MAKING MODERN LIVING POSSIBLE

how to use
solenoid valves

INDUSTRIAL AUTOMATION

IC.PS.600.A4.02 / 520B2809

One call and you're in control

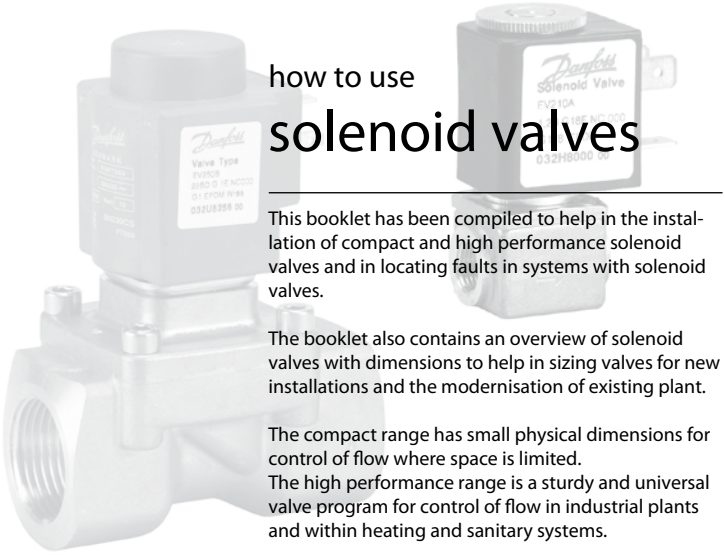
One call to Danfoss gives you access to an entire range of high-quality industrial controls. The Danfoss line encompasses components for industial monitoring and control systems based on the principles of pressure and temperature measurement, electrical power, and fluid control, and includes:

- Electro-mechanical contactors
- Electronic contactors and motor controllers
- Pressure and temperature switches
- Pressure transmitters
- Temperature sensors and transmitters
- Solenoid valves
- Externally operated valves
- Thermostatically operated valves

Given their important monitoring and control functions, Danfoss components are designed for accuracy, reliabillity and long life. And our determination to guarantee a high-quality product is matched by an equally strong commitment to customer service. A specialist in the Danfoss industrial controls group can advise you on product selection and configuration, based on long experience in your industry. You'll find that with sales and service centers in over 100 countries, Danfoss is usually only a local call away.

Flexible and user-friendly

Danfoss solenoid valve bodies and electrical coils are normally supplied separately and then combined together. They are assembled quickly and simply without any tools. This provides optimum product flexibility and availability. If a coil does need to be replaced then it can be done without stopping or draining any system.
The solenoid valves are also available as assembled units if required.



how to use

solenoid valves

This booklet has been compiled to help in the installation of compact and high performance solenoid valves and in locating faults in systems with solenoid valves.

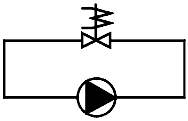
The booklet also contains an overview of solenoid valves with dimensions to help in sizing valves for new installations and the modernisation of existing plant.

The compact range has small physical dimensions for control of flow where space is limited.
The high performance range is a sturdy and universal valve program for control of flow in industrial plants and within heating and sanitary systems.

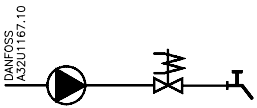
Contents

Choosing the correct solenoid valve

Symbolise valves used in a closed circuit system, typically with low differential pressures.



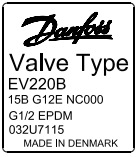
Symbolise valves used in an open system. Used typically for drinking water. Differential pressure higher than 0,5 bar.



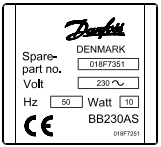
Note !
For more details see page 11.

Note that this booklet describes only brass solenoid valves.
For other types, please contact Danfoss.

Danfoss solenoid valves



1



2

Identification of Danfoss solenoid valves:

Illustration 1 shows the label with relevant information that is attached to the coil.

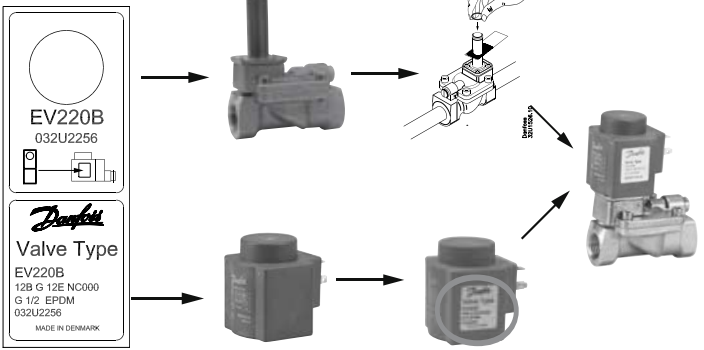
The example here is from an EV220B solenoid valve:

15: 15 mm orifice
B: Brass body material
G 12: ISO 228/1, 1/2 inch connection
E: EPDM seal material
NC: Normally closed

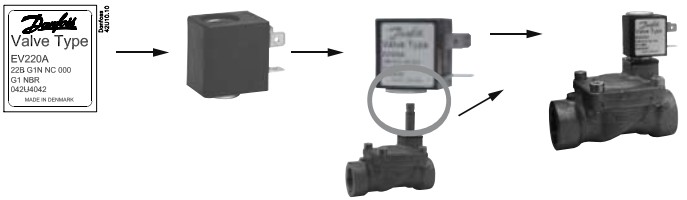
The coil type (BB230AS) is printed on the front of the coil as well as voltage (V) and frequency (Hz) - see illustration 2.

After identification, see the first section of this handbook.

B - Valve High performance



A - Valve Compact



If the the coil label cannot be read, the valve can be identified from the letter/ number combination stamped in the valve body.

Example:

506U4042

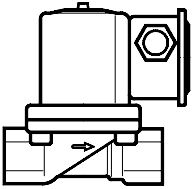
Week 50 2006 | 042U4042

Valve identification missing

If no code is stamped in the valve, the following information will be of great help when ordering Danfoss solenoid valves as replacements:

- Application (closed circuit, open system or drain application)?
- Function (de-energised open or closed)?
- End connection?
- Medium (water, oil, air, etc.)?
- k_v value?
- Coil voltage?
- Alternating (ac) or direct current (dc)?

Flow direction



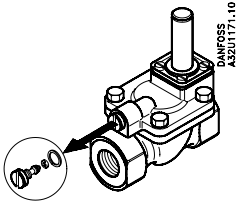
To be able to operate correctly, all solenoid valves must be installed with the arrow cast on the body pointing in the direction of flow.

Water hammer

Water hammer is a typical result of high liquid velocity (high pressure and high flow velocity through small pipe diameters).

There are several reasonable solutions to the problem:

A: Reduce the pressure by installing a pressure reduction valve ahead of the solenoid valve. If possible, increase the pipe diameter.

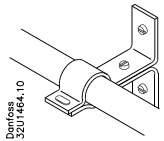


Equalising orifice

B: Damp the water hammer by installing a flexible hose or flexible buffer ahead of the solenoid valve.

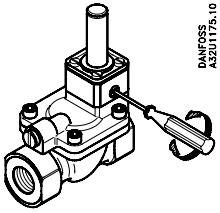
C: Use a solenoid valve of the type EV220B 15-50. The equalising orifice can be replaced by a version with smaller diameter. This gives a longer closing time (see "Spare parts" and "Opening and closing times").

Pipe



The pipes on both sides of the valve must be securely fastened.

Test pressure



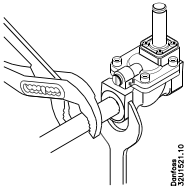
When applying test pressure: All valves in the system must be open. There are three ways of doing this:

1. By applying voltage to the coil
2. By opening the valves manually(when the manual override accessory is fitted)
3. By connecting the Danfoss permanent magnet (see Tools, page 40)

Note that the manual opening unit is *not* supplied as standard, but as an accessory for EV220B 15-50 valves (see page 31).

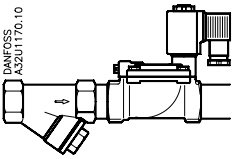
Remember to screw the opening unit back (CLOCKWISE) before starting up the system, otherwise the valve cannot close.

Tightening up



Always use counter-force when tightening up pipe connections, i.e. use a spanner on both the valve body as well as on the pipe connector (as shown).

Dirt in the system

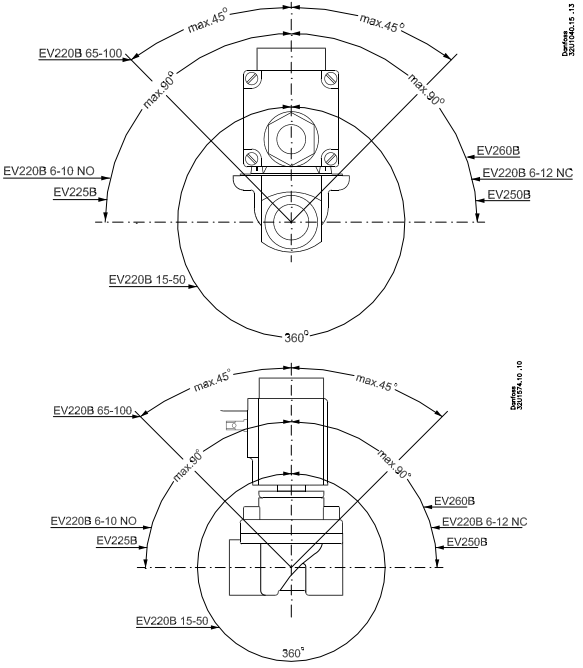


Always flush out piping before installing a solenoid valve. If there is dirt in the medium, a filter should be installed ahead of the valve.

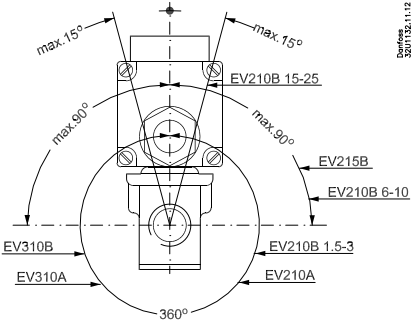
Installing the coil

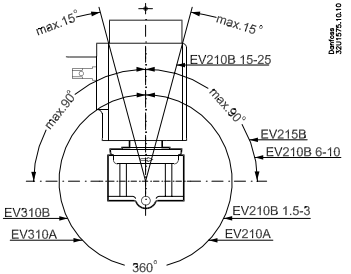
Danfoss recommends that the solenoid valve be installed with coil upwards. This minimises the risk of dirt collecting in the armature tube.
If "clean" media is used, i.e. media containing no dirtparticles, the solenoid valve will operate when installed in the orientation as shown below.

Servo-operated and assisted lift servo-operated valves

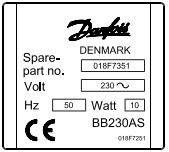


Direct-operated valves

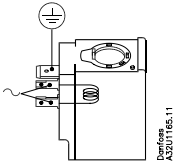




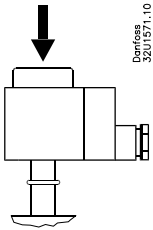
Coil



Check to ensure that the coil operating voltage is correct (see text on coil, in "Volt"). Also ensure that the data is correct (voltage and frequency) and matches the supply. If the two sets of data do not correspond, the coil might burn out.
As far as possible, always choose single-frequency coils; they give off less heat than double-frequency versions.



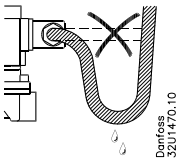
The coil has three pins. The middle pin is marked according to the illustration (left) and must be used for earthing.
The two other pins are coil terminals and either can be used for the phase or neutral supply. The terminals can be used respectively for phase and neutral as required.



Please note for high performance range!
When mounting the clip-on coil, simply press it gently onto the armature, until it clicks into place. An O-ring should normally be fitted over the armature tube before fitting the coil.

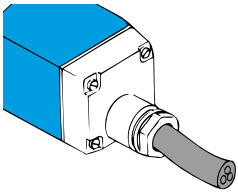
Cable entries must always be screwed in correctly.

Cable connection



The cable must be installed as shown in the illistration to avoid water running into the terminal box.

Cable



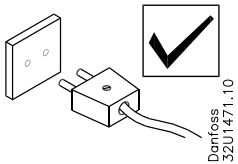
To avoid moisture penetrating in the terminal box, the whole cable diameter must be secured in the entry. For this reason, always use round cables as they are the only type that can be effectively sealed.

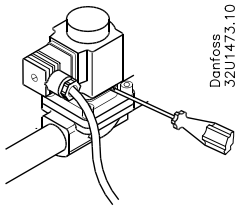
Note the colours on the cable leads. Yellow/green is always earth. The other leads should be for the phase and neutral supply.

Coil replacement

Please note for clip-on coils.
When replacing a coil, use a screwdriver to lever it from the armature.

Caution: Before removing a coil, voltage must be disconnected, otherwise the coil will burn out.

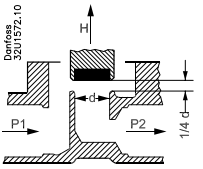




It is important to indentify all relevant parameters when selecting a solenoid valve.

This includes:
- Capacity / k_v - value
- Pressure conditions
- Media conditions
- Other conditions

Capacity / k_v - value:
- Specifies how many **m^3/hour** (capacity) water is passing through the valve at a differential pressure at **1 bar.**
- Is a result of all the different constants coming from shape of orifices, units etc. which are reduced to one new constant, the k_v - value.
- Is used to calculate capacity:
- ρ = density (kg / m^3)
- $\Delta P = P_1 - P_2$



$$\mathbf{Q = k_v \sqrt{\frac{\Delta P}{\rho}}}\ \text{[m3 / h]}$$

Pressure conditions:

Open system (system with drain)

In an open system the pressure conditions are well-defined.
This enables clarification as to whether there is sufficient pressure differential to be able to open a servo-operated valve. The following types of valves are well-suited for use in open systems:

EV210B, EV210A, EV310B and EV310A direct -operated solenoid valves
EV220B, EV220A and EV225B servo-operated solenoid valves

Closed circuit (cirulating system)
In a closed circuit system the pressure conditions are undefined. Therefor a solenoid valve capable of opening without pressure differential is required.

EV250B assisted lift servo-operated valve
EV210B, EV210A, EV310B and EV310A direct-operated solenoid valves

Operating pressure

Valves in the standard range are designed for pressure of max 6-30 bar - the actual figure depends on the type of valve.
The product range includes valves for special application, designed for pressures of up to 80 bar. The large standard range combined with these valves enable the use of Danfoss solenoid valves for all types of systems, wether with normal or more extreme inlet pressures.

Differential pressure/ MOPD

- Difference between inlet pressure and outlet pressure ($\Delta P = P1 - P2$).
- Max. permissible differential pressure against which the valve can open
- Also specified as MOPD: **M**aximum **O**pening **P**ressure **D**ifferential
- MOPD specifies the differential pressure value in worst case:
  - 100 % duty rate
  - Maximum medium and ambient temperature
  - Nominel voltage, typically -10%
- Specified pressure is often limited by endurance demands more than MOPD

Media conditions:

The valves are designed to resist the temperatures normally found in industrial applications.

If the temperature is outside these limits, there is a risk of the valve not functioning correctly because of, for example, rubber materials becoming hard. Exceeding the temperature rating can also result in the shortening of valve life. If the valve is to be used in a special application, with a temperature in excess of the rated limits, there are valves available in the product range which have been designed for use in higher temperature systems.

The characteristics of the medium

The valve have been designed for use with different media.

In general the following is valid:
Valves containing EPDM-rubber are suitable for water and steam*.
Valves containing FKM-/NBR-rubber are suitable for oil and air.

Incorrect use of valve types
1) If a valve containing EPDM-rubber is used for a medium containing oil (compressed air normally contains particles of oil from the compressor) the rubber will expand and the valve will not be able to function optimally.

2) A valve containing FKM-/NBR-rubber can be used for water. However for servo-operated valves, the water temperature must be kept below 60°C for FKM, 90°C for NBR. If this temperature is exceeded it will have a negative effect on the life of the valve.

Other media
For slightly aggressive media (e.g. demineralised water) dezincificationresistant brass valves must be used. Stainless steel valves are used for more aggressive media.

**For steam temperatures above 120°C there is a type of valve especially designed for steam*

Other conditions:

Ambient temperature
The ambient temperature must be within certain limits for the coil to function optimally.

Water hammer

All piping systems with relatively high flow rates are susceptible to water hammer when a valve is opened or closed. A damped solenoid valve (eg. EV220B 15-50) should be used if there is a risk of water hammer. After installation the valve can be adjusted for water hammer by changing a replaceable equalising orifice. *See "Spare parts"*

Filter

In systems with contaminated media there is a risk of moving parts in a valve not working as intended. Dirt is the most common cause of function failure in solenoid valves. To help avoid this problem we suggest the fitting of a filter on the upstream side of the valve.

Coil voltage and power

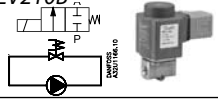
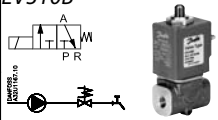
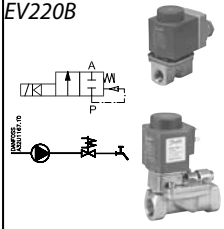
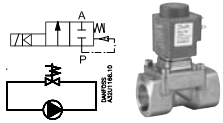
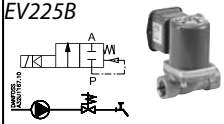
It is necessary to know which voltage (Volt a.c./d.c. nominel ± 10%) is available within an application to select the correct coil. The maximum permissible differential pressure can also be increased by fitting a more powerful coil.
The coil power depends on the type of coil (BA,BB,AC,AM etc.)

Other environmental factors

In wet or very humid environments, coils with IP 67 enclosure classification must be used.

Valve function

Most industrial systems operate with a de-energised closed valve (NC = normally closed). Our valve range also offers de-energised open valves (NO = normally open) for applications requiring this feature.

	Medium			
	Air and neutral gases	**Water**	**Oil**	**Steam**
EV210B 	X	X	X	
EV310B 	X	X	X	
EV220B 	X	X	X	
	X	X	X	X
EV250B 	X	X	X	X
EV225B 				X

For other characteristics please see the valve selection guide

Characteristics		Description
Connection [ISO 228/1]	**Function**	
G 3/8" - G 1"	NC/NO	EV210B covers a wide range of direct-operated 2/2-way solenoid valves for universal use. EV210B is a real robust valve program with high performance and can be used in all kind of tough working conditions.
G 1/8" - G 3/8"	NC/NO	EV310B is a direct-operated 3/2- way solenoid valve. The valve is especially used in connection with air-operated valves to allow air supply and air relief for the air actuator.
G 1/4" - G 1"	NC/NO	EV220B 6-22 is a direct servo-operated 2/2-way solenoid valve program. This program is especially for OEM applications demanding a robust solution and moderate flow rates.
G 1/2" - G 2"	NC/NO	EV220B 15-50 is a universal indirect servo-operated 2/2-way solenoid valve program. Valve body in brass, dezincification resistant brass and stainless steel ensures that a broad variety of applications can be covered.
G 3/8" - G 1"	NC	EV250B with assisted lift is especially to use in closed circuits with low differential pressure, but demanding moderate flow rates. Valve body in DZR brass ensures a long life, even in connection with aggressive steam media.
G 1/4" - G 1"	NC	The EV225B design is based on a PTFE diaphragm and valve body in dezincification resistant brass, ensuring high reliable function and long life even in connection with contaminated steam.

	Medium			
	Air and neutral gases	**Water**	**Oil**	**Steam**
EV210A 	X	X	X	
EV310A 	X	X	X	
EV220A 	X	X	X	

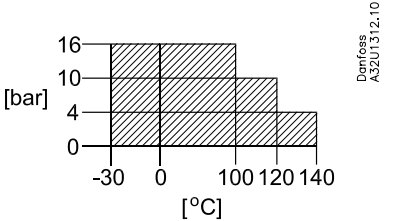
Characteristics		Description
Connection [ISO 228/1]	**Function**	
G 1/8" and G 1/4"	NC/NO	EV210A is a very compact direct-operated 2/2-way solenoid valve program. With brass or stainless steel valve body for industrial applications including rough vacuum.
G 1/8" and G 1/4"	NC/NO	EV310A is a direct-operated 3/2- way solenoid valve. The valve is especially used in connection with air-operated valves to allow air supply and air relief for the air actuator.
G 1/4" - G 2"	NC	EV220A is a compact indirect servo-operated 2/2-way solenoid valve program. With brass valve body for robust industrial applications.
G 1/4" - G 1"	NO	

Media table

Seal Material °C / Medium	EPDM[1)]	FKM	NBR	PTFE
Water / glycols	- 30 to +140	0 to +60 0 to +100*	-10 to +90	-
Oil	-	0 to +100	-10 to +90	-
Air	-	0 to +100	-10 to +90	-
Steam	to +140	-		to +185

** Direct-operated valves*

1)



EPDM is suitable for water and steam within the illustrated ranges

BB coils (IP65)

Coil consumption	Supply voltage / frequency[1)]	**Code no.**
10 W without cabel plug	220 - 230 V ac / 50 Hz	**018F7351**
10 W without cabel plug	110 V ac / 50-60 Hz	**018F7360**
10 W without cabel plug	24 V ac / 50 Hz	**018F7358**
18 W without cabel plug	24 V dc	**018F7397**
Cable plug for BB coils		**042N0156**
O-ring for fixing and sealing coil (pack of 10 pcs.)		**018F0094**

BG coils (IP67)

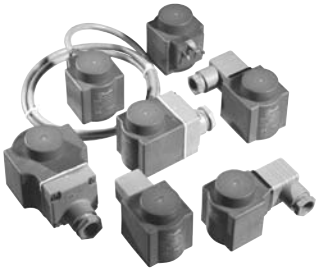
Coil consumption	Supply voltage / frequency[1)]	**Code no.**
20 W with terminal box	24 V dc	**018F6857**
O-ring for fixing and sealing coil (pack of 10 pcs.)		**018F0094**

For installations sensitive to noise

BN coil (hum-free, IP65)

Coil consumption	Supply voltage / frequency[1)]	**Code no.**
20 W with 1 m cable	220 - 230 V ac / 50-60 Hz	**018F7301**
O-ring for fixing and sealing coil (pack of 10 pcs.)		**018F0094**

1) For other voltages or coil types, See coil data sheet..



AB coils (IP00-IP65)

Coil consumption	Supply voltage / frequency[1)]	**Code no.**
4.5 W without cabel plug	110 V ac / 50/60 Hz	**042N0804**
4.5 W without cabel plug	220-230 V ac / 50/60 Hz	**042N0800**
5 W without cabel plug	24 V dc	**042N0803**
Cable plug for AB coils		**042N0139**

AC coils (IP00-IP65)

Coil consumption	Supply voltage / frequency[1)]	**Code no.**
7 W without cabel plug	110 V ac / 50/60 Hz	**042N0825**
7 W without cabel plug	220-230 V ac / 50/60 Hz	**042N0821**
10 W without cabel plug	24 V dc	**042N0824**
Cable plug for AC coils		**042N0139**

AM coils (IP00-IP65)

Coil consumption	Supply voltage / frequency[1)]	**Code no.**
7.5 W without cabel plug	110 V ac / 50/60 Hz	**042N0845**
7.5 W without cabel plug	220-230 V ac / 50/60 Hz	**042N0840**
9.5 W without cabel plug	24 V dc	**042N0843**
Cable plug for AM coils		**042N0156**

1) For other voltages or coil types,
See coil data sheet..

Closing times and water hammer

With the larger valves, very short closing times can cause water hammer.
The EV220B servo-operated valves have damped closing and fulfil EN 60730-2-8 specifications.

The table give the opening/closing times of the various types, but it must be emphasised that tube dimensions / lengths and differences in operating conditions - especially pressure - can cause deviations from the values given.

High performance (blue) range

Type	Opening [ms]	Closing [ms]
EV210B 1.5	10	20
EV210B 3	20	20
EV210B 6	20	20
EV250B 12	100	100
EV250B 18	150	100
EV250B 22	150	100
EV220B 10	50	300
EV220B 12	60	300
EV220B 15	40	350
EV220B 20	40	1000
EV220B 25	300	1000
EV220B 32	1000	2500
EV220B 40	1500	4000
EV220B 50	5000	10000
EV310B	10 - 20	10 - 20

Compact (black) range

Type	Opening [ms]	Closing [ms]
EV210A	7 - 10	7 - 10
EV220A 6	40	250
EV220A 10	50	300
EV220A 12	60	300
EV220A 14	100	400
EV220A 18	200	500
EV220A 22	200	500
EV220A 32	2500	4000
EV220A 40	4000	6000
EV220A 50	5000	10000
EV310A	7 - 10	7 - 10

Changing opening and closing times

Please note for high performance type. EV220B 15-50 closing times can be changed by replacing the equalising orifice at the inlet side of the valve (see "Water hammer", page 15, and "Spare parts", page 34). To decrease water hammer, choose a smaller equalising orifice.

The table shows the opening and closing times depending on the equalising orifice chosen (standard times marked in bold). The times stated cover water as a medium, and are for guidance only. Tube dimensions / lengths and operating conditions, for example differential pressure, may influence the values.

Orifice		EV220B 15		EV220B 20		EV220B 25		EV220B 32		EV220B 40		EV220B 50	
[mm]	grooves [1]	Open	Close	Open	Close	Open	Close	Open	Close	Open	Close	Open	Close
		[s]											
0.5	1	0.04	0.35	0.04	1.0	0.11	3.0	1.6	6.0	1.3	8.0	3.4	40.0
0.8	2	0.04	0.3	0.04	0.5	0.3	1.0	1.0	2.5	1.5	4.0	3.6	11.0
1.2	3	0.04	0.12	0.04	0.25	0.30	0.5	1.2	1.0	1.5	2.0	5.0	10.0
1.4	4	0.04	0.1	0.06	0.18	0.30	0.4	1.0	0.8	2.0	1.5	5.2	6.5

[1] *Number of grooves*

Symptom: **Solenoid valve does not open**

Probable cause	Remedy
No voltage on coil	Check whether valve is de-energised open or closed (NO or NC): 1. Use a magnetic detector 2. Lift coil slightly and note whether it offers resistance against lifting Note: Never remove a coil with voltage applied - it may burn out. Check relay contacts. Check lead connections. Check fuses.
Incorrect voltage/frequency	Check to make sure the coil's electrical requirements are the same as the installation supply. Measure the operating voltage at the coil. Permissible voltage variation: ±10% for dual frequency; dc and NO applications +10% / -15% for ac on single frequency voltages If necessary, replace coil with correct version.
Coil burnt out	See page 29
Diff. pressure too high	Check coil data. If necessary, replace coil with correct version. Reduce differential pressure, e.g. by limiting inlet pressure.
Diff. pressure too low	Check coil data and differential pressure. If necessary, replace coil with correct version.
Damaged/bent armature tube	Replace valve
Dirt at diaphragm[2)]	Clean diaphragm. If necessary, replace defective component(s)[1)].
Dirt in valve seat/dirt in armature/armature tube[2)]	Clean valve; if necessary, replace defective component(s).
Corrosion	Replace defective component(s)[1)]
Components missing after valve dismantling	Fit missing component(s)[1)].

Symptom: **Solenoid valve partly opens**

Probable cause	**Remedy**
Differential pressure too low	Check valve data, incl. differential pressure. Replace valve with correct version.
Damaged or bent armature tube	Replace valve.
Dirt at diaphragm	Clean diaphragm. If necessary, replace defective component(s)[1].
Dirt in valve seat/dirt in armature/ armature tube[2]	Clean valve, if necessary, replace defective component(s).
Corrosion	Replace defective component(s)[1].
Components missing after valve dismantling	Fit missing component(s)[1].

[1] See "Spare parts"
[2] If there is repeated build up of dirt in the armature / armature tube, consider the installation af an isolating diaphragm kit, if applicable (see "Spare parts")

Symptom: **Solenoid valve does not close/partly closes**

Possible cause	Remedy
Voltage remains on coil	First lift coil slightly and note whether it offers resistance. Note: Never remove a coil with voltage applied - it might burn out. Check wiring diagram and wiring. Check relay contacts. Check lead connections.
Dirt in or closed pilot orifice/equalising piece	Clean orifice with needle or similar (max. dia. 0.5 mm). Blow clean with compressed air. If necessary, replace defective component(s).
Manual opening unit cannot be screwed back after use.	Check position of opening unit and adjust as necessary.
Pulsation in pressure line. *Differential pressure too high in open position.* *Pressure on outlet side periodically higher than pressure on inlet side.*	Check valve data. Check pressure and liquid flow. Replace valve with one more suitable. Check rest of installation.
Damaged/bent armature tube	Replace valve.
Defective valve plate, diaphragm or valve seat	Check pressure and liquid flow. Replace defective component(s)[1)].
Diaphragm upside down	Check correct installation of valve[1)]
Dirt in valve seat/dirt in armature tube	Clean valve; if necessary, replace defective components
Corrosion, pilot/main orifice	Replace defective components.
Valve installed wrong way round	Check liquid flow direction and make sure the arrow is pointing in the same direction.
Components missing after valve dismantling	Fit missing component(s)[1)].

Symptom: **Solenoid valve sounds wrong**

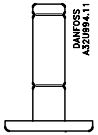
Probable cause	**Remedy**
Hum	Hum caused by ac frequency. Can be removed by changing to coil with rectifier (see page 21).
Water hammer when valve opens *Water hammer when valve closes*	See "Installation"
Differential pressure too high and/or pulsation in pressure line	Check valve data and differential pressure. Check pressure and liquid flow. Replace with more suitable valve. Check rest of installation.

[1] *See "Spare parts"*

Symptom: **Coil burnt - cold with voltage on**

Probable cause	Remedy
Incorrect voltage/frequency	Check coil data. If necessary, change to correct coil type. Check wiring diagram and wiring. Check maximum voltage variation: Permissible voltage variation: ±10% for dual frequency; dc and NO applications +10% / -15% for ac on single frequency voltages
Coil short-circuit *(could be moisture in coil)*	Check rest of installation for possible short-circuiting. Check lead connections at coil. When fault has been found, replace coil. (See also "Coil" in section "Installation"). Consider fitting a 'clip-on' style coil with addional sealing O-ring (for high performance range only).
Armature sluggish *a) Damaged/bent armature tube* *b) Damaged armature* *c) Dirt in armature tube*	Replace defective component(s). Remove dirt.
Temperature of medium too high	Check valve and coil data in relation to installation specification. Change to suitable coil or valve.
Ambient temperature too high	If possible, move valve to colder surroundings. Check valve and coil data in relation to installation specification. Increase ventilation around valve and coil.

Normally open components (NO)



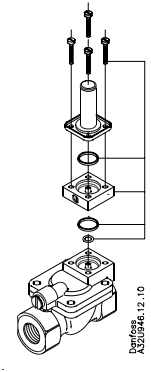
The set contains locking button and nut for coil, normally open assembly kit (armature and armature tube) and an O-ring.

Type	Code no.	
	FKM seal material [1)]	**EPDM seal material[1)]**
EV210B 1.5 - 4.5 NO	**032U2004**	**032U2005**
EV220B 6 NO	**032U0166**	**032U0165**
EV220B 10 NO	**032U0167**	**-**
EV220B 15 - 50 NO	**032U0295**	**032U0296**

NO components are also available for Danfoss valves with other seal materials.

[1)] See page 20 for seal material description.

Manual opening unit

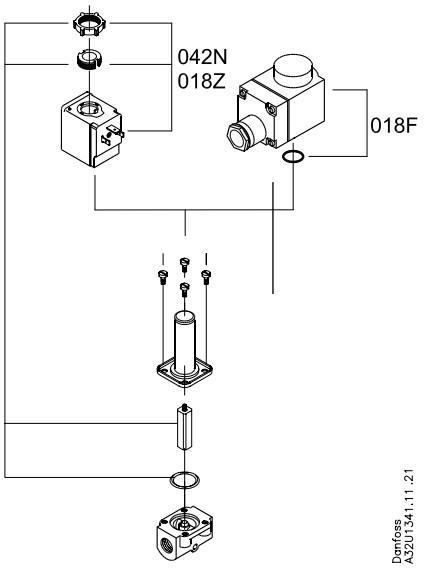


The manual opening unit for EV220B 15-50 can be used to open and close the valve in the event of power failure or when applying test pressure.

Code no. **032U0150**

Spare parts set for EV210B NC

The spare parts set contains locking button and nut for coil, armature with valve plate and spring, and O-rings.



EPDM[1] versions

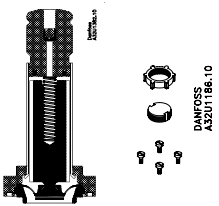
Type	Code no.
EV210B 1.5 - 4.5	**032U6000**
EV210B 6,8,10	**032U2006**

FKM[1] versions

Type	Code no.
EV210B 1.5 - 4.5	**032U2003**
EV210B 6,8,10	**032U2011**

[1] See page 20 for description of seal materials

Isolating diaphragm kit for EV210B 1.5-4.5 NC and EV220B 15-50 NC



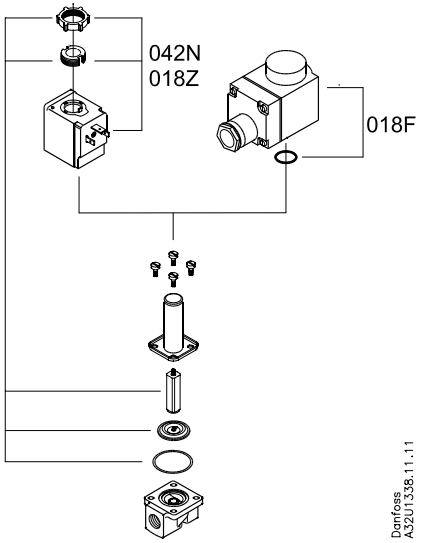
Avoids build up of contaminates that can block movement of the armature. Permits use of more agressive media that would normally attack the armature. Gel filled; guarentees operation after long periods on inactivity.

Seal material	Code no.
EPDM[1]	**042U1009**
FKM[1]	**042U1010**

[1] See page 20 for description of seal materials

Spare parts set for EV220B 6-12 NC

The spare parts set contains locking button and nut for coil, armature with valve plate and spring, diaphragm and two O-rings.

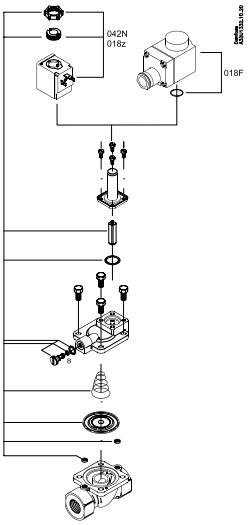


Spare parts sets are also available for Danfoss EV220B valves with other seal materials (see page 20 for seal material description).

EPDM versions

Valve type	**Code no.**
EV220B 6 NC	**032U1062**
EV220B 10 NC	**032U1065**
EV220B 12 NC	**032U1068**

Spare parts set for EV220B 15-50



Type	Seal materiale	**Code no.**
EV220B 15	EPDM[1)]	**032U1071**
EV220B 20	EPDM[1)]	**032U1073**
EV220B 25	EPDM[1)]	**032U1075**
EV220B 32	EPDM[1)]	**032U1077**
EV220B 40	EPDM[1)]	**032U1079**
EV220B 50	EPDM[1)]	**032U1081**

Spare parts sets are also available for Danfoss EV220B valves with other seal materials.

[1)] See page 20 for description of seal materials

The spare parts set contains locking button and nut for coil, armature with valve plate and spring, O-ring for armature tube, spring and diaphragm, two O-rings for servo system and O-ring and gasket for orifice.

Isolating diaphragm kit: See page 32

Equalising orifice set

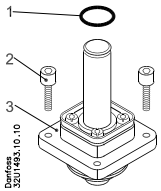
The equalising orifice set contains an equalising orifice with O-ring and gasket. Valve closing times can be changed by replacing the standard equalising orifice with that of another size (see also "Opening and closing times", page 23).

Orifice	Seal material	Standard orifice for valve type	**Code no.**
0.5	EPDM[1)]	EV220B 15 - 20	**032U0082**
0.8	EPDM[1)]	EV220B 25 - 40	**032U0084**
1.2	EPDM[1)]	EV220B 50	**032U0086**
1.4	FKM[1)]	EV220B 40 - 50	**032U0087**

Equalising orifice sets are also available for Danfoss EV220B valves with other seal materials.

[1)] See page 20 for description of seal materials

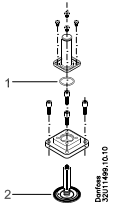
Spare parts set for EV250B 12-22 NC EPDM seal material



The spare parts kit comprises:
1. O-ring for coil.
2. 4 screws.
3. Complete NC actuator unit with diaphragm, assist spring, armature, closing spring, cover and armature tube.

Valve type	**Code no.**
EV250B 10 - 12BD	**032U5315**
EV250B 18 - 22 BD	**032U5317**

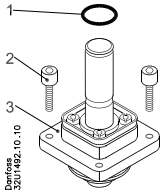
Spare parts set for EV250B 12-22 NC FKM seal material



The spare parts kit comprises:
1. O-ring between armature tube and cover.
2. Service element consisting of an armature with valve plate and spring fitted on the diaphragm.

Valve type	**Code no.**
EV250B 10 - 12BD	**032U5271**
EV250B 18 - 22 BD	**032U5273**

Spare parts set for EV250B 12-22 NO

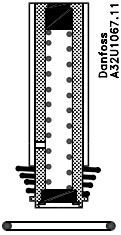


The spare parts kit comprises:
1. O-ring for coil.
2. 4 screws.
3. Complete NO actuator unit with diaphragm, assist spring, NO armature unit and cover.

Valve type	Seal material	**Code no.**
EV250B 10 - 12BD	EPDM	**032U5319**
EV250B 18 - 12 BD	FKM	**032U5320**
EV250B 10 - 22BD	EPDM	**032U5321**
EV250B 10 - 22BD	FKM	**032U5322**

Spare parts kit for EV310B

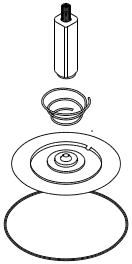
The spare parts kit compries an armature with mounted spring



Type	Seal Material	**Code no.**
NC	FKM	**032U2033**
NO	FKM	**032U2035**

Spare parts kit for EV225B 6 - 25

Spare parts kit for EV225B comprises an armature with valve plate and spring, closing spring, diaphragm and O-ring.

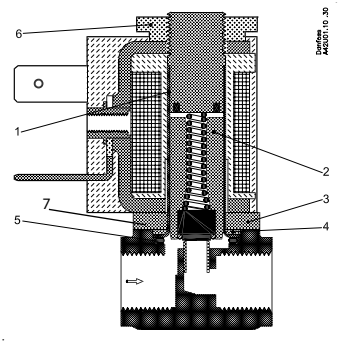


Type	Code no.
EV225B 6 - 10	**032U3171**
EV225B 15	**032U3172**
EV225B 20 - 25	**032U3173**

Spare coils for EV225B 6 - 25

Coil voltages	Code no.
24 V, 50 Hz (10 W ac)	**032K1436.82**
48 V, 50 Hz (10 W ac)	**032K1436.87**
110 V, 50 Hz (10 W ac)	**032K1436.83**
220-230 V, 50 Hz (10 W ac)	**032K1436.84**
240 V, 50 Hz (10 W ac)	**032K1436.85**
110 V, 60 Hz (10 W ac)	**032K1436.91**
220 V, 60 Hz (10 W ac)	**032K1436.90**
24 V dc (17 W dc)	**032K1409.02**

Spare parts for
EV210A NC

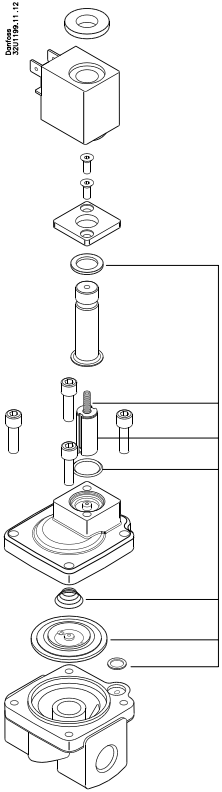


Seal material	**Code no.**
EPDM	**042U0067**
FKM	**042U0068**

The spare parts set comprises the following parts:

1) Armature tube
2) Armature with valve plate and spring
3) Flange
4) Disk
5) O-ring
6) Nut
7) 2 screws for connecting tube to valve body

Spare parts kit for EV220A 6 -50 NC



Spare parts kit comprising armature assemply, diaphragm assambly, armature spring, diaphragm, spring and two O-rings.

Type	Seal material	**Code no.**
EV220A 6 - 10B	EPDM	**042U1000**
EV220A 6 - 10B	NBR	**042U1001**
EV220A 6 - 10B	FKM	**042U1002**
EV220A 12 - 14B	EPDM	**042U1003**
EV220A 12 - 14B	NBR	**042U1004**
EV220A 12 - 14B	FKM	**042U1005**
EV220A 18 - 22B	EPDM	**042U1006**
EV220A 18 - 22B	NBR	**042U1007**
EV220A 18 - 22B	FKM	**042U1008**
EV220A 32B	EPDM	**042U1037**
EV220A 32B	NBR	**042U1038**
EV220A 32B	FKM	**042U1046**
EV220A 40B	EPDM	**042U1039**
EV220A 40B	NBR	**042U1040**
EV220A 40B	FKM	**042U1047**
EV220A 50B	EPDM	**042U1041**
EV220A 50B	NBR	**042U1042**
EV220A 50B	FKM	**042U1048**

Magnetic field indicator

This handy key ring tool reacts to magnetic fields from solenoid valves. Place the indicator close to the coil, and the red-white disc will prove the coil to be active by rotating.

Permanent magnet

With this tool it is possible to operate solenoid valves without wiring up the electrical coil.

Please contact your local Danfoss office to obtain these popular tools.

Quality approval

Danfoss high quality level also applies to our valve range. Continuous monitoring of all processes in the valve factories ensure a uniform, high quality level is achieved by the international standard ISO 9001 approved quality assurance system.
This means that Danfoss complies with the requirements on product development, design, production and sales.

ISO 9001

Environmental certifications

Danfoss recognises environmental management as one of the top corporate priorities, and we consider ourselves as being among the most environmentally conscious companies in our branch of industry. In order to promote sustainable development we will prevent, limit and as far as possible eliminate environmental effects.
Having ISO 14001-certification and EMAS[1)]-registration proves these traditional Danfoss values to be fully implemented in the Industrial Controls unit.

ISO 14001

EU ECO MANAGEMENT AND AUDIT SCHEME

[1)] Eco Management and Audit Scheme

DK-6000 Kolding
Denmark