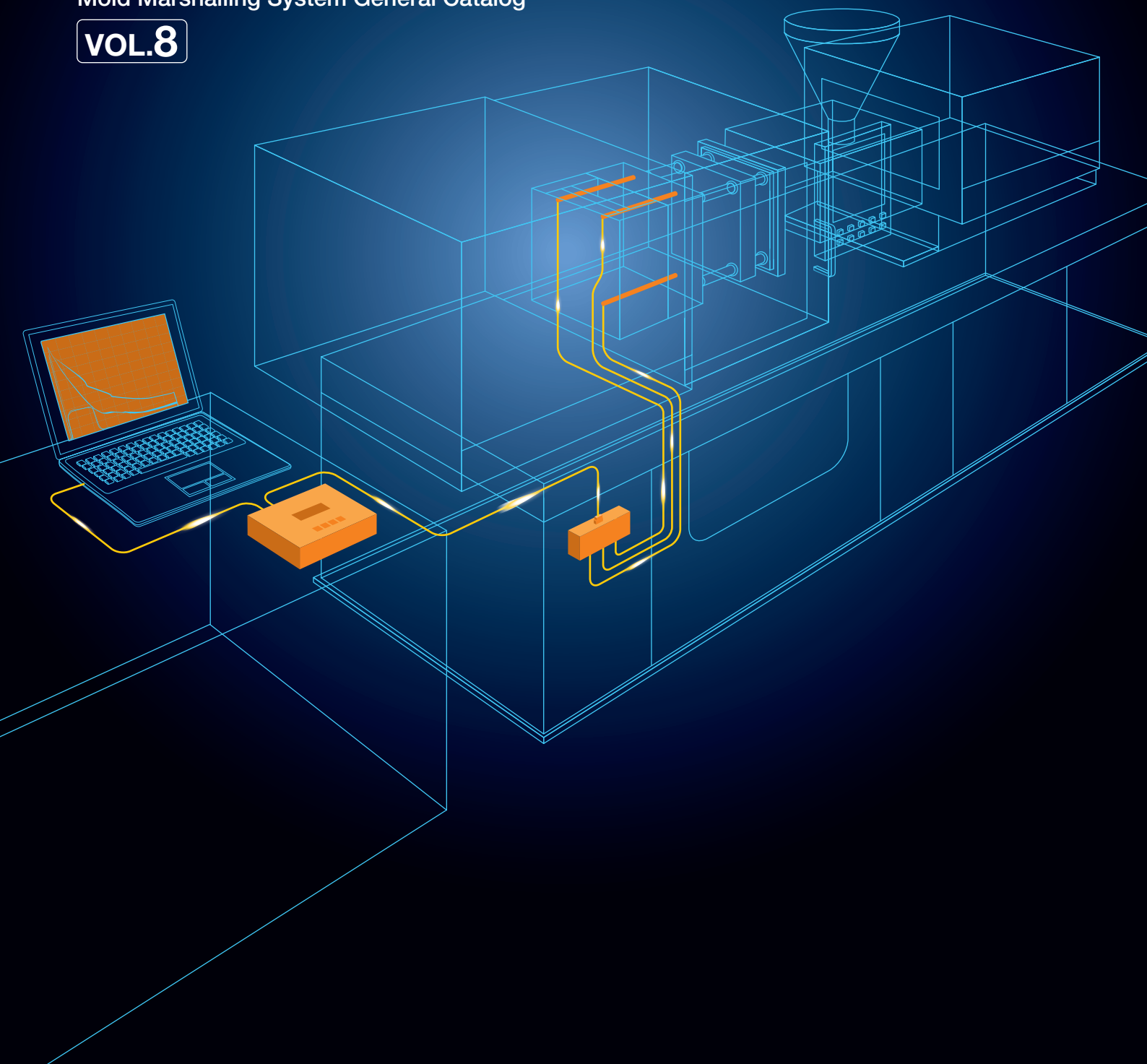
Futaba

In-mold Measuring System

MOLD MARSHALLING SYSTEM

Mold Marshalling System General Catalog

VOL.8



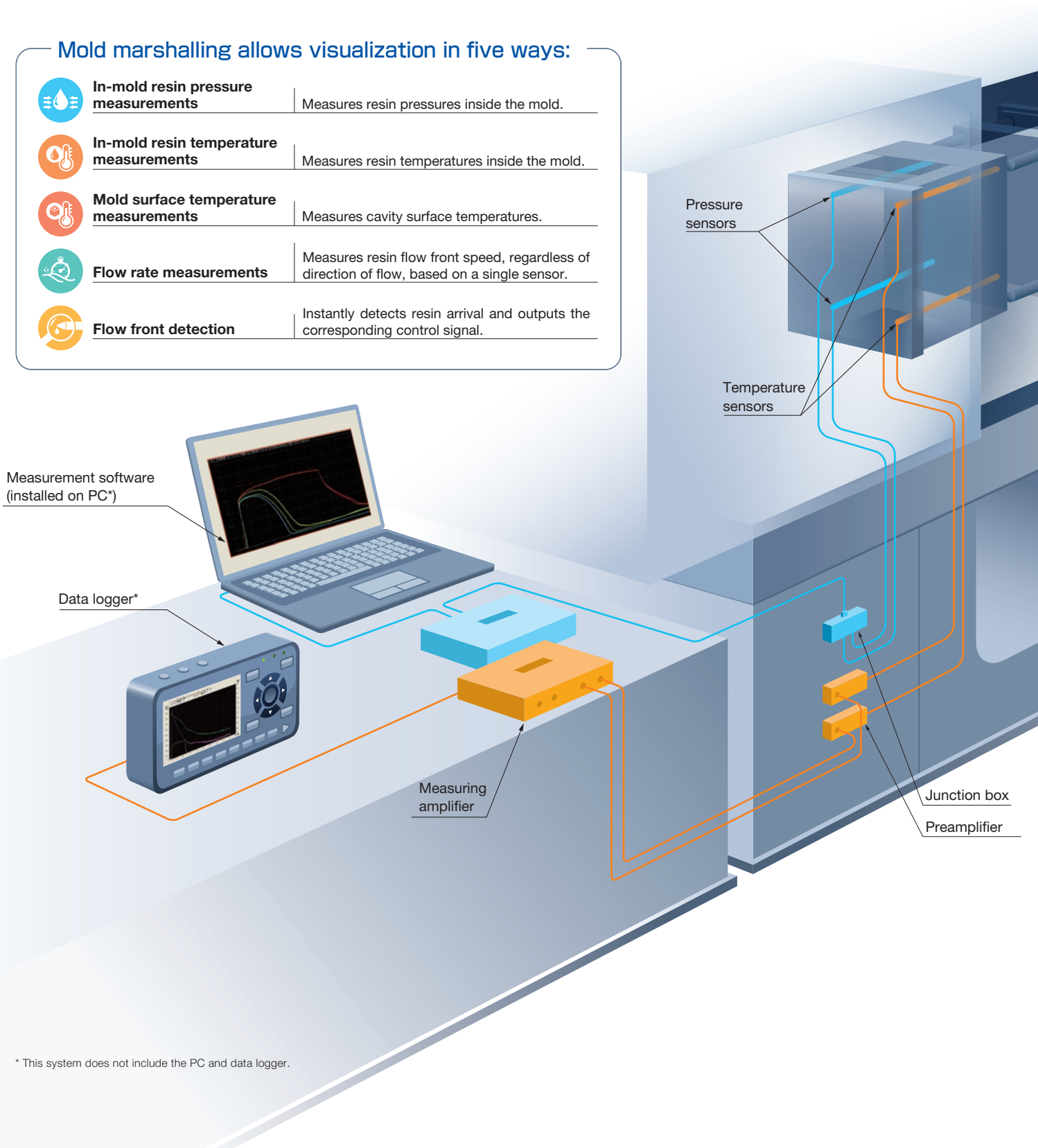
Visualizing inside molds

Measuring system improves injection molding quality and reduces costs

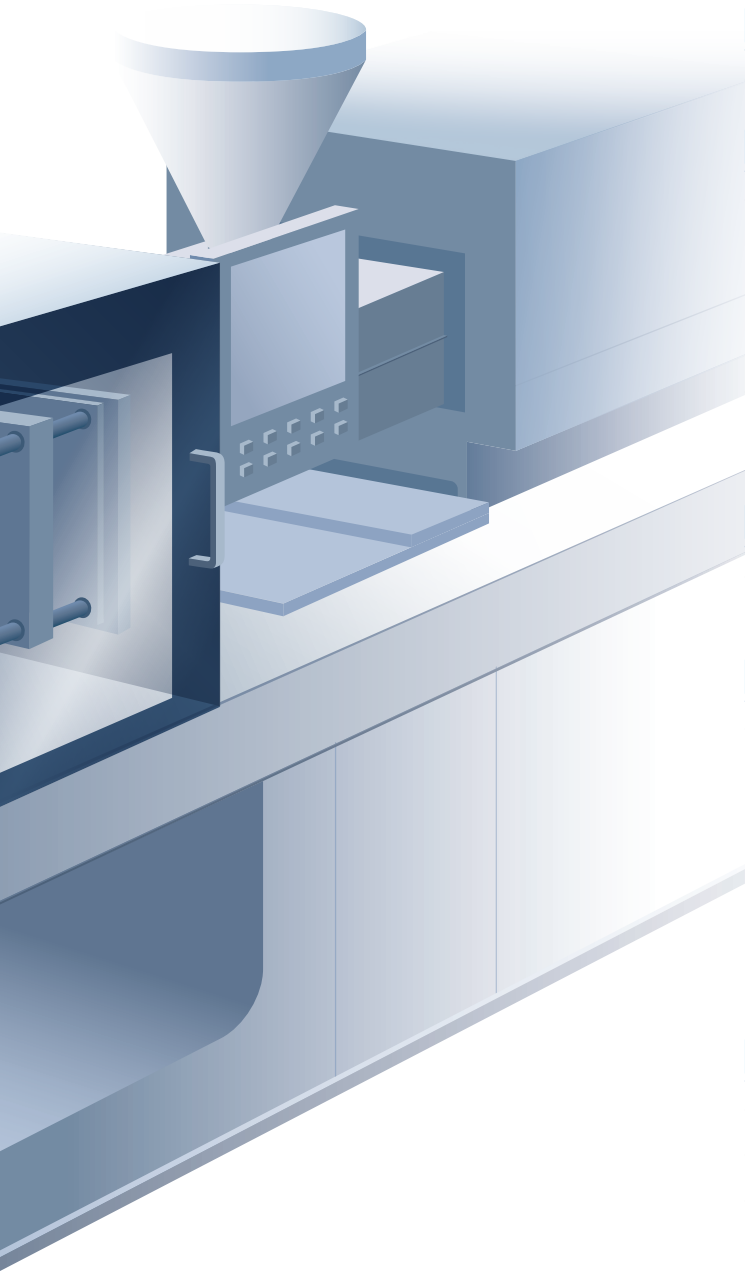
The mold marshalling system is an injection molding measuring system that uses sensors and special-purpose amplifiers installed inside a mold to convert the behavior of the resin inside the mold (the mold itself previously regarded as something of a black box) into a signal or voltage. The system outputs 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 five 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.
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 MPS08S and MFS02S with dedicated software

Compact

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

Functional

- Allows simultaneous measurement at multiple points.
  - MPS08S resin pressure measuring amplifier: 8-point simultaneous measurement (measurement at up to 24 points)
  - MPV04S resin pressure measuring amplifier: 4-point simultaneous measurement
  - EPT001S resin temperature measuring amplifier: 4-point simultaneous measurement
  - MFS02S 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 MPS08S and MFS02S with dedicated software

MOLD MARSHALLING SYSTEM

Futaba

MOLD MARSHALLING SYSTEM VOL.8

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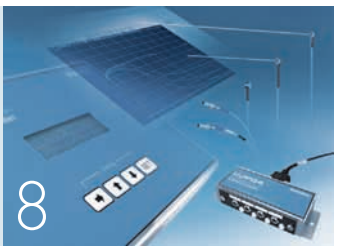
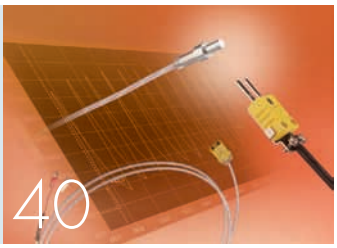
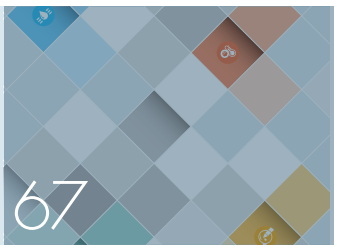
Repairs

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.

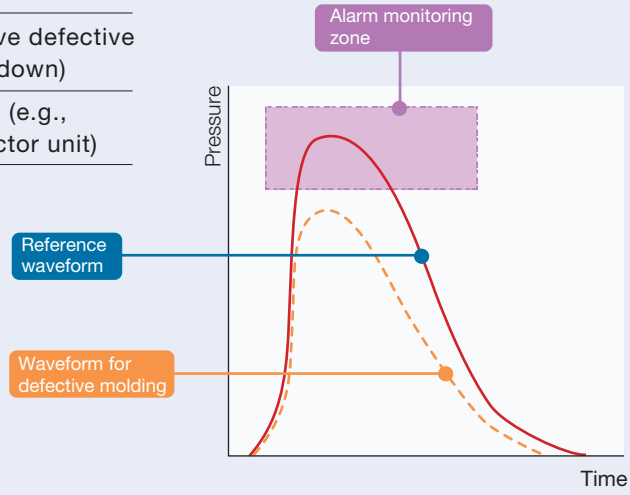
Pressure measuring system

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)



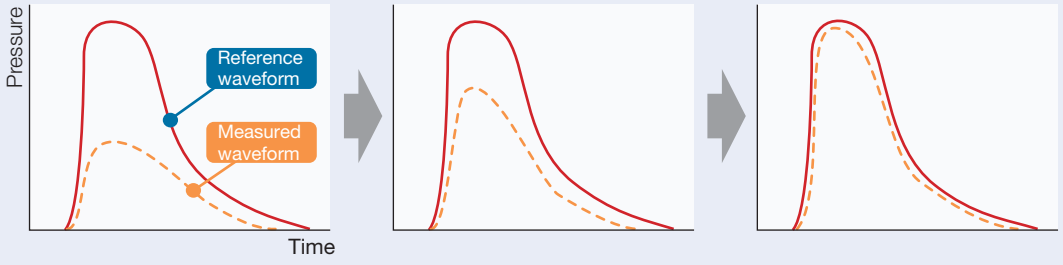
Pressure measuring system

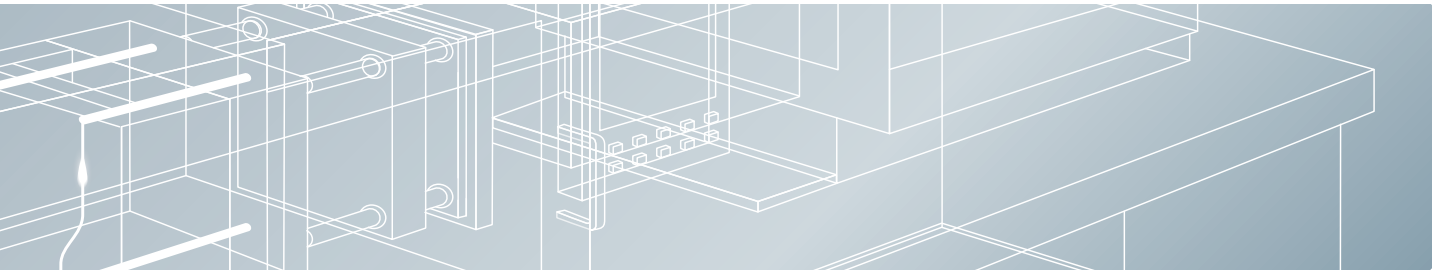
Setting molding parameters after changes in molding machine or molding location

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)





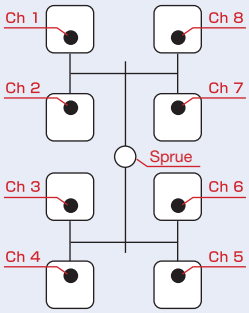
Pressure measuring system

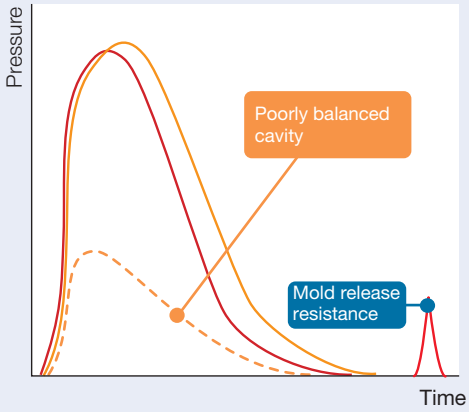
Mold structural and flow analysis

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

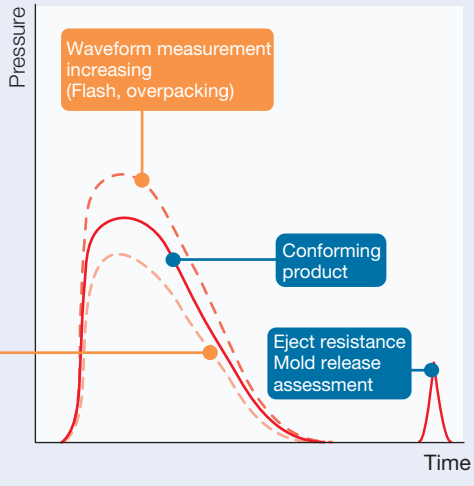
In-mold pressure waveform and confirmation of correlation to molding defect

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 77 for details.



Advantages

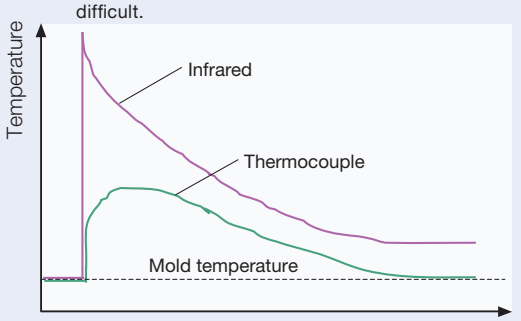
Resin temperature measuring system

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)

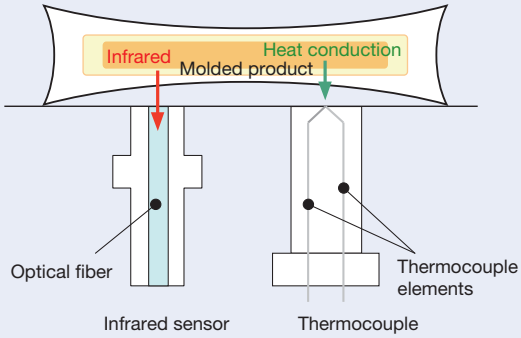
The system makes it possible to track rapidly changing resin temperatures inside the mold. In contrast, standard thermocouples feature response times on the order of several seconds, making measurements of peak temperature difficult.



Comparison of waveforms for infrared and thermocouples
(compared inside identical mold)

■ Noncontact temperature measurement (optical fiber infrared method)

In contrast to thermocouples and other contact sensors, non-contact 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.



Mold surface temperature measuring system

Reducing numbers of discarded shots

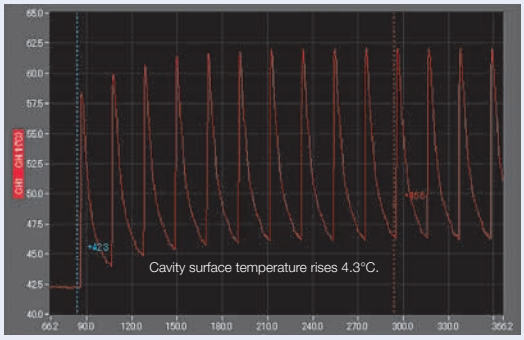
Enables decision-making based on data from molding start until the mold temperature stabilizes to minimize discarded shots (i.e., reduce resin waste), reducing environmental burdens. For example, at a plant where the first 30 shots after starting molding are customarily discarded, the ability to determine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

■ Molding conditions

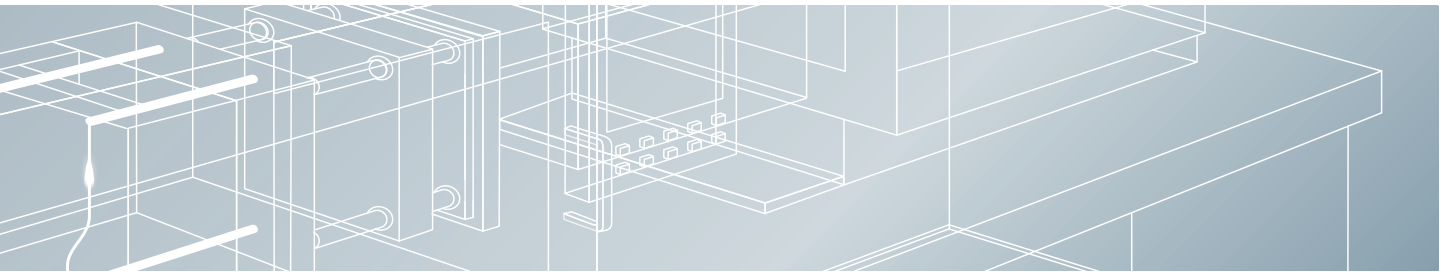
Molded product size:	70×40
Resin:	PP
Temperature controller temperature setting:	40°C (cartridge heater)

■ 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

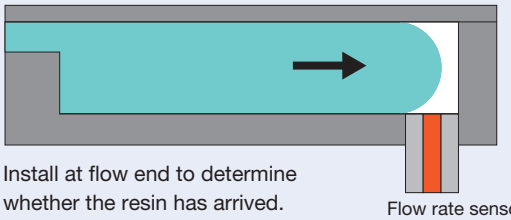


Flow rate measuring system

Visual defect detection and mold maintenance timing detection

Benefits expected from flow rate sensors

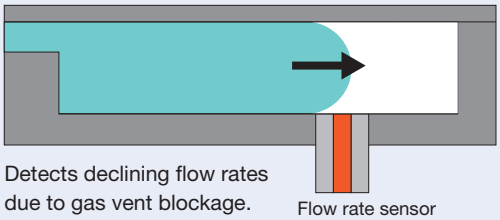
■ Short shot detection (on/off)



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

Flow rate sensor

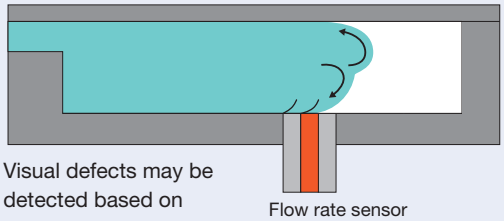
■ Mold maintenance timing detection



Detects declining flow rates due to gas vent blockage.

Flow rate sensor

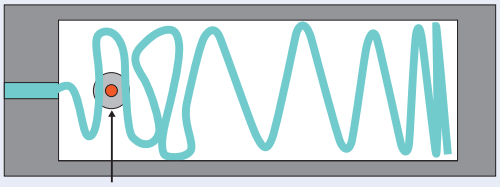
■ Detection of visual defects such as silver streaks and flow marks



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 silver streaks and flow marks



Flow rate sensor

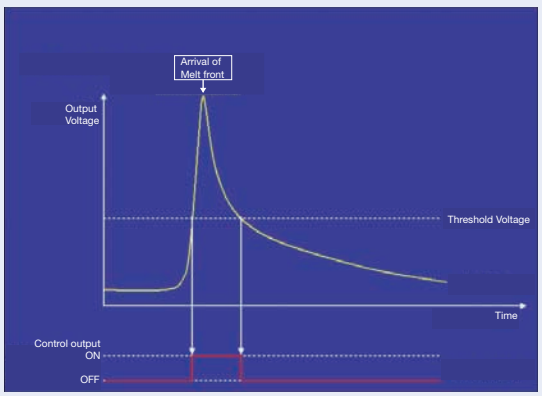
Jetting results in clearly different waveforms.

Flow front detection system

V-P transfer timing control

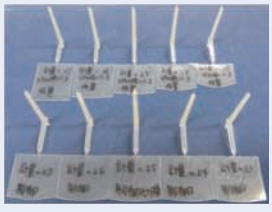
(Controlling flow using infrared output as a V-P transfer control signal)

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.



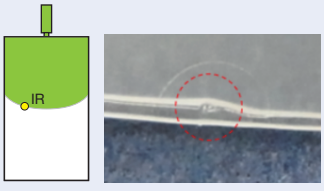
Screen showing typical signal operation

Reproducing V-P transfer position variation



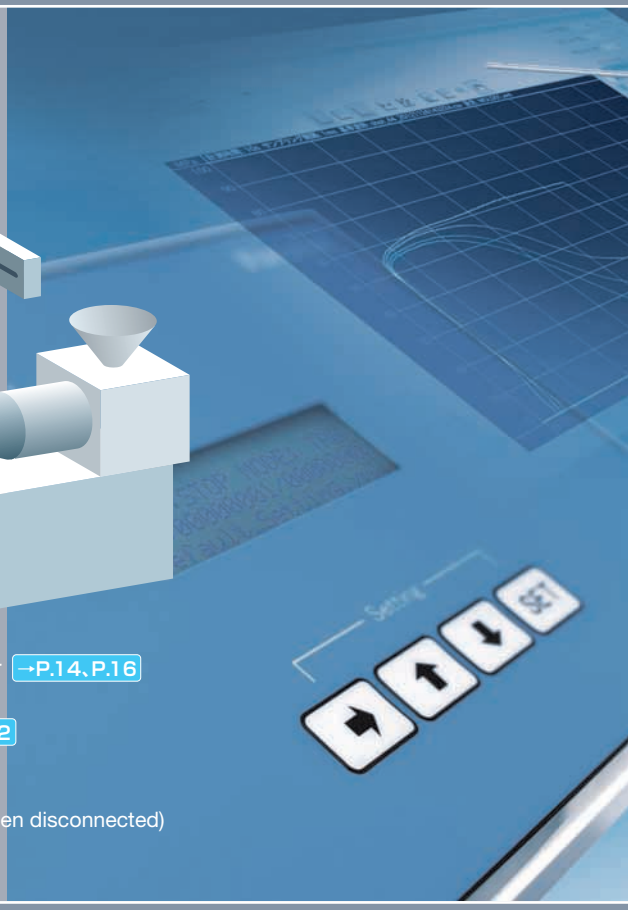
Molded product sample

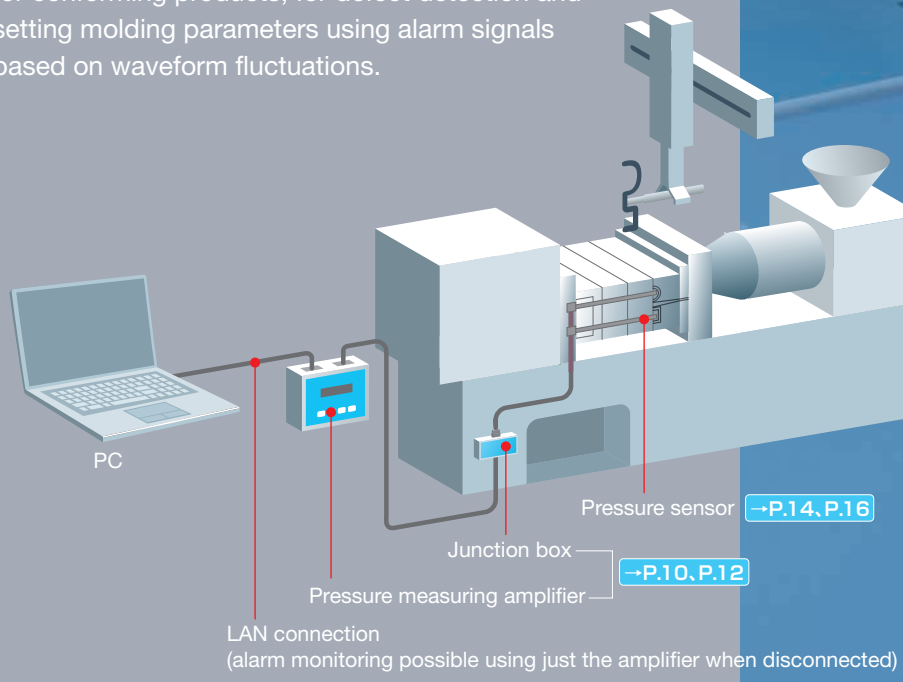
Sensor location



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.

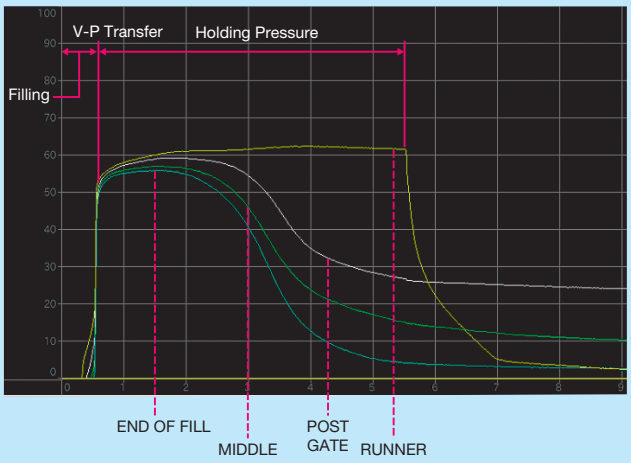




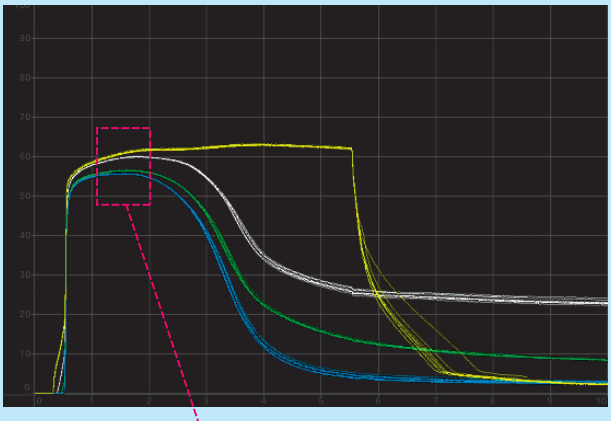
Measured waveform

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 ranges can be set to effectively monitor for defects such as short shots and overpacking during mass production.

Reference waveform and in-mold pressure waveforms

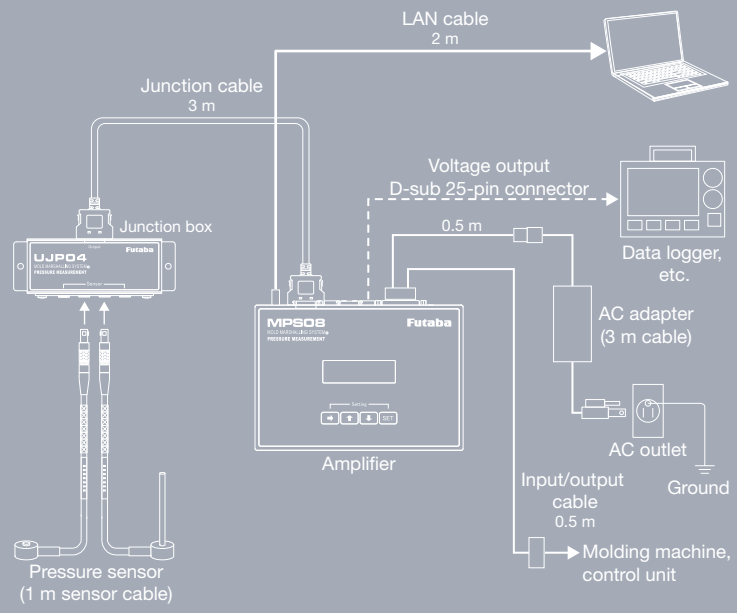


Overlaid pressure waveforms



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

[System configuration diagram]

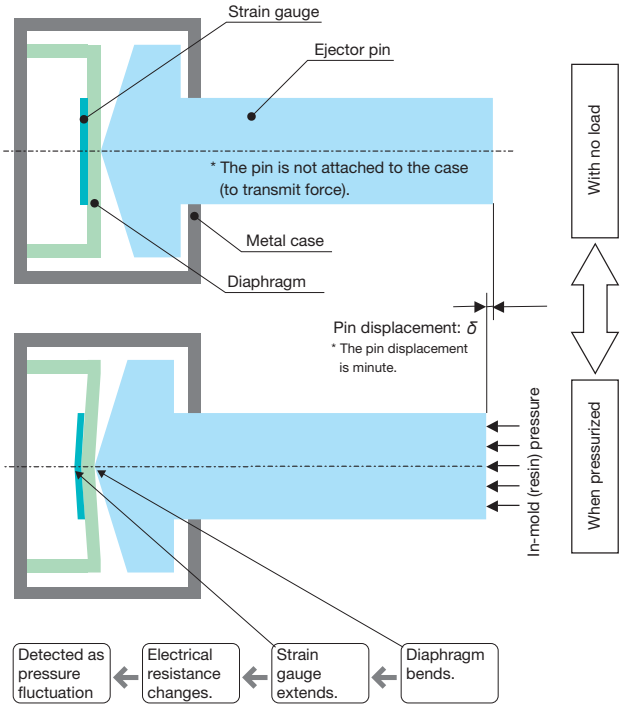


*1 PC and data logger are not included with this system.
*2 Recommended PC specifications (CPU: Core 2 Duo 1.2 GHz or higher; memory: minimum 1 GB)

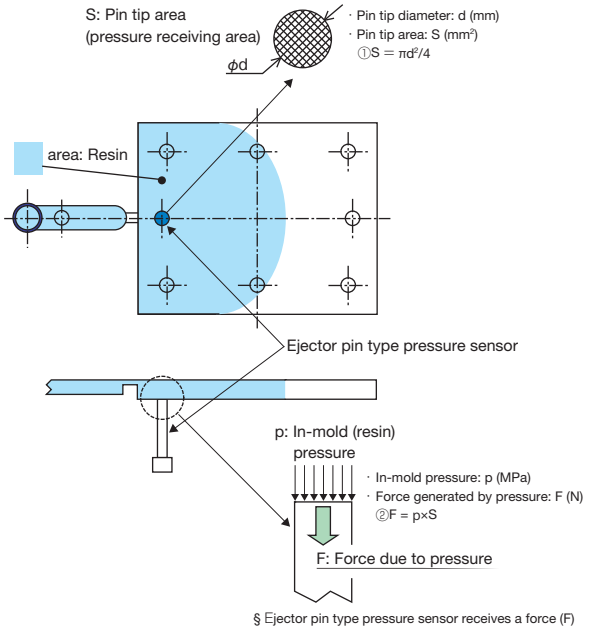
Measuring principles

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

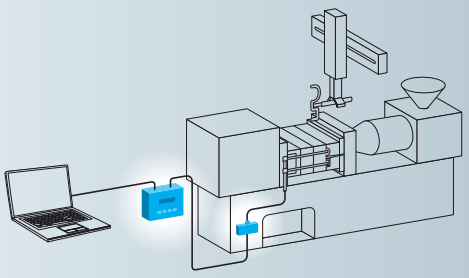


§ Ejector pin type pressure sensor receives a force (F) from in-mold resin pressure in direction toward the flange.

Pressure measuring amplifier

MPS08S

CE *1



- CE compliant*1 pressure measuring amplifier (model MPS08)
- Allows simultaneous measurement of eight channels with a single unit.
- Up to three amplifiers can be linked to allow simultaneous measurement of up to 24 channels.
- Either English- or Japanese-language interface selectable via measurement software
- Integrates three different earlier models (EPA PC connected type, EPC mass production monitoring type, and EPV analog voltage output type) into a single unit*2

*1 Must be used in conjunction with SSE series or SSB series pressure sensors.
*2 With the MPS08, the "Amplifier internal memory data saving function" for the earlier EPC (mass production monitoring type) model has been modified to save data to the connected PC.

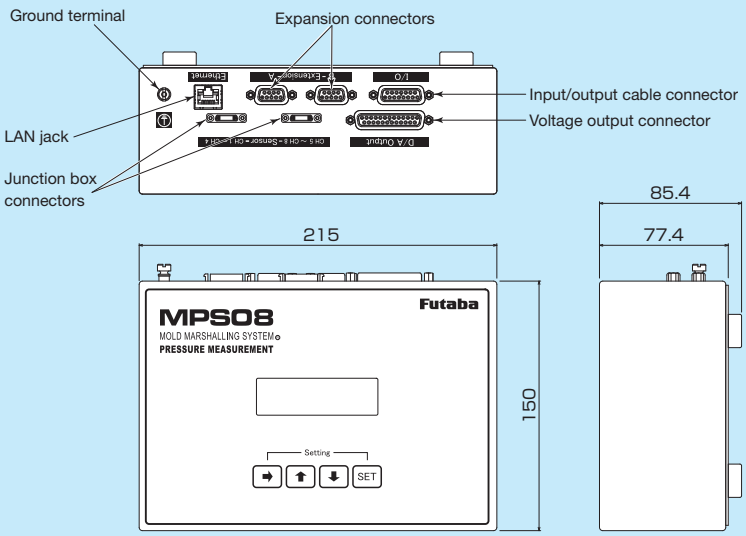
Specifications

MPS08S pressure measuring amplifier set

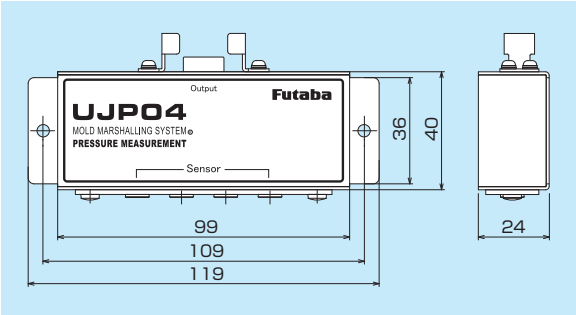
Product code		MPS08S N+W
Number of measurement points		4 (expandable to 8)
Analog voltage output	Output voltage	0.0 V to 10.0 V (20 MPa/V)
	Impedance	100 Ω
Accuracy		±2% F.S.
Sampling interval*6		1 ms / 5 ms / 10 ms / 20 ms
Sampling period*7		Max. 120 s
Measurement range		0 MPa to 200 MPa*3
Power supply 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	0°C to +50°C (Junction box: 0°C to +70°C)
	Operating humidity	35% to 85% RH (no condensation)
Weight		Approx. 1,900 g
Accessories		Junction box (×1), junction cable (×1)*4, AC adapter, signal input/output cable, LAN cable, measurement software
Recommended hardware (PC) specifications		Processor: Intel Core II Duo CPU or higher Required memory: minimum 1 GB

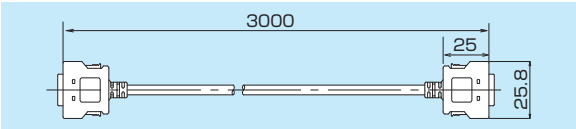
*3 The upper limit measurement range will vary depending on the sensor measurement range.
*4 Note that eight-point measurement requires the purchase of an additional junction box and junction cable set.
*5 See page 21 for measurements of more than eight points.
*6 Interval for measuring data: 1 ms (1/1,000 second) means the acquisition of 1,000 data items per second.
*7 The time period for which data can be measured

External dimensions



Junction box





UJP04 junction box

Product code	UJP04

AMUJP junction box mounting magnets (2-magnet set)

Product code	AMUJP
Accessories	Phillips pan head screw and nut set (2 sets)

WJP0430 junction cable

Product code	WJP0430

Signal input/output cable extension assembly (available separately)

This cable (2 m) is used to transmit triggers, alarms, alarm cancellation, and other signals to the molding machine (fitted with Y terminals for easy connection).

Product name	Product code
Signal input/output cable extension assembly	WCI0020-E-D9S-Y N-MPS08

Voltage output cable (available separately)

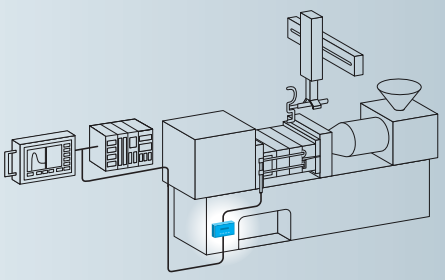
This cable (2 m) is used to transfer the pressure values measured for each channel as analog voltages to a data logger, molding machine, or other external device. When expanding or linking multiple amplifiers, a separate cable is required for each additional MPS08.

Product name	Product code
Voltage output cable	WCI0820-V-D25P-Y N-MPS08

Pressure measuring amplifier

MPV04S (Analog voltage output type)

CE *1 RoHS 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.

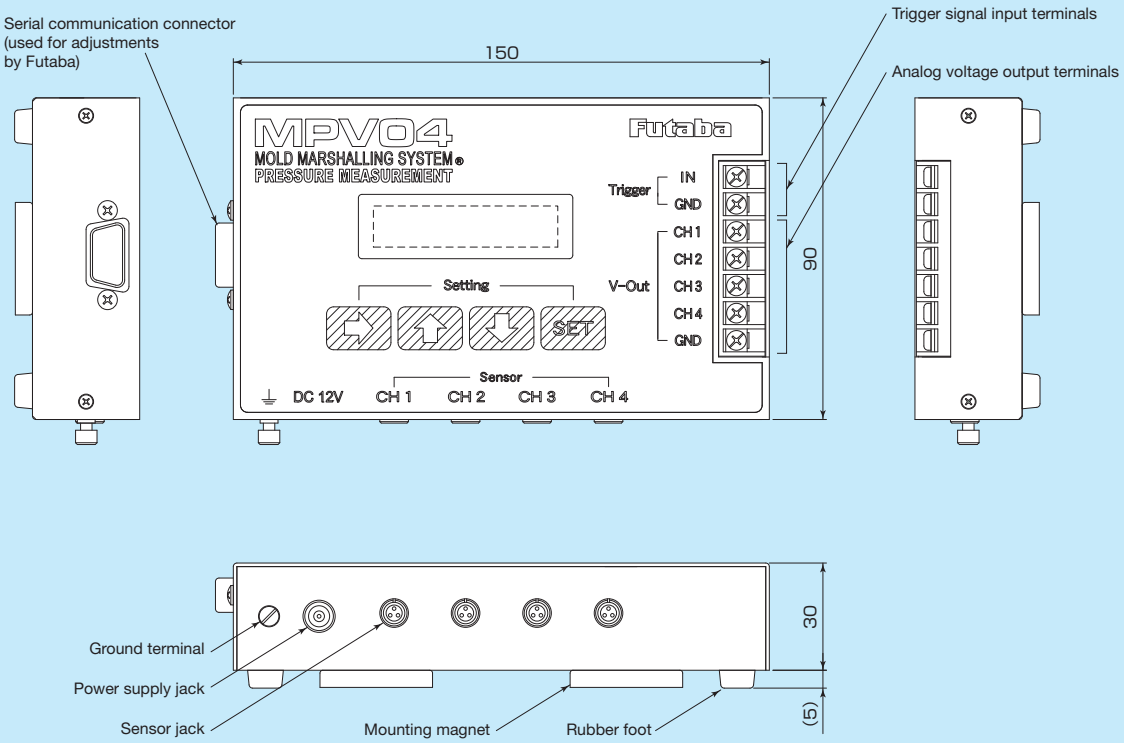
Specifications

MPV04S pressure measuring amplifier set

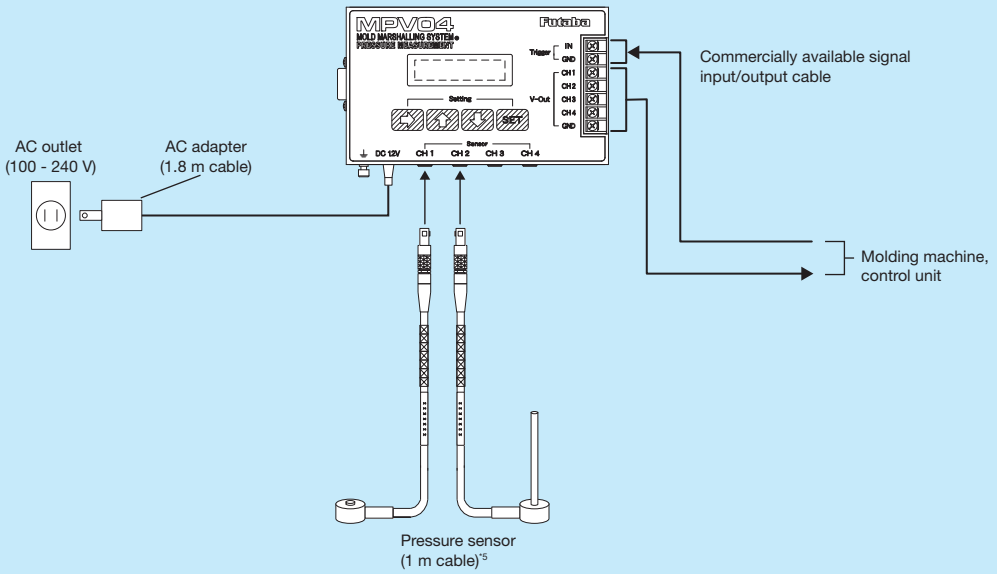
Product code		MPV04S
Number of measurement points		4
Analog voltage output	Output voltage	0.0 V to 10.0 V (20 MPa/V)*2
	Impedance	100 Ω
Accuracy		±2% F.S.
Sampling interval*3		1 ms
Measurement range		0 MPa to 200 MPa*4
Power supply specifications	Power supply	12 V DC (dedicated AC adapter, input 100 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



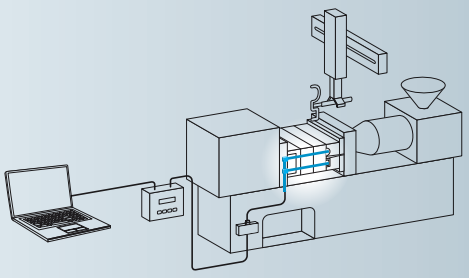
System configuration diagram



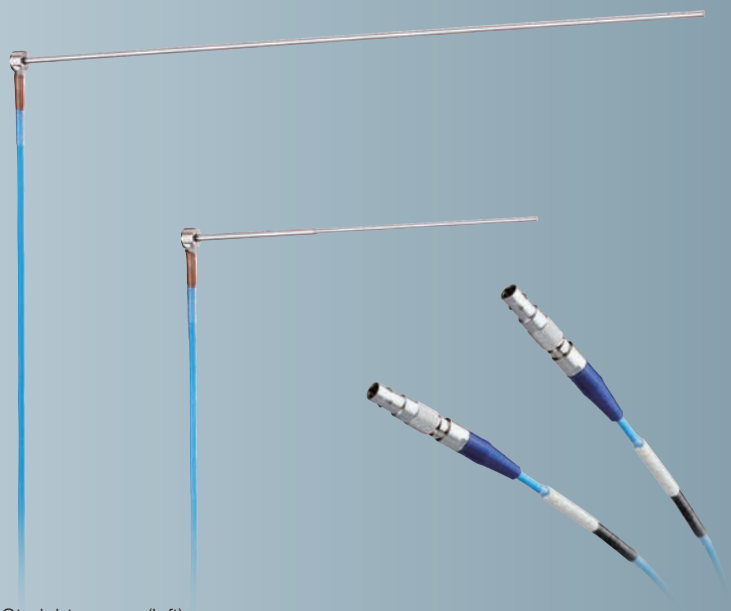
*5 Products with customer-specified cable lengths are also available. (→ pages 15 and 17)

Ejector pin type SSE series

CE *1



- 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 MPS08 or MPV04 pressure measuring amplifier.
*2 Machining such as flange cutting to prevent rotation is not possible.

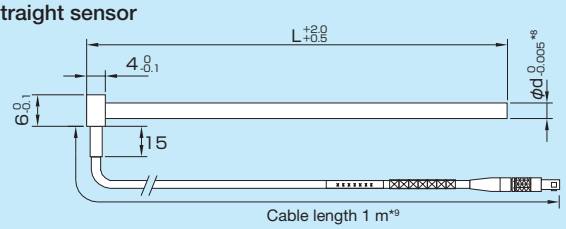
Specifications

Product code		SSE series (→ page 26)						
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						

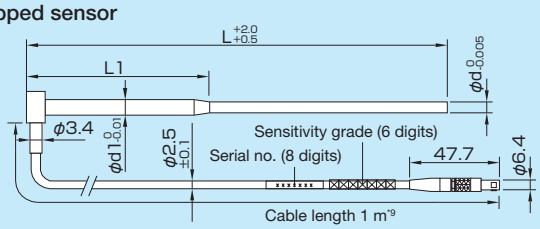
*3 Indicates deflection on the protruding side under the rated capacity load.
*4 SSEEJ-3.0×400 is SKD61. Hardness 900 HV minimum (nitride treated after tempering) (→ page 26)
*5/6 Explanation of terms on page 77
*7 Incompatible with earlier pressure measuring amplifiers (EPA, EPC, EPV)

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.

Mounting method (for mounting in spacer type molds)

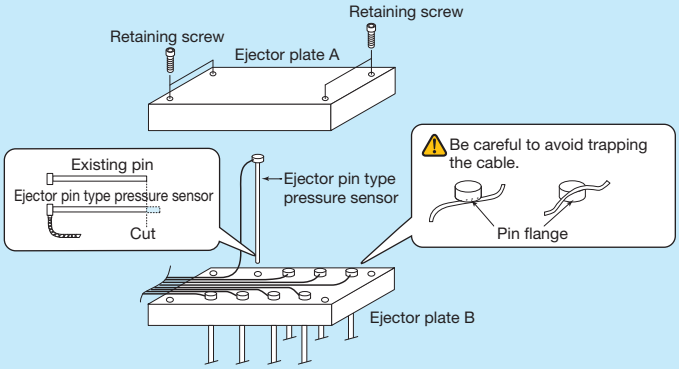
STEP 1 Loosen the retaining screws, remove ejector plate A, and remove the ejector pin from the location to be measured.

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.

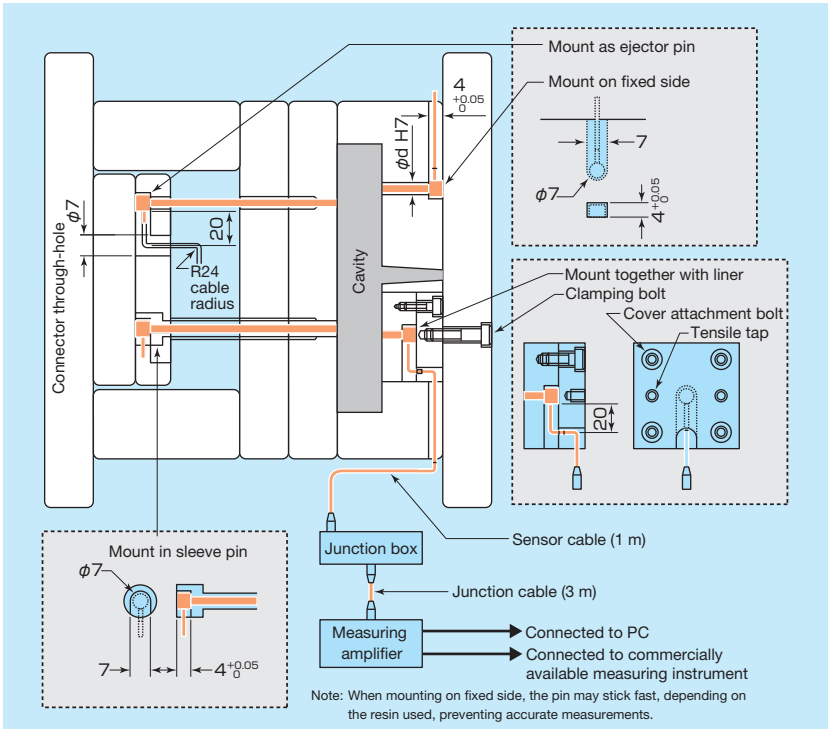


Mounting example

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

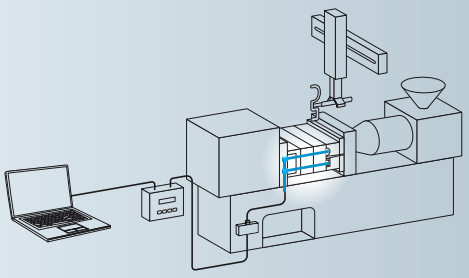
Sensors with customer-specified pin diameters, pin lengths, and step lengths are available.
Please contact your nearest Futaba sales office.
(Specifications will be determined based on consultations.)
It may not be possible to offer products for certain specifications.



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



- 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).

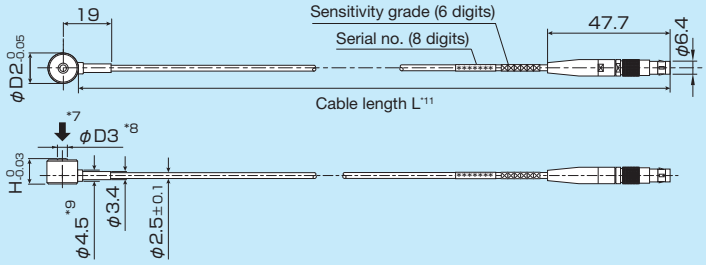
*1 Must be used in conjunction with an MPS08 or MPV04 pressure measuring amplifier.

Specifications

Product code	SSB050N08×06	SSB200N08×06	SSB01KN08×06	SSB050N08×06H	SSB200N08×06H	SSB01KN08×06H	SSB04KN10×08H*6	SSB16KN12×10H*6
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 77
*5 Incompatible with earlier pressure measuring amplifiers (EPA, EPC, EPV)
*6 Download the latest version of the measurement software to connect to the MPS08 and MPV04 pressure measuring amplifiers. For details, please contact your nearest Futaba sales office.

External dimensions



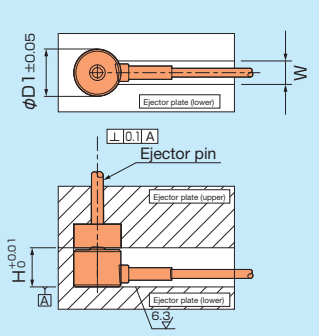
Dimensions table

Rated capacity	D2	D3	H	L
50 N/200 N/1 kN	8	2	6	1,000
4 kN	10	4	8	2,000
16 kN	12	4	10	2,000

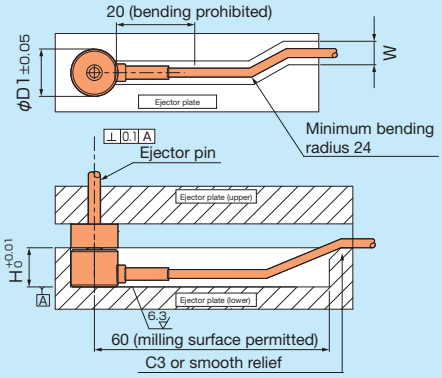
*7 Loading direction: The arrow in the diagram indicates the positive load direction.
*8 The height of the protruding section is 0.5 mm for all types.
*9 Steps are available only with the large capacity types (4 kN and 16 kN).
*10 This sensor supports loads via the case outer circumference.
Do not use the rear cover to support a load; it is not designed to withstand loads.
*11 Products with customer-specified cable lengths are also available.

Mounting example

Ejector plate specifications Counterbored type



Ejector plate specifications Spacer type

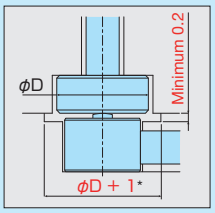


Dimensions table

Rated capacity	D1	H	W
50 N/200 N/1 kN	8.1	6	5
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 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 16).

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				

Accessories

For MPS08 measuring amplifier

Amplifier interconnection cable — Length: 0.5 m

This cable is used to expand or link amplifiers and to supply power.
Up to three amplifiers can be linked.

■ **Product code : WCM0005-L-D9P-D9P N-MPS08**

Voltage output cable — Length: 2 m

This cable is used to output the 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 MPS08.

■ **Product code : WCI0820-V-D25P-Y N-MPS08**

Signal input/output cable extension assembly — Length: 2 m

This cable is used to transmit triggers, alarms, alarm cancellation, and other signals to the molding machine (fitted with Y terminals for easy connection).

■ **Product code : WCI0020-E-D9S-Y N-MPS08**

Tester connector cable — Length: 1 m

This cable is used to check for disconnection of pressure sensors.

■ **Product code : ATCS**

For junction box

Junction box mounting magnets　Set of two magnets

■ Product code : AMUJP

Junction box connector dust cap

■ Product code : ADUJP

Pressure sensor adapter for EPS series

Adapter required to use the MPS08 pressure amplifier with earlier pressure sensors (EPS series)

■ Product code : ACAE01

Junction cable　Length: 5 m

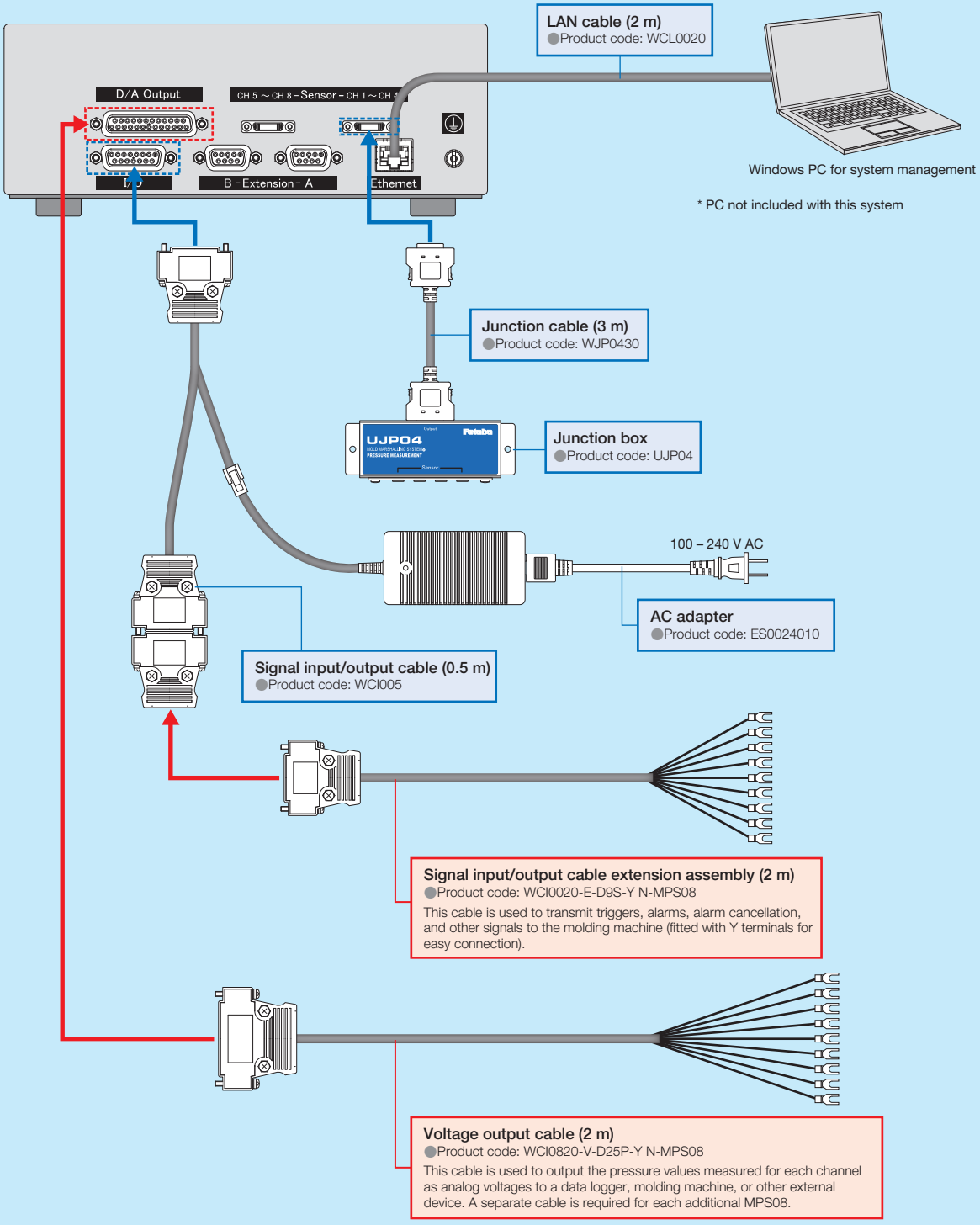
Extends the 3 m standard cable included in the pressure measuring amplifier set to 5 m.

■ Product code : WJP0450

Connection diagram

Connection diagram for MPS08S pressure measuring amplifier set accessories and optional cables

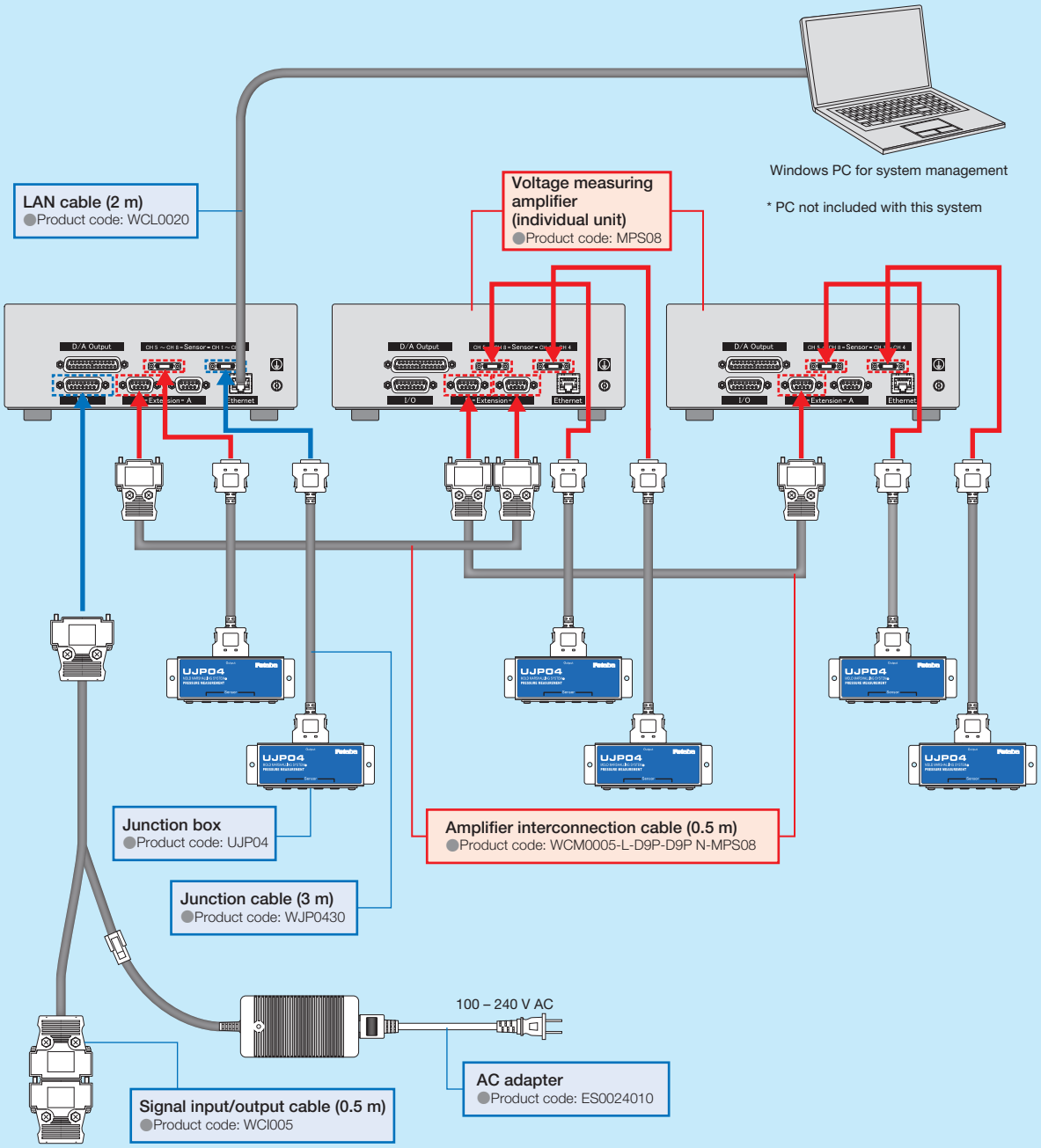
The five items indicated by blue boxes are included as accessories in the MPS08S pressure measuring amplifier set.
The two items indicated by red boxes are sold separately.



Connection diagram for MPS08 pressure measuring amplifier expansion

Up to three pressure measuring amplifiers can be connected using the amplifier interconnection cable (available separately) for simultaneous measurement of up to 24 channels.

* The five items indicated by blue boxes are included as accessories in the MPS08S pressure measuring amplifier set.
* A separate amplifier interconnection cable is required for each amplifier added.
* One set consisting of a junction box and a junction cable is required for every four channels.
* One AC adapter can be used to power up to three amplifiers.
* A separate voltage output cable (2 m) is required for each MPS08 added.

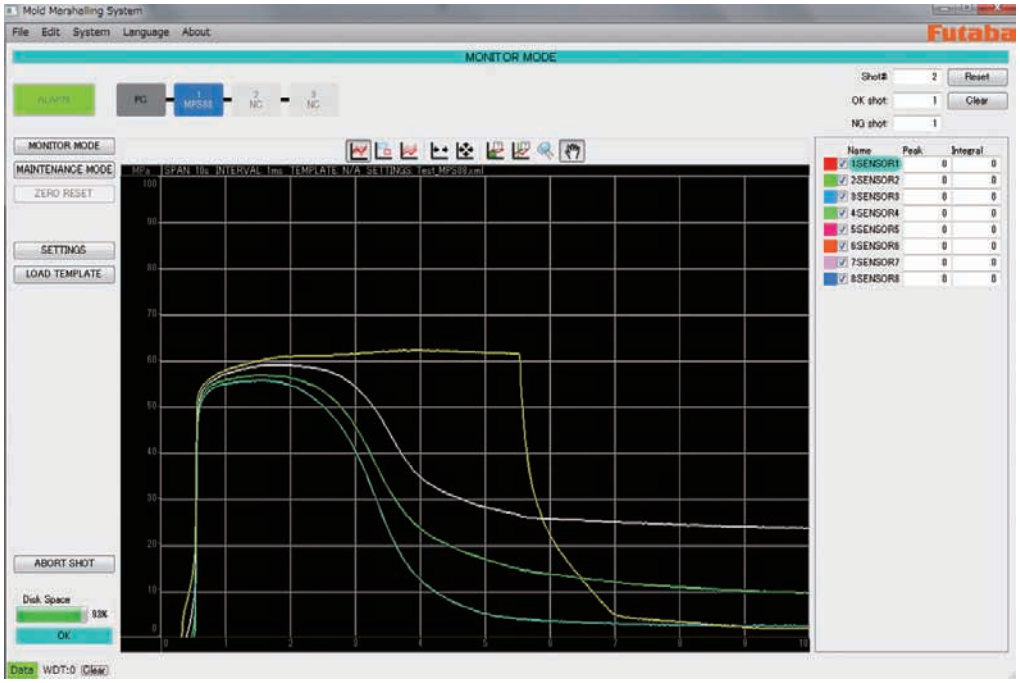


Measurement software functions

* Provided with MPS08S only

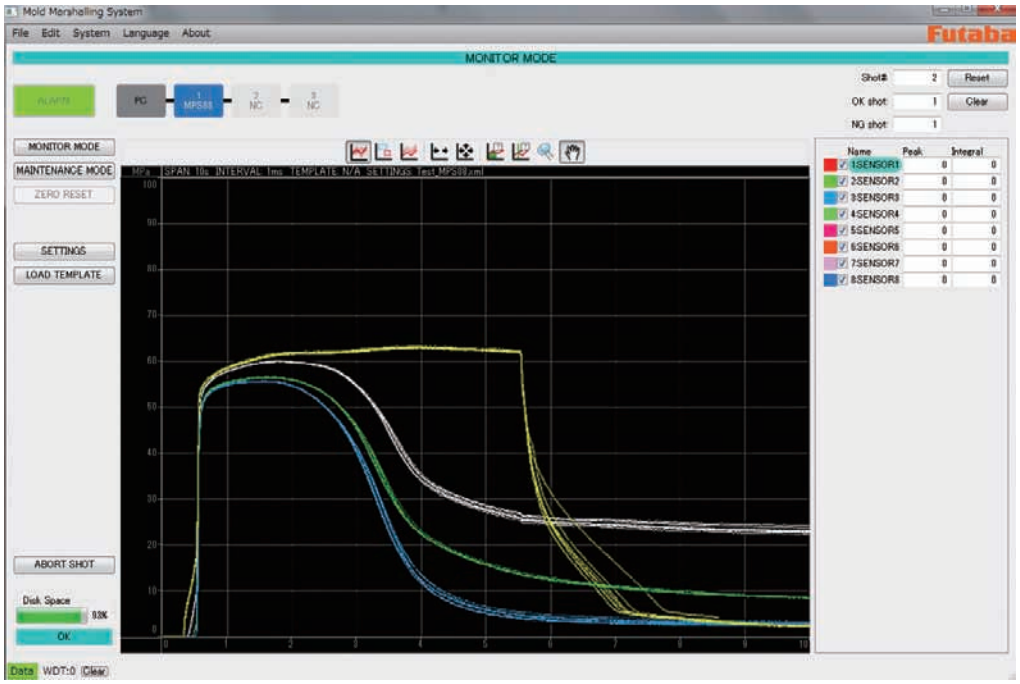
Reference waveform display

Press “LOAD TEMPLATE” to display automatically saved pressure data 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.



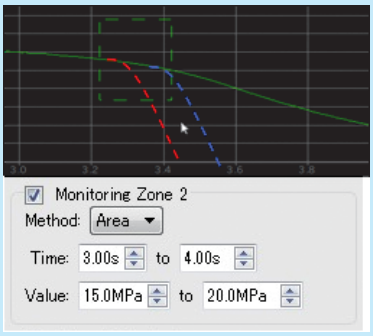
Alarm signal output

Multiple monitoring ranges can be set based on the reference waveform. If the waveform is outside the monitoring range, 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 six parameters can be monitored for each channel.)

① Area pressure monitoring

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

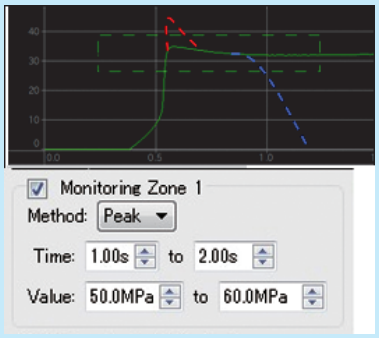
Monitors whether all measurements are within the preset pressure range over the specified monitoring timeframe.



② Peak pressure monitoring

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

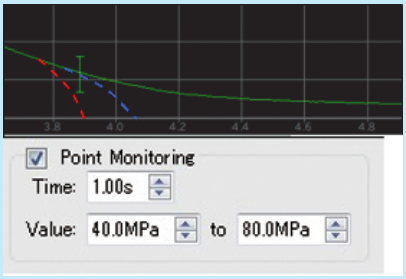
Monitors whether the maximum pressure (peak pressure) value falls within the preset pressure range over the specified monitoring timeframe.



③ Monitoring after t seconds

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

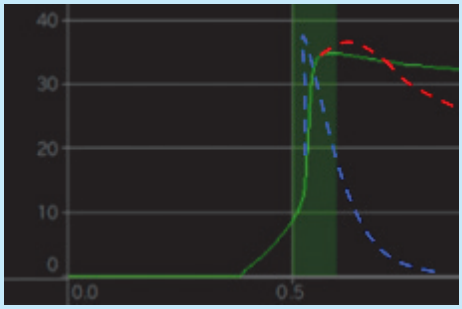
Monitors whether the pressure value falls within the preset pressure range after the specified time period.



④ Peak pressure arrival time monitoring

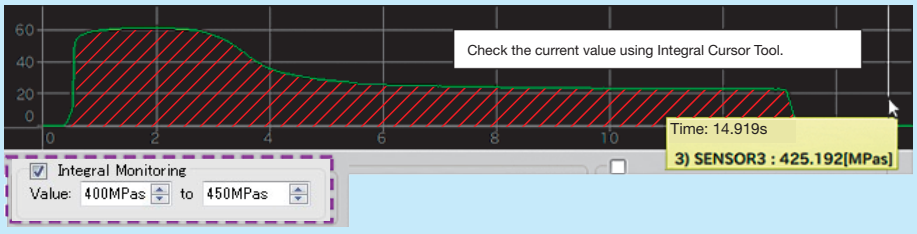
[Blue broken curve: OK / Red broken curve: Alarm]

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



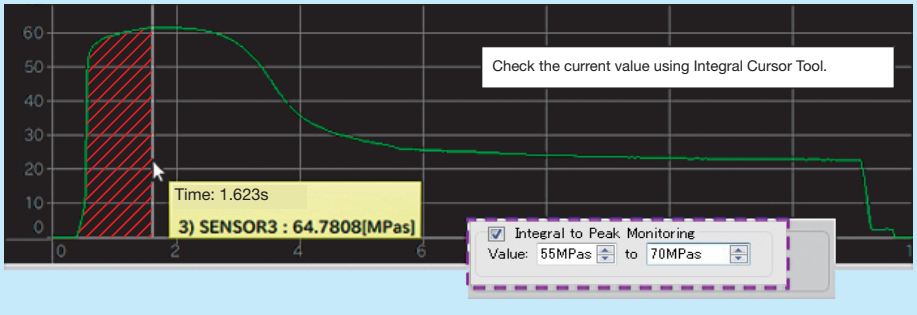
⑤ Integral monitoring

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.



Measurement software functions

* Provided with MPS08S only

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 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. 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 uploaded 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 uploaded 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 range 1 evaluation</td></tr>
<tr><td>Z2</td><td>Monitoring range 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>

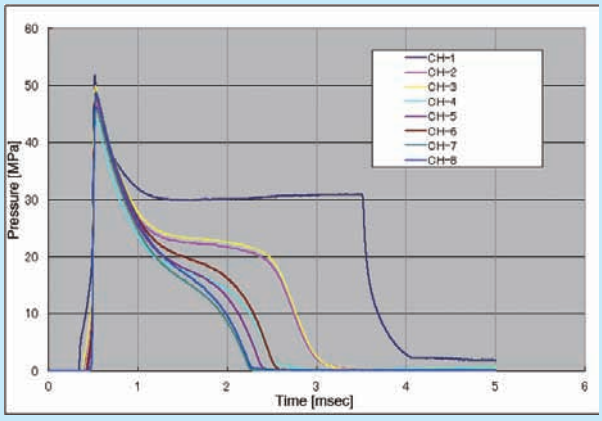
Example of use with spreadsheet applications

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	9.2	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

Product name	Product code
Pressure measuring amplifier set Junction box (×1), junction cable (×1), AC adapter, signal input/output cable, LAN cable, and measurement software	MPS08S N+W
Pressure measuring amplifier	MPS08
Junction box	UJP04
Junction cable (3 m)	WJP0430
AC adapter	ES0024010
Signal input/output cable (0.5 m)	WCI005
LAN cable (2 m)	WCL0020
Measurement software	PPS N+W
Pressure measuring amplifier set (analog voltage output type) AC adapter	MPV04S
Pressure measuring amplifier (analog voltage output type)	MPV04
AC adapter	ES0012001

Accessories

Product name	Product code
Junction box mounting magnets (set of 2)	AMUJP
Junction box connector dust cap	ADUJP
Pressure sensor adapter for EPS series	ACAE01
Signal input/output cable extension assembly (2 m)	WCI0020-E-D9S-Y N-MPS08
Voltage output cable (2 m)	WCI0820-V-D25P-Y N-MPS08
Amplifier interconnection cable (0.5 m)	WCM0005-L-D9P-D9P N-MPS08
Junction cable (5 m)	WJP0450
Tester connector cable (1 m)	ATCS
Gauge plug for button type SSB series*	SSBD08×06

* Used to fill the sensor mounting hole when the sensor is removed.

Product list

Pressure sensors - Ejector pin type, standard products

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, standard products

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

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.

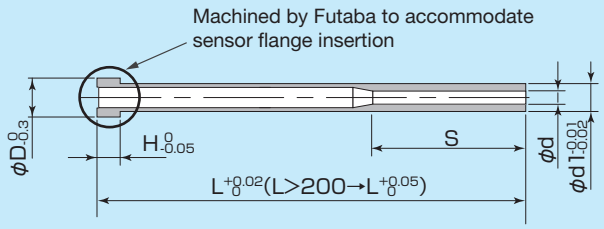
Product code: EPSSVP-○○.○×○○○.○○
(d1 / L)

* Specify the L dimension to match overall sensor length.

Material: SKD61 + nitride treatment

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

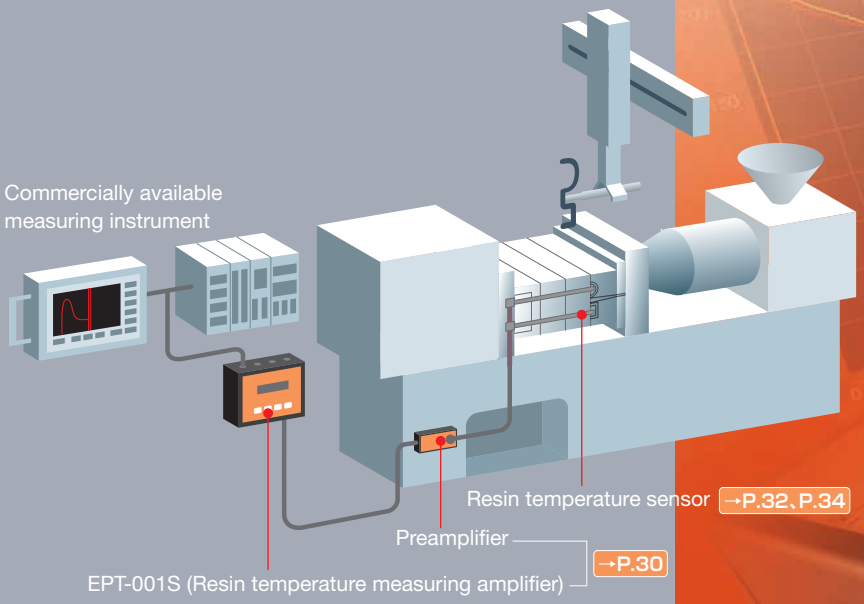
External dimennsions



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

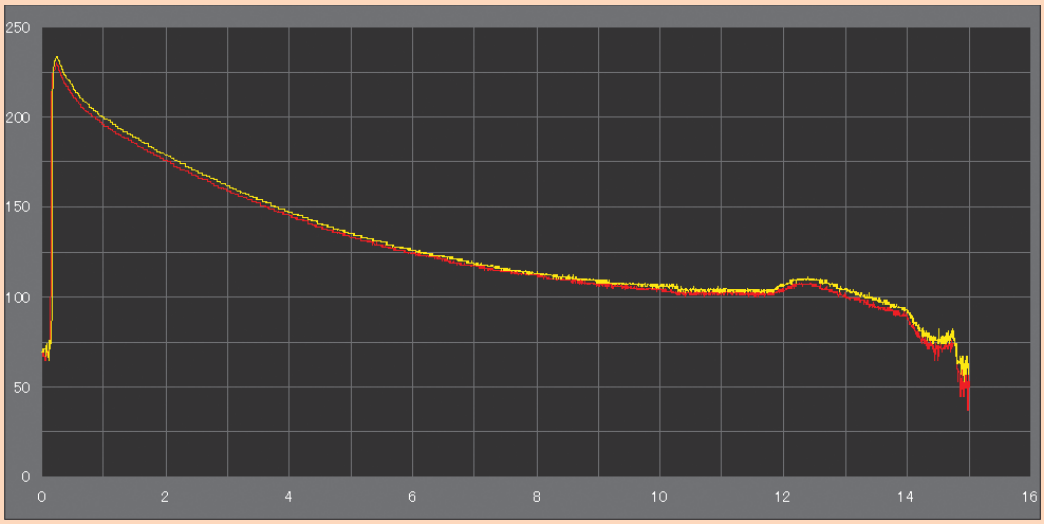
Enables real-time monitoring of resin temperatures inside the mold.



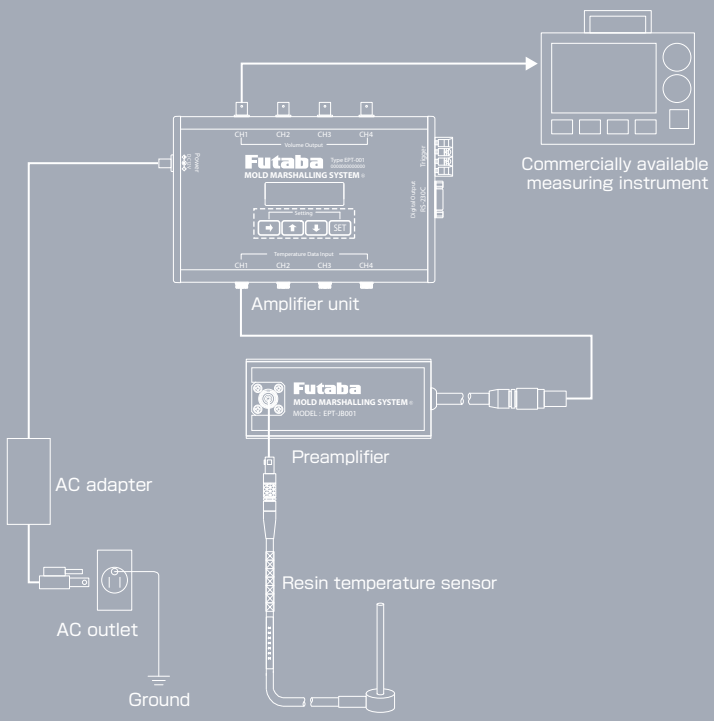
Measured waveform

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

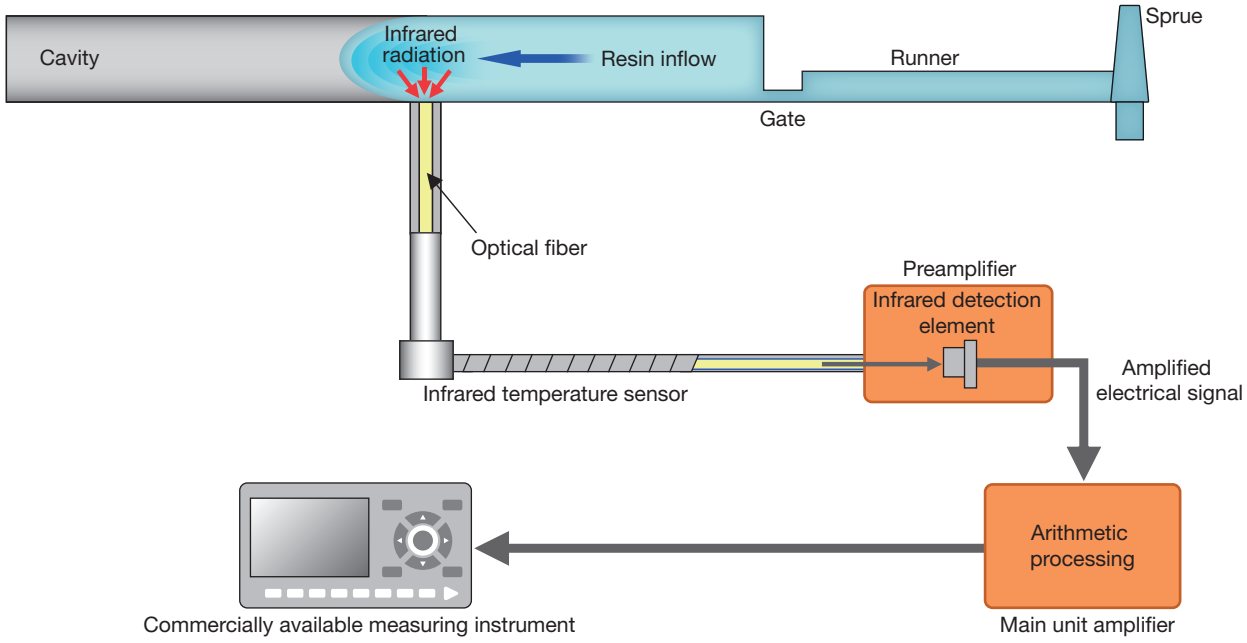


[System configuration diagram]



Measuring principles

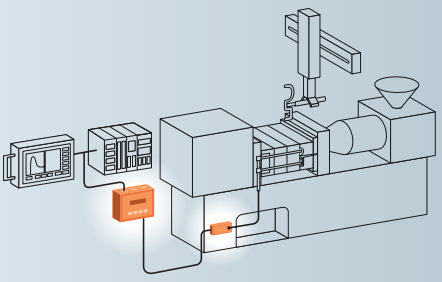
The infrared radiation emitted by the resin is conducted via optical fiber to the preamplifier, where it is converted into an electrical signal.
After conversion, it is arithmetically processed by the amplifier and output as a temperature signal.



Resin temperature measuring amplifier

EPT-001S

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

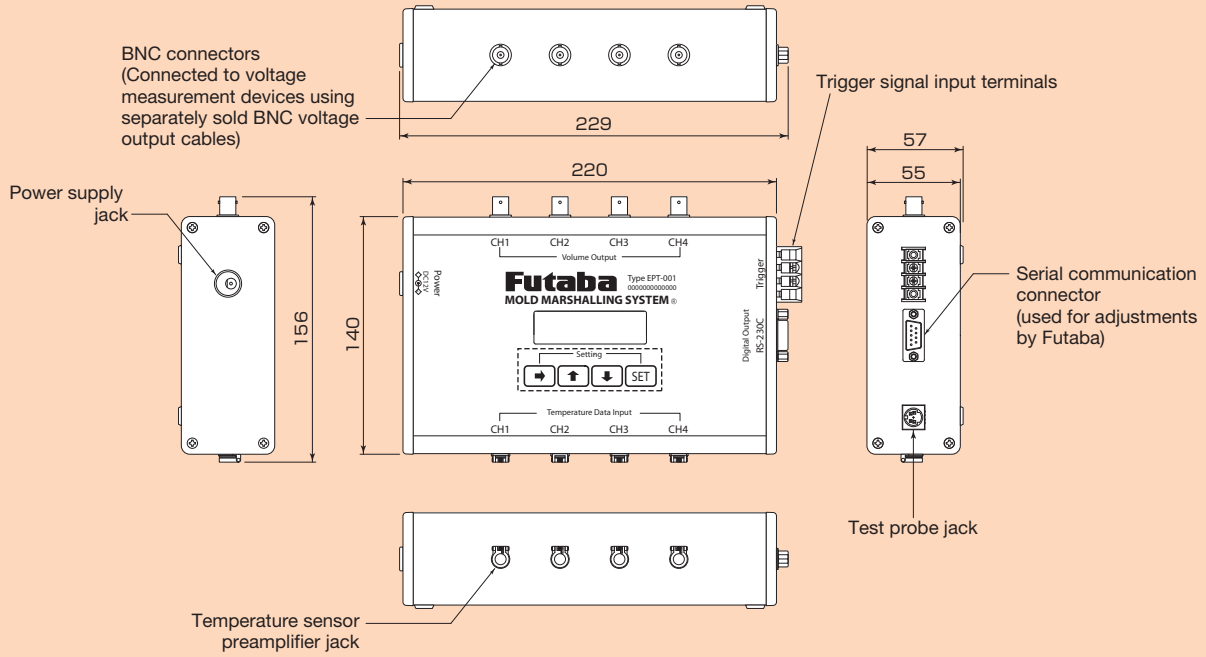
Main unit amplifier

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)

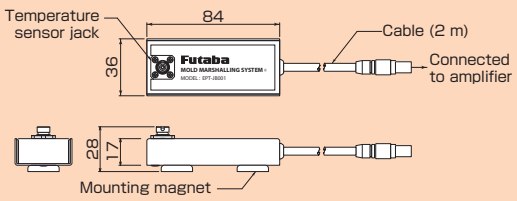
*2 Interval for measuring data: 1 ms (1/1,000 seconds) means the acquisition of 1,000 data items per second.

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

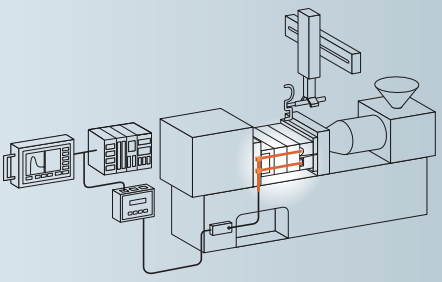
This cable is used to transfer values measured for each channel as analog voltages to a data logger, molding machine, or other external device.

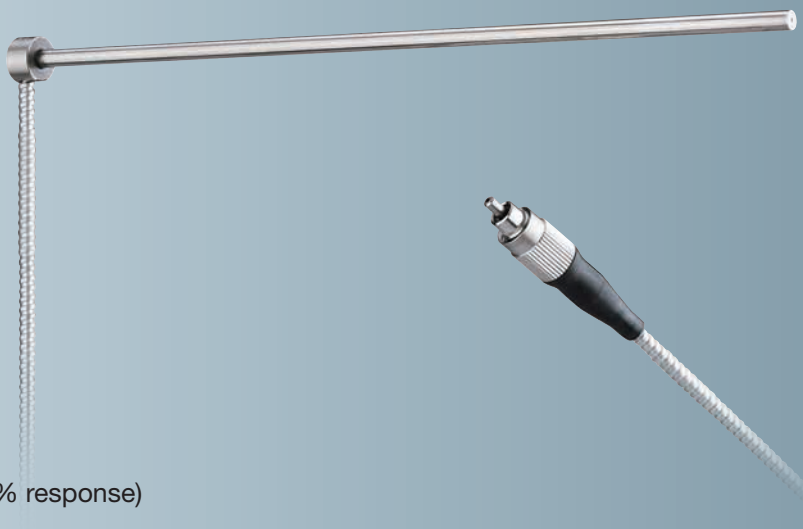
Product name	Product code
BNC voltage output cable (1 m)	EPT-VC01M
BNC voltage output cable (2 m)	EPT-VC02M

Resin temperature sensors

Ejector pin type EPSSZL series

RoHS compliant





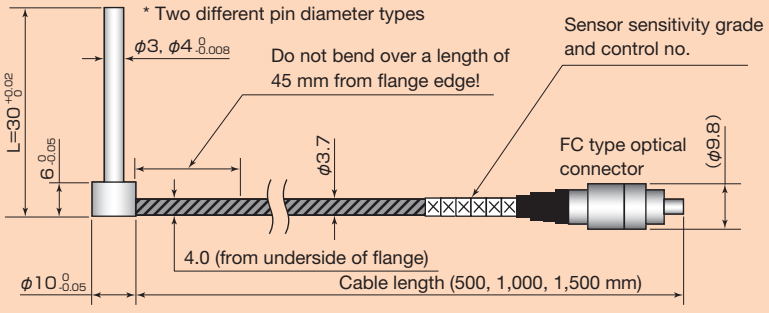
- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- Ejector pin configuration allows easy installation on mold. *1
- Capable of measuring resin temperatures from 60°C to 430°C

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

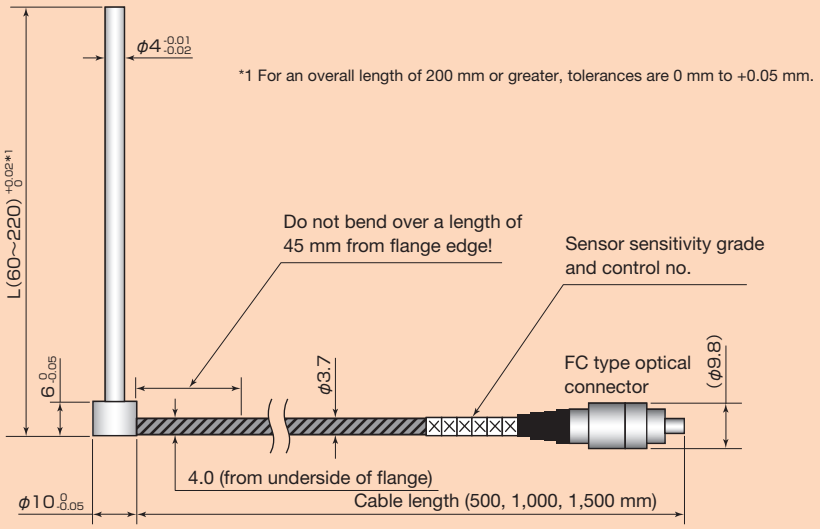
Specifications

Product code		EPSSZL series (→ page 38)
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)
Measurement range (amplifier model EPT-001S)		60°C to 430°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

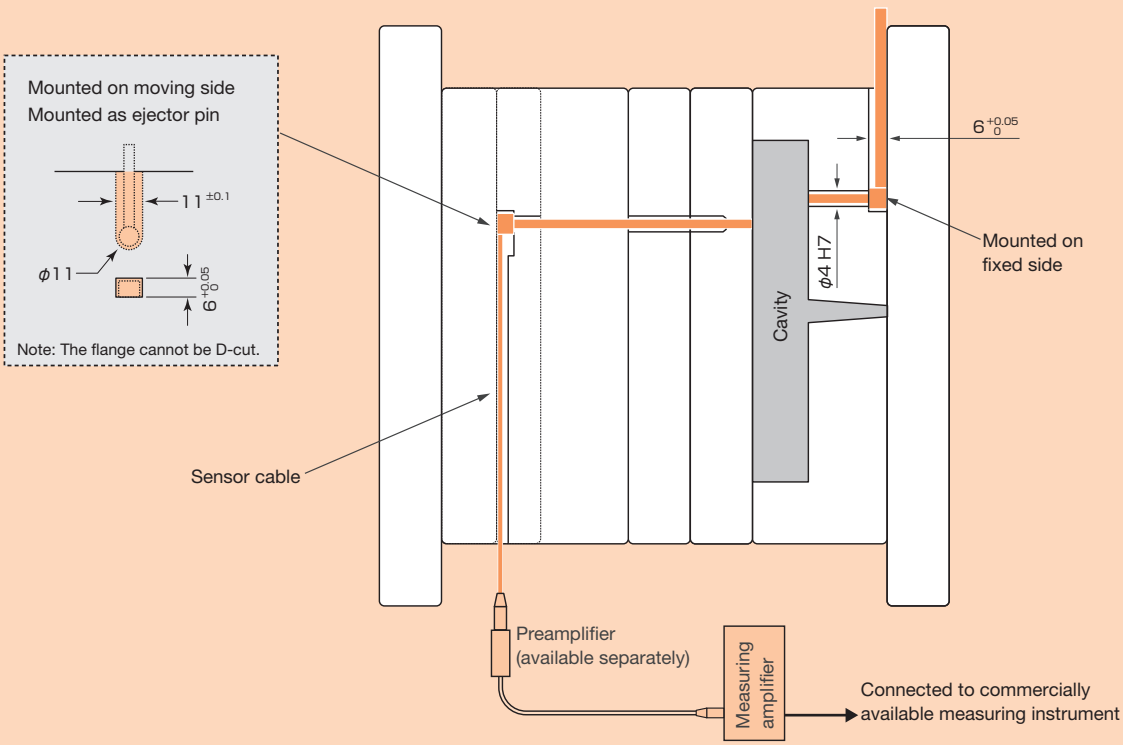
External dimensions Overall length 30 mm type



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



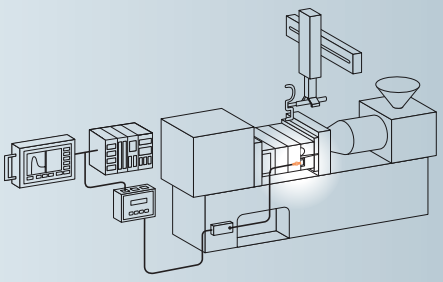
Mounting example



Resin temperature sensors

Flush-mount type EPSSZT series

RoHS compliant

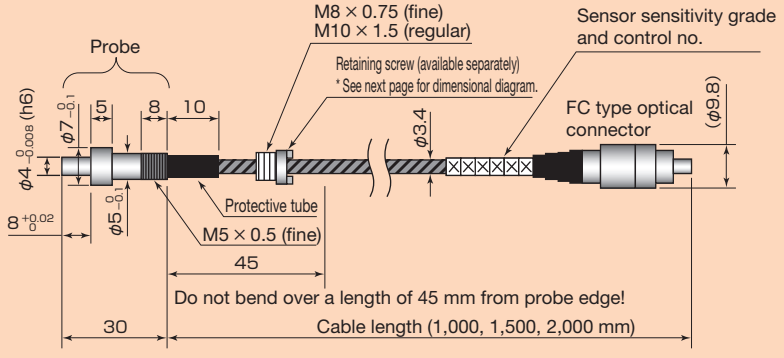


- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- The flush-mount type provides wide latitude in sensor mounting position.
- Capable of measuring resin temperatures from 60°C to 390°C

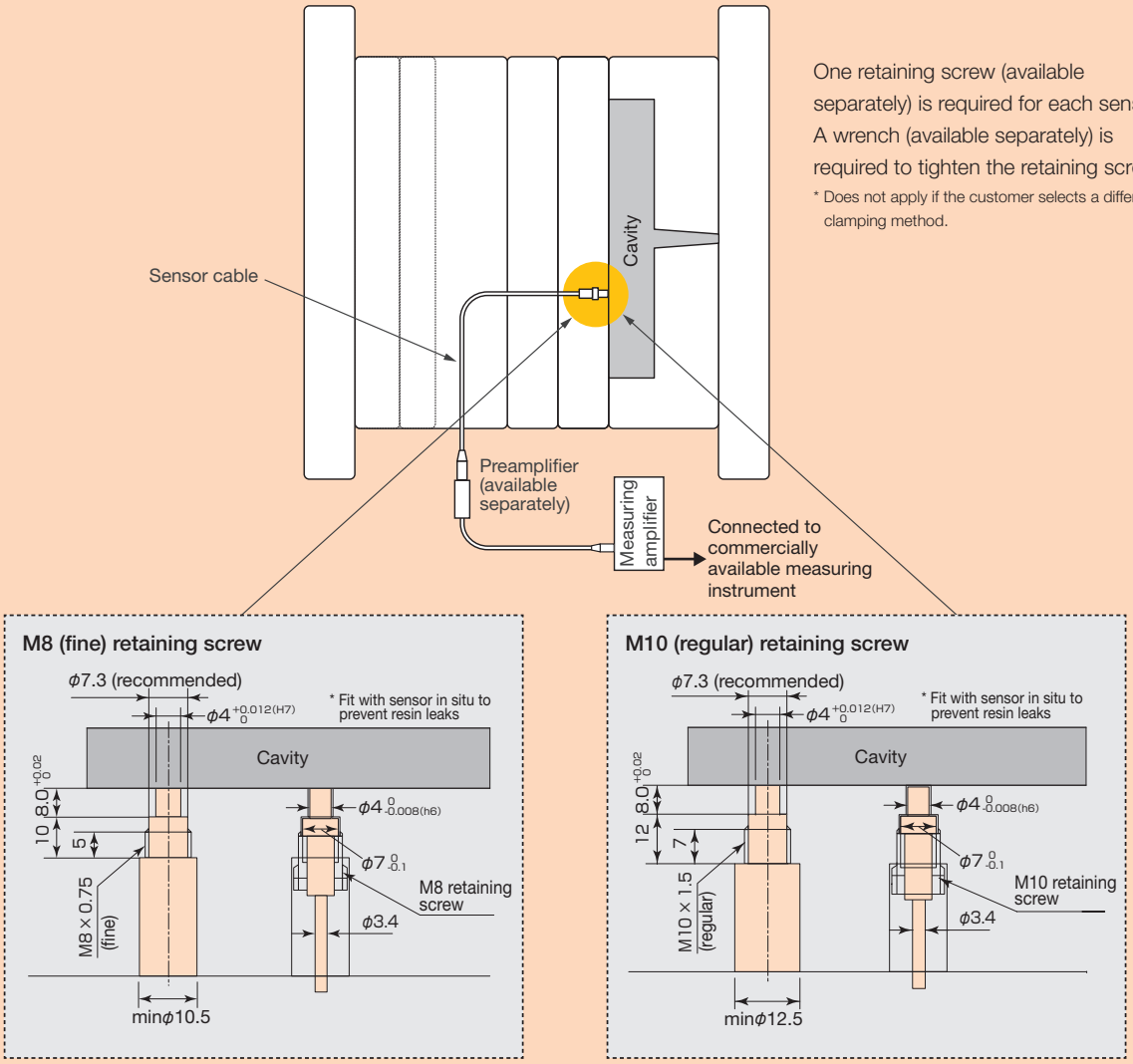
Specifications

Product code	EPSSZT series (→ page 38)
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

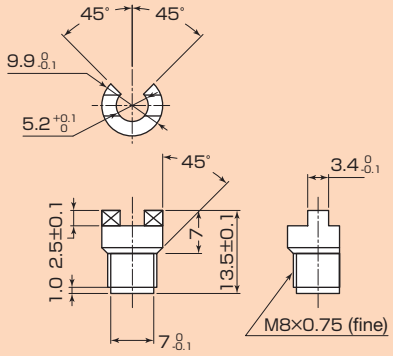


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

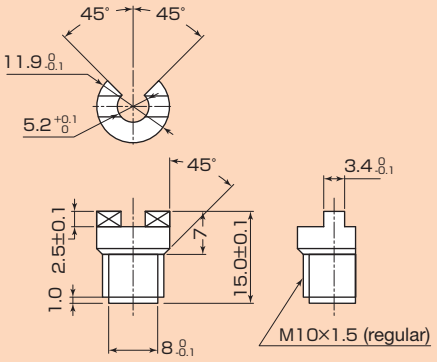
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



M10 (regular)



Accessories

For resin temperature measuring amplifier

BNC voltage output cable — Length: 1 m, 2 m

Cable for outputting values measured for each channel as analog voltages to a data logger, molding machine, or other external device.

■ **Product code**

BNC voltage output cable (1 m): EPT-VC01M

BNC voltage output cable (2 m): EPT-VC02M

For flush-mount type resin temperature sensors

Retaining screw — Material: SUS303

Available in M8 × 0.75 (fine) or M10 × 1.5 (regular).
One retaining screw is required for each sensor.

■ **Product code**

Retaining screw M8 × 0.75 (fine): EPSSZT-M8

Retaining screw M10 × 1.5 (regular): EPSSZT-M10

Wrench — Length: 300 mm; material: SUS303

Used to tighten retaining screws or when the sensor is difficult to remove due to resin buildup. Used with both fine and regular retaining screws.

■ **Product code**

Sensor securing wrench: EPSSZT-FXWR

Sensor removal wrench: EPSSZT-PLWR

Product list

Resin temperature measuring amplifier

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

Accessories

Product name	Product code
BNC voltage output cable (1 m)	EPT-VC01M
BNC voltage output cable (2 m)	EPT-VC02M
Retaining screw M8 × 0.75 (fine)	EPSSZT-M8
Retaining screw M10 × 1.5 (regular)	EPSSZT-M10
Sensor securing wrench	EPSSZT-FXWR
Sensor removal wrench	EPSSZT-PLWR

Product list

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

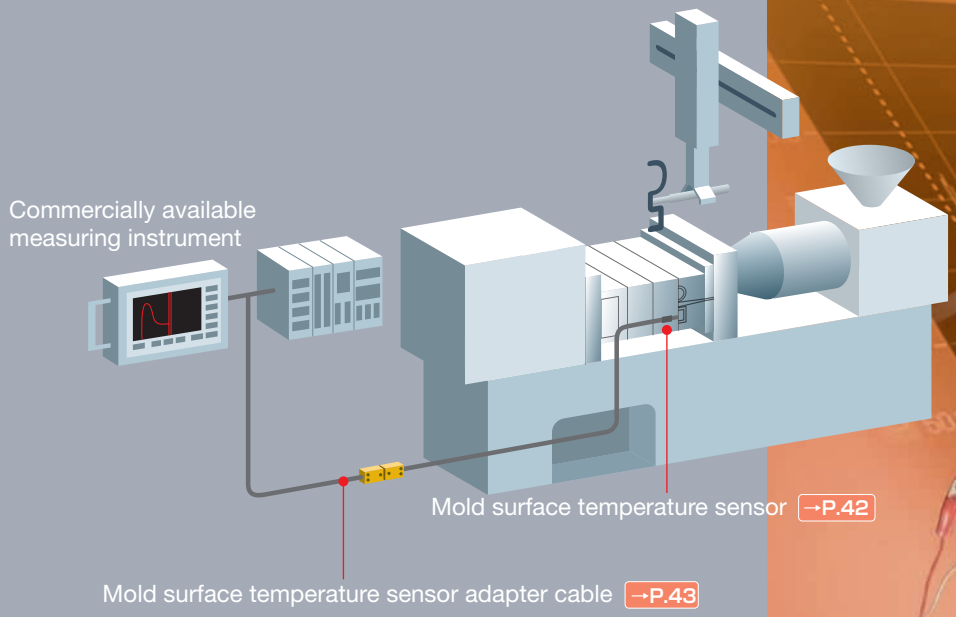
Resin temperature sensors - Flush-mount type

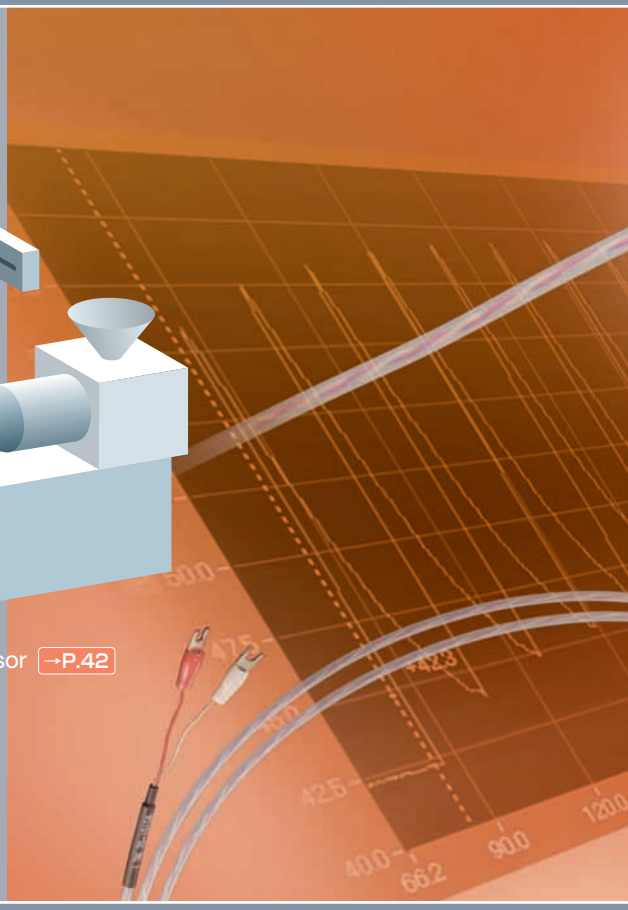
Product name		Tip diameter ϕd (mm)	Product code
Flush-mount type, cable length 1.0 m		4.0	EPSSZT-04.0×030 N100
Flush-mount type, cable length 1.5 m			EPSSZT-04.0×030 N150
Flush-mount type, cable length 2.0 m			EPSSZT-04.0×030 N200
Optional parts	Retaining screw*1 M8 × 0.75 (fine)	–	EPSSZT-M8
	Retaining screw*1 M10 × 1.50 (regular)	–	EPSSZT-M10
	Sensor securing wrench*2	–	EPSSZT-FXWR
	Sensor removal wrench*3	–	EPSSZT-PLWR

*1 One retaining screw is required for each sensor.
*2 The sensor securing wrench is used to tighten retaining screws (used with both fine and regular retaining screws).
*3 The sensor removal wrench is used when the sensor is difficult to remove due to resin buildup.
*4 Does not apply if the customer selects a different clamping method.

Mold Surface Temperature Measuring System

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





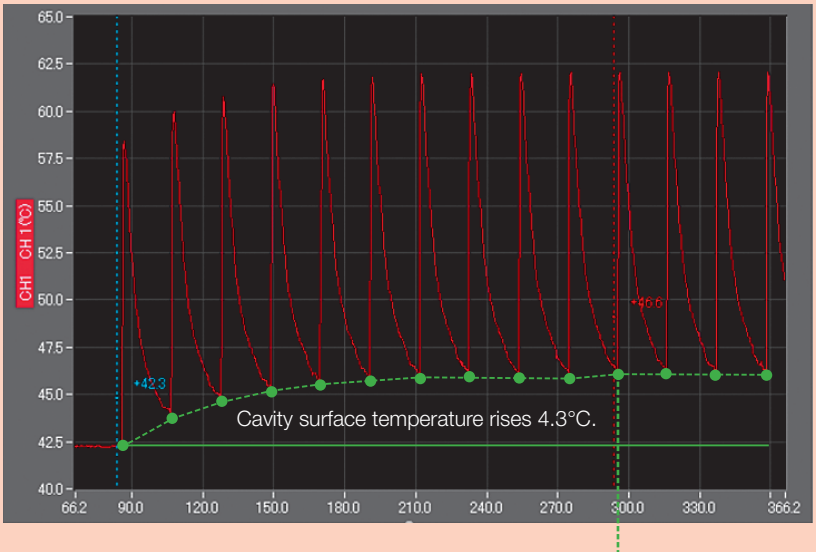
Measured waveform

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

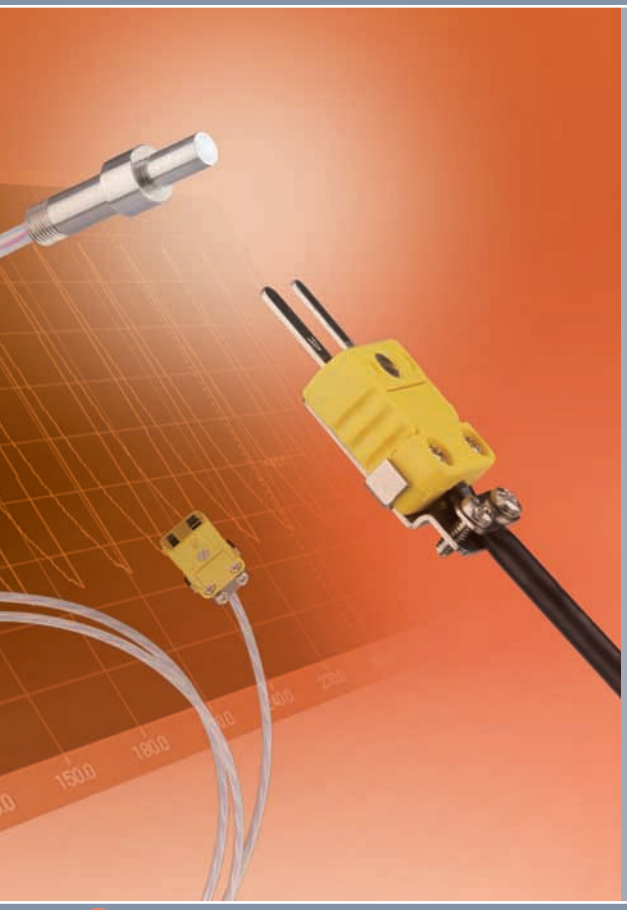
Molding conditions

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

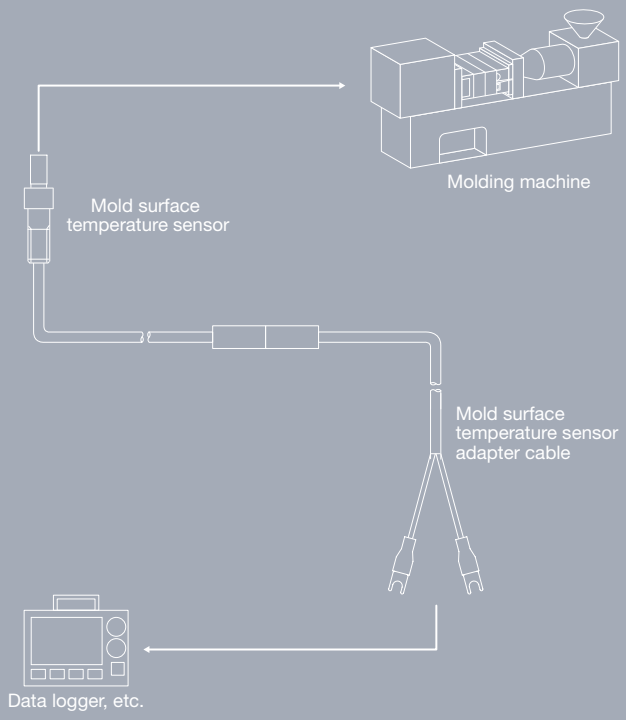


Cavity temperature rises 4.3°C from 42.3°C for the first 10 shots to 46.6°C before stabilizing.

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.

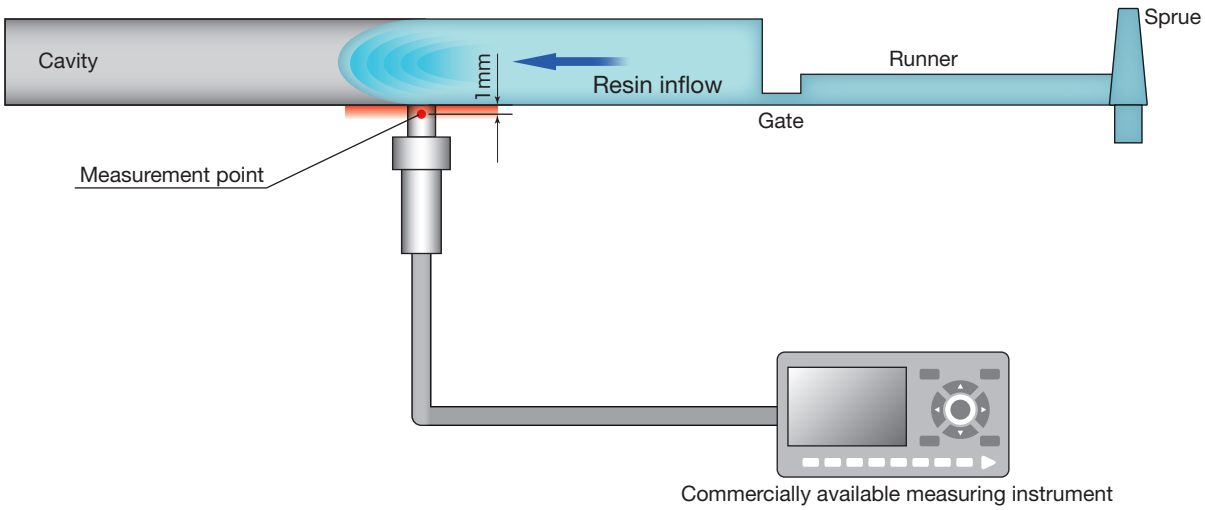


[System configuration diagram]



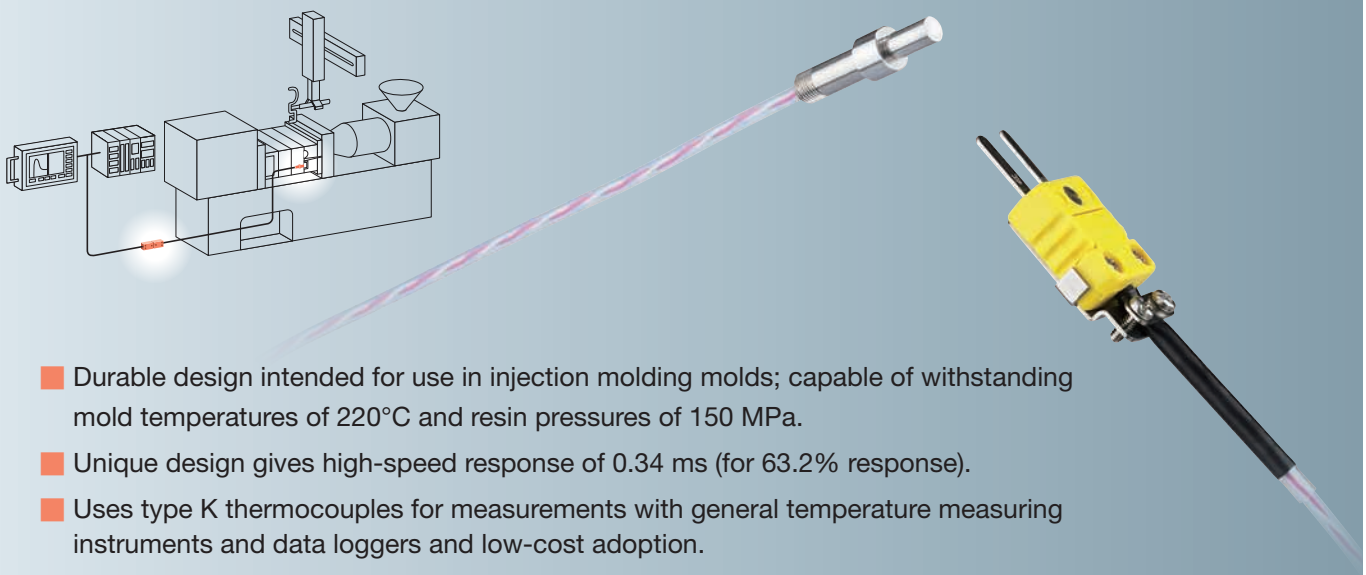
Measuring principles

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

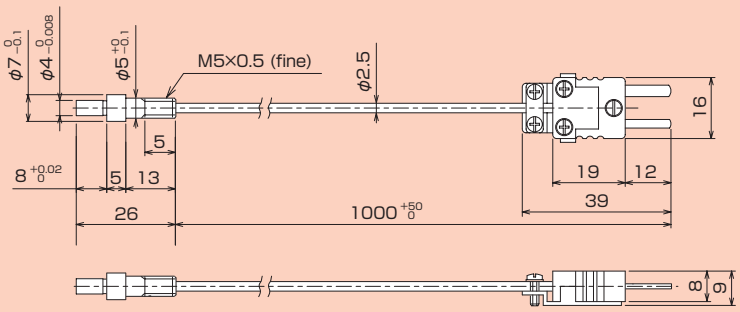


- Durable design intended for use in injection molding molds; capable of withstanding mold temperatures of 220°C and resin pressures of 150 MPa.
- Unique design gives high-speed response of 0.34 ms (for 63.2% response).
- Uses type K thermocouples for measurements with general temperature measuring instruments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

Specifications

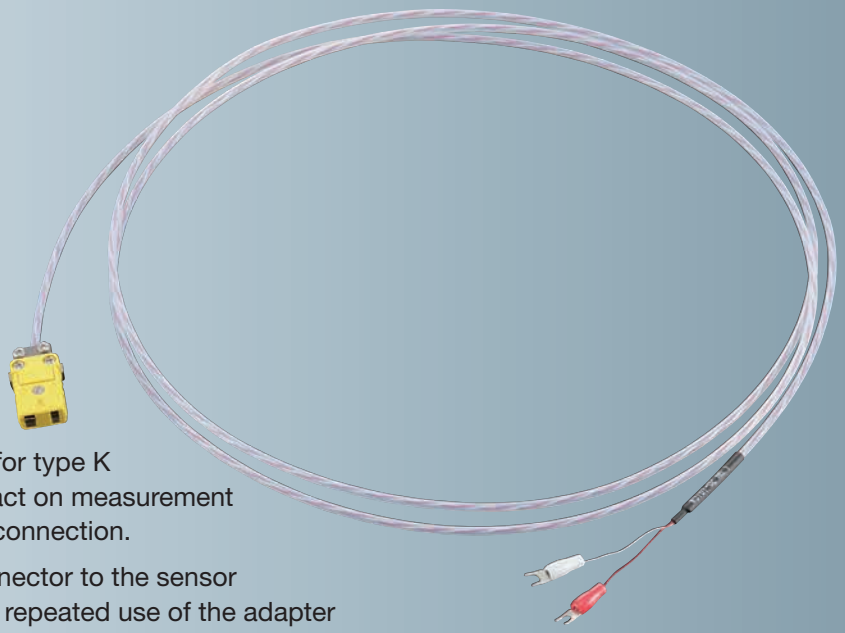
Product code	STF04.0×08.0×026
Probe diameter	ϕ4
Probe material	SUS630 (hardness: HRC 38 maximum)
Temperature detection method	Thermocouple, grounded type
Type	K class 1
Operating temperature range	Maximum 220°C (mold temperature)
Withstand pressure	Maximum 150 MPa
Cable	Teflon tube (external diameter 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

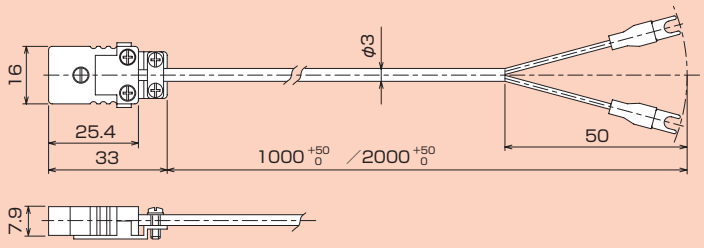


- Features dedicated connectors for type K thermocouples, eliminating impact on measurement accuracy due to connection/disconnection.
- Can be separated using the connector to the sensor embedded in the mold, allowing repeated use of the adapter cable.

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

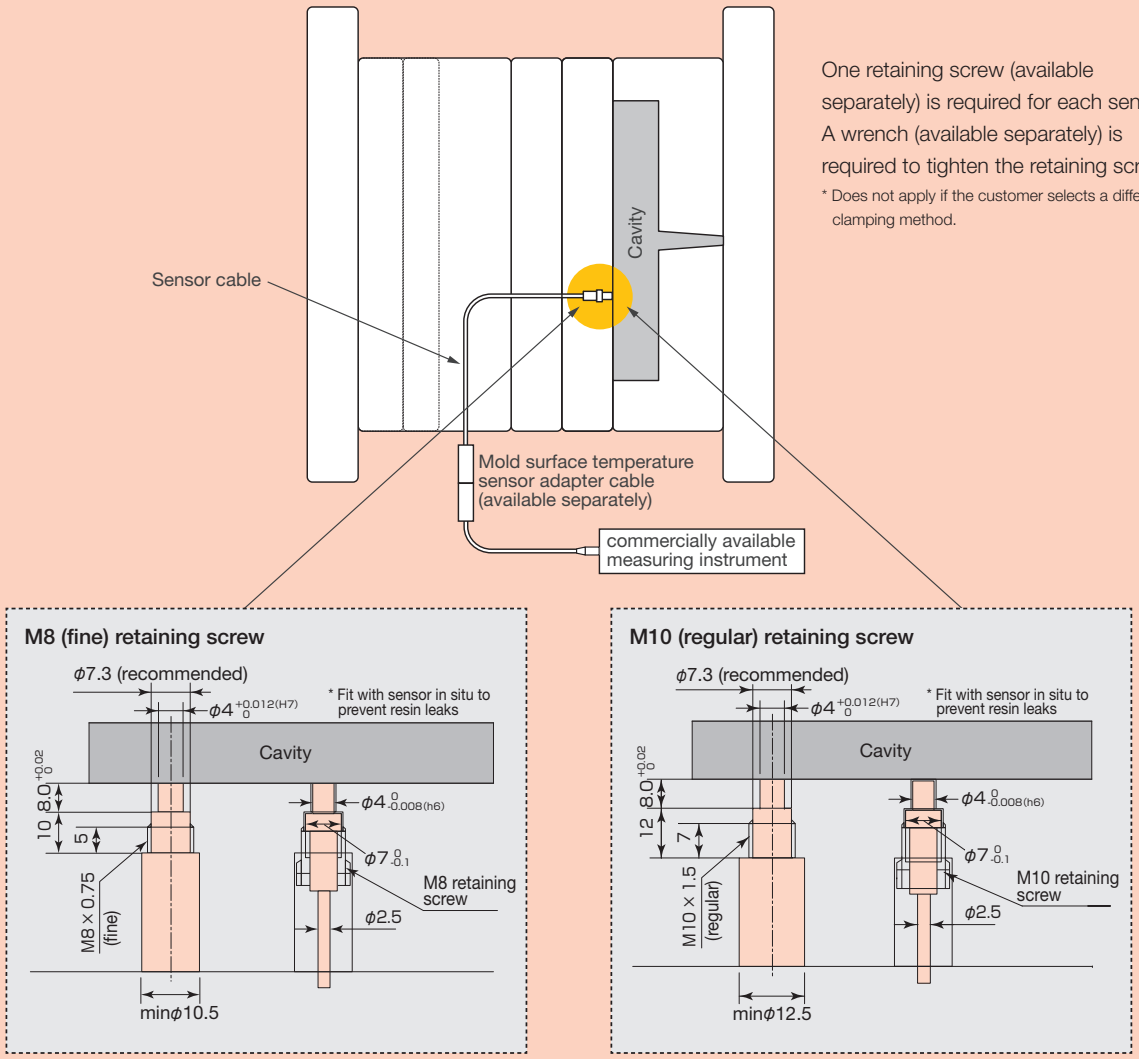
External dimensions



* 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

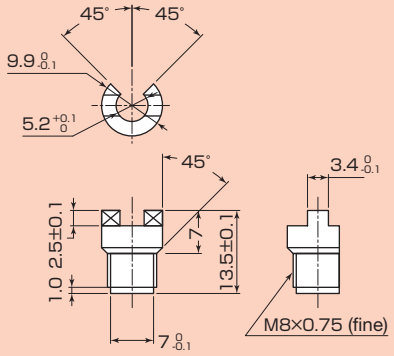


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

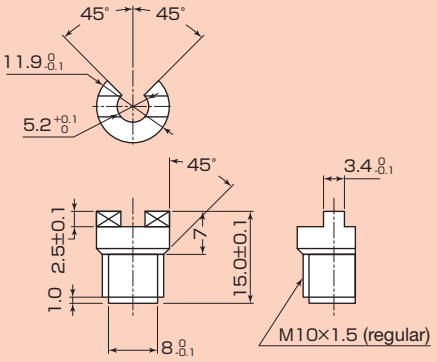
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



M10 (regular)



Accessories / Product list

For mold surface temperature sensor

Retaining screw — Material: SUS303

Available in M8 × 0.75 (fine) or M10 × 1.5 (regular).
One retaining screw is required for each sensor.

■ **Product code**
Retaining screw M8 × 0.75 (fine): EPSSZT-M8
Retaining screw M10 × 1.5 (regular): EPSSZT-M10

Wrench — Length: 300 mm; material: SUS303

Used to tighten retaining screws or when the sensor is difficult to remove due to resin buildup. Used with both fine and regular retaining screws.

■ **Product code**
Sensor securing wrench: EPSSZT-FXWR
Sensor removal wrench: EPSSZT-PLWR

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

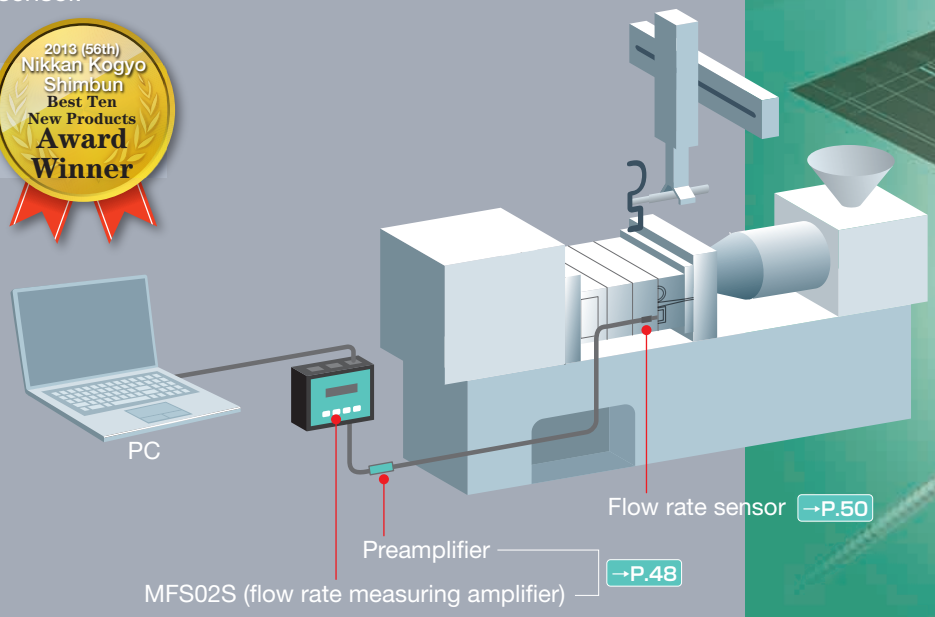
Accessories

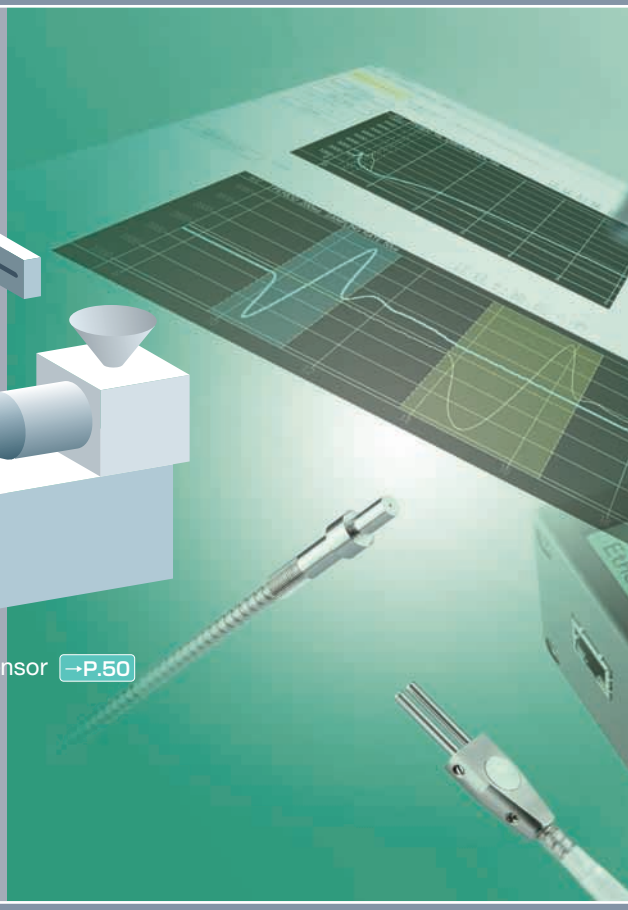
Product name	Product code
Retaining screw M8 × 0.75 (fine)	EPSSZT-M8
Retaining screw M10 × 1.5 (regular)	EPSSZT-M10
Sensor securing wrench	EPSSZT-FXWR
Sensor removal wrench	EPSSZT-PLWR

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.

2013 (56th) Nikkan Kogyo Shimbun Best Ten New Products Award Winner

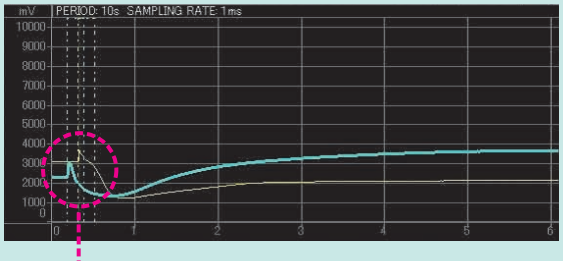




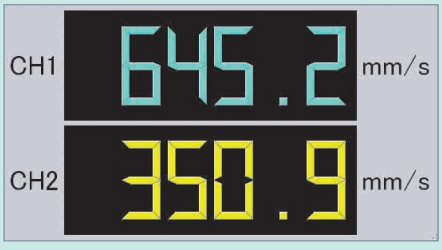
Measured waveform

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.

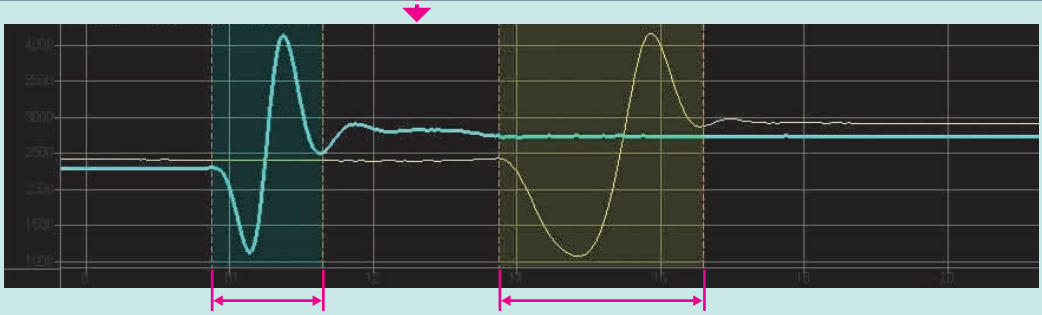
Flow rate waveform



Flow front speed



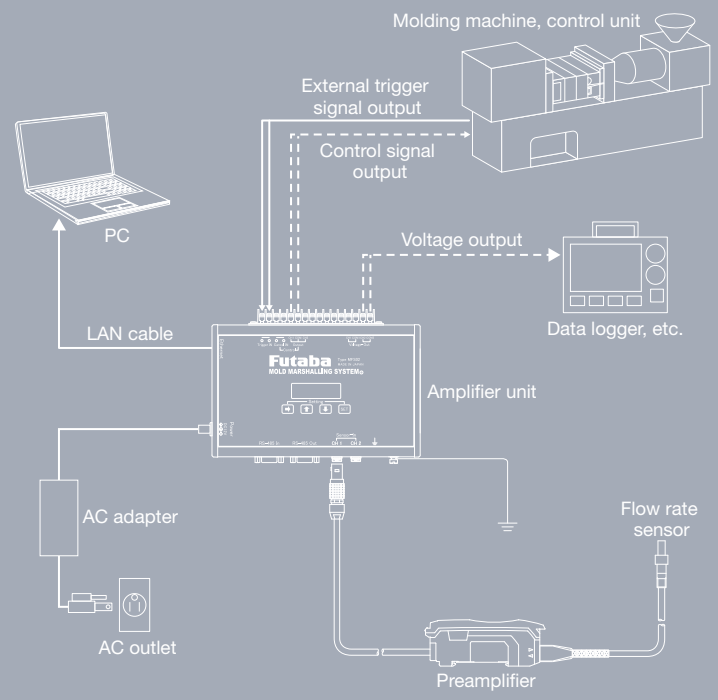
Flow front passage waveform



Short intervals along time axis indicates fast flow rates.

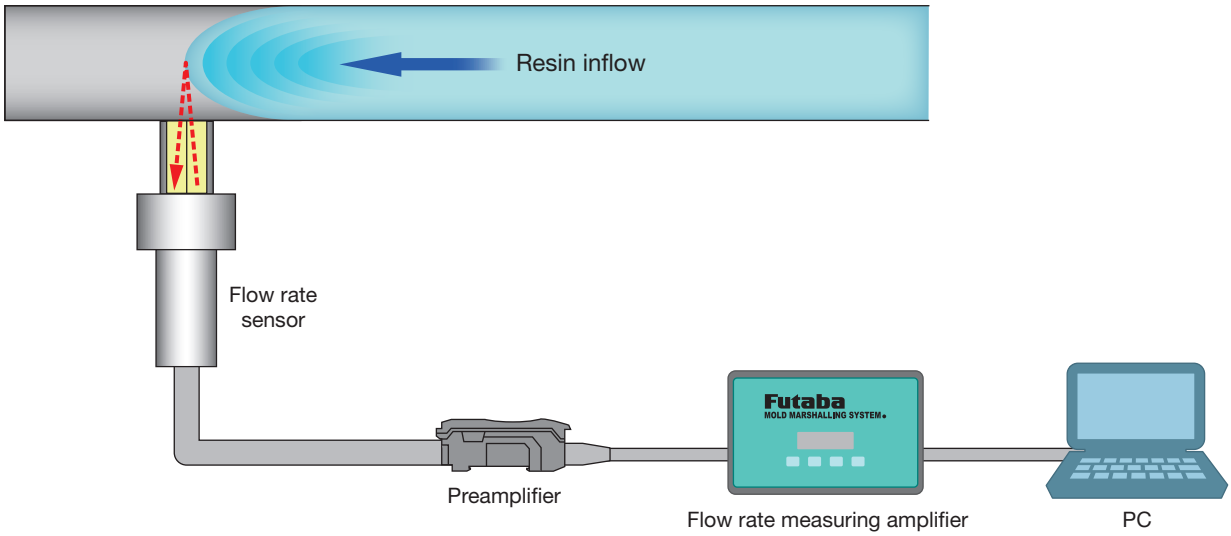
Long intervals along time axis indicates slow flow rates.

[System configuration diagram]



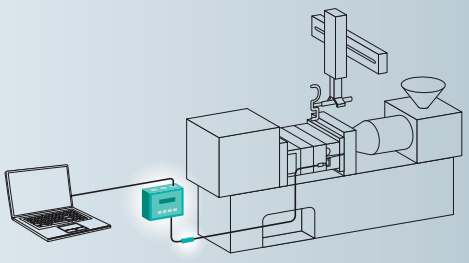
Measuring principles

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

MFS02S



- 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.

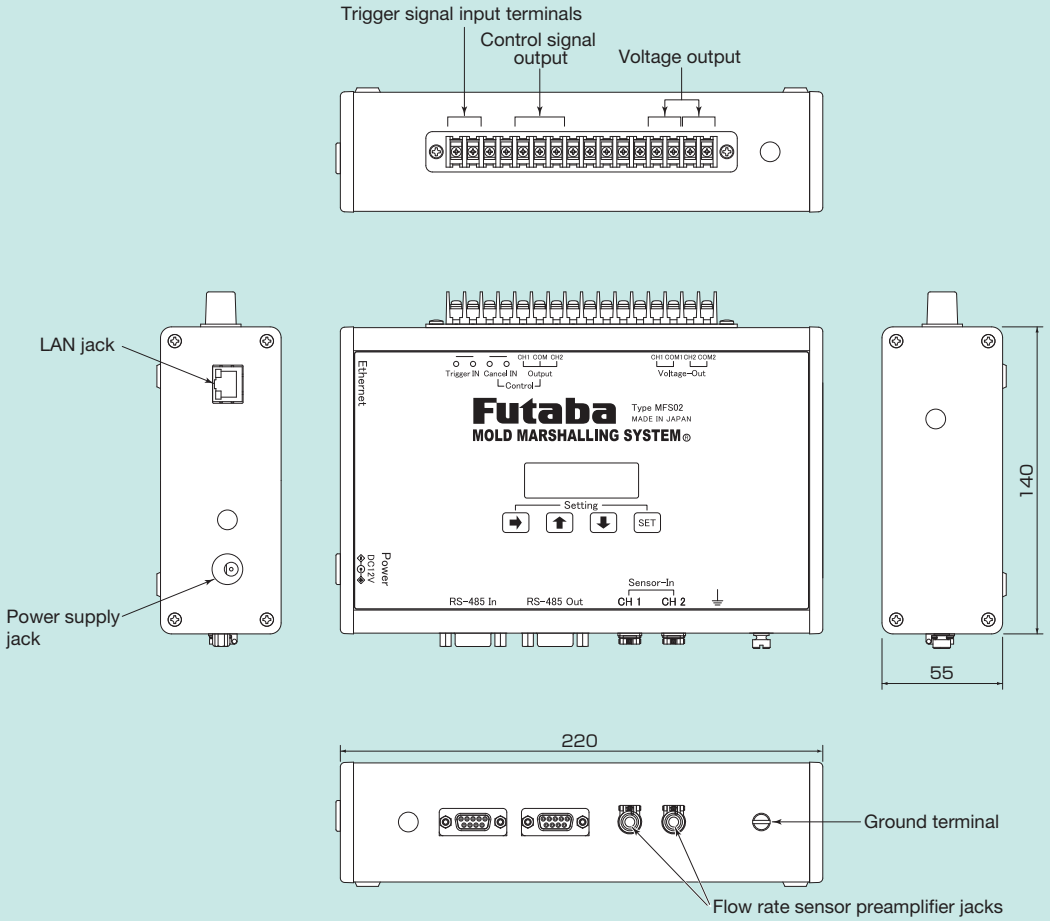
Specifications

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

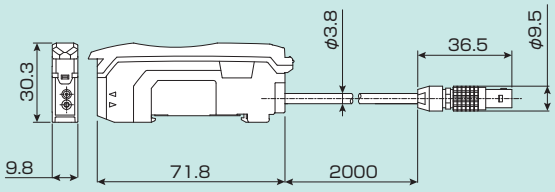
*1 The range of flow rate measurements will vary depending on product thickness (t). The range quoted here is for t = 1.
*2 One preamplifier and flow rate sensor (not included) are required for each measurement point.
*3 A PC (not included) is required for this measuring system.
*4 Interval for measuring 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



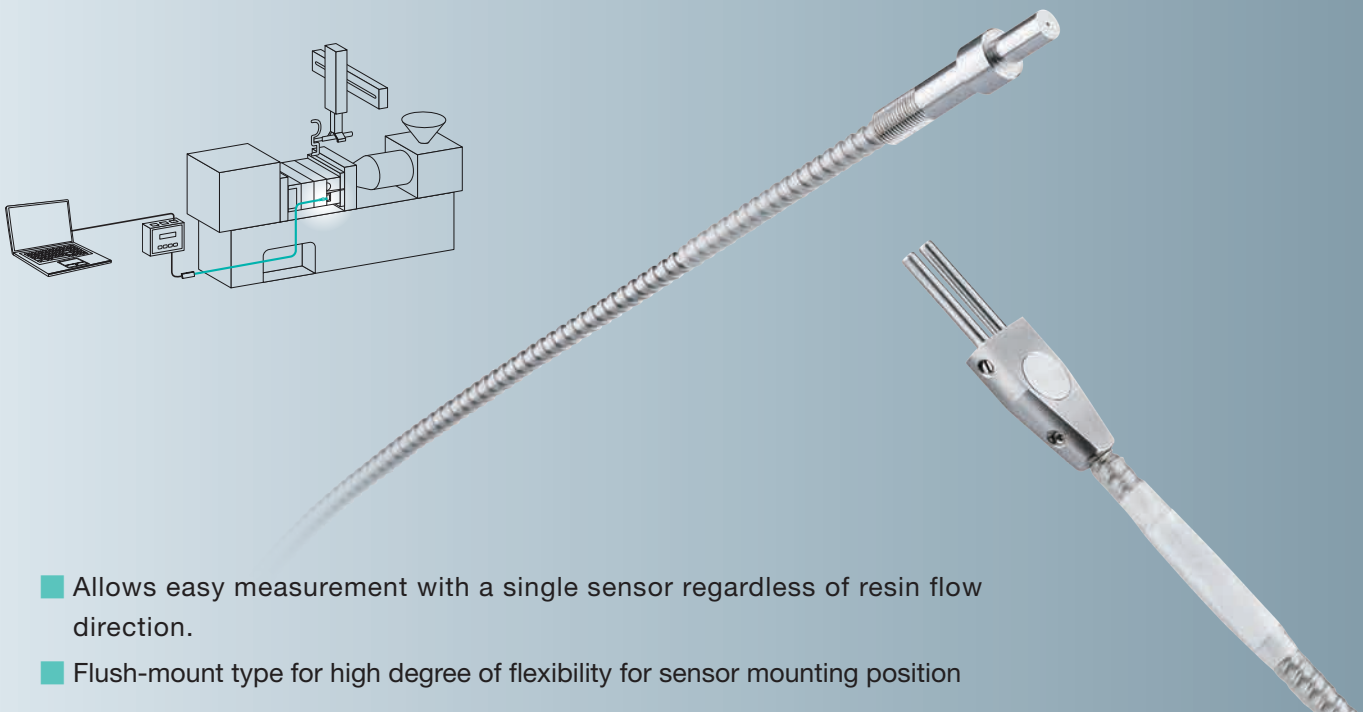
Preamplifier

Product code	UPV01



Flow rate sensor

SMF04.0×08.0×026

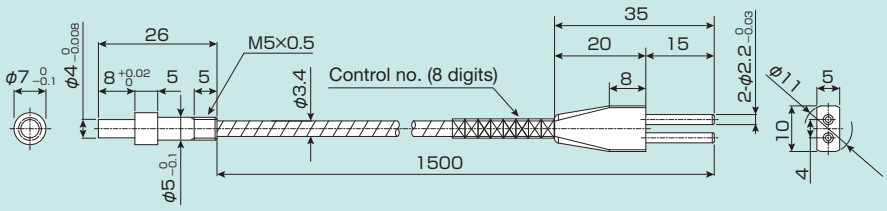


- Allows easy measurement with a single sensor regardless of resin flow direction.
- Flush-mount type for high degree of flexibility for sensor mounting position

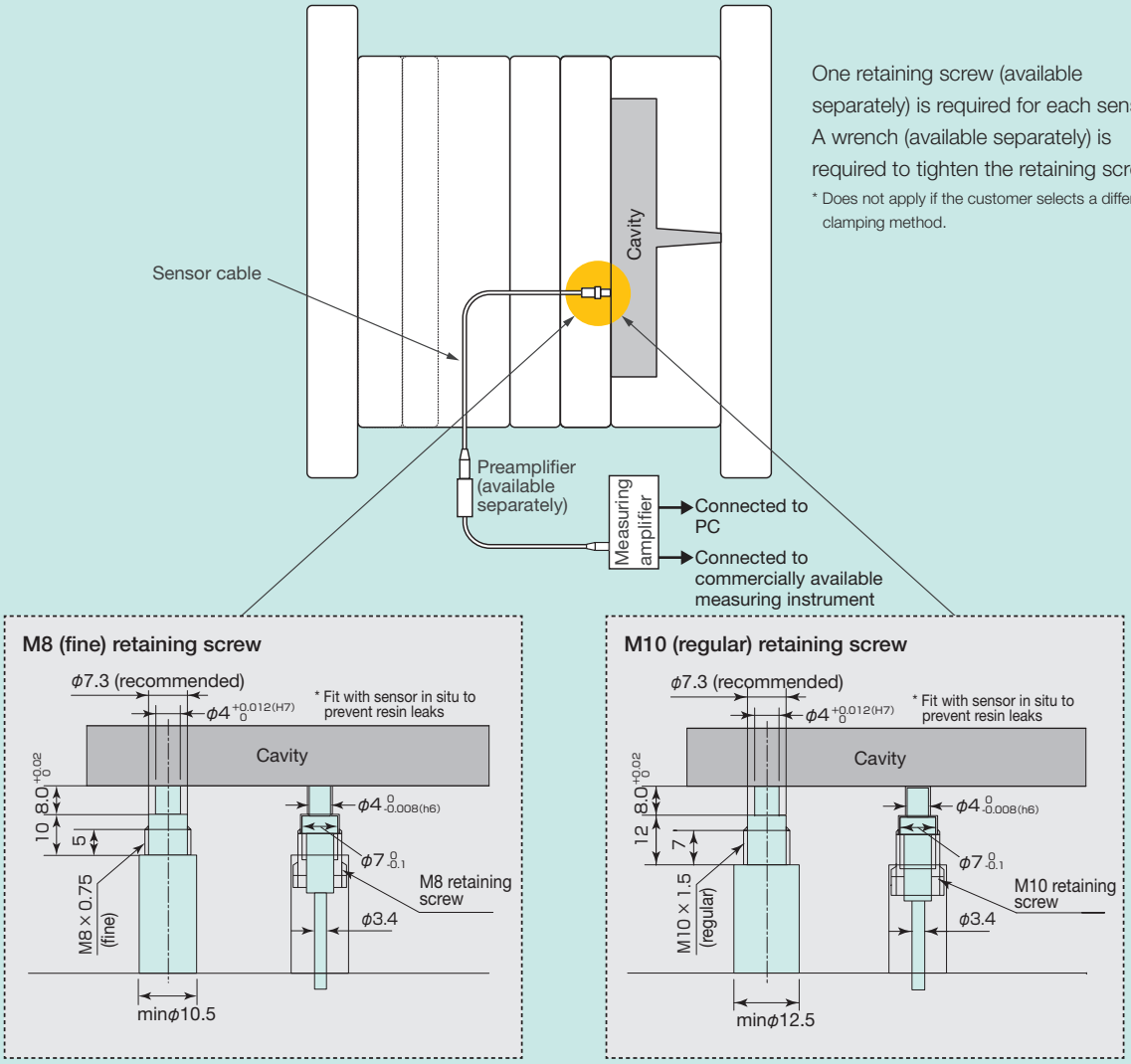
Specifications

Product code	SMF04.0×08.0×026
Probe material	SUS630 (hardness: HRC 38 maximum)
Operating temperature rangerange	Maximum 150°C (mold temperature)
Withstand pressure	Maximum 150 MPa
Cable	With stainless-steel protective tube (outer diameter 3.4 mm), minimum bending radius 50 mm

External dimensions



Mounting example

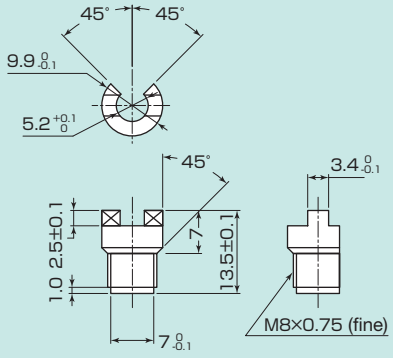


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

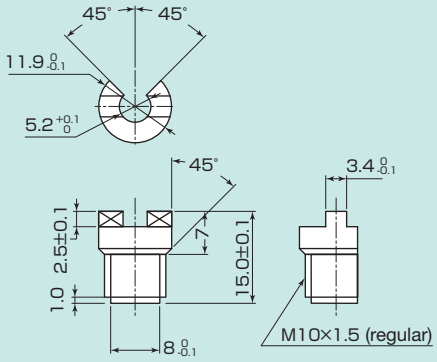
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



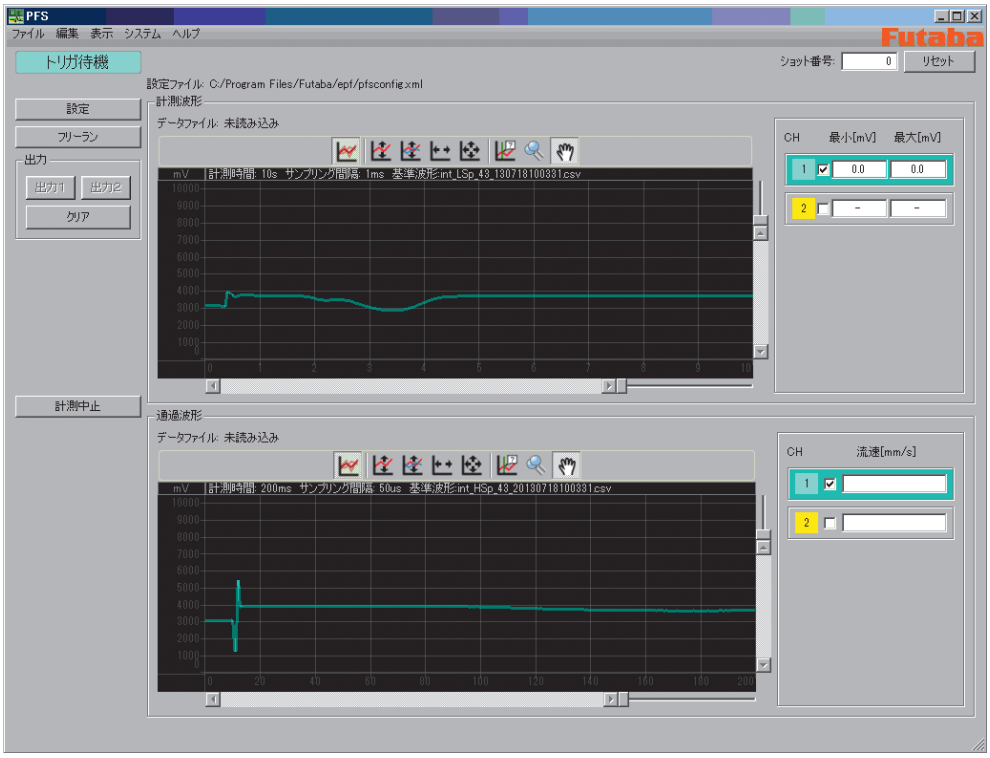
M10 (regular)



Measurement software functions

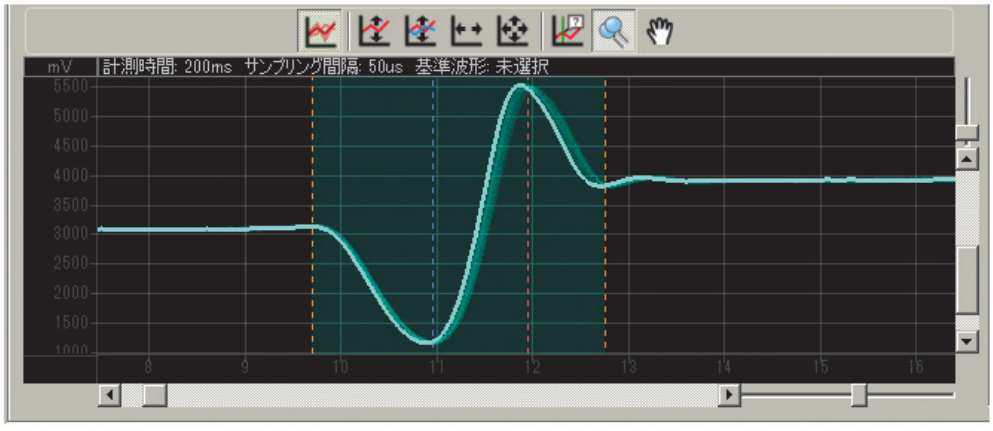
Reference waveform display

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 for 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 uploaded as reference waveform data on the PFS software. ●Data can be uploaded into spreadsheet software for editing.
Numerical data (monitoring items)	Peak file (Peak)	.csv	C:/Users/Username/My Documents/MMS_DATA/ Date folder	●Saved separately by shot number. ●Can be uploaded as reference waveform data on the PFS software. ●Data can be uploaded into spreadsheet software for editing.

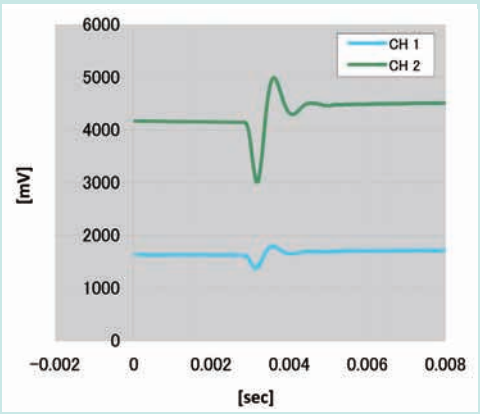
Example of use with spreadsheet software

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

Tabular form

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

Graph form



Accessories

For flow rate sensor

Retaining screw — Material: SUS303

Available in M8 × 0.75 (fine) or M10 × 1.5 (regular).
One retaining screw is required for each sensor.

■ **Product code**

Retaining screw M8 × 0.75 (fine): EPSSZT-M8

Retaining screw M10 × 1.5 (regular): EPSSZT-M10

Wrench — Length: 300 mm; material: SUS303

Used to tighten retaining screws or when the sensor is difficult to remove due to resin buildup. Used with both fine and regular retaining screws.

■ **Product code**

Sensor securing wrench: EPSSZT-FXWR

Sensor removal wrench: EPSSZT-PLWR

Product list

Flow rate measuring amplifiers/sensor

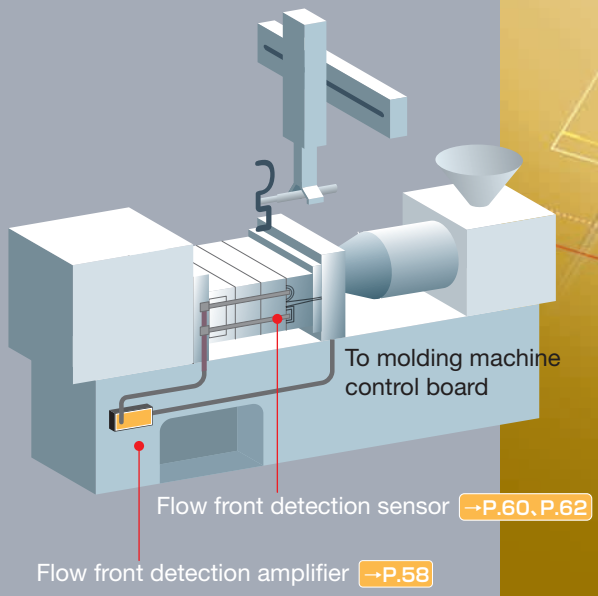
Product name	Product code
Flow rate measuring amplifier	MFS02S
Preamplifier	UPV01
Flow rate sensor	SMF04.0×08.0×026

Accessories

Product name	Product code
Retaining screw M8 × 0.75 (fine)	EPSSZT-M8
Retaining screw M10 × 1.5 (regular)	EPSSZT-M10
Sensor securing wrench	EPSSZT-FXWR
Sensor removal wrench	EPSSZT-PLWR

Flow Front Detection System

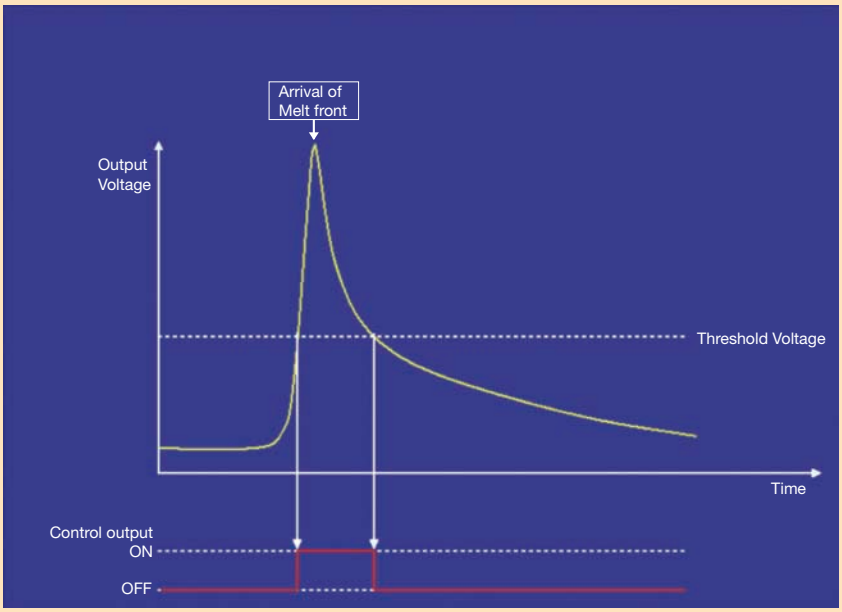
Combined with 8 ms (63.2% response) high-speed response sensors, the system detects resin arrival immediately and outputs a control signal.

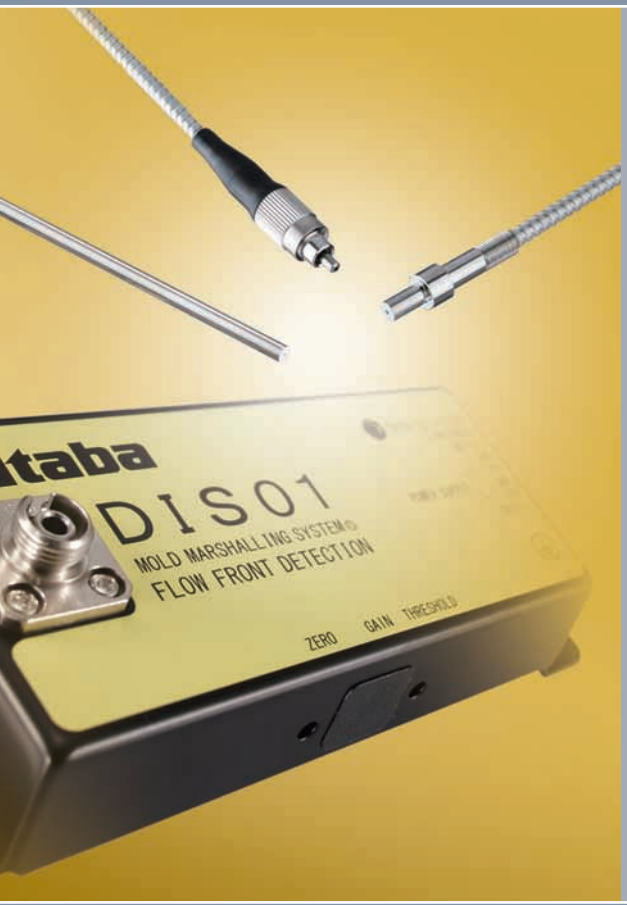


Measured waveform

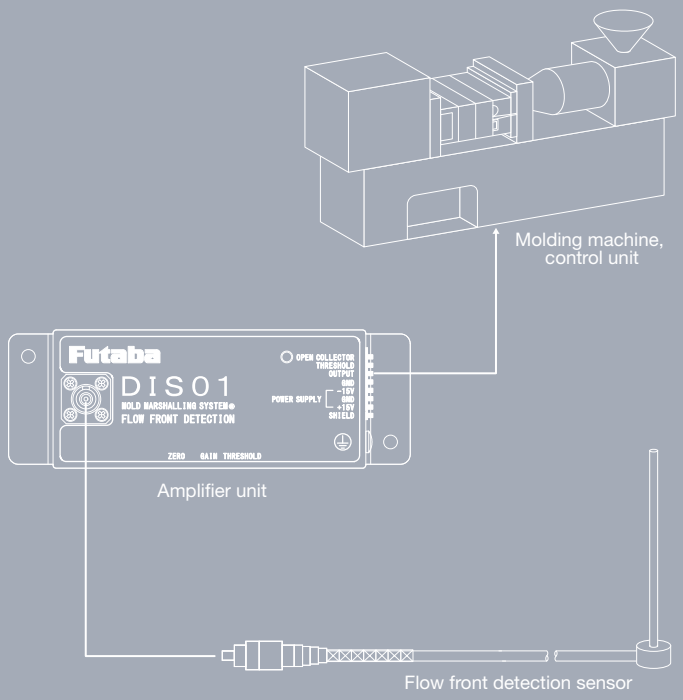
Location at the end of the molded product allows use in controlling V-P transfer timing and detecting short shots.

Operation signal diagram



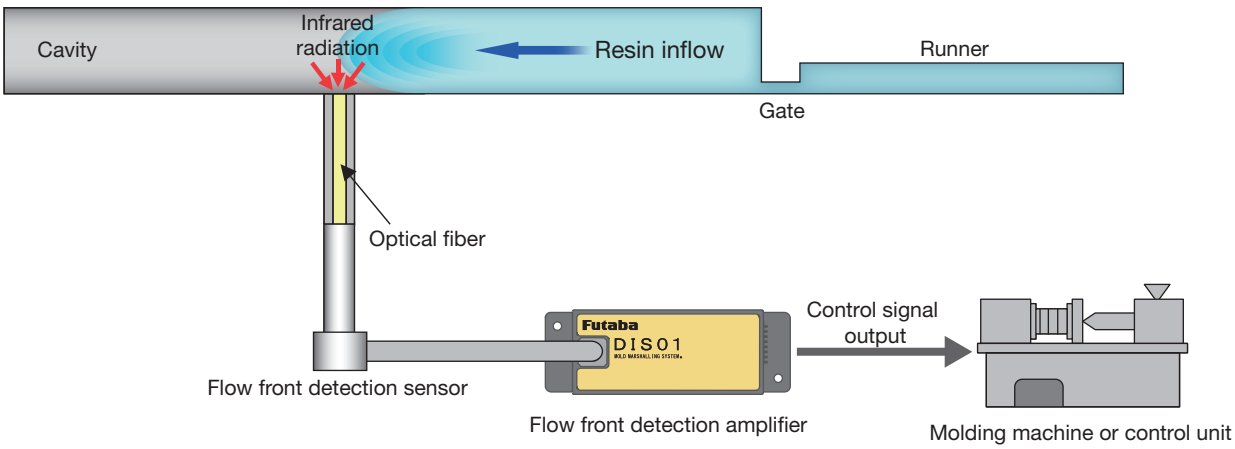


[System configuration diagram]



Measuring principles

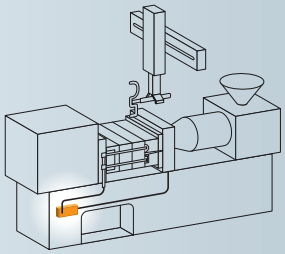
The arrival of the resin flow front is detected instantly using infrared light.
The LED lamp lights up at the same time as signal output from the open collector.



Flow front detection amplifier

DIS01

CE



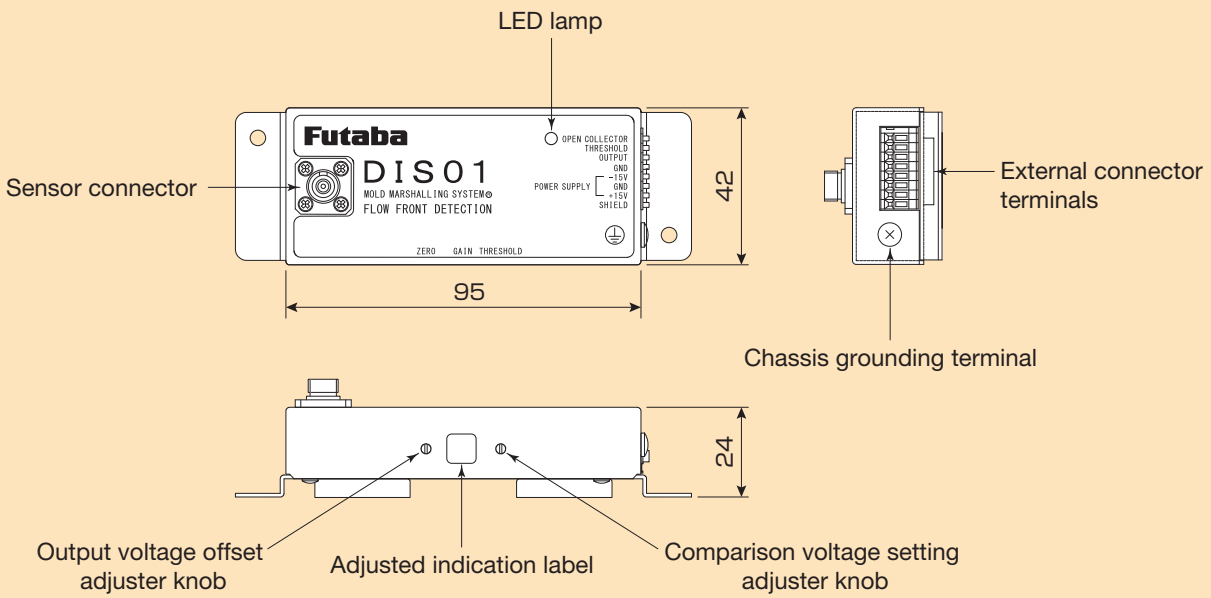
- Infrared detection system resistant to disturbance offers high noise resistance.
- Threshold for outputting control signals can be adjusted between 0 V and 13 V.

Specifications

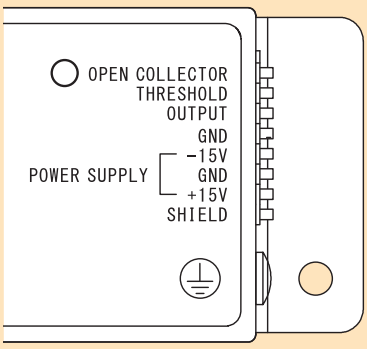
Product code	DIS01
Power supply voltage	±15 V DC, 1.5 W maximum
Control output	0 V to 13 V
Adjustment output	0 V to 13 V
Control signal output	NPN open collector, withstand voltage 50 V, maximum current 100 mA
Operating temperature range	10°C to 40°C
Mounting method	Magnets or screws (M4)
Weight	Approx.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

* Does not include power supply cables or screws.

External dimensions



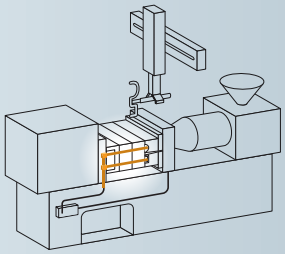
External connector terminals

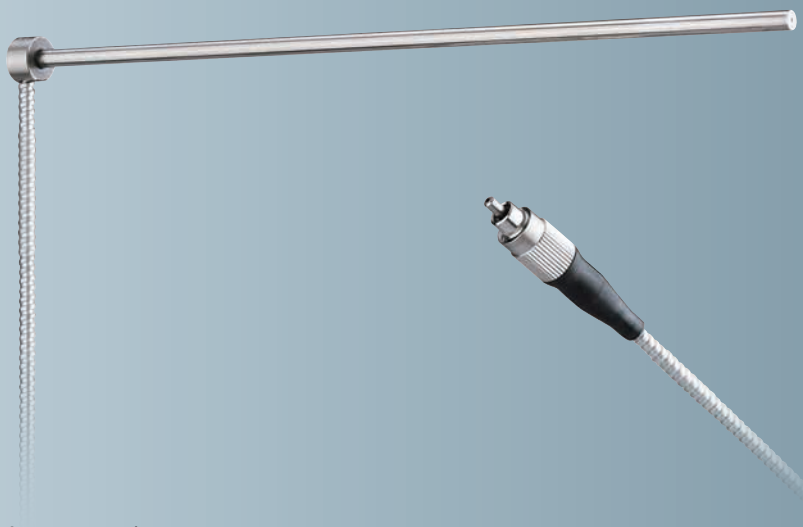


Signal name	Input/output	Details
OPEN COLLECTOR	Output	Comparison voltage signal (open collector)
THRESHOLD	Output	Comparison voltage output (no buffer)
OUTPUT	Output	Analog output
GND	Output	Ground
–15V	Input	Negative power supply input (-15 V ±5%)
GND	Input	Ground
+15V	Input	Positive power supply input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

Ejector pin type DISSZL series

RoHS compliant





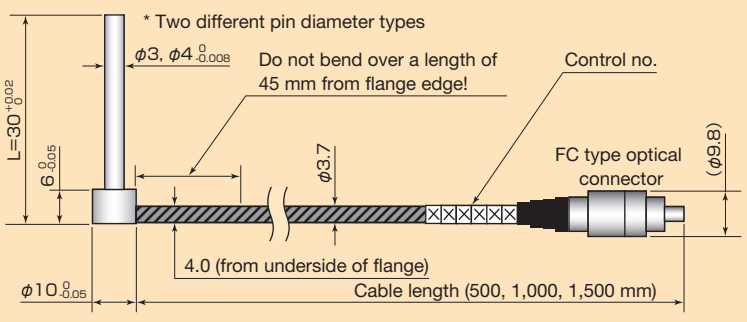
- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- Ejector pin configuration allows easy installation on mold.*1

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

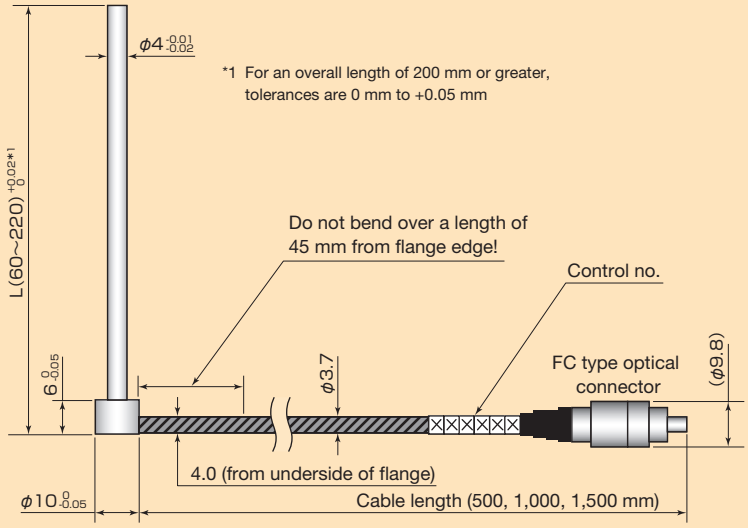
Specifications

Product code		DISSZL series (→ page 65)
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

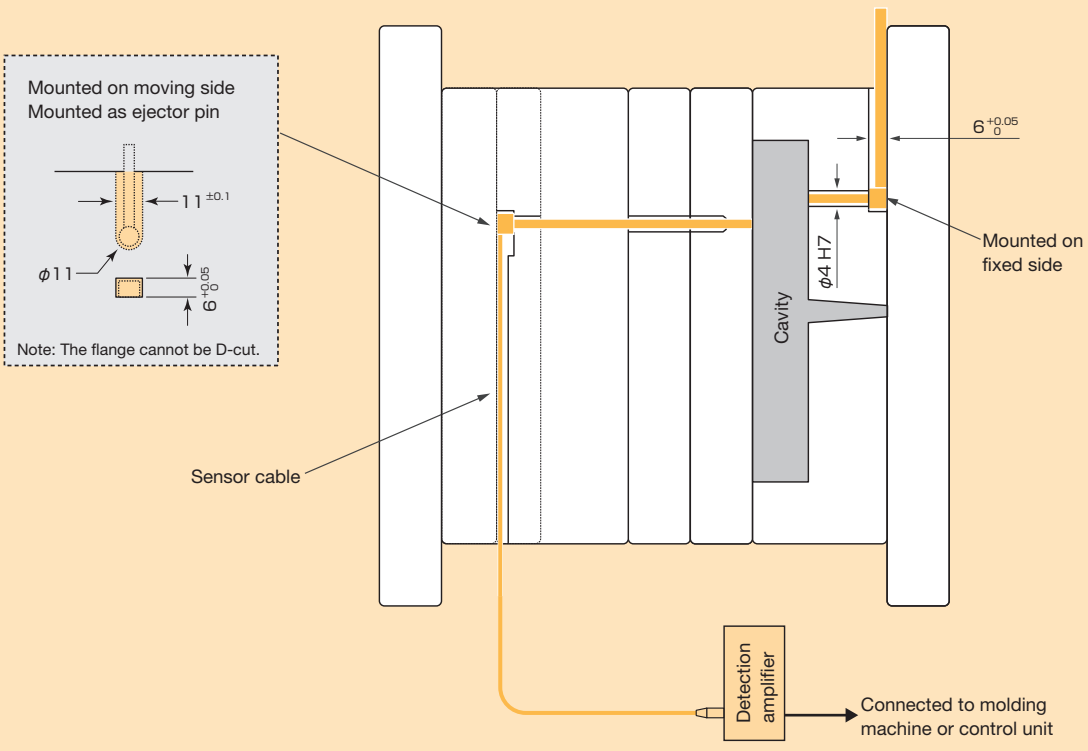
External dimensions Overall length 30 mm type



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

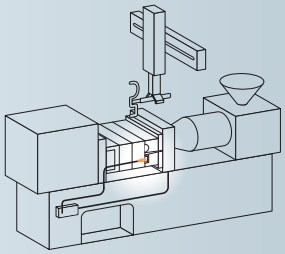


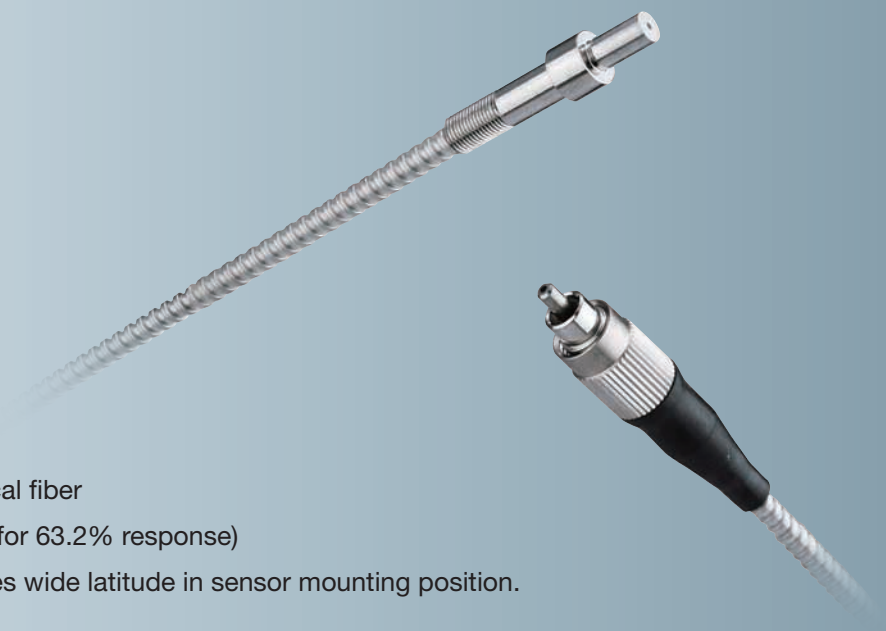
Mounting example



Flush-mount type DISSZT series

RoHS compliant



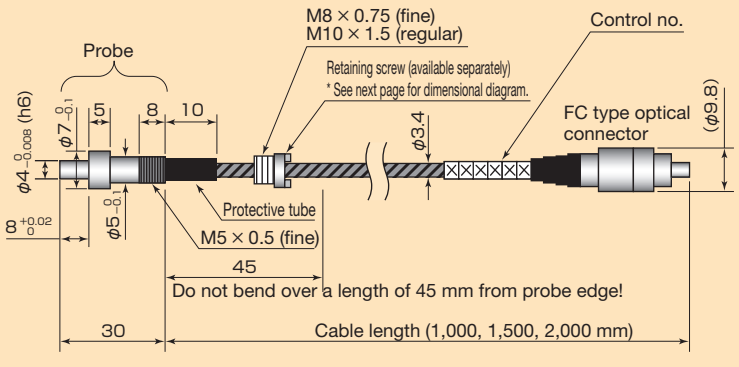


- Infrared detection using optical fiber
- High-speed response: 8 ms (for 63.2% response)
- The flush-mount type provides wide latitude in sensor mounting position.

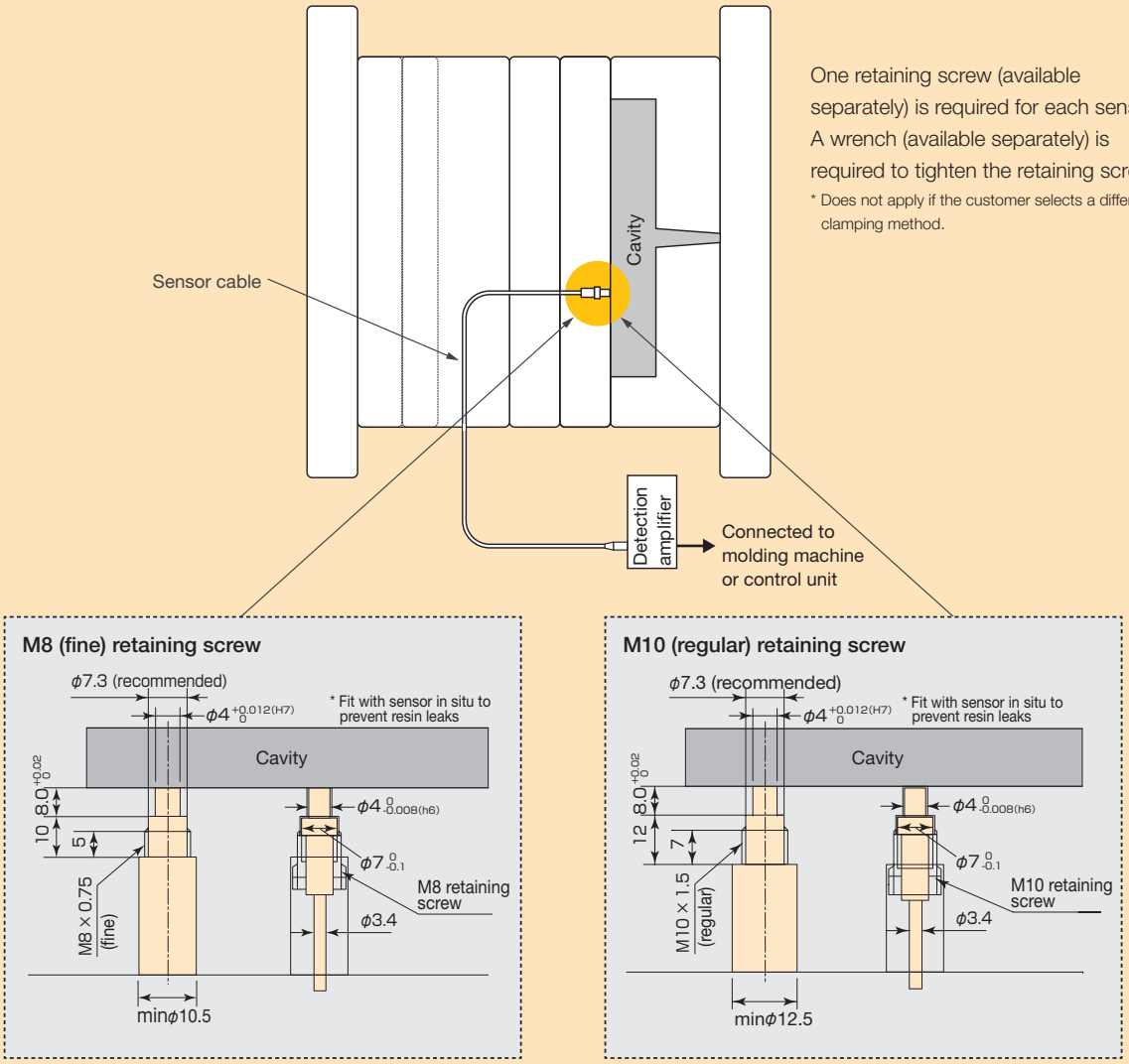
Specifications

Product code	DISSZT series (→ page 66)
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

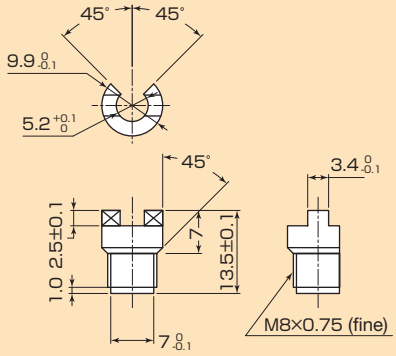


One retaining screw (available separately) is required for each sensor. A wrench (available separately) is required to tighten the retaining screw.

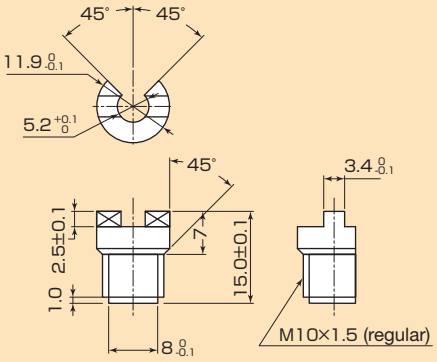
* Does not apply if the customer selects a different clamping method.

Retaining screw

M8 (fine)



M10 (regular)



Accessories

For flush-mount type flow front detection sensors

Retaining screw — Material: SUS303

Available in M8 × 0.75 (fine) or M10 × 1.5 (regular).
One retaining screw is required for each sensor.

■ **Product code**

Retaining screw M8 × 0.75 (fine): EPSSZT-M8

Retaining screw M10 × 1.5 (regular): EPSSZT-M10

Wrench — Length: 300 mm; material: SUS303

Used to tighten retaining screws or when the sensor is difficult to remove due to resin buildup. Used with both fine and regular retaining screws.

■ **Product code**

Sensor securing wrench: EPSSZT-FXWR

Sensor removal wrench: EPSSZT-PLWR

Product list

Flow front detection amplifier

Product name	Product code
Flow rate measuring amplifier	DIS01

Accessories

Product name	Product code
Retaining screw M8 × 0.75 (fine)	EPSSZT-M8
Retaining screw M10 × 1.5 (regular)	EPSSZT-M10
Sensor securing wrench	EPSSZT-FXWR
Sensor removal wrench	EPSSZT-PLWR

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

Product list

Flow front detection sensors - Flush-mount type

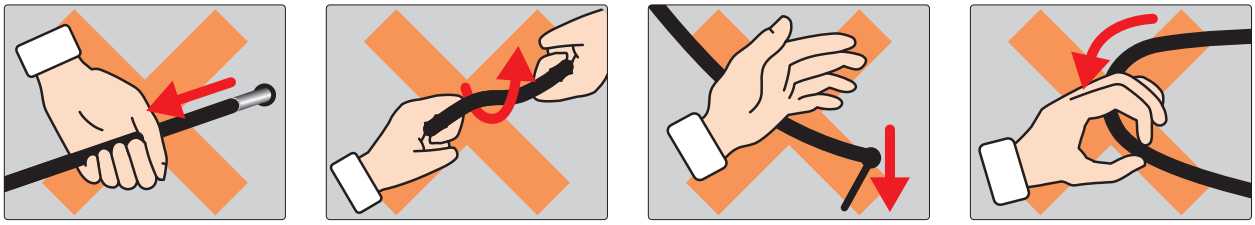
Product name		Tip diameter ϕd (mm)	Product code
Flush-mount type, cable length 1.0 m		4.0	DISSZT-04.0×030 N100
Flush-mount type, cable length 15 m			DISSZT-04.0×030 N150
Flush-mount type, cable length 2.0 m			DISSZT-04.0×030 N200
Optional parts	Retaining screw*1 M8 × 0.75 (fine)	–	EPSSZT-M8
	Retaining screw*1 M10 × 1.5 (regular)	–	EPSSZT-M10
	Sensor securing wrench*2	–	EPSSZT-FXWR
	Sensor removal wrench*3	–	EPSSZT-PLWR

*1 One retaining screw is required for each sensor.
*2 The sensor securing wrench is used to tighten retaining screws (used with both fine and regular retaining screws).
*3 The sensor removal wrench is used when the sensor is difficult to remove due to resin buildup.
*4 Does not apply if the customer selects a different clamping method.

Reference Information

Usage precautions
Q&A
Machinery and Tooling Division products
International sales offices
Contact information

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

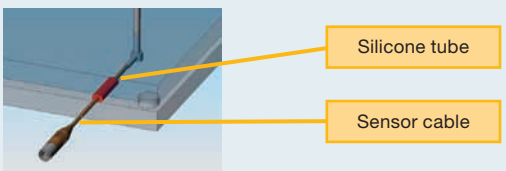
Pressure sensors

[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]

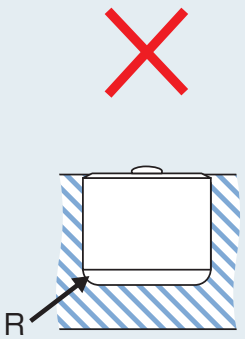
Pin diameter [mm]	ϕ0.8	ϕ1.0	ϕ1.2	ϕ1.5	ϕ2.0	ϕ2.5	ϕ3.0
Load equivalent to 100 MPa [kgf]	5.13	8.01	11.5	18.0	32.0	50.1	72.1
Stroke [mm]	0.050	0.040	0.040	0.055	0.073	0.080	0.076

* Displacement of sensor unit

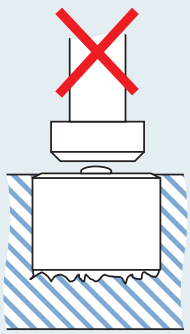
Pressure sensor - button type mounting

* Pressure sensors - button type SSB series only

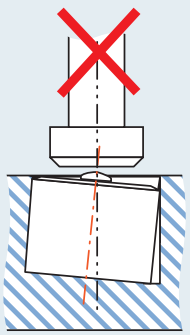
15. Note the following when installing button type pressure sensors:



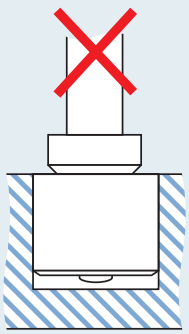
Do not machine the bottom with rounded edges.



The machined underside must be smooth.



Install perpendicular to the pin shaft.



Do not mount the sensor upside down.

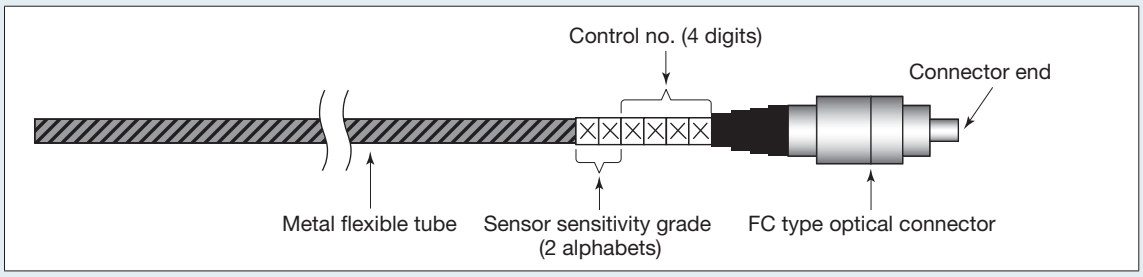
Resin temperature sensors

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

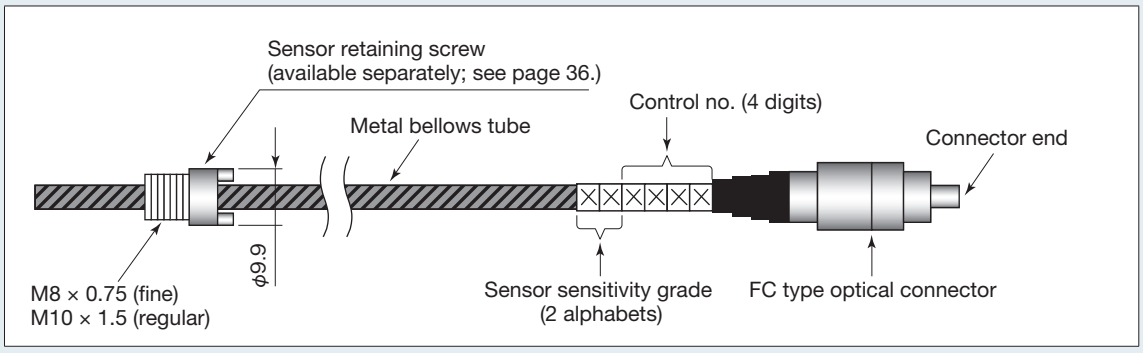
Installation and measurements

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

MPS08 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: WCM0005-L-D9P-D9P N-MPS08 catalog page 21)

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 are the required specifications for the PC?

A4. A PC having a Core II Duo or higher CPU and memory capacity of at least 1 GB is recommended.

Q5. What is the purpose of the LAN port? Is wireless LAN connection possible?

A5. 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.

Q6. What is the volume of the data obtained?

A6. 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

Q7. What happens when the PC runs out of available disk space?

A7. The pressure waveform will appear on the measurement screen, but once the hard disk capacity falls below 30%, 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.

Q8. Can I use a commercially available LAN cable?

A8. Yes. (Depending on length, the cable may be susceptible to noise effects.)

Q9. The amplifier is heavier than previous models. Is it still possible to mount it to the side of the molding machine with magnets, as before? If not, how should it be installed?

A9. The amplifier weighs approximately 2 kg. It cannot be mounted to the side of the molding machine with magnets as with earlier models. It must be placed flat on a work platform or the like positioned next to the molding machine.

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

A10. Yes. The MPS08 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.

Q11. Why is a trigger signal input to the amplifier required?

A11. 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.

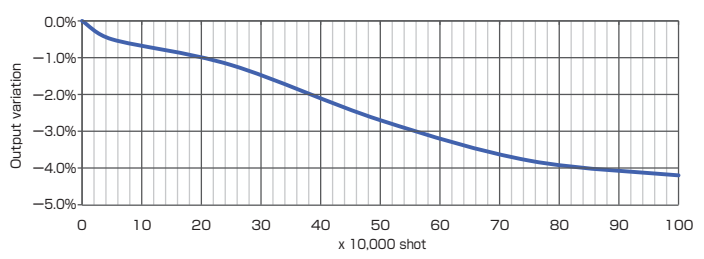
Ejector pin type pressure sensors

Q12. Do the specifications for the previous sensors (EPS series) and new sensors (SS series) differ?

A12. 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.

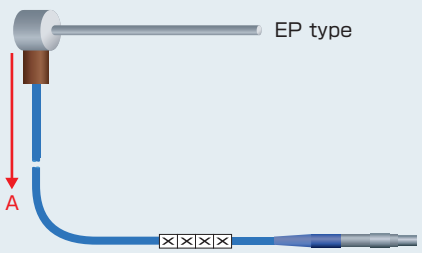
Q13. How durable are the sensors?

A13. 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.



Q14. How strong is the sensor cable attachment base?

A14. 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

Q15. Can the profile of the pin tip be machined?

A15. 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.

Q16. Is it possible to measure mold release resistance (ejection force)?

A16. 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 (mm2). 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:	$S = (3 \times 3 \times \pi) / 4 = 7.0686$ (mm^2)
Ejection force:	P (N) = C × S = 20 × 7.0686 = 141.4
	141.4 (N) × 0.102 =14.4 (kgf)

Q17. How do we check for sensor disconnection?

A17. 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 18)

Q18. Can the sensors be used with die-cast molding?

A18. Yes, provided the in-mold pressure does not exceed 100 MPa and the mold temperature does not exceed 150°C within the specifications range.

Q19. Do the sensors include a temperature compensation circuit?

A19. 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).

Q20. Can the sensors be connected for measurement to commercially available measuring amplifiers?

A20. The sensors are based on proprietary Futaba specifications and cannot be connected for measurement to other instruments.

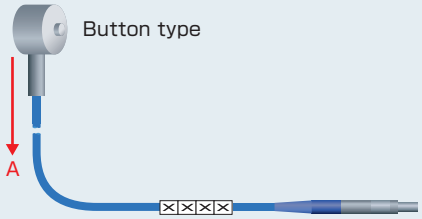
Button type pressure sensors

Q21. When choosing button type pressure sensors, how should I determine the expected in-mold pressure?

A21. This is generally less than half the injection peak pressure. Refer to the data for the molding machine.

Q22. How strong is the sensor cable attachment base?

A22. 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.



Q23. Can I measure pressure if the lower flange face of the ejector pin is in contact with the protruding part of the sensor?

A23. Install so that the sensor and ejector pin centers are aligned (within ±0.3 mm).

Q24. Machining the tip of the ejector pin to form a diagonal face alters the pressure-receiving area. How should the pressure be calculated?

A24. 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.

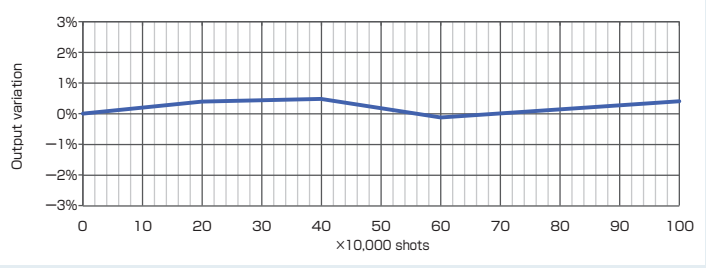
Example For 1 mm diameter: Pressure-receiving area (mm^2) × expected in-mold pressure (MPa) = 0.79 (mm^2) × 120 MPa = 94.8 (N)

Q25. What is the displacement of the sensor?

A25. The maximum displacement under the rated load is 0.02 mm.

Q26 How durable are the sensors?

A26. Sensors can withstand at least 1 million cycles in repeated load testing (SSB01KN08 × 06: 150°C, 1,000 N, with cycle period of 1.2 s). This does not constitute a guarantee. Factors such as usage conditions may affect durability.



Compatibility of old and new products

Q27. Can I use the earlier sensors (EPA, EPC, EPV) with the new sensors (SS series)?

A27. No. They cannot be used together.

In-mold resin pressure measuring system Q&A

Q28. Can a new amplifier (MPS08) be used with the earlier sensors (EPS series)?

A28. 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 19)

Q29. How long will the earlier amplifiers (EPA, EPC, EPV) and sensors (EPS series) continue to be sold?

A29. The earlier amplifiers will continue to be sold until stocks run out. The earlier sensors will continue to be sold for the foreseeable future.

Q30. Does pin diameter affect measurements?

A30. 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

Q31. The sensor cable broke.

A31. 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.

Q32. I did something that crushed the sensor connector.

A32. This can be repaired for a fee. (Please contact your nearest Futaba sales office.)

Q33. No waveforms appear on the measurement screen.

A33. 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.

Q34. I'm not sure where to insert the sensor.

A34. You can measure pressure no matter where it's inserted. To detect short shots, insert close to where short shots occur.

Q35. I want to detect short shots, but I'm not sure what alarm monitoring threshold to use.

A35. 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.

Q36. What's the ideal pressure waveform?

A36. 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.

Q37. I mistakenly input a voltage to the amplifier trigger signal.

A37. 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.

Q38. What's the correlation between pressure measurements and common molding defects?

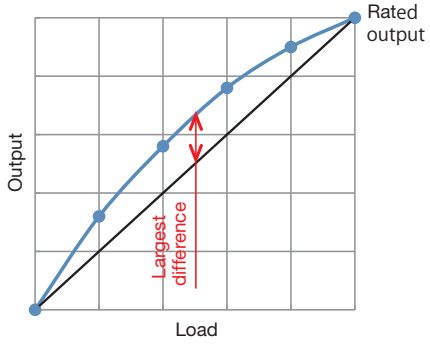
A38. Refer to the following table:

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.

Q39. What is nonlinearity?

A39. 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

Q40. What are sensitivity fluctuations?

A40. 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

Q41. Are instruction manuals available in other languages?

A41. An English language instruction manual is available. Instruction manuals in other languages are planned for the future.

Q42. Is the equipment loan scheme still in place?

A42. Yes. (Loans are normally for two weeks and one time only.)

Q43. What is the language-switching function on the measurement software?

A43. 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.

Q44. What does the CE marking mean?

A44. 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.

Q45. Why was the entire model range modified at this time?

A45. The changes involve improvements in noise resistance in compliance with CE requirements. Additionally, the functions formerly offered by three measuring amplifier models were integrated into a single model for improved usability. (The built-in memory function of the EPC-002 has been discontinued.)

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 36)

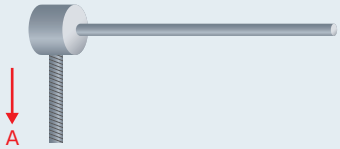
Resin temperature sensors

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. Damaged sensor connectors cannot be repaired.

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.)

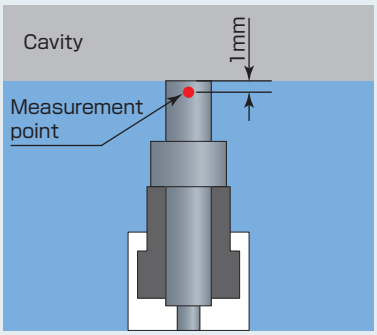
Mold surface temperature measuring system Q&A

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.

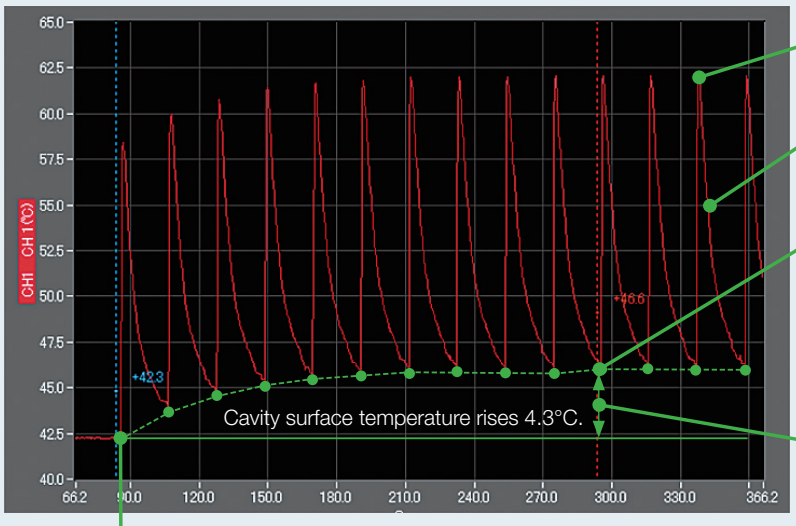
Q2. Where in the cavity is the temperature measured?

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 45)

④ Sensor securing wrench: Tool used to tighten and loosen the retaining screw ③ (catalog page 45)

⑤ Sensor removal wrench: Tool used to extract sensors fixed to the mold (catalog page 45)

* 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.

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 is the volume 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?

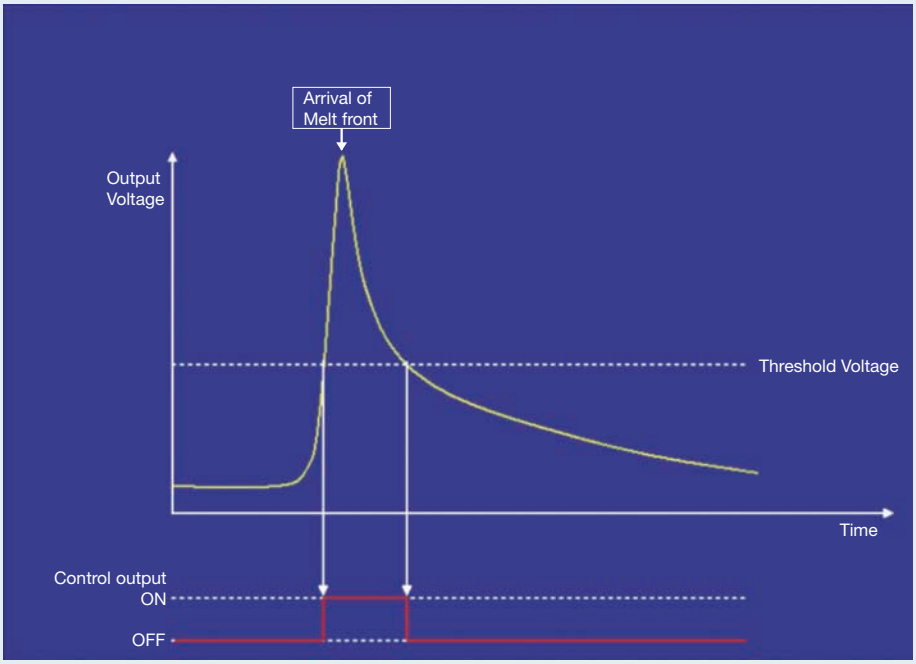
A2. We assume molten resin at temperatures of 160°C or higher for ease of threshold setting.

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. The system uses Futaba resin temperature sensors. (Resin temperature sensors catalog pages 32 and 34)
These are listed as flow front detection sensors because the system cannot measure resin temperature.

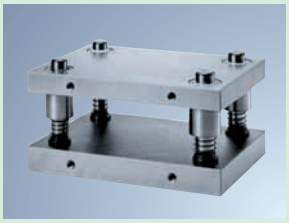
Machinery and Tooling Division products

Press mold parts

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

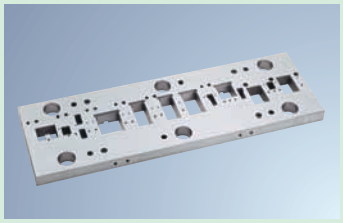
We offer high-quality high-precision machining technologies to meet customer requirements ranging from standard parts to machined and assembled parts.

Standard die sets

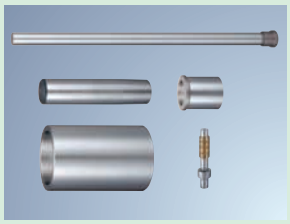


Fully machined die sets

Fully machined inner plates

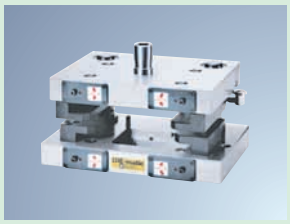


Press mold guide parts



MG guides

Diematic system



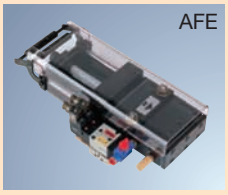
Labor-saving devices

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

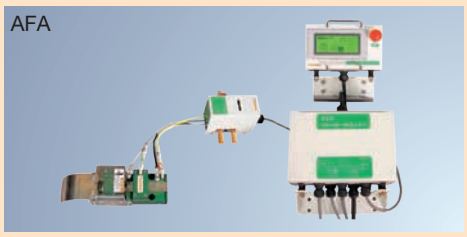
AFE



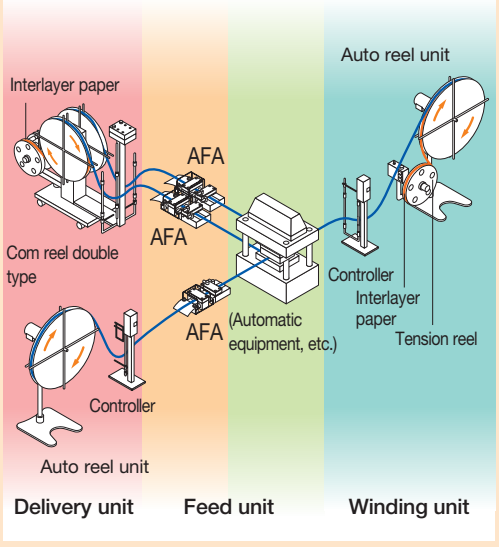
Com reel

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.

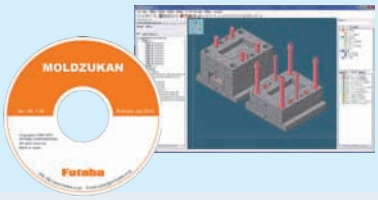
Additional machining

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-Cavity 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.

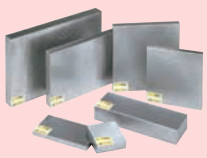
Supporting customers' business developments with an extensive range of products, high quality, and short lead times, from standard plates to customer-specified size plates

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

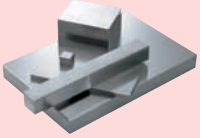
Customer-specified size plates

High precision plates

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

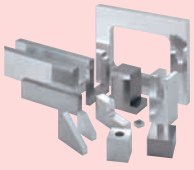
Customer-specified size milled plates

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

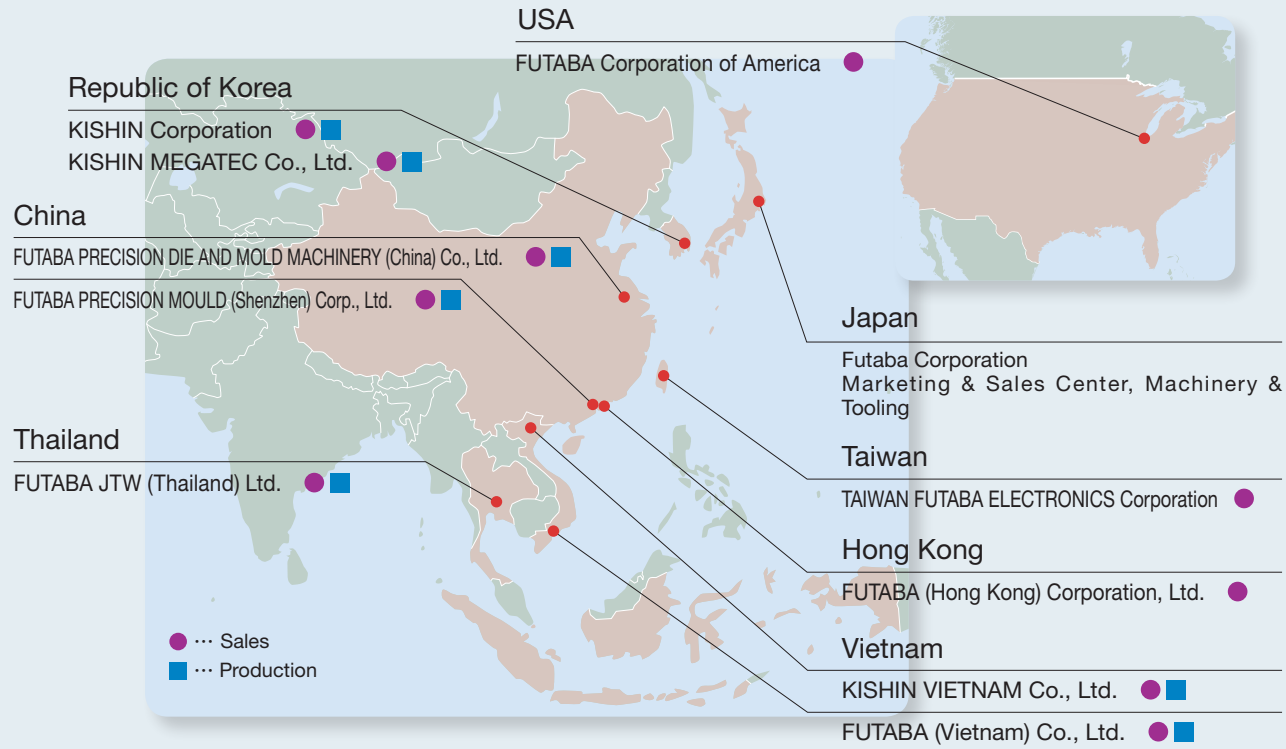


Equipment plates

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



International sales offices



Products handled by sales offices

Region	Product sales categories							Company name	Country
	Mold bases	Mold parts	Die sets	Press mold parts	Plates	Labor-saving devices	Mold Marshalling System		
Japan	●	●	●	●	●	●	●	Futaba Corporation	Japan
Republic of Korea	●	●	●	●	●	●	●	KISHIN Corporation	Republic of Korea
Republic of Korea	●	●						KISHIN MEGATEC Co., Ltd.	Republic of Korea
China: northern and eastern regions	●	●	●	●	●	●	●	FUTABA PRECISION DIE AND MOLD MACHINERY (China) Co., Ltd.	China (Kunshan)
China: southern regions	●	●	●	●	●	●	●	FUTABA PRECISION MOULD (Shenzhen) Corp., Ltd.	China
Hong Kong, Philippines, etc.	●	●	●	●	●	●	●	FUTABA (Hong Kong) Corporation, Ltd.	Hong Kong
Taiwan						●	●	TAIWAN FUTABA ELECTRONICS Corporation	Taiwan
Thailand	●	●	●	●	●	●	●	FUTABA JTW (Thailand)	Thailand
Vietnam	●	●		●	●			FUTABA (Vietnam) Co., Ltd.	Vietnam
Vietnam	●	●	●		●			KISHIN VIETNAM Co., Ltd.	Vietnam
USA							●	FUTABA Corporation of America	USA
Other counties or regions	●	●	●	●	●	●	●	Futaba Corporation	Japan

* For inquiries about purchase or use overseas, please contact the Marketing & Sales Center, Machinery & Tooling (phone: 81-475-30-0809).

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Fax: 82-32-815-0299~30
Busan Office, Daegu Office, Seoul Office

KISHIN MEGATEC Co.,Ltd.

57 Jeyakdanji-ro, Hyangnam-eup, Hwaseong-si, Gyeonggi-do, Republic of Korea
Phone: 82-31-355-9811
Fax: 82-31-355-9820

FUTABA PRECISION DIE AND MOLD MACHINERY (China) Co., Ltd.

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Fax: 86-512-57035840

FUTABA PRECISION MOULD (Shenzhen) Corp., Ltd.

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Fax: 86-755-84736197

FUTABA (Hong Kong) Corporation, Ltd.

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TAIWAN FUTABA ELECTRONICS Corporation

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Fax: 84-8-7700-550

KISHIN VIETNAM Co., Ltd.

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FUTABA JTW (Thailand) Ltd.

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Fax: 66-38-522-275

FUTABA Corporation of America

711 East State Parkway, Schaumburg, Illinois 60173, USA
Phone: 1-847-884-1444
Fax: 1-847-884-1635

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 March 2018.

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-Cavity Measuring System
Mold Marshalling System
General Catalog VOL. 8.1
Issued: March 2018 (First edition, first printing)

Futaba Corporation
629 Oshiba, Mobara, Chiba Prefecture

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

1803DC

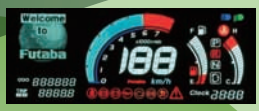
Futaba high-technology links the visions of individuals and societies to the future

OLED (organic EL displays)

VFD (vacuum fluorescent displays)

Segment type, alphanumeric type,
dot-matrix type, hybrid type,
VFD with built-in driver (CIG-VFD),
active matrix VFD (AM VFD),
FIVFD (fully integrated VFD)

Audio VFD

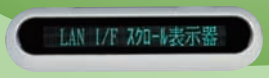


In-car VFD

VFD (vacuum fluorescent display) modules

Message modules, full dot-matrix modules,
dot character modules,
scrolling boards

VFD modules



Scrolling boards

Radio controls for hobby use

Radio control transmitters, receivers, servos, amplifiers,
gyros, flight simulators, hobby-use robot function parts

Radio control transmitters
(for helicopters and planes)

Radio control
transmitters (for cars)

Brushless servo motors

Gyro units (for helicopters)

Hobby use robot
function parts

Industrial wireless devices

Specified low-power radio modems, wireless modules,
SS wireless modems, industrial wireless modems,
telecontrol systems

Wireless modems

Telecontrol systems

Vacuum tube technologies

Fluorescent materials

Circuit technologies

Servos

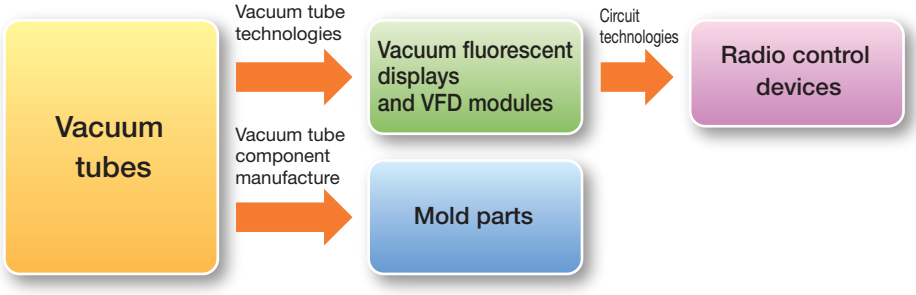
Wireless

Gyros

Futaba

Electronics business

Looking at the origins…



Founded in 1948, Futaba Corporation got its start by manufacturing and selling vacuum tubes for receivers. The company subsequently began manufacturing vacuum fluorescent displays utilizing its vacuum tube manufacturing technologies. The company has built up its current base by developing and commercializing press mold parts from knowhow gained through vacuum tube component manufacture and radio control devices based on circuit design technologies.

Production machinery business

In-cavity Measuring System (Mold Marshalling System)

In-mold resin pressure measuring system

Image processing and automatic inspection systems

Image processing automatic inspection system

Horizontal automatic winding unit

Feed systems (labor-saving devices

Air feeders, NC feeders, auto reels, unit levelers, coil cradles

High-performance NC grip feeder

Hot runner system

Multipoint valve gate system

Electrode forming system

Electrode forming molding machine

Electrode forming mold

Sensing

Control technology

Precision machining

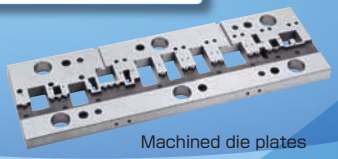
Standardization

Additional machined mold equipment

Additional machined mold bases, fully machined mold bases, fully machined die sets, machined inner plates

Additional machined mold bases

Fully machined die set



Machined die plates

Standard mold equipment

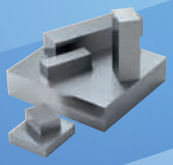
Die sets, mold bases

Standard plates & mold parts

Precision plates, precision press mold guide parts, high precision plates, die set parts, mold parts

Standard die set

Standard mold base

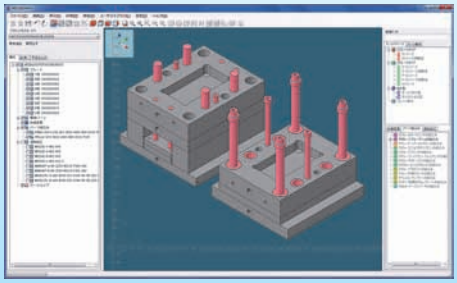


Precision plates

Press mold guide parts

Mold parts

Design and purchase support software



Then, development of mold parts and addition of items such as VFD modules have completed the current product range.
Futaba Corporation's policy to manufacture all components in-house is an approach that ensures a foundation of dependable quality, which extends to jigs, tools, and production equipment.

Futaba
Corporation