FISCHER MESS- UND REGELTECHNIK

Data sheet

KE

Additional electrical attachments

for installation in Fischer analogue measurement devices

Limit switch

Application

Limit switches make or break circuits depending on the pointer setting of mechanical display measuring devices, such as pressure or differential pressure manometers or thermometers.

Switch amplifiers are required to adapt the limit switches to the various tasks.

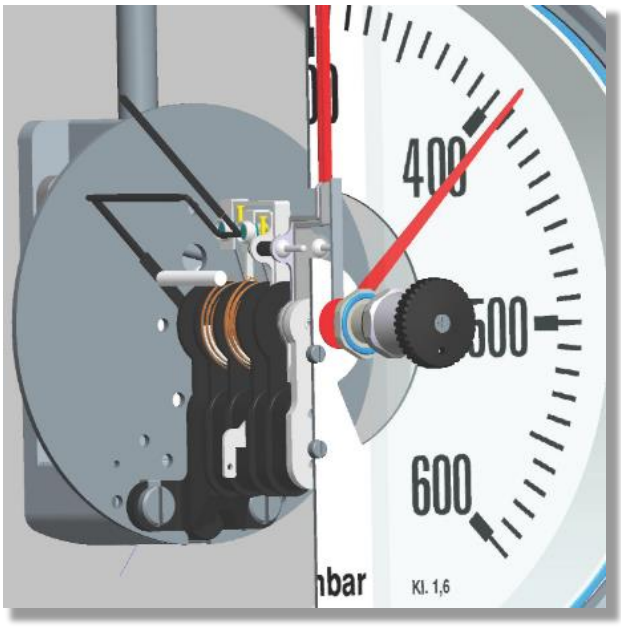
Design and mode of operation

The limit switch is installed below the dial (see fig.). It is designed so that the actual value display can move freely across the entire scale.

There is an adjustment lock attached to the front pane. Using a detachable adjustment key, the contacts mounted to the target value displays can be set to every point of the scale range.

If the contact arm that is connected to the actual value display reaches the contact pin on the target display, the power circuit is closed.

An elastic connection between the contact arm and the actual value display keeps the contact closed until the actual value deviates from the set target value.



The actual value display can continue to move under a slight load exerted by the spring coupling.

The installation space required to install the limit switches is formed by a high bayonet ring that forms a liquid-tight unit together with the basic casing (protection class IP65).

The electrical connection is usually realised with a cable connection socket mounted to the side.

Limit measuring ranges for installing additional attachments

Fischer Series	Creep and magnetic spring contacts			**Inductive contacts**	
	Single	double	double, separate	Single	double
MA11	≥ 1 bar	≥ 1.6 bar	≥ 1.6 bar	≥ 1 bar	≥ 1.6 bar
MA13	≥ 1 bar	≥ 1.6 bar	≥ 1.6 bar	≥ 1 bar	≥ 1.6 bar
MA15	≥ 60 mbar	≥ 100 mbar	≥ 100 mbar	≥ 60 mbar	≥ 100 mbar
MA16	≥ 60 mbar	≥ 100 mbar	≥ 100 mbar	≥ 60 mbar	≥ 100 mbar
DA03	≥ 100 mbar	≥ 100 mbar	≥ 100 mbar	≥ 60 mbar	≥ 100 mbar
DA04	≥ 250 mbar	≥ 250 mbar	≥ 250 mbar	≥ 250 mbar	≥ 250 mbar
DA09	≥ 100 mbar	≥ 100 mbar	≥ 100 mbar	≥ 60 mbar	≥ 100 mbar
TA	≥ 60 °K	≥ 60 °K	≥ 60 °K	≥ 60 °K	≥ 60 °K
TK	≥ 60 °K	≥ 60 °K	≥ 60 °K	≥ 60 °K	≥ 60 °K

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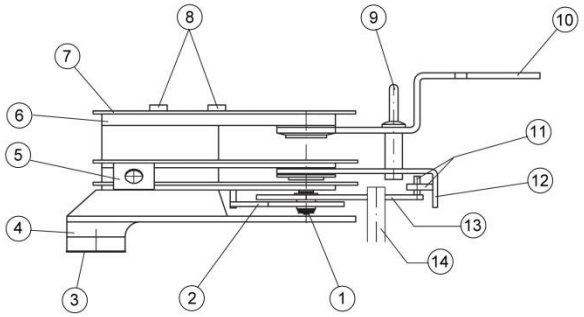
Creep contact

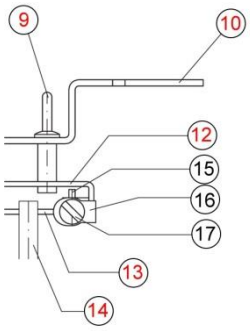


1 Ruby bearing jewels
2 Spiral springs
3 Protective earth connection
4 Contact foot
5 Electrical connection
6 Front plate
7 Type plate
8 Type plate screws
9 Adjustment pin
10 Red target value display
11 Contact pins
12 Carrier arm
13 Contact arm with leaf spring
14 Drive pin of the actual value display

In the case of creep contacts, the speed with which the contacts meet is only determined by the time change of the actual value display. Switching is realised when the target and actual value displays match. Creep contacts must be used if precise switching is required for small switching hystereses. A precondition for their use is vibration-free attachment of the measuring device (contact bounce).

The switching capacity is less than that of magnetic spring contacts. Creep contacts cannot be installed in devices with damping liquid.

Magnetic spring contact



15 Contact pin
16 Magnetic retaining plate
17 Screw-in magnet

Magnetic spring contacts can be used in almost all operating conditions.

There is a permanent magnet mounted to the target value display. To close the power circuit, the contact pin of the moving contact arm is jerked up through the magnet.

When opening the power circuit, the magnet holds the contact arm up until the reset force of the measuring element exceeds the effective magnetic force. The contact jerks open.

The jerky switching processes reduces the formation of light arcs, increases the contact pressure and suppresses contact bouncing.

Contact function

(1) Make contact
Contact closes for increasing display in clockwise direction.

(2) Break contact
Contact opens for increasing display in clockwise direction.

(3) Change-over contact
Contact changes for increasing display in clockwise direction.

Contact material

Silver-nickel (AgNi 80/20) is used as a standard material due to its balanced properties. This material stands out by virtue of its resistance to oxidising media or media containing sulfur, its low loss of contact material and low contact resistance.

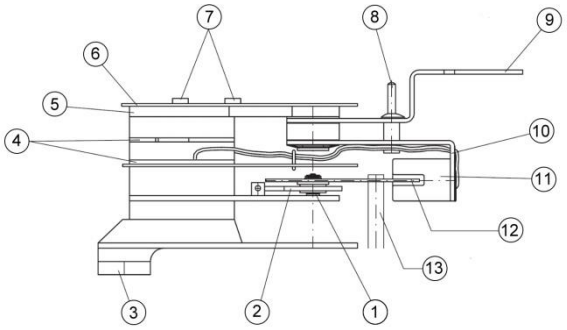
A 10 µm thick layer of gold is applied to the basic silver-nickel material. The external corrosion-resistant gold layer allows high contact security, and even and low contact resistance. If used, steps must be taken to ensure that the switch voltage of 12 V is not exceeded and the switching current is < 10 mA, as otherwise the gold layer will be damaged.

Technical data

	Creep contacts
Max. switching voltage	250 V AC/DC
Max. switching current	0.5A (resistive load)
Max. switching output	18 W / 30 VA
Max. no. of contacts	3
Switching function	Make contact / break contact
Permissible ambient temperature	-20 … +70 °C
Switch hysteresis[1]	approx.. 0.5 %FS
Contact material	AgNi 80/20 10µ hard gold plated
	Magnetic spring contact
Max. switching voltage	250 V AC/DC
Max. switching current	1 A (resistive load)
Max. switching output	30 W / 50 VA
Max. no. of contacts	3
Switching function	Make contact / break contact
Permissible ambient temperature	-20 … +70 °C
Switch hysteresis[1]	approx. 2 … 4 %FS
Contact material	AgNi 80/20 10µ hard gold plated

[1] Depending on the stability of the measuring system

Inductive contact



1	Ruby bearing jewels
2	Spiral springs
3	Contact foot
4	Electrical connection
5	Front plate
6	Type plate
7	Type plate screws
8	Adjustment pin
9	Red target value display
10	Carrier arm
11	Inductive slot type initiator
12	Metal flag
13	Drive pin of the actual value display

Inductive signal generators are designed like standard contacts. Instead of the mechanical contact, an inductive slot type initiator is mounted, into which a metal flag moves during switching.

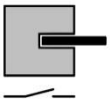
The slot type initiator is located on the target value display and the metal flag is mounted to the actual value display. There is an oscillator in the slot type initiator. As long as the metal flag does not enter the slot, the oscillating circuit is undamped. The internal resistance is relatively low.

If the metal flag enters the air gap of the slot type initiator, its oscillating circuit is damped. The internal resistance increases and the resulting change in the signal current is the input signal for the insolating unit.

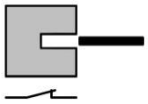
Inductive limit switches can be used as operating equipment in explosive areas (zones 1 and 2). However, they may only be operated in conjunction with suitable isolating units that satisfy the European standards DIN EN 60079-0 and DIN EN 60079-11, and the NAMUR recommendations DIN EN 60947-5-6.

Contact function

In the case of inductive contacts, the switch function is not only determined by the slot type initiator but also by the switch amplifier.



When the target value is exceeded, the metal flag moves in. The initiator is damped. The signal current drops to ≤ 1 mA and is therefore quasi interrupted.



When the target value is exceeded, the metal flag moves out. The initiator is undamped. A signal current of ≥ 3mA flows.

Technical data

	Inductive contact
Design	NAMUR (DIN EN 60947-5-2)
Ex identification	II 1 G Ex ia IIC T6 II 2 G Ex ia IIC T6
EC type testing	PTB 99 ATEX 2219 X
Rated Voltage	8 V DC
Operating voltage U_B	5 … 25 V
Insulation voltage	500V
Admissible ambient temperature	- 20 … +70 °C
Switching function	Make contact (DC pnp)
Initiator undamped	≥ 3 mA
Initiator damped	≤ 1 mA
Switching precision	approx.. 0.5 %FS
Self-inductance	29 µH
Self-capacitance	20 nF

Class precision

As the mobile parts of the limit switch need to be moved by the measuring system, this has a slight influence on the measuring accuracy despite careful selection of materials and correct storage.

In compliance with DIN 16085, this additional deviation of 50% caused by the limit switch may not exceed the defined class precision.

Use of contacts in devices filled with liquid

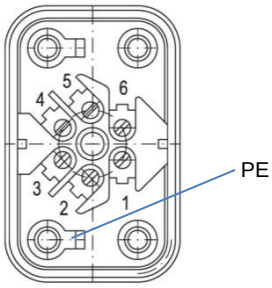
Creep contacts cannot be installed in devices with damping liquid.

It is technically possible to use magnetic spring contacts in devices filled with liquid; however, the light arc that is unavoidably created during switching burns some of the liquid every time a switch process is carried out, which in turn causes discoloration. Also, the liquid fosters contact burning and therefore impacts on the life span of the limit switch.

It is therefore advisable to only install inductive limit switches in measuring devices filled with liquid.

Electrical connection

All measuring devices with installed limit switches are wired in a cable socket attached to the side of the casing of the measuring device.



Number of terminals	6 + PE
Max. cable cross-section	2.5 mm^2
Protection class as per IEC 529	IP 65
Cable screw connection	M20 x1.5
Casing material	Polyamide 6
Number of terminals	6 + PE
Max. cable cross-section	2.5 mm^2
Protection class as per IEC 529	IP 65

Creep and magnetic spring contacts

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Type

A Joint reference potential
B Separate power circuits

S Creep contacts
C Magnetic spring contact

Contact assignment

The contacts are assigned to the target value displays from left to right.

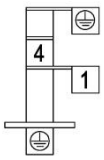
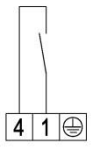
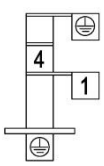
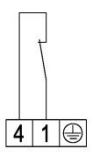
For 2 contacts:

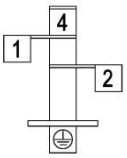
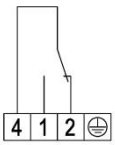
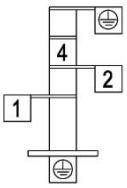
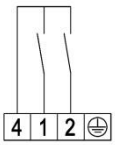
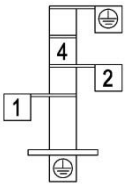
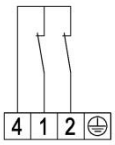
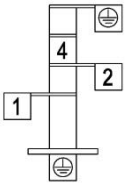
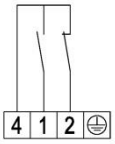
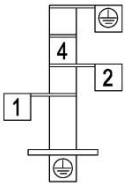
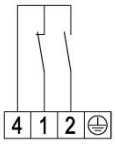
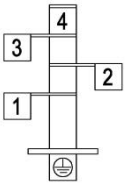
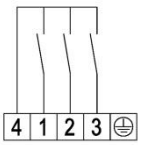
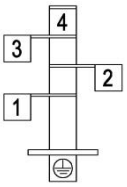
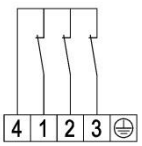
Contact 1	left target value display
Contact 2	right target value display

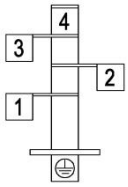
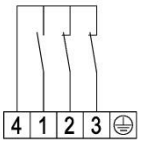
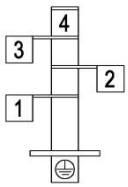
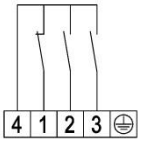
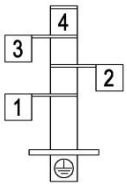
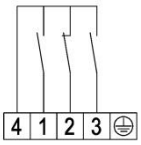
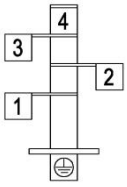
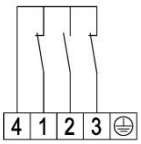
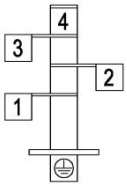
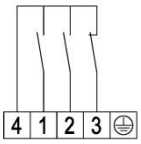
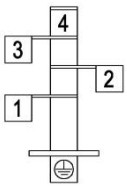
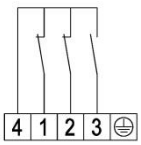
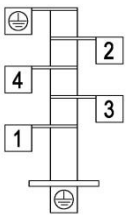
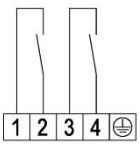
For 3 contacts:

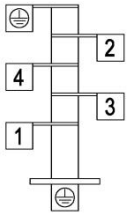
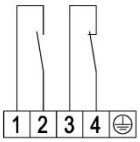
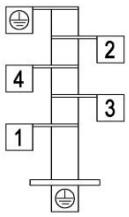
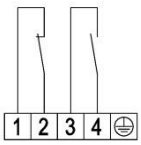
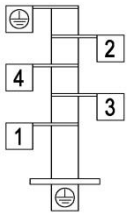
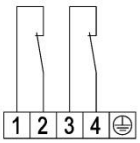
Contact 1	left target value display
Contact 2	middle target value display
Contact 3	right target value display

All information for increasing display in clockwise direction.

Type	Contact			Connections	
	Qty	No.	Function	Limit switch	Cable socket
S100A M100A	1	1	Make contact		
S200A M200A	1	1	Break contact		

Type	Contact			Connections	
	Qty	No.	Function	Limit switch	Cable socket
S300A M300A	1	1	Change-over contact		
S110A M110A	2	1 2	Make contact Make contact		
S220A M220A	2	1 2	Break contact Break contact		
S120A M120A	2	1 2	Make contact Break contact		
S210A M210A	2	1 2	Break contact Make contact		
S111A M111A	3	1 2 3	Make contact Make contact Make contact		
S222A M222A	3	1 2 3	Break contact Break contact Break contact		

Type	Contact Qty	No.	Function	Connections Limit switch	Cable socket
S122A M122A	3	1 2 3	Make contact Break contact Break contact		
S211A M211A	3	1 2 3	Break contact Make contact Make contact		
S121A M121A	3	1 2 3	Make contact Break contact Make contact		
S212A M212A	3	1 2 3	Break contact Make contact Break contact		
S112A M112A	3	1 2 3	Make contact Make contact Break contact		
S221A M221A	3	1 2 3	Break contact Break contact Make contact		
S110B M110B	2	1 2	Make contact Make contact		

Type	Contact			Connections	
	Qty	No.	Function	Limit switch	Cable socket
S120B M120B	2	1 2	Make contact Break contact		
S210B M210B	2	1 2	Break contact Make contact		
S220B M220B	2	1 2	Break contact Break contact		

Inductive contacts

KE ##						#	H	2

Type

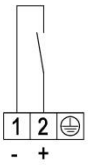
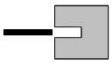
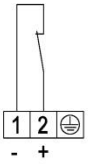
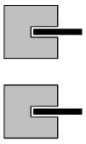
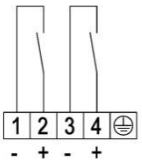
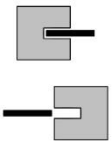
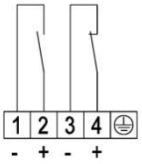
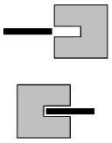
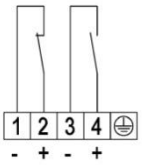
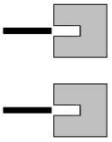
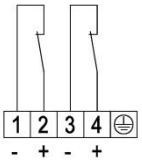
C Separate power circuits due to system design

I Inductive contact

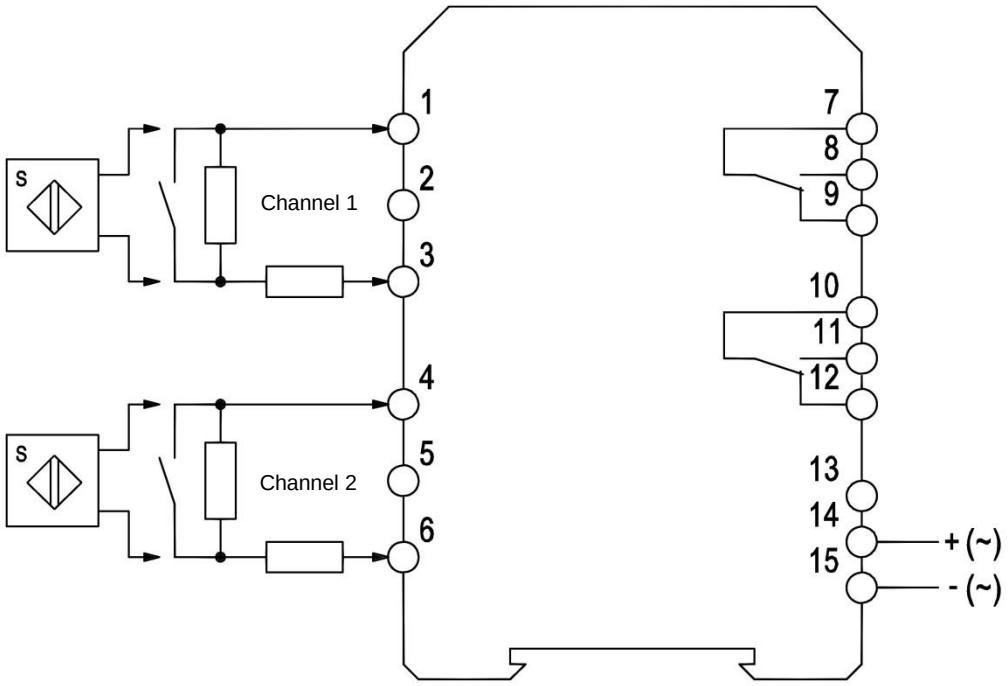
Contact assignment

Contact 1 left target value display
Contact 2 right target value display

All information when target value is exceeded and increasing display in clockwise direction.

Type	Contact			Metal flag	Connections	Relay of the isolating unit	
	Qty	No.	Control current		Cable socket	No.	Switch behaviour (working current principle)
I100C	1	1	≤ 1 mA			1	Relay is energised
I200C	1	1	≥ 3 mA			1	Relay is deactivated
I110C	2	1 ≤ 1 mA 2 ≤ 1 mA				1 Relay is energised 2 Relay is energised	
I120C	2	1 ≤ 1 mA 2 ≥ 3 mA				1 Relay is energised 2 Relay is deactivated	
I210C	2	1 ≥ 3 mA 2 ≤ 1 mA				1 Relay is deactivated 2 Relay is energised	
I220C	2	1 ≥ 3 mA 2 ≥ 3 mA				1 Relay is deactivated 2 Relay is deactivated	

Connection of isolating unit amplifier TS500Ex



Accessories

Item no.	Designation		Delivery
05003065	Isolating unit amplifier	TS500Ex-ia-1R-5	1 Channel with relay output
05003066	Isolating unit amplifier	TS500Ex-ia-2R-5	2 Channel with relay output

Order Codes

Electrical auxiliary devices

Contacts

Type KE [ ][ ][ ][ ][ ][ ][ ][ ] **H 2**

Nominal size
Casing Ø 100 ..... > **2 0**
Casing Ø 160 ..... > **2 1**

Limit switch
Creep contacts ..... > **S**
Magnetic spring contact ..... > **M**
Inductive contact ..... > **I**

Contact function

Contact 1
Make contact ..... > **1**
Break contact ..... > **2**
Change-over contact ..... > **3**

Contact 2
No contact ..... > **0**
Make contact ..... > **1**
Break contact ..... > **2**

Contact 3
No contact ..... > **0**
Make contact ..... > **1**
Break contact ..... > **2**

Switching mechanism
Standard with common reference potential ..... > **A**
Separate power circuits (max. 2 contacts) ..... > **B**
Inductive contacts – separated due to system design ..... > **C**

Contact material
For inductive contacts - no material ..... > **0**
Silver-nickel (AgNi 80/20) ..... > **3**
Silver-nickel (AgNi 80/20) 10µ hard gold plated ..... > **4**

Design
Contact structure with high-drawn pointers ..... > **H**

Torque
Spiral spring torque 0.0133 Nmm/90° ..... > **2**

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