HYDAC INTERNATIONAL

KINESYS

Manual commissioning

HFI – MM Frequency inverter

Typ: HFI – MM Frequency inverter

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2 Preface

The system consists of a standard motor with an attached frequency converter. For distribution the frequency converter is already mounted and connected with the motor. The electrical connection is made directly at the frequency converter. In this document the connection and the parameterization for the easy commissioning are shown.

3 Main connection

3.1 Frame size A - C

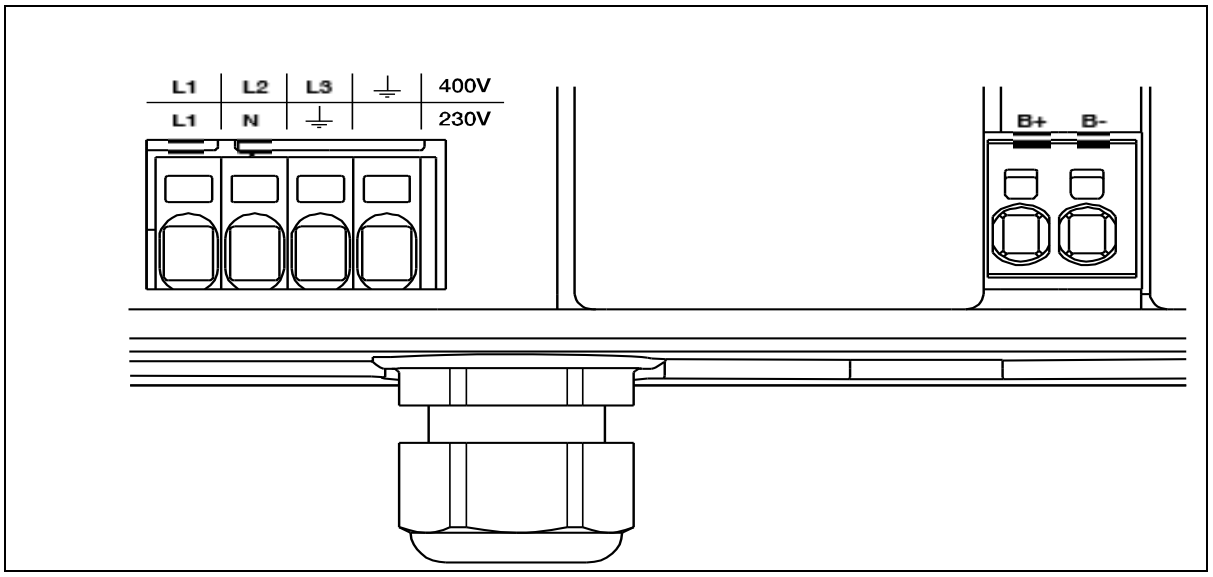

Figure 3-1: Mains connection BG A - C

The mains cable must be put through the cable gland and the phases L1, L2, L3 for 400 V and the ground wire with the protective earth (PE) contact must be connected to the terminal.
The cable gland serves the cable relief; the PE connection wire must be significantly longer than the other wires.

Terminal No.	Label	Configuration
1	L1	Mains phase 1
2	L2	Mains phase 2
3	L3	Mains phase 3
4	PE	Ground wire

Table 1: 3x400V terminal connection X1

3.2 Frame size D

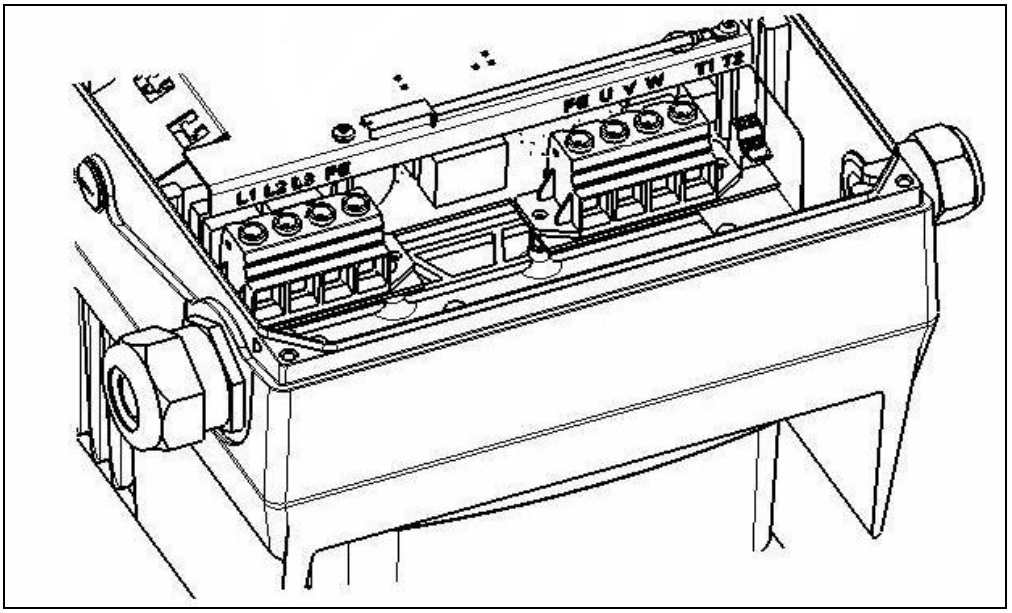

Figure 3-2: Mains connection BG D

Initially the four screws of the case cap must be screwed off and the cab must be removed.

The mains cable must be put through the cable gland and the phases L1, L2, L3 for 400 V and the ground wire with the protective earth (PE) contact must be connected to the terminal.
The cable gland serves the cable relief; the PE connection wire must be significantly longer than the other wires.

Terminal No.	Label	Configuration
1	L1	Mains phase 1
2	L2	Mains phase 2
3	L3	Mains phase 3
4	PE	Ground wire

Table 2: 3x 400V terminal connection X2

4 Control ports

4.1 Wiring diagram

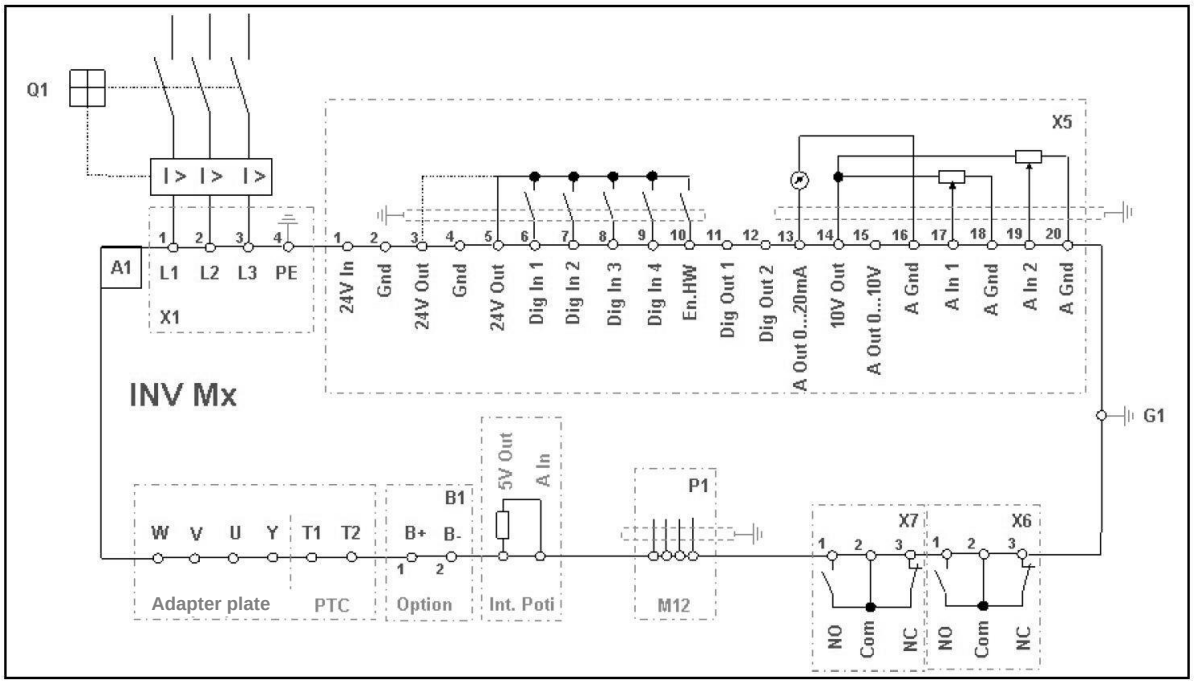

Figure 4-1: Wiring diagram

The drive controller and the control card are operational after connecting a 400 V AC voltage to terminal L1 to L3.

Alternatively it is possible to commission only the inverter's control card with an external 24 V DC Voltage. However it is not possible to drive the motor without a mains connection.

4.2 Control terminal strip

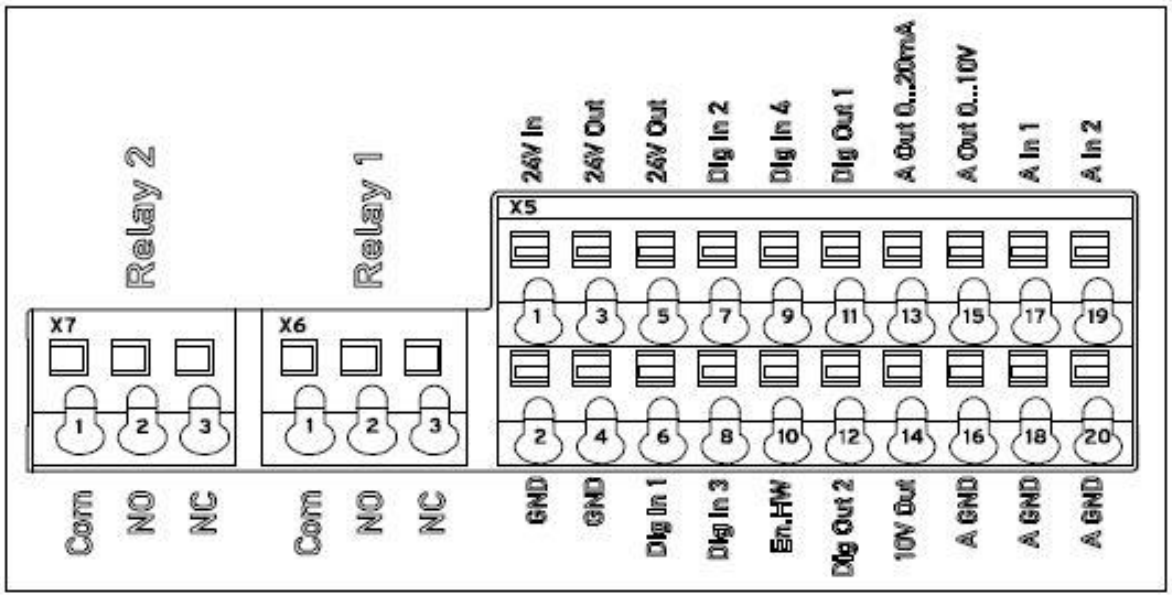

Figure 4-2: Control terminal strip

The required control wires must be put through the cable glands into the housing. The pin assignment is shown in Figure 4-2.

4.3 Terminal layout

The terminal layout is listed below.

Terminal No.	Label	Configuration
1	COM	Center contact Relay 1
2	NO	Normally open contact Relay 1
3	NC	Normally closed contact Relay 1

Table 3-1: Terminal layout X3

Terminal No.	Label	Configuration
1	COM	Center contact Relay 2
2	NO	Normally open contact Relay 2
3	NC	Normally closed contact Relay 2

Table 3-2: Terminal layout X4

Terminal No.	Label	Configuration
1	24 V In	External power supply
2	GND	Ground
3	24 V Out	Internal power supply
4	GND	Ground
5	24 V Out	Internal power supply
6	Dig. In 1	Software release signal (Parameter 1.131)
7	Dig. In 2	unassigned
8	Dig. In 3	unassigned
9	Dig. In 4	Fault reset (Parameter 1.180)
10	En-HW	Hardware release signal
11	Dig. Out 1	Error message (Parameter 4.150)
12	Dig. Out 2	unassigned
13	A. Out 0…20 mA	Actual frequency value (Parameter 4.100)
14	10 V Out	For external voltage divider
15	A. Out 0…10V	Actual frequency value (Parameter 4.100)
16	A. GND (Ground 10 V)	Ground
17	A. In 1	Actual PID value (Parameter 3.060)
18	A. GND (Ground 10 V)	Ground
19	A. In 2	unassigned
20	A. GND (Ground 10 V)	Ground

Table 4-3: Terminal layout of standard application card

4.4 Connection scheme

For unlocking the modulation the hardware release signal needs to be activated.

Two variants for the hardware release signal are shown below.

4.4.1 Control connection for hardware release signal with internal power supply (1st variant)

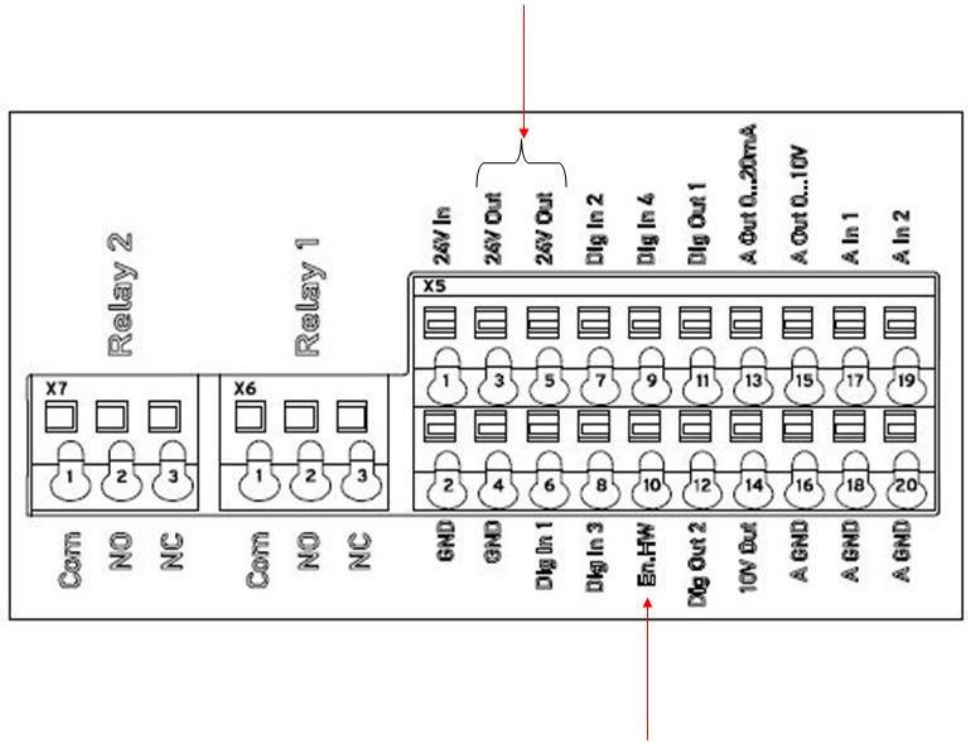

Figure 4-4: Control port for hardware release signal with internal power supply

To activate the hardware release signal, the port „En.HW“ needs to be connected to the port „24V Out“.

4.4.2 Control connection for hardware release signal with external power supply (2nd variant)

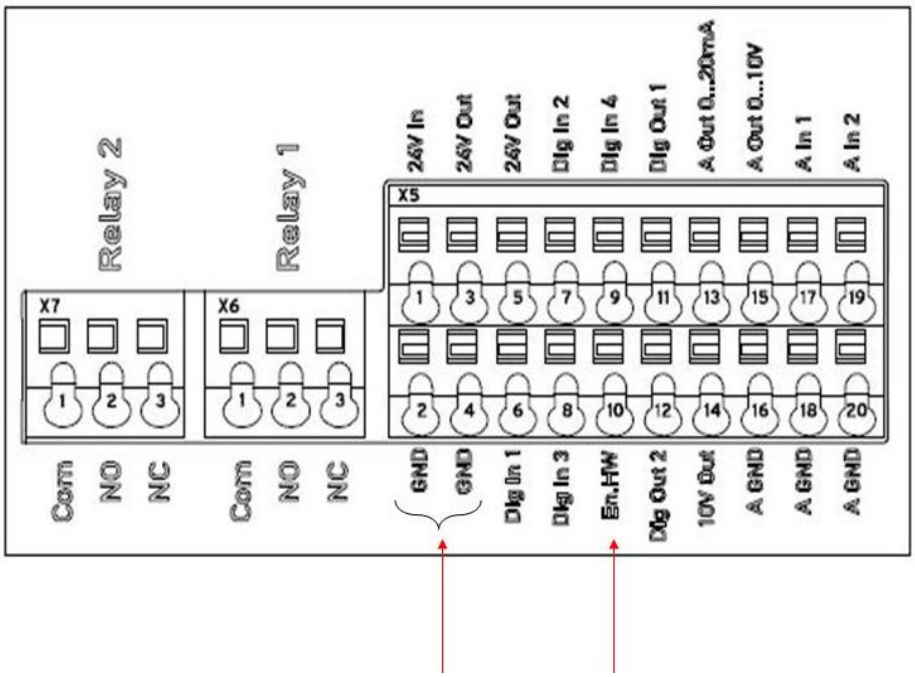

Figure 4-5: Control connection for hardware release signal with external power supply

To activate the hardware release signal with an external power supply, the positive pole (24V DC) of the external power supply needs to be connected to „En.HW“ and the negative pole to GND.

5 Commissioning

To parameterize the frequency converter, connect the USB parameterization cable to a PC. To establish a connection with the software HMM Start-Up, the correct interface must be chosen (in general the last COM-Port).

Figure 5-1: Interface

After connecting, the following screen appears.

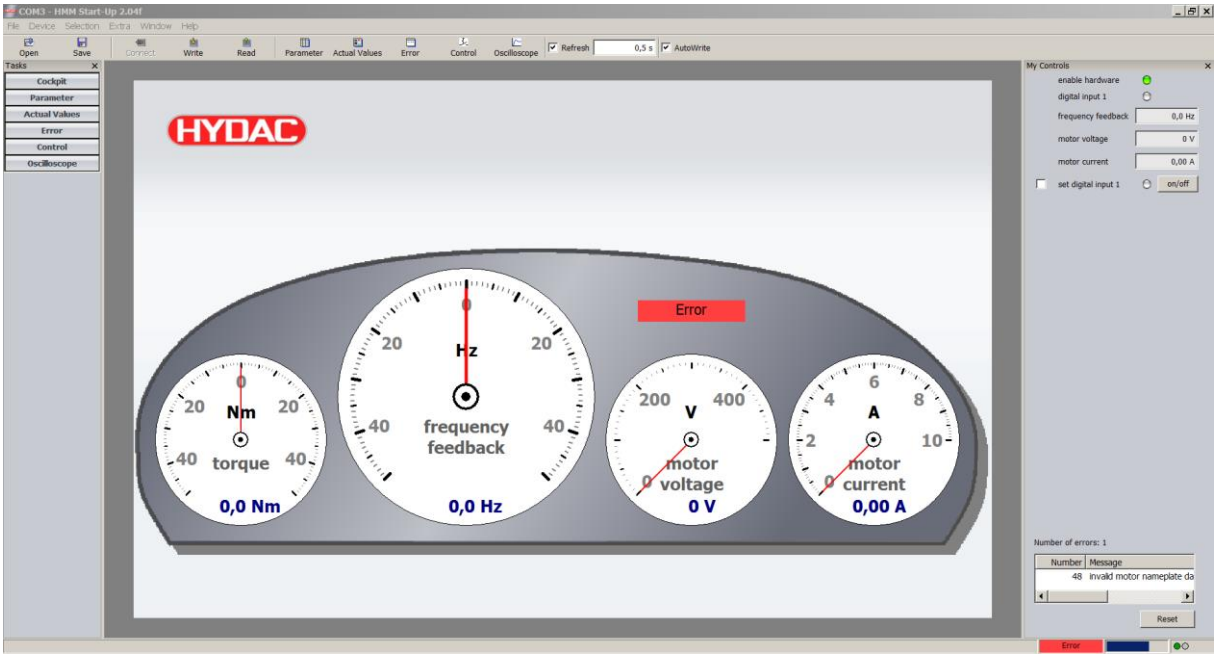

Figure 5-2: Cockpit

As default, the motor specific values are entered and the motor identification was carried out. If you use another motor or the Failure “invalid motor nameplate data” appears, then you have to enter the right motor specific values.

Below is an example for a motor nameplate:

- Motor current: 5,88 A
- Motor power: 3 kW
- Motor speed: 2890 rpm
- Motor frequency: 50 Hz
- Motor voltage: 400 V
- Motor-cosphi: 0,87

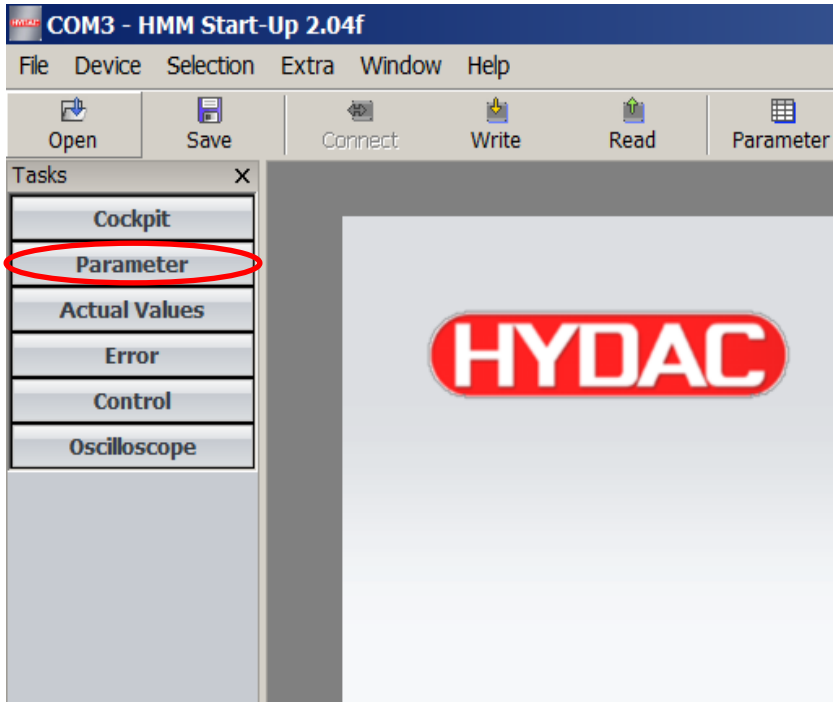

Figure 5-3: Opening the parameter tab

To enter the motor values to frequency inverter's parameters, open the parameter list. Therefore click on "Parameter" as shown in

Figure 5-3.

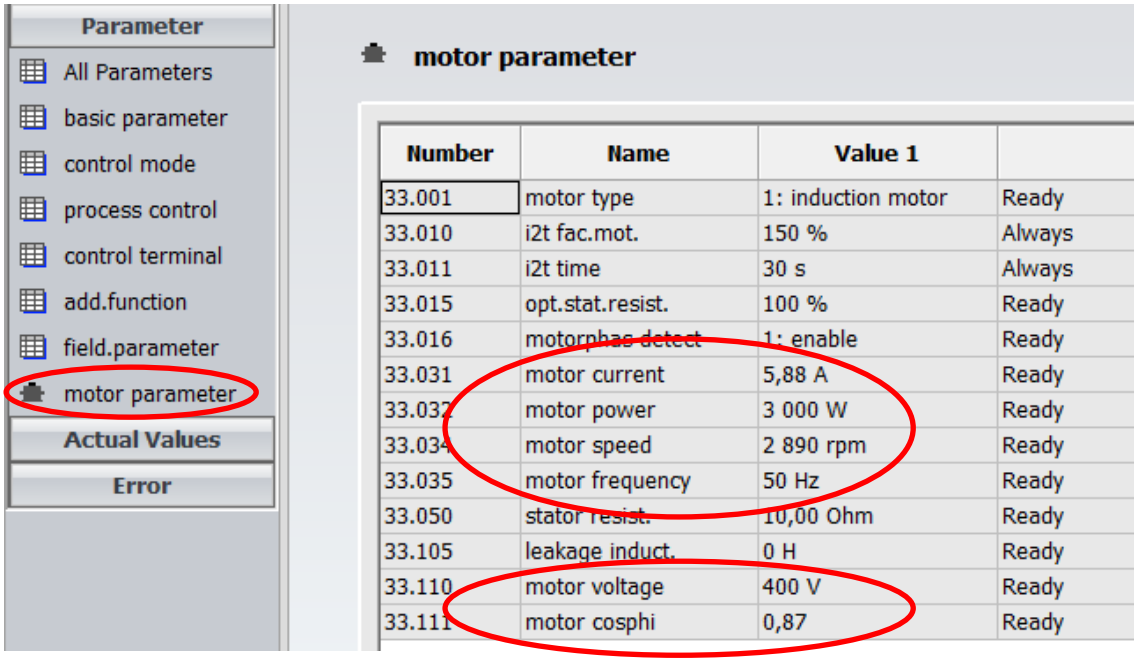

Figure 5-4: motor parameter

Afterwards enter the motor values in the tab “motor parameter” and confirm each entry with the green check mark.

The following parameters need to be set:

- 33.031 motor current
- 33.032 motor power
- 33.034 motor speed
- 33.035 motor frequency
- 33.110 motor voltage
- 33.111 motor-cosphi

When the motor specific values are grayed, then you have no permissions. Please contact the manufacturer.

After entering the motor values a motor identification needs to be performed. To start the identification, confirm the fault with the reset button on the right first. Afterwards click on “Device” → “Commissioning”

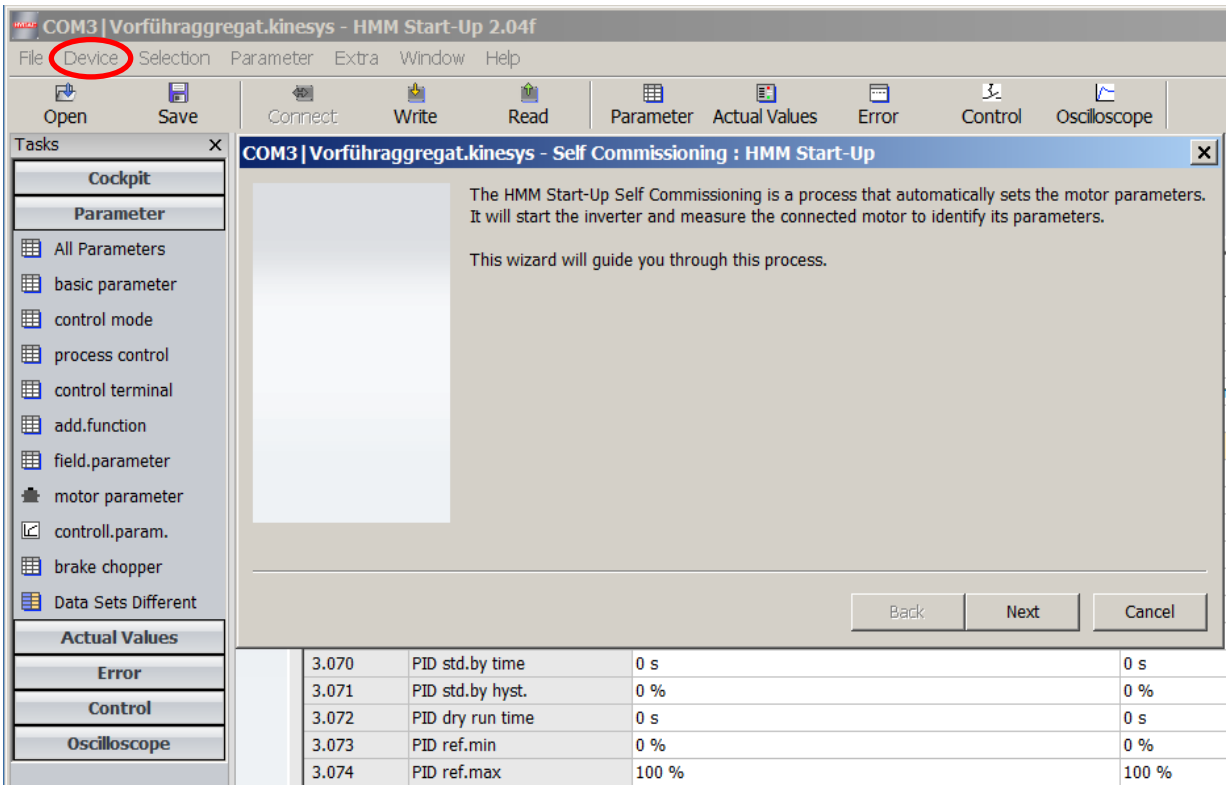

Figure 5-5: Motor identification

Follow the instructions of the wizard.

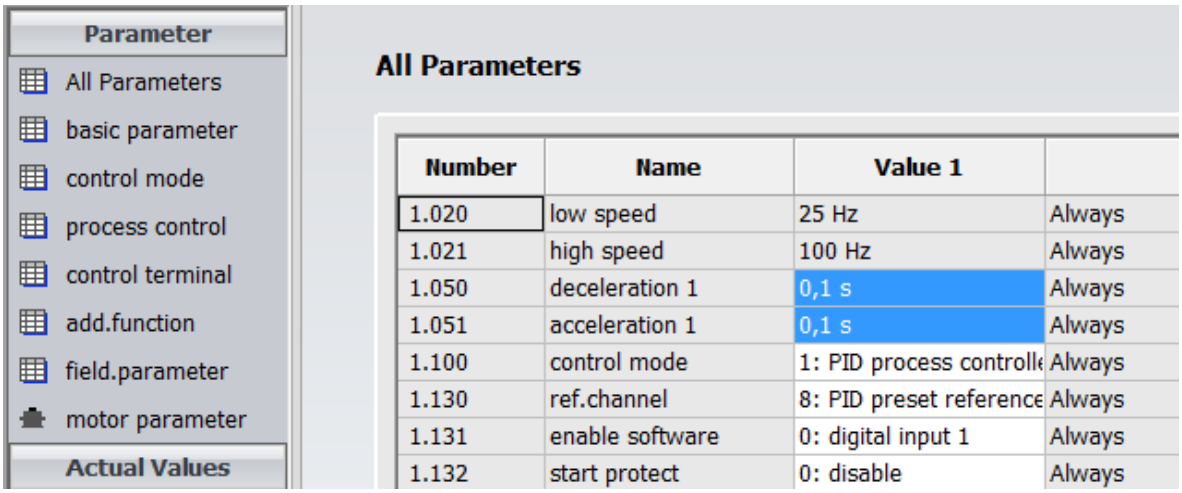

Figure 5-6: Ramp time

By default the ramp time (value number 1.050 and 1.051) is set to 5 seconds. Depending on the application this variable can be changed to a suitable value.

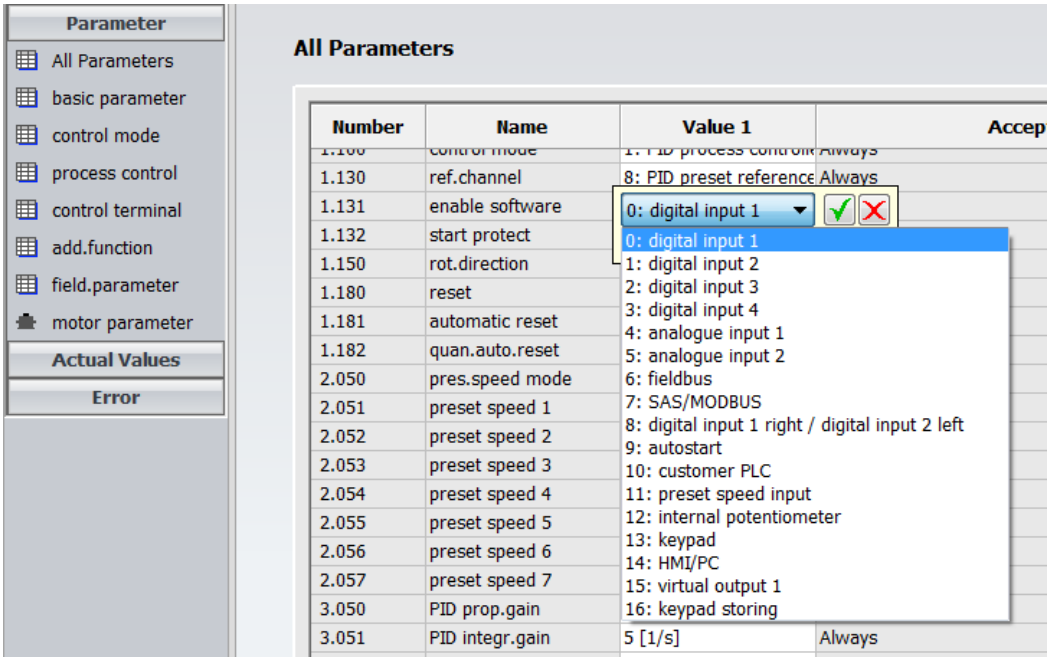

Figure 5-7: Software release signal: digital input 1

That the motor is allowed to start, besides the hardware release signal, a software release signal (1.131) is needed. The software release signal can be wired with the control terminal or set in the software. If a software release signal is desired to be triggered in the software, it can be set to digital input 1 in the simplest case. See chapter 7 for further information.

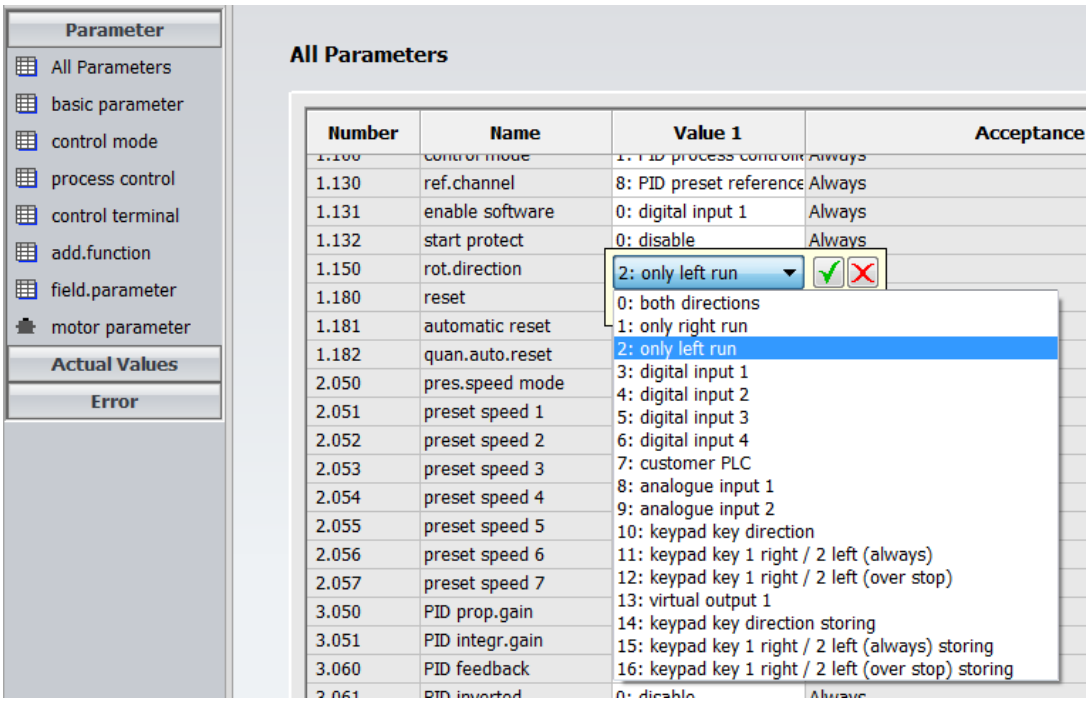

Figure 5-8: Rotation direction

With the parameter “rot.direction (1.150)” the desired motor rotation direction can be set.

5.1 Operation mode “preset speed”

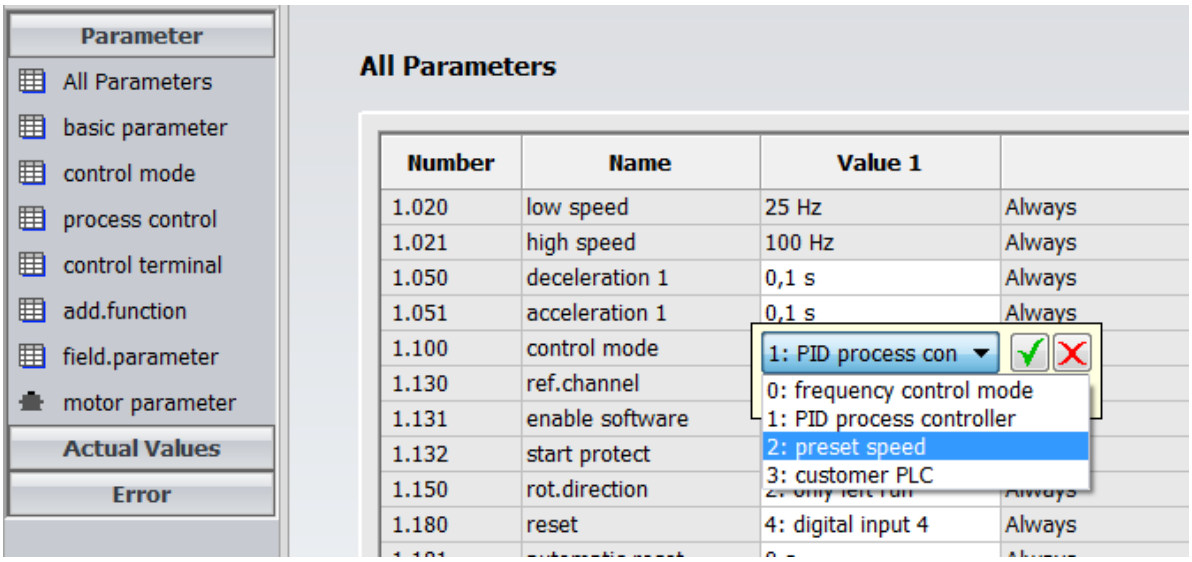

Figure 5-9: Operation mode “preset speed”

If the motor should run with a fixed frequency, the parameter “Control mode (1.100)” has to be set to “preset speed”.

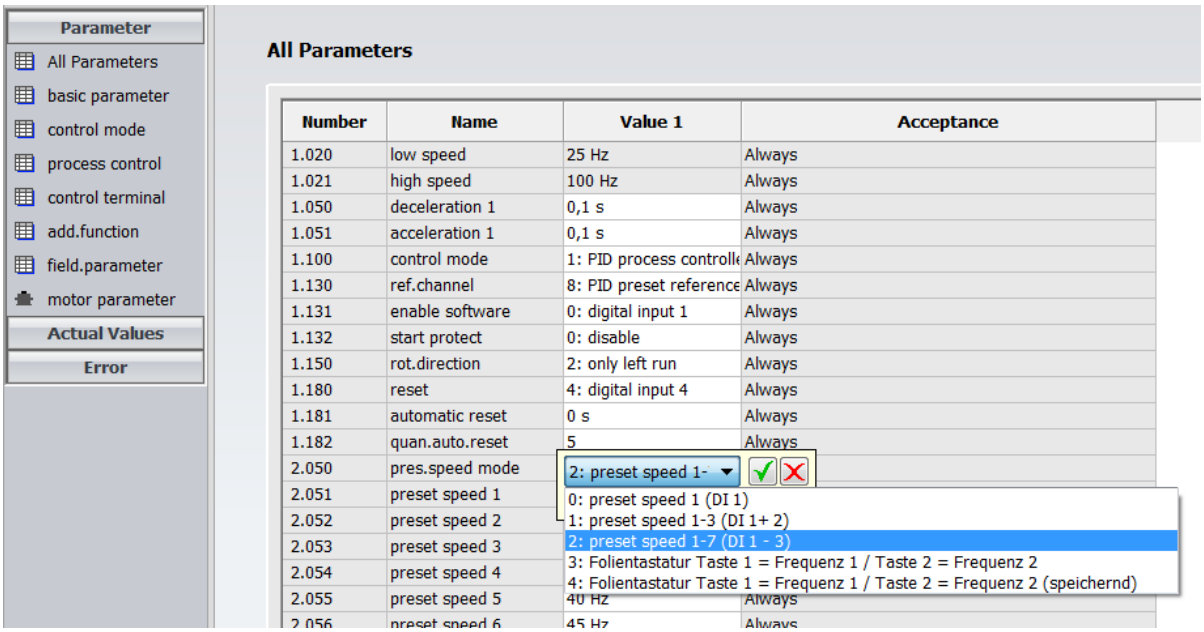

Figure 5-10: Preset speed mode

If “preset speed 1” is chosen under “pres. speed mode (2.050)” the value of “preset speed 1 (2.051)” will be used. Enter the desired value here, e.g. 10 Hz.

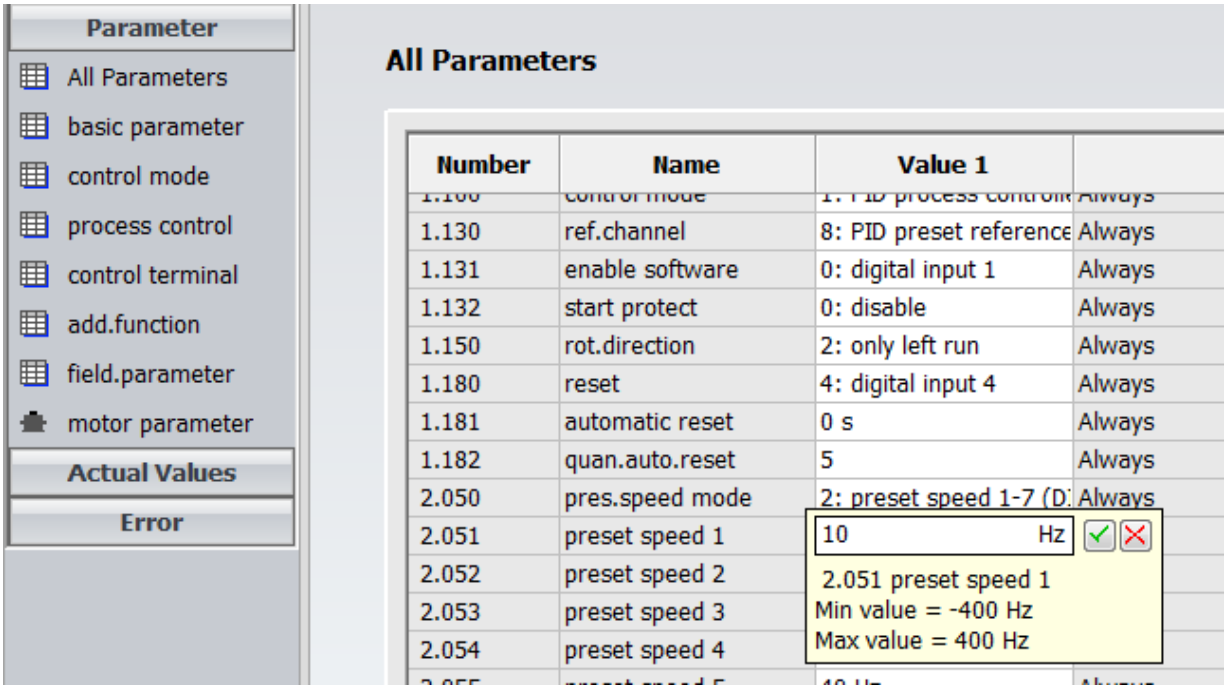

Figure 5-11: value of “preset speed 1”

For enabling the motor, see Chapter 7: Software release signal.

5.2 Internal potentiometer as set point value

If the motor should be controlled with the internal potentiometer, the following parameters have to be set.

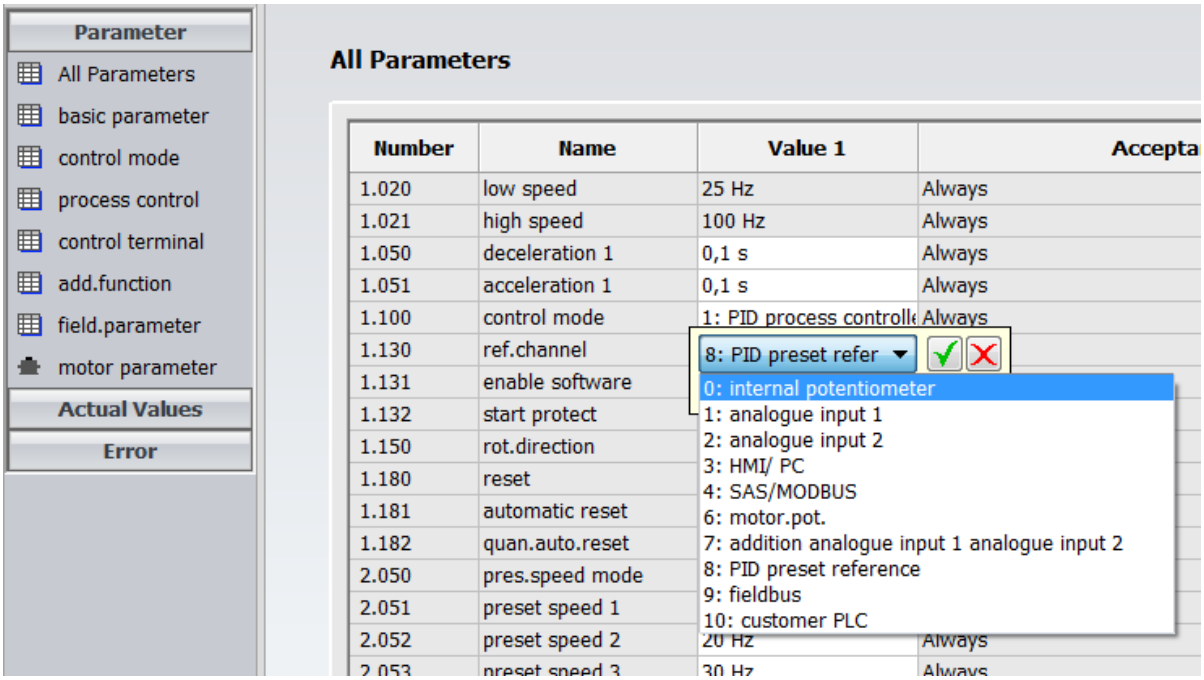

Figure 5-12: Control mode “internal potentiometer”

The parameter “ref.channel (1.130)” needs to be set to “internal potentiometer”.

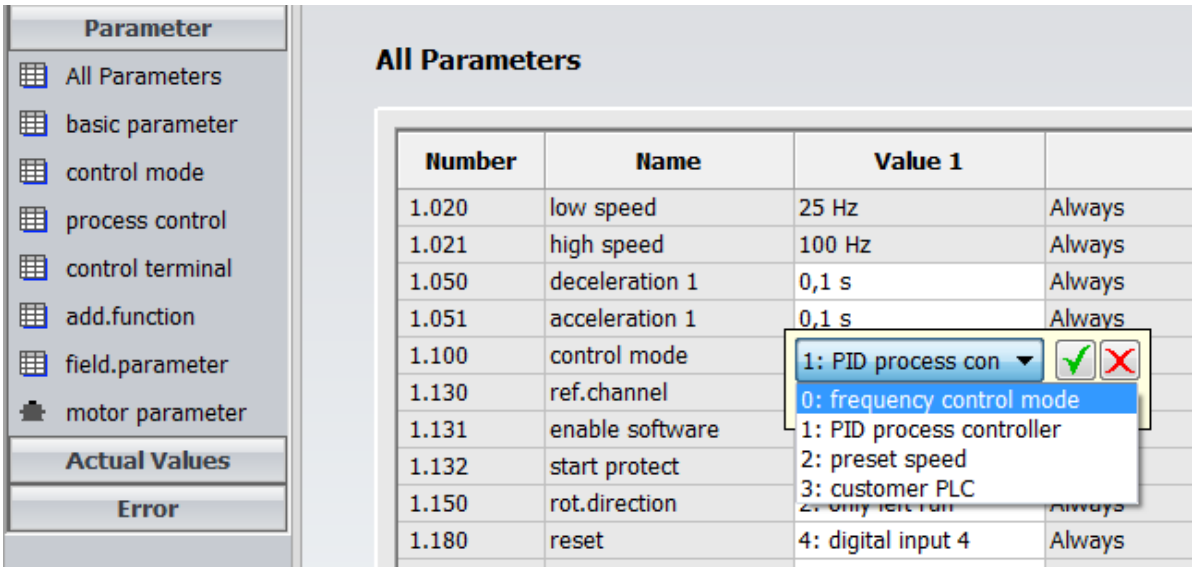

Figure 5-13: Operation mode “frequency control mode”

Furthermore the parameter “control mode (1.100)” has to be set to “frequency control mode”. After setting the software release signal the set point frequency can be changed with the internal potentiometer.

For enabling the motor, see Chapter 7: Software release signal.

5.3 External analog signal as set point value

If the motor speed should be controlled with an external analog signal, the external source has to be wired with the control terminal.

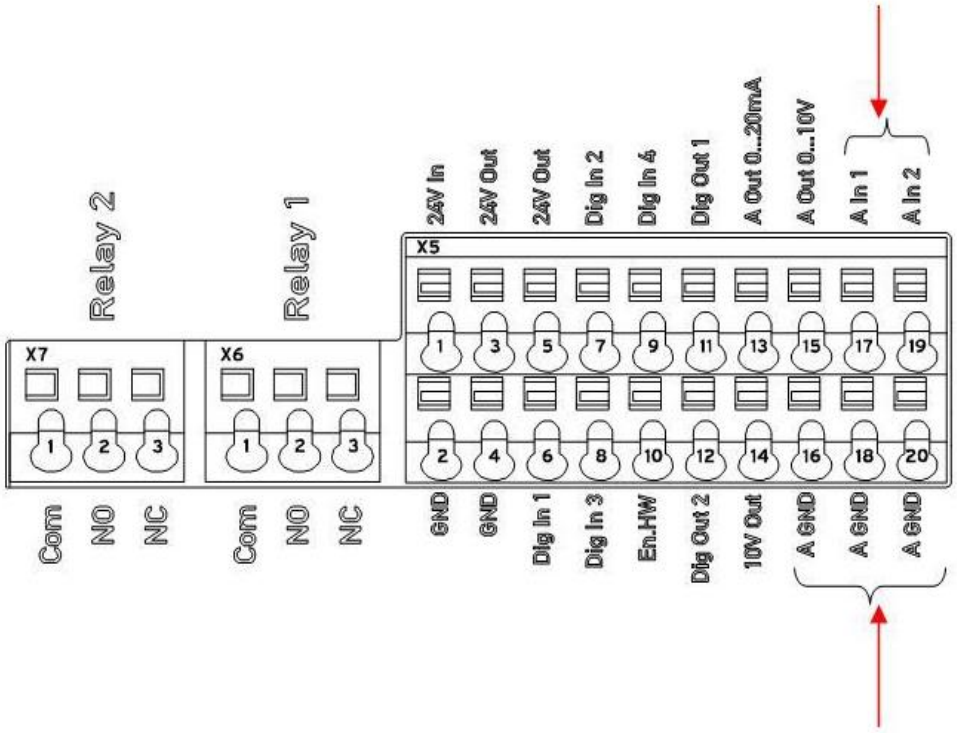

Figure 5-14: control terminal for external analog speed control

“A In1” has to be connected with the positive pole and “A GND” with the ground pole of the external voltage source.

The following software parameters have to be set to control the rotation speed with an external voltage signal.

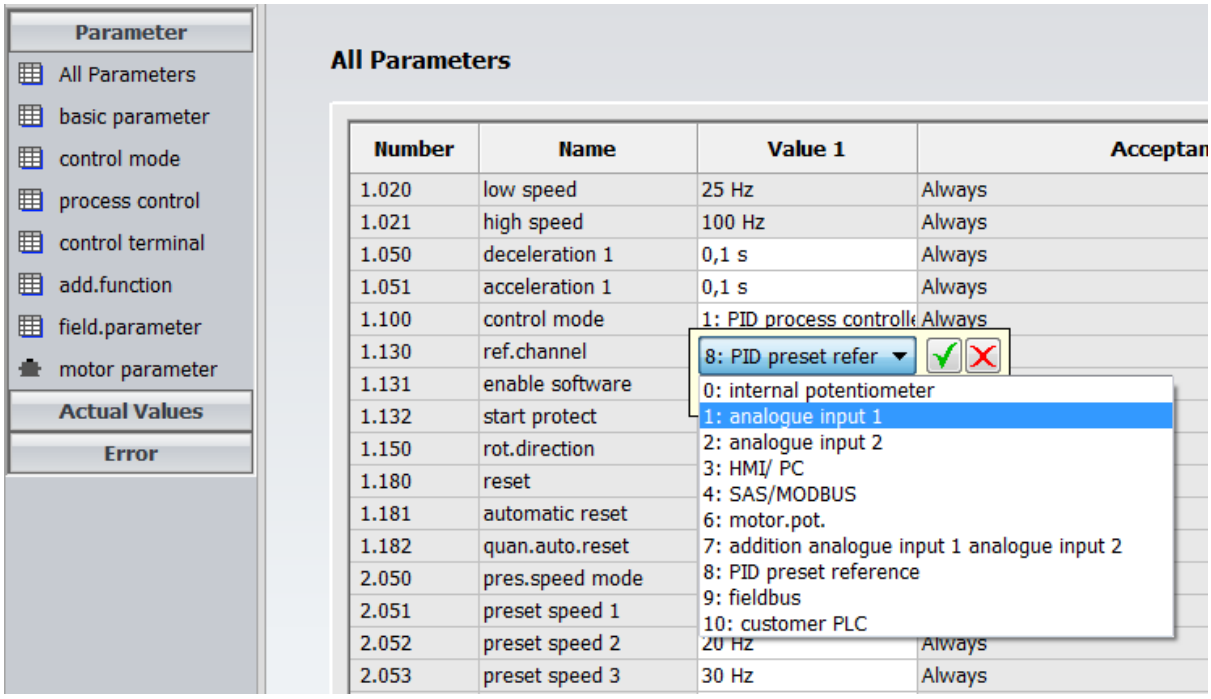

Figure 5-15: Reference channel “analogue input 1”

The parameter “ref.channel (1.130)” has either to be set to “analogue input 1” or to “analogue input 2”.

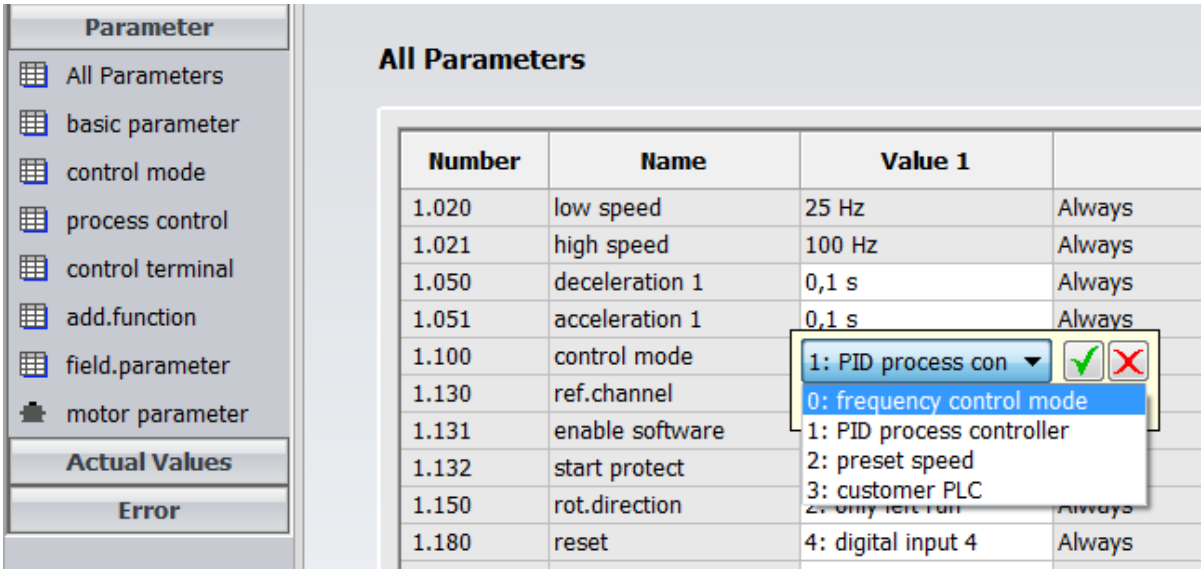

Figure 5-16: control mode: frequency control mode

The value “control mode (1.100)” has to be set to “frequency control mode”. After setting the software release signal, the set point frequency can be dictated by the external signal.

For enabling the motor, see Chapter 7: Software release signal.

6 PID controller

6.1 Set point generator

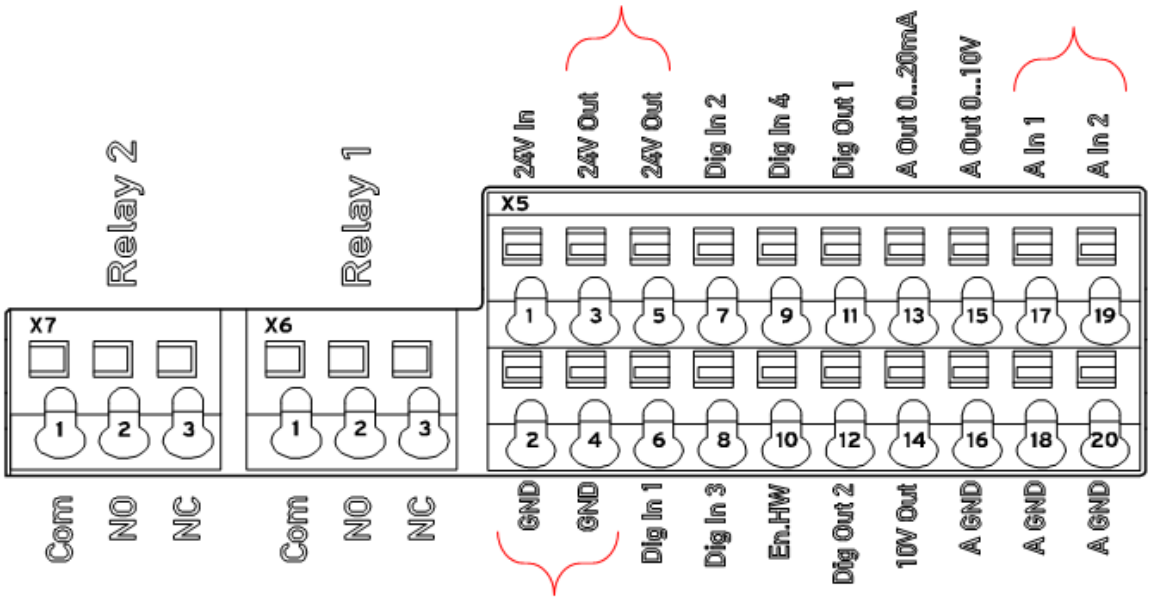

Figure 6-1: control port for pressure regulator

The supply voltage of the pressure sensor needs to be connected with “24V Out”, 0V with “GND” and the signal line (voltage signal) with „A In 1“ or „A In 2“, depending on the reference channel setting in Figure 4-15.

6.2 Set point control

To activate the PID process controller the following parameters have to be set.

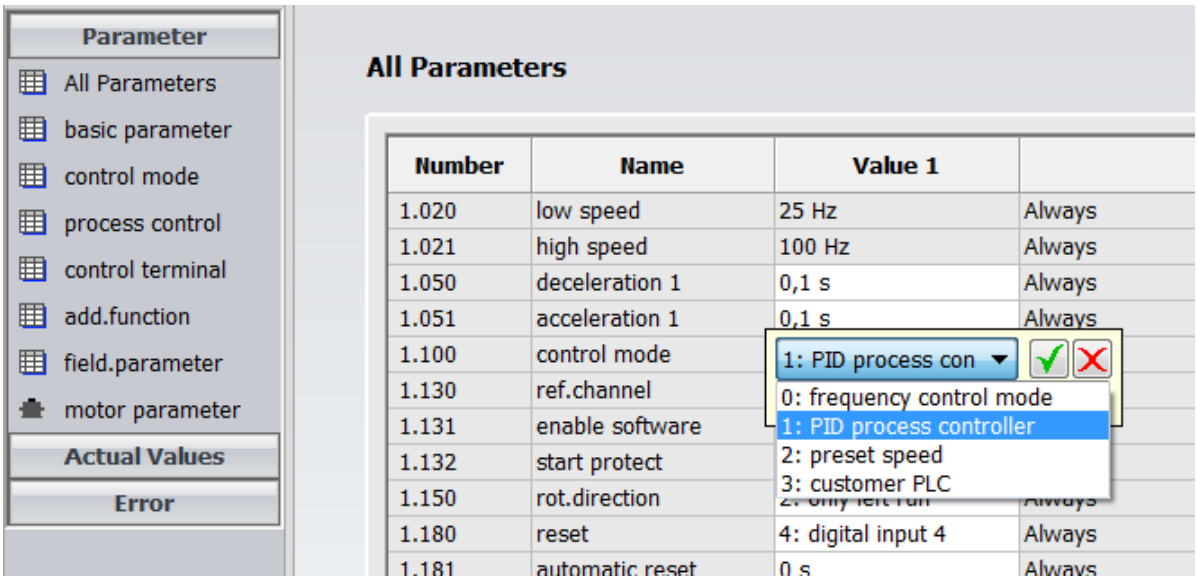

Figure 6-2: PID process controller

The parameter “control mode (1.100)” has to be set to “PID process controller”.

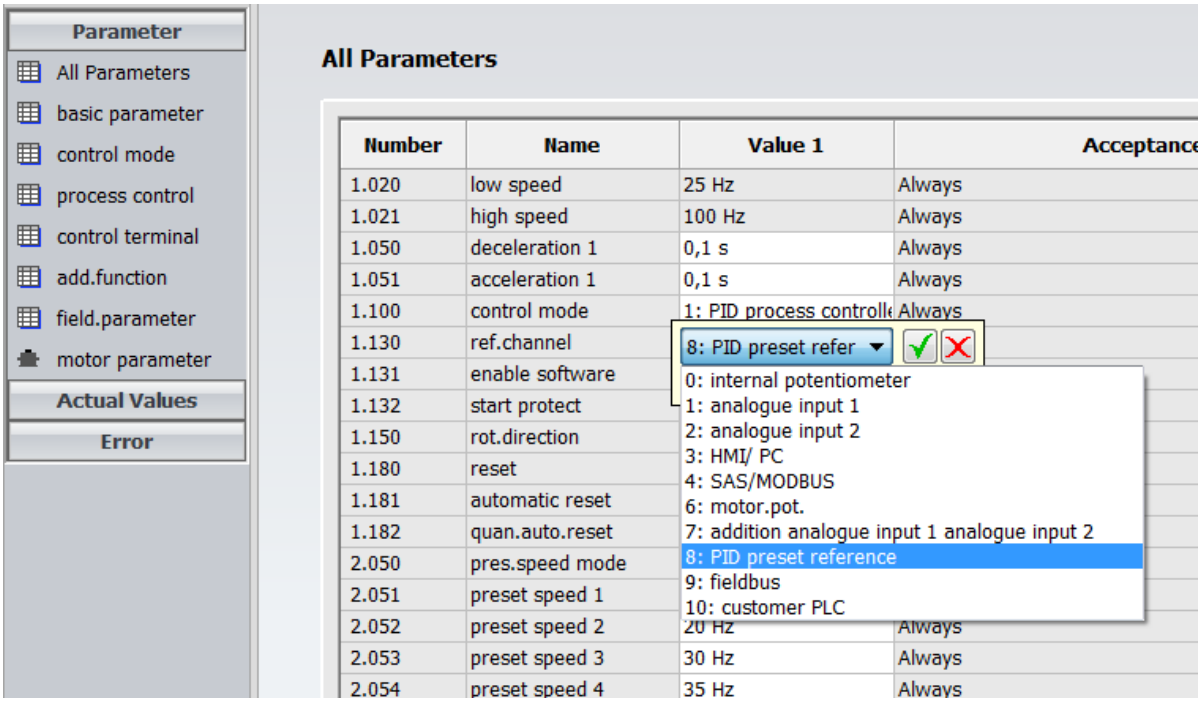

Figure 6-3: PID preset reference

For set point control the parameter “ref.channel (1.130)” has to be set to “PID preset reference”.

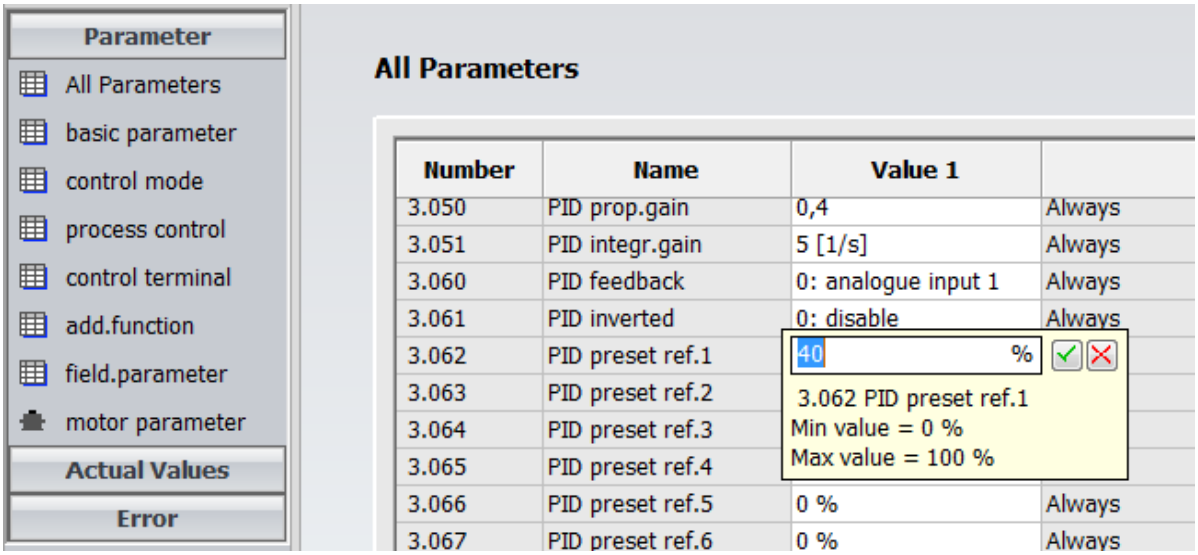

Figure 6-4: PID preset reference

The desired set point value can be defined at the parameter "PID preset ref.1 (3.062)". This value represents the percentage of the maximal pressure sensor output voltage.

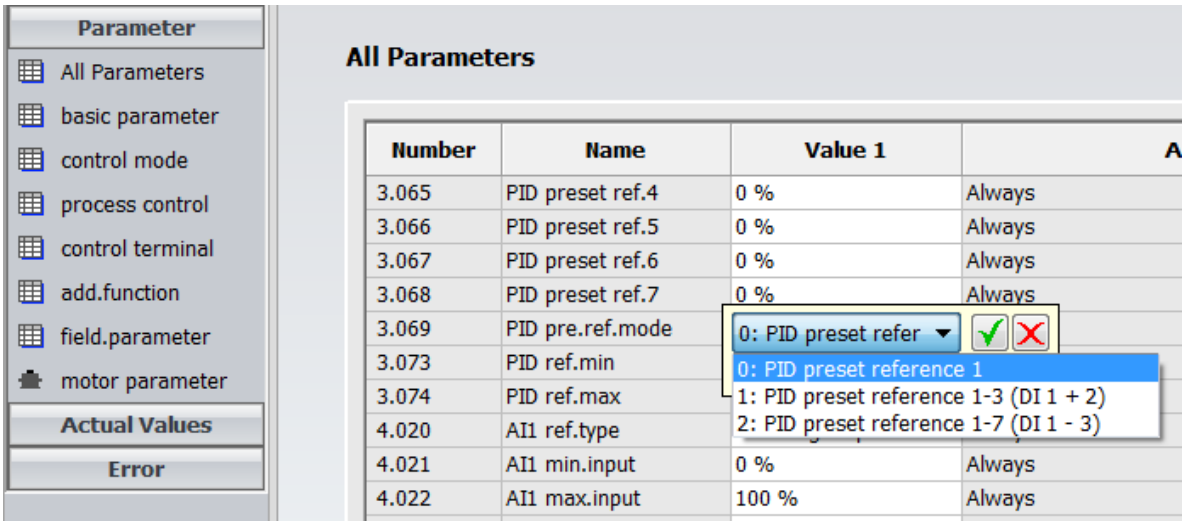

Figure 6-5: PID preset reference mode

That the motor can be controlled with preset reference 1, the parameter "PID pre.ref.mode (3.069)" has to be set to "PID preset reference 1".

6.3 Pressure control with analog set point setting

For the analog set point setting the analog signal has to be connected to “An1” or “An2” and the following settings have to be done.

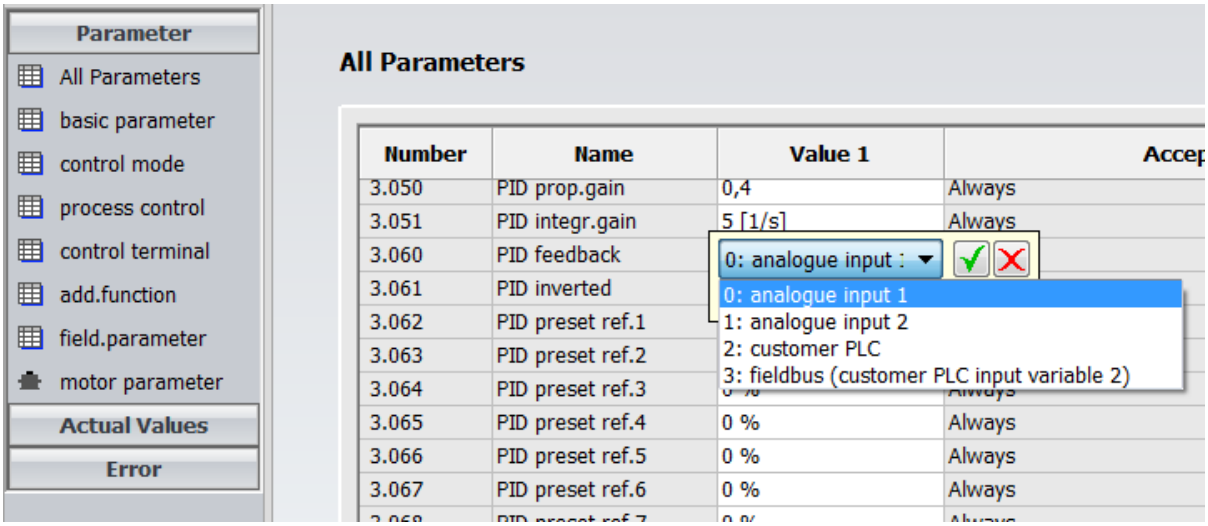

Figure 6-6: PID feedback

The parameter “PID feedback (3.060)” has, depending on the connected port, to be set to “analogue input 1” or “analogue input 2”.

6.4 PID controller settings

For each system the control parameters “proportional gain” and “integral gain” have to be adapted. The “derivational gain” is rarely required.

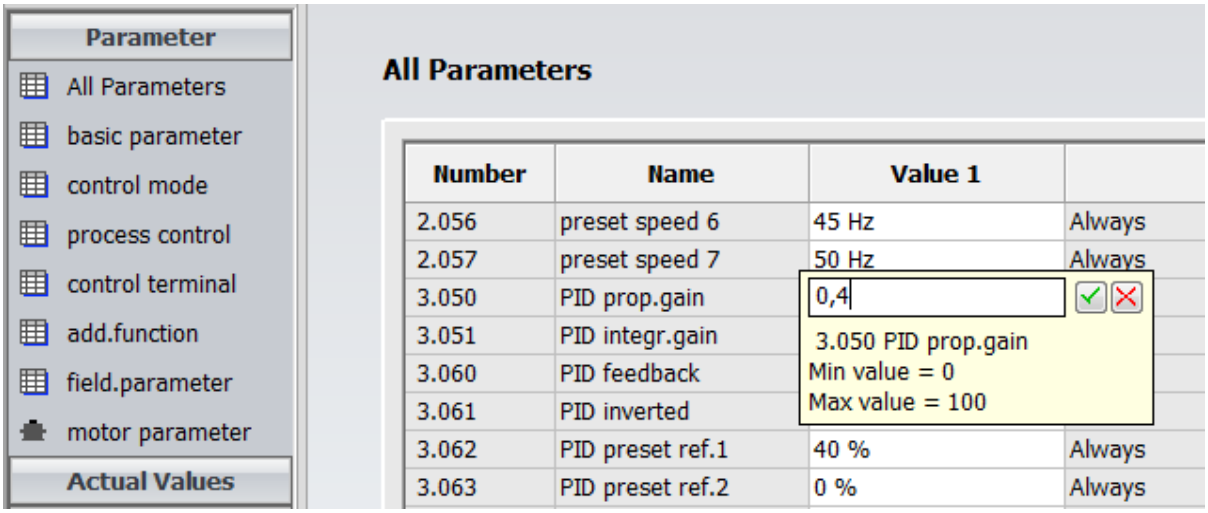

Figure 6-7: PID-P gain

Set the desired value for the proportional gain at “PID prop.gain (3.050)”.

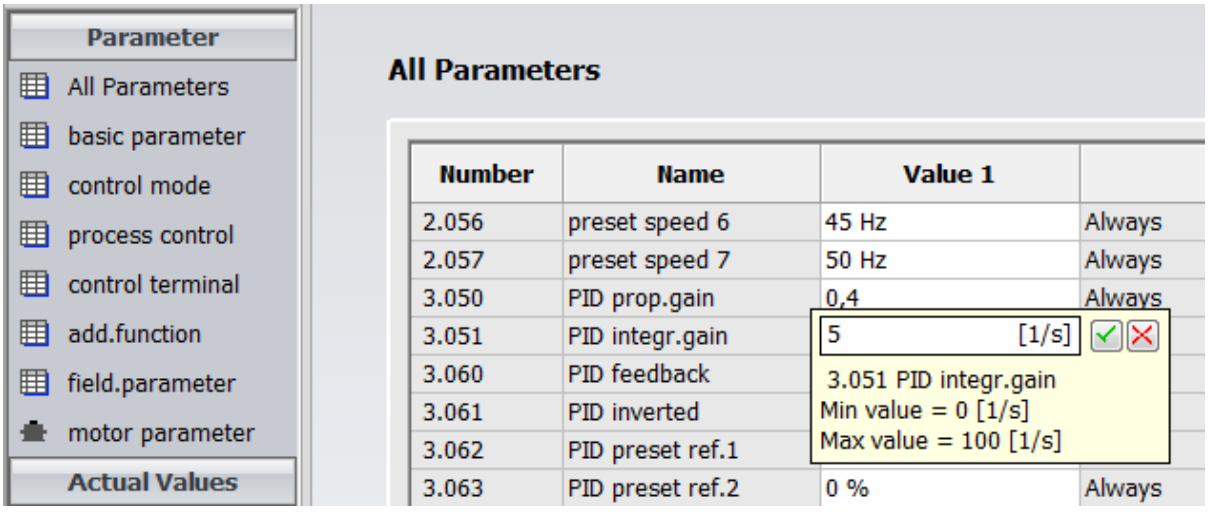

Figure 6-8: PID-I gain

Set the desired value for the integral gain at “PID integr.gain (3.051)”.

To find the correct parameters the following approach can be used:

Gradually increase the proportional gain until the system starts swinging. Thereafter slightly decrease the P-Gain and adjust the system dynamics with the I-Gain.

7 Software release signal

There are two possibilities to set the software release signal:

- In the software HMM Start-Up
- By external wiring

Setting the software release signal in the software HMM Start-Up

In the Control tab the digital input 1 can be set to TRUE, that “software release signal” is triggered and the motor can start running.

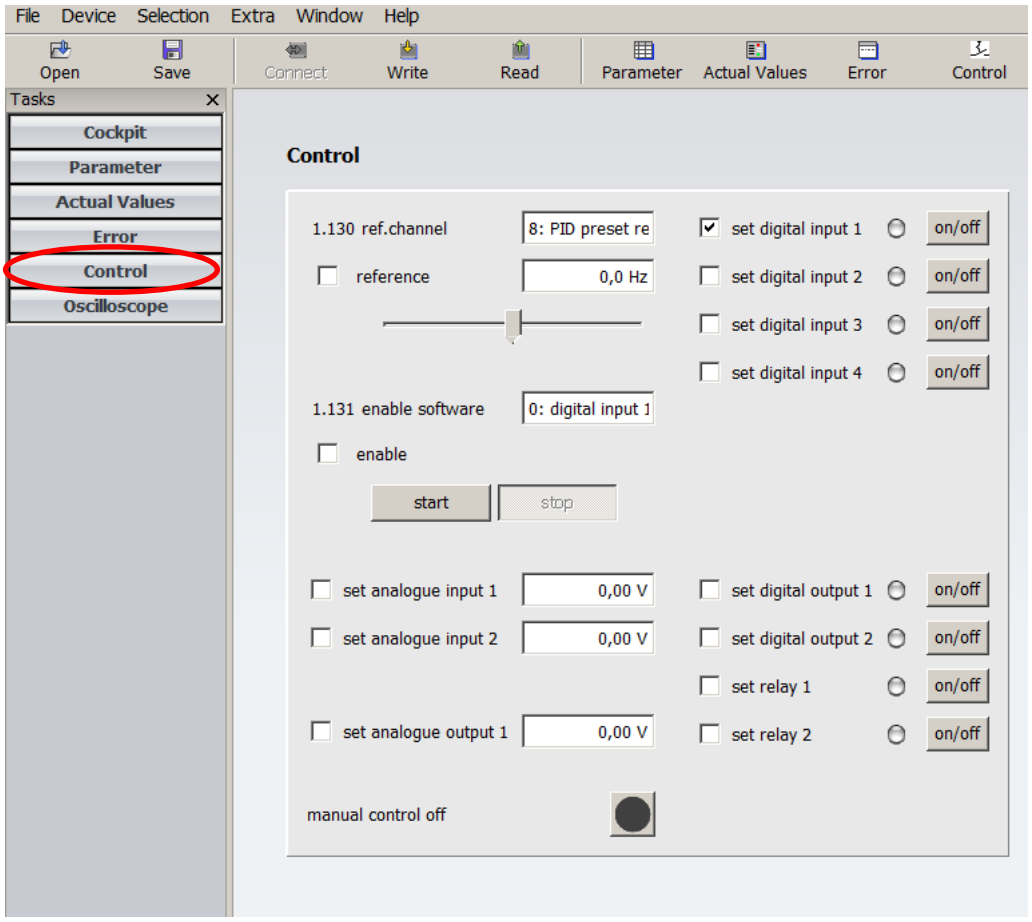

Figure 7-1: Control tab

Once digital input 1 is set to TRUE (see Figure 7-2), the motor starts running.

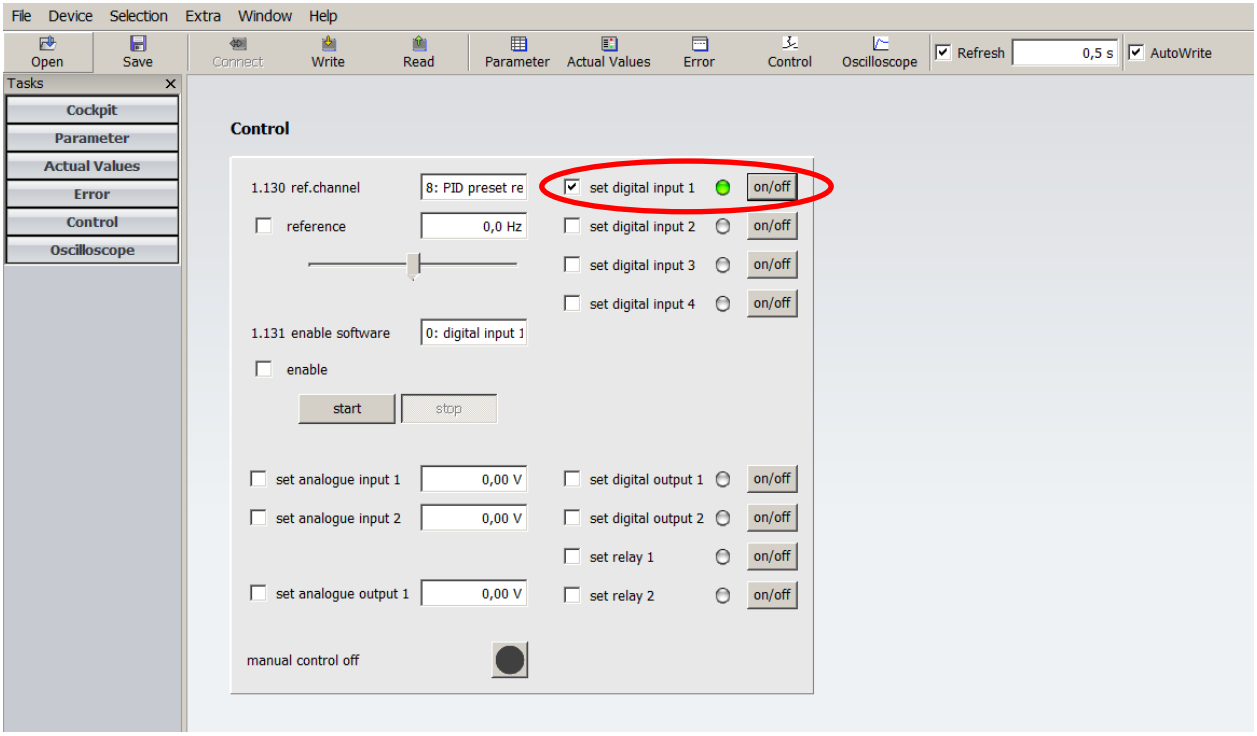

Figure 7-2: Active digital input 1

Setting the software release signal by external wiring

See Table 3-3 and chapter 5 for basic commissioning.

8 Saving up and restoring the parameterization

8.1 Save

If the parameterization should be backed up, click on the “File”-tab on the “Save as” entry and save the data in a desired location.

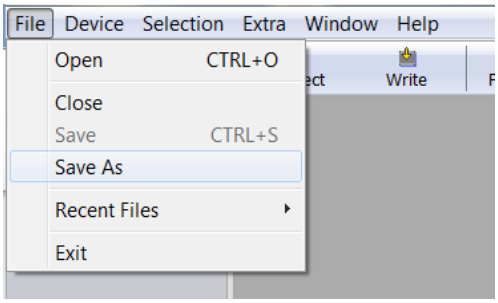

Figure 8-1: Save

8.2 Restore

If a parameterization should be loaded, click on the “Open” button and chose the desired File.

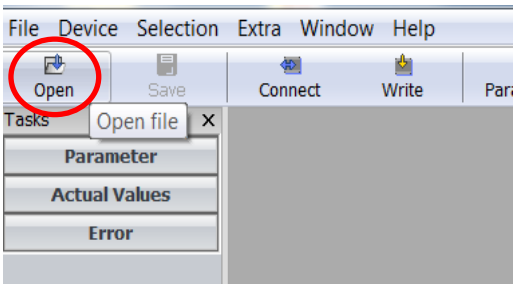

Figure 8-2: Restore

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