

*Danfoss*

Commercial compressors

Selection & Application guidelines

# **Maneurop<sup>®</sup>**

## **RECIPROCATING COMPRESSORS**

**LTZ**

**50 Hz**

R404A / R507

Low temperature refrigeration



1 CYLINDER  
2 CYLINDERS  
4 CYLINDERS

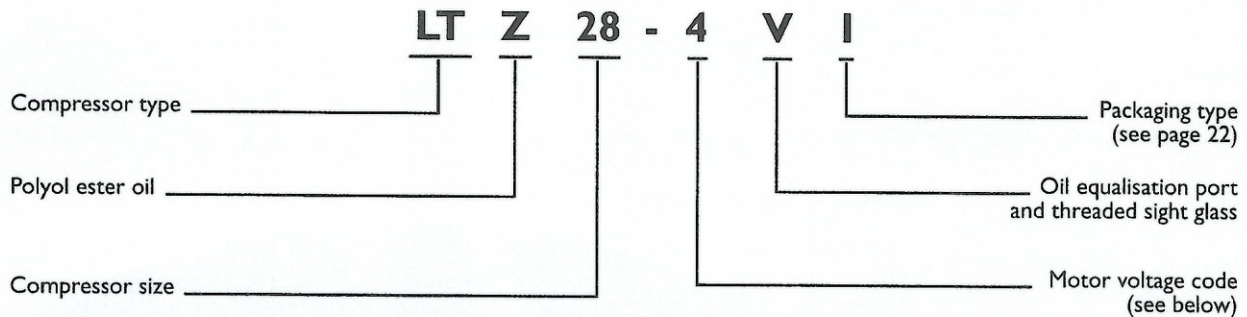


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# Compressor nomenclature

## ORDER REFERENCE



### EXAMPLE:

**LTZ 28 - 4I** LTZ 28, individual packaging (I), motor voltage code 4, standard version

**LTZ 28 - 4VI** LTZ 28, individual packaging (I), motor voltage code 4, VE version (V)

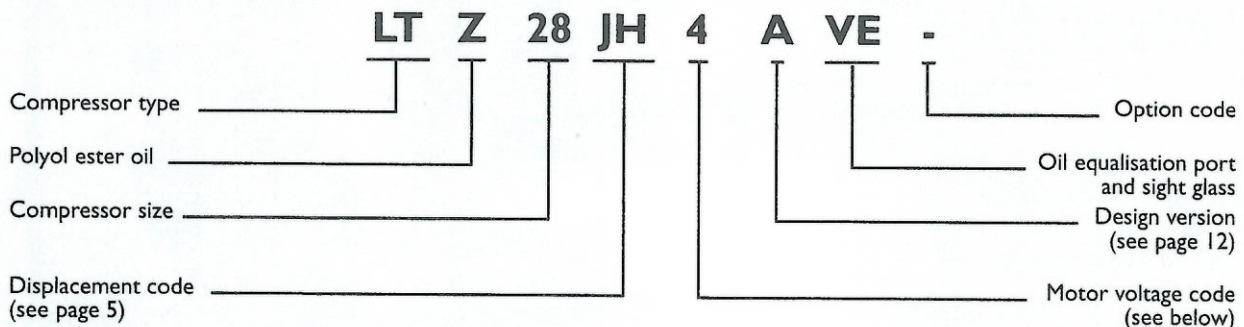
**LTZ 28 - 4M** LTZ 28, multiple packaging (M), motor voltage code 4, standard version

**LTZ 28 - 4VM** LTZ 28, multiple packaging (M), motor voltage code 4, VE version (V)

Individual packaging: single packaging per compressor

Multiple packaging: single packaging for several compressors, full pallet (number of compressors per pallet depending on compressor model).

## COMPRESSOR REFERENCE (INDICATED ON THE COMPRESSOR NAMEPLATE)



## MOTOR VOLTAGE

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
9	380 V / 3 ph / 60 Hz	342 - 418 V



# Specifications

## TECHNICAL SPECIFICATIONS AND VERSIONS

Compressor model	Displacement		Cyl. number	Oil charge (dm <sup>3</sup> )	Net weight (kg)	Design versions					
	(cm <sup>3</sup> /rev)	(m <sup>3</sup> /h)*				motor voltage code					
						1	3	4	5	6	9
LTZ 22 JE	48.06	8.36	1	0.95	21	S-VE	S-VE	S-VE	S-VE	-	S-VE
LTZ 28 JH	67.89	11.81	1	0.95	23	S-VE	S-VE	S-VE	S-VE	-	S-VE
LTZ 40 HL	96.13	16.73	2	1.8	35	-	-	VE	-	-	-
LTZ 44 HM	107.71	18.74	2	1.8	35	VE	VE	VE	-	VE	VE
LTZ 50 HP	135.78	23.63	2	1.8	35	VE	VE	VE	-	VE	VE
LTZ 88 HU	215.44	37.49	4	3.9	62	-	VE	VE	-	VE	VE
LTZ 100 HW	271.55	47.25	4	3.9	64	-	VE	VE	-	VE	VE

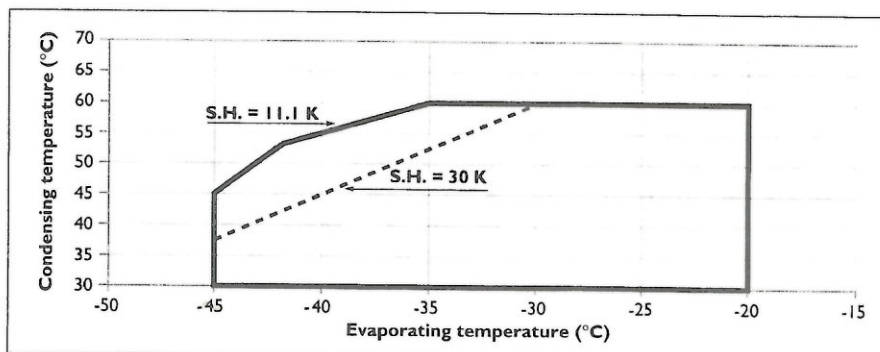
\* At 2900 rpm • S: without oil sight glass and oil equalisation connection • VE: with threaded oil sight glass and 3/8" flare oil equalisation connection.

## NOMINAL PERFORMANCE R404A, R507- 50 HZ

Compressor model	NOMINAL RATINGS * R404A, R507					COP (W/W)
	Cooling capacity (W)	Power input (kW)	Current input (A)			
			400V / 3 ph	230V / 1 ph	230V / 3 ph	
LTZ 22 JE	825	945	2.14	5.36	-	0.87
LTZ 28 JH	1 264	1 369	2.85	7.81	-	0.92
LTZ 40 HL	1 934	2 206	4.42	-	-	0.88
LTZ 44 HM	2 115	2 578	5.72	-	13.05	0.82
LTZ 50 HP	2 917	3 401	6.29	-	13.15	0.86
LTZ 88 HU	4 002	4 810	9.62	-	15.88	0.83
LTZ 100 HW	5 545	6 017	10.28	-	16.69	0.92

\* Ratings with R404A at dew point conditions or with R507: - 35°C evaporating temperature, 40°C condensing temperature, 0 K subcooling, 10 K superheat, 50 Hz  
Capacity and power input data ± 5%

## OPERATING ENVELOPE



**Application Envelope  
for LTZ compressors with  
R404A/R507**



# Performance tables R404A / R507

400 V / 3 ph / 50Hz

Models	TE	-45			-40			-35			-30			-25			-20		
		TC	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.
LTZ 22 JE 4	30	470	0.62	1.7	740	0.76	2.0	1 090	0.92	2.3	1 530	1.10	2.6	2 090	1.30	2.8	2 770	1.53	3.1
	40	340	0.63	1.6	550	0.78	1.8	820	0.95	2.1	1 190	1.14	2.4	1 640	1.35	2.7	2 200	1.59	3.0
	50	-	-	-	370	0.77	1.8	550	0.95	2.1	810	1.15	2.4	1 140	1.37	2.7	1 560	1.62	3.0
	60	-	-	-	-	-	-	440	0.94	2.2	570	1.15	2.5	760	1.38	2.8	1 020	1.65	3.0
LTZ 28 JH 4	30	920	0.87	1.9	1 280	1.08	2.3	1 740	1.32	2.7	2 340	1.58	3.1	3 070	1.87	3.5	3 980	2.19	4.0
	40	560	0.90	2.0	870	1.12	2.4	1 260	1.37	2.8	1 760	1.65	3.3	2 380	1.95	3.8	3 150	2.30	4.3
	50	-	-	-	550	1.12	2.4	850	1.38	2.9	1 230	1.68	3.4	1 710	2.01	3.9	2 310	2.38	4.5
	60	-	-	-	-	-	-	560	1.35	2.8	800	1.67	3.3	1 130	2.03	3.9	1 540	2.43	4.6
LTZ 40 HL 4	30	1 200	1.45	3.2	1 720	1.78	3.7	2 420	2.14	4.3	3 340	2.54	4.9	4 510	2.97	5.5	5 950	3.43	6.1
	40	950	1.50	3.2	1 360	1.83	3.8	1 930	2.21	4.4	2 690	2.61	5.0	3 660	3.05	5.7	4 880	3.52	6.3
	50	-	-	-	910	1.84	3.8	1 310	2.22	4.4	1 870	2.64	5.1	2 600	3.09	5.7	3 550	3.57	6.4
	60	-	-	-	-	-	-	880	2.20	4.3	1 200	2.63	4.9	1 670	3.09	5.6	2 310	3.59	6.3
LTZ 44 HM 4	30	1 170	1.81	5.0	1 810	2.19	5.3	2 660	2.58	5.7	3 760	2.96	6.1	5 140	3.34	6.5	6 820	3.70	7.0
	40	900	1.75	4.9	1 420	2.16	5.3	2 110	2.58	5.7	3 020	3.00	6.2	4 170	3.43	6.6	5 580	3.84	7.2
	50	-	-	-	910	2.07	5.2	1 410	2.53	5.7	2 070	3.00	6.2	2 950	3.48	6.7	4 050	3.95	7.3
	60	-	-	-	-	-	-	930	2.37	5.5	1 330	2.90	6.0	1 880	3.44	6.6	2 630	3.98	7.3
LTZ 50 HP 4	30	1 770	2.49	5.2	2 560	2.95	5.7	3 590	3.42	6.2	4 890	3.87	6.8	6 470	4.31	7.3	8 390	4.72	7.9
	40	1 370	2.37	5.1	2 050	2.88	5.7	2 920	3.40	6.3	4 010	3.93	6.9	5 370	4.45	7.6	7 020	4.95	8.3
	50	-	-	-	1 330	2.75	5.5	1 990	3.34	6.2	2 850	3.95	7.0	3 920	4.57	7.8	5 250	5.19	8.7
	60	-	-	-	-	-	-	1 230	3.14	5.9	1 800	3.85	6.8	2 540	4.59	7.8	3 500	5.33	8.8
LTZ 88 HU 4	30	2 140	3.59	7.3	3 280	4.12	8.4	4 800	4.65	9.4	6 760	5.19	10.3	9 220	5.72	11.2	12 230	6.25	12.0
	40	1 720	3.54	7.5	2 700	4.16	8.6	4 000	4.81	9.6	5 690	5.49	10.6	7 830	6.20	11.6	10 480	6.93	12.5
	50	-	-	-	1 650	3.97	8.6	2 670	4.77	9.7	4 030	5.63	10.8	5 770	6.54	11.8	7 970	7.50	12.7
	60	-	-	-	-	-	-	1 470	4.34	9.4	2 410	5.40	10.5	3 690	6.54	11.6	5 350	7.76	12.7
LTZ 100 HW 4	30	3 370	4.50	8.0	4 880	5.27	9.2	6 830	6.03	10.4	9 290	6.77	11.6	12 300	7.47	12.8	15 940	8.11	14.0
	40	2 530	4.19	7.6	3 850	5.09	8.9	5 550	6.02	10.3	7 690	6.96	11.7	10 330	7.89	13.1	13 550	8.80	14.4
	50	-	-	-	2 340	4.74	8.7	3 710	5.87	10.3	5 450	7.05	11.9	7 650	8.27	13.5	10 340	9.49	15.1
	60	-	-	-	-	-	-	2 040	5.34	10.2	3 300	6.81	12.0	4 950	8.34	13.9	7 020	9.93	15.8

230 V / 1 ph / 50Hz

Models	TE	-45			-40			-35			-30			-25			-20		
		TC	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.	C	P.F.	P.A.
LTZ 22 JE 5	30	470	0.62	4.2	740	0.76	4.9	1 090	0.92	5.7	1 530	1.10	6.4	2 090	1.30	7.1	2 770	1.53	7.8
	40	340	0.63	3.9	550	0.78	4.6	820	0.95	5.4	1 190	1.14	6.1	1 640	1.35	6.8	2 200	1.59	7.6
	50	-	-	-	370	0.77	4.5	550	0.95	5.3	810	1.15	6.0	1 140	1.37	6.8	1 560	1.62	7.5
	60	-	-	-	-	-	-	440	0.94	5.4	570	1.15	6.2	760	1.38	6.9	1 020	1.65	7.6
LTZ 28 JH 5	30	920	0.87	5.2	1 280	1.08	6.2	1 740	1.32	7.3	2 340	1.58	8.5	3 070	1.87	9.7	3 980	2.19	11.0
	40	560	0.90	5.5	870	1.12	6.6	1 260	1.37	7.8	1 760	1.65	9.1	2 380	1.95	10.4	3 150	2.30	11.8
	50	-	-	-	550	1.12	6.6	850	1.38	7.9	1 230	1.68	9.3	1 710	2.01	10.8	2 310	2.38	12.4
	60	-	-	-	-	-	-	560	1.35	7.5	800	1.67	9.1	1 130	2.03	10.7	1 540	2.43	12.5

**LEGEND**

TE evaporating temperature (°C)  
TC condensing temperature (°C)

P.F. cooling capacity (W)  
P.A. power input (kW)  
C current consumption (A)

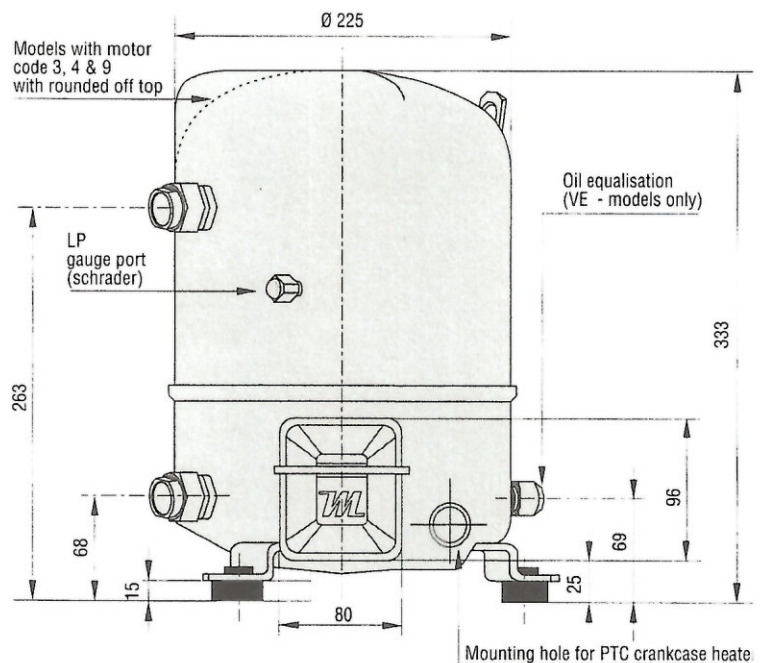
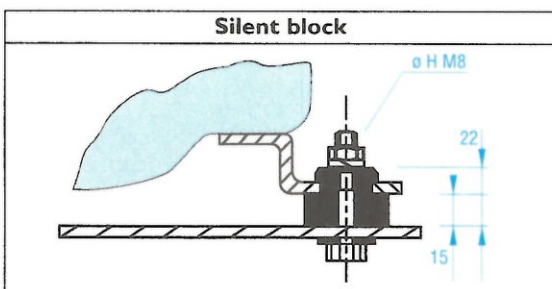
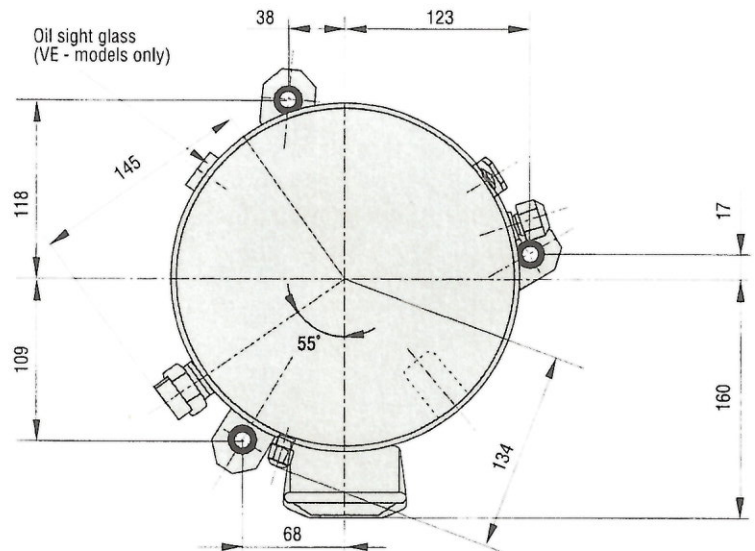
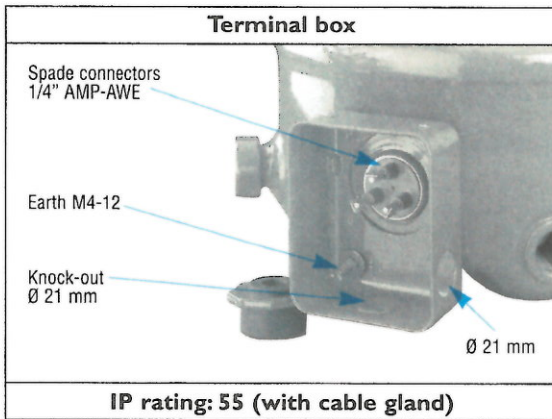
**RATING CONDITIONS**

Superheat 10 K  
Subcooling 0 K



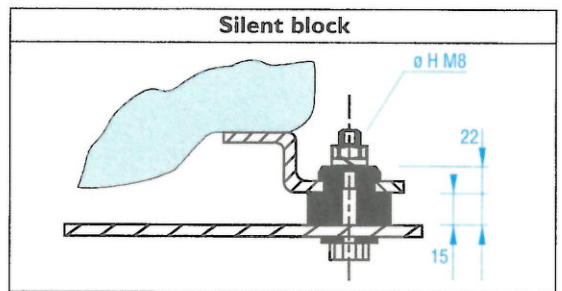
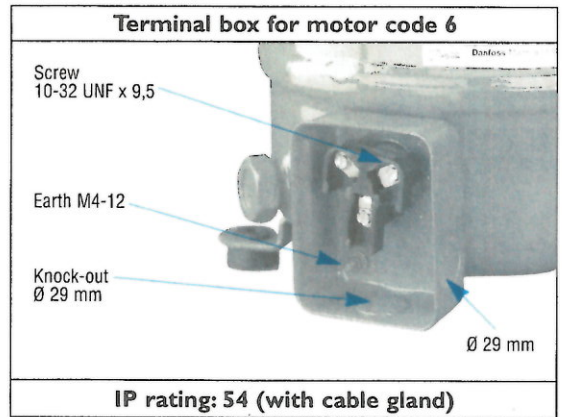
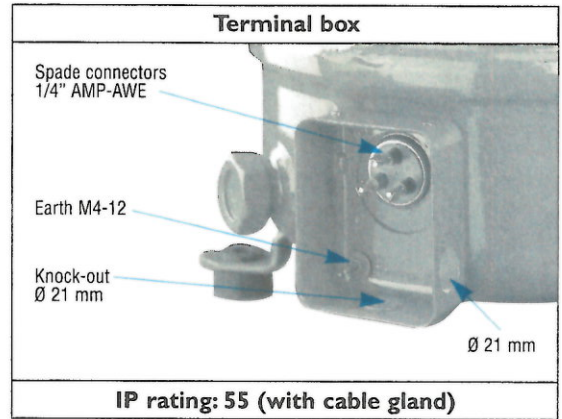
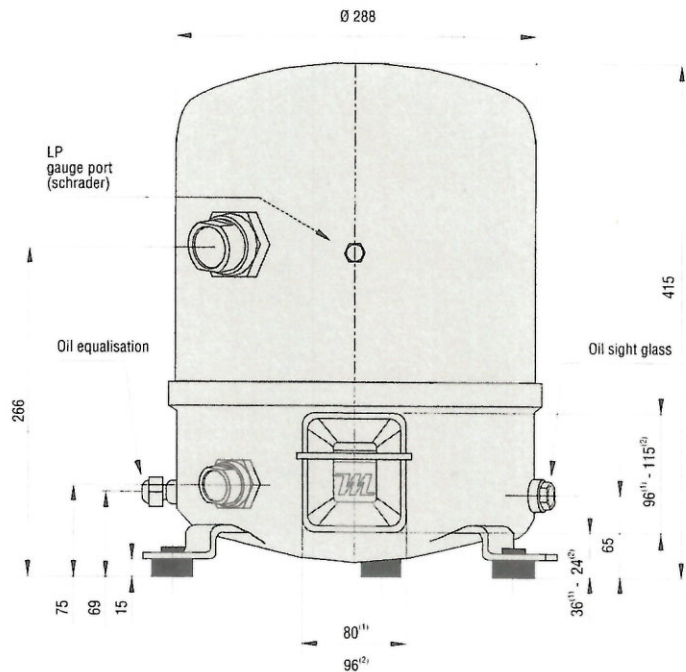
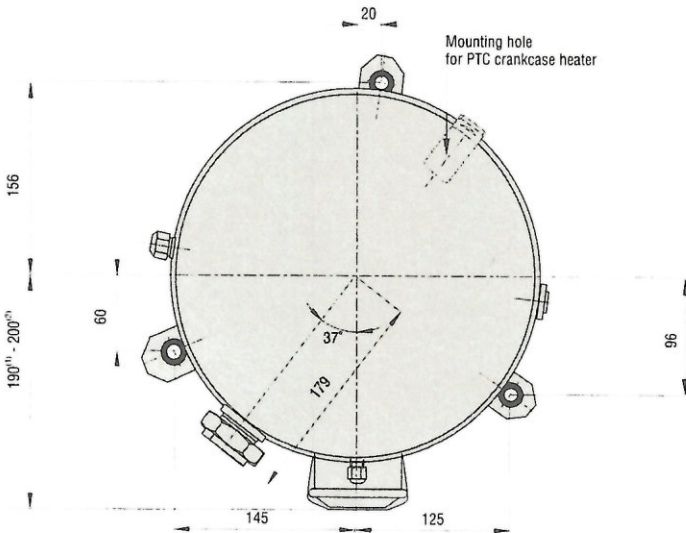
# Outline drawings

## I CYLINDER



	Rotolock connections size		Pipe sizing size		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
LTZ 22 JE	1 1/4"	1"	5/8"	1/2"	V09	V06
LTZ 28 JH						

# 2 CYLINDERS

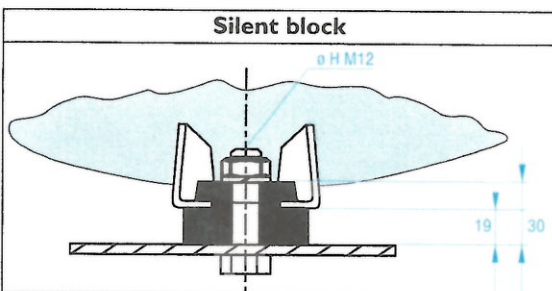
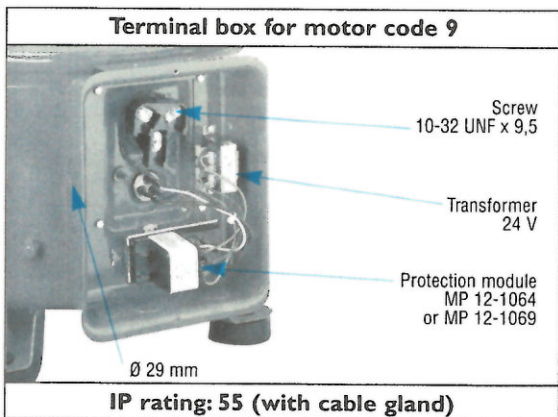
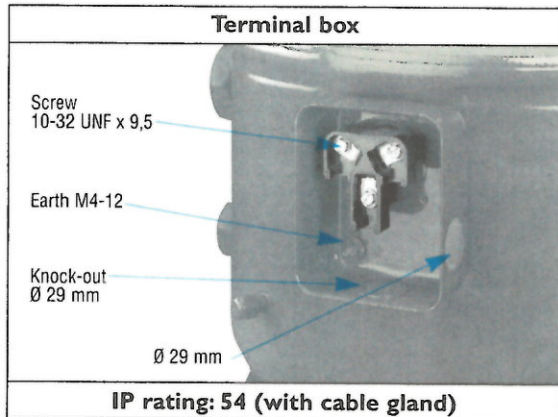


<sup>(1)</sup> LTZ 2 cyl. Code 1-3-4-9  
<sup>(2)</sup> LTZ 2 cyl. Code 6

	Rotolock connections size		Pipe sizing size		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
LTZ 40 HL LTZ 44 HM	1"3/4	1"1/4	7/8"	3/4"	V07	V04
LTZ 50 HP	1"3/4	1"1/4	1"1/8	3/4"	V02	V04

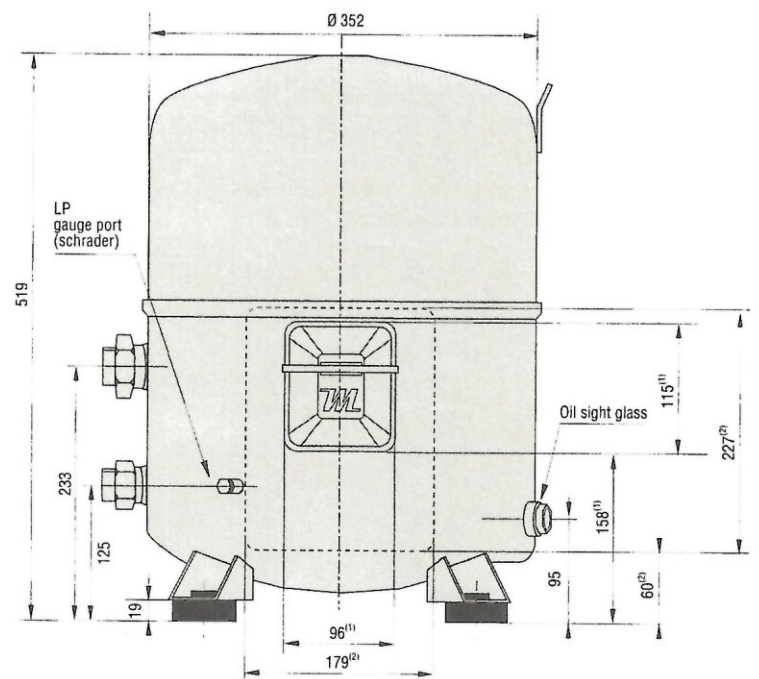
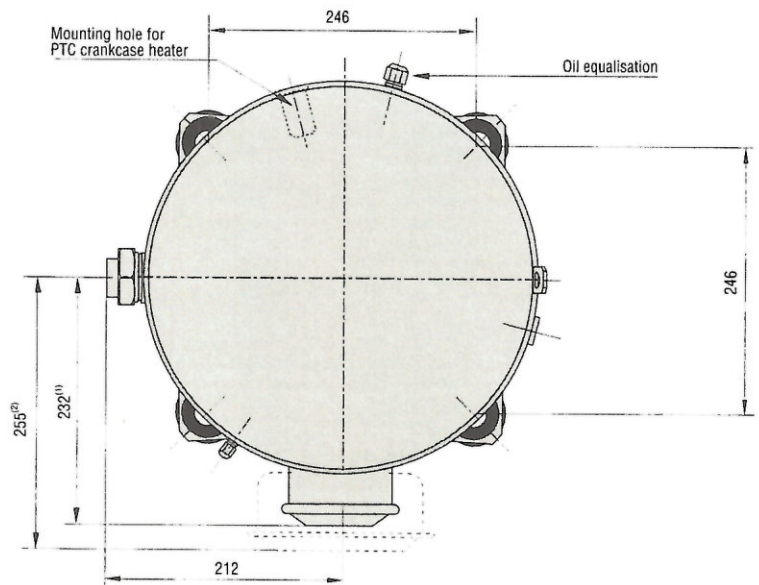


# 4 CYLINDERS



<sup>(1)</sup> LTZ 4 cyl. Code 3-4-6

<sup>(2)</sup> LTZ 4 cyl. Code 9



	Rotolock connections size		Pipe sizing size		Rotolock valves	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
LTZ 88 HU LTZ 100 HW	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 (Ohm) ( $\pm 7\%$ at 20°C)			
	1	5	1	5	1		5	
Winding					run	start	run	start
LTZ 22 JE	49.3	41	17	15	1.25	2.49	1.78	4.74
LTZ 28 JH	81	55	25	16	0.74	1.85	1.16	3.24
LTZ 44 HM	103	-	34	-	0.41	1.90	-	-
LTZ 50 HP	143	-	37	-	0.33	1.95	-	-

Motor code 1: 208 - 230 V / 1ph / 60 Hz

Motor code 5: 230 V / 1ph / 50 Hz

## MOTOR PROTECTION AND SUGGESTED WIRING DIAGRAMS

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. If the motor is overloaded and the protector trips, it may take up to

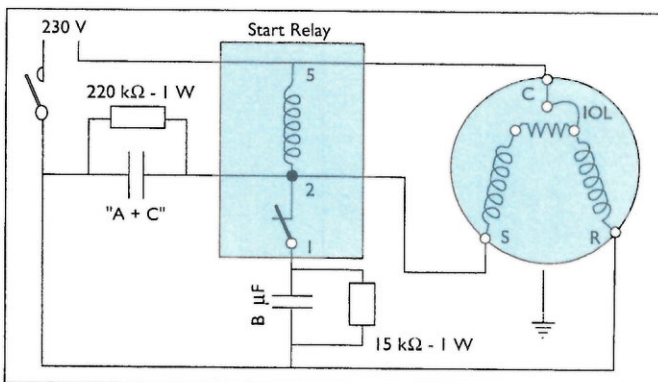
three hours to reset and restart the compressor.

### Standard single phase CSR wiring with accessory crankcase heater configuration

This system 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. A PTC crankcase heater is required.



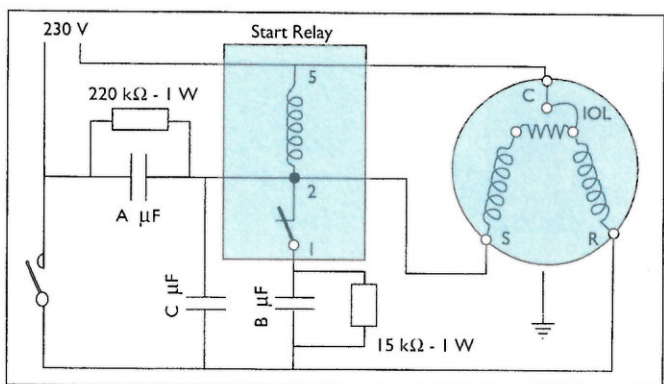
IOL: motor protector  
A + C: run capacitors  
B: start capacitor  
C: Common  
S: Start winding (auxiliary)  
R: Run winding (main)

Capacitors A and C are replaced by a single capacitor of size A + C.

### Single phase CSR wiring with trickle heat circuit configuration for LTZ 22

The trickle circuit provides compressor crankcase heating by feeding a low current to the auxiliary winding via the run capacitor during off periods.

Single phase LTZ 22 compressors can be operated without crankcase heater accessory when a trickle heat circuit is applied. For the larger single phase compressor models LTZ 28-50, the PTC crankcase heater is required.



IOL: motor protector  
A & C: run capacitors  
B: start capacitor  
C: Common  
S: Start winding (auxiliary)  
R: Run winding (main)



## Electrical connections and wiring

### CAPACITOR AND RELAY SELECTION TABLE

230 V / 1 ph / 50Hz Models	Run capacitors (1)		Start capacitors (2)	Start relay
	(A) $\mu$ F	(C) $\mu$ F	(B) $\mu$ F	
LTZ 22 JE-5	20	10	100	all models
LTZ 28 JH-5	20	10	100	3ARR3J4A4

(1) Run capacitors: 440 volts - minimum 10 000 hours.  
(2) Start capacitors: 330 Volts.

208 - 230 V / 1 ph / 60Hz Models2	Run capacitors (1)		Start capacitors (2)	Start relay
	(A) $\mu$ F	(C) $\mu$ F	(B) $\mu$ F	
LTZ 22 JE-1	15	30	100	all models 3ARR3J4A4
LTZ 28 JH-1	25	25	135	
LTZ 44 HM-1	30	15	135	
LTZ 50 HP-1	30	15	135	

### THREE PHASE ELECTRICAL CHARACTERISTICS

Motor Code	LRA - Locked Rotor Current (A)				MCC - Maximum Continuous Current (A)				Winding resistance (Ohm) ( $\pm 7\%$ at 20°C)			
	3	4	6	9	3	4	6	9	3	4	6	9
LTZ 22 JE	38	16	-	22	11	6	-	5	2.49	10.24	-	13.1
LTZ 28 JH	57	23	-	29	16	7.5	-	8.5	1.37	7.11	-	9.7
LTZ 40 HL	-	42	-	-	-	9	-	-	-	3.80	-	-
LTZ 44 HM	100	42	92	57	22	9.5	18	11	0.74	3.80	0.96	2.54
LTZ 50 HP	117	40	92	64	23	12	18	15	0.62	3.80	0.96	2.54
LTZ 88 HU	157	78.5	126	110	43	22	35	23	0.48	1.98	0.77	1.26
LTZ 100 HW	210	105	170	150	54	27	43	30	0.37	1.54	0.49	0.84

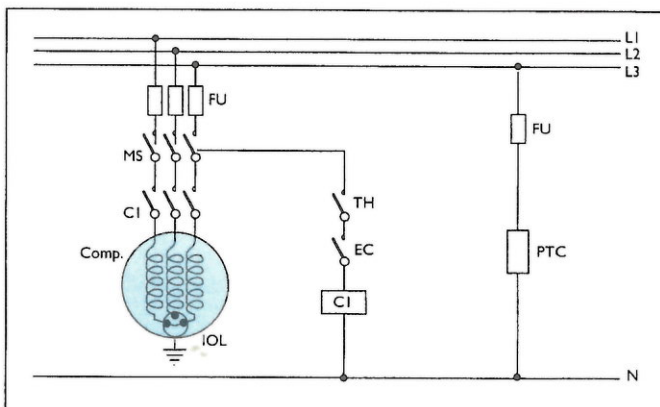
Note: for three phase motors, the winding resistances measured at compressor terminals is the sum of two winding resistor values shown above.

### MOTOR PROTECTION AND SUGGESTED WIRING DIAGRAM

The 3-phase compressors are protected by an internal motor protector, connected to the neutral point of the star connected stator windings. This IOL (internal overload line break) protects the motor against overheating, current overload and locked rotor conditions. The protector cuts out all 3 phases

simultaneously. If the motor is overloaded and the protector trips, it may take up to three hours to reset and restart the compressor.

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



#### LEGEND:

FU	.....	fuses
MS	.....	main switch
CI	.....	compressor contactor
TH	.....	thermostat
EC	.....	external controls
COMP	.....	compressor
MP	.....	protection module
PTC	.....	crankcase heater
TR	.....	transformer
IOL	.....	internal overload line break

# Miscellaneous

## APPROVALS

Maneurop® LTZ compressors with motor code 1, 3 and 4 are UL approved (except LTZ40-4). All LTZ models have CE marking.



## DESIGN VERSION

EX: LTZ 50 HP 4 A VE

	1	3	4	5	6	9
LTZ 22	A	A	A	A	*	A
LTZ 28	A	A	A	A	*	A
LTZ 40	-	-	A	-	-	-
LTZ 44	*	*	A	-	*	A
LTZ 50	*	A	A	-	*	A
LTZ 88	-	*	*	-	*	A
LTZ 100	-	*	*	-	*	A

Modifications in the original compressor design are indicated with a design version code. This design version code appears in the compressor reference directly after the motor voltage code (see page 4).

The table shows the actual design version for LTZ compressors. When no modifications to the original design are made, no design version code appears. This is indicated with a \*-symbol in the table. The order reference does not include the design version code.

\* no letter  
- model not available

## IP RATING

All Maneurop® LTZ compressors are rated IP54 or IP55 according to CEI 529, see table below. These IP

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

IP      5      5

**First numeral:** \_\_\_\_\_

Level of protection against contact and foreign objects  
5 = Complete protection against contact and against harmful dust deposits

**Second numeral:** \_\_\_\_\_

Level of protection against water  
4 = Protection against water splashing from any direction  
5 = Protection against jets of water from any direction

Model	Rating
LTZ 22	IP55
LTZ 28	IP55
LTZ 40	IP55
LTZ 44-1/3/4/9	IP55
LTZ 44-6	IP54
LTZ 50-1/3/4/9	IP55
LTZ 50-6	IP54
LTZ 88-3/4/6	IP54
LTZ 88-9	IP55
LTZ 100-3/4/6	IP54
LTZ 100-9	IP55



# Refrigerants and lubricants

## GENERAL INFORMATION

Maneurop® LTZ compressors are developed for HFC refrigerants R404A and R507 which are generally accepted as long term alternatives for CFC refrigerant R502.

Maneurop® LT compressors are still available for replacement or applications with HCFC blends.

The table below gives an overview of different refrigerants for low

temperature applications and the corresponding Maneurop® compressor and lubricant. Also check local legislation and safety standards.

Refrigerant	Type	ODP <sup>1</sup>	GWP <sup>2</sup>	Compressor	Lubricant	Remarks
R404A	HFC	0	3260	LTZ	POE 160Z, factory charged	-
R507	HFC	0	3300	LTZ	POE 160Z, factory charged	-
R22 based transitional refrigerants	HCFC	0.02 0.03	1960 3570	LT	Replace factory charged mineral oil by 160 ABM.	Transitional refrigerants and R502, should never be used in combination with LTZ compressors.
R502	CFC	0.22	5500	LT	Maneurop® mineral oil 160 P, factory charged.	
Hydrocarbons	HC	Danfoss Maneurop does not authorise the use of hydrocarbons with their compressors.				

<sup>1</sup> ODP: Ozone Depletion Potential - <sup>2</sup> GWP: Global warming Potential, time-horizon 100 years, source ARTI 1999

### R404A

Refrigerant R404A is a ternary mixture of R125, R143a and R134a. Its thermodynamic properties are comparable to R502. R404A has a very small temperature glide (< 1 K) between dew point and bubble point and should therefore 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. Apply the Maneurop® LTZ compressor with factory charged 160Z polyolester oil. Maneurop® LT compressors should never be used for R404A systems.

### R507

Refrigerant R507 is a binary mixture of R125 and R143a. Its thermodynamic properties are comparable to R502. R507 has no temperature glide and behaves as a pure refrigerant (azeotropic mixture). Apply the Maneurop® LTZ compressor with factory charged 160Z polyolester oil. Maneurop® LT compressors should never be used for R507 systems.

### R22 based transitional refrigerants

A wide variety of R22-based transitional refrigerants (also called service refrigerants or drop-in blends) are developed as temporary R502 alternatives. Some examples are R402A, R402B, R403A and R403B. They all have a (low) ODP value. Because of the R22 component, Maneurop® LTZ compressor should not be used for these refrigerants, but Maneurop® LT compressors should be used instead. The initial mineral oil charge of the LT compressor must be replaced by Maneurop® 160ABM alkylbenzene/mineral lubricant.

### R502

The Montreal protocol states that CFC refrigerants such as R502 may no longer be applied in new installations in the signatory member countries. For other countries or for replacement in existing installations Maneurop® LT compressors are still available. Maneurop® LTZ compressors shall never be used for R502 systems.

### Hydrocarbons

Hydrocarbons such as propane, isobutane etc. are extremely flammable. Danfoss Maneurop does not authorise the use of hydrocarbons with LTZ or LT compressors in any way.