FrigoPack® FU+

Frequency Inverters designed for Refrigeration

KIMO
RHVAC Controls

www.frigokimo.com

Effective speed control saves energy and running costs

The main objective in refrigeration and HVAC technology is the reliable supply of refrigeration.

To ensure intelligent and energy-saving control together, the entire system must be considered.

The intelligent refrigeration frequency inverter ***FrigoPack*** **FU+** was developed based on decades of know-how in refrigeration technology and therefore stands for reliability, quality and ease of operation.

In addition to reciprocating, screw or scroll compressors, condensing fans are also controlled in an optimum manner.

FrigoPack refrigeration frequency inverters can achieve constant operating pressures even with load fluctuations.

The resulting constant temperature has a positive effect on the quality of the refrigerated products. Dehydration of stored goods is reduced to a minimum.

Defrosting intervals are extended and energy costs reduced.

FrigoPack **FU+** is the ideal frequency inverter for refrigeration and air conditioning systems in supermarkets, hotels, restaurants and food production.

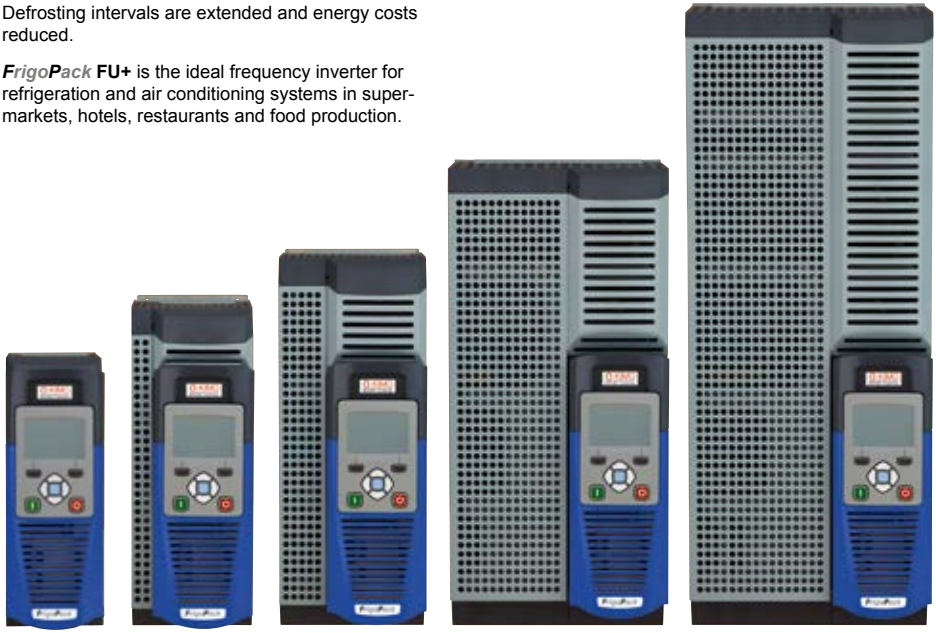
The modular structure allows a wide range of applications by adding extension modules that are **automatically** identified by ***FrigoPack*** **FU+**. The functionality is automatically adapted for various applications.

The rated current range from 5.5 A to 790 A provides a high degree of flexibility in the selection and application of the ***FrigoPack*** **FU+** frequency inverter.

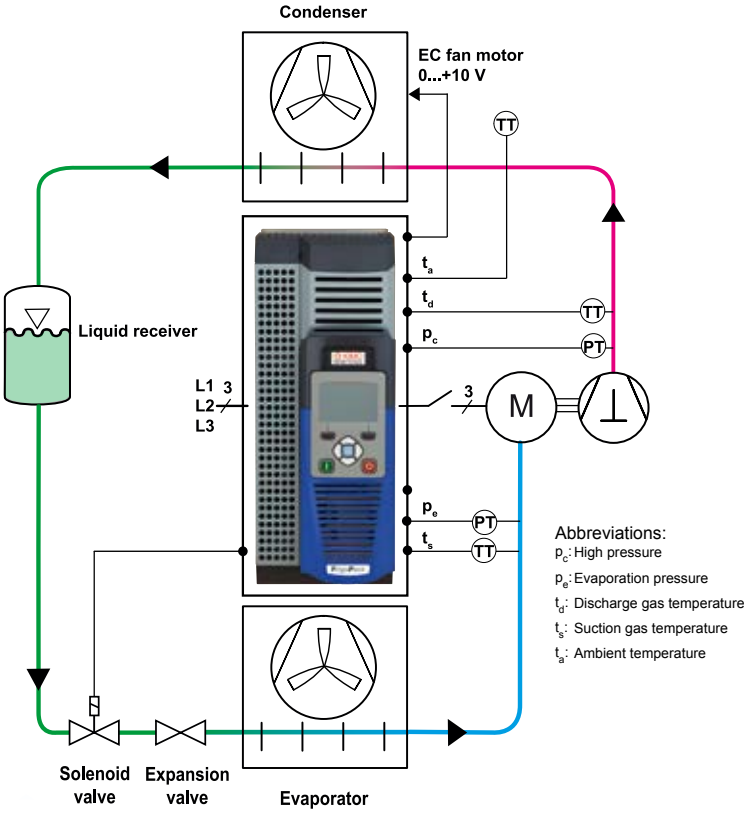
This ***FrigoPack*** **FU+** range of refrigeration frequency inverters offers a better control and ease of setting up, improved operating performance, higher efficiency, better compressor protection and integrated intelligence.

Whether process cooling, indirect cooling, chiller or heat pumps:

We keep control !



Refrigeration Cycle with *FrigoPack* FU+ Control



- Measurement of the evaporation pressure and calculation of evaporating temperature
- Measurement of the high pressure and calculation of condensing temperature (bubble temperature with refrigerant glide)
- Measurement of the suction gas temperature (to calculate the suction gas superheat) → To reduce risk of damage to the compressor
- Measurement and processing of the discharge gas temperature
- Measurement of the ambient temperature to enable "floating" condenser control
- Rack control of 1...4 compressors (or up to 6 compressors with an additional extension module) → effective and energy-saving
- Demand-dependent speed control of EC-fans on the condenser → effective and energy-saving
- Control of solenoid valve in the suction line → reduces risk of liquid refrigerant in the compressor (with too low superheat)
- Hot gas bypass control for HVAC applications (to control down to zero cooling capacity)

Simple commissioning in just a few steps

Intuitive keypad

The IP55 keypad can be mounted either on the frequency inverter itself or on the outside of the enclosure.
The clearly arranged four-line display and the intuitive menu navigation with arrow keys allows easy and fast setting up by the installer.

Commissioning

The ***FrigoPack*** **FU+** has been developed exclusively for refrigeration applications and is unique in frequency inverter technology.
The installer can commission the inverter easily and intuitively in just a few steps. Databases containing refrigerant and compressor data are stored on the SD card.
In addition all refrigeration and electrical menus are also stored in various languages.
Refrigeration and electrical settings can be easily made in selectable languages.

Mounting inside and outside the enclosure

- Multi-position mounting plates with keyhole slots allow for easy mounting
- Upgrade kits for mounting outside the enclosure are available

Ethernet connection and integrated web server

- The Ethernet connection allows all parameters to be read by the integrated web server
- Connection and communication in a local IT network is possible

Suitable for all areas of application

- Internal EMC filter up to class C2 (1st environment for use in commercial buildings if installed by a professional)
- CE-Marking:
  - EMC: EN61800-3 (2004)(+A1:2012)
  - LVD: EN 61800-5-1 (2007)
- DC link chokes above 2.2 kW do reduce harmonics to below IEC/EN61000-3-12 limits
- UL, cUL: C(UL)UL LISTED, File E142140

Intuitive and easy to use keypad

- Easy-to-use keypad allows simple commissioning and setting-up
- Can be mounted to IP54 without accessories on the enclosure door

New cooling design improves reliability

- Fans can be exchanged without removing the frequency inverter
- Separate cooling path of the power stack avoids contamination of the control electronics

Simplified commissioning and data storage with the SD card

- Database with data of numerous European and American compressor manufacturers
- Database with the latest refrigerants (including glide)
- Data logging of electrical and refrigeration parameters (> 10 years)
- Software and firmware updates can be done by customers

Intelligent control with basic module BM-1

- Supplied as standard with ***FrigoPack*E FU+**
- Control of the evaporating temperature (dew)
- Control of the condensing temperature (bubble)
- LEDs indicate whether pressure transmitters have been connected correctly
- Intelligent control of up to 4 compressors in a rack system
- Intelligent control of up to 6 compressors possible with extension modules

Safety function Safe-Torque-Off (STO)

- Immediate stop of the compressor in the event of a fault with stop category 0 (in accordance with DIN EN 60204-1)
- Reduced installation time and cost

Optional CM-1 communication module extends functionality

- One RS485 interface for Modbus RTU communication
- Two RS232 interfaces allow connection to external KIMO extension modules

Designed for use in refrigeration technology

Flexibility due to modular design

The modular design of the ***FrigoPack* FU+** allows the user maximum flexibility and functionality.

***FrigoPack*EC FU+**
The basic version.
Control by an external control signal (0...10 V or 4...20 mA).

***FrigoPack*E FU+**
The universal version.
The mounting of basic module BM-1 extends the function of the frequency inverter with the internal control of evaporating and condensing temperatures.
The software functionality is automatically extended.

Communication module & further extension modules

The optional mounting of the CM-1 communication module also enables Modbus RTU communication with the RS485 Modbus interface.
Two RS232 interfaces allow the connection of external extension modules.
Important measurements such as the temperatures of the suction and discharge lines are also monitored with PT1000 sensors. The superheats are calculated for compressor protection.

One standard software for all refrigeration applications

The intelligent ***FrigoPack* FU+** frequency inverter automatically detects the basic and extension modules connected and adapts the software to the refrigeration task.

Outstanding in refrigeration technology

Available versions

- ***FrigoPack*EC FU+**
  for external control of one compressor with an external 0...+10 V control signal
- ***FrigoPack*E FU+**
  with BM-1 basic module for the control of evaporating and condensing temperatures

Functions and features

Refrigerants

- Database with all current refrigerants

Compressors

- Selection of the variable-speed compressor VsC from a compressor database with many known manufacturers
- Control of 1...4 compressors standard
- Only one parameter necessary for setting-up integrated rack control

Condenser

- Condenser fan control (EC Motors) with 0…10 V output signal

Electrical supply

- Supply voltage 3AC 380…480 V with automatic adaption
- Extended maximum frequency by connecting a step-up autotransformer in the power supply

Commissioning, modern communication

- Quick setup in few steps
- Setting the operating points with temperatures
- Integrated web server for intelligent observation of all operating parameters with a smartphone or a PC
- Download of the complete parameter list for fast and reliable support
- Integrated serial interface (Ethernet Modbus or Webserver)
- Serial interface RS485 with Modbus RTU (module CM-1)

EMC Electromagnetic compatibilty

- EMC filter integrated as standard
- Supply choke in the DC link (input current less than motor current)

Electrical connections

- 2 analog inputs for pressure transmitters 4...20 mA
- 6 digital inputs
- Safety function "Safe Torque Off" with stop category 0
- 2 analog outputs for condenser fan control and special functions
- 3 relay outputs

Data Logging (> 10 years)

- Data logging via SD-card

Optional extended functionality

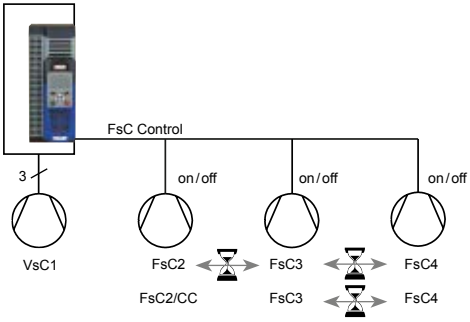
- Floating condenser control
- Superheat monitoring

Mounting

- Housing extensions for external wall mounting (IP40)

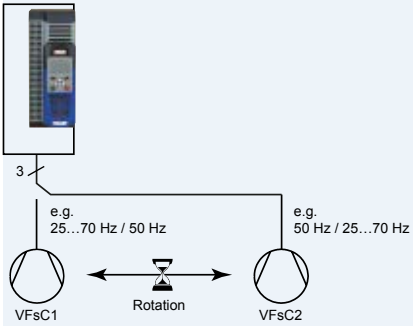
The optimum control system for your compressor rack

Classic control



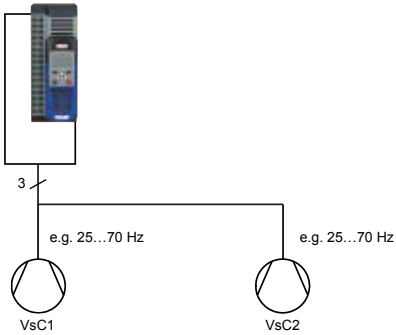
- Rack control of 1...4 compressors or with extension module up to 6 compressors
- Compressor VsC1 is frequency controlled, compressors FsC2...6 are switched on directly, if required
- Capacity control (CC) is feasible (possible improvement of the control factor)
- Intelligent compressor rotation of the fixed-speed compressors (FsCs)

Compressor rotation (swop)



- Rack control of 2 identical compressors
- Compressors VFsC1 and VFsC2 are frequency controlled in rotation
- The other VFsC functions as a FsC until rotation

Twin Compressor Control (TCC)



- Rack control of 2 compressors VsC1 / VsC2
- Both compressors are frequency controlled
- Stepless control

Designations:
VsC: Variable-speed Compressor
FsC: Fixed-speed Compressor
VFsC: Variable- / Fixed-speed Compressor
CC: Capacity control (≥ 4 cylinders)

Selection of the correct
FrigoPack FU+ Refrigeration Frequency Inverter

***FrigoPack* Select**

With the online selection app ***FrigoPack* Select** on www.frigokimo.com the correct frequency inverter can be selected in a short time. At first, the manufacturer of the variable-speed compressor is selected. A variety of known manufacturers 1 can be selected from the dropdown selection list.

In the following steps the refrigerant 2 and exact type of compressor are chosen. Based on the data available in the web integrated data base 3 the App now selects suitable ***FrigoPack*** frequency inverters 4 and presents a list.

Selection of compressor manufacturer

Many different compressor manufacturers may be selected

Refrigerant selection

With mixed refrigerants glide is also considered

***FrigoPack* Select** specification of frequency inverters

A database is used to calculate the size of the frequency inverter

Selection of the ***FrigoPack*** frequency inverter

A list of all suitable frequency inverters will be displayed

Smart and intuitive monitoring of process parameters

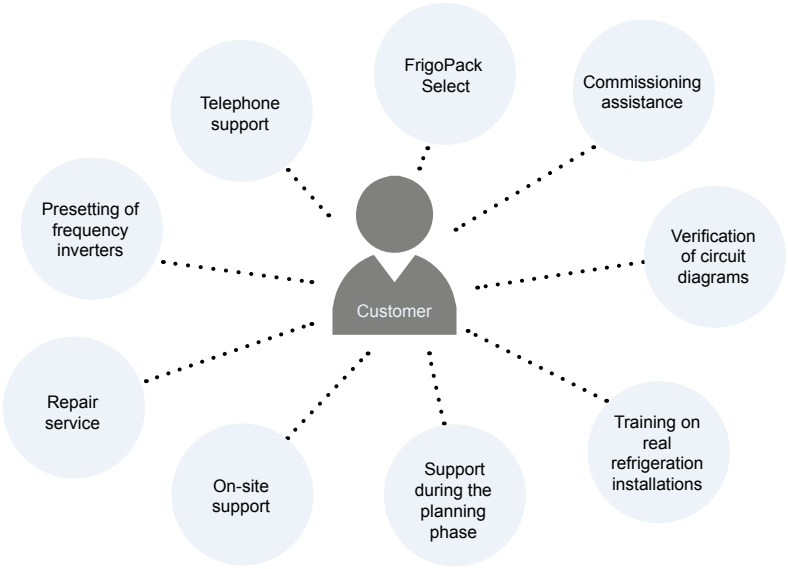
Monitoring

- Access via laptop (Ethernet / WLAN) and smartphone (WLAN) possible
- Intuitive display of evaporation and condensing temperatures
- All important parameters at one view
- All parameters are displayed in real time

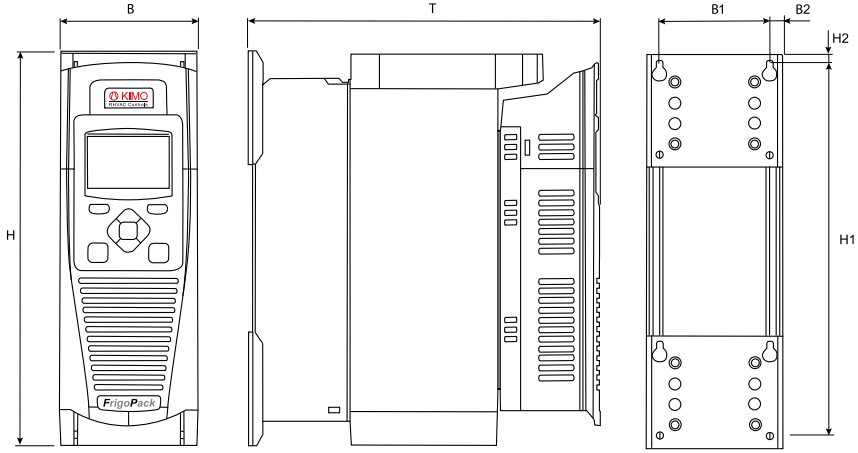
In case of error

- Fast and easy download of all process parameters directly from the inverter
- List of all operating data can be sent directly to applications@frigokimo.com
- On the basis of the snapshot, comprehensive support can be provided
- Errors during data collection are avoided

Our services

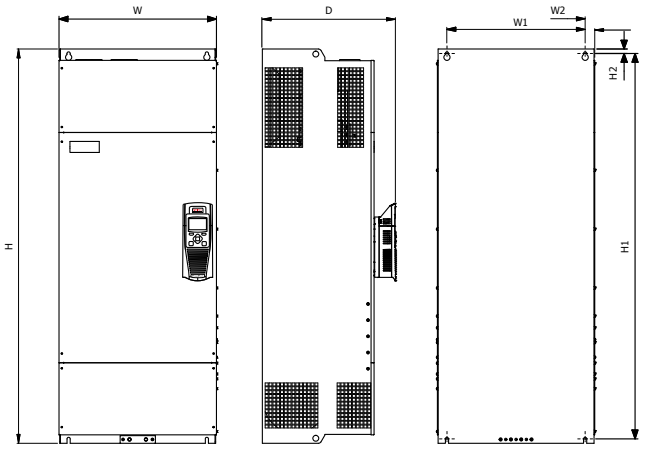


Technical data and dimensions
FrigoPack FU+ (Frame Sizes D to J)



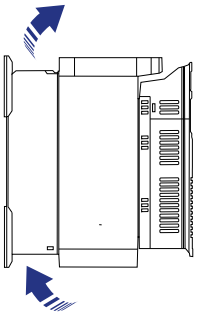
Product code FPEC / FPE	Rated current	Max. Current 3 s	Max. weight	Size	Dimensions in mm						
					W	W1	W2	H	H1	H2	D
FU+5.5	5,5 A	8,6 A	5 kg	D	100	80	10	286	270	6,5	255
FU+12	12 A	19 A									
FU+16	16 A	23 A	7 kg	E	125	100	12,5	333	320	6,5	255
FU+23	23 A	30 A									
FU+32	32 A	44 A	10 kg	F	150	125	12,5	383	370	6,5	255
FU+38	38 A	61 A									
FU+45	45 A	72 A	22 kg	G	220	190	13	480	465	7,25	287
FU+60	60 A	86 A									
FU+73	73 A	114 A									
FU+87	87 A	139 A	43 kg	H	260	220	20	670	650	10	316
FU+105	105 A	174 A									
FU+145	145 A	165 A									
FU+180	180 A	276 A	81 kg	J	330	285	23	800	780	10	374
FU+205	205 A	342 A									
FU+260	260 A	390 A									

Technical data and dimensions
FrigoPack FU+ (Frame Sizes K to N)



Product code FPEC / FPE	Rated current	Max. Current 3 s	Max. weight	Size	Dimensions in mm						
					W	W1	W2	H	H1	H2	D
FU+315	315 A	391 A	125 kg	K	400	280	60	1310	1282	15	460
FU+380	12 A	473 A									
FU+440	440 A	570 A									
FU+530	530 A	660 A	182 kg	L	535	470	32,5	1340	1310	15	460
FU+590	590 A	795 A									
FU+650	650 A	885 A	240 kg	M	604	545	29.5	1463	1448	15	460
FU+700	700 A	975 A									
FU+790	790 A	1050 A	266 Kg	N	604	545	29,5	1593	1563	15	460

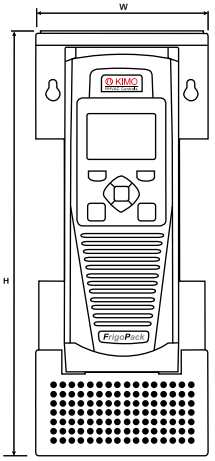
Cooling spacing

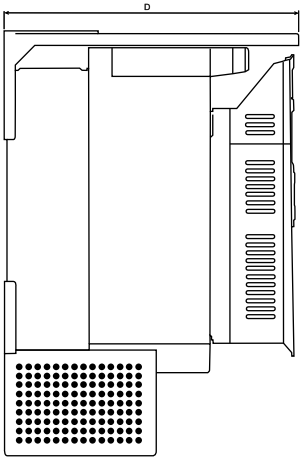


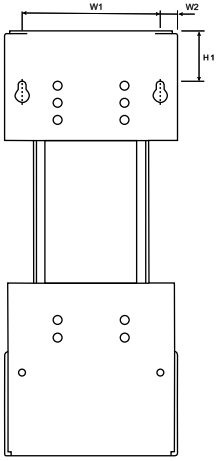
Frame size FP FU+	Distances in mm		
	Front	Top / Bottum	Left / Right
D / E / F / G / H	10	75	10
J	10	100	10
K	10	200	75
L / M / N	10	200	100

Mounting outside an electrical enclosure

Housing extensions (IP40 top, IP20 bottom) for wall-mounting of ***FrigoPack*** **FU+** frame sizes D to H outside of an electrical enclosure (to EN 60204-1) are available.







IP40 top

IP20 bottom

Frame size	Max. weigth	Abmessungen in mm					
		W	W1	W2	H	H1	D
D	6,7 kg	150	120	15	370	45	258
E	9,2 kg	170	140	15	420	45	258
F	12,8 kg	200	170	15	460	45	258
G	27,0 kg	270	240	15	600	45	290
H	49,3 kg	310	280	15	790	45	318

For your notes

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PS-508.2-1906