Metal-sheet Double-feed Detector

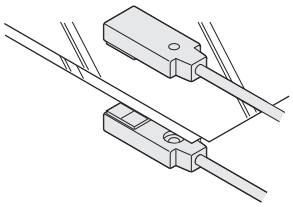
GD SERIES

Related Information ■ General terms and conditions..... F-7 ■ General precautions.....P.1501

From ultra-thin lead frames to iron sheets... Double feed detection of various metal sheets

Double metal sheets detected

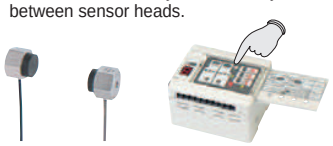
The high-end **GD** sensing technology detects double feeds of any metal sheet 0.01 mm 0.0004 in, or more, thick.



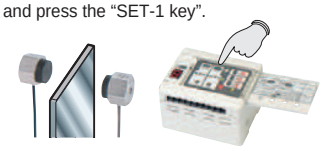
Easy sensitivity setting with actual samples

Optimum sensitivity setting is easy by using the teaching function with actual samples.

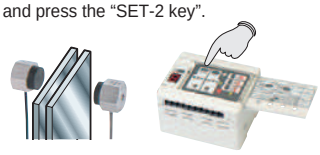
1. Press the “0-ADJ. key” while no object exists between sensor heads.



2. Place one sheet between the sensor heads and press the “SET-1 key”.



3. Place two sheets between the sensor heads and press the “SET-2 key”.

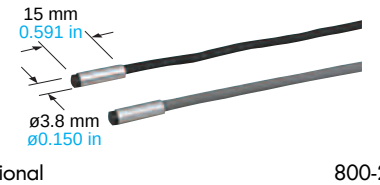


VARIETIES

Three types of sensor heads for various objects

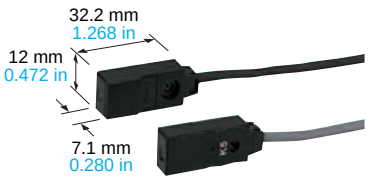
Small object detection sensor head / GD-3

This is an extremely small sensor head, only ø3.8 × 15 mm ø0.150 × 0.591 in, suitable for detecting small components.



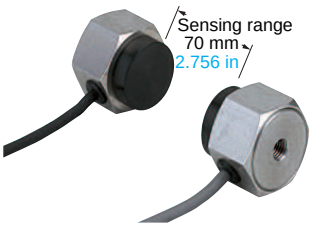
High precision sensor head / GD-10

It is suitable for high precision detection of double feeds of lead frames or thin metal sheets.



Long sensing range sensor head / GD-20

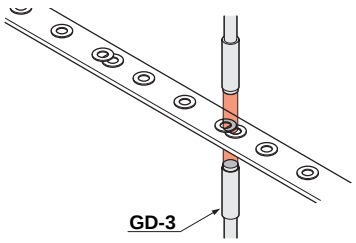
It achieves a long sensing range of 70 mm 2.756 in. Further, it employs a robust metal case with IP67 protection to withstand harsh environment.



APPLICATIONS

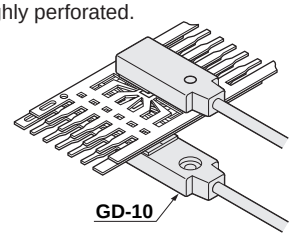
Detecting overlap of washers

GD-3 detects an overlap of small components such as washers.



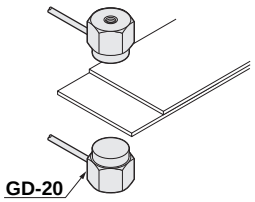
Detecting double feeds of lead frames

The high precision sensor head **GD-10** does not miss double feeds of lead frames even if they are very thin and highly perforated.



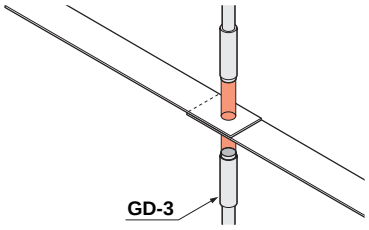
Detecting double feeds of sheet metal

The long sensing range sensor head **GD-20** allows the object thickness to be as much as 10 mm 0.394 in. Hence, various objects can be detected.



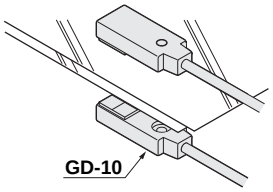
Detecting seam of hoop material

Even a minute difference in thickness can be detected.



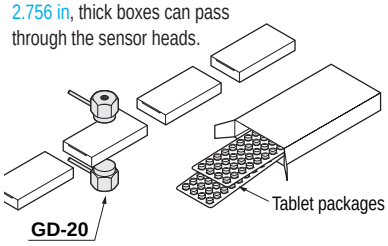
Detecting double feeds of aluminum foils

GD-10 can detect double feeds of thin aluminum foils which are several tens of micrometer thick.



Detecting missing tablet package in box

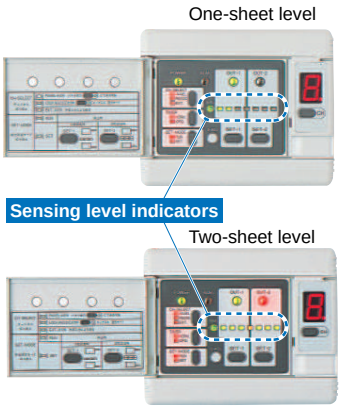
GD-20 can check if each box contains a given number of aluminum tablet packages.
Since **GD-20** has a sensing range of up to 70 mm 2.756 in, thick boxes can pass through the sensor heads.



FUNCTIONS

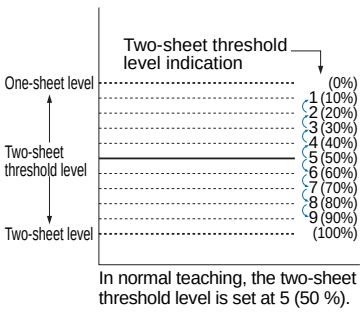
Seven LEDs indicate the sensing level

The optimum sensing point can be confirmed at a glance as seven LEDs indicate the sensing level.



Two-sheet threshold level shift function

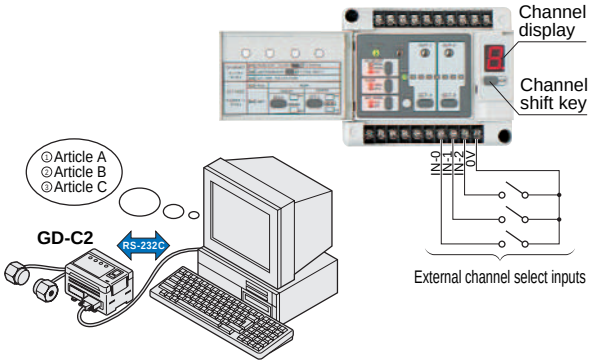
The two-sheet threshold level set by teaching can be shifted in nine steps to suit the detection conditions. This enables very stable detection.



In normal teaching, the two-sheet threshold level is set at 5 (50 %).

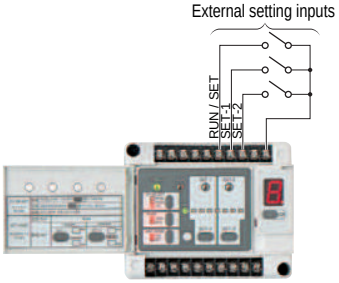
Suitable for flexible manufacturing

Since sensitivities of eight channels can be stored, product changeover is smooth and easy.
Select channel number by the “Channel shift key” on the operation panel or by using external channel select inputs. Further, since **GD-C2** is equipped with RS-232C communication function, the sensitivity values can be stored in a personal computer, etc., and fed into the controller as per requirement.



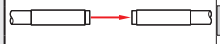
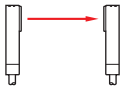
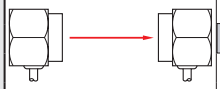
External initialization

Teaching is possible by external devices, such as, PLC, etc. This enhances productivity by machine automation.



ORDER GUIDE

Sensor heads

Type	Appearance	Sensing range (between sensor heads)	Detectable sheet thickness	Model No.	Applicable controllers
Small object detection		10 mm 0.394 in	Standard sensing object size: 20 × 20 mm 0.787 × 0.787 in Material \ Setting distance: 5 mm 0.197 in / 10 mm 0.394 in Iron (SPCC): 0.01 to 0.1 mm 0.0004 to 0.004 in / 0.03 to 0.1 mm 0.001 to 0.004 in Aluminum: 0.015 to 1 mm 0.001 to 0.039 in / 0.015 to 1 mm 0.001 to 0.039 in Copper: 0.018 to 1 mm 0.001 to 0.039 in / 0.018 to 0.3 mm 0.001 to 0.012 in Brass: 0.03 to 1 mm 0.001 to 0.039 in / 0.03 to 0.5 mm 0.001 to 0.020 in Stainless steel (SUS304): 0.3 to 1 mm 0.012 to 0.039 in / 0.3 to 1 mm 0.012 to 0.039 in	**GD-3**	**GD-C3**
High precision		30 mm 1.181 in	Standard sensing object size: 80 × 80 mm 3.150 × 3.150 in Material \ Setting distance / Applicable controllers: 20 mm 0.787 in / 30 mm 1.181 in Iron (SPCC) — GD-C1/C2: 0.07 to 1 mm 0.003 to 0.039 in / 0.07 to 0.5 mm 0.003 to 0.020 in Iron (SPCC) — GD-C3: 0.01 to 0.3 mm 0.0004 to 0.012 in / 0.01 to 0.1 mm 0.0004 to 0.004 in Aluminum — GD-C1/C2: 0.03 to 6 mm 0.001 to 0.236 in / 0.03 to 2 mm 0.001 to 0.079 in Aluminum — GD-C3: 0.015 to 1 mm 0.001 to 0.039 in / 0.015 to 1 mm 0.001 to 0.039 in Copper — GD-C1/C2: 0.03 to 6 mm 0.001 to 0.236 in / 0.03 to 2 mm 0.001 to 0.079 in Copper — GD-C3: 0.018 to 1 mm 0.001 to 0.039 in / 0.018 to 1 mm 0.001 to 0.039 in Brass — GD-C1/C2: 0.03 to 6 mm 0.001 to 0.236 in / 0.03 to 2 mm 0.001 to 0.079 in Brass — GD-C3: 0.01 to 1 mm 0.0004 to 0.039 in / 0.01 to 1 mm 0.0004 to 0.039 in Stainless steel (SUS304) — GD-C1/C2: 0.1 to 6 mm 0.004 to 0.236 in / 0.1 to 2 mm 0.004 to 0.079 in Stainless steel (SUS304) — GD-C3: 0.05 to 2 mm 0.002 to 0.079 in / 0.05 to 1 mm 0.002 to 0.039 in	**GD-10**	**GD-C1** **GD-C2** **GD-C3**
Long sensing range		70 mm 2.756 in	Standard sensing object size: 200 × 200 mm 7.874 × 7.874 in Material \ Setting distance: 35 mm 1.378 in / 70 mm 2.756 in Iron (SPCC): 0.07 to 10 mm 0.003 to 0.394 in / 0.07 to 6 mm 0.003 to 0.236 in Aluminum: 0.03 to 10 mm 0.001 to 0.394 in / 0.03 to 6 mm 0.001 to 0.236 in Copper: 0.03 to 10 mm 0.001 to 0.394 in / 0.03 to 6 mm 0.001 to 0.236 in Brass: 0.03 to 10 mm 0.001 to 0.394 in / 0.03 to 6 mm 0.001 to 0.236 in Stainless steel (SUS304): 0.1 to 10 mm 0.004 to 0.394 in / 0.1 to 6 mm 0.004 to 0.236 in	**GD-20**	**GD-C1** **GD-C2**

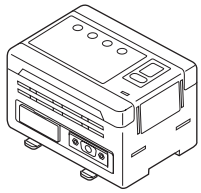
Note: Only the combinations between the sensor heads and the controllers described in the above table are allowed. Any other combination may damage the connected sensor heads.

10 m 32.808 ft cable length type and 20 m 65.617 ft cable length type

10 m 32.808 ft cable length type and 20 m 65.617 ft cable length type for **GD-20** are also available. (Standard: 3 m 9.843 ft)

Type	Standard	10 m 32.808 ft cable length type	20 m 65.617 ft cable length type
Long sensing range	**GD-20**	**GD-20-C10**	**GD-20-C20**

Controllers

Type	Appearance	Model No.	Output
Standard		**GD-C1**	NPN open-collector transistor
With RS-232C		**GD-C2**	
Small object detection		**GD-C3**	

Make sure to use the sensor heads and the controller together in the above combinations.

SPECIFICATIONS

Sensor heads

Item \ Type			Small object detection		High precision		Long sensing range	
Model No.			GD-3		GD-10		GD-20	
Applicable controllers			GD-C3		GD-C1, GD-C2, GD-C3		GD-C1, GD-C2	
Sensing range (between sensor heads)			10 mm 0.394 in or less		30 mm 1.181 in or less		70 mm 2.756 in or less	
Detectable sheet thickness (Note 2)			Standard sensing object size: 20 × 20 mm 0.787 × 0.787 in		Standard sensing object size: 80 × 80 mm 3.150 × 3.150 in		Standard sensing object size: 200 × 200 mm 7.874 × 7.874 in	
	Material \ Setting distance / Applicable controllers		5 mm 0.197 in	10 mm 0.394 in	20 mm 0.787 in	30 mm 1.181 in	35 mm 1.378 in	70 mm 2.756 in
	Iron (SPCC)	GD-C1/C2	—	—	0.07 to 1 mm 0.003 to 0.039 in	0.07 to 0.5 mm 0.003 to 0.020 in	0.07 to 10 mm 0.003 to 0.394 in	0.07 to 6 mm 0.003 to 0.236 in
		GD-C3	0.01 to 0.1 mm 0.0004 to 0.004 in	0.03 to 0.1 mm 0.001 to 0.004 in	0.01 to 0.3 mm 0.0004 to 0.012 in	0.01 to 0.1 mm 0.0004 to 0.004 in	—	—
	Aluminum	GD-C1/C2	—	—	0.03 to 6 mm 0.001 to 0.236 in	0.03 to 2 mm 0.001 to 0.079 in	0.03 to 10 mm 0.001 to 0.394 in	0.03 to 6 mm 0.001 to 0.236 in
		GD-C3	0.015 to 1 mm 0.001 to 0.039 in	0.015 to 1 mm 0.001 to 0.039 in	0.015 to 1 mm 0.001 to 0.039 in	0.015 to 1 mm 0.001 to 0.039 in	—	—
	Copper	GD-C1/C2	—	—	0.03 to 6 mm 0.001 to 0.236 in	0.03 to 2 mm 0.001 to 0.079 in	0.03 to 10 mm 0.001 to 0.394 in	0.03 to 6 mm 0.001 to 0.236 in
		GD-C3	0.018 to 1 mm 0.001 to 0.039 in	0.018 to 0.3 mm 0.001 to 0.012 in	0.018 to 1 mm 0.001 to 0.039 in	0.018 to 1 mm 0.001 to 0.039 in	—	—
	Brass	GD-C1/C2	—	—	0.03 to 6 mm 0.001 to 0.236 in	0.03 to 2 mm 0.001 to 0.079 in	0.03 to 10 mm 0.001 to 0.394 in	0.03 to 6 mm 0.001 to 0.236 in
		GD-C3	0.03 to 1 mm 0.001 to 0.039 in	0.03 to 0.5 mm 0.001 to 0.020 in	0.01 to 1 mm 0.0004 to 0.039 in	0.01 to 1 mm 0.0004 to 0.039 in	—	—
	Stainless steel (SUS304)	GD-C1/C2	—	—	0.1 to 6 mm 0.004 to 0.236 in	0.1 to 2 mm 0.004 to 0.079 in	0.1 to 10 mm 0.004 to 0.394 in	0.1 to 6 mm 0.004 to 0.236 in
		GD-C3	0.3 to 1 mm 0.012 to 0.039 in	0.3 to 1 mm 0.012 to 0.039 in	0.05 to 2 mm 0.002 to 0.079 in	0.05 to 1 mm 0.002 to 0.039 in	—	—
Environmental resistance	Protection		IP67 (IEC)				IP67 (IEC), IP67G	
	Ambient temperature		–10 to +60 °C +14 to +140 °F, Storage: –25 to +70 °C –13 to +158 °F					
	Ambient humidity		45 to 85 % RH, Storage: 35 to 95 % RH					
	Vibration resistance		10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each					
	Shock resistance		1,000 m/s² acceleration (100 G approx.) in X, Y and Z directions for three times each					
Material			Enclosure: Stainless steel (SUS 303), Sensing face: ABS		Enclosure: Polyalylate		Sensing face: Polyacetal, Main body: Stainless steel	
Cable			Sender: 0.3 mm² single core shielded cable, 3 m 9.843 ft long Receiver: 0.1 mm² 2-core shielded cable, 3 m 9.843 ft long				Sender: 0.5 mm² single core shielded cable, 3 m 9.843 ft long Receiver: 0.3 mm² 2-core shielded cable, 3 m 9.843 ft long	
Cable extension			Extension up to total 20 m 65.617 ft is possible with an equivalent shielded cable.					
Weight			Net weight: 90 g approx.		Net weight: 80 g approx.		Net weight: 440 g approx.	
Accessory			—		Sensor head mounting bracket: 1 set for sender and receiver		—	

Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.
2) The above detectable sheet thicknesses are typical data at the given sensing distance. The allowable thickness will differ from the range described in the above table at other setting distances. Further, double feeds of aluminum foils can also be detected at distances shorter than the above. Please contact our office for details.

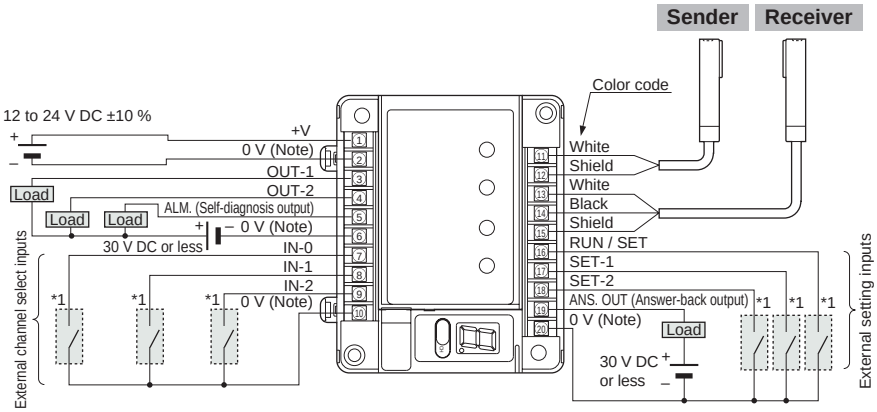
Controllers

Item \ Type			Standard	With RS-232C communication function	Small object detection
Model No.			GD-C1	GD-C2	GD-C3
Supply voltage			12 to 24 V DC ±10 % Ripple P-P 10 % or less		
Current consumption			12 V DC: 700 mA or less, 24 V DC: 400 mA or less		
Output (OUT-1, OUT-2, ALM. Answer-back)			NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)		
	Output Operation	OUT-1	OFF above the one-sheet threshold level		
		OUT-2	OFF above the two-sheet threshold level		
		A L M.	OFF when an error occurs		
		Answer-back (ANS. OUT)	Refer to the time chart of the "**Sensitivity setting** of **PRECAUTIONS FOR PROPER USE**"		
	Short-circuit protection		Incorporated		
Response time			Automatically selected either 5 ms or less, or 30 ms or less, depending on the object		5 ms or less
Set level storage function			Set values of eight channels stored		
Set level teaching function			Incorporated		
External setting function			Incorporated		
Indicators	Power		Green LED (lights up when the power is ON)		
	Self-diagnosis (ALM.)		Red LED (lights up during SET mode and when an error occurs during RUN mode)		
	Sensing mode (SENSE)		2-color indicator (lights up green during normal sensing mode, but yellow during precise sensing mode)		
	OUT-1		Green LED (lights up when OUT-1 is OFF, and blinks twice on completion of 0-ADJ. or SET-1 setting in SET mode)		
	OUT-2		Red LED (lights up when OUT-2 is OFF, and blinks twice on completion of 0-ADJ. or SET-2 setting in SET mode)		
	Sensing level		Yellow LED × 1 and green LED × 6 (indicate the sensing level)		
Timer function			Approx. 50 ms fixed delay timer (switchable either effective or ineffective)		
Environmental resistance	Ambient temperature		–10 to +50 °C +14 to +122 °F (No dew condensation or icing allowed), Storage: –25 to +70 C° –13 to +158 °F		
	Ambient humidity		45 to 85 % RH, Storage: 35 to 90 % RH		
	Voltage withstandability		1,000 V AC for one min. between all supply terminals connected together and enclosure		
	Insulation resistance		50 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure		
	Vibration resistance		10 to 55 Hz frequency, 0.75 mm amplitude in X, Y and Z directions for two hours each		
	Shock resistance		300 m/s² acceleration (30 G approx.) in X, Y and Z directions for three times each		
Material			Heat-resistant ABS		
Weight			Net weight: 440 g approx.		
Accessory			Insulation plate: 2 pcs.		

Note: Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +20 °C +68 °F.

I/O CIRCUIT AND WIRING DIAGRAMS

Wiring diagram



*1

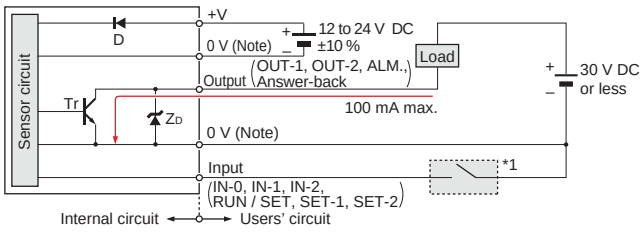
Non-voltage contact or
NPN open-collector transistor

or

Low : 0 to 1 V
High: 4.5 to 30 V, or open

Note: Terminal ②, 0 V of power supply, is isolated from 0 V of input / output circuitry for noise immunity. However, if you expect to share the power supply with the output loads, connect terminals ② and ⑥, terminals ② and ⑩, or terminals ② and ⑳ to make 0 V common.

I/O circuit diagram



Note: 0 V of power supply is isolated from 0 V of input / output circuitry. To share the power supply with a load, both the 0 V terminals should be short-circuited.

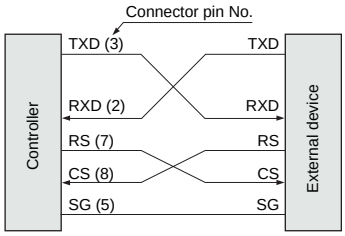
Symbols … D : Reverse supply polarity protection diode
ZD: Surge absorption zener diode
Tr : NPN output transistor

External channel select truth table

Input / Channel No.	IN-0	IN-1	IN-2
1	L	H	H
2	H	L	H
3	L	L	H
4	H	H	L
5	L	H	L
6	H	L	L
7	L	L	L
8	H	H	H

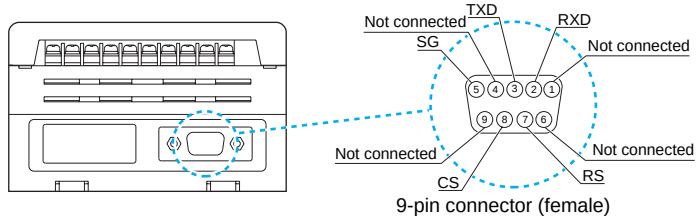
L: Low (0 to 1 V), H: High (4.5 to 30 V, or open)

RS-232C wiring diagram (GD-C2 only)



TXD : Transmit data, command
RXD: Receive data, command
RS : Request-to-send
CS : Clear-to-send
SG : Signal ground

Pin arrangement



PRECAUTIONS FOR PROPER USE

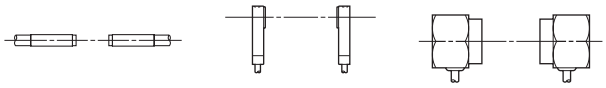
Refer to p.1501 for general precautions.

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
- Make sure to use the sensor heads and controllers in the specified combinations. If they are used in any other combination, the sensor heads may get damaged.

Mounting

Placing of sensor heads

- Make the sender and receiver face each other and align their sensing center line.

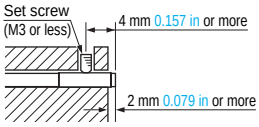


- Keep a distance from any magnet or a device generating magnetic field. It may degrade the detectability.
- Surrounding metal influences the detectability. Please contact our office for more details.
- If more than one set of sensor heads are closely mounted, detectability may be affected. Please contact our office for more details.

Mounting sensor heads

<GD-3>

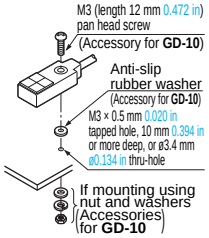
Mounting with set screw



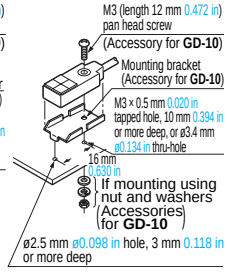
- Use a set screw (M3 or less), and the tightening torque should be 0.12 N·m or less.

<GD-10>

Fixing at one point



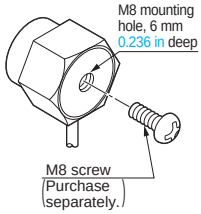
Fixing at two points



- The tightening torque should be 0.5 N·m or less.
- To mount the sensor head with a nut, the thru-hole should be ø3.4 mm ø0.134 in.

  (The mounting board must be 2.3 mm 0.091 in, or less, thick.)

<GD-20>



- The tightening torque should be 11.2 N·m or less.

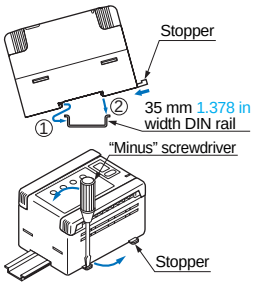
Mounting of controller

<On DIN rail>

① With the stopper pressed in the direction of the arrow (it locks), fit the front portion of the mounting section of the amplifier on the 35 mm 1.378 in width DIN rail.

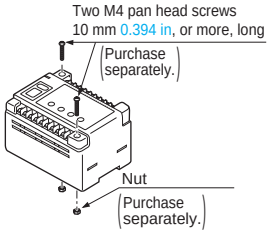
② Press and fit the rear portion of the mounting section on the 35 mm 1.378 in width DIN rail.

* To remove, insert a “minus” screwdriver into the stopper and pull out.



<On board with screws>

- Use two M4 pan head screws 10 mm 0.394 in, or more, long. The tightening torque should be 1.2 N·m or less.



Sensing mode

- The **GD** series has two sensing modes, one is the normal sensing mode and the other is the precise sensing mode. They are automatically selected by the characteristics of the object.

Normal sensing mode: The **GD** series goes into this mode when the number of objects (e.g., large metal sheets) is distinguished with relative ease.

Iron etc.

Precise sensing mode: The **GD** series goes into this mode when the number of objects (e.g., lead frames) is difficult to distinguish. In this mode, the sensitivity difference is so minute between two sensing levels that vibration and temperature changes must be carefully managed.

Lead frame etc.

- The sensing mode indicator lights up green during the normal sensing mode, but lights up yellow during the precise sensing mode.

PRECAUTIONS FOR PROPER USE

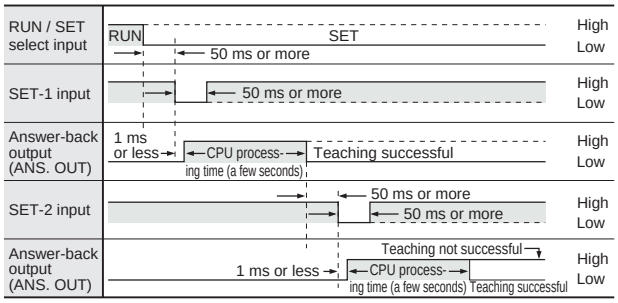
Refer to p.1501 for general precautions.

Sensitivity setting

Teaching by external input

- The teaching can also be performed by external input signals.

Time chart

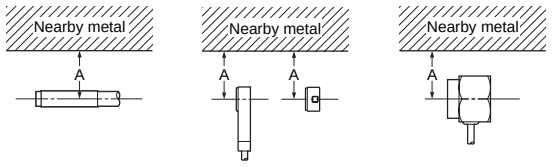


Distance from nearby metals

- As metals near the sensor head may affect the sensing performance, pay attention to the following points.

Influence of nearby metal

- The sensor head must be separated from nearby metal by a minimum distance as specified in the table below.



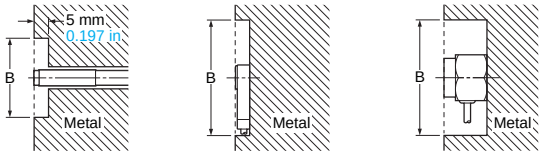
GD-3 GD-10 GD-20

Dimension A (in case of iron)

Model No. \ Setting distance	5 mm 0.197 in	10 mm 0.394 in	30 mm 1.181 in	70 mm 2.756 in
GD-3	15 mm 0.591 in	20 mm 0.787 in	—	—
GD-10	100 mm 3.937 in			—
GD-20	100 mm 3.937 in			

Embedding in metal

- The sensing performance may be affected if the sensor is completely embedded in a metal. Keep a minimum clearance between the sensor head and the metal as specified in the table below.



GD-3 GD-10 GD-20

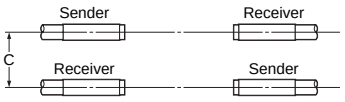
Dimension B (in case of iron)

Model No. \ Setting distance	5 mm 0.197 in	10 mm 0.394 in	30 mm 1.181 in	70 mm 2.756 in
GD-3	ø15 mm ø0.591 in	ø20 mm ø0.787 in	—	—
GD-10	ø100 mm ø3.937 in			—
GD-20	ø300 mm ø11.811 in			

Interference prevention

- When two or more sensor heads are mounted in parallel, keep a minimum separation distance as specified below to avoid interference.

In case the sender and another sensor's receiver are placed adjacently

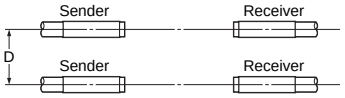


Dimension C

Model No. \ Setting distance (Note)	5 mm 0.197 in	10 mm 0.394 in	20 (35) mm 0.787 (1.378) in	30 (70) mm 1.181 (2.756) in
GD-3	60 mm 2.362 in	80 mm 3.150 in	—	—
GD-10	160 mm 6.299 in			220 mm 8.661 in
GD-20	370 mm 14.567 in			630 mm 24.803 in

Note: The value in the brackets is for **GD-20**.

In case the respective senders and receivers are placed adjacently



Dimension D

Model No. \ Setting distance (Note)	5 mm 0.197 in	10 mm 0.394 in	20 (35) mm 0.787 (1.378) in	30 (70) mm 1.181 (2.756) in
GD-3	30 mm 1.181 in	50 mm 1.969 in	—	—
GD-10	200 mm 7.874 in			250 mm 9.843 in
GD-20	450 mm 17.717 in			700 mm 27.559 in

Note: The value in the brackets is for **GD-20**.

RS-232C DATA TRANSMISSION (GD-C2 only)

- **GD-C2** can feed in the set level data into a PC or PLC memory using **RS-232C** serial communication and retrieve it whenever required.
  In this case, the taught data should be stored in the prescribed channel.

Transmission specifications

- Baud rate: Selectable from 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, or 31,250 bits/sec.
- Format: Data bits ... 7 bits or 8 bits
  Parity check ..... None or Enable, Even or Odd
  Stop bits ..... 1 bit or 2 bits
  Terminal code ..... CR or ETX

Self-diagnosis (Alarm) function

- The **GD** series constantly runs self-diagnosis, outputs the result with self-diagnosis output, and lights the self-diagnosis indicator. In addition, error content is shown on the channel display using error codes.

Others

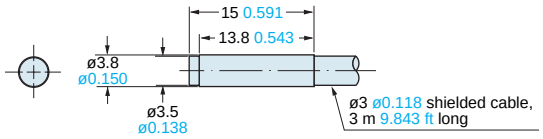
- Do not operate the sensor for a few seconds immediately after supplying power because of transient conditions including self-diagnosis time.

- Make sure to check the ability of the sensor to detect the number of sheets of your actual objects before use. If real objects differ from teaching samples in size or in characteristics, or the detecting condition deviates, an error may occur. Please note that magnetic metals or metals with low magnetic permeability such as steel especially have a strong tendency.
- In situations when magnets are in close proximity such as during electromagnet conveyance, this causes malfunctions due to electromagnetic disorder.
- When conducting minute detections, favorable sensing conditions are obtained only after having elapsed 60 min. after the initial introduction of the power supply.

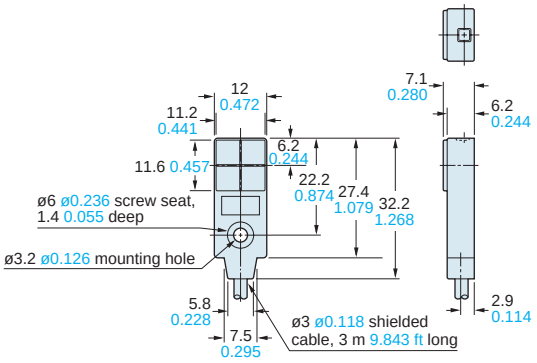
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

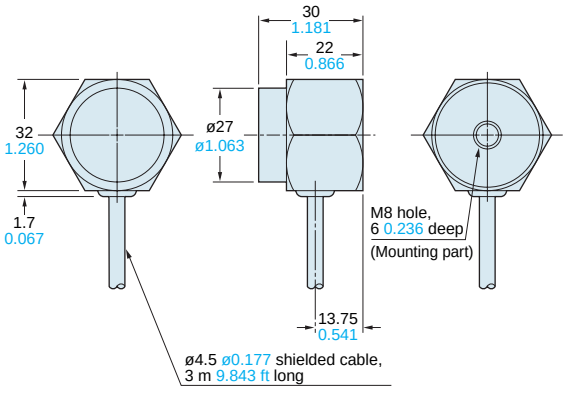
GD-3 Sensor head



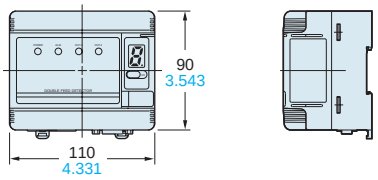
GD-10 Sensor head



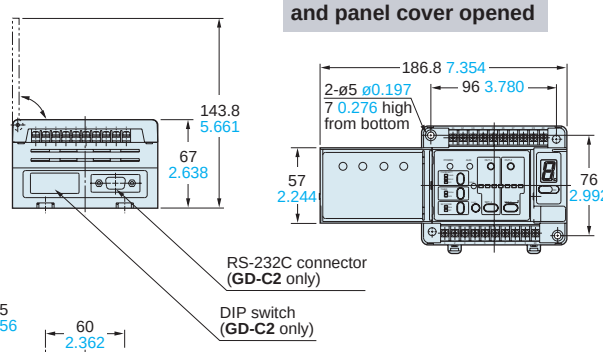
GD-20 Sensor head

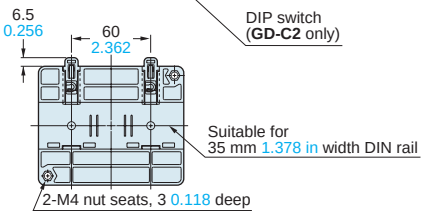


GD-C1 GD-C2 GD-C3 Controller



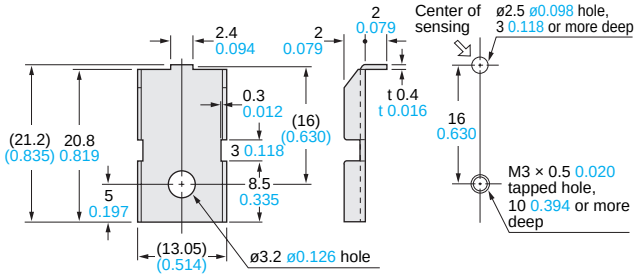
Terminal cover removed and panel cover opened





Sensor head mounting bracket set (Accessory for **GD-10**)

Mounting hole dimensions



Material: Cold rolled carbon steel (SPCC)
(Nickel plated)

1 pc. each of M3 (length 12 mm 0.472 in) pan head screw, nut, plain washer, spring washer, and anti-slip rubber washer (ø9.5 × t 0.5 mm ø0.374 × t 0.020 in) is attached.

Panel cut-out dimensions