

Contents

1. General
2. Safety Information
3. Description, Application
 - 3.1 Electromechanical Limit Switch Assemblies
 - 3.2 Inductive Limit Switch Assemblies
 - 3.3 Electronic Limit Switch Assemblies
4. Use in Explosion Hazard Areas
5. Technical Data
6. Installation/Operation
 - 6.1 Storing and Transportation
 - 6.2 Installation
 - 6.3 Mechanical Connection
 - 6.4 Electrical Connection
 - 6.5 Adjusting the Setpoint Indicator
7. Maintenance, Repairs
8. Decommissioning
9. Disposal
10. Annex
 - Technical Data – Contact Ratings

1. General

Please read these instructions before operating the device.

Electric limit switch assemblies are used for the purpose of opening or closing connected electric circuits at the preset limits. Gauges with electric limit switch assemblies carry the CE Mark. This documents that the product agrees with the in each case valid directives and their harmonised standards. The Declaration of Conformity is available upon request.

2. Safety Information



Under all circumstances observe the currently valid national safety regulations (Germany: VDE 0100) during installation work, commissioning and operation.

All work must only be done while the components are completely deenergised.

The connections must only be provided by expert personnel.

When not observing the corresponding regulations, persons may suffer severe injury and/or there is the risk of damaging equipment.

The equipment is not of the pressure sustaining type with a safety function in the sense of DGRL 97/23/EG.

3. Description, Application

Electric limit switch assemblies are directly built into the gauge in the factory. The type of contact which has been built in, is stated on the nameplate of the gauge where also the switching function and the terminal assignment is depicted schematically. The setpoints may be adjusted to match the requirements of the specific application.

Example:
Circuit for contact
type M22



3.1 Electromechanical Limit Switch Assemblies

Electromechanical limit switch assemblies are auxiliary switches in the sense of EN60947-5-1 (IEC947-5-1). Contact is established in that the contacts come in to contact through the movement of the actual value pointer, depending on the pressure change.

Standard contact circuit: Type S

Magnetic contact circuit: Type M

The type of switching function is indicated by codes.

S1/M1= normally open (closes when the setpoint is exceeded in the clockwise direction)

S2/M2= normally closed (opens when the setpoint is exceeded in the clockwise direction)

S3/M3= changeover (when the setpoint is exceeded in the clockwise direction)

Standards compliance: EN 60947-1; EN 60947-1A11;
EN 60947 –5-1

3.2 Inductive Limit Switch Assemblies

Inductive limit switch assemblies are equipped with non-contact electric proximity switches. The switching function is effected by means of a control lug which is moved by the actual value pointer within the area of an electromagnetic field of the slot initiator. When the set up limits are exceeded, the electric circuits are opened or closed.

Type I1 = normally open (closes when the setpoint is exceeded in the clockwise direction)

Type I2 = normally closed (opens when the setpoint is exceeded in the clockwise direction)

Standards compliance: EN 60947-5-6

3.3 Electronic Limit Switch Assemblies

These inductively operating limit switch assemblies include a switching amplifier for directly driving low-power electronic signal processing equipment, like PLCs. Here the advantages of inductive contacts like reliable establishing of contact, wearless owing to the non-contact limit switch design as well as a very low degree of retroaction with respect to the measurement system, are utilised.



ARMATURENBAU GmbH

Manometerstraße 5 • D-46487 Wesel - Ginderich
Phone: (0 28 03) 91 30-0 • Fax: (0 28 03) 10 35
armaturenbau.com • mail@armaturenbau.com



Subsidiary Company and Sales East Germany and Eastern Europe

MANOTHERM Beierfeld GmbH

Am Gewerbestraße 9 • D-08344 Grünhain-Beierfeld
Phone: (0 37 74) 58-0 • Fax: (0 37 74) 58-545
manotherm.com • mail@manotherm.com

B5
03/06

Instructions – Electric Limit Switch Assembly in pressure and temperature gauges

The electronic contact has been implemented for 2 or 3 wire connections with a PNP output. The operating voltage range amounts to 10 ... 30 V DC, the maximum switching current is 100 mA.

Type E1 = normally open (closes when the setpoint is exceeded in the clockwise direction the output goes active)
Type E2 = normally closed (opens when the setpoint is exceeded in the clockwise direction the output goes inactive)

4. Use in Explosion Hazard Areas



For inductive limit switch assemblies, EC type approvals are available (for downloading from the download area of our home page):

Si...: KEMA 01 ATEX 1264 X
SJ...: PTB 99 ATEX 2219 X
PTB 99 ATEX 2049 X
ZELM 03 ATEX 0128 X

These types were developed and approved for use in explosion hazard areas belonging to the intrinsic safety protection category in accordance with EN 50014 and EN 50020.



When using these types in explosion hazard areas, deratings must be observed!

The temperature ranges, dependent on the temperature class and further data, can be taken from the type approval documents.

This equipment must only be connected to suitable operating means (isolating switching amplifiers, for example) which also meet the requirements of intrinsic safety. Intrinsic safety must always be ensured for the entire electric circuit!



The information provided in the EC type approval documents as well as the legislation, resp. directives relevant to use or the intended application, must be observed.



The equipment must be protected against strong electromagnetic fields and mechanical damage.

Equipment which is operated in explosion hazard areas, must not be modified.

Repairs on such equipment must be exclusively done by the manufacturer!

5. Technical Data

Ambient Conditions

Limit switch assemblies can be used in the range from -20...+70 °C provided the temperatures specified for the basic unit do not restrict this range. In such cases the restricted values apply.

The protection category in accordance with EN 60529 depends on the type of enclosure for the basic unit and can also be taken from data sheet.

Performance Data for Electromechanical Limit Switch Assemblies

Rated operating voltage: 250 V max.

Breaking capacity: 10 W/18 VA (standard contact circuit)
30 W/50 VA (magnetic contact circuit)
20 W/20 VA (for oil-filled housings and magnetic contact circuit)

Contact material: Silver nickel 10µ gold plated (Ag80 Ni20 Au10µ)

Permitted contact ratings, see page 4

Performance Data for Inductive Limit Switch Assemblies

	SJ2(3,5)...	Si...
Slot width:	2 (3.5) mm	2 mm
Nominal voltage U ₀ :	8 VDC	8.2 VDC
Current consumption:		
Oscillator, non-dampened	≥3 mA	≥2.1 mA
Oscillator, dampened	≤1 mA	≤1.2 mA
Switching frequency:	5 (3) kHz	1.5 kHz
EMC in accordance with:	EN 60947-5-2	
Ambient temperature:	-25...70 °C ¹⁾	



Data for explosion hazard areas

Marking : I1G Ex ia IIC T6
I1D iaD 20T...°C I1D T95°C
Effective internal capacitance C_i: 30 (50) nF²⁾ 41 nF
Effective internal inductance L_i: 100 (250) µH²⁾ 266µH

¹⁾ Note: derating for explosion hazard applications!

²⁾ For one sensor circuit; 10 m long cable has been taken into account

Performance Data for Electronic Limit Switch Assemblies

Operating voltage range: 10...30 VDC
Reverse polarity protection: yes
EMC in accordance with: EN 60947-5-2
Output type: PNP
Switching action: Normally open
Switching current: 100 mA max.
Residual current: 100µA max.
Ambient temperature: -25...+70 °C

Electromagnetic Compatibility

Gauges with inductive or electronic limit switch assemblies are, as a rule, provided with the **CE Mark** for electromagnetic compatibility.

Gauges with electromechanical limit switch assemblies are also provided with the CE Mark, but with the restriction that no more than 5 switching actions per minute may be performed.

6. Installation/Operation

6.1 Storing and Transportation

- Permissible storage temperature -40...+70°C
- Equipment with limit switch assemblies needs to be protected during shipping and storing against mechanical damage. Such equipment must be left in its original packaging until being installed.
- Before use, allow adaptation to the prevailing temperature.
- The packaging material may be disposed of as wastepaper. Before shipping the equipment on or returning it, it must be sufficiently be protected against being damaged.



ARMATURENBAU GmbH

Manometerstraße 5 • D-46487 Wesel - Ginderich
Phone: (0 28 03) 91 30-0 • Fax: (0 28 03) 10 35
armaturenbau.com • mail@armaturenbau.com



Subsidiary Company and Sales East Germany and Eastern Europe

MANOTHERM Beierfeld GmbH

Am Gewerbepark 9 • D-08344 Grünhain-Beierfeld
Phone: (0 37 74) 58-0 • Fax: (0 37 74) 58-545
manotherm.com • mail@manotherm.com

B5
03/06

6.2 Installation

First check whether you are dealing with the right equipment for your specific application. Both mechanical and electrical connections are required.

The equipment must be installed such that it is not subject to vibrations so as to avoid contact bouncing of closed switches.

In the case of unstable measurement locations, the equipment can be mounted using a gauge holder (possibly in connection with flexible lines).

If vibrations cannot be avoided by suitable installation measures, then equipment with a liquid filling must be used.



Select the installation location so that coarse contamination, much fluctuating ambient temperatures and vibrations are avoided.

6.3 Mechanical Connection

- Corresponding to the general engineering rules for pressure and temperature gauges, EN 837-2 resp. EN 13190, for example.
- Apply tightening forces at the flats using a suitable tool.
- Do **not** apply the necessary force via the housing or the cable connections.
- In the case of safety pressure gauges (carrying the symbol S on the dial) ensure a clearance behind the blowing out rear side of at least 15 mm.

6.4 Electrical Connection

- Installation and electrical connection by qualified expert personnel only.
- By removing the centrally arranged mounting M3 mounting screw remove the connector.
- Connect the cables using the screw terminals.
- After having provided the connection manually tighten the mounting screw.

The assignment of the connections and the switching functions are stated on the nameplate. Connection terminals and ground terminal are marked accordingly.



The cable cross sections must be rated for sustaining the maximum current uptake. The cable diameters must agree with the nominal width for the sealing inserts.

The equipment does not include any overcurrent protection facilities (for a corresponding recommendation, see Table on page 4).

6.5 Adjusting the Setpoint Pointers



The setpoints are adjusted from the outside through an adjustment lock in the window protecting the dial.

With a separate or permanently fitted key (included in the delivery), the setpoint pointers of the contact units are preset to the value at which the switching action shall occur.

By pressing the adjustment key (1) into the adjustment lock (3) and by simultaneously turning it, the setpoint pointers (2) can be adjusted freely over the entire range of the dial.

For reasons of switching accuracy, switching reliability and service life of the gauge, the setpoint pointers should be set to between 10 and 90 % of the respective measurement range.

In the case of equipment with a liquid filling, the adjustment lock must never be opened! Such equipment may lose its liquid.

7. Maintenance, Repairs

The equipment is maintenance-free.

To ensure measurement accuracy and reliability of the switching action, we recommend to regularly check the equipment (once to twice a year). For this, the equipment must be separated from the process and checked using a pressure and temperature test facility.

To clean the equipment, a moist piece of cloth will suffice. Before cleaning the inside of any connectors, these must be deenergised.

Before switching on the equipment, make sure that all parts have been left to dry properly.



Any repairs must only be done by the manufacturer.
The equipment must not be opened!

8. Decommissioning

For decommissioning, remove the equipment completely from the area where it was used.



The equipment must only be removed after having depressurised the connecting line.

9. Disposal



Please help us to protect the environment and dispose of or recycle the materials used according to the relevant regulations in force.

Subject to alterations.

Rev. 2.x_version date March 9, 2006



ARMATURENBAU GmbH

Manometerstraße 5 • D-46487 Wesel - Ginderich
Phone: (0 28 03) 91 30-0 • Fax: (0 28 03) 10 35
armaturenbau.com • mail@armaturenbau.com



Subsidiary Company and Sales East Germany and Eastern Europe

MANOTHERM Beierfeld GmbH

Am Gewerbestraße 9 • D-08344 Grünhain-Beierfeld
Phone: (0 37 74) 58-0 • Fax: (0 37 74) 58-545
manotherm.com • mail@manotherm.com

B5
03/06

Instructions – Electric Limit Switch Assembly in pressure and temperature gauges

10. Annex

Technical Data – Contact Ratings

Contact rating limits for resistive loads (in accordance with EN 60947-5-1:1991):

	Standard (slow action) contact	Magnetic (snap action) contact	
		Gas filled equipment	Liquid filled equipment
Rated insulation voltage	60 < U _I < 250 V	60 < U _I < 250 V	60 < U _I < 250 V
Rated operating voltage U _{eff}	250 V max	250 V max.	250 V max.
Nominal operating current			
Switch-on current	0.7 A	1.0 A	1.0 A
Breaking current	0.7 A	1.0 A	1.0 A
Continuous current	0.6 A	0.6 A	0.6 A
Breaking capacity	10 W 18 VA	30 W 50 VA	20 W 20 VA

In the case of contacts with slight spirals, the nominal operating currents must be halved owing to the low cross-section of the spring (this applies only to custom versions which are not listed in the data sheets).

None of the limits for voltage, current and power must be exceeded.

Recommended contact rating for resistive and inductive loads

Voltage in acc. with DIN IEC 38	Standard (slow action) contact			Magnetic (snap action) contact					
				Gas filled equipment			Liquid filled equipment		
	Resistive load	Inductive load		Resistive load	Inductive load		Resistive load	Inductive load	
DC voltage/ AC voltage	DC	AC	AC cos φ > 0.7	DC	AC	AC cos φ > 0.7	DC	AC	AC cos φ > 0.7
V	mA	mA	mA	mA	mA	mA	mA	mA	mA
230	40	45	25	100	120	65	65	90	40
110	80	90	45	200	240	130	130	180	85
48	120	170	70	300	450	200	190	330	130
24	200	350	100	400	600	250	250	150	150

Recommended values for overcurrent protection facilities (in accordance with EN 60947-5-1)¹⁾

Voltage	Magnetic (snap action) contact			Standard (slow action) contact		
	Nominal equipment rating			Nominal equipment rating		
V	63	100	160	63	100	160
24	1A	2A	2A	0.63A	1A	1A
250	0.63A	1A	1A	0.125A	0.315A	0.315A

In the case of contacts with slight spirals, these values must be halved (this applies only to custom versions which are not listed in the data sheets).

¹⁾ The values refer to semi-time lag fuses and a maximum short-circuit current of 100A.

Pulse Controlled Multifunction Relays, Type MSR

Multifunction relays serve the purpose of increasing the breaking capacity since the control circuit is of the low voltage type.

Very frequently the breaking capacity of electromechanical limit switch assemblies is exceeded resulting in rapid wear on the contact pins and thus unsafe functional impairments.

When using limit switch assemblies in oil (this relates only to magnetic contact circuits) there, moreover, result difficulties regarding switching reliability, service life of the contacts and the occurrence of oil contamination.

In the case of oil-filled contact pressure gauges or thermometers, the oil is burned due to the switching arcs which occur, resulting on the one hand in the oil becoming turbid and on the other hand charring of the contacts. By using our pulse controlled multifunction relays, these problems are completely avoided. The service life of the limit switch assemblies is considerably increased since opening and closing of the contacts is to 99 % effected when there is no voltage across the contacts. Moreover, flutter effects are almost entirely prevented due to the timing characteristic of the relay.

