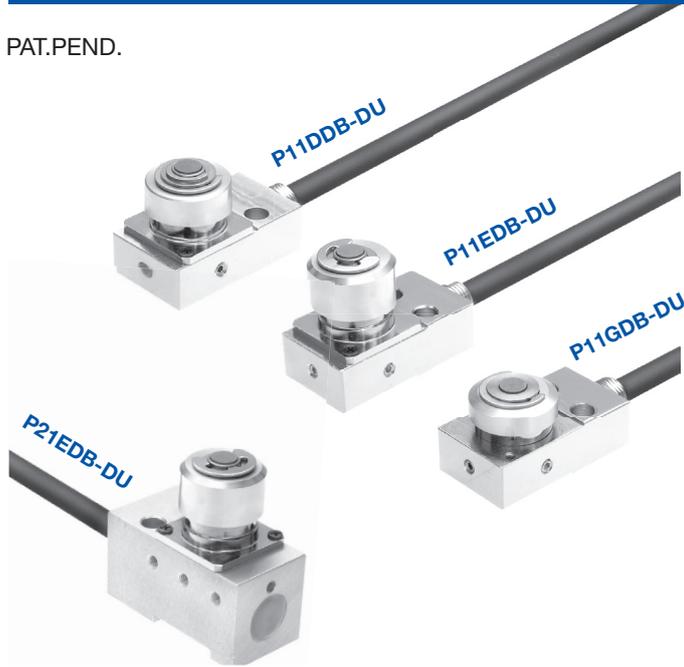


P11 / P21

1-signal / 2-signal plunger type

Straight touch, Flat type (Plain bearing)

PAT.PEND.

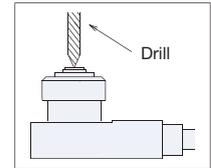


Space-saving design

Suitable for the situation where height for installation is restricted. Excellent parallelism between the contacting surface and the mounting surface.

Best suited for small tool setter

Tool preset, tool wear & breakage detection, and correction of the tool position displacement caused by thermal expansion.



P21 has a second switch for over travel alert signal

Representative specification

unit:mm

Product name	Contacting part	Stroke	Mounting hole	with LED
P11DDB-DU	1-signal	3 (D)	2- ϕ 4.6	P11DDB-DU LD
P11DMB-DU			2-M4	P11DMB-DU LD
P11EDB-DU		5 (E)	2- ϕ 4.6	P11EDB-DU LD
P11EMB-DU			2-M4	P11EMB-DU LD
P11GDB-DU		2 (G)	2- ϕ 4.6	P11GDB-DU LD
P11GMB-DU			2-M4	P11GMB-DU LD
P21EDB-DU	2-signal	5 (E)	2- ϕ 4.6	P21EDB-DU LD

-DU : Contacting part ϕ 5 flat carbide
Protective cover, Upward (No gap)

-LD : LED indicator (Attached to the switch)

Common specification

First signal specification

Switch structure	Dry contact
Output mode	B : Normally close
Pretravel	0
Repeatability	Both On→Off, Off→On/ 0.0005 (At operating speed 50~200mm/min)*
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

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

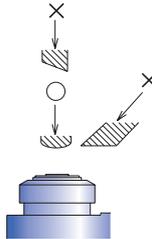
unit:mm

Cable (Refer to P2-4)	Standard length 3 m Oil resistant ϕ 5 / 2 cores, (2-signal : 4 cores) Tensile strength 30N, minimum bending R7
Operating temperature range	0°C~80°C (Ice-free)
Temperature drift	0
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	DC5V~DC24V 10mA (MAX20mA) Resistance load
Second signal (only for P21)	
Output mode	B : Normally close
Pretravel	2.5

How to use

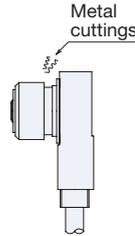
Make contact with detected object at right angle (within deflection angle $\pm 3^\circ$)
 Do not press the plunger to the stroke end. It may cause malfunction due to the impact.

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



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 in the body.



Outer dimension

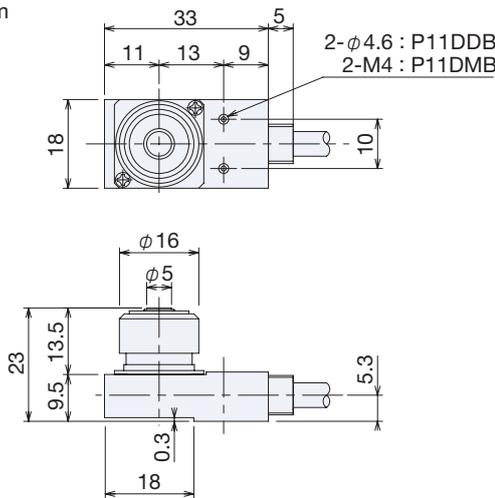
1-signal type

(-D : Contacting part $\phi 5$ flat carbide) (-U : Protective cover, Upward, No gap)

P11DDB-DU (B : NC)

P11DMB-DU (B : NC)

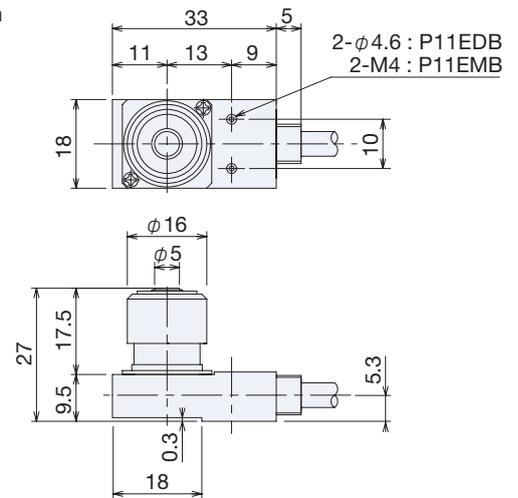
Stroke 3mm



P11EDB-DU (B : NC)

P11EMB-DU (B : NC)

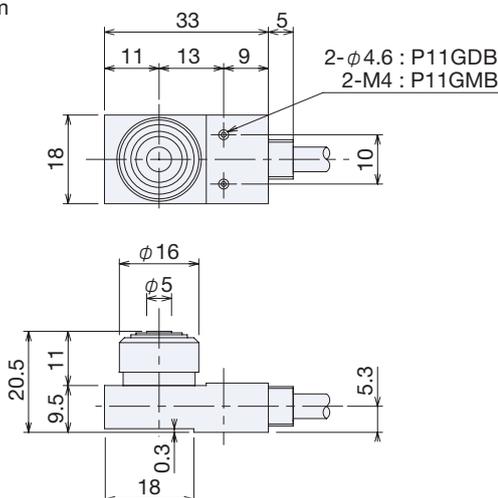
Stroke 5mm



P11GDB-DU (B : NC)

P11GMB-DU (B : NC)

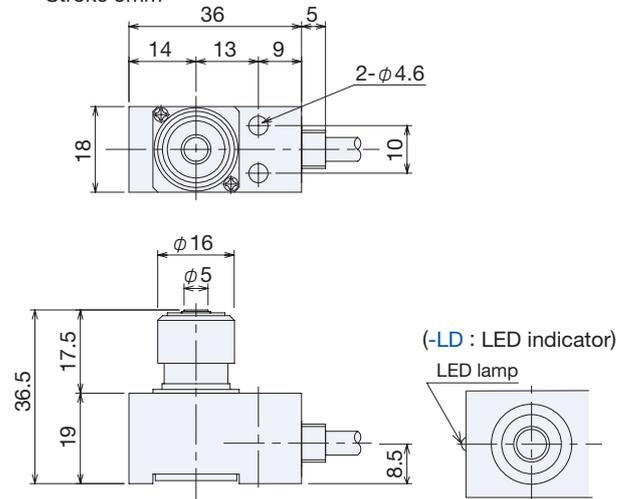
Stroke 2mm



2-signal type

P21EDB-DU (B : NC)

Stroke 5mm



Circuit diagram

(Old wire color)

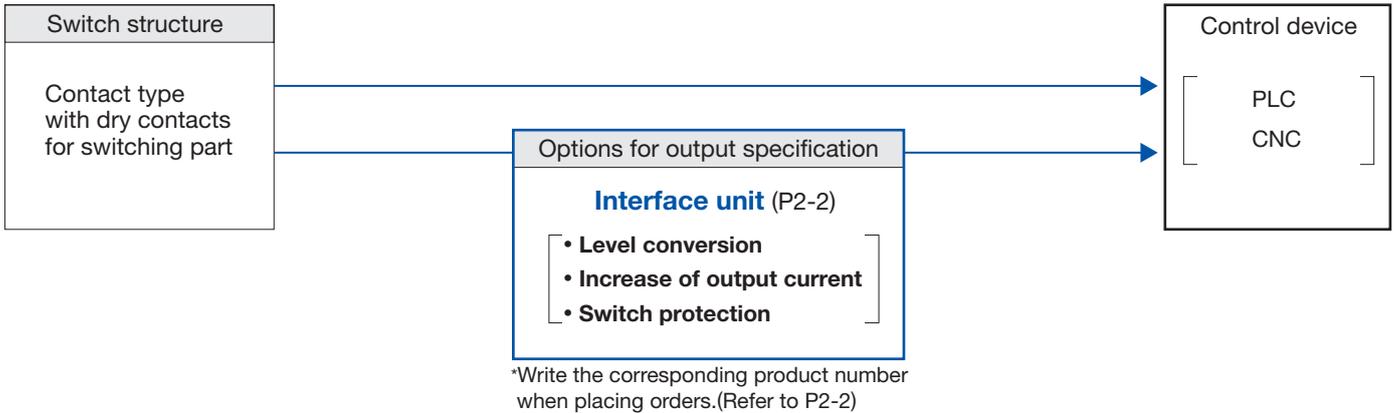
No LED	with LED
1-signal type (P11) Normally close (NC) 	1-signal type (P11) Normally close (NC)
2-signal type (P21) First Signal Normally close (NC) 	2-signal type (P21) First Signal Normally close (NC)

Electrical specification / circuit diagram. (Refer to P2-1)

When using the switches with LED option, limit the current below 10mA.

Contact type with dry contacts for switching part

Block diagram



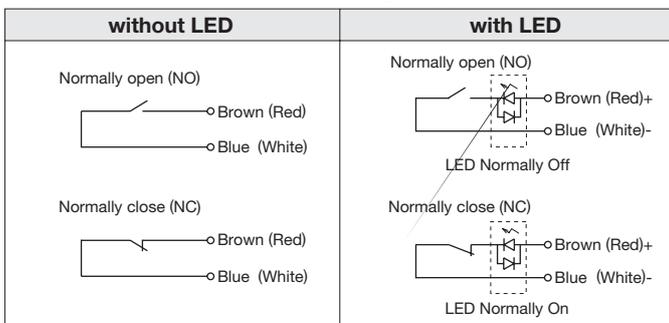
Specification

Contact rating	DC+5V~DC+24V 10mA (MAX20mA) Resistance load (Switch without LED,DC1V-24V possible)
Insulation resistance	More than 100MΩ with DC250V Megger
Output mode	A : Normally open or B : Normally close

Refer to P6-3 about how to use switches under the condition of AC100V-200V.

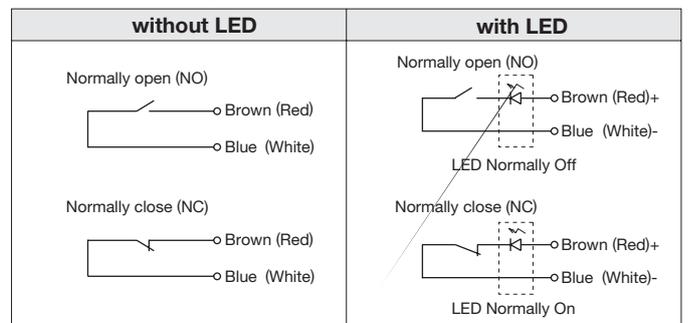
Circuit diagram

High-accuracy MT-Touch Switch 1-signal type (Old wire color)

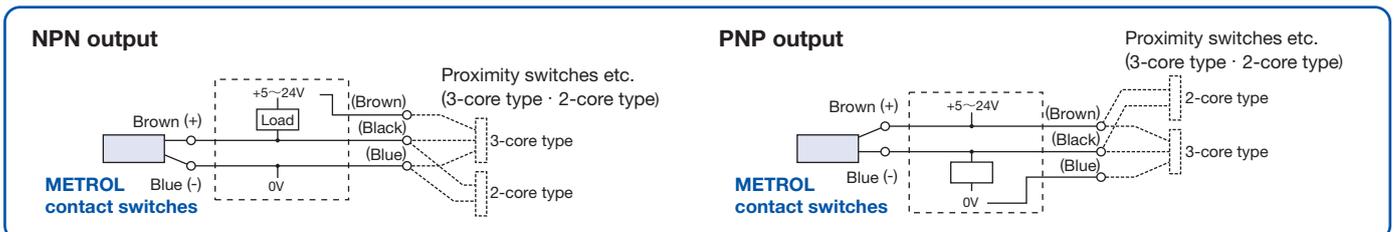


When using the switches with LED option, limit the current below 10mA.

CS-Touch Switch and others
(Other sensors 1-signal types)



How to replace currently using proximity switches (3-core and 2-core type) with METROL (2-core type)



Interface unit

Electrical specification

Power supply voltage	DC24V ±10% (Full-wave rectification with ripple 5% or less)
Power consumption	30mA
Input	One contact signal
Output	Transfer output (in-phase or inverted output)
Operating temperature range	0°C~50°C

- When using the switches (except MT-Touch Switch) with the interface unit, the option for the LED attached on the switch is not available.
- The diode is attached in parallel to the LED for MT-Touch Switch for the cases where the switch is used with the interface unit.
- No diode is attached to the switches except for MT-Touch Switch.

Output specification

Product name		CL-1N	CL-1P	CL-1FT	CL-1F	CL-1FH
Output method		NPN-TR	PNP-TR	Photo coupler	Photo Mos relay	
Diagram						
Output level		0V sink	24V source	No-voltage floating output		
Output capacity		DC24V 100mA 350mW		DC30V 20mA 120mW	AC/DC60V 100mA 240mW	AC/DC200V 100mA 240mW
Operating time	Delay	100µsec (Representing value)			500µsec(Representing value)	
	Spread	20~100µsec			10~20µsec	

Characteristics

1) Protection for the dry contacts from inrush current

- The interface unit is not needed, when using the switches under the contact rating. The switch side of the interface unit has high-frequency alternating current control and it reduces the influence of sparks and chattering caused by vibration.
- Being separated from I/O circuit, the dry contacts of the switches remain intact from sudden inrush current.

2) Increase the output current (except photo coupler type)

- Enable to drive a relay or similar devices directly.
- When driving a relay by this unit, the repetitive accuracy would be lowered due to delay of the relay.

3) Level conversion unit

- Level conversion (normally close to normally open, normally open to normally close)

Outer dimension

Terminal layout

In-phase output: 1, 4, 5, 8, 9, 12, 13, 14

Inverted output: 2, 3, 6, 7, 10, 11

DC24V (+), (-)

Switch input (+), (-)

No terminal block is provided. Refer to the following.

Panasonic: HC2-SFD-S

Omron: PYF-08A

Connecting diagram with electrical load

CL-1N

CL-1P

CL-1FT

CL-1F/CL-1FH

Connection diagram (Plural switches)

When connecting plural switches to one plug-in type interface unit, refer to the diagram below.

Within 20m

Within 100mm

It is available only for the switches without LED.

- Make sure no noise and inductive source.
- Overall length of the sensor side cables should be in 100mm.

Precautions

- 1) Do not connect the load exceeding the output rating specified for each model. Since the switching parts and interface elements may be damaged due to the flow of current in excess of the rating caused by noise or surge induction, place the switch at an adequate distance from any power lines or other sources of noise.
- 2) As a rule of thumb, connect one switch to one unit.
- 3) Select the installation location of I/F unit so that the cable length between the switch and the I/F unit should not exceed 20m .
- 4) Since the I/F unit is not water-proof, protect it from moisture such as water and oil.
- 5) In case of using Normally-open type switch with a LED indicator, I/F unit can be used only when the LED is normally OFF and turns ON in operation. Similarly, for Normally-Close type switch, the unit can be used only when the LED is normally ON and turns OFF in operation.
- 6) This I/F unit is especially designed for the METROL switches, do not use this I/F unit with the switch from other manufacturers.

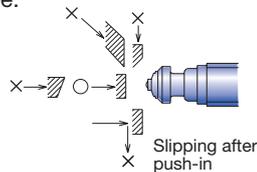
Common warnings and precautions

Electrical

- Use under the specified contact rating.
- Chattering may occur when opening and closing the circuit with dry contacts regardless of whether the switch has a snap action mechanism. Take the first signal as a judgment signal.
- In adverse condition such as using a magnet coil for inductive load and over current may occur, regardless of whether the switch has dry contacts or is contact-less using interface unit with built-in surge protection unit is recommended(Refer to P2-2).
- When using the switch with LED, keep the current below 10mA.

How to use

- When using the plunger type with plain bearing, make contact with the detected object at right angle (with deflection angle $\pm 3^\circ$). For sliding, rotating, angled, offset objects, use ball bearing type or contacting ball type.



- When the plunger is pushed straight by the detected object, do not allow the object to abruptly slide away, as it will cause the plunger to snap back. Note that this may cause failure of the bearing and built-in switching part.
- Because offset distance (misalignment with axis of the plunger) should be shorter than 5mm, the maximum diameter for detecting surface is 10mm for the plunger type with plain bearing.
- In case the detected surface is angled or ragged, note that the switch may fail to operate properly or cause malfunction.
- If the contacting part is worn away depending on conditions, the signal point becomes different. When designing the detected objects, give consideration to its angle, chamfer and roughness so that the contacting part holds up longer. (Mainly for sliding touch type)

Operating environment

- Use in the environment in where cuttings and dust don't prevent switch movement.
- Choose protective cover option in case cutting may damage the rubber boot.
- An extra cover is recommended to avoid direct hit by high-pressure coolant or heavy cuttings.

Contacting part material

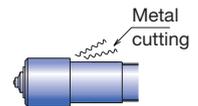
- Even though hardened stainless steel is used as the material of the contacting part or stopper surface (for Stopper Bolt with a Built-in Switch series), they are oxidized and may gather rust under certain conditions.

Rubber for protective structure (boot, seal, O-ring)

- Rubbers for some products are intended for water-soluble cutting oil (Alkaline). For oily, chlorine-base, coolants and other chemicals, consult METROL for assistance.
- The rubber material for High-accuracy MT-Touch Switch and CS-Touch Switch is for both oily and water-soluble coolants.

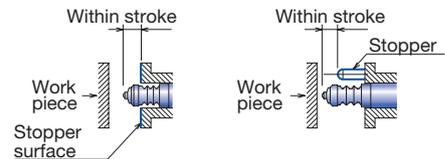
Installation

- Ensure that the threaded part of the switch is not bent during installation.
- When using fixing screws, do not tighten the screws with excessive force. That may distort the switch shape or restrict the movement of the plunger. If the fixing screws are damaged, the switch can be stuck and difficult to be detached.
- When the switch with a protective cover is installed horizontally, an extra cover is needed separately to prevent coolant or cuttings from entering inside and getting piled up on the switch.



For the switches without stopper

- Do not excessively press the plunger to the stroke end. It may cause malfunction due to impact.
- If there is possibility to press the plunger to the stroke end, install a separate stopper to prevent malfunction.



For cartridge type switches

- Tighten the cartridge firmly by fingers. Do not use pliers to fix it. That may cause malfunction.
- The cartridge is thin. Handle it carefully.
- When installing the cartridge type switches, give consideration to enough space to replace the cartridge.

Screw / nut tightening torque Screw / Nut

	Screw / Nut	Tightening torque	Applicable models
PT-Touch Switch	M5×0.5	1N·m	PT
MT-Touch Switch	M8×0.5	4N·m	P085DB
	M10×0.5	8N·m	P10
	M14×0.5	10N·m	P10DH
CS-Touch Switch	M5×0.5	2N·m	CSJ055
	M6×0.75	4N·m	CS067
	M8×0.75	7N·m	CSP087
	M10×0.5	8N·m	CSM
	M21×1	12N·m	CSH
Machine Components with a Built-in Switch	M6×0.5	2N·m	ST BP SP
	M6×1	8N·m	
	M8×1.25	20N·m	
	M10×1.5	35N·m	
Stopper-Mini	M10×0.75	10N·m	STM

Cables and cable protection

Type of cable

Cabtyre cable

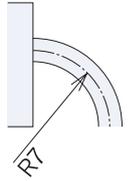
Cabtyre cables are used as robot cables without any safety compromise since the working voltage and current are low, though cabtyre cables are not applicable to UL, CSA, EN or other safety standards.

Specification

Conductor material	Copper-tin alloy, tight winding
Conductor resistance	1Ω/m (per 1 core)
Sheath material	PVC (Non-migrating styrene, oil-resistant, alkaline-resistant)
Minimum bending radius	7mm
Outer diameter	$\phi 3$ (2-core) $\phi 3.5$ (3-core) $\phi 4$ (2-core for dry contact type, 3-core for contact-less type and 5-core for dry contact type) $\phi 5$ (s-core, 3-core) $\phi 5.5$ (5-core)
Sheath color	Black : 2 cores, 3 cores for normally close Gray : 2 cores, 3 cores for normally open (Excludes MT-Touch Switch Series)

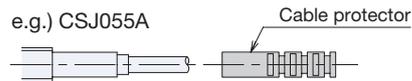
Handling instruction

- 1) Do not pull or twist the cable with excessive force. Max.30N (3kgf)
- 2) Water-resistance →P6-7
- 3) When extending cable length, use cabtyre cable having a cross-section area of at least 0.02mm².
- 4) The minimum bending radius is 7mm.



Cable protector (Depending on products)

e.g.) CSJ055A



Core-wire cable

For CS-Touch Switch CSM short type (P4-7) and stopper-mini type (P5-16)

Specification: $\phi 0.6$ AWG 30 (0.05mm²) Tensile strength 15N

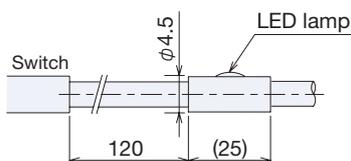
Cross-section area / weight(Including sheath / 1m)

Outer diameter	Cores	AWG	Cross-section area (mm ²)	Weight (g)
$\phi 2.8$	2-core	AWG 26	(0.151mm ²)	10g
$\phi 3.5$	3-core	AWG 28	(0.096mm ²)	15g
$\phi 4$	2-core	AWG 30	(0.063mm ²)	16g
$\phi 4$	3-core	AWG 28	(0.096mm ²)	19g
$\phi 4$	5-core	AWG 28	(0.096mm ²)	21g
$\phi 5$	2-core	AWG 30	(0.063mm ²)	26g
$\phi 5$	4-core	AWG 30	(0.063mm ²)	32g
$\phi 5$	3-core	AWG 30	(0.063mm ²)	26g
$\phi 5.5$	5-core	AWG 30	(0.063mm ²)	33g

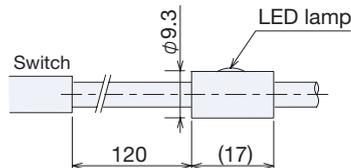
Outer dimension

L : Tubular type

Cable $\phi 3$ or smaller



Cable $\phi 4$



Cable $\phi 5$

