MAKING MODERN LIVING POSSIBLE

Technical brochure

Thermostatic expansion valves

PHT

www.danfoss.com

Contents

Page

Introduction 3
Features 3
Technical data 3
Ordering - Components 4
- Pilot orifice assembly 4
- Valve body, flange gaskets, flange bolts and screws 4
- Thermostatic element (incl. accessory bag with screws) 4
- Flange set 4

Design - Function 5
Identification 5
Capacity:
- R22 / 407C 6
- R407C 7
- R134a 8
- R404A / R507 9

Dimensions and weights 10

© Danfoss A/S (AC-SMC / mr), 08 - 2010

Introduction

PHT thermostatic expansion valves regulate the injection of refrigerant liquid into evaporators. Injection is controlled by the refrigerant superheat. Therefore the valves are especially suitable for liquid injection in "dry" evaporators where the superheat at the evaporator outlet is proportional to the evaporator load.

Features

- *Range:*
  –40 to +50°C
  Equally applicable to freezing, refrigeration and air conditioning plant.
- *Interchangeable orifice assembly*
  - easier stocking
  - easy capacity matching
  - better service.
- *Very tight main orifice*
  Also used as solenoid valve (not PHT 300) - see the section "Design - Function"
- *Rated capacities from 105 to 1890 kW*
  (30 to 540 TR) for R22
- *Can be supplied with MOP*
  (Max. Operating Pressure)
  Protects the compressor motor against excessive evaporating pressure.
- *Patented double contact bulb*
  Fast and easy to install.
  Good temperature transfer from pipe to bulb.

Technical data

Refrigerants
R22, R470C, R134a, R404A / R507

Max. temperature
Bulb, when valve is installed: 100°C
Bulb, element not mounted: 60°C

Min. temperature
–50°C

Max. test pressure
PHT 85 and 125:
PT = 42 bar

PHT 300:
PT = 28 bar

Maximum working pressure
PHT 85 and 125:
PS / MWP = 28 bar

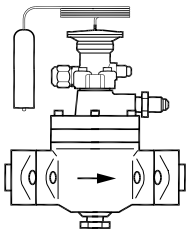
PHT 300:
PS / MWP = 20 bar

Superheat
Static superheat SS can be adjusted with setting spindle (④).
The standard superheat setting SS is 4 K.

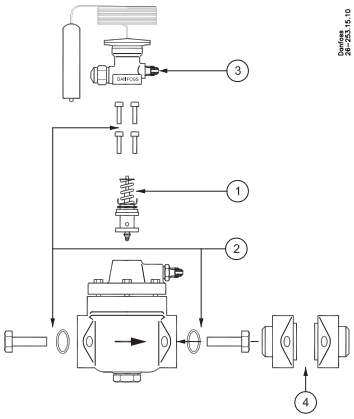
© Danfoss A/S (RA-SMC / mr), 06 - 2010

Ordering

Components



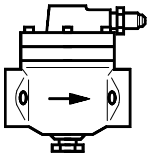
PHT 85
Solder or weld flanges



1. *Orifice assembly for pilot valve*
2. *Valve body, flange gaskets, flange bolts and screws*
3. *Thermostatic element (incl. accessory bag with screws)*
4. *Flange set*

1. Pilot orifice assembly

Type	Code no.
PHT	**067B2790**

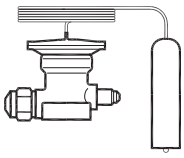


2. Valve body, flange gaskets, flange bolts and screws

Type	Orifice no.	Rated capacity [2] R22/ 407C		Rated capacity [1] R134a				Code no.
		Range N: –40 to +10°C		Range N: –40 to +10°C		Range A: +10 to +50°C		
		TR	kW	TR	kW	TR	kW	
PHT 85	1	30	105	16	55	20	69	**026H1160**
PHT 85	2	50	175	26	92	33	114	**026H1161**
PHT 85	3	80	280	39	138	52	182	**026H1162**
PHT 85	4	130	455	59	208	72	273	**026H1163**
PHT 125	1	225	790	125	438	156	545	**026H1164**
PHT 300	1	325	1140	178	622	221	773	**026H0165**
PHT 300	2	540	1890	309	1083	351	1227	**026H0166**

[1] A PHT 85 with orifice no. 5 and a capacity of +5 → +10% compared to orifice no. 4 can be ordered. The code no. is 026H1187.
[2] The rated capacity for range N is based on evaporating temperature t_e = +5°C, condensing temperature t_c = +32°C, and refrigerant liquid temperature ahead of valve t_l = +28°C.
The rated capacity for range A is based on evaporating temperature t_e = +5°C, condensing temperature t_c = +42°C, and refrigerant liquid temperature ahead of valve t_l = +38°C.

See following pages for extended capacity tables.



3. Thermostatic element (incl. accessory bag)

Range	Refrigerant	Code no.	
		3 m capillary tube	5 m capillary tube
–40 to +10°C	R22/ R407C	**067B3303**	**067B3304**
	R22/ R407C, MOP 100 psig	**067B3300**	**067B3306**
	R407C	**067B3314**	**067B3341**
	R407C, MOP 95 psig	**067B3311**	
	R134a	**067B3310**	**067B3315**
	R134a, MOP 55 psig	**067B3316**	**067B3317**
	R404A / R507		**067B3319**
+10 to +50°C	R134a		**067B3318**

4. Flange set

Valve flange	Flange type	Weld flanges		Solder flanges			
		in.	Code no.	in.	Code no.	mm	Code no.
PHT 85	2	1	**027N1025**				
PHT 85	2			$1^1/_8$	**027L1029**	28	**027L1028**
PHT 85	2			$1^3/_8$	**027L1035**	35	**027L1035**
PHT 125	3 A	$1^1/_4$	**027N1032**				
PHT 300	4 A	$1^1/_2$	**027N1040**				
PHT 300	4 A	2	**027N1050**				

© Danfoss A/S (AC-SMC / mr), 08 - 2010

Design
Function

General
PHT valves have an interchangeable orifice assembly.

PHT valves are built up of three interchangeable main components:
I. Thermostatic element, pos. 1
II. Orifice assembly, pos. 2
III. Valve body with connections, pos. 3
Including Insert, pos. 7

For the same valve type and refrigerant, the associated orifice assembly is suitable for all versions of valve body and in all evaporating temperature ranges.

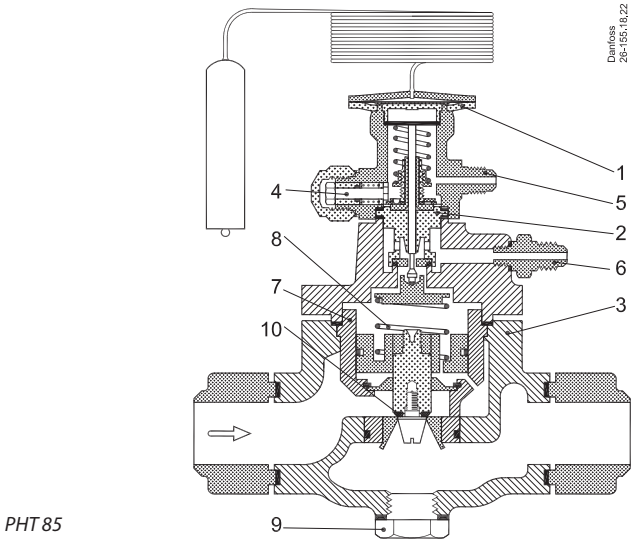
The charge in the thermostatic element depends on the evaporating temperature range.

A teflon valve plate (pos. 10) in the main valve (not PHT 300) ensures a tight main orifice.

All valves with external pressure equalization (pos. 5).

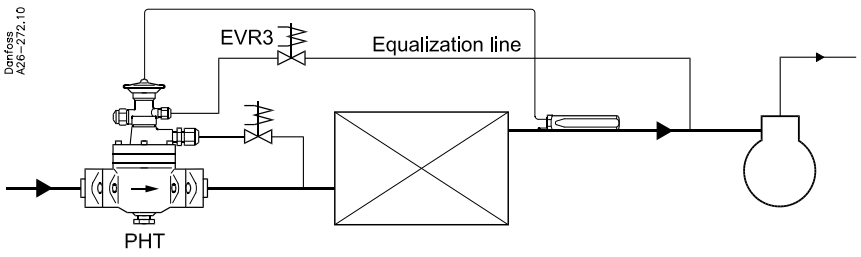
The double contact bulb gives fast and precise reaction to temperature changes in the evaporator. It also makes fitting the bulb quick and easy.
The valves are able to withstand the effects that normally occur with hot gas defrosting.

To ensure long operating life, the valve cone and seat are made of a special alloy with particularly good wear qualities.



PHT 85

1. Thermostatic element (diaphragm)
2. Interchangeable orifice assembly
3. Valve body
4. Superheat setting spindle (see instructions)
5. Ext. pressure equalizing connection with 1/4 in./6 mm flare nut
6. Pilot connection
7. Insert in main valve
8. Main spring
9. Bottom plug
10. Teflon valve plate



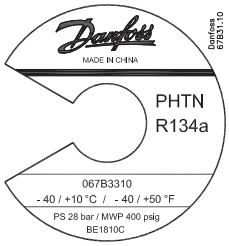
To obtain a completely tight system an EVR 3 must be installed in the equalization line.

Identification

The thermostatic element is fitted with a label (on top of the diaphragm).The code refers to the refrigerant for which the valve is designed:

X = R22 / R407C
Z = R407C
N = R134a
S = R404a / R507

The label gives valve type, evaporating temperature range, MOP point, refrigerant, and max. test pressure, PB/MWP.



Thermostatic element label

© Danfoss A/S (RA-SMC / mr), 06 - 2010

Capacity

R22 / R407C

Capacity in kW for range N: –40°C to +10°C

Valve type	Orifice no.	Pressure drop across valve Δp bar								Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
		Evaporating temperature +10°C								**Evaporating temperature 0°C**							
PHTX 85	1	67.3	95	112	124	133	139	142	144	56.7	76.6	93.4	103	111	115	119	121
PHTX 85	2	109	151	178	196	209	217	222	224	94.4	131	153	169	180	188	194	196
PHTX 85	3	174	244	287	316	336	349	356	360	147	206	241	265	283	295	303	306
PHTX 85	4	299	422	493	542	572	594	606	611	230	331	391	432	460	480	495	500
PHTX 125	1	518	605	695	803	876	927	957	982	454	573	698	763	813	840	863	870
PHTX 300	1	786	1048	1211	1317	1387	1432	1455	1476	671	887	1022	1110	1182	1216	1250	1271
PHTX 300	2	1290	1688	1935	2096	2202	2269	2302	2327	1133	1471	1685	1827	1941	1997	2048	2077
		Evaporating temperature –10°C								**Evaporating temperature –20°C**							
PHTX 85	1	46	64	74.9	82.9	88.4	92.9	94.5	97.4		49.6	57.8	63.3	68.2	71.5	73.1	75.3
PHTX 85	2	78.4	108	126	139	148	156	159	163		85.6	99.5	109	117	123	125	129
PHTX 85	3	119	166	195	215	228	239	245	248		129	151	166	178	186	192	195
PHTX 85	4	153	231	276	310	334	350	361	368		139	165	187	205	215	230	234
PHTX 125	1	381	505	582	637	677	707	727	730		403	465	511	541	567	585	591
PHTX 300	1	552	723	827	898	957	1002	1034	1040		570	648	711	751	789	821	818
PHTX 300	2	953	1228	1401	1522	1620	1695	1747	1757		990	1124	1233	1304	1370	1425	1422
		Evaporating temperature –30°C								**Evaporating temperature –40°C**							
PHTX 85	1		36.6	42.8	46.8	49.8	52.2	54.3	55.9			30.6	33.6	36.1	38	39.4	40.2
PHTX 85	2		64.1	74.7	81.7	86.9	91.1	94.6	97.4			54	59.2	63.7	66.9	69.4	70.4
PHTX 85	3		95.3	112	124	132	138	144	147			79.9	88.5	94.7	99.7	104	107
PHTX 85	4		100	120	134	145	153	158	161			84.7	95.5	103	111	115	119
PHTX 125	1		310	358	390	413	434	449	461			266	289	309	321	339	340
PHTX 300	1		429	487	536	570	598	621	627			364	399	430	454	467	474
PHTX 300	2		759	862	949	1011	1062	1104	1115			655	719	775	820	844	857

Correction for subcooling Δt_{sub}

Note:
Insufficient subcooling can produce flash gas.

The evaporator capacities used must be corrected if subcooling deviates from 4 K. The corrected capacity can be obtained by dividing the required evaporator capacity by the correction factor below. Selections can then be made from the tables above.

Δt_{sub}	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
Correction factor	1.00	1.06	1.11	1.15	1.2	1.25	1.3	1.35	1.39	1.44

Example
Refrigerant = R22
Evaporator capacity Q_e = 110 kW
Subcooling = 10 K

Correction factor from table = 1.06
Corrected capacity = 110 : 1.06 ≅ 104 kW

© Danfoss A/S (AC-SMC / mr), 08 - 2010

Capacity

R407C

Capacity in kW for range N: –40°C to +10°C

Valve type	Orifice no.	Pressure drop across valve Δp bar								Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
		Evaporating temperature +10°C								**Evaporating temperature 0°C**							
PHTZ 85	1	70	97.9	114	125	133	136	138	138	59	78.9	95.3	104	111	113	115	116
PHTZ 85	2	113	155	182	198	209	213	213	215	98	135	156	171	180	184	188	188
PHTZ 85	3	181	251	293	319	336	342	345	346	153	212	246	268	283	289	294	294
PHTZ 85	4	311	435	503	547	572	582	588	587	239	341	399	436	460	470	480	480
PHTZ 125	1	539	623	709	811	876	908	928	943	472	590	712	771	813	823	837	835
PHTZ 300	1	817	1079	1235	1330	1387	1403	1411	1417	698	914	1042	1121	1182	1192	1212	1220
PHTZ 300	2	1342	1739	1974	2117	2202	2227	2233	2234	1178	1515	1719	1845	1941	1957	1987	1994
		Evaporating temperature –10°C								**Evaporating temperature –20°C**							
PHTZ 85	1	47.8	65.3	75.6	82.9	88.4	91	91.7	92.5		50.6	58.4	63.3	67.5	69.4	70.2	70.8
PHTZ 85	2	81.5	110	127	139	148	153	154	155		87.3	100	109	116	119	120	121
PHTZ 85	3	124	169	197	215	228	234	238	236		132	152	166	176	180	184	183
PHTZ 85	4	159	236	279	310	334	343	350	350		142	167	187	203	209	221	220
PHTZ 125	1	396	515	588	637	677	693	705	693		411	470	511	536	550	562	555
PHTZ 300	1	574	737	835	898	957	982	1003	988		581	654	711	743	765	788	769
PHTZ 300	2	991	1253	1415	1522	1620	1661	1695	1669		1010	1135	1233	1291	1329	1368	1337
		Evaporating temperature –30°C								**Evaporating temperature –40°C**							
PHTZ 85	1		37.3	43.2	46.3	48.8	50.1	51.6	52			30.6	32.9	34.7	36.1	36.6	37
PHTZ 85	2		65.4	75.4	80.9	85.2	87.5	89.9	90.6			54	58	61.2	63.6	64.5	64.8
PHTZ 85	3		97.2	113	123	129	132	137	137			79.9	86.7	90.9	94.7	96.7	98.4
PHTZ 85	4		102	121	133	142	147	150	150			84.7	93.6	98.9	105	107	109
PHTZ 125	1		316	362	386	405	417	427	429			266	283	297	305	315	313
PHTZ 300	1		438	492	531	559	574	590	583			364	391	413	431	434	436
PHTZ 300	2		774	871	939	991	1019	1049	1037			655	705	744	779	785	788

Correction for subcooling Δt_{sub}

The evaporator capacities used must be corrected if subcooling deviates from 4 K. The corrected capacity can be obtained by dividing the required evaporator capacity by the correction factor below. Selections can then be made from the tables above.

Note:
Insufficient subcooling can produce flash gas.

Δt_{sub}	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
Correction factor	1.00	1.08	1.14	1.21	1.27	1.33	1.39	1.45	1.51	1.57

© Danfoss A/S (RA-SMC / mr), 06 - 2010

Capacity

R134a

Capacity in kW for range N: –40°C to +10°C

Valve type	Orifice no.	Pressure drop across valve Δp bar					Pressure drop across valve Δp bar				
		2	4	6	8	10	2	4	6	8	10
		Evaporating temperature +10°C					**Evaporating temperature 0°C**				
PHTN 85	1	45	62	71	76	79	36	49	56	60	62
PHTN 85	2	77	104	118	127	131	62	84	96	103	106
PHTN 85	3	118	161	183	196	201	93	128	146	157	161
PHTN 85	4	169	239	273	293	305	102	152	179	197	206
PHTN 125	1	372	486	545	576	591	304	399	448	477	488
PHTN 300	1	537	697	775	824	842	433	560	625	668	686
PHTN 300	2	927	1184	1303	1380	1407	762	974	1081	1149	1176
		Evaporating temperature –10°C					**Evaporating temperature –20°C**				
PHTN 85	1	27	36	41	44	46		25	29	31	32
PHTN 85	2	47	64	73	77	80		44	50	54	56
PHTN 85	3	69	95	109	117	120		64	75	81	83
PHTN 85	4	73	103	119	128	132		69	82	89	92
PHTN 125	1	232	306	345	367	375		216	246	264	268
PHTN 300	1	330	422	478	508	526		294	339	363	376
PHTN 300	2	591	748	846	895	925		531	612	655	678
		Evaporating temperature –30°C					**Evaporating temperature –40°C**				
PHTN 85	1		15	18	19	21		9	10	12	12
PHTN 85	2		27	32	34	36		16	18	21	21
PHTN 85	3		40	47	51	53		23	27	30	31
PHTN 85	4		42	51	56	60		24	30	33	35
PHTN 125	1		141	161	171	180		87	99	108	112
PHTN 300	1		197	227	246	253		126	147	158	164
PHTN 300	2		362	416	450	465		234	273	292	304

Capacity in kW for range A: +10°C to +50°C

		Evaporating temperature +50°C					**Evaporating temperature +40°C**				
PHTN 85	1	70	92	105	115	121	70	96	111	121	127
PHTN 85	2	105	138	159	172	183	107	145	166	181	190
PHTN 85	3	179	233	267	289	305	178	243	276	302	316
PHTN 85	4	324	417	472	508	535	316	426	483	524	551
PHTN 125	1	439	569	647	699	738	471	601	674	728	762
PHTN 300	1	723	790	936	1065	1160	778	989	1108	1196	1251
PHTN 300	2	1153	1477	1670	1799	1891	1234	1548	1724	1857	1943
		Evaporating temperature +30°C					**Evaporating temperature +20°C**				
PHTN 85	1	64	87	100	108	114	56	77	88	94	98
PHTN 85	2	102	137	156	168	178	93	125	142	152	158
PHTN 85	3	165	223	253	271	286	146	198	225	239	249
PHTN 85	4	286	387	435	462	489	240	272	330	372	394
PHTN 125	1	485	628	698	738	772	445	578	643	677	699
PHTN 300	1	737	950	1058	1121	1176	658	853	944	993	1029
PHTN 300	2	1201	1515	1672	1765	1852	1102	1400	1535	1608	1661
		Evaporating temperature +10°C					**Evaporating temperature 0°C**				
PHTN 85	1	47	65	74	80	82	38	53	60	65	67
PHTN 85	2	80	109	124	132	137	66	90	103	110	113
PHTN 85	3	123	169	192	205	211	100	137	158	169	173
PHTN 85	4	182	258	292	315	325	117	178	206	225	234
PHTN 125	1	387	507	564	597	609	324	423	475	506	515
PHTN 300	1	563	730	810	859	876	464	599	669	713	731
PHTN 300	2	963	1229	1353	1427	1453	808	1033	1147	1216	1243
		Evaporating temperature –10°C									
PHTN 85	1	30	42	48	51	52					
PHTN 85	2	52	72	82	88	90					
PHTN 85	3	77	107	124	132	136					
PHTN 85	4	83	118	136	146	150					
PHTN 125	1	262	340	385	406	418					
PHTN 300	1	372	475	533	568	583					
PHTN 300	2	657	832	934	991	1016					

Correction for subcooling Δt_{sub}

The evaporator capacities used must be corrected if subcooling deviates from 4 K. The corrected capacity can be obtained by dividing the required evaporator capacity by the correction factor below. Selections can then be made from the tables above.

Note:
Insufficient subcooling can produce flash gas.

Δt_{sub}	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
Correction factor	1.00	1.08	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.54

© Danfoss A/S (AC-SMC / mr), 08 - 2010

Capacity

R404A / R507

Capacity in kW for range N: –40°C to +10°C

Valve type	Orifice no.	Pressure drop across valve Δp bar								Pressure drop across valve Δp bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
		Evaporating temperature +10°C								**Evaporating temperature 0°C**							
PHTS 85	1	60.9	84.7	98.1	107	112	115	113	110	52.9	73.1	84.3	91	94.9	97.3	97.2	93.8
PHTS 85	2	96.1	131	150	162	170	173	170	166	86.4	118	135	145	150	155	153	148
PHTS 85	3	156	215	245	266	278	283	278	271	136	188	214	229	240	245	243	234
PHTS 85	4	274	374	425	458	477	486	475	463	227	313	356	384	401	412	406	394
PHTS 125	1	446	564	629	671	697	706	690	670	415	539	601	639	664	679	667	646
PHTS 300	1	709	913	1027	1099	1142	1159	1131	1098	625	803	895	951	990	1015	995	645
PHTS 300	2	1133	1430	1595	1702	1766	1788	1743	1691	1032	1299	1434	1522	1582	1619	1588	1531
		Evaporating temperature –10°C								**Evaporating temperature –20°C**							
PHTS 85	1	44.3	61.4	70.2	75	78	79.2	79.2	76.9		48.6	55.3	59.3	61.2	62.9	62	61.1
PHTS 85	2	74.6	102	116	123	129	130	130	126		82.8	93.8	100	103	106	105	103
PHTS 85	3	114	157	179	191	199	202	200	194		125	143	153	158	162	160	156
PHTS 85	4	169	243	277	298	314	319	318	310		160	188	204	216	224	225	222
PHTS 125	1	362	471	525	556	573	580	571	554		388	433	458	470	480	473	464
PHTS 300	1	531	685	760	796	832	842	834	809		553	612	645	670	684	670	656
PHTS 300	2	903	1141	1256	1315	1370	1387	1374	1333		945	1040	1095	1135	1159	1136	1113
		Evaporating temperature –30°C								**Evaporating temperature –40°C**							
PHTS 85	1			41.9	45.1	46.3	47.4	46.5	45			30.7	32.5	33.6	33.7	34	32.4
PHTS 85	2			72.5	77.8	78.9	81.5	80.1	77.5			53.7	56.9	58.8	58.8	59.4	56.7
PHTS 85	3			109	117	121	122	121	118			80	85	88.3	89.7	88.2	86.2
PHTS 85	4			118	127	132	136	133	131			85.1	91.9	96.4	98.2	97.6	94.6
PHTS 125	1			342	361	371	376	369	360			259	271	278	281	278	271
PHTS 300	1			472	503	516	524	513	507			355	374	385	395	384	382
PHTS 300	2			824	875	898	911	892	883			631	664	685	701	683	677

Correction for subcooling Δt_{sub}

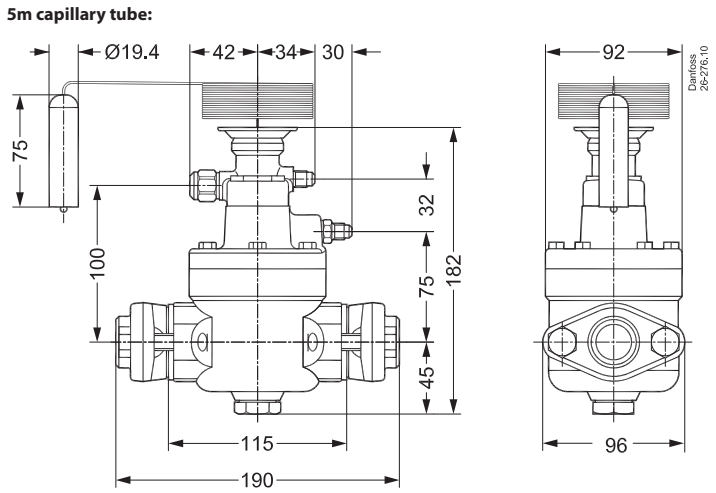
The evaporator capacities used must be corrected if subcooling deviates from 4 K. The corrected capacity can be obtained by dividing the required evaporator capacity by the correction factor below. Selections can then be made from the tables above.

Note:
Insufficient subcooling can produce flash gas.

Δt_{sub}	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
Correction factor	1.00	1.1	1.2	1.29	1.37	1.46	1.54	1.63	1.7	1.78

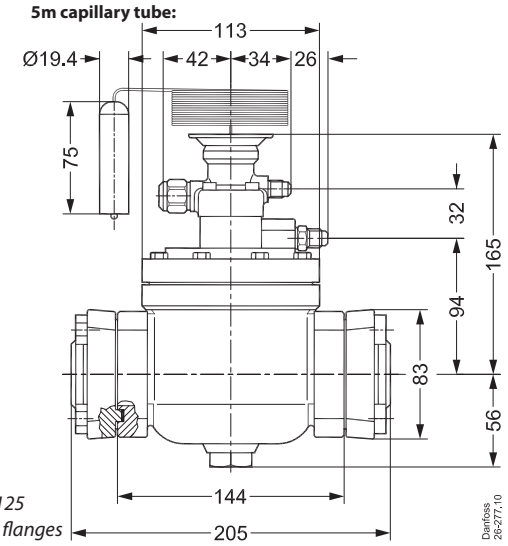
© Danfoss A/S (RA-SMC / mr), 06 - 2010

Dimensions and weights



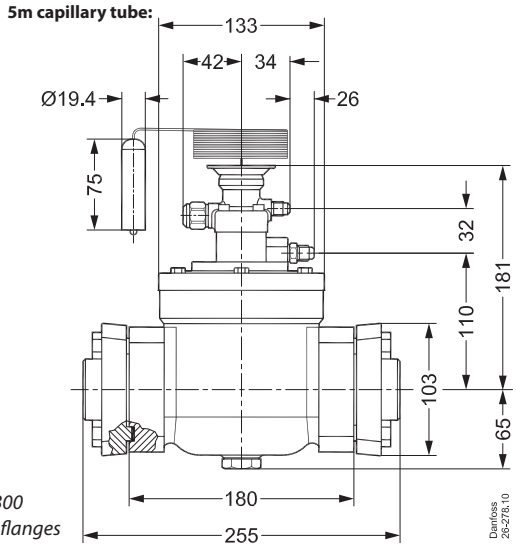
PHT 85
Solder or weld flanges

Weight 4.5 kg



PHT 125
Weld flanges

Weight 9.5 kg



PHT 300
Weld flanges

Weight 15.5 kg

© Danfoss A/S (AC-SMC / mr), 08 - 2010

© Danfoss A/S (RA-SMC / mr), 06 - 2010

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequential changes being necessary in specifications already agreed.
All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.

© Danfoss A/S (AC-SMC / mr), 08 - 2010