OKPD2 28.14.11

Series 327 Valves

Operation Manual

METRAN

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1 Description and Operation

1.1 Application

1.1.1 Series 327 valves (valves) are 3/2-way direct-acting solenoid valves with a balanced construction designed to control liquid or gas flow in various processes.

Valves are available in various options and configurations, including material and design that fit to various applications.

1.1.2 It is the customer's sole responsibility to make a careful analysis of all process variables (such as chemical composition, fluid temperature and pressure, abrasive materials, contaminants, etc.) when selecting a valve, materials, options and components for a particular application.

The manufacturer is not responsible for the compatibility of the selected valve model and the fluid or other process parameters.

1.1.3 Valves are designed for operation in non-explosive and explosive environments.

1.1.4 Valves comply with the requirements of the Technical Regulations of the Customs Union (CU TR) 010/2011 On Safety of Machines and Equipment.

1.1.5 Explosion-proof valves are designed for installation and operation in hazardous areas and outdoor installations in compliance with GOST IEC 60079-14 and other documents regulating the use of electrical equipment in explosive environments. Explosion-proof valves meet the requirements of CU TR 012/2011, GOST 32407 (ISO/DIS 80079-36), GOST 31610.0 (IEC 60079-0), GOST ISO/DIS 80079-37, GOST IEC 60079-1, GOST 31610.11 (IEC 60079-11), GOST 31610.18 (IEC 60079-18), GOST 31610.7 (IEC 60079-7), GOST IEC 60079-31 and have a special explosion protection mark Ex.

1.1.6 Valves have the following protection type:

– Constructional safety "c";

1.1.7 Solenoid enclosures incorporated in the valve have the following protection types:

– Explosion-proof enclosure "d";
– Dust-ignition proof enclosures "t";

– Intrinsically safe electrical circuit “i”;
– Encapsulation “m”;
– Increased safety “e”.

1.2 Specifications

1.2.1 Depending on the intended use, valves are available for standard and high flow. Basic performance specifications depending on the flow are given in Table 1.

Table 1. Basic Performance Specifications

Parameter		**Standard Flow**	**High Flow**
Orifice size, mm		5.7	12
Connecting thread		1/4" NPT or 1/4" G	1/4", 1/2" NPT or 1/4" G, 1/2" G
Fluids		air, inert gas, water, oils, light petroleum products	air, inert gas
Operating pressure, bar		0-10	
Flow coefficient Kv, m^3/hr (l/min)		0.45 (7.5)	1.5 (25)
Flow rate for air under normal conditions Qn, Nl/min		495	1650
Maximum fluid viscosity, cST (mm^2/s)		65	-
Time of stroke, ms		<100	
Solenoid insulation class as per GOST 8865 (IEC 85-84)		H	
Solenoid voltage, V	DC	24-48 (other voltages are available on request)	
	AC (50/60 Hz)	24-48, 115, 230 (other voltages are available on request)	
Allowable voltage variation		±10%	
Lifetime		24 yr	
Fluid temperature		Refer to Table 2	
Ambient temperature		Refer to Table 6	
Weight		Refer to Table 7	

1.2.2 Depending on the operating temperature range and the fluid, various materials are available for valve seals. They are given in Table 2.

1.2.3 Ambient temperature range for explosion-proof solenoids may be limited by enclosure type.

Table 2. Seal Material vs. Fluid Temperature

Orifice Size, mm	Fluid Temperature Range	Seal Material
5.7	–20 to 120 °C	FPM (fluoroelastomer)
	–40 to 40 °C	VMQ (silicone)
	–60 to 60 °C	FVMQ (fluorosilicone)
12	–25 to 60 °C	NBR (nitrile)
	–10 to 90 °C	FPM (fluoroelastomer)
	–60 to 60 °C	FVMQ (fluorosilicone)

1.2.4 When selecting a valve, special attention must be paid to the resistance of the materials used to the fluid or the environment.

Valves must not be used with fluids that are prone to crystallization and cause formation of hard deposits on the surfaces of valve parts.

Table 3. Materials in Contact with Fluid

Body	Brass or AISI 316L SST
Stem	Stainless steel
Core tube	Stainless steel
Core and plugnut	Stainless steel
Springs	Stainless steel
Sealings	NBR, FPM, VMQ, FVMQ
Rider ring	PTFE

1.2.5 Depending on the power rating of the cold solenoid in the holding mode, four levels of valve power consumption are available as shown in Table 4.

Table 4. Valve Power Consumption

Power Consumption	Power Rating, W	ID
Low	0.5-1.8	LP
Reduced	3.6-3.7	RP
Medium	5.7-5.8	MP
Basic	10.0-11.6	BP

1.2.6 Special enclosures are used to protect solenoids from external effects and to meet explosion protection requirements. Types and description of used enclosures are given in Table 5, characteristics and application conditions are given in Table 6, views are shown in Figures 1-6.

Table 5. Solenoid Enclosures

ID	Description	Connection	Fig.
SC	Solenoid with spade plug connector (GOST IEC 60730)	Spade plug connector with cable gland EN175301-803A (ISO 4400) for cables with an outer diameter from 6 to 10 mm	1
EF	Encapsulated enclosure of the solenoid with zinc plated steel core	Unconnected cable ends	6
EV	Explosion-proof encapsulated enclosure of the solenoid, AISI 316 SST core (GOST IEC 60079-1, GOST 31610.18)		
PV	Explosion-proof encapsulated enclosure of the solenoid (GOST 31610.18)		5
EM	Waterproof explosion-proof metal enclosure of the solenoid, IP66/67 (GOST 31610.7, 18, GOST IEC 60079-31)	M20 plastics cable gland for cables with an outer diameter from 7 to 12 mm	2
WP	Waterproof metal enclosure of the solenoid, IP67		
WS	Waterproof AISI 316 SST enclosure of the solenoid, IP67		
WSEM	Waterproof explosion-proof AISI 316 SST enclosure of the solenoid, IP66/67(GOST 31610.7, 18, GOST IEC 60079-31)		
NFIS	Intrinsically safe aluminum enclosure of the solenoid, IP66/ IP67 (GOST 31610.11, GOST IEC 60079-31)		3
WSNFIS	Intrinsically safe AISI 316L SST enclosure of the solenoid, IP66/ IP67 (GOST 31610.11, GOST IEC 60079-31)		
WSCRIS	Intrinsically safe AISI 316L SST enclosure of the solenoid (GOST 31610.0,11, GOST IEC 60079-31)		4
NF	Flameproof aluminum enclosure of the solenoid (GOST IEC 60079-1,-31)	1/2" NPT threaded cable entry. Enclosures are supplied without cable gland	3
WSNF	Flameproof 316L SST enclosure of the solenoid (GOST IEC 60079-1,-31)		

Table 5 (Continued)

NFTIS	Intrinsically safe aluminum enclosure of the solenoid, IP66/IP67 (GOST 31610.11, GOST IEC 60079-31)		
WSNFTIS	Intrinsically safe 316L SST enclosure of the solenoid, IP66/IP67 (GOST 31610.11, GOST IEC 60079-31)		
WSCR	Flameproof 316L SST enclosure of the solenoid (GOST 31610.0, GOST IEC 60079-1, GOST IEC 60079-31)		4
NFET	Flameproof aluminum enclosure of the solenoid (GOST IEC 60079-1,-31)	M20 x 1.5 threaded cable entry. Enclosures are supplied without cable gland	3
WSNFET	Flameproof 316L SST enclosure of the solenoid (GOST IEC 60079-1,-31)		
NFETIS	Intrinsically safe aluminum enclosure of the solenoid, IP66/IP67 (GOST 31610.11, GOST IEC 60079-31)		
WSNFETIS	Intrinsically safe 316L SST enclosure of the solenoid, IP66/IP67 (GOST 31610.11, GOST IEC 60079-31)		
WSCREM	Increased Safety / Encapsulated solenoid in the 316L SST enclosure (GOST 31610.0, 7, 18, GOST IEC 60079-31)	M20 316 SST cable gland for cables with an outer diameter from 7.2 to 11.7 mm	4

Table 6. Solenoid Characteristics

Enclosure	Power Rating, W				Ambient Temperature Range	Enclosure IP Class (GOST 14254)
	Inrush	Holding	Hot	Cold		
SC	10	10	9	11.2	–40 to 55	IP65, moulded
WP/ WS						IP67, steel/SST
NF/ WSNF					–60 to 40/60	IP66/67, aluminum/SST
EM/ WSEM					–40 to 40	IP66/67, steel/SST
PV	-	-	9	11.2	–40 to 55	IP65, moulded
EF/EV	12	12	9.3	11.6	–40 to 52/40	NEMA 4X
SC	5.8	5.8	5.2	5.7	–40 to 90	IP65, moulded
WP/ WS						IP67, steel/SST
NF/ WSNF					–60 to 60/75/90	IP66/67, aluminum/SST
WSCR						IP66/67, SST
WSCREM					–60 to 40/90	
EM/ WSEM					–40 to 40/75	IP66/67, steel/SST
SC	3.7	3.7	3.2	3.6	–40 to 55	IP65, moulded
WP/ WS						IP67, steel/SST
NF/ WSNF					–60 to 60	IP66/67, aluminum/SST
WSCR					–60 to 40/60/90	IP66/67, SST
WSCREM						
EM/ WSEM						IP66/67, steel/SST
NF/ WSNF	1.85	1.85	1.5	1.8	–60 to 55	IP66/67, aluminum/SST
WSCR						IP66/67, SST
WSCREM						
NFIS	0.5	0.5	0.5	0.5	–40 to 60	IP66/67, aluminum/SST
WSCRIS						IP66/67, SST
WSNFIS						IP66/67, aluminum/SST

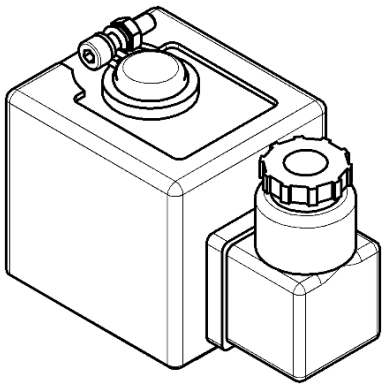


Figure 1. SC Enclosure

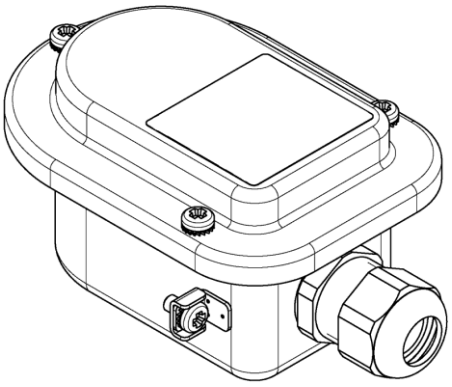


Figure 2. WP, WS, EM, WSEM Enclosure

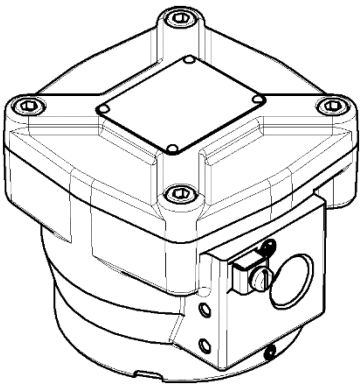


Figure 3. NF, WSNF, NFIS, WSNFIS, NFET, WSNFET, NFETIS, WSNFETIS Enclosure

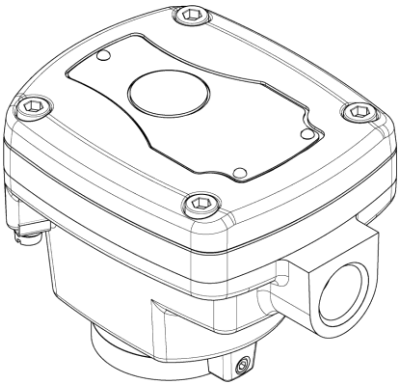


Figure 4. WSCR, WSCREM, WSCRIS Enclosure

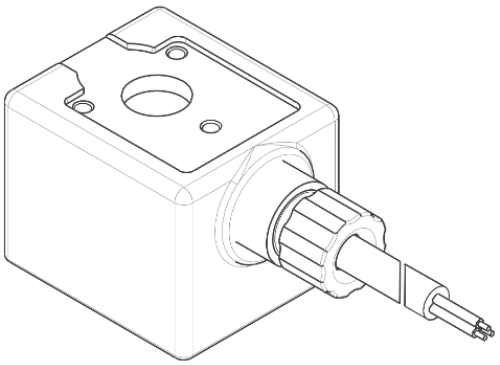


Figure 5. PV Enclosure

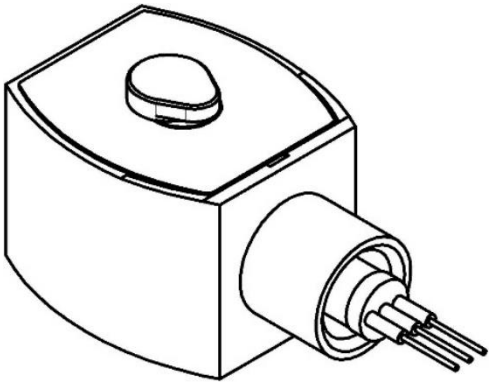


Figure 6. EF, EV Enclosure

1.2.7 Valve weight depending on the power consumption and the enclosure is given in Table 7.

Table 7. Valve Weight

Orifice Size, mm	Enclosure	Power Consumption	Weight, kg, max
5.7	PV, EF, EV, WP, WS, EM, WSEM	BP	1.1
	SC	BP/MP/RP	1.1
	WP, WS, EM, WSEM	MP/RP	1.3
	NF, NFIS	BP/MP/RP/LP	2.7
	WSNF, WSNFIS	BP/MP/RP/LP	3.8
	WSCR, WSCREM, WSCRIS	MP/RP/LP	3.1
12	SC, WP, WS, EM/WSEM	BP	1.6
	NF	BP	2.4
	WSNF	BP	3.8
	WSCR, WSCREM	BP	3.2

1.2.8 Valve dimensions depending on the installed enclosure are given in Appendix B.

1.3 Product Components

1.3.1 The valve consists of an actuator mounted in the valve body and a solenoid with a magnetic core, which are placed in an insulated enclosure.

1.3.2 Depending on the version, the physical configuration and the components of the valve may vary. The main parts list is given in Figure 7 and Table 8.

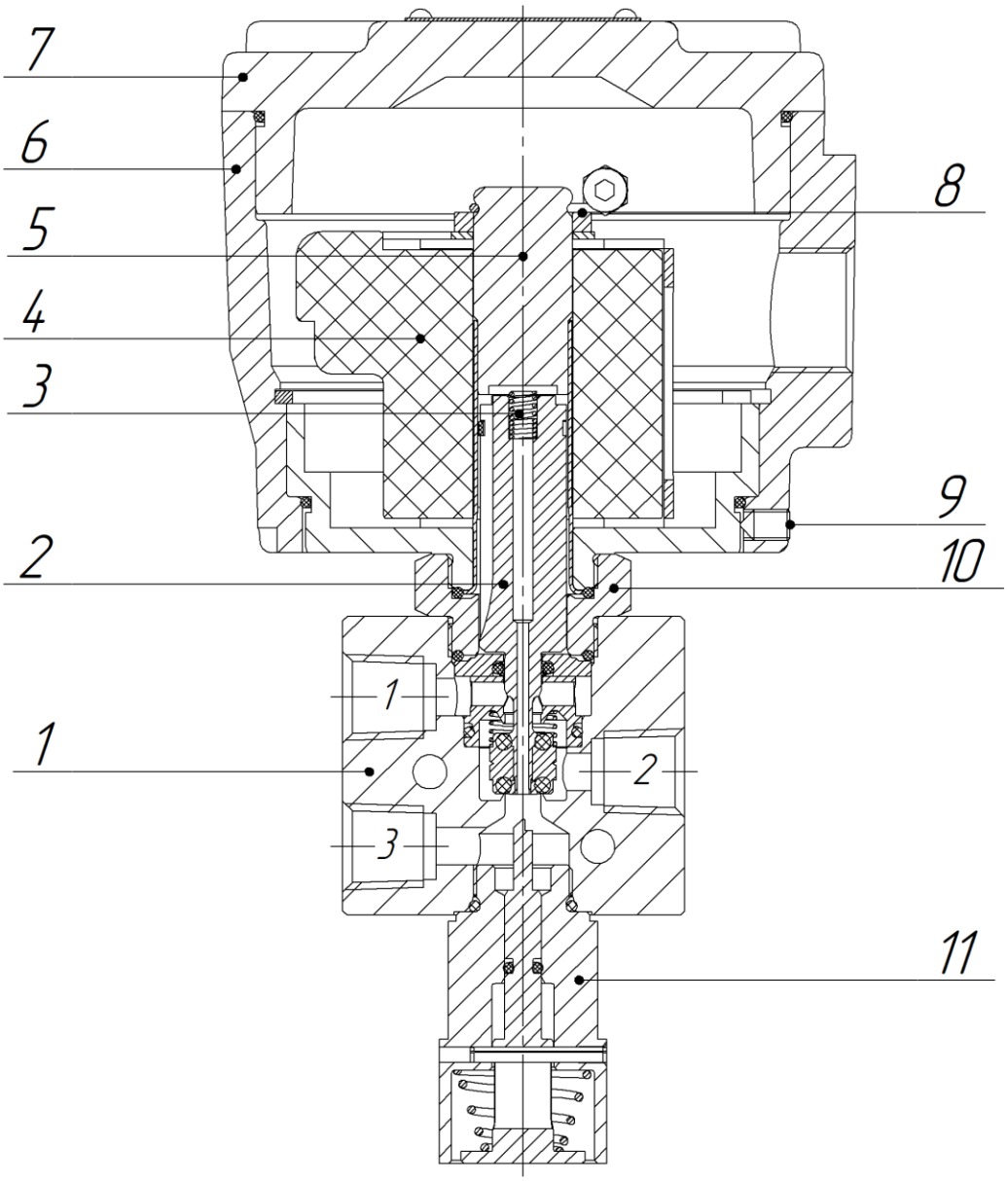


Figure 7. Valve Components

Table 8. Valve Components

Key	Description
1	Body
2	Spindle
3	Spring
4	Solenoid
5	Core
6	Enclosure
7	Enclosure cover
8	Solenoid retainer
9	Set screw
10	Adapter (optional)
11	Manual operator (optional)

1.4 Design and Operation

1.4.1 Design Description

Solenoid enclosures (6) SC, PV, EF, EV are one-piece construction with the solenoid (4) itself, so for these versions the valve design is as follows: spindle (2) and spring (3) are installed in the core (5), which is screwed into the body (1). The solenoid (4) is fixed to the core (5) by a special retainer (8).

Solenoid enclosures shown in Figures 2, 3, 4 have a composite design of the solenoid enclosure (6). For these versions the composition and design of the valve is as follows: spindle (2) and spring (3) are installed in the core (5), which is screwed into the body (1). The solenoid (4) is fixed to the core (2) and secured with a retainer (8) inside the solenoid enclosure (6), which is tightly closed and sealed with a cover (7). For valve versions with low solenoid power, a special adapter (10) can be attached to the core (5).

The solenoid enclosure (6) can be rotated to the required position, the selected position is secured by the set screw (9), if it is provided by the enclosure design. For SC, PV, EF, EV solenoid enclosures, the solenoid is fixed in the required position by the retainer (8).

The valve may be equipped with a manual operator. In this case, the manual operator (11) is screwed to the lower part of the body (1).

1.4.2 Principle of Operation

Valve principle of operation. The valve has three connection ports, which are marked with numbers in Figure 7 and also marked on the body (1). The fluid can be supplied to any of the ports. Without voltage supply, the spindle (2) is in the lower position and tightly closes port 3, thus ports 1 and 2 are freely communicating (open) and the fluid can flow through them. After applying voltage to the solenoid coil (4), the spindle (2) moves under the influence of electromagnetic forces and tightly closes port 1, thus ports 1 and 2 are separated, and the fluid begins to flow through the freely communicating ports 3 and 2. When voltage is removed, the spindle moves to the initial position, tightly closes port 3, and the fluid begins to flow through ports 1 and 2.

1.4.3 Manual Operator Principle of Operation:

The manual operator forces the valve to actuate in the absence of voltage.

Two types of manual operation are available for the valve. Push type manual operator (MO option) and screw type manual operator (MS option).

To activate the push type manual operator (MO option), press the spring-loaded button at the bottom of the body to the stop and hold the button depressed for the required time. After pressing, the spindle (2) rises up and closes the fluid flow between ports 1 and 2. To reset the valve to its initial position, release the button. In this way, the spindle (2) moves to the initial position and closes the fluid flow between ports 2 and 3.

To actuate the screw type manual operator (MS option), push the rotary knob at the bottom of the body and turn it clockwise. After turning, the spindle (2) will rise up and close the fluid flow between ports 1 and 2. To reset the valve to its initial position, turn the knob counterclockwise. In this way, the spindle (2) moves to the initial position and closes the fluid flow between ports 2 and 3.

1.5 Provision of Explosion Protection

1.5.1 Valve explosion protection is ensured by meeting the requirements of CU TR 012/2011, GOST 31610.0-2019 (IEC 60079-0:2017), GOST 32407-2013 (ISO/DIS 80079-36), GOST ISO/DIS 80079-37-2013.

1.5.2 Explosion protection of solenoids incorporated into valves is ensured by meeting the requirements of CU TR 012/2011 and compliance of their design with general requirements as per GOST 31610.0-2019 (IEC 60079-0:2017), Intrinsically Safe Electrical Circuit “i” explosion protection type as per GOST 31610.11-2014 (IEC 60079-11:2011), Explosion-Proof Enclosure “d” explosion protection type as per GOST IEC 60079-1-2013, Encapsulation “m” explosion protection type as per GOST 31610.18-2016/IEC 60079-18:2014, Increased Safety “e” explosion protection type as per GOST 31610.7-2017 (IEC 60079-7:2015), Dust-Ignition Proof Enclosures “t” as per GOST IEC 60079-31-2013.

1.5.3 Solenoid explosion protection characteristics are given in Tables 9-14.

Table 9. Valve and Solenoid Ex Marking and Ambient Temperature

Description	**Ex Marking**	**Ambient Temperature Range, Ta, °C**
Series 327 Valves	1Ex h IIC T6…T1 Gb X Ex h IIIC T85°C… T450°C Db X	–60 °C ≤ Tamb ≤ 80 °C
WSNF, NF	1Ex db IIC T6…220°C (T2) Gb X Ex tb IIIC T85°C…T220°C Db	–60 °C ≤ Tamb ≤ * °C
	1Ex db IIC T6 Gb X Ex tb IIIC T85°C Db X	–60 °C ≤ Tamb ≤ 55 °C or –60 °C ≤ Tamb ≤ 70 °C (as ordered)
WSNFIS, NFIS	0Ex ia IIC T6 Ga X Ex tb IIIC T85°C Db X or 1Ex ia IIC T6 Gb X Ex tb IIIC T85°C Db X	–40 °C ≤ Tamb ≤ 60 °C
WSCR	1Ex db IIC T6...T3 Gb X Ex tb IIIC T80°C...T195°C Db X	–60 °C ≤ Tamb ≤ ** °C
WSCRIS	0Ex ia IIC T6 Ga X Ex tb IIIC T85°C Db X or 1Ex ia IIC T6 Gb X Ex tb IIIC T85°C Db X	–40 °C ≤ Tamb ≤ 60 °C
WSCREM	1Ex eb mb IIC T6...T3 Gb X Ex tb IIIC T80°C...T195°C Db X	–60 °C ≤ Tamb ≤ *** °C
SG	2Ex ec IIC T4 Gc X Ex tc IIIC T115°C Dc X	–10 °C ≤ Tamb ≤ 50 °C
	2Ex ec IIC T4 Gc X Ex tc IIIC T110°C Dc X	–10 °C ≤ Tamb ≤ 60 °C
PV	1Ex mb IIC T**** Gb X Ex mb IIIC T**** °C Db X	–60°C ≤ Tamb ≤ **** °C
WSEM, EM	1Ex eb mb IIC T6…T3 Gb X Ex tb IIIC T85°C...T200°C Db X	–40 °C ≤ Tamb ≤ 75 °C

* Refer to Tables 10, 11.
** Refer to Table 12.
*** Refer to Table 13.
**** Refer to Table 14.

Table 10. Temperatures for WSNF Solenoids

Temperature Class	Maximum Surface Temperature	Maximum Ambient Temperature, °C	Maximum Power, W	
			AC	DC
T6	T85°C	25	17	31.5
		40	11.5	20
		60	5.5	8.5
		75	1	2.5
T5	T100°C	25	21	40.5
		40	15	32.5
		60	10.5	18
		75	6	10
T4	T135°C	25	28.5	40.5
		40	22.5	37.5
		60	19.5	32.5
		75	16.5	31
		80	15.4	25
		100	10.5	20

Table 11. Temperatures for NF Solenoids

Maximum Ambient Temperature, °C	Maximum Power, W		Maximum Fluid Temperature, °C			
	AC	DC				
25	17	31.5	40	75	140	-
40	11.5	20	55	90	155	-
60	5.5	8.5	75	110	175	-
75	1	2.5	90	125	180	-
25	21	40.5	-	60	125	-
40	15	32.5	-	75	140	-
60	10.5	18	-	95	160	-
75	6	10	-	110	175	-
25	28.5	40.5	-	-	90	-
40	22.5	37.5	-	-	105	-
60	19.5	32.5	-	-	125	-
75	16.5	31	-	-	140	-
80	15.4	25	-	-	145	160
100	10.5	20	-	-	165	-
Temperature Class			T5	T4	T3	220°C
Maximum Surface Temperature			T100°C	T125°C	T200°C	T220°C

Table 12. Temperatures for WSCR Solenoids

Temperature Class	Maximum Surface Temperature	Maximum Ambient Temperature, °C	Maximum Power, W	Cable Temperature, °C
T6	T80°C	25	8.5	60
		40	6	65
		60	3	75
T5	T95°C	25	11.5	70
		40	8.5	75
		60	5	80
		75	3	90
T4	T130°C	25	19.5	85
		40	16	90
		60	11.5	100
		75	8.5	110
		100	4.5	120
T3	T195°C	25	27	100
		40	23	110
		60	18	115
		75	15	125
		100	9.5	135

Table 13. Temperatures for WSCREM Solenoids

Temperature Class	Maximum Surface Temperature	Maximum Ambient Temperature, °C	Maximum Power, W	Cable Temperature, °C
T6	T80°C	25	8.5	60
		40	6	65
		60	3	75
T5	T95°C	25	11.5	70
		40	8.5	75
		60	5	80
		75	3	90
T4	T130°C	25	19.5	85
		40	16	90
		60	11.5	100
		75	8.5	110
		90	6	115
T3	T195°C	25	27	105
		40	23	110
		60	18	115
		75	15	125
		100	11.5	130

Table 14. Temperatures for PV Solenoids

Version	Power, W	Voltage, V	Maximum Ambient Temperature, °C	Temperature Class, Maximum Surface Temperature
EMXX	up to 4.05	up to 440 AC	65	T3, T200°C
	4.05-10.5	up to 440 AC	65	T3, T200°C
	up to 11.2	up to 240 DC	65	T4, T135°C
	up to 11.2	up to 240 DC	65	T3, T200°C
	11.2-19.7	up to 240 DC	40	T4, T135°C
	up to 1.7	up to 240 DC	65	T6, T85°C
	≤19.7	up to 240 DC	70	T3, T200°C
EM5	up to 2.5	up to 440 AC	40	T4, T135°C
	2.5-4	up to 440 AC	65	T3, T200°C
	up to 5	up to 440 AC	60	T4, T135°C
	4-10	up to 440 DC	40	T3, T200°C
	up to 3.5	up to 240 DC	40	T5, T100°C
	up to 3.5	up to 240 DC	40	T3, T200°C
	up to 3.5	up to 240 DC	60	T4, T135°C
	up to 3.5	up to 240 DC	60	T3, T200°C
	3.5-6.9	up to 240 DC	65	T3, T200°C
	6.9-22.0	up to 240 DC	40	T3, T200°C
	up to 10	up to 440 50/60 Hz	65	T3, T200°C

1.6 Marking

1.6.1 The nameplate attached directly to the solenoid or the solenoid enclosure shall bear the following markings:

- Metran trademark;
- Manufacturer’s name and the country of manufacture;
- Valve model string;
- Serial number according to the manufacturer's numbering system;
- Fluid;
- Operating pressure range;
- DN;
- Type of threaded pipe connection;
- Supply voltage;
- Power consumption;
- Ingress protection (IP) class;
- Date of manufacture (year and month);
- Mark of Conformity for products in the market of Eurasian Economic Union countries;
- Additional markings are allowed on the nameplate in accordance with the design documentation.

1.6.2 For explosion-proof valves, the nameplate is additionally marked with:

- Special explosion protection mark in accordance with CU TR 012/2011;
- Certification Authority name;
- Number of the Certificate of Conformity to CU TR 012/2011;
- Explosion protection marking as per GOST 31610.0 depending on the version;
- Warning “OPEN AT LEAST 35 MINUTES AFTER DE-ENERGIZATION”.

1.6.3 Any techniques may be used to apply marking on the valve nameplate (1.6.1-1.6.2); they must ensure text integrity and clarity over the entire lifetime.

1.6.4 Transport marking of containers complies with GOST 14192, manufacturer’s drawings and includes handling signs THIS SIDE UP.

The main, additional and information signs are marked on one of the side walls of the container (box) with black indelible paint.

1.7 Packaging

1.7.1 Valves should be packaged in closed ventilated areas at an ambient temperature of 15 to 40 °C and relative air humidity up to 80% provided that the air is free of aggressive constituents.

1.7.2 Valve consumer containers are cardboard boxes. The valve is secured against movement by cardboard spacers or packing paper.

1.7.3 The packing label is affixed to the consumer container. The product documentation is placed under the cover of the consumer container.

1.7.4 When valves are exported to countries with tropical climate, the accompanying documentation is packed according to GOST 23170.

1.7.5 Shipping containers are plywood or cardboard boxes.

When shipping to the Far North, the shipping containers are boxes of type III-1 or VI according to GOST 5959.

1.7.6 The total mass of the valve shipping container does not exceed 50 kg.

2 Operation

2.1 Operating Restrictions

2.1.1 Solenoid valves are intended for use only within the specifications stated on the nameplate.

2.1.2 Operation of valves is only permitted if safety instructions approved by management of the operating company are available. Such instructions must consider specific application conditions in a particular process.

2.1.3 Modification of the equipment design is allowed only after consultation with the manufacturer or its representative.

2.1.4 Explosion-proof valves are installed in hazardous areas 0 and/or 1 and/or 2 according to GOST IEC 60079-10-1 for categories of explosive mixtures IIA, IIB, IIC and temperature class T1...T6 according to GOST 31610.20-1 / IEC 60079-20-1 and zones of classes 21 and 22 according to GOST 31610.10-2 / IEC 60079-10-2 according to the explosion protection marking of electrical equipment, GOST IEC 60079-14 and other documents regulating the use of electrical equipment in potentially explosive environments.

2.1.5 X sign at the end of the valve explosion protection marking indicates that special conditions must be observed during operation:

– The solenoids must be operated in accordance with the operating instructions provided by the manufacturer.
– The maximum surface temperature of the valve must not exceed the temperature of the specified temperature class. The temperature class is assigned according to the temperature of the fluid, this relationship is shown in Table 15.

2.1.6 WSNF, NF, WSCR Solenoids:

– Flameproof joints cannot be repaired.
– The special cover fasteners are socket head screws conforming to ISO 4762. The minimum screw grade must be A4-70. Screws should only be replaced with identical screws.

2.1.7 WSNFIS, NFIS, WSCRIS Solenoids:

- Solenoids shall only be connected to intrinsically safe certified equipment with compatible electrical parameters.
- NFIS solenoids marked 1Ex ia IIC T6 Gb X, Ex tb IIIC T85°C Db X must be protected against shock or friction.
- Solenoids must be equipped with certified cable entries with a degree of protection appropriate for the application.

2.1.8 WSCREM Solenoids:

- Solenoids must be equipped with certified cable entries with a degree of protection appropriate for the application.
- An external protection device capable of continuously withstanding 1.7 times the rated current shall be installed in front of the equipment.

2.1.9 PV Solenoids:

- Solenoids shall be connected to a power supply protected by a fuse capable of interrupting any short circuit current.
- During installation, the free end of the permanently connected integral cable must be suitably closed. The terminals of solenoids that are supplied with an integral cable without an additional cable entry must also be adequately protected against mechanical damage.
- EMXX and EM5 solenoids are suitable for use in liquid fuel metering pumps, dispensers and remote pump units only if they are equipped with cables marked H03V2V2-F, H05V2V2-F or H05V2V5-F.

2.1.10 WSEM, EM Solenoids:

- The solenoid shall be protected by a suitably rated fuse (1.5 x I nom, mentioned on the nameplate) capable of interrupting the prospective short circuit current.
- If the solenoid is used in a dust environment, the risk of electrostatic discharge shall be avoided.

2.1.11 For WSNFIS, NFIS, WSCRIS Solenoids:

– The delay time until the valve is actuated after energizing is less than 2 sec.
– Only air or neutral gas can be used as the fluid.

Table 15. Temperature Class vs. Maximum Fluid Temperature

Maximum Fluid Temperature, °C	**Temperature Class for Group II**	**Maximum Surface Temperature, °C**
+80	T6	T85°C
+95	T5	T100°C
+130	T4	T135°C
+195	T3	T200°C
+290	T2	T300°C
+440	T1	T450°C

2.2 Preparation for Use

2.2.1 Check container integrity upon receipt of solenoid valve shipment. Take formal note in case of its damage and file a complaint with the carrier.

2.2.2 In wintertime, boxes with valves should be unpacked in a heated room at least 12 hours after entering.

2.2.3 Check completeness and marking in accordance with the Technical Data Sheet, make sure that there is no damage. Valves shall have no visible damage. The surface of the solenoid enclosure, valve body and threaded connections shall be free from corrosion, cavities, burrs and cracks.

OPERATION OF DAMAGED VALVES IS PROHIBITED.

2.2.4 Check the explosion protection marking for valves with explosion-proof solenoids.

IT IS FORBIDDEN TO OPERATE THE VALVE WITH AN EXPLOSION PROTECTION MARKING THAT DOES NOT FIT THE LOCATION.

2.2.5 The valve may only be installed on site by the personnel who read this Operation Manual and passed safety training.

2.2.6 The valve may be installed in any position, which is convenient for maintenance. For installation, it is recommended to consider overall and installation dimensions given in Appendix B.

2.2.7 If there is an explosion-proof solenoid enclosure, the connection is carried out using a cable entry. The cable entries must have a reliable sealing of the holes with IP degree not worse than that of the solenoid enclosure. The screws fixing the enclosure cover must be tightened to the stop with the torque specified in Appendix C.

2.2.8 Before installation depressurize the piping system and clean internally.

2.2.9 The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.

2.2.10 Reducing the connections may cause improper operation or malfunctioning.

2.2.11 To prevent damage of the valve sealing surface by contaminants from the fluid, a filter must be installed upstream of the valve on the supply side of the fluid.

2.2.12 The valves are intended for use on clean dry air or inert gas, filtered to 50 micrometer maximum.

2.2.13 The dew point of the fluid should be at least 10°C below the minimum temperature that affects any part of the air or gas system to prevent freezing.

2.2.14 If tape, paste, spray or a similar lubricant is used when tightening pipe connections, avoid particles entering inner chambers.

2.2.15 If necessary, a sealant or tape that is chemically inert to the valve materials may be used to seal the connections.

2.2.16 To avoid damage to the valve, do not overtighten pipe connections.

2.2.17 The pipe connections should not apply any force, torque or strain to the product.

2.2.18 All required electrical connections are only to be made by trained personnel and have to be in accordance with the local regulations and standards.

2.2.19 Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.

2.2.20 The cross-section and type of cable for valve connection should be selected taking into account the solenoid power rating, standards requirements, operating conditions and the type of solenoid electrical connection shown in Table 5.

2.2.21 All electrical screw terminals must be properly tightened according to Appendix C before putting into service.

2.2.22 Dependent upon voltage and solenoid enclosure, electrical components must be provided with an earth connection and satisfy local regulations and standards.

2.3 Provision of Explosion Protection during Installation

2.3.1 Follow the instructions in these documents during valve installation:

- GOST 31610.0 (IEC 60079-0);
- GOST IEC 60079-14;
- This Manual and other local regulatory documents.

2.3.2 Valves may only be installed and operated by people who are familiar with this Operation Manual and have appropriate training.

2.3.3 Installation is carried out at power off. If an explosive mixture is present at the time of installation of explosion-proof valves, the valve must not be subjected to friction or impact that could cause sparking.

2.3.4 Prior to installation, the valve must be inspected. It is necessary to pay attention to explosion protection marking, warning labels, integrity of enclosure housing and availability of the grounding clip (for valves with Explosion-Proof Enclosure or Dust-Ignition Proof Enclosure protection type), the state of plug-in cable, availability of glands for cables and covers.

2.3.5 For valves with Explosion-Proof Enclosure protection type, external electrical circuits should be connected through the cable entries that meet the requirements of GOST IEC 60079-1.

2.3.6 For valves with Dust-Ignition Proof Enclosure protection type, external electrical circuits should be connected through the cable entries that meet the requirements of GOST IEC 60079-31.

2.4 Use

2.4.1 During operation of the valves, follow instructions of this Operation Manual, end-user instructions and other normative technical documents applicable to this branch of industry.

2.4.2 When operating explosion-proof valves, protective measures must be taken in accordance with the special conditions for safe use specified under the X sign.

2.4.3 Before pressurizing the system, first carry-out an electrical test.

2.4.4 Before use, energize the coil a few times and notice a muffled click signifying the solenoid operation.

2.4.5 To test a pressurized system with a de-energized valve, use MO or MS manual operator. Dismount the manual operator and mount the plug to avoid unauthorized operation.

2.5 Actions under Extreme Conditions

2.5.1 Possible failures that may occur during valve operation, troubleshooting and remedies are described in Table 16.

Table 16. Failures and Remedies

Consequences of Failures and Damage	Possible Cause	Guidelines to Determine Consequences of Unit (Part) Failures and Damage	Guidelines to Eliminate Consequences of Failures and Damage
The valve does not operate when a control signal is given	Solenoid circuit discontinuity or cable breakdown	Measure resistance of solenoid and communication cable wires.	Disassemble solenoid housing, repair breakage or replace solenoid.
	Jammed spindle (moving parts)	Dismantle and disassemble the valve, inspect spindle and core for contamination and damage.	Clean off dirt, blow down with pressurized air. If damaged, replace the spindle. If the core is damaged, contact the manufacturer for repair.
	Poor electrical contact of terminals	Check terminal dirtiness and holding strength.	Clean off dirt, tighten terminals to the torque specified in Appendix C.
The valve does not close when de-energized	Spring breakage inside the spindle	Disassemble the valve, inspect the spindle for damage.	Replace the spindle.
	Jamming due to contamination of moving parts	Dismantle and disassemble the valve, inspect moving parts.	Clean off dirt, blow down with pressurized air or replace damaged parts.

Table 16 (Continued)

Excessive leakage	Cracks in the valve body	Inspect the valve body for damage and leaks; if the fluid is gaseous, soap the body to identify the location of the damage.	Contact the manufacturer.
	Corrosion damage to the valve body	Inspect the valve body for corrosion processes.	Contact the manufacturer.
	Damage to sealing surfaces	Disassemble the valve, clean it from dirt, inspect for damage to O-rings, valve seat.	Replace damaged seals. If the valve seat is damaged, contact the manufacturer.
	Contamination of inner chambers	Disassemble valve, inspect for contamination.	Clean off dirt, blow down with pressurized air.
Manual operator leakage	Worn rubber O-ring	Unscrew the manual operator and visually check for wear of the O-ring.	Disassemble the manual operator and replace a rubber O-ring.
	Deformation of the stem	Unscrew the manual operator and visually check the stem.	Straighten the stem. If it cannot be straightened, replace the manual operator.
Leaky joints	Seals in the valve joints are in bad condition	Soap the valve joints, observe which joints show bubble formation.	Replace leaky seals.

2.5.2 Critical Failures

– Excessive leakage through the valve trim;
– Loss of tightness against the environment;
– Damage to the explosion protection of the solenoid enclosure;
– Short circuit or open circuit of the solenoid.

2.5.3 Personnel Actions in Case of Critical Failure

In case of critical failure, de-energize and depressurize the equipment section with the failed valve. Valves with critical failures are not allowed for operation.

3 Maintenance

3.1 General Guidelines

3.1.1 The valves may only be serviced by people who are familiar with this Operation Manual and have appropriate training.

3.1.2 Valve maintenance depends on the operating conditions.

3.1.3 Periodic cleaning is recommended; its frequency shall depend on the fluid and the operating conditions.

3.2 Safety Provisions

3.2.1 When performing maintenance, precautions must be taken to protect against thermal burns, mechanical impact and other types of injury in accordance with the safety rules established at the site.

3.2.2 When performing maintenance on the explosion-proof valve, it is also necessary to observe the precautions set out in 2.3.

3.2.3 When using the valve with the manual operator, it is necessary to observe precautions to protect against accidental actuation of the valve.

3.3 Preventive Inspection

3.3.1 Preventive inspections are carried out in accordance with the procedure established at the end user site and may include:

- Checking the integrity of the solenoid enclosure and the cable sheath, absence of corrosion and damage on them; checking the presence of all fasteners and their elements;
- Checking the presence of explosion protection marking (for explosion-proof valves);
- Checking condition of the ground unit (if any): grounding screws should be tightened, they should contain no rust. They should be cleaned, if necessary.

3.2.2 During maintenance, components shall be checked for excessive wear.

3.3.3 In case of problems during maintenance, the manufacturer or its authorized representatives should be contacted.

4 Routine Repair

4.1 General Guidelines

4.1.1 Routine repair of valves is performed by employees of the service organization, who have been certified by the qualification committee and read this Operation Manual.

4.1.2 Possible failures, causes and remedies are given in Table 16.

4.1.3 Failed assemblies and parts may only be replaced with original spare parts. To order spare parts, please contact the manufacturer.

4.2 Safety Provisions

4.2.1 During routine repair of the valve, general safety provisions in accordance with the requirements of GOST 12.2.003-91, GOST R 53672-2009, GOST 12.1.019-79, GOST 12.2.007-75, end-user instructions and other normative technical documents applicable to this branch of industry apply.

4.2.2 IT IS STRICTLY FORBIDDEN to perform remedial actions in the presence of:

a) power supply to the valve solenoid;

b) pressure in the pipeline.

4.2.3 WARNING! IT IS STRICTLY FORBIDDEN to perform unauthorized adjustment and disassembly of the valve.

4.2.4 IT IS STRICTLY FORBIDDEN to carry out welding or other works connected with heating of the valve and the pipeline connected to it during the routine repair of the valve.

4.2.5 To avoid accidents and incidents, it is forbidden to start working with the valve without reading this Operation Manual.

5 Storage

5.1.1 Valves may be stored both in transport containers piled and in consumer containers or without packaging on the racks. Transport containers may be piled up to 5 boxes high.

5.1.2 Storage conditions in transport containers and inner packaging shall comply with Class 3 (G3) in accordance with GOST 15150.

5.1.3 Storage conditions for valves without packaging shall comply with Class 1 (L) in accordance with GOST 15150.

5.1.4 Air in the room where valves are stored should be free of any corrosive substances.

6 Transportation

6.1.1 Valves in transport containers are transported by any mode of enclosed transport in accordance with the instructions and rules applicable for this mode of transport. Method of box stowage shall exclude any displacement of boxes in transport vehicles. When handling and transporting, avoid exposure to direct sunlight, moisture, mechanical shocks.

6.1.2 When shipping and storing, the position of transport containers with valves shall correspond to manipulation signs.

6.1.3 Transportation conditions shall meet storage conditions 5 or 3 (for sea shipping under deck) in accordance with GOST 15150.

6.1.4 The period of valve transportation in appropriate conditions shall not exceed 3 months.

7 Disposal

Valves are disposed in accordance with a local procedure.

APPENDIX A

(Mandatory)

List of Reference Documents

Table A.1

Reference Document	Description	Number of Section, Subsection, Paragraph, Subparagraph, Appendix with Reference
CU TR 010/2011	On Safety of Machines and Equipment	1.1.4
CU TR 012/2011	Technical Regulation of the Customs Union CU TR 012/2011 On Safety of Equipment Intended for Use in Explosive Atmospheres	1.1.5, 1.5.1, 1.5.2, 1.6.2
GOST 31610.0-2019 (IEC 60079-0:2017)	Explosive Atmospheres. Part 0. Equipment. General Requirements	1.1.5, 1.2.6, 1.5.1, 1.5.2, 1.6.2, 2.3.1
GOST IEC 60079-1-2013	Explosive Atmospheres. Part 1. Equipment with Explosion-Proof Enclosure “d” Explosion Protection Type	1.1.5, 1.2.6, 1.5.2, 2.3.1, 2.3.5
GOST 31610.7-2017 (IEC 60079-7:2015)	Explosive Atmospheres. Part 7. Equipment. Increased Safety “e”	1.1.5, 1.2.6, 1.5.2
GOST 31610.11-2014 (IEC 60079-11:2011)	Explosive Atmospheres. Part 11. Equipment with Intrinsically Safe Electrical Circuit “i” Explosion Protection Type	1.1.5, 1.2.6, 1.5.2, 2.3.1
GOST IEC 60079-14-2013	Explosive Atmospheres. Part 14. Electrical Installations Design, Selection and Erection	1.1.5, 2.1.4
GOST 31610.18-2016 (IEC 60079-18:2014)	Explosive Atmospheres. Part 18. Equipment with Encapsulation “m” Explosion Protection Type	1.1.5, 1.2.6, 1.5.2

Table A.1 (Continued)

GOST IEC 60079-31-2013	Explosive Atmospheres. Part 31. Equipment with Dust-Ignition Proof Enclosure “t” Explosion Protection Type	1.1.5, 1.2.6, 1.5.2, 2.3.1, 2.3.6
GOST 32407-2013 (ISO/DIS 80079-36)	Explosive Atmospheres. Part 36. Non-Electrical Equipment for Use in Explosive Atmospheres. General Test Requirements and Methods	1.1.5, 1.5.1
GOST ISO/DIS 80079-37-2013	Explosive Atmospheres. Part 37. Non-Electrical Equipment for Use in Explosive Atmospheres. Non-Electrical Equipment with Constructional Safety “c”, Control of Ignition Source “b”, Liquid Immersion “k” Explosion Protection Types	1.1.5, 1.5.1
GOST 31610.20-1-2020 (ISO/IEC 80079-20-1:2017)	Explosive Atmospheres. Part 20.1. Material Characteristics for Gas and Vapor Classification. Test Methods and Data	2.1.4
GOST IEC 60079-10-1-2013	Explosive Atmospheres. Part 10-1. Classification of Areas. Explosive Gas Atmospheres	2.1.4
GOST IEC 60079-10-2-2011	Explosive Atmospheres. Part 10-2. Classification of Areas. Explosive Dust Atmospheres	2.1.4
GOST 8865-93 (IEC 85-84)	Electrical Insulation Systems. Thermal Evaluation and Classification	1.2.1
GOST 14192-96	Cargo Marking	1.6.4
GOST 23170-78	Packing for Products of Engineering Industry. General Requirements	1.7.4

Table A.1 (Continued)

GOST 5959-80	Uncollapsable Wooden Sheet Material Boxes for Weights up to 200 kg. General Specifications	1.7.5
GOST 12.2.003-91	Occupational Safety Standards System. Industrial Equipment. General Safety Requirements	4.2.1
GOST R 53672-2009	Pipeline Valves. General Safety Requirements	4.2.1
GOST 12.1.019-79	Occupational Safety Standards System. Electrical Safety. General Requirements and List of Protection Types	4.2.1
GOST 12.2.007-75	Electrical Products. General Safety Requirements	4.2.1
GOST 15150-69	Machines, instruments and other industrial products. Modifications for different climatic regions. Categories, operating, storage and transportation conditions as to environment climatic aspects influence	5.1.2, 5.1.3, 6.1.3
GOST IEC 60730-1-2011	Automatic electrical controls. Part 1. General requirements	1.2.6
EN175301-803A (ISO 4400)	Fluid power systems and components. Three-pin electrical plug connectors with earth contact. Characteristics and requirements	1.2.6
GOST 14254-2015 (IEC 60529:2013)	Degrees of protection provided by enclosures (IP code)	1.2.6

APPENDIX B

(Mandatory)

Valve Overall Dimensions

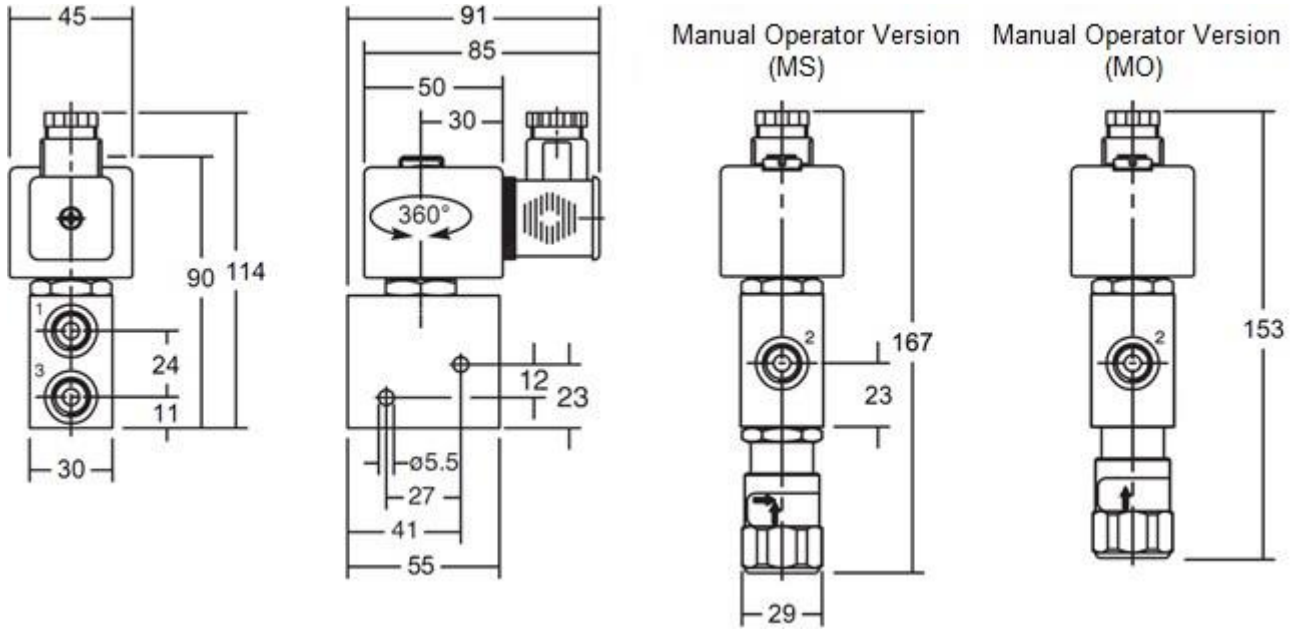


Figure 8. Overall Dimensions of the Valve with SC Enclosure, Basic Power

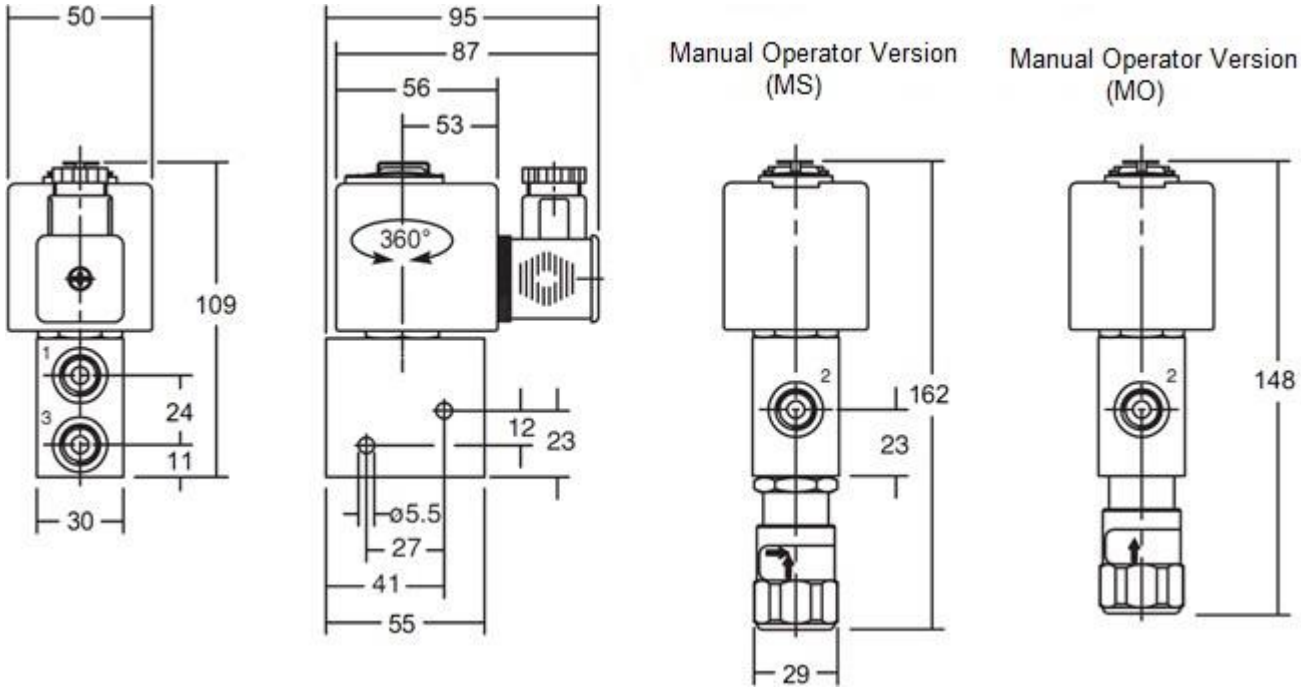


Figure 9. Overall Dimensions of the Valve with SC Enclosure, Medium and Reduced Power

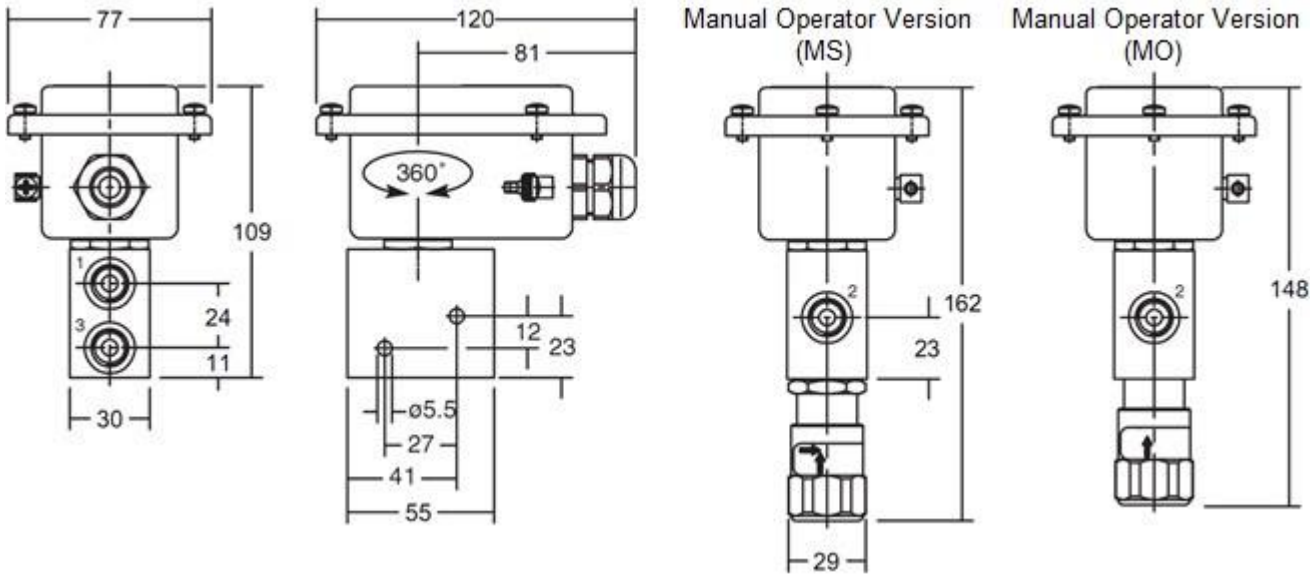


Figure 10. Overall Dimensions of the Valve with WP, WS, EM, WSEM Enclosures, Basic Power

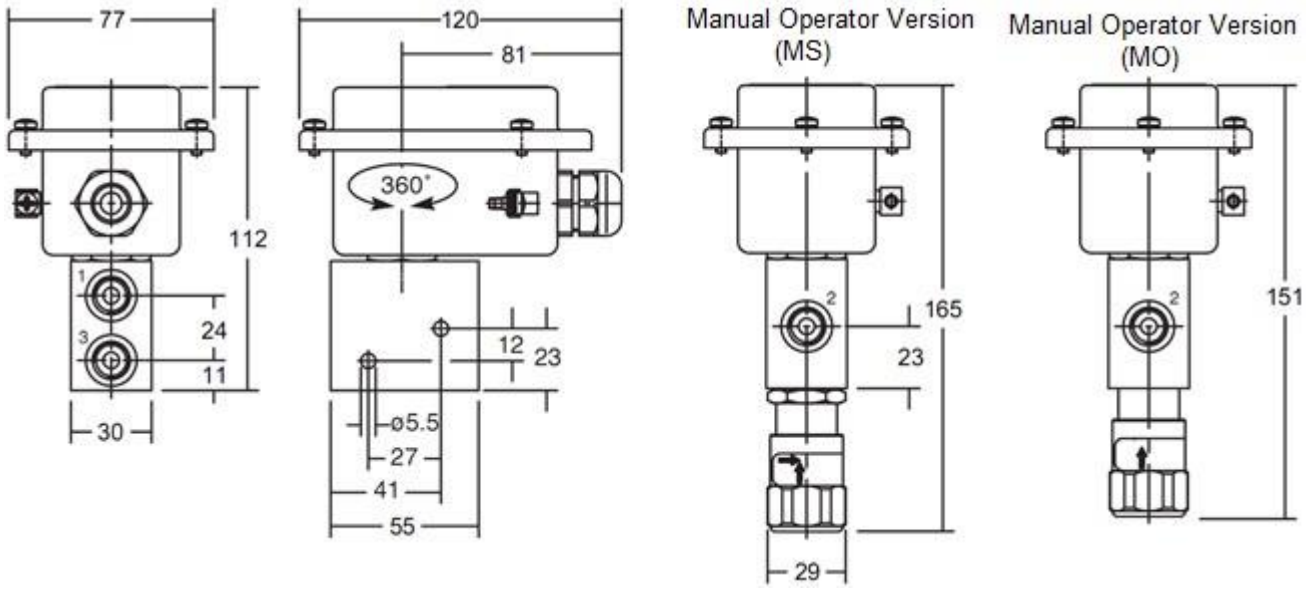


Figure 11. Overall Dimensions of the Valve with WP, WS, EM, WSEM Enclosures, Medium and Reduced Power

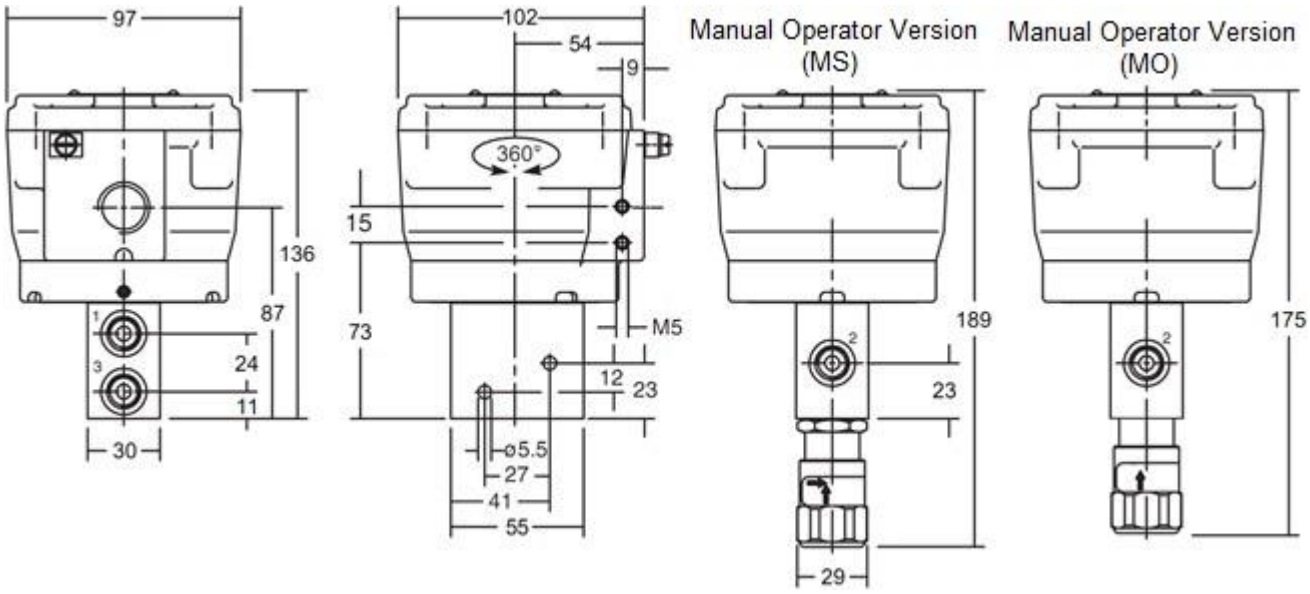


Figure 12. Overall Dimensions of the Valve with NF, WSNF Enclosures, Basic, Medium and Reduced Power

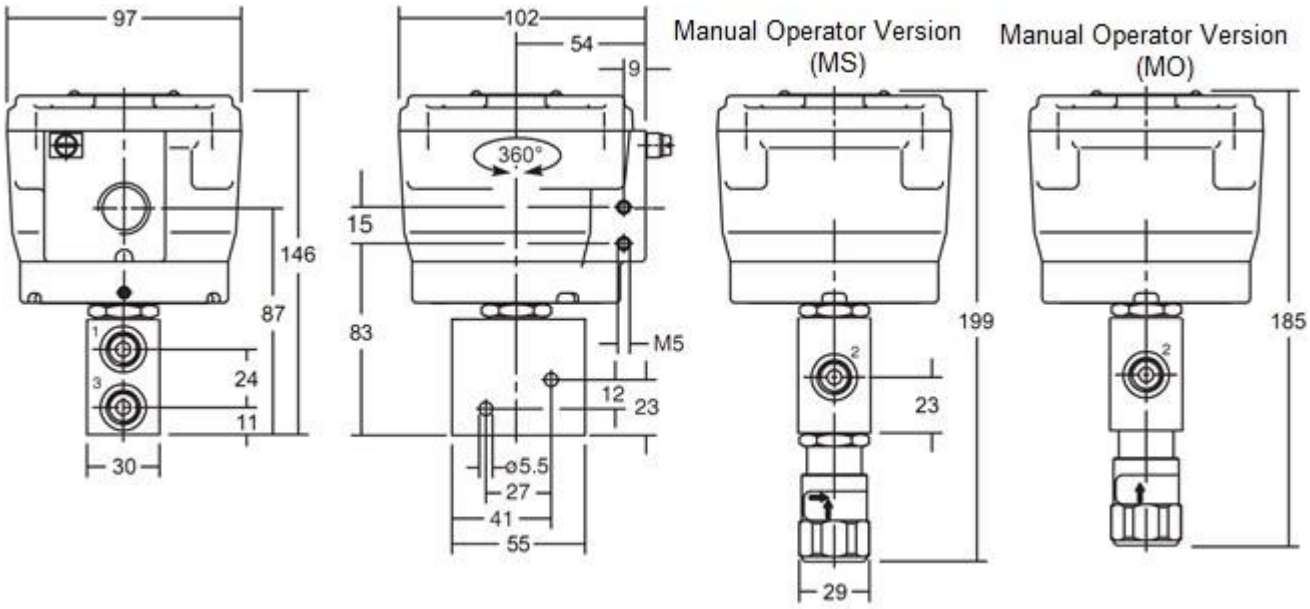


Figure 13. Overall Dimensions of the Valve with NF, WSNF, NFIS, WSNFIS Enclosures, Low Power

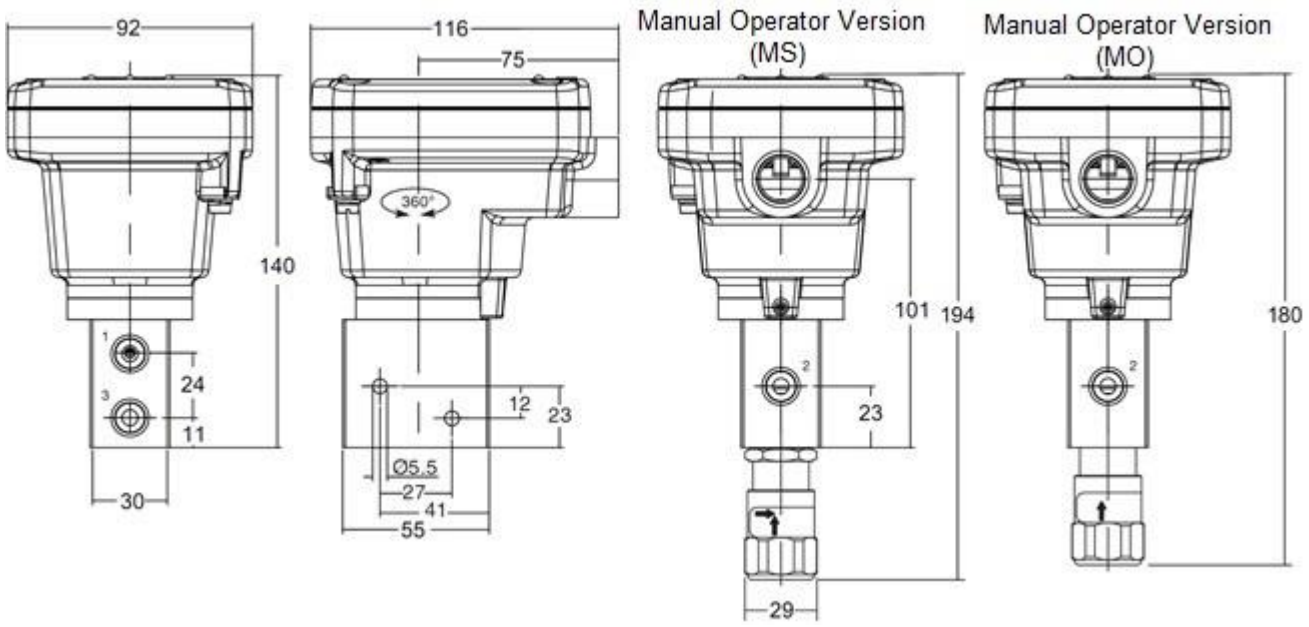


Figure 14. Overall Dimensions of the Valve with WSCR, WSCREM, WSCRIS Enclosures, Medium, Reduced and Low Power

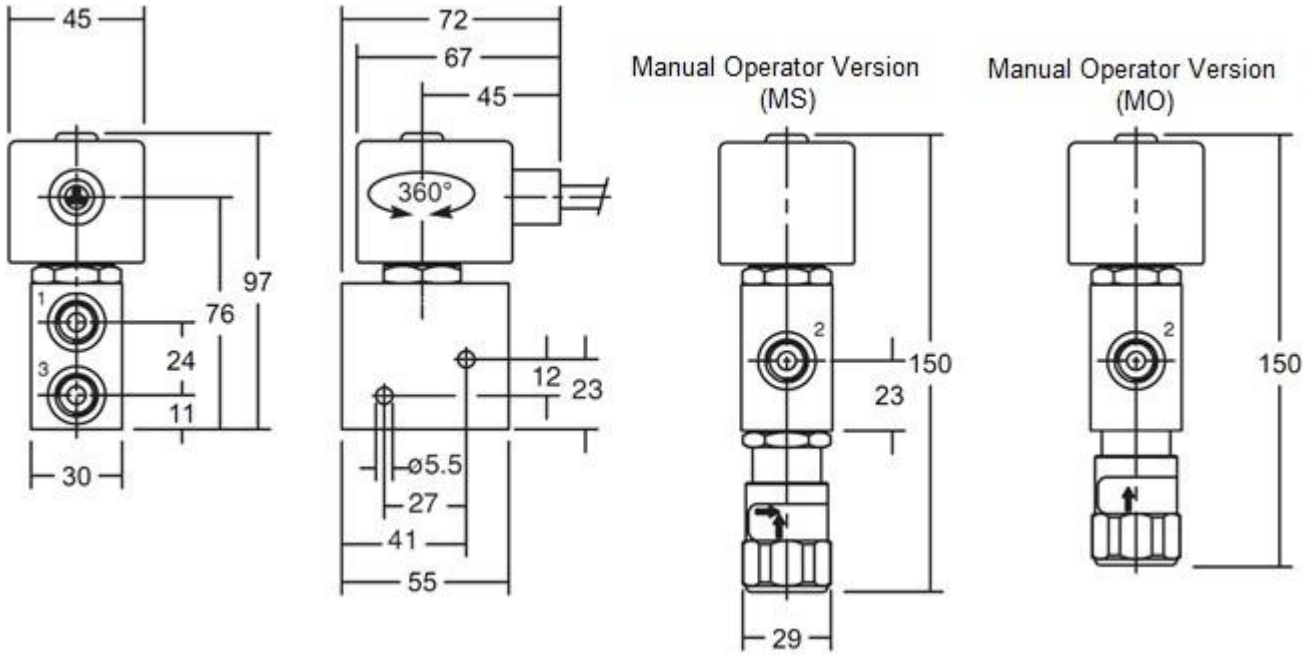


Figure 15. Overall Dimensions of the Valve with PV Enclosure, Basic Power

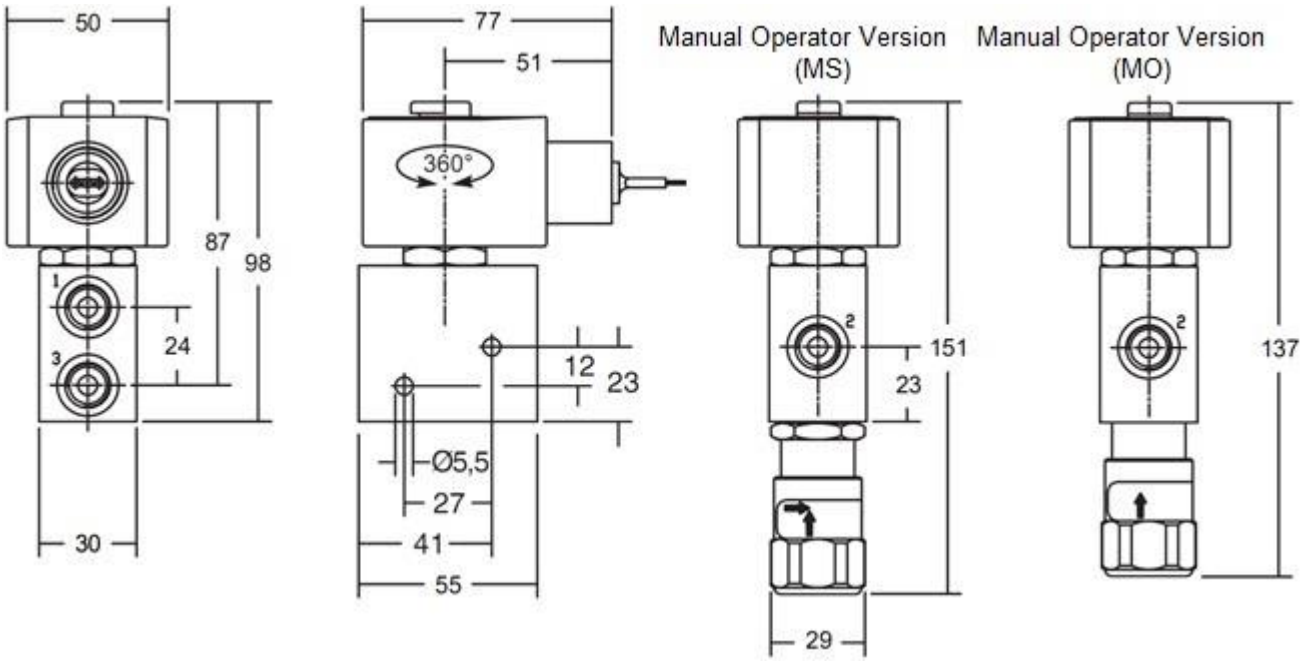


Figure 16. Overall Dimensions of the Valve with EF, EV Enclosures, Basic Power

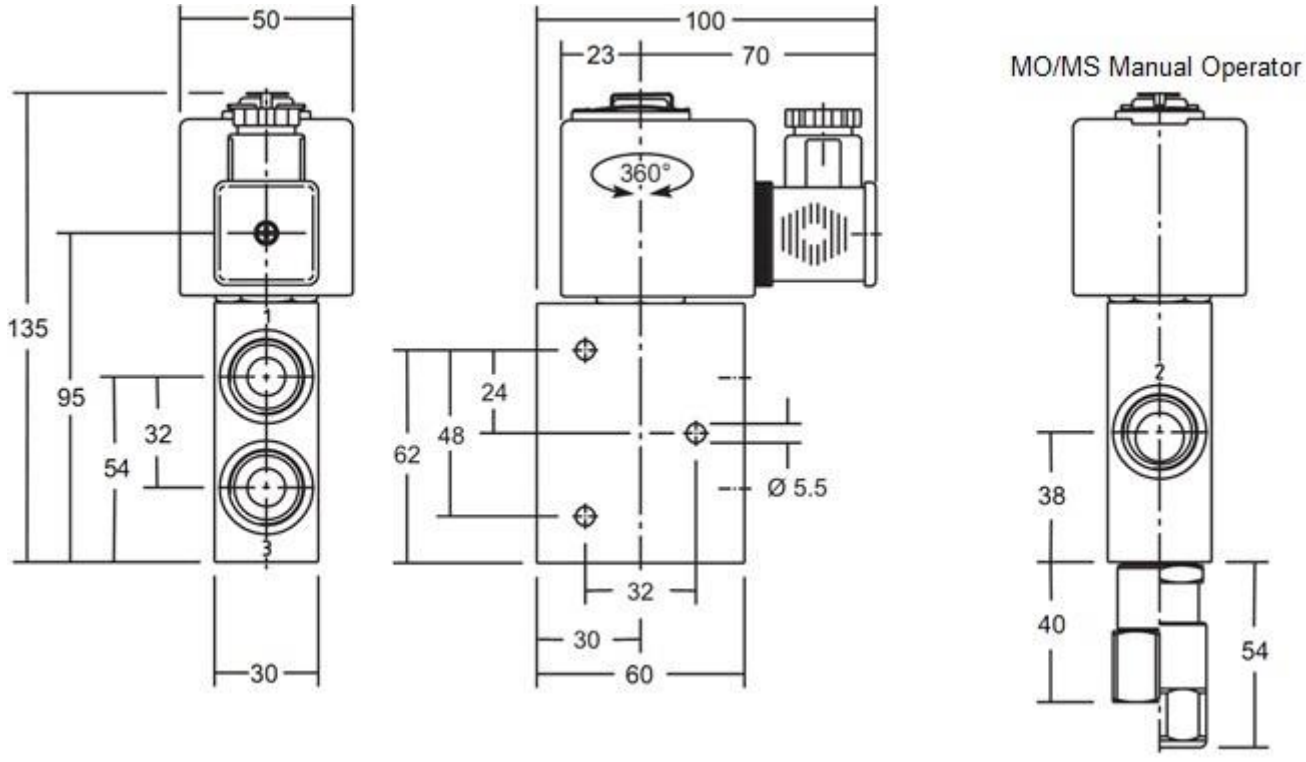


Figure 17. Overall Dimensions of the High Flow Valve with SC Enclosure, Basic Power

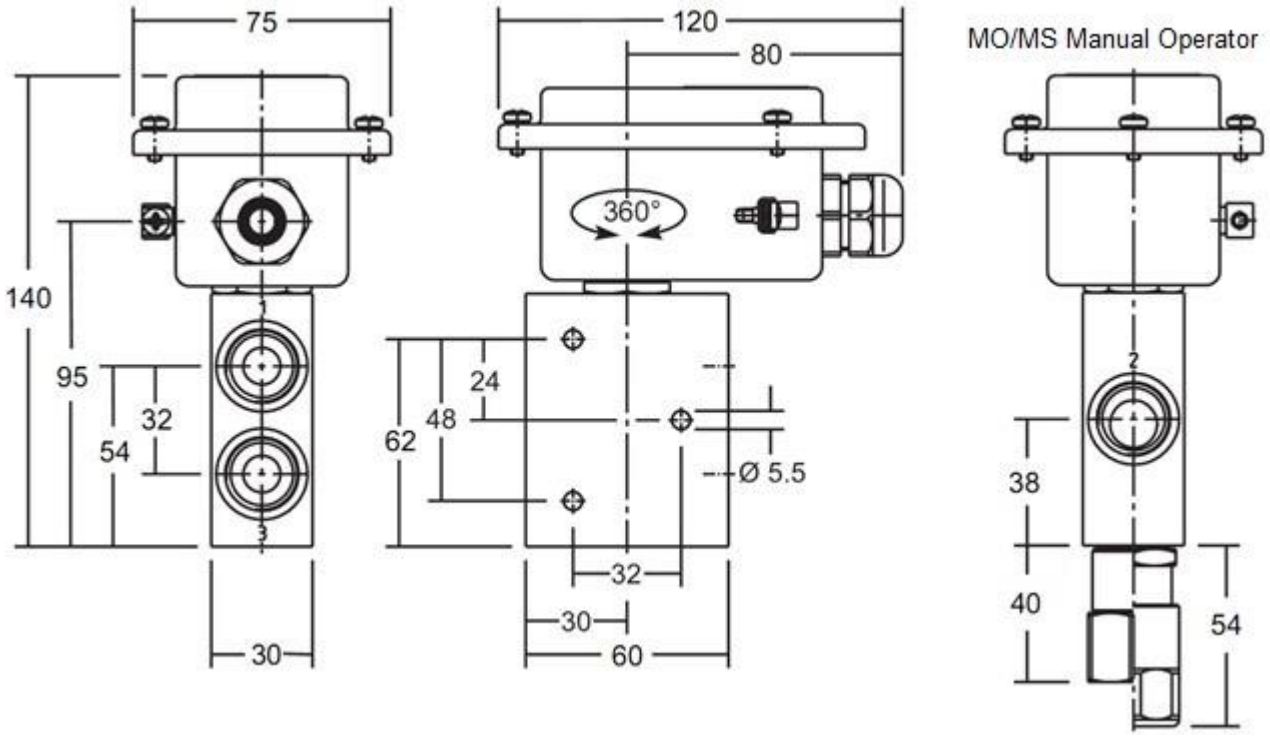


Figure 18. Overall Dimensions of the High Flow Valve with WP, WS, EM/WSEM Enclosures, Basic Power

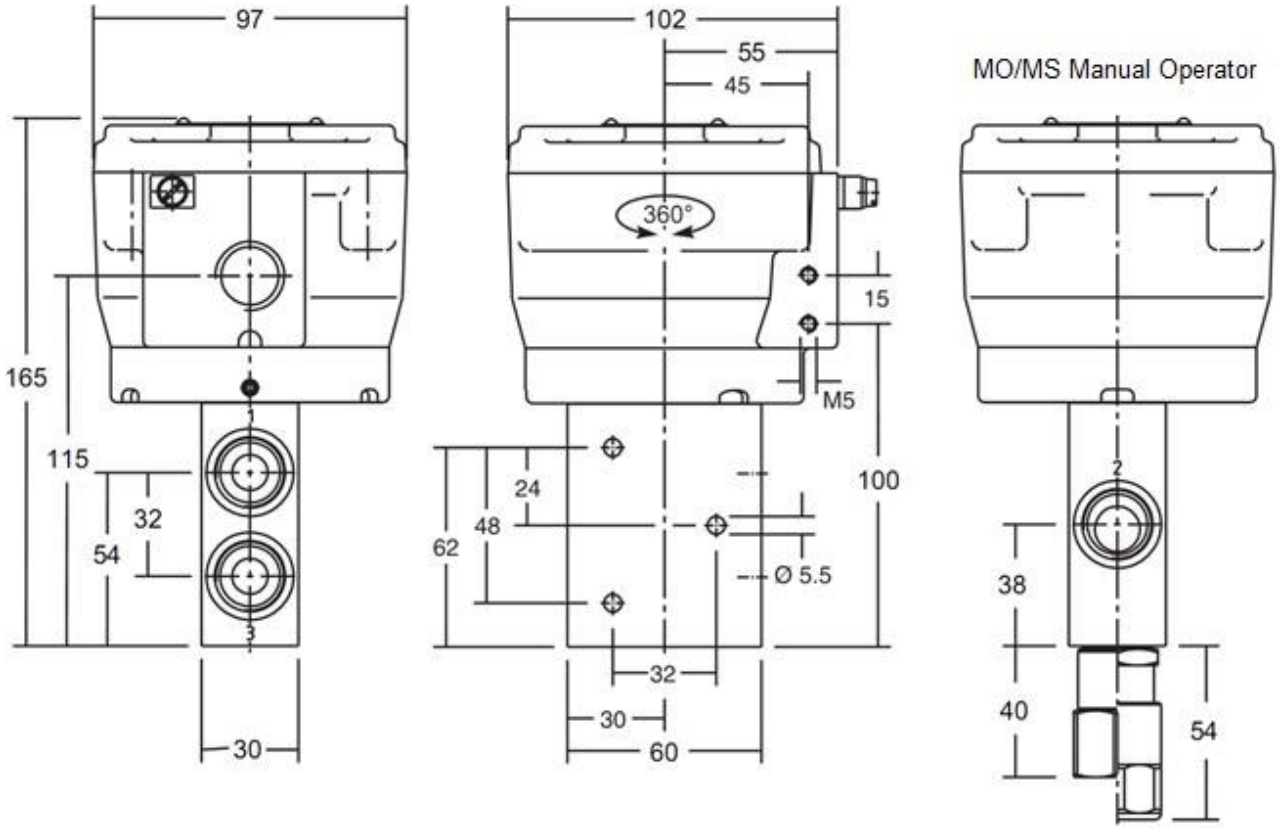


Figure 19. Overall Dimensions of the High Flow Valve with NF, WSNF Enclosures, Basic Power

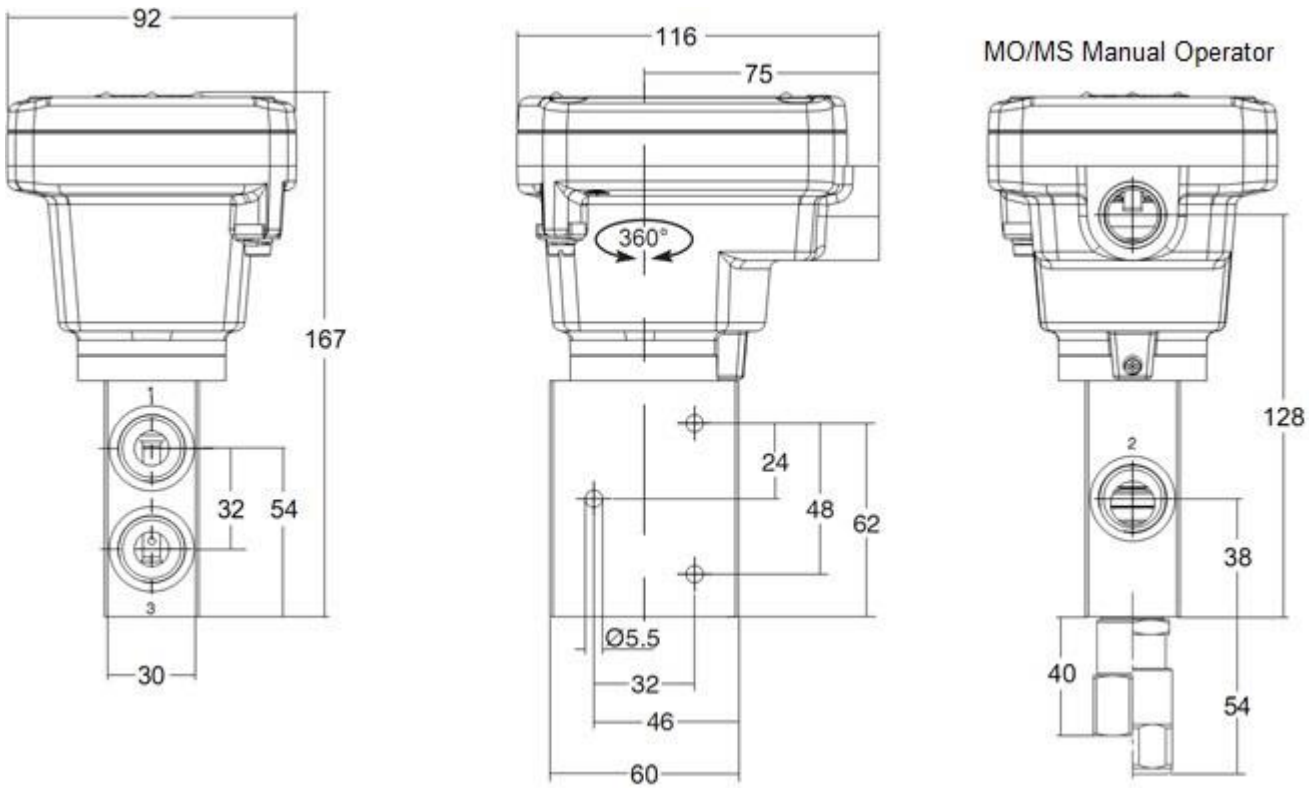


Figure 20. Overall Dimensions of the High Flow Valve with WSCR, WSCREM Enclosures, Basic Power

APPENDIX C

(Mandatory)

Torque Chart

To ensure proper installation of the valve and avoid damage to its parts, the threaded connections shall be tightened to a torque not exceeding that specified in Table 17.

Table 17. Threaded Connection Torques

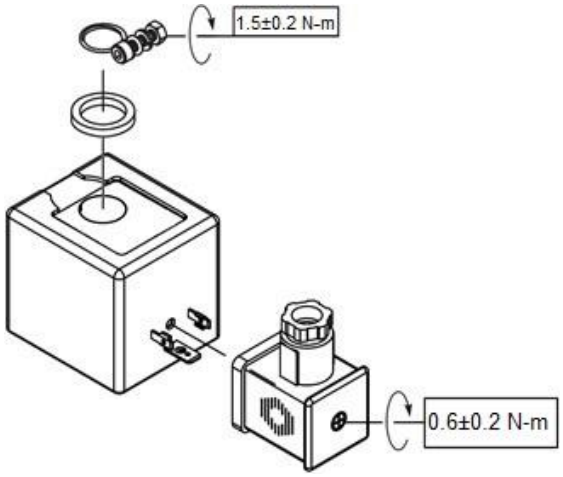
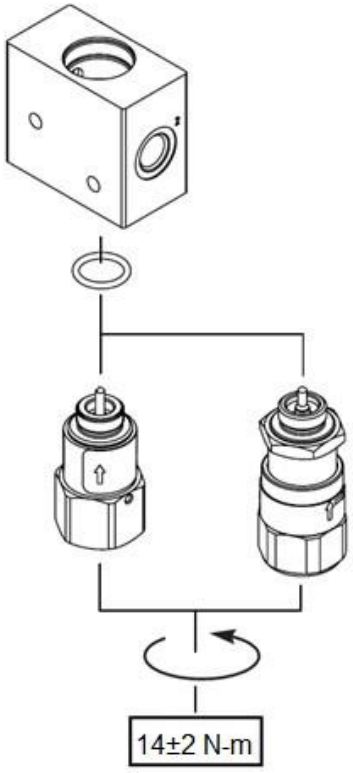
Image	Description
	Solenoid electrical connection, solenoid retainer installation for SC enclosure
	Installation of push and screw type manual operators

Table 17 (Continued)

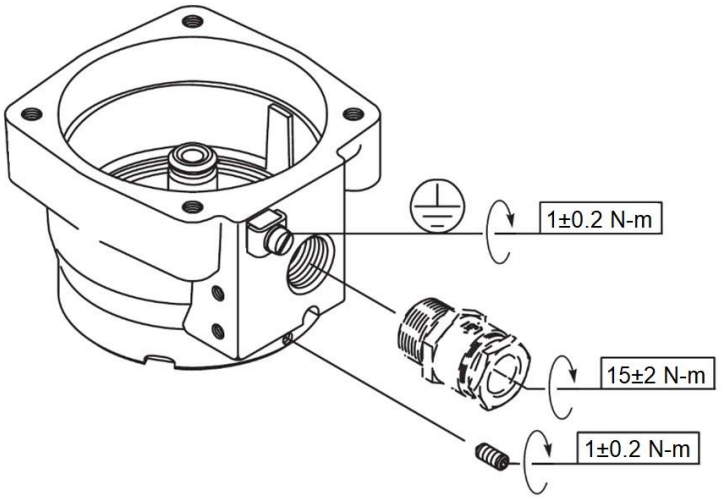
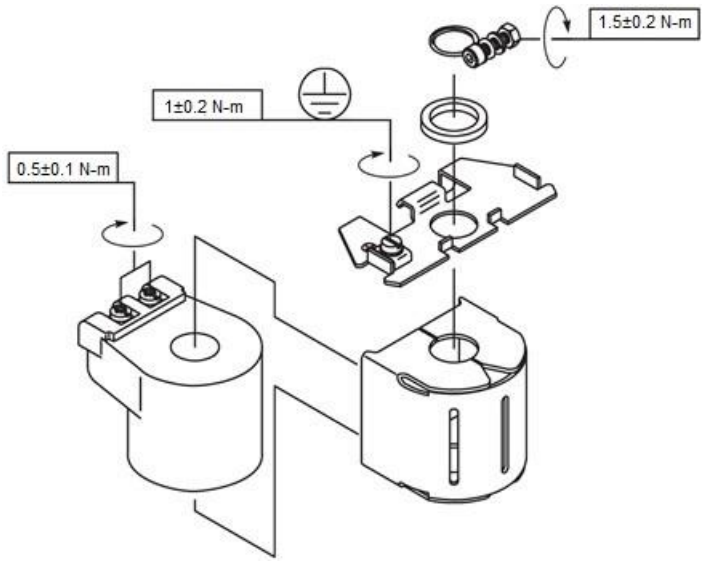
	Grounding connection, cable entry installation, tightening set screw for NF, WSNF enclosures
	Connecting conductors to solenoid terminals, grounding connection, installing solenoid retainer for NF, WSNF enclosures

Table 17 (Continued)

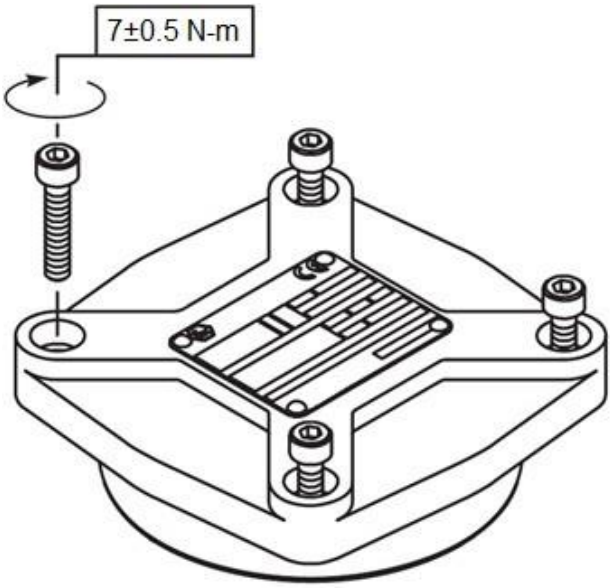
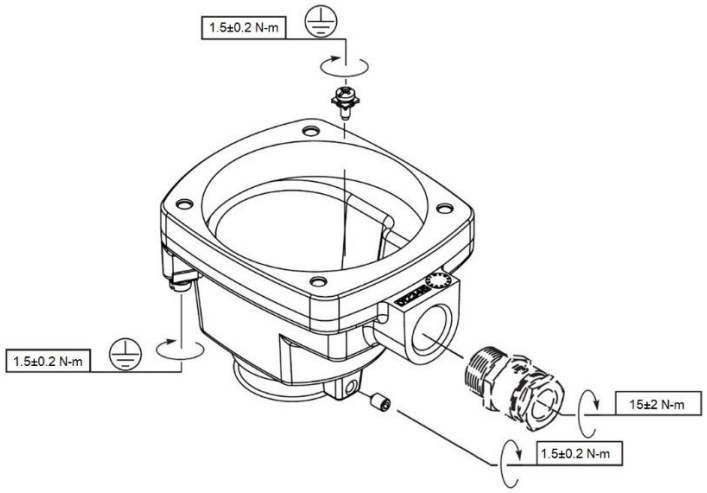
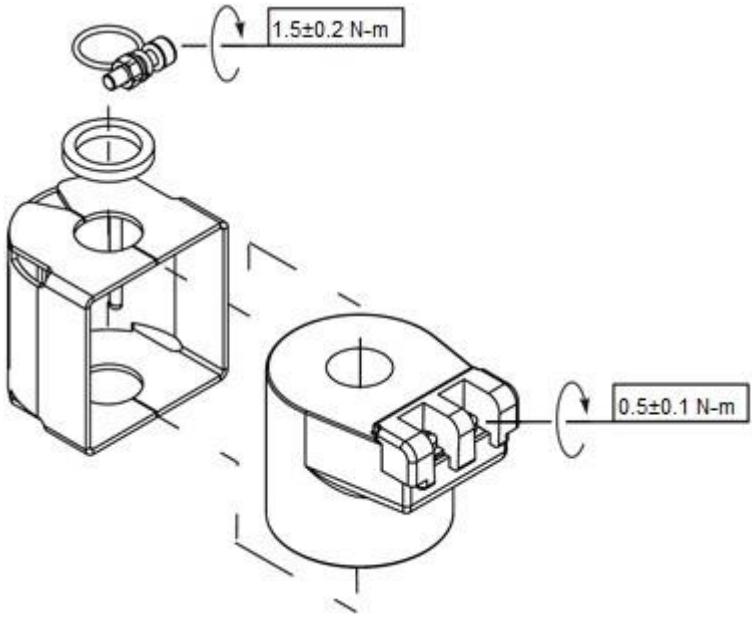
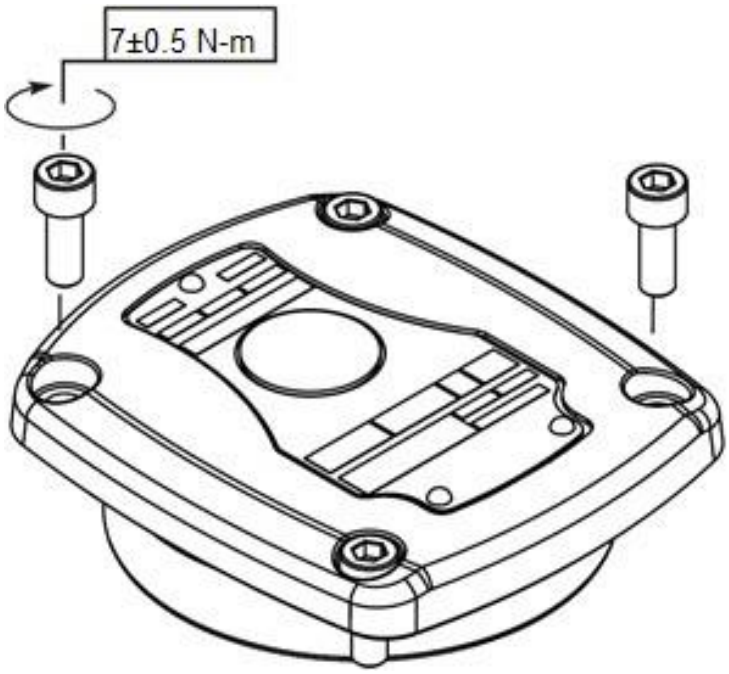
	Cover screws for NF, WSNF enclosures
	Grounding connection, cable entry installation, tightening set screw for WSCR enclosure

Table 17 (Continued)

	Connecting conductors to solenoid terminals, installing solenoid retainer for WSCR enclosure
	Cover screws for WSCR enclosure