neles

LIMIT SWITCH
Neles Quartz

Installation, Maintenance and
Operating Instructions

metso
Expect results

7 QZ 70 en • 12/2010

Table of Contents

READ THESE INSTRUCTIONS FIRST!
These instructions provide information about safe handling and operation of the limit switch.
If you require additional assistance, please contact the manufacturer or manufacturer's representative.
Addresses and phone numbers are printed on the back cover.
SAVE THESE INSTRUCTIONS!

1 GENERAL

1.1 Introduction

This manual provides essential information on the Neles Quartz limit switches.

The Neles Quartz limit switches are used for indication of the electrical position of valves and other devices.

1.2 Markings

The limit switch has an identification plate attached to the cover, see Fig. 1.

Fig. 1 Identification plate

Identification plate markings:

- ❑ Model
- ❑ Serial number
- ❑ Date
- ❑ Sensor rating
- ❑ Transmitter rating
- ❑ Note
- ❑ Warning
- ❑ Protection class information
- ❑ CE and EX marks
- ❑ Metso logo

1.3 Specifications

All models

Materials	
Housing and cover	Epoxy coated anodized marine grade aluminum
Clear cover and indicator	Lexan® polycarbonate
Elastomer seals	Buna-N, optional Viton and EPDM
Drive shaft	Stainless steel
Drive bushing	Brass, oil impregnated
Fasteners	Stainless steel
Unit weights	
With aluminum cover	
Short	1.27 kg / 2.80 lb
Medium	1.55 kg / 3.42 lb
Tall	1.75 kg / 3.85 lb
With clear cover	
Short	1.20 kg / 2.64 lb
Medium	1.27 kg / 2.79 lb
Tall	1.39 kg / 3.06 lb
Certifications and Approvals	
Explosion Proof (QX_)	
ATEX	II 2 G c T5 Ex d IIC T5
cFMus	Class I, Div. 1, Groups BCD Class II, Div. 1, Groups EFG
Nonincendive (QN_)	
ATEX	II 1 G, EEx nA IIC T5
cFMus	Class I, Div. 2, Groups ABCD Class II, Div. 2, Groups FG
Intrinsically Safe (QN_)	
ATEX	II 1 G, EEx ia IIC T5
cFMus	Class I, Div. 1 and 2, Groups ABCD Class II, Div. 1 and 2, Groups EFG
Enclosure Protection	
ATEX	IP67 NEC/CEC 4, 4X & 6

All electrical components are CE compliant.

Inductive proximity sensors
Dual Module SST Sensor (33)

Outputs:	2 cam selectable NO or Hold Closed
Maximum current:	
Inrush	2.0 A / 125 V AC/DC
Continuous	0.3 A / 125 V AC/DC
Voltage range:	8 to 125 V DC, 24 to 125 V AC
Minimum on current:	2.0 mA
Temperature range:	-40 °C to 80 °C
Leakage current:	
DC circuits	0.15 mA
AC circuits	0.25 mA
Max voltage drop	6.5 V / 10 mA 7.5 V / 100mA
Operating life:	Unlimited

SST sensor (X)

Voltage Range:	8 to 125 VD C/24-125 V AC
Inrush Current:	2.0 A at 125 V AC/V DC (max)
Continuous Current:	0.3 A at 125 V AC/V DC
Minimum On Current:	2.0 mA
Current Leakage:	Less than 0.25 mA
Maximum Voltage Drop:	6.5 V at 10 mA 7.0 V at 100 mA
Temp. Range:	-40 °C to 80 °C
Operating Life:	Unlimited

P+F sensor (E)

Type	NBB2-V3-E0-V5
Configuration	NPN, 3-wire type
Operating voltage	10 to 30 V DC
Current ratings	100 mA
Temperature range	-25 °C to +80 °C/-13 °F to +176 °F

P+F sensor (F)

Type	NBB2-V3-E2-V5
Configuration	PNP, 3-wire type
Operating voltage	10 to 30 V DC
Current ratings	100 mA
Temperature range	-25 °C to +70 °C/-13 °F to +158 °F

Intrinsically Safe Inductive Proximity Switches
Namur Sensor Dual Module (44)

Outputs:	2 Namur Sensors (DIN 19234)
Current Ratings:	
Target Present Current	<1.0 mA (LED = OFF)
Target Absent Current	>3.0 mA (LED = ON)
Voltage Range:	6 to 29 V DC
Temperature Range:	-40 °C to 80 °C
Operating Life:	Unlimited

P+F Sensor (A)

Type	NJ2-12GK-SN
Configuration	2-wire type, NAMUR NC, conforms to DIN 19234
Operating voltage	5 to 25 V DC
Current ratings:	Target off: I > 3 mA, Target on: I < 1 mA
Temperature range	-40 °C to +62 °C/-40 °F to +144 °F

P+F Sensor (N)

Type	NJ2-V3-N
Configuration	2-wire type, NAMUR NC, conforms to DIN 19234
Nominal voltage	8 V DC
Current ratings	Target off: I > 3 mA, Target on: I < 1 mA
Temperature range	-25 °C to +80 °C/-13 °F to +176 °F

Reed Type Maxx-Guard Proximity Sensors

Operating Life	5 million Cycles
Seal	Hermetically sealed
Temperature range	-40 °C to +80 °C/-40 °F to +176 °F

SPST (L)

Configuration	With LED
Electrical Ratings	150 mA at 30 V DC / 125 V AC
Max. Voltage Drop	3.5 V at 10 mA 6.5 V at 100 mA
Contact	Ruthenium

SPST (P)

Electrical Ratings	150 mA at 30 V DC / 125 V AC
Max. Voltage Drop	0.1 V at 10 mA 0.5 V at 100 mA
Contact	Ruthenium

SPDT (G)

Electrical Ratings	300 mA at 24 V DC 200 mA at 120 V AC
Max. Voltage Drop	0.1 V at 10 mA 0.5 V at 100 mA
Contact	Rhodium

SPDT (H)

Electrical Ratings	240 V AC max; 3 A max 100 W max; 2.0 W min
Max. Voltage Drop	0.1 V at 10 mA 0.5 V at 100 mA
Contact	Tungsten

SPDT (S)

Configuration	With LED
Electrical Ratings	300 mA at 125 V AC
Max. Voltage Drop	3.5 V at 10 mA 6.5 V at 100 mA
Contact	Tungsten

Mechanical Micro Switches
Silver contacts (V)

Electrical ratings:	10.0 A / 125/250 V AC 0.5 A / 125 V DC
Temperature range:	-40 °C to 80 °C
Operating life:	400 000 cycles

Gold contacts (W)

Electrical Ratings:	1.0 A at 125 V AC 0.5 A at 30 V DC
Temp. Range:	-40 °C to 80 °C
Operating Life:	100 000 cycles

DPDT switches (14)

Electrical Ratings:	4.5 A at 125/250 V AC
Temp. Range:	-40 °C to 80 °C
Operating Life:	250 000 cycles

Valve Control Terminals (VCT)
(93)

Communication Protocol:	Foundation Fieldbus (H1)
Configuration:	2 Discrete Inputs (Sensors) 2 Discrete Outputs (Piezo Valves)
Voltage:	9 to 32 V DC (Bus Voltage)
Output Voltage:	6.5 V DC
Max. Output Current:	2.0 mA at 6.5 V DC
Current Draw:	16 mA
Function Blocks:	Channel 1 = DI1 (Green LED) Channel 2 = DI2 (Red LED) Channel 3 = DO1 (OUT 1) Channel 4 = DO2 (OUT 2)
Temperature Range:	-40 °C to 80 °C

(96)

Communication Protocol:	AS-Interface
Configuration:	2 Discrete Inputs (Sensors) 2 Auxiliary Discrete Inputs 2 Discrete Outputs (Solenoids)
Voltage:	24 to 30 V DC (AS-i Voltage)
Output Voltage:	24 V DC
Max. Output Current:	160 mA, Both Outputs Combined
Max. Output Power:	4 W, Both Outputs Combined
Temperature Range:	-40 °C to 80 °C
ID/IO Codes:	ID = F; IO = 4; ID1 = F; ID2 = E
Default Address:	00

Bit Assignment:	Inputs	Outputs
	Bit 1 = Aux Input 1	Bit 1 = Not Used
	Bit 2 = Aux input 2	Bit 2 = Not Used
	Bit 3 = Green LED	Bit 3 = OUT 1
	Bit 4 = Red LED	Bit 4 = OUT 2

(97)

Communication Protocol:	AS-Interface with Extended Addressing
Configuration:	2 Discrete Inputs (Sensors) 2 Auxiliary Discrete Inputs 1 Discrete Output (Solenoid)
Voltage:	24 to 30 V DC (AS-i Voltage)
Output Voltage:	24 V DC
Max. Output Current:	100 mA
Max. Output Power:	2.4 W

Temperature Range:	-40 ºC to 82 ºC	
ID/IO Codes:	ID = A; IO = 4; ID1 = 7; ID2 = E	
Default Address:	0A	
Bit Assignment:	Inputs	Outputs
	Bit 1 = Aux Input 1	Bit 1 = Not Used
	Bit 2 = Aux input 2	Bit 2 = Not Used
	Bit 3 = Green LED	Bit 3 = OUT 1
	Bit 4 = Red LED	Bit 4 = Not Used

Position Transmitters (50, 70)

Output:	4–20 mA
Voltage range:	10 to 40 V DC
Recommended voltage:	24 V DC, 50 mA minimum
Max load:	700 Ω / 24 V DC (See load curve, Fig. 2))
Span:	Adjustable from 35° to 270°
Max linearity error:	Standard (_5_) potentiometer ± 0.85°
	High perf. (_7_) potentiometer ± 0.35°
Temperature range:	-40 °C to 80 °C

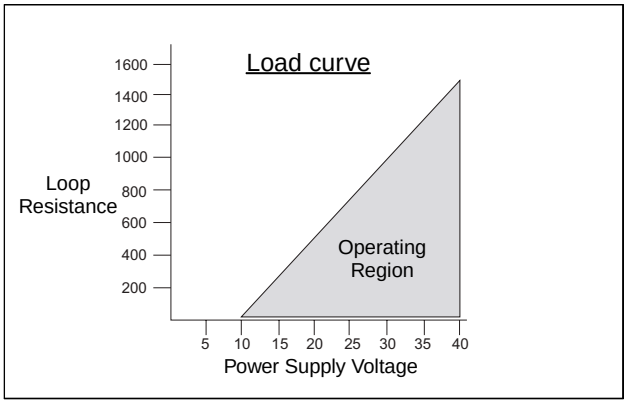


Fig. 2 Load curve (_5_)

1.4 CE marking

The limit switch meets the requirements of the European Directives and has been marked according to the Directive.

1.5 Recycling and disposal

Most limit switch parts can be recycled if sorted according to material. See the list below for materials. In addition, separate recycling and disposal instructions are available from us. A limit switch can also be returned to us for recycling and disposal against a fee.

1.6 Safety precautions

CAUTION:
Do not exceed the permitted values!
Exceeding the permitted values marked on the limit switch may cause damage to the switch and to equipment attached to the switch and could lead to uncontrolled pressure release in the worst case. Damage to the equipment and personal injury may result.

CAUTION:
To prevent ignition of hazardous atmospheres, replace cover before energizing the electrical circuits. Keep cover tightly closed when in operation.

2 MOUNTING

1. Attach mounting plate to actuator using fasteners and lockwashers provided.
2. Loosen indicator cover set-screw.
3. Rotate indicator cover to desired viewing angle and retighten set-screw. (Make sure indicator cover is pushed all the way into housing slot.)
4. Rotate coupling spacer and indicator drum to desired position. (OPEN or CLOSED appearing through indicator window.)
5. Remove spacer screw and fit reinforcer and coupling into coupling spacer or Namur coupling. Separate spacer and indicator drum and rotate spacer to align coupling with actuator shaft. Fit coupling spacer over indicator drum drive hub.
6. Secure torque coupling assembly or Namur coupling with screw of proper length. (Additional coupling spacers and longer screw may be required on some mountings.)
7. Slide Thru-Bolts with washers into housing and fit retaining quad-rings over bolts to retain them.
8. Top of actuator shaft should be within 6.35 mm (1/4") from torque coupling screw head or Namur coupler.
9. Torque coupler or Namur coupler must be fully engaged in slot and be centered on the shaft or block attached to the shaft.
10. Operate actuator to full open and full closed positions and check for proper alignment between switch and actuator. Eccentricity of shaft must not be greater than 0.25 mm (0.01") from centerline. The torque coupler or Namur coupler must be centered on the flats of the actuator shaft or block in both the full open and full closed position. Realign as necessary and final tighten Thru-Bolts.
11. "Fine-tune" visual indicator cover repeating steps 2 and 3 and lightly tighten set screw.

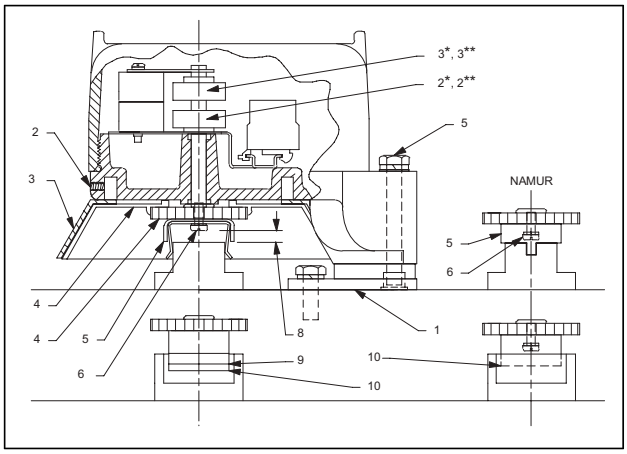


Fig. 3 Mounting and switch setting steps

3 ADJUSTING

3.1 Touch & Tune™ switch setting

Notes: All adjustments assume you are looking down on the top of the sensors. The edge of the cam metal strip will be at the edge of the sensor target when activation occurs. When the cam is released be sure it slides fully onto the spline. One spline tooth setting is 4 1/2°.

Types 33, 93, 96, 97

I. For Normally Open function, Fig. 4

1. With the valve in the "Closed" position and if the valve turns counter-clockwise to open, set both cams so that the metal activation strips are 180° from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counter-clockwise until the red LED goes "out" then clockwise again until the red LED just comes "on". Reverse the direction of the cam if the valve opens clockwise. (2* in Fig. 3).
3. Move the valve to the opposite position (Open), push down on the top cam and rotate counter-clockwise until the green LED just comes "on". Reverse the direction of the cam if the valve opens clockwise. (3* in Fig. 3).

For the normally open operation, both LEDs will be off during the actuation period. If the optional green "Closed" visual indicator is used the colors would be reversed in I and II.

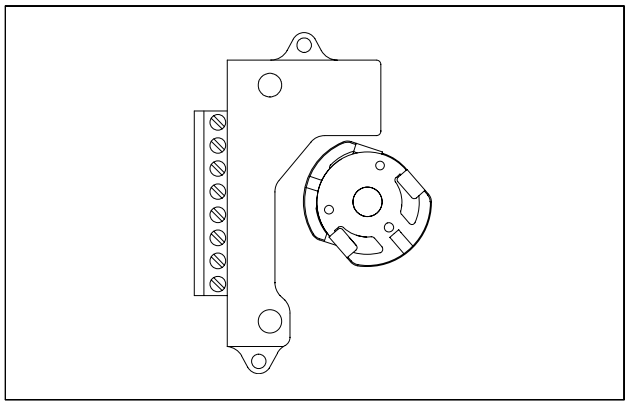


Fig. 4 Cams set for Normally Open function

II For Normally Closed function, Fig. 5

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counter-clockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes "out". If the valve turns clockwise to open, rotate bottom cam counter-clockwise until it goes out. (2** in Fig. 3).
3. Operate the valve to the opposite position (Open). Push down on the top cam. If the green LED is "off", rotate top cam clockwise until it comes "on". When the green LED is "on" turn cam counter-clockwise until the green LED just goes "off". (3** in Fig. 3).

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the “Closed” position and the green LED is off in the “Open” position. If the optional green "Closed" visual indicator is used the colors would be reversed in I and II.

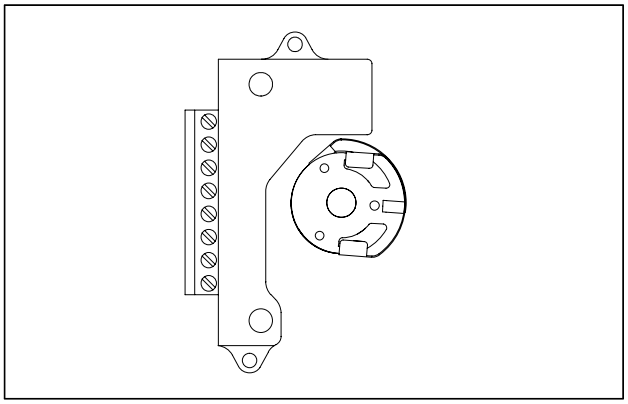


Fig. 5 Cams set for Normally Closed function

Type X

I. For Normally Open Function, Fig. 6

1. With the valve in the "Closed" position and if the valve turns counter-clockwise to open, set both cams so that the metal activation strips are 180° from each other with the bottom cam set in the middle of the sensor target.
2. Lift the bottom cam and turn counter-clockwise until the red LED goes "out" then clockwise again until the red LED just comes "on". (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (Open), push down on the top cam and rotate counter-clockwise until the green LED just comes "on". (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both LEDs will be off during the actuation period. If the optional green "Closed" visual indicator is used the colors would be reversed in I and II.

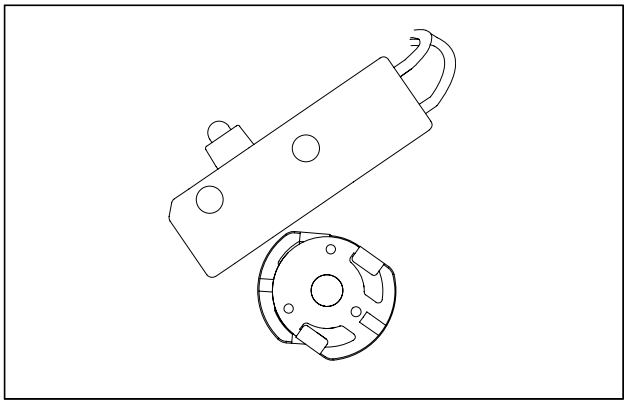


Fig. 6 Cams Set for Normally Open Sensor Function

II. For Normally Closed Function, Fig. 7

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets.
2. If the valve turns counter-clockwise to open, pull up on the bottom cam and rotate clockwise until the red LED goes "out". (If the valve turns clockwise to open, rotate bottom cam counter-clockwise until it goes out.)
3. Operate the valve to the opposite position (Open). Push down on the top cam. If the green LED is "off", rotate top cam clockwise until it comes "on". When the green LED is "on" turn cam counter-clockwise until the green LED just goes "off".

For the normally closed operation, both the red and green LEDs will be illuminated during the actuation period. The red LED is off in the “Closed” position and the green LED is off in the “Open” position. If the optional green "Closed" visual indicator is used the colors would be reversed in I and II.

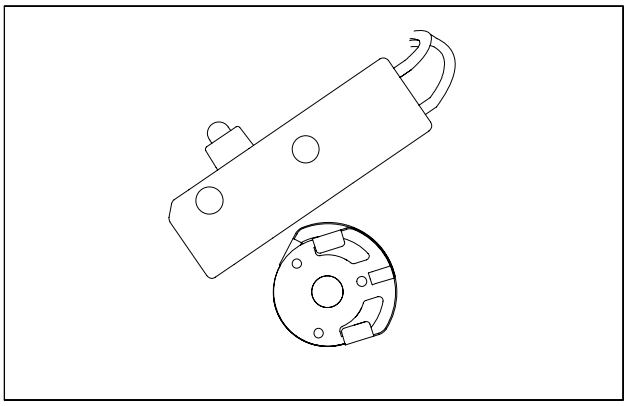


Fig. 7 Cams Set for Normally Closed Sensor Function

Types E, F

I. For Normally Open Function, Fig. 8

1. With the valve in the "Closed" position and if the valve turns counter-clockwise to open, set both cams so that the metal activation strips are 180° from each other with the bottom cam set in the middle of the sensor target. Connect test equipment to bottom switch as per Bench Test Procedure.
2. Lift the bottom cam and turn counter-clockwise until the voltmeter reads 0 V DC then clockwise again until the voltmeter just reads >20 V DC. (Reverse the direction of the cam if the valve opens clockwise.)
3. Move the valve to the opposite position (Open), connect test equipment to top switch. Push down on the top cam and rotate counter-clockwise until the voltmeter just reads >20 V DC. (Reverse the direction of the cam if the valve opens clockwise.)

For the normally open operation, both sensors will be off during the actuation period.

II. For Normally Closed Function, Fig. 9

1. With the valve in the closed position, set both cams so that the metal activation strips are aligned with each other and set in the middle of the sensor targets. Connect test equipment to bottom switch as per Bench Test Procedure.
2. If the valve turns counter-clockwise to open, pull up on the bottom cam and rotate clockwise until the voltmeter just reads 0 V DC. (If the valve turns clockwise to open, rotate bottom cam counter-clockwise until the voltmeter reads 0 V DC)
3. Operate the valve to the opposite position (Open). Connect test equipment to top switch. Push down on the top cam. If the voltmeter reads 0 V DC, rotate top cam clockwise until it reads >20 V DC. With the voltmeter reading >20 V DC rotate cam counter-clockwise until the voltmeter just reads 0 V DC.

For the normally closed operation, both sensors will be activated during the actuation period.

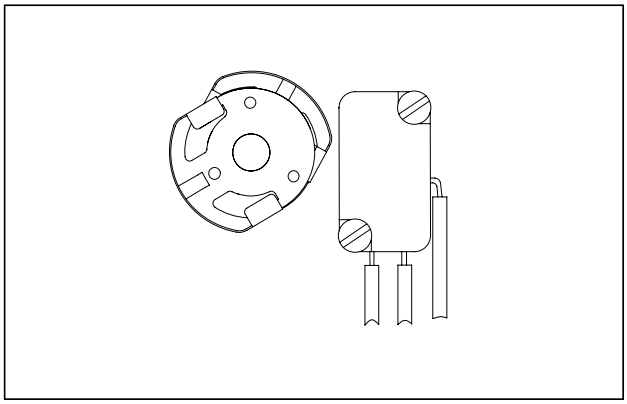


Fig. 8 Cams Set for Normally Open Function

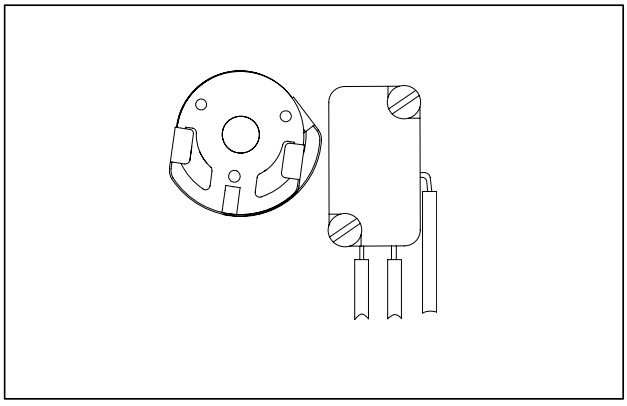


Fig. 9 Cams Set for Normally Closed Function

Types P, L, G, H, S

1. Lift bottom cam and rotate until sensor is activated. (White highlight will be next to sensor.) Release cam and be sure it slides fully onto spline.
2. Operate actuator to opposite position, push down on top cam and repeat process.

Types V, W, 14

1. Lift bottom cam and rotate until switch is activated. Release cam and be sure it slides fully onto spline.
2. Operate actuator to opposite position, push down on top cam and repeat process.

Type 44

I Valve Closed to Open in counter-clockwise rotation, Fig. 4

1. With the valve in the "Closed" position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam.
2. Lift up bottom cam and rotate counter-clockwise until the green LED comes "on" and remains "on" when the cam is released, then rotate clockwise until the green LED just goes "off" and remains out when the cam is released.
3. Move valve to the "Open" position. Push down top cam and rotate counter-clockwise until the red LED just goes "off". Release cam.

II Valve Closed to Open in clockwise rotation, Fig. 5

1. With the valve in the "Closed" position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam.
2. Lift up bottom cam and rotate clockwise until the green LED comes "on" and remains "on" when the cam is released, then rotate counter-clockwise until the green LED just goes "off" and remains out when the cam is released.
3. Move valve to the "Open" position. Push down top cam and rotate clockwise until the red LED just goes "off". Release cam.

Notes:

1. With the valve in the Closed position, the red LED is "on" and the bottom sensor is active (i.e. drawing less than 1.0 mA of current), while the top sensor is inactive (i.e. drawing greater than 3.0 mA of current).
2. When the valve is in the Open position, the green LED is "on" and the top sensor is active while the bottom sensor is inactive.
3. During valve transition from "Closed to Open" or "Open to Closed" both LED's will be "on" and neither sensor will be active.

Type A

I. Valve Closed to Open in counter-clockwise rotation, Fig. 10

1. With the valve in the "Closed" position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 90° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Lift up bottom cam and rotate counter-clockwise until the ammeter reads >3 mA, then rotate clockwise until the ammeter reads <1 mA. Release the cam.
3. Move valve to the "Open" position. Connect power supply and ammeter to the top switch. Push down top cam and rotate clockwise until the ammeter reads >3 mA then counterclockwise until the ammeter reads <1 mA. Release cam.

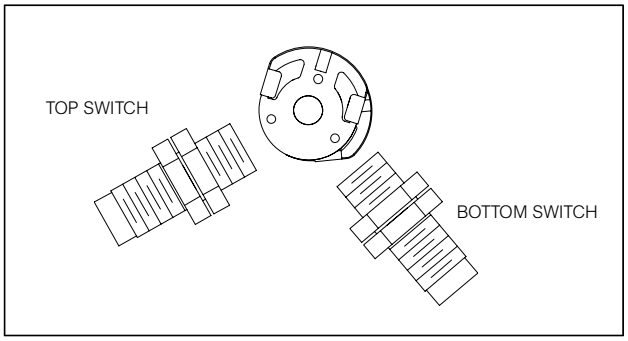


Fig. 10 Cams Set for Counter-Clockwise Rotation

II. Valve Closed to Open in clockwise rotation, Fig. 11

1. With the valve in the "Closed" position, set the top cam so that the metal activation strip is centered on the top sensor target and the bottom cam is 90° from the top cam. Connect power supply and ammeter to the top switch.
2. Push down top cam and rotate clockwise until the ammeter reads >3 mA, then rotate counter-clockwise until the ammeter reads <1 mA. Release the cam.
3. Move valve to the "Open" position. Connect power supply and ammeter to the bottom switch. Lift up bottom cam and rotate clockwise until the ammeter reads >3 mA, then rotate counter-clockwise until the ammeter reads <1 mA. Release the cam.

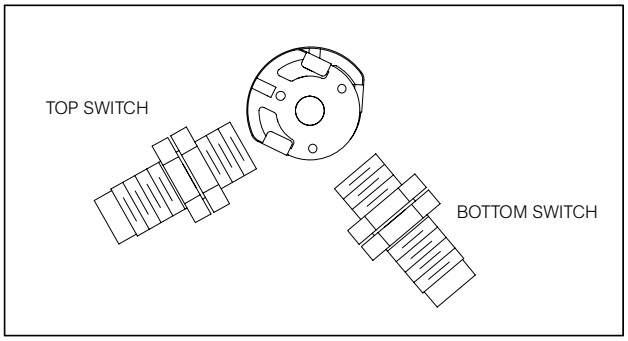


Fig. 11 Cams Set for Clockwise Rotation

Type N

Valve Closed to Open in counter-clockwise rotation, Fig. 12

1. With the valve in the "Closed" position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Lift up bottom cam and rotate counter-clockwise until the ammeter reads >3 mA, then rotate clockwise until the ammeter reads <1 mA. Release the cam.
3. Move valve to the "Open" position. Connect power supply and ammeter to the top switch. Push down top cam and rotate counter-clockwise until the ammeter reads <1 mA. Release cam.

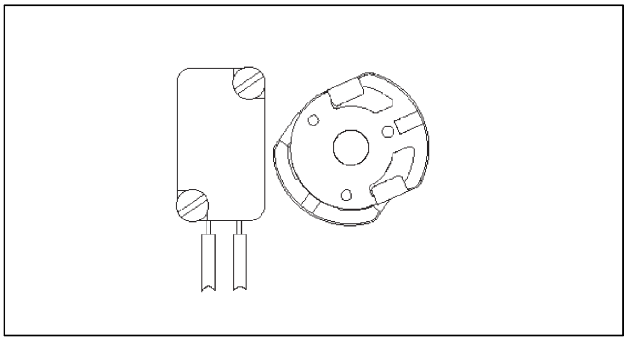


Fig. 12 Cams set for Normally Open function

Valve Closed to Open in clockwise rotation, Fig. 13

1. With the valve in the "Closed" position, set the bottom cam so that the metal activation strip is centered on the bottom sensor target and the top cam is 180° from the bottom cam. Connect power supply and ammeter to the bottom switch.
2. Lift up bottom cam and rotate clockwise until the ammeter reads >3 mA, then rotate counter-clockwise until the ammeter reads <1 mA. Release the cam.
3. Move valve to the "Open" position. Connect power supply and ammeter to the top switch. Push down top cam and rotate counter-clockwise until the ammeter reads <1 mA. Release cam.

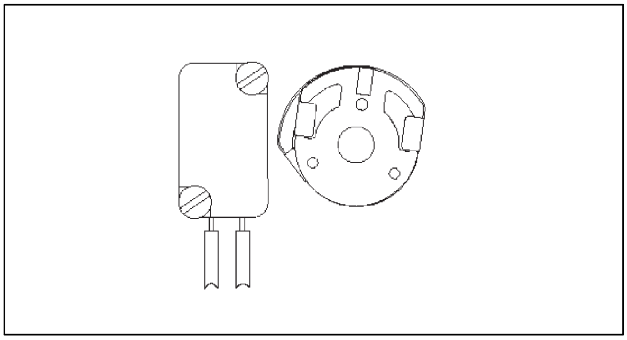


Fig. 13 Cams set for Normally Closed function

3.2 Position transmitter calibration

Type Q_5_

1. Connect the plug as shown for either clockwise or counter clockwise to open operation (as viewed from top), see Fig. 14.
2. Operate actuator to desired "zero" position. With power disconnected, connect an ohm meter across the terminals located on top of the potentiometer. For counter clockwise rotation, connect to the terminals with the black lead and white lead. For clockwise rotation, connect the ohm meter to the terminals with the red lead and white lead.
3. Loosen bottom set screw and rotate coupling until the ohm meter reads between 400–600. Retighten set screw. Verify the ohm meter still reads between 400 - 600 Ω
4. Disconnect the ohm meter and connect DC power to the + and - terminals, Fig. 15.
5. Adjust the screw on the zero trimpot for a 4 mA output.
6. Operate actuator to the desired "100 %" position.
7. Adjust the screw on the span trimpot for a 20 mA output. Zero and Span adjustments are non interactive.

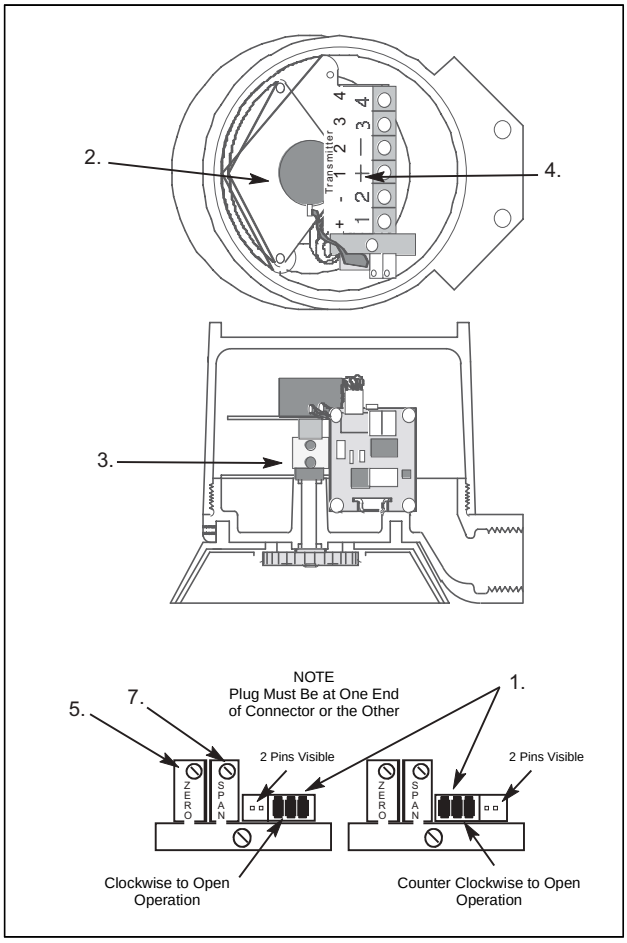


Fig. 14 Position transmitter calibration

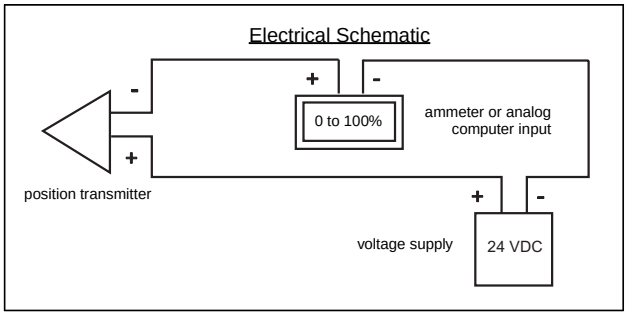


Fig. 15 Electrical schematic for position transmitter calibration

3.3 Bench test procedure

3.3.1 Type 33

Use StoneL Light Read Tester. Or use a 24 V DC or 120 V AC power supply with series load resistor (2 kΩ - 6 kΩ).

WARNING:
Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

3.3.2 Type X

Use StoneL Light Read Tester. Or use a 24 V DC or 120 V AC power supply with series load resistor (2 kΩ - 6 kΩ).

WARNING:
Failure to use a series load resistor when bench testing sensors with a power supply will result in permanent damage to the unit.

3.3.3 Types E, F

Connect a load resistor of 3 kΩ to 10 kΩ across a switch's Load and (+) terminals (QN2E, QX2E), or a switch's Load and (-) terminals (QN2F, QX2F). Using a 24 V DC power source, connect the power source (+) lead to a switch's (+) terminal and the power source (-) lead to a switch's (-) terminal. Connect a voltmeter across the load resistor. Apply 24 V DC. With cam activation strip in front of sensor target, the voltmeter will read >20 V DC.

Activation strip away from sensor target voltmeter will read 0 V DC.

Warning: Connecting the switch to a power source without a load resistor may result in irreparable damage to the switch.

3.3.4 Type 44

Use StoneL Light Read Tester or use a 24 V DC power supply.

No series load resistor required.

3.3.5 Types A, N

Use StoneL Light Read Tester or use a 12 V DC power supply and an ammeter.

No series load resistor required.

3.3.6 Types P, L, G, H, S

Test LED units with 9 volt battery and series load resistor between 150 and 1000 Ω - 1/2 W. Ohm meter will not work. (Light Read tester available from StoneL or StoneL distributor.)

Minimum of 3.5 V required for proper switch operation.

3.3.7 Type 93

Use 9 to 32 V DC power supply across FB + and FB -.

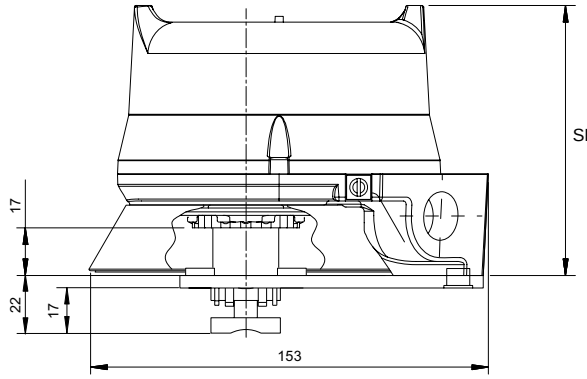
No series resistor needed. To test communication, a functioning Foundation Fieldbus network is required.

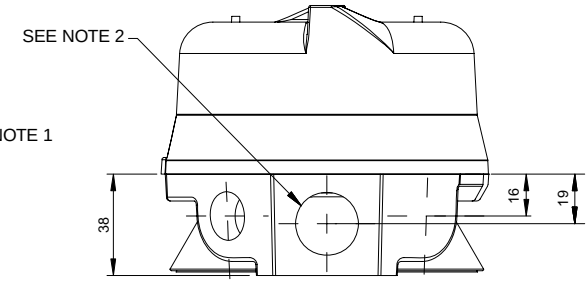
3.3.8 Types 96, 97

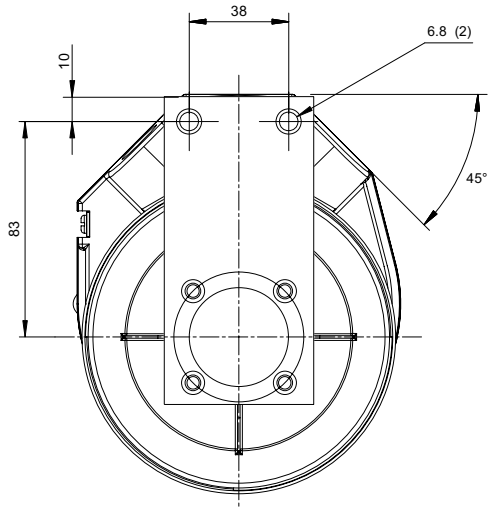
To Bench Test AS-Interface Module: Use 24 V DC power supply across ASI + and ASI -. No series resistor needed. To test communication, a functioning AS-Interface network is required.

Do not apply external power to output terminals.

4 DIMENSIONS







NOTES:

1) COVER HEIGHTS MAY VARY ON DIFFERENT MODELS.

- UNIT HEIGHT WITH SHORT COVER = 102 mm
COVER REMOVAL CLEARANCE = 143 mm

- UNIT HEIGHT WITH MEDIUM COVER = 123 mm
COVER REMOVAL CLEARANCE = 184 mm

- UNIT HEIGHT WITH TALL COVER = 155 mm
COVER REMOVAL CLEARANCE = 241 mm
CONSULT FACTORY FOR COVER SIZES ON
SPECIFIC MODELS.

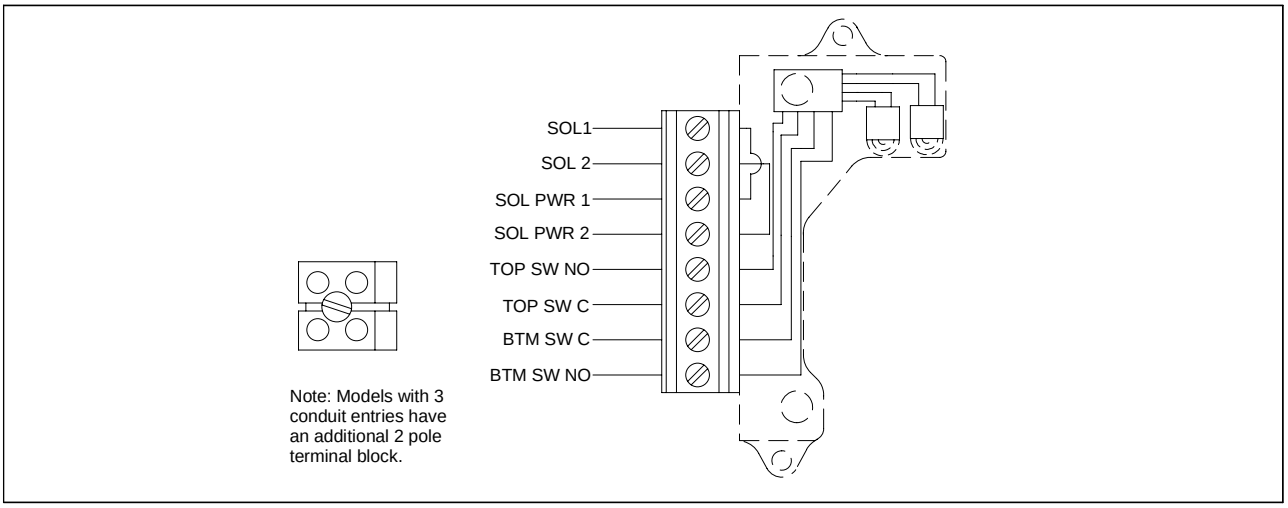
2) CONDUIT ENTRY SIZES MAY VARY ON DIFFERENT MODELS.

CONSULT FACTORY FOR CONDUIT SIZES ON
SPECIFIC MODELS.

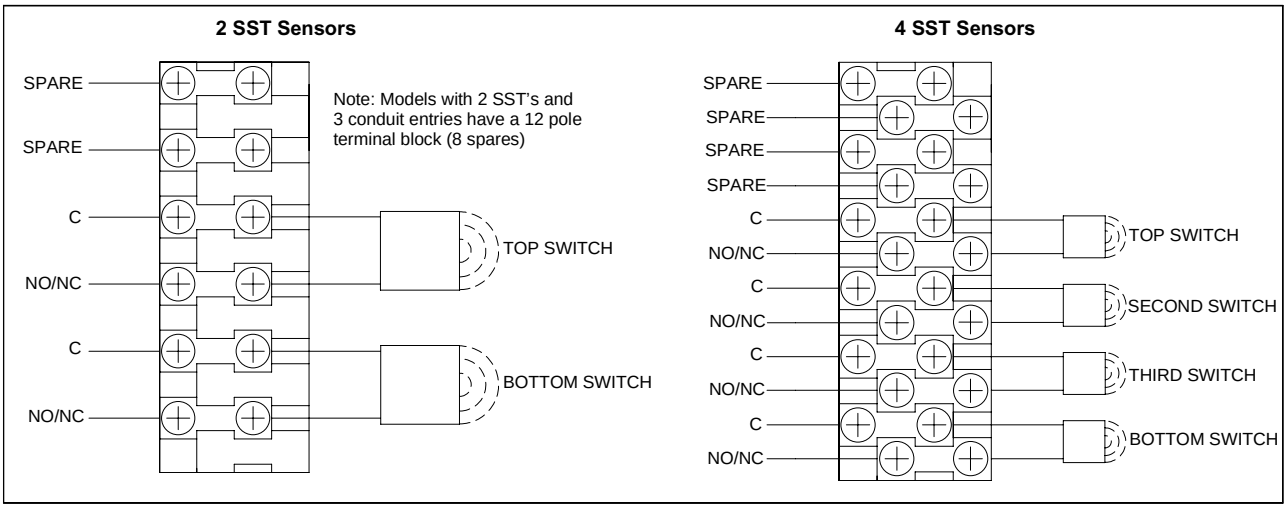
5 WIRING DIAGRAMS

5.1 Inductive Proximity Sensors

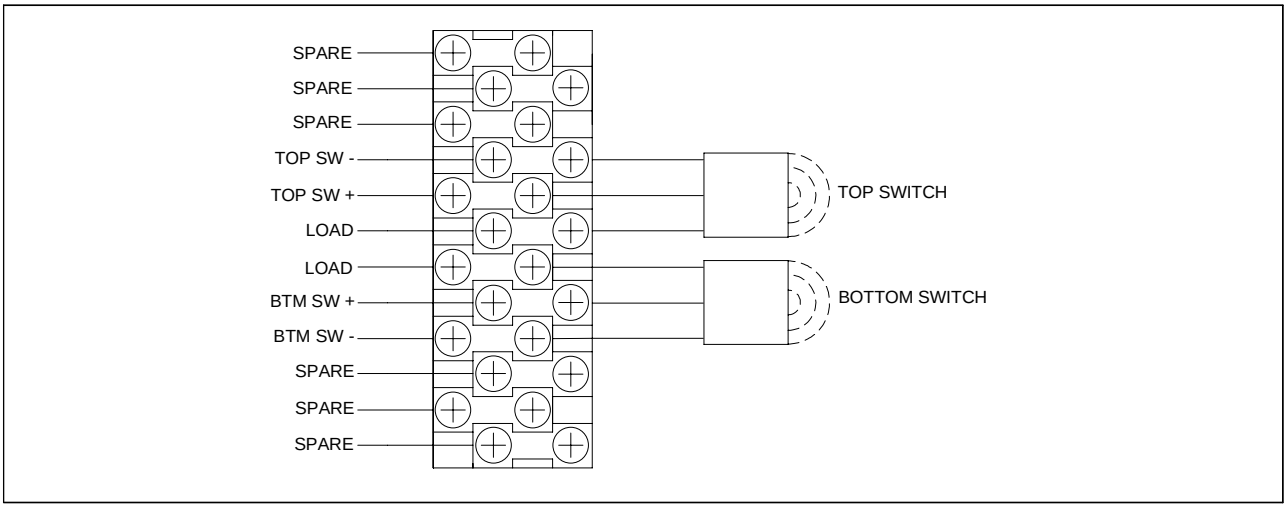
5.1.1 Type 33



5.1.2 Type X

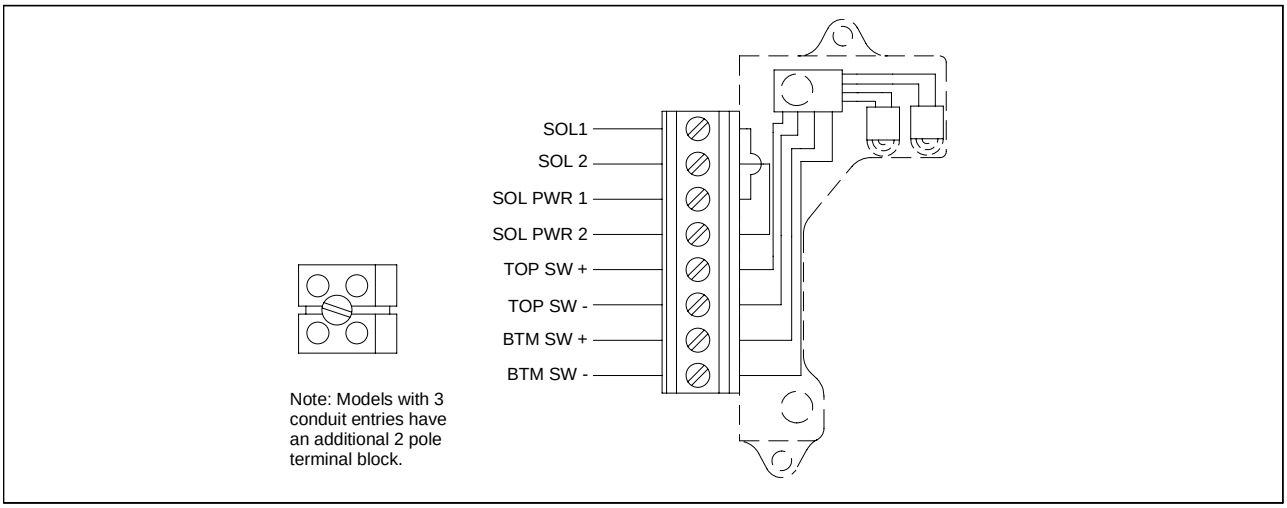


5.1.3 Types E and F

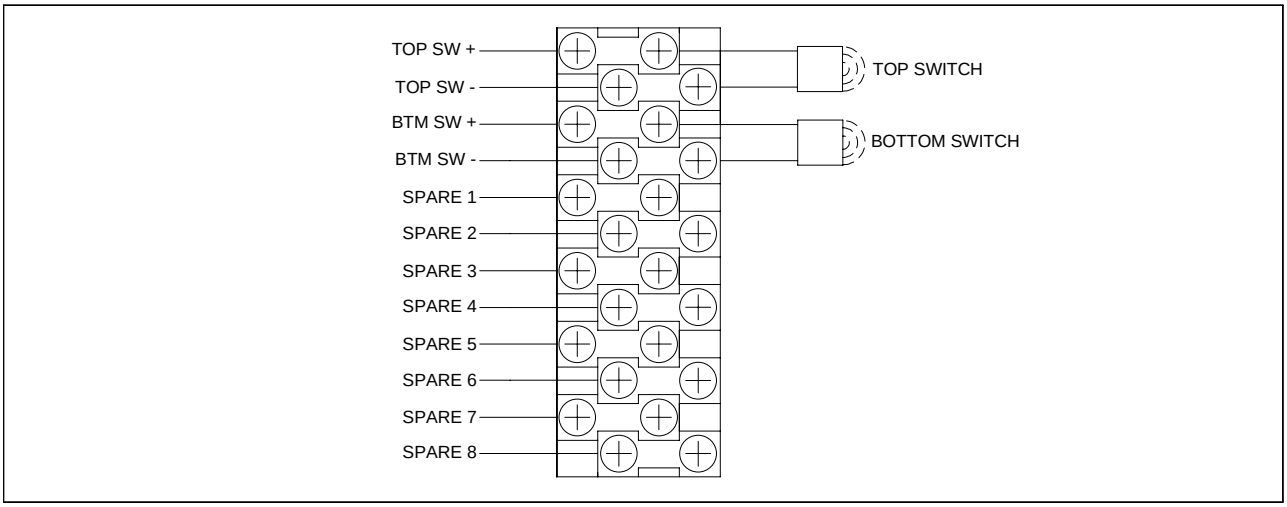


5.2 Intrinsically Safe Inductive Proximity Switches

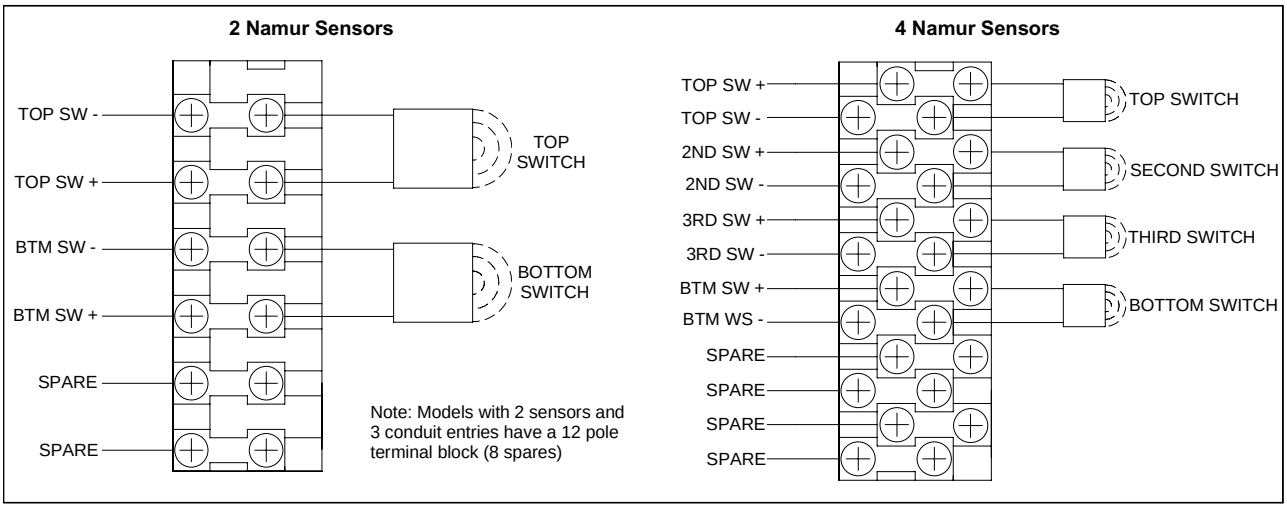
5.2.1 Type 44



5.2.2 Type A

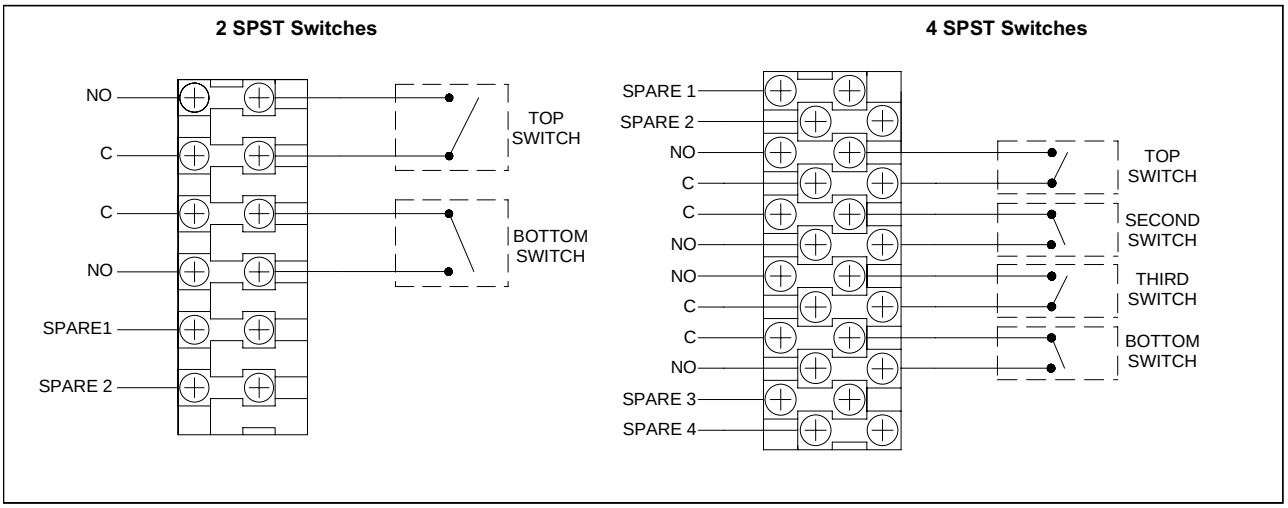


5.2.3 Type N

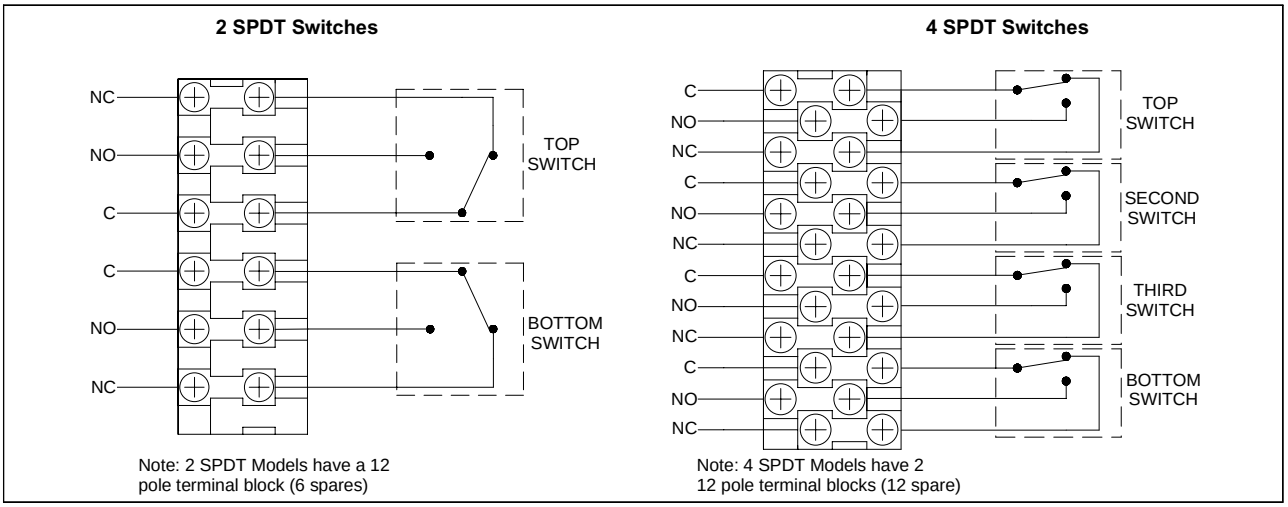


5.3 Reed Type Proximity Switches

5.3.1 Types P and L

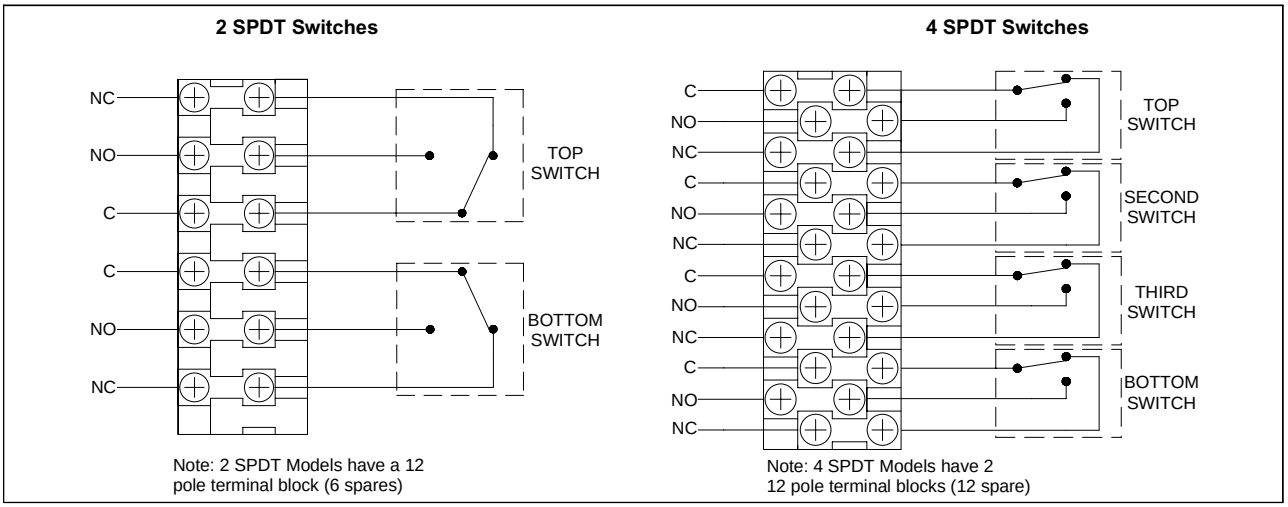


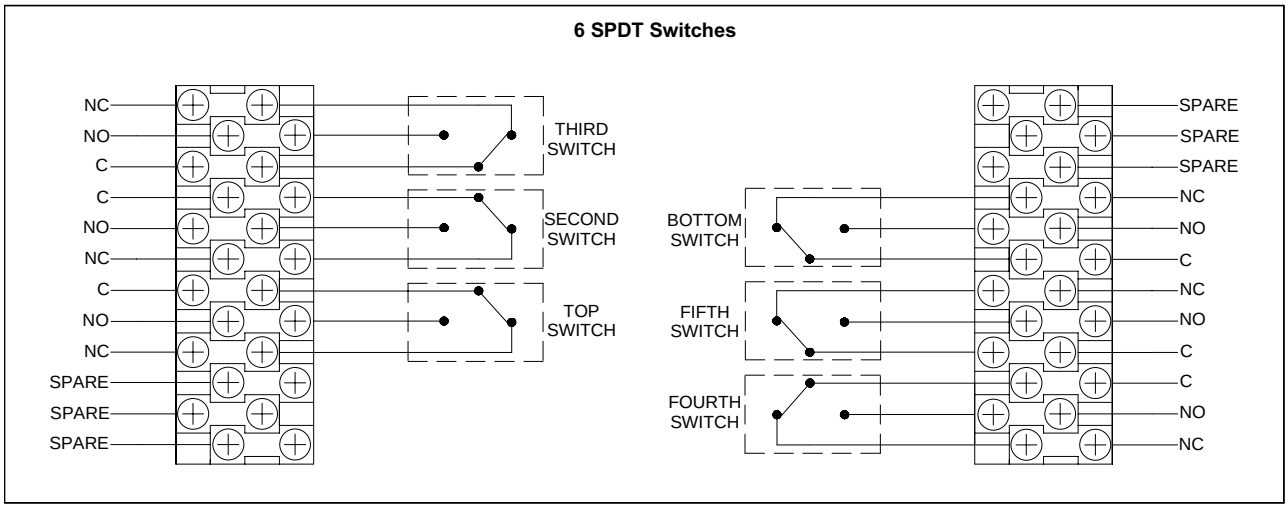
5.3.2 Types G, H and S



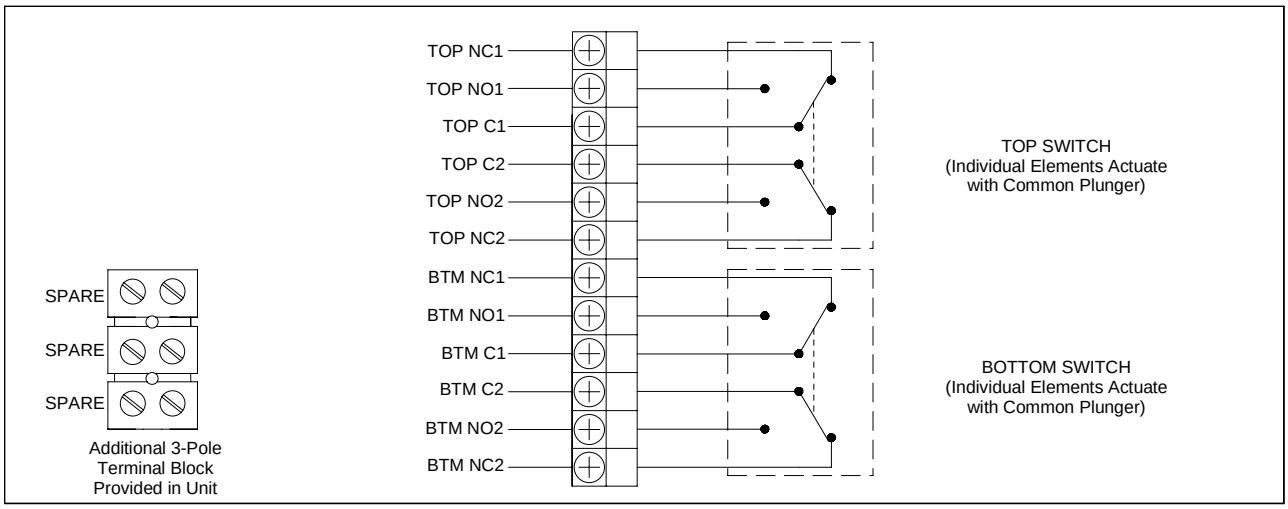
5.4 Mechanical Micro Switches

5.4.1 Types V and W



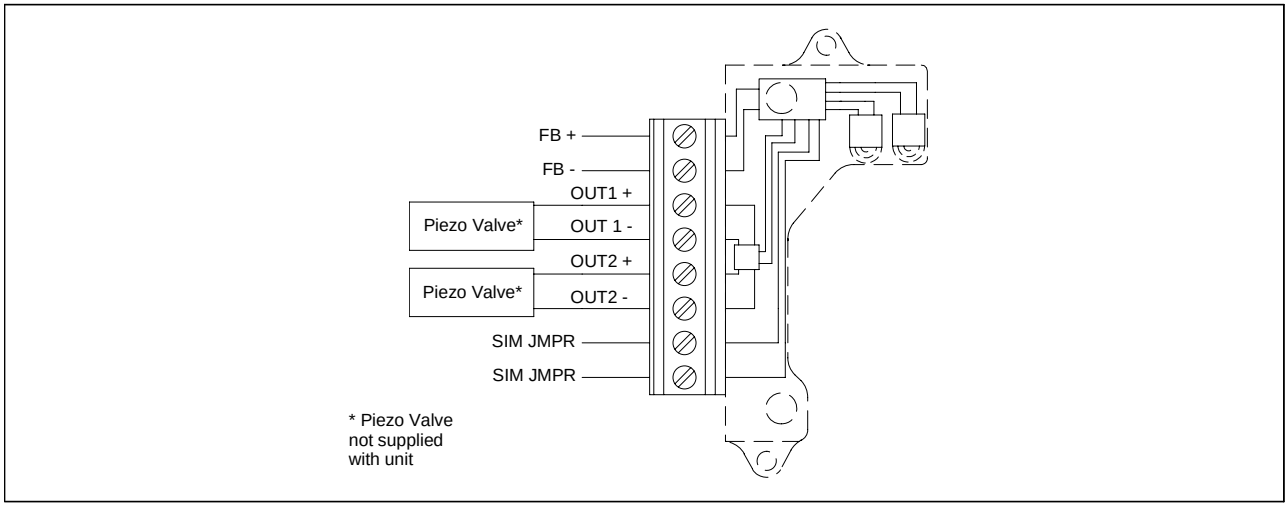


5.4.2 Type 14

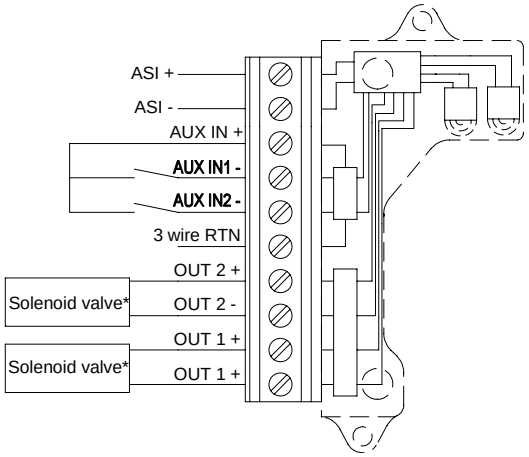


5.5 Valve Control Terminals (VCT)

5.5.1 Type 93

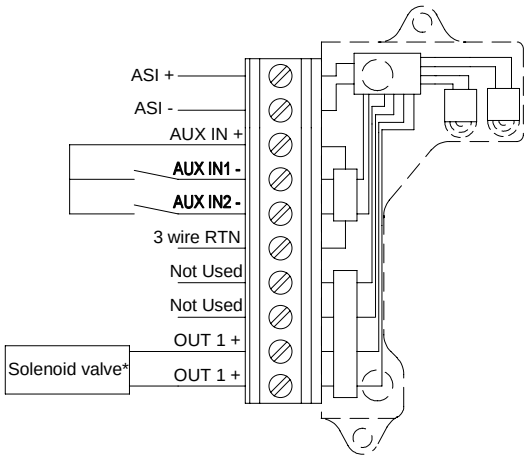


5.5.2 Type 96



* Solenoid valves not supplied with unit

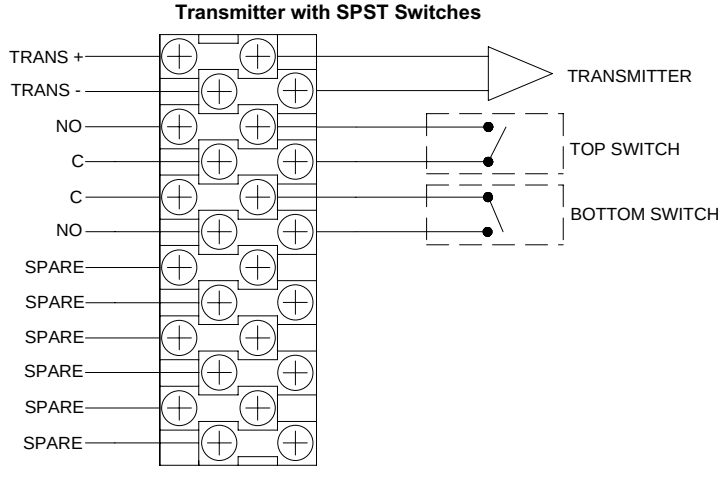
5.5.3 Type 97



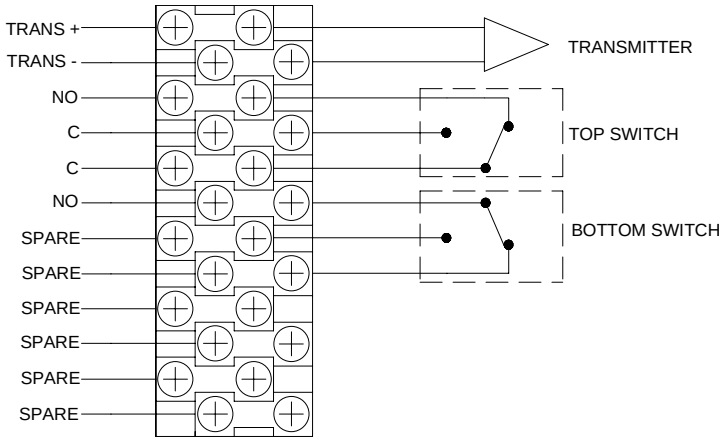
* Solenoid valve not supplied with unit

5.6 Position Transmitters

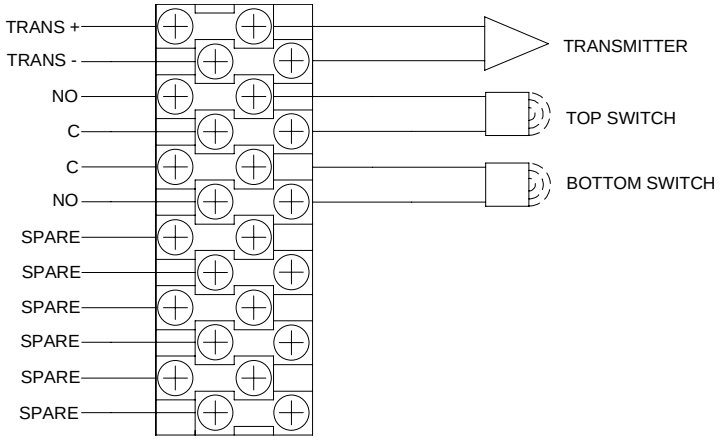
5.6.1 Types 50 and 70



Transmitter with SPDT Switches



Transmitter with Solid State Switches



6 TYPE CODE

Limit switch, Neles Quartz

1.	2.	3.	4.	5.	6.	7.	8.
QX	2	V	K	05	H	D	M

1.	PRODUCT GROUP
	Neles Quartz, Limit switch with mechanical or proximity switches or position transmitter.
QX	**ATEX** certification: ATEX II 2 G c T5 Ex d IIC T5 Ta = -40 °C to +80 °C IP67 Applicable to 4. sign "K" Applicable to all switch options, 3. sign, except "94". **FM** certification: Explosionproof for Class I, Div. 1, Groups BCD, T5 Ta = -40 °C to +80 °C; Dust-ignitionproof for Class II, Div. 1, Groups EFG, T5 Ta = -40 °C to +80 °C; NEMA 4, 4X, 6 Applicable to 4. sign "B" Applicable to all switch options, 3. sign, except "A", "N", "44" or "94" Nonincedive for Class I, Div. 2, Groups ABCD, T5 Ta = -40 °C to +80 °C; Suitable for Class II, Div. 2, Groups FG, T5 Ta = -40 °C to +80 °C; NEMA 4, 4X, 6 Applicable to 4. sign "B" Applicable to all switch options, 3. sign, except "A", "N", "V", "W", "14", "44" or "94". **cFM** (Canada) certification: Explosionproof for Class I, Div. 1, Groups BCD, T5 Ta = -40 °C to +80 °C; Dust-Protected for Class II, Div. 1, Groups EFG, T5 Ta = -40 °C to +80 °C; NEMA 4, 4X, 6 Applicable to 4. sign "B" Applicable to all switch options, 3. sign, except "A", "G", "N", "44" or "94" Ignition Protected Apparatus for Class I, Div. 2, Groups ABCD, T5 Ta = -40 °C to +80 °C; Suitable for Class II, Div. 2, Groups FG, T5 Ta = -40 °C to +80 °C; NEMA 4, 4X, 6 Applicable to 4. sign "B" Applicable to all switch options, 3. sign, except "A", "G", "N", "V", "W", "14", "44" or "94".
QN	**ATEX** certifications: II 1 G Ex ia IIC T5...T1 Ta*, IP67 See certificate for Ta* Applicable to 3. sign "44", "A" or "N" Applicable to 4. sign "K" or "A"" **FMus** and **cFM** certifications: Intrinsically safe for Class I, II, III, Divisions 1, Groups A, B, C, D, E, F, G Applicable to 3. sign "O", "44", "A" or "N" Applicable to 4. sign "B" or "P" Applicable to 5. sign "02" or "03" Nonincendive for Class I, Division 2, Groups A, B, C, D Not applicable to 3. sign "44", "A", "N", "G", "V", "W" or "14" Applicable to 4. sign "B" or "P" Applicable to 5. sign "02" or "03"
QG	General purpose type, no certificates. Not applicable to 2. sign "6" Only available with mechanical micro switches, 3. sign "V", "W" or 14". Applicable to 4. sign "P" only.

2.	QUANTITY OF SWITCHES / FUNCTION
	2. sign to be empty when the 3. sign "14", "33", "44", "93", "94" or "96" is selected.
2	2 switches Not applicable to 3. sign "X", "14", "33", "44", "93", "94" or "96"
4	4 switches Not applicable to 3. sign "A", "14", "33", "44", "93", "94" or "96"
6	6 switches Applicable to 3. sign "V" or "W"
5	Standard position transmitter Accuracy ±0.85°, cycle life 2 million rotations Two wire, 4-20 mA, supply source 10-40 V DC, max. load 700 Ω at 24 V DC With two switches or without switches. If 3. sign is "O", no switches are included. Not applicable to 3. sign "14", "33", "44", "93", "94" or "96"
7	High performance position transmitter Accuracy ±0.35°, cycle life 50 million rotations Two wire, 4-20 mA, supply source 10-40 V DC, max. load 700 Ω at 24 V DC With two switches or without switches. If 3. sign is "O", no switches are included. Not applicable to 3. sign "14", "33", "44", "93", "94" or "96"

3.	SWITCH TYPE
O	No switches. Applicable to 2. sign "5" or "7"
	Inductive Proximity Switches Temperature range -40 ºC to +80 °C / -40 ºF to +176 °F.
33	SST Sensor Dual Module, 2 switches, NO, 8-125 V DC / 24 - 125 V AC
X	SST Sensor, NO, 8-125 V DC / 24-125 V AC. Not applicable to 2. sign "2", use 3. sign "33" for "2X"
E	P+F; NBB2-V3-E0-V5, NPN, 3-wiretype, 100 mA, 10 - 30 V DC Temperature range -25 ºC to +80 °C / -13 ºF to +176 °F.
F	P+F; NBB2-V3-E2-V5, PNP, 3-wiretype, 100 mA, 10 - 30 V DC Temperature range -25 ºC to +70 °C / -13 ºF to +158 °F.
	Intrinsically Safe Inductive Proximity Switches Temperature range -40 ºC to +80 °C / -40 ºF to +176 °F.
44	Namur Sensor Dual Module, 2 switches, (DIN 19234), 6 - 29 V DC; >3 mA; < 1 mA.
A	P+F; NJ2-12GK-SN, 2-wire type, DC; > 3 mA; < 1 mA. Temperature range -40 ºC to +62 °C / -40 ºF to +144 °F.
N	P+F; NJ2-V3-N, 2-wire type, DC; > 3 mA; < 1 mA. Temperature range -25 ºC to +80 °C / -13 ºF to +176 °F.
	Reed Type Proximity Switches Temperature range -40 ºC to +80 °C / -40 ºF to +176 °F.
H	Maxx-Guard, SPDT, 300 mA, 20-250 V AC
L	Maxx-Guard, with LED, SPST, 150 mA, 9-250 V AC
P	Maxx-Guard, SPST, 0.3 A, 150 mA, <250 V AC
S	Maxx-Guard, with LED, SPDT, 300 mA, 20-250 V AC
G	Maxx-Guard, SPDT, 300 mA, <125 V AC
	Mechanical Micro Switches Temperature range -40 ºC +80 °C / -40 ºF to +176 °F.
V	V3L-389; 10 A – 250 V AC, 0.5 A – 125 V DC
W	V3L-507-D8; gold plated contacts, 0.5 A - 30 V DC, 1 A - 125 V AC
14	ITW/Licon; 22-104; DPDT, 4.5 A – 250 V AC, 2 switches
	Valve Communication Terminal (VCT), 2 switches Temperature range -40 ºC to +80 °C / -40 ºF to +176 °F.
93	FOUNDATION Fieldbus VCT, bus powered. Physical layer according to IEC 61158-2.
96	AS-Interface VCT
97	AS-Interface VCT, Extended addressing

4.	ENCLOSURE
	Standard IP67 (4, 4X & 6) enclosure. Cover height depends on the 2. sign (see Section 4 for details).
	Aluminum Cover Epoxy coated anodized aluminum
K	Applicable to 1. sign "QX" or "QN" with ATEX certifications
B	Applicable to 1. sign "QX" or "QN" with FM/cFM certifications
	Clear Cover Lexan® polycarbonate
A	Applicable to 1. sign "QN" with ATEX certificate
P	Applicable to 1. sign "QN" with FM/cFM certificate or "QG"

5.	CONDUIT ENTRY
02	1 pc. 3/4" NPT and 1 pc. 1/2" NPT Applicable to all enclosure options, 4.sign
03	1 pc. 3/4" NPT and 2 pcs 1/2" NPT Applicable to all enclosure options, 4.sign
05	2 pcs. M20x1.5 Not applicable to 4.sign "B" or "P" when 1. sign is "QX" or "QN"
06	3 pcs. M20x1.5 Not applicable to 4.sign "B" or "P" when 1. sign is "QX" or "QN"

6.	SHAFT
H	Attachment face according to standard VDI/VDE 3845, equipped with an H-clip.

7.	INDICATOR
D	Red-Closed Green-Open

8.	LABEL
M	Metso

Metso Automation Inc.

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South America, Av. Independéncia, 2500-Iporanga, 18087-101, Sorocaba-São Paulo, Brazil. Tel. +55 15 2102 9700. Fax +55 15 2102 9748
Asia Pacific, 20 Kallang Avenue, Lobby B, #06-00, PICO Creative Centre, Singapore 339411, Singapore. Tel. +65 6511 1011. Fax +65 6250 0830
China, 19/F, the Exchange Beijing, No. 118, Jianguo Lu Yi, Chaoyang Dist, 100022 Beijing, China. Tel. +86-10-6566-6600. Fax +86-10-6566-2575
Middle East, Roundabout 8, Unit AB-07, P.O. Box 17175, Jebel Ali Freezone, Dubai, United Arab Emirates. Tel. +971 4 883 6974. Fax +971 4 883 6836

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