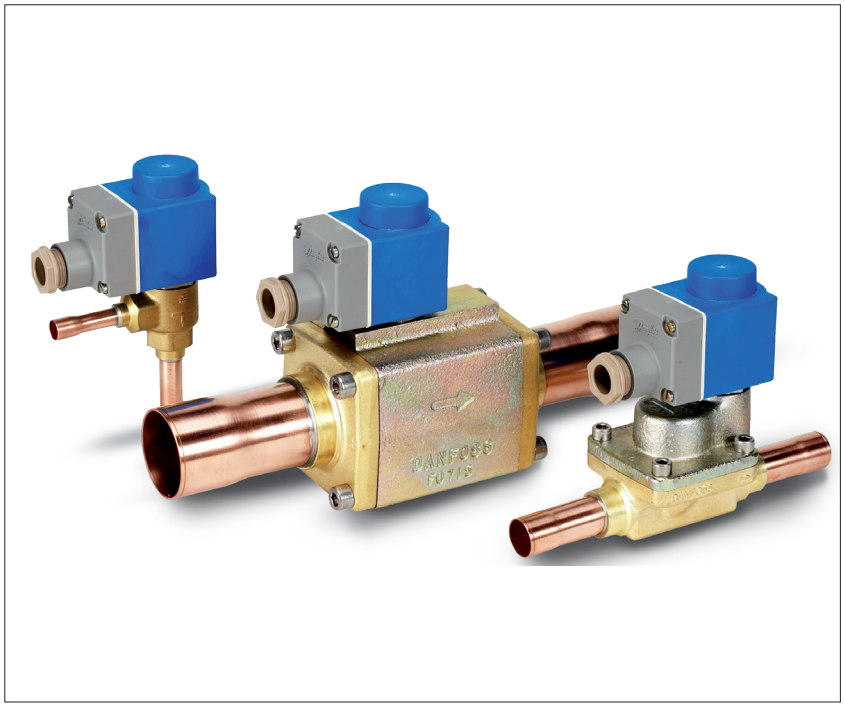
ENGINEERING TOMORROW

Data sheet

Electric expansion valves

Types AKV 10, AKV 15 and AKV 20



AKV are electrically operated expansion valves designed for refrigerating plants.

The AKV valves are normally controlled by a controller from Danfoss' range of ADAP- KOOL® controllers.

The AKV valves are supplied as a component programme, as follows:
– Separate valve
– Separate coil with terminal box or cable
– Spare parts in the form upper part, orifice and filter

Valve capacity is indicated with a number forming part of the type designation.
The number represents the size of the orifice of the valve in question. A valve with orifice 3 will for example be designated AKV 10-3.
The orifice assembly is replaceable.

Features

- Refrigerants: R744, R22/R407C, R404A/R507, R410A, R134a, R407A, R23, R407F, R422B, R422D, R448A, R449A, R449B, R450A, R452A, R513A.
  For a complete list of approved refrigerants, visit *www.products.danfoss.com* and search for individual code numbers, where refrigerants are listed as part of technical data.
- The valve requires no adjustment
- Wide regulation range
- Replaceable orifice assembly
- Both expansion valve and solenoid valve
- Wide range of AC and DC coils

Approvals

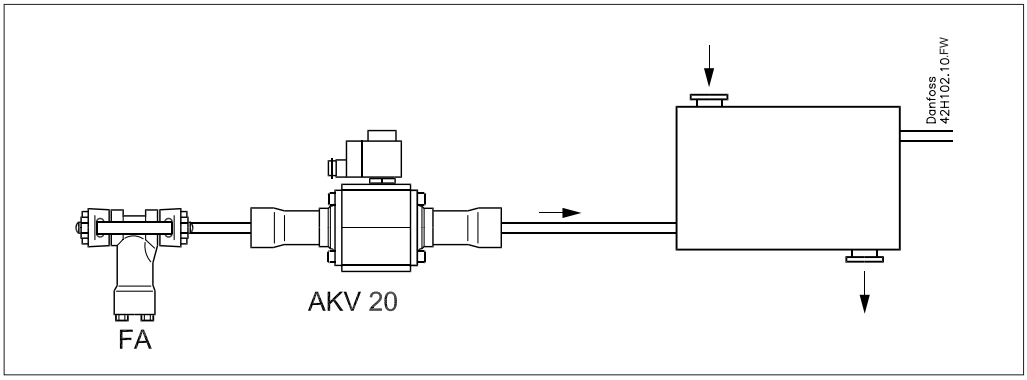
DEMKO, Denmark
SETI, Finland
SEV, Switzerland

UL listed (separate code nos)
CSA certified (separate code nos)
Low Voltage Directive (LVD) 2006/95/EC

Technical data

Valve type	AKV 10	AKV 15	AKV 20
Tolerance of coil voltage	10 / - 15%	10 / - 15%	10 / - 15%
Enclosure to IEC 529	Max. IP67	Max. IP67	Max. IP67
Working principle	Pulse Width Modulation (PWM)		
Recommended period of time	6 s.	6 s.	6 s.
Capacity (R404A/R507)	0.6 – 14 kW	14 – 85 kW	56 – 530 kW
Regulation range (Capacity range)	10 – 100%	10 – 100%	10 – 100%
Connection	Solder	Solder	Solder or weld
Evaporating temperature	-50 – 60 °C	-50 – 60 °C	-40 – 60 °C
Ambient temperature	-50 – 50 °C	-40 – 50 °C	-40 – 50 °C
MOPD (Max. Opening Pressure Differential)	18 bar	22 bar	18 bar
Filter, replaceable	Internal 100 µm	External 100 µm	External 100 µm
Max. working pressure	AKV 10-1 – 10-6: 52 barg AKV 10-7: 42 bar	AKV 15-1 – 15-4: 46 barg	AKV 20-1 – 20-5: 28 barg

Filter



On plants using AKV 15 or AKV 20 a filter must be mounted in front of AKV 15 and AKV 20.

AKV 10 has built-in filter and external filter is not necessary.

Rated capacity and ordering

Valve type	Rated capacity [1]														k_v value	Connections Solder ODF		
	R22		R134a		R407C		R404A/ R507		R407A		R410A		R744			Inlet × outlet [in]	Inlet × outlet [mm]	Multipack Code no.
	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[m³/h]			
AKV 10																		
AKV 10-1	1.03	0.29	0.8	0.23	1.09	0.31	0.72	0.21	1.02	0.29	1.20	0.34	1.31	0.37	0.010	-	10 × 12	068F1162
	1.03	0.29	0.8	0.23	1.09	0.31	0.72	0.21	1.02	0.29	1.20	0.34	1.31	0.37	0.010	3/8 × 1/2	-	068F1161
AKV 10-2	1.75	0.50	1.35	0.38	1.85	0.52	1.23	0.35	1.73	0.49	2.05	0.58	2.23	0.63	0.017	-	10 × 12	068F1165
	1.75	0.50	1.35	0.38	1.85	0.52	1.23	0.35	1.73	0.49	2.05	0.58	2.23	0.63	0.017	3/8 × 1/2	-	068F1164
AKV 10-3	2.57	0.73	1.99	0.57	2.71	0.77	1.81	0.51	2.54	0.72	3.01	0.86	3.27	0.93	0.025	-	10 × 12	068F1168
	2.57	0.73	1.99	0.57	2.71	0.77	1.81	0.51	2.54	0.72	3.01	0.86	3.27	0.93	0.025	3/8 × 1/2	-	068F1167
AKV 10-4	4.73	1.34	3.66	1.04	4.99	1.42	3.33	0.95	4.67	1.33	5.54	1.57	6.02	1.71	0.046	-	10 × 12	068F1171
	4.73	1.34	3.66	1.04	4.99	1.42	3.33	0.95	4.67	1.33	5.54	1.57	6.02	1.71	0.046	3/8 × 1/2	-	068F1170
AKV 10-5	6.58	1.87	5.10	1.45	6.95	1.98	4.63	1.32	6.50	1.85	7.70	2.19	8.38	2.38	0.064	-	10 × 12	068F1174
	6.58	1.87	5.10	1.45	6.95	1.98	4.63	1.32	6.50	1.85	7.70	2.19	8.38	2.38	0.064	3/8 × 1/2	-	068F1173
AKV 10-6	11.7	3.33	9.07	2.58	12.4	3.52	8.25	2.35	11.6	3.29	13.7	3.90	14.9	4.24	0.114	-	10 × 12	068F1177
	11.7	3.33	9.07	2.58	12.4	3.52	8.25	2.35	11.6	3.29	13.7	3.90	14.9	4.24	0.114	3/8 × 1/2	-	068F1176
AKV 10-7	16.7	4.73	12.9	3.66	17.6	5.00	11.7	3.34	16.5	4.68	19.5	5.55	21.2	6.03	0.209	-	12 × 16	068F1180
	16.7	4.73	12.9	3.66	17.6	5.00	11.7	3.34	16.5	4.68	19.5	5.55	21.2	6.03	0.209	1/2 × 5/8	-	068F1179
AKV 15																		
AKV 15-1	25.7	7.30	19.9	5.66	27.1	7.72	18.1	5.14	25.4	7.23	30.1	8.56	32.7	9.30	0.250	3/4 × 3/4	-	068F5000
	25.7	7.30	19.9	5.66	27.1	7.72	18.1	5.14	25.4	7.23	30.1	8.56	32.7	9.30	0.250		18 × 18	068F5001
	25.7	7.30	19.9	5.66	27.1	7.72	18.1	5.14	25.4	7.23	30.1	8.56	32.7	9.30	0.250	3/4 × 3/4	-	068F5035
AKV 15-2	41.1	11.7	31.8	9.03	43.3	12.3	28.9	8.23	40.6	11.6	48.1	13.7	52.4	14.9	0.400	3/4 × 3/4	-	068F5005
	41.1	11.7	31.8	9.03	43.3	12.3	28.9	8.23	40.6	11.6	48.1	13.7	52.4	14.9	0.400	-	18 × 18	068F5006
	41.1	11.7	31.8	9.03	43.3	12.3	28.9	8.23	40.6	11.6	48.1	13.7	52.4	14.9	0.400	3/4 × 3/4	-	068F5036
AKV 15-3	64.5	18.3	49.9	14.1	68.1	19.4	45.4	12.9	63.8	18.1	75.7	21.5	82.6	23.5	0.630	7/8 × 7/8	-	068F5010
	64.5	18.3	49.9	14.1	68.1	19.4	45.4	12.9	63.8	18.1	75.7	21.5	82.6	23.5	0.630	7/8 × 7/8	-	068F5037
AKV 15-4	102	29.0	78.6	22.3	107	30.5	71.9	20.5	101	28.6	120	34.1	131	37.2	1.000	1 1/8 × 1 1/8	-	068F5015
	102	29.0	78.6	22.3	107	30.5	71.9	20.5	101	28.6	120	34.1	131	37.2	1.000	-	28 × 28	068F5016
	102	29.0	78.6	22.3	107	30.5	71.9	20.5	101	28.6	120	34.1	131	37.2	1.000	1 1/8 × 1 1/8	-	068F5038

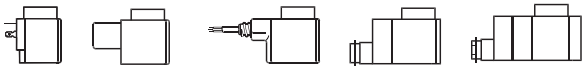
Valve type	Rated capacity [1]														k_v value	Connections			
																Solder ODF		Weld	
	R22		R134a		407C		R404A/ R507		R407A		R410A		R744			Inlet × outlet [in]	Inlet × outlet [mm]	Inlet × outlet [in]	Code no.
	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[kW]	[TR]	[m³/h]				
AKV 20																			
AKV 20-1	103	29.2	79.5	22.6	108	30.8	72	20.6	102	28.9	120	34.2	131	37.2	1.0	1 3/8 × 1 3/8	35 × 35	-	042H2020
	103	29.2	79.5	22.6	108	30.8	72	20.6	102	28.9	120	34.2	131	37.2	1.0	-	-	1 1/4 × 1 1/4	042H2021
AKV 20-2	164	46.6	127	36.0	173	49.2	115	32.9	162	46.1	192	54.7	210	59.7	1.6	1 3/8 × 1 3/8	35 × 35	-	042H2022
	164	46.6	127	36.0	173	49.2	115	32.9	162	46.1	192	54.7	210	59.7	1.6	-	-	1 1/4 × 1 1/4	042H2023
AKV 20-3	255	72.6	197	55.9	269	76.5	180	51.2	252	71.7	300	85.3	328	93.3	2.5	-	42 × 42	-	042H2025
	255	72.6	197	55.9	269	76.5	180	51.2	252	71.7	300	85.3	328	93.3	2.5	1 5/8 × 1 5/8	-	-	042H2024
	255	72.6	197	55.9	269	76.5	180	51.2	252	71.7	300	85.3	328	93.3	2.5	-	-	1 1/4 × 1 1/4	042H2026
AKV 20-4	405	115	311	88.3	426	121	286	81.4	400	114	477	136	526	150	4.0	2 1/8 × 2 1/8	54 × 54	-	042H2027
	405	115	311	88.3	426	121	286	81.4	400	114	477	136	526	150	4.0	-	-	1 1/2 × 1 1/2	042H2028
AKV 20-5	631	179	478	136	660	188	446	127	620	176	746	212	835	237	6.3	2 1/8 × 2 1/8	54 × 54	-	042H2029
	631	179	478	136	660	188	446	127	620	176	746	212	835	237	6.3	-	-	2 × 2	042H2030

[1] Rated capacities are based on:
Condensing temperature t_c = 38 °C / 100 °F
Liquid temperature t_l = 37 °C/ 98 °F
Evaporating temperature t_e = 4.4 °C / 40 °F

Note! AKV 20 are not suitable for R744 applications with media temperatures constantly below 0 °C.
For other media temperatures, please contact Danfoss.

Ordering

Coils for AKV valves

DC coils		Code no.	AKV	AKV	AKV	AKV	AKV	AKV
			10-1 10-2 10-3 10-4 10-5	10-6	10-7	15-1 15-2 15-3 15-4	20-1 20-2 20-3	20-4 20-5
220 V DC 20 W, standard	with terminal box	**018F6851**	+	+	+	+	+	+
100 V DC 18 W, special	with terminal box	**018F6780**	+	+	+	+	+	+
	with DIN plugs	—						
230 V DC 18 W, special	with terminal box	**018F6781** [1]	+	+	+	+	+	+
	with DIN plugs	**018F6991** [1]						
230 V DC 18 W, special	with 2.5 m cable	**018F6288** [1]	+	+	+	+	+	+
	with 4.0 m cable	**018F6278** [1]						
	with 8.0 m cable	**018F6279** [1]						

[1]) Recommended for commercial refrigeration plant.

AC coils		Code no.	AKV	AKV	AKV	AKV	AKV	AKV
240 V AC 10 W, 50 Hz	with terminal box	**018F6702**	+	+	–	+	–	–
	with DIN plugs	**018F6177**						
240 V AC 10 W, 60 Hz	with terminal box	**018F6713**	+	+	–	+	–	–
	with DIN plugs	—						
240 V AC 12 W, 50 Hz	with terminal box	**018F6802**	+	+	+	+	+	–
230 V AC 10 W, 50 Hz	with terminal box	**018F6701**	+	+	–	+	–	–
	with DIN-plugs	**018F6176**						
230 V AC 10 W, 60 Hz	with terminal box	**018F6714**	+	+	–	+	–	–
	with DIN-plugs	**018F6189**						
230 V AC 10 W, 50/60 Hz	with terminal box	**018F6732**	+	+	–	+	–	–
	with DIN-plugs	**018F6193**						
230 V AC 12 W, 50 Hz	with terminal box	**018F6801**	+	+	–	+	+	–
230 V AC 12 W, 60 Hz	with terminal box	**018F6814**	+	+	–	+	+	–
230 V AC 20 W, 50 Hz	with terminal box	**018F6905** [2]	+	+	+	+	+	+
115 V AC 10 W, 50 Hz	with terminal box	**018F6711**	+	+	–	+	–	–
	with DIN-plugs	—						
115 V AC 10 W, 60 Hz	with terminal box	**018F6710**	+	+	–	+	–	–
	with DIN-plugs	**018F6185**						
110 V AC 12 W, 50 Hz	with terminal box	**018F6811**	+	+	–	+	+	–
110 V AC 12 W, 60 Hz	with terminal box	**018F6813**	+	+	–	+	+	–
110 V AC 20 W, 50 Hz	with terminal box	**018Z6904**	+	+	+	+	+	+
24 V AC 10 W, 50 Hz	with terminal box	**018F6707**	+	–	–	+	–	–
	with DIN-plugs	**018F6182**						
24 V AC 10 W, 60 Hz	with terminal box	**018F6715**	–	–	–	+	–	–
	with DIN-plugs	—						
24 V AC 12 W, 50 Hz	with terminal box	**018F6807**	+	–	–	+	+	+
24 V AC 12 W, 60 Hz	with terminal box	**018F6815**	+	–	–	+	+	+
24 V AC 20 W, 50 Hz	with terminal box	**018F6904** [2]	+	+	+	+	+	+
24 V AC 20 W, 60 Hz	with terminal box	**018F6902** [2]	+	+	+	+	+	+

[2]) 20 W coils can not be connected to AKC 24P2 and AKC 24W2.

Capacity

Valve type	Capacity in [kW] at pressure drop across valve Δp [bar]								
	2	4	6	8	10	12	14	16	18
R22/R407C									
AKV 10-1	0.7	0.9	1.0	1.1	1.2	1.2	1.2	1.2	1.2
AKV 10-2	1.1	1.4	1.6	1.8	1.8	1.9	1.9	2.0	1.9
AKV 10-3	1.8	2.3	2.6	2.8	2.9	3.0	3.0	3.0	3.1
AKV 10-4	2.8	3.6	4.1	4.4	4.6	4.7	4.8	4.9	4.9
AKV 10-5	4.4	5.7	6.4	6.9	7.2	7.5	7.6	7.7	7.7
AKV 10-6	7.0	9.0	10.2	11.0	11.5	11.8	12.1	12.2	12.3
AKV 10-7	11.2	14.4	16.3	17.6	18.4	18.9	19.3	19.5	19.3
AKV 15-1	17.5	22.5	25.5	27.5	28.7	29.6	30.1	30.4	30.6
AKV 15-2	28.0	36.0	40.8	44.0	45.9	47.4	48.2	48.7	49.0
AKV 15-3	44.0	56.6	64.3	69.2	72.3	74.6	75.9	76.7	77.2
AKV 15-4	69.9	89.9	102.0	110.0	115.0	118.0	121.0	122.0	123.0
AKV 20-1	69.9	89.9	102.0	110.0	115.0	118.0	121.0	122.0	123.0
AKV 20-2	112.0	144.0	163.0	176.0	184.0	189.0	193.0	195.0	193.0
AKV 20-3	175.0	225.0	255.0	275.0	287.0	296.0	301.0	304.0	306.0
AKV 20-4	280.0	360.0	408.0	440.0	459.0	474.0	482.0	487.0	490.0
AKV 20-5	440.0	566.0	643.0	692.0	723.0	746.0	759.0	767.0	772.0
R134a									
AKV 10-1	0.6	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
AKV 10-2	0.9	1.2	1.4	1.4	1.5	1.5	1.5	1.5	1.4
AKV 10-3	1.5	1.9	2.1	2.3	2.3	2.4	2.4	2.3	2.3
AKV 10-4	2.4	3.0	3.4	3.6	3.7	3.8	3.8	3.7	3.6
AKV 10-5	3.7	4.8	5.3	5.7	5.9	5.9	5.9	5.9	5.7
AKV 10-6	5.9	7.6	8.5	9.0	9.3	9.4	9.4	9.3	9.0
AKV 10-7	9.4	12.1	13.5	14.4	14.8	15.0	15.0	14.8	14.4
AKV 15-1	14.8	18.9	21.2	22.5	23.2	23.5	23.5	23.2	23.5
AKV 15-2	23.6	30.3	33.8	36.0	37.1	37.6	37.6	37.1	36.0
AKV 15-3	37.2	47.7	53.3	56.6	58.5	59.2	59.2	58.5	56.6
AKV 15-4	59.0	75.7	84.6	89.9	92.8	94.0	94.0	92.8	89.9
AKV 20-1	59.0	75.7	84.6	89.9	92.8	94.0	94.0	92.8	89.9
AKV 20-2	94.9	121.0	135.0	144.0	149.0	150.0	150.0	149.0	144.0
AKV 20-3	148.0	189.0	212.0	225.0	232.0	235.0	235.0	232.0	225.0
AKV 20-4	236.0	303.0	338.0	360.0	371.0	376.0	376.0	371.0	360.0
AKV 20-5	372.0	477.0	533.0	566.0	585.0	592.0	592.0	585.0	566.0

Correction for subcooling

The evaporator capacity used must be corrected, if the subcooling deviates from 4 K. Use the actual correction factor indicated in the table.

Multiply the evaporator capacity by the correction factor to obtain the corrected capacity.

Correction factors for subcooling Δt_{sub}

Correction factor	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R22/R407C	1.00	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.72	0.69
R134a	1.00	0.93	0.88	0.84	0.80	0.76	0.73	0.70	0.68	0.65

Corrected capacity = evaporator capacity x correction factor.

Capacity
(continued)

Valve type	Capacity in [kW] at pressure drop across valve Δp [bar]								
	2	4	6	8	10	12	14	16	18
									R404A/R507
AKV 10-1	0.6	0.7	0.8	0.8	0.9	0.8	0.8	0.8	0.8
AKV 10-2	0.9	1.1	1.3	1.3	1.4	1.4	1.3	1.3	1.2
AKV 10-3	1.4	1.8	2.0	2.1	2.1	2.1	2.1	2.0	1.9
AKV 10-4	2.3	2.9	3.1	3.3	3.4	3.4	3.3	3.3	3.1
AKV 10-5	3.6	4.5	4.9	5.2	5.3	5.3	5.3	5.1	4.9
AKV 10-6	5.6	7.1	7.8	8.2	8.4	8.5	8.4	8.2	7.7
AKV 10-7	9.0	11.4	12.5	13.2	13.5	13.5	13.4	13.1	12.4
AKV 15-1	14.1	17.8	19.6	20.6	21.0	21.1	20.9	20.4	19.4
AKV 15-2	22.6	28.5	31.4	33.0	33.7	33.9	33.4	32.6	30.8
AKV 15-3	35.5	44.9	49.4	51.9	53.0	53.2	52.7	51.4	48.7
AKV 15-4	56.4	71.2	78.3	82.4	84.2	84.6	83.7	81.5	77.3
AKV 20-1	56.4	71.2	78.3	82.4	84.2	84.6	83.7	81.5	77.3
AKV 20-2	90.3	114	125	132	135	135	134	131	124
AKV 20-3	141	178	196	206	210	211	209	204	194
AKV 20-4	226	285	314	330	337	339	334	326	308
AKV 20-5	355	449	494	519	530	532	527	514	487

Correction for subcooling
The evaporator capacity used must be corrected, if the subcooling deviates from 4 K. Use the actual correction factor indicated in the table.

Multiply the evaporator capacity by the correction factor to obtain the corrected capacity.

Correction factors for subcooling Δt_{sub}

Correction factor	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R404A/R507	1.00	0.91	0.83	0.78	0.73	0.68	0.65	0.61	0.59	0.56

Corrected capacity = evaporator capacity x correction factor.

Capacity
(continued)

Valve type	Capacity in [kW] at pressure drop across valve Δp [bar]								
	2	4	6	8	10	12	14	16	18
R410A									
AKV 10-1	0.9	1.1	1.3	1.4	1.5	1.5	1.6	1.6	1.6
AKV 10-2	1.4	1.8	2.0	2.2	2.3	2.4	2.5	2.5	2.5
AKV 10-3	2.1	2.8	3.2	3.4	3.6	3.8	3.9	3.9	4.0
AKV 10-4	3.4	4.4	5.1	5.5	5.8	6.0	6.2	6.3	6.4
AKV 10-5	5.3	7.0	8.0	8.7	9.1	9.5	9.7	9.9	10.4
AKV 10-6	8.5	11.1	12.7	13.7	14.5	15.0	15.4	15.7	15.9
AKV 10-7	13.6	17.7	20.2	22.0	23.2	24.0	24.7	25.2	25.4
AKV 15-1	21.2	27.7	31.6	34.4	36.2	37.6	38.5	39.2	39.8
AKV 15-2	33.9	44.3	50.6	55.0	57.8	60.2	61.7	62.8	63.7
AKV 15-3	53.2	69.6	79.7	86.5	91.1	94.7	97.2	98.9	100
AKV 15-4	84.6	111	127	137	145	150	154	157	159
AKV 20-1	84.6	111	127	137	145	150	154	157	159
AKV 20-2	136	177	202	220	232	240	247	252	254
AKV 20-3	212	277	316	344	362	376	385	392	398
AKV 20-4	339	443	506	550	578	602	617	628	637
AKV 20-5	532	696	797	865	911	947	972	989	1000
R744									
AKV 10-1	0.8	1.1	1.3	1.5	1.7	1.8	2.0	2.1	2.2
AKV 10-2	1.2	1.7	2.1	2.4	2.7	2.9	3.2	3.4	3.6
AKV 10-3	2.0	2.8	3.4	3.9	4.3	4.8	5.1	5.5	5.8
AKV 10-4	3.1	4.3	5.3	6.2	6.8	7.5	8.1	8.7	9.1
AKV 10-5	4.8	6.8	8.3	9.6	10.7	11.7	12.7	13.5	14.3
AKV 10-6	7.7	10.8	13.2	15.3	17.0	18.7	20.2	21.5	22.7
AKV 10-7	12.2	17.3	21.0	24.5	27.2	29.8	32.3	34.4	36.3
AKV 15-1	19.1	27.0	32.9	38.3	42.6	46.7	50.5	53.8	56.9
AKV 15-2	30.6	43.2	52.6	61.2	68.1	74.7	80.8	86.1	91.0
AKV 15-3	48.2	68.2	82.9	96.5	107	118	127	136	143
AKV 15-4	76.5	108	132	153	170	187	202	215	227
AKV 20-1	76.5	108	132	153	170	187	202	215	227
AKV 20-2	122	173	210	245	272	298	323	344	363
AKV 20-3	191	270	329	383	426	467	505	538	569
AKV 20-4	306	432	526	612	681	747	808	861	910
AKV 20-5	482	682	829	965	1074	1177	1273	1357	1434

Correction for subcooling

The evaporator capacity used must be corrected, if the subcooling deviates from 4 K. Use the actual correction factor indicated in the table.

Multiply the evaporator capacity by the correction factor to obtain the corrected capacity.

Correction factors for subcooling Δt_{sub}

Correction factor	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R410A	1.00	0.95	0.90	0.85	0.81	0.77	0.73	0.70	0.67	0.64
R744	1.00	0.91	0.86	0.81	0.77	0.73	0.69	0.66	0.63	0.60

Corrected capacity = evaporator capacity x correction factor.

SI units R410A

Valve / Orifice	Cond. temp. [°C]	Evaporating [°C]					
		-40	-30	-20	- 10	0	10
		Capacity [kW]					
AKV 10							
AKV 10-1	25	1.37	1.36	1.33	1.26	1.14	0.95
AKV 10-2		2.33	2.32	2.26	2.14	1.94	1.61
AKV 10-3		3.42	3.41	3.32	3.15	2.85	2.36
AKV 10-4		6.30	6.26	6.11	5.80	5.25	4.35
AKV 10-5		8.75	8.71	8.50	8.07	7.31	6.05
AKV 10-6		15.5	15.5	15.1	14.4	13.0	10.8
AKV 10-7		22.1	22.0	21.5	20.4	18.5	15.3
AKV 10							
AKV 15-1	25	34.1	34.0	33.2	31.5	28.5	23.6
AKV 15-2		54.4	54.2	53.0	50.3	45.7	37.8
AKV 15-3		84.9	84.9	83.1	79.1	71.8	59.6
AKV 15-4		133	133	131	125	114	94
AKV 20							
AKV 20-1	25	136	136	133	126	114	94.5
AKV 20-2		216	216	211	201	183	151
AKV 20-3		333	334	328	313	285	237
AKV 20-4		522	525	518	497	454	379
AKV 20-5		802	808	801	773	713	599

[2]) The rated capacity is based on:
Evaporating temperature t_e : 4.4 °C / 40 °F
Condensing temperature t_c : 38 °C / 100 °F
Refrigerant temperature ahead of valve t_l : 37 °C / 98 °F

SI units R410A

Valve / Orifice	Cond. temp. [°C]	Evaporating [°C]					
		-40	-30	-20	- 10	0	10
		Capacity [kW]					
AKV 10							
AKV 10-1	25	1.37	1.36	1.33	1.26	1.14	0.95
AKV 10-2		2.33	2.32	2.26	2.14	1.94	1.61
AKV 10-3		3.42	3.41	3.32	3.15	2.85	2.36
AKV 10-4		6.30	6.26	6.11	5.80	5.25	4.35
AKV 10-5		8.75	8.71	8.50	8.07	7.31	6.05
AKV 10-6		15.5	15.5	15.1	14.4	13.0	10.8
AKV 10-7		22.1	22.0	21.5	20.4	18.5	15.3
AKV 10							
AKV 15-1	25	34.1	34.0	33.2	31.5	28.5	23.6
AKV 15-2		54.4	54.2	53.0	50.3	45.7	37.8
AKV 15-3		84.9	84.9	83.1	79.1	71.8	59.6
AKV 15-4		133	133	131	125	114	94
AKV 20							
AKV 20-1	25	136	136	133	126	114	94.5
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[2]) The rated capacity is based on:
Evaporating temperature t_e : 4.4 °C / 40 °F
Condensing temperature t_c : 38 °C / 100 °F
Refrigerant temperature ahead of valve t_l : 37 °C / 98 °F

Subcooling correction factor 'fsub'

Subcooling [K]	2	4	10	15	20	25	30	35	40	45	50
Correction factor	0.98	1.00	1.07	1.13	1.19	1.25	1.31	1.36	1.42	1.48	1.53

*Distributer correction factor 'fp' *)*

Evaporating [°C]		-40	-30	-20	-10	0	10
Pressure drop [bar]	0	1	1	1	1	1	1
	1	0.97	0.97	0.97	0.96	0.96	0.94
	1.5	0.96	0.96	0.95	0.95	0.93	0.91
	2	0.94	0.94	0.93	0.93	0.91	0.88

*) calculated at 32 °C condensing temperature.

Valve sizing

To obtain an expansion valve that will function correctly under different load conditions it is necessary to consider the following points in below sequence when sizing the valve:

1. Evaporator capacity
2. Pressure drop across the valve
3. Correction for subcooling
4. Correction for evaporating temperature
5. Determination of valve size
6. Correctly dimensioned liquid line

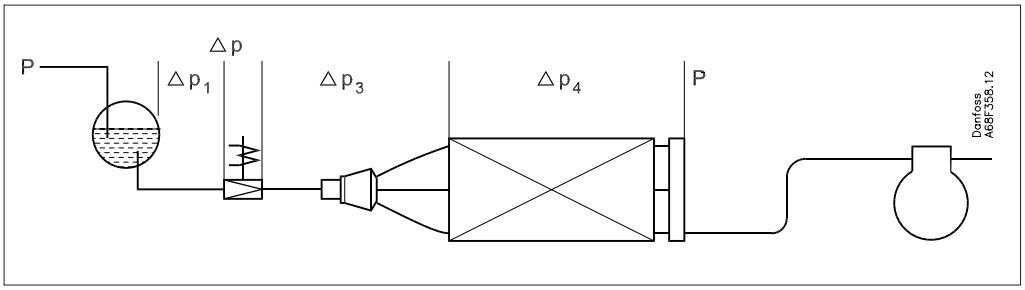
1. Evaporator capacity

The evaporator capacity is found in the specifications from the evaporator supplier.

2. Pressure drop across the valve

The pressure drop across the valve directly determines the capacity and must therefore be considered.
The pressure drop across the valve is normally calculated as the condensing pressure less the evaporating pressure and other sundry pressure drops in the liquid line, distributor, evaporator, etc. It is indicated in the following formula:

$\Delta p_{valve} = p_c - (p_e + \Delta p_1 + \Delta p_3 + \Delta p_4)$



Δp_{valve} pressure drop across the valve
p_c condensing pressure
p_e evaporating pressure
Δp_1 pressure drop across the liquid line
Δp_3 pressure drop across the distributor system
Δp_4 pressure drop across the evaporator

⚠ Note:
The pressure drop across the liquid line and the distributor system must be calculated on the basis of the max. capacity of the valve, as the valve operates with pulse-width modulation.

Example
of calculation of pressure drop across a valve:

Refrigerant: R22/R407C
Condensing temperature: 35 °C (p_c = 13.5 bar)
Evaporating temperature: 0 – 6 °C (p_e = 4.1 bar)
Δp_1 = 0.2 bar
Δp_3 = 0.8 bar
Δp_4 = 0.1 bar

This will give the following equation:

$\Delta p_{valve} = p_c - (p_e + \Delta p_1 + \Delta p_3 + \Delta p_4)$
$= 13.5 - (4.1 + 0.2 + 0.8 + 0.1)$
$= 8.3$ bar

The found value for "pressure drop across the valve" is used later in the section "*Determination of valve size*".

Valve sizing
(continued)

3. Correction for subcooling

The evaporator capacity used must be corrected, if the subcooling deviates from 4 K.
Use the actual correction factor indicated in the table.

Multiply the evaporator capacity by the correction factor to obtain the corrected capacity.

Correction factors for subcooling Δt_{sub}

Correction factor	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R22/R407C	1.00	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.72	0.69
R134a	1.00	0.93	0.88	0.84	0.80	0.76	0.73	0.70	0.68	0.65
R404A/R507	1.00	0.91	0.83	0.78	0.73	0.68	0.65	0.61	0.59	0.56
R410A	1.00	0.95	0.90	0.85	0.81	0.77	0.73	0.70	0.67	0.64
R744	1.00	0.91	0.86	0.81	0.77	0.73	0.69	0.66	0.63	0.60

Corrected capacity = evaporator capacity x correction factor.

The corrected capacity is used in the section "Determination of valve size".

Example of corection:
Refrigerant: R22/R407C
Evaporator capacity Q_e: 5 kW
Subcooling: 10 K

Correction factor according to the table = 0.94
Corrected capacity = 5 × 0.94 = 4.7 kW.

⚠ **Note:**
Too little subcooling may cause flash gas.

4. Correction for evaporating temperature (t_e)

To obtain a correctly dimensioned valve it is important that the application is considered. Depending on the application, the valve should have an overcapacity enabling it to cope with the extra amount of refrigeration needed during certain periods, e.g. during the defrost recovery process.

The valve's opening degree should therefore be between 50 and 75% when regulating.
In this way it is ensured that the valve has a sufficiently wide regulation range, so that it can manage changed loads at or near the normal working point. Correction factors based on the evaporating temperature are indicated below:

Correction factors for evaporating temperature (t_e)

Evaporating temperature t_e [°C]	5	0	-10	-15	-20	-30	-40
AKV 10	1.25	1.25	1.25	1.25	1.6	1.6	1.6
AKV 15	1.0	1.0	1.0	1.0	1.2	1.3	1.4
AKV 20	1.0	1.0	1.0	1.0	1.2	1.3	1.4

Valve sizing
(continued)

5. Determination of valve size
When the valve size meeting the required capacity is selected it is important to note that the capacity indications are the valve's rated capacity, i.e. when the valve is 100% open.

In this section we tell you how the valve's size is determined.

There are three factors that have an influence on the choice of the valve:

- The pressure drop across the valve
- The corrected capacity (correction for subcooling)
- The corrected capacity for evaporating temperature

The three factors have been described earlier in this section on dimensioning.

When these three factors have been established, the selection of the valve can be made:

- First multiply the "corrected capacity" by a value stated in the table.
- Use the new value in the capacity table in combination with the pressure drop value.
- Now select the valve size.

Example of selection of valve
Use as starting point the two earlier mentioned examples, where the following two values have been obtained:

Δp_{valve} = 8.3 bar
Q_e corrected = 4.7 kW
The valve should be used in a coldroom. Consequently, 1.25 should be selected as "correction factor for the evaporating temperature".

The dimensioned capacity will then be:
1.25 x 4.7 kW = 5.88 kW.

Now select a valve size from one of the capacity tables.

With the given values Δp_{valve} = 8.3 bar and a capacity of 5.88 kW, select the valve size for AKV 10-5.
This valve will have a capacity of approx. 7 kW.

---

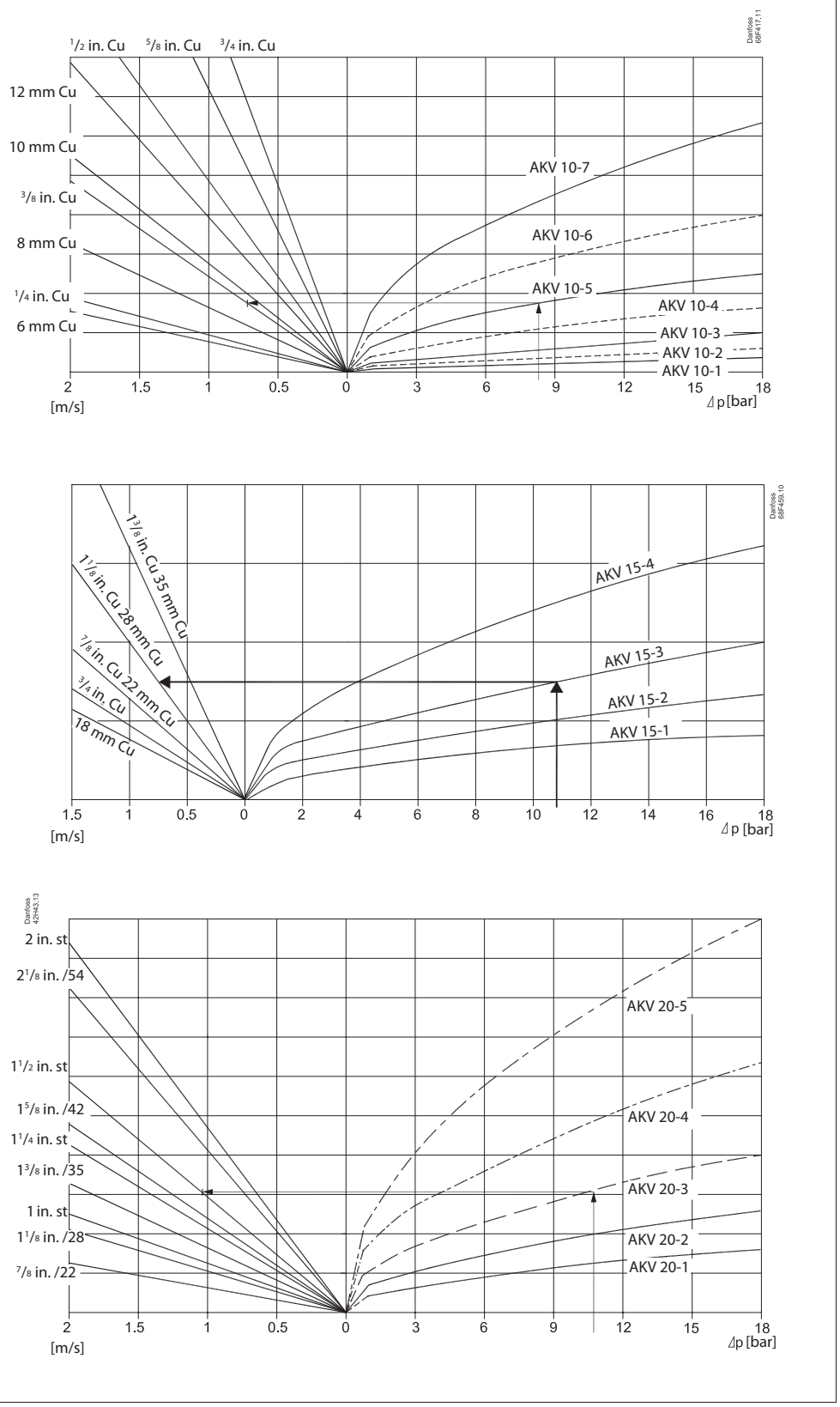
6. Correctly dimensioned liquid line
To obtain a correct supply of liquid to the AKV valve, the liquid line to the individual AKV valve must be correctly dimensioned.
The liquid flow rate should not exceed 1 m/sec.

This must be observed on account of the pressure drop in the liquid line (lack of subcooling) and pulsations in the liquid line.

Dimensioning of the liquid line **must be based on the capacity of the valve at the pressure drop** with which it is operating (cf. capacity table), and not on the evaporator's capacity.

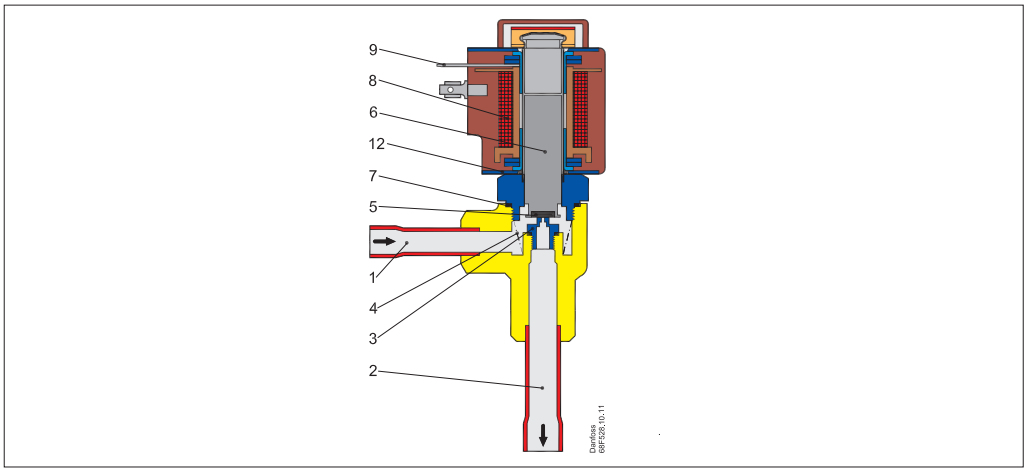
Valve sizing
(continued)

R22/R407C, R134a, R404A, R507



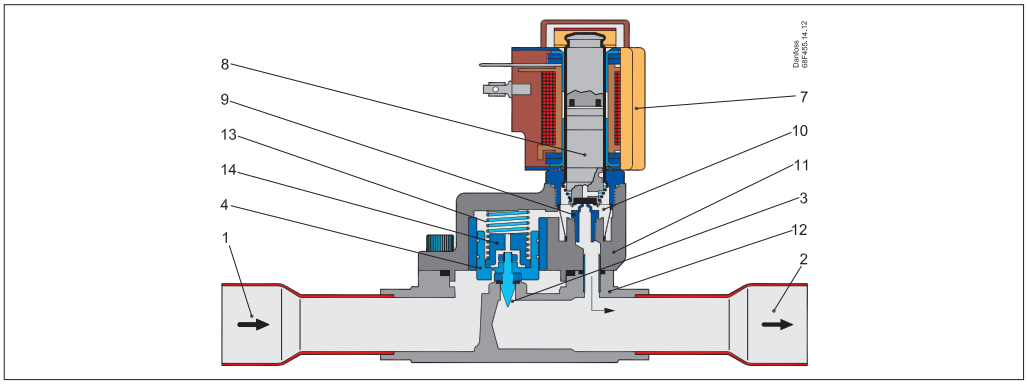
Design

AKV 10



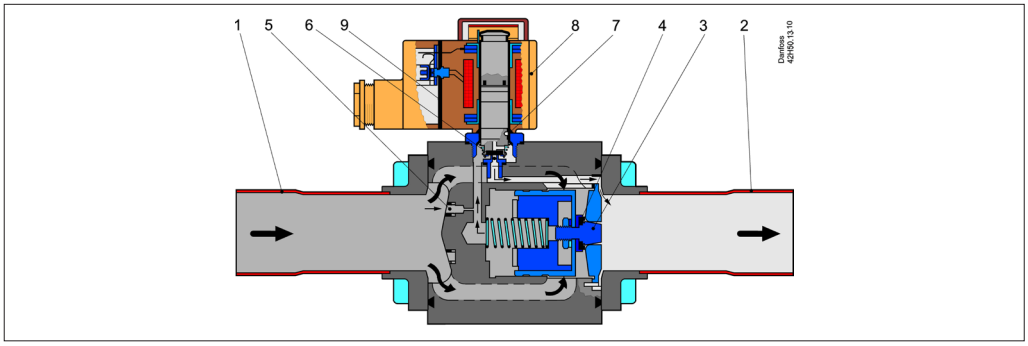
1. Inlet
2. Outlet
3. Orifice
4. Filter
5. Valve seat
6. Armature
7. Copper gasket
8. Coil

AKV 15



1. Inlet
2. Outlet
3. Orifice
4. Piston assembly
7. Coil
8. Armature
9. Pilot orifice
10. Filter
11. Cover
12. Valve body
13. Spring
14. Orifice assembly

AKV 20



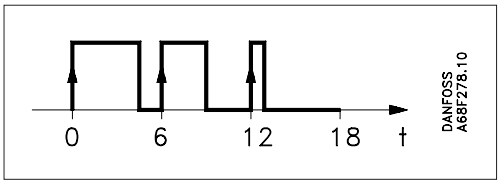
1. Inlet
2. Outlet
3. Orifice
4. Valve seat
5. Filter
6. Pilot orifice
7. O-ring
8. Coil
9. Terminal box

Function

The valve capacity is regulated by means of pulse-width modulation. Within a period of six seconds a voltage signal from the controller will be transmitted to and removed from the valve coil. This makes the valve open and close for the flow of refrigerant.

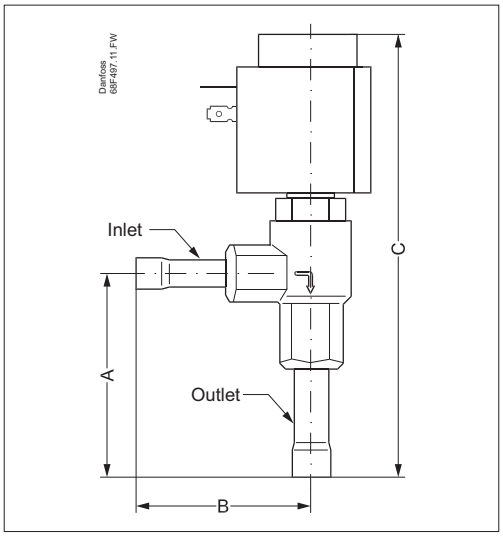
The relation between this opening and closing time indicates the actual capacity. If there is an intense need for refrigeration, the valve will remain open for almost all six seconds of the period. If the required amount of refrigeration is modest, the valve will only stay open during a fraction of the period.

The amount of refrigeration needed is determined by the controller. When no refrigeration is required, the valve will remain closed and thus function as a solenoid valve.



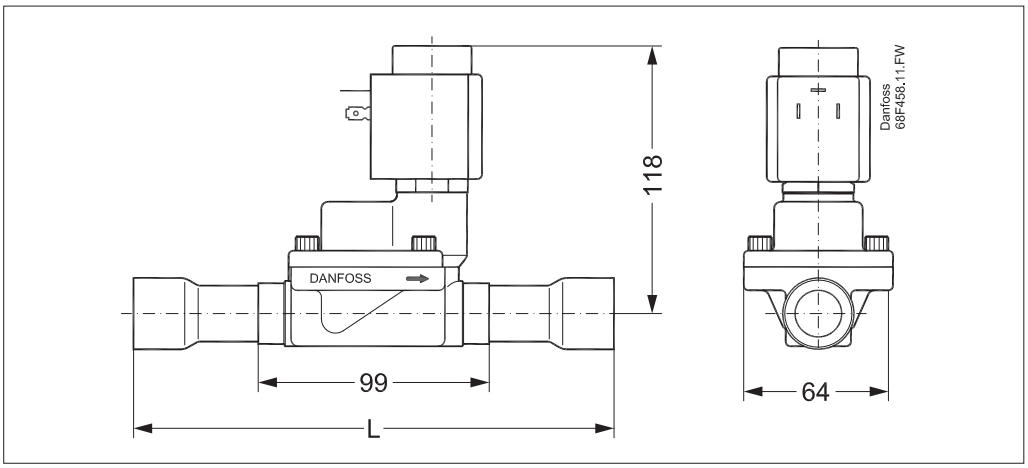
Dimensions and weights

AKV 10 solder



Valve type	Connection type	n	A	B	C	Inlet	Outlet	Inlet	Outlet	Net weight without coil
			[mm]	[mm]	[mm]	[in.]	[in.]	[mm]	[mm]	[kg]
AKV 10-n	Solder	1, 2, 3, 4, 5, 6	75	67	154	3/8	½	10	12	0.38
AKV 10-n	Solder	7	73	75	152	½	5/8	12	16	0.38

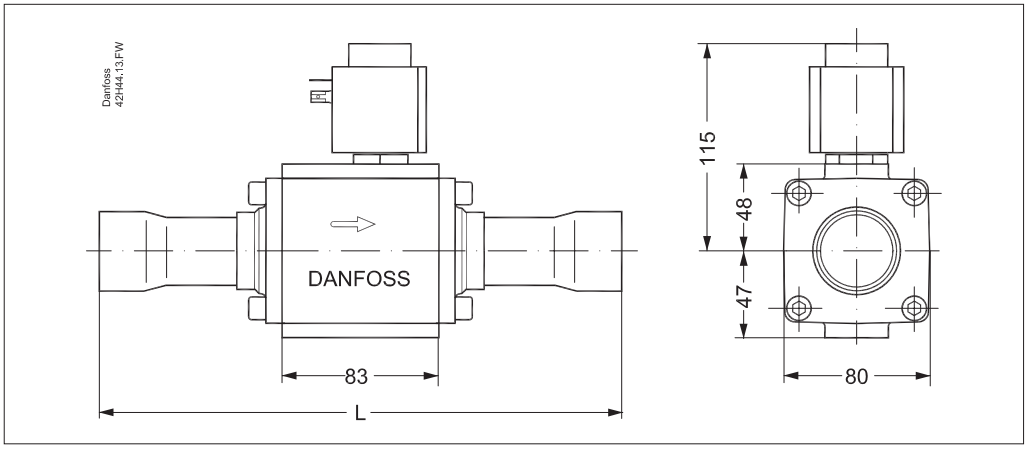
AKV 15



Valve type	Inlet	Outlet	Inlet	Outlet	L	Net weight without coil
	[in.]	[in.]	[mm]	[mm]	[mm]	[kg]
AKV 15 -1	¾	¾	18	18	190	1.5
AKV 15-2	¾	¾	18	18	190	1.5
AKV 15-3	7/8	7/8	22	22	190	1.5
AKV 15-4	1 1/8	1 1/8	28	28	216	1.5

Dimensions and weights
(continued)

AKV 20



Valve type	Solder connections						Weld connections			
	Inlet	Outlet	Inlet	Outlet	L	Net weight without coil	Inlet	Outlet	L	Net weight withoaut coil
	[in.]	[in.]	[mm]	[mm]	[mm]	[kg]	[in.]	[in.]	[mm]	[kg]
AKV 20-1	1 3/8	1 3/8	35	35	281	4.3	1 ¼	1 ¼	176	4.1
AKV 20-2	1 3/8	1 3/8	35	35	281	4.3	1 ¼	1 ¼	176	4.1
AKV 20-3	1 5/8	1 5/8	42	42	281	4.3	1 ¼	1 ¼	176	4.1
AKV 20-4	2 1/8	2 1/8	54	54	281	4.3	1 ½	1 ½	176	4.1
AKV 20-5	2 1/8	2 1/8	54	54	281	4.3	2	2	176	4.1