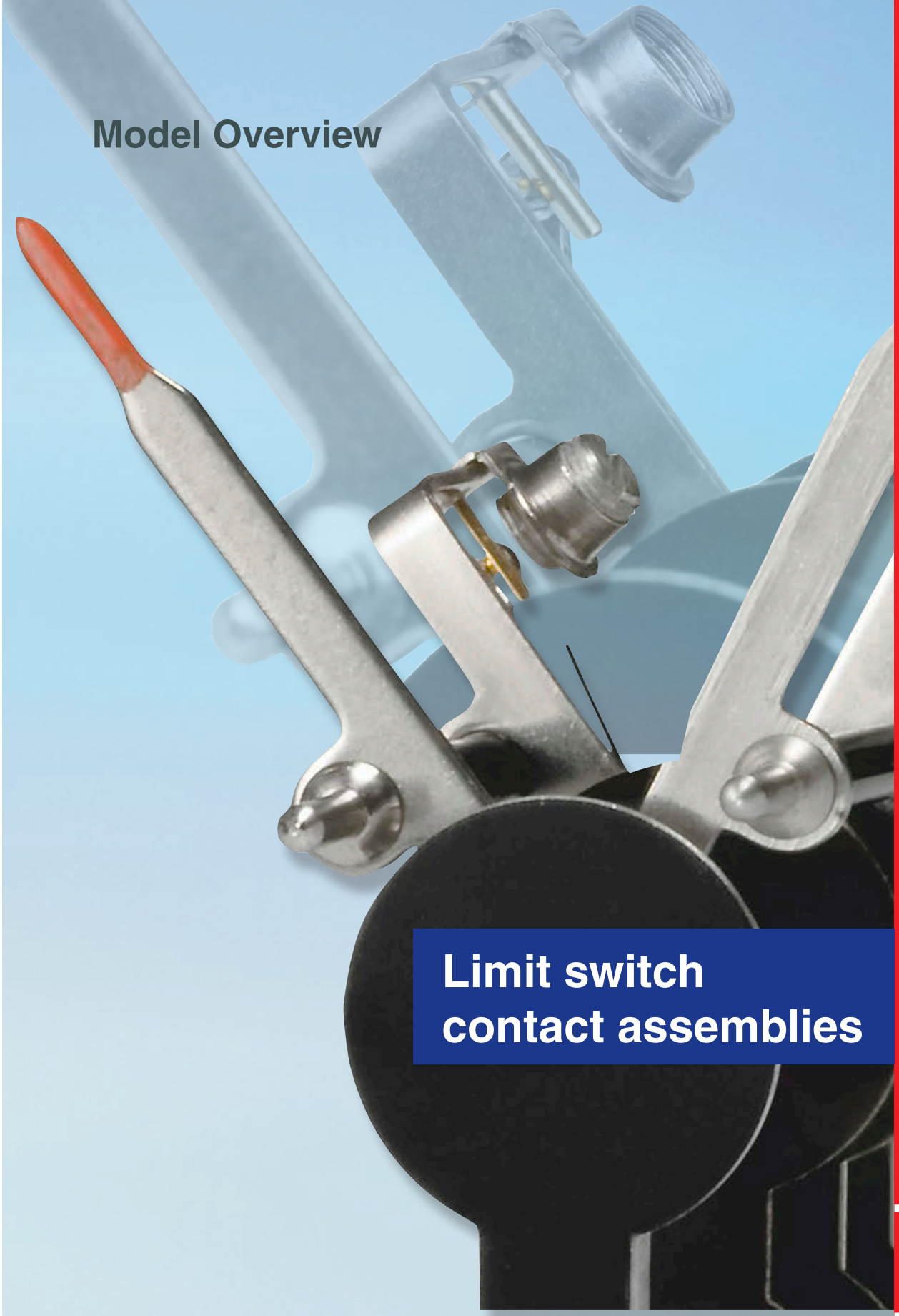
Heading 9.1

Model Overview



# Limit switch contact assemblies

9.1000
11/13

ARMATURENBAU GmbH MANOTHERM Beierfeld GmbH

## Content

In the following you will find a model overview of our limit switch contact assemblies from **catalogue heading 9**.

In this overview, definitions, applications and modes of operation are explained in general and in detail for the particular models of limit switch contact assemblies. Additionally you will find detailed information on selection, switching functions and minimum spans, on operating conditions, on Ex-protection, on technical data, on options and others.

Further information can also be found in DIN 16 085.

Furthermore, **heading 9** comprises electrical accessories, such as pressure transmitters and digital displays. We are glad to provide you with detailed documentation upon request.

Specifications, such as dimensional drawings, electrical connections, indications on the order code and other options, can be found in the data sheets of the respective instrument models with the last digits .90.

Information on accessories such as relays and others, can be found on the following pages and in the data sheets that are indicated there.



The complete catalogue is also available as CD-ROM, which is updated annually.


## Catalogue Headings

| | | |
|---|---|---|
| Heading | 1 | Bourdon tube pressure gauges |
| Heading | 2 | Bourdon tube test gauges |
| Heading | 3 | Diaphragm pressure gauges (horizontal) |
| Heading | 4 | Diaphragm pressure gauges (vertical) |
| Heading | 5 | Duplex and differential pressure gauges |
| Heading | 6 | Capsule gauges for low pressure |
| Heading | 7 | Chemical seals |
| Heading | 8 | Thermometers |
| Heading | 9 | - Limit switch contact assemblies<br>- Pressure transmitters and digital displays |
| Heading | 10 | Pressure gauge test equipment |
| Heading | 11 | Accessories |

Overviews and data sheets can be found on the internet at **www.armaturenbau.com** or **www.manotherm.com**

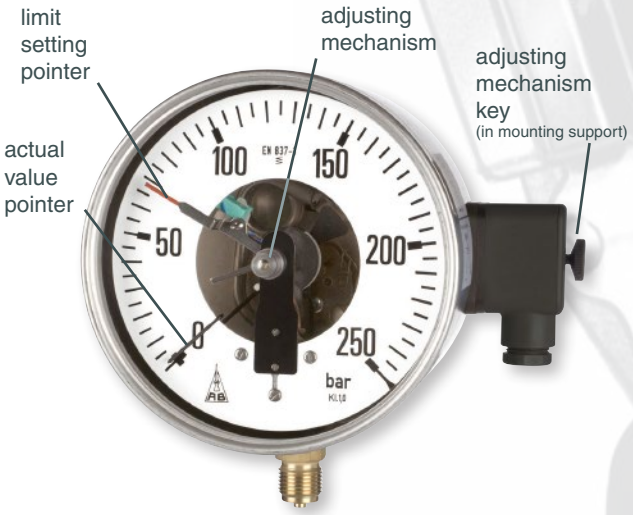
## Certificates

Quality Management DIN EN ISO 9001

| | |
|---|---|
| | GOST type certification Russia |
| | GOST-R for customs purposes Russia |
| | GOST type certification Ukraine |
| | GOST type certification Kazakhstan |

## Application

Limit switch contact assemblies open or close electrical or pneumatic circuits.




## Mode of operation

The construction of limit switch contact assemblies allows the continued operation of the **actual value pointer** beyond the **limit setting pointer**, after the limiting signal transmission has occured. The limit setting pointers can be adjusted on the whole range of the scale. Please consider the references and recommendations made in "Contact adjustment ranges" (page 4).

The limit setting pointer is adjusted to the value at which the switching operation is to take place, from outside with a **removable key**. With limit switch contact assemblies in NCS 63 with reed contact, the adjustment is generally carried out manually after removal of the bayonet ring. With e-Gauges® the reference values are programmed.

Regulations according to DIN 16 085 (pressure gauges) and DIN 16 196 (thermometers) apply to limit switch contact assemblies with 1 and 2 contacts.

In addition, we also deliver limit switch contact assemblies with 3 or 4 contacts. In this case, special adjustment regulations regarding adjustment ranges, switching hysteresis and superimposed adjustability are necessary.

Further information on the above mentioned and on deliverable limit switch contact assemblies and others, can be found in the data sheets with the last digits .90 or are given upon request.

## Limit switch contact assemblies

We differ the following **models:**

| | | Model |
|---|---|---|
| 1. | **Direct** (electromechanical) | |
| | 1.1 Standard contact | **S** |
| | 1.2 Magnetic contact | **M** |
| | 1.3 Micro switch | **MS** |
| 2. | **Indirect** (contact-free) | |
| | 2.1 Electronic contact | **E** |
| | 2.2 Inductive contact | **I** |
| | 2.3 Pneumatic contact | **P** |
| | 2.4 Reed contact | **R** |
| | 2.5 e-Gauge® | **eG** |

## Definitions

**Contact load**

Allowed maximum values of the electrical load of a contact.

**Switching pressure**

The switching pressure is the pressure of the medium at the moment of activation of the switching function. (Source: DIN 16 085)

**Switching point**

The switching point is the value on the scale at which the switching function is activated.

**Switching direction** (direction of action of the switching function)

The switching direction is marked by the movement of the actual value pointer at which the switching operation proceeds:
-> clockwise switching direction with rising pressure and
-> anticlockwise switching direction with falling pressure

**Switching function**

We have defined 3 switching functions:

| | |
|---|---|
| Make contact (code number 1) | Contact makes, when the pointer is moving clockwise and the adjusted limit value is exceeded. |
| Break contact (code number 2) | Contact breaks, when the pointer is moving clockwise and the adjusted limit value is exceeded. |
| Change-over contact (code number 3) | One contact breaks and one contact makes at the same time (or immediately one after the other), when the adjusted limit value is exceeded. |

see "Switching functions" on page 5

**Switching accuracy** (accuracy of the switching operation)

The switching accuracy indicates the deviation of the switching pressure from the adjusted limit value in the defined switching direction. According to DIN 16 085, it should not exceed the 1.5-fold of the error limits of the pressure measuring instrument.

**Switching difference**

The switching difference is the difference between the switching points of two limit values.
The minimum distance between two switching points is the possible minimum switching difference.

**Switching pressure reversal error** (switching hysteresis)

"The switching pressure reversal error is the difference of the switching pressures at the moment of activation of the switching function of a contact during rising and falling pressure, but unchanged reference value of the switching pressure."
(Source: DIN 16 085)

# Limit switch contact assemblies in general

## Information on the selection

### Installation options for limit switch contact assemblies

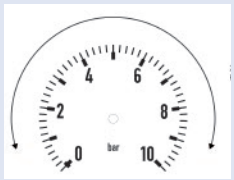
| Pressure gauge / thermometer model | Nominal case size |
|---|---|
| • Bourdon tube pressure gauges | 63, 100, 160, 96 x 96, 144 x 144 |
| • Differential pressure gauges | 100, 160 |
| • Diaphragm pressure gauges | 100, 160 |
| • Capsule gauges for low pressure | 100 (e-Gauge® only) |
| • Gas-actuated thermometer | 100, 160, 96 x 96, 144 x 144 |

### Contact adjustment ranges

The DIN standards 16 085 (pressure gauges) and DIN 16 196 (thermometers) apply in connection with the instrument standards DIN EN 831–1/–3 (pressure gauges) resp. DIN EN 13 190 (thermometers).
As further loads act on pressure gauges / thermometers with limit switch contact assemblies, we have defined the range in which limit switch contact assemblies should work optimally and are adjusted ex works, according to the standards as follows:

**Limit switch contact assemblies with 1 contact**
Adjustment ranges:
S/E/I/P-contact 10 – 90 % (——)
M-contact 15 – 85 % (----)

**Limit switch contact assemblies with 2 contacts**
S/E/I/P-contacts
Adjustment range
both contacts 10 – 90 %



**Limit switch contact assemblies with 2 contacts**
M-contacts
Adjustment ranges
1. contact 15 – 70 % (——)
2. contact 30 – 85 % (——)

Outside the defined ranges, larger switching inaccuracies, among others, and larger or minor switching pressure reversal errors can occur.
The greater difficulty with magnetic contacts is that when decreasing the magnetic forces during adjustment, the defined maximum contact load can not be fully used.
With magnetic contacts it is generally not possible to combine a maximum contact load with a minimum skipping behaviour (minor magnetic force).

### Switching difference

The switching difference between two switching points has to be larger than the switching pressure reversal error, and with magnetic contacts it additionally has to be larger than the skipping behaviour, so that the switching points can be differentiated reliably.

**In practice we recommend**

| Limit switch contact assemblies | Switching function | Switching difference |
|---|---|---|
| **S, E, I, P** | 11, 22 | > switching pressure reversal error |
| | 12, 21 | ≥ 2 % of the span |
| **M** | 11, 22 | ≥ 6 % of the span |
| | 12, 21 | ≥ 12 % of the span |

### Minimum spans

Please also note the minimum spans for the respective instrument models (see page 5) which depend, among others, on the directive force of the measuring unit.

## Information in an order

For an optimal functioning of the instruments with limit switch contact assemblies, you should indicate in addition to the ordering code:

- the switching pressure/s,
- the switching range/s, in which the contact/s is/are adjusted, if it lies/they lie beyond the adjustment ranges defined by us,
- if an anticlockwise switching direction is requested.

Detailed information on the ordering code can be found in the data sheets of the respective instrument model with the last digits .90.

## Special solutions

If your operating conditions lie beyond these limits, please do not hesitate to contact us and we will work out an individual solution, adjusted to your conditions.

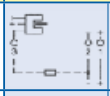
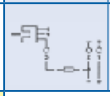
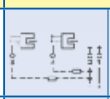
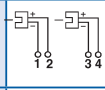
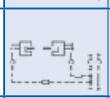
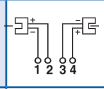
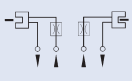
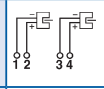
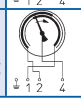
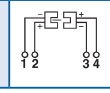
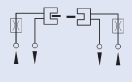
## Special pressure gauges with limit switch contact assemblies

Model: **RChE**
Case: stainless steel
Ring: snap-in window (turnable)
Special equipment: construction type tested acc. to EN 562, 1 x inductive contact, I1 acc. to EN ICE 60 497-5-6 connection ¼" NPT
Data sheet: **1231-9.2**

Model: **RChg, RChgOe, RChgN**
Case: stainless steel
Ring: crimped-on ring, stainl. steel
Special equipment: gas density monitors for $SF_6$-gas give alarm in case of leakage. The instruments are adjusted for the particular case of application to calibration pressure, switching points and ambient temperature.
Data sheet: **1902**

Model: **RCh 100 / 160 with e-Gauge®**
**RChG 100 / 160 with e-Gauge®**
Case: stainless steel
Ring: bayonet ring, stainless steel
Special equipment: the e-Gauge® operates absolutely contact-free and turns a "normally" indicating instrument with NCS 100/160 into a multifunctional instrument with 2 digital switching outputs and an analogue output signal of 4...20 mA.
Data sheet: **1201.93**

## Switching functions (for clockwise pointer movement, i. e. direction of action of the switching function is rising pressure with pressure gauges):

| 1 Contact | Standard / Magnetic S, M | | | Electronic E | | Inductive I | | Pneumatic P | | Reed R | | Micro switch MS | | e-Gauge® eG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Break contact |  | S2 | M2 |  | E2 |  | I2 |  | P2 |  | R2 | – | | |
| Make contact |  | S1 | M1 |  | E1 |  | I1 |  | P1 |  | R1 | – | | |
| **Single change-over** | **Standard / Magnetic S, M** | | | | | | | | | | | **Micro switch MS** | | |
| |  | S3 | M3 | | | | | | | | |  | MS3 | |
| **2 Contacts[1]** | **Standard / Magnetic S, M** | | | **Electronic E** | | **Inductive I** | | **Pneumatic P** | | **Reed R** | | **Micro switch MS** | | **e-Gauge® eG** |
| 1. and 2. break contact |  | S22 | M22 |  | E22 |  | I22 | | s.b.[2] |  | R22 | – | | eG22 |
| 1. break contact 2. make contact |  | S21 | M21 |  | E21 |  | I21 |  | P21 |  | R21 | – | | eG21 |
| 1. and 2. make contact |  | S11 | M11 |  | E11 |  | I11 | | s.b.[3] |  | R11 | – | | eG11 |
| 1. make contact 2. break contact |  | S12 | M12 |  | E12 |  | I12 |  | P12 |  | R12 | – | | eG12 |

[1] clockwise sequence of the contacts

[2] obtainable by replugging the hose bridges of P21

[3] obtainable by replugging the hose bridges of P12

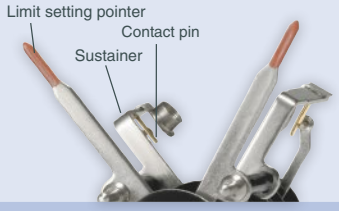
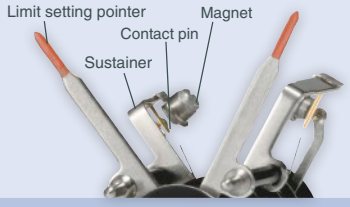
ws = white / bn = brown / gb = yellow / gn = green

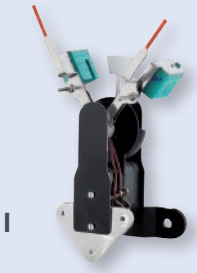
## Minimum spans

| Model limit switch contact assembly | Measuring instrument | | Meas. unit | Number of contacts 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| **S** (Standard contact) | Bourdon tube pressure gauges | NCS 63 | bar | upon request | upon request | — | — |
| | | NCS 100, 96[2] | bar | 1.0 | 1.6 | 2.5 | upon request |
| | | NCS 160, 144[2] | bar | 1.0 | 1.6 | 2.5 | 2.5 |
| | Differential pressure gauges[1] | DiRZ...160 | bar | 1.0 | 1.6 | upon request | — |
| | Diaphragm pressure gauges | NCS 100, flange-Ø 160 | mbar | 60 | 100 | 160 | 160 |
| | | NCS 100, flange-Ø 100 | bar | 0.6 | 0.6 | 0.6 | 0.6 |
| | | NCS 160, flange-Ø 160 | mbar | 60 | 100 | 160 | 160 |
| | | NCS 160, flange-Ø 100 | bar | 0.6 | 0.6 | 0.6 | 0.6 |
| | Thermometers | NCS 100, 160 | °C | no minimum span for standard temperature ranges | | | |
| **M** (Magnetic contact) | Bourdon tube pressure gauges | NCS 63 | bar | 2.5 | 4.0 | — | — |
| | | NCS 100, 96[2] | bar | 1.6 | 2.5 | 4 | upon request |
| | | NCS 160, 144[2] | bar | 1.6 | 2.5 | 4 | 4 |
| | Differential pressure gauges[1] | DiRZ...160 | bar | 1.6 | 4.0 | upon request | — |
| | Diaphragm pressure gauges | NCS 100, flange-Ø 160 | mbar | 100 | 160 | 250 | 250 |
| | | NCS 100, flange-Ø 100 | bar | 0.6 | 0.6 | 2.5 | 2.5 |
| | | NCS 160, flange-Ø 160 | mbar | 100 | 160 | 250 | 250 |
| | | NCS 160, flange-Ø 100 | bar | 0.6 | 0.6 | 2.5 | 2.5 |
| | Thermometers | NCS 100, 160 | °C | no minimum span for standard temperature ranges | | | |
| **E** (Electronic contact) | Bourdon tube pressure gauges | NCS 63 | bar | 2.5 | 4.0 | — | — |
| | | NCS 100, 96[2] | bar | 1.0 | 1.6 | 2.5 | upon request |
| | | NCS 160, 144[2] | bar | 1.0 | 1.6 | 2.5 | upon request |
| | Differential pressure gauges[1] | DiRZ...160 | bar | 1.0 | 1.6 | upon request | — |
| | Diaphragm pressure gauges | Flange-Ø 160 | mbar | 60 | 60 | 60 | upon request |
| | | Flange-Ø 100 | bar | 0.6 | 0.6 | 0.6 | upon request |
| | Thermometers | NCS 100, 160 | °C | no minimum span for standard temperature ranges | | | |
| **I** (Inductive contact) | Bourdon tube pressure gauges | NCS 63 | bar | 2.5 | 4.0 | — | — |
| | | NCS 100, 96[2] | bar | 1.0 | 1.6 | 2.5 | upon request |
| | | NCS 160, 144[2] | bar | 1.0 | 1.6 | 2.5 | upon request |
| | Differential pressure gauges[1] | DiRZ...160 | bar | 1.0 | 1.6 | upon request | — |
| | Diaphragm pressure gauges | Flange-Ø 160 | mbar | 60 | 60 | 60 | upon request |
| | | Flange-Ø 100 | bar | 0.6 | 0.6 | 0.6 | upon request |
| | Thermometers | NCS 100, 160 | °C | no minimum span for standard temperature ranges | | | |
| **P** (Pneumatic contact) | Bourdon tube pressure gauges | NCS 100, 96[2] | bar | 1.0 | — | — | — |
| | | NCS 160, 144[2] | bar | 1.0 | 1.6 | — | — |
| | Diaphragm pressure gauges | NCS 100, flange-Ø 160 | mbar | 60 | — | — | — |
| | | NCS 100, flange-Ø 100 | bar | 0.6 | — | — | — |
| | | NCS 160, flange-Ø 160 | mbar | 60 | 60 | — | — |
| | | NCS 160, flange-Ø 100 | bar | 0.6 | 0.6 | — | — |
| **R** (Reed contact) | Bourdon tube pressure gauges | RSCh 63, RCha 63 | bar | 2.5 | 2.5 | — | — |
| **MS** (Micro switch) | Bourdon tube pressure gauges | NCS 100 | bar | 2.5 | upon request | — | — |
| **eG** (e-Gauge®) | Bourdon tube pressure gauges | RCh / RChG 100 | bar | 0.6 | 0.6 | — | — |
| | Capsules | KPCh / KPChG 100 / 160 | mbar | 100 | 100 | — | — |
| | Thermometers | TBiSCh / TBiGelCh 100 / 160 | °C | no minimum span for standard temperature ranges | | | |

[1] Differential pressure gauges with diaphragm upon request

# Limit switch contact assemblies in detail

| | Limit switch contact assemblies S | Limit switch contact assemblies M |
|---|---|---|
| **Mode of operation**<br>  <br>S<br>  <br>M | • The mechanism for limiting signal transmission in limit switch contact assemblies with standard contacts consists of the adjustable limit setting pointer, connected with the sustainer that holds a contact pin, and the wiper that holds the second contact pin, and that is moved by the actual value pointer.<br>• The switching operation takes place, when the actual value pointer and the limit setting pointer are superimposed.<br>• The contact pins get in contact or are separated.<br>• The torque acting on the actual value pointer is low, so that the contacts switch exactly at the adjusted reference value.<br>  | • In comparison to limit switch contact assemblies with standard contacts, limit switch contact assemblies with magnetic contacts additionally have a locking varnish protected screwable permanent magnet that is mounted on the sustainer of the limit setting pointer.<br>• The permanent magnet reinforces the contact force and protects the contacts against deflagration caused by electric arc influences.<br>• As the contacts approximate, the contact making is sharply accelerated by the magnet, resp. decelerated at separation of the contacts. This skipping behaviour can constitute 2 to 5 % of the span, depending on the directive force of the measuring element and the adjusted magnetic force.<br>  |
| **Application / Operating conditions** | Standard contacts are suitable, when:<br>• the instrument is protected from vibrations and no pulsations occur, as otherwise accidental switchings can take place.<br>• the contact pins do not contaminate or oxidise, for example through aggressive atmosphere.<br>For technical data see page 8 | Magnetic contacts can be applied almost anywhere, as they are, to a large extent, unsusceptible to vibrations.<br>• Switching capacity, switching safety and contact load are considerably higher than those of standard contacts.<br>For technical data see page 8 |
| **Installation in case-Ø (NCS)** | 63, 100, 160, 96 x 96, und 144 x 144 | 63, 100, 160, 96 x 96, und 144 x 144 |
| **Case filling** | Limit switch contact assemblies with standard contacts can only be mounted in instruments without case filling. | Limit switch contact assemblies with magnetic contacts are restrictedly suitable for instruments with case filling, when using a multifunctional relay of the type series MSR (see below). |
| **Relays** | Impulse-controlled multifunctional relays of the type series MSR:<br>• increase the switching safety and allow for a higher frequency of operation that is susceptible to external influences, such as aggressive atmosphere, contamination or oxidation of the contact pins.<br>• reduce the contact load.<br>• reduce accidental switchings caused by vibrations / pulsations, through an integrated delayed release of 450 ms.<br>For details see data sheet **9521** | Impulse-controlled multifunctional relays of the type series MSR:<br>• should be used for instruments with case filling. They reduce the risk of oil contamination caused by the electric arc.<br>• increase the switching safety and allow for a higher frequency of operation that is susceptible to external influences, such as aggressive atmosphere, contamination or oxidation of the contact pins.<br>• reduce the contact load.<br>• reduce accidental switchings caused by vibrations / pulsations, through an integrated delayed release of 450 ms.<br>For details see data sheet **9521** |
| **Ex-Protection** | – | – |

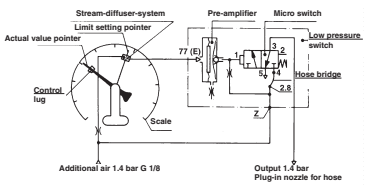
| | Limit switch contact assemblies E | Limit switch contact assemblies I |
|---|---|---|
| **Mode of operation**<br>  <br>E<br>  <br>I | • The mechanism for limiting signal transmission in limit switch contact assemblies with electronic contacts consists of a slot-type initiator with integrated switching amplifiers (PNP-output) and a control lug.<br>• The slot-type initiator is mounted on a sustainer that is connected to the limit setting pointer, while the control lug is moved by the actual value pointer.<br>• Contact makes, when the control lug dips into the slot-type initiator. Contact breaks, when the control lug leaves the slot-type initiator.<br>• The switching operation takes place when the control lug is positioned in the middle of the slot-type initiator.<br>• The torque acting on the actual value pointer with the control lug is low, so that the switching operation takes place precisely at the adjusted reference value. | • The mechanism for limiting signal transmission in limit switch contact assemblies with inductive contacts consists of a slot-type initiator (displacement transducer according to DIN EN 60 947-5-6 (NAMUR)), a control lug and a relay in a downstreamed switch amplifier (application in hazardous areas) or a multifunctional relay of the type series MSR-I (application in non-hazardous areas). Switch amplifiers, resp. multifunctional relays, do not belong to the scope of supply of an instrument with inductive contacts.<br>• The displacement transducer is mounted on a sustainer that is connected to a limit setting pointer, while the control lug is moved by the actual value pointer.<br>• The slot-type initiator is basically a transistor-oscillator whose oscillator coils are arranged on both sides of the slot-type initiator.<br>• When the control lug dips into the slot-type initiator, it has high impedance (low control circuit ≤ 1mA), the relay in the downstreamed switch amplifier is de-energised and contact breaks. When the control lug leaves the slot-type initiator, it has low impedance (high control circuit ≥ 3 mA), the relay operates and contact makes.<br>• The torque acting on the actual value pointer with the control lug is low, so that the switching operation takes place precisely at the adjusted reference value. |
| **Application / Operating conditions** | Electronic contacts are suited for every industrial application.<br>• They are less susceptible to accidental switchings caused by vibrations / pulsations than standard contacts.<br>• They are wear-resistant (contact-free switching) and corrosion-free (all electrical components are moulded in cast resin and encased waterproof in a plastic case).<br>• As the slot-type initiator is a 3-wire slot-type initiator with PNP-switching output, an SPS, an optocoupler or other electronical evaluation units with small voltages and currents can be directly activated.<br><br>For technical data see page 9 | Inductive contacts, in connection with our multifunctional relays of the type series MSR-I, are suited for every industrial application.<br>• They are wear-resistant (contact-free switching) and corrosion-free (all electrical components are moulded in cast resin and encased waterproof in a plastic case).<br>• According to IEC 61 508, slot-type initiators can be applied up to SIL 2.<br><br>For technical data see page 9 |
| **Installation in case-Ø (NCS)** | 63, 100, 160, 96 x 96, und 144 x 144 | 63, 100, 160, 96 x 96, und 144 x 144 |
| **Case filling** | Limit switch contact assemblies with electronic contacts can be mounted in instruments with case filling. | Limit switch contact assemblies with inductive contacts can be mounted in instruments with case filling. |
| **Relays** | – | Impulse-controlled multifunctional relays of the type series MSR-I:<br>• are applied in facilities where no Ex-protection is required.<br>• reduce accidental switchings / pulsations through an integrated switching delay of 450 ms.<br><br>For details see data sheet **9531** |
| **Ex-Protection** | – | • When using our switch amplifiers KF..-SR2-.. the equipment corresponds to the type of protection intrinsic safety i. It is II2G EExia IIC T6-classified and is approved for use in hazardous areas.<br>• The switch amplifiers have to be installed outside the hazardous area.<br>• EC-type-examination Certificates of the Federal Technical Institute (Phyiskalisch Technische Bundesanstalt = PTB) on the intrinsic safety of the used slot-type initiators and switch amplifiers, are available.<br>• The allowed line length between limit switch contact assembly and downstream unit is, in consideration of the intrinsic safety according to PTB, approximately 3 km.<br>• EC-type-examination Certificates can be downloaded from **www.armaturenbau.com** or **www.manotherm.com** or can be supplied upon request.<br><br>For details (switch amplifiers) see data sheet **9532** |

# Limit switch contact assemblies in detail

| | | Limit switch contact assemblies S | | | Limit switch contact assemblies M | | |
|---|---|---|---|---|---|---|---|
| **Technical data** | | | | | without case filling | | with case filling |
| **Electrical** | | Rated insulation voltage: | 250 V | | 250 V | | |
| | | Rated operational voltage: | 230 V AC (mains) | | 230 V AC (mains) | | |
| | | Rated operational current: | max. 0.6 A | | max. 0.6 A | | max. 90 mA |
| | | Make / break current: | max. 0.7 A | | max. 1.0 A | | |
| | | Switching capacity: | 10 W / 18 VA | | 30 W / 50 VA | | 20 W / 20 VA |
| **Measurement technique** | | Switching press. reversal error: | ≤ accuracy class | | accuracy class plus 2 – 5 % of the span | | |
| | | Switching accuracy: | ≤ 1.5 x accuracy class | | ≤ 1.5 x accuracy class | | |
| | | Ambient temperature: | -20 °C to +70 °C | | -20 °C to +70 °C | | |
| **Contact material** | | | silver-nickel, 10 µ gold-plated (AG80NI20Au10 µ) | | silver-nickel, 10 µ gold-plated (AG80NI20Au10µ) | | |
| **Recommended contact load for instruments without case filling at ohmic and inductive load** | | | | | | | |
| Voltage acc. to DIN IEC 60 038 | | | | | | | |
| DC | AC | DC | AC | cosφ > 0.7 | DC | AC | cosφ > 0.7 |
| 220 V | 230 V | 40 mA | 45 mA | 25 mA | 100 mA | 120 mA | 65 mA |
| 110 V | 110 V | 80 mA | 90 mA | 45 mA | 200 mA | 240 mA | 130 mA |
| 48 V | 48 V | 120 mA | 170 mA | 70 mA | 300 mA | 450 mA | 200 mA |
| 24 V[1)] | 24 V | 200 mA | 350 mA | 100 mA | 400 mA | 600 mA | 250 mA |
| [1)] at 24 V DC the switching current should not be less than 20 mA. | | | | | | | |
| **Minimum values for contact load for instruments without case filling at ohmic load** | | | | | | | |
| Rated operational voltage $U_{eff}$ min. | | | 24 V | | 24 V | | |
| Switching capacity (DC, AC) | | | 0.4 W | | 0.4 W | | |
| **CE-Marking** | | Measuring instruments with limit switch contact assemblies with standard contacts basically bear the CE-mark for electromagnetic compatibility and the low voltage directives. | | | Measuring instruments with limit switch contact assemblies with magnetic contacts basically bear the CE-mark for electromagnetic compatibility and the low voltage directives. | | |
| **Options** | | • More than 2 contacts, see data sheet of the respective instrument model with the last digits .90. There you can also find information on the super-imposed adjustability of the limit setting pointers.<br>• Separated circuitries<br>• Double change-over contact S 33<br>• Wire break monitoring (resistor connected in parallel for each contact) | | | • More than 2 contacts, see data sheet of the respective instrument model with the last digits .90. There you can also find information on the super-imposed adjustability of the limit setting pointers.<br>• Separated circuitries<br>• Double change-over contact M 33<br>• Wire break monitoring (resistor connected in parallel for each contact) | | |

| | Limit switch contact assemblies E | | Limit switch contact assemblies I | |
|---|---|---|---|---|
| **Technical data** | | | | |
| **Electrical** | Rated operational voltage: | 10...30 V DC | Rated operational voltage: | 5...25 V DC |
| | Switching capacity: | ≤ 100 mA | Rated voltage: | 8 V DC |
| | | | Current consumption: | max. 3 mA |
| **Measurement technique** | Switching pressure reversal error: | ≤ accuracy class | Switching pressure reversal error: | ≤ accuracy class |
| | Switching accuracy: | ≤ 1.5 x accuracy class | Switching accuracy: | ≤ 1.5 x accuracy class |
| | Ambient temperature: | -25 °C to +70 °C | Ambient temperature: | -20 °C to +70 °C |
| | | | -SN- / S1N version (see options): | -40 °C to +100 °C |
| **CE-Marking** | Measuring instruments with limit switch contact assemblies with electronic contacts basically bear the CE-mark for electromagnetic compatibility. | | Measuring instruments with limit switch contact assemblies with inductive contacts basically bear the CE-mark for the ATEX-standard. | |
| **Options** | • More than 2 contacts, see data sheet of the corresponding instrument model with the last digits .90. There you can also find information on the superimposed adjustability of the limit setting pointers.<br>• PNP-switching output as 2-wire connection. | | • More than 2 contacts, see data sheet of the corresponding instrument model with the last digits .90. There you can also find information on the superimposed adjustability of the limit setting pointers.<br>• NCS 160 with 2 contacts in intervall switching, absolutely reactionless mode of operation, especially suitable for test gauges class 0.6. In this special version, the control lug is mounted on the actual value pointer. When using the switch amplifier KFA6-SR2-Ex2.W.IR that was especially developed for this limit switch contact assembly, it is guaranteed that when the adjusted minimum resp. maximum limit values are exceeded, the respective switching function is maintained. The control lug can thus go beyond the adjusted reference value, leave the slot-type initiator and dip into it again on return, without change in the switching condition. A power failure would have no effect either. After recovery of the power supply, the last given switching condition is re-established.<br>• Safety version (SN) in connection with switch amplifier instruments in safety engineering (see Technical Information Sheet T03-000-041) applicable for construction of self-monitoring controls *(safety switching)*. If an error occurs, be it at the slot-type initiator or at the switch amplifier, the initial condition is compulsorily "0". The conception of these safety switches was tested and approved by the TÜV (Technical Inspection Authority) according to the safety-related requirements for important switchings. The electrical characteristic values correspond to DIN EN 60 947-5-6 (NAMUR).<br>• Safety version with contrary direction of action (S1N). | |

# Limit switch contact assemblies in detail

| | Limit switch contact assemblies P | Limit switch contact assemblies R |
|---|---|---|
| **Mode of operation** | • The mechanism for limiting signal transmission in limit switch contact assemblies with pneumatic contacts consists of a stream-diffuser-system, a control lug and a pneumatic low pressure switch (PP-transformer).<br>• The stream-diffuser system is mounted on a sustainer that is connected to the limit setting pointer, while the control lug is moved by the actual value pointer.<br>• In this system, a reduced permanent air flow is conducted from the jet nozzle into the diffuser. The low pressure signal (> 25 mbar) captured by the diffuser, is conducted to the pre-amplifier of the low pressure switch. This causes the micro switch to connect the hoses and thus produces an actuated output-signal of 1.4 bar at the outlet. When the actual value pointer reaches the limit setting pointer, the control lug, moved by the actual value pointer, interrupts the air flow in the stream-diffuser-system. Through failure of the low pressure signal at the pre-amplifier, the switching is triggered. The micro switch moves back into its initial position and ventilates the connection. | • The reed contact is a fast bistable special switch that can be applied for switching of low-level signals in the mV- resp. µA-range.<br>• It consists of 2 contact studs made of ferromagnetic material that under inert atmosphere are remelted hermeticallly dense in a glass tube and are mounted turnable on a conductor plate behind the dial. When approaching a sufficiently strong magnetic field at the actual value pointer, both contact studs make use of a reversal polarity and thus activate the contact.<br>• A permanent magnet behind the glass tube provides for maintenance of the switching function, when the actual value pointer moves on.<br>• Manual adjustment of the reference values after removal of the bayonet ring; with case configurations "Fr" and "rFr", reference values are adjusted from the outside with a removable key. |
| |  <br>P<br>  <br>Reedkontakt | |
| **Application / Operating conditions** | Pneumatic contacts are characterised by high switching accuracy and are relatively unsusceptible to vibrations.<br>  | Compared to electromechanical contacts (S, M) reed contacts have the following advantages:<br>• Contact-free switching at reliable contact making<br>• Small dimensions |
| **Installation in case-Ø (NCS)** | 100, 160, 96 x 96, und 144 x 144 | 63 |
| **Case filling** | Limit switch contact assemblies with pneumatic contacts do not work in fluid filled instruments (air flow). | Limit switch contact assemblies with reed contacts can only be applied for instruments without case filling. |
| **Ex-Protection** | Limit switch contact assemblies with pneumatic contacts are absolutely explosion-resistant, suitable for zone 0. | Possible, when using intrinsically safe switch amplifiers, as they are passive electrical equipment without storage properties. No marking according to ATEX; a manufacturer's declaration can be issued. |
| **Technical data** | **Air consumption:** < 30 l/h<br>PP-transformer: < 40 Nl/h at 1.4 bar<br>**Operating air pressure:** 1.4 bar $^{\pm 0,1}$ bar<br>**Purity specification for control air:** ≤ 0.04 mm<br>**Mech. durability:** PP-transformer: ca. $10^8$ switching cycles | **Switching capacity max.:** 10 W / 10 VA<br>**Switching voltage max.:** 75 V DC, 50 V AC<br>**Switching current max.:** 0.5 A at direct or alternating voltage and pure ohmic load<br>**Adjustment range:** 10 % to 90 % of the full scale<br>**Mech. durability:** ca.$10^5$ – $10^6$ switching cycles |
| **Measurement technique** | **Switching pressure reversal error:** ≤ accuracy class<br>**Switching accuracy:** ≤ 1.5 x accuracy class<br>**Ambient temperature:** -20 °C to +70 °C | **Switching pressure reversal error:** max. 2.5 % of the span<br>**Switching accuracy:** ≤ 1.5 x accuracy class<br>**Ambient temperature:** -30 °C to +75 °C |
| **CE-Marking** | Measuring instruments with pneumatic contacts do not fall within the CE-marking obligation. | Measuring instruments with reed contacts basically bear the CE-mark for electromagnetic compatibility. |
| **Options** | • More than 2 contacts are not deliverable.<br>• Instead of the pneumatic low pressure switch (PP-transformer) a pneumatic / electrical converter (PE-transformer) can also be applied. This is recommended when connecting pneumatic and electrical instruments and for monitoring signals over greater distances, in order to avoid delays.<br>• By replugging the hose bridges, the switching functions P11 / P22 can be reversed. | • More than 2 contacts are not deliverable.<br>• Single change-over contact R3 |

| | Limit switch contact assemblies MS | Limit switch contact assemblies eG |
|---|---|---|
| **Mode of operation**<br>  <br>**MS**<br>  <br>**e-Gauge®** | • The micro switch is a snap switch in which a spring element sharply controls the contacts. It is attached to the movement.<br>• Micro switches are basically of the 1-pin change-over contact type. They close or open the electrical circuitries according to the direction of motion at the adjusted limit values. | • e-Gauge® is a patented, revolutionary sensor accessory for analogue pointer instruments, such as pressure gauges and thermometers.<br>• Via angle encoder with inductive tapping the e-Gauge® turns almost any pressure gauge or thermometer into a switch and transmitter.<br>• The e-Gauge® operates contact-free and turns a "normally" indicating instrument NCS 100 or 160 with bayonet ring case into a multifunctional instrument with standard 2 digital NPN-switching outputs and an output signal of 4...20 mA.<br><br>Any information on the e-Gauge®, especially on the analogue output 4...20 mA, can be found in the data sheets of the respective instruments with the last digits .93; for example bourdon tube pressure gauges RCh 100 / 160 resp. RChG 100 / 160 with e-Gauge®, data sheet 1201.93. |
| **Application / Operating conditions** | • Micro switches are especially suitable where a high breaking capacity is required.<br>• Furthermore, they are characterised by their vibration resistance and their long durability.<br>• Due to the required minimum operating forces, movements with assembled micro switches are only restrictedly suitable for low measuring ranges and have a lower switching accuracy. | • Operates absolutely contact-free.<br>• Nearly no directive force of the measuring unit required. Only the weight of the pointer increases slightly, due to the electronic component.<br>• No influence on the indication because of spirals, which is why they can also be applied for capsule gauges and bimetal thermometers.<br>• The limit values are programmed.<br>• Both limit values can be programmed in such a way that they switch at the same reference value. |
| **Installation in case-Ø (NCS)** | 100 | 100, 160 |
| **Case filling** | Limit switch contact assemblies with micro switches can only be applied for instruments without case filling, due to the externally accessible adjustment mechanism. | Limit switch contact assemblies with e-Gauge® can be applied for instruments with case filling. |
| **Ex-Protection** | – | – |
| **Technical data** | **Rated operational voltage:** max. 250 V AC<br>**Switching current:** max. 5 A (ohmic load)<br>max. 5 A (inductive load, cosφ > 0.75) | **Rated operational voltage:** 8 – 28 V DC<br>**Current consumption:** max. 50 mA<br>**Switching capacity:** max. 28 V DC, max. 50 mA |
| **Measurement technique** | **Switching pressure reversal error:** accuracy class plus 2 – 5 % of the span<br>**Switching accuracy:** ≤ 1.5 x accuracy class<br>**Ambient temperature:** -20 °C to +70 °C | **Switching pressure reversal error:** 1 % of the span<br>**Ambient temperature:** -30 °C to +60 °C (without case filling)<br>-20 °C to +60 °C (with case filling)<br>**Additional output signal:** 4...20 mA (3-wire) |
| **CE-Marking** | Measuring instruments with micro switch basically bear the CE-mark for electromagnetic compatibility and the low voltage directive. | Measuring instruments with e-Gauge® basically bear the CE-mark for electromagnetic compatibility. |
| **Options** | • 2 contacts upon request | • More than 2 contacts are not deliverable.<br>• Reaction time deviating in 0.01 s steps, from 0.01 s up to 20 s.<br>• Switching pressure reversal error deviating from 1 %, in 0.1 % steps from 0 to 25 % of the final value. |

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