

This quick guide includes the steps that enable you to easily install and setup your Vacon 10 frequency converter.

Before putting your drive into operation, download and read the complete Vacon 10 user manual from www.vacon.com -> Downloads

1. SAFETY



THE ELECTRICAL INSTALLATION MAY ONLY BE CARRIED OUT BY A COMPETENT ELECTRICIAN!

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

Please read these warnings carefully:



The components of the frequency converter's power unit are live when Vacon 10 is connected to the mains. 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 brake resistor terminals - / + are live when Vacon 10 is connected to the 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 even when Vacon 10 is disconnected from the mains.



The earth leakage current of Vacon 10 frequency converters exceeds 3.5 mA AC. A reinforced protective ground connection must be available in accordance with standard EN61800-5-1. **See Chapter 7!**



If the frequency converter is used as 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 the mains while the motor is running, Vacon 20 will remain live if the motor is fed by the process. In this case, the motor functions as a generator that feeds energy to the frequency converter.



After disconnecting the frequency converter from the mains, wait until the fan stops and the display segments or status LEDs on the front panel switch off. Wait 5 more minutes before doing any work on Vacon 10 connections.



The motor can start automatically after a fault if the autoreset function is active.

NOTE: English and French product manuals with applicable information on safety, warnings, and cautions can be downloaded from www.vacon.com/downloads.

REMARQUE Vous pouvez télécharger les versions anglaise et française des manuels produit contenant l'ensemble des informations de sécurité, avertissements et mises en garde applicables sur le site www.vacon.com/downloads.

2. INSTALLATION

2.1 Mechanical installation

There are two possible ways to mount Vacon 10 on the wall, either by screw or DIN rail mounting.

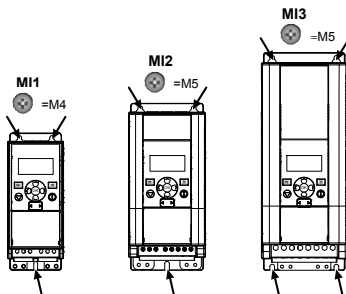


Figure 2.1: Screw mounting, MI1 - MI3

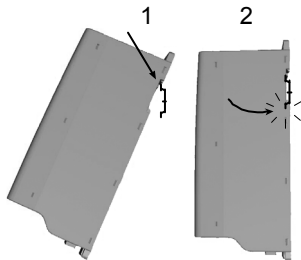


Figure 2.2: DIN rail mounting, MI1 - MI3

Note! See the mounting dimensions on the back of the drive. Leave **free space** for cooling above (**100 mm**), below (**50 mm**), and on the sides (**20 mm**) of Vacon 10! [Side-to-side installation allowed only if the ambient temperature is below 40 °C.]

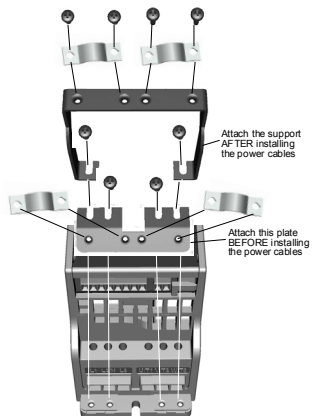


Figure 2.3: Attaching the PE plate and API cable support, MI1 - MI3

2.2 Cabling and connections

2.2.1 Power cabling

Note: The tightening torque for power cables is 0.5 - 0.6 Nm [4-5 In-Lbs].

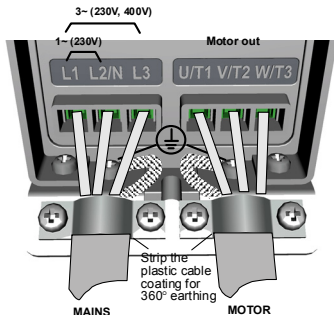


Figure 2.4: Vacon 10 power connections, MI1

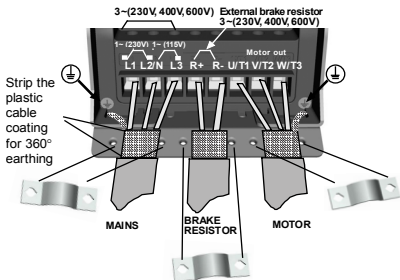


Figure 2.5: Vacon 10 power connections, MI2 - MI3

2.2.2 Control cabling

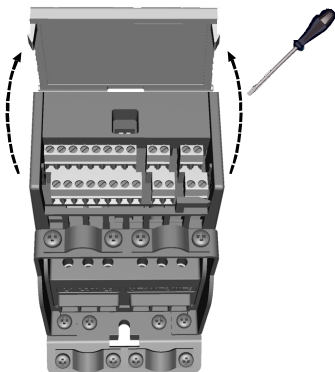


Figure 2.6: Open the lid (MI1 - MI3)

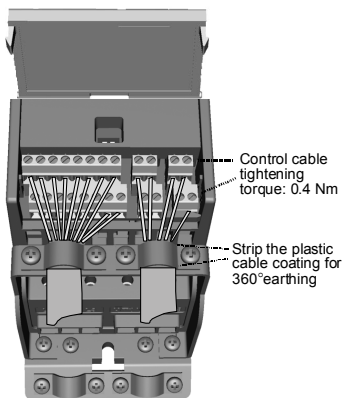


Figure 2.7: Install the control cables (MI1 - MI3)

3. CONTROL I/O AND TERMINALS

| Terminal | Signal | Factory preset | Description |
|----------|---------|--------------------|---|
| 1 | +10Vref | Ref. voltage out | Maximum load 10 mA |
| 2 | AI1 | Analog signal in 1 | Freq. reference ^{PJ} 0 - 10 V, Ri = 300 kΩ (min) |
| 3 | GND | I/O signal ground | |
| 6 | 24Vout | 24V output for DIs | ±20 %, max load 50 mA |
| 7 | GND | I/O signal ground | |
| 8 | DI1 | Digital input 1 | Start forward ^{PJ} |
| 9 | DI2 | Digital input 2 | Start reverse ^{PJ} |
| 10 | DI3 | Digital input 3 | Fault reset ^{PJ} |
| A | A | RS485 signal A | FB Communication |
| B | B | RS485 signal B | FB Communication |
| 4 | AI2 | Analog signal in 2 | PI actual value ^{PJ} |
| 5 | GND | I/O signal ground | |
| 13 | GND | I/O signal ground | |
| 14 | DI4 | Digital input 4 | Preset speed B0 ^{PJ} |
| 15 | DI5 | Digital input 5 | Preset speed B1 ^{PJ} |
| 16 | DI6 | Digital input 6 | External fault ^{PJ} |
| 18 | A0 | Analog output | Output frequency ^{PJ} |
| 20 | DO | Digital signal out | Active = READY ^{PJ} Open collector, max load 35V/50mA |
| 22 | R01 NO | Relay out 1 | Active = RUN ^{PJ} Switching load: 250Vac/3A, 24V DC 3A |
| 23 | R01 CM | | |
| 24 | R02 NC | Relay out 2 | Active = FAULT ^{PJ} Switching load: 250Vac/3A, 24V DC 3A |
| 25 | R02 CM | | |
| 26 | R02 NO | | |

Table 3.1: Vacon 10 default I/O configuration and connections
^{PJ} = Programmable function; see parameter lists and descriptions, chapters 5.

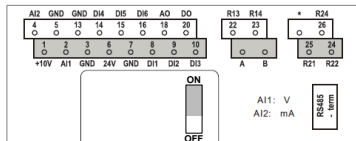
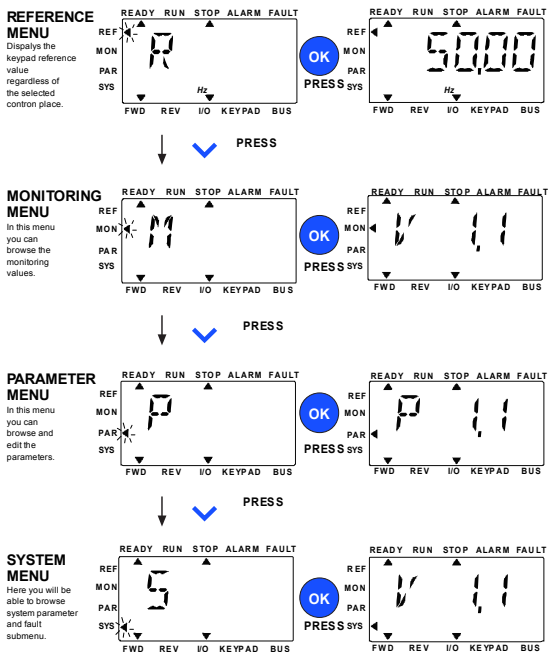


Figure 3.1: Vacon 10 I/O

4. NAVIGATION AND STARTUP

4.1 The main menus of Vacon 10



4.2 Putting into operation and startup wizard

4.2.1 Steps to put the drive into operation:

| | |
|--|--|
| 1. Read the safety instructions on page 1 | 7. Perform the test run without the motor ; see the User Manual at www.vacon.com |
| 2. Secure the grounding and check that cables comply with requirements | 8. Run no-load tests without the motor connected to the process |
| 3. Check the quality and quantity of the cooling air | 9. Perform an identification run (Par. ID631) |
| 4. Check that all start/stop switches are in the STOP position | 10. Connect the motor to the process and perform the test run again |
| 5. Connect the drive to the mains | 11. Vacon 10 is now ready for use |
| 6. Run the startup wizard and set all necessary parameters | |

Table 4.1: Steps to put the drive into operation

4.2.2 Startup wizard

Vacon 10 runs the startup wizard when the machine is powered up for the first time. The wizard is run by setting SYS Par.4.2 =1. The following figures show the procedure.

NOTE: Running the startup wizard always returns all parameters to their factory default settings.

NOTE: StartUp-Wizard can be skipped after pressing the STOP button continuously for 30 seconds

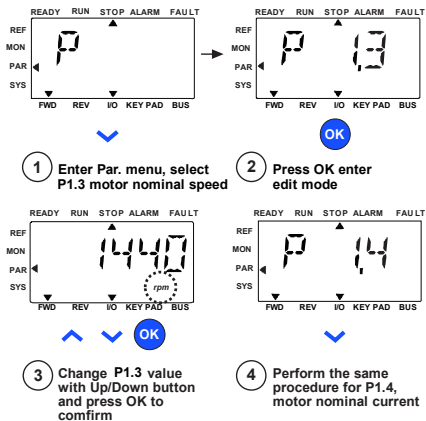
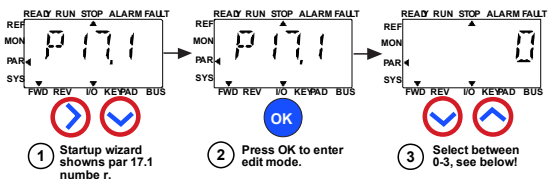


Figure 4.2: Vacon 10 startup wizard (standard application)


Selections:

| | P1.7 | P1.8 | P1.15 | P2.2 | P2.3 | P3.1 | P4.2 | P4.3 |
|-----------------------|----------------|---------------------------|-------------|-----------|----------|-------|------|------|
| 0 = Basic | 1.5 x INMOT | 0= Frequency control | 0= Not used | 0= Ramp | 0= Coast | 0 Hz | 3s | 3s |
| 1 = Pump drive | 1.1 x INMOT | 0= Frequency control | 0= Not used | 0= Ramp | 1= Ramp | 20 Hz | 5s | 5s |
| 2 = Fan drive | 1.1 x INMOT | 0= Frequency control | 0= Not used | 1= Flying | 0= Coast | 20 Hz | 20s | 20s |
| 3 = High Torque drive | 1.5 x INMOT | 1=Open loop speed control | 1= used | 0= Ramp | 0= Coast | 0 Hz | 1s | 1s |

Parameters affected:

P1.7 Current limit (A)
 P1.8 Motor control mode
 P1.15 Torque boost
 P2.2 Start function

P2.3 Stop function
 P3.1 Min frequency
 P4.2 Acc. time (s)
 P4.3 Dec time (s)

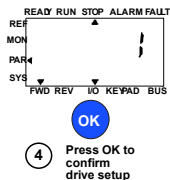


Figure 4.3: Drive setup

5. MONITORING & PARAMETERS

NOTE: This guide is for Vacon 10 standard application, if you need description of parameters in detail, please download the application manual on: www.vacon.com -> downloads.

5.1 Monitoring values

| Code | Monitoring signal | Unit | ID | Description |
|-------|------------------------------------|------|----|---|
| V1.1 | Output frequency | Hz | 1 | Output frequency to motor |
| V1.2 | Frequency reference | Hz | 25 | Frequency reference to motor control |
| V1.3 | Motor speed | rpm | 2 | Calculated motor speed |
| V1.4 | Motor current | A | 3 | Measured motor current |
| V1.5 | Motor torque | % | 4 | Calculated actual/nominal motor torque |
| V1.6 | Motor Power | % | 5 | Calculated actual/nominal motor power |
| V1.7 | Motor voltage | V | 6 | Motor voltage |
| V1.8 | DC link voltage | V | 7 | Measured DC link voltage |
| V1.9 | Drive temperature | °C | 8 | Heatsink temperature |
| V1.10 | Motor temperature | % | 9 | Calculated motor temperature |
| V2.1 | Analog input 1 | % | 59 | A11 signal range as percent of used range |
| V2.2 | Analog input 2 | % | 60 | A12 signal range as percent of used range |
| V2.3 | Analog output | % | 81 | A0 signal range as percent of used range |
| V2.4 | Digital input status DI1, DI2, DI3 | | 15 | Digital input status |
| V2.5 | Digital input status DI4, DI5, DI6 | | 16 | Digital input status |
| V2.6 | R01, R02, D0 | | 17 | Relay/digital output status |
| V4.1 | PI setpoint | % | 20 | Regulator setpoint |
| V4.2 | PI feedback value | % | 21 | Regulator actual value |
| V4.3 | PI error | % | 22 | Regulator error |
| V4.4 | PI output | % | 23 | Regulator output |

Table 5.1: Vacon 10 monitoring signals

5.2 Quick setup parameters (virtual menu; displays when par. 17.2 = 1)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|--|--------------------------|--------------------------|------|--------------------------|-----|--|
| P1.1 | Motor nominal voltage | 180 | 690 | V | Varies | 110 | Check rating plate on motor |
| P1.2 | Motor nominal frequency | 30,00 | 320,00 | Hz | 50.00 / 60.00 | 111 | Check rating plate on motor |
| P1.3 | Motor nominal speed | 30 | 20000 | rpm | 1440 / 1720 | 112 | Default applies for a 4-pole motor |
| P1.4 | Motor nominal current | 0,2 x I _{Nunit} | 2.0 x I _{Nunit} | A | I _{Nunit} | 113 | Check rating plate on motor |
| P1.5 | Motor cos Φ (Power Factor) | 0,30 | 1,00 | | 0,85 | 120 | Check rating plate on motor |
| P1.7 | Current limit | 0,2 x I _{Nunit} | 2.0 x I _{Nunit} | A | 1.5 x I _{Nunit} | 107 | Maximum motor current |
| P1.15 | Torque boost | 0 | 1 | | 0 | 109 | 0 = Not used 1 = Used |
| P2.1 | Remote control place 1 selection | 0 | 1 | | 0 | 172 | 0 = I/O terminal 1 = 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 | Minimum frequency reference |
| P3.2 | Max frequency | P3.1 | 320,00 | Hz | 50.00 / 60.00 | 102 | Maximum frequency reference |
| P3.3 | Remote Control Place 1 frequency reference selection | 1 | 6 | | 4 | 117 | 1 = Preset Speed 0 2 = Keypad 3 = Fieldbus 4 = AI1 5 = AI2 6 = PI |
| P3.4 | Preset speed 0 | P3.1 | P3.2 | Hz | 5.00 | 180 | Activated by digital inputs |
| P3.5 | Preset speed 1 | P3.1 | P3.2 | Hz | 10.00 | 105 | Activated by digital inputs |
| P3.6 | Preset speed 2 | P3.1 | P3.2 | Hz | 15.00 | 106 | Activated by digital inputs |
| P3.7 | Preset speed 3 | P3.1 | P3.2 | Hz | 20,00 | 126 | Activated by digital inputs |

Table 5.2: Quick setup parameters

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|------------------------|-----|--------|------|---------|-----|---|
| P4.2 | Acceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 103 | Acceleration time from 0 Hz to maximum frequency. |
| P4.3 | Deceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 104 | Deceleration time from maximum frequency to 0 Hz. |
| P6.1 | AI1 Signal range | 0 | 1 | | 0 | 379 | 0 = 0 - 100% 1 = 20% - 100% 20% is the same as 2 V minimum signal level. |
| P6.5 | AI2 Signal range | 0 | 1 | | 0 | 390 | 0 = 0 - 100% 1 = 20% - 100% 20% is the same as 4 mA minimum signal level. |
| P14.1 | Automatic reset | 0 | 1 | | 0 | 731 | 0 = Disable 1 = Enable |
| P17.2 | Parameter conceal | 0 | 1 | | 1 | 115 | 0 = All parameters visible 1 = Only quick setup parameter group visible |

Table 5.2: Quick setup parameters

5.3 Motor settings (Control panel: Menu PAR -> P1)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|---------------------------------|--------------------------|--------------------------|------|--------------------------|-----|---|
| P1.1 | Motor nominal voltage | 180 | 690 | V | Varies | 110 | Check rating plate on motor |
| P1.2 | Motor nominal frequency | 30,00 | 320,00 | Hz | 50.00 / 60.00 | 111 | Check rating plate on motor |
| P1.3 | Motor nominal speed | 30 | 20000 | rpm | 1440 / 1720 | 112 | Default applies for a 4-pole motor |
| P1.4 | Motor nominal current | 0,2 x I _{Nunit} | 2.0 x I _{Nunit} | A | I _{Nunit} | 113 | Check rating plate on motor |
| P1.5 | Motor cos Φ (Power Factor) | 0,30 | 1,00 | | 0,85 | 120 | Check rating plate on motor |
| P1.7 | Current limit | 0,2 x I _{Nunit} | 2.0 x I _{Nunit} | A | 1.5 x I _{Nunit} | 107 | Maximum motor current |
| P1.8 | Motor control mode | 0 | 1 | | 0 | 600 | 0 = Frequency control 1 = Open loop speed control |
| P1.9 | U/f ratio | 0 | 2 | | 0 | 108 | 0 = Linear 1 = Square 2 = Programmable |
| P1.10 | Field weakening point | 8,00 | 320,00 | Hz | 50.00 / 60.00 | 602 | Field weakening point frequency |
| P1.11 | Field weakening point voltage | 10,00 | 200,00 | % | 100,00 | 603 | Voltage at field weakening point as % of U _{nmot} |
| P1.12 | U/f midpoint frequency | 0,00 | P1.10 | Hz | 50.00 / 60.00 | 604 | Midpoint frequency for programmable U/f |
| P1.13 | U/f midpoint voltage | 0,00 | P1.11 | % | 100,00 | 605 | Midpoint voltage for programmable U/f as % of U _{nmot} |
| P1.14 | Zero freq. voltage | 0,00 | 40,00 | % | 0,00 | 606 | Voltage at 0 Hz as % of U _{nmot} |
| P1.15 | Torque Boost | 0 | 1 | | 0 | 109 | 0 = Disabled 1 = Enabled |
| P1.16 | Switching frequency | 1,5 | 16,0 | kHz | 4.0/2.0 | 601 | PWM frequency. If values are higher than default, reduce current capacity |
| P1.17 | Brake Chopper | 0 | 2 | | 0 | 504 | 0 = Disabled 1 = Enabled: Always 2 = Run state |

Table 5.3: Motor settings

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|-------------------------|------|--------|------|---------|-----|---|
| P1.19 | Motor identification | 0 | 1 | | 0 | 631 | 0 = Not active 1 = Standstill identification (need run command within 20 s to activate) |
| P1.20 | Rs voltage drop | 0,00 | 100,00 | % | 0,00 | 662 | Voltage drop over motor windings as % of $U_{n\text{mot}}$ at nominal current |
| P1.21 | Overtoltage controller | 0 | 2 | | 1 | 607 | 0 = Disabled 1 = Enabled, Standard mode 2 = Enabled, Shock load mode |
| P1.22 | Undervoltage controller | 0 | 1 | | 1 | 608 | 0 = Disable 1 = Enable |
| P1.23 | Sine filter | 0 | 1 | | 0 | 522 | 0 = Not in use 1 = In use |
| P1.24 | Modulator type | 0 | 65535 | | 28928 | 648 | Modulator configuration word: B1 = discontinuous modulation (DPWMMIN) B2 = Pulse dropping in overmodulation B6 = under modulation B8 = instantaneous DC voltage compensation* B11 = Low noise B12 = Dead time compensation* B13 = Flux error compensation* *Enable by default |

Table 5.3: Motor settings

NOTE: These parameters display when P17.2 = 0.

5.4 Start/stop setup (Control panel: Menu PAR -> P2)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|------|--------------------------------|-----|-----|------|---------|-------|---|
| P2.1 | Remote Control Place Selection | 0 | 1 | | 0 | 172 | 0 = I/O terminals 1 = 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 |
| P2.4 | I/O Start/Stop logic | 0 | 3 | | 2 | 300 | I / O control signal 1 I / O control signal 2 0 Forward Reverse 1 Fwd(ledge) Inverted Stop 2 Fwd(ledge) Rev(ledge) 3 Start Reverse |
| P2.5 | Local / Remote | 0 | 1 | | 0 | 211 | 0 = Remote control 1 = Local control |
| P2.6 | Keypad control direction | 0 | 1 | | 0 | 123 | 0 = Forward 1 = Reverse |
| P2.9 | Keypad button lock | 0 | 1 | | 0 | 15520 | 0 = Unlock all keypad button 1 = Lock/Rem button locked |

Table 5.4: Start/stop setup

5.5 Frequency references (Control panel: Menu PAR -> P3)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|--|------|--------|------|---------------|-----|--|
| P3.1 | Min frequency | 0,00 | P3.2 | Hz | 0,00 | 101 | Minimum allowed frequency reference |
| P3.2 | Max frequency | P3.1 | 320,00 | Hz | 50.00 / 60.00 | 102 | Maximum allowed frequency reference |
| P3.3 | Remote Control Place frequency reference selection | 1 | 6 | | 4 | 117 | 1 = Preset Speed 2 = Keypad 3 = Fieldbus 4 = AI1 5 = AI2 6 = PI |
| P3.4 | Preset speed 0 | P3.1 | P3.2 | Hz | 5.00 | 180 | Activated by digital inputs |
| P3.5 | Preset speed 1 | P3.1 | P3.2 | Hz | 10.00 | 105 | Activated by digital inputs |
| P3.6 | Preset speed 2 | P3.1 | P3.2 | Hz | 15.00 | 106 | Activated by digital inputs |
| P3.7 | Preset speed 3 | P3.1 | P3.2 | Hz | 20.00 | 126 | Activated by digital inputs |
| P3.8 | Preset speed 4 | P3.1 | P3.2 | Hz | 25.00 | 127 | Activated by digital inputs |
| P3.9 | Preset speed 5 | P3.1 | P3.2 | Hz | 30.00 | 128 | Activated by digital inputs |
| P3.10 | Preset speed 6 | P3.1 | P3.2 | Hz | 40.00 | 129 | Activated by digital inputs |
| P3.11 | Preset speed 7 | P3.1 | P3.2 | Hz | 50.00 | 130 | Activated by digital inputs |

Table 5.5: Frequency references

NOTE: These parameters display when P17.2 = 0.

5.6 Ramp and brake setup (Control panel: Menu PAR -> P4)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|---------------------------|-------------------|-------------------|------|-------------|-----|--|
| P4.1 | Ramp S-shape | 0,0 | 10,0 | s | 0,0 | 500 | 0 = Linear >0 = S-curve ramp time |
| P4.2 | Acceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 103 | Defines the time required for the output frequency to increase from zero frequency to maximum frequency |
| P4.3 | Deceleration time 1 | 0,1 | 3000,0 | s | 3,0 | 104 | Defines the time required for the output frequency to decrease from maximum frequency to zero frequency |
| P4.4 | Ramp S-shape 2 | 0,0 | 10,0 | s | 0,0 | 501 | See P4.1 |
| P4.5 | Acceleration time 2 | 0,1 | 3000,0 | s | 10,0 | 502 | See P4.2 |
| P4.6 | Deceleration time 2 | 0,1 | 3000,0 | s | 10,0 | 503 | See P4.3 |
| P4.7 | Flux Braking | 0 | 3 | | 0 | 520 | 0 = Off 1 = Deceleration 2 = Chopper 3 = Full Mode |
| P4.8 | Flux Braking Current | 0,5 x I_{Nunit} | 2,0 x I_{Nunit} | A | I_{Nunit} | 519 | |
| P4.9 | DC Braking Current | 0,3 x I_{Nunit} | 2,0 x I_{Nunit} | A | I_{Nunit} | 507 | Defines the current injected into the motor during DC braking |
| P4.10 | Stop DC current time | 0,00 | 600,00 | s | 0,00 | 508 | Determines if braking is ON or OFF and the braking time of the DC brake when the motor is stopping 0 = Not active |
| P4.11 | Stop DC current frequency | 0,10 | 10,00 | Hz | 1,50 | 515 | The output frequency at which DC braking is applied |
| P4.12 | Start DC current time | 0,00 | 600,00 | s | 0,00 | 516 | 0 = Not active |

Table 5.6: Ramp and brake setup

5.7 Digital inputs (Control panel: Menu PAR -> P5)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|-----------------------|-----|-----|------|---------|------|--|
| P5.1 | I/O control signal 1 | 0 | 6 | | 1 | 403 | 0 = Not used 1 = DI1 2 = DI2 3 = DI3 4 = DI4 5 = DI5 6 = DI6 |
| P5.2 | I/O control signal 2 | 0 | 6 | | 2 | 404 | See P5.1 |
| P5.3 | Reverse | 0 | 6 | | 0 | 412 | See P5.1 |
| P5.4 | Ext. fault Close | 0 | 6 | | 6 | 405 | See P5.1 |
| P5.5 | Ext. fault Open | 0 | 6 | | 0 | 406 | See P5.1 |
| P5.6 | Fault reset | 0 | 6 | | 3 | 414 | See P5.1 |
| P5.7 | Run enable | 0 | 6 | | 0 | 407 | See P5.1 |
| P5.8 | Preset speed B0 | 0 | 6 | | 4 | 419 | See P5.1 |
| P5.9 | Preset speed B1 | 0 | 6 | | 5 | 420 | See P5.1 |
| P5.10 | Preset speed B2 | 0 | 6 | | 0 | 421 | See P5.1 |
| P5.11 | Ramp time 2 selection | 0 | 6 | | 0 | 408 | See P5.1 |
| P5.12 | Disable PI | 0 | 6 | | 0 | 1020 | See P5.1 |
| P5.13 | Force to I/O | 0 | 6 | | 0 | 409 | See P5.1 |

Table 5.7: Digital inputs

5.8 Analog inputs (Control panel: Menu PAR -> P6)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|------|------------------|---------|--------|------|---------|-----|--|
| P6.1 | AI1 Signal range | 0 | 1 | | 0 | 379 | 0 = 0 - 100% (0 - 10 V) 1 = 20% - 100% (2 - 10 V) |
| P6.2 | AI1 Custom min | -100,00 | 100,00 | % | 0,00 | 380 | 0.00 = No min scaling |
| P6.3 | AI1 Custom max | -100,00 | 300,00 | % | 100,00 | 381 | 100.00 = No max scaling |
| P6.4 | AI1 filter time | 0,0 | 10,0 | s | 0,1 | 378 | 0 = no filtering |
| P6.5 | AI2 signal range | 0 | 1 | | 0 | 390 | 0 = 0 - 100% (0 - 20 mA) 1 = 20% - 100% (4 - 20 mA) |
| P6.6 | AI2 Custom min | -100,00 | 100,00 | % | 0,00 | 391 | 0.00 = No min scaling |
| P6.7 | AI2 Custom max | -100,00 | 300,00 | % | 100,00 | 392 | 100.00 = No max scaling |
| P6.8 | AI2 filter time | 0,0 | 10,0 | s | 0,1 | 389 | 0 = no filtering |

Table 5.8: Analog inputs

5.9 Digital outputs (Control panel: Menu PAR -> P8)

| Code | Parameter | Min | Max | Unit | Default | ID | Selections |
|------|----------------------|-----|-----|------|---------|------|---|
| P8.1 | RO1 signal selection | 0 | 11 | | 2 | 313 | 0 = Not used 1 = Ready 2 = Run 3 = Fault 4 = Fault Inverted 5 = Warning 6 = Reversed 7 = At Speed 8 = Motor regulator active 9 = FB Control Word B13 10 = FB Control Word B14 11 = FB Control Word B15 |
| P8.2 | RO2 signal selection | 0 | 11 | | 3 | 314 | See P8.1 |
| P8.3 | DO1 signal selection | 0 | 11 | | 1 | 312 | See P8.1 |
| P8.4 | RO2 inversion | 0 | 1 | | 0 | 1588 | 0 = No inversion 1 = Inverted |

Table 5.9: Digital outputs

5.10 Analog outputs (Control panel: Menu PAR -> P9)

| Code | Parameter | Min | Max | Unit | Default | ID | Selections |
|------|--------------------------------|-----|-----|------|---------|-----|---|
| P9.1 | Analog output signal selection | 0 | 4 | | 1 | 307 | 0 = Not used 1 = Output freq ($0-f_{max}$) 2 = Output current ($0-I_{nMotor}$) 3 = Motor torque ($0-T_{nMotor}$) 4 = PI output (0 - 100%) |
| P9.2 | Analog output minimum | 0 | 1 | | 0 | 310 | 0 = 0 mA 1 = 4 mA |

Table 5.10: Analog outputs

5.11 Protections (Control panel: Menu PAR -> P13)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|--------|------------------------------|-----|-------|------|---------|------|--|
| P13.1 | Analog Input low fault | 0 | 2 | | 1 | 700 | 0 = No action 1 = Alarm 2 = Fault: Coast |
| P13.2 | Undervoltage fault | 1 | 2 | | 2 | 727 | 1 = No response (no fault generated but drive still stops modulation) 2 = Fault:Coast |
| P13.3 | Earth fault | 0 | 2 | | 2 | 703 | See P13.1 |
| P13.4 | Output Phase Fault | 0 | 2 | | 2 | 702 | See P13.1 |
| P13.5 | Stall protection | 0 | 2 | | 0 | 709 | See P13.1 |
| P13.6 | Under load protection | 0 | 2 | | 0 | 713 | See P13.1 |
| P13.7 | Motor thermal protection | 0 | 2 | | 2 | 704 | See P13.1 |
| P13.8 | Mtp: Ambient temperature | -20 | 100 | °C | 40 | 705 | Environment temperature |
| P13.9 | Mtp: Zero speed cooling | 0,0 | 150,0 | % | 40,0 | 706 | Cooling as % at 0 speed |
| P13.10 | Mtp: Thermal time constant | 1 | 200 | min | 45 | 707 | Motor thermal time constant |
| P13.23 | FWD/REV conflict supervision | 0 | 2 | | 1 | 1463 | Same as P13.1 |

Table 5.11: Protections

NOTE: These parameters are shown when **P17.2 = 0**.

5.12 Fault autoreset parameters (Control panel: Menu PAR -> P14)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|------------------|------|-------|------|---------|-----|--|
| P14.1 | Automatic Reset | 0 | 1 | | 0 | 731 | 0 = Disabled 1 = Enable |
| P14.2 | Wait time | 0,10 | 10,00 | s | 0,50 | 717 | Waiting time after fault |
| P14.3 | Trial time | 0,00 | 60,00 | s | 30,00 | 718 | Maximum time for trials |
| P14.5 | Restart Function | 0 | 2 | | 2 | 719 | 0 = Ramping 1 = Flying 2 = From Start Function |

Table 5.12: Fault autoreset parameters

NOTE: These parameters are shown when **P17.2 = 0**.

5.13 PI control parameters (Control panel: Menu PAR -> P15)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|--------|---------------------------|------|--------|------|---------|-----|--|
| P15.1 | Setpoint source selection | 0 | 3 | | 0 | 332 | 0 = Fixed setpoint % 1 = AI1 2 = AI2 3 = Fieldbus (ProcessDataIn1) |
| P15.2 | Fixed setpoint | 0,0 | 100,0 | % | 50,0 | 167 | Fixed setpoint |
| P15.4 | Feedback source selection | 0 | 2 | | 1 | 334 | 0 = AI1 1 = AI2 2 = Fieldbus (Process-DataIn2) |
| P15.5 | Feedback value minimum | 0,0 | 50,0 | % | 0,0 | 336 | Value at minimum signal |
| P15.6 | Feedback value maximum | 10,0 | 300,0 | % | 100,0 | 337 | Value at maximum signal |
| P15.7 | P gain | 0,0 | 1000,0 | % | 100,0 | 118 | Proportional gain |
| P15.8 | I time | 0,00 | 320,00 | s | 10,00 | 119 | Integrative time |
| P15.10 | Error inversion | 0 | 1 | | 0 | 340 | 0 = Direct (Feedback < Setpoint -> Increase PID output) 1 = Inverted (Feedback > Setpoint -> Decrease PID output) |

Table 5.13: PI control parameters

NOTE: These parameters are shown when **P17.2 = 0**.

5.14 Application Setting (Control panel: Menu PAR -> P17)

| Code | Parameter | Min | Max | Unit | Default | ID | Note |
|-------|-------------------|-----|-----|------|---------|-----|---|
| P17.1 | Application Type | 0 | 3 | | 0 | 540 | 0 = Basic 1 = Pump 2 = Fan drive 3 = High Torque NOTE: Visible only when the startup wizard is active. |
| P17.2 | Parameter conceal | 0 | 1 | | 1 | 115 | 0 = All parameters visible 1 = Only quick setup parameter group visible |

Table 5.14: Application Setting parameters

5.15 System parameters

| Code | Parameter | Min | Max | Default | ID | Note |
|---|-----------------------|-----|-----|---------|------|---|
| Software information (MENU SYS -> V1) | | | | | | |
| V1.1 | API SW ID | | | | 2314 | |
| V1.2 | API SW version | | | | 835 | |
| V1.3 | Power SW ID | | | | 2315 | |
| V1.4 | Power SW version | | | | 834 | |
| V1.5 | Application ID | | | | 837 | |
| V1.6 | Application revision | | | | 838 | |
| V1.7 | System load | | | | 839 | |
| Fieldbus parameter (MENU SYS - V2) | | | | | | |
| V2.1 | Communication status | | | | 808 | Status of Modbus communication. Format: xx.yyy where xx = 0 - 64 (number of error messages) yyy = 0 - 999 (number of good messages) |
| P2.2 | Fieldbus protocol | 0 | 1 | 0 | 809 | 0 = Not used 1 = Modbus used |
| P2.3 | Slave address | 1 | 255 | 1 | 810 | Default setting: None parity, 1 stop bit |
| P2.4 | Baud rate | 0 | 5 | 5 | 811 | 0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600 |
| P2.7 | Communication timeout | 0 | 255 | 10 | 814 | 1 = 1 sec 2 = 2 sec, etc. |

Table 5.15: System parameters

| Code | Parameter | Min | Max | Default | ID | Note |
|--------------------------|----------------------------|-----|-----|---------|-----|--|
| P2.8 | Reset communication status | 0 | 1 | 0 | 815 | |
| Other information | | | | | | |
| V3.1 | MWh counter | | | | 827 | Million watt hour |
| V3.2 | Power on days | | | | 828 | |
| V3.3 | Power on hours | | | | 829 | |
| V3.4 | Run counter: Days | | | | 840 | |
| V3.5 | Run counter: Hours | | | | 841 | |
| V3.6 | Fault counter | | | | 842 | |
| P4.2 | Restore factory defaults | 0 | 1 | 0 | 831 | 1 = Restores factory defaults for all parameters |
| F5.x | Active Fault menu | | | | | |
| F6.x | Fault History menu | | | | | |

Table 5.15: System parameters

6. FAULT TRACING

| Fault code | Fault name | Fault code | Fault name |
|-------------------|--------------------------------------|-------------------|--|
| 1 | Overcurrent | 25 | Microcontroller watchdog fault |
| 2 | Overvoltage | 27 | Back EMF protection |
| 3 | Earth fault | 29 | Thermistor fault |
| 8 | System fault | 34 | Internal bus communication |
| 9 | Undervoltage | 35 | Application fault |
| 11 | Output phase fault | 41 | IGBT Overtemperature |
| 13 | Frequency converter undertemperature | 50 | Analog input select 20% - 100% (selected signal range 4 to 20 mA or 2 to 10 V) |
| 14 | Frequency converter over-temperature | 51 | External fault |
| 15 | Motor stalled | 53 | Fieldbus fault |
| 16 | Motor overtemperature | 55 | Wrong run fault (FWD/REV conflict) |
| 17 | Motor underload | 57 | Identification fault |
| 22 | EEPROM checksum fault | 111 | Temperature fault |

Table 6.1: Fault codes. See the User Manual for detailed fault descriptions.

7. GENERAL DATA

| | | | | | |
|------------------------------|--|--|------------|------------|-------------|
| Dimensions and weight | Frame | Height (mm) | Width (mm) | Depth (mm) | Weight (kg) |
| | MI1 | 160 | 66 | 98 | 0.5 |
| | MI2 | 195 | 90 | 102 | 0.7 |
| | MI3 | 254 | 100 | 109 | 1 |
| Supply network | Networks | Vacon 10 (400 V) cannot be used with corner grounded networks | | | |
| | Short circuit current | Maximum short circuit current has to be 50 kA | | | |
| Motor connection | Output voltage | 0 - U_{in} | | | |
| | Output current | Continuous rated current I_N at ambient temperature max +50 °C (depends on the unit size), overload 1.5 x I_N max 1 min/10 min | | | |
| Control connection | Digital input | Positive; Logic 1: 8...+30V; Logic 0: 0...1.5V, $R_i = 20K\Omega$ | | | |
| | Analog input voltage | 0...+10V, $R_i = 300 K\Omega$ (min) | | | |
| | Analog input current | 0(4)...20mA, $R_i = 200\Omega$ | | | |
| | Analog output | 0(4)...20mA, $R_L = 500\Omega$ | | | |
| | Digital output | Open collector, max load 35V/50mA | | | |
| | Relay output | Switching load: 250Vac/3A, 24V DC 3A | | | |
| | Auxiliary voltage | ±20%, max. load 50mA | | | |
| Ambient conditions | Ambient operating temperature | -10 °C (no frost)...+40/50 °C (depends on the unit size): rated loadability I_N When the MI1-3 is installed side-by-side, the ambient operating temperature is always 40 °C. This also applies to the IP21/Nema1 option in MI1-3. | | | |
| | Storage temperature | -40 °C...+70 °C | | | |
| | Relative humidity | 0...95% RH, non-condensing, non-corrosive, no dripping water | | | |
| | Altitude | 100% load capacity (no derating) up to 1000 m; 1% derating for each 100 m above 1000 m; max 2000 m | | | |
| | Enclosure class | IP20/IP21/Nema1 for MI1-3. | | | |
| | Pollution degree | PD2 | | | |
| EMC | Immunity | Complies with EN50082-1, -2, EN61800-3 | | | |
| | Emissions (see detailed descriptions in Vacon 10 User Manual at www.vacon.com) | 230V: Complies with EMC category C2; with internal RFI filter. 400V: Complies with EMC category C2; with internal RFI filter. Both: No EMC emission protection (Vacon level N); without RFI filter. | | | |
| Standards | For EMC: EN61800-3 For safety: UL508C, EN61800-5 | | | | |

| | | |
|--|--|--|
| Certificates and manufacturer's declarations of conformity | | For safety: CE, UL, cUL, KC For EMC: CE, KC (see unit nameplate for more detailed approvals) |
|--|--|--|

| Cable and fuse requirements (see detailed data in Vacon 10 User Manual at www.vacon.com) 380 - 480 V, 3~ 208 - 240 V, 3~ | Frame | Fuse [A] | Mains cable Cu (mm ²) | Terminal cable min-max (mm ²) | | |
|---|-------|----------|-----------------------------------|---|---------|-------------------|
| | | | | Main | Earth | Control and relay |
| 115 V, 1~ | MI1 | 6 | 3*1.5+1.5 | 1.5-4 | 0.5-1.5 | |
| | MI2 | 10 | | | | |
| | MI3 | 20 | | | | |
| 208 - 240 V, 1~ | MI2 | 20 | 2*2.5+2.5 | 1.5-4 | 0.5-1.5 | |
| | MI3 | 32 | | | | |
| | MI1 | 10 | | | | |
| 600 V | MI1 | 10 | 2*2.5+2.5 | 1.5-6 | 0.5-1.5 | |
| | MI2 | 20 | | | | |
| | MI3 | 32 | | | | |
| 600 V | MI3 | 6 | 3*1.5+1.5 | 1.5-4 | 0.5-1.5 | |
| | MI3 | 10 | | | | |
| | MI3 | 20 | | | | |

- The drive can be connected to the power supply with the above-mentioned fuses. The short circuit current of the power supply may not exceed 50 kA.
- Use cables with heat resistance of at least +70 °C.
- The fuses also function as cable overload protection.
- These instructions only apply to cases with one motor and one cable connection from the frequency converter to the motor.
- In order to comply with standard EN61800-5-1, the protective conductor should be **at least 10 mm² Cu or 16 mm² Al**. Another option 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 | | | | | | | |
|--|---|-----------------------------------|----------------------|-----------|-------------------------------|--------------------|----------------|
| Fre- quency converter type | Rated loadability | | Motor shaft power | | Nominal input cur- rent | Mechanical size | Weight (kg) |
| | 100% contin- uous current I_N [A] | 150% over- load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.7 | 2.6 | 0.33 | 0.25 | 4.2 | M11 | 0.55 |
| 0002 | 2.4 | 3.6 | 0.5 | 0.37 | 5.7 | M11 | 0.55 |
| 0003 | 2.8 | 4.2 | 0.75 | 0.55 | 6.6 | M11 | 0.55 |
| 0004 | 3.7 | 5.6 | 1 | 0.75 | 8.3 | M12 | 0.7 |
| 0005 | 4.8 | 7.2 | 1.5 | 1.1 | 11.2 | M12 | 0.7 |
| 0007 | 7 | 10.5 | 2 | 1.5 | 14.1 | M12 | 0.7 |
| 0009* | 9.6 | 14.4 | 3 | 2.2 | 22.1 | M13 | 0.99 |

Table 7.1: Vacon 10 power ratings, 208 - 240 V

* The maximum ambient operating temperature of this drive is 40 °C!

| Mains voltage 208 - 240 V, 50/60 Hz, 3~ series | | | | | | | |
|--|---|-----------------------------------|----------------------|-----------|-------------------------------|--------------------|----------------|
| Fre- quency converter type | Rated loadability | | Motor shaft power | | Nominal input cur- rent | Mechanical size | Weight (kg) |
| | 100% contin- uous current I_N [A] | 150% over- load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.7 | 2.6 | 0.33 | 0.25 | 2.7 | M11 | 0.55 |
| 0002 | 2.4 | 3.6 | 0.5 | 0.37 | 3.5 | M11 | 0.55 |
| 0003 | 2.8 | 4.2 | 0.75 | 0.55 | 3.8 | M11 | 0.55 |
| 0004 | 3.7 | 5.6 | 1 | 0.75 | 4.3 | M12 | 0.7 |
| 0005 | 4.8 | 7.2 | 1.5 | 1.1 | 6.8 | M12 | 0.7 |
| 0007* | 7 | 10.5 | 2 | 1.5 | 8.4 | M12 | 0.7 |
| 0011* | 11 | 16.5 | 3 | 2.2 | 13.4 | M13 | 0.99 |

Table 7.2: Vacon 10 power ratings, 208 - 240 V, 3~

*The maximum ambient operating temperature of this drive is +40°C!

| Mains voltage 115 V, 50/60 Hz, 1~ series | | | | | | | |
|--|---|-----------------------------------|----------------------|-----------|-------------------------------|--------------------|----------------|
| Fre- quency converter type | Rated loadability | | Motor shaft power | | Nominal input cur- rent | Mechanical size | Weight (Kg) |
| | 100% contin- uous current I_N [A] | 150% over- load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.7 | 2.6 | 0.33 | 0.25 | 9.2 | MI2 | 0.7 |
| 0002 | 2.4 | 3.6 | 0.5 | 0.37 | 11.6 | MI2 | 0.7 |
| 0003 | 2.8 | 4.2 | 0.75 | 0.55 | 12.4 | MI2 | 0.7 |
| 0004 | 3.7 | 5.6 | 1 | 0.75 | 15 | MI2 | 0.7 |
| 0005 | 4.8 | 7.2 | 1.5 | 1.1 | 16.5 | MI3 | 0.99 |

Table 7.3: Vacon 10 power ratings, 115 V, 1~

| Mains voltage 380 - 480 V, 50/60 Hz, 3~ series | | | | | | | |
|--|---|-----------------------------------|----------------------|-----------|-------------------------------|--------------------|----------------|
| Fre- quency converter type | Rated loadability | | Motor shaft power | | Nominal input cur- rent | Mechanical size | Weight (kg) |
| | 100% contin- uous current I_N [A] | 150% over- load current [A] | P [HP] | P [KW] | [A] | | |
| 0001 | 1.3 | 2 | 0.5 | 0.37 | 2.2 | MI1 | 0.55 |
| 0002 | 1.9 | 2.9 | 0.75 | 0.55 | 2.8 | MI1 | 0.55 |
| 0003 | 2.4 | 3.6 | 1 | 0.75 | 3.2 | MI1 | 0.55 |
| 0004 | 3.3 | 5 | 1.5 | 1.1 | 4 | MI2 | 0.7 |
| 0005 | 4.3 | 6.5 | 2 | 1.5 | 5.6 | MI2 | 0.7 |
| 0006 | 5.6 | 8.4 | 3 | 2.2 | 7.3 | MI2 | 0.7 |
| 0008 | 7.6 | 11.4 | 4 | 3 | 9.6 | MI3 | 0.99 |
| 0009 | 9 | 13.5 | 5 | 4 | 11.5 | MI3 | 0.99 |
| 0012 | 12 | 18 | 7.5 | 5.5 | 14.9 | MI3 | 0.99 |

Table 7.4: Vacon 10 power ratings, 380 - 480 V

| Mains voltage 600 V, 50/60 Hz, 3~ series | | | | | | | |
|--|---|-----------------------------------|----------------------|-----------|--------------------------------------|--------------------|----------------|
| Fre- quency converter type | Rated loadability | | Motor shaft power | | Nominal input cur- rent [A] | Mechanical size | Weight (kg) |
| | 100% continu- ous current I_N [A] | 150% over- load current [A] | P [HP] | P [KW] | | | |
| 0002 | 1.7 | 2.6 | 1 | 0.75 | 2 | MI3 | 0.99 |
| 0003 | 2.7 | 4.2 | 2 | 1,5 | 3.6 | MI3 | 0.99 |
| 0004 | 3,9 | 5,9 | 3 | 2,2 | 5 | MI3 | 0.99 |
| 0006 | 6,1 | 9,2 | 5 | 3.7 | 7,6 | MI3 | 0.99 |
| 0009 | 9 | 13,5 | 7.5 | 5,5 | 10,4 | MI3 | 0.99 |

Table 7.5: Vacon 10 power ratings, 600 V

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

Quick Modbus setup

| | |
|----------|--|
| 1 | A: Select Fieldbus as remote control place: P2.1 to 1 – Fieldbus B: Set Modbus RTU protocol to "ON:" S2.2 to 1 – Modbus |
| 2 | A. Set Control Word to "0" [2001] B. Set Control Word to "1" [2001] C. Frequency converter status is RUN D. Set Reference value to "5000" [50.00%] [2003] E. Actual Speed is 5000 [25.00 Hz if MinFreq is 0.00 Hz and MaxFreq is 50.00 Hz] F. Set Control Word to "0" [2001] G. Frequency converter status is STOP |