

# H-Max™ HVAC Drives

## Quick Start Guide

Effective September 2011  
Supersedes August 2011





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Cover Photo: Eaton H-Max HVAC Drives

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## HVAC Application

The Eaton HVAC drive contains a preloaded application for instant use.

### Specific Functions of Eaton HVAC Application

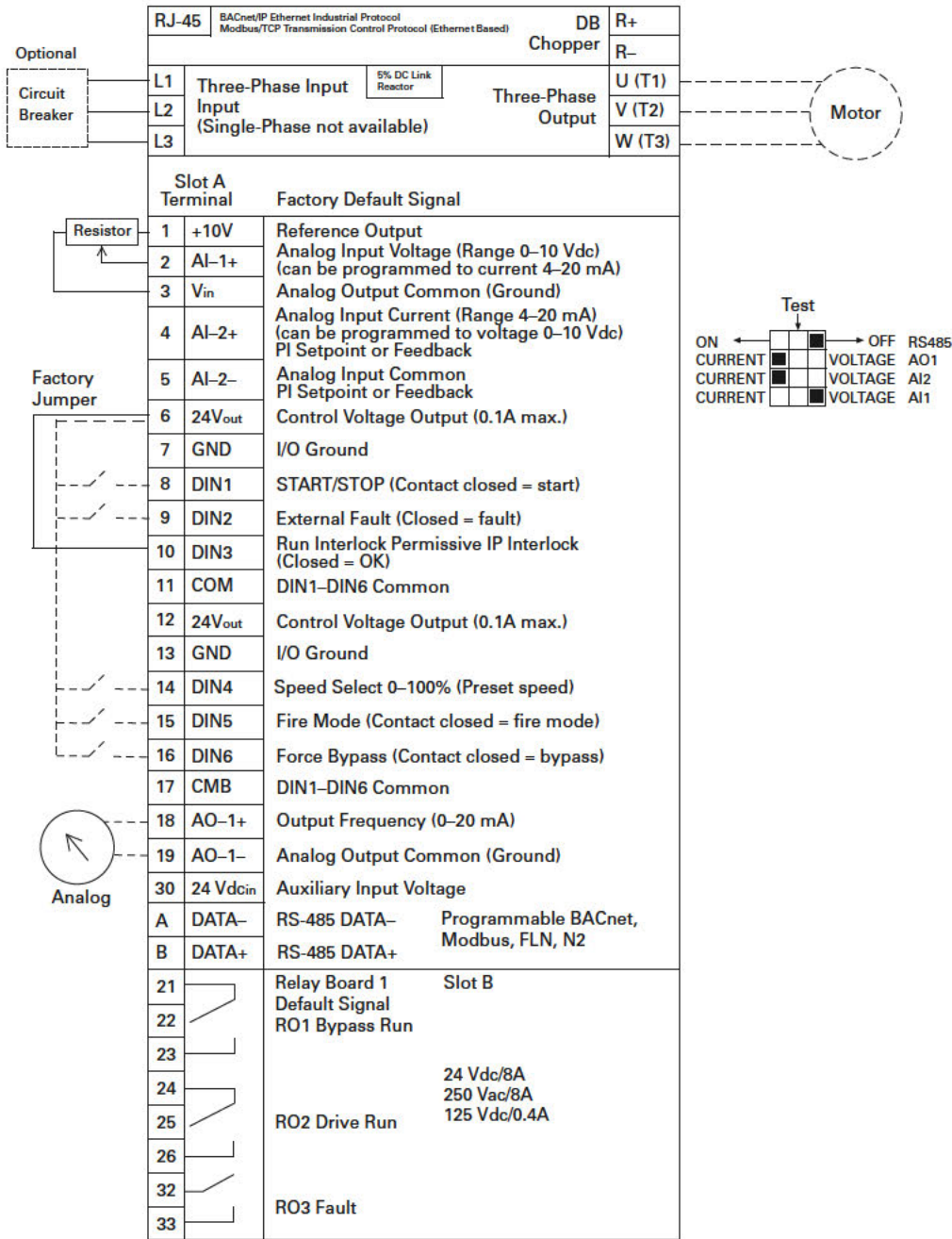
The Eaton HVAC application is an easy-to-use application for not only basic pump and fan applications where only one motor and one drive is needed, but also offers extensive possibilities for PID control.

#### Features

- Startup Wizard for extremely fast setup for basic pump or fan applications
- Mini-Wizards to ease the setup of applications
- Hand/Off/Auto button for easy change between Hand (keypad), OFF, and Auto (Remote control) place. The auto control place is selectable by parameter (I/O or Fieldbus)
- Control page for easy operation and monitoring of the most essential values
- Run interlock input (damper interlock). Drive will not start before this input is activated
- Different pre-heat modes used to avoid condensation problems
- Maximum output frequency 320 Hz
- Real-time clock and timer functions available (optional battery required). Possible to program three time channels to achieve different functions on the drive (for example, Start/Stop and Preset frequencies)
- External PID-controller available. Can be used to control a valve using the drive's I/O, for example
- Sleep mode function which automatically enables and disables drive running with user defined levels to save energy
- Two-zone PID-controller (two different feedback signals; minimum and maximum control)
- Two setpoint sources for the PID-control. Selectable with digital input
- PID setpoint boost function
- Feed forward function to improve the response to the process changes
- Process value supervision
- Multi-pump control
- Pressure loss compensation for compensating pressure losses in the pipework, for example, when sensor is incorrectly placed near the pump or fan

Example of Control Connections

Control Connections

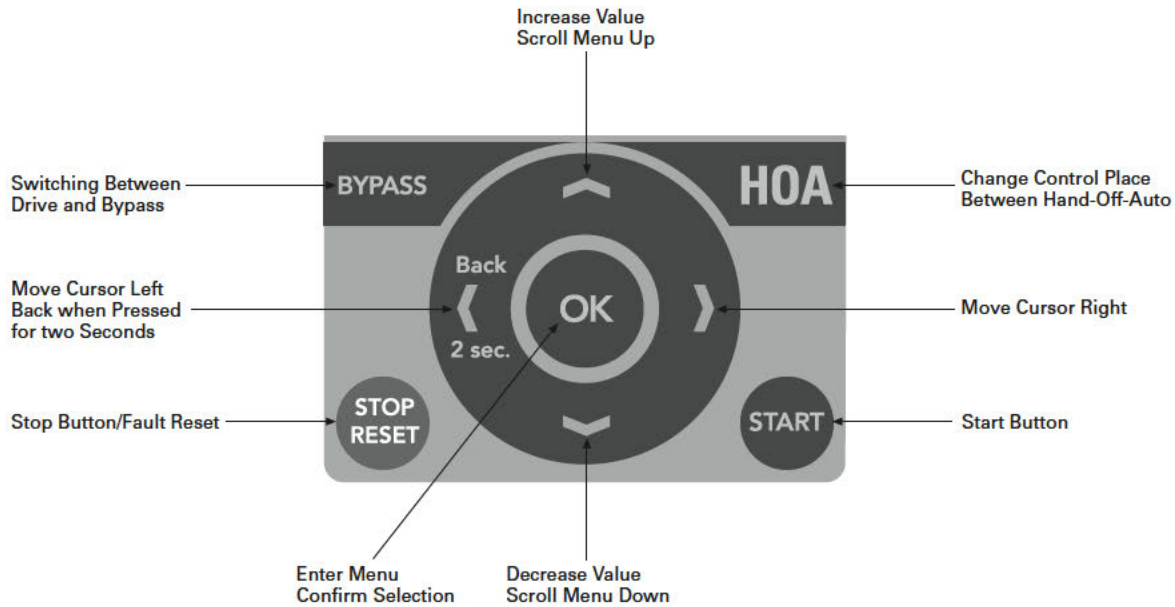


## Keypad of the Drive

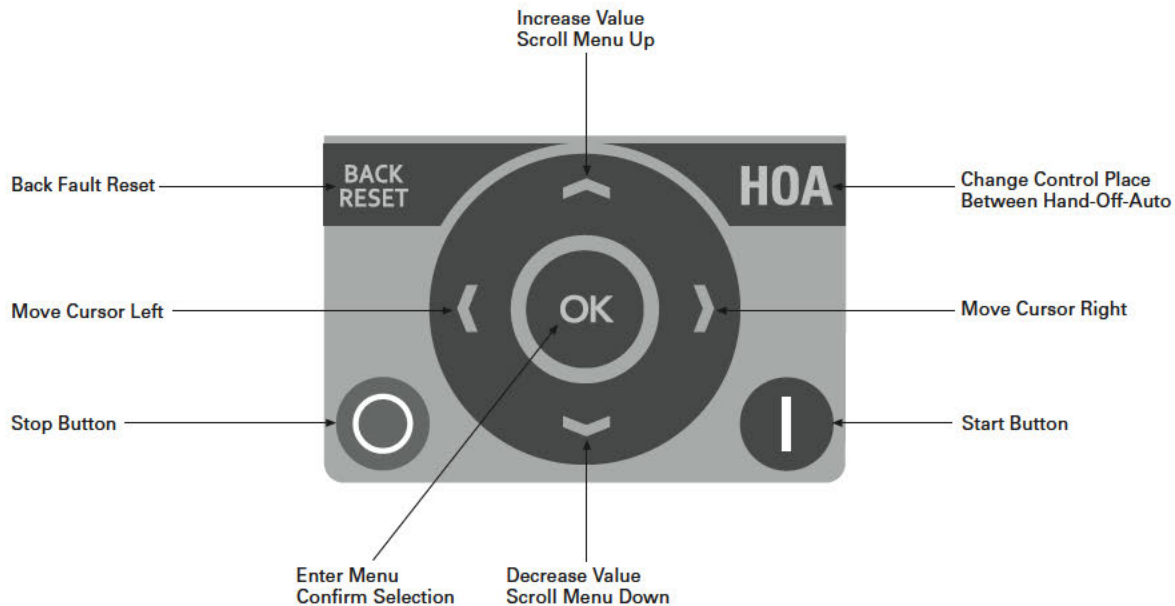
The control keypad is the interface between the Eaton H-MAX frequency converter and the user. With the control keypad it is possible to control the speed of a motor, to supervise the state of the equipment and to set the frequency converter's parameters.

There are two different keypads used with the H-MAX drive. The North American Keypad is slightly different than the EMEA Keypad. Functionality is quite similar. The EMEA keypad does not support the bypass functionality commonly used in the United States.

### US Keypad Buttons



### EMEA Keypad Buttons



# Keypad of the Drive

## Keypad Display

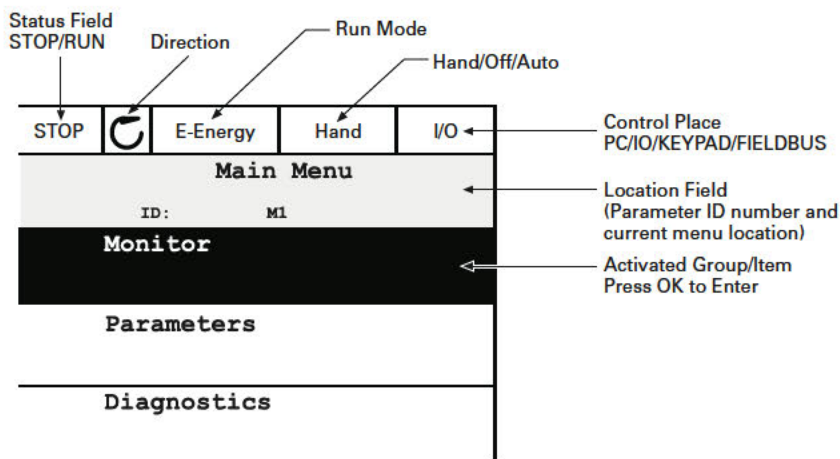
The keypad display indicates the status of the motor and the drive and any irregularities in motor or drive functions. On the display, the user sees information about his present location in the menu structure and the item displayed.

## Main Menu

The data on the control keypad are arranged in menus and submenus. Use the up and down arrows to move between the menus. Enter the group/item by pressing the OK button and return to the former level by pressing the Back/Reset button.

The *Location field* indicates your current location. The *Status field* gives information about the present status of the drive. See "Control Connections" on **Page 2**.

## Main Menu



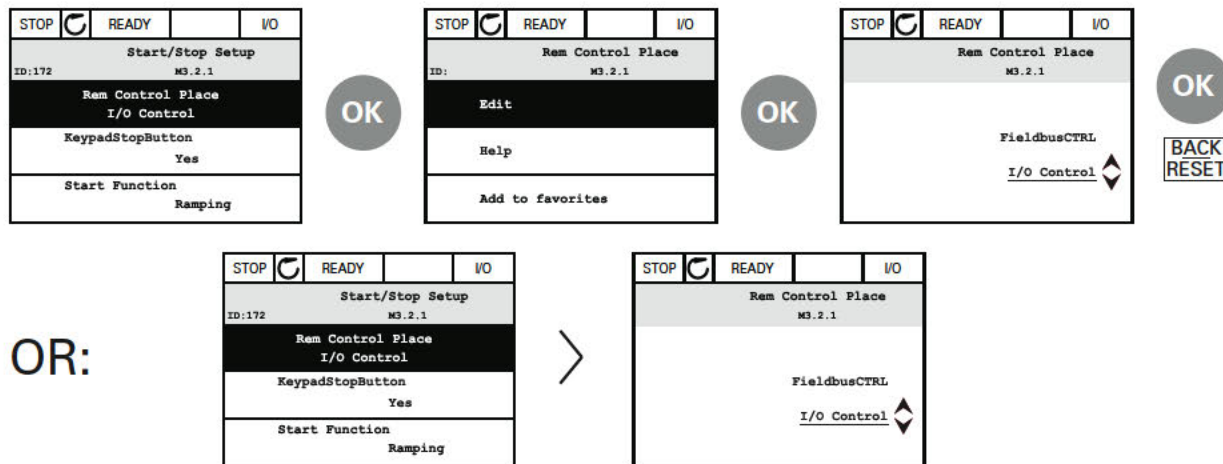
## Using the Graphical Keypad

### Editing Values

Change value of a parameter following the procedure below:

1. Locate the parameter.
2. Enter the *Edit* mode.
3. Set new value with the up/down arrow buttons. You can also move from digit to digit with the arrow buttons left/right if the value is numerical and then change the value with the up/down arrow buttons.
4. Confirm change with OK button or ignore change by returning to previous level with Back/Reset button.

## Editing Values on Graphical Keypad



## HOA Control Button

The HOA (Hand-Off-Auto) button is used for two functions: to quickly access the Control page and to easily change between the Hand (Keypad), Off, and Auto (Remote) control places.

### Control Place

The *control place* is the source of control where the drive can be started and stopped. Every control place has its own parameter for selecting the frequency reference source. In the HVAC drive, the *Hand control place* is always the keypad. The *Auto control place* is determined by parameter P2.1.1 (Keypad, I/O Terminal, I/O three-wire, or Fieldbus CTRL). The selected control place can be seen on the status bar of the keypad.

### Local Control

The keypad is always used as control place while in hand control. Hand control has higher priority than auto control. Therefore, if, for example, bypassed by parameter P2.1.17 through digital input while in *Remote*, the control place will still switch to Keypad if *Hand* is selected. Switching between Hand, Off, and Auto Control can be done by pressing the HOA button on the keypad.

### Changing Control Place

Change of control place from *Hand* to *Auto* (keypad).

1. Anywhere in the menu structure, push the HOA button.
2. Push the *arrow up* or the *arrow down* button to select *Hand/Off/Auto* and confirm with the OK button.
3. On the next display, select *Hand, Off, or Auto* and again confirm with the OK button.
4. The display will return to the same location as it was when the HOA button was pushed. However, if the Remote control place was changed to Hand (Keypad) you will be prompted for keypad reference.

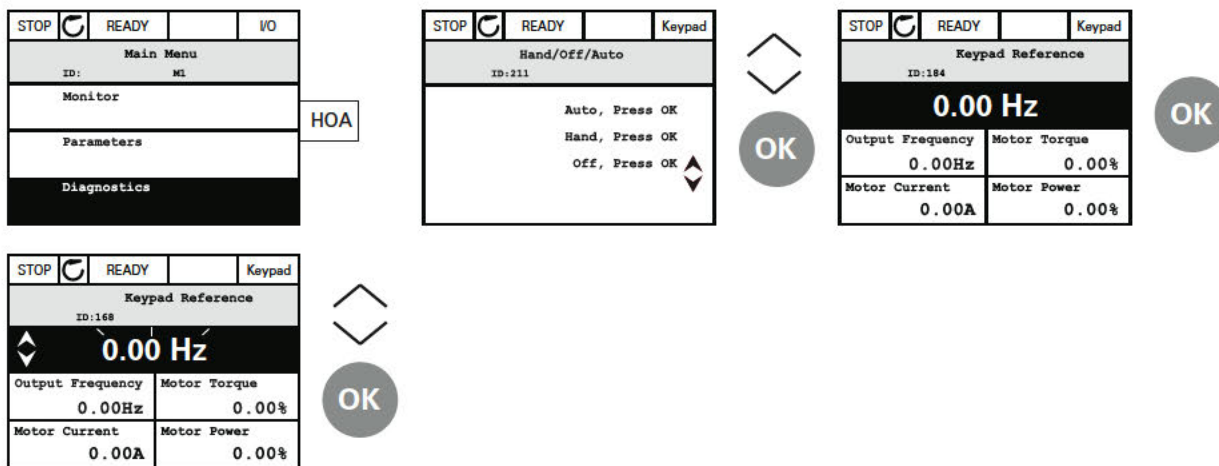
# Keypad of the Drive

## Accessing the Control Page

The *Control page* is meant for easy operation and monitoring of the most essential values.

1. Anywhere in the menu structure, push the *HOA* button.
2. Push the *arrow up* or the *arrow down* button to select *Control page* and confirm with the *OK* button.
3. The control page appears. If keypad control place and keypad reference are selected to be used, you can set the *Keypad reference* after having pressed the *OK* button. If other control places or reference values are used, the display will show Frequency reference which is not editable. The other values on the page are Multimonitoring values. You can choose which values appear here for monitoring (for this procedure, see Application Manual).

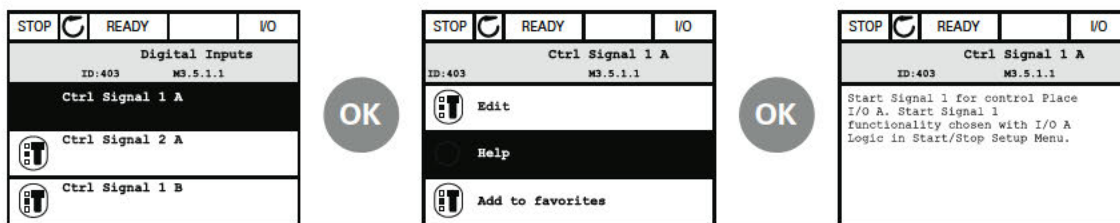
## Accessing Control Page



## Help Texts

The graphical keypad features instant help and information displays for various items. All parameters offer an instant help display. Select Help and press the OK button. Text information is also available for faults, alarms and the Startup Wizard.

## Help Text Example



## Eaton H-Max—Startup

### Startup Wizard

In the *Startup Wizard*, you will be prompted for essential information needed by the drive so that it can start controlling your process. In the Wizard, you will need the following keypad buttons:



Left/Right arrows. Use these to easily move between digits and decimals.



Up/Down arrows. Use these to move between options in menu and to change value.



OK button. Confirm selection with this button.



Back/Reset button. Pressing this button, you can return to the previous question in the Wizard. If pressed at the first question, the Startup Wizard will be cancelled.

Once you have connected power to your Eaton H-Max frequency converter, follow these instructions to easily set up your drive.

|          |                              |                             |
|----------|------------------------------|-----------------------------|
| <b>1</b> | Run Startup Wizard           | Yes<br>No                   |
| <b>2</b> | Language Select              | Depends on language package |
| <b>3</b> | Daylight Saving <sup>①</sup> | Russia<br>US<br>EU<br>OFF   |
| <b>4</b> | Time <sup>①</sup>            | hh:mm:ss                    |
| <b>5</b> | Day <sup>①</sup>             | dd.mm.                      |
| <b>6</b> | Year <sup>①</sup>            | yyyy                        |

**Note**

<sup>①</sup> These questions appear if battery is installed.

|           |                         |   |
|-----------|-------------------------|---|
| <b>7</b>  | Application             | H-Max Standard<br>PID<br>Multi-Pump                                 |
| <b>8</b>  | Bypass                  | Enabled<br>Disabled   |
| <b>9</b>  | Motor Nominal Current   | Min: 0.26A<br>Max: Drive Dependent                                  |
| <b>10</b> | Motor Nominal Voltage   | Min: 180.0V<br>Max: 690.0V  |
| <b>11</b> | Motor Nominal Frequency | Min: 8 Hz<br>Max: 320 Hz  |
| <b>12</b> | Motor Nominal Speed     | Min: 24 RPM<br>Max: 19200 RPM                                       |
| <b>13</b> | Min Frequency           | Min: 0 Hz<br>Max: 60 Hz   |
| <b>14</b> | Max Frequency           | Min: 12 Hz<br>Max: 320 Hz   |
| <b>15</b> | Accel Time 1            | Min: 0.1s<br>Max: 3000s   |
| <b>16</b> | Decel Time 1            | Min: 0.1s<br>Max: 3000s   |
| <b>17</b> | StartSourceHand         | Keypad<br>FieldbusCTRL<br>I/O Three-Wire<br>I/O Terminal            |
| <b>18</b> | StartSourceAuto         | I/O Terminal<br>Keypad<br>FieldbusCTRL<br>I/O Three-Wire            |
| <b>19</b> | SpeedSetptHand          | Keypad Ref<br>PID1 Activated<br>AI1 + AI2<br>AI2<br>AI1<br>Fieldbus |
| <b>20</b> | SpeedSetptAuto          | PID1 Activated<br>AI1 + AI2<br>AI2<br>AI1<br>Fieldbus<br>Keypad Ref |

Now the Startup Wizard is done.

The Startup Wizard can be re-initiated by pressing and holding the back/reset button for two seconds. The Startup Wizard will appear upon next power up.

## PID Mini-Wizard

The PID Mini-Wizard is activated in the Quick Setup menu. This Wizard presupposes that you are going to use the PID controller in the “one feedback/one setpoint” mode. The control place will be I/O A and the default process unit “%”.

The PID Mini-Wizard asks for the following values to be set:

|          |                        |  |
|----------|------------------------|--|
| <b>1</b> | FeedBack1 Srce         | AI2<br>AI1<br>Not Used<br>ProceDataIn8<br>ProceDataIn7<br>ProceDataIn6<br>ProceDataIn5<br>ProceDataIn4<br>ProceDataIn3<br>ProceDataIn2<br>ProceDataIn1<br>AI6<br>AI5<br>AI4<br>AI3               |
| <b>2</b> | Process Unit Selection | (Several Selections)   |
| <b>3</b> | Process Unit Min       | —  |
| <b>4</b> | Process Unit Max       | —  |
| <b>5</b> | P-Gain                 | Min: 0%<br>Max: 200%   |
| <b>6</b> | Integration Time       | Min: 0.00s<br>Max: 600.00s   |
| <b>7</b> | SetPT1 Source          | Keypad SP1<br>Not Used<br>ProceDataIn8<br>ProceDataIn7<br>ProceDataIn6<br>ProceDataIn5<br>ProceDataIn4<br>ProceDataIn3<br>ProceDataIn2<br>ProceDataIn1<br>AI6<br>AI5<br>AI4<br>AI3<br>AI2<br>AI1 |

## Multi-Pump

If Multi-Pump is the selected application, parameter group 2.16 will be visible in the menu structure. Default values may need to be adjusted to meet your application needs.

| Parameter Group Name                | Parameter Number | Parameter Name             |
|-------------------------------------|------------------|----------------------------|
| Parameter Group 2.16:<br>Multi-Pump | P2.16.1          | Number of motors           |
|                                     | P2.16.2          | Interlock function         |
|                                     | P2.16.3          | Include FC                 |
|                                     | P2.16.4          | Autochange                 |
|                                     | P2.16.5          | Autochange interval        |
|                                     | P2.16.6          | Autochange frequency limit |
|                                     | P2.16.7          | Autochange motor limit     |
|                                     | P2.16.8          | Bandwidth                  |
|                                     | P2.16.9          | Bandwidth delay            |

**Keypad Menus**

|            |                      |                |                     |
|------------|----------------------|----------------|---------------------|
| Monitor    | Basic                | Diagnostics    | Active Faults       |
|            | Timer Functions      |                | Reset Faults        |
|            | Multimonitor         |                | Fault History       |
| Parameters | Basic Parameters     | I/O & Hardware | Total Counters      |
|            | Analog Inputs        |                | Trip Counters       |
|            | Digital Inputs       |                | Software Info       |
|            | Analog Outputs       |                | Basic I/O           |
|            | Digital Outputs      |                | Slot D              |
|            | Drive Control        |                | Slot E              |
|            | Motor Control        |                | Real Time Clock     |
|            | Protections          |                | Power Unit Settings |
|            | Fixed Frequencies    |                | Keypad              |
|            | Fire Mode            |                | RS485               |
|            | Multi-Pump           |                |                     |
|            | Braking              |                | Ethernet            |
|            | Fieldbus             |                | User Settings       |
|            | Second Parameter Set |                | Favorites           |
|            | Timer Functions      |                |                     |

## Parameter List

| Parameter Group Name                        | Parameter Number | Parameter Name       | ID   |
|---|------------------|----------------------|------|
| <b>Parameter Group 2.1—Basic Parameters</b> |                  |                      |      |
| Basic                                       | P2.1.1           | Application          | 213  |
|   | P2.1.2           | ByPass               | 214  |
|   | P2.1.3           | HOA Control Stc      | 1359 |
|   | P2.1.4           | Start Srce Hand      | 1300 |
|   | P2.1.5           | Speed Setpt Hand     | 1301 |
|   | P2.1.6           | Start Srce Auto      | 1302 |
|   | P2.1.7           | Speed Setpt Auto     | 1303 |
|   | P2.1.8           | Min Frequency        | 101  |
|   | P2.1.9           | Max Frequency        | 102  |
|   | P2.1.10          | Accel Time 1         | 103  |
|   | P2.1.11          | Decel Time 1         | 104  |
|   | P2.1.12          | Motor Nom Currnt     | 113  |
|   | P2.1.13          | Motor Nom Voltg      | 110  |
|   | P2.1.14          | Motor Nom Freq       | 111  |
|   | P2.1.15          | Motor Nom Speed      | 112  |
|   | P2.1.16          | MotorPowerFactor     | 120  |
|   | P2.1.17          | Current Limit        | 107  |
|   | P2.1.18          | Service Factor       | 1357 |
| <b>Parameter Group 2.2—Analog Inputs</b>    |                  |                      |      |
| Analog Input 1                              | P2.2.1.1         | AI1 Signal selection | 377  |
|   | P2.2.1.2         | AI1 Signal Inv       | 387  |
|   | P2.2.1.3         | AI1 Signal Range     | 379  |
|   | P2.2.1.4         | AI1 Custom Min       | 380  |
|   | P2.2.1.5         | AI1 Custom Max       | 381  |
|   | P2.2.1.6         | AI1 Filter Time      | 378  |
| Analog Input 2                              | P2.2.2.1         | AI2 Signal selection | 388  |
|   | P2.2.2.2         | AI2 Signal Inv       | 398  |
|   | P2.2.2.3         | AI2 Signal Range     | 390  |
|   | P2.2.2.4         | AI2 Custom Min       | 391  |
|   | P2.2.2.5         | AI2 Custom Max       | 392  |
|   | P2.2.2.6         | AI2 Filter Time      | 389  |
| Analog Input 3                              | P2.2.3.1         | AI3 Signal selection | 141  |
|   | P2.2.3.2         | AI3 Signal Inv       | 151  |
|   | P2.2.3.3         | AI3 Signal Range     | 143  |
|   | P2.2.3.4         | AI3 Custom Min       | 144  |
|   | P2.2.3.5         | AI3 Custom Max       | 145  |
|   | P2.2.3.6         | AI3 Filter Time      | 142  |

| Parameter Group Name                                | Parameter Number | Parameter Name       | ID             |
|---|------------------|----------------------|----------------|
| <b>Parameter Group 2.2—Analog Inputs, continued</b> |                  |                      |                |
| Analog Input 4                                      | P2.2.4.1         | AI4 Signal selection | 152            |
|   | P2.2.4.2         | AI4 Signal Inv       | 162            |
|   | P2.2.4.3         | AI4 Signal Range     | 154            |
|   | P2.2.4.4         | AI4 Custom Min       | 155            |
|   | P2.2.4.5         | AI4 Custom Max       | 156            |
|   | P2.2.4.6         | AI4 Filter Time      | 153            |
| Analog Input 5                                      | P2.2.5.1         | AI5 Signal selection | 188            |
|   | P2.2.5.2         | AI5 Signal Inv       | 198            |
|   | P2.2.5.3         | AI5 Signal Range     | 190            |
|   | P2.2.5.4         | AI5 Custom Min       | 191            |
|   | P2.2.5.5         | AI5 Custom Max       | 192            |
|   | P2.2.5.6         | AI5 Filter Time      | 189            |
| Analog Input 6                                      | P2.2.6.1         | AI6 Signal selection | 199            |
|   | P2.2.6.2         | AI6 Signal Inv       | 209            |
|   | P2.2.6.3         | AI6 Signal Range     | 201            |
|   | P2.2.6.4         | AI6 Custom Min       | 202            |
|   | P2.2.6.5         | AI6 Custom Max       | 203            |
|   | P2.2.6.6         | AI6 Filter Time      | 200            |
| <b>Parameter Group 2.2—Basic Parameters</b>         |                  |                      |                |
| Basic   | P2.2.7.1         | Ref Scale Min.       | 1307           |
|   | P2.2.7.2         | Ref Scale Max.       | 1308           |
| <b>Parameter Group 2.3—Digital Inputs</b>           |                  |                      |                |
| Digital Input 1                                     | P2.3.1.1         | DI1 Open Invert      | Not accessible |
|   | P2.3.1.2         | DI1 Function         | Not accessible |
| Digital Input 2                                     | P2.3.2.1         | DIN 2 Invert         | 1419           |
|   | P2.3.2.2         | DIN2 Function        | 1320           |
| Digital Input 3                                     | P2.3.3.1         | DIN 3 Invert         | 1420           |
|   | P2.3.3.2         | DIN3 Function        | 1321           |
| Digital Input 4                                     | P2.3.4.1         | DIN 4 Invert         | 1421           |
|   | P2.3.4.2         | DIN4 Function        | 1322           |
| Digital Input 5                                     | P2.3.5.1         | DIN 5 Invert         | 1422           |
|   | P2.3.5.2         | DIN5 Function        | 1323           |
| Digital Input 6                                     | P2.3.6.1         | DIN 6 Invert         | 1423           |
|   | P2.3.6.2         | DIN6 Function        | 1324           |
| Digital Input Ext 1                                 | P2.3.7.1         | Ext-D1 Terminal      | 1325           |
|   | P2.3.7.2         | Ext-D1 Function      | 1326           |
| Digital Input Ext 2                                 | P2.3.8.1         | Ext-D2 Terminal      | 1327           |
|   | P2.3.8.2         | Ext-D2 Function      | 1328           |

## Parameter List

| Parameter Group Name                        | Parameter Number | Parameter Name                  | ID    |
|---|------------------|---------------------------------|-------|
| <b>Parameter Group 2.3—Basic Parameters</b> |                  |                                 |       |
| Basic                                       | P2.3.9.1         | Start logic                     | 1304  |
|   | P2.3.9.2         | INTLK Timeout                   | 1305  |
|   | P2.3.9.3         | Delay Time                      | 1306  |
|   | P2.3.9.4         | Intrlk Stop Mode                | 1356  |
|   | P2.3.9.5         | Interlock 1 Text                | 1315  |
|   | P2.3.9.6         | Interlock 2 Text                | 1316  |
|   | P2.3.9.7         | Interlock 3 Text                | 1317  |
| <b>Parameter Group 2.4—Analog Outputs</b>   |                  |                                 |       |
| Analog Output 1                             | P2.4.1.1         | AO1 Function                    | 10050 |
|   | P2.4.1.2         | AO1 Filter Time                 | 10051 |
|   | P2.4.1.3         | AO1 Min Signal                  | 10052 |
|   | P2.4.1.4         | AO1 MinScale                    | 10053 |
|   | P2.4.1.5         | AO1 MaxScale                    | 10054 |
|   | P2.4.1.6         | AO1 Invert                      | 10060 |
| <b>Parameter Group 2.5—Digital Outputs</b>  |                  |                                 |       |
| Digital Output 1                            | P2.5.1.1         | RO1 function                    | 11001 |
|   | P2.5.1.2         | RO1 Invert                      | 11020 |
|   | P2.5.1.3         | RO1 ON delay                    | 11002 |
|   | P2.5.1.4         | RO1 OFF delay                   | 11003 |
| Digital Output 2                            | P2.5.2.1         | RO2 function                    | 11004 |
|   | P2.5.2.2         | RO2 Invert                      | 11021 |
|   | P2.5.2.3         | RO2 ON delay                    | 11005 |
|   | P2.5.2.4         | RO2 OFF delay                   | 11006 |
| Digital Output 3                            | P2.5.3.1         | RO3 function                    | 11007 |
| Supervision                                 | P2.5.9.1         | Superv1 Item                    | 1622  |
|   | P2.5.9.2         | Supervision #1 mode             | 1623  |
|   | P2.5.9.3         | Supervision #1 limit            | 1624  |
|   | P2.5.9.4         | Supervision #1 limit hysteresis | 1625  |
|   | P2.5.9.5         | Superv2 Item                    | 1626  |
|   | P2.5.9.6         | Supervision #2 mode             | 1627  |
|   | P2.5.9.7         | Supervision #2 limit            | 1628  |
|   | P2.5.9.8         | Supervision #2 limit hysteresis | 1629  |

| Parameter Group Name                     | Parameter Number | Parameter Name        | ID   |
|--|------------------|-----------------------|------|
| <b>Parameter Group 2.6—Drive Control</b> |                  |                       |      |
| Basic                                    | P2.6.1.1         | Start Function        | 505  |
|  | P2.6.1.2         | Stop Function         | 506  |
|  | P2.6.1.3         | InhibitDirection      | 1336 |
|  | P2.6.1.4         | Reference Unit        | 1362 |
|  | P2.6.1.5         | Keypad Reference      | 184  |
|  | P2.6.1.6         | Keypad Direction      | 123  |
|  | P2.6.1.7         | Keypad Reference copy | 181  |
|  | P2.6.1.8         | Keypad Stop Button    | 114  |
|  | P2.6.1.9         | Accel Time 2          | 502  |
|  | P2.6.1.10        | Decel Time 2          | 503  |
|  | P2.6.1.11        | RampselectMode        | 1333 |
|  | P2.6.1.12        | Accel2Threshold       | 526  |
|  | P2.6.1.13        | Decel2Threshold       | 1334 |
|  | P2.6.1.14        | S-Ramp 1 Shape        | 500  |
|  | P2.6.1.15        | S-Ramp 2 Shape        | 501  |
| Skip Frequencies                         | P2.6.2.1         | Range 1 Low Lim       | 509  |
|  | P2.6.2.2         | Range 1 High Lim      | 510  |
|  | P2.6.2.3         | Range 2 Low Lim       | 511  |
|  | P2.6.2.4         | Range 2 High Lim      | 512  |
|  | P2.6.2.5         | Range 3 Low Lim       | 513  |
|  | P2.6.2.6         | Range 3 High Lim      | 514  |
|  | P2.6.2.7         | Range 4 Low Lim       | 1337 |
|  | P2.6.2.8         | Range 4 High Lim      | 1338 |
|  | P2.6.2.9         | Range 5 Low Lim       | 1339 |
|  | P2.6.2.10        | Range 5 High Lim      | 1340 |
|  | P2.6.2.11        | Range 6 Low Lim       | 1341 |
|  | P2.6.2.12        | Range 6 High Lim      | 1342 |
|  | P2.6.2.13        | RampTimeFactor        | 518  |
| <b>Parameter Group 2.7—Motor Control</b> |                  |                       |      |
| Motor Control                            | P2.7.1           | V/Hz RatioSelect      | 108  |
|  | P2.7.2           | Field WeakngPnt       | 602  |
|  | P2.7.3           | Voltage at FWP        | 603  |
|  | P2.7.4           | V/Hz Mid Freq         | 604  |
|  | P2.7.5           | V/Hz Mid Voltage      | 605  |
|  | P2.7.6           | Zero Freq Voltg       | 606  |
|  | P2.7.7           | Switching Freq        | 601  |

## Parameter List

| Parameter Group Name              | Parameter Number | Parameter Name    | ID   |
|-----------------------------------|------------------|-------------------|------|
| <b>Parameter Group 2.8—Faults</b> |                  |                   |      |
| Faults                            | P2.8.1.1         | AI Low Fault      | 700  |
|                                   | P2.8.1.2         | Undervoltage Flt  | 727  |
|                                   | P2.8.1.3         | OutputPhase Flt   | 702  |
|                                   | P2.8.1.4         | Motor Duty Cycle  | 708  |
|                                   | P2.8.1.5         | Underload Flt     | 713  |
|                                   | P2.8.1.6         | Motor Therm Prot  | 704  |
|                                   | P2.8.1.7         | MotAmbient Temp   | 705  |
|                                   | P2.8.1.8         | ZeroSpeedCooling  | 706  |
|                                   | P2.8.1.9         | ThermTimeConst    | 707  |
|                                   | P2.8.1.10        | Thermistor Fault  | 732  |
|                                   | P2.8.1.11        | External Fault    | 701  |
|                                   | P2.8.1.12        | FieldbusComm Flt  | 733  |
|                                   | P2.8.1.13        | InputPhaseFault   | 730  |
|                                   | P2.8.1.14        | MotorStall Flt    | 709  |
|                                   | P2.8.1.15        | PID1 Supervision  | 749  |
|                                   | P2.8.1.16        | PID2 Supervision  | 757  |
|                                   | P2.8.1.17        | SlotCommFlt       | 734  |
|                                   | P2.8.1.18        | Preset Alarm Freq | 183  |
| Automatic Reset                   | P2.8.2.1         | Automatic Reset   | 731  |
|                                   | P2.8.2.2         | Restart function  | 719  |
|                                   | P2.8.2.3         | Wait Time         | 717  |
|                                   | P2.8.2.4         | Trial Time        | 718  |
|                                   | P2.8.2.5         | Number of trials  | 759  |
|                                   | P2.8.2.6         | Undervoltage Flt  | 720  |
|                                   | P2.8.2.7         | Overvoltage Flt   | 721  |
|                                   | P2.8.2.8         | Overcurrent Flt   | 722  |
|                                   | P2.8.2.9         | AI Low Fault      | 723  |
|                                   | P2.8.2.10        | UnitOverTemp Flt  | 724  |
|                                   | P2.8.2.11        | MotorOverTempFlt  | 725  |
|                                   | P2.8.2.12        | External Fault    | 726  |
|                                   | P2.8.2.13        | IGBT temp         | 1358 |

| Parameter Group Name                      | Parameter Number | Parameter Name                        | ID   |
|---|------------------|---------------------------------------|------|
| <b>Parameter Group 2.9—PID Controller</b> |                  |                                       |      |
| PID Controller 1, Basic Settings          | P2.9.1.1.1       | Gain, PID Controller 1                | 118  |
|   | P2.9.1.1.2       | Integration Time, PID Controller 1    | 119  |
|   | P2.9.1.1.3       | Derivation Time, PID Controller 1     | 132  |
|   | P2.9.1.1.4       | ProcessUnitSel, PID Controller 1      | 1036 |
|   | P2.9.1.1.5       | ProcessUnitMin, PID Controller 1      | 1033 |
|   | P2.9.1.1.6       | ProcessUnitMax, PID Controller 1      | 1034 |
|   | P2.9.1.1.7       | ProcessUnitDecimals, PID Controller 1 | 1035 |
|   | P2.9.1.1.8       | Error Inversion, PID Controller 1     | 340  |
|   | P2.9.1.1.9       | Dead Band, PID Controller 1           | 1056 |
|   | P2.9.1.1.10      | Dead band delay, PID Controller 1     | 1057 |
| PID Controller 1, Setpoints               | P2.9.1.2.1       | Keypad SP 1, PID Controller 1         | 167  |
|   | P2.9.1.2.2       | Keypad SP 2, PID Controller 1         | 168  |
|   | P2.9.1.2.3       | Ramp Time, PID Controller 1           | 1068 |
|   | P2.9.1.2.4       | SetPt 1 Source, PID Controller 1      | 332  |
|   | P2.9.1.2.5       | SetPt 1 min, PID Controller 1         | 1069 |
|   | P2.9.1.2.6       | SP 1 maximum, PID Controller 1        | 1070 |
|   | P2.9.1.2.7       | SP 1 Sleep Freq, PID Controller 1     | 1016 |
|   | P2.9.1.2.8       | SP 1 Sleep delay, PID Controller 1    | 1017 |
|   | P2.9.1.2.9       | SP 1 WakeUpLevel, PID Controller 1    | 1018 |
|   | P2.9.1.2.10      | SP 1 boost, PID Controller 1          | 1071 |
|   | P2.9.1.2.11      | SP 2 Source, PID Controller 1         | 431  |
|   | P2.9.1.2.12      | SP 2 minimum, PID Controller 1        | 1073 |
|   | P2.9.1.2.13      | SP 2 maximum, PID Controller 1        | 1074 |
|   | P2.9.1.2.14      | SP 2 Sleep Freq, PID Controller 1     | 1075 |
|   | P2.9.1.2.15      | SP 2 Sleep delay, PID Controller 1    | 1076 |
|   | P2.9.1.2.16      | SP 2 WakeUpLevel, PID Controller 1    | 1077 |
|   | P2.9.1.2.17      | SP 2 boost, PID Controller 1          | 1078 |
| PID Controller 1, Feedbacks               | P2.9.1.3.1       | Function, PID Controller 1            | 333  |
|   | P2.9.1.3.2       | Gain, PID Controller 1                | 1058 |
|   | P2.9.1.3.3       | FeedBack 1 Srce, PID Controller 1     | 334  |
|   | P2.9.1.3.4       | FB 1 Minimum, PID Controller 1        | 336  |
|   | P2.9.1.3.5       | FB 1 Maximum, PID Controller 1        | 337  |
|   | P2.9.1.3.6       | FB 2 Source, PID Controller 1         | 335  |
|   | P2.9.1.3.7       | FB 2 Minimum, PID Controller 1        | 338  |
|   | P2.9.1.3.8       | FB 2 Maximum, PID Controller 1        | 339  |
| PID Controller 1, Feedforward             | P2.9.1.4.1       | Function, PID Controller 1            | 1059 |
|   | P2.9.1.4.2       | Gain, PID Controller 1                | 1060 |
|   | P2.9.1.4.3       | FF 1 Source, PID Controller 1         | 1061 |
|   | P2.9.1.4.4       | FF1 Minimum, PID Controller 1         | 1062 |
|   | P2.9.1.4.5       | FF1 Maximum, PID Controller 1         | 1063 |
|   | P2.9.1.4.6       | FF 2 Source, PID Controller 1         | 1064 |
|   | P2.9.1.4.7       | FF2 Minimum, PID Controller 1         | 1065 |
|   | P2.9.1.4.8       | FF2 Maximum, PID Controller 1         | 1066 |

## Parameter List

| Parameter Group Name                                 | Parameter Number | Parameter Name                        | ID   |
|--|------------------|---------------------------------------|------|
| <b>Parameter Group 2.9—PID Controller, continued</b> |                  |                                       |      |
| PID Controller 1, Process Supervision                | P2.9.1.5.1       | Enable Superv, PID Controller 1       | 735  |
|  | P2.9.1.5.2       | Upper limit, PID Controller 1         | 736  |
|  | P2.9.1.5.3       | Lower limit, PID Controller 1         | 758  |
|  | P2.9.1.5.4       | Delay, PID Controller 1               | 737  |
| PID Controller 1, Pressure Loss Compensation         | P2.9.1.6.1       | Enable SP 1, PID Controller 1         | 1529 |
|  | P2.9.1.6.2       | SP 1 Max Comp., PID Controller 1      | 1530 |
|  | P2.9.1.6.3       | Enable SP 2, PID Controller 1         | 1531 |
|  | P2.9.1.6.4       | SP 2 Max Comp., PID Controller 1      | 1532 |
| PID Controller 2, Basic Settings                     | P2.9.2.1.1       | Gain, PID Controller 2                | 1631 |
|  | P2.9.2.1.2       | Integration Time, PID Controller 2    | 1632 |
|  | P2.9.2.1.3       | Derivation Time, PID Controller 2     | 1633 |
|  | P2.9.2.1.4       | ProcessUnitSel, PID Controller 2      | 1635 |
|  | P2.9.2.1.5       | ProcessUnitMin, PID Controller 2      | 1664 |
|  | P2.9.2.1.6       | ProcessUnitMax, PID Controller 2      | 1665 |
|  | P2.9.2.1.7       | ProcessUnitDecimals, PID Controller 2 | 1666 |
|  | P2.9.2.1.8       | Error Inversion, PID Controller 2     | 1636 |
|  | P2.9.2.1.9       | Dead Band, PID Controller 2           | 1637 |
|  | P2.9.2.1.10      | Dead band delay, PID Controller 2     | 1638 |
| PID Controller 2, Setpoints                          | P2.9.2.2.1       | Keypad SP 1, PID Controller 2         | 1640 |
|  | P2.9.2.2.2       | Keypad SP 2, PID Controller 2         | 1641 |
|  | P2.9.2.2.3       | Ramp Time, PID Controller 2           | 1642 |
|  | P2.9.2.2.4       | SetPt 1 Source, PID Controller 2      | 1643 |
|  | P2.9.2.2.5       | SetPt 1 min, PID Controller 2         | 1644 |
|  | P2.9.2.2.6       | SP 1 maximum, PID Controller 2        | 1645 |
|  | P2.9.2.2.7       | SP 2 Source, PID Controller 2         | 1646 |
|  | P2.9.2.2.8       | SP 2 minimum, PID Controller 2        | 1647 |
|  | P2.9.2.2.9       | SP 2 maximum, PID Controller 2        | 1648 |
| PID Controller 2, Feedbacks                          | P2.9.2.3.1       | Function, PID Controller 2            | 1650 |
|  | P2.9.2.3.2       | Gain, PID Controller 2                | 1651 |
|  | P2.9.2.3.3       | FeedBack 1 Srce, PID Controller 2     | 1652 |
|  | P2.9.2.3.4       | FB 1 Minimum, PID Controller 2        | 1653 |
|  | P2.9.2.3.5       | FB 1 Maximum, PID Controller 2        | 1654 |
|  | P2.9.2.3.6       | FB 2 Source, PID Controller 2         | 1655 |
|  | P2.9.2.3.7       | FB 2 Minimum, PID Controller 2        | 1656 |
|  | P2.9.2.3.8       | FB 2 Maximum, PID Controller 2        | 1657 |
| PID Controller 2, Process Supervision                | P2.9.2.4.1       | Enable Superv, PID Controller 2       | 1659 |
|  | P2.9.2.4.2       | Upper limit, PID Controller 2         | 1660 |
|  | P2.9.2.4.3       | Lower limit, PID Controller 2         | 1661 |
|  | P2.9.2.4.4       | Delay, PID Controller 2               | 1662 |

| Parameter Group Name                          | Parameter Number | Parameter Name              | ID   |
|---|------------------|-----------------------------|------|
| <b>Parameter Group 2.10—Fixed Frequencies</b> |                  |                             |      |
| Fixed Frequencies                             | P2.10.1          | Preset Freq 1               | 105  |
|   | P2.10.2          | Preset Freq 2               | 106  |
|   | P2.10.3          | Preset Freq 3               | 126  |
|   | P2.10.4          | Preset Freq 4               | 127  |
|   | P2.10.5          | Preset Freq 5               | 128  |
|   | P2.10.6          | Preset Freq 6               | 129  |
|   | P2.10.7          | Preset Freq 7               | 130  |
| <b>Parameter Group 2.11—Fire Mode</b>         |                  |                             |      |
| Fire Mode                                     | P2.11.1          | Firemode Freq               | 1598 |
| <b>Parameter Group 2.12—Multi-Pump</b>        |                  |                             |      |
| Multi-Pump                                    | P2.12.1          | Number of motors            | 1001 |
|   | P2.12.2          | Interlock function          | 1032 |
|   | P2.12.3          | Include FC                  | 1028 |
|   | P2.12.4          | Autochange                  | 1027 |
|   | P2.12.5          | Autochange interval         | 1029 |
|   | P2.12.6          | Autochange: frequency limit | 1031 |
|   | P2.12.7          | Autochange: motor limit     | 1030 |
|   | P2.12.8          | Bandwidth                   | 1097 |
|   | P2.12.9          | Bandwidth delay             | 1098 |
| <b>Parameter Group 2.13—Braking</b>           |                  |                             |      |
| Braking                                       | P2.13.1          | DC Brake Current            | 507  |
|   | P2.13.2          | DC Time Stop                | 508  |
|   | P2.13.3          | DC BrakeFreqStop            | 515  |
|   | P2.13.4          | StartMagnTime               | 516  |
|   | P2.13.5          | StartMagnCurrent            | 517  |
|   | P2.13.6          | Preheat Current             | 1335 |
| <b>Parameter Group 2.14—Fieldbus</b>          |                  |                             |      |
| Fieldbus                                      | P2.14.1          | FB Data Out1 Sel            | 852  |
|   | P2.14.2          | FB Data Out2 Sel            | 853  |
|   | P2.14.3          | FB Data Out3 Sel            | 854  |
|   | P2.14.4          | FB Data Out4 Sel            | 855  |
|   | P2.14.5          | FB Data Out5 Sel            | 856  |
|   | P2.14.6          | FB Data Out6 Sel            | 857  |
|   | P2.14.7          | FB Data Out7 Sel            | 858  |
|   | P2.14.8          | FB Data Out8 Sel            | 859  |
| <b>Parameter Group 2.15—Second Param Set</b>  |                  |                             |      |
| Motor 2                                       | P2.15.1.1        | Motor Nom Currnt, Set2      | 1347 |
|   | P2.15.1.2        | Motor Nom Voltg, Set2       | 1348 |
|   | P2.15.1.3        | Motor Nom Freq, Set2        | 1349 |
|   | P2.15.1.4        | Motor Nom Speed, Set2       | 1350 |
|   | P2.15.1.5        | MotorPowerFactor, Set2      | 1351 |
|   | P2.15.1.6        | Current Limit, Set2         | 1352 |
|   | P2.15.1.7        | Motor Therm Prot, Set2      | 1353 |

## Parameter List

| Parameter Group Name                                    | Parameter Number | Parameter Name                | ID   |
|---|------------------|-------------------------------|------|
| <b>Parameter Group 2.15—Second Param Set, continued</b> |                  |                               |      |
| Drive Control 2   | P2.15.2.1        | Min Frequency, Set2           | 1343 |
|   | P2.15.2.2        | Max Frequency, Set2           | 1344 |
|   | P2.15.2.3        | Accel Time 1, Set2            | 1345 |
|   | P2.15.2.4        | Decel Time 1, Set2            | 1346 |
|   | P2.15.2.5        | V/Hz RatioSelect, Set2        | 1355 |
| <b>Parameter Group 2.16—Timer Functions</b>             |                  |                               |      |
| Interval 1  | P2.16.1.1        | ON Time, Interval 1           | 1670 |
|   | P2.16.1.2        | Off Time, Interval 1          | 1671 |
|   | P2.16.1.3        | From Day, Interval 1          | 1672 |
|   | P2.16.1.4        | To Day, Interval 1            | 1673 |
|   | P2.16.1.5        | Assign to channel, Interval 1 | 1674 |
| Interval 2  | P2.16.2.1        | ON Time, Interval 2           | 1675 |
|   | P2.16.2.2        | Off Time, Interval 2          | 1676 |
|   | P2.16.2.3        | From Day, Interval 2          | 1677 |
|   | P2.16.2.4        | To Day, Interval 2            | 1678 |
|   | P2.16.2.5        | Assign to channel, Interval 2 | 1679 |
| Interval 3  | P2.16.3.1        | ON Time, Interval 3           | 1680 |
|   | P2.16.3.2        | Off Time, Interval 3          | 1681 |
|   | P2.16.3.3        | From Day, Interval 3          | 1682 |
|   | P2.16.3.4        | To Day, Interval 3            | 1683 |
|   | P2.16.3.5        | Assign to channel, Interval 3 | 1684 |
| Interval 4  | P2.16.4.1        | ON Time, Interval 4           | 1685 |
|   | P2.16.4.2        | Off Time, Interval 4          | 1686 |
|   | P2.16.4.3        | From Day, Interval 4          | 1687 |
|   | P2.16.4.4        | To Day, Interval 4            | 1688 |
|   | P2.16.4.5        | Assign to channel, Interval 4 | 1689 |
| Interval 5  | P2.16.5.1        | ON Time, Interval 5           | 1690 |
|   | P2.16.5.2        | Off Time, Interval 5          | 1691 |
|   | P2.16.5.3        | From Day, Interval 5          | 1692 |
|   | P2.16.5.4        | To Day, Interval 5            | 1693 |
|   | P2.16.5.5        | Assign to channel, Interval 5 | 1694 |
| Timer 1   | P2.16.6.1        | Duration                      | 1695 |
|   | P2.16.6.2        | Assign to channel             | 1696 |
| Timer 2   | P2.16.7.1        | Duration                      | 1697 |
|   | P2.16.7.2        | Assign to channel             | 1698 |
| Timer 3   | P2.16.8.1        | Duration                      | 1699 |
|   | P2.16.8.2        | Assign to channel             | 1700 |


## Diagnostics

Under this menu, you can find *Active faults*, *Reset faults*, *Fault history*, *Counters* and *Software info*.

### Active Faults

| Menu          | Function   | Note   |
|---------------|--|--|
| Active faults | When a fault/faults appear(s), the display with the name of the fault starts to blink. Press OK to return to the Diagnostics menu. The <i>Active faults</i> submenu shows the number of faults. Select the fault and push OK to see the fault-time data. | The fault remains active until it is cleared with the Reset button (push for 2s) or with a reset signal from the I/O terminal or Fieldbus or by choosing <i>Reset faults</i> (see below). The memory of active faults can store the maximum of 10 faults in the order of appearance. |

### Reset Faults

| Menu         | Function  | Note  |
|--------------|---|---|
| Reset faults | In this menu you can reset faults. For closer instructions. |  <b>CAUTION!</b> Remove external Control signal before resetting the fault to prevent unintentional restart of the drive. |

### Fault History

| Menu          | Function  | Note  |
|---------------|---|---|
| Fault history | 40 latest faults are stored in the Fault history. | Entering the Fault history and clicking OK on the selected fault shows the fault time data (details). |

## Fault Codes

### Fault Codes and Descriptions

| Fault Code | Fault ID | Fault Name                   | Possible Cause  | Remedy  |
|------------|----------|------------------------------|---|---|
| 1          | 1        | Overcurrent (hardware fault) | AC drive has detected too high a current ( $>4 \cdot I_M$ ) in the motor cable:   | <ul style="list-style-type: none"> <li>• Check loading</li> <li>• Check motor</li> <li>• Check cables and connections</li> <li>• Make identification run</li> <li>• Check ramp times</li> </ul>                                   |
|            | 2        | Overcurrent (software fault) | <ul style="list-style-type: none"> <li>• Sudden heavy load increase</li> <li>• Short circuit in motor cables</li> <li>• Unsuitable motor</li> </ul>   |   |
| 2          | 10       | Overvoltage (hardware fault) | The DC-link voltage has exceeded the limits defined:  | <ul style="list-style-type: none"> <li>• Make deceleration time longer</li> <li>• Use brake chopper or brake resistor (available as options)</li> <li>• Activate overvoltage controller</li> <li>• Check input voltage</li> </ul> |
|            | 11       | Overvoltage (software fault) | <ul style="list-style-type: none"> <li>• Too short a deceleration time</li> <li>• Brake chopper is disabled</li> <li>• High overvoltage spikes in supply</li> <li>• Start/Stop sequence too fast</li> </ul> |   |
| 3          | 20       | Earth fault (hardware fault) | Current measurement has detected that the sum of motor phase current is not zero:   | Check motor cables and motor  |
|            | 21       | Earth fault (software fault) | <ul style="list-style-type: none"> <li>• Insulation failure in cables or motor</li> </ul>   |   |
| 5          | 40       | Charging switch              | The charging switch is open, when the START command has been given: <ul style="list-style-type: none"> <li>• Faulty operation</li> <li>• Component failure</li> </ul>                                       | <ul style="list-style-type: none"> <li>• Reset the fault and restart</li> <li>• Should the fault re-occur, contact the distributor near to you</li> </ul>   |

## Fault Codes and Descriptions, continued

| Fault Code | Fault ID | Fault Name               | Possible Cause  | Remedy   |  |
|------------|----------|--------------------------|---|--|--|
| 7          | 60       | Saturation               | Various causes: <ul style="list-style-type: none"> <li>Defective component</li> <li>Brake resistor short-circuit or overload</li> </ul>   | <ul style="list-style-type: none"> <li>Cannot be reset from keypad</li> <li>Switch off power</li> <li>DO NOT RECONNECT POWER! Contact factory</li> <li>If this fault appears simultaneously with F1, check motor cables and motor</li> </ul> |  |
| 8          | 600      | System fault             | Communication between control board and power unit has failed   | Reset the fault and restart. Should the fault re-occur, contact the distributor near you   |  |
|            | 602      |                          | Watchdog has reset the CPU  |  |  |
|            | 603      |                          | Voltage of auxiliary power in power unit is too low   |  |  |
|            | 604      |                          | Phase fault: Voltage of an output phase does not follow the reference   |  |  |
|            | 605      |                          | CPLD has faulted but there is no detailed information about the fault   |  |  |
|            | 606      |                          | Control and power unit software are incompatible  |  | Update software. Should the fault re-occur, contact the distributor near you             |
|            | 607      |                          | Software version cannot be read. There is no software in power unit   |  | Update power unit software. Should the fault re-occur, contact the distributor near you  |
|            | 608      |                          | CPU overload. Some part of the software (for example application) has caused an overload situation. The source of fault has been suspended  |  | Reset the fault and restart. Should the fault re-occur, contact the distributor near you |
|            | 609      |                          | Memory access has failed. For example, retain variables could not be restored   |  |  |
|            | 610      |                          | Necessary device properties cannot be read  |  |  |
|            | 647      |                          | Software error  |  | Update software. Should the fault re-occur, contact the distributor near you             |
|            | 648      |                          | Invalid function block used in application. System software and application are not compatible  |  |  |
|            | 649      |                          | Resource overload: <ul style="list-style-type: none"> <li>Error when loading parameter initial values</li> <li>Error when restoring parameters</li> <li>Error when saving parameters</li> </ul>   |  |  |
| 9          | 80       | Undervoltage (fault)     | DC link voltage is under the voltage limits defined: <ul style="list-style-type: none"> <li>Most probable cause: Too low a supply voltage</li> <li>AC drive internal fault</li> <li>Defect input fuse</li> <li>External charge switch not closed</li> </ul> <b>Note:</b> This fault is activated only if the drive is in Run state. | In case of temporary supply voltage break reset the fault and restart the AC drive. Check the supply voltage. If it is adequate, an internal failure has occurred. Contact the distributor near you  |  |
|            | 81       | Undervoltage (alarm)     |   |  |  |
| 10         | 91       | Input phase              | Input line phase is missing   | Check supply voltage, fuses and cable  |  |
| 11         | 100      | Output phase supervision | Current measurement has detected that there is no current in one motor phase  | Check motor cable and motor  |  |

## Fault Codes and Descriptions, continued

| Fault Code | Fault ID | Fault Name                                 | Possible Cause   | Remedy   |
|------------|----------|--|--|--|
| 12         | 110      | Brake chopper supervision (hardware fault) | <ul style="list-style-type: none"> <li>No brake resistor installed</li> <li>Brake resistor is broken</li> <li>Brake chopper failure</li> </ul> | Check brake resistor and cabling. If these are OK, the chopper is faulty. Contact the distributor near you   |
|            | 111      | Brake chopper saturation alarm             |  |  |
| 13         | 120      | AC drive undertemperature (fault)          | Too low temperature measured in power unit's heatsink or board. Heat-sink temperature is under $-10^{\circ}\text{C}$                           | —  |
|            | 121      | AC drive overtemperature (alarm)           |  |  |
| 14         | 130      | AC drive overtemperature (fault, heatsink) | Too high temperature measured in power unit's heatsink or board. Heat-sink temperature is over $100^{\circ}\text{C}$                           | <ul style="list-style-type: none"> <li>Check the correct amount and flow of cooling air</li> <li>Check the heatsink for dust</li> <li>Check the ambient temperature</li> <li>Make sure that the switching frequency is not too high in relation to ambient temperature and motor load</li> </ul> |
|            | 131      | AC drive overtemperature (alarm, heatsink) |  |  |
|            | 132      | AC drive overtemperature (fault, board)    |  |  |
|            | 133      | AC drive overtemperature (alarm, board)    |  |  |
| 15         | 140      | Motor stalled                              | Motor is stalled   | Check motor and load   |
| 16         | 150      | Motor overtemperature                      | Motor is overloaded  | Decrease motor load. If no motor overload exists, check the temperature model parameters   |
| 17         | 160      | Motor underload                            | Motor is underloaded   | Check load   |
| 19         | 180      | Power overload (short-time supervision)    | Drive power is too high  | Decrease load  |
|            | 181      | Power overload (long-time supervision)     |  |  |
| 25         | —        | Motor control fault                        | Start angle identification has failed. Generic motor control fault   | —  |
| 32         | 312      | Fan cooling                                | Fan lifetime is up   | Change fan and reset fan lifetime counter  |
| 33         | —        | Fire mode enabled                          | Fire mode of the drive is enabled. The drive's protections are not in use  | —  |
| 37         | 360      | Device changed (same type)                 | Option board changed for one previously inserted in the same slot. The board's parameter settings are saved                                    | Device is ready for use. Old parameter settings will be used   |
| 38         | 370      | Device changed (same type)                 | Option board added. The option board was previously inserted in the same slot. The board's parameter settings are saved                        | Device is ready for use. Old parameter settings will be used   |
| 39         | 380      | Device removed                             | Optional board removed from slot   | Device no longer available   |
| 40         | 390      | Device unknown                             | Unknown device connected (power unit/option board)   | Device no longer available   |
| 41         | 400      | IGBT temperature                           | IGBT temperature (unit temperature + $I_2T$ ) is too high  | <ul style="list-style-type: none"> <li>Check loading</li> <li>Check motor size</li> <li>Make identification run</li> </ul>   |
| 43         | 420      | Encoder fault                              | Encoder 1 channel A is missing   | <ul style="list-style-type: none"> <li>Check encoder connections</li> <li>Check encoder and encoder cable</li> <li>Check encoder board</li> <li>Check encoder frequency in open loop</li> </ul>  |
|            | 421      |  | Encoder 1 channel B is missing   |  |
|            | 422      |  | Both encoder 1 channels are missing  |  |
|            | 423      |  | Encoder reversed   |  |
|            | 424      |  | Encoder board missing  |  |

## Fault Codes and Descriptions, continued

| <b>Fault Code</b> | <b>Fault ID</b>              | <b>Fault Name</b>  | <b>Possible Cause</b>   | <b>Remedy</b>  |
|-------------------|------------------------------|--|---|--|
| <b>44</b>         | 430                          | Device changed (different type)                              | Option board changed for one not present in the same slot before. No parameter settings are saved   | Set the option board parameters again  |
| <b>45</b>         | 440                          | Device changed (different type)                              | Option board added. The option board was not previously present in the same slot. No parameter settings are saved   | Set the option board parameters again  |
| <b>51</b>         | 1051                         | External fault   | Digital input   | —  |
| <b>52</b>         | 1052<br>1352                 | Keypad communication fault                                   | The connection between the control keypad and frequency converter is broken   | Check keypad connection and possible keypad cable  |
| <b>53</b>         | 1053                         | Fieldbus communication fault                                 | The data connection between the Fieldbus master and Fieldbus board is broken  | Check installation and Fieldbus master   |
| <b>54</b>         | 1354<br>1454<br>1654<br>1754 | Slot A fault<br>Slot B fault<br>Slot D fault<br>Slot E fault | Defective option board or slot  | Check board and slot   |
| <b>65</b>         | 1065                         | PC communication fault                                       | The data connection between the PC and frequency converter is broken  | —  |
| <b>66</b>         | 1066                         | Thermistor fault   | The thermistor input has detected an increase of motor temperature  | <ul style="list-style-type: none"> <li>• Check motor cooling and load</li> <li>• Check thermistor connection (if thermistor input is not in use it has to be short circuited)</li> </ul> |
| <b>69</b>         | 1310<br>1311<br>1312         | Fieldbus mapping error                                       | <p>Non-existing ID number is used for mapping values to Fieldbus Process Data Out</p> <p>Not possible to convert one or more values for Fieldbus Process Data Out</p> <p>Overflow when mapping and converting values for Fieldbus Process Data Out (16-bit)</p> | <p>Check parameters in Fieldbus Data Mapping menu</p> <p>The value being mapped may be of undefined type. Check parameters in Fieldbus Data Mapping menu</p> <p>—</p>                    |
| <b>101</b>        | 1101                         | Process supervision fault (PID1)                             | PID controller: Feedback value outside of supervision limits (and the delay if set)   | —  |
| <b>105</b>        | 1105                         | Process supervision fault (PID2)                             | PID controller: Feedback value outside of supervision limits (and the delay if set)   | —  |



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