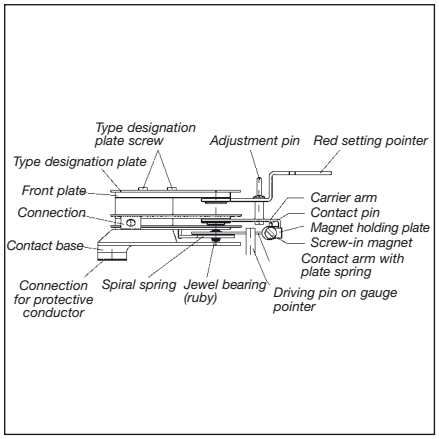
Electrical contacts – electromechanical



Electrical contacts – electromechanical

General

Electrical contacts in measuring devices with pointers are auxiliary electrical switches which open or close electrical circuits at set limit values by means of a contact arm which is moved in accordance with the indicated value.

They consist of:

- *an adjustable red setting pointer*
- *a carrier arm which is connected to the setting pointer and which carries the contact pin*
- *a contact arm which is moved by the gauge pointer and which carries the second contact pin*

A contact adjustment lock allows the user to adjust the setting pointer to the value at which the device is to switch.

The gauge pointer can move beyond the adjusted setting pointer after the contact has been made. However, the contact remains active.

Two types of contacts are available: magnetic spring contacts and sliding contacts.

Magnetic spring contact

Principle of operation

Magnetic spring contacts have a permanent magnet screwed to the setting pointer at the contact carrier arm.

To close the circuit, the contact pin of the moving contact arm is attracted by the magnet and the contact closes.

When the circuit opens, the magnet attracts the contact arm until the resetting force of the measuring element overcomes the effective force of the magnet and the contact opens again.

The snap action reduces arcing between the contacts, thus allowing for greater switch ratings. Due to the increased contact force, this type of contact is also less sensitive to vibrations. Furthermore, the stability of contact is increased by greater contact pressure.

Application

Magnetic spring contacts can be used under almost any type of operating condition.
They can also be integrated into gauges with filling.

In order to prevent switching errors (particularly in the case of greater inductive switch ratings or considerable system vibration or in gauges with filling) we recommend installing our pulse-controlled series MSR contact protection relays.

Technical specifications

Nominal supply voltage
250 V max.

Making and breaking current
1.0 A max.

Permanent current
0.6 A max.

Switch rating
30 W 50 VA max.

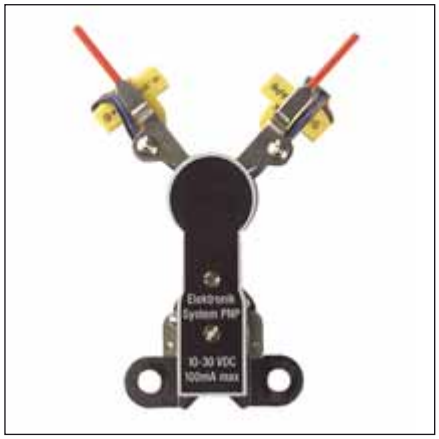
Contact material
Ag80 Ni20 Au 10 µ (additional cost for special materials)

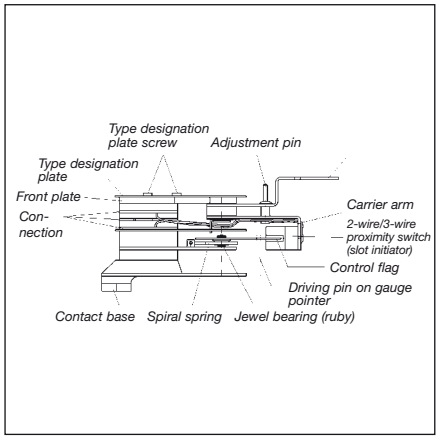
Switching accuracy
Approx. 2–5 % of full scale value

Operating temperature range
-20 °C/+70 °C, depending on type of gauge

Adjustment range
5–95 % of the gauge measuring range

Electrical contacts – electronic





Electronic contact

General

Electronic contacts have non-contacting electrical displacement pick-ups (proximity switches).
They consist of:

- *An adjustable red setting pointer*
- *A carrier arm which is connected to the setting pointer and which carries the control head with the complete, encapsulated electronics*
- *A control flag which is moved by the gauge pointer*

A contact adjustment lock allows the user to adjust the setting pointer to the value at which the unit has to switch.

The gauge pointer can move beyond the adjusted setting pointer after the contact has been made. However, the contact remains active.

Principle of operation

The slot type proximity switches used in the electronic contacts are simple 2-wire or 3-wire DC voltage switches.

Due to the slot design, the proximity switches are also referred to as slot initiators.

The electromagnetic field is concentrated between two opposing coils. The switch is activated when the aluminium control flag moved by the gauge pointer reaches the gap between the two coils (slot). The signal is generated without a delay, according to the movement of the gauge pointer.

The switching behaviour of the PNP switches used in these contacts is usually defined as a normally open contact, i.e.:

Control flag in the slot initiator
- *Contact closed*
- *Output active*

Control flag not in the slot initiator
- *Contact open*
- *Output not active*

Application

Due to the non-contacting switching procedure, the high switching accuracy and the long service life, electronic contacts with PNP output are ideal for any type of industrial application.

The use of these contacts is particularly advantageous in applications with liquid filled measuring instruments, at low voltages (DC 10–30 V) and low DC loads (≤ 100 mA), e.g.

- ***for PLC signal input***
- ***to control opto-isolators***
- ***for other electronic evaluation units***

Version

Standard electronic contacts are shipped with a 3-wire initiator type Si2-K08-AP6. The contacts are also available with the Si2-K08-AG6 2-wire initiator.

Technical specifications

Supply voltage
DC 10–30 V

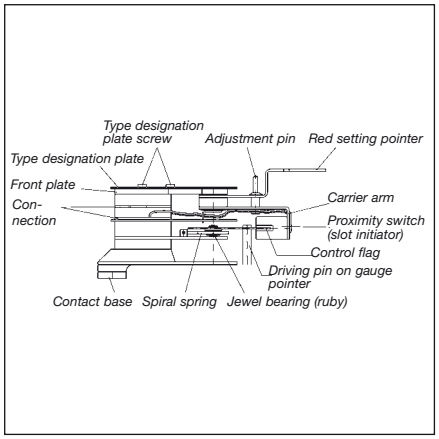
Switch rating
≤ 100 mA

Switching accuracy
Approx. 0.5 % of full scale value

Operating temperature range
-25 °C/+70 °C, depending on type of gauge

Adjustment range
5–95 % of the gauge measuring range

Electrical contacts – inductive



Inductive contact

General

Inductive contacts have non-contact electric displacement pick-ups according to EN 60947-5-6 or NAMUR.
They consist of:

- *an adjustable red setting pointer*
- *a carrier arm which is connected to the setting pointer and which carries the control head with the complete, encapsulated electronics*
- *a control flag which is moved by the gauge pointer*

A contact adjustment lock allows the user to adjust the setting pointer to the value at which the unit has to switch.

The gauge pointer can move beyond the adjusted setting pointer after the contact has been made. However, the contact remains active.

Principle of operation

Inductive contacts are used in connection with a switching amplifier. The amplifier supplies the control head with direct voltage. As soon as the control flag reaches the control head, the internal resistance in the control head increases (high ohmic initiator). This causes the current to change and is used to control the switching amplifier.

The amplifier converts the input signal into a binary output signal.

Therefore, the switching function of inductive contacts is not only determined by the slot initiator, but also by the switching amplifier.

Application

Due to the non-contacting switching, the high switching accuracy and the long service life, inductive contacts are ideal for industrial applications and should be used in liquid filled gauges.
Inductive contacts are particularly recommended when the switching frequency is very high and when highest demands are made on reliability.

The electronics are fully encapsulated, therefore this type of contact is also suitable for use in areas with corrosive atmospheres.

If suitable isolating switching amplifiers are used (such as KFA6-SR2-Ex), the system will conform to the hazardous area classification „intrinsic safety i“. It will be classified as
II 2G EEx ia IIC T6 or
II 1G EEx ia IIC T6 and may be used in hazardous areas zones 1 and 2. The isolating switching amplifier, however, must always be installed in the safe area, e.g. outside the hazardous area.

For standard industrial applications not requiring Ex protection, we recommend our cost-efficient multifunctional series MSR-I relays

Technical specifications

Nominal voltage
8 V = (Ri 1 kOhm)

Supply voltage
5–25 V

Current input
3 mA (active area free)
1 mA (active area covered)

Switching accuracy
Approx. 0.5 % of full scale value

Operating temperature range
-20 °C/+70 °C, depending on type of gauge

Adjustment range
5–95 % of the gauge measuring range

Switching functions and definitions

Figure 1

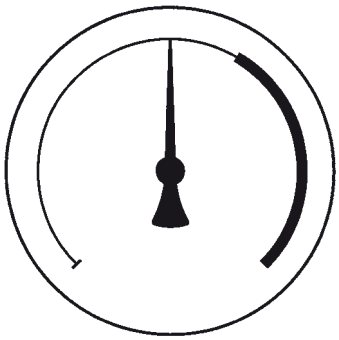


Figure 2

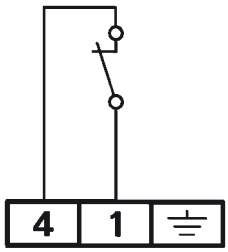
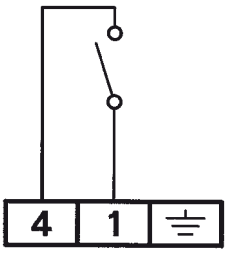


Figure 3



Definition of switching function

1 = Contact closes clockwise when the set point is reached.
2 = Contact opens clockwise when the set point is reached.
W = 1 contact opens and 1 contact closes at the same time (changeover).

The switching function of a contact is always specified in terms of a clockwise movement of the pointer.

If the actual gauge pointer moves counter-clockwise, the switching function is inverted!

Where several contacts are fitted to a gauge, the contact closest to the left end of the scale is defined as the „first“ contact.
This also applies to vacuum ranges!

Optimisation of the switching performance

Application related information, such as the directional movement of the contact pointer (e.g. contact switches with increasing or decreasing pressure), the switch point setting or the speed of pressure changes, help to optimise contact adjustment to achieve a more accurate switching performance.

Selection table for switching functions

The selection tables for switching functions on pages 358 and 359 list the switching functions of single, double and the most common triple contacts (with switching/wiring diagram).

This chart facilitates the quick and easy finding of the correct contact designation for the required switching function.

Description of the switching scheme

Figure 1:
- thin line = contact open, circuit open
- thick line = contact closed, circuit closed

Description of the wiring diagram

Figure 2:
- contact closed
- circuit closed

Figure 3:
- contact open
- circuit open

Definition of the contact type

MK = **m**agnetic spring **c**ontact
SK = **s**liding **c**ontact
EK = **e**lectronic **c**ontact
IK = **i**nductive **c**ontact

Depending on the type of the pressure gauge, up to four contacts can be fitted to one gauge.
The number of switching contacts is indicated by a figure (1–4) after the contact type designation.

Example:
MK 2.12

- Magnetic spring contact
- 2 contacts
- 1st contact closes
- 2nd contact opens

Definition of complete gauge

The code for the contact is added to the type designation of the gauge.

Example:
RF100Ch IK1.2

- Bourdon tube pressure gauge
- NG 100
- Gauge for chemical applications
- Inductive contact
- One contact
- Contact opens

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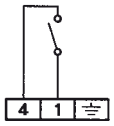
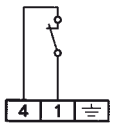
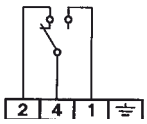
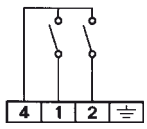
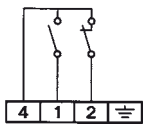
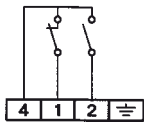
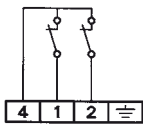
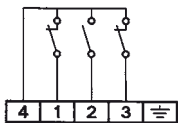
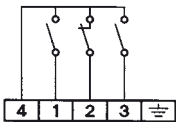
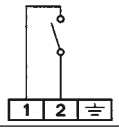
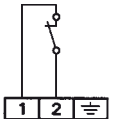
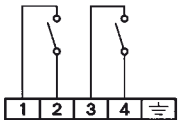
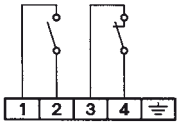
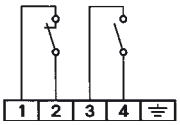
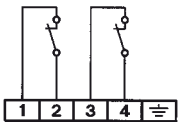
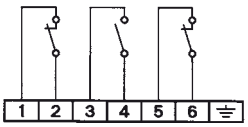
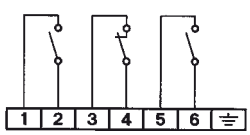
Switching functions of electrical contacts (electromechanical)

Switching scheme	Wiring diagram	Switching function (pointer moves in clockwise direction)	Contact type	
			Magnetic spring contact	Sliding contact
Single contact				
		Contact closes	MK1.1	SK1.1
		Contact opens	MK1.2	SK1.2
		Contact switches over, i.e 1 contact opens 1 contact closes	MK1.W	SK1.W
Double contact				
		1st contact closes 2nd contact closes	MK2.11	SK2.11
		1st contact closes 2nd contact opens	MK2.12	SK2.12
		1st contact opens 2nd contact closes	MK2.21	SK2.21
		1st contact opens 2nd contact opens	MK2.22	SK2.22
Triple contact				
		1st contact opens 2nd contact closes 3rd contact opens	MK3.212	SK3.212
		1st contact closes 2nd contact opens 3rd contact closes	MK3.121	SK3.121

Switching functions of electrical contacts (inductive)

Switching scheme	Wiring diagram	Switching function	The clockwise rotation of the pointer of the gauge moves the control flag...	Contact type
		Pointer moves clockwise		**Inductive contact**
		Single contact		
		Contact closes	outside the switch contact head area	IK1.1
		Contact opens	inside the switch contact head area	IK1.2
		Double contact		
		1st contact closes 2nd contact closes	the 1st and 2nd contact outside the switch contact head	IK2.11
		1st contact closes 2nd contact opens	the 1st contact outside the switch contact head the 2nd contact inside the switch contact head	IK2.12
		1st contact opens 2nd contact closes	the 1st contact inside the switch contact head the 2nd contact outside the switch contact head	IK2.21
		1st contact opens 2nd contact opens	the 1st and 2nd contact inside the switch contact head	IK2.22
		Triple contact		
		1st contact opens 2nd contact closes 3rd contact opens	the 1st and 3rd contact inside the switch contact head the 2nd contact outside the switch contact head	IK3.212
		1st contact closes 2nd contact opens 3rd contact closes	the 1st and 3rd contact outside the switch contact head the 2nd contact inside the switch contact head	IK3.121