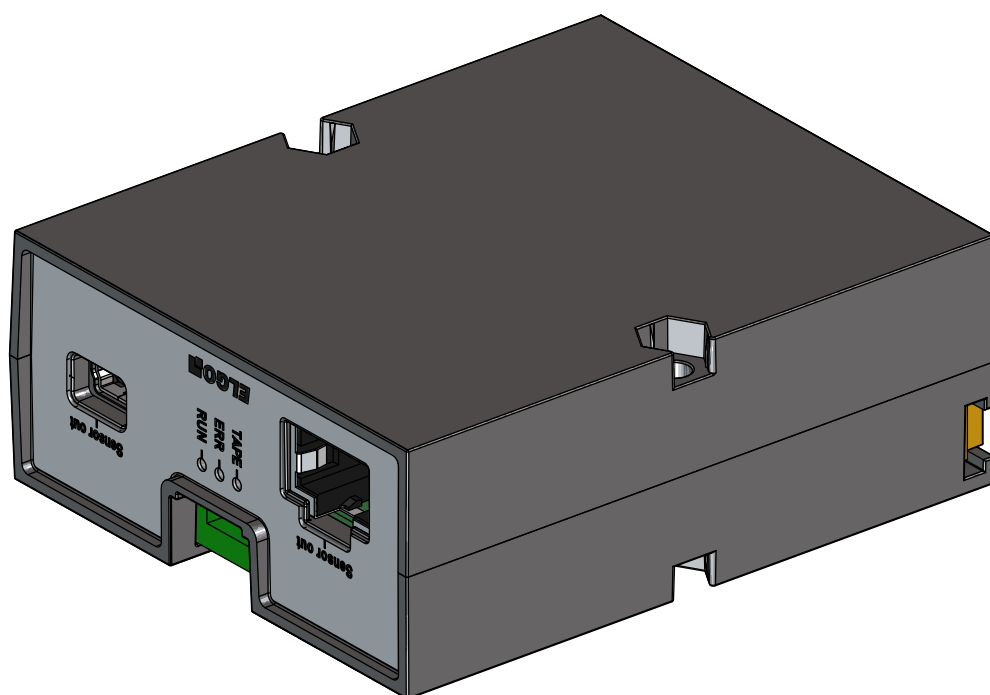


Operating Manual

SERIE LIMAX1M

Magnetic, Pseudo-Absolute Shaft Information System
(Translation of the original operating manual)



- Absolute measurement for hoisting heights up to 90 m
- Auto-referencing: Absolute position is detected after 240 mm
- Resolution: 62.5 / 125 / 250 / 500 or 1000 μm
- Insensitive to smoke, dirt and moisture
- Operating speed up to 4 m/s (higher on request)
- Interfaces: CANopen DS417, CANopen DS406 or USB
On request: RS485, RS422 or SSI
- Simple and flexible mounting options
- Vertical installation of the magnetic tape
- Wear-free, contactless and noiseless measuring principle

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4 General

4.1 Information Operating Manual

This manual contains important information regarding the handling of the device. For your own safety and operational safety, please observe all safety warnings and instructions.




Precondition for safe operation is the compliance with the specified safety and handling instructions. Moreover, the existing local accident prevention regulations and the general safety rules at the site of operation have to be observed.

Please read the operating manual carefully before starting to work with the device! It is part of the product and should be kept close to the device and accessible for the staff at any time. The illustrations in the manual are for better demonstration of the facts. They are not necessarily to scale and can slightly differ from the actual design.


4.2 Explanation of Symbols

Special notes in this manual are characterized by symbols. The notes are introduced by signal words which express the magnitude of danger. Please follow this advice and act carefully in order to avoid accidents and damage and injuries.


Warning notes:

	<p>DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.</p>
	<p>WARNING! This symbol in connection with the word „Warning“ means a possibly impending danger for the life and health of persons. Failure to heed these instructions can result in serious damage to health and even fatal injury.</p>
	<p>CAUTION! This symbol in connection with the signal word "Caution" indicates a possibly dangerous situation. Failure to heed these instructions can lead to injuries or damage of property.</p>



Special safety instructions:

	<p>DANGER! This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons due to voltage. Failure to heed these instructions can result in serious damage to health and even fatal injury. The operations may only be carried out by a professional electrician.</p>
---	---

Tips and recommendations:

	<p>NOTE! ... points out useful tips and recommendations as well as information for an efficient and trouble-free operation.</p>
---	--

References:

-  1.2) Marks a reference to chapter 1.2 of this manual.
-  DOC 3.4) Marks a reference to chapter 3.4 of the document *DOC*.

4.3 Referrals

/LIMAX-MKF-MI/	Mounting instructions for the Magnetic Tape Installation Kit LIMAX MKF https://www.elgo.de/fileadmin/user_upload/pdf/manual/lift/LIMAX-MKF-MI-DE.pdf
/LIMAX-RMS-000-MI/	Mounting instructions for the Magnetic Tape Installation Kits LIMAX RMS & LIMAX RMS90 https://www.elgo.de/fileadmin/user_upload/pdf/manual/lift/LIMAX-RMS-000-MI-DEF.pdf
/LIMAX-S-RMS-000-MI/	Mounting instructions for the Magnetic Tape Installation Kit LIMAX S-RMS https://www.elgo.de/fileadmin/user_upload/pdf/manual/lift/LIMAX-S-RMS-000-MI-DEF.pdf
/LIMAX-S-RMS2-000-MI/	Mounting instructions for the Magnetic Tape Installation Kit LIMAX S-RMS2 https://www.elgo.de/fileadmin/user_upload/pdf/manual/lift/LIMAX-S-RMS2-000-MI-DEF.pdf

4.4 Statement of Warranties

The statement of warranties is enclosed separately in the sales documents.

Guarantee:

The producer guarantees the functional capability of the process engineering and the selected parameters. The period of warranty is one year and begins with the date of delivery.

4.5 Demounting and Disposal

Unless acceptance and disposal of returned goods are agreed upon, demount the device considering the safety instructions of this manual and dispose it with respect to the environment.

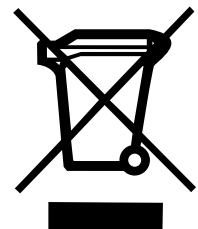
Before demounting:

Disconnect the power supply and secure against re-start. Then disconnect the supply lines physically and discharge remaining energy. Remove operational supplies and other material.

Disposal:

Recycle the decomposed elements:

- Metal components in scrap metal
- Electronic components in electronic scrap
- Recycle plastic components
- Dispose the remaining components according to their material consistence



CAUTION!

Wrong disposal causes environmental damages! Electronic scrap, electronic components, lubricants and other auxiliary materials are subject to special refuse and can only be disposed by authorized specialists!

Local authorities and waste management facilities provide information about environmentally sound disposal.

5 Safety



CAUTION!

Please read the operating manual carefully, before using the device! Observe the installation instructions! Only start up the device if you have understood the operating manual.

The operating company is obliged to take appropriate safety measure.
The initial operation may only be performed by qualified and trained staff.

Selection and installation of the devices as well as their embedding into the controlling system require qualified knowledge of the applicable laws and normative requirements on the part of the machine manufacturer.

5.1 General Causes of Risk

This chapter gives an overview of all important safety aspects to guarantee an optimal protection of employees and a safe and trouble-free operation. Non-observance of the instructions mentioned in this operating manual can result in hazardous situations.

5.2 Personal Protective Equipment

Employees have to wear protective clothing during the installation of the device to minimize danger of health.

Therefore: Change into protective clothing before performing the works and wear them throughout the process. Additionally observe the labels regarding protective clothing in the operating area.

Protective clothing:

	<p>PROTECTIVE CLOTHING</p> <p>... is close-fitting working clothing with light tear strength, tight sleeves and without distant parts. It serves preliminarily for protection against being gripped by flexible machine parts. Do not wear rings, necklaces or other jewelry.</p>
	<p>PROTECTIVE GLOVES</p> <p>... for protecting the hands against abrasion, wear and other injury of the skin.</p>
	<p>PROTECTIVE HELMET</p> <p>... for protection against injuries of the head.</p>

5.3 Conventional Use

The product described in this manual was developed to execute safety-related functions as a part of an entire assembly or machine. It is the responsibility of the manufacturer of a machine or installation to ensure the proper operation of the system. The ELGO-device is conceived only for the intended use described in this manual.

The ELGO length measuring system LIMAX1M serves only to measure linear positions

**CAUTION!**

Danger through non-conventional use!

Non-intended use and non-observance of this operating manual can lead to dangerous situations.

Therefore:

- Only use the device as described
- Strictly follow the instructions of this manual

Avoid in particular:

- Remodeling, refitting or changing of the construction or single components with the intention to alter the functionality or scope of the device.

Claims resulting from damages due to non-conventional use are not possible.
Only the operator is liable for damages caused by non-conventional use.

6 Transport and Storage

6.1 Safety Instructions for Transport, Unpacking and Loading

**CAUTION!**

Transport the package (box, palette etc.) professionally. Do not throw, hit or fold it.

6.2 Handling of Packaging Material

Notes for proper disposal: ☞ 4.5

6.3 Inspection of Transport

Check the delivery immediately after the receipt for completeness and transport damage.

In case of externally recognizable transport damages:

- Do not accept the delivery or only accept under reserve.
- Note the extent of damages on the transportation documents or delivery note.
- File complaint immediately.

**NOTE!**

Claim any damage immediately after recognizing it. The claims for damage must be filed in the lawful reclaim periods.

6.4 Storage

Store the device only under the following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sun light
- Avoid mechanical shocks
- Storage temperature (☞ 8) needs to be observed
- Relative humidity (☞ 8) must not be exceeded
- Inspect packages regularly if stored for an extensive period of time (>3 months)

7 Product Features

Due to its essential advantages, the pseudo-absolute shaft information system LIMAX1M represents a particularly inexpensive, insensitive and easy to install alternative to conventional shaft information systems. The specification “M” in the type designation stands for “Miniature” and means the smallest sensor design of the LIMAX series. Due to its compact design, LIMAX1M requires very little space and is therefore ideal for retrofitting and modernizing existing elevator systems.

During commissioning a one-time referencing is required, which must be requested by the lift control (see section 9.6). After that LIMAX1M is auto-referencing, i.e. the system automatically detects the absolute position after a moving distance of 240 mm (see 9.5 Pseudo-Absolute Measuring Principle).

LIMAX1M is able to cover hoisting heights of up to 90 meters at operating speeds of up to 4 m/s.

Compared to other shaft information systems, the LIMAX1M is characterized by an exceptionally low price. Flexible mounting options ensure simple and quick installation during the initial installation or when the measuring system needs to be replaced.

7.1 Functional Principle

The magnetic tape AB20-80-10-1-R-D-15-BK80 carries the unique positioning information as a magnetic code. It is installed free hanging in the elevator shaft by use of a mounting kit. The sensor head is mounted to the elevator car. While the actual measurement is contactless the tape must be kept within a maximum distance to the sensor head. Therefore, the tape is guided along the sensor by use of the polymer tape guide which is an integral component of the sensor head.

The magnetic measurement principle is extremely robust. Dust, dirt and humidity do not affect the measurement in any way. Also, smoke and even higher temperatures have no influence on the measuring quality. Further the tape is robust enough to withstand the sometimes-harsh conditions in elevator shafts.

7.2 Structure of the Sensor

The LIMAX1M sensor consists of the following components:

- Sensor housing with integrated mounting holes
- RJ45 socket for CAN or mini-USB socket for USB interface (according to order specification)
- Guidance made of sliding plastic (keeps the magnetic tape at a defined distance from the sensor).
- Triple LED line for status messages and operating states.

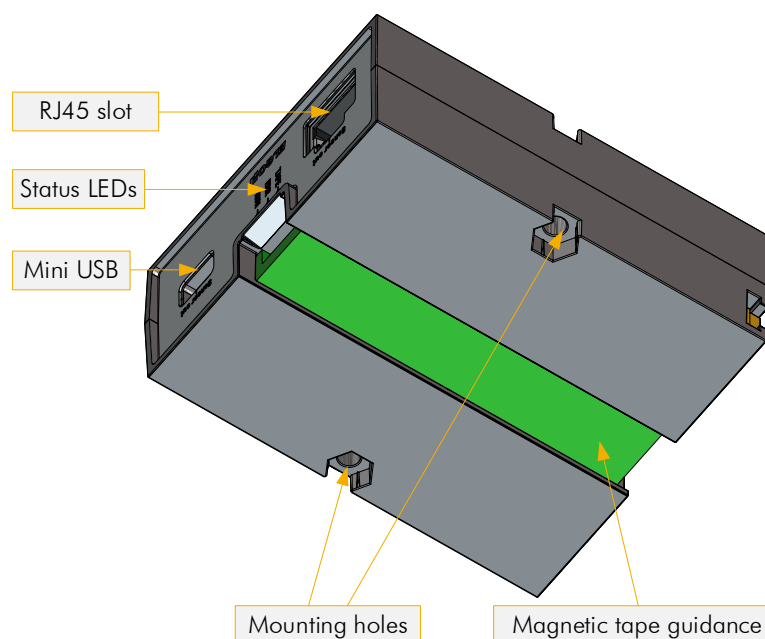
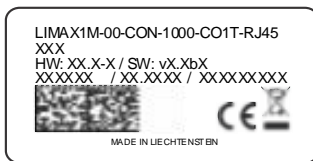


Figure 1: Structure of the LIMAX1M sensor

8 Technical Data

8.1 Identification



The type label serves for the identification of the unit. It is located on the housing of the sensor and gives the exact type designation (=order reference) with the corresponding part number. Furthermore, the type label contains a unique, traceable device number, the production date as well as the hardware and software versions. When corresponding with ELGO always indicate this data.

Figure 2: Type Label

8.2 Dimensions Sensor

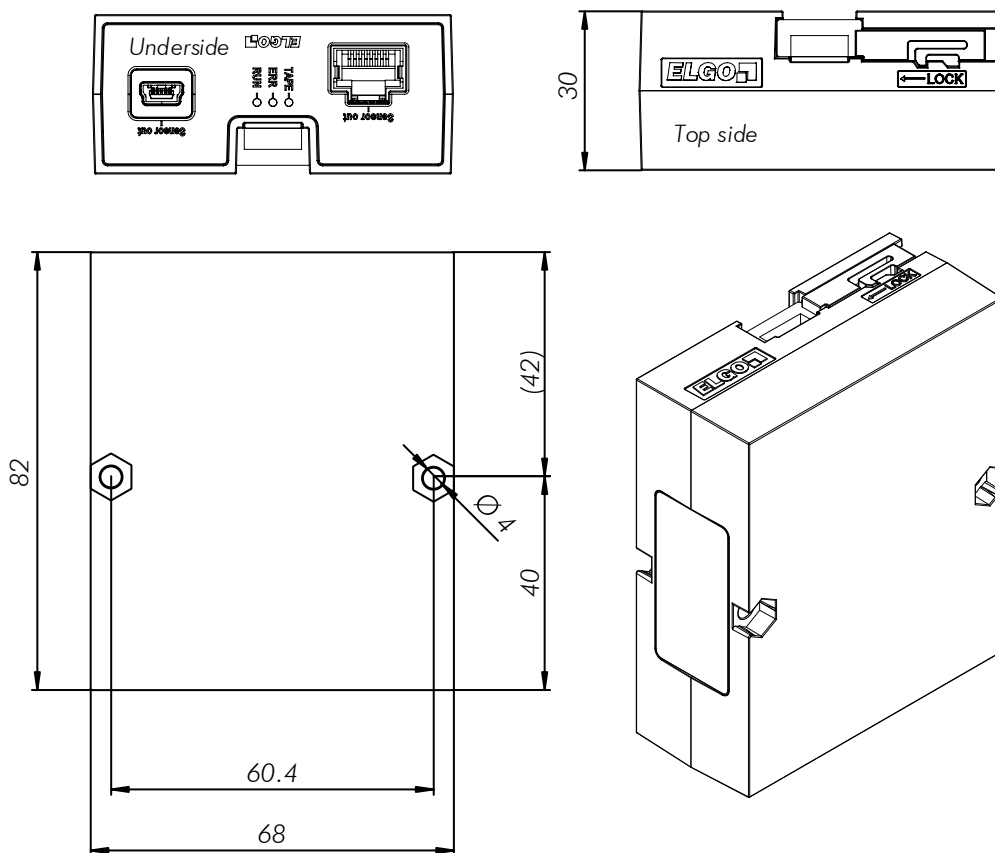


Figure 3: Dimensions of the Sensor

8.3 Dimensions Mounting Angle (Accessories)

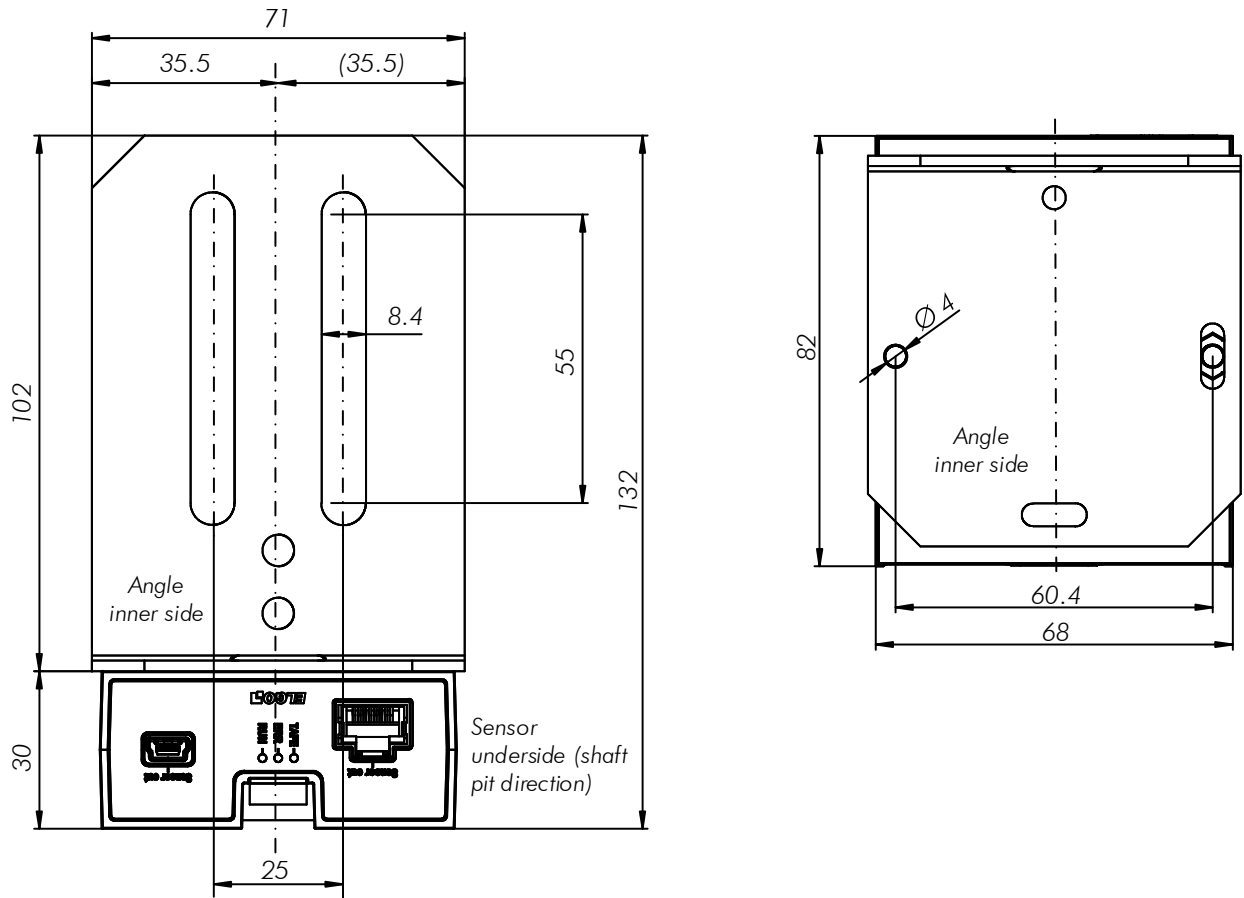


Figure 4: Dimensions of the Mounting Angle

The order designation can be found in section 14.1 Accessories

8.4 Technical Data Sensor

LIMAX1M (Standard Version)

Mechanical Data

Measuring principle	pseudo-absolute
Repeat accuracy	± 1 increment
System accuracy in μm at 20 °C	$\pm(1000 + 50 \times L)$ L = measuring length in meters
Distance sensor / tape	the correct distance is guaranteed by guidance
Housing material	plastic
Housing dimensions	L x W x H = 82 x 68 x 30 mm
Required magnetic tape	AB20-80-10-1-R-D-15-BK80
Basic pole pitch (magnetic tape)	8 mm
Maximum measuring length	90 m
Connections	standard RJ45 socket or Mini USB socket (see ↗ 14 Type Designation)
Sensor cable	external network cable resp. USB cable required
Weight	approx. 60 g without cable

Electrical Data

Power supply voltage	10 ... 30 VDC resp. 5 VDC with USB interface
Residual ripple	< 200 mVpp
Current consumption	max. 150 mA
Interface	standard: CANopen DS417 optional: CANopen DS406 or USB with standard protocol on request: SSI, RS485, RS422
Resolution	1.0 / 0.5 / 0.25 / 0.125 / 0.0625 mm (see ↗ 14 Type Designation)
Operating speed	max. 4 m/s (higher on request)
Cycle time	250 μs

Environmental Conditions

Storage temperature	-25 ... +85 °C
Operating temperature	-10 ... +70 °C (-25 ... +85 °C on request)
Operating altitude	max. 3000 m above sea level
Humidity	max. 95 %, non-condensing
Protection class	IP43

8.5 Technical Data Magnetic Tape

The magnetic tape consists of two components:

- The actual magnetic tape which carries the position information
- A mechanical stainless steel back iron

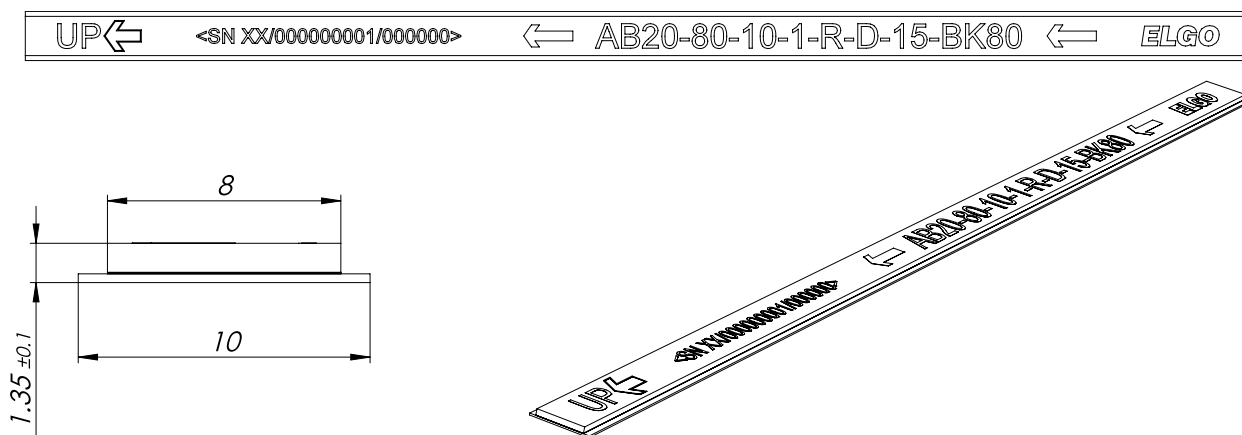



Figure 5: Magnetic Tape: Structure and Dimensions


Magnetic Tape AB20-80-10-1-R-D-15-BK80





Coding	absolute, single-track system
Pole pitch	8 mm
Operation temperature installed	-20 ... +65 °C (-20 ... +80 °C when using without adhesive tape, options "B" or "D")
Storage temperature uninstalled	Short-term: -10 ... +60 °C Medium-term: 0 ... +40 °C Long-term: +18 °C (-20 ... +80 °C when using without adhesive tape, options "B" or "D")
Gluing temperature	+18 °C ... +30 °C
Relative humidity	max. 95 %, non-condensing
Accurateness 20°C in µm	± (1000 + 50 x L) L = measuring length in meters
Material carrier tape	precision strip 1.4310 / X10CrNi 18-8 (EN 10088-3)
Double-faced adhesive tape	3M-9088 (observe instructions), others on request
Dimensions	→ without adhesive tape: 10 mm (±0.1) x 1,35 mm (±0.11) → with adhesive tape (excl. carrier): 10 mm (±0.1) x 1,56 mm (±0.13) → with adhesive tape (incl. carrier): 10 mm (±0.1) x 1.63 mm (±0.14)
Length expansion coefficient	$\alpha \approx 16 \times 10^{-6} \text{ 1/K}$
Thermal length expansion	$\Delta L[\text{m}] = L[\text{m}] \times \alpha[1/\text{K}] \times \Delta\theta[\text{K}]$ (L = tape length in meters, $\Delta\theta$ = relative temperature change)
Bending radius	min. 150 mm
Available lengths	max. 260 m
Weight magnetic tape	approx. 62 g/m (incl. magnetic tape and cover tape)
Tape imprint	ELGO standard, printing color black, digit height ≥ 5 mm
Influence of external magnets	External magnetic fields must not exceed 64 mT (640 Oe; 52 kA/m on the surface of the magnetic tape as this could damage or destroy the code on the tape.
Protection class	IP65

9 Installation and First Start-Up

	<p>CAUTION</p> <p>Please read the operating manual carefully before using the device! Strictly observe the Installation instructions! In case of damage caused by failure to observe this operating manual, the warranty expires.</p> <p>ELGO is not liable for any secondary damage and for damage to persons, property or assets. The operator is obliged to take appropriate safety measures.</p> <p>The first start-up may only be performed by staff that has been trained and authorized by the operator.</p>
---	--

9.1 Operating Area

	<p>WARNING!</p> <p>Do not use the device in explosive or corrosive environments! The device must not be installed close to sources of strong inductive or capacitive interference or strong electrostatic fields!</p>
---	--

   	<p>CAUTION!</p> <p>The electrical connections must be made by suitably qualified personnel in accordance with local regulations.</p> <p>The device may be designed for switchboard mounting. During work on the switchboard, all components must be de-energized if there is a danger of touching the energized parts (protection against contacts)!</p> <p>Wiring works may only be performed in the de-energized state!</p> <p>Thin cable strands have to be equipped with end sleeves!</p> <p>Before switching on the device, connections and plug connectors have to be checked!</p> <p>The device must be mounted in a way that it is protected against harmful environmental influences such as splashing water, solvents, vibration, shock and severe pollution and the operating temperature must not be exceeded.</p>
--	---

9.2 Installation of Sensor and Magnetic Tape

9.2.1 Magnetic Tape Installation Principle

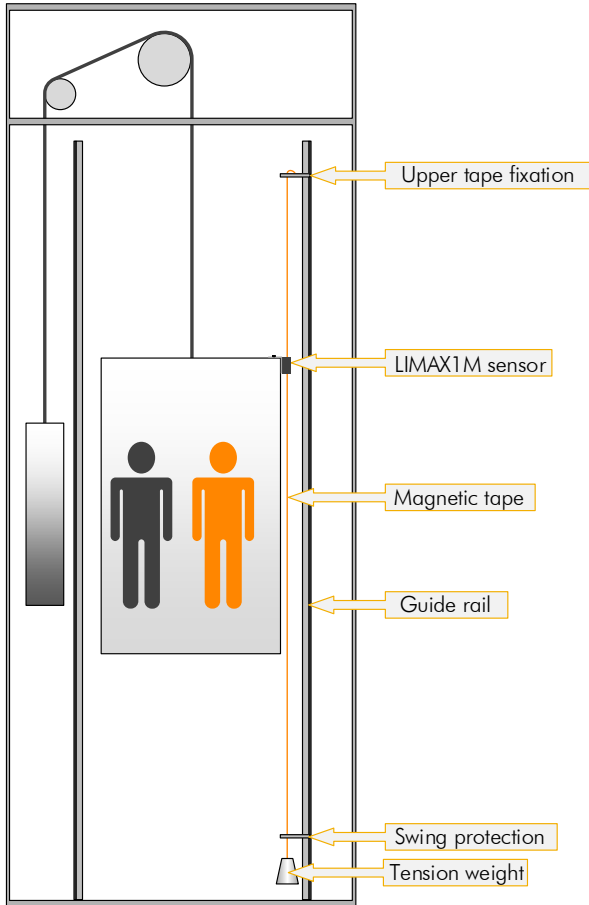


Figure 6: Installation with tension weight

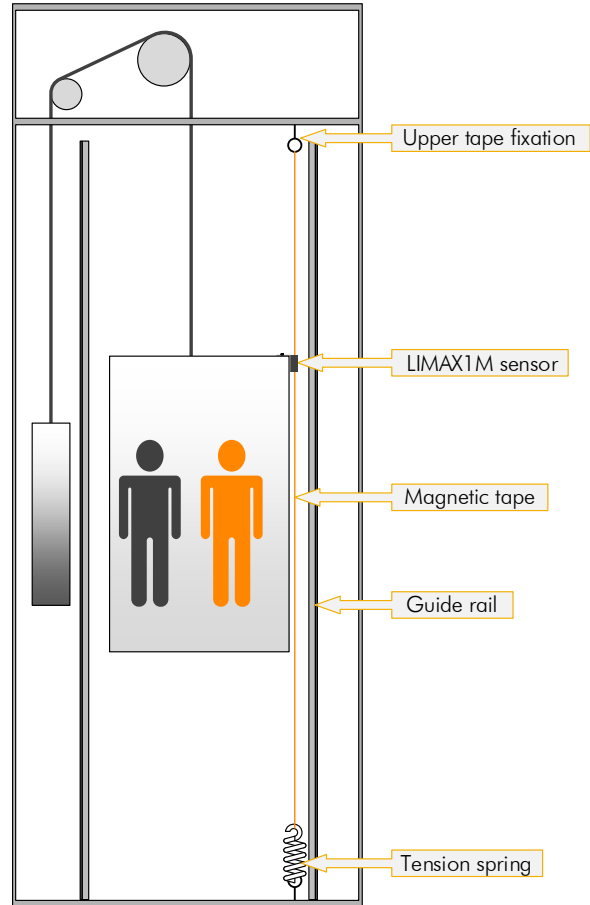


Figure 7: Installation with tension spring

LIMAX1M can be installed at any position in the shaft, depending on space situation and layout of the particular elevator installation.

The magnetic tape is installed freely suspended in the shaft. It can be fixed with an RMS mounting kit (accessorial part see § 14.1) on a guide rail. Alternatively fixation in the shaft head is either on beams or directly doweled into the ceiling.

At the bottom, a sway guard is recommended. This will keep the tape from swaying in an uncontrolled manner which may cause damage to the tape or other components in the shaft. The necessary tension in the tape is provided by a tension weight of about 7.5 kg (see Figure 6). Alternatively the magnetic tape can be tensioned by a spring (see Figure 7).

9.3 Mounting the Sensor

Depending on the specific conditions of the elevator, the sensor head can be mounted directly on the cabin body (e.g. cabin roof) or cabin frame. Optionally, the sensor can be mounted on the cabin via the two mounting holes in the sensor housing or via the optional mounting angle.



OBSERVE MOUNTING DIRECTION!

When mounting the sensor, make sure that the side with the connections and LEDs points downwards towards the shaft pit (sensor underside). The other side with the orange guide lock must point upwards in the positive counting direction (sensor upper side).

A wrong direction does not provide correct values!

The marking arrows attached to the magnetic tape and sensor point in the positive counting direction (towards the shaft head).

9.3.1 Via Mounting Holes in the Housing

For this purpose, two M3 threaded holes with a suitable drilling distance of 60.4 mm (see section 8.2) must be prepared on the side of the cabin or on the holding device used. Then the sensor can be mounted with two M3 screws (according to DIN 933).

9.3.2 Via Mounting Angle (recommended)

The 90° mounting angle (see 14.1 Accessories) has two mounting surfaces. The short side has suitable mounting holes to screw it to the sensor. The long side with the two slotted holes is used to fix the angle on the cabin roof (as shown in the right figure below).

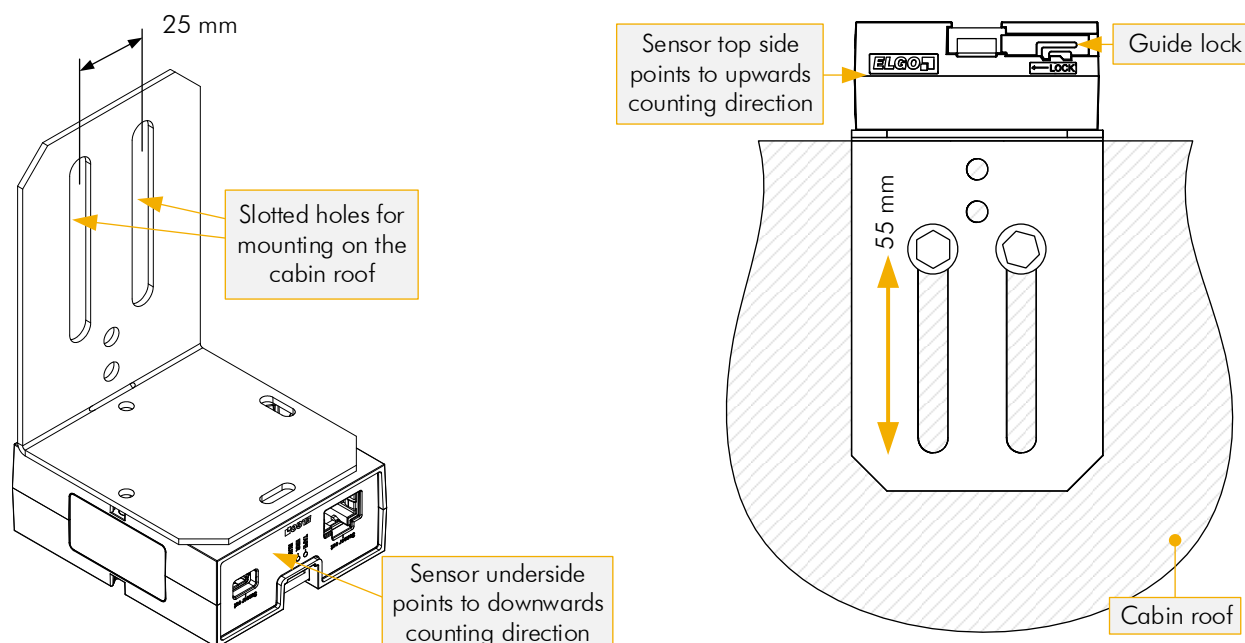


Figure 8: Mounting Angle (accessorial part)

For this purpose, the mounting surface has two slotted holes at a distance of 25 mm (see left figure above), which are designed for mounting with M8 hexagon head screws (according to DIN 933) and suitable washers. Two M8 threaded holes must first be prepared on the cabin roof.

Advantage of the mounting angle:

The two elongated holes provide more flexibility, as the sensor can be moved within a range of 55 mm and thus individually adapted to the mechanical conditions.

9.4 Installation of the Magnetic Tape



EXTERNAL MAGNETIC FIELDS!

The influence of the magnetic tape by magnetic fields must be avoided! The magnetic tape must not come into direct contact with other magnetic fields (e.g. permanent magnets, magnetic clamps, electromagnets, magnetic stands)! This may cause irreparable damage, which will compromise the measuring accuracy or even the functioning.

9.4.1 General Information

The magnetic tape technology has proven to be highly robust. LIMAX1M will work under the most adverse environmental conditions. High temperatures, humidity and dirt do not affect the magnetic coding of the tape or the reading accuracy of the sensor. Even weak magnetic fields such as they are generated by door magnets can be tolerated.

If some basic rules and guidelines are followed, LIMAX1M systems require a minimum amount of installation and maintenance effort while offering maximum lifetime.

One important issue to consider is the protection of the magnet tape against mechanical wear. The LIMAX1M tape consists of two components which are described in section 8.5 Technical Data Magnetic Tape.

9.4.2 Installation Concept

9.4.2.1 Mounting Principle



NOTE!

The magnetic tape itself is not designed to withstand excessive mechanical wear. It is therefore important to ensure that the system is installed such a way that the mechanical contact between tape and sensor head is mainly between the steel tape and the polymer sensor guide. These two materials are exactly matched to this application.

Avoiding contact between the magnetic side and the sensor could be achieved with a perfectly perpendicular installation of the band. Yet, in reality this is not practicable. It is therefore preferable to install the tape with a horizontal offset (see section 9.4.3 Installation Procedure/ Step 8.) from the sensor. During operation this method will result in a forced contact between the steel side of the tape and the polymer guide of the sensor which guarantees an optimal operation of the system.

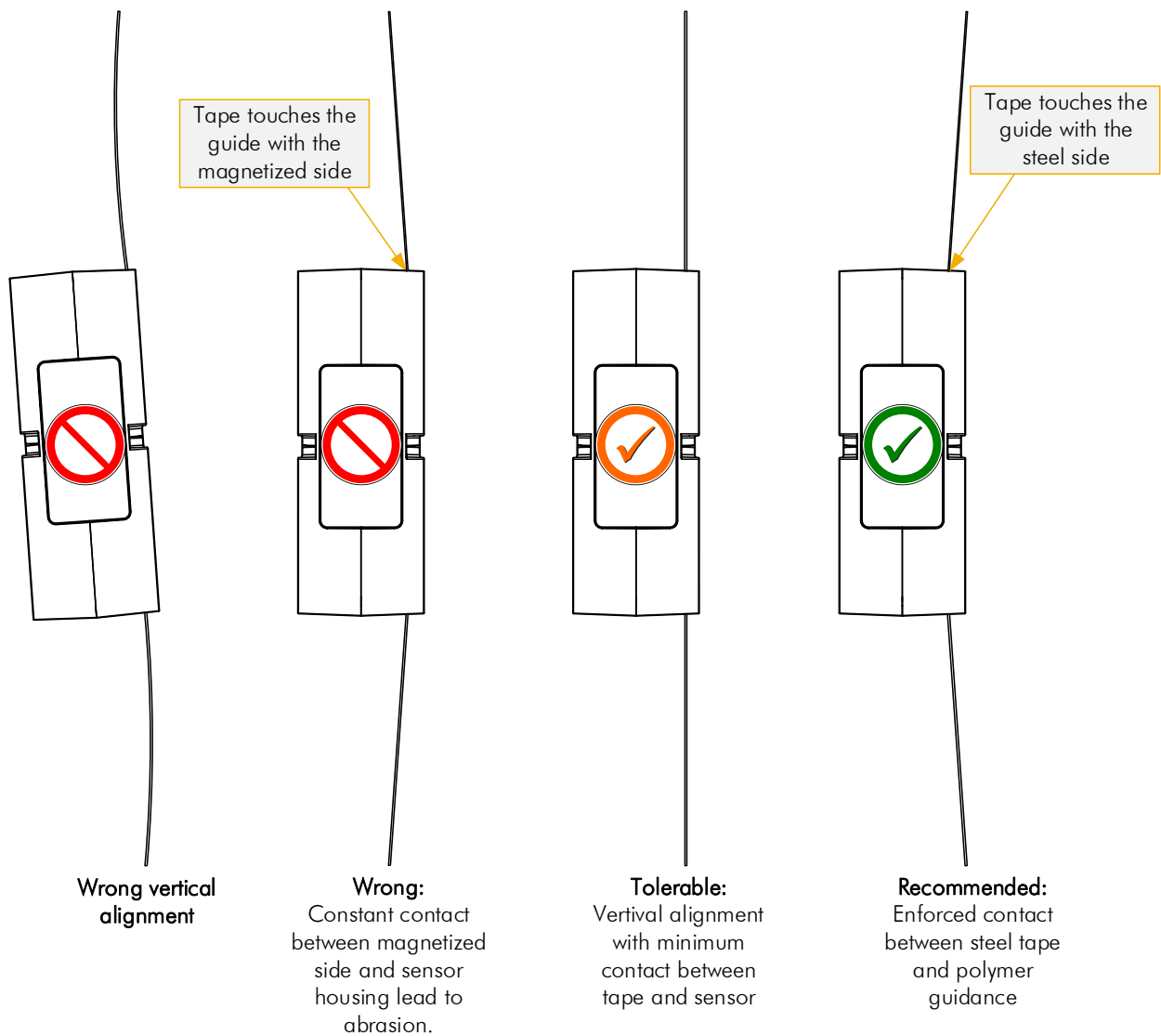


Figure 9: Assessment of the magnetic tape offset

9.4.3 Installation Procedure

1. Attach the top end of the magnetic tape in the shaft head. Ideally use an ELGO Magnetic Tape Mounting Kit (see 14.1 Accessories). Check for correct orientation of the tape. The arrows on the magnetic side must point in upward direction:



Figure 10: Correct direction of the magnetic tape

2. The printed side (magnetic side) of the tape must point inwards towards the sensor. The steel side thus points outwards towards the shaft wall.
3. Move down with the inspection drive. Unroll the belt. The cardboard packaging of the tape is designed in such a way that the tape can be unwound directly from the packaging. Thus the tape always optimally protected.
4. Attach the tension weight (about 7.5 kg) at the bottom end of the tape in the shaft. Secure the tape with a sway guard. Pay attention to a proper vertical mounting of the tape.

If you use dowels to fix the tape in the shaft, tighten the spring such, that the according tractions results to minimum 7.5 kg. When using the ELGO Mounting Kit RMS/RMS90 this is equivalent to a spring elongation of about 90 mm. Note that slightly higher tensile forces are never a problem, but avoid under-tensioning. In higher buildings it may even be preferable to slightly increase the tension in order to prevent flapping of the tape during operation. However, if correctly installed tensile forces of more than 10 kg should never be necessary.

5. Move the cabin to the middle of the shaft.
6. Mount the sensor on the cabin. The orange guide lock must point upwards (see Figure 8). This corresponds to the upwards counting direction (see step 1. above).
7. Align the sensor. Use the tape as a reference. First align the sensor in the middle of the tape.

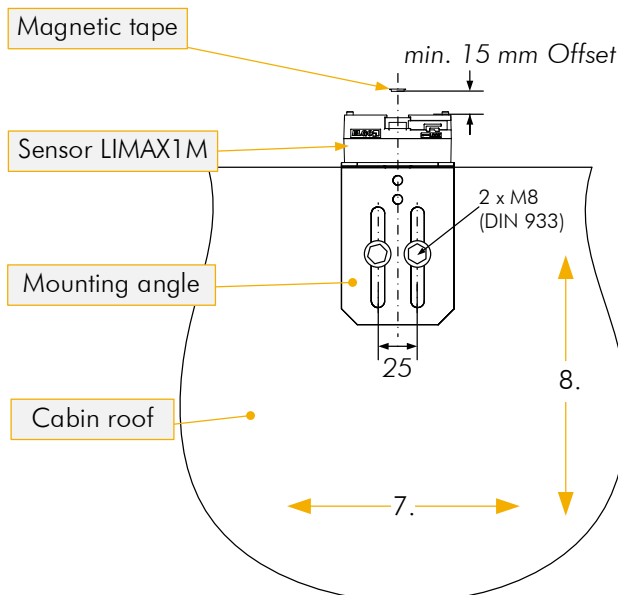


Figure 11: Distance and orientation of the tape with reference to the sensor

8. Then adjust an offset for pre-tension between sensor and tape. For hoisting heights up to 90 meters, we recommend a distance of at least 15 mm. This offset ensures that the tape is correctly guided on the steel side during operation. This dimension can be increased later if the tape still rubs against the sensor with the magnetic side.
9. Insert the tape through the sensor (procedure see section 9.4.4.)
10. Then check the proper alignment of sensor and tape (see section 9.4.5). Deviations and angular misalignments must be corrected.

9.4.4 Connecting the Magnetic Tape to the Sensor

After the magnetic tape has been installed in the shaft and the sensor has been attached to the cabin in accordance with section 9.4.3, the magnetic tape can be inserted through sensor. Proceed as follows:

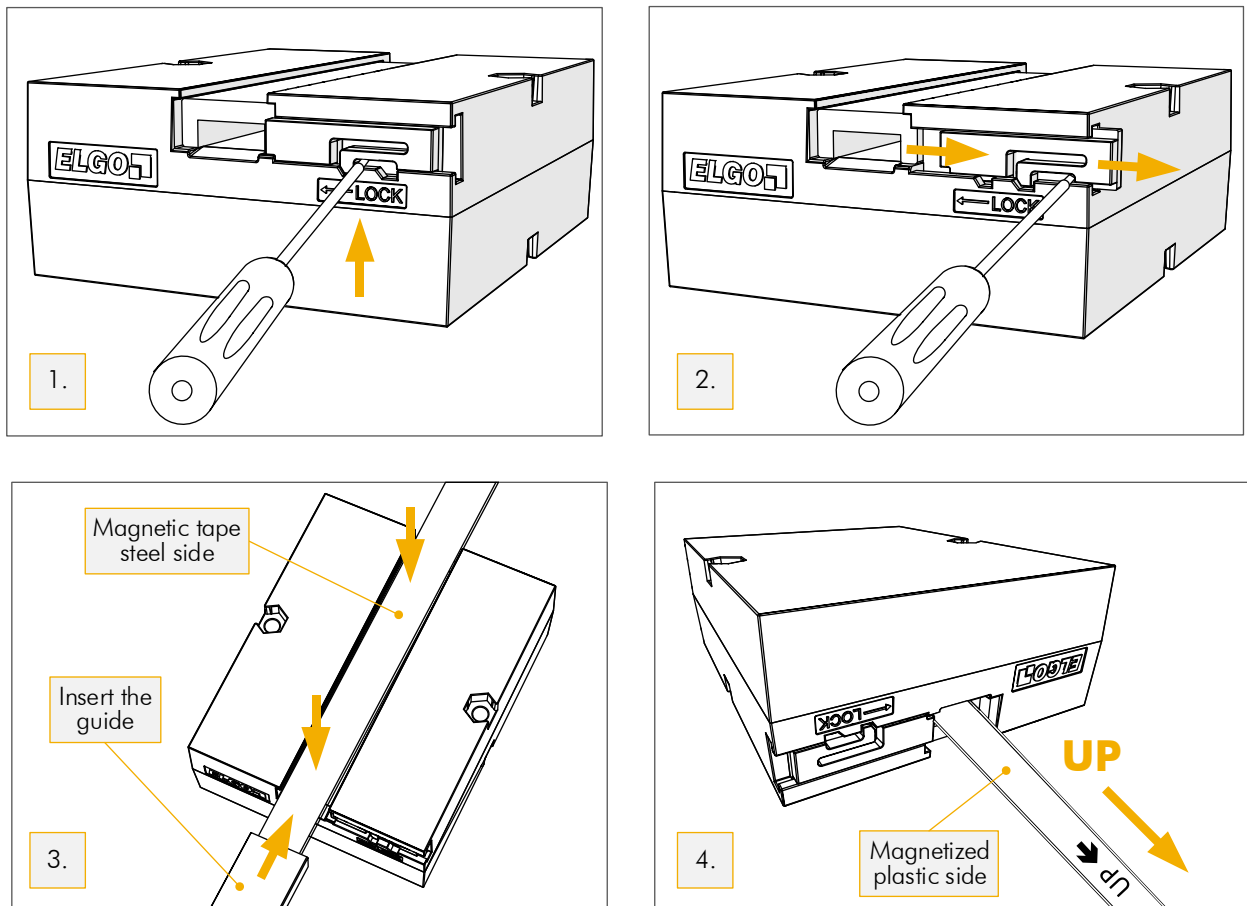


Figure 12: Connecting the magnetic tape to the sensor

1. Use a small screwdriver to push the locking mechanism of the orange guide lock upwards.
2. Slide the guide lock (as shown in the figure) to the right and remove the green guide rail by pulling it out of the sensor housing.
3. Insert the magnetic tape into the groove of the sensor housing. The magnetized plastic side must point inwards (towards the sensor) resp. the steel side must point outwards (towards the shaft wall). The guide rail can then be inserted back into the housing and the locking device engaged to the left again.
4. Please make sure that the sensor side with the guide lock points upwards to the shaft head (see Figure 8 in section 9.3.2).

Afterwards the correct fit of the magnetic tape in the guide should be checked (see next section 9.4.5).

9.4.5 Checking the Fit of the Magnetic Tape

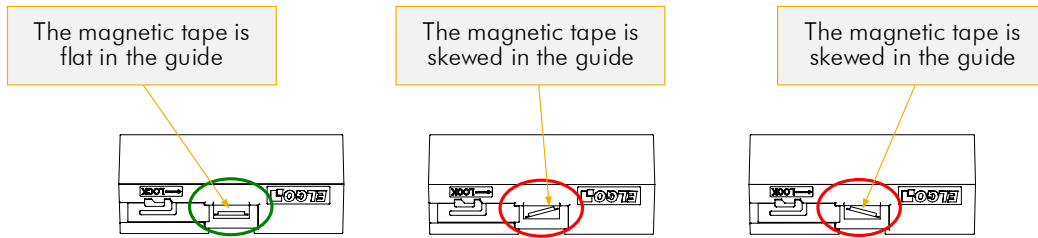


Figure 13: Assessment of the tape guide rail in the sensor - twisted magnetic tape

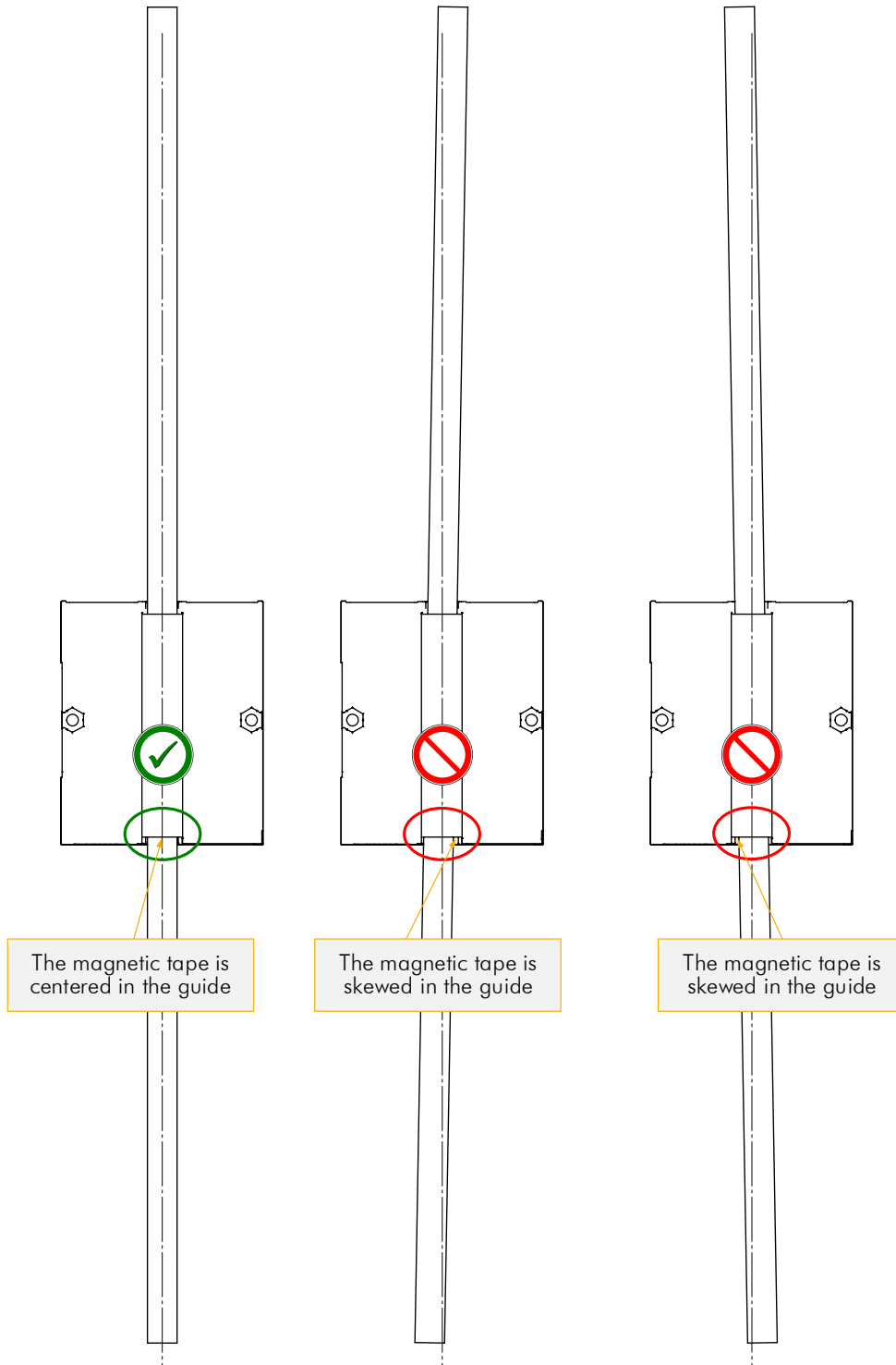


Figure 14: Assessment of the tape guide rail in the sensor - skewed magnetic tape

9.4.6 Important: Final Installation Check

Values for tape tension and offset between tape and sensor are guidelines based on experience. But in any case, a proper check after installation is mandatory. **It must absolutely be avoided that the magnetic side constantly grinds on the sensor body during operation.** Perform an inspection run along the complete shaft. Observe the system and pay attention to the respective positions of tape and sensor.

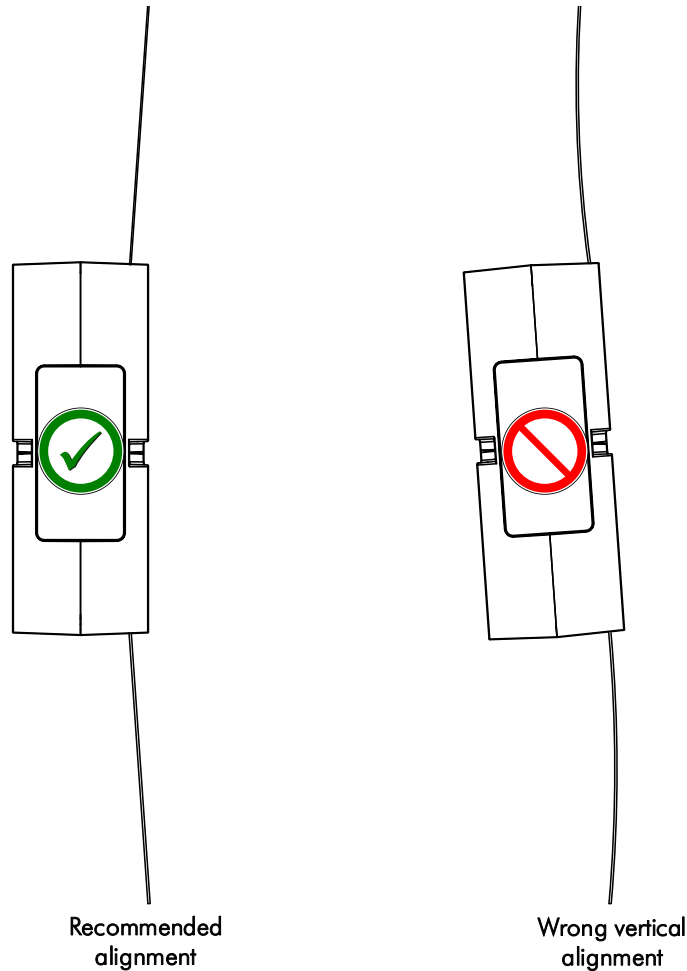



Figure 15: Final inspection check



You have achieved an optimal installation if the steel side of the tape is constantly pressed slightly against the polymer guide of the sensor. At some points in the shaft also double-check on the underside side of the sensor. If the sensor is tilted it may look good on top, but the tape can still grind along the bottom edge of the sensor.

If the installations check reveals that the tape slides on magnetic side, start to increase the offset between sensor and tape. Values of up to 5 cm are acceptable. If this measure does not solve the problem it is very likely that the tape is not plumb in the shaft. This is easy to check for, provided your elevator control allows for inspection trips without the absolute position signal: Just take the tape out of the sensor and run an inspection trip along the shaft. Observe the distance between sensor and tape along the travel. Misalignments will become obvious.

Also ensure that the tension on the tape is sufficient. A loosely tensioned tape will hinder proper guiding.


After completion of the installation clean the tape. Start at the shaft head and perform an inspection run downwards over the complete distance while pulling the tape with light pressure through a dry clean cloth.

	<p>NOTE!</p> <p>Be specifically alert if steel construction work is taking place in the shaft. Steel particles released by grinding, welding or such work will adhere to the magnetic tape. The tape is insensitive to fine metal dust. However, <u>coarser</u> metal chips can cause problems. Clean this debris off instantly. Repeat the cleaning process before putting the elevator into operation after complete installation.</p>
---	---

	<p>DO NOT USE A MAGNET FOR CLEANING!</p> <p>Never use a magnet to remove metal chips from the magnetic tape. This will destroy the magnetic code and thus the magnetic tape.</p>
	<p>PROTECTIVE GLOVES!</p> <p>Always wear protective gloves when cleaning the magnetic tape.</p>

9.5 Pseudo-Absolute Measuring Principle

LIMAX1M is a pseudo-absolute magnetic length measuring system. Pseudo-absolute means that after switching on, the absolute code first must be recognized by a single movement in an arbitrary direction (at least 240 mm). From this point on, the system measures absolute.


	<p>NOTE!</p> <ul style="list-style-type: none"> ▪ Until the absolute position is reached, LIMAX1M outputs a relative position (starting at 130 m). ▪ During the movement process, it must be ensured that the corresponding distance can be driven safely in this direction.
---	---

9.6 Referencing

During commissioning, the lift control must first be paired with the magnetic tape by an initial referencing. This is necessary because the absolute-coded magnetic tape (260 m roll material) is cut at an unknown resp. undefined position to the required length of the lift shaft.

- Make sure that the device outputs an absolute position (see section 9.5)
- Move the cabin to a fixed position (e.g. first floor \pm 10 m) and stop the cabin there.
- Set the lift control value to the same value of the actual car position.

From now on, the system always references itself automatically after switching on, as soon as the absolute position is available.

	<p>NOTE!</p> <p>Referencing must always be carried out:</p> <ul style="list-style-type: none"> ▪ At first commissioning of LIMAX1M + Magnetic Tape ▪ When the magnetic tape or the lift control is replaced
---	--

10 LEDs (Operating States and Messages)

The three LEDs mounted on the sensor housing are used to display and monitor operating states.

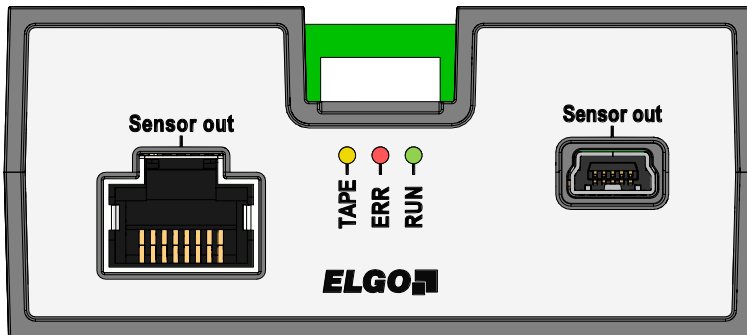


Figure 16: LEDs for status messages

RUN GREEN	→	Operating status
FLASHING	=	System is in operation
ERR RED	→	Error indication
ON	=	Status error, system is not ready for operation
OFF	=	Status OK, system is ready for operation
TAPE YELLOW	→	Magnetic tape monitoring
ON	=	Magnetic tape is missing
OFF	=	Magnetic tape is available

11 Interfaces

11.1 CAN Interface

11.1.1 CANopen DS417 and DS406

The standardized CANopen interfaces DS417 (elevator profile) and DS406 (encoder profile) are available for LIMAX1M. By default, these interfaces are delivered with the following configuration:

Table 1: Configuration CANopen DS417

CANopen DS417	
Bit rate	250 kbit/s
Identifier	18 C h [Node ID 0x04]
Event timer	100
Event type	Profile Event (\triangle transmit on change)
Producer heartbeat	1000 ms
Resolution	1 mm

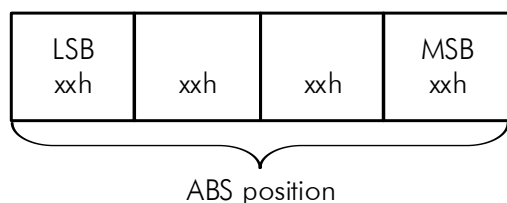


Figure 17: Protocol DS417

The detailed CAN specifications can be requested as a separate document from ELGO. Available CAN options and further information about the DS417 elevator profile can be found in the corresponding XDD and EDS file. Download on https://www.elgo.de/fileadmin/user_upload/software/LIMAX1M_DS417.zip

Table 2: Configuration CANopen DS406

CANopen DS406	
Bit rate	250 kbit/s
Identifier	181h [Node ID 1]
Event timer	20
Producer heartbeat	1000 ms
Resolution	1 mm
First 4 Bytes	Position in mm
Next 2 Bytes	Speed in mm/s

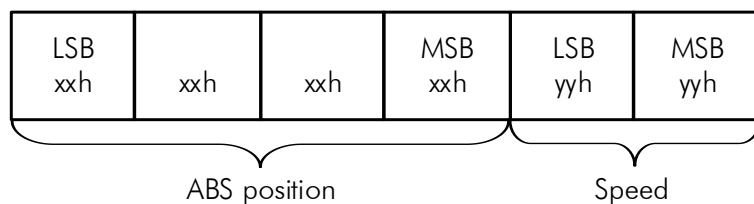


Figure 18: Protocol DS406

The detailed CAN specifications can be requested as a separate document from ELGO. Available CAN options and further information about the DS06 encoder profile can be found in the corresponding XDD and EDS file. Download on https://www.elgo.de/fileadmin/user_upload/software/LIMAX1M_DS406.zip

11.1.2 Initial Operation

After starting the CANopen device is in the Pre-operational Mode (☞ 11.1.4.2) and therefore doesn't send any position data. In order to achieve this, the device needs to be set into Operational Mode (☞ 11.1.4.1).

11.1.3 Save Parameters

In the normal case the settings are lost at power off or failure. In order to avoid this, they need to be saved according to the following procedure.

1. Change into the Operational or Pre-operational Mode, if necessary.
2. The following figure shows the CAN-message, which should be transmitted to the CANopen device and the following answer:

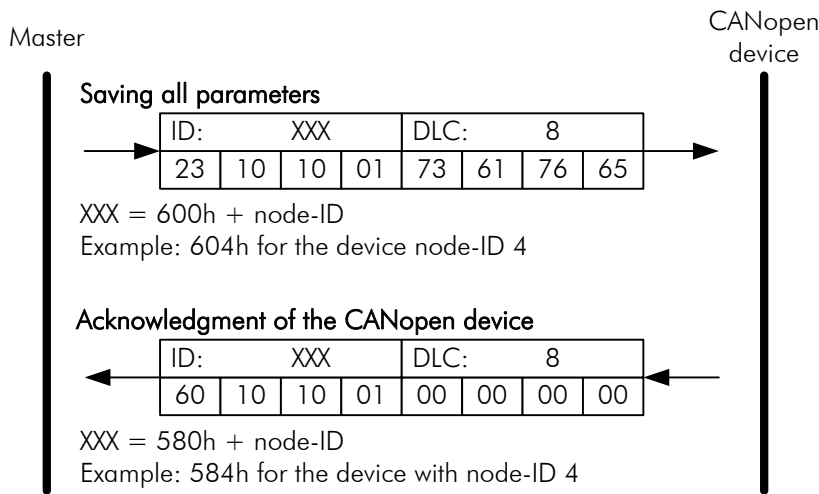


Figure 19: Saving Parameters

11.1.4 Changing Operating Modes

11.1.4.1 Change to Operational Mode

In the Operational Mode the communication of the device is fully functional.

The following CAN-message causes the change of all CANopen participants into the Operational Mode:

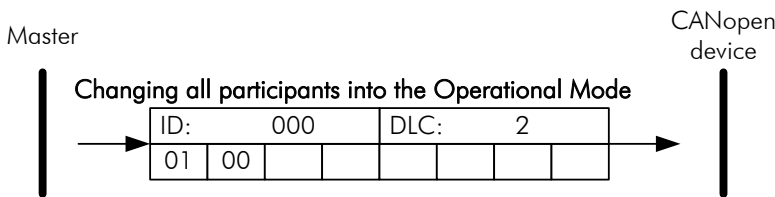


Figure 20: Change to Operational Mode

11.1.4.2 Change to Pre-Operational Mode

In the Pre-operational Mode the communicating settings of the device are adjusted.

The following CAN-message causes the change of all CANopen participants into the Pre-Operational mode:

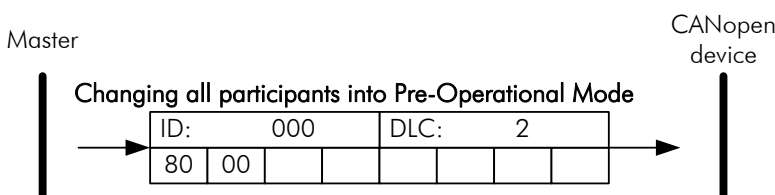


Figure 21: Change to Pre-operational Mode

11.1.4.3 Change to Stopped Mode

Bus sharing units in the Stopped Mode are passive participants. In this mode all the communication is turned off, except the monitoring activity (e.g. heartbeat).

The following CAN-message causes the change of all CANopen participants into the Stopped Mode:

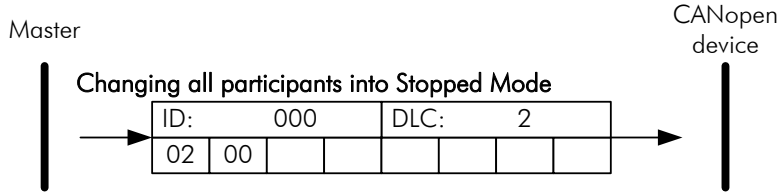



Figure 22: Change to Stopped Mode

11.1.5 LSS Configuration

Basic settings like node-ID and baud rate have to be adjusted with the Layer Setting Services (LSS).

11.1.5.1 Change to LSS Configuration Mode

In order to be able to change the Parameter (Node ID, bit rate), the device has to be changed into the LSS Configuration Mode.



CAUTION!

With the following command all the bus sharing units which are in the “Stopped Mode” are changed into the LSS Configuration Mode. Use this command, if only one device is connected to the bus, because other devices could be affected in their function.

The following CAN-message causes the change into the LSS Configuration Mode.

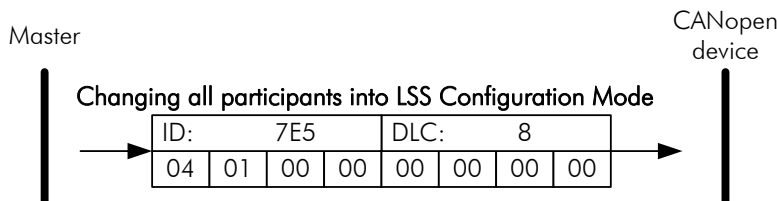


Figure 23: Change to LSS Configuration Mode

11.1.5.2 Save Parameters in the LSS Mode

In order not to lose the changes in case of a power failure, they have to be saved in the non-volatile memory of the CANopen device. The following figure shows the necessary message for this procedure:

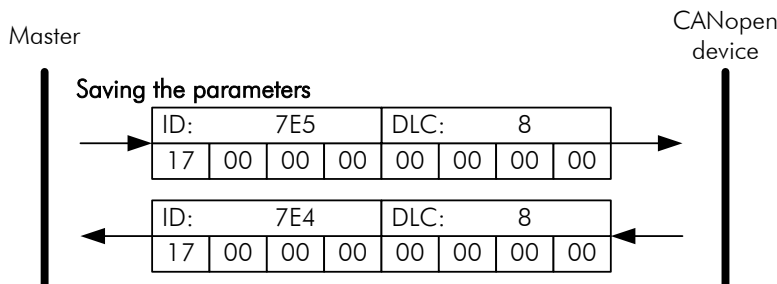


Figure 24: Save parameters in the LSS Mode

11.1.6 Bit Rate Setting

1. Change the device into the Stopped mode (☞ 11.1.4.3)
2. Change the device into the LSS Configuration (☞ 11.1.5.1)
3. Change bit rate according to the following command:

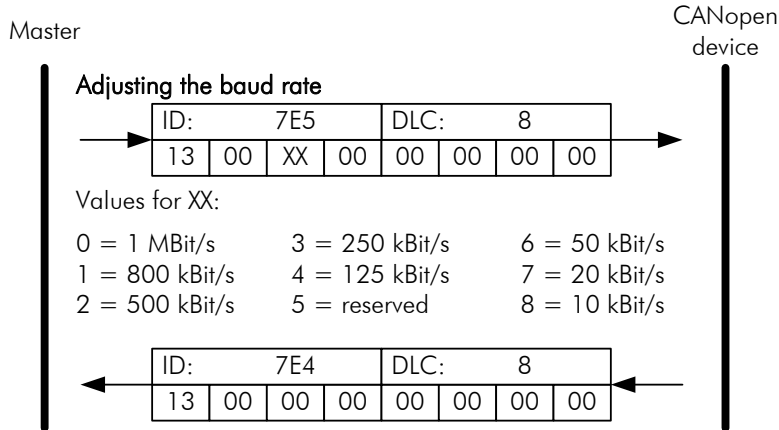


Figure 25: Bit rate setting

4. Save parameter as described in section ☞ 11.1.5.2.
5. Turn the device off and restart it again.

11.1.7 Node ID Setting

1. Change the device into the Stopped mode (☞ 11.1.4.3)
2. Change the device into the LSS Configuration (☞ 11.1.5.1)
3. Change node-ID with the following message:

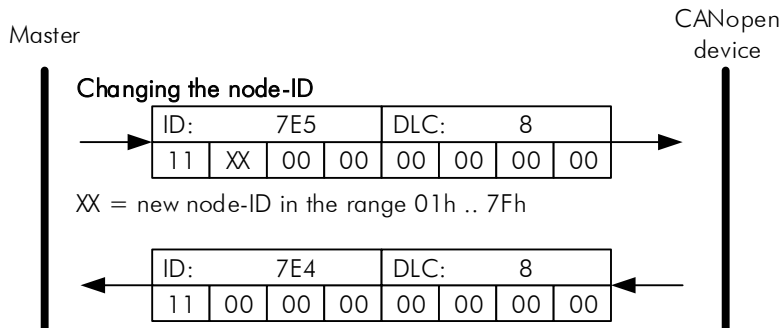


Figure 26: Node ID setting

6. Save parameter as described in section ☞ 11.1.5.2.
7. Turn the device off and restart it again.

11.2 USB Interface

LIMAX1M implements a USB2.0 Full Speed Device with the CDC class ("Virtual COM-Port"). The detailed USB specifications can be requested as a separate document from ELGO.

11.3 SSI Interface

11.3.1 Data Protocol

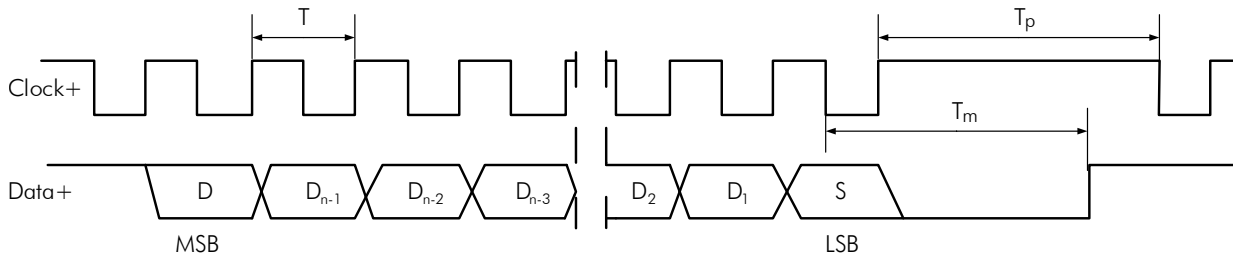


Figure 27: SSI data protocol

- T: 4 μs (= 250 kHz maximum clock frequency)
- T_m: 20 μs (Monoflop time)
- T_p: min. 250 μs (break time)

11.3.2 SSI-Bits

- D00: Not used (PFB-Bit, 0)
- D01: Pos bit 0.0625 mm
- ...
- D22: Pos bit 131072 mm
- D23: Pos status bit (0: ABS-Pos / 1: REL-Pos)
- D24: Reserved for later use

11.4 RS485 or RS422 Interface

On request an RS485 or RS422 interface is available for LIMAX1M. The detailed RS485 or RS422 specifications can be requested as a separate document from ELGO.

12 Connections

12.1 Pin Assignment of the RJ45 Socket

12.1.1 CAN Interface

Table 3: RJ45 pin assignment CAN interface

Connector	Drawing	Pin No.	Function	Description
RJ45 socket		1	CAN-H	CAN HIGH signal
		2	CAN-L	CAN LOW signal
		3	GND-IN ¹	0 V / Ground ¹
		4	NC	Not connected
		5	NC	Not connected
		6	NC	Not connected
		7	GND-IN ¹	0 V / Ground ¹
		8	VCC-IN	+10 ... 30 VDC power supply
		Housing	PE	Screen / shield

12.1.2 SSI Interface

Table 4: RJ45 pin assignment SSI interface

Connector	Drawing	Pin No.	Function	Description
RJ45 socket		1	DATA-	SSI Data -
		2	DATA+	SSI Data +
		3	GND-IN ¹	0 V / Ground ¹
		4	CLK-	SSI Clock -
		5	CLK+	SSI Clock +
		6	VCC-IN ¹	+10 ... 30 VDC power supply ¹
		7	GND-IN ¹	0 V / Ground ¹
		8	VCC-IN ¹	+10 ... 30 VDC power supply ¹
		Housing	PE	Screen / shield

12.1.3 RS485 Interface

Table 5: RJ45 pin assignment RS485 interface

Connector	Drawing	Pin No.	Function	Description
RJ45 socket		1	NC	Not connected
		2	NC	Not connected
		3	GND-IN ¹	0 V / Ground ¹
		4	RS485-B	RS485 Channel B
		5	RS485-A	RS485 Channel A
		6	VCC-IN ¹	+10 ... 30 VDC power supply ¹
		7	GND-IN ¹	0 V / Ground ¹
		8	VCC-IN ¹	+10 ... 30 VDC power supply ¹
		Housing	PE	Screen / shield

12.1.4 RS422 Interface

Table 6: RJ45 pin assignment RS422 interface

Connector	Drawing	Pin No.	Function	Description
RJ45 socket		1	TX+	Transmitter +
		2	TX-	Transmitter -
		3	GND-IN ¹	0 V / Ground ¹
		4	RX-	Receiver -
		5	RX+	Receiver +
		6	VCC-IN ¹	+10 ... 30 VDC power supply ¹
		7	GND-IN ¹	0 V / Ground ¹
		8	VCC-IN ¹	+10 ... 30 VDC power supply ¹
		Housing	PE	Screen / shield

¹ The double listed pins VCC-IN and GND-IN are bridged internally.

13 Disturbances

This chapter describes possible causes for disturbances and measures for their removal. In case of increased disturbances, please follow the measures for fault clearance in section 13.1. In case of disturbances that cannot be eliminated by following the advice and the fault clearance measures given here, please contact the manufacturer (see second page).

13.1 Fault Clearance



CAUTION!

The device, the connection line and the signal cable must not be installed next to sources of interference that emit strong inductive or capacitive interference or strong electrostatic fields.

External perturbations can be avoided through suitable cable routing.



The shield of the signal output cable should only be connected to the following circuit on one side. The shield should not be grounded on both sides. Signal cables always have to be routed separately from the load power line. A safety distance of at least 0.5 m has to be kept from inductive and capacitive sources of interference such as contactors, relays, motors, switching power supplies, clocked controllers etc.!

If interferences occur in spite of all the items stated above being observed, please proceed as follows:

1. Installation of RC-circuits via contactor coils of AC-contactors (e.g. 0,1 μ F / 100 Ω)
2. Installation of recovery diodes via DC-inductors
3. Installation of RC-circuits via the different motor phases (in the terminal box of the motor)
4. Do not connect protective earth and ground
5. Connect a mains filter ahead of the external power pack

13.2 Re-start after Fault Clearance

After the fault clearance:

1. Reset the emergency stop mechanism if necessary
2. Reset the error report at the super-ordinate system if necessary.
3. Ensure that there are no persons in the danger area.
4. Follow the instructions from chapter 9.



WARNING! Danger of injury through non-conventional fault clearance!

Non-conventional fault clearance can lead to severe injuries and damage of property.

Therefore:

- Any work to clear the faults may only be performed by sufficiently qualified staff
- Arrange enough space before starting the works
- Make sure that the mounting area is clean and tidy. Loose components and tools are sources of accidents.

If components need to be replaced:

- Pay attention to a correct installation of the spare parts.
- Reinstall all the fixing elements properly
- Before turning on the device, ensure that all covers and safety equipment is installed correctly and works properly

13.3 Maintenance

The device is maintenance-free.

13.4 Cleaning



WARNING!

The device can only be cleaned with a damp cloth, do not use aggressive cleanser!

14 Type Designation

Example: LIMAX1M - 00 - CON - 1000 - CO1T - RJ45

Device Designation:

LIMAX1M = LIMAX1 MINI (single-channel)

Version:

00 = standard version
01 = first special version (etc.)

Signal Cable Length:

CON = connector on housing (without cable)

Resolution:

62N5 = 62.5 μm = 0.0625 mm
0125 = 125 μm = 0.125 mm
0250 = 250 μm = 0.25 mm
0500 = 500 μm = 0.50 mm
1000 = 1000 μm = 1.00 mm

Interface:

CO1T* = CANopen [lift profile DS417] ← standard
CO0T* = CANopen [encoder profile DS406] ← option
USB0 = USB [standard protocol] ← option
4220 = RS422 [standard protocol RS422 / Position] ← on request
4850 = RS485 [standard protocol RS485] ← on request
SSB0 = SSI [25 Bit binary code / Position] ← on request
SSG0 = SSI [25 Bit Gray code / Position] ← on request

*) **Note:** The CAN interface is in general terminated by 120 R, but not galvanically isolated

Connection Options:

RJ45 = RJ45 slot
USBM = Mini USB slot

14.1 Accessories

Table 7: Accessories for LIMAX1M

Order designation	Description
LIMAX1M MW SET	Mounting angle to attach LIMAX1M to the lift cabin
AB20-80-10-1-R-D-15-BK80	Magnetic tape LIMAX1M, absolute encoded single track system
LIMAX MKF	Installation kit for suspended installation with dowel
LIMAX MKB	Installation kit for suspended installation with guiding rails and rail holder
LIMAX RMS	Installation kit for suspended installation with crossbeam for standard layout
LIMAX RMS 90	Installation kit for suspended installation with crossbeam for Rucksack-layout
LIMAX S-RMS	Installation kit for suspended installation, with tape detection
LIMAX S-RMS2	Installation kit for suspended installation, with tape detection 2

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