

Danfoss

Selection
& Application Guidelines

Reciprocating Compressors MT/MTZ 50 - 60 Hz



R22 - R407C - R134a - R404A/R507A

Maneurop[®]
RECIPROCATING COMPRESSORS

REFRIGERATION AND
AIR CONDITIONING

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MANEUROP® RECIPROCATING COMPRESSORS

Maneurop® reciprocating compressors from Danfoss Commercial Compressors are specially designed for applications with a wide range of operating conditions. All components are of high quality and precision in order to assure a long product life.

Maneurop® MT and MTZ series compressors are of the hermetic reciprocating type and are designed for medium and high evaporating temperature applications.

The compressor design allows for the motor to be 100% suction-gas cooled.

The positive benefits of internal motor protection, high efficiency circular valve design and high torque motors provide for a quality installation.

The MT series is designed for use with the "traditional" R22 refrigerant, using Danfoss mineral oil 160P as lubricant. The MT series can also be applied with several R22 based refrigerant blends (substitute refrigerants), using 160 ABM alkylbenzene as lubricant. The MTZ series is specifically designed for use with the HFC refrigerants R407C, R134a, R404A, and R507A, using 160PZ polyester oil as lubricant.

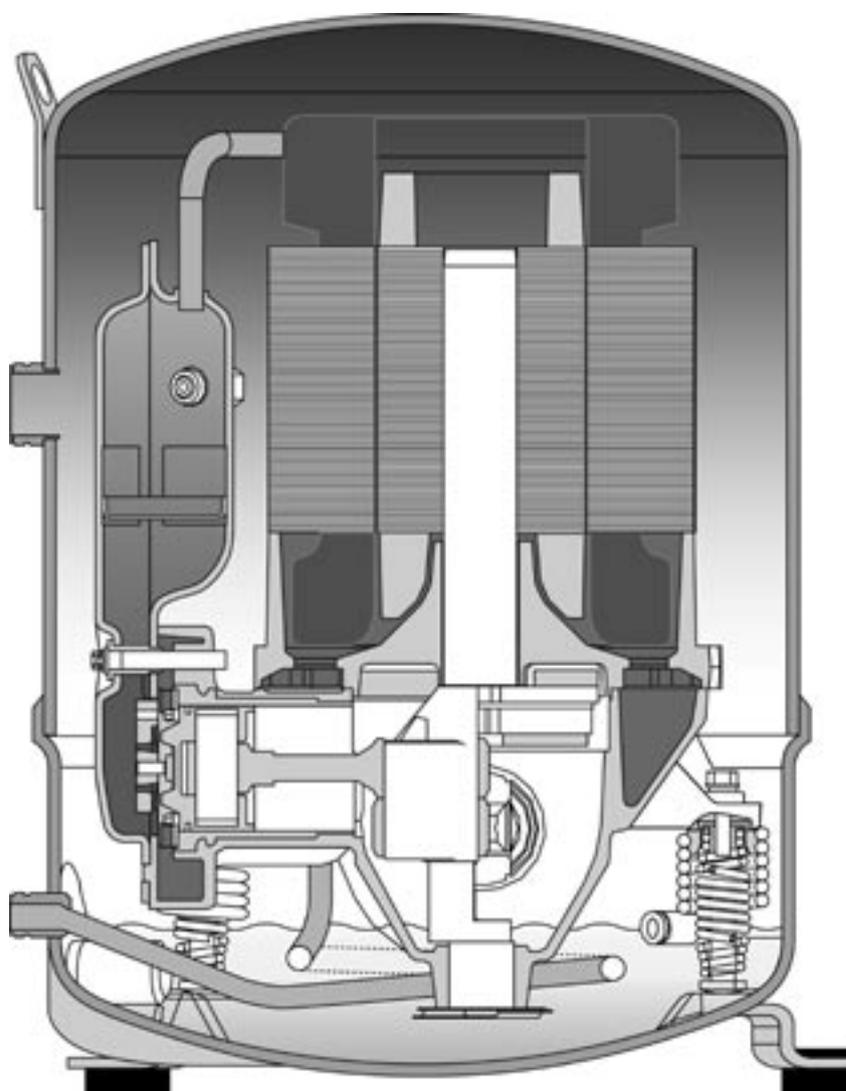
MTZ compressors can be used in new installations and also to replace Maneurop® MTE compressors in existing installations.

MT and MTZ compressors have a large internal free volume that protects against the risk of liquid hammering when liquid refrigerant enters the compressor.

MT and MTZ compressors are fully suction-gas cooled. This means that no additional compressor cooling is required and allows the compressors to be insulated with acoustic jackets, to obtain lower sound levels, without the risk of compressor overheating.

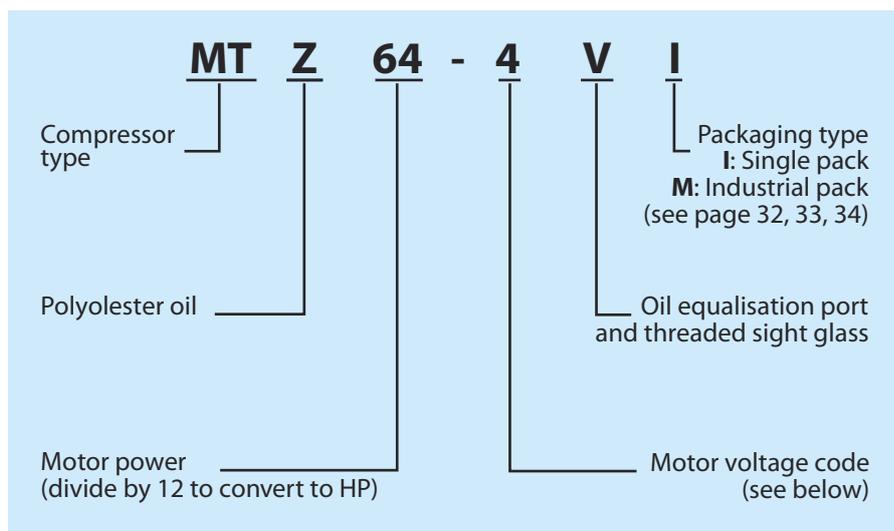
MT and MTZ compressors are available in 26 different models with displacement ranging from 30 to 543 cm³/rev. Seven different motor voltage ranges are available for single and three phase power supplies at 50 and 60 Hz. Most compressors exist in two versions:

- standard version
- VE version (oil equalisation + oil sight glass).



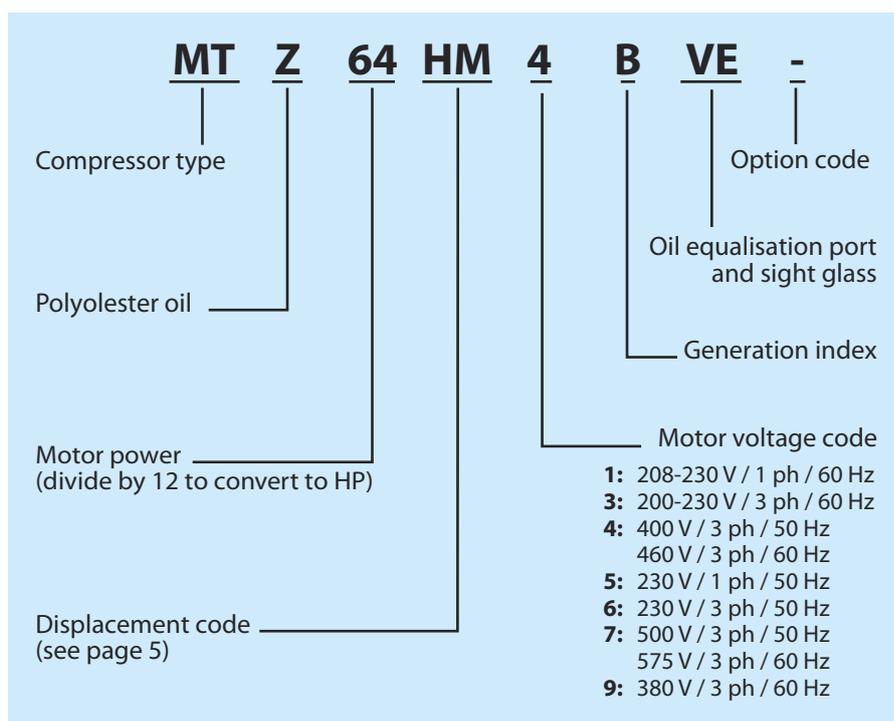
COMPRESSOR MODEL DESIGNATION

Code numbers (for ordering)



Available code numbers are listed on pages 32-33

Compressor reference (indicated on the compressor nameplate)



Versions

Models	S version (standard)		VE version (optional)	
	Oil sight glass	Oil equalisation connection	Oil sight glass	Oil equalisation connection
MT/MTZ018-040 (1 cyl.)	-	-	threaded	3/8"flare
MT/MTZ044-081 (2 cyl.)	-	-	threaded	3/8"flare
MT/MTZ100-160 (4 cyl.)	brazed	-	threaded	3/8"flare

SPECIFICATIONS

Technical specifications

Compressor model	Displacement			Cyl. number	Oil charge dm ³	Net weight kg	Available motor voltage codes						
	Code	cm ³ /rev	m ³ /h at 2900 rpm				1	3	4	5	6	7	9
MT/MTZ018	JA	30.23	5.26	1	0.95	21	●	●	●	●	○	-	-
MT/MTZ022	JC	38.12	6.63	1	0.95	21	●	●	●	●	●	○	●
MT/MTZ028	JE	48.06	8.36	1	0.95	23	●	●	●	●	●	○	●
MT/MTZ032	JF	53.86	9.37	1	0.95	24	●	●	●	●	●	○	○
MT/MTZ036	JG	60.47	10.52	1	0.95	25	●	●	●	●	●	○	●
MT/MTZ040	JH	67.89	11.81	1	0.95	26	●	●	●	-	●	-	-
MT/MTZ044	HJ	76.22	13.26	2	1.8	35	●	●	●	-	●	●	●
MT/MTZ045	HJ	76.22	13.26	2	1.8	37	-	●	●	-	-	-	-
MT/MTZ050	HK	85.64	14.90	2	1.8	35	●	●	●	●	●	●	●
MT/MTZ051	HK	85.64	14.90	2	1.8	37	-	●	●	-	-	-	-
MT/MTZ056	HL	96.13	16.73	2	1.8	37	●	●	●	-	●	●	●
MT/MTZ057	HL	96.13	16.73	2	1.8	39	-	●	●	-	-	-	-
MT/MTZ064	HM	107.71	18.74	2	1.8	37	●	●	●	-	●	-	●
MT/MTZ065	HM	107.71	18.74	2	1.8	39	-	●	●	-	-	-	-
MT/MTZ072	HN	120.94	21.04	2	1.8	40	-	●	●	-	●	-	●
MT/MTZ073	HN	120.94	21.04	2	1.8	41	-	●	●	-	-	-	-
MT/MTZ080	HP	135.78	23.63	2	1.8	40	-	●	●	-	●	-	●
MT/MTZ081	HP	135.78	23.63	2	1.8	41	-	●	●	-	-	-	-
MT/MTZ100	HS	171.26	29.80	4	3.9	60	-	●	●	-	●	●	●
MT/MTZ125	HU	215.44	37.49	4	3.9	64	-	●	●	-	●	●	○
MT/MTZ144	HV	241.87	42.09	4	3.9	67	-	●	●	-	●	●	●
MT/MTZ160	HW	271.55	47.25	4	3.9	69	-	●	●	-	●	-	●

● Available in MT and MTZ ○ Available in MTZ only

Approvals and certificates

Maneurop® MT/MTZ compressors comply with the following approvals and certificates.

Certificates are listed on the product datasheets:
<http://www.danfoss.com/odsg>

CE (European Directive)		All models
UL (Underwriters Laboratories)		Models with motor voltage code 3 and 4
CCC (China Compulsory Product Certification)		Depending on the model and motor voltage code.
Gost certificate (for Russia)		Depending on the model and voltage code.

SPECIFICATIONS

Nominal performance data for R404A and R22

R404A	Refrigeration											
Compressor model	50 Hz, EN12900 ratings To = -10 °C, Tc = 45°C, SC = 0 K, SH = 10 K				50 Hz, ARI ratings To = -6.7 °C, Tc = 48.9 °C, SC = 0 K, SH = 11.1 K				60 Hz, ARI ratings To = -6.7 °C, Tc = 48.9 °C, SC = 0 K, SH = 11.1 K			
	Cooling capacity W	Power input kW	Current input A	C.O.P. W/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W
MTZ018-4*	1 900	1.21	2.73	1.58	2 070	1.31	2.86	5.40	2 630	1.76	2.86	5.09
MTZ022-4*	2 620	1.48	3.06	1.77	2 830	1.62	3.24	5.96	3 600	2.05	3.27	6.00
MTZ028-4*	3 430	1.96	4.04	1.75	3 690	2.14	4.30	5.88	4 680	2.68	4.23	5.95
MTZ032-4*	3 980	2.16	4.25	1.84	4 260	2.37	4.56	6.15	5 110	2.98	4.56	5.85
MTZ036-4*	4 670	2.58	4.95	1.81	4 990	2.83	5.33	6.02	5 900	3.33	5.09	6.04
MTZ040-4*	5 330	2.95	5.87	1.81	5 680	3.24	6.29	5.97	6 730	3.76	5.88	6.11
MTZ044-4	5 150	3.16	6.37	1.63	5 530	3.43	6.66	5.51	7 100	4.18	6.58	5.79
MTZ045-4*	5 370	2.77	5.35	1.93	5 780	3.02	5.67	6.53	7 110	3.85	5.85	6.30
MTZ050-4	6 150	3.61	6.53	1.70	6 580	3.92	6.92	5.73	8 290	4.82	7.04	5.87
MTZ051-4*	6 260	3.22	5.95	1.94	6 700	3.50	6.33	6.54	8 360	4.42	6.53	6.46
MTZ056-4	7 000	4.00	7.07	1.75	7 500	4.38	7.57	5.85	9 310	5.44	7.80	5.84
MTZ057-4*	6 710	3.51	6.83	1.91	7 250	3.85	7.25	6.43	9 490	4.98	7.52	6.50
MTZ064-4	8 130	4.54	8.30	1.79	8 700	4.96	8.84	5.99	10 580	6.11	8.98	5.91
MTZ065-4*	7 980	4.20	7.82	1.90	8 590	4.60	8.35	6.37	10 540	5.67	8.31	6.35
MTZ072-4	9 150	4.99	8.64	1.84	9 760	5.45	9.28	6.11	11 850	6.91	9.76	5.85
MTZ073-4*	8 920	4.69	8.95	1.90	9 570	5.11	9.50	6.39	11 960	6.53	9.73	6.25
MTZ080-4	10 520	5.84	10.12	1.80	11 200	6.38	10.87	5.99	13 400	8.03	11.35	5.70
MTZ081-4*	10 470	5.61	10.20	1.87	11 180	6.14	10.94	6.22	13 600	7.81	11.35	5.94
MTZ100-4*	12 280	6.76	12.21	1.82	13 170	7.35	12.94	6.11	15 480	8.72	12.79	6.06
MTZ125-4*	15 710	8.44	13.79	1.86	16 800	9.21	14.86	6.22	19 970	11.37	15.41	6.00
MTZ144-4*	18 490	9.78	16.29	1.89	19 690	10.65	17.47	6.31	23 530	12.99	17.93	6.18
MTZ160-4*	20 310	11.08	18.26	1.83	21 660	12.09	19.64	6.11	25 570	14.73	20.17	5.92

* 50 Hz, EN12900 data for indicated models are Asercom certified

R404A data are also valid for refrigerant R507A

R22	Refrigeration				Air Conditioning							
Compressor model	50 Hz, EN12900 ratings To = -10 °C, Tc = 45 °C, SC = 0 K, SH = 10 K				50 Hz, ARI ratings To = +7.2°C, Tc = 54.4 °C, SC = 8.3 K, SH = 11.1 K				60 Hz, ARI ratings To = +7.2°C, Tc = 54.4 °C, SC = 8.3 K, SH = 11.1 K			
	Cooling capacity W	Power input kW	Current input A	C.O.P. W/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W
MTZ018-4	1 690	1.00	2.27	1.69	3 880	1.45	2.73	9.16	4 660	1.74	2.73	9.16
MTZ022-4	2 490	1.29	2.55	1.94	5 360	1.89	3.31	9.69	6 440	2.27	3.31	9.69
MTZ028-4	3 730	1.81	3.59	2.06	7 380	2.55	4.56	9.87	8 850	3.06	4.56	9.87
MTZ032-4	3 950	2.11	3.73	1.87	8 060	2.98	4.97	9.22	9 680	3.58	4.97	9.22
MTZ036-4	4 810	2.35	4.30	2.04	9 270	3.37	5.77	9.38	11 130	4.05	5.77	9.38
MTZ040-4	5 220	2.67	4.86	1.95	10 480	3.86	6.47	9.27	12 570	4.63	6.47	9.27
MTZ044-4	5 300	2.72	6.03	1.95	11 040	3.89	7.37	9.69	13 240	4.66	7.37	9.69
MTZ045-4	4 860	2.46	5.02	1.98	10 520	3.53	6.37	10.17	12 890	4.32	6.42	10.18
MTZ050-4	5 810	2.95	5.22	1.97	12 320	4.32	8.46	9.74	14 790	5.18	8.46	9.74
MTZ051-4	5 870	2.94	5.53	2.00	12 230	4.19	7.20	9.97	14 690	5.04	7.26	9.95
MTZ056-4	6 830	3.44	6.21	1.99	13 770	5.04	10.27	9.32	16 530	6.05	10.27	9.32
MTZ057-4	6 440	3.18	6.39	2.03	13 750	4.58	8.19	10.24	16 520	5.58	8.23	10.10
MTZ064-4	7 640	3.89	7.06	1.96	15 820	5.66	9.54	9.53	18 980	6.80	9.54	9.53
MTZ065-4	7 750	3.64	7.03	2.13	15 730	5.27	9.16	10.18	18 850	6.32	9.33	10.18
MTZ072-4	8 520	4.29	7.58	1.99	17 120	6.31	10.54	9.26	20 550	7.57	10.54	9.26
MTZ073-4	8 710	4.19	8.48	2.08	18 190	6.12	10.98	10.15	21 840	7.33	10.77	10.16
MTZ080-4	9 720	4.84	8.24	2.01	19 530	7.13	11.58	9.36	23 440	8.55	11.58	9.36
MTZ081-4	10 360	4.89	9.52	2.12	20 730	7.08	12.48	9.99	24 880	8.50	12.34	10.00
MTZ100-4	11 330	5.79	11.82	1.96	23 400	7.98	14.59	10.00	28 080	9.58	14.59	10.00
MTZ125-4	15 260	7.55	12.28	2.02	30 430	10.66	17.37	9.74	36 510	12.80	17.37	9.74
MTZ144-4	17 270	8.47	17.06	2.04	34 340	11.95	22.75	9.80	41 210	14.35	22.75	9.80
MTZ160-4	19 190	9.49	16.81	2.02	38 270	13.40	22.16	9.75	45 930	16.08	22.16	9.75

To: Evaporating temperature at dew point (saturated suction temperature)
 Tc: Condensing temperature at dew point (saturated discharge temperature)
 SC: Subcooling,
 SH: Superheat

Capacity and power input data are +/- 5%
 Asercom: Association of European Refrigeration Compressor and Controls Manufacturers
 ARI: Air Conditioning and Refrigeration Institute

SPECIFICATIONS

Nominal performance data for R407C and R134a

R407C Air Conditioning												
Compressor model	50 Hz, EN12900 ratings To = +5 °C, Tc = 50 °C, SC = 0 K, SH = 10 K				50 Hz, ARI ratings To = +7.2 °C, Tc = 54.4 °C, SC = 8.3 K, SH = 11.1 K				60 Hz, ARI ratings To = +7.2 °C, Tc = 54.4 °C, SC = 8.3 K, SH = 11.1 K			
	Cooling capacity W	Power input kW	Current input A	C.O.P. W/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W
MTZ018-4*	3 470	1.27	2.73	2.73	3 850	1.38	2.86	9.53	5 050	1.73	2.82	9.98
MTZ022-4*	4 550	1.71	3.27	2.67	5 020	1.86	3.47	9.23	6 280	2.26	3.45	9.48
MTZ028-4*	5 880	2.17	4.30	2.72	6 540	2.36	4.57	9.45	8 220	2.82	4.41	9.93
MTZ032-4*	6 650	2.43	4.57	2.74	7 330	2.65	4.90	9.43	8 990	3.20	4.80	9.61
MTZ036-4*	7 510	2.93	5.58	2.56	8 280	3.21	5.99	8.82	9 990	3.90	5.78	8.74
MTZ040-4*	8 660	3.40	6.46	2.55	9 580	3.71	6.92	8.81	11 720	4.46	6.69	8.98
MTZ044-4*	8 940	3.34	6.10	2.67	9 870	3.63	6.49	9.27	12 600	4.36	6.84	9.85
MTZ045-4*	9 130	3.12	5.84	2.93	10 100	3.38	6.18	10.21	12 730	4.25	6.34	10.23
MTZ050-4	10 190	3.79	6.90	2.69	11 270	4.11	7.34	9.34	14 100	4.95	7.33	9.72
MTZ051-4*	10 420	3.69	6.51	2.83	11 530	4.01	6.95	9.82	14 110	4.87	7.06	9.89
MTZ056-4	11 700	4.32	7.85	2.71	12 940	4.69	8.36	9.42	15 920	5.66	8.41	9.60
MTZ057-4*	11 680	4.02	7.45	2.90	13 000	4.37	7.91	10.16	16 050	5.40	8.03	10.15
MTZ064-4	13 180	4.84	8.79	2.72	14 590	5.26	9.35	9.47	17 700	6.35	9.47	9.50
MTZ065-4*	13 360	4.61	8.35	2.90	14 850	5.02	8.91	10.10	18 080	6.14	9.01	10.05
MTZ072-4	14 800	5.50	9.81	2.69	16 380	5.97	10.48	9.36	19 890	7.21	10.78	9.41
MTZ073-4*	15 320	5.42	9.85	2.83	17 050	5.87	10.48	9.91	20 780	7.30	10.61	9.72
MTZ080-4	16 750	6.29	11.02	2.66	18 530	6.83	11.83	9.25	22 520	8.24	12.35	9.33
MTZ081-4*	17 380	6.29	11.31	2.76	19 330	6.83	12.08	9.67	22 870	8.24	11.99	9.47
MTZ100-4*	20 480	7.38	13.05	2.78	22 700	8.00	13.83	9.69	28 220	9.86	14.22	9.77
MTZ125-4*	26 880	9.48	15.14	2.84	29 790	10.32	16.28	9.85	35 620	12.83	18.07	9.47
MTZ144-4*	29 770	10.68	17.55	2.79	33 070	11.59	18.80	9.74	40 900	14.42	19.81	9.68
MTZ160-4*	34 090	12.40	20.08	2.75	37 820	13.46	21.50	9.59	45 220	16.64	22.46	9.27

* 50 Hz, EN12900 data for indicated models are Asercom certified

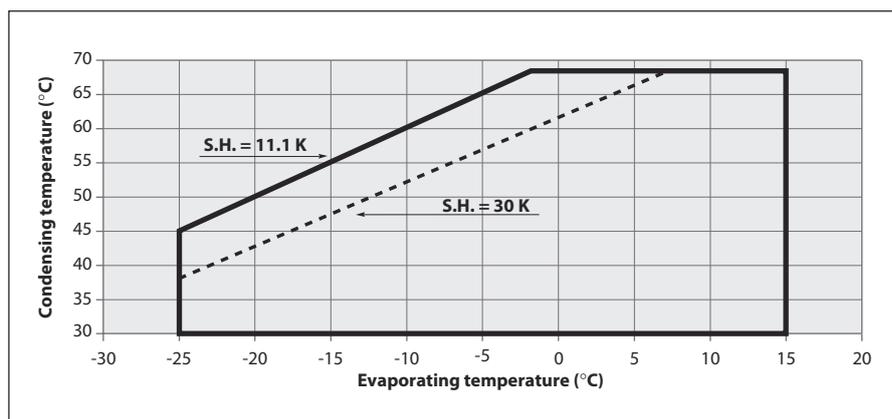
R134a Air Conditioning												
Compressor model	50 Hz, EN12900 ratings To = +5 °C, Tc = 50 °C, SC = 0 K, SH = 10 K				50 Hz, ARI ratings To = +7.2 °C, Tc = 54.4 °C, SC = 8.3 K, SH = 11.1 K				60 Hz, ARI ratings To = +7.2 °C, Tc = 54.4 °C, SC = 8.3 K, SH = 11.1 K			
	Cooling capacity W	Power input kW	Current input A	C.O.P. W/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W	Cooling capacity W	Power input kW	Current input A	E.E.R. Btu.h/W
MTZ018-4	2 310	0.92	2.12	2.51	2 550	0.99	2.19	8.81	3 280	1.22	2.09	9.20
MTZ022-4	3 000	1.11	2.42	2.70	3 350	1.20	2.51	9.56	4 350	1.54	2.56	9.63
MTZ028-4	3 730	1.41	3.18	2.65	4 210	1.53	3.30	9.40	5 640	2.04	3.37	9.43
MTZ032-4	4 390	1.74	3.80	2.52	4 950	1.87	3.94	9.03	6 130	2.39	3.89	8.76
MTZ036-4	5 340	1.97	3.88	2.71	6 000	2.13	4.09	9.60	7 170	2.75	4.20	8.91
MTZ040-4	5 700	2.15	4.58	2.66	6 400	2.33	4.89	9.36	8 160	3.08	4.72	9.03
MTZ044-4	6 120	2.36	5.51	2.60	6 870	2.52	5.65	9.29	8 740	3.14	5.47	9.51
MTZ045-4	6 090	2.06	4.56	2.96	6 850	2.22	4.73	10.53	8 820	2.84	4.70	10.59
MTZ050-4	7 170	2.68	5.33	2.67	8 070	2.88	5.50	9.57	10 090	3.60	5.36	9.57
MTZ051-4	7 110	2.44	5.02	2.91	8 010	2.63	5.20	10.39	10 110	3.29	5.33	10.48
MTZ056-4	8 040	2.99	5.61	2.69	9 070	3.21	5.83	9.63	11 130	3.95	5.92	9.62
MTZ057-4	7 680	2.62	5.93	2.93	8 720	2.84	6.17	10.47	11 380	3.82	6.37	10.16
MTZ064-4	9 160	3.36	6.66	2.73	10 350	3.62	6.96	9.77	13 260	4.68	7.11	9.67
MTZ065-4	8 960	3.02	6.53	2.96	10 160	3.26	6.81	10.63	13 000	4.20	6.77	10.56
MTZ072-4	10 540	3.74	6.83	2.82	11 850	4.01	7.20	10.09	14 640	5.19	7.59	9.64
MTZ073-4	10 230	3.50	7.66	2.92	11 650	3.78	7.99	10.52	14 640	4.81	7.88	10.39
MTZ080-4	12 080	4.31	8.03	2.80	13 580	4.64	8.45	10.00	16 550	5.99	8.79	9.42
MTZ081-4	11 750	4.02	8.44	2.92	13 320	4.35	8.83	10.44	16 490	5.47	8.68	10.29
MTZ100-4	13 770	4.89	9.84	2.81	15 530	5.28	10.24	10.04	18 730	6.50	10.11	9.84
MTZ125-4	16 980	5.84	10.24	2.91	19 070	6.29	10.80	10.35	23 110	7.71	11.09	10.23
MTZ144-4	21 030	7.27	13.11	2.89	23 620	7.83	13.78	10.30	28 390	9.81	14.28	9.87
MTZ160-4	23 080	7.98	13.90	2.89	25 860	8.57	14.67	10.29	31 520	10.91	15.54	9.86

To: Evaporating temperature at dew point (saturated suction temperature)
 Tc: Condensing temperature at dew point (saturated discharge temperature)
 SC: Subcooling,
 SH: Superheat

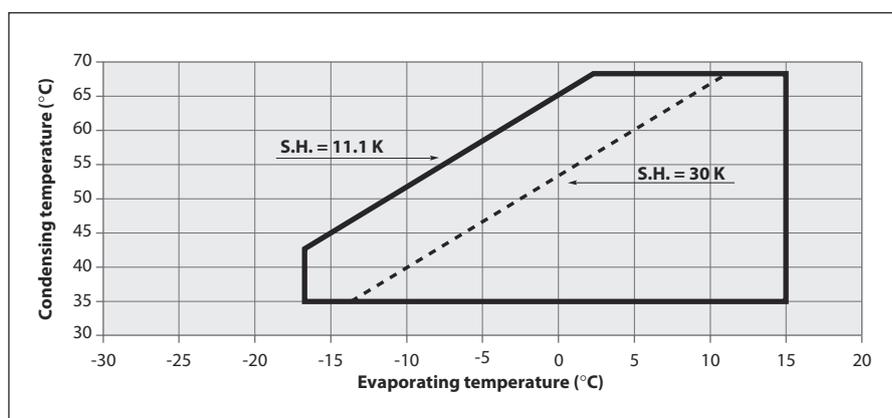
Capacity and power input data are +/- 5%
 Asercom: Association of European Refrigeration Compressor and Controls Manufacturers
 ARI: Air Conditioning and Refrigeration Institute

OPERATING ENVELOPES

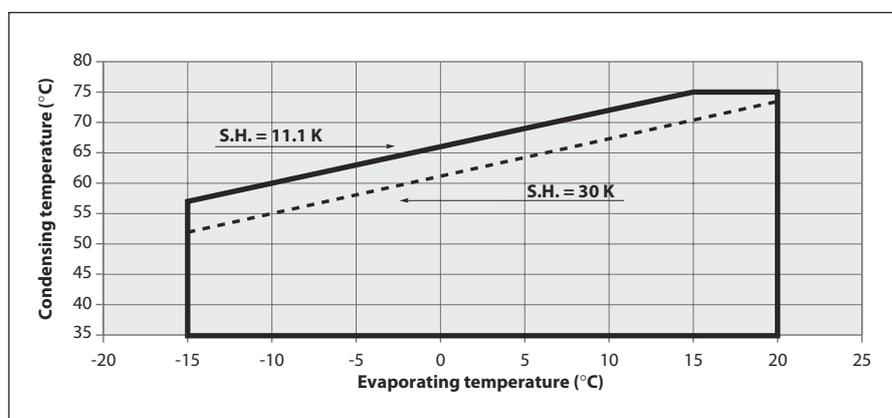
MT
R22



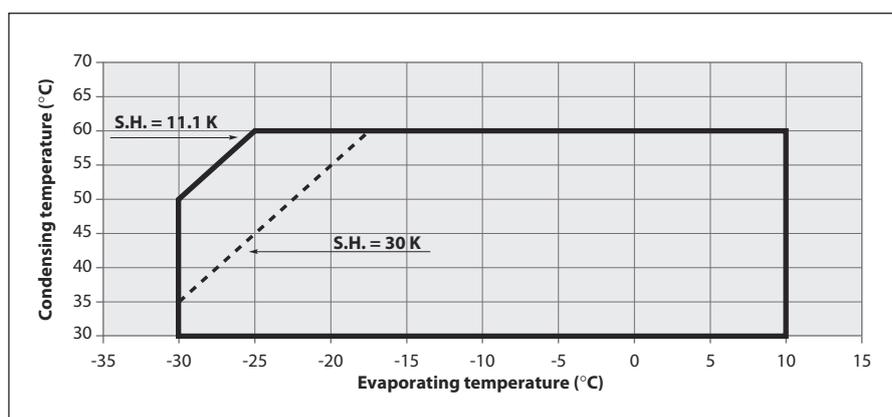
MTZ
R407C at DEW point



MTZ
R134a



MTZ
R404A/R507A



OPERATING ENVELOPES

Zeotropic refrigerant mixtures

Refrigerant mixtures can be either zeotropic or azeotropic.

An azeotropic mixture (like R502 or R507A) behaves like a pure refrigerant. During a phase transition (from vapour to liquid or from liquid to vapour) the composition of vapour and liquid stays the same.

In a zeotropic mixture (like R407C) on

the other hand the composition of vapour and liquid changes during the phase transition. When the effect of this phase transition is very small, the mixture is often called a near-azeotropic mixture. R404A is such a near-azeotropic mixture.

The composition change causes phase shift and temperature glide.

Phase shift

In system components where both vapour and liquid phase are present (evaporator, condenser, liquid receiver), the liquid phase and vapour phase do not have the same composition. In fact both phases form two different refrigerants. Therefore zeotropic refri-

gerants need some special attention. Zeotropic refrigerants must always be charged in liquid phase. Flooded evaporators and suction accumulators should not be applied in systems with zeotropic refrigerants. This also applies to near-azeotropic mixtures.

Temperature glide

During the evaporating process and the condensing process at constant pressure, the refrigerant temperature will decrease in the condenser and rise in the evaporator. Therefore when speaking about evaporating and condensing temperatures, it is important to indicate whether this is a dew point temperature or a mean point value. In the figure below, the dotted lines are lines of constant temperature.

They do not correspond to the lines of constant pressure.

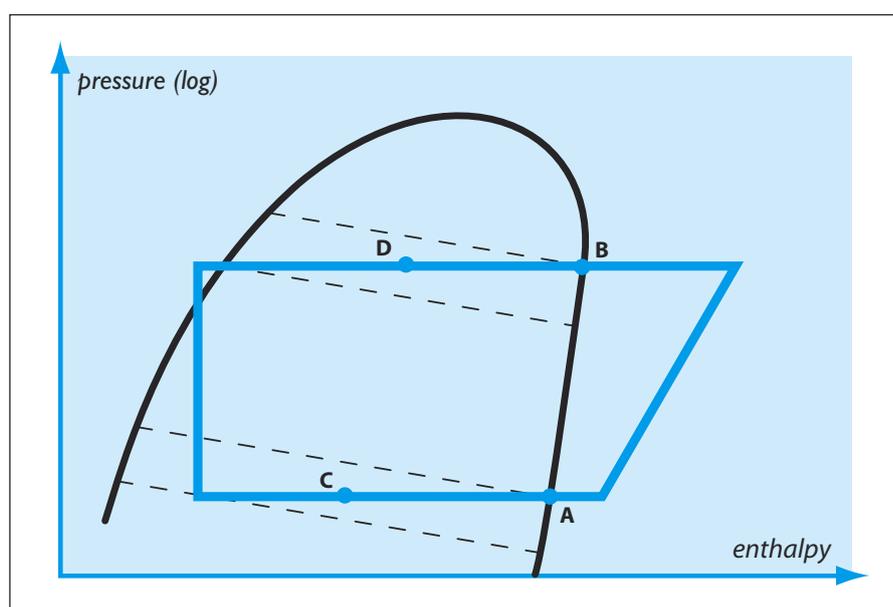
Points A and B are dew point values. These are temperatures on the saturated vapour line.

Points C and D are mean point values.

These are temperatures which correspond more or less with the average temperature during the evaporating and condensing process. For the same R407C cycle, mean point temperatures are typically about 2 to 3°C lower than dew point temperatures. According to Asercom recommendations, Danfoss Commercial Compressors uses dew point temperatures for selection tables and application envelopes etc.

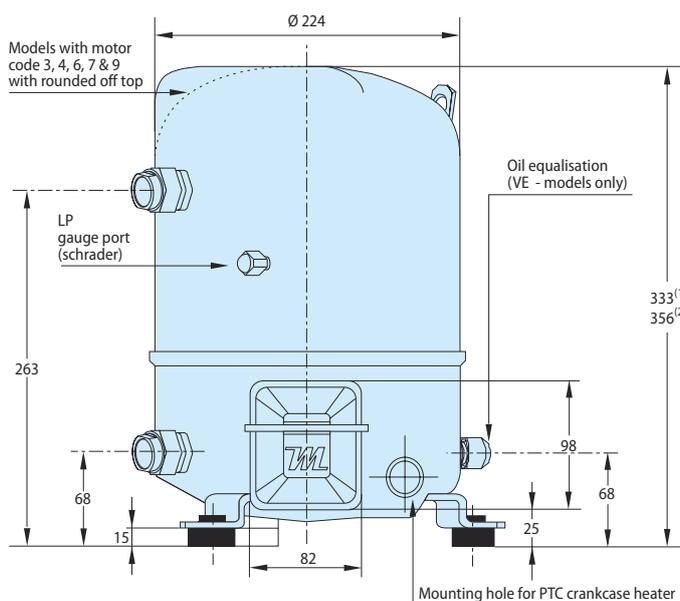
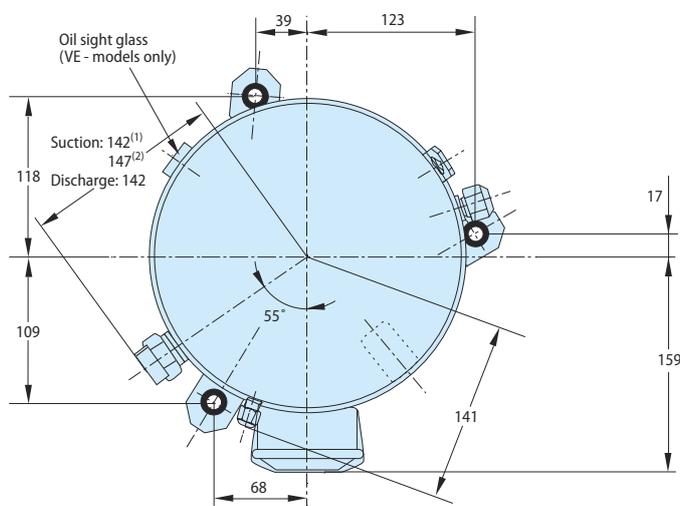
To obtain exact capacity data at mean point temperatures, the mean point temperatures must be converted to dew point temperatures with help of refrigerant data tables from the refrigerant manufacturer.

Dew temperature and mean temperature for R407C



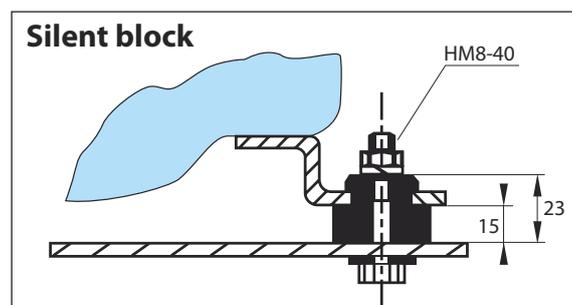
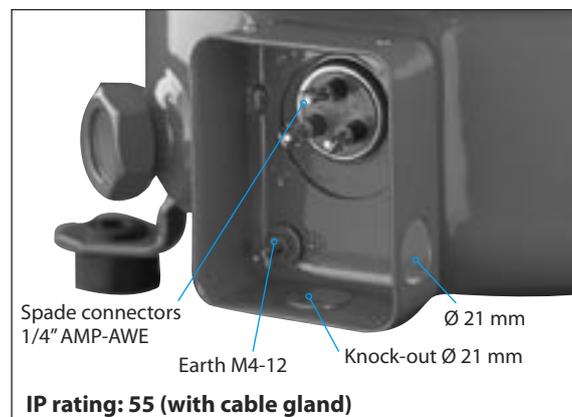
OUTLINE DRAWINGS

1 cylinder



(1) MTZ 18, 22-3/4/5/6/7/9, 28-3/4/5/6/7/9
 (2) MTZ 22-1, 28-1, 32, 36, 40

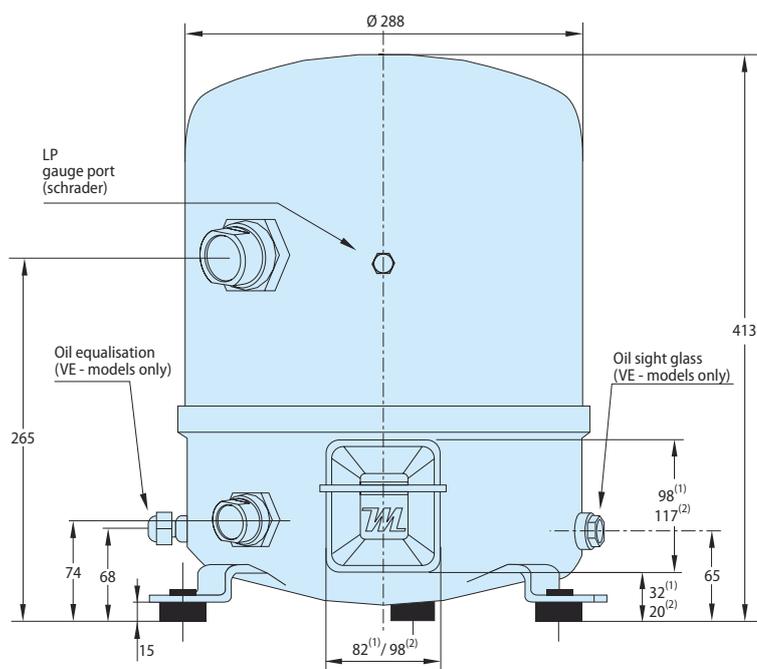
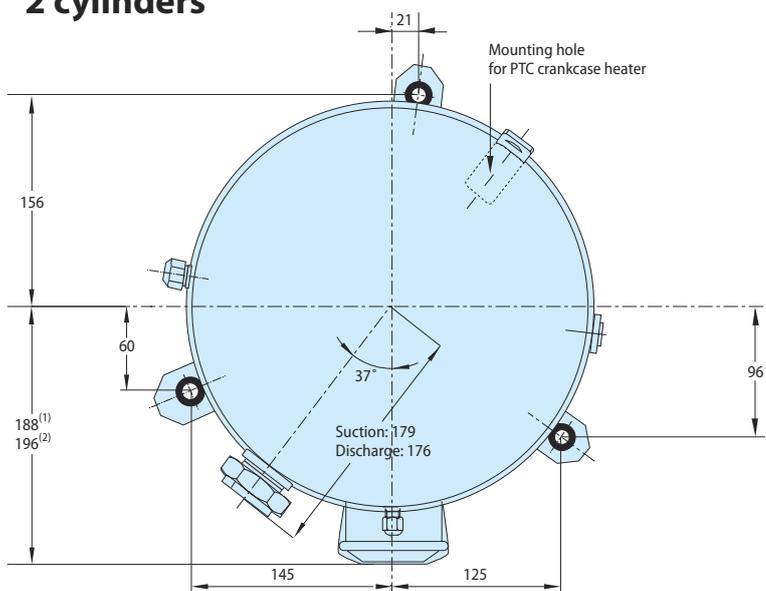
Terminal box



	Rotolock connections size		Pipe sizing		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
MT/MTZ018 MT/MTZ022 - 3/4/5/6 MT/MTZ028 - 3/4/5/6	1"	1"	1/2"	3/8"	V06	V01
MT/MTZ022 - 1	1"1/4	1"	5/8"	3/8"	V09	V01
MT/MTZ028 - 1 MT/MTZ032 MT/MTZ036 MT/MTZ040	1"1/4	1"	5/8"	1/2"	V09	V06

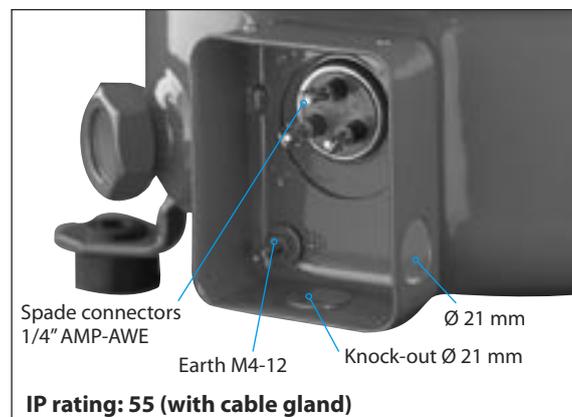
OUTLINE DRAWINGS

2 cylinders

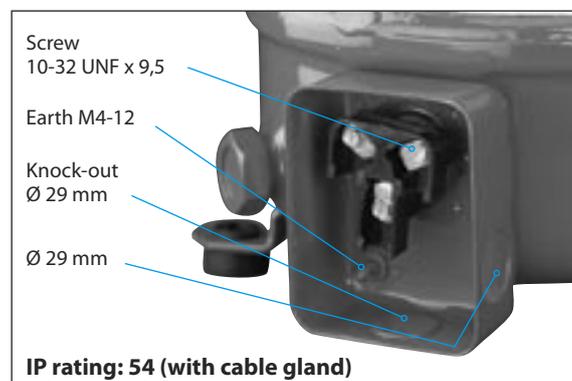


(1) MTZ 44-1, all code 3 except 80-3 & 81-3, all code 4, 7, 9
 (2) MTZ 50-1, 56-1, 64-1, 80-3, 81-3, all code 6

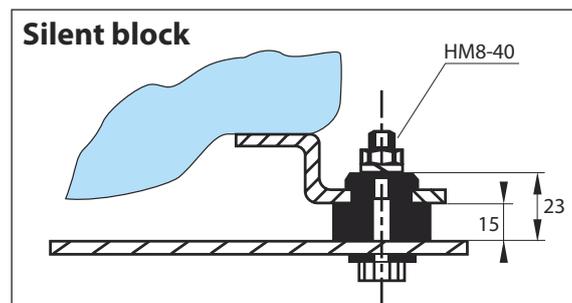
Terminal box for model (1)



Terminal box for model (2)



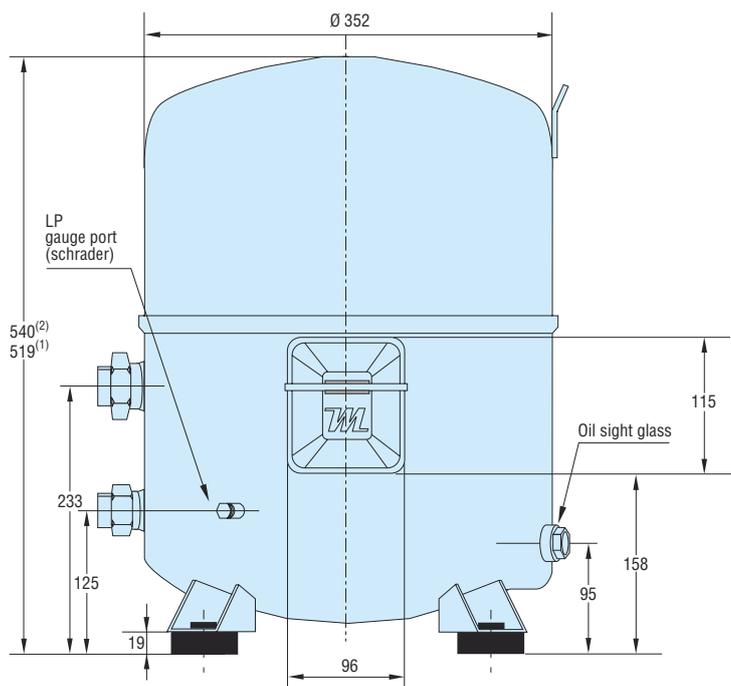
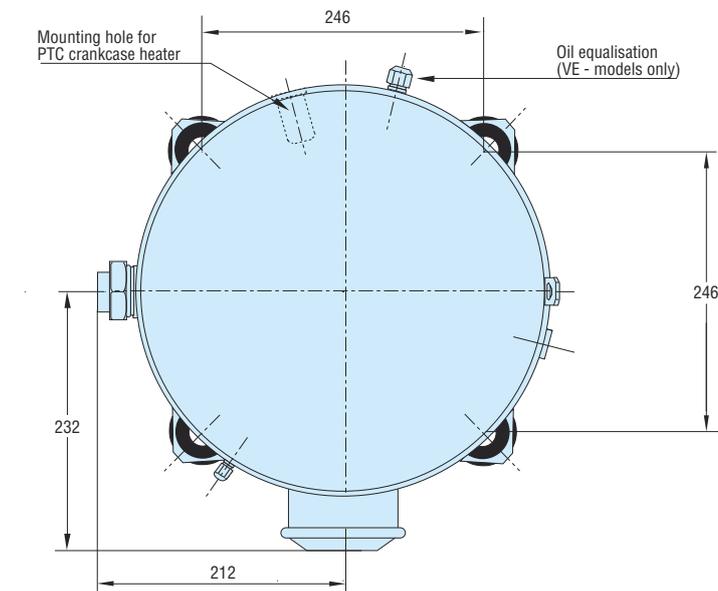
Silent block



	Rotolock connections size		Pipe sizing		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
MT/MTZ044 MT/MTZ045 MT/MTZ050 MT/MTZ051 MT/MTZ056 MT/MTZ057 MT/MTZ064 MT/MTZ065 MT/MTZ072 MT/MTZ073	1"3/4	1"1/4	7/8"	3/4"	V07	V04
MT/MTZ080 MT/MTZ081	1"3/4	1"1/4	1"1/8"	3/4"	V02	V04

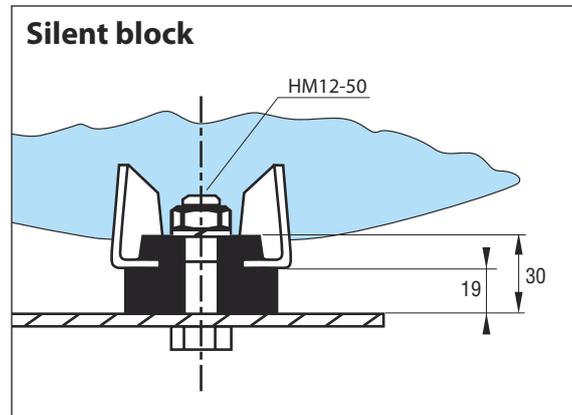
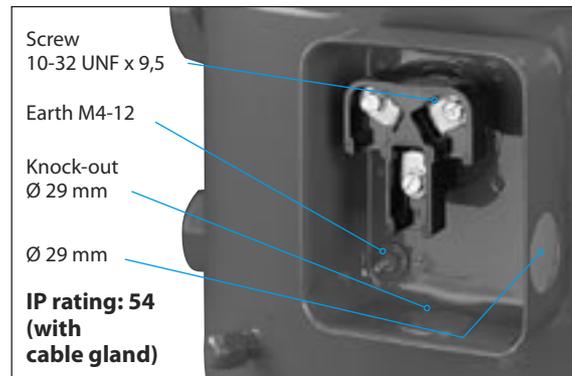
OUTLINE DRAWINGS

4 cylinders



(1) MTZ 100, 125
(2) MTZ 144, 160

Terminal box



	Rotolock connections size		Pipe sizing		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
MT/MTZ100 MT/MTZ125 MT/MTZ144 MT/MTZ160	1"3/4	1"1/4	1"1/8"	3/4"	V02	V04

ELECTRICAL CONNECTIONS AND WIRING

Single phase electrical characteristics

Motor Code	LRA - Locked Rotor Current (A)		MCC - Maximum Continuous Current (A)		Winding resistance (Ω) ($\pm 7\%$ at 20°C)			
	1	5	1	5	1		5	
Winding					run	start	run	start
MT/MTZ018	51	40	13	10	1.36	4.82	1.80	4.70
MT/MTZ022	49.3	41	17	15	1.25	2.49	1.78	4.74
MT/MTZ028	81	55	25	16	0.74	1.85	1.16	3.24
MT/MTZ032	84	70	26.5	20	0.64	2.85	0.90	4.30
MT/MTZ036	84	70	30	20	0.64	2.85	0.89	4.35
MT/MTZ040	99	-	34	-	0.53	2.00	-	-
MT/MTZ044	97	-	31	-	0.45	1.90	-	-
MT/MTZ050	114	92	36	29	0.37	1.79	0.52	2.65
MT/MTZ056	136	-	42.5	-	0.32	1.61	-	-
MT/MTZ064	143	-	46	-	0.32	2.10	-	-

Capacitor and relay selection

Models	50 Hz		PSC/CSR*		CSR only		Start relay
			Run capacitors (1)		Start capacitors (2)		
			(A) μF	(C) μF	(B) μF		
MT/MTZ018 JA-5			20	10	100		3ARR3J4A4
MT/MTZ022 JC-5			20	10	100		
MT/MTZ028 JE-5			20	10	100		
MT/MTZ032 JF-5			25	10	135		
MT/MTZ036 JG-5			25	10	135		

* PSC: Permanent Split Capacitor
CSR: Capacitor Start Run

(1) Run capacitors: 440 volts

(2) Start capacitors: 330 Volts

Models	60 Hz		PSC/CSR*		CSR only		Start relay
			Run capacitors (1)		Start capacitors (2)		
			(A) μF	(C) μF	(B) μF		
MT/MTZ018 JA-1			20	10	100		3ARR3J4A4
MT/MTZ022 JC-1			20	10	100		
MT/MTZ028 JE-1			20	10	100		
MT/MTZ032 JF-1			25	10	135		
MT/MTZ036 JG-1			25	10	135		
MT/MTZ040 JH-1			35	20	100		
MT/MTZ044 HJ-1			30	15	135		
MT/MTZ050 HK-1			30	15	135		
MT/MTZ056 HL-1			35	15	200		
MT/MTZ064 HM-1			40	15	235		

Trickle circuit

The trickle circuit provides the facility of heating the compressor crankcase by feeding a small current to the auxiliary winding and the run capacitor. See the drawings page 14.

By using PSC or CSR starting systems, compressor models MT/MTZ018-022

can be operated without crankcase heaters as the heater function is provided by the trickle circuit. For the larger single phase compressor models MT/MTZ028-064, the use of the PTC crankcase heater is recommended.

PSC wiring

PSC wiring may be used for refrigerant circuits with capillary tubes or expansion valves with bleed ports. Pressure

equalisation must be ensured before start-up because of the low starting torque characteristics of this system.

CSR wiring

CSR wiring provides additional motor torque at start-up, by the use of a start capacitor in combination with the run capacitor. This system can be used for refrigerant circuits with capillary tubes or expansion valves. The start capacitor is only connected during the starting operation, a potential relay is used to disconnect it after the start sequence.

The single phase compressor motors

are internally protected by a temperature/current sensing bimetallic protector, which senses the main and start winding currents, and also the winding temperature. Once the protector has tripped, it may take up to two to four hours to reset and restart the compressor.

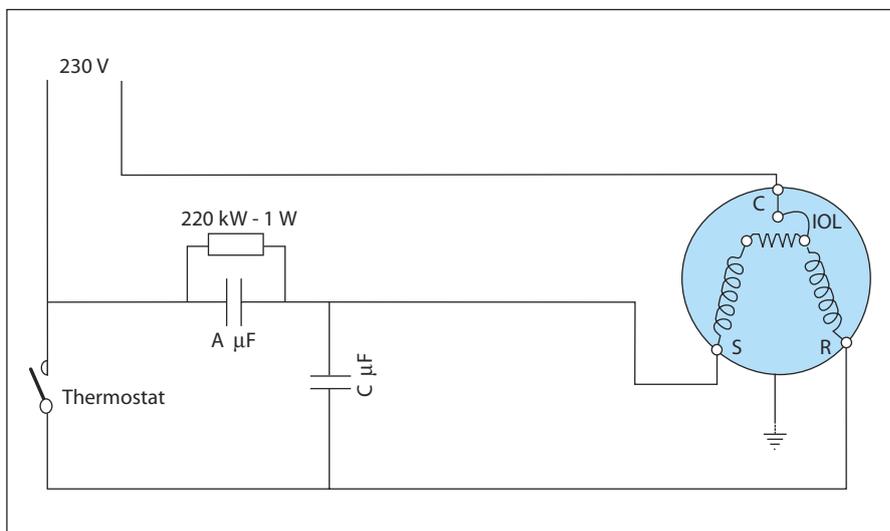
Check that power supply corresponds to compressor characteristics (refer to compressor nameplate).

ELECTRICAL CONNECTIONS AND WIRING

Suggested wiring diagrams

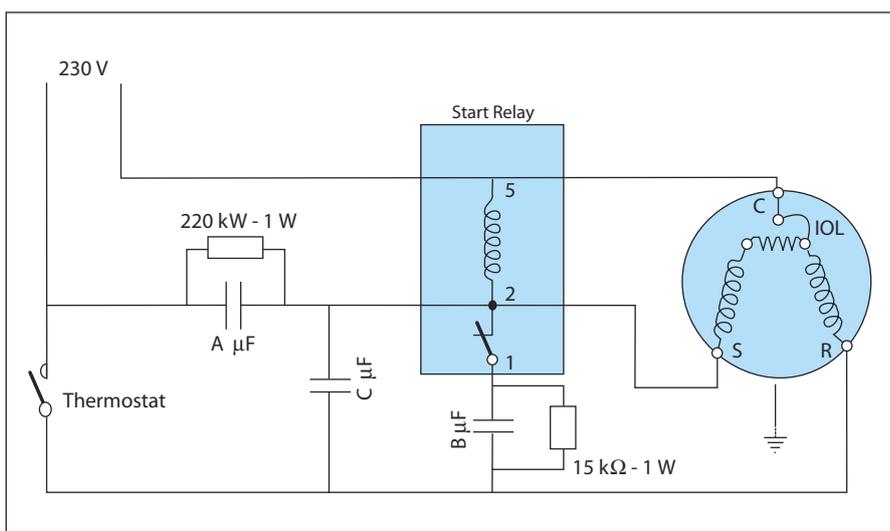
Single phase PSC wiring with trickle circuit

- IOL Motor protector
- A & C Run capacitors
- C Common
- S Start winding (auxiliary)
- R Run winding (main)



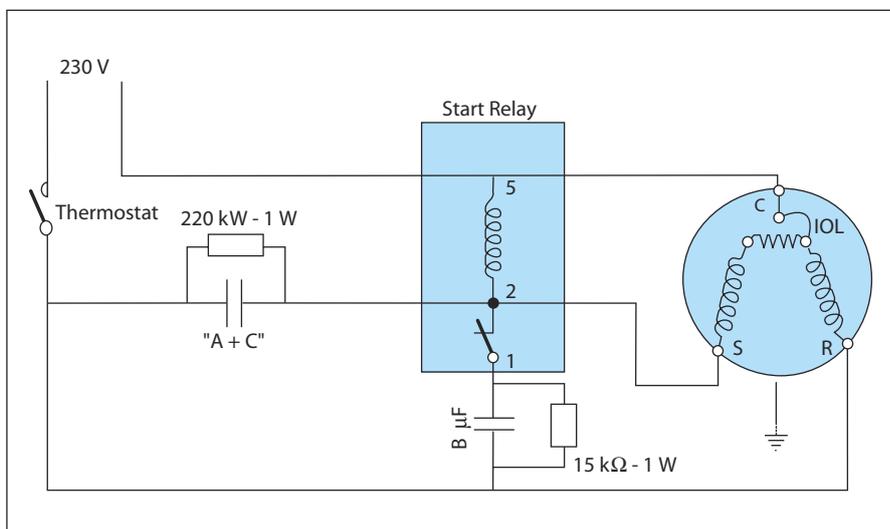
Single phase CSR wiring with trickle circuit

- IOL Motor protector
- A & C Run capacitors
- B Start capacitor
- C Common
- S Start winding (auxiliary)
- R Run winding (main)



Single phase CSR wiring without trickle circuit

- IOL Motor protector
 - A + C Run capacitors
 - B Start capacitor
 - C Common
 - S Start winding (auxiliary)
 - R Run winding (main)
- Capacitors A and C are replaced by a single capacitor of size A + C



ELECTRICAL CONNECTIONS AND WIRING

Three phase electrical characteristics

Motor Code	LRA - Locked Rotor Current (A)					MCC - Maximum Continuous Current (A)					Winding resistance (Ω) ($\pm 7\%$ at 20°C)				
	3	4	6	7	9	3	4	6	7	9	3	4	6	7	9
MT/MTZ018	38	20	30	-	-	9	5	7	-	-	2.49	10.24	3.38	-	-
MT/MTZ022	38	16	30	16	22.5	11	6	8.5	4.5	6	2.49	10.24	3.38	15.20	6.58
MT/MTZ028	57	23	41	20	32	16	7.5	11.5	6	8.5	1.37	7.11	2.30	10.60	4.80
MT/MTZ032	60	25	60	22	35	18	8	18	5.5	9	1.27	6.15	1.27	8.90	4.20
MT/MTZ036	74	30	74	26	35	17	9	17	7	9.5	1.16	5.57	1.16	8.60	4.10
MT/MTZ040	98	38	74	-	-	22	10	18	-	-	0.95	4.56	0.95	-	-
MT/MTZ044	115	42	85	44	78	22	9.5	19	8.5	13	0.74	3.80	1.13	5.83	1.68
MT/MTZ045	115	48.5	-	-	-	17	9.5	-	-	-	0.69	3.22	-	-	-
MT/MTZ050	115	42	77	44	78	25	12	19	10	13.5	0.72	3.80	1.39	5.83	1.68
MT/MTZ051	120	48.5	-	-	-	22	11.5	-	-	-	0.69	3.60	-	-	-
MT/MTZ056	130	60	105	50	72	26	12	23	11	15	0.57	2.41	0.76	3.86	-
MT/MTZ057	130	64	-	-	-	24	12	-	-	-	0.55	2.39	-	-	-
MT/MTZ064	137	67	124	-	72	29	15	25	-	17.5	0.57	2.41	0.76	-	1.64
MT/MTZ065	135	64	-	-	-	28	14	-	-	-	0.55	2.39	-	-	-
MT/MTZ072	135	80	143	-	100	31	15.5	27	-	18.5	0.55	1.90	0.56	-	1.32
MT/MTZ073	155	80	-	-	-	32	17	-	-	-	0.48	1.90	-	-	-
MT/MTZ080	140	80	132	-	102	36	18	29	-	22.5	0.48	1.90	0.56	-	1.30
MT/MTZ081	140	80	-	-	-	36	19	-	-	-	0.48	1.90	-	-	-
MT/MTZ100	157	90	126	62	110	43	22	35	17	26	0.50	1.85	0.67	3.10	1.26
MT/MTZ 125	210	105	170	75	150	54	27	43	22	30	0.38	1.57	0.43	2.51	0.84
MT/MTZ 144	259	115	208	90	165	64	30	51	25	40	0.27	1.19	0.37	2.00	0.72
MT/MTZ 160	259	140	208	99	165	70	36	51	29	46	0.27	1.10	0.37	1.76	1.10

Motor protection and suggested wiring diagrams

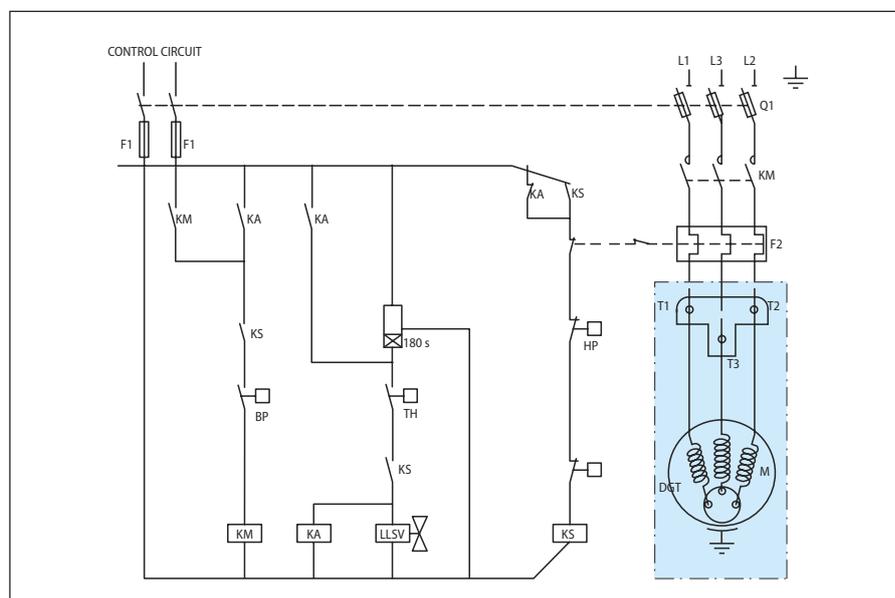
The 3-phase compressors are protected by an internal motor protector, connected to the neutral point of the star connected stator windings, the protector cuts out all 3-phases simultaneously.

Note: once the overload protector has tripped it may take up to 3 hours to re-set and restart the compressor.

For all 3-phase compressors, a PTC crankcase heater is required.

Wiring diagram with pump-down cycle

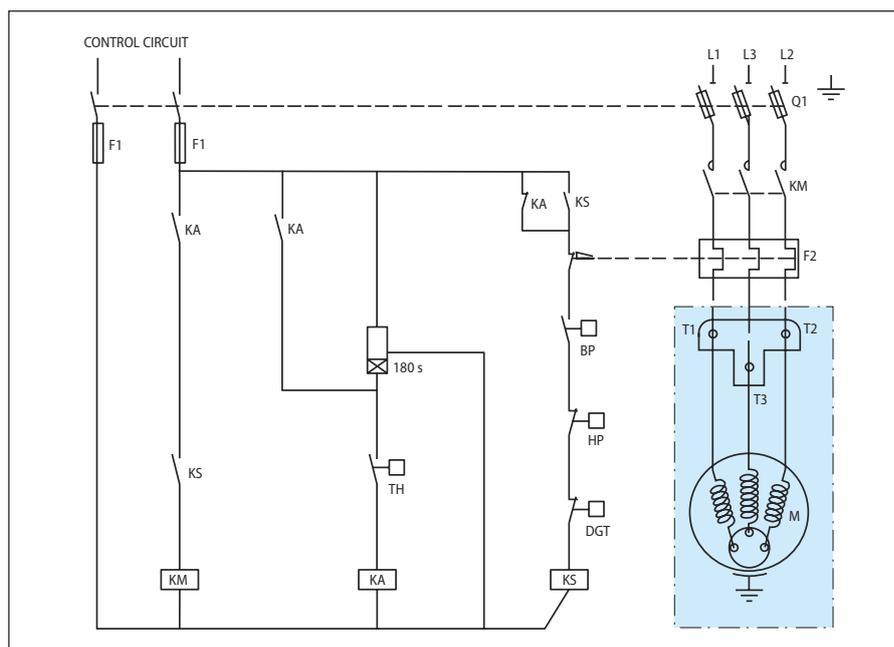
Control device	TH
Optional short cycle timer (3 min) 5 pts	180 s
Control relay	KA
Liquid Solenoid valve	LLSV
Compressor contactor	KM
Safety lock out relay	KS
Pump-down control & L.P. switch	BP
H.P. switch	HP
Fused disconnect	Q1
Fuses	F1
External overload protection	F2
Compressor motor	M
Motor safety thermostat	thM
Discharge gas thermostat	DGT



ELECTRICAL CONNECTIONS AND WIRING

Wiring diagram without pump-down cycle

Control device	TH
Optional short cycle timer (3 min) 5 pts	180 s
Control relay	KA
Liquid Solenoid valve	LLSV
Compressor contactor	KM
Safety lock out relay	KS
Pump-down control & L.P. switch	BP
H.P. switch	HP
Fused disconnect	Q1
Fuses	F1
External overload protection	F2
Compressor motor	M
Motor safety thermostat	thM
Discharge gas thermostat	DGT



Soft starters

Starting current of Maneurop® 3-phase compressors can be reduced by using a soft starter. Two different versions are available: CI-tronic™ soft starters type MCI (recommended) and soft start kits with statoric resistors type SCR. The starting current can be reduced by up to 50% depending on the compressor model and the type of soft starter. Also mechanical stresses that occur at star-

ting are reduced which increases the life of the internal components.

For details of the CI-tronic™ MCI soft starters, please refer to literature DKACT.PD.C50.C1.02.

For details of the SCR soft start kits, please contact Danfoss.

The number of starts should be limited to 6 per hour. HP/LP pressure equalisation is required before starting.

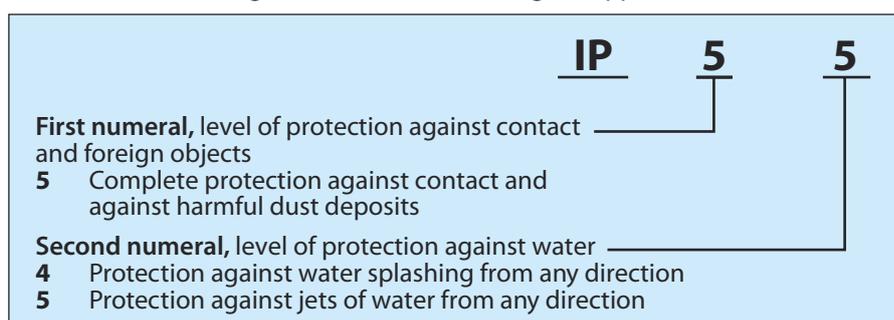
Voltage application range

Motor Code	Nominal voltage	Voltage application range
1	208-230 V / 1 ph / 60 Hz	187 - 253 V
3	200-230 V / 3 ph / 60 Hz	180 - 253 V
4	400 V / 3 ph / 50 Hz	360 - 440 V
	460 V / 3 ph / 60 Hz	414 - 506 V
5	230 V / 1 ph / 50 Hz	207 - 253 V
6	230 V / 3 ph / 50 Hz	207 - 253 V
7	500 V / 3 ph / 50 Hz	450 - 550 V
	575 V / 3 ph / 60 Hz	517 - 632 V
9	380 V / 3 ph / 60 Hz	342 - 418 V

IP rating

The compressor terminal boxes IP rating according to CEI 529 are shown on the outline drawings section.

The IP ratings are only valid when correctly sized cable glands of the same IP rating are applied.



REFRIGERANTS AND LUBRICANTS

General information

When choosing a refrigerant, different aspects must be taken into consideration:

- Legislation (now and in the future)
- Safety
- Application envelope in relation to expected running conditions
- Compressor capacity and efficiency
- Compressor manufacturer recommendations & guidelines

Additional points could influence the final choice:

- Environmental considerations
- Standardisation of refrigerants and lubricants
- Refrigerant cost
- Refrigerant availability

The table below gives an overview of the different refrigerant-lubricant-compressor combinations for Maneurop®, MT & MTZ compressors.

Refrigerant	Type	Lubricant type	Compressor type	Danfoss lubricant	Application
R22	HCFC	Mineral	MT	White oil, 160P	Medium / High temperature
R407C	HFC	Polyolester	MTZ	Polyolester oil 160PZ	Medium / High temperature
R134a	HFC	Polyolester	MTZ	Polyolester oil 160PZ	Medium / High temperature
R404A	HFC	Polyolester	MTZ	Polyolester oil 160PZ	Medium temperature
R507A	HFC	Polyolester	MTZ	Polyolester oil 160PZ	Medium temperature
Transitional refrigerants, R22 based		Alkylbenzene (ABM)	MT	Alkylbenzene oil 160 ABM Note: Initial mineral oil charge has to be replaced by 160 ABM oil.	Medium / High temperature
Hydrocarbons	Danfoss does not authorise the use of hydrocarbons in Maneurop® MT/MTZ compressors				

The Montreal protocol states that CFC refrigerants such as R12 and R502 may no longer be applied in new installations in the signatory members countries.

Therefore capacity and other data for

these refrigerants are not published in this document. Maneurop® MT compressors however are suitable for use with these refrigerants and can still be used as replacements in existing installations.

R22

R22 is an HCFC refrigerant and is still a wide use today. It has a low ODP (Ozone Depletion Potential) and therefore it will be phased out in the future. Check local legislation. Always use mineral white oil 160P.

The Maneurop® MT compressor is dedicated for R22 and is supplied with an initial mineral oil charge.

R407C

Refrigerant R407C is an HFC refrigerant with similar thermodynamic properties to those of R22.

R407C has zero ozone depletion potential (ODP=0). Many installers and OEMs consider R407C to be the standard alternative for R22. R407C is a zeotropic mixture and has a temperature glide of about 6 K. For more specific information about zeotropic refrigerants; refer to section «zeotropic refrigerant mixtures». R407C must be charged in the liquid phase.

Always use the Maneurop® MTZ compressors with Danfoss 160PZ polyolester oil, which is supplied with the MTZ compressor for R407C applications. Maneurop® MT compressors should never be used with R407C, even when the mineral oil is replaced with polyolester oil.

REFRIGERANTS AND LUBRICANTS

R134a

Refrigerant R134a is an HFC refrigerant with thermodynamic properties comparable to those of the CFC refrigerant R12. R134a has zero ozone depletion potential (ODP = 0) and is commonly accepted as the best R12 alternative. For applications with high evaporating and high condensing temperatures, R134a is the ideal

choice. R134a is a pure refrigerant and has zero temperature glide. For R134a applications always use the Maneurop® MTZ compressor with Danfoss 160PZ polyolester oil which is supplied with the MTZ compressor. Maneurop® MT compressors should never be used for R134a, even when the mineral oil is replaced by polyolester oil.

R404A

Refrigerant R404A is an HFC refrigerant with thermodynamic properties comparable to those of the CFC refrigerant R502. R404A has zero ozone depletion potential (ODP = 0) and is commonly accepted as one of the best R502 alternatives. R404A is especially suitable for low evaporating temperature applications but it can also be applied to medium evaporating temperature applications. R404A is a mixture and has a very small temperature glide, and therefore must be charged in its liquid phase, but for most other aspects this small glide can be neglected. Because of the small glide, R404A is often called

a near-azeotropic mixture. For more information refer to section «zeotropic refrigerant mixtures». For low evaporating temperature applications down to -45°C, Maneurop® NTZ compressors should be used. Refer to the NTZ selection and application guidelines. For medium temperature R404A applications, always use the Maneurop® MTZ compressor with 160PZ polyolester oil which is supplied with the MTZ compressor. Maneurop® MT compressors should never be used for R404A, even with the mineral oil replaced by polyolester oil.

R507A

Refrigerant R507A is an HFC refrigerant with thermodynamic properties comparable to those of the CFC refrigerant R502 and virtually equal to those of R404A. R507A has no ozone depletion potential (ODP = 0) and is commonly accepted as one of the best R502 alternatives. As with R404A, R507A is particularly suitable for low evaporating temperature applications but it can also be used for medium evaporating temperature applications. R507A is an azeotropic mixture with no temperature glide. For low evapo-

rating temperature applications down to -45°C, Maneurop® NTZ compressor should be used. Refer to the NTZ selection and application guidelines. For medium temperature R507A applications, always use the Maneurop® MTZ compressor and Maneurop® 160PZ polyolester oil which is supplied with the MTZ compressor. Maneurop® MT compressors should never be used for R507A, even with the mineral oil replaced by polyolester oil.

R22 based transitional refrigerants

A wide variety of R22 based transitional refrigerants exist (also called service refrigerants or drop-in blends). These were developed as temporary R12 or R502 alternatives. Some examples are R401A, R401B, R409A and R409B as R12 alternatives and R402A, R402B, R403A and R403B as R502 alternatives.

Because of the R22 component, they all have a (low) ozone depletion potential. Maneurop® MT compressors can be applied with these transitional refrigerants. The initial mineral oil charge must be replaced by Maneurop® 160 ABM alkylbenzene oil.

Hydrocarbons

Hydrocarbons such as propane, isobutane etc. are extremely flammable. Danfoss does not authorise the use

of hydrocarbons with Maneurop® MT or MTZ compressors in any way, even with a reduced refrigerant charge.

SYSTEM DESIGN RECOMMENDATIONS

Piping desing

Oil in a refrigeration circuit is required to lubricate moving parts in the compressor. During normal system operation small oil quantities will continuously leave the compressor, with the discharge gas. With good system piping design this oil will return to the compressor. As long as the amount of oil circulating through the system is small it will contribute to good system operation and improved heat transfer efficiency. However, too large amounts of oil in the system will have a negative effect on condenser and evapora-

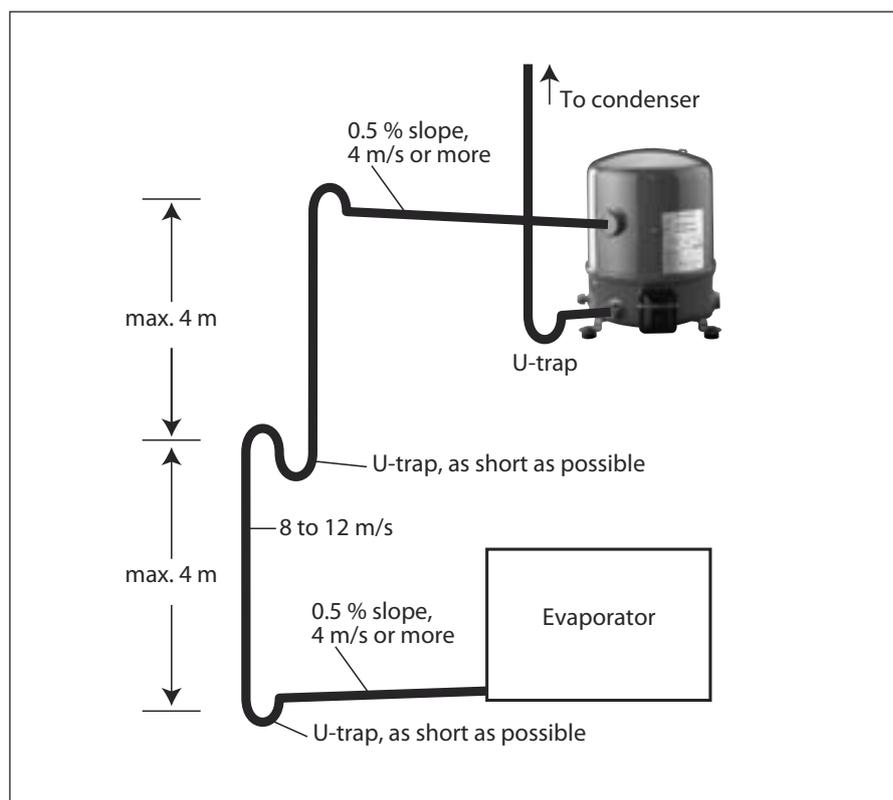
tor efficiency. If, in a poorly designed system, the amount of oil returning to the compressor is lower than the amount of oil leaving the compressor, the compressor will become starved of oil and the condenser, evaporator and/or refrigerant lines will become filled with oil. In such situations, additional oil charge will only correct the compressor oil level for a limited period of time and increase the amount of surplus oil in the rest of the system. Only correct piping design can ensure a good oil balance in the system.

Suction lines

Horizontal suction line sections shall have a slope of 0.5% in the direction of refrigerant flow (5 mm per meter). The cross-section of horizontal suction lines shall be such that the resulting gas velocity is at least 4 m/s. In vertical risers, a gas velocity of 8 to 12 m/s is required to ensure proper oil return. A U-trap is required at the foot of each vertical riser. If the riser is higher than 4 m, additional U-traps are required for each additional 4 meters. The length of each U-trap must be as short as possible to avoid the accumulation of excessive quantities of oil (see figure below).

For compressors mounted in parallel, the common suction riser should be designed as a double riser. Also refer to the News bulletin "Mounting instructions for installation of Maneurop® compressors in parallel" and "Parallel application guidelines".

Gas velocities higher than 12 m/s will not contribute to significantly better oil return. However they will cause higher noise levels and result in higher suction line pressure drops which will have a negative effect on the system capacity.



SYSTEM DESIGN RECOMMENDATIONS

Note that the suction rotolock valves, which can be ordered from Danfoss as accessories, are designed for average pipe sizes, selected for systems running at nominal conditions. The pipe sizes selected for specific

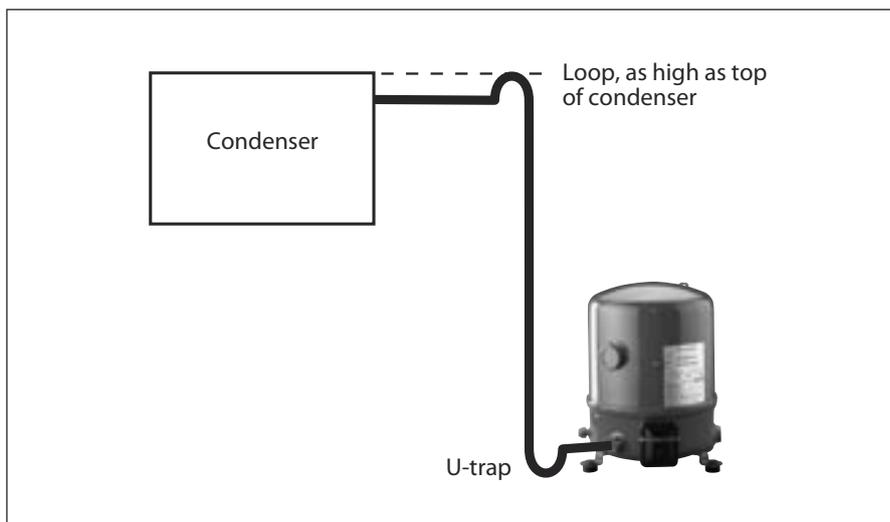
systems may differ from these recommended sizes.

It is recommended that the suction lines are insulated to limit suction gas superheat.

Discharge line

When the condenser is mounted above the compressor, a loop above the condenser and a U-trap close to the

compressor are required to prevent liquid draining from the condenser into the discharge line during standstill.



Oil charge and oil separator

In most installations the initial compressor oil charge will be sufficient. In installations with line runs exceeding 20 m, or with many oil traps or an oil separator, additional oil may be required.

In installations with the risk of slow oil return such as in multiple evaporator or multiple condenser installations, an oil separator is recommended. Also refer to page 29.

Filter driers

For new installations with MTZ compressors Danfoss recommends using the Danfoss DML 100%-molecular sieve, solid core filter drier. Molecular sieve filter driers with loose beads from third party suppliers shall be avoided.

containing activated alumina are recommended.

For servicing of existing installations where acid formation is present the Danfoss DCL solid core filter driers

The drier is to be oversized rather than undersized. When selecting a drier, always take into account its capacity (water content capacity), the system refrigerating capacity and the system refrigerant charge.

Operating limits

High Pressure

A high pressure safety switch is required to stop the compressor, should the discharge pressure exceed the values shown in the table below. The high pressure switch can be set to lower values depending on the application and ambient conditions. The HP switch

must either be in a lockout circuit, or be a manual reset device to prevent compressor cycling around the high pressure limit. When a discharge valve is used, the HP switch must be connected to the service valve gauge port, which cannot be isolated.

SYSTEM DESIGN RECOMMENDATIONS

Low pressure

A low pressure safety switch is recommended to avoid compressor operation at too lower suction pressures.

		MT R22	MTZ R407C	MTZ R134a	MTZ R404A / R507A
Test pressure low side	bar (g)	25	25	25	25
Working pressure range high side	bar (g)	10.9 - 27.7	12.5 - 29.4	7.9 - 22.6	13.2 - 27.7
Working pressure range low side	bar (g)	1.0 - 7.0	1.4 - 6.6	0.6 - 4.7	1.0 - 7.2
Relief valve opening pressure difference	bar (g)	30	30	30	30
Relief valve closing pressure difference	bar (g)	8	8	8	8

Low ambient temperature operation

At low ambient temperatures, the condensing temperature and condensing pressure in air cooled condensers will decrease.

This low pressure may be insufficient to supply enough liquid refrigerant to the evaporator. As a result the evaporator temperature will strongly decrease with the risk of frosting. At compressor start-up, the compressor can pull a deep vacuum and it can be switched off by the low pressure protection. Depending on the low pressure switch setting and delay timer short cycling can occur. To avoid these problems, several solutions are possible, based on reducing condenser capacity:

- Indoor location of condensers
- Liquid flooding of condensers (note: this solution requires extra refrigerant

charge, which can introduce other problems. A non-return valve in the discharge line is required and special care should be taken when designing the discharge line.)

- Reduce air flow to condensers.

Other problems can also occur when the compressor is operating at low ambient temperature. During shut down periods, liquid refrigerant can migrate to a cold compressor.

For such conditions a belt-type crankcase heater is strongly recommended. Note that with 100% suction gas cooled motors, Maneurop® compressors can be externally insulated.

Refer to section «Liquid refrigerant migration & charge limits» for more details.

Operating voltage and cycle rate

Operating voltage range

The operating voltage limits are shown in the table on page 4. The voltage applied to the motor terminals must always be within these table limits. The maximum allowable voltage imbalance for 3-phase compressors

is 2%. Voltage imbalance causes high current draw on one or more phases, which in turn leads to overheating and possible motor damage.

Voltage imbalance is given by the formula:

$$\% \text{ voltage imbalance: } \frac{|V_{\text{avg}} - V_{1-2}| + |V_{\text{avg}} - V_{1-3}| + |V_{\text{avg}} - V_{2-3}|}{2 \times V_{\text{avg}}} \times 100$$

V_{avg} = Mean voltage of phases 1, 2 and 3
 V_{1-2} = Voltage between phases 1 and 2

V_{1-3} = Voltage between phases 1 and 3
 V_{2-3} = Voltage between phases 2 and 3.

Cycle rate limit

There may be no more than 12 starts per hour (6 when a soft start accessory is used). A higher number reduces the service life of the motor-compressor unit. If necessary, use an anti-short-cycle timer in the control circuit.

A time-out of six minutes is recom-

mended. The system must be designed in such a way to guarantee a minimum compressor running time in order to provide proper oil return and sufficient motor cooling after starting. Note that the oil return rate varies as a function of the system design.

SYSTEM DESIGN RECOMMENDATIONS

Liquid refrigerant control and charge limits

Refrigeration compressors are basically designed as gas compressors. Depending on the compressor design and operating conditions, most compressors can also handle a limited amount of liquid refrigerant. Maneurop® MT and MTZ compressors have a large internal volume and can therefore handle relatively large amounts of liquid refrigerant without major problems. However even when a compressor can handle liquid refrigerant, this will not

be favourable to its service life. Liquid refrigerant can dilute the oil, wash oil out of bearings and result in high oil carry over, resulting in loss of oil from the sump. Good system design can limit the amount of liquid refrigerant in the compressor, which will have a positive effect on the compressor service life.

Liquid refrigerant can enter a compressor in different ways, with different effects on the compressor.

Off-cycle migration

During system standstill and after pressure equalisation, refrigerant will condense in the coldest part of the system. The compressor can easily be the coldest spot, for example when it is placed outside in low ambient temperatures. After a while, the full system refrigerant charge can condense in the compressor crankcase. A large amount will dissolve in the compressor oil until the oil is completely saturated with refrigerant. If other system components are located at a higher level, this process can be even faster because gravity will assist the liquid refrigerant to flow back to the compressor. When the compressor is started, the pressure

in the crankcase decreases rapidly.

At lower pressures the oil holds less refrigerant, and as a result part of the refrigerant will violently evaporate from the oil, causing the oil to foam.

This process is often called "boiling".

The negative effects from migration on the compressor are:

- oil dilution by liquid refrigerant
- oil foam, transported by refrigerant gas and discharged into the system, causing loss of oil and in extreme situations risk for oil slugging
- in extreme situations with high system refrigerant charge, liquid slugging could occur (liquid entering the compressor cylinders)

Liquid floodback during operation

During normal and stable system operation, refrigerant will leave the evaporator in a superheated condition and enter the compressor as a superheated vapour.

Normal superheat values at compressor suction are 5 to 30 K. However the refrigerant leaving the evaporator can contain an amount of liquid refrigerant due to different reasons:

- wrong dimensioning, wrong setting or malfunction of expansion device

- evaporator fan failure or blocked air filters.

In these situations, liquid refrigerant will continuously enter the compressor.

The negative effects from continuous liquid floodback are:

- permanent oil dilution
- in extreme situations with high system refrigerant charge and large amounts of floodback, liquid slugging could occur.

Liquid floodback at change over cycles in reversible heat pumps

In heat pumps, change over from cooling to heating cycles, defrost and low load short cycles may lead to liquid refrigerant floodback or saturated refrigerant return conditions.

The negative effects are:

- oil dilution
- in extreme situations with high system refrigerant charge and large amounts of floodback, liquid slugging could appear.

Liquid floodback and zeotropic refrigerants

Liquid floodback in systems working with a zeotropic refrigerant such as R407C introduces additional negative effects. A part of the refrigerant leaves the evaporator in liquid phase and this

liquid has a different composition than the vapour.

This new refrigerant composition may result in different compressor operating pressures and temperatures.

SYSTEM DESIGN RECOMMENDATIONS

Crankcase heater

A crankcase heater protects against the off-cycle migration of refrigerant and proves effective if oil temperature is maintained 10 K above the saturated LP temperature of the refrigerant. Tests must thereby be conducted to ensure that the appropriate oil temperature is maintained under all ambient conditions. A PTC crankcase heater is recommended on all stand-alone compressors and split systems. PTC crankcase heaters are self-regulating. Under extreme conditions such as very low ambient temperature a belt type crankcase heater could be used in addition to the PTC heater, although this is not a preferred solution for 1 and 2 cylinder compressors. The belt crankcase heater must be positioned on the compressor shell as close as possible

to the oil sump to ensure good heat transfer to the oil.

Belt crankcase heaters are not self-regulating. Control must be applied to energise the belt heater once the compressor has been stopped and then to de-energise it while the compressor is running. The belt heater must be energised 12 hours before restarting the compressor following an extended down period.

If the crankcase heater is not able to maintain the oil temperature at 10 K above the saturated LP temperature of the refrigerant during off cycles or if repetitive floodback is present a the Liquid Line Solenoid Valve (LLSV) + pump-down cycle is required, eventually in conjunction with a suction accumulator.

Liquid line solenoid valve & pump-down

In refrigeration applications, the Liquid Line Solenoid Valve (LLSV) is highly recommended. During the off-cycle, the LLSV isolates the liquid charge in the condenser side, thus preventing against refrigerant transfer or excessive migration of refrigerant into the compressor. Furthermore, when using

a LLSV in conjunction with a pump-down cycle, the quantity of refrigerant in the low-pressure side of the system will be reduced.

A pump-down cycle design is required when evaporators are fitted with electric defrost heaters.

Suction accumulator

A suction accumulator offers considerable protection against refrigerant floodback at start-up, during operation or after the defrost operation. This device also helps to protect against off-cycle migration by means of providing additional internal free volume to the low pressure side of the system. The suction accumulator must be selected in accordance with the accumu-

lator manufacturer recommendations. As a general rule, Danfoss recommends to size the accumulator for at least 50% of the total system charge. Tests however must be conducted to determine the optimal size.

A suction accumulator shall not be used in systems with zeotropic refrigerant mixtures.

SOUND AND VIBRATION MANAGEMENT

Sound

Running compressors cause sound and vibration. Both phenomena are closely related.

Sound produced by a compressor is transmitted in every direction by the ambient air, the mounting feet, the pipework and the refrigerant in the pipework.

The easiest way to reduce the sound transmitted through ambient air is to fit a Danfoss acoustic hood accessory.

Because Maneurop® compressors are 100% suction gas cooled, and require

no body cooling, they can be insulated. Values for the sound reduction achieved with acoustic hoods are shown also in the table on the right. For inside mounted compressors, sound insulation of the plantroom is an alternative to sound insulation of the compressor.

Sound transmitted by mounting feet, pipework and refrigerant should be treated the same way as for vibration.

Please refer to the next section.

Sound power level for MTZ with R404A, motor code 4
 Te = -10°C,
 TC = 45°C

	Sound power level at 50 Hz dB(A)		Sound power level at 60 Hz dB(A)	
	without hood	with hood*	without hood	with hood*
MTZ018	73	65	73	66
MTZ022	74	68	77	71
MTZ028	71	64	73	66
MTZ032	71	64	73	66
MTZ036	70	64	76	69
MTZ040	70	65	72	67
MTZ044	80	74	82	76
MTZ045	80	74	82	76
MTZ050	83	76	84	78
MTZ051	83	76	84	78
MTZ056	81	74	81	74
MTZ057	81	74	81	74
MTZ064	80	74	84	78
MTZ065	80	74	84	78
MTZ072	79	72	82	75
MTZ073	79	72	82	75
MTZ080	79	73	84	78
MTZ081	79	73	84	78
MTZ100	85	79	87	81
MTZ125	84	78	86	80
MTZ144	83	77	86	80
MTZ160	83	77	86	80

* Sound data with hood are valid for the Danfoss acoustic hood accessory.

Model	Acoustic hood accessory	code no.
MT/MTZ018 - 040	Acoustic hood for 1 cyl compressors	7755001
MT/MTZ044 - 081	Acoustic hood for 2 cyl compressors	7755002
MT/MTZ100 - 160	Acoustic hood for 4 cyl compressors	7755003

SOUND AND VIBRATION MANAGEMENT

Vibration

The mounting grommets delivered with the compressor should always be used. They reduce the vibration transmitted by the compressor mounting feet to the base frame.

The base on which the compressor is mounted should be sufficiently rigid and of adequate mass to ensure the full effectiveness of the mounting grommets.

The compressor should never be directly mounted to the base frame without the grommets, otherwise high vibration transmission would occur and the compressor service life reduced. Suction and discharge lines must have adequate flexibility in 3 planes. Eventually vibration absorbers may be required.

Care must be taken to avoid tubing having resonant frequencies close to those of the compressor frequency.

Vibration is also transmitted by the refrigerant gas. Maneurop[®], compressors have built in mufflers to reduce this vibration.

To further reduce vibration an extra muffler can be installed.

Note: Maneurop[®] MT & MTZ compressors have been designed and qualified for stationary equipment used in A/C and Refrigeration applications.

Danfoss doesn't warrant these compressors for use in mobile applications, such as trucks, railways, subways, etc...

INSTALLATION AND SERVICE

System cleanliness

System contamination is one of the main factors affecting equipment reliability and compressor service life.

Therefore it is important to ensure system cleanliness when manufacturing a refrigeration system. During the manufacturing process, system contamination can be caused by:

- Brazing and welding oxides
- Filings and particles from removing burrs from pipe-work
- Brazing flux
- Moisture and air.

Only use clean and dehydrated refrigeration grade copper tubes and silver alloy brazing material. Clean all parts before brazing and always purge

nitrogen or CO₂ through the pipes during brazing to prevent oxidation. If flux is used, take every precaution to prevent leakage into the piping. Do not drill holes (e.g. for schröder valves) in parts of the installation that are already completed, when filings and burrs can not be removed. Carefully follow the instructions below regarding brazing, mounting, leak detection, pressure test and moisture removal. All installation and service work shall only be done by qualified personnel respecting all procedures and using tools (charging systems, tubes, vacuum pump, etc.) dedicated for the refrigerant that will be used.

Compressor handling, mounting and connection to the system

Compressor handling

Maneurop® MT and MTZ compressors are provided with a lifting lug. This lug should always be used to lift the compressor. Once the compressor is installed, the compressor lifting lug should

never be used to lift the complete installation.

Keep the compressor in an upright position during handling.

Compressor mounting

Mount the compressor on a horizontal plane with a maximum slope of 3 degrees. All compressors are supplied with three or four rubber mounting grommets, each complete with metal sleeves and nuts and bolts. Refer to the outline drawings on page 18 to 21.

These grommets largely attenuate the compressor vibration transmitted to the base frame. The compressor must always be mounted with these grommets. Refer to the table below for torque values.

Designation		Recommended torque (Nm)
Cable screw of T connector in electrical box	screw 10/32 - UNF x 3	3
Rotolock valves and solder sleeves	1"	80
	1"1/4	90
	1"3/4	110
Mounting grommet bolts	1 - 2 - 4 cylinder	15
Oil sight glass	-	50
Oil equalisation connection	1 - 2 - 4 cylinder	30

Compressor connection to the system

New compressors have a protective nitrogen holding charge. The suction and discharge caps should only be removed just before connecting the compressor to the installation to avoid air and moisture entering the compressor.

Whenever possible the compressor must be the last component to be integrated in the system. It is advisable to braze the solder sleeves or service valves to the pipework before the compressor is mounted. When all brazing is finished and when the total

INSTALLATION AND SERVICE

system is ready, the compressor caps can be removed and the compressor can be connected to the system with a minimum exposure to ambient air.

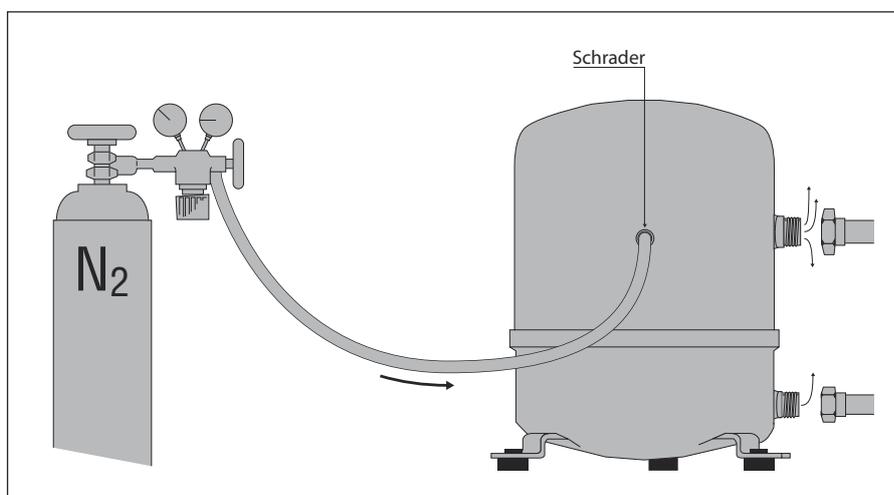
If this procedure is not possible, the sleeves or valves may be brazed to the pipes when mounted on the compressor.

In this situation nitrogen or CO₂ must be purged through the compressor via the schrader valve to prevent air and moisture ingress. Purging must start when the caps are removed and proceeded during the brazing process.

When rotolock valves are used on

the compressor, they shall be closed immediately after mounting, thus keeping the compressor isolated from atmosphere or from a not yet dehydrated system.

Note: When the compressor is built into a "pack" or "rack" configuration which is not installed immediately on its final location, a vacuum pull-down and moisture removal must be performed to this pack (rack) as if it were a complete system (see below). The pack must be charged with nitrogen or CO₂ and open tubes must be blocked with caps or plugs.



System pressure test

It is recommended that an inert gas such as nitrogen be used for pressure testing. Dry air may also be used but care should be taken since it can form an inflammable mixture with the compressor oil. When performing a system

pressure test, the maximum allowed pressure for the different components should not be exceeded.

For MT/MTZ compressors the maximum test pressures are shown in the table below.

	1-2-4 cylinder compressors
Maximum compressor test pressure, low side	25 bar(g)
Maximum compressor test pressure, high side	30 bar(g)

Do not exceed 30 bar pressure difference between high pressure side and low pressure side of the compressor

because this will open the internal compressor relief valve.

Leak detection

Whenever possible (if valves are present) the compressor must be kept isolated from the system. Perform a leak detection using the final refrigerant. Pressurise with nitrogen or another neutral gas and use a leak detector for the applied refrigerant. Any spectro-

metric detection system using helium can also be applied.

Eventual leaks shall be repaired respecting the instructions written above. It is not recommended to use other gasses such as oxygen, dry air or acetylene as these gasses can form an

INSTALLATION AND SERVICE

Vacuum pull-down moisture removal

inflammable mixture. Never use CFC or HCFC refrigerants for leak detection of HFC systems.

Note 1 : Leak detection with refrigerant may not be allowed in some countries. Check local regulations.

Moisture obstructs the proper functioning of the compressor and the refrigeration system.

Air and moisture reduce service life and increase condensing pressure, and cause excessively high discharge temperatures, which can destroy the lubricating properties of the oil. Air and moisture also increase the risk of acid formation, giving rise to copper plating. All these phenomena can cause mechanical and electrical compressor failure.

To eliminate these factors, a vacuum pull-down according to the procedure below is recommended:

1. Whenever possible (if valves are present) the compressor must be kept isolated from the system.
2. After the leak detection, the system must be pulled-down under a vacuum of 500 microns (0.67 mbar). A two stage vacuum pump shall be used with a capacity appropriate to the system volume. It is recommended to use connection lines with a large diameter and to connect these to the service valves and not to the schrader connection to avoid too high pressure losses.
3. When the vacuum level of 500 micron is reached, the system must be

Note 2 : Leak detecting additives shall not be used as they may affect the lubricant properties.

Warranty may be voided if leak detecting additives have been used.

isolated from the vacuum pump. Wait 30 minutes during which the system pressure should not rise. When the pressure rapidly increases, the system is not leak tight.

A new leak detection must be performed and the vacuum pull-down procedure should be restarted from step 1. When the pressure slowly increases, this indicates the presence of moisture. In this case step 2 and 3 should be repeated.

4. Connect the compressor to the system by opening the valves. Repeat step 2 and 3.

5. Break the vacuum with nitrogen or the final refrigerant.

6. Repeat step 2 and 3 on the total system.

At commissioning, system moisture content may be up to 100 ppm. During operation the filter drier must reduce this to a level < 20 ppm.

Warning :

Do not use a megohmmeter or apply power to the compressor while it is under vacuum, as this may cause motor winding damage.

Never run the compressor under vacuum as it may cause compressor motor burn-out.

Start-up

Before initial start-up or after a prolonged shut down period, energise the crankcase heater (if fitted) 12 hours

prior to start-up, or turn on power for single phase compressors with trickle circuit.

Refrigerant charging

Zeotropic and «near-azeotropic» refrigerant mixtures such as R407C and R404A must always be charged in the liquid phase. For the initial charge, the compressor must not run and service valves must be closed. Charge refrigerant as close as possible to the nominal system charge before starting the compressor. Then slowly add refrigerant in the liquid phase, on the low pressure side as far away as possible

from the running compressor.

The refrigerant charge quantity must be suitable for both winter and summer operation. Refer also to section «Protection against flooded starts and liquid floodback» for information about refrigerant charge limits.

Warning: when a liquid line solenoid valve is used, the vacuum in the low pressure side must be broken before applying power to the system.

INSTALLATION AND SERVICE

Oil charge and oil level

The oil charge must be checked before commissioning (1/4 to 3/4 of the oil sight glass). Check the oil level again after a minimum of 2 hours operation at nominal conditions. In most installations the initial compressor oil charge will be sufficient. In installations with line runs exceeding 20 m or with many oil traps or an oil separator, additional oil may be required. Normally the quantity of oil added should be no more than 2% of the total refrigerant charge (this percentage does not take

into account oil contained in accessories such as oil separators or oil traps). If this amount has already been added and the oil level in the compressor keeps decreasing, the oil return in the installation is insufficient. Refer also to section "Piping design".

In installations where slow oil return is likely such as in multiple evaporator or multiple condenser installations, an oil separator is recommended. Refer to the table on page 17 to select the correct oil.

Suction gas superheat

The optimum suction gas superheat is 8 K. A lower superheat value will contribute to better system performance (higher mass flow and more efficient use of evaporator surface). Low superheat values however increase the risk of unwanted liquid floodback to the compressor.

For very low superheat values an electronically controlled expansion valve is recommended.

The maximum allowable superheat is about 30 K. Higher values can be accepted but in these cases, tests have to be performed to check that the maximum discharge temperature of 130°C will not be exceeded. Note that high superheat values decrease the compressor application envelope and system performance.

ACCESSORIES AND SPAREPARTS

The below tables show an extract of the available accessories and spareparts for Maneurop® reciprocating compressors. For an exhaustive list please refer to Accessories & Spareparts catalogue, ref. FRCC.EK.002.A1.02

Rotolock accessories

Type	Code no.	Description	Application	Packaging	Pack size
V06-V01	7703004	Valve set, V06 (1"~1/2"), V01 (1"~3/8")	MT/MTZ018-028 (except 028 code 1)	Multipack	4
V09-V06	7703005	Valve set, V09 (1-1/4"~5/8"), V06 (1"~1/2")	MT/MTZ032-040 (& 028 code 1)	Multipack	4
V07-V04	7703006	Valve set, V07 (1-3/4"~7/8"), V04 (1-1/4"~3/4")	MT/MTZ044-072	Multipack	6
V02-V04	7703009	Valve set, V02 (1-3/4"~1-1/8"), V04 (1-1/4"~3/4")	MT/MTZ080-160	Multipack	6
C06-C01	7703011	Angle adapter set, C06 (1"~1/2"), C01 (1"~3/8")	MT/MTZ018-028 (except 028 code 1)	Multipack	4
C09-C06	7703012	Angle adapter set, C09 (1-1/4"~5/8"), C06 (1"~1/2")	MT/MTZ032-040 (& 028 code 1)	Multipack	4
C07-C04	7703013	Angle adapter set, C07 (1-3/4"~7/8"), C04 (1-1/4"~3/4")	MT/MTZ044-072	Multipack	6
C02-C04	7703014	Angle adapter set, C02 (1-3/4"~1-1/8"), C04 (1-1/4"~3/4")	MT/MTZ080-160	Multipack	6
G01	8156130	Gasket, 1"	Models with 1" rotolock connection	Multipack	10
G01	7956001	Gasket, 1"	Models with 1" rotolock connection	Industry pack	50
G09	8156131	Gasket, 1-1/4"	Models with 1-1/4" rotolock connection	Multipack	10
G09	7956002	Gasket, 1-1/4"	Models with 1-1/4" rotolock connection	Industry pack	50
G07	8156132	Gasket, 1-3/4"	Models with 1-3/4" rotolock connection	Multipack	10
G07	7956003	Gasket, 1-3/4"	Models with 1-3/4" rotolock connection	Industry pack	50
	8156009	Gasket set, 1", 1-1/4", 1-3/4", Oil sight glass gaskets black & white	All 1-2-4 cylinder models	Multipack	10

Crankcase heaters

Type	Code no.	Description	Application	Packaging	Pack size
PTC35W	7773001	PTC crankcase heater, 35 W, incl. heat transfer paste	All models	Multipack	10
PTC35W	7973009	PTC crankcase heater, 35 W, incl. heat transfer paste	All models	Industry pack	50
PTC35W	7773125	PTC crankcase heater, 35 W, mounting without paste	All models	Multipack	10
PTC35W	7973011	PTC crankcase heater, 35 W, mounting without paste	All models	Industry pack	50
	7773106	Belt type crankcase heater, 55 W, 230 V, CE mark, UL	MT/MTZ018-040	Multipack	4
	7773002	Belt type crankcase heater, 54 W, 240 V, UL	MT/MTZ018-040	Multipack	4
	7773013	Belt type crankcase heater, 54 W, 400 V, UL	MT/MTZ018-040	Multipack	4
	7773111	Belt type crankcase heater, 54 W, 460 V, UL	MT/MTZ018-040	Multipack	4
	7773109	Belt type crankcase heater, 65 W, 110 V, CE mark, UL	MT/MTZ044-081	Multipack	6
	7973001	Belt type crankcase heater, 65 W, 110 V, CE mark, UL	MT/MTZ044-081	Industry pack	50
	7773107	Belt type crankcase heater, 65 W, 230 V, CE mark, UL	MT/MTZ044-081	Multipack	6
	7973002	Belt type crankcase heater, 65 W, 230 V, CE mark, UL	MT/MTZ044-081	Industry pack	50
	7773117	Belt type crankcase heater, 65 W, 400 V, CE mark, UL	MT/MTZ044-081	Multipack	6
	7773010	Belt type crankcase heater, 50 W, 110 V, UL	MT/MTZ044-081	Multipack	6
	7773003	Belt type crankcase heater, 50 W, 240 V, UL	MT/MTZ044-081	Multipack	6
	7773009	Belt type crankcase heater, 50 W, 400 V, UL	MT/MTZ044-081	Multipack	6
	7773006	Belt type crankcase heater, 50 W, 460 V, UL	MT/MTZ044-081	Multipack	6
	7773119	Belt type crankcase heater, 75 W, 575 V, UL	MT/MTZ044-081	Multipack	6
	7773110	Belt type crankcase heater, 75 W, 110 V, CE mark, UL	MT/MTZ100-160	Multipack	6
	7773108	Belt type crankcase heater, 75 W, 230 V, CE mark, UL	MT/MTZ100-160	Multipack	6
	7973005	Belt type crankcase heater, 75 W, 230 V, CE mark, UL	MT/MTZ100-160	Industry pack	50
	7773118	Belt type crankcase heater, 75 W, 400 V, CE mark, UL	MT/MTZ100-160	Multipack	6
	7773004	Belt type crankcase heater, 75 W, 240 V, UL	MT/MTZ100-160	Multipack	6
	7773014	Belt type crankcase heater, 75 W, 400 V, UL	MT/MTZ100-160	Multipack	6
	7773008	Belt type crankcase heater, 75 W, 460 V, UL	MT/MTZ100-160	Multipack	6
	7773105	Belt type crankcase heater, 75 W, 575 V, UL	MT/MTZ100-160	Multipack	6

Acoustic hoods

Type	Code no.	Description	Application	Packaging	Pack size
	7755001	Acoustic hood for 1 cylinder compressor	MT/MTZ018-040	Single pack	1
	7755002	Acoustic hood for 2 cylinder compressor	MT/MTZ044-081	Single pack	1
	7755003	Acoustic hood for 4 cylinder compressor	MT/MTZ100-160	Single pack	1

ACCESSORIES AND SPAREPARTS

3-phase soft start equipment

Type	Code no.	Description	Application	Packaging	Pack size
SCR01	7702003	Soft start kit with statoric resistors, prewired box, SCR01	MT/MTZ044-081	Single pack	1
SCR03	7705001	Soft start kit with statoric resistors, prewired box, SCR03	MT/MTZ100-160	Single pack	1
MCI 15 C	7705006	Electronic soft start kit, MCI 15C	MT/MTZ018-081	Single pack	1
MCI 25 C	7705007	Electronic soft start kit, MCI 25C	MT/MTZ100-160	Single pack	1

Single phase PSC starting kits

Type	Code no.	Description	Application	Packaging	Pack size
PSC	7701026	PSC starting kit, 20 µF, 10 µF	MT/MTZ018-028 code 5	Multipack	4
PSC	7701024	PSC starting kit, 25 µF, 10 µF	MT/MTZ032-036 code 5	Multipack	4
PSC	7701025	PSC starting kit, 15 µF, 10 µF	MT/MTZ018 code 1	Multipack	4
PSC	7701035	PSC starting kit, 30 µF, 15 µF	MT/MTZ022 & 044-051 code 1 & 050-5	Multipack	4
PSC	7701151	PSC starting kit, 25 µF, 25 µF	MT/MTZ028 code 1	Multipack	4
PSC	7701152	PSC starting kit, 25 µF, 20 µF	MT/MTZ032-036 code 1	Multipack	4
PSC	7701153	PSC starting kit, 35 µF, 20 µF	MT/MTZ040 code 1	Multipack	4
PSC	7701036	PSC starting kit, 30 µF, 20 µF	MT/MTZ057 code 1	Multipack	6
PSC	7701037	PSC starting kit, 30 µF, 25 µF	MT/MTZ064-065 code 1	Multipack	6

Single phase CSR starting kits & starting kits in prewired box

Type	Code no.	Description	Application	Packaging	Pack size
CSR	7701022	CSR starting kit, 20 µF, 10 µF, 100 µF	MT/MTZ018-028 code 5	Multipack	4
CSR	7701023	CSR starting kit, 25 µF, 10 µF, 135 µF	MT/MTZ032-036 code 5	Multipack	4
CSR	7701021	CSR starting kit, 15 µF, 10 µF	MT/MTZ018 code 1	Multipack	4
CSR	7701038	CSR starting kit, 15 µF, 30 µF, 100 µF	MT/MTZ022 code 1	Multipack	4
CSR	7701154	CSR starting kit, 25 µF, 25 µF, 135 µF	MT/MTZ028 code 1	Multipack	4
CSR	7701155	CSR starting kit, 25 µF, 20 µF, 100 µF	MT/MTZ032-036 code 1	Multipack	4
CSR	7701156	CSR starting kit, 35 µF, 20 µF, 100 µF	MT/MTZ040 code 1	Multipack	4
CSR	7701042	CSR starting kit, 30 µF, 15 µF, 135 µF	MT/MTZ044-051 code 1	Multipack	6
CSR	7701043	CSR starting kit, 30 µF, 20 µF, 200 µF	MT/MTZ057 code 1	Multipack	6
CSR	7701044	CSR starting kit, 30 µF, 25 µF, 235 µF	MT/MTZ064-065 code 1	Multipack	6
CSR	7701028	CSR starting kit, prewired box, 20 µF, 10 µF, 100 µF	MT/MTZ018-028 code 5	Single pack	1
CSR	7701029	CSR starting kit, prewired box, 25 µF, 10 µF, 135 µF	MT/MTZ032-036 code 5	Single pack	1
CSR	7701147	CSR starting kit, prewired box, 15 µF, 30 µF, 100 µF	MT/MTZ022 code 1	Single pack	1
CSR	7701148	CSR starting kit, prewired box, 25 µF, 25 µF, 135 µF	MT/MTZ028 code 1	Single pack	1
CSR	7701149	CSR starting kit, prewired box, 25 µF, 20 µF, 100 µF	MT/MTZ032-036 code 1	Single pack	1
CSR	7701150	CSR starting kit, prewired box, 35 µF, 20 µF, 100 µF	MT/MTZ040 code 1	Single pack	1
CSR	7701049	CSR starting kit, prewired box, 30 µF, 15 µF, 135 µF	MT/MTZ044-051 code 1	Single pack	1

Kickstart kits

Type	Code no.	Description	Application	Packaging	Pack size
	7701060	Kickstart kit; relay + start capacitor 227 µF	MT/MTZ018 code 1 & 5	Single pack	1
	7701059	Kickstart kit; relay + start capacitor 280 µF	MT/MTZ022-064 code 1 & 5 excl 050-5	Single pack	1

Lubricants

Type	Code no.	Description	Application	Packaging	Pack size
160PZ	7754019	POE lubricant, 160PZ, 1 litre can	MTZ with R404A, R507A, R134a, R407C	Multipack	12
160PZ	7754020	POE lubricant, 160PZ, 2 litre can	MTZ with R404A, R507A, R134a, R407C	Multipack	8
160P	7754001	Mineral oil, 160P, 2 litre can	MT or LT with R22 or R502	Multipack	8
160P	7754002	Mineral oil, 160P, 5 litre can	MT or LT with R22 or R502	Multipack	4
160ABM	7754009	Alkylbenzene oil 160ABM, 2 litre can	MT or LT with transitional refrigerants	Multipack	8

ORDERING INFORMATION AND PACKAGING

Ordering information

Maneurop® MT & MTZ reciprocating compressors can be ordered from Danfoss Commercial Compressors in either industrial packs (also called multiple packaging) or in single packs (also called individual packaging).

The code numbers ending on "M" in below tables represent the compressors in industrial packs. For ordering single packs, please replace the last letter "M" by letter "I".

MT compressors in industrial pack (multiple packaging)

R22

Compressor model	Design ¹⁾	Code no.						
		1	3	4	5	6	7	9
		208-230/1/60	200-230/3/60	460/3/60 400/3/50	230/1/50	230/3/50	575/3/60 500/3/50	380/3/60
MT018	S	-	MT18-3M	MT18-4M	MT18-5M	-	-	-
	VE	MT18-1VM	MT18-3VM	MT18-4VM	MT18-5VM	-	-	-
MT022	S	MT22-1M	MT22-3M	MT22-4M	MT22-5M	-	-	-
	VE	MT22-1VM	MT22-3VM	MT22-4VM	MT22-5VM	MT22-6VM	-	MT22-9VM
MT028	S	MT28-1M	MT28-3M	MT28-4M	MT28-5M	MT28-6M	-	-
	VE	MT28-1VM	MT28-3VM	MT28-4VM	MT28-5VM	MT28-6VM	-	MT28-9VM
MT032	S		MT32-3M	MT32-4M	MT32-5M	MT32-6M	-	-
	VE	MT32-1VM	MT32-3VM	MT32-4VM	MT32-5VM	MT32-6VM	-	-
MT036	S		MT36-3M	MT36-4M	MT36-5M	MT36-6M	-	-
	VE	MT36-1VM	MT36-3VM	MT36-4VM	MT36-5VM	MT36-6VM	-	MT36-9VM
MT040	S	MT40-1M	MT40-3M	MT40-4M	-	MT40-6M	-	-
	VE	MT40-1VM	MT40-3VM	MT40-4VM	-	MT40-6VM	-	-
MT044	S	MT44-1M	MT44-3M	MT44-4M	-	-	-	MT44-9M
	VE	MT44-1VM	MT44-3VM	MT44-4VM	-	MT44-6VM	MT44-7VM	MT44-9VM
MT045	S	-	-	MT45-4M	-	-	-	-
	VE	-	MT45-3VM	MT45-4VM	-	-	-	-
MT050	S	-	MT50-3M	MT50-4M	-	-	-	MT50-9M
	VE	MT50-1VM	MT50-3VM	MT50-4VM	MT50-5VM	MT50-6VM	MT50-7VM	MT50-9VM
MT051	S	-	MT51-3M	MT51-4M	-	-	-	-
	VE	-	MT51-3VM	MT51-4VM	-	-	-	-
MT056	S	-	MT56-3M	MT56-4M	-	-	MT56-7M	MT56-9M
	VE	MT56-1VM	MT56-3VM	MT56-4VM	-	MT56-6VM	MT56-7VM	MT56-9VM
MT057	S	-	-	MT57-4M	-	-	-	-
	VE	-	MT57-3VM	MT57-4VM	-	-	-	-
MT064	S	-	MT64-3M	MT64-4M	-	-	-	MT64-9M
	VE	MT64-1VM	MT64-3VM	MT64-4VM	-	MT64-6VM	-	MT64-9VM
MT065	S	-	MT65-3M	MT65-4M	-	-	-	-
	VE	-	MT65-3VM	MT65-4VM	-	-	-	-
MT072	S	-	MT72-3M	MT72-4M	-	-	-	MT72-9M
	VE	-	MT72-3VM	MT72-4VM	-	MT72-6VM	-	MT72-9VM
MT073	S	-	MT73-3M	MT73-4M	-	-	-	-
	VE	-	MT73-3VM	MT73-4VM	-	-	-	-
MT080	S	-	-	MT80-4M	-	-	-	MT80-9M
	VE	-	MT80-3VM	MT80-4VM	-	MT80-6VM	-	MT80-9VM
MT081	S	-	-	MT81-4M	-	-	-	-
	VE	-	MT81-3VM	MT81-4VM	-	-	-	-
MT100	Sv	-	MT100-3M	MT100-4M	-	MT100-6M	MT100-7M	MT100-9M
	VE	-	MT100-3VM	MT100-4VM	-	MT100-6VM	MT100-7VM	MT100-9VM
MT125	Sv	-	MT125-3M	MT125-4M	-	MT125-6M	MT125-7M	-
	VE	-	MT125-3VM	MT125-4VM	-	MT125-6VM	MT125-7VM	-
MT144	Sv	-	MT144-3M	MT144-4M	-	-	-	MT144-9M
	VE	-	MT144-3VM	MT144-4VM	-	MT144-6VM	MT144-7VM	MT144-9VM
MT160	Sv	-	MT160-3M	MT160-4M	-	MT160-6M	-	MT160-9M
	VE	-	MT160-3VM	MT160-4VM	-	MT160-6VM	-	MT160-9VM

¹⁾ S = Single compressor, no oil sight glass, no oil equalisation connection
 Sv = Single compressor, brazed oil sight glass, no oil equalisation connection
 VE = Single compressor, threaded oil sight glass, 3/8" oil equalisation connection

ORDERING INFORMATION AND PACKAGING

MTZ compressors in industrial pack (multiple packaging)

R404A / R507A / R134a / R407C

Compressor model	Design ¹⁾	Code no.						
		1	3	4	5	6	7	9
		208-230/1/60	200-230/3/60	460/3/60 400/3/50	230/1/50	230/3/50	575/3/60 500/3/50	380/3/60
MTZ018	S	MTZ18-1M	MTZ18-3M	MTZ18-4M	MTZ18-5M	-	-	-
	VE	MTZ18-1VM	MTZ18-3VM	MTZ18-4VM	MTZ18-5VM	MTZ18-6VM	-	-
MTZ022	S	MTZ22-1M	MTZ22-3M	MTZ22-4M	MTZ22-5M	MTZ22-6M	-	-
	VE	MTZ22-1VM	MTZ22-3VM	MTZ22-4VM	MTZ22-5VM	MTZ22-6VM	MTZ22-7VM	MTZ22-9VM
MTZ028	S	MTZ28-1M	MTZ28-3M	MTZ28-4M	MTZ28-5M	MTZ28-6M	-	-
	VE	MTZ28-1VM	MTZ28-3VM	MTZ28-4VM	MTZ28-5VM	MTZ28-6VM	MTZ28-7VM	MTZ28-9VM
MTZ032	S	MTZ32-1M	MTZ32-3M	MTZ32-4M	MTZ32-5M	MTZ32-6M	MTZ32-7M	-
	VE	MTZ32-1VM	MTZ32-3VM	MTZ32-4VM	MTZ32-5VM	MTZ32-6VM	MTZ32-7VM	MTZ32-9VM
MTZ036	S	MTZ36-1M	MTZ36-3M	MTZ36-4M	MTZ36-5M	MTZ36-6M	-	-
	VE	MTZ36-1VM	MTZ36-3VM	MTZ36-4VM	MTZ36-5VM	MTZ36-6VM	MTZ36-7VM	MTZ36-9VM
MTZ040	S	MTZ40-1M	MTZ40-3M	MTZ40-4M	-	MTZ40-6M	-	-
	VE	MTZ40-1VM	MTZ40-3VM	MTZ40-4VM	-	MTZ40-6VM	-	-
MTZ044	S	-	MTZ44-3M	MTZ44-4M	-	-	MTZ44-7M	MTZ44-9M
	VE	MTZ44-1VM	MTZ44-3VM	MTZ44-4VM	-	MTZ44-6VM	MTZ44-7VM	MTZ44-9VM
MTZ045	S	-	-	MTZ45-4M	-	-	-	-
	VE	-	MTZ45-3VM	MTZ45-4VM	-	-	-	-
MTZ050	S	-	MTZ50-3M	MTZ50-4M	-	-	MTZ50-7M	MTZ50-9M
	VE	MTZ50-1VM	MTZ50-3VM	MTZ50-4VM	MTZ50-5VM	MTZ50-6VM	MTZ50-7VM	MTZ50-9VM
MTZ051	S	-	-	MTZ51-4M	-	-	-	-
	VE	-	MTZ51-3VM	MTZ51-4VM	-	-	-	-
MTZ056	S	-	MTZ56-3M	MTZ56-4M	-	-	MTZ56-7M	MTZ56-9M
	VE	MTZ56-1VM	MTZ56-3VM	MTZ56-4VM	-	MTZ56-6VM	MTZ56-7VM	MTZ56-9VM
MTZ057	S	-	-	MTZ57-4M	-	-	-	-
	VE	-	MTZ57-3VM	MTZ57-4VM	-	-	-	-
MTZ064	S	-	MTZ64-3M	MTZ64-4M	-	-	-	MTZ64-9M
	VE	MTZ64-1VM	MTZ64-3VM	MTZ64-4VM	-	MTZ64-6VM	-	MTZ64-9VM
MTZ065	S	-	-	MTZ65-4M	-	-	-	-
	VE	-	MTZ65-3VM	MTZ65-4VM	-	-	-	-
MTZ072	S	-	MTZ72-3M	MTZ72-4M	-	MTZ72-6M	-	MTZ72-9M
	VE	-	MTZ72-3VM	MTZ72-4VM	-	MTZ72-6VM	-	MTZ72-9VM
MTZ073	S	-	-	MTZ73-4M	-	-	-	-
	VE	-	MTZ73-3VM	MTZ73-4VM	-	-	-	-
MTZ080	S	-	-	MTZ80-4M	-	-	-	MTZ80-9M
	VE	-	MTZ80-3VM	MTZ80-4VM	-	MTZ80-6VM	-	MTZ80-9VM
MTZ081	S	-	-	MTZ81-4M	-	-	-	-
	VE	-	MTZ81-3VM	MTZ81-4VM	-	-	-	-
MTZ100	Sv	-	MTZ100-3M	MTZ100-4M	-	MTZ100-6M	MTZ100-7M	MTZ100-9M
	VE	-	MTZ100-3VM	MTZ100-4VM	-	MTZ100-6VM	MTZ100-7VM	MTZ100-9VM
MTZ125	Sv	-	MTZ125-3M	MTZ125-4M	-	MTZ125-6M	MTZ125-7M	MTZ125-9M
	VE	-	MTZ125-3VM	MTZ125-4VM	-	MTZ125-6VM	MTZ125-7VM	MTZ125-9VM
MTZ144	Sv	-	MTZ144-3M	MTZ144-4M	-	MTZ144-6M	MTZ144-7M	MTZ144-9M
	VE	-	MTZ144-3VM	MTZ144-4VM	-	MTZ144-6VM	MTZ144-7VM	MTZ144-9VM
MTZ160	Sv	-	MTZ160-3M	MTZ160-4M	-	MTZ160-6M	-	MTZ160-9M
	VE	-	MTZ160-3VM	MTZ160-4VM	-	MTZ160-6VM	-	MTZ160-9VM

¹⁾ S = Single compressor, no oil sight glass, no oil equalisation connection
Sv = Single compressor, brazed oil sight glass, no oil equalisation connection
VE = Single compressor, threaded oil sight glass, 3/8" oil equalisation connection

ORDERING INFORMATION AND PACKAGING

Packaging

Model	Single pack		Multipack				Industrial pack			
	Dimensions (mm)	Net weight (kg)	Nbr	Dimensions (mm)	Gross weight (kg)	Static stacking	Nbr	Dimensions (mm)	Gross weight (kg)	Static stacking
1 cylinder										
MT/MTZ018	l: 330 w: 295 h: 385	21	6	l: 1000 w: 600 h: 510	142	4	12	l: 1200 w: 800 h: 500	279	4
MT/MTZ022		21			142				279	
MT/MTZ028		23			151				295	
MT/MTZ032		24			158				305	
MT/MTZ036		25			164				322	
MT/MTZ040		26			168				329	
2 cylinders										
MT/MTZ044-050	l: 395 w: 365 h: 455	35	6	l: 1150 w: 800 h: 560	227	4	8	l: 1200 w: 800 h: 550	294	4
MT/MTZ045-051		37			239				306	
MT/MTZ056-064		37			239				306	
MT/MTZ057-065		39			254				333	
MT/MTZ072-080		40			257				342	
MT/MTZ073-081		41			262				347	
4 cylinders										
MT/MTZ100	l: 485 w: 395 h: 600	60	6	l: 1200 w: 1000 h: 730	398	4	6	l: 1200 w: 800 h: 650	388	4
MT/MTZ125		64			414				404	
MT/MTZ144		67			430				420	
MT/MTZ160		69			444				434	

Single pack: One compressor in a cardboard box.
In some publications this packaging may be indicated as 'individual packaging.'

Multipack: A full pallet of compressors, each individually packed in a cardboard box. Mainly dedicated to wholesalers and Danfoss distribution centers.

Industrial pack: A full pallet of unpacked compressors. Mainly dedicated to OEM customers.
In some publications this packaging may be indicated as 'Multiple packaging.'

Nbr: Number of compressor in a pack

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