RVPM

Variable Frequency Drive for Permanent Magnet (PM), Brushless DC (BLDC) and Induction Motor (IM) compressors

▶ Benefits

- **Specifically designed for HVAC&R compressor applications.** Cost effective solution with optimised features to control the speed of 3-phase PM, BLDC and IM compressors
- **Easy to use.** RVPM requires a minimal set of parameters (typically 10) to properly configure the compressor
- **Plug and play**. Through the RVPM configuration software, a number of compressor models are already pre-configured resulting in an almost plug and play installation.
- **Space saving solution.** Cold-plate or heatsink with through-panel mounting options are available for higher installation flexibility and minimal panel space occupancy
- **Extends compressor lifetime.** RVPM is equipped with different protection functions to protect the drive and the compressor during abnormal operating conditions
- **Complete monitoring.** The RVPM is equipped with a Modbus RTU communication port for both read and write functions

▶ Description

RVPM is a variable frequency drive (VFD) for rotary and scroll compressors with permanent magnet (PM), brushless direct current (BLDC) and induction (IM) motors typically used in HVAC and Refrigeration applications. The RVPM is equipped with both a sensorless vector control (SLVC) for PM/BLDC compressors and a variable-voltage and frequency (V/f) control for IM compressors.
Both 1-phase (up to 4.5 kW) and 3-phase (up to 8 kW) input RVPM models are available.

Specifications are stated at 60°C at a switching frequency of 6 kHz unless otherwise stated.

▶ Applications

Heat pumps, chillers, air-conditioning units, air-handling units, refrigeration display cabinets.

▶ Main functions

- Speed control of Permanent Magnet (PM), Brushless DC (BLDC) and Induction Motor (IM) compressors
- Control via serial communication (Modbus RTU over RS485)
- Crankcase heater function

RVPM

References

Order code

👉 **RVPM** ☐ ☐ ☐ **FP** ☐

Enter the code entering the corresponding option instead of ☐

Code	Option	Description	Notes
R	-		
V	-	Product family: Variable frequency drive for PM, BLDC and IM compressors	
P	-		
M	-		
☐	1	1-Phase supply	
	3	3-Phase supply	
☐	20	Input voltage: 230 VAC (-15%, +10%)	
	40	Input voltage: 400 VAC (-15%, +10%)	
☐	0500	Output power: 4.5 kW / 6.0 HP	Only 1-phase model
	0800	Output power: 8.0 kW / 10 HP	Only 3-phase model
F	-	EMC filter (pre-wired)	
P	-	Aluminium plate for attachment to cold-plate	
☐	-		
	F	Heatsink option (through panel mounting)	

Selection guide

AC supply	Rated output power	Rated output current @ 40°C	Cooling method	Ordering code	DC choke / PFC reactor (ordering code)
1 - Phase (230 VAC)	4.5 kW	16 AAC	Cold-plate	RVPM1200500FP	RVDC0500
		12 AAC	Heatsink	RVPM1200500FPF	
3 - Phase (400 VAC)	8.0 kW	24 AAC	Cold plate	RVPM3400800FP	RVDC0800
		22 AAC	Heatsink	RVPM3400800FPF	

Further reading

Information	Where to find it	QR
Instruction manual	http://cga.pub/?bcaef8	
Modbus communication protocol	http://cga.pub/?d5a222	
Configuration software	http://cga.pub/?64d754	

RVPM

▶ CARLO GAVAZZI compatible components

Purpose	Component name / code	Notes
Accessory	RVDC0500	PFC reactor (200 µF @ 25 A) for RVPM1... models
	RVDC0800	DC choke (2 mH @ 25 A) for RVPM3... models
Note: The proper RVDC accessories must always be connected to the RVPM for proper operation.		

Structure
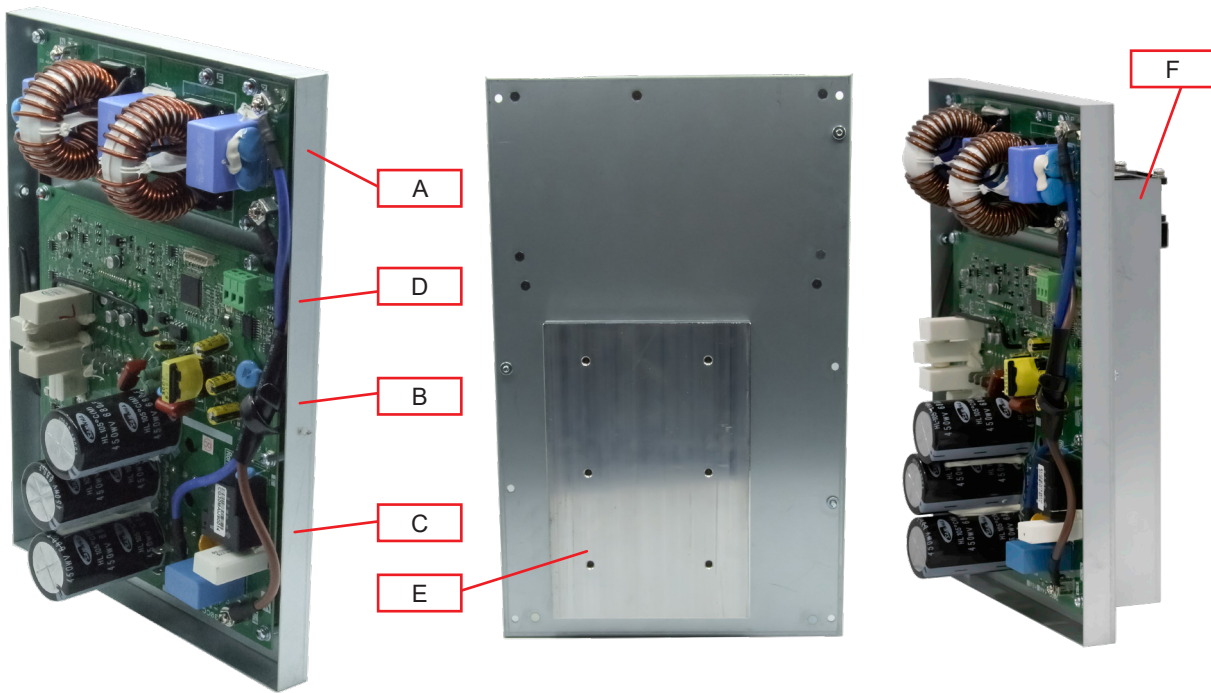
Element	Component	Function
A	EMC board	EMC filter board
B	Main drive board	Inverter board
C	Metal frame	Support frame for main drive board and EMC filter board
D	Modbus port	Communication (read/write) to PLC
E	Aluminium plate	Interface plate to mount the RVPM on cold-plate (applies to RVPM...FP models)
F	Heatsink	Heatsink with forced cooling and through-panel mounting (applies to RVPM...FPF models)

Mode of operation

The RVPM series of VFDs works on two distinct control algorithms depending on the type of compressor it controls

Control algorithm for Permanent Magnet (PM) and Brushless DC (BLDC) compressors

- To control PM/BLDC compressors select the control type Sensor-less vector (Register: 0 = 0)
- RVPM requires 10 configuration parameters for the compressor operation. Please refer to section Compressor Configuration for more details. The configuration parameters include:

  1. **Motor electrical data**
     - Line to line stator resistance: stator resistance of motor between phases.
     - Ld and Lq motor inductances
     - Number of poles on the motor
     - All these motor parameters are normally available on the compressor datasheet.

  2. **Motor nameplate data**
     - Motor base voltage: the motor base voltage is the voltage that is applied at the motor at the base frequency value. The value of the base voltage can be adjusted from 25V up to a maximum value equal to the maximum input voltage.
     - Motor base frequency: the frequency value at which the base voltage is applied.
     - Motor rated current: the motor current at full load/full speed

  3. **Motor start up parameters**
     - The final set of motor parameters consists of the parameters during start-up. These parameters are also referenced in the curves below.
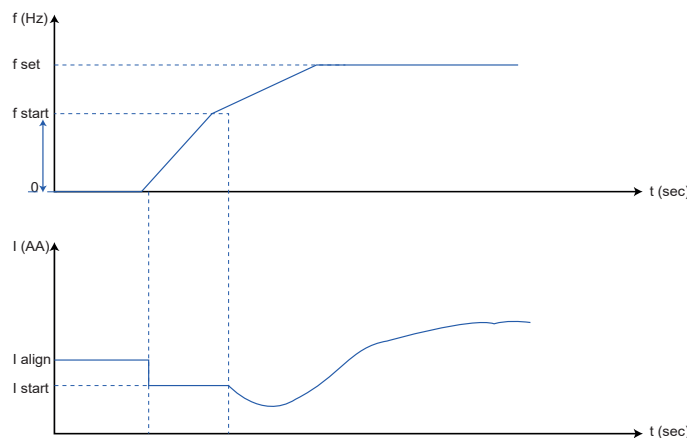
Align current (I align): this the current that allows the RVPM to align the rotor to the start position. It can be adjusted from 0% to 200% of the motor rated although a value between 100% (default) to 150% of the motor rated current is recommended.
Starting current (Istart): sets the maximum level of current limit during the start-up sequence. *I start* can be adjusted from 0% to 100% of the motor rated current. A value between 75% (default) to 100% is recommended.
*Open-loop control acceleration*: The open-loop acceleration should be configured according to the compressor datasheet. Typically it varies from 3 - 6 Hz/sec. This value represents the rate of change of the frequency (speed) of the compressor when there is a change in the frequency setting (*f set*).

Once the above configuration parameters are set, the RVPM is ready to control the compressor. As soon as the run command is applied, the RVPM will go through the start-up sequence by applying *I align* for a few seconds. After this period, the RVPM will limit the current to *I start* and accelerate the motor up to *f start* in an open-loop control mode according to the open-loop control acceleration value. After *f start* is reached, the RVPM will continue accelerating the compressor until *f set* is reached.

The deceleration value and method of stopping can also be configured. The RVPM can stop the compressor via two methods: coast to stop or deceleration to stop.

RVPM

Control algorithm for Induction Motor (IM) compressors

- To control IM motors select the control type Induction Motor (Register: 0x00 = 2)
- In V/f control mode, the compressor voltage is varied linearly with the frequency from 0 Hz to the point where the rated input voltage is applied to the motor.

- The voltage applied to the motor at 0 Hz (V boost) can also be adjusted to increase the starting torque - this parameter is defined as the boost voltage (Register: 35) and can be adjusted from 0.1 % to 25 % of the motor rated voltage. The duration (t boost) of this boost voltage can also be configured via the *V/f magnetising time* (Register: 51).

V/f operation with boost voltage
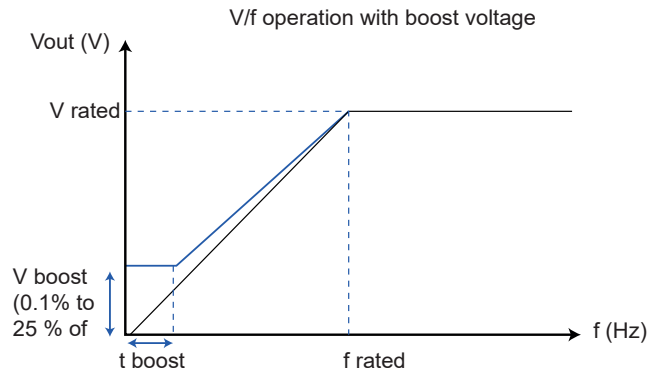
- A programmable voltage and frequency adjustment point is also available to modify the V/f curve at a specific voltage (V_m) and frequency (f_m) point. These two parameters are V/f frequency adjustment (Register: 36) and V/f voltage adjustment (Register: 37)

V/f operation with adjusted V/F ramp profile
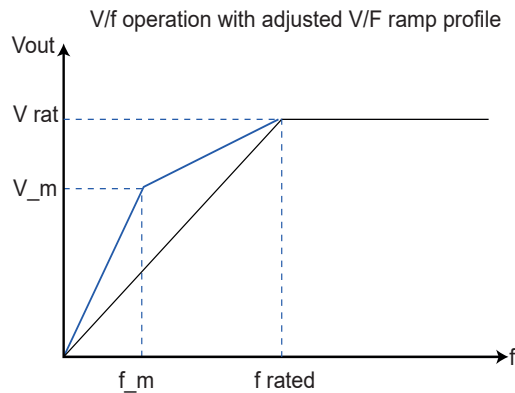
- Note: The adjusted voltage value (V_m) must be set to a value larger than V boost. If the set value of $V\_m < V$ boost the RVPM will ignore this setting until V_m is set to a larger value. In such cases, the RVPM will apply V boost until f_m is reached.

Crankcase heater function

- RVPM is equipped with a function that mimics the operation of a crankcase heater. The crankcase heater function forces a programmable current into the compressor windings during non-running states.

- Crankcase heater function is enabled via Modbus register 100 = 8.(bit 2).

- The value of the injected current is determined by the value in Modbus register 65. The value represents the % motor rated current. (Modbus register 3 value).

- During the crankcase heater operation a "hissing sound" might be heard. To minimise this sound, increase the switching frequency. (Modbus register 124).

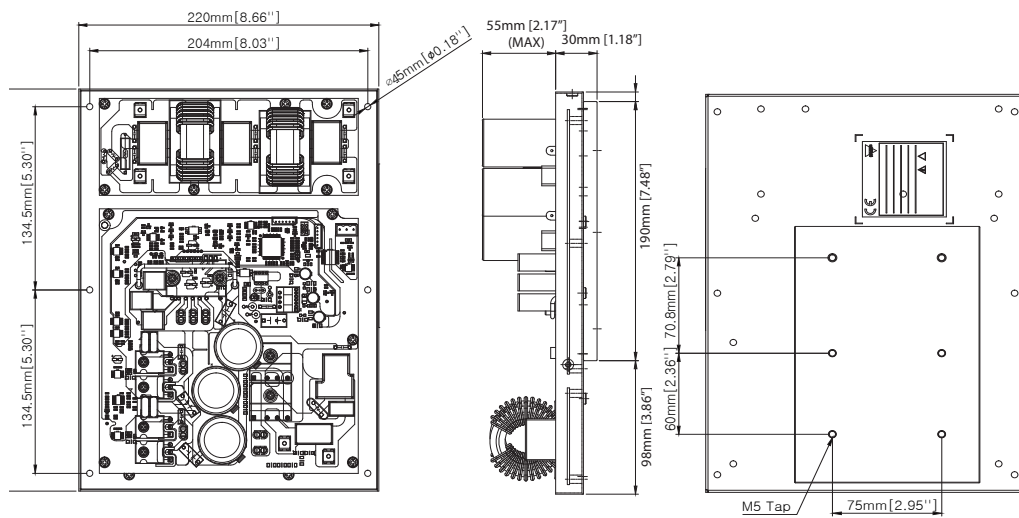# RVPM

Features

▶ **General data**

| Control algorithm	Sensor-less vector control (SLVC) for PM/BLDC compressors Variable-voltage and frequency (V/f) for IM compressors
Protection grade	IP00
Cooling type	RVPM...FP: Aluminium plate for assembly to heat exchanger / cold plate RVPM...FPF: Heatsink with forced cooling (through panel mounting)
Weight (approx.)	RVPM...FP: 2.5 kg RVPM...FPF: 3.5 kg

▶ **Dimensions**

RVPM 1-Phase: RVPM1200500FP
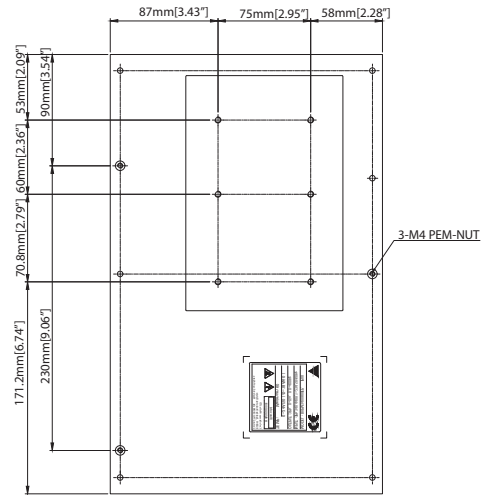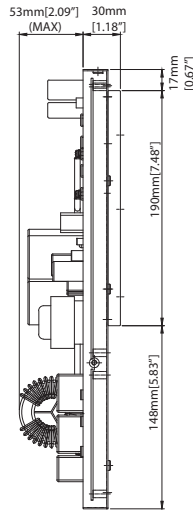Unit: mm [inches]

RVPM 1-Phase: RVPM1200500FPF
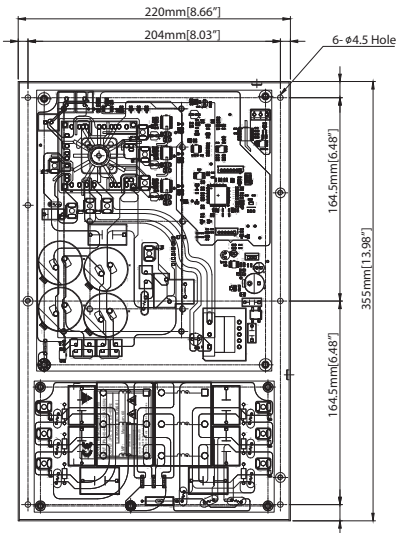Unit: mm [inches]
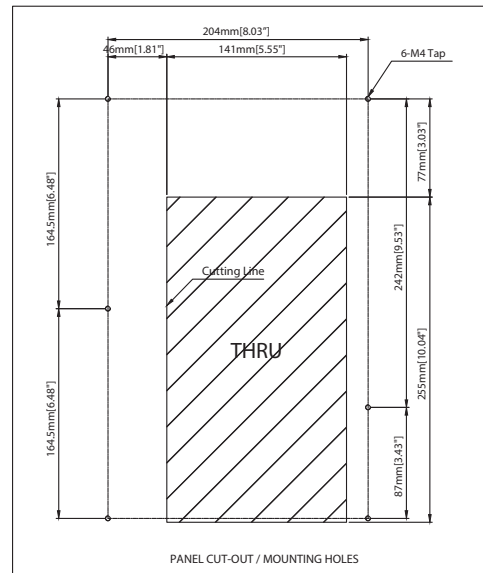

Panel Cut-out / Mounting holes
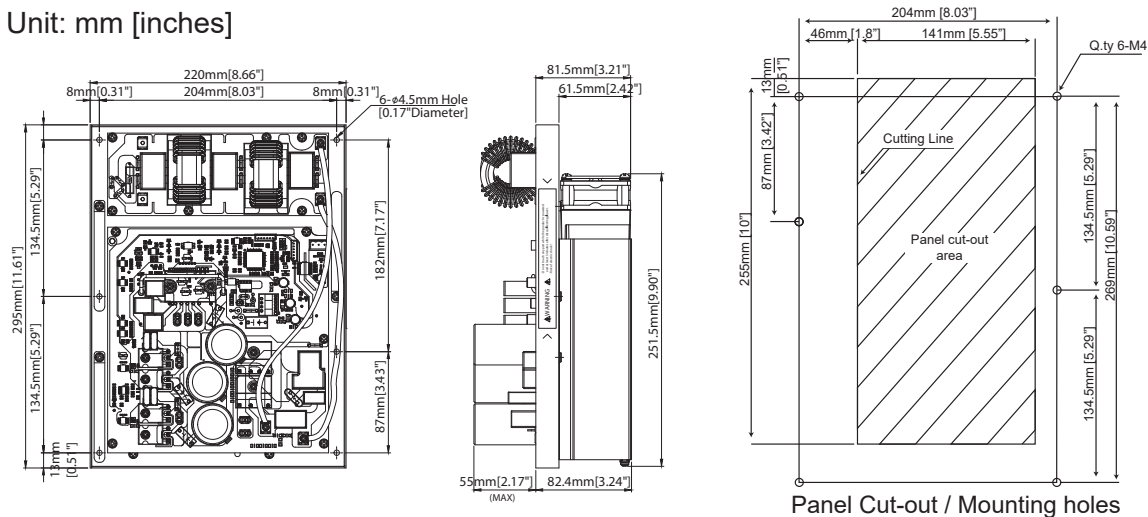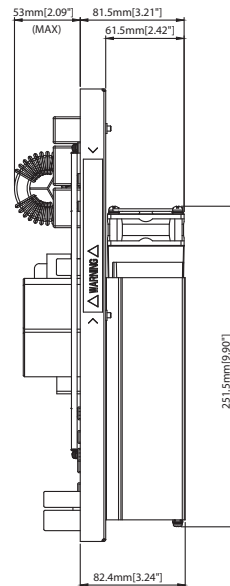
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RVPM 3-phase: RVPM3400800FP
Unit: mm [inches]

RVPM 3-phase: RVPM3400800FPF
Unit: mm [inches]

PANEL CUT-OUT / MOUNTING HOLES
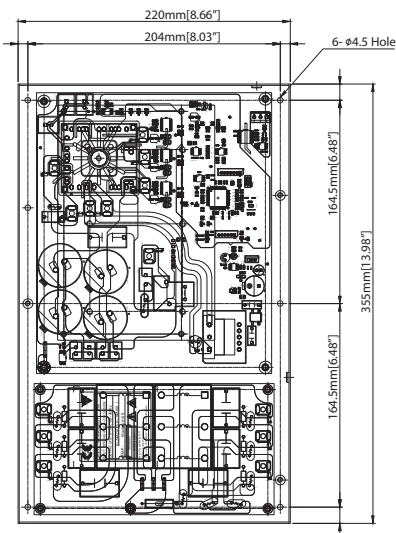
RVPM

PFC reactor: RVDC0500
Unit: mm [inches]

320 mm ± 20 [12.598"±0.79]

5.5 mm [0.217"]
9.5 mm [0.374"]

5.5 mm ±0.3 [0.217"±0.01]

60 mm ±0.5 [2.362"±0.02]
48 mm ±0.3 [1.890"±0.01]

87 mm ±0.5 [3.425"±0.02] 104.5 mm ±0.4 [4.114"±0.02] 116.5 mm ±0.5 [4.587"±0.02]
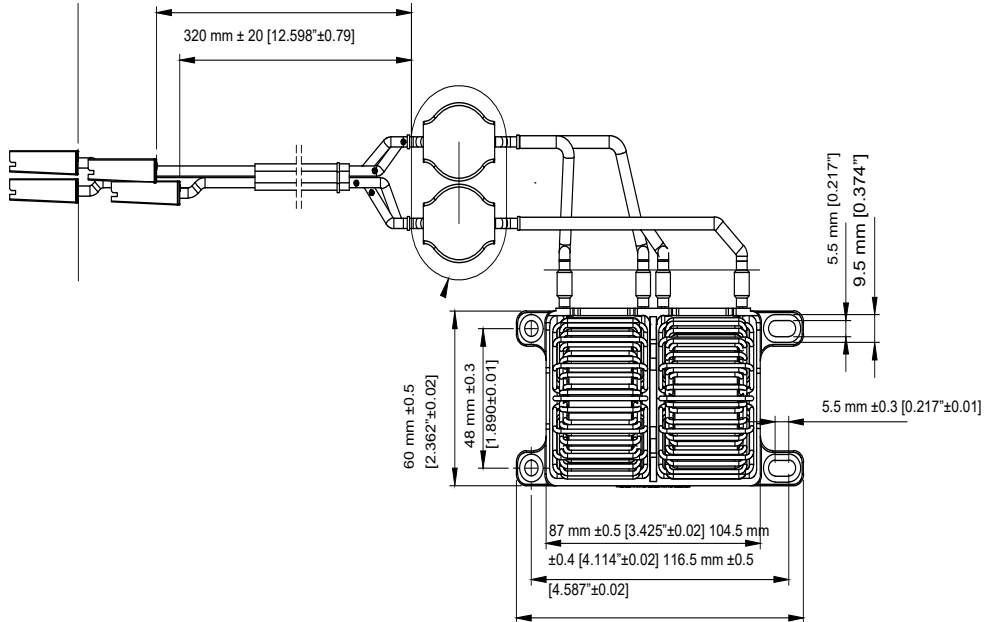
DC choke: RVDC0800
Unit: mm [inches]

95.6 mm ±0.5 [3.763"±0.02]
82 mm ±0.5 [3.228" ±0.02]
6.8 mm [0.268"]
6.8 mm [0.268"]

85 mm (MAX) [3.347"]
40 mm ±1 [1.575"±0.04]

6.5 mm [0.256"]

84.5 mm ±0.5 [3.326"±0.02]
79 mm ±0.5 [3.11"±0.02]
16.5 mm [0.65"]

90 mm ±1 [3.543"±0.04]

2 mH   25A

5.5 mm ±0.5 [0.217"±0.02]

84 mm ±0.5 [3.31"±0.02]

450 mm ±10 [17.717"±0.39]
270 mm [10.630"]
120 mm [7.724"]

66.1 mm [2.602"]

550 mm ±10 [21.654"±0.39]

1.6t

RVPM
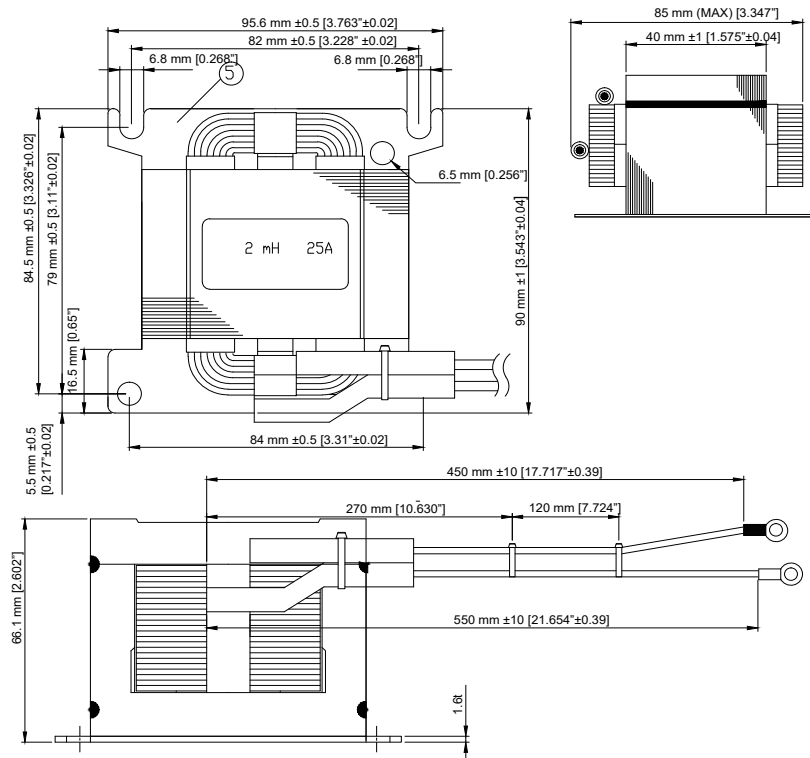
Communication interface

Protocol	Modbus (RTU)
Function code	Read holding registers (0x03h) Read input registers (0x04h) Write signal holding register (0x06h)
Type	Bi-directional (static and dynamic variables and parameters)
Functions	Compressor parameters configuration Start / stop Monitoring of measured variables Monitoring of drive status
Physical layer	RS485
Data format	Data bits: 8 Parity: none Stop bits: 2
Baud rate	9,600 bits/s / 19,200 bits/s : (default)

Communication settings

Parameter	Register	Default value	Range
Baud rate	0x1Eh	19,200 bits/s	0 : 9,600 bits/s 1 :19,200 bits/s
Parity and stop bit	0x1Fh	None, 2 stop bits	0 : None, 2 stop bits 1 : Even, 1 stop bit 2 : Odd, 1 stop bit
Device address	0x20h	1	1 - 247

Power supply

	RVPM1200500FP.	RVPM3400800FP.
AC supply phase	1 - phase	3 - phase
Input voltage	195.5 - 253 VACrms	340 - 440 VACrms
Input frequency	50 / 60 Hz (± 5%)	
Topology	Internally supplied (via mains)	
Integrated varistor	Yes	

RVPM

▶ Compressor configuration

The RVPM internal registers have to be configured according to the compressor model that is being used. The following table gives the list of parameters that are required to setup the compressor. Additional parameters for advanced configuration are available in the Modbus manual.

Parameter	Register	Range
Control mode	0x01h	0 = sensor-less vector control for PM/ BLDC compressor 2 = V/f control for IM compressors
Compressor rated frequency (Hz)	0x01h	25 - 400 Hz
Compressor rated voltage (V)	0x02h	RVPM 1-Phase: 25 - 250 VAC RVPM 3-Phase: 25 - 500 VAC
Compressor rated current (full load)	0x03h	0.1* RVPM rated output current - RVPM rated output current
Acceleration (Hz/s)	0x12h	0 - 50 Hz / s
Deceleration (Hz/s)	0x17h	0 - 50 Hz / s
Stator resistance - line to line (m Ω)	0x2Eh	0 - 30,000 m Ω
D-axis inductance, Ld (mH)	0x30h	0 - 600 mH
Q-axis inductance, Lq (mH)	0x32h	0 - 600 mH
Output frequency upper limit (Hz)	0x06h	Frequency lower limit [0x07h] - 400 Hz
Output frequency lower limit (Hz)	0x07h	0 - Frequency upper limit [0x06h]
Number of poles	0xB4h	6 - 20

▶ Environmental

Working temperature	-30 °C to +60 °C (-22 °F to + 140 °F)
Storage temperature	-30 °C to +60 °C (-22 °F to +140 °F)
Relative humidity	< 90% non-condensing @ 40ºC
Installation category	2
Installation altitude	1000 m
Vibration	Acc. to IEC/EN 60068-2-6 5.9 m/s^2 (0.6 g), 10 ~ 55 Hz

▶ Compatibility and conformity

Standard compliance	Low voltage directive	IEC / EN 61800-5-1
	Electromagnetic compatibility	IEC 61800-3: 2004+A1:2011 EN 61800-3:2004+A1:2012 Category C2 (2nd environment)
Marks	CE	

RVPM

Input specifications

	RVPM1200500FP.	RVPM3400800FP.
Rated input power	5.0 kW	8.2 kW
Rated input current	22 AAC	23 AAC
Maximum input current	28 AAC	26 AAC
Control input	Modbus RTU port (over RS485)	

Output specifications

|		RVPM1200500FP	RVPM1200500FPF	RVPM3400800FP	RVPM3400800FPF
Rated output power		4.5 kW		8.0 kW	
Output frequency range		0 - 400 Hz			
Frequency resolution		0.1 Hz			
Switching frequency		4 kHz - 6 kHz			
Rated output current	@ 40 °C	16 Arms	12 Arms	24 Arms	22 Arms
	@ 50 °C	16 Arms	12 Arms	24 Arms	20 Arms
	@ 60 °C	14 Arms	10 Arms	18 Arms	18 Arms
Overload output current		150 % of rated RVPM current for 1 min.			
Maximum output current		200 % of rated RVPM current for 0.4 min.			

Performance

Current / power ratings: kW and HP @ 40 °C

Model	IEC rated current	Rated output power	
RVPM1200500FP	16 Arms	4.5 kW	6.0 HP
RVPM1200500FPF	12 Arms		
RVPM3400800FP	24 Arms	8.0 kW	10 HP
RVPM3400800FPF	22 Arms		

RVPM

Connection diagrams
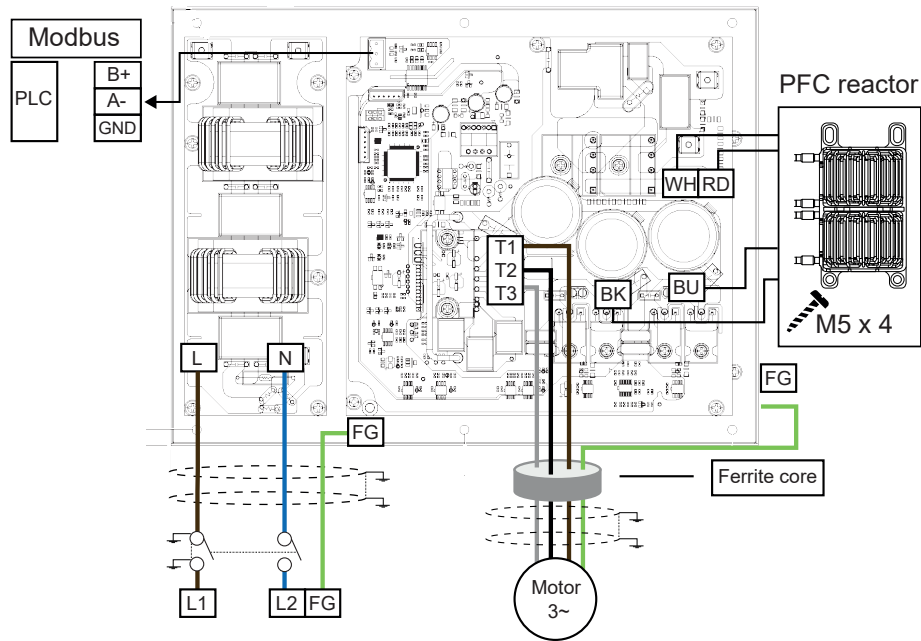
Function	RVPM1200500FP.	
	Main board	**EMC board**
	Terminal marking	
Line connections	L1, N1	L, N
Load connections	T1, T2, T3	L1, N1
Modbus connections	B+, A-, GND	-
Functional ground	FG	
PFC reactor connections	WH (white), RD (red), BK (black), BU (blue)	-

Note (1): Use shielded cables. The cable shield must be connected to ground.
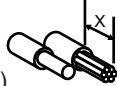**Note (2): Connect ferrite cores (not provided with RVPM) on the output (T1, T2, T3) cables to improve EMC performance**

RVPM
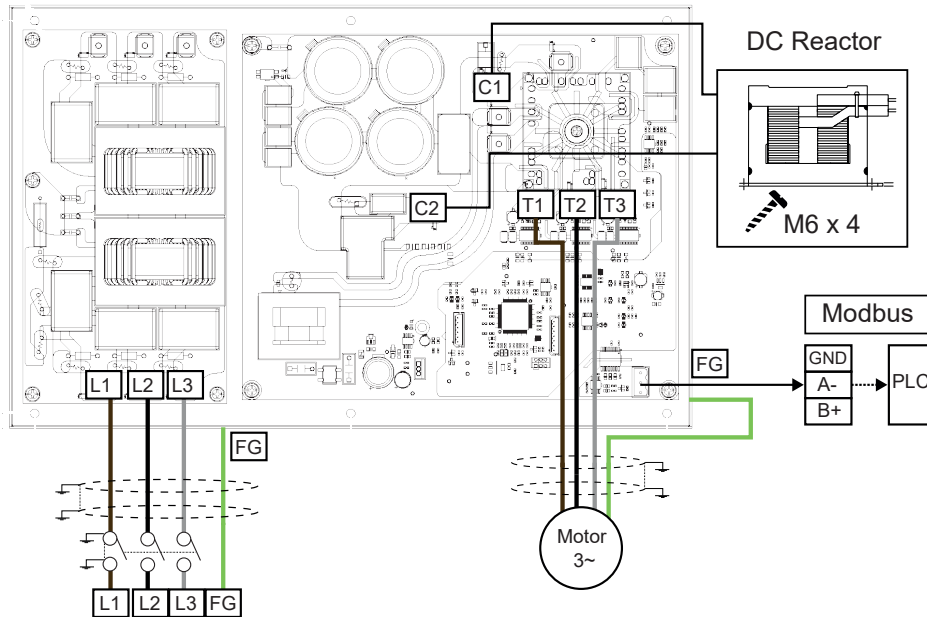
Function	RVPM3400800FP.	
	Main board	**EMC board**
	Terminal marking	
Line connections	L1, L2, L3	L1, L2, L3
Load connections	T1, T2, T3	R (white), S (black), T (red)
Modbus connections	B+, A-, GND	-
Functional ground	FG	
DC reactor connections	C1, C2	-
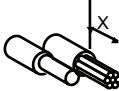
Note: Use shielded cables. The cable shield must be connected to ground.

RVPM

Connection specifications

RVPM3400800FP...				
Function	**Marking**	**Termination type**	**Wire dimensions**	**Tightening torque**
Line connections	**L1, L2, L3**	M3.5 lug	2.5 - 4 mm² AWG 12...14	0.64 - 0.75 Nm (5.6 - 6.5 lb in)
Load connections	**T1, T2, T3**			
Modbus connections	**B+, A-, GND**	Pluggable terminals M3 screw	X = 7.0 - 8.0 mm 0.2...1.5 mm² AWG 28 - 12 (solid) AWG 30 - 12 (stranded)	0.5 Nm (4.43 lb - in)
Functional ground	**FG**	M3.5 lug	1.5 - 2.5 mm² AWG 14...16	0.64 - 0.75 Nm (5.6 - 6.5 lb in)
DC reactor connections	**C1, C2**		4 mm² AWG 12	

Notes
1) Use shielded cables. The cable shield must be connected to ground.
2) DC reactor is already provided with cables and terminations.
3) DC reactor requires M6 screws for mounting.
4) Max. depth screws for coldplate = 6mm.
5) For RVPM...FPF models, provide the fans with a 24VDC 0.2A power supply (red - positive (+), black - negative (-) terminal).

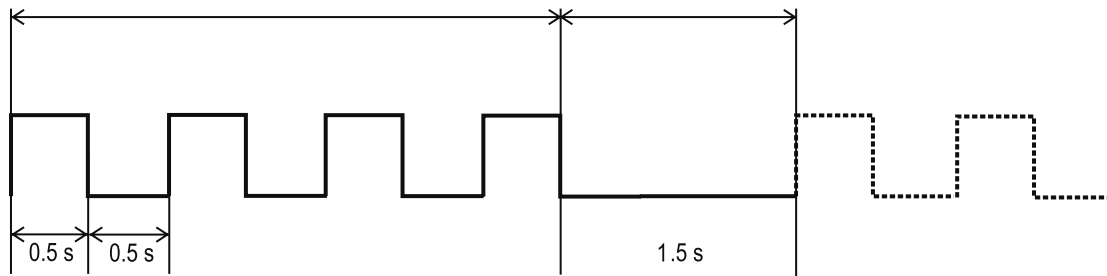| RVPM120500FP...				
Function	**Marking**	**Termination type**	**Wire dimensions**	**Tightening torque**
Line connections	**L, N**	M3.5 lug	2.5 - 4 mm2 AWG 12...14	0.64 - 0.75 Nm (5.6 - 6.5 lb in)
Load connections	**T1, T2, T3**	Faston (6.35 x 0.8 mm)	2.5 - 4 mm2 AWG 12...14	-
Modbus connections	**B+, A-, GND**	Pluggable terminal M3 screw	x = 7.0 - 8.0 mm 0.2...1.5 mm² AWG 28 - 12 (solid) AWG 3 -12 (stranded)	0.5 Nm (4.43 lb - in)
Functional ground	**FG**	M3.5 lug	1.5 - 2.5 mm² AWG 14...16	0.64 - 0.75 Nm (5.6 - 6.5 lb in)
PFC reactor connections	**WH (white), RD (red), BK (black), BU (blue)**	Faston (6.35 x 0.8 mm)	2.5 mm² AWG 14	-

Notes |
1) Use shielded cables. The cable shield must be connected to ground. |
2) Connect ferrite cores (not provided with RVPM on the input (L, N) and output (T1, T2, T3) cables to improve EMC performance. |
3) PFC reactor is already provided with cables and terminations. |
4) PFC reactor requires M5 screws for mounting. |
5) Max. depth screws for coldplate = 6mm. |
6) For RVPM...FPF models, provide the fans with a 24VDC 0.2A power supply (red - positive (+), black - negative (-) terminal). |
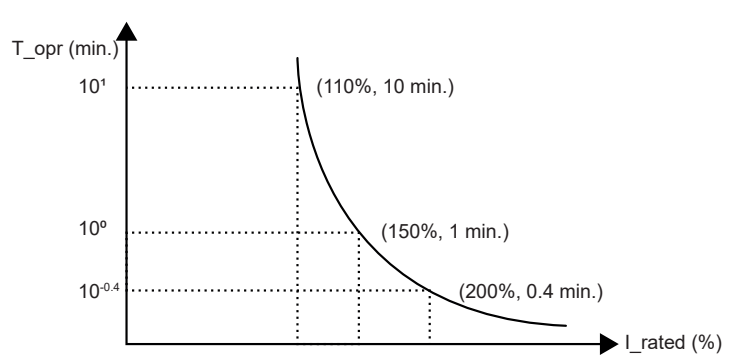
RVPM

Troubleshooting

The RVPM includes a number of diagnostics and protection alarms. Each of these alarms is signalled through a flashing sequence on the red LED.

Number of LED flashes	1
Alarm	Output over current
Alarm description	If a high instantaneous output current is detected, the RVPM will issue the output over current alarm
Possible cause(s)	• The compressor absorbs a higher current than the power rating of the RVPM drive • Compressor winding short circuit • Transient load change • Acceleration / deceleration rate setting too high
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through alarm reset command • Switch off and on the RVPM's power supply
Troubleshooting	• Check that the compressor rated current setting is not smaller than compressor current at the specific frequency of operation. Note: The compressor current listed in the datasheet might not necessarily be equal to the current at the maximum frequency of operation allowed by the compressor. Contact the compressor manufacturer should this data not be available on the datasheet. • Check that the RVPM maximum output current is larger than the compressor maximum current • Check the compressor winding resistance to check if compressor is damaged • If the alarm occurs during acceleration/deceleration or a change in the speed setpoint, apply a lower acceleration / deceleration rate • Check the programmable parameters related to the compressor model • If the alarm persists contact a Carlo Gavazzi representative

RVPM

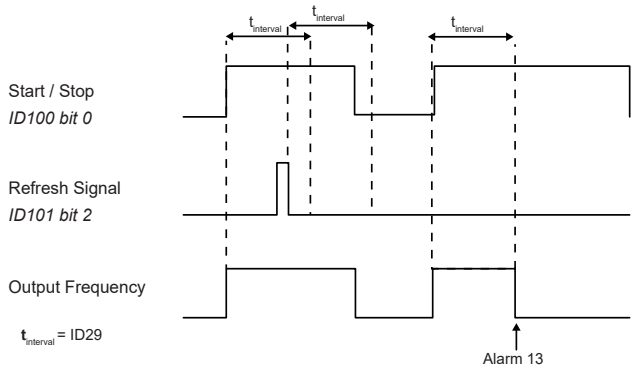| Number of LED flashes	2
Alarm	Compressor overload
Alarm description	If the RVPM time-current characteristic is violated, the RVPM will issue the compressor overload alarm **Key** T_opr: operating time I_rated: percentage of motor rated current **Note: the compressor rated current is the reference for the compressor overload protection**
Possible cause(s)	• The system current demand is larger than under normal conditions • Compressor absorbs a higher current than what RVPM can handle
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through alarm reset command • Switch off and on the drive's power supply
Troubleshooting	• Check that the compressor rated current setting is not smaller than compressor name plate current • Check the programmable parameters related to the compressor model

Number of LED flashes	3
Alarm	Overvoltage
Alarm description	If the DC Link Voltage > *overvoltage fault level setting*, the RVPM will issue an overvoltage alarm
Possible cause(s)	• Deceleration rate setting too high • Voltage fluctuation on the power supply network
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through alarm reset command • Switch off and on the RVPM's power supply
Troubleshooting	• Set a lower deceleration rate • Measure the input voltage and check that it is within the allowed range

RVPM

Number of LED flashes	4
Alarm	Under voltage
Alarm description	If the DC link voltage < *under voltage fault level setting*, the RVPM will issue an under voltage alarm
Possible cause(s)	• Voltage fluctuation on the power supply network • The voltage detection circuit inside the drive is faulty
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through alarm reset command • Switch off and on the drive's power supply
Troubleshooting	• Set a lower deceleration rate • Measure the input voltage and check that it is within the allowed range • If the alarm persists, contact a Carlo Gavazzi representative

Number of LED flashes	5
Alarm	Over temperature
Alarm description	RVPM constantly measures the power module (IGBTs) temperature. If the IGBT temperature exceeds the maximum level allowed an over temperature alarm is triggered
Possible cause(s)	• High surrounding temperature • The power module is not properly cooled • The temperature sensor or temperature sensing circuit inside the drive is faulty
RVPM reaction	RVPM switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through *Alarm Reset* command • Allow enough time for the RVPM to cool down before attempting another start • Switch off and on the power supply to reset the alarm
Troubleshooting	• Improve the cooling and ventilation system • Consider reducing the *Switching Frequency* setting • Consider enabling either the *Switching Frequency* or *Output Frequency Auto-reduction* protection function • If the alarm persists, contact a Carlo Gavazzi representative

RVPM

Number of LED flashes	13
Alarm	Modbus communication loss
Alarm description	If *Refresh Interval* value > 0, RVPM expects a *Refresh Command [65h]* within the refresh interval during run state. If the refresh command is not sent during this period, the RVPM assumes that communication has been lost and Modbus communication loss alarm is triggered.
Possible cause(s)	• RS485 serial disconnection between the RVPM drive and the Modbus master
RVPM reaction	The RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through Alarm Reset command • Switch off and on the drive's power supply
Troubleshooting	• Check the RS485 serial wiring • Make sure that refresh command is being sent before the *refresh interval* period

Number of LED flashes	14
Alarm	Input over current (single-phase models only)
Alarm description	If a high instantaneous input current is detected, RVPM will issue the input over current alarm
Possible cause(s)	• Transient load change • *Acceleration Rate* is set too high
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through *Alarm Reset* command • Switch off and on the power supply
Troubleshooting	• Check compressor windings to check if compressor is damaged • Set a lower *Acceleration* rate • Check the programmable parameters related to the compressor • If the alarm persists, contact a Carlo Gavazzi representative

RVPM

Number of LED flashes	15
Alarm	Power module faulty
Alarm description	In case the RVPM detects that the power module is damaged, the drive will trip
Possible cause(s)	• Excessive load
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• This alarm is not resettable and it is suggested to replace the unit and contact a Carlo Gavazzi representative should this alarm occur
Troubleshooting	• Consider replacing the RVPM drive

Number of LED flashes	16
Alarm	Control power under voltage (3-phase models only)
Alarm description	If the IGBT gate driver input voltage < voltage level required, the RVPM will issue the control power under voltage
Possible cause(s)	• Insufficient power supply voltage • The control circuit inside the drive is faulty
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through *Alarm Reset* command • Switch off and on the drive's power supply
Troubleshooting	• Check the power supply voltage • If the alarm is persistent contact a Carlo Gavazzi representative

Number of LED flashes	17
Alarm	Compressor phase loss
Alarm description	RVPM will issue a compressor phase loss alarm if the following conditions are true: • Output Current Balance Sensitivity [C3h] value > 0 and; • An unbalance in the output current is detected
Possible cause(s)	• Any of the phases of the compressor cables gets disconnected
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Check the connections between the RVPM and compressor • Reset the alarm through *Alarm Reset* command • Switch off the drive's power supply, check the connections between the compressor and drive and then turn on again
Troubleshooting	• Check for any loose connections on the U, V, W side of the drive • Check for any loose connections on the compressor terminals

RVPM

Number of LED flashes	22
Alarm	Power supply under voltage or phase loss (3-phase models only)
Alarm description	If the power supply under voltage or phase loss is detected, the RVPM will issue an alarm. This alarm is enabled by: *Power Supply Phase Loss Supervisor* The sensitivity of this function and the time to detect the phase loss are determined by: • *Power Supply Phase Loss DC Voltage Ripple* and • *Power Supply Phase Loss Fault time* respectively
Possible cause(s)	• Insufficient power supply voltage • Power cable supplying the drive disconnected
RVPM reaction	RVPM will switch off the gate drivers and compressor will coast to stop
Action to recover alarm	• Reset the alarm through Alarm Reset command after checking the connections of the power cable • Switch off the drive's power supply, check the connections between the compressor and drive and then turn on again
Troubleshooting	• Measure the input voltage and check that it is within the allowed range • If the alarm persists, contact a Carlo Gavazzi representative