CANopen

User Manual

LINAK®

WE IMPROVE YOUR LIFE

Contents

Preface

Dear User,

We are delighted that you have chosen a LINAK® product.

LINAK systems are high-tech products based on many years of experience in the manufacture and development of actuators, lifting columns, desk frames, electric control boxes, controls, batteries, accessories and chargers.

This User Manual does not address the end user. It is intended as a source of information for the equipment or system manufacturer only, and it will tell you how to install, use and maintain your LINAK electronics. The manufacturer of the end product has the responsibility to provide a User Manual, where relevant safety information from this manual is passed on to the end user.

We are convinced that your LINAK product/system will give you many years of problem-free operation.

Before our products leave the factory, they undergo both function and quality testing. Should you, nevertheless, experience problems with your product/system, you are always welcome to contact your supplier.

LINAK subsidiaries and some distributors situated all over the world have authorised service centres, which are always ready to help you. Locate your local contact information on the back page.

LINAK provides a warranty on all products. (See warranty section).

This warranty, however, is subject to correct use in accordance with the specifications, maintenance being done correctly, and any repairs being carried out at a service centre, which is authorised to repair LINAK products.

Changes in installation and use of LINAK systems can affect their operation and durability. The products may only be opened by authorised personnel.

This User Manual has been written based on the present technical knowledge. LINAK reserves the right to carry out technical modifications and keeps the associated information updated.

LINAK A/S

Terms of use

LINAK® takes great care in providing accurate and up-to-date information on its products. However, the user is responsible for determining the suitability of LINAK products for a specific application.

Due to continual development, LINAK products are subject to frequent modifications and changes. LINAK reserves the rights to conduct modifications, updates, and changes without any prior notice. For the same reason, LINAK cannot guarantee the correctness and actual status of imprinted information on its products.

LINAK uses its best efforts to fulfil orders. However, for the reasons mentioned above, LINAK cannot guarantee availability of any particular product at any given time. LINAK reserves the right to discontinue the sale of any product displayed on its website or listed in its catalogues or in other written material created and produced by LINAK, LINAK subsidiaries, or LINAK affiliates.

All sales are subject to the 'Standard Terms of Sale and Delivery for LINAK A/S' available on LINAK websites.

About LINAK® CANopen actuators

LINAK TECHLINE® CANopen actuators are primarily designed with focus on mobile agriculture and industrial automation. The communication protocol relies on the CiA 301 standard. The contents of this document assume that the reader is familiar with the CiA 301 standard.

In addition to full position control, the CANopen actuator is able to provide feedback information about the piston position, service data, and full diagnostics. It also provides system identification data and actual current at runtime.

CANopen specifications

This section describes the requirements of the CANopen hardware and software interface:

The physical layer is in accordance with ISO 11898-2	
Speed	125 kbps, 250 kbps, or 500 kbps (changeable in Actuator Connect™ or BusLink)
Max. bus length	250 metres
Max. stub length	11 metres
Max. node count	127
Wiring	Unshielded twisted pair
Cable impedance	120 Ω (±10%)

All system tests carried out are limited to consist of 3-meter cables. Non-error tolerant physical layer with the following specifications: Low-power mode is according to ISO 11898-5.

Standards

The LINAK TECHLINE CANopen offers a communication profile defined in CiA DS 301 v.4.0.2. This includes a command set for controlling the actuator in addition to feedback status.

Connection diagram

9-pin

Power

BROWN	24/48 V DC	2
BLUE	GND	1

Control

RED	Extends the actuator HW Addressing pin 2	5
BLACK	Retracts the actuator HW Addressing pin 3	4
ORANGE*	Split power supply V DC	1
LIGHT BLUE	HW Addressing pin 1	6
YELLOW	CAN_H	2
GREEN	CAN_L	3
GREY	Not to be connected	0

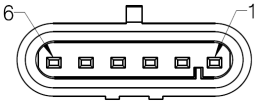
Communication

VIOLET	Parallel data	7
WHITE	Parallel GND	8

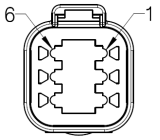
AMP

Deutsch

AMP



Deutsch



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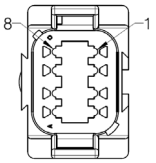


*Split power supply and a motor supply (Brown), which refer to a common GND (Blue).

This approach is used to maintain power on the intelligent part of the actuator. In case the main supply is disconnected, split power supply allows e.g. that the position is maintained. The main supply may be disconnected for reasons related to safety, maintenance or installation.

Actuator Connect™ is available for CANopen actuators and can be used for:

Diagnostics, manual run and configuration. The newest version is available online here.

Connect the actuator to Actuator Connect via a USB adapter cable (must be purchased separately) to enable and configure various features.

I/O specifications

9-pin

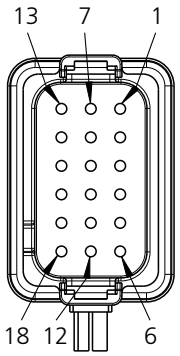
<table>
<tr><th>Input/Output</th><th colspan="2">Specification</th><th colspan="2">Comments</th></tr>
<tr><td>Description</td><td colspan="2">CANopen is compatible with the CiA 301 standard.
Uses CAN messages to command movement, setting parametres and to deliver feedback from the actuator.
Actuator identification is provided, using hardware and software addressing.</td><td colspan="2">CANopen</td></tr>
<tr><td>Brown</td><td colspan="2">24/48 V DC</td><td colspan="2" rowspan="2">Note: Do not swap the power supply polarity on the Brown and Blue wires!
The PCB is coupled to the housing through a capacitor.</td></tr>
<tr><td>Blue</td><td colspan="2">GND
For more information, see the section ‘Power supply’</td></tr>
<tr><td>Red</td><td>Extends the actuator / Hardware addressing (2)</td><td rowspan="2">The signal becomes active at:
> 67% of V_{IN}
The signal becomes inactive at:
< 33% of V_{IN}
Input current: 10 mA</td><td rowspan="2">Manual run:
If not connected to VCC at startup:</td><td rowspan="2">Hardware addressing:
When used for Hardware addressing, connect to VCC or negative (GND)</td></tr>
<tr><td>Black</td><td>Retracts the actuator / Hardware addressing (1)</td></tr>
<tr><td>Orange*</td><td colspan="2">Split power supply VCC communication only.
24 V DC with ≈28 mA current consumption.
48 V DC with ≈16 mA current consumption.
Connect to positive. The split power supply uses the common GND from the power supply (Blue wire).</td><td colspan="2">Used only if the actuator supports split power supply.</td></tr>
<tr><td>Light Blue</td><td colspan="2">Hardware addressing (3)</td><td colspan="2">When used for Hardware addressing, connect to VCC or negative (GND).</td></tr>
<tr><td>Yellow</td><td colspan="2">CAN_H</td><td colspan="2" rowspan="2">Actuators with CANopen do not contain the 120 Ω terminal resistor. The physical layer is in accordance with ISO 11898-2.
Speed: Autobaud up to 500 kbps</td></tr>
<tr><td>Green</td><td colspan="2">CAN_L</td></tr>
<tr><td>Grey</td><td colspan="2">Not to be connected</td><td colspan="2"></td></tr>
<tr><td>Violet</td><td colspan="2">Parallel data</td><td colspan="2" rowspan="2">Only Actuator Connect™ can be used as service interface.
Use Grey adapter cable</td></tr>
<tr><td>White</td><td colspan="2">Parallel GND</td></tr>
</table>

* Split power supply (Orange) and a motor supply (Brown), which refer to a common GND (Blue).

Connection diagram

18-pin

Deutsch



Power

4	+ Split power supply
5*	+ 12/24 V DC
6*	+ 12/24 V DC
11*	GND
12*	GND

Control

7	Extends the actuator
8	Retracts the actuator
10*	Parallel data and service port

Communication

17	CAN_H
18	CAN_L
9	Not to be connected
13	Address 1 [LSB]
14	Address 2
15	Address 3
16	Address 4 [MSB]

NOT to be connected

1	Do not connect
2	Do not connect
3	Do not connect

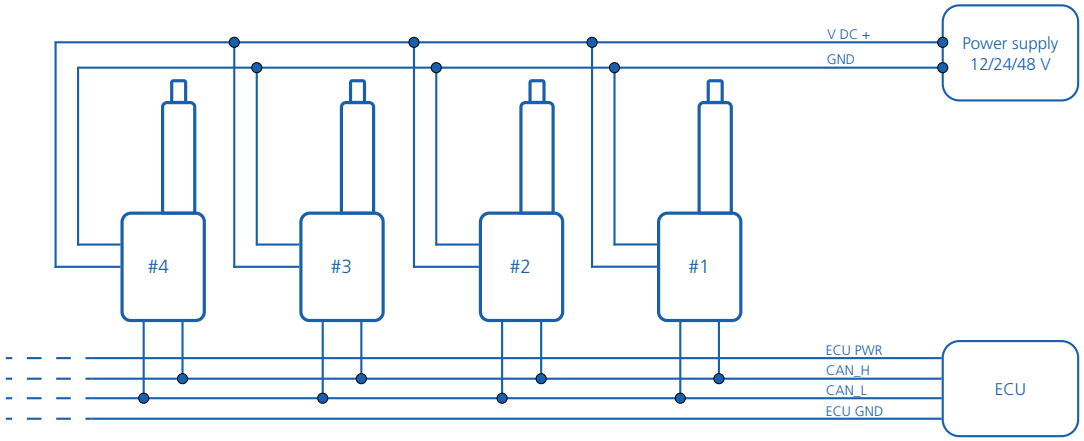
I/O specifications

18-pin

Input/Output	Specification	Comments
Description	CANopen is compatible with the CiA 301 standard. Uses CAN messages to command movement, setting parametres and to deliver feedback from the actuator. Actuator identification is provided, using hardware and software addressing.	CANopen
Pin 4	+ Split power supply	Note: Do not swap the power supply polarity on the Brown and Blue wires! The PCB is coupled to the housing through a capacitor.
Pin 5	12/24 V DC For more information, see the section 'Power supply'	
Pin 11	GND	Common ground for motor, split power supply, service port, and internal parallel connection
Pin 12	GND	
Pin 7	Extends the actuator	The signal becomes active at: > 67% of V_{IN} = ON The signal becomes inactive at: < 33% of V_{IN} = OFF Input current: 10 mA
Pin 8	Retracts the actuator	
Pin 10	Parallel data and service port	Only Actuator Connect™ can be used as service interface. Use Grey adapter cable
Pin 17	CAN_H	Actuators with CANopen do not contain the 120 Ω terminal resistor. The physical layer is in accordance with ISO 11898-2. Speed: Autobaud up to 500 kbps
Pin 18	CAN_L	
Pin 9	Not to be connected	Factory interface: Connecting these pins may damage the actuator
Pin 13	Address 1 [LSB]	Pins 13 to 16 are dedicated for CAN ID. The four inputs can deliver 16 unique addresses. Note that manual run is not possible while setting the address.
Pin 14	Address 2	
Pin 15	Address 3	
Pin 16	Address 4 [MSB]	
Pin 1	Not to be connected	Factory interface: Connecting these pins may damage the actuator
Pin 2		
Pin 3		

Electrical installation

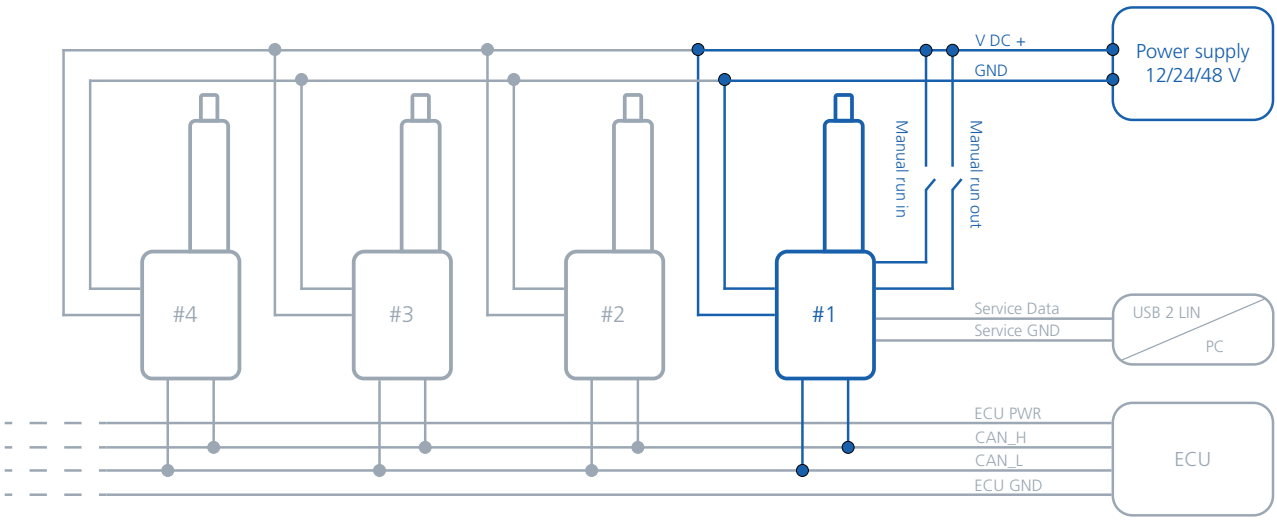
ISO 11898-2 defines the Reduced Physical Layer, 500 Kbps, Unshielded Twisted Pair (UTP), and runs with separate communication and power supply wires.



The power supply for the LINAK® CANopen actuator should be kept separate from the CANopen power supply, if such one exists.

Manual run

During Manual run mode where Inputs 1-3 are low or floating on power-up, the actuator will continue sending status feedback on the CAN bus. However, if other CAN devices are active on the network, Manual run mode will be disengaged. The CAN software address range 1-127 is reserved for this mode. The service interface is also accessible during Manual run mode.



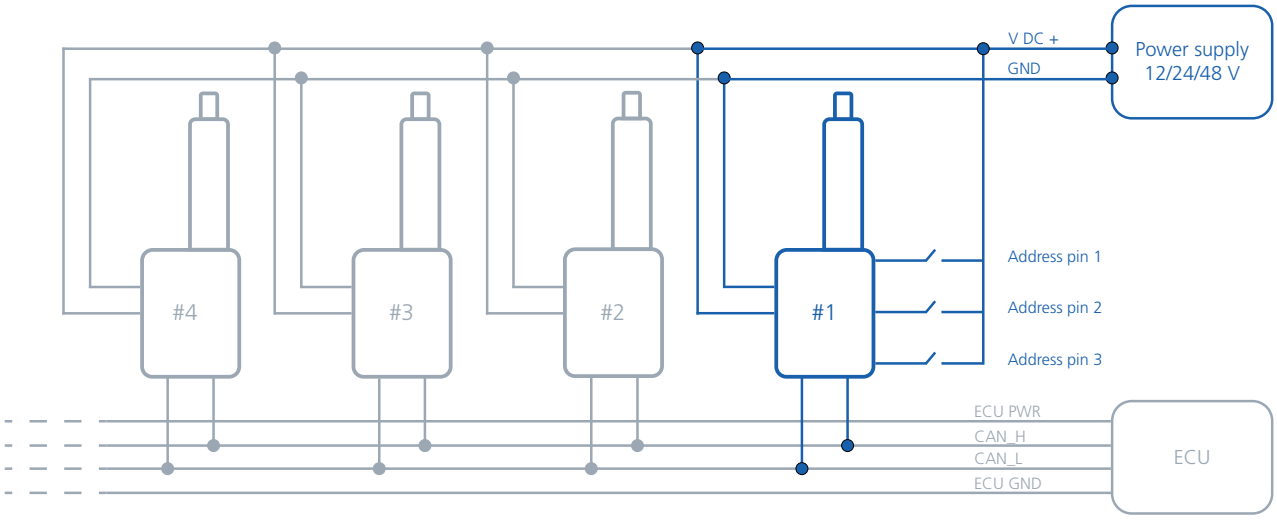
For more information about wiring colours, please see the connection diagram.

CAN hardware addressing

HW addressing determines the initial actuator address. A number of input pins, depending on the actuator model, are available for address configuration. The set configuration will be read by the actuator at power-up. If all address pins are open (not connected), the actuator will enter Manual run mode.

9-pin connector

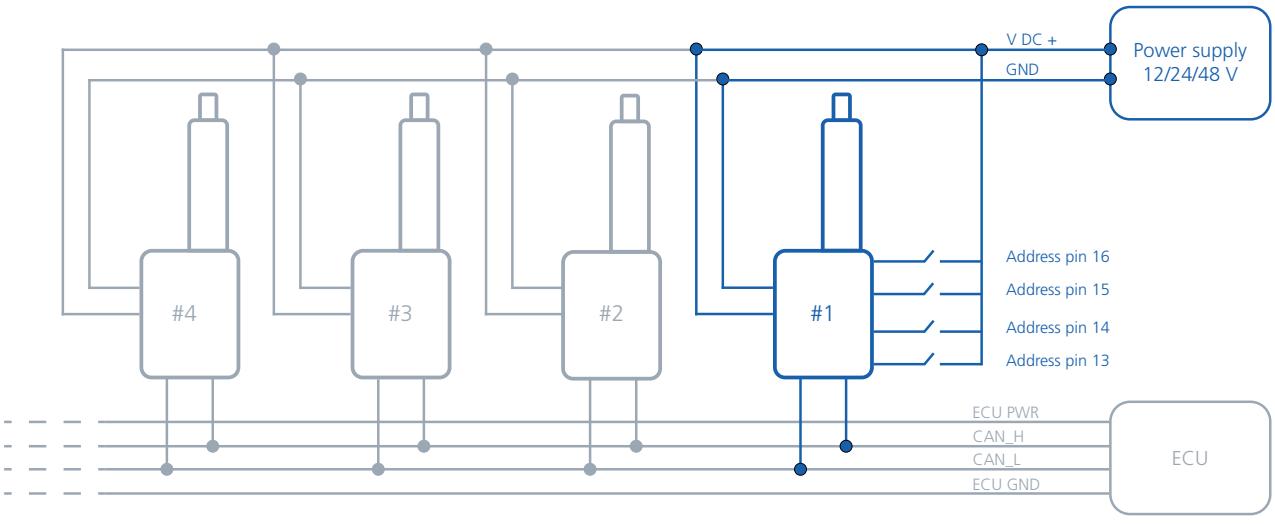
Black	Red	Light Blue	Address	
Address pin 3 [MSB]	Address pin 2	Address pin 1 [LSB]	HW	CAN
				Manual run
Open	Open	Open	N/A	0x80 (128)
Open	Open	High	1	0x81 (129)
Open	High	Open	2	0x82 (130)
Open	High	High	3	0x83 (131)
High	Open	Open	4	0x84 (132)
High	Open	High	5	0x85 (133)
High	High	Open	6	0x86 (134)
High	High	High	7	0x87 (135)



CAN hardware addressing

18-pin connector

Pin 16	Pin 15	Pin 14	Pin 13	Address	
Address pin 4 [MSB]	Address pin 3	Address pin 2	Address pin 1 [LSB]	HW	Node
Open	Open	Open	Open	Manual run	
Open	Open	Open	High	1	0x81 (129)
Open	Open	High	Open	2	0x82 (130)
Open	Open	High	High	3	0x83 (131)
Open	High	Open	Open	4	0x84 (132)
Open	High	Open	High	5	0x85 (133)
Open	High	High	Open	6	0x86 (134)
Open	High	High	High	7	0x87 (135)
High	Open	Open	Open	8	0x88 (136)
High	Open	Open	High	9	0x89 (137)
High	Open	High	Open	10	0x8A (138)
High	Open	High	High	11	0x8B (139)
High	High	Open	Open	12	0x8C (140)
High	High	Open	High	13	0x8D (141)
High	High	High	Open	14	0x8E (142)
High	High	High	High	15	0x8F (143)



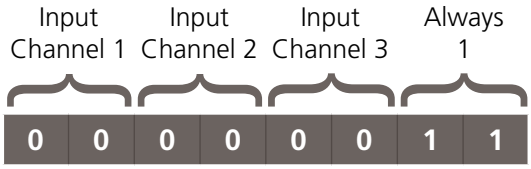
AUX input

The AUX inputs are all-purpose inputs for external devices such as buttons and sensors. Each of the three input channels consists of two bits which represent the voltage level on the input channel, thereby allowing four levels of the VCC to be expressed through a CAN bus message.

Each channel consists of two bits divided into four levels of VCC:

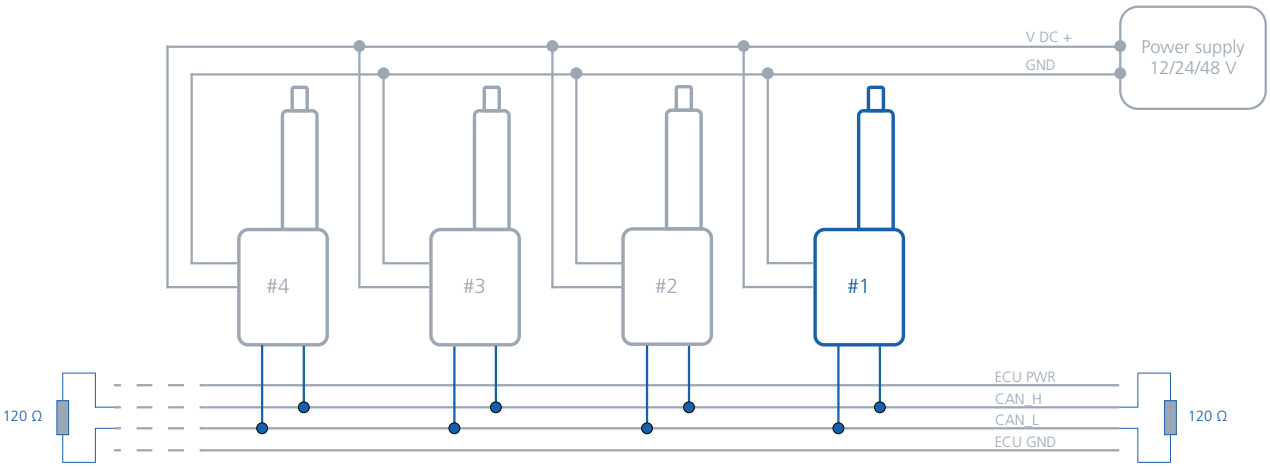
Input bits		VCC				
1	1	■	■	■	■	76-100%
1	0	■	■	■		51-75%
0	1	■	■			26-50%
0	0	■				0-25%

The three AUX inputs will be present in the last byte of Feedback Status Details of Process Data Objects (PDO).



Termination

Termination resistors of 120 Ω shall be connected according to the figure below. The actuator does not have internal termination.



Parallel

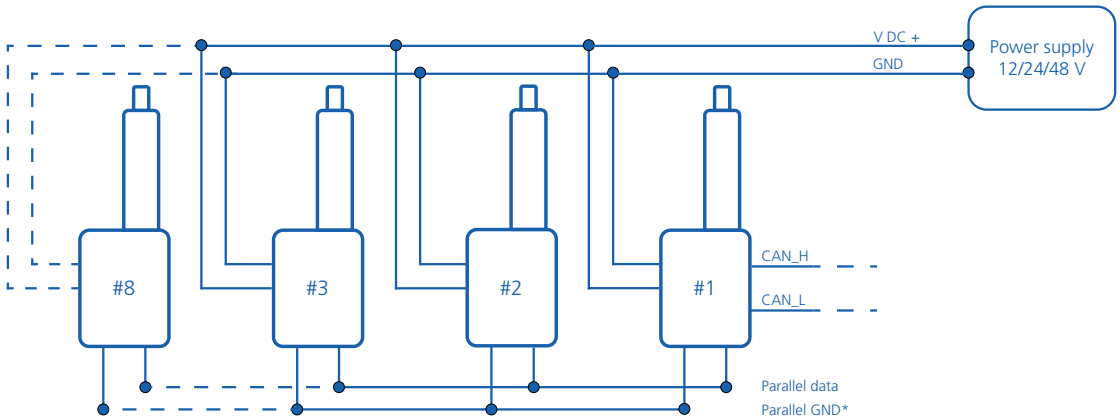
The industrial LINAK® actuators can be ordered with parallel functionality. If this feature is enabled, it is possible to run up to 8 actuators in a parallel system with just one actuator communicating CAN to the master. The system works as a critical parallel, meaning that all actuators must be present in the system and have the exact same configuration (both mechanical and software functionality).

Below is a checklist to ensure that the system operates as intended:

Action	Description
Set up parallel in Actuator Connect™	Each actuator must be configured to operate in parallel (2-8 actuators). This can be set up using the Actuator Connect™ tool. *Please note: In some cases this is pre-configured from factory.*
Wire up the system	The actuators feature internal communication for parallel synchronisation and error codes.
Check cable lengths	Keep the total length of the communication line below 40 metres to avoid communication dropouts. In a parallel system with 8 actuators this would result in signal cable lengths of <5 metres.
Check power supply	The system can be designed with either one main power supply or it can be supplied by individual supplies corresponding to the number of actuators in the system. Please respect actuator specifications regarding voltage level and current consumption! Make sure that the power supplies have a common GND and the same potential.

Parallel

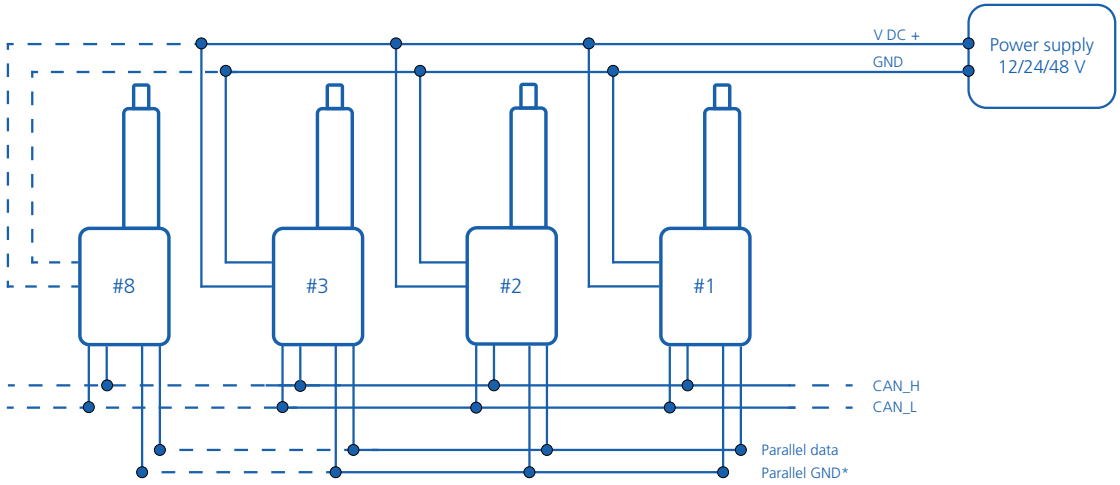
Option 1 - A simple parallel setup



In a simple parallel setup there is only one actuator connected to the BUS communication. This actuator receives run commands and shares data with the BUS controller. The remaining actuators in the system are only connected to internal parallel communication. This way, the internal communication ensures that the system operates in parallel and stops in case of an obstacle, or when other errors occur on one of the actuators.

The actuators share simple error messages with the master, which can be distributed via the BUS communication.

Option 2 - Bus communication on all actuators



If there is a need for e.g. monitoring the real-time data of each actuator, it is possible to connect all actuators as nodes to the BUS communication. This will provide comprehensive usage data, which can be used to enhance performance in the application. Similar to option 1, this requires that all actuators are connected to internal parallel communication.

* Please be aware that the Parallel GND wire (White) is not applicable for the 18-pin connector. The 18-pin connector has GND connections on pin 11 and 12.

Getting started

This section further describes how to communicate with CANopen actuators and contains examples of typical user scenarios and application solutions. All examples include references to registers which are further described in detail below.

Functional overview

The LINAK® TECHLINE CANopen offers a communication profile defined in CiA DS 301 v4.0.2. This includes a command set for controlling the actuator in addition to feedback status.

- Process Data Objects (PDO)
- Service Data Objects (SDO)
- Objects with special functions for syncronisation, error alert and response:
  - Synchronisation object (SYNC)
  - Emergency object (EMCY)
- Network Management Objects (NMT) for initialisation, error monitoring and status monitoring of the device:
  - NMT commands
  - Boot-up messages
  - Heartbeat messages

Power supply

CANopen actuators are available with the following supply voltage range: 12 V, 24 V, and 48 V DC. These versions are available with or without split power supply. The accepted supply voltage range is specified for the version as shown below:

Supply voltage	Function	Voltage range			Valid for
		V_{MIN}	V_{TYP}	V_{MAX}	
12 V	Motor	10.5 V	12 V	21 V	18-pin only
	CAN communication*	6 V	12 V	39 V	
24 V	Motor	18 V	24 V	32 V	9-pin and 18-pin
	CAN communication*	10 V	24 V	39 V	
48 V	Motor	36 V	48 V	58 V	9-pin only
	CAN communication*	10 V	48 V	60 V	

* When split power supply is used, the CANopen interface will be powered via a separate power input (split supply) from the motor, while the motor power is still used as common ground (GND). If split power supply is not used, the CANopen interface will be powered via the motor supply.

Configuration

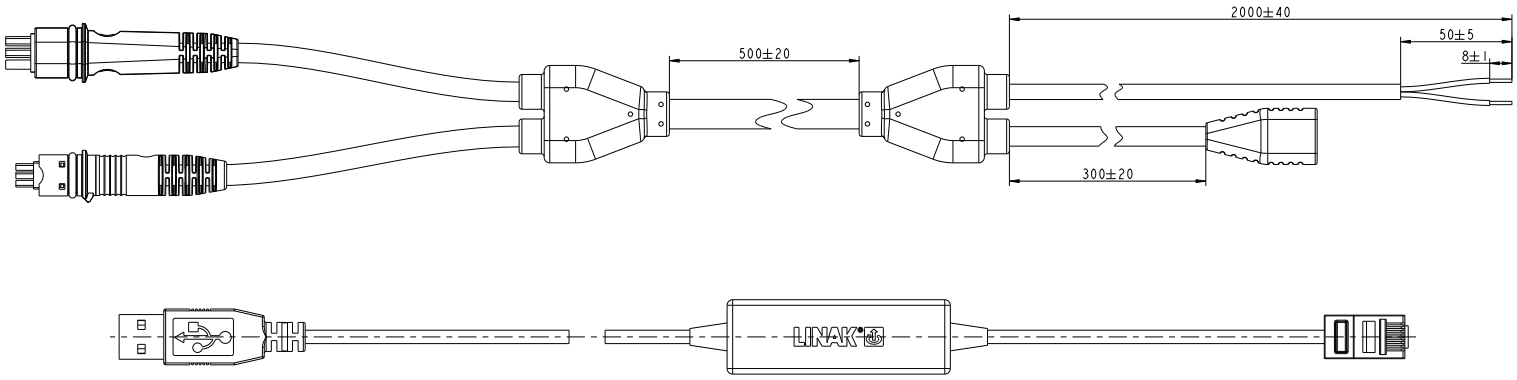
Before being integrated into a CANopen system, a few of the actuator parametres must be checked and eventually changed. This preparation is done via the use of the configuration tool Actuator Connect™ and guarantees that the actuator is able to execute basic functionality.

Further fine-tuning may be required to fulfil system or application requirements. Via this tool it is also possible to access historical usage data and real-time monitoring.

Valid for LA33, LA36, LA37, LA76 and LA77:

9-pin

A separate configuration cable kit (item no. 0367996 = straight Y-cable + USB2LIN) is required to use Actuator Connect™ on a PC. This cable must be connected to the 9-pin connector on the actuator side. On the opposite side, power must be applied to the flying leads, and the USB connector must be inserted into your PC.



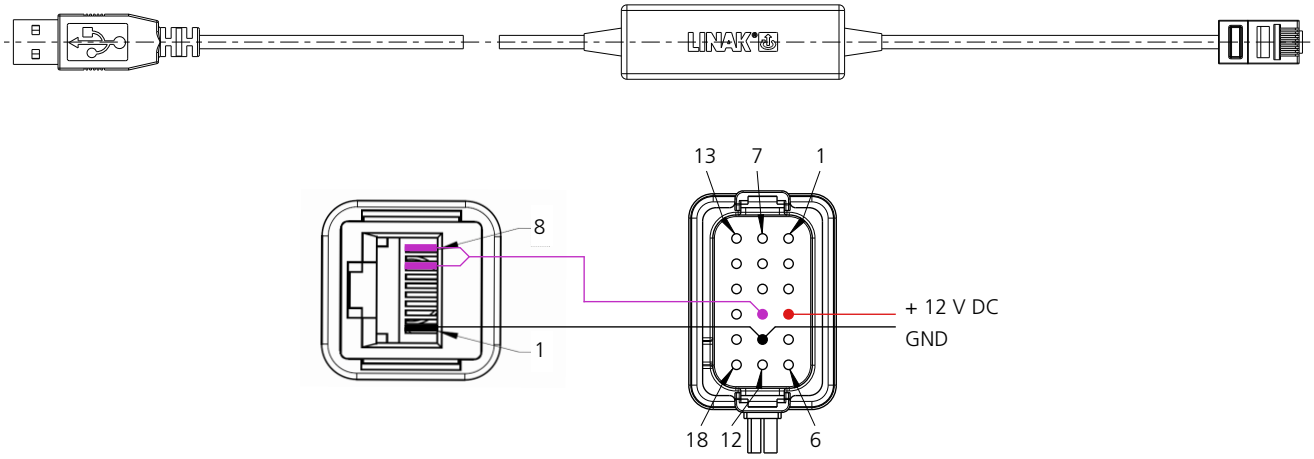
For more information about wiring/connector, please see the connection diagram.

Configuration

Valid for LA33, LA36, LA37, LA76 and LA77:

18-pin

In addition to the wiring diagram provided below, a separate USB configuration cable (USB2LIN06-X) is required in order to use Actuator Connect™ on a PC. This cable should be connected to the RJ45 connector on the actuator. On the other end, ensure that power is supplied to Red and Black on the 18-pin connector (flying leads), and plug the USB connector into your PC.



Parameters to be verified by Actuator Connect™

Parameters	Description
Actuator address	Valid range: 1-127 Default address: 32 (0x20)
Bit rate (kbps)	50/100/125/250/500 Auto

Command details

Run in/out

Inwards and outwards movement is performed by sending the proper identifier while the actuator is in CANopen mode. In Service mode, movement is achieved by using the LINAK® BusLink PC software or by applying the proper signals to the Manual run wires. When using Manual run, a start-up delay of up to 150 ms must be expected due to safety measures.

Position

Max. min. position: Stroke length
Level setting steps: 0.1 mm

Load, ramping up and down, and specific actuator type (spindle/gear box) should be taken into account in regards to accuracy.
The Position SetPoint can be set dynamically. If the new SetPoint involves a change in running direction, the ramps will follow the pre-set ramp time.

Max. current

Applying a current limit will induce a degree of mechanical overload protection to the installation.

Max. current limit: Fixed limit*
Level setting steps: 0.25 A

* The custom current limit setting cannot overrule the fixed factory setting which ensures partial protection of the electronics and mechanics. See section ‘Internal monitoring’ for details.

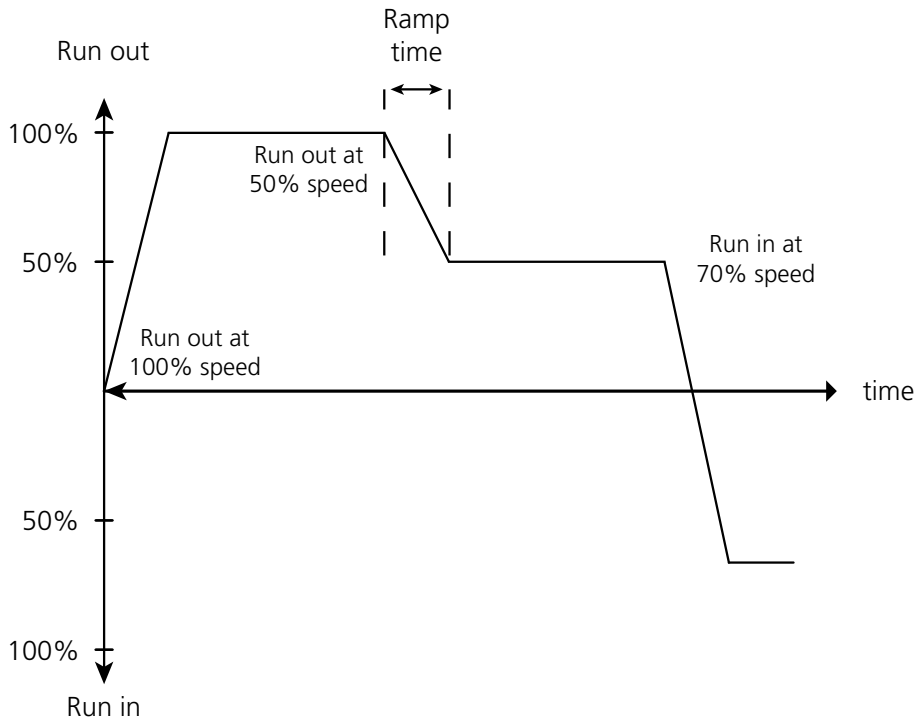
Speed control

The speed is controlled using Pulse Width Modulation (PWM).

Min. duty cycle:	0 %
Max. duty cycle:	100 %
Level setting steps:	0.5 %

Closed loop speed control will ensure a more accurate speed. In order to obtain this, the maximum speed is reduced to approximately 80%. The actual speed will be influenced by the gear and spindle size in the actuator.

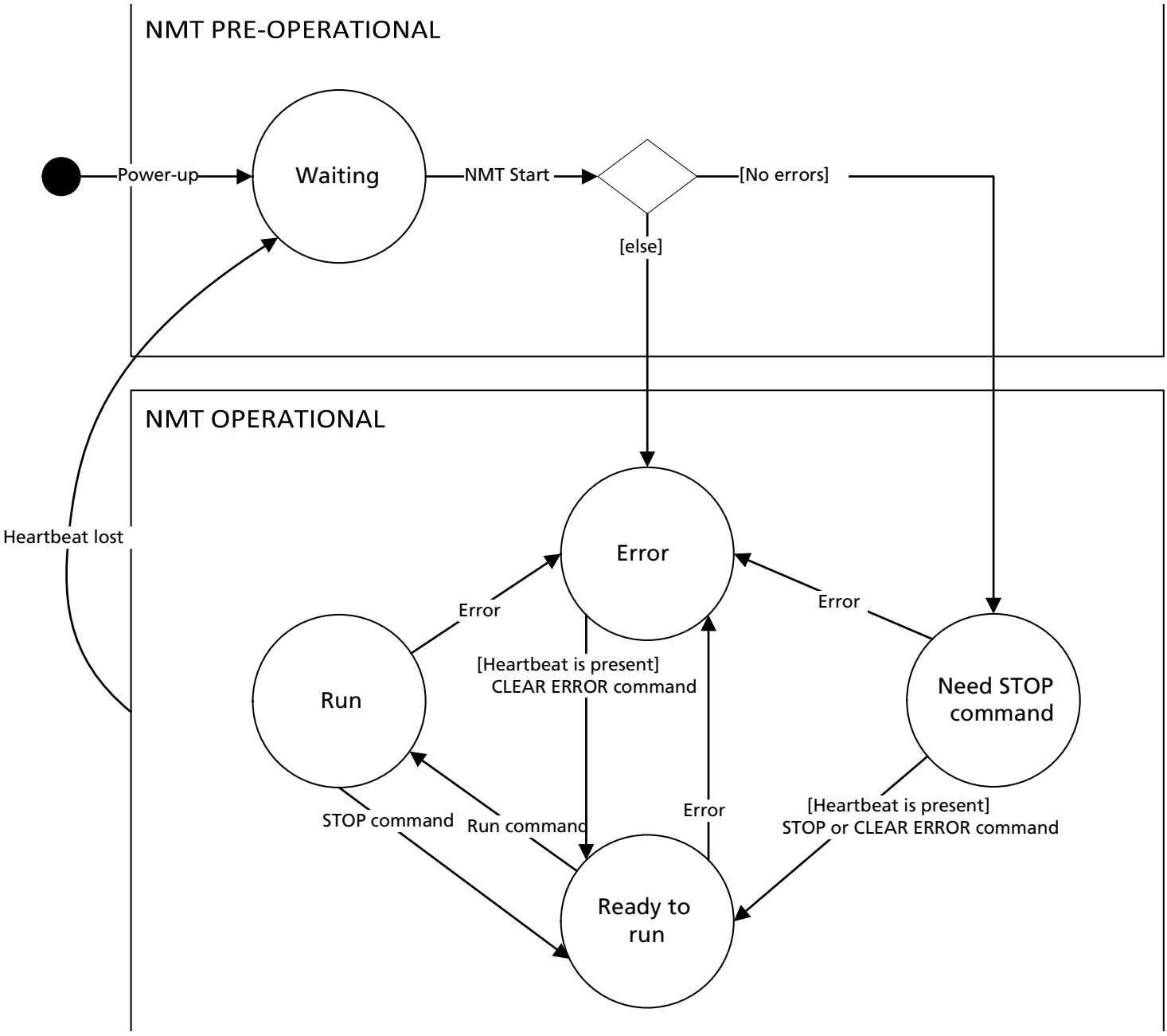
The speed setting can be changed dynamically at run time.



Start-up and running conditions

In order to run the actuator, please take the following into account:

- If the Heartbeat is not present, the actuator will not accept any PDO commands.
- Commands must be re-sent if communication is interrupted or the Heartbeat signal is missing.
- RUN IN and RUN OUT commands cannot be issued if errors are present (error code != 0).
- Heartbeat status can be read with status bit 5.
- Upon entering OPERATIONAL, actuator requires a ‘Stop’ or ‘Clear error’ command.



Starting procedures

Follow the example below to complete the startup procedures necessary for successful communication.

The CAN address in this example is in 32 (0X20).

CAN ID [hex]	Data [hex]								Description	
	0	1	2	3	4	5	6	7		
701	05								Master heartbeat. Sent every 100 ms	Startup Procedures
720	00								Actuator boot-up	
620	23	16	10	01	C8	00	01	00	Receive Service Data Objects (SDO)	
5A0	60	16	10	01	00	00	00	00	Actuator response	
000	01	20							Network Management (NMT) Start	
1A0	00	00	00	C1	01	00	00	C0	Transmit Process Data Object TPD01. 'Stop' command needed.	
220	03	FB	FB	FB	FB	FB	00	00	'Stop' command.	
1A0	00	00	00	C1	00	00	00	C0	Transmit PD01. Actuator at Endstop reached in [0 mm]	Running Examples
220	01	FB	FB	FB	FB	FB	00	00	'Run out' command	
1A0	A1	00	06	C8	00	31	00	CO	Transmit PD01. Actuator is running out [2.6 mm]	
1A0	F7	01	00	C2	00	00	00	CO	Transmit PD01. Actuator reached endstop outwards [50.3 mm]	
220	02	FB	FB	FB	FB	FB	00	00	'Run in' command	
1A0	60	00	06	D0	00	32	00	C0	Transmit PD01. Actuator is running in [9.6 mm]	
1A0	00	00	00	C1	00	00	00	C0	Transmit PD01. Actuator reached endstop inwards [0 mm]	

Master
Slave

To use a different CAN address than 32 (0x20), please redefine the CAN ID to suit the need.

Process Data Objects (PDO)

RPD01 is mapped to 0x2000
TPD01 is mapped to 0x2001

Command details

Index	Subindex	Command	Data type	Details	Description	Unit
0x2000	1	Position	UINT16	0-64255 64256 64257 64258 64259 64260 64261 64262-65535	Run to position Clear ErrorCode register (see 0x1001) Command run actuator out Command run actuator in Command stop actuator Command run actuator out (Recovery mode) Command run actuator in (Recovery mode) Invalid value, actuator will not run	0.1 mm/ bit
	2	Current	UINT8	0-250 251 252-255	Max. current limit Use default current value Invalid value, actuator will not run	0.25 A/bit
	3	Speed	UINT8	0-200 201-250 251 252-255	Speed to use Use 100% speed Actuator default speed value Invalid value, actuator will not run	0.5% /bit
	4	Soft Start	UINT8	0-250 251 252-255	Start ramping time (ms) Use default soft start value Invalid value, actuator will not run	0.05 s/bit
	5	Soft Stop	UINT8	0-250 251 252-255	Stop ramping time (ms) Use default soft stop value Invalid value, actutor will not run	0.05 s/bit

Feedback status details

Index	Subindex	Command	Data type	Details	Description	Unit
0x2001	1	Position	UINT16	0-64255 64256-65023 65024 65025-65535	Position of actuator piston Reserved Position lost Reserved	0.1 mm/bit
	2	Current	UINT8	0 1-250 251-253 254 255	Not running Measured motor current Reserved Fault in current measurement circuit Reserved	0.25 A/bit
	3	Status Flags	UINT8	b0 b1 b2 b3 b4 b5 b6-b7	Endstop reached in Endstop reached out Overcurrent Running out Running in CANopen heartbeat needed Reserved	8-bit independent status bit-indicators
	4	Error Codes	UINT8	0 1 2 3 4 5 6 7 8 9 10 254 255	No error Need ‘Stop’ command Hall error Overvoltage Undervoltage Failed to maintain heartbeat Endstop reached error Temperature error Heartbeat error (internal) SMPS error (internal) Current measurement (internal) Internal fault (not specified) External fault (not specified)	8-bit error code indicating the currently active error of highest priority
	5	Speed	UINT16	0-4015 4016-65535	Speed of actuator piston Reserved	0.1 mm/s / bit
	6	AUX Input	UINT8	b0-b1 b2-b3 b4-b5 b6-b7	Input 1 level Input 2 level Input 3 level Reserved (always1)	25% VCC/ bit

Service Data Objects (SDO)

Index	Subindex	Data Type	Access	Name	Details	Unit	Description
0x1000			R	Device Type		see CiA 301 7.5.2.1	
0x1001			R	Error Register		see CiA 301 7.5.2.2	
0x1005			RW	COB-ID SYNC		see CiA 301 7.5.2.5	Default value is used (0x80)
0x1009			R	Manufacturer Hardware Version		see CiA 301 7.5.2.9	PCBA name
0x1014			R	COB-ID EMCY		see CiA3017.5.2.17	Default value is used (0x80 + Node ID)
0x1015			RW	Inhibit Time EMCY		see CiA 301 7.5.2.18	Default value is used (0)
0x1016			RW	Consumer Heartbeat Time		see CiA 301 7.5.2.19	
0x1017			RW	Producer Heartbeat Time		see CiA 301 7.5.2.20	
0x1018	**Identity Object see CiA 301 7.5.2.21**						
	1	UINT32	R	Vendor ID	0x000004AA		LINAK
	2	UINT32	R	Producer Code			Software number (e.g. 1050000)
	3	UINT32	R	Revision Number			CANopen interface revision
	4	UINT32	R	Serial Number			Same as UIN
0x1200	**SDO Server Parameter see CiA 301 7.5.2.33**						
	1		R	COB-ID Client -> Server (RX)			Default value is used (0x600+ Node ID)
	2		R	COB-ID Server -> Client (TX)			Default value is used (0x580 + Node ID)
0x1400	**RPDO Communication Parameter see CiA 301 7.5.2.35**						
	1		RW	0x300 + Node ID			Default value is used (0x200 + Node ID)
	2		RW	0x400 + Node ID			
0x1600			R	RDPO Mapping Parameter		see CiA 301 7.5.2.36	1 to 1 mapping of 0x2000 (Actuator Command)

Service Data Objects (SDO)

Index	Subindex	Data Type	Access	Name	Details	Unit	Description
0x1800	**TDPO Communication Parameter 0 see CiA 301 7.5.2 37**						
	1	UINT32	R	COB-ID Used by TDPO			Default value is used (0x180 + Node ID)
	2	UINT8	RW	Transmission Character			Event-driven (Manufacturer specific)
	5	UINT16	RW	Event Timer	250	1ms/bit	
0x1801	**TDPO Communication Parameter 1**						
	1	UINT32	R	COB-ID Used by TDPO			Default value is used (0x280 + Node ID)
	2	UINT8	RW	Transmission Character			Event-driven (Manufacturer specific)
	5	UINT16	RW	Event Timer	250	1 ms/bit	
0x1A00				TDPO Mapping Parameter		see CiA 301 7.5.2.38	1 to 1 mapping of 0x2001 (Actuator Status)
0x4000	**Record Diagnostic Actuator Diagnostic Parameters**						
		Record		**Diagnostic**		**Actuator diagnostic parameters**	
	0	UINT8	R	Highest Sub-index Supported			
	1	UINT8	RW	Current Limit Out		0.25A/bit	
	2	UINT8	RW	Current Limit In		0.25A/bit	
	3	UINT16	RW	Soft Start Time Out		1ms/bit	
	4	UINT16	RW	Soft Start Time In		1ms/bit	
	5	UINT16	RW	Soft Stop Time Out		1ms/bit	
	6	UINT16	RW	Soft Stop In		1ms/bit	
	7	UINT8	RW	Max. Speed	0-200 201-255	0.5% /bit 100%	
	8	UINT16	RW	Virtual Endstop Reached Out Position		0.1mm/bit	
	9	UINT16	RW	Virtual Endstop Reached In Position		0.1mm/bit	
	10	UINT32	R	UIN		8 number format	

Service Data Objects (SDO)

Index	Subindex	Data Type	Access	Name	Details	Unit	Description
0x4000	11	UINT32	R	SW Variant		SW**xxxxxxx**Vx-x	Software number (e.g. 1050000)
	12	UINT32	R	SW Version Major		SWxxxxxxxV**x**-x	
	13	UINT32	R	SW Version Minor		SWxxxxxxxVx-**x**	
	14	UINT32	R	Config. Production Order Number			
	15	UINT32	R	Production Date		yyyymmdd	
	16	UINT8	R	Max. Current Seen		0.25 A/bit	
	17	UITN8	R	Max. FET Temperature Seen		1°C/bit - 40	
	18	UINT32	R	Max. Ambient Temperature Seen		1°C/bit - 40	
	19	UINT8	R	Min. Ambient Temperature Seen		1°C/bit - 40	
	20	UINT32	R	Current Usage		1 As/bit	
	21	UINT32	R	Runtime		1 s/bit	
	22	UINT8	R	Number of Stops Due to Overvoltage			
	23	UINT8	R	Number of Stops Due to FET Over-temperature			
	24	UINT8	R	Number of Stops Due to Ambient Over-temperature			
	25	UINT8	R	Number of Stops Due to Low Voltage			
	26	UINT89	R	Number of Stops Due to Hall Errors			
	27	UINT8	R	Number of Stops Due to Endstop Switch Errors			
	28	UINT8	R	LINAK Current Overload Out Stops			

Service Data Objects (SDO)

Index	Subindex	Data Type	Access	Name	Details	Unit	Description
0x4000	29	UINT8	R	LINAK Current Overload in Stops			
	30	UINT8	R	Resettable Custom Current Overload Out Stops			
	31	UINT8	R	Resettable Custom Current Overload in Stops			
	32	UINT16	R	Communication Errors			
	33	UINT16	R	Number of Endstops Reached Out			
	34	UINT16	R	Number of Endstops Reached In			
	35	UINT32	R	Number of Starts Out			
	36	UINT32	R	Number of Starts In			
	37	UINT32	R	Total Piston Distance		5 m/bit	
	38	UINT16	R	Last Stop Reason ID 0			Stop Reason ID
	39	UINT8	R	Last Stop Count ID 0			Number of consecutive stop reasons of the same type
	40	UINT32	R	Last Stop Powered Time ID 0			Powered time when the last stop occured
	41	UINT16	R	Last Stop Reason ID 1			Stop reason ID
	42	UINT8	R	Last Stop Count ID 1			Number of consecutive stop reasons of the same type
	43	UINT32	R	Last Stop Powered Time ID 1			Powered time when the last stop occured
	44	UINT16	R	Last Stop Reason ID 2			Stop reason ID

Service Data Objects (SDO)

Index	Subindex	Data Type	Access	Name	Details	Unit	Description
0x4000	45	UINT8	R	Last Stop Count ID 2			Number of consecutive stop reasons of the same type
	46	UINT32	R	Last Stop Powered Time ID 2			Powered time when the last stop occured
	47	UINT16	R	Last Stop Reason ID 3			Stop reason ID
	48	UINT8	R	Last Stop Count ID 3			Number of consecutive stop reasons of the same type
	49	UINT32	R	Last Stop Powered Time ID 3			Powered time when the last stop occured
	50	UINT16	R	Last Stop Reason ID 4			Stop reason ID
	51	UINT8	R	Last Stop Count ID 4			Number of consecutive stop reasons occured
	52	UINT32	R	Last Stop Powered Time ID 4			Powered time when the last stop occured
	53	UINT32	R	Total Corrected Distance		1 mm/bit	
	54	UINT8	R	FET Temperature		1°C /bit - 40	
	55	UINT8	R	Ambient Temperature		1°C /bit - 40	
	56	UINT16	R	Stroke Length		0.1 mm/bit	
	57	UINT16	R	Zero Point Offset		0.1 mm/bit	
	58	UINT32	R	Actuator PO Number			
	59	UINT8	RW	LINAK Special Function	0	Reserved	
					1		Restart actuator
					2		Force lose position
					3-255	Reserved	
	60	UINT8	R	CAN Address 1 in Parallel System			Sorted in descending order
	61	UINT8	R	CAN Address 2 in Parallel System			

Service Data Objects (SDO)

Index	Subindex	Data Type	Access	Name	Details	Unit	Description
0x4000	62	UINT8	R	CAN Address 3 in Parallel System			
	63	UINT8	R	CAN Address 4 in Parallel System			
	64	UINT8	R	CAN Address 5 in Parallel System			
	65	UINT8	R	CAN Address 6 in Parallel System			
	66	UINT8	R	CAN Address 7 in Parallel System			
	67	UINT8	R	CAN Address 8 in Parallel System			
	68	UINT32	R	Powered Time		1 s/bit	
	69	UINT8	R	Remaining Life		1% /bit	0xFA: Remaining life not supported

FAQ

Problem	Cause / Solution
Why is the actuator not running despite giving it a 'Run' command?	1. Ensure that all power requirements are met. 2. Check the Error codes and Status flag registers for indications of an abnormal state. 3. Make sure to follow the start-up procedures described on page 22.
Feedback data is available but the actuator is not able to run.	Actuators are designed with a split power supply that requires separate power to the motor module and the control module. Make sure both modules are powered properly.
The master does not receive any response from the actuator.	1. Make sure that the device has the expected Node ID. 2. Ensure correct baud-rate. Node ID and baud-rate can be changed using the Actuator Connect™ service tool.
The feedback received from the actuator does not match the expected outcome.	Some controllers may reverse the byte order. Please make sure the correct Most Significant Byte [MSB] and Least Significant Byte [LSB] are matching your configuration.

Error codes

Error	Description
0	**No error detected** No LINAK defined error detected.
1	**'Run' command overruled** As a safety precaution to prevent unintentional movement at power-up, the actuator will not run until a 'Stop' command or 'Clear error' command has been sent.
2	**Position sensor** Position sensors are outside of expected operating range. VCC motor OK. Example: 10 pulses were reported on one Hall sensor and no Hall pulses on the other. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
3	**Overvoltage** Input supply voltage is above operating voltage level. Consult the documentation for correct voltage levels. The error will automatically be cleared when voltage is within operating limits.
4	**Undervoltage** Input supply voltage is below operating voltage level. Consult the documentation for correct voltage levels. The error will automatically be cleared when voltage is within operating limits.
5	**Communication sync.** Heartbeat from the master is not within the expected heartbeat interval. Consult the documentation for minimum requirements for heartbeat interval.
6	**Endstop switch (N/A for bus interfaces)** Endstop switches are behaving unexpectedly. Example: Both endstop switches have been activated simultaneously for more than 100 ms. Perform the initialisation process by running the actuator fully extended and retracted.
7	**Temperature** Internal actuator temperature is above operating limit. Consult the documentation for correct temperature levels. The error will automatically be cleared when the temperature is within operating limits.

Error codes

Error	Description
8	**Motor controller** Internal motor controller hardware error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
9	**Internal power supply** The internal power supply is behaving unexpectedly. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
10	**Internal current measurement** Internal current reference is outside the expected limits. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
11	**Parallel arbitration** Start-up parallel configuration procedure in progress.
12	**Position not changing** Internal position sensor is behaving unexpectedly and motor might stall. Please check your application for blockage or other irregularities. If the error persists, contact LINAK or replace the product.
13	**Position initialisation not possible** Internal initialisation parameters missing. Contact LINAK.
14	**Alone in parallel system** Incorrect number of actuators in parallel system.
15	**Incorrect number in parallel system** Incorrect number of actuators in parallel system or wrongly configured.
254	**Other internal error (Not specified)** Unspecified internal hardware/software error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
255	**Other external error (Not specified)** Unspecified external hardware/software error. Please inspect your application for possible issues. Send 'Clear error' command to clear error.

Parallel error codes

Error	Description
6	**Analogue input out of range (N/A for bus interfaces)** Analogue input signal is outside operating limits. Servo or Proportional. Consult the documentation for correct input signal.
7	**Position not changing** Internal position sensor is behaving unexpectedly and motor might stall. Please check your application for blockage or other irregularities. If the error persists, contact LINAK or replace the product.

Parallel error codes

Error	Description
8	**Run signal overruled** Communication has been overruled by a higher priority input. Communication is split into the following priorities: 1. Bus communication (CAN bus, Ethernet, etc.) 2. LINAK service tool (Actuator Connect™) 3. Manual run using Red and Black wires Send a 'Clear error' command to continue.
9	**Position initialisation not possible** Internal initialisation parameters missing. Contact LINAK.
10	**Parallel start-up** Error in parallel setup. The number of connected actuators does not match your configuration. Check the configuration by using the LINAK tool Actuator Connect.
11	**Parallel running** The actuators are performing the internal setup and are not ready for operation.
12	**BLDC motor** Internal hardware error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
13	**Endstop switch (N/A for bus interfaces)** Endstop switches are behaving unexpectedly. Both endstop switches have been activated simultaneously for more than 100ms. Perform the initialization process by running the actuator fully extended and retracted.
14	**Parallel communication** Error in internal parallel communication. More than 5 communication errors in 500 ms. Please check the wire connections and re-power the complete setup.
15	**Parallel setup stopped** One or more actuators cannot comply with commands and stop. Master commands 'Stop' to other actuators in the network. Send 'Clear error' command to clear error. If the error persists, check your application and wire connections and re-power your complete setup.
24	**Other error** Actuator receives an undefined error code. This can be due to outdated firmware. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
25	**Position lost** Follow the relevant initialisation procedures by running the actuators from fully retracted to fully extended. If the error persists, contact LINAK or replace the product.

CANopen certified by CiA

Certificate # **CiA202006-301V42/303-0243**

Vendor ID **00 00 04 AA**

Manufacturer Linak A/S

Device LAxxCAN

Product code: Object 1018h/02h	00100597	Revision number: Object 1018h/03h	00010000
Hardware version: Object 1009h	10LAXXCA-A-0	Software version: Object 100Ah	–

EDS LINAK_actuator.eds

File version:	1	File revision:	1
EDS version:	4.0		

Nuremberg, 10.06.2020

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