

## Installation, Operating & Maintenance Instructions

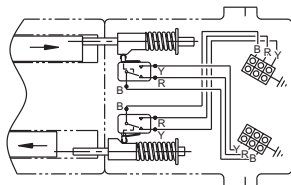
# Norbro J-Switch



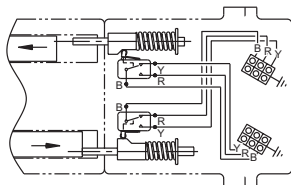
# INTRODUCTION

The J-Switch is a control package incorporating switches, sensors or pneumatic valves for actuator end of travel indication. It is retrofittable to all sizes and revisions of Norbro 40R series actuators from size 10 to 42 and 40 series from size 10 to 50 by simply specifying the product with the relevant operating pin lengths, removing the actuator blanking plugs and attaching to the actuator endcap. It may also be supplied factory fitted to the actuator.

## Example X29 Option



Pistons Together



Pistons Apart

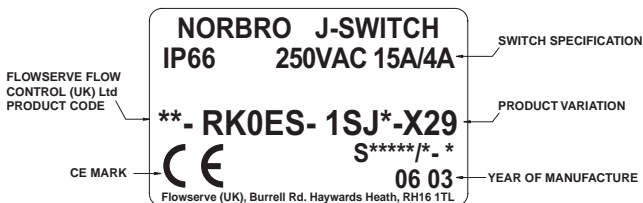
## 1 STORAGE AND PRESERVATION

When dispatched, all J-Switches are prepared for storage. All protective packaging, end cap port plugs, pinion covers etc. should remain in position until the J-Switch is due to be installed. J-Switches should be stored in a clean, dry environment.

## 2 J-SWITCH MARKINGS

Each J-Switch has the following identification information on the product label attached to the side of the body:

### Non-ATEX J-Switch Label



### ATEX J-Switch Label



ATEX Directive: If the product label carries the ATEX Directive number '94/9/EC' followed by the Explosion Protection Symbol and codes identifying the equipment group and category, the zone suitability and protection type beside the CE mark, the product complies with the ATEX Directive and The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996.

Definition of product label marking above:

'II' = Equipment Group; '2' = Equipment Category; 'G' = Gas Zone suitability (Zones 1 & 2); 'D' = Dust Zone suitability (Zones 21 & 22); 'c' = type of protection i.e. constructional safety (prEN 13463-5); 'X' = Refer to IOM for special safety instructions.

EEx = Explosion protection to:

'd' = Flameproof enclosure.

'ia' = Intrinsic safety.

'n' = Non-incendiary.

Surface Temperature: As per EN 13463-1:2001(E) paragraph 14.2.g, the temperature class or maximum surface temperature cannot be marked on the product as it is dependant on the operating conditions.

### 3 HEALTH AND SAFETY

When installing or maintaining J-Switch:

- a) Conduct a risk assessment and eliminate or reduce hazards to an acceptable level.
- b) Work in accordance with Safe Systems of Work.
- c) Observe all site Health and Safety Rules in particular Permit to Work and Hot Work procedures.
- d) Wear all necessary Personal Protective Equipment.
- e) Never remove or maintain a J-Switch or joint unless the actuator supply has been fully de-pressurised, drained and where necessary, purged of toxic / explosive / flammable media. Always operate the actuator to ensure that no trapped pressure exists.
- f) Never use a J-Switch on a duty, which exceeds its prescribed operating parameters. Refer to Flowserve Flow Control (UK) Ltd. Technical Sales for further information.
- g) Never modify or alter J-Switches unless the manufacturer has been consulted and/or recommends such changes.
- h) Due to the large physical size and weight of some sizes of this product, always use correct lifting methods and equipment when installing, removing and maintaining the product, and that it is correctly supported in its final operating location.
- i) Due to the variety of duties on which this product can be employed, it is the end users responsibility to ensure the compatibility of the product with the specific application (i.e. signal voltage, corrosion, which may effect it's suitability).
- j) Before equipment is installed in areas which may be subject to seismic activity or extreme climatic conditions consult Flowserve Flow Control (UK) Ltd. Technical Sales.
- k) If the processes or environments that the products are used in are likely to cause temperatures (high or low) that may cause injury to personnel if touched, then adequate insulation/protection must be fitted.
- l) If the equipment is to be used on unstable gas duty, ensure that the operational parameters as indicated on the product label cannot be exceeded.
- m) Do not rub J Switch with a dry cloth as this can cause a build up of static charge. Only clean with a damp cloth.

## 4 SPECIFICATION

### 4.1 ENVIRONMENTAL CONSIDERATIONS

It should be noted that the successful use of this device in wet, or other detrimental environments (e.g. the intrinsically safe version for hazardous areas) depends on proper conduit installation techniques.

Electrical conduit options are M20 x 1.5p, Pg 13.5, Pg 16, ½ NPT and Plug / Socket.

To uphold the IP66 rating obtained on the J-Switch product, a conduit gland of equal or better IP rating should be fitted.

The operating temperature of the J-Switch is restricted to the temperature range of the switch option chosen. This information is detailed in the switch operating specifications. Standard J-Switch enclosure temperature range (excluding switch, sensor, valve and terminal temperature limits) is -20°C to +100°C.

### 4.2 SWITCH & SENSOR OPTIONS / ELECTRICAL SPECIFICATIONS

Detailed below are the switch, sensor and valve options available and their specific characteristics, operating voltages, current ratings, the working temperature range and the type of wire termination. ATEX marked variants are suitable for IICGDC.

#### ● X23 Ex N/d II Single Pole Double Throw (SPDT) ATEX

5A resistive 3A inductive up to 30VDC

5A resistive 5A inductive up to 250VAC

Switch temperature range -62°C to +150°C

**SWITCH RATED LIFE:** 25 000 cycles

**NOTE:** The J-Switch enclosure temperature range (excluding switch temperature limits) is -20°C to +100°C.

Working temperature range for this option is -20°C to +100°C.

The flying leads which are 900mm in length are an integral part of the switch. Ensure that the wires are terminated by a qualified electrician to a suitable customer supplied device.

#### ● X26 Gold contacts

Ex N/d II Single Pole Double Throw (SPDT) ATEX

5A resistive 3A inductive up to 30VDC

5A resistive 5A inductive up to 250VAC

Switch temperature range -62°C to +150°C.

**SWITCH RATED LIFE:** 25 000 cycles

**NOTE:** The J-Switch enclosure temperature range (excluding switch temperature limits) is -20°C to +100°C.

Working temperature range for this option is -20°C to +100°C.

The flying leads which are 900mm in length are an integral part of the switch.

Ensure that the wires are terminated by a qualified electrician to a suitable customer supplied device.

## 4 SPECIFICATION (cont.)

- **X29** Gold contacts  
Single Pole Double Throw (SPDT)  
10A resistive 4A inductive up to 12 VDC  
10A resistive 1.5A inductive up to 24 VDC  
15A resistive 4A inductive up to 250 VAC  
Switch temperature range -40°C to +85°C  
**SWITCH RATED LIFE:** 10 000 000 cycles  
**NOTE:** The J-Switch enclosure temperature range (excluding switch temperature limits) is -20°C to +100°C.  
Working temperature range for this option is -20°C to +85°C.  
The switches are terminated in a 2 x 3 way terminal strip mounted on the bracket. There is also a plug/socket version available. All wiring must be carried out by a qualified electrician.
- **X56** Pneumatic "Normally Non Passing" 2/2 Telemecanique Electric valve  
'Push In' connectors for 4 mm diameter plastic tubing.  
0 to 6 bar.  
**SWITCH RATED LIFE:** 10 000 000 cycles  
**NOTE:** The J-Switch enclosure temperature range (excluding valve temperature limits) is -20°C to +100°C.
- **X66** EEx d IIc Single Pole Double Throw (SPDT) **ATEX**  
5A resistive 3A inductive up to 30VDC  
5A resistive 5A inductive up to 250VAC  
Switch temperature range -20°C to +55°C  
**SWITCH RATED LIFE:** 1 000 000 cycles  
**NOTE:** The J-Switch enclosure temperature range (excluding switch temperature limits) is -20°C to +100°C.  
Working temperature range for this option is -20°C to +55°C.  
The flying leads which are 0.5 metres in length are an integral part of the switch.  
Ensure that the wires are terminated by a qualified electrician to a suitable customer supplied device.

### INTRINSICALLY SAFE VARIATIONS

**NOTE:** Switches / sensors are simple apparatus and therefore can be used for I.S. circuits with an appropriate barrier.

- **X65** As X29, but labelled **INTRINSICALLY SAFE. ATEX**
- **P&F** EEx ia IIC T6 inductive proximity sensor **ATEX**  
2 wire  
8 VDC, <1 mA actuated, >3 mA unactuated  
Sensor temperature range -25°C to +100°C.  
**SWITCH RATED LIFE:** 165 years at 30°C  
**NOTE:** The J-Switch enclosure temperature range (excluding sensor temperature limits) is -20°C to +100°C.  
The working temperature range for this option is -20°C to +100°C.  
The sensors are terminated in a 2 x 2 way terminal strip mounted on the bracket. All wiring must be carried out by a qualified electrician.

## 5 INSTALLATION

The J-Switch can be supplied either as a retrofitable product to a Norbro actuator or pre-assembled by the factory to a Norbro actuator.

**WARNING:** Prior to fitting the J-Switch to a Norbro actuator, it is necessary to fully vent all actuator chambers of pressure. This can be done by isolating the feed air supply, then venting both the air chambers within the actuator.

To achieve this, operate the solenoid/control valve to both positions with no supply pressure which will allow both chambers to vent.

### 5.1 FITTING A J-SWITCH TO A NORBRO ACTUATOR

- a) Remove the two end cap plugs from the switch end cap.
- b) Remove the J-Switch cover and the plastic bag containing 'O' rings, screws and bonded seals.
- c) Remove bracket screws in base of enclosure.
- d) Remove bracket assembly from housing, noting the orientation of the bracket assembly with the housing conduit entry.
- e) Fit greased 'O' rings (two large, two small) to external recesses of housing.
- f) Align the housing (standard build conduit entry facing down) with the actuator end cap fixing pattern.
- g) Place bonded seals over appropriate screws and secure housing to actuator end cap.  
**IMPORTANT:** Ensure that the operating pins on the bracket assembly are adjusted so that the slotted end of the pins have approximately 9mm protruding above the top lug.
- h) Insert bracket assembly into housing in the same orientation as when it was removed, through into actuator (long operating pin into left hole).
- j) Secure with the two mounting screws.
- k) Temporarily fit the cover and pressurise the left inlet end cap port of the actuator. Check the end cap / housing interface integrity with leak detection fluid. Remove all excess fluid after the check has been completed.

## 5 INSTALLATION (cont.)

### 5.2 ADJUSTING THE SWITCH AND SENSING POSITIONS

Actuators factory fitted with a J-Switch are dispatched from Flowserve Flow Control (UK) Ltd. with the switch / sensor switching point already set at the stroke end positions. However, minor adjustments may be required once the product has been installed (e.g. fitted to a valve with restricted rotation).

If adjustment is required, follow the instructions below:-

- a) Remove the J-Switch cover, pressurise the right inlet endcap port.  
The actuator will rotate anti-clockwise (pistons apart - open).
- b) Viewed from the J-Switch, rotate the left operating pin anti-clockwise (retracting the operating pin) by approximately three rotations.
- c) Rotate the operating pin clockwise until the microswitch 'clicks' or the sensor operates.  
Release the pressure from right inlet end cap port.
- d) Pressurise the left inlet endcap port. The actuator will rotate clockwise (pistons together - closed).
- e) Viewed from the J-Switch, rotate the right operating pin anti-clockwise (retracting the operating pin) by approximately three rotations.
- f) Rotate the operating pin clockwise until the microswitch 'clicks' or the sensor operates.  
Release the pressure from left inlet end cap port.
- g) Check switch function by cycling the actuator with an Ohmmeter across the appropriate terminals of one switch.
- h) Repeat (g) for the other switch.

**NOTE:** Sensor function can be checked in a similar way with an appropriate checking device.

The J-Switch has now been correctly adjusted and can be wired to another device by a qualified electrician. The cover must now be replaced.



## **6 OPERATION**

The cover of the J-Switch must be fitted and the enclosure fully sealed before the actuator can be operated. This should only be done in accordance with site procedures by authorised personnel.

The J-Switches switch / sensor only operates when the actuator has been pressurised and has travelled to the extreme of its travel or is in its end of travel position while unpressurised.

## 7 MAINTENANCE

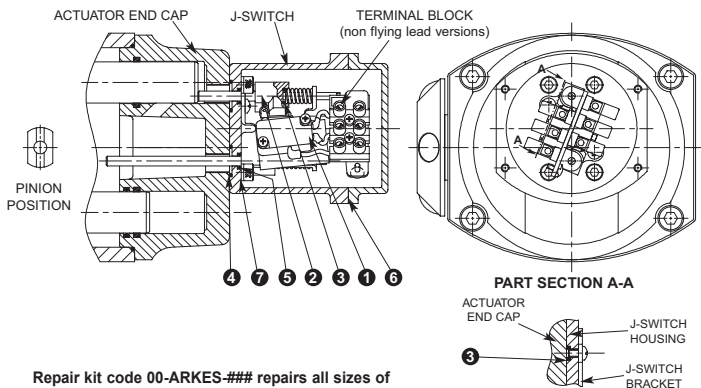
**WARNING:** Maintenance must be carried out by qualified personnel.

Prior to any maintenance being carried out on the J-Switch it is necessary to fully vent all actuator chambers of pressure. This can be done by isolating the feed air supply then venting both the air chambers within the actuator. To achieve this, operate the solenoid / control valve to both positions with no air supply pressure, which will allow both chambers to vent. The device may have live AC / DC connection therefore all electrical supplies to the J-Switch must be disconnected.

All local wiring regulations must be followed.

### 7.1 REPAIR KIT

#### ACTUATOR SHOWN PISTONS TOGETHER (CLOSED POSITION)



Repair kit code 00-ARKES-### repairs all sizes of J-Switch attached 40R & 40 Series of designated switch option.

Grease: Rocol Sapphire Lo-Temp 2

Item No.	Description	Qty.	Part No.
1*	Switch / roller lever assembly / insulator sheet	2	### in repair kit code
2	Cam	2	ES-10-208
3	'O' Ring - housing screw recess and cam	4	R008
4	'O' Ring - housing pin recess	2	R014
5	'O' Ring - pin	2	R802
6	Cover gasket	1	ES-10-230
7	Bonded seal	4	PP45-3

\* All switches and sensors are supplied with leads attached. Certain switch options are provided with soldered leads for termination to the terminal strip, others have a separate switch roller lever if applicable.

### Denotes switch type e.g. X29.

## 7 MAINTENANCE (cont.)

### 7.2 MAINTENANCE INSTRUCTIONS

Only components approved by the manufacturer should be used for the repair and maintenance of the J-Switch. Flowserve Flow Control (UK) Ltd. will not accept any responsibility for problems arising from the use of non-authorised components.

For each of the J-Switch repair kit switch / sensor / valve options, the contents can be used to repair all sizes of J-Switch attached to both the 40R / 40 series of actuator.

To order the correct repair kit for the J-Switch product, clearly state the switch, sensor or valve type or the complete J-Switch product coding from the label.

### 7.3 DISMANTLING INSTRUCTIONS

**WARNING: Maintenance must be carried out by qualified personnel. All local wiring regulations must be followed.**

**Before removing the J-Switch cover, ensure that electrical supply has been isolated. It is also necessary to fully vent all actuator chambers of pressure. This can be done by isolating the feed air supply, then venting both the air chambers within the actuator. To achieve this, operate the solenoid / control valve to both positions with no supply pressure which will allow both chambers to vent.**

#### 7.3.1 DISMANTLING

- a) Remove cover screws and cover.
- b) Disconnect customer wires from terminal strips, noting the colours for each termination.
- c) Remove bracket screws in base of enclosure.
- d) Remove bracket assembly from housing.
- e) Remove housing to actuator screws.
- f) Remove housing from actuator end cap.
- g) Loosen switch wires from terminal strips (if present).
- h) Remove switch securing screws.
- j) Remove switches (insulation sheet and lever operators if present).
- k) Rotate an operating pin clockwise, viewed from the slotted end. The operating pin will become disengaged from the cam. Withdraw from bracket assembly whilst constraining the spring and the cam.
- l) Compress cam spring enough to withdraw cam and spring from bracket.
- m) Repeat for remaining operating pin / spring / cam.  
Remove all 'O' rings taking care not to damage grooves or sealing surfaces.  
Carefully clean components and check for damage.

## 7 MAINTENANCE (cont.)

### 7.4 RE-ASSEMBLY

**NOTE:** Where greasing is specified, use Rocol Sapphire Lo-Temp 2 Grease.

#### 7.4.1 HOUSING / END CAP

- a) Ensure that the sealed recesses are clear and undamaged.
- b) Fit greased 'O' rings (two large, two small) to external recesses of housing.
- c) Align the housing (standard build conduit entry facing down) with the actuator end cap fixing pattern.
- d) Place bonded seals over appropriate screws and secure housing to actuator end cap.

#### 7.4.2 BRACKET ASSEMBLY

- a) Fit greased 'O' ring to cam recess.
- b) Place spring on cam 'O' ring.
- c) Compress cam spring enough to insert cam and spring between bracket lugs (cam ramp must be positioned at the base and towards centre of bracket).
- d) Insert slotted end of long operating pin through base of bracket on earth point "E" side of bracket (size 10 has operating pins of equal length). Rotate slotted end anti-clockwise until approximately 9mm is protruding above the top lug.
- e) Repeat for other operating pin / spring / cam
- f) **X29 AND P&F ONLY:** Secure the switch wires to the terminal strips, referring to the wiring diagram on the inside of the lid.
- g) Place switch and lever operator onto bracket (for the X29 place the insulating sheet between the switch and the bracket).
- h) Secure switch to bracket.
- j) Repeat for other switch.
- k) Fit greased 'O' rings over operating pins.

## 7 MAINTENANCE (cont.)

### 7.4.3 BRACKET / HOUSING ASSEMBLY

- a) With the earth point "E" facing the conduit entry (standard build conduit entry facing down), insert bracket assembly into housing and through into actuator (long operating pin into left hole). If the switch has flying leads, pull these through the conduit entry.
- b) Secure bracket to housing.

### 7.4.4 ADJUSTMENT AND TESTING

- a) Temporarily fit the cover and pressurise the left inlet end cap port of the actuator. Check the end cap / housing interface integrity with leak detection fluid. Remove all excess fluid after the check has been completed and remove cover.
- b) With the right inlet end cap port of the actuator pressurised, rotate the left operating pin clockwise until the switch activates. Repeat for the left port and right operating pin.
- c) With no electrical supply connected, cycle the actuator checking that the switches are activated.

**WARNING: The cover of the J-Switch must be fitted and the enclosure fully sealed before the electrical supply is connected and the actuator operated. This should only be carried out in accordance with site procedures by authorised personnel.**

- d) Re-connect customer wires to terminal strips, colour / termination as noted on removal and check that the switches function appropriately.
- e) Replace cover.

The J-Switch complies with the following European directives:

<b>89/36/EEC</b>	Electromagnetic Compatibility
<b>73/23/EEC</b>	Low Voltage Directive
<b>92/59/EEC</b>	General Product Safety
<b>94/9/EC</b>	ATEX Directive



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