HOW TO SWITCH FROM LMS400 TO LMS4000 – TELEGRAMS & MORE

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CONTENT

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- Introduction
- Abbreviations
- General differences of the devices
- Physical setup for communication
- Terminal & Telegram Framing “CoLa”
- Measurement data telegram
- Trigger options
- Encoder integration
- Changed telegram naming
- Further use cases

INTRODUCTION

This presentation is intended for current users of LMS400 devices with need for support for **switching their application to the new LMS4000**.

Main focus is put on the description and function of the different telegram structure and use of **telegrams**, including some specfic use cases.

There will be no explanation of how to program a 3D visualization or the further processing of measurement data.

ABBREVIATIONS

- CoLa: Command Language (telegram language of SICK LiDAR sensors)
- CoLa ASCII: Telegram commands are in plain text with a <STX>…<ETX> framing and of varying length
- CoLa Binary: Telegram commands are in hexadecimal code with a header (02 02 02 02), followed by the definition of the telegram length (fixed), the telegram content itself and a concluding XOR checksum of the telegram content
- CoLa ASCII/Binary: Special telegram structure with a framing like CoLa Binary, the telegram content being in plain text however (like CoLa ASCII)

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GENERAL DIFFERENCES OF THE DEVICES

Feature	LMS400/VMD	LMS4000
Range	0,7 ... 3 m	0,7 ... 3 m
Range Reflectivity in %	4.5% ... 100% / 6.5 % ... 200%	**2% ... 200% / 3.5 % ... 300%**
Angular resolution	0.1° ... 1°	**0.0833°**
Systematical error (typ.)	± 4 mm	**± 1 mm / ± 1.5 mm**
Statistical error (1σ, typ.)	3 ... 15 mm	**1.25 ... 6.5 mm / 0.75 ... 4.5 mm**
Scanning Frequency	180 Hz ... 500 Hz	**600 Hz**
Data interface	RS-232 / 10Mbit Ethernet	1 Gbit Ethernet
Outputs	5 (4x PNP / 1x analog)	3 (1x PNP / 2 Multiports) or CAN Out
Inputs	4	2 (Multiports) or CAN In
Motor synchronization	Yes, 2 devices	**Yes, several devices**
Operating temperature	0°C ... +40°C	**-10°C ... +50°C**
Laser protection class	2	2
Laser Power	10 mW / 7,5 mW	13 mW / 10 mW
Integrated application	Measurement data + Applications inside	Measurement data + VMS Applications with SIM2000ST

GENERAL DIFFERENCES OF THE DEVICES
IMPORTANT DISTINCTIONS

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- Telegram of LMS4000 now based on **CoLa ASCII / CoLa Binary standard** telegram (like LMS1xx, LMS5xx, TiM5xx), no compatibility with old “mLRreqdata” telegram possible → customers must adapt their software
- **New cables** due to direct M12 connection (see accessory) & Gbit Ethernet
- **Fix scanning frequency** (600 Hz) **and angular resolution** (0.0833°) instead of variable settings → if data rate is to high, filters can be used or output interval my be increased
- **Several devices** can be **synchronized** with LMS4000 (star topology) instead of only two (point-to-point via FSI), better LED visualization of Sync-Status
- **Power** connection now on **Pin 1&3** (standard), only CAN variants still on Pin 2&3
- **No Connection hood** (IP65 & cloning) → cloning planned for a later date
- **No Level Control** application and **no Analog output** or serial interface → later implementation depending on market feedback
- **Firmware Update** in field and **Auto-IP** search now possible (with SOPAS ET)
- Laser Control and Gate settings (for trigger) now combined
- Variants with higher laser power come with laser protection hood (Not to be removed!)
- New GUI 2.0 implemented

GENERAL DIFFERENCES OF THE DEVICES
IDENTICAL FEATURES

- Identical operating range and aperture angle
- Continuous wave (CW) measurement principle
- Laser class 2, laser source visible red light (650 nm)
- Equal weight and housing size of standard device
  - All previous mounting accessories can still be used
- All previous encoders, trigger sensors or power supplies can still be used
- Identical Repair and Service rates (and numbers)

GENERAL DIFFERENCES OF THE DEVICES
CONSEQUENCES

- Significant hardware and software changes have made the creation of a 1:1 compatible device impossible
- Necessary minimum adaptions:
  - Exchange of Power cable (V = Pin 1, GND = Pin 3) and Ethernet cable (x-coded, 8-pin)
  - Implementation of new telegram commands
  - Adaptions to evaluation algorithm of measurement data due to different and now fix angular resolution of 1/12° (0.0833…°)
- Further possibly necessary changes:
  - Adaptions to evaluation algorithm of measurement data due to output rate now at 600 Hz or divisors thereof (300 Hz, 200 Hz, 150 Hz, 120 Hz, 100 Hz, …)
  - Triggering, that was done in combination with an encoder and “track delay” (specific distance) must be transferred into a “time delay”

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PHYSICAL SETUP
POWER, ETHERNET, ENCODER

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LMS400

- Power D-Sub DE-15 connector,
  (Pin 1 = V_{In}, Pin 5 = Ground)

- Ethernet connection RJ45, 4-pin

- Optional: Encoder M12, 5-pin, a-coded
  (Pin 2 = Encoder B, Pin 4 = Encoder A)

LMS4000

- Power connection M12, 5-pin, a-coded
  (Pin 1 = V_{In}, Pin 3 = Ground)

- Ethernet connection M12, 8-pin, x-coded

- Optional: Encoder M12, 5-pin, a-coded
  (Pin 2 = Encoder B, Pin 4 = Encoder A)

PHYSICAL SETUP
CONNECTION TO SOPAS FOR PARAMETRIZATION

LMS400

1. Connect device via Ethernet to PC.
2. Switch on device and start PC.
3. Address range of Ethernet connection at PC must be identical to device (default = 192.168.0.XX)
4. Start SOPAS ET (download from http://www.sick.com/SOPAS_ET)
5. Go to “Device Catalog” > ⚙ > Install > From www.mysick.com > Select “LMS400”. The drivers (*.jar) are downloaded and installed > Finish
6. Go to “Device Search” > Search settings… > Device family oriented search > LMS4xx > Ethernet > Choose IP address of the device (default IP = 192.168.0.1) > define a search name > Finish
7. Search will now detect sensor, (default Port = 2111), double click if device tile is not shown on the left side
8. Go “online”, log in to the device (AUTHORIZED CLIENT, password “client”) and open device window
9. Device can now be parametrized

LMS4000

1. Connect device via Ethernet to PC.
2. Switch on device and start PC.
3. Address range of Ethernet connection at PC must be identical to device (default = 192.168.0.XX)
4. Start SOPAS ET (download from http://www.sick.com/SOPAS_ET)
5. Default search will detect sensor, double click on desired port connection
6. Install drivers (SDD) by selecting “from device” option
7. Go “online”, log in to the device (AUTHORIZED CLIENT, password “client”) and open device window
8. Device can now be parametrized

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TERMINAL & TELEGRAM FRAMING “CoLa”

ESTABLISH TERMINAL CONNECTION IN SOPAS (PORT 2111)

LMS400

1. Start the terminal emulator:  > Tools > Terminal.
2. Select the “Create new connection function” > Ethernet > CoLa A/B
3. Ethernet (TCP/IP connection settings)
   - IP settings: IP address (default: **192.168.0.1**); TCP port: **2111**; SOPAS hub address: 0
   - Protocol: CoLa dialect = **ASCII/binary**; CoLa addressing mode: **by name**; Duplex mode: full-duplex; Byte order: big-endian
   - Timing: Connection timeout: 1,500 ms; Additional timeout: 0 ms
4. Finish > Connection is established
5. Test connection with log in as Authorized client: sMN SetAccessMode 03 B18244B6

No.	Com	Length	Data
1			Device connected: CoLa TCP 192.168.0.1:2111
2		38	sMN SetAccessMode 03 B18244B6
3		26	sMA SetAccessMode
4		29	sAN SetAccessMode 01

LMS4000 (BINARY)

1. Start the terminal emulator:  > Tools > Terminal.
2. Select the “Create new connection function” > Ethernet > CoLa A/B
3. Ethernet (TCP/IP connection settings)
   - IP settings: IP address (default: **192.168.0.1**); TCP port: **2111**; SOPAS hub address: 0
   - Protocol: CoLa dialect = **binary**; CoLa addressing mode: **by name**; Duplex mode: full-duplex; Byte order: big-endian
   - Timing: Connection timeout: 1,500 ms; Additional timeout: 0 ms
4. Finish > Connection is established
5. Test connection with log in as Authorized client: 734D4E2053657441636365737 34D6F6465 2003 B18244B6

HEX presentation

No.	Com	Length	Data
1			Device connected: CoLa TCP 192.168.0.1:2111
2		32	<73><4d><4e><20><53><65><74><41><63><63><65><73><73><4d><6f><64><65><20><03><b1><82><44><b6>
3		28	<73><41><4e><20><53><65><74><41><63><63><65><73><73><4d><6f><64><65><20><00>

ASCII presentation

No.	Com	Length	Data
6		32	sMN SetAccessMode <ETX><b1><82>D<b6>
7		28	sAN SetAccessMode <NUL>

TERMINAL & TELEGRAM FRAMING “CoLa”
ESTABLISH TERMINAL CONNECTION IN SOPAS (PORT 2112)

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- Not possible by default

LMS4000 (BINARY)

1. Start the terminal emulator:  > Tools > Terminal.
2. Select the “Create new connection function” > Ethernet > CoLa A/B
3. Ethernet (TCP/IP connection settings)
   - IP settings: IP address (default: 192.168.0.1); TCP port: **2112**; SOPAS hub address: 0
   - Protocol: CoLa dialect = **ASCII**; CoLa addressing mode: **by name**; Duplex mode: full-duplex; Byte order: big-endian
   - Timing: Connection timeout: 1,500 ms; Additional timeout: 0 ms
4. Finish > Connection is established
5. Test connection with log in as Authorized client:

No.	Com	Length	Data
1			Device connected: CoLa TCP 192.168.0.1:2112
2		31	sMN SetAccessMode 03 B18244B6
3		21	sAN SetAccessMode 0

TERMINAL & TELEGRAM FRAMING “CoLa”
BINARY FRAMING

- CoLa Binary
  - only possible framing for LMS400
  - **Recommended framing for LMS4000**
- All values in hexadecimal code ($_h$), grouped into pairs of two digits (= 1 byte)
- Setup in **4 parts**: header, data length, data and checksum
  - Header = 4 byte = 02020202_h
  - Data length = 4 byte (example for data content having 23 byte = 00000017_h)
  - Data = telegram command or answer
  - Checksum = 1 byte, calculated by XOR of data

TERMINAL & TELEGRAM FRAMING “CoLa”
DATA CONTENT WITH **BINARY FRAMING**

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= ASCII (therefore CoLa ASCII/binary)

- Several parts, all separated by spaces
- Parts comprised of
  - Command or answer with characters in plaintext
  - Parameter values (e.g. scan range) either in decimal (special indicator required) or in hexadecimal
  - Fixed hexadecimal values with a specific, intrinsic meaning (e.g. login password)
- Values of all parts converted to hexadecimal by use of ASCII table
- Spaces are needed since data content varies in length, due to the fact that parameter values differ in size (and length) and leading zeros are always being deleted
- Consequence: telegrams with mainly measurement data (numbers) have more than **double the size** of compared to numbers being directly converted to hex

LMS4000

= BINARY

- Several parts (the same as with ASCII)
- Only command/answer parts separated and ended by spaces
- Only command/answer parts converted to hexadecimal by use of ASCII table
- Data content of one telegram has always the same length, leading zeros are not deleted
- Consequence: telegrams sometimes more complex to construct or modify, since some parts need to be converted via ASCII table and some converted as numbers to hex

TERMINAL & TELEGRAM FRAMING “CoLa”

BINARY FRAMING **+ DATA** CONTENT **– LOGIN EXAMPLE**

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LMS400

Command (Authorized Client login)
sMN SetAccessMode 03 F4724744

Transmitted:
02 02 02 02 00 00 00 1D 73 4D 4E **20**
53 65 74 41 63 63 65 73 73 4D 6F 64
65 **20** 30 33 **20** 46 34 37 32 34 37 34
34 *62*

Parts:

Header & Length	($1D_h$= 29 byte)
Command part 1	(3 byte)
Space	(1 byte)
Command Part 2	(13 byte)
Space	(1 byte)
User Level	(2 byte)
Space	(1 byte)
Password	(8 byte)
Checksum	

LMS4000

Command (Authorized Client login)
sMN SetAccessMode 03 F4724744

Transmitted:
02 02 02 02 00 00 00 17 73 4D 4E **20**
53 65 74 41 63 63 65 73 73 4D 6F 64
65 **20** 03 F4 72 47 44 B3

Parts:

Header & Length	(17_h= 23 byte)
Command part 1	(3 byte)
Space	(1 byte)
Command Part 2	(13 byte)
Space	(1 byte)
User Level	(1 byte)
Password	(4 byte)
Checksum	

TERMINAL & TELEGRAM FRAMING “CoLa”
ASCII FRAMING & DATA CONTENT

- Alternative framing for LMS4000, not possible with LMS400
- Not recommended for data transmission (only for parametrization)
- **All values** in plain text and **converted** to hexadecimal code ($_h$) **by use of ASCII table**
- Setup in **3 parts**: Start byte, data and Stop byte
  - Start byte = <STX> = 02_h
  - Data = telegram command or answer
  - Stop byte = <ETX> = 03_h

Data content:

- See LMS400 ASCII (with binary framing)

TERMINAL & TELEGRAM FRAMING “CoLa”

ASCII FRAMING **+ DATA** CONTENT **– LOGIN EXAMPLE**

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LMS4000:

Command (Authorized Client login)
sMN SetAccessMode 03 F4724744

Transmitted:
02 73 4D 4E **20** 53 65 74 41 63 63 65 73 73 4D 6F 64 65 **20** 30 33 **20** 46 34 37 32 34 37 34 34 *03*

Parts:

Start byte	
Command part 1	(3 byte)
Space	(1 byte)
Command Part 2	(13 byte)
Space	(1 byte)
User Level	(2 byte)
Space	(1 byte)
Password	(8 byte)
Stop byte	

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MEASUREMENT DATA TELEGRAM
GENERAL

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- Command “sMN mLRreqdata“ starts laser and places request for available data
- Order of data bytes at reply command turned back to front (20 00 = 00 20)
- One header/description for all data channels
- Telegram name sent once before data stream
- Additional information in telegram: Input state, Encoder ticks, Scan counter, Telegram counter, System counter

LMS4000

- Command “sEN LMDscandata” only places request for available data
- Order of data always the same (not turned around)
- Separate headers/descriptions for each data channel (independent)
- Telegram name included in each data telegram
- Additional information in telegram: Input & Output state, Encoder ticks, Scan counter, Telegram counter, Time information, Device information (name, serial number, ...), Device status, Description measurement specifics

MEASUREMENT DATA TELEGRAM

EXAMPLE: DISTANCE + REMSSION DATA (1)

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Angular Range set at 1° with 0.1° angular resolution = 2x10 values

Received:

02 02 02 02 00 00 00 44 20 00 01 00 A0 BB 0D 00 E8 03 0A 00 2C 01 02 00 00 00 FF 00 53 08 1F 66 08 1B 67 08 14 55 08 14 65 08 14 61 08 16 6A 08 18 5D 08 17 60 08 17 59 08 16 00 00 00 00 00 00 C7 1C EA 03 00 00 58 02 11 03 4A C7 *F4*

Parts (1/3):

Header & Length	(44_h= 68 byte)
Format (Dist. + Rem.)	(2 byte)
Scaling of Dist. (1)	(2 byte)
Start Angle (90.0000°)	(4 byte)
Angular range (1.000°)	(2 byte)
Values (10)	(2 byte)
Frequency (300 Hz)	(2 byte)
Scaling of Rem. (2)	(2 byte)
Lowest Rem. (0)	(2 byte)
Highest Rem. (255)	(2 byte) [...]

LMS4000

Angular Range set at 1° with 1/12° angular resolution = 2x13 values (distance and remission)

(sent: 02 02 02 02 00 00 00 11 73 45 4E 20 4C 4D 44 73 63 61 6E 64 61 74 61 20 01 33)

Received:

02 02 02 02 00 00 00 A8 73 53 4E **20** 4C 4D 44 73 63 61 6E 64 61 74 61 **20** 00 01 00 01 01 16 C7 95 00 00 0D 75 F9 75 06 F8 33 65 06 F8 36 D1 00 00 08 00 00 00 00 00 EA 60 00 00 21 C0 00 01 00 00 00 00 00 00 00 02 44 49 53 54 31 3D CC CC CD 00 00 00 00 00 0D BB A0 03 41 00 0D 53 66 53 64 53 71 53 74 53 70 53 6B 53 74 53 7B 53 68 53 6A 53 65 53 63 53 62 52 53 53 49 31 3F 80 00 00 00 00 00 00 00 0D BB A0 03 41 00 0D 02 A1 02 9E 02 9E 02 A1 02 9C 02 9E 02 A0 02 9F 02 9E 02 9D 02 9D 02 9E 02 A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 *A3*

Parts (1/3):

Header & Length	($A8_h$= 168 byte)
Answer part 1 (sSN)	(3 byte)
Space	(1 byte)
Answer part 2 (LMDscandata)	(11 byte)
Space	(1 byte)
Version number (1)	(2 byte)
Device number (1)	(2 byte)
Serial number (18270101)	(4 byte)
Device status (0 = OK)	(2 byte)
Telegram Counter (3445)	(2 byte)
Scan Counter (63861)	(2 byte)
Time since start (116,929.381 s)	(4 byte)
Transmission time (116,9230.257 s)	(4 byte)
Digital Inputs (all 0)	(2 byte)
Digital Outputs (Out 4 active)	(2 byte)
Reserved	(4 byte)
Frequency (600.00 Hz)	(2 byte)
Measurement frequency (6840x100 Hz)	(4 byte)
Encoder ports (1)	(2 byte)
Encoder ticks (0)	(4 byte)
Reserved	(2 byte)
Amount of 16 bit channels (2=Dist. + Rem.)	(2 byte) [...]

MEASUREMENT DATA TELEGRAM

EXAMPLE: DISTANCE + REMSSION DATA (2)

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Angular Range set at 1° with 0.1° angular resolution = 2x10 values

Received:
02 02 02 02 00 00 00 44 20 00 01 00 A0 BB 0D 00 E8 03 0A 00 2C 01 02 00 00 00 FF 00 53 08 1F 66 08 1B 67 08 14 55 08 14 65 08 14 61 08 16 6A 08 18 5D 08 17 60 08 17 59 08 16 00 00 00 00 00 00 C7 1C EA 03 00 00 58 02 11 03 4A C7 *F4*

Parts (2/3): [...]

Dist. value 1 (2.131 m)	(2 byte)
Rem. value 1 (31x2=62)	(1 byte)
Dist. value 2 (2.150 m)	(2 byte)
Rem. value 2 (54)	(1 byte)
... (Dist. & Rem. values 3-9)	(21 byte)
Dist. value 10 (2.137 m)	(2 byte)
Rem. value 10 (44)	(1 byte) ...

LMS4000

Angular Range set at 1° with 1/12° angular resolution = 2x13 values (distance and remission)

Received:
02 02 02 02 00 00 00 A8 73 53 4E 20 4C 4D 44 73 63 61 6E 64 61 74 61 20 00 01 00 01 01 16 C7 95 00 00 0D 75 F9 75 06 F8 33 65 06 F8 36 D1 00 00 08 00 00 00 00 00 EA 60 00 00 21 C0 00 01 00 00 00 00 00 00 02 44 49 53 54 31 3D CC CC CD 00 00 00 00 00 0D BB A0 03 41 00 0D 53 66 53 64 53 71 53 74 53 70 53 6B 53 74 53 7B 53 68 53 6A 53 65 53 63 53 62 52 53 53 49 31 3F 80 00 00 00 00 00 00 00 0D BB A0 03 41 00 0D 02 A1 02 9E 02 9E 02 A1 02 9C 02 9E 02 A0 02 9F 02 9E 02 9D 02 9D 02 9E 02 A0 00 00 00 00 00 00 00 00 00 00 00 00 *A3*

Parts (2/3): [...]

Channel 1 (DIST1)	(5 byte)
Scale factor (0.1 = float value)	(4 byte)
Offset (0)	(4 byte)
Start Angle (90.0000°)	(4 byte)
Angle resolution (0.0833°)	(2 byte)
Number of values (13)	(2 byte)
Dist. value 1 (2.1350 m)	(2 byte)
Dist. value 2 (2.1860 m)	(2 byte)
... (Dist values 3-12)	(20 byte)
Dist value 13 (2.1346 m)	(2 byte)
Channel 2 (RSSI1)	(5 byte)
Scale factor (1 = float value)	(4 byte)
Offset (0)	(4 byte)
Start Angle (90.0000°)	(4 byte)
Angle resolution (0.0833°)	(2 byte)
Number of values (13)	(2 byte)
Rem. value 1 (673 digit)	(2 byte)
Rem. value 2 (670 digit)	(2 byte)
... (Rem values 3-12)	(20 byte)
Rem value 13 (672 digit)	(2 byte) [...]

MEASUREMENT DATA TELEGRAM

EXAMPLE: DISTANCE + REMSSION DATA (3)

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Angular Range set at 1° with 0.1° angular resolution = 2x10 values

Received:
02 02 02 02 00 00 00 44 20 00 01 00 A0 BB 0D 00 E8 03 0A 00 2C 01 02 00 00 00 FF 00 53 08 1F 66 08 1B 67 08 14 55 08 14 65 08 14 61 08 16 6A 08 18 5D 08 17 60 08 17 59 08 16 00 00 00 00 00 00 C7 1C EA 03 00 00 58 02 11 03 4A C7 *F4*

Parts (3/3): [...]

Digital Inputs (all 0)	(2 byte)
Reserved	(4 byte)
Encoder tick value (7367)	(2 byte)
Reserved	(4 byte)
Scan Counter (600)	(2 byte)
Telegram Counter (785)	(2 byte)
Sys. Counter (51018x0.32768 = 16,7176 s)	(2 byte)

Checksum

LMS4000

Angular Range set at 1° with 1/12° angular resolution = 2x13 values

Received:
02 02 02 02 00 00 00 A8 73 53 4E 20 4C 4D 44 73 63 61 6E 64 61 74 61 20 00 01 00 01 01 16 C7 95 00 00 0D 75 F9 75 06 F8 33 65 06 F8 36 D1 00 00 08 00 00 00 00 00 EA 60 00 00 21 C0 00 01 00 00 00 00 00 00 00 02 44 49 53 54 31 3D CC CC CD 00 00 00 00 00 0D BB A0 03 41 00 0D 53 66 53 64 53 71 53 74 53 70 53 6B 53 74 53 7B 53 68 53 6A 53 65 53 63 53 62 52 53 53 49 31 3F 80 00 00 00 00 00 00 00 0D BB A0 03 41 00 0D 02 A1 02 9E 02 9E 02 A1 02 9C 02 9E 02 A0 02 9F 02 9E 02 9D 02 9D 02 9E 02 A0 00 00 00 00 00 00 00 00 00 00 00 00 *A3*

Parts (3/3): [...]

Amount of 8 bit channels (0)	(2 byte)
Reserved	(2 byte)
Device name (0= not transmitted)	(2 byte)
Reserved	(2 byte)
Time stamp (0 = not transmitted)	(2 byte)
Reserved	(2 byte)

Checksum

MEASUREMENT DATA TELEGRAM
DATA CHANNELS

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- Available data channels
  - Distance
  - RSSI
  - Distance + RSSI

LMS4000

- Available data channels
  - Distance
  - RSSI
  - Angle offset
  - Distance + RSSI
  - Distance + Angle offset
  - RSSI + Angle offset
  - Distance + RSSI + Angle offset
  - No data
    (additional information only)

MEASUREMENT DATA TELEGRAM
CONFIGURE DATA CHANNELS

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- Separate data request telegram for each channel combination
- Distance only = sMN mLRreqdata 0021
- RSSI only = sMN mLRreqdata 0022
- Distance & RSSI = sMN mLRreqdata 0020

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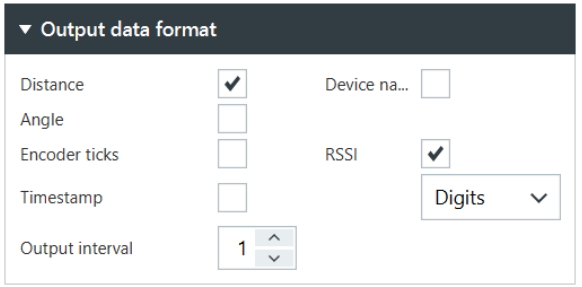
- Data request telegram is always = sEN LMDscandata 1
- Separate channel configuration either via SOPAS ET (Output data format) *or* telegram sWN LMDscandatacfg → Log in as “Authorized client“
- Distance & RSSI:



- Command sWN LMDscandatacfg + **01**00**01**0100000000000000001
- Distance only: Command + **01**00**00**0100000000000000001
- No data: Command + **00**00**00**0100000000000000001

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TRIGGER OPTIONS
GENERAL

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- Laser Control can be combined with Trigger Gate or controlled separately
- Separate start and stop conditions possible
- Gate with track or time control
  - Time delay
  - Expansion time
- Laser timeout = laser shuts down X min after start condition is fulfilled
- Trigger by:
  - Software
  - Hardware (In 1, In 3, In 1 and/or In3)
  - Test trigger
  - Trigger by Master device

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- Trigger Gate is included in “Laser control”-function
- Stop conditions corresponds to start (high signal → low signal)
- Gate with time control only
  - Delay on start
  - Delay on stop
- General Timeout = Gate is stopped X seconds after start condition in case stop condition does not occur
- Trigger by:
  - Software
  - Hardware (In 1, In 2, In 1 or In2)

TRIGGER OPTIONS
TRIGGER WITH MEASUREMENT DATA TELEGRAM

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- Different data request telegram for trigger compared normal data request = sMN mLRreqtrigdata
- Compare Distance + RSSI
  Standard = sMN mLRreqdata 0020
  Trigger = sMN mLRreqtrigdata 0020

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- Data request telegram is always = sEN LMDscandata 1
- Data is sent permanently if “Laser control”-function is set to free running, else as soon that start condition is fulfilled

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ENCODER INTEGRATION

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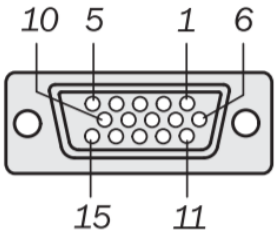
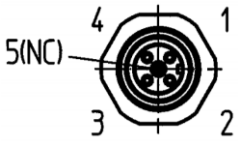
D-Sub connector

- Pin 6 = Enocder A
- Pin 7 = Encoder B



Encoder connector (Accessory hood)

- Pin 2 = Encoder A
- Pin 4 = Encoder B



Sopas settings

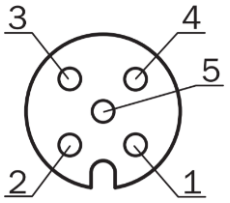
Interfaces > Encoder

- Tickls only (Encoder A)
- Phase (A & B)
- Level (A & B)
- Selectable Frequency (Speed x Resolution)

LMS4000

Encoder connector

- Pin 1 = V_{Out}
- Pin 2 = Encoder B
- Pin 3 = Ground
- Pin 4 = Encoder A



Sopas settings

Interfaces > Encoder

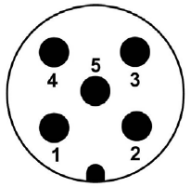
- Tickls only (Encoder A)
- Phase (A & B)
- Level (A & B)
- Fixed Frequency (1 kHz)

ENCODER INTEGRATION

LMS400

Recommended Encoder
= 1051292 / 2058477

Pin 1 = V_{In}
Pin 2 = Encoder B
Pin 3 = Ground
Pin 4 = Encoder A
Pin 5 = Zero Index



Necessary settings for output in measurement data

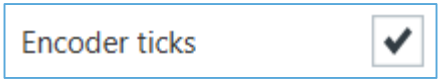
- Values are always given out

LMS4000

Recommended Encoder
= identical

Necessary settings for output in measurement data

- Activation in Ouput data format



or

- Parametrized via telegram:
  sWN LMDscandatacfg +
  0100010100000000000**01**000001

CONTENT

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- Introduction
- Abbreviations
- General differences of the devices
- Physical setup for communication
- Terminal & Telegram Framing “CoLa”
- Measurement data telegram
- Trigger options
- Encoder integration
- **Changed telegram naming**
- Further use cases

CHANGED TELEGRAM NAMING

LMS400 TELEGRAMS WITH LMS4000 (1)

Description	LMS400	LMS4000
Continuous measured value output	sMN mLRreqdata	sEN LMDscandata 1
Triggered measured value output	sMN mLRreqtrigdata	sEN LMDscandata 1
Output defined number of scans	sWN LRscnt	sRN LMDscandata (only 1 scan)
Stop measurement	sMN mLRstopdata	sEN LMDscandata 0
Configuration of the scanning frequency and angular resolution	sMN mSCsetscanconfig	Not possible
Configuration by defining the scanning frequency	sMN mSCconfigbyfreq	Not possible
Configuration by defining the angular resolution	sMN mSCconfigbyang	Not possible
Enable extended RIS detectivity	sWN MDblex	Not possible
Select user level	sMN SetAccessMode	Identical
Query user level	sMN GetAccessMode	Identical
Set password	sMN SetPassword	Not possible
Set device name	sWN LocationName	Identical
Save parameters permanently	sMN mEEwriteall	Identical

CHANGED TELEGRAM NAMING

LMS400 TELEGRAMS WITH LMS4000 (2)

Description	LMS400	LMS4000
Terminate configuration	sMN Run	Identical
Reset device	sMN mDCreset	sMN mSCloadappdef
Place device in delivery status	sMN mMDsetdefault	sMN mSCloadfacdef
Select synchronization type	sWN SYtype	Identical
Define phase	sWN SYphas	Identical
Enable filter	sWN FLsel	(Each filter activated separately combined with definition)
Define median filter	sWN FLmed	sWN LFPmedianfilter
Define range filter	sWN FLrang	sWN LFPcubicareafilter (similar function, included from V1.4)
Define mean filter	sWN FLmean	sWN LFPmeanfilter
Time or distance controlled	sWN IObase	Not possible
Define digital inputs	sWN IOpins	sWN PortConfiguration
Define the gate settings	sWN IOgcfg	sWN IOlasc
Enable laser control	sWN IOlasc	Identical (different parameters though)

CHANGED TELEGRAM NAMING

LMS400 TELEGRAMS WITH LMS4000 (3)

Description	LMS400	LMS4000
Select the encoder settings	sWN IOencm	sWN LICencset
Enable outputs	sMN mMSsetoutput	Not possible
Select hardware setting	sWN HIr422	Not possible
Select baud rate	sWN HIbaud	Not possible
Select number of stop bits	sWN HIstop	Not possible
Select data and parity bits	sWN HIdpar	Not possible
Select block check byte setting	sWN HIblck	Not possible
Select receive start character	sWN HIrpre	Not possible
Select receive stop character	sWN HIrpst	Not possible
Select send start character	sWN HItpre	Not possible
Select send stop character	sWN HItpst	Not possible
Define IP address	sWN EIip	sWN EIIpAddr
Define gateway address	sWN EIgate	Identical

CHANGED TELEGRAM NAMING

LMS400 TELEGRAMS WITH LMS4000 (4)

Description	LMS400	LMS4000
Define subnet mask	sWN EIMsak	Identical
Define port for the TCP/IP communication	sWN EIport	sWN EIHstPort (Host) sWN EIUDPPort (UDP)
Read MAC address	sRN EImac	sRN EIMacAdr
Select format for the CoLa protocol	sWN EIcola	sWN EIHstCola (Host) sWN EIUDPCola (UDP)
Query warnings	sRN MSwarn	Identical
Query errors	sRN MSerr	Identical
Query serious errors	sRN MSfat	Identical
Start measured value output for Level Control	sMN mLRreqlevelcontroldata	Not possible
Stop measured value output for Level Control	sMN mLRstoplevelcontroldata	Not possible

MANY THANKS FOR YOUR ATTENTION.

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