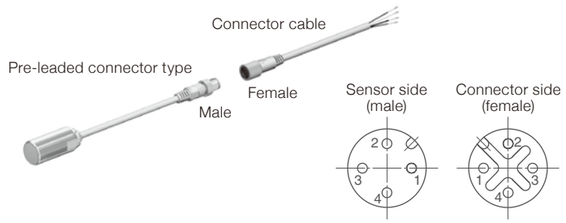
Connector cables

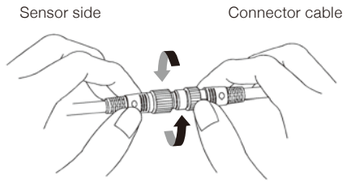
Appearance	Type	Cable description	Cable dia.	Cores	Conductor area (mm²)	Cable length	Model No.
	For DC	Vinyl-insulated cable, oil & vibration resistant (UL/NFPA79)	ϕ6.1	4	0.5 (108/0.08)	2m	PA5-4ISX2SK
						5m	PA5-4ISX5SK
		Polyurethane-insulated cable, high resistance to oil & vibration	ϕ6.0		0.5 (110/0.08)	2m	PA5-4ISX2CK
						5m	PA5-4ISX5CK



When connecting a pre-leaded quick-lock connector-type sensor, be sure to use a model PA5-_ _ _ connector cable.

Fastening the connector

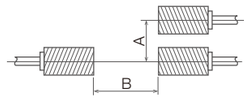
Align the grooves and rotate the nut on the connector cable side by hand until it fits tightly with the switch-side connector.



Precautions for Use

• Mutual interference prevention

If proximity sensors are installed side-by-side or facing each other, mutual interference will occur, resulting in malfunction. Maintain the minimum distances between sensors according to the table below.

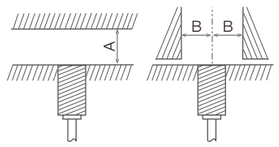


Unit: mm

Model No.	A	B
H3C-HB02M-C□□1	15	20
H3C-HC03M-C□□1	20	30

• Effects from nearby metal objects

The presence of nearby metal objects other than the workpiece can affect the operating distance characteristics. Maintain the minimum distance shown in the table below between the sensor and any metal objects.



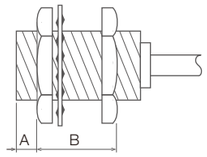
Unit: mm

Model No.	A	B
H3C-HB02M-C□□1	8	8
H3C-HC03M-C□□1	8	9

A: Distance from the proximity sensor's sensing surface to an iron plate in front of the sensor
B: Distance from the proximity sensor's axis to an iron plate in front of the sensor

• Tightening torque

Use the supplied nuts and toothed washers for installation. The maximum tightening torque of the nuts varies depending on the distance from the sensor head. The maximum tightening torque is indicated in the table below. When tightening, do not hold or turn the indicator (plastic part). The maximum tightening torque can vary depending on the materials and surface conditions of the mounting plates, mounting housings, nuts, washers, and other parts used for the sensor. Check in advance that the torque is appropriate for the actual combination of parts used.



Model No.	A (mm)	Allowable tightening torque (N·m)
H3C-HB02M-C□□1	0	–
H3C-HC03M-C□□1	10	20

Model No.	B (mm)	Allowable tightening torque (N·m)
H3C-HB02M-C□□1	28	8
H3C-HC03M-C□□1	22	30

Please read "Terms and Conditions" from the following URL before ordering and use.
https://www.azbil.com/products/factory/order.html

Azbil Corporation
Advanced Automation Company

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Kanagawa 251-8522 Japan
URL: https://www.azbil.com

1st Edition: Mar. 2020-SO

azbil

Adjustable Proximity Sensor

Model H3C-H_

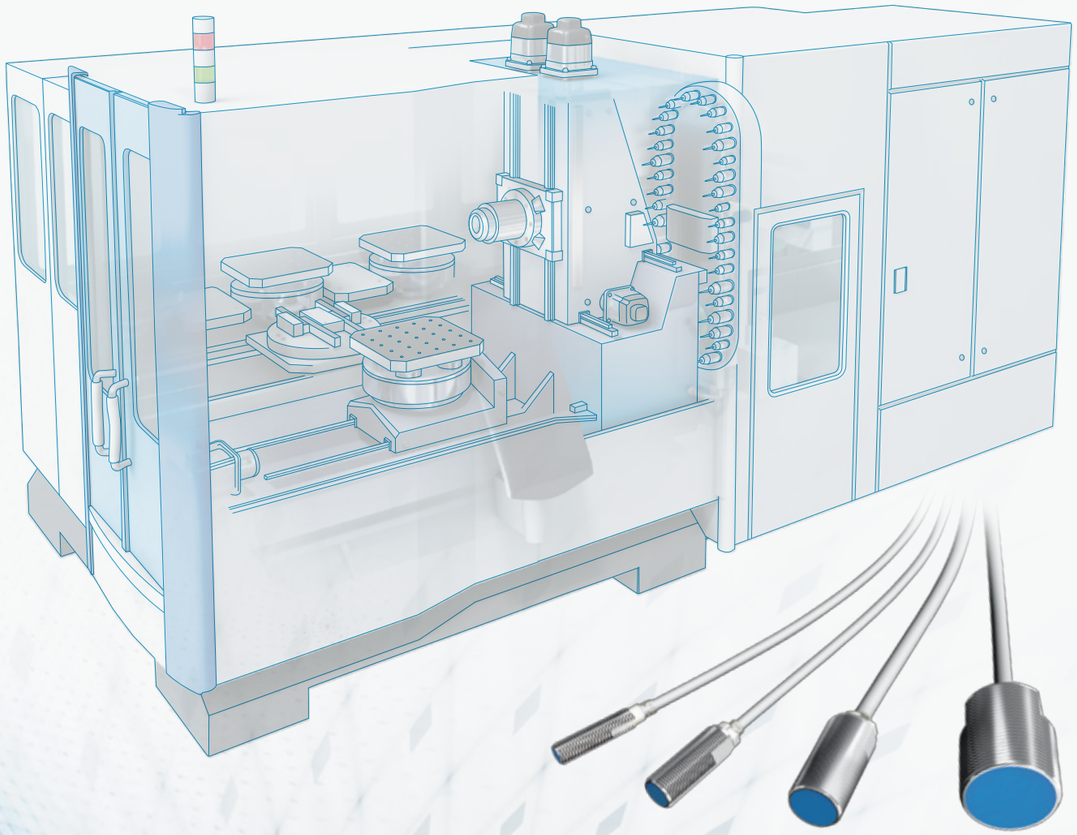
Using a teaching method, the threshold level at the desired sensing position can be set easily.

Azbil Corporation

A proximity switch that exceeds expectations.

Easy setup by anyone, and reliable workpiece sensing

Automatic tuning sets the optimal set point
using teaching of the workpiece detection level,
eliminating variation in operation between sensors,
and improving the equipment's operating rate.



Adjustable Proximity Sensor

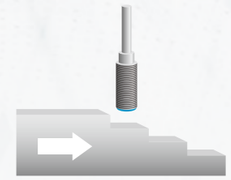
Adjustable Proximity Sensor

Model H3C-H_

Feature 01

Using the 2 outputs, sensing in 4 areas

Eliminates the need for troublesome positioning of multiple switches.



[Zone sensing]

P. 04

Feature 02

Automatic setting of set points according to the workpieces' detection levels

ON/OFF setting is available within the sensing area.

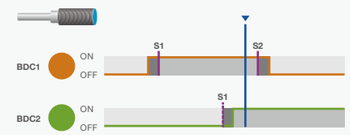
[Tuning]

P. 04

Feature 03

Long-awaited visualization of sensing safety margin

Checking is possible
while the equipment is operating.



[Visualization]

P. 05

Application examples

Solutions for Various Problems

- ☑ Detection of machine tool clamp position
- ☑ Reliable sensing of minute movements
- ☑ Monitoring of liquid levels
- ☑ Workpiece discrimination by robotic hands
- ☑ Detection of machine tool chuck cylinder position
- ☑ Sensor fault diagnosis
- ☑ Avoidance of workpiece-collision errors
- ☑ Sensing of index table position

P. 06

A variety of tuning functions to suit your application

Standard Mode
- ☐ Single Point Mode
- ☐ Two Point Mode
- ☐ Window Mode

Combination Mode
- ☐ 2-Point Operate
- ☐ 3-Point Operate
- ☐ 4-Point Operate

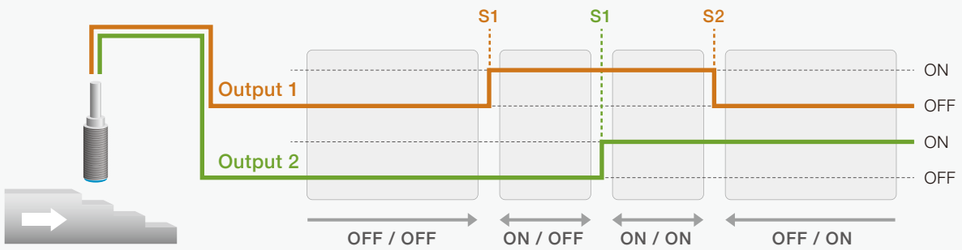
P. 08

Feature

01 Sensing of 4 areas using 2 outputs

[Zone sensing]

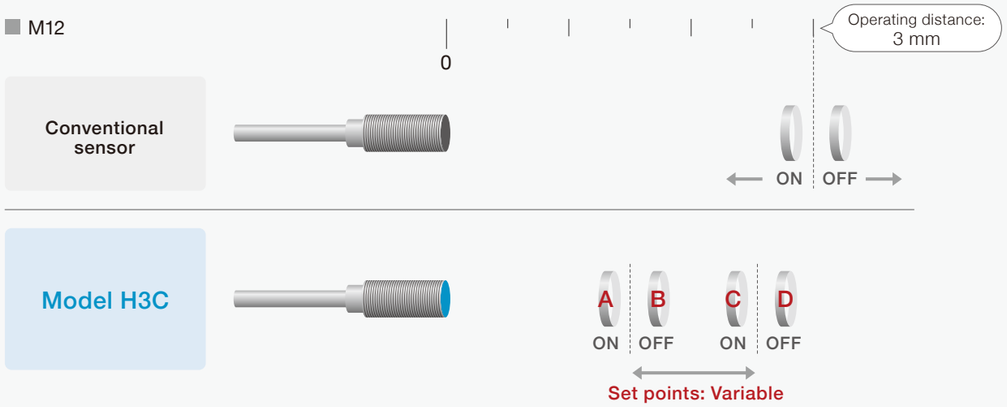
Sensing of 4 areas is done by a combination of the operational logic and operational modes of outputs 1 (BDC1) and 2 (BDC2). A single switch does the work of multiple units, saving space and significantly cutting adjustment man-hours. This reduces the need for troublesome adjustment of the position of multiple switches.



Feature

02 Set points automatically set according to workpieces' detection levels

[Tuning]



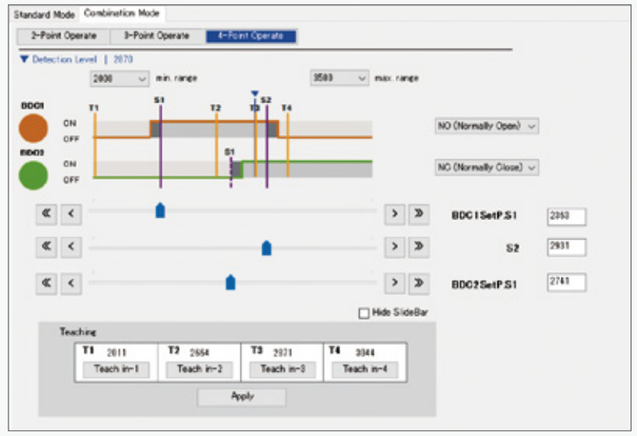
A dedicated setting tool can be used for easy setting according to the application.
Because conventional proximity switches have a fixed operating point, there are problems with adjusting the switch' s position and available installation space. With the H3C, the set point can be set anywhere within the operating range, allowing easy adjustment of settings in order to sense minute changes, etc.

Feature

03 Long-awaited visualization of sensing safety margin

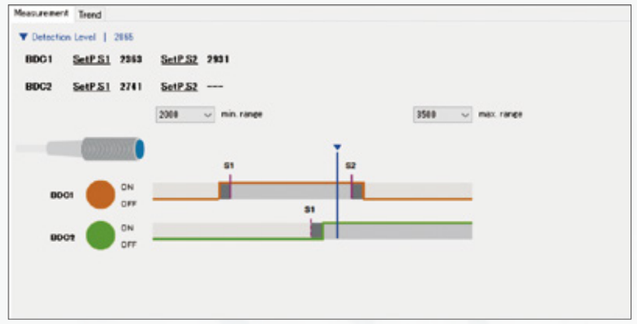
[Visualization]

The dedicated setting tool helps check the proximity switch' s positional accuracy and safety margin for sensing (excess gain). Conventional proximity switches' LED indicators show only that they are operating, but the excess gain cannot be checked. The H3C' s dedicated setting tool shows the set points and current positions on-screen while the equipment is operating. Set points can be fine-tuned as necessary.



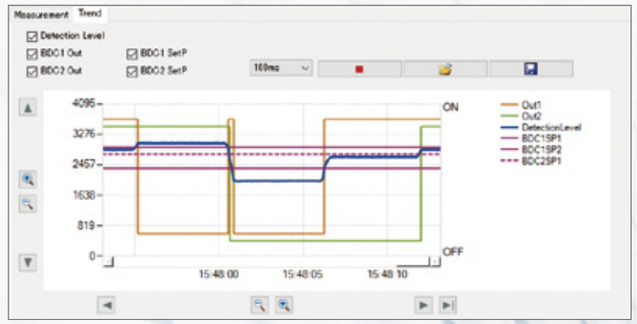
Point 01

Teaching of each workpiece' s detection level helps to automatically set the optimal set point (threshold level). Also, fine-tuning can be done with a convenient adjustor.



Point 02

Detection levels and corresponding set points (threshold levels) can be checked while the equipment is operating, which allows the safety margin for sensing to be seen.



Point 03

The behavior of the sensor during trial operation can be viewed on a graph.
In addition to displaying the current detection levels, the graph can also show outputs and set points (threshold levels) at the same time.

Sample Uses

Sensing of main spindle tool clamp position

With multiple proximity switches, tool clamp position can be detected.

Common problems

- Adjusting switch positions takes a long time.
- Adjustment results vary depending on the worker.
- After setup, the amount of excess gain is unknown.

A single H3C unit (with 2 outputs) can detect the tool clamp position.

- It is necessary only to adjust the setting distances of the switches. Less adjustment work
- The detection levels for the clamp position in each state are written to the sensors, and optimal set points are automatically set. Less variation among workers
- The safety margin for sensing after setup can be monitored with the dedicated setting tool, and fine-tuning can be done on the tool' s screen. Excess gain can be fine-tuned

Detection of chuck cylinder positions

Two proximity switches detect the cylinder stroke position.

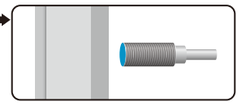
Common problems

- When retooling, workpiece size (dia.) often changes, requiring readjustment of switch position.
- Retooling takes many man-hours, affecting the operating rate.

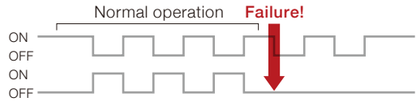
A single H3C unit (with 2 outputs) can detect tool clamp positions.

- Tapered dog allows setting a large clamp area for a workpiece, eliminating the need to change the dog position when retooling. Less retooling work
- This enables the machine to operate continuously. Improved operating rate

Sensor failure detection with two inverted ON/OFF outputs

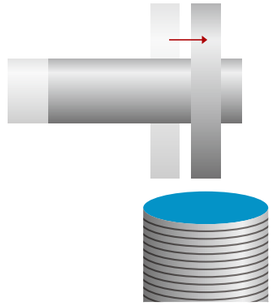


Ex.: A proximity sensor in a high location cannot be seen.



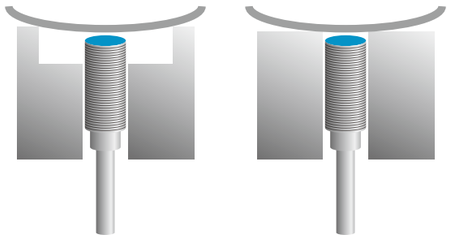
Fault diagnosis (of internal short circuits, disconnections, etc.) is possible each time a workpiece is detected.

Reliable sensing of minute movements



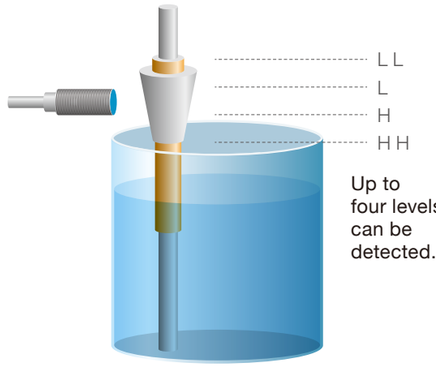
Set points can be freely set within the sensing range.

Avoiding failures caused by collision with workpiece



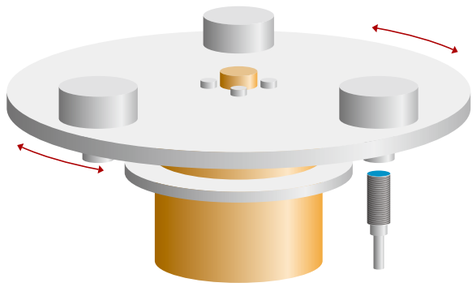
By cancelling interference from nearby metal, sensor can be positioned to avoid collisions.

Monitoring of liquid levels



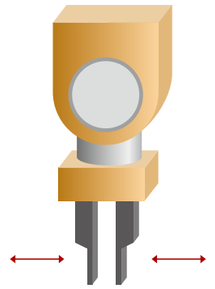
Up to four levels can be detected.

Sensing index table positions



Up to three positions can be identified.

Workpiece discrimination by robotic hands



Different workpieces can be identified with settings for each workpiece size.

A variety of tuning functions to suit your application

Standard mode

This function sets the set point (threshold level) of output 1 (BDC1) or output 2 (BDC2) as well as the operational mode.

Single Point Mode	**[Single Value Teach]**	Sets the set point (threshold level) to the value obtained by multiplying the teach point and the setting ratio (10 to 200%).
	[Two Value Teach]	Sets the set point to the midpoint of the two teach points.
	[Dynamic Teach]	Sets the set point to the midpoint of the maximum and the minimum sensing levels of a moving workpiece in the interval from teach start to teach stop.
Two Point Mode	**[Single Value Teach]**	Sets ON and OFF at two teach points.
Window Mode	**[Single Value Teach]**	Sets the threshold levels to two teach points. (Sets the window width.)

Combination mode

Patent pending

This function simultaneously sets the set points (threshold levels) of two outputs (BDC1 and BDC2) as well as the operational mode.

2-Point Operate	Simultaneously sets the set points of outputs 1 and 2 to the midpoint of the two teach points.
3-Point Operate	Simultaneously sets the set point of output 1 to the midpoint of teach points 1 and 2, and the set point of output 2 to the midpoint of teach points 2 and 3.
4-Point Operate	Simultaneously sets the set point of output 1 (S1) to the midpoint of teach points 1 and 2, the set point of output 2 (S1) to the midpoint of teach points 2 and 3, and the set point of output 1 (S2) to the midpoint of teach points 3 and 4.

Position of the target object		Near ← Position of the target object → Far		
Standard Mode				
Single Point Mode	BDC1/BDC2 (NO)	ON	OFF	
Two Point Mode		ON	OFF	
Window Mode		OFF	ON	OFF
Combination Mode				
2-Point Operate	BDC1 (NO)	ON	OFF	
	BDC2 (NC)	OFF	ON	
3-Point Operate	BDC1 (NO)	ON	OFF	
	BDC2 (NC)	OFF		ON
4-Point Operate	BDC1 (NO)	OFF	ON	OFF
	BDC2 (NC)	OFF	ON	

Notes:
Model H3C can be configured with the dedicated DTM model (H3Z-DTM-00).
For details on the tuning functions, refer to the operation manual (CP-SP-1452JE).
The dedicated tool (model H3Z-DTM-00) can be downloaded from URL(https://www.azbil.com/).

Tuning equipment components

- **Proximity sensor**

- **IO-Link USB Master**

- **USB connection cable**

- **PC (with a USB port)**

Model Nos.

Appearance		Sensing distance	Connection method	Operation logic	Type
Shape	Outer diameter				PNP output
	M8*	2 mm	M12 pre-wired connector (300 mm)	ON/OFF switchable	H3C-HB02M-CP31
	M12	3 mm			H3C-HC03M-CP31

Note: Price not yet determined. Please contact our nearest branch or sales office.
*Available soon.

Specifications

Size	M8	M12
Model No.	**H3C-HB02M-CP31**	**H3C-HC03M-CP31**
Sensing method	High-frequency oscillation	
Rated voltage	24 V DC	
Operating voltage range	10–30 V DC (incl. 10 % ripple)	
Current consumption	20 mA max. (24 V DC)	
Operating distance (C/Q output)*1	2 mm ±10%	3 mm ±10%
Operating distance (DO)*1	1.6 mm ±10%	2.4 mm ±10%
Sensing range*2	Zero to the operating distance or less upon shipment (C/Q output)	
Standard target	8 × 8 × 1 mm iron	12 × 12 × 1 mm iron
Differential travel	15 % max. of the operating distance	
Operation state (operation logic)*1	N.O./N.C. switchable type (factory default: N.O.)	
Operation mode*1	Single point mode / two point mode / window mode / operation stop switchable (factory default: single point mode)	
Output state	PNP open collector (output device: P-MOS FET)	
Control output	Switching current: 50 mA or less; residual voltage: 1 V or lower; output dielectric strength: 30 V DC	
Response frequency	1 kHz	
Temperature characteristics	±10 % max. of the operating distance (+25 °C) (–25 to +60 °C)	
Indicators*3	Standard I/O mode (SIO mode): lit orange during C/Q (BDC1) output Lit green during DO (BDC2) output	
	IO-Link mode: lit orange during BDC1:1 Blinking green (cycle: 1 s)	
Ambient operating temperature	–25°C~+60°C	
Ambient storage temperature	–25°C~+70°C	
Ambient operating humidity	35~95%RH	
Insulation resistance	50 MΩ min. (500 V DC) between live parts and case	
Dielectric strength	500 V AC min., 50/60 Hz for 1 min, between live parts and case	
Vibration resistance	10 to 55 Hz, 1.5 mm in peak-to-peak amplitude, for 2 h in the X, Y, and Z directions	
Shock resistance	490 m/s², 10 times in each of X, Y, and Z directions	
Protection level	IP67 (IEC standard)	
Circuit protection	Reverse connection protection, surge absorption, load short circuit protection	

*1. Factory default. Set points, operation state, and operation mode can be set via IO-Link communication.
*2. Set points can be set to anywhere between 0 mm and the operating distance (C/Q output) at the time of shipment (when using a standard target).
*3. For details, refer to “Output indicator” (page 10).

Specifications of IO-Link communication

Communication specifications	IO-Link version	IO-Link protocol version Ver1.1
	Transmission speed	COM3 (230.4kbps)
	Data length	PD size: 2 bytes, OD size: 1 byte (M-sequence type: TYPE_2_2)
	Minimum cycle time	1ms

External standards

EMC Directive	
EMC standard: EN 60947-5-2	
EMS (electromagnetic susceptibility)	
Electrostatic discharge immunity	Contact discharge 4 kV (IEC 61000-4-2)
Electromagnetic radiation immunity	3V/m 80MHz~1GHz, 1.4GHz~2GHz 1V/m 2GHz~6GHz (IEC 61000-4-3)
Fast transient immunity	2kV/5kHz (IEC 61000-4-4)
Conductive noise immunity	3V 150kHz~80MHz (IEC 61000-4-6)
EMI (electromagnetic interference)	
Emissions requirements	Group 1, Class A (CICPR11)

KC Mark
KC Mark (Korean Wireless Telegraphy Act) compliant

Output indicator

Single point mode SIO (standard I/O)

Workpiece position		BDC2 set point	BDC1 set point
C/Q (output)	NO	ON	
	NC		ON
DO (output)	NO	ON	
	NC		ON
Indicator lamp: orange	NO	Lit	
	NC		Lit
Indicator lamp: green	NO	Lit	
	NC		Lit

Note:
- The C/Q output and the orange indicator turn on according to the set point and N.O./N.C. setting for BDC1.
- The DO output and the green indicator turn on according to the set point and N.O./N.C. setting for BDC2.

Single point mode IO-Link communication

Workpiece position			BDC2 set point	BDC1 set point
C/Q (IO-Link communication)	Process data: BDC1	NO	1: ON	0: OFF
		NC	0: OFF	1: ON
	Process data: BDC2	NO	1: ON	0: OFF
		NC	0: OFF	1: ON
DO (output)		NO	ON	
		NC		ON
Indicator lamp: orange		NO	Lit	
		NC		Lit
Indicator lamp: green			Lit (cycle: 1 s)	

Note:
- Detection is carried out according to the set point and N.O./N.C. setting for BDC1; the resulting data is output to the specified process data bits; and then the indicator (orange) turns on in sync.
- The DO output turns on according to the set point and N.O./N.C. setting for BDC2. (The indicator is not synchronized.)
- During IO-Link communication, the indicator lamp (green) blinks.

Window mode SIO (standard I/O)

Workpiece position		BDC1 set point 1	BDC1 set point 2
C/Q (output)	NO		ON
	NC	ON	
Indicator lamp: orange	NO		Lit
	NC	Lit	

Workpiece position		BDC2 set point 1	BDC2 set point 2
DO (output)	NO		ON
	NC	ON	
Indicator lamp: green	NO		Lit
	NC	Lit	

Note:
- The C/Q output and the orange indicator turn on according to set point 1, set point 2, and the N.O./N.C. setting for BDC1.
- The DO output and the green indicator turn on according to set point 1, set point 2, and the N.O./N.C. setting for BDC2.

Window mode IO-Link communication

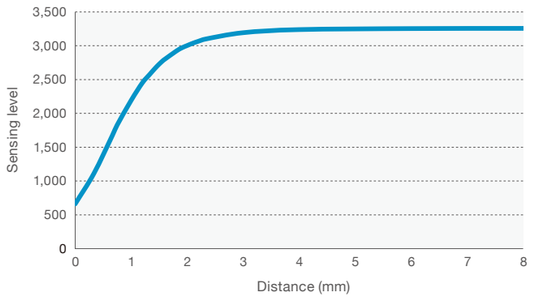
Workpiece position			BDC1 set point 1	BDC1 set point 2
C/Q (IO-Link communication)	Process data: BDC1	NO	0: OFF	1: ON	0: OFF
		NC	1: ON	0: OFF	1: ON
Indicator lamp: orange		NO		Lit	
		NC	Lit		Lit

Workpiece position			BDC2 set point 1	BDC2 set point 2
C/Q (IO-Link communication)	Process data: BDC2	NO	0: OFF	1: ON	0: OFF
		NC	1: ON	0: OFF	1: ON
DO (output)		NO		ON	
		NC	ON		ON
Indicator lamp: green			Lit (cycle: 1 s)		

Note:
- Detection is carried out according to set point 1, set point 2, and the N.O./N.C. setting for BDC1; the resulting data is output to the specified process data bits; and then the indicator (orange) turns on in sync.
- The DO output turns on according to set point 1, set point 2, and the N.O./N.C. setting for BDC2. (The indicator is not synchronized.)
- During IO-Link communication, the indicator (green) blinks.

Monitor output (typical example for a standard target)

M8



M12

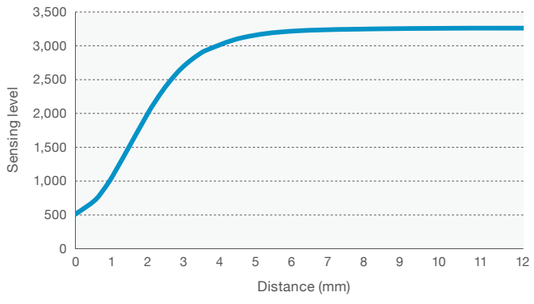
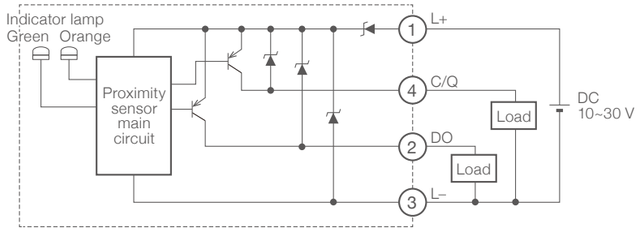
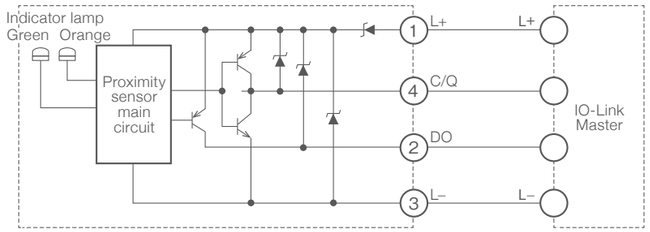


Diagram of the output circuit and wiring

Standard I/O mode (SIO mode)



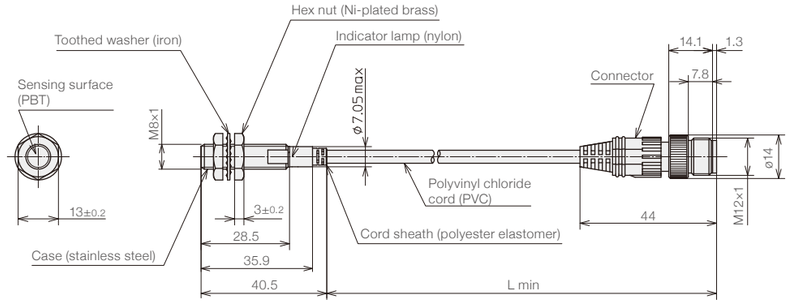
IO-Link communication mode (COM mode)



Connector pin layout

External dimensions

M8



M12