

MAGNETIC SERIES

SEMI-HERMETIC COMPACT SCREW COMPRESSORS





Product information

Features & Benefits **Conformity Declaration** Performance Data FSS3 Software Directive 2012/27/EU Capacity **Product Range Model Designation Information Plate Standard Equipment and Optional Accessories IPM Motor Inverter Selection** Variable Vi Control System **Control Protection Device Capacity Regulation Technical Data Operating Limits Technical Drawings and Dimensions**

Contact & Subsidiaries

Product information SEMI-HERMETIC COMPACT SCREW COMPRESSORS

The Magnetic screw compressor series is composed by semi-hermetic twin-screw compressors with Interior Permanent Magnet (IPM) motor.

The series is caracterized by its high efficiency and variable Vi. The series features **5 models**, ranging from 170 to 310 HP and volumetric displacements from 152 to 1176 m^3/h .

Our Magnetic series covers wide capacities and application ranges, such as air conditioning, process cooling, heat pumps, and medium evaporative temperature refrigeration



Product information

4

FEATURES & BENEFITS

K IPM MOTOR

HIGH EFFICIENCY



Frascold Magnetic 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 Directive, 2006/95/EC Low Voltage Directive).

The compressor may be put into operation only if it has been installed in accordance with the assembly instructions provided in the installation manual.

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

The standards applied are described in the Manufacturer Declaration of incorporation, according to the 2006/42/EC, and available a: **www.frascold.it**

Product information

PERFORMANCE DATA - FSS3 SOFTWARE

Please refer to our FSS3 Frascold Selection Software to check the performance of all our compressors.



Product information 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 loadconditions. The new Magnetic series helps to meet the requirements of the Directive 2012/27/EU and permits to achieve the following goals:



LEGAL DISCLAIMER: While Frascold has made every effort at the time of publication to ensure the accuracy of the information provided herein, product specifications and performances could be subject to change without notice. You can find the most updated information in our Frascold Selection Software FSS3 at the link: https://www.frascold.it/en/software

MAG 5

6



MAG 9



To visualize performance with other refrigerants, contact us or refer to the Frascold Selection Software FSS3: https://www.frascold.it/software





Product information MODEL DESIGNATION



Product information 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.



Product information STANDARD EQUIPMENT AND OPTIONAL ACCESSORIES

Description	MAGNETIC
Integrated three stage internal oil separator, crankcase heater, replaceable oil filter	
Two oil level (min & max) sight glasses (for 5 and 9 sizes)	
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	
IP65 terminal box	
Oil Drain Valve	
Suction Valve with soldering connections (Suction layout necessary for size 9)	
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	
Rubber vibration dampers (4pcs)	
Special painting	

Product information IPM MOTOR

Every compact screw compressor model within the Magnetic series features the exclusive IPM motor, which is a synchronous motor that incorporates an electric rotor embedded with magnets. The IPM motor provides superior levels of energy efficiency along with more accurate speed control, while also eliminating any sliding effect. Integrating this innovative technology delivers a decrease in power consumption, contributes to larger energy savings, and increases cooling capacity.

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 and speed is increased linearly. In this way, the resulting current rises very smoothly.

Product information 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	MAC9-01	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 a lower switching frequency please contact Frascold

Magnetic Series

Product information 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.



Product information CONTROL PROTECTION DEVICE

Standard compressor protection

The discharge temperature in certain conditions such as high condensing temperatures, low evaporating pressures or extremely high compression ratios, may reach values that can damage the compressor. All the models are supplied with the **INT69 FRY** electronic protection module, that stops the compressor in the event that the discharge temperature exceeds the set safety limit.

Optional compressor protection

Optionally, all compressors can be equipped with the new Kriwan **INT69 FRYL® Diagnose** protection module. This provides data logging, diagnostic, and protection features that can improve the 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)

12



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 mobile app for reading data may be downloaded directly and free of charge from the Google Play Store or from the App Store. 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

INT69[®] Diagnose is intellectual property and trademarks of KRIWAN Industrie-Elektronik GmbH.

Product information CAPACITY REGULATION

The capacity of CX Frascold screw compressors can be adjusted with:



2

VARIABLE FREQUENCY DRIVE (VFD)

CAPACITY CONTROL (CC)*

* on request

13

Step capacity control

CX compressors are supplied with a partialisation system with step capacity control, or stepless on request (see below). This system allows 4 steps of capacity reduction, corresponding to 25% (only for start up), 50%, 75%, 100% or the project cooling capacity. The capacity control is made through combinations of three solenoid valves.

Stepless capacity control

CX compressors can be turned into a stepless capacity control regulation (50-100%), by simply using a specific kit, containing a plate and a gasket (code TOOWK1603 for compressors size 0 or TOOWK1602 for compressors size 5 and 9).

The stepless capacity control is made by using three solenoid valves (V1, V2 and V3).



2 VARIABLE FREQUENCY DRIVE (VFD)

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



TECHNICAL DATA

MAGNETIC

	Displacement						Maximum pressure						
Models	min	max	Nominal power	MRA	Min speed	Max speed	LP	HP	Suction line		Discharge valve		Weight
	[m	³ /h]	[HP]	[A]	[rp	m]	[ba	ar]	[mm] [inch]		[mm]	[inch]	[Kg]
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	DN	125	104,8	4 1/8"	1475
MAG9-02	254	1176	310	500	1100	5100	20,5	30	DN	125	104,8	4 1/8"	1475

LEGAL DISCLAIMER:

While Frascold has made every effort at the time of publication to ensure the accuracy of the information provided herein, product specifications and performances could be subject to change without notice. You can find the most updated information in our Frascold Selection Software FSS3 at the link: https://www.frascold.it/en/software

• Technical data and operating limits OPERATING LIMITS

For specific model and refrigerant performance data, please use the FSS3 Frascold Selection Software available for free download at **https://www.frascold.it/software**

R134a / R513A / R1234yf



Suction gas superheating 10K

R1234ze



Suction gas superheating 10K

LEGAL DISCLAIMER:

While Frascold has made every effort at the time of publication to ensure the accuracy of the information provided herein, product specifications and performances could be subject to change without notice. You can find the most updated information in our Frascold Selection Software FSS3 at the link: https://www.frascold.it/en/software







STANDARD





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	-
NP	Nameplate	-







STANDARD



SL DV



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	11/8"
15	Pressure transducer	-
NP	Nameplate	-

Around the world **CONTACT & SUBSIDIARIES**

HEADQUARTER & PRODUCTION PLANT

FRASCOLD SPA - ITALY, MILAN

Via B. Melzi 105, 20027 Rescaldina (MI) Italy Tel. +39 0331 742201 - Fax +39 0331 576102 frascold@frascold.it www.frascold.it

COMMERCIAL OFFICE

FRASCOLD CHINA

Frascold Refrigeration Co. Ltd Room 612, 6th Floor, Jinqiao Life Hub, No.3611 Zhangyang Road, New Pudong District, Shanghai - China Ph. +86 021 58650192 / 58650180 Fax +86 021 58650180 frascold.china@frascold.net www.frascold.net

FRASCOLD USA

5343 Bowden Road, Suite 2 Jacksonville, FL 32216 - USA Ph. +1 (855) 547 5600 Office info@frascoldusa.com www.frascoldusa.com

FRASCOLD INDIA PVT LTD

Frascold India Pvt Ltd. A1/2/14/15, Gallops Industrial Park, NH-8A, Sarkhej-Bavla Road, Rajoda, Ahmedabad 382220 Gujarat - India Ph: +91 2717 685858 sales@frascoldindia.com www.frascoldindia.com

FRASCOLD VIETNAM

Frascold Vietnam Co. Ltd Unit 701, 7th floor, 5 Hoang Van Thai street, Tan Phu Ward, 07 District, Ho Chi Minh City - Vietnam Ph: +84 028 54117375 frascold.china@frascold.net



DEDICATED PRODUCTIONS FOR LOCAL MARKETS

CHINA - FVR PRODUCTION PLANT Frascold refrigeration equipment Co. Ltd Block 10, Phase 3 of the Standard Building in the General Free Trade Zone no. 88 Weichuang road, Taizhou city of Jiangsu province - China

INDIA - CDU ASSEMBLY PLANT Frascold India Pvt Ltd. A1/2/15/16 Gallops Industrial Park, NH-8A, Sarkhej-Bavla Rd, Rajoda, Ahmedabad 382220 Gujarat - India FCAT_401_24_00_EN September 2024

We make temperature

