
Screw limit switches. XRBA and XR2 ranges
Overtravel limit switches. XF9 range

Catalogue



Simply easy!™

Screw limit switches

Overtravel limit switches

Screw limit switches. XRBA and XR2 ranges

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Overtravel limit switches. XF9 range

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Screw limit switches XRBA and XR2 ranges

Applications	Standard duty ~ or ∴ (Ithe = 10 A)	Heavy duty ~ or ∴ (Ithe = 10 A)
		
Number of contacts	4 or 6	3, 4, 6, 10, 14, 20, 24 or 28
Conventional thermal current (Ithe)	10 A	10 A
Type of contacts	Single-pole C/O, snap action	Single-pole C/O, snap action
Reduction gear ratio	For 1 revolution of cams: 13/1, 17/1, 46/1, 60/1, 78/1, 210/1, 274/1 or 960/1	For 6 turns of threaded shaft: 0.4/6, 0.8/6, 1.6/6, 3/6, 6/6, 10/6, 20/6, 40/6, 80/6, 150/6, 300/6, 560/6 or 1100/6
Adaptation for potentiometer	•	–
Conformity to standards	IEC/EN 60947-5-1	IEC/EN 60947-5-1
Degree of protection	XRBA4: IP 55 conforming to IEC/EN 60529, IP 557 conforming to NF C 20-010 XRBA6: IP 55 conforming to IEC/EN 60529, IP 555 conforming to NF C 20-010	IP 54 conforming to IEC/EN 60529
Cable entry	1 tapped entry for n° 9 cable gland Clamping capacity 5 to 8 mm 1 tapped entry for n° 16 cable gland Clamping capacity 10 to 14 mm	2 tapped entries for n° 13 cable gland Clamping capacity 9 to 12 mm
Materials	Stainless steel input drive shaft Aluminium alloy body housing XRBA4: aluminium alloy cover XRBA6: polyphenylene oxide cover	Aluminium alloy body housing, insulated cover
Type reference	XRBA	XR2AA
Pages	6	13

Heavy duty ~ or ☰ (Ithe = 10 A)



3, 4, 6, 10, 14, 20, 24 or 28

10 A

Single-pole C/O, snap action

For 6 turns of threaded shaft: 0.4/6, 0.8/6, 1.6/6, 3/6, 6/6, 10/6, 20/6, 40/6, 80/6, 150/6, 300/6, 560/6 or 1100/6

–

IEC/EN 60947-5-1

IP 54 conforming to IEC/EN 60529

Removable gland plate

Sheet steel enclosure

XR2AB

13

Heavy duty ~ or ☰ (Ithe = 20 A)



3, 5, 9, 13, 19, 23 or 27

20 A

Single-pole N/C or N/O, with snap action mechanism

For 6 turns of threaded shaft: 0.4/6, 0.8/6, 1.6/6, 3/6, 6/6, 10/6, 20/6, 40/6, 80/6, 150/6, 300/6, 560/6 or 1100/6

–

IEC/EN 60947-5-1

IP 54 conforming to IEC/EN 60529

Removable gland plate

Sheet steel enclosure

XR2B

13

Screw limit switches

Standard duty, XRBA range

Functions

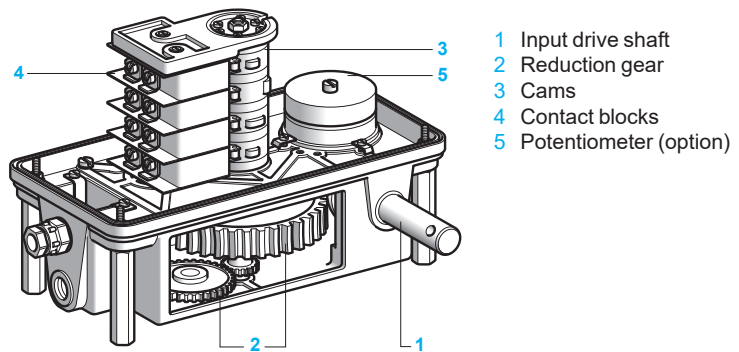
These switches are designed to monitor the movement of an object via an input drive shaft coupled to the actuator. Detection of position is ensured by a system of independently adjustable cams which actuate the electrical contact blocks.

They are usually used for applications where it is either impossible or impractical to mount standard type position sensors that are actuated directly by the moving object.

Main applications:

- position control of moving parts of hoisting or materials handling equipment (winches, travelling cranes, gantries, cranes, rotary excavators, etc.).
- liquid level control in pumping systems.

Description



Operation

The input drive shaft, which is coupled to the machine part being controlled, is normally fitted on the right-hand side. This transmits the movement by means of a worm screw and reduction gear to a set of 4 or 6 independent cams which, in turn, operate the contact blocks.

A choice of 3 cam types (20°, 50° and 80°) enables a wide range of cam arrangements to be achieved.

The cams are easily accessible and individual adjustment of the cams is a simple operation, without risk of affecting the setting of adjacent cams.

As an option, a potentiometer can be fitted in order to provide an analogue output.

Environment			
Conformity to standards			IEC/EN 60947-5-1
Protective treatment	Standard version		"TC"
	Special version		"TH" on request
Ambient air temperature	For storage	°C	- 40...+ 70
	For operation	°C	- 25...+ 70
Shock resistance			80 gn (11 ms)
Vibration resistance			> 5 gn (10...60 Hz)
Degree of protection			XRBA4●●●● : IP 55 conforming to IEC/EN 60529, IP 557 conforming to NF C 20-010 XRBA6●●●● : IP 55 conforming to IEC/EN 60529, IP 555 conforming to NF C 20-010
Materials			Stainless steel input shaft. Aluminium alloy body housing. Aluminium alloy cover for XRBA4●●●● Polyphenylene oxide cover for XRBA6●●●●
Cable entry			1 tapped entry for n° 9 cable gland (clamping capacity 5 to 8 mm) and 1 tapped entry for n° 16 cable gland (clamping capacity 10 to 14 mm)

Mechanical characteristics			
Reduction gear ratio	For 1 revolution of cams		13/1, 17/1, 46/1, 60/1, 78/1, 210/1, 274/1 or 960/1
Average drive torque	At 20°C	N.cm	5
Maximum speed of input drive shaft		rpm	1000
Mechanical durability			15 x 10 ⁶ drive shaft revolutions

Electrical characteristics of contacts			
Type of contacts			Single-pole C/O, snap action
Rated operational characteristics	Conforming to IEC/EN 60947-5-1		~ AC-15, A300 (U _e = 240 V, I _e = 3 A), --- DC-13, Q300 (U _e = 250 V, I _e = 0.27 A)
Conventional thermal current		A	I _{the} = 10
Rated insulation voltage	Conforming to IEC/EN 60947-1	V	U _i = 250
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1	kV	U _{imp} = 6
Resistance across terminals		mW	≤ 25
Short-circuit protection			10 A cartridge fuse type gG
Connection			Screw and captive cable clamp terminals. Clamping capacity: 2 x 1.5 mm ² with cable end Clips or solder tags available on request

Electrical durability		a.c. supply ~ 50/60 Hz					d.c. supply ---						
Conforming to IEC/EN 60947-5-1		Power broken in VA for 0.5 million operating cycles					Power broken in W for 0.5 million operating cycles						
Utilisation categories: AC-15 and DC-13													
Operating rate: 3600 operating cycles/hour													
Load factor: 0.5													
		Voltage (V)	12	24	48	127	220	Voltage (V)	12	24	48	110	220
		mm	18	35	700	165	220	mm	27	39	50	65	67
		mm	65	108	216	450	530	mm	55	84	110	130	135

Optional potentiometer characteristics (analogue output)			
Rotation ratio between cams and potentiometer			1, 1.5 (1.333) or 2 (1.933)
Maximum rotation angle of potentiometer			350°
Potentiometer type			Type SI, size 15, ball bearing mounted Power: 3 W Withstand voltage: 1500 V Ohmic value: 10 000 Ω (other values available on request)

Screw limit switches

Standard duty, XRBA range

534926



XRBA4●●●●



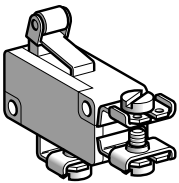
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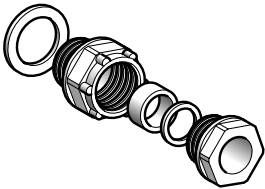
XRBA902



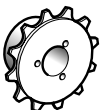
XRBA903



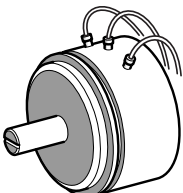
XEPA10801D64



DE9PL116044



XRZ91●



XRZ9●●

Screw limit switches

Description	Number of contacts	Basic reference, to be completed (1)	Weight kg
Screw limit switches (with bare drive shaft)	4	XRBA4●●●●	1.500
	6	XRBA6●●●●	1.350

Separate components and replacement parts

Description	Type	Reference	Weight kg
Cams	20° (2)	XRBA901	0.002
	50° (2)	XRBA902	0.002
	80° (2)	XRBA903	0.002
Contact block Short roller lever actuator 1 C/O snap action contact		XEPA1081D64	0.011
Cable glands	N° 16 plastic, clamping capacity 10 to 14 mm	DE9PL116044	0.008
Chain sprockets 12.7 mm pitch, for switch input drive shaft	12 teeth	XRZ912	0.080
	14 teeth	XRZ914	0.090
	16 teeth	XRZ916	0.100
Chains (12.7 mm pitch) conforming to standard NF E 26-101, chromium plated, with joining link (3)	L = 2 metres	XR2AZ302	0.600
	L = 5 metres	XR2AZ305	1.500
	L = 10 metres	XR2AZ310	3.000
Potentiometer Type SI, size 15, 3 W	10 000 Ω	XRZ9100	0.060

Other Ohmic values: please consult our Customer Care Centre.

(1) For completion of the basic reference, please refer to Order form on page 7.

(2) Average values.

(3) For liquid level control applications, the length of the chain should at least be equal to the difference between the upper and lower liquid levels + 0.50 m.

Customer		Schneider Electric		
Company	Order N°	Delivery date	Sales Office - Subsidiary Co.	Order N°

To use this order form:

- State the number of identical screw limit switches required
- Complete the basic reference with the 9 or 11 digits indicating the various switch options
- Mark the required cam arrangement on the drawing below.

For examples showing completion of the basic reference, refer to pages 8 and 9.

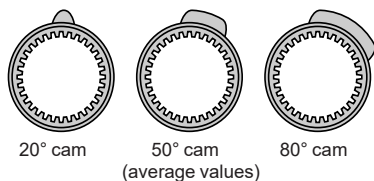
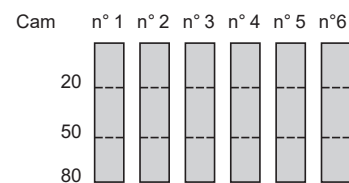
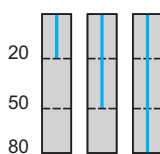
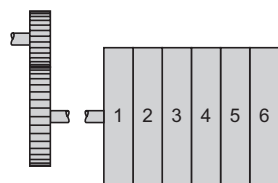
Number of identical switches	Basic reference, to be completed	Number of contacts	Reduction gear ratio	Drive shaft position	Adaptation for 10 kΩ potentiometer	Option cam					
						N°1	N°2	N°3	N°4	N°5 (1)	N°6 (1)
<input type="text"/>	XRBA <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Number of contacts											
Switch with 4 contacts		4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Switch with 6 contacts		6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Reduction gear ratio (for 1 revolution of cams)											
13/1			1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
17/1			2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
46/1			3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
60/1			4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
78/1			5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
210/1			6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
274/1			7	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
960/1			8	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Drive shaft position											
Right-hand side (standard model)				1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Left-hand side				2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Adaptation for 10 kΩ potentiometer											
Without adaptation					00	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
With adaptation, ratio 1					13	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
With adaptation, ratio 1.5 (1.333)					23	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
With adaptation, ratio 2 (1.933)					33	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Choice of cams (3 different angles, 4 or 6 positions)											
<i>To select a cam, add 4 digits for XRBA4 switches or 6 digits for XRBA6 switches.</i>											
20° cam						2	2	2	2	2 (1)	2 (1)
50° cam						5	5	5	5	5 (1)	5 (1)
80° cam						8	8	8	8	8 (1)	8 (1)

Required cam arrangement

The cam positioned nearest to the plate is considered as cam n° 1

Marking guide for cam arrangement diagram

Mark the required cam arrangement



(1) Do not add these digits for XRBA4 switches (with 4 contacts).

Note: If the above cam arrangement is left blank, the cams will be factory-mounted as standard as shown below:

Cam n°	1	2	3	4	5	6
XRBA4●●●●	20°	50°	80°	20°	—	—
XRBA6●●●●	20°	20°	50°	50°	80°	80°

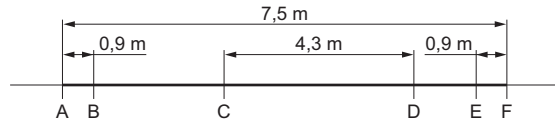
Example of a standard product: reference **XRBA45100** corresponds to a switch with 4 contacts, a reduction gear ratio of 78/1, a right-hand side shaft input and no potentiometer. The cams are positioned in the following order: 20°, 50°, 80° and 20°.

Application: monitoring the movement of a machine part

Example:

Monitoring the movement of a machine part from A to F (AF = 7.5 m) with potentiometer linked display.
Chain sprocket on switch input drive shaft: 16 teeth on 12.7 mm pitch.

- Point A** Stop position, direction F → A
- Point B** Slow-down position, direction F → A
- Points C and D** Specific points
- Point E** Slow-down position, direction A → F
- Point F** Stop position, direction A → F



Selection of switch and completion of basic reference

- **Number of contacts:** 6 positions to monitor, therefore, 6 contacts. **1st digit of reference:** **6**
- **Reduction gear ratio:** Distance AF = 7.5 m, therefore, number of turns of input drive shaft: $\frac{7.5}{16 \times 0.0127} = 37$
- **Select a reduction ratio whereby the number of turns of the input drive shaft is greater than 37**

	Reduction ratio between number of turns of drive shaft and 1 revolution of cams	Rotation ratio between cams and the potentiometer (actual value)	Maximum rotation of cams for 37 turns of switch input drive shaft	Maximum rotation of potentiometer
1 st solution	46/1	1	$\frac{360 \times 37}{46} = 289^\circ$	$\frac{360 \times 37}{46} \times 1 = 269^\circ$
2 nd solution	60/1	1.5 (1.333)	$\frac{360 \times 37}{60} = 222^\circ$	$\frac{360 \times 37}{60} \times 1.333 = 296^\circ$
3 rd solution	78/1	2 (1.933)	$\frac{360 \times 37}{78} = 171^\circ$	$\frac{360 \times 37}{78} \times 1.933 = 330^\circ$

Assume the 3rd solution is best suited for the application, which offers a wide potentiometer operating angle (330°) whilst maintaining cam setting flexibility (171° operating angle).

- **Reduction gear ratio:** 78/1 **2nd digit of reference:** **5**
- **Input drive shaft position:** Right-hand side preferred **3rd digit of reference:** **1**
- **Adaptation for potentiometer:** Value of 10 kΩ and a ratio of 2 **4th and 5th digits of reference:** **33**

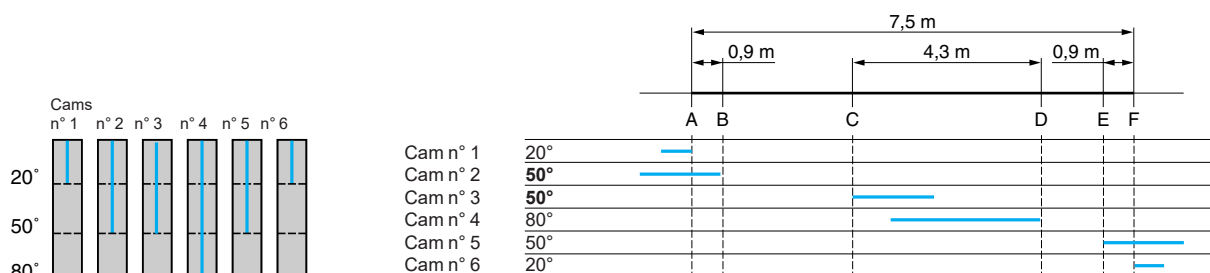
Reference of screw limit switch to be entered on Order form on page 7

XRBA

6	5	1	33
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Selection of cams, marking cam arrangement diagram

- **Point A - cam n° 1:** 20° cam (stop cam).
- **Point B - cam n° 2:** The selection of cam n° 2 is determined by the distance BA (0.90 m), giving:
A 20° cam could be used, but a 50° cam is more suitable in order to ensure an overlap with the stop cam. $\frac{171^\circ \times 0.90}{7.5} \approx 20^\circ$
- **Points C and D - cams n° 3 and 4:** The distance CD = 4.30 m, giving:
2 overlapping cams are required, for example: cam n° 3 = 50°, cam n° 4 = 80°. $\frac{171^\circ \times 4.30}{7.5} \approx 98^\circ$
- **Point E - cam n° 5:** The selection of cam n° 5 is determined by the distance EF (0.9 m), giving:
A 50° cam is therefore selected, for the same reasons as the cam for point B. $\frac{171^\circ \times 0.90}{7.5} \approx 20^\circ$
- **Point F - cam n° 6:** 20° cam (stop cam).



Specific application: liquid level control (1)

Selection guide table for reduction ratio between number of turns of switch input drive shaft and 1 revolution of the cams and chain sprocket size to be fitted to switch input drive shaft.

Change in level to be controlled (in metres)	Screw limit switches without potentiometer			Screw limit switches with potentiometer				
	Reduction gear ratio	Chain sprocket Number of teeth (12.7 mm pitch)	Cam rotation angle	Reduction gear ratio	Chain sprocket Number of teeth (12.7 mm pitch)	Adaptation for potentiometer Ratio	Cam rotation angle	Potentiometer rotation angle
0.5	13/1	12	91°	13/1	12	2	91°	182°
1	13/1	12	182°	13/1	14	2	156°	312°
1.5	13/1	12	273°	13/1	14	1.5	233°	350°
2	13/1	14	311°	17/1	16	1.5	208°	312°
2.5	17/1	12	347°	46/1	12	2	128°	256°
3	17/1	16	313°	46/1	12	2	154°	308°
3.5	46/1	12	180°	46/1	14	2	154°	308°
4	46/1	12	205°	46/1	16	2	154°	308°
4.5	46/1	12	231°	46/1	12	1.5	231°	347°
5	46/1	12	257°	60/1	14	2	169°	338°
5.5	46/1	12	282°	78/1	12	2	167°	334°
6	46/1	12	308°	60/1	14	1.5	202°	303°
6.5	46/1	12	334°	78/1	14	2	169°	339°
7	46/1	14	308°	78/1	16	2	159°	318°
7.5	60/1	12	295°	78/1	12	1.5	227°	341°
8	60/1	12	315°	78/1	14	1.5	208°	312°
8.5	60/1	12	335°	78/1	14	1.5	221°	331°
9	46/1	16	347°	78/1	16	1.5	204°	306°
9.5	60/1	14	321°	78/1	16	1.5	216°	324°
10	60/1	14	337°	78/1	16	1.5	227°	341°
10.5	78/1	12	318°	78/1	12	1	318°	318°
11	78/1	12	333°	78/1	12	1	333°	333°
11.5	78/1	12	348°	78/1	12	1	348°	348°
12	78/1	14	311°	78/1	14	1	311°	311°
12.5	78/1	14	324°	78/1	14	1	324°	324°
13	78/1	14	337°	78/1	14	1	337°	337°
13.5	78/1	16	307°	78/1	16	1	307°	307°
14	78/1	16	318°	78/1	16	1	318°	318°
14.5	78/1	16	329°	78/1	16	1	329°	329°
15	78/1	16	341°	78/1	16	1	341°	341°

Example: Controlling a change in liquid level of 5.30 m

Selection of reduction gear ratio

From the above table, select the value immediately superior to 5.30 m, i.e. 5.50 m

■ **Case n° 1: without potentiometer. Recommended solution:**

□ Reduction gear ratio: 46/1, chain sprocket with 12 teeth on 12.7 mm (0.0127 m) pitch.

□ Cam rotation angle:

using above table: $\frac{282 \times 5.30}{5.50} = 272^\circ$ or, by calculation: $\frac{5.30}{12 \times 0.0127} \times 360 = 272^\circ$

□ Completion of basic switch reference:

2nd digit of reference:

3

4th and 5th digits of reference:

00

■ **Case n° 2: with potentiometer. Recommended solution:**

□ Reduction gear ratio: 78/1, chain sprocket with 12 teeth on 12.7 mm (0.0127 m) pitch.

□ Ratio of potentiometer adaptation: 2

□ Cam rotation angle:

using above table: $\frac{167 \times 5.30}{5.50} = 161^\circ$ or, by calculation: $\frac{5.30}{12 \times 0.0127} \times 360 = 161^\circ$

□ Potentiometer rotation angle:

using above table: $\frac{334 \times 5.30}{5.50} = 322^\circ$ or, by calculation: $2 \times \left(\frac{5.30}{12 \times 0.0127} \times 360 \right) = 322^\circ$

□ Completion of basic switch reference:

2nd digit of reference:

5

4th and 5th digits of reference:

33

(10 kΩ potentiometer)

(1) Accessories for liquid level control: see page 16.

Screw limit switches

Heavy duty, XR2 range

Functions

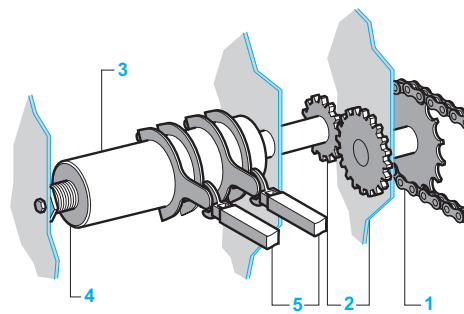
These switches are designed to monitor the movement of an object via an input drive shaft coupled to the actuator. Detection of position is ensured by a system of adjustable fingers which actuate the electrical contact blocks.

They are usually used for applications where it is either impossible or impractical to mount standard type position sensors that are actuated directly by the moving object.

Main applications:

- position control of moving parts of hoisting or materials handling equipment (winches, travelling cranes, gantries, cranes, rotary excavators, etc.),
- liquid level control in pumping systems.

Description



- 1 Input drive shaft, with facilities for attaching chain sprocket.
- 2 2-pin primary gearbox, with choice of reduction ratio.
- 3 Internally threaded shaft, driven via gearbox, fitted with adjustable fingers which actuate the electrical contact blocks.
- 4 Fixed lead screw, along which threaded shaft travels.
- 5 Snap action contact blocks, actuated by fingers.

Operation

Due to the variable composition 2-pin primary gearbox, multiple choices of reduction ratio between the input drive shaft and the threaded shaft, which operates the finger actuators, are possible.

The finger actuators, clamped to the rotating threaded shaft, describe a helical path and operate the contacts as and when they are engaged along its length of travel (6 turns maximum).

To avoid damage at the end of travel of the threaded shaft, a clutch is incorporated in the drive mechanism (patented feature).

Environment			
Conformity to standards			IEC/EN 60947-5-1
Protective treatment	Standard version		"TC"
	Special version		"TH" on request
Ambient air temperature	For storage	°C	- 40...+ 70
	For operation	°C	- 25...+ 70
Shock resistance			50 gn (11 ms)
Vibration resistance			> 5 gn (10...55 Hz)
Degree of protection			IP 54 conforming to IEC/EN 60529
Materials			XR2AA : Aluminium alloy body housing, insulated cover XR2AB and XR2BB : Sheet steel enclosure
Cable entry			XR2AA : 2 tapped entries for n° 13 cable gland (clamping capacity 9 to 12 mm) XR2AB and XR2BB : Removable gland plate

Mechanical characteristics			
Maximum number of turns of threaded shaft			6
Threaded shaft screw pitch		mm	4
Operating finger radius		mm	40
Length of developed helical travel		mm	4
Contact actuators differential snap-over angle (measured at finger)			30°
Tripping point repeat accuracy			0.02% between 2 successive operations
Number of turns of input drive shaft			For 6 turns of threaded shaft: 0.4, 0.8, 1.6, 3, 6, 10, 20, 40 or 80
Mechanical durability			10 x 10 ⁶ drive shaft revolutions

Electrical characteristics of contacts			
Type of contacts			XR2A : single-pole C/O, snap action XR2B : single-pole N/C or N/O, with snap action mechanism
Rated operational characteristics			~ AC-15, A300 (U _e = 240 V, I _e = 3 A), --- DC-13, Q300 (U _e = 250 V, I _e = 0.27 A), conforming to IEC/EN 60947-5-1
Conventional thermal current	A		XR2A : I _{the} = 10 XR2B : I _{the} = 20
Rated insulation voltage	V		U _i = 500, conforming to IEC/EN 60947-1 U _i = --- 600, conforming to CSA C 22-2 n° 14
Rated impulse withstand voltage	kV		U _{imp} = 6, conforming to IEC/EN 60947-1
Resistance across terminals	mW		≤ 25
Short-circuit protection			XR2A : 10 A cartridge fuse type gG XR2B : 20 A cartridge fuse type gG
Connection			Screw clamp terminals. Clamping capacity: 2 x 1.5 mm ² with or without cable end, 2 x 2.5 mm ² without cable end

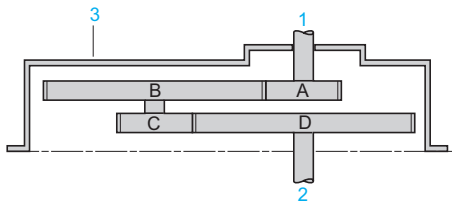
Electrical durability
 Conforming to IEC/EN 60947-5-1
 Utilisation categories: AC-15 and DC-13
 Operating rate: 3600 operating cycles/hour
 Load factor: 0.5

		a.c. supply ~ 50/60 Hz								d.c. supply ---							
		Voltage (V)		Power broken in VA								Power broken in W					
				12	24	48	127	220	380	500	12	24	48	110	220	440	
For 3 million operating cycles	XR2A	mm		100	200	400	700	750	800	800	100	120	110	95	80	45	
		mm		100	220	480	1050	1150	1150	1200	100	140	130	110	95	65	
	XR2B	mm		240	450	800	1300	1500	1500	1500	135	115	105	95	90	85	
		mm		240	450	800	1900	2200	2200	2200	220	450	400	330	280	240	
For 10 million operating cycles	XR2A	mm		45	75	120	180	200	200	200	45	40	35	30	20	7.5	
		mm		70	120	180	270	290	300	300	100	90	85	80	60	33	
	XR2B	mm		220	350	450	500	500	520	520	55	45	38	35	32	30	
		mm		220	440	600	740	750	750	750	220	450	400	330	280	240	

Variable composition primary gearbox characteristics

Primary gearbox reference code (1) (2)	04	08	16	3	6	10	20	40	80	
Primary gearbox type	Single-stage									
Theoretical number of turns of input drive shaft "K"	0.4	0.8	1.6	3	6	10	20	40	80	
Number of teeth per pinion	A	59	59	49	59	Direct drive	49	26	26	16
	B	16	16	26	16		26	49	49	59
	C	59	49	49	26		16	26	16	16
	D	16	26	26	49		59	49	59	59
Number of turns of threaded shaft	6	6	6	6	6	6	6	6	6	
Actual number of turns of input drive shaft	0.441	0.863	1.689	3.066	6	11.739	21.3	41.697	81.586	
Maximum speed of input drive shaft in rpm	12	25	50	75	150	200	250	300	350	

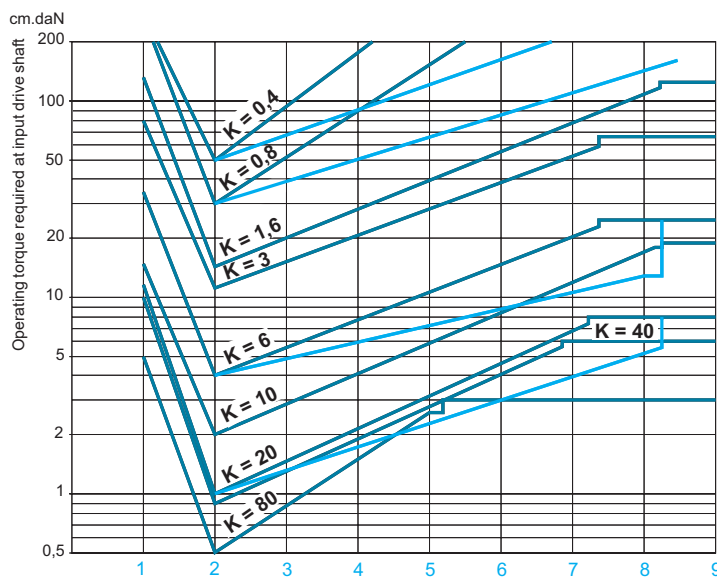
Primary gearbox arrangement (for references of the gearbox only, see page 14)



- 1 Input drive shaft
- 2 Threaded shaft (6 turns) and contact side
- 3 Casing

(1) Code required to complete the basic reference of the screw limit switch.
 (2) For ratios greater than 80 turns, please consult our Customer Care Centre.

Average drive torque



- 1 Clutch torque (at front mechanical stop/end of travel)
- 2 Nominal torque required to drive switch
- 3 Torque required to operate 1 contact
- 4 Torque required to operate 2 contacts simultaneously
- 5 Torque required to operate 3 contacts simultaneously
- 6 Torque required to operate 4 contacts simultaneously
- 7 Torque required to operate 6 contacts simultaneously
- 8 Torque required to operate 8 contacts simultaneously
- 9 Clutch torque (at rear mechanical stop/end of travel)

Screw limit switches

Heavy duty, XR2 range

534911



XR2AA03K●●

534912



XR2AB06K●●

534913



XR2BB03K●●

Switches with C/O contacts (Ithe = 10 A) (ZC1ZB211)

Presentation	Drive shaft end fittings	Number of contacts	Basic reference, to be completed by adding primary gearbox code (1)	Weight kg
Aluminium alloy body housing, plastic cover	Sprocket key and washer (2)	3	XR2AA03K●●	6.000
Sheet steel enclosure	Sprocket key and washer (2)	4	XR2AB04K●●	10.000
		6	XR2AB06K●●	12.000
		10	XR2AB10K●●	15.000
		14	XR2AB14K●●	18.000
		20	XR2AB20K●●	23.000
		24	XR2AB24K●●	28.000
		28	XR2AB28K●●	35.000

Switches with N/C contacts (Ithe = 20 A) (ZC4CB2) (3)

Presentation	Drive shaft end fittings	Number of contacts	Reference (1)	Weight kg
Sheet steel enclosure	Sprocket key and washer (2)	3	XR2BB03K●●	10.000
		5	XR2BB05K●●	12.000
		9	XR2BB09K●●	15.000
		13	XR2BB13K●●	18.000
		19	XR2BB19K●●	23.000
		23	XR2BB23K●●	28.000
		27	XR2BB27K●●	35.000

(1) Code corresponding to the required primary gearbox, selected according to number of turns of the switch input drive shaft.
See page 12.

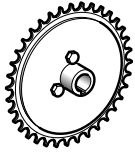
Example: for a screw limit switch with 3 C/O contacts and a theoretical number of input shaft turns "K" = 0.4, the reference becomes: **XR2AA03K04**.

(2) Switches supplied without input drive shaft chain sprocket. For suitable sprockets and chains, see page 14.

(3) For switches fitted with N/O contacts, please consult your Regional Sales Office.

Screw limit switches

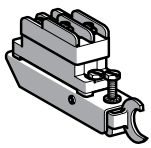
Heavy duty, XR2 range



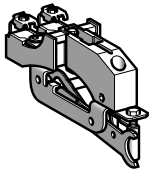
XR2AZ2●●



XR2AZ001



ZC1ZB211



ZC4CB2



XR2AZ●●●

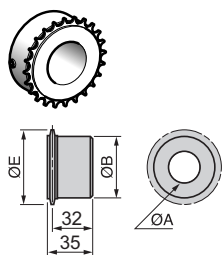
Separate components and replacement parts

Description	Type	Reference	Weight kg	
Chain sprockets, 12.7 mm pitch, for switch input drive shaft	Flat sprocket with fixing hub	12 teeth	XR2AZ212	0.180
		16 teeth	XR2AZ216	0.200
		24 teeth	XR2AZ224	0.230
		36 teeth	XR2AZ236	0.450
		48 teeth	XR2AZ248	0.770
		56 teeth	XR2AZ256	1.130
Operating finger		XR2AZ001	0.030	
Contact blocks with snap-over actuator	C/O (for XR2A)	ZC1ZB211	0.120	
	N/C (for XR2B)	ZC4CB2	0.140	
Chains (12.7 mm pitch) conforming to standard NF E 26-101, chromium plated, with joining link (1)	L = 2 metres	XR2AZ302	0.600	
	L = 5 metres	XR2AZ305	1.500	
	L = 10 metres	XR2AZ310	3.000	
Replacement primary gearbox kit comprising: - casing with input drive shaft (fitted with sprocket key, washer and screw) - steel pinions	Single-stage	K04	XR2AZ804	1.520
		K08	XR2AZ808	1.520
		K16	XR2AZ816	1.520
		K3	XR2AZ83	1.470
		K6	XR2AZ86	1.470
		K10	XR2AZ810	1.470
		K20	XR2AZ820	1.520
		K40	XR2AZ840	1.470
		K80	XR2AZ880	1.520

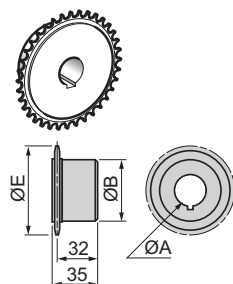
(1) For liquid level control applications, the length of the chain should at least be equal to the difference between the upper and lower liquid levels + 0.50 m.

Screw limit switches

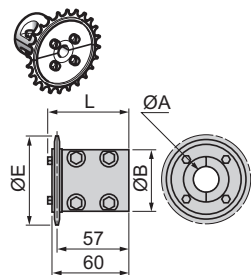
Winch shaft chain sprockets,
conforming to standard NF E 23-111,
12.7 mm pitch



XR2AZ3●●●5



XR2AZ4●●●5



XR2AZ52450

Monobloc sprockets with through hub

Number of teeth	ØE	ØA (bore Ø in mm)		Reference	Weight kg
		0...25 ØB	26...35 ØB		
12	57	50	–	XR2AZ31225	0.386
16	73	50	55	XR2AZ31625	0.424
24	105	50	–	XR2AZ32425	0.632
			55	XR2AZ32435	0.500
48	202	50	55	XR2AZ34825	1.000

Monobloc sprockets with keyed through hub

Number of teeth	ØE	ØA (bore Ø in mm)		Reference	Masse kg
		0...25 ØB	26...35 ØB		
16	73	50	55	XR2AZ41625	0.421
24	105	50	–	XR2AZ42425	0.580
			55	XR2AZ42435	0.600
36	153	50	55	XR2AZ43625	0.750

Split sprockets with through hub

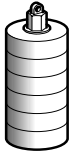
Number of teeth	ØE	L	ØA (bore Ø in mm)		Reference	Masse kg
			21...50 ØB			
24	105	64.5	80		XR2AZ52450	0.680

Screw limit switches

Accessories for liquid level control using float (1)



XL1DB0111



XR2AZ002

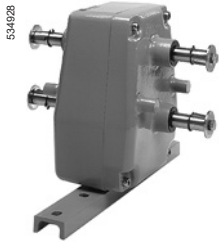


XL1DB04

Accessories

Description	Type	Material	Reference	Weight kg
Ballast float, Ø 270 mm for change in level less than 4.50 m	Without guide lugs	Stainless steel	XL1DB0111	5.900
Counterweights	For Ø 270 mm float	–	XR2AZ002	2.540
	For Ø 350 mm float	–	XR2AZ003	7.500
Pulley assembly	–	–	XL1DB04	1.050
Cable, Ø 37 mm, length 6 m (with attachment clamp)	–	Stainless steel	XL1DB05	0.250

(1) For mounting example, see page 19.



ZR2FA●

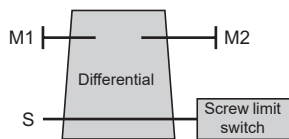
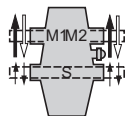
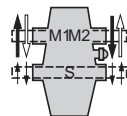


Figure 1



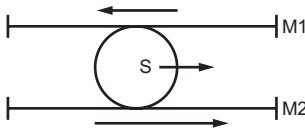
ZR2FA1: same direction

Figure 2



ZR2FA2: opposing directions

Schematic representation



Functions

This unit enables the monitoring of any speed difference between 2 movements which, under normal circumstances, should be identical. Any difference in speed is transmitted to an XR2 screw limit switch which, in turn, re-establishes correct operation.

Main applications:

- Controlling movement of grabs on cranes and travelling cranes.
- Liquid level control in decantation tanks.
- Monitoring relative difference between 2 moving parts.

Operation

The difference in rotational speeds of shafts M1 and M2, which are connected to motors or capstans, is transferred to a set of internal pinions which, in turn, control the rotation of shaft S which is connected to one or more screw limit switches.

Relationship between rotational directions

If the rotation of shafts M1 and M2 is synchronised, shaft S does not turn.
If the rotation of shafts M1 and M2 is out of synchronisation, shaft S turns.

This relationship is indicated either by white arrows or black arrows (each shaft having 2 possible directions of rotation).

The rotational direction of shaft S is indicated by the arrow on shaft S immediately below the arrow on shaft M which represents the highest rotational speed (see figures 1 and 2).

M1 = M2: S does not turn

M1 ≠ M2: S turns

Note

In both cases, the rotational speed ratio between shafts M and S is 2/1. It is important to know the maximum number of turns or differential travel that the screw limit switch must control (if necessary, both sides of its initial setting).

References

The differential units are supplied with "bare shafts" fitted with keyed discs, ready for the attachment of numerous types of coupling. They are dust and damp-proof and the internal mechanism is maintenance free. All 3 shafts are steel and are needle roller bearing mounted. A set of duplicate cast steel pinions ensure the accuracy of the differential. The cover is both glued and screwed to the housing.

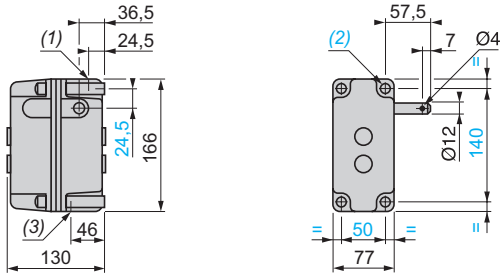
Description	Type	Reference	Weight kg
Differential units	For input shafts turning in the same direction	ZR2FA1	6.510
	For input shafts turning in opposing directions	ZR2FA2	6.510
Flexible coupling		ZR2FA005	0.120
Winch shaft chain sprockets		See page 15	—



ZR2FA005

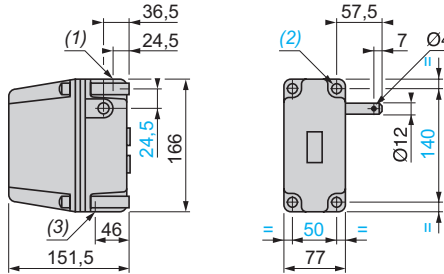
Screw limit switches

XRBA4●●●●



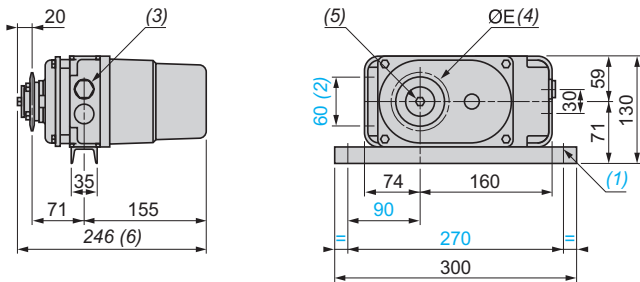
- (1) 1 tapped entry for n° 9 cable gland.
- (2) 4 tapped fixing holes for M5 screws, depth 20.
- (3) 1 tapped entry for n° 16 cable gland.

XRBA6●●●●



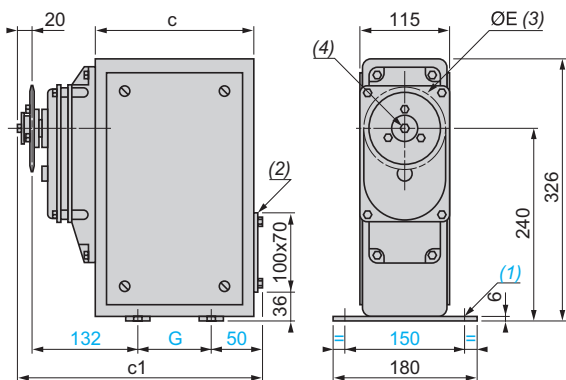
- (1) 1 tapped entry for n° 9 cable gland.
- (2) 4 tapped fixing holes for M5 screws, depth 20.
- (3) 1 tapped entry for n° 16 cable gland.

XR2AA●●●● with chain sprocket XR2AZ2●● fitted



- (1) 2 elongated fixing holes Ø 9 x 11.
- (2) Alternative fixings: 2 x M8 threaded holes on same axis as cable glands.
- (3) 2 tapped entries for n° 13 cable gland.
- (4) Ø E of chain sprocket XR2AZ2●● (see next page).
- (5) Bore Ø of chain sprocket XR2AZ2●●: Ø 16, 2 x 5 keyway.
- (6) + 125 mm for removal of cover.

XR2AB●●●●, XR2BB●●●● with chain sprocket XR2AZ2●● fitted

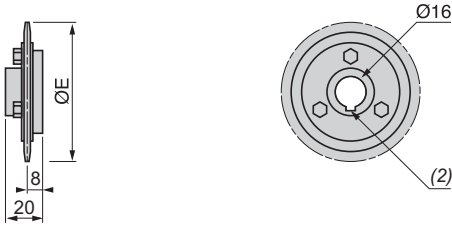


- (1) 4 elongated fixing holes Ø 9 x 11.
- (2) Removable plate for connections or for mounting cable glands.
- (3) Ø E of chain sprocket XR2AZ2●● (see next page).
- (4) Bore Ø of chain sprocket XR2AZ2●●: Ø 16, 2 x 5 keyway.

Reference	Number of contacts	c	c1	G
XR2AB04K●●	4	200	310	100
XR2AB06K●●	6	260	370	160
XR2AB10K●●	10	440	550	340
XR2AB14K●●	14	560	670	460
XR2AB20K●●	20	800	910	700
XR2AB24K●●	24	980	1090	880
XR2AB28K●●	28	1100	1210	1000

Reference	Number of contacts	c	c1	G
XR2BB03K●●	3	200	310	100
XR2BB05K●●	5	260	370	160
XR2BB09K●●	9	440	550	340
XR2BB13K●●	13	560	670	460
XR2BB19K●●	19	800	910	700
XR2BB23K●●	23	980	1090	800
XR2BB27K●●	27	1100	1210	1000

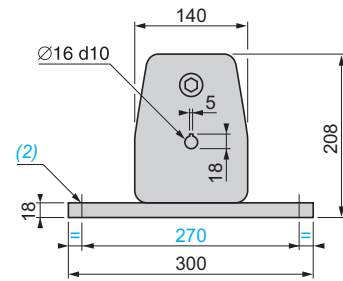
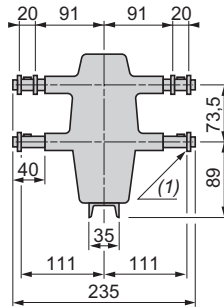
Chain sprockets (1) for switch input drive shaft XR2AZ2●●



Reference	Number of teeth	Ø E
XR2AZ212	12	57
XR2AZ216	16	73
XR2AZ224	24	105
XR2AZ236	36	153
XR2AZ248	48	202
XR2AZ256	56	234

(1) Chain pitch: 12.7 mm.
(2) Keyway: 2 x 5 mm.

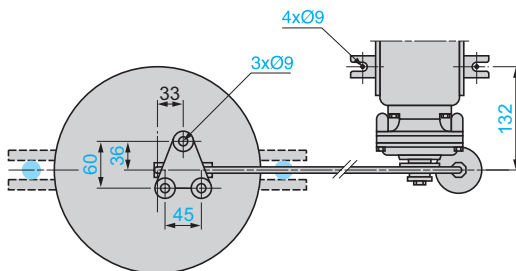
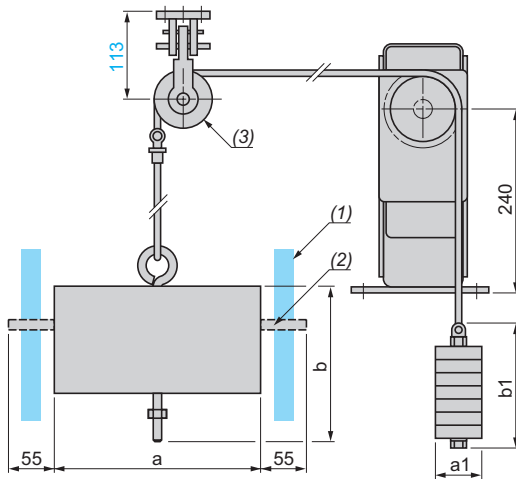
Differential units ZR2FA●



(1) Removable circlips.
(2) 2 elongated fixing holes Ø 9 x 11 for Ø 8 screws.

Application: liquid level control

Mounting details using an XR2●B●●●● screw limit switch



	a	a1	b	b1
Change in liquid level up to 4.5 m (using XL1DB01●1 and XR2AZ002)	270	60	200	160
Change in liquid level greater than 4.5 m (using XL1DB02●1 and XR2AZ003)	350	148	245	110

(1) Guide rods.
(2) Guide rod lugs.
(3) Pulley, internal Ø 65 mm.

Functions

The overtravel limit switches for power circuit switching are specifically designed to ensure the safety of hoisting equipment.

They directly break the power supply to the hoist motor if the load being handled accidentally exceeds the operating limits of the equipment.

Their mechanism is designed to ensure breakage of the power supply in the event of a malfunction and therefore, an overtravel limit switch cannot be used in place of an end of travel limit switch. It must only be used as a back-up device in the event of failure of the latter, or any other component forming part of an automated control circuit monitoring for excessive overtravel.

Description

XF9D●●● overtravel limit switches are housed in an aluminium alloy case.

XF9F●●● overtravel limit switches are housed in a sheet steel enclosure.

They are equipped with power contacts from Schneider Electric contactors.

Operation

Mounting and operating precautions

It is recommended that the overtravel limit switch be connected as near as possible to the motor, in order to minimise the risk of shunting.

The switch must be positioned in such a manner so as to avoid any damage in the event of the load exceeding the end of travel limits.

In order to ensure positive operation, the operating lever of the overtravel limit switch must be actuated directly by the moving part being monitored. It is essential that the use of any flexible or deformable intermediate actuators be avoided.

Manual reset switches - resetting after tripping

- Before resetting the overtravel limit switch ensure that the cause of its tripping is located and rectified.
- Rotate and hold lever up against end stop.
- Simultaneously press the reset button (XF9D), using accessory included with switch, or operate the reset lever (XF9F) and turn the control station switch away from the trip position.
- Rotate lever back to its initial position.

Environment								
Overtravel limit switch type			XF9D251	XF9D651	XF9F1151 XF9F1152	XF9F1851 XF9F1852	XF9F2651 XF9F2652	
Conformity to standards			IEC 60158-1, NF C 63-110, VDE 0660, IEC 60947-1, IEC 60947-4					
Product certification	3-phase		CSA					
			20 HP 40 A, 600 V	20 HP 80 A, 600 V	100 HP 175 A, 600 V	150 HP 40 A, 200 A, 600 V	200 HP 428 A, 600 V	
	Single-phase, 2-pole		3 HP 40 A, 230 V	10 HP 80 A, 230 V	–	–	–	
Protective treatment	Standard version		"TC"					
	Special version		"TH" on request					
Ambient air temperature	For storage	°C	- 40...+ 70					
	For operation	°C	- 25...+ 70					
Degree of protection	Conforming to IEC/EN 60529		IP 54		IP 43			
Housing			Aluminium alloy case		Sheet steel enclosure			
Cable entry			2 tapped entries for n° 21 cable gland	3 tapped entries for n° 29 cable gland	2 entries incorporating n° 36 plastic cable gland			
Contact block characteristics								
Number of poles			4		3			
Rated operational current (Ie)	For 2-pole scheme	A	50	130	–	–	–	
	For 3-pole scheme on AC-3	A	25	65	115	185	265	
Conventional thermal current (Ithe) at $\theta \leq 40$ °C	For 2-pole scheme	A	80	160	–	–	–	
	For 3-pole scheme	A	40	80	200	275	350	
Rated insulation voltage (Ui)	Conforming to IEC 60158-1, IEC 947-4, VDE 0110 Group C	V	500		660			
	Conforming to CSA 22-2 n° 14	V	600					
Rated breaking capacity (I rms)	Conforming to IEC 60158-1 500 V	A	400	1000	1100	1600	2200	
	For 2-pole scheme 660 V	A	180	630	900	1200	1750	
Connection Min./max. cable c.s.a.	Flexible wiring, without cable end	1 conductor	mm ²	1.5/10	2.5/25	–	–	–
		2 conductors	mm ²	1.5/6	2.5/16	–	–	–
	Flexible wiring, with cable end	1 conductor	mm ²	1/6	2.5/16	–	–	–
		2 conductors	mm ²	1/4	2.5/6	–	–	–
	Solid wiring, without cable end	1 conductor	mm ²	1.5/6	2.5/25	–	–	–
		2 conductors	mm ²	1.5/6	4/16	–	–	–
	Cable	1 conductor	mm ²	–	–	95	150	240
		2 conductors	mm ²	–	–	95	150	240

Overtravel limit switches

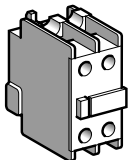
For power circuits, XF9 range



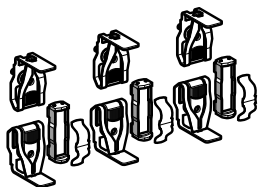
XF9D651



XF9F...2



LADN11



LA5FG431

References

Switches without auxiliary contact block

Description	Rated operational current A	Conventional thermal current A	Disconnection	Reference	Weight kg
With manual latching and resetting restricted by a padlockable device Snap action opening mechanism Maximum travel: 75° in each direction	25	40	3-pole or 4-pole	XF9D251	2.200
	or	or	2-pole		
	50	80	3-pole or 4-pole	XF9D651	5.000
	65	80	2-pole		
130	160	3-pole	XF9F1151	25.500	
With manual latching and resetting Horizontal or vertical actuation Snap action opening mechanism	185	275	3-pole	XF9F1851	26.000
	265	350	3-pole	XF9F2651	27.500
With counterweights and automatic resetting Horizontal or vertical actuation Slow break opening mechanism Minimum actuation speed: 2.5m/s	115	200	3-pole	XF9F1152	28.500
	185	275	3-pole	XF9F1852	29.000
	265	350	3-pole	XF9F2652	32.500

Auxiliary contact blocks

Description	For use with switches	Reference	Weight kg
N/C + N/O instantaneous	XF9F...2	LADN11	0.030

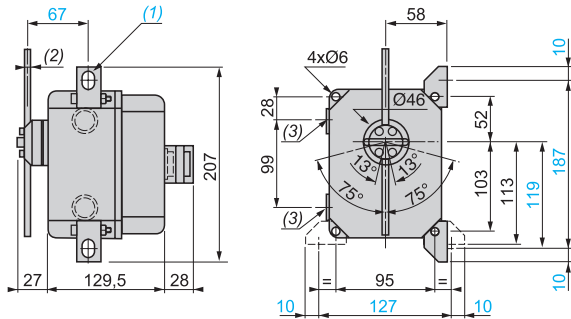
Replacement parts

Description	For use with switches	Reference	Weight kg
Contact set comprising per pole: - 2 fixed contacts, - 1 moving contact, - 2 deflectors, - 1 backplate, clamping screw and washers	XF9F115●	LA5FF431	0.270
	XF9F185●	LA5FG431	0.350
	XF9F265●	LA5FH431	0.660
Arc chambers	XF9F115●	LA511550	0.490
	XF9F185●	LA518550	0.670
	XF9F265●	LA526550	0.920

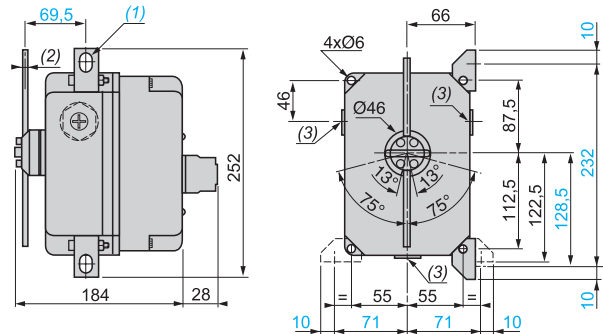
■ Contacts closed
□ Contacts open

Dimensions

XF9D251



XF9D651

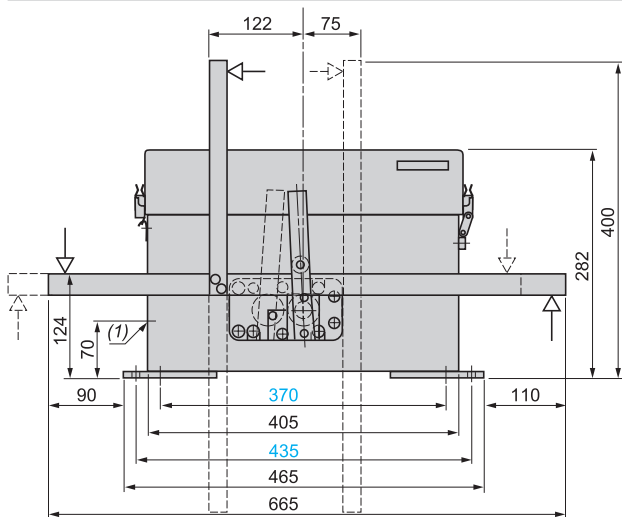


- (1) 2 elongated holes Ø 6 x 8.5 (removable fixing lugs).
- (2) 6 mm square rod, length 200 (can be mounted at 90°).
- (3) 2 tapped entries for n° 21 cable gland.
- 13° = contact actuation, 75° = maximum travel.

- (1) 2 elongated holes Ø 6 x 8.5 (removable fixing lugs).
- (2) 6 mm square rod, length 200 (can be mounted at 90°).
- (3) 3 plain entries for n° 29 cable gland.
- 13° = contact actuation, 75° = maximum travel.

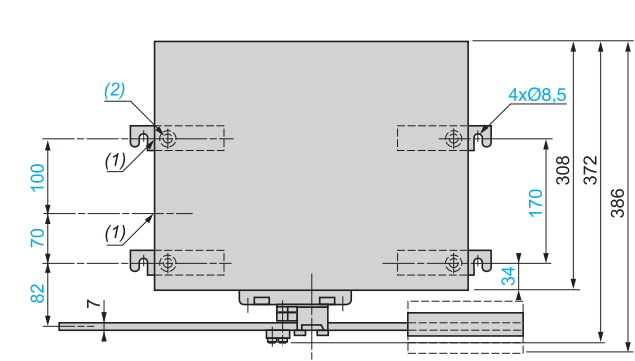
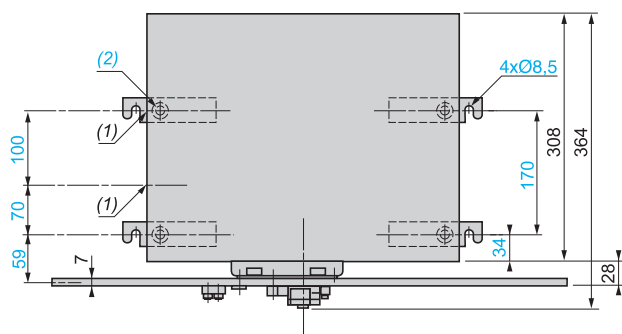
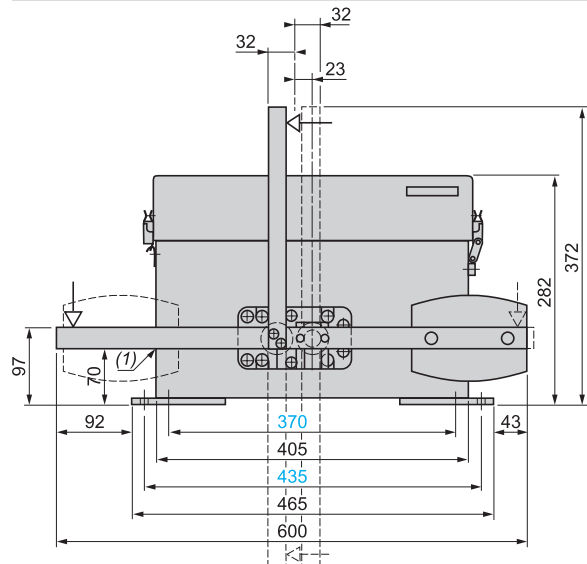
XF9F●●●1

Manual resetting



XF9F●●●2

Automatic resetting



- (1) 2 entries incorporating n° 36 plastic cable gland.
- (2) 4 holes Ø 8.5 to be drilled by user (for attaching fixing lugs to enclosure base).

- (1) 2 entries incorporating n° 36 plastic cable gland.
- (2) 4 holes Ø 8.5 to be drilled by user (for attaching fixing lugs to enclosure base).

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