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CANopen®

LE-200

- **Software/Support DVD: 490-01001**
  - Soft-No.: 490-00408

User Manual

Laser Measuring Device LE-200 with CANopen - interface

- **Additional safety instructions**
- **Installation**
- **Commissioning**
- **Configuration / Parameterization**
- **Troubleshooting / Diagnostic options**

TR electronic

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TR-Electronic GmbH
D-78647 Trossingen
Eglishalde 6
Tel.: (0049) 07425/228-0
Fax: (0049) 07425/228-33
E-mail: info@tr-electronic.de
http://www.tr-electronic.de

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Author:	MÜJ

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First release	07/24/03	00
Expansion of the function for the error output, object 2005 • Speed-check, configurable via TRWinProg	09/19/03	01
• New Object: 2007, Resolution • Revision of the warning label	12/11/03	02
• Modification of the Laser Standard DIN EN 60825-1 • Warning bit “Plausibility measured value” • Additional reflector foils, max. measuring range 240 m	12/18/07	03
• Implementation of new reflectors • Physical resolution = 0,1 mm	02/05/09	04
• Shield connection via cable screw glands removed	01/12/10	05
• General changes • Modification of the warnings • Mounting removed	03/21/13	06

1 General information

The User Manual includes the following topics:

- Safety instructions in additional to the basic safety instructions defined in the Assembly Instructions
- Electrical characteristics
- Installation
- Commissioning
- Configuration / parameterization
- Causes of faults and remedies

As the documentation is arranged in a modular structure, this User Manual is supplementary to other documentation, such as product datasheets, dimensional drawings, leaflets and the assembly instructions etc.

The User Manual may be included in the customer's specific delivery package or it may be requested separately.

1.1 Applicability

This User Manual applies exclusively to the following measuring system models with ***CANopen*** interface:

- LE-200

The products are labelled with affixed nameplates and are components of a system.

The following documentation therefore also applies:

- the operator's operating instructions specific to the system,
- this User Manual,
- and the assembly instruction which is enclosed when the device is delivered: **“TR-ELE-BA-DGB-0018”**

1.2 References

1.	ISO 11898: Road Vehicles Interchange of Digital Information - Controller Area Network (CAN) for high-speed Communication, November 1993	
2.	Robert Bosch GmbH, CAN Specification 2.0 Part A and B, September 1991	
3.	CiA DS-201	V1.1, CAN in the OSI Reference Model, February 1996
4.	CiA DS-202-1	V1.1, CMS Service Specification, February 1996
5.	CiA DS-202-2	V1.1, CMS Protocol Specification, February 1996
6.	CiA DS-202-3	V1.1, CMS Encoding Rules, February 1996
7.	CiA DS-203-1	V1.1, NMT Service Specification, February 1996
8.	CiA DS-203-2	V1.1, NMT Protocol Specification, February 1996
9.	CiA DS-204-1	V1.1, DBT Service Specification, February 1996
10.	CiA DS-204-2	V1.1, DBT Protocol Specification, February 1996
11.	CiA DS-206	V1.1, Recommended Layer Naming Conventions, February 1996
12.	CiA DS-207	V1.1, Application Layer Naming Conventions, February 1996
13.	CiA DS-301	V4.2, CANopen Communication Profile based on CAL, December 2007
14	CiA DS-302	V4.1, Additional application layer functions, February 2009
15	CiA DS-303-3	V1.3, Indicator specification, August 2006
16.	CiA DS-305	V2.2.5, Layer Setting Services (LSS) and Protocols, November 2010
17.	CiA DS-406	V3.2, CANopen Profile for Encoder, December 2006

1.3 Abbreviations and definitions

LE-200	***L***aser Measuring Device, LE-200 series
EC	***E***uropean ***C***ommunity
EMC	***E***lectro ***M***agnetic ***C***ompatibility
ESD	***E***lectro ***S***tatic ***D***ischarge
IEC	***I***nternational ***E***lectrotechnical ***C***ommission
VDE	German Electrotechnicians Association

CAN specific

CAL	***C***AN ***A***pplication ***L***ayer. The application layer for CAN-based networks as specified by CiA in Draft Standard 201 ... 207.
CAN	***C***ontroller ***A***rea ***N***etwork. Data link layer protocol for serial communication as specified in ISO 11898.
CiA	***C***AN ***i***n ***A***utomation international manufacturer and user organization e.V.: non-profit association for Controller Area Network (CAN).
CMS	***C***AN-based ***M***essage ***S***pecification. One of the service elements of the application layer in the CAN Reference Model.
COB	Communication Object. (CAN Message) A unit of transportation in a CAN Network. Data must be sent across a Network inside a COB.
COB-ID	COB-Identifier. Identifies a COB uniquely in a Network. The identifier determines the priority of that COB in the MAC sub-layer too.
DBT	Distributor. One of the service elements of the application in the CAN Reference Model. It is the responsibility of the DBT to distribute COB-ID´s to the COB´s that are used by CMS.
EDS	***E***lectronic-***D***ata-***S***heet
FSA	***F***inite ***s***tate ***a***utomata. State machine to control LSS services.
LSS	***L***ayer ***S***etting ***S***ervices. Services and protocols for the configuration of the Node-ID and Baud rate about the CAN Network.
NMT	***N***etwork ***M***anagement. One of the service elements of the application in the CAN Reference Model. It performs initialization, configuration and error handling in a CAN network.
PDO	***P***rocess ***D***ata ***O***bject. Object for data exchange between several devices.
SDO	***S***ervice ***D***ata ***O***bject. Peer to peer communication with access to the Object Dictionary of a device.

2 Additional safety instructions

2.1 Definition of symbols and instructions

⚠ WARNING	means that death or serious injury can occur if the required precautions are not met.
⚠ CAUTION	means that minor injuries can occur if the required precautions are not met.
NOTICE	means that damage to property can occur if the required precautions are not met.
	indicates important information or features and application tips for the product used.

2.2 Additional instructions for proper use

The measurement system is designed for operation with CANopen networks according to the International Standard ISO/DIS 11898 and 11519-1 up to max. 1 Mbit/s. The profile corresponds to the ***"CANopen Device Profile for Encoder CiA DS-406 V2.0A"***.

The technical guidelines for the structure of the CANopen network from the CAN User Organization CiA are always to be observed in order to ensure safe operation.

Proper use also includes:

- observing all instructions in this User Manual,
- observing the assembly instructions. The ***"Basic safety instructions"*** in particular must be read and understood prior to commencing work.

2.3 Organizational measures

- This User Manual must always kept accessible at the site of operation of the measurement system.
- Prior to commencing work, personnel working with the measurement system must have read and understood
  - the assembly instructions, in particular the chapter ***"Basic safety instructions"***,
  - and this User Manual, in particular the chapter "Additional safety instructions".

  This particularly applies for personnel who are only deployed occasionally, e.g. at the parameterization of the measurement system.

3 Technical data

The characteristics have validity, only after an operating time of approximate 30 minutes.

3.1 Electrical characteristics

Supply voltage ..... 18 - 27 V DC (± 5 %)
with heating, optional ..... 24 V DC (± 5 %)
Current consumption (no-load) ..... < 350 mA
with heating, optional ..... < 2.5 A
Measuring principle ..... Phase delay time measurement
Measuring range (on reflecting foil) ..... 0.2 – 125 m standard, 170 m, 195 m, 240 m (special devices)
other measuring ranges on request
*** Resolution** ..... selectable, physical resolution 0.1 mm
Linearization
up to 12 m (standard)..... absolute linearity error ± 3 mm
complete measuring length ..... absolute linearity error ± 5 mm
Reproducibility ..... ± 2 mm
Opto-transmitter ..... Laser diode (red light)
Wavelength λ ..... 670 nm
Max. laser power..... $P_{max} \leq 1$ mW
Laser protection class ..... 2 according to DIN EN 60 825-1: 2003-10
Lifetime ..... 50 000 h
Measured value output / refresh cycle ..... 1000 values / s
Integration time ..... 1 ms
Programming via RS485 ..... WINDOWS® compatible (TRWinProg) / Profibus-DP
CANopen Interface ..... CAN Bus Interface according to ISO/DIS 11898
Data protocol ..... CAN 20 A, CAN open Device Profile for Encoder CiA DS-406 V2.0
Output code ..... Binary
Baud rate (via switches)..... - 20 kbps, line length up to 2500 m
- 125 kbps, line length up to 500 m
- 500 kbps, line length up to 100 m
- 1000 kbps, line length up to 25 m
Special features ..... Configuration. of the following parameters via the CAN-Bus
Preset value, Clear Preset, Output value in case of an error,
Function ext. input, Automatic error acknowledgement,
Function error output, Switching functions,
Operating parameters, Position value, Measuring step,
Cyclic transmitting of the position values
*** Switching input/output**
Levels switching input ..... 1 level > +8 V, 0 level < +2 V, up to ± 35 V, 5 kOhm
Levels switching output ..... 1 level > US-2 V, 0 level < 1 V, up to 100 mA
EMC
Immunity to disturbance ..... DIN EN 61000-6-2: 2006
Transient emissions ..... DIN EN 61000-6-3: 2007

* programmable parameter

4 CANopen information's

CANopen was developed by the CiA and is standardized since at the end of 2002 in the European standard EN 50325-4.

As communication method CANopen uses the layers 1 and 2 of the CAN standard which was developed originally for the use in road vehicles (ISO 11898-2). In the automation technology these are extended by the recommendations of the CiA industry association with regard to the pin assignment and transmission rates.
In the area of the application layer CiA has developed the standard CAL (CAN Application Layer).

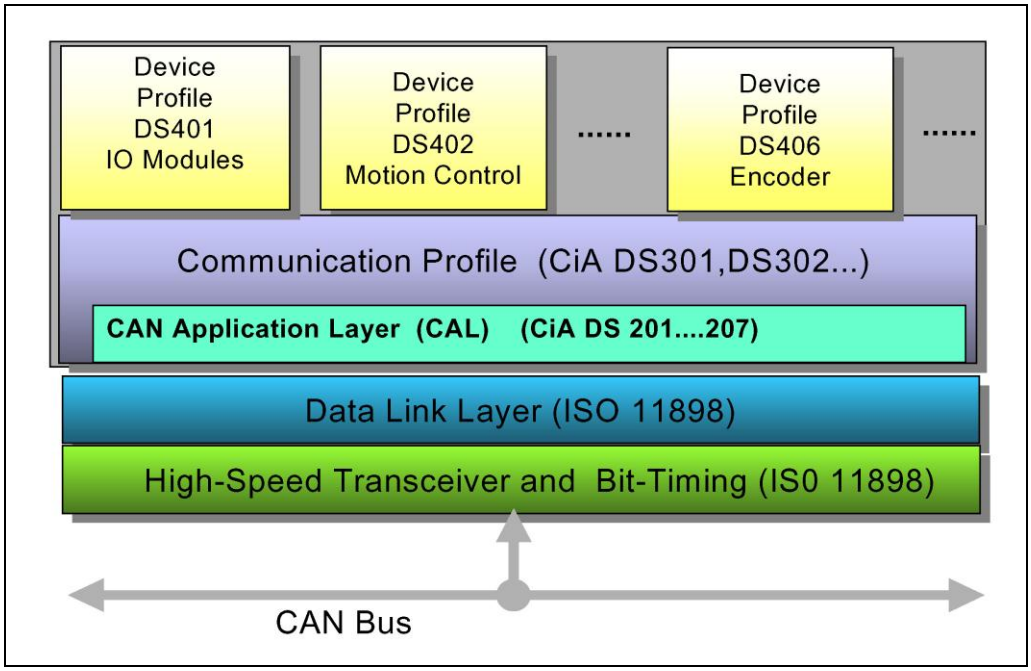


Figure 1: CANopen classified in the ISO/OSI reference model

In case of CANopen at first the communication profile as well as a "Build instructions" for device profiles was developed, in which with the structure of the object dictionary and the general coding rules the common denominator of all device profiles is defined.

4.1 CANopen – Communication profile

The CANopen communication profile (defined in CiA DS-301) regulates the devices data exchange. Here real time data (e.g. position value) and parameter data (e.g. code sequence) will be differentiated. To the data types, which are different from the character, CANopen assigns respectively suitable communication elements.

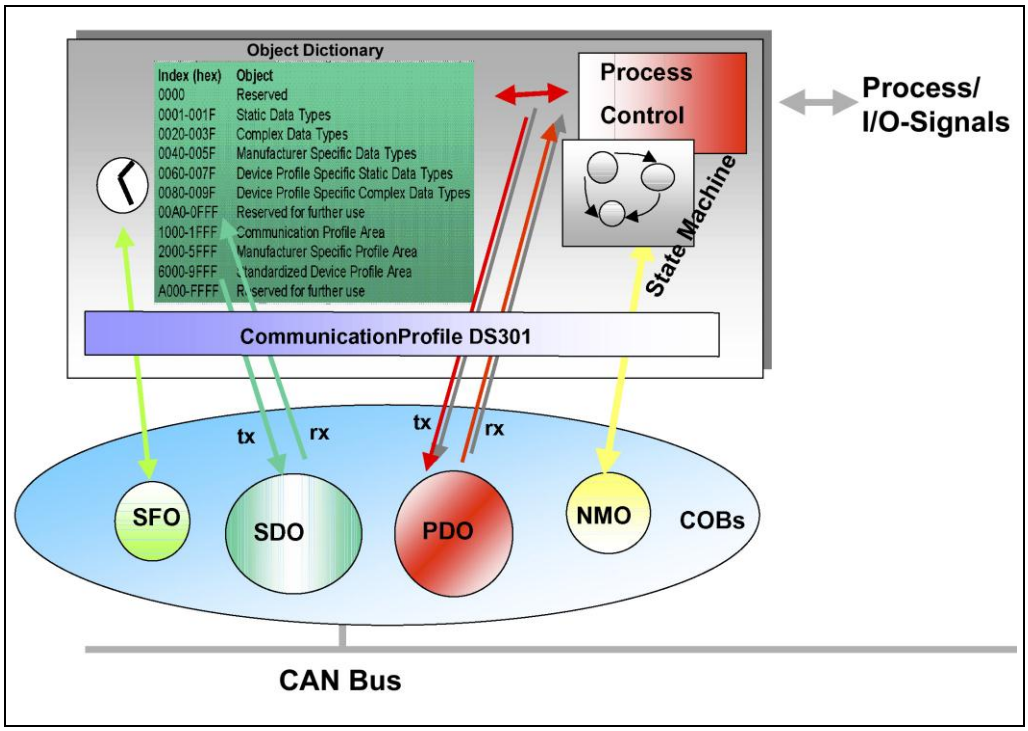


Figure 2: Communication profile

Special **F**unction **O**bject **(SFO)**

- Synchronization (SYNC)
- Emergency (EMCY) Protocol

Network **M**anagement **O**bject **(NMO)**

e.g.

- Life / Node-Guarding
- Boot-Up,…
- Error Control Protocol

4.2 Process- and Service-Data-Objects

Process-Data-Object (PDO)

Process-Data-Objects manage the process data exchange, e.g. the cyclical transmission of the position value.
The process data exchange with the CANopen PDOs is "CAN pure", therefore without protocol overhead. All broadcast characteristics of CAN remain unchanged. A message can be received and evaluated by all devices at the same time.

Service-Data-Object (SDO)

Service-Data-Objects manage the parameter data exchange, e.g. the non-cyclical execution of the Preset function.
For parameter data of arbitrary size with the SDO an efficient communication mechanism is available. For this between the configuration master and the connected devices a service data channel for the parameter communication is available. The device parameters can be written with only one telegram handshake into the object dictionary of the devices or can be read out from this.

Important characteristics of the SDO and PDO

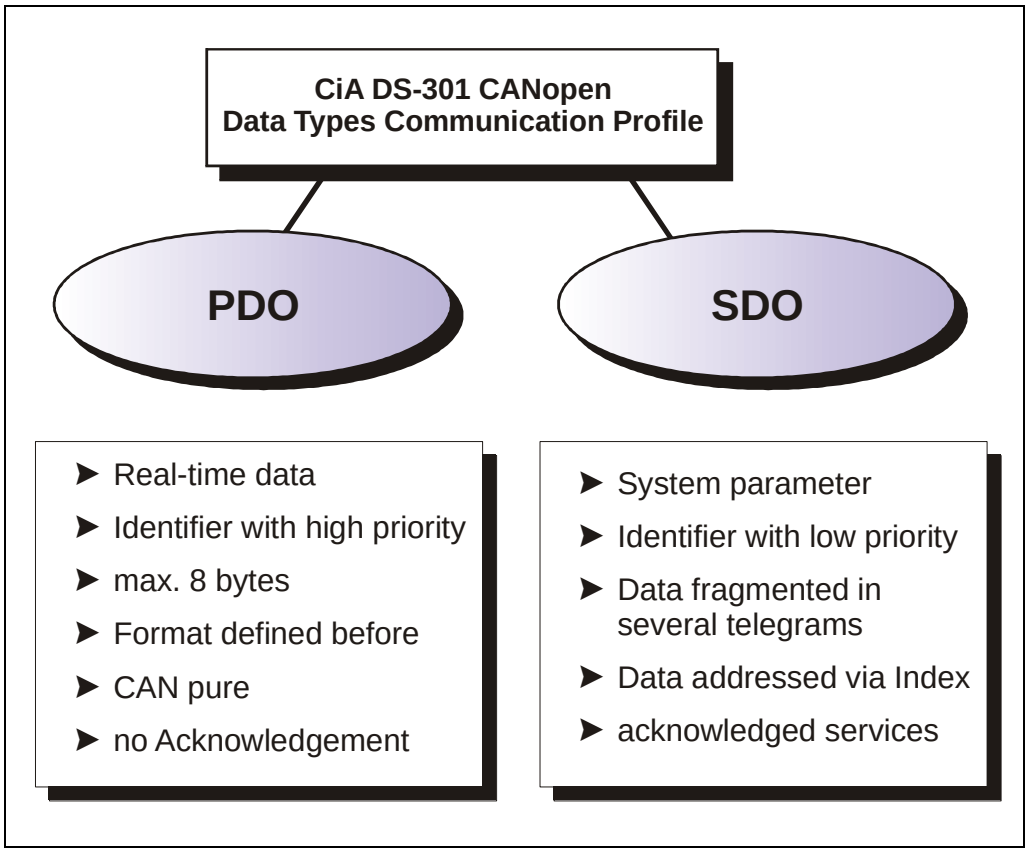


Figure 3: Comparison of PDO/SDO characteristics

4.3 Object Dictionary

The object dictionary structures the data of a CANopen device in a clear tabular arrangement. It contains all device parameters as well as all current process data, which are accessible thereby also about the SDO.

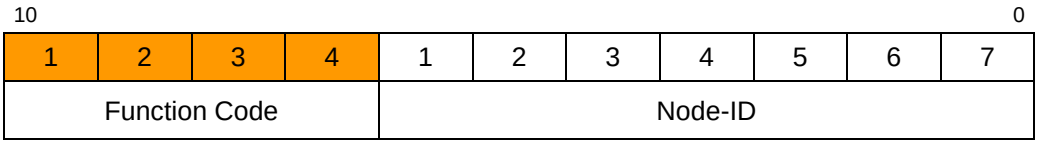
Index	Object	
0000_h	not used	Common to all devices
0001_h - $025F_h$	Data type definitions	
0260_h - $0FFF_h$	Reserved	
1000_h - $1FFF_h$	Communication profile area	
2000_h - $5FFF_h$	Manufacturer specific profile area	Device specific
6000_h - $9FFF_h$	Standardized device profile area	
$A000_h$ - $BFFF_h$	Standardized interface profile area	
$C000_h$ - $FFFF_h$	Reserved	

Figure 4: Structure of the Object Dictionary

4.4 CANopen default identifier

CANopen devices can be used without configuration in a CANopen network. Just the setting of a bus address and the baud rate is required. From this node address the identifier allocation for the communication channels is derived.

COB-Identifier = Function Code + Node-ID



Examples

Object	Function Code	COB-ID	Index Communication Parameter
NMT	0000	0	–
SYNC	0001	80h	1005
PDO1 (tx)	0011	181h – 1FFh	1800h

4.5 Network management

The network management supports a simplified Boot-Up of the net. With only one telegram all devices can be switched into the Operational condition.

After Power on the measuring system is first in the "Pre-Operational" condition (2).

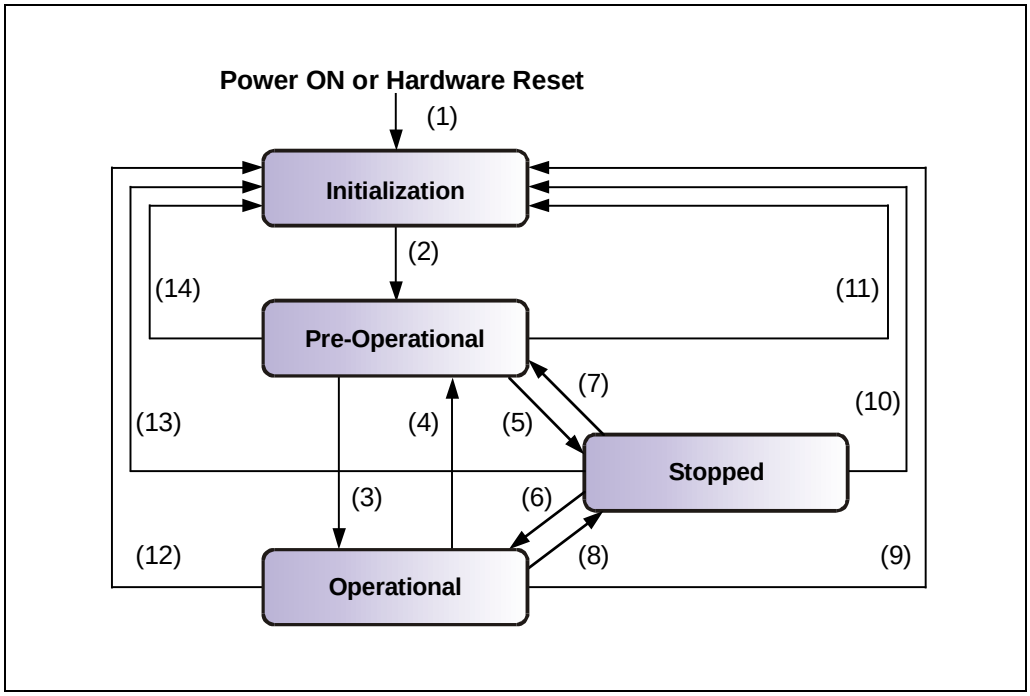


Figure 5: Boot-Up mechanism of the network management

State	Description
(1)	At Power on the initialization state is entered autonomously
(2)	Initialization finished - enter PRE-OPERATIONAL automatically
(3),(6)	Start_Remote_Node --> Operational
(4),(7)	Enter_PRE-OPERATIONAL_State --> Pre-Operational
(5),(8)	Stop_Remote_Node
(9),(10),(11)	Reset_Node
(12),(13),(14)	Reset_Communication

4.6 Device profile

The CANopen device profiles describe the "what" of the communication. In the profiles the meaning of the transmitted data is unequivocal and manufacturer independently defined. So the basic functions of each device class

e.g. for encoder: ***CiA DS-406***

can be responded uniformly. On the basis of these standardized profiles CANopen devices can be accessed in an identical way over the bus. Therefore devices which support the same device profile are exchangeable with each other.

You can obtain further information on CANopen from the ***CAN in Automation*** User- and Manufacturer Association:

CAN in Automation
Am Weichselgarten 26
DE-91058 Erlangen

Tel. +49-9131-69086-0
Fax +49-9131-69086-79

Website: www.can-cia.org
e-mail: headquarters@can-cia.org

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5 Installation / Preparation for start-up

The CANopen system is wired in bus topology with terminating resistors (120 ohms) at the beginning and at the end of the bus line. If it is possible, drop lines should be avoided. The cable is to be implemented as shielded twisted pair cable and should have an impedance of 120 ohms and a resistance of 70 mΩ/m. The data transmission is carried out about the signals CAN-H and CAN-L with a common GND as data reference potential. Optionally also a 24 V supply voltage can be carried.

In a CANopen network max. 127 slaves can be connected. The measuring system supports the Node-ID range from 1-64. The transmission rate can be adjusted via DIP-switches.

The length of a CANopen network is depending on the transmission rate and is represented in the following:

Cable cross section	20 kbit/s	125 kbit/s	500 kbit/s	1 Mbit/s
0.25 mm^2 – 0.34 mm^2	2500 m	500 m	100 m	25 m

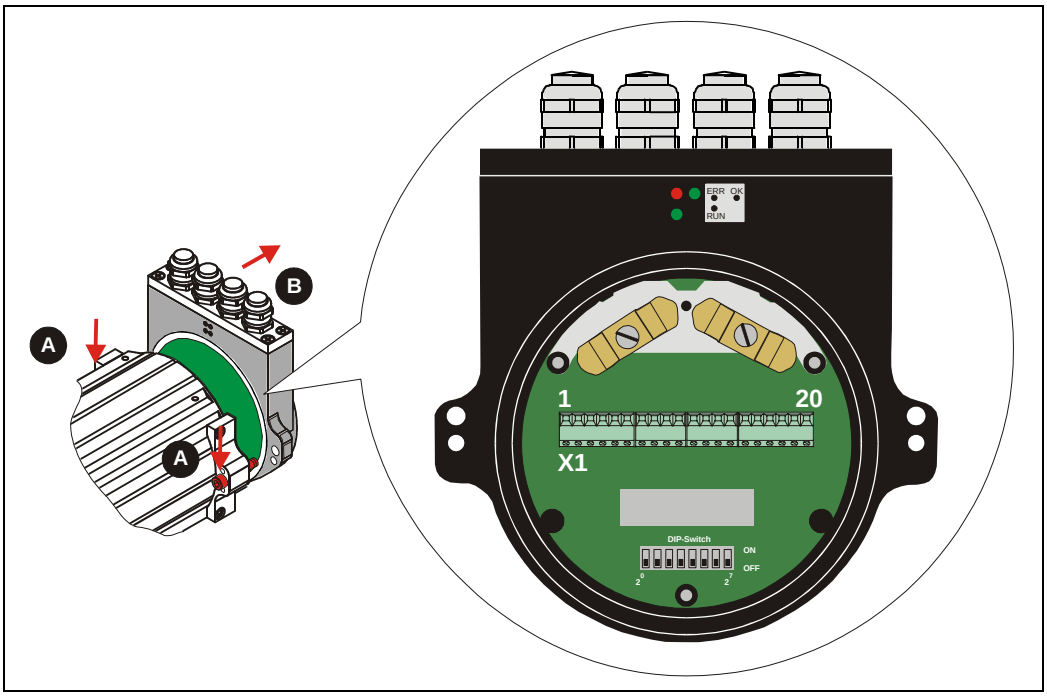
The

- *ISO 11898,*
- *the recommendations of the CiA DR 303-1 (CANopen cabling and connector pin assignment)*
- *and other applicable standards and guidelines are to be observed to insure safe and stable operation!*

In particular, the applicable EMC directive and the shielding and grounding guidelines must be observed!

5.1 Electrical connection

In order to be able to carry out the connection, the connection cap must be removed from the laser first.
For this the screws (A) are loosened and the cap (B) is removed away from the laser.



5.1.1 Supply voltage

Pin 7 0V, GND

Pin 8 Standard: 18 – 27 V DC
Device with heating: 24 V DC (±5%)

5.1.2 CANopen

Pin 15 GNDI (reference potential CAN_L / CAN_H)

Pin 16 Shield (internal RC-element onto case)

Pin 17 CAN_H

Pin 18 CAN_H

Pin 19 CAN_L

Pin 20 CAN_L

5.2 Bus termination

For the communication a defined no-signal level must be guaranteed on the CAN bus. To this both line ends have to be terminated with terminating resistors.
In the laser measuring device is not provided an add-on connection of the terminating resistor. Therefore, if the laser measuring device is the last slave in the CAN bus line, the termination must be made manually with a terminating resistor of 121 ohms between the CAN_H and CAN_L lines.

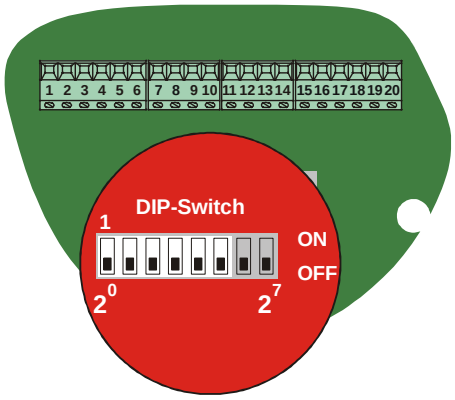
5.3 DIP-switch – settings

The switch position is read-in only in the power-on state, therefore following modifications can be not recognized!

5.3.1 Identifier (Node-ID)

The identifier (laser address) 1 – 64 is adjusted via the DIL-switches 1-6:
DIL-1 = ID 2^0, DIL-6 = ID 2^5
The Node-ID is the adjusted hardware number by the DIL-switches 1-6 + 1.
That means:
all 6 switches off = 0, Node-ID = 1
(see also "Object 100Bh: Node-ID", page 35)

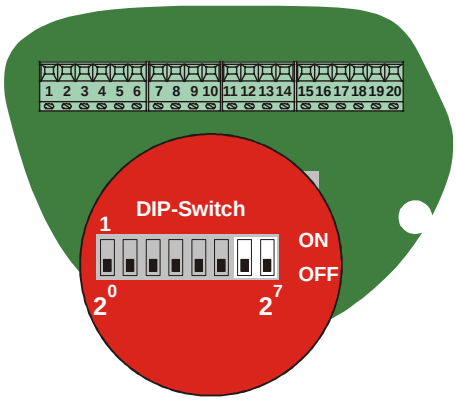
Note:
The adjusted address may be assigned only once in the CANopen bus.



5.3.2 Baud rate

The baud rate is adjusted via the DIL-switches 7-8:

DIP-7	DIP-8	Baud rate
OFF	OFF	20 kbps
ON	OFF	125 kbps
OFF	ON	500 kbps
ON	ON	1000 kbps



5.4 Switching input / Switching output

The programming of the switching input /switching output is carried out either directly via the bus, or via the PC software "TRWinProg".

Functions of the switching input:

- Preset
- Switch off laser diode
- Failure quit

Functions of the switching output:

- Temperature- ,
- Intensity- ,
- Hardware-Fail-Output or
- every fail
- Speed-check
- Plausibility measured value
- Switching output position

Pin 1 GND, reference potential pin 2

Pin 2 Switching output

Pin 3 Switching input

5.5 RS485 - programming interface

The RS485 programming interface was developed mainly only as service interface for the technician.
Primarily therefore the programming possibilities via the CANopen should be used.
Via the PC software "TRWinProg" and a PC adapter the connection to the laser measuring device is established. More informations see page 23 or in the TRWinProg software manual.

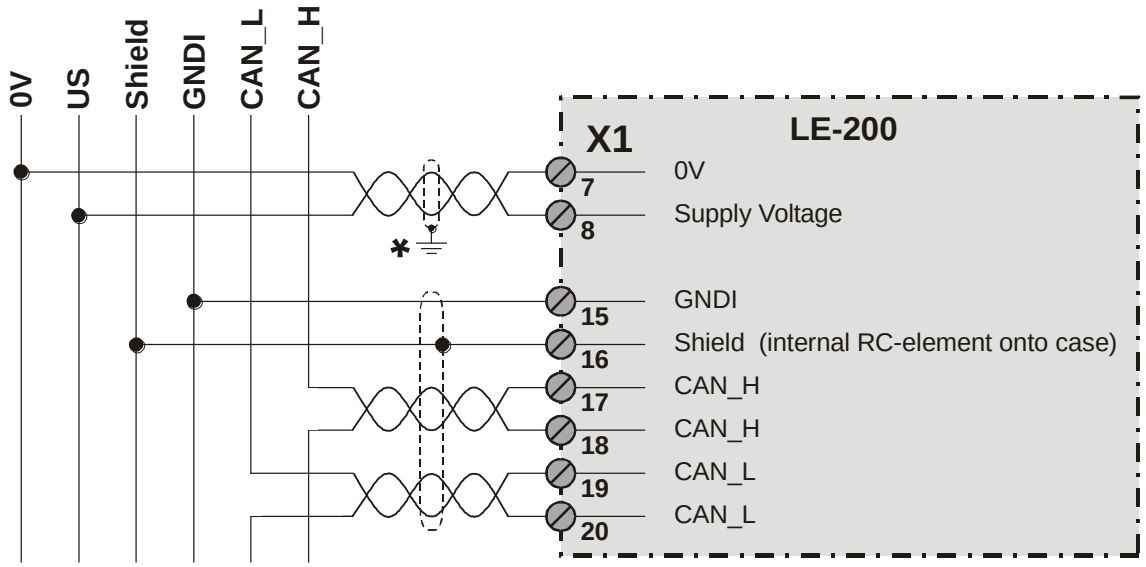
Pin 9 RS485–

Pin 10 RS485+

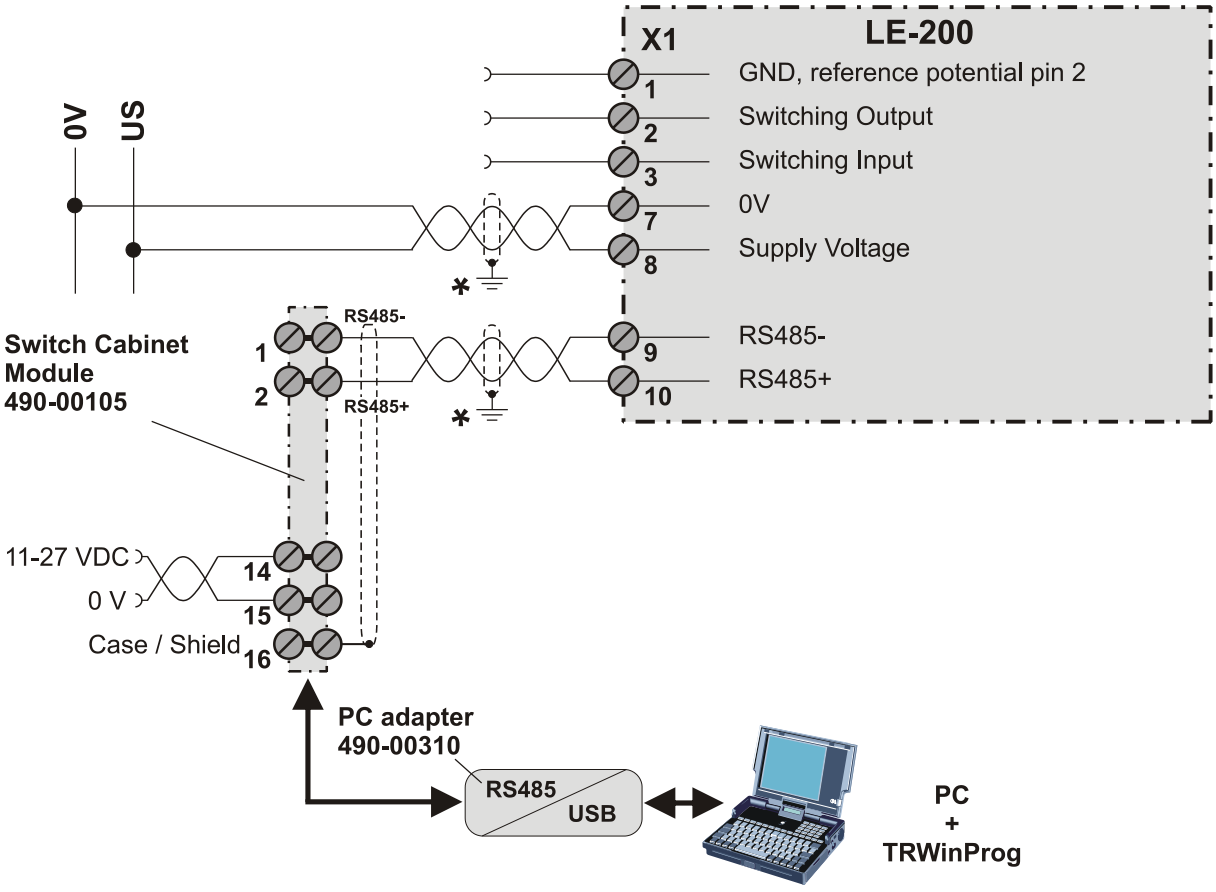
5.6 Wiring examples

***** Shield connection, see chapter General interference suppression measures page 24.
CiA DR 303-1 conformal pin assignment see “TR-ELE-TI-DGB-0011”

CANopen connection



RS485-connection with parameter setting via "TRWinProg"



5.7 General interference suppression measures

- Lay the (shielded) connecting cable to the device at a sufficient distance or in a separate room from any power cables which are subject to interference. Otherwise the data transmission of the measured value can be interfered.
- To ensure reliable data transmission, use fully shielded cables and make sure they are well earthed. For differential data transfer (RS422, RS485 etc.), twisted-pair wires must be used in addition.
- Use a minimum cable cross-section of 0.22 mm^2 for data transfer purposes**.**
- Use a minimum earthing cable (machine base) cross-section of 10 mm^2 in order to avoid equipotential currents across the shield. Make sure the resistance of the earthing cable is much lower than that of the shield.
- Avoid crossing cables where possible. If unavoidable, only cross them at right-angles.
- Ensure continuous wiring of the shield and a large contact area on special shield clampings, see Figure 6 point **(A)**.

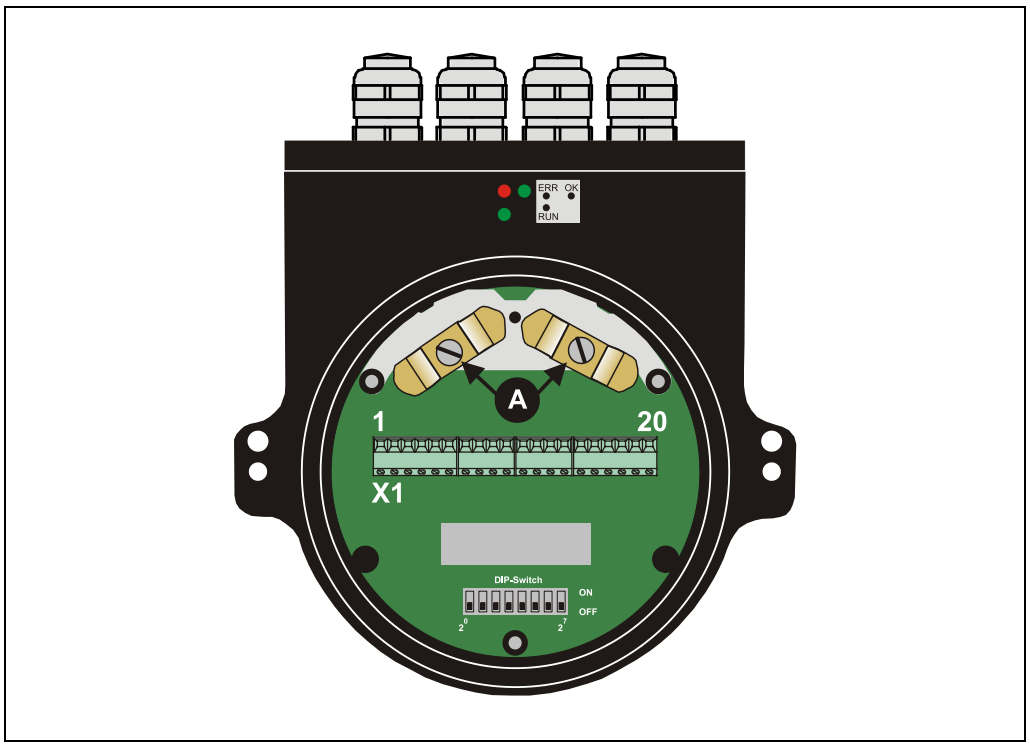


Figure 6: Connection cap with shield clampings

5.8 Switching on the supply voltage

After the connection, baud rate and Node-ID-setting has been carried out, the supply voltage can be switched on.

After power on and finishing the initialization, the laser goes to the Pre-operational state and waits for command. If the laser detects an internal error, an emergency message with the error code will be transmitted (see chapter "Emergency Message", page 47).

6 Commissioning

6.1 CANopen interface

The CAN-Bus-Interface is defined by the international norm ISO/DIS 11898 and specifies the two lowest layers of the ISO/DIS CAN Reference Model.

The CAN-BUS-Interface with the BUS-Driver PCA82C251 is galvanic isolated of the laser electronic and becomes the power over internal DC/DC-converter. There is no external power supply necessary for the CAN-BUS-Driver.

The conversion of the laser information to the CAN message format (CAN 2.0A) is done by the CAN-controller SJA1000. The function of the CAN-controller is controlled by a watchdog .

The CANopen Communication Profile (CIA standard DS 301) is a subset of CAN Application Layer (CAL) and describes, how the services are used by devices. The CANopen Profile allows the definition of device profiles for decentralized I/O.

The laser with CANopen-protocol support the Device Profile for Encoder (CIA Draft Standard Proposal 406, Version 2.0). **The encoders support the extended functions in Class C2**.

The communication functionality and objects, which are used in the laser profile, are described in an EDS-File (Electronic Data Sheet).
When using a CANopen Configuration Tool (e.g.:CANSETTER), the user can read the objects of the laser (SDOs) and program the functionality.

The selection of transmission rate and node number is done by hardware (switches).

6.1.1 EDS-file

The EDS-file (electronic data sheet) contains all informations about the laser specific parameters and operating modes of the laser measuring device. The EDS-file is needed by the CANopen network configuration tool to be able to configure or to take into operation the laser measuring device duly.

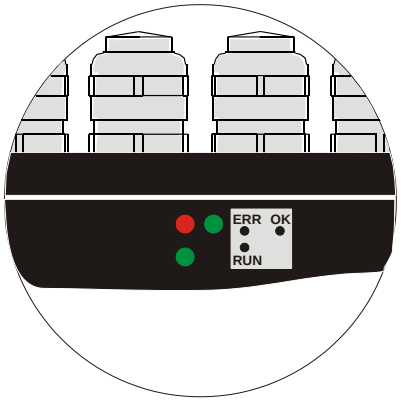
The EDS-file has the file name **"LE200.EDS"**

The file is on the Software/Support DVD:
Order number: 490-01001, Soft-No.: 490-00408.

6.1.2 Bus status

At the connection cap the laser has 3 LEDs, which display the bus status of the laser:

LEDs Off	Laser is not on-line - Device may not be powered
RUN, green	On-line, with connections in the established state - Device is allocated to a master
RUN, green flashing	Recoverable fault - e.g. I/O-connections are in the time-out state (Node-Guarding active)
ERR, red	- Turn off system, after that turn on system - Replace laser device
ERR, red flashing	- Off-Line
OK, green	Laser hardware ok



7 Communication profile

Two process data objects (PDO) are implemented in the device. One is used for asynchronous transmission and the other one for the cyclic transmission functions.

The output position value is transmitted in binary code:

COB-ID	Output Position Value			
11 Bit	Byte 0	Byte 1	Byte 2	Byte 3
	2^7 to 2^0	2^{15} to 2^8	2^{23} to 2^{16}	2^{31} to 2^{24}

7.1 Transmitting of the position value

Before the laser position can be transferred the laser has to be started with the Node Start command.

Node Start Protocol

COB-Identifier = 0	
Byte 0	Byte 1
1	Node-ID

Node Start command with the Node-ID of the laser (slave) starts only this device.

Node Start command with **Node-ID = 0** starts all slaves connected to the bus.

After the Node Start command the laser transmit the position value one time with the COB-ID of object 1800h.

Now the laser position value can be transmitted over one of the two Transmit Process Data Objects, see chapter “1st Transmit Process Data Object (asynchronous)” and “2nd Transmit Process Data Object (synchronous)” on page 28.

7.1.1 1st Transmit Process Data Object (asynchronous)

The 1st transmit PDO (object 1800h) transmit the position value of the laser. The cyclic time is defined by the value of the cyclic timer (object 6200H). This transmission starts automatically after the Node Start command and the value of the cyclic timer is > 0. The default value of the COB-ID is 180h + Node-ID.

Object	Function Code	COB-ID	Index Communication Parameter
PDO1 (tx)	0011bin	181h – 1FFh	1800h

Index	Sub-Index	Comment	Default Value	Attr.
1800h	0	number of supported entries	3	ro
	1	COB-ID used by PDO 1	180h + Node-ID	ro
	2	transmission type	254	ro
	3	inhibit time	0	rw
1A00h	0	number of mapped objects	1	ro
	1	Position value	60040020h	ro

In order to stop the transmission of the measuring system position temporarily, the output can be interrupted by timer value = 0, in object 6200h.

7.1.2 2nd Transmit Process Data Object (synchronous)

The 2nd transmit PDO (object 1802) transmit the position value of the laser one time on request in a cyclic way (remote / sync):

- The measuring system receives a remote frame with the COB-ID (default value 280h + Node-ID)

Object	Function Code	COB-ID	Index Communication Parameter
PDO2 (tx)	0101bin	281h – 2FFh	1802h

- The measuring system receives a sync telegram with the COB-ID (default value 080h) defined in object 1005h. All slaves with this SYNC-COB-ID will transmit the position value.

Object	Function Code	COB-ID	Index Communication Parameter
SYNC	0001bin	80h	1005

Index	Sub-Index	Comment	Default Value	Attr.
1802h	0	number of supported entries	3	ro
	1	COB-ID used by PDO 2	280 + Node-ID	ro
	2	transmission type	1	ro
	3	inhibit time	0	rw
1A02h	0	number of mapped objects	1	ro
	1	Position value	60040020h	ro

7.2 Read/Write Service Data Object

The transfer of the Service Data Object (SDO) is done by the CMS "Multiplexed Domain" protocol (CIA DS202/2).

7.2.1 Read SDO:

(Initiate "Domain Upload")

Request Protocol format:

COB-Identifier = 600h + Node-ID

Read SDOs								
Byte	0	1	2	3	4	5	6	7
content	Code	Index		Sub-index	Data 0	Data 1	Data 2	Data 3
	40h	low	high	byte	0	0	0	0

The Read SDO telegram has to be send to the slave.

The slave answers with the following telegram:

Response Protocol format:

COB-Identifier = 580h + Node-ID

Read SDOs								
Byte	0	1	2	3	4	5	6	7
content	Code	Index		Sub-index	Data 0	Data 1	Data 2	Data 3
	4xh	low	high	byte	data	data	data	data

Format byte 0:

MSB LSB

7	6	5	4	3	2	1	0
0	1	0	0	n		1	1

n = number of data bytes (bytes 4-7) that does not contain data.

If only 1 data byte (Data 0) contains data the value of byte 0 is "4FH".

If byte 0 = 80h the transfer has been aborted.

7.2.2 Write SDO:

(Initiate "Domain Download")

Request Protocol format:

COB-Identifier = 600h + Node-ID

Write SDOs								
Byte	0	1	2	3	4	5	6	7
content	Code	Index		Sub-index	Data 0	Data 1	Data 2	Data 3
	2xh	low	high	byte	0	0	0	0

Format byte 0:

MSB LSB

7	6	5	4	3	2	1	0
0	0	1	0	n		1	1

n = number of data bytes (bytes 4-7) that does not contain data.

If only 1 data byte (Data 0) contains data the value of byte 0 is "2FH".

The Write SDO telegram has to be send to the slave.

The slave answers with the following telegram:

Response Protocol format:

COB-Identifier = 580h + Node-ID

Read SDOs								
Byte	0	1	2	3	4	5	6	7
content	Code	Index		Sub-index	Data 0	Data 1	Data 2	Data 3
	60h	low	high	byte	0	0	0	0

If byte 0 = 80h the transfer has been aborted.

8 Communication specific standard objects

Following table gives an overview on the supported indices in the communication profile area:

Index (h)	Object	Name	Type	Attr.	Site
1000	VAR	device type	Unsigned32	const	32
1001	VAR	error register	Unsigned8	ro	32
1002	VAR	manufacturer status register	Unsigned32	ro	32
1003	ARRAY	pre-defined error field	Unsigned32	ro	33
1004	ARRAY	Number of PDOs supported	Unsigned32	ro	34
1005	VAR	COB-ID SYNC-message	Unsigned32	rw	34
1008	VAR	device name	Vis-String	const	35
1009	VAR	hardware version	Vis-String	const	35
100A	VAR	software version	Vis-String	const	35
100B	VAR	Node-ID	Unsigned32	ro	35
100C	VAR	guard time	Unsigned16	rw	35
100D	VAR	life time factor	Unsigned8	rw	36
100E	VAR	COB-ID guarding protocol	Unsigned32	ro	36
1010	VAR	store parameters	Unsigned32	rw	36

8.1 Object 1000h: Device Type

Contains information about the device type. The object at index 1000h describes the type of device and its functionality. It is composed of a 16 bit field which describes the device profile that is used (Device Profile Number 406 = 196h) and a second 16 bit field which gives information on the type of device.

Structure of parameter

Unsigned32, const

Device Type			
Device Profile Number		Encoder Type	
Byte 0	Byte 1	Byte 2	Byte 3
196h		2^7 to 2^0	2^{15} to 2^8

Encoder type

Code	Definition
08	Laser measuring device

8.2 Object 1001h: Error Register

This object contains the error register for the device. If an alarm bit is set (object 6503), bit 5 is set in the error register.

Unsigned8, Read

Bit	Meaning
0	0
1	0
2	0
3	0
4	0
5	device profile specific
6	0
7	0

8.3 Object 1002h: Manufacturer Status Register

This object is not used by the laser, by read access the value is always "0".

8.4 Object 1003h: Pre-defined Error Field

This object contains an occurred laser error and indicates the error via the Emergency object.

Index	Sub-Index	Comment	Type
1003h	0	number of errors / clear error code	Unsigned8
	1	standard error field	Unsigned32

Sub-index 0: The entry in sub-index 0 contains the number of occurred errors and registers it in sub-index 1.

After elimination of the error the error code can be cleared about a write access on sub-index 0.

Sub-index 1: The error field consists of an 8 bit error code.

Unsigned32, Read

Standard Error Field			
Byte 0	Byte 1	Byte 2	Byte 3
error code	0	0	0
2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0	-	-	-

Description of the error code

No error Byte 0 = 0x00	Corresponds to the normal condition
Intensity Bit 0 in byte 0	The bit is set, if an intensity value of smaller 8% is present, or the laser beam is interrupted and leads to the error value output.
Temperature Bit 1 in byte 0	The bit is set, if the device temperature is outside of the range from 0 - 50 °C. A low range deviation has still no influence on the measurement and is therefore to be regarded as a warning.
Hardware Bit 2 in byte 0	The bit is set, if an internal hardware error were noticed and leads to the error value output.
Laser diode switched off Bit 3 in byte 0	The bit is set, if the laser diode was switched off over the bus, or the switching input. Serves only for information purposes.
Intensity warning Bit 4 in byte 0	The bit is set, if an intensity value of smaller 12% were determined and means that the measuring system optics, or the reflecting foil is to be cleaned. However, the device operates error-freely furthermore.
Overspeed warning Bit 5 in byte 0	The bit is set if the speed, adjusted in the PC program TRWinProg, is exceeded. About the default setting the speed-check is switched off. A configurability over the bus is not possible.
Plausibility warning Bit 6 in byte 0	The bit is set if the plausibility of the measured value cannot be guaranteed. E.g. this is the case at a position jump if a second reflection foil is held into the laser beam.

8.5 Object 1004h: Number of PDOs supported

This object contains information about the maximum number of PDOs supported by the laser.

Index	Sub-Index	Comment	Type
1004h	0	number of PDOs supported	Unsigned32
	1	number of synchronous PDOs	Unsigned32
	2	number of asynchronous PDOs	Unsigned32

Sub-index 0 describes the overall number of PDOs supported (synchronous / asynchronous).
Sub-index 1 describes the number of synchronous PDOs supported by the laser.
Sub-index 2 describes the number of asynchronous PDOs supported by the laser.

Unsigned32, Read

Number of PDOs			
Byte 0	Byte 1	Byte 2	Byte 3
Transmitted PDOs		Received PDOs	

Sub-index 0: Transmitted PDOs = 2, Received PDOs = 0
Sub-index 1: Transmitted PDOs = 1, Received PDOs = 0
Sub-index 2: Transmitted PDOs = 1, Received PDOs = 0

8.6 Object 1005h: COB-ID SYNC message

This object defines the COB-ID of the synchronization object (SYNC). Further, it defines whether the device processes the SYNC or whether the device generates the SYNC.

Unsigned32, Read/Write

MSB LSB

31	30	29	28-11	10-0
1	0	0	0	00 1000 0000

Bit 31 = 1 , Device processes SYNC message
Bit 31 = 0 , Device does not generate SYNC message

Bit 30 = 0
Bit 29 = 0 , 11 bit ID (CAN 2.0A)
Bit 28 -11 = 0
Bit 10 – 0 = 11 bit SYNC-COB-IDENTIFIER, default value = 080h

If a SYNC-telegram with the identifier, defined in this object (080H), and data length = 0 has been received by the device, the position value of the laser is transmitted by the 2nd Transmit PDO (object 1802).
The default value 80 H in byte 0 (bit 0 -7) can be overwritten by another value (≠ 0). The new adjusted value is stored permanently about “Object 1010h: Store Parameters”, page 36.

8.7 Object 1008h: Manufacturer Device Name

Contains the manufacturer device name (visible string) “LE200”.

8.8 Object 1009h: Manufacturer Hardware Version

Contains the manufacturer hardware version (visible string).

8.9 Object 100Ah: Manufacturer Software Version

Contains the manufacturer software version (visible string).
See also object 6507.

8.10 Object 100Bh: Node-ID

This object contains the Node-ID (device address).

The value is selected by 6 hardware switches and cannot be changed using SDO services.

Unsigned32, Read

Node_ID			
Byte 0	Byte 1	Byte 2	Byte 3
Node-ID	reserved	reserved	reserved

Value range: 1 – 64.

The Node-ID is the selected hardware number by switches + 1. That means:

all 6 switches off = 0, Node-ID = 1
switch bit 5 = on = 32, Node-ID = 33

8.11 Object 100Ch: Guard-Time

The objects of index 100CH and 100DH include the guard time in milli-seconds and the life time factor. The life time factor multiplied with the guard time gives the live time for the node guarding protocol.

Unsigned16, Read/Write

Guard-Time	
Byte 0	Byte 1
2^7 to 2^0	2^{15} to 2^8

8.12 Object 100Dh: Life Time Factor

The life time factor multiplied with the guard time gives the life time for the node guarding protocol. If the result is “0”, no node guarding is supported.

Unsigned8, Read/Write

Life Time Factor
Byte 0
2^7 to 2^0

8.13 Object 100Eh: Node Guarding Identifier

The identifier is used for the node guarding and the life guarding procedure.

Unsigned32, Read

MSB				LSB
31	30	29	28-11	10-0
reserved		0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11 bit identifier

Bit 10 – 0 = 11 bit identifier, value = 700h + Node-ID

8.14 Object 1010h: Store Parameters

This object supports the saving of parameters in non volatile memory (EEPROM).

Index	Sub-Index	Comment	Type
1010h	0	largest supported sub-index	Unsigned8
	1	save all parameters	Unsigned32

Sub-index0: The entry in sub-index 0 contains the largest sub-index which is supported. Value = 1.

Sub-index1: By read access the device provides information about its saving possibility.

Unsigned32, Read/Write

MSB			LSB
bits	31-2	1	0
value	= 0	0	1

By read access the device provides information about its saving possibility.

Bit 0 = 1, the device saves parameters only on command. That means, if parameters have been changed by the user and no “Store Parameter Command” has been executed, at the next power on, the parameters will have there old values.

By write access the device stores the parameters to the non volatile memory.
In order to avoid storage of parameters by mistake, storage is only executed when a specific signature is written to the object. The signature is “save”.

Signature	Unsigned32 MSB			LSB
	e	v	a	s
	65h	76h	61h	73h

On reception of the correct signature, the device stores the parameters. If the storing failed, the device responds with abort domain transfer, error class 6 , error code 6 (hardware fault). See also “Object 6503h - Alarms”, page 44.

If a wrong signature is written, the device refuses to store and responds with abort domain transfer, error class 8, error code 0.

9 Parameterization and configuration

The configuration of the laser occurs alternatively via the configuration software of the CANopen – master or via the TRWinProg-software. With a download of the control parameters the parameters, which were configured via the TRWinProg-software, will be overwritten by the control.
In this instruction only the configuration via the CANopen – master is described. The PC program TRWinProg is described in an instruction of its own.

9.1 Standardized encoder profile area

Each encoder shares the dictionary entries from 6000h to 65FFh. These entries are common to encoders. Additionally the laser measuring device uses the entries from 2000 to 2006h.
NOTE that all indices shown in the “Index” column are hexadecimal.

The overview of all laser entries are shown below:

Index	Object	Name	Data Length	Attr.	Page
Parameters					
2000	VAR	Clear Preset	Unsigned8	rw	39
2001	VAR	Output value in case of an error	Unsigned8	rw	39
2002	VAR	Error value **(not supported)**	Unsigned32	rw	-
2003	VAR	Function external input	Unsigned8	rw	40
2004	VAR	Automatic error acknowledgement	Unsigned8	rw	40
2005	VAR	Function error output	Unsigned8	rw	40
2006	VAR	Switching functions	Unsigned8	rw	41
2007	VAR	Resolution	Unsigned8	rw	41
6000	VAR	Operating parameters	Unsigned16	rw	42
6003	VAR	Preset value	Unsigned32	rw	42
6004	VAR	Position value	Unsigned32	ro	43
6005	REC	Measuring step	Unsigned32	ro	43
6200	VAR	Cyclic-Timer	Unsigned16	rw	43
Diagnostics					
6500	VAR	Operating status	Unsigned16	r	44
6501	VAR	Measuring step	Unsigned32	ro	44
6503	VAR	Alarms	Unsigned16	r	44
6504	VAR	Supported alarms	Unsigned16	r	45
6505	VAR	Warnings	Unsigned16	r	45
6506	VAR	Supported Warnings	Unsigned16	r	46
6507	VAR	Software version	Unsigned32	r	46
6508	VAR	Operating time	Unsigned32	r	46
6509	VAR	Offset value	Signed32	r	46
650A	VAR	Manufacturer offset value	Signed32	r	46
650B	VAR	Serial number	Unsigned32	r	46

On the following pages each single object is explained in detail.

9.1.1 Object 2000 – Clear Preset

⚠ WARNING

NOTICE

Risk of injury and damage to property by an actual value jump when the `clear preset function` is performed!

- The `clear preset function` should only be performed at rest, otherwise the resulting actual value jump must be permitted in the program and application!

Via this object, the zero-point correction calculated in “Object 6003h – Preset value”, page 42 is deleted. The correction arises from the difference of the desired preset value to the physical laser position. That means, after deletion of the zero-point correction the laser outputs his “real” physical position.

Unsigned8, Read/Write

0	Clear Preset
1	No clearing

9.1.2 Object 2001 – Output value in case of an error

Determines, which data value is to be transmitted in the case of an error. The data value is output, if the laser can output no more measurement. This is given e.g., if a beam interruption is present.

Unsigned8, Read/Write

0	***Null (default)***	The position is set to “0”
1	0xFF	All 24 bits are set to ‘1’ (0xFFFFFF or -1)
2	last valid value	Output of the last valid position

9.1.3 Object 2003 – Function external input

Determines, whether the switching input is to be used as
- Preset input
- Switch-off Laser-Diode (LD) or
- Failure reset – input

With connection of the switching input as Preset-input the laser is adjusted on the predefined position value in “Object 6003h – Preset value”, page 42. With connection the switching input as LD-input the laser diode is switched off for the extension of the life time. If in the PC-program “TRWinProg” in the basic parameters the switching-off of the laser diode is carried out automatically, the LD-switching input does not have a function.

Unsigned8, Read/Write

0	***disabled (default)***	Function switched off, following parameters without meaning
1	Preset function	External switching input is determined as Preset input. Software execution see chapter “Object 2006 – Switching functions”, page 41.
2	LD switching input	External switching input is used for switching-off of the laser diode. Software switching-off see chapter “Object 2006 – Switching functions”, page 41.
3	Error acknowledgement	External switching input is used as error acknowledge-ment. Software acknowledgement see chapter “Object 1003h: Pre-defined Error Field”, page 33.

9.1.4 Object 2004 – Automatic error acknowledgement

Determines, whether occurring error reports should be cleared automatically after eliminating the trouble.

Unsigned8, Read/Write

0	***not automatically (default)***	An occurring error report can be cleared via “Object 1003h: Pre-defined Error Field”, page 33 or via “Object 2003 – Function external input”, page 40.
1	automatically	An occurring error report is cleared automatically after remedying of the error.

9.1.5 Object 2005 – Function error output

Determines, the function of the error output (external switching output). Definition of the error see “Description of the error code”, page 33.

Unsigned8, Read/Write

0	***disabled (default)***
1	Temperature
2	Intensity
3	Hardware
4	all errors
5	Speed-check
6	Plausibility measured value

9.1.6 Object 2006 – Switching functions

Unsigned8, Read/Write

Switch off laser diode Bit 0 = 1	By setting this bit the laser diode (LD) is switched off for the extension of the life time. If in "Object 2003 – Function external input", page 40 = "LD-switching input" is preselected, or in the PC-program "TRWinProg" in the basic parameters the switching-off of the laser diode is carried out automatically, this function is ineffective.
Switch on laser diode Bit 1 = 1	By setting this bit the laser diode is switched on. This function is ineffective if: see "Switch off laser diode" above.
Execute Preset Bit 2 = 1	By setting this bit the laser is adjusted to the value deposited in "Object 6003h – Preset value", page 42.

A read access returns the status of the laser diode:

0	Laser diode is switched off
1	Laser diode is switched on

9.1.7 Object 2007 – Resolution

Definition of the measuring system resolution. Options:

0	Centimeter
1	***Millimeter (default)***
2	1/10 millimeter
3	1/100 millimeter
4	Inch
5	1/10 Inch
6	Free resolution (in 1/100 mm), valid values are 1 - 65535, ***default = 100***

With selection "Free resolution" the entered value of the object "Object 6005h – Measuring step" is used.

9.1.8 Object 6000h – Operating parameters

The operating parameters contain the functions for code sequence.

Structure of parameter

Unsigned16, Read/Write

Bit	Function	Bit = 0	Bit = 1
0	Code Sequence	increasing	decreasing
1	reserved		
3 - 11	reserved		
12-15	Manufacturer specific functions		

Code sequence:

The code sequence defines whether increasing or decreasing position values are output.

0 (default)	With increasing distance to the laser, values increasing
1	With increasing distance to the laser, values decreasing

9.1.9 Object 6003h – Preset value

⚠ WARNING

NOTICE

Risk of injury and damage to property by an actual value jump when the `Preset function` is performed!

- The *`preset function`* should only be performed at rest, otherwise the resulting actual value jump must be permitted in the program and application!

The Preset function can be used to adjust the laser to any position value within a range of 0 … to measuring length in increments.
The output position value is set to the parameter "Preset value" when writing to this object. The call of "Object 1010h: Store Parameters", page 36 isn't necessary.

Structure of parameter

Unsigned32, Read/Write

Preset value			
Byte 0	Byte 1	Byte 2	Byte 3
2^7 to 2^0	2^{15} to 2^8	2^{23} to 2^{16}	2^{31} to 2^{24}

9.1.10 Object 6004h – Position value

The object 6004h "Position value" defines the output position value for the communication objects 1800h and 1802h.

Structure of parameter

Unsigned32, Read

Position value			
Byte 0	Byte 1	Byte 2	Byte 3
2^7 to 2^0	2^{15} to 2^8	2^{23} to 2^{16}	2^{31} to 2^{24}

9.1.11 Object 6005h – Measuring step

If in object "Object 2007 – Resolution" the selection "Free resolution" was carried out, via the measuring step the resolution of the measuring system is defined.

Index	Sub-Index	Comment	Type
6005h	0	number of entries	Unsigned8
	1	measuring step	Unsigned32

Unsigned32, Read

Measuring step			
Byte 0	Byte 1	Byte 2	Byte 3
2^7 to 2^0	2^{15} to 2^8	2^{23} to 2^{16}	2^{31} to 2^{24}
Input value in 1/100 mm		0	0

Input value in 1/100 mm
1 mm e.g. corresponds to the input value of 100. That means, that the laser output 1 step / mm.

Default value: 100, maximum value: 65535

9.1.12 Object 6200h – Cyclic timer

Defines the parameter "Cyclic timer". A Cyclic transmission of the position value is set, when the cyclic timer is programmed > 0. Values between 1 ms and 65535 ms can be selected.

e.g.: 1 ms = 1 h
256 ms = 100 h

This value isn't saved in the device permanently and is lost with switching off the supply voltage. With each restart the cyclic timer is ≠ 0 and must always be rewritten therefore.

When the laser is started with the NODE START command and the value of the cyclic timer is > 0, the 1st transmit PDO (object 1800h) transmit the laser position.

9.2 Laser diagnostics

9.2.1 Object 6500h - Operating status

This object contains the operating status of the laser. It gives information on laser internal programmed parameters.
(see also "Object 6000h – Operating parameters", page 41)

Structure of parameter
Unsigned16, Read

Bit	Function	Bit = 0	Bit = 1
0	Code Sequence	increasing	decreasing
1	reserved		
3 - 11	reserved		
12 - 15	Manufacturer specific functions		

0 = With increasing distance to the laser, values increasing
1 = With increasing distance to the laser, values decreasing

9.2.2 Object 6501h – Measuring step

The object 6501h indicates the adjusted resolution of the measuring system in 1/100 mm.
(see also "Object 6005h – Measuring step", page 43)

Structure of parameter
Unsigned32, Read

Measuring step			
Byte 0	Byte 1	Byte 2	Byte 3
2^7 to 2^0	2^{15} to 2^8	2^{23} to 2^{16}	2^{31} to 2^{24}
adjusted resolution in 1/100 mm		0	0

9.2.3 Object 6503h - Alarms

Additionally to the "emergency message", object 6503h provides further alarm messages. An alarm is set if a malfunction in the laser could lead to incorrect position value. If an alarm occurs, the according bit is set to logical high until the alarm is cleared and the laser is able to provide an accurate position value.

Structure of parameter
Unsigned16, Read

Alarms								
Byte 0								Byte 1
error code								Reserved for further use
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	-

Description of the error code

No error Byte 0 = 0x00	Corresponds to the normal condition
Intensity Bit 0 in byte 0	The bit is set, if an intensity value of smaller 8% is present, or the laser beam is interrupted and leads to the error value output.
Temperature Bit 1 in byte 0	The bit is set, if the device temperature is outside of the range from 0 - 50 °C. A low range deviation has still no influence on the measurement and is therefore to be regarded as a warning.
Hardware Bit 2 in byte 0	The bit is set, if an internal hardware error were noticed and leads to the error value output.
Laser diode switched off Bit 3 in byte 0	The bit is set, if the laser diode was switched off over the bus, or the switching input. Serves only for information purposes.
Intensity warning Bit 4 in byte 0	The bit is set, if an intensity value of smaller 12% were determined and means that the measuring system optics, or the reflecting foil is to be cleaned. However, the device operates error-freely furthermore.
Overspeed warning Bit 5 in byte 0	The bit is set if the speed, adjusted in the PC program TRWinProg, is exceeded. About the default setting the speed-check is switched off. A configurability over the bus is not possible.
Plausibility warning Bit 6 in byte 0	The bit is set if the plausibility of the measured value cannot be guaranteed. E.g. this is the case at a position jump if a second reflection foil is held into the laser beam.

9.2.4 Object 6504h - Supported alarms

Object 6504h contains the information on supported alarms by the laser.

Structure of parameter

Unsigned16, Read

Bit	Function	Bit = 0	Bit = 1
0	Intensity	No	Yes
1	Temperature	No	Yes
2	Hardware	No	Yes
3	Laser diode switched off	No	Yes
4	Intensity warning	No	Yes
5 - 13	Reserved for further use		
14 - 15	Manufacturer specific functions		

9.2.5 Object 6505h - Warnings

This object is not supported.
By read access the value is always "0".

9.2.6 Object 6506h - Supported warnings

This object is not supported.
By read access the value is always "0".

9.2.7 Object 6507h – Software version

This object contains the software version which is implemented in the laser. It is combined to a revision number and an index. The version-no. is indicated in ASCII code.

e.g.:	Version:	2.12			
	Binary:	0011 0010	0010 1110	0011 0001	0011 0010
	Hex:	32	2E	31	32

Structure of parameter
Unsigned32, Read

Software version			
Byte 0	Byte 1	Byte 2	Byte 3
2^7 to 2^0	2^{15} to 2^8	2^7 to 2^0	2^{15} to 2^8

9.2.8 Object 6508h - Operating time

The operating time function indicates the operation hours of the ***activated laser diode***.

9.2.9 Object 6509h - Offset value

This object contains the offset value calculated by the preset function. The offset value is stored and can be read from the laser.

9.2.10 Object 650Ah - Manufacturer offset value

This object is not supported.
By read access the offset value is "0".

9.2.11 Object 650Bh - Serial number

This object contains the serial number of the laser device (4 byte).

10 Emergency Message

Emergency messages are triggered by the occurrence of a device internal malfunction and are transmitted from the concerned application device to the other devices with highest priority.

Emergency Message								
Byte	0	1	2	3	4	5	6	7
content	Emergency Error Code		Error register (object 1001H)	0	0	0	0	0

COB-Identifier = 080h + Node-ID

If the laser detects an internal error, an emergency message will be transmitted with the error code of "", page 33 and the error register object 1001H. Additionally to the emergency object the according bit in "Object 6503h - Alarms", page 44 is set.

If the error disappears, the laser transmits an emergency message with error code "0" (reset error / no error) and error register "0". To this it is prerequisite that the error acknowledgment was set to "automatically" (see "Object 2004 – Automatic error acknowledgement", page 40).

11 Causes of Faults and Remedies

The error causes are determined in "Object 1003h: Pre-defined Error Field", page 33. Depending on setting the error messages must be acknowledged for resetting the error code (see chapter "Object 1003h: Pre-defined Error Field", page 33 / "Object 2003 – Function external input", page 40 and "Object 2004 – Automatic error acknowledgement", page 40).

Error code	Cause	Remedy
Bit 0 Intensity error	The device checks the intensity of the received laser signal continuously, it was detected a below-minimum intensity.	Clean measuring system optics Clean reflecting foil Rule out an interruption of the laser beam If the possibility of soiling or interruption of the laser signal can be ruled out, the device must be replaced.
Bit 1 Device temperature	The temperature has exceeded or fallen short of the range of 0 - 50°C at the housing of the device	Appropriate measures must be taken to prevent the device from overheating or undercooling.
Bit 2 Hardware error	The device has detected an internal hardware error.	If the error occurs repeated, the device must be replaced.
Bit 3 Laser diode switched off	The bit is set, if the laser diode was switched off over the bus, or the switching input.	Serves only for information purposes.
Bit 4 Intensity warning	The device determined an intensity of < 12%.	This message is only a warning and means that the measuring system optics, or the reflecting foil is to be cleaned. However, the device operates error-freely furthermore.
Bit 5 Speed-check warning	The speed level adjusted over the PC program TRWinProg was exceeded.	This message is a warning and means that possibly corresponding measures must be taken, so that no system components will be damaged.
Bit 6 Plausibility warning	The plausibility of the measured value couldn't be guaranteed any more.	This message is a warning and means that possibly corresponding measures must be taken, so that no system components will be damaged.