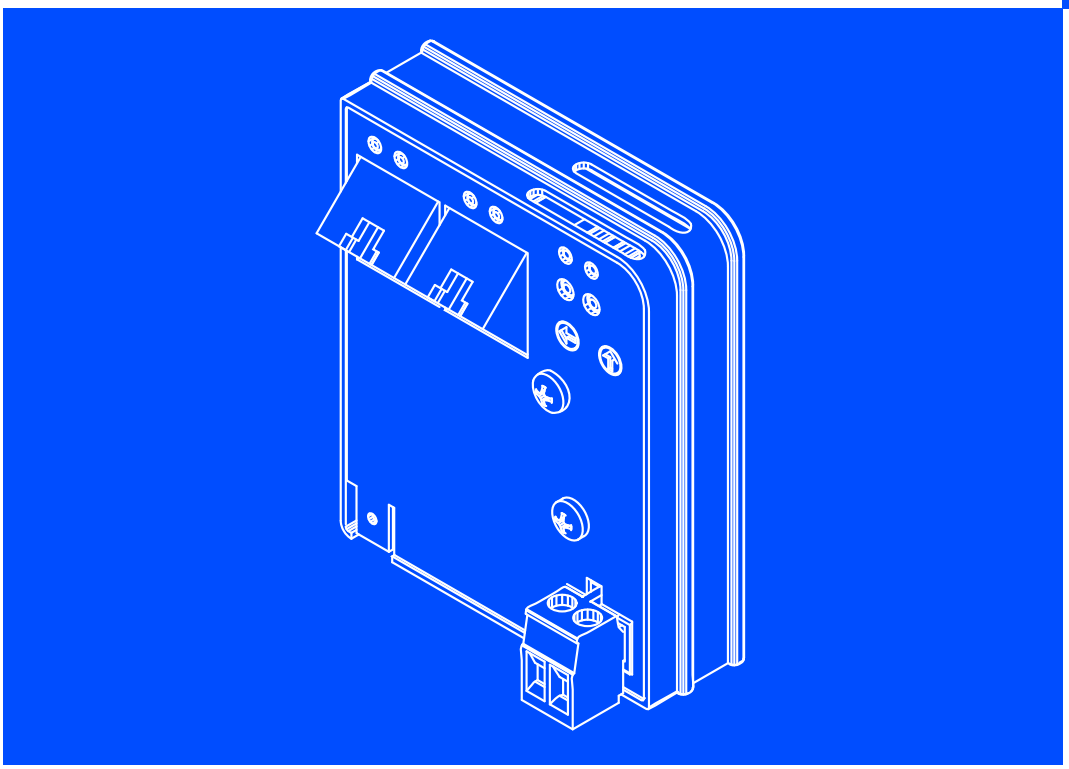
EDSMF2191IB
13445992

L-force Communication

Communication Manual

POWERLINK



EMF2191IB

Communication module

Lenze

1 About this documentation

Contents

This documentation exclusively describes the EMF2191IB (POWERLINK) communication module.

Note!

This documentation supplements the **mounting instructions** supplied with the function/communication module and the **documentation of the used standard device**.

The mounting instructions contain safety instructions which must be observed!

The features and functions of the communication module are described in detail.

Examples illustrate typical applications.

Furthermore this documentation contains the following:

- Safety instructions that must be observed.
- Key technical data relating to the communication module
- Information on versions of Lenze standard devices to be used.
- Notes on troubleshooting and fault elimination

The theoretical correlations are only explained in so far as they are necessary for comprehending the function of the communication module.

This documentation does not describe the software of an original equipment manufacturer. No responsibility is taken for corresponding information given in this manual. Information on how to use the software can be obtained from the documents of the host system (master).

All brand names mentioned in this manual are trademarks of their respective companies.

Tip!

Detailed information about POWERLINK can be found on the website of the "Ethernet POWERLINK Standardisation Group":

http://www.ethernet-powerlink.org

Target group

This documentation is intended for all persons who plan, install, commission and maintain the networking and remote service of a machine.

Tip!

Information and auxiliary devices related to the Lenze products can be found in the download area at

http://www.Lenze.com

Validity information

The information in this documentation applies to the following devices:

Extension module	Type designation	From hardware version	From software version
POWERLINK communication module	EMF2191IB	VA	1.0

1.1 Document history

Version			Description
1.0	05/2008	TD00	First edition
2.0	09/2013	TD17	• Corrected information on cycle times (📖 19) • New chapter structure

Your opinion is important to us!

These instructions were created to the best of our knowledge and belief to give you the best possible support for handling our product.

If you have suggestions for improvement, please e-mail us to:

feedback-docu@Lenze.de

Thank you for your support.

Your Lenze documentation team

1.2 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	Point	In general, the decimal point is used. For instance: 1234.56
Decimal	Standard notation	Example: 1234
Hexadecimal	0x[0 ... 9, A ... F]	Example: 0x60F4
Binary ● Nibble	0b[0, 1] Point	Example: '0b0110' Example: '0b0110.0100'
Text		
Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
Icons		
Page reference	🕮	Reference to another page with additional information For instance: 🕮 16 = see page 16
Documentation reference	🌍	Reference to another documentation with additional information For example: 🌍 EDKxxx = see documentation EDKxxx

1.3 Terminology used

Term	Meaning
EPSG	**E**thernet **P**owerlink **S**tandardisation **G**roup User organisation which defines POWERLINK.
Inverter	Inverter, the communication module can be used with (📖 12).
Standard device	
Slave (CN)	**C**ontrolled **N**ode POWERLINK node which is a slave in the real-time Ethernet POWERLINK.
Master (MN)	**M**anaging **N**ode POWERLINK node which has the master function in the real-time Ethernet POWERLINK.
Node ID	POWERLINK node address
MAC address (MAC ID)	**M**edia **A**ccess **C**ontrol address The MAC address is unequivocal worldwide. The MAC address is represented by six bytes in hexadecimal form the single bytes being separated by dots. The first three bytes refer to the manufacturer, the other bytes serve to identify the device.
HW	Hardware
SW	Software

1.4 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:

Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 **Danger!**	**Danger of personal injury through dangerous electrical voltage.** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 **Danger!**	**Danger of personal injury through a general source of danger.** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 **Stop!**	**Danger of property damage.** Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 **Note!**	Important note to ensure troublefree operation
 **Tip!**	Useful tip for simple handling
	Reference to another documentation

2 Safety instructions

Note!

It is absolutely vital that the stated safety measures are implemented in order to prevent serious injury to persons and damage to material assets.

Always keep this documentation to hand in the vicinity of the product during operation.

2.1 General safety information

Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

- Lenze drive and automation components ...
  ... must only be used for the intended purpose.
  ... must never be operated if damaged.
  ... must never be subjected to technical modifications.
  ... must never be operated unless completely assembled.
  ... must never be operated without the covers/guards.
  ... can - depending on their degree of protection - have live, movable or rotating parts during or after operation. Surfaces can be hot.
- For Lenze drive components ...
  ... only use permitted accessories.
  ... only use original manufacturer spare parts.
- All specifications of the corresponding enclosed documentation must be observed.
  This is vital for a safe and trouble-free operation and for achieving the specified product features.
  The procedural notes and circuit details provided in this document are proposals which the user must check for suitability for his application. The manufacturer does not accept any liability for the suitability of the specified procedures and circuit proposals.
- Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.
  According to IEC 60364 or CENELEC HD 384, these are persons ...
  ... who are familiar with the installation, assembly, commissioning and operation of the product,
  ... possess the appropriate qualifications for their work,
  ... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.

2.2 Device- and application-specific safety instructions

- During operation, the communication module must be securely connected to the standard device.
- With external voltage supply, always use a separate power supply unit, safely separated in accordance with EN 61800-5-1 in every control cabinet (SELV/PELV).
- Only use cables that meet the given specifications. (📖 30)

Documentation of the standard device, control system, and plant/machine

All the other measures prescribed in this documentation must also be implemented. Observe the safety instructions and application notes contained in this manual.

2.3 Residual hazards

Protection of persons

- If controllers are connected to phase-earthed system with a rated mains voltage ≥ 400 V, external measures need to be implemented to provide reliable protection against accidental contact. (see chapter ”4.2”, 📖 18)

Device protection

- The communication module contains electronic components that can be damaged or destroyed by electrostatic discharge.

3 Product description

3.1 Application as directed

The communication module ...

- ► is a device intended for use in industrial power systems;
- ► can only be used in POWERLINK networks;
- ► can be used together with the following standard devices (nameplate data):

Device type	Design	Version		Variant	Explanation
		HW	SW [1)]		
82EVxxxxxBxxxXX		≥ Vx	≥ 1x		8200 vector
82CVxxxxxBxxxXX		≥ Vx	≥ 1x		8200 vector, cold plate
82DVxxxKxBxxxXX		≥ Vx	≥ 1x		8200 vector, thermally separated
EPL 10200	E	≥ 1x	≥ 1x		Drive PLC
33.93XX	xE.	≥ 2x	≥ 1x	Vxxx	9321 - 9332 vector
33.938X	xE.	≥ 1x	≥ 0x		9381 - 9383 vector
33.93XX	xC.	≥ 2x	≥ 1x	Vxxx	9321 - 9332, with cold plate version
33.93XX	EI / ET	≥ 2x	≥ 1x	Vxxx	9300 Servo PLC
33.93XX	CI / CT	≥ 2x	≥ 1x	Vxxx	9300 Servo PLC, cold plate
ECSxSxxxx4xxxxXX		≥ 1A	≥ 6.0		ECSxS "Speed & Torque"
ECSxPxxxx4xxxxXX		≥ 1A	≥ 6.0		ECSxP "Posi & Shaft"
ECSxMxxxx4xxxxXX		≥ 1A	≥ 6.0		ECSxM "Motion"
ECSxAxxxx4xxxxXX		≥ 1A	≥ 2.3		ECSxA "Application"
ECSxExxxx4xxxxXX		≥ VA	≥ 3.0		ECSxE power supply module

1) operating system software versions of the controllers

Any other use shall be deemed inappropriate!

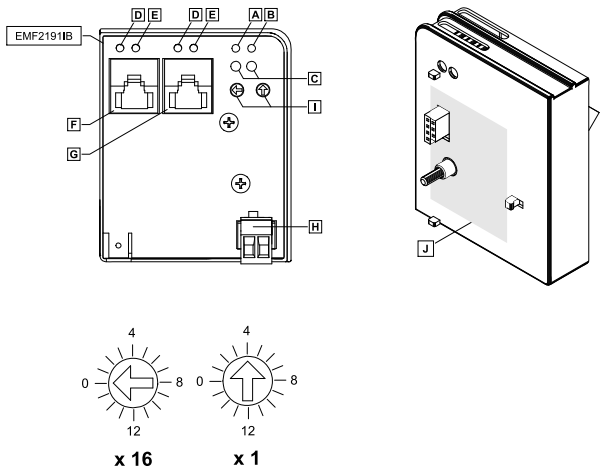
3.2 Identification

① →	33.2191IB	VA	10
	Device series		
		Hardware version	
			Software version

3.3 Product features

- Powerful and real-time capable communication system for motion and general applications. Real time Ethernet with the Ethernet POWERLINK V2 communication profile.
- Communication module for the AIF slot of the frequency inverters 8200 vector, 9300 vector and ECS servo system.
- Support of the Ethernet POWERLINK slave functionality (controlled node).
- Very short slave (Controlled Node) response times for optimal network performance.
- Integrated Ethernet hub (double) for easily setting up line topologies without any additional components.
- External 24V supply for maintaining the POWERLINK communication in case the device fails.
- Use of max. 3 PDO crosslinks for master (managing node) or slave (controlled node) to create systems with ”distributed intelligence”.

3.4 Connections and interfaces



Connections

Pos.	Description
F G	POWERLINK connection Version: RJ45 socket according to IEC 60603-7
H	Connection to external supply of the communication module Version: Connector with screw connection, 2-pole

Switch

Pos.	Description
I	Switches for addressing the nodes ● Left switch: Setting with factor 16 ● Right switch: Setting with factor 1 The addition of both products results in the node address (node ID) Node ID = 254 (the node ID is obtained from a DHCP server)

Displays

LED			
Pos.	**Colour**	**Condition**	**Description**
A	green	off	The communication module is supplied with voltage, but has no connection to the basic device (basic device is either switched off, in the initialisation phase, or not available).
		on	The communication module is supplied with voltage and is connected to the standard device.
B	green	The NMT state machine triggers the two-colored LED: ● Green: Display of status messages ● Red: Display of error messages	
		Off	NMT_GS_OFF, NMT_GS_INITIALISATION, NMT_CS_NOT_ACTIVE / NMT_MS_NOT_ACTIVE
			NMT_CS_PREOPERATIONAL_1 / NMT_MS_PREOPERATIONAL_1 (LED flashes once within a second.)
			NMT_CS_PREOPERATIONAL_2 / NMT_MS_PREOPERATIONAL_2 (LED flashes twice within a second.)
			NMT_CS_READY_TO_OPERATE / NMT_MS_READY_TO_OPERATE (LED flashes three times within a second.)
			NMT_CS_BASIC_ETHERNET (LED is blinking with a frequency of 10 Hz or depending on the connection state)
			NMT_CS_STOPPED (LED is blinking with a frequency of 2.5 Hz.)
			NMT_CS_OPERATIONAL / NMT_MS_OPERATIONAL (LED is lit permanently.)
	Red		ERROR (LED is lit permanently. An error has occurred.)
C	Red	On	The red and green drive LED indicates the operating status of the standard device (see documentation of the standard device).
D	green	blinking	Depending on the connection state, the data is transmitted or received (ACTIVITY).
E	yellow	on	Ethernet connection is available (LINK).

4 Technical data

4.1 General data and operating conditions

Field	Values
Order designation	EMF2191IB
Communication profile	Ethernet POWERLINK V2
Interface	RJ45, Fast Ethernet Mode MII (according to IEEE 802.3)
Communication medium	TP (100BaseTX, Cat5e)
Cable length	max. 100 m between 2 nodes / hubs
Total extension	Number of nodes x 100 m
Network topology	Tree, star, line
Transmission mode	Half duplex
Type of node	Slave (CN, Controlled Node)
Node address	Max. 239
Conformities, approvals	• CE • cUL
Baud rate	100 Mbps
Voltage supply	External supply via separate power supply unit + V = 24 V DC (20.4 V - 0 % ... 28.8 V + 0 %) I = 140 mA - Reference potential for external voltage supply

Documentation for Lenze series of devices 8200 vector, 9300 and ECS

Here you can find the **ambient conditions** and the **electromagnetic compatibility (EMC)** specifications applying to the communication module.

4.2 Protective insulation

Danger!

Dangerous electrical voltage

If Lenze controllers are used on a phase earthed mains with a rated mains voltage ≥ 400 V, protection against accidental contact is not ensured without implementing external measures.

Possible consequences:

► Death or serious injury

Protective measures:

► If protection against accidental contact is required for the control terminals of the controller and the connections of the plugged device modules, ...
  – a double isolating distance must exist.
  – the components to be connected must be provided with the second isolating distance.

Insulation between bus and ...	Type of insulation (in accordance with EN 61800-5-1)
● Earth reference / PE	Functional insulation
● With external supply	Functional insulation
● Power stage	
– 8200 vector	Reinforced insulation
– 9300 servo inverter	Reinforced insulation
– 93xx servo position controller	Reinforced insulation
– 93xx servo register control	Reinforced insulation
– 93xx servo cam profiler	Reinforced insulation
– 9300 vector / Servo PLC	Reinforced insulation
– ECS devices	Reinforced insulation
● Control terminals	
– 8200 vector	Functional insulation
– 9300 servo inverter	Basic insulation
– 93xx servo position controller	Basic insulation
– 93xx servo register control	Basic insulation
– 93xx servo cam profiler	Basic insulation
– 9300 vector / Servo PLC	Basic insulation
– ECS devices	Basic insulation

4.3 Data for POWERLINK communication

Field	Values	
Jitter synchronisation information	approx. 1 µs	
Total cycle times	Slave (CN):	1, 2, 3 ... 60 ms ● The module can be operated with a minimum cycle of 1 ms. ● In multiplex mode, a minimum cycle of 200 µsec is supported if the data is accepted on the millisecond.
Buffer size	Tx-iso:	max. 92 bytes (64 bytes of PDO user data)
	Rx-iso:	max. 328 bytes (300 bytes of PDO user data)
Frame size	Max. asynchronous telegram size (MTU): 1518 bytes	
SDO communication method	UDP/IP	
Number of RPDOs	3	
RPDO user data per application (all RPDOs)	max. 32 objects with a total of max 64 bytes	
Number of TPDOs	1	
TPDO user data per application	max. 32 objects with a total of max 64 bytes	
Delay time	T_{PReq} - T_{PRes}:	1900 ns
	T_{SoA} - T_{ASnd}:	1900 ns

4.3.1 Cycle time

The cycle time of the communication system is the time in which all process data between the master (managing node) and the slaves (controlled nodes) are exchanged.

It depends on the data of the communication system and can be calculated as follows e. g. for a baud rate of 500 kbps:

$$t_{zykl} = 3,35 \cdot 10^{-3} (n + 48 + 3\,BK) + 0,24\,L + 0,2$$

t_{cycl}	Cycle time [ms]
n	Sum of all data bits in the POWERLINK network
BK	Number of bus terminals
L	Length of the remote bus cable [km]

The following diagram shows the relation between cycle time and number of connected fieldbus nodes. The given values refer to the connection of Lenze inverters (e.g. 82xx) with 48 bits (1 parameter data word + 2 process data words).

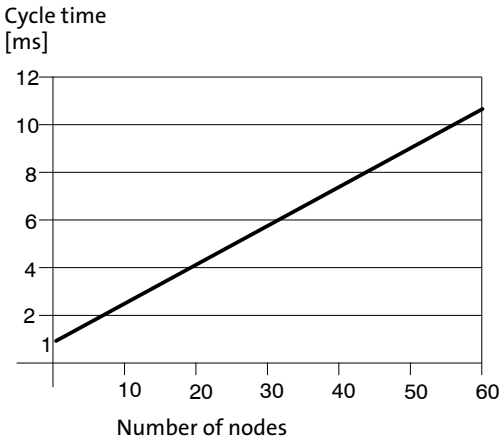


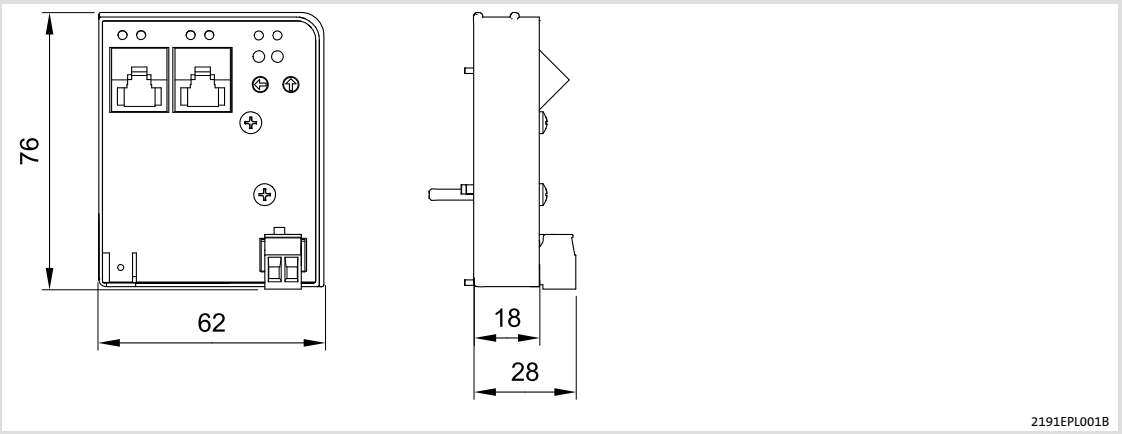
Fig. 4-1 Relationship between cycle time and number of nodes

4.3.2 Processing time in the inverter

There are no interdependencies between parameter data and process data.

Processing times	Parameter data	Process data
Processing time inside the inverter	• For controller-internal parameters approx. 30 ms + a tolerance of 20 ms • Some codes may have a longer processing time (see documentation of the inverter)	• There is no synchronisation between the communication module and the inverter. • Times of 8200 vector/motec, starttec: Approx 3 ms + a tolerance of 2 ms • Times of 9300 / ECS: Approx. 2 ms + a tolerance of 1 ms (each being independent of the basic cycle time)
Additional times outside the inverter	• Communication transfer times • Communication processing times of the transmitting node	

4.4 Dimensions



All dimensions in mm

5 Installation

Danger!

Inappropriate handling of the communication module and the standard device can cause serious personal injury and material damage.

Observe the safety instructions and residual hazards described in the documentation for the standard device.

Stop!

The device contains components that can be destroyed by electrostatic discharge!

Before working on the device, the personnel must ensure that they are free of electrostatic charge by using appropriate measures.

5.1 Mechanical installation

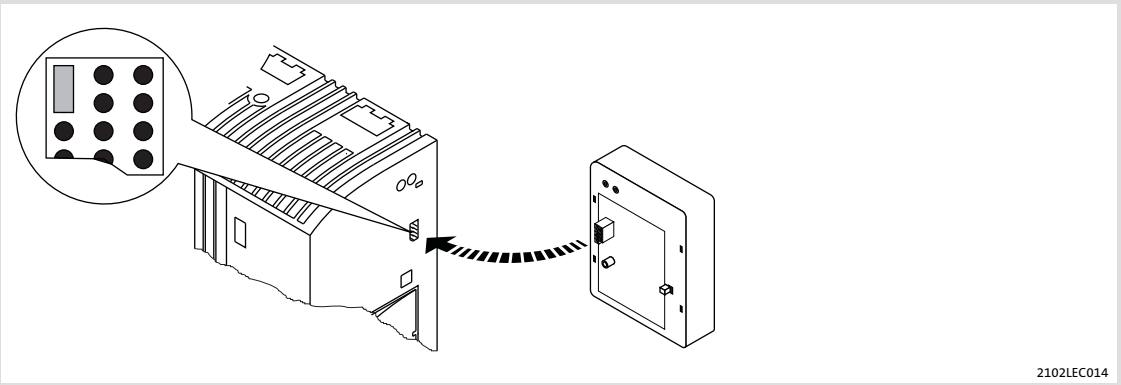


Fig. 5-1 Attaching the communication module

- ► Plug the communication module onto the standard device (here: 8200 vector).
- ► Tighten the communication module to the standard device using the fixing screw in order to ensure a good PE connection.

Note!

For the internal supply of the communication module by the 8200 vector frequency inverter the jumper has to be adjusted within the interface opening (see illustration above).

Observe the notes (📖 32).

5.2 Electrical installation

5.2.1 Wiring according to EMC (CE-typical drive system)

For wiring according to EMC requirements observe the following points:

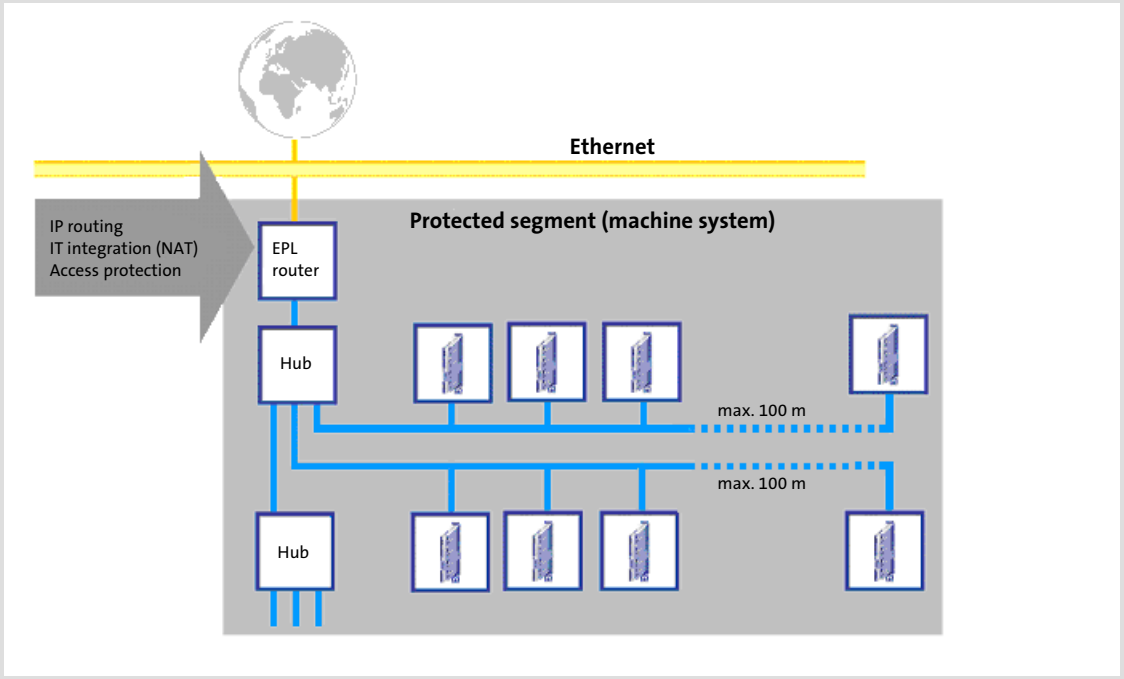
Note!

- ► Separate control cables/data lines from motor cables.
- ► Connect the shields of control cables/data lines *at both ends* in the case of digital signals.
- ► Use an equalizing conductor with a cross-section of at least 16 mm^2 (reference: PE) to avoid potential differences between the bus nodes.
- ► Observe the other notes concerning EMC-compliant wiring given in the documentation for the standard device.

Wiring procedure

1. Comply with bus topology, thus do not use stubs.
2. Observe notes and wiring instructions in the documents for the control system.
3. Only use cables that comply with the given specifications (🕮 30).
4. Observe notes for the voltage supply of the module (🕮 32).

5.2.2 Network topology



Detailed information on this topic can be found in the Ethernet POWERLINK brochure ”Real-time Industrial Ethernet is reality”

5.2.3 POWERLINK

POWERLINK network segment

Note!

Standard Ethernet nodes are not permitted in the POWERLINK network segment.

In order to use the real-time capability of the POWERLINK technology, the POWERLINK nodes must be interconnected in a separate network segment.

In accordance with the POWERLINK rules, only the network master (managing node) controls the access of the slaves (controlled nodes) to the network. The network master is the only node that transmits autonomously. All other nodes (controlled nodes) only transmit when they are entitled to transmit by the master.

Non-POWERLINK nodes (e.g. PCs) typically violate these rules by sending frames independently of the master. These frames interfere with the cyclic frame exchange of the POWERLINK nodes and prevent the real-time capability of the POWERLINK.

Connection to the standard Ethernet network

The connection to an external standard Ethernet network is carried out via an Ethernet POWERLINK router.

These infrastructure component separates the network traffic in the POWERLINK network segment from the one in the standard Ethernet. The handling of the frames depend on their direction:

- Standard Ethernet ---> POWERLINK network segment

  Only frames that are addressed to nodes in the POWERLINK network segment are forwarded. The forwarding takes place in the asynchronous area of the POWERLINK cycle.

- POWERLINK network segment ---> Standard Ethernet

  Only asynchronous frames that are not addressed to nodes in the POWERLINK network segment are forwarded.

Topologies in the POWERLINK network segment

Note!

The use of class 1 hubs and switches inside the POWERLINK network segment is not permitted.

Inside the segment only Ethernet hubs may be used as infrastructure elements. The hubs must meet the requirements on class 2 repeaters acc. to IEEE 802.3u.

For this purpose, Lenze offers the dual hub integrated into the communication module and the separate eight-fold hub, type E94AZCEH.

Class 1 hubs and switches are not permissible since they have considerably longer delay times for the frame forwarding and a bigger jitter. Both sizes reduce the real-time capability and dynamics.

The cable length between both nodes is limited to 100 m.

The topology rules (IEEE 802.3u) required for controlling the collisions may be violated in the POWERLINK network segment since according to the POWERLINK access order, frame collisions are prevented. This enables a structure of lines and any hybrid forms between star and line topology.

Recommended topology

For an easy configuration and due to many possible topology variants we recommend to create networks according to the following rules:

1. Create slave groups with up to 10 nodes
2. Connect groups in star shape to the master (managing node).
3. For more than 2 groups: Use external 8-port hubs, e. g. Lenze hub E94AZCEH.

   Exception: For maximally 2 groups, these are directly connected to the two ports of the communication module.

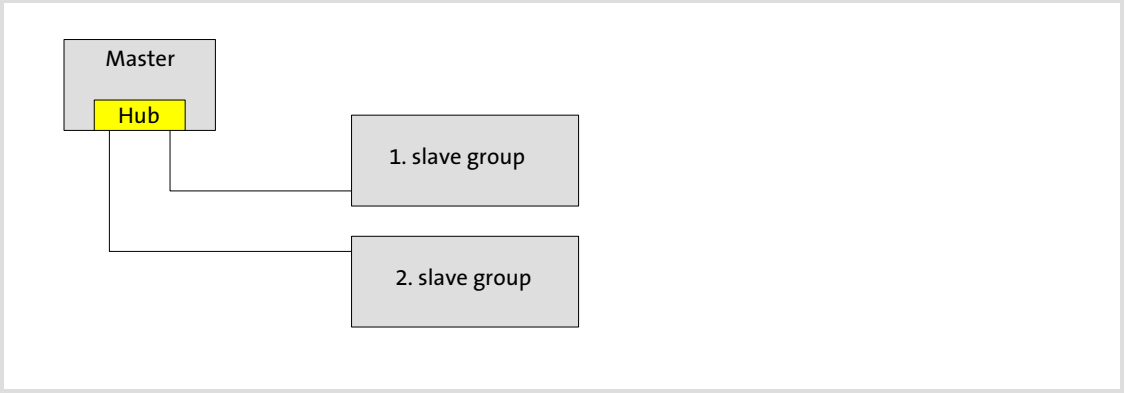


Fig. 5-2 Star topology for 1 to 2 slave groups

4. Connect slave groups to the master via one external hub each.
   – For max. 7 slave groups one hub is sufficient.
   – For more than 7 slave groups, use further hubs.
   – The groups can be distributed on the hubs just as you like.

5.2.4 Operation in the standard Ethernet

Note!

Operation in the standard Ethernet does not permit any real-time communication.

The communication module can be operated in the standard Ethernet for a basic parameter setting provided that the following applies:

1. Operation of the module in slave mode:
   – Network address ≤239
   – IP address: 192.168.100.<*EPL address*>
2. Real time operation must not be carried out.
3. No integration of a master (EPL address ≥ 240) into the standard Ethernet network.

More notes on wiring

► Do not wire, if possible, more than 9 nodes in succession in a network line.

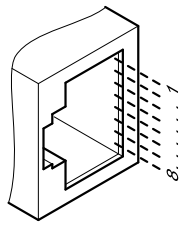
5.2.5 POWERLINK connection

You can use a standard Ethernet patch cable for connecting the communication module to the fieldbus (see "Ethernet cable specifications" (📖 30)).

Note!

Plug/remove the Ethernet cable plug in a straight manner (at right angles) into/from the socket to make sure that the RJ45 socket will not be damaged.

Pin assignment

RJ45 socket	PIN	Signal
 E94AYCXX004C	1	Tx +
	2	Tx -
	3	Rx +
	4	-
	5	-
	6	Rx -
	7	-
	8	-

Tip!

The POWERLINK interfaces feature an auto MDIX function. This function adjusts the polarity of the RJ45 interfaces so that a connection is established irrespective of the polarity of the opposite POWERLINK interface, and irrespective of the type of cable used (standard patch cable or crossover cable).

5.2.6 Specification of the Ethernet cable

Note!
Only use cables complying with the below specifications.

Ethernet cable specifications	
Ethernet standard	Standard Ethernet (according to IEEE 802.3), 100base TX (fast Ethernet)
Cable type	S/FTP (Screened Foiled Twisted Pair), ISO/IEC 11801 or EN 50173, CAT 5e
Damping	23.2 dB (at 100 MHz and per 100 m)
Crosstalk damping	24 dB (at 100 MHz and per 100 m)
Return loss	10 dB (per 100 m)
Surge impedance	100 Ω

Design of the Ethernet cable

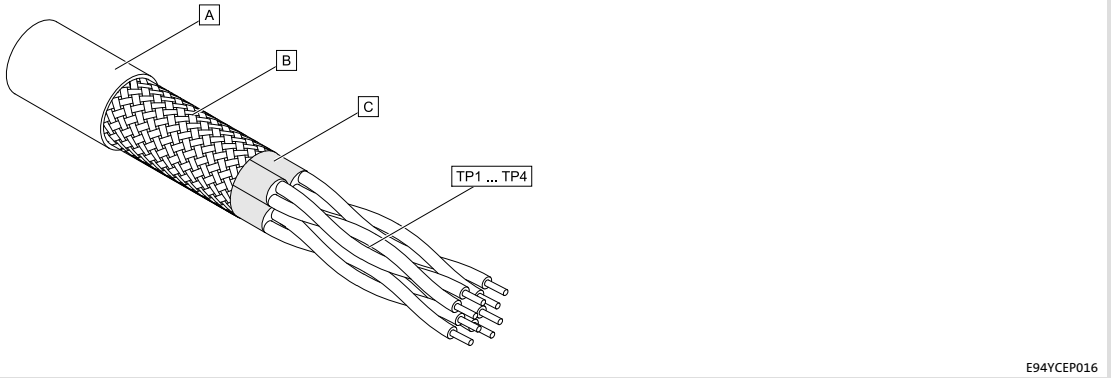


Fig. 5-3 Design of the Ethernet cable (S/FTP, CAT 5e)

A	Cable insulation
B	Braid
C	Foil shielding of the core pairs
TP1 ... TP4	Twisted core pairs 1 ... 4

Colour code of Ethernet cable

Note!

Wiring and colour code are standardised in EIA/TIA 568A/568B.

You can use 4-pin Ethernet cables in accordance with the industrial standard. The cable type only connects the assigned pins 1, 2, 3 and 6 with each other.

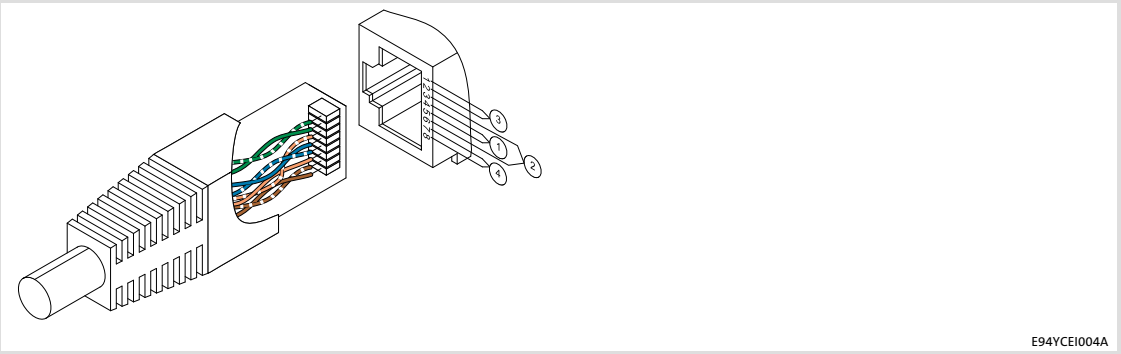


Fig. 5-4 Ethernet plug in accordance with EIA/TIA 568A/568B

Pair	Pin	Signal	EIA/TIA 568A	EIA/TIA 568B
3	1	Tx +	White/green	White/orange
	2	Tx -	Green	Orange
2	3	Rx +	White/orange	White/green
1	4	Not assigned	Blue	Blue
	5	Not assigned	White/blue	Blue/white
2	6	Rx -	Orange	Green
4	7	Not assigned	White/brown	White/brown
	8	Not assigned	Brown	Brown

5.2.7 Voltage supply

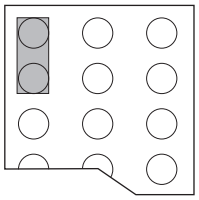
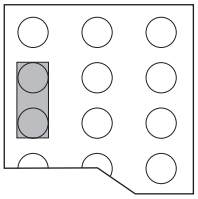
Internal voltage supply

Note!

Internal voltage supply has been selected in the case of standard devices with an extended AIF interface opening (e.g. front of 8200 vector). The area shown on a grey background in the graphic marks the jumper position.

- ► By default, this is **not** supplied internally in the standard device.
- ► For internal voltage supply place the jumper on the position indicated below.

In the case of all other device series (9300, ECS), voltage is always supplied from the standard device.

Lenze setting (Only external voltage supply possible.)	**Internal voltage supply**
	

External voltage supply

Note!

In the case of an external voltage supply and for greater distances between the control cabinets, always use a separate power supply unit (SELV/PELV) that is safely separated in accordance with EN 61800-5-1 in each control cabinet.

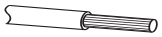
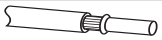
The external voltage supply of the communication module ...

- ► is required if communication via the fieldbus is to be continued when the supply of the device fails.
- ► is provided via the 2-pin terminal strip with screw-type connection (24 V DC):

Terminal	Description
+	External voltage supply U = 24 V DC (20.4 V - 0 % ... 28.8 V + 0 %) I = 85 mA
-	Reference potential for external voltage supply

- ► The parameters of a standard device disconnected from the mains cannot be accessed.

Terminal data

Area	Values	
Electrical connection	Plug connector with screw connection	
Possible connections	rigid:	
		1.5 mm² (AWG 16)
	flexible:	
		without wire end ferrule 1.5 mm² (AWG 16)
		with wire end ferrule, without plastic sleeve 1.5 mm² (AWG 16)
		with wire end ferrule, with plastic sleeve 1.5 mm² (AWG 16)
Tightening torque	0.5 ... 0.6 Nm (4.4 ... 5.3 lb-in)	
Stripping length	6 mm	

6 Commissioning

During commissioning, system-dependent data as e.g. motor parameters, operating parameters, responses and parameters for fieldbus communication are selected for the controller.

In Lenze devices, this is done via codes. The codes are stored in numerically ascending order in the Lenze controllers and in the plugged-in communication/function modules.

In addition to these configuration codes, there are codes for diagnosing and monitoring the bus devices.

6.1 Before switching on

Stop!

Before switching on the standard device with the communication module for the first time, check the entire wiring for completeness, short circuit and earth fault.

6.2 Setting the node address

Note!

- ► Use different node addresses for several networked inverters.
  The Lenze setting for the node address (node ID) has the value ’4’:
  – link switch in position ’0’
  – right switch in position ’4’
- ► Switch the voltage supply of the inverter/communication module off and on again to activate changed settings.

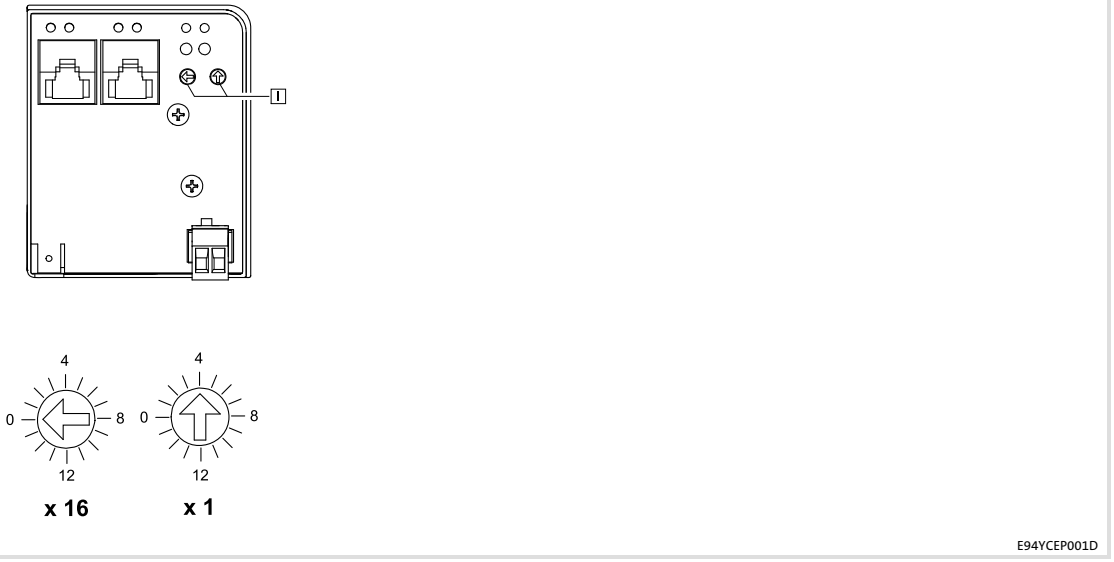


Fig. 6-1 Setting the node address

Each node has to be assigned to a unique address (node ID).

- ► Valid address range for slave (controlled node): 1 ... 239
- ► The corresponding IP address of the communication module results from the setting of the two rotary switches.
  IP address: 192.168.100.**<Node ID>**

$$(\text{Value}\left\{\textbf{\textit{Left Switch}}\right\} \times 16) + (\text{Value}\left\{\textbf{\textit{Right Switch}}\right\}) = \text{Node Address}$$

Example

- ► Left rotary switch in position ’2’
- ► Right rotary switch in position ’5’

$$(2 \times 16) + 5 = 37$$

==> The node address is ’37’.

6.3 Configuration via the ”Automation Studio”

The upgrade mechanism of the ”Automation Studio” of the B & R company serves to establish an internet connection via which the necessary installation files are called.

After the upgrade, tick ”display customised devices” in the hardware selection list to display the Lenze devices.

The following functions are available:

- Adding Lenze devices to the hardware configuration
- Setting node parameters (e.g. node ID)
- I/O configuration (basic configuration settings of the controller)
- Defining the I/O mapping (assignment of the process data objects of the controller to the PLC objects)

The communication module is configured like a B & R device. The I/O configuration indicates the code which are compulsory for commissioning the inverter.

If further codes have to be written, library functions from the PLC project can be used. For this purpose, you can find the ”AsEPL” library in the ”Library Manager”. It provides the functions ”EplSDOWrite” and ”EplSDORead” which serve to read and write any parameters of the device.

Indexing the Lenze codes

The index number is converted to a code as follows:

Conversion formula	
Index (dec)	**Index (hex)**
24575 - Lenze code	0x5FFF - (Lenze code)

Example of C0001 (operating mode):

Index (dec)	Index (hex)
24575 - 1 = 24574	0x5FFF - 1 = 0x5FFE

Further information on the ”Automation Studio” functions can be found in the corresponding documentation.

6.4 Initial switch-on

Switch on the inverter and check whether it is ready for operation using the diagnostic LEDs at the front of the communication module.

- ► Red diagnostic LEDs must not be on.
- ► The following signalling should be visible:

LED			
Pos.	**Colour**	**Condition**	**Description**
A	green	on	The communication module is supplied with voltage and is connected to the standard device.
B	green	The NMT state machine triggers the two-colored LED: ● Green: Display of status messages ● Red: Display of error messages	
			NMT_CS_BASIC_ETHERNET (LED is blinking with a frequency of 10 Hz or depending on the connection state)
			NMT_CS_OPERATIONAL / NMT_MS_OPERATIONAL (LED is lit permanently.)
D	green	blinking	Depending on the connection state, the data is transmitted or received (ACTIVITY).
E	yellow	on	Ethernet connection is available (LINK).

7 Diagnostics

The LEDs on the front are provided to the communication module for the purpose of fault diagnostics.

Displays

LED			
Pos.	**Colour**	**Condition**	**Description**
A	green	off	The communication module is supplied with voltage, but has no connection to the basic device (basic device is either switched off, in the initialisation phase, or not available).
		on	The communication module is supplied with voltage and is connected to the standard device.
B	green	The NMT state machine triggers the two-colored LED: ● Green: Display of status messages ● Red: Display of error messages	
		Off	NMT_GS_OFF, NMT_GS_INITIALISATION, NMT_CS_NOT_ACTIVE / NMT_MS_NOT_ACTIVE
			NMT_CS_PREOPERATIONAL_1 / NMT_MS_PREOPERATIONAL_1 (LED flashes once within a second.)
			NMT_CS_PREOPERATIONAL_2 / NMT_MS_PREOPERATIONAL_2 (LED flashes twice within a second.)
			NMT_CS_READY_TO_OPERATE / NMT_MS_READY_TO_OPERATE (LED flashes three times within a second.)
			NMT_CS_BASIC_ETHERNET (LED is blinking with a frequency of 10 Hz or depending on the connection state)
			NMT_CS_STOPPED (LED is blinking with a frequency of 2.5 Hz.)
			NMT_CS_OPERATIONAL / NMT_MS_OPERATIONAL (LED is lit permanently.)
	Red		ERROR (LED is lit permanently. An error has occurred.)
C	Red	On	The red and green drive LED indicates the operating status of the standard device (see documentation of the standard device).
D	green	blinking	Depending on the connection state, the data is transmitted or received (ACTIVITY).
E	yellow	on	Ethernet connection is available (LINK).

8 Appendix

8.1 Index table

Overview

The following objects specified by the Ethernet POWERLINK communication profile are supported.

Tip!

The Ethernet POWERLINK specification contains details on the POWERLINK communication profile and can be obtained from the Ethernet POWERLINK Standardisation Group (EPSG):

http://www.ethernet-powerlink.org

EPL index	Subindex	Index name	More information
0x1000		NMT_DeviceType_U32	📖 42
0x1001		ERR_ErrorRegister_U8	📖 42
0x1003		ERR_History_ADOM	-
0x1006		NMT_CycleLen_U32	📖 42
0x1008		NMT_ManufactDevName_VS	-
0x1009		NMT_ManufactHwVers_VS	-
0x100A		NMT_ManufactSwVers_VS	-
0x1010		NMT_StoreParam_REC	-
0x1011		NMT_RestoreDefParam_REC	-
0x1018	1 ... 4	NMT_IdentityObject_REC	📖 42
0x1020		CFM_VerifyConfiguration_REC	-
0x1030	1 ... 9	NMT_InterfaceGroup_0h_REC	📖 43
0x1101	1	Dia_NMTTelegramCount_REC	📖 43
0x1400	1 ... 2	PDO_RxCommParam_00h_REC	📖 43
0x1401	1 ... 2	PDO_RxCommParam_01h_REC	📖 44
0x1402	1 ... 2	PDO_RxCommParam_02h_REC	📖 44
0x1600	1 ... 20	PDO_RxMappParam_00h_REC	📖 44
0x1601	1 ... 20	PDO_RxMappParam_01h_REC	📖 45
0x1602	1 ... 20	PDO_RxMappParam_02h_REC	📖 45
0x1800	1 ... 2	PDO_TxCommParam_00h_REC	-
0x1A00	1 ... 20	PDO_TxMappParam_00h_REC	📖 46
0x1C0A		DLL_CNCollision_REC	📖 46
0x1C0B		DLL_CNLossSoC_REC	📖 46
0x1C0C		DLL_CNLossSoA_REC	-
0x1C0D		DLL_CNLossPReq_REC	-
0x1C0E		DLL_CNSoCJitter_REC	-
0x1C0F		DLL_CNCRCError_REC	📖 47
0x1C10		DLL_CNLossOfLinkCum_U32	📖 47
0x1C13		DLL_CNSoCJitterRange_U32	-

EPL index	Subindex	Index name	More information
0x1C14		DLL_LossOfFrameTolerance_U32	-
0x1E40	1 ... 5	NWL_IpAddrTable_0h_REC	📖 48
0x1E4A	1 ... 3	NWL_IpGroup_REC	-
0x1F50		PDL_DownloadProgData_ADOM	-
0x1F51		PDL_ProgCtrl_AU8	-
0x1F52		PDL_LocVerApplSw_REC	-
0x1F81	1 ... 64	NMT_NodeAssignment_AU32	📖 49
0x1F82		NMT_FeatureFlags_U32	📖 50
0x1F83		NMT_EPLVers_U8	📖 50
0x1F8C		NMT_CurrState_U8	📖 51
0x1F8D	1 ... 64	NMT_MNPResPayloadList_AU32	📖 51
0x1F93	1 ... 2	NMT_EPLNodeID_REC	📖 51
0x1F98	1 ... 9	NMT_CycleTiming_REC	-
0x1F99		NMT_CNBasicEthernetTimeout_U32	📖 51
0x1F9A		NMT_HostName_VSTR	📖 52
0x1F9E		NMT_ResetCmd_U8	📖 52

How to read the index table

Model of an index table

Index	Name			
Subcode	Lenze	Values	Data type	
			Access:	

Meaning

Header	Meaning
Index	Number of the Ethernet POWERLINK index I-xxxx
Name	Display text

Leading columns	Meaning		
Subcode	Number of the subcode		
Lenze	Lenze setting (”Default” setting) of the code		
	Disp	→ Display code The code cannot be configured.	
Values	Minimum value	[smallest increment/unit]	Maximum value
	In case of a display code the displayed values are specified.		
Data type	• BITFIELD_8		
	• BITFIELD_32		
	• U8	8 bit value without sign	
	• U16	16 bit value without sign	
	• U32	32 bit value without sign	
	• U64	64 bit value without sign	
	• VS	Visible String, string with specified length	

Footer	Meaning
Access	ro: The parameter can only be read (display code) rw: The parameter can be changed

I-1000: EPL device type

Index 0x1000	EPL name NMT_DeviceType_U32			
Subcode	Lenze	Values	Data type	
-	Disp		U32	
			Access: ro	

The object displays the device type of the node.

I-1001: EPL error register

Index 0x1001	EPL name ERR_ErrorRegister_U8			
Subcode	Lenze	Values	Data type	
-	Disp		U8	
			Access: ro	

The object contains currently pending errors arranged according to error classes. The bits of the error register have the following meaning:

Bit	Description
0	Generic error, signals an existing error message in the CN which can be read out via StatusResponse
1	Amperage
2	Voltage
3	Temperature
4	Communication error
5	Device profile-related error
6	Reserved (0)
7	Manufacturer-specific error

I-1006: EPL cycle time

Index 0x1006	EPL name NMT_CycleLen_U32			
Subcode	Lenze	Values	Data type	
-	1	1 ... [1 ms] ... 20	U32	
			Access: rw	

The object contains the length of the EPL cycle in [µs].

I-1018: EPL identity object

Index 0x1018	EPL name NMT_IdentityObject_REC			
Subcode	Lenze	Values	Data type	
1: VendorId_U32		0x59	U32	
2: ProductCode_U32		2191		
3: RevisionNo_U32		0x00000000		
4: SerialNo_U32				
			Access: ro	

The object contains identification information on the communication module.

I-1030:
EPL MAC address

Index **0x1030**	EPL name **NMT_InterfaceGroup_0h_REC**			
Subcode	Lenze	Values	Data type	
1: InterfaceIndex_U16	Disp	0	U16	
2: InterfaceDescription_VSTR		EMF2191IB_1	VSTR	
3: InterfaceType_U8		6	U8	
4: InterfaceMtu_U32		1500	U32	
5: InterfacePhysAddress_OSTR		”00:0A:86:84:xx:xx”	OSTR	
6: InterfaceName_VSTR		”IF1”	VSTR	
7: InterfaceOperStatus_U8		1	U8	
			Access: ro for subcodes 1, 2, 3, 4, 5 and 7 Access: rw for subcode 6	

The object contains information on the Ethernet interface. The subcode 5 contains the MAC address. When the communication module is produced, the MAC address is assigned unequivocally worldwide and provides addressing on the lowest level.

I-1101:
EPL telegram counter

Index **0x1101**	EPL name **DIA_NMTTelegrCount_REC**			
Subcode	Lenze	Values	Data type	
1: IsochrCyc_U32	-	-	U32	
			Access: ro	

Subcode 1 of the object contains a counter for POWERLINK cycles. The counter is started with each power-on of the node at 0. An overflow occurs at 4.294.967.295.

I-1400:
EPL address : RPDO

Index **0x1400**	EPL name **PDO_RxCommParam_XXh_REC.NodeID_U8**			
Subcode	Lenze	Values	Data type	
1	0	0, 1 ... 240, 253, 254	U8	
			Access: rw	

Subcode 1 of the object contains the node address (node ID) of the transmitting node for the PDO channel (n+1).

Values > ’0’ describe the origin of a PRes telegram. The value ’0’ is reserved for ”PReq” (cannot be used in systems with a Lenze Servo Drive 9400 as managing node).

The value is only valid if the corresponding object 0x160x has a value > ’0’.

I-1401:
EPL address : RPDO

Index **0x1401**	EPL name **PDO_RxCommParam_XXh_REC.NodeID_U8**			
Subcode	Lenze	Values	Data type	
1	0	0, 1 ... 240, 253, 254	U8	
			Access: rw	

Subcode 1 of the object contains the node address (node ID) of the transmitting node for the PDO channel (n+1).

Values > ’0’ describe the origin of a PRes telegram. The value ’0’ is reserved for ”PReq” (cannot be used in systems with a Lenze Servo Drive 9400 as managing node).

The value is only valid if the corresponding object 0x160x has a value > ’0’.

I-1402:
EPL address : RPDO

Index **0x1402**	EPL name **PDO_RxCommParam_XXh_REC.NodeID_U8**			
Subcode	Lenze	Values	Data type	
1	0	0, 1 ... 240, 253, 254	U8	
			Access: rw	

Subcode 1 of the object contains the node address (node ID) of the transmitting node for the PDO channel (n+1).

Values > ’0’ describe the origin of a PRes telegram. The value ’0’ is reserved for ”PReq” (cannot be used in systems with a Lenze Servo Drive 9400 as managing node).

The value is only valid if the corresponding object 0x160x has a value > ’0’.

I-1600:
EPL number of RPDO

Index **0x1600**	EPL name **PDO_RxMappParam_xxh_AU64.NumberOfEntries**			
Subcode	Lenze	Values	Data type	
0	0	0, 1 ... 32	U64	
			Access: rw	

The object describes the number of valid mapping entries for the PDO channel (n+1).

The value ’0’ inhibits the PDO channel. The sum of all mapping entries enabled via the objects 0x160x must not exceed the value ’64’.

l-1601:
EPL number of RPDO

Index	EPL name			
0x1601	**PDO_RxMappParam_xxh_AU64.NumberOfEntries**			
Subcode	Lenze	Values	Data type	
0	0	0, 1 ... 32	U64	
			Access: rw	

The object describes the number of valid mapping entries for the PDO channel (n+1).

The value ’0’ inhibits the PDO channel. The sum of all mapping entries enabled via the objects 0x160x must not exceed the value ’64’.

l-1602:
EPL number of RPDO

Index	EPL name			
0x1602	**PDO_RxMappParam_xxh_AU64.NumberOfEntries**			
Subcode	Lenze	Values	Data type	
0	0	0, 1 ... 32	U64	
			Access: rw	

The object describes the number of valid mapping entries for the PDO channel (n+1).

The value ’0’ inhibits the PDO channel. The sum of all mapping entries enabled via the objects 0x160x must not exceed the value ’64’.

I-1A00: EPL TPDO

Index	EPL name			
0x1A00	**PDO_TxMappParam_00h_AU64**			
Subcode	Lenze	Values	Data type	
1 ... 32: ObjectMapping	-	see below	U64	
			Access: rw	

The object describes the mapping for the TPDO channel. Subcode 0 describes the number of valid mapping object entries. Subcodes 1 to 32 describe the mapping of the individual objects.

The entry is structured as follows:

Byte	Name	Description
0, 1	Index	EPL index of the mapped object
2	Subindex	Subindex
3	Reserved	
4, 5	Offset	Offset, calculated from the start of the PDO user data [bits]
6, 7	Length	Length of the mapped object [bits]

I-1C0A: EPL CN: Telegr. collisions

Index	EPL name			
0x1C0A	**DLL_CNCollision_REC**			
Subcode	Lenze	Values	Data type	
1: CumulativeCnt_U32	-	-	U32	
			Access: ro	

The object indicates the number of Ethernet collisions detected by the slave (controlled node).

Each event is counted. Every single event is followed by an error message. No threshold value management is implemented.

I-1C0B: EPL CN: Loss of synchr.

Index	EPL name			
0x1C0B	**DLL_CNCollision_REC**			
Subcode	Lenze	Values	Data type	
1: CumulativeCnt_U32	-	-	U32	
2: ThresholdCnt_U32	-	-		
3: Threshold_U32	1	0, 1, 2 etc.		
			Access: see below	

The slave (controlled node) expects SoC frames in time intervals which correspond to the cycle time.

The object indicates the error counters for missing SoC frames.

I-1C0F:
EPL CN: Frame error (CRC)

Index **0x1C0F**	EPL name **DLL_CNCRCError_REC**			
Subcode	Lenze	Values	Data type	
1: CumulativeCnt_U32	-	-	U32	
2: ThresholdCnt_U32	0	0, 1, 2, 3 ...	U32	
3: Threshold_U32	0	0, 1, 2, 3 ...	U32	
			Access: Subcode 3: rw , otherwise ro	

The object indicates the number of frame checksum errors detected by the slave (controlled node).

I-1C10:
EPL CN: Link interruptions

Index **0x1C10**	EPL name **DLL_CNLossOfLinkCum_U32**			
Subcode	Lenze	Values	Data type	
-	-	-	U32	
			Access: ro	

The object indicates the counter of the slave (controlled node) for Ethernet connection interruptions.

Each event is counted. Every single event is followed by an error message. No threshold value management is implemented.

I-1E40:
EPL IP address

Index **0x1E40**	EPL name **NWL_IpAddrTable_0h_REC.Addr_IPAD**			
Subcode	Lenze	Values	Data type	
2	Disp	-	U32	
3	□	-		
5	0xC0A864FE	-		
			Access: ro	

- Subcode 2:

  The subcode contains the IP address of the communication module. It is derived according to the following rule from the node address (node ID, I-1F93):

  →192.168.100.<I-1F93>

- Subcode 3:

  The subcode contains the IP subnet mask which limits the IP address range that can be addressed directly (i.e. without using a gateway in the EPL segment of the routers). In an EPL segment, the subnet mask is permanently assigned to the value ’255.255.255.0’ (0xFFFFFF00).

- Subcode 5:

  The subcode contains the IP address of the EPL router via which the EPL segment is connected to the higher-level network.

  The standard entry corresponds to the standard router address of the POWERLINK specification:

  → 192.168.100.254

  Permissible entries replace the lowest-order byte of the standard entry with the EPL address of the node which has the function of a router.

I-1F81:
EPL node declaration CN

Index	EPL name			
0x1F81	**NMT_NodeAssignment_AU32**			
Subcode	Lenze	Values	Data type	
	see table		U32	
			Access: rw	

The object describes the slave (controlled node) and its properties.

The describing bit field has the following structure:

	Relevance				
Bit	**MN**	**CN**	**Lenze**	**Value**	**Description**
0 (LSB)	☑	☑	0, 1	0	Node with this ID does not exist
				1	Node with this ID exists
1	☑	☑	0, 1	0	Node with this ID is no CN
				1	Node with this ID is a CN
2	☑	☐	1	0 *)	starting CNs are not automatically booted
				1	starting CNs are automatically booted
3	☑	☑	1	0	optional CN.
				1	obligatory CN.
4	☑	☐	0	0	CN can be reset independently of the current state using the NMTResetCommunication command
				1 *)	CN must not be reset when being in the NMT_CS_OPERATIONAL state
5	☑	☐	0	0	Application SW version verification is not required
				1 *)	Application SW version verification is required
6	☑	☐	0, 1	0	Automatic application SW update is not allowed
				1	Automatic application SW update is allowed
7	-	-	0	-	Reserved
8	☑	☑	0, 1	0	Isochronously accessed CN.
				1	AsyncOnly CN, bit 9 irrelevant
9	☑	☑	0	0	Continuously accessed CN
				1 *)	Multiplex CN
10 ... 30	-	-	0	-	Reserved
31 (MSB)	☑	☑	0, 1	0	Bit 0 .. 30 inhibited
				1	Bit 0 .. 30 enabled

*) Not permissible for Servo Drives 9400

I-1F82: EPL feature flags

Index	EPL name			
0x1F82	**NMT_FeatureFlags_U32**			
Subcode	Lenze	Values	Data type	
-	Disp		U32	
			Access: ro	

The object indicates the POWERLINK functions implemented by the slave (controlled node).

The describing bit field has the following structure:

	Relevance			
Bit	**MN**	**CN**	**TRUE**	**FALSE**
0	☐	☑	→Isochronous access is allowed	Only AsyncOnly access
1	☑	☑	→SDO via UDP/IP	No SDO by UDP/IP
2	☑	☑	SDO via EPL ASnd (only MN for Servo Drives 9400)	No SDO via EPL ASnd (only CN for Servo Drives 9400)
3	☑	☑	SDO integrated in PDO	No SDO integrated in PDO
4	☑	☑	Support NMT Info Services	No NMT Info Services
5	☑	☑	Support of extended NMT State Commands	No extended NMT State Commands
6	☑	☑	Support of dynamic PDO mapping	No dynamic PDO mapping
7	☑	☐	NMT services via UDP/IP	No NMT services via UDP/IP
8	☑	☑	Configuration manager function	No configuration manager function
9	☑	☑	Isochronous multiplex access is possible	Only isochronous cyclic access is allowed
10	☐	☑	Address assignment via SW	No address assignment via SW
11	☑	☐	Support of basic Ethernet mode of the master	No support of basic Ethernet mode of the master
12	☑	☑	Device can be used as Powerlink to standard Ethernet router	Device does not support any Powerlink to standard Ethernet function
13	☑	☑	Device can be used as Powerlink to fieldbus router	Device does not support any Powerlink to fieldbus router function
14 ... 31	-	-	Reserved (these bits are assigned to FALSE)	-

I-1F83: EPL version

Index	EPL name			
0x1F83	**NMT_EPLVers_U8**			
Subcode	Lenze	Values	Data type	
-	Disp	0x20	U8	
			Access: ro	

The object describes the version of the Ethernet POWERLINK communication profile implemented by the communication module.

The higher-order nibble describes the major version, the lower order nibble describes the minor version. The implemented value corresponds to the EPL version 2.0.

I-1F8C:
EPL communication status

Index	EPL name			
0x1F8C	**NMT_CurrNMTState_U8**			
Subcode	Lenze	Values	Data type	
-	Disp	see table		
			Access: ro	

The object contains the current NMT state.

I-1F8D:
EPL CN: Max. user data PRes RPDO

Index	EPL name			
0x1F8D	**NMT_PResPayloadList_AU16**			
Subcode	Lenze	Values	Data type	
1 ... 100	36 bytes	see description, unit: Byte	U16	
			Access: rw	

This object defines the reserved user data length of the PRes frames.

Each subcode corresponds to a node with the same node ID. The node must have been enabled via the object 0x1F81. The subcode describes the received PRes frames.

The value must be within the range of 36 ... 1490 bytes. The values are limit values for the total sizes of the PDO mappings to be defined for received PRes frames.

I-1F93:
EPL device address

Index	EPL name			
0x1F93	**NMT_EPLNodeID_REC.NodeID_U8**			
Subcode	Lenze	Values	Data type	
-	-	1 .. 239	U8	
			Access: ro	

The object contains the currently valid node address (node ID).

I-1F99:
EPL CN: Max. MN detection time

Index	EPL name			
0x1F99	**NMT_CNBasicEthernetTimeout_U32**			
Subcode	Lenze	Values	Data type	
-	5000000 µs	0 ... 50000000 µs	U32	
			Access: rw	

The object contains a time interval for a booting slave (controlled node) for detecting a master (managing node). If a booting slave (controlled node) detects a master (managing node) during the interval, it changes to NMT_CS_PREOPERATIONAL_1. If not, it changes to ”Basic Ethernet Mode”.

I-1F9A: EPL host name

Index	EPL name			
0x1F9A	**NMT_Hostname_VSTR**			
Subcode	Lenze	Values	Data type	
-	-	see "naming convention"	VS15	
			Access: rw	

The object contains a DNS-compatible device name. The length is limited to 15 characters.

Naming convention:

- The device name ...
  – starts with a letter;
  – ends with a letter or a digit.
- The device name consists of ...
  – letters (A .. Z), upper or lower case,
  – digits (0 .. 9),
  – hyphen (-).

Note!
The device name must be unambiguous within the network domain.

I-1F9E: EPL reset command

Index	EPL name			
0x1F9E	**NMT_ResetCmd_U8**			
Subcode	Lenze	Values	Data type	
-	see table		U8	
			Access: wo	

The object initiates a reset of the node. The following reset commands are available:

Command	Value	Status transition
NMTInvalidService	0xFF (255)	no function (default)
NMTResetNode	0x28 (40)	→ NMT_GS_RESET_APPLICATION
NMTResetCommunication	0x29 (41)	→ NMT_GS_RESET_COMMUNICATION
NMTResetConfiguration	0x2A (42)	→ NMT_GS_RESET_CONFIGURATION
NMTSwReset	0x2B (43)	→ NMT_GS_INITIALISING

When the reset has been executed, the object is automatically set to "NMTInvalidService".

Stop!
A reset command on a single node in the network can cause cycle and monitoring errors.

9 Index

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