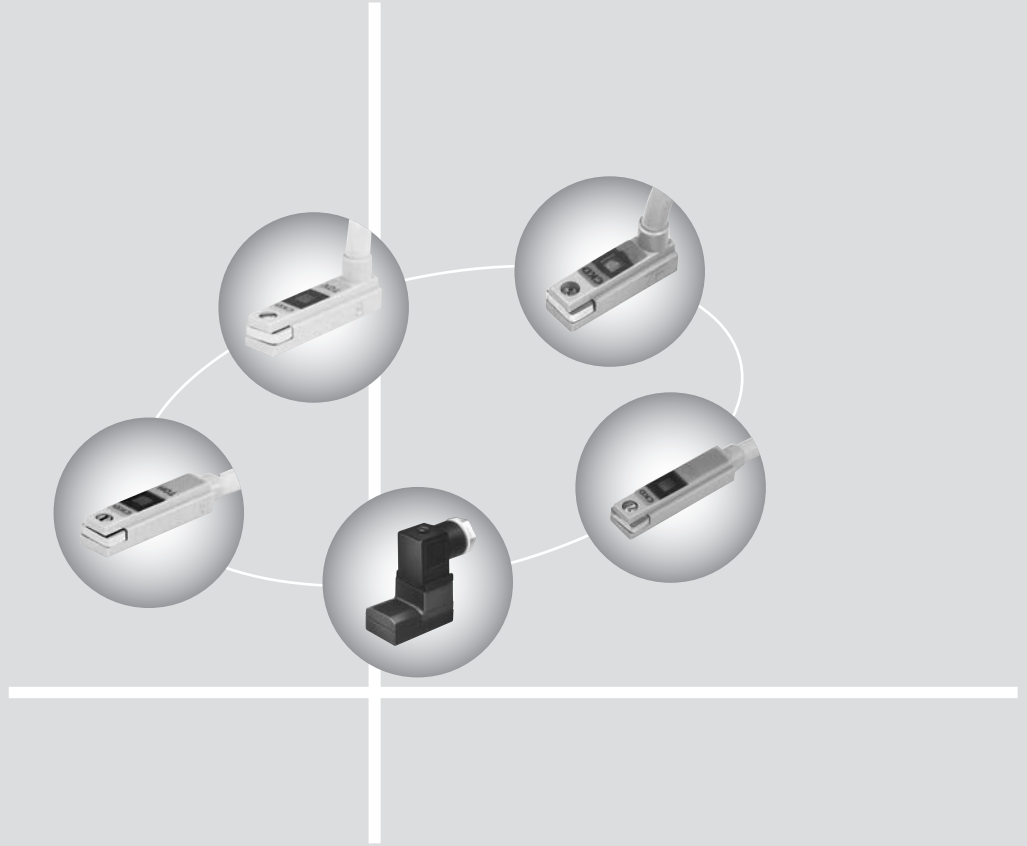


# Switch Specifications

## F•K•T•C Series



# Switch Specifications

## F·K·T·C Series

### Switch Selection List

| Code | Stock         | Power      | Contact Type | SW Type | Connection                         | Reference                                   | Protective Construction | Rated Voltage                | Rated Current                       | Surrounding Temperature | Indicator Lamp         | Adaptive Control Device |
|------|---------------|------------|--------------|---------|------------------------------------|---|-------------------------|------------------------------|-------------------------------------|-------------------------|------------------------|-------------------------|
| C    | Standard      | AC/DC      | Contact      | T0V-3   | Right angle direction with 3m cord | Standard                                    | IP67                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA | -10 to +60°C            | Lit when ON            | Relay Sequencer         |
| J    | Standard      | AC/DC      | Contact      | T0V-5   | Right angle direction with 5m cord | Standard                                    | IP67                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA |                         |                        |                         |
| W    | Standard      | AC/DC      | Contact      | ROB     | Connector Type                     | Standard                                    | None                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA |                         |                        |                         |
| CK   | Standard      | AC/DC      | Contact      | T5V-3   | Right angle direction with 3m cord | For high-temperature use, Series connection | IP67                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA | -10 to +100°C           | None                   |                         |
| CL   | Standard      | AC/DC      | Contact      | T5V-5   | Right angle direction with 5m cord | For high-temperature use, Series connection | IP67                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA | -10 to +100°C           | None                   |                         |
| DT   | Standard      | DC         | Non-contact  | T2V-3   | Right angle direction with 3m cord | Standard                                    | IP67                    | DC10 to 30V                  | 5 to 20mA                           | -10 to +60°C            | Lit when ON            | Relay Sequencer         |
| DU   | Semi-Standard | DC         | Non-contact  | T2V-5   | Right angle direction with 5m cord | Standard                                    | IP67                    |                              |                                     |                         |                        |                         |
| CW   | Standard      | DC         | Non-contact  | T2YV-3  | Right angle direction with 3m cord | 2-color lamp                                | IP67                    |                              |                                     |                         |                        |                         |
| CX   | Special       | DC         | Non-contact  | T2YV-5  | Right angle direction with 5m cord | 2-color lamp                                | IP67                    |                              |                                     |                         |                        |                         |
| SH   | Semi-Standard | DC         | Non-contact  | D-M9BWZ | Horizontal direction 5 meter cord  | 2-color lamp                                | IP67                    | DC12/24V                     | 2.5 to 40mA                         | Red/Green 2-color Lamp  | Relay Sequencer        |                         |
| SV   | Semi-Standard | DC         | Non-contact  | D-M9BWZ | Right angle direction with 5m cord | 2-color lamp                                | IP67                    |                              |                                     |                         |                        |                         |
| CH   | Standard      | AC/DC      | Contact      | T0H-3   | Horizontal direction 3 meter cord  | Standard                                    | IP67                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA | Lit when ON             |                        | Relay Sequencer         |
| JH   | Semi-Standard | AC/DC      | Contact      | T0H-5   | Horizontal direction 5 meter cord  | Standard                                    | IP67                    |                              |                                     |                         |                        |                         |
| CC   | Special       | DC         | Non-contact  | T2YLV-3 | Right angle direction with 3m cord | Coolant Proof                               | IP67                    | Less than 30V                | 5 to 20mA                           | Red/Green 2-color Lamp  |                        |                         |
| CF   | Special       | DC         | Non-contact  | T2YLV-5 | Right angle direction with 5m cord | Coolant Proof                               | IP67                    |                              |                                     |                         |                        |                         |
| CG   | Special       | DC         | Non-contact  | T2YLH-3 | Horizontal direction 3 meter cord  | Coolant Proof                               | IP67                    |                              |                                     |                         |                        |                         |
| CJ   | Special       | DC         | Non-contact  | T2YLH-5 | Horizontal direction 5 meter cord  | Coolant Proof                               | IP67                    |                              |                                     |                         |                        |                         |
| KH   | Special       | AC/DC      | Contact      | T5H-3   | Horizontal direction 3 meter cord  | For high-temperature use, Series connection | IP67                    | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA | -10 to +100°C           | None                   |                         |
| LH   | Special       | AC/DC      | Contact      | T5H-5   | Horizontal direction 5 meter cord  | For high-temperature use, Series connection | IP67                    |                              |                                     |                         |                        |                         |
| WH   | Special       | DC         | Non-contact  | T2YH-3  | Horizontal direction 3 meter cord  | 2-color lamp                                | IP67                    | DC10~30V                     | 5 to 50mA                           | -10 to +60°C            | Red/Green 2-color Lamp |                         |
| XH   | Semi-Standard | DC         | Non-contact  | T2YH-5  | Horizontal direction 5 meter cord  | 2-color lamp                                | IP67                    |                              |                                     |                         |                        |                         |
| TH   | Special       | DC         | Non-contact  | T2H-3   | Horizontal direction 3 meter cord  | Standard                                    | IP67                    |                              |                                     |                         |                        |                         |
| UH   | Special       | DC         | Non-contact  | T2H-5   | Horizontal direction 5 meter cord  | Standard                                    | IP67                    |                              |                                     |                         |                        |                         |
| FG   | Semi-Standard | AC/DC      | Contact      | T5V-3   | Connector + 3m cord                | NCS-302                                     | None (SW-IP67)          | DC12/24V<br>AC110V<br>AC220V | 5 to 50mA<br>7 to 20mA<br>7 to 10mA | -10 to +100°C           | None                   |                         |
| SA   | Semi-Standard | AC/DC      | Contact      | T5V-3   | Connector + 3m cord                | NCS-252                                     | None (SW-IP67)          |                              |                                     |                         |                        |                         |
| FH   | Semi-Standard | AC/DC      | Contact      | T5V-5   | Connector + 5m cord                | NCS-302                                     | None (SW-IP67)          |                              |                                     |                         |                        |                         |
| FJ   | Semi-Standard | For DC use | Contact      | T0V-0.5 | Connector + 0.5m cord              | XS2G-D4C5                                   | IP67                    |                              |                                     | -10 to +60°C            | Lit when ON            |                         |
| FW   | Semi-Standard | For AC use | Contact      | T0V-0.5 | Connector + 0.5m cord              | XS2G-D4C5                                   | IP67                    |                              |                                     |                         |                        |                         |

Note ) All of the switches are in compliance with CE mark. In principle, the non-contact switches (T2\* and D-M\*) comply with the CE marking. If you need a contact switch (T0\*, T5\* and R0\*) complying with the CE marking, please contact us for order. (The T0\* and T5\* switches can be used as up to 110 VAC.)

|    |                            |         |
|----|----------------------------|---------|
| SP | Contact Protection Circuit | XEB1K   |
| SA | Surge measures circuit     | SW-SKAC |
| SD |                            | SW-SKDC |

### Cautions

※ To connect an inductive load (relay or solenoid valve), be sure to provide a protection circuit, because a surge voltage is generated when the switch is turned OFF. To connect a capacitance load (capacitor), be sure to provide a protection circuit, because an inrush current is generated when the switch is turned ON. Extension of the cable length may result in damage to the switch or shortened service life depending on the wiring capacity. In this case, provide a contact protection circuit.

To use an inductive load at 100 V/200 V AC, be sure to provide contact protection measures as described above.









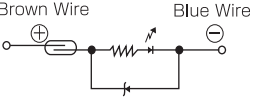
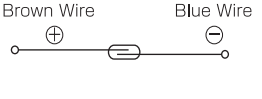
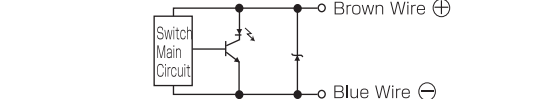
(Surge protection circuit to be connected within 1 m from the inductive load protection circuit SP = XEB1K1, and the switch: SW-SKAC·SW-SKDC)




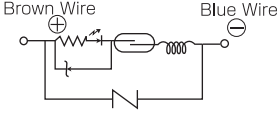
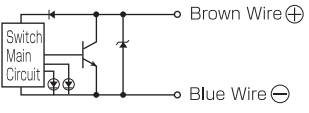
Please tell us separately when the contact protection circuit of the read switch is necessary. Please refer to Figure 1 of P146.

# Switch Specifications

## F·K·T·C Series

### Switch Specifications

| Switch Type                    | TOV/TOH   |   | T5V/T5H   |   | T2V/T2H  |   | T2YV/T2YH   |   |
|--------------------------------|---|---|---|---|--|---|---|---|
| Appearance                     |    |  |    |  |    |  |  |  |
| Symbol                         | TOV   | TOH   | T5V   | T5H   | T2V  | T2H   | T2YV  | T2YH  |
|                                | C (with 3m cord)<br>/J (with 5m cord)   | CH (with 3m cord)<br>/JH (with 5m cord)   | CK (with 3m cord)<br>/CL (with 5m cord)   | KH (with 3m cord)<br>/LH (with 5m cord)   | DT (with 3m cord)<br>/DU (with 5m cord)  | TH (with 3m cord)<br>/UH (with 5m cord)   | CW (with 3m cord)<br>/CX (with 5m cord)   | WH (with 3m cord)<br>/XH (with 5m cord)   |
| Contact Type                   | Contact Type  |   |   |   | Non-contact Type   |   |   |   |
| Adaptive Control Device        | Relay, Programmable Controller (Sequencer)  |   |   |   | Programmable Controller (Sequencer)  |   |   |   |
| Operating Voltage / Current    | DC12/24V, 5 to 50mA<br>AC110V, 7 to 20mA<br>AC220V, 7 to 10mA                       |   |   |   | Note 2)<br>DC10 to 30V, 5 to 25mA  |   | DC10 to 30V, 5 to 20mA  |   |
| An internal voltage drop       | Less than 2.4V  |   | 0V  |   | Less than 4V   |   |   |   |
| Operating Lamp                 | LED lit when ON   |   | None  |   | LED lit when ON  |   | Red/Green LED lit when ON<br>(The best operation position Green lighting)           |   |
| Operating Temperature Range    | -10°C to +60°C  |   | -10°C to +100°C   |   | -10°C to +60°C   |   |   |   |
| Lead Length                    | Standard: 3m (Oil-resistance Vinyl Cabtyre Cable Cord 2-wire 0.2mm <sup>2</sup> )   |   |   |   |  |   | Standard: 3m (Oil-Resistance Vinyl Cabtyre Cable Cord 2-wire 0.3mm <sup>2</sup> )   |   |
| Maximum Impact                 | 30G (294m/s <sup>2</sup> )  |   |   |   | 100G (980m/s <sup>2</sup> )  |   |   |   |
| Leakage Current                | 0   |   |   |   | Less than 1mA  |   |   |   |
| Insulation Resistance          | Greater than 20 MΩ at 500VDC megger   |   |   |   |  |   |   |   |
| Insulation Pressure Resistance | Assuming no problems after the application of 1000VAC over 1 minute                 |   |   |   |  |   |   |   |
| Protective Construction        | IEC Standard: IP67, JIS-C0920 (water proof type), oil proof                         |   |   |   |  |   |   |   |
| Internal Circuit               |  |   |  |   |  |   |   |   |

| Switch Type                    | ROB   | D-M9BWVZ   | D-M9BWZ   |
|--------------------------------|---|--|---|
| Appearance                     |  |   |  |
| Symbol                         | W   | SV   | SH  |
| Contact Type                   | Contact Type  | Non - Contact 2-color lamp   |   |
| Adaptive Control Device        | Programmable Controller (Sequencer)   | Relay, Programmable Controller (Sequencer)   |   |
| Operating Voltage / Current    | DC12/24V, 5 to 50mA<br>AC110V, 7 to 20mA<br>AC220V, 7 to 10mA                       | DC10 to 28V, 2.5 to 40mA   |   |
| An internal voltage drop       | Less than 2.4V  | Less than 4V   |   |
| Operating Lamp                 | LED lit when ON   | Red/Green LED lit when ON (The best operation position Green lighting)               |   |
| Operating Temperature Range    | -10°C to +60°C  | -10°C to +60°C   |   |
| Lead Length                    | Connector Type  | Oil-resistance Vinyl Cabtyre Cable Cord 2-wire 0.15mm <sup>2</sup>                   |   |
| Maximum Impact                 | 30G (294m/s <sup>2</sup> )  | 1000m/s <sup>2</sup>   |   |
| Leakage Current                | 0   | Less than 0.8mA  |   |
| Insulation Resistance          | Greater than 20 MΩ at 500VDC megger   | Greater than 50 MΩ at 500VDC megger  |   |
| Insulation Pressure Resistance | 1 minute at 1500 VAC  | Assuming no problems after the application of 1000VAC over 1 minute                  |   |
| Protective Construction        | Not water proof   | IEC60529 Standard: IP67, JIS-C0920 (water proof type)                                |   |
| Internal Circuit               |  |  |   |

Note 1) The maximum value of 25mA for the operating voltage/current listed above is at +25 . The current will drop below 25mA when the surrounding temperature exceeds 25 . (at 60 , it will be in the range of 5 to 10mA)

Note 2) Make sure that the curve radius of the cord is longer than 10mm.

Note 3) The above switches have no protection circuit.

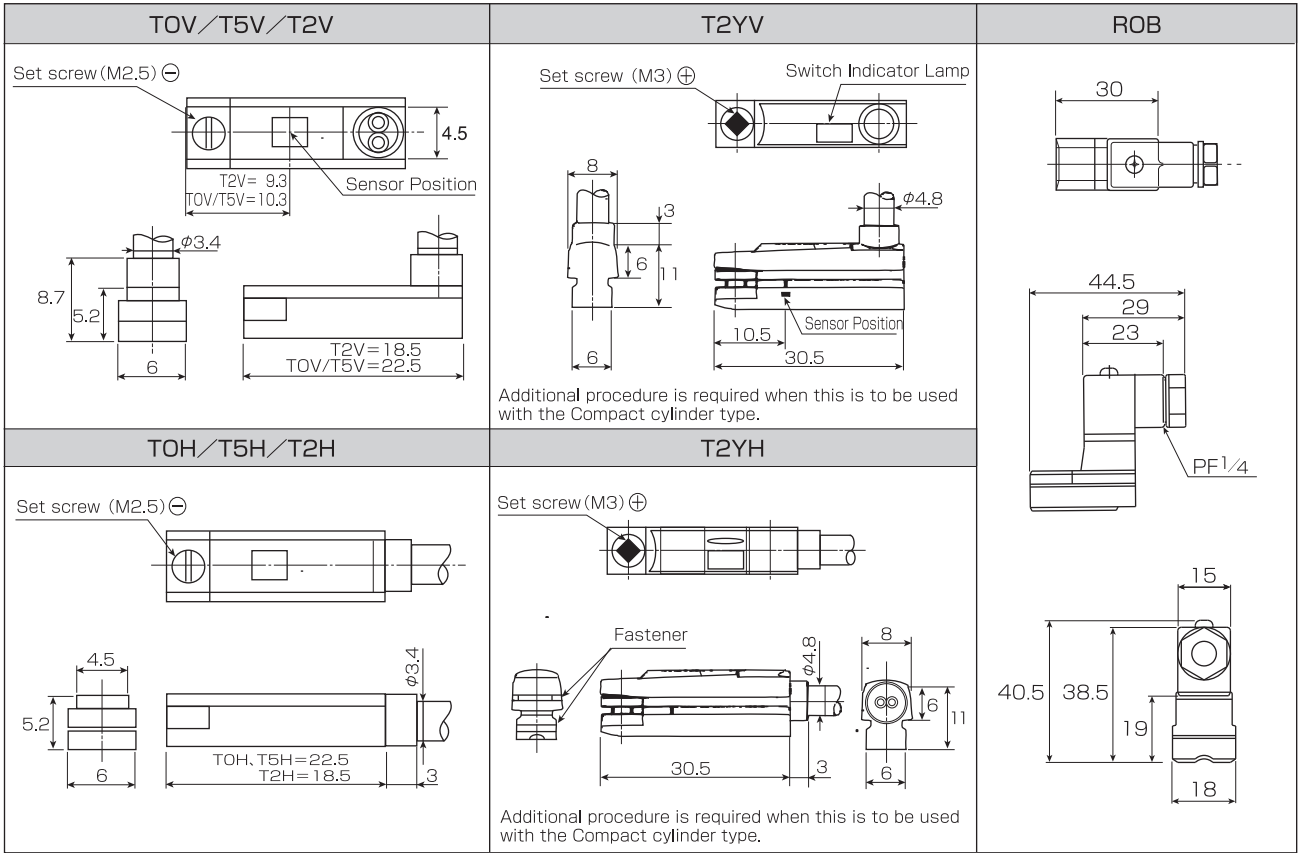
Note 4) The above switches do not contain harmful substances under control of the RoHs Directive (six substances in total).

# Switch Specifications

## F·K·T·C Series

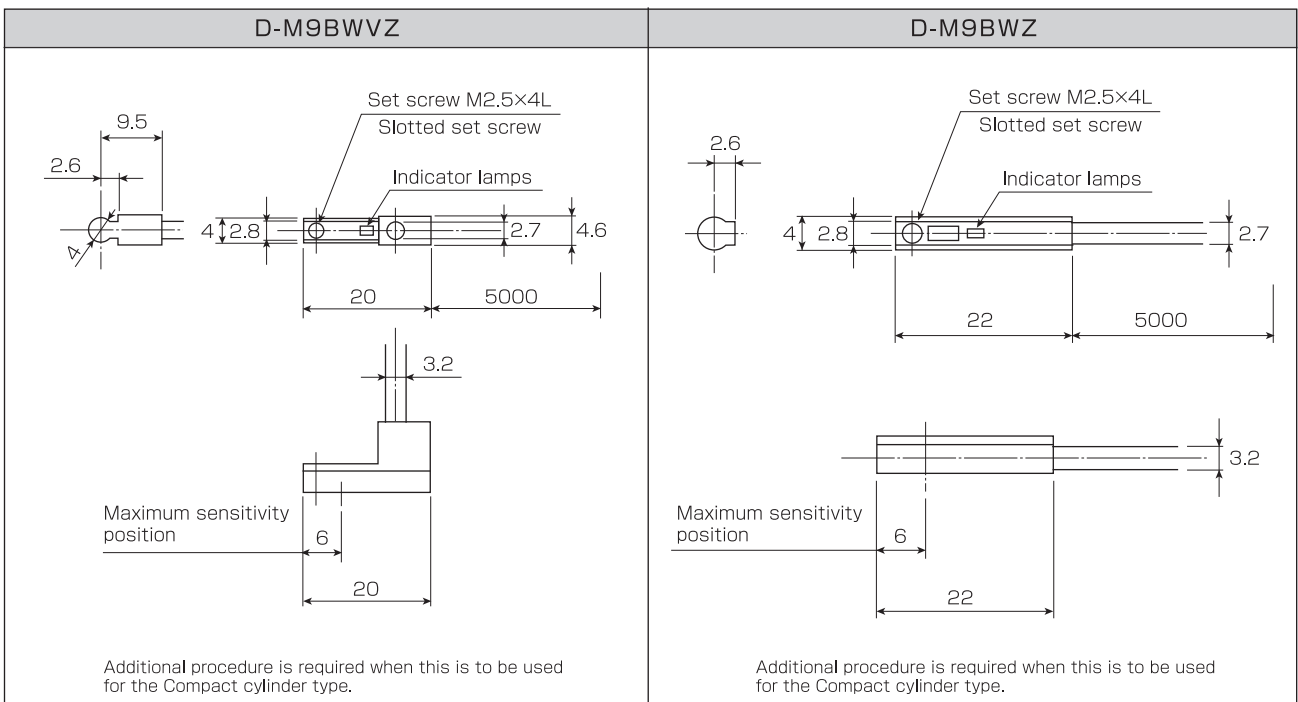
### Switch External Dimensions (Standard Switches: T/R Types)

Units:mm



### Switch External Dimensions (Standard Equivalent Switches: D/M Types)

Units:mm



Note 1) The lead wire becomes the oval of 2.7×3.2.  
 Note 2) A special adaptor is mounted on D-M※.

# Switch Specifications

## F·K·T·C Series

### Switch with Connector Specifications



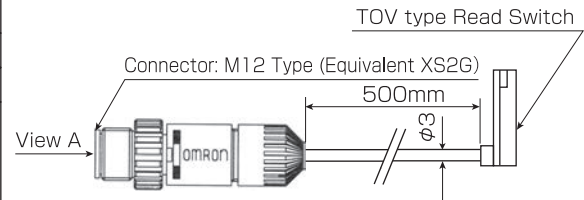
| Read Switch with Connector |            |
|----------------------------|------------|
| Connector                  | Omron XS2G |
| Protective Construction    | IP67       |
| Cable Length               | 0.5m       |

Companion connectors  
(conforming to the IEC-947-5-2 standard)  
that can be used with XS2G

|                        |                                       |
|------------------------|---------------------------------------|
| Japanese Manufacturers | Hirose Electric Co., Ltd. HR24 Series |
|                        | Yamatate Corporation PA5 Series       |
| Overseas Manufacturers | Hirschmann E Series M12 Type          |

| Specifications | DC Specifications                 | AC Specifications |
|----------------|-----------------------------------|-------------------|
| Code           | FJ type                           | FW type           |
| Switch Type    | TOV                               | TOV               |
| Connector      | M12 Type (Equivalent XS2G)        | XS2G-A4C5         |
| Pin Position   | Pin positions as seen from View A |                   |
|                |                                   |                   |

### FJ Model/FW Model

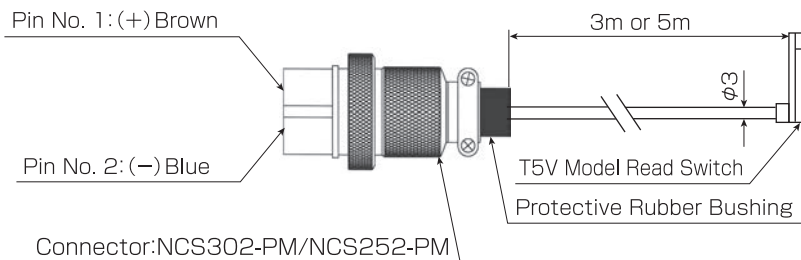


※Please consult us when you wish to change the type of switch to be used.

M12 Type (Equivalent XS2G)  
M12 Type (Equivalent XS2G)

### ■With Nanaboshi Electric Metal Connector

|                            |   |
|----------------------------|---|
| Special Order Support Part | Nanaboshi Electric Mfg. Co. Metal Connector, NCS Read Switch with Connector |
| Connector                  | Nanaboshi Electric Mfg. Co. NCS252-PM or NCS302-PM                          |
| Cable Length               | 3m or 5m  |
| Read Switch Model          | T5V   |



※Please consult us when you wish to change the type of switch to be used.

### ■Code

| Code | Switch Specifications | Note  |
|------|-----------------------|---|
| FG   | T5V3+Connector        | 2FE, FF, FG and FH are NCS302 + 252<br>1FE comes with NCS302.     |
| FH   | T5V5+Connector        | When ordering only the NCS252,<br>please indicate it as "NCS252". |

※As for the connector and the metal outlet, the combination with other switches (Refer to P139) is possible.  
Please consult separately.

# Switch Specifications

## F·K·T·C Series

F series

K series

T series

C series

MINI series Switch specifications

### F Series Switch Mounting Minimum Cylinder Stroke

Units:mm

| Mounting Type<br>Type of Switch<br>Bore | Except for TC/CF |               |   |   |               |   | TC/CF   |               |                 |               |               |
|---|------------------|---------------|---|---|---------------|---|---|---------------|-----------------|---------------|---------------|
|   | With Cord (T※)   |               |   | Connector (ROB)                                 |               |   | With Cord (T※)                                  |               | Connector (ROB) |               |               |
|   | Switch Qty.      | With 1 Switch | With 2 Switches (mounted on the same surface) | With 2 Switches (mounted on different surfaces) | With 1 Switch | With 2 Switches (mounted on the same surface) | With 2 Switches (mounted on different surfaces) | With 1 Switch | With 2 Switch   | With 1 Switch | With 2 Switch |
| φ32                                     | 25               | 50            | 25  | 45  | 70            | 45  | 75  | 75            | 75              | 75            | 75            |
| φ40                                     | 25               | 50            | 25  | 45  | 70            | 45  | 75  | 75            | 75              | 75            | 75            |
| φ50                                     | 25               | 50            | 25  | 25  | 50            | 25  | 80  | 80            | 80              | 80            | 80            |
| φ63                                     | 25               | 50            | 25  | 25  | 50            | 25  | 90  | 90            | 90              | 90            | 90            |
| φ80                                     | 25               | 50            | 25  | 25  | 50            | 25  | 90  | 90            | 90              | 90            | 90            |
| φ100                                    | 25               | 50            | 25  | 25  | 50            | 25  | 100   | 100           | 100             | 100           | 100           |
| φ125                                    | 25               | 50            | 25  | 25  | 50            | 25  | 100   | 100           | 100             | 100           | 100           |
| φ140                                    | 25               | 50            | 25  | 25  | 50            | 25  | 100   | 100           | 100             | 100           | 100           |

Note 1) In the case of the TC, the trunnion position is the catalogue standard.

Note 2) There may be variations in dimensions due to the surrounding environment or other factors, so please use these values only as a guide.

### K Series Switch Mounting Minimum Cylinder Stroke

Units:mm

| Mounting Type<br>Type of Switch<br>Bore | Except for TC/CF          |               |   |   | TC/CF         |               |
|---|---------------------------|---------------|---|---|---------------|---------------|
|   | With Cord (TO※ T2Y※ D-M※) |               |   | With Cord (TO※ T2Y※ D-M※)                       |               |               |
|   | Switch Qty.               | With 1 Switch | With 2 Switches (mounted on the same surface) | With 2 Switches (mounted on different surfaces) | With 1 Switch | With 2 Switch |
| φ32                                     | 20                        | 30            | 20  | 60  | 60            |               |
| φ40                                     | 20                        | 30            | 20  | 60  | 60            |               |
| φ50                                     | 20                        | 30            | 20  | 60  | 60            |               |
| φ63                                     | 20                        | 30            | 20  | 60  | 60            |               |
| φ80                                     | 20                        | 30            | 20  | 60  | 60            |               |
| φ100                                    | 20                        | 30            | 20  | 60  | 60            |               |
| φ125                                    | 20                        | 30            | 20  | 60  | 60            |               |

Note 1) In the case of the TC, the trunnion position is the catalogue standard.

Note 2) There may be variations in dimensions due to the surrounding environment or other factors, so please use these values only as a guide.

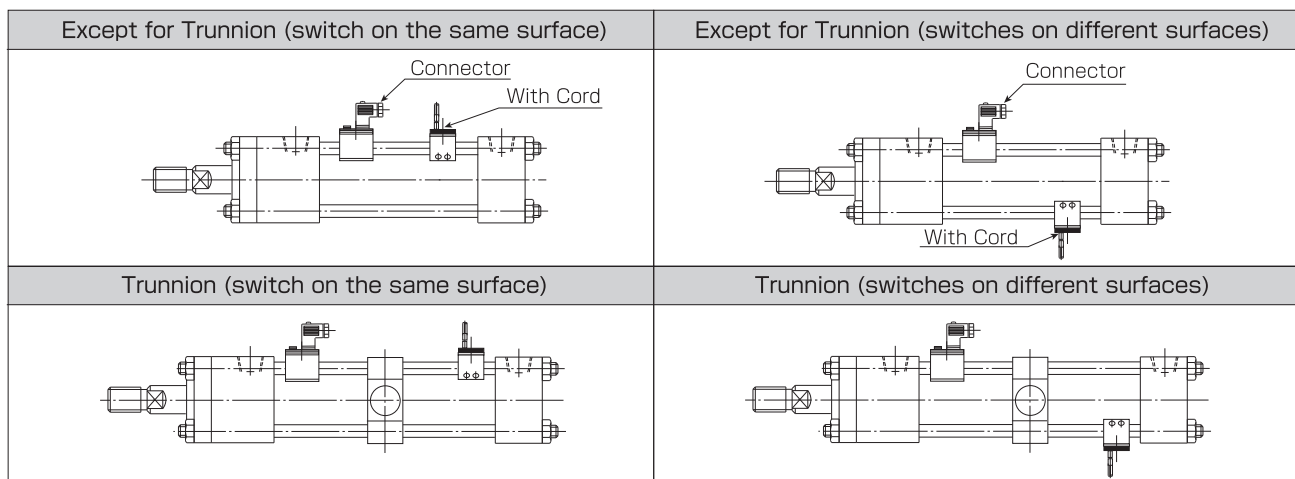
### T Series Switch Mounting Minimum Cylinder Stroke

Units:mm

| Mounting Type<br>Type of Switch<br>Bore | Except for TC/CF    |               |   | TC/CF   |               |
|---|---------------------|---------------|---|---|---------------|
|   | With Cord (T※ D-M※) |               |   | With Cord (T※ D-M※)                             |               |
|   | Switch Qty.         | With 1 Switch | With 2 Switches (mounted on the same surface) | With 2 Switches (mounted on different surfaces) | With 1 Switch |
| φ40                                     | 25                  | 50            | 25  | 85  | 85            |
| φ50                                     | 25                  | 50            | 25  | 85  | 85            |
| φ63                                     | 25                  | 50            | 25  | 95  | 95            |
| φ80                                     | 25                  | 50            | 25  | 100   | 100           |

Note 1) In the case of the TC, the trunnion position is the catalogue standard.

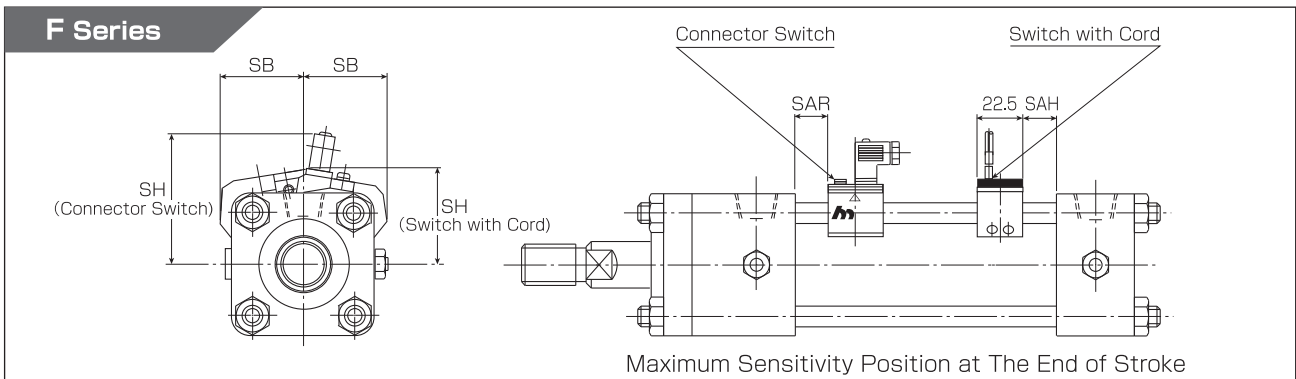
Note 2) The above data are for your reference. Numerical error may occur with influence of surrounding environment and variations in switch sensitivity.



# Switch Specifications

## F·K·T·C Series

### Standard Switch Mounting External Dimensions/Maximum Sensitivity Positions

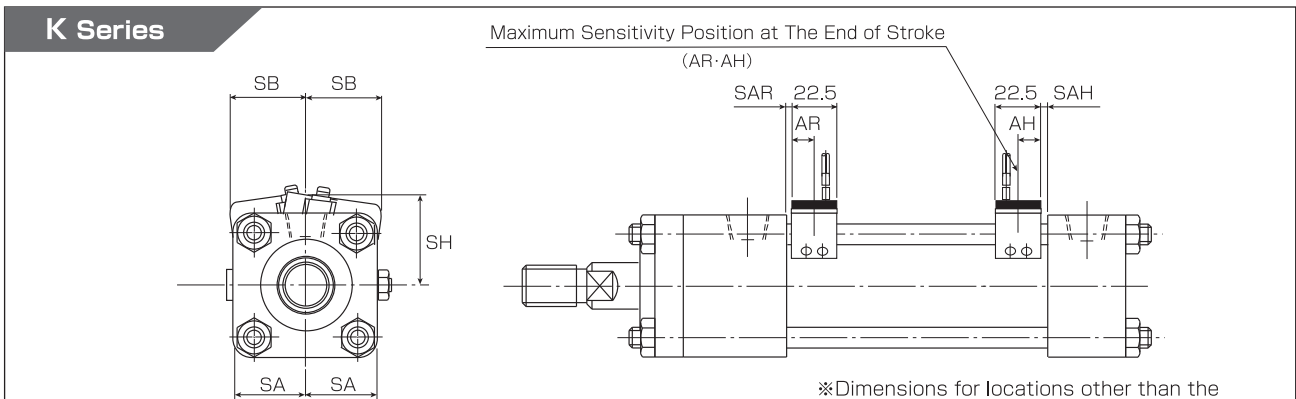


**Table of Dimensions** (Standard Switch : T0※·T5※·ROB Types) Units:mm

| Symbol<br>Bore | With Cord |    |     |     |     |     | Connector |      |      |     |     |     |
|----------------|-----------|----|-----|-----|-----|-----|-----------|------|------|-----|-----|-----|
|                | SB        | SH | T0※ |     | T2※ |     | D-M※      |      | SB   | SH  | RO  |     |
|                |           |    | SAR | SAH | SAR | SAH | SAR       | SAH  |      |     | SAR | SAH |
| φ32            | 24        | 32 | 18  | 18  | 18  | 18  | 21.5      | 21   | 28.5 | 70  | 15  | 15  |
| φ40            | 33        | 36 | 20  | 22  | 20  | 22  | 23        | 24   | 40   | 64  | 18  | 19  |
| φ50            | 36        | 39 | 21  | 22  | 21  | 23  | 23.5      | 26   | 43   | 70  | 18  | 19  |
| φ63            | 44        | 46 | 25  | 26  | 24  | 25  | 26.5      | 28.5 | 45   | 85  | 20  | 24  |
| φ80            | 54        | 56 | 27  | 29  | 28  | 30  | 26.5      | 28.5 | 58   | 94  | 23  | 25  |
| φ100           | 65        | 66 | 30  | 30  | 33  | 33  | 29.5      | 31.5 | 68   | 104 | 25  | 25  |
| φ125           | 79        | 80 | 28  | 30  | 28  | 30  | 32        | 33   | 87   | 120 | 23  | 25  |
| φ140           | 88        | 88 | 32  | 32  | 36  | 36  | 35        | 37   | 98   | 130 | 33  | 33  |

※Dimensions for locations other than the switch mounting section are the same as for the Switch-Adjusted Specifications/No Switch.

- Note 1) The mounting direction for the switch are both towards the inside of the wiring entrance for the head and cap sides.
- Note 2) The switch mount differs for each size.
- Note 3) There may be variations in dimensions due to the surrounding environment or other factors, so these values should only be used as guides.
- Note 4) The matching of the actual part in switch mounting is recommended.

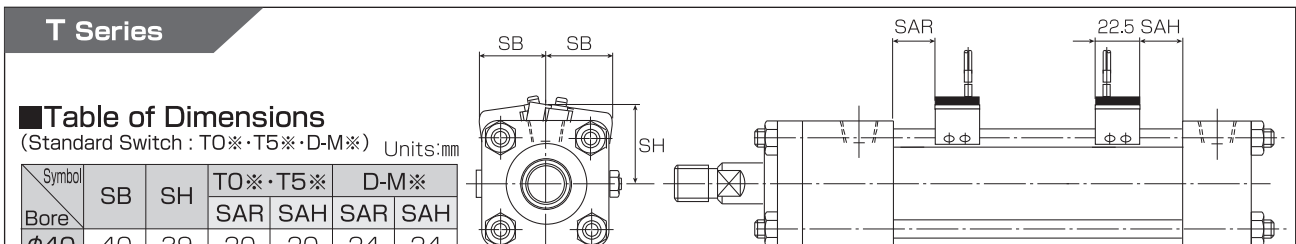


**Table of Dimensions** (Standard Switch : T0※·T5※·D-M※) Units:mm

| Symbol<br>Bore | SA | SB | SH | T0※·T5※ |     |    |    | D-M※ |      |    |    |
|----------------|----|----|----|---------|-----|----|----|------|------|----|----|
|                |    |    |    | SAR     | SAH | AR | AH | SAR  | SAH  | AR | AH |
| φ32            | 22 | 24 | 27 | 1.5     | 2   | 17 | 16 | 8    | 7.5  | 7  | 7  |
| φ40            | 25 | 26 | 32 | 1.5     | 2   | 17 | 16 | 7.5  | 7.5  | 7  | 7  |
| φ50            | 31 | 31 | 37 | 1.5     | 2   | 17 | 16 | 7    | 7    | 7  | 7  |
| φ63            | 38 | 37 | 43 | 2       | 2   | 17 | 18 | 8    | 8    | 7  | 7  |
| φ80            | 47 | 47 | 51 | 0       | 0   | 16 | 16 | 7    | 6.5  | 7  | 7  |
| φ100           | 57 | 59 | 66 | 3       | 4   | 19 | 20 | 11.5 | 11.5 | 7  | 7  |
| φ125           | 69 | 67 | 69 | 15      | 17  | 24 | 26 | 17.5 | 17.5 | 7  | 7  |

※Dimensions for locations other than the switch mounting section are the same as for the Switch-Adjusted Specifications/No Switch.

- Note 1) The mounting direction for the switch are both towards the inside of the wiring entrance for the head and cap sides.
- Note 2) The switch mount differs for each size.
- Note 3) There may be variations in dimensions due to the surrounding environment or other factors, so these values should only be used as guides.
- Note 4) The matching of the actual part in switch mounting is recommended.



**Table of Dimensions** (Standard Switch : T0※·T5※·D-M※) Units:mm

| Symbol<br>Bore | SB | SH | T0※·T5※ |     | D-M※ |      |
|----------------|----|----|---------|-----|------|------|
|                |    |    | SAR     | SAH | SAR  | SAH  |
| φ40            | 40 | 39 | 20      | 20  | 24   | 24   |
| φ50            | 48 | 48 | 23      | 23  | 26   | 25.5 |
| φ63            | 52 | 55 | 26      | 26  | 28   | 29   |
| φ80            | 64 | 66 | 30      | 30  | 35   | 35   |

- Note 1) The mounting direction for the switch are both towards the inside of the wiring entrance for the head and cap sides.
- Note 2) The above data are for your reference. Numerical error may occur with influence of surrounding environment and variations in switch sensitivity. (The matching of the actual part in switch mounting is recommended.)

# Switch Specifications

## C Series

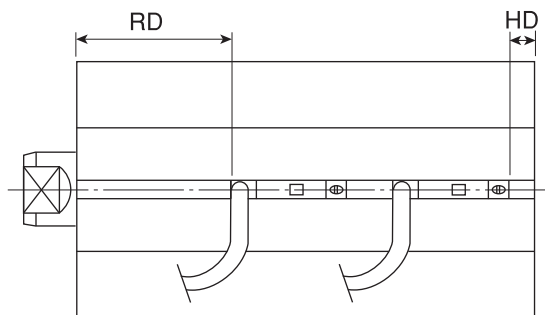
### Switch Mounting Position

〈Stroke End Mounting〉

Attach the head side of the switch to the RD and the cap side to the HD dimensions in the Maximum Sensitivity Positioning Table for maximum switch sensitivity in operation.

〈Middle position Mounting〉

In cases where the piston is to be stopped mid-stroke, stop the piston at the stoppage position and move the switches to a position before or after the top of the piston and determine where each switch will change to the ON state. The location between the two points is the position of maximum sensitivity and is where the switch should be mounted.



### Response Speed (Cylinder Speed)

In the case where the switch is mounted at a position mid-stroke in the cylinder and the piston's passing time is to be used to drive a load, if the cylinder speed is too fast, the switch output will become too slow and there will be no response to the load so caution should be exercised in mounting position.

Reference : Switch Output Time Formula

$$\text{Switch Output Time (s)} = \frac{\text{Switch Operating Range (mm)}}{\text{Cylinder Speed (mm/s)}}$$

### Table of Dimensions

Units:mm

| Symbol | TOV · TOH · T5V · T5H |    |          |    |     |    |
|--------|-----------------------|----|----------|----|-----|----|
|        | CSR-SA                |    | CSR - LD |    | CHR |    |
|        | RD                    | HD | RD       | HD | RD  | HD |
| φ32    | 30                    | 5  | 24       | 9  | 30  | 1  |
| φ40    | 30                    | 7  | 27       | 10 | 30  | 2  |
| φ50    | 33                    | 11 | 31       | 11 | 30  | 8  |
| φ63    | 39                    | 13 | 35       | 13 | 35  | 9  |
| φ80    | 47                    | 20 |          |    | 43  | 12 |
| φ100   |                       |    |          |    | 51  | 22 |

### Table of Dimensions

Units:mm

| Symbol | T2YV · T2YH |    |          |    |     |    | D-M※   |      |          |      |      |      |
|--------|-------------|----|----------|----|-----|----|--------|------|----------|------|------|------|
|        | CSR-SA      |    | CSR - LD |    | CHR |    | CSR-SA |      | CSR - LD |      | CHR  |      |
|        | RD          | HD | RD       | HD | RD  | HD | RD     | HD   | RD       | HD   | RD   | HD   |
| φ32    | 23          | 6  | 16       | 9  | 21  | 2  | 26     | 8    | 20       | 12.5 | 25.5 | 5.5  |
| φ40    | 21          | 7  | 19       | 9  | 20  | 3  | 25     | 11   | 21.5     | 13.5 | 24.5 | 6.5  |
| φ50    | 24          | 11 | 23       | 11 | 21  | 8  | 28     | 14   | 24.5     | 17.5 | 26.5 | 9.5  |
| φ63    | 31          | 13 | 28       | 12 | 26  | 9  | 32.5   | 15.5 | 30.5     | 19.5 | 31   | 12   |
| φ80    | 38          | 21 |          |    | 36  | 11 | 41     | 24   |          |      | 38   | 15   |
| φ100   |             |    |          |    | 44  | 22 |        |      |          |      | 51.5 | 24.5 |

Note 1) The switch mounting direction is both towards cap side of the wiring exit for both the head and cap sides.

Note 2) There may be variations in dimensions due to the surrounding environment or other factors, so these values should only be used as guides. The matching of the actual part in switch mounting is recommended.



# Switch Specifications

## F·K·T·C Series

### Working Range

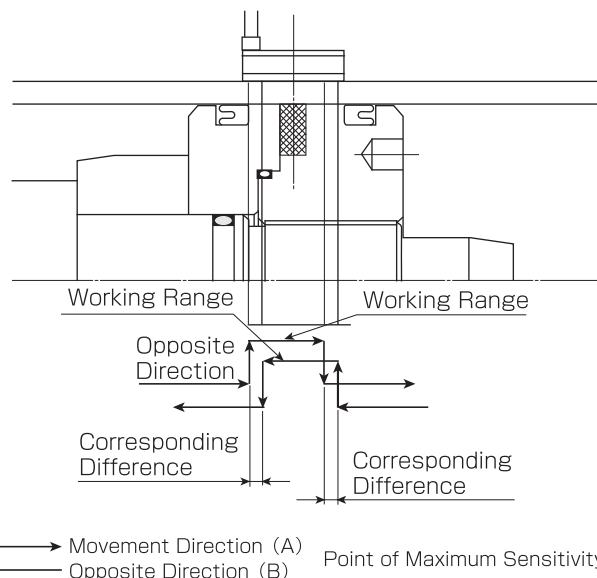
The Working Range is the range from where the piston moves and the switch goes ON to the point where it moves in the same direction causing the switch to change to the OFF state.

The point in the middle of the Working Range is the position of maximum sensitivity.

Setting the switch at this point will result in the least disturbance from external forces and ensure stable switch operation.

### Corresponding Difference

The Corresponding Difference is the difference in the range of movement from where the piston is moved in direction A shown in the diagram on the right towards direction B. If the piston is stopped within this region, the switch is easily influenced by outside factors and a non-contact switch may change from the ON to the OFF state or the OFF to the ON state due to electrical noise. A contact switch may exhibit the same behavior due to vibration and both types of switches may possibly react with the same ON-OFF fluctuations due to magnetic disturbances so caution should be exercised.



### <Operation/Tolerance Range List>

#### Tie Rod System Cylinder (TO※)

Units:mm

| FFR · FSR |               |      |                          |      | KR   |               |      |                          |      | TR   |               |      |                          |      |
|-----------|---------------|------|--------------------------|------|------|---------------|------|--------------------------|------|------|---------------|------|--------------------------|------|
| Bore      | Working Range |      | Corresponding Difference |      | Bore | Working Range |      | Corresponding Difference |      | Bore | Working Range |      | Corresponding Difference |      |
|           | TO※           | D-M※ | TO※                      | D-M※ |      | TO※           | D-M※ | TO※                      | D-M※ |      | TO※           | D-M※ | TO※                      | D-M※ |
| φ32       | 11.5          | 2.5  | 2                        | 0.5  | φ32  | 9.5           | 2.5  | 2                        | 0.5  | —    | —             | —    | —                        | —    |
| φ40       | 12            | 2.5  | 2                        | 0.5  | φ40  | 10.5          | 2.5  | 2                        | 0.5  | φ40  | 8.5           | 3    | 2                        | 0.5  |
| φ50       | 12.5          | 3.5  | 2                        | 0.5  | φ50  | 12.5          | 3.5  | 2                        | 0.5  | φ50  | 10            | 3.5  | 2                        | 0.5  |
| φ63       | 15            | 4    | 2                        | 0.5  | φ63  | 14.5          | 3.5  | 2                        | 0.5  | φ63  | 12            | 4    | 2                        | 0.5  |
| φ80       | 14            | 5    | 2                        | 0.5  | φ80  | 19            | 4    | 2                        | 0.5  | φ80  | 12            | 4    | 2                        | 0.5  |
| φ100      | 16            | 5    | 2                        | 0.5  | φ100 | 20            | 5    | 2                        | 0.5  | —    | —             | —    | —                        | —    |
| φ125      | 20            | 6    | 2                        | 0.5  | φ125 | 22            | 5    | 2                        | 0.5  | —    | —             | —    | —                        | —    |
| φ140      | 16            | 6    | 3                        | 0.5  | —    | —             | —    | —                        | —    | —    | —             | —    | —                        | —    |

Note) There may be tolerance differences due to the surrounding environment, switch sensitivity tolerances, etc., so these values are only intended as guides.

#### Compact Cylinder Type

Units:mm

| Bore | TOV · TOH · T5V · T5H |                          |                 |                          |               |                          | T2YV · T2YH     |                          |                 |                          |               |                          | D-M※            |                          |                 |                          |               |                          |
|------|-----------------------|--------------------------|-----------------|--------------------------|---------------|--------------------------|-----------------|--------------------------|-----------------|--------------------------|---------------|--------------------------|-----------------|--------------------------|-----------------|--------------------------|---------------|--------------------------|
|      | CSR-SA mounting       |                          | CSR-LD mounting |                          | CHR           |                          | CSR-SA mounting |                          | CSR-LD mounting |                          | CHR           |                          | CSR-SA mounting |                          | CSR-LD mounting |                          | CHR           |                          |
|      | Working Range         | Corresponding Difference | Working Range   | Corresponding Difference | Working Range | Corresponding Difference | Working Range   | Corresponding Difference | Working Range   | Corresponding Difference | Working Range | Corresponding Difference | Working Range   | Corresponding Difference | Working Range   | Corresponding Difference | Working Range | Corresponding Difference |
| φ32  | 17                    | 2                        | 17              | 2                        | 12            | 2                        | 10              | 2                        | 10              | 1                        | 9             | 1.5                      | 7               | 2                        | 7               | 1                        | 5             | 0.5                      |
| φ40  | 18                    | 2                        | 19              | 2                        | 12            | 2                        | 10              | 3                        | 10              | 1                        | 9             | 1.5                      | 8               | 2                        | 8               | 1                        | 5             | 0.5                      |
| φ50  | 18                    | 3                        | 19              | 2                        | 12            | 2                        | 10              | 2                        | 10              | 1                        | 10            | 1.5                      | 8               | 2                        | 8               | 1                        | 5             | 0.5                      |
| φ63  | 19                    | 3                        | 21              | 2                        | 15            | 2                        | 11              | 2                        | 12              | 1                        | 11            | 1.5                      | 9               | 2                        | 9               | 1                        | 6             | 0.5                      |
| φ80  | 23                    | 3                        | —               | —                        | 16            | 2                        | 12              | 2                        | —               | —                        | 13            | 1.5                      | 10              | 2                        | —               | —                        | 6             | 0.5                      |
| φ100 | —                     | —                        | —               | —                        | 21            | 2                        | —               | —                        | —               | —                        | 15            | 1.5                      | —               | —                        | —               | —                        | 7             | 0.5                      |

### Surrounding Magnetic Environment

- The presence of strong magnetic fields or devices that generate high currents (large magnets, solenoids, spot welders, etc.) may cause the switch to malfunction, so care should be exercised to avoid such surroundings.
- Devices that generate large surge currents (magnetic lifters, high frequency induction furnaces, motors, etc) located near non-contact switches may degrade the switch's internal circuit components or lead to the switch's failure so surge protection should be considered in such environments.
- In the case where there are large amounts of steel particles near a hydraulic cylinder Switch adjusted, such as those resulting from cutting or spatter from welding operations, the magnetic strength within the cylinder may be decreased or changed, influencing its detection sensitivity or even causing the switch to stop operating, so appropriate measures should be taken to guard against this.

### General Environment

- Avoid operation in wet environments. Water can cause malfunctions and insulation failure.
- Avoid operation in environments where pharmaceuticals or petroleum-based chemicals are used. Avoid usage in environments where oils of any kind, coolant fluids, pharmaceuticals and such are present. Doing so may have a detrimental effect on the switch and the lead wires (leading to failure of the insulation, faulty operation due to the imbibition of resin fillings, hardening of the lead wire insulation, etc.). Note that we also offer switches with coolant resistant specifications. Please feel free to contact us for further details.
- Do not use in locations where the switch will be jolted heavily. In the case of the contact switch, if a strong shock (greater than 294m/sec<sup>2</sup>) is applied during operation, there is the possibility that momentary contact or opening will occur resulting in its malfunction. If the environment in which the switch is to be used requires a shock resistant (shock resistance:980m/s<sup>2</sup>) non-contact switch, please contact us for further details.

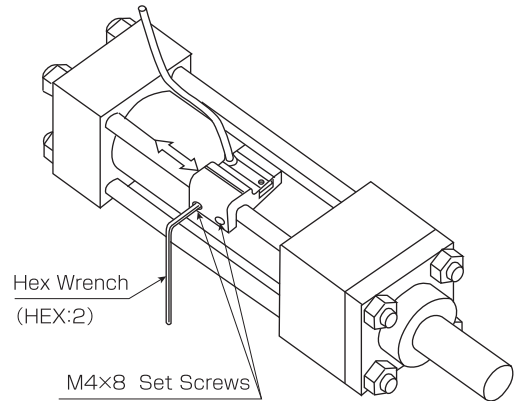
# Switch Specifications

## F·K·T·C Series

### F Series

#### Moving the Switch

Unscrew the set screws (2 screws) 1/2 to 3/4 turn to allow easy movement in the axis direction. After adjusting the position, apply gentle pressure to make sure the bottom of the tube is firm against the holder and tighten the set screws to lock the position.



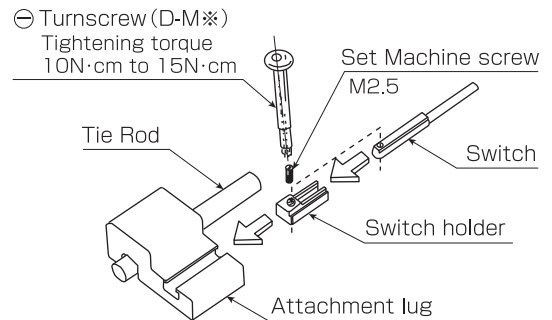
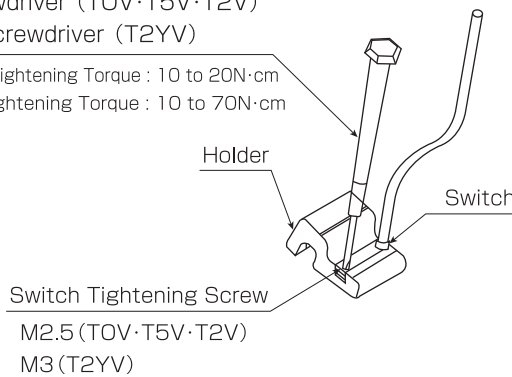
| Tie Rod Size             | φ6mm           | φ8 to φ12mm                        | φ16, φ18mm                 | φ22, φ24mm      |
|--------------------------|----------------|------------------------------------|----------------------------|-----------------|
| Applicable Cylinder Size | KR: φ32 to φ50 | KR: φ63 to φ100<br>F※R: φ32 to φ63 | KR: φ125<br>F※R: φ80, φ100 | F※R: φ125, φ140 |
| Torque Value Range       | 55 to 65N·cm   | 60 to 80N·cm                       | 80 to 100N·cm              | 100 to 120N·cm  |

#### Mounting the Switch

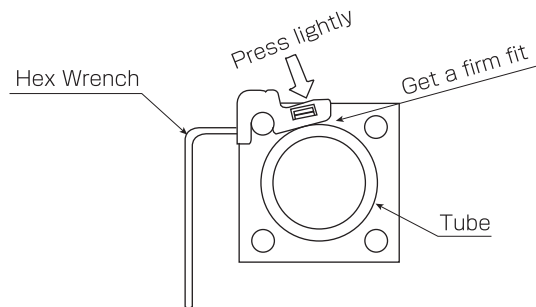
① Insert the switch into the groove in the holder, and tighten the switch fastening screws to 10 to 20N·cm.

- ⊖ Flat Screwdriver (TOV·T5V·T2V)
- ⊕ Phillips Screwdriver (T2YV)

TOV/T5V/T2V=Tightening Torque : 10 to 20N·cm  
T2YV/T2YH=Tightening Torque : 10 to 70N·cm



② The fixation of a holder should bind a set screw (M4 hollow point) tight, pushing a switch against a tube lightly. Please make a torque value table into near aim.



### C Series

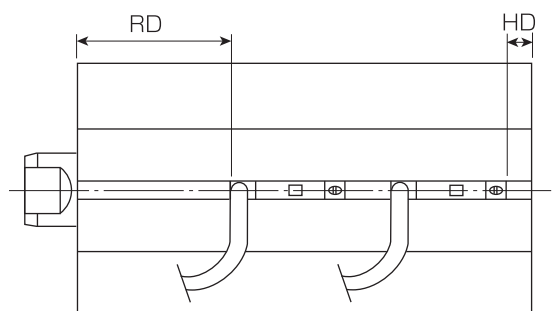
#### Moving the Switch

Loosen the tightening screws (fastening screws) and move the switch along the cylinder tube. Tighten it at the prescribed position.

#### Mounting/Replacing Read Switches

Loosen the tightening screws, and remove the switch from the groove. Align the replacement switch with the prescribed position in the groove and tighten the screws to fasten the switch in place.

(The torque ranges for the tightening screws are: TOV/TOH = 10 to 20N·cm T2YV/T2YH = 50 to 70N·cm Note that the tightening screws for the TOV/TOH require a flat screwdriver. The T2YV/T2YH screws require a Phillips screwdriver.)



# Switch Specifications

## F·K·T·C Series

### ■Attaching the Connectors (W Type Switch: ROB)

Use the diagrams as a reference and follow the procedure outlined below to attach the W Type terminal box.

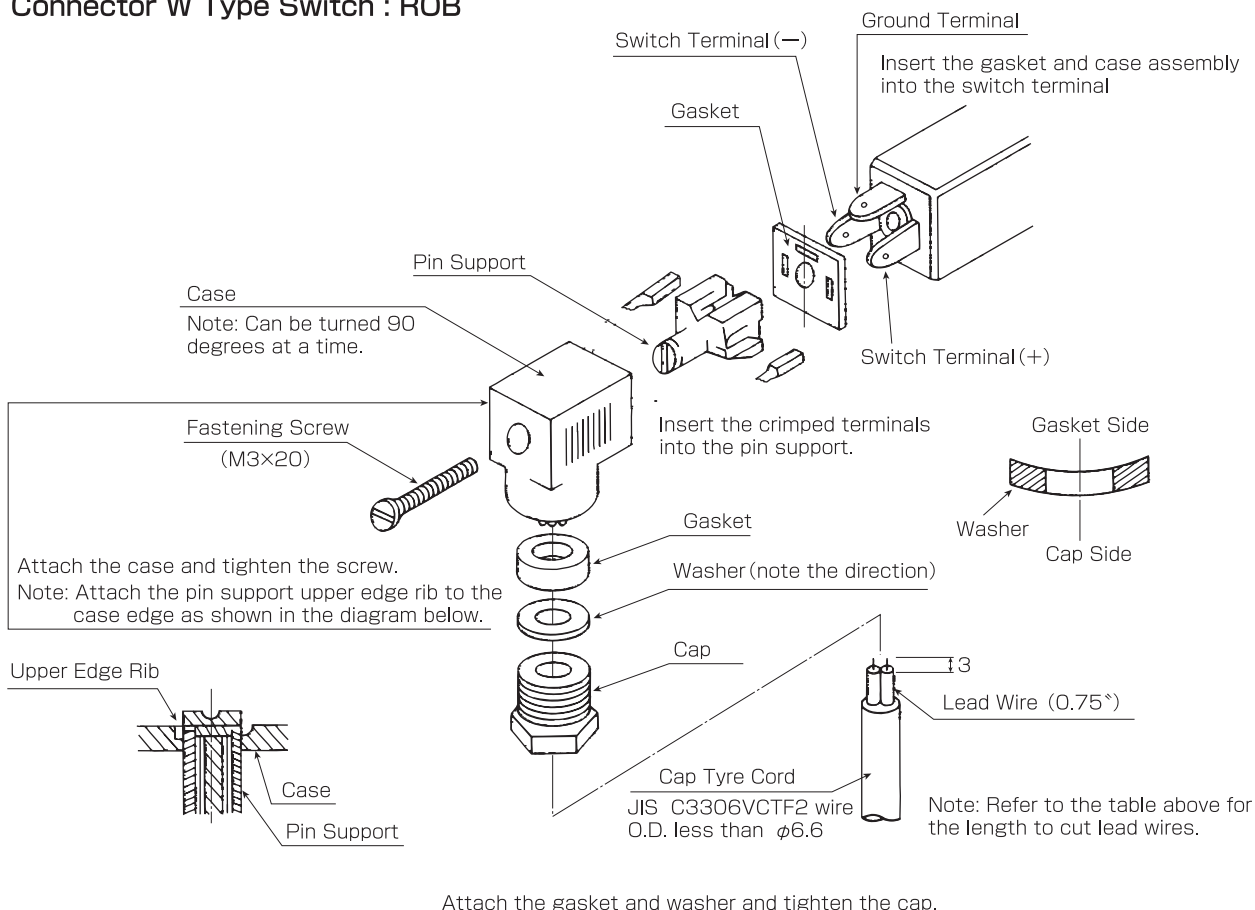
- ① Remove all of the fastening screws and pull the switch out of the terminal box.
- ② From the top of the case, push on the pin support to separate it from the case.
- ③ Remove the cap, washer, and gasket.
- ④ Determine the direction you are going to bring the lead wires out of the terminal box.
- ⑤ Use the case attachment directions shown in the diagram above and cut the lead wires in accordance with the direction you will be using. Peel off the seal and strip the insulation.
- ⑥ Firmly crimp the included solderless terminals.
- ⑦ Carefully pass the lead wires through the cap, washer, gasket and case in the selected direction.  
Pass the lead wire through the case and use a pair of long nose pliers to bring the wire out.
- ⑧ Insert the terminal into the pin support and press it towards the case, taking care to maintain the proper direction. Push it in until the top edge rib of the pin support is slightly above the case's upper surface.
- ⑨ Insert the fastening screws into the case pin support.
- ⑩ Put the gasket and washer on the case and then tighten the cap.
- ⑪ Insert the case into the switch terminal and tighten the fastening screws.

#### ●Length to Cut Lead Wires

The length to which lead wires should be cut will vary with the direction the case is mounted. Please refer to the table below for specifics.

| Case Mounting Direction Upperside View |  |  |  |
|--|--|--|--|
|  |  |  |  |
| Case Mounting Direction Underside View |  |  |  |
|  |  |  |  |
| Lead Length                            |  |  |  |
|  |  |  |  |

### Connector W Type Switch : ROB



# Switch Specifications

## F·K·T·C Series

F series

K series

T series

C series

MINI series Switch specifications

### Lead Wire Protection

Run the wiring so that it does not subject the lead wires to repeated bending, pulling or stress. Use anti-bending support such as that used for robot wiring in sections that are movable.

### Lead Wire Connection

Do not connect the switch lead wires directly to the power source. Always check to make sure the load is connected in series. In addition, in the case of TO\*, refer to A, B below.

- A When used for DC, the brown wire should be connected to the positive  $\oplus$  side and the blue wire should be connected to the negative  $\ominus$  side. If the connections are reversed, the switch will operate; however, the lamp will fail to light up.
- B When the relay for AC is connected to the programmable controller's input side going through a half-wave rectifier, there may be cases in which the lamp does not light; however, the lamp will light when the switch's lead wires are reconnected with the polarities reversed.

### Contact Capacity

Avoid loads that will exceed the maximum contact capacity of the switch. Note also that if the current drops below the rated value, the lamp may not light in the case of the TO\*.

### Series Connection

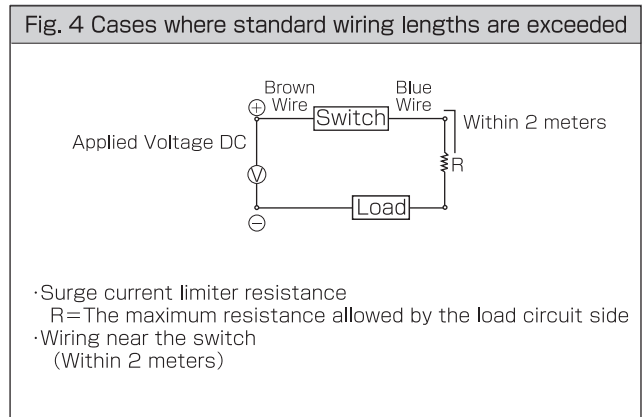
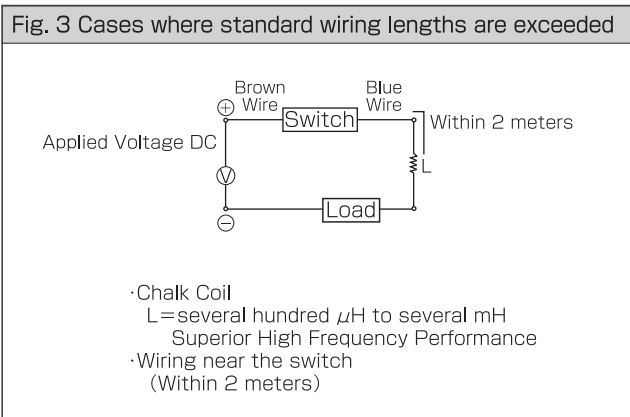
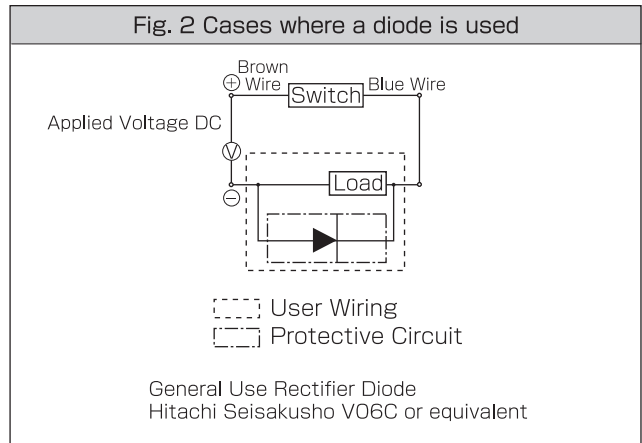
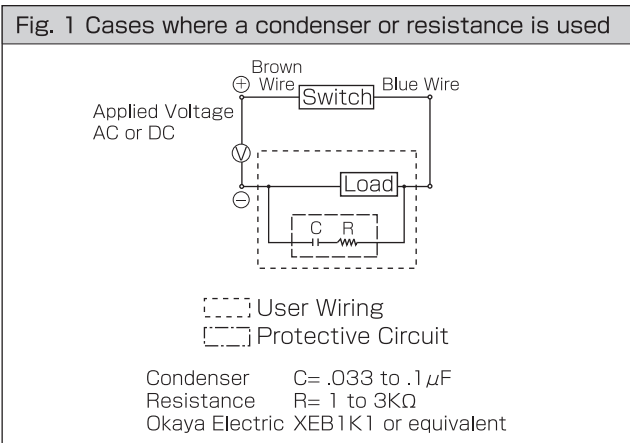
When multiple TO\*s are connected and used in series, the voltage at the switch drops and is the sum of all of the drops in voltages of the switches connected. In order to confirm operation, a TO\* can be used as a single unit (approx. 2.4V). The lamp will light only when all of the switches are in an ON state.

### Parallel Connection

When multiple switches are connected and used in parallel, there is no limit to the number of units that can be connected; however, in the case of the TO\*, the lamp may dim or fail to light up.

### Contact Protection

When the switch is to be used with inductive loads such as relays, etc. the contact protection circuit shown in Figures 1 and 2 must be set up. Note also that the contact protection circuit shown in Figures 3 and 4 must be set up when wiring lengths exceed 50 meters for DC and 10 meters for AC.



### Relays

Use only those relays that correspond to those listed below

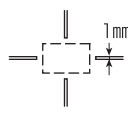
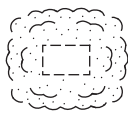
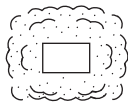
- Omron \_\_\_\_\_ MY Type
- Fuji Electric \_\_\_\_\_ HH5 Type
- Tokyo Electric \_\_\_\_\_ MPM Type
- Panasonic \_\_\_\_\_ HC Type

### Switch Protective Construction


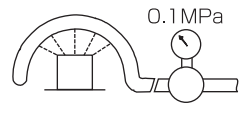

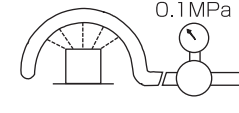

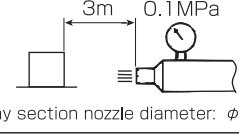

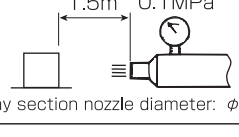



#### IEC (International Electrotechnical Commission (IEC529))

IP— **A** **B** IP: International Protection

#### **A** Grades and Protection with regard to People and Fixed Foreign Objects

| Grade | Degree of Protection   |  |
|-------|--|--|
| 4     |                     | The infiltration of the tips of fixed objects such as wire and steel belts exceeding a thickness or diameter or 1mm is not possible. |
| 5     |                     | Fine particles that can influence operations cannot infiltrate into the interior.  |
| 6     | Dust bears Type<br> | Fine particles cannot infiltrate the interior.   |

#### **B** Protection and Grades regarding Water Infiltration

| Grade | JIS                         | Degree of Protection   |  | Test Methods  |
|-------|-----------------------------|--|--|---|
| 0     | —                           | No special protection  | No special protection against water infiltration.                                      | No test.  |
| 3     | Rainproof Type              | Protection against rain<br>             | Not influenced or harmed by rainfall falling anywhere from vertically to 60 degrees.   | The testing device illustrated on the right sprays water vertically to 60 degrees for a 10 minute period.<br>  |
| 4     | Mist-resistant Type         | Protection against mist<br>             | Not influenced or harmed by mist coming from any direction.                            | The testing device illustrated on the right sends out a mist from every direction possible for a 10 minute period.<br>   |
| 5     | Stream jet Resistant Type   | Protection against streams of water<br> | Not influenced or harmed by stream jets of water coming from any direction.            | The testing device illustrated on the right shoots out water from every direction possible for a 15 minute period.<br>Spray section nozzle diameter: $\phi 12.5$<br> |
| 6     | Water Resistant Type        | Protection against waves<br>            | No infiltration occurs even when strong jets of water are sprayed from all directions. | The testing device illustrated on the right shoots out water from every direction possible for a 15 minute period.<br>Spray section nozzle diameter: $\phi 12.5$<br> |
| 7     | Infiltration Resistant Type | Water Submersible Protection<br>        | Water will not infiltrate at the prescribed pressure over a set period of time.        | Submerging for 30 minutes at 1 meter.<br>  |
| 8     | Submersible Type            | Submergence Protection<br>              | Can be used while continuously immersed in water.                                      | Determined Separately   |





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