

Mold Marshalling System

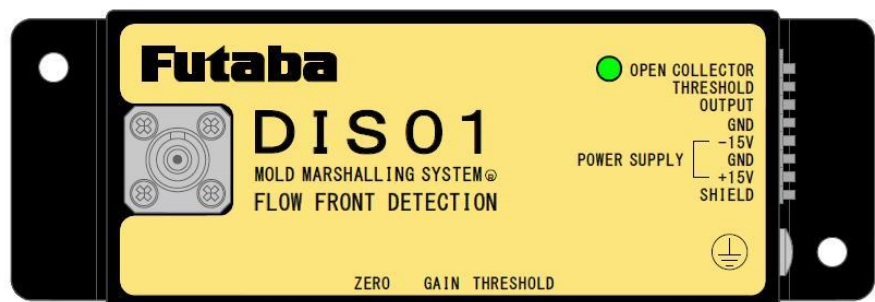
Flow front detection amplifier

DIS01

Instruction Manual

Thank you for your purchasing a product of Futaba Corporation.
Please read this instruction manual carefully and patronize the product for many years to come.

Do not use the product in any way other than explained in this instruction manual.



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Safety Precautions (Be sure to read before use)

■ Before Use

Before using the product, read this “Safety Precautions” and the instruction manual carefully. After reading the manual, keep it in a safe place so that it can be used whenever needed. When using the product, be sure to observe the following safety precautions. Futaba Corporation assumes no liability for the injury caused by using the product contrary to these precautions.

■ This manual uses the following alert symbols for safe use of the product.



WARNING

Failure to observe the instructions with this symbol could result in death or serious personal injury.



CAUTION

Failure to observe the instructions with this symbol could result in injury or only damage to property.

■ General Precautions

- When starting product operation, make sure in advance that the functions of the product are normally working with normal performance.
- If the product fails, use adequate safety measures to prevent various types of damage.
- Note that we cannot guarantee the functionality and performance for use of the product not conforming to the specifications or any remodeled product.
- When using the product in combination with other equipment, evaluate it thoroughly because the functionality and performance may not be satisfactory depending on the use conditions and environment.

■ Precautions



WARNING

When installing the product or connecting cables, be sure to disconnect the power cable in advance. Failure to do so could result in electric shock or malfunction.



WARNING

Do not use a broken cable or a cable with a flow in the covering. Doing so could result in fire, electric shock, or device damage or failure.



WARNING

Use the power within the range ($\pm 15V$ 1.5Wmax) stipulated in the specifications. Using the power outside the range could result in fire or device damage or failure.



CAUTION

Keep the sensor and amplifier away from water. Failure to do so result in electric shock or device damage.

Preface

“Flow front detection amplifier DIS01” is an amplifier that detects the passage of resin over the sensor and controls the injection molding machine using a Futaba Corporation’s optical fiber temperature sensor.

The amplifier converts the resin temperature to an analog voltage, compares the voltage with a preset threshold voltage and outputs the result via a transistor open collector while simultaneously displaying the status using a LED lamp mounted on it.

Major features are as follows:

- The system can detect resin arrival with a simple configuration consisting of only an amplifier and temperature sensors.
- It uses high-speed response sensors.
- Infrared detection system resistant to disturbance offers high noise resistance.
- Threshold voltage signals can be adjusted between 0 to 13V (only by operating the knob).
- The product is compliant with CE standards. So it can be used overseas as well.

Please read this instruction manual carefully and use the product correctly.

If you have any questions, please contact our sales department.

Standard Accessories

■ This equipment comes with the following standard accessories.

After unpacking the equipment, make sure that all accessories are included.

- Flow front detection amplifier “DIS01”..... 1
- Instruction manual (this manual)..... 1
- Warranty and Certificate of Registration..... 1

Options (Sold Separately)

- Flow front detection sensor (ejector pin type, flush-mount type)

Recommended Power Supply

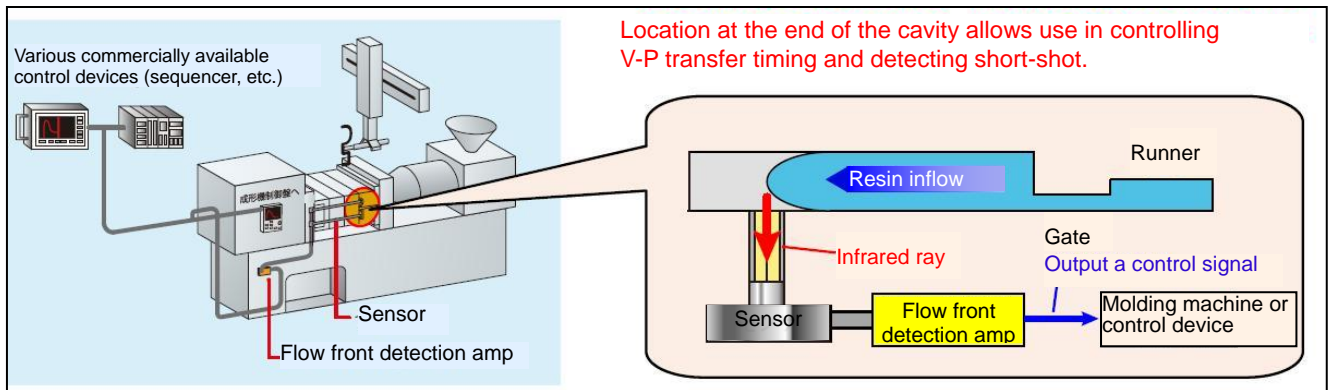
- OMRON Power Supply Type S82S-7728 (input 24 VDC, output ± 15 VDC)

Handling Precautions

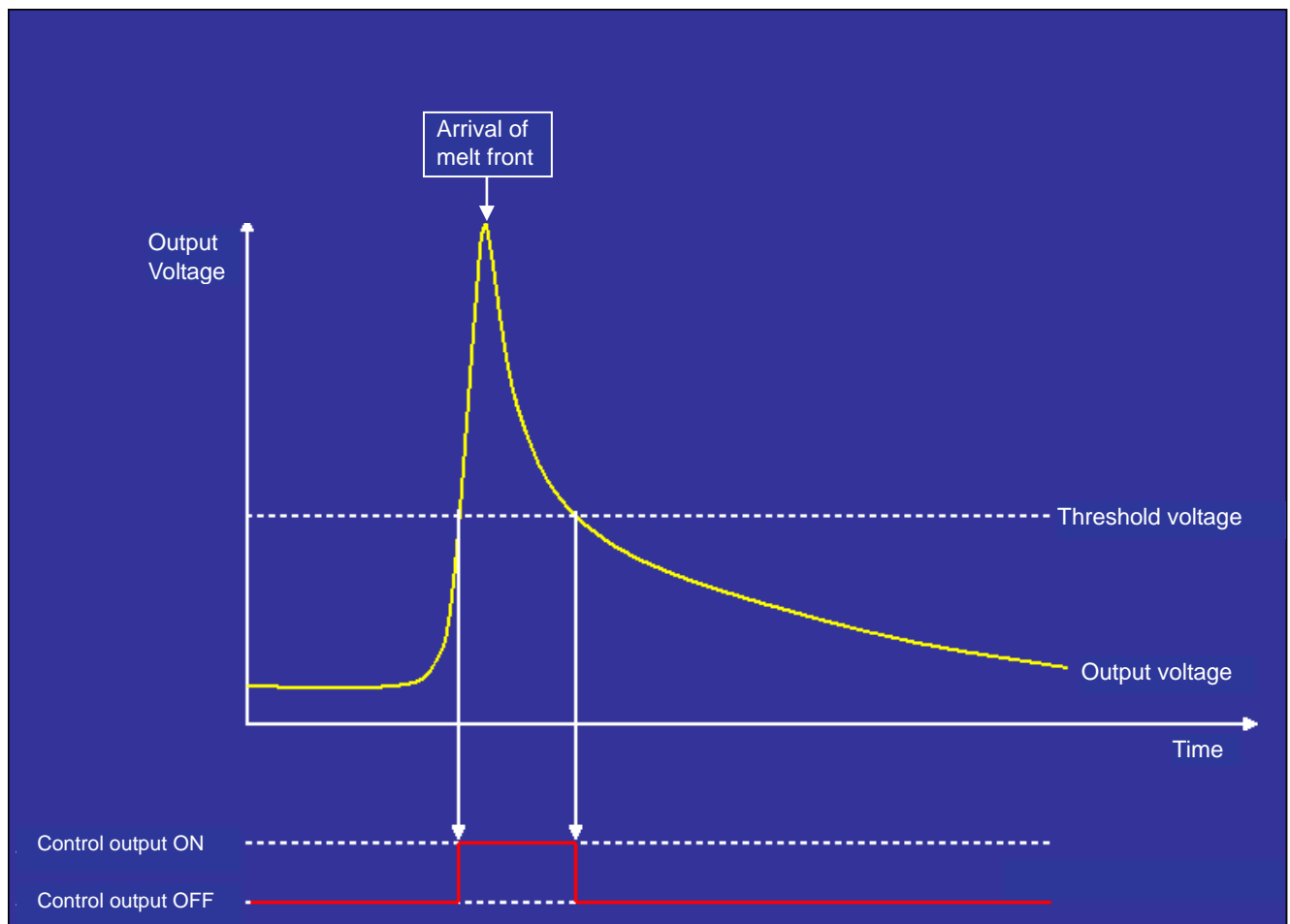
- Turn on the power to the amplifier after connecting between the systems. Do not turn on/off the power supply by disconnecting and connecting the cable. It could damage the amplifier.
- When the power is once turned off, wait for at least 5 seconds before turning it on again. If the power is turned on within 5 seconds or turned on and off repeatedly, power failure may be caused by rush current generated at power on.
- Warm up the system before use, for about 30 minutes after power on.
- This amplifier cannot save measured data.
- Before using the amplifier, be sure to execute “set zero point” using the output voltage offset adjuster knob. Without doing “set zero point”, resin arrival cannot be detected correctly.
- Avoid using the system in an environment subject to remarkably high or low temperature. **The allowable range of operating temperature is 10 to 40°C.** If it is unavoidable to use the system at a place subject to direct sunlight or in a cold area, protect it from sunlight or keep it warm.
- Use the system in the relative humidity range from 35 to 85%. Using it out of the humidity range or in an environment subject to water splashes could result in performance deterioration or failure.
- Do not use the system in a dusty place. Performance degrades if the dust gets inside. Prevent dust from getting inside not only during operation but also during storage. Use the system in an environment in which personal computers can be used. When sensors are not connected, install the supplied cap on the connector of the amplifier.
- If the environment changes drastically, do not operate the system soon. Leave the system in the new operating environment to adapt it to the environment and then use it. If the ambient temperature or humidity is changed drastically due to movement, condensation may cause performance degradation and failure.
- Do not use the system in an environment subject to vibration or impact. Continuous vibration or large impact could cause performance degradation or failure.
- Do not use the system in strong electromagnetic fields. Use it in an environment in which personal computers can be used. Using it in the vicinity of a radio, microwave oven, or electric furnace that generates a strong electromagnetic field could cause performance degradation, malfunction, or failure.
- Do not use the system in locations with poor power supply conditions.
- When installing a sensor, do not twist the cable of the sensor forcibly. It could cause the optical fiber inside the cable to break.

Configuration

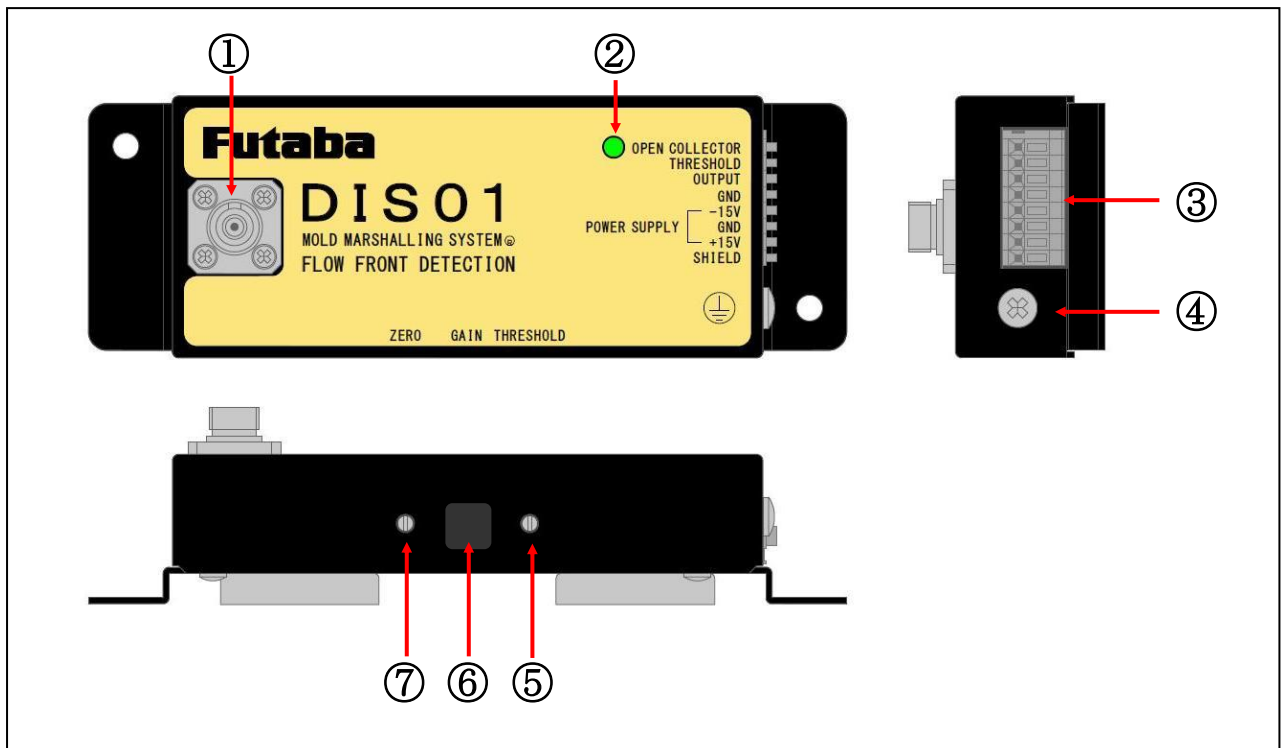
■ Connection configuration



■ Signal operation timing chart



1. Names and Major Functions of Components



- ① Sensor connecting connector..... Used to connect a flow front detection sensor.
For the connection method, refer to Section 2-2 “Connections in System”.
- ② LED lamp..... Illuminates when a control output signal is output.
- ③ External connector terminal..... Used to connect cables when external devices are connected. Refer to Section 2-3 “Connecting control output signal”.
- ④ Chassis grounding terminal..... Terminal for ground.
- ⑤ Threshold voltage adjuster knob..... Knob for adjusting thresholds voltage.
Can be operated using a flathead screwdriver with a blade width of 2.6 mm or less.
- ⑥ “Adjusted” indication label Indicates that the scaling factor of output voltages has been set.
- ⑦ Output voltage offset adjuster knob..... Knob for performing offset of sensor output voltage.

2. Preparation

This section explains the preparation required before turning on the power.

2-1 Installing the System

2-1-1 Installing the temperature sensor

For the procedure for installing a sensor on the mold, refer to the “Temperature sensor installation reference drawing” attached to the purchased sensor.

2-1-2 Installing the amplifier

Install the amplifier in the vicinity of the mold. The operating temperature range is 10 to 40°C. Be careful not to expose it to temperature out of the range.

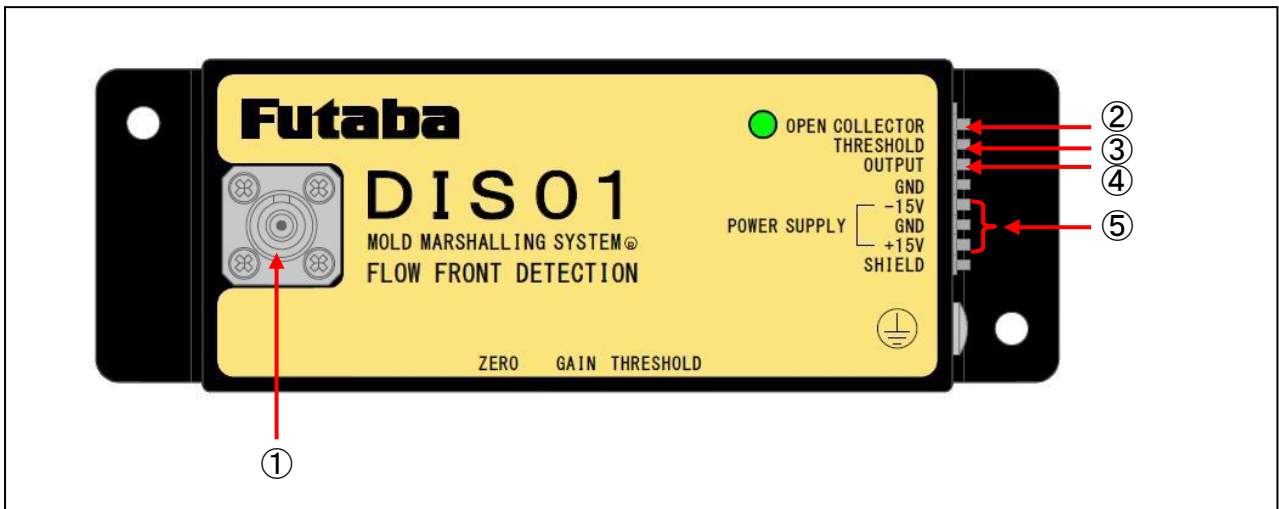
The following two ways of installation are available. In any ways, install the amplifier so that the sensor cable does not get caught or is not pulled during movement of the mold.

- ① Screw the amplifier near the mold (The customer is requested to perform M4 tapping.)
- ② Fix the amplifier using magnets near the mold.

*Magnets may come off and cause unexpected loss. Use them at customer’s own risk.

2-2 Connections in System

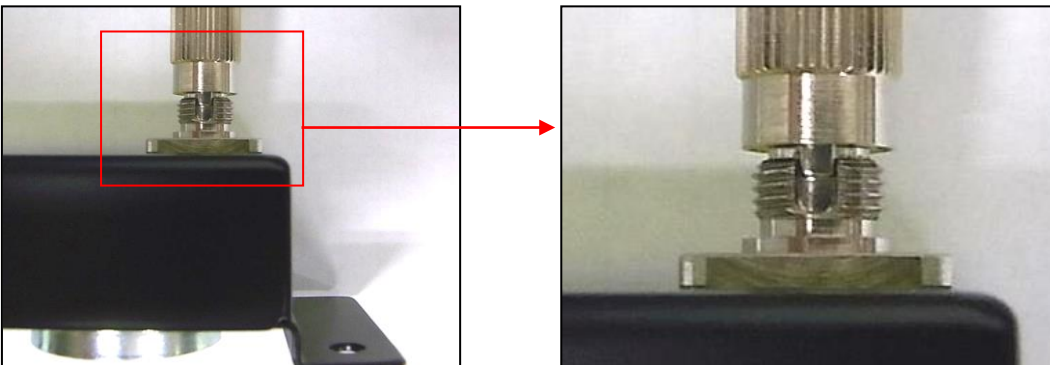
- Connect the components in order of the number shown in the following figure.
Connect the power supply ⑤ after completing the connection ① to ④.



- ① Connect a sensor to the amplifier.

Connect a sensor to the amplifier. While aligning the convex portion of the sensor-side connector with the notch on the amplifier-side connector, screw it into the hole of the connector. When aligning the convex portion with the notch, do not twist the sensor cable forcibly. It could cause the optical fiber inside the cable to break.

After aligning the convex portion with the notch, turn the screw to fix the connector.



- ② Connect the control output signal. (Open collector output)
Refer to Section 2-3 "Connecting control output Signal".
- ③④ Connect the external measuring device.
Refer to Section 5 "Measuring with External Device"
- ⑤ Connect the power supply.
Refer to Section 2-4 "Connecting the Power Supply".

2-3 Connecting Control output Signal

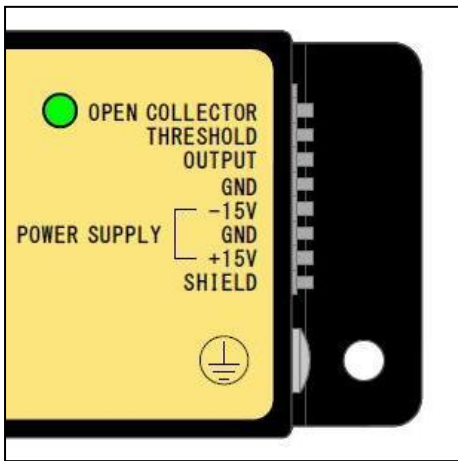
<<What is the control output signal?>>

The control output signal means a signal output from the amplifier to an external device such as a molding machine or robot.

Control output signal A control signal is output when the sensor output voltage exceeds the threshold voltage. This signal is used to detect the passage of resin over the sensor and control the molding machine.

- Wire signal cables to the external connector terminal on the side of the amplifier by referring to the following.

● External connector terminal



| Signal name | IN/OUT | Details |
|----------------|--------|--|
| OPEN COLLECTOR | OUT | Control output signal (open collector) |
| THRESHOLD | OUT | Threshold output (Analog Voltage) |
| OUTPUT | OUT | Sensor output (Analog Voltage) |
| GND | OUT | Ground |
| - 15 V | IN | Negative power supply input (-15V±5%) |
| GND | IN | Ground |
| + 15 V | IN | Positive power supply input (+15V±5%) |
| SHIELD | --- | (Connected internally to ground) |



- Pressing the switch opens/closes the connection spring and allows the cable to be fitted to the terminal block as shown in the picture.

The recommended size of the cable to be connected to the external connector terminal is AWG22. (Applicable wire range: AWG28 to AWG22)

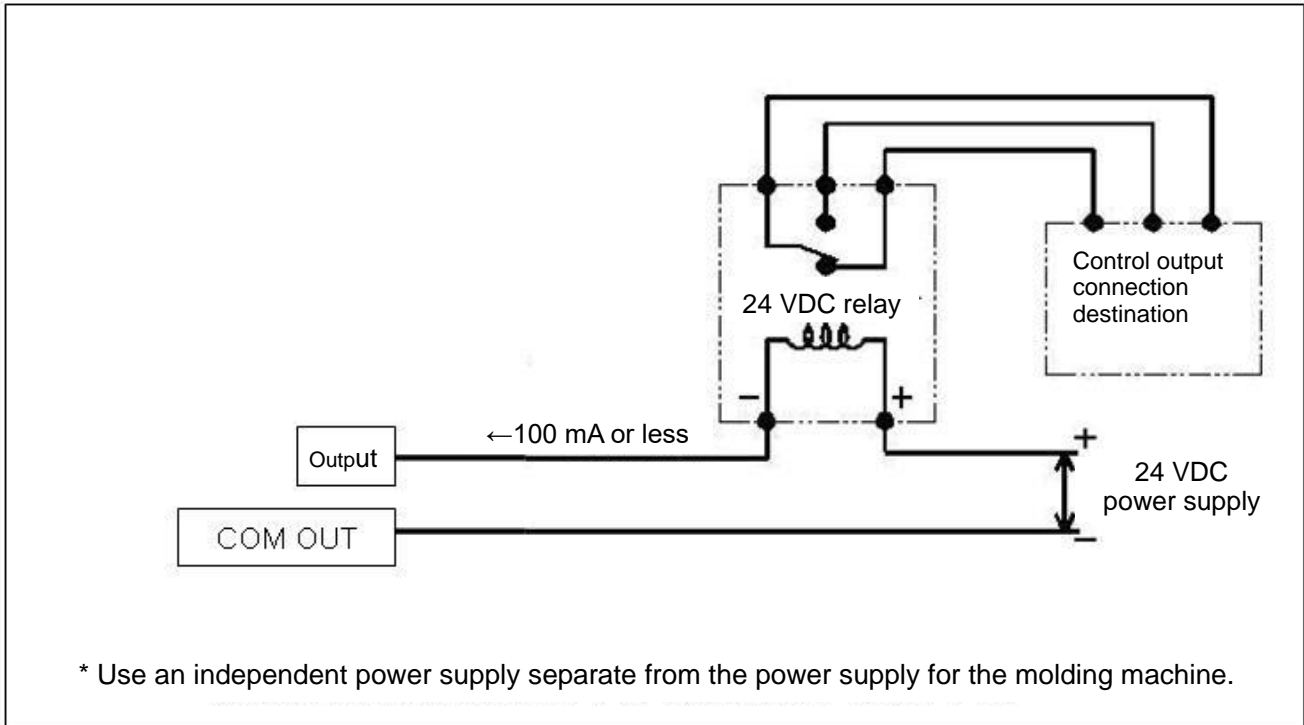
● Control output signal circuit specifications



The control output from the main unit is up to 100 mA (30 V or less) in the NPN open collector. Use the power supply with the negative side connected to the ground.

Example: Connect I/O signals using the 24 VDC power supply and 24 VDC relay.

* When using an electromechanical relay, use a relay equipped with the coil surge absorption circuit.



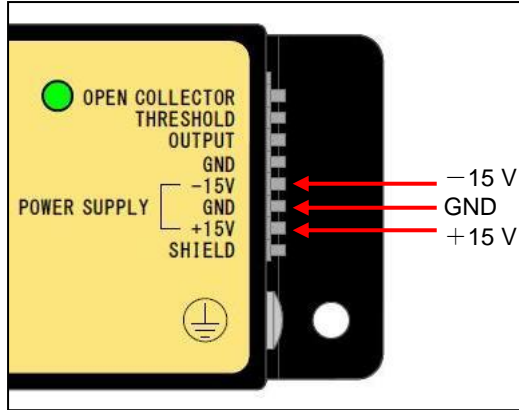
2-4 Connecting the Power Supply

- Supply power to this equipment from the power supply that can output ± 15 VDC voltage.
 - * The amplifier does not have a power switch. Never turn power on or off by connecting or disconnecting the cable. It could damage not only the amplifier but also other devices connected.
 - * Power supply and connection cables should be prepared by the customer.
- Before turning the power supply on, check the supply voltage and the connection points.
 - * If the supply voltage is out of the above voltage range or each terminal voltage of the power supply has higher potential than the supply voltage against the ground, never connect it to this equipment. It could cause failure or accident.
- Connect the supply voltage as follows:
 - ① Extend three cables of +15V, -15V and GND from the power supply unit.

Recommended power supply:

OMRON power supply type S82S-7728 (input 24VDC, output ± 15 VDC)

② Connect the cables to the following locations.



For the procedure for connecting the cable, refer to Section 2-3 “Connecting Output Signal”.

③ Start the power supply unit to turn on the power to the amplifier.

In the field where equipment that generates noise such as an induction motor or electric welder is used, the power condition is expected to be bad with much noise. Take measures against noise by using commercially available isolation transformer or noise cut transformer.

- Warm up the system for 30 minutes or more after power on. Insufficient warm-up could make sensor output voltage unstable.

3. Basic Operation of Amplifier

This section describes the basic operation of amplifier “DIS01”.

3-1 Turning Power ON/OFF

- Turning power ON

Turn on the power to the amplifier by referring to Section 2-4 “Connecting the Power Supply”.

- Turning power OFF

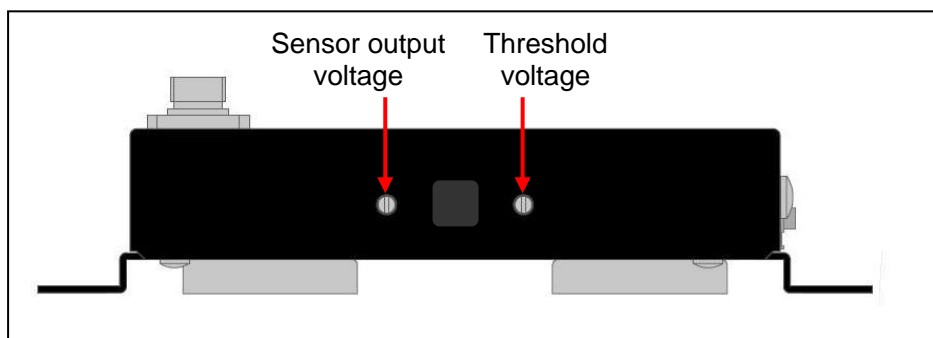
Turn off the power of the power supply unit.

***The amplifier does not have a power switch. Never turn power on or off by connecting or disconnecting the cable. It could damage not only the amplifier but also other devices connected.**

3-2 Operating the Knobs

- Operate the knobs located on the side of the amplifier as needed in the following cases.

- Performing “Zero point setting” for Sensor output voltage.
- Changing the threshold voltage.

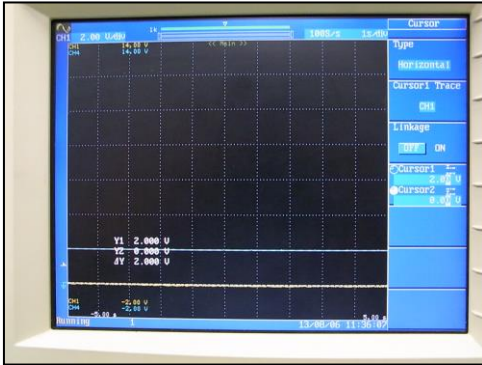


3-2-1 Adjusting the output voltage

Operate the output voltage offset adjuster knob to change the offset voltage of the output voltage.
For the procedure for checking the voltage with an external device, refer to Section 5 “Measuring with External Device”.

3-2-2 Adjusting the threshold voltage

Operate the threshold voltage setting adjuster knob to change the threshold voltage.
For the procedure for checking the voltage with an external device, refer to Section 5 “Measuring with External Device”.



The figure at left shows the sensor output voltage and threshold voltage displayed on the oscilloscope.
At shipment, comparison voltage is set to 2V.

* About the setting of threshold voltage...

Set the threshold based on the sensor output voltage during molding.

The sensor output voltage plots a logarithmic curve. So, as the temperature become low, more fine adjustment of the threshold is required.

4. Checking the Operation

This section explains how to check whether the control output signal works normally.

4-1 Checking Control Output Signal (Open Collector Output)

When the sensor output voltage exceeds the threshold voltage, open collector output is turned ON and a control output signal is output.

The control output signal can be checked using a multimeter or other continuity detectors. Connect to “O.C.SIGNAL” and “GND” on the external connector terminal to check the signal.

A Sensor output signal is output when something hot or emitting strong infrared ray (lighter, LED light, etc.) is brought closer to the sensor.

4-2 Checking Control Output Signal (LED Lamp)

When a control output signal is output, LED lamp on the amplifier lights up as well.

Check the signal in the same way as in Section 4-1.

5. Measuring with External Device

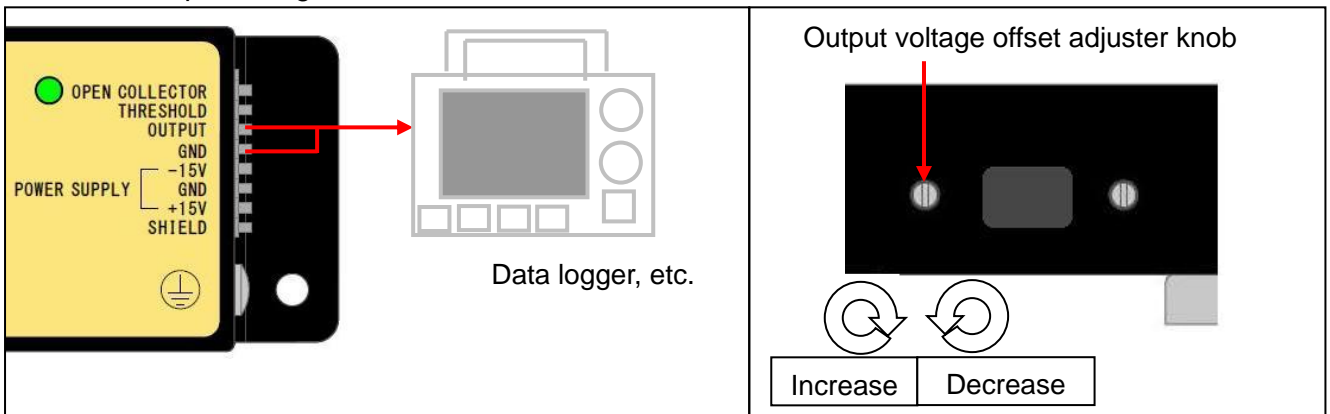
The flow front detection amplifier can be connected to an external measuring device to measure and set output voltages and threshold voltages.

This section explains how to connect the system to an external measuring device and adjust the knobs.

■ Connect an external measuring device to the external connector terminals by referring to the following.

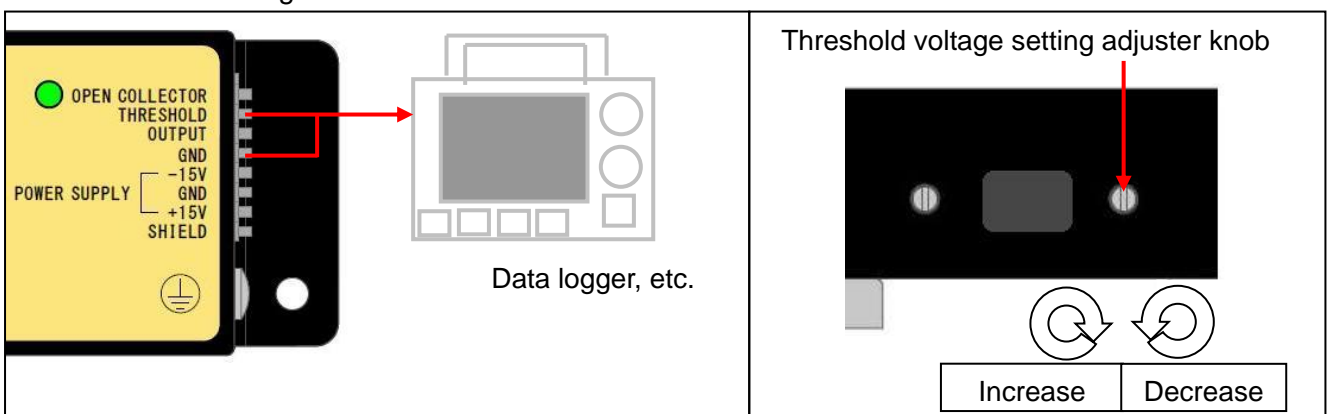
- The procedure for connecting cables is the same as that for connecting the power supply.
- External connector terminals “GND” and “SHIELD” are internally connected.

● Sensor output voltage



※ The allowable range of sensor output voltage is 0 to 13 V.

● Threshold voltage



※ The allowable setting range of threshold voltage is 0 to 13 V.

6. Specifications

■ List of specifications

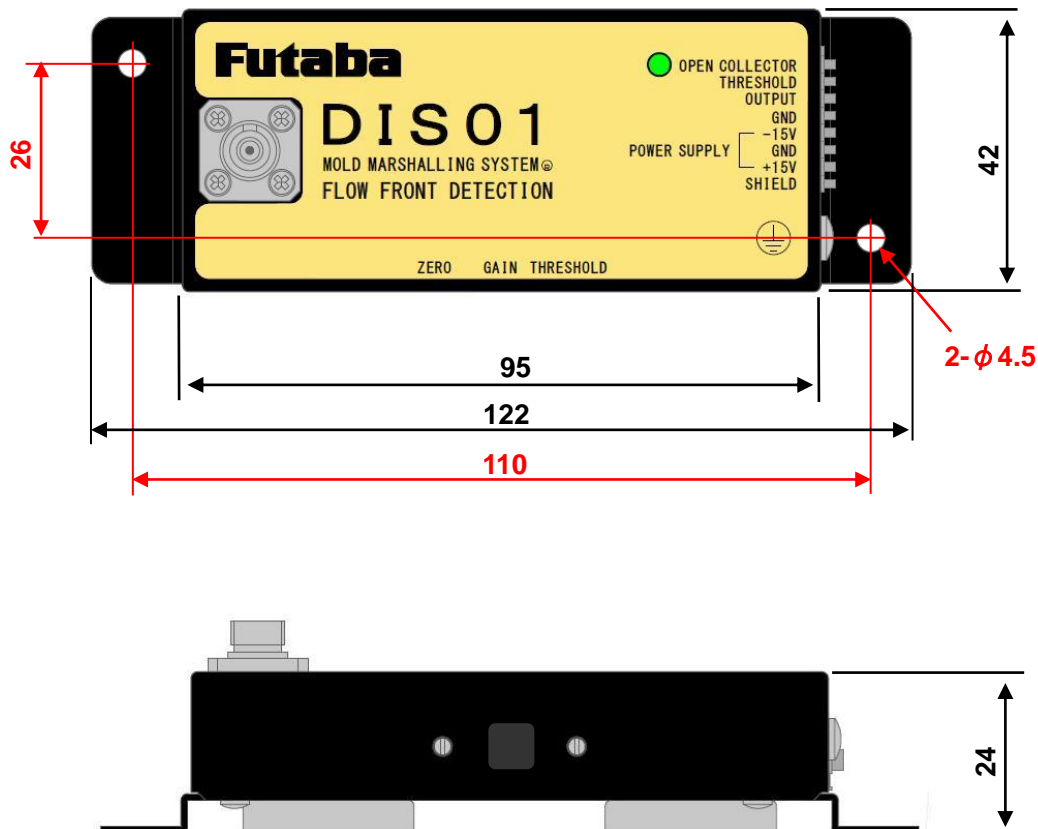
<Flow front detection amplifier DIS01>

| | |
|-----------------------------|------------------------|
| Produce name | DIS01 |
| Power supply voltage | ±15 VDC, 1.5 W maximum |
| Sensor output | 0 V to 13V |
| Threshold output | 0 V to 13V |
| Control output | NPN open collector |
| Operating temperature range | 10 to 40°C |
| Mounting method | Magnets or screws (M4) |
| Weight | Approx. 0.2 kg |

[Note] Does not include power supply cables or screws.

■ Outline drawing [Unit: mm]

<Flow Front Detection Amplifier DIS01>



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