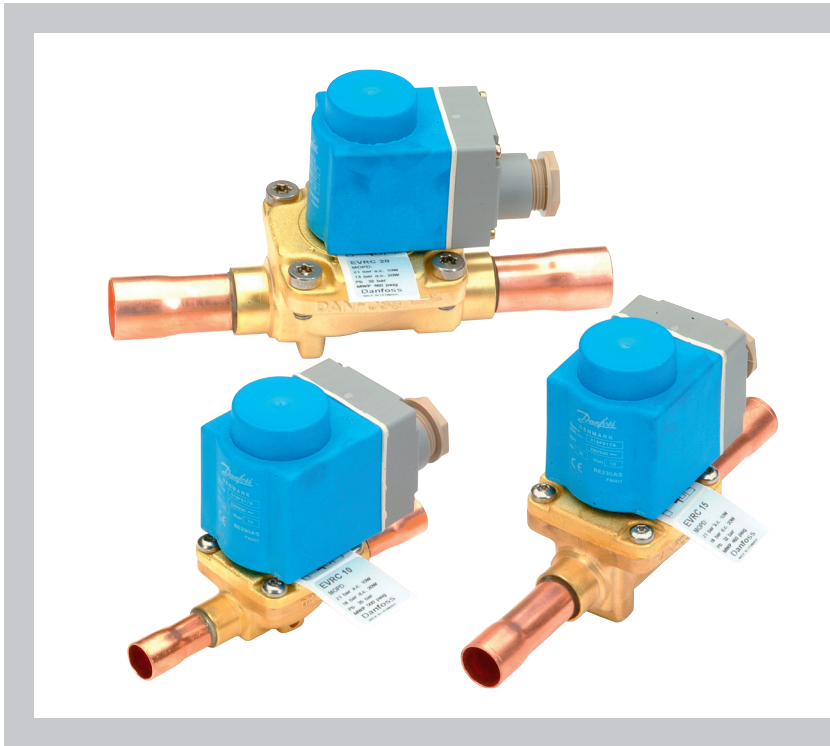


Data sheet

# Solenoid Valve for R410A and R744

## Types EVR 2 – 6 and EVRH 10 – 40



EVRH high pressure range is a direct or servo operated solenoid valve specially designed to meet the requirements for high pressure refrigerants as R410A and R744. The EVRH valve can be used for liquid, suction and hot gas lines

**Features**

- Normally closed
- Wide choice of coils for a.c. and d.c. voltage
- Suitable for R410A and R744
- Designed for media temperatures up to 105 °C
- Design pressure 45.2 barg
- MOPD up to 38 bar / 550 psi with 20 W coil
- Solder connection up to 1 5/8 in.
- Extended ends for soldering
- It is not necessary to dismantle the valve during soldering.

**Approvals**

Low Voltage Directive (LVD) 2006/95/EC

Versions with UL approval can be supplied on request

**Technical data**

*Temperature of medium*  
 -40 – 105 °C for 10 or 12 W coil  
 Max. 130 °C during defrost  
 -40 – 80 °C for 20 W coil

*Refrigerant*  
 R744, R22/R407C, R404A/R507, R410A,  
 R134a, R407A, R23. For other refrigerants,  
 please contact Danfoss.

Type	Opening differential pressure with standard coil $\Delta p$ [bar]					$k_v$ value <sup>1)</sup> [m <sup>3</sup> /h]	Max. working pressure Ps [barg]
	Max. (MOPD) liquid <sup>2)</sup>						
	Min.	10 W a.c.	12 W a.c.	20 W a.c.	20 W d.c.		
<b>EVR 2</b>	0.0	25	25	38	18	0.16	45.2
<b>EVR 3</b>	0.0	21	25	38	18	0.27	45.2
<b>EVR 6</b>	0.05	21	25	38	18	0.8	45.2
<b>EVRH 10</b>	0.05	21	25	38	18	1.9	45.2
<b>EVRH 15</b>	0.05	21	25	38	18	2.6	45.2
<b>EVRH 20 (a.c.)</b>	0.05	21	25	38	—	5.0	45.2
<b>EVRH 20 (d.c.)</b>	0.05	—	—	—	16	5.0	45.2
<b>EVRH 25</b>	0.2	21	25	40	18	10.0	45.2
<b>EVRH 32</b>	0.2	21	25	40	18	16.0	45.2
<b>EVRH 40</b>	0.2	21	25	40	18	25.0	45.2

<sup>1)</sup> The  $k_v$  value is the water flow in [m<sup>3</sup>/h] at a pressure drop across the valve of 1 bar  $\rho = 1000 \text{ kg/m}^3$ .

<sup>2)</sup> MOPD (Max. Opening Pressure Differential) for media in gas form is approx. 1 bar greater.

*Ambient temperature and enclosure for coil:*  
 see separate brochure "coils for solenoid valve".

**Ordering**

*Solenoid valve – Normally closed (NC) – Soldering ODF without manual stem – without coil*

Type	Required coil type	Connection		Code no.	
		[in.]	[mm]	[in.]	[mm]
<b>EVR 2</b>	a.c. / d.c.	1/4	6	<b>032F1201</b>	<b>032F1202</b>
<b>EVR 3</b>	a.c. / d.c.	3/8	10	<b>032F1204</b>	<b>032F1208</b>
<b>EVR 3</b>	a.c. / d.c.	1/4	6	<b>032F1206</b>	<b>032G1207</b>
<b>EVR 6</b>	a.c. / d.c.	3/8	10	<b>032F1212</b>	<b>032F1213</b>
<b>EVR 6</b>	a.c. / d.c.	1/2	12	<b>032F1209</b>	<b>032F1236</b>
<b>EVRH 10</b>	a.c. / d.c.	1/2	12	<b>032G1054</b>	<b>032G1055</b>
<b>EVRH 15</b>	a.c. / d.c.	5/8	16	<b>032G1056</b>	<b>032G1056</b>
<b>EVRH 20</b>	a.c.	7/8	22	<b>032G1057</b>	<b>032G1057</b>
<b>EVRH 20</b>	d.c.	7/8	22	<b>032G1058</b>	<b>032G1058</b>
<b>EVRH 25</b>	a.c. / d.c.	1 1/8	—	<b>032G1059</b>	—
<b>EVRH 32</b>	a.c. / d.c.	—	35	—	<b>032G1081</b>
<b>EVRH 40 <sup>1)</sup></b>	a.c. / d.c.	1 5/8	—	<b>032G1062</b>	—

<sup>1)</sup> With manual stem

**Capacity R410A**

Liquid capacity  $Q_c$  [kW]

Type	Liquid capacity $Q_c$ at pressure drop across valve $\Delta p$ [bar]				
	0.1	0.2	0.3	0.4	0.5
<b>R410A</b>					
<b>EVR 2</b>	2.58	3.64	4.46	5.15	5.76
<b>EVR 3</b>	4.35	6.15	7.53	8.69	9.72
<b>EVR 6</b>	12.88	18.21	22.30	25.76	28.80
<b>EVRH 10</b>	30.58	43.25	52.97	61.17	68.39
<b>EVRH 15</b>	41.85	59.19	72.49	83.70	93.58
<b>EVRH 20</b>	80.48	113.82	139.40	160.97	179.97
<b>EVRH 25</b>	160.97	227.64	278.81	321.94	359.94
<b>EVRH 32</b>	257.55	364.23	446.09	515.10	575.90
<b>EVRH 40</b>	402.42	569.11	697.02	804.85	899.85

Capacities are based on:  
 Liquid temperature  $t_l = 25\text{ °C}$   
 ahead of the valve  
 Evaporating  
 temperature  $t_e = -10\text{ °C}$   
 Superheat 0 K

*Correction factors*

When sizing valves, the plant capacity must be multiplied by a correction factor depending on liquid temperature  $t_l$  ahead of the valve / evaporator.

When the corrected capacity is known, the selection can be made from the table.

*Correction factors for liquid temperature  $t_l$*

$t_l$ [°C]	-10	0	10	15	20	25	30	35	40	45	50
<b>R410A</b>	0.73	0.79	0.86	0.9	0.95	1	1.06	1.14	1.23	1.33	1.47

**Capacity R410A**  
(continued)

Suction vapour capacity  $Q_c$

Type	Pressure drop $\Delta$ [bar]	Suction vapour capacity $Q_c$ [kW] at evaporating temperature $t_e$ [°C]					
		-40	-30	-20	-10	0	10
<b>R410A</b>							
<b>EVR 2</b>	0.07	0.16	0.20	0.25	0.31	0.37	0.44
	0.15	0.23	0.29	0.36	0.45	0.54	0.64
	0.20	0.26	0.33	0.42	0.51	0.62	0.74
<b>EVR 3</b>	0.07	0.27	0.34	0.42	0.52	0.63	0.75
	0.15	0.38	0.49	0.61	0.75	0.91	1.09
	0.20	0.43	0.56	0.70	0.87	1.05	1.25
<b>EVR 6</b>	0.07	0.79	1.01	1.26	1.54	1.86	2.21
	0.15	1.13	1.45	1.82	2.24	2.70	3.22
	0.20	1.28	1.66	2.09	2.57	3.11	3.71
<b>EVRH 10</b>	0.07	1.88	2.40	2.99	3.66	4.41	5.25
	0.15	2.68	3.45	4.32	5.31	6.42	7.65
	0.20	3.03	3.94	4.96	6.10	7.39	8.81
<b>EVRH 15</b>	0.07	2.57	3.28	4.09	5.01	6.03	7.18
	0.15	3.66	4.72	5.92	7.27	8.78	10.47
	0.20	4.15	5.38	6.78	8.35	10.11	12.06
<b>EVRH 20</b>	0.07	4.95	6.31	7.87	9.63	11.60	13.80
	0.15	7.04	9.07	11.38	13.98	16.89	20.13
	0.20	7.98	10.36	13.04	16.06	19.43	23.18
<b>EVRH 25</b>	0.07	9.90	12.63	15.74	19.26	23.21	27.61
	0.15	14.08	18.15	22.76	27.96	33.78	40.25
	0.20	15.95	20.71	26.08	32.12	38.87	46.37
<b>EVRH 32</b>	0.07	15.85	20.20	25.18	30.81	37.13	44.17
	0.15	22.53	29.04	36.42	44.74	54.05	64.41
	0.20	25.52	33.14	41.74	51.40	62.19	74.19
<b>EVRH 40</b>	0.07	24.76	31.56	39.34	48.14	58.01	69.02
	0.15	35.20	45.37	56.90	69.90	84.45	100.64
	0.20	39.88	51.78	65.21	80.31	97.17	115.92

Capacities are based on liquid temperature  $t_l = 25$  °C ahead of evaporator. The table values refer to the evaporator capacity and are given as a function of evaporating temperature  $t_e$  and pressure drop  $\Delta p$  across the valve. Capacities are based on dry, saturated vapour ahead of the valve. During operation with superheated vapour ahead of the valve, the capacities are reduced by 4% for each 10 K superheat.

*Correction factors*

When sizing valves, the evaporator capacity must be multiplied by a correction factor depending on liquid temperature  $t_l$  ahead of expansion valve.

When the corrected capacity is known, the selection can be made from the table.

*Correction factors*

$t_l$ [°C]	-10	0	10	15	20	25	30	35	40	45	50
<b>R410A</b>	0.76	0.80	0.89	0.92	0.96	1.0	1.05	1.11	1.18	1.26	1.37

**Capacity R410A**  
(continued)

Hot gas capacity  $Q_h$  [kW]

Type	Pressure drop $\Delta p$ [bar]	Evaporating temp. $t_e$ -10 °C, hot gas temp. $t_h = t_c$ 25 °C, Subcooling $\Delta t_{sub} = 4$ K				
		Condensing temperature $t_c$ [°C]				
		20	30	40	50	60
<b>R410A (EVR 2 – 6, EVRH 10 – 20)</b>						
<b>EVR 2</b>	0.1	0.59	0.62	0.63	0.64	0.61
	0.2	0.83	0.87	0.89	0.90	0.86
	0.4	1.16	1.22	1.26	1.26	1.22
	0.8	1.62	1.71	1.77	1.78	1.72
	1.6	2.21	2.36	2.45	2.48	2.40
<b>EVR 3</b>	0.1	0.99	1.04	1.07	1.07	1.03
	0.2	1.40	1.47	1.51	1.51	1.46
	0.4	1.96	2.06	2.13	2.13	2.06
	0.8	2.73	2.88	2.98	3.00	2.90
	1.6	3.73	3.98	4.14	4.18	4.06
<b>EVR 6</b>	0.1	2.94	3.08	3.17	3.18	3.06
	0.2	4.14	4.35	4.47	4.49	4.32
	0.4	5.81	6.11	6.30	6.32	6.10
	0.8	8.08	8.54	8.83	8.88	8.58
	1.6	11.04	11.78	12.26	12.39	12.02
<b>EVRH 10</b>	0.1	6.98	7.32	7.53	7.54	7.27
	0.2	9.83	10.33	10.62	10.65	10.27
	0.4	13.80	14.52	14.96	15.01	14.49
	0.8	19.19	20.28	20.97	21.09	20.38
	1.6	26.23	27.98	29.11	29.43	28.54
<b>EVRH 15</b>	0.1	9.55	10.02	10.30	10.32	9.95
	0.2	13.46	14.13	14.54	14.58	14.05
	0.4	18.88	19.87	20.47	20.55	19.82
	0.8	26.27	27.76	28.69	28.86	27.90
	1.6	35.89	38.29	39.84	40.27	39.05
<b>EVRH 20</b>	0.1	18.37	19.27	19.81	19.85	19.13
	0.2	25.88	27.17	27.96	28.03	27.02
	0.4	36.31	38.20	39.36	39.51	38.12
	0.8	50.51	53.38	55.17	55.51	53.64
	1.6	69.03	73.64	76.61	77.44	75.10

An increase in hot gas temperature  $t_h$  of 10 K, based on  $t_h = t_c$  25 °C reduces valve capacity approx. 2% and vice versa.

A change in evaporating temperature  $t_e$  changes valve capacity: see correction factor table below.

*Correction factors*

When sizing valves, the table value must be multiplied by a correction factor depending on evaporating temperature  $t_e$ .

*Correction factors for liquid temperature  $t_l$*

$t_l$ [°C]	-40	-30	-20	-10	0	10
<b>R410A</b>	0.92	0.95	0.98	1.0	1.02	1.03

An increase in hot gas temperature  $t_h$  of 10 K reduces valve capacity approx 2% and vice versa.

**Capacity R410A**  
(continued)

Hot gas capacity  $Q_h$  [kW]

Type	Pressure drop $\Delta p$ [bar]	Evaporating temp. $t_e$ -10 °C, hot gas temp. $t_h = t_c$ 25 °C, Subcooling $\Delta t_{sub} = 4$ K				
		Condensing temperature $t_c$ [°C]				
		20	30	40	50	60
<b>R410A (EVRH 25 – 40)</b>						
<b>EVRH 25</b>	0.1	36.74	38.54	39.62	39.71	38.26
	0.2	51.76	54.35	55.91	56.06	54.05
	0.4	72.61	76.40	78.72	79.02	76.24
	0.8	101.02	106.76	110.35	111.02	107.29
	1.6	138.05	147.28	153.22	154.88	150.20
<b>EVRH 32</b>	0.1	58.79	61.67	63.40	63.53	61.22
	0.2	82.81	86.95	89.46	89.70	86.47
	0.4	116.18	122.25	125.96	126.44	121.99
	0.8	161.63	170.82	176.55	177.63	171.66
	1.6	220.88	235.64	245.15	247.80	240.32
<b>EVRH 40</b>	0.1	91.85	96.35	99.06	99.27	95.66
	0.2	129.39	135.86	139.78	140.16	135.11
	0.4	181.53	191.01	196.81	197.56	190.61
	0.8	252.55	266.91	275.86	277.54	268.22
	1.6	345.13	368.19	383.04	387.19	375.50

An increase in hot gas temperature  $t_h$  of 10 K, based on  $t_h = t_c$  25 °C reduces valve capacity approx. 2% and vice versa.

A change in evaporating temperature  $t_e$  changes valve capacity: see correction factor table below.

*Correction factors*

When sizing valves, the table value must be multiplied by a correction factor depending on evaporating temperature  $t_e$ .

*Correction factors for liquid temperature  $t_l$*

$t_l$ [°C]	-40	-30	-20	-10	0	10
<b>R410A</b>	0.92	0.95	0.98	1.0	1.02	1.03

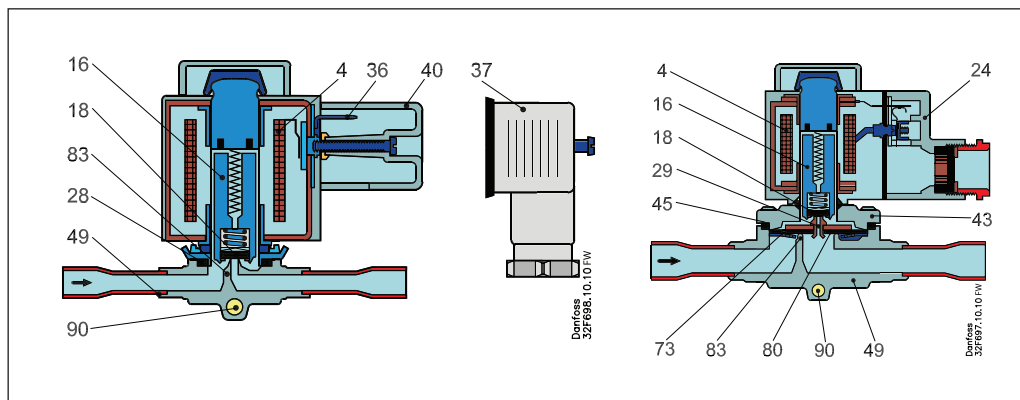
An increase in hot gas temperature  $t_h$  of 10 K reduces valve capacity approx 2% and vice versa.

**Capacity R744**

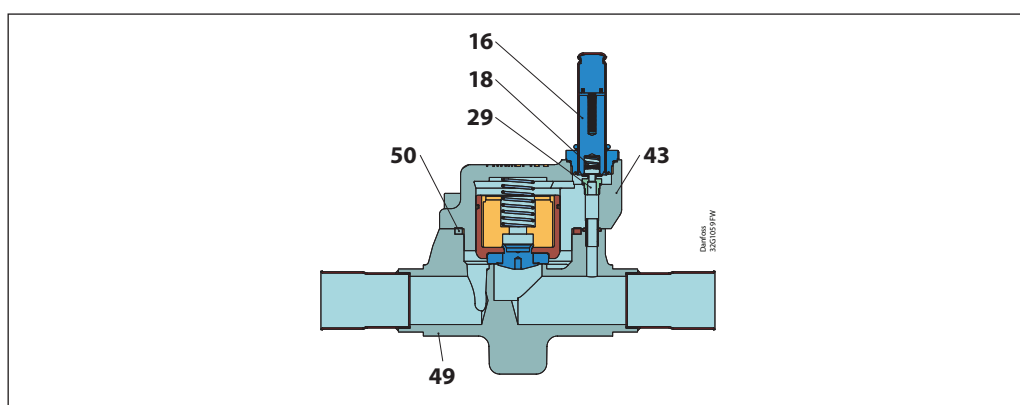
Due to the fact that EVRH only can be used for sub critical R744 application, capacity tables are not illustrated in this catalog. For capacity dimension please refer to the Danfoss Coolselector or contact your local Danfoss office.

Design / Function

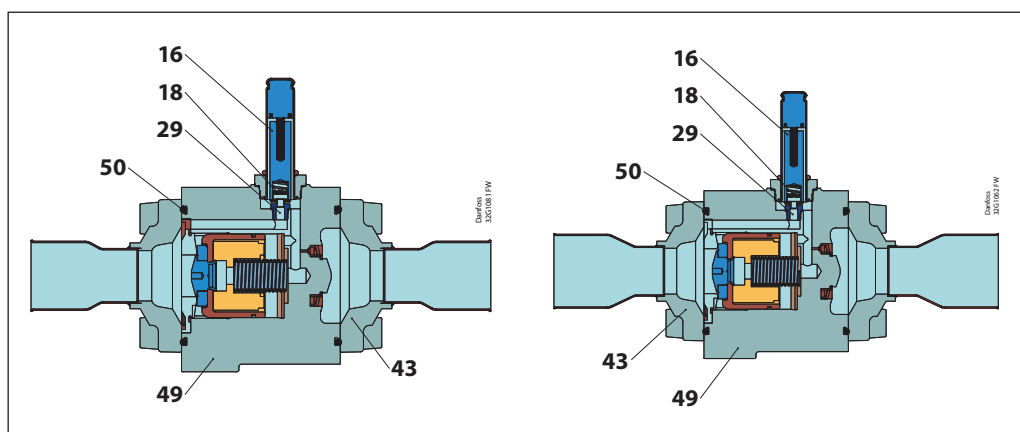
EVR 2 – 6 and EVRH 10 – 20



EVRH 25



EVRH 32 – 40



- 4. Coil
- 16. Armature
- 18. Valve plate / Pilot valve plate
- 24. Connection for flexible steel hose
- 28. Gasket
- 29. Pilot orifice
- 37. DIN socket (to DIN 43650)
- 40. Protective cap / Terminal box
- 43. Valve cover
- 44. O-ring
- 45. Valve cover gasket
- 49. Valve body
- 50. Gasket
- 73. Equalization hole
- 80. Diaphragm / Servo piston
- 83. Valve seat
- 90. Mounting hole

**Design / Function**  
(continued)

*EVRH solenoid valves are designed on two different principles:*

1. Direct operation
2. Servo operation

*1. Direct operation*

EVR 2 and EVR 3 are direct operated. The valves open directly for full flow when the armature (16) moves up into the magnetic field of the coil. This means that the valves operate with a minimum differential pressure of 0 bar. The valve plate (18) is fitted directly on the armature (16). Inlet pressure acts from above on the armature and the valve plate. Thus, inlet pressure, and spring force act to close the valve when the coil is currentless.

*2. Servo operation*

EVR 6 and EVRH 10 – 20 are servo operated with a "floating" diaphragm (80). The pilot orifice (29) is placed in the centre of the diaphragm. The pilot valve plate (18) is fitted direct to the armature (16). When the coil is currentless, the main orifice and pilot orifice are closed. The pilot orifice and main orifice are held closed by the armature spring force and the differential pressure between inlet and outlet sides. When current is applied to the coil the armature is drawn up into the magnetic field and opens the pilot orifice. This relieves the pressure above the diaphragm, i.e. the space above the diaphragm becomes connected to the outlet side of the valve.

The differential pressure between inlet and outlet sides then presses the diaphragm away from the main orifice and opens it for full flow. Therefore a certain minimum differential pressure is necessary to open the valve and keep it open. For EVR 6 and EVRH 10 – 20 valves this differential pressure is 0.05 bar. When current is switched off, the pilot orifice closes. Via the equalization holes (73) in the diaphragm, the pressure above the diaphragm then rises to the same value as the inlet pressure and the diaphragm closes the main orifice.

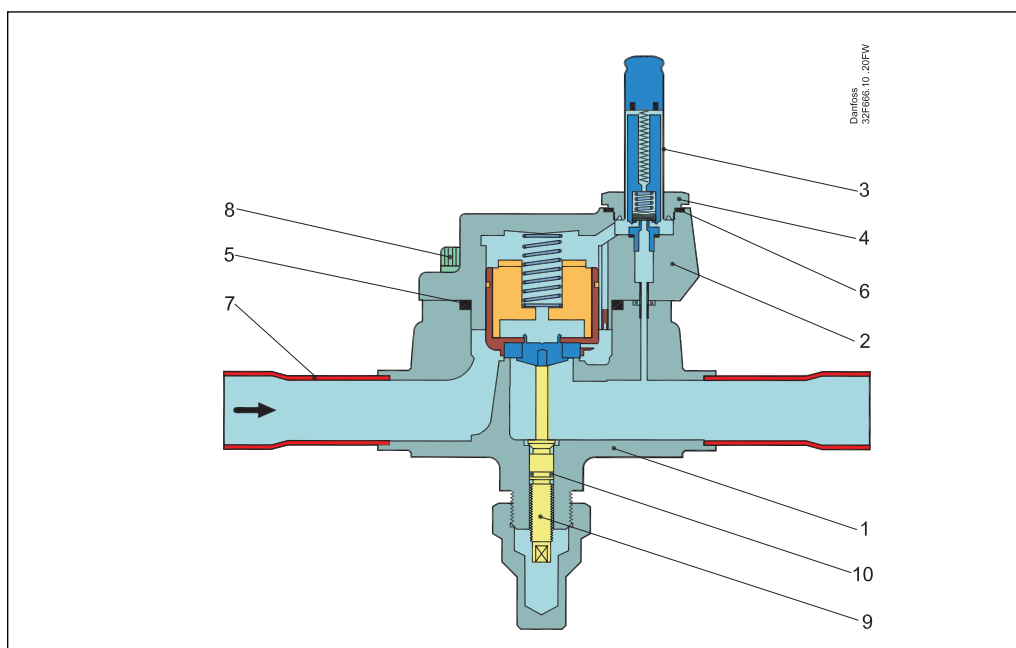
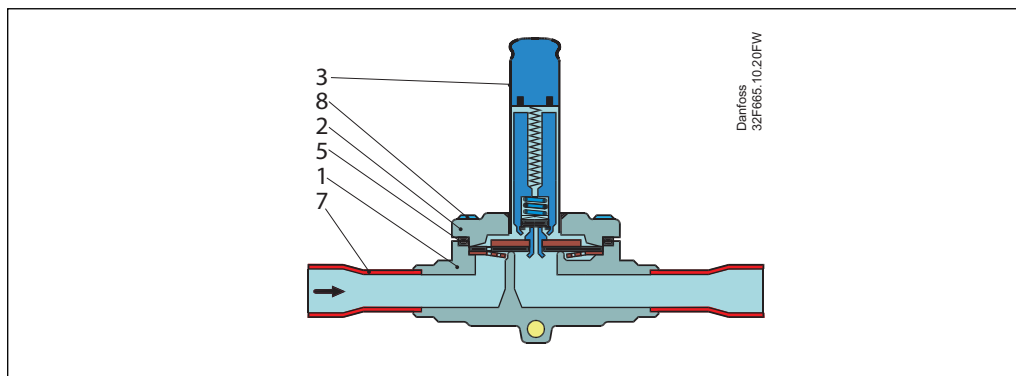
EVRH 25 – 40 are servo operated piston valves. The valves are closed with currentless coil. The servo piston (80) with main valve plate (84) closes against the valve seat (83) by means of the differential pressure between inlet and outlet side of the valve and the force of the compression spring (76).

When current to the coil is switched on, the pilot orifice (29) opens. This relieves the pressure on the piston spring side of the valve. The differential pressure will then open the valve. The minimum differential pressure needed for full opening of the valves is 0.2 bar.



Material specifications

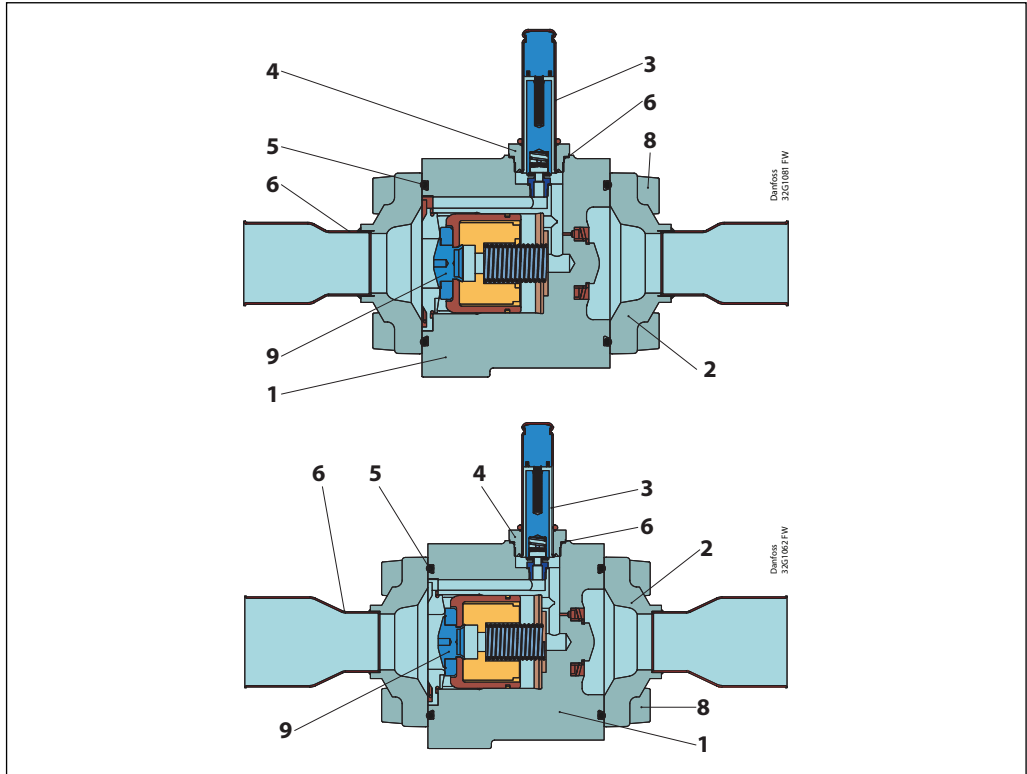
EVR 2 – 6 and EVRH 10 – 25



No.	Description	Solenoid valves Type	Material	Analysis	Mat.no.	W.no.	Standard	
							DIN	EN
1	Valve body	EVR 2 – 6 EVRH 10 – 25	Brass	CuZn40Pb2	CW617N	2.0402	17672-1	12165
2	Cover	EVR 2 – 6	Stainless steel	X5 CrNi18-10	—	1.4301	—	10088
		EVRH 10 – 20	Brass	CuZn40Pb2	CW617N	2.0402	17672-1	12165
		EVRH 25	Cast iron	EN-GJS-400-18-LT	EN-JS1025	—	—	1563
3	Armature tube	EVR 2 – 6 EVRH 10 – 25	Stainless steel	X2 CrNi19-11	—	1.4306	—	10088
4	Armature tube nut	EVRH 25	Stainless steel	X8 CrNiS 18-9	—	1.4305	—	10088
5	Gasket	EVR 2 – 6 EVRH 10 – 25	Rubber	Cr	—	—	—	—
6	Gasket	EVRH 25	Al. gasket	Al 99.5	—	3.0255	—	10210
7	Solder tube	EVR 2 – 6 EVRH 10 – 25	Copper	SF-Cu	CW024A	2.0090	1787	12449
8	Screws	EVR 2 – 6 EVRH 10 – 25	Stainless steel	A2-70	—	—	3506	—
9	Spindle for man. operat.	EVRH 25	Stainless steel	X8 CrNiS 18-9	—	1.4305	—	10088
10	Gasket	EVRH 25	Rubber	Cr	—	—	—	—

**Material specifications**  
(continued)

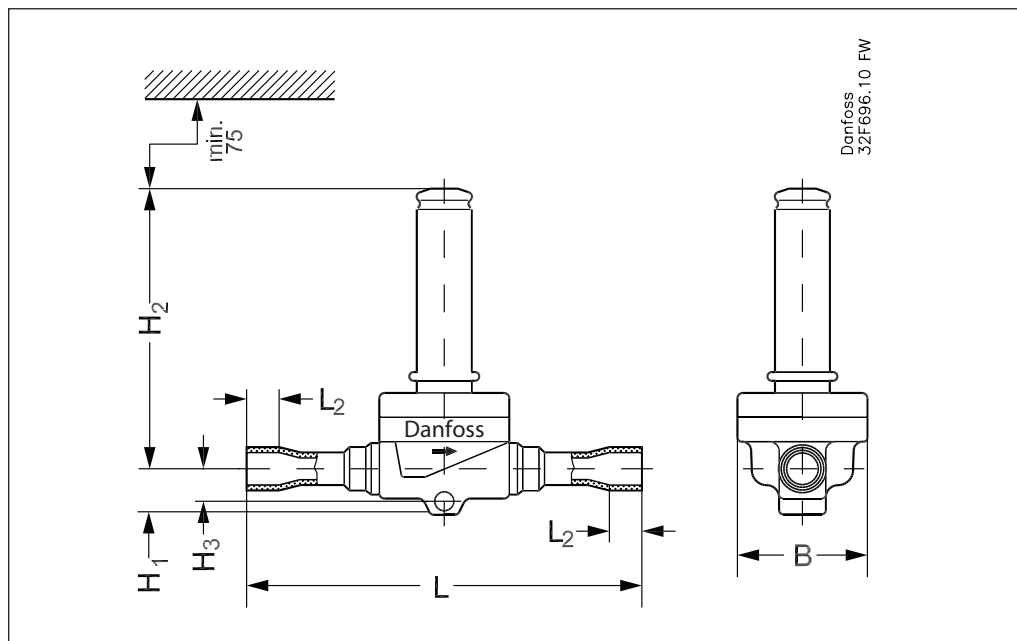
EVRH 32 – 40



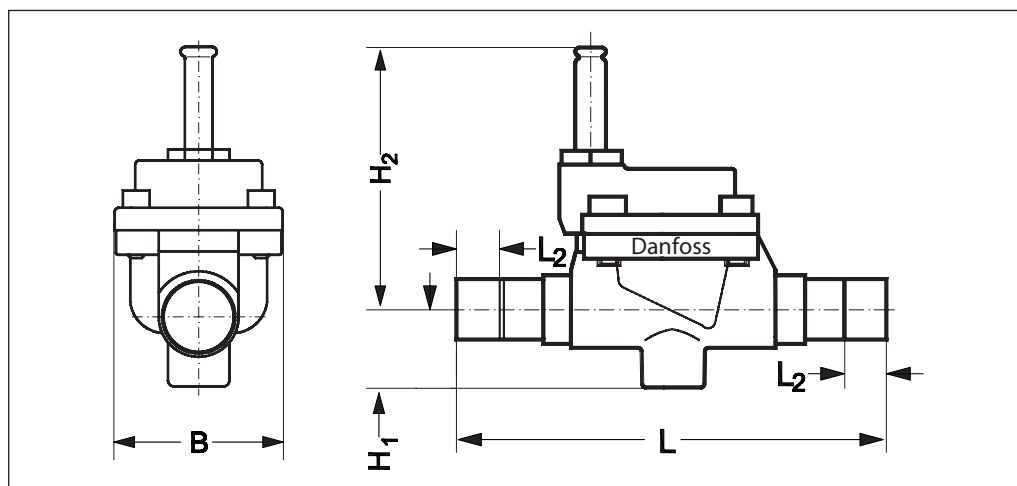
No.	Description	Material	Analysis	Mat.no.	W.no.	Standard	
						DIN	EN
1	Valve body	Cast Iron	EN-GJS-400-18-LT	EN-JS1025	—	—	1563
2	Cover	Brass	CuZn40Pb2	CW617N	2.0402	—	12165
3	Armature tube	Stainless steel	X2 CrNi19-11	—	1.4306	—	10088
4	Armature tube nut	Stainless steel	X8 CrNiS 18-9	—	1.4305	—	10088
5	Gasket	Rubber	Cr	—	—	—	—
6	Gasket	Al. gasket	Al 99.5	—	3.0255	—	10210
7	Solder tube	Bi-metallic tube	Stainless steel/ Cu	CW024A	2.0090	1787	12449
8	Screws	Stainless steel	A2-70	—	—	3506	—
9	Spindle for man. operation	Stainless steel	X8 CrNiS 18-9	—	1.4305	—	10088

Dimensions and weights

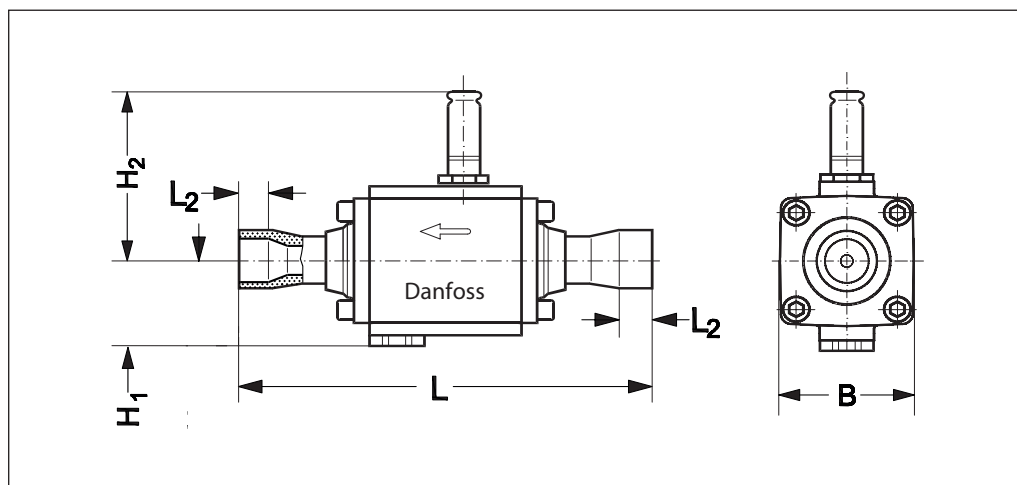
EVR 2 – 6 and EVRH 10 – 20



EVRH 25

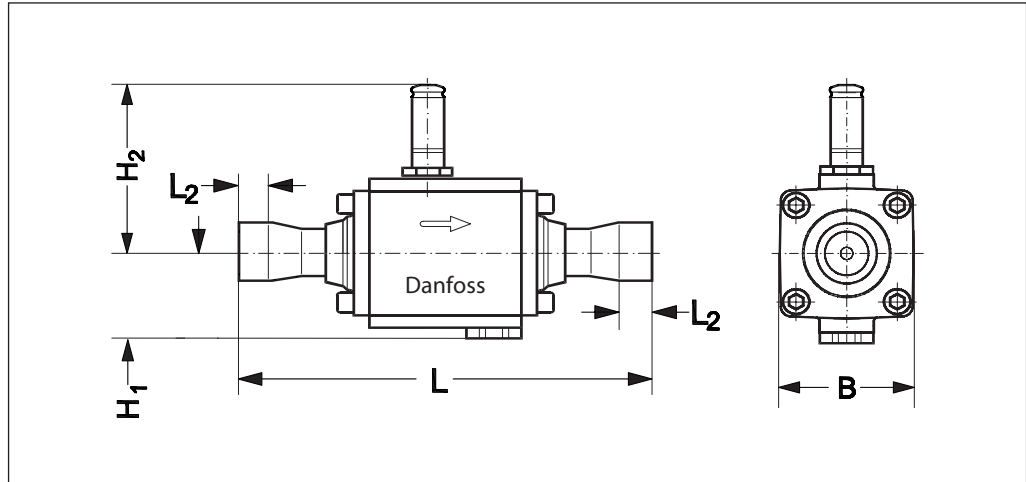


EVRH 32

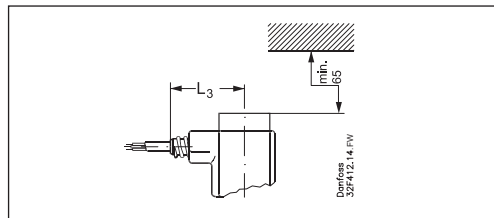


Dimensions and weights  
(continued)

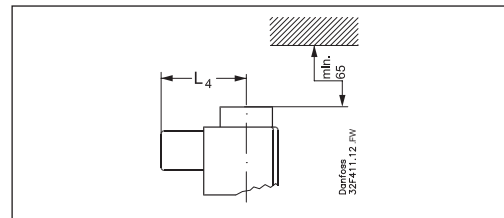
EVRH 40



Coil with cable



Coil with DIN plugs



Net weight of coil

10 W: approx. 0.3 kg  
12 and 20 W: approx. 0.5 kg

EVRH 25, EVRH 32 – 40, solder connection

Type	Connection solder		H <sub>1</sub> [mm]	H <sub>2</sub> [mm]	H <sub>3</sub> [mm]	L [mm]	L <sub>2</sub> [mm]	B [mm]	Net weight [kg]
	[in.]	[mm]							
EVR 2, EVR 3	1/4	6	14	64	9	102	7	33	0.2
EVR 6	3/8	10	14	75	10	111	9	36	0.3
EVRH 10	1/2	12	16	76	10	127	10	46	0.5
EVRH 15	5/8	16	19	83	—	176	12	56	0.8
EVRH 20	7/8	22	20	87	—	191	17	72	1.0
EVRH 25	1 1/8	—	38.5	130.5	—	206	22	95	3.0
EVRH 32	—	35	50	104	—	242	18	80	4.3
EVRH 40	1 5/8	—	53	104	—	260	29	80	4.3