Solenoid actuator

Series MG…x, MG…-A...x

With ⟨Ex⟩ protection for use for correct purpose in
Ex zone 1 and 21 according to 2014/34/EU (ATEX) CE

Operating instructions

(translation)

Basics

Valve / solenoid actuator combinations are delivered fully assembled and tested as standard. When solenoid actuators are replaced or changed, it must be ensured that combination with a UNI fitting is approved and that the magnet is properly attached to the fitting (e.g. with the permissible tightening torque). The device-specific serial number and the year of manufacture can be found on the nameplate for clear identification.
Solenoid actuators are electrotechnical components which cannot be operated without an associated fitting, and may not be operated on their own! Always use solenoid actuators with IP65 with a rain protection cover for outdoor installations. Solenoid actuators which are obviously damaged must not be installed and must be replaced. If the solenoid actuators are exposed to special types of external stress, additional protective measures are required and must be provided by the operator. Any modifications to the device which are undefined or have not been agreed can have a negative influence on the explosion protection, and in the worst case it may even be cancelled out altogether. UNI-Geräte does not accept liability for damage (to the device / beyond) caused by modification(s) to the device. The same applies to warranty claims.

Information on explosion protection

The solenoid actuators and the integrated solenoid valve controls comply with the explosion protection types "db" and "eb" in device category II2G, as well as "tb", device category II2D. They can be used in areas in which explosive mixtures of air and combustible gas, vapour, aerosol or dust may occur, i.e. in Ex zone 1 / 21. The electrical and thermal parameters of the separate variants can be obtained from the respective type plates. The explosion protection applies to operation of the device.
During installation, maintenance or repair, the relevant national regulations for explosion-proof equipment must be observed. Such work may only be carried out by qualified personnel or under their supervision respectively. Thereby EN 60079-14 (installation), EN IEC 60079-17 (maintenance) and EN IEC 60070-19 (repair) must be observed as technical guidelines.
Defective components of the solenoid actuator may only be replaced with original spare parts or parts approved by UNI-Geräte.

Description of the device

The solenoid actuator (pot magnet) is used as a drive unit for valves. Constructionally the actuator consists of a magnet housing (flameproof enclosure, magnet plate and Ex-chamber cover with connection compartment), a coil and electronics. Depending on the version, the solenoid actuator can be operated with direct or alternating voltage. A rectifier is built into the AC voltage version. The various types of coils therefore always have direct current flowing through them when they are live. The MG…x solenoid actuators have a conventional coil with one winding and the resulting average permanent attraction forces with average power consumption during continuous operation. The type MG…-A...x solenoid actuators, on the other hand, have two windings on their coil body, a pull-in winding and a hold-in winding. The installed TS200 / TS900 / TS1500 valve controller switches from the pull-in winding to the hold-in winding or from higher to lower power after a defined time. In this way, very high pull-in forces with simultaneous continuous (hold-in) operation can be achieved for short periods with low power consumption.

Specific conditions of use

Repairs on flameproof joints may only be performed in accordance with design specifications provided by UNI-Geräte. Repairs based on the values in table 3 of EN 60079-1:2014 are not permitted.

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Notes on installation and safe operation

- Only heat-resistant connecting cables with an upper operating temperature of at least 100 ° C may then be used to connect the solenoid actuator.
- The emergence of explosive atmospheres is to be avoided in the region of the magnetic core and guide tube.
- With respect to paintwork, it must be ensured that the total thickness of the coating is not to exceed the tolerance of 0.2 mm (200 µm) from EN IEC 60079-0:2018 Table 9.
- The solenoid actuator is not to be subjected to any charge-generating processes (presence of accelerated particles on the surface, e.g. electrons from high-voltage electrodes, flowing powder particles or liquids).

Electrical connection

- The electrical installation must be carried out by a qualified electrician or under the supervision thereof, taking the relevant national regulations into consideration. Prior to installation, the device specifications must be compared with the intended operating conditions to ensure that proper operation takes place.
- The diameter range / clamping range of the cable gland must be noted and adhered to.
- When flexible connecting cables are being used, insulated wire end sleeves with plastic collars in accordance with DIN 46228-4 must be used.
- The supply voltage at the solenoid actuator must be within the range of –15% to +10% of the nominal voltage. The connection is performed to the wiring diagram in these operating instructions.
- The magnet housing cover must be reassembled with care in order to guarantee the IP protection class. Versions which are delivered with a connecting cable from the factory are ready for use, i.e. the connection compartment does not need to be opened.
- The solenoid actuators must be protected against the dangerous effects of short circuits, earth faults and overloading. Upstream protective devices must be of a type which prevents automatic restarting under fault conditions. Their rated voltage must be equal to or greater than the nominal voltage of the solenoid actuator. Their breaking capacity must be equal to or greater than the maximum short-circuit current which can be assumed at the installation site (usually 1500 A).
- An upstream fuse for protecting the device must be rated with a maximum of 3 times the nominal current of the solenoid actuator (in accordance with IEC 60127-1). If the rated current is very small, the fuse with the smallest current value in accordance with the specified IEC standard must be selected. With solenoid actuators with pull-in/hold-in control (MG…-A…x), the higher value (pull-in current) must be taken into consideration.
- An upstream motor protection switch with short-circuit tripping and a thermal quick release must be set to the nominal current of the solenoid actuator. With solenoid actuators with pull-in/hold-in control (MG…-A…x), the higher value (pull-in current) must be taken into consideration. Based on its characteristic curve, the motor protection switch must be set so that it trips after 20 s with a pull-in current.
- The length and cable cross-section of the connecting cable should be dimensioned so that a maximum voltage drop of 4% (in accordance with VDE 0100-520) is not exceeded. The "recommended maximum cable length" tables for the respective actuator types can be used for the calculation.
- If a silicone (or silicone-containing) connecting cable or a cable that is not scratch-resistant is being used, it must be protected against mechanical damage (e.g. by an interrupted tube system with edge protection).
- A maximum permissible ripple of 20% applies to all solenoid actuators with the direct current design.

CE markings

The Council of the European Union has issued common directives for the free movement of goods within the Union, which specify minimum requirements for health and safety protection. The CE mark confirms that products are compliant with the EU directives, i.e. compliant with the relevant standards, particularly the harmonized ones.

Note concerning directive 2014/34/EU (Explosion directive / ATEX directive):
The solenoid actuators fulfil the relevant requirements of Directive 2014/34/EU. Therefore, they bear the CE mark according to Annex II of the directive. The declaration of conformity is enclosed.

Note concerning directive 2014/30/EU (EMC directive):
The solenoid actuators fulfil the requirements of the product family standards to be used in the industrial sector and also in the residential, business and commercial sectors as well as in small businesses. When AC and DC versions are being used, the user must provide a suitable line filter (e.g. X-capacitor 47 nF) at the power supply input in order to attenuate the physically-related cable-bound switch-off interference of the solenoid. Solenoid actuators as drive elements for valves do not represent independently operating devices in the sense of the EMC directive, and are only subjected to further processing or installed into a machine by specialist companies. Starting up is not allowed until it has been established that the entire machine or system complies with the provisions of the EMC directive.

Operation

100% duty cycles are also permitted at the most unfavourable ambient temperatures.

WARNING!
Risk of injury from hot surfaces!

- Do not touch the solenoid actuator when in operation without suitable personal protection equipment.

When in operation, ensure that the maximum surface temperature of 95 °C is not exceeded. This is guaranteed if neither the maximum permissible ambient and medium temperature nor the maximum permissible supply voltage level are exceeded. The solenoid actuator must be protected from inadmissible heating if necessary. All solenoid actuators are wired with a protective measure to reduce the induction voltage. To avoid potentially damaging residual induction voltage, the user must take suitable measures that go beyond the built-in protective measures if necessary.

Disassembly of the solenoid actuator

NOTE!
To disassemble the solenoid actuator, its flameproof enclosure must be opened. This may only be carried out by qualified personnel or under their supervision respectively. See also information on explosion protection (Page 1).

NOTE!
When disassembling, reassembly must already be taken into consideration. If necessary, work steps should be documented in such a way that subsequent assembly is possible without problems.
Improper installation impairs explosion protection!
Proper installation will require:

- Lubricant Klüberplex BE 31-222;
- Torque wrench;
- Two screws M8 x 40 mm (or longer) as auxiliary means.

CAUTION!

- The metallic joint surfaces of the dismantled housing parts form flameproof joints and must be protected against damage at all times.
- They must not come into contact with hard or sharp objects, e.g. tools.
- The housing parts must not be placed on the joint surfaces.

To identify the gap surfaces, see illustrations on page 9.

WARNING!
Risk of injury from hot surfaces!

- Only touch the solenoid actuator with suitable personal protective equipment.
- Prior to dismantling, allow the solenoid actuator to cool off.

WARNING!
Danger of electric shock!

- Disconnect the solenoid actuator from power supply completely (all poles) prior to opening the housing.
- Observe the electrical safety rules.
- The device may only be connected by a qualified electrician.

WARNING!
Danger of explosion!

- Cables disconnected from the solenoid actuator must be kept voltage-free.
- Components inside the solenoid actuator may exceed the maximum permissible surface temperature of 95 °C.
- Prior to opening the housing, a cooling off time of 120 minutes is to be observed.

- Undo cylinder head screws (910/3) and remove them with the spring washers (905/3).
- Remove the magnet housing cover (105) from the Ex-chamber cover (127).
- Disconnect the connecting cable from the terminals of the cable bushing (733) and the inner earthing terminal (717/1).
- Then remove the connecting cable from the connection compartment after loosening the cable gland (701).
- Disconnect the outer earth wire from the external earthing terminal (717/2).
- Undo cylinder head screws (910/2) and remove them with the spring washers (905/2).

CAUTION!
Do not use sharp objects (e.g., a screwdriver) to separate the Ex-chamber cover (127) from the magnet housing (103)! This could lead to damage to the joint surfaces!

- Lift the Ex-chamber cover (127) straight off the magnet housing (103). While doing so, take the cables of the internal wiring into account!
- For solenoid actuators MG…x, disconnect the wire leads at the connection terminal or at the rectifier.
- For solenoid actuators MG…-A...x, disconnect the wire leads on the transistor controller (TS….).
- Then remove the Ex-chamber cover (127) and place it on a clean surface. Do not place the cover on the joint surfaces!
- Disconnect the connecting cables of the solenoid coil (702) from the components on the magnet plate (500).
- Undo the cylinder head screw (910/1) and remove it with the spring washer (905/1).
- By screwing two screws (M8x40mm) into the threaded holes on the magnet plate (500) provided for this purpose, it can be removed from the upper part of the valve housing (106). Thereby, the spring pins (943/1) and (943/2), which serve to lock the magnet plate (500), are pulled out of the upper part of the valve housing (106).

NOTE!
The spring pins (943/1) and (943/2) are stuck in the magnet plate (500) after disassembly and must be carefully hammered out.

- Remove the magnet housing (103) together with the solenoid coil (702) from the upper part of the valve housing (106).
- If necessary, the components on the magnet plate (500) can now be dismantled or the solenoid coil (702) can be removed.

Assembly of the solenoid actuator

CAUTION!
The metallic joint surfaces between the magnet housing (103) and the upper part of the valve housing (106), as well as between the magnet housing (103) and the Ex-chamber cover (127) form flameproof joints. They must be free of defects such as scratches, for example. A repair or refurbishment of these surfaces is not allowed!

CAUTION!
The wire leads for internal wiring have heat-resistant silicone insulation. This only has a low mechanical strength and must be protected against damage, e.g. from being pinched.

- The joint surfaces must be cleaned before assembly and then greased with Klüberplex BE 31-222 lubricant.
- Place the magnet housing (103) together with the solenoid coil (702) onto the upper part of the valve housing (106). Avoid impacts against the joint surfaces!
- Insert the magnet plate (500) into the magnet housing (103) using two screws (M8x40mm) and place it on the upper part of the valve housing (106). Do not touch the joint surfaces!
- Align the holes for the spring pins (943/1) and (943/2) in the magnet plate (500) and the magnet housing (103).
- Screw the cylinder head screw (910/1) with the spring washer (905/1) through the magnet plate (500) into the thread of the upper part of the valve housing (106) until hand-tight.
- Insert the spring pins (943/1) and (943/2) and drive them into the magnet housing (103) until they are flush with the magnet plate (500). While doing so, do not damage the joint surfaces!
- Tighten the cylinder head screw (910/1) to the required torque.
- Reconnect the cables of the solenoid coil (702).
- Reconnect the electrical wiring between the components (connection terminal, rectifier or transistor controller) on the magnet plate (500) and the Ex-chamber cover (127).
- Insert the Ex-chamber cover (127) straight into the magnet housing (103). Do not touch the joint surfaces!
- Screw in the cylinder head screws (910/2) with the spring washers (905/2). Tighten crosswise to the required torque.

NOTE!
Electrical tests after repair or maintenance must be carried out taking into account safe work procedure guidelines for explosive gas atmospheres (EN 60079-14, Annex B).

- Insert the connecting cable through the cable gland (701) into the connection compartment and reconnect it to the terminals of the cable bushing (733) and to the inner earthing terminal (717/1).
- Retighten the cable gland (701).
- Reconnect the outer earth wire to the external earthing terminal (717/2).
- Place the magnet housing cover (105) on the Ex-chamber cover (127). Ensure that the O-ring (403) is correctly seated! If necessary, grease with Klüberplex BE 31-222 lubricant.
- Screw in the cylinder head screws (910/3) with the spring washers (905/3) and tighten to the required torque.

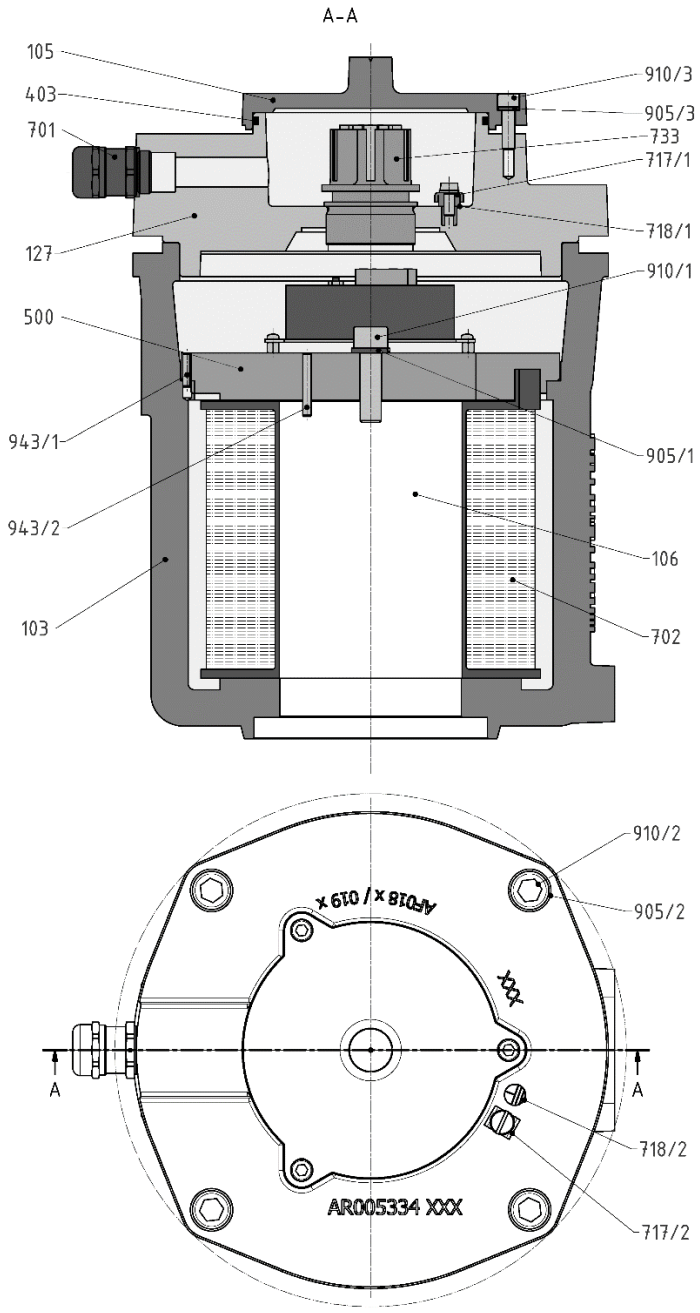
NOTE!
The solenoid actuator and the upper part of the valve housing (106) have been custom fitted in the factory The installation of a substitute actuator may only be put into operation according to the express specification of UNI-Geräte or by UNI-Geräte itself!

Tightening torques of the cylinder head screws (910/X)

Position	Number	Connection	Thread	Tightening torque
910/1	1	Magnet plate (500) / upper part of the valve housing (106)	M8	30 Nm
			M10	30 Nm
910/2	4	Ex chamber cover (127) / magnet housing (193)	M10	50 Nm
			M12	50 Nm
910/3	3	Magnet housing cover (105) / Ex chamber cover (127).	M6	4.6 Nm

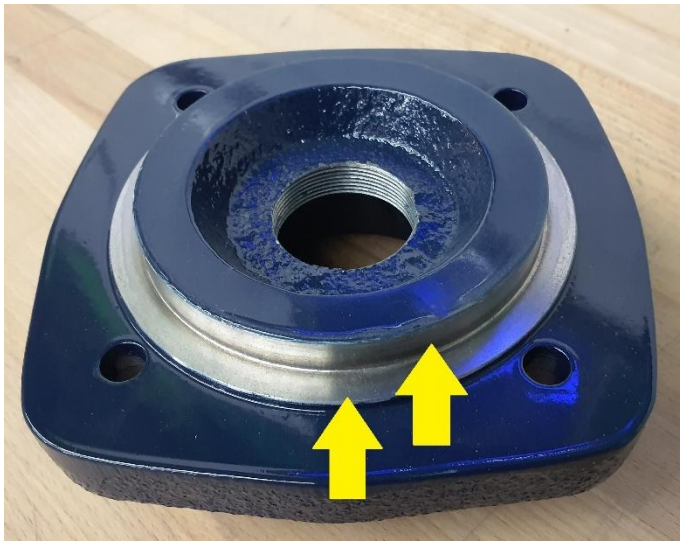
NOTE!
Solenoid actuators that have been repaired must be marked in accordance with EN IEC 60079-19, Annex A.
Disassembly of the actuator to carry out work on the valve (e.g. maintenance) is not considered a repair in this sense.

Solenoid actuator MG...x, MG...-A...x

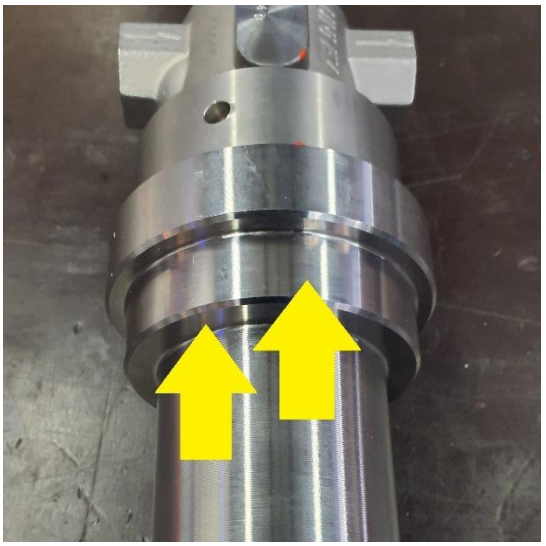


Item	Unit	Designation
103	1	Magnet housing
105	1	Magnet housing cover
106	Upper part of the valve housing	
127	1	Ex-chamber cover
403	1	O-ring
500	1	Magnet plate
701	1	Cable gland
702	1	Solenoid coil
717/1	1	Earthing terminal (inner)
717/2	1	Earthing terminal (external)
718/1	1	Earthing symbol (inner)
718/2	1	Earthing symbol (external)
733	1	Cable bushing
905/1	1	Spring washer
905/2	4	Spring washer
905/3	3	Spring washer
910/1	1	Cylinder head screw
910/2	4	Cylinder head screw
910/3	3	Cylinder head screw
943/1	1	Spring pin
943/2	1	Spring pin

Joint surfaces of the magnet housing and valve parts



Ex-chamber cover (127)



Upper part of the valve housing (106)

Magnet housing (103) top

Magnet housing (103) bottom

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Technical data

Ex marking:	Ⓔx II 2 G Ex db eb IIC T5 Gb
	Ⓔx II 2 D Ex tb IIIC T95°C Db
Protection type:	IP65
Max. housing temperature:	95 °C
Ambient temperature:	-20 to +60 °C
Media temperature:	
Upper part of the valve housing with media contact	-20 to +60 °C
Upper part of the valve housing without media contact	no influence
Duty cycle:	100%
Mains frequency for AC version:	40 to 60 Hz

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Solenoid actuator MG...x

Type MG	P* W	Nominal current A*										
		24 V DC	48 V DC	110 V DC	120 V DC	125 V DC	220 V DC	24 V AC	110 V AC	120 V AC	210 V AC	230 V AC
008x	30	1.3	0.6	0.3	0.3	0.2	0.1	1.3	0.3	0.3	0.2	0.1
010x	40	1.7	0.8	0.4	0.3	0.3	0.2	1.7	0.4	0.3	0.2	0.2
012x	50	2.1	1.0	0.5	0.4	0.4	0.2	2.1	0.5	0.4	0.2	0.2
014x	70	2.9	1.5	0.6	0.6	0.6	0.3	2.9	0.6	0.6	0.3	0.3
016x	90	3.8	1.9	0.8	0.8	0.7	0.4	3.8	0.8	0.8	0.4	0.4
018x	125	5.2	2.6	1.1	1.0	1.0	0.6	5.2	1.1	1.0	0.6	0.5
019x	160	6.7	3.3	1.5	1.3	1.3	0.7	6.7	1.5	1.3	0.8	0.7

* Nominal power

** Nominal current at nominal voltage and ambient temperature 20°C, 100% duty cycle, stationary heated (at ambient temperature of 20°C at inrush current → nominal current x 1.25)

Switching frequency: 1000 switching operations / hour

Recommended maximum cable length

Cable length for a maximum voltage drop of 4% in accordance with VDE 0100-520
(See sample calculations on page 12)

Type MG	P W	Length factor* m/mm²										
		24 V DC	48 V DC	110 V DC	120 V DC	125 V DC	220 V DC	24 V AC	110 V AC	120 V AC	210 V AC	230 V AC
008x	30	17	75	343	374	585	2058	17	343	374	982	2152
010x	40	13	56	257	374	390	1029	13	257	374	982	1076
012x	50	11	45	206	281	292	1029	11	206	281	982	1076
014x	70	8	30	172	187	195	686	8	172	187	655	717
016x	90	6	24	129	140	167	515	6	129	140	491	538
018x	125	4	17	94	112	117	343	4	94	112	327	430
019x	160	3	14	69	86	90	294	3	69	86	246	307

* Cable length = length factor x cable cross-section

Solenoid actuator MG...A...Xn with internal controller TS900, TS1500

Type	P*	Nominal current A**				
		TS 900	TS 1500			
MG	W	24 V DC	110 V DC	220 V DC	110 V AC	230 V AC
016-Ax	720/70	30/2.9	6.5/0.6	3.3/0.3	6.5/0.6	3.1/0.3
018-A1x	900/70	38/2.9	8.2/0.6	4.1/0.3	8.2/0.6	3.9/0.3
018-A2x	1200/70	-	11/0.6	5.5/0.3	11/0.6	5.2/0.3
019-A1x	1200/120	-	11/1.1	5.5/0.6	11/1.1	5.2/0.5
019-A2x	1500/90	-	14/0.8	6.8/0.4	14/0.8	6.5/0.4
019-A5x	200/20	8.3/0.8	1.8/0.2	0.9/0.1	1.8/0.2	0.9/0.1

* Nominal power

** Nominal current at nominal voltage and ambient temperature 20°C, 100% duty cycle, stationary heated (at ambient temperature of 20°C at inrush current → nominal current x 1.25)

Switching frequency for ambient temp. +20 °C 20 switching operations / hour
Switching frequency for ambient temp. +60 °C 10 switching operations / hour
Changeover time: 3 seconds
Changeover time with opening delay: 10 seconds

Recommended maximum cable length

Cable length for a maximum voltage drop of 4% in accordance with VDE 0100-520
(See sample calculations on page 12)

Type	P	Length factor* m/mm²				
		TS 900	TS 1500			
MG	W	24 V DC	110 V DC	220 V DC	110 V AC	230 V AC
016-Ax	720/70	1	16	62	16	69
018-A1x	900/70	1	13	50	13	55
018-A2x	1200/70	-	9	37	9	41
019-A1x	1200/120	-	9	37	9	41
019-A2x	1500/90	-	7	30	7	33
019-A5x	200/20	3	57	229	57	239

* Cable length = length factor x cable cross-section

Solenoid actuator MG...A5x with internal controller TS200

Type MG	P* W	Nominal current A**					
		24 V DC	110 V DC	220 V DC	110 V AC	230 V AC	240 V AC
010-A5x	200/20	8.3/0.8	1.8/0.2	0.9/0.1	1.8/0.2	0.9/0.1	0.8/0.1
012-A5x							
014-A5x							
016-A5x							
018-A5x							
019-A5x							

* Nominal power

** Nominal current at nominal voltage and ambient temperature 20°C, 100% duty cycle, stationary heated (at ambient temperature of 20°C at inrush current → nominal current x 1.25)

Switching frequency: 600 switching operations / hour
Changeover time: 1.5 seconds

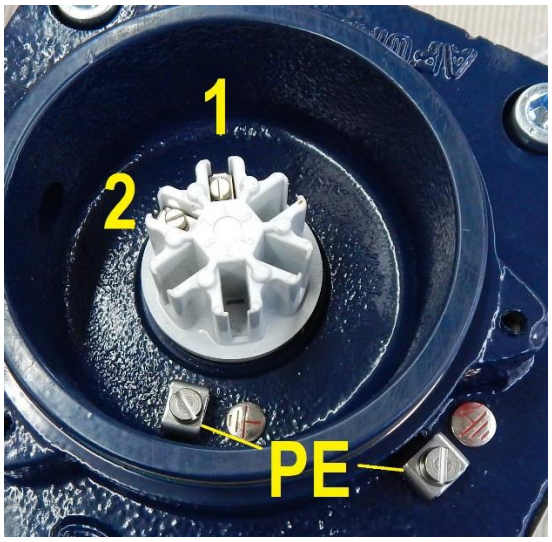
Recommended maximum cable length

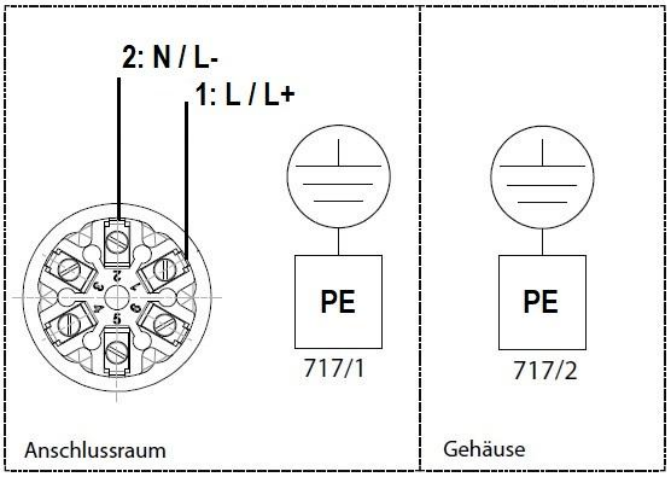
Cable length for a maximum voltage drop of 4% in accordance with VDE 0100-520
(See sample calculations on page 12)

Type MG	P W	Length factor* m/mm²					
		24 V DC	110 V DC	220 V DC	110 V AC	230 V AC	240 V AC
010-A5x	200/20	3	57	229	57	239	281
012-A5x							
014-A5x							
016-A5x							
018-A5x							
019-A5x							

* Cable length = length factor x cable cross-section

Wiring diagram





Protective conductor connection

The solenoid actuator must always be integrated into the equipotential bonding. A connection option is available for this purpose in the connection compartment (717/1). Pursuant to EN IEC 60079-0, along with the internal protective conductor terminal, an additional external earthing terminal is to be provided.

NOTE!
The solenoid actuator is to be **additionally** earthed via the external earthing connection (712/2).

Connection cross-section

Terminals 1/2:	0.75…6 mm²
Earthing connections PE:	0.75…4 mm² (6 mm² single-wire or with forked cable lug)

NOTE!
The connection cross-section of the earthing connections must **at least** correspond to that of terminals 1/2.

Sample calculations for the maximum cable length and the required cable cross-section

The maximum cable length results from multiplying the length factor with the selected cable cross-section.

Example: Type: MG 012x 230 VAC
Table value length factor: 1076 m/mm²
Selected cable cross-section: 1.5 mm²
→ Maximum cable length = 1076 m/mm² x 1.5 mm² = 1614 m

Alternatively, the required cable cross-section can be determined by dividing the specified cable length by the length factor:

Example: Type: MG 018x 110 VDC
Table value length factor: 94 m/mm²
Specified cable length: 200 m
→ Required cable cross-section = 200 m / 94 m/mm² = 2.13 mm²
→ Selected cable cross-section: 2.5 mm²

Dimensions

(see dimensional drawing on page 13)

Type MG	Weight [kg]	Construction dimensions [mm]								
		A	B	B´	ØC	D	E	F	G	ØH
008x	16.5	84	241	321	192	109	30	20	10	M8
010(-A…)x	18.0	84	263	353	192	102	50	26	13	M8
012(-A…)x	18.7	84	263	363	192	107	50	26	13	M8
014(-A…)x	22.0	94	290	410	212	89	50	26	13	M8
016(-A…)x	25.1	94	302	442	212	100	50	26	13	M8
018(-A…)x	40.6	115	320	470	241	100	50	26	13	M10
019(-A…)x	42.9	115	320	470	241	101	50	26	13	M10

B´ Dimension for removing the solenoid actuator

D Height difference between solenoid actuators MG…x, MG…-A...x and Standard MG.., MG..A.

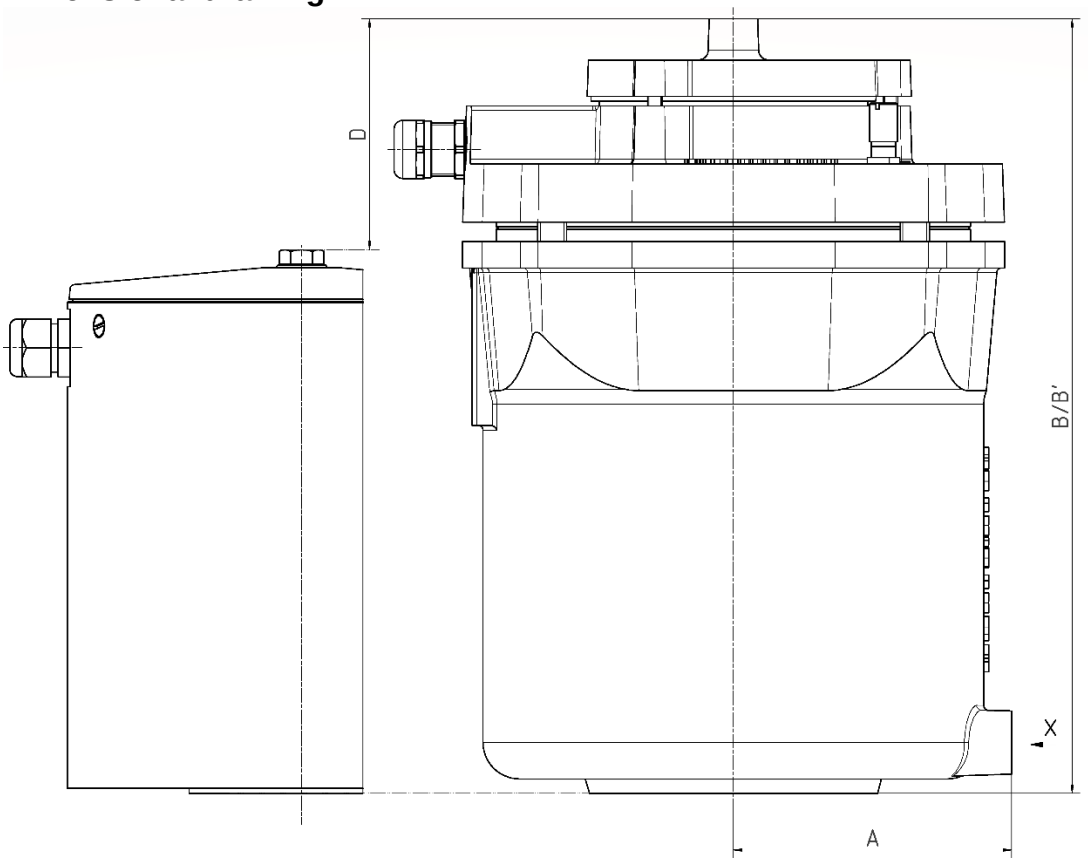
Solenoid actuator

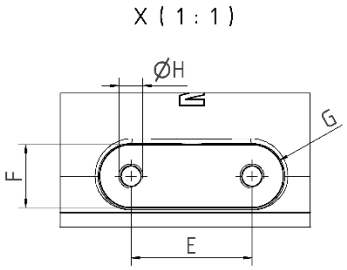
Series MG…x, MG…-A...x

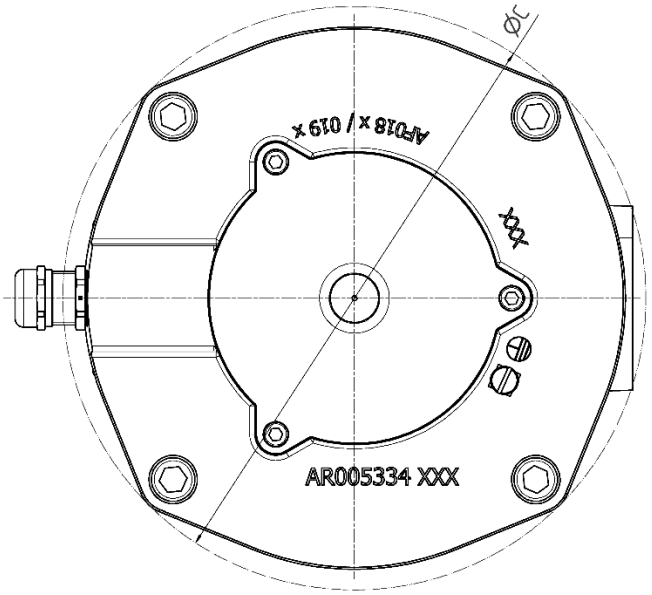
With Ⓔx protection for use for correct purpose in
Ex zone 1 and 21 according to 2014/34/EU (ATEX) CE

uni geräte
elektrotechnische fabrik gmbh

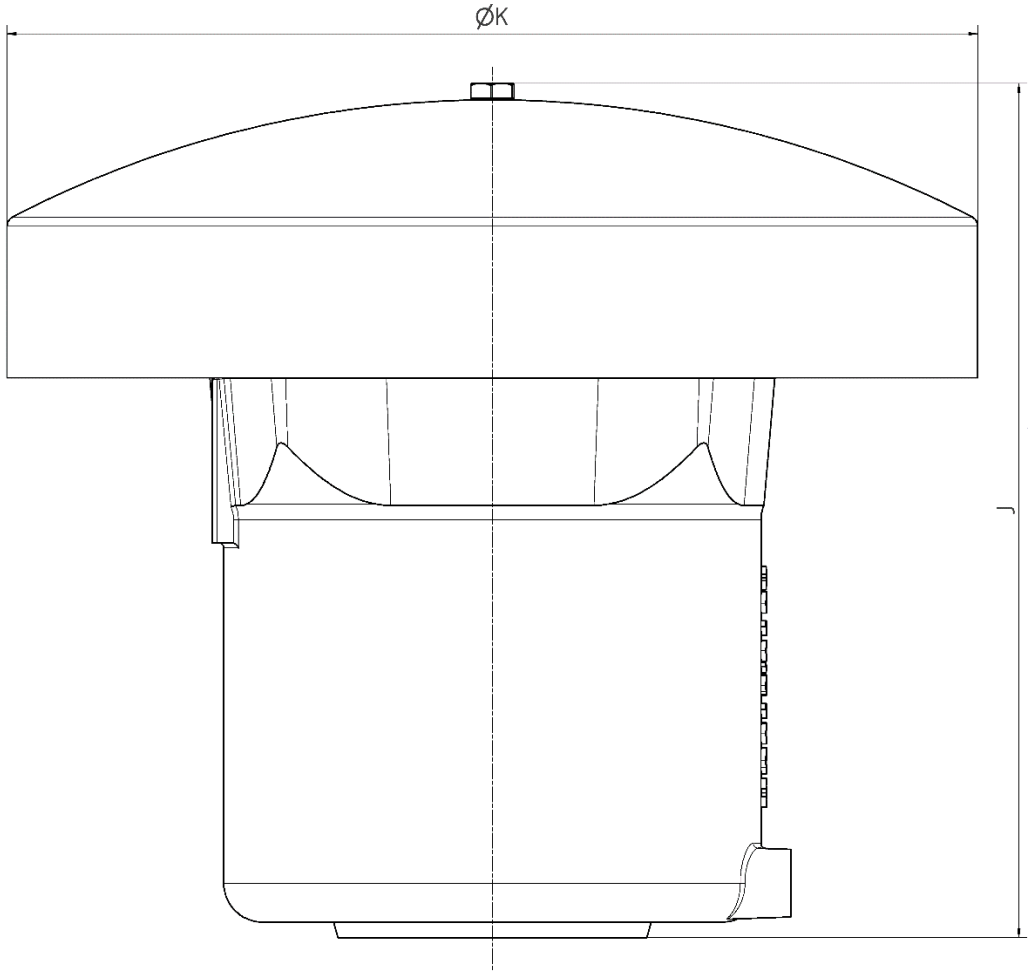
Dimensional drawing







Rain protection cover



Type MG	Size	Construction dimensions [mm]	
		J	ØK
008x	3	294	260
010(-A…)x	3	316	260
012(-A…)x	3	316	260
014(-A…)x	4	381	370
016(-A…)x	4	393	370
018(-A…)x	4	411	370
019(-A…)x	4	411	370