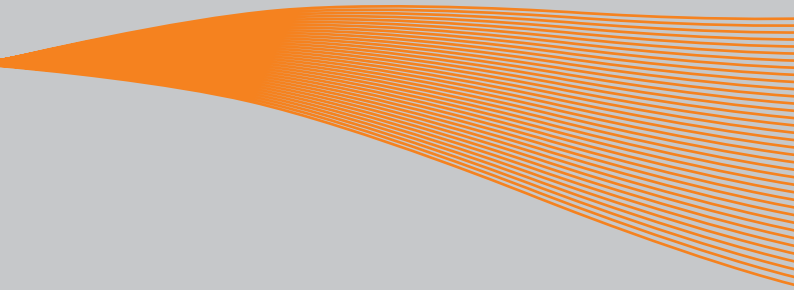
VACON 10
AC DRIVES

QUICK GUIDE
API RS-485



VACON
DRIVEN BY DRIVES

This quick guide includes the essential steps for easy installation and setup of your Vacon 10 frequency converter. Before commissioning your drive, download and read the complete Vacon 10 User Manual available at:
www.vacon.com -> Support & Downloads

1. SAFETY

ONLY A COMPETENT ELECTRICIAN IS ALLOWED TO CARRY OUT THE ELECTRICAL INSTALLATION!

This quick guide contains clearly marked warnings which are intended for your personal safety and to avoid any unintentional damage to the product or connected appliances.

Please read these warnings carefully:

The components of the power unit of the frequency converter are live when Vacon 10 is connected to mains potential. Coming into contact with this voltage is extremely dangerous and may cause death or severe injury.

The motor terminals U, V, W (T1, T2, T3) and the possible brake resistor terminals R+/R- are live when Vacon 10 is connected to mains, even if the motor is not running.

The control I/O-terminals are isolated from the mains potential. However, the relay output terminals may have a dangerous control voltage present even when Vacon 10 is disconnected from mains.

The earth leakage current of Vacon 10 frequency converters exceeds 3.5mA AC. According to standard EN61800-5-1, a reinforced protective ground connection must be ensured. **See Chapter 7!**

If the frequency converter is used as a part of a machine, the machine manufacturer is responsible for providing the machine with a main switch (EN 60204-1).

If Vacon 10 is disconnected from mains while running the motor, it remains live if the motor is energized by the process. In this case the motor functions as a generator feeding energy to the frequency converter.

After disconnecting the frequency converter from the mains, wait until the fan stops and the status leds on the front panel go out. Wait 5 more minutes before doing any work on Vacon 10 connections.

The motor can start automatically after a fault situation, if autoreset function has been activated.

2. INSTALLATION

2.1 Mechanical installation

There are two possible ways to mount Vacon 10 in the wall; either screw or DIN-rail mounting.

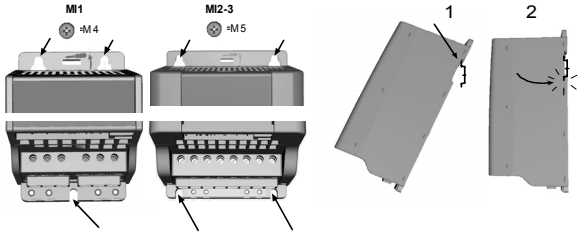


Figure 1: Screw mounting (left) and DIN-rail mounting (right)

NOTE! See the mounting dimensions on the back of the drive.
Leave **free space** for cooling above **(100 mm)** and below **(50 mm)** Vacon 10!

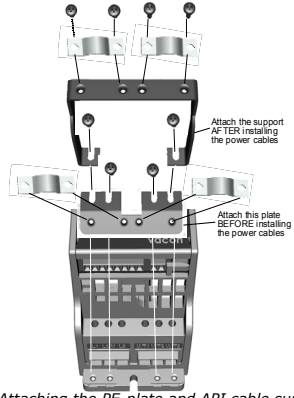


Figure 2: Attaching the PE-plate and API cable support

2.2 Cabling and connections

2.2.1 Power cabling

Note! Tightening torque for power cables is 0.5 - 0.6 Nm

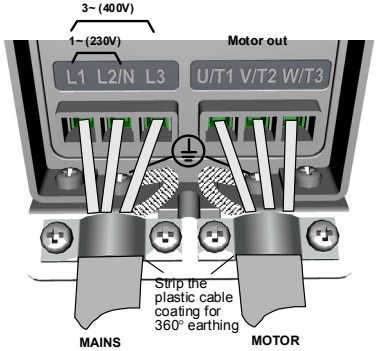


Figure 3: Vacon 10 power connections, MI1

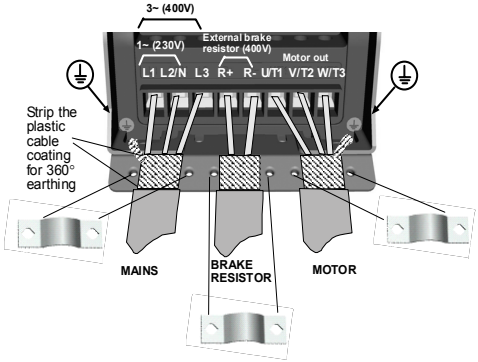


Figure 4: Vacon 10 power connections, MI2 - MI3

2.2.2 Control cabling

Figure 5: Open the cover

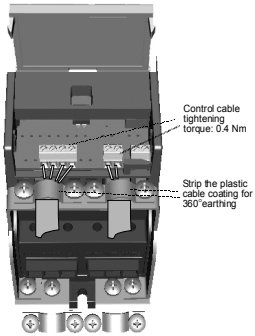


Figure 6: Install the control cables. See next page!

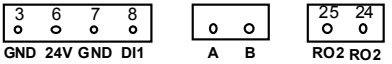
3. CONTROL I/O AND TERMINALS

Vacon 10 I/O terminals for API RS-485:

Terminal		Signal	Factory preset	Description
3	GND	I/O signal ground		
6	24Vout	24V output for DI		±20 %, max. load 50 mA
7	GND	I/O signal ground		
8	DI1	Digital input 1	1 = Start forward	0 - +30 V Ri = 12 kΩmin
A	A	RS485 signal A	FB Communication	
B	B	RS485 signal B	FB Communication	
24	RO 21	Relay out 2	ACTIVE (Relay opened) = FAULT P)	Max. switching load: 250Vac/2A or 250Vdc/ 0,4A
25	RO 22			

Table 1: Vacon 10 General purpose application default I/O configuration and connections for API RS-485 version

Vacon 10 RS-485 I/O terminals:



4. NAVIGATION & STARTUP

4.1 The status LEDs of Vacon 10 RS-485

There are three status LED lights on the front panel of Vacon 10 RS-485. The LEDs indicate the status of the drive, provide the user with information on faults and help the user to select the control place or fieldbus address.

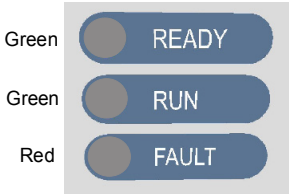
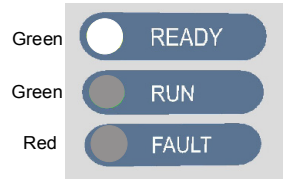


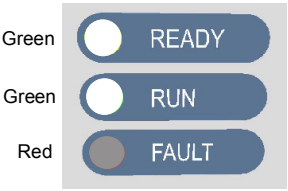
Figure 1: The status LEDs of Vacon 10 RS-485

The following figures present the functionality of the status LEDs in different situations:

READY LED on: Vacon 10 is ready for operation

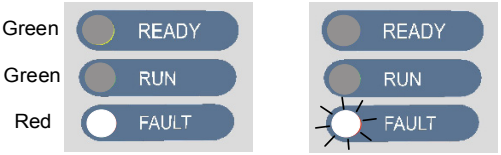


READY and RUN LEDs on:
Vacon 10 is running the motor



Red LED on:
Vacon 10 is not ready
(e.g. supply voltage too low)

Red LED is blinking:
there is an active fault
(See chapter 6)



4.2 Commissioning

4.2.1 Commissioning steps:

1. Read safety instructions on page 1
2. Secure the grounding and check that cables comply with requirements
3. Check quality and quantity of cooling air
4. Check that the possible start/stop switch is in STOP position
5. Connect the drive to mains
6. This step is not valid for API RS-485
7. Perform test run without motor, see the User Manual at www.vacon.com
8. Run no-load tests without motor being connected to the process
9. Connect the motor to the process and perform test run once again
10. Vacon 10 rs-485 is now ready for use

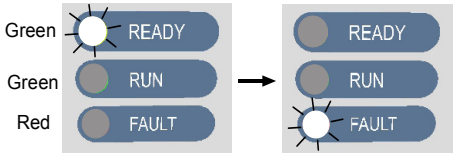
Table 1: Commissioning steps

4.3 Selection of control place or fieldbus address

In Vacon 10 RS-485 the user can select the control place and Modbus slave address without connecting the drive to PC. The procedures are described below.

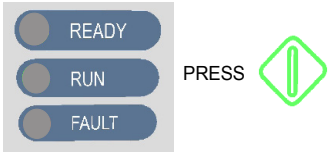
4.3.1 Selection of control place

1) Press the STOP button for 5 seconds in STOP state, the READY and FAULT LEDs start to blink in turns:



2) Press the STOP-button to proceed to the next step

3) Keypad control place selection, all LEDs are off

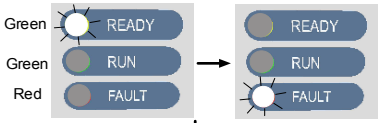


The keypad is now the control place and frequency reference source of the drive and the drive is ready for operation.

NOTE! When keypad is selected as the control place, Vacon RS-485 starts forward when the START button is pressed. The frequency reference can be increased for 5Hz with each press of the button.

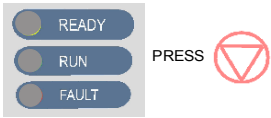
4.3.2 Selection of fieldbus address

1) Press the STOP button for 5 seconds, the READY and FAULT LEDs start to blink in turns:

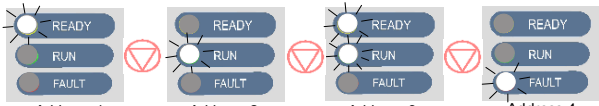


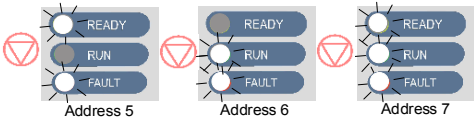
2) Press the STOP-button to proceed to the next step

3) Keypad control place selection, all LEDs are off



4) Modbus slave address selection. The slave addresses are binary coded and indicated with blinking LEDs. Press the STOP button to move to the next address:





Confirm the desired address with START button:

Vacon 10 will return to READY state and fieldbus is now the control place and frequency reference source of the drive. Via PC tools or fieldbus the address can be selected between 1 and 255. (NOTE: if no button is pressed in 30 seconds, the drive will always return to READY state)

5. MONITORING & PARAMETERS

Note! Complete parameter listing and descriptions are given in Vacon 10 User Manual, available at: www.vacon.com -> Support & Downloads

5.1 Monitoring values

Code	Monitoring signal	Unit	ID	Description
M1.1	Output frequency	Hz	1	Frequency to the motor
M1.2	Frequency reference	Hz	25	
M1.3	Motor shaft speed	rpm	2	Calculated motor speed
M1.4	Motor current	A	3	Measured motor current
M1.5	Motor torque	%	4	Calculated actual/nominal torque of the motor
M1.6	Motor power	%	5	Calculated actual/nominal power of the motor
M1.7	Motor voltage	V	6	Motor voltage
M1.8	DC-link voltage	V	7	Measured DC-link voltage
M1.9	Unit temperature	C°	8	Heat sink temperature
M1.10	Motor temperature	C°		Calculated motor temperature
M1.14	DI1		15	Digital input status. When DI1 is active, PC tool indicates '100'
M1.16	RO2		17	Relay output status When RO1 is active, PC tool indicates '10'
M1.17	PI setpoint	%	20	In percent of the maximum process reference
M1.18	PI feedback	%	21	In percent of the maximum actual value
M1.19	PI error value	%	22	In percent of the maximum error value
M1.20	PI Output	%	23	In percent of the maximum output value

Table 1: Vacon 10 API RS-485 monitoring values (General purpose application)

5.2 Quick setup parameters

Code	Parameter	Min	Max	Unit	Default	ID	Note
P1.1	Motor nominal voltage	180	500	V	230 400	110	Check rating plate on the motor
P1.2	Motor nom. frequency	30	320	Hz	50,00	111	Check rating plate on the motor
P1.3	Motor nominal speed	300	20000	rpm	1440	112	Default applies for a 4-pole motor.
P1.4	Motor nominal current	0,2 x I_{Nunit}	1,5 x I_{Nunit}	A	I_{Nunit}	113	Check rating plate on the motor
P1.5	Motor cos φ	0,30	1,00		0,85	120	Check rating plate on the motor
P1.7	Current limit	0,2 x I_{Nunit}	2 x I_{Nunit}	A	1,5 x I_{Nunit}	107	
P1.15	Torque boost	0	1		0	109	**0** = Not used **1** = Used
P2.1	Control place	1	3		3	125	**1** = I/O terminal **2** = Keypad **3** = Fieldbus
P2.2	Start function	0	1		0	505	**0** = Ramp **1** = Flying start
P2.3	Stop function	0	1		0	506	**0** = Coasting **1** = Ramp
P3.1	Min frequency	0,00	P3.2	Hz	0,00	101	
P3.2	Max frequency	P3.1	320	Hz	50,00	102	
P3.3	I/O reference	0	2		2	117	**0** = Preset Speeds **1** = Keypad Reference **2** = Fieldbus Reference
P3.4	Preset speed 0	0,00	P3.2	Hz	5,00	124	Activated by digital inputs
P3.5	Preset speed 1	0,00	P3.2	Hz	10,00	105	Activated by digital inputs
P4.2	Acceleration time	0,1	3000	s	1,0	103	
P4.3	Deceleration time	0,1	3000	s	1,0	104	
P10.4	Automatic restart	0	1		0	731	**0** = Not used **1** = Used
P13.1	Parameter conceal	0	1		1	115	**0** = All parameters visible **1** = Only basic parameters

Table 2: Quick setup parameters (General purpose application)

5.3 System menu parameters

Code	Parameter	Min	Max	Default	ID	Note
Software information (MENU PAR -> S1)						
S1.1	Software package				833	
S1.2	Power SW version				834	
S1.3	API SW version				835	
S1.4	API Firmware interface				836	
S1.5	Application ID				837	
S1.6	Application revision				838	
S1.7	System load				839	
RS485 information (MENU PAR -> S2)						
S2.1	Communication status				808	Format: **xx.yyy** **xx** = 0 - 64 (Number of error messages) **yyy** = 0 - 999 (Number of good messages)
S2.2	Fieldbus protocol	0	1	1	809	**0 =** FB disabled **1**= Modbus
S2.3	Slave address	1	255		810	
S2.4	Baud rate	0	5	5	811	**0**=300, **1**=600, **2**=1200, **3**=2400, **4**=4800, **5**=9600,
S2.5	Number of stop bits	0	1	1	812	**0**=1, **1**=2
S2.6	Parity type	0	0	0	813	**0**= None (locked)
S2.7	Communication time-out	0	255	0	814	**0**= Not used, **1**= 1 second, **2**= 2 seconds, etc.
S2.8	Reset communication status				815	**1**= Resets par. S2.1
Total counters (MENU PAR -> S3)						
S3.1	MWh counter	0	1	0	827	
S3.2	Power on days	0	1	0	828	
S3.3	Power on hours	0	1	0	829	
User settings (MENU PAR -> S4)						
S4.2	Restore factory defaults	0	1	0	831	**1**= Restores factory defaults

Table 3: System menu parameters

6. FAULT TRACING

In Vacon 10 RS-485, the red FAULT LED gives information on the active faults to the user. The red LED blinks in certain sequences according to the fault type. The sequences are presented below:

■ = short pulse
▬ = long pulse

Red LED blinking sequence	Fault code	Fault name
▬ ■	1	Overcurrent
■ ▬	2	Overvoltage
▬ ▬ ■	3	Earth fault
▬ ■ ▬	8	System fault
■ ▬ ▬	9	Undervoltage
▬ ■ ■	13	Frequency converter undertemperature
■ ▬ ■	14	Frequency converter overtemperature
■ ■ ▬	15	Motor stalled
▬ ▬ ▬ ■	16	Motor overtemperature
▬ ▬ ■ ▬	22	EEPROM checksum fault
▬ ■ ▬ ▬	25	Microcontroller watchdog fault
■ ▬ ▬ ▬	34	Internal bus communication
▬ ▬ ■ ■	35	Application fault
■ ▬ ▬ ■	51	External fault
▬ ■ ■ ▬	53	Fieldbus fault

Table 1: Fault codes. See User Manual for detailed fault descriptions.

7. GENERAL DATA

Dimensions and weight	**Frame**	**Height**	**Width**	**Depth (mm)**	**Weight (kg)**
	MI1	156,5	65,5	98,5	0,55
	MI2	195	90	101,5	0,70
	MI3	262,5	100	108,5	0,99
Supply network	Networks	Vacon 10 480 V cannot be used with corner grounded networks			
	Short circuit current	Maximum short circuit current has to be < 50kA			
Motor connection	Output voltage	0 - U_{in}			
	Output current	Continuous rated current I_N at ambient temperature max. +50°C, overload 1.5 x I_N max. 1min/10min			
Ambient conditions	Ambient operating temperature	-10°C (no frost)...+50°C: rated loadability I_N			
	Storage temperature	-40°C...+70°C			
	Enclosure class	IP20			
	Relative humidity	0...95% RH, non-condensing, non-corrosive, no dripping water			
	Altitude	100% load capacity (no derating) up to 1000m. 1% derating for each 100m above 1000m; max. 2000m			
EMC	Immunity	Complies with EN50082-1, -2, EN61800-3			
	Emissions	230V : Complies with EMC category C2 (Vacon level H); With an internal RFI filter 400V: Complies with EMC category C2 (Vacon level H): With an internal RFI filter Both: No EMC emission protection (Vacon level N): Without RFI filter **See detailed descriptions in Vacon 10 User Manual at: www.vacon.com/support**			
Standards		For EMC: EN61800-3, For safety: UL508C, EN61800-5-1			
Certificates and manufacturer's declarations of conformity		For safety: CB, CE, UL, cUL, For EMC: CE, CB, c-tick (see unit nameplate for more detailed approvals)			

Cable and fuse requirements	Frame	Fuse (A)	Mains cable Cu (mm^2)	Terminal cable min-max (mm^2)	
				Main & earth	Control & relay
380 - 500V	MI1	6	3*1.5+1.5	1.5-4	0.5-1.5
	MI2	10			
	MI3	20	3*2.5+2.5	1.5-6	
208 - 240V	MI1	10	2*1.5+1.5	1.5-4	
	MI2	20	2*2.5+2.5		
	MI3	32	2*6+6	1.5-6	

- With above-mentioned fuses, the drive can be connected to power supply the short circuit current of which is max. 50kA
- Use cables with heat resistance of at least +70 C.
- The fuses function also as cable overload protection.

- These instructions apply only to cases with one motor and one cable connection from the frequency converter to the motor.
- To fulfil standard EN61800-5-1, the protective conductor should be **at least 10mm2 Cu or 16mm Al**. Another possibility is to use an additional protective conductor of at least the same size as the original one.

Vacon 10 power ratings

Mains voltage 208-240 V, 50/60 Hz, 1~ series					
Frecuency converter type	Rated loadability		Motor shaft power	Nominal input current	Mechanical size
	100% contin. current I_N [A]	150% overload current [A]	P [kW]	[A]	
Vacon 10-1L-0001 - 2	1,7	2,6	0,25	4,2	MI1
Vacon 10-1L-0002 - 2	2,4	3,6	0,37	5,7	MI1
Vacon 10-1L-0003 - 2	2,8	4,2	0,55	6,6	MI1
Vacon 10-1L-0004 - 2	3,7	5,6	0,75	8,3	MI1
Vacon 10-1L-0005 - 2	4,8	7,2	1,1	11,2	MI2
Vacon 10-1L-0007 - 2	7,0	10,5	1,5	14,1	MI2
Vacon 10-1L-0009 - 2 *	9,6	14,4	2,2	15,8	MI3

* The maximum ambient operating temperature of Vacon 10-1L-0009 - 2 is **+40°C!**

Mains voltage 380-480 V, 50/60 Hz, 3~ series					
Frecuency converter type	Rated loadability		Motor shaft power	Nominal input current	Mechanical size
	100% continuous current I_N [A]	150% overload current [A]	380-480V supply P[kW]	[A]	
Vacon 10-3L-0001 - 4	1,3	2,0	0,37	2,2	MI1
Vacon 10-3L-0002 - 4	1,9	2,9	0,55	2,8	MI1
Vacon 10-3L-0003 - 4	2,4	3,6	0,75	3,2	MI1
Vacon 10-3L-0004 - 4	3,3	5,0	1,1	4,0	MI1
Vacon 10-3L-0005 - 4	4,3	6,5	1,5	5,6	MI2
Vacon 10-3L-0006 - 4	5,6	8,4	2,2	7,3	MI2
Vacon 10-3L-0008 - 4	7,6	11,4	3,0	9,6	MI3
Vacon 10-3L-0009 - 4	9,0	13,5	4,0	11,5	MI3
Vacon 10-3L-0012 - 4	12,0	18,0	5,5	14,9	MI3

Note: The input currents are calculated values with 100 kVA line transformer supply.

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