Rapid Link 5

RASP5

PROFINET Communication

Level 3	1 – Fundamental – No previous experience necessary 2 – Basic – Basic knowledge recommended 3 – Advanced – Reasonable knowledge required 4 – Expert – Good experience recommended

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Original Application Note is the English version of this document.

All non-English language versions of this document are translations of the original application note.

1. Edition 2020, publication date 08/2020

2. Edition 2020, publication date 08/2020 – Changes in NETSendPDZ 5

Content

Danger! - Dangerous electrical voltage!

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Cover or enclose any adjacent live components.
- Follow the engineering instructions (AWA/IL) for the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE, PES) must be connected to the protective earth (PE) or the potential equalization. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automatic control functions.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that an open circuit on the signal side does not result in undefined states.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specification, otherwise this may cause malfunction and/or dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes. Unlatching of the emergency-stop devices must not cause a restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been properly installed and with the housing closed.
- Wherever faults may cause injury or material damage, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (e.g. by means of separate limit switches, mechanical interlocks etc.).
- Frequency inverters may have hot surfaces during and immediately after operation.
- Removal of the required covers, improper installation or incorrect operation of motor or frequency inverter may destroy the device and may lead to serious injury or damage.
- The applicable national safety regulations and accident prevention recommendations must be applied to all work carried on live frequency inverters.
- The electrical installation must be carried out in accordance with the relevant electrical regulations (e. g. with regard to cable cross sections, fuses, PE).
- Transport, installation, commissioning and maintenance work must be carried out only by qualified personnel (IEC 60364, HD 384 and national occupational safety regulations).
- Installations containing frequency inverters must be provided with additional monitoring and protective devices in accordance with the applicable safety regulations. Modifications to the frequency inverters using the operating software are permitted.
- All covers and doors must be kept closed during operation.
- To reduce the hazards for people or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the frequency inverter (increased motor speed or sudden standstill of motor). These measures include: – Other independent devices for monitoring safety related variables (speed, travel, end positions etc.).
  – Electrical or non-electrical system-wide measures (electrical or mechanical interlocks).
  – Never touch live parts or cable connections of the frequency inverter after it has been disconnected from the power supply. Due to the charge in the capacitors, these parts may still be alive after disconnection. Consider appropriate warning signs.

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Figures Content

1 General

This documentation describes how to set up communication between a PROFINET- capable PLC and the RASP5. Access to process and parameter data of RASP5 is the main part of this Appnote.

It is aimed at experienced drive specialists and automation technicians. A thorough knowledge of the PROFINET fieldbus and the programming of a PROFINET master is required. Knowledge of handling the RASP5 drive is also required.

Please read this Appnote carefully before installing and operating the PROFINET connection.

We assume that you have a good knowledge of engineering fundamentals, and that you are familiar with handling electrical systems and machines, as well as with reading technical drawings.

Please follow the notes in the IL034093ZU instruction leaflet. Refer to Rapid Link 5 manual MN034004DE for the specific information.

2 System Overview

The following figure shows the RASP 5 in a PROFINET communication network.

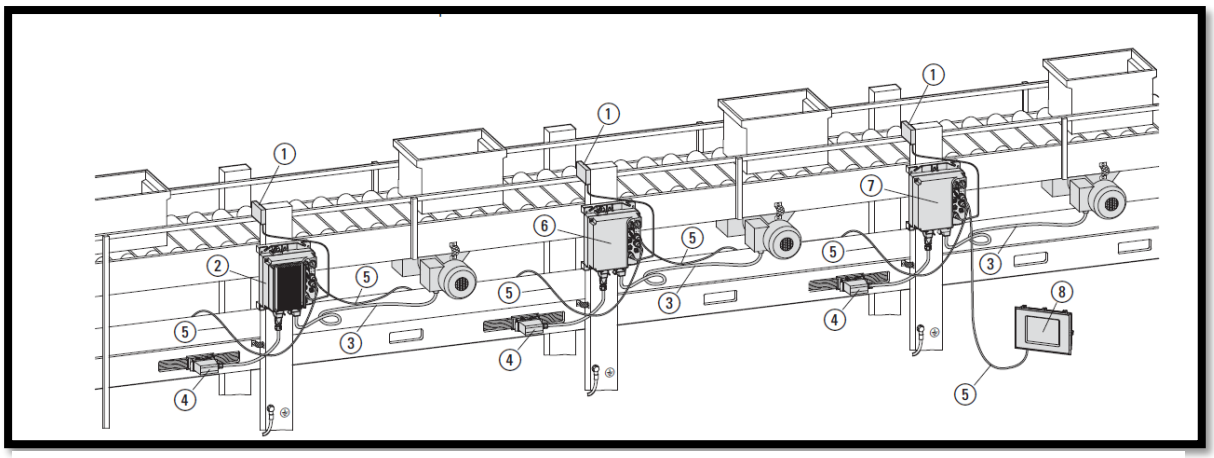


Figure 1: Integration of Rapid Link 5 in a PROINET network

① Sensors

② RASP5

③ Motor cable

④ Energy cable

⑤ Network cable

⑥ RAMO5-W…

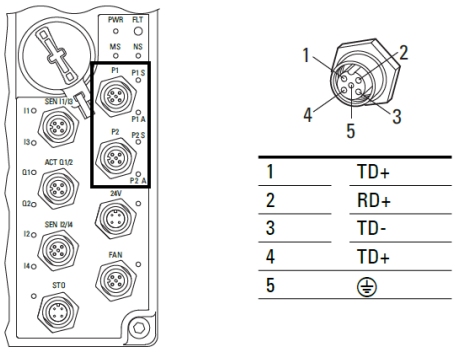
⑦ RAMO5-D…

⑧ Configuration PC with engineering tool

3 Connecting RASP 5 into PROFINET network

The following instructions explain how to connect the RASP5 to a PROFINET network.

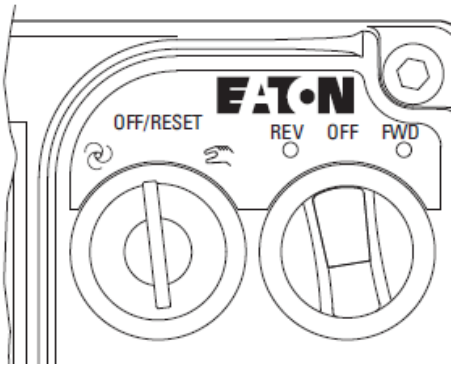
1. Connect the Ethernet cable to RASP5 by using M12 connectors. The other end to the PROFINET network where PLC is present or switch. Figure 2 below shows the PROFINET port of RASP5.



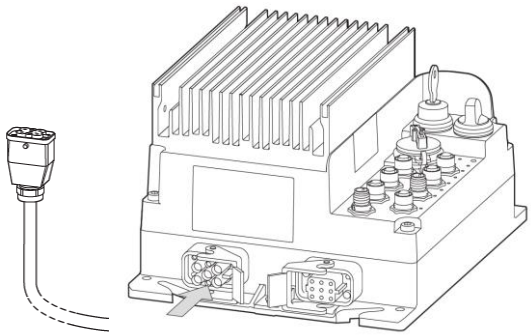
1	TD+
2	RD+
3	TD-
4	TD+
5	⏚

Figure 2: PROFINET port of RASP5

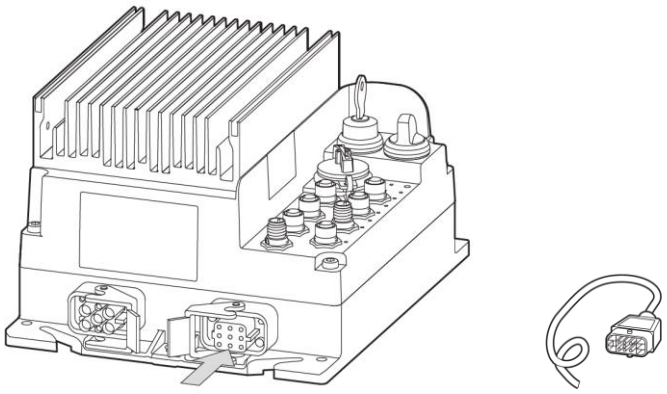
2. Turn key and selector switch (FWD/REV) to '0' position and OFF/Reset to the middle position. This is necessary for unattended operation of the motor!



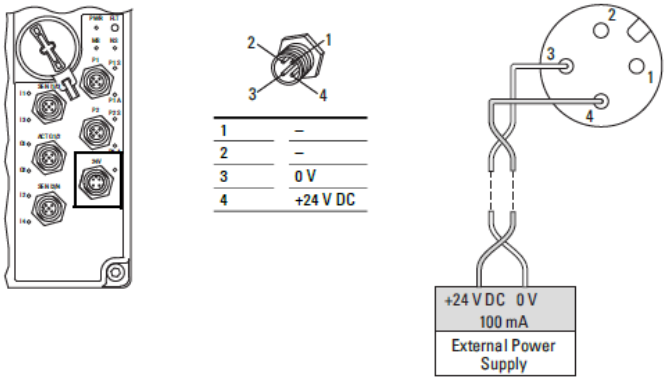
3. Connect mains plug e.g. HAN Q4/2 to RASP5. Apply 400 V AC to the device (mains). Arrow below shows the position.



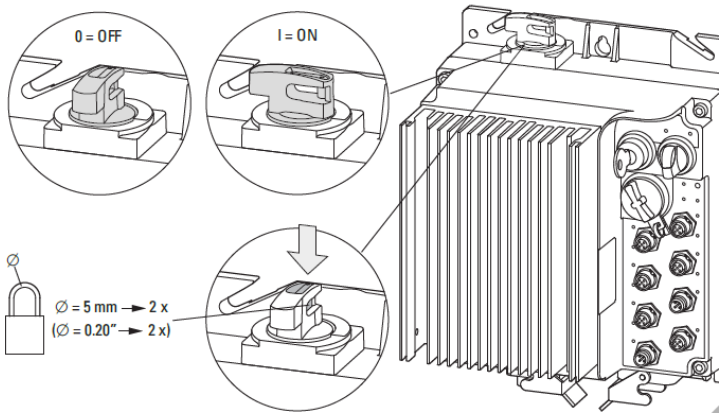
4. Connect motor plug to the RASP5. Arrow below shows the position of motor connector.



5. If only test connection to the PLC required, then 24 V DC can be applied to the M12 connector of RASP5.



6. Turn repair switch to ON position (only for RASP5-...-xxxR...).



7. Set the IP address of RASP by using IP Config tool form HMS. See chapter 4.
8. Ready for the programming!

	**Notice!** Before power on it must be ensured that the motor and the motor cable is properly connected.

4 Configuration of the IP address

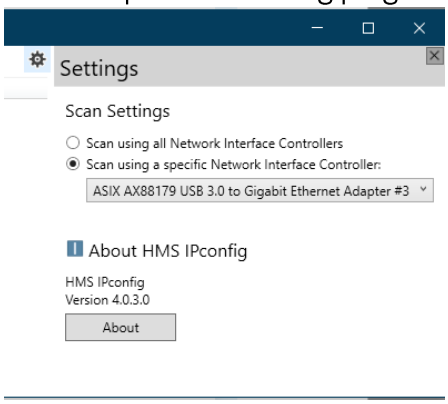
The following instructions describe how to configure the IP address of the Rapid Link 5 module. The address is configured using the IPconfig tool. This program can be downloaded on the internet at:

www.anybus.com/support → **Support**

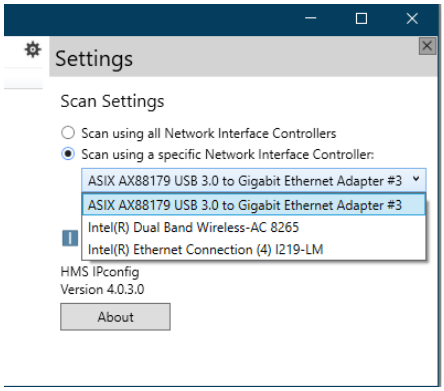
Select **Support Tools** from the drop-down menu.

Proceeded as follows:

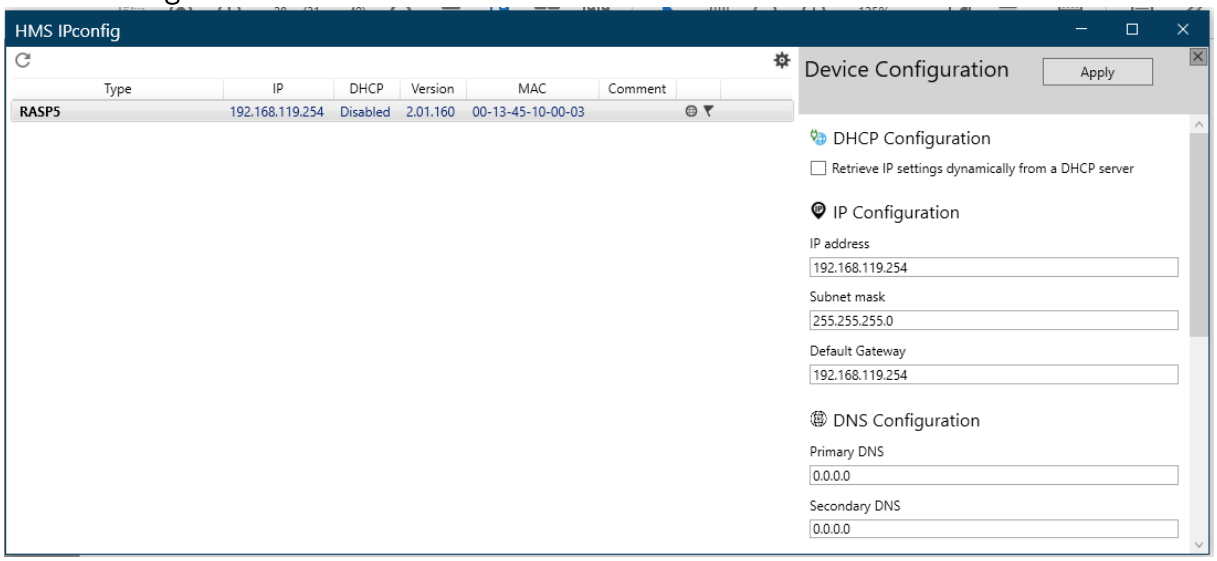
- Connect RASP5 device to the computer.
- Switch on RASP5.
- Open the IPconfig program and click on settings.



- Select the computer network adapter from the network interface controller drop-down menu.



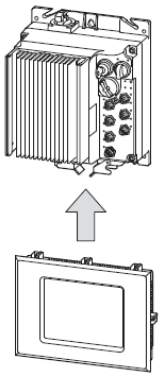
- The program will show all available modules. Select RASP5 and set required address on the right-hand side.



- Addressing is done!

5 Access to process and parameter data

5.1 Input process data (NETReceivePDZ)



4 input process data are available (NETreceivePDZ x; x = 1, 2, 3, 4)

1. Control word - NETReceivePDZ 1
2. Target frequency - NETReceivePDZ 2
3. User Ramp - NETReceivePDZ 3 (P5-07)
4. Reserved - NETReceivePDZ 4 (P5-08)

The following section will describe each data in detail.

NETReceivePDZ 1 - Control word

Below table shows the control word structure - NETReceivePDZ 1.

Bit Number	Function
Bit 0	DriveControlCommand
BIT 1	DriveControlCommand_DirectionRev
BIT 2	FaultReset
BIT 3	CoastToStop
BIT 4	Not Used
BIT 5	QuickStop
BIT 6	FixedFreqFF1
BIT 7	OverwriteSetPointToZero
Bit 8	Actuator 1
Bit 9	Actuator 2
Bit 10	Reserved
Bit 11	Reserved
Bit 12	Reserved
Bit 13	Reserved
Bit 14	Reserved
Bit 15	Reserved

NETReceivePDZ 2 - Set point

The permissible values are in the range from P1-02 (minimum frequency) to P1-01 (maximum frequency). In the application, the value is scaled with the factor 0.1. Example: 500 ≙ 50 Hz

NETReceivePDZ 3 - User ramp time

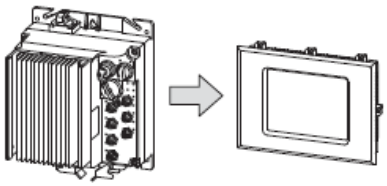
The permissible values range from 0 to 3000 seconds. The values are set with parameter P5-07. The function is enabled via parameter P5-04. In the application, the value is scaled with the factor 0.01. Example: 500 ≙ 5.00 s

NETReceivePDZ 4

NETReceivePDZ 4 has no function.

5.2 Output process data

There are 6 output process data (NETSendePDZ x; x = 1, 2, 3, 4, 5, 6) available:



1. Status word - NETSendPDZ 1
2. Current frequency - NETSendPDZ 2
3. Motor current (default), - NETSendPDZ 3
   More options are selectable by P5 – 05
4. Power Stage temperature (default), - NETSendPDZ 4
   More options are selectable by P5 – 06
5. Power - NETSendPDZ 5
6. Actual error message - NETSendPDZ 6

The following section will describe each data in detail.

NETSendPDZ 1 – Statusword

Below table shows the status word structure - NETSendPDZ 1.

Bit Number	Function
Bit 0	Ready
BIT 1	Running
BIT 2	DirectionRev
BIT 3	Fault
BIT 4	AtSetSpeed
BIT 5	AtZeroSpeed
BIT 6	SpeedControlActive
Bit 7	STO Status
Bit 8	Sensor 1
Bit 9	Sensor 2
Bit 10	Sensor 3
Bit 11	Sensor 4
Bit 12	Sensor 5 (X7 DI5 - Fast Stop Input)
Bit 13	Mains Voltage present
Bit 14	24V DC present
Bit 15	Reserved

NETSendPDZ 2 - Current frequency (actual value)

NETSendPDZ 2 provides the current output frequency.
In the application the value is scaled with the factor 0.1.
Example: 500 ≙ 50 Hz

NETSendPDZ 3

NETSendPDZ 3 supplies the current motor current in the default setting.
NETSendPDZ 3 can be selected via parameter P5-05.
The following values can be sent to the PLC via NETSendPDZ 3:

P5-05 =

0: Motor current in Amps with one decimal place, e.g. 100 ≙ 10.0 A

1: Output power in kW with 2 decimal places, e.g. 400 ≙ 4.00 kW

2: Status of the sensor inputs (SEN Ix; x = 1, 2, 3, 4)

3: Internal temperature, -500 - 1500 ≙ -50.0 - 150.0 °C

NETSendPDZ 4

RASP5 NETSendPDZ 4 provides internal temperature in the default setting.
NETSendPDZ 4 can be selected via parameter P5-06.
The following values can be sent to the PLC via NETSendPDZ 4:

P5-06 =

0: Motor current in Amps with one decimal place, e.g. 100 ≙ 10.0 A

1: Output power in kW with 2 decimal places, e.g. 400 ≙ 4.00 kW

2: Status of the sensor inputs (SEN Ix; x = 1, 2, 3, 4)

3: Internal temperature, -500 - 1500 ≙ -50.0 - 150.0 °C

NETSendPDZ 5 – Outout power

NETSendePDZ 5 sends the output power to the master.
The value is given with two decimal place (example: 400 ≙ 4kW)

NETSendPDZ 6 - Error message

NETSendePDZ 6 provides the corresponding Error code.
You will find the error codes and the description in Chapter ***11Error Messages***

.

5.3 Acyclic (parameter) access

RASP5 supports acyclic communication through PROFINET. Base Mode Parameter Access can be used to read or modify parameters. The corresponding index number can be found in the chapter: **10. Parameter Table**

Access to drive parameters via PROFINET uses the Record Data Read or Write service of API. The table on chapter 10 chapter gives API number, Slot, Sub Slot, and Index for each parameter.

All parameter values can be read from the drive and written to, depending on the operating mode of the drive – some parameters cannot be changed whilst the drive is enabled for example.

6 Example program – RASP5 with TIA Portal

The following chapter shows how to configure a program in the TIA Portal. The hardware and software requirements are listed in detail. Very basic programming and configuration steps are not the part of this chapter. Refer to TIA Portal manual for the detailed information.

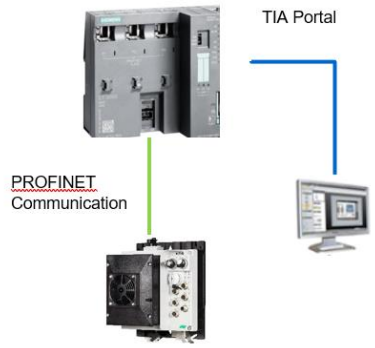
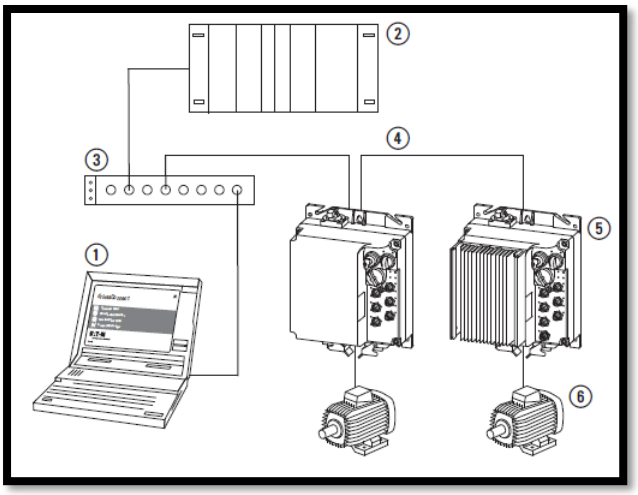


Figure 3: RASP5 with TIA portal

6.1 Material requirements for PLC Control

In order to setup a proper communication between master (PLC) and RASP5 (slave), it is assumed that certain hardware and software components are available. The corresponding components are listed below:



① Configuration PC with engineering tool

② PLC

③ Switch

④ PROFINET cable

⑤ RASP5

⑥ Motor

Figure 4: Material requirements for PLC Control

Used hardware and software

- PC with TIA-Portal V13-SP1
- Siemens CPU ET200s Profinet (PROFINET onboard)
- RASP5
- GSDML File
- Ethernet Cable (for e.g. CAT-5 Cable)
- Ethernet Switch
- Motor, cables for the mains and motor connection (Refer to MN or in this Appnote for the detailed cable requirements)

Note: Select remote/automatic mode

To enable fieldbus communication via PROFINET, selector switch must be changed automatic mode.

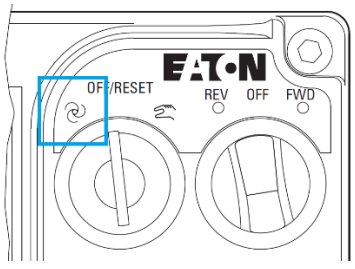


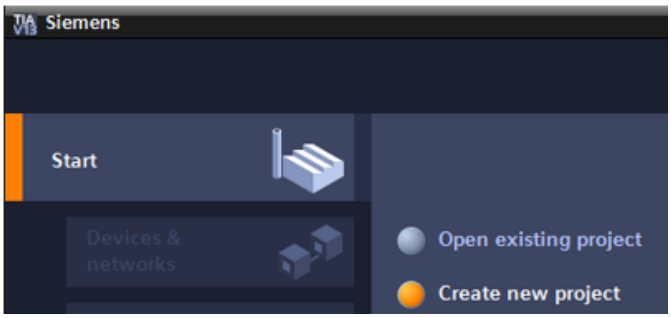
Figure 5: Automatic mode for communication

6.2 TIA Portal Configuration Setup

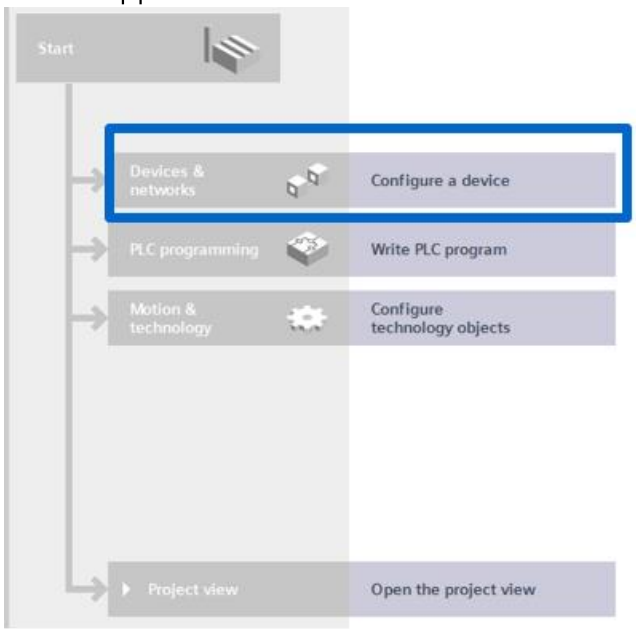
Following steps will describe how to create project for cyclic and acyclic communication.

6.2.1 Hardware configuration

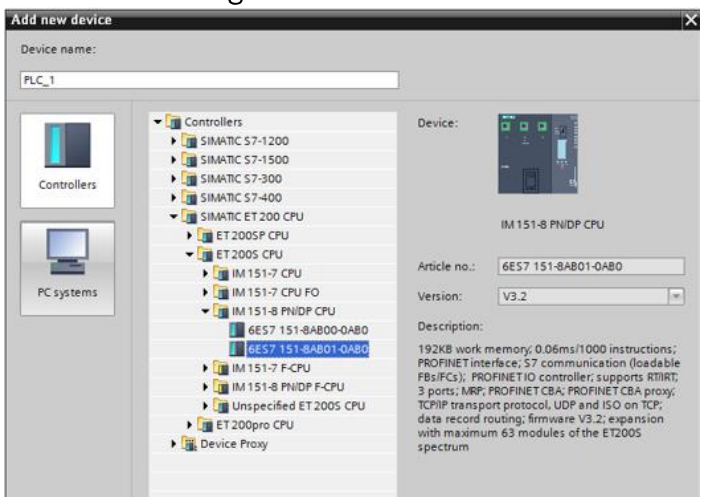
- Create a new project



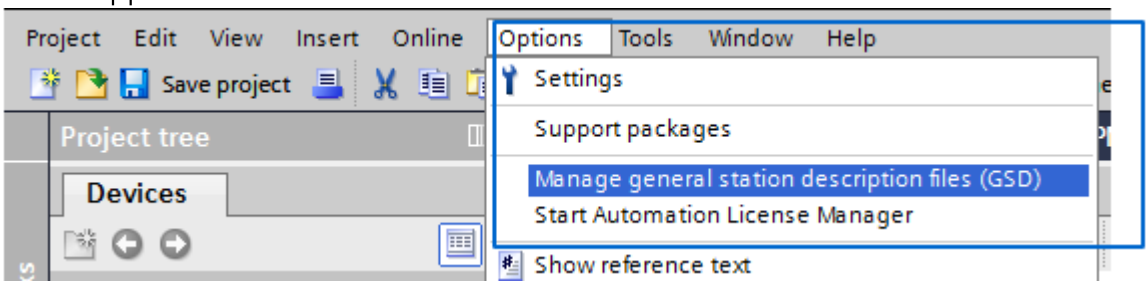
- Append a CPU



- Find the right CPU

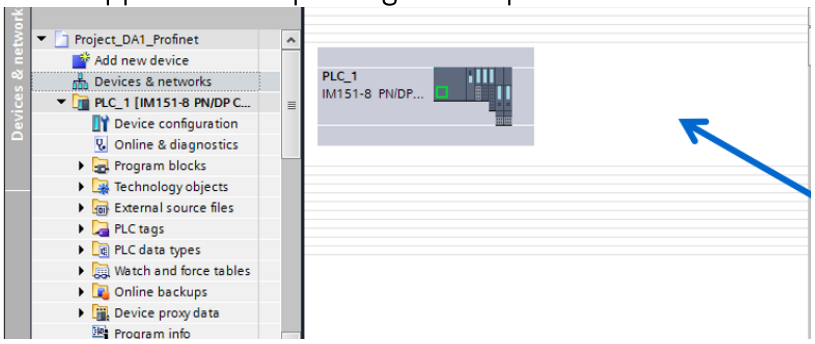


- Append RASP5



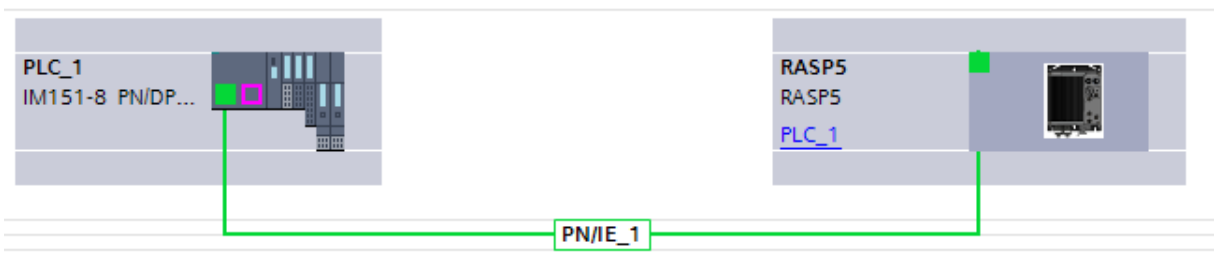
The file **GSDML-V2.34-EATON Rapid Link 5 RASP-RASP5-20200630** needs to be installed

- Append RASP5 per drag and Drop to the Network



Catalog → Other field devices → PROFINET IO → Drives → EATON Industries → RAPID LINK 5 → RASP5

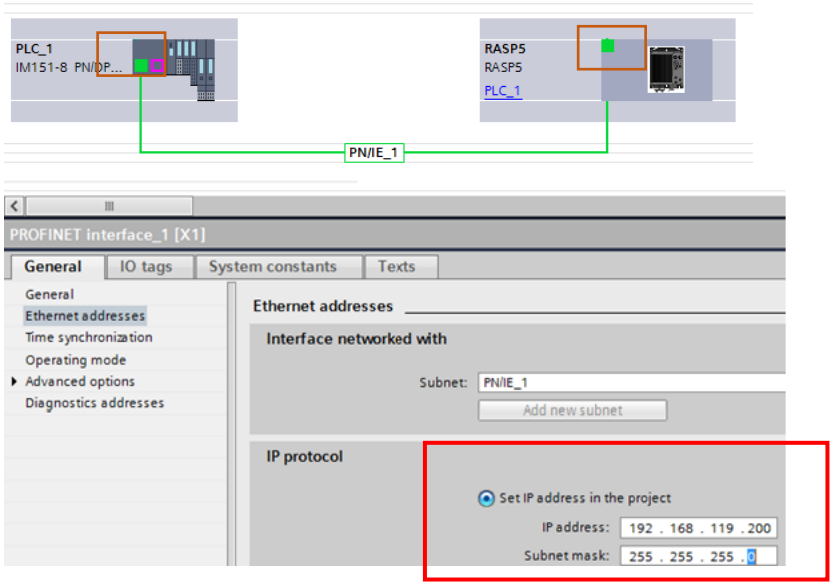
- Assign RASP5 to the Controller



- Set IP Addresses

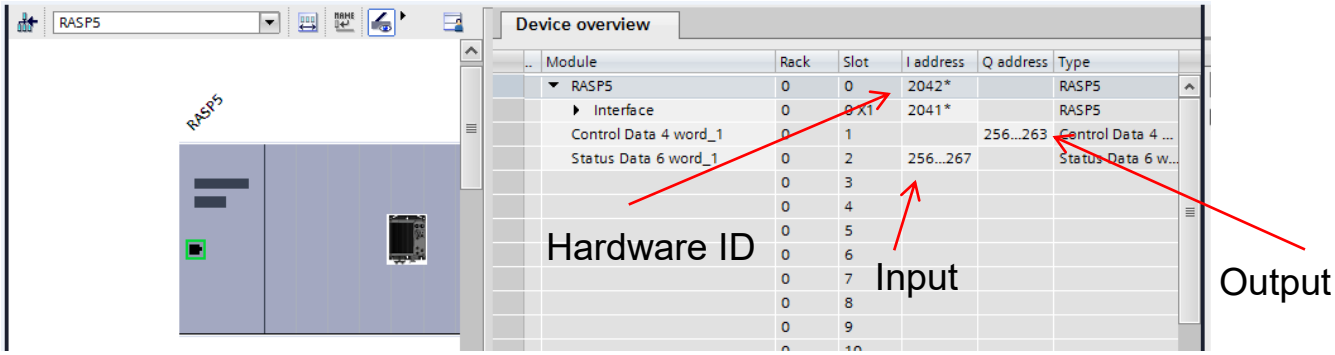
Select small green box on CPU and RASP

General → Ethernet Addresses → IP-Protocol



- Hardware and I/O Address Overview

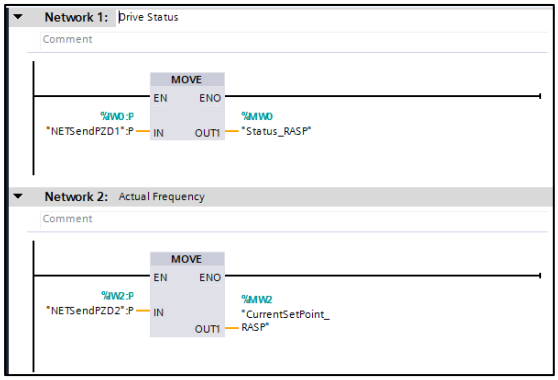
I/O Mapping for Programming is highlighted below:

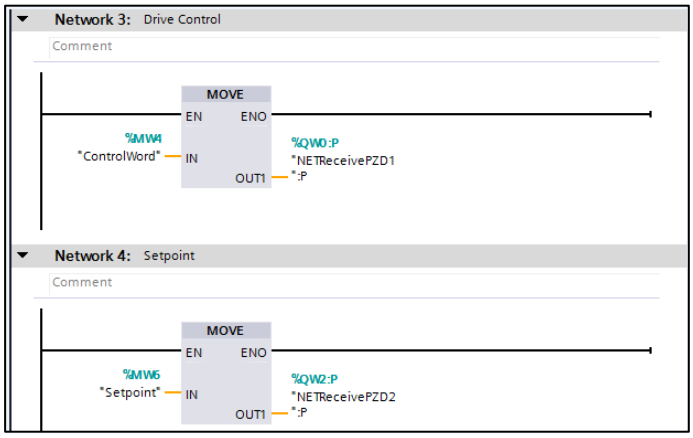


6.2.2 Software configuration – Writing a program for cyclic & acyclic communication

6.2.2.1 Cyclic communication

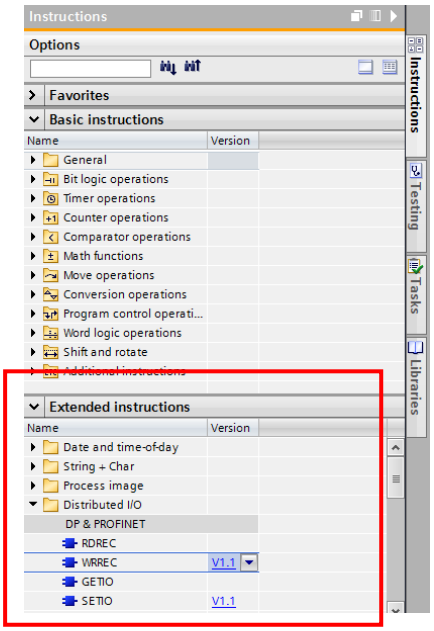
Declare input and output and call addresses in OB1.





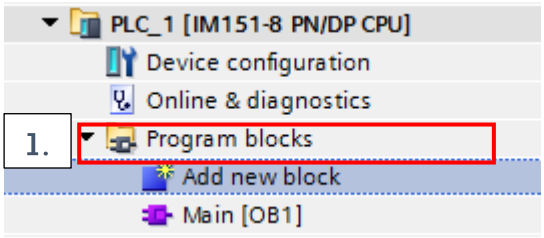
6.2.2.2 Acyclic communication

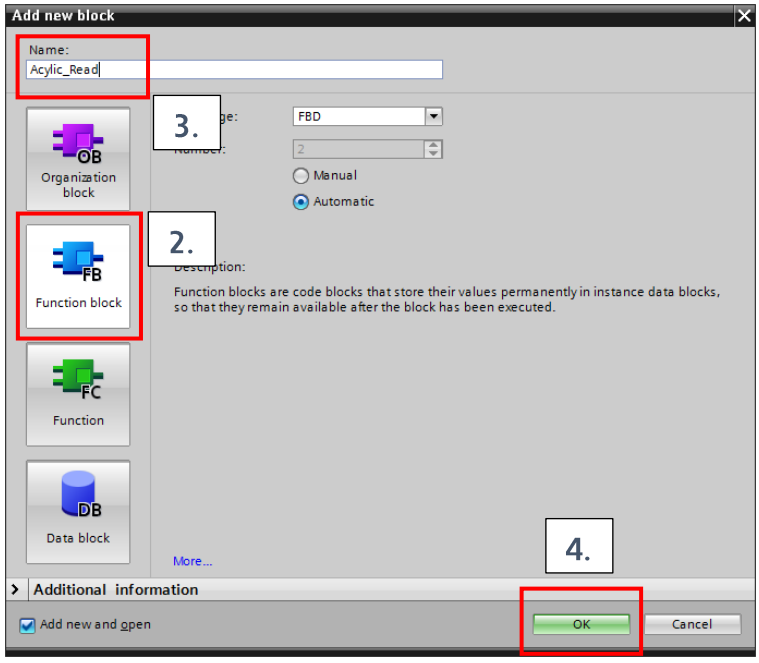
Acyclic Communication Library must be added to OB1 for the parameter access. Below a screenshot where read and write block can be called.



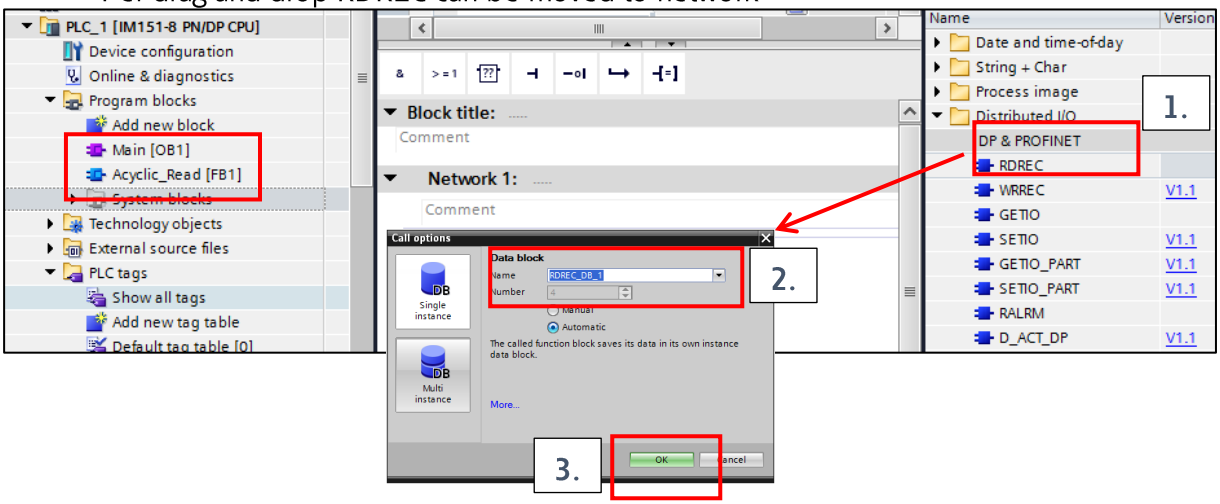
6.2.2.3 Adding a Read Block

Following steps show how a read block can be added.

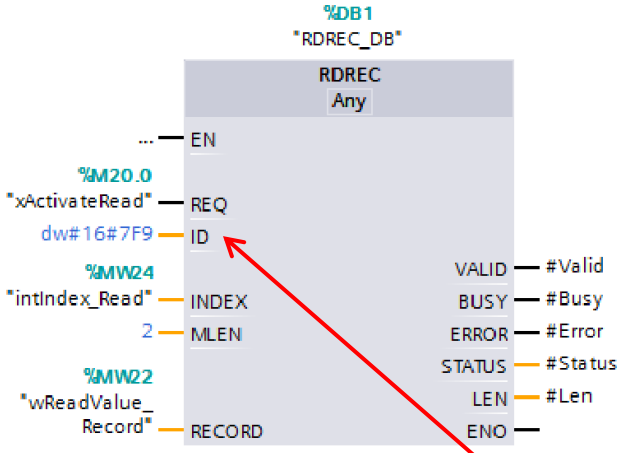




- Call RDREC in FB1
- Per drag and drop RDREC can be moved to network



- Substitute RDREC variables



- **ID number** is highlighted here:

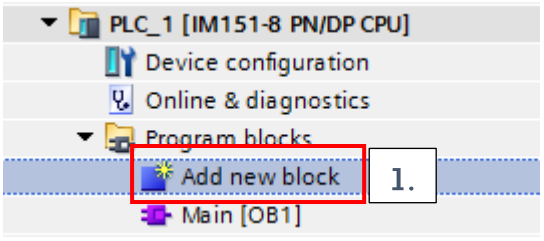
	Module	Rack	Slot	I address	Q address	Type
	RASP5	0	0	2042*		RASP5
	Interface	0	0 X1	2041*		RASP5
	Control Data 4 word_1	0	1		256...263	Control Data 4 ..
	Status Data 6 word_1	0	2	256...267		Status Data 6 w
		0	3			

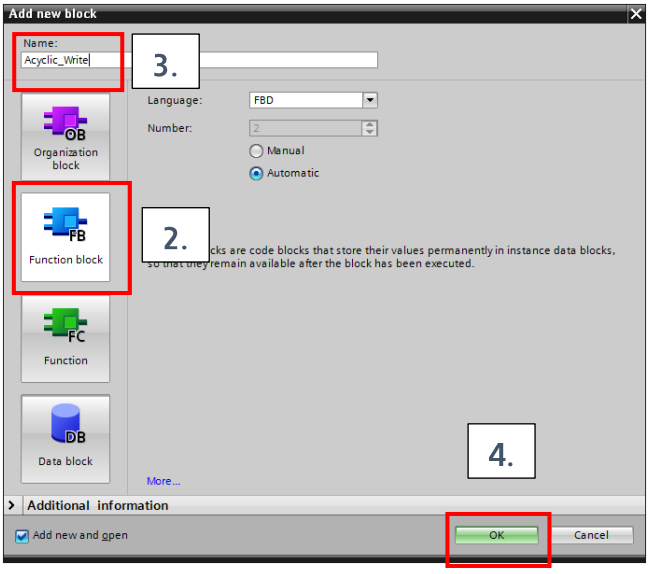
- See Index number and MLEN in chapter **10. Parameter Table**
- **Record** in the parameter value.
- **REQ** activates the read block then the value appears in **Record.**

Note: Detailed programing step are skipped here. Refer to TIA Portal help for more information.

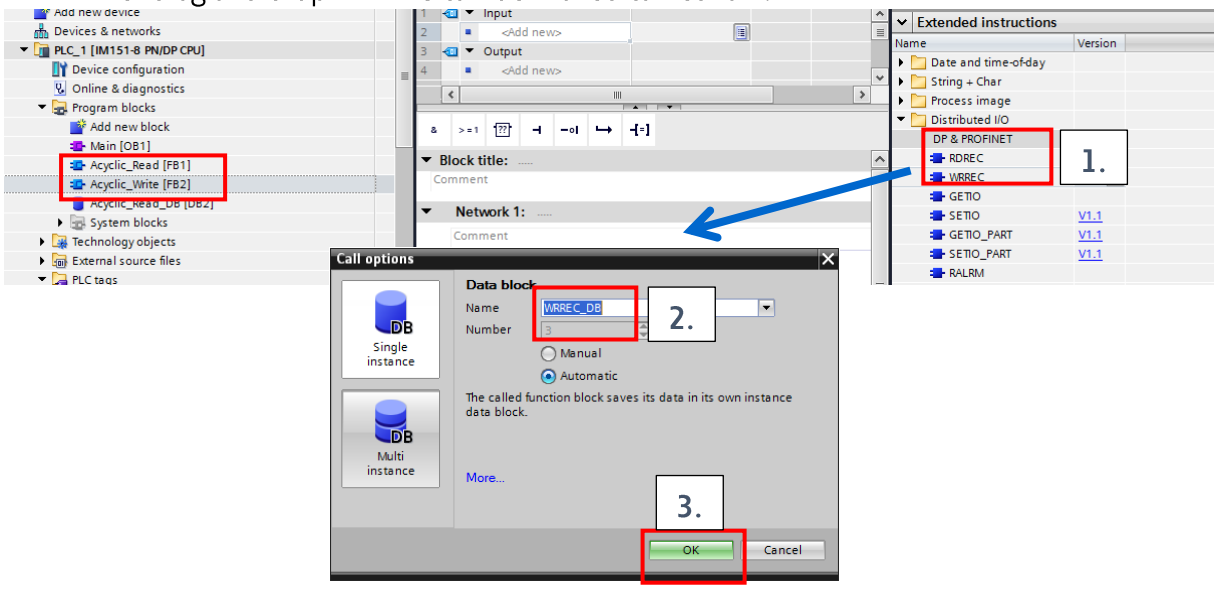
6.2.2.4 Adding Write Block

Following steps show how a read block can be added

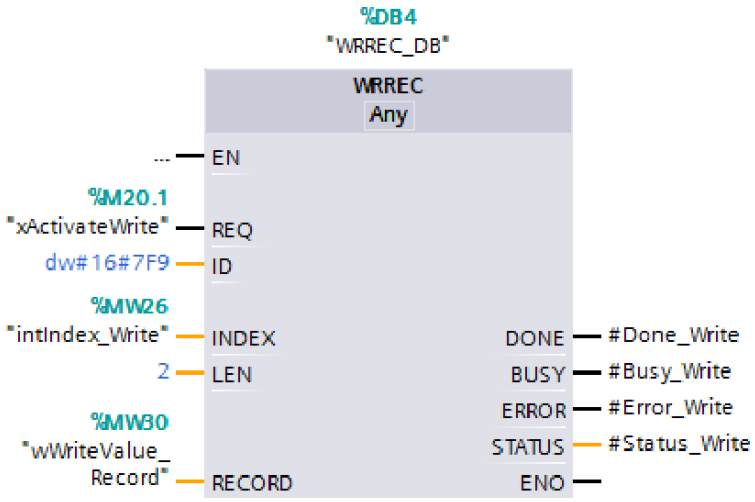




- Call WRREC in FB2
  Per drag and drop WRREC can be moved to network.

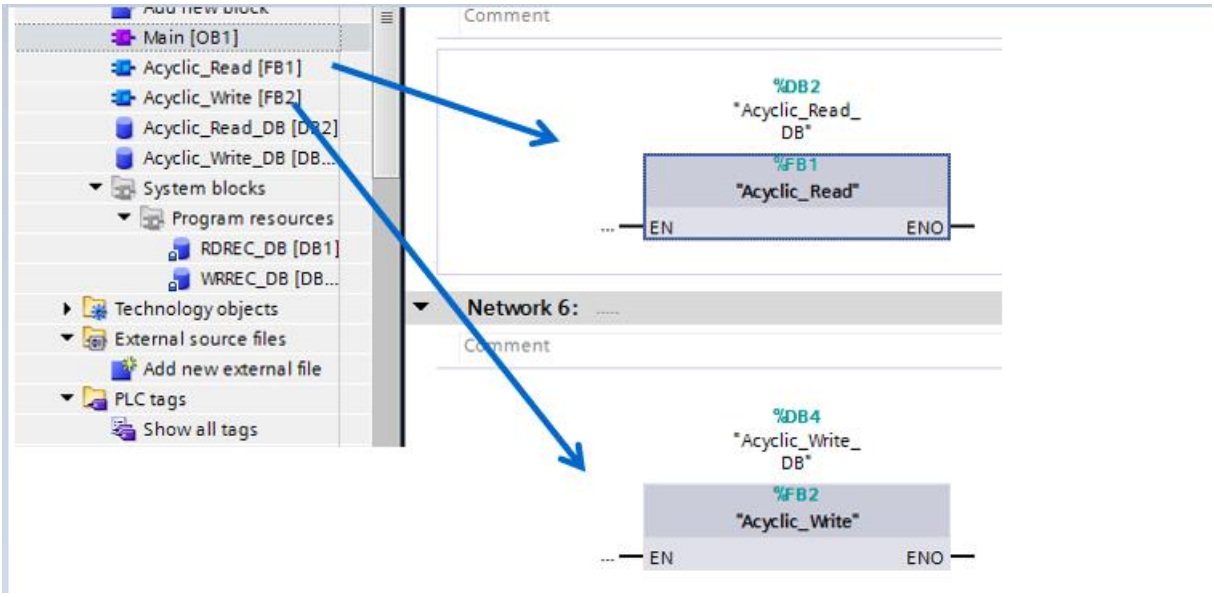


- Substitute WRREC variables



- **ID** number is the same as Read block.
- **REQ** activates Write process.
- Index number and LEN can be found the chapter ***10. Parameter Table***
- **Record**: The value which going to be write in to the parameter.
- **Finalize Program**

Call Function Block in OB1. This can be done by dragging the Function blocks to OB1.



7 Parameterization Software, Keypad and App

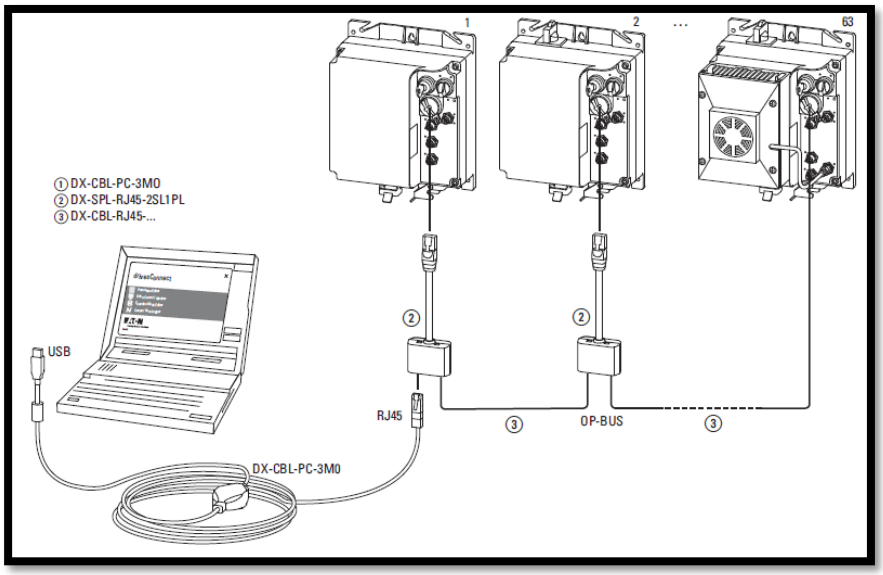


Figure 6: PC connection to RASP5

The table below shows tools and hardware for RASP5 (PC software, PC cable, keypad and smartphone app).

Parameterization PC Software	drivesConnect drivesConnect
Remote Keypad	DX-KEY-LED2
	DX-KEY-OLED
PC - Connection	DX-CBL-PC-3M0
	DX-COM-STICK-KIT (Bluetooth Stick)
Parameterization App	drivesConnect mobile (Bluetooth Stick DX-COM-STICK3-KIT is required)

Connection cable or Bluetooth Stick are not supplied with the RASP5.Those are optional articles.

The drivesConnect mobile App helps to connect smartphone to the RASP5. The parametrization and monitor information can be done by using App (Android or IOS based). For detailed information refer to App Note: **AP040189EN**. You can find it with the Overview Document.

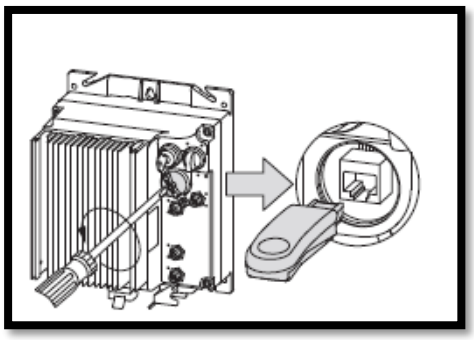


Figure 7: Bluetooth connection to RASP5

	RASP5
Remote Keypad	DX-KEY-LED2 
	DX-KEY-OLED 

8 Motor Plug and Motor Cable

RASP5 has motor plug type HAN Q8.

For motor cable length less than 10 m, the motor cable with the plastic plug can also be used with RASP5. Longer motor cables need the metal plug due to EMC reasons.

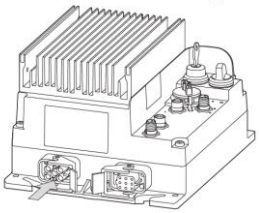
The motor cable for RASP5– metal housing – must be ordered separately.

The table below shows the cable:

Motor Cable	**RASP5 (metal plug)**
	
Type	HAN Q8
Housing Material	Metal
Cable Catalog Name	RASP-CM2-2MO (2m)

9 Requirements for Parametrization and PLC Communication

Following table indicates RASP5 regarding power supply which is need for communication to PLC and PC (parametrize Rapid Link modules).

PLC Communication and Parametrization
RASP5
24 V DC Supply **or** Power Supply (Mains) Required


RASP5 requires mains **or** 24 V DC for the PLC communication.

Note: If RASP5 supplied over 24 V DC only the parameter settings must be saved per P2-36

10 Parameter Table

Para-meter	Default	Name	API	Slot	Sub Slot	Index	Data format	Range	Scaling
P0-02	N/A	Thermistor Input1	0	0	1	0015	U16	0-1	
P0-03	N/A	DI Status	0	0	1	0006	U16		Part of status word - Reg 6
P0-04	N/A	f-PreRamp	0	0	1	0016	S16	-5000 to 5000	500 = 50.0Hz
P0-05	N/A	T-Controlboard	0	0	1	0027	S16	-500 to 1500	10 = 1.0 Degree C
P0-06	N/A	Overload	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-07	N/A	Output Frequency	0	0	1	0007	S16	-5000 to 5000	500 = 50.0Hz
P0-08	N/A	Motor Speed	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-09	N/A	Motor Current	0	0	1	0008	U16	0 to 65535	10 = 1.0A
P0-10	N/A	Motor Power Rel	0	0	1	000A	U16	0 to 65535	100 = 1.00kW
P0-11	N/A	Motor Voltage	0	0	1	002B	U16	0 to 65535	100 = 100VAC
P0-12	N/A	Motor Torque	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-13	N/A	Trip Log	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-14	N/A	Magnetizing current Id	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-15	N/A	Torque current Iq	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-16	N/A	DC-Link Voltage Ripple	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-17	N/A	HOA Status	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-18	N/A	FWD/REV Status	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-19	N/A	DO 1 to 3 Status	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-20	N/A	DC-Link Voltage	0	0	1	0017	U16	0 to 65535	100 = 100VDC
P0-21	N/A	Heatsink Temperature	0	0	1	0009	S16	-500 to 1500	10 = 1.0 Degree C
P0-22	N/A	TimeToNextService	0	0	1	0026	U16	0 to 65535	1 = 1 hour
P0-23	N/A	t-Run IGBT in OT	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-24	N/A	t-Run PCB in OT	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-25	N/A	f-PostRamp	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-26	N/A	kWh Meter	0	0	1	0020	U16	0 to 65535	10 = 1.0kWh
P0-27	N/A	MWh Meter	0	0	1	0021	U16	0 to 65535	1 = 1MWh
P0-28.1	N/A	Application Version	0	0	1	000F	U16	0 to 65535	100 = 1.00
P0-28.2	N/A	System Version	0	0	1	0010	U16	0 to 65535	100 = 1.00
P0-29.1	N/A	Device Type	0	0	1	0011	U16	0 to 65535	
P0-29.2	N/A	NoOfInputPhases	0	0	1	000C	U16	0 to 65535	
P0-29.3	N/A	FrameSize	0	0	1	000C	U16	0 to 65535	
P0-29.4	N/A	kW/HP	0	0	1	000C	U16	0 to 65535	
P0-29.5	N/A	Power@Ue	0	0	1	000D	U16	0 to 65535	100 = 1.00
P0-29.6	N/A	Device Voltage	0	0	1	000C	U16	0 to 65535	
P0-29.7	N/A	DeviceType	0	0	1	000C	U16	0 to 65535	
P0-30	N/A	Serial Number	0	0	1	0019	U16	0 to 65535	
P0-31	N/A	t-Run	0	0	1	000C	U16	0 to 65535	Reg 34 in seconds Reg 35 in hours
P0-32	N/A	t-Run since Restart	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-33	N/A	t-Run since Trip	N/A	N/A	N/A	N/A	N/A	N/A	N/A

P0-34	N/A	t-HoursRun Enable	0	0	1	0024	U16	0 to 65535	Reg 34 in seconds Reg 35 in hours
P0-35	N/A	Fan Runtime	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-36	N/A	DC-Link Log	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-37	N/A	DC-Link V-Ripple Log	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-38	N/A	Heatsink Log	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-39	N/A	AmbientTemp Log	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-40	N/A	MotorCurrent Log	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-41	N/A	FaultCounter Overcurrent	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-42	N/A	FaultCounter DC-Overvoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-43	N/A	FaultCounter DC-Undervoltage	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-44	N/A	FaultCounter Overtemperature Heatsink	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-45	N/A	FaultCounter Overcurrent Brake Chopper	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-46	N/A	FaultCounter Overtemperature Ambient	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-47	N/A	FaultCounter Internal Fault (IO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-48	N/A	FaultCounter Internal Fault (DSP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-49	N/A	FaultCounter Local COM Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-50	N/A	FaultCounter Communication Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-51	N/A	Input Data1 Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-52	N/A	Ouput Data Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-53	N/A	Phase U Current Offset Ref	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-54	N/A	Phase V Current Offset Ref	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-55	N/A	Phase W Current Offset Ref	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-56	N/A	t-PowerOn	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-57.1	N/A	V d-Axis	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-57.2	N/A	V q-Axis	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-58	N/A	UserProgramID	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-59	N/A	Value@Pointer	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-62	N/A	t-accNET	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-63	N/A	f-Ref Interface0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-64	N/A	Actual Switching Frequency	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P0-65	N/A	System Software Version	N/A	N/A	N/A	N/A	N/A	N/A	N/A
P1-01	50.0 Hz	f-max	0	0	1	0065	U16	0.0 - 250.0Hz	0-3000 = 0-50Hz
P1-02	0.0 Hz	f-min	0	0	1	0066	U16	0.0 - 50.0Hz	0-3000 = 0-50Hz
P1-03	5.0 s	t-acc	0	0	1	0067	U16	0.1 - 3000.0s	300 = 30.0s
P1-04	2.0 s	t-dec	0	0	1	0068	U16	0.1 - 3000.0s	300 = 30.0s
P1-05	1: Ramp to Stop	Stop Mode	0	0	1	0069	U16	0-2	

P1-07	400 V	Motor Nom Voltage	0	0	1	006B	U16	0, 20 - 500V	230 = 230 V
P1-08	Model Dependant	Motor Nom Current	0	0	1	006C	U16	2.4A = 0.2 - 2.4A 4.3A = 0.4 - 4.3A 5.6A = 0.5 - 5.6A 8.5A = 0.8 - 8.5A	1 = 0.1A
P1-09	50 Hz	Motor Nom Frequency	0	0	1	006D	U16	10 - 500Hz	50 = 50Hz
P1-10	0 rpm	Motor Nom Speed	0	0	1	006E	U16	0, 100 - 3000rpm	
P1-11	0,00%	V-Boost	0	0	1	006F	U16	0.0 - 40%	
P1-12	10.0 Hz	f-Fix1	0	0	1	0070	U16	0.0 - P1-01	0-3000 = 0-50Hz
P1-13	1: HAND:[-] [-] [-] [-]/AUTO:[-] [-] [-] [-]	DI Config Select	0	0	1	0071	U16	1 - 8	
P1-14	0	Access Key	0	0	1	0072	U16	0 - 65535	
P2-01	30.0 Hz	f-Fix2	0	0	1	00C9	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-02	40.0 Hz	f-Fix3	0	0	1	00CA	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-03	50.0 Hz	f-Fix4	0	0	1	00CB	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-04	10.0 Hz	f-Fix5	0	0	1	00CC	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-05	15.0 Hz	f-Fix6	0	0	1	00CD	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-06	20.0 Hz	f-Fix7	0	0	1	00CE	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-07	25.0 Hz	f-Fix8	0	0	1	00CF	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-08	0.0 s	t-SRamp1	0	0	1	00D0	U16	0.0 - 10.0s	100 = 10.0s
P2-09	1: OFF	OverVoltage Control	0	0	1	00D1	U16	0 - 1	
P2-10	0: OFF	REV Enable	0	0	1	00D2	U16	0 - 1	
P2-11	5.0 s	t-acc2	0	0	1	00D3	U16	0.0 - 3000.0s	300 = 30.0s
P2-12	0.0 Hz	n-accMulti1	0	0	1	00D4	U16	0.0 - P1-01	
P2-13	5.0 s	t-dec2	0	0	1	00D5	U16	0.0 - 3000.0s	300 = 30.0s
P2-14	0.0 Hz	n-decMulti1	0	0	1	00D6	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-15	0.0 Hz	f-Skip1	0	0	1	00D7	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-16	0.0 Hz	f-SkipBand1	0	0	1	00D8	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-17	0.0 Hz	f-Skip2	0	0	1	00D9	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-18	0.0 Hz	f-SkipBand2	0	0	1	00DA	U16	0.0 - P1-01	0-3000 = 0-50Hz
P2-19	0: cTq	V/f Characteristic Curve	0	0	1	00DB	U16	0 - 2	
P2-20	0,00%	f-MidV/f	0	0	1	00DC	U16	0.0 - 100%	
P2-21	0,00%	V-MidV/f	0	0	1	00DD	U16	0.0 - 100%	
P2-22	1: 8kHz	Switching Frequency	0	0	1	00DE	U16	0 - 5	0
P2-23	0: OFF	Auto Thermal Management	0	0	1	00DF	U16	0 -1	
P2-24	0: Edge-r	Start Mode	0	0	1	00E0	U16	0 - 10	
P2-25	0: Ramp	REAF Start Function	0	0	1	00E1	U16	0 -2	
P2-26	0.5 s	Auto Reset Delay	0	0	1	00E2	U16	0.1 - 60.0s	300 = 30.0s
P2-27	1: ON	Action at Thermistor fault Motor	0	0	1	00E3	U16	0 - 1	
P2-28	0 Hours	Service Interval Time	0	0	1	00E4	U16	0 - 60000	
P2-29	0: No Reset	Reset ServiceIndicator	0	0	1	00E5	U16	0 - 1	
P2-30	0: OFF	Parameter Set	0	0	1	00E6	U16	0 - 1	

P2-31	0: EU	Default Selection	0	0	1	00E7	U16	0 - 1	
P2-32	101	Access Key Level2	0	0	1	00E8	U16	0 - 65535	
P2-33	0: OFF	Parameter Lock	0	0	1	00E9	U16	0 - 1	
P2-34	0	TCP Enable Service	0	0	1	00EA	U16	0 - 15	
P2-36	0: Disable	Save Parameters 24V-ext.	0	0	1	00EC	U16	0 - 1	
P2-37	0: Spin Start Off	Spin Start Enable	0	0	1	00ED	U16	0 - 1	
P3-01	0: Simple Mode Brake Control	Brake Mode	0	0	1	012D	U16	0 - 1	
P3-02	1.5 Hz	Brake f-open	0	0	1	012E	U16	0.0 - P1-01	
P3-03	1.0 Hz	Brake f-close	0	0	1	012F	U16	0.0 - P1-01	
P3-04	0.0 A	Brake M-Level Release	0	0	1	0130	U16	2.4A = 0.6 - 2.4A 4.3A = 1.1 - 4.3A 5.6A = 1.4 - 5.6A 8.5A = 2.1 - 8.5A	1 = 0.1A
P3-05	0.0 s	Brake Release Delay	0	0	1	0131	U16	0 - 320.0s	3200 = 320.0s
P3-06	0: OFF	DI1 Logic	0	0	1	0132	U16	0 - 1	
P3-07	0: OFF	DI2 Logic	0	0	1	0133	U16	0 - 1	
P3-08	0: OFF	DI3 Logic	0	0	1	0134	U16	0 - 1	
P3-09	0: OFF	DI4 Logic	0	0	1	0135	U16	0 - 1	
P3-10	0: OFF	DI5 Logic	0	0	1	0136	U16	0 - 1	
P3-11	0: OFF	t-dec Select B0	0	0	1	0137	U16	0 - 1	
P4-01	0,00%	DC-Brake Current	0	0	1	0191	U16	0.0 - 100%	
P4-02	0.0 s	t-DCBrake@Start	0	0	1	0192	U16	0.0 - 600.0%	
P4-03	1.5 Hz	f-DCBrake@Stop	0	0	1	0193	U16	0.0 - 10.0Hz	0-3000 = 0-50Hz
P4-04	0.0 s	t-DCBrake@Stop	0	0	1	0194	U16	0.0 - 600.0%	
P4-05	2: Automatic Activation in RUN & STOP	Brake Chopper Mode	0	0	1	0195	U16	0 - 2	
P4-06	400 Ohm	Brake Resistor	0	0	1	0196	U16	50 - 500	
P4-07	0.10 kW	P-Brake Resistor	0	0	1	0197	U16	0.00 - 20.00kW	
P4-08	2,00%	Brake Chopper ED Heat-Up	0	0	1	0198	U16	0.0 - 20.0%	
P5-01	2	RS485-0 Address	0	0	1	01F5	U16	1 - 63	
P5-02	2.0 s	COM Loss Timeout	0	0	1	01F6	U16	0.0 - 5.0s	50 = 5s
P5-03	0: Trip	Action@Communication Loss	0	0	1	01F7	U16	0 - 3	
P5-04	0: OFF	FieldbusRampControl	0	0	1	01F8	U16	0 - 1	
P5-05	0: Current [xx.x A]	NETSendPZD3	0	0	1	01F9	U16	0: Current [xx.x A] 1: Power [x.xx kW] 2: Digital Input Status 3: Power Stage Temperature	

P5-06	3: Power Stage Temperature	NETSendPZD4	0	0	1	01FA	U16	0: Torque (%) 1: Power [x.xx kW] 2: Digital Input Status 3: Power Stage Temperatur e	
P5-07	1: User Ramp	NETReceivePZD3	0	0	1	01FB	U16	0: Dummy 1: Fieldbus Ramp	
P5-08	0: Dummy	NETReceivePZD4	0	0	1	01FC	U16	0: Dummy	Reserved
P5-09	0	PointerToParameter	0	0	1	01FD	U16	0 - 200	
P5-10	0: OFF	Disable QuickStop	0	0	1	01FE	U16	0 - 1	
P5-11	0: Basic ASi command configuration	ASi command configuration	0	0	1	01FF	U16	0 - 2	
P6-01	0: Smart Vector Speed Control	Motor Control Mode	0	0	1	0259	U16	0 - 6	
P6-02	50,00%	MSC Kp	0	0	1	025A	U16	0 - 400%	
P6-03	0.050 s	MSC Ti	0	0	1	025B	U16	0.010 - 1.000s	
P6-04	150%	M-Max Motoring	0	0	1	025C	U16	0 - 200%	% relates to drive rated current
P6-05	0: OFF	Action@Underload Motor	0	0	1	025D	U16	0 - 1	
P6-06	50,00%	M-Min (f-Ref=0) Limit	0	0	1	025E	U16	10.0 - 150.0%	
P6-07	10,00%	M-Min (f>f-Vmax) Limit	0	0	1	025F	U16	5.0 - 150.0%	
P6-08	0: U-V-W	Change Phase sequence Motor	0	0	1	0260	U16	0 - 1	
P6-09	1: ON	T-Memory Enable	0	0	1	0261	U16	0 - 1	
P6-10	0: OFF	Action @I-CurrentLimit	0	0	1	0262	U16	0 - 1	
P6-11	0: OFF	Enhanced Generator Control	0	0	1	0263	U16	0 - 1	
P6-12	5,00%	Over voltage Current limit	0	0	1	0264	U16	0.0 - 100.0%	
P6-13	10	Load Inertia Factor	0	0	1	0265	U16	0 - 600	
P6-14	30 ms	t-Excitation-V/f	0	0	1	0266	U16	0 - 5000m	
P6-15	0,00%	Torque Boost	0	0	1	0267	U16	0.0 - 100.0%	
P6-16	0,00%	f-Torque Boost Limit	0	0	1	0268	U16	0.0 - 50.0%	
P6-17	0	PM-Motor Signal In Level	0	0	1	0269	U16	0 - 200	
P6-18	0: OFF	Over Modulation Enable	0	0	1	026A	U16	0 - 1	
P7-01	0: Disable	Motor Identification	0	0	1	02BD	U16	0	
P7-02	0,8	Motor PF	0	0	1	02BE	U16	0.50 - 1.00	
P7-03	8.00 Ohm	Motor Stator Resistance R1	0	0	1	02BF	U16	0.00 - 655.35	
P7-04	6.00 Ohm	Motor Rotor Resistance R2	0	0	1	02C0	U16	0.00 - 655.35	
P7-05	650.0 mH	Motor Stator Inductance d-Axis	0	0	1	02C1	U16	0.0 - 6553.5	
P7-06	65.0 mH	Motor Stator Inductance q-Axis	0	0	1	02C2	U16	0.0 - 6553.5	

11 Error Messages

11.1 Introduction

The Rapid Link Modules have several internal monitoring functions. If deviations from the correct operating status are detected, an error message is displayed.

11.1.1 Error messages

The last four error messages are stored in the order in which they occurred (the most recent error in the first place). The error messages can be read out under monitor parameter P0-13. The values are not deleted when resetting to the factory settings!

11.1.2 Acknowledge fault (Reset)

The current error message can be acknowledged and reset as follows:

- Switch off the supply voltage
- Press the stop button
- Set key switch to OFF/RESET

11.1.3 Automatic reset

The auto reset function can be set using parameters P2-24 and P2-26. The P2-26 parameter determines the time which will elapse between consecutive drive reset attempts when Auto Reset is enabled by P2-24.

11.1.4 Error list

The following table lists the failure codes, the possible causes and indicates corrective measures.

11.2 RASP Error list

Message	Error no.	Possible cause and remedy
StoP	-	Ready for operation. There is no drive enable signal present. There are no error messages present.
Inhibt	-	STO inputs (terminals 3 and 4) de-energized Safety relay switched off Voltage source overloaded Consequence: The drive is disabled.
no-FLt	00	Shown for P0-13 if there are no messages in the error register.
01 -b	01	Excessively high braking current Check the brake resistor and its wiring for short-circuits and ground faults.

		Make sure that the braking resistance value is not lower than the minimum permissible braking resistance.
OL-br	02	Thermal overload on brake resistor The drive has been switched off in order to prevent the brake resistor from being thermally destroyed. Make the P1-04 and P2-13 ramp times longer in order to have less frequent braking. Reduce the load's inertia, if possible.
O-I	03	Overcurrent at variable frequency drive output Occurs right after switching on the unit: Check the cable connection between inverter and motor. Check the motor for shorted turns and ground faults. Occurs when starting the motor: • Check whether the motor can rotate freely and make sure that it is not being blocked mechanically. • Motor with mechanical brake: Check whether this has been triggered. • Check the connection configuration (star/delta). • Check to make sure that the motor data was entered correctly in P1-07, P1-08, and P1-09. In vector mode (P6-01 = 1): Check whether the value cos ϕ (P7-02) has been entered correctly and a motor identification run has been successfully performed. Increase the acceleration ramp time (t-acc, P1-03) if necessary. • With speed control (P6-01 = 6): Reduce the voltage boost with P1-11. Occurs during operation at a constant speed: • Check whether the motor is overloaded. Occurs during acceleration/deceleration: • The ramp times are too short and require too much power. If P-03/P-04 cannot be increased, a larger device may be required.
I.t-trP	04	Motor overload. The thermal protection mechanism has tripped as a result of the device being run above the rated motor current set with P1-08 longer than a specific time. • Check to make sure that the motor data was entered correctly in P1-07, P1-08, and P1-09. • In vector mode (P6-01 = 1): Check whether the value cos ϕ (P7-02) has been entered correctly and a motor identification run has been successfully performed. • Check the motor's connection configuration (e. g., start/delta). • If the decimal points on the display flash during operation, this means that the unit is being run in its overload range (> P1-08). In this case, use P1-03 to make the acceleration ramp longer or reduce the load. • Make sure that the motor is not being mechanically blocked and that there are no additional loads on the motor.
PS-trP	05	Overcurrent (Hardware) • Check the wiring to the motor and the motor itself for short-circuits and ground faults. • Disconnect the motor cable from the variable frequency drive and switch the variable frequency drive back on. If the error message still appears, the device needs to be replaced. Before commissioning the new device, check the system for short-circuits or ground faults that could have caused the device to fail.
O.Uolt	06	Overvoltage in DC link The DC-Link Voltage value can be viewed using parameter P0-20. P0-36 contains an error register with the last values before the unit was switched off (scan time: 256 ms). • Check to make sure that the supply voltage falls within the range for which the variable frequency drive is sized.

		• If the error occurs during deceleration or stopping: Extend delay ramp (P1-04/P2-13) or use a brake resistor. • In vector mode (P6-01 = 1): Reduce the speed controller's amplification (P6-02).
U.Uolt	07	Undervoltage in DC link Note: Generally, this message will appear when the supply voltage is switched off on the device and the DC link voltage dies away. In this case, there is no fault. If the message appears during operation: • Check whether the power supply voltage is too low. • Check all components/devices in the variable frequency drive's feeder circuit (circuit-breaker, contactor, choke, etc.) to make sure they are connected properly and have an adequate contact resistance.
O-t	08	Overtemperature at heat sink. The drive is too hot. The heat sink temperature can be viewed by using P0-21. P0-38 contains an error register with the last values before the unit was switched off (scan time: 30 s). • Check to make sure that the variable frequency drive is being operated within the ambient temperature range specified for it. • Make sure that cooling air can circulate freely (clearances to neighboring devices above and below the variable frequency drive). • The ventilation vent on the device must not be blocked, e.g., by dirt or due to devices being installed too closely together. • Reduce the switching frequency with P2-24. • Reduce the load, if possible.
U-t	09	Under-temperature The message will appear if the ambient temperature falls below -10 °C. In order to be able to start the drive, the temperature must be higher than this.
P-dEF	10	The parameters' default settings have been loaded. • Press the STOP button: The drive can then be reconfigured:
SC-0bS	12	Communication fault with an external operating unit or with a PC. • Check connections.
FLt-dc	13	Excessively high DC link voltage ripple The DC link voltage ripple can be viewed using P0-16. An error register with the last values before the unit was switched off contains P0-37 (scan time: 20 ms). • Check to make sure that all the mains supply phases are present and that their voltage balance falls within the permissible tolerance range (3 %. • Reduce the load if possible. • If the fault persists, please contact your nearest Eaton sales branch.
P-LOSS	14	Failure of one phase of the infeed
h O-I	15	Overcurrent at output • See Error no. 03.
th-FLt	16	Malfunctioning heat sink thermistor. • Please contact your nearest Eaton sales branch.
dAtA-F	17	Error in internal memory. The parameters have not been saved and the default settings have been loaded. • Change the parameter values (again) and save them once more. • If the message appears again, please contact your nearest Eaton sales branch.

dAtA-E	19	Error in internal memory. The parameters have not been saved and the default settings have been loaded. • Change the parameter values (again) and save them once more. • If the message appears again, please contact your nearest Eaton sales branch.
F-Ptc	21	Motor PTC thermistor overtemperature
O-hEAt	23	The measured ambient temperature exceeds the specified value. • Make sure that the required clearance around the device is being maintained and that cooling air can flow through the vents on the device unimpeded. • Reduce the switching frequency with P2-22. • If possible: Reduce load.
O-tor9	24	Maximum permissible torque exceeded. • If possible: Reduce the load or increase acceleration time t-acc.
U-tor9	25	Underload If the motor current is 25 % below the rated motor current, this error message appears.
OUt-F	26	Device output fault • Please contact your nearest Eaton sales branch.
Sto-F	29	Internal STO circuit fault • Please contact your nearest Eaton sales branch.
AtF-01	40	Motor identification failed: The measured stator resistance varies between the phases. • Make sure that the motor is connected properly and working correctly. • Check the motor windings to make sure they have the same resistance values.
AtF-02	41	Motor identification failed: The measured stator resistance is too large. • Make sure that the motor is connected properly and working correctly. • Check to make sure that the device's rated output matches the motor's rated output. The difference should not exceed one full output class.
AtF-03	42	Motor identification failed: The measured motor inductance is too low. • Make sure that the motor is connected properly and working correctly.
AtF-04	43	Motor identification failed: The measured motor inductance is too high. • Make sure that the motor is connected properly and working correctly. • Check to make sure that the device's rated output matches the motor's rated output. The difference should not exceed one full output class.
AtF-05	44	Motor identification failed: The measured motor parameters do not match. • Make sure that the motor is connected properly and working correctly. • Check to make sure that the device's rated output matches the motor's rated output. The difference should not exceed one full output class.
OUt-Ph	49	A phase in the motor cable is not connected or is disconnected.
Sc-F01	50	No valid field bus telegram was received within the time specified in P5-02. • Check to make sure that the network master is working correctly. • Check connecting cables. • Increase the value of P5-02 to an acceptable value.

OF-01	60	No internal connection to an optional card
OF-02	61	Optional module in undefined operating state
OF-10	69	Sensor fault - overload or short circuit

12 References

Documentation	RASP5	LINK
Manual RASP…	MN034004EN	DownloadCenter
Instruction Leaflet RASP…	IL034093ZU	DownloadCenter
Application Note - Parametrization per Bluetooth	AP040189EN	Drives AP Note Overview Document

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