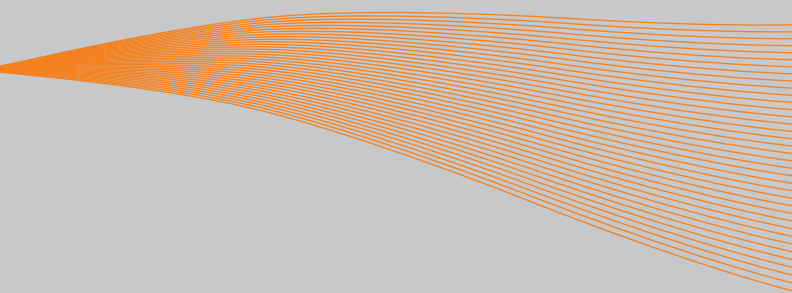


**VACON 20**  
AC DRIVES

## QUICK GUIDE



This quick guide includes the essential steps for easy installation and setup of your Vacon 20 frequency converter. Before commissioning your drive, download and read the complete Vacon 20 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 20 is connected to 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 the possible brake resistor terminals - / + are live when Vacon 20 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 20 is disconnected from mains.



The earth leakage current of Vacon 20 frequency converters exceeds 3.5 mA 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 20 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 display segments or status leds on the front panel go out. Wait 5 more minutes before doing any work on Vacon 20 connections.



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

## 2. INSTALLATION

### 2.1 Mechanical installation

There are two possible ways to mount Vacon 20 in the wall. For MI1 - MI3, either screw or DIN-rail mounting; For MI4 - MI5, screw or flange mounting.

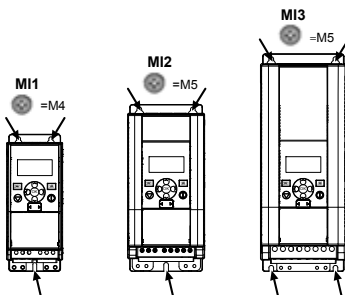


Figure 1: Screw mounting, MI1 - MI3

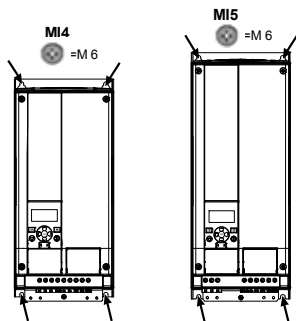


Figure 2: Screw mounting, MI4 - MI5

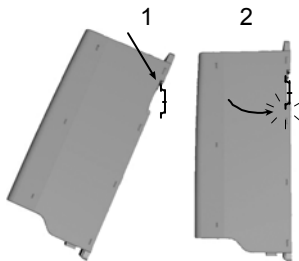


Figure 3: DIN-rail mounting, MI1 - MI3

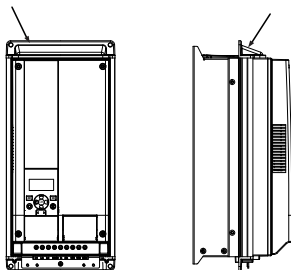


Figure 4: flange mounting, MI4 - MI5

**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 20! (For MI1 - MI3, side-to-side installation allowed only if the ambient temperature is below 40 °C; For MI4 - MI5, side-to-side installation is not allowed.)

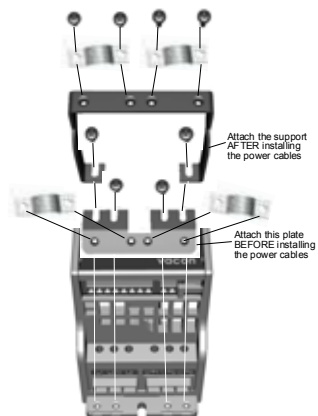


Figure 5: Attaching the PE-plate and API cable support, MI1 - MI3

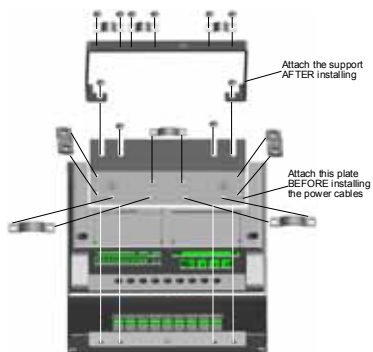


Figure 6: Attaching the PE-plate and API cable support, MI4 - MI5

## 2.2 Cabling and connections

### 2.2.1 Power cabling

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

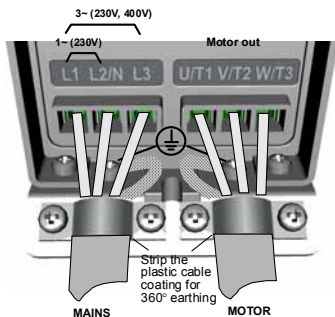


Figure 7: Vacon 20 power connections, MI1

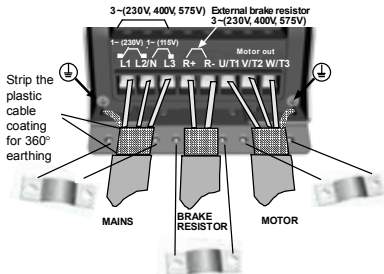


Figure 8: Vacon 20 power connections, MI2 - MI3

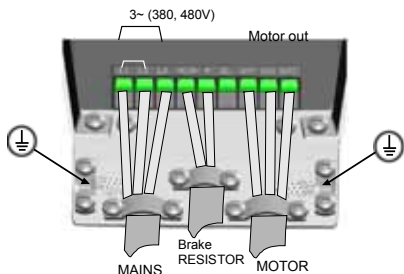


Figure 9: Vacon 20 power connections, MI4

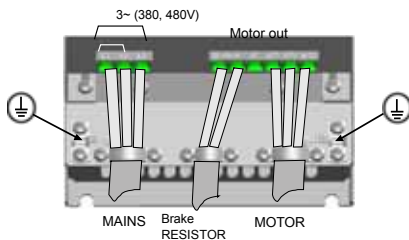


Figure 10: Vacon 20 power connections, MI5

### 2.2.2 Control cabling



Figure 11: Open the lid MI1 - MI3

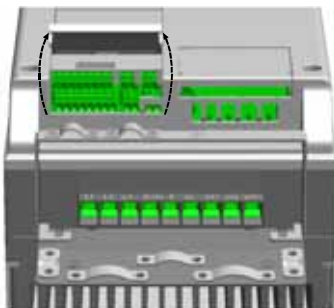


Figure 12: Open the lid MI4 - MI5

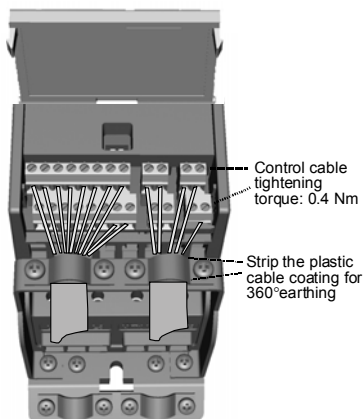


Figure 13: Install the control cables, MI1 - MI3

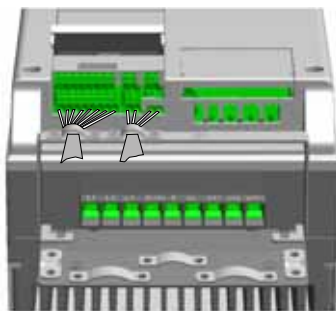


Figure 14: Install the control cables, MI4 - MI5

## 3. CONTROL I / O AND TERMINALS

## Vacon 20

| terminal | Signal  | Factory preset        | Description                                                                                          |
|----------|---------|-----------------------|------------------------------------------------------------------------------------------------------|
| 1        | +10 Vre | Ref. voltage out      | Maximum load 10 mA                                                                                   |
| 2        | AI1     | Analog signal in 1    | Freq. reference <sup>P1</sup> 0 - 10 V, Ri ≥ 200 kΩ                                                  |
| 3        | GND     | I / O signal ground   |                                                                                                      |
| 6        | 24 Vout | 24 V output for DI's  | ±20 %, max. load 50 mA                                                                               |
| 7        | DI_C    | Digital Input Commom  | Digital Input Commom for DI1 - DI6, refer to Table 2 for DI sink type                                |
| 8        | DI1     | Digital input 1       | Start forward <sup>P1</sup> 18 - 30 V, Ri > 5 kΩ                                                     |
| 9        | DI2     | Digital input 2       | Start reverse <sup>P1</sup>                                                                          |
| 10       | DI3     | Digital input 3       | Fault reset <sup>P1</sup>                                                                            |
| A        | A       | RS485 signal A        | FB Communication Negative                                                                            |
| B        | B       | RS485 signal B        | FB Communication Positive                                                                            |
| 4        | AI2     | Analog signal in 2    | Default: 0(4)-20 mA, Ri ≤ 250 Ω<br>Other: 0 - 10 V, Ri ≥ 200 kΩ<br>Selectable through microswitch    |
| 5        | GND     | I / O signal ground   |                                                                                                      |
| 13       | DO-     | Digital Output Commom | Digital Output Commom                                                                                |
| 14       | DI4     | Digital input 4       | Preset speed B0 <sup>P1</sup> 18 - 30 V, Ri > 5 kΩ                                                   |
| 15       | DI5     | Digital input 5       | As DI,<br>Other: Encoder Input A (frequency up to 10 kHz)<br>Selectable through microswitch          |
| 16       | DI6     | Digital input 6       | As DI,<br>Other: Encoder Input B (frequency up to 10 kHz), Pulse Train Input (frequency up to 5 kHz) |
| 18       | AO      | Analog Output         | 0 - 10 V, RL > 1 kΩ<br>0(4)-20 mA, RL < 500 Ω<br>Selectable through microswitch                      |
| 20       | DO      | Digital signal out    | Active = READY <sup>P1</sup> Open collector, max. load 48 V / 50 mA                                  |

Table 1: Vacon 20 General purpose application default I / O configuration and connections for control board

<sup>P1</sup> = Programmable function, See User Manual: parameter lists and descriptions for detail

| Terminal | Signal | Factory preset               | Description                                              |
|----------|--------|------------------------------|----------------------------------------------------------|
| 22 RO 13 |        | Active = RUN <sup>P)</sup>   | Max. switching load:<br>250 Vac / 2 A or 250 Vdc / 0.4 A |
| 23 RO 14 |        |                              |                                                          |
| 24 RO 22 |        | Active = FAULT <sup>P)</sup> | Max. switching load:<br>250 Vac / 2 A or 250 Vdc / 0.4 A |
| 25 RO 21 |        |                              |                                                          |
| 26 RO 24 |        |                              |                                                          |

Table 1: Vaccon 20 General purpose application default I / O configuration and connections for control board

<sup>P)</sup> = Programmable function, See User Manual: parameter lists and descriptions for detail

| Terminal | Signal  | Factory preset       | Description                                                                                             |
|----------|---------|----------------------|---------------------------------------------------------------------------------------------------------|
| 3        | GND     | I / O signal ground  |                                                                                                         |
| 6        | 24 Vout | 24 V output for DI's | ±20 %, max. load 50 mA                                                                                  |
| 7        | DI_C    | Digital Input Commom | Digital Input Commom for DI1-DI6                                                                        |
| 8        | DI1     | Digital input 1      | Start forward <sup>P)</sup>                                                                             |
| 9        | DI2     | Digital input 2      | Start reverse <sup>P)</sup>                                                                             |
| 10       | DI3     | Digital input 3      | Fault reset <sup>P)</sup>                                                                               |
| 14       | DI4     | Digital input 4      | Preset speed B0 <sup>P)</sup>                                                                           |
|          |         |                      | 18 - 30 V, Ri > 5 kΩ                                                                                    |
| 15       | DI5     | Digital input 5      | Preset speed B1 <sup>P)</sup>                                                                           |
|          |         |                      | As DI,<br>Other: Encoder Input A (frequency up to 10 kHz)<br>Selectable through microswitch             |
| 16       | DI6     | Digital input 6      | External Fault <sup>P)</sup>                                                                            |
|          |         |                      | As DI,<br>Other: Encoder Input B (frequency up to 10 kHz),<br>Pulse Train Input (frequency up to 5 kHz) |

Table 2: DI Sink Type, remove jumper J500 and connect the wire using table 2

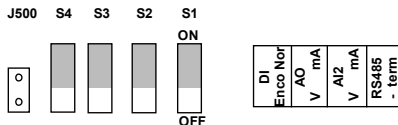
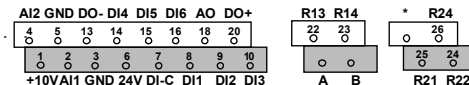


Figure 15: Microswitches

Vacon 20 I / O terminals:

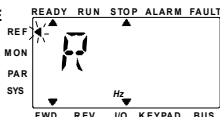


## 4. NAVIGATION &amp; STARTUP

## 4.1 The main menus of Vacon 20

**REFERENCE****MENU**

Displays the keypad reference value regardless of the selected control place.



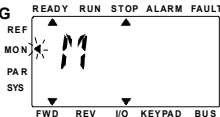
**OK**  
PRESS



**PRESS**

**MONITORING****MENU**

In this menu you can browse the monitoring values.



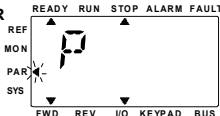
**OK**  
PRESS



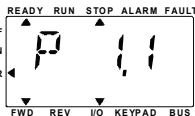
**PRESS**

**PARAMETER****MENU**

In this menu you can browse and edit the parameters.



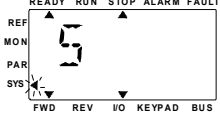
**OK**  
PRESS



**PRESS**

**SYSTEM****MENU**

Here you will be able to browse system parameter and fault submenu.



**OK**  
PRESS



Figure 16: The main menu of Vacon 20

## 4.2 Commissioning and startup wizard

### 4.2.1 Commissioning steps:

|                                                                        |                                                                                                                    |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1. Read safety instructions on page 1                                  | 7. Perform test run <b>without motor</b> , see the User Manual at <a href="http://www.vacon.com">www.vacon.com</a> |
| 2. Secure the grounding and check that cables comply with requirements | 8. Run no-load tests without motor being connected to the process                                                  |
| 3. Check quality and quantity of cooling air                           | 9. Perform an identification run [Par. ID631]                                                                      |
| 4. Check that all start / stop switches are in <b>STOP</b> position    | 10. Connect the motor to the process and perform test run once again                                               |
| 5. Connect the drive to mains                                          | 11. Vacon 20 is now ready for use                                                                                  |
| 6. Run the Startup wizard and set all necessary parameters             |                                                                                                                    |

Table 3: Commissioning steps

### 4.2.2 Startup wizard

Vacon 20 runs the startup wizard in first power-up. The wizard can be run by setting SYS Par.4.2 =1. The following figures show the procedure.

**NOTE! Running the startup wizard will always return all parameter settings to their factory defaults!**

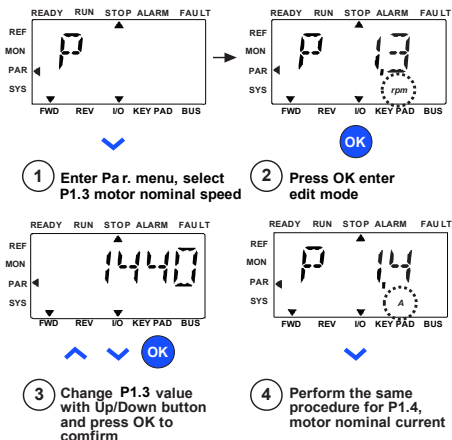
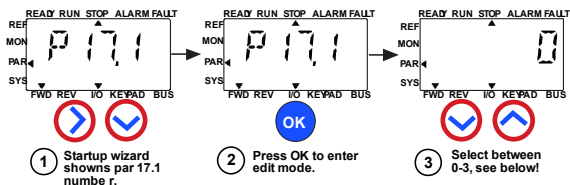


Figure 17: Vacon 20 startup wizard (standard application)



## Selections:

|                       | P1.1 | P1.2     | P1.7        | P1.8                      | P1.15        | P2.1 | P2.2       | P2.3      | P3.1  | P3.2     | P3.3        | P4.2 | P4.3 |
|-----------------------|------|----------|-------------|---------------------------|--------------|------|------------|-----------|-------|----------|-------------|------|------|
| 0 = Basic             | V*   | 50/60 Hz | 1,5 x INMOT | 0 = Frequency control     | 0 = Not used | I/O  | 0 = Ramp   | 0 = Coast | 0 Hz  | 50/60 Hz | 4=AI1 0-10V | 3s   | 3s   |
| 1 = Pump drive        | V*   | 50/60 Hz | 1,1 x INMOT | 0 = Frequency control     | 0 = Not used | I/O  | 0 = Ramp   | 1 = Ramp  | 20 Hz | 50/60 Hz | 4=AI1 0-10V | 5s   | 5s   |
| 2 = Fan drive         | V*   | 50/60 Hz | 1,1 x INMOT | 0 = Frequency control     | 0 = Not used | I/O  | 1 = Flying | 0 = Coast | 20 Hz | 50/60 Hz | 4=AI1 0-10V | 20s  | 20s  |
| 3 = High Torque drive | V*   | 50/60 Hz | 1,5 x INMOT | 1=Open loop speed control | 1 = used     | I/O  | 0 = Ramp   | 0 = Coast | 0 Hz  | 50/60 Hz | 4=AI1 0-10V | 1s   | 1s   |

\*Same as drive voltage, except in 115V drives this value is 230V

## Parameters affected:

|                         |                    |
|-------------------------|--------------------|
| P1.1 Motor Un (V)       | P2.3 Stop function |
| P1.2 Motor fn (Hz)      | P3.1 Min frequency |
| P1.7 Current limit (A)  | P3.2 Max frequency |
| P1.8 Motor control mode | P3.3 I/O reference |
| P1.15 Torque boost      | P4.2 Acc. time (s) |
| P2.1 Control place      | P4.3 Dec time (s)  |
| P2.2 Start function     |                    |

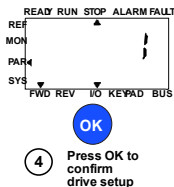


Figure 18: Drive setup

## 5. MONITORING & PARAMETERS

**NOTE!** This guide is for Vacon 20 standard application, if you are using a special application, please download the application manual on: [www.vacon.com](http://www.vacon.com) -> Support & 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 torque of the motor           |
| V1.6  | Output Power                       | KW   | 79   | Output power from drive to motor                          |
| 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                              |
| V1.11 | Motor shaft power                  | %    | 5    | Calculated actual / nominal power of the motor            |
| V2.1  | Analog input 1                     | %    | 13   | AI1 signal range in percent of used range                 |
| V2.2  | Analog input 2                     | %    | 14   | AI2 signal range in percent of used range                 |
| V2.3  | Analog output                      | %    | 26   | AO signal range in 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  | RO1, RO2, DO                       |      | 17   | Relay / digital output status                             |
| V2.7  | Pulse train / encoder input        | %    | 1234 | 0 - 100% scale value                                      |
| V2.8  | Encoder rpm                        | rpm  | 1235 | Scaled according to Encoder pulses / revolution parameter |

Table 4: Vacon 20 monitoring values (General purpose application)

| Code | Monitoring signal       | Unit | ID | Description                                                                                                                                                                                                                                                                                             |
|------|-------------------------|------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| V3.1 | Drive Status Word       |      | 43 | Bit codes status of drive<br><b>B0</b> = Ready<br><b>B1</b> = Run<br><b>B2</b> = Reverse<br><b>B3</b> = Fault<br><b>B6</b> = RunEnable<br><b>B7</b> = AlarmActive<br><b>B12</b> = RunRequest<br><b>B13</b> = MotorRegulatorActive                                                                       |
| V3.2 | Application Status Word |      | 89 | Bit codes status of application:<br><b>B3</b> = Ramp 2 Active<br><b>B5</b> = Remote CTRL Place 1 active<br><b>B6</b> = Remote CTRL Place 2 active<br><b>B7</b> = Fieldbus Control Active<br><b>B8</b> = Local Control Active<br><b>B9</b> = PC Control Active<br><b>B10</b> = Preset Frequencies Active |
| V3.3 | DIN Status Word         |      | 56 |                                                                                                                                                                                                                                                                                                         |
| V4.1 | PID setpoint            | %    | 20 | Regulator setpoint                                                                                                                                                                                                                                                                                      |
| V4.2 | PID feedback value      | %    | 21 | Regulator actual value                                                                                                                                                                                                                                                                                  |
| V4.3 | PID error               | %    | 22 | Regulator error                                                                                                                                                                                                                                                                                         |
| V4.4 | PID output              | %    | 23 | Regulator output                                                                                                                                                                                                                                                                                        |
| V4.5 | Process                 |      | 29 | Scaled process variable<br>see par. 15.18                                                                                                                                                                                                                                                               |

Table 4: Vacon 20 monitoring values (General purpose application)

## 5.2 Quick setup parameters (Virtual menu, shows 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 the motor.                                                                                                                            |
| P1.2  | Motor nominal frequency                              | 30,00                    | 320,00                   | Hz   | 50,00 / 60,00            | 111 | Check rating plate on the 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 <sub>Nunit</sub> | 2,0 x I <sub>Nunit</sub> | A    | I <sub>Nunit</sub>       | 113 | Check rating plate on the motor.                                                                                                                            |
| P1.5  | Motor cos $\phi$                                     | 0,30                     | 1,00                     |      | 0,85                     | 120 | Check rating plate on the motor.                                                                                                                            |
| P1.7  | Current limit                                        | 0,2 x I <sub>Nunit</sub> | 2 x I <sub>Nunit</sub>   | A    | 1,5 x I <sub>Nunit</sub> | 107 | Maximum motor current                                                                                                                                       |
| P1.15 | Torque boost                                         | 0                        | 1                        |      | 0                        | 109 | 0 = Not used<br>1 = Used                                                                                                                                    |
| P2.1  | Remote control place 1 selection                     | 0                        | 2                        |      | 0                        | 172 | 0 = I / O terminal<br>1 = Fieldbus<br>2 = Keypad                                                                                                            |
| P2.2  | Start function                                       | 0                        | 1                        |      | 0                        | 505 | 0 = Ramp<br>1 = Flying start                                                                                                                                |
| P2.3  | Stop function                                        | 0                        | 1                        |      | 0                        | 506 | 0 = Coasting<br>1 = Ramp                                                                                                                                    |
| P3.1  | Min frequency                                        | 0,00                     | P3.2                     | Hz   | 0,00                     | 101 | Minimum freq reference                                                                                                                                      |
| P3.2  | Max frequency                                        | P3.1                     | 320,00                   | Hz   | 50,00 / 60,00            | 102 | Maximum freq reference                                                                                                                                      |
| P3.3  | Remote Control Place 1 frequency reference selection | 1                        | 9                        |      | 7                        | 117 | 1 = Preset Speeds 0<br>2 = Keypad<br>3 = Fieldbus<br>4 = AI1<br>5 = AI2<br>6 = PID<br>7 = AI1 + AI2<br>8 = Motor potentiometer<br>9 = Pulse train / Encoder |
| P3.4  | Preset speed 0                                       | P3.1                     | P3.2                     | Hz   | 5,00                     | 124 | Preset speed 0 is used as frequency reference when P3.3 = 1                                                                                                 |
| 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                                                                                                                                 |

Table 5: Quick setup parameters

| Code  | Parameter              | Min  | Max    | Unit | Default | ID  | Note                                                                                   |
|-------|------------------------|------|--------|------|---------|-----|----------------------------------------------------------------------------------------|
| P3.7  | Preset speed 3         | P3.1 | P3.2   | Hz   | 20,00   | 126 | Activated by digital inputs                                                            |
| P4.2  | Acceleration time<br>1 | 0,1  | 3000,0 | s    | 3,0     | 103 | Acceleration time from 0 Hz to maximum frequency.                                      |
| P4.3  | Deceleration time<br>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%<br>1 = 20% - 100%<br>20% is the same as 2 V minimum signal level.         |
| P6.5  | AI2 Signal range       | 0    | 1      |      | 0       | 390 | 0 = 0 - 100%<br>1 = 20% - 100%<br>20% is the same as 2 V or 4 mA minimum signal level. |
| P14.1 | Automatic reset        | 0    | 1      |      | 0       | 731 | 0 = Disable<br>1 = Enable                                                              |
| P17.2 | Parameter conceal      | 0    | 1      |      | 1       | 115 | 0 = All parameters visible<br>1 = Only quick setup parameter group visible             |

Table 5: Quick setup parameters

## 5.3 Motor settings (Control panel: Menu PAR -&gt; P1)

| Code  | Parameter                       | Min               | Max               | Unit | Default           | ID  | Note                                                                          |
|-------|---------------------------------|-------------------|-------------------|------|-------------------|-----|-------------------------------------------------------------------------------|
| P1.1  | Motor nominal voltage           | 180               | 690               | V    | Varies            | 110 | Check rating plate on the motor                                               |
| P1.2  | Motor nominal frequency         | 30,00             | 320,00            | Hz   | 50,00 / 60,00     | 111 | Check rating plate on the 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 the motor                                               |
| P1.5  | Motor cos $\Phi$ (Power Factor) | 0,30              | 1,00              |      | 0,85              | 120 | Check rating plate on the motor                                               |
| P1.6  | Motor type                      | 0                 | 1                 |      | 0                 | 650 | 0 = Induction<br>1 = Permanent magnet                                         |
| P1.7  | Current limit                   | 0,2 x $I_{Nunit}$ | 2 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<br>1 = Open loop speed control                          |
| P1.9  | U / f ratio                     | 0                 | 2                 |      | 0                 | 108 | 0 = Linear<br>1 = Quadratic<br>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 mid point frequency       | 0,00              | P1.10             | Hz   | 50,00 / 60,00     | 604 | Mid point frequency for programmable U / f                                    |
| P1.13 | U / f mid point voltage         | 0,00              | P1.11             | %    | 100,00            | 605 | Mid point voltage for programmable U / f as % of $U_{nmot}$                   |
| P1.14 | Zero freq voltage               | 0,00              | 40,00             | %    | Varies            | 606 | Voltage at 0 Hz as % of $U_{nmot}$                                            |
| P1.15 | Torque Boost                    | 0                 | 1                 |      | 0                 | 109 | 0 = Disabled<br>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 the current capacity |
| P1.17 | Brake Chopper                   | 0                 | 2                 |      | 0                 | 504 | 0 = Disabled<br>1 = Enabled: Always<br>2 = Run state                          |

Table 6: Motor settings

| Code  | Parameter               | Min  | Max    | Unit | Default | ID  | Note                                                                                       |
|-------|-------------------------|------|--------|------|---------|-----|--------------------------------------------------------------------------------------------|
| P1.18 | Motor identification    | 0    | 1      |      | 0       | 631 | 0 = Not active<br>1 = Standstill identification (need run command within 20 s to activate) |
| P1.19 | Rs voltage drop         | 0,00 | 100,00 | %    | 0,00    | 675 | Voltage drop over motor windings as % of $U_{n\text{mot}}$ at nominal current.             |
| P1.20 | Overvoltage controller  | 0    | 2      |      | 1       | 607 | 0 = Disabled<br>1 = Enabled, Standard mode<br>2 = Enabled, Shock load mode                 |
| P1.21 | Undervoltage controller | 0    | 1      |      | 1       | 608 | 0 = Disable<br>1 = Enable                                                                  |
| P1.22 | Sine filter             | 0    | 1      |      | 0       | 522 | 0 = Not in use<br>1 = In use                                                               |

Table 6: Motor settings

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

## 5.4 Start / stop setup (Control panel: Menu PAR -&gt; P2)

| Code | Parameter                        | Min | Max | Unit | Default | ID  | Note                                                                                                                                                                                                               |
|------|----------------------------------|-----|-----|------|---------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P2.1 | Remote Control Place 1 Selection | 0   | 2   |      | 0       | 172 | 0 = I / O terminals<br>1 = Fieldbus<br>2 = Keypad                                                                                                                                                                  |
| P2.2 | Start function                   | 0   | 1   |      | 0       | 505 | 0 = Ramp<br>1 = Flying start                                                                                                                                                                                       |
| P2.3 | Stop function                    | 0   | 1   |      | 0       | 506 | 0 = Coasting<br>1 = Ramp                                                                                                                                                                                           |
| P2.4 | I / O Start / Stop logic         | 0   | 4   |      | 2       | 300 | I / O control    I / O control<br>signal 1        signal 2<br>0 Forward        Backward<br>1 Fwd(edge)      Inverted Stop<br>2 Fwd(edge)      Bwd(edge)<br>3 Start            Reverse<br>4 Start(edge)     Reverse |
| P2.5 | Local / Remote                   | 0   | 1   |      | 0       | 211 | 0 = Remote control<br>1 = Local control                                                                                                                                                                            |
| P2.6 | Keypad control direction         | 0   | 1   |      | 0       | 123 | 0 = Forward<br>1 = Backward                                                                                                                                                                                        |
| P2.7 | Keypad stop button               | 0   | 1   |      | 1       | 114 | 0 = Keypad control only<br>1 = Always                                                                                                                                                                              |
| P2.8 | Remote Control Place 2 Selection | 0   | 2   |      | 0       | 173 | 0 = I / O terminals<br>1 = Fieldbus<br>2 = Keypad                                                                                                                                                                  |

Table 7: Start / stop setup

## 5.5 Frequency references (Control panel: Menu PAR -&gt; P3)

| Code  | Parameter                                            | Min  | Max    | Unit | Default       | ID  | Note                                                                                                                                                       |
|-------|------------------------------------------------------|------|--------|------|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P3.1  | Min frequency                                        | 0,00 | P3.2   | Hz   | 0,00          | 101 |                                                                                                                                                            |
| P3.2  | Max frequency                                        | P3.1 | 320,00 | Hz   | 50,00 / 60,00 | 102 |                                                                                                                                                            |
| P3.3  | Remote Control Place 1 frequency reference selection | 1    | 9      |      | 7             | 117 | 1 = Preset Speeds 0<br>2 = Keypad<br>3 = Fieldbus<br>4 = AI1<br>5 = AI2<br>6 = PID<br>7 = AI1+ AI2<br>8 = Motor potentiometer<br>9 = Pulse train / Encoder |
| P3.4  | Preset speed 0                                       | P3.1 | P3.2   | Hz   | 5,00          | 124 | Preset speed 0 is used as frequency reference when P3.3 = 1                                                                                                |
| 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                                                                                                                                |
| P3.12 | Remote Control Place 2 frequency reference selection | 1    | 9      |      | 5             | 131 | As the parameter P3.3                                                                                                                                      |
| P3.13 | Motor Potentiometer Ramp                             | 1    | 50     | Hz/s | 5             | 331 | Speed variation rate                                                                                                                                       |
| P3.14 | Motor Potentiometer Reset                            | 0    | 2      |      | 2             | 367 | 0 = No Reset<br>1 = Reset if stopped<br>2 = Reset if powered down                                                                                          |

Table 8: Frequency references

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

## 5.6 Ramps and brakes setup (Control panel: Menu PAR -&gt; P4)

| Code  | Parameter                  | Min               | Max               | Unit | Default     | ID   | Note                                                                                                                  |
|-------|----------------------------|-------------------|-------------------|------|-------------|------|-----------------------------------------------------------------------------------------------------------------------|
| P4.1  | Ramp S-shape               | 0,0               | 10,0              | s    | 0,0         | 500  | 0 = Linear<br>>0 = S-curve ramp time                                                                                  |
| P4.2  | Acceleration time 1        | 0,1               | 3000,0            | s    | 3,0         | 103  |                                                                                                                       |
| P4.3  | Deceleration time 1        | 0,1               | 3000,0            | s    | 3,0         | 104  |                                                                                                                       |
| P4.4  | Ramp S-shape 2             | 0,0               | 10,0              | s    | 0,0         | 501  |                                                                                                                       |
| P4.5  | Acceleration time 2        | 0,1               | 3000,0            | s    | 10,0        | 502  |                                                                                                                       |
| P4.6  | Deceleration time 2        | 0,1               | 3000,0            | s    | 10,0        | 503  |                                                                                                                       |
| P4.7  | Flux Braking               | 0                 | 3                 |      | 0           | 520  | 0 = Off<br>1 = Deceleration<br>2 = Chopper<br>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.<br>0 = Not active |
| P4.11 | Stop DC current frequency  | 0,10              | 10,00             | Hz   | 1,50        | 515  | The output frequency at which the DC-braking is applied.                                                              |
| P4.12 | Start DC current time      | 0,00              | 600,00            | s    | 0,00        | 516  | 0 = Not active                                                                                                        |
| P4.13 | Accel2 Frequency Threshold | 0,00              | P3.2              | Hz   | 0,00        | 527  | 0,00 = disabled                                                                                                       |
| P4.14 | Decel2 Frequency Threshold | 0,00              | P3.2              | Hz   | 0,00        | 528  | 0,00 = disabled                                                                                                       |
| P4.15 | External Brake: Open Delay | 0,00              | 320,00            | s    | 0,20        | 1544 |                                                                                                                       |

Table 9: Ramps and brakes setup

| Code  | Parameter                                               | Min  | Max   | Unit | Default | ID   | Note |
|-------|---------------------------------------------------------|------|-------|------|---------|------|------|
| P4.16 | External Brake:<br>Open Frequency<br>limit              | 0,00 | P3.2  | Hz   | 1,50    | 1535 |      |
| P4.17 | External Brake :<br>Close Frequency<br>limit            | 0,00 | P3.2  | Hz   | 1,00    | 1539 |      |
| P4.18 | External Brake :<br>Close Frequency<br>limit in Reverse | 0,00 | P3.2  | Hz   | 1,50    | 1540 |      |
| P4.19 | External Brake :<br>Open/Close Cur-<br>rent limit       | 0,0  | 200,0 | %    | 20,0    | 1585 |      |

*Table 9: Ramps and brakes setup*

## 5.7 Digital inputs (Control panel: Menu PAR -&gt; P5)

| Code  | Parameter                             | Min | Max | Unit | Default | ID   | Note                                                                                                                          |
|-------|---------------------------------------|-----|-----|------|---------|------|-------------------------------------------------------------------------------------------------------------------------------|
| P5.1  | I / O control signal 1                | 0   | 6   |      | 1       | 403  | 0 = Not used<br>1 = DI1<br>2 = DI2<br>3 = DI3<br>4 = DI4<br>5 = DI5<br>6 = DI6                                                |
| P5.2  | I / O control signal 2                | 0   | 6   |      | 2       | 404  | As parameter 5.1                                                                                                              |
| P5.3  | Reverse                               | 0   | 6   |      | 0       | 412  | As parameter 5.1                                                                                                              |
| P5.4  | Ext. fault Close                      | 0   | 6   |      | 6       | 405  | As parameter 5.1                                                                                                              |
| P5.5  | Ext. fault Open                       | 0   | 6   |      | 0       | 406  | As parameter 5.1                                                                                                              |
| P5.6  | Fault reset                           | 0   | 6   |      | 3       | 414  | As parameter 5.1                                                                                                              |
| P5.7  | Run enable                            | 0   | 6   |      | 0       | 407  | As parameter 5.1                                                                                                              |
| P5.8  | Preset speed B0                       | 0   | 6   |      | 4       | 419  | As parameter 5.1                                                                                                              |
| P5.9  | Preset speed B1                       | 0   | 6   |      | 5       | 420  | As parameter 5.1                                                                                                              |
| P5.10 | Preset speed B2                       | 0   | 6   |      | 0       | 421  | As parameter 5.1                                                                                                              |
| P5.11 | Ramp time 2 selection                 | 0   | 6   |      | 0       | 408  | As parameter 5.1                                                                                                              |
| P5.12 | Motor potentiometer up                | 0   | 6   |      | 0       | 418  | As parameter 5.1                                                                                                              |
| P5.13 | Motor potentiometer down              | 0   | 6   |      | 0       | 417  | As parameter 5.1                                                                                                              |
| P5.14 | Remote control place 2                | 0   | 6   |      | 0       | 425  | Activates control place 2<br>As parameter 5.1                                                                                 |
| P5.15 | Remote control place freq reference 2 | 0   | 6   |      | 0       | 343  | Activates control place 2<br>See parameter 5.1                                                                                |
| P5.16 | PID setpoint 2                        | 0   | 6   |      | 0       | 1047 | Activates reference 2<br>As parameter 5.1                                                                                     |
| P5.17 | Motor PreHeat Active                  | 0   | 6   |      | 0       | 1044 | Activates the Motor Pre-Heat (DC-Current) in stop state when parameter Motor Preheat function is set to 2<br>As parameter 5.1 |

Table 10: Digital inputs

## 5.8 Analogue inputs (Control panel: Menu PAR -&gt; P6)

| Code | Parameter        | Min     | Max    | Unit | Default | ID  | Note                                                   |
|------|------------------|---------|--------|------|---------|-----|--------------------------------------------------------|
| P6.1 | AI1 Signal range | 0       | 1      |      | 0       | 379 | 0 = 0 - 100% ( 0 - 10 V)<br>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 - 10 V / 0 - 20 mA<br>1 = 2 - 10 V / 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 11: Analogue inputs

## 5.9 Pulse train / Encoder (Control panel: Menu PAR -&gt; P7)

| Code | Parameter                     | Min  | Max   | Unit | Default       | ID   | Note                                                                                                                         |
|------|-------------------------------|------|-------|------|---------------|------|------------------------------------------------------------------------------------------------------------------------------|
| P7.1 | Min pulse frequency           | 0    | 10000 | Hz   | 0             | 1229 | Pulse frequency to be interpreted as a 0% signal.                                                                            |
| P7.2 | Max pulse frequency           | 0,0  | 10000 | Hz   | 10000         | 1230 | Pulse frequency to be interpreted as a 100% signal.                                                                          |
| P7.3 | Freq. ref. at min pulse freq. | 0,00 | P3.2  | Hz   | 0,00          | 1231 | Frequency corresponding to 0% if used as frequency reference.                                                                |
| P7.4 | Freq. ref. at max pulse freq. | 0,00 | P3.2  | Hz   | 50,00 / 60,00 | 1232 | Frequency corresponding to 100% if used as frequency reference.                                                              |
| P7.5 | Encoder direction             | 0    | 2     |      | 0             | 1233 | 0 = Disable<br>1 = Enable / Normal<br>2 = Enable / Inverted                                                                  |
| P7.6 | Encoder pulses / revolution   | 1    | 65535 | ppr  | 256           | 629  | Pulse count of encoder per round. Used for scaling encoder rpm monitor value only.                                           |
| P7.7 | Config DI5 and DI6            | 0    | 2     |      | 0             | 1800 | 0 = DI5 and DI6 are for normal digital input<br>1 = DI6 is for pulse train<br>2 = DI5 and DI6 are for encoder frequency mode |

Table 12: Pulse train/Encoder

## 5.10 Digital outputs (Control panel: Menu PAR -&gt; P8)

| Code  | Parameter            | Min  | Max    | Unit | Default | ID   | Selections                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------|----------------------|------|--------|------|---------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P8.1  | R01 signal selection | 0    | 19     |      | 2       | 313  | 0 = Not used<br>1 = Ready<br>2 = Run<br>3 = Fault<br>4 = Fault Inverted<br>5 = Warning<br>6 = Reversed<br>7 = At Speed<br>8 = Motor regulator active<br>9 = FB Control Word.B13<br>10 = FB Control Word.B14<br>11 = FB Control Word.B15<br>12 = Output freq superv.<br>13 = Output torque superv.<br>14 = Unit temperature superv.<br>15 = Analogue input superv.<br>16 = Preset Speed Active<br>17 = External Brake ctrl<br>18 = Keypad control active<br>19 = I / O control active |
| P8.2  | R02 signal selection | 0    | 19     |      | 3       | 314  | As parameter 8.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| P8.3  | D01 signal selection | 0    | 19     |      | 1       | 312  | As parameter 8.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| P8.4  | R02 inversion        | 0    | 1      |      | 0       | 489  | 0 = No inversion<br>1 = Inverted                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| P8.5  | R02 ON delay         | 0,00 | 320,00 | s    | 0,00    | 460  | 0,00 = No delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| P8.6  | R02 OFF delay        | 0,00 | 320,00 | s    | 0,00    | 461  | 0,00 = No delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| P8.7  | R01 inversion        | 0    | 1      |      | 0       | 1587 | 0 = No inversion<br>1 = Inverted                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| P8.8  | R01 ON delay         | 0,00 | 320,00 | s    | 0,00    | 458  | 0,00 = No delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| P8.9  | R01 OFF delay        | 0,00 | 320,00 | s    | 0,00    | 459  | 0,00 = No delay                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| P8.10 | R03 signal selection | 0    | 19     |      | 0       | 317  | As parameter 8.1, R03-R05 implemented but hidden until an option board is connected.                                                                                                                                                                                                                                                                                                                                                                                                 |
| P8.11 | R04 signal selection | 0    | 19     |      | 0       | 318  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| P8.12 | R05 signal selection | 0    | 19     |      | 0       | 1386 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Table 13: Digital outputs

## 5.11 Analogue outputs (Control panel: Menu PAR -&gt; P9)

| Code | Parameter                        | Min  | Max    | Unit | Default | ID  | Selections                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------|----------------------------------|------|--------|------|---------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P9.1 | Analog output signal selection   | 0    | 14     |      | 1       | 307 | 0 = Not used<br>1 = Output freq. (0-f <sub>max</sub> )<br>2 = Output current (0-I <sub>nMotor</sub> )<br>3 = Motor torque (0-T <sub>nMotor</sub> )<br>4 = PID output (0 - 100%)<br>5 = Freq. refer. (0-f <sub>max</sub> )<br>6 = Motor speed (0-n <sub>max</sub> )<br>7 = Motor power (0-P <sub>nMotor</sub> )<br>8 = Motor Voltage (0-U <sub>nMotor</sub> )<br>9 = DC-link Voltage (0 - 1000 V)<br>10 = Process Data In1 (0 - 10000)<br>11 = Process Data In2 (0 - 10000)<br>12 = Process Data In3 (0 - 10000)<br>13 = Process Data In4 (0 - 10000)<br>14 = Test 100% |
| P9.2 | Analog output minimum            | 0    | 1      |      | 0       | 310 | 0 = 0 V / 0 mA<br>1 = 2 V / 4 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| P9.3 | Analog output scaling            | 0,0  | 1000,0 | %    | 100,0   | 311 | Scaling factor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| P9.4 | Analog output filter time        | 0,00 | 10,00  | s    | 0,10    | 308 | Filter time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| P9.5 | Analog output 2 signal selection | 0    | 14     |      | 1       | 472 | As parameter 9.1, A02&A03 implemented but hidden until an option board is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| P9.6 | Analog output 2 minimum          | 0    | 1      |      | 0       | 475 | As parameter 9.2, A02&A03 implemented but hidden until an option board is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| P9.7 | Analog output 2 scaling          | 0,0  | 1000,0 | %    | 100,0   | 476 | As parameter 9.3, A02&A03 implemented but hidden until an option board is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| P9.8 | Analog output filter time        | 0,00 | 10,00  | s    | 0,10    | 473 | As parameter 9.4, A02&A03 implemented but hidden until an option board is connected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Table 14: Analogue outputs

| Code  | Parameter                        | Min  | Max    | Unit | Default | ID  | Selections       |
|-------|----------------------------------|------|--------|------|---------|-----|------------------|
| P9.9  | Analog output 3 signal selection | 0    | 14     |      | 1       | 479 | As parameter 9.5 |
| P9.10 | Analog output 3 minimum          | 0    | 1      |      | 0       | 482 | As parameter 9.6 |
| P9.11 | Analog output 3 scaling          | 0,0  | 1000,0 | %    | 100,0   | 483 | As parameter 9.7 |
| P9.12 | Analog output 3 filter time      | 0,00 | 10,00  | s    | 0,10    | 480 | As parameter 9.8 |

*Table 14: Analogue outputs*

## 5.12 Fieldbus Data-Mapping (Control panel: Menu PAR -&gt; P10)

| Code  | Parameter                  | Min | Max | Unit | Default | ID   | Note                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------|----------------------------|-----|-----|------|---------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P10.1 | FB Data Output 1 selection | 0   | 15  |      | 0       | 852  | 0 = Frequency reference<br>1 = Output reference<br>2 = Motor speed<br>3 = Motor current<br>4 = Motor voltage<br>5 = Motor torque<br>6 = Motor power<br>7 = DC link voltage<br>8 = Active fault code<br>9 = Analogue AI1<br>10 = Analogue AI2<br>11 = Digital input state<br>12 = PID feedback value<br>13 = PID setpoint<br>14 = Pulse train / encoder input(%)<br>15 = Pulse train / encoder pulse() |
| P10.2 | FB Data Output 2 selection | 0   | 15  |      | 1       | 853  | Variable mapped on PD2                                                                                                                                                                                                                                                                                                                                                                                |
| P10.3 | FB Data Output 3 selection | 0   | 15  |      | 2       | 854  | Variable mapped on PD3                                                                                                                                                                                                                                                                                                                                                                                |
| P10.4 | FB Data Output 4 selection | 0   | 15  |      | 4       | 855  | Variable mapped on PD4                                                                                                                                                                                                                                                                                                                                                                                |
| P10.5 | FB Data Output 5 selection | 0   | 15  |      | 5       | 856  | Variable mapped on PD5                                                                                                                                                                                                                                                                                                                                                                                |
| P10.6 | FB Data Output 6 selection | 0   | 15  |      | 3       | 857  | Variable mapped on PD6                                                                                                                                                                                                                                                                                                                                                                                |
| P10.7 | FB Data Output 7 selection | 0   | 15  |      | 6       | 858  | Variable mapped on PD7                                                                                                                                                                                                                                                                                                                                                                                |
| P10.8 | FB Data Output 8 selection | 0   | 15  |      | 7       | 859  | Variable mapped on PD8                                                                                                                                                                                                                                                                                                                                                                                |
| P10.9 | Aux CW Data In selection   | 0   | 5   |      | 0       | 1519 | PDI for Aux CW<br>0 = Not used<br>1 = PDI1<br>2 = PDI2<br>3 = PDI3<br>4 = PDI4<br>5 = PDI5                                                                                                                                                                                                                                                                                                            |

Table 15: Fieldbus Data-Mapping

## 5.13 Prohibited Frequencies (Control panel: Menu PAR -&gt; P11)

| Code  | Parameter                             | Min  | Max  | Unit | Default | ID  | Note                       |
|-------|---------------------------------------|------|------|------|---------|-----|----------------------------|
| P11.1 | Prohibit Frequency Range 1 Low Limit  | 0,00 | P3.2 | Hz   | 0,00    | 509 | Low Limit<br>0 = Not used  |
| P11.2 | Prohibit Frequency Range 1 High Limit | 0,00 | P3.2 | Hz   | 0,00    | 510 | High Limit<br>0 = Not used |
| P11.3 | Prohibit Frequency Range 2 Low Limit  | 0,00 | P3.2 | Hz   | 0,00    | 511 | Low Limit<br>0 = Not used  |
| P11.4 | Prohibit Frequency Range 2 High Limit | 0,00 | P3.2 | Hz   | 0,00    | 512 | High Limit<br>0 = Not used |

Table 16: Prohibited Frequencies

## 5.14 Limit Supervisions (Control panel: Menu PAR -&gt; P12)

| Code  | Parameter                          | Min  | Max    | Unit | Default | ID  | Note                                            |
|-------|------------------------------------|------|--------|------|---------|-----|-------------------------------------------------|
| P12.1 | Output freq. supervision function  | 0    | 2      |      | 0       | 315 | 0 = Not used<br>1 = Low limit<br>2 = High limit |
| P12.2 | Output freq. supervision limit     | 0,00 | P3.2   | Hz   | 0,00    | 316 | Output frequency supervision threshold          |
| P12.3 | Torque supervision function        | 0    | 2      |      | 0       | 348 | 0 = Not used<br>1 = Low limit<br>2 = High limit |
| P12.4 | Torque supervision limit           | 0,0  | 300,0  | %    | 0,0     | 349 | Torque supervision Threshold                    |
| P12.5 | Unit Temperature Supervision       | 0    | 2      |      | 0       | 354 | 0 = Not used<br>1 = Low limit<br>2 = High limit |
| P12.6 | Unit Temperature Supervision Limit | -10  | 100    | °C   | 40      | 355 | Unit temperature supervision threshold          |
| P12.7 | Analogue input superv signal       | 0    | 1      |      | 0       | 356 | 0 = AI1<br>1 = AI2                              |
| P12.8 | AI superv ON level                 | 0,00 | 100,00 | %    | 80,00   | 357 | ON threshold AI superv.                         |
| P12.9 | AI superv OFF level                | 0,00 | 100,00 | %    | 40,00   | 358 | OFF threshold AI superv.                        |

Table 17: Limit Supervisions

## 5.15 Protections (Control panel: Menu PAR -&gt; P13)

| Code   | Parameter                    | Min  | Max                      | Unit | Default            | ID   | Note                                                                                                            |
|--------|------------------------------|------|--------------------------|------|--------------------|------|-----------------------------------------------------------------------------------------------------------------|
| P13.1  | Analog Input low fault       | 0    | 4                        |      | 1                  | 700  | 0 = No action<br>1 = Alarm<br>2 = Alarm, preset alarm frequency<br>3 = Fault: Stop function<br>4 = Fault: Coast |
| P13.2  | Under voltage fault          | 1    | 2                        |      | 2                  | 727  | 1 = No response (no fault generated but drive still stops modulation)<br>2 = Fault: Coast                       |
| P13.3  | Earth fault                  | 0    | 3                        |      | 2                  | 703  | 0 = No action<br>1 = Alarm<br>2 = Fault: Stop function<br>3 = Fault: Coast                                      |
| P13.4  | Output Phase Fault           | 0    | 3                        |      | 2                  | 702  | As parameter 13.3                                                                                               |
| P13.5  | Stall protection             | 0    | 3                        |      | 0                  | 709  | As parameter 13.3                                                                                               |
| P13.6  | Under load protection        | 0    | 3                        |      | 0                  | 713  | As parameter 13.3                                                                                               |
| P13.7  | Motor thermal protection     | 0    | 3                        |      | 2                  | 704  | As parameter 13.3                                                                                               |
| 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  | Varies             | 707  | Motor thermal time constant                                                                                     |
| P13.11 | Stall Current                | 0,00 | 2,0 x I <sub>Nunit</sub> | A    | I <sub>Nunit</sub> | 710  |                                                                                                                 |
| P13.12 | Stall time                   | 0,00 | 300,00                   | s    | 15,00              | 711  | Stall time limited                                                                                              |
| P13.13 | Stall frequency              | 0,10 | 320,00                   | Hz   | 25,00              | 712  | Stall min. frequency                                                                                            |
| P13.14 | UL: Field weakening load     | 10,0 | 150,0                    | %    | 50,0               | 714  | Minimum torque at field weakening                                                                               |
| P13.15 | UL: Zero freq load           | 5,0  | 150,0                    | %    | 10,0               | 715  | Minimum torque at F0                                                                                            |
| P13.16 | UL: Time limit               | 1,0  | 300,0                    | s    | 20,0               | 716  |                                                                                                                 |
| P13.17 | Analog Input low fault delay | 0,0  | 10,0                     | s    | 0,5                | 1430 |                                                                                                                 |

Table 18: Protections

| Code   | Parameter              | Min  | Max  | Unit | Default | ID  | Note                                                                                                                    |
|--------|------------------------|------|------|------|---------|-----|-------------------------------------------------------------------------------------------------------------------------|
| P13.18 | External fault         | 0    | 3    |      | 2       | 701 | 0 = No action<br>1 = Alarm<br>2 = Fault: Stop function<br>3 = Fault: Coast                                              |
| P13.19 | Fieldbus fault         | 0    | 4    |      | 3       | 733 | As parameter 13.1                                                                                                       |
| P13.20 | Preset alarm frequency | P3.1 | P3.2 | Hz   | 25,00   | 183 | Frequency used when fault response is Alarm + preset Frequency.                                                         |
| P13.21 | Parameters edit lock   | 0    | 1    |      | 0       | 819 | 0 = Edit enabled<br>1 = Edit disabled                                                                                   |
| P13.22 | Thermistor Fault       | 0    | 3    |      | 2       | 732 | 0 = No action<br>1 = Alarm<br>2 = Fault: Stop function<br>3 = Fault: Coast<br>Hidden until an option board is connected |

Table 18: Protections

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

#### 5.16 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<br>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                              |
| P14.4 | Trials number    | 1    | 10    |      | 3       | 759 | Maximum trials                                       |
| P14.5 | Restart Function | 0    | 2     |      | 2       | 719 | 0 = Ramping<br>1 = Flying<br>2 = From Start Function |

Table 19: Fault autoreset parameters

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

## 5.17 PID control parameters (Control panel: Menu PAR -&gt; P15)

| Code   | Parameter                | Min  | Max    | Unit | Default | ID  | Note                                                                                                                                                                                                      |
|--------|--------------------------|------|--------|------|---------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P15.1  | Setpoint selection       | 0    | 7      |      | 0       | 332 | 0 = Fixed setpoint %<br>1 = AI1<br>2 = AI2<br>3 = ProcessDataIn1 (0 - 100%)<br>4 = ProcessDataIn2 (0 - 100%)<br>5 = ProcessDataIn3 (0 - 100%)<br>6 = ProcessDataIn4 (0 - 100%)<br>7 = Pulse train/encoder |
| P15.2  | Fixed setpoint 1         | 0,0  | 100,0  | %    | 50,0    | 167 | Fixed setpoint                                                                                                                                                                                            |
| P15.3  | Fixed setpoint 2         | 0,0  | 100,0  | %    | 50,0    | 168 | Alternative fixed setpoint, selectable with DI                                                                                                                                                            |
| P15.4  | Feedback value selection | 0    | 7      |      | 1       | 334 | 0 = AI1<br>1 = AI2<br>2 = ProcessDataIn1 (0 - 100%)<br>3 = ProcessDataIn2 (0 - 100%)<br>4 = ProcessDataIn3 (0 - 100%)<br>5 = ProcessDataIn4 (0 - 100%)<br>6 = AI2-AI1<br>7 = Pulse train / encoder        |
| 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 | %    | 10,00   | 118 | Proportional gain                                                                                                                                                                                         |
| P15.8  | I time                   | 0,00 | 320,00 | s    | 10,00   | 119 | Integrative time                                                                                                                                                                                          |
| P15.9  | D time                   | 0,00 | 10,00  | s    | 0,00    | 132 | Derivative time                                                                                                                                                                                           |
| P15.10 | Error inversion          | 0    | 1      |      | 0       | 340 | 0 = Direct (Feedback < Setpoint -> Increase PID output)<br>1 = Inverted (Feedback > Setpoint -> Decrease PID output)                                                                                      |

Table 20: PID control parameters

| Code   | Parameter                      | Min  | Max    | Unit | Default | ID   | Note                                                                                                                                                       |
|--------|--------------------------------|------|--------|------|---------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P15.11 | Sleep minimum frequency        | 0,00 | P3.2   | Hz   | 25,00   | 1016 | Drive goes to sleep mode when the output frequency stays below this limit for a time greater than that defined by parameter Sleep delay                    |
| P15.12 | Sleep delay                    | 0    | 3600   | s    | 30      | 1017 | Delay for enter sleep                                                                                                                                      |
| P15.13 | Wake up error                  | 0,0  | 100,0  | %    | 5,0     | 1018 | Threshold for exit sleep                                                                                                                                   |
| P15.14 | Sleep setpoint boost           | 0,0  | 50,0   | %    | 10,0    | 1071 | Referred to setpoint                                                                                                                                       |
| P15.15 | Setpoint boost time            | 0    | 60     | s    | 10      | 1072 | Boost time after P15.12                                                                                                                                    |
| P15.16 | Sleep maximum loss             | 0,0  | 50,0   | %    | 5,0     | 1509 | Referred to feedback value after boost                                                                                                                     |
| P15.17 | Sleep loss check time          | 1    | 300    | s    | 30      | 1511 | After boost time P15.15                                                                                                                                    |
| P15.18 | Process display source select  | 0    | 6      |      | 0       | 1513 | 0 = PID feedback value<br>1 = Output frequency<br>2 = Motor speed<br>3 = Motor torque<br>4 = Motor power<br>5 = Motor current<br>6 = Pulse Train / Encoder |
| P15.19 | Process display decimal digits | 0    | 3      |      | 1       | 1035 | Decimals on display                                                                                                                                        |
| P15.20 | Process display maximum value  | 0,0  | 3200,0 |      | 100,0   | 1034 | Process max value                                                                                                                                          |

Table 20: PID control parameters

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

## 5.18 Motor Pre-heat (Control panel: Menu PAR -&gt; P16)

| Code  | Parameter               | Min | Max               | Unit | Default | ID   | Note                                                                                                                       |
|-------|-------------------------|-----|-------------------|------|---------|------|----------------------------------------------------------------------------------------------------------------------------|
| P16.1 | Motor Pre-heat Function | 0   | 2                 |      | 0       | 1225 | 0 = Not used<br>1 = Always in stop state<br>2 = Controlled by digital input                                                |
| P16.2 | Motor Pre-heat Current  | 0   | 0,5 x $I_{Nunit}$ | A    | 0       | 1227 | DC current for Pre-heating of motor and drive in stop state. Active in stop state or by digital input while in stop state. |

Table 21: Motor Pre-heat

## 5.19 Easy usage menu (Control panel: Menu PAR -&gt; P17)

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

Table 22: Easy usage menu parameters

## 5.20 System parameters

| Code                                                                                          | Parameter                    | Min | Max | Default | ID    | Note                                                                                                                                         |
|-----------------------------------------------------------------------------------------------|------------------------------|-----|-----|---------|-------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Software information (MENU PAR -&gt; V1)</b>                                               |                              |     |     |         |       |                                                                                                                                              |
| 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   |                                                                                                                                              |
| <b>When Modbus and no Option board has been installed the comm. Parameters are as follows</b> |                              |     |     |         |       |                                                                                                                                              |
| V2.1                                                                                          | Communication status         |     |     |         | 808   | Status of Modbus communication.<br>Format: xx.yyy<br>where xx = 0 - 64<br>(Number of error messages) yyy = 0 - 999 (Number of good messages) |
| P2.2                                                                                          | Fieldbus protocol            | 0   | 1   | 0       | 809   | 0 = Not used<br>1 = Modbus used                                                                                                              |
| P2.3                                                                                          | Slave address                | 1   | 255 | 1       | 810   |                                                                                                                                              |
| P2.4                                                                                          | Baud rate                    | 0   | 8   | 5       | 811   | 0 = 300<br>1 = 600<br>2 = 1200<br>3 = 2400<br>4 = 4800<br>5 = 9600<br>6 = 19200<br>7 = 38400<br>8 = 57800                                    |
| P2.6                                                                                          | Parity type                  | 0   | 2   | 0       | 813   | 0 = None<br>1 = Odd<br>2 = Even                                                                                                              |
| P2.7                                                                                          | Communication time out       | 0   | 255 | 0       | 814   | 0 = Not used<br>1 = 1 sec<br>2 = 2 secs, etc                                                                                                 |
| P2.8                                                                                          | Reset communication status   | 0   | 1   | 0       | 815   |                                                                                                                                              |
| <b>When Canopen board has been installed the comm. Parameters are as follows</b>              |                              |     |     |         |       |                                                                                                                                              |
| V2.1                                                                                          | Canopen communication status |     |     |         | 14004 |                                                                                                                                              |

Table 23: System parameters

| Code                                                                               | Parameter                               | Min  | Max  | Default | ID    | Note                                             |
|------------------------------------------------------------------------------------|-----------------------------------------|------|------|---------|-------|--------------------------------------------------|
| P2.2                                                                               | Canopen operation mode                  | 1    | 2    | 1       | 14003 |                                                  |
| P2.3                                                                               | Canopen Node ID                         | 1    | 127  | 1       | 14001 |                                                  |
| P2.4                                                                               | Canopen baud rate                       | 1    | 8    | 6       | 14002 |                                                  |
| <b>When DeviceNet board has been installed the comm. Parameters are as follows</b> |                                         |      |      |         |       |                                                  |
| V2.1                                                                               | Communication status                    |      |      |         | 14014 |                                                  |
| P2.2                                                                               | Output assembly type                    | 20   | 111  | 21      | 14012 |                                                  |
| P2.3                                                                               | MAC ID                                  | 0    | 63   | 63      | 14010 |                                                  |
| P2.4                                                                               | Baud rate                               | 1    | 3    | 1       | 14011 |                                                  |
| P2.5                                                                               | Input assembly type                     | 70   | 117  | 71      | 14013 |                                                  |
| <b>When ProfiBus board has been installed the comm. Parameters are as follows</b>  |                                         |      |      |         |       |                                                  |
| V2.1                                                                               | Communication status                    |      |      |         | 14022 |                                                  |
| V2.2                                                                               | Fieldbus protocol                       |      |      |         | 14023 |                                                  |
| V2.3                                                                               | Active protocol                         |      |      |         | 14024 |                                                  |
| V2.4                                                                               | Active buad rate                        |      |      |         | 14025 |                                                  |
| V2.5                                                                               | Telegram type                           |      |      |         | 14027 |                                                  |
| P2.6                                                                               | Operate mode                            | 1    | 3    | 1       | 14021 |                                                  |
| P2.7                                                                               | Slave address                           | 2    | 126  | 126     | 14020 |                                                  |
| <b>Other information</b>                                                           |                                         |      |      |         |       |                                                  |
| 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   |                                                  |
| V3.7                                                                               | Panel parameter set status monitor      |      |      |         |       | Hidden when connect with PC.                     |
| P4.2                                                                               | Restore factory defaults                | 0    | 1    | 0       | 831   | 1 = Restores factory defaults for all parameters |
| P4.3                                                                               | Password                                | 0000 | 9999 | 0000    | 832   |                                                  |
| P4.4                                                                               | Time for panel and lcd backlight active | 0    | 99   | 5       | 833   |                                                  |
| P4.5                                                                               | Save parameter set to panel             | 0    | 1    | 0       |       | Hidden when connect with PC.                     |
| P4.6                                                                               | Restore parameter set from panel        | 0    | 1    | 0       |       | Hidden when connect with PC.                     |
| F5.x                                                                               | Active Fault menu                       |      |      |         |       |                                                  |
| F6.x                                                                               | Fault History menu                      |      |      |         |       |                                                  |

Table 23: System parameters

## 6. FAULT TRACING

| Fault code | Fault name                           | Fault code | Fault name                                                                     |
|------------|--------------------------------------|------------|--------------------------------------------------------------------------------|
| <b>1</b>   | Overcurrent                          | <b>25</b>  | Microcontroller watchdog fault                                                 |
| <b>2</b>   | Overvoltage                          | <b>27</b>  | Back EMF protection                                                            |
| <b>3</b>   | Earth fault                          | <b>34</b>  | Internal bus communication                                                     |
| <b>8</b>   | System fault                         | <b>35</b>  | Application fault                                                              |
| <b>9</b>   | Undervoltage                         | <b>41</b>  | IGBT Overtemperature                                                           |
| <b>11</b>  | Output phase fault                   | <b>50</b>  | Analog input select 20% - 100% (selected signal range 4 to 20 mA or 2 to 10 V) |
| <b>13</b>  | Frequency converter undertemperature | <b>51</b>  | External fault                                                                 |
| <b>14</b>  | Frequency converter overtemperature  | <b>52</b>  | Door Panel fault                                                               |
| <b>15</b>  | Motor stalled                        | <b>53</b>  | Fieldbus fault                                                                 |
| <b>16</b>  | Motor overtemperature                | <b>54</b>  | Slot fault                                                                     |
| <b>17</b>  | Motor underload                      | <b>55</b>  | Wrong run fault                                                                |
| <b>22</b>  | EEPROM checksum fault                | <b>57</b>  | Identification fault                                                           |

Table 24: Fault codes. See User Manual for detailed fault descriptions.

## 7. GENERAL DATA

|                                                                   |                                                                                                                    |                                                                                                                                                                                                                                                                                                                              |       |            |             |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|-------------|
| <b>Dimensions and weight</b>                                      | Frame                                                                                                              | Height                                                                                                                                                                                                                                                                                                                       | Width | Depth (mm) | Weight (kg) |
|                                                                   | MI1                                                                                                                | 157                                                                                                                                                                                                                                                                                                                          | 66    | 98         | 0.5         |
|                                                                   | MI2                                                                                                                | 195                                                                                                                                                                                                                                                                                                                          | 90    | 102        | 0.7         |
|                                                                   | MI3                                                                                                                | 262                                                                                                                                                                                                                                                                                                                          | 100   | 109        | 1           |
|                                                                   | MI4                                                                                                                | 370                                                                                                                                                                                                                                                                                                                          | 165   | 165        | 8           |
|                                                                   | MI5                                                                                                                | 414                                                                                                                                                                                                                                                                                                                          | 165   | 202        | 10          |
| <b>Supply network</b>                                             | Networks                                                                                                           | Vacon 20 (400 V) cannot be used with corner grounded networks                                                                                                                                                                                                                                                                |       |            |             |
|                                                                   | Short circuit current                                                                                              | Maximum short circuit current has to be < 50 kA, For MI4 without DC-choke, maximum short circuit current has to be < 2.3 kA, for MI5 without DC-choke, maximum short circuit current has to be < 3.8 kA.                                                                                                                     |       |            |             |
| <b>Motor connection</b>                                           | Output voltage                                                                                                     | 0 - U <sub>in</sub>                                                                                                                                                                                                                                                                                                          |       |            |             |
|                                                                   | Output current                                                                                                     | Continuous rated current I <sub>N</sub> at ambient temperature max. +50 °C (depends on the unit size), overload 1.5 x I <sub>N</sub> max. 1 min / 10 min                                                                                                                                                                     |       |            |             |
| <b>Ambient conditions</b>                                         | Ambient operating temperature                                                                                      | -10 °C (no frost)...+40 / 50 °C (depends on the unit size): rated load-ability I <sub>N</sub><br>Side by side installation for MI1-3 it is always 40 °C; For IP21/ Nema1 option in MI1-3 the maximum temperture is also 40 °C.                                                                                               |       |            |             |
|                                                                   | 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, IP21 for MI4-5                                                                                                                                                                                                                                                                                |       |            |             |
| <b>EMC</b>                                                        | Pollution degree                                                                                                   | PD2                                                                                                                                                                                                                                                                                                                          |       |            |             |
|                                                                   | Immunity                                                                                                           | Complies with EN50082-1, -2, EN61800-3                                                                                                                                                                                                                                                                                       |       |            |             |
| <b>Standards</b>                                                  | Emissions(See detailed descriptions in Vacon 20 User Manual at: <a href="http://www.vacon.com">www.vacon.com</a> ) | 230V : Complies with EMC category C2; With an internal RFI filter. MI4&5 complies C2 with an optional DC choke and CM choke. 400V: Complies with EMC category C2; With an internal RFI filter MI4&5 complies C2 with an optional DC choke and CM choke. Both: No EMC emission protection (Vacon level N): Without RFI filter |       |            |             |
|                                                                   |                                                                                                                    | For EMC: EN61800-3,<br>For safety: UL508C, EN61800-5                                                                                                                                                                                                                                                                         |       |            |             |
| <b>Certificates and manufacturer's declarations of conformity</b> |                                                                                                                    | For safety: CE, UL, cUL,<br>For EMC: CE, c-tick<br>(see unit nameplate for more detailed approvals)                                                                                                                                                                                                                          |       |            |             |

| Cable and fuse requirements<br>(See detailed data in Vacon 20 User Manual at:<br>www.vacon.com)<br>380 - 480 V, 3~<br>208 - 240 V, 3~ | Frame     | Fuse [A]                                                  | Mains cable<br>Cu (mm <sup>2</sup> ) | Terminal cable min-max<br>(mm <sup>2</sup> ) |        |                    | 0.5-1.5 |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------|--------------------------------------|----------------------------------------------|--------|--------------------|---------|
|                                                                                                                                       |           |                                                           |                                      | Main                                         | Earth  | Control &<br>relay |         |
|                                                                                                                                       | MI1       | 6                                                         | 3*1.5+1.5                            | 1.5-4                                        |        |                    |         |
|                                                                                                                                       | MI2       | 10                                                        |                                      |                                              |        |                    |         |
|                                                                                                                                       | MI3       | 20                                                        | 1.5-6                                |                                              |        |                    |         |
|                                                                                                                                       | MI4       | 20<br>25<br>40<br>[20 and 40 is only for 208 - 240 V, 3~] | 3*6+6                                | 1-10Cu                                       | 1-10   |                    |         |
|                                                                                                                                       | MI5       | 40                                                        | 3*10+10                              | 2.5-50<br>Cu / Al                            | 2.5-35 |                    |         |
|                                                                                                                                       | 115 V, 1~ | MI2                                                       | 20                                   | 2*2.5+2.5                                    | 1.5-4  |                    |         |
| MI3                                                                                                                                   |           | 32                                                        | 2*6+6                                |                                              |        |                    |         |
| 208 - 240, 1~                                                                                                                         | MI1       | 10                                                        | 2*1.5+1.5                            |                                              |        |                    |         |
|                                                                                                                                       | MI2       | 20                                                        | 2*2.5+2.5                            |                                              |        |                    |         |
|                                                                                                                                       | MI3       | 32                                                        | 2*6+6                                | 1.5-6                                        |        |                    |         |
| 575V                                                                                                                                  | MI3       | 6                                                         | 3*1.5+1.5                            | 1.5-4                                        |        |                    |         |
|                                                                                                                                       | MI3       | 10                                                        |                                      |                                              |        |                    |         |
|                                                                                                                                       |           | MI3                                                       | 20                                   | 3*2.5+2.5                                    | 1.5-6  |                    |         |

- With above-mentioned fuses, the drive can be connected to power supply the short circuit current of which is max. 50 kA
- 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 10 mm<sup>2</sup> Cu or 16 mm<sup>2</sup> Al**. Another possibility is to use an additional protective conductor of at least the same size as the original one.

## Vacon 20 power ratings

| Mains voltage 208 - 240 V, 50 / 60 Hz, 1~ series |                                   |                                   |                      |           |                             |                    |                |
|--------------------------------------------------|-----------------------------------|-----------------------------------|----------------------|-----------|-----------------------------|--------------------|----------------|
| Freq.<br>converter<br>type                       | Rated loadability                 |                                   | Motor shaft<br>power |           | Nominal<br>input<br>current | Mechanical<br>size | Weight<br>(kg) |
|                                                  | 100% contin.<br>current $I_N$ [A] | 150% over-<br>load current<br>[A] | P<br>[HP]            | P<br>[KW] | [A]                         |                    |                |
| 0001                                             | 1.7                               | 2.6                               | 0.33                 | 0.25      | 4.2                         | MI1                | 0.55           |
| 0002                                             | 2.4                               | 3.6                               | 0.5                  | 0.37      | 5.7                         | MI1                | 0.55           |
| 0003                                             | 2.8                               | 4.2                               | 0.75                 | 0.55      | 6.6                         | MI1                | 0.55           |
| 0004                                             | 3.7                               | 5.6                               | 1                    | 0.75      | 8.3                         | MI2                | 0.55           |
| 0005                                             | 4.8                               | 7.2                               | 1.5                  | 1.1       | 11.2                        | MI2                | 0.7            |
| 0007                                             | 7                                 | 10.5                              | 2                    | 1.5       | 14.1                        | MI2                | 0.7            |
| 0009*                                            | 9.6                               | 14.4                              | 3                    | 2.2       | 22.1                        | MI3                | 0.99           |

Table 25: Vacon 20 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 |                                   |                                   |                      |           |                             |                    |                |
|--------------------------------------------------|-----------------------------------|-----------------------------------|----------------------|-----------|-----------------------------|--------------------|----------------|
| Freq.<br>converter<br>type                       | Rated loadability                 |                                   | Motor shaft<br>power |           | Nominal<br>input<br>current | Mechanical<br>size | Weight<br>(kg) |
|                                                  | 100% contin.<br>current $I_N$ [A] | 150% over-<br>load current<br>[A] | P<br>HP              | P<br>[KW] | [A]                         |                    |                |
| 0001                                             | 1.7                               | 2.6                               | 0.33                 | 0.25      | 2.7                         | MI1                | 0.55           |
| 0002                                             | 2.4                               | 3.6                               | 0.5                  | 0.37      | 3.5                         | MI1                | 0.55           |
| 0003                                             | 2.8                               | 4.2                               | 0.75                 | 0.55      | 3.8                         | MI1                | 0.55           |
| 0004                                             | 3.7                               | 5.6                               | 1                    | 0.75      | 4.3                         | MI2                | 0.7            |
| 0005                                             | 4.8                               | 7.2                               | 1.5                  | 1.1       | 6.8                         | MI2                | 0.7            |
| 0007*                                            | 7                                 | 10.5                              | 2                    | 1.5       | 8.4                         | MI2                | 0.7            |
| 0011*                                            | 11                                | 16.5                              | 3                    | 2.2       | 13.4                        | MI3                | 0.99           |
| 0012                                             | 12.5                              | 18.8                              | 4                    | 3         | 14.2                        | MI4                | 9              |
| 0017                                             | 17.5                              | 26.3                              | 5                    | 4         | 20.6                        | MI4                | 9              |
| 0025                                             | 25                                | 37.5                              | 7.5                  | 5.5       | 30.3                        | MI4                | 9              |
| 0031                                             | 31                                | 46.5                              | 10                   | 7.5       | 36.6                        | MI5                | 11             |
| 0038                                             | 38                                | 57                                | 15                   | 11        | 44.6                        | MI5                | 11             |

Table 26: Vacon 20 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 |                                   |                                   |                      |           |                             |                    |                |
|--------------------------------------------|-----------------------------------|-----------------------------------|----------------------|-----------|-----------------------------|--------------------|----------------|
| Freq.<br>converter<br>type                 | Rated loadability                 |                                   | Motor shaft<br>power |           | Nominal<br>input<br>current | Mechanical<br>size | Weight<br>(Kg) |
|                                            | 100% contin.<br>current $I_N$ [A] | 150% over-<br>load current<br>[A] | P<br>[HP]            | P<br>[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 27: Vacon 20 power ratings, 115 V, 1~

| Mains voltage 380 - 480 V, 50 / 60 Hz, 3~ series |                                   |                                   |                      |           |                             |                    |                |
|--------------------------------------------------|-----------------------------------|-----------------------------------|----------------------|-----------|-----------------------------|--------------------|----------------|
| Freq.<br>converter<br>type                       | Rated loadability                 |                                   | Motor shaft<br>power |           | Nominal<br>input<br>current | Mechanical<br>size | Weight<br>(kg) |
|                                                  | 100% contin.<br>current $I_N$ [A] | 150% over-<br>load current<br>[A] | P<br>[HP]            | P<br>[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           |
| 0016                                             | 16                                | 24                                | 10                   | 7.5       | 17.1                        | MI4                | 9              |
| 0023                                             | 23                                | 34.5                              | 15                   | 11        | 25.5                        | MI4                | 9              |
| 0031                                             | 31                                | 46.5                              | 20                   | 15        | 33                          | MI5                | 11             |
| 0038                                             | 38                                | 57                                | 25                   | 18.5      | 41.7                        | MI5                | 11             |

Table 28: Vacon 20 power ratings, 380 - 480 V

\* The maximum ambient operating temperature of these drives is +50 °C

| Mains voltage 575 V, 50 / 60 Hz, 3~ series |                                   |                                |                      |           |                             |                    |                |
|--------------------------------------------|-----------------------------------|--------------------------------|----------------------|-----------|-----------------------------|--------------------|----------------|
| Fre-<br>quency<br>converter<br>type        | Rated loadability                 |                                | Motor shaft<br>power |           | Nominal<br>input<br>current | Mechanical<br>size | Weight<br>(kg) |
|                                            | 100% contin.<br>current $I_N$ [A] | 150% over-<br>load current [A] | P<br>[HP]            | P<br>[kW] | [A]                         |                    |                |
| 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 29: Vacon 20 power ratings, 575 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<br>B: Set Modbus RTU protocol to "ON": S2.2 to 1 – Modbus                                                                                                                                                                                                           |
| 2 | A. Set Control Word to "0" (2001)<br>B. Set Control Word to "1" (2001)<br>C. Frequency converter status is RUN<br>D. Set Reference value to "5000" (50,00%) (2003)<br>E. Actual Speed is 5000 (25.00 Hz if MinFreq is 0.00 Hz and MaxFreq is 50.00 Hz)<br>F. Set Control Word to "0" (2001)<br>G. Frequency converter status is STOP |



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