

Manual

Ants LES01 (Linear Encoder Safe)

english



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Functional Safety
EN 81

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Document no.	R67049.0002 - Index 4
Document name	Manual Ants LES01 (Linear Encoder Safe)
Language version	English (EN) - German is the original version
Date of issue	01/2019 - Index 4
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Table of contents

1.	Abbreviations used	4
2.	Symbols used / Warnings and safety information	4
3.	Exchange protocol	5
	3.1 Exchange protocol	5
	3.2 Potential errors, their meaning and troubleshooting (IDs: 0x20 and 0x21, Byte 8):	7

1. Abbreviations used

Ants LES01	Ants LES (Linear Encoder Safe, Generation 1)
PSU01	Position Supervisor Unit
UCM	Unintended Car Movement

2. Symbols used / Warnings and safety information

 DANGER	This symbol, together with the signal word “Danger”, indicates immediately imminent threat to life and health of persons. The non-compliance with this warning will lead to death or severe injuries.
 WARNING	This symbol, together with the signal word “Warning”, indicates a potential danger to life and health of persons. The non-compliance with this warning may lead to death or severe injuries.
 CAUTION	This symbol, together with the signal word “Caution”, indicates a potential danger to life and health of persons. The non-compliance with this warning may lead to slight or minor injuries.
NOTICE	Tips and recommendations as well as information for an efficient and trouble-free operation.

3. Exchange protocol

3.1 Exchange protocol

This chapter pertains to the programming and configuration of an external evaluation unit, intended for use of the secure position transmission as a partial safety function and the handling of the system in case of an error.

Prerequisite for understanding the first part of this chapter is advanced knowledge of the configuration, use and evaluation of CAN buses and BUS protocols.

This section is not necessary for functional installation and commissioning of an evaluation device certified for the Ants LES01. If the overall system is not capable of running, all sections address potential error diagnoses and troubleshooting. In case of doubt, contact the manufacturer.

The unique exchange protocol described below applies for use of the Elevator Safe with an external evaluation unit. An evaluation device intended for use with the Ants LES01 must comply with all specifications. An SFF of over 99% is achieved with implementation of all specified measures.

The evaluation unit must always use suitable measures (depending on the safe function) to switch the elevator system to a safe state when the position data is not provided. Then, if continued operation and an error reset is permissible is the responsibility of the evaluation unit. The overall system must be replaced if there are mechanical damages of any type. The only exception from this is ground slide jaws. This indicates an assembly error of the system.

The architecture of the Ants LES01 stipulates that two alternating independent channels send position data (referred to as master and slave). Even ID numbers are assigned to the master and odd ID numbers are assigned to the slave. CAN packages for standard positions have the length 4; all other CAN packages have the length 8.

Meaning, timing and other additional conditions are specified as follows. Data values that are not described in greater detail here are reserved for internal use of the Ants LES01. The possible 8 data bytes of a CAN message are numbered from 1 to 8, where 1 is the first chronologically. The preamble "0x" identifies hexadecimal numbers.

Specification	Description
Alternating sending of the channels	In normal operation, each channel sends its position data every 4 ms. The slave synchronises to half of the master intervals so that positions are sent every 2 ms.
Data must be checked for plausibility	The positions must be checked for plausibility at an evaluation unit in order to be able to discover transmission errors which cannot be caught by the CAN protocol (depending on SIL priority of the overall system).
Specified CAN ID use	The CAN IDs are used in the 11bit standard. In the process, even IDs are always assigned to the master and the corresponding IDs + 1 are assigned to the slave.
Permissible CAN IDs	<p>The following CAN IDs are permissible:</p> <p>0x10(0x11) System messages, 0x20(0x21) Error messages, 0x30(0x31) Status messages, 0x80(0x81) Position messages.</p> <p>Transmission of these messages must only take place from the Ants LES01 (Exception: (Un)lock message, see further below).</p>
Ants LES01 transmits system messages	<p>System messages have the ID 0x10(0x11).</p> <p>The length of the message is 8 bytes. Byte 8 describes the system message: 0xF0 Ants LES01-Lock(ed), 0xFF Ants LES01-Unlock. Byte 1-2 unlock key (only with Ants LES01-Locked, Ants LES01-Unlock). An external participant must lock the Ants LES01 by sending the Ants LES01-Lock(ed) subsystem message.</p>
Ants LES01 transmits detected errors	Each channel transmits detected errors via error messages. Error messages have the ID 0x20(0x21). The length of the message is 8 bytes. Byte 8 describes the error type; bytes 1-7 show additional information that is output depending on the error type. These are not specified in detail, but should be logged in case of error for diagnosis by the manufacturer. A list of all error codes is provided below. The evaluation unit must make the logged errors available to qualified personnel. This is described in the operating manual.

Ants LES01 transmits status messages	Each channel also transmits status messages outside of normal operation. System messages have the ID 0x30(0x31). The length of the message is 8 bytes. Byte 8 describes the substatus message: 0x0F channel starts high (Byte 1-4 CRD of the LES software), 0xF0 channel ready. The meaning of the byte in channel ready is not specified.
The Ants LES01 transmits positions data	Each channel transmits its position data. The length of the message is 4 bytes. Bytes 1-3 show the global position of the channel (MSB first). Byte 4 is not specified in detail. This data must be checked for plausibility (see above).
The Ants LES01 is in a locked state	The Ants LES01 is in a locked state and no longer sends messages except for the Ants LES01 locked subsystem message (see above) with the current unlock key. An evaluation unit may unlock an Ants LES01 again by sending an Ants LES01 unlock subsystem message together with the currently valid unlock key in Bytes 1-2. The key of the Ants LES01 locked message changes continuously. The time window in which an unlock key is valid is 30 ms. An evaluation unit must read this key and send an Ants LES01 unlock subsystem message (ID 0x10, see above) with the read key without major delay. The re-enabling of the Ants LES01 after an error is the responsibility of the evaluation unit.
Only the Ants LES01 can send via CAN bus	Only the Ants LES01 itself can send messages via CAN bus, with the exception of the Ants LES01 unlock subsystem message. If an unauthorised message is detected, an error is output and the Ants LES01 is locked.


3.2 Potential errors, their meaning and troubleshooting (IDs: 0x20 and 0x21, Byte 8):

In general, the Ants LES01 cannot be repaired. A defective device must be completely replaced. In the process, observe that the Ants LES01 is normally a subsystem of a safety system. Therefore, it must be determined which Ants LES01 (ID) was exchanged for a new Ants LES01 (new ID) in order to assure the traceability of safety components.

In case of an error, the error of the Ants LES01 must be detected and appropriate measures (see below) must be set. The connected evaluation unit provided possibilities for reading the error. For this purpose, please refer to the corresponding operating manual.

Errors can occur due to ground sliding jaws (also critical errors). In this exceptional case, only the sliding jaws may be exchanged (see above). Since no forces act on the sliding jaws when mounted correctly, ground jaws indicate an installation error. Please check to ensure that the encoder band is mounted perpendicularly and runs through the sensor straight, without pressure on the sliding jaws.

In rare cases, errors can occur due to dirt on the band and resulting soiling in the encoder. In this case, the band must be checked and cleaned, and the encoder must be unplugged and cleaned with compressed air. Please wait at least one minute in order to allow any condensate to dry before plugging the Ants LES01 in again.

 CAUTION	<p>After each error that switches the Ants LES01 to the locked status, the entire length of the elevator shaft must be run without errors before the elevator can be enabled again. If errors occur repeatedly, the causes must be determined. If these errors cannot be eliminated by the permitted measures described above, the entire Ants LES01 must be replaced.</p> <p>If mechanical parts of the Ants LES01 are bent or diminished, the Ants LES01 must always be replaced. In addition, the cause must be determined, because mechanical stress on the Ants LES01 can (could) occur, because no force (except for minor friction forces from the band) must act on the Ants LES01 in normal operation.</p>
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A list of potential error codes and their meaning and evaluation is presented below:

Error code	Description	Evaluation
0x01	Position code not valid. Can only arise with unlock during start-up / restart.	Critical error. Potential causes: Band defective/ dirty. Slide jaw ground. Measuring system failed.
0x02	Band not clamped in the encoder.	No band inserted. Unlock the Ants LES01 if a band has been inserted.
0x03	Difference between channels. Can only arise with unlock during start-up / restart.	Critical error. Potential causes: Band defective/ dirty. Slide jaw ground. Measuring system failed.
0x04	Impossible measurement of the clock track (small holes).	Critical error. Potential causes: Band defective/ dirty. Slide jaw ground. Measuring system failed.
0x05	Implausible measurements in the channel.	Critical error. Potential causes: Band defective/ dirty. Slide jaw ground. Measuring system failed.
0x06	Impossible measurement of the code track (large holes).	Critical error. Potential causes: Band defective/ dirty. Slide jaw ground. Measuring system failed.

0x07	The Ants LES01 is not in the lot (more than 5 degree angle on average).	Critical error. Encoder is tilted. Inspect encoder installation.
0x08	Difference between channels.	Critical error. Potential causes: Band defective/ dirty. Slide jaw ground. Measuring system failed.
0x09	A channel has failed.	Critical error. Faults on the bus line, measuring system defective.
0x0A	BUS communication error.	Non-critical error. Potential causes: other impermissible participants on the bus.
0x0B	Impermissible communication on the bus.	Non-critical error. Potential causes: other impermissible participants on the bus.
0x0C	CRC checksum error via program code.	Critical error. The encoder system must be exchanged.
0x0D	Implausible acceleration values.	Critical error. Potential causes: The encoder is stuck. Check the entire band.
0x0E	Not used	-
0x0F	The encoder is not upright. Can only arise with unlock during start-up / restart.	Critical error. Check encoder installation.
0x10	Excessive speed of the Ants LES01 detected (over 5 m/s).	Non-critical error. Check elevator system for speed.
0x11	Partial voltage drop in the Ants LES01.	Critical error. Potential causes: incorrect band. Slide jaw ground. Measuring system failed.

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