Data sheet

Solenoid valves for R 410A and R744 (CO_2)
Type EVR 2 to EVR 8 and EVRH 10 to EVRH 40

EVR 2 and EVR 3 (direct operated) and EVR 4 to EVR 8 / EVRH 10 to EVRH 40 (servo-operated) are high pressure solenoid valves
specially designed to meet the requirements of high pressure refrigerants such as R410A and R744 (CO2).
The EVRH valve can be used for liquid, suction and hot gas lines.

Features

- Normally Closed and Normally Open
- Coils for a.c. and d.c. voltages
- Suitable for R410A and R744 (CO_2)
- Media temperatures up to 221°F
- Design pressure 655 psig
- MOPD up to 350 psi
- Solder connections up to 7/8 inch
- Extended soldering ends
- Solders without dismantling the valve

Note: EVR 2-3 are not suitable for CO_2 applications with media temperatures constantly below 0 °C. For other media temperatures, please contact Danfoss.

Approvals

The Low Voltage Directive (LVD) 73/23/EC with amendments EN 60730-2-8.

c UL us Listed

Technical data

Type	Opening differential pressure Δp [psig] (with standard coil)			C_v value [gal/min]
	Min. ODP	MOPD		
		14 – 17 W a.c.	20 W d.c.	
EVR 2	0	350	260	0.19
EVR 3	0	300	260	0.32
EVR 4	0.7	300	260	0.7
EVR 6	0.7	300	260	0.92
EVR 6 NO	0.7	300	300	0.92
EVR 8	0.7	300	260	1.3
EVRH 10	0.7	300	260	2.2
EVRH 15	0.7	300	260	3.0
EVRH 20	0.7	300	190	5.8
EVRH 22	0.7	300	190	6.9
EVRH 25	1.0	300	260	12
EVRH 32	1.0	300	260	18
EVRH 40	1.0	300	260	29

Ordering

EVR / EVRH Valves

Solenoid valve – Normally Closed (NC) – Soldering ODF without coil

Type	Required coil type	in.	Code no.
EVR 2	a.c./d.c.	1/4	**032F7100**
EVR 3		1/4	**032F7105**
EVR 3		3/8	**032F1157**
EVR 4		3/8	**032F7110**
EVR 4		1/2	**032F7111**
EVR 6		3/8	**032F7115**
EVR 6		1/2	**032F1162**
EVR 6		5/8	**032F7117**
EVR 8		1/2	**032F7121**
EVR 8		5/8	**032F7122**
EVRH 10		1/2	**032G1077**
EVRH 15		5/8	**032G1078**
EVRH 20	a.c.	7/8	**032G1079**
EVRH 25	a.c./d.c.	1 1/8	**032G1059**
EVRH 32 [1)]		–	**032G1081**
EVRH 40		1 5/8	**032G1062**

[1)] Only available with mm connections

Solenoid valve – Normally Open (NO)

Type	Required coil type	in.	Code no.
EVR 6	a.c./d.c.	3/8	032F1164
EVRH 10		1/2	032F1329

BJ and BX Coils

Valve type	Coil type	Code no.	Wire length [in.]	Wire length [cm]	Voltage [V a.c.]	Frequency [Hz]	Power consumption [W]	Weight [lbs / kg]
Junction box NEMA 2								
EVR / EVRH EVRA / EVRAT EVRS / EVRST EVM	BJ024CS	018F4100	7	18	24	50 / 60	14	0.860 / 0.390
	BJ120CS	018F4110	7	18	110 120	50 / 60 60	16 15	
	BJ240CS	018F4120	7	18	208 – 240 230	60 50	14 17	
Conduit boss NEMA 4								
EVR / EVRH EVRA / EVRAT EVRS / EVRST EVM EV220B 6-50 EV210B EV215B EV225 EV250B	BX024CS	018F4102	18	46	24	50 / 60	14	0.717 / 0.325
	BX024CS	018F4103	71	180	24	50 / 60	14	
	BX024CS	018F4104	98	250	24	50 / 60	14	
	BX120CS	018F4112	18	46	110 120	50 / 60 60	16 15	
	BX120CS	018F4113	36	91				
	BX120CS	018F4114	71	180				
	BX120CS	018F4115	98	250				
	BX240CS	018F4122	18	46	208 – 240 230	60 50	14 17	
	BX240CS	018F4123	98	250				

Technical data

Design
In accordance with UL 429

Power supply
Alternating current (a.c.)

Permissible voltage variation
Alternating current (a.c.):
50 Hz and 60 Hz: -10% – +15%
50/60 Hz: +/- 10%

Power consumption
Alternating current (a.c.): Inrush: 49 VA;
Holding: 28 VA, 16 W

Insulation of coil wire
Class H according to IEC 85

Connection
Junction box or Conduit boss

Enclosure, IEC 60529
Junction box NEMA 2 ~ IP 12–32
Conduit boss NEMA 4 ~ IP 54

Ambient temperature
-40 °F – 122 °F (-40 °C – 50 °C)

Capacity, R410A

Liquid capacity Q_0 tons **R410A**

Type	Liquid capacity Q_0 tons at pressure drop across valve p psi						
	1	2	3	4	5	6	7
EVR 2	0.56	0.78	**0.96**	1.1	1.23	1.35	1.46
EVR 3	0.98	1.37	**1.68**	1.93	2.15	2.36	2.55
EVR 4	2.12	2.98	**3.65**	4.2	4.69	5.14	5.55
EVR 6	2.79	3.92	**4.8**	5.52	6.16	6.75	7.3
EVR 8	3.94	5.54	**6.78**	7.8	8.7	9.54	10.3
EVRH 10	6.63	9.31	**11.4**	13.1	14.6	16	17.3
EVRH 15	9.07	12.7	**15.6**	17.9	20	21.9	23.7
EVRH 20	17.5	24.5	**30**	34.5	38.5	42.2	46.6
EVRH 22	20.82	29.4	**36**	41.4	46.2	50.6	54.8
EVRH 25	33.65	47.59	**58.29**	67.31	75.25	82.44	89.04
EVRH 32	53.85	76.15	**93.27**	107.69	120.41	131.90	142.47
EVRH 40	84.14	118.99	**145.73**	168.27	188.13	206.09	222.60

Capacities are based on:
liquid temperature t_l = 100 °F

Evaporating temperature t_e = 40 °F
Superheat 10 °F

Suction vapour capacity. Q_0 **R410A**

Type	Pressure drop Δp [psi]	Suction vapour capacity Q_0 tons at evaporating temperature t_e °F							
		-40	-20	0	10	20	30	40	50
EVR 2	1	0.04	0.05	0.07	0.07	0.08	0.09	**0.10**	0.11
	2	0.06	0.07	0.09	0.11	0.12	0.13	0.14	0.16
	3	0.07	0.09	0.12	0.13	0.14	0.16	**0.18**	0.19
EVR 3	1	0.07	0.09	0.12	0.13	0.14	0.16	0.18	0.20
	2	0.10	0.13	0.16	0.18	0.21	0.23	0.25	0.28
	3	0.12	0.16	0.20	0.23	0.25	0.28	0.31	0.34
EVR 4	1	0.15	0.20	0.25	0.28	0.31	0.35	**0.39**	0.43
	2	0.22	0.28	0.36	0.40	0.45	0.49	0.55	0.60
	3	0.27	0.35	0.44	0.49	0.55	0.61	0.67	0.74
EVR 6	1	0.20	0.26	0.33	0.37	0.41	0.46	**0.51**	0.56
	2	0.29	0.37	0.47	0.53	0.59	0.65	0.72	0.79
	3	0.35	0.46	0.58	0.65	0.72	0.80	0.88	0.97
EVR 8	1	0.28	0.36	0.46	0.52	0.57	0.64	**0.71**	0.78
	2	0.41	0.52	0.66	0.74	0.82	0.91	1.01	1.10
	3	0.49	0.64	0.81	0.91	1.01	1.12	1.23	1.36
EVRH 10	1	0.48	0.62	0.79	0.89	0.98	1.09	**1.20**	1.33
	2	0.68	0.88	1.12	1.25	1.39	1.54	1.70	1.87
	3	0.84	1.08	1.37	1.54	1.71	1.89	2.09	2.30
EVRH 15	1	0.66	0.85	1.09	1.21	1.35	1.50	**1.65**	1.81
	2	0.93	1.21	1.53	1.72	1.91	2.11	2.33	2.56
	3	1.14	1.48	1.88	2.10	2.33	2.59	2.85	3.14
EVRH 20	1	1.27	1.64	2.09	2.33	2.59	2.88	**3.17**	3.49
	2	1.79	2.32	2.95	3.30	3.67	4.06	4.48	4.93
	3	2.20	2.85	3.61	4.04	4.49	4.98	5.49	6.04
EVRH 22	1	1.51	1.95	2.49	2.77	3.08	3.43	**3.77**	4.15
	2	2.13	2.76	3.51	3.93	4.37	4.83	5.33	5.87
	3	2.62	3.39	4.29	4.81	5.34	5.92	6.53	7.19
EVRH 25	1	2.46	3.23	4.13	4.63	5.16	5.72	6.33	6.96
	2	3.39	4.50	5.78	6.49	7.25	8.05	8.91	9.82
	3	4.04	5.42	7.01	7.89	8.82	9.81	10.87	11.98
EVRH 32	1	3.93	5.17	6.61	7.40	8.25	9.16	10.12	11.14
	2	5.42	7.20	9.25	10.39	11.60	12.89	14.26	15.70
	3	6.46	8.68	11.22	12.62	14.11	15.70	17.38	19.17
EVRH 40	1	6.15	8.08	10.32	11.57	12.90	14.31	15.82	17.41
	2	8.47	11.25	14.45	16.23	18.12	20.14	22.27	24.54
	3	10.09	13.56	17.53	19.72	22.05	24.53	27.16	29.95

Note: Bold figures refer to rated capacity

The table values refer to evaporator capacity and are given as a function of evaporating temperature t_e and pressure drop Δp across the valve. Capacities are based on liquid temperature t_l = 100 °F ahead of the expansion valve and superheat t_s = 7 °F. For each additional 10°F of superheat, the table capacities must be reduced by 2%.

Correction factors for liquid temperature t_l
When liquid temperature t_l ahead of the expansion valve is other than 100°F, adjust the table capacities by multiplying them by the appropriate correction factor found in the following table:

t_l°F	80	90	100	110	120
Factor	1.10	1.05	1.00	0.95	0.90

Capacity R410A

Hot gas capacity Q_h tons

type	pressure drop p [psi]	Evaporating temp. t_e=+40 °F. hotgas temp. t_h=t_c+40 °F. subcooling t_u=10 °F	
		Condensing temperature t_c °F	
		+70	+100
EVR 2	2	0.19	**0.20**
	5	0.30	0.31
	10	0.42	0.44
	15	0.52	0.54
	20	0.60	0.62
	25	0.67	0.69
EVR 3	**2**	0.33	**0.34**
	5	0.52	0.54
	10	0.74	0.76
	15	0.90	0.94
	20	1.04	1.08
	25	1.16	1.21
EVR 4	**2**	0.72	**0.75**
	5	1.13	1.17
	10	1.61	1.65
	15	1.97	2.02
	20	2.27	2.33
	25	2.54	2.60
EVR 6	**2**	0.94	**0.98**
	5	1.49	1.55
	10	2.11	2.19
	15	2.59	2.68
	20	2.98	3.10
	25	3.34	3.46
EVR 8	2	1.31	**1.37**
	5	2.08	2.17
	10	2.95	3.06
	15	3.62	3.75
	20	4.17	4.33
	25	4.67	4.84
EVRH 10	**2**	2.24	**2.33**
	5	3.54	3.68
	10	5.02	5.20
	15	6.14	6.36
	20	7.08	7.36
	25	7.92	8.22
EVRH 15	2	3.07	**3.18**
	5	4.85	5.03
	10	6.86	7.11
	15	8.40	8.70
	20	9.69	10.00
	25	10.8	11.2
EVRH 20	**2**	5.90	**6.12**
	5	9.32	9.68
	10	13.2	13.7
	15	16.1	16.7
	20	18.6	19.3
	25	20.8	21.6
EVRH 22	**2**	7.02	**7.28**
	5	11.1	11.5
	10	15.7	16.3
	15	19.2	19.9
	20	22.1	23.0
	25	24.7	25.7
EVRH 25	2	12.95	13.91
	5	20.32	21.89
	10	28.34	30.70
	15	34.22	37.28
	20	38.94	42.68
	25	42.88	47.30
EVRH 32	2	20.73	22.26
	5	32.51	35.02
	10	45.34	49.12
	15	54.75	59.65
	20	62.30	68.29
	25	68.61	75.68
EVRH 40	2	32.39	34.78
	5	50.79	54.72
	10	70.85	76.75
	15	85.54	93.20
	20	97.34	106.70
	25	107.21	118.25

Hot gas capacity values in the table are given as a function of condensing temperature t_c and pressure drop across the valve Δp.
Capacities are based on gas superheated 40 °F above condensing temperature,

($t_h = t_c + 40$ °F)

For each additional 10 °F of superheat above 40 °F, the table capacities must be reduced by 1%.
In a hot gas defrost circuit, evaporator temperature affects valve capacity.

When the evaporator temperature differs from +40 °F, adjust the table capacities by multiplying them by applying a correction factor from the following table.

Correction factors for t_h and t_c

t_i°F	-40	-20	0	20	40	50
Factor	1.18	1.14	1.09	1.04	1	0.97

Note: The MOPD is depending on the choise of coil, please refer to page 4.

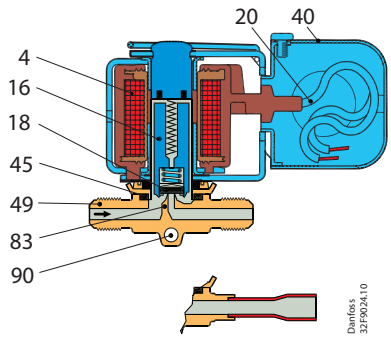
Capacity R744 (CO_2)

With CO_2 EVRH valves can only be used in subcritical applications.
For CO_2 capacity tables, refer to Coolselector or contact your local Danfoss office.

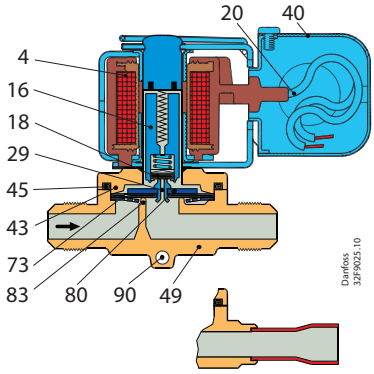
Note: EVR 2-3 are not suitable for CO_2 applications with media temperatures constantly below 0 °C. For other media temperatures, please contact Danfoss.

Design and Function

4. Coil
16. Armature
18. Valve plate/ Pilot valve plate
20. Ground terminal
28. Gasket
29. Pilot orifice
40. Protective cap, Junction box
43. Valve cover
45. Valve cover gasket
49. Valve body
73. Equalization port
80. Diaphragm and servo piston
83. Valve seat
90. Mounting hole



Direct operated
EVR 2 and EVR 3



Servo operated
EVR 4 to EVR 8 and EVRH 10 to EVRH 40

EVRH solenoid valves are designed on two different principles:
1. Direct operation
2. Servo operation

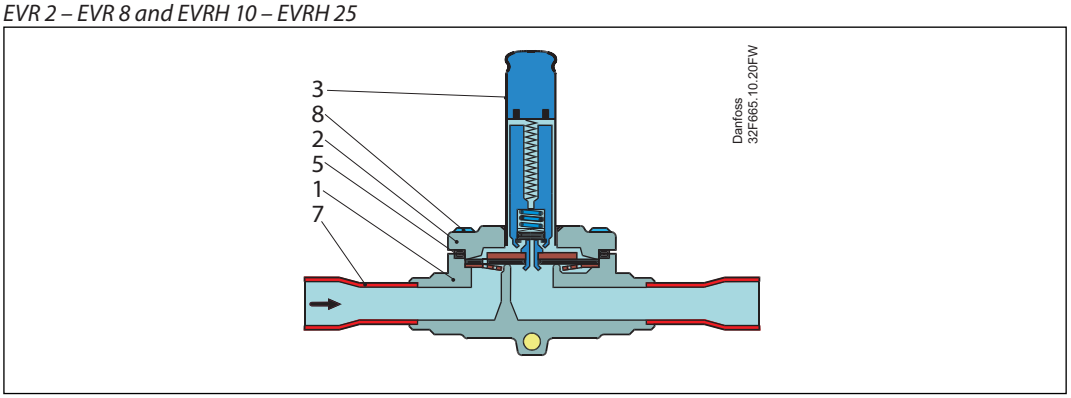
1. Direct operation
EVR 2 and EVR 3 are direct operated. The valves open directly for full flow when the armature (16) moves up into the magnetic field of the coil. This means that the valves operate with a min. differential pressure of 0 bar. The valve plate (18) is fitted directly on the armature (16). 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.

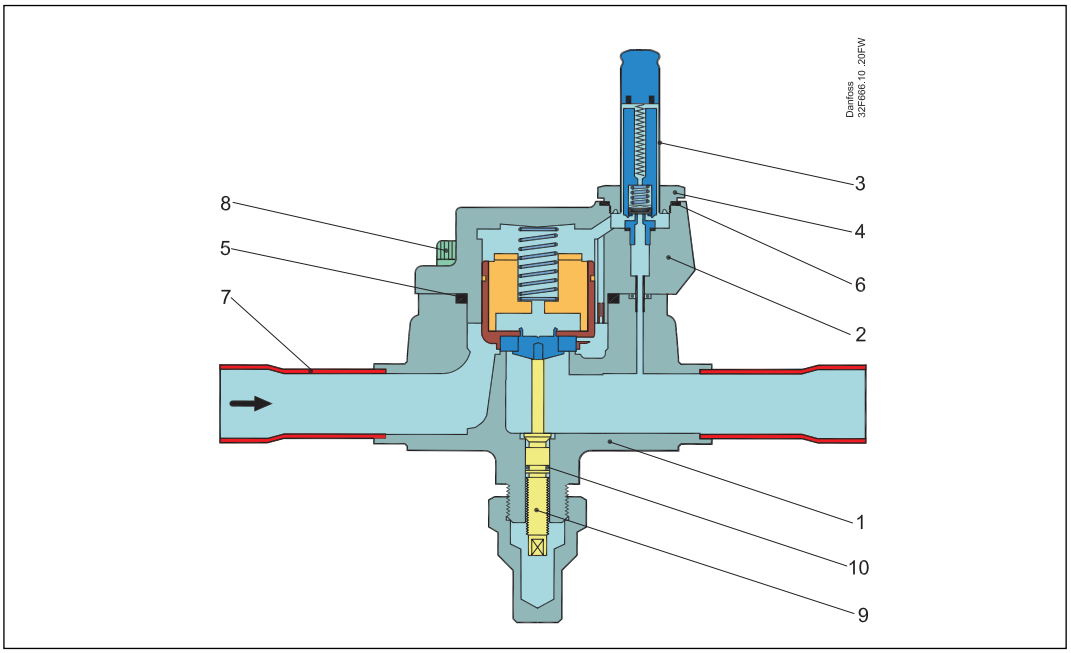
2. Servo operation
EVR 4 to EVR 8 and EVRH 10 – EVRH 20 are servo operated with a "floating" diaphragm (80). The pilot orifice (29) is placed in the centre of the diaphragm. The pilot valve plate (18) is fitted direct to the armature (16). When the coil is currentless, the main orifice and pilot orifice 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 4 to EVR 8 and EVRH 10 – EVRH 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 – EVRH 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 – EVR 8 and EVRH 10 – EVRH 25

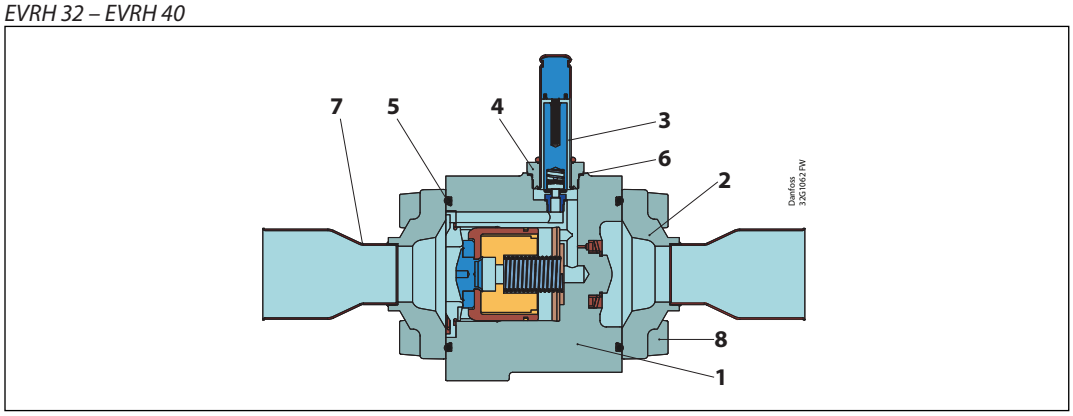




No.	Description	Solenoid valves Type	Material	Analysis	Mat.no.	W.no.	Standard	
							DIN	EN
1	Valve body	EVR 2 – EVR 8 EVRH 10 – EVRH 25	Brass	CuZn40Pb2	CW617N	2.0402	17672-1	12165
2	Cover	EVR 2 – EVR 8	Stainless steel	X5 CrNi18-10	–	1.4301	–	10088
		EVRH 10 – EVRH 20	Brass	CuZn40Pb2	CW617N	2.0402	17672-1	12165
		EVRH 25	Cast iron	EN-GJS-400-18-LT	EN-JS1025	–	–	1563
3	Armature tube	EVR 2 – EVR 8 EVRH 10 – EVRH 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 – EVR 8 EVRH 10 – EVRH 25	Rubber	Cr	–	–	–	–
6	Gasket	EVRH 25	Al. gasket	Al 99.5	–	3.0255	–	10210
7	Solder tube	EVR 2 – EVR 8 EVRH 10 – EVRH 25	Copper	SF-Cu	CW024A	2.0090	1787	12449
8	Screws	EVR 2 – EVR 8 EVRH 10 – EVRH 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)

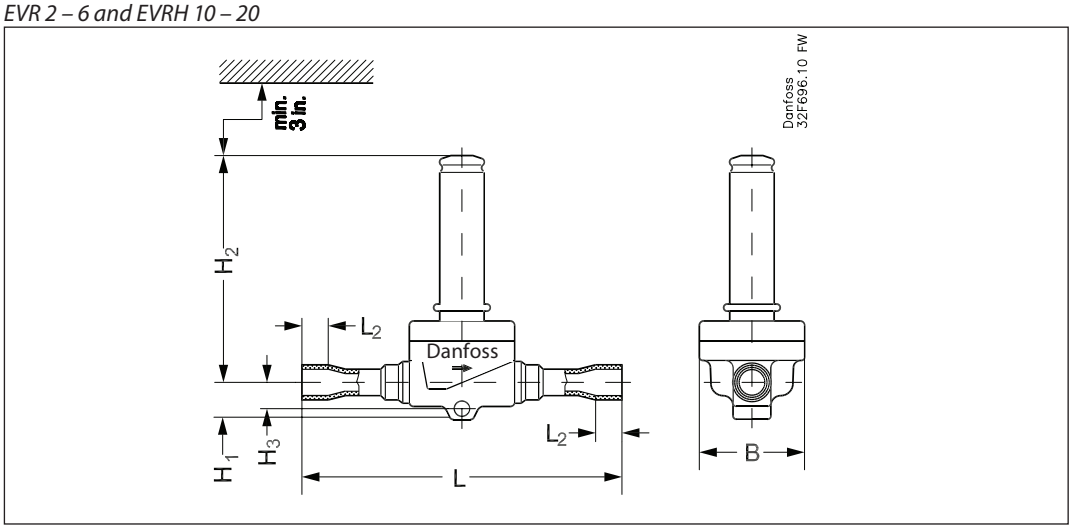
EVRH 32 – EVRH 40



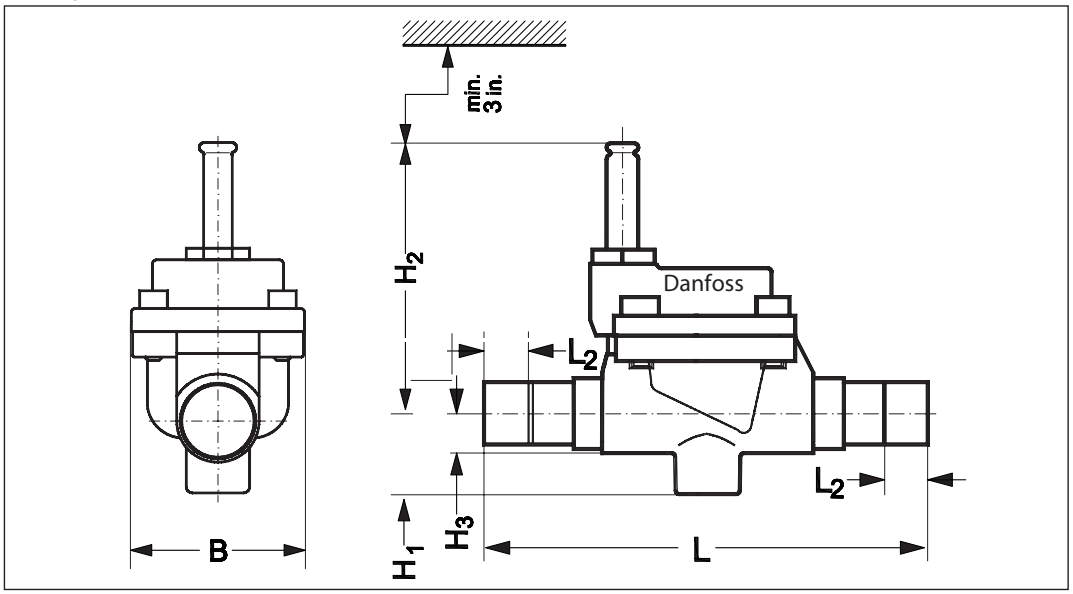
No.	Description	Material	Analysis	Mat.no.	W.no.	Standard	
						DIN	EN
1	**Valve body**	Cast Iron	EN-GJS-400-18-LT	EN-JS1025	—	—	1563
2	**Cover**	Brass	CuZn40Pb2	CW617N	2.0402	—	12165
3	**Armature tube**	Stainless steel	X2 CrNi19-11	—	1.4306	—	10088
4	**Armature tube nut**	Stainless steel	X8 CrNiS 18-9	—	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	—

Dimensions and weight

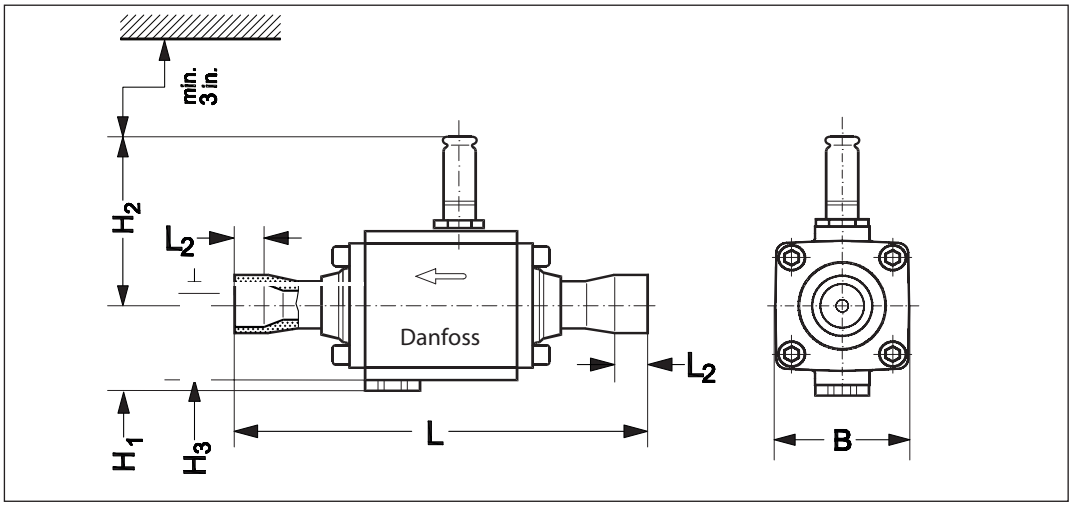
EVR 2 – 6 and EVRH 10 – 20



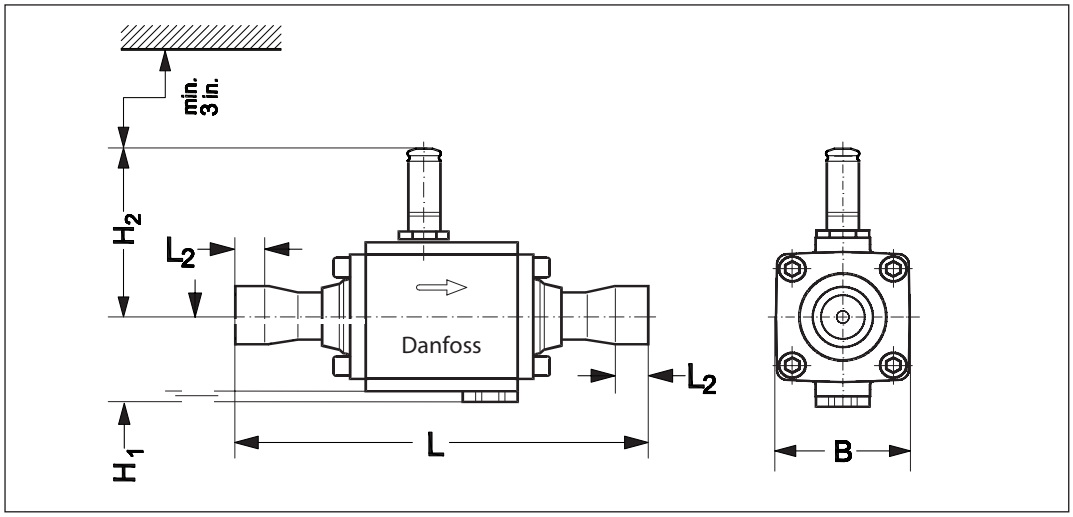
EVRH 25



EVRH 32



EVRH 40



EVRH 25, EVRH 32 – 40, solder connection

Type	Solder connection [in.]	H1 [in.]	H2 [in.]	H3 [in.]	L [in.]	L2 [in.]	B [in.]	Weight [lbs]
EVR 2	1/4 lbs	9/16	2 1/2	5/16	4	9/32	1 5/16	0.44
EVR 3	1/4	9/16	2 1/2	5/16	4	9/32	1 5/16	0.44
	3/8	9/16	2 1/2	5/16	4 5/8	5/16	1 5/16	0.44
EVR 4	3/8	9/16	2 3/4	3/8	4 1/4	5/16	1 5/16	–
	1/2	9/16	2 3/4	3/8	5	3/8	1 5/16	–
EVR 6	3/8	9/16	2 3/4	3/8	4 1/4	5/16	1 5/16	0.66
	1/2	9/16	2 3/4	3/8	5	3/8	1 5/16	0.66
	5/8	9/16	2 3/4	3/8	6	1/2	1 5/16	0.66
EVR 8	1/2	9/16	2 3/4	3/8	5	3/8	1 5/16	–
	5/8	9/16	2 3/4	3/8	6	1/2	1 5/16	–
EVRH 10	1/2	5/8	3	7/16	5	3/8	1 13/16	1.10
EVRH 15	5/8	3/4	3 1/4	–	6 15/16	1/2	2 3/16	1.76
EVRH 18	–	3/4	3 1/4	–	–	–	2 3/16	–
EVRH 20	7/8	25/32	3 7/16	–	7 1/2	5/8	2 13/16	2.20
EVRH 22	7/8	25/32	3 7/16	–	7 1/2	5/8	2 13/16	–
EVRH 25	1 1/8	–	5 1/8	1 1/2	8 1/8	7/8	3 3/4	3.0
EVRH 32	–	–	1 1/16	2	9 1/2	11/16	3 1/8	4.3
EVRH 40	1 5/8	–	1 1/16	2 1/16	10 1/4	1 1/8	3 1/8	4.3

Net weight of coil: 0.67 lbs