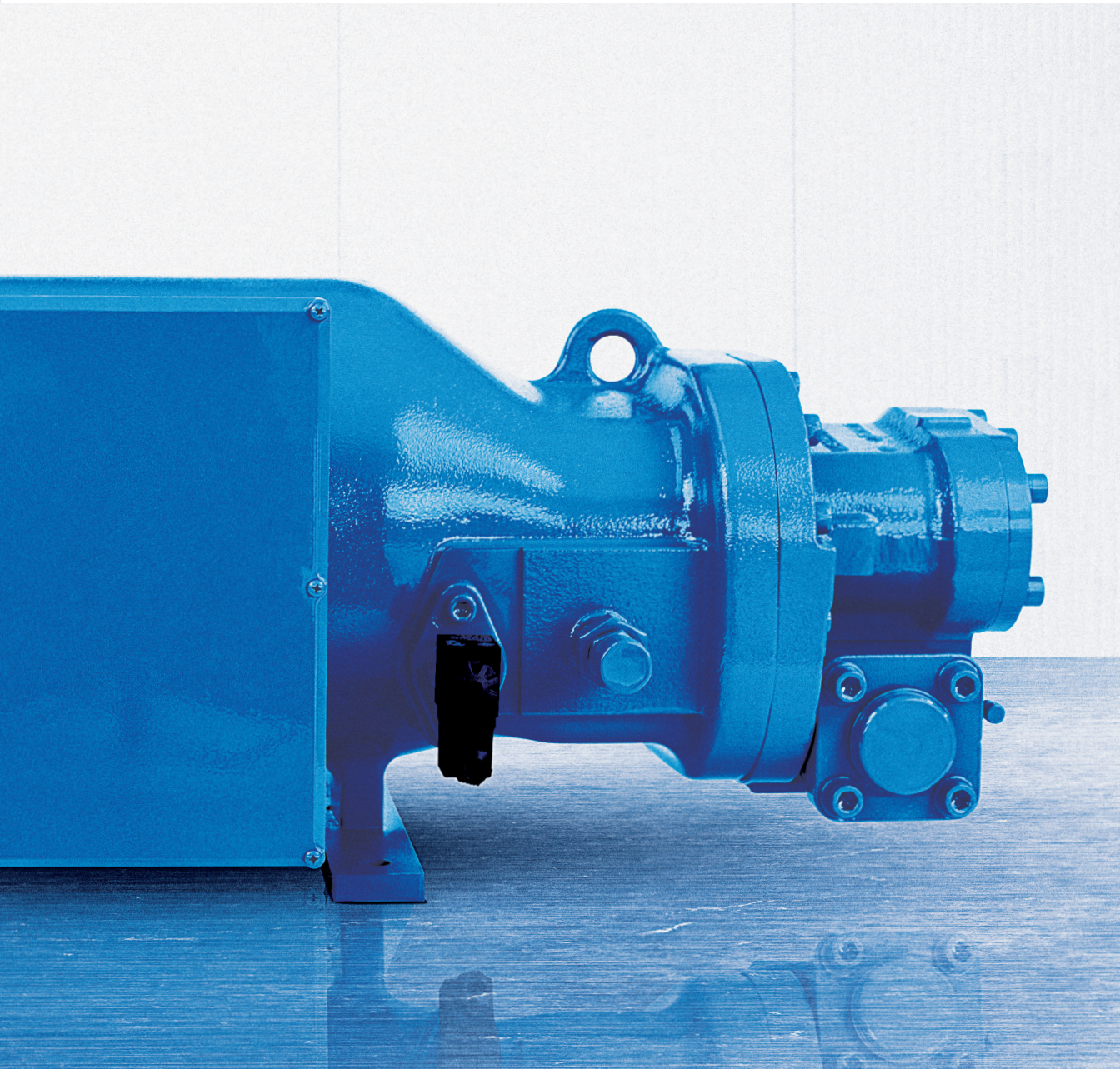


SCREW COMPRESSORS FOR REFRIGERATION

FVR / NR6 series

50Hz



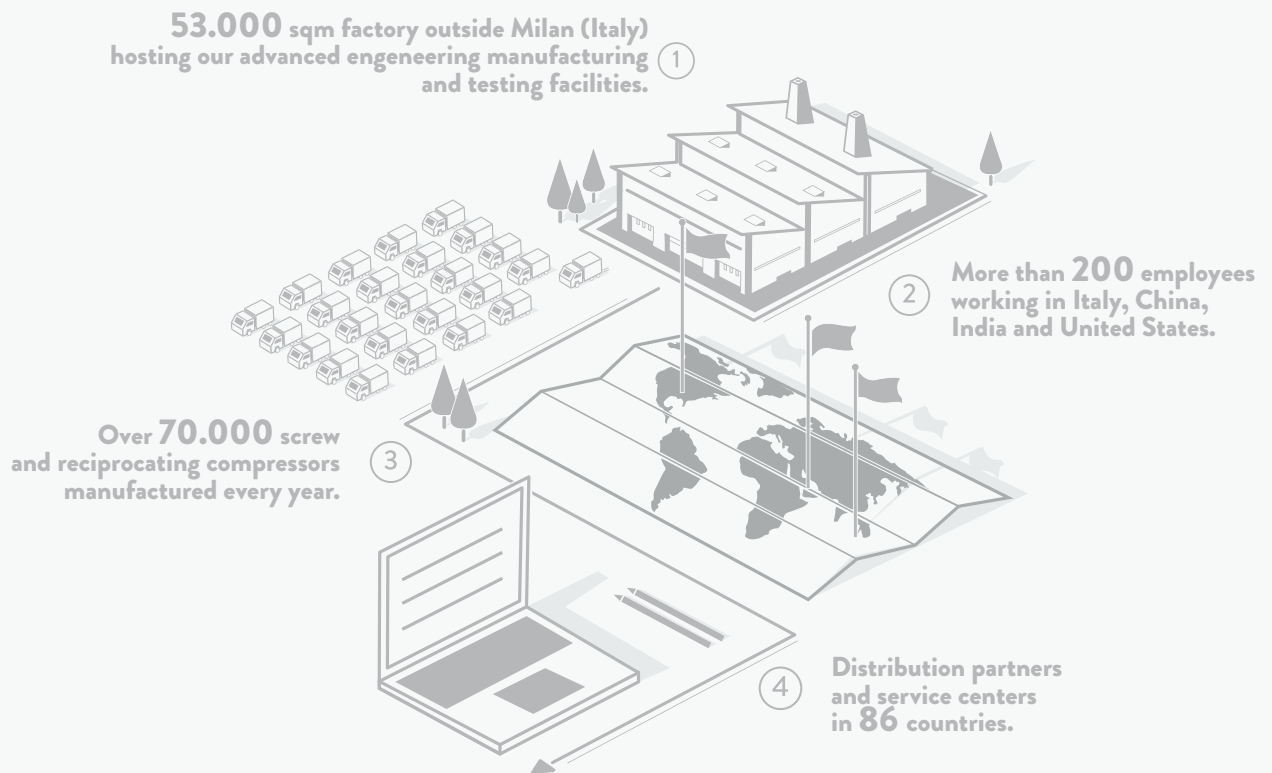
INDEX

4	About the Company
5	Segments and Solutions
6	Product Information
16	Technical Data and Operating Limits
22	Technical Drawings and Dimensions
28	Contact us

ABOUT THE COMPANY

Frascold manufactures over 70,000 screw and reciprocating compressors a year. Our 53,000 m² factory outside of Milan (Italy) houses our advanced engineering, manufacturing and testing facilities. More than 200 employees work in the Headquarters and in the Subsidiaries based in the United States, China and India, with distribution partners and service centers in 86 countries.

4



More than 80 years ago Frascold born as a small family owned Company developing solutions in refrigeration and conditioning industry. Today we invest more and more in people, products, technologies and services aiming to become the best partner for our Customers and the touchstone for the market.

GIUSEPPE GALLI - Frascold Executive Managing Director

SEGMENTS



COMFORT



COMMERCIAL & TRANSPORT
REFRIGERATION



INDUSTRIAL
REFRIGERATION



PROCESS COOLING

SOLUTIONS

Cooling capacity range @50Hz



SCREW COMPRESSORS



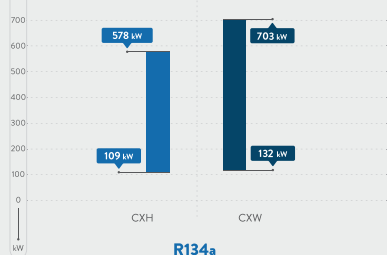
RECIPROCATING COMPRESSORS



CONDENSING UNITS

5

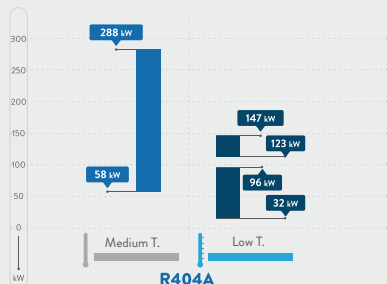
CONDITIONING



Testing Conditions Data Reference:

CXH: Evap. T. +2°C; Cond. T. +50°C; Superheating 10K; Subcooling 5K
CXW: Evap. T. +3°C; Cond. T. +38°C; Superheating 1K; Subcooling 5K

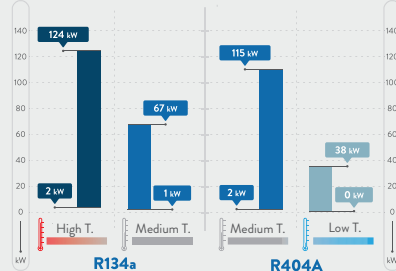
REFRIGERATION



Testing Conditions Data Reference:

Medium T.: Evap. T. -10°C; Cond. T. +45°C
Low T.: Evap. T. -35°C; Cond. T. +40°C ECO

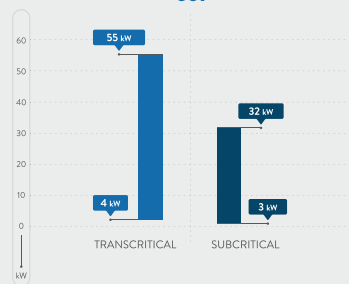
STANDARD REFRIGERANTS



Testing Conditions Data Reference:

High T.: Evap. T. +5°C; Cond. T. +50°C
Medium T.: Evap. T. +10°C; Cond. T. +45°C
Low T.: Evap. T. -35°C; Cond. T. +40°C

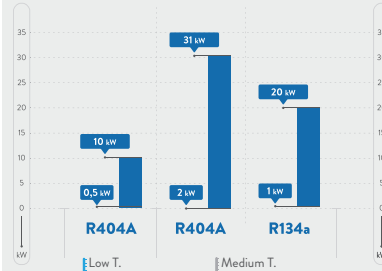
CO₂



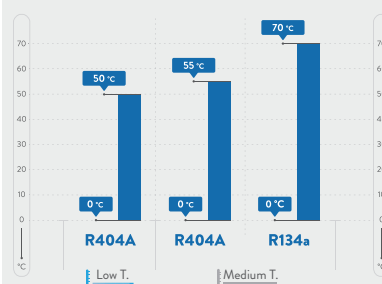
Testing Conditions Data Reference:

Transcritical: Evap. T. -10°C; Gas cooler out T. 33°C;
Gas cooler pressure 83,7 bar; Superheating 10K;
Subcritical: Evap. T. -30°C; Cond. T. +10°C; Superheating 10K;

EB / LB2 RANGE



MAX AMBIENT TEMPERATURE (°C)



Testing Conditions Data Reference:

Medium T.: Cooling Capacity @32°C Ambient T.; Evap. T. -10°C
Low T.: Cooling Capacity @32°C Ambient T.; Evap. T. -35°C



FVR / NR6 SCREW COMPRESSORS FOR REFRIGERATION

The latest addition to the Frascold family is the all new FVR and NR6 Series screw compressor. This small-footprint machine is the distillation of our many years experience building screw compressors. Quiet, efficient, and reliable, the FVR Series is everything you have come to expect from Frascold.

The series consists of **9 models** ranging from 30 - 60 Hp and displacements of 120 to 160 m³/h. A broad refrigerant range includes **R134a, R404A, R407A, R407F, R448A, R449A, and R290**. The FVR Series is ideal for many uses including industrial, pharmaceutical, retail, marine and heat pump applications.

FEATURES AND BENEFITS



Plug&Play: Easy installation & service



All models VFD compatible



High efficiency



Compact footprint



2 years warranty standard



Refrigerants

HFCs, HFOs and natural refrigerants.



Silent operations

Perfect mechanical balancing means low vibrations, pulsations and noise.



Flexibility

The right compressor for any application: Commercial refrigeration, Air conditioning, Industrial refrigeration, Retail cooling systems, Pharmaceutical manufacturing, Liquid chillers, Process chillers, Marine cooling systems, Cryogenic systems & Heat Pumps.



Advanced protection systems (Optional)

CONFORMITY DECLARATION

Frascold Screw compressors for refrigeration are intended for installation in refrigeration systems. The machine or partly completed machines shall comply with local safety regulation and standards of the place of installation (within the EU according to the EU Directives 2006/42/EC Machinery Directive, 2014/68/UE Pressure Equipment, 2006/95/EC Low Voltage Directive). They may be put into operation only if the compressor has been installed in accordance with these assembly instructions.

Commissioning is only possible if the entire system into which it is integrated has been inspected and approved in accordance to the provisions of legal regulations.

The Manufacturer Declaration, describes the standards to be applied.
The Manufacturer Declaration of incorporation, according to the 2006/42/EC, is available at: **www.frascold.it**, documentation, manufacturer's declaration.

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PERFORMANCE DATA FSS3 SOFTWARE

Please refer to our FSS3 to check performances of all our compressors.



①

① Operating limits



②

② Cooling capacity



③

③ All operating data with any kind of refrigerant



④

④ European standard EN12900 at 50Hz



⑤

⑤ Technical information



⑥

⑥ Drawings



⑦

⑦ Manuals



⑧

⑧ Catalogues and certifications

CONTROL PROTECTION DEVICE

Standard compressor protection:

All the compressors are supplied complete with an **INT69 FRY** electronic protection module connected to a chain of PTC thermistors inserted into the electric motor, and a thermistor sensor positioned on the discharge temperature control output. If a problem is encountered, the module will shut the compressor down to prevent damage.

Optional compressor protection:

Optionally, all compressors can be equipped with the new **Kriwan INT69 FRYL® Diagnose** protection module. This adds data logging, diagnostic, and protection features which can improve reliability and service life of the compressor. Logged data can be used to aid in system optimization, identify problems and prevent malfunctions before they happen. The **INT69 FRYL® Diagnose** protection device has a dedicated connection port for the following compressor protection devices:

- Thermistor PTC (1, 2)
- Discharge temperature sensor (3, 4)
- Oil level check (5, 6)
- Oil filter clogging sensor (7, 8)
- Oil flowswitch (9, 10)



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Protection features:

Data logged on the **INT69 FRYL® Diagnose** device can be downloaded via USB or DP-Modbus. This data can be used by technicians to correct system issues or conduct preemptive maintenance. The Kriwan software for reading data may be downloaded directly and free of charge from the web-site. In the event of a compressor malfunction, the device makes available the following features and data:

Safety Features

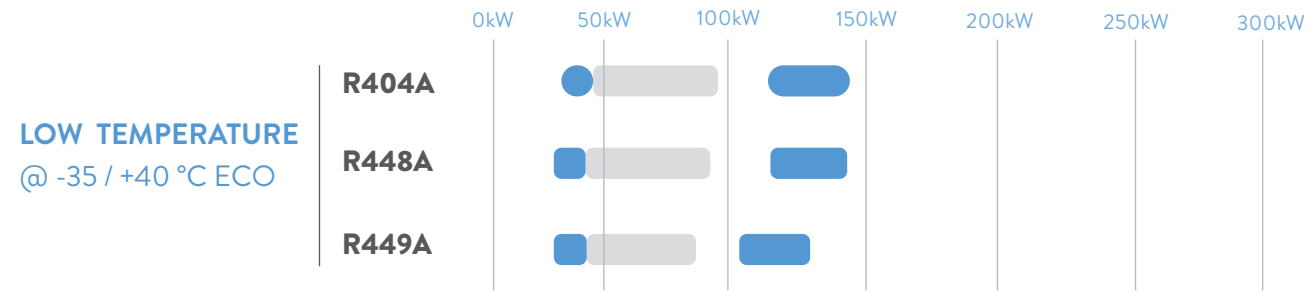
- Phase control
- Monitoring the number of start-ups
- Oil temperature check (and of discharge)
- Motor temperature check
- Oil level check
- Oil filter clogging check
- Oil flow check

Statistical Data

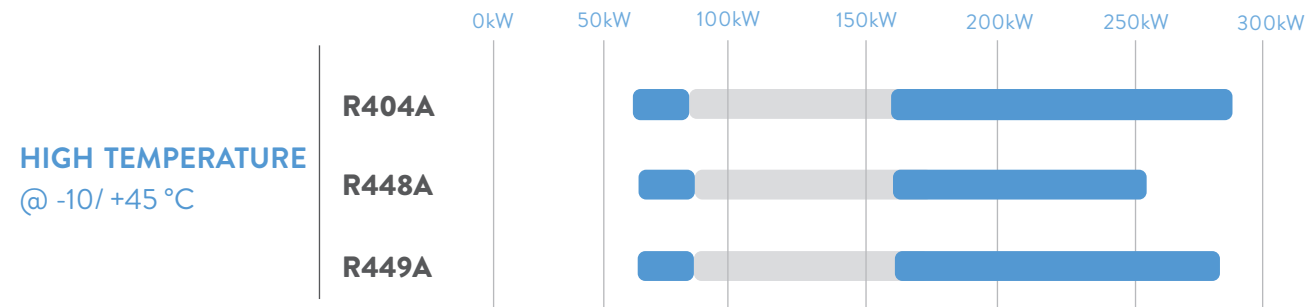
- Detailed list of the last 20 errors
- Number of on/off cycles
- Number of compressor start-ups
- Run times of compressor and accessories
- Number of start-ups over the last 7 days
- Maximum number of re-starts in an hour

COOLING CAPACITY

Range @50Hz



	FVR	CURRENT CAPACITY	NR6
R404A	32 kW - 43 kW	43kW - 96 kW	123 kW -147 kW
R448A	28 kW - 37 kW	37 kW - 96 kW	123 kW -146 kW
R449A	28 kW - 37 kW	37 kW - 83 kW	107 kW - 127 kW



	FVR	CURRENT CAPACITY	NR6
R404A	59 kW - 78 kW	78 kW - 172 kW	160 kW - 288 kW
R448A	61 kW - 81 kW	81 kW - 176 kW	161 kW - 256 kW
R449A	60 kW - 80 kW	80 kW - 174 kW	160 kW - 281 kW

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PRODUCT RANGE

FVR-NR6 MODELS RANGE

H Series 13 Models

Motor 1
120 - 538 m³/h
40 - 180 HP

HIGH
& MEDIUM
TEMPERATURE

LOW
TEMPERATURE

L Series 10 Models

Motor 2
120 - 538 m³/h
30 - 60 HP

H Series 12 Models

Motor 3
120 - 538 m³/h
30 - 140 HP

R134a
APPLICATION

FVR	L		50	160	Y
-----	---	--	----	-----	---

Version	
Y	Standard

INFORMATION PLATE

FVR/NR Series

STANDARD EQUIPMENT AND OPTIONAL ACCESSORIES

Description	FVR		NR6	
	Std.	Opt.	Std.	Opt.
Part winding (PWS) electric motor 380-420 V / 3 / 50 Hz (440-480 V / 3 / 60 Hz)	•		•	
Suction shut-off valves with soldering connections	•			•
Discharge shut-off valves with soldering connections		•	•	
Suction flanges with weld bushing			•	
Discharge flanges with soldering connections	•			
Integrated check valve and safety valve	•		•	
Steps capacity control and unloaded start	•		•	
IP65 terminal box	•		•	
Discharge temperature PTC sensor	•		•	
T00EC45B electronic protection module with manual reset (monitors motor windings, temperature, checks at start presence and correct sequence of phases and sense of rotation)	•		•	
Rotalock connection for oil injection	•		•	
Integrated oil filter and oil flow switch			•	
Oil injection kit: oil filter, oil flow switch, solenoid valve, oil sight glass [FVR] / Oil injection kit: solenoid valve, oil sight glass [NR6]	•		•	
Nitrogen protective charge	•		•	
Packing ensuring proper handling and adequate protection	•		•	
Connection for ECO	•		•	
Special voltage for electric motor		•		•
Rubber vibration dampers (4 pcs)		•		•
Valve connection kit for ECO		•		•
Electronic Alarm Control Module for oil flow switch		•		•
Oil Filter Clogging Differential Pressure Switch (Electronic)		•		•
Bridges for DOL Start (STD for 120...160)		•		•
Special painting according to C5M painting requirements		•		•

CAPACITY REGULATION

Frascold reciprocating compressors capacity can be regulated with:

1. **CAPACITY CONTROL (CC)**
2. **VARIABLE FREQUENCY DRIVE (VFD)**

CAPACITY CONTROL (CC)

Under conditions of reduced thermal load, the compressor is capable of bringing the system to be cooled to the design temperature in a shorter time. In such a case, it is necessary to verify if the increased number of compressor start-ups (which derives from the shorter period of cooling) is compatible with the maximum that the compressor can support. The device used to control capacity, thus reducing the cooling capacity of the compressor, makes it possible to compensate this situation and prevent the efficiency of the entire cooling system from being compromised.

Checking the capacity requires the following functioning modes:

	Steps
FVR	75 / 100%
NR6	50 / 75 / 100 %

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The step system for the NRH/L6 series allows for obtaining a further partialisation step which corresponds with 25% of the refrigeration capacity available and is used exclusively as an unloaded start. The capacity check is carried out by the operation of three solenoids. The control sequence of the solenoids and the operational diagram are set out below.

Solenoid activation Diagram

Capacity Control 1:

Model Series	Full load (100%)	1. Step (75%)	2. Step (50%)	Start/Stop 2:
RTSH/L 120-150	V1= ●	V1= ○	-	-
NRH/L 6	V1= ● V2= ○ V3= ○	V1= ● V2= ○ V3= ●	V1= ● V2= ● V3= ○	V1= ○ V2= ○ V3= ○

1: The effective capacity of the stages depends on the operating conditions.

2: The start/stop step can only be used during the start-up and stopping phases.

○ Coil de-energized

● Coil energized

VARIABLE FREQUENCY DRIVE (VFD)

All the compressors are designed for use with inverter technology and are suitable for operating within frequency range (30÷70 Hz). In some conditions of use, a restriction on the range of frequency might apply. In particular, the upper frequency is dependent on the maximum operational current (MRA). For performance data at the various frequencies and the maximum limits under each condition, see Frascold selection software.

Calculate maximum frequency

Within the limits of use of each specific compressor and refrigerant for each work point, there is a maximum frequency not to be exceeded, which can be calculated using the following formula:

$f(\text{Max})$ = maximum possible frequency [Hz]

MRA = maximum operational current [A]

I_e = current absorbed at the work point at 50 Hz [A]

$$f(\text{Max}) = \frac{\text{MRA} \times 50 \text{ Hz}}{I_e}$$

Calculate corresponding capacity

The refrigeration capacity is calculated as a function of the frequency using the following formula:

$Q_0(f)$ = refrigeration capacity at working frequency [W]

f_a = actual frequency applied to the compressor [Hz]

$Q_0 50 \text{ Hz}$ = refrigeration capacity at 50 Hz [W]

$$Q_0(f) = \frac{f_a \times Q_0 50 \text{ Hz}}{50 \text{ Hz}}$$

TECHNICAL DATA AND OPERATING LIMITS

FVR / NR6 Series

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You can find the most updated information in our Product Selection Software FSS3 at the link:

https://www.frascold.it/en/download/software/fss_3_frascold_selection_software



Standard motor Voltage - PWS 400 (+10%) V/3/50Hz // 460 (+10%) V/3/60Hz

Models	Motor Vers.	Displacement		Nominal power 50Hz	Partition steps	MRA	LRA, PW motor	LRA, DOL motor	Frequency min.	Frequency max.	Protection Index	
		50Hz	60Hz									
		[m³/h]	[m³/h]									
FVR-L-30-120	-	120	144	23	100 - 75	61	125	216	30	70	IP65	
FVR-H-30-120	1	120	144	23	100 - 75	61	125	216	30	70	IP65	
FVR-H-40-120	2	120	144	30	100 - 75	68	171	294	30	70	IP65	
FVR-L-40-140	-	140	168	30	100 - 75	68	171	294	30	70	IP65	
FVR-H-40-140	1	140	168	30	100 - 75	68	171	294	30	70	IP65	
FVR-H-50-140	2	140	168	38	100 - 75	89	200	306	30	70	IP65	
FVR-L-50-160	-	160	192	38	100 - 75	89	200	306	30	70	IP65	
FVR-H-50-160	1	160	192	38	100 - 75	89	200	306	30	70	IP65	
FVR-H-60-160	2	160	192	45	100 - 75	108	254	389	30	70	IP65	
NRH6-110-316Y	2	316	379,2	85	100-75-50	184	434	720	30	70	IP65	
NRH6-110-372Y	1	372	446,4	85	100-75-50	154	434	720	30	70	IP65	
NRH6-125-372Y	2	372	446,4	95	100-75-50	218	530	838	30	70	IP65	
NRL6-125-428Y	-	428	513,6	95	100-75-50	198	530	838	30	70	IP65	
NRH6-115-428Y	1	428	513,6	85	100-75-50	184	434	720	30	70	IP65	
NRH6-140-428Y	2	428	513,6	105	100-75-50	245	587	921	30	70	IP65	
NRH6-125-468Y	1	468	561,6	95	100-75-50	198	530	838	30	70	IP65	
NRH6-160-468Y	2	468	561,6	120	100-75-50	282	729	1114	30	70	IP65	
NRL6-160-538Y	-	538	645,6	120	100-75-50	287	729	1114	30	70	IP65	
NRH6-140-538Y	1	538	645,6	105	100-75-50	245	587	921	30	70	IP65	
NRH6-180-538Y	2	538	645,6	135	100-75-50	304	786	1209	30	70	IP65	

Find the most updated information in our Product Selection Software FSS3 at the link :
https://www.frascold.it/en/download/software/fss_3-frascold_selection_software

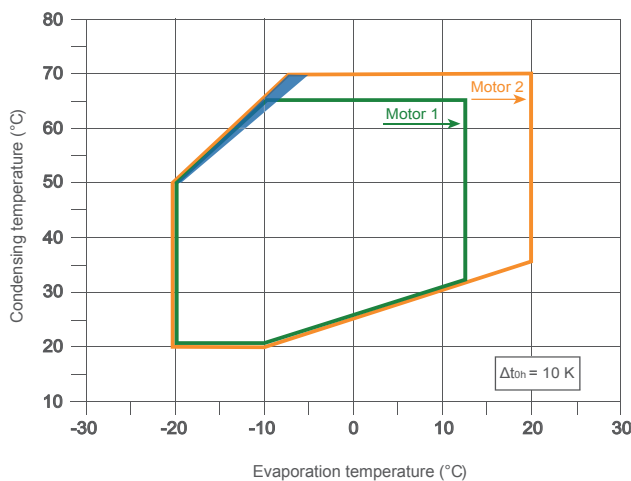
	Max operating pressure	Max. equalized pressure	Suction Valve (SV)	Suction Valve (SV)	Discharge Valve (DV)	Discharge Valve (DV)	Discharge Bushing (DL)	Discharge Bushing (DL)	Suction bushing (SL)	Suction bushing (SL)	Net Weight
	[bar]	[bar]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[kg]
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	210
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	210
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	215
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	218
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	223
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	223
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	223
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	223
	30	20,5	54	2" 1/8	-	-	42	1" 5/8	-	-	226
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	730
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	731
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	734
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	735
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	732
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	742
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	736
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	749
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	749
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	749
	30	20,5	-	-	DN80	DN80	-	-	105	4" 1/8	765

OPERATING LIMITS

Diagrams published in this catalog are to be considered as a general diagram for the full range of semi-hermetic reciprocating compressors. For specific model and refrigerant performance data, please use the **FSS.3 Frascold Selection Software** available for free download at www.frascold.it.

Diagrams assume a full compressor load with a power supply frequency of 50 Hz. Performance displayed for R134a, R404A, R507A, R448A, R449A, R407F, R407A, and R290. Data on other refrigerants available on request. Capacities are shown in accordance with European EN12900 standard and at 50Hz operation. To calculate capacity in other conditions and at 60 Hz use the Frascold Selection Software (download free at frascold.it).

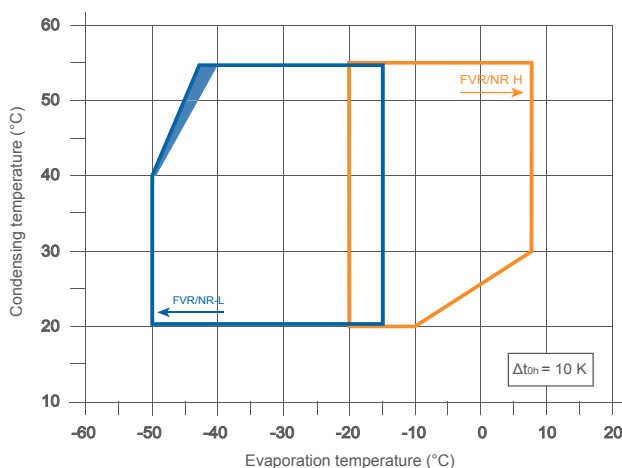
R134a



Standard application diagram

Motor size 1 - 2
Compressor capacity 100%
Overheating = 10K

R404A - R507A

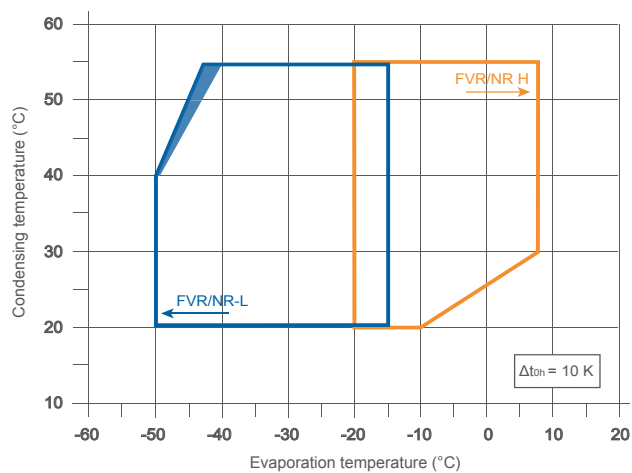


Standard application diagram

FVR/NR H/L
Compressor capacity 100%
Overheating = 10K

■ For operation in this zone, please contact Frascold.

R448A - R449A



Standard application diagram

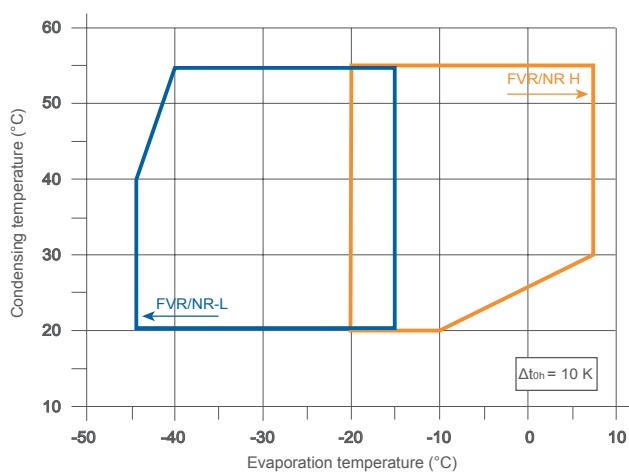
FVR/NR H/L

Compressor capacity 100%

Overheating = 10K

For operation in this zone, please contact Frascold.

R407F - R407A



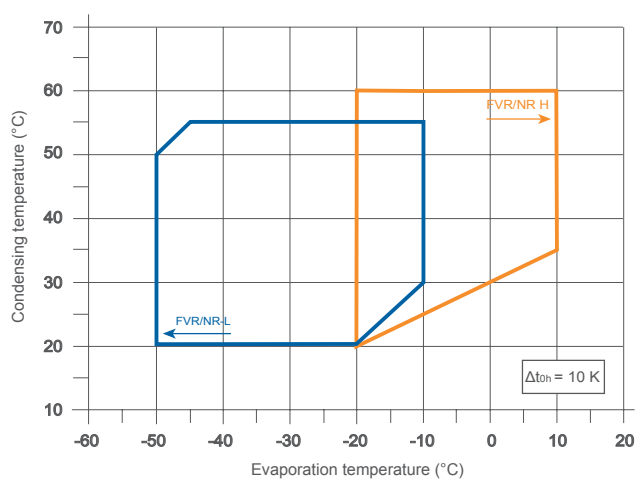
Standard application diagram

FVR/NR H/L

Compressor capacity 100%

Overheating = 10K

R290



Standard application diagram

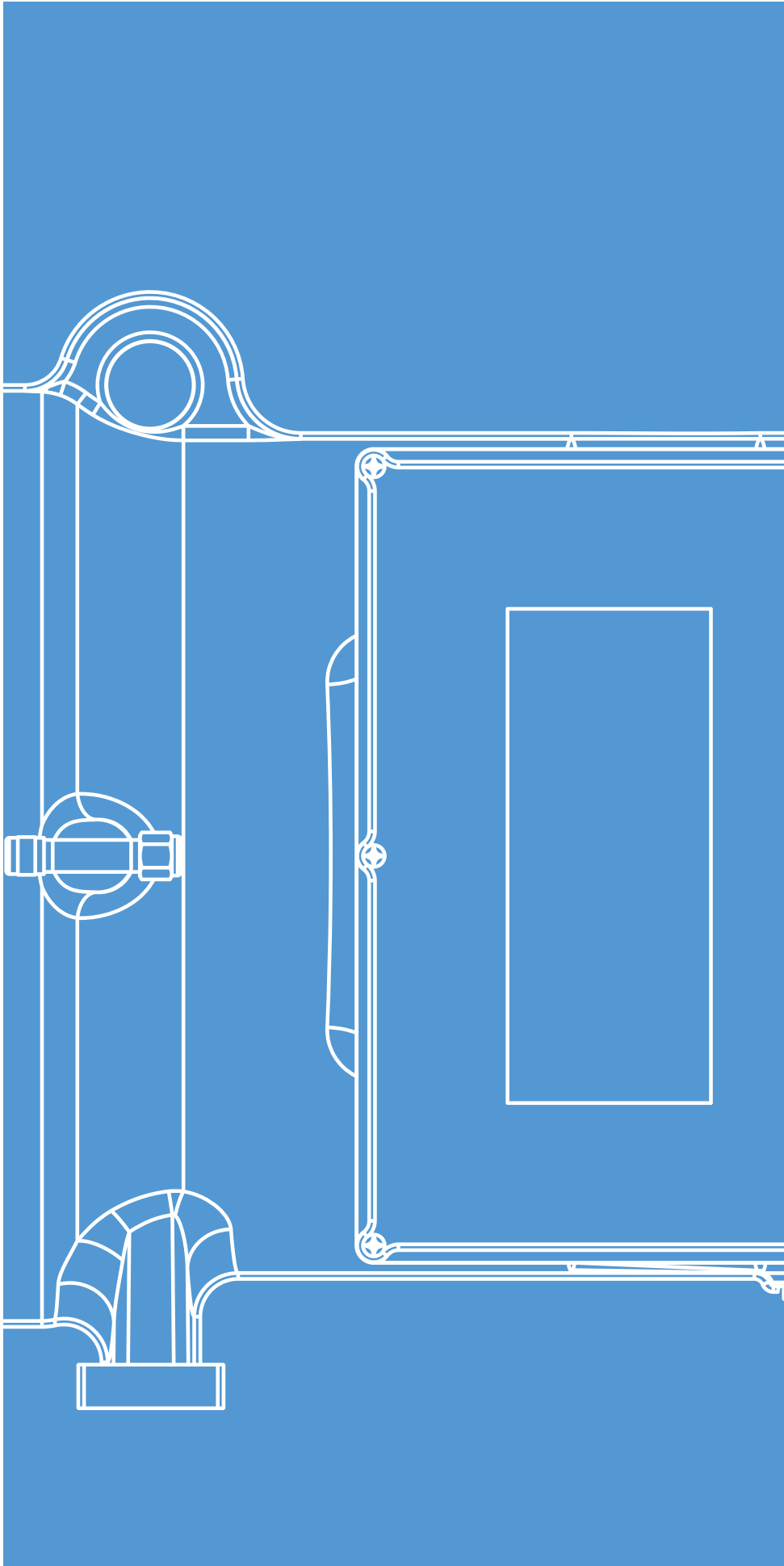
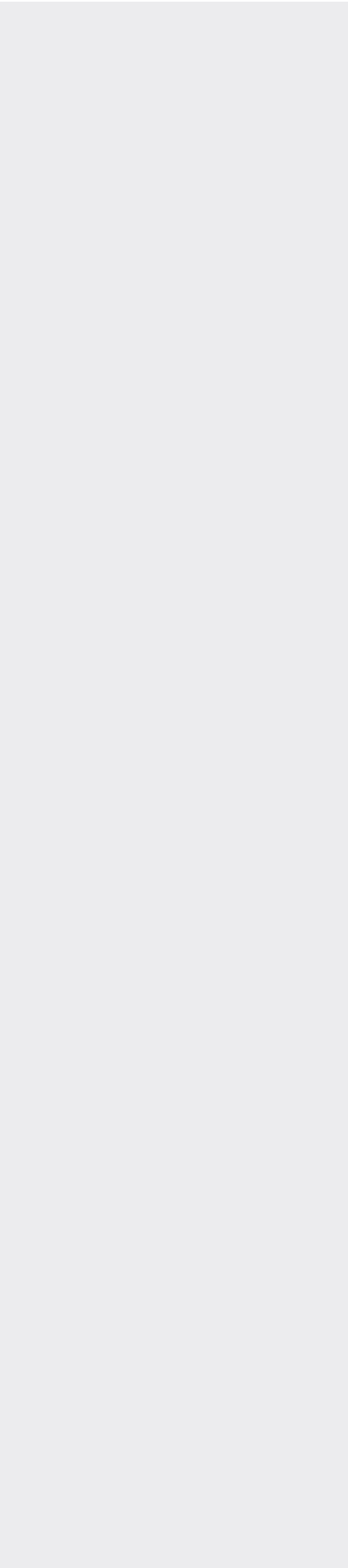
FVR/NR H/L

Compressor capacity 100%

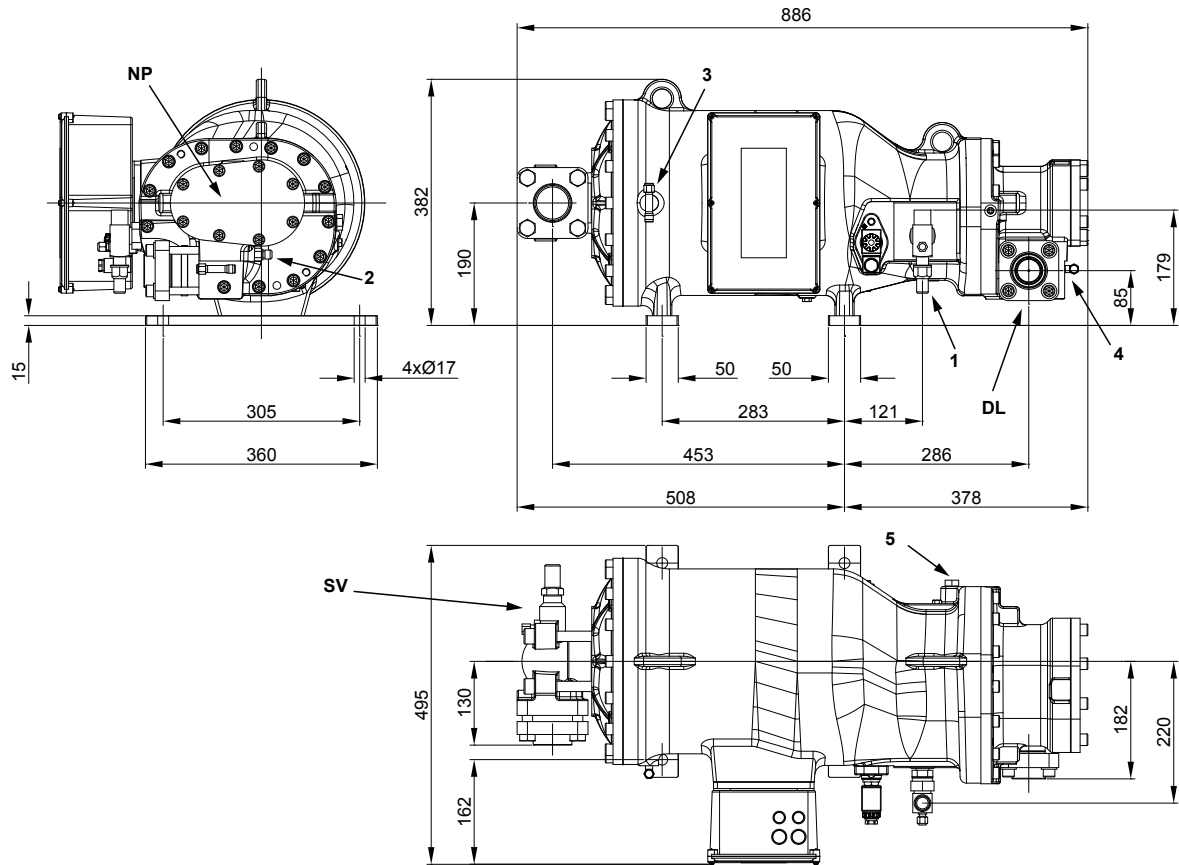
Overheating = 10K

TECHNICAL DRAWINGS AND DIMENSIONS

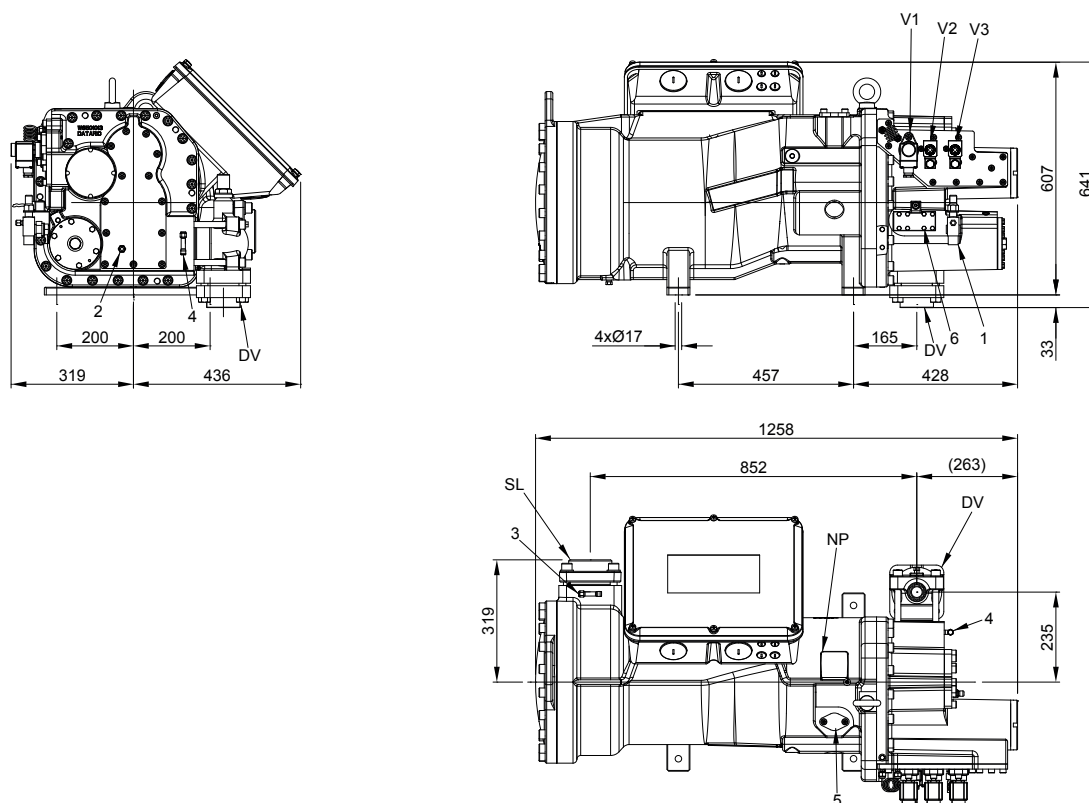
FVR / NR6 Series



FVRH/L 120 - 150 - 160



1	Oil return connection	
2	Discharge temperature sensor	
3	Low pressure connection	
4	High pressure connection	
5	Connection for ECO	½" SAE
V1	Capacity control valve (step 1)	
SV	Suction valve	2 ⅞" - 54,0 mm
DL	Discharge valve	1 ⅝" - 42,0 mm
NP	Information plate	



1	Oil return connection	
2	Discharge temperature sensor	
3	Low pressure connection	
4	High pressure connection	
5	Connection for ECO	
6	Oil flowswitch	
V	Capacity control valve	
SL	Suction valve	3 1/8" - 80 mm
DV	Discharge valve	DN80 - 105 mm
NP	Information plate	

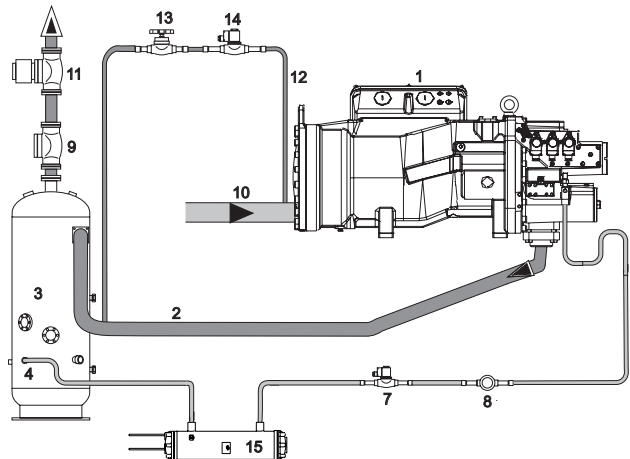
OIL INJECTION KIT

The standard Frascold oil injection kit includes:

- Oil filter
- Flowswitch with electronic control module
- Solenoid valve
- Oil flow sight glass

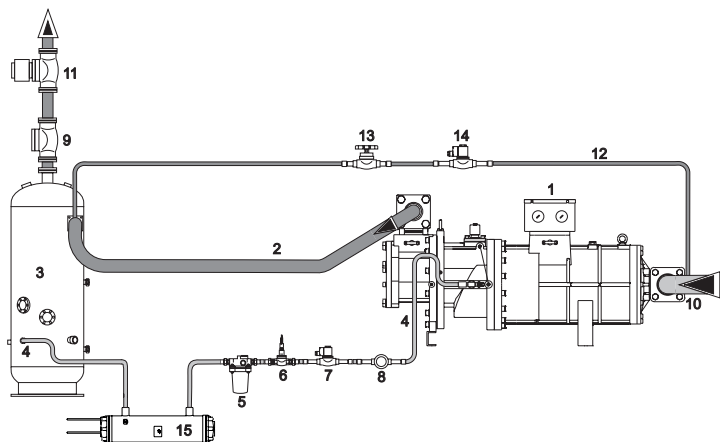
Oil circuit diagram for NR_6

In the NR_6 Models, the flowswitch and the oil filter are integrated with the compressor.



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Oil circuit diagram for all other models.



1	Compressor
2	Discharge line
3	Remote oil separator with thermostat, resistance and level detector
4	Oil return line to the compressor
5	Oil filter
6	Oil flowswitch
7	Solenoid valve
8	Oil sight glass
9	Check valve
10	Suction line
11	Discharge pressure regulation valve
12	External equalization line
13	Shut off valve
14	Solenoid valves
15	Oil cooler



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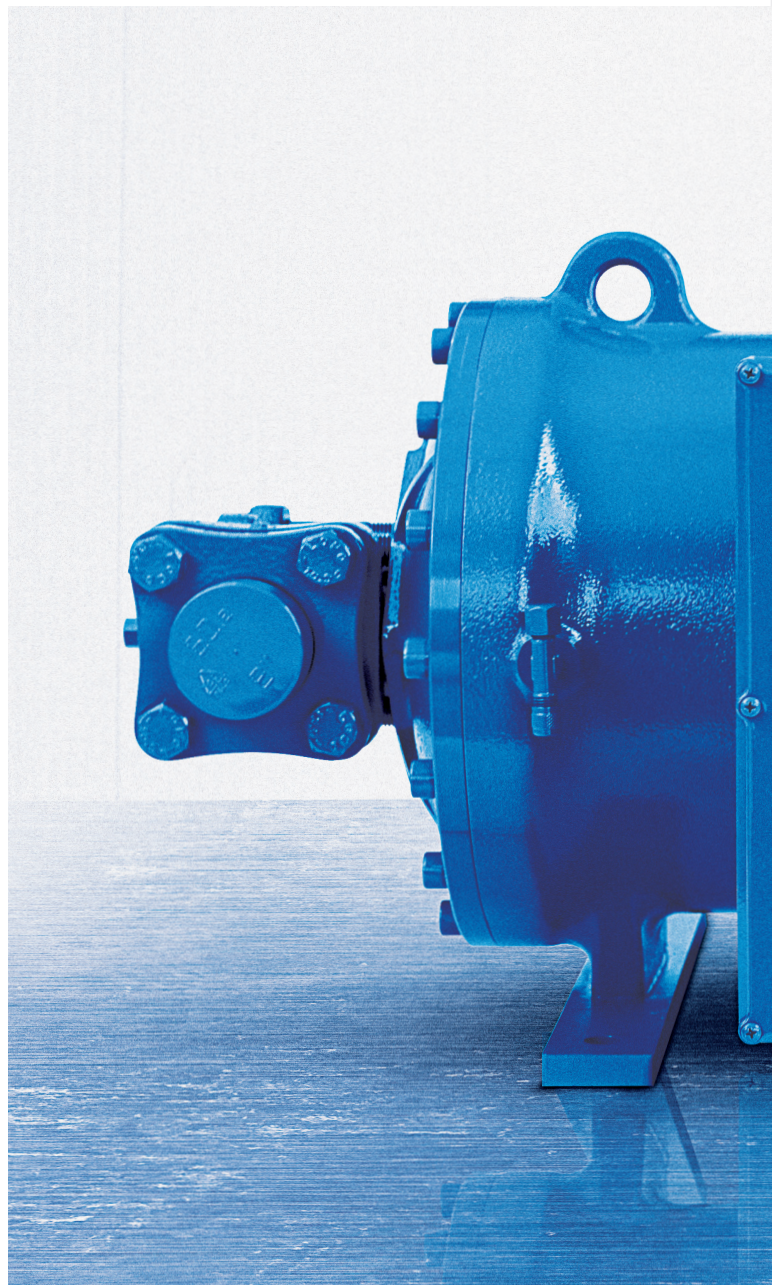
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