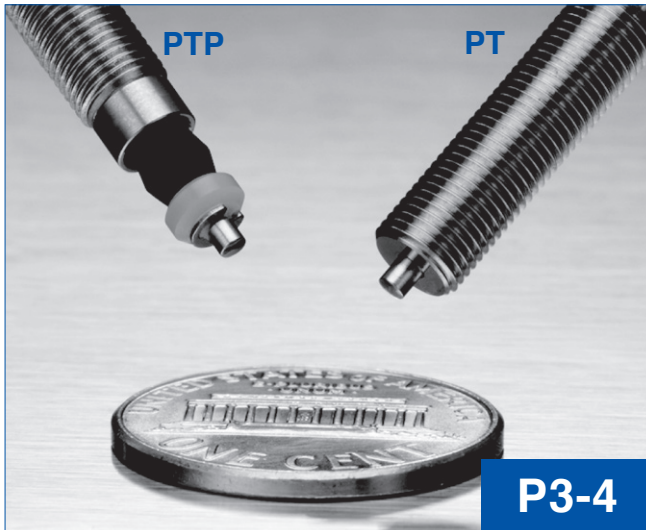


High-precision POSITIONING SWITCH SERIES

■ Ultra-small precision PT-Touch Switch



■ High-precision P-Touch Switch



Ultra-small precision PT-Touch Switch

■ 1 μm (range) in repetitive accuracy

■ M5×17mm

· Straight touch type (Metal bearing)

PT P3-4

High-precision MT-Touch Switch

■ 0.5 μm (range) in repetitive accuracy

■ IP67 protective structure, high resistance to harsh environment

· Straight touch type (Metal bearing)

P08 / P10 / P12 .. P3-10

· Sliding and angled touch type (Ball bearing)

P10DH P3-16

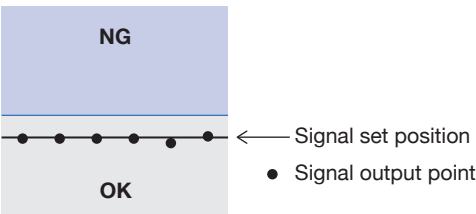
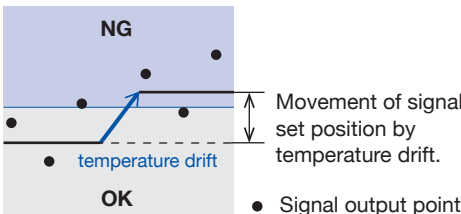
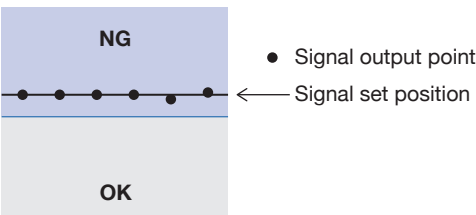
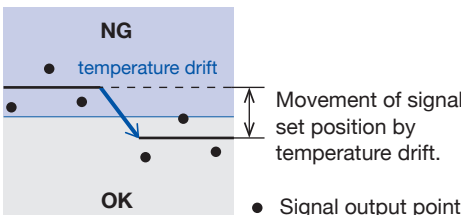
· Straight touch, flat type (Metal bearing)

P11 P3-22

Features and merits of High-precision positioning switches

1. High repetitive accuracy

Improvement in production efficiency and quality management.

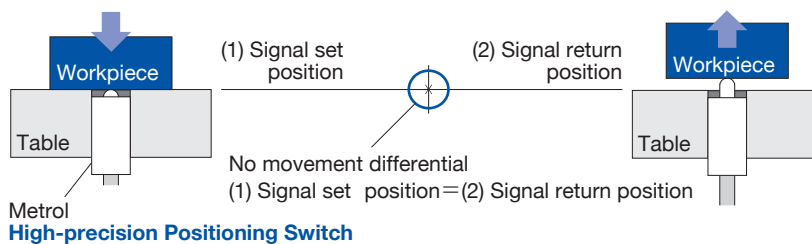
	High-precision positioning switches by Metrol	Existence detection sensors
	<ul style="list-style-type: none"> - Small signal point adjustment variance - Possible to determine OK/NG even for detected object with narrow allowable tolerance. - Precision mechanical type without any electronic circuitry. Results in no movement differential of signal set position caused by temperature drift from its temperature characteristics. 	<ul style="list-style-type: none"> - Signal point adjustment variance is large. - Unable to detect OK/NG objects where allowable tolerance range is small. - Signal set points are moved by temperature drift.
Set signal position at limit value of OK range	 <p>Can be set to the extreme of limit value ⇒ Improvement in both production efficiency and quality management.</p>	 <p>Determines NG item as OK item ⇒ Decrease in production efficiency (yield rate)</p>
Set signal position at limit value of NG range	 <p>Can be set to the extreme of limit value ⇒ Improvement in both production efficiency and quality management.</p>	 <p>Determines NG item as OK item ⇒ Manufacture of defective item</p>

2. No movement differential

Can detect micro movement of workpiece.

✓ Workpiece seating check using High-precision Positioning Switches

No movement differential between set signal position and signal return position makes it possible to **detect micro movement of workpiece.**

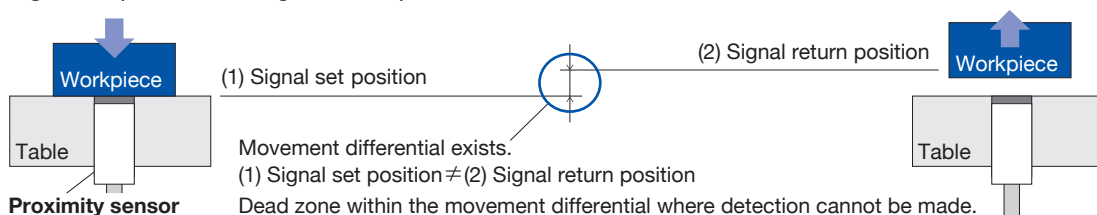


What is movement differential?

The difference in distance between the point where the sensor detects the detected object and activates and the point where it returns. (Distance from the signal set position to signal return position)

✗ Workpiece seating check using proximity sensor

Micro movement of workpiece cannot be detected as there is a movement differential between the signal set position and signal return position.

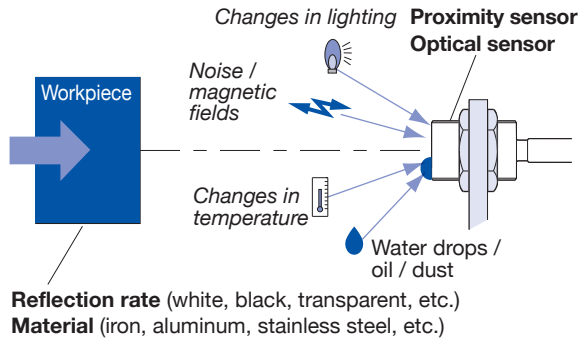


3. Robust under harsh environment

Stable detection of detected object without being affected by external environment such as material, shape, temperature and others.

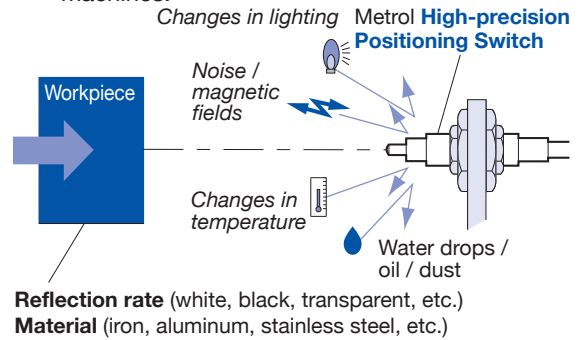
✗ Workpiece detection using a proximity and light sensor

Signal point varies with the change in external environment, necessitating frequent master alignment.



✓ Workpiece detection using a High-precision Positioning Switch

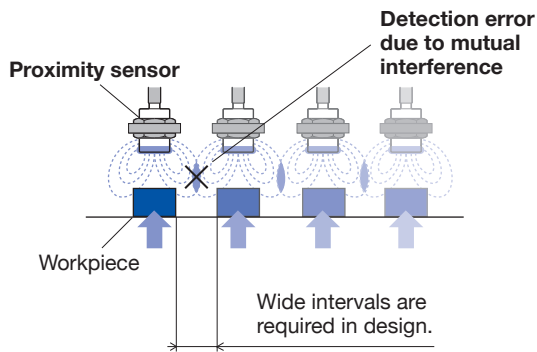
Contact type switch makes it difficult to be affected by external environment making it usable as origin and reference points in NC machines.



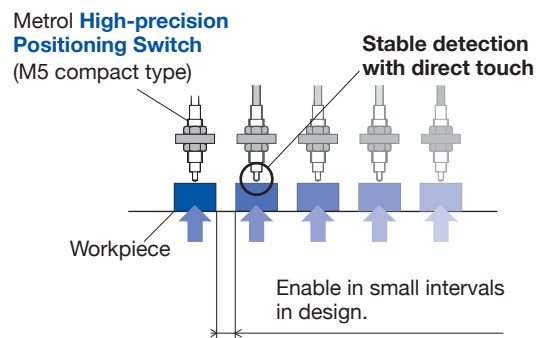
4. No mutual interference

Can be used for narrow pitches.

✗ Detection of workpiece with proximity sensors



✓ Detection of workpiece with High-precision Positioning Switches

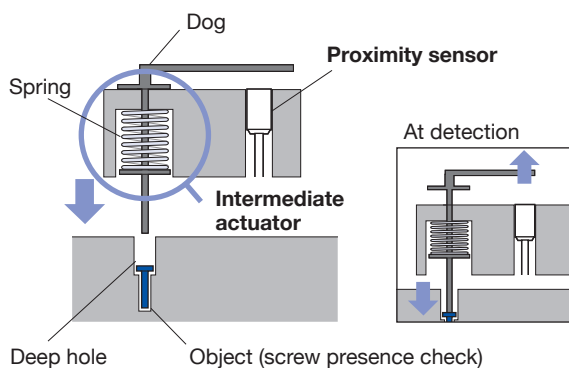


5. No need to manufacture intermediate actuator for stable detection.

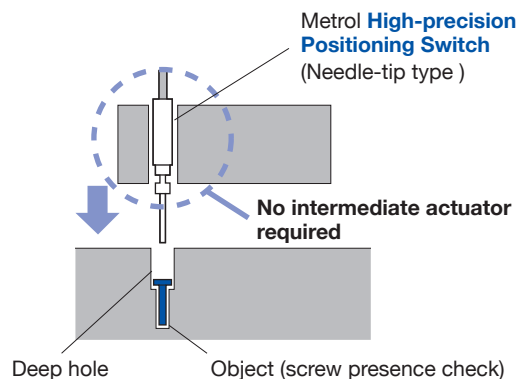
Results in miniaturization of machine and equipment and in cost reduction.

✗ Detection of screws in deep holes with a proximity sensor

Requires a mediating actuator for stable detection, making the mechanism complex.

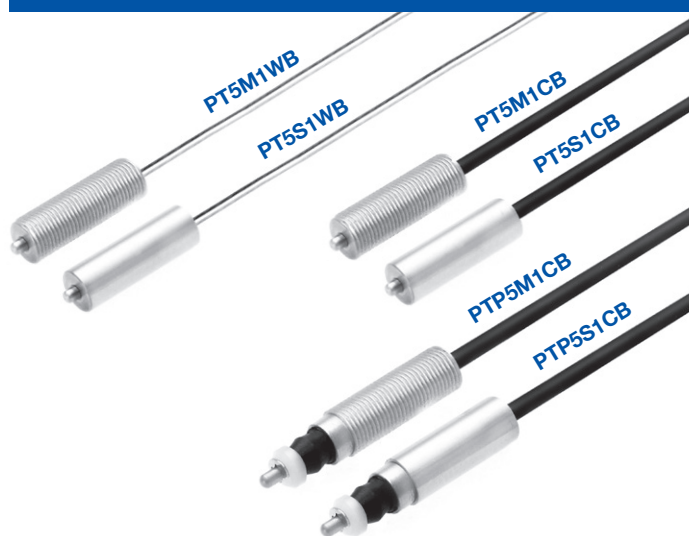


✓ Detection of screws in deep holes with High-precision Positioning Switches



PT

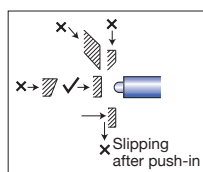
1 signal plunger type
Straight touch type (Metal bearing)



Features

- M5 (or $\phi 5$) x 17mm slim switches
- 1 μ m /3 μ m in repetitive accuracy (user selectable)

《Application》



Standard specification

Repeatability : 1 μ m type

Unit : mm

Repeatability ^{*1}	Protective structure	Product name	Output mode	Pretravel	Contact force	Cable	Size	With LED
0.001mm(range) (Both ON \leftrightarrow OFF)	IP40	PT5M1WB	B : NC	0 ^{*2}	0.5N	Core-wire cable	M5x0.5	
		PT5S1WB					$\phi 5$	
		PT5M1CB				M5x0.5	PT5M1CB -L	
		PT5S1CB				$\phi 5$	PT5S1CB -L	
	IP67	PTP5M1CB	M5x0.5	PTP5M1CB -L				
		PTP5S1CB	$\phi 5$	PTP5S1CB -L				
IP40		PT5M1WA	A : NO	About 0.3	0.5N	Core-wire cable	M5x0.5	
		PT5S1WA	$\phi 5$					

Repeatability : 3 μ m type

Repeatability ^{*1}	Protective structure	Product name	Output mode	Pretravel	Contact force	Cable	Size	With LED
0.003mm(range) (Both ON \leftrightarrow OFF)	IP40	PT5M3WB	B : NC	0 ^{*2}	0.5N	Core-wire cable	M5x0.5	
		PT5S3WB					$\phi 5$	
		PT5M3CB				M5x0.5	PT5M3CB -L	
		PT5S3CB				$\phi 5$	PT5S3CB -L	
	IP67	PTP5M3CB	M5x0.5	PTP5M3CB -L				
		PTP5S3CB	$\phi 5$	PTP5S3CB -L				
IP40		PT5M3WA	A : NO	About 0.3	0.5N	Core-wire cable	M5x0.5	
		PT5S3WA	$\phi 5$					

*1 At operating speed 50-200mm/min (operating speed slower than 10mm/min is not recommended).

-L : LED indicator

*2 Adjust the installed location of the switch by the signal switching point.

(120mm from the switch)

Common specification

unit:mm

Switch structure	Dry contact
Movement differential	0
Contact life time	3 million (No bungle caused by vibration and use under contacting rating)
Stroke	1.5
Contact material	SUS HRC45
Case material	SUS303

◎The following options are available

- Transistor output (refer to P7-3)
- Reverse connect protection
- Level conversion
- Output current is increased to 100mA
- Shape of contacting part
- LED indicator

Cable (Refer to P7-5)	Core-wire cable : 0.5m (x 2) Oil-resistant $\phi 0.6$ Tensile strength 15N
	Cabtyre cable : 2m Oil-resistant $\phi 2.8/2$ cores Tensile strength 30N Minimum bending R7
Operating temperature range	0°C-80°C (ice-free)
Temperature drift	0 (because of no amplifier)
Oscillation	10-55Hz Total amplitude 1.5 for X, Y, Z each direction
Impact	300m/s ² for X,Y,Z each direction
Contact rating (Refer to P14-3)	DC5V-DC24V Steady current : 10mA or less (rush current : 20mA or less) When using the switch with LED, limit the current below 10mA.
Standard accessory	Two fixing nuts for threaded type

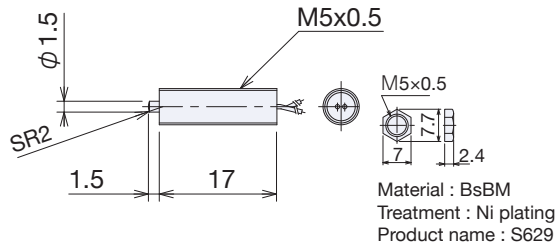
Outer dimension

Output mode B : NC

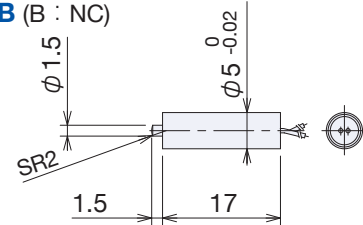
For LED indicator (-L), refer to the next page.

Core-wire cable

PT5M1WB (B : NC)
PT5M3WB (B : NC)

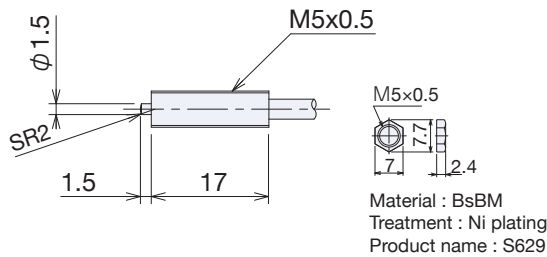


PT5S1WB (B : NC)
PT5S3WB (B : NC)

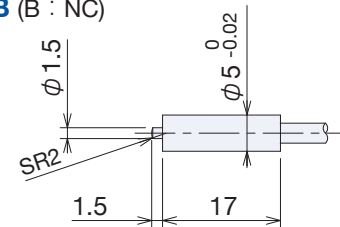


Cable type

PT5M1CB (B : NC)
PT5M3CB (B : NC)

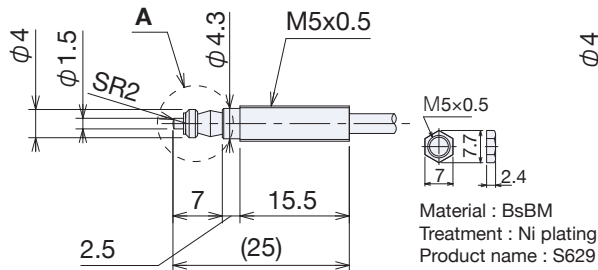


PT5S1CB (B : NC)
PT5S3CB (B : NC)

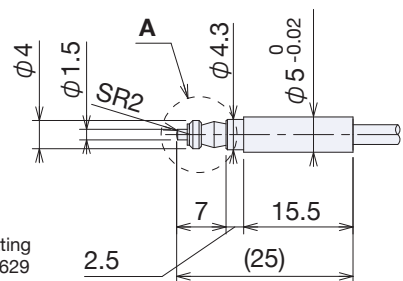


Waterproof type (IP67)^{*3}

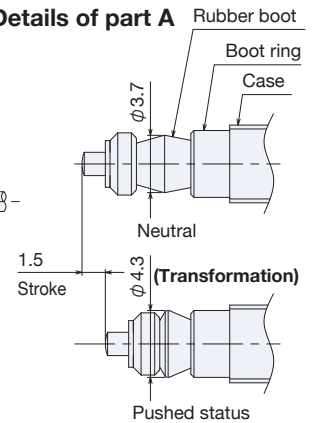
PTP5M1CB (B : NC)
PTP5M3CB (B : NC)



PTP5S1CB (B : NC)
PTP5S3CB (B : NC)



Details of part A



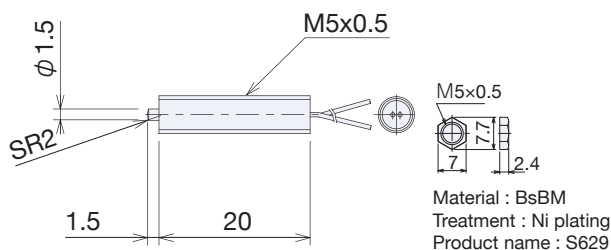
*3 Not suitable for use in harsh environment such as where there are scattering of coolant.

The use of High-precision MT-Touch Switch P085DB/P08SB (P3-10) is recommended in that case.

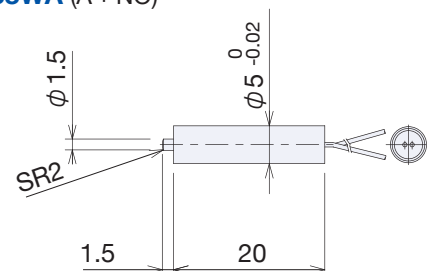
Output mode A : NO

Core-wire cable

PT5M1WA (A : NO)
PT5M3WA (A : NO)



PT5S1WA (A : NO)
PT5S3WA (A : NO)



Ultra-small precision PT-Touch Switch

Options

Output mode B : NC

Product name	Transistor output	Shape of contacting part	LED Indicator
Core-wire cable PT5M1WB PT5S1WB PT5M3WB PT5S3WB Cabtyre cable PT5M1CB PT5S1CB PT5M3CB PT5S3CB PTP5M1CB PTP5S1CB PTP5M3CB PTP5S3CB	Blank : Not required Only applicable for cabtyre cables TNA TNB TPA TPB (refer to P7-3)	Blank : $\phi 1.5$ plunger SR2 Only applicable for PTP B : $\phi 3$ flat SUS Hardened	Blank : Not required Only applicable for cabtyre cables L : 120mm from the switch

B : $\phi 3$ flat

PTP

L : Tubular type

LED lamp

Switch

Transistor output type : $\phi 9.3 \times (32)$

- ▶ e.g.) PT5M1CB-L
- ▶ Transistor output e.g.) PT5M1CBTNA-L

Output mode A : NO

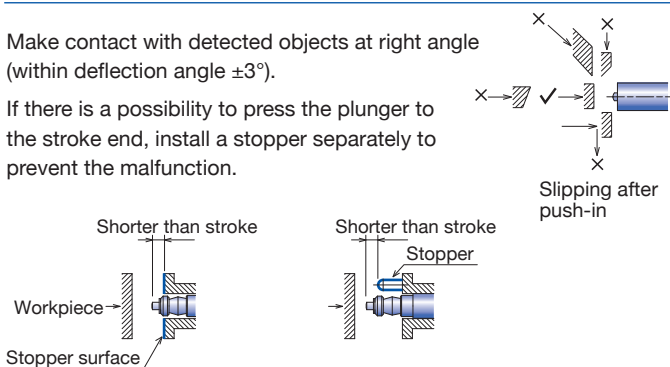
Product name	LED indicator
PT5M1WA PT5S1WA PT5M3WA PT5S3WA	Not available

- ▶ e.g.) PT5M1WA

How to use

Make contact with detected objects at right angle (within deflection angle $\pm 3^\circ$).

If there is a possibility to press the plunger to the stroke end, install a stopper separately to prevent the malfunction.



Tightning torque for case screws and nuts

	Screw / Nut	Tightning torque
PT-Touch Switch	M5×0.5	1N·m

Circuit diagram

without LED	with LED
Normally closed (NC) Normally Open (NO) 	Normally closed (NC) LED normally On

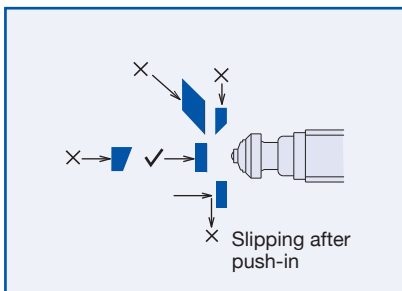
For electrical specification / circuit diagram (refer to P7-2)

When using the switch with LED, limit the current below 10mA.
(Refer to P14-3 "Confirmation of switch operation")

High-precision MT-TOUCH SWITCH

Selection by how to touch the objects

Straight touch



- Size: M8 / M10×0.5
- It is easy to adjust the set position thanks to fine thread.



- Size: $\phi 8$ / $\phi 10$
- With split clamp, position adjustment can be accurately done.

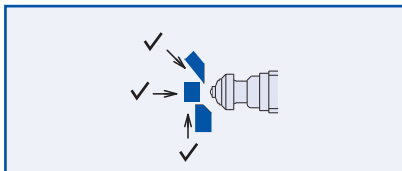


- No need of brackets



- Flat type which does not take up a large space.
- Suitable as a toolsetter

Sliding and angled touch



- Ball bearing type

Merits of High-precision MT-Touch Switch

■ Small variance in operating point

Repetitive accuracy of 0.5 μm / 2 μm (range)

Can be used as origin and reference points in CNC machine tools.

Wrong decision and short time breakdowns due to wrong signals can be reduced.

■ Can be used in harsh environment

Tightly sealed water-resistant structure switch corresponding to IP67. (Except for P10MC)

■ No movement differential

Minute displacement can be continuously detected.




■ No temperature drift

No signal point drift due to the voltage of the power supply or self-generation.


■ Low current, low voltage switch that has a long life (3 million cycles) when used within the rated range.

Product list

unit:mm

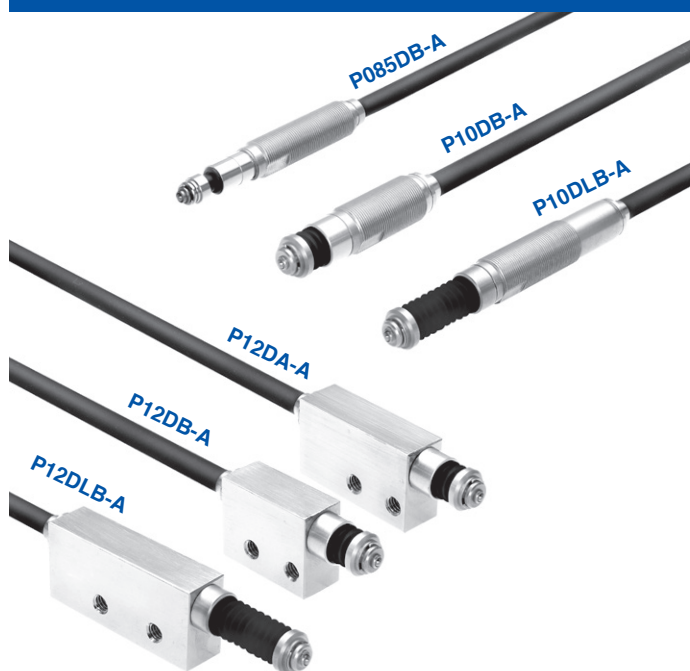
	Standard product name	Output mode	Protective structure	Size	Page
Metal bearing Threaded type / Non-threaded type 	P085DB	B : Normally close	IP 67	M8×0.5	P3-10
	P08SB			φ8	
	P10DA / P10DB	A : Normally open		M10×0.5	
	P10SA / P10SB	B : Normally close		φ10	
	P10DLB	B : Normally close		M10×0.5	
Square type 	P12DA / P12DB	A : Normally open	IP 67	2-M4	P3-16
	P12DLB	B : Normally close			
		B : Normally close			
Ball bearing type Threaded type 	P10DHA / P10DHB	A : Normally open	IP 67	M14×0.5	P3-16
	P10SHA / P10SHB	B : Normally close		φ14	
	P10DHLTB	B : Normally close		M14×0.5	

Flat type

Metal bearing 	P11DDB / P11DMB	B : Normally close	IP 67	2-M4 /2-φ4.6	P3-22
	P11EDB / P11EMB				

P08 / P10 / P12

1 signal plunger type
Straight touch type (Metal bearing)



Features

- **Small signal point adjustment variance**
 Repetitive accuracy of 0.5 μm (range)
 Wrong decision and short time breakdowns due to wrong signals can be reduced.
- **Can be used in harsh environment**
 Tightly sealed waterproof structure switch corresponding to IP67.
- **No movement differential**
 Minute displacement can be continuously detected.
- **No temperature drift**
 No signal point drift due to the voltage of the power supply or self-generation.
- **Low current, low voltage switch that has a long life (3 million cycles) when used within the rated range.**

Standard specification

unit:mm

Shape	Product name	Output mode	Pretravel	Stroke	Size	with LED
Cylinder type (Threaded / Non-threaded)	P085DB-A	B : Normally close	0 (*1)	3	M8×0.5	P085DB-A-L
	P08SB-A				φ8	P08SB-A-L
	P10DA-A	A : Normally open	0.2		M10×0.5	P10DA-A-L
	P10DB-A	B : Normally close	0 (*1)			P10DB-A-L
	P10SA-A	A : Normally open	0.2		φ10	P10SA-A-L
	P10SB-A	B : Normally close	0 (*1)			P10SB-A-L
	P10DLB-A					P10DLB-A-L
Square type	P12DA-A	A : Normally open	0.2	3	10×18×31	P12DA-A-L
	P12DB-A	B : Normally close	0 (*1)		10×18×23	P12DB-A-L
	P12DLB-A			10	10×18×39	P12DLB-A-L

-A: Contacting part Sφ2 ball carbide

-L: LED indicator (120mm from the switch)

*1 Adjust the installed location of the switch by the signal switching point.

Common specification

Switch structure	Dry contact
Output mode	A : Normally open / B : Normally close
Repeatability	Both On→Off, Off→On/ 0.0005 (range) (At operating speed 50-200mm/min) *2
Movement differential	0
Contact life time	3 million (If no specified bungle caused by vibration and used under voltage and current rating)
Protective structure	IP67
Contact force	1N
Case material	SUS303 *BsBM+Ni Plating for P12D series
Standard accessory	Two fixing nuts for threaded type

*2 Operating speed slower than 10mm/min is not recommended.

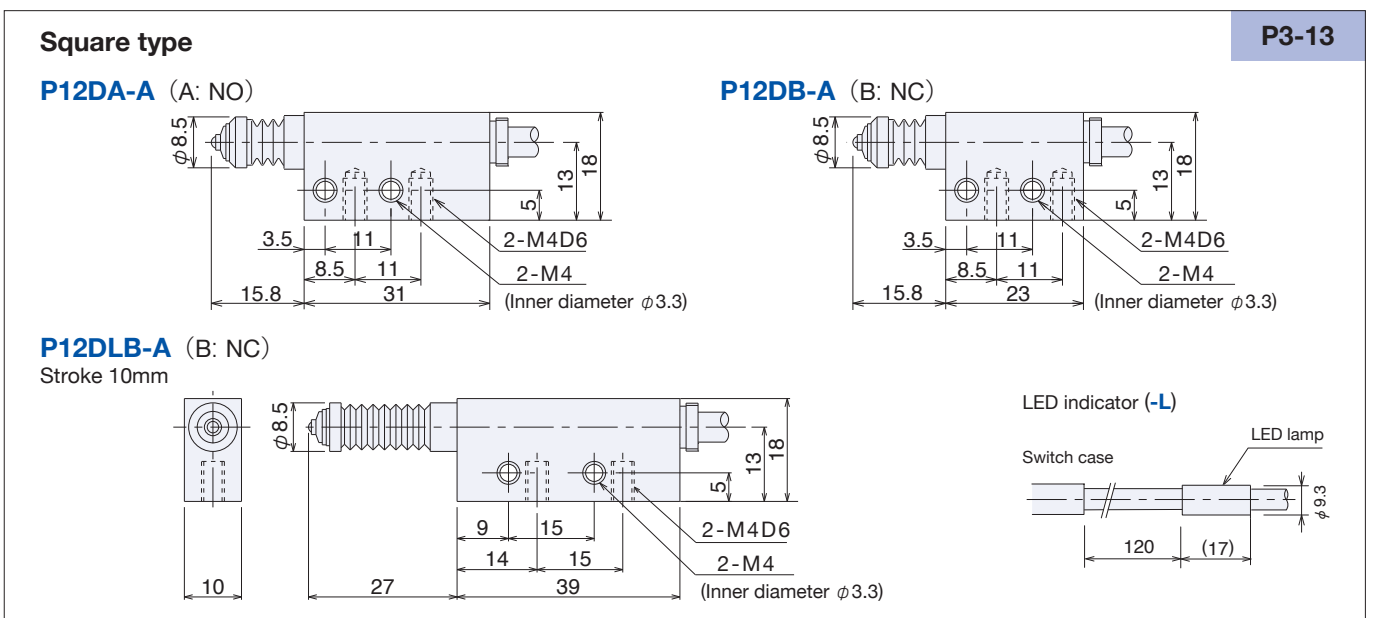
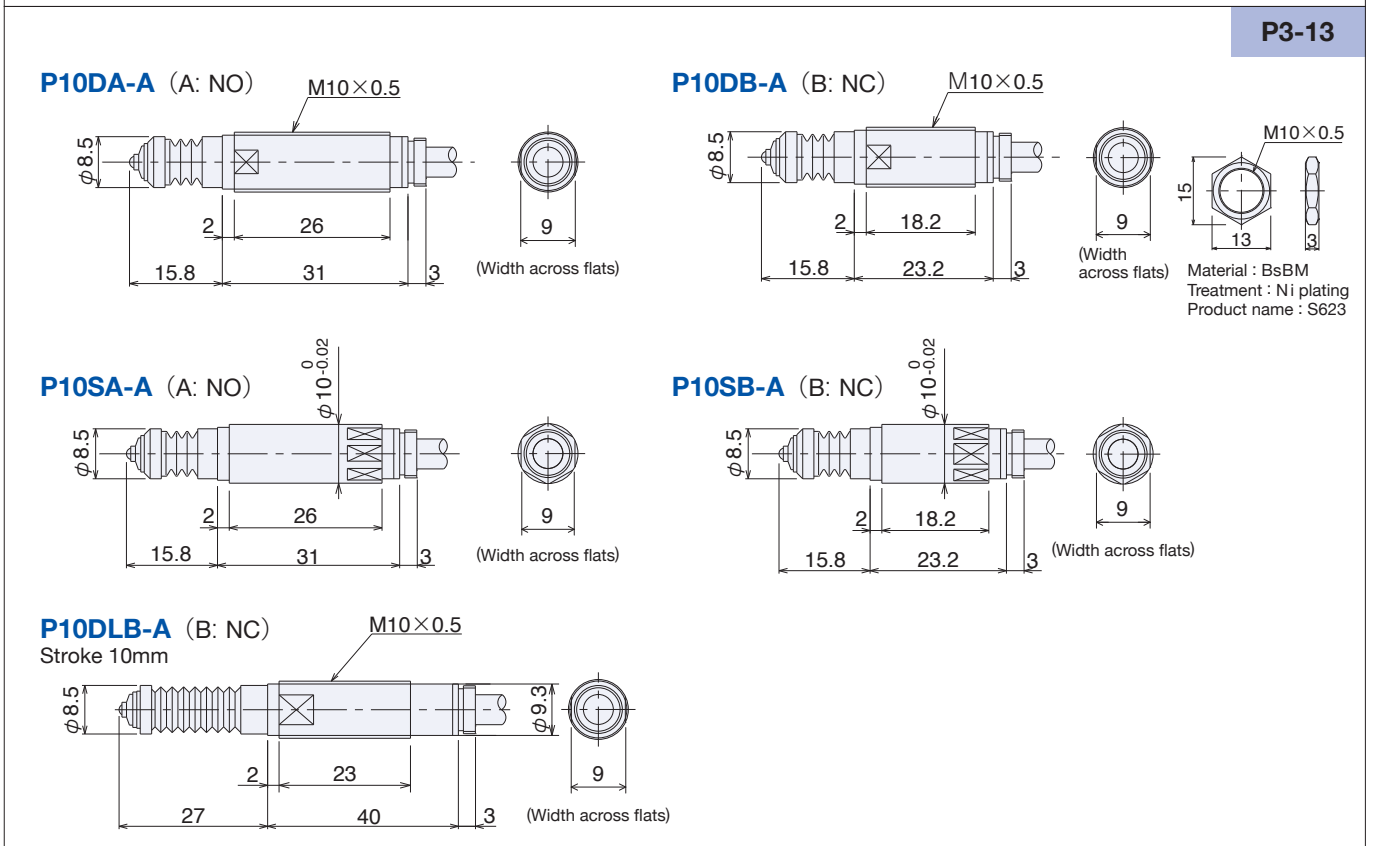
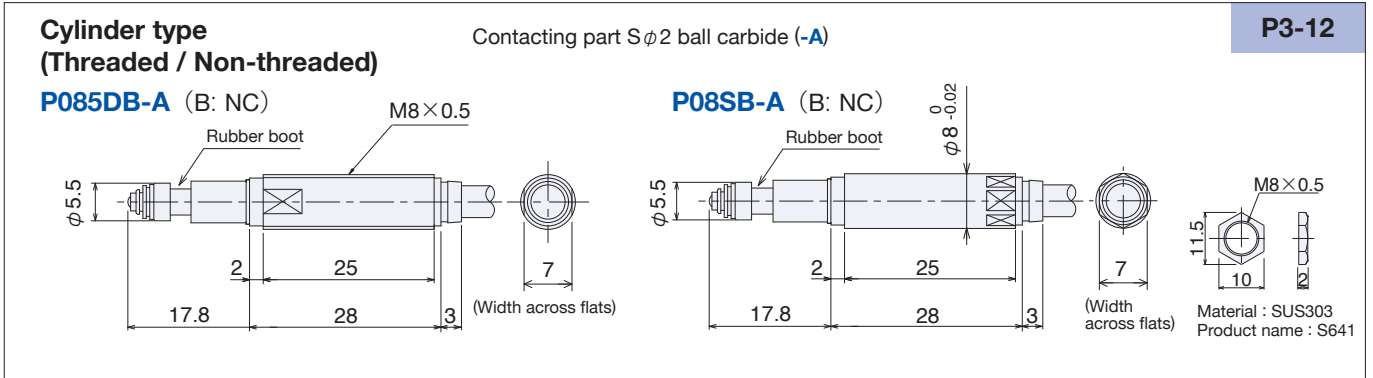
unit:mm

Cable (Refer to P7-5)	Standard length 3 m Oil resistant φ5 / 2 cores, φ4 / 2 cores for P085DB, P08SB, Tensile strength 30N, minimum bending R7
Operating temperature range	0°C-80°C (Ice-free)
Temperature drift	0 (because of no amplifier)
Oscillation	10-55Hz total amplitude 1.5 for X,Y,Z each direction
Impact	300m/s ² for X,Y,Z each direction
Contact rating (Refer to P14-3)	DC5V-DC24V Steady current: 10 mA or less (rush current: 20 mA or less) When using the switch with LED, limit the current below 10mA.

◎The following options are available.

- Transistor output (Refer to P7-3)
- Reverse connect protection.
- Level conversion.
- Output current is increased to 100mA.
- Shape of contacting part
- Protective cover
- LED indicator
- Contact force
- Cable direction
- Cable

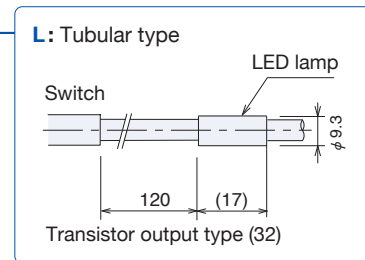
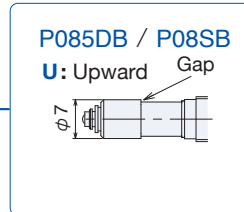
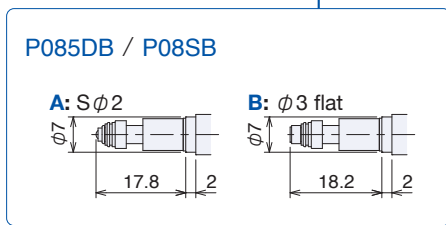
Outer dimension



Options

Product name	Shape of contacting part	Protective cover	LED indicator	Contact force	Cable
Cylinder type P085DB P08SB	A (Standard): S ϕ 2 ball carbide B: ϕ 3 flat carbide	Blank: Not required U: Upward (Not available for "S" contact force option)	Blank: No LED L: 120mm from the switch	Blank: 1N S: 0.3N (No rubber boot is provided.IP40) G: 0.5N H: 1.5N	Blank: Standard (3m) 5: 5m
Transistor output TNA Added to standard product name TNB TPA TPB (Refer to P7-3)					

- ▶ e.g.) P085DB-AL-5
- ▶ Transistor output
e.g.) P085DBTNA-AL-5



Shape of contacting part

Mark: Shape	Shape of detected objects
A: S ϕ 2 ball carbide	Flat
B: ϕ 3 flat	Convex, ball (Cutters, drills)

Contact force

Mark: Shape	Operating condition
S: 0.3N	No chattering caused by vibration or impact
G: 0.5N	(No rubber boot is provided for "S", IP40)
H: 1.5N	Intense vibration or impact

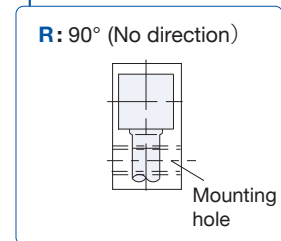
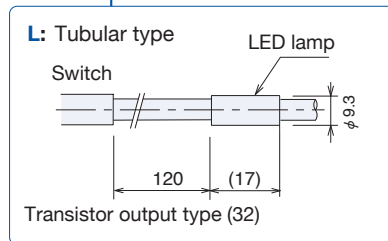
Refer to P6-2 for low contact force type (0.1N)

Options

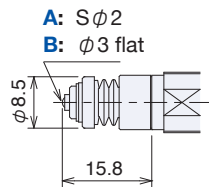
Product name	Shape of contacting part	Protective cover	LED indicator	Contact force	Cable direction	Cable	Cable protection (Refer to P3-15)	
Cylinder type P10DA P10DB P10SA P10SB P10DLB Square type P12DA P12DB P12DLB	A (Standard): S ϕ 2 ball carbide	Blank: Not required	Blank: No LED L: 120mm from the switch	Blank: 1N S: 0.3N (No rubber boot is provided. IP40) G: 0.5N H: 1.5N	Blank: Straight R: 90° (Only P12 series can be applied)	Blank: Standard (3m)	Blank: Not required <3m cable> W2: 2m wire braid P2: 2m protective tube	
	B: ϕ 3 flat carbide	U: Upward (Not available for non threaded type) (Not available for "S" contact force option)					5: 5m	<5m cable> W4: 4m wire braid P4: 4m protective tube
	T: Replaceable (Threaded M2.5) No contacting part							
	* Contacting parts are sold separately (Refer to the next page)							

Transistor output	
TNA	Added to standard product name
TNB	
TPA	
TPB	
(Refer to P7-3)	

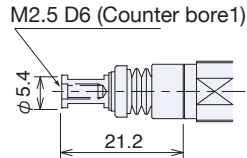
- ▶ e.g.) P10DB-AL-5W4
- ▶ Transistor output e.g.) P10DBTNA-AL-5W4



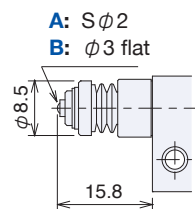
P10DA / P10DB / P10SA / P10SB



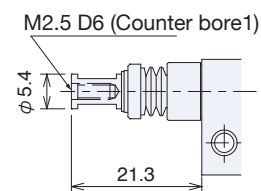
T: Replaceable (Threaded M2.5)
No contacting part



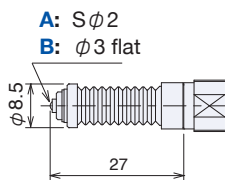
P12DA / P12DB



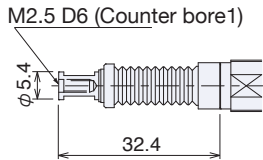
T: Replaceable (Threaded M2.5)
No contacting part



P10DLB

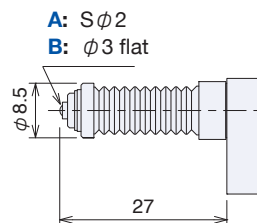


T: Replaceable (Threaded M2.5)
No contacting part

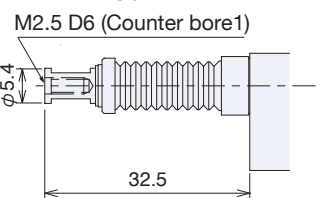


Compatible with contacting parts of commercially produced dial gauges

P12DLB

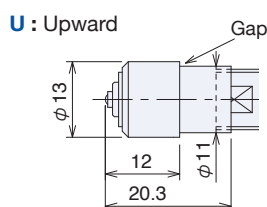


T: Replaceable (Threaded M2.5)
No contacting part

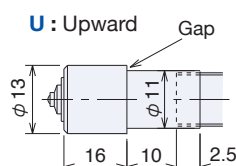


Compatible with contacting parts of commercially produced dial gauges

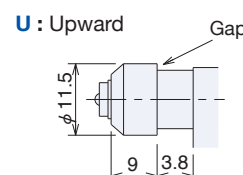
P10DA / P10DB



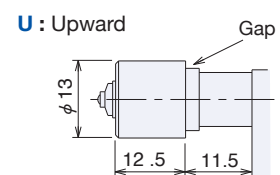
P10DLB



P12DA / P12DB



P12DLB



■ Specification of option

Shape of contacting part

Mark: Shape	Shape of detected objects
A: S ϕ 2 ball carbide	Flat
B: ϕ 3 flat	Convex, ball (Cutters, drills)
T: Replaceable (Threaded M2.5)	Specify mounting direction when using special shape or heavy contacting parts

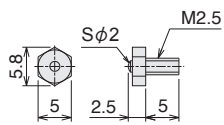
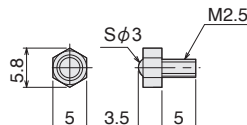
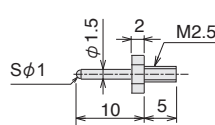
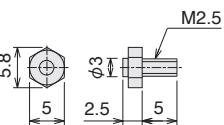
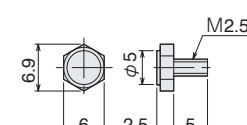
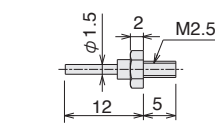
Contact force

Mark: Shape	Operating condition
S: 0.3N	No chattering caused by vibration or impact (No rubber boot is provided for "S", IP40)
G: 0.5N	
H: 1.5N	Intense vibration or impact

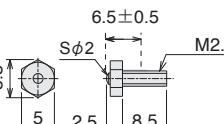
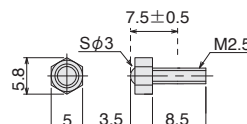
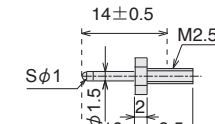
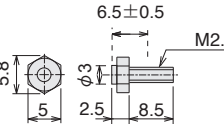
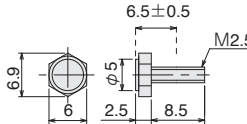
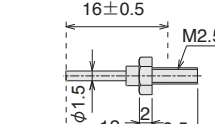
Refer to P6-2 for low contact force type (0.1N)

■ Detachable contacting parts (sold separately)

Fixed contacting parts

Outer dimension	Product name	Outer dimension	Product name	Outer dimension	Product name
 <p>Sϕ2 ball</p>	F4130W Tungsten carbide	 <p>Sϕ3 ball</p>	F4150W Tungsten carbide	 <p>Needle</p>	F4129W Tungsten carbide
 <p>ϕ3 flat</p>	F4131W Tungsten carbide	 <p>ϕ5 flat</p>	F4132W Tungsten carbide	 <p>Flat needle</p>	F4161W Tungsten carbide

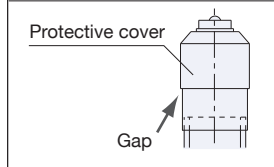
This can make installation process easier and eliminate the risk of twisting the cable when adjusting the signal point of the switch.

Outer dimension	Product name	Outer dimension	Product name	Outer dimension	Product name
 <p>Sϕ2 ball</p>	F4130AW Tungsten carbide	 <p>Sϕ3 ball</p>	F4150AW Tungsten carbide	 <p>Needle</p>	F4129AW Tungsten carbide
 <p>ϕ3 flat</p>	F4131AW Tungsten carbide	 <p>ϕ5 flat</p>	F4132AW Tungsten carbide	 <p>Flat needle</p>	F4161AW Tungsten carbide

Accessory for the adjustable contacting parts : Locknut for adjustment

Protective covers

U: Mostly for upward installation



Precaution for attaching to brackets

When using protective covers or special contacting parts, insert cable side in the mounting hole.

(In the case of using connector, undo it before insertion)

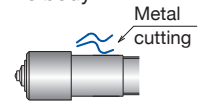
Precautions for installation of nuts :

When any of the following options is selected, the cover must be removed before installing the nut.

(These options come with instructions for installing nuts.)

For metal cuttings and coolant

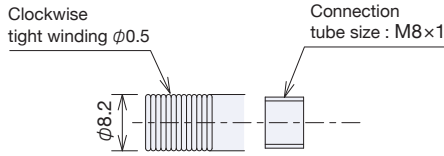
- Protective cover is strongly recommended to avoid damage from cuttings and coolant when the switch is used in machining environment. In addition, an extra cover is recommended to avoid direct hit by high-pressure coolant or heavy cuttings.
- For horizontal mounting, an extra cover prevents coolant or cuttings from entering inside and getting piled up on the body.
- Fabricate and place an extra cover to avoid metal chips adhering to the rubber boots during the grinding operation.



Cable protection (Protective structure, Refer to P14-5)

Wire braid for protection

Material : Steel wire, Clockwise tight winding
Minimum bending radius : 7mm
Mark : **W**

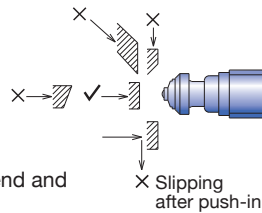


Precautions

- 1) Switch side is fastened with screws and machine side is simply cut. When extension is needed, use threaded connection tube.
- 2) Since gaps are formed at bend section (especially at the attachment end) of the wire braid, make sure the instruction of cuttings does not damage the cable.
- 3) Be careful not to damage the cable sheath as a result of crushing it during clamping.
- 4) When binding it up and clamp with other cables, make sure not to apply excessive force to the attachment end.
- 5) Wire braids extend by their own weight. Fabricate wire braids slightly shorter than the cable length.

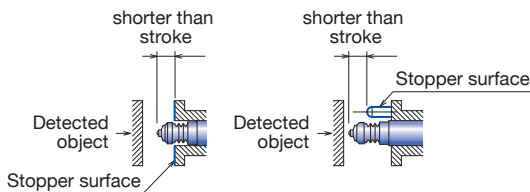
How to use

Make contact with the object at right angle.
Do not press the plunger to the stroke end. It may cause malfunction due to the impact.



Action is limited between the tip end and the edge of the internal bearing.
The end face may deform when the detector is hit, causing the failure in the return.

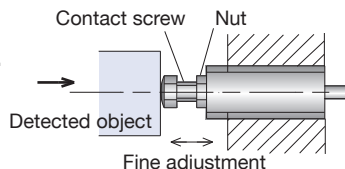
If there is a possibility to press the plunger to the stroke end, install a stopper separately to prevent the malfunction.



How to set the signal point with adjustable contacts

Fine adjustment by the contact screw. (About ±0.5)
The switch is locked in position with the nut.

- 1) This also serves to prevent loosening.
- 2) Particularly convenient for making internal adjustment in machines.

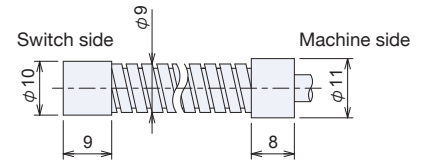


Extracted from Technical Guide P14-6

Protective tube

Used mainly in machining environment (Protection for cuttings).
(Not applicable to the cable having diameter smaller than φ5)

Dimension : outer diameter φ9
Minimum bending radius : 25mm
Mark : **P**



Precautions

- 1) Switch side is screwed in and metal ring is attached to machine side.
- 2) Because protective tube is not flexible, clamp it to fix so as not to apply excessive force to the switch.
- 3) When binding it up and clamping with other cables, make sure not to apply excessive force to the attachment end.
- 4) Cables are not waterproof.

Tightening torque for case screws and nuts

High-precision MT-Touch Switch	Screw / Nut	Tightening torque	Applicable models
	M8×0.5	4N·m	P085DB
	M10×0.5	8N·m	P10

Circuit diagram

without LED	with LED
<p>Normally open (NO)</p> <p>Brown + Blue -</p>	<p>Normally open (NO)</p> <p>Brown + Blue - LED Normally Off</p>
<p>Normally close (NC)</p> <p>Brown + Blue -</p>	<p>Normally close (NC)</p> <p>Brown + Blue - LED Normally On</p>

Electrical specification / circuit diagram. (Refer to P7-2)

When using the switches with LED option, limit the current below 10mA. (Refer to P14-3 "Confirmation of switch operation")

P10DH

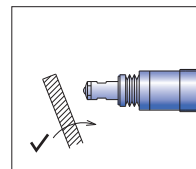
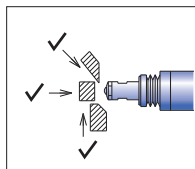
1-signal plunger type (Ball bearing)

Sliding and angled touch type

Features

- A linear movement ball bearing makes it optimum for slide and deflection angle contacts.

《Application》



* Photo shows the contacting part (F4130W) attached.

Standard specification

unit:mm

Product name	Output mode	Pretravel	Stroke	Size	with LED
P10DHA-T	A : Normally open	0.2	3	M14×0.5	P10DHA-T L
P10DHB-T	B : Normally close	0 (*1)			P10DHB-T L
P10SHA-T	A : Normally open	0.2		φ14	P10SHA-T L
P10SHB-T	B : Normally close	0 (*1)	10	M14×0.5	P10SHB-T L
P10DHLTB-T					P10DHLTB-T L

*1 Adjust the installed location of the switch by the signal switching point.

-L: LED indicator (120mm from the switch)

Common specification

unit:mm

Switch structure	Dry contact	Cable	Standard length 3 m Oil resistant φ5 / 2 cores, Tensile strength 30N, minimum bending R7
Output mode	A : Normally open / B : Normally close	(Refer to P7-5)	
Repeatability	Both On→Off, Off→On/ 0.0005 (axial direction) (At operating speed 50-200mm/min) ^{*2}	Operating temperature range	0°C-80°C (Ice-free)
Movement differential	0	Temperature drift	0 (because of no amplifier)
Contact life time	3 million (If no specified bungle caused by vibration and used under voltage and current rating)	Oscillation	10-55Hz total amplitude 1.5 for X,Y,Z each direction
Protective structure	IP67	Impact	300m/s ² for X,Y,Z each direction
Contact force	1N (axial direction)	Contact rating (Refer to P14-3)	DC5V-DC24V Steady current: 10 mA or less (rush current: 20 mA or less) When using the switch with LED, limit the current below 10mA.
Plunger shaft	Anti-rotating lock	Standard accessory	Two fixing nuts for threaded type

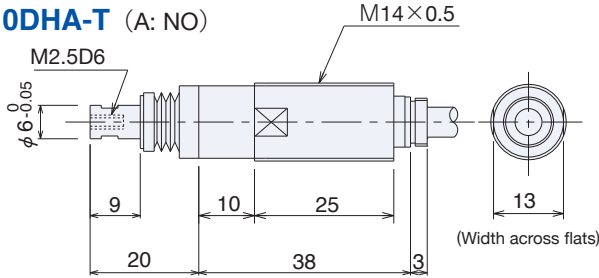
*2 Operating speed slower than 10mm/min is not recommended.

◎The following options are available.

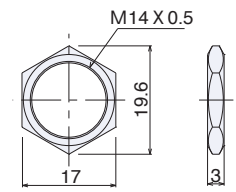
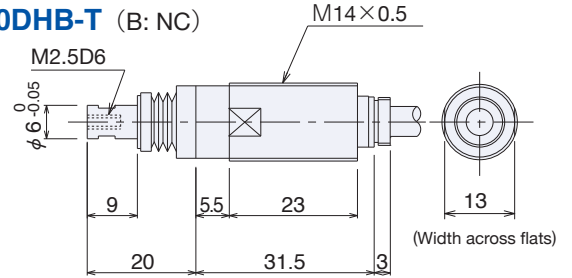
- Transistor output (Refer to P7-3)
 - Reverse connect protection.
 - Level conversion.
 - Output current is increased to 100mA.
- Shape of contacting part
- Protective cover
- LED indicator
- Contact force
- Cable direction
- Cable

Outer dimension

P10DHA-T (A: NO)

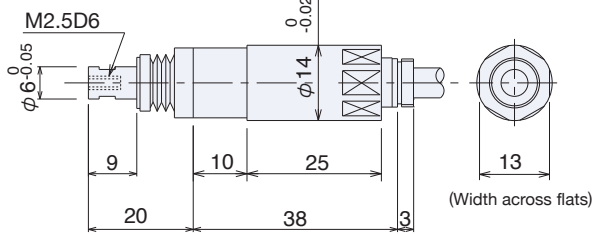


P10DHB-T (B: NC)

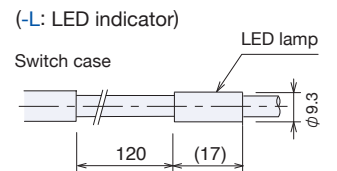
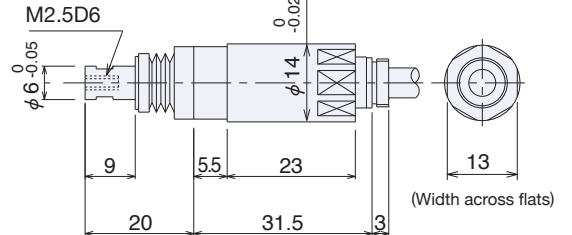


Material : BsBM
Treatment : Ni plating
Product name : S621

P10SHA-T (A: NO)



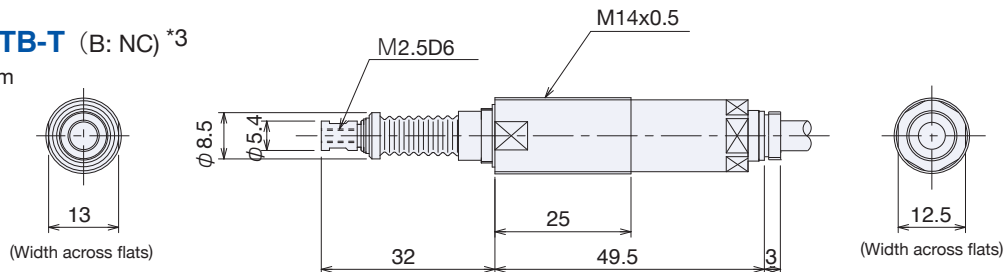
P10SHB-T (B: NC)



Long stroke type

P10DHLTB-T (B: NC) *3

Stroke 10mm



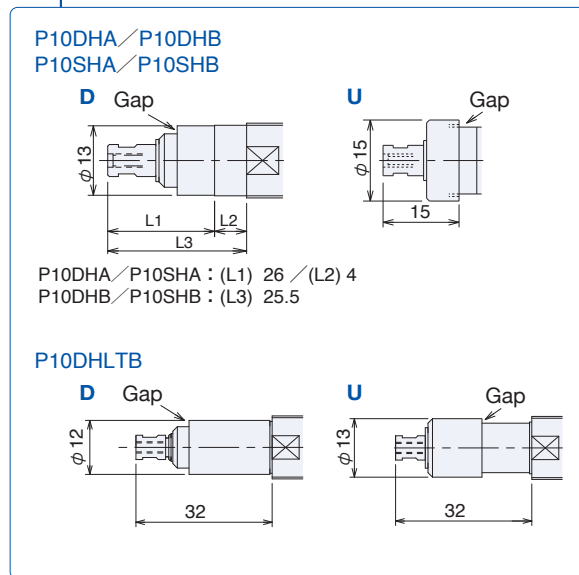
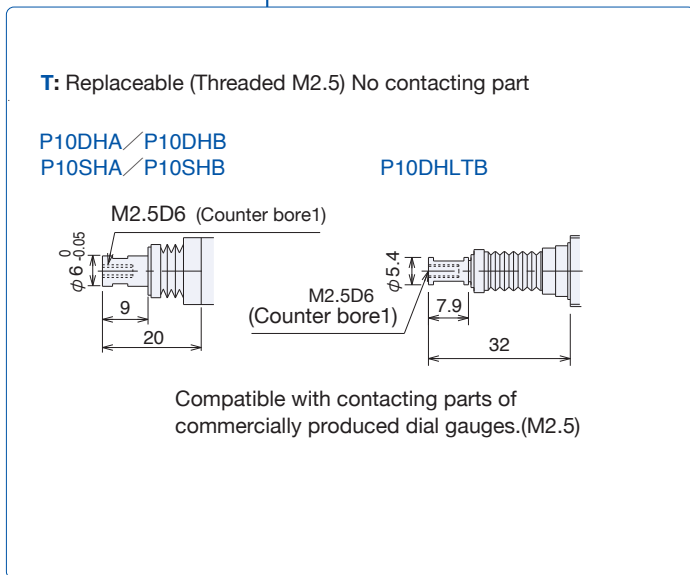
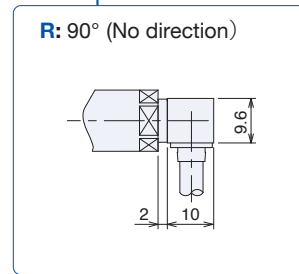
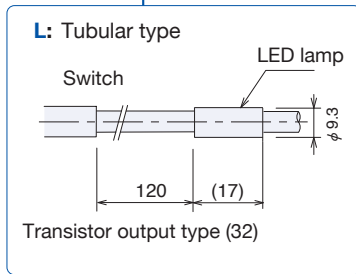
*3 Conventional contact integrated one-piece type has been changed to removable type.

Options

Product name	Shape of contacting part	Protective cover	LED indicator	Contact force	Cable direction	Cable	Cable protection (Refer to P3-15)
P10DHA P10DHB P10SHA P10SHB P10DHLTB	T: Replaceable (Threaded M2.5) No contacting part * Contacting parts are sold separately (Refer to the next page)	Blank: Not required D: Downward (Not available for "S" contact force option) U: Upward (Not available for "S" contact force option)	Blank: No LED L: 120mm from the switch	Blank: 1N S: 0.3N (No rubber boot is provided. IP40.) G: 0.5N H: 1.5N	Blank: Straight R: 90° (unavailable when boot protection shape U is selected, except for P10DHLTB)	Blank: Standard (3m) 5: 5m	Blank: Not required <3m cable> W2: 2m wire braid P2: 2m protective tube ----- <5m cable> W4: 4m wire braid P4: 4m protective tube

Transistor output
Added to standard product name TNA TNB TPA TPB (Refer to P7-3)

- ▶ e.g.) P10DHA-TDL-5
- ▶ Transistor output e.g.) P10DHATNA-T



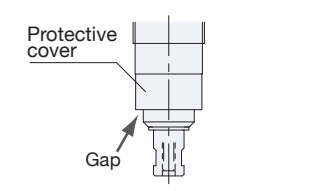
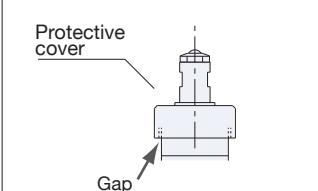
Options

Shape of contacting part

Mark: Shape	Operating condition
T: Replaceable (Threaded M2.5)	Specify mounting direction when using special shape or heavy contacting part

Protective covers

Choose the suitable cover according to switch mounting direction so that the metal cuttings and coolant can't enter from the gaps. (Refer to P14-5)

D: Mostly for downward installation	U: Mostly for upward installation
	

Precaution for attaching to brackets

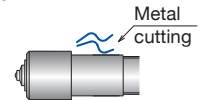
When using U type protective covers or special contacting parts, insert cable side in the mouting hole.

Contact force

Mark: Shape	Operating condition
S: 0.3N	No chatting caused by vibration or impact (No rubber boot is provided for "S", IP40)
G: 0.5N	
H: 1.5N	Intense vibration or impact

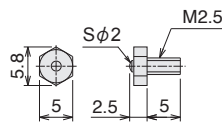
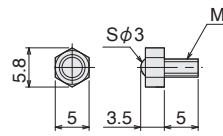
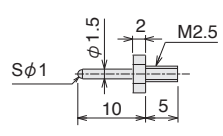
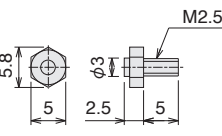
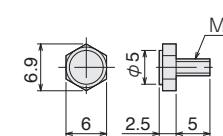
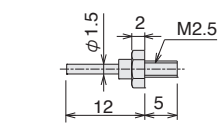
For metal cuttings and coolant

- Protective cover is strongly recommended to avoid damage from cuttings and coolant when the switch is used in machining environment.
- In addition, an extra cover is recommended to avoid direct hit by high-pressure coolant or heavy cuttings.
- For horizontal mounting, an extra cover prevents coolant or cuttings from entering inside and getting piled up on the body.
- Fabricate and place an extra cover to avoid metal chips adhering to the rubber boots during the grinding operation.

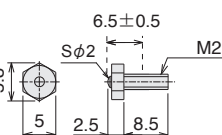
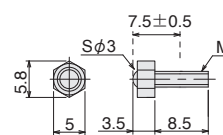
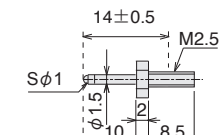
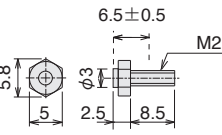
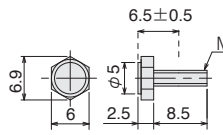
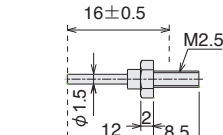


Detachable contacting parts (sold separately)

Fixed contacting parts

Outer dimension	Product name	Outer dimension	Product name	Outer dimension	Product name
Sφ2 ball 	F4130W Tungsten carbide	Sφ3 ball 	F4150W Tungsten carbide	Needle 	F4129W Tungsten carbide
φ3 flat 	F4131W Tungsten carbide	φ5 flat 	F4132W Tungsten carbide	Flat needle 	F4161W Tungsten carbide

This can make installation process easier and eliminate the risk of twisting the cable when adjusting the signal point of the switch.

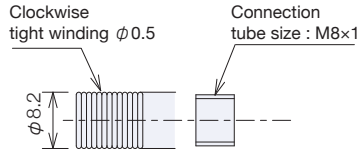
Outer dimension	Product name	Outer dimension	Product name	Outer dimension	Product name
Sφ2 ball 	F4130AW Tungsten carbide	Sφ3 ball 	F4150AW Tungsten carbide	Needle 	F4129AW Tungsten carbide
φ3 flat 	F4131AW Tungsten carbide	φ5 flat 	F4132AW Tungsten carbide	Flat needle 	F4161AW Tungsten carbide

Accessory for the adjustable contacting parts : Locknut for adjustment

Cable protection (Protective structure, Refer to P14-5)

Wire braid for protection

Material : Steel wire, Clockwise tight winding
Minimum bending radius : 7mm
Mark : **W**



Precautions

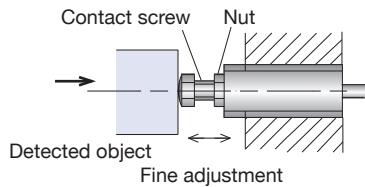
- 1) Switch side is fastened with screws and machine side is simply cut. When extension is needed, use threaded connection tube.
- 2) Since gaps are formed at bend section (especially at the attachment end) of the wire braid, make sure the instruction of cuttings does not damage the cable.
- 3) Be careful not to damage the cable sheath as a result of crushing it during clamping.
- 4) When binding it up and clamp with other cables, make sure not to apply excessive force to the attachment end.
- 5) Wire braids extend by their own weight. Fabricate wire braids slightly shorter than the cable length.

How to set the signal point with adjustable contacts

Fine adjustment by the contact screw. (About ±0.5)
The switch is locked in position with the nut.

- 1) This also serves to prevent loosening.
- 2) Particularly convenient for making internal corrections.

Extracted from
Technical Guide P14-6



Circuit diagram

without LED	with LED
<p>Normally open (NO)</p>	<p>Normally open (NO)</p> <p>LED Normally Off</p>
<p>Normally close (NC)</p>	<p>Normally close (NC)</p> <p>LED Normally On</p>

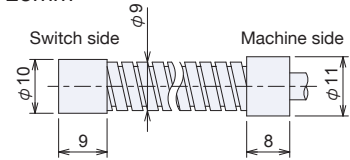
Electrical specification / circuit diagram. (Refer to P7-2)

When using the switches with LED option, limit the current below 10mA. (Refer to P14-3 "Confirmation of switch operation")

Protective tube

Used mainly in machining environment (Protection for cuttings).
(Not applicable to the cable having diameter smaller than φ5)

Dimension: outer diameter φ9
Minimum bending radius : 25mm
Mark : **P**

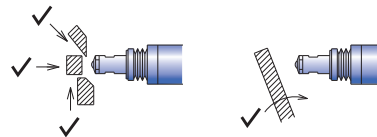


Precautions

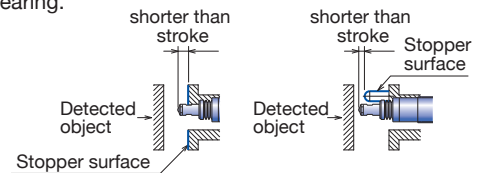
- 1) Switch side is screwed in and metal ring is attached to machine side.
- 2) Because protective tube is not flexible, clamp it to fix so as not apply excessive force to the switch.
- 3) When binding it up and clamping with other cables, make sure not to apply excessive force to the attachment end.
- 4) Cables are not waterproof.

How to use

Suitable for sliding and angled objects.



Action is limited between the tip end and the edge of the internal bearing.



If there is a possibility to press the plunger to the stroke end, install a stopper separately to prevent the malfunction.

Tightening torque for case screws and nuts

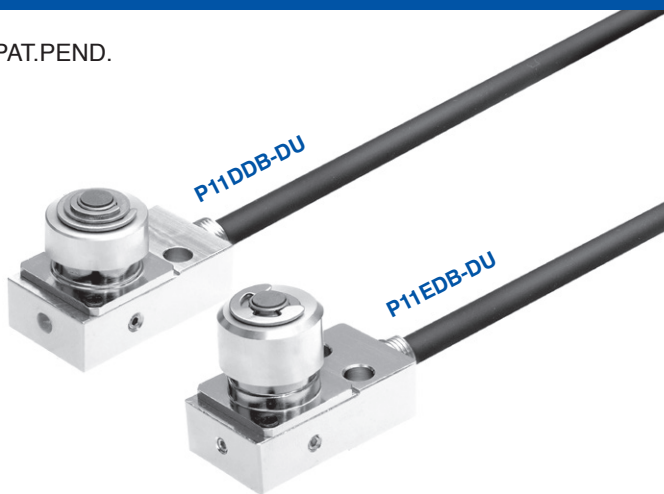
	Screw / Nut	Tightening torque	Applicable models
High-precision MT-Touch Switch	M14x0.5	10N · m	P10DH

P11

1 signal flat type

Straight touch type (Metal bearing)

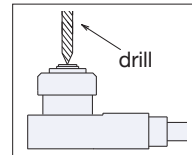
PAT.PEND.



Features

■ **Installation** : Due to there is no fine tuning mechanism for signal setting, use as follows.

- The origin for the object which is moving or displacing
- Ideal for tool setter of the NC machine (Usable for the thermal displacement correction of machine)
- Providing the adjustment section to the moving object (Refer to P14-6 Technical guide - Setting methods)



■ Since this will be used at the circumstances which the coolant and cutting chips spatter, the typical specification will be gap-less, boot protection.

■ Parallelism : 0.01mm

■ Contact diameter : Up to $\phi 10$

Standard specifications

unit mm

Product name	Stroke	Mounting hole	With LED
P11DDB-DU	3	2- $\phi 4.6$	P11DDB-DU LD
P11DMB-DU		2-M4	P11DMB-DU LD
P11EDB-DU	5	2- $\phi 4.6$	P11EDB-DU LD
P11EMB-DU		2-M4	P11EMB-DU LD

-DU : $\phi 5$ Flat carbide,
Protective cover for upward installation

LD : LED indicator (attached to the sensor)

Common specifications

unit mm

Contact structure	Dry contact
Output mode	B : Normally close
Pretravel	0*1
Repeatability	Both ON→OFF OFF→ON 0.0005 (range) (At operating speed 50-200mm/min)*2
Movement differential	0
Contact life time	3 million (If no specified bungle caused by vibration and) (used under voltage and current rating)
Protective structure	IP67
Contact force	1.5N

Cable (Refer to P7-5)	Standard length 3m Oil resistant $\phi 5 / 2$ cores Tensile strength 30N, Minimum bending R7
Operating temperature range	0°C-80°C (Ice-free)
Temperature drift	0 (because of no amplifier)
Oscillation	10-55Hz total amplitude 1.5 for X,Y,Z each direction
Impact	300m/s ² for X,Y,Z each direction
Contact rating (Refer to P14-3)	DC5V - DC24V Steady current : 10mA or less Rush current : 20mA or less When using the switches with LED option, limit the current below 10mA.

*1 Adjust the installed location of the sensor by the signal switching point.

*2 Operating speed slower than 10mm/min is not recommended.

◎ The following options are available.

- Transistor output (Refer to P7-3)
- Air pipe
- Contact force
- Reverse connect protection.
- Shape of contacting part
- Cable direction
- Level conversion.
- Protective covers
- Cable
- Output current is increased to 100mA.
- LED indicator

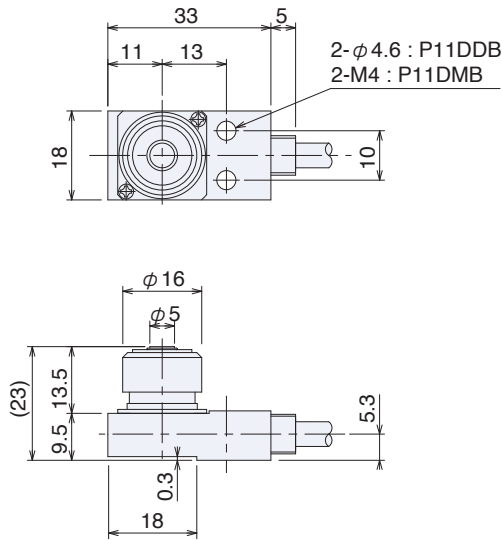
Outer dimension

φ5 Flat carbide (-D)
Protective cover for upward installation (U)

P11DDB-DU (B : NC)

P11DMB-DU (B : NC)

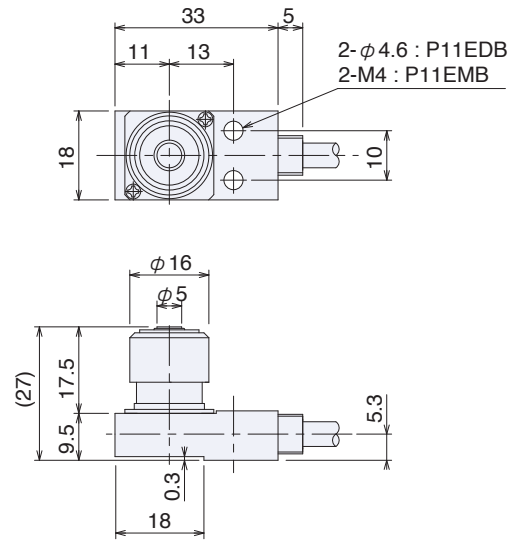
Stroke 3mm



P11EDB-DU (B : NC)

P11EMB-DU (B : NC)

Stroke 5mm



Circuit diagram

Without LED	With LED
<p>Nomally Closed (NC)</p>	<p>Nomally Closed (NC)</p>

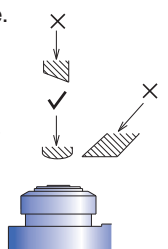
Electrical specification / circuit diagram. (Refer to P7-2)

When using the sensors with LED option, limit the current below 10mA
(refer to P14-3 "Confirmation of Sensor Operation").

How to use

Make contact with detected objects at right angle.

Action is limited between the tip end and the edge of the bearing. The end face of the bearing may deform when the detector is hit, causing the failure in the return.

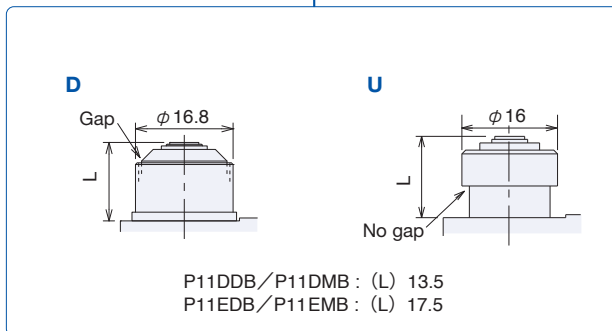
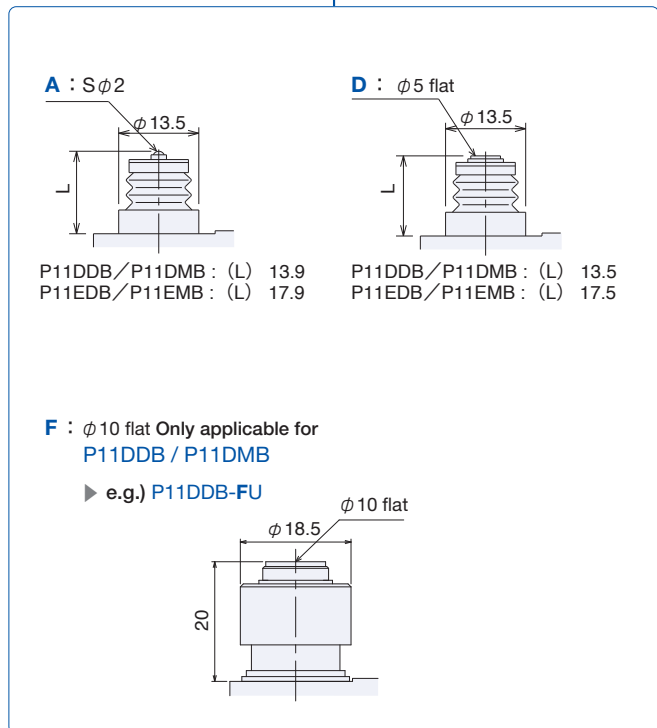
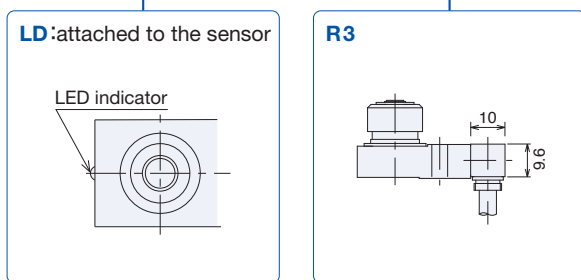


Options

Product name	Shape of contacting part	Protective cover	LED indicator	Contact force	Cable direction	Cable	Cableprotection (Refer to P3-25)
P11DDB P11DMB P11EDB P11EMB	Standard D : $\phi 5$ flat carbide A : $\phi 2$ ball carbide ----- F : $\phi 10$ flat carbide (Only applicable for P11DDB/P11DMB)	Standard U : For upward installation D : For downward installation (Not available for "F" contacting part) Blank : Not required (Not available for "F" contacting part)	Blank : Not required LD : attached to the sensor	Blank : 1.5N K : 1N (Not available for "F" contacting part)	Blank : Straight R3 : 90°	Blank: Standard (3m) 5 : 5m	Blank: Not required <3m cable> W2 : 2m wire braid P2 : 2m protective tube ----- <5m cable> W4 : 4m wire braid P4 : 4m protective tube

Transistor output	Air pipe
Added to standard product name TNA TNB TPA TPB (refer to P7-3)	Blank : Not required P/PR : Added to standard product name or after transistor output (refer to P3-25)

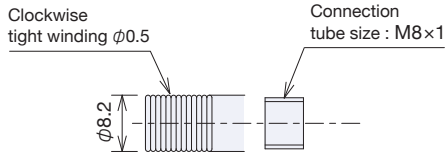
- ▶ e.g.) **P11DDB-DULDR3-5**
- ▶ Transistor output e.g.) **P11DDBTNA-DU**
- ▶ Air pipe e.g.) **P11DDBP-DU**



Cable protection (Protective structure, Refer to P14-5)

Wire braid for protection

Material : Steel wire, Clockwise tight winding
Minimum bending radius : 7mm
Mark : **W**



Precautions

- 1) Switch side is fastened with screws and machine side is simply cut. When extension is needed, use threaded connection tube.
- 2) Since gaps are formed at bend section (especially at the attachment end) of the wire braid, make sure the instruction of cuttings does not damage the cable.
- 3) Be careful not to damage the cable sheath as a result of crushing it during clamping.
- 4) When binding it up and clamp with other cables, make sure not to apply excessive force to the attachment end.
- 5) Wire braids extend by their own weight. Fabricate wire braids slightly shorter than the cable length.

Options

Shape of contacting part

Mark : Shape	Shape of detected objects
D : $\phi 5$ flat, carbide	Convex, ball (cutters, drills)
A : $\phi 2$ ball, carbide	Flat
F : $\phi 10$ flat, carbide	Convex, ball (cutters, drills)

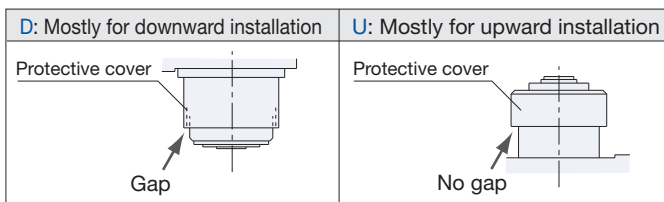
Contact force

Mark : Contact force	Operating condition
K : 1N	Drills of $\phi 5$ or smaller

Refer to P6-2 for low contact force type (0.1N)

Protective covers

Choose a suitable cover such that metal cuttings and coolant do not enter from the gaps (horizontal types prevent coolant from penetrating and building up inside). (Refer to P14-5)



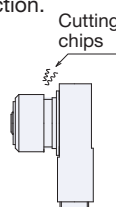
Coolant and cutting chips

As the rubber boots may be torn in an environment where chips can scatter and adhere or coolant can splash on the boots, be sure to select the boot protection.

In addition, please provide a separate cover if the high pressure coolant or water jet violently hit the contact or boots protection.

When using the protective cover in a horizontal position, be sure to provide a cover or the like so that the chips do not accumulate on the switch body.

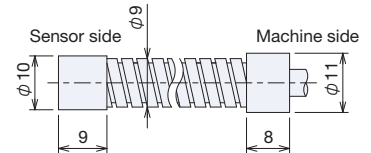
When using a grinding machine, if polishing or grinding chips are deposited on the rubber surface, please provide a cover separately.



Protective tube

Used mainly in machining environment (Protection for cuttings). (Not applicable to the cable having diameter smaller than $\phi 5$)

Dimension : outer diameter $\phi 9$
Minimum bending radius : 25mm
Mark : **P**

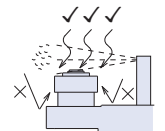


Precautions

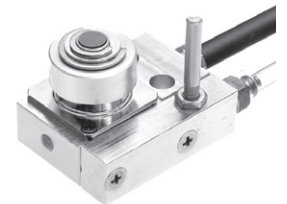
- 1) Switch side is screwed in and metal ring is attached to machine side.
- 2) Because protective tube is not flexible, clamp it to fix so as not to apply excessive force to the switch.
- 3) When binding it up and clamping with other cables, make sure not to apply excessive force to the attachment end.
- 4) Cables are not waterproof.

Air pipe

Air pipes are used to blow off cuttings or coolant that have adhered to the contact surface or tool.



Product name
Standard product name + P
Standard product name + PR



Example

