Safety in system: Protection for man and machine

Catalogue Automation Technology

SCHMERSAL

Safe solutions for your industry

Introduction

Heinz and Philip Schmersal,
Managing directors of the Schmersal Group

Turning workplaces into safer places.

Industry finds itself in exciting times - in the age of Industry 4.0, production systems are becoming increasingly flexible and with decentralised intelligence, with man and machine working ever closer. Whatever the change, the safety of employees remains paramount, nothing less is acceptable, and through standards and norms, safety is becoming more and more consistent around the globe.

The Schmersal Group can support you in designing your machinery and plants to ensure maximum safety in accordance with relevant standards and legislation. We offer the world's widest selection of safety components and link them to integrated solutions to satisfy your requirements. We ensure that safety remains an integral component of your processes, thereby helping to maximise system productivity.

Efficient machine safety that complies with relevant standards is a prerequisite for success in international markets. At the same time, the global dimension itself makes machine safety a demanding task. Our international network of tec.nicum experts offers independent advice on all aspects of functional safety, as well as a comprehensive service programme.

When it comes to the safety of machinery and efficient safety technology, you can count on us to be a reliable partner.

Talk to us – we look forward to working with you!

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Mechanical position detection – Special variants

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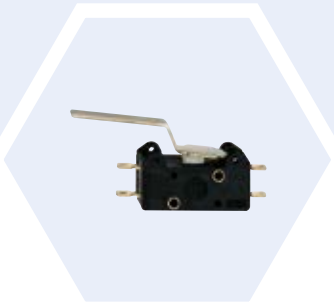
Safety in system: Protection for man and machine

Position and limit switches

Belt alignment switches



Micro switches

Automation technology: versatile portfolio and customer-specific solutions

For decades, progress in automation technology has ensured ever more efficient production. Digitally automated production started with the introduction of the programmable logic controller (PLC) in the 1970s. Industry 4.0 is continuing this development: with intelligent machines, widespread usage of networks and connection to the Internet, automation technology is reaching a new stage. The resulting positive effects include, for instance, cost and time savings in production as well as an overall increase in competitiveness.

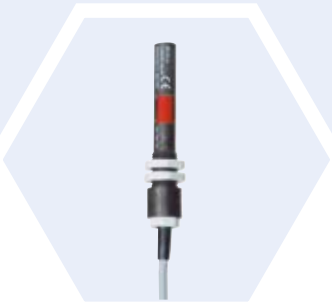
The Schmersal Group has made a significant contribution to this progress over the past few decades, particularly in the area of position acquisition. Schmersal was one of the pioneers during the development of non-contact proximity switches in the 70s.

Today Schmersal offers a broad range of position switches, gear switches, pull-wire switches, foot switches, micro switches and magnetic reed switches... for the automation of work processes in industrial installations.

The continuously further developed series from Schmersal help to increase the efficiency of the manufacturing processes and are suitable for many applications in a very wide range of sectors – from lift switchgear, through automotive technology to heavy industry.

For example the proximity switches are used in, among other areas, robotics and in the automated production lines in the automotive industry. Schmersal also offers a large variety of switchgear for lift and escalator manufacturers for positioning and monitoring the functions of lifts that meet the requirements in directives and standards worldwide.

Besides the standard versions, customised variants for special requirements such as high operating temperatures or sector-specific approvals, e. g. IECEx, are also available.



Magnetic reed switches

Pull-wire switches

Foot switches

Turning workplaces into safer places. With systems and solutions from Schmersal.

Along with its varied portfolio of automation components, the Schmersal Group offers a comprehensive range of services through its tec.nicum division. The international network of tec.nicum experts develop individual solutions optimally adapted to the related application on-site for customers.

As a provider of systems and solutions, the Schmersal Group therefore offers everything from a single source: the latest automation technology, sector-specific know-how as well as consulting and engineering.

History
Milestones 1945 – 2016

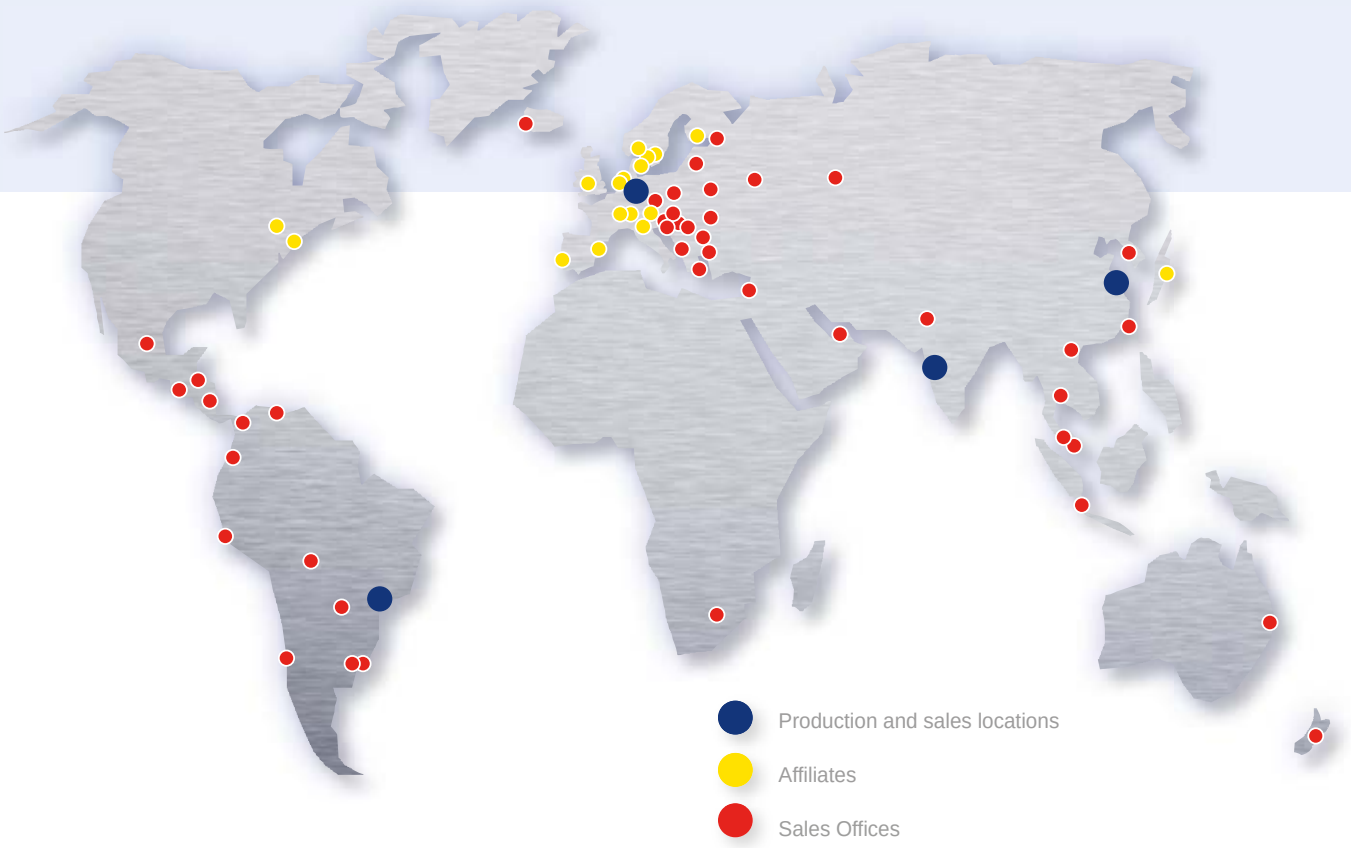
Schmersal Brazil 1974

Schmersal China 2013

Startup of the new central warehouse in 2013

1945	The brothers Kurt Andreas Schmersal and Ernst Schmersal **form the company** in Wuppertal.
1950s	The **product portfolio** is continuously expanded. Many switchgears are used in safety related applications such as in explosive areas.
1970s	Schmersal is one of the first companies to begin development and production of **electronic proximity switches**.
1974	**ACE Schmersal** is formed in Boituva, Brazil.
1982	**Generational change**: Heinz and Stefan Schmersal take over the company from their fathers.
1997	**ELAN Schaltelemente GmbH & Co. KG** based in Wettenberg is acquired.
1999	The production facility **Schmersal Industrial Switchgear Co. Ltd** (SISS) is formed in Shanghai, China.
2007	Philip Schmersal joins the **third generation of the** Schmersal Group.
2008	In October 2008 the Schmersal Group takes over **Safety Control GmbH** and its affiliate Protec GmbH in Mühldorf/Inn.
2013	**Böhnke + Partner Steuerungssysteme GmbH** is acquired. **Schmersal India** becomes a production facility. Startup of the new **European central warehouse** in Wuppertal.
2015	In 2015, the Schmersal Group celebrated its **70th anniversary**. Schmersal Böhnke+Partner move into a **new production and office building** in Bergisch Gladbach.
2016	The Schmersal Group is establishing its own business area for services under the name **tec.nicum**.

Schmersal worldwide



With its own affiliates in around 20 countries and capable sales and service partners in 30 more countries, the Schmersal Group has operations worldwide.

We started quite early with the internationalisation of sales, consultancy and production. This is also one of the reasons that we are a favoured global partner for machinery and plant construction and also an approved partner for many medium sized engineering companies with local presence. Wherever there are machines that work with Schmersal safety switches, the nearest branch or representative is not far away.

- Germany, Wuppertal
- Germany, Wettenberg
- Germany, Mühldorf
- Germany, Bergisch Gladbach
- Brazil, Boituva
- China, Shanghai
- India, Pune

- Belgium, Aarschot
- Denmark, Ballerup
- Finland, Helsinki
- France, Seyssins
- United Kingdom, Malvern, Worcestershire
- Italy, Borgosatollo
- Japan, Tokyo
- Canada, Brampton
- Netherlands, Harderwijk
- Norway, Oslo
- Austria, Vienna
- Portugal, Póvoa de Sta. Iria
- Sweden, Mölnlycke
- Switzerland, Arni
- Spain, Barcelona
- USA, Tarrytown NY

- Argentina, Buenos Aires
- Australia, Brisbane
- Baltic States, Kaunas
- Bolivia, Santa Cruz de la Sierra
- Bulgaria, Ruse City
- Chile, Santiago
- Ecuador, Quito
- Greece, Athens
- Guatemala, Guatemala-City
- Indonesia, Jakarta
- Iceland, Reykjavik
- Israel, Petach Tikva
- Kazakhstan, Ayran
- Colombia, Medellín
- South Korea, Seoul
- Croatia, Zagreb
- Malaysia, Rawang
- Macedonia, Skopje
- Mexico, Mexico City
- New Zealand, Christchurch
- Pakistan, Islamabad

- Paraguay, Minga Guazú
- Peru, Lima
- Poland, Warsaw
- Romania, Sibiu
- Russia, Moscow
- Serbia, Belgrade
- Singapore, Singapore
- Slovenia, Ljubljana
- South Africa, Johannesburg
- Taiwan, Taichung
- Thailand, Bangkok
- Czech Republic, Prague
- Turkey, Istanbul
- Ukraine, Kiev
- Hungary, Györ
- Uruguay, Montevideo
- United Arab Emirates, Sharjah
- Venezuela, Caracas
- Vietnam, Hanoi
- Belarus, Minsk

Schmersal Worldwide
Offices in Germany

Wuppertal

K.A. Schmersal GmbH & Co. KG

- Founded in 1945
- Around 700 employees

Focal points
- Headquarters of the Schmersal Group
- Development and manufacture of switchgears and switching systems for safety, automation and lift engineering
- Accredited test laboratory
- Central research and development
- Logistics centre for European markets

Wettenberg

K.A. Schmersal GmbH & Co. KG

- Founded in 1952 (1997)
- Around 180 employees

Focal points
- Development and manufacture of switchgears for operation and monitoring, safety-related relay modules and controls as well as switchgears for explosion protection

Mühldorf / Inn

Safety Control GmbH

- Founded in 1994 (2008)
- Around 30 employees

Focal points
- Development and manufacture of optical electronic components for safety and automation engineering

Bergisch Gladbach

Böhnke + Partner GmbH Steuerungssysteme

- Founded in 1991 (2013)
- Around 70 employees

Focal points
- Development and manufacture of components, controls and remote diagnostic systems for the lift industry

( ) = inclusion in the Schmersal Group

Schmersal Worldwide
International Offices

Boituva / Brazil

ACE Schmersal

- Founded in 1974
- Around 400 employees

Focal points
- Manufacture of electromechanical and electronic switchgears
- Customer-specific control systems for the North and South American market

Shanghai / China

Schmersal Industrial Switchgear Co. Ltd

- Founded in 1999
- Around 165 employees

Focal points
- Development and manufacture of switchgears for safety, automation and lift engineering for the Asian market

Pune / India

Schmersal India Private Limited

- Founded in 2013
- Around 60 employees

Focal points
- Development and manufacture of switchgears for safety, automation and lift engineering for the Indian market

1. Position switches according to EN 50041 / EN 50047
Description

System universally deployable series

Recording and monitoring, from extraordinarily compact to very robust.

With these properties, the new position switches are aimed at a wide variety of applications across all disciplines of mechanical engineering and plant manufacturing as well as elevator technology.

The advantages of the new position switch series at a glance:
- Reliable position detection
- Highly versatile
- Robust and reliable
- Can be combined in numerous ways thanks to modular design

Area of application

Type 1 position switches according to ISO 14119 are for determining the position and monitoring of movable components on machines and for protective equipment that can be moved laterally or is rotatable. This allows them to be used in all industrial environments.

The protection classes IP66 an IP67 form the requirements for the use of position switches in adverse ambient conditions.

Design and way of functioning

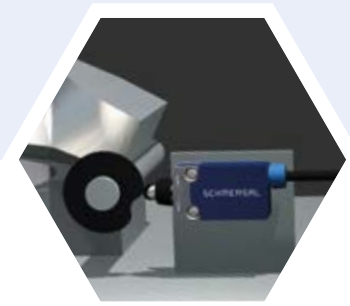
All position switches are equipped with positive break NC contacts in accordance with IEC 60947-5-1 and are available with snap action and also slow action. In conjunction with an appropriate safety controller, a single position switch can be used up to PL d. Using two position switches PL e can be achieved according to ISO 13849-1.

Flexible solutions

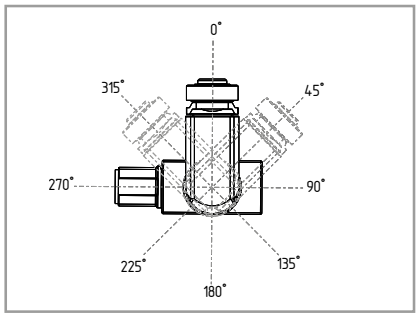
Switching elements with up to three contacts
Switching elements with three contacts ensures a redundant switch-off with additional signalling contact. All switching elements of the diverse contact combinations are equipped with galvanically separated contacts with positive break NC contacts.

Latching function
To save the switching state, versions are available with snap action and an optional latching function where the mounting element must be manually reset to the starting condition.

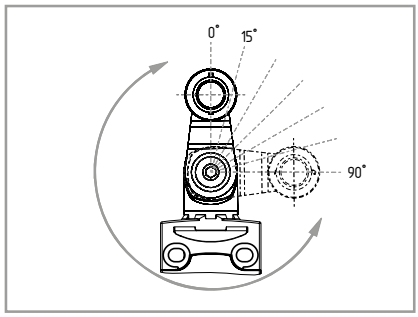
Modular diversity
The modular design with consistent components across all series reduces the number of different versions, lowers the effort required for storage and increases availability.



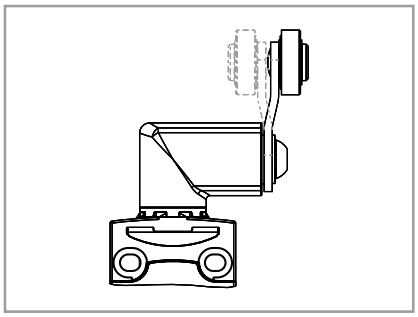
Actuator elements and lever



Adjustable actuator elements
All actuating elements can be rotated in 45° steps and can be quickly replaced and implemented due to the simple mounting design.



Adjustable lever
Roller lever can be set in 15° steps.



Rotatable lever
For versions with a rotatable roller lever, the lever can be fitted so that the roller is on the inside.

1. Position switches according to EN 50041 / EN 50047
Order information complete device or modular construction kit

All position switches of the PS116, PS2xx and PS3xx series can be obtained either as a complete device or a modular construction kit. The complete device with actuating element S200 serves as a basic switch in the construction kit system. The following ordering example can therefore be transferred to all of the series listed.

Ordering example

Position switch PS116, snap action 1 NO contact / 1 NC contact, roller lever, M12 connector on right

Complete device

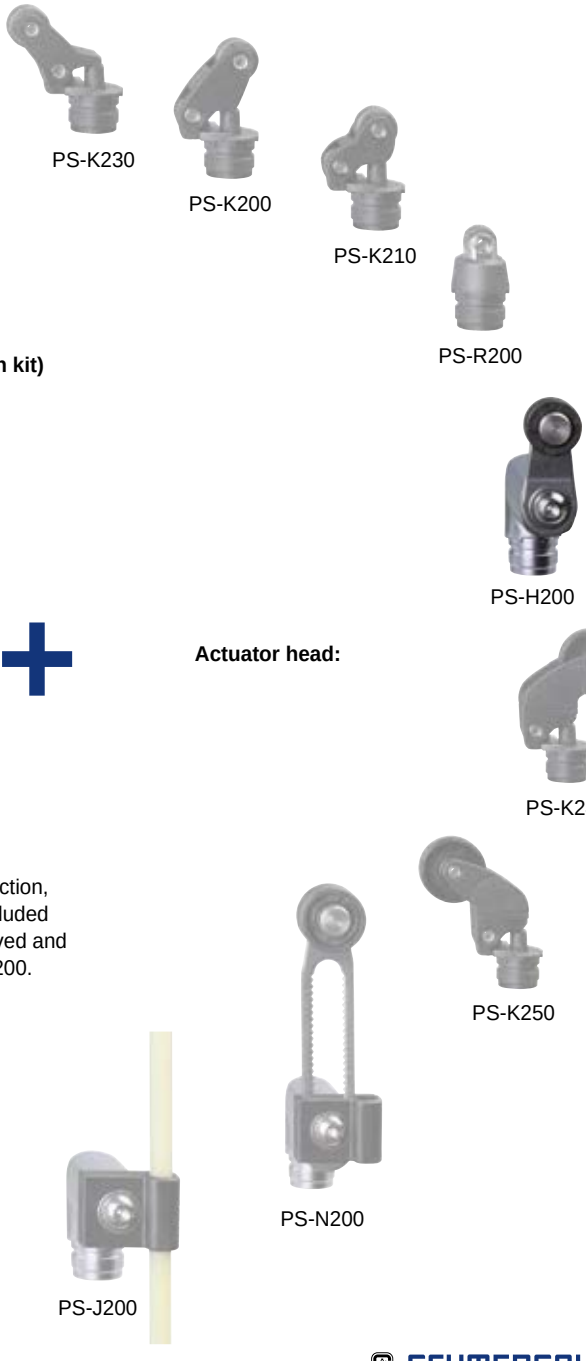
PS116-Z11-STR-H200

Modular selection (construction kit) to be ordered separately

Basic switch:
PS116-Z11-STR-S200

For assembly of the modular selection, the enclosure of the thrust pin included in the basic switch must be removed and replaced by the roller lever PS-H200.

Actuator head:



Ordering code

PSxxx-Z11-L200-S200

Switching elements (others on request)	
Z11	Snap action 1 NO contact / 1 NC contact
Z12	Snap action 1 NO contact / 2 NC contacts
Z11R	Snap action 1 NO contact / 1 NC contact with latching (not for PS3xx)
T11	Slow action 1 NO contact / 1 NC contact
T12	Slow action 1 NO contact / 2 NC contacts
T03	Slow action 3 NC contacts
T11UE	Slow action 1 NO contact / 1 NC contact with overlapping contacts
T02H	Slow action 2 NC contacts with staggered contacts

Connection	
	Cable entry M20, screw connection
ST	Connector plug M12, bottom
STR	Connector plug M12, right
L200	Pre-wired cable bottom, 2 m (PS116 only)
LR200	Pre-wired cable right, 2 m (PS116 only)

Actuator elements (more on request)	
PS116 and PS2xx series	
S200	Plunger
R200	Roller plunger, roller Ø 9.5 mm
K200	Offset roller lever, roller Ø 12 mm
K210	Offset roller lever, roller Ø 14 mm
K230	Angle roller lever, roller Ø 14 mm
K240	Angle roller lever, roller Ø 22 mm
K250	Angle roller lever, roller Ø 22 mm
H200	Roller lever, roller Ø 16 mm, length 24 mm
N200	Roller lever, roll Ø 20 mm, can be adjusted in 2 mm increments (24 … 66 mm)
J200	Rod lever with plastic rod Ø 6 mm, length 200 mm
PS3xx series	
S300	Plunger
R300	Roller plunger, roller Ø 17.2 mm
K360	Angle roller lever, roller Ø 20 mm
K370	Offset roller lever, roller Ø 20 mm
H300	Offset roller lever, roller Ø 25 mm
N300	Roller lever, roll Ø 20 mm, can be adjusted in 2 mm increments (24 … 66 mm)
J300	Rod lever, rod Ø 6 mm, length 200 mm

1. Position switches according to EN 50041 / EN 50047
Standardised construction forms, extraordinary features

Folding latching cover

All plastic versions are fitted with a folding and captive latching cover. The cover can be opened with the aid of a flat-head screwdriver and needs no tools to be closed.

Reduced assembly times

The 45° rotated connection terminals of all switch elements reduce the assembly time considerably.

Actuating element replace and turn

All actuating elements can be rotated in 45° steps and can be quickly replaced and implemented due to the simple mounting design. This means that adaptation to the prescribed actuating direction is possible at any time.

PS116

1. Release locking plate (flat-head screwdriver or accessory tool ACC-PS116-1)
2. Remove or turn existing actuating element
3. Position of new actuating element
4. Secure locking plate

The symmetrical layout of the enclosure means that it can be used for left-hand and right-hand versions of the same switch.
This applies to both the cable and the connector design.

PS2xx / PS3xx

1. Release locking plate (flat-head screwdriver)
2. Remove or turn existing actuating element
3. Position of new actuating element
4. Secure locking plate

1. Position switches according to EN 50041 / EN 50047
Overview of the series

	 ■ PS116	 ■ PS215	 ■ PS216
Key Features			
	• Symmetrical casing • Compact design • Fitted (cable / M12 connector) • Complete device or modular construction kit • Design to EN 50047	• Simplified connection (connection terminals rotated by 45°) • Robust design • Complete device or modular construction kit • Design to EN 50047	• Simplified connection (connection terminals rotated by 45°) • Folding latching cover • Complete device or modular construction kit • Design to EN 50047
Technical features			
Electrical characteristics			
Switching system	Snap-/slow action	Snap-/slow action	Snap-/slow action
Latching variant	■	■	■
Max. number of contacts	3	3	3
Max. switching capacity U/I	230 VAC / 3 A; 24 VDC / 1.5 A	230 VAC / 3 A; 24 VDC / 3 A	230 VAC / 3 A; 24 VDC / 3 A
Mechanical data			
Housing material	Metal / thermoplastic enclosure	Metal enclosure, painted	Thermoplastic enclosure
Connection	Cable 4/6 pole M12 connector 4/6 pole	1 x M20 M12 connector 5/8 pole	1 x M20 M12 connector 4/8 pole
Cable section [3)]	4/6 x 0.5 mm²	max. 1.5 mm² (incl. conductor ferrules)	max. 1.5 mm² (incl. conductor ferrules)
Dimensions (W x H x D)	31 x 52 x 16.6 mm	31 x 66 x 33 mm	31 x 66 x 33 mm
Ambient conditions			
Ambient temperature	−30 °C … +80 °C	−30 °C … +80 °C	−30 °C … +80 °C
Protection class	IP66, IP67	IP66, IP67	IP66, IP67
Actuator heads	see page 18	see page 18	see page 18
Safety classification			
Standards	ISO 13849-1	ISO 13849-1	ISO 13849-1
B_{10D} NC contact	20,000,000	20,000,000	20,000,000
Certificates	cULus CCC EAC	cULus CCC EAC	cULus CCC EAC

To get detailed information about the products and certificates, visit **www.schmersal.net**.

		
■ PS226	**■ PS315**	**■ PS316**
• Simplified connection (connection terminals rotated by 45°) • Folding latching cover • Complete device or modular construction kit • Design to EN 50047	• Simplified connection (connection terminals rotated by 45°) • Robust design • Complete device or modular construction kit • Design to EN 50041	• Simplified connection (connection terminals rotated by 45°) • Folding latching cover • Complete device or modular construction kit • Design to EN 50041
Snap-/slow action	Snap-/slow action	Snap-/slow action
■	–	–
3	3	3
230 VAC / 3 A; 24 VDC / 3 A	230 VAC / 3 A; 24 VDC / 3 A	230 VAC / 3 A; 24 VDC / 3 A
Thermoplastic enclosure	Metal enclosure, painted	Thermoplastic enclosure
2 x M20 M12 connector 4/8 pole	1 x M20 M12 connector 5/8 pole	1 x M20 M12 connector 4/8 pole
max. 1.5 mm² (incl. conductor ferrules)	max. 1.5 mm² (incl. conductor ferrules)	max. 1,5 mm² (incl. conductor ferrules)
31 x 59.2 x 33 mm	40 x 77.7 x 37.2 mm	40 x 77.7 x 37.2 mm
−30 °C … +80 °C	−30 °C … +80 °C	−30 °C … +80 °C
IP66, IP67	IP66, IP67	IP66, IP67
see page 18	see page 22	see page 22
ISO 13849-1	ISO 13849-1	ISO 13849-1
20,000,000	20,000,000	20,000,000

1. Position switches according to EN 50041 / EN 50047

PS116 / PS2xx – Actuator heads

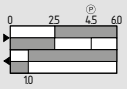
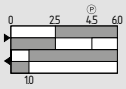
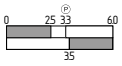
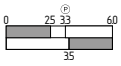
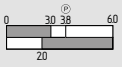
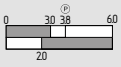
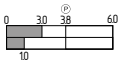
Actuator heads

	Plunger S200	Roller plunger R200
Actuator description	Thermoplastic plunger Actuator type B according to EN 50047	Thermoplastic roller plunger Actuator type C according to EN 50047
Positive break force	> 40 N	> 40 N
Actuating speed **Snap action**	min. 10 mm/min, max. 0.5 m/s	min. 10 mm/min, max. 0.5 m/s
Slow action	min. 60 mm/min, max. 0.5 m/s	min. 60 mm/min, max. 0.5 m/s
Positioning the lever	–	–

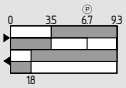
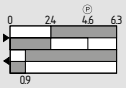
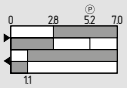
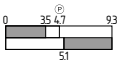
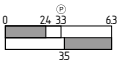
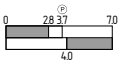
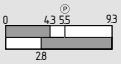
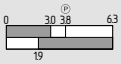
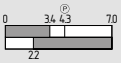
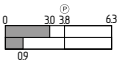
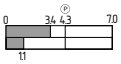
Ordering data modular construction kit

		PS-S200	PS-R200
Product type description		PS-S200	PS-R200
Material number		103010968	103010967

Switch travel diagrams

Snap action	**Per NO contact / per NC contact**		
Slow action	**Per NO contact / per NC contact**		
	1 NO / 1 NC with overlapping		
	2 NC with staggered contacts		

Contact closed Contact open Ⓟ Positive break travel / angle

		
Offset roller lever K200	**Offset roller lever K210**	**Angle roller lever K230**
Thermoplastic offset roller lever Actuator type E according to EN 50047	Thermoplastic offset roller lever	Thermoplastic angle roller lever
> 40 N	> 40 N	> 40 N
min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s
min. 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s
–	–	–
PS-K200	PS-K210	PS-K230
103010961	103010962	103010963
		
		
		
		

1. Position switches according to EN 50041 / EN 50047

PS116 / PS2xx – Actuator heads

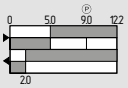
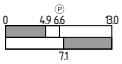
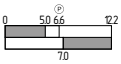
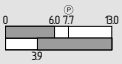
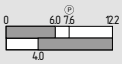
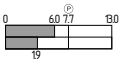
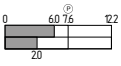
Actuator heads

	Angle roller lever K240	Angle roller lever K250
Actuator description	Thermoplastic angle roller lever	Thermoplastic angle roller lever
Positive break force	> 40 N	> 40 N
Actuating speed **Snap action**	min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s
Slow action	min. 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s
Positioning the lever	–	–

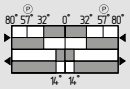
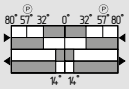
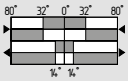
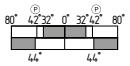
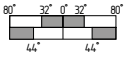
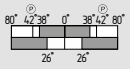
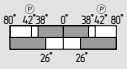
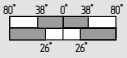
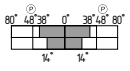
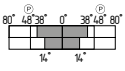
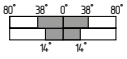
Ordering data modular construction kit

Product type description		PS-K240	PS-K250
Material number		103010964	103010965

Switch travel diagrams

Snap action	**Per NO contact / per NC contact**		
Slow action	**Per NO contact / per NC contact**		
	1 NO / 1 NC with overlapping		
	2 NC with staggered contacts		

Contact closed Contact open Ⓟ Positive break travel / angle

		
Roller lever H200	**Roller lever N200**	**Roller lever J200**
Metal lever with plastic roller Actuator type A according to EN 50047	Length adjustable metal lever with plastic roller adjustable in 2 mm increments	Plastic rod, 200 mm Can only be used for positioning tasks
> 40 N	> 40 N	> 40 N
min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s
min 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s	min 60 mm/min, max. 1 m/s
adjustable in 15° steps	adjustable in 15° steps	adjustable in 15° steps
PS-H200	PS-N200	PS-J200
103010948	103010966	103010951
		
		
		
		

1. Position switches according to EN 50041 / EN 50047

PS3xx – Actuator heads

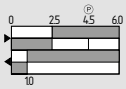
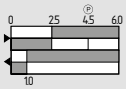
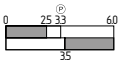
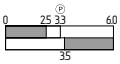
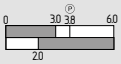
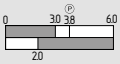
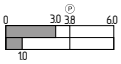
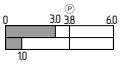
Actuator heads

	Plunger S300	Roller plunger R300
Actuator description	Thermoplastic plunger Actuator type B according to EN 50041	Thermoplastic roller plunger Actuator type C according to EN 50041
Positive break force	> 50 N	> 50 N
Actuating speed **Snap action**	min. 10 mm/min, max. 0.5 m/s	min. 10 mm/min, max. 0.5 m/s
Slow action	min. 60 mm/min, max. 0.5 m/s	min. 60 mm/min, max. 0.5 m/s
Positioning the lever	–	–

Ordering data modular construction kit

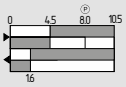
Product type description		PS-S300	PS-R300
Material number		103015397	103015398

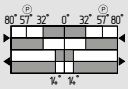
Switch travel diagrams

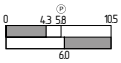
Snap action	**Per NO contact / per NC contact**		
Slow action	**Per NO contact / per NC contact**		
	1 NO / 1 NC with overlapping		
	2 NC with staggered contacts		

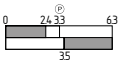
Contact closed Contact open Ⓟ Positive break travel / angle

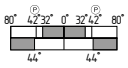
Angle roller lever K360	Offset roller lever K370	Roller lever H300
Thermoplastic angle roller lever	Thermoplastic offset roller lever	Metal lever with plastic roller Actuator type A according to EN 50041
> 50 N	> 50 N	> 50 N
min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s	min. 10 mm/min, max. 1 m/s
min. 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s
–	–	adjustable in 15° steps
PS-K360	PS-K370	PS-H300
103015399	103015400	103015401

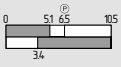


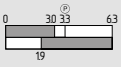


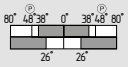


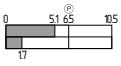


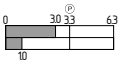


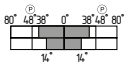




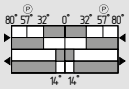
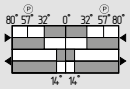
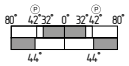
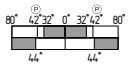
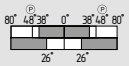
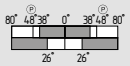
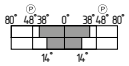
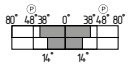








1. Position switches according to EN 50041 / EN 50047
PS3xx – Actuator heads

	Roller lever N300	Roller lever J300
Actuator heads		
Actuator description	Length adjustable metal lever with plastic roller adjustable in 2 mm increments	Plastic rod, 200 mm Can only be used for positioning tasks Actuator type A according to EN 50041
Positive break force	> 50 N	–
Actuating speed	min. 10 mm/min,	min. 10 mm/min,
Snap action	max. 1 m/s	max. 1 m/s
Slow action	min. 60 mm/min, max. 1 m/s	min. 60 mm/min, max. 1 m/s
Positioning the lever	adjustable in 15° steps	adjustable in 15° steps
Ordering data modular construction kit		
Product type description	PS-N300	PS-J300
Material number	103015402	103015403
Switch travel diagrams		
Snap action	**Per NO contact / per NC contact**		
Slow action	**Per NO contact / per NC contact**		
	1 NO / 1 NC with overlapping		
	2 NC with staggered contacts		

Contact closed Contact open Ⓟ Positive break travel / angle

tec.nicum

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tec.nicum is the new service division of the Schmersal Group. It offers machine manufacturers, machine operators and distributors competent advice with product and manufacturer neutrality.

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  Execution and installation

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1. Position switches according to EN 50041 / EN 50047

PS116 – Preferred types and ordering details

Position switch with actuating element	Connection	Switching system	NO contacts	NC contacts	Type designation	Material number
S200 Basic switch	Connector plug	Snap action	1	1	**PS116-Z11-ST-S200**	**103006651**
			1	2	**PS116-Z12-ST-S200**	**103006662**
		Slow action	1	1	**PS116-T11-ST-S200**	**103006652**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-S200**	**103006633**
			1	2	**PS116-Z12-L200-S200**	**103006647**
		Snap action with latch	1	1	**PS116-Z11R-L200-S200**	**103009907**
			0	2	**PS116-Z02R-L200-S200**	**103012043**
		Slow action	1	1	**PS116-T11-L200-S200**	**103006634**
R200	Connector plug	Snap action	1	1	**PS116-Z11-ST-R200**	**103006653**
			0	2	**PS116-Z02-ST-R200**	**103008391**
			1	2	**PS116-Z12-ST-R200**	**103006663**
		Snap action with latch	1	2	**PS116-Z12R-ST-R200**	**103009897**
		Slow action	1	1	**PS116-T11-ST-R200**	**103006654**
			2	1	**PS116-T21-ST-R200**	**103009215**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-R200**	**103006635**
		Slow action	1	1	**PS116-T11-L200-R200**	**103006636**
			1	2	**PS116-T12-L200-R200**	**103006648**
K200	Connector plug	Snap action	1	1	**PS116-Z11-ST-K200**	**103006655**
			1	2	**PS116-Z12-ST-K200**	**103006664**
	Connecting cable		1	1	**PS116-Z11-L200-K200**	**103006637**
K210	Connector plug	Snap action	1	1	**PS116-Z11-ST-K210**	**103006656**
			1	2	**PS116-Z12-ST-K210**	**103009491**
		Slow action	1	1	**PS116-T11-ST-K210**	**103006657**
			2	1	**PS116-T21-ST-K210**	**103013834**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-K210**	**103006638**
		Snap action with latch	1	2	**PS116-Z12R-L200-K210**	**103009906**
		Slow action	1	1	**PS116-T11-L200-K210**	**103006639**
K230	Connector plug	Snap action	1	1	**PS116-Z11-ST-K230**	**103006658**
		Slow action	0	2	**PS116-T02-ST-K230**	**103014690**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-K230**	**103006640**
			0	2	**PS116-Z02-L200-K230**	**103011608**
K240	Connector plug	Snap action	1	2	**PS116-Z12-ST-K240**	**103006665**
	Connecting cable		1	1	**PS116-Z11-L200-K240**	**103006641**
K250	Connector plug	Snap action	1	2	**PS116-Z12-ST-K250**	**103006666**
		Slow action	1	2	**PS116-T12-ST-K250**	**103006667**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-K250**	**103006642**
		Slow action	1	1	**PS116-T11-L200-K250**	**103006643**
			1	2	**PS116-T12-L200-K250**	**103015281**

To see a wide range of other types, visit **www.schmersal.net**.

1. Position switches according to EN 50041 / EN 50047

PS116 – Preferred types and ordering details

Position switch with actuating element	Connection	Switching system	NO contacts	NC contacts	Type designation	Material number
H200	Connector plug	Snap action	1	1	**PS116-Z11-ST-H200**	**103006659**
			1	2	**PS116-Z12-ST-H200**	**103009490**
		Slow action	1	1	**PS116-T11-ST-H200**	**103006660**
			1	2	**PS116-T12-ST-H200**	**103006668**
			0	3	**PS116-T03-ST-H200**	**103012315**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-H200**	**103006644**
		Slow action	1	1	**PS116-T11-L200-H200**	**103006645**
			1	2	**PS116-T12-L200-H200**	**103006649**
N200	Connector plug	Snap action	1	1	**PS116-Z11-ST-N200**	**103006661**
			1	2	**PS116-Z12-ST-N200**	**103010921**
		Slow action	1	1	**PS116-T11-ST-N200**	**103011367**
			2	0	**PS116-T20-ST-N200**	**103010065**
			1	2	**PS116-T12-ST-N200**	**103011553**
			2	1	**PS116-T21-ST-N200**	**103010067**
	Connecting cable	Snap action	1	1	**PS116-Z11-L200-N200**	**103006646**
			1	2	**PS116-Z12-L200-N200**	**103008748**
		Slow action	1	2	**PS116-T12-L200-N200**	**103006650**
J200	Connector plug	Slow action with staggered contacts	0	2	**PS116-T02H-ST-J200**	**103014413**

1. Position switches according to EN 50041 / EN 50047

PS2xx – Preferred types and ordering details

Position switch with actuating element		Switching system	NO contacts	NC contacts	Type designation	Material number
S200 Basic switch	PS215 Metal	Snap action	1	1	**PS215-Z11-S200**	**103014952**
			0	2	**PS215-Z02-S200**	**103014953**
			1	2	**PS215-Z12-S200**	**103014954**
		Slow action	1	1	**PS215-T11-S200**	**103014977**
			0	2	**PS215-T02-S200**	**103014978**
			1	2	**PS215-T12-S200**	**103014979**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-S200**	**103013713**
			0	2	**PS216-Z02-S200**	**103015001**
			1	2	**PS216-Z12-S200**	**103015002**
		Slow action	1	1	**PS216-T11-S200**	**103015022**
			0	2	**PS216-T02-S200**	**103015023**
			1	2	**PS216-T12-S200**	**103015024**
	PS226 Thermoplastic	Snap action	1	1	**PS226-Z11-S200**	**103015048**
			0	2	**PS226-Z02-S200**	**103015049**
			1	2	**PS226-Z12-S200**	**103015050**
		Slow action	1	1	**PS226-T11-S200**	**103015073**
			0	2	**PS226-T02-S200**	**103015074**
			1	2	**PS226-T12-S200**	**103015075**
R200	PS215 Metal	Snap action	1	1	**PS215-Z11-R200**	**103014955**
		Slow action	1	1	**PS215-T11-R200**	**103014981**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-R200**	**103015003**
			0	2	**PS216-Z02-R200**	**103015004**
			1	2	**PS216-Z12-R200**	**103015005**
		Slow action	1	1	**PS216-T11-R200**	**103015028**
			0	2	**PS216-T02-R200**	**103015029**
			1	2	**PS216-T12-R200**	**103015030**
	PS226 Thermoplastic	Snap action	1	1	**PS226-Z11-R200**	**103015051**
		Slow action	1	1	**PS226-T11-R200**	**103015076**

To see a wide range of other types, visit **www.schmersal.net**.

1. Position switches according to EN 50041 / EN 50047

PS2xx – Preferred types and ordering details

Position switch with actuating element		Switching system	NO contacts	NC contacts	Type designation	Material number
K200	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-K200**	**103015006**
		Slow action	1	1	**PS216-T11-K200**	**103015031**
K210	PS215 Metal	Snap action	1	1	**PS215-Z11-K210**	**103014960**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-K210**	**103015008**
		Slow action	1	1	**PS216-T11-K210**	**103015033**
K230	PS215 Metal	Snap action	1	1	**PS215-Z11-K230**	**103014963**
		Slow action	1	1	**PS215-T11-K230**	**103014988**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-K230**	**103015010**
		Slow action	1	1	**PS216-T11-K230**	**103015035**
K240	PS215 Metal	Slow action	1	1	**PS215-T11-K240**	**103014991**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-K240**	**103015013**
		Slow action	1	1	**PS216-T11-K240**	**103015038**
	PS226 Thermoplastic	Snap action	1	1	**PS226-Z11-K240**	**103015061**
K250	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-K250**	**103015015**
		Slow action	1	1	**PS216-T11-K250**	**103015040**
H200	PS215 Metal	Slow action	1	1	**PS215-T11-H200**	**103014995**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-H200**	**103013857**
			1	2	**PS216-Z12-H200**	**103015017**
		Slow action	1	1	**PS216-T11-H200**	**103015042**
			1	2	**PS216-T12-H200**	**103015043**
N200	PS215 Metal	Snap action	1	1	**PS215-Z11-N200**	**103014972**
		Slow action	1	1	**PS215-T11-N200**	**103014997**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-N200**	**103015018**
			1	2	**PS216-Z12-N200**	**103015019**
		Slow action	1	1	**PS216-T11-N200**	**103015044**
			1	2	**PS216-T12-N200**	**103015045**
J200	PS215 Metal	Snap action	1	1	**PS215-Z11-J200**	**103014974**
	PS216 Thermoplastic	Snap action	1	1	**PS216-Z11-J200**	**103015020**

1. Position switches according to EN 50041 / EN 50047

PS3xx – Preferred types and ordering details

Position switch with actuating element		Switching system	NO contacts	NC contacts	Type designation	Material number
S200 Basic switch	PS315 Metal	Snap action	1	1	**PS315-Z11-S200**	**103015406**
			0	2	**PS315-Z02-S200**	**103015407**
			1	2	**PS315-Z12-S200**	**103015408**
		Slow action	1	1	**PS315-T11-S200**	**103015412**
			0	2	**PS315-T02-S200**	**103015414**
			1	2	**PS315-T12-S200**	**103015415**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-S200**	**103015409**
			0	2	**PS316-Z02-S200**	**103015410**
			1	2	**PS316-Z12-S200**	**103015411**
		Slow action	1	1	**PS316-T11-S200**	**103015417**
			0	2	**PS316-T02-S200**	**103015418**
			1	2	**PS316-T12-S200**	**103015419**
S300	PS315 Metal	Snap action	1	1	**PS315-Z11-S300**	**103015096**
			0	2	**PS315-Z02-S300**	**103015097**
			1	2	**PS315-Z12-S300**	**103015098**
		Slow action	1	1	**PS315-T11-S300**	**103015112**
			0	2	**PS315-T02-S300**	**103015113**
			1	2	**PS315-T12-S300**	**103015114**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-S300**	**103015129**
			0	2	**PS316-Z02-S300**	**103015130**
			1	2	**PS316-Z12-S300**	**103015131**
		Slow action	1	1	**PS316-T11-S300**	**103015146**
			0	2	**PS316-T02-S300**	**103015147**
			1	2	**PS316-T12-S300**	**103015148**
R300	PS315 Metal	Snap action	1	1	**PS315-Z11-R300**	**103015099**
			0	2	**PS315-Z02-R300**	**103015100**
		Slow action	1	1	**PS315-T11-R300**	**103015116**
			0	2	**PS315-T02-R300**	**103015117**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-R300**	**103015132**
			0	2	**PS316-Z02-R300**	**103015133**
		Slow action	1	1	**PS316-T11-R300**	**103015152**
			0	2	**PS316-T02-R300**	**103015153**

To see a wide range of other types, visit **www.schmersal.net**.

1. Position switches according to EN 50041 / EN 50047

PS3xx – Preferred types and ordering details

Position switch with actuating element		Switching system	NO contacts	NC contacts	Type designation	Material number
K360	PS315 Metal	Snap action	1	1	**PS315-Z11-K360**	**103015102**
		Slow action	1	1	**PS315-T11-K360**	**103015119**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-K360**	**103015135**
		Slow action	1	1	**PS316-T11-K360**	**103015155**
K370	PS315 Metal	Snap action	1	1	**PS315-Z11-K370**	**103015104**
		Slow action	1	1	**PS315-T11-K370**	**103015121**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-K370**	**103015137**
		Slow action	1	1	**PS316-T11-K370**	**103015157**
H300	PS315 Metal	Snap action	1	1	**PS315-Z11-H300**	**103015106**
		Slow action	1	1	**PS315-T11-H300**	**103015123**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-H300**	**103015139**
		Slow action	1	1	**PS316-T11-H300**	**103015159**
			1	2	**PS316-T12-H300**	**103015160**
N300	PS315 Metal	Snap action	1	1	**PS315-Z11-N300**	**103015108**
		Slow action	1	1	**PS315-T11-N300**	**103015125**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-N300**	**103015141**
		Slow action	1	1	**PS316-T11-N300**	**103015161**
			1	2	**PS316-T12-N300**	**103015162**
J300	PS315 Metal	Snap action	1	1	**PS315-Z11-J300**	**103015110**
		Slow action	1	1	**PS315-T11-J300**	**103015127**
	PS316 Thermoplastic	Snap action	1	1	**PS316-Z11-J300**	**103015143**
		Slow action	1	1	**PS316-T11-J300**	**103015163**

2. Position and limit switches
Description

Area of application

Position and limit switches are used to detect the position and monitoring of moving parts in machinery and plants. The various series are suitable for applications including steel processing, the transport and handling of bulk materials, as well as in other fixed plants and vehicles.

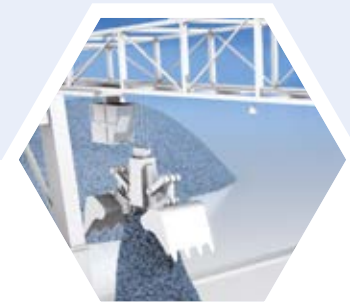
Design and operating principle

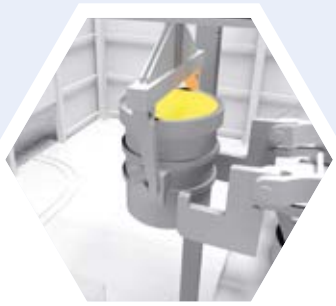
Various series are available, all of which are equipped with a robust metal enclosure and all of which are suitable for position detection under extreme ambient conditions. These include types with extended temperature ranges, covering applications at high temperature in steel works or foundries, as well as applications at low temperature in cold store warehouses. The enclosures, coated in a dual-component finish, protect the switches from oil, grease, salt and acids in diluted concentrations.

The ATEC/IECEx-certified types allow for use in potentially explosive environments. Corresponding solutions exist for zones 1 and 21.

In the individual series there are, in addition to the various standard actuators, also individual actuating elements for different applications. With the switching elements, the user has the choice of a number of different variants with up to six contacts.

Position and limit switches have been part of the core programme of the Schmersal Group for decades. The variety of designs and product ranges is correspondingly large.





Overview

Position and limit switches		you can find from
Standard switches	M 330	Page 38
Series S0	T/M 015	Page 48
	T 016	
	T/M 017	
Series S1	T 422	Page 56
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	T 454	
	T/M 461	
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	T/M 250	
Series S2	T/M 064	Page 72
	T/M 471	
	T 130/136	

2. Position and limit switches
Overview of the series



	■ M 330	■ T/M 015	■ T 016
Key Features			
	• **Standard switch** • 2 contacts • Metal enclosure • Design EN 50041	• **Series S0** • 2 contacts • Metal enclosure	• **Series S0** • 3 contacts • Metal enclosure
Technical features			
Electrical characteristics			
Switching principle	Snap action	Slow action or snap action, positive break NC contact	Slow action, positive break NC contact
Max. switching capacity U/I			
- Snap action	230 VAC / 2.5 A	400 VAC / 2.5 A	–
- Slow action	–	400 VAC / 4 A	400 VAC / 4 A
Mechanical data			
Housing material	Aluminium die-cast, paint finish	Aluminium die-cast, paint finish	Aluminium die-cast, paint finish
Cable entry	1 x M20	3 x M20	3 x M20
Connection	Screw terminals	Screw terminals	Screw terminals
Cable section [1)]	max. 2.5 mm²	max. 2.5 mm²	max. 2.5 mm²
Dimensions (W x H x D)	40 x 76 x 40 mm	67 x 75 x 43 mm	67 x 105 x 43 mm
Ambient conditions			
Ambient temperature	−30 °C … +90 °C up to −40 °C (-1172) up to +160 °C (-1366)	−30 °C … +90 °C	−30 °C … +90 °C
Protection class	IP65	IP65	IP65
Actuator heads	see page 38	see page 48	see page 48
Safety classification			
Standards	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
B_{10D} NC contact	20,000,000	2,000,000	2,000,000
Certificates	cULus, CCC, EAC	CCC, EAC	cULus, CCC, EAC
Other versions			
ATEX / IECEx	Zone 22	–	–
with gold-plated contacts	–	–	–
With blow-out magnets to switch high DC currents	–	■	■

To get detailed information about the products and certificates, visit **www.schmersal.net**.

				
■ T/M 017	**■ T 422**	**■ T/M 441**	**■ T 454**	**■ T/M 461**
• **Series S0** • 4 contacts • Metal enclosure	• **Series S1** • 1 contact • Metal enclosure	• **Series S1** • 2 contacts • Metal enclosure	• **Series S1** • 2 or 4 contacts • Metal enclosure • Exterior parts made of stainless steel	• **Series S1** • 3 or 4 contacts • Metal enclosure
Slow action or snap action, positive break NC contact	Slow action, positive break NC contact	Slow action or snap action, positive break NC contact	Slow action, positive break NC contact	Slow action or snap action, positive break NC contact
400 VAC / 2.5 A	–	230 VAC / 4 A	230 VAC / 4 A	230 VAC / 4 A
400 VAC / 4 A	400 VAC / 4 A	400 VAC / 4 A	230 VAC / 4 A	400 VAC / 4 A
Aluminium die-cast, paint finish	Grey cast iron, galvanised and painted	Grey cast iron, galvanised and painted	Grey cast iron, galvanised and painted	Grey cast iron, galvanised and painted
3 x M20	2 x M20	2 x M20	2 x M20	2 x M20
Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
max. 2.5 mm²	max. 2.5 mm²	max. 2.5 mm²	max. 2.5 mm²	max. 2.5 mm²
67 x 130 x 43 mm	75 x 71 x 63 mm	75 x 99 x 63 mm	83 x 127 x 64 mm	83 x 155 x 64 mm
−30 °C … +90 °C	−30 °C … +90 °C −40 °C … +200 °C	−30 °C … +90 °C −40 °C … +200 °C	−40 °C … +70 °C	−30 °C … +90 °C −40 °C … +200 °C
IP65	IP65	IP65	IP66, IP67	IP65
see page 48	see page 56	see page 56	see page 56	see page 56
IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
–	–	Zone 21, 22	Zone 1, 21	–
–	0.3 µm	0.3 µm	0.3 µm	0.3 µm
■	–	–	–	–

[1] Including conductor ferrules

2. Position and limit switches
Overview of the series

■ U 432

■ U 434

■ T/M 035

Key Features

	• **Series U** • 2 contacts • Metal enclosure • Switching points and contact type adjustable	• **Series U** • 4 contacts • Metal enclosure • Switching points and contact type adjustable	• **Series S3** • 2 contacts • Metal enclosure • Ball-bearing mounted switching shaft

Technical features

Electrical characteristics			
Switching principle	Slow action	Slow action	Slow action or snap action, positive break NC contact
Max. switching capacity U/I			
- Snap action	–	–	400 VAC / 2.5 A
- Slow action	400 VAC / 6 A	400 VAC / 6 A	400 VAC / 4 A
Mechanical data			
Housing material	Aluminium die-cast, paint finish	Aluminium die-cast, paint finish	Grey cast iron, galvanised and painted
Cable entry	3 x M20	3 x M20	3 x M20
Connection	Screw terminals	Screw terminals	Screw terminals
Cable section [1)]	max. 2.5 mm²	max. 2.5 mm²	max. 2.5 mm²
Dimensions (W x H x D)	62 x 80 x 50 mm	62 x 127 x 50 mm	58 x 142 x 61.5 mm
Ambient conditions			
Ambient temperature **- Tropical and temperature resistant**	−20 °C … +60 °C up to −30 °C (-1272)	−20 °C … +60 °C up to −30 °C (-1272)	−30 °C … +90 °C
Protection class	IP65	IP65	IP67
Actuator heads	see page 62	see page 62	see page 68

Safety classification

Standards	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
B_{10D} NC contact	2,000,000	2,000,000	2,000,000
Certificates	cULus EAC	cULus EAC	cULus EAC

Other versions

ATEX / IECEx	–	–	–
with gold-plated contacts	–	–	–
With blow-out magnets to switch high DC currents	–	–	■

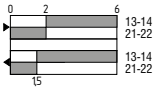
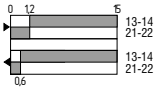
To get detailed information about the products and certificates, visit **www.schmersal.net**.

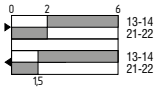
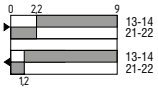
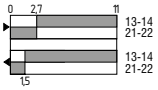
			
■ T/M 250	■ T/M 064	■ T/M 471	■ T 130/136
• **Series S3** • 2 or 4 contacts • Metal enclosure • Switching mechanism can be set	• **Series S2** • 3 or 4 contacts • Metal enclosure • Switching mechanism can be set for switching to right, left or in both directions	• **Series S2** • 4 or 6 contacts • Metal enclosure • Switching mechanism can be set for switching to right, left or in both directions	• **Series S2** • T 130: 6 contacts; T 136: 4 contacts • Metal enclosure
Slow action or snap action, positive break NC contact	Slow action or snap action, positive break NC contact	Slow action or snap action, positive break NC contact	Slow action, positive break NC contact
230 VAC / 2.5 A 400 VAC / 4 A	400 VAC / 25 A 400 VAC / 25 A	400 VAC / 25 A 400 VAC / 25 A	– T 130: 400 VAC / 25 A T 136: 400 VAC / 25 A
Grey cast iron, galvanised and painted	Grey cast iron, galvanised and painted	Grey cast iron, galvanised and painted	Grey cast iron, galvanised and painted
2 x M25	2 x M25	3 x M25	4 x M25
Screw terminals	Screw terminals	Screw terminals	Screw terminals
max. 2.5 mm²	max. 4 mm²	max. 4 mm²	max. 4 mm²
103 x 180 x 125 mm	149 x 156 x 111 mm	130 x 194 x 150 mm	T 130: 135 x 154 x 120; T 136: 154 x 154 x 120
−30 °C … +90 °C −40 °C … +200 °C	−30 °C … +90 °C	−30 °C … +90 °C	−30 °C … +90 °C
IP67	IP65	IP65	IP65
see page 69	see page 72	see page 72	see page 72
IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
2,000,000	2,000,000	2,000,000	1,000,000
Zone 21, 22	Zone 21, 22	–	–
–	–	–	–
■	–	–	–

[1] Including conductor ferrules

2. Position and limit switches

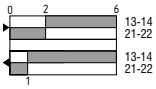
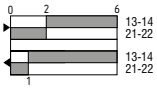
Series M330 – Actuating elements

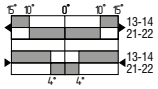
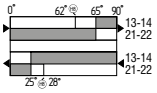
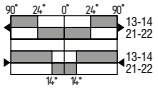
	Plunger S	Telescopic plunger 2 S
Actuator heads		
Actuator description	Plunger to DIN EN 50041	Sleeve for protection against the ingress of dirt
Head can be turned 4 x 90°	–	–
Actuating force	17.5 N	45 N
Actuating torque	–	–
Switch travel diagrams		
Snap action 1 NO / 1 NC	**MS 330-11y** 	**M2S 330-11y** 

		
Roller plunger R	**Offset roller lever K**	**Angle roller lever 3K**
to DIN EN 50041 Plastic roller Actuation head can be rotated by 90 with metal roller available on request	Plastic roller Actuator head can be repositioned in steps 4 x 90° with metal roller available on request	Plastic roller Actuation parallel to axis of switch from below Actuator head can be repositioned in steps 4 x 90° with metal roller available on request
–	–	–
17.5 N	19 N	16 N
–	–	–
MR 330-11y 	**MK 330-11y** 	**M3K 330-11y** 

2. Position and limit switches

Series M330 – Actuating elements

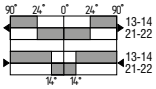
	Side plunger 3S	Side roller plunger 3R
Actuator heads		
Actuator description	Sleeve for protection against the ingress of dirt	Plastic roller Sleeve for protection against the ingress of dirt with metal roller available on request
Head can be turned 4 x 90°	■	■
Actuating force	17 N	17 N
Actuating torque	–	–
Switch travel diagrams		
Snap action **1 NO / 1 NC**	**M3S 330-11y** 	**M3R 330-11y** 

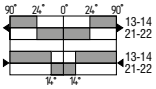
		
Spring rod lever AF	**Fork roller level 4D**	**Rod lever V.**
can be deflected in any direction Elasticity of the spring allows for deflection above the max. switching angle of 15°	Plastic rollers Actuation head with 90° end-position latching Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request	Low-wear rod lever Temperature-resistant design up to +160 °C incl. 10° gearing, suffix -1366 Shaft and actuator with 10° gearing, suffix -1164
–	■	■
9 N	–	–
–	50.5 Ncm	50.5 Ncm
MAF 330-11y	**M3V4D 330-11y**	**MV. 330-11y**
		

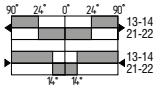
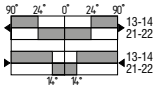
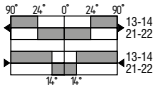
2. Position and limit switches

Series M330 – Actuating elements

	Roller lever 8H	Roller lever H
Actuator heads		
Actuator description	Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request with 10 gearing, suffix -1164	Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request with 10 gearing, suffix -1164
Head can be turned 4 x 90	■	■
Actuating force	–	–
Actuating torque	24 Ncm	50.5 Ncm
Switch travel diagrams		
Snap action 1 NO / 1 NC	**MV8H 330-11y**	**MVH 330-11y**



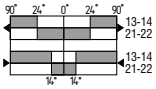


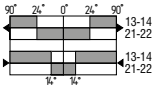
Roller lever 3H	Roller lever 7H	Spring rod lever on shaft 4H
Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request with 10 gearing, suffix -1164	Length adjustable metal lever with plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request	Spring with rod Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft
■	■	–
–	–	–
50.5 Ncm	50.5 Ncm	50.5 Ncm
MV3H 330-11y	**MV7H 330-11y**	**MV4H 330-11y**
		

2. Position and limit switches

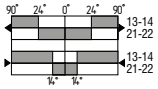
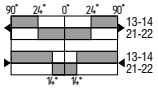
Series M330 – Actuating elements

	Rod lever 9H	Rod lever 10H
Actuator heads		
Actuator description	Stainless steel round rod Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft	Plastic rod Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft Rod available in aluminium or stainless steel
Head can be turned 4 x 90°	■	■
Actuating force	–	–
Actuating torque	50.5 Ncm	50.5 Ncm
Switch travel diagrams		
Snap action 1 NO / 1 NC	**MV9H 330-11y**	**MV10H 330-11y**





Leaf spring rod lever 2H	Leaf spring lever 6H
Epoxy-resin leaf spring Leaf spring thickness 2.5 mm Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft	Spring-steel leaf spring Leaf spring thickness 0.8 mm Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft
■	■
–	–
50.5 Ncm	50.5 Ncm

MV2H 330-11y	MV6H 330-11y
	

2. Position and limit switches

Series M330 – Preferred types

Series	Switching system	Contacts	Actuator	Special features	Type designation	Material number
M 330 	Snap action	1 NO / 1 NC	Telescopic plunger 2 S	---	**M2S 330-11Y**	**101149639**
			Angle roller lever 3K	---	**M3K 330-11Y**	**101168054**
			Side roller plunger 3R	---	**M3R 330-11Y**	**101161735**
			Side plunger 3S	---	**M3S 330-11Y**	**101168055**
			Fork roller level 4D	---	**M3V4D 330-11Y**	**101165920**
			Spring rod lever AF	---	**MAF 330-11Y**	**101160633**
			Offset roller lever K	---	**MK 330-11Y**	**101163173**
			Roller plunger R	---	**MR 330-11Y**	**101165677**
				Temperature-resistant design up to +160 °C	**MR 330-11Y-1366**	**101162603**
			Plunger S	---	**MS 330-11Y**	**101160614**
				Temperature-resistant design up to +160 °C	**MS 330-11Y-1366**	**101164485**
			Rod lever V.	---	**MV. 330-11Y**	**101164341**
			Rod lever 10H	---	**MV10H 330-11Y**	**101168057**
				Temperature-resistant design up to +160 °C incl. 10° gearing	**MV10H 330-11Y-1366**	**101174397**
			Leaf spring rod lever 2H	---	**MV2H 330-11Y**	**101057633**
			Roller lever 3H	---	**MV3H 330-11Y**	**101168052**
				Temperature-resistant design up to +160 °C incl. 10° gearing	**MV3H 330-11Y-1366**	**101057642**
			Spring rod lever on shaft 4H	---	**MV4H 330-11Y**	**101168053**
				Temperature-resistant design up to +160 °C incl. 10° gearing	**MV4H 330-11Y-1366**	**101057649**
			Leaf spring lever 6H	---	**MV6H 330-11Y**	**101149664**
			Roller lever 7H	---	**MV7H 330-11Y**	**101158933**
				Temperature-resistant design up to +160 °C incl. 10° gearing	**MV7H 330-11Y-1366**	**101160085**
			Rod lever 9H	---	**MV9H 330-11Y**	**101168056**
				Temperature-resistant design up to +160 °C incl. 10° gearing	**MV9H 330-11Y-1366**	**101168903**
			Roller lever H	---	**MVH 330-11Y**	**101160129**
				Temperature-resistant design up to +160 °C incl. 10° gearing	**MVH 330-11Y-1366**	**101166264**
	Operating lever as accessory				**Leaf spring lever 6H**	**101064152**
					Spring rod lever on shaft 4H	**101064151**
					Roller lever 3H	**101064143**
					Roller lever 7H	**101064153**
					Roller lever H	**101064128**
					Rod lever 10H	**101064157**
					Rod lever 9H	**101064156**

2. Position and limit switches

Series M330 – Ordering code

MV7H 330-11Y-G24-1366

Actuator selection	
S	Plunger
2NO	Telescopic plunger
R	Roller plunger
K	Offset roller lever
3K	Angle roller lever
3NO	Side plunger
3R	Side roller plunger
AF	Spring rod lever
4D	Fork roller lever
V.	Rod lever
H	Roller lever H
3H	Roller lever 3H
7H	Roller lever 7H
4H	Spring rod lever on shaft 4H
9H	Rod lever 9H
10H	Rod lever 10H
2H	Leaf spring rod lever 2H
6H	Leaf spring lever 6H

Special versions	
AuNi	Gold-nickel alloy contacts
1164	Shaft and actuator with 10° gearing
1366	Temperature-resistant design to +160 °C incl.10° gearing for swivel levers

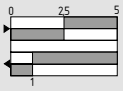
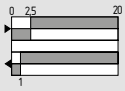
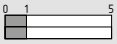
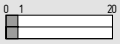
LED	
	without LED
G24	with LED

For technical reasons, not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

To see a wide range of other types, visit **www.schmersal.net**.

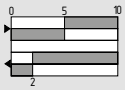
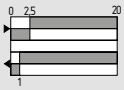
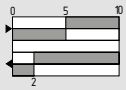
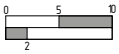
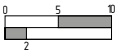
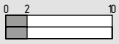
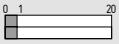
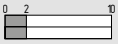
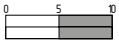
2. Position and limit switches

Series S0 – Actuating elements

	Plunger S	Telescopic plunger 2 S
Actuator heads		
Actuator description	Thermoplastic plunger	Actuator head with captive stainless steel ball actuator With large after-travel Available with bellows to protect against coarse dirt, ordering suffix -q
Head can be turned 4 x 90°	–	–
Actuating speed	max. 1 m/s	max. 1 m/s
Vertical actuating angle	max.20°	max.20°
from right	–	–
from left	–	–
Switch travel diagrams		
Snap action **1 NO / 1 NC**	**MS 015-11y** 	**M2S 015-11y** 
Slow action **1 NO / 1 NC**	**TS 015-11y** 	**T2S 015-11y** 
2 NC	**TS 015-02y** 	**T2S 015-02y** 
2 NO	**TS 015-20y** 	**T2S 015-20y** 

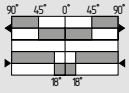
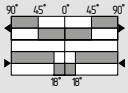
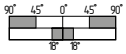
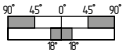
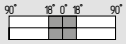
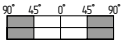
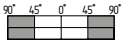
The switching distances of the contacts in series T 016 and T/M 017 correspond to series T/M 015.

		
Offset roller lever K	**Tilt lever 2K**	**Angle roller lever 3K**
Plastic roller Actuator head can be repositioned in steps 4 x 90° with metal roller available on request	Plastic roller Actuation only possible from left Free movement of actuator from right Actuator head can be repositioned in steps 4 x 90° with metal roller available on request	Plastic roller Actuation parallel to axis of switch from below Actuator head can be repositioned in steps 4 x 90° with metal roller available on request
–	–	–
max. 0.5 m/s	max. 0.5 m/s	max. 0.5 m/s
–	–	max.45°
max.30°	max.60°	–
max.45°	max.45°	–

MK 015-11y 	**M2K 015-11y** 	**M3K 015-11y** 
TK 015-11y 	**T2K 015-11y** 	**T3K 015-11y** 
TK 015-02y 	**T2K 015-02y** 	**T3K 015-02y** 
TK 015-20y 	**T2K 015-20y** 	**T3K 015-20y** 

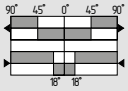
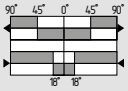
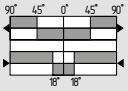
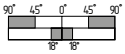
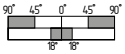
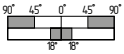
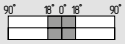
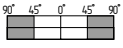
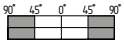
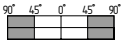
Contact closed
Contact open

2. Position and limit switches
Series S0 – Actuating elements

	Rod lever V.	Roller lever 8H
Actuator heads		
Actuator description	Shaft and actuator available with gearing, suffix -1164	Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request
Head can be turned 4 x 90°	■	■
Actuating speed	max. 3 m/s	max. 3 m/s
Vertical actuating angle	–	–
from right	max.30°	max.30°
from left	max.30°	max.30°
Switch travel diagrams		
Snap action **1 NO / 1 NC**	**MV. 015-11y** 	**MV8H 015-11y** 
Slow action **1 NO / 1 NC**	**TV. 015-11y** 	**TV8H 015-11y** 
2 NC	**TV. 015-02y** 	**TV8H 015-02y** 
2 NO	**TV. 015-20y** 	**TV8H 015-20y** 

The switching distances of the contacts in series T 016 and T/M 017 correspond to series T/M 015.

Roller lever H	Roller lever 3H	Roller lever 7H
Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request	Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request	Length adjustable metal lever with plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request
■	■	■
max. 3 m/s	max. 3 m/s	max. 3 m/s
–	–	–
max.30°	max.30°	max.30°
max.30°	max.30°	max.30°

MVH 015-11y 	**MV3H 015-11y** 	**MV7H 015-11y** 
TVH 015-11y 	**TV3H 015-11y** 	**TV7H 015-11y** 
TVH 015-02y 	**TV3H 015-02y** 	**TV7H 015-02y** 
TVH 015-20y 	**TV3H 015-20y** 	**TV7H 015-20y** 

Contact closed

Contact open

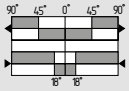
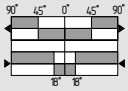
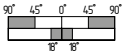
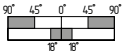
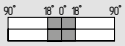
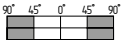
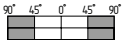
2. Position and limit switches

Series S0 – Actuating elements

Actuator heads

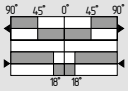
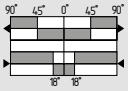
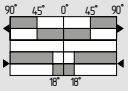
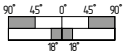
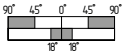
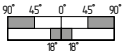
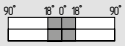
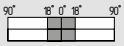
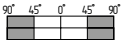
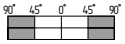
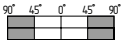
	Spring rod lever on shaft 4H	Rod lever 9H
Actuator description	Elasticity of spring allows for inexact movement of actuator Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft	Steel rod Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft
Head can be turned 4 x 90°	■	■
Actuating speed	max. 3 m/s	max. 3 m/s
Vertical actuating angle	–	–
from right	max.30°	max.30°
from left	max.30°	max.30°

Switch travel diagrams

Snap action	**1 NO / 1 NC**	**MV4H 015-11y** 	**MV9H 015-11y** 
Slow action	**1 NO / 1 NC**	**TV4H 015-11y** 	**TV9H 015-11y** 
	2 NC	**TV4H 015-02y** 	**TV9H 015-02y** 
	2 NO	**TV4H 015-20y** 	**TV9H 015-20y** 

The switching distances of the contacts in series T 016 and T/M 017 correspond to series T/M 015.

		
Rod lever 10H	**Leaf spring rod lever 2H**	**Leaf spring lever 6H**
Epoxy resin rod Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft	Epoxy-resin leaf spring Leaf spring thickness 2.5 mm Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft	Spring-steel leaf spring Leaf spring thickness 0.8 mm Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft
■	■	■
max. 3 m/s	max. 3 m/s	max. 3 m/s
–	–	–
max.30°	max.30°	max.30°
max.30°	max.30°	max.30°

MV10H 015-11y 	**MV2H 015-11y** 	**MV6H 015-11y** 
TV10H 015-11y 	**TV2H 015-11y** 	**TV6H 015-11y** 
TV10H 015-02y 	**TV2H 015-02y** 	**TV6H 015-02y** 
TV10H 015-20y 	**TV2H 015-20y** 	**TV6H 015-20y** 

Contact closed
Contact open

2. Position and limit switches
Series S0 – Preferred types

Series	Switching system	Contacts	Actuator	Type designation	Material number
S0 	Snap action	1 NO / 1 NC	Telescopic plunger - 2 S	**M2S 015-11Y**	**101160497**
			Offset roller lever K	**MK 015-11Y**	**101160412**
			Plunger S	**MS 015-11Y**	**101170443**
			Rod lever V.	**MV. 015-11Y**	**101174600**
			Roller lever 3H	**MV3H 015-11Y**	**101058452**
			Roller lever H	**MVH 015-11Y**	**101160442**
	Slow action	1 NO / 1 NC	Plunger S	**TS 015-11Y**	**101170456**
			Tilt lever 2K	**T2K 015-11Y**	**101170062**
			Telescopic plunger - 2 S	**T2S 015-11Y**	**101161467**
		2 NC	Offset roller lever K	**TK 015-02Y**	**101054782**
	Slow action	2 NO / 1 NC	Telescopic plunger - 2 S	**T2S 016-21Y**	**101054869**
		3 NC	Plunger S	**TS 016-03Y**	**101168064**
			Rod lever V.	**TV. 016-03Y**	**101060212**
	Snap action	2 NO / 2 NC	Offset roller lever K	**MK 017-22Y**	**101164045**
	Slow action			**TK 017-22Y**	**101054954**
	Operating lever as accessory			**Leaf spring lever 6H**	**101064152**
				Spring rod lever on shaft 4H	**101064151**
				Roller lever 3H	**101064143**
				Roller lever 7H	**101064153**
				Roller lever 8H	**101064239**
				Roller lever H	**101064128**
				Rod lever 10H	**101064157**
				Rod lever 9H	**101064156**

2. Position and limit switches
Series S0 – Ordering code

MV3H 015-11Y-C

Switching system	
T	Slow action ⊖
M	Snap action

Actuator selection	
S	Plunger
2NO	Telescopic plunger
K	Offset roller lever
2K	Tilt lever
3K	Angle roller lever
V.	Rod lever
8H	Roller lever 8H
H	Roller lever H
3H	Roller lever 3H
7H	Roller lever 7H
4H	Spring rod lever on shaft 4H
9H	Rod lever 9H
10H	Rod lever 10H
6H	Leaf spring lever 6H

Special versions	
Ü	Slow action with overlapping contacts
H	Slow action with staggered contacts
C	Magnetic blow-out

Contacts	
02	2 NC
03	3 NC
11	1 NO/1 NC
12	2 NO/1 NC
13	3 NO/1 NC
20	2 NO
21	1 NO/2 NC
22	2 NO/2 NC
30	3 NO
31	1 NO/3 NC

Enclosure selection	
015	Metal enclosure with 2 contacts
016	Metal enclosure with 3 contacts
017	Metal enclosure with 4 contacts

For technical reasons, not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

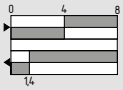
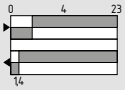
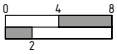
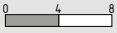
To see a wide range of other types, visit **www.schmersal.net**.

2. Position and limit switches
Series S1 – Actuating elements

Actuator heads

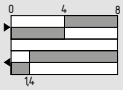
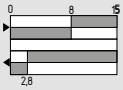
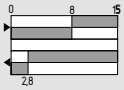
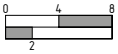
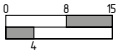
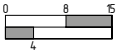
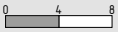
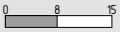
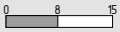
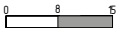
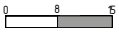
Actuator description	Plunger S	Telescopic plunger - 2 S
	Plunger	Actuator with captive metal ball With large after-travel Available with bellows to protect against coarse dirt, ordering suffix -q
Head can be turned 4 x 90°	–	–
Actuating speed	max. 1 m/s	max. 1 m/s
Vertical actuating angle	max.20°	max.20°
from right	–	–
from left	–	–

Switch travel diagrams

		Plunger S	Telescopic plunger - 2 S
Snap action	**1 NO / 1 NC**	**MS 441-11y** 	**M2S 441-11y** 
Slow action	**1 NO / 1 NC**	**TS 441-11y** 	**T2S 441-11y** 
	1 NC	**TS 422-01y** 	**T2S 422-01y** 
	1 NO	**TS 422-10y** 	**T2S 422-10y** 

The switching distances of the contacts in series T 452 and T/M 461 correspond to series T/M 441 and T 422.

		
Roller plunger R	**Offset roller lever K**	**Offset roller lever J**
Plastic roller Actuator can be turned by 90 with metal roller available on request	Plastic roller Actuation only possible from left Actuator head can be repositioned in steps 4 x 90° with metal roller available on request	Plastic roller Actuation only possible from left Actuator head can be repositioned in steps 4 x 90° with metal roller available on request
–	–	–
max. 0.5 m/s	max. 0.5 m/s	max. 0.5 m/s
–	–	–
max.30°	max.30°	max.30°
max.30°	max.45°	max.45°

MR 441-11y 	**MK 441-11y** 	**MJ 441-11y** 
TR 441-11y 	**TK 441-11y** 	**TJ 441-11y** 
TR 422-01y 	**TK 422-01y** 	**TJ 422-01y** 
TR 422-10y 	**TK 422-10y** 	**TJ 422-10y** 

2. Position and limit switches
Series S1 – Actuating elements

Actuator heads

	Fork lever 2C	Roller lever L
Actuator description	with end-position latching Actuator head can be repositioned in steps 4 x 90° Changes to the actuation direction by turning the actuator Surface-hardened actuator	Plastic roller Continuous adjustment of lever position 360° Actuator can be turned by 180° on the shaft with metal roller available on request Shaft and actuator with gearing, suffix -1801
Head can be turned 4 x 90°	–	■
Actuating speed	max. 0.5 m/s	max. 3 m/s
Vertical actuating angle	–	–
from right	–	max.30°
from left	–	max.30°

Switch travel diagrams

		Fork lever 2C	Roller lever L
Snap action	**1 NO / 1 NC**	**M2C 441-11y**	**ML 441-11y**
Slow action	**1 NO / 1 NC**	**T2C 441-11y**	**TL 441-11y**
	1 NC	**T2C 422-01y**	**TL 422-01y**
	1 NO	**T2C 422-10y**	**TL 422-10y**

The switching distances of the contacts in series T 452 and T/M 461 correspond to series T/M 441 and T 422.

Roller lever D

Plastic roller
Continuous adjustment
of lever position 360°
Actuator can be turned
by 180° on the shaft
with metal roller available on request
Shaft and actuator with gearing,
suffix -1801

■

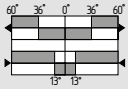
max. 3 m/s

–

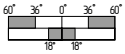
max.30°

max.30°

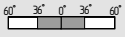
MD 441-11y



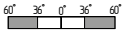
TD 441-11y



TD 422-01y



TD 422-10y



2. Position and limit switches

Series S1 – Preferred types

Series	Switching system	Contacts	Actuator	Special features	Type designation	Material number
S1 	Slow action	1 NO	Roller lever D	---	**TD 422-10Y**	**101059468**
		1 NC		---	**TD 422-01Y**	**101170460**
			Roller plunger R	---	**TR 422-01Y**	**101058682**
			Fork lever 2C	---	**T2C 422-01Y**	**101059651**
			Roller lever L	---	**TL 422-01Y**	**101168785**
		1 NO		---	**TL 422-10Y**	**101059278**
	Snap action	1 NO / 1 NC		---	**M. 441-11Y**	**101170470**
				−40°C … +200°C	**M. 441-11Y-T**	**101170473**
			Fork lever 2C	---	**M2C 441-11Y**	**101059676**
			Telescopic plunger 2 S	---	**M2S 441-11Y**	**101058560**
			Offset roller lever J	---	**MJ 441-11Y**	**101059115**
			Offset roller lever K	---	**MK 441-11Y**	**101058945**
			Roller lever L	---	**ML 441-11Y**	**101170496**
				−40°C … +200°C	**ML 441-11Y-T**	**101170498**
			Roller plunger R	---	**MR 441-11Y**	**101058758**
			Plunger S	---	**MS 441-11Y**	**101169605**
	Slow action	1 NO / 1 NC		---	**T. 441-11Y**	**101162538**
				−40°C … +200°C	**T. 441-11Y-T**	**101056534**
			Fork lever 2C	---	**T2C 441-11Y**	**101059661**
			Roller lever D	---	**TD 441-11Y**	**101170463**
			Offset roller lever K	---	**TK 441-11Y**	**101058908**
			Roller lever L	---	**TL 441-11Y**	**101059310**
			Roller plunger R	---	**TR 441-11Y**	**101171772**
	Slow action. with staggered contacts	2 NO / 2 NC		---	**T. 454-22Z-H**	**103013113**
	Snap action	2 NO / 2 NC	Roller lever D	---	**MD 461-22Y**	**101059618**
	Operating lever as accessory				**Roller lever D**	**101064671**
					Roller lever L	**101064609**

2. Position and limit switches
Series S1 – Ordering code

M2C 441-11Y-1276-2

Switching system	
T	Slow action ⊖
M	Snap action

Actuator selection	
S	Plunger
2NO	Telescopic plunger
R	Roller plunger
K	Offset roller lever
J	Offset roller lever
2C	Fork lever
L	Roller lever L
D	Roller lever D

Enclosure selection	
422	Metal enclosure with 1 contact
441	Metal enclosure with 2 contacts
454	Metal enclosure with 2 or 4 contacts
461	Metal enclosure with 3 or 4 contacts

Special versions	
T	Tropic and temperature-resistant version −40 °C to +200 °C
1276-2	Gold-plated contacts

Contacts	
01	1 NC
02	2 NC
03	3 NC
10	1 NO
11	1 NO/1 NC
12	2 NO/1 NC
13	3 NO/1 NC
20	2 NO
21	1 NO/2 NC
22	2 NO/2 NC
30	3 NO
31	1 NO/3 NC

For technical reasons, not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

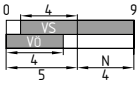
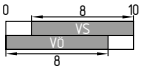
To see a wide range of other types, visit **www.schmersal.net**.

2. Position and limit switches
Series U – Actuating elements

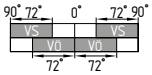
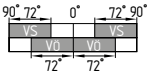
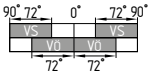
Actuator heads

	Plunger S	Offset roller lever K
Actuator description	Plunger Switching points and contact type adjustable	Plastic roller with metal roller available on request Switching points and contact type adjustable
Head can be turned 4 x 90°		
Actuating speed	max. 0.5 m/s	max. 0.5 m/s
Vertical actuating angle	max.20°	–
from right	–	max.30°
from left	–	max.45°
Actuator weight	–	–

Switch travel diagrams

		US 432y	UK 432y
Slow action	**Optionally adjustable NO contact or NC contact**		

Contact function, i. e. NC or NO contact, and switching points can be adjusted using a screwdriver.
On request, the contact type and switching points can also be supplied as adjustable.
On swivel levers, each contact setting is effective in both directions of rotation.

		
Rod lever V	**Roller lever 8H**	**Roller lever H**
Shaft and actuator available with gearing, suffix -1164 Switching points and contact type adjustable	Plastic roller Shaft and actuator available with gearing with metal roller, ordering suffix -RMS Switching points and contact type adjustable	Plastic roller Shaft and actuator available with gearing with metal roller, ordering suffix -RMS Switching points and contact type adjustable
max. 3 m/s	max. 3 m/s	max. 3 m/s
–	–	–
max.30°	max.30°	max.30°
max.30°	max.30°	max.30°
–	25 g	45 g
UV. 432y	**UV8H 432y**	**UVH 432y**
		

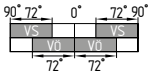
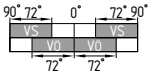
Key
VS: Adjustment range, NO contact
VO: Adjustment range, NC contact
N: After-travel

2. Position and limit switches
Series U – Actuating elements

Actuator heads

	Roller lever 3H	Roller lever 7H
Actuator description	Plastic roller Shaft and actuator available with gearing with metal roller, ordering suffix -RMS Switching points and contact type adjustable	Length adjustable metal lever with plastic roller with metal roller, ordering suffix -RMS Switching points and contact type adjustable
Head can be turned 4 x 90°		
Actuating speed	max. 3 m/s	max. 3 m/s
Vertical actuating angle	–	–
from right	max.30°	max.30°
from left	max.30°	max.30°
Actuator weight	95 g	105 g

Switch travel diagrams

		UV3H 432y	UV7H 432y
Slow action	**Optionally adjustable NO contact or NC contact**		

Contact function, i. e. NC or NO contact, and switching points can be adjusted using a screwdriver.
On request, the contact type and switching points can also be supplied as adjustable.
On swivel levers, each contact setting is effective in both directions of rotation.

Spring rod lever on shaft 4H	Rod lever 9H	Rod lever 10H
Spring rod lever on shaft Switching points and contact type adjustable	Steel rod Switching points and contact type adjustable	Plastic rod Switching points and contact type adjustable
max. 3 m/s	max. 3 m/s	max. 3 m/s
–	–	–
max.30°	max.30°	max.30°
max.30°	max.30°	max.30°
105 g	90 g	75 g
UV4H 432y	**UV9H 432y**	**UV10H 432y**

Key
VS: Adjustment range, NO contact
VO: Adjustment range, NC contact
N: After-travel

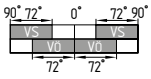
2. Position and limit switches
Series U – Actuating elements

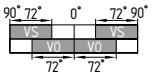
Actuator heads

	Leaf spring rod lever 2H	Leaf spring lever 6H
Actuator description	Epoxy-resin leaf spring Leaf spring thickness 2.5 mm	Spring-steel leaf spring Leaf spring thickness 0.8 mm
Head can be turned 4 x 90°		
Actuating speed	max. 3 m/s	max. 3 m/s
Vertical actuating angle	–	–
from right	max.30°	max.30°
from left	max.30°	max.30°
Actuator weight	85 g	85 g

Switch travel diagrams

Slow action	**Optionally adjustable NO contact or NC contact**	**UV2H 432y**	**UV6H 432y**





Key
VS: Adjustment range, NO contact
VO: Adjustment range, NC contact
N: After-travel

Contact function, i. e. NC or NO contact, and switching points can be adjusted using a screwdriver.
On request, the contact type and switching points can also be supplied as adjustable.
On swivel levers, each contact setting is effective in both directions of rotation.

2. Position and limit switches

Series U – Preferred types and ordering code

Series	Switching system	Contacts	Actuator	Type designation	Material number
U 432/434 	Slow action	2 NC	Offset roller lever K	**UK 432Y**	**101166388**
			Plunger S	**US 432Y**	**101176036**
			Rod lever V.	**UV. 432Y**	**101162761**
			Rod lever 10H	**UV10H 432Y**	**101060554**
			Roller lever 3H	**UV3H 432Y**	**101060537**
			Rod lever 9H	**UV9H 432Y**	**101060553**
			Roller lever H	**UVH 432Y**	**101161093**
		2 NO / 2 NC	Plunger S	**US 434Y**	**101176035**
	Operating lever as accessory			**Leaf spring lever 6H**	**101064152**
				Spring rod lever on shaft 4H	**101064151**
				Roller lever 3H	**101064143**
				Roller lever 7H	**101064153**
				Roller lever 8H	**101064239**
				Roller lever H	**101064128**
				Rod lever 10H	**101064157**
				Rod lever 9H	**101064156**

UV10H 432Y-2S-1172

Actuator selection	
S	Plunger
K	Offset roller lever
V.	Rod lever
8H	Roller lever 8H
H	Roller lever H
3H	Roller lever 3H
7H	Roller lever 7H
4H	Spring rod lever on shaft 4H
9H	Rod lever 9H
Enclosure selection	
432	Metal enclosure with 2 contacts
434	Metal enclosure with 4 contacts

Special versions	
1172	Low-temperature design to −30 °C
Contacts	
Series 432 with 2 contacts	
	2 NC
2NO	2 NO
1NO/1NC	1 NO/1 NC contacts
Series 434 with 4 contacts	
	2 NO/2 NC contacts
4NC	4 NC
4NO	4 NO
1NO/3NC	3 NO/1 NC contacts
3NO/1NC	1 NO/3 NC contacts

For technical reasons, not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

To see a wide range of other types, visit **www.schmersal.net**.

	Roller lever 2L
Actuator heads	
Actuator description	Metal roller Ball-bearing mounted switching shaft
Head can be turned 4 x 90°	■
Actuating speed	max. 1 m/s
Vertical actuating angle	–
from right	max.30°
from left	max.30°

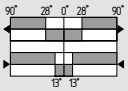
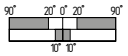
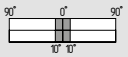
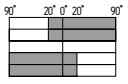
Switch travel diagrams

Snap action	**1 NO / 1 NC**	**M2L 035-11z**
Slow action	**1 NO / 1 NC**	**T2L 035-11z**
	2 NC	**T2L 035-02z**
	2 NO	**T2L 035-20z**

Actuator heads

	Roller lever D
Actuator description	Plastic roller Switching mechanism can be set for switching: right, left or in both directions
Head can be turned 4 x 90°	–
Actuating speed	max. 3 m/s
Vertical actuating angle	–
from right	max.30°
from left	max.30°

Switch travel diagrams

Snap action	**1 NO / 1 NC**	**MD 250-11z** 
Slow action	**1 NO / 1 NC**	**TD 250-11z** 
	2 NC	**TD 250-02z** 
	2 NC contact to the left 2 NC contact to the right	**TD 250-02/02z** 

2. Position and limit switches
Series S3 – Preferred types

Series		Switching system	Contacts	Actuator	Type designation	Material number
S3	T/M 035 	Slow action	2 NC contact	Roller lever 2L	**T2L 035-02Z**	**101056296**
			2 NO		**T2L 035-20Z**	**101056298**
	T/M 250 	Snap action	1 NO / 1 NC	Roller lever D	**MD 250-11Z**	**101057965**
		Slow action	1 NC to the right/ 1 NC to the left		**TD 250-01/01Z**	**101058138**
			2 NC to the right/ 2 NC to the left		**TD 250-02/02Z**	**101058179**
			2 NC contact		**TD 250-02Z**	**101057989**
			1 NO/1 NC to the right/ 1 NO/1 NC to the left		**TD 250-11/11Z**	**101058150**
			2 NO / 2 NC		**TD 250-22Z**	**101058095**

2. Position and limit switches
Series S3 – Ordering code

T2L 035-02ZÜ-C

Switching system	
T	Slow action ⊖
M	Snap action
Contacts	
02	2 NC
11	1 NO/1 NC contacts
20	2 NO

Special versions	
	Without
C	Magnetic blow-out
Special versions	
Ü	Slow action with overlapping contacts
H	Slow action with staggered contacts

TD 250-11/11ZÜ-R-T

Switching system	
T	Slow action ⊖
M	Snap action
Contacts	
02	2 NC
11	1 NO/1 NC contacts
01/01	1 NC to the right/1 NC to the left
02/02	2 NC to the right/2 NC to the left
11/11	1 NO/1 NC to the right/ 1 NO/1 NC to the left

Special versions	
T	Tropic and temperature-resistant version −40 °C to +200 °C
1276-2	Gold-plated contacts
Special versions	
C	Magnetic blow-out
R	Latching 2 x 45°
Special versions	
	Without
Ü	Slow action with overlapping contacts

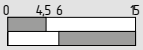
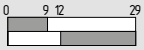
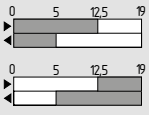
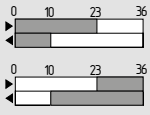
For technical reasons, not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

To see a wide range of other types, visit **www.schmersal.net**.

2. Position and limit switches
Series S2 – Actuating elements

	Plunger S	Offset roller lever J
Actuator heads		
Actuator description	Plunger Roller levers J and X can be subsequently fitted at plunger S	Plastic roller with metal roller available on request available with rubber roller, suffix -1
Head can be turned 4 x 90°	–	■
Actuating speed	max. 1 m/s	max. 0.5 m/s
Vertical actuating angle	max.20°	–
from right	–	max.45°
from left	–	max.30°

Switch travel diagrams

Slow action	**Per NO contact / per NC contact**	**TS 064** 	**TJ 064** 
	Per NO contact / per NC contact		
	Per NO contact / per NC contact		
	Per NO contact / per NC contact		
Snap action	**Per NO contact / per NC contact**	**MS 064** 	**MJ 064** 
	Per NO contact / per NC contact		

These actuators can only be used with series TS/MS 064.
Roller levers J and X can be subsequently fitted at plunger S

Offset roller lever X	Roller lever L	Roller lever A
Plastic roller with metal roller available on request	Plastic roller with metal roller available on request available with rubber roller, suffix -1 Continuous adjustment of lever position 360°	Plastic roller with metal roller available on request available with rubber roller, suffix -1 Continuous adjustment of lever position 360°
■	–	–
max. 0.5 m/s	max. 3 m/s	max. 3 m/s
–	–	–
max.45°	max.30°	max.30°
max.30°	max.30°	max.30°

TX 064	**TL 064-11Y**	**TA 064-11Y**	
	TL 064-01Y **TL 136-01Y**	**TL 064-10Y** **TL 136-10Y**	**TA 064-01Y** **TA 136-01Y**	**TA 064-10Y** **TA 136-10Y**
	TL 471-11Y	**TA 471-11Y**	
	TL 130-01Y	**TL 130-10Y**	**TA 130-01Y**	**TA 130-10Y**
MX 064	**ML 471-11Y**	**ML 471-11Y-Li**	**MA 471-11Y**	**MA 471-11Y-Li**
	ML 064-01Y **ML 064-10Y**	**ML 064-01Y-Li** **ML 064-10Y-Li**	**MA 064-01Y** **MA 064-10Y**	**MA 064-01Y-Li** **MA 064-10Y-Li**

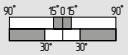
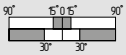
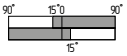
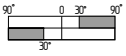
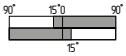
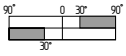
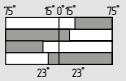
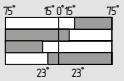
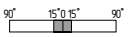
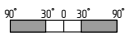
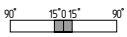
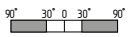
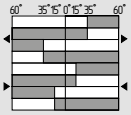
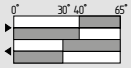
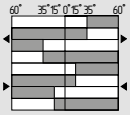
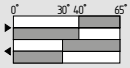
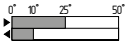
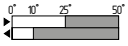
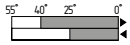
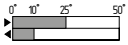
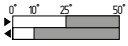
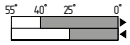
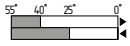
2. Position and limit switches

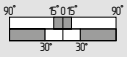
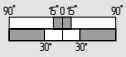
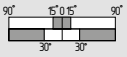
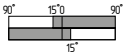
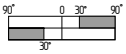
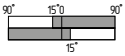
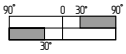
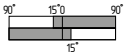
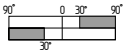
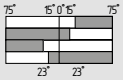
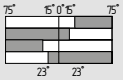
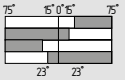
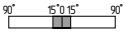
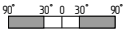
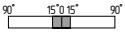
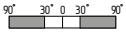
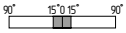
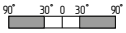
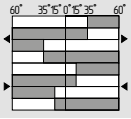
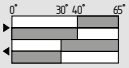
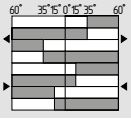
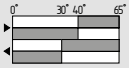
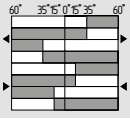
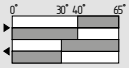
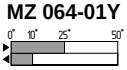
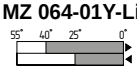
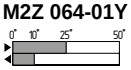
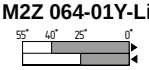
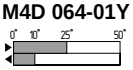
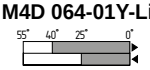
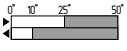
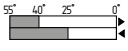
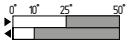
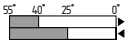
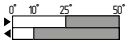
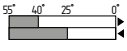
Series S2 – Actuating elements

Actuator heads

	Roller lever 2A	Roller lever V
Actuator description	Plastic roller with metal roller available on request available with rubber roller, suffix -1 Continuous adjustment of lever position 360°	Plastic roller with metal roller available on request available with rubber roller, suffix -1 Continuous adjustment of lever position 360°
Head can be turned 4 x 90°	–	–
Actuating speed	max. 3 m/s	max. 3 m/s
Vertical actuating angle	–	–
from right	max.30°	max.30°
from left	max.30°	max.30°

Switch travel diagrams

Slow action	**Per NO contact / per NC contact**	**T2A 064-11Y** 		**TV 064-11Y** 	
	Per NO contact / per NC contact	**T2A 064-01Y** **T2A 136-01Y** 	**T2A 064-10Y** **T2A 136-10Y** 	**TV 064-01Y** **TV 136-01Y** 	**TV 064-10Y** **TV 136-10Y** 
	Per NO contact / per NC contact	**T2A 471-11Y** 		**TV 471-11Y** 	
	Per NO contact / per NC contact	**T2A 130-01Y** 	**T2A 130-10Y** 	**TV 130-01Y** 	**TV 130-10Y** 
Snap action	**Per NO contact / per NC contact**	**M2A 471-11Y** 	**M2A 471-11Y-Li** 	**MV 471-11Y** 	**MV 471-11Y-Li** 
	Per NO contact / per NC contact	**M2A 064-01Y**  **M2A 064-10Y** 	**M2A 064-01Y-Li**  **M2A 064-10Y-Li** 	**MV 064-01Y**  **MV 064-10Y** 	**MV 064-01Y-Li**  **MV 064-10Y-Li** 

Pull lever Z	Pull lever 2Z	Offset roller lever 4D
Continuous adjustment of lever position 360°	Continuous adjustment of lever position 360°	Continuous adjustment of lever position 360°
–	–	–
max. 3 m/s	max. 3 m/s	max. 3 m/s
–	–	–
max.30°	max.30°	max.30°
max.30°	max.30°	max.30°
TZ 064-11Y 	**T2Z 064-11Y** 	**T4D 064-11Y** 
TZ 064-01Y **TZ 136-01Y** 	**TZ 064-10Y** **TZ 136-10Y** 	**T2Z 064-01Y** **T2Z 136-01Y** 	**T2Z 064-10Y** **T2Z 136-10Y** 	**T4D 064-01Y** **T4D 136-01Y** 	**T4D 064-10Y** **T4D 136-10Y** 
TZ 471-11Y 	**T2Z 471-11Y** 	**T4D 471-11Y** 
TZ 130-01Y 	**TZ 130-10Y** 	**T2Z 130-01Y** 	**T2Z 130-10Y** 	**T4D 130-01Y** 	**T4D 130-10Y** 
MZ 471-11Y 	**MZ 471-11Y-Li** 	**M2Z 471-11Y** 	**M2Z 471-11Y-Li** 	**M4D 471-11Y** 	**M4D 471-11Y-Li** 
MZ 064-01Y 	**MZ 064-01Y-Li** 	**M2Z 064-01Y** 	**M2Z 064-01Y-Li** 	**M4D 064-01Y** 	**M4D 064-01Y-Li** 
MZ 064-10Y 	**MZ 064-10Y-Li** 	**M2Z 064-10Y** 	**M2Z 064-10Y-Li** 	**M4D 064-10Y** 	**M4D 064-10Y-Li** 

2. Position and limit switches
Series S2 – Preferred types

Series		Switching system	Contacts	Actuator	Special features	Type designation	Material number
S2	T/M 064 	Snap action	3 NC	Offset roller lever J	---	**MJ 064-03Y**	**101056945**
		Slow action	3 NC	Offset roller lever J	---	**TJ 064-03Y**	**101057481**
			1 NO / 2 NC	Plunger S	---	**TS 064-12Y**	**101057473**
			2 NO / 1 NC	Pull lever Z	---	**TZ 064-21Y**	**101060723**
			3 NC		Latching 2 x 45°	**TZ 064-03Y-R=2X45GR.**	**101116036**
			1 NO / 2 NC	Roller lever A	---	**TA 064-12Y**	**101060739**
			3 NC		---	**TA 064-03Y**	**101060769**
			1 NO / 2 NC	Offset roller lever	Latching 2 x 90°	**T4D 064-12Y-R=2X90GR.**	**101099338**
	T./M. 064 	Snap action	1 NO / 2 NC	Rod lever	Actuating direction always 50° right-hand side rotation	**M. 064-12Y**	**101060848**
		Slow action	1 NO to the left/ 2 NO to the right	Rod lever	Actuating direction, each time 90° right-hand side and left-hand side rotation	**T. 064-10/20Y**	**101060794**
			3 NO			**T. 064-30Y**	**101060756**
			2 NO / 1 NC		Latching 1 x 90°	**T. 064-21Y-R=1X90GR.**	**101087099**
	T/M 471 	Snap action	1 NO/2 NC to the left/ 1 NO/2 NC to the right	Rod lever	Actuating direction, each time 60° right-hand side and left-hand side rotation	**M. 471-12/12Y**	**101061195**
		Slow action	2 NC to the left/ 2 NC to the right		Actuating direction, each time 75° right-hand side and left-hand side rotation	**T. 471-02/02Y**	**101061077**
	T 130/136 	Slow action	3 NO / 3 NC	Rod lever	---	**T. 130-33Y**	**101061303**
				Roller lever	Actuating direction, each time 90° right-hand side and left-hand side rotation	**TA 130-30/03Y**	**101135027**
	Operating lever as accessory					**Roller lever 2A**	**101064634**
						Roller lever A	**101064371**
						Roller lever D	**101064671**
						Roller lever L	**101064609**
						Offset roller lever 4D	**101065612**
						Pull lever Z	**101064387**

2. Position and limit switches

Series S2 – Ordering code

MX 064-22Y-R

Switching system	
T	Slow action ⊖
M	Snap action
Actuator selection	
S	Plunger
J	Offset roller lever
X	Offset roller lever
Contacts	
03	3 NC
12	2 NO/1 NC
21	1 NO/2 NC
30	3 NO
04	4 NC
13	3 NO/1 NC
22	2 NO/2 NC
31	1 NO/3 NC
40	4 NO

Special versions	
Ü	Slow action with overlapping contacts
H	Slow action with staggered contacts
R	Latching 2 x 45°

T. 471-02/02Y-Ü-Li

Switching system	
T.	Slow action ⊖
M.	Snap action
Enclosure selection	
064	Metal enclosure with 3 or 4 contacts
471	Metal enclosure with 4 or 6 contacts
130	Metal enclosure with up to 6 contacts
136	Metal enclosure with up to 10 contacts
Contacts	
03	3 NC
04	4 NC
12	2 NO/1 NC contacts
13	3 NO/1 NC contacts
21	1 NO/2 NC contacts
22	2 NO/2 NC contacts
30	3 NO
31	1 NO/3 NC contacts
33	3 NO/3 NC contacts
40	4 NO
01/02	1 NC to the left/2 NC to the right
02/01	2 NC to the left/1 NC to the right
02/02	2 NC to the left/2 NC to the right
03/03	3 NC to the left/3 NC to the right
10/20	1 NC to the left/2 NC to the right
12/12	1 NO/2 NC left/1 NO/2 NC right
20/10	2 NC left/1 NC right
20/20	2 NO to the left/2 NO to the right
21/21	2 NO/1 NC left/2 NO/1 NC right
30/30	3 NO to the left/3 NO to the right

Actuation direction	
	Right-hand side rotation
LI	Left-hand side rotation
Special versions	
Ü	Slow action with overlapping contacts
H	Slow action with staggered contacts
R	Latching 2 x 45°

The switches are supplied with rod levers.
The actuation lever must be ordered as an additional accessory.

Actuator selection	
L	Roller lever L
A	Roller lever A
2A	Roller lever 2A
V	Roller lever V
Z	Pull lever Z
2Z	Pull lever 2Z
2C	Fork lever 2C
4D	Offset roller lever 4D

For technical reasons, not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

3. Position switches – Special variants
Description

Gear switch

Area of application
Gear limit switches are used in the materials lifting and handling industry, roller doors, stage systems etc. Depending on the contact configuration, they are used for deactivation or for positioning motion sequences. The drive is provided via a shaft.

Design and operating principle
Both the enclosure, which is largely made of a seawater-resistant die-cast alloy housing, and the covers made of shock-resistant thermoplastic resistant to many chemicals are suitable for extreme ambient conditions.

On the basic versions with the transmission ratios 1:50 (G50) and 1:150 (G150) the turns of the drive are transmitted directly to the disc cam via a worm and worm wheel, i. e. the disc cams rotate once by 360° for 50 or 150 turns of the drive shaft.

The switching point of the contact is adjusted on the standard version by undoing the central screw, or conveniently via the disc cam with front setting, e. g. using ordering suffix "1600-1". Along with the standard transmission ratios, other transmission ratios are available.

Rotating spindle limit switches

Area of application
Rotating spindle limit switches are used in, among other areas, machine tools, cranes and material handling plants.

Design and operating principle
The robust cast-iron enclosure with 2-component paint finish is suitable for extreme ambient conditions. The movement range of the spindle of between 4 and 55 turns permits exact switching of the change-over contact with galvanically separated contact bridges.

Slack-wire switches

Area of application
Slack-wire switches are used to monitor the wire tension.

Design and operating principle
A slack, sagging wire, for example here on a material handling plant, releases the normally actuated switch and the plant is switched off.

Belt alignment switches

Area of application
Belt alignment switches monitor the straight running of conveyor plants. If the conveyor belt moves off-centre from the drive and pulleys the switching devices trigger.

Design and operating principle
With staggered switching a pre-warning for example is initiated with 10° deviation and the conveyor belt is switched off for example at 25°. Individual staggered switching is available upon request. In addition to multiple versions of belt alignment switches, Schmersal offers a comprehensive programme of stainless steel rollers with different lengths and diameters. The roller diameter to be selected is dependent on the belt speed.

On staggered or long conveyor systems, the transparency of the system can be increased considerably by using a 2-wire bus connection because the switching condition of all belt alignment switches can be indicated individually with all the other warning messages in a collective indication system. This helps with any troubleshooting and drastically reduces any downtime. The overall installation effort and expenditure is considerably reduced.

3. Position switches – Special variants
Overview of the series

	■ G50 / G150	■ MSP 452	■ T/M 441
Key Features			
	• **Gear switches** • Up to 8 contacts • Different cam forms for various switching travels • Switching point adjustment using disc cams with front setting (e.g. 1600-1)	• **Rotating spindle limit switches** • 4 contacts • Movement range 4…55 turns	• **Slack-wire switches** • 2 contacts • Suitable for heavy duty
Technical features			
Electrical characteristics			
Switching principle	Slow action or snap action, positive break NC contact	Snap action	Slow action or snap action, positive break NC contact
Max. switching capacity U/I	T/M 697: 230 VAC / 4 A Z/T 6881: 230 VAC / 2.5 A	230 VAC / 2.5 A	230 VAC / 4 A
Mechanical data			
Housing material	Metal with shock-resistant thermoplastic cover	Cast iron, 2-component paint finish	Cast iron, 2-component paint finish
Cable entry	2 x M20 x 1.5	2 x M20 x 1.5	2 x M20 x 1.5
Connection	Screw terminals	Screw terminals	Screw terminals
Cable section [1]	max. 2.5 mm²	3 x 0.75 mm²	max. 2.5 mm²
Dimensions (W x H x D)	200 x 114 x 120 mm	118 x 174 x 64 mm	106 x 181 x 63 mm
Ambient conditions			
Ambient temperature	−30 °C … +80 °C	−30 °C … +90 °C	−30 °C … +90 °C
Protection class	IP65	IP65	IP65
Actuator heads	–	–	–
Safety classification			
Standards	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
B_{10D} NC contact	20,000,000	–	2,000,000
Certificates	cULus, CCC	CCC	CCC, EAC
Other versions			
ATEX / IECEx	–	–	Zone 21, 22

[1] Including conductor ferrules

To get detailed information about the products and certificates, visit **www.schmersal.net**.

■ M 330

- **Belt alignment switches**
- 2 contacts
- Adjustable length lever with nylon roller
- Belt speeds ≤ 1 m/s

Snap action with self-cleaning contact

230 VAC / 2.5 A

Aluminium die-cast, paint finish

1x M20 x 1.5

Screw terminals

max. 2.5 mm²

40 x 76 x 40 mm

−30 °C … +90 °C

IP65

see page 83

IEC 60947-5-1

–

cULus EAC

–

■ T/M 441

- **Belt alignment switches**
- 2 contacts
- Stainless steel roller
- Belt speeds ≤ 3 m/s (roller Ø 30 mm)

Snap action or slow action

230 VAC / 4 A

Cast iron, 2-component paint finish

2x M20 x 1.5

Screw terminals

max. 2.5 mm²

106 x 105 x 63 mm

−30 °C … +90 °C

IP65

see page 83

IEC 60947-5-1

2,000,000

EAC

Zone 21, 22

■ T. 454

- **Belt alignment switches**
- 4 contacts
- Stainless steel roller
- 2 switching angles (prewarning, deactivation)
- Exterior parts made of stainless steel
- Optionally with Dupline interface

Slow action

230 VAC / 4 A; 24 VDC / 1 A

Cast iron, 2-component paint finish

2x M20 x 1.5

Screw terminals

max. 2.5 mm²

67 x 130 x 43 mm

−40 °C … +70 °C

IP66, IP67

see page 83

IEC 60947-5-1

2,000,000

cULus EAC

Zone 1, 2, 21, 22

■ T/M 250

- **Belt alignment switches**
- 4 contacts
- Stainless steel roller
- Belt speeds ≤ 6 m/s (roller Ø 50 mm)
- 2 switching angles (prewarning, deactivation)

Snap action or slow action

400 VAC / 6 A

Cast iron, 2-component paint finish

2x M25 x 1.5

Screw terminals

max. 2.5 mm²

62 x 58 x 50 mm

−30 °C … +90 °C

IP67

see page 83

IEC 60947-5-1

2,000,000

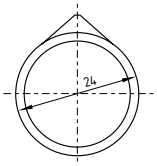
cULus EAC

Zone 21, 22

3. Position switches – Special variants

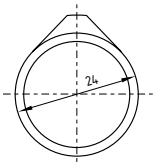
Gear switches – cam shapes

Pointed cam Ø 24 mm 1600-



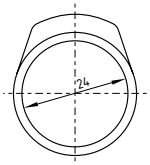
- Standard cam shapes: pointed cam Ø 24 mm
- Max. 8 switching elements possible
- Suitable for front setting

30° cam Ø 24 mm 2281-



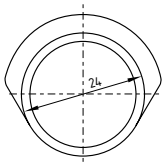
- Standard cam shapes: 30° cam Ø 24 mm
- Max. 8 switching elements possible
- Suitable for front setting

90° cam Ø 24 mm 1601-



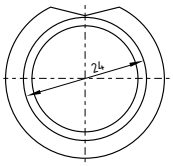
- Standard cam shapes: 90° cam Ø 24 mm
- Max. 8 switching elements possible
- Suitable for front setting

180° cam Ø 24 mm 2269-



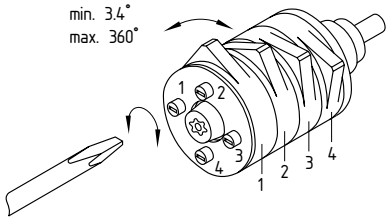
- Standard cam shapes: 180° cam Ø 24 mm
- Max. 8 switching elements possible
- Suitable for front setting

360° solid cam Ø 24 mm 1905-



- Standard cam shapes: 360° cam Ø 24 mm
- Max. 8 switching elements possible
- Suitable for front setting

Pointed cam with front setting -1600-1



- Pointed cam with front setting -1600-1
- Example with 4 pointed cams

3. Position switches – Special variants

Belt alignment switches – actuating elements/accessories

Belt alignment lever 243 — 101065529

- Cast lever with stainless steel roller
- Roller diameter 25 mm
- Roller length 50 mm
- Belt speeds ≤ 1 m/s

Belt alignment lever 966 — 101095169

- Cast lever with stainless steel roller
- Roller diameter 32 mm
- Roller length 65 mm
- Belt speeds ≤ 3 m/s

Belt alignment lever 1224 — 101065592

- Cast lever with stainless steel roller
- Roller diameter 32 mm
- Roller length 100 mm
- Belt speeds ≤ 3 m/s

LEV-U14-B30-150-RVA — 103014651

- Stainless steel lever with stainless steel roller
- Roller diameter 30 mm
- Roller length 155 mm
- Belt speeds ≤ 3 m/s

LEV-U14-B50-150-RVA — 103012919

- Stainless steel lever with stainless steel roller
- Roller diameter 50 mm
- Roller length 155 mm
- Belt speeds ≤ 6 m/s

RF-454-DN — 103013689

- Dupline interface RF-454-DN
- Monitoring of two floating contacts on the T. 454

Cable gland — 103006011

- M20 x 1,5 cable gland, metal
- Brass, nickel-plated
- Authorised cable diameter 6 … 12 mm
- Tightening torque 8 Nm

Cable gland — 103007570

- Cable gland M20 x 1.5 with pressure compensation element
- Brass, nickel-plated
- Authorised cable diameter 6 … 12 mm
- Tightening torque 3 Nm

Screw plug — 103006009

- M20 x 1.5 screw plug, metal
- Brass, nickel-plated
- Tightening torque 8 Nm

3. Position switches – Special variants
Preferred types

Series		Switching element	Contacts	Special features	Type designation	Material number
Gear switches	G 50	Snap action M	1NO/1NC		**G50-017M11/11Y**	**101167213**
			1NO/1NC		**G50-035M11/11Y**	**101166487**
			2NO/2NC		**G50-025M22/22Y**	**101166507**
			2NO/2NC		**G50-050M22/22Y**	**101166440**
			3NO/3NC		**G50-017M33/33Y**	**101173256**
			3NO/3NC		**G50-050M33/33Y**	**101166453**
			4NO/4NC		**G50-050M44/44Y**	**101166455**
		Snap action Z	2NO/2NC		**G50-035Z22/22Y**	**101166495**
			2NO/2NC		**G50-050Z22/22Y**	**101166463**
		Slow action T	2NO/2NC	with adjustable pointed cam	**G50-017T22/22Y-1600-1**	**101100246**
	G150	Snap action Z/M	2NO/2NC 4NO/4NC	with adjustable pointed cam	**G150-075Z22/M44Y-1600-1**	**101166383**
		Snap action M	1NO/1NC	with adjustable pointed cam	**G150-075M11/11Y-1600-1**	**101094554**
			1NO/1NC		**G150-150M11/11Y**	**101173980**
		Snap action Z	2NO/2NC		**G150-050Z22/22Y**	**101063401**
		Slow action T	2NC/2NO		**G150-150T02/02Y**	**101123693**
Rotating spindle limit switches	MSP 452	Snap action	1NO/1NC		**MSP 452-11/11Y**	**101160615**
Slack-wire switches	T/M 441	Snap action	1NO/1NC	with slack-wire lever type 14	**M. 441-11Y-14**	**101058315**
		Slow action	1NO/1NC	with slack-wire lever type 14	**T. 441-11Y-14**	**101056537**
Belt alignment switches	M 330	Snap action	1NO/1NC	with belt alignment lever 1348	**MV10H 330-11Y-1348**	**101159310**
	T/M 441	Snap action	1NO/1NC	with belt alignment lever 243	**M. 441-11Y-243**	**101168784**
		Slow action	1NO/1NC	with belt alignment lever 243	**T. 441-11Y-243**	**101170427**
		Slow action	1NO/1NC	with belt alignment lever 966	**T. 441-11Y-966**	**101081746**
	T. 454	Slow action	2NO/2NC	without belt alignment lever	**T. 454-22Z-H**	**103013113**
		Slow action	2NO/2NC	without belt alignment lever, with integrated Dupline interface	**T. 454-22Z-H-DN**	**103014142**
	T/M 250	Slow action	1NO/1NC	with belt alignment lever 966	**T. 250-02Z-966**	**101055273**
		Slow action	1NO/1NC	with belt alignment lever 966	**T. 250-11Z-966**	**101057959**
		Slow action	2NO/2NC	with belt alignment lever 966	**T. 250-22Z-966**	**101058103**
		Slow action	2NO/2NC	with belt alignment lever 1224	**T. 250-22Z-H-1224**	**101134281**
		Snap action	1NO/1NC	with belt alignment lever 1224	**M. 250-11Z-1224**	**101057978**
		Snap action	2NO/2NC	with belt alignment lever 1224	**M. 250-22Z-1224**	**101083514**
		Slow action	2NO/2NC	with belt alignment lever 1224	**T. 250-22Z-1224**	**101058212**

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4. Micro switches
Description

Area of application

Micro switches are used as control and precision engineering systems, in apparatus and in vehicle construction. Schmersal devices are designed for industrial applications with stringent quality and reliability requirements.

Design and way of functioning

Minimum space requirements, a high switching capacity and a robust design are just a few of the many benefits of a micro switch. With its internationally standardised mounting and external dimensions, as well as different termination types, switches can be used universally.

Micro switches are available with snap action or slow action and can be combined with a wide range of actuators.

Snap action
Contact where the movement of the switch is abrupt and independent of the actuating speed.

Slow action
Contact where the movement of the switch is independent of the actuating speed.

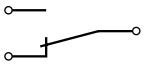
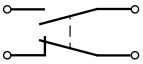
Positive break
The design of a contact separation as a direct result of a defined movement of the actuator in the switch using non-sprung parts. To guarantee the positive break, the actuator must be actuated with the defined positive break travel.

Friction or self-cleaning contacts
The moving contact bridge is centrally aligned to the V-shaped fixed contact under spring pressure, thereby generating a defined friction. The friction process has a self-cleaning effect on the fixed contacts each time the switch is actuated.

Switching elements
Switches are classified into the following types in accordance with IEC 60947-5-1.

Switching elements

Switching elements may be classified according to one of the following construction form letters:

Type	Contact configuration	Circuit diagram
Type A	NO contact with single break. Switching element with two terminals.	
Type B	NC contact with single break. Switching element with two terminals.	
Type X	NO contact with double break. Switching element with two terminals.	
Type Y	NC contact with double break. Switching element with two terminals.	
Type C	Change-over contact with single break. Switching element with three terminals.	
Type Za	Change-over contact with double break. Switching element with four terminals. The contacts have the same polarity.	
Type Zb	Change-over contact with double break. Switching element with four terminals. The two moving contacts are electrically isolated from one another.	

Micro switches have protection class IP 40, except for versions with rubber casing.
In addition, versions with cover for protection against contact with live parts are also available.
The following device types are sorted according to enclosure dimensions, starting with the smallest construction form.

4. Micro switches
Overview of the series

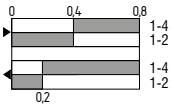
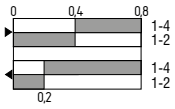
	■ M 610	■ M 630	■ M 6800 / 6900
Key Features			
	• Change-over contact with single break, type C • Self-cleaning contacts • Telescopic attachment	• Change-over contact with single break, type C • Self-cleaning contacts • Magnetic arc quenching (ordering suffix c) • Reduced actuating force 0.4 N (ordering suffix 934)	• Change-over contact with double break, type Za • Self-cleaning contacts • End-position latching (ordering suffix P2) • Tandem version (ordering suffix P3)
Other versions			
Gold contacts	■	–	–
Technical features			
Electrical characteristics			
Switching principle	Snap action with self-cleaning contact	Snap action with self-cleaning contact	Snap action with self-cleaning contact
Thermal test current I_{the}	4 A	10 A	6 A
Max. switching capacity U/I	230 VAC / 2.5 A	230 VAC / 4 A	230 VAC / 4 A
Mechanical data			
Housing material	glass-fibre reinforced thermoplastic	glass-fibre reinforced thermoplastic	thermoplastic
Mechanical life	10 million operations	30 million operations	30 million operations
Connection	Soldering, plug-in or screw terminal	Soldering, plug-in or universal terminal	Soldering, flat plug or universal terminal
Cable section [1]	max. 1.5 mm²	max. 1.5 mm²	max. 1.5 mm²
Dimensions (W x H x D)	19.8 x 11.1 x 6.4 mm	27.8 x 18.3 x 10 mm	32 x 16.6 x 12.6 mm
Ambient conditions			
Ambient temperature	−30 °C … +85 °C	−30 °C … +120 °C	−30 °C … +85 °C
Protection class	Enclosure: IP40; Connections: IP00	Enclosure: IP40; Connections: IP00	Enclosure: IP40; Connections: IP00
Actuator heads	refer to page 90	refer to page 94	refer to page 98
Safety classification			
Standards	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
B_{10D} NC contact	20,000,000	20,000,000	20,000,000
Certificates	–	–	–

[1] Including conductor ferrules

					
■ M 687	**■ M/T 697**	**■ Z/T 6881**	**■ Z/T 232**	**■ M 660 / 6600**	**■ M 6610 / 6620**
• Change-over contact with double break, type Za • Self-cleaning contacts • Slim design	• Change-over contact with double break, type Za (snap action) NC contact with double break, type Y (slow action) • Slim design	• Change-over contact with double break, type Zb • Positive break to IEC 60947-5-1 Appendix K • High resistance to vibration and shock • Switching of low voltages	• Change-over contact with double break, type Zb • Positive break to IEC 60947-5-1 Appendix K • Contact opening 2 x 2 mm • Plastic plunger	• Change-over contact with single break, type C • Self-cleaning contacts • Suitable for aggressive ambient conditions • Protection class IP 65 • Largely resistant to oil and fuel	• Change-over contact with single break, type C • Self-cleaning contacts • Suitable for aggressive ambient conditions • Protection class IP 67 • Largely resistant to oil and fuel
■	–	–	■	■	–
Snap action with self-cleaning contact	Snap action Slow action, positive break	Snap/slow action, both positive break	Snap/slow action, both positive break	Snap action with self-cleaning contact	Snap action with self-cleaning contact
6 A	6 A	10 A	10 A	4 A	4 A
230 VAC / 2.5 A	230 VAC / 2.5 A	230 VAC / 2.5 A; 24 VDC / 6 A (600 mm/min) 24 VDC / 5 mA	230 VAC / 4 A 24 VDC / 1 A	230 VAC / 1 A	230 VAC / 1 A
glass-fibre reinforced thermoplastic	glass-fibre reinforced thermoplastic	glass-fibre reinforced thermoplastic	glass-fibre reinforced thermoplastic	Rubber (Perbunan)	glass-fibre reinforced thermoplastic
30 million operations	30 million operations	Z: 1 million switching operations T: 30 million switching operations	20 million operations	3 million operations	3 million operations
g-in terminals	g-in terminals	Screw terminals	Screw terminals	Pre-wired cable 0.5 m	Pre-wired cable 0.5 m
max. 2.5 mm²	max. 2.5 mm²	max. 2 x 1.5 mm²	max. 2.5 mm²	H05VV-F 3 x 0.75 mm²	H05VV-F 3 x 0.75 mm²
60 x 25 x 11.9 mm	60 x 25 x 11.9 mm	60 x 35 x 12 mm	27 x 62 x 25 mm	32 x 77 x 11.8 mm	34 x 62.5 x 18 mm
−30 °C … +120 °C	−30 °C … +120 °C	−30 °C … +85 °C	−30 °C … +80 °C	−30 °C … +80 °C	−30 °C … +80 °C
Enclosure: IP40; Connections: IP00 Index i: IP20	Enclosure: IP40; Connections: IP00 Index i: IP20	Enclosure: IP40; Connections: IP00 Index i: IP20	Enclosure: IP40; Connections: IP00	IP65	IP65
refer to page 102	refer to page 102	refer to page 103	refer to page 101	refer to page 104	refer to page 106
IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1	IEC 60947-5-1
20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000
EAC	EAC	EAC	–	EAC (only M 6600)	–

4. Micro switches

Series M 610 – Actuating elements

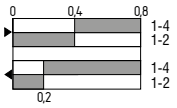
	Plunger	Actuator 1A		
Actuator heads				
Actuator description	Plastic cone Can be actuated from all directions	Lever can subsequently be realised in 3 lever bearings		
Lever bearing	–	I	II	III
Actuating travel, total [mm]	1.2	2.70	1.90	1.50
Pre-travel [mm]	–	1.50	1.05	0.80
Max. differential [mm]	–	0.60	0.45	0.35
Actuating force [N]	0.8	0.36	0.52	0.68
Max. ejection force [N]	0.3	0.10	0.14	0.18
Switch travel diagrams				
Snap action with self-cleaning contact	**M 610-11-…-…** 	**M 610-11-…-1A-…** 		

Actuator 1C

Lever can subsequently be realised in 3 lever bearings

I	II	III
2.10	1.50	1.20
1.20	0.80	0.65
0.50	0.35	0.25
0.47	0.67	0.87
0.13	0.18	0.23

M 610-11-…-1C-…

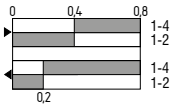


Actuator 1E

Roller width 2.5 mm
Lever can subsequently be realised in 3 lever bearings

I	II	III
2.60	1.80	1.40
1.45	1.00	0.75
0.55	0.40	0.30
0.38	0.54	0.70
0.11	0.15	0.19

M 610-11-…-1E-…

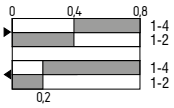


Actuator 1D

Lever can subsequently be realised in 3 lever bearings

I	II	III
3.50	2.50	1.90
1.90	1.40	1.00
0.80	0.55	0.40
0.28	0.40	0.52
0.08	0.11	0.14

M 610-11-…-1D-…

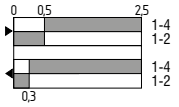


4. Micro switches

Series M 610 – Actuating elements

	Telescopic plunger 2S
Actuator heads	
Actuator description	Thermoplastic plunger
Actuating travel, total [mm]	2.50
Pre-travel [mm]	0.50
Max. differential [mm]	0.20
Actuating force [N]	2.10
Max. ejection force [N]	0.30

Switch travel diagrams

Snap action with self-cleaning contact	**M 610-11-…-2S-…** 

4. Micro switches

Series M 610 – Terminations

Soldering terminal with hole	Soldering terminal with collar	Screw terminals
		
■ Ordering suffix -20	■ Ordering suffix -21	■ Ordering suffix -60

4. Micro switches

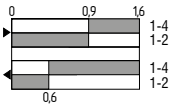
Series M 630 – Actuating elements

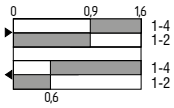
Actuator heads

Actuator description	Plunger	Actuator A				
	Thermoplastic plunger	Lever can subsequently be realised in two lever bearings				
Actuating force [N]	1.2	See force-travel diagram on page 96				
Actuating travel [mm]	1.6	See force-travel diagram on page 96				
Actuators / Lever	–	**A17**	**A24**	**A30**	**A40**	**A50**
Length L1 [mm]	–	17	24	30	40	50
Total length L [mm]	–	20	27	33	43	53

Switch travel diagrams

Snap action with double break	**M 630-11-…**	**M 630-11-…-A …**

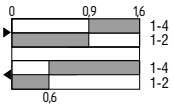




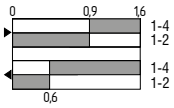
Actuator E	Actuator F
Plastic roller Ø 8 mm Lever can subsequently be realised in two lever bearings	Plastic roller Ø 5 mm Lever can subsequently be realised in two lever bearings
See force-travel diagram on page 96	See force-travel diagram on page 96
See force-travel diagram on page 96	See force-travel diagram on page 96

E17	E24	E30	E40	E50	F
17	24	30	40	50	16.2
20	27	33	43	53	18.2

M 630-11-…-E …



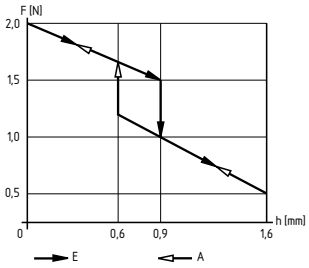
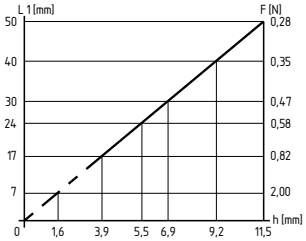
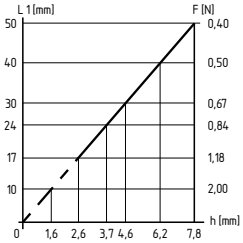
M 630-11-…-F …



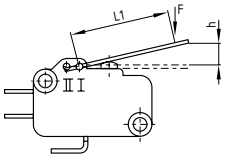
4. Micro switches

Series M 630 – Terminations and force-travel diagrams

Soldering terminals	Plug-in connector	Universal terminal
		
■ Ordering suffix -2	■ Ordering suffix -3	■ Ordering suffix -5 ■ Universal terminal can be used as a soldering, plug-in or screw terminal

Force travel at plunger	Force travel at lever bearing I	Force travel at lever bearing II
		

Key
L1: Actuating distance
h: Travel at actuator/plunger
F: Actuating force at actuator/plunger
E: Travel on depression of plunger
A: Travel on return of plunger
S: Switching point = h / 1.78
Δ h: Differential = h / 5.33

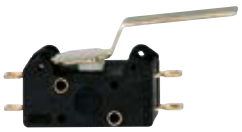


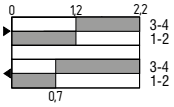
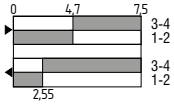
Proximity switches
Non-contact and electronic

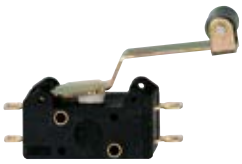
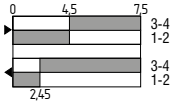
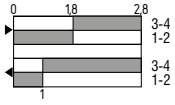
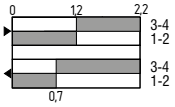
Detailed information can be
found in a separate catalogue
"Inductive Proximity switches"

4. Micro switches

Series M 6800 / 6900 – Actuating elements



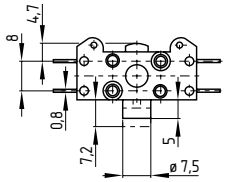
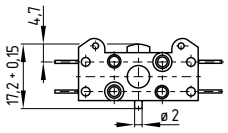
	Plunger	Actuator 80 A
Actuator heads		
Actuator description	Thermoplastic plunger	
Actuating force	approx. 4 N	approx. 0.9 N
Actuating travel	2.2 mm	7.5 mm
Actuator weight	–	2.7 g
Switch travel diagrams		
Snap action with self-cleaning contact	**M 6800-11-**… **M 6900-11-**… 	**M 6800-11-**…**-80 A** **M 6900-11-**…**-80 A** 

		
Actuator 80 E	**Actuator 80 M**	**Actuator 80 B 9**
Plastic roller Ø 8 mm		Stainless steel metal ball Ø 9 mm
approx. 0.95 N	approx. 2.4 N	approx. 3.8 N
7.5 mm	2.8 mm	2.2 mm
4 g	1 g	3.9 g
M 6800-11-…-80 A **M 6900-11-…-80 A** 	**M 6800-11-…-80 A** **M 6900-11-…-80 A** 	**M 6800-11-…-80 A** **M 6900-11-…-80 A** 

4. Micro switches

Series M 6800 / 6900 – Terminations

Soldering terminals	Flat plug-in connector	Universal terminal
		
■ Ordering suffix -2	■ Ordering suffix -3	■ Ordering suffix -5

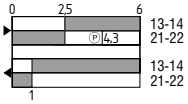
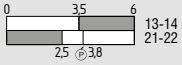
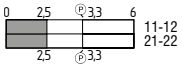
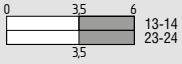
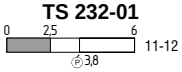
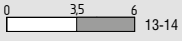
Latching in the limit positions	Tandem design	
		
■ Ordering suffix -P2	■ Ordering suffix -P3	

4. Micro switches

Series Z/T 232 – Actuating elements

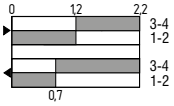
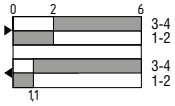
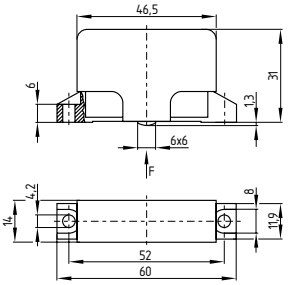
	Plunger
Actuator heads	
Actuator description	Thermoplastic plunger
Actuating force	approx. 9 N
Actuating travel	6.0 mm

Switch travel diagrams

Snap action	**1 NO / 1 NC**	**ZS 232-11** 
Slow action	**1 NO / 1 NC**	**TS 232-11** 
	2 NC	**TS 232-02** 
	2 NO	**TS 232-20** 
	1 NC	**TS 232-01** 
	1 NO	**TS 232-10** 

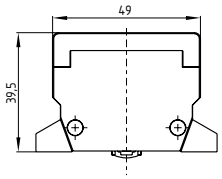
4. Micro switches

Series M 687 and M/T 697 – Actuating elements

		Plunger	Offset roller lever 8 R
Actuator heads			
Actuator description		Thermoplastic plunger	Plastic roller Ø 8 mm Roller width 6.4 mm
Actuating force		approx. 4 N	approx. 4 N
Actuating travel		2.2 mm	6 mm
Switch travel diagrams			
Snap action	**1 NO / 1 NC**	**M 687-11-**… **M 697-11-**… 	**M 687-11-**…**-8R-**… **M 697-11-**…**-8R-**… 
Slow action	**1 NC**	**T 697-01-**… 	**T 697-01-**…**-8R-**… 
Accessories			
Terminal cover			■ Ordering suffix -i ■ As protection against contact with live parts ■ Hand and finger guard in accordance with VDE 0106-100 ■ Clips into position

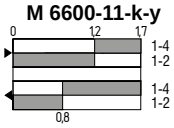
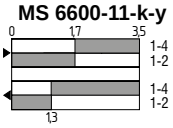
4. Micro switches

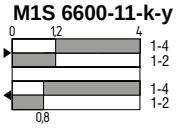
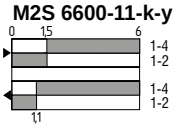
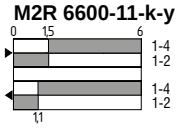
Series Z/T 6881 – Actuating elements

		Plunger	Offset roller lever 80R
Actuator heads			
Actuator description		Thermoplastic plunger	Plastic roller Ø 8 mm Roller width 6.4 mm
Actuating force		Snap action: approx. 20 N; Slow action: approx. 7 N	Snap action: approx. 12 N; Slow action: approx. 4 N
Actuating travel		4.2 mm	6 mm
Switch travel diagrams			
Snap action	**1 NO / 1 NC**	**Z 6881-11-1-**…	**Z 6881-11-1-80 R-**…
Slow action	**1 NO / 1 NC**	**T 6881-11-1-**…	**T 6881-11-1-80 R-**…
Accessories			
Terminal cover			■ Ordering suffix -i ■ As protection against contact with live parts ■ Hand and finger guard in accordance with VDE 0106-100 ■ Clips into position ■ P7 with 4 mm extended plunger

4. Micro switches

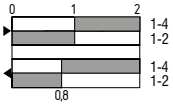
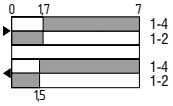
Series M 660 / 6600 – Actuating elements

	Basic component M	Semicircular rubber dome S
Actuator heads		
Actuator description	Rubber enclosure Metal sheath: Stainless steel without mounting flange M 660, with mounting flange M 6600	Semicircular rubber dome Rubber enclosure Metal sheath: Stainless steel
Actuating force	2.5 N	–
Actuating travel	1.7 mm	3.5 mm
Actuating speed	–	–
Vertical actuating angle	–	–
Switch travel diagrams		
Snap action with self-cleaning contact	**M 660-11-k-y** **M 6600-11-k-y** 	**MS 660-11-k-y** **MS 6600-11-k-y** 

		
Telescopic plunger 1S	**Telescopic plunger 2S**	**Roller telescopic plunger 2R**
Threaded tube: nickel-plated brass Simple mounting with steel hex nuts Large after-travel Excellent switching point setting options	Threaded tube: nickel-plated brass Simple mounting with steel hex nuts Large after-travel Excellent switching point setting options With bellows to protect the plunger from soiling	Threaded tube: nickel-plated brass Simple mounting with steel hex nuts Large after-travel Excellent switching point setting options with roller across the switch axis, ordering suffix -u
–	–	–
4 mm	6 mm	6 mm
–	–	max. 0.5 m/s
–	–	max. 30º
M1S 660-11-k-y **M1S 6600-11-k-y** 	**M2S 660-11-k-y** **M2S 6600-11-k-y** 	**M2R 660-11-k-y** **M2R 6600-11-k-y** 

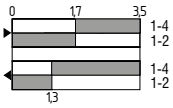
4. Micro switches

Series M 6610 / 6620 – Actuating elements

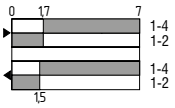
	Semicircular rubber dome S	Telescopic plunger 1S
Actuator heads		
Actuator description	Thermoplastic enclosure without mounting flange M 6610, with mounting flange M 6620	Simple mounting with steel hex nuts Large after-travel Excellent switching point setting options With bellows to protect the plunger from soiling
Actuating force	2.5 N	–
Actuating travel	2 mm	7 mm
Switch travel diagrams		
Change-over contact with single break	**MS 6610-11-k-z** **MS 6620-11-k-z** 	**M1S 6610-11-k-z** 

Telescopic plunger 2S	Roller telescopic plunger 2R
Simple mounting with steel hex nuts Large after-travel Excellent switching point setting options With bellows to protect the plunger from soiling	Simple mounting with steel hex nuts Large after-travel Excellent switching point setting options with roller across the switch axis, ordering suffix -u
–	–
3.5 mm	7 mm

M2S 6610-11-k-z



M2R 6610-11-k-z



4. Micro switches
Preferred types

Series		Connection	Actuator
M 610		Soldering terminal with hole	Actuator 1C
			Actuator 1E
		Soldering terminal with collar	Actuator 1A
		Screw terminals	Plunger
			Actuator 1A
			Actuator 1C
			Actuator 1E
M 630		Soldering terminals	Plunger
			Actuator F
		Plug-in connector	Actuator E17
			Actuator E24
		Universal terminal	Plunger
			Actuator E17
M 6800		Flat plug-in connector	Actuator 80B9
M 6900		Soldering terminals	Actuator 80B9
		Flat plug-in connector	Plunger
			Actuator 80A
			Actuator 80B9
M 687		Screw terminals	Plunger
			Offset roller lever 8R
		Flat plug-in connector	Offset roller lever 8R
M/T 697		Screw terminals	Plunger
			Offset roller lever 8R
Z/T 6881		Screw terminals	Plunger
			Offset roller lever 80R
Z/T 232		Screw terminals	Plunger S
M 660/6600		Connecting cable 3 x 0.75 mm²	Basic component M
			Telescopic plunger 1S
			Telescopic plunger 2S
			Roller telescopic plunger 2R
			Basic component M
			Rubber dome S
			Telescopic plunger 1S
			Telescopic plunger 2S
			Roller telescopic plunger 2R
M 6610/6620		Connecting cable 3 x 0.75 mm²	Roller telescopic plunger 2R
			Telescopic plunger 2S
			Telescopic plunger 1S
			Rubber dome S

	Lever bearing	Special features	Type designation	Part number
	II	---	**M 610-11-20-1C**	**101061367**
	II	---	**M 610-11-20-1E**	**101061368**
	III	---	**M 610-11-20-1E-III**	**101103324**
	III	---	**M 610-11-21-1A-III**	**101087693**
	---	---	**M 610-11-60**	**101088335**
	III	---	**M 610-11-60-1A-III**	**101091701**
	II	---	**M 610-11-60-1C**	**101061406**
	II	---	**M 610-11-60-1E**	**101061408**
	III	---	**M 610-11-60-1E-III**	**101089809**
	---	---	**M 630-11-2**	**101061417**
	---	Magnetic arc quenching	**M 630-11-2-C**	**101061418**
	II	---	**M 630-11-2-F-II**	**101087707**
	II	---	**M 630-11-3-E17-II**	**101088373**
	I	---	**M 630-11-3-E24**	**101061483**
	---	---	**M 630-11-5**	**101061493**
	---	Magnetic arc quenching	**M 630-11-5-C**	**101061494**
	I	Magnetic arc quenching	**M 630-11-5-C-E17**	**101061518**
	---	Tandem design	**M 6800-11-3-P3-80B9**	**101061884**
	---	---	**M 6900-11-2-80B9**	**101061897**
	---	Latching in the limit positions	**M 6900-11-3-P2**	**101061926**
	---	---	**M 6900-11-3-80A**	**101061903**
	---	---	**M 6900-11-3-80B9**	**101061904**
	---	Tandem design	**M 6900-11-3-P3-80B9**	**101061947**
	---	---	**M 687-11-1**	**101055253**
	---	Gold contacts	**M 687-11-1-AUNI**	**101055255**
	---	---	**M 687-11-1-8R**	**101055284**
	---	---	**M 687-11-3-8R**	**101055281**
	---	Snap action	**M 697-11-1**	**101055182**
	---	Slow action	**T 697-01-1**	**101055452**
	---	Snap action	**M 697-11-1-8R**	**101055185**
	---	Slow action	**T 6881-11-1**	**101138614**
	---	Snap action	**Z 6881-11-1**	**101138616**
	---	Slow action	**T 6881-11-1-80R**	**101138615**
	---	Snap action	**Z 6881-11-1-80R**	**101138617**
	Snap action	1 NO / 1 NC	**ZS 232-11**	**101113330**
		2 NC	**ZS 232-02**	**101113332**
	Slow action	1 NO / 1 NC	**TS 232-11**	**101113333**
		1 NO / 1 NC	**TS 232-11UE**	**101181513**
		2 NC	**TS 232-02**	**101113335**
		2 NO	**TS 232-20**	**101113334**
	---	---	**M 660-11-K-Y**	**101055325**
	---	---	**M1S 660-11-K-Y**	**101055425**
	---	---	**M2S 660-11-K-Y**	**101055373**
	---	---	**M2R 660-11-K-Y**	**101055396**
	---	with mounting flange	**M 6600-11-K-Y**	**101055341**
	---	with mounting flange	**MS 6600-11-K-Y**	**101055354**
	---	with mounting flange	**M1S 6600-11-K-Y**	**101055442**
	---	with mounting flange	**M2S 6600-11-K-Y**	**101055391**
	---	with mounting flange	**M2R 6600-11-K-Y**	**101055418**
	Roller across the switch axis	with mounting flange	**M2R 6600-11-K-Y-U**	**101086952**
	---	---	**M2R 6610-11-K-Z**	**101055457**
	---	---	**M2S 6610-11-K-Z**	**101055456**
	---	---	**M1S 6610-11-K-Z**	**101055455**
	with mounting flange	---	**MS 6620-11-K-Z**	**101055458**

5. Magnetic reed switches
Description

Magnetic reed switches

Alongside mechanically operated limit switches, magnetic reed switches are enjoying an increase in importance. They are often used to complement limit switches with plungers, rollers and swivel levers and are considered an important link to non-contact and contactless limit switches.

Non-contact limit switches are ideally used where mechanically operated limit switches cannot function as they ideally should, due to unfavourable operating conditions such as:

- High or low operating speeds
- High or low switching frequency
- Strong influence of dirt and dust
- High humidity
- Chemical atmospheres
- Large fluctuations in actuating pre-travel

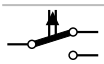
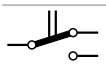
One type of non-contact limit switch is the magnetic reed switch (other types: inductive, capacitive and optical proximity switches, see series I).

In order to select the right switch, however, it is important to familiarise yourself with the general design, function, benefits and drawbacks of magnetic reed switches.

Magnetic reed switches of type series BN 2, BN 3, BN 6 and BN 8 comprises two units – the switch itself and the actuating magnet.

The switching tubes in our magnetic reed switches are filled with inert gas (nitrogen).
The contact reeds, which are made from iron/nickel alloy, are melted into a glass body and coated with rhodium around the contact points. The gap between the contact reeds is just 0.2 - 0.3 mm, so that the magnetic force required for the switching process is minimal. The enclosed glass body keeps the contact points clean of dust, moisture and corrosion, helping to increase the contact reliability of magnetic reed switches to an extremely high level.

The design and precise calculation of the pre-loaded magnet determines the contact type:

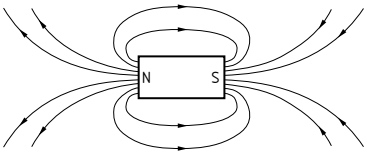
	NO contact
	NC contact
	Toggle contact
	Bistable contact
	Bistable toggle contact

Permanent magnets

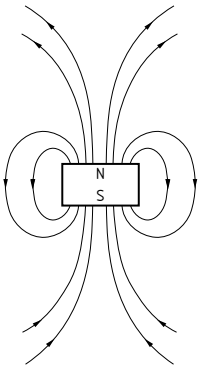
Both permanent magnets (with/without enclosure) and electromagnets are used for switch actuation. The switching magnet selected for side actuation is dependent on the switch type. For NC, NO and toggle contacts, this is a switching magnet with N-S pole; for bistable and bistable toggle contacts, this is a switching magnet with N-pole or S-pole.

The barium ferrite used as the magnet material in our permanent magnets is both resistant to ageing and resistant to external magnetic fields, which could impair its magnetic strength. Its temperature sensitivity of 0.2%/ °C with respect to switching point accuracy should, however, be borne in mind, as magnetic force will decrease by this factor as temperatures rise, and increase as temperatures fall. A permanent change in the −30 °C to +90 °C range is not to be expected.

Magnetic field, N-S magnet

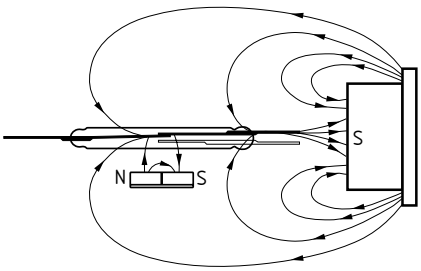


Magnetic field, N-magnet or S-magnet



5. Magnetic reed switches
Description

Front side actuation



Front side actuation
To actuate the magnetic reed switches from the side with a magnet in the manner outlined above, some type series can be actuated from the side or front side (index V).

Switches with NO, NC and toggle contact types are actuated from the side with an N-S magnet, as is customary. All switches are marked in the same place with symbols to ensure the correct pairing and actuation direction of the switching magnets. The following applies: S/green to S/green and N/red to N/red.

Front side actuation for NO, NC and toggle contact types is only possible with S-poled magnets. A red symbol plate with direction arrows is mounted to the front.

Switches with bistable and bistable toggle contact types are actuated from the side with either an N-pole or S-pole magnet, depending on the function, as is customary. In this case too, coloured symbols are mounted to the side of the switch to indicate the actuation direction.

Front side actuation for bistable and bistable toggle contacts can only be effected in the direction specified on the front symbol plate with an N-S magnet. If the N-S magnet is rotated 180° around the magnet's axis, the bistability changes to the opposite direction.

Resistance to vibration

Although the bistable switch requires a considerable setting accuracy when compared to NO and NC switches, these devices are extremely resistant to vibration. By embedding the switching tube troughs in foam rubber, the BN 20 type series has increased vibration strength. If the switches are under the influence of the switching magnets, even strong vibrations will not be capable of altering the switching condition. Caution should always be exercised when it comes to heavy shock loads, as too high a load can render a magnetic reed switch non-functional, irrespective of the contact type, due to permanent deformation of the contact reeds.

Life

It must be ensured that carefully harmonised devices are not damaged due to overload when being installed or tested.

Magnetic switch contacts have a tendency to stick if the maximum specified current strength is exceeded. Once re-opened, they continue to function, but lose accuracy, potentially turning a NC contact into a NO contact. If lamps or alternating current magnets are switched on, the current peaks that occur at the point of switch-on may be ten to twelve times the rated current. When switching off inductive circuits, excess voltages occur, which can quickly lead to complete destruction of devices. In such cases, it is essential that suitable spark suppression measures are introduced. In order to minimise excess voltages, VDR resistors may be switched in parallel with the inductive circuits.

Usual spark suppression with capacitors always involves use of a damping resistor, as otherwise there is a risk of welding from the charge and discharge processes of the capacitor. The optimum values for means of suppression (RC circuit) can, however, only be determined by means of tests on a case-by-case basis. It should be noted that incorrect adjustment may be more disadvantageous than no adjustment at all. In DC current circuits, we recommend switching a diode in parallel to the inductive circuit to help protect the contacts.

If magnetic reed switches are protected from overloads as outlined above, the life of an electrical contact may far exceed that of the device being switched. Non-contact switches actuated with minimal force are also exposed to no wear on the drive side, giving them an almost unlimited life.

Switching hysteresis

Like mechanical snap-action switches, magnetic reed switches have a switching hysteresis, i.e. their switch-on and switch-off points do not coincide. This particular property is the result of the difference in response and drop-out excitation. Since this difference is also a measure of the contact pressure, and therefore the contact reliability, an ideal value of 0, i.e. switch-on and switch-off at the same point, cannot be achieved.

Uses

Magnetic reed switches can be used in virtually all areas of control technology, and owing to their special characteristics, are often preferred over mechanically operated limit switches. Some examples are:

1. High switching speed and large switching frequency: use in counting circuits.
2. Reliable contacting, even in the presence of aggressive media, as the contact point is located inside a protective tube: use in galvanic equipment.
3. No mechanical drives, low actuating force: use in motion sensors and standstill monitoring.
4. Low noise: use in lift construction.
5. Non-contact actuation, operated with non-magnetic materials: use as pressure monitors and float switches.

5. Magnetic reed switches
Overview of the series

	■ BN 80	■ BN 85 [1)]	■ BN 310
			
Key Features			
Switching distance max.	60 mm	40 mm	60 mm
Contact variants	Bistable contact NC/NO	Bistable contact	Bistable contact NC/NO
Actuation direction	From side	front side	side or front available on request
Design	rectangular, flat	rectangular	rectangular, flat
Technical features			
Electrical characteristics			
Switching voltage	250 VAC/DC	60 VAC/DC	250 VAC/DC
Switching current	0.5 A	1 A	3 A
Switching capacity	10 VA / 8 W	30 VA / W	120 VA / W
Resistance to shock	15 g, on sine wave oscillation	60 g, on sine wave oscillation	30 g / 11 ms
Mechanical data			
Housing material	Thermoplastic enclosure	Thermoplastic enclosure	Thermoplastic enclosure
Connection	LiYY cable, 1 m	2 single conductors LiY, 1 m	Cable H03VV-F
Cable section:	2 x 0.25 mm²	2 x 0.75 mm²	2 x 0.75 mm²
Dimensions (W x D x H)	44 x 13 x 9 mm	40 x 35 x 16.5 mm	88 x 25 x 13 mm
Ambient conditions			
Ambient temperature	−25 °C … +75 °C	0 °C … +75 °C	−25 °C … +75 °C
Protection class	IP67	IP40	IP67
Actuator heads	refer to page 120	refer to page 120	refer to page 120
Safety classification			
Certificates	cULus (Exception: Index -R)	–	cULus

To get detailed information about the products and certificates, visit **www.schmersal.net**.

				
■ BN 325 [2]	■ BN 20	■ BN 75	■ BN 120	■ BN 650
55 mm	50 mm	–	60 mm	60 mm
Bistable contact	Bistable contact NC/NO	NC, NO	Bistable contact NC/NO	Bistable contact NC/NO
From side	side or front	Float switch	side or front	side or front
rectangular	rectangular	–	cylindrical, Ø 12 mm	cylindrical, Ø 13 mm
250 VAC/DC	250 VAC/DC	220 VAC/DC	200 VAC/DC	200 VAC/DC
3 A	3 A	1 A	1 A	1 A
120 VA / W	120 VA / W	60 VA / W	30 VA / W	30 VA / W
50 g / 11 ms	–	–	30 g / 11 ms	30 g / 11 ms
Thermoplastic enclosure	Metal enclosure	Thermoplastic enclosure	Thermoplastic enclosure	Thermoplastic enclosure
Various terminations, see table on page 116	Screw terminals	M12 connector or pre-wired cable	LiYY cable, 1 m	LiYY cable, 1 m
–	–	–	2 x 0.25 mm²	2 x 0.25 mm²
85 x 26 x 24 mm	104 x 52 x 47 mm	80 x 99.5 x 55 mm	Ø12 , 71 mm	Ø13, 103 mm
−25 °C … +75 °C	−25 °C … +90 °C	−25 °C … +80 °C	−25 °C … +70 °C	−25 °C … +70 °C
IP40 / IP67	IP67	IP68, IP65 (connector) IP67 (cable)	IP67	IP67
refer to page 120	refer to page 120	refer to page 120	refer to page 120	refer to page 120
–	–	–	–	–

[1] The magnetic switch BN 85-5 enables installing up to 5 BN 85 units in one enclosure.
Mutual interference can be avoided due to integrated shielded plates.

[2] Because of its integrated shield and plug connector, BN 325 is especially suitable for installations close together.
Protection class: IP40 with insulated plug, IP67 with cable outlet on additional shielding plate.

5. Magnetic reed switches

Preferred types

Series		Actuation	Connection	Switching distance	Contacts	Latching	Type designation	Material number
BN 80		From side	pre-assembled cable, 1m	20 mm	1NC		BN 80-01Z	101082364
				32 mm	1NO		BN 80-10Z	101055844
				60 mm	1 bistable contact	■	BN 80-RZ	101139647
BN 310		From side	pre-assembled cable, 1m	20 mm	1NO/1NC contact	■	BN 310-11RZ	101184486
					2NC		BN 310-2RZ	101182138
				50 mm	1NC		BN 310-01Z	101133844
					1NO		BN 310-10Z	101133842
				60 mm	1 bistable contact	■	BN 310-RZ	101133843
BN 325		Front side	Blade terminal 4.8 mm and 1 shielding plate	55 mm	1 bistable contact	■	BN 325-R	101147009
			Blade terminal 4.8 mm and 2 shielding plates				BN 325-R-1239	101147090
			Cable outlet left and 2 shielding plates				BN 325-R-1279	101147091
			Cable outlet right and 2 shielding plates				BN 325-R-1279-2	101148084
BN 20		From side	---	45 mm	1NC		BN 20-01Z	101172087
					2NC		BN 20-02Z	101057005
					1NO		BN 20-10Z	101172882
					1NO/1NC		BN 20-11Z	101168014
					2NO		BN 20-20Z	101057006
			---	50 mm	1NO/1NC	■	BN 20-11RZ	101165310
					2 bistable contact		BN 20-2RZ	101172893
					1 bistable contact		BN 20-RZ	101168090
					1 bistable contact		BN 20-RZ-ST	101155508
BN 75		Float switch	---	---	1NC		BN 75-01Y	101055740
					1NC		BN 75-01Z-1391	101055741
					1NO		BN 75-10Y	101055743
					1NO		BN 75-10Z-1391	101055744
					1NO/1NC		BN 75-11Y	101055701
					1NO/1NC		BN 75-11Z-1391	101055702
BN 120		From side	Threaded flange M12	50 mm	1NC		BN 120-01Z	101186840
					1NO		BN 120-10Z	101186839
				60 mm	1 bistable contact	■	BN 120-RZ	101186843
		Front side		45 mm			BN 120-RZ/V	101186844
				55 mm	1NC		BN 120-01Z/V	101186842
					1NO		BN 120-10Z/V	101186841
BN 650		From side	pre-assembled cable, 1m	50 mm	1NC		BN 650-01Z	101187280
					1NO		BN 650-10Z	101187273
				60 mm	1 bistable contact	■	BN 650-RZ	101187283
		Front side		45 mm			BN 650-RZ/V	101187284
				55 mm	1NC		BN 650-01Z/V	101187282
					1NO		BN 650-10Z/V	101187281

5. Magnetic reed switches

Ordering code

BN 120-10Z/V

Enclosure selection	
80	rectangular, flat
310	rectangular, flat
325	rectangular
20	rectangular
75	Float switch
120	cylindrical, Ø 12 mm
650	cylindrical, Ø 13 mm

Contacts	
01	1 NC
02	2 NC
10	1 NO
11	1 NO/1 NC
20	2 NO
R	1 bistable contact
2R	2 bistable contact

Termination on BN325	
	Blade terminal 4.8 mm and 1 shielding plate
1239	Blade terminal 4.8 mm and 2 shielding plates
1279	Cable outlet left and 2 shielding plates
1279-2	Cable outlet right and 2 shielding plates

Actuation direction	
	From side
V	front side

For technical reasons not all possible variations and/or combinations can be delivered.
The existing key type is used to translate the product type designation.

To see a wide range of other types, visit **www.schmersal.net**.

5. Magnetic reed switches

Selection of actuating magnets according to switch distances

Actuating magnet	BN 80			BN 85-r	BN 310	BN 310 with bistable contact		BN 325-r
	BN 80-10z	BN 80-01z	BN 80-rz			BN 310-rz	BN 310-2rz	
BP 6 S			4 - 18	2 - 12				
BP 7 S			6 - 22					
BP 8	3 - 8	0 - 5						
BP 8 S				2 - 10				
BP 10	6 - 12	2 - 9	2 - 9		5			
BP 10 N						15		10
BP 10 S			10 - 30	5 - 20		15		10
2 x BP 10	12 - 20	2 - 13	2 - 13		17			
2 x BP 10 N						20		15
2 x BP 10 S			12 - 36	6 - 27		20		15
BP 15	8 - 14	2 - 10			6			
BP 15 N								
BP 15 S								
2 x BP 15	12 - 22	2 - 15			17			
2 x BP 15S			13 - 38	7 - 28				
2 x BP 15/2					17			
2 x BP 15/2 N						22		17
2 x BP 15/2 S						22		17
BP 34					5 - 20			
BP 34 N						15 - 30		10 - 25
BP 34 S			20 - 50	10 - 40		15 - 30		10 - 25
2 x BP 34	12 - 26	5 - 18						
2 x BP 34 S			22 - 60					
BP 20	12 - 24	0 - 14			20			
BP 20 N						3 - 25		5 - 20
BP 20 S			10 - 38	3 - 28		3 - 25		5 - 20
BP 31	12 - 24	0 - 14			20			
BP 31 N						3 - 25		5 - 20
BP 31 S			12 - 40	4 - 30		3 - 25		5 - 20
BP 11								
BP 11 N						15		10
BP 11 S			10 - 30	4 - 23		15		10
2 x BP 11 N								
2 x BP 11 S								
BP 12	24 - 32	4 - 20			10 - 30			
BP 12 N						20		15
BP 12 S			10 - 34	5 - 27		20		15
2 x BP 12 N								
2 x BP 12 S								
BP 21								
BP 21 N						15 - 45		15 - 40
BP 21 S						15 - 45		15 - 40
2 x BP 21 N								
2 x BP 21 S								
BP 22 N								
BP 22 S								
2 x BP 22 N								
2 x BP 22 S								
BP 310-1S							0 - 10	
BP 310-1N							0 - 10	
BP 310-2S							0 - 15	
BP 310-2N							0 - 15	
BE 20					20			
BE 20 N						20		15
BE 20 S						20		15

The specified switching distances are applicable for the actuation of individually mounted components without ferromagnetic influence.
A change to the distance, positive or negative, is possible due to ferromagnetic influences.

BN 20		BN 120		BN 120-../V		BN 650		BN 650-../V	
	with bistable contact		with bistable contact		with bistable contact		with bistable contact		with bistable contact
		5				5			
	5		15				15		
	5		15	5			15	5	
12		17			3	17			3
	10		20				20		
	10		20	10			20	10	
		6				6			
			17				17		
			17	6			17	6	
		17				17			
12		17				17			
	15		22				22		
	15		22				22		
		15 - 20			15	15 - 20			15
	10 - 25		15 - 30				10 - 30		
	10 - 25		15 - 30	20			15 - 30	20	
15		20			10	20			10
	15		25				25		
	15		25	15			25	15	
15		20			10	20			10
	15		25				25		
	15		25	15			25	15	
		20			15	20			15
	5		15				15		
	5		15	5			15	5	
			25				25		
			25	15			25	15	
25		10 - 30			20	10 - 30			20
	10		20				20		
	10		20	10			20	10	
			10 - 30				10 - 30		
			10 - 30	25			10 - 30	25	
		25 - 50			45	25 - 50			45
	10 - 35		15 - 45				15 - 45		
	10 - 35		15 - 45	30			15 - 45	30	
			20 - 60				20 - 60		
			20 - 60	20 - 55			20 - 60	20 - 55	
									35
				25				25	35
					35				
				15 - 55	35			15 - 55	
15					10				10
	10		20				20		
	10		20	6			20	6	

The mutual interference between multiple actuating magnets must be observed. (For special versions: diverging values possible)

5. Magnetic reed switches
Actuating magnets

BP 6 — 101091837

- Actuating magnet, unenclosed, N-S
- S pole: 90 lowered

BP 7 — 101125556

- Actuating magnet, unenclosed, N-S
- S-pole marked red

BP 8 — 101054816

- Actuating magnet, unenclosed, N-S
- S-pole marked red

BP 10 — 101057531

- Actuating magnet, unenclosed, N-S
- Colour coding of poles by labels

BP 11 N — 101059923

- Actuating magnet, metal enclosure Al, N
- N-pole marked green
- For mounting on ferrous material

BP 11 S — 101057533

- Actuating magnet, metal enclosure Al, S
- S-pole marked red
- For mounting on ferrous material

BP 12 N — 101059917

- Actuating magnet, metal enclosure Al, N
- N-pole marked green
- For mounting on ferrous material

BP 12 S — 101057532

- Actuating magnet, metal enclosure Al, S
- S-pole marked red
- For mounting on ferrous material

BP 15 SS — 101139818

- Actuating magnet, N-S
- Stainless steel
- Suitable for food processing industry

5. Magnetic reed switches
Actuating magnets

BP 15 — 101060163

- Actuating magnet, with plastic enclosure, N-S
- S-pole marked red
- N-pole marked green
- Suitable for mounting on ferrous material with a distance of 18 mm

BP 34 — 101057553

- Actuating magnet, with plastic enclosure, N-S
- S-pole marked red
- N-pole marked green
- Suitable for mounting on ferrous material with a distance of 25 mm

BP 34/2 — 101195164

- Actuating magnet, unenclosed, N-S
- S-pole marked red

BP 15/2 — 101060165

- Actuating magnet, unenclosed, N-S
- Polarity pressed
- Suitable for mounting on ferrous material with a distance of 18 mm

BP 21 N — 101057536

- Actuating magnet, metal enclosure Al, N
- N-pole marked green
- For mounting on ferrous material

BP 21 S — 101057534

- Actuating magnet, metal enclosure Al, S
- S-pole marked red
- For mounting on ferrous material

BP 20 — 101057549

- Actuating magnet, metal enclosure Al, S
- S-pole marked red
- N-pole marked green
- Suitable for mounting on ferrous material with a distance of 20 mm

BP 20 N — 101057538

- Actuating magnet, metal enclosure Al, N
- N-pole marked green
- Suitable for mounting on ferrous material with a distance of 20 mm

BP 20 S — 101057541

- Actuating magnet, metal enclosure Al, S
- S-pole marked red
- Suitable for mounting on ferrous material with a distance of 20 mm

5. Magnetic reed switches
Actuating magnets

BP 22 N(S) 101057432

- Actuating magnet; Zn metal enclosure
- S-pole marked red
- N-pole marked green
- For mounting on ferrous material
- Can be used as N or S magnet

BP 22/2 N(S) 101057544

- Actuating magnet; Zn metal enclosure
- S-pole marked red, N-pole marked green
- 33 % magnetic force
- For mounting on ferrous material
- Can be used as N or S magnet

BP 31 101057530

- Actuating magnet, with plastic enclosure, N-S
- S-pole marked red
- N-pole marked green
- Suitable for mounting on ferrous material with a distance of 20 mm

BP 31 N 101057520

- Actuating magnet, with plastic enclosure, N-S
- N-pole marked green
- Suitable for mounting on ferrous material with a distance of 20 mm

BP 31 S 101057521

- Actuating magnet, with plastic enclosure, S
- S-pole marked red
- Suitable for mounting on ferrous material with a distance of 20 mm

BP 310-1 N 101182160

- Actuating magnet, with plastic enclosure, N-S
- Switching distance 0 … 10 mm

BP 310-1 S 101182275

- Actuating magnet, with plastic enclosure, S
- Switching distance 0 … 10 mm

BP 310-2 N 101182284

- Actuating magnet, with plastic enclosure, N-S
- Switching distance 0 … 15 mm

BP 310-2 S 101182287

- Actuating magnet, with plastic enclosure, S
- Switching distance 0 … 15 mm

5. Magnetic reed switches
Actuating magnets/Accessories

BE 20 24V 101057437

- Electromagnet, with plastic enclosure

HOLDER H1/1 101068965

- For BN 650
- Metal holder with 2 elasticated bearing blocks
- Guarantees high vibration resistance

HOLDER H2 101068281

- For BN 650
- Metal holder with rubber discs

CLAMP H 15 101068881

- For BN 650
- Material: thermoplastic

COMPENSATION COIL KS 1 101064997

- Temperature range −25 °C … +90 °C
- For cable lengths up to 100 m
- Connecting cable H05V-K 1 mm², Cable length 100 mm
- Position compensation coil in series with switching pipe
- Temperature-resistant design −25 C to +150 C, ordering suffix -T

COMPENSATION COIL KS 2 101065000

- Temperature range −25 °C … +90 °C
- For cable lengths up to 200 m or 2 x 100 m
- Connecting cable H05V-K 1 mm², Cable length 100 mm
- Position compensation coil in series with switching pipe

6. Pull-wire switches
Description

Area of application

Pull-wire switches are used on machinery and plants for signalling and/or for area monitoring. The switching command can be activated at arbitrary points on the wire run.

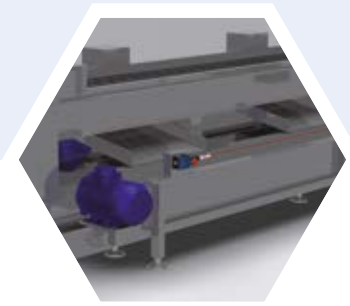
Areas of application range from issuing commands in a production process, to machinery startup and opening/closing electrically operated doors and gates.

Design and way of functioning

The way of functioning is dependent on the application and the type of pull-wire switch that has been selected.

Types with wire pull and wire breakage detection require the wire to be pre-tensioned so that the pull-wire switch is in the switching condition. The switching function is activated if the tensioned pull wire is pulled or in the event of wire breakage. In this case, the normally-closed contacts are opened and the normally-open contacts are closed.

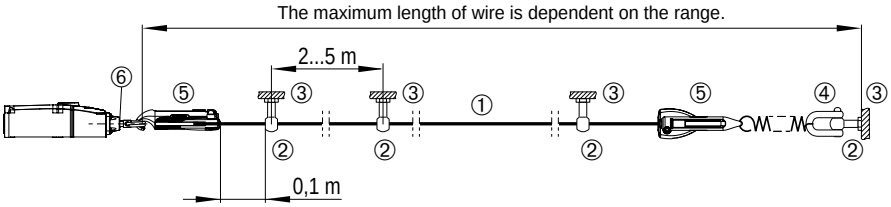
On types with wire pull function, the switching function is activated by a quick pull on the wire. In this case, the pull-wire switch must be fitted vertically. Types with varying pulling forces are available, depending on the application.



Mounting instructions

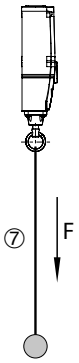
Pull-wire switch with wire pull and wire breakage detection - TQ 700/TQ 900/TQ 441

If the tensioned pull wire is pulled or in the event of wire breakage, the switching function of the pull-wire switch is activated.



Pull-wire switch with wire pull function - TQ 700 S

The TQ 700 S pull-wire switch must be fitted vertically.
If the pull-wire is pulled, the switching function of the pull-wire switch is activated.



Key

① Wire rope
② Eyebolt
③ nut
④ shackle
⑤ Rope tensioner
⑥ Position indication
⑦ Pull wire with sphere (accessories available)

6. Pull-wire switches

Overview of the series

	 ■ TQ 700 S	 ■ TQ 700
Key Features		
	• Wire pull detection • Maximum cable length 10 m • 2 contacts	• Wire pull and breakage detection • Maximum cable length 10 m • 2 contacts
Technical features		
Electrical characteristics		
Max. switching capacity U/I	230 VAC / 4 A; 24 VDC / 4 A	230 VAC / 4 A; 24 VDC / 4 A
Mechanical data		
Actuating force	88 N (40 N)	17 N
Cable entry	1 x M20	1 x M20
Cable section [1]	0.75 … 2.5 mm²	0.75 … 2.5 mm²
Dimensions (W x H x D)	40.5 x 160 x 51 mm	40.5 x 160 x 51 mm
Ambient conditions		
Ambient temperature	−25 °C … +70 °C	−25 °C … +70 °C
Protection class	IP67	IP67
Safety classification		
Approvals		

[1] Including conductor ferrules

To get detailed information about the products and certificates, visit **www.schmersal.net**.

■ TQ 900

- Wire pull and breakage detection
- Maximum cable length 75 m
- 4 contacts

230 VAC / 4 A; 24 VDC / 1 A
42 N
3 x M20
0.75 … 2.5 mm²
71 x 220 x 69.7 mm
−25 °C … +70 °C
IP67

■ TQ 441

- Wire pull and breakage detection
- Maximum cable length 25 m
- 2 contacts

230 VAC / 4 A; 24 VDC / 4 A
17 N (4 N)
2 x M20
0.75 … 4 mm²
106 x 135 x 61 mm
−30 °C … +90 °C
IP65

6. Pull-wire switches
Preferred types

Series		Enclosure	Operating principle	Possible wire length	Wire pull/wire breakage detection	Contacts	Special equipment	Type designation	Material number
TQ 700		Thermoplastic	1-side operation	10 m	■	1 NO/1 NC		**TQ 700-11**	**101192479**
					■	2NC		**TQ 700-02**	**101192480**
					■	2NO		**TQ 700-20**	**101192481**
TQ 700 S		Thermoplastic	1-side operation	10 m	Wire pull detection	1 NO/1 NC		**TQ 700-11 S**	**101217092**
						1 NO/1 NC	Reduced actuating force	**TQ 700-11S-40N**	**103003622**
						2NC		**TQ 700-02 S**	**101217791**
						2NO		**TQ 700-20 S**	**103000084**
TQ 900		Zinc die-cast/ thermoplastic	1-side operation	75 m	■	1 NO/1 NC	Indicator lamp see accessories	**TQ 900-11**	**101184478**
					■	2 NO/2 NC		**TQ 900-22**	**101184479**
					■	1 NO/3 NC		**TQ 900-13**	**101184481**
					■	2NC		**TQ 900-02**	**101186145**
TQ 441		Die-cast aluminium	1-side operation	25 m	■	1NC / 1NC		**TQ 441-01/01Y-UE**	**101160101**
					■	1NC / 1NC	Reduced actuating force	**TQ 441-01/01Y-UE-1572**	**101062344**

Other versions upon request.

To see a wide range of other types of pull-wire switch, visit **www.schmersal.net**.

6. Pull-wire switches
Accessories

Eyebolt

- BM 10 x 40 **101084928**
- BM 8 x 70 Niro **101192471**
- Included in delivery: Eyebolt with nut

Wire clamp

- Wire clamp
- 3 mm Niro **101203477**
- 5 mm Niro **101203478**

Duplex wire clamp 101190917

- Duplex wire clamp 3 mm (stainless steel)

Egg-shaped wire clamp 101196043

- Egg-shaped wire clamp, size 3

Wire thimbles

- Wire thimble
- 3 mm Niro **101203472**
- 5 mm Niro **101203476**

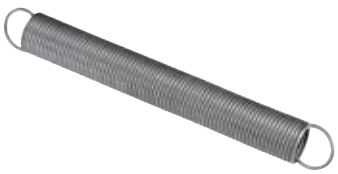
Pulley 101192433

- Pulley (stainless steel) to guide the wire rope where the path is not a straight line
- According to ISO 13850, pulleys may only be mounted in such a way that the complete length of the pull-wire is visible.

Tensioning jack 101087930

- Tensioner M6
- For exact adjustment of the tension of the wire rope
- Adjustable 145 mm ... 225 mm
- To DIN 1480

Tension spring



- Tension spring to maintain the reaction force
- RZ-2041 (only for TQ 900) **101186696**
- ACC-700-RZ173I (only for TQ 700) **103005863**

Shackle 101186490

- Shackle (stainless steel)
- For fixing the wire rope to the eyebolt

For detailed information on selection, visit **www.schmersal.net**.

6. Pull-wire switches
Accessories

Wire rope

- Wire rope **on request**
- With red PVC sheath
- Ø total 5 mm
- Ø of the steel core 3 mm

Wire unit complete

- Wire unit complete **on request**
- Ready-to-fit
- Included in delivery: 1 Wire rope; 2 Wire clamps; 1 Duplex wire clamp; 1 Wire thimble; 1 Eyebolt

S 900 rope tensioner 101186704

- S 900 rope tensioner
- Straightforward, time-saving wire tension setting

Cable gland 103006011

- M20 x 1,5 cable gland, metal
- For TQ 900 / TQ 441
- Brass, nickel-plated
- Authorised cable diameter: 6 ... 12 mm
- Tightening torque 8 Nm

Cable gland 103006013

- M20 x 1.5 cable gland, plastic
- For TQ 700
- Polyamide
- Authorised cable diameter: 6 ... 12 mm
- Tightening torque 4.5 Nm

Screw plug 103006009

- M20 x 1.5 screw plug, metal
- For TQ 900 / TQ 441
- Brass, nickel-plated
- Tightening torque 8 Nm

Indicator lamp G24-M20 101150877

- Indicator lamp G24-M20 for TQ 900 (LED 24 VDC – red/green)

Pull wire with sphere - PR-B-..

- Pull wire with sphere for TQ 700 S
- PR-B-1M **101218018**
  PR-B-2M **101218019**
  PR-B-3M **101218020**
  PR-B-4M **101218021**

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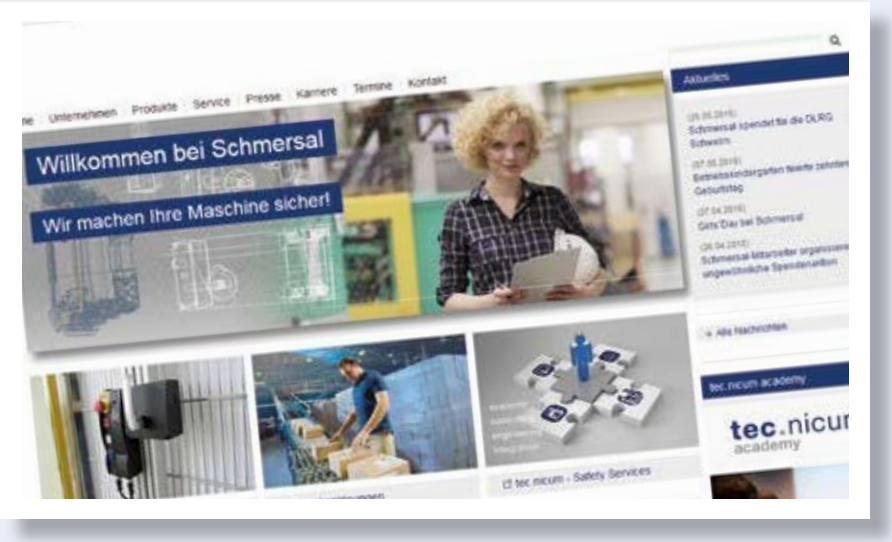


For detailed information, check out
www.schmersal.com

7. Foot switches
Description

Area of application

Safety foot switches are mounted on machines and plants in cases where manual operation is not possible. They are used to initiate and shutdown work and production cycles.

Depending on the ambient conditions and mechanical load, there are different foot switch variants. The robust foot switches in a metal design are used generally in machine tools and plants, e. g. on presses, punches, bending and sheet metal machinery etc.

The plastic foot switches of the NKF series are used as signal generators for switching on and off process and production sequences. They are used in all industrial environments such as in the textile industry, logistics and material handling and also in the packaging industry.

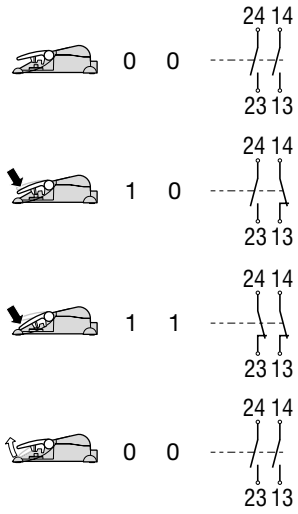
Design and way of functioning

All foot switches in the range TF 232 are available both with protective cover (ordering suffix H) and without. The devices equipped with either slow action or snap action switch inserts are available as both single-pedal and double-pedal variants. Up to 4 contacts are available per pedal.

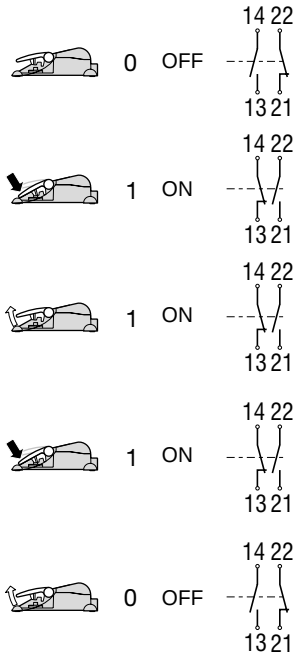
The additional contact staggering and bi-stable operating principles expand the wide range of possible uses.

The plastic foot switches in the range NKF offer solutions for up to three pedals with either NO contacts or change-over contacts. The pre-assembled variants are equipped as standard with a 2 meter pre-wired cable.

Staggered operating principle (ordering suffix -HD)
The staggering is realised by means of a pressure point, which is installed under the pedal. When the foot pedal is actuated as far as the pressure point, 1 NO contact is closed. If the pedal is actuated beyond the pressure point, the second NO contact is closed.
The first pair of contacts remain enabled.



Bi-stable operating principle (ordering suffix -F)
Upon the first foot lever action, the switch insert is switched on (= ON). Upon the second foot lever action, the latching of the switching elements is neutralised, i.e. the switch insert is switched off by the spring in the switch insert (= OFF) (push/push function).



7. Foot switches

Overview of the series

	■ F 232	■ 2F 232	■ NKF
Key Features			
	• With 1 foot pedal • 2 or 4 contacts • Enclosure in Aluminium die-cast	• With 2 foot pedals • 4, 6 or 8 contacts • Enclosure in Aluminium die-cast	• 1, 2- or 3 foot pedals • max. 2 contacts per pedal • Plastic enclosure
Other versions			
Staggered contacts	■	■	–
Bi-stable function	■	–	–
Technical features			
Electrical characteristics			
Max. switching capacity U/I	230 VAC / 4 A; 24 VDC / 1 A	230 VAC / 4 A; 24 VDC / 1 A	240 VAC / 2.5 A; 24 VDC / 1 A
Mechanical data			
Execution of the electrical connection	Screw terminals	Screw terminals	connecting cable
Cable entry	1 x M20	2 x M25	–
Cable section [1]	0.75 … 2.5 mm²	0.75 … 2.5 mm²	0.5 mm²
Dimensions (H x W x D)	170 x 189 x 274 mm	295 x 189 x 274 mm	depending on the version
Ambient conditions			
Ambient temperature	−25 °C … +60 °C	−25 °C … +60 °C	−25 °C … +60 °C
Protection class	IP65	IP65	IP67
Safety classification			
Standards	IEC/EN 60947-5-1	IEC/EN 60947-5-1	IEC/EN 60947-5-1
B_{10D} NC contact	100,000	100,000	100,000
Certificates	cULus CCC	cULus CCC	cULus

[1] Including conductor ferrules

To get detailed information about the products and certificates, visit **www.schmersal.net**.

7. Foot switches
Ordering details

Series		Protective cover	Pedals	Switching principle	Contacts / pedal	Special features	Type designation	Material number
T/Z.. 232	TF 232		with 1 foot pedal	Slow action	1 NO/1 NC		**TF 232-11**	**101181519**
					1 NO/1 NC	Bi-stable function	**TF 232-11F**	**101182012**
					2 NO/2 NC		**TF 232-22**	**101181525**
	TFH 232	■			1 NO/1 NC		**TFH 232-11**	**101181529**
					1 NO/1 NC	Bi-stable function	**TFH 232-11F**	**101182016**
					2 NO/2 NC		**TFH 232-22**	**101181532**
					2NO	Staggered contacts	**TFH 232-20HD**	**101182013**
	ZF 232			Snap action	1 NO/1 NC		**ZF 232-11**	**101181537**
					2 NO/2 NC		**ZF 232-22**	**101181539**
	ZFH 232	■			1 NO/1 NC		**ZFH 232-11**	**101181541**
					2 NO/2 NC		**ZFH 232-22**	**101181543**
	T2F 232		with 2 foot pedals	Slow action	1 NO/1 NC		**T2F 232-11/11**	**101181578**
	T2FH 232	■			1 NO/1 NC		**T2FH 232-11/11**	**101181584**
					2 NO/2 NC		**T2FH 232-22/22**	**101181587**
	Z2F 232			Snap action	1 NO/1 NC		**Z2F 232-11/11**	**101181590**
	Z2FH 232	■			1 NO/1 NC		**Z2FH 232-11/11**	**101181594**
					2 NO/2 NC		**Z2FH 232-22/22**	**101181596**
NKF	NKF		with 1 foot pedal	Snap action	1 change-over contact		**NKF1-1PWZ-B-2M**	**103003074**
					1NO		**NKF1-10Z-B-2M**	**103003077**
	NKF2		with 2 foot pedals		1 change-over contact		**NKF2-1PW/1PWZ-B-2M**	**103003075**
					1NO		**NKF2-10/10Z-B-2M**	**103003078**

Other versions upon request

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For detailed information, check out
www.tecnicum.com

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tec.nicum – Developed services relating to the machine safety and industrial safety

In the Schmersal Group, tec.nicum is the department for services relating to machine and industrial safety. The experts at tec.nicum implement all sorts of safety-related projects for their customers – from analysis of the status quo through planning and documentation to the final handover of the finished, norm-compliant machine.

tec.nicum offers companies a global network of TÜV Rheinland -certified Functional Safety Engineers, so the services of the international tec.nicum organisation can be accessed quickly and easily wherever the customer is. tec.nicum experts not only have sound knowledge of the applicable regional and national guidelines, laws and ordinances, they also have technical know-how and extensive experience in project implementation.

The experts at tec.nicum aim to offer customers a capable, product and manufacturer-neutral consultancy on all the latest statutory guidelines and support them in designing their machines and workplaces to be norm-compliant.

For all of its consultancy and solution strategies, tec.nicum sets great store by objectivity.

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- **Customer-specific training**
- **Inhouse training**
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- **Risk assessment** (HSE)
- **CE – conformity assessment**
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The head office of the tec.nicum organisation, which operates all over the world, is in Wuppertal, Germany.

Contact:

tec.nicum
K.A. Schmersal GmbH & Co. KG
Möddinghofe 30
42279 Wuppertal
Phone: +49 202 6474-932
Telefax: +49 202 6474-100
E-Mail: info-de@tecnicum.com
www.tecnicum.com

Addresses

Hauptsitz – Headquarters

K.A. Schmersal GmbH & Co. KG
Postfach 24 02 63,
42232 Wuppertal
Möddinghofe 30
42279 Wuppertal
Phone: +49 202 6474-0
Fax: +49 202 6474-100
info@schmersal.com
www.schmersal.com

Germany

Leipzig
K.A. Schmersal GmbH & Co. KG
Vertriebsbüro Leipzig
Servicepark
Druckereistraße 4
04159 Leipzig
Phone: +49 341 48734-50
Fax: +49 341 48734-51
vbleipzig@schmersal.com

Berlin
KSA Komponenten der Steuerungs- und Automatisierungstechnik GmbH
Pankstraße 8-10 / Aufg. L
13127 Berlin
Phone: +49 30 474824-00
Fax: +49 30 474824-05
info@ksa-gmbh.de
www.ksa-gmbh.de

Hamburg / Münster
K.A. Schmersal GmbH & Co. KG
Vertriebsbüro Hamburg
Innungsstraße 3
21244 Buchholz i.d.N.
Phone: +49 41 81 9220-0
Fax: +49 41 81 9220-20
vbhamburg@schmersal.com

Hannover
ELTOP GmbH
Robert-Bosch-Straße 8
30989 Gehrden
Phone: +49 51 089273-20
Fax: +49 51 089273-21
eltop@eltop.de
www.eltop.de

Wettenberg
K.A. Schmersal GmbH & Co. KG
Vertriebsbüro Wettenberg
Im Ostpark 2
35435 Wettenberg
Phone: +49 641 9848-575
Fax: +49 641 9848-577
vbwettenberg@schmersal.com

Köln
Stollenwerk
Technisches Büro GmbH
Scheuermühlenstraße 40
51147 Köln
Phone: +49 2203 96620-0
Fax: +49 2203 96620-30
info@stollenwerk.de
www.stollenwerk.de

Siegen
Siegfried Klein
Elektro-Industrie-Vertretungen
In der Steinwiese 46
57074 Siegen
Phone: +49 271 6778
Fax: +49 271 6770
info@sk-elektrotechnik.de
www.sk-elektrotechnik.de

Saarland
Herbert Neundörfer Werks-vertretungen GmbH & Co. KG
Am Campus 5
66287 Göttelborn
Phone: +49 6825 9545-0
Fax: +49 6825 9545-99
info@herbert-neundoerfer.de
www.herbert-neundoerfer.de

Bietigheim
K.A. Schmersal GmbH & Co. KG
Technologiezentrum
Pleidelsheimer Straße 15
74321 Bietigheim-Bissingen
Phone: +49 7142 91028-0
Fax: +49 7142 91028-28
tzbw@schmersal.com

Bayern Süd
INGAM Ing. Adolf Müller GmbH
Industrievertretungen
Elly-Staegmeyr-Straße 15
80999 München
Phone: +49 89 8126044
Fax: +49 89 8126925
info@ingam.de
www.ingam.de

Nürnberg
K.A. Schmersal GmbH & Co. KG
Vertriebsbüro Nürnberg
Lechstraße 21
90451 Nürnberg
Phone: +49 911 6496053
Fax: +49 911 63290729
vbnuernberg@schmersal.com

Europe

Austria – Österreich
AVS-Schmersal Vertriebs Ges.m.b.H.
Biróstraße 17
1232 Wien
Phone: +43-1-6 10 28
Fax: +43-1-6 10 28-1 30
info@avs-schmersal.at
www.avs-schmersal.at

Belgium – Belgien
Schmersal Belgium NV/SA
Nieuwlandlaan 73
Industriezone B413
3200 Aarschot
Phone: +32-16-57 16 18
Fax: +32-16-57 16 20
info@schmersal.be
www.schmersal.be

Bosnia and Herzegovina
Tipteh d.o.o. Sarajevo
Ulica Ramiza Salčina 246
71000 Sarajevo
Phone: +387-61 92 36 23
nadir.durmic@tipteh.ba
www.tipteh.ba

Bulgaria – Bulgarien
CDL Sensorik Ltd.
Chavdar Voivoda Str, No.12, Office 1
7002 Ruse City
Phone: +359 82 82 00 52
office@cdlsensorik.com
www.cdlsensorik.com

Croatia – Kroatien
Tipteh Zagreb d.o.o.
Ratarska 35
10000 Zagreb
Phone: +385 1-3 81 65 74
Fax: +385 1-3 81 65 77
tipteh@tipteh.hr
www.tipteh.hr

Czech Republic – Tschech. Republik
MERCOM COMPONENTA s.r.o.
Bechyňská 640
199 00 Praha 9 – Letňany
Phone: +4 20-267 31 46 40-2
mercom@mercom.cz
www.mercom.cz
www.schmersal.cz

Denmark – Dänemark
Schmersal Danmark A/S
Lautruphøj 1-3
2750 Ballerup
Phone: +45-70 20 90 27
Fax: +45-70 20 90 37
info@schmersal.dk
www.schmersal.dk

Finland – Finnland
Advancetec Oy
Äyritie 12 B
01510 Vantaa
Phone: +3 58-2 07 19 94 30
Fax: +3 58-9 35 05 26 60
advancetec@advancetec.fi
www.schmersal.fi

France – Frankreich
Schmersal France
BP 18 – 38181 Seyssins Cedex
8, rue Raoul Follereau
38180 Seyssins
Phone: +33-4 76 84 23 20
technique@schmersal.com
info-fr@schmersal.com
www.schmersal.fr

Greece – Griechenland
Kalamarakis Sapounas S.A.
Ionias & Neromilou
PO Box 46566 Athens
13671 Chamomilos Acharnes
Athens
Phone: +30-210-2 40 60 00-6
Fax: +30-210-2 40 60 07
ksa@ksa.gr
www.ksa.gr

Hungary – Ungarn
NTK Ipari-Elektronikai és
Kereskedelmi Kft
Gesztenyefa u. 4.
9027 Győr
Phone: +36-96-52 32 68
Fax: +36-96-43 00 11
info@ntk-kft.hu
www.ntk-kft.hu

Iceland – Island
Reykjafell Ltd.
Skipholti 35
125 Reykjavik
Phone: +354-5 88 60 10
Fax: +354-5 88 60 88
reykjafell@reykjafell.is

Italy – Italien
Schmersal Italia s.r.l.
Via Molino Vecchio, 206
25010 Borgosatollo, Brescia
Phone: +39-0 30-2 50 74 11
Fax: +39-0 30-2 50 74 31
info@schmersal.it
www.schmersal.it

Lithuania/Estonia/Latvia - Litauen/Estland/Lettland
BOPLALIT
Mus galite rasti:
Baltų pr. 145, LT-47125, Kaunas
Phone: +370 37 298989
Phone: +370 37 406718
info@boplalit.lt
www.boplalit.lt

Macedonia – Mazedonien
Tipteh d.o.o. Skopje
Bul Partizanski odredi br:80, Lok:5
1000 Skopje
Phone: +389-70-39 94 74
Fax: +389-23-17 41 97
info@tipteh.mk
www.tipteh.mk

Netherlands – Niederlande
Schmersal Nederland B.V.
Lorentzstraat 31
3846 AV Harderwijk
Phone: +31-3 41-43 25 25
Fax: +31-3 41-42 52 57
info-nl@schmersal.com
www.schmersal.nl

Norway – Norwegen
Schmersal Norge
Hoffsveien 92
0377 Oslo
Phone: +47-22 06 00 70
Fax: +47-22 06 00 80
info-no@schmersal.com
www.schmersal.no

Poland – Polen
Schmersal - Polska Sp.j.
ul. Baletowa 29
02-867 Warszawa
Phone: +48-22-8 16 85 78
Fax: +48-22-8 16 85 80
info@schmersal.pl
www.schmersal.pl

Portugal – Portugal
Schmersal Ibérica, S.L.
Apartado 30
2626-909 Póvoa de Sta. Iria
Phone: +351-219 593 835
info-pt@schmersal.com
www.schmersal.pt

Romania – Rumänien
CD SENSORIC SRL
Str. George Enescu 21
550248 Sibiu
Phone: +40-2 69-25 33 33
Fax: +40-2 69-25 33 44
proiecte@cdl.ro
www.cdl.ro

Russia – Russland
OOO AT electro Moskau
ul. Avtosavodskaya 16-2
109280 Moskau
Phone: +7-49 5-9 21 44 25
Fax: +7-49 5-9 26 46 45
info@at-e.ru
www.at-e.ru

OOO AT electro Petersburg
Polytechniskaya str, d.9,B
194021 St. Petersburg
Phone: +7-81 2-7 03 08 17
Fax: +7-81 2-7 03 08 34
spb@at-e.ru

AT-Electronics Ekaterinburg
Bebelya str. 17, room 405
620034 Ekaterinburg
Phone: +7-34 3-2 45 22 24
Fax: +7-34 3-2 45 98 22
ural@at-e.ru

Serbia – Serbien
Tipteh d.o.o. Beograd
Moše Pijade 17A
11070 Vrčin, Belgrade
Phone: +3 81 (0)11 – 8053 628
Fax: +3 81 (0)11 – 8053 045
office@tipteh.rs
www.tipteh.rs

Slovakia – Slowakei
MERCOM COMPONENTA s.r.o.
Bechyňská 640
199 00 Praha 9 – Letňany
Phone: +4 20-267 31 46 40-2
mercom@mercom.cz
www.mercom.cz
www.schmersal.cz

Slovenia – Slowenien
Tipteh d.o.o.
Ulica Ivana Roba 21
1000 Ljubljana
Phone: +386-1-2 00 51 50
Fax: +386-1-2 00 51 51
info@tipteh.si
www.tipteh.si

Spain – Spanien
Schmersal Ibérica, S.L.
Rambla P. Catalanes, 12
08800 Vilanova i la Geltrú
Phone: +34-902 56 64 57
info-es@schmersal.com
www.schmersal.es

Sweden – Schweden
Schmersal Nordiska AB
F O Petersons gata 28
421 31 Västra Frölunda
Phone: +46-31-3 38 35 00
Fax: +46-31-3 38 35 39
info-se@schmersal.com
www.schmersal.se

Addresses

- **Switzerland – Schweiz**
  Schmersal Schweiz AG
  Moosmattstraße 3
  8905 Arni
  Phone: +41-43-3 11 22 33
  Fax: +41-43-3 11 22 44
  info-ch@schmersal.com
  www.schmersal.ch

- **Turkey – Türkei**
  Entek Otomasyon Urunleri San. ve Tic. A.S.
  Mahmutbey Mah.
  Tasocagi Yolu Cad. No: 9 Entek Plaza
  34218 Bagcilar / Istanbul
  Phone: +90 850 201 4141
  Fax: +90 212 320 1188
  info@entek.com.tr
  www.entek.com.tr

- **Ukraine – Ukraine**
  VBR Ltd.
  41, Demiyivska Str.
  03040 Kyiv Ukraine
  Phone: +38 (044) 259 09 55
  Fax: +38 (044) 259 09 55
  office@vbr.com.ua
  www.vbr-electric.com.ua/schmersal

- **United Kingdom – Großbritannien**
  Schmersal Ltd.
  Sparrowhawk Close
  Enigma Business Park
  Malvern Worcestershire WR14 1GL
  Phone: +44-16 84-57 19 80
  Fax: +44-16 84-56 02 73
  uksupport@schmersal.com
  www.schmersal.co.uk

Worldwide

- **Argentina – Argentinien**
  Condelectric S. A.
  info@condelectric.com.ar
  www.condelectric.com.ar
  ELECTRO-DOS
  contacto@electro-dos.com.ar
  www.electro-dos.com.ar

- **Australia – Australien**
  Control Logic Pty. Ltd.
  25 Lavarack Avenue, PO Box 1456
  Eagle Farm, Queensland
  Phone: +61-7 36 23 12 12
  Fax: +61-7 36 23 12 11
  sales@control-logic.com.au
  www.control-logic.com.au

- **Belarus – Weißrussland**
  ZAO Eximelektro
  Ribalko Str. 26-110
  BY-220033 Minsk, Belarus
  Phone: +375-17-298-44-11
  Fax: +375-17-298-44-22
  eximelektro@tut.by
  www.exim.by

- **Bolivia – Bolivien**
  Bolivien International Fil-Parts
  3er. Anillo, 1040, Frente al Zoo
  Santa Cruz de la Sierra
  Phone: +591 (3) 3 42 99 00
  presidente@filparts.com.bo
  www.filparts.com.bo

- **Brazil – Brasilien**
  ACE Schmersal Eletroeletrônica Industrial LTDA
  Rodovia Boituva – Porto Feliz, KM 12
  Jardim Esplanada – CEP: 18550-000,
  Boituva, SP
  Phone: +55-15-32 63-98 00
  Fax: +55-15-32 63-98 99
  export@schmersal.com.br
  www.schmersal.com.br

- **Canada – Kanada**
  Schmersal Canada LTD.
  15 Regan Road Unit #3
  Brampton, Ontario L7A IE3
  Phone: +1 905 495-7540
  Fax: +1 905 495-7543
  Info-ca@schmersal.com
  www.schmersal.ca

- **Chile – Chile**
  Vitel S.A.
  francisco@vitel.cl
  www.vitel.cl
  SOLTEX
  central@soltex.cl
  www.soltex.com.cl
  INSTRUTEC
  gcaceres@instrutec.cl
  www.instrutec.cl
  OEG
  jmp@oeggroup.com
  www.oeggroup.cl
  EECOL INDUSTRIAL ELECTRIC
  ventas@eecol.cl
  www.eecol.cl

- **PR China – VR China**
  Schmersal Industrial Switchgear (Shanghai) Co. Ltd.
  Cao Ying Road 3336
  201712 Shanghai / Qingpu
  Phone: +86-21-63 75 82 87
  Fax: +86-21-63 75 82 97
  sales@schmersal.com.cn
  www.schmersal.com.cn

- **Colombia – Kolumbien**
  EQUIPELCO
  aospina@equipelco.com
  www.equipelco.com
  SAMCO
  jvargas@samcoingenieria.com
  www.samcoingenieria.com

- **Ecuador – Ecuador**
  SENSORTEC S.A
  AV. Napo y Pinto Guzmán
  Quito
  Phone: +593 091 40 27 65
  +593 095 04 86 11
  infogye@sensortecsa.com
  www.sensortecsa.com

- **Guatemala – Guatemala**
  PRESTELECTRO
  AV Petapa 44-22,
  Zona 12; Cent. Com Florencia 01012
  Phone: +502 24 42-33 46
  Anabella.Barrios@prestelectro.com
  www.prestelectro.com

- **India – Indien**
  Schmersal India Private Limited
  Plot No G 7/1,
  Ranjangaon MIDC,
  Taluka Shirur,
  District Pune 412220, India
  Phone: +91 21 38 61 47 00
  Fax: +91 20 66 86 11 14
  info-in@schmersal.com
  www.schmersal.in

- **Indonesia – Indonesien**
  PT. Wiguna Sarana Sejahtera
  Jl. Daan Mogot Raya No. 47
  Jakarta Barat 11470
  Phone: +62-21-5 63 77 70-2
  Fax: +62-21-5 66 69 79
  email@ptwiguna.com
  www.ptwiguna.com

- **Iran – Iran**
  Omid Electric
  No. 1-5, 1st Floor, Azizi passage,
  Southern Lalehzar Str. Tehran
  ZIP: 1144944181
  Phone: +98 21 33924027
  +98 21 33911022
  Fax: +98 21 33936635
  sales@omidelectric.com
  www.omidelectric.com

- **Israel – Israel**
  A.U. Shay Ltd.
  23 Imber St. Kiriat. Arieh.
  P.O. Box 10049
  Petach Tikva 49222 Israel
  Phone: +9 72-3-9 23 36 01
  Fax: +9 72-3-9 23 46 01
  shay@uriel-shay.com
  www.uriel-shay.com

- **Japan – Japan**
  Schmersal Japan KK
  3-39-8 Shoan, Suginami-ku
  Tokyo 167-0054
  Phone: +81-3-3247-0519
  Fax: +81-3-3247-0537
  safety@schmersaljp.com
  www.schmersal.jp

- **Korea – Korea**
  Mahani Electric Co. Ltd.
  20, Gungmal-ro, Gwacheon-si,
  Gyeonggi-do 427-060, Korea
  Phone: +82-2-21 94-33 00
  Fax: +82-2-21 94-33 97
  yskim@mec.co.kr
  www.mec.co.kr

- **Malaysia – Malaysien**
  Ingermark (M) SDN.BHD
  No. 29, Jalan KPK 1/8
  Kawasan Perindustrian Kundang
  48020 Rawang, Selangor Darul Ehsan
  Phone: +6 03-60-34 27 88
  Fax: +6 03-60-34 21 88
  enquiry@ingermark.com

- **Mexico – Mexiko**
  ISEL SA de CV
  mario.c@isel.com.mx
  www.isel.com.mx
  INNOVATIVE AUTOMOTION SOLUTIONS
  ias@iasmx.com
  www.iasautomation.com.mx
  EASA ENERGIA Y AUTOMATIZACIÓN
  ias@iasmx.com
  www.iasautomation.com.mx
  DINAMICA S.A de C.V
  ias@iasmx.com
  www.iasautomation.com.mx
  SIGRAMA S.A de C.V
  ias@iasmx.com
  www.iasautomation.com.mx
  VGR TECHNOLOGIES
  ias@iasmx.com
  www.iasautomation.com.mx

- **New Zealand – Neuseeland**
  Hamer Automation
  85A Falsgrave Street
  Philipstown
  Christchurch, New Zealand
  Phone: +64-33 66 24 83
  Fax: +64-33 79 13 79
  sales@hamer.co.nz
  www.hamer.co.nz

- **Pakistan – Pakistan**
  Schmersal India Private Limited
  Plot No G 7/1,
  Ranjangaon MIDC,
  Taluka Shirur,
  District Pune 412220, India
  Phone: +91 21 38 61 47 00
  Fax: +91 20 66 86 11 14
  info-in@schmersal.com
  www.schmersal.in

- **Paraguay – Paraguay**
  Brasguay S.R.L.
  R. Internacional 07
  KM 14 ; Minga Guazu
  Phone: +595 (61) 583-418 218 577
  brasguay@brasguay.com.py
  www.brasguay.com.py

- **Peru – Peru**
  Fametal S.A.
  fametal@fametal.com
  www.fametal.com
  AYD
  informes@ayd.com.pe
  www.ayd.com.pe

- **Singapore – Singapur**
  AZAREL International Pte Ltd.
  Empire Techno Centre
  30 Kaki Bukit Road 3 #01-10
  Singapore 417819
  Phone: +65-67 42 29 88
  Fax: +65-67 42 26 28
  sales@azarel.com.sg
  www.azarel.com.sg

- **South Africa – Südafrika**
  A+A Dynamic Distributors (Pty) Ltd.
  20-24 Augusta Road
  Regents Park
  2197 Booysens
  Phone: +27-11-6 81 59 00
  Fax: +27-11-4 35 13 18
  awkayser@iafrica.com

- **Taiwan – Taiwan**
  Golden Leader Camel Ent. Co., Ltd.
  No. 453-7, Pei Tun Rd.
  Taichung City 40648, Taiwan
  Phone: +886-4-22 41 29 89
  Fax: +886-4-22 41 29 23
  camel88@ms46.hinet.net
  www.leadercamel.com.tw

- **Thailand – Thailand**
  Isensor Co. Ltd.
  57/65 Soi Song Sa-ard
  Vibhavadirangsit Road
  Chomphon, Chatuchak
  Bangkok 10900
  Phone: +66 - 2 - 276 8783
  Fax: +66 - 2 - 275 5875
  info@isensor.co.th
  www.isensor.co.th

- **United Arab Emirates – Vereinigte Arabische Emirate**
  Kempston Controls LLC
  PO Box: 60998
  St. 13, Umm Ramool,
  Dubai, U.A.E.
  Tel: +971 4 2987 111
  Fax:+971 4 2987 113
  Email: sales@kempstoncontrols.ae
  www.kempstoncontrols.ae

- **Uruguay – Uruguay**
  Gliston S.A.
  Pedernal 1896 – Of. 203
  Montevideo
  Phone: +598 (2) 2 00 07 91
  colmedo@gliston.com.uy
  www.gliston.com.uy

- **USA – USA**
  Schmersal Inc.
  15 Skyline Drive
  Hawthorne, NY 10532
  Phone: +1 8 88-4 96-51 43
  Fax: +1 9 14-3 47-15 67
  infousa@schmersal.com
  www.schmersalusa.com

- **Venezuela – Venezuela**
  EMI Equipos y Sistemas C.A.
  Calle 10, Edf. Centro Industrial
  Martinisi, Piso 3, La Urbina, Caracas
  Phone: +58 (212) 2 43 50 72
  ventas@emi-ve.com
  www.emi-ve.com

- **Vietnam – Vietnam**
  Ingermark (M) Sdn Bhd, Rep Office
  Unit 208, C6 Bldg., Block 1
  My Dinh 1, New Urban Area
  Tu Liem District, Hanoi
  Phone: +84-4 287 2638
  Fax: +84-4 287 2639
  ingvietn18@ymail.com

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Customers of the Schmersal Group include global players from the area of mechanical engineering and plant manufacturing as well as operators of machinery. They profit from the company's extensive expertise as a provider of systems and solutions for machine safety. Furthermore, Schmersal specialises in various areas including foodstuff production, the packaging industry, machine tool industry, lift switchgear, heavy industry and the automotive industry.

A major contribution to the systems and solutions offered by the Schmersal Group is made by tec.nicum with its comprehensive range of services: certified Functional Safety Engineers advise machinery manufacturers and machinery operators in all aspects relating to machinery and occupational safety – and do so with product and manufacturer neutrality. Furthermore, they plan and realise complex solutions for safety around the world in close collaboration with the clients.

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