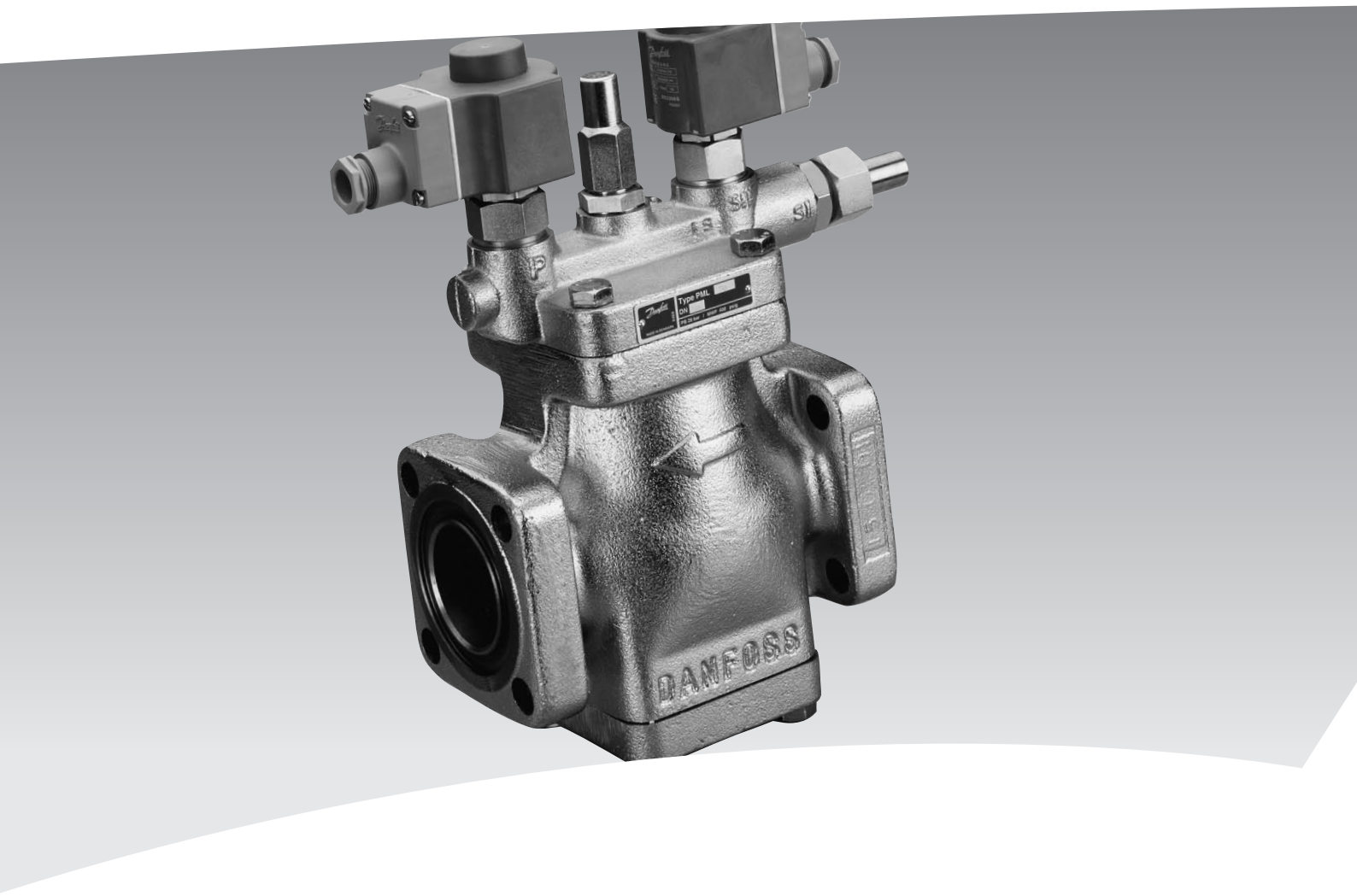

Solenoid valves, two-step on/off

Type PMLX

REFRIGERATION AND
AIR CONDITIONING

Technical leaflet

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Introduction

PMLX are 2-step servo-operated main valves with screwed-on pilot solenoid valves. PMLX valves use an external pressure source for opening (which means that no differential pressure across the PMLX valve is required).
PMLX are used in suction lines for the opening against high differential pressure, e.g. after hot gas defrost in large industrial refrigeration systems with ammonia or fluorinated refrigerants.

PMLX opens in two steps:

- Step one opens to approx. 10% of the capacity, when the pilot solenoid valves are activated.
- Step two opens automatically after the pressure differential across the valve reaches approximately 1.5 bar.

Features

- Can be used for all normal, non-flammable refrigerants, including R 717, and non-corrosive gases/liquids - assuming seals of the correct material are used.
- Large range of flanges with connection dimensions in accordance with standards: DIN, ANSI, SOC and SA.
- Inexpensive and simple installation.
- Screw thread pilot valve fitting.
- Only one signal required for both pilot solenoid valves.
- The valve has a pressure gauge connection so that inlet pressure can be measured.
- The PMLX main valve top cover can be oriented in any direction without the function of pilot valves being affected.
- The valve can be equipped with an AKS 45 electronic position indicator as an accessory.
- Especially suitable for systems where low pressure drop is required.
- Stabilizes working conditions and eliminates pressure pulsations during opening after defrosting.
- Provides safety against pressure "shocks" as the valve can only open fully when $\Delta p < 1.5$ bar (22 psig).

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Design

Connections
There is a very wide range of connection possibilities with PMLX main valves:

- Welding, DIN (2448)
- Welding, ANSI (B 36.10)
- Welding socket, ANSI (B 16.11)
- Solder connection, DIN (2856)
- Solder connection, ANSI (B 16.22)

The PMLX main valve top cover can be oriented in any direction without the function of pilot valves being affected.

Valve body
EN-GJS-400-18-LT

Seals
Do not contain asbestos.

Pressure Equipment Directive (PED)
The PMLX-valves are approved in accordance with the European standard specified in the Pressure Equipment Directive and are CE marked.

For further details / restrictions - see Installation Instruction

PMLX valves			
Nominal bore	DN≤ 25 (1 in.)	DN 32-125 mm (1 1/4 - 5 in.)	DN 150 mm (6 in.)
Classified for	Fluid group I		
Category	Article 3, paragraph 3	II	III

Technical data

- *Refrigerants*
  Can be used for all normal, non-flammable refrigerants, including R 717, and non-corrosive gases/liquids - assuming seals of the correct material are used.
  Use with flammable hydrocarbons cannot be recommended; please contact Danfoss.
- *Temperature range*
  –60/+120°C (–76/+248°F).
- *Surface*
  PMLX 32 - 65:
  The external surface is zinc-chromated to give good protection against corrosion.
  PMLX 80 - 125:
  The surface of the PMLX 80 - 125 is treated with a multi-layer painting.
- *Pressure range*
  The valve is designed for:
  Max. working pressure: 28 bar g (406 psig)
  Test pressure: 42 bar g (609 psig)

  Opening differential pressure:
  0 bar g (0 psig) as valve is kept open by external pilot pressure.
  Max. (MOPD), solenoid valves only (10 W a.c. [NC] /12 W a.c. [NO] or 20 W d.c.): 21 bar g (305 psig).

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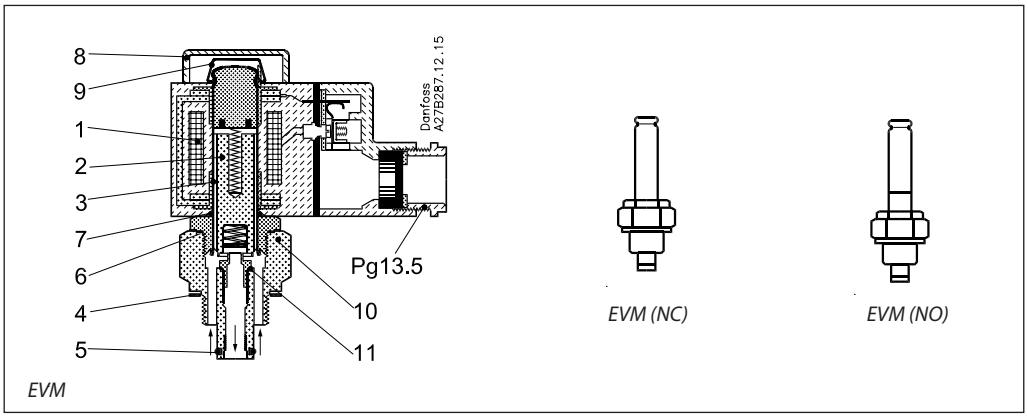
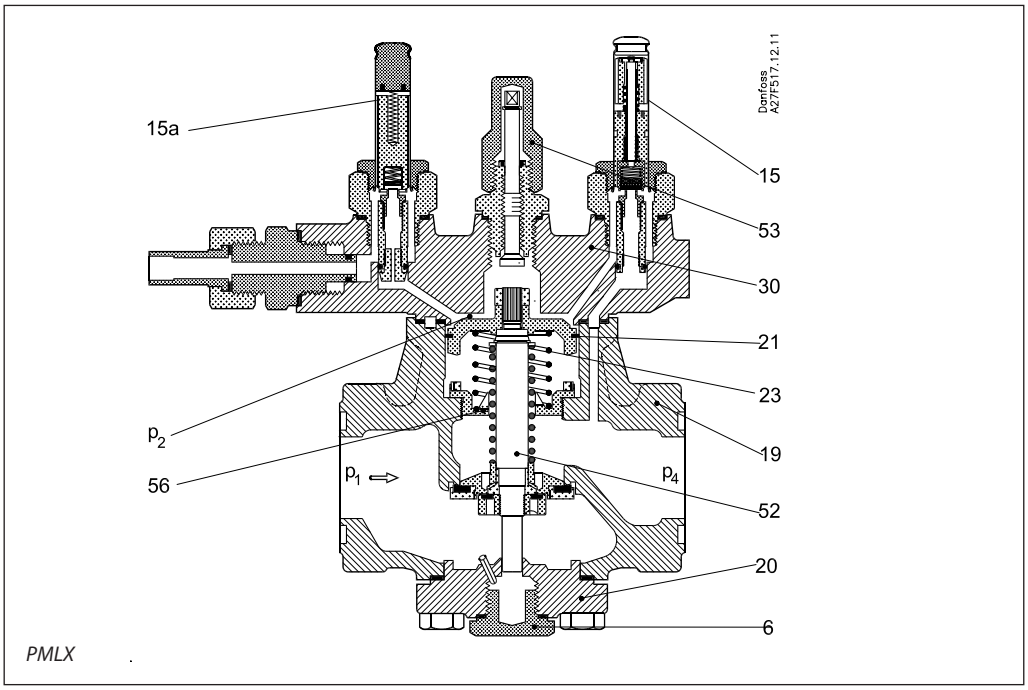
Design
Function



EVM

1	Coil
2	Armature
3	Armature tube
4	Gasket
5	O-ring
6	Seal ring
7	O-ring
8	Fixed cap
9	Clip
10	Union nut
11	Valve seat



PMLX

6	Drain plug
15 + 15a	Pilot valve
19	Valve body
20	Bottom Cover
21	Piston
23	Compression spring
30	Cover
52	Valve spindle
53	Manual operation
56	Insert bush

Solenoid valves PMLX are pilot-operated valves in which the external pilot pressure will open the valve without a differential pressure across the valve. The differential pressure across the valve comes from the refrigerant flow through the valve and is given in the capacity tables.

The main valve is provided with two pilot solenoid valves, as well as a nipple for connection to external pilot pressure.

The external pilot pressure line must be connected to a system pressure (p_2) which is at least 1 bar (14.7 psig) higher than the inlet pressure (p_1) of the valve.

The PMLX is kept open when voltage is applied to the EVM pilot solenoid valves pos. 15 and pos. 15a.

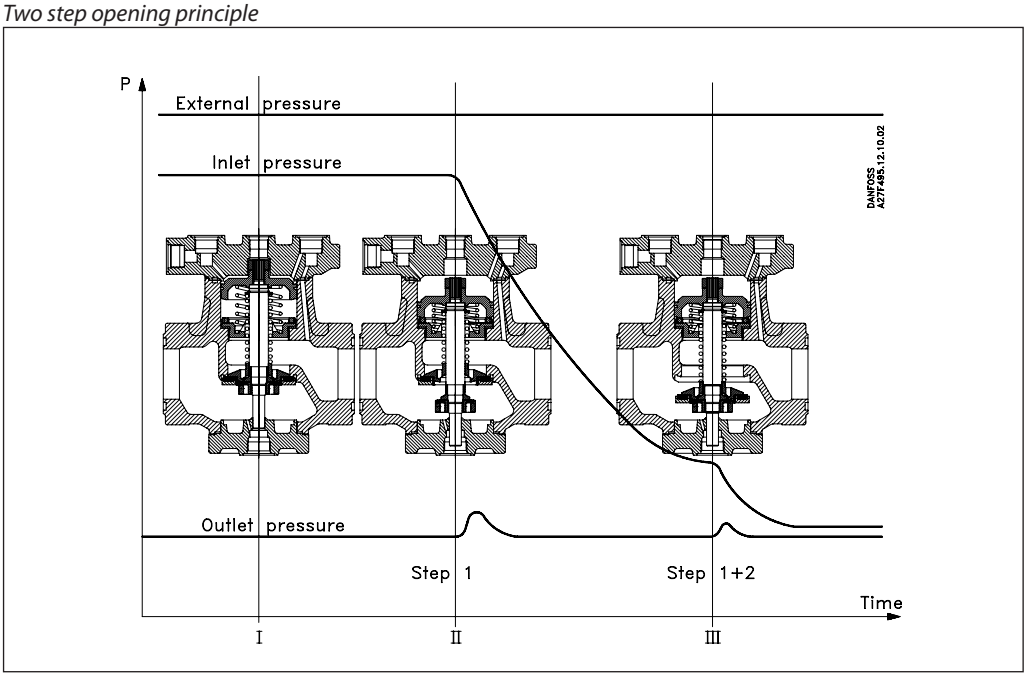
The PMLX is kept closed when the EVM pilot solenoid valves pos. 15 and pos. 15a are de-energised.

EVM, pos. 15, relieves the pilot pressure across the servo piston to the discharge side of the valve.

EVM, pos. 15a, allows pilot pressure into the valve and onto the piston.

Function
(continued)

Two step opening principle



The valve is used as a shut-off valve in suction lines to open after hot gas defrost.

Since PMLX uses external pilot pressure, the valve will be open even if the differential pressure is 0.

PMLX must not be used in pipe systems where the differential pressure across the main valve in open position can exceed 1 bar (15 psig), otherwise the step two on the valve will close.

The pilot solenoid valve (pos.15a) allows external pilot pressure (p_2) to the top of the servo piston and thus opens the first step corresponding to approx. 10% of the valve capacity. At the same time the spring, (pos. 23), will be compressed. This will start a pressure equalization of the inlet pressure (p_1) to the outlet pressure (p_4). When the differential pressure across the valve has fallen to approx. 1.5 bar (22 psig) the spring will be strong enough to open the second step and open the valve for full capacity.
This way high-pressure pulsations, which would occur when opening for full capacity in one step, can be avoided.

Important note for PMLX valves:
The PMLX valve is kept in its open position by hot gas. The hot gas condenses in the cold valve and creates liquid on top of the servo piston. When the pilot valves change status to close the PMLX, the pressure on the servo piston equalises with the suction pressure (p4) through the pilot valve (pos. 15). This equalisation takes time because condensed liquid is present in the valve.

The exact time taken from when the pilot valves change position to complete closing of the PMLX will depend on temperature, pressure, refrigerant and size of valve. Thus an exact closing time for the valves cannot be given but, in general, lower temperatures give longer closing times.
It is very important to take the closing times into consideration when hot gas defrost is performed on evaporators. Steps must be taken to ensure that the hot gas supply valve is not opened before the PMLX in the suction line is completely closed. If the hot gas supply valve is opened before the PMLX in the suction line is closed, considerable energy will be lost and potentially dangerous situations might arise because of "liquid hammer". In PMLX valves, the spring-loaded second stage might be induced to hammer by gas and liquid being forced through the valve at $\Delta p > 1.5$ bar across the PMLX. The final result could be severe damage to the valve.

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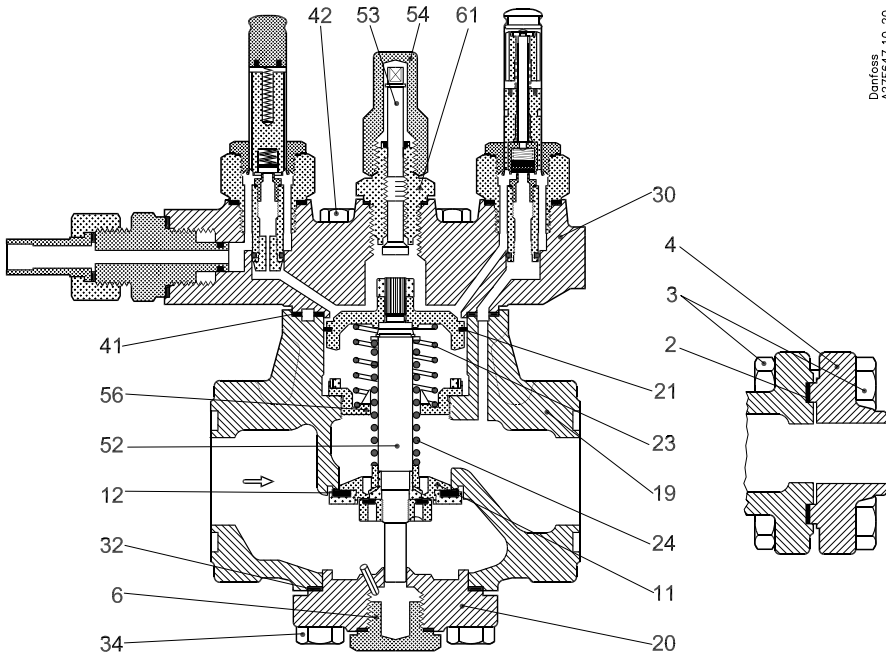
Material specification



Material specification for PMLX valves

No.	Part	Material	DIN / EN	ISO	ASTM
2	Gasket between body and bottom cover	Non-metal Non-asbestos			
3	Bolts for flange (to be ordered separately)	Stainless steel	A2 / A4-70	A2 / A4-70	
4	Flange PMLX 32 - 65	Steel	RSt. 37-2, 10025	Fe360 B, 630	Grade C, A 283
4	Flange PMLX 80 - 125	Steel	TSTE 355, 2635 / 3159		
6	Plug	Steel	9SMn28 1651	Type 2 R683/9	1213 SAE J 403
11	Trottle cone	Steel	9SMn28 1651	Type 2 R683/9	1213 SAE J 403
12	Valve seat	Teflon [PTFE]			
19	Valve body	Low temperature, cast iron (spherical)	EN-GJS-400-18-LT EN 1563		
20	Bottom cover	Low temperature, cast iron (spherical)	EN-GJS-400-18-LT EN 1563		
21	Servo piston	Cast iron	GG-25	Grade 250	Class 40B
23	Spring	Steel			
30	Cover	Low temperature, cast iron (spherical)	EN-GJS-400-18-LT EN 1563		
32	Gasket between body and bottom cover	Non-metal Non-asbestos			
34	Bolts for bottom cover (to be ordered separately)	Stainless steel	A2 / A4-70	A2 / A4-70	
41	Gasket	Non-metal Non-asbestos			
42	Bolts for top cover (to be ordered separately)	Stainless steel	A2 / A4-70	A2 / A4-70	
52	Valve spindle	Stainless steel	A2-70	A2-70	Type 308
53	Manual operating spindle	Steel	9SMn28 1651	Type 2 R683/9	1213 SAE J 403
54	Cap for manual operating spindle	Steel	9SMn28 1651	Type 2 R683/9	1213 SAE J 403
56	Servo piston	Cast iron	GG-25	Grade 250	Class 40B
61	Spindle seal	Steel 1651	9SMn28 R683/9	Type 2 SAE J 403	1213

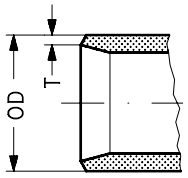
Flange connections

Danfoss flange sets inclusive of gaskets, bolts and nuts, are specially made for the Danfoss product range and must only be used for the purpose described.
When ordering PMLX valves, select the connection flanges from the list of standard flanges below. (The code numbers are for one set of two flanges).

The required PMLX valves can then be selected with or without pilot valves.

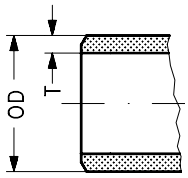
PMLX 80 to PMLX 125 can also be ordered complete with DIN weld flanges by separate code number.

DIN



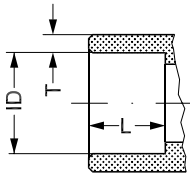
For use with valve type	Size mm	Size in.	OD mm	T mm	OD in.	T in.	Flange type	Code no.
Butt welding DIN (2448)								
PMLX 32	32 40	1 1/4 1 1/2	42.4 48.3	2.6 2.6	1.669 1.902	0.102 0.103	10	**027N2332** **027N2340**
PMLX 40	40 50	1 1/2 2	48.3 60.3	2.6 2.9	1902 2.370	0.103 0.110	11	**027N2440** **027N2450**
PMLX 50	50 65	2 2 1/2	60.3 76.1	2.9 2.9	2.370 3.000	0.110 0.110	12	**027N2550** **027N2565**
PMLX 65	65 80	2 1/2 3	76.1 88.9	2.9 3.2	3.000 3.500	0.110 0.130	13	**027N2665** **027N2680**
PMLX 80	100	4	114.3	3.6	4.500	0.140	14A	**027F2123**
PMLX 100	125	5	139.7	4.0	5.500	0.160	14B	**027F2124**
PMLX 125	150	6	168.3	4.5	6.630	0.180	14C	**027F2125**

ANSI



For use with valve type	Size mm	Size in.	OD mm	T mm	OD in.	T in.	Flange type	Schedule	Code no.
Butt welding ANSI B 36.10									
PMLX 32	32 40	1 1/4 1 1/2	42.4 48.3	4.9 5.1	1.669 1.902	0.193 0.201	10	80 80	**027N3034** **027N3035**
PMLX 40	40 50	1 1/2 2	48.3 60.3	5.1 3.9	1.902 2.370	0.201 0.150	11	80 40	**027N3036** **027N3037**
PMLX 50	50 65	2 2 1/2	60.3 73.0	3.9 5.2	2.370 2.870	0.150 0.200	12	40 40	**027N3038** **027N3039**
PMLX 65	65 80	2 1/2 3	73.0 88.9	5.2 5.5	2.870 3.500	0.200 0.220	13	40 40	**027N3040** **027N3041**
PMLX 80	100	4	114.3	6.0	4.500	0.240	14A	40	**027N3042**
PMLX 100	125	5	141.3	6.6	5.560	0.260	14B	40	**027N3043**
PMLX 125	150	6	168.3	7.1	6.630	0.280	14C	40	**027N3044**

SOC



For use with valve type	Size mm	Size in.	ID mm	T mm	ID in.	T in.	L mm	L in.	Flange type	Code no.
Socket welding ANSI (B 16.11)										
PMLX 32	32	1 1/4	42.7	6.05	1.681	0.238	13	0.512	10	**027N2003**
PMLX 40	40	1 1/2	48.8	6.35	1.921	0.250	13	0.512	11	**027N2004**
PMLX 50	50	2	61.2	6.95	2.409	0.274	16	0.630	12	**027N2005**
PMLX 65	65	2 1/2	74.0	8.75	2.913	0.344	16	0.630	13	**027N2006**

NOTE:
The flanges sets are exclusive gaskets, bolts and nuts.

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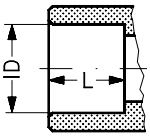
Flange connections

SA



For use with valve type	Size mm	Size in.	ID mm		ID in.		L mm	L in.	Flange type	Code no.
Soldering DIN (2856)										
PMLX 32	35		35.07				25		10	**027L2335**
PMLX 40	42		42.09				28		11	**027L2442**
PMLX 50	54		54.09				33		12	**027L2554**
PMLX 65	76		76.1				33		13	**027L2676**
Soldering (ANSI B 16.22)										
PMLX 32		$1^3/_8$			1.375			0.984	10	**027L2335**
PMLX 40		$1^5/_8$			1.625			1.102	11	**027L2441**
PMLX 50		$2^1/_8$			2.125			1.300	12	**027L2554**
PMLX 65		$2^5/_8$			2.625			1.300	13	**027L2666**

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Ordering of PMLX valves

Complete valves

The code nos. for PMLX 32 - 65 include:
- Main valve
- External pilot connection
- Flange gaskets
- Flange bolts
- NC/NO pilot valves.

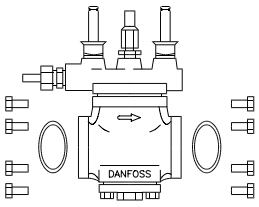
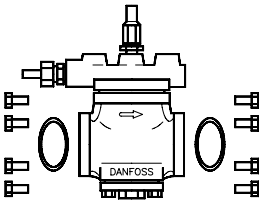
The code nos. for PMLX 80-125 include:
- Main valve
- External pilot connection
- Flange gaskets
- Flange bolts

Flanges must always be ordered separately.

Code nos. for PMLX 80, 100 and 125 are also available including DIN weld flanges.

If PMLX valves with other combinations of pilot valves are required (e.g. NC/NC or NO/NO) please order the main valve (PMLX without valves) and the pilot valves separately.

Coils are ordered separately according to coil voltage and frequency (see RD3JE).
For EVM (NC), code no. **027B1120**,
10 / 12 watt a.c. coils or 20 watt d.c. coils are used.
For EVM (NO), code no. **027B1130**, 12 watt d.c. coils or 20 watt d.c. coils, type I, are used.

	PMLX with NC / NO pilot valves	PMLX without pilot valves with external pilot connection and damping orifice
		
Valve size	EN-GJS-400-18-LT*	EN-GJS-400-18-LT*
PMLX 32	**027F3032**	**027F3040**
PMLX 40	**027F3033**	**027F3041**
PMLX 50	**027F3034**	**027F3042**
PMLX 65	**027F3035**	**027F3043**
PMLX 80	-	**027F2254**
PMLX 100	-	**027F2255**
PMLX 125	-	**027F2256**

* CE marked

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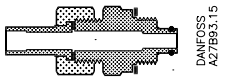
Accessories

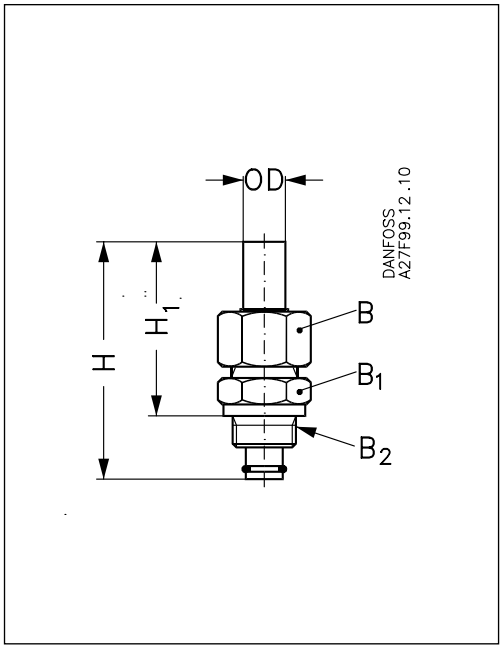
External pilot connection



PMLX	Description	Code no.
32 - 65	External pilot connection (incl. damping orifice, D: 1.0 mm)	**027F1048**
32 - 65	External pilot connection (1/4" FPT) (incl. damping orifice, D: 1.0 mm)	**027B2065**
80 - 125	External polot connection (incl. damping orifice, D: 1.8 mm)	**027F1049**
80 - 125	External pilot connection (1/4" FPT) (incl. damping orifice, D: 1.8 mm)	**027B2066**
32 - 125	Accessory bag with seal and O-ring for pilot valve	**027F0666**

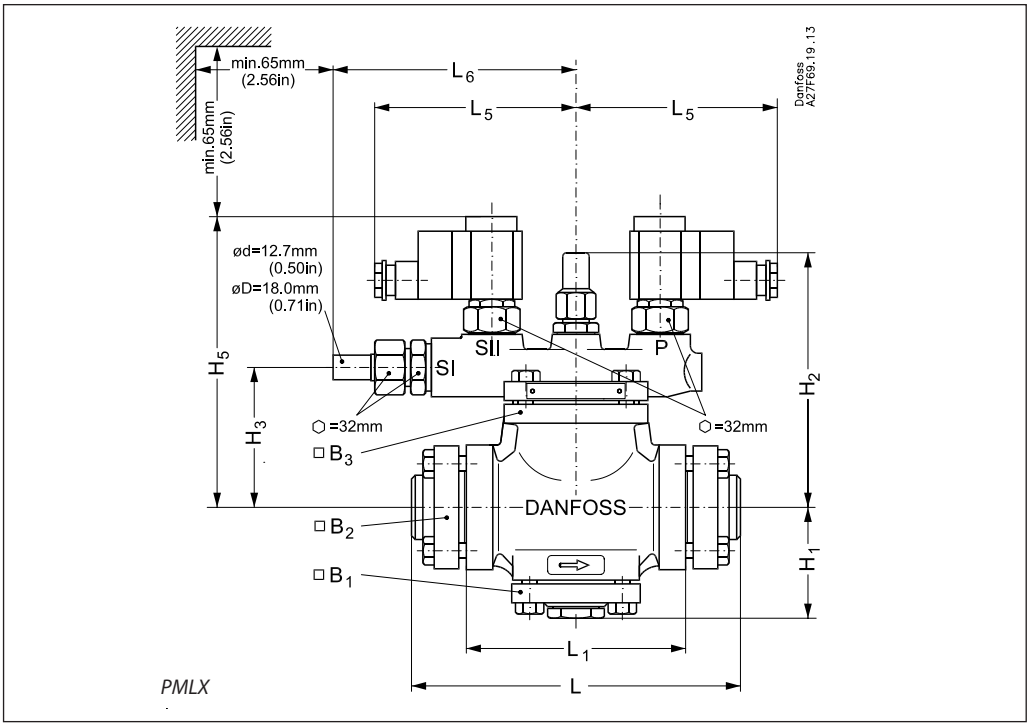
PMLX	Description	Code no.
32 - 65	Damping orifice for EVM. 10 off, (D: 1.0 mm)	**027F0664**
80 - 125	Damping orifice for EVM. 10 off, (D: 1.8 mm)	**027F0176**

A damping orifice should be installed if the pressure difference between the low and the high pressure side is more than 6 bar.



Accessories			H	H_1	OD	B	B_1	B_2
External pilot connection								
	mm in.		90 3.54	66 2.60	18 0.71	NV 32	NV 32	M 24 × 1.5

Dimensions and weights



Flange set for valve type	Weight kg. / lb
PMLX 32	1.5 kg.
(DN 20 - 32)	3.3 lb
PMLX 40	1.9 kg.
(DN 40 - 50)	4.2 lb
PMLX 50	2.8 kg.
(DN 50 - 65)	6.2 lb
PMLX 65	3.0 kg.
(DN 65 - 80)	6.6 lb

Type		H_1	H_2	H_3	H_5	L	L_1	L_5 max.		L_6	B_1	B_2	B_3	Weight
								10 W	20 W					
PMLX 32	mm	72	178	96	208	240	170	122	132	160	84	82	94	12.6 kg.
(DN 20 - 32)	in.	2.8	7	3.8	8.2	9.4	6.7	4.8	5.2	6.3	3.3	3.2	3.7	27.8 lb
PMLX 40	mm	79	187	105	215	254	170	125	135	163	94	89	102	15.3 kg.
(DN 40 - 50)	in.	3.1	7.4	4.2	8.5	10	6.7	4.9	5.3	6.4	3.7	3.5	4.2	33.7 lb
PMLX 50	mm	95	205	123	234	288	200	125	135	163	104	106	113	21.1 kg.
(DN 50 - 65)	in.	3.7	8.1	4.8	9.2	11.3	7.9	4.9	5.3	6.4	4.1	4.2	4.4	46.5 lb
PMLX 65	mm	109	227	146	257	342	250	130	140	168	127	113	135	29.6 kg.
(DN 65 - 80)	in.	4.3	8.9	5.7	10.1	13.5	9.8	5.1	5.5	6.6	5.0	4.4	5.3	65.2 lb
PMLX 80	mm	152	365	214	325	437	310	141	151	182	190	235	210	80 kg. [1]
(DN 100)	in.	6.0	14.4	8.4	12.8	17.2	12.2	5.5	5.9	7.2	7.5	9.2	8.3	176.4 lb [1]
PMLX 100	mm	173	396	246	356	489	350	155	165	192	226	270	243	120 kg. [1]
(DN 125)	in.	6.8	15.6	9.7	14	19.3	13.8	6.1	6.5	7.5	8.9	10.6	9.6	264.5 lb [1]
PMLX 125	mm	208	453	301	412	602	455	171	181	218	261	300	286	170 kg. [1]
(DN 150)	in.	8.2	17.8	11.8	16.2	23.7	17.9	6.7	7.1	8.6	10.3	11.8	11.3	374.8 lb [1]

[1]) Weight with flanges and pilot valves.

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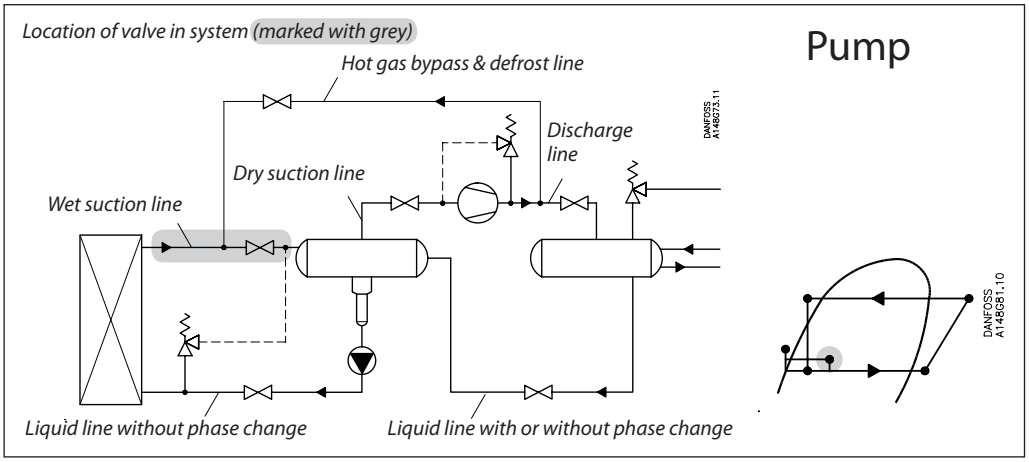
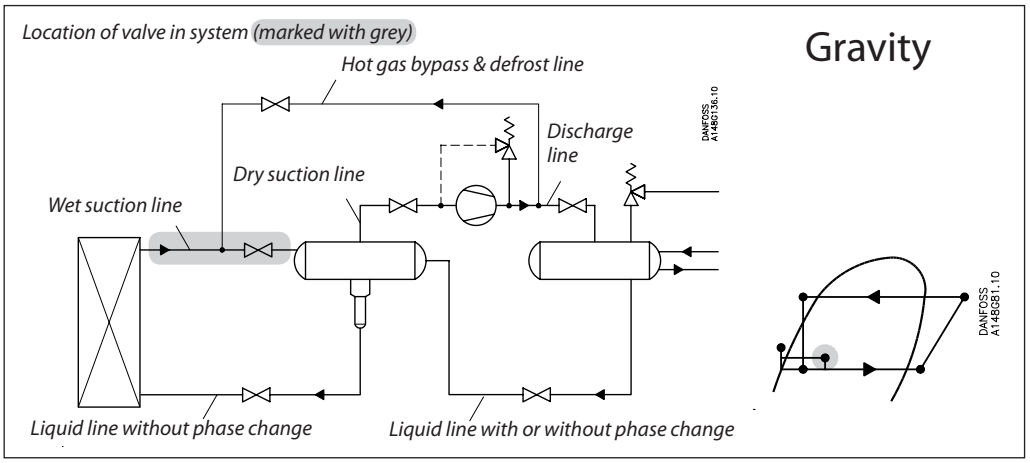
Nominal capacities

Wet suction line





Nominal capacities

Wet suction line

SI units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:

T_e = –20°C
Q_0 = 100 kW
Circulation ratio = 3
Max. ΔP = 0.1 bar

The capacity table is based on nominal conditions (pressure drop ΔP = 0.05 bar, circulation ratio = 4).

The actual capacity must therefore be corrected to a nominal condition by multiplication with correction factors.

Correction factor for ΔP = 0.1 bar, $f_{\Delta P}$ = 0.71
Correction factor for circulation ratio, f_{circ} = 0.9

$Q_n = Q_0 \times f_{\Delta P} \times f_{circ}$ = 100 x 0.71 x 0.9
= 63.9 kW.

From the capacity table a PMLX 50 with Q_n = 85 kW is the correct selection for the application.

US units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:

T_e = – 20°F
Q_0 = 10 TR
Circulation ratio = 3
Max. ΔP = 1.25 psi

The capacity table is based on nominal conditions (pressure drop ΔP = 0.75 psi, circulation ratio = 4).

The actual capacity must therefore be corrected to a nominal condition by multiplication with correction factors.

Correction factor for ΔP = 1.25 psi, $f_{\Delta p}$ = 0.77
Correction factor for circulation ratio, f_{circ} = 0.9

$Q_n = Q_0 \times f_{\Delta P} \times f_{circ} = 10 \times 0.77 \times 0.9 = 6.9$ TR

From the capacity table a PMLX 32 with Q_n = 9.7 TR is the correct selection for the application.

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Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW],
circulation ratio = 4,
ΔP = 0.05 bar

R 717

Type	k_v m^3/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4	20.5	27	33	40	48	56	64	73
PMLX 40	29.4	27	35	43	53	63	73	84	96
PMLX 50	47.8	44	57	70	85	102	119	137	156
PMLX 65	80.3	73	95	118	143	171	200	231	262
PMLX 80	170	155	201	250	304	362	424	488	555
PMLX 100	242	221	286	356	432	515	603	695	790
PMLX 125	385	352	456	566	688	820	959	1106	1256

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	1
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for circulation ratio (f_{circ})

Circulation ratio	Correction factor
2	0.77
3	0.90
4	1
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
circulation ratio = 4,
ΔP = 0.75 psi

R 717

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0	5.7	7.7	9.7	12.1	14.6	17.2	20	23
PMLX 40	34.1	7.5	10.0	12.7	15.9	19	23	26	30
PMLX 50	55.4	12.2	16.3	21	26	31	37	42	48
PMLX 65	93	20	27	35	43	52	62	71	81
PMLX 80	197	43	58	74	92	111	131	151	172
PMLX 100	281	62	83	105	131	157	186	215	245
PMLX 125	447	98	132	167	208	250	296	342	390

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

Correction factor for circulation ratio (f_{circ})

Circulation ratio	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

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Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW],
circulation ratio = 4,
ΔP = 0.05 bar

R 22

Type	k_v m^3/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4	10.0	12.2	14.7	17.2	19.8	22.5	25.2	27.7
PMLX 40	29.4	13.1	16.1	19.2	22.6	26.0	30	33	36
PMLX 50	47.8	21.3	26.1	31	37	42	48	54	59
PMLX 65	80.3	36	44	53	62	71	81	90	99
PMLX 80	170	76	93	111	131	151	171	191	210
PMLX 100	242	108	132	158	186	214	243	272	299
PMLX 125	385	172	210	252	296	341	387	432	476

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	**1**
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for circulation ratio (f_{circ})

Circulation ratio	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
circulation ratio = 4,
ΔP = 0.75 psi

R 22

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0	2.8	3.5	4.3	5.1	6.0	6.8	7.7	8.5
PMLX 40	34.1	3.7	4.6	5.7	6.7	7.8	8.9	10.1	11.2
PMLX 50	55.4	6.0	7.5	9.2	10.9	12.7	14.5	16.5	18.1
PMLX 65	93	10.1	12.7	15.4	18.4	21	24	28	30
PMLX 80	197	21	27	33	39	45	52	59	65
PMLX 100	281	30	38	47	55	64	74	83	92
PMLX 125	447	48	61	74	88	102	117	133	146

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

Correction factor for circulation ratio (f_{circ})

Circulation ratio	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

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Nominal capacities

Wet suction line

SI units

Capacity table for nominal conditions, Q_N [kW],
circulation ratio = 4,
ΔP = 0.05 bar

R 404A

Type	k_v m^3/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4	10.3	12.5	14.7	17.2	19.6	22.0	24.3	26.4
PMLX 40	29.4	13.6	16.4	19.3	22.5	25.7	29	32	35
PMLX 50	47.8	22.1	26.7	31	37	42	47	52	56
PMLX 65	80.3	37	45	53	62	70	79	87	95
PMLX 80	170	79	95	112	130	149	167	185	200
PMLX 100	242	112	135	159	185	212	238	263	285
PMLX 125	385	178	215	253	295	337	378	418	454

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	**1**
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for circulation ratio (f_{circ})

Circulation ratio	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
circulation ratio = 4,
ΔP = 0.75 psi

R 404A

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0	2.9	3.6	4.3	5.1	5.9	6.6	7.4	8.0
PMLX 40	34.1	3.8	4.7	5.7	6.7	7.7	8.7	9.7	10.5
PMLX 50	55.4	6.2	7.7	9.2	10.9	12.5	14.2	15.8	17.0
PMLX 65	93	10.5	13.0	15.5	18.3	21	24	27	29
PMLX 80	197	22	27	33	39	45	50	56	60
PMLX 100	281	32	39	47	55	63	72	80	86
PMLX 125	447	50	62	74	88	101	114	127	137

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

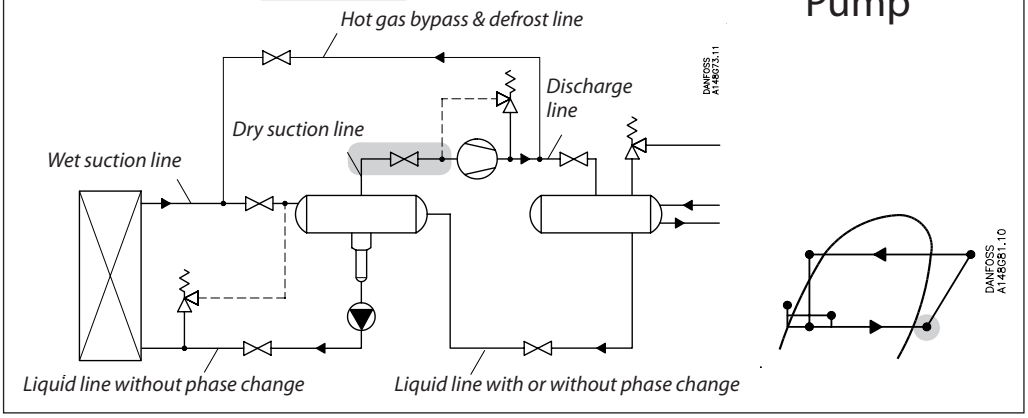
Correction factor for circulation ratio (f_{circ})

Circulation ratio	Correction factor
2	0.77
3	0.90
4	**1**
6	1.13
8	1.20
10	1.25

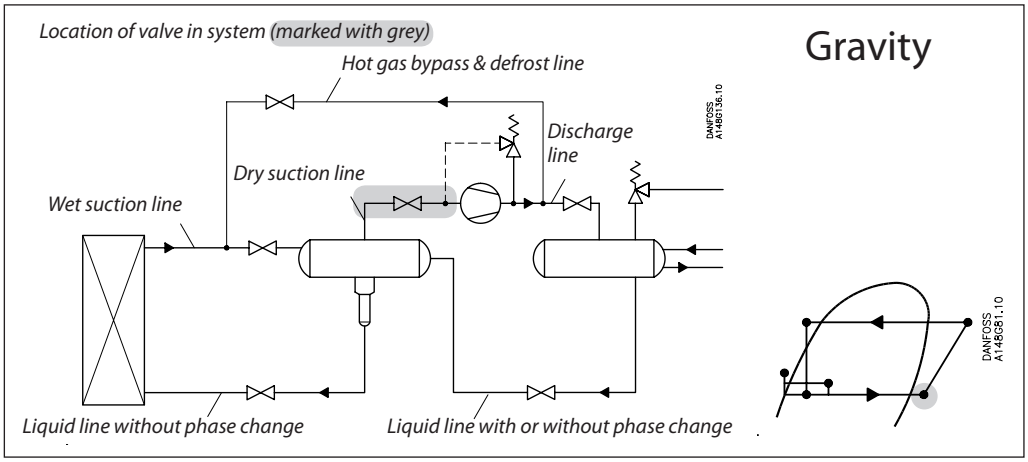
Nominal capacities

Dry suction line

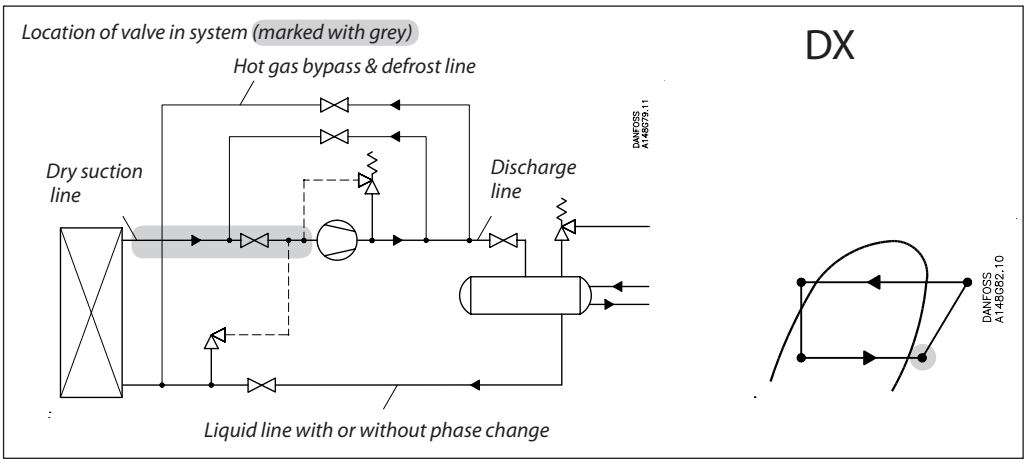
Pump



Gravity



DX



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Nominal capacities

Dry suction line

SI units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:

T_e = –20°C
Q_0 = 100 kW
T_{liq} = 10°C
Max. ΔP = 0.1 bar

The capacity table is based on nominal conditions (pressure drop ΔP = 0.05 bar, T_{liq} = 30°C).

The actual capacity must therefore be corrected to a nominal condition by multiplication with correction factors.

Correction factor for ΔP = 0.1 bar, $f_{\Delta P}$ = 0.71
Correction factor for liquid temperature, f_{Tliq} = 0.92

Correction factor for superheat (T_s) = 1.0
$Q_n = Q_0 \times f_{\Delta P} \times f_{Tliq} \times f_{Ts}$
$= 100 \times 0.71 \times 0.92 \times 1.0 = 65.3$ kW

From the capacity table a PMLX 40 with Q_n = 81 kW is the correct selection for the application.

US units

Calculation example (R 717 capacities):

Running conditions in a plant are as follows:

T_e = 0°F
Q_0 = 30 TR
T_{liq} = 50°F
Max. ΔP = 1.25 psi

The capacity table is based on nominal conditions (pressure drop ΔP = 0.75 psi, T_{liq} = 90°F)

The actual capacity must therefore be corrected to a nominal condition by multiplication with correction factors.

Correction factor for ΔP = 1.25 psi, $f_{\Delta p}$ = 0.77
Correction factor for liquid temperature, f_{Tliq} = 0.92

Correction factor for superheat (T_s) = 1.0
$Q_n = Q_0 \times f_{\Delta P} \times f_{Tliq} \times f_{Ts}$
$= 30 \times 0.77 \times 0.92 \times 1.0 = 21.25$ TR

From the capacity table a PMLX 40 with Q_n = 24 TR is the correct selection for the application.

Nominal capacities

Dry suction line

R 717

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
ΔP = 0.05 bar

Type	k_v m^3/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4	28.9	38.1	49	61	76	92	110	130
PMLX 40	29.4	38	50	64	81	99	120	144	170
PMLX 50	47.8	62	81	104	131	161	196	234	277
PMLX 65	80.3	103.5	137	175	220	271	329	394	465
PMLX 80	170	219	289	371	467	574	697	834	985
PMLX 100	242	312	412	528	664	817	992	1187	1402
PMLX 125	385	496	655	839	1057	1299	1578	1888	2231

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	**1**
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–20°C	0.82
–10°C	0.86
0°C	0.88
10°C	0.92
20°C	0.96
30°C	**1**
40°C	1.04
50°C	1.09

R 717

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 0.75 psi

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0	8.0	11.0	14.4	18.4	23.2	28.7	34.5	41
PMLX 40	34.1	10.5	14.4	18.9	24.1	30.5	37.6	45	54
PMLX 50	55.4	17.1	23.5	30.7	39	50	61.2	74	88
PMLX 65	93	28.7	39	52	66	83	103	124	147
PMLX 80	197	60.8	84	109	139	176	218	262	312
PMLX 100	281	86.5	119	155	198	251	310	372	444
PMLX 125	447	138	189	247	316	399	493	592	706

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.82
10°F	0.85
30°F	0.88
50°F	0.92
70°F	0.96
90°F	**1**
110°F	1.04
130°F	1.09

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Nominal capacities

Dry suction line

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
ΔP = 0.05 bar

R 22

Type	k_v m³/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4	11.4	14.7	18.7	23.3	28.4	34	41	48
PMLX 40	29.4	14.9	19.3	24.5	31	37	45	53	63
PMLX 50	47.8	24.3	31	40	50	61	73	87	102
PMLX 65	80.3	41	53	67	84	102	123	146	172
PMLX 80	170	86	112	142	177	215	259	309	363
PMLX 100	242	123	159	202	252	307	369	439	517
PMLX 125	385	195	253	321	401	488	587	699	822

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	**1**
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–20°C	0.71
–10°C	0.75
0°C	0.80
10°C	0.86
20°C	0.92
30°C	**1**
40°C	1.09
50°C	1.22

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 0.75 psi

R 22

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0	3.1	4.2	5.4	6.9	8.5	10.4	12.8	15.2
PMLX 40	34.1	4.1	5.5	7.1	9.0	11.2	13.7	16.8	20
PMLX 50	55.4	6.7	8.9	11.6	14.7	18.2	22	27	32
PMLX 65	93	11.3	15.0	19	25	31	37	46	54
PMLX 80	197	23.8	32	41	52	65	79	97	115
PMLX 100	281	33.9	45	59	74	92	113	138	164
PMLX 125	447	54	72	93	118	147	179	219	261

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.73
10°F	0.77
30°F	0.82
50°F	0.87
70°F	0.93
90°F	**1**
110°F	1.09
130°F	1.20

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Nominal capacities

Dry suction line

R 134a

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
ΔP = 0.05 bar

Type	k_v m³/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4		9.7	12.8	16.6	21	26	32	39
PMLX 40	29.4		12.7	16.8	22	27	34	42	51
PMLX 50	47.8		21	27	35	45	56	68	83
PMLX 65	80.3		35	46	60	75	94	115	139
PMLX 80	170		73	97	126	159	198	243	295
PMLX 100	242		105	138	180	226	282	346	419
PMLX 125	385		166	220	286	360	449	551	667

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	**1**
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–20°C	0.66
–10°C	0.70
0°C	0.76
10°C	0.82
20°C	0.90
30°C	**1**
40°C	1.13
50°C	1.29

R 134a

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 0.75 psi

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0		2.7	3.7	4.9	6.4	8.1	10.2	12.5
PMLX 40	34.1		3.6	4.9	6.4	8.3	10.6	13.4	16.4
PMLX 50	55.4		5.8	7.9	10.5	13.6	17.2	21.8	26.7
PMLX 65	93	9.8	13.3	17.6	23	29	37	45	
PMLX 80	197	21	28	37	48	61	78	95	
PMLX 100	281	30	40	53	69	87	110	135	
PMLX 125	447	47	64	84	109	138	176	215	

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.64
10°F	0.68
30°F	0.74
50°F	0.81
70°F	0.89
90°F	**1**
110°F	1.15
130°F	1.35

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Nominal capacities

Dry suction line

R 404A

SI units

Capacity table for nominal conditions, Q_N [kW],
T_{liq} = 30°C,
ΔP = 0.05 bar

Type	k_v m³/h	Evaporating temperature T_e							
		–50°C	–40°C	–30°C	–20°C	–10°C	0°C	10°C	20°C
PMLX 32	22.4	8.6	11.4	14.9	19.2	24.0	29.6	36	43
PMLX 40	29.4	11.2	15.0	19.6	25.2	31	39	47	57
PMLX 50	47.8	18.3	24.4	32	41	51	63	77	93
PMLX 65	80.3	31	41	54	69	86	106	129	156
PMLX 80	170	65	87	113	146	182	224	274	330
PMLX 100	242	92	124	161	207	259	319	390	469
PMLX 125	385	147	197	257	330	412	508	620	747

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (bar)	Correction factor
0.01	2.24
0.03	1.29
0.05	**1**
0.08	0.79
0.10	0.71
0.14	0.60

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–20°C	0.55
–10°C	0.60
0°C	0.66
10°C	0.74
20°C	0.85
30°C	**1**
40°C	1.23
50°C	1.68

R 404A

US units

Capacity table for nominal conditions, Q_N [Tons of Refrigeration],
T_{liq} = 90°F,
ΔP = 0.75 psi

Type	C_v USgal/min	Evaporating temperature T_e							
		–60°F*	–40°F	–20°F	0°F	20°F	40°F	60°F	80°F
PMLX 32	26.0	2.2	3.1	4.2	5.4	7.0	8.7	11.0	13.4
PMLX 40	34.1	2.9	4.1	5.4	7.1	9.1	11.5	14.5	17.6
PMLX 50	55.4	4.8	6.6	8.9	11.6	14.8	18.6	23.5	28.7
PMLX 65	93	8.0	11.4	14.9	19.5	24.9	31.3	39.5	48.1
PMLX 80	197	17.0	23.5	31.5	41.2	52.8	66.3	83.6	101.9
PMLX 100	281	24.2	33.4	44.9	58.7	75.1	94.4	119.0	145.1
PMLX 125	447	38.5	53.1	71.4	93.4	119.5	150.2	189.3	230.8

* 2°F below min. operating temperature.

Correction factor for ΔP ($f_{\Delta P}$)

ΔP (psi)	Correction factor
0.15	2.24
0.45	1.29
0.75	**1**
1.25	0.77
1.75	0.65
2.25	0.58

Correction factor for liquid temperature (T_{liq})

Liquid temperature	Correction factor
–10°F	0.52
10°F	0.57
30°F	0.63
50°F	0.72
70°F	0.83
90°F	**1**
110°F	1.29
130°F	1.92

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