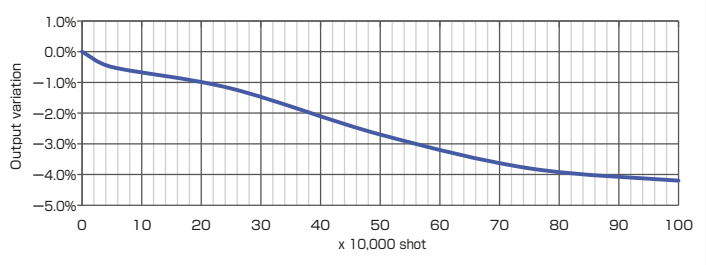
Ejector pin type pressure sensors

Q10. Do the specifications for the previous sensors (EPS series) and new sensors (SS series) differ?

A10. The sensor flange diameter has changed from 5.7 mm to 6.0 mm.
The cable and connecting wires have also been modified to improve noise resistance. Thus, the connector type also differs.

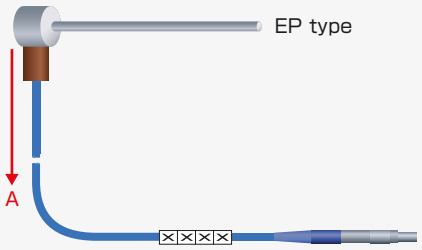
Q11. How durable are the sensors?

A11. The sensors can withstand at least 1 million cycles in repeated load testing (at normal temperature, 80 MPa, with cycle period of 1.2 s, and 3 mm diameter). This does not constitute a guarantee. Factors such as usage conditions may affect durability.



Q12. How strong is the sensor cable attachment base?

A12. The maximum tensile force that can be applied to the cable perpendicular to the pin (direction A in the figure below) before it fails is 9.5 kg.



In-mold resin pressure measuring system Q&A

Q13. Can the profile of the pin tip be machined?

A13. The profile cannot be machined for EP type pressure sensors, as machining to prevent rotation is not possible. However, using button type pressure sensors allows machining because existing pins can be used unchanged.

Q14. Is it possible to measure mold release resistance (ejection force)?

A14. Yes. This can be determined from the waveform at ejection on the measurement screen.

Reference The ejection force (N) can be obtained by multiplying the peak pressure (MPa) on the ejection waveform by the pressure sensor pressure-receiving area (mm^2). Multiply by 0.102 to convert to units of kgf.

Calculation example

Ejection peak pressure:	C = 20 (MPa)
Pressure sensor diameter:	d = 3 (mm)
Pressure sensor pressure-receiving area:	S = (3 × 3 × π) / 4 = 7.0686 (mm^2)
Ejection force:	P (N) = C × S = 20 × 7.0686 = 141.4
	141.4 (N) × 0.102 =14.4 (kgf)

Q15. How do we check for sensor disconnection?

A15. A simple way is using a tester connector cable (available separately) to check whether a sensor is functioning.
(Tester connector cable product code: ATCS catalog page 31)

Q16. Can the sensors be used with die-cast molding?

A16. Yes, provided the in-mold pressure does not exceed 100 MPa and the mold temperature does not exceed 150°C within the specifications range.

Q17. Do the sensors include a temperature compensation circuit?

A17. No special temperature compensation circuit is included. Resistance fluctuations due to cable temperature and cable length are canceled by the circuit configuration. Strain gauge temperature drift is canceled by zero resetting when a trigger signal is input (at the start of measurement).

Q18. Can the sensors be connected for measurement to commercially available measuring amplifiers?

A18. The sensors are based on proprietary Futaba specifications and cannot be connected for measurement to other instruments.

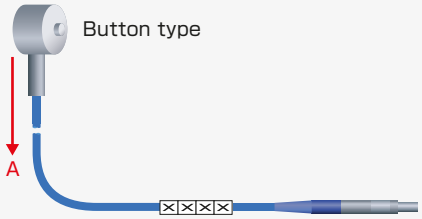
Button type pressure sensors

Q19. When choosing button type pressure sensors, how should I determine the expected in-mold pressure?

A19. This is generally less than half the injection peak pressure. Refer to the data for the molding machine.

Q20. How strong is the sensor cable attachment base?

A20. The maximum tensile force that can be applied to the cable in a vertical direction (direction A in the figure below) before it fails is 9.5 kg.



Q21. Can I measure pressure if the lower flange face of the ejector pin is in contact with the protruding part of the sensor?

A21. Install so that the sensor and ejector pin centers are aligned (within ±0.3 mm).

Q22. Machining the tip of the ejector pin to form a diagonal face alters the pressure-receiving area. How should the pressure be calculated?

A22. The pressure-receiving area is calculated as the projected area in the mold opening direction. The area for a 1 mm diameter round pin is calculated using the diameter 1 mm, even if the tip face is machined diagonally. The pressure acts on the diagonally cut face along a perpendicular axis, but this will be the same when converted to the pressure in the mold opening direction. This means you can use the same equation.

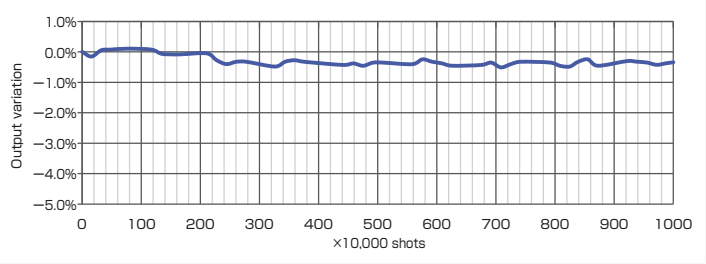
Example For 1 mm diameter: Pressure-receiving area (mm^2) × expected in-mold pressure (MPa) = 0.79 (mm^2) × 120 MPa = 94.8 (N)

Q23. What is the displacement of the sensor?

A23. The maximum displacement under the rated load is 0.02 mm.

Q24. How durable are the sensors?

A24. Sensors can withstand at least 10 million cycles in repeated load testing (SSB01KN08×06: 23°C, 1,200 N, with cycle period of 0.5 s). This does not constitute a guarantee. Factors such as usage conditions may affect durability.



Compatibility of old and new products

Q25. Can I use the earlier sensors (EPA, EPC, EPV) with the new sensors (SS series)?

A25. No. They cannot be used together.

In-mold resin pressure measuring system Q&A

Q26. Can a new amplifier (MPS08B) be used with the earlier sensors (EPS series)?

A26. Yes, by connecting with an adapter (available separately). Note that CE compliance is assured only when used with the new sensors (SS series). (Adapter product code: ACAE01 catalog page 31)
Measurements with a mixed configuration of EPS series and SS series are not possible.

Q27. How long will the earlier amplifiers (EPA, EPC, EPV, MPS08) and sensors (EPS series) continue to be sold?

A27. The earlier amplifiers will continue to be sold until stocks run out. The earlier sensors will continue to be sold for the foreseeable future.

Q28. Does pin diameter affect measurements?

A28. With the EP type sensors, measurements are calibrated for each pin diameter, so measurements do not vary. With button type sensors, adjustments are performed by entering the pin diameter on the setup screen of the measurement software. Measurements do not vary.

Frequently asked questions

Q29. The sensor cable broke.

A29. It may be possible to repair a damaged sensor cable for a fee, depending on the location of the breakage. Examination of the actual part involved is required. (Please contact your nearest Futaba sales office.)
* Repairs are generally possible if the breakage is at least 50 mm from the sensor flange.

Q30. I did something that crushed the sensor connector.

A30. This can be repaired for a fee. (Please contact your nearest Futaba sales office.)

Q31. No waveforms appear on the measurement screen.

A31. It may be due to a disconnection in the sensor or communication error between the amplifier and the PC. For information on checking the sensor, refer to **Q17**. A communication error may be due to poor connection. Try disconnecting and then reconnecting the cable.

Q32. I'm not sure where to insert the sensor.

A32. You can measure pressure no matter where it's inserted. To detect short shots, insert close to where short shots occur.

Q33. I want to detect short shots, but I'm not sure what alarm monitoring zone threshold to use.

A33. The data obtained must be matched to product quality. One approach is to set a threshold based on tolerances provided for maximum and minimum peak data values saved for stabilized molding.

Q34. What's the ideal pressure waveform?

A34. Waveforms will differ, even for the same mold interior, depending on the sensor location. An ideal waveform can be described as one that can be consistently reproduced and meets required quality levels.

Q35. I mistakenly input a voltage to the amplifier trigger signal.

A35. This can damage electronic components inside the amplifier. Connect to a nonvoltage contact input (e.g., a relay). The same applies for the alarm reset signal.

Q36. What's the correlation between pressure measurements and common molding defects?

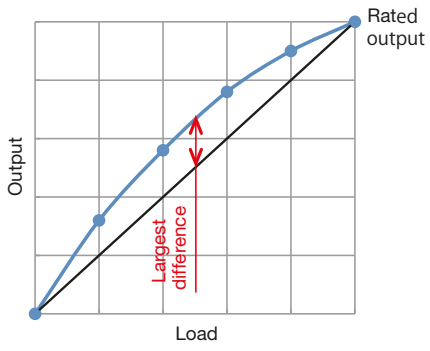
A36. Refer to the following table:

Molding defect	Defect phenomenon	Main causes and conditions	Contribution from in-mold pressure measurement
Short shot	Missing resin in portions of molded products	Complete filling is not achieved due to insufficient resin, insufficient filling pressure, or insufficient filling speed.	Installing pressure sensors close to the short shot location may enable detection of in-mold pressure drops when short shots occur.
Flash	Thin films protruding from molded product edges and holes	Resin will flow through gaps in the mold if the filling pressure is too high or the mold clamping force is insufficient.	The in-mold pressure will be higher for high filling pressure compared to conforming products.
Warping	Molded products are bent (deformed).	The residual stress inside the molded product is poorly balanced (e.g., due to the pressure inside the molded product being high in places or slow speed creating uneven pressure when hardening).	Understanding the pressure balance and pressure status during hardening of molded products may help in taking effective corrective action.
Flow marks	Wave patterns due to resin flow formed on the molded product surface	The resin front flow rate is low, resulting in hardening as it flows.	Understanding the time taken to complete filling may help in taking effective corrective action.
Weld lines	Linear patterns formed where separate resin flows from the gate rejoin	Resin is not fully mixed and welded at the confluence due to factors such as low resin flow rates.	Understanding the time taken to complete filling may help in taking effective corrective action.
Sink marks	Depressions formed on the surface of molded products	The surface sinks due to contraction of the resin as it solidifies.	Understanding parameters such as in-mold pressure rise and fall may help in taking effective corrective action.
Voids	Cavities formed inside molded products	Cavities form inside due to contraction of the resin as it solidifies.	Understanding parameters such as in-mold pressure rise and fall may help in taking effective corrective action.
Silver streaks	Shiny silvery streaks on the molded product surface	Streaks form on the surface when air inside the cavity becomes mixed into the resin.	Understanding the time taken to complete filling may help in taking effective corrective action.
Overpacking	This refers to applying a higher-than-anticipated injection or holding pressure, or injecting more resin than required into the mold.		The in-mold pressure is higher than for conforming products.

* "The contribution from the in-mold pressure measurement" refers to generally conceivable benefits, not specific test data.

Q37. What is nonlinearity?

A37. This is the value indicating the maximum difference between the calibration curve and the straight line connecting the output at zero load with the output at the rated load as a percentage of the rating.



Non-linearity (%) = Largest difference/Rated output

Q38. What are sensitivity fluctuations?

A38. Sensitivity fluctuations are fluctuations due to fluctuations in operating temperature. They are expressed as fluctuation rate per 1°C.

In-mold resin pressure measuring system Q&A

Miscellaneous

Q39. Are instruction manuals available in other languages?

A39. An English language instruction manual is available. Instruction manuals in other languages are planned for the future.

Q40. Is the equipment loan scheme still in place?

A40. Yes. (Loans are normally for two weeks and one time only.)

Q41. What is the language-switching function on the measurement software?

A41. This function on the measurement software screen allows the user to switch languages at the touch of a button.
It currently supports English and Japanese. Other languages will be added in the future.

Q42. What does the CE marking mean?

A42. The CE marking is a standards compliance marking required for specified products sold in the European Union (EU). It indicates compliance with the Essential Safety Requirements (ESRs) stipulated by the EU (EC) directive. “CE” is an acronym for the French phrase “Conformité Européene” (European Conformity). Products undergo specified compliance evaluations by the manufacturers (importers) or third-party certification bodies and carry the CE marking on the products themselves, on packaging, and on accompanying documentation, guaranteeing free retail and distribution within the EU region. There are two procedures, depending on the specific product: cases in which certification is obtained from a third-party certification body (“Notified Body” or “NB”) and cases in which self-certification is acceptable. The CE marking is required only when exporting to EU countries (from Japan External Trade Organization (JETRO)). Compliance with European standards, however, can be said to demonstrate high performance and safety.

In-mold resin temperature measuring system Q&A

EPT-001 resin temperature measuring amplifier

Q1. What's the voltage output?

A1. A voltage of 1 V DC is output per 100°C.

Q2. From where is the voltage output?

A2. The voltage is output from the BNC terminal on the measuring amplifier unit. (A BNC voltage output cable, available separately, is required.)
(BNC voltage cable product code: EPT-VC01M, EPT-VC02M catalog page 42)

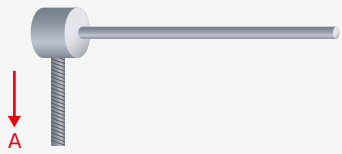
Resin temperature sensors

Q3. What's the maximum pressure the sensors can withstand?

A3. Sensors can withstand up to 150 MPa.

Q4. How strong is the sensor cable attachment base?

A4. The maximum tensile force that can be applied to the cable in a vertical direction (direction A in the figure below) before it fails is 10 kg.



Q5. Can the profile of the pin tip be machined?

A5. The profile cannot be machined. Glass fiber is embedded inside the sensor all the way to the pin tip. Additionally, note that the sensor cannot be machined after delivery.

Q6. How can I check whether a sensor is functioning correctly?

A6. If the sensor is broken, no light will be visible from the pin tip. Determining whether measurements are correct requires sending the sensor to Futaba to check the output. (Recalibration will be performed for a fee.)

Q7. Can the cable be extended?

A7. The cable cannot be extended. Choose the correct cable length at the time of purchase.

Q8. Does the measured temperature vary depending on resin color?

A8. The measurement location (along the axis of thickness) will vary depending on the resin material. Generally, temperatures are measured at the resin surface for black resin and at a certain depth inside the resin along the axis of thickness for all other colors.

Q9. Is it possible to measure the nozzle temperature?

A9. No. It is not possible to measure nozzle temperatures. The sensors are designed for measuring resin temperatures inside the mold.

Q10. Can I view waveforms on the molding machine monitor?

A10. Yes. Waveforms can be displayed if the molding machine has an interface for inputting an analog voltage and can display these values on the monitor.

Frequently asked questions

Q11. The sensor cable broke.

A11. Broken sensor cables cannot be repaired.

Q12. I did something that crushed the sensor connector.

A12. This can be repaired for a fee. (Contact your nearest Futaba sales office.).

Miscellaneous

Q13. Are instruction manuals available in other languages?

A13. An English language instruction manual is available. Instruction manuals in other languages are planned for the future.

Q14. Is the same equipment loan scheme still in place?

A14. Yes. (Loans are normally for two weeks and one time only.)

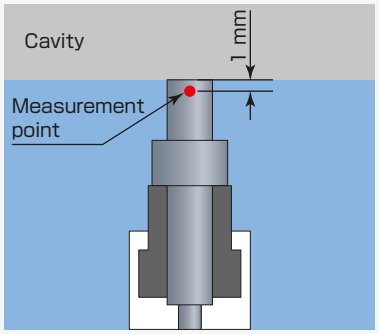
Mold surface temperature measuring system Q&A

Q1. What are the benefits gained from adopting this measuring system?

A1. Measuring mold temperatures close to the cavity has useful applications in monitoring molding conditions, quality control, and defect screening. It also makes it possible to check the stability of mold temperatures, refine discarded shot management, and reduce resin waste.

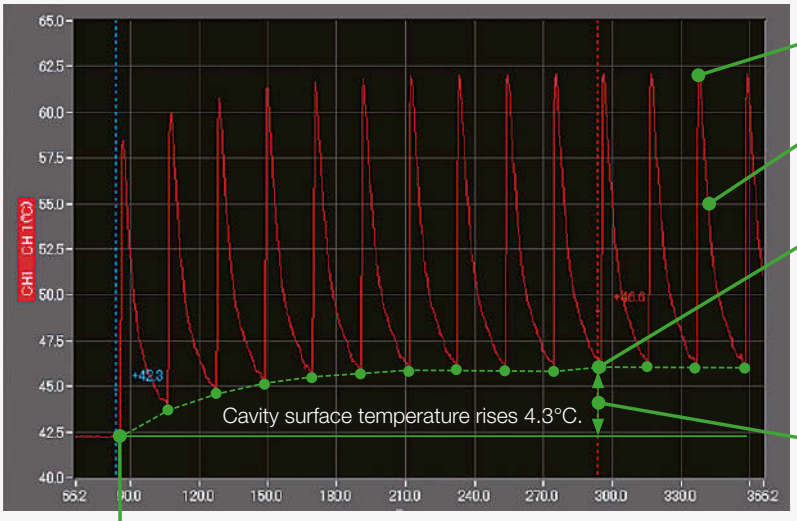
Q2. Where in the cavity is the temperature measured?

A2. The contact used to detect temperature is located within 1 mm from the sensor tip. The sensor is mounted flush with the cavity surface to measure temperatures at a point inside the mold 1 mm from the cavity surface.



Q3. What does the waveform show?

A3. In mass-production molding, checking points ② and ③ below reveals whether stabilized molding has been attained (using commercially available measuring instruments and software).



① Mold surface peak temperature

② Molded product cooling (hardening) time

③ Mold surface temperature when inflow resin meets mold surface

④ Number of shots required to reach stabilized molding after molding start

⑤ Mold surface temperature rise due to inflow resin

⑥ Difference between temperature controller temperature setting and mold surface temperature at molding start
(The example above is for temperature controller temperature settings of 40°C.)

Q4. What kind of a profile is a flush-mount profile?

A4. This means the sensor is installed with the sensor tip flush with the cavity surface (“exposed mounting”).

Q5. Is additional machining possible?

A5. Grinding is possible over a length of 0.01 mm to 0.02 mm from the tip. However, the tip profile cannot be machined or made curved or diagonal.

Q6. Why are type K thermocouples used?

A6. Type K thermocouples are the most widely used thermocouples and inexpensive.

Q7. What do I need to purchase to introduce the system?

A7. ① Mold surface temperature sensor
② Mold surface temperature sensor adapter cable (1 m or 2 m cable)
① and ② can be used to connect to commercially available measuring instruments.
③ Retaining screw (M8 or M10): Slot-head screw for mounting sensors to the mold (catalog page 49)
④ Sensor securing wrench: Tool used to tighten and loosen the retaining screw ③ (catalog page 49)
⑤ Sensor removal wrench: Tool used to extract sensors fixed to the mold (catalog page 49)

* Items ① to ④ are required at the system introduction.
* ⑤ is not required to remove sensors that can be removed by pushing gently from the sensor tip.
Note that the retaining screw ③ and sensor securing wrench ④ are not required if sensors are mounted on the mold by a method that does not use screws.

Q8. Can sensors be used without purchasing the mold surface temperature sensor adapter cable?

A8. A thermocouple connector is fitted to the sensor, but you can extract the thermocouple wire by disassembling this. If this is connected directly to the measuring instrument terminal board, measurement is possible without an adapter cable.

Injection molding monitoring system Q&A

MVS08 injection molding monitoring system

Q1. How is measurement data saved when three MVS08 units are connected together?

A1. Data is saved for each MVS08 unit as a file containing the following in the file name:
MVS08 unit: 1st unit: MODULE1, second unit: MODULE2, 3rd unit MODULE3.

Q2. Is it possible to edit waveforms saved to a PC?

A2. Measurement data is saved as CSV files. These files can be edited.

Q3. What are the minimum PC requirements?

A3. Operating system (Japanese language compatible): Windows 7 (32 bit/64 bit), Windows 8 (32 bit/64 bit), Windows 8.1 (32 bit/64 bit), Windows 10 (32 bit/64 bit); processor: Intel CPU Core i5 or higher; memory: 4 GB or more; other: Ethernet port. .NET Framework 4.0 or later must be installed.

Q4. Can I connect by wireless LAN?

A4. The warranty does not cover wireless LAN connection.

Q5. What are the typical volumes of the saved data?

A5. The volume of the waveform data will vary depending on sampling rate and measurement time.
Refer to the following table for a guide:

(Units: kB)

Measurement time / Sampling rate	30 seconds	60 seconds	120 seconds	600 seconds	1,200 seconds	2,400 seconds
1 ms	704	1,407	3,050	–	–	–
5 ms	141	282	617	3,050	–	–
10 ms	71	142	297	1,407	3,050	–
20 ms	36	71	142	704	1,407	3,050

Q6. What happens when the PC runs out of available disk space?

A6. The waveform will appear on the measurement screen. However, once the hard disk capacity falls below 10%, the “Available disk space” display on the measurement screen will turn red, and data can no longer be saved. We recommend transferring data elsewhere at frequent intervals.

Q7. Can I use any commercially available LAN cable?

A7. Depending on specifications, a certain cable may be susceptible to noise. The recommended Futaba cable is a 2 m long Cat 7 shielded cable.

Q8. Can I view waveforms on the molding machine monitor?

A8. The MVS08 can only be connected to a PC. It cannot be connected to devices such as molding machines or data loggers.

Q9. Can I connect the EPV-001?

A9. No.

Q10. Can I connect a flow rate measuring system?

A10. No.

Q11. How can I load information from an injection molding machine (external device)?

A11. With a molding machine, data can be loaded using the dedicated cable, provided that information such as injection pressure, holding pressure, and screw position is in the form of a voltage output (in the range 0 to 10 V DC). (Interface cable product code: WCI0130-2P N-MVS08 catalog page 77)

Q12. Does molding process monitoring also allow defect signals to be output during mass production?

A12. An NPN open collector signal is output in the same way as with the existing measuring amplifier.

Q13. Since this uses a LAN connection, is it possible to save data to an in-house server?

A13. Data can be saved on an in-house server using a hub. (Consult with your company's system administrator for IP address settings.)

Q14. Communication isn't possible, even after setting the IP address as described in the manual.

A14. Disable firewalls and anti-virus software, then restart the PC and try again.

Q15. Is the equipment loan scheme still in place?

A15. Yes. (Loans are normally for two weeks and one time only.)

Flow rate measuring system Q&A

Q1. Is it possible to measure flow rates of resin that contains filler?

A1. No. Filler in resin reflects light irregularly and prevents measurement.

Q2. Does the color of the resin affect flow rate measurement?

A2. Flow rates can be measured regardless of resin color (which ranges from clear to black).

Q3. Does the range of flow rate measurements depend on product plate thickness?

A3. The flow front radius varies depending on product plate thickness. This may restrict measurement time.

Q4. Are there restrictions on where sensors can be installed?

A4. The sensors are designed to measure resin flowing between parallel plates. Avoid installing sensors close to curved surfaces, ribs, or upright walls.

Q5. Can the profile of the pin tip be machined?

A5. The profile can't be machined. This is because glass fiber is embedded inside the sensor all the way to the pin tip. Additionally, note that the sensor cannot be machined after delivery.

Q6. Can the cable be extended?

A6. No. The cable cannot be extended.

Q7. How can I check whether a sensor is functioning correctly?

A7. Please contact your nearest Futaba sales office.

Q8. Communication between the amplifier and PC isn't working correctly.

A8. The network settings may not be correctly configured. Check the IP address settings.

Q9. No waveforms appear on the measurement screen.

A9. The sensor may have failed; communication between the amplifier and the PC may not be performed; no trigger signal is being input. A communication error may be due to poor connection. Try disconnecting and reconnecting the cable.

Q10. How can I output waveforms to an external device?

A10. A voltage output is provided with the range 1 V to 5 V.

Q11. How can I output a signal to indicate the passage of resin?

A11. Signals can be output for each channel in the form of an NPN open collector output. Connect via a 24 V DC power supply and relay.

Q12. What are the typical volumes of the data obtained?

A12. The volume of the waveform data will vary depending on sampling rate and measurement time.
Refer to the table below.

(Units: kB)

Measurement time / Sampling rate	30 seconds	60 seconds	120 seconds
1 ms	840	1,680	3,360
5 ms	165	330	660
10 ms	81	162	324
20 ms	41	81	162

Flow front detection system Q&A

Q1. What are possible applications of this system?

A1. The system can be set to issue a signal on detecting the molten resin flow front. This can be used to control the machine.

Q2. Is it impossible to detect the flow front if the molten resin temperature is too low?

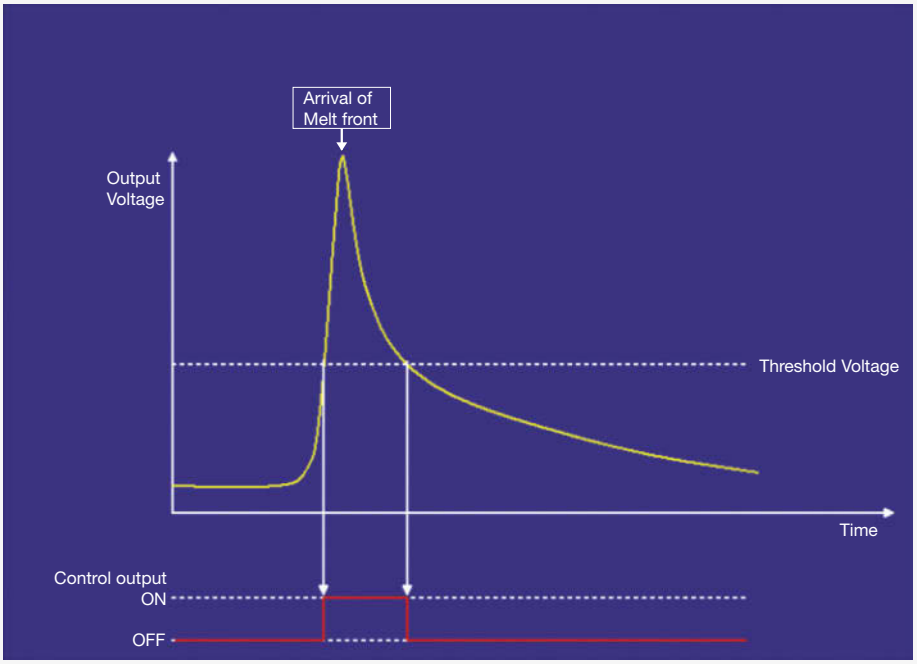
A2. We assume molten resin at temperatures of 160°C or higher for ease of threshold setting.

Q3. Is flow front detection affected by the presence of filler or product plate thickness in the same way as flow rate detection?

A3. The flow front is detected using infrared emitted by the molten resin. This is unaffected by the presence of filler or product plate thickness.

Q4. How can I set threshold values?

A4. Shown below is “Operation signal diagram” from the instruction manual. The comparison voltage (threshold voltage in the figure) can be moved up or down to adjust the timing for outputting the comparison (control) signal.



Q5. What sensors are used?

A5. We use resin temperature sensors. However, because resin temperature cannot be measured, these are listed as flow front detection sensors (pages 92 and 94 in the front detection sensor catalog).

Machinery and Tooling Division products

Press mold parts

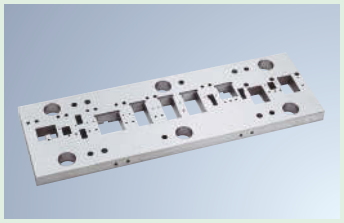
Offering new value creation for customers across a broad range of manufacturing scenarios

We offer high-quality high-precision machining technologies to meet customer requirements ranging from standard parts to machined and assembled parts.

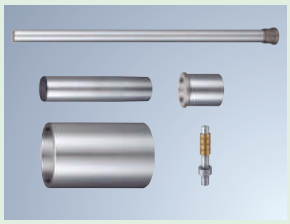
Standard die sets

Fully machined die sets

Fully machined inner plates



Press mold guide parts



Diematic system

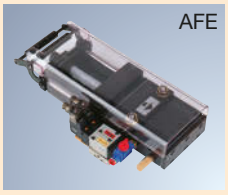
Labor-saving devices

We offer an extensive range of reliable products to improve the efficiency of automated lines as well as to automate and reduce the labor overhead associated with press and plastic molding processing.

NCG

NCR

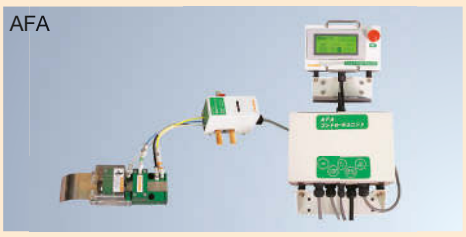
AFE



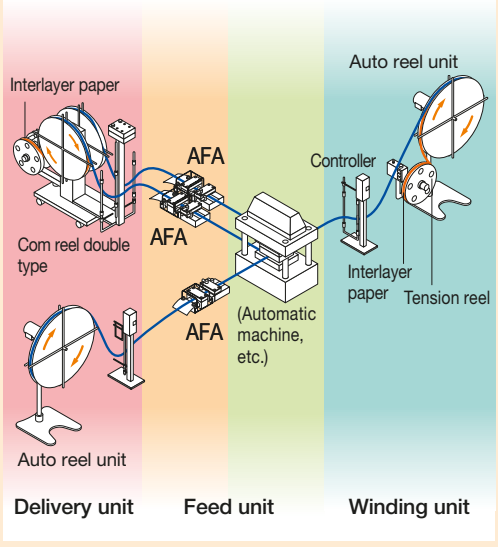
Com reel

Auto reel unit

AFA



〈Line configuration example〉



Mold parts

Solutions for reducing mold design and manufacturing man-hours and for short-lead-time mold manufacture

We provide solutions for a wide range of demands related to mold bases and parts.

Mold bases

Extensive range of sizes and types
Standard mold base specifications can be altered with short lead times to meet the requirements associated with a wide range of variations.

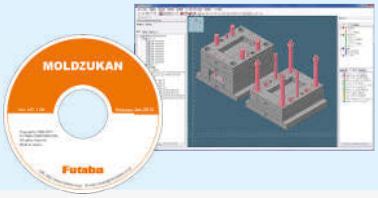
Additional machining

The available selection of additional machining and parts assembly has expanded significantly in response to wide-ranging additional machining demands.

Mold parts

The available selection of mold parts incorporated into mold bases has expanded significantly in response to a wide range of mold base requirements.

MOLDZUKAN®



Fully machined mold bases (mold plates)

Mold Marshalling System
(In-mold Measuring System)

Visualizing the mold interior
A measuring system that improves injection molding quality and reduces costs.

Features

- Wide range of functions
- Low cost
- Simple
- Functional
- Compact

In-mold resin pressure measuring system

Plates

We provide solutions to a wide range of plate requirements—solutions of dependable quality delivered with short lead times.

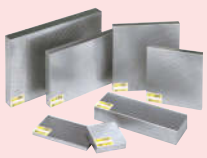
Supporting customers' business developments with an extensive range of products, high quality, and short lead times, from standard plates to customer-specified size plates

Futaba plates

Standard plates

Precision plates

A wide range of standardized materials and sizes
Delivered with short lead times



Precision mini plates

Standardized liner plates and jig plates
Delivered with short lead times

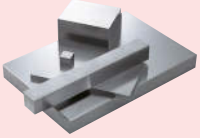
Customer-specified size plates

High precision plates

Customer-specified sizes with an emphasis on precision
Popular for contribution to reducing machining man-hours

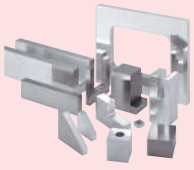
Customer-specified size milled plates

Customer-specified sizes with an emphasis on cost performance
Suited for a wide range of applications



Equipment plates

Delivered after time-consuming profile machining, made of steel, aluminum, or stainless steel



Introduction to the hot runner system

Injection molding uses sprue and runners to form the resin flow paths through which plasticized resin is forced into the mold cavities in a molding machine. The hot runner system is a runner-less system that eliminates the need to wait for solidification and remove the sprue and runners for each molding cycle. The system normally uses electric heaters to heat the resin flow paths from the sprue to gate openings and maintain resin flow conditions.

Benefits of the hot runner system

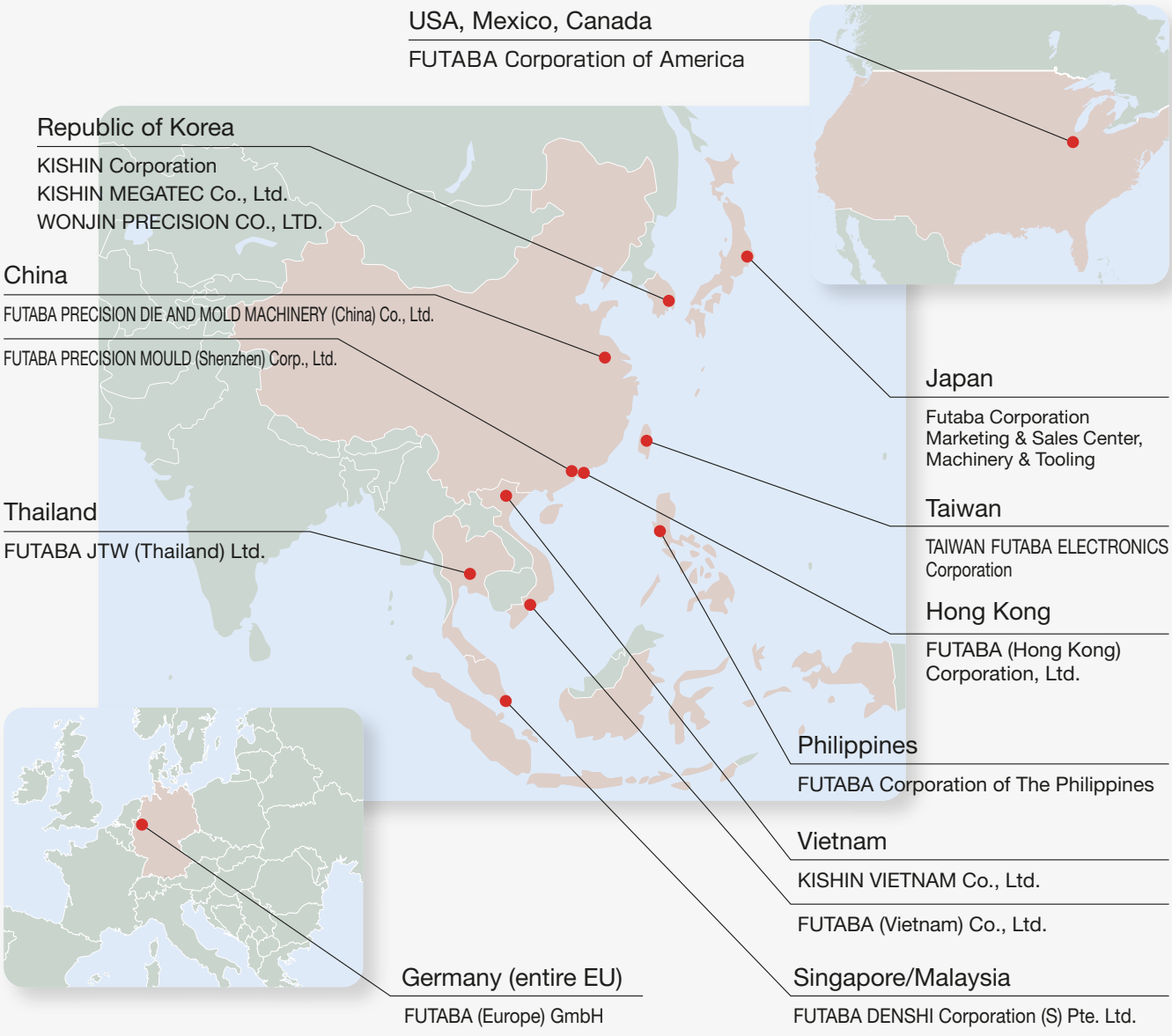
The runner-less hot runner system offers the following advantages over cold runner systems:

- Reduced material consumption/resin waste
- Reduced molding cycle times
- More consistent mold shapes

Temperature controllers

Our temperature controllers for the hot runner system allow control of up to 48 points. A wide range of models are available to let you select the one ideal for your budget and requirements.

International sales offices



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Fax. 63-2-843-2898

FUTABA(Europe)GmbH

Halskestrasse 9, D-47877 Willich, Germany
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Fax. 49-2154-943-200

Contact information

◎Inquiries

For inquiries about this catalog, please contact your nearest Futaba Corporation sales office or branch office.

◎The information provided in this catalog is correct as of August 2021.

The standards and dimensions indicated in this catalog are subject to change without notice to allow for product improvements.

◎Shipping fees

Shipping fees will be calculated separately.

◎The products described in this catalog are not covered by items 1 to 15 of Table 1 of the Export Trade Control Order, but are covered by item 16 of the Catch-All Controls introduced in April 2002.

Please note that restrictions under the Foreign Exchange and Foreign Trade Act may apply if items are exported in conjunction with other equipment.

Futaba In-mold Measuring System
Mold Marshalling System
General Catalog VOL. 10
Issued: August 2021 (First edition, first printing)

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629 Oshiba, Mobara, Chiba Prefecture

URL http://www.futaba.co.jp/en/

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Futaba
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