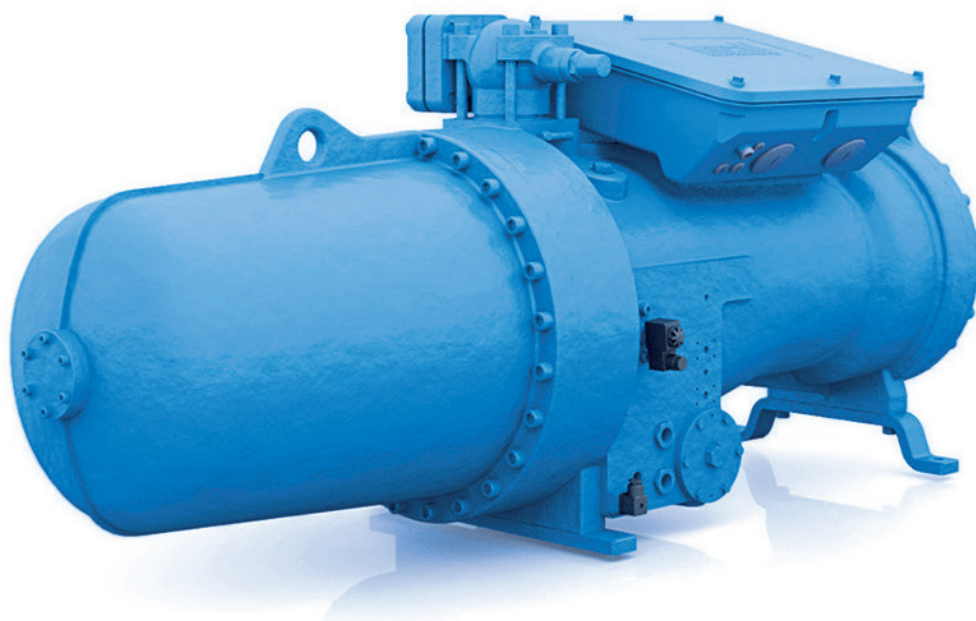


# MAGNETIC SERIES

Compact Screw Compressors - IPM motor



**frascold**<sup>®</sup>  
*Blue is better*



# INDEX

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4	About the Company
5	Segments and Solutions
6	Magnetic Compact Screw Compressor
16	Technical Data & Operating Limits
20	Technical Drawings and Dimensions
26	Contact us

# ABOUT THE COMPANY

Frascold manufactures over 70,000 screw and reciprocating compressors a year. Our 53,000 m<sup>2</sup> 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.

**53.000 sqm factory outside Milan (Italy)**  
hosting our advanced engineering manufacturing  
and testing facilities. ①

**More than 200 employees**  
working in Italy, China,  
India and United States. ②

**Over 70.000 screw**  
and reciprocating compressors  
manufactured every year. ③

**Distribution partners**  
and service centers  
in **86** countries. ④

*More than 85 years ago Frascold was 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 & @60Hz



## SCREW COMPRESSORS

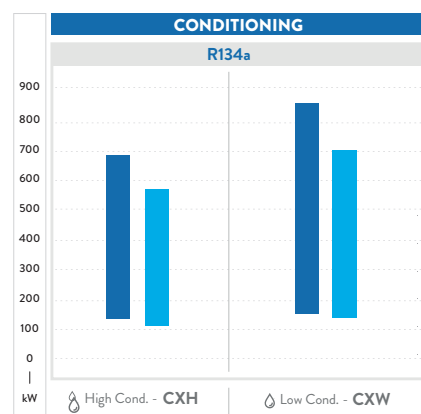


## RECIPROCATING COMPRESSORS



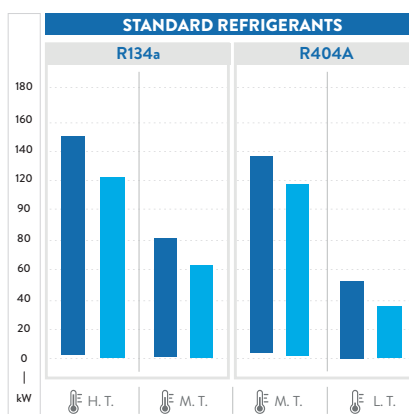
## CONDENSING UNITS

60Hz 50Hz



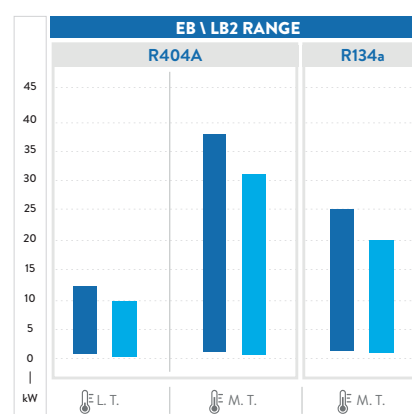
Testing conditions data reference:

H. Cond.: evap. T. +2°C; cond. T. +50°C; superheating 10K; subcooling 5K  
L. Cond.: evap. T. +3°C; cond. T. +38°C; superheating 10K; subcooling 5K



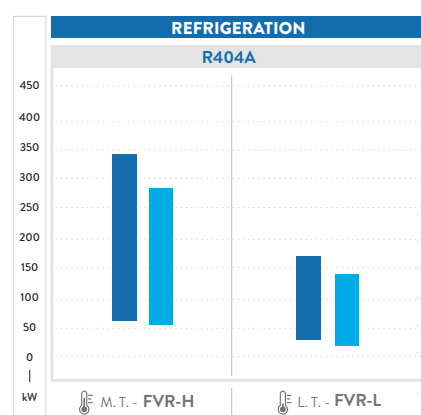
Testing conditions data reference:

H.T.: evap. T. +5°C; cond. T. +50°C  
M.T.: evap. T. -10°C; cond. T. +45°C  
L.T.: evap. T. -35°C; cond. T. +40°C



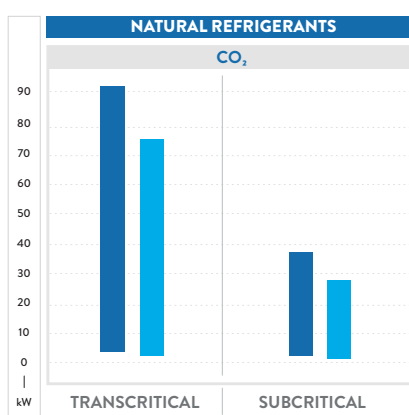
Testing conditions data reference:

M.T.: cooling capacity @32°C ambient T.; evap. T. -10°C  
L.T.: cooling capacity @32°C ambient T.; evap. T. -35°C



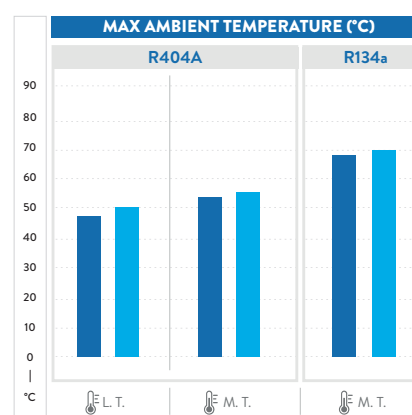
Testing conditions data reference:

M.T.: evap. T. -10°C; cond. T. +45°C  
L.T.: evap. T. -35°C; cond. T. +40°C ECO



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;



Testing conditions data reference:

M.T.: evap. T. -10°C  
L.T.: evap. T. -35°C



# MAGNETIC SERIES COMPACT SCREW COMPRESSORS WITH IPM MOTOR

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The latest addition to the Frascold CX family is the new Magnetic compressor. This series is composed by semi-hermetic twin-screw compressors, with IPM motor (Interior Permanent Magnet) with very high efficiency and variable  $V_i$ .

This new series consists in **5 models**, ranging from 170 to 310 HP and displacements from 152 to 1176 m<sup>3</sup>/h. The series covers a wide cooling capacity and extremely application ranges (air conditioning, process cooling, heat pumps and even refrigeration at medium evaporating temperatures).

# FEATURES & BENEFITS



## *IPM Motors*

The compressors are equipped with a synchronous interior permanent magnet motor.



## *High Flexibility*

Different versions and/or options widen the application envelope and assure always the best performances.



## *High Efficiency*

All possible configurations grant higher efficiency at seasonal (SEER/ SEPR/ SCOP) conditions, thanks to the optimized fluid dynamics and the latest design and manufacturing technologies.



## *Axial Suction Connection (Optional)*



## *Excellent Reliability*

Designed for heavy-duty operation and equipped with top quality components.



## *Safe Operation*



## *Long Life*

Generously sized bearings, both for loads and life



## *Easy Installation and accessibility*

Variable Vi Plug&Play (all the sensors connection made in Frascold)



## *Inverter Matching*

The compressor must be driven by an external inverter capable of driving the synchronous IPM motor, granting a wide range of regulation (nominal 20-100%) and soft start.

# CONFORMITY DECLARATION

**Frascold Magnetic compact screw compressors** 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/EU Pressure Equipment, 2014/35/EU Low Voltage Directive).

Commissioning is only possible if the entire system into the compressor it is integrated has been inspected and approved in accordance with the provisions of local 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](http://www.frascold.it)

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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



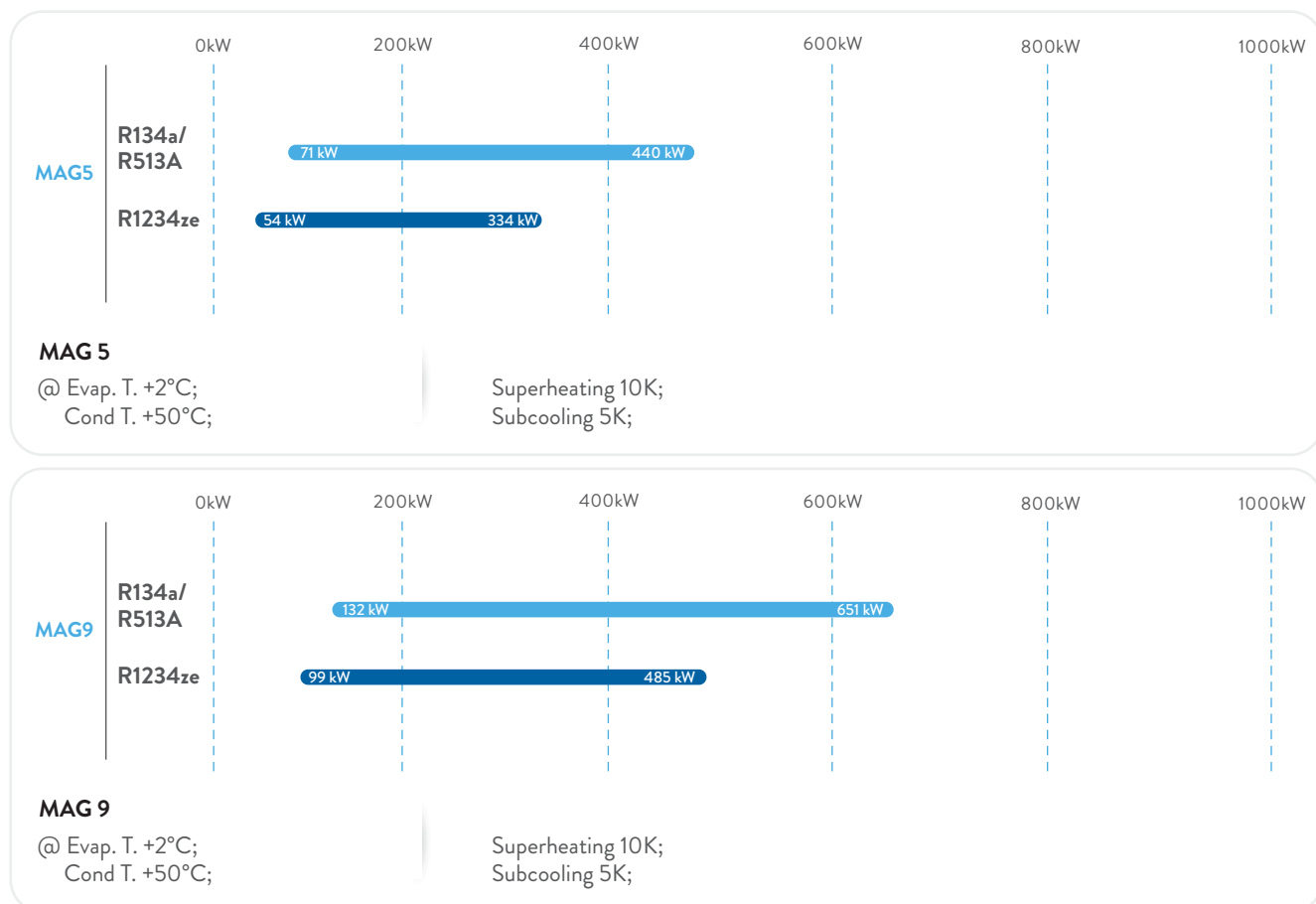
# DIRECTIVE 2012/27/EU

The Directive 2012/27/EU has defined the temperature and part load conditions and the calculation methods for the determination of SEER (Seasonal Energy Efficiency) and SCOP (Seasonal Coefficient of Performance). This European Standard gives the methods for testing heat pumps, air conditioners and chillers at part load conditions. The new Magnetic series helps to meet the requirements of the Directive 2012/27/EU and permits to achieve the following goals:

**-20%** Greenhouse Gas Emissions

**+20%** Energy Efficiency

## COOLING CAPACITY



### LEGAL DISCLAIMER:

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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/software>

# PRODUCT RANGE

## MAGNETIC COMPACT SCREW COMPRESSOR MODELS RANGE

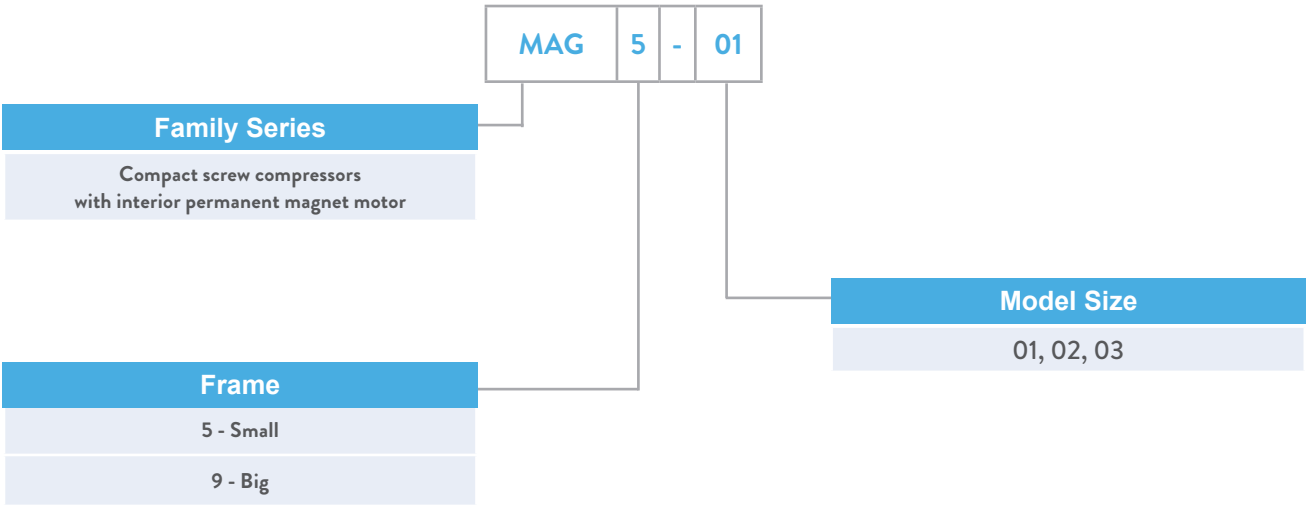
**170 – 206 HP**  
from 137 to 765 m<sup>3</sup>/h

**MAG5 SERIES**  
3 Models

**MAG9 SERIES**  
2 Models

**310 HP**  
from 227 to 1.054 m<sup>3</sup>/h

# MODEL DESIGNATION



# INFORMATION PLATE

All the important information to identify the compressor is displayed on the nameplate. The date of production is contained in the serial number. The user is responsible for indicating the refrigerant type.

**frascold®** Type **MAG5-03** Compressor model  
Nr. **AU000001** Serial number

Displacement and speed range: 

Displ. m³/h	RPM
180	min
765	max

Oil type: POE170 3~

Max. Operating Disch. Pressure: bar 30  
Max. Static Suct. Pressure: bar 20,5

Conformity markings: **EAC** **CE**

Motor rated voltage: Volt  
Motor rated frequency: Hz

Max. starting current: 

MRA	LRA
360	<30

Maximum operating current: Identification barcode

Identification number: **MAG503 A0U000001**  
Place of manufacturing: **MADE IN ITALY**

# IPM MOTOR

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The compressors models of Magnetic Series are semi-hermetic twin-screw compressors, with very high efficiency IPM motor (Interior Permanent Magnet).

## The features of these series are:



### High efficiency

Compared to a traditional asynchronous motor, the magnetic field (responsible for the rotational movement), is generated by the magnets embedded inside the rotor body. In this way there are no power losses related to the excitation currents in the rotor and high efficiencies are reached.



### More compact

A reduction in power losses reduces the cooling load required. The rotor is also smaller thanks to the use of innovative materials.



### Better management of rotation speed

Permanent magnet motors are synchronous motors therefore there is no slip between the nominal and the real rotation speed. Thanks to this feature speed can be controlled more precisely.



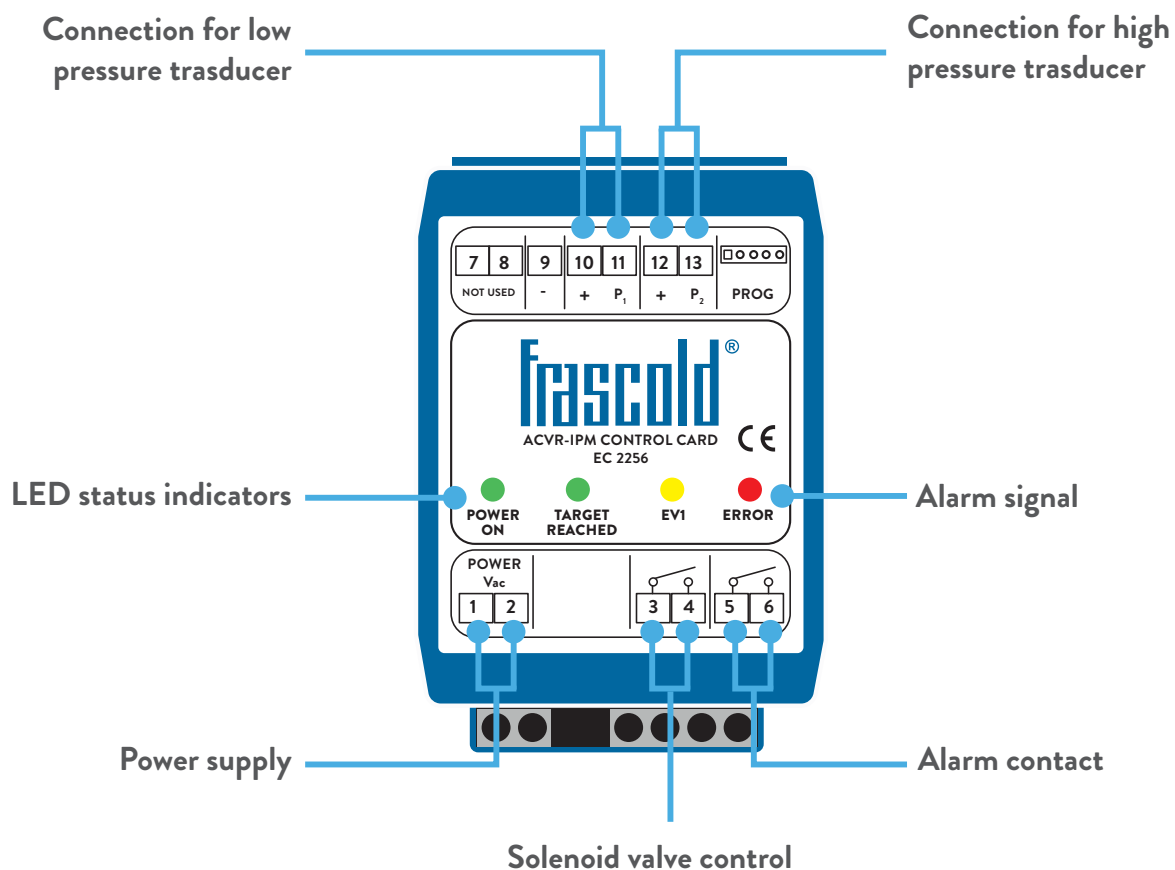
### Lower starting currents

To avoid losing synchronism, the IPM motors must be started from a zero rotation speed and speed is increased linearly. In this way, the resulting current rises very smoothly.

# VARIABLE Vi CONTROL SYSTEM

All the compressors are supplied with an integrated and exclusive Frascold's design 2 steps Vi Control System, which ensures a higher efficiency at various operating conditions. The control of the Vi is managed by a device that is able to modify the geometry of the discharge port of the compressor. The movement of the control device is managed by the high pressure oil through a solenoid valve driven by an integrated module (EC2256).

The Vi module is placed inside the electrical box already wired to the pressure transducers and solenoid valve.



# INVERTER SELECTION

Thanks to the IPM motor and its combination with the inverter, wide speed ranges can be achieved (from 1.000 to 5.400 rpm). The inverter allows you to modulate the frequency as needed and must be able to drive IPM motors with sinusoidal Back EMF.

Motor Parameters	MAG5-01	MAG5-02	MAG5-03	MAG9-01	MAG9-02
Rated Power [HP]	170	170	206	310	310
Rated Power [kW]	127	127	154	231	231
Input Voltage of VFD [V]	400	400	400	400	400
Max operating current (MRA) [A]	245	280	360	485	535
Max Speed [rpm]	4600	5400	5100	4600	5100
Max Frequency [Hz]	230	270	255	153	170
Motor Pole	6	6	6	4	4
D Axial Inductance [mH]	0.533	0.533	0.415	0.24	0.24
Q Axial Inductance [mH]	1.18	1.18	0.825	0.625	0.625
Line- Line Rs Resistance [ $\Omega$ ]	0.02161	0.02161	0.01145	0.0085	0.0085
Phase EMF Coefficient [V/rpm]	0.077	0.077	0.032	0.0358	0.0358
Recommended Switch Freq [Hz] *	4k	4k	4k	4k	4k

\*For lower switching frequency please contact Frascold.

# STANDARD EQUIPMENT AND OPTIONAL ACCESSORIES

## MAGNETIC COMPACT SCREW COMPRESSORS

Description	MAGNETIC	
	Std.	Opt.
Integrated three stage internal oil separator, crankcase heater, replaceable oil filter	•	
Two oil level (min & max) sight glasses (for 5 and 9 series)	•	
POE 170 cSt lubricant charge	•	
Discharge valve with soldering connections	•	
Suction flange with soldering sleeve	•	
Axial suction layout		•
Integrated check valve and pressure relief	•	
Two step Vi Control	•	
Nitrogen protective charge	•	
Oil Temperature PTC Sensor	•	
Packing ensuring proper handling and adequate protection	•	
IP65 terminal box	•	
Oil Drain Valve	•	
Suction Valve with soldering connections (Suction layout necessary for 9 series)		•
Opto-electronic oil level control		•
Oil Flow Switch		•
Oil Filter Clogging Differential Pressure Switch (Electronic)		•
Connection Kit for Economiser or Liquid Injection		•
Adapter Kit for External Oil cooler / Secondary oil separator		•
Bridges for DOL Start	•	
Rubber vibration dampers (4pcs)		•
Special painting		•

# TECHNICAL DATA AND OPERATING LIMITS

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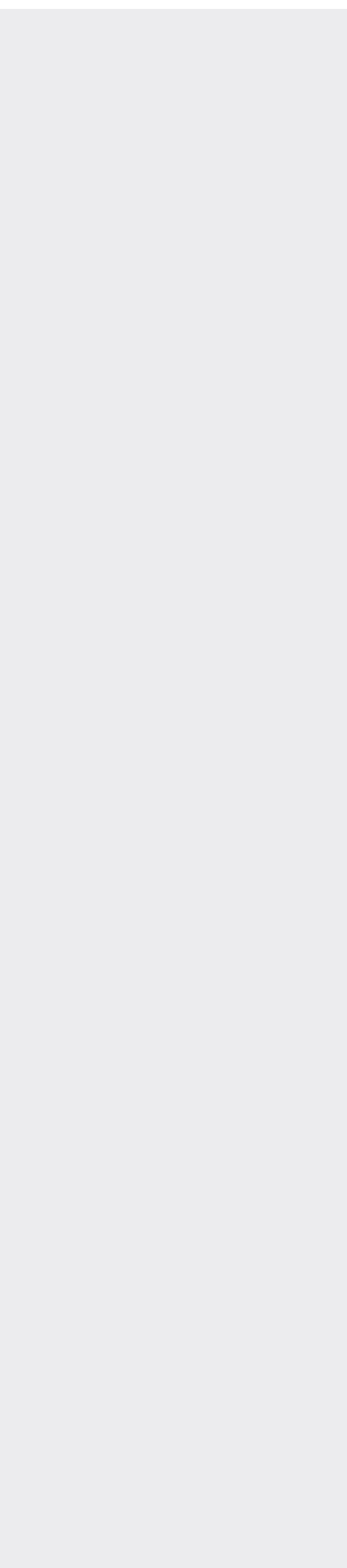
## MAGNETIC SERIES

### Compact Screw Compressors - IPM motor

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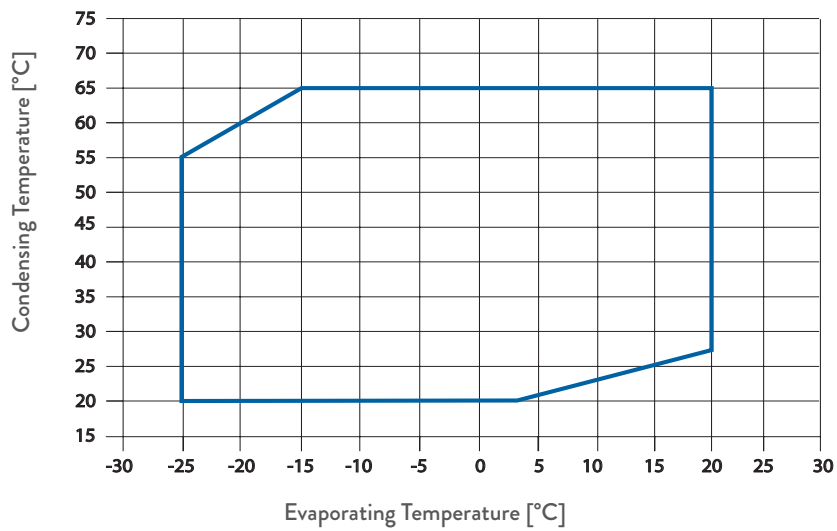
**MAGNETIC**

Models	Displacement		Nominal power	MRA	Min speed	Max speed	Maximum pressure		Suction line		Discharge Valve		Weight
							LP	HP					
	[m³/h]		[HP]	[A]	[rpm]	[bar]		[mm]	[inch]	[mm]	[inch]	[Kg]	
Min.	Max.												
MAG5-01	152	581	170	245	1200	4600	20,5	30	104,8	4 1/8"	80	-	865
MAG5-02	152	682	170	280	1200	5400	20,5	30	104,8	4 1/8"	80	-	865
MAG5-03	189	804	206	360	1200	5100	20,5	30	104,8	4 1/8"	80	-	878
MAG9-01	254	1061	310	431	1100	4600	20,5	30	DN125		104,8	4 1/8"	1475
MAG9-02	254	1176	310	500	1100	5100	20,5	30	DN125		104,8	4 1/8"	1475

Find the most updated information in our Product Selection Software FSS3 at the link :  
<https://www.frascold.it/en/software>

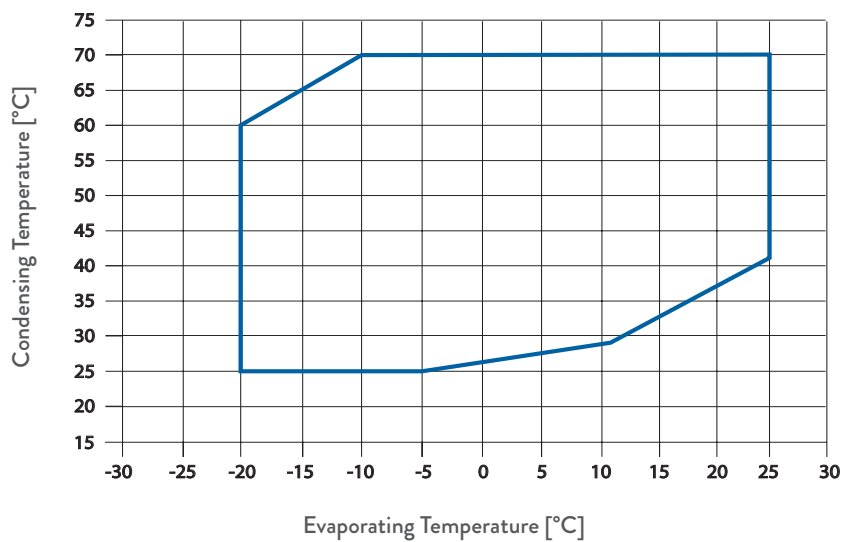
## Operating Limits

### *R134a / R513A / R1234yf*



Suction gas  
superheating 10K

### *R1234ze*



Suction gas  
superheating 10K

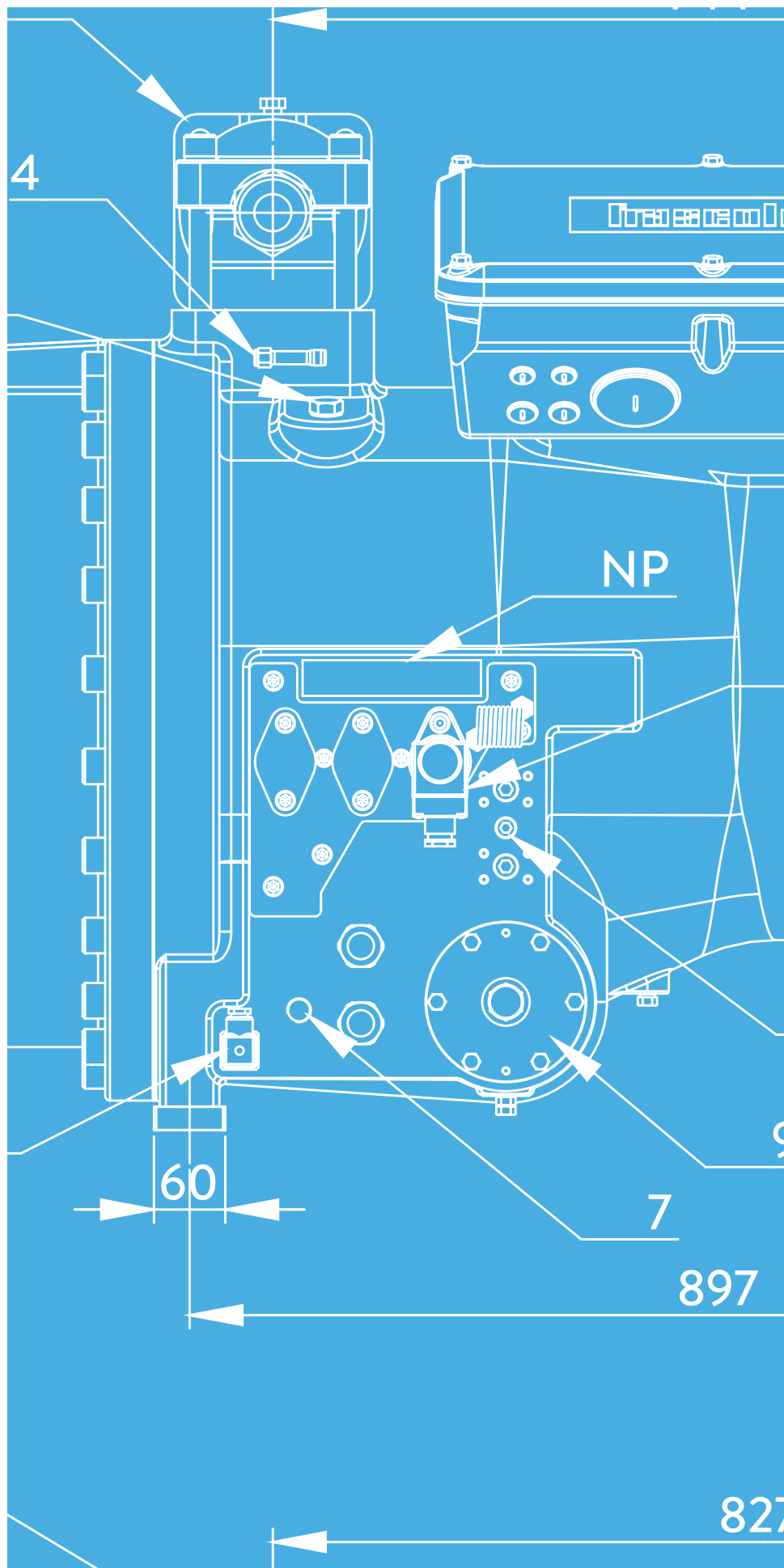
To verify speed frequency limits please consult our product selection software FSS3

# TECHNICAL DRAWINGS AND DIMENSIONS

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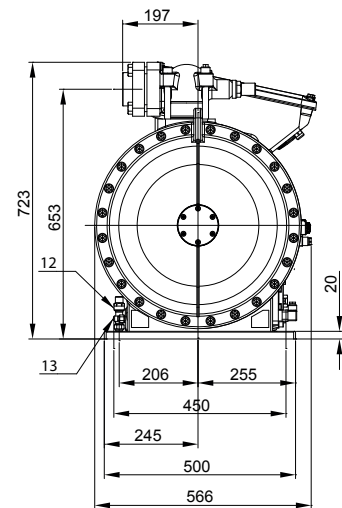
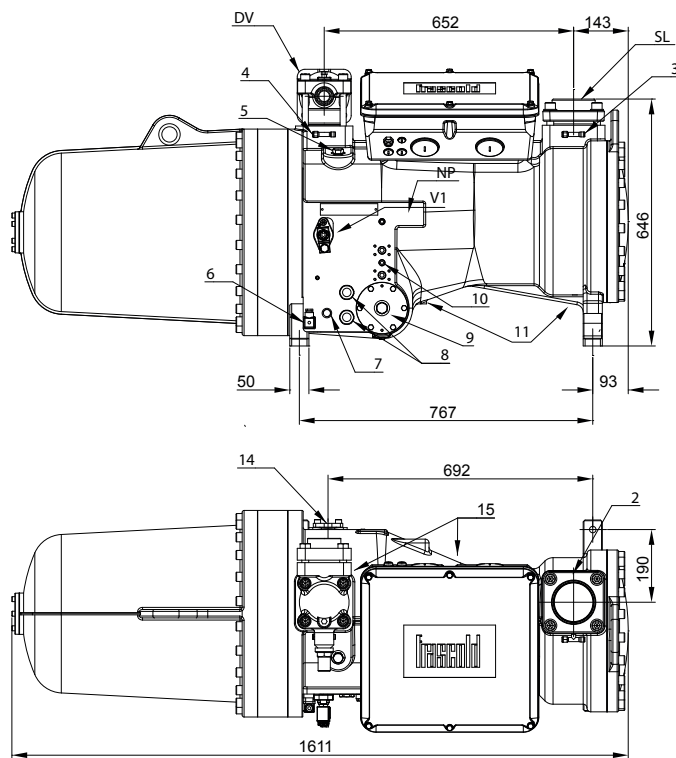
## MAGNETIC SERIES

Compact Screw Compressors - IPM motor



MAG5

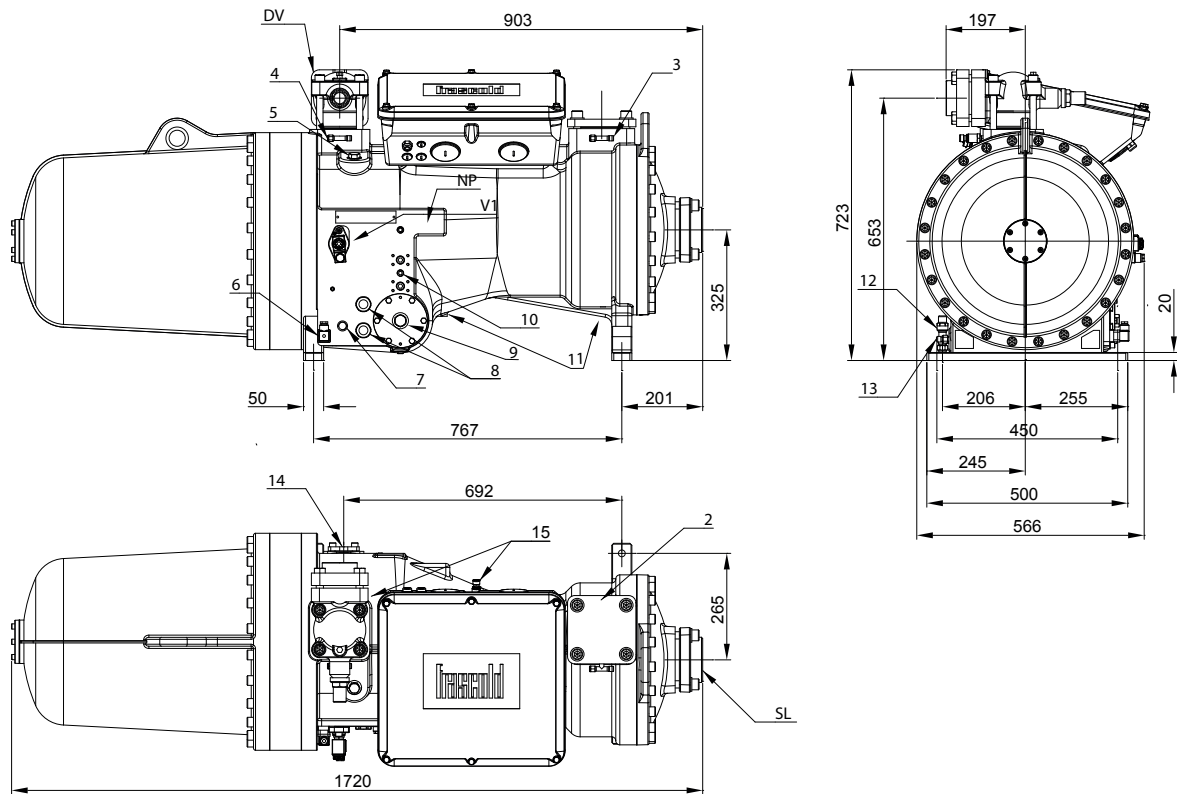
STANDARD



SL	Suction line	4 1/8" - 104,8 mm
DV	Discharge valve	DN80
V1	Vi control valve	-
2	Low pressure connection	1/8" NPT
3	High pressure plug	1/4" SAE x 1/4" SAE
4	Low pressure plug	1/4" SAE x 1/4" SAE
5	Oil charge plug	3/8" GAS
6	Crankcase heater	-
7	Oil level regulator connection	3/4" NPT
8	Oil level sight glass	-
9	Filter clogging sensor connection	1/2" GAS
10	Oil cooler connection	1/2" NPT
11	Oil drain plug	1/4"NPT
12	Oil drain valve	1/8" NPT
13	Maximum oil temperature sensor	-
14	ECO/liquid injection connection	1 1/8"
15	Pressure transducer	-

MAG5

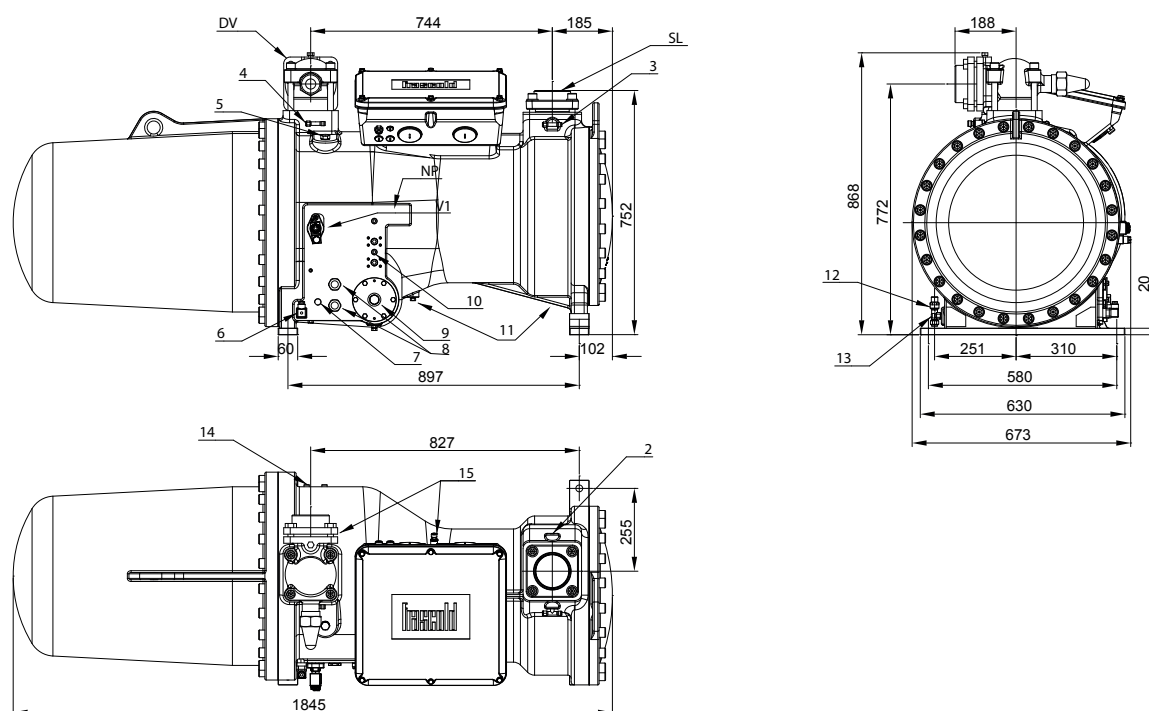
WITH AXIAL SUCTION



SL	Suction line	4 1/8" - 104,8 mm
DV	Discharge valve	DN80
V1	Vi control valve	-
2	Low pressure connection	1/8" NPT
3	High pressure plug	1/4" SAE x 1/4" SAE
4	Low pressure plug	1/4" SAE x 1/4" SAE
5	Oil charge plug	3/8" GAS
6	Crankcase heater	-
7	Oil level regulator connection	3/4" NPT
8	Oil level sight glass	-
9	Filter clogging sensor connection	1/2" GAS
10	Oil cooler connection	1/2" NPT
11	Oil drain plug	1/4" NPT
12	Oil drain valve	1/8" NPT
13	Maximum oil temperature sensor	-
14	ECO/liquid injection connection	1 1/8"
15	Pressure transducer	-

## MAG9

## STANDARD

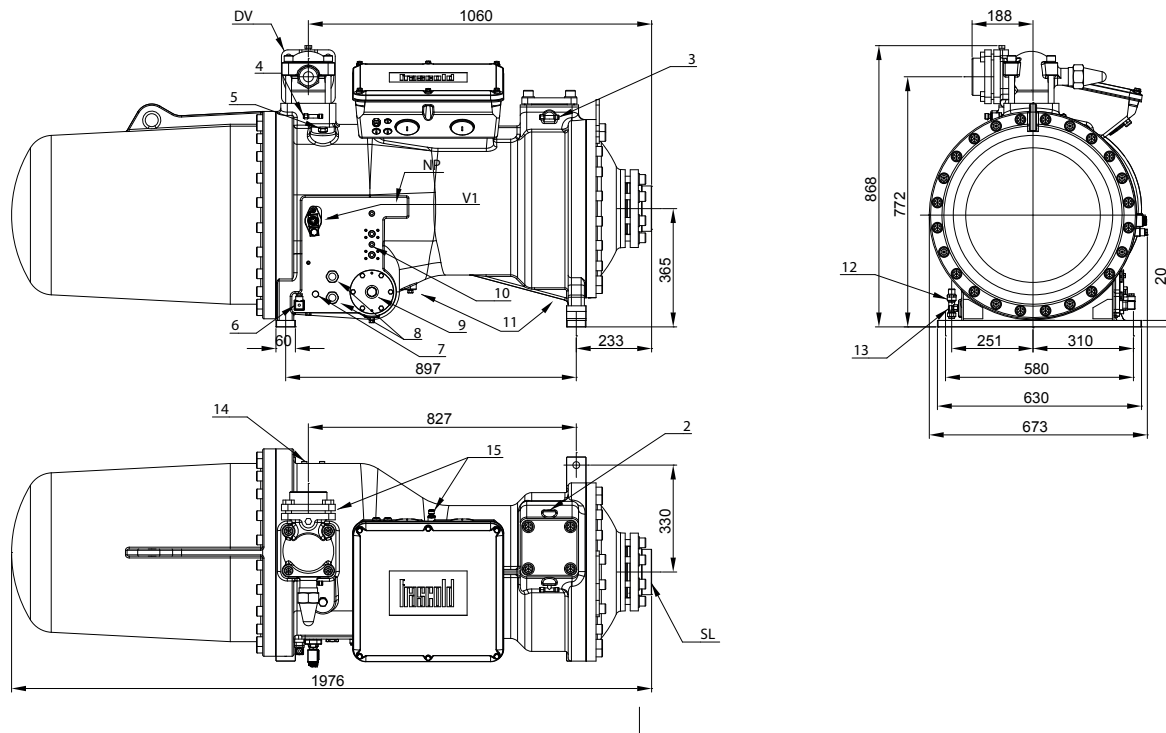


SL	Suction line	DN125
DV	Discharge valve	4 1/8" - 104,8 mm
V1	Vi control valve	-
2	Low pressure connection	1/8" NPT
3	High pressure plug	1/4" SAE x 1/4" SAE
4	Low pressure plug	1/4" SAE x 1/4" SAE
5	Oil charge plug	3/8" GAS
6	Crankcase heater	-
7	Oil level regulator connection	3/4" NPT
8	Oil level sight glass	-
9	Filter clogging sensor connection	1/2" GAS
10	Oil cooler connection	1/2" NPT
11	Oil drain plug	1/4" NPT
12	Oil drain valve	1/8" NPT
13	Maximum oil temperature sensor	-
14	ECO/liquid injection connection	1 1/8"
15	Pressure transducer	-
NP	Nameplate	-



MAG9

WITH AXIAL SUCTION



SL	Suction line	DN125
DV	Discharge valve	4 1/8" - 104,8 mm
V1	Vi control valve	-
2	Low pressure connection	1/8" NPT
3	High pressure plug	1/4" SAE x 1/4" SAE
4	Low pressure plug	1/4" SAE x 1/4" SAE
5	Oil charge plug	3/8" GAS
6	Crankcase heater	-
7	Oil level regulator connection	3/4" NPT
8	Oil level sight glass	-
9	Filter clogging sensor connection	1/2" GAS
10	Oil cooler connection	1/2" NPT
11	Oil drain plug	1/4" NPT
12	Oil drain valve	1/8" NPT
13	Maximum oil temperature sensor	-
14	ECO/liquid injection connection	1 1/8"
15	Pressure transducer	-
NP	Nameplate	-

# CONTACT & SUBSIDIARIES





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