

SCHIENLE

MAGNETTECHNIK

Operating instructions

Flame proof solenoid Explosion proof solenoid

Types : 01 EX14 037x yzzz

Design certificate acc. ATEX:	FM 13ATEX 0071 X ⊕ Ex II 2G Ex db IIB T4 Gb ⊕ Ex II 2D Ex tb IIIC T135°C Db
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Design certificate acc. IECEx:	IECEx FMG 13.0027 X Ex d IIB T4 Gb Ex tb IIIC T135°C Db
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Design certificate acc. NEC500 And CEC Anex J:	XP, Class I, Div. 1, Grp C, D, T4
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Design certificate acc. NEC500 And CEC Section 18:	DIP, Class II, Div. 1, Grp E,F,G T4 DIP, Class III, Div. 1 & 2
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Design certificate acc. NEC505:	Class I, Zone 1, AEx d IIB T4
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Design certificate acc. NEC506:	Zone 21, AEx tb IIIC T135°C
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Design certificate acc. CEC Section 18:	Class I, Zone 1, Ex d IIB T4
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Name of certification authority: FM Approvals, 743 Reynolds Rd.
West Glocester, RI 02814 USA

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Producer:

Schienle Magnettechnik GmbH
In Oberwiesen 3
D-88682 Salem-Neufrach
Germany



 +49 (0)7553-8268 60
 +49 (0)7553-8268 61
 www.schienle.de

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1 Introduction

The solenoid was designed, manufactured and tested in compliance with the standards and regulations generally applicable within the standards listed on page 5. On leaving the factory the solenoids safety-related conditions were proven to be faultless. The operator must only read and observe the notes and warnings provided with this operating instruction in order to maintain this status and to ensure safe operation.

The solenoid must only be installed and wire-connected by a qualified technician, who is familiar with and works according to the generally accepted engineering standards and the latest legal regulations and standards of explosion protection.

2 Intended use

This solenoid is assigned to the group II, category 2 of the ATEX directive.

This device can be used in areas where explosion hazard occurs through:

- Gas/air mixtures, vapours or mists of flammable materials according to classes IIA, IIB and hydrogen
- Flammable dust/air mixtures.

This device is applicable in explosion hazardous zones 1, 2, 21 and 22.

The maximum surface temperature (according to the specification in chapter 10) behaves:
135°C, temperature class T4.

Table 1 Comparison of equipment groups and categories and the associated zones acc. the regulation 2014/34/EU

Equipment group acc. 2014/34/EU	Category acc. 2014/34/EU	Area of use, characteristics (extract from the Directive)	Usability in zone acc. to 1999/92/EG
I	M1	Atmospheres endangered by firedamp (equipment group I), i.e. underground mines and their surface installations. Can remain operational in the presence of a potentially explosive atmosphere. Very high level of safety.	-
I	M2	Atmospheres endangered by firedamp (equipment group I), i.e. underground mines and their surface installations. Must be able to be switched off in the presence of a potentially explosive atmosphere. High level of safety.	-
II	1G	Potentially explosive atmospheres in which potentially explosive gases, mists, or vapours are present permanently, or frequently, or for long periods (equipment group II). Equates to Zone 0 in accordance with Directive 1999/92/EC. Very high level of safety.	0, 1, 2
II	2G	Potentially explosive atmospheres in which potentially explosive gases, mists, or vapours are occasionally present (equipment group II). Equates to Zone 1 in accordance with Directive 1999/92/EC. High level of safety.	1, 2
II	3G	Potentially explosive atmospheres in which potentially explosive gases, mists, or vapours are normally not present, or present only infrequently, or for short periods (equipment group II). Equates to Zone 2 in accordance with Directive 1999/92/EC. Normal level of safety.	2
II	1D	Potentially explosive atmospheres in which potentially explosive dust/air mixtures are present permanently, or frequently, or for long periods (equipment group II). Equates to Zone 22 in accordance with Directive 1999/92/EC. Very high level of safety.	20, 21, 22
II	2D	Potentially explosive atmospheres in which potentially explosive dust/air mixtures are occasionally present (equipment group II). Equates to Zone 21 in accordance with Directive 1999/92/EC. High level of safety.	21, 22
II	3D	Potentially explosive atmospheres in which a potentially explosive atmosphere from raised dust is normally not present, or present only infrequently, or for short periods (equipment group II). Equates to Zone 22 in accordance with Directive 1999/92/EC. Normal level of safety.	22

Table 2 Device groups II – Temperature classes

Temperature class	Highest surface temperature	Ignition temperature of the gas, mist or vapour
T1	450°C	>450°C
T2	300°C	>300°C
T3	200°C	>200°C
T4	135°C	>135°C
T5	100°C	>100°C
T6	85°C	>85°C

Cable protection cap for use in ATEX and IECEx areas (no conduit)
Type Hummel HSK-K Flex

Please notice the points 4, 5 and 10 before the initiation and installation of the device.

Type coding
01 EX14 037x yzzz

- Voltage version e.g. 024 is 24V
- Type identification of the tube system (e.g. A, B, C, D)
- Power and application of the solenoid (A for 23W)

Table 3 Type coding

Version	Type coding
A (23 Watt)	01 EX14 037A C024

Example: Version A - 23 Watt, actuation system C, voltage 24 V

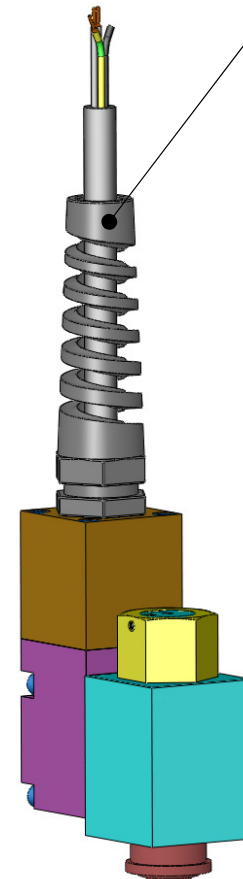
3 Electrical data

- Rated voltage: U_N [V DC] $\pm 10\%$ max.
- Supply voltage: U_N [V DC] (for electronics)
- Ripple voltage: $\pm 15\%$
- Resistance: R_{20} [Ω] $\pm 5\%$ at +20 [°C]
- Working duty: S1 (100%ED)

3.1 Version A with 23 Watt

Table 4 Voltage versions A

Type coding	Voltage	Resistance	Limiting current	Suppressor
	U_N	R_{20}	I_G	
	[VDC]	[Ohm]	[A]	
01 EX14 037x y012	12	6,5	1,35	Diode
01 EX14 037x y024	24	25,6	0,67	Diode
01 EX14 037x y035	36	59	0,45	Diode
01 EX14 037x y048	48	105,5	0,34	Diode
01 EX14 037x y072	72	240	0,23	Bridge rectifier
01 EX14 037x y080	80	292	0,2	Bridge rectifier
01 EX14 037x y098	98	450	0,17	Bridge rectifier
01 EX14 037x y110	110	550	0,15	Bridge rectifier
01 EX14 037x y180	180	1565	0,09	Bridge rectifier
01 EX14 037x y205	205	1910	0,08	Bridge rectifier



4 Initial installation

- The ambient temperature of -40°C until +55°C shall not be in excess while the maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70°C
- It is the users duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- Care is to be given that the solenoid is not subjected to direct sunlight during operation.
- The protection class is performed on the label of the solenoid.

5 Installation notice - installation, mounting, demounting

The solenoid consist of different individual components (field coil, guide tube and screw nut). These components are fine-tuned to one another and must not be replaced individually.

- Disconnect Power Before Removal!
- The user has to safeguard each solenoid with a fuse: $I_N \leq 3 \times I_G$, with trigger characteristic "slow blow" T. The breaking capacity of the fuse link has to be stronger than the max short circuit current at the users operating area.
- EX-secured components must be used during mounting in case the fuse and/or the interface are within the Ex-range.
- In addition, the solenoid must be connected to ground via the purpose-built ground clamp an the connector casing.
- The Ex-Solenoid presented herewith shall only be operated with a valve body according to the Instructions in point 10.
- The guide tubes and field coils fixing nuts must be tightened with 10 Nm. In addition, the fixing nut must be secured against disengagement with a headless screw.
- The connection cable must be passed sufficiently protected.
- Conduit Seal required within 18 inches for use in Division area. Conduit Seal required within 2 inches (50mm) of the enclosure for use in Zone area.
- To maintain IP67 ingress protection, suitable pipe dope or 3 wraps of ½ inch width Teflon tape shall be required when installing.

6 Specification

- Coils and plug cavity to be molded watertight. Insulation class "F"(155C°)
- Protection type IAW DIN VDE 0470, EN 60529 and/or IEC 529 Device: IP 67
- Surface protection (casing). Zinc coated or gas-nitride and oxidized self
- Max. temperature of operating medium (generally hydraulic fluid): 70°C
- Max. ambient temperature: +55°C, lowest -40°C
- **Please note: is not allowed to change the cable or the cable connection!**

7 Suppressor, Bridge Rectifier

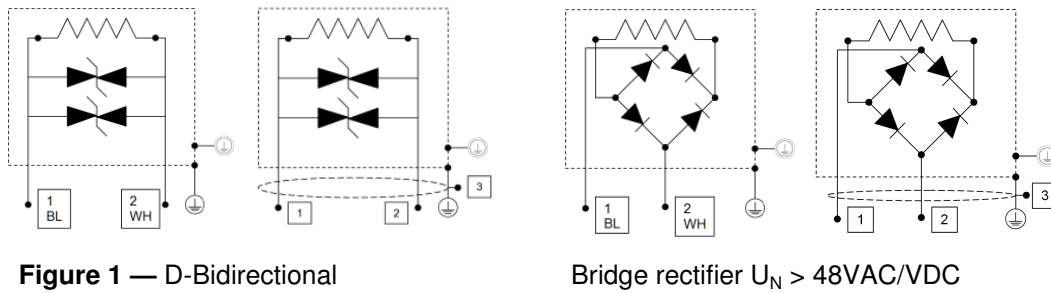


Figure 1 — D-Bidirectional voltage limiter – diodes:
 $U_z = 36V$, bipolar for
 $U_N = 12$ and $24V$ (voltages between 24 and 48 not used yet)

Bridge rectifier $U_N > 48VAC/VDC$

Unshielded and shielded cable

Unshielded and shielded cable

8 Maintenance, service, troubleshooting

- The solenoid generally requires almost no maintenance. All electrical connections shall be checked regularly for possible damages (visual check)
- The surface of the device shall be checked regularly for dust deposits, which should be cleaned off.
- Do not try to open or to repair the device. If any troubles occur, please contact the manufacturer.

9 Safety notice – Please read carefully

- In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- Any deposits on the surface of the device shall not obstruct heat emission
- Coating of the equipment is permitted as long as its layer thickness does not exceed the limit value of 2mm for the relevant group "IIB" or EPL "Gb". It is the responsibility of the user to select a suitable coating that meets the requirements of the IEC/EN 60079-0 standard, in particular as regards the risk of electrostatic charging. It is furthermore the user's responsibility to ensure the legibility of the information shown on the type plate when the coating is applied. The technical data relating to the electrical system and explosion protection must be permanently attached by affixing either a type plate or an adhesive label suitable for explosion protection. It must be possible to restore the legibility of the original type plate by removal of the coating. The pins of the manual emergency mechanisms should be covered prior to coating using a small adhesive label for protection.

Caution:

- Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- Always exchange the complete solenoid (field coil system and guiding tube). Do not try to repair the solenoid.
- In no case shall any changes be made to the solenoid or the connecting cable.
- Never operate the solenoid when disconnected from the valve body. (See also item 10)
- Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off to a temperature below 50 °C before it is demounted.

10 Grouping of single solenoid and valve

10.1 General

The current single solenoid must only be operated with a valve body and an anti rotation anchor. Immediate to the solenoid an anti rotation anchor hooks up, which is performed in two different versions.

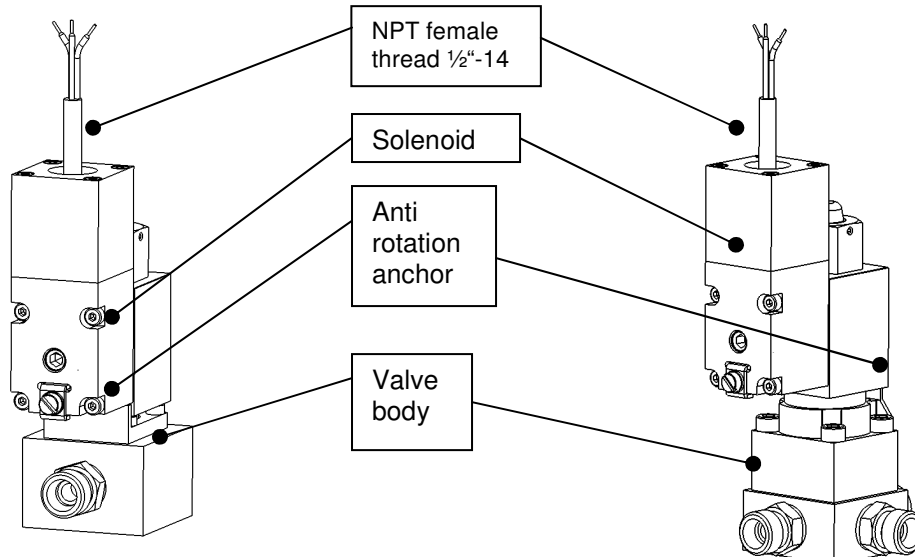


Figure 2 — Anti rotation anchor version 1– Anti rotation anchor (bracket plate), valve body and version 2 Anti rotation anchor (plate and flange) and valve body

The cubic valve body hooks up immediate to the anti rotation anchor. The minimum dimensions of the valve body must correspond to the dimensions shown in **table 5**. Also a possible group configuration with more than one valve body must correspond to the defaults shown in **table 5**.

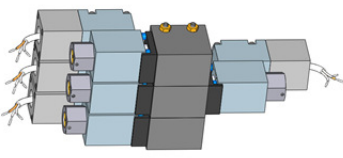
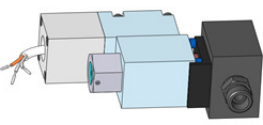
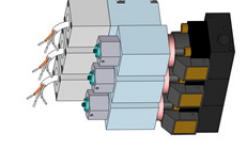
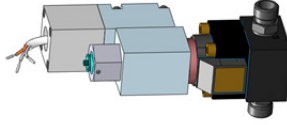
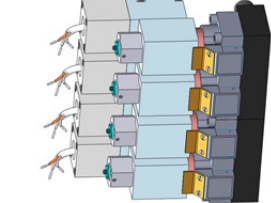
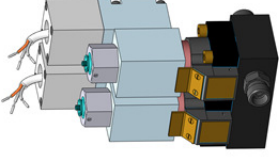
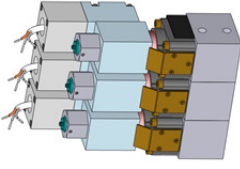
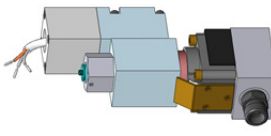
10.2 Specific Conditions of Use – Please read carefully

Principally attend following indications concerning table 3:

1. To keep the temperature class the explosion-proof solenoid shall only be operated in combination with a valve block with minimum volume according to the table 5. The maximum ambient temperature of 55°C must not be exceeded.
2. The apparatus has flying lead cable conductors that exit the enclosure. A suitably certified Ex d or Ex e terminal box is required to be connected to apparatus enclosure for completing to external supply circuit.
3. The usage of other anti rotating anchor is only allowed when released by solenoid manufacturer, Schienle GmbH.
4. In case multiple valve bodies are used, these must be lined up directly along the same axis and must be connected with appropriate connecting elements (screws or tie rods etc.).
5. In case single valve body is used, it is the users duty to ensure free and unhindered heat emission during operation.
6. A valve body can also be composed of many separate component parts, which are strong connected.
7. If it is allowed to use 2 solenoids per valve body, they have to be mounted on opposite sides.
8. A repair is not possible.

The user has to take care that during working only one solenoid per valve body is actuated. A simultaneous activation of solenoids at one and the same valve body is forbidden. The user has to fulfil this by a proper electrical connection.

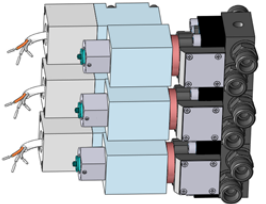
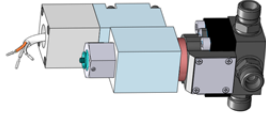
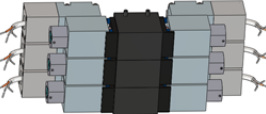



Table 5 Assembly versions (symbolic display)

Properties/criterion	Version 1 - valve bank -	Version 2 - single valve -	Version 3 - valve bank -	Version 4 - single valve -	Version 5 - valve bank -	Version 6 - single valve -	Version 7 - valve bank -	Version 8 - single valve -
Valve type	BVH1	BVG 1	exG...	exG...	exG21	exG21	exNG ...-1	exNG ...-1
Anti-rotation anchor type	Type 1	Type 1	Type 2	Type 2	Type 2	Type 2	Type 3	Type 3
Minimum volume of the valve body	152220 mm³	61250 mm³	57500 mm³	65250 mm³	115625 mm³	138000 mm³	111375 mm³	72600 mm³
Minimum width of the valve body in direction of the valve bank	43 mm	---	46 mm	---	92,5 mm	---	45 mm	---
Example of a valve body with minimum dimensions	43 x 60 x 59 [mm]	35 x 35 x 50 [mm]	25 x 46 x 50 [mm]	29 x 45 x 50 [mm]	92,5 x 25 x 50 [mm]	92 x 30 x 50 [mm]	45 x 55 x 45 [mm]	44 x 55 x 30 [mm]
Solenoid valve may be connected laterally (valve bank)	Yes	No	Yes	No	Yes	No	Yes	No
Solenoid valve may be used individually (single valve)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantity of solenoids per valve body	1 or 2 solenoids (opposing)	1 or 2 solenoids (opposing)	Only one solenoid (side by side)	Only one solenoid	2 solenoids (side by side)	2 solenoids (side by side)	Only one solenoid (side by side)	Only one solenoid
Application on version C (23W, T4)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Examples – valve arrangement								

The indication in 10.2 is to be kept without fail

Properties/criterion	Version 9 - valve bank -	Version 10 - single valve -	Version 11 - valve bank -	Version 12 - single valve -	Version 13 - valve bank -	Version 14 - single valve -	Version 15 - valve bank -	Version 16 - single valve -
Valve type	VP 1	VP 1	exG 22	exG 22	BVE 1	BVE 1	VP 1-W	VP 1-W
Anti-rotation anchor type	Type 4	Type 4	Type 5	Type 5	Type 6	Type 6	Type 7	Type 7
Minimum volume of the valve body	57500 mm³	65250 mm³	115625 mm³	138000 mm³	152220 mm³	61250 mm³	48960 mm³	43776 mm³
Minimum width of the valve body in direction of the valve bank	46 mm	---	92.5 mm	---	43 mm	---	51 mm	---
Example of a valve body with minimum dimensions	25 x 46 x 50 [mm]	29 x 45 x 50 [mm]	92.5 x 25 x 50 [mm]	92 x 30 x 50 [mm]	43 x 60 x 59 [mm]	35 x 35 x 50 [mm]	51 x 40 x 24 [mm]	48 x 38 x 24 [mm]
Solenoid valve may be connected laterally (valve bank)	Yes	No	Yes	No	Yes	No	Yes	No
Solenoid valve may be used individually (single valve)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantity of solenoids per valve body	Only one solenoid (side by side)	Only one solenoid	2 solenoids (side by side)	2 solenoids (side by side)	1 or 2 solenoids (opposing)	1 or 2 solenoids (opposing)	Only one solenoid (side by side)	Only one solenoid
Application on version C (23W, T4)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Examples – valve arrangement								

The indication in 10.2 is to be kept without fail

Properties/criterion	Version 17 - valve bank -	Version 18 - single valve -	Version 19 - valve bank -	Version 20 - single valve -	Version 21 - valve bank -	Version 22 - single valve -
Valve type	VP 1-G	VP 1-G	SWR 2	SW 2	SWR 2 proportional	SW 2 proportional
Anti-rotation anchor type	Type 8	Type 8	Type 1	Type 1	Type 1	Type 1
Minimum volume of the valve body	42840 mm ³	38016 mm ³	116525 mm ³	116525 mm ³	116525 mm ³	116525 mm ³
Minimum width of the valve body in direction of the valve bank	51 mm	---	39.5 mm	---	39.5 mm	---
Example of a valve body with minimum dimensions	51 x 35 x 24 [mm]	48 x 33 x 24 [mm]	39.5 x 60 x 59 [mm]	39.5 x 60 x 59 [mm]	39.5 x 50 x 59 [mm]	39.5 x 50 x 59 [mm]
Solenoid valve may be connected laterally (valve bank)	Yes	No	Yes	No	Yes	No
Solenoid valve may be used individually (single valve)	Yes	Yes	Yes	Yes	Yes	Yes
Quantity of solenoids per valve body	Only one solenoid (side by side)	Only one solenoid	Always 2 solenoids (opposing)	Always 2 solenoids (opposing)	Always 2 solenoids (opposing)	Always 2 solenoids (opposing)
Application on version C (23W, T4)	Yes	Yes	Yes	Yes	Yes	Yes
Examples – valve arrangement						

The indication in 10.2 is to be kept without fail

Valve bodies with larger volume may be used.

11 Type Marking Plate and warning statement



<p>01 EX14 037A x024 24VDC R20=25,6Ω I_G=0,67A</p> <p>FM 13ATEX 0071X</p> <p>II 2G Ex db IIB+H2 T4 Gb IP67</p> <p>II 2D Ex tb IIIC T135°C Db</p> <p>IECEx FMG 13.0027X</p> <p>Ex d IIB+H2 T4 Gb IP67 CE 0408</p> <p>Ex tb IIIC T135°C Db</p> <p>XP, Class I, Div. 1, Grp B,C,D T4</p> <p>DIP, Class II, Div. 1, Grp E,F,G T4</p> <p>DIP, Class III, Div 1 & 2</p> <p>Class I, Zone 1, AEx d, IIB+H2 T4 Gb</p> <p>Zone 21, AEx tb IIIC, T135°C Db</p> <p>Class I, Zone 1, Ex d, IIB+H2 T4 Gb</p> <p>IP67</p> <p>external fuse I_N≤3I_G</p> <p>-40°C ≤ T_a ≤ +55°C</p> <p>Schienle Magnettechnik und Elektronik GmbH In Oberwiesen 3, D-88682 Salem</p>	 <p>228514/101</p> <p>0405</p> 	<p><u>Disconnect Power Before Removal /</u> <u>Débranchez la puissance avant le</u> <u>déplacement</u></p> <p><u>Conduit Seal required within 18 inches</u> <u>for Division use / Joint de conduit</u> <u>requis à moins de 18 inches pour</u> <u>l'usage de Division</u></p> <p><u>Conduit Seal required within 2 inches</u> <u>(50mm) of the enclosure for Zone use /</u> <u>Joint de conduit requis à moins de 2</u> <u>inches (50 millimètres) de clôture pour</u> <u>l'usage de zone</u></p>
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Figure 3 – Type marking plate – y: version A and B with MWPR description, version C without MWPR because no hydraulic pressure in the tube.
Optionally, the solenoid may me marked without the applicability for hydrogen (H2, Grp B)

12 Standards and Regulations

DIN VDE 0580, release 2011-11: Electromagnetic devices and components - general requirements
 EN 60079-0:2012+A11:2013: Explosive atmospheres - Part 0: Equipment - General requirements
 EN 60079-1:2014: Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
 EN 60079-31:2014: Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"
 EN 600529+A1: 2001: Degrees of protection provided by Enclosures (IP Code)

IEC 60079-0:2007: Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
 IEC 60079-1:2007: Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
 IEC 60079-31:2008 + Corrigendum 1:2009: Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"
 IEC 60529:2001: Degrees of protection provided by Enclosures (IP Code)

ANSI/ISA 60079-0:2009: Explosive Atmospheres - Part 0: Equipment - General Requirements
 ANSI/ISA 60079-1:2009: Explosive Atmospheres - Part 1: Equipment Protection by Flameproof Enclosure "d"
 ANSI/ISA 60079-31:2009: Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"
 ANSI/IEC 60529: Degrees of protection provided by enclosures (IP Code)

FM Approval standard Class Number 3600 (December 2011): General Requirements
 FM Approval standard Class Number 3615 (August 2006): Explosionproof Electrical Equipment – General Requirements
 FM Approval standard Class Number 3616 (December 2011): Approval Standard for Dust-Ignitionproof Electrical Equipment – General Requirements
 FM Approval standard Class Number 3810 (January 2005): Measurement, Control and Laboratory Use

CSA-C22.2 No. 0.4-2009: Bonding of Electrical Equipment
 CSA-C22.2 No. 0.5-2012: Threaded Conduit Entries
 CSA-C22.2 No. 25-2009: Enclosures for Use in Class II Groups E, F and G Hazardous Locations
 CSA-C22.2 No. 30-2007: Explosion-Proof Enclosures for Use in Class I Hazardous Locations
 CSA-C22.2 No. 60079-0-2011: General requirements
 CSA-C22.2 No. 60079-1-2011: Equipment Protection by Flameproof Enclosure "d"
 CSA-C22.2 No. 60529: Degrees of protection provided by enclosures (IP Code)

13 Non intended usage

Any warranty claims are denied in case the regulations in this operating manual are not observed!
 Not intended use of this device may rise a risk of serious damage or loose of the explosion proof safety.

Danger area	Danger	Safety note
Hydraulic connection between solenoid and hydraulic valve	Disconnection under pressure Lost of explosion proof safety	Unpressurize the hydraulic system before disconnecting Disconnect the solenoid from the valve only in a de-energized state
Solenoid surface	Skin burning by hot surface of the solenoid	Let the solenoid cool down after de-energizing
Electrical connection	Electric shock	Work on the solenoid only in a de-energized state Disconnect the cable from the electrical voltage supply/junction box only in de-energized state

13 EU-Declaration of Conformity





The manufacturer,

**Schienle Magnettechnik und Elektronik GmbH
In Oberwiesen 3
88682 Salem – Neufrach**

herewith declares that the product

Description: Flame proof solenoid, Explosion proof solenoid
Type : 01 EX14 037x yzzz
EU-certificate: FM 13 ATEX 0071X

Marking:

 II 2G Ex db IIB+H2 T4 Gb
 II 2D Ex tb IIIC T135°C Db

Is been designed, assembled and proved in accordance with the EU regulation 2014/34/EU and following harmonized norms:

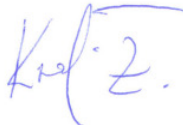
EN 60079-0:2012+A11:2013: Explosive atmospheres - Part 0: Equipment - General requirements (IEC 60079-0:2011, modified + Cor.:2012 + Cor.:2013);

EN 60079-1:2014: Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" (IEC 60079-1:2014)

EN 60079-31:2014: Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t" (IEC 60079-31:2013);

Salem-Neufrach
Place

20.04.2016
Date


Ex-Responsible Person