

valve & automation



EAC CE

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2354



SIL 3 ROHS

 **ATEX**



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1. PRODUCT OVERVIEW

Solenoid valves are electromechanical parts used in the control of fluids. That is, they convert electrical energy into mechanical movement. This conversion is achieved through a magnetic circuit consisting of a solenoid coil. The term solenoid is also used for valve.

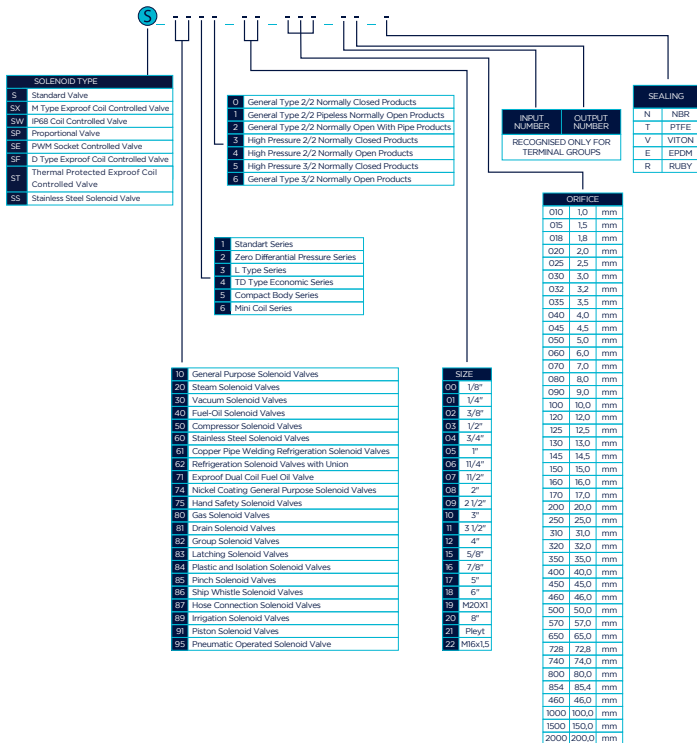
a. Intended Use of the Product

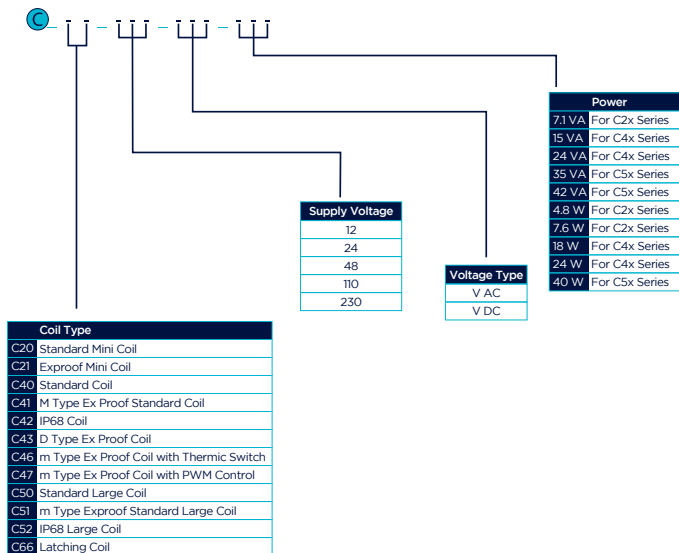
The solenoid valves are the control elements that are used for the fluids. The functions of the solenoid may be summarized as to provide the flow, cut the flow, proportion correctly, to mix two mixtures. In the forms of 2/2-way and 3/2-way, the solenoid valves may be used in various applications. They are the valves used in the fluid control the most. They are used in many fluids such as air, water, steam, acid, gas, natural gas, fuel-oil, gasoline, LPG, diesel oil and etc.

The reasons to use the solenoid valves:

- They have a compact structure;
- Cost-saving
- Rapidly start the operations; low-energy consumption;
- Compatible with the material;
- Long life-cycle;
- High reliability.

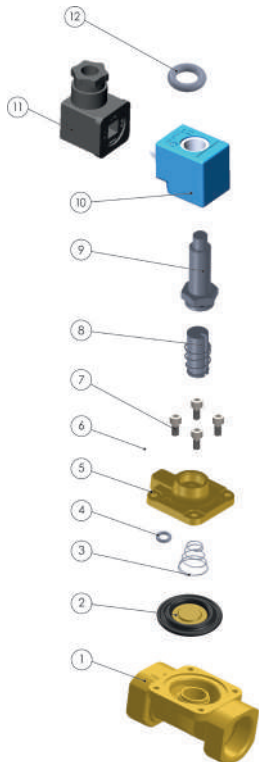
b. Product Coding System





The code starting with **S** is the solenoid valve's code and the code starting with **C** is the coil's code used on the valve.

c. Lists of Exploded Pictures and Parts



12	Hexagon Nut
11	Socket
10	Coil
9	Tube
8	Core
7	Bolt
6	Ball
5	Cover
4	O - RING
3	Spring
2	Diaphragm
1	Body
No	Part Name

Figure 1. Pilot-Control Solenoid Valve

Table 1. List of parts

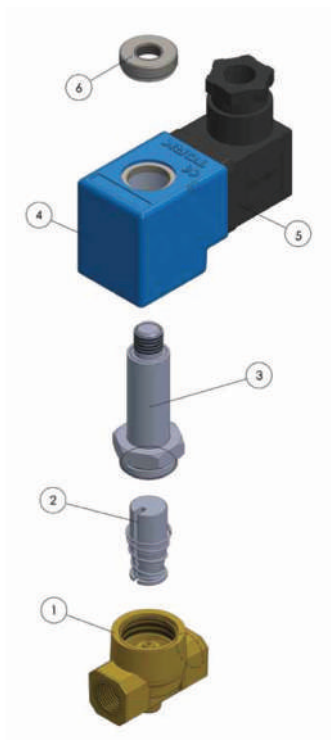


Figure 2. Direct Operated Solenoid Valves

6	Hexagon Nut
5	Socket
4	Coil
3	Tube
2	Core
1	Body
No	Part Name

Table 2. List of parts

d. Label Information

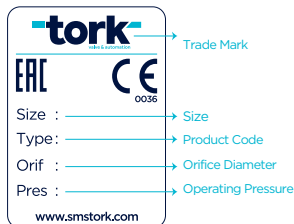


Figure 3. Labelling Details

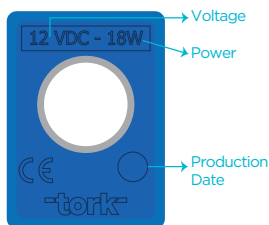


Figure 4. Coil Details

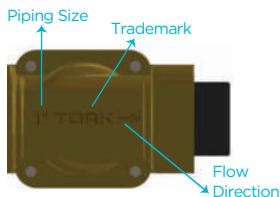


Figure 5. Details on the body -1
Please check the production date of the body as well.

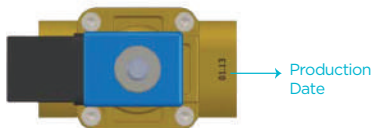


Figure 6. Details on the body -2

The general specifications of the valve are also written on the label. Please find it the pictures on the side. More data is available in the technical documentation. In case further details are needed, please contact your supplier.

After purchasing the solenoid valve, please check the data on the label. It should be checked if it has the desired specifications or not. These data influence the operation of the valve therefore your system operation.

The data written on the coil, that is, the operating voltage, frequency, and power should be checked. The electrical limits of the coil should be compatible with your system. The coil with excessive power will cause power loss while the coil with less power will cause the valve not to operate. The date of manufacture should also be checked.

Please check the connection scale and flow direction. This is important both for conducting the proper assembly and proper operation of the system.

e. Valves with Ex-Proof Solenoid Coils

In explosive environments or the environments with explosion risk, the TORK solenoid coils with ATEX certification are used. The solenoid valves with ex proof coils can be used in, for example, LPG, natural gas, fuel-oil, and diesel oil. The operating voltage of the solenoid coils are as follows:

AC	230V	110V	24V	12V	DC	110V	24V	12V
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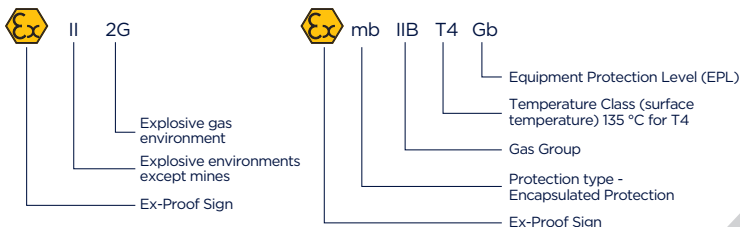
In ex-proof solenoid coils, all conductors are encapsulated with an insulating material according to the standard requirements. Therefore, the coils are provided with an IP65 socket and a 3m power cable already assembled.

The C46 model AtEx coils have a 120 degrees centigrade thermal switch. If the coil exceeds this temperature value for an unusual reason, the thermal relay prevents the coil from operating. When the coil temperature returns to normal, the coil starts working again.



Figure 7: TORK M Class and D Class ATEX Solenoid Valve Coil

Ex Codes Sample



Ground Connection of Ex Proof Coils

For ex proof coils ground connection must be provided.

You can use ground cable of the power cable.

And also, external ground cable can be connected to the grounding point shown on the Figure 8.



Figure 8. Ground connection of ex proof solenoid coils

2. PRODUCT OPERATION

When supply of voltage (230V, 110V, 24V, and 12V DC or AC voltages) is applied to the solenoid coil, coil transforms into an electromagnet and generates a magnetic force. This force causes the core inside the valve to move. The valve opens or closes according to this movement.

If fluid flows when the coil is energised, the valve is called a normally closed valve, while if fluid does not flow when the coil is energised, it is called a normally open valve.

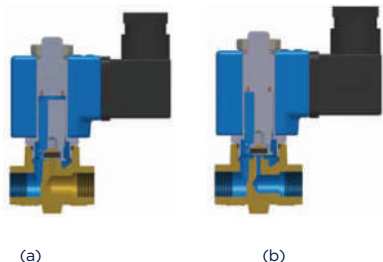
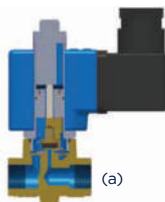
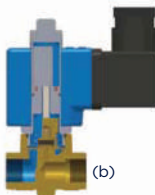


Figure 9: Normally-closed valve operation (a) while no power is available (b) while power is available with the coil



(a)

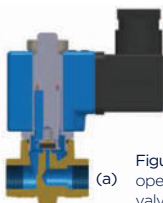


(b)

Figure 10: Normally - open valve operation (a) while no power is available (b) while power is available with the coil.

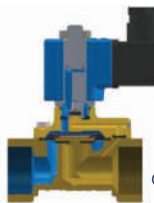
As shown in Figure 11, when the coil is energised, the orifice through which the fluid flows is directly closed or opened. For this reason, it is called 'direct-operated'.

The opening and closing operations of pilot-controlled solenoid valves are performed via a control segment and using line pressure. As shown in Figure 12, fluid in the line fills the upper section of the diaphragm. The line pressure and spring driving force used to close the orifice. When the solenoid coil is energised, the core is pulled up, the fluid on the diaphragm is transferred to the line outlet through the discharge port and orifice is opened.



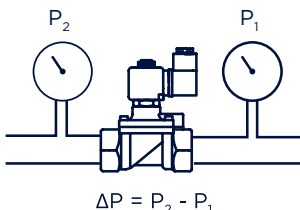
(a)

Figure 11: Direct operated solenoid valve operation



(b)

Figure 12: Pilot-control solenoid valve operation



Operation Choices:

1. Direct Operated valves; $\Delta P \geq 0$ (general purpose series), $\Delta P \geq -1$ bar (vacuum series)
2. Pilot operated solenoid valves; $\Delta P \geq 0,5$ bar (general purpose series), $\Delta P \geq 0,3$ bar (mini series), $\Delta P \geq 0$ (zero line) are available.

a. Operation conditions

Pressure limits

The solenoid valves operate in different pressure limits from 1 bar to 100 bars. They are produced in the pressure standards between 0 bar 16 bars. For the pressure limits over 16 bars, the special valves are produced upon demand.

Temperature limits

The environment temperature for the solenoid valves' operation ranges between -10°C to +80°C. The temperature of the fluid that will pass through the solenoid valves is determined in accordance with the sealing element. The temperature limits are shown in Table 3.

Sealing Element	Fluid Temperature	
	Min. Temperature °C	Max Temperature °C
NBR	-10	80
VITON	-10	160
EPDM	-10	130
PTFE	-10	180
RUBY	-10	160

Table 3. The temperatures of the fluid passing through the solenoid valve

b. Electrical Limits of the Coils

The electrical limits of the coils are as shown in Table 4.



Coil	Voltage	Current	Power
C40, C41, C42, C43, C46	12 VDC	1,5 A	18 W
	24 VDC	0,86 A	18 W
	110 VDC	0,175 A	18 W
	12 VAC	1,3 A	15 VA
	24 VAC	0,63 A	15 VA
	110 VAC	0,16 A	15 VA
	220 VAC	0,078 A	15 VA
C20	220 VAC	0,134 A	24 VA
	12 VDC	0,417 A	5 W
	24 VDC	0,23 A	5 W
	24 VAC	0,3 A	7,2 VA
	110 VAC	0,064 A	7,2 VA
C50	220 VAC	0,032 A	7,2 VA
	12 VDC	3,4 A	40 W
	24 VDC	1,7 A	40 W
	12 VAC	3 A	35 VA
	24 VAC	1,5 A	35 VA
	110 VAC	0,3 A	35 VA
	220 VAC	0,190 A	42 VA

Coil are used in valves are produced standard as IP65. On request IP68 coil or ex proof coils are possible.

Table 4. Electrical limits of the used coils.

3. PRODUCT INSTALLATION

! Before assembly;

Make sure that there are no damages with the product and all required parts are available. The product should not be accepted in the case that it is damaged or if there are missing parts.

Check the labels and other information on the product and package.

Make sure that the line pressure does not exceed the maximum pressure specified on the product label.

Check the compatibility of the product to be assembled with the system to be used. The operating limits specified in the technical specifications section should not be exceeded.

Make sure that there is no flow in the line where the coil will be connected, and that such possibility has been prevented during the assembly.

During the valve mount the proper wrench must be used.

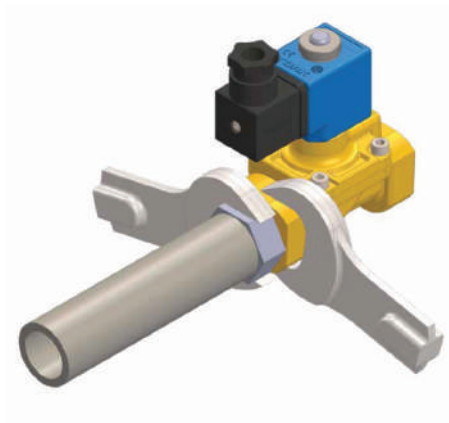
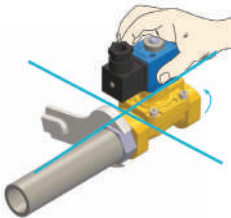


Figure 13. Solenoid valve assembly

After connecting the solenoid valve to the pipe system as shown in the Figure 14 and Figure 15, the coil is placed onto the valve manually as shown in the figures. After coil is fitted, it is manually screwed with knurled nut. The cable-connected socket is fitted to the coil and then fixed with fixing screw. In pipe type solenoid valve, the pipe is placed as shown in the Figure 15 and then screwed with the relevant wrench.



! The coil should not be loosened or removed by applying force to the coil without removing the upper nut.

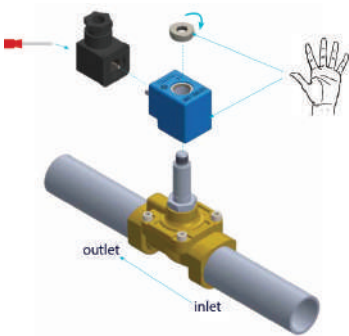


Figure14. Pipeless-type solenoid valve assembly

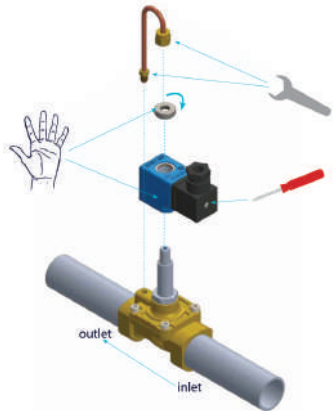


Figure 15. Pipe-type solenoid valve assembly

Warnings

- ❗ The coil gets hot in long-term operations. The hot coil may cause burnt if touched.
- ❗ The coil should not be energised when the coil is not attached to the tube.
- ❗ The power should be connected to the coil via a socket, which should be closed. The power cable must be installed by an AUTHORIZED person. The open connections may cause electric shock and short-circuits.
- ❗ For protection from short circuit faults, a FUSE must be installed to the line of coil.
- ❗ The coil should be operated along with its own cover nut. The lack of cover nut may also cause damages to the coil or not to run.
- ❗ Every coil should operate under the voltage limits written on it. The higher or lower voltages may cause damages to the coils or not to run.
- ❗ Filters should be used for required fluids. The residuals and rusts accumulated in the valve may cause inconveniency for the coil to pull the core. This inconveniency may cause burn of the core.
- ❗ The pressure on the solenoid valve should be set to zero before removing it from the system.
- ❗ In critical applications like electronic cards coil must be controlled through a RELAY.

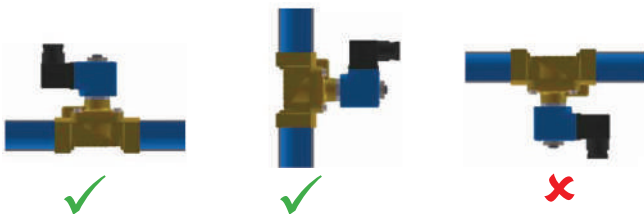


Figure 16. Solenoid valve connection form (a) Right, (b) Right, (c) Wrong

! In solenoid valve assembly, please be careful that the coil should not be at the lower part when conducting assembly. Otherwise, the core in the tube shall be affected by the residuals and rusts accumulated in time and prevent the coil to move the core. The solenoid valve may be assembled as shown in Figure 16 a or Figure 16 b.



Figure 17. Using of filter and PTFE band

! Mounting by hand is not proper neither user health nor mounting health.

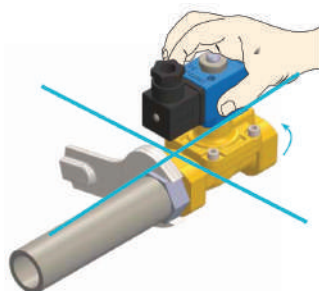


Figure 18. Wrong mounting of valve.

❗ When connecting the cable ends to connector, for AC voltages, the phase/neutral ends, and for the DC voltages, the positive (+) and negative (-) terminals should be connected to the number 1 and 2 connections. The earth terminal should be connected with the grounding conductor in the cable, if any. The grounding conductor is the yellow-green wire.

❗ Any bending or twisting should not be found with the cable connected to the socket in order to avoid defects resulting from loose contact or short circuit. The cable should be upright as shown in the Figure 20 a. In addition, the twists in the socket input may allow humidity to penetrate into the socket. In order to prevent humidity or water to leak into the socket, the diameter of the cable should be in a size that provides sealing.

❗ The coil should not run without tube. It means that it should run only when it is connected to the valve along with the tube and core. Otherwise, the conducting wire in the coil will burn and become dysfunctional within a short time. Figure 21 must be considered about this issue.

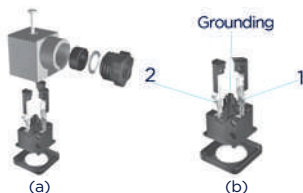


Figure 19. (a) Connector inner parts, (b) Connector connection points

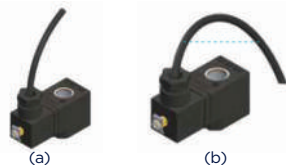


Figure 20. The position of the connecting

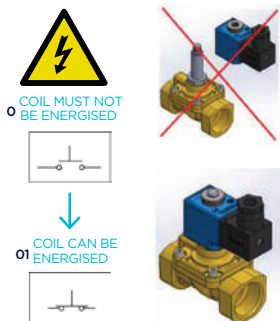



Figure 21. Warning about coil mounting.

4. PRODUCT LIFE

The useful life of a solenoid is 3 to 10 years. But a general lifetime of the products cannot be specified, as it is decisively influenced by ambient conditions, the single application and combination with other components. The function can only be fulfilled in case of exclusive use of TORK products. The use of energy-saving sockets for the coil or the use of suitable filters in the flow line increases the usability of the product.

5. PRODUCT CARE AND MAINTENANCE

According to the exploded pictures in pages 6 and 7, the solenoid valve is opened and the parts are examined and cleaned with the pressurized air. Particularly the core, diaphragm, diaphragm spring and orifice should properly be cleaned. The burrs and residuals on them should be removed. The damaged parts, if any, should be replaced with original TORK brand spare parts. The spare parts may be supplied from our company.

 Please be careful not to damage the sensitive inner parts during care and assembly. After any care or maintenance, the electrical connections should be checked, the required electrical measures should be taken and it should be tested if the valve is operating or not.

6. PRODUCT SPARE PARTS

The spare parts of the solenoid valves:

- Diaphragms
- Tube – core
- Coil
 - * Standard coil/Ex-proof
 - * Large Coil
 - * Mini coil/Ex-proof
- Socket
 - * Led sockets
 - * Normal sockets

You should choose the spare parts in the size compatible with the valve you use. Please contact our company to supply the spare parts and further information.

7. PRODUCT SHIPMENT

During shipment, the valve should not fall down or be exposed to solid impact. In addition, the tube and coil parts should also be protected from any damages. The weights that may damage the valve should not be placed on the packages of the solenoid valves. The products should be shipped in their original cardboard boxes.

8. WARRANTY PERIOD FOR THE PRODUCT

The warranty period for the TORK brand solenoid valves is two years. The maximum repair period is 20 days. The warranty does not include products if the valves are used out of scope of the terms of use specified when ordered from our company or in case of breaks resulted from the user's fault.

To benefit from the warranty, please apply to the manufacturer company with the warranty certificate approved by the company within the warranty period. In the case when you send the solenoid valve via courier, please remember to add a description your complaint, the photocopy of your warranty certificate, your email address, address and telephone number.

PRODUCING COMPANY

SMS SANAYİ MALZEMELERİ ÜRETİM VE SATIŞI A.Ş.

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P: +90 262 290 20 20 F: +90 262 290 20 21 e-mail: tork@smstork.com

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WARRANTY CONDITIONS

1. If there is a fault caused by the production, the manufacturer will repair or replace the defective product in its sole discretion.
2. The warranty period is two (2) years and starts from the date of delivery of the product to consumers.
3. All products, including all sub-parts, covered by our warranty.
4. The maximum repair time is one (1) month and starts from the products' arrival date to SMS factory.
5. Within the warranty period manufacturing defects, products will be repaired without any charge under any name,
6. During the warranty period, provided that the products will be exchanged free of charge if the fault is sourced by production.
7. Damages caused by the using of the product contrary to the points listed in the operating instructions are excluded from warranty coverage.
8. If there are complaints about the product please contact customer relations manager firstly.
9. For return or repair-maintenance of products send them to the factory to the customer relations department.
10. Consult to General Directorate of Consumer and Competition Protection of the Ministry Industry and Commerce of Turkey about the issues may arise with warranty certificate.



EXPORT TO 87 DIFFERENT COUNTRIES







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