## Summary

● Tool setters for CNC lathes are used to preset the tool bit.

● When a tool bit presses against the contact of the sensor, a signal from an ON-OFF switch demonstrating superior repeatability is output to the CNC or PC to automatically program the bit position.
As a result, there is no longer necessary to repeat the process of test cutting, measuring, calculating and inputting to the CNC as in the past, thus the need for tool setting expertise is eliminated, and there are no more concerns over damaging machine due to setting errors.

● Tool bit breakage can be detected and the worn amount can be corrected.
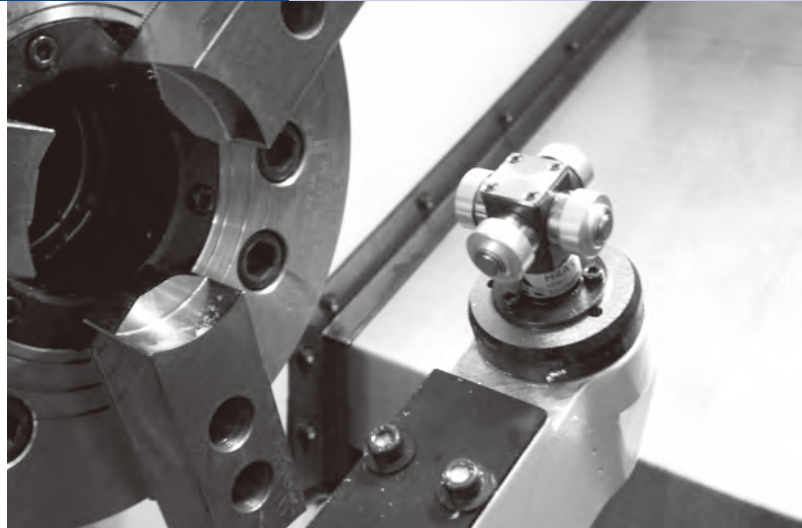
## Features

1) As the signal is output by directly contacting the leading edge of the tool, it does not cause false positives and has high reliability.

2) The internal switch is of the contact type with high precision (repeatability: 1-2μm), and is free of movement differential.

3) Since there is no need of an amplifier, there is no temperature drift caused by self-generation and temperature characteristic of the sensor unit.

4) Dustproof and waterproof structure has superior durability even under harsh conditions caused by the presence of coolant and cuttings.
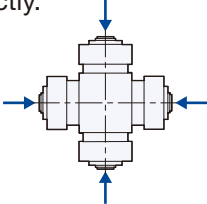
(mm)

| Product name | H4A-001 | H4A-002 | H4D | H4E |
|---|---|---|---|---|
| Features | · Linear Type<br>· The number of sensing direction can be selected | | · Rotating Contact Type<br>· The contact opposite side size can be selected | · Swing Contact Type<br>· The contact opposite side is the smallest |
| No. of detecting direction | 1-5 | | 4 | 4 |
| Output | Serial | Parallel | Serial | Serial |
| Repeatability | 0.001 | | 0.001 | 0.002 (2σ) |
| Contact diameter | $\phi$5 | | $\phi$3 - 5<br>(Depending on the contact opposite side length) | □ 7×5 |
| Contact opposite side length | 40 | | 12, 14, 16, 20 | 7 |
| Stroke | 2 | | from 2<br>(Depending on the contact opposite side length) | from 2<br>(Depending on the shaft length) |

## Selection Guide

● A wide variety of dedicated types depending on the intended use.

**For CNC Lathes**

### Linear Type

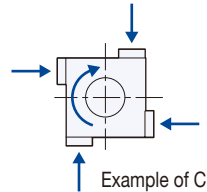Touch sensors are placed each directions and act directly.

### Rotating Contact Type

The shaft rotates when an edge pushes each touch sensor.
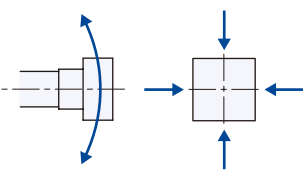
Example of Clockwise

### Swing Contact Type

Swings in 4 directions

**1 Signal Type**
**H4A-001**

→P3-5

**Multi-Signal Type**
(Direction Determination Possible)
**H4A-002**

→P3-7

**1 Signal Type**
**H4D**

→P3-9

**1 Signal Type**
**H4E**

→P3-11

## ■Mounting

· Use the datum surface of the flange in order to attach the contact surface in parallel (in case of angular flange).

## ■Cables

1. Do not pull on cables with excessive force (up to about 30N (3 kgf)).

2. The cable bending radius should be R7 or more.

3. Since switch contacts may be damaged by the current higher than the rated due to induction of noise and surges, install cables as far away from motor power sources and noise sources as possible (particularly when bundling cables).

4. Do not damage cables during wiring. This can impair water resistance capacity.

5. Cover cables with protective tubes when there is a risk of damaging to cables by the usage environment. Minimum bending radius when using protective tubes is R25 and the maximum length is 15 m.

## ■Electrical

1. Contact rating: DC5-24V
   Steady current :10mA or less (Rush current : 20mA or less)

2. Make electrical connections so that the sensor is grounded when the machine body is grounded.

3. As the sensors with LED have polarity, please be aware of the (+) (-) connection. Recommended value of 10 mA, resistive load.
   Limit the LED forward current below 10mA.

4. Refer to P4-9 for information on output structure when an interface unit is provided.

## ■Connector

Cables can be branched between the sensor and machine with connectors, thereby facilitating assembly and maintenance. These connectors are also waterproof, and have superior durability.

· The connector is attached at a midpoint in the cable (distance from sensor: min. 1m)

Note : Do not pull the cable when you remove the connector. Push the connector firmly until it tightly fits with O-ring and make sure the protective ring is fastened.

## ■Protective covers (see Technical Guide on P6-4)

**Protective covers are for preventing rubber boots form damage, and preventing from impairment of water-resistance and dust proofing caused by metal fragments and other cuttings.**

1. Protective covers are not provided for some products. In that case, an extra cover is needed to protect rubber boot from damaging by cutting chips.

2. Even for products with boots protective covers, please consider the mounting orientation, direction of the chips and coolant and the like to make sure that chips and coolant do not get accumulated within the boots protection cover.

## ■Proper Tool Contact

1. Ensure that the cutting tool makes contact along a straight line in the direction in which it is pushed.

2. Do not allow the sensor to push in excessively beyond the sensor stroke. The sensor or blade may be damaged if pushed in excessively.

3. Set to a lower speed in the case of a narrow drill diameter ($\phi$0.5-0.9 mm). However, operating speed slower than 10mm/min is not recommended.

4. Even for the same tool, changing the operation speed or the contact point to the contact will cause errors in accuracy.

Note : Please be sure that the operating speed when the contact that has been pushed in is returned to the original state is within the range in which the contact can follow the tool. When it is rapidly returned or the tool is shifted horizontally, the internal may be damaged in reaction. Similarly, do not return it rapidly when testing it with a finger during installation, cleaning, etc.

Finger

① ② ③ snap
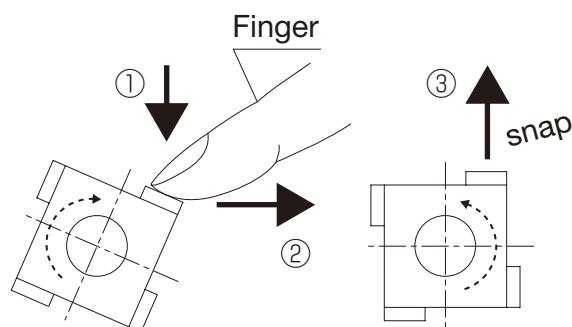
●Requesting Quotation

· Send us the quotation request along with attached spec sheet (with additional requirement if any) by Fax/E-mail.
  FAX: +81 42 528 1442/ Email: touchsensor@metrol.co.jp

· The format (figure number) is determined when the delivery specification figure is submitted.

●Ordering Replacement and Spare Parts

· Please specify the product name (model name) on the nameplate attached to the product.

· Please add an "**H**" after the product No. when not requiring accessories such as an I/F unit or relay cable (machine side).

· Please add an "**S**" when ordering a set.
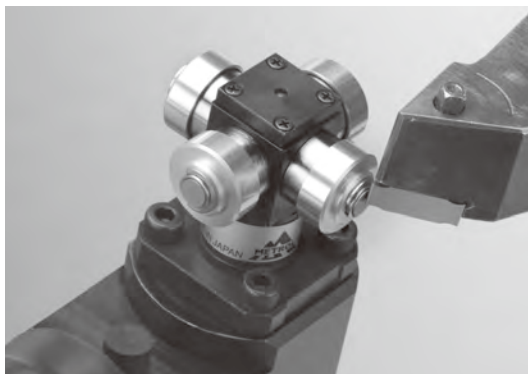
# H4A

## 1 Signal Type

■Tool setters for CNC lathes are used for precise blade positioning, and detection of the wear and breakage.

■Touch sensors are arranged and directly linked in each direction.

## ■Standard specifications (mm)

| Product name | H4A-001 |
|---|---|
| Output mode | NC (Normally closed) |
| Pretravel | 0 |
| Stroke | 2 |
| Repeatability | 0.001* (Recommended operating speed of 50 - 200mm/min) |
| Contact life time | 3 million |
| Protective structure | IP67 |
| Contact force | 2N |
| Contact material | Tungsten carbide |
| Surface finishing | Grinding 4s |
| Contact rating | DC5V - DC24V Steady Current: 10 mA or Less Rush Current: 20 mA or Less **Limit the LED forward current below 10mA.** |
| Cable | Oil resistant φ5 / 2 cores Tensile strength 30N, Minimum bending R7 |
| LED lamp | Default : LED ON / Operating : LED OFF |

* Repeatability of the tool setter alone

## ■Precautions

· Do not press the adjacent contact simultaneously.

· Do not turn the protective cover during cleaning and so forth. The rubber boot inside will not return properly if it becomes twisted.

· When any one of the sensors faces the ground, choose the suitable cover so that it can prevent coolant or cuttings from entering through the gap and accumulating inside the cover.

· Rubber materials used in some products provide protection against water-soluble coolants and alkaline liquids. (Refer to P6-4)

●Precautions for Tool Setters for CNC Lathes···P3-3
●Precautions for Sensor Connecting···P1-3
●Cable Options···P6-2
●Technical Guide···P6-1

**Tool Setter for CNC Lathes  Linear Type**

## ■Outer dimensions

**H4A-001**

(40)
20  20
// 0.005/5 A
⊥ 0.005/5 B
⊥ 0.005/5 A B
// 0.005/5

① ② ③ ④
20  20  20
(40)
23  34
23
34
4-φ4.5
LED lamp

⑤
10.5
4-Tungsten carbide φ5
(49.5)  30
φ16.5
5
9
B
O-Ring S20
φ23 −0.10/−0.15

### ●Circuit diagram

LED
BROWN +
NC NC NC NC
BLUE −

### ●Protective covers

Select a type that prevents coolant from entering through the gap and accumulating inside.

**U type (standard)**
Upward, sideways
φ16
Gap

**D type**
Downward
Detecting direction
: select from ① - ④
φ13
Gap

**Not required**
Always make sure to enclose when not in use
Boot cover

## Specification sheet

**E-mail : touchsensor@metrol.co.jp**

▼Please send us your inquiry by fax/e-mail after copying this page, and filling in necessary infomation. Sample : ☑

**Optional specifications** (Bold:Standard)          Date:(mm,dd,yy) _____

| No. of detecting direction（1-5） | _____ | Location No. of detecting direction | ☐ ① | ☐ ② | ☐ ③ | ☐ ④ | ☐ ⑤ |
| Protective cover | ☐ **U type** | ☐ D type /Direction No. _____ | | | ☐ Not required (housing type) | | |

**Cable options** (1m/unit)

| Length / Cable protection | _____ m ╱ ☐ Not required | ☐ Protective tube _____ m（Upper limit:15m) | ☐ Wire braid _____ m（Upper limit:10m) |
| Connector (Refer to P6-2) | ☐ Not required | ☐ Connector | |
| Machine side cable option | Length | _____ m | |
| from connector (if desired) | Cable protection | ☐ Not required | ☐ Protective tube _____ m（Upper limit:15m) | ☐ Wire braid _____ m（Upper limit:10m) |

| Company | |
| Dept. / Title | |
| Customer name | |
| Address | |
| TEL | |
| FAX | |
| E-mail | |

### How to order

**1. Spec sheet**
E-mail
Please fill out the specification sheet and send to Metrol.

**2. Selection**
METROL
The drawing of specific model based on spec sheet is sent .

**3. Confirmation**
OK!
E-mail
"T24E-04-19"
Check the drawing to select/confirm the specific model.

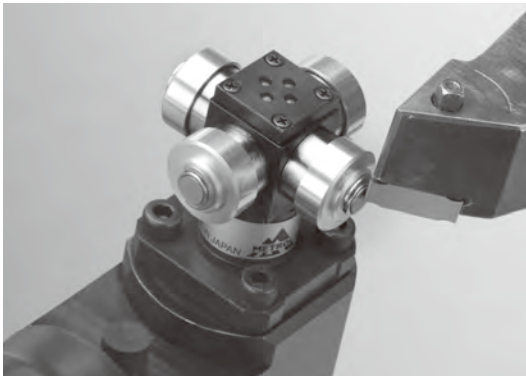**4. Order**
E-mail
Quotation & Order
The quotation is sent and you can place an order.

✉ **E-mail: touchsensor@metrol.co.jp**
PDF sheet is available for download at **www.metrol.co.jp/en**

FAX: +81-42-528-1442  ✉ touchsensor@metrol.co.jp

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# H4A

## Multi Signal Type (Direction determination possible)



■Tool setters for CNC lathes are used for precise blade positioning, and detection of the wear and breakage.
■Touch sensors are arranged and directly linked in each direction.
■As the sensors are connected in parallel, direction determination is possible.



## ■Standard specifications                (mm)

| Product name | H4A-002 |
|---|---|
| Output mode | NC (Normally closed) |
| Pretravel | 0 |
| Stroke | 2 |
| Repeatability | 0.001*<br>(Recommended operating speed of 50 - 200mm/min) |
| Contact life time | 3 million |
| Protective structure | IP67 |
| Contact force | 2N |
| Contact material | Tungsten carbide |
| Surface finishing | Grinding 4s |
| Contact rating | DC5V - DC24V Steady Current: 10 mA or Less<br>                        Rush Current: 20 mA or Less<br>**Limit the LED forward current below 10mA.** |
| Cable | Oil resistant φ5.5 / 5 cores<br>Tensile strength 30N, Minimum bending R7 |
| LED lamp | Default : LED ON / Operating : LED OFF |

* Repeatability of the tool setter alone

## ■Precautions

· Do not press the adjacent contact simultaneously.

· Do not turn the protective cover during cleaning and so forth. The rubber boot inside will not return properly if it becomes twisted.

· When any one of the sensors faces the ground, choose the suitable cover so that it can prevent coolant or cuttings from entering through the gap and accumulating inside the cover.

· Rubber materials used in some products provide protection against water-soluble coolants and alkaline liquids. (Refer to P6-4)

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

●Precautions for Tool Setters for CNC Lathes···P3-3
●Precautions for Sensor Connecting···P1-3
●Cable Options···P6-2
●Technical Guide···P6-1

**H4A-002**

// 0.005/5 A
⊥ 0.005/5 B

(40)
20  20

⊥ 0.005/5 A B
// 0.005/5

① BLACK
A

④ YELLOW
② GREEN

③ ORANGE
4-φ4.5
4-LED lamp

20
20
(40)
23
34
23
34

⑤
10.5
4-Tungsten carbide φ5 flat
(49.5)
30
φ16.5
5
9
B
O-Ring S20
φ23 $^{-0.10}_{-0.15}$

●Circuit diagram

LED  5.1KΩ x 4
NC

LED
NC

LED
NC

LED
NC

① BLACK +
② GREEN +
③ ORANGE +
④ YELLOW +
COM WHITE -

●Protective covers

Select a type that prevents coolant from entering through the gap and accumulating inside.

**U type (standard)**
Upward, sideways

φ16
Gap

**D type**
Downward
Detecting direction
: select from ① - ④

φ13
Gap

**Not required**
Always make sure to enclose when not in use

Rubber boot

---

## Specification sheet

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**Optional specifications** (Bold:Standard)

Date:(mm,dd,yy) _____

| No. of detecting direction (1-5) | _____ | Location No. of detecting direction | ☐ ① | ☐ ② | ☐ ③ | ☐ ④ | ☐ ⑤ |
|---|---|---|---|---|---|---|---|
| Protective cover | ☐ **U type** | ☐ D type /Direction No. _____ | | | ☐ Not required (housing type) | | |

**Cable options**

| Length / Cable protection | _____ m / | ☐ Not required | ☐ Protective tube _____ m(Upper limit:15m) | ☐ Wire braid _____ m(Upper limit:10m) |
|---|---|---|---|---|
| Connector (Refer to P6-2) | ☐ Not required | | ☐ Connector | |
| Machine side cable option | Length | _____ m | | |
| from connector (if desired) | Cable protection | ☐ Not required | ☐ Protective tube _____ m(Upper limit:15m) | ☐ Wire braid _____ m(Upper limit:10m) |

| Company | |
|---|---|
| Dept. / Title | |
| Customer name | |
| Address | |
| TEL | |
| FAX | |
| E-mail | |

**How to order**

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**3. Confirmation**
OK!
E-mail
"T24E-04-19"
Check the drawing to select/confirm the specific model.

**4. Order**
Quotation & Order
The quotation is sent and you can place an order.

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# H4D

## 1 Signal Type

■Tool setters for CNC lathe are used for precise tool bit positioning, and detection of the wear and breakage.

■A type which opposite side size of the contact has been reduced and the shaft can rotate.

## ■Standard specifications (mm)

| Product name | H4D |
|---|---|
| Output mode | NC (Normally closed) |
| Pretravel | 0 |
| Stroke | 2 |
| Rotating direction | Clockwise /Conterclockwise |
| Repeatability | 0.001* |
| | (Recommended operating speed of 50 - 200mm/min) |
| Contact life time | 3 million |
| Protective structure | IP67 |
| Contact force | 1.2N |
| Contact material | Tungsten carbide |
| Surface finishing | Grinding 4s |
| Contact rating | DC5V - DC24V Steady current :10mA or less |
| | Rush current : 20mA or less |
| Cable | Oil resistant φ5 / 2 cores |
| | Tensile strength 30N, Minimum bending R7 |

* Repeatability of the tool setter alone

## ■Precautions

· Do not rotate in the opposite direction of the specifications.

· Rubber materials used in some products provide protection against water-soluble coolants and alkaline liquids.
(Refer to P6-4)

· After pushing the detecting contact surface to the stroke end with your finger, do not remove your finger suddenly as show in the drawing.

Such action often causes a malfunction resulting from disengagement of internal components.

· Do not rapidly press down the contact with your finger when cleaning as well.

· Operating speed slower than 10mm/min is not recommended.
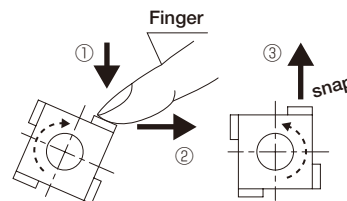
●Precautions for Tool Setters for CNC Lathes···P3-3

●Precautions for Sensor Connecting···P1-3

●Cable Options···P6-2

●Technical Guide···P6-1

# H4D 1 Signal Type

**Tool Setter for CNC Lathes** Rotating Contact Type

## ■Outer dimensions

**H4D**



4-φ4 flat
Tungsten Carbide

↑ **Rotating parts**

φ10.5
φ18.8

φ18 -0.10 -0.15

4-φ5

●**Circuit diagram**

NC ——○ BROWN
——○ BLUE

●**Contact opposite side length**
The contact diameter and contact force determine the contact opposite side length.

**Length : 14(standard)**
Contact diameter : φ4
Contact force : 1.2N

**Length : 12**
Contact diameter : φ3
Contact force : 1.4N

**Length : 16**
Contact diameter : φ5
Contact force : 1N

**Length : 20**
Contact diameter : φ5
Contact force : 0.8N

## Specification sheet

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**Optional specifications** (Bold:Standard)

Date:(mm,dd,yy)

| Rotating direction | ☐ **Clockwise** | ☐ counterclockwise | |
|---|---|---|---|
| Contact opposite side length/ Contact diameter | ☐ **Length 14 / Diameter φ4** | ☐ Length 12 / Diameter φ3 | |
| | ☐ Length 16 / Diameter φ5 | ☐ Length 20 / Diameter φ5 | |

**Cable options** (1m/unit)

| Length / Cable protection | _____ m ╱ ☐ Not required ☐ Protective tube _____ m(Upper limit:15m) ☐ Wire braid _____ m(Upper limit:10m) | |
|---|---|---|
| Connector (Refer to P6-2) | ☐ Not required | ☐ Connector |
| Machine side cable option | Length | _____ m |
| from connector (if desired) | Cable protection | ☐ Not required ☐ Protective tube _____ m(Upper limit:15m) ☐ Wire braid _____ m(Upper limit:10m) |

| Company | |
|---|---|
| Dept. / Title | |
| Customer name | |
| Address | |
| TEL | |
| FAX | |
| E-mail | |

### How to order

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**2. Selection**
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**3. Confirmation**
*OK!*
"T24E-04-19"
Check the drawing to select/confirm the specific model.

**4. Order**
Quotation & Order
The quotation is sent and you can place an order.

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PDF sheet is available for download at **www.metrol.co.jp/en**

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■Tool setters for CNC lathe are used for precise tool bit positioning, and detection of the wear and breakage.

■A type which opposite side size of the contact has been reduced to the maximum and can swing in 4 directions.

## ■Standard specifications (mm)

| Product name | **H4E** |
|---|---|
| Output mode | NC (Normally closed) |
| Pretravel | 0 |
| Stroke | ±2 |
| Repeatability | 0.002 (2σ) * <br> (Recommended operating speed of 50 - 200mm/min) |
| Contact life time | 300,000 |
| Protective structure | IP67 |
| Contact force | 1.6N |
| Contact material | Tungsten carbide |
| Surface finishing | Grinding 4s |
| Contact rating | DC5V - DC24V Steady Current: 10 mA or Less <br> Rush Current: 20 mA or Less <br> **Limit the LED forward current below 10mA.** |
| Cable | Oil resistant $\phi$5 / 2 cores <br> Tensile strength 30N, Minimum bending R7 |
| LED lamp | Default : LED ON / Operating : LED OFF |

* Repeatability of the tool setter alone

## ■Circuit diagram
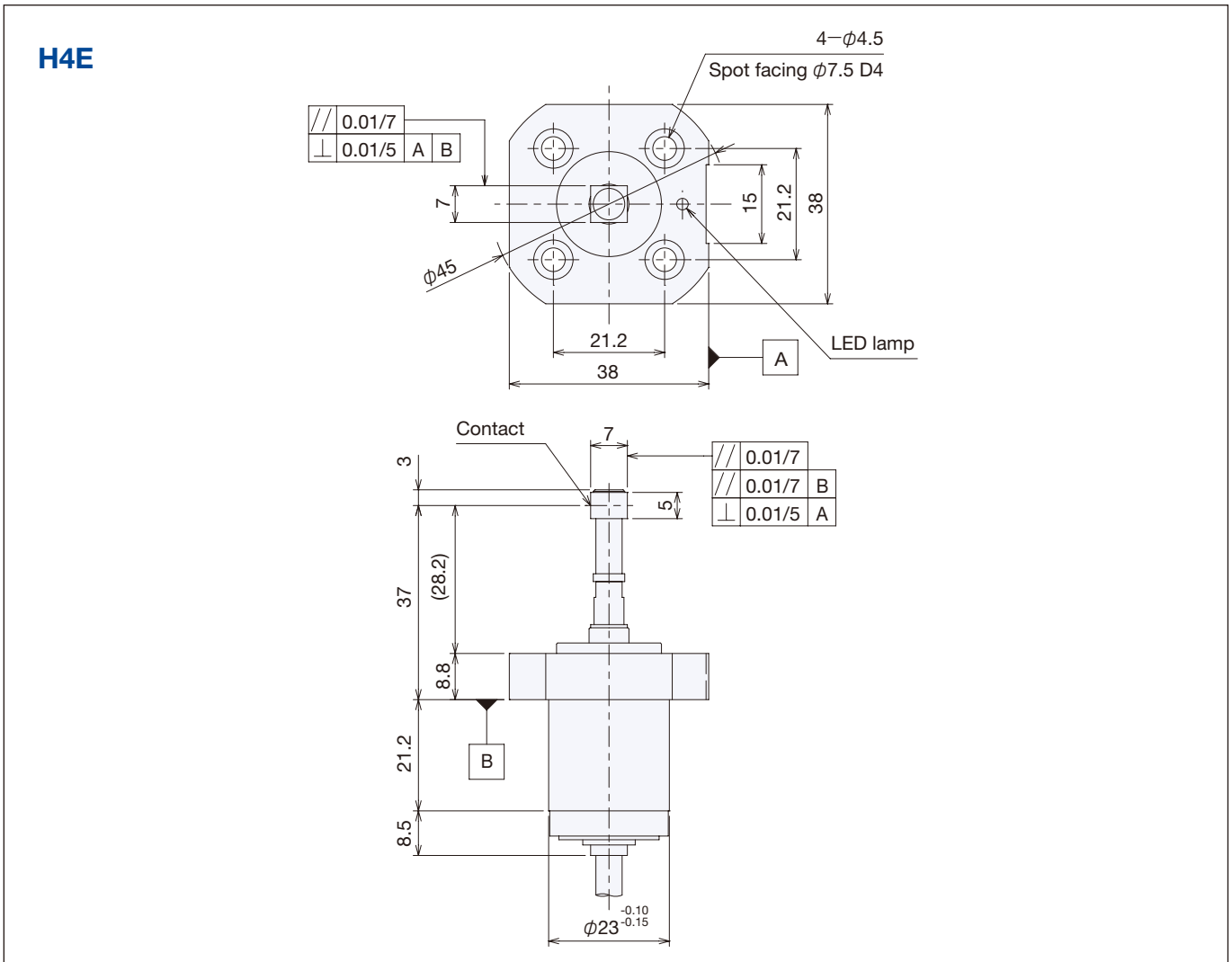
LED

BROWN +

NC NC NC NC

BLUE −
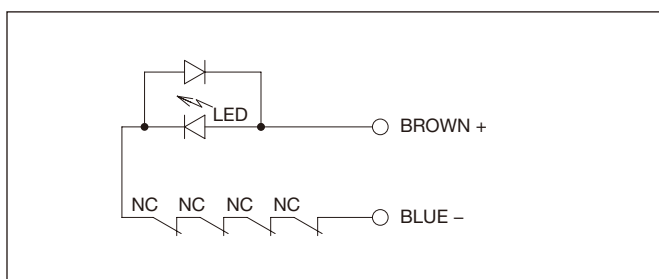
## ■Precautions

· As the built-in contact serves as a swing fulcrum, excessive operation speed will accelerate the deterioration of the contacts. In addition, as the contact material with low electrical resistance cannot be used, it needs to be energized only during measurement to protect the contact life.

· Please do not forcefully press the contact to the operating limits. Also, do not press it from the top to the bottom.

· Operating speed slower than 10mm/min is not recommended.
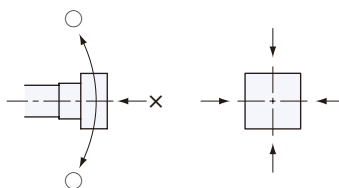
●Precautions for Tool Setters for CNC Lathes···P3-3

●Precautions for Sensor Connecting···P1-3

●Cable Options···P6-2

●Technical Guide···P6-1

## Tool Setter for CNC Lathes  Swing Contact Type

### ■Outer dimensions

**H4E**

// 0.01/7
⊥ 0.01/5 | A | B

4−φ4.5
Spot facing φ7.5 D4

7
15
21.2
38

φ45

21.2
38

LED lamp

A

Contact

7

// 0.01/7
// 0.01/7 | B
⊥ 0.01/5 | A

3
5
37
(28.2)
8.8
21.2
B
8.5

φ23 $^{-0.10}_{-0.15}$

### Specification sheet

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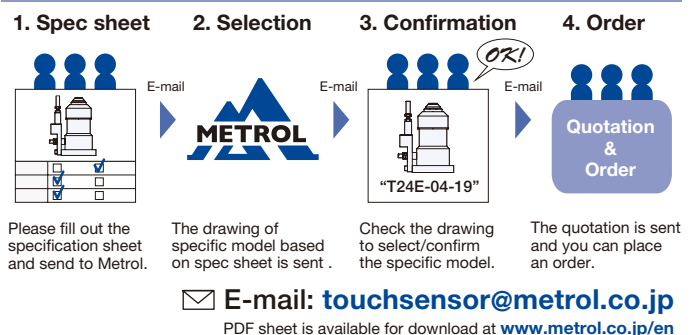
**Cable options (1m/unit)**

**Date:(mm,dd,yy)** _____

| Length / Cable protection | _____ m ╱ ☐ Not required | ☐ Protective tube _____ m(Upper limit:15m) | ☐ Wire braid _____ m(Upper limit:10m) |
|---|---|---|---|
| Connector (Refer to P6-2) | ☐ Not required | ☐ Connector | |
| Machine side cable option | Length | _____ m | |
| from connector (if desired) | Cable protection | ☐ Not required | ☐ Protective tube _____ m(Upper limit:15m) | ☐ Wire braid _____ m(Upper limit:10m) |

| Company | |
|---|---|
| Dept. / Title | |
| Customer name | |
| Address | |
| TEL | |
| FAX | |
| E-mail | |

**How to order**

**1. Spec sheet**

E-mail

Please fill out the specification sheet and send to Metrol.

**2. Selection**

METROL

E-mail

The drawing of specific model based on spec sheet is sent .

**3. Confirmation**

OK!

E-mail

"T24E-04-19"

Check the drawing to select/confirm the specific model.

**4. Order**

**Quotation & Order**

The quotation is sent and you can place an order.

✉ **E-mail: touchsensor@metrol.co.jp**

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High-Precision Positioning Switch
**METROL® Metrol**

**3-12**

No.C5-1E