

Inverter



# i500

Inverter i510 / i550 - Cabinet

Operation Manual

EN

## PRELIMINARY

SW-Version 02.01

# Lenze

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# 1 About this manual

This manual

- applies to the i500 inverter series,
- contains important technical information for the commissioning and operation of the i500,
- explains the most important parameters and settings for the commissioning of standard applications.

## 1.1 Purpose of this manual

The purpose of this manual is to provide all necessary information for the installation, commissioning, start-up and troubleshooting of i500 inverters. It is also intended as a planning aid and reference for drive configurations. Reading and understanding this manual is therefore a basic requirement for all engineers and commissioning technicians/electricians working with i500 inverters in their applications, machines and systems.

## 1.2 Storage place

The operation manual must be stored such that it can be easily accessed by all persons working on the inverter.

## 1.3 Reference to other documents

Beside the operation manual the following documents are also required for the safe installation, commissioning and operation of the inverter:

- i500 Mounting and switch-on instructions
- i500 Reference/Commissioning manual
- i500 EthernetBus manual
- Easy Starter software documentation

## 1.4 Copyright

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All rights reserved. All information and illustrations contained in this operation manual are the property of Lenze Drives GmbH and may not be used in any manner harmful to their interests.

### 1.4.1 Manufacturer's address

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## 1.5 Disclaimer of liability

The descriptions, technical data and illustrations in this operation manual are subject to change without prior notice.

The procedural notes and circuit details described in this operation manual are only proposals. It is up to the user to check whether they can be adapted to the particular applications. Lenze does not take any responsibility for the suitability of the procedures and circuit proposals described.

## 1.6 Parameter description

Every parameter has a hexadecimal index number. Parameters which are visible on the keypad have also a parameter number. In the Easy starter the parameter number and the hexadecimal index are visible. Every parameter can have subindex.

| Example        | Parameter number | Index      |
|----------------|------------------|------------|
| Base Frequency | P303.02          | 0x2B01:002 |
| Control select | P200.00          | 0x2824:000 |

|                                |          |          |                              |      |     |
|--------------------------------|----------|----------|------------------------------|------|-----|
| Parameter number               | Index    | Subindex |                              |      |     |
| P510:1                         | 0x23A1:1 |          | IP address (*)               | I550 | R/V |
| -- ... [192.168.124.16] ... -- |          |          | EtherNet/IP address settings |      |     |

Parameters which are not visible on the keypad are marked in the manual as P (Without number)

i

Parameters or selections with marking (\*) are not available on all control unit types.

Example:

|                                |          |                              |  |      |
|--------------------------------|----------|------------------------------|--|------|
| P510:1                         | 0x23A1:1 | IP address (*)               |  | I550 |
| -- ... [192.168.124.16] ... -- |          | EtherNet/IP address settings |  |      |

## 2 Safety information

### 2.1 Intended use of inverter

The i500 inverters are used for controlling low-voltage motors in industrial and commercial applications within the range of the inverter's technical specifications.

### 2.2 Examples of unintended use

- Commissioning of an i500 inverter in the event of visible damage or if its display shows any sign of damage.
- Commissioning of an i500 inverter that is not fully mounted.
- Illegal technical modifications or software modifications on an i500 inverter.
- Using accessories not approved for the i500 inverter.
- Operating an i500 inverter without necessary protecting covers or outside the technical specifications.
- Operating an i500 inverter in explosive atmosphere.



This list shows a few examples of unintended use, it is not complete and not limited to the examples stated.

### 2.3 Qualified personnel

Only qualified personnel according to relevant international and national standards may work on or with the inverter. The necessary skills of qualified persons are defined as follows:

- They have read and understand this operation manual.
- They are familiar with installing, mounting, commissioning, and operating the i500 inverter.
- They have the corresponding qualifications for their work.
- They know safe work procedures and lockout/ tagout procedures to create a safe work area.
- They know and can apply all regulations for the prevention of accidents, directives, and laws applicable at the place of use.

### 2.4 Signal words and symbols

The following symbol and signal words are used in this manual to indicate dangers and important information:



The safety alert symbol is part of a safety message and is used to alert to potential hazards.



#### **DANGER!**

**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.



#### **WARNING!**

**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.



#### **CAUTION!**

**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

2 Safety information  
Warning labels on inverter

**i NOTICE!**

**NOTICE** indicates a situation which could lead to property damage.

**i** This symbol indicates an important note or helpful advice to ensure trouble-free operation.

**➔** This symbol indicates a page reference or reference to another i500 manual.

2.4.1 Elements of a safety message

|                                                                                |                                                            |
|--------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>⚠ WARNING!</b>                                                              | <b>← Safety alert symbol with signal word in color bar</b> |
| <b>Dangerous electrical voltage</b>                                            | ← Type and source of danger                                |
| Death or severe injuries.                                                      | ← Consequences of non-compliance                           |
| ▶ All works on the inverter must only be carried out in the deenergised state. | ← Prevention measure(s)                                    |
| ▶ ...                                                                          |                                                            |

2.5 Warning labels on inverter

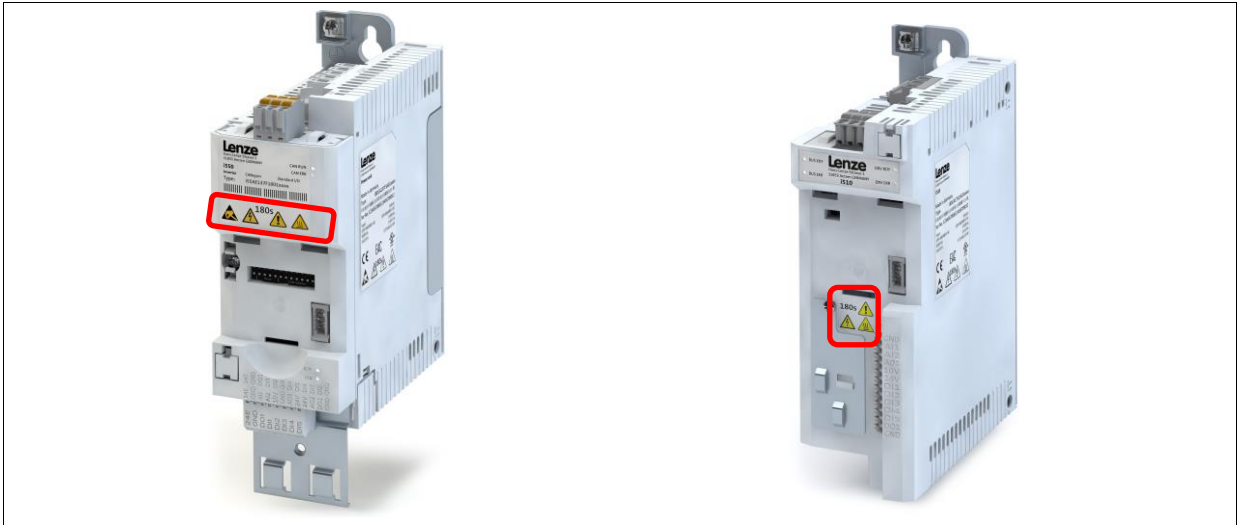


Fig. 1: i500 warning labels

Observe the following warning labels on the front side of the inverter:

| Warning label | Description                                                                                                                                                                                                                                                                                                                                              |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <b>Dangerous electrical voltage</b><br>Before working on the inverter, check whether all power connections are dead!<br>After mains OFF, power connections X100 and X105 carry a dangerous electrical voltage for the time specified on the inverter!<br>After switching off the mains voltage wait at least 180s before starting to work on the device. |
|               | <b>High leakage current</b><br>Carry out fixed installation and PE connection in compliance with standard EN 61800–5–1 !                                                                                                                                                                                                                                 |

## 2 Safety information

### Basic safety measures

|                                                                                   |                                                                                                                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Hot surface</b><br>Use personal protective equipment or wait until inverter has cooled down!                                     |
| <b>Warning label</b>                                                              | <b>Description</b>                                                                                                                  |
|  | <b>Electrostatic sensitive devices</b><br>Before working on the inverter, the staff must ensure to be free of electrostatic charge! |

## 2.6 Basic safety measures

### **WARNING!**

#### Workplace hazards

Possible death or severe personal injury.

- ▶ Observe all specifications of the corresponding documentation supplied. This is the precondition for safe and trouble-free commissioning and operation of the inverter and for obtaining the product features specified.
- ▶ Observe the specific safety instructions in this operation manual.
- ▶ Equip the inverter/drive system with additional monitoring and protection devices if required by national safety regulations.
- ▶ Commissioning of the inverter and the related drive system (i.e. starting of the operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 2006/42/EC (Machinery Directive); the standard EN 60204 must be observed.



### **WARNING!**

#### Dangerous electrical voltage

An electrical shock can cause death or severe personal injury.

- ▶ Apply lockout/tagout procedures whenever possible.
- ▶ Connect/disconnect all pluggable inverter connections only in deenergised condition!
- ▶ Only remove the inverter from the installation in completely deenergised state.

### **NOTICE!**

#### Incorrect inverter installation

Disregarding the following instructions may lead to inverter damage and damage to material assets:

- ▶ The inverter must be installed and cooled according to the instructions given in the “i500 Mounting and switch-on instructions”. The ambient air must not exceed pollution degree 2 according to EN 61800-5-1.
- ▶ Ensure proper handling and avoid excessive mechanical stress. Do not bend any inverter components and do not change any insulation distances during transport or handling.

### **NOTICE!**

#### Incomplete or faulty inverter parameterization

Disregarding the following advices may lead to inverter damage and damage to material assets:

- ▶ Always check if the procedural notes and circuit details described in this document can be adapted to the particular application.
- ▶ Refer to the i500 Commissioning manual for the parameterization of technically sophisticated applications.

## 2.7 Electromagnetic influences

The i500 inverters can be installed in drive systems of category C2 according to EN 61800-3. These devices can cause radio interferences in residential areas. In this case, special measures can be necessary.

### NOTICE!

#### **Possible electromagnetic interference of drive and control system**

Sporadic malfunctions can cause unsafe operation conditions.

- ▶ Commissioning of the inverter and the related drive system (i.e. starting of the operation as directed) is only allowed when there is compliance with the EMC Directive (2004/108/EC).
- ▶ The inverter must be installed in a housing (e.g. control cabinet) to meet the limit values for radio interferences valid at the site of installation.

## 2.8 Residual hazards

Consider the following residual hazards in the risk assessment of the application.

### WARNING!

#### **Unexpected drive motion**

Possible personal injury or property damage.

If there is a short circuit of two power transistors in the inverter, a residual movement of up to 180°/number of pole pairs can occur at the connected motor! (For 4-pole motor: residual movement max.  $180^\circ/2 = 90^\circ$ ).

### WARNING!

#### **Dangerous residual voltage – long discharge time!**

An electrical shock can cause death or severe personal injury.

- ▶ After the inverter or the drive system has been disconnected from the supply voltage, all live components and power terminals must not be touched immediately because capacitors in the inverter can still be charged.
- ▶ Observe the waiting time on the inverter label.

### WARNING!

#### **High leakage current**

i500 inverters may cause a DC current in the PE conductor.

Possible personal injury due to inappropriate or insufficient protective measures.

- ▶ If a residual current device (RCD) is used for protection against direct or indirect contact for an inverter with three-phase supply, only a residual current device (RCD) of type B is permissible on the supply side of the inverter.
- ▶ If the inverter has a single-phase supply, a residual current device (RCD) of type A is also permissible.
- ▶ Apart from using a residual current device (RCD), other protective measures can be taken as well, e.g. electrical isolation by double or reinforced insulation or isolation from the supply system by means of a transformer.

## 3 Product description



Fig. 2: i500 inverter series

### 3.1 General

The i500 is a inverter series in the 0.25-45 kW power range. Its distinguishing features are:

- a streamlined design,
- scalable functionality
- exceptional user-friendliness.

i500 provides a high-quality inverter that conforms with the EN 50598-2 efficiency classes (IE). Overall, this provides a reliable inverter for a wide range of machine applications.

#### Highlights

- Streamlined design with a width of 60 mm up to 2.2 kW saves space in the control cabinet. Also the inverter fits to a 150 mm cabinet up to 11 kW.
- Innovative interaction options enable faster than ever setup times.
- The wide-ranging modular system enables various product configurations depending on machine requirements.
- i500 can be used for wide range of applications:  
Pumps and fans, conveyor, travelling, winding, shaper, tool and hoist drives...

### 3.1.1 i500 inverter types

|                                            | i510                                                                                                         | i550                                                                                   |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Performance data</b>                    |                                                                                                              |                                                                                        |
| Mains: 1 AC 230 V or (1/3 AC 230 V planed) | 0.25 to 2.2 kW                                                                                               | 0.25 to 2.2 kW                                                                         |
| Mains: 3 AC 400/480 V                      | 0.37 to 2.2 kW                                                                                               | 0.37 to 45.0 kW<br>(Planned up to 110.0 kW)                                            |
| <b>Overload ability</b>                    | 150% / 60s and 200% / 3s                                                                                     |                                                                                        |
| <b>Interfaces</b>                          | Digital inputs/outputs (5/1), analog inputs/outputs (2/1), relays<br>(optional extension with i550)          |                                                                                        |
|                                            |                                                                                                              | External 24 V supply<br>PTC thermal contact input<br>HTL incremental encoder (100 kHz) |
|                                            | CANopen, Modbus                                                                                              | CANopen, Modbus, PROFIBUS, Ether-<br>CAT, PROFINET, EtherNet/IP                        |
|                                            |                                                                                                              | Integrated brake chopper<br>DC bus connection (3 AC 400V devices)                      |
| <b>Approvals</b>                           | CE, EAC<br>UL & cUL (up to 22 kW, further approvals in progress)<br>RoHS2, IE2 in accordance with EN 50598-2 |                                                                                        |
| <b>Functions</b>                           | V/f controls (linear, quadratic) Sensorless vector control                                                   |                                                                                        |
|                                            | DC injection Braking<br>Compound Braking<br>Mechanical Brake management low-wear brake control               |                                                                                        |
|                                            |                                                                                                              | Dynamic braking through brake re-<br>sistance                                          |
|                                            | PID controller, Motor potentiometer, Flying restart                                                          |                                                                                        |
| <b>Safety technology</b>                   |                                                                                                              | Safe torque off (STO)                                                                  |

## 3.2 Overview

Get familiar with the two inverter types on the following overview images.

### 3.2.1 i510 inverter overview

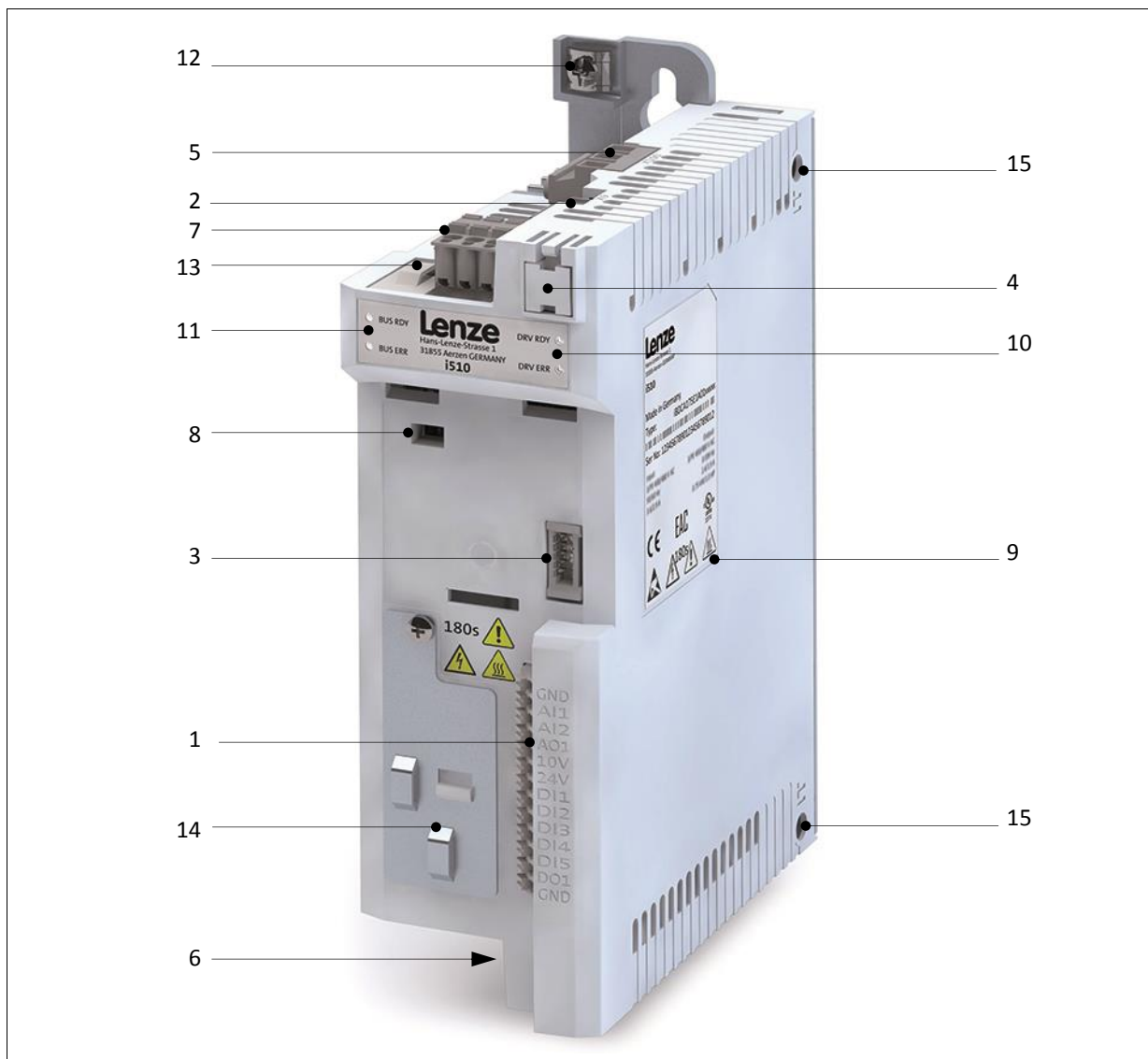


Fig. 3: i510 inverter overview

#### Position numbers

- |                                          |                                                |
|------------------------------------------|------------------------------------------------|
| 1) X3 – Control terminal (Basic I/O)     | 9) Rating plate                                |
| 2) X9 – Relay output                     | 10) Inverter status LEDs                       |
| 3) X16 – Interface for diagnostic module | 11) Network status LEDs                        |
| 4) X20 - Memory module                   | 12) PE / Ground connection                     |
| 5) X100 – Mains connection               | 13) Shield connection (CANopen/Modbus)         |
| 6) X105 – Motor connection               | 14) Shield connections for control connections |
| 7) X216 – Network (Option)               | 15) IT screw (from 0.55 kW)                    |
| 8) Switch between CANopen/Modbus         |                                                |

### 3.2.2 i550 inverter overview

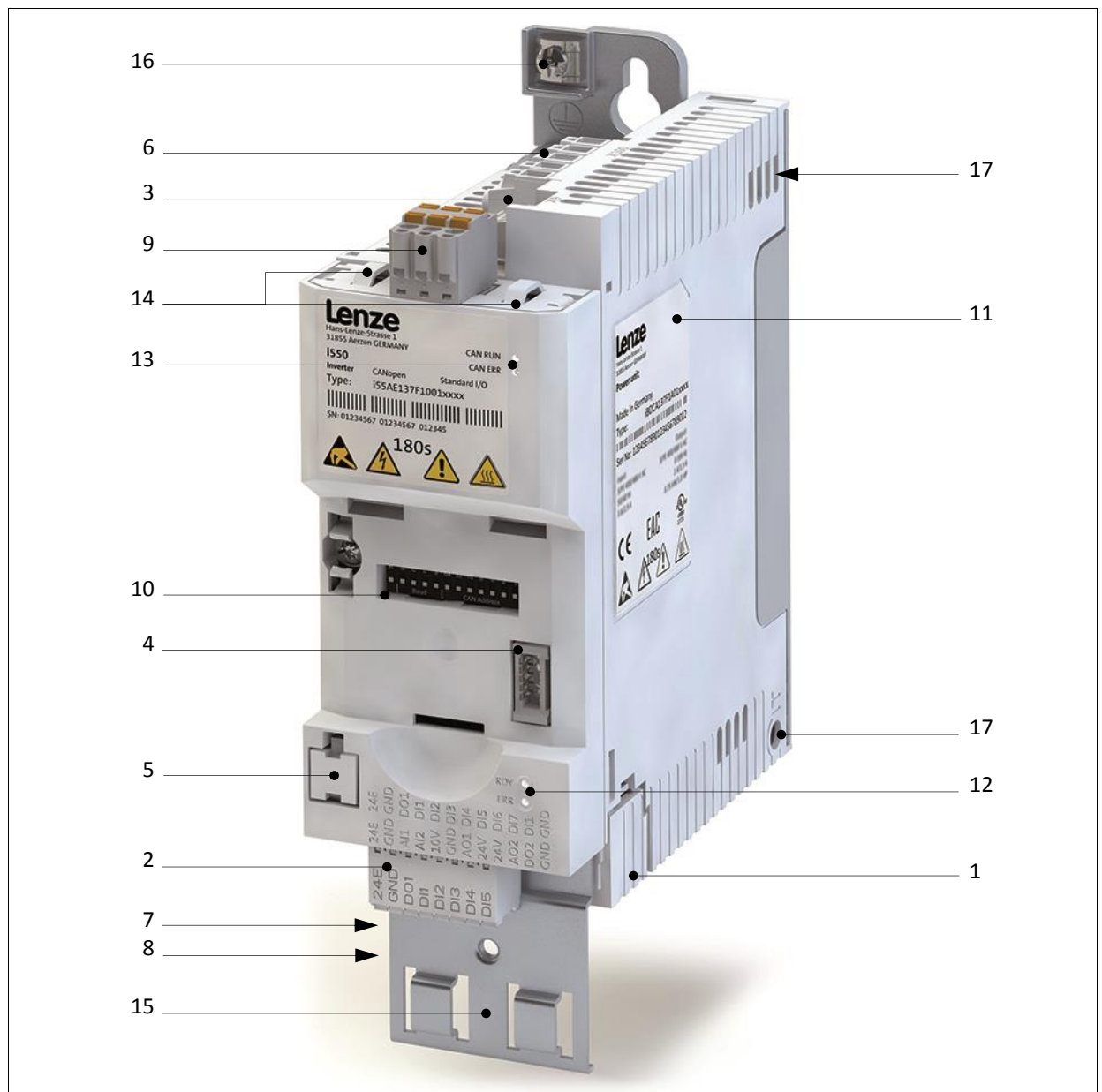


Fig. 4: i550 inverter overview

#### Position numbers

- |                                                                               |                                                                          |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1) X1 – Safety module (Option)                                                | 10) DIP switch for baud rate and bus address (CANopen, Modbus, PROFIBUS) |
| 2) X3 – Control terminal (standard I/O or application I/O)                    | 11) Rating plate                                                         |
| 3) X9 – Relay output                                                          | 12) Inverter status LEDs                                                 |
| 4) X16 – Interface for diagnostic module                                      | 13) Network status LEDs                                                  |
| 5) X20 – Memory module                                                        | 14) Shield connection (CANopen/Modbus)                                   |
| 6) X100 – Mains connection and DC-Link connection (Only 3Ph/400V power units) | 15) Shield connections for control connections                           |
| 7) X105 – Motor and brake resistor connection                                 | 16) PE / Ground connection                                               |
| 8) X109 – PTC input                                                           | 17) IT screw (from 0.55 kW)                                              |
| 9) X2xx – Network (Option)                                                    |                                                                          |

### 3 Product description

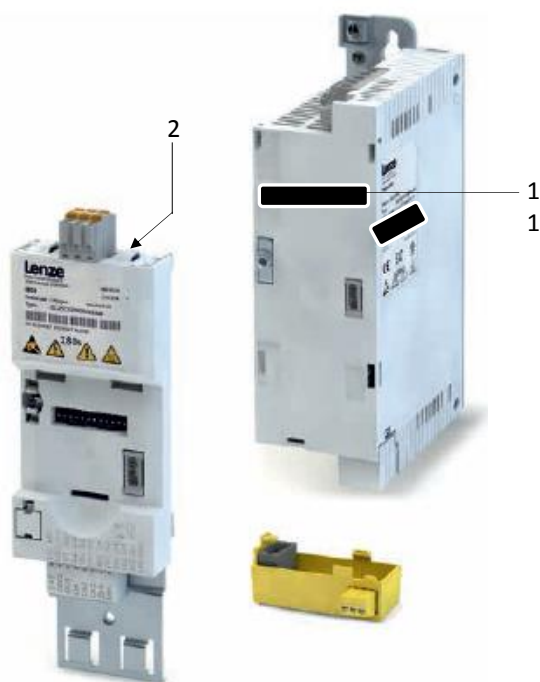
#### Typecode

## 3.3 Typecode

The typecode can be seen on the inverter itself and also over the parameters

#### Single parts (Only i550)

The single parts (Power unit, control unit, safety) have their own type code. This codes are also present on the complete inverter!



#### Complete inverter: (i510 & i550)

If the inverter was ordered completely an additional type code reflects the complete inverter.



1. Power unit – type code (P192:5) and serial number (P192:7)
2. Control unit – type code (P192:4) and serial number (192:6)
3. Complete inverter – Product code (P190:1) and serial number(P190:2)

## 4 Installation

### 4.1 Mechanical installation

#### NOTICE!

##### **Possible overheating and reduced service life**

Observe the minimal clearances for sufficient ventilation.



For inverter dimensions and mounting options refer to separate manual:  
i500 Mounting and switch-on instructions

### 4.2 Electrical installation

#### DANGER!

##### **Dangerous electrical voltage**

Possible death or severe injuries due to electrical shock.

- ▶ All installation works on the inverter must only be carried out in the deenergised state.
- ▶ After switching off the mains voltage, the capacitors in the inverter can still be charged. Observe the waiting time on the inverter label before commencing work.

#### CAUTION!

The integral solid state short circuit protection included in the inverter does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

#### CAUTION!

The inverter (PE) terminals connections must be connected to system earth / ground. Earth / ground impedance must conform to the requirements of national and local industrial safety regulations and all applicable electrical codes. The integrity of all earth / ground connections should be periodically checked.

### 4.2.1 Wiring overview i510

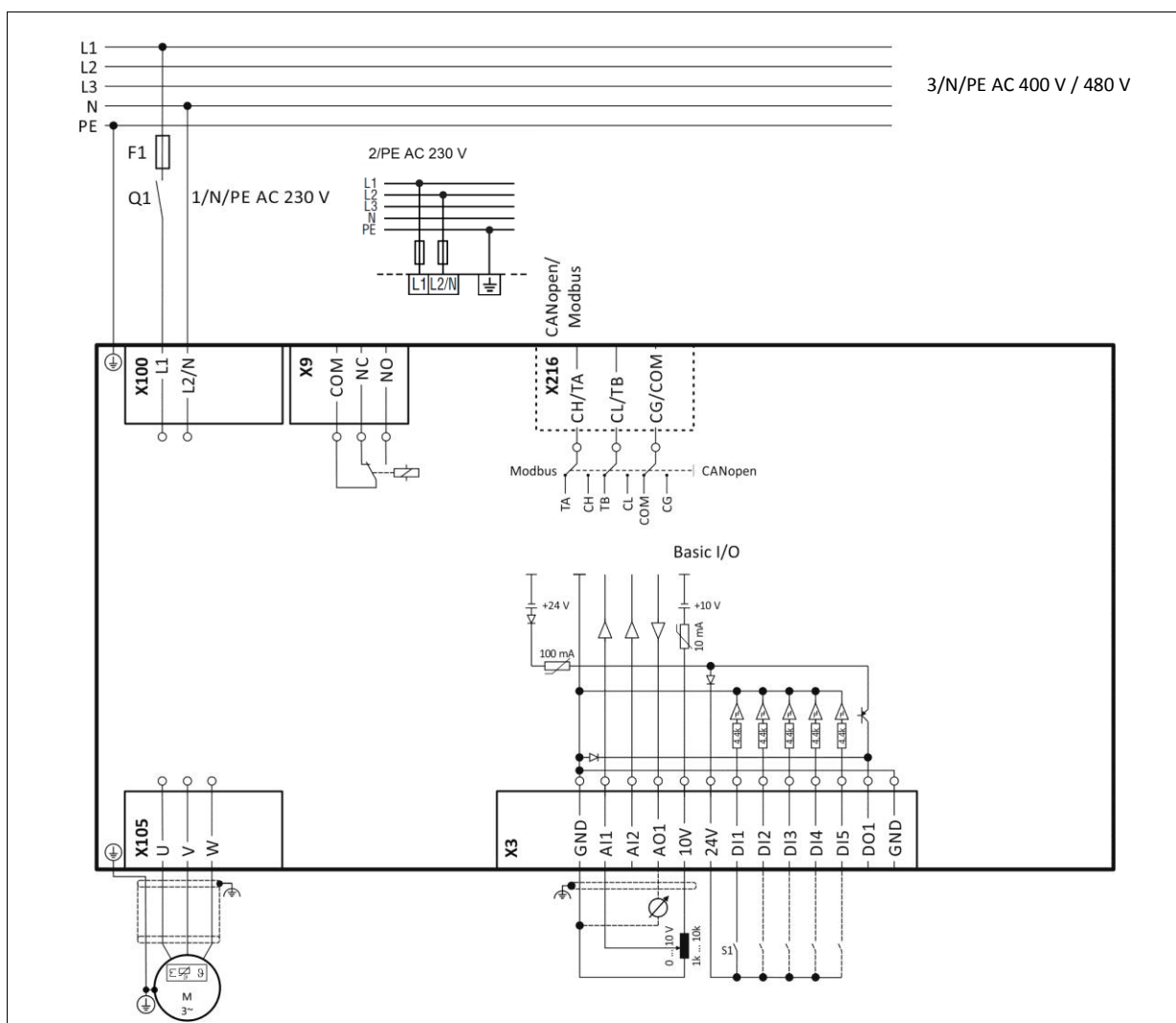


Fig. 5: i510 wiring, 230 V AC

Connections shown by dashed lines are optional.

For 400V connection see next subchapter “4.2.2 Wiring overview i550” on page 19.

→ For connections to other electricity supply systems refer to separate manual: i500 Mounting and switch-on instructions

### 4.2.2 Wiring overview i550

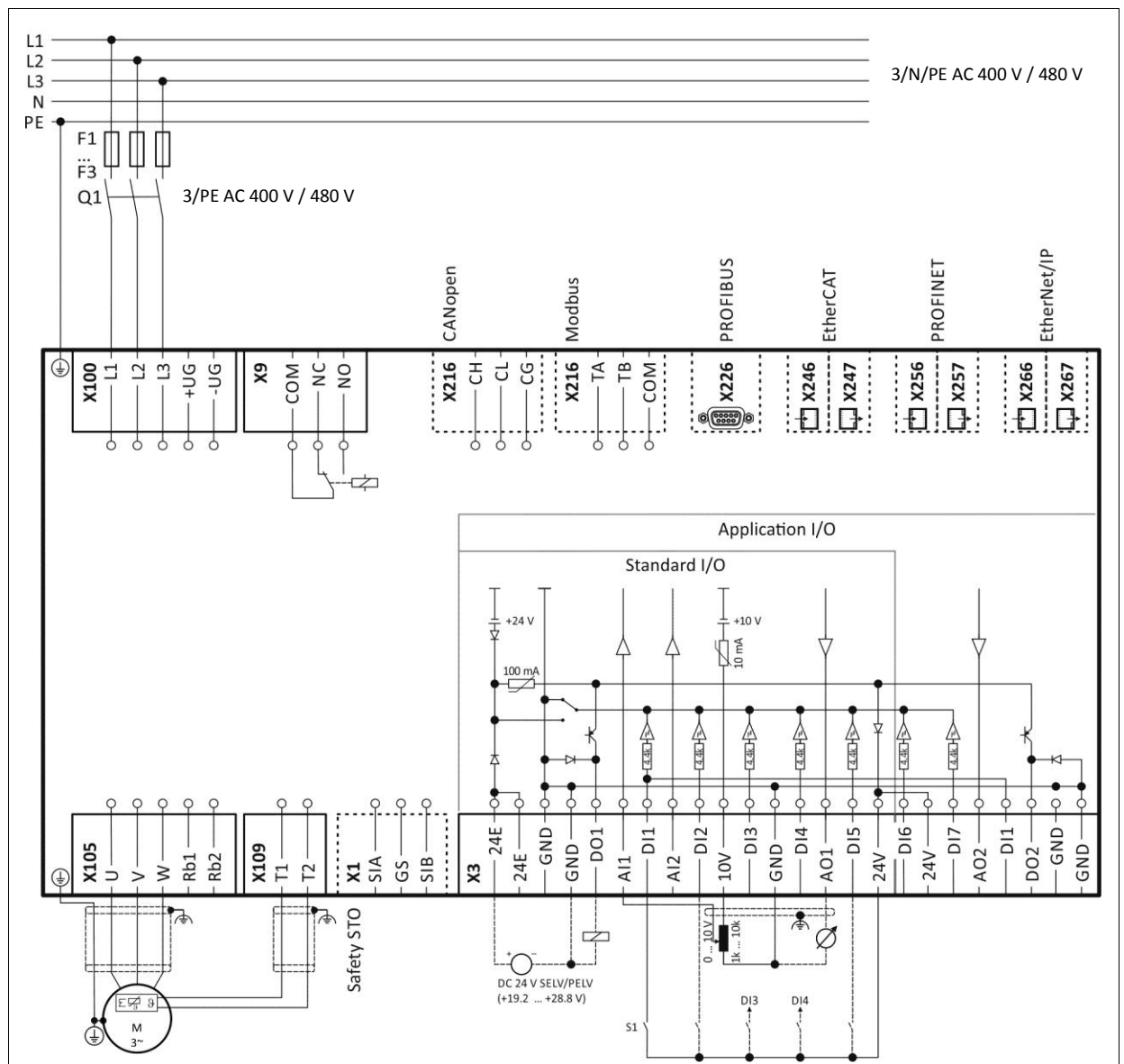


Fig. 6: i550 wiring, 400 V AC

Connections shown by dashed lines are optional.

For 230V connection see next previous subchapter “4.2.1 Wiring overview i510” on page 18



For connections to other electricity supply systems refer to separate manual:  
i500 Mounting and switch-on instructions

### 4.2.3 Control wiring i510/i550

| Terminal designation | Product |                |                  | Function                                                                                                                                             |
|----------------------|---------|----------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | i510    | i550 (Std I/O) | i550 (Appl. I/O) |                                                                                                                                                      |
| 24E                  | —       | 2x *           | 2x *             | Connection point for external 24 VDC control power                                                                                                   |
| GND                  | 2x *    | 3x *           | 5x *             | Ground / earth reference for analog and digital I/O                                                                                                  |
| DO1                  | •       | •              | •                | Programmable digital output (24 VDC)                                                                                                                 |
| DO2                  | —       | —              | •                | Programmable digital output (24 VDC)                                                                                                                 |
| AI1                  | •       | •              | •                | Analog input:<br>i510: 0...5/10 VDC, 0/4...20 mA (uni-directional)<br>i550: -10/-5...0...5/10 VDC (bi-directional),<br>0/4...20 mA (uni-directional) |
| AI2                  | •       | •              | •                | Analog input:<br>i510: 0...5/10 VDC (uni-directional)<br>i550: -10/-5...0...5/10 VDC (bi-directional),<br>0/4...20 mA (uni-directional)              |
| 10V                  | •       | •              | •                | 10 VDC, 10 mA supply for reference potentiometer                                                                                                     |
| DI1                  | •       | •              | 2x *             | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| DI2                  | •       | •              | •                | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| DI3                  | •       | •              | •                | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| DI4                  | •       | •              | •                | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| DI5                  | •       | •              | •                | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| DI6                  | —       | —              | •                | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| DI7                  | —       | —              | •                | Programmable digital input (<5V = Low, >15V = High)                                                                                                  |
| AO1                  | •       | •              | •                | Programmable analog output:<br>0...10 VDC, 0/4...20 mA (scalable, gain, offset, deadband)                                                            |
| AO2                  | —       | —              | •                | Programmable analog output:<br>0...10 VDC, 0/4...20 mA (scalable, gain, offset, deadband)                                                            |
| 24V                  | •       | •              | •                | 24 VDC, 100 mA customer use and reference for DI's                                                                                                   |
| COM                  | •       | •              | •                | Programmable form "C" relay output:<br>COM = Common, NC = Normally Closed, NO = Normally Open<br>30 VDC, 250 VAC @ 2 A                               |
| NC                   | •       | •              | •                |                                                                                                                                                      |
| NO                   | •       | •              | •                |                                                                                                                                                      |
| T1                   | —       | •              | •                | PTC thermal sensor input 1                                                                                                                           |
| T2                   | —       | •              | •                | PTC thermal sensor input 2                                                                                                                           |
| SIA                  | —       | optional       | optional         | STO (safety) input A                                                                                                                                 |
| GS                   | —       | optional       | optional         | STO (safety) ground / earth reference                                                                                                                |
| SIB                  | —       | optional       | optional         | STO (safety) input B                                                                                                                                 |

\*Terminal are internally connected and can be used for loop wiring

4.2.4 Default control setup

The i5x0 has a default I/O preconfiguration intended for many typical applications. This preconfiguration is described below (i510 pictured):

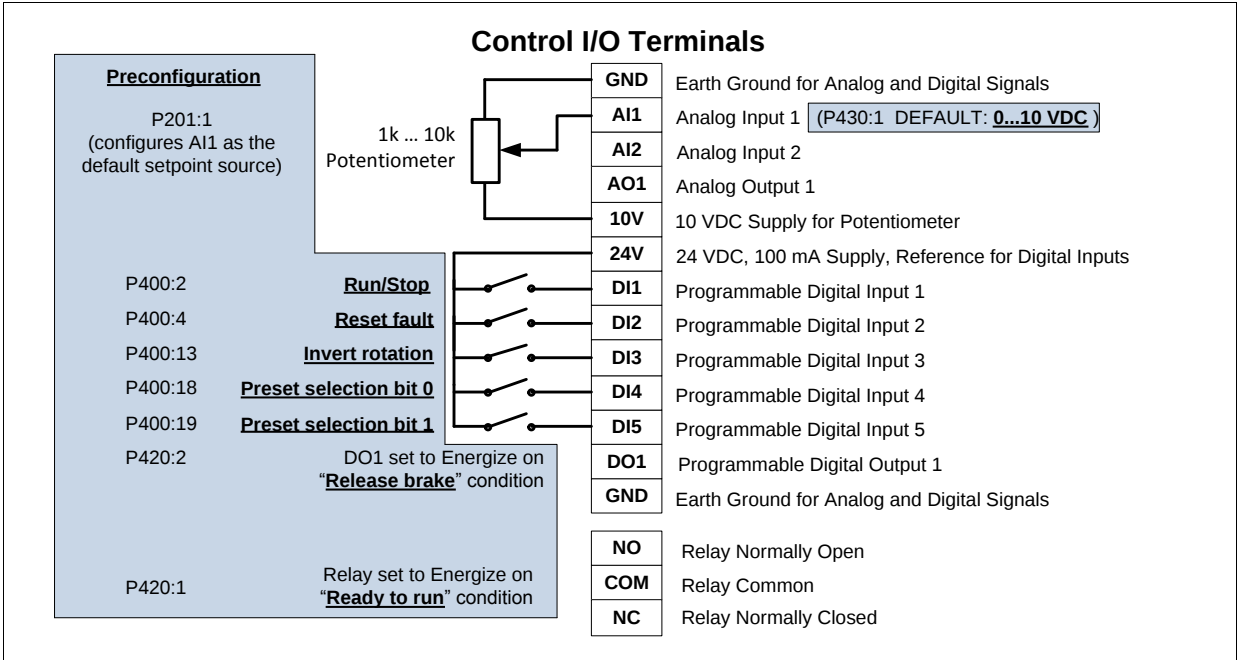


Fig. 7: i510, I/O preconfiguration

The i5x0 inverter can be operated "out-of-the-box" with this control scheme and without any further configuration. Below is an example of the inverter behavior based on the default signals described above:

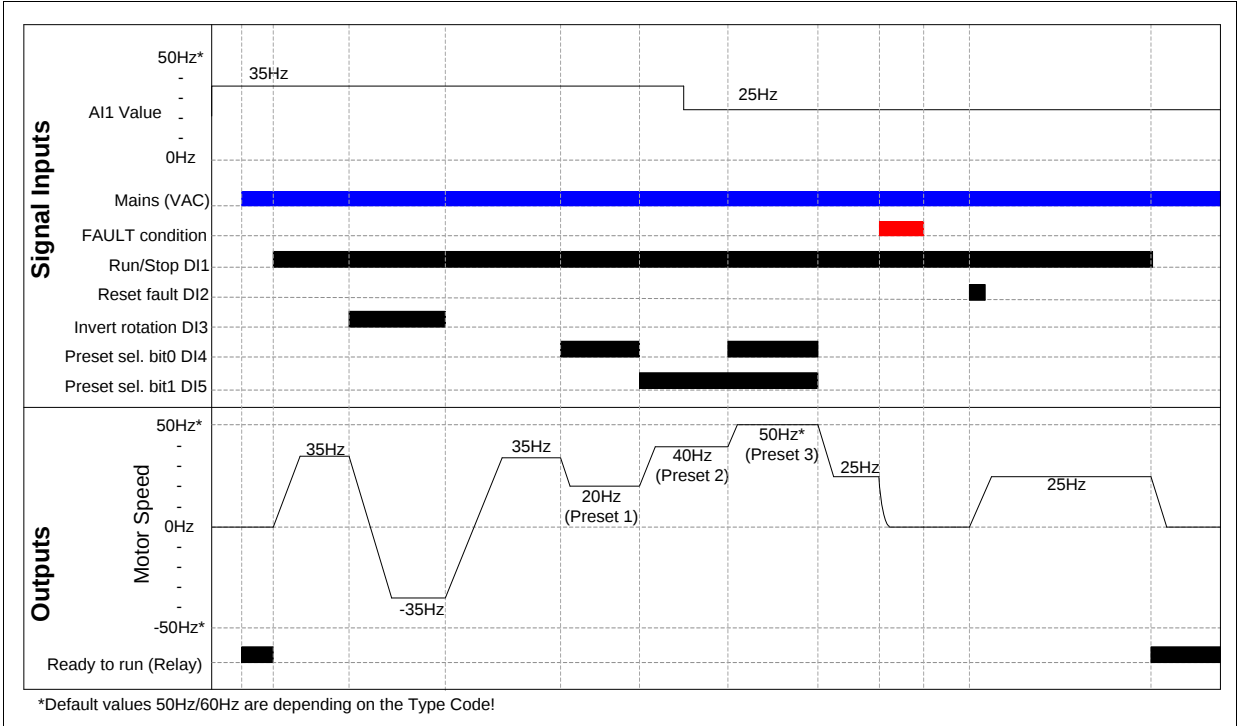


Fig. 8: Control scheme

## 5 Commissioning

### **DANGER!**

#### Hazards during parameter change

A parameter change gets immediately active. This can result in a unexpected reaction of the motor shaft.

- ▶ Do Parameter change, if possible, only if the inverter is inhibited.

### **WARNING!**

#### Hazards during inverter installation and commissioning

Possible death or severe personal injury.

- ▶ Only authorized and qualified persons are allowed to install and commission the inverter.
- ▶ Keep the manual "i500 Mounting and switch-on instructions" at hand.
- ▶ Proper lockout/ tagout procedures must be applied to prevent inadvertently starting of motor or making alive of equipment.
- ▶ The motor shall be uncoupled from load and free to rotate before performing tests. Verify that the equipment is ready to be operated and that all safety circuits have been checked and are operational.

## 5.1 Set-up tools

Three set-up methods with special tools and software are available for commissioning the i500.

### 5.1.1 Overview

|                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>i5MADK0000000S</p>                     | <p><b>Keypad</b></p> <ul style="list-style-type: none"> <li>• Change parameter</li> <li>• Diagnosis</li> <li>• Local control</li> </ul> <p>If it's only a matter of setting a few key parameters such as acceleration and deceleration time, this can be done quickly on the keypad.</p>                                                                                                                                                  |
|  <p>(Cable: 2.5 m EWL0085, 5m EWL0086)</p> | <p><b>Easy Starter &amp; USB adapter</b></p> <ul style="list-style-type: none"> <li>• Change parameter (advanced)</li> <li>• Out of the box commissioning (parameter change without main power)</li> <li>• Diagnosis</li> <li>• Parameter management</li> </ul> <p>If functions such as the motor potentiometer or sequence control for a positioning application need to be set, it's best to use the Easy Starter engineering tool.</p> |
|  <p>i5MADW0000000S</p>                     | <p><b>WLAN &amp; Android App</b></p> <ul style="list-style-type: none"> <li>• Change parameter (advanced)</li> <li>• Diagnosis</li> <li>• Parameter management</li> </ul> <p>This intuitive app</p> <ul style="list-style-type: none"> <li>• Emulates the inverter keypad on a smartphone.</li> <li>• Adjustment to simple applications such as a conveyor belt.</li> </ul>                                                               |

## 5 Commissioning

### Set-up tools

#### 5.1.2 Keypad

The keypad with display is snapped on the front side of the inverter.

- Keypad (Type code: i5MADK0000000S)

#### Operating elements

|                                                                                   |                                                                                   |                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------|
|  |  | Navigation in menu<br>Adjust parameter values   |
|                                                                                   |  | Enter (sub-)menu/parameter<br>Confirm parameter |
|                                                                                   |  | Exit (sub-)menu/parameter                       |
|                                                                                   |  | Keystop inverter                                |
|                                                                                   |  | Enable inverter                                 |

#### Display

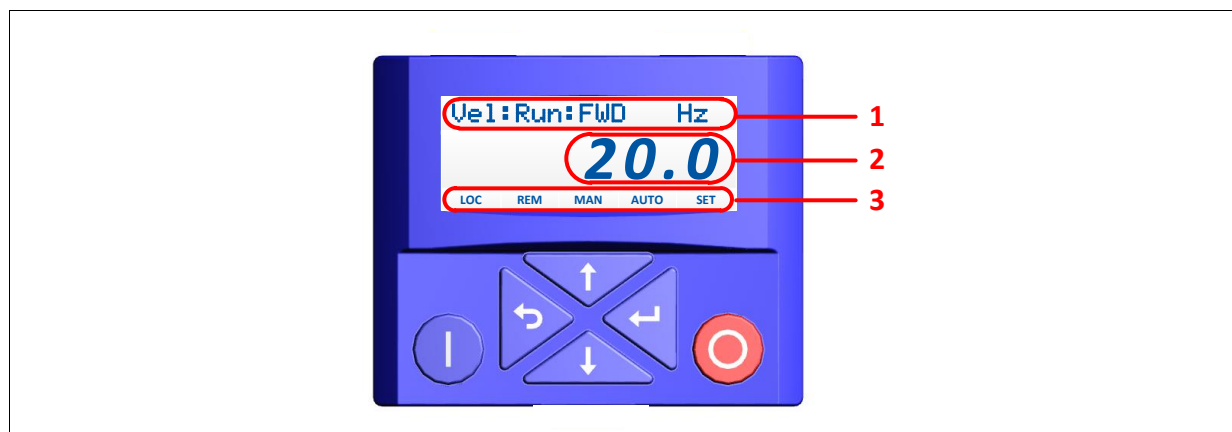


Fig. 9: Keypad display

| Pos. | Description                                                                                                                                                                   |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Status and unit                                                                                                                                                               |
| 2    | Speed / Parameter value / Fault code                                                                                                                                          |
| 3    | LOC • Local start button on keypad is active (stop button is always active)                                                                                                   |
|      | REM • Local start button is inactive (start is initiated remotely)                                                                                                            |
|      | MAN • Up/Down arrows are active and control speed                                                                                                                             |
|      | AUTO • Up/Down arrows are inactive (speed control is external)                                                                                                                |
|      | Set  • When blinking indicates that a setting or value has changed and needs to be entered |

## 5 Commissioning

### Set-up tools

---

Every parameter has a hexadecimal index number. Parameters which are visible on the keypad have also a parameter number. In the Easy starter the parameter number and the hexadecimal index are visible. Every parameter can have subindex.

| Example        | Parameter number | Index      |
|----------------|------------------|------------|
| Base Frequency | P303.02          | 0x2B01:002 |
| Control select | P200.00          | 0x2824:000 |

The parameters are organized into groups 0...7:

| Group | Name          | Group | Name                |
|-------|---------------|-------|---------------------|
| 0     | Favorites     | 5     | Fieldbus Setup      |
| 1     | Diagnostics   | 6     | Process Controller  |
| 2     | Basic Setup   | 7     | Auxiliary Functions |
| 3     | Motor Control |       |                     |
| 4     | I/O Setup     |       |                     |



Group 0 - Favorites contains links to the most commonly used parameters for initial commissioning and monitoring of the inverter for general applications.

### Navigation in Group 0 - Favorites

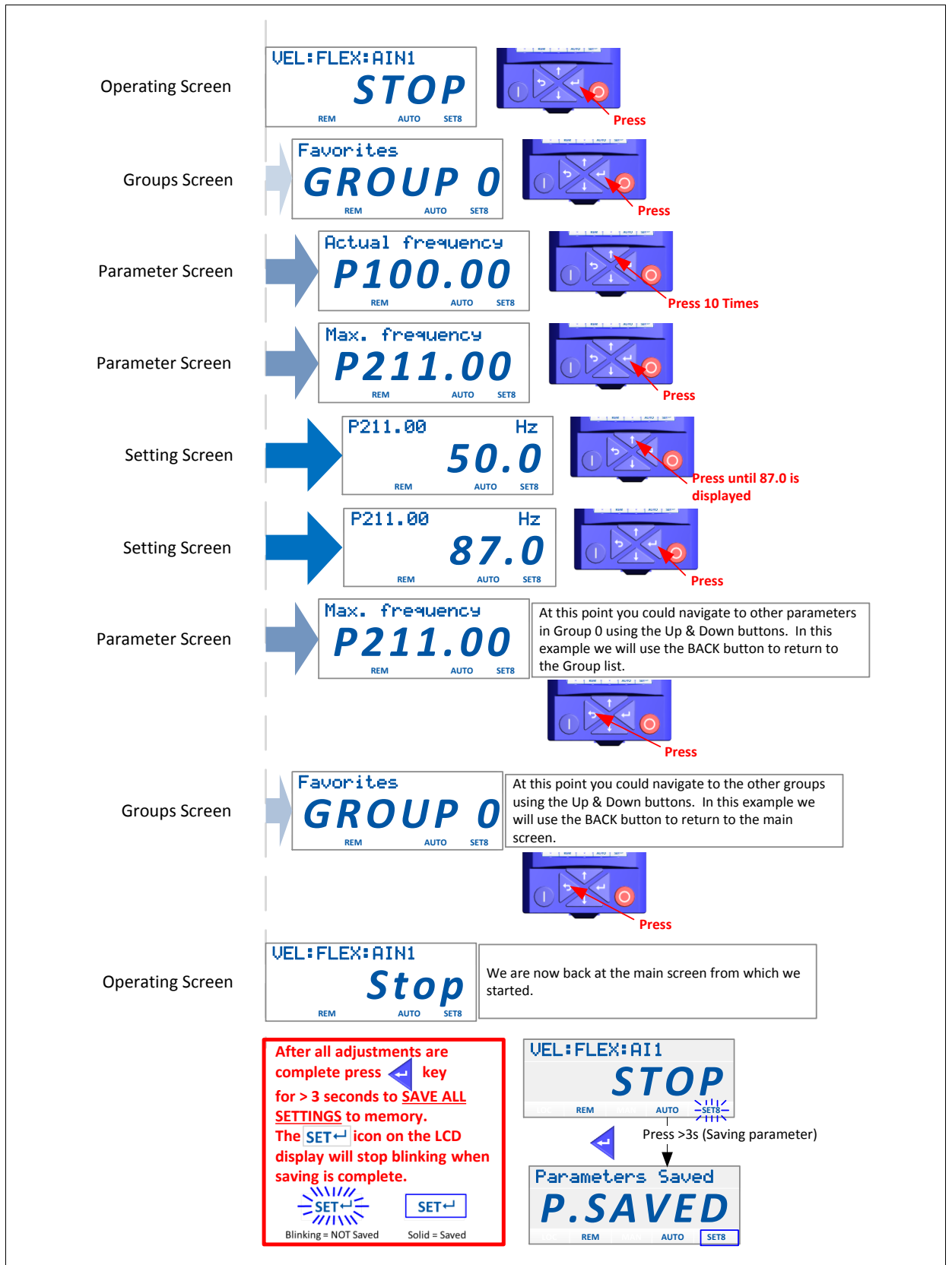


Fig. 10: Navigation in Group 0 - Favorites

### Navigation in Group 1-8

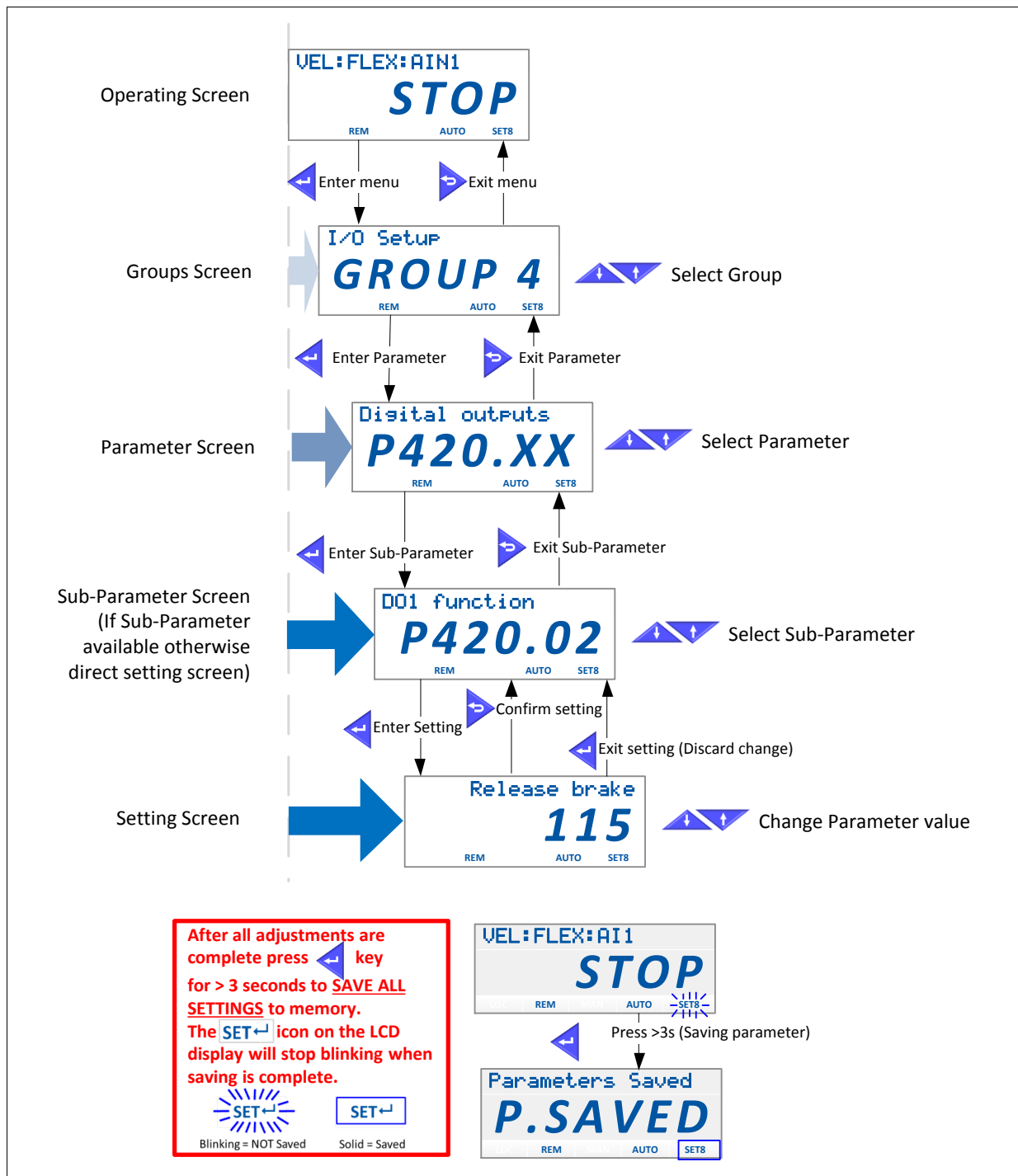


Fig. 11: Navigation in Group 1-7

### 5.1.3 Easy Starter & USB adapter

#### Required materials

- USB adapter (Type code: IOMAXDU00000S)
- USB cable (standard version)  
(2.5 m EWL0085, 5m EWL0086)
- Easy Starter software (version from 1.8.0.0)
- PC or laptop with free USB port

**i** The Easy Starter software is available for free - see download area on the Lenze web ([www.lenze.com](http://www.lenze.com)).  
Observe the system requirements and installation procedure on the download page.

#### Procedure

1. Download and install the Easy Starter software.
2. Connect USB adapter to inverter.
3. Connect USB adapter to laptop with USB cable.

**i** No external voltage or mains voltage is required to program the inverter.

4. Run Easy Starter software.
5. Select "USB Diagnosis via adapter" for communication. Then click on "Insert" button.
6. Program inverter:

|                       |                                                      |
|-----------------------|------------------------------------------------------|
| <b>Setting</b>        | Guided setting windows                               |
| <b>Diagnosis</b>      | Actual status of inverter / IO / Errors / Controller |
| <b>Parameter list</b> | Access to all parameters                             |
| <b>Trend</b>          | Record data trends from inverter values              |

**→** For more information see documentation of the Easy Starter software.

7. Click on the following icon to save the parameters to the inverters nonvolatile memory:



## 5.2 Commissioning procedure

Use the following table as a reminder that guides you through the commissioning procedure.

| Step | Action                                                                                                                                                                                                                                                                                                                             | Information                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 1    | <b>Initial checks</b> <ul style="list-style-type: none"> <li>• Check delivery for completeness.</li> <li>• Check the nameplate information to ensure that you have the correct type of inverter for your motor/application.</li> <li>• Check for delivery damages. Don't continue if your inverter seems to be damaged!</li> </ul> | ➔ 3.3 Typecode, page 16                           |
| 2    | <b>Module assembly (only i550)</b> <ul style="list-style-type: none"> <li>• Assembly your Control Unit (CU) on your Power Unit (PU) and Safety Unit (Option)</li> </ul>                                                                                                                                                            | ➔ i500 Mounting and switch-on instructions        |
| 3    | <b>Mechanical installation</b> <ul style="list-style-type: none"> <li>• Install the inverter according to the instruction.</li> </ul>                                                                                                                                                                                              |                                                   |
| 4    | <b>Electrical installation</b> <ul style="list-style-type: none"> <li>• If you install the inverter to an IT network, remove the IT-screws.</li> <li>• Install the control wiring.</li> <li>• Install motor and supply wiring in accordance to the EMC requirements.</li> </ul>                                                    |                                                   |
| 5    | <b>Functional test (if needed)</b><br>Perform a uncoupled functional test for basic test                                                                                                                                                                                                                                           |                                                   |
| 6    | <b>General parameter setup</b><br>The i500 has linked the most common parameters to the <b>favorites menu</b> . With these parameters most common basic application can be solved.                                                                                                                                                 | ➔ 5.4 General parameter setup (Favorites) page 29 |
| 7    | <b>Parameter setup (Auxiliary functions)</b><br>The i500 contains additional functions which can be used for more complex applications.                                                                                                                                                                                            | ➔ 6 Function & parameter description, page 34.    |
| 8    | <b>Testrun &amp; tuning</b> <ul style="list-style-type: none"> <li>• Run the motor and check the performance of your application.</li> <li>• Adjust the corresponding parameter to tune your application.</li> </ul>                                                                                                               | ➔ 6 Function & parameter description, page 34.    |
| 9    | <b>Diagnose &amp; troubleshooting</b><br>Status LED and error messages are available for troubleshooting.                                                                                                                                                                                                                          | ➔ 9 Troubleshooting, page 117                     |

## 5 Commissioning

### General parameter setup (Favorites)

## 5.4 General parameter setup (Favorites)

The i500 has linked the most common parameters to the favorites menu. With this parameters most common basic application can be solved.



This chapter leads you through the favorites menu and gives you basic hints.

For detailed information about the parameters and additional functions, see chapter "6 Function & parameter description" on page 34 or the separate manual: i500 Commissioning manual

### 5.4.1 Diagnostic

| P no.  | Type        | Name                 | Default setting | Unit |
|--------|-------------|----------------------|-----------------|------|
| P100:0 | Diagnostics | Actual frequency     | Actual value    | Hz   |
| P103:0 | Diagnostics | Actual motor current | Actual value    | %    |
| P106:0 | Diagnostics | Motor voltage        | Actual value    | VAC  |
| P150:0 | Diagnostics | Error code           | Actual value    | –    |

Further diagnostic parameters are available in Group 1 – Diagnostics.

### 5.4.2 Basic setup

1. Select the default control location (terminal – flexible or keypad).
2. Select the default speed set-point.
3. Select the required start and stop method for your application.
4. Check if correct mains voltage is set for your network.
5. Set the motor frequency range (see illustration below).
6. Set the motor acceleration/ deceleration time (see illustration below).

| P no.  | Type        | Name                    | Default setting                   | Unit |
|--------|-------------|-------------------------|-----------------------------------|------|
| P200:0 | Basic Setup | Control source          | 0: Flexible                       | –    |
| P201:1 | Basic Setup | Frequency setpnt.source | 2: Analog input 1                 | –    |
| P203:1 | Basic Setup | Start method            | 0: Normal                         | –    |
| P203:3 | Basic Setup | Stop method             | 1: Standard Ramp                  | –    |
| P208:1 | Basic Setup | AC input voltage        | 230/400/480<br>Typecode dependent | VAC  |
| P210:0 | Basic Setup | Minimum frequency       | 0.0                               | Hz   |
| P211:0 | Basic Setup | Maximum frequency       | 50.0 / 60.0<br>Typecode dependent | Hz   |
| P220:0 | Basic Setup | Acceleration time 1     | 5.0                               | sec  |
| P221:0 | Basic Setup | Deceleration time 1     | 5.0                               | sec  |

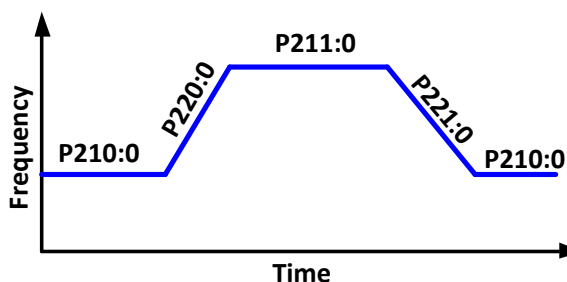


Fig. 12: Motor settings

### 5.4.3 Motor control modes

Most applications like fans, pumps, and conveyors are possible in V/f (Voltage/frequency) mode. If the application requires more dynamic and speed assurance then the SLVC (Sensor less Vector Control) mode can be used.

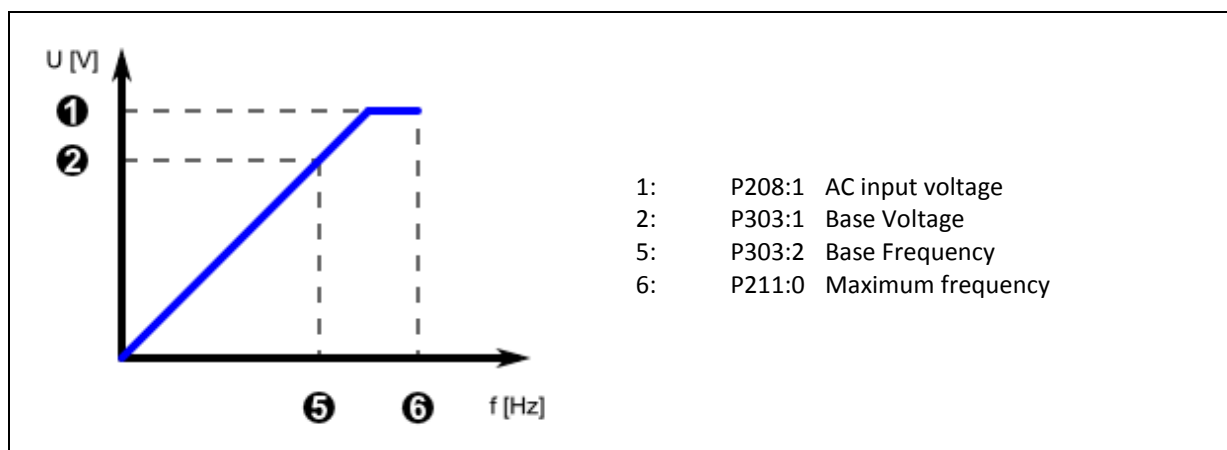


Fig. 13: V/F mode

For V/f mode set the following parameters:

Example: 400V/50Hz Motor  
Base Voltage = 400V  
Base Frequency = 50 Hz

| P no.  | Type          | Name               | Default setting                   | Unit |
|--------|---------------|--------------------|-----------------------------------|------|
| P300:0 | Motor Control | Motor control mode | 6: VFC open loop                  | –    |
| P302:0 | Motor Control | V/f shape          | 0: Linear                         | –    |
| P303:1 | Motor Control | Base Voltage       | 230/400/480<br>Typecode dependent | VAC  |
| P303:2 | Motor Control | Base Frequency     | 50.0 / 60.0<br>Typecode dependent | Hz   |



For SLVC mode refer to chapter “6.5.1 Motor control mode”, page 56.

#### Motor rotation restriction

Set this parameter if your application requires that the motor is running only in one direction:

| P no.  | Type          | Name                   | Default setting     | Unit |
|--------|---------------|------------------------|---------------------|------|
| P304:0 | Motor Control | Rotational restriction | 1: Forwards/Reverse | –    |

## 5 Commissioning

### General parameter setup (Favorites)

#### Tuning parameters

For most applications the default tuning parameters can be used:

| P no.  | Type          | Name                | Default setting                   | Unit |
|--------|---------------|---------------------|-----------------------------------|------|
| P305:0 | Motor control | Switching frequency | 21: 8kHz var/opt/4kHz min.        | kHz  |
| P308:1 | Motor control | Load at 60 sec      | 150                               | %    |
| P316:1 | Motor control | V/f boost: static   | 0.4%...2.5%<br>Typecode dependent | %    |
| P324:0 | Motor control | Max current         | 200.0                             | %    |



If the performance is insufficient during operation, see chapter “Motor Control setup” for tuning the parameters above.

#### Control selection

The i500 can be controlled from various locations and in different ways.

| P no.  | Type        | Name           | Default setting | Unit |
|--------|-------------|----------------|-----------------|------|
| P200:0 | Basic Setup | Control source | 0: Flexible     | —    |

#### Basic functionalities:

- **Inverter enable**  
Enables the inverter. Signal must have the state TRUE (by Input or setting) to be able to start the motor.
- **Run/Stop**  
Enables the running of the motor. Can be used as single signal or in combination with the signals Start Forward / Start Reverse. Signal must have the state TRUE (by Input or setting) to be able to start the motor.
- **Start Forward / Start Reverse**  
Used to start the motor (Positive edge triggered). Stop is down with the **Run/Stop** signal.
- **Run Forward / Run Reverse**  
Used to run and stop the motor (Maintained signals)
- **Rotation inversion**  
Inverts the speed setpoint
- **Fault Reset**  
For a successful reset of a fault it is necessary to correct the condition that caused the fault first. Afterwards there are different possibilities to reset the fault:
- **Quick Stop (QSP)** works as “pause” / “zero-speed” function. (The QSP ramp time can be set in P225:0)



In **Flexible** Control mode (P200:0) either **Inverter enable (P400:1)** or **Run/Stop (P400:2)** must be assigned to I/O to ensure that the drive can always be stopped!  
(Exception: Inverter is controlled from network, **Network enable (P400:37)** is HIGH)



See chapter “6.2.3 Control examples” on page 39 for control application examples.  
See chapter “6.6.1 Function list (Run/Stop/Start/Jog/Reverse)” on page 69 for detailed information

| P no.  | Type      | Name             | Default setting     | Unit |
|--------|-----------|------------------|---------------------|------|
| P400:1 | I/O Setup | Inverter enable  | 1: TRUE             | —    |
| P400:2 | I/O Setup | Run/Stop         | 11: Digital input 1 | —    |
| P400:3 | I/O Setup | Quick Stop [QSP] | 0: Not connected    | —    |

## 5 Commissioning

### General parameter setup (Favorites)

| P400:4  | I/O Setup | Reset fault           | 12: Digital input 2 | –    |
|---------|-----------|-----------------------|---------------------|------|
| P400:5  | I/O Setup | DC brake              | 0: Not connected    | –    |
| P400:6  | I/O Setup | Start forward (CW)    | 0: Not connected    | –    |
| P400:7  | I/O Setup | Start reverse (CCW)   | 0: Not connected    | –    |
| P400:8  | I/O Setup | Run forward (CW)      | 0: Not connected    | –    |
| P400:9  | I/O Setup | Run reverse (CCW)     | 0: Not connected    | –    |
| P400:13 | I/O Setup | Invert rotation       | 13: Digital input 3 | –    |
| P no.   | Type      | Name                  | Default setting     | Unit |
| P400:18 | I/O Setup | Preset selection bit0 | 14: Digital input 4 | –    |
| P400:19 | I/O Setup | Preset selection bit1 | 15: Digital input 5 | –    |
| P400:20 | I/O Setup | Preset selection bit2 | 0: Not connected    | –    |

### Output selection

The digital output and relay can be used as feedback signal for your control system.

| P no.  | Type      | Name           | Default setting    | Unit |
|--------|-----------|----------------|--------------------|------|
| P420:1 | I/O Setup | Relay function | 51: Ready to run   | –    |
| P420:2 | I/O Setup | DO1 function   | 115: Holding brake | –    |

### Analog input 1 for speed setpoint

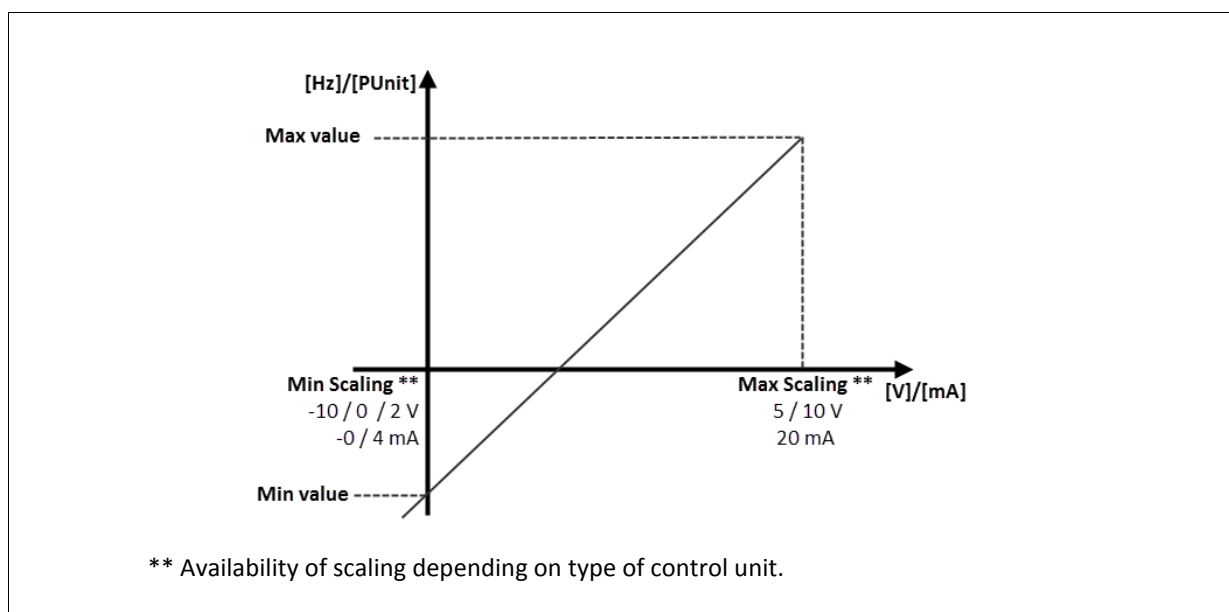


Fig. 14: Speed setpoint

If you have defined the AI1 as your speed setpoint define the correct input scaling.

| P no.  | Type      | Name                | Default setting               | Unit |
|--------|-----------|---------------------|-------------------------------|------|
| P430:1 | I/O Setup | AI1 configuration   | 0: 0...10VDC                  | –    |
| P430:2 | I/O Setup | AI1 frequency @ min | 0.0                           | Hz   |
| P430:3 | I/O Setup | AI1 frequency @ max | 50.0/60.0 *Typecode dependent | Hz   |

## 5 Commissioning

### General parameter setup (Favorites)

---

#### Analog output 1

Analog output can be used as a feedback for your control system. Select the correct scaling and range (See Fig. 14 for Scaling):

| P no.  | Type      | Name               | Default setting | Unit |
|--------|-----------|--------------------|-----------------|------|
| P440:1 | I/O Setup | AO1 configuration  | 1: 0...10VDC    | –    |
| P440:2 | I/O Setup | AO1 function       | 1: Output freq. | –    |
| P440:3 | I/O Setup | AO1 function @ min | 0               | –    |
| P440:4 | I/O Setup | AO1 function @ max | 1000            | –    |

#### Preset frequency

Define your basic preset frequency if required:

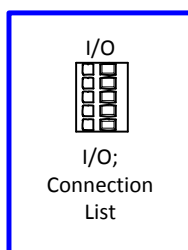
| P no.  | Type      | Name      | Default setting               | Unit |
|--------|-----------|-----------|-------------------------------|------|
| P450:1 | I/O Setup | Preset 01 | 20.0                          | Hz   |
| P450:2 | I/O Setup | Preset 02 | 40.0                          | Hz   |
| P450:3 | I/O Setup | Preset 03 | 50.0/60.0 *Typecode dependent | Hz   |
| P450:4 | I/O Setup | Preset 04 | 0.0                           | Hz   |

## 6 Function & parameter description

### 6.1 Parameter / function overview

The i500 series is a multipurpose inverter with a various amount of functionalities. For fast and easy commissioning the parameters are grouped. The group 0 “Favorites” contains a link to the most common used parameters. The following graphic shows an overview over the functionalities and where they can be programmed. For detailed information see the corresponding chapter.

#### Control / Setpoint Sources



#### Inverter Parameters

##### Favorites (Group 0)

- Access most important parameters

##### Diagnostics (Group 1)

##### Basic Setup (Group 2)

- Control selection
- Start/Stop configuration
- Max/Min Frequency
- Acc/Dcc time
- QSP deceleration time

##### Motor Control (Group 3)

- VFC controller setup
- SLVC controller setup
- Motor parameter
- Motor supervision
- Skip frequency

##### I/O Setup (Group 4)

- Digital IOs
- Analog IOs
- Preset setpoints

##### Fieldbus Setup (Group 5)

- Fieldbus setup
- Network mapping

##### Process Controller (Group 6)

- Controller setup
- PID Alarms
- Pump sleep/rinse mode

##### Auxiliary Functions (Group 7)

- Keypad Setup
- Brake control
- Brake energy management
- Flying start
- User group
- Parameter set
- Fault reaction
- Access control

#### Motor / Operation



Motor



Motor Brake



Feedback PID (optional)

Additional in i550:



HTL Encoder



PTC



Brake transistor

## 6 Function & parameter description

### Parameter / function overview

Every parameter has a hexadecimal index number. Parameters which are visible on the keypad have also a parameter number. In the Easy starter the parameter number and the hexadecimal index are visible. Every parameter can have subindex.

| Example        | Parameter number | Index      |
|----------------|------------------|------------|
| Base Frequency | P303.02          | 0x2B01:002 |
| Control select | P200.00          | 0x2824:000 |

| Parameter number               | Index    | Subindex                     |  |      |     |
|--------------------------------|----------|------------------------------|--|------|-----|
| P510:1                         | 0x23A1:1 | IP address (*)               |  | 1550 | R/V |
| -- ... [192.168.124.16] ... -- |          | EtherNet/IP address settings |  |      |     |

Parameters which are not visible on the keypad are marked in the manual as P (Without number)

Parameters or selections with marking (\*) are not available on all control unit types.

Example:

|                                |          |                              |      |
|--------------------------------|----------|------------------------------|------|
| P510:1                         | 0x23A1:1 | IP address (*)               | I550 |
| -- ... [192.168.124.16] ... -- |          | EtherNet/IP address settings |      |

## 6.2 Control concept

### 6.2.1 Setpoint structure / operation mode

The i500 can be used for various applications. The graphic below gives an overview for the operation modes and the setpoint structure.

#### Modes of Operation

In general the inverter has 2 modes of operation:

- Lenze velocity mode (PID optionally)
- Velocity mode (CiA402)

#### Setpoint source

First of all the setpoint depends on the selected operation mode (P301:0). Every mode has a default setpoint source (P201:1, P201:2, P201:3). This default setpoint source applies if no other source is selected. In the connection list (P400:15 to 400:21). On the list below the priority of the different source signals can be seen.



See chapter "6.4.2 Default setpoint", on page 50  
See chapter "6.6.2 Setpoint selection", on page 73



The actual control setpoint source can be seen in P125:2

#### Setpoint Priority:

The priority of the setpoint is according the following list:

| Flexible or Keypad control<br>(P400:37 Network Enable= False)                                                                                                                                                                                                                     | Network mode<br>(P400:37 Network Enable= TRUE)                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>1. Trigger for Setpoint Source (Connection List)</b><br><b>P400:14 – P400:25</b><br>In order of the selected trigger <ol style="list-style-type: none"> <li>1: Constant TRUE</li> <li>11: Digital Input 1</li> <li>12: Digital Input 2</li> <li>13: Digital Input 3</li> </ol> | <b>1. Setpoint/Network setpoint controlled with:</b><br>AC Drive Control Word<br>C135 Control Word<br>NETWordIN1 |
| <b>2. Default setpoint source</b><br><b>Frequency P201:1 (0x2860:1)</b><br><b>PID P201:2 (0x2860:2)</b>                                                                                                                                                                           | <b>2. Default setpoint source</b><br><b>Frequency P201:1 (0x2860:1)</b><br><b>PID P201:2 (0x2860:2)</b>          |

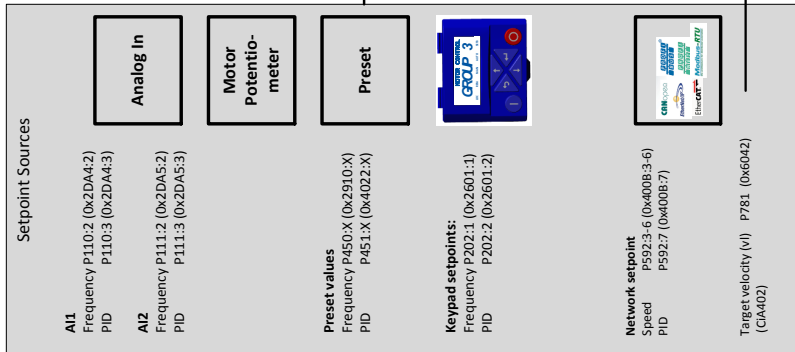


In Network mode (P400:37 = TRUE) the triggers P400:14 – P400:25 are not active.

To select the network as setpoint source in network mode (P400:37 = TRUE) use the "Default setpoint source" (P201:1-2) or the corresponding control bits (AC Drive Control Word, C135 Control Word, NETWordIN1).

### Control concept

**Active setpoint source**  
**P125:2 (0x28B:2)**



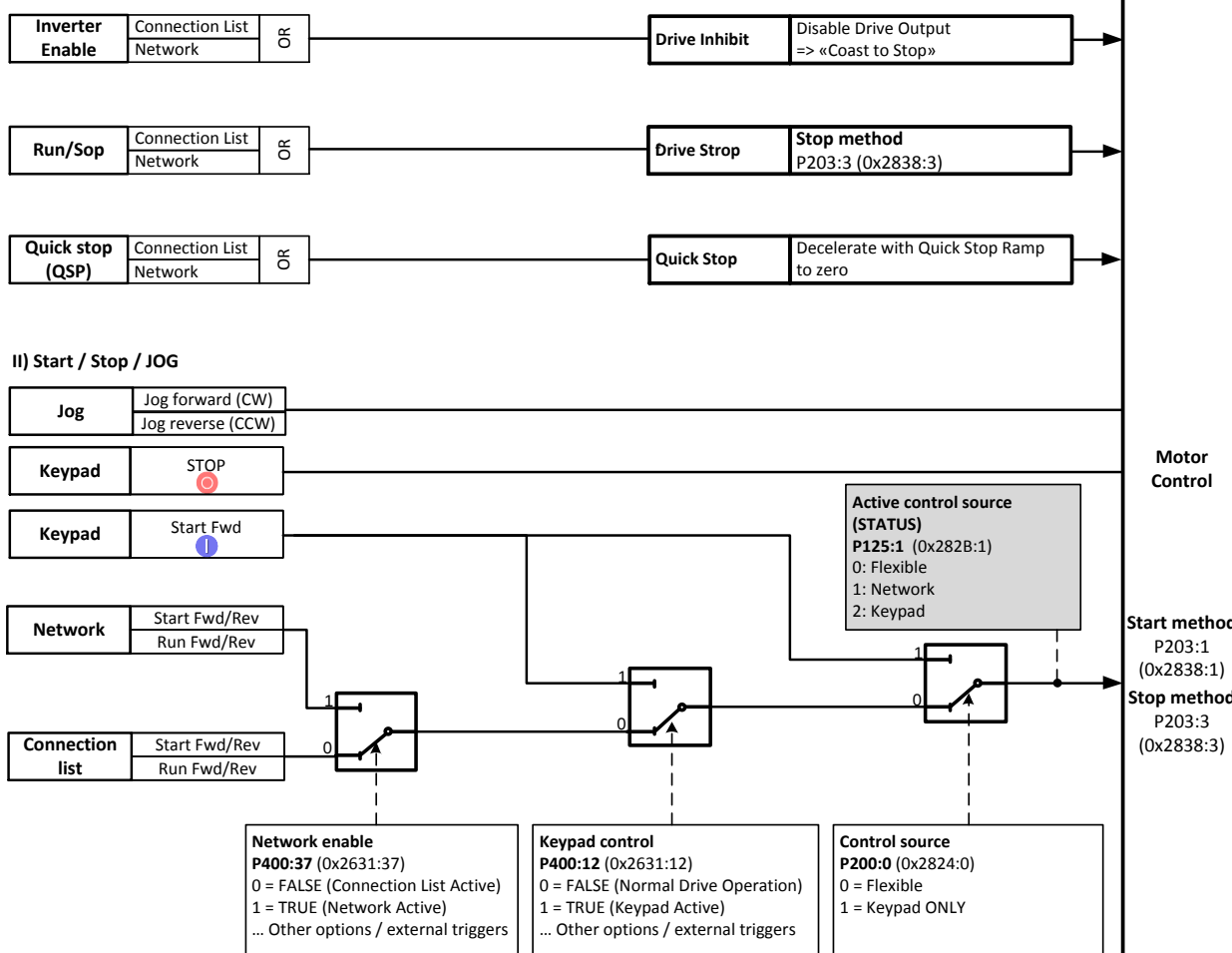
## 6 Function & parameter description

### Control concept

#### 6.2.2 Control Source

The i500 can be controlled from various locations like digital IO's, keypad or network. The following graphic gives an overview of the parameters and their influence.

##### I) Inverter Enable / Run/Stop / Quick Stop



The actual control source can be seen in P125:1

## 6 Function & parameter description

### Control concept

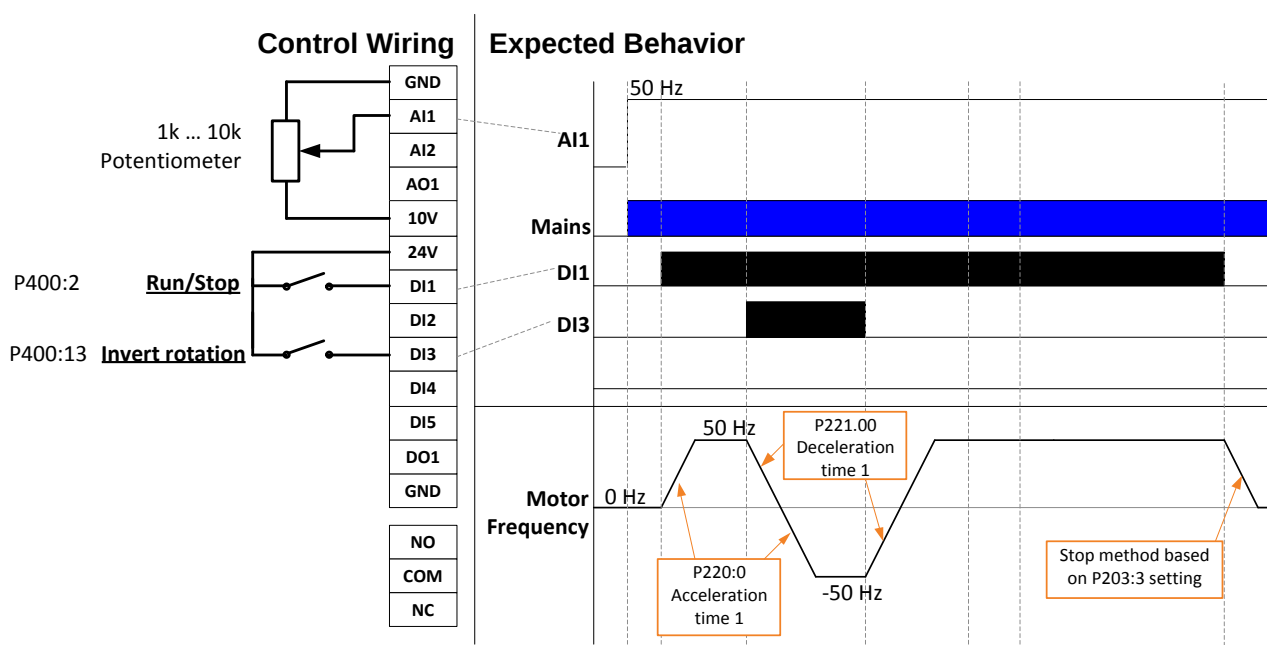
### 6.2.3 Control examples

The inverter can be configured with different Run/Start/Stop signals. The following 3 examples show the most commonly used signals with the corresponding parameters and a signal flow chart which explains in detail the behavior of the inverter.

#### Run/Stop (One Signal)

- Using one signal **Run/Stop** to start and stop the inverter. **Run/Stop** Level High will start the inverter, Level Low will stop the inverter according to the selected stop method (P203:3)
- Invert Rotation** Level High will change the motor direction

| Parameter | Parameter Name      | Default LENZE Setting |
|-----------|---------------------|-----------------------|
| P400:1    | Inverter enable     | 1: Constant TRUE      |
| P400:2    | Run/Stop            | 11: Digital input 1   |
| P400:3    | Quick stop          | 0: Not connected      |
| P400:6    | Start forward (CW)  | 0: Not connected      |
| P400:7    | Start reverse (CCW) | 0: Not connected      |
| P400:8    | Run forward (CW)    | 0: Not connected      |
| P400:9    | Run reverse (CCW)   | 0: Not connected      |
| P400:13   | Invert rotation     | 13: Digital input 3   |



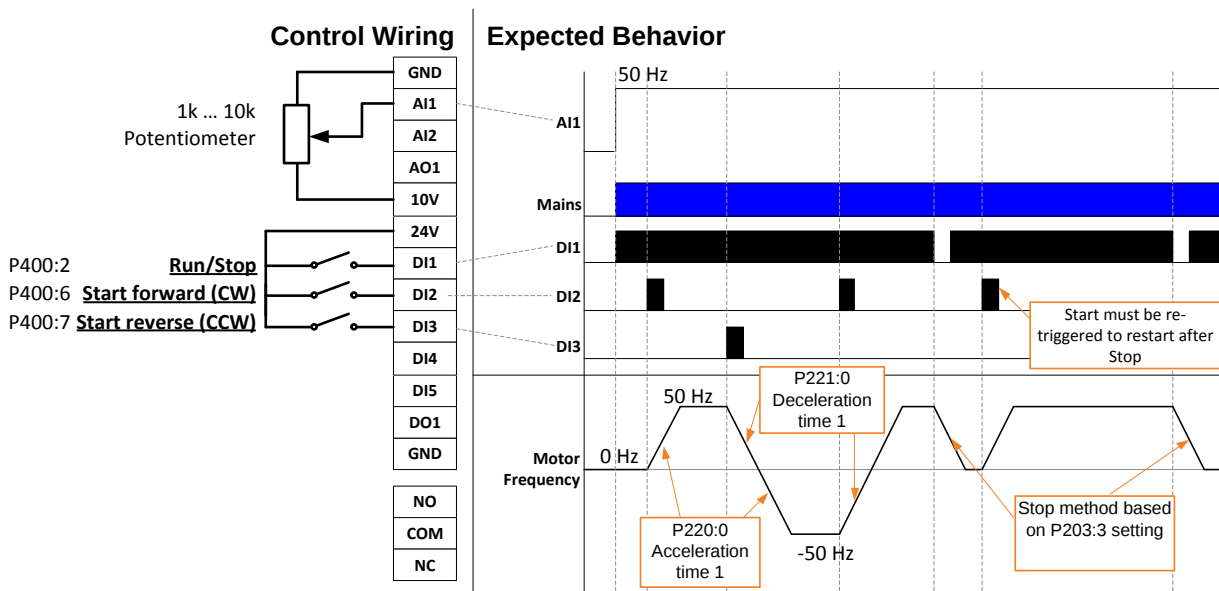
## 6 Function & parameter description

### Control concept

#### Start forward/reverse (Rising Edge triggered Signals)

- Start using flag triggered signals **Start forward (CW)** and **Start reverse (CCW)**
- Run/Stop** Level LOW will stop the inverter according to the selected stop method (P203:3)

| Parameter | Parameter Name      | Setting for this example |
|-----------|---------------------|--------------------------|
| P400:1    | Inverter enable     | 1: Constant TRUE         |
| P400:2    | Run/Stop            | 11: Digital input 1      |
| P400:3    | Quick stop          | 0: Not connected         |
| P400:6    | Start forward (CW)  | 12: Digital input 2      |
| P400:7    | Start reverse (CCW) | 13: Digital input 3      |
| P400:8    | Run forward (CW)    | 0: Not connected         |
| P400:9    | Run reverse (CCW)   | 0: Not connected         |
| P400:13   | Invert rotation     | 0: Not connected         |



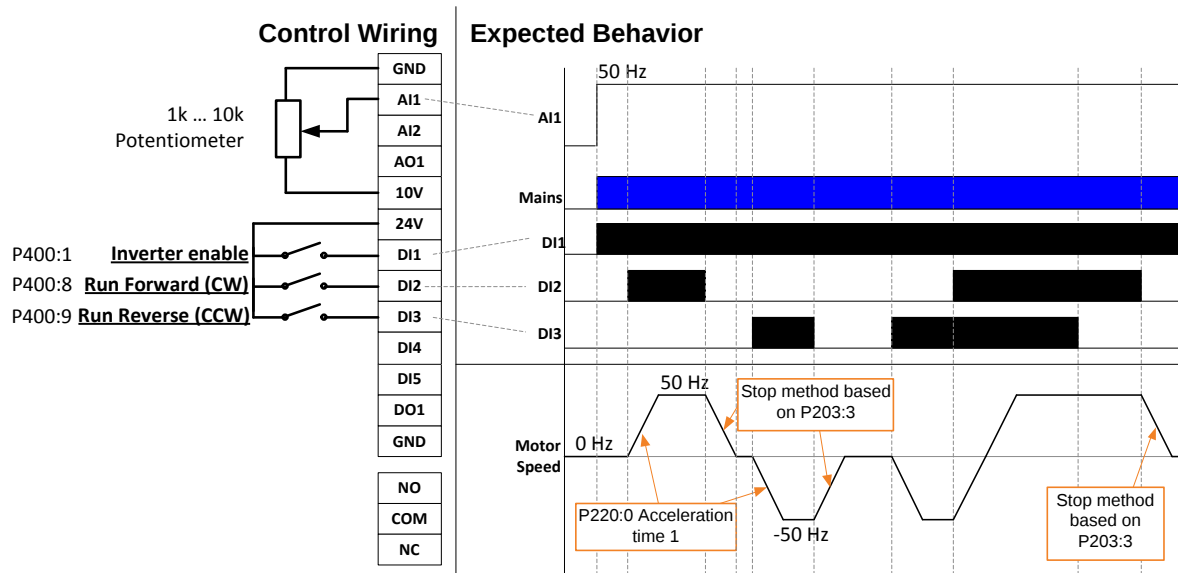
## 6 Function & parameter description

### Control concept

#### Run Forward/Reverse (Steady Signals)

- Start using steady signals **Run Forward (CW)** and **Run Reverse (CCW)**. If no Run command is active the motor will stop according the selected stop method (P203:3)
- Inverter enable** Level Low will stop the inverter with a coast stop.

| Parameter | Parameter Name      | Setting for this example |
|-----------|---------------------|--------------------------|
| P400:1    | Inverter enable     | 11: Digital input 1      |
| P400:2    | Run/Stop            | 1: Constant TRUE         |
| P400:3    | Quick stop          | 0: Not connected         |
| P400:6    | Start forward (CW)  | 0: Not connected         |
| P400:7    | Start reverse (CCW) | 0: Not connected         |
| P400:8    | Run forward (CW)    | 12: Digital input 2      |
| P400:9    | Run reverse (CCW)   | 13: Digital input 3      |
| P400:13   | Invert rotation     | 0: Not connected         |



#### 6.2.4 Rotation direction

The rotation of the motor depends on different parameters.

- **Commands Forward/Reverse**

The reverse commands invert the setpoint (Multiplied by factor -1).

Exception: If the input is bidirectional (-10V ... +10V), the direction Forward/Reverse of the Start and Run are ignored

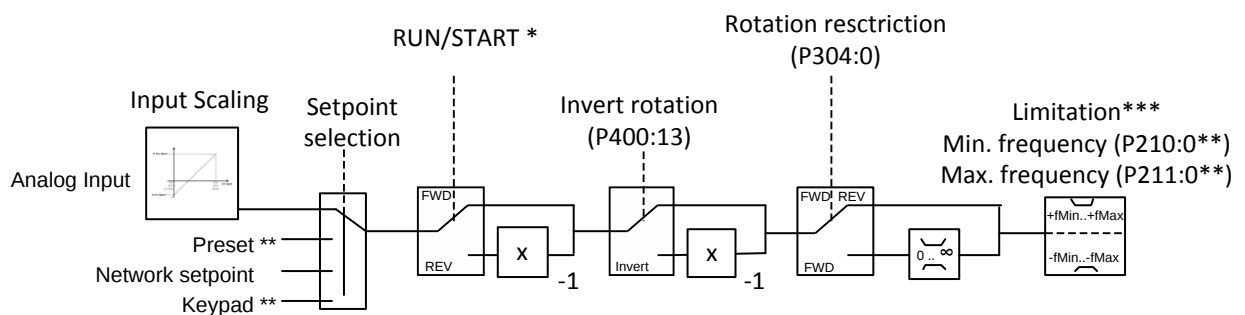
- **Invert rotation**

The function "Invert rotation" inverts the speed setpoint (Multiplied by factor -1)

- **Rotation restriction**

The rotation can be restricted to forward. Negative set points will be ignored.

The following graphic shows an overview of the rotation direction:



Note:

\* If the input is bidirectional (-10V..10V), the direction FWD/REV of the Start and Run are ignored

\*\* Only positive value can be entered

\*\*\*Direction changes only if speedsetpoint is higher than fmin!

## 6.3 Group 1 – Diagnostics

### General:

Bit coded status words are displayed on the keypad as described in the following picture:

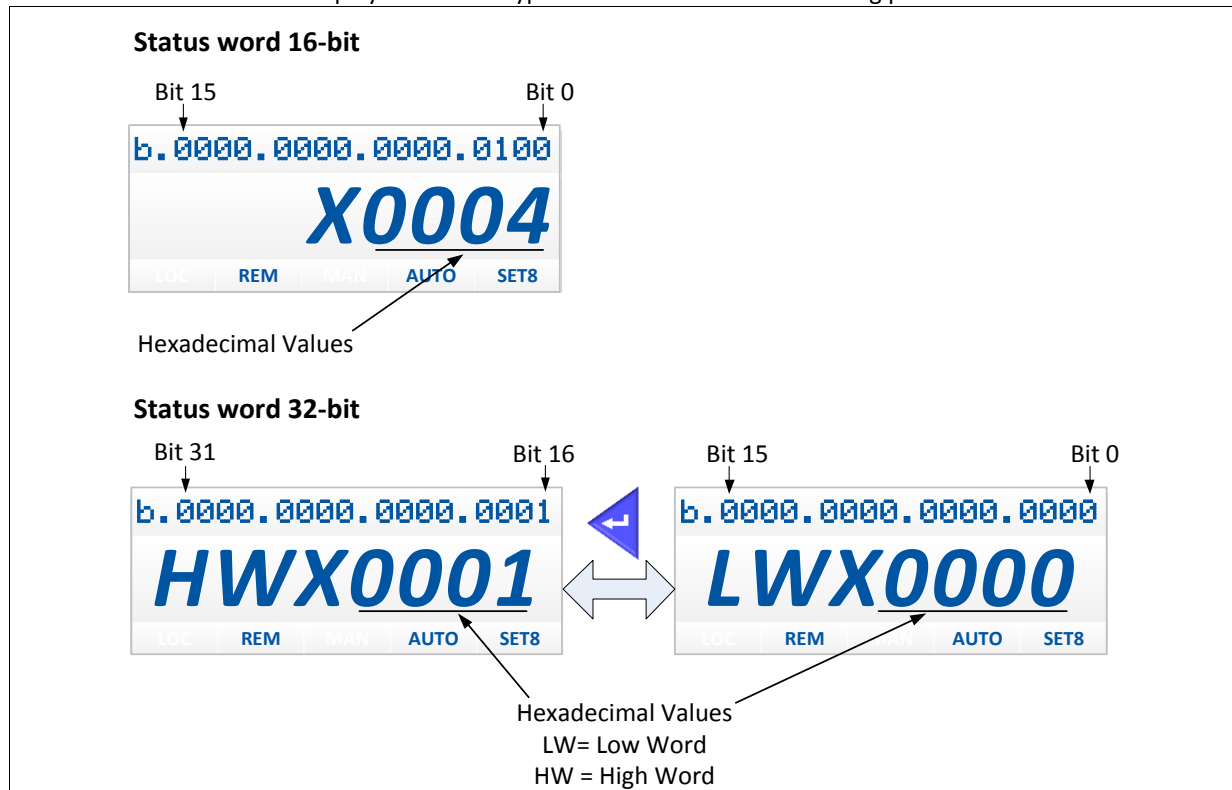


Fig. 15: Display of bit coded status word on keypad

### 6.3.1 General Diagnostic Data

| P100:0                             | 0x2DDD:0 | Actual frequency                                                                | i510 | i550 | R |
|------------------------------------|----------|---------------------------------------------------------------------------------|------|------|---|
| -- ... [Actual value] ... -- Hz    |          | Actual motor frequency                                                          |      |      |   |
| P101:0                             | 0x400D:0 | Scaled actual value                                                             | i510 | i550 | R |
| -- ... [Actual value] ... -- Units |          | Actual motor speed in user units.<br>Actual frequency x Scaling factor (P702:0) |      |      |   |
| P102:0                             | 0x2B0E:0 | Frequency setpoint                                                              | i510 | i550 | R |
| -- ... [Actual value] ... -- Hz    |          | Actual frequency setpoint                                                       |      |      |   |
| P103:0                             | 0x6078:0 | Actual motor current                                                            | i510 | i550 | R |
| -- ... [Actual value] ... -- %     |          | Actual motor current in % of P323:0                                             |      |      |   |
| P104:0                             | 0x2D88:0 | Actual motor current                                                            | i510 | i550 | R |
| -- ... [Actual value] ... -- A     |          | Actual motor current                                                            |      |      |   |
| P105:0                             | 0x2D87:0 | DC-bus voltage                                                                  | i510 | i550 | R |
| -- ... [Actual value] ... -- V     |          | Actual DC-Link voltage                                                          |      |      |   |
| P106:0                             | 0x2D89:0 | Actual motor voltage                                                            | i510 | i550 | R |
| -- ... [Actual value] ... -- VAC   |          | Actual motor voltage                                                            |      |      |   |
| P107:0                             | 0x6077:0 | Actual torque                                                                   | i510 | i550 | R |
| -- ... [Actual value] ... -- %     |          | Actual motor torque (100% = Max. torque)                                        |      |      |   |

### 6.3.2 Output Power

|                                  |                 |                              |             |             |          |
|----------------------------------|-----------------|------------------------------|-------------|-------------|----------|
| <b>P108:1</b>                    | <b>0x2DA2:1</b> | <b>Effective power</b>       | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- kW  |                 | Actual motor effective power |             |             |          |
| <b>P108:2</b>                    | <b>0x2DA2:2</b> | <b>Apparent power</b>        | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- kVA |                 | Actual motor apparent power  |             |             |          |

### 6.3.3 Output Energy

|                                  |                 |                                                                         |             |             |          |
|----------------------------------|-----------------|-------------------------------------------------------------------------|-------------|-------------|----------|
| <b>P109:1</b>                    | <b>0x2DA3:1</b> | <b>Motor</b>                                                            | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- kWh |                 | Estimated energy at the inverter output when the motor is being driven. |             |             |          |
| <b>P109:2</b>                    | <b>0x2DA3:2</b> | <b>Generator</b>                                                        | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- kWh |                 | Estimated energy at the inverter output when the motor is regenerating. |             |             |          |

### 6.3.4 Analog Input 1 Diagnosis

|                                    |                  |                                                      |             |             |          |
|------------------------------------|------------------|------------------------------------------------------|-------------|-------------|----------|
| <b>P110:1</b>                      | <b>0x2DA4:1</b>  | <b>Percent value</b>                                 | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- %     |                  | Actual value of AI1 in % of the selected input range |             |             |          |
| <b>P110:2</b>                      | <b>0x2DA4:2</b>  | <b>Frequency value</b>                               | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- Hz    |                  | Actual value of AI1 as frequency setpoint            |             |             |          |
| <b>P110:3</b>                      | <b>0x2DA4:3</b>  | <b>Process controller value</b>                      | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- PUnit |                  | Actual value of AI1 as PID input                     |             |             |          |
| <b>P110:4</b>                      | <b>0x2DA4:4</b>  | <b>Torque value</b>                                  | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- %     |                  | Actual value of AI1 as torque setpoint               |             |             |          |
| <b>P110:16</b>                     | <b>0x2DA4:16</b> | <b>Status analog input 1</b>                         | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --       |                  | Bit coded status of AI1                              |             |             |          |

### 6.3.5 Analog Input 2 Diagnosis

|                                    |                  |                                                      |             |             |          |
|------------------------------------|------------------|------------------------------------------------------|-------------|-------------|----------|
| <b>P111:1</b>                      | <b>0x2DA5:1</b>  | <b>Percent value</b>                                 | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- %     |                  | Actual value of AI2 in % of the selected input range |             |             |          |
| <b>P111:2</b>                      | <b>0x2DA5:2</b>  | <b>Frequency value</b>                               | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- Hz    |                  | Actual value of AI2 as frequency setpoint            |             |             |          |
| <b>P111:3</b>                      | <b>0x2DA5:3</b>  | <b>Process controller value</b>                      | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- PUnit |                  | Actual value of AI2 as PID input                     |             |             |          |
| <b>P111:4</b>                      | <b>0x2DA5:4</b>  | <b>Torque value</b>                                  | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- %     |                  | Actual value of AI2 as torque setpoint               |             |             |          |
| <b>P111:16</b>                     | <b>0x2DA5:16</b> | <b>Status analog input 2</b>                         | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --       |                  | Bit coded status of AI2                              |             |             |          |

### 6.3.6 Analog Output 1 Value

|                                 |                 |                              |             |             |          |
|---------------------------------|-----------------|------------------------------|-------------|-------------|----------|
| <b>P112:1</b>                   | <b>0x2DAA:1</b> | <b>Voltage</b>               | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- V  |                 | Actual output voltage of A01 |             |             |          |
| <b>P112:2</b>                   | <b>0x2DAA:2</b> | <b>Current</b>               | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- mA |                 | Actual output current of A01 |             |             |          |

## 6 Function & parameter description

### Group 1 – Diagnostics

#### 6.3.7 Analog Output 2 Value

| P113:1                          | 0x2DAB:1 | Voltage (*)                  |  | i550 | R |
|---------------------------------|----------|------------------------------|--|------|---|
| -- ... [Actual value] ... -- V  |          | Actual output voltage of A02 |  |      |   |
| P113:2                          | 0x2DAB:2 | Current (*)                  |  | i550 | R |
| -- ... [Actual value] ... -- mA |          | Actual output current of A02 |  |      |   |

#### 6.3.8 Heatsink temperature

| P117:1                          | 0x2D84:1 | Heatsink temperature        | i510 | i550 | R |
|---------------------------------|----------|-----------------------------|------|------|---|
| -- ... [Actual value] ... -- °C |          | Actual heatsink temperature |      |      |   |

#### 6.3.9 I/O Status

| P118:0                                                                                                                                                                                                                                                                     | 0x60FD:0 | Digital inputs status                                                                                     | i510 | i550 | R |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------|------|------|---|
| Bit # description:<br>16: Level at digital input 1<br>17: Level at digital input 2<br>18: Level at digital input 3<br>19: Level at digital input 4<br>20: Level at digital input 5<br>21: Level at digital input 6<br>22: Level at digital input 7<br>25: Low active - NPN |          | Status of digital input (Bit coded)<br>Display toggles between LWX/HWX<br>LWX Bit 0-15<br>HWX Bit 16 - 31 |      |      |   |
| P119:0                                                                                                                                                                                                                                                                     | 0x2DAC:0 | Keypad status                                                                                             | i510 | i550 | R |
| Bit # description:<br>0: Start Key<br>1: Stop Key<br>2: Up Key<br>3: Down Key<br>4: Enter Key<br>5: Escape Key                                                                                                                                                             |          | Keypad status (Bit coded)                                                                                 |      |      |   |
| P120:0                                                                                                                                                                                                                                                                     | 0x2DAD:0 | Digital outputs status                                                                                    | i510 | i550 | R |
| Bit # description:<br>0: Relay<br>1: Digital output 1<br>2: Digital output 2<br>10: Charge Relay                                                                                                                                                                           |          | Status of digital outputs and relay (Bit coded)                                                           |      |      |   |

#### 6.3.10 Process Controller Diagnosis

| P121:1                                                                                                   | 0x401F:1 | PID setpoint           | i510 | i550 | R |
|----------------------------------------------------------------------------------------------------------|----------|------------------------|------|------|---|
| -- ... [Actual value] ... -- PUnit                                                                       |          | Actual PID setpoint    |      |      |   |
| P121:2                                                                                                   | 0x401F:2 | PID feedback           | i510 | i550 | R |
| -- ... [Actual value] ... -- PUnit                                                                       |          | Actual PID feedback    |      |      |   |
| P121:3                                                                                                   | 0x401F:3 | Status (PID)           | i510 | i550 | R |
| Bit # description:<br>0: Process controller off<br>1: PID output set to 0<br>2: PID I-component set to 0 |          | PID status (Bit coded) |      |      |   |

## 6 Function & parameter description

### Group 1 – Diagnostics

|                                                                             |  |
|-----------------------------------------------------------------------------|--|
| 3: PID influence shown<br>4: Setpoint = actual value<br>5: Sleepmode active |  |
|-----------------------------------------------------------------------------|--|

#### 6.3.11 Motor protection i2xt

| P123:0                         | 0x2D4F:0 | Motor utilisation (i <sup>2</sup> *t)   | i510 | i550 | R |
|--------------------------------|----------|-----------------------------------------|------|------|---|
| -- ... [Actual value] ... -- % |          | Actual thermal load of the motor (I2xt) |      |      |   |

#### 6.3.12 Control / Setpoint Source

| P125:1                       | 0x282B:1 | Active control source                                                                                                                                                                                | i510 | i550 | R |
|------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|---|
| -- ... [Actual value] ... -- |          | Actual active control source                                                                                                                                                                         |      |      |   |
| P125:2                       | 0x282B:2 | Active setpoint source                                                                                                                                                                               | i510 | i550 | R |
| -- ... [Actual value] ... -- |          | Actual active setpoint source                                                                                                                                                                        |      |      |   |
| P125:3                       | 0x282B:3 | LCD icon states                                                                                                                                                                                      | i510 | i550 | R |
| -- ... [Actual value] ... -- |          | Actual status of LCD (Bit coded)                                                                                                                                                                     |      |      |   |
| P125:4                       | 0x282B:4 | Active drive mode                                                                                                                                                                                    | i510 | i550 | R |
| -- ... [Actual value] ... -- |          | Actual drive mode                                                                                                                                                                                    |      |      |   |
| P125:5                       | 0x282B:5 | Actual control register                                                                                                                                                                              | i510 | i550 | R |
| -- ... [Actual value] ... -- |          | Network Mode:<br>Last active control register. Parameter Index is shown as hex code:<br>Format: 0xiiii00 (iiii = Index hexadecimal, ss = Subindex hexadecimal)<br>Example: 0x400C0100 --> 0x400C:01  |      |      |   |
| P125:6                       | 0x282B:6 | Actual setpoint register                                                                                                                                                                             | i510 | i550 | R |
| -- ... [Actual value] ... -- |          | Network Mode:<br>Last active setpoint register. Parameter Index is shown as hex code:<br>Format: 0xiiii00 (iiii = Index hexadecimal, ss = Subindex hexadecimal)<br>Example: 0x400B0300 --> 0x400B:03 |      |      |   |

#### 6.3.13 Inverter status

| P126:1                                                                                                                                                                                                                                                                                   | 0x282A:1 | Cause of disable                     | i510 | i550 | R |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------|------|------|---|
| Bit # description:<br>0: Flexible I/O: Inhibit<br>1: Network inhibit<br>2: Axis inhibit<br>6: DC bus voltage<br>7: Drive not ready<br>9: Motor parameter ident<br>10: Auto brake<br>12: CiA 402 disabled<br>13: CiA402 Quick stop inhibit<br>14: STO inhibit<br>15: CiA402 mode disabled |          | Cause of controller stop (Bit coded) |      |      |   |
| P126:2                                                                                                                                                                                                                                                                                   | 0x282A:2 | Cause of quick stop                  | i510 | i550 | R |
| Bit # description:<br>0: Flexible I/O: configuration<br>1: Network<br>2: Axis command                                                                                                                                                                                                    |          | Cause of quick stop (Bit coded)      |      |      |   |

## 6 Function & parameter description

### Group 1 – Diagnostics

| P126:3                                                                                                                                                                                                                                          | 0x282A:3 | Cause of stop             | i510 | i550 | R |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------|------|------|---|
| Bit # description:<br>0: Flexible I/O: Run/Stop<br>1: Flexible I/O: Run CW<br>2: Flexible I/O: Run CCW<br>3: Flexible I/O: Jog CW<br>4: Flexible I/O: Jog CCW<br>5: Network<br>6: Keypad<br>7: Control mode transition<br>15: Waiting for start |          | Cause of stop (Bit coded) |      |      |   |
| P126:5                                                                                                                                                                                                                                          | 0x282A:5 | CiA402 state machine      | i510 | i550 | R |
| 0: Initial<br>2: Not Ready to Switch On<br>3: Switch On Disabled<br>4: Ready to Switch On<br>5: Switched on<br>6: Operation enable<br>7: Disable Operation<br>8: Shut Down<br>9: Quick stop active<br>10: Fault reaction active<br>11: Fault    |          | Actual state of inverter  |      |      |   |

#### 6.3.14 Device utilization (ixt)

| P135:4                         | 0x2D40:4 | Device utilisation (i*t)                 | i510 | i550 | R   |
|--------------------------------|----------|------------------------------------------|------|------|-----|
| -- ... [Actual value] ... -- % |          | Actual inverter utilization              |      |      |     |
| P135:5                         | 0x2D40:5 | Device utilisation (i*t): Error response | i510 | i550 | R/W |
| 2: Trouble<br>3: Error         |          | Configuration of ixt error response      |      |      |     |

#### 6.3.15 Error code

| P150:0                       | 0x603F:0 | Error code                                                                       | i510 | i550 | R |
|------------------------------|----------|----------------------------------------------------------------------------------|------|------|---|
| -- ... [Actual value] ... -- |          | Actual pending error code.<br>See chapter "Troubleshooting" for code explanation |      |      |   |

#### 6.3.16 Timer / Counter

On the keypad timers are displayed in the following format:

Days (d), Hours (h), Minutes (m), Seconds (s) (Example: 05d15h13m12s)

| P151:1                          | 0x2D81:1 | Operating time                                                                                                         | i510 | i550 | R |
|---------------------------------|----------|------------------------------------------------------------------------------------------------------------------------|------|------|---|
| -- ... [Actual value] ... -- s  |          | Total operating time of inverter (Inverter released)                                                                   |      |      |   |
| P151:2                          | 0x2D81:2 | Power-on time                                                                                                          | i510 | i550 | R |
| -- ... [Actual value] ... -- s  |          | Total time that inverter was powered on                                                                                |      |      |   |
| P151:3                          | 0x2D81:3 | Control unit operating time                                                                                            | i510 | i550 | R |
| -- ... [Actual value] ... -- ns |          | Total time that control unit was powered on. It includes the time where the control section is powered by USB adapter. |      |      |   |

## 6 Function & parameter description

### Group 1 – Diagnostics

|                                |                 |                                          |             |             |          |
|--------------------------------|-----------------|------------------------------------------|-------------|-------------|----------|
| <b>P151:4</b>                  | <b>0x2D81:4</b> | <b>Main Switching Cycles</b>             | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --   |                 | Total number of power cycles             |             |             |          |
| <b>P151:5</b>                  | <b>0x2D81:5</b> | <b>Relay switching cycles</b>            | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --   |                 | Total number of relay switchings         |             |             |          |
| <b>P151:6</b>                  | <b>0x2D81:6</b> | <b>Short-circuit counter</b>             | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --   |                 | Total number of short circuit detections |             |             |          |
| <b>P151:7</b>                  | <b>0x2D81:7</b> | <b>Earth fault counter</b>               | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --   |                 | Total number of earth faults             |             |             |          |
| <b>P151:8</b>                  | <b>0x2D81:8</b> | <b>Clamp counter</b>                     | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... --   |                 | Total number of active clamping          |             |             |          |
| <b>P151:9</b>                  | <b>0x2D81:9</b> | <b>Fan operating time</b>                | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- s |                 | Total time of running fan.               |             |             |          |

### 6.3.17 History Buffer

|                              |                 |                               |             |             |          |
|------------------------------|-----------------|-------------------------------|-------------|-------------|----------|
| <b>P155:0</b>                | <b>0x2006:0</b> | <b>Error history buffer</b>   | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                 | See chapter "Troubleshooting" |             |             |          |

### 6.3.18 Device data

|                              |                  |                                                                                                                                                                            |             |             |          |
|------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|----------|
| <b>P190:1</b>                | <b>0x2000:1</b>  | <b>Product code</b>                                                                                                                                                        | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Product code of complete inverter<br>Example: I55AE222D10V10017S<br>(If control unit and power unit were ordered separately it will indicate<br>XXXXXXXXXXXXXXXXXXXX)      |             |             |          |
| <b>P190:2</b>                | <b>0x2000:2</b>  | <b>Serial number</b>                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Serial number of complete inverter<br>Example: 0000000000000000XYZXYZ<br>(If control unit and power unit were ordered separately it will indicate<br>XXXXXXXXXXXXXXXXXXXX) |             |             |          |
| <b>P190:4</b>                | <b>0x2000:4</b>  | <b>Ctrl unit firmware version</b>                                                                                                                                          | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: 01.00.01.00                                                                                                                                                       |             |             |          |
| <b>P190:5</b>                | <b>0x2000:5</b>  | <b>Control unit - firmware type</b>                                                                                                                                        | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: IOFW51AC10                                                                                                                                                        |             |             |          |
| <b>P190:6</b>                | <b>0x2000:6</b>  | <b>Ctrl unit bootloader version</b>                                                                                                                                        | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: 00.00.00.13                                                                                                                                                       |             |             |          |
| <b>P190:7</b>                | <b>0x2000:7</b>  | <b>Control unit- bootloader type</b>                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: IOBL51AOnn                                                                                                                                                        |             |             |          |
| <b>P190:8</b>                | <b>0x2000:8</b>  | <b>Object directory version</b>                                                                                                                                            | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: 108478                                                                                                                                                            |             |             |          |
| <b>P190:10</b>               | <b>0x2000:10</b> | <b>Power unit- firmware version</b>                                                                                                                                        | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: 00196                                                                                                                                                             |             |             |          |
| <b>P190:11</b>               | <b>0x2000:11</b> | <b>Power unit - firmware type</b>                                                                                                                                          | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  | Example: IDFW5AA                                                                                                                                                           |             |             |          |
| <b>P190:12</b>               | <b>0x2000:12</b> | <b>Power Unit bootloader vers.</b>                                                                                                                                         | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  |                                                                                                                                                                            |             |             |          |

## 6 Function & parameter description

### Group 2 – Basic setup

|                              |                  |                                     |             |             |          |
|------------------------------|------------------|-------------------------------------|-------------|-------------|----------|
| <b>P190:13</b>               | <b>0x2000:13</b> | <b>Power unit - bootloader type</b> | <b>i510</b> | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                  |                                     |             |             |          |

#### 6.3.19 Device Name

|                           |                 |                               |             |             |            |
|---------------------------|-----------------|-------------------------------|-------------|-------------|------------|
| <b>P191:0</b>             | <b>0x2001:0</b> | <b>Device name</b>            | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -- ... [My Device] ... -- |                 | Configurable name of inverter |             |             |            |

#### 6.3.20 Device Module

|                              |                 |                                                          |  |             |          |
|------------------------------|-----------------|----------------------------------------------------------|--|-------------|----------|
| <b>P192:4</b>                | <b>0x2002:4</b> | <b>Control unit - type code</b>                          |  | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                 | Type code of control unit<br>Example: I5CA500200V000000S |  |             |          |
| <b>P192:5</b>                | <b>0x2002:5</b> | <b>Power unit - product code</b>                         |  | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                 | Type code of power unit<br>Example: I5DAE222F10V1000S    |  |             |          |
| <b>P192:6</b>                | <b>0x2002:6</b> | <b>Control unit - serial number</b>                      |  | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                 |                                                          |  |             |          |
| <b>P192:7</b>                | <b>0x2002:7</b> | <b>Power unit - serial number</b>                        |  | <b>i550</b> | <b>R</b> |
| -- ... [Actual value] ... -- |                 |                                                          |  |             |          |

#### 6.3.21 Additional status

|                                                                                            |                 |                                                                                                                                                      |             |             |          |
|--------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|----------|
| <b>P197:0</b>                                                                              | <b>0x2040:0</b> | <b>Access protection status</b>                                                                                                                      | <b>i510</b> | <b>i550</b> | <b>R</b> |
| Bit # description:<br>0: Full write access protected<br>1: Write access only for favorites |                 | Actual status of access protection<br>0 = No protection<br>1 = Only read access to all parameters<br>2 = Only read & write access on favorites group |             |             |          |
| <b>P198:0</b>                                                                              | <b>0x2827:0</b> | <b>Loaded parameter status</b>                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R</b> |
| 0: User settings<br>1: Reset 60 Hz Settings<br>2: Reset 50 Hz Settings<br>3: OEM Settings  |                 | Actual loaded parameter settings                                                                                                                     |             |             |          |

## 6.4 Group 2 – Basic setup

### 6.4.1 Default control source



See chapter “6.2.1 Setpoint structure / operation mode”, page 36  
See chapter “6.2.2 Control Source”, page 38

|                                 |                 |                                                                                                                                                                                                                                                                                          |             |             |            |
|---------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
| <b>P200:0</b>                   | <b>0x2824:0</b> | <b>Control source</b>                                                                                                                                                                                                                                                                    | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0: Flexible</b><br>1: Keypad |                 | Defines the default Control Source for Start, Stop and Rotation direction.<br>The inverter can be controlled from several sources such as terminals (Digital Inputs), Fieldbus or Keypad.<br><br><b>0: Flexible Control</b><br>Start / Stop and rotation direction configured in P400.xx |             |             |            |

## 6 Function & parameter description

### Group 2 – Basic setup

|  |                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>1: Keypad</b><br/>Local or remote mounted keypad provides the start / stop commands to the inverter. Other sources for starting the inverter are ignored in this mode.</p> <p><b>NOTE:</b> Digital Input "Inverter Enable" (P400:1), "Run/Stop" (P400:2) and Keypad Stop are always active!</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 6.4.2 Default setpoint

The default setpoint selects the setpoint sources that will become active when no other setpoint is selected by any other means. The default setpoint values can come from external sources (Analog Inputs, Network, etc.) and internal sources (Presets)



See chapter 6.2.1 Setpoint structure / operation mode, page 36

| P201:1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0x2860:1 | Frequency control: Default setpoint source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | i510 | i550 | R/W |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 1: Keypad frequency setpoint<br><b>2: Analog input 1</b><br>3: Analog input 2<br>5: Network frequency setpoint<br>11: Preset frequency val. 1<br>12: Preset frequency val. 2<br>13: Preset frequency val. 3<br>14: Preset frequency val. 4<br>15: Preset frequency val. 5<br>16: Preset frequency val. 6<br>17: Preset frequency val. 7<br>18: Preset frequency val. 8<br>19: Preset frequency val. 9<br>20: Preset frequency val. 10<br>21: Preset frequency val. 11<br>22: Preset frequency val. 12<br>23: Preset frequency val. 13<br>24: Preset frequency val. 14<br>25: Preset frequency val. 15<br>50: Motor potentiometer (MOP) |          | Default Frequency setpoint<br><br><b>1: Keypad frequency setpoint</b><br>Setpoint by Up and Down buttons on the optional local or remote keypad<br><br><b>2: Analog input 1</b><br>Selects analog input 1 as default setpoint.<br><br><b>3: Analog input 2</b><br>Selects analog input 2 as default setpoint.<br><br><b>5: Network frequency setpoint</b><br>Selects the network as default setpoint<br><br><b>Frequency: 11..25: Preset val. 1..15</b><br>Selects the preset values defined in P450:1 - P450:15 as default setpoint<br><br><b>PID: 11..18: Preset setpoint 1..18</b><br>Selects the preset values defined in P451:1 - P451:8 as default setpoint<br><br><b>Torque: 11..18: Preset setpoint 1..18</b><br>Selects the preset values defined in P452:1 - P452:8 as default setpoint<br><br><b>31-38: Preset segment</b><br>Select sequencer segment setting as default setpoint<br><br><b>50: Motor potentiometer (MOP)</b><br>Default setpoint defined by MOP (Motorized potentiometer function).<br>Two digital inputs (increase/decrease) control the setpoint |      |      |     |
| P201:2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0x2860:2 | PID control : Default setpoint source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | i510 | i550 | R/W |
| <b>1: Keypad PID setpoint</b><br>(Reference see P201:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          | Default PID setpoint                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |      |     |

### 6.4.3 Keypad setpoints

| P202:1                              | 0x2601:1 | Frequency setpoint                                         | i510 | i550 | R/W |
|-------------------------------------|----------|------------------------------------------------------------|------|------|-----|
| 0.0 ... [20.0] ... 599.0 Hz         |          | Actual Keypad setpoint, defined by Up and Down buttons     |      |      |     |
| P202:2                              | 0x2601:2 | Process controller setpoint                                | i510 | i550 | R/W |
| -300.00 ... [0.00] ... 300.00 PUnit |          | Actual Keypad PID setpoint, defined by Up and Down buttons |      |      |     |

### 6.4.4 Start and Stop configuration

The motor can be started and stopped with different methods:

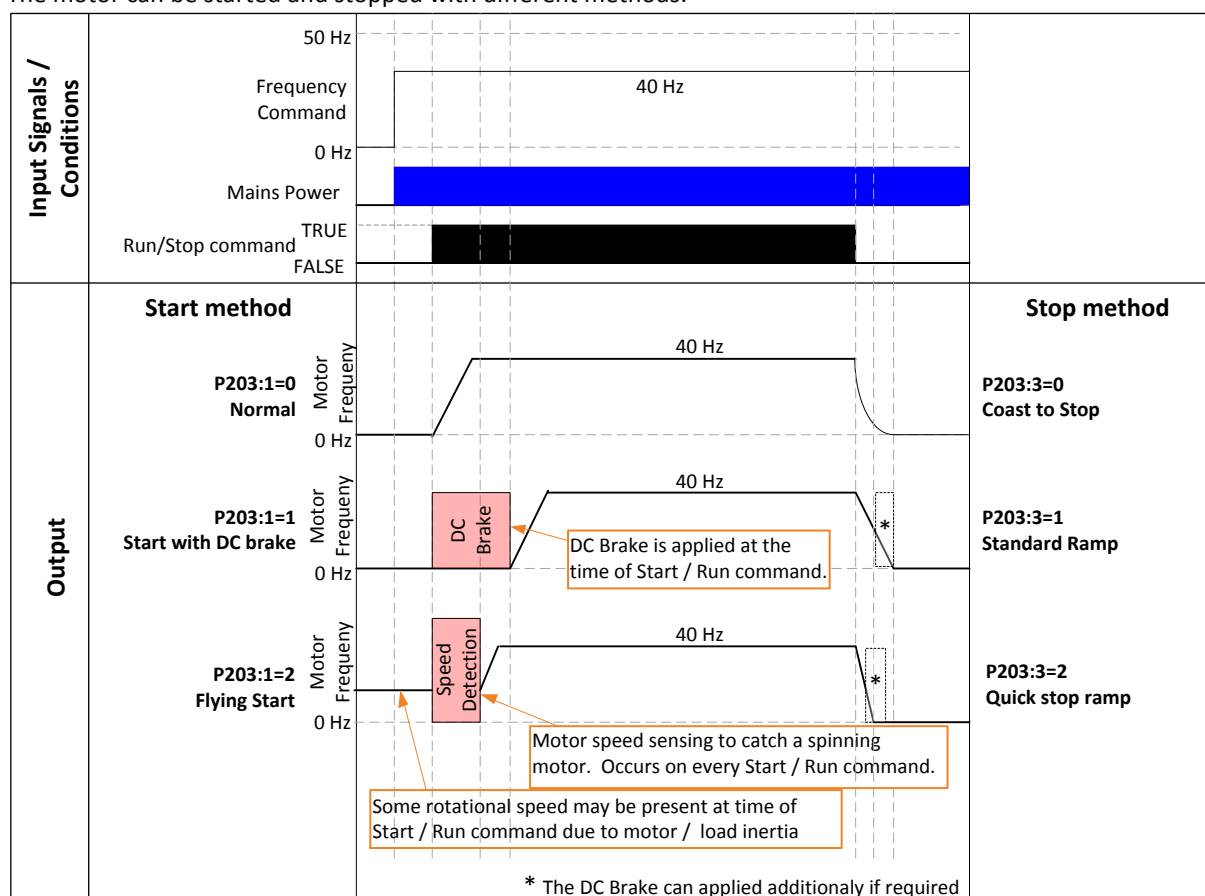


Fig. 16: Start and Stop configuration



See chapter “6.9.3DC brake setup”, page 88 for DC brake setup

| P203:1                                                        | 0x2838:1 | Start method                                                                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
|---------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>0: Normal</b><br>1: Start with DC brake<br>2: Flying Start |          | Defines starting method of the motor<br><br><b>0: Normal:</b><br>Inverter accelerates the motor in the selected direction when the start is initiated<br><br><b>1: Start with DC brake:</b><br>Inverter apply the DC Brake when the start is initiated, before beginning rotation of the motor. When the DC Brake delay time has elapsed the |      |      |     |

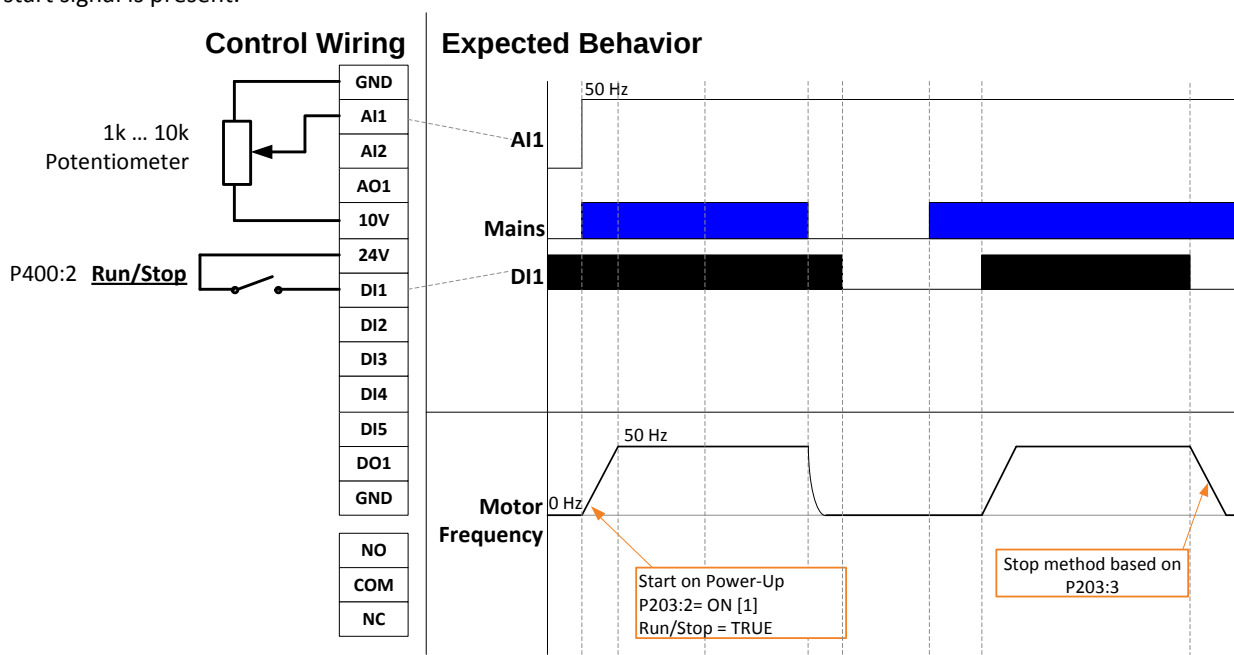
## 6 Function & parameter description

### Group 2 – Basic setup

|                                                                            |                 |                                                                                                                                                                                                                                                                                                                                                                                                                           |             |             |            |
|----------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
|                                                                            |                 | <p>acceleration of the motor will begin.<br/>To activate DC Brake also P704:1 and P704:2 need to be set.</p> <p><b>2: Flying Start:</b><br/>Inverter can start on a rotating motor. During start the inverter detects the actual frequency and catches the motor. This feature provides smoother starting for high inertia loads like fans, flywheels, etc...</p>                                                         |             |             |            |
| <b>P203:3</b>                                                              | <b>0x2838:3</b> | <b>Stop method</b>                                                                                                                                                                                                                                                                                                                                                                                                        | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <p>0: Coast to Stop<br/><b>1: Standard Ramp</b><br/>2: Quick stop ramp</p> |                 | <p>Defines the Stopping method of the motor</p> <p><b>0: Coast</b><br/>Inverter will shut off the output of the motor and the motor will coast to stop based on the inertia of the machine.</p> <p><b>1: Standard Ramp</b><br/>Inverter will ramp down the motor according to the selected deceleration time</p> <p><b>2: Quick stop ramp</b><br/>Inverter will ramp down the motor according to the quick stop ramp.</p> |             |             |            |

### 6.4.5 Start on power up

The “Start on Power” function allows to start the inverter automatically upon application of mains power if a valid start signal is present.



|                                |                 |                                                                                                                                                                                                              |             |             |            |
|--------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
| <b>P203:2</b>                  | <b>0x2838:2</b> | <b>Start on Power up</b>                                                                                                                                                                                     | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <p><b>0: Off</b><br/>1: On</p> |                 | <p>Configuration of “Start on Power” function</p> <p><b>0: Off</b><br/>Already present start/run signal upon application of mains power are ignored. The inverter needs a new start/run signal to start.</p> |             |             |            |

## 6 Function & parameter description

### Group 2 – Basic setup

|  |                                                                                                                         |
|--|-------------------------------------------------------------------------------------------------------------------------|
|  | <b>1: On</b><br>The inverter starts automatically when mains power is applied and a valid start/run command is present. |
|--|-------------------------------------------------------------------------------------------------------------------------|

#### 6.4.6 Voltage configuration

| P208:1                                                                     | 0x2540:1 | Rated mains voltage                                                                                                                                                                | i510 | i550 | R/W |
|----------------------------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: 230 Veff<br>1: 400 Veff<br>2: 480 Veff<br>10: 230V:reduced LU level (*) |          | Configuration of the actual applied mains voltage (VAC).<br><br>Note: Default value is type code dependent                                                                         |      |      |     |
| P208:2                                                                     | 0x2540:2 | Warning level under voltage                                                                                                                                                        | i510 | i550 | R/W |
| 0 ... [Type Code dependent] ... 800 V                                      |          | Warning threshold for undervoltage<br>If the DC-bus voltage falls below the threshold value the inverter reports a warning. Reset of the warning is done with a hysteresis of 10V. |      |      |     |
| P208:3                                                                     | 0x2540:3 | Error level under voltage                                                                                                                                                          | i510 | i550 | R   |
| -- ... [Actual value] ... -- V                                             |          | Error threshold for undervoltage<br>If the DC-bus voltage falls below the threshold value the inverter changes to Error state.                                                     |      |      |     |
| P208:4                                                                     | 0x2540:4 | Clear level under voltage                                                                                                                                                          | i510 | i550 | R   |
| -- ... [Actual value] ... -- V                                             |          | Error reset threshold for undervoltage                                                                                                                                             |      |      |     |
| P208:5                                                                     | 0x2540:5 | Warning level over voltage                                                                                                                                                         | i510 | i550 | R/W |
| 0 ... [Type Code dependent] ... 800 V                                      |          | Warning threshold for overvoltage<br>If the DC-bus voltage exceeds the threshold value the inverter reports a warning. Reset of the warning is done with a hysteresis of 10V.      |      |      |     |
| P208:6                                                                     | 0x2540:6 | Error level over voltage                                                                                                                                                           | i510 | i550 | R   |
| -- ... [Actual value] ... -- V                                             |          | Error threshold for overvoltage<br>If the DC-bus voltage exceeds the threshold value the inverter changes to Error state.                                                          |      |      |     |
| P208:7                                                                     | 0x2540:7 | Clear level over voltage                                                                                                                                                           | i510 | i550 | R   |
| -- ... [Actual value] ... -- V                                             |          | Error reset threshold for overvoltage                                                                                                                                              |      |      |     |

#### 6.4.7 Min/Max frequency

Minimum Frequency and Maximum Frequency define the overall operating frequency range (Hz) of the inverter. All references setpoints (analog input frequency setpoints, preset frequency setpoints, network frequency setpoints, etc...) are limited this settings.

| P210:0                                     | 0x2915:0 | Minimum frequency       | i510 | i550 | R/W |
|--------------------------------------------|----------|-------------------------|------|------|-----|
| 0.0 ... [0.0] ... 599.0 Hz                 |          | Minimum motor frequency |      |      |     |
| P211:0                                     | 0x2916:0 | Maximum frequency       | i510 | i550 | R/W |
| 0.0 ... [Type Code dependent] ... 599.0 Hz |          | Maximum motor frequency |      |      |     |

#### 6.4.8 Acceleration / Deceleration

Two sets of Acceleration/Deceleration ramps are available. Two ways of switching between ACC/DEC 1 and ACC/DEC 2 are available:

- External Trigger (i.e. Digital Input)
- Ramp time switch level to trigger from ACC/DEC1 to ACC/DEC2 based on Frequency

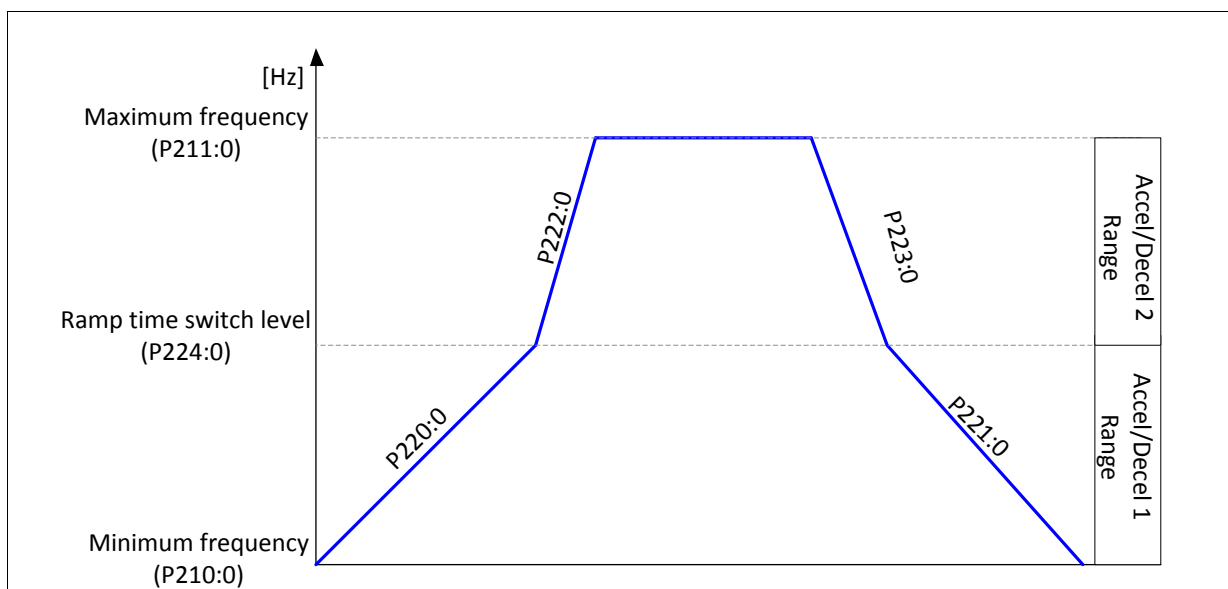


Fig. 17: Speed setpoint

| P400:39                                   | 0x2631:39 | Ramp 2 selection                                                                                                                 | i510 | i550 | R/W |
|-------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0:Not connected<br>(Reference see P400:1) |           | Trigger for ACC/DEC2 selection:<br><b>TRUE:</b> Selects ACC2/DEC2 as ramp times                                                  |      |      |     |
| P220:0                                    | 0x2917:0  | Acceleration time 1                                                                                                              | i510 | i550 | R/W |
| 0.0 ... [5.0] ... 3600.0 s                |           | Acceleration time 1 for the output frequency to increase from 0.0 Hz to Maximum frequency (P211:0)                               |      |      |     |
| P221:0                                    | 0x2918:0  | Deceleration time 1                                                                                                              | i510 | i550 | R/W |
| 0.0 ... [5.0] ... 3600.0 s                |           | Deceleration time 1 for the output frequency to decrease from P211:0 Maximum Frequency to 0.0 Hz                                 |      |      |     |
| P222:0                                    | 0x2919:0  | Acceleration time 2                                                                                                              | i510 | i550 | R/W |
| 0.0 ... [5.0] ... 3600.0 s                |           | Acceleration time 2 for the output frequency to increase from 0.0 Hz to Maximum frequency (P211:0)<br><br>Note: MOP use ACC/DEC2 |      |      |     |
| P223:0                                    | 0x291A:0  | Deceleration time 2                                                                                                              | i510 | i550 | R/W |
| 0.0 ... [5.0] ... 3600.0 s                |           | Acceleration time 2 for the output frequency to decrease from Maximum Frequency (P211:0) to 0.0 Hz<br><br>Note: MOP use ACC/DEC2 |      |      |     |

## 6 Function & parameter description

### Group 2 – Basic setup

| P224:0                     | 0x291B:0 | Ramp time switch level                                                                                                                                                                                                                                                                                                                                                                                             | i510 | i550 | R/W |
|----------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [0.0] ... 599.0 Hz |          | <p>Switch point between ACC/DEC1 and ACC/DEC2:<br/>           Act frequency &lt; Ramp time switch level (P224:0) --&gt; Use Accel/Decel time #1<br/>           Act frequency &gt; Ramp time switch level(P224:0) --&gt; Use Accel/Decel time #2</p> <p>0: Function Disabled</p> <p><b>Note:</b><br/>           Selection of ACC/DEC by P400:39, PID ACC/DEC sequencer ACC/DEC, Quickstops have higher priority</p> |      |      |     |
| P226:1                     | 0x291E:1 | Smooth factor                                                                                                                                                                                                                                                                                                                                                                                                      | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 100.0 %  |          | <p>Smoothing factor for S-Shap characteristic ramping.</p> <p><b>Note:</b><br/>           Smoothing factor will extend ramp time:<br/>           50% --&gt; 1,5 x configured ramp time<br/>           100% --&gt; 2 x configured ramp time</p>                                                                                                                                                                     |      |      |     |

#### 6.4.9 Quickstop ramp time (QSP)

The inverter has an additional stopping method called “Quick Stop” (QSP) It works as a zero-speed or Pause function where the ramp time can be setup separately.

| P225:0                     | 0x291C:0 | Quick stop decel. time                                                                                                                                                                                                                           | i510 | i550 | R/W |
|----------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [1.0] ... 3600.0 s |          | <p>Quick stop ramp time for the output frequency to decrease from Maximum frequency (P211:0) to 0.0 Hz</p> <p><b>Note:</b> In Cia402 Velocity mode (P301:0 = [2] Velocity mode (vl) ) the quick stop deceleration time is defined by P790:0.</p> |      |      |     |

## 6.5 Group 3 – Motor control

### 6.5.1 Motor control mode

The inverter can control the motor in different modes:

#### AC induction motors:

| Motor control mode<br>(P300:0)          | Modes of operation<br>(P301:0) | V/f characteristic shape<br>(P302:0) | i510 | i550 |
|-----------------------------------------|--------------------------------|--------------------------------------|------|------|
| VFC open loop [6]                       | MS-Velocity mode [-2]          | Linear [0]                           | X    | X    |
|                                         |                                | Quadratic [1]                        | X    | X    |
|                                         |                                | Eco [3]                              | X    | X    |
| Sensorless vector control [4]<br>SLVC   | MS-Velocity mode [-2]          |                                      | X    | X    |
| Servo control ASM [2]<br>(With encoder) | MS-Velocity mode [-2]          |                                      |      | X    |

#### VFC open loop (Linear / quadratic)

Typical for AC induction motors. Suitable for many general applications like conveyors, pumps, fans, etc. No motor feedback is needed.

See the following chapters:

- “6.5.2 V/f: Curve setting”, page 59
- “6.5.3 V/f: Slip compensation”, page 60
- “6.5.4 V/f: Frequency boost”, page 60

#### VFC Eco

Energy Saving Control for Asynchronous Motor (reduction of copper losses).

1. Set the motor control mode:  
P300:0 to “VFC open Loop [6]”
2. Set the V/f characteristic shape:  
P302:0 to “Eco [3]”
3. Advanced Motor setup:  
Set motor parameter (6.5.12 Motor parameter, page 65) or select the motor out of the Lenze catalogue (In case of a Lenze motor & Easy Starter).
4. Set VFC-ECO Minimum Voltage:  
P330:1 Set VFC-ECO Minimum Voltage

→ See “6.5.2 V/f: Curve setting” on page 59

## 6 Function & parameter description

### Group 3 – Motor control

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#### Sensorless vector control (SLVC)

For higher performance on torque response and speed regulation the SLVC can be used. To use this mode the motor parameter and the motor identification mode is required. No motor feedback is needed.

1. Set the motor control mode:  
P300:0 to "Sensorless vector control [4]"
2. Advanced Motor setup:  
Set motor parameter (6.5.12 Motor parameter, page 65) or select the motor out of the Lenze catalogue (In case of a Lenze motor & Easy Starter).

#### NOTICE!

For the usage of SLVC the following restrictions apply:

- ▶ Only for asynchronous motors
- ▶ Only permissible for one single motor
- ▶ Not Permissible for hoists
- ▶ The connected motor may be maximum two power classes lower than the motor assigned to the inverter

#### Servo control (ASM)

Vector controlled servo control (with encoder) for asynchronous motors. Generally, the servo control offers the same advantages as the sensorless vector control (SLVC) with increased speed regulation performance.

1. Set the motor control mode:  
P300:0 to "Servo control ASM [2]"
2. Advanced Motor setup:  
Set motor parameter (6.5.12 Motor parameter, page 65) or select the motor out of the Lenze catalogue (In case of a Lenze motor & Easy Starter).
3. Encoder setup (6.5.16 HTL Encoder setup, page 67)

## 6 Function & parameter description

### Group 3 – Motor control

#### Functions:

|                                              | Index                | Display Code     | VFC open loop [6] | SLVC [4] | Servo control ASM [2]* |
|----------------------------------------------|----------------------|------------------|-------------------|----------|------------------------|
| 6.5.8 Switching frequency                    | 0x2939:0             | P305:0           | X                 | X        | X                      |
| 6.5.2 V/f: Curve setting                     | 0x2B00:0<br>0x2B01:X | P302:0<br>P303:X | X                 |          |                        |
| 6.5.3 V/f: Slip compensation                 | 0x2B09:X             | P315:X           | X                 |          |                        |
| 6.5.4 V/f: Frequency boost                   | 0x2B12:X             | P316:X           | X                 |          |                        |
| 6.5.11 Skip frequency                        | 0x291F:X             | P317:X           | (X)               | X        | X                      |
| 6.5.5 V/f: Oscillation damping               | 0x2B0A:X             | P318:X           | (X)               |          |                        |
| 6.5.6 V/f: Override point of field weakening | 0x2B0C:X             | P319:X           | (X)               |          |                        |
| 6.5.12 Motor parameter                       | 0x2C01:X<br>0x6075:0 | P320:X<br>P323:0 | (X)               | X        | X                      |
| 6.5.13 Speed limitation                      | 0x6080:0             | P322:0           | (X)               | X        | X                      |
| 6.5.14 Current limitation                    | 0x6073:0             | P324:0           | (X)               | X        | X                      |
| 0<br>Torque limitation                       | 0x6076:0<br>0x6072:0 | P325:0<br>P326:0 |                   | X        | X                      |

(X) Optional

| P300:0                                                                              | 0x2C00:0 | Motor control mode                                                                                                                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
|-------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 2: Servo Control ASM (*)<br>4: Sensorless vector control<br><b>6: VFC open loop</b> |          | Selection of the motor control mode                                                                                                                                                                                                                                                                                                                                                              |      |      |     |
| P301:0                                                                              | 0x6060:0 | Modes of operation                                                                                                                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| <b>-2: MS-Velocity mode</b><br>0: Mode no change/assigned<br>2: Velocity mode (vI)  |          | Selection of the operation mode of the inverter<br><b>-2: MS-Velocity mode: (Manufacturer specific velocity mode)</b><br>Speed controlled motor with optional PID (Normal operating mode)<br><br><b>0: Mode no change/assigned</b><br>No operation mode selected. Drive disabled.<br><br><b>2: Velocity mode (vI):</b><br>CiA402 velocity mode. Control word 0x6040 is following CiA402 standard |      |      |     |

## 6.5.2 V/f: Curve setting

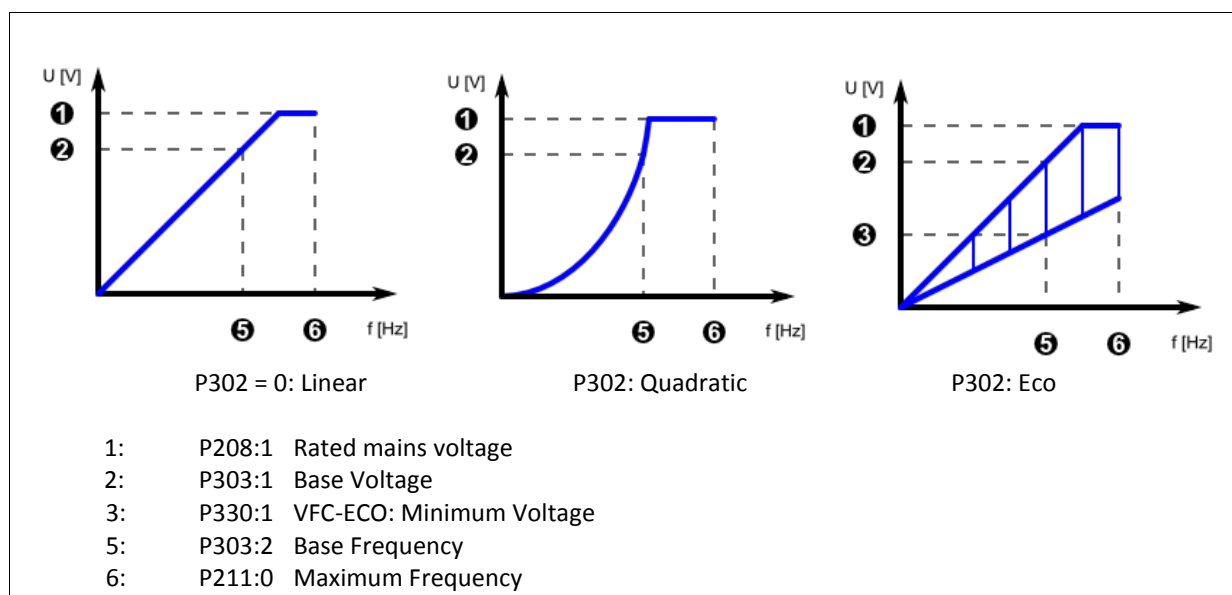


Fig. 18: V/F mode

| P302:0                                 | 0x2B00:0 | V/f characteristic shape                                                                                                                                                                                                                                                                                                                                         | i510 | i550 | R/W |
|----------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: Linear<br>1: Quadratic<br>3: Eco    |          | Configuration of V/f shape<br><b>0: Linear</b><br>The curve has a constant V/f ratio which provides constant torque in the motor. V/f curves are used in many general applications.<br><b>1: Quadratic</b><br>The curve V/f is a quadratic function. This is used for fan or pump applications.<br><b>3: Eco</b><br>Energy Saving Control for Asynchronous Motor |      |      |     |
| P303:1                                 | 0x2B01:1 | Base Voltage                                                                                                                                                                                                                                                                                                                                                     | i510 | i550 | R/W |
| 0 ... [Type Code dependent] ... 5000 V |          | V/f Base Voltage<br>To be set to motor nominal voltage                                                                                                                                                                                                                                                                                                           |      |      |     |
| P303:2                                 | 0x2B01:2 | Base Frequency                                                                                                                                                                                                                                                                                                                                                   | i510 | i550 | R/W |
| 0 ... [Type Code dependent] ... 599 Hz |          | V/f Base Frequency<br>To be set to motor nominal frequency                                                                                                                                                                                                                                                                                                       |      |      |     |
| P330:1                                 | 0x2B0D:1 | Minimum voltage                                                                                                                                                                                                                                                                                                                                                  | i510 | i550 | R/W |
| 20 ... [20] ... 100 %                  |          | Minimum voltage (Only used for Eco Mode)<br>The efficiency range of VFC Eco is limited by the standard U/f curve and the VFC Eco curve. (See graphic above)<br>This parameter describes the operating point in relation to a chosen percentage value of Base voltage (P303:1) at Base frequency (P303:2). See graphic above.                                     |      |      |     |

## 6 Function & parameter description

### Group 3 – Motor control

#### 6.5.3 V/f: Slip compensation

In a standard AC induction motor, the shaft speed decreases as load increases, and increases as load decreases. Slip compensation is used to counteract changes in motor speed (slip) caused by changes in load.

##### 1. Setup the following motor parameter.

(Out of this parameters the inverter automatically calculates the nominal slip)

P320:4 Motor parameter: Rated speed

P320:5 Motor parameter: Rated frequency

##### 2. Setup the slip influence gain

100% means that full motor rated slip is applied with full torque. If the slip compensation is not accurate (Example: Motor data not accurate) the slip compensation can be adjusted with this value.

| P315:1                            | 0x2B09:1 | Gain                                                                                                                                                                                                                                                                                          | i510 | i550 | R/W |
|-----------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| -200.00 ... [100.00] ... 200.00 % |          | Configuration of the slip compensation influence.<br>100% means that full motor rated slip is applied with full torque.                                                                                                                                                                       |      |      |     |
| P315:2                            | 0x2B09:2 | Filter time                                                                                                                                                                                                                                                                                   | i510 | i550 | R/W |
| 1 ... [5] ... 6000 ms             |          | Configuration of the slip compensation filter time.<br>The default is optimized for best slip speed loss recovery time performance of typical motors. If oscillation or instability occurs at full load (or near full load) then increasing the Slip Compensation Filter Time is recommended. |      |      |     |

#### 6.5.4 V/f: Frequency boost

The voltage boost (Fixed or during Acceleration) can increase the starting torque for application with high inertia load, high friction loads.

| P316:1                                   | 0x2B12:1 | Fixed boost                                                                                                                         | i510 | i550 | R/W |
|------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [Type Code dependent] ... 20.0 % |          | The Fixed voltage boost increases the output voltage with the configured % of Base Voltage (P303:1)                                 |      |      |     |
| P316:2                                   | 0x2B12:2 | Boost at acceleration                                                                                                               | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 20.0 %                 |          | The Acceleration voltage boost increases the output voltage during acceleration in with the configured [%] of Base Voltage (P303:1) |      |      |     |

#### 6.5.5 V/f: Oscillation damping

The oscillation damping function is used to reduce speed oscillations which can occur in unloaded or lightly loaded operation.



See Easy starter for setup and more information

#### 6.5.6 V/f: Override point of field weakening



See Easy starter for setup and more information

### 6.5.7 Rotation restriction

The rotation of the motor can be restricted to forward only.



See chapter “6.2.4 Rotation direction”, page 42

| P304:0                                    | 0x283A:0 | Rotation restriction                                                                                                                                                                                                                                                                                        | i510 | i550 | R/W |
|-------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: Forward only<br>1: Forward and reverse |          | <p>The inverter can be limited to Forward (FWD) rotation only. This affects the final output setpoint for velocity and PID setpoint</p> <p><b>Note:</b><br/>This command only prevents negative velocity setpoints. Therefore it is still possible that the motor runs reverse (Example: Wrong wiring).</p> |      |      |     |

### 6.5.8 Switching frequency

The inverter output is DC voltage that is sine-coded pulse width modulated (PWM) to approximate variable frequency AC voltage. The frequency of the PWM pulses is adjustable. This adjustment is called the PWM switching frequency.

**General:**

- Higher switching frequencies will result in less audible noise but will cause the inverter to generate more heat and operate less efficiently.
- Lower switching frequencies will result in more audible noise but will cause decreased earth leakage current, increased inverter efficiency and increased ambient operating temperature range.

| P305:0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0x2939:0 | Switching frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | i510 | i550 | R/W |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 1: 4kHz var. / optimized<br>2: 8kHz var. / optimized<br>3: 16kHz var. / optimized<br>5: 2kHz fix / optimized<br>6: 4kHz fix / optimized<br>7: 8kHz fix / optimized<br>8: 16kHz fix / optimized<br>11: 4kHz var. / min. Pv<br>12: 8kHz var. / min. Pv<br>13: 16kHz var. / min. Pv<br>15: 2kHz fix / min. Pv<br>16: 4kHz fix / min. Pv<br>17: 8kHz fix / min. Pv<br>18: 16kHz fix / min. Pv<br>21: 8kHz var./ opt./4kHz min.<br>22: 16kHz var./opt./4kHz min.<br>23: 16kHz var./opt./8kHz min<br>31: 8kHz var./ Pv/4kHz min.<br>32: 16kHz var./ Pv/4kHz min.<br>33: 16kHz var./ Pv/8kHz min. |          | <p>Definition of the Switching Frequency</p> <p><b>1, 2, 3:</b><br/>Optimized for best inverter performance (symmetrical modulation)<br/>Variable switching frequency: Inverter reduces the switching frequency if output current or inverter temperature are too high. Minimal Switching Frequency is limited to 2 kHz.</p> <p><b>5, 6, 7, 8:</b><br/>Optimized for best inverter performance (symmetrical modulation)<br/>Switching frequency is fixed.</p> <p><b>11, 12, 13:</b><br/>Optimized for best inverter efficiency (asymmetrical modulation).<br/>Variable switching frequency: Inverter reduces the switching frequency if output current or inverter temperature are too high. Minimal Switching Frequency is limited to 2 kHz.</p> <p><b>15, 16, 17, 18:</b><br/>Optimized for best inverter efficiency (asymmetrical modulation).<br/>Switching frequency is fixed.</p> <p><b>21, 22, 23:</b><br/>Optimized for best inverter performance (symmetrical modulation)<br/>Variable switching frequency: Inverter reduces the switching frequency if</p> |      |      |     |

## 6 Function & parameter description

### Group 3 – Motor control

|  |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>output current or inverter temperature are too high. Minimal Switching Frequency is limited to 4 kHz or 8 kHz</p> <p><b>31, 32, 33:</b><br/>Optimized for best inverter efficiency (asymmetrical modulation).<br/>Variable switching frequency: Inverter reduces the switching frequency if output current or inverter temperature are too high. Minimal Switching Frequency is limited to 4 kHz or 8 kHz</p> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 6.5.9 Motor thermal overload (i2xt)

The function monitors the thermal power dissipation from the measured motor currents on the basis of a mathematical model. This can be used for motor overload protection. It is only usable for functional protection, i.e. to guarantee the service life time of the motor. It is not suitable as safety relevant protection against energy induced hazards.

#### **DANGER!**

##### Fire hazard from motor overload

Additional means must be provided to prevent fire hazards arising from motor overload

- Independent temperature monitoring of the motor with shut down

#### **DANGER!**

##### Uncontrolled motor behavior

If the motor overload occurs the inverter stops modulating and no torque is available on the motor. On motors under load without holding brake this can lead to uncontrolled motor movements.

- Use the inverter only under the specified load conditions.

| P308:1                            | 0x2D4B:1 | Maximum utilisation [60 s]                                                                                                                                                                                                                                                                                                                                                                                                                                                  | i510 | i550 | R/W |
|-----------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 30 ... [150] ... 200 %            |          | Configuration of the I2xt trip time.<br>If the motor is running with nominal current (P323) for longer than the configured trip time, the inverter will trip according the configured reaction.                                                                                                                                                                                                                                                                             |      |      |     |
| P308:2                            | 0x2D4B:2 | Speed compensation                                                                                                                                                                                                                                                                                                                                                                                                                                                          | i510 | i550 | R/W |
| 0: On<br>1: Off                   |          | <p>Slow speed compensation (&lt;40 Hz)</p> <p><b>0: On</b><br/>The over load trip time on motor is reduced to compensate the decreased cooling of self-cooled AC induction motors when running at slow speed.</p> <p><b>1: Off</b><br/>Function disabled, no reduction.</p> <p><b>Notes:</b><br/>- For compliance with UL the user must enable this function or use an appropriate PTC to protect the motor.<br/>- Function to protect motors at speed lower than 40 Hz</p> |      |      |     |
| P308:3                            | 0x2D4B:3 | Error response                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      | i550 | R/W |
| 3:Fault<br>(Reference see P310:1) |          | <p>Configuration of the i2xt over load fault reaction. If the trip level is reached to motor will react as defined.</p> <p><b>Notes:</b><br/>- For compliance with UL the user must enable this function or use an appropriate PTC to protect the motor.</p>                                                                                                                                                                                                                |      |      |     |

#### 6.5.10 Motor temperature sensor

For detecting and monitoring of the motor temperature, a PTC thermistor (DIN 44081 Single, DIN 44082 Triplet) or a thermal contact (NC contact) can be connected to the terminals T1 and T2.

Stop!

#### **i NOTICE!**

The inverter can only evaluate one PTC thermistor!

Do not connect several PTC thermistors in series or parallel.

- ▶ If several motors are operated on one inverter, use thermal contacts (NC contacts) connected in series.
- ▶ To achieve full motor protection, an additional temperature monitoring with separate evaluation must be installed.



This function is only available with i550. It is recommended to always use this function if the motor is equipped with a PTC thermistors or thermo contact.

| P309:2                                   | 0x2D49:2 | Reaction                                                                                                                                                                                                                                                                                                                                                                                                   | i550 | R/W |
|------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|
| <b>3:Fault</b><br>(Reference see P310:1) |          | Motor temperature sensor fault reaction<br><b>0: No response</b><br>No reaction on the inverter<br><b>1: Warning</b><br>Warning will be displayed. Inverter will continue operation normally.<br><b>2: Trouble</b><br>Inverter will go to Trouble state and ramp down the motor with the Quick Stop Ramp time.<br><b>3: Fault</b><br>Inverter will go to Fault state and stop the motor with a coast stop. |      |     |

#### 6.5.11 Skip frequency

Three skip frequencies are available to lock out critical frequencies that cause mechanical resonance.

##### Example:

Skip frequency 20 Hz

Skip bandwidth 10 Hz

Frequency area 15 Hz .. 25 Hz is skipped



Skip frequencies are absolute.

Disable function: Skip bandwidth = 0

Skip frequencies cannot be set to include 0Hz (i.e. if 2Hz was set as a skip frequency and a bandwidth of 4Hz or greater was selected, the skip range is ignored).

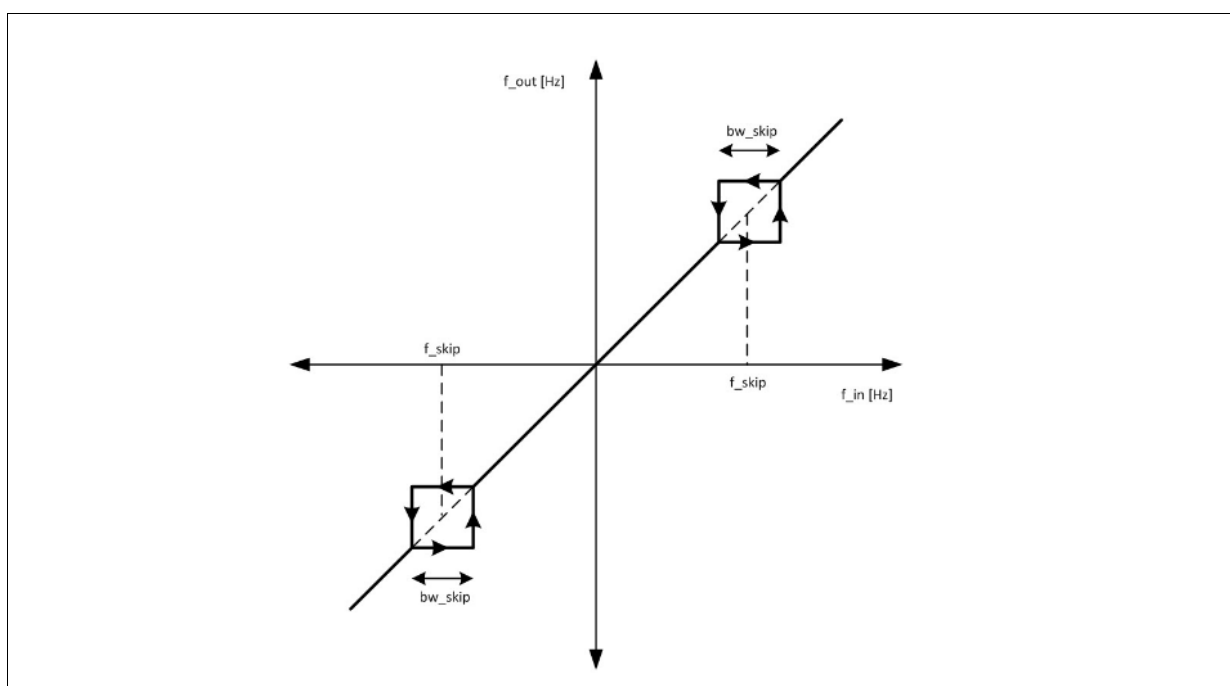


Fig. 19: Skip frequency

| P317:1                     | 0x291F:1 | Skip frequency 1 | i510 | i550 | R/W |
|----------------------------|----------|------------------|------|------|-----|
| 0.0 ... [0.0] ... 599.0 Hz |          | Skip frequency 1 |      |      |     |
| P317:2                     | 0x291F:2 | Skip bandwidth 1 | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 10.0 Hz  |          | Skip bandwidth 1 |      |      |     |
| P317:3                     | 0x291F:3 | Skip frequency 2 | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz |          | Skip frequency 2 |      |      |     |
| P317:4                     | 0x291F:4 | Skip bandwidth 2 | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 10.0 Hz  |          | Skip bandwidth 2 |      |      |     |
| P317:5                     | 0x291F:5 | Skip frequency 3 | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz |          | Skip frequency 3 |      |      |     |
| P317:6                     | 0x291F:6 | Skip bandwidth 3 | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 10.0 Hz  |          | Skip bandwidth 3 |      |      |     |

## 6 Function & parameter description

### Group 3 – Motor control

#### 6.5.12 Motor parameter



For the mode “Sensorless vector control”, “Servo Control ASM”, and “VFC Eco mode” the parameter set-up and calibration is necessary.

For “VFC open loop” linear/quadratic it is not necessary but can increase the control behavior.

Two ways are possible to setup the motor parameter:

##### Lenze motor & Easy Starter

Select the motor out of the Lenze catalogue

##### Third party motor or Keypad

Set the motor parameter described below and execute the “identification” (P327:4) or “estimation” (P327:4)

| P320:4                                                            | 0x2C01:4 | Rated speed                                                                                                                                                                                                                                                                                                                                                                                                                                                    | i510 | i550 | R/W |
|-------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 50 ... [1450] ... 50000 rpm                                       |          | Rated motor nominal speed (motor nameplate)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                                      |      |      |     |
| P320:5                                                            | 0x2C01:5 | Rated frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                | i510 | i550 | R/W |
| 1.0 ... [50.0] ... 1000.0 Hz                                      |          | Rated motor nominal frequency (motor nameplate)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                                  |      |      |     |
| P320:6                                                            | 0x2C01:6 | Rated power                                                                                                                                                                                                                                                                                                                                                                                                                                                    | i510 | i550 | R/W |
| -- ... [Type Code dependent] ... -- kW                            |          | Rated motor nominal power (motor nameplate)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                                      |      |      |     |
| P320:7                                                            | 0x2C01:7 | Rated voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                  | i510 | i550 | R/W |
| -- ... [Type Code dependent] ... -- V                             |          | Rated motor nominal voltage (motor nameplate)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                                    |      |      |     |
| P320:8                                                            | 0x2C01:8 | Rated cosine phi                                                                                                                                                                                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| 0.00 ... [0.80] ... 1.00                                          |          | Rated motor nominal cos phi (motor nameplate)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                                    |      |      |     |
| P323:0                                                            | 0x6075:0 | Motor rated current                                                                                                                                                                                                                                                                                                                                                                                                                                            | i510 | i550 | R/W |
| 0.001 ... [Type Code dependent] ... 500.000 A                     |          | Rated motor nominal cos phi (motor nameplate)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                                    |      |      |     |
| P335:1                                                            | 0x2910:1 | Motor                                                                                                                                                                                                                                                                                                                                                                                                                                                          | i510 | i550 | R/W |
| 0.00 ... [Type Code dependent] ... 20000000.00 kg cm <sup>2</sup> |          | Moment of inertia of motor (Set it based on Motor)<br>Automatically set if Lenze Motor is selected from catalog.                                                                                                                                                                                                                                                                                                                                               |      |      |     |
| P335:2                                                            | 0x2910:2 | Load                                                                                                                                                                                                                                                                                                                                                                                                                                                           | i510 | i550 | R/W |
| 0.00 ... [Type Code dependent] ... 20000000.00 kg cm <sup>2</sup> |          | Moment of inertia of load (Set it based on Application)                                                                                                                                                                                                                                                                                                                                                                                                        |      |      |     |
| P                                                                 | 0x2910:3 | Coupling                                                                                                                                                                                                                                                                                                                                                                                                                                                       | i510 | i550 | R/W |
| 0: Stiff<br>1: Elastic<br>2: With backlash                        |          | Coupling of motor and load (Set it based on Application)                                                                                                                                                                                                                                                                                                                                                                                                       |      |      |     |
| P327:4                                                            | 0x2822:4 | Motor identification                                                                                                                                                                                                                                                                                                                                                                                                                                           | i510 | i550 | R/W |
| 0 ... [0] ... 1                                                   |          | Motor identification (Energized)<br>1: Enables the motor identification (Energized). After setting the parameter a valid Run/Start command starts the identification. For that cycle DI1 (Run / Stop Command). This initiates the energized identification. The identification may take several seconds/minutes and measures the motor characteristic and calculates motor control parameters (Speed/Current control loop) based on the identified parameters. |      |      |     |

## 6 Function & parameter description

### Group 3 – Motor control

|                 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                  |             |             |            |
|-----------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
|                 |                 | During the identification the blue status LED is ON. The blue LED flashing and the red LED OFF indicate that the identification was successfully finished. The red LED ON indicates that the identification failed.                                                                                                                                                                                              |             |             |            |
| <b>P327:5</b>   | <b>0x2822:5</b> | <b>Motor estimation</b>                                                                                                                                                                                                                                                                                                                                                                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0 ... [0] ... 1 |                 | Motor estimation (Non-Energized)<br>1: Enables the motor estimation. The estimation takes less than 1s and calculates the equivalent circuit data and the motor control parameters (Speed/Current control loop) based on the motor rated values.<br><br>The blue LED flashing and the red LED OFF indicate that the calibration was successfully finished. The red LED ON indicates that the calibration failed. |             |             |            |

#### 6.5.13 Speed limitation

The overall maximal speed can be limited.



The speed limitation is active after the ramp generator!

|                             |                 |                             |             |             |            |
|-----------------------------|-----------------|-----------------------------|-------------|-------------|------------|
| <b>P322:0</b>               | <b>0x6080:0</b> | <b>Max motor speed</b>      | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0 ... [6075] ... 480000 rpm |                 | Overall Maximum motor speed |             |             |            |

#### 6.5.14 Current limitation

The maximum current can be limited. If the current limit is reached the output frequency is reduced in motor operation and increased in generator operation. When the over current condition passes, the inverter will return to normal operation and reaccelerate to the set point.

If the limitation cannot correct the condition and the inverter remains in current limit for too long, it will trip with I2T motor error.

|                              |                 |                                      |             |             |            |
|------------------------------|-----------------|--------------------------------------|-------------|-------------|------------|
| <b>P324:0</b>                | <b>0x6073:0</b> | <b>Max current</b>                   | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0.0 ... [200.0] ... 3000.0 % |                 | Maximum motor current in % of P323:0 |             |             |            |

## 6 Function & parameter description

### Group 3 – Motor control

#### 6.5.15 Torque limitation

The maximum torque can be limited.

**i** Note: The limitation is not active in V/f mode!

| P325:0                                                 | 0x6076:0 | Motor rated torque                                                                                                          | i510 | i550 | R/W |
|--------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.001 ... [Type Code dependent] ...<br>1000.000 Nm     |          | Motor rated torque in [Nm]                                                                                                  |      |      |     |
| P326:0                                                 | 0x6072:0 | Maximum Torque in [%]                                                                                                       | i510 | i550 | R/W |
| 0.0 ... [250.0] ... 3000.0 %                           |          | Maximum motor torque in % of P325:0                                                                                         |      |      |     |
| P329:1                                                 | 0x2D67:1 | Torque monitor:response                                                                                                     | i510 | i550 | R/W |
| 0: No reaction<br>1: Warning<br>2: Trouble<br>3: Fault |          | Torque limitation fault reaction<br><b>Note:</b> Status bit "MotorTorqueMax" is set independently of the selected response. |      |      |     |
| P329:2                                                 | 0x2D67:2 | Torque monit:Shutter delay                                                                                                  | i510 | i550 | R/W |
| 0.000 ... [0.000] ... 10.000 s                         |          | Torque limitation fault delay                                                                                               |      |      |     |

#### 6.5.16 HTL Encoder setup

A HTL encoder can be connected to the DI3 and DI4 of the inverter. The encoder can be used for:

- As a motor encoder for speed control
- As a process encoder as a setpoint (e.g. true web speed for winding application) or as an actual value for e.g. PID Controller

##### Setup:

1. Select the encoder in P410:2
2. Set the encoder increment/revolution P341:1
3. Select the function of the encoder:  
P600:2 Feedback PID / P201:2 PID setpoint / P201:1 Frequency setpoint  
**Note:** If SC or SLPSM mode is selected the encoder is automatically assigned as feedback.  
The actual encoder feedback is displayed in 0x2C42:6

| P341:1                                  | 0x2C42:1 | Increments/ revolution                                                                                  |      | i550 | R/W |
|-----------------------------------------|----------|---------------------------------------------------------------------------------------------------------|------|------|-----|
| 1 ... [128] ... 16384                   |          | Set the number of increments per revolution of the connected encoder<br>(See data sheet of the encoder) |      |      |     |
| P410:2                                  | 0x2630:2 | Mode selection                                                                                          | i510 | i550 | R/W |
| 0: Digital input<br>1: Encoder (AB) (*) |          | Mode selection for digital input functionalities (DI4 / DI3)                                            |      |      |     |
| P                                       | 0x2C42:6 | Actual velocity                                                                                         |      | i550 | R   |
| -- ... [Actual value] ... -- rpm        |          | Actual velocity feedback of encoder                                                                     |      |      |     |

## 6 Function & parameter description

### Group 3 – Motor control

#### 6.5.17 Overspeed monitoring

The inverter contains Motor Overspeed detection. If the specified threshold is exceeded, the inverter will react as defined.



The overspeed monitoring is only active if the motor is in motoring mode.

| P350:1                            | 0x2D44:1 | Threshold                | i510 | i550 | R/W |
|-----------------------------------|----------|--------------------------|------|------|-----|
| 50 ... [8000] ... 50000 rpm       |          | Overspeed threshold      |      |      |     |
| P350:2                            | 0x2D44:2 | Reaction                 | i510 | i550 | R/W |
| 3:Fault<br>(Reference see P310:1) |          | Overspeed fault reaction |      |      |     |

#### 6.5.18 Overcurrent monitoring

The inverter monitors the output current and compares it to a threshold value. If the specified threshold is exceeded, the inverter will react as defined.



This parameter can also be set and overwritten by selecting a Motor from the catalog or by using the non-energized calibration process. The user should adjust this default value for proper protection.

| P353:1                                        | 0x2D46:1 | Threshold                  | i510 | i550 | R/W |
|-----------------------------------------------|----------|----------------------------|------|------|-----|
| 0.0 ... [Type Code dependent] ...<br>1000.0 A |          | Overcurrent threshold      |      |      |     |
| P353:2                                        | 0x2D46:2 | Reaction                   | i510 | i550 | R/W |
| 3:Fault<br>(Reference see P310:1)             |          | Overcurrent fault reaction |      |      |     |

## 6.6 Group 4 – I/O setup

### 6.6.1 Function list (Run/Stop/Start/Jog/Reverse)

Parameters P400:1...P400:49 contain the main functions of the inverter. The function can be assigned to a trigger. If the trigger is activated the function is executed. The digital trigger values can come from external sources (Digital Inputs, Network, etc.) and internal sources (Inverter status, faults, etc.) It is possible to assign more than one function to a single trigger.

#### Basic functionalities:

- **Inverter enable**  
Enables the inverter. Signal must have the state TRUE (by Input or setting) to be able to start the motor.
- **Run/Stop**  
Enables the running of the motor. Can be used as single signal or in combination with the signals Start Forward / Start Reverse. Signal must have the state TRUE (by Input or setting) to be able to start the motor.
- **Start Forward / Start Reverse**  
Used to start the motor (Positive edge triggered). Stop is down with the **Run/Stop** signal.
- **Run Forward / Run Reverse**  
Used to run and stop the motor (Maintained signals)
- **Rotation inversion**  
Inverts the speed setpoint
- **JOG Forward / JOG Reverse**  
JOG the motor with a fixed speed. Jog has higher priority than Run/Stop, Start or Run commands.
- **Fault Reset**  
For a successful reset of a fault it is necessary to correct the condition that caused the fault first. Afterwards there are different possibilities to reset the fault:

| Function to reset fault: | Parameter | Transition                  |
|--------------------------|-----------|-----------------------------|
| Reset fault              | P400:4    | FALSE > TRUE (rising edge)  |
| Inverter enable          | P400:1    | TRUE > FALSE (Falling Edge) |
| Run/Stop                 | P400:2    | TRUE > FALSE (Falling Edge) |
| Keypad STOP              | -         | FALSE > TRUE (Rising edge)  |



See chapter “6.2.2 Control Source”, page 38  
See chapter “6.2.3 Control examples”, page 39



In **Flexible** Control mode (P200:0) either **Inverter enable (P400:1)** or **Run/Stop (P400:2)** must be assigned to I/O to ensure that the drive can always be stopped!  
(Exception: Inverter is controlled from network, **Network enable (P400:37)** is HIGH)

#### NOTICE!

The JOG functions have priority over Stop commands. If the inverter is currently JOGGING, pressing the STOP key on the keypad or triggering STOP command will NOT stop the motor!

## 6 Function & parameter description

### Group 4 – I/O setup

| P400:1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0x2631:1 | Inverter enable                                                                                                                                                                                                                                                                                                   | i510 | i550 | R/W |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: Not connected<br><b>1: Constant TRUE</b><br>11: Digital input 1<br>12: Digital input 2<br>13: Digital input 3<br>14: Digital input 4<br>15: Digital input 5<br>16: Digital input 6 (*)<br>17: Digital input 7 (*)<br>50: Running<br>51: Ready to run<br>53: Stop active<br>54: Quick stop active<br>58: Device warning<br>59: Device fault active<br>60: Heatsink temp. warning<br>69: Rotation inverted<br>70: Frequency thld exceeded<br>71: Actual speed = 0<br>78: Current thld exceeded<br>79: Maximum torque<br>80: Follower signal loss<br>81: Error analog input 1<br>82: Error analog input 2<br>83: Loss of load<br>104: Local control active<br>105: Remote control active<br>106: Manual setpoint active<br>107: Automatic setpoint active |          | <b>State:</b><br>TRUE enables the inverter.<br>FALSE inhibits the inverter and the motor will cost stop.<br><br><b>Note:</b><br>Signal must have the state TRUE (by Input or setting) to be able to start the motor                                                                                               |      |      |     |
| P400:2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0x2631:2 | Run/Stop                                                                                                                                                                                                                                                                                                          | i510 | i550 | R/W |
| <b>11: Digital input 1</b><br>(Reference see P400:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          | Inverter Run/Stop signal<br><br><b>State:</b><br>TRUE will make the inverter ready to run<br>FALSE will stop the motor according to the defined stop method<br><br><b>Note:</b><br>Set 01 TRUE to disable the function<br><br>Signal must have the state TRUE (by Input or setting) to be able to start the motor |      |      |     |
| P400:3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0x2631:3 | Quick stop                                                                                                                                                                                                                                                                                                        | i510 | i550 | R/W |
| <b>0: Not connected</b><br>(Reference see P400:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | The quick stop function works as pause or zero speed function. If the quick stop is applied the motor will ramp down with the defined QSP ramp.<br><br><b>Note:</b><br>0: FALSE disables this functionality                                                                                                       |      |      |     |
| P400:4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0x2631:4 | Reset fault                                                                                                                                                                                                                                                                                                       | i510 | i550 | R/W |
| <b>12: Digital input 2</b><br>(Reference see P400:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          | Trigger for fault reset<br>FALSE->TRUE transition the faults will be reset.                                                                                                                                                                                                                                       |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

| P400:6                                           | 0x2631:6 | Start forward (CW)                                                                                                                                                                                                                                                                                                                                                                                                                                                            | i510 | i550 | R/W |
|--------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>0:Not connected</b><br>(Reference see P400:1) |          | <p>Start forward signal (Edge triggered)</p> <p><b>State:</b><br/>Transition FALSE--&gt;TRUE will start the motor forward</p> <p><b>Note:</b><br/>- Use P400:2 "Run/Stop" signal to stop the motor<br/>- Set the signal to 0: FALSE to disable the function<br/>- If a bipolar input (-10V..+10V) is used the direction is controlled by the reference signal</p>                                                                                                             |      |      |     |
| P400:7                                           | 0x2631:7 | Start reverse (CCW)                                                                                                                                                                                                                                                                                                                                                                                                                                                           | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1) |          | <p>Start reverse signal (Edge triggered)</p> <p><b>State:</b><br/>Transition FALSE--&gt;TRUE will start the motor forward</p> <p><b>Note:</b><br/>- Use P400:2 "Run/Stop" signal to stop the motor<br/>- Set the signal to 0: FALSE to disable the function<br/>- If a bipolar input (-10V..+10V) is used the direction is controlled by the reference signal</p>                                                                                                             |      |      |     |
| P400:8                                           | 0x2631:8 | Run forward (CW)                                                                                                                                                                                                                                                                                                                                                                                                                                                              | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1) |          | <p>Run forward signal (Maintained signal)</p> <p><b>State:</b><br/>TRUE will start the motor forward<br/>The last activated signal of run forward and run reverse defines the direction!<br/>FALSE of Run Forward and Run Reverse will stop the motor according to the defined stop method</p> <p><b>Note:</b><br/>- Set the signal to 0: FALSE to disable the function<br/>- If a bipolar input (-10V..+10V) is used the direction is controlled by the reference signal</p> |      |      |     |
| P400:9                                           | 0x2631:9 | Run reverse (CCW)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1) |          | <p>Run reverse signal (Maintained signal)</p> <p><b>State:</b><br/>TRUE will start the motor reverse<br/>The last activated Signal of Run Forward and Run Reverse defines the direction!<br/>FALSE of Run Forward and Run Reverse will stop the motor according to the defined stop method</p> <p><b>Note:</b><br/>- Set the signal to 0: FALSE to disable the function<br/>- If a bipolar input (-10V..+10V) is used the direction is controlled by the reference signal</p> |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

| P400:10                                      | 0x2631:10 | Jog forward (CW)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | i510 | i550 | R/W |
|----------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0:Not connected<br>(Reference see P400:1)    |           | <p>JOG Forward with preset frequency 5</p> <p><b>State:</b><br/>TRUE will start the motor forward with preset frequency 5<br/>FALSE will stop the motor<br/>If JOG forward and JOG reverse are applied at the same time the motor will stop and the JOG has to be retriggered!</p> <p><b>WARNING:</b><br/>The JOG functions have priority over Stop commands. If the inverter is currently JOGGING, pressing the STOP key on the keypad or triggering STOP command will NOT stop the motor!</p> |      |      |     |
| P400:11                                      | 0x2631:11 | Jog reverse (CCW)                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| 0:Not connected<br>(Reference see P400:1)    |           | <p>JOG Forward with preset frequency 6</p> <p><b>State:</b><br/>TRUE will start the motor reverse with preset frequency 6<br/>FALSE will stop the motor<br/>If JOG forward and JOG reverse are applied at the same time the motor will stop and the JOG has to be retriggered!</p> <p><b>WARNING:</b><br/>The JOG functions have priority over Stop commands. If the inverter is currently JOGGING, pressing the STOP key on the keypad or triggering STOP command will NOT stop the motor!</p> |      |      |     |
| P400:12                                      | 0x2631:12 | Keypad control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | i510 | i550 | R/W |
| 0:Not connected<br>(Reference see P400:1)    |           | <p>Keypad Selection for Start/Stop command</p> <p><b>State:</b><br/>TRUE: Start and Stop commands coming from the keypad<br/>FALSE: Start and Stop commands are defined by the connection list</p>                                                                                                                                                                                                                                                                                              |      |      |     |
| P400:13                                      | 0x2631:13 | Invert rotation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
| 13:Digital input 3<br>(Reference see P400:1) |           | <p>Rotation inversion signal</p> <p><b>State:</b><br/>TRUE: target reference setpoint is inverted (i.e. times -1)<br/>FALSE: the target reference setpoint in not inverted</p>                                                                                                                                                                                                                                                                                                                  |      |      |     |

## 6.6.2 Setpoint selection

### Setpoint Priority:

The priority of the setpoint is according the following list:

| Terminal/Flexible or Keypad control<br>(P400:37 = False)                                                                                                                                                                                                                                                                                  | Network mode<br>(P400:37 = TRUE)                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Trigger for Setpoint Source (Connection List)</b><br><b>P400:14 – P400:25</b><br>In order of the selected trigger<br>1. 1: TRUE<br>2. 11: Digital Input 1 (DI1)<br>3. 12: Digital Input 2 (DI2)<br>4. 13: Digital Input 3 (DI3)<br><br><b>2. Default Setpoint</b><br><b>Speed P201:1 (0x2860:1)</b><br><b>PID P201:2 (0x2860:2)</b> | <b>1. Setpoint/Network setpoint controlled with:</b><br>AC Drive Control Word<br>C135 Control Word<br>NETWordIN1<br><br><b>2. Default Setpoint</b><br><b>Speed P201:1 (0x2860:1)</b><br><b>PID P201:2 (0x2860:2)</b> |



In Network mode (P400:37 = TRUE) the triggers P400:14 – P400:25 are not active.

To select the network as setpoint source in network mode (P400:37 = TRUE) use the “Default setpoint source” (P201:1-2) or the corresponding control bits (AC Drive Control Word, C135 Control Word, NET-WordIN1).



The actual control setpoint source can be seen in P125:2



See chapter “6.4.2 Default setpoint”, page 50

See chapter “6.2.1 Setpoint structure / operation mode”, page 36

| P400:14                                                                         | 0x2631:14 | AI1 setpoint selection                                                                                                                                                                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
|---------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>0:Not connected</b><br>(Reference see P400:1)                                |           | Selects Analog input 1 as setpoint source                                                                                                                                                                                                                                                                                                                                                                                                              |      |      |     |
| P400:15                                                                         | 0x2631:15 | AI2 setpoint selection                                                                                                                                                                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1)                                |           | Selects Analog input 2 as setpoint source                                                                                                                                                                                                                                                                                                                                                                                                              |      |      |     |
| P400:16                                                                         | 0x2631:16 | Keypad setpoint selection                                                                                                                                                                                                                                                                                                                                                                                                                              | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1)                                |           | Selects Keypad as setpoint source                                                                                                                                                                                                                                                                                                                                                                                                                      |      |      |     |
| P400:17                                                                         | 0x2631:17 | Setpoint = Network                                                                                                                                                                                                                                                                                                                                                                                                                                     | i510 | i550 | R/W |
| <b>0: Not connected</b><br>116: Netw.Ref active<br>(Other Reference see P400:1) |           | Selects Network as setpoint source (SW 02.01) in terminal mode.<br><b>Note:</b> In Network mode (P400:37 = TRUE) the triggers P400:14 – P400:25 are not active. To select the network as setpoint source in network mode (P400:37 = TRUE) use the “Default setpoint source” (P201:1-2) or the corresponding control bits (AC Drive Control Word, C135 Control Word, NET-WordIN1).<br><br>116: TRUE if AC Drive Control Word (0x400B:1) bit 6 is active |      |      |     |
| P400:18                                                                         | 0x2631:18 | Preset selection bit 0                                                                                                                                                                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
| <b>14:Digital input 4</b><br>(Reference see P400:1)                             |           | Preset frequency setpoint selection bit 0<br>Combination Example:<br>bit0 and bit2 result in preset frequency 5                                                                                                                                                                                                                                                                                                                                        |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

| P400:19                                             | 0x2631:19 | Preset selection bit 1                    | i510 | i550 | R/W |
|-----------------------------------------------------|-----------|-------------------------------------------|------|------|-----|
| <b>15:Digital input 5</b><br>(Reference see P400:1) |           | Preset frequency setpoint selection bit 1 |      |      |     |
| P400:20                                             | 0x2631:20 | Preset selection bit 2                    | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1)    |           | Preset frequency setpoint selection bit 2 |      |      |     |
| P400:21                                             | 0x2631:21 | Preset selection bit 3                    | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1)    |           | Preset frequency setpoint selection bit 3 |      |      |     |

### 6.6.3 Motor Potentiometer

With the motor potentiometer mode (MOP) the setpoint is controlled with the two triggers Increase and Decrease (Example: 2 digital inputs).

- The MOP is enabled by trigger P400:25 or can be set as default setpoint source.
- **Motor potentiometer up** TRUE: Setpoint will increase with acceleration time 2
- **Motor potentiometer down** TRUE: Setpoint will decrease with deceleration time 2
- MOP is increasing/decreasing the setpoint according acceleration/deceleration time 2. The motor is following the setpoint with acceleration/deceleration time 1 also in MOP-mode.
- If both triggers are TRUE or FALSE at the same time the setpoint will remain constant.
- The start value of the MOP is defined with P413:0

| P400:23                                                   | 0x2631:23 | Motor potentiometer up                                                                                                                                                                                                                                                                                   | i510 | i550 | R/W |
|-----------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>0:Not connected</b><br>(Reference see P400:1)          |           | State TRUE will increase the speed setpoint in MOP-Mode.                                                                                                                                                                                                                                                 |      |      |     |
| P400:24                                                   | 0x2631:24 | Motor potentiometer down                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1)          |           | State TRUE will decrease the speed setpoint in MOP-Mode.                                                                                                                                                                                                                                                 |      |      |     |
| P400:25                                                   | 0x2631:25 | Motor potentiometer select                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P400:1)          |           | Trigger to enable the MOP-Mode. After enabling the speed is controlled by digital inputs MOP up / MOP down.                                                                                                                                                                                              |      |      |     |
| P413:0                                                    | 0x4003:0  | Motor pot. start mode                                                                                                                                                                                                                                                                                    | i510 | i550 | R/W |
| <b>0: Last value</b><br>1: Init Value<br>2: Minimum Value |           | Defines the start setpoint value when MOP is enabled.<br><b>0: Last value</b><br>MOP starts with the last MOP set value.<br><b>1: Init Value</b><br>MOP starts with the value in P414:1 or P414:2<br><b>2: Minimum Value</b><br>MOP starts with minimum frequency (P210:0) or minimum PID value (P605:1) |      |      |     |
| P414:1                                                    | 0x4004:1  | Speed                                                                                                                                                                                                                                                                                                    | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                                |           | Frequency start value for MOP-Mode<br><b>Note:</b> Only active if P413:0 is set to 1                                                                                                                                                                                                                     |      |      |     |
| P414:2                                                    | 0x4004:2  | Process controller (PID)                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
| -300.00 ... [0.00] ... 300.00 PUnit                       |           | Process controller start value for MOP-Mode<br><b>Note:</b> Only active if P413:0 is set to 1                                                                                                                                                                                                            |      |      |     |

### 6.6.4 User defined faults

Two user defined fault can be configured. (Example: To stop motor in case of process fault) If a user defined fault occurs the inverter goes into fault state. After clearing the fault the resetting of the inverter is required.

| P400:43                                    | 0x2631:43 | User-defined fault 1                  | i510 | i550 | R/W |
|--------------------------------------------|-----------|---------------------------------------|------|------|-----|
| 0: Not connected<br>(Reference see P400:1) |           | Configuration of user defined fault 1 |      |      |     |
| P400:44                                    | 0x2631:44 | User-defined fault 2                  | i510 | i550 | R/W |
| 0: Not connected<br>(Reference see P400:1) |           | Configuration of user defined fault 2 |      |      |     |

### 6.6.5 Digital input configuration

The digital input are used for control operations. The following configurations are available for the digital input signals:

- **Assertion Level (Only I550)**  
The I550 digital inputs can be used with PNP or NPN signals. The setting applies for all digital inputs!
- **Signal inversion**  
Every digital Input can be inverted individually
- **Connection list / Function**  
In general a digital input is assigned to a specific function like Start Reverse or Quick stop. With that it is possible to have more than one function on the same digital input.



See chapter 6.6.1 Function list (Run/Stop/Start/Jog/Reverse), page 69 for the configurable functions.

| P410:1                                  | 0x2630:1 | Assertion level                                                                                                     |      | i550 | R/W |
|-----------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: LOW active<br>1: HIGH active         |          | Input signal assertion for PNP/NPN selection<br>0: Low<br>For NPN input signals<br>1: High<br>For PNP input signals |      |      |     |
| P410:2                                  | 0x2630:2 | Mode selection                                                                                                      | i510 | i550 | R/W |
| 0: Digital input<br>1: Encoder (AB) (*) |          | Mode selection for digital input functionalities (DI4 / DI3):<br>0: DI4 / DI3 = digital inputs<br>1: Encoder (AB)   |      |      |     |
| P411:1                                  | 0x2632:1 | Digital input 1                                                                                                     | i510 | i550 | R/W |
| 0: Not inverted<br>1: Inverted          |          | Inversion of Digital Input                                                                                          |      |      |     |
| P411:2                                  | 0x2632:2 | Digital input 2                                                                                                     | i510 | i550 | R/W |
| 0: Not inverted<br>1: Inverted          |          | Inversion of Digital Input                                                                                          |      |      |     |
| P411:3                                  | 0x2632:3 | Digital input 3                                                                                                     | i510 | i550 | R/W |
| 0: Not inverted<br>1: Inverted          |          | Inversion of Digital Input                                                                                          |      |      |     |
| P411:4                                  | 0x2632:4 | Digital input 4                                                                                                     | i510 | i550 | R/W |
| 0: Not inverted<br>1: Inverted          |          | Inversion of Digital Input                                                                                          |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

| P411:5                         | 0x2632:5 | Digital input 5            | i510 | i550 | R/W |
|--------------------------------|----------|----------------------------|------|------|-----|
| 0: Not inverted<br>1: Inverted |          | Inversion of Digital Input |      |      |     |
| P411:6                         | 0x2632:6 | Digital input 6 (*)        |      | i550 | R/W |
| 0: Not inverted<br>1: Inverted |          | Inversion of Digital Input |      |      |     |
| P411:7                         | 0x2632:7 | Digital input 7 (*)        |      | i550 | R/W |
| 0: Not inverted<br>1: Inverted |          | Inversion of Digital Input |      |      |     |

### 6.6.6 Frequency threshold setup

A frequency threshold can be used to trigger a function, a digital output or the relay. The trigger is referenced to actual inverter output frequency. This trigger is TRUE when the actual output frequency is above a programmable frequency threshold.

| P412:0                     | 0x4005:0 | Frequency threshold | i510 | i550 | R/W |
|----------------------------|----------|---------------------|------|------|-----|
| 0.0 ... [0.0] ... 599.0 Hz |          | Frequency threshold |      |      |     |

### 6.6.7 Digital output configuration

The digital outputs (Relay, DO) can be configured:

- Functionality can be selected
- Inversion of Output (Only Relay and DO)

| P420:1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0x2634:1 | Relay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | i510 | i550 | R/W |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: Not connected<br>1: Constant TRUE<br>11: Digital input 1<br>12: Digital input 2<br>13: Digital input 3<br>14: Digital input 4<br>15: Digital input 5<br>16: Digital input 6 (*)<br>17: Digital input 7 (*)<br>34: NETWordIN2 - bit 0<br>35: NETWordIN2 - bit 1<br>36: NETWordIN2 - bit 2<br>37: NETWordIN2 - bit 3<br>38: NETWordIN2 - bit 4<br>39: NETWordIN2 - bit 5<br>40: NETWordIN2 - bit 6<br>41: NETWordIN2 - bit 7<br>42: NETWordIN2 - bit 8<br>43: NETWordIN2 - bit 9<br>44: NETWordIN2 - bit 10<br>45: NETWordIN2 - bit 11<br>46: NETWordIN2 - bit 12<br>47: NETWordIN2 - bit 13<br>48: NETWordIN2 - bit 14<br>49: NETWordIN2 - bit 15 |          | 0: Not Connected / always false<br>1: TRUE always<br>11-17: TRUE when corresponding digital input is asserted<br>34-49: TRUE when selected bit of the NETWordIn is high.<br>50: TRUE when the inverter is running.<br>FALSE when inverter is disabled, DC-Brake active, quick stopped and speed <0,2Hz, faulted or stopped.<br>51: TRUE when inverter not in Failure, Safety OK and DC link charged (SW 02.01)<br>52: TRUE when the inverter is enabled.<br>53: TRUE when inverter is enabled, output=0V, not running and not faulted<br>54: TRUE when quick stop is selected and active.<br>55: TRUE when Safe Torque OFF is active<br>56: TRUE when the inverter has a fault condition.<br>57: TRUE when the inverter has a fault condition that is locked and cannot be reset.<br>58: TRUE when a warning is present.<br>59: TRUE when a trouble condition is present.<br>60: TRUE when the heat sink temperature exceeds the warning level<br>65: TRUE when a PTC fault is detected.<br>66: TRUE when a flying start or a restart is active<br>67: TRUE when the DC brake is on.<br>69: TRUE when output frequency is negative<br>70: TRUE when the output frequency is > the frequency threshold |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |             |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
| 50: Running<br><b>51: Ready for operation</b><br>52: Inverter enable<br>53: Stop active<br>54: Quick stop active<br>55: Safe Torque Off<br>56: Fault<br>57: Fault interlocking<br>58: Device warning<br>59: Device fault active<br>60: Heatsink temp. warn. active<br>65: PTC fault<br>66: Flying restart<br>67: DC brake active<br>69: Inverse rotation<br>70: Frequency thld exceeded<br>71: Actual speed = 0<br>72: Setpoint speed reached<br>73: PID feedback = setpoint<br>74: Sleep mode on<br>75: Minimum alarm<br>76: Maximum alarm<br>77: Minimum/Maximum alarm<br>78: At current limit<br>79: At torque limit<br>80: Follower signal loss<br>81: Error analog input 1<br>82: Error analog input 2<br>83: Loss of load<br>104: Local control active<br>105: Remote control active<br>106: Manual setpoint active<br>107: Automatic setpoint active<br>108: Parameter set 1 active<br>109: Parameter set 2 active<br>110: Parameter set 3 active<br>111: Parameter set 4 active<br>112: Parameter set load OK<br>113: Parameter set load fail<br>114: Network control<br>115: Holding brake release |                 | (P412:0)<br>71: TRUE when the output frequency is zero +/- 0.01Hz<br>72: TRUE when the inverter reaches the commanded setpoint and setpoint <> 0 Hz<br>73: TRUE when the PID feedback is equal to the programmed setpoint +/- 2%<br>74: TRUE when in Sleep mode<br>75: TRUE when a minimum alarm is triggered (reference to P608:1)<br>76: TRUE when a maximum alarm is triggered (reference to P608:2)<br>77: TRUE when no minimum/maximum alarm is active. (reference to P608:1 & P608:2)<br>78: TRUE when the actual motor current has exceeded the level in P324:0.<br>79: TRUE when the actual torque has exceeded the level in P326:0, 0x60E0:0 or 0x60E1:0.<br>80: TRUE when AI1 / AI2 are configured for 4...20 mA, the setpoint source is active and the signal falls below 2 mA.<br>81: TRUE when loss of the analog input 1 has been detected. P430:8-10<br>82: TRUE when loss of the analog input 2 has been detected. P431:8-10<br>83: TRUE when no load is detected<br>104: TRUE when local (LOC) mode is active (local keypad START control)<br>105: TRUE when remote (REM) mode is active (all control sources EXCEPT keypad control)<br>106: TRUE when manual (MAN) mode is active (Keypad setpoint control)<br>107: TRUE when automatic (AUTO) mode is active (All setpoint sources other than Keypad)<br>108: TRUE when parameter set #1 is loaded and active.<br>109: TRUE when parameter set #1 is loaded and active.<br>110: TRUE when parameter set #1 is loaded and active.<br>111: TRUE when parameter set #1 is loaded and active.<br>112: TRUE after any parameter set 1...4 change-over has completed without error.<br>113: TRUE when any parameter set load fails.<br>114: TRUE when on AC Drive control word (P592:1) Bit 5 = TRUE (specifically for AC Drive profile)<br>115: TRUE when brake release signal is TRUE (either by auto trigger or manual trigger). |             |             |            |
| <b>P420:2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>0x2634:2</b> | <b>Digital output 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>115:Holding brake release</b><br>(Reference see P420:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 | Function of Digital Output 1<br>(Reference list see P420:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |             |            |
| <b>P420:3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>0x2634:3</b> | <b>Digital output 2 (*)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             | <b>i550</b> | <b>R/W</b> |
| <b>56:Fault</b><br>(Reference see P420:1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 | Function of Digital Output 2<br>(Reference list see P420:1)<br><br>Note: Only with Application IO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |             |            |
| <b>P421:1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>0x2635:1</b> | <b>Relay</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0: Not inverted</b><br><b>1: Inverted</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 | Inversion of Relay Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |             |            |

## 6 Function & parameter description

### Group 4 – I/O setup

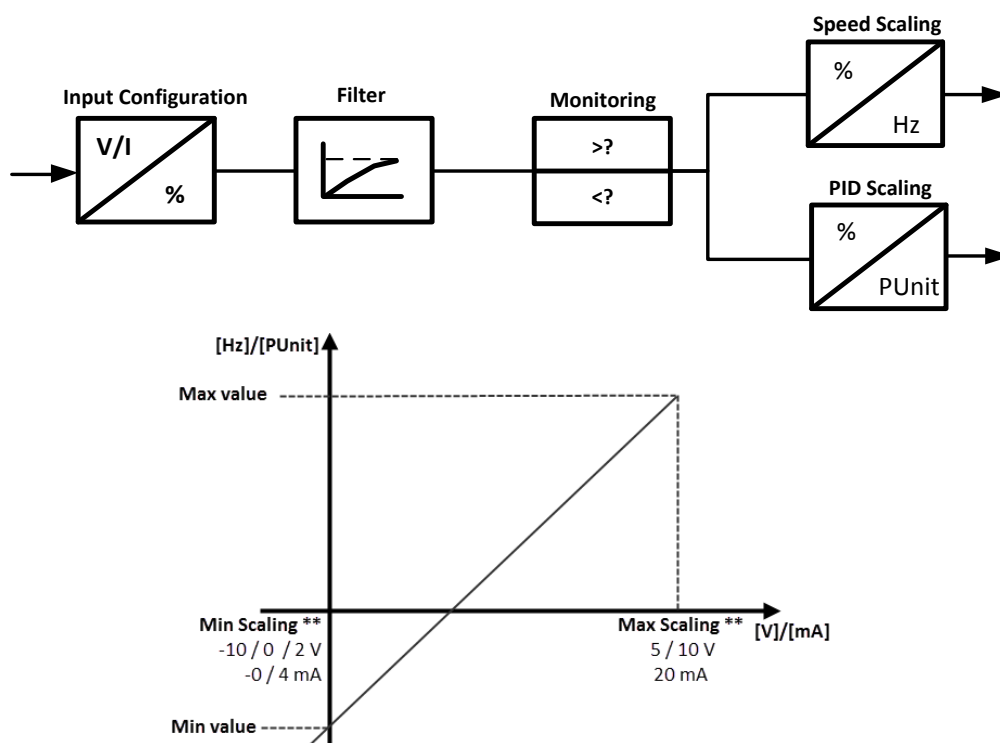
| P421:2                                | 0x2635:2 | Digital output 1              | i510 | i550 | R/W |
|---------------------------------------|----------|-------------------------------|------|------|-----|
| 0: Not inverted<br>1: Inverted        |          | Inversion of Digital Output 1 |      |      |     |
| P421:3                                | 0x2635:3 | Digital output 2 (*)          |      | i550 | R/W |
| 0: Not inverted<br>1: Inverted        |          | Inversion of Digital Output 2 |      |      |     |
| <b>Note:</b> Only with Application IO |          |                               |      |      |     |

### 6.6.8 Analog input settings

The inverter is equipped with two analog inputs. These can be configured as reference or feedback signal.

The following settings are available:

- Input configuration
- Input filter time / Input Dead time
- Input monitoring function
- Input scaling



\*\* Availability of scaling depending on type of control unit.

| P430:1                                                                                           | 0x2636:1 | AI 1 configuration                     | i510 | i550 | R/W |
|--------------------------------------------------------------------------------------------------|----------|----------------------------------------|------|------|-----|
| 0: 0...10VDC<br>1: 0...5VDC<br>2: 2...10VDC<br>3: -10...+10VDC (*)<br>4: 4...20mA<br>5: 0...20mA |          | Configuration of Analog input signal 1 |      |      |     |
| <b>Note:</b> On i510 only current and unipolar voltage input available.                          |          |                                        |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

|                                                                                                                                                    |                  |                                                                                                                                                                                                                                             |             |             |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
| <b>P430:2</b>                                                                                                                                      | <b>0x2636:2</b>  | <b>Analog input 1: Min value [Hz]</b>                                                                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -1000.0 ... <b>[0.0]</b> ... 1000.0 Hz                                                                                                             |                  | Frequency scaling of the analog input<br>Represents the minimum of the analog input value                                                                                                                                                   |             |             |            |
| <b>P430:3</b>                                                                                                                                      | <b>0x2636:3</b>  | <b>Analog input 1: Max value [Hz]</b>                                                                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -1000.0 ... <b>[50.0]</b> ... 1000.0 Hz                                                                                                            |                  | Frequency scaling of the analog input<br>Represents the maximum of the analog input value                                                                                                                                                   |             |             |            |
| <b>P430:4</b>                                                                                                                                      | <b>0x2636:4</b>  | <b>Analog input 1: Min value [Punit/%]</b>                                                                                                                                                                                                  | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -300.00 ... <b>[0.00]</b> ... 300.00 PUnit/%                                                                                                       |                  | PID/Torque scaling of the analog input<br>Represents the minimum of the analog input value                                                                                                                                                  |             |             |            |
| <b>P430:5</b>                                                                                                                                      | <b>0x2636:5</b>  | <b>Analog input 1: Max value [Punit/%]</b>                                                                                                                                                                                                  | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -300.00 ... <b>[100.00]</b> ... 300.00 PUnit/%                                                                                                     |                  | PID/Torque scaling of the analog input<br>Represents the maximum of the analog input value                                                                                                                                                  |             |             |            |
| <b>P430:6</b>                                                                                                                                      | <b>0x2636:6</b>  | <b>Analog input 1: Filter time</b>                                                                                                                                                                                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0 ... <b>[10]</b> ... 10000 ms                                                                                                                     |                  | Analog input filter time constant                                                                                                                                                                                                           |             |             |            |
| <b>P430:7</b>                                                                                                                                      | <b>0x2636:7</b>  | <b>Analog input 1: Deadband</b>                                                                                                                                                                                                             | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0.0 ... <b>[0.0]</b> ... 100.0 %                                                                                                                   |                  | Configuration of the deadband such that any input value below this percentage will be treated as 0Hz. (In % of Max Input Value)<br>Example: Deadband 10% of 50Hz:<br>-10V ... 10V Deadband -5Hz ... 5 Hz<br>0 ... 10V Deadband 0Hz ... 5 Hz |             |             |            |
| <b>P430:8</b>                                                                                                                                      | <b>0x2636:8</b>  | <b>Analog input 1: Monitoring level</b>                                                                                                                                                                                                     | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -100.0 ... <b>[0.0]</b> ... 100.0 %                                                                                                                |                  | Monitoring condition of the analog input                                                                                                                                                                                                    |             |             |            |
| <b>P430:9</b>                                                                                                                                      | <b>0x2636:9</b>  | <b>Analog input 1: Monitoring action</b>                                                                                                                                                                                                    | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0: Below level 1</b><br><b>1: Above level 1</b>                                                                                                 |                  | Monitoring condition of the analog input                                                                                                                                                                                                    |             |             |            |
| <b>P430:10</b>                                                                                                                                     | <b>0x2636:10</b> | <b>Analog input 1: Error response</b>                                                                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>3: Fault</b><br>(Reference see P310:1)                                                                                                          |                  | Fault reaction of the analog input monitoring.                                                                                                                                                                                              |             |             |            |
| <b>P431:1</b>                                                                                                                                      | <b>0x2637:1</b>  | <b>AI2 configuration</b>                                                                                                                                                                                                                    | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0: 0...10VDC</b><br><b>1: 0...5VDC</b><br><b>2: 2...10VDC</b><br><b>3: -10...+10VDC (*)</b><br><b>4: 4...20mA (*)</b><br><b>5: 0...20mA (*)</b> |                  | Configuration of analog input signal 2<br><br><b>Note:</b> On i510 only unipolar voltage input available.                                                                                                                                   |             |             |            |
| <b>P431:2</b>                                                                                                                                      | <b>0x2637:2</b>  | <b>Analog input 2: Min value [Hz]</b>                                                                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -1000.0 ... <b>[0.0]</b> ... 1000.0 Hz                                                                                                             |                  | Frequency scaling of the analog input<br>Represents the minimum of the analog input value                                                                                                                                                   |             |             |            |
| <b>P431:3</b>                                                                                                                                      | <b>0x2637:3</b>  | <b>Analog input 2: Max value [Hz]</b>                                                                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -1000.0 ... <b>[50.0]</b> ... 1000.0 Hz                                                                                                            |                  | Frequency scaling of the analog input<br>Represents the maximum of the analog input value                                                                                                                                                   |             |             |            |
| <b>P431:4</b>                                                                                                                                      | <b>0x2637:4</b>  | <b>Analog input 2: Min value [Punit/%]</b>                                                                                                                                                                                                  | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -300.00 ... <b>[0.00]</b> ... 300.00 PUnit/%                                                                                                       |                  | PID/Torque scaling of the analog input<br>Represents the minimum of the analog input value                                                                                                                                                  |             |             |            |
| <b>P431:5</b>                                                                                                                                      | <b>0x2637:5</b>  | <b>Analog input 2: Max value [Punit/%]</b>                                                                                                                                                                                                  | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -300.00 ... <b>[100.00]</b> ... 300.00 PUnit/%                                                                                                     |                  | PID/Torque scaling of the analog input<br>Represents the maximum of the analog input value                                                                                                                                                  |             |             |            |
| <b>P431:6</b>                                                                                                                                      | <b>0x2637:6</b>  | <b>Analog input 2: Filter time</b>                                                                                                                                                                                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0 ... <b>[10]</b> ... 10000 ms                                                                                                                     |                  | Analog input filter time constant                                                                                                                                                                                                           |             |             |            |

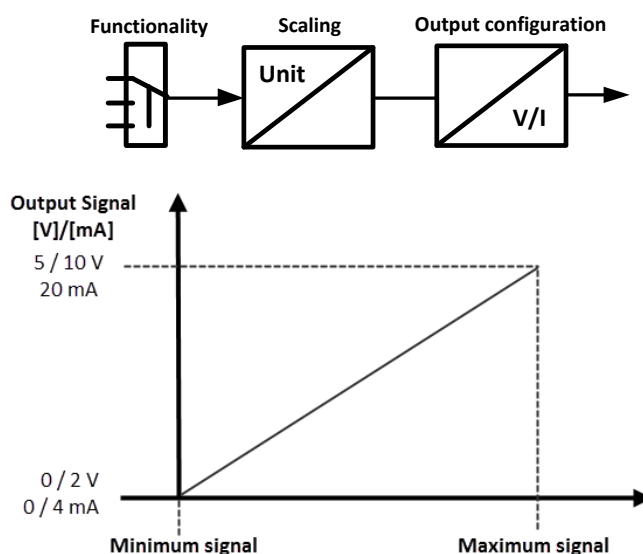
## 6 Function & parameter description

### Group 4 – I/O setup

| P431:7                               | 0x2637:7  | Analog input 2: Deadband                                                                                                                                                                                                                    | i510 | i550 | R/W |
|--------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [0.0] ... 100.0 %            |           | Configuration of the deadband such that any input value below this percentage will be treated as 0Hz. (In % of Max Input Value)<br>Example: Deadband 10% of 50Hz:<br>-10V ... 10V Deadband -5Hz ... 5 Hz<br>0 ... 10V Deadband 0Hz ... 5 Hz |      |      |     |
| P431:8                               | 0x2637:8  | Analog input 2: Monitoring level                                                                                                                                                                                                            | i510 | i550 | R/W |
| -100.0 ... [0.0] ... 100.0 %         |           | Monitoring condition of the analog input                                                                                                                                                                                                    |      |      |     |
| P431:9                               | 0x2637:9  | Analog input 2: Monitoring action                                                                                                                                                                                                           | i510 | i550 | R/W |
| 0: Below level 1<br>1: Above level 1 |           | Monitoring condition of the analog input                                                                                                                                                                                                    |      |      |     |
| P431:10                              | 0x2637:10 | Analog input 2: Error response                                                                                                                                                                                                              | i510 | i550 | R/W |
| 3:Fault<br>(Reference see P310:1)    |           | Fault reaction of the analog input monitoring.                                                                                                                                                                                              |      |      |     |

### 6.6.9 Analog output settings

The analog output can be used to send a feedback signal to the control system (I. e. Motor current, Actual Frequency, ...). Different functions and output configurations are available.



| P440:1                                                                                                            | 0x2639:1 | AO1 configuration                                                             | i510 | i550 | R/W |
|-------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------|------|------|-----|
| 0: Disabled<br>1: 0...10VDC<br>2: 0...5VDC<br>3: 2...10VDC<br>4: 4...20mA<br>5: 0...20mA                          |          | Configuration of Analog output signal 1                                       |      |      |     |
| P440:2                                                                                                            | 0x2639:2 | Function                                                                      | i510 | i550 | R/W |
| 0: Not connected<br>1: <b>Output frequency</b><br>2: Frequency setpoint<br>3: Analog input 1<br>4: Analog input 2 |          | Analog output function1<br><br>Scaling factors:<br>1: [0.1 Hz]<br>2: [0.1 Hz] |      |      |     |

## 6 Function & parameter description

### Group 4 – I/O setup

|                                                                         |                 |                                                                                                                                                                                                               |             |             |            |
|-------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
| 5: Motor current<br>6: Actual power<br>20: NETWordIN3<br>21: NETWordIN4 |                 | 3: [0.1 %]<br>4: [0.1 %]<br>5: [0.1 A]<br>6: [0.001 kW]<br>20: [0.1 %]<br>21: [0.1 %]                                                                                                                         |             |             |            |
| <b>P440:3</b>                                                           | <b>0x2639:3</b> | <b>Minimum signal</b>                                                                                                                                                                                         | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -- ... <b>[0]</b> ... --                                                |                 | Minimum scaling of the analog output 1<br>Setting x Scaling factor = Minimum analog output value:<br><br>Example: Setting 10, 'Actual output frequency'<br>Minimum analog output value = 10 x 0.1 Hz = 1Hz    |             |             |            |
| <b>P440:4</b>                                                           | <b>0x2639:4</b> | <b>Maximum signal</b>                                                                                                                                                                                         | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| -- ... <b>[1000]</b> ... --                                             |                 | Maximum scaling of the analog Output 1<br>Setting x Scaling factor = Maximum analog output value:<br><br>Example: Setting 500, 'Actual output frequency'<br>Maximum analog output value = 500 x 0.1 Hz = 50Hz |             |             |            |

## 6 Function & parameter description

### Group 4 – I/O setup

#### 6.6.10 Preset setpoints (Frequency, PID)

The inverter has 15 preset frequency setpoints, 8 preset PID setpoints. They can be selected in two ways:

- As default setpoint (Frequency: P201:1, PID: P201:2)
- Triggered by digital inputs (P400:18 – 400:21)

The Preset setpoint selection is done by a binary combination of bits triggering the Preset Setpoint Selection Functions. Combination Example: bit0 and bit2 result in Preset 6



See chapter 6.2.1 Setpoint structure / operation mode, page 36

| P450:1                                     | 0x2911:1   | Preset 1                                                             | i510 | i550 | R/W |
|--------------------------------------------|------------|----------------------------------------------------------------------|------|------|-----|
| 0.0 ... [20.0] ... 599.0 Hz                |            | Preset frequency setpoint 1                                          |      |      |     |
| P450:2                                     | 0x2911:2   | Preset 2                                                             | i510 | i550 | R/W |
| 0.0 ... [40.0] ... 599.0 Hz                |            | Preset frequency setpoint 2                                          |      |      |     |
| P450:3                                     | 0x2911:3   | Preset 3                                                             | i510 | i550 | R/W |
| 0.0 ... [Type code dependent] ... 599.0 Hz |            | Preset frequency setpoint 3                                          |      |      |     |
| P450:4                                     | 0x2911:4   | Preset 4                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 4                                          |      |      |     |
| P450:5                                     | 0x2911:5   | Preset 5                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 5<br><b>Note:</b><br>Also used for Jog FWD |      |      |     |
| P450:6                                     | 0x2911:6   | Preset 6                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 6<br><b>Note:</b><br>Also used for Jog REV |      |      |     |
| P450:7                                     | 0x2911:7   | Preset 7                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 7                                          |      |      |     |
| P450:8                                     | 0x2911:8   | Preset 8                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 8                                          |      |      |     |
| P450:9                                     | 0x2911:9   | Preset 9                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 9                                          |      |      |     |
| P450:10                                    | 0x2911:10  | Preset 10                                                            | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 10                                         |      |      |     |
| P450:11                                    | 0x2911:11  | Preset 11                                                            | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 11                                         |      |      |     |
| P450:12                                    | 0x2911:12  | Preset 12                                                            | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 12                                         |      |      |     |
| P450:13                                    | 0x2911:13  | Preset 13                                                            | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 13                                         |      |      |     |
| P450:14                                    | 0x2911:14  | Preset 14                                                            | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 14                                         |      |      |     |
| P450:15                                    | 0x2911:15  | Preset 15                                                            | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 599.0 Hz                 |            | Preset frequency setpoint 15                                         |      |      |     |
| P451:1-8                                   | 0x4022:1-8 | Process controller preset 1-8                                        | i510 | i550 | R/W |
| -300.00 ... [0.00] ... 300.00 PUnit        |            | Preset PID setpoint 1-8                                              |      |      |     |

## 6.7 Group 5 – Fieldbus



See chapter 7 Fieldbus on page 95

## 6.8 Group 6 – PID setup

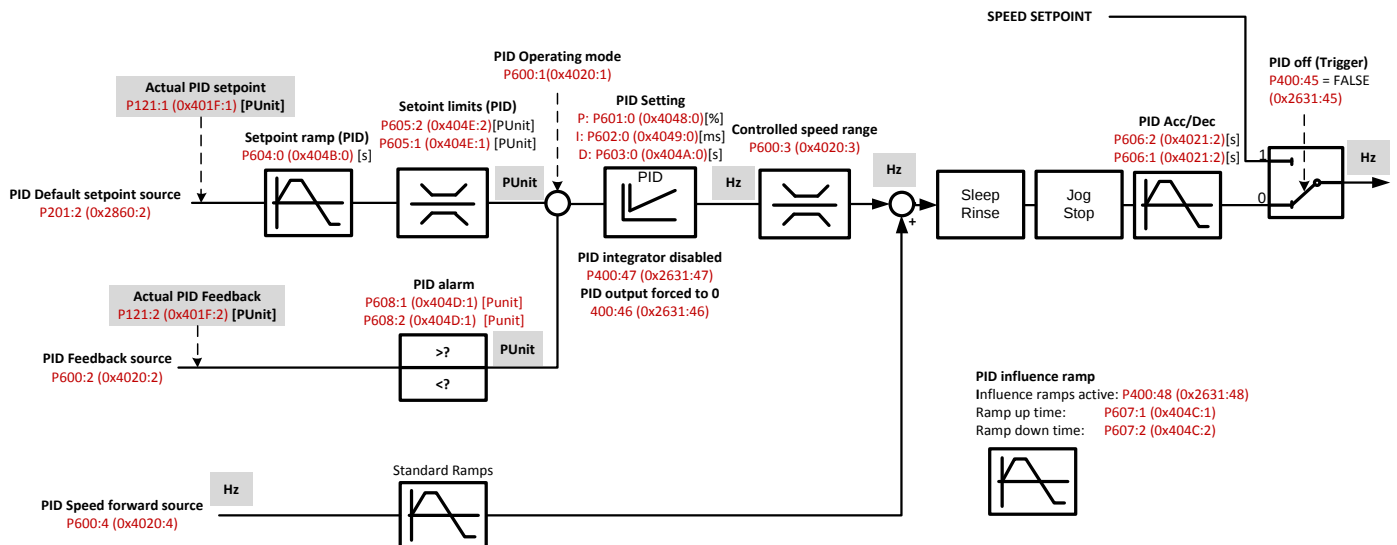
To regulate the motor speed related to a process value the inverter has a PID controller integrated. This is a closed loop control.

Example:

Using an feedback signal (i.e. pressure transducer) the inverter can regulate the speed.

### Setup procedure:

1. Select the correct PID Operating mode (P600:1)
2. Select the PID feedback source (P600:2) and setup the analog input accordingly
3. Select the PID default setpoint source (P201:2)
4. Set the PID speed range (P600:3) to a proper value
5. Test and tune your PID control  
(Start with default settings first)
6. Set additional functions (if needed)  
Setpoint ramp time, PID ramp time, Min/Max Alarm, line speed, influence function.



### 6.8.1 PID Setup

| P600:1                    | 0x4020:1 | Operating mode                                                          | i510 | i550 | R/W |
|---------------------------|----------|-------------------------------------------------------------------------|------|------|-----|
| <b>0: Disabled</b>        |          | PID Operating mode                                                      |      |      |     |
| 1: Normal operation       |          |                                                                         |      |      |     |
| 2: Reverse operation      |          | 0: Disabled:                                                            |      |      |     |
| 3: Normal bi-directional  |          | PID is disabled                                                         |      |      |     |
| 4: Reverse bi-directional |          | 1: Normal operation                                                     |      |      |     |
|                           |          | Direct acting system. Motor needs to increase the speed to increase the |      |      |     |

## 6 Function & parameter description

### Group 6 – PID setup

|                                                                                                                                                                                                                                                          |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |             |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|
|                                                                                                                                                                                                                                                          |                 | <p>feedback signal.<br/>Example: Booster pump regulated by Pressure. (Increase of Motor speed results in an increase of the pressure)<br/>Motor can turn only in one direction</p> <p>2: Reverse operation<br/>Motor needs to increase the speed to decrease the feedback signal.<br/>Example: Cooling water pump regulated by temperature. (Increase of the cooling pump speed results in a decrease of the temperature.)<br/>Motor can run only in one direction</p> <p>3: Normal bi-directional<br/>Normal acting mode. Motor can run in both directions.</p> <p>4: Reverse bi-directional<br/>Reverse acting mode. Motor can run in both directions.</p> |             |             |            |
| <b>P600:2</b>                                                                                                                                                                                                                                            | <b>0x4020:2</b> | <b>Feedback source</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>1: Analog input 1</b><br>2: Analog input 2<br>3: DC Bus voltage<br>4: Motor Current<br>5: Network                                                                                                                                                     |                 | Selection of the PID feedback source<br><b>Note:</b> The PID set point and PID Feedback can be different signals!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |             |            |
| <b>P600:3</b>                                                                                                                                                                                                                                            | <b>0x4020:3</b> | <b>Controlled speed range</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0 ... <b>[100]</b> ... 100 %                                                                                                                                                                                                                             |                 | Defines the % of the inverter output frequency that PID will regulate to.<br>Example:<br>P211:0 Max frequency = 50 Hz<br>P600:3 PID Controlled speed range = 80 %<br>--> Max calculated PID setpoint 40 Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |             |            |
| <b>P600:4</b>                                                                                                                                                                                                                                            | <b>0x4020:4</b> | <b>Speed feedforward source</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0: No Speed Added</b><br>1: Keypad frequency setpoint<br>2: Analog input 1<br>3: Analog input 2<br>4: Preset frequency setpoint 1<br>5: Preset frequency setpoint 2<br>6: Preset frequency setpoint 3<br>7: Preset frequency setpoint 4<br>8: Network |                 | Selection of Speed feedforward source<br>PID speed output = Speed feedforward source + PID controlled speed<br>(Used for Trim control, Dancer control). The line speed (feed-forward) value is added to the calculated PID output frequency value (see PID block diagram above).                                                                                                                                                                                                                                                                                                                                                                             |             |             |            |
| <b>P601:0</b>                                                                                                                                                                                                                                            | <b>0x4048:0</b> | <b>P component gain</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 0.0 ... <b>[5.0]</b> ... 1000.0 %                                                                                                                                                                                                                        |                 | PID controller P gain<br>% of max Frequency that results from a 1% PID Error<br>Example:<br>PID Error = 20 PUnits<br>P601:0 P component gain = 2%<br>P211:0 Maximum frequency = 50Hz<br>--> PID Output = PID Error * P Gain * (Maximum frequency / 100)<br>--> PID Output = 10 Hz                                                                                                                                                                                                                                                                                                                                                                            |             |             |            |
| <b>P602:0</b>                                                                                                                                                                                                                                            | <b>0x4049:0</b> | <b>I component reset time</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| 20 ... <b>[400]</b> ... 6000 ms                                                                                                                                                                                                                          |                 | PID controller adjustment time Tn<br>- Value "6000 ms" deactivates the I component.<br>- With P400:47 the I Part can be disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |             |            |

## 6 Function & parameter description

### Group 6 – PID setup

| P603:0                     | 0x404A:0 | D component gain                                                                           | i510 | i550 | R/W |
|----------------------------|----------|--------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [0.0] ... 20.0 s   |          | PID controller D gain<br>% of max Frequency that results from 1%/s change of the PID Error |      |      |     |
| P604:0                     | 0x404B:0 | Setpoint ramp (PID)                                                                        | i510 | i550 | R/W |
| 0.0 ... [20.0] ... 100.0 s |          | PID Setpoint ramp up/down time<br>(Time from Analog Min to Analog Max)                     |      |      |     |

### 6.8.2 PID triggers

| P400:45                                   | 0x2631:45 | Process controller off                                                                                                                                                       | i510 | i550 | R/W |
|-------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0:Not connected<br>(Reference see P400:1) |           | Switch off PID controller by external trigger<br><b>State:</b><br>TRUE: Inverter switched to velocity mode.<br>FALSE: PID control is determined by P600:1 PID Operating mode |      |      |     |
| P400:46                                   | 0x2631:46 | PID output forced to 0                                                                                                                                                       | i510 | i550 | R/W |
| 0:Not connected<br>(Reference see P400:1) |           | Switch off PID controller output to zero<br><b>State:</b><br>TRUE: The output of the PID controller is forced to 0.<br>FALSE: No action                                      |      |      |     |
| P400:47                                   | 0x2631:47 | PID integrator disabled                                                                                                                                                      | i510 | i550 | R/W |
| 0:Not connected<br>(Reference see P400:1) |           | Disable PID Integrator by external Trigger                                                                                                                                   |      |      |     |

### 6.8.3 PID Setpoint limits

| P605:1                                 | 0x404E:1 | Minimum setpoint                       | i510 | i550 | R/W |
|----------------------------------------|----------|----------------------------------------|------|------|-----|
| -300.00 ... [-300.00] ... 300.00 PUnit |          | Minimum limitation of the PID setpoint |      |      |     |
| P605:2                                 | 0x404E:2 | Maximum setpoint                       | i510 | i550 | R/W |
| -300.00 ... [300.00] ... 300.00 PUnit  |          | Maximum limitation of the PID setpoint |      |      |     |

### 6.8.4 PID Acceleration / Deceleration

| P606:1                     | 0x4021:1 | Acceleration time                                                  | i510 | i550 | R/W |
|----------------------------|----------|--------------------------------------------------------------------|------|------|-----|
| 0.0 ... [1.0] ... 3600.0 s |          | PID output Acceleration time<br>(Time from 0 to Maximum frequency) |      |      |     |
| P606:2                     | 0x4021:2 | Deceleration time                                                  | i510 | i550 | R/W |
| 0.0 ... [1.0] ... 3600.0 s |          | PID output Deceleration time<br>(Time from Maximum frequency)      |      |      |     |

## 6 Function & parameter description

### Group 6 – PID setup

#### 6.8.5 PID Influence

The Influence of the PID can be ramped up / down with a external Trigger.

Example usage: Winding application.

| P400:48                                          | 0x2631:48 | PID influence ramps active                                                                                                                                                                                                                                 | i510 | i550 | R/W |
|--------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>1:Constant TRUE</b><br>(Reference see P400:1) |           | Activates PID influence ramp by external Trigger<br><b>States:</b><br>TRUE: Influence ramp time have no effect on PID<br><b>Transition states:</b><br>FALSE --> TRUE: Ramping up PID according P607:1<br>TRUE --> FALSE: Ramping down PID according P607:2 |      |      |     |
| P607:1                                           | 0x404C:1  | Ramp up time                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| 0.0 ... <b>[5.0]</b> ... 999.9 s                 |           | Ramp up time during switch ON of influencing (P400:48 PID influence ramps active)<br>(Time from 0 to Maximum frequency)                                                                                                                                    |      |      |     |
| P607:2                                           | 0x404C:2  | Ramp Down Time                                                                                                                                                                                                                                             | i510 | i550 | R/W |
| 0.0 ... <b>[5.0]</b> ... 999.9 s                 |           | Ramp down time during switch OFF of influencing (P400:48 PID influence ramps active)<br>(Time from Maximum frequency to 0)                                                                                                                                 |      |      |     |

#### 6.8.6 PID Alarms

| P608:1                                       | 0x404D:1 | MIN alarm threshold                                                                                                                                                                                           | i510 | i550 | R/W |
|----------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| -300.00 ... <b>[0.00]</b> ... 300.00 PUnit   |          | Minimum alarm of PID feedback signal<br>If PID feedback signal is lower than Min alarm level the signal is activated. Signal can be used to switch Digital Output / Relays / Network Output (Selection 75-77) |      |      |     |
| P608:2                                       | 0x404D:2 | MAX alarm threshold                                                                                                                                                                                           | i510 | i550 | R/W |
| -300.00 ... <b>[100.00]</b> ... 300.00 PUnit |          | Maximum alarm of PID feedback signal<br>If PID feedback signal is high than Min alarm level the signal is activated. Signal can be used to switch Digital Output / Relays / Network Output (Selection 75-77)  |      |      |     |

#### 6.8.7 PID Sleep/Rinse function

The PID has an integrated sleep & rinse function.

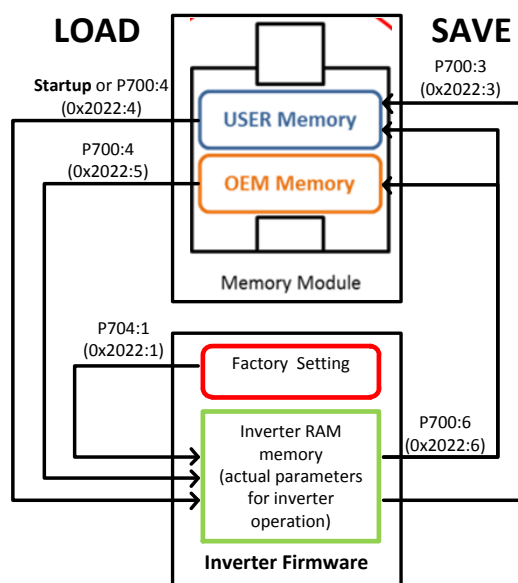
- **Sleep function:** Stop PID if there is no demand from the process
- **Rinse function:** Start the inverter periodically during sleep mode to prevent accumulation of deposits in the piping or the pump system.



See Easy starter for setup and more information

## 6.9 Group 7 – Auxiliary Functions

### 6.9.1 Device functions (Factory reset, load/store parameter)



| P700:1                                                                                                             | 0x2022:1 | Load factory setting                                                                                                                                                                                                                                                                                                                             | i510 | i550 | R/W |
|--------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: Off / ready<br>1: On / start<br>2: In process<br>3: Action cancelled<br>4: No access<br>5: No access / disabled |          | All parameters are reset to the factory setting optimized for 50Hz or 60Hz line frequency. Line frequency is selected by type key of device.<br><br><b>1: On / start</b><br>Start the reset to factory function<br><b>0, 2, 3, 4, 5:</b><br>Status of the reset to factory function<br><br><b>Note:</b> possible when the inverter is inhibited. |      |      |     |
| P700:3                                                                                                             | 0x2022:3 | Save data into EPM                                                                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| 0: Off / ready<br>(Reference see P700:1)                                                                           |          | Saves RAM values to the USER section of the EPM                                                                                                                                                                                                                                                                                                  |      |      |     |
| P700:4                                                                                                             | 0x2022:4 | Load data from EPM                                                                                                                                                                                                                                                                                                                               | i510 | i550 | R/W |
| 0: Off / ready<br>(Reference see P700:1)                                                                           |          | Reload USER parameters from EPM to the RAM.                                                                                                                                                                                                                                                                                                      |      |      |     |
| P700:5                                                                                                             | 0x2022:5 | Load OEM data from EPM                                                                                                                                                                                                                                                                                                                           | i510 | i550 | R/W |
| 0: Off / ready<br>(Reference see P700:1)                                                                           |          | Reload OEM parameters from EPM to the RAM.                                                                                                                                                                                                                                                                                                       |      |      |     |
| P700:6                                                                                                             | 0x2022:6 | Save OEM data to EPM                                                                                                                                                                                                                                                                                                                             | i510 | i550 | R/W |
| 0: Off / ready<br>(Reference see P700:1)                                                                           |          | Saves RAM values to the OEM section of the EPM.                                                                                                                                                                                                                                                                                                  |      |      |     |

#### 6.9.2 Keypad setup

| P701:0                                    | 0x2862:0 | Keypad setpoints                                                                                                                                                                                                                                                                                                                                                                                                            | i510 | i550 | R/W |
|-------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 1 ... [1] ... 100                         |          | Defines the setpoint increment by pressing UP/DOWN buttons on the keypad.<br>(Scaling: Frequency = 0.1, PID = 0,01)                                                                                                                                                                                                                                                                                                         |      |      |     |
| P702:0                                    | 0x4002:0 | Speed display scaling                                                                                                                                                                                                                                                                                                                                                                                                       | i510 | i550 | R/W |
| 0.00 ... [0.00] ... 650.00                |          | User unit can be shown on the keypad during running of the motor. (Example: Calculated speed after gearbox) The scaling factor P702:0 defines the user unit:<br>User unit = "Actual frequency" x P702:0<br>The scaled user unit is also shown in P101:0 (0x400D:0)<br><b>Note:</b><br>0: Function disabled<br>In PID mode the user unit has to be selected setting P703:0 to the scaled user unit (Set P703:0 = 0x400D0000) |      |      |     |
| P703:0                                    | 0x2864:0 | Keypad display                                                                                                                                                                                                                                                                                                                                                                                                              | i510 | i550 | R/W |
| 0x0 ... [0x0] ... 0xFFFFFFFF00            |          | The parameter which is shown on the keypad during running of the motor can be configured. Format: 0xiiiiss00 (iiii = Index heximal, ss=subindex)<br><b>Note:</b><br>0: Function disabled<br>Only parameters from group 1 can be selected.                                                                                                                                                                                   |      |      |     |
| P705:0                                    | 0x2863:0 | Keypad language selection                                                                                                                                                                                                                                                                                                                                                                                                   | i510 | i550 | R/W |
| 0: No Language<br>1: English<br>2: German |          | Selects the language of the Keypad                                                                                                                                                                                                                                                                                                                                                                                          |      |      |     |

#### 6.9.3 DC brake setup

DC Braking creates a braking torque by injecting DC current into the motor. This is useful to aid in decelerating a load that would otherwise take a long time due to inertia. It is also useful to lock the motor rotor either before starting or upon stopping.

The DC-Brake can be used as follows:

##### 1. Starting of the motor

DC-Brake can be selected as starting method in P203:1. At the starting of the motor the DC-Brake with the value of P704:1 is applied for the time defined in P704:2. After that the speed is ramped up.

##### 2. Stopping of the motor

If during stopping the motor frequency goes below the level P704:3 the inverter stops the speed deceleration and applies the DC Brake with the value of P704:1 is applied for the time defined in P704:2.

##### 3. Manually triggered (i.e. Digital IO)

The Trigger P400:5 activates the DC brake manually.

**Note:** The DC brake is ON as long as the function is triggered!

## 6 Function & parameter description

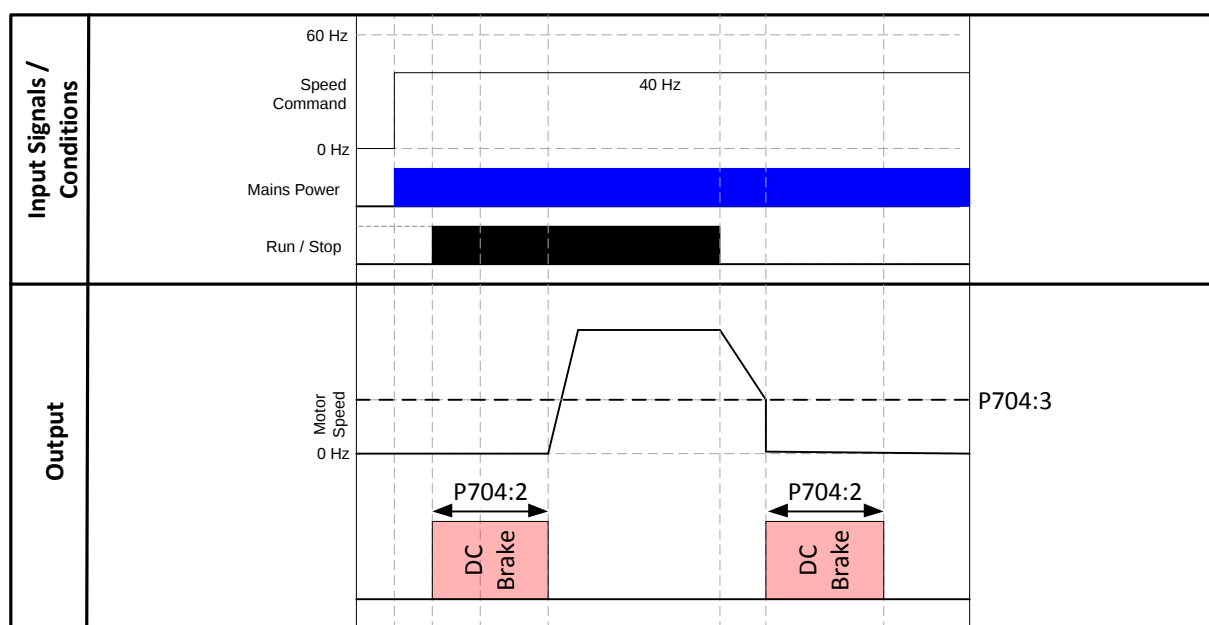
### Group 7 – Auxiliary Functions

#### **NOTICE!**

##### **Motor failure or damage**

During DC-Brake the motor heats up.

- ▶ DC Braking should only be used in applications where the load is stopped infrequently and should only be applied for the minimum time required possible.



| P400:5                                           | 0x2631:5 | DC brake                                                                                                                         | i510 | i550 | R/W |
|--------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>0:Not connected</b><br>(Reference see P400:1) |          | Manual DC Brake activation signal<br><br><b>Level:</b><br>TRUE: DC brake will be active.<br>FALSE: DC brake will be deactivated. |      |      |     |
| P704:1                                           | 0x2B84:1 | Current                                                                                                                          | i510 | i550 | R/W |
| 0.0 ... <b>[0.0]</b> ... 200.0 %                 |          | DC Brake current as of % of motor rated current                                                                                  |      |      |     |
| P704:2                                           | 0x2B84:2 | Auto hold time                                                                                                                   | i510 | i550 | R/W |
| 0.0 ... <b>[0.0]</b> ... 999.9 s                 |          | DC Brake time                                                                                                                    |      |      |     |
| P704:3                                           | 0x2B84:3 | Auto enable threshold                                                                                                            | i510 | i550 | R/W |
| 0.0 ... <b>[0.0]</b> ... 599.0 Hz                |          | Frequency Threshold to apply the DC Brake during deceleration of motor.                                                          |      |      |     |

#### 6.9.4 Regenerative energy management

##### **0: Brake resistor (only 550)**

If the threshold voltage is exceeded the braking resistor is energized.

##### **1: Deceleration override**

The motor will stop decelerating momentarily if the threshold voltage threshold is exceeded. (Maximum 4 s)

##### **2: Resistor and deceleration override (only 550)**

Combination of brake resistor and deceleration override

##### **3: Compound and deceleration override**

Combination of compound brake and deceleration override

The compound is an alternative where the inverter will superimpose a temporary increase to the speed setpoint to force the drive to cycle between decelerating and accelerating to maintain control of the DC Bus. Compound braking will cause the regenerative energy to be bled off of the motor in the form of heat. This results in the motor temperature rising and must be used with care to not shorten the life of the motor.

##### **4: Resistor/compound/override (only 550)**

Combination of brake resistor compound brake and deceleration override.

#### **NOTICE!**

##### **Brake resistor failure**

A wrong dimensioned brake resistor can lead to a component failure.

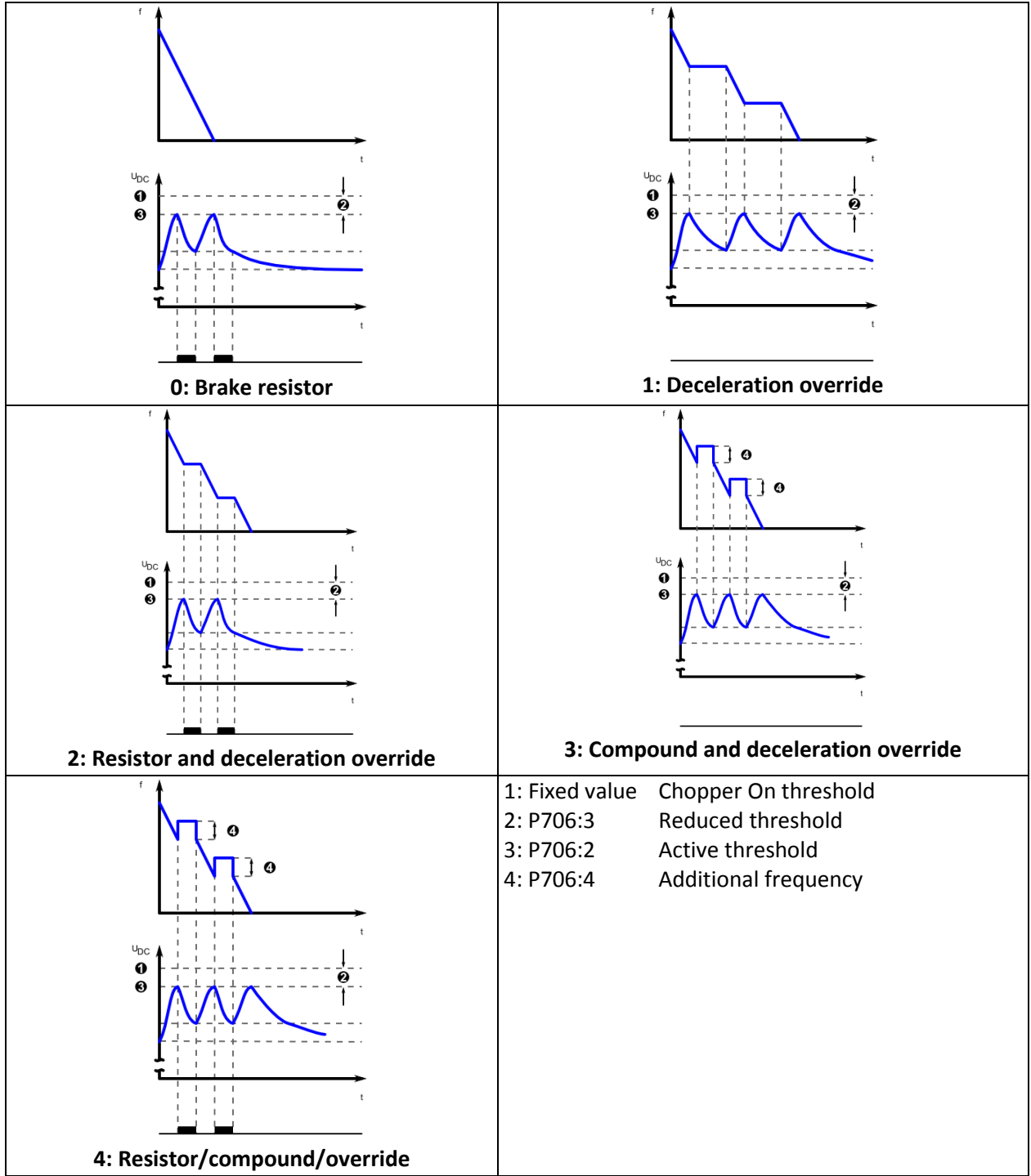
- ▶ Use the brake resistor specified for the inverter.
- ▶ Avoid thermal overload of the brake resistor
- ▶ Set the correct parameter for the braking resistor

#### **NOTICE!**

##### **Thermal overload of the motor**

During compound braking the motor overload monitoring (I2xt) is not adapted. If the braking too frequently, there is a risk of the motor being thermally overloaded.

- ▶ Avoid long braking times using the compound braking.
- ▶ The Compound Braking function must not be used with vertical conveyors (hoists) or with active loads!



## 6 Function & parameter description

### Group 7 – Auxiliary Functions

| P706:1                                                                                                                                                          | 0x2541:1  | Operating mode                                                                                                                                                         | i510 | i550 | R/W |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0: Brake resistor (*)<br><b>1: Deceleration override</b><br>2: Resistor and decel. override (*)<br>3: Comp. and decel.override<br>4: Resistor/comp/override (*) |           | Selection of braking mode                                                                                                                                              |      |      |     |
| P706:2                                                                                                                                                          | 0x2541:2  | Active threshold                                                                                                                                                       | i510 | i550 | R   |
| -- ... [Actual value] ... -- V                                                                                                                                  |           | DC link voltage threshold at which the braking is activated.<br>The threshold depends on the selected "Rated mains voltage" and parameter "Reduced threshold" (P706:3) |      |      |     |
| P706:3                                                                                                                                                          | 0x2541:3  | Reduced threshold                                                                                                                                                      | i510 | i550 | R/W |
| 0 ... [0] ... 100 V                                                                                                                                             |           | The activation of the braking method is reduced by this parameter.                                                                                                     |      |      |     |
| P706:4                                                                                                                                                          | 0x2541:4  | Additional frequency                                                                                                                                                   | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 10.0 Hz                                                                                                                                       |           | Additional Frequency for deceleration compound braking mode.                                                                                                           |      |      |     |
| P706:5                                                                                                                                                          | 0x2541:5  | Deceleration override time                                                                                                                                             | i510 | i550 | R/W |
| 0.0 ... [2.0] ... 60.0 s                                                                                                                                        |           | Maximum time in deceleration override braking mode. If the DC-Voltage doesn't fall below in the defined time the inverter goes to fault state.                         |      |      |     |
| P706:6                                                                                                                                                          | 0x2541:6  | Brake resistor response                                                                                                                                                |      | i550 | R/W |
| <b>0: Off: Inverter disable / Error</b><br>1: On: Disable/Off: Error<br>2: Off: Disable / On: Error<br>3: On: Disable / Error                                   |           | Defines the behavior of the braking chopper in case of state Inhibit and Error. (Used for inverters connected over DC-Link)                                            |      |      |     |
| P707:2                                                                                                                                                          | 0x2550:2  | Resistance value                                                                                                                                                       |      | i550 | R/W |
| 0.0 ... [Type Code dependent] ...<br>500.0 Ohm                                                                                                                  |           | Setup brake resistor<br>Set the nominal resistance of the brake resistor                                                                                               |      |      |     |
| P707:3                                                                                                                                                          | 0x2550:3  | Rated power                                                                                                                                                            |      | i550 | R/W |
| 0 ... [Type Code dependent] ...<br>800000 W                                                                                                                     |           | Setup brake resistor<br>Set the rated power of the brake resistor                                                                                                      |      |      |     |
| P707:4                                                                                                                                                          | 0x2550:4  | Maximum thermal load                                                                                                                                                   |      | i550 | R/W |
| 0.0 ... [Type Code dependent] ...<br>100000.0 kW                                                                                                                |           | Setup brake resistor<br>Set the maximal thermal load of the brake resistor                                                                                             |      |      |     |
| P707:7                                                                                                                                                          | 0x2550:7  | Thermal load                                                                                                                                                           |      | i550 | R   |
| -- ... [Actual value] ... -- %                                                                                                                                  |           | Actual thermal load of the braking resistor                                                                                                                            |      |      |     |
| P707:8                                                                                                                                                          | 0x2550:8  | Warning level                                                                                                                                                          |      | i550 | R/W |
| 50.0 ... [90.0] ... 150.0 %                                                                                                                                     |           | If the actual thermal load of the braking resistor exceeds the defined level, the reaction in P707:10 is executed                                                      |      |      |     |
| P707:9                                                                                                                                                          | 0x2550:9  | Error threshold                                                                                                                                                        |      | i550 | R/W |
| 50.0 ... [100.0] ... 150.0 %                                                                                                                                    |           | If the actual thermal load of the braking resistor exceeds the defined level, the reaction in P707:11 is executed                                                      |      |      |     |
| P707:10                                                                                                                                                         | 0x2550:10 | Response to warning                                                                                                                                                    |      | i550 | R/W |
| <b>1:Warning</b><br>(Reference see P310:1)                                                                                                                      |           | Configuration of the brake resistor warning reaction                                                                                                                   |      |      |     |
| P707:11                                                                                                                                                         | 0x2550:11 | Response to error                                                                                                                                                      |      | i550 | R/W |
| <b>3:Fault</b><br>(Reference see P310:1)                                                                                                                        |           | Configuration of the brake resistor error reaction                                                                                                                     |      |      |     |

### 6.9.5 Loss of Load Detection

A loss of load can be detected and function can be triggered. (Example: Relay)

➔ See Easy starter for setup and more information

### 6.9.6 Motor Brake Control

The i500 has an integrated function to control a mechanical brake.

➔ See Easy starter for setup and more information

### 6.9.7 Access protection

The write access to the parameter set can be fully or partially protected. Read access can't be prohibited. For that PIN1 and PIN2 are available

#### Enable access protection:

By setting a PIN (1-9999) the access protection is automatically set as follow:

|                                                |        |                                                        |
|------------------------------------------------|--------|--------------------------------------------------------|
| Power ON<br>Login with PIN1                    | ➔      | Favorites only<br>Full write access                    |
| Power ON<br>Login with PIN2                    | ➔      | No write access<br>Full write access                   |
| Power ON<br>Login with PIN1<br>Login with PIN2 | ➔<br>➔ | No write access<br>Favorites only<br>Full write access |

#### Login (Keypad)

The PIN is automatically requested if you enter the menu

#### Logout (Keypad)

Go out of the menu is logging you out automatically

#### Disable access protection:

1. Login
2. Set the corresponding PIN parameter back to 0 disables the access protection

| P730:0              | 0x203D:0 | Access protection PIN1                                                                                                                         | i510 | i550 | R/W |
|---------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| -1 ... [0] ... 9999 |          | Configure PIN1 for access protection<br>Setting PIN to 1-9999 enables the access protection<br>Setting PIN to 0 disables the access protection |      |      |     |
| P731:0              | 0x203E:0 | Access protection PIN2                                                                                                                         | i510 | i550 | R/W |
| -1 ... [0] ... 9999 |          | Configure PIN2 for access protection<br>Setting PIN to 1-9999 enables the access protection<br>Setting PIN to 0 disables the access protection |      |      |     |

#### **i** NOTICE!

The Behavior from the keypad and PC tool are the same. If the PIN1/PIN2 is lost the only way to unlock the device is to reset the device back to factory settings with the SW-tool.

## 6 Function & parameter description

### Group 7 – Auxiliary Functions

---

#### 6.9.8 Favorites setup

The favorites menu can be freely configured.



See Easy starter for setup and more information

---

#### 6.9.9 Multiple Parameter Set Setup

The inverter can switch between 4 sets of 32 parameters. The 32 parameters can be freely configured.



See Easy starter for setup and more information

---

## 7 Fieldbus

### Enable Network

In order to control the drive from the network the 0x2631:37 (P400:37) Network enable needs to be set (Either setting "TRUE" or mapping to a digital input to trigger signal). Once it is asserted the drive enters the network control mode.

**i**

It is important to note that in network control mode the following functions still are active:

- Inverter Enable 0x2361:1 (P400:1)
- Run/Stop 0x2361:1 (P400:2)
- Quick Stop 0x2361:3 (P400:3)
- Reset fault 0x2361:4 (P400:4)
- DC Brake 0x2361:5 (P400:5)
- Jog forward (CW) 0x2361:10 (P400:10)
- Jog reverse (CCW) 0x2361:11 (P400:11)

All other function triggers 0x2361:6-25 (P400:6-25) are not active while the drive is in the network control mode.

To select the network as setpoint source in network mode use the "Default setpoint source" (P201:1-2) or the corresponding control bits (AC Drive Control Word, C135 Control Word, NETWordIN1).

| P400:37                                                                         | 0x2631:37 | Network enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | i510 | i550 | R/W |
|---------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| <b>0: Not connected</b><br>114: Netw.Ctrl activ<br>(Other Reference see P400:1) |           | Enables the network for control<br><br>114: TRUE if AC Drive Control Control Word (0x400B:1) bit 5 is active<br><br><b>State:</b><br>TRUE: Network is enabled<br>FALSE: Network is disabled<br><b>Note:</b><br>If Network is enabled ( <b>Network enable 0x2361:37, P400:37</b> is HIGH) it is not mandatory that <b>Inverter enable (0x2361:1, P410:1)</b> or <b>Run/Stop (0x2361:2, P410:2)</b> are assigned to a digital input (DI1-7). They can be set to [1] Constant TRUE to Enable and Run the inverter without using digital inputs (DI1-7). |      |      |     |

Several command words, status and setpoint are available to control the drive from remote:

- CIA402 (Predefined mapping) Used for EtherCAT/CAN
- AC drive profile (Predefined mapping) Used for EtherNet/IP
- Lenze Legacy (Predefined mapping)
- Network IN/Out (Configurable mapping)



See chapter 8 Drive Profile on page 103 for details.

## 7.1 CANopen quick start

The Can communicates with the drive over the COB-IDs. This COB-IDs access the RPDO and TPDO Registers which are mapped to the parameter registers.



Detailed information about dip-switch settings for Node address, baud rate, and network termination are described in the i500 Mounting and switch-on instructions.

1. Register the eds file into your CANOpen master's configuration software
2. Set an individual Node address:  
i510: Parameter setting P510:1 (0x2301:1)  
i550: Dip-Switches or Parameter setting P510:1 (0x2301:1)
3. Set the baud rate  
i510: Parameter setting P510:2 (0x2301:2)  
i550: Dip-Switches or Parameter setting P510:2 (0x2301:2)
4. Setup network termination and both network ends (Resistor)  
i510: Install external 120 Ohm ¼ W Resistor  
i550: Dip-Switches setting
5. CANOpen Slave / Mini-Master  
The CANOpen enter a Preopreational state upon but-up. The CANOpen master send a NMT message to wake the drive up and the CANOpen goes to Operational state. The i500 can be configured as CANOpen Slave or Mini-Master. A "mini-master" will boot in an "operational" state and after the delay time programmed in 0x2301:4 (P510.4) will send out the NMT message to set all slaves on the network to the "operational" state.
6. Watchdog  
Per Default the watchdog is enabled with P540:5 (0x1400:5) setting 100ms. (Setting 0 disables the watchdog)  
For a safe operation it is highly recommended to have the watchdog enabled!
7. Save the parameters (Set P700:3, 0x2022:3=1) and power cycle the drive completely that the configuration takes effect.
8. For network control the following setup needs to be done:  
(This can also be done with SDO messages)
  - For network control the P400:37 (0x2631:37) "Network enable" need to be set.
  - Set P201:1 (0x2860:1) "Default frequency setpoint" to the network
9. Change the mapping as followed:

Controller to the drive:

| COB ID       | Register       | Accessed Parameter                       |
|--------------|----------------|------------------------------------------|
| 0x200+nodeID | RPDO1, Entry 1 | 0x4008:1 NetWordIN1                      |
| 0x200+nodeID | RPDO1, Entry 2 | 0x400B:3 Network Speed Setpoint [0.1 Hz] |

Drive to the Controller

| COB ID       | Register       | Accessed Parameter                     |
|--------------|----------------|----------------------------------------|
| 0x180+nodeID | TPDO1, Entry 1 | 0x400A:1 NetWordOut1                   |
| 0x180+nodeID | TPDO1, Entry 2 | 0x400C:3 Network Speed Actual [0.1 Hz] |



The mapping can be easily done with a guided screen in Easy Starter (Version ≥ V1.9)  
If the mapping is down over the master PLC the procedure under point 10-11 needs to be followed.

10. RPDO1 Mapping (Used to command the drive)  
RPDO1 must first have it's COB ID set and have the PDO unlocked so that it's mapping can be changed.  
To do so you must set bit 31 in 0x1400:1. This will unlock the PDO for editing (makes the PDO invalid).

**RPDO1 Default COB ID: 0x200+the node ID (hex)**

## 7 Fieldbus

### CANopen quick start

---

Example:

Node ID is 10 (0xA) mapping of RPDO1 should be changed

1. Unlock the mapping:  
COB ID = 0x200+A. Setting Bit 31  
Set 0x1400:1 to 0x8000020A
  2. Set the number of mapped subindexes for RPDO1 = 0. This allows the default data mapping of the PDO to be changed.  
Set 0x1600:0 = 0
  3. Set the data mapping for the first two bytes of RPDO1 to NetWordIN1:  
Set 0x1600:1 = 0x40080110.
  4. Set the mapping of byte 3 and of RPDO1 to Network Speed Setpoint [0.1 Hz]  
Set 0x1600:2 = 0x400B0310.  
The second word of RPDO1 will now be the drive's speed command in 0.1 Hz (i.e. 412=41.2Hz, absolute value)
  5. Set the number of mapped subindexes for RPDO1 = 2  
Set 0x1600:0 = 2
  6. Set the timeout for RPDO1 monitoring value in milliseconds  
Set 0x1400:5 = msec, Fault reaction set in 0x2857:1
  7. Lock mapping  
Bit31 of 0x1400:1 must be set back to 0. Write the COB ID back to 0x1400:1  
COB ID = 0x200+A (If required the COB ID can be set here individually)  
Set 0x1400:1 to 0x20A
11. **TPDO1 Mapping (used to get status from the drive)**  
TPDO1 must first have its COB ID set and have the PDO unlocked so that its mapping may be changed. To do so you must set bit 31 in 0x1800:1. This will unlock the PDO for editing (makes the PDO invalid).

**TPDO1 Default COB ID: 0x180+the node ID (hex)**

(Note: Bit 30=Remote Frame OFF should be always set → 0x40000180)

Example:

Node ID is 10 (0xA) mapping of TPDO1 should be changed

1. Unlock the mapping:  
COB ID = 0x40000180+A. Setting Bit 31  
Writing 0xC000018A to 0x1800:1
  2. Set the number of mapped subindexes for RPDO1 = 0. This allows the default data mapping of the PDO to be changed  
Set 0x1A00:0 = 0
  3. Set the data mapping for the first two bytes of TPDO1 to NetWordOut1:  
Set 0x1A00:1 = 0x400A0110
  4. Set the mapping of byte 3 of TPDO1 to Network Speed Actual [0.1 Hz]  
Set 0x1A00:2 = 0x400C0310
  5. Set the number of mapped subindexes for TPDO1 = 2  
Set 0x1A00:0 = 2
  6. By default TPDO will transmit on event (0x1800:2 = 255). The event timer is default 20msec (0x1800:5 = 20) TPDO1 will be transmitted every 20msec.
  7. Lock mapping  
Bit31 of 0x1800:1 must be set back to 0. Write the COB ID back to 0x1800:1  
COB ID = 0x40000180+A (If required the COB ID can be set here individually)  
Set 0x1800:1 to 0x4000018A
12. Controlling the inverter:
- With the default IO-setting DI1 need to be asserted (Run/Stop).
  - Set Bit 4 of NetWordIN1 to start the drive

## 7 Fieldbus

### CANopen quick start

---

Default setting of NetWordIN1 / NetWordOUT1 (SW 02.01)

| Lenze control word (NetWordIN1) |                       |
|---------------------------------|-----------------------|
| Bits                            | Function              |
| 0                               | Not connected         |
| 1                               | Not connected         |
| 2                               | Quick Stop            |
| 3                               | Not connected         |
| 4                               | Run forward (CW)      |
| 5                               | Preset bit0 selection |
| 6                               | Preset bit1 selection |
| 7                               | Reset Fault           |
| 8                               | Not connected         |
| 9                               | DC brake              |
| 10                              | Not connected         |
| 11                              | Not connected         |
| 12                              | Invert rotation       |
| 13                              | Not connected         |
| 14                              | Not connected         |
| 15                              | Not connected         |

| Lenze status word (NetWordOUT1) |                        |
|---------------------------------|------------------------|
| Bits                            | Function               |
| 0                               | Ready for operation    |
| 1                               | Not connected          |
| 2                               | Inverter enable        |
| 3                               | Fault                  |
| 4                               | Not connected          |
| 5                               | Quick stop active      |
| 6                               | Running                |
| 7                               | Device warning         |
| 8                               | Not connected          |
| 9                               | Not connected          |
| 10                              | Setpoint speed reached |
| 11                              | At current limit       |
| 12                              | Actual speed = 0       |
| 13                              | Invert rotation        |
| 14                              | Holding brake release  |
| 15                              | Safe Torque Off        |

## 7.2 Modbus quick start

### 1. General Information about Modbus

The Can communicates with the drive over the Modbus-Register Numbers. This Number access the parameter registers.

The supports the following function codes:

- 3 (Read Holding Registers)
- 6 (Preset Single Register)
- 16 (10hex - Preset Multiple Registers)
- 23 - (17hex - Read/Write 4X registers)



All data in Lenze drives is only accessible via Modbus as 4X holding registers.

In Modbus the function code used defines what the leading character in the Modbus address (so the leading 4 is not transmitted in the message).

It is important to note that Lenze complies with base 1 addressing of Modbus. So there is a 1 offset in the address transmitted to the address requested (i.e. 0000 would be register 40001, 0001 would be 40002, 0002 would be 40003, etc.).



By default important Parameters are already mapped to Modbus Registers

Modbus Control Parameters

| Modbus Register No | Index    | Description                                     |
|--------------------|----------|-------------------------------------------------|
| 42101              | 0x400B:1 | Drive Command Word (AC Drive Control Word)      |
| 42102              | 0x400B:5 | Network Frequency Setpoint ABS[0.01Hz]          |
| 42103              | 0x4008:2 | NetWordIN2 (trigger for Digital / Relay Output) |
| 42104              | 0x4008:3 | NetWordIN3 (Analog output source)               |
| 42105              | 0x2DA7:0 | Network PID Setpoint                            |
| 42106              | 0x6071:0 | Target Torque                                   |
| 42107              | 0x4008:1 | NetWordIN1 (triggers for functions in PAR0400)  |
| 42108              | 0x4008:4 | NetWordIN4(Analog output source)                |
| 42109 - 42121      |          | Reserved                                        |

Modbus Drive Status Parameters (Read Only)

| Modbus Register No | Index    | Description                               |
|--------------------|----------|-------------------------------------------|
| 42001              | 0x400C:1 | Drive Status Word (See bit details below) |
| 42002              | 0x400C:6 | Actual Frequency ABS [0.01Hz]             |
| 42003              | 0x603F:0 | Error Code                                |
| 42004              | 0x400C:0 | Drive State                               |
| 42005              | 0x2D89:0 | Motor Voltage                             |
| 42006              | 0x2D88:0 | Motor Current                             |
| 42007              | 0x6078:0 | Motor Load                                |
| 42008              | 0x2DA2:2 | Effective power output [HIGH WORD]        |
| 42009              |          | Effective power output [LOW WORD]         |

## 7 Fieldbus

### Modbus quick start

|               |                                                 |                                     |
|---------------|-------------------------------------------------|-------------------------------------|
| 42010         | 0x2D84:1                                        | Heatsink Temperature (Actual Value) |
| 42011         | 0x2D87:0                                        | DC Bus Voltage                      |
| 42012         | 0x60FD:0<br>(Upper 16 bits only! – bits 16..31) | Digital Inputs                      |
| 42013         | 0x6077:0                                        | Torque Actual Value                 |
| 42014 - 42021 |                                                 | Reserved                            |



Detailed information about dip-switch settings for Node address, baud rate, data format and network termination are described in the i500 Mounting and switch-on instructions.

2. Set an individual Node address  
Default Address 1  
i510: Parameter setting (P510:1, 0x2321:1)  
i550: Dip-Switches or Parameter setting (P510:1, 0x2321:1)
3. Set the baud rate:  
Default: Auto Detect. First 5 – 10 messages will be lost!  
i510: Parameter setting (P510:2, 0x2321:2)  
i550: Dip-Switch b=0 AutoDetect  
Dip-Switch b=1 Parameter setting (P510:2, 0x2321:2)
4. Set the data Format:  
Default: Auto Detect. First 5 – 10 messages will be lost!  
i510: Parameter setting (P510.3, 0x2321:3)  
i550: Dip-Switch a=0 AutoDetect  
Dip-Switch a=1 Parameter setting (P510.3, 0x2321:3)
5. Setup network termination and both network ends (Resistor)  
i510: Install external 120 Ohm ¼ W Resistor  
i550: Dip-Switches setting
6. Save the parameter with P700:3 (0x2022:3) and power cycle the drive completely that the configuration takes effect.
7. For network control the following setup needs to be done:
  - For network control the P400:37 (0x2631:37) "Network enable" need to be set.
  - Set P201:1 (0x2860:1) "Default frequency setpoint" to the network



Per default the watchdog timeout response for the communication is set to fault (P515.1, 0x2858:1).

8. With the default IO-setting DI1 need to be asserted (Run/Stop)
9. Controlling the inverter:  
Set the following bits on register 42101 (AC Drive control word) with function code 0x06 or 0x10 to start:  
0x61 (Bit0 - Run Forward, Bit5 - Network Control, Bit6-Network Setpoint)
10. Set speed setpoint:  
Set register 42102 (Network Frequency Setpoint ABS[0.01Hz]) with the setpoint with function code 0x06  
Example: 1234 = 12.34 Hz

## 7.3 Profibus quick start



Detailed information about network setup and dip-switch settings for Node address are described in the i500 Mounting and switch-on instructions.

1. Set an individual node address:  
i550: Dip-Switches or Parameter setting P510:1 (0x2341.1)  
The active node address will be displayed in P511:1 (0x2342.1)
2. Save the parameters (P700:3, 0x2022:3) and power cycle the drive completely that the configuration takes effect.
3. Configuration of the host:  
Read the device description file (GSD) into the Profibus master.



The user data length is defined during the initialization phase of the master. The i500 support the configuration of a maximum of 16 process data words (max 32 bytes) in each direction.

4. Process data configuration  
The process data configuration must be configured in the Profibus master configuration tool.  
The default configuration in the i550 GSD-file is:

### PLC to Drive:

Lenze control word (NetWordIN1) P590:1 (0x4008:1)  
Network frequency setpoint 0.01Hz P592:5 (0x400B:5)  
16Bit selectable OUT-Data

### Drive to PLC:

Lenze status word (NetWordOUT1) P591:1 (0x400A:1)  
Actual Speed [0.01 Hz] P593:6 (0x400C:6)  
Actual motor current [0.1A] P104 (0x2D88)

| Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | E-Adresse | A-Adresse |
|------------|------------|-----------------------------|-----------|-----------|
| 1          | 132        | L-Controlword 0x4008:01     |           | 264...265 |
| 2          | 131        | Net freq. 0.01Hz 0x400B:05  |           | 266...267 |
| 3          | 129        | 16Bit selectable OUT-Data   |           | 268...269 |
| 4          | 68         | L-Statusword 0x400A:01      | 264...265 |           |
| 5          | 67         | Act.freq. 0.01Hz 0x400C:06  | 266...267 |           |
| 6          | 67         | Motor current A 0x2D88:00   | 268...269 |           |



The configuration of the process data is automatically sent to the drive. Also the Bit-configuration of NetWordIN1 and NetWordOUT1.

## 7 Fieldbus

### Profibus quick start

The default setting for the Lenze control word (NetWordIN1) and Lenze status word (NetWordOUT1) are as follow (SW 02.01):

| Lenze control word (NetWordIN1) |                       |
|---------------------------------|-----------------------|
| Bits                            | Function              |
| 0                               | Not connected         |
| 1                               | Not connected         |
| 2                               | Quick Stop            |
| 3                               | Not connected         |
| 4                               | Run forward (CW)      |
| 5                               | Preset bit0 selection |
| 6                               | Preset bit1 selection |
| 7                               | Reset Fault           |
| 8                               | Not connected         |
| 9                               | DC brake              |
| 10                              | Not connected         |
| 11                              | Not connected         |
| 12                              | Invert rotation       |
| 13                              | Not connected         |
| 14                              | Not connected         |
| 15                              | Not connected         |

| Lenze status word (NetWordOUT1) |                        |
|---------------------------------|------------------------|
| Bits                            | Function               |
| 0                               | Ready for operation    |
| 1                               | Not connected          |
| 2                               | Inverter enable        |
| 3                               | Fault                  |
| 4                               | Not connected          |
| 5                               | Quick stop active      |
| 6                               | Running                |
| 7                               | Device warning         |
| 8                               | Not connected          |
| 9                               | Not connected          |
| 10                              | Setpoint speed reached |
| 11                              | At current limit       |
| 12                              | Actual speed = 0       |
| 13                              | Invert rotation        |
| 14                              | Holding brake release  |
| 15                              | Safe Torque Off        |

5. For network control the following setup needs to be done:
  - For network control the P400:37 (0x2631:37) "Network enable" need to be set.
  - Set P201:1 (0x2860:1) "Default frequency setpoint" to the network
6. Controlling the inverter
  - With the default IO-setting DI1 need to be asserted (Run/Stop)
  - Set "Network frequency setpoint 0.01Hz", (Example 1234 = 12.34 Hz)
  - Set Bit 4 of "Lenze control word (NetWordIN1)" to start the drive

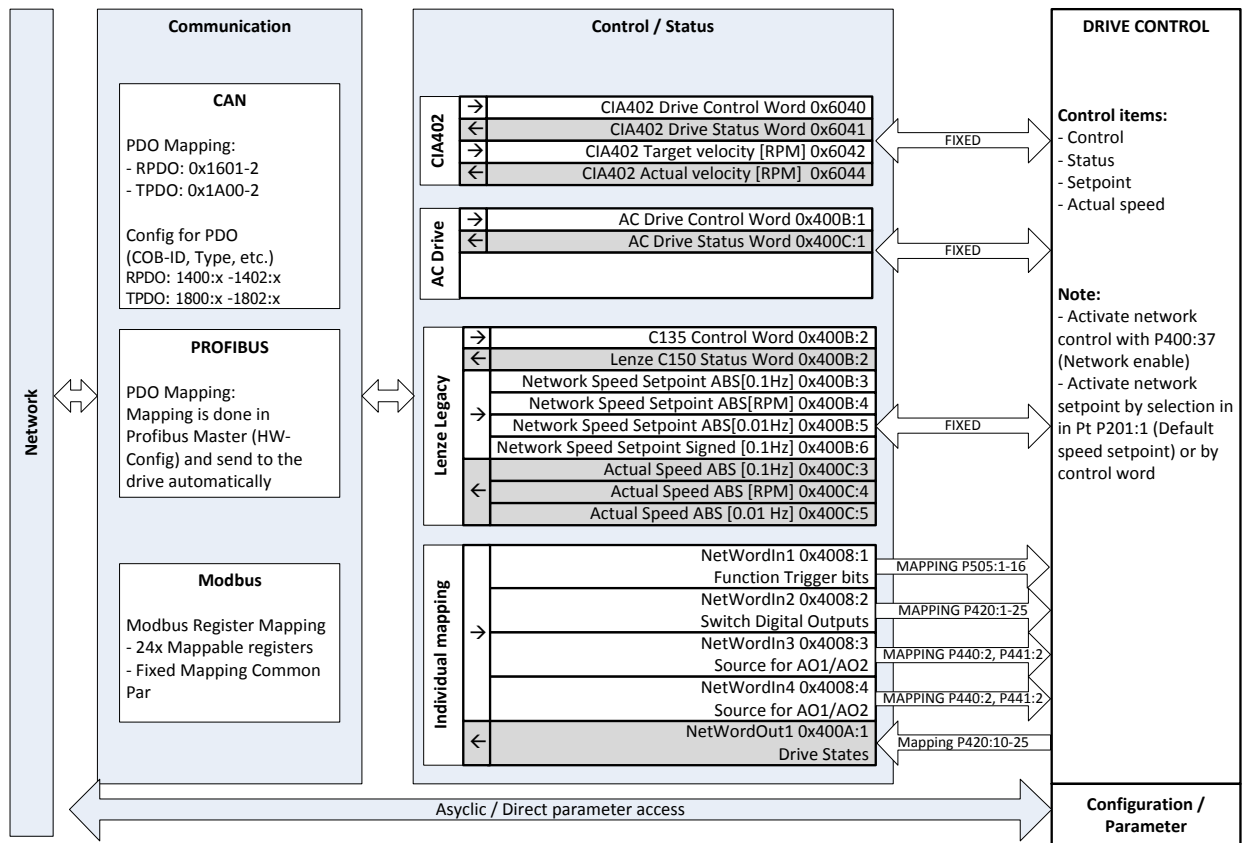


Per default the watchdog timeout response for the communication is set to fault (P515:1, 0x2859:1).

## 8 Drive Profile (Fieldbus)

Several command words, status and setpoint are available to control the drive from remote:

- CIA402 (Predefined mapping) Used for EtherCAT/CAN
- AC drive profile (Predefined mapping) Used for EtherNet/IP
- Lenze Legacy (Predefined mapping)
- Network IN/Out (Individual mapping)



## 8.1 CIA402

This chapter describes the CIA402 Format



This Format is normally used for EtherCAT and CAN



With default settings the Lenze-State machine is active. For full compatibility with CIA402 state machine the CiA402 mode needs to be selected in 0x6060. (Selection: [2] "Velocity mode CIA402")

For detailed description about CiA402 state machine refer to CiA402 documents.

### 8.1.1 Control word

0x6040 CIA402 Drive Control Word

| Bit | Function                | Note                                                |
|-----|-------------------------|-----------------------------------------------------|
| 0   | Switch on               | 0 = Switch inverter OFF<br>1 = Switch inverter ON   |
| 1   | Enable voltage          | 0 = Disable Voltage<br>1 = Enable Voltage           |
| 2   | Activate quick stop     | 0 = Quick stop active<br>1 = Quick stop not active  |
| 3   | Enable operation        | 0 = Controller inhibit<br>1 = No controller inhibit |
| 4   | Operation mode specific |                                                     |
| 5   | Operation mode specific |                                                     |
| 6   | Operation mode specific |                                                     |
| 7   | Fault reset             | Transition from 0 to 1 resets fault                 |
| 8   | n/a                     |                                                     |
| 9   | Operation mode specific |                                                     |
| 10  | Reserved                |                                                     |
| 11  | Reserved                |                                                     |
| 12  | Reserved                |                                                     |
| 13  | Reserved                |                                                     |
| 14  | Holding brake release   | 1 = Releases holding brake                          |
| 15  | Reserved                |                                                     |

### 8.1.2 Status word

0x6041:0      P780:0      CIA402 Drive Status Word

| Bit | Function              | Note                                               |
|-----|-----------------------|----------------------------------------------------|
| 0   | Ready to switch on    |                                                    |
| 1   | Switched on           |                                                    |
| 2   | Operation enabled     |                                                    |
| 3   | Fault active          |                                                    |
| 4   | Voltage enabled       |                                                    |
| 5   | Quick stop            | 0 = Quick stop active<br>1 = Quick stop not active |
| 6   | Switch on disabled    |                                                    |
| 7   | Warning active        |                                                    |
| 8   | Deactivate RPDOs      |                                                    |
| 9   | Remote                | Network control mode active                        |
| 10  | Target reached        | Target speed reached                               |
| 11  | Internal limit active | Internal limit of speed setpoint active            |
| 12  | Reserved              |                                                    |
| 13  | Reserved              |                                                    |
| 14  | Brake released        |                                                    |
| 15  | STO not active        |                                                    |

### 8.1.3 Speed setpoint / Actual Speed

| P781:0                | 0x6042:0 | Target velocity vl            | i510 | i550 | R/W |
|-----------------------|----------|-------------------------------|------|------|-----|
| -- ... [0] ... -- rpm |          | CiA402 network speed setpoint |      |      |     |

| P783:0                           | 0x6044:0 | Velocity actual value vl | i510 | i550 | R |
|----------------------------------|----------|--------------------------|------|------|---|
| -- ... [Actual value] ... -- rpm |          | CiA402 actual speed      |      |      |   |

## 8.2 Legacy Lenze Format

This chapter describes the Legacy Lenze Format.



This Format was used in other Lenze products such as 8200Vector and 8400

### 8.2.1 Control word C135

0x400B:2

P592:2

Lenze Legacy C135 control word

| Bits | Function                     | Comments                                                                                                                                      |
|------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 0    | Setpoint Selection bit 0     | Bits 0,1 decoding:<br>0 = Flexible (Default setpoint is active)<br>1 = Preset Setpoint #1<br>2 = Preset Setpoint #2<br>3 = Preset Setpoint #3 |
| 1    | Setpoint Selection bit 1     |                                                                                                                                               |
| 2    | Rotation (0-CW/1-CCW)        |                                                                                                                                               |
| 3    | Activate quick stop          | 0 = Not Active<br>1 = Active                                                                                                                  |
| 4    | Reserved                     |                                                                                                                                               |
| 5    | Reserved                     |                                                                                                                                               |
| 6    | Reserved                     |                                                                                                                                               |
| 7    | Reserved                     |                                                                                                                                               |
| 8    | Reserved                     |                                                                                                                                               |
| 9    | Disable (1-active/0-inactiv) | 0 = Controller released<br>1 = Controller Inhibited                                                                                           |
| 10   | Network user fault           |                                                                                                                                               |
| 11   | Fault reset (0→1)            | 0->1 edge causes TRIP reset                                                                                                                   |
| 12   | Reserved                     |                                                                                                                                               |
| 13   | Reserved                     |                                                                                                                                               |
| 14   | DC Brake Active              | 0 = Not Active<br>1 = Active                                                                                                                  |
| 15   | Reserved                     |                                                                                                                                               |

## 8 Drive Profile (Fieldbus)

Legacy Lenze Format

### 8.2.2 Status word

0x400C:2

P593:2

Lenze Legacy C150 status word

| Bits | Function                     | Comments                                                                                                                                                                                                                           |
|------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0    | Active Parameter Set         | 0 = Parameter Set 1 or 3 active<br>1 = Parameter Set 2 or 4 active                                                                                                                                                                 |
| 1    | Power stage inhibited        | 0 = enabled<br>1 = inhibited                                                                                                                                                                                                       |
| 2    | Current/torque limit reached | Current limit reached<br>Torque limit reached (in Torque mode)                                                                                                                                                                     |
| 3    | Frequency setpoint reached   |                                                                                                                                                                                                                                    |
| 4    | Ramp generator               | Input = Output                                                                                                                                                                                                                     |
| 5    | Below Frequency threshold    | Below Frequency threshold Qmin Index 0x4005<br>(f < 0x4005) Qmin                                                                                                                                                                   |
| 6    | Actual frequency = 0         |                                                                                                                                                                                                                                    |
| 7    | Inhibit (1-activ/0-inactiv)  | 0 = Drive Enabled<br>1 = Drive Inhibited                                                                                                                                                                                           |
| 8    | Encode status bit 0          | 0000 = Initializing<br>0001 = Mains Voltage Off<br>0010 = Switch n Inhibited<br>0011 = Operation Inhibited<br>0100 = Flying Restart<br>0101 = DC Brake Active<br>0110 = Operation Enabled<br>0111 = Message Active<br>1000 = FAULT |
| 9    | Encode status bit 1          |                                                                                                                                                                                                                                    |
| 10   | Encode status bit 2          |                                                                                                                                                                                                                                    |
| 11   | Encode status bit 3          |                                                                                                                                                                                                                                    |
| 12   | Over-temperature warning     |                                                                                                                                                                                                                                    |
| 13   | DC Bus overvoltage           |                                                                                                                                                                                                                                    |
| 14   | Rotation (0-CW/1-CCW)        |                                                                                                                                                                                                                                    |
| 15   | Ready for Operation          |                                                                                                                                                                                                                                    |

## 8 Drive Profile (Fieldbus)

Legacy Lenze Format

0x400C:5      P593:5      Lenze Legacy drive state

| Bits | Function                   | Comments |
|------|----------------------------|----------|
| 0    | Fault Locked               |          |
| 1    | Fault                      |          |
| 2    | Start Pending              |          |
| 3    | Identification Not Done    |          |
| 4    | Inhibit                    |          |
| 5    | Stop                       |          |
| 6    | Switching On Sequence      |          |
| 7    | Identification in Progress |          |
| 8    | Running                    |          |
| 9    | Acceleration               |          |
| 10   | Deceleration               |          |
| 11   | Deceleration Override      |          |
| 12   | DC Brake                   |          |
| 13   | Flying Start               |          |
| 14   | Current Limit              |          |
| 16   | Sleep Mode                 |          |

### 8.2.3 Speed setpoint / Actual Speed

Several speed command formats are also available:

| P592:3                        | 0x400B:3 | Network frequency setpoint                                                                                    | i510 | i550 | R/W |
|-------------------------------|----------|---------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [0.0] ... 599.0 Hz    |          | Legacy network frequency setpoint<br>Scaling: 0.1 Hz unsigned (direction information comes via control word)  |      |      |     |
| P592:4                        | 0x400B:4 | Network setpoint speed                                                                                        | i510 | i550 | R/W |
| 0 ... [0] ... 50000 rpm       |          | Legacy network speed setpoint<br>Scaling: RPM unsigned (direction information comes via control word)         |      |      |     |
| P592:5                        | 0x400B:5 | Network setp. frequency                                                                                       | i510 | i550 | R/W |
| 0.00 ... [0.00] ... 599.00 Hz |          | Legacy network frequency setpoint<br>Scaling: 0.01 Hz unsigned (direction information comes via control word) |      |      |     |
| P592:6                        | 0x400B:6 | Network speed setpoint                                                                                        | i510 | i550 | R/W |
| -599.0 ... [0.0] ... 599.0 Hz |          | Legacy network frequency setpoint<br>Scaling: 0.1 Hz signed                                                   |      |      |     |

Several actual speed formats are also available:

| P593:3                           | 0x400C:3 | Actual frequency Hz                                 | i510 | i550 | R |
|----------------------------------|----------|-----------------------------------------------------|------|------|---|
| -- ... [Actual value] ... -- Hz  |          | Legacy actual frequency<br>Scaling 0.1Hz, unsigned  |      |      |   |
| P593:4                           | 0x400C:4 | Actual motor speed RPM                              | i510 | i550 | R |
| -- ... [Actual value] ... -- rpm |          | Legacy actual speed<br>Scaling RPM, unsigned        |      |      |   |
| P593:6                           | 0x400C:6 | Actual frequency                                    | i510 | i550 | R |
| -- ... [Actual value] ... -- Hz  |          | Legacy actual frequency<br>Scaling 0.01Hz, unsigned |      |      |   |

## 8.3 AC Drive Profile

This chapter describes the AC Drive Format

**i** This Format is normally used for EtherNet/IP

### 8.3.1 Control word

0x400B:1      P592:1      AC Drive control word

**i** Some of the bits will be ignored if bit5 **NetCtrl** bit is not set, see table below for details

| Bits | Function                       | Comments                                                                                                                                                                                                                                                                                                                                                                                |
|------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0    | Run forward (CW)               | Run Forward - see transition table below for exact logic<br><b>NOTE: Bit processed only when NetCtrl = 1</b>                                                                                                                                                                                                                                                                            |
| 1    | Run reverse (CCW)              | Run Reverse - see transition table below for exact logic<br><b>NOTE: Bit processed only when NetCtrl = 1</b>                                                                                                                                                                                                                                                                            |
| 2    | Fault Reset (0 -> 1)           | Reset existing fault. Only on transition from 0->1                                                                                                                                                                                                                                                                                                                                      |
| 3    | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 4    | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 5    | Control from Network (NetCtrl) | If bit5 NetCtrl is 1 and Network Enable 0x2631:37 = 114 (Network ControlEnableRequest.Bit): All bits of this control word are processed.<br><br>If bit5 NetCtrl is 0 or Network Enable 0x2631:37 is not asserted: Control bits 0, 1, 12, 13, 14, 15 are NOT processed; their states are ignored and the drive is in local control with functions triggered by settings in 0x2631 (P400) |
| 6    | Network setpoint source        | If NetRef = 1<br>Network Setpoint becomes active drive setpoint. Network Setpoint could be speed, frequency, PID setpoint or Torque setpoint<br><br>If NetRef = 0<br>Selected default setpoint 0x2860:1-2 (0x201:1-2) is active.<br><br><b>Note:</b> Bit 6 can also be used to set network as setpoint source in terminal mode. See 0x2631:17 (P400:17)                                 |
| 7    | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 8    | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 9    | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 10   | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 11   | Reserved                       |                                                                                                                                                                                                                                                                                                                                                                                         |
| 12   | Inhibit                        | <b>NOTE: Bit processed only when NetCtrl = 1</b>                                                                                                                                                                                                                                                                                                                                        |
| 13   | Activate quick stop            | <b>NOTE: Bit processed only when NetCtrl = 1</b>                                                                                                                                                                                                                                                                                                                                        |
| 14   | PID off (1 – off)              | <b>NOTE: Bit processed only when NetCtrl = 1</b>                                                                                                                                                                                                                                                                                                                                        |
| 15   | DC Brake                       | <b>NOTE: Bit processed only when NetCtrl = 1</b>                                                                                                                                                                                                                                                                                                                                        |

## 8 Drive Profile (Fieldbus)

### AC Drive Profile

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#### 8.3.2 Status word

0x400C:1

P593:1

AC Drive status word

| Bits | Function               | Comments                                         |
|------|------------------------|--------------------------------------------------|
| 0    | Fault/Trip             | 0 = No Fault<br>1 = Faulted                      |
| 1    | Warning active         |                                                  |
| 2    | Running forward (CW)   | 0 = Not running Forward<br>1 = Running Forward   |
| 3    | Running reverse (CCW)  | 0 = Not running Forward<br>1 = Running Forward   |
| 4    | Ready                  | 0 = NOT Ready<br>1 = Ready                       |
| 5    | Control from Network   | 0 = Local Control<br>1 = Network Control         |
| 6    | Reference from Network | 0 = Local Reference<br>1 = Network Reference     |
| 7    | At Reference           | 0 = Setpoint not reached<br>1 = Setpoint reached |
| 8    | Profile State bit0     |                                                  |
| 9    | Profile State bit1     |                                                  |
| 10   | Profile State bit2     |                                                  |
| 11   | Profile State bit3     |                                                  |
| 12   | PID active             | 0 = PID NOT Active<br>1 = PID Active             |
| 13   | Torque mode active     | 0 = NOT in Torque Mode<br>1 = Torque Mode Active |
| 14   | Current Limit reached  | 0 = NOT in Current Limit<br>1 = in Current Limit |
| 15   | DC Brake Active        | 0 = DC brake NOT active<br>1 = DC brake active   |

## 8 Drive Profile (Fieldbus)

### AC Drive Profile

**Drive State: Lenze CIA402 state machine to Ethernet/IP Drive State conversion table:**

| CiA402 Plus State                                        | AC Drive Profile Drive State |
|----------------------------------------------------------|------------------------------|
| INIT (0, 1)                                              | 0 - Vendor Specific          |
| NOT_READY_TO_SWITCH_ON (2)                               | 1 = Startup                  |
| SWITCH_ON_DISABLED (3)                                   | 2 = Not_Ready                |
| READY_TO_SWITCH_ON (4)<br>SWITCHED_ON (5)                | 3 = Ready                    |
| OPERATION_ENABLED (6)                                    | 4 = Enabled                  |
| DISABLE_OPERATION (7)<br>SHUT_DOWN (8)<br>QUICK_STOP (9) | 5 = Stopping                 |
| FAULT_REACTION_ACTIVE (10)                               | 6 = Fault_Stop               |
| FAULT (11)                                               | 7 = Faulted                  |

### 8.3.3 Speed setpoint / Actual Speed

Several speed command formats are also available:

| P592:3                        | 0x400B:3 | Network frequency setpoint                                                                                    | i510 | i550 | R/W |
|-------------------------------|----------|---------------------------------------------------------------------------------------------------------------|------|------|-----|
| 0.0 ... [0.0] ... 599.0 Hz    |          | Legacy network frequency setpoint<br>Scaling: 0.1 Hz unsigned (direction information comes via control word)  |      |      |     |
| P592:4                        | 0x400B:4 | Network setpoint speed                                                                                        | i510 | i550 | R/W |
| 0 ... [0] ... 50000 rpm       |          | Legacy network speed setpoint<br>Scaling: RPM unsigned (direction information comes via control word)         |      |      |     |
| P592:5                        | 0x400B:5 | Network setp. frequency                                                                                       | i510 | i550 | R/W |
| 0.00 ... [0.00] ... 599.00 Hz |          | Legacy network frequency setpoint<br>Scaling: 0.01 Hz unsigned (direction information comes via control word) |      |      |     |
| P592:6                        | 0x400B:6 | Network speed setpoint                                                                                        | i510 | i550 | R/W |
| -599.0 ... [0.0] ... 599.0 Hz |          | Legacy network frequency setpoint<br>Scaling: 0.1 Hz signed                                                   |      |      |     |

Several actual speed formats are also available:

| P593:3                           | 0x400C:3 | Actual frequency Hz                                 | i510 | i550 | R |
|----------------------------------|----------|-----------------------------------------------------|------|------|---|
| -- ... [Actual value] ... -- Hz  |          | Legacy actual frequency<br>Scaling 0.1Hz, unsigned  |      |      |   |
| P593:4                           | 0x400C:4 | Actual motor speed RPM                              | i510 | i550 | R |
| -- ... [Actual value] ... -- rpm |          | Legacy actual speed<br>Scaling RPM, unsigned        |      |      |   |
| P593:6                           | 0x400C:6 | Actual frequency                                    | i510 | i550 | R |
| -- ... [Actual value] ... -- Hz  |          | Legacy actual frequency<br>Scaling 0.01Hz, unsigned |      |      |   |

## 8.4 NETword Configuration

Instead of using the predefined command and status word there are general NETWords can be configured.



Depending on the fieldbus the mapping can be done in the Slave (inverter) or in the Master (PLC).  
Note: If the mapping is done in the Master (Example: PROFIBUS) the mapping in the Slave is overwritten!

### Master → Inverter (NETWordIn)

- NETWordIn1: Function trigger bit  
Value: 0x4008:1 (P590:1)  
Configuration: 0x400E:1 (P505:1-16)
- NETWordIn2: Switch digital outputs/relay  
Value: 0x4008:2 (P590:2)  
Configuration: 0x2643:1-3 (P420:1-3)
- NETWordIn3: Source for AO1/AO2  
Value: 0x4008:3 (P590:3)  
Configuration AO1: 0x2639:2 (P440:2)  
Configuration AO1: 0x263A:2 (P441:2)
- NETWordIn4: Source for AO1/AO2  
Value: 0x4008:4 (P590:4)  
Configuration AO1: 0x2639:2 (P440:2)  
Configuration AO1: 0x263A:2 (P441:2)

### Inverter → Master (NETWordOut)

- NETWordOut1: Drive Status bits  
Value: 0x400A:1 (P591:1)  
Configuration: 0x2635:10-25 (P420:10-25)
- NETWordOut2: Switched by Sequencer  
Value: 0x400A:2 (P591:2)  
Configuration: Sequencer parameter

### 8.4.1 NETWordIn configuration

#### Actual value:

| P590:1                    | 0x4008:1 | NETWordIN1                                                                                                                             | i510 | i550 | R/W |
|---------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|
| --                        |          | Actual value of mappable network in word 1 bit collector<br>(Trigger Function)<br>--> Trigger mapping 0x400E1-16 (P505:1-16)           |      |      |     |
| P590:2                    | 0x4008:2 | NETWordIN2                                                                                                                             | i510 | i550 | R/W |
| --                        |          | Actual value of mappable network in word 2 bit collector<br>(Trigger for digital Outputs)<br>--> Trigger mapping 0x2634:1-3 (P420:1-3) |      |      |     |
| P590:3                    | 0x4008:3 | NETWordIN3                                                                                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 100.0 % |          | Actual value of mappable network in word 3<br>(Source for Analog Output 1 and 2)<br>--> Mapping 0x2639:2 (P440:2), 0x263A:2 (P441:2)   |      |      |     |
| P590:4                    | 0x4008:4 | NETWordIN4                                                                                                                             | i510 | i550 | R/W |
| 0.0 ... [0.0] ... 100.0 % |          | Actual value of mappable network in word 3<br>(Source for Analog Output 1 and 2)<br>--> Mapping 0x2639:2 (P440:2), 0x263A:2 (P441:2)   |      |      |     |

#### Configuration:

| P505:1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0x400E:1 | NETWordIN1.00                        | i510 | i550 | R/W |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------|------|------|-----|
| <b>0: Not connected</b><br>1: Inverter disabled<br>2: Stop<br>3: Quick stop<br>4: Reset fault<br>5: DC brake<br>8: Run forward (CW)<br>9: Run reverse (CCW)<br>13: Invert rotation<br>14: AI1 setpoint selection<br>15: AI2 setpoint selection<br>17: Network setpoint selection<br>18: Preset bit0 selection<br>19: Preset bit1 selection<br>20: Preset bit2 selection<br>21: Preset bit3 selection<br>39: Ramp 2 selection<br>40: Load parameter set<br>41: Parameter set 1 selection<br>42: Parameter set 2 selection<br>43: User-Netw. fault 1<br>44: User-Netw. fault 2<br>45: Process controller off<br>46: Set PID output to 0<br>47: PID integrator disabled<br>48: PID influence ramps active |          | Function of Network Input Word Bit 0 |      |      |     |
| P505:2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0x400E:2 | NETWordIN1.01                        | i510 | i550 | R/W |
| <b>0: Not connected</b><br>(Reference see P505:0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          | Function of Network Input Word Bit 1 |      |      |     |

## 8 Drive Profile (Fieldbus)

### NETword Configuration

|                                                           |                  |                                                               |             |             |            |
|-----------------------------------------------------------|------------------|---------------------------------------------------------------|-------------|-------------|------------|
| <b>P505:3</b>                                             | <b>0x400E:3</b>  | <b>NETWordIN1.02</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>3:Quick stop</b><br>(Reference see P505:0)             |                  | Function of Network Input Word Bit 2                          |             |             |            |
| <b>P505:4</b>                                             | <b>0x400E:4</b>  | <b>NETWordIN1.03</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 3 (SW 02.01: New Default)  |             |             |            |
| <b>P505:5</b>                                             | <b>0x400E:5</b>  | <b>NETWordIN1.04</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>8:Run forward (CW)</b><br>(Reference see P505:0)       |                  | Function of Network Input Word Bit 4 (SW 02.01: New Default)  |             |             |            |
| <b>P505:6</b>                                             | <b>0x400E:6</b>  | <b>NETWordIN1.05</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>18:Preset bit0 selection</b><br>(Reference see P505:0) |                  | Function of Network Input Word Bit 5 (SW 02.01: New Default)  |             |             |            |
| <b>P505:7</b>                                             | <b>0x400E:7</b>  | <b>NETWordIN1.06</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>19:Preset bit1 selection</b><br>(Reference see P505:0) |                  | Function of Network Input Word Bit 6 (SW 02.01: New Default)  |             |             |            |
| <b>P505:8</b>                                             | <b>0x400E:8</b>  | <b>NETWordIN1.07</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>4:Reset fault</b><br>(Reference see P505:0)            |                  | Function of Network Input Word Bit 7                          |             |             |            |
| <b>P505:9</b>                                             | <b>0x400E:9</b>  | <b>NETWordIN1.08</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 8 (SW 02.01: New Default)  |             |             |            |
| <b>P505:10</b>                                            | <b>0x400E:10</b> | <b>NETWordIN1.09</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>5:DC brake</b><br>(Reference see P505:0)               |                  | Function of Network Input Word Bit 9 (SW 02.01: New Default)  |             |             |            |
| <b>P505:11</b>                                            | <b>0x400E:11</b> | <b>NETWordIN1.10</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 10                         |             |             |            |
| <b>P505:12</b>                                            | <b>0x400E:12</b> | <b>NETWordIN1.11</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 11                         |             |             |            |
| <b>P505:13</b>                                            | <b>0x400E:13</b> | <b>NETWordIN1.12</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>13:Invert rotation</b><br>(Reference see P505:0)       |                  | Function of Network Input Word Bit 12 (SW 02.01: New Default) |             |             |            |
| <b>P505:14</b>                                            | <b>0x400E:14</b> | <b>NETWordIN1.13</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 13                         |             |             |            |
| <b>P505:15</b>                                            | <b>0x400E:15</b> | <b>NETWordIN1.14</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 14                         |             |             |            |
| <b>P505:16</b>                                            | <b>0x400E:16</b> | <b>NETWordIN1.15</b>                                          | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>0:Not connected</b><br>(Reference see P505:0)          |                  | Function of Network Input Word Bit 15                         |             |             |            |

## 8.4.2 NETWordOut configuration

### Actual value:

| P591:1                                                            | 0x400A:1 | NetWordOUT1                                                                                                             | i510 | i550 | R |
|-------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------|------|------|---|
| Bit # description:<br>0: Mapping bit 0<br>1: Mapping bit 1<br>... |          | Actual value of mappable network out word 1 bit collector<br>(Status bits)<br>--> Trigger mapping 0x2634:1-3 (P420:1-3) |      |      |   |
| P591:2                                                            | 0x400A:2 | NetWordOUT2                                                                                                             | i510 | i550 | R |
| Bit # description:<br>0: Mapping bit 0<br>1: Mapping bit 1<br>... |          | No mapping                                                                                                              |      |      |   |

### Configuration:

| P420:10                                                    | 0x2634:10 | NETWordOUT1 - bit 0                               | i510 | i550 | R/W |
|------------------------------------------------------------|-----------|---------------------------------------------------|------|------|-----|
| <b>51:Ready for operation</b><br>(Reference see P420:1)    |           | Function of Network Bit 0                         |      |      |     |
| P420:11                                                    | 0x2634:11 | NETWordOUT1 - bit 1                               | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P420:1)           |           | Function of Network Bit 1 (SW 02.01: New Default) |      |      |     |
| P420:12                                                    | 0x2634:12 | NETWordOUT1 - bit 2                               | i510 | i550 | R/W |
| <b>52:Inverter enable</b><br>(Reference see P420:1)        |           | Function of Network Bit 2 (SW 02.01: New Default) |      |      |     |
| P420:13                                                    | 0x2634:13 | NETWordOUT1 - bit 3                               | i510 | i550 | R/W |
| <b>56:Fault</b><br>(Reference see P420:1)                  |           | Function of Network Bit 3                         |      |      |     |
| P420:14                                                    | 0x2634:14 | NETWordOUT1 - bit 4                               | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P420:1)           |           | Function of Network Bit 4 (SW 02.01: New Default) |      |      |     |
| P420:15                                                    | 0x2634:15 | NETWordOUT1 - bit 5                               | i510 | i550 | R/W |
| <b>54:Quick stop active</b><br>(Reference see P420:1)      |           | Function of Network Bit 5                         |      |      |     |
| P420:16                                                    | 0x2634:16 | NETWordOUT1 - bit 6                               | i510 | i550 | R/W |
| <b>50:Running</b><br>(Reference see P420:1)                |           | Function of Network Bit 6 (SW 02.01: New Default) |      |      |     |
| P420:17                                                    | 0x2634:17 | NETWordOUT1 - bit 7                               | i510 | i550 | R/W |
| <b>58:Device warning</b><br>(Reference see P420:1)         |           | Function of Network Bit 7                         |      |      |     |
| P420:18                                                    | 0x2634:18 | NETWordOUT1 - bit 8                               | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P420:1)           |           | Function of Network Bit 8 (SW 02.01: New Default) |      |      |     |
| P420:19                                                    | 0x2634:19 | NETWordOUT1 - bit 9                               | i510 | i550 | R/W |
| <b>0:Not connected</b><br>(Reference see P420:1)           |           | Function of Network Bit 9 (SW 02.01: New Default) |      |      |     |
| P420:20                                                    | 0x2634:20 | NETWordOUT1 - bit 10                              | i510 | i550 | R/W |
| <b>72:Setpoint speed reached</b><br>(Reference see P420:1) |           | Function of Network Bit 10                        |      |      |     |

## 8 Drive Profile (Fieldbus)

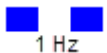
### NETword Configuration

| <b>P420:21</b>                                             | <b>0x2634:21</b> | <b>NETWordOUT1 - bit 11</b>                        | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
|------------------------------------------------------------|------------------|----------------------------------------------------|-------------|-------------|------------|
| <b>78:At current limit</b><br>(Reference see P420:1)       |                  | Function of Network Bit 11 (SW 02.01: New Default) |             |             |            |
| <b>P420:22</b>                                             | <b>0x2634:22</b> | <b>NETWordOUT1 - bit 12</b>                        | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>71:Actual speed = 0</b><br>(Reference see P420:1)       |                  | Function of Network Bit 12 (SW 02.01: New Default) |             |             |            |
| <b>P420:23</b>                                             | <b>0x2634:23</b> | <b>NETWordOUT1 - bit 13</b>                        | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>69:Inverse rotation</b><br>(Reference see P420:1)       |                  | Function of Network Bit 13 (SW 02.01: New Default) |             |             |            |
| <b>P420:24</b>                                             | <b>0x2634:24</b> | <b>NETWordOUT1 - bit 14</b>                        | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>115:Holding brake release</b><br>(Reference see P420:1) |                  | Function of Network Bit 14 (SW 02.01: New Default) |             |             |            |
| <b>P420:25</b>                                             | <b>0x2634:25</b> | <b>NETWordOUT1 - bit 15</b>                        | <b>i510</b> | <b>i550</b> | <b>R/W</b> |
| <b>55:Safe Torque Off</b><br>(Reference see P420:1)        |                  | Function of Network Bit 15 (SW 02.01: New Default) |             |             |            |

## 9 Troubleshooting

### 9.1 LED status display

The inverter has two LEDs (RDY = READY, ERR = ERROR) on the front cover to identify the status of the inverter:

| RDY<br>(Blue)                                                                     | ERR<br>(Red)                                                                      | State                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------|
| –                                                                                 | –                                                                                 | No supply voltage                                     |
|  | –                                                                                 | STO active                                            |
|                                                                                   |  | STO active, warning active                            |
|  | –                                                                                 | Inverter inhibited                                    |
|                                                                                   |  | Inverter inhibited, DC Voltage not                    |
|                                                                                   |  | Inverter inhibited, Warning active                    |
|                                                                                   |  | Inverter inhibited, Fault active                      |
| 3s ON / 1s OFF                                                                    | –                                                                                 | PID Sleep Mode active                                 |
|  | –                                                                                 | Inverter released, drive running OR Quick Stop active |
|                                                                                   |  | Inverter released, drive running, Warning active      |
|                                                                                   |  | Inverter released, Trouble reaction active            |

### 9.2 CAN LED status display

The LED CAN-RUN and CAN-ERR in combination indicate when the inverter is not yet active on the CAN-Bus.

| CAN-RUN<br>(Green)                                                                  | CAN-ERR<br>(Red)                                                                    | State                                    |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------|
| –                                                                                   |  | Inverter not active on CAN-Bus / Bus OFF |
|  |                                                                                     | Automatic baud rate detection            |

In general the LED CAN-RUN indicates CANopen state

| CAN-RUN<br>(Green)                                                                  | CANopen state   |
|-------------------------------------------------------------------------------------|-----------------|
|  | Pre-Operational |
|  | Operational     |
|  | Stopped         |

In general the LED CAN-ERR indicates error states:

| CAN-ERR<br>(Red)                                                                    | CANopen error                                              |
|-------------------------------------------------------------------------------------|------------------------------------------------------------|
|  | Warning Limit reached                                      |
|  | Node Guard Event                                           |
|  | Sync Message Error (Can only occur in state "Operational") |

### 9.3 Modbus LED status display

The Modbus module has two LEDs (RDY = READY, ERR = ERROR) on the front cover to identify the status:

| RDY<br>(Green)                                                                    | ERR<br>(Red)                                                                      | State                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------|
| –                                                                                 | ANY                                                                               | No reception / transmission     |
|  |                                                                                   | Frame reception or transmission |
| ANY                                                                               | –                                                                                 | No error                        |
|                                                                                   |  | Communication Fault             |
|                                                                                   |  | Internal fault                  |
|  |                                                                                   | Automatic baud rate detection   |

### 9.4 Profibus LED status display

The profibus module has two LEDs (NS = Status, NE = ERROR) on the front cover to identify the status:

| NS<br>(Green)                                                                       | NE<br>(Red)                                                                         | State                                                                  |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| –                                                                                   | –                                                                                   | Fieldbus deactivated, not initialized, power off or Firmware download  |
|   |                                                                                     | Connected to master PLC in RUN state, current state is "data exchange" |
|  |                                                                                     | Not connected, PLC STOP or no data exchange                            |
|  |  | Incorrect setting of station address, operation with default values    |
|  |                                                                                     | Watchdog expired                                                       |
| –                                                                                   |  | Unrecoverable fault                                                    |
| ANY                                                                                 |  | PROFIBUS parameterization error                                        |
|                                                                                     |  | PROFIBUS configuration error                                           |

## 9.5 Error history

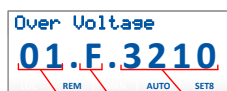
### 9.5.1 Error History Keypad

Any time the inverter experiences an Error condition during operation it is captured in the inverter non-volatile memory. For historical Error tracking purposes the Errors can be viewed in P155.00. This parameter contains the actual Error codes, the time (in running hours) that the Error occurred and the count of Errors (in case of multiple instances of the same Error condition). The Error History will retain the 32 most recent Errors.

The data in the Error History is described below:



Press 



Error Code  
F= Fault  
T = Trouble  
W = Warning  
History Entry Number (01...32)  
Lowest number (01) is most recent error

Press 



Time of error in Day, Hours, Minutes, Seconds  
(Based on Operating Time P151.03)  
Count of occurrences of this error condition  
CT = Abbreviation for «Count»  
History Entry Number (01..32)  
Lowest number (01) is most recent number

Pressing the  button will toggle between the two screens described above.

Pressing the  and  buttons will navigate from Error 01 to Error 32.

## 9.5.2 Error History Easy Starter

|                                                                                   |                         |
|-----------------------------------------------------------------------------------|-------------------------|
|  | Opens the error logbook |
|  | Reset the drive error   |

| Logbook     |         |             |                    |                                                     |       |
|-------------|---------|-------------|--------------------|-----------------------------------------------------|-------|
| Time        | Type    | occurred in | CiA 402 error code | Text                                                | Count |
| 12:18:38:02 | Error   | Device      | 0x4310             | motor temperature has reached error level           | 8     |
| 12:16:31:59 | Error   | Device      | 0xFF64             | power stage communication is out of synchronization | 1     |
| 12:16:31:55 | Warning | Device      | 0xFF15             | DC link circuit - undervoltage warning              | 0     |
| 12:16:31:55 | Error   | Device      | 0x3220             | DC link circuit - undervoltage , 1V                 | 1     |
| 12:16:31:55 | Warning | Device      | 0xFF15             | DC link circuit - undervoltage warning              | 1     |
| 12:15:02:09 | Error   | Device      | 0x4310             | motor temperature has reached error level           | 10    |
| 12:14:30:25 | Warning | Device      | 0xFF18             | DC link circuit - overvoltage warning               | 1     |
| 12:14:26:35 | Error   | Device      | 0x4310             | motor temperature has reached error level           | 1     |
| 12:14:26:20 | Error   | Device      | 0xFF64             | power stage communication is out of synchronization | 1     |
| 12:14:26:17 | Error   | Device      | 0x3220             | DC link circuit - undervoltage , 1V                 | 1     |
| 12:14:25:37 | Error   | Device      | 0x4310             | motor temperature has reached error level           | 2     |
| 12:14:23:26 | Error   | Device      | 0xFF64             | power stage communication is out of synchronization | 1     |
| 12:14:23:23 | Warning | Device      | 0xFF15             | DC link circuit - undervoltage warning              | 0     |
| 12:14:23:23 | Error   | Device      | 0x3220             | DC link circuit - undervoltage , 1V                 | 1     |
| 12:14:23:22 | Warning | Device      | 0xFF15             | DC link circuit - undervoltage warning              | 1     |
| 12:05:56:20 | Error   | Device      | 0xFF53             | connection list wrong connected (not safe manner)   | 2     |

|                    |                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time               | Time of the fault occurrence based on "Operation time (Control unit)" P150.03.<br>If more than one fault of the same type is counted (Count >1) the first fault occurrence time is shown!<br>[dd:hh:mm:ss] |
| Type               | Error type (Warning, Error, Trouble)                                                                                                                                                                       |
| Occurred in        | Occurrence of the event                                                                                                                                                                                    |
| CiA 402 Error code | Error Code                                                                                                                                                                                                 |
| Text               | Error text                                                                                                                                                                                                 |
| Count              | Number of sequential fault occurrences                                                                                                                                                                     |

## 9.6 Error messages

| Error (Hex) | Error (Dec) | Fault Type   | Tool text        | Description                                                                                                                                                            |
|-------------|-------------|--------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x2250      | 8784        | Error        | PU over current  | Short circuit (device internal). Will be triggered by the following events:<br>- Brake chopper over current<br>- Power stage over current<br>- Charge relay not closed |
| 0x2320      | 8992        | Error        | Earth leak fault | Short circuit/earth leakage (device internal)                                                                                                                          |
| 0x2340      | 9024        | Error        | Motor shorted    | Short circuit (motor-side)                                                                                                                                             |
| 0x2350      | 9040        | Configurable | i2t motor        | Load level fault (I2t, thermal state). (P308:1-3)                                                                                                                      |
| 0x2382      | 9090        | Configurable | ixt Fault        | Ixt fault. (P135:5)                                                                                                                                                    |

## 9 Troubleshooting

### Error messages

|        |       |              |                  |                                                                                                                                                                                                                                                                                                                          |
|--------|-------|--------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x2383 | 9091  | Warning      | ixt Warning      | Ixt warning                                                                                                                                                                                                                                                                                                              |
| 0x2387 | 9095  | Error        | Clamp timeout    | Clamp responded too often                                                                                                                                                                                                                                                                                                |
| 0x3120 | 12576 | Error        | Mains Phase fail | Main single phase fault                                                                                                                                                                                                                                                                                                  |
| 0x3210 | 12816 | Error        | DC Bus OV        | DC link circuit overvoltage                                                                                                                                                                                                                                                                                              |
| 0x3211 | 12817 | Warning      | Warn.DC Bus OV   | DC link circuit overvoltage warning                                                                                                                                                                                                                                                                                      |
| 0x3220 | 12832 | Trouble      | DC Bus UV        | DC link circuit undervoltage                                                                                                                                                                                                                                                                                             |
| 0x3221 | 12833 | Warning      | Warn.DC Bus UV   | DC link circuit undervoltage warning                                                                                                                                                                                                                                                                                     |
| 0x3222 | 12834 | Warning      | DC Bus on-UV     | DC link voltage to low for power up                                                                                                                                                                                                                                                                                      |
| 0x4210 | 16912 | Error        | PU Overtemp.     | Power module overtemperature fault                                                                                                                                                                                                                                                                                       |
| 0x4281 | 17025 | Warning      | Heats. fan error | Heat sink fan fault. Check heat sink fan                                                                                                                                                                                                                                                                                 |
| 0x4285 | 17029 | Warning      | Warn.PU Overtemp | Power module overtemperature warning                                                                                                                                                                                                                                                                                     |
| 0x4310 | 17168 | Configurable | Overtemp. motor  | Motor temperature has reached error level. (P309:2)                                                                                                                                                                                                                                                                      |
| 0x5112 | 20754 | Warning      | 24V supply low   | 24V supply level critical                                                                                                                                                                                                                                                                                                |
| 0x5380 | 21376 | Error        | Incomp. OEM HW   | Control Unit HW OEM Type is not compatible with Power Unit HW OEM Type                                                                                                                                                                                                                                                   |
| 0x6010 | 24592 | Warning      | Watchdog timeout | Watchdog time-out                                                                                                                                                                                                                                                                                                        |
| 0x618A | 24970 | Warning      | Int. fan error   | Internal fan fault                                                                                                                                                                                                                                                                                                       |
| 0x6280 | 25216 | Error        | P400 config err  | Connection list wrong connected.<br><b>Start forward/reverse</b> an <b>Run forward/reverse</b> can't be used together.<br>In <b>Flexible</b> control mode <b>Inverter enable</b> or <b>Run/Stop</b> must be assigned to a I/O. (Exception: Inverter is controlled from network, <b>Network enable</b> (P400:37) is HIGH) |
| 0x6281 | 25217 | Error        | User fault 1     | User fault 1 (Defined in P400:43)                                                                                                                                                                                                                                                                                        |
| 0x6282 | 25218 | Error        | User fault 2     | User fault 2 (Defined in P400:44)                                                                                                                                                                                                                                                                                        |
| 0x6290 | 25232 | Warning      | Invert rotation  | Reverse direction protection warning. (P304:0)                                                                                                                                                                                                                                                                           |
| 0x6291 | 25233 | Error        | Trouble overflow | Maximal allowed troubles exceeded. (P760:2-5)                                                                                                                                                                                                                                                                            |
| 0x62A0 | 25248 | Error        | AC User fault    | AC control user fault                                                                                                                                                                                                                                                                                                    |
| 0x62A1 | 25249 | Error        | Netw.UserFault 1 | Network user fault 1                                                                                                                                                                                                                                                                                                     |
| 0x62A2 | 25250 | Error        | Netw.UserFault 2 | Network user fault 2                                                                                                                                                                                                                                                                                                     |
| 0x62B1 | 25265 | Error        | NetworkIN1 error | NetworkIN1 duplicate bit connection fault                                                                                                                                                                                                                                                                                |
| 0x7080 | 28800 | Error        | Assertionlevel   | Last setting of Assertion level is different to stored parameter.<br>Check setting of P410:1, save parameters and re-boot inverter.                                                                                                                                                                                      |
| 0x7081 | 28801 | Configurable | AI1 monitoring   | Analog input 1 fault (P430:8-10)                                                                                                                                                                                                                                                                                         |
| 0x7082 | 28802 | Configurable | AI2 monitoring   | Analog input 2 fault (P431:8-10)                                                                                                                                                                                                                                                                                         |
| 0x70A1 | 28833 | Warning      | AO1 monitoring   | Analog output 1 fault                                                                                                                                                                                                                                                                                                    |
| 0x70A2 | 28834 | Warning      | AO2 monitoring   | Analog output 2 fault                                                                                                                                                                                                                                                                                                    |
| 0x7121 | 28961 | Error        | Pole posi error  | Pole position identification fault                                                                                                                                                                                                                                                                                       |
| 0x7180 | 29056 | Configurable | Mot max current  | Motor over current. (P353:1-2)                                                                                                                                                                                                                                                                                           |
| 0x7385 | 29573 | Warning      | F.fdb spd limit  | Feedback system: speed limit                                                                                                                                                                                                                                                                                             |
| 0x7580 | 30080 | Configurable | Diag TX error    | Diagnosis transmit message ring buffer error (0x218B:0)                                                                                                                                                                                                                                                                  |
| 0x7581 | 30081 | Configurable | Diag RX error    | Diagnosis receive message ring buffer error (0x218B:0)                                                                                                                                                                                                                                                                   |
| 0x7680 | 30336 | Warning      | EPM full         | There are to many parameters on the EPM.                                                                                                                                                                                                                                                                                 |

## 9 Troubleshooting

### Error messages

|        |       |         |                   |                                                                                                                                                                                                                                                                                                                                                                         |
|--------|-------|---------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |       |         |                   | <b>Fault reaction:</b><br>The device will copy the current backup to the user block and won't overwrite the RAM data.<br><b>Troubleshooting:</b><br>Trigger the command P700:3. The device will erase the user block and create a new one with current RAM data.                                                                                                        |
| 0x7681 | 30337 | Error   | EPM not present   | The EPM is not present.<br><b>Fault reaction:</b><br>Factory setting will load. The user is not able to reset this fault.<br><b>Troubleshooting:</b><br>Switch off the device, plug in an EPM and power up again.                                                                                                                                                       |
| 0x7682 | 30338 | Error   | EPM invalid data  | The user parameter setting is invalid. Both blocks (User and backup block) are invalid.<br><b>Fault reaction:</b><br>The user parameter setting has lost. The default values will be loaded automatically.<br><b>Troubleshooting:</b><br>Save again user parameters with P700:3. The default values will be stored to the EPM. The old user parameter set will be lost. |
| 0x7684 | 30340 | Warning | Save incomplete   | The store command has been interrupted through an unexpected power down. The user data are not completely stored.<br><b>Fault reaction:</b><br>At power up, the data will load from backup and be copied to user block (The backup is on an older condition).<br><b>Troubleshooting:</b><br>Check the parameter setting and store them again.                           |
| 0x7686 | 30342 | Error   | Net.config.error  | Fieldbus module configuration mismatch fault                                                                                                                                                                                                                                                                                                                            |
| 0x7689 | 30345 | Warning | OEM data invalid  | One or more parameters are invalid or the OEM block is blank.<br><b>Fault reaction:</b><br>The user parameter set will load automatically.<br><b>Troubleshooting:</b><br>Save OEM parameter (P700:6). In this case, the user parameter set will be lost.                                                                                                                |
| 0x768A | 30346 | Error   | Wrong EPM         | EPM: EPM Type not match                                                                                                                                                                                                                                                                                                                                                 |
| 0x7690 | 30352 | Error   | OEM CU not match  | The FW version does not match to the current used EPM data.<br><b>Fault reaction:</b><br>The data will load to RAM.<br><b>Troubleshooting:</b><br>Factory setting needs to be loaded (P700:1)                                                                                                                                                                           |
| 0x7691 | 30353 | Error   | PU Data not match | The FW type does not match to the current used EPM data.<br><b>Fault reaction:</b><br>The data will load to RAM.<br><b>Troubleshooting:</b><br>Factory setting needs to be loaded (P700:1)                                                                                                                                                                              |

## 9 Troubleshooting

### Error messages

|        |       |              |                  |                                                                                                                                                                                                                                                                                               |
|--------|-------|--------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x7692 | 30354 | Error        | User CU not matc | <p>New FW type detected. The FW type is compatible to the current used EPM.</p> <p><b>Fault reaction:</b><br/>The data will load to RAM.</p> <p><b>Troubleshooting:</b><br/>Accept new FW type (P700:27) (Changes in parameter setting).<br/>Alternative: Load factory settings (P700:1).</p> |
| 0x7693 | 30355 | Error        | EPM PU size inco | <p>The PU type does not match to the current used EPM data.</p> <p><b>Fault reaction:</b><br/>The data will load to RAM.</p> <p><b>Troubleshooting:</b><br/>Factory setting need to be loaded (P700:1)</p>                                                                                    |
| 0x7694 | 30356 | Error        | EPM new PU size  | <p>New PU type detected. The PU type is compatible to the current used EPM.</p> <p><b>Fault reaction:</b><br/>The data will load to RAM.</p> <p><b>Troubleshooting:</b><br/>Accept new PU type (P700:27) (Changes in parameter setting).<br/>Alternative: Load factory settings (P700:1).</p> |
| 0x7695 | 30357 | Warning      | InvalidChgovrCfg | <p>One or more parameter are not usable for the parameter changeover.</p> <p><b>Fault reaction:</b><br/>Parameter changeover is disabled.</p> <p><b>Troubleshooting:</b><br/>Check fault status in P756:1 and correct the wrong index indicated in P756:2.</p>                                |
| 0x7697 | 30359 | Error        | Param. lost      | EPM data: Lost modified parameters because of 24V power-cycling                                                                                                                                                                                                                               |
| 0x8112 | 33042 | Configurable | TO expl. msg     | Fieldbus - Timeout explicit message (P515:6)                                                                                                                                                                                                                                                  |
| 0x8114 | 33044 | Configurable | TO overall comm  | Fieldbus - Overall communication timeout (P515:7)                                                                                                                                                                                                                                             |
| 0x8182 | 33154 | Configurable | CAN bus off      | CAN bus off. (0x2857:10)                                                                                                                                                                                                                                                                      |
| 0x8183 | 33155 | Configurable | CAN bus warning  | CAN warning. (0x2857:11)                                                                                                                                                                                                                                                                      |
| 0x8184 | 33156 | Configurable | CAN heartb. C1   | CAN heartbeat time-out consumer 1. (0x2857:5)                                                                                                                                                                                                                                                 |
| 0x8185 | 33157 | Configurable | CAN heartb. C2   | CAN heartbeat time-out consumer 2. (0x2857:6)                                                                                                                                                                                                                                                 |
| 0x8186 | 33158 | Configurable | CAN heartb. C3   | CAN heartbeat time-out consumer 3. (0x2857:7)                                                                                                                                                                                                                                                 |
| 0x8187 | 33159 | Configurable | CAN heartb. C4   | CAN heartbeat time-out consumer 4. (0x2857:8)                                                                                                                                                                                                                                                 |
| 0x8190 | 33168 | Configurable | Watchdog timeout | Fieldbus watchdog expired. (P515:1)                                                                                                                                                                                                                                                           |
| 0x8191 | 33169 | Configurable | Cycl data error  | Fieldbus disruption of cyclic data exchange. (P515:2)                                                                                                                                                                                                                                         |
| 0x8192 | 33170 | Configurable | Net. Init. error | Fieldbus communication stack initialization error (P515:4)                                                                                                                                                                                                                                    |
| 0x8193 | 33171 | Configurable | Inv. cyclic data | Fieldbus invalid cyclic process data. (P515:5)                                                                                                                                                                                                                                                |
| 0x81A0 | 33184 | Warning      | Modbus TX error  | Modbus transmit message ring buffer error                                                                                                                                                                                                                                                     |
| 0x81A1 | 33185 | Configurable | Timeout Modbus   | Modbus network time-out. (P515:1-2)                                                                                                                                                                                                                                                           |
| 0x81A2 | 33186 | Warning      | Modbus request   | Modbus wrong request from master                                                                                                                                                                                                                                                              |
| 0x8286 | 33414 | Configurable | PDO map error    | Fieldbus PDO mapping error. (P515:3)                                                                                                                                                                                                                                                          |
| 0x8291 | 33425 | Configurable | Timeout RPDO1    | CAN time-out Rx PDO 1 (0x2857:1)                                                                                                                                                                                                                                                              |
| 0x8292 | 33426 | Configurable | Timeout RPDO2    | CAN time-out Rx PDO 2 (0x2857:2)                                                                                                                                                                                                                                                              |

## 9 Troubleshooting

### Error messages

|        |       |              |                  |                                                                                                                                                                           |
|--------|-------|--------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0x8293 | 33427 | Configurable | Timeout RPDO3    | CAN time-out Rx PDO 3 (0x2857:3)                                                                                                                                          |
| 0x8311 | 33553 | Configurable | F.TrqExc         | Max torque exceeded (P329:1)                                                                                                                                              |
| 0x9080 | 36992 | Error        | Keypad removed   | Keypad removed fault                                                                                                                                                      |
| 0xFF02 | 65282 | Configurable | Brk Resistor OL  | Brake resistor overload fault. (P707:9, P707:11)                                                                                                                          |
| 0xFF05 | 65285 | Error        | STO error        | Safety supervision fault                                                                                                                                                  |
| 0xFF06 | 65286 | Configurable | Motor overspeed  | Motor over speed. (P350:1-2)                                                                                                                                              |
| 0xFF09 | 65289 | Configurable | Mot.PhaseFailure | Motor phase failure (P310:1-3)                                                                                                                                            |
| 0xFF0A | 65290 | Configurable | Phase U failure  | Motor phase failure phase U. (P310:1-3)                                                                                                                                   |
| 0xFF0B | 65291 | Configurable | Phase V failure  | Motor phase failure phase V. (P310:1-3)                                                                                                                                   |
| 0xFF0C | 65292 | Configurable | Phase W failure  | Motor phase failure phase W. (P310:1-3)                                                                                                                                   |
| 0xFF19 | 65305 | Error        | Motor ID fault   | Motor parameter identification fault                                                                                                                                      |
| 0xFF36 | 65334 | Configurable | BrkResistor OL   | Brake resistor overload warning. (P707:8, P707:10)                                                                                                                        |
| 0xFF37 | 65335 | Error        | Auto start disab | Automatic start was inhibited. Run/Start signal was present during Power-On and start was inhibited because of setting in P203:2. Remove Run/Start signal and reset fault |
| 0xFF56 | 65366 | Warning      | Warn. Max. Freq  | Max output frequency reached                                                                                                                                              |

For other faults reboot the inverter. If the problem can't be resolved contact LENZE.

## 10 Maintenance

The i500 inverter does not require any maintenance if the prescribed operating conditions are observed.

### 10.1 Routine inspections

#### **NOTICE!**

It is a good practice to check the inverter during a routine inspection of the drive system:

- ▶ Remove dust from inverter housing if necessary.
- ▶ Check that ventilation slots are not covered or obstructed.
- ▶ Check the condition and tightness of the electric connections.
- ▶ The integrity of all earth / ground connections should be periodically checked.

#### **DANGER!**

##### **Dangerous electrical voltage**

Possible death or severe injuries due to electrical shock.

- ▶ All inspection works on the inverter must only be carried out in the deenergised state.
- ▶ After switching off the mains voltage, the capacitors in the inverter can still be charged. Observe the waiting time on the inverter label before commencing work.

### 10.2 Product support

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Germany

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Fax: +49 5154 82-1112  
Email: [service.de@lenze.com](mailto:service.de@lenze.com)

## 11 Decommissioning

### 11.1 Safety instructions



#### **WARNING!**

##### **Dangerous electrical voltage**

An electrical shock can cause death or severe personal injury.

- ▶ Apply lockout/tagout procedures for decommissioning.
- ▶ Connect/disconnect all pluggable inverter connections only in deenergised condition!
- ▶ Only remove the inverter from the installation in completely deenergised state.

### 11.2 Removal and disposal

Recycle metal and plastic materials of the inverter. Ensure professional disposal of assembled PCBs.



Observe all applicable national regulations for the disposal of waste electronic equipment.



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