Thomson Electrak® HD
Electric Linear Actuator

Installation Manual

Edition 2022-05

P-264-HD

CE

THOMSON®

Linear Motion. **Optimized.**™

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Version history

Edition	Reason for revision
2016-01	First edition
2017-02	Synchronization option added
2017-05	Synchronization option functionallity changed
2017-09	Synchronization option functionallity changed, 1,7 kN data added
2017-12	16 kN data added, synchronization option acceptable input voltage variation added
2018-01	Wiring diagram corrections for option EXX, ELX, EXP, EXD, ELP
2018-05	Synchronization option acceptable input voltage variation changed, synchronization loading recommendations changed, synchronization speed reduction changed
2018-06	Ordering key, Screw type, dynamic load capacity, 1.7 kN data added
2018-08	Troubleshooting section added
2018-12	Encoder input voltage changed to 4-24 Vdc in the wiring diagrams
2019-02	Information on speed control added
2019-04	Note on PWM driver voltage limitations added
2019-09	Various CAN bus data updated/added
2019-11	Added information on rear and front adapter option type A and changed limit switch output data for control options ELX, ELP, ELD, LLX
2020-01	Added information on option SYN
2020-08	Added information on CANopen option, corrected weights for 16 kN version
2021-02	EDS file link corrected
2021-03	Data for the 48 Vdc model added. CANopen options baud rate added. Bus option tables data corrected.
2021-04	Data for the LPS control option added.
2021-05	Inputs for manual control of options CNO/COO added.
2022-05	Added: 50 mm stroke to the ordering key + 50 mm stroke weight and hand wind warning

Warranty

The Thomson Electrak® HD is warranted to be free from defects in materials and workmanship for a period of twelve (12) months from date of delivery. The application of this product is the responsibility of the buyer and Thomson makes no representation or warranty as to the suitability of the product for any particular use or purpose. For a copy of the entire warranty for this product that is contained in our standard terms and conditions of sale, please go to http://www.thomsonlinear.com/website/com/eng/support/terms_and_conditions.php.

Disclaimer

Technical changes to improve the performance of the equipment may be made without prior notice!

Contents

1. General

1.1 About this manual

This manual contains mechanical and electrical installation instructions for the Thomson Electrak® HD electric linear actuator. It also contains, among other things:
• technical data
• installation data
• type designation key.

It is important to carefully read this manual before installing the actuator and to have the correct qualifications needed to perform the installation.

1.2 Target group

This manual addresses qualified mechanical and electrical personnel.

1.3 Symbols used

⚠ This symbol is shown to highlight a general warning, general instruction or as a warning for a mechanical hazard.

1.4 Transport and storage

The actuator may only be transported and stored in the original packaging supplied by Thomson. The temperature during transportation and storage must be between -40 to +85° C (-40 to +185° F). Avoid shocks to the package. If the package is damaged, check the actuator for visible damage and notify the carrier, and if appropriate also Thomson.

1.5 Packaging

The packaging consists of a cardboard box. The box contains the actuator and this manual. For large quantity orders bulk packaging may be used in which case the packaging and the content will vary depending on the order agreement.

1.6 Disposal

Where required by law, used packaging and actuators are taken back by Thomson for professional disposal if the transportation cost is paid by the sender. Please contact Thomson for shipping information.

1.7 Support

If technical support or information is needed for this product, please contact the nearest Thomson Service Center. See the back of this manual. You can also visit www.thomsonlinear.com for information on this product and how to contact us.

2. Safety

2.1   Safety notes

⚠ • Only properly qualified personnel are permitted to perform mechanical and electrical installation of this product. Properly qualified personnel are familiar with mechanical or electrical installation work and have the appropriate qualifications for their job.
• Read this manual and any other available documentation before working on the equipment that the actuator is or shall be a part of.
• Conform strictly to the information contained in this manual and on the actuator product label on the actuator. Never exceed the performance limits stated herein.
• Never work on the actuator or its installation with the power on.
• Never unplug any cables or connectors during operation or with power on.
• Immediately stop using the actuator if it seems faulty or damaged in any way and notify an appropriate person so that corrective actions can be taken.
• Never open the actuator as that will compromise the sealing and the function of the actuator. There are no serviceable components inside.
• Grease may be present on the extension tube. Contact is non-hazardous. Film should not be removed.

3. Standards

3.1   EC Declaration of incorporation of partly completed machinery

We, Thomson Linear declare that this product corresponds with the International Standard ISO 13766:2006-05 2nd Edition (Earth Moving Machinery, Electromagnetic Compatibility). The directive (MD) 2006/42/EC annex 2.1.B, RoHSII directive 2011/65/EU, and that the standard EN ISO 12100:2010, Safety of machinery, have been applied.

We, Thomson Linear declare that this product corresponds with the standards EN12895:2015+A1:2019 (Industrial Trucks - Electromagnetic Compatibility) and EN61000-6-4 (Emissions). The directive (MD) 2006/42/EC annex 2.1.B, RoHSII directive 2011/65/EU, and that the standard EN ISO 12100:2010, Safety of machinery, have been applied.

Thomson Electrak® HD Linear Actuator
Product

Thomson Electrak® HD Linear Actuator
Product

HD12(24)Bxxx-xxxxxxxxxxx
Description

HD48Bxxx-xxxxxxxxxxx
Description

Can be used when the machine or the system, which it shall be, a part of is in accordance with the demands in the EEC Machinery Directive and/or other relevant regulations.

Can be used when the machine or the system, which it shall be, a part of is in accordance with the demands in the EEC Machinery Directive and/or other relevant regulations.

Kristianstad 20160216   Håkan Persson
Place and date   Name

Kristianstad 20210319   Håkan Persson
Place and date   Name

Business Unit Manager
Title   Signature

**Business Unit Manager**
Title   Signature

4. Installation

4.1   Product label

The product label can be found on the side of the cover tube. It will tell you which model of actuator you have, its basic performance data and where it is manufactured. Please study the product label to determine actuator type before starting any installation or service on the actuator. If you need any assistance from Thomson, please provide the serial number, manufacturing date and the designation of the actuator(s) in question. You can also use the QR code on the label to directly access Electrak HD information on www.thomsonlinear.com.
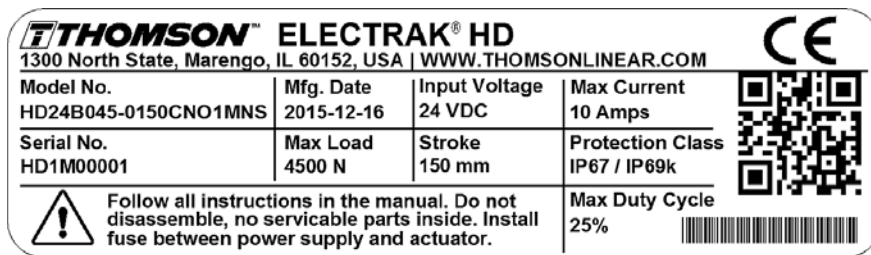
4.2   Terminology
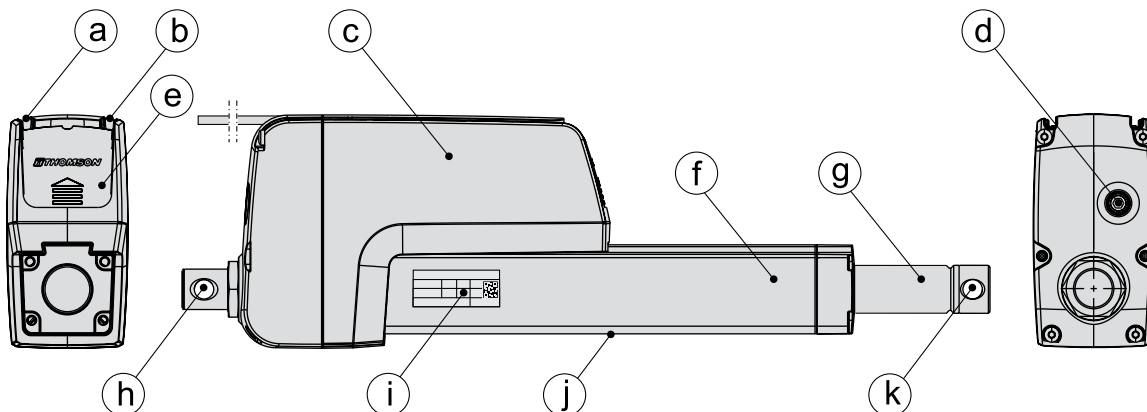
a. power cable   b. signal cable   c. housing

d. manual override input   e. cable connector cover plate   f. cover tube

g. extension tube   h. rear adapter   i. product label

j. limit switch slots   k. front adapter

4.3   Operation environment
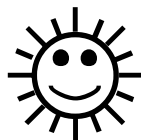
Min. -40° C (-40° F)   Max. +85° C (+185° F)   IP67 / IP69K

1. Operation temperature range is -40 to +85° Celsius (-40 to +185° Fahrenheit).
2. Protection degree against the ingress of water and particles is IP67 / IP69K.
3. Relative humidity range is 10 - 90 % non-condensing.

4.4 Mechanical installation

4.4.1 General installation safety notes

⚠ • Never work on the actuator with the power switched on!
   • Do not hold the extension tube while the unit is energized.
   • Failure modes of the actuator should be considered to ensure it does not create harm.

4.4.2 Basic installation considerations

1. Only mount the actuator using the holes in the rear (a) and front (b) adapters. Check the model number on the actuator product label (section 4.1) and then look at the ordering key (section 7.2) to find out your adapter type configuration. See the below drawings and table to find out the exact adapter dimensions.
2. Make sure that the actuator mounting position allows access to the cable connector cover plate (c), so that it can be removed to allow access to the cable connector(s) (section 4.4.4).
3. The cable or cables (d) exit the cable slot at the rear of the actuator housing at delivery but can be made to leave the housing at any point after the cable connector cover plate.
4. The manual override input (e) must have enough free space around it to allow it to be operated (section 4.4.5).
5. If external limit switches will be used, the mounting of the actuator must allow access to the limit switch slots (f) running along the underside of the cover tube (section 4.4.6).
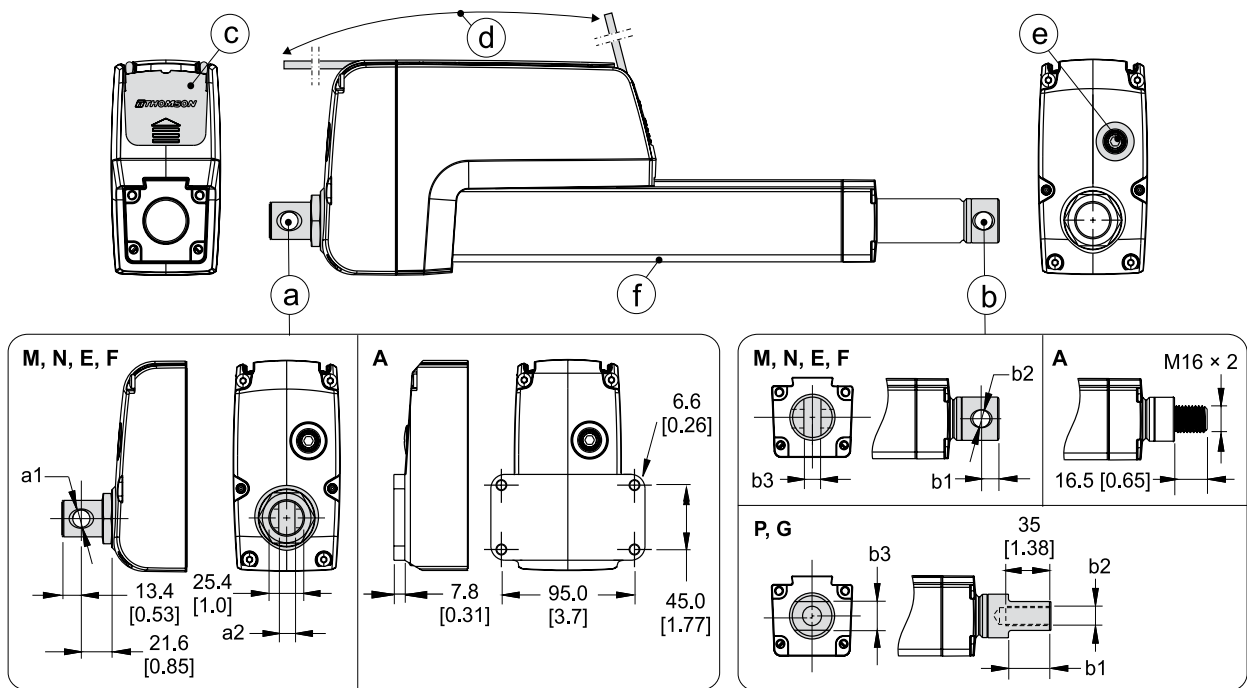
Adapter Dimensions [mm (in)]

|	Adapter type					
	M	E	N	F	P	G
a1	12.2 E9 (0.48)	12.8 (0.51)	12.2 E9 (0.48)	12.8 (0.51)	-	-
a2	-	-	8.2 (0.32)	8.2 (0.32)	-	-
b1	10.9 (0.43)	10.9 (0.43)	12.9 (0.51)	12.9 (0.51)	30 (1.18)	30 (1.18)
b2	12.2 E9 (0.48)	12.8 (0.51	12.2 E9 (0.48)	12.8 (0.51)	M12 × 1.75	1/2-20 NF-2B
b3	-	-	8.2 (0.32)	8.2 (0.32)	19 (0.75)	19 (0.75)

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4.4.3 Mounting orientation and forces
1. The actuator can be mounted in any orientation and handle both pushing and pulling loads.
2. Always install actuator so that the force of the load acts in the center of the extension tube and the rear adapter.
3. Only mount the actuator to the rear and front adapter mounting holes.
4. Only use solid mounting pins and support them at both ends.
5. The mounting pins must be parallel to each other both radially and axially.
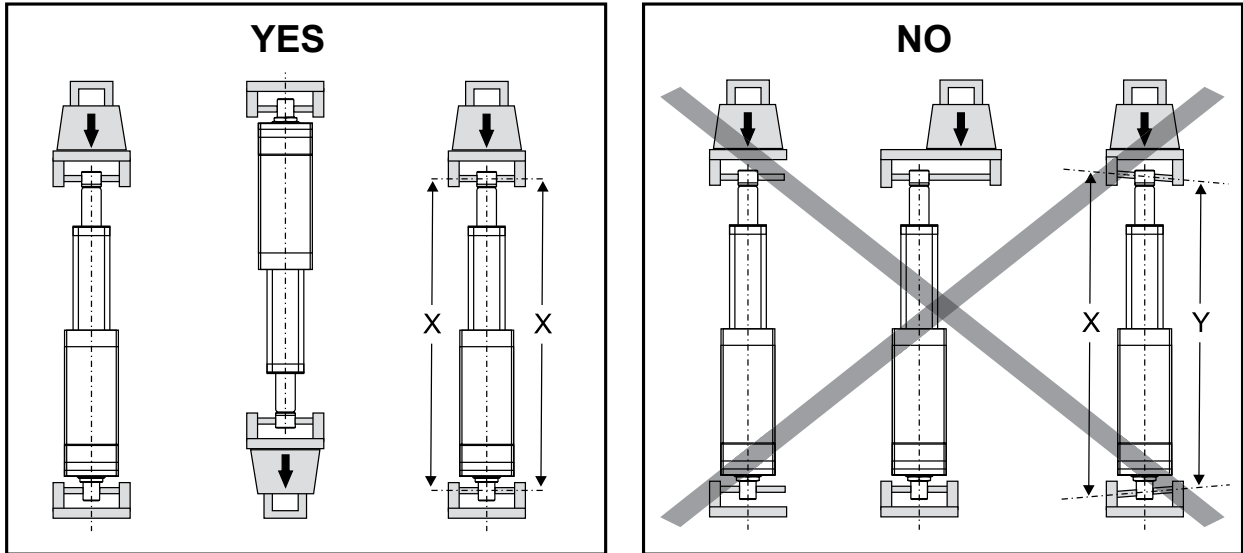
4.4.4 Cable connector cover plate
1. The cover plate is held in place by a screw (M3 with Torx T10 head) that can be accessed through the hole in the top of the cover plate (a). Keep in mind to mount the actuator so that there is enough clearance to access the screw with a tool!
2. Once the cover plate is released it needs to be pushed about 20 mm (0.8 inch) in the direction of the arrow symbol on the cover plate before it can be removed from the actuator (b). The connectors are a part of the backside of the cover plate and can be accessed once the cover plate is removed.
3. Make sure to put the cover plate back correctly and torque the screw to 1.2Nm (10.6 in-lb) to ensure that the actuator cover plate and connectors are properly sealed.
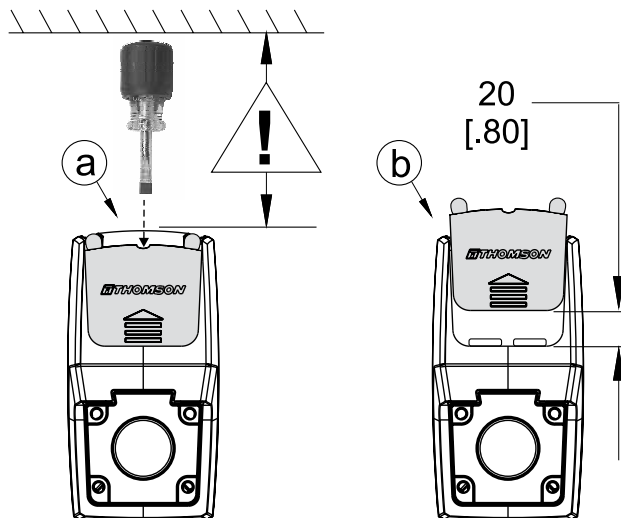
4.4.5 Manual override mounting and operation

1. Make sure when mounting the actuator that there is space enough between the rear adapter and any object behind it to allow the manual override to be operated!

2. To operate the manual override, remove the cover plug (a) using a flat head screw driver. Then turn on the manual override input hexagon key (b) using a 6 mm hexagon deepwall socket (c).

3. The maximum torque required to move the extension tube at the fully rated actuator load using the manual override is typically 1.7 Nm (15 in-lb).

4. The distance the extension tube travels per manual override input revolution depends on the actuator type. See the table below.

Extension Tube Movement / Manual Override Input Revolution [mm (in)]	
Actuator type	Movement
HDxx-B017	0.403 (0.0159)
HDxx-B026	0.224 (0.0088)
HDxx-B045	0.134 (0.0053)
HDxx-B068	0.099 (0.0039)
HDxx-B100	0.059 (0.0023)
HDxx-B160	0.369 (0.0145)
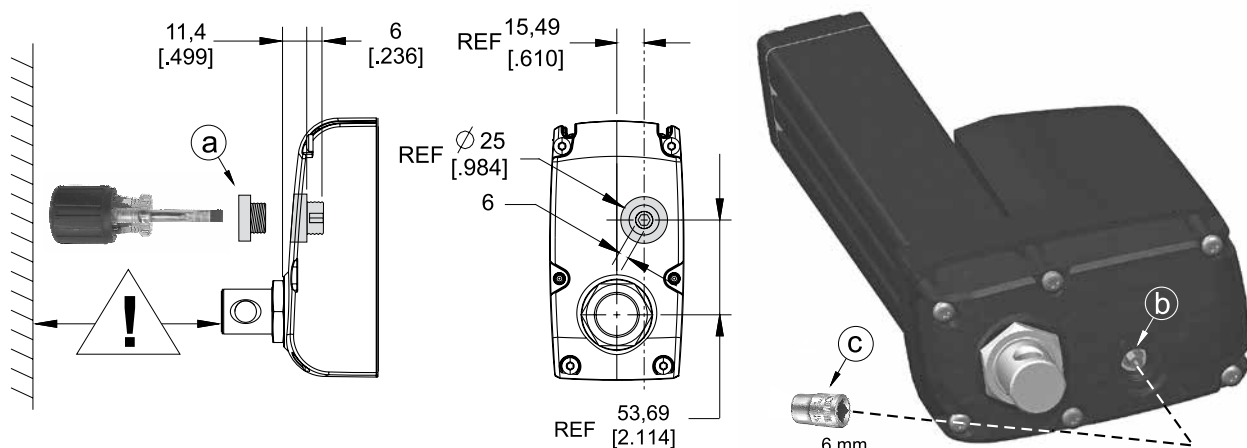
Always make sure to switch off the power to the actuator before using the manual override.
Do not apply higher torque than 1.7 Nm (15 in-lb) to the manual override input.
Never run the extension tube in to the end of stroke as that may damage the actuator.
Never extend past the internal 50 mm limit switch on a 50 mm stroke unit.
Never use any type of drill or power tool to operate the manual override.

4.4.6 Mounting of optional external limit switches

1. The external limit switches are mounted in the two slots (a) at the bottom of the cover tube.

2. Put the sensor (b) into one of the slots and and lock it at the desired position by turning the clamp screw 45 degrees (c).
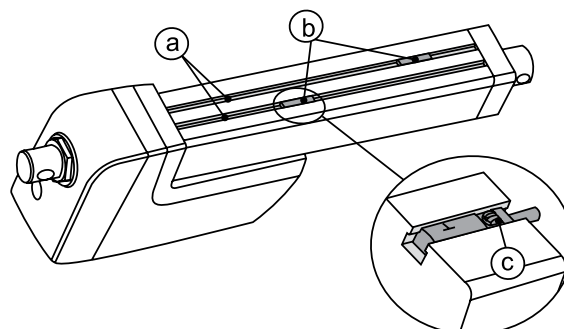
If the sensor is mounted in the immediate vicinity of magnetic components, the switching characteristics of the sensor may change.

4.5   Electrical installation

4.5.1 General notes

- Make sure the leads/cables leading to the motor can handle the maximum motor current.
- An emergency stop is recommended to reduce the chance of a crushing hazard.
- Never work on the actuator or the wiring with the power switched on!

4.5.2 Fuse size

Protect the actuator and the wiring by using a slow blow fuse between the actuator and the power source.

Recommended Fuse Size	
Actuator supply voltage	Fuse size
12 VDC	40 A
24 VDC	20 A
48 VDC	10 A

4.5.3 Electrical connections

The actuator is always supplied with a power cable (a). Depending on which control option was selected, it can also have a signal cable (b). The cable(s) have flying leads in one end for customer connections. In the other end the cable(s) are integrated in to the cable connector cover plate (c) (section 4.4.4). The plug in connector allows replacing the actuator without disconnecting the flying leads.
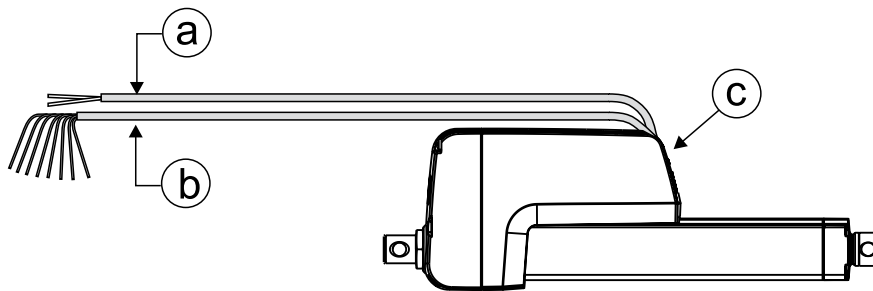
4.5.4 Lead cross sections

To avoid malfunction due to voltage drop the cross section of the leads between the actuator power cable leads and the power source must be of sufficient size. For longer cables than stated in the table, calculations based on the supply voltage, the current draw, the length of the cables and the ambient temperature must be done.
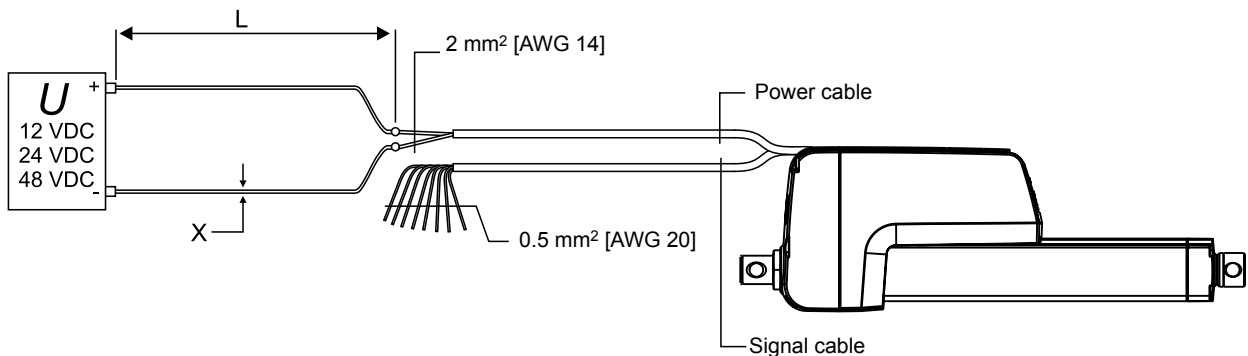
Power Lead Cross Sections		
	Min. allowed cross section (X)	
Length of cable (L)	12 and 24 Vdc	48 Vdc
0 - 4 m	2.5 mm^2 [AWG 16]	1.5 mm^2 [AWG 18]
4 - 10 m	4 mm^2 [AWG 12]	2.5 mm^2 [AWG 16]

4.5.5 Inrush current

At the start of the actuator there is an inrush current to the motor that will last between 75 to 150 milliseconds. See below table to determine the inrush current for the control option being used.

Control Option Inrush Current Level	
Option	Inrush current
EXX, ELX, EXP, EXD, ELP, ELD	up to 4 × rated current for the actuator model and load in question
LXX, LLX, LXP, LPS, CNO, COO, SYN	up to 2 × rated current for the actuator model and load in question

⚠ If using an AC powered power supply it must be sized to handle the inrush current (batteries typically have no problem delivering the inrush current). Also contacts, switches and relays must be sized appropriately to be able to handle the inrush current.

4.6   Control options installation and operation

4.6.1 General notes

⚠ • Avoid placing signal cables along power cables to reduce the risk of interference.
• Avoid using a vehicle earth as the return conductor. Instead use a two wire system to reduce the risk of interference.
• In very sensitive applications or where there is a risk of interference we recommend using shielded signal cables.
• Keep in mind that long cables in combination with small lead cross sections and low voltages may lead to undervoltage and malfunction due to voltage drop.
• Relays or other coil operated devices should have spark protection to avoid interference.
• Never work on the actuator or the wiring with the power switched on!

4.6.2 Speed control by adjusting the input voltage

⚠ Electrak HD cannot be speed controlled by adjusting the input voltage. When using battery or full wave rectified direct currents that are within the acceptable voltage limits, the built-in Electronic Monitoring Package will keep the actuator at the correct speed for the load in question. Outside of the limits, the actuator will be stopped (section 4.6.4). When using Pulse Width Modulation (PWM) to speed control the actuator, the internal PCB will be permanently damaged and cause malfunction.

4.6.3 How to determine the control option

Electrak HD is equipped with one of the control options in the table below. To determine the option your actuator has, check the model number on the product label on the actuator (section 4.1) and then check the ordering key (section 7.2). Not all options are available for 48 Vdc, see the ordering key for availability (section 7.2). Use the table below and go to the corresponding section for further information.

Control Options		
Option	Functions	Section
EXX	Electrak Monitoring Package only	4.6.4
ELX	Electrak Monitoring Package + End of Stroke Indication Output	4.6.5
EXP	Electrak Monitoring Package + Analog Position Output	4.6.6
EXD	Electrak Monitoring Package + Digital Position Output	4.6.7
ELP	Electrak Monitoring Package + End of Stroke Indication Output + Analog Position Output	4.6.8
ELD	Electrak Monitoring Package + End of Stroke Indication Output + Digital Position Output	4.6.9
LXX	Electrak Monitoring Package + Low Level Signal Motor Switching	4.6.10
LLX	Electrak Monitoring Package + LXX + End of Stroke Indication Output	4.6.11
LXP	Electrak Monitoring Package + LXX + Analog Position Output	4.6.12
LPS	Electrak Monitoring Package + LXX + Programmable Limit Switches + Signal-Follower	4.6.13
SYN	Synchronization	4.6.14
CNO	CAN bus SAE J1939 Control + Open Loop Speed Control	4.6.15
COO	CAN bus CANopen Control + Open Loop Speed Control	4.6.15

4.6.4 Control option EXX (Electrak monitoring package only)

Utilizing the internal control system the actuator will:

• Stop the actuator immediately at each end of mechanical travel and throughout the stroke anytime current exceeds a factory preset value for the rated load (over load condition). This value is adjusted during operation automatically to provide consistent force. Resetting the actuator requires motion in opposite direction to continue normal operation.

• Stop the actuator when the current move is finished in the situation where voltage or temperature are outside their normal operating ranges. Once within the normal operating range the actuator will automatically reset and normal operation can be continued.

⚠ Always turn power off to the actuator before working on it to eleminate the risk of the actuator making unplanned moves after it has carried out the automatic reset.

To extend the actuator apply +Vdc to red and -Vdc to black. To retract apply -Vdc to red and +Vdc to black.

EXX Control Option Specifications	

Input voltage   [Vdc]
  HD12
  HD24
  HD48
	
	9 - 16
	18 - 32
	-

Max. actuator current draw [A]	see product label

F   Fuse
S1   Double pole double throw switch
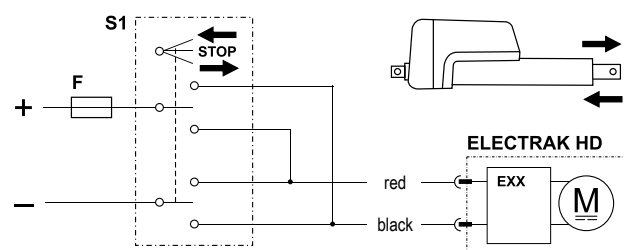
4.6.5 Control option ELX

In addition to all of the features included in the EXX version (section 4.6.4), the ELX also includes the additional feature of end of stroke indication. These normally open outputs can be used to provide feedback that the actuator has reached it's mechanical minimum or maximum stroke.

To extend the actuator apply +Vdc to red and -Vdc to black. To retract apply -Vdc to red and +Vdc to black.

ELX Control Option Specifications		

Input voltage   [Vdc]
  HD12
  HD24
  HD48
		
		9 - 16
		18 - 32
		-

Max. actuator current draw	[A]	see product label
Output contact type		potential free
Limit switch max. voltage	[Vdc/ac]	30/120
Limit switch max. current	[mA]	100

F   Fuse
S1   Double pole double throw switch

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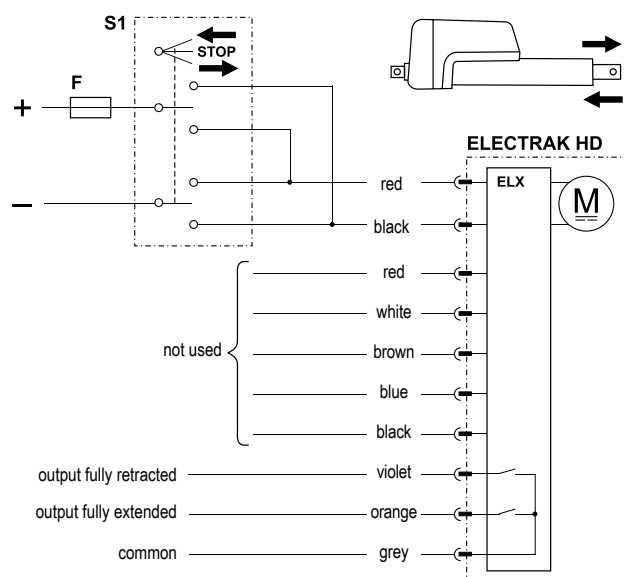
4.6.6 Control option EXP

In addition to all of the features included in the EXX version (section 4.6.4), the EXP adds a potentiomenter providing a voltage signal for the customer to use to determine position, speed and direction.

To extend the actuator apply +Vdc to red and -Vdc to black. To retract apply -Vdc to red and +Vdc to black.

EXP Control Option Specifications		

Input voltage [Vdc]
  HD12
  HD24
  HD48
		9 - 16
		18 - 32
		-

Max. actuator current draw [A]		see product label
Potentiometer type		wirewound
Potentiometer max. input voltage [Vdc]		32
Potentiometer max. power [W]		1
Potentiometer linearity [%]		± 0.25

Potentiometer output resolution [ohm/mm]
  50 - 100 mm stroke
  150 - 250 mm stroke
  300 - 500 mm stroke
  550 - 1000 mm stroke
		
		65.62
		32.81
		19.69
		9.84

F   Fuse
S1   Double pole double throw switch

4.6.7 Control option EXD
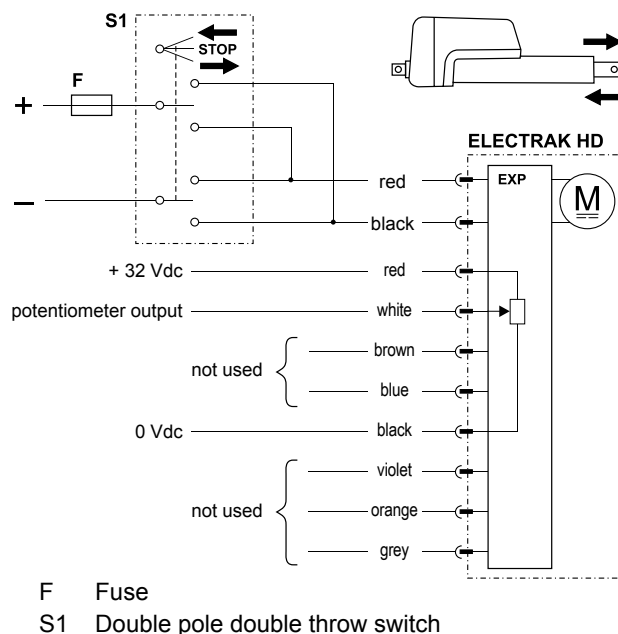
In addition to all of the features included in the EXX version (section 4.6.4), the EXD also includes an encoder providing a single pulse train signal to determine position and speed.

To extend the actuator apply +Vdc to red and -Vdc to black. To retract apply -Vdc to red and +Vdc to black.

EXD Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 -
Max. actuator current draw [A]		see product label
Encoder type		gear tooth
Encoder input voltage [Vdc]		4 - 24
Encoder output low voltage levels (logical zero) [Vdc] typical / max.		 0.1 / 0.25
Encoder resolution [mm/pulse] HDxx-B017 HDxx-B026 HDxx-B045 HDxx-B068 HDxx-B100 HDxx-B160		 0.277 0.154 0.092 0.068 0.040 0.027

F   Fuse
S1   Double pole double throw switch

4.6.8 Control option ELP

In addition to all of the features included in the EXX version (section 4.6.4), the ELP has both end of stroke indication and a potentiometer providing a voltage signal to determine position, speed and direction.

To extend the actuator apply +Vdc to red and -Vdc to black. To retract apply -Vdc to red and +Vdc to black.

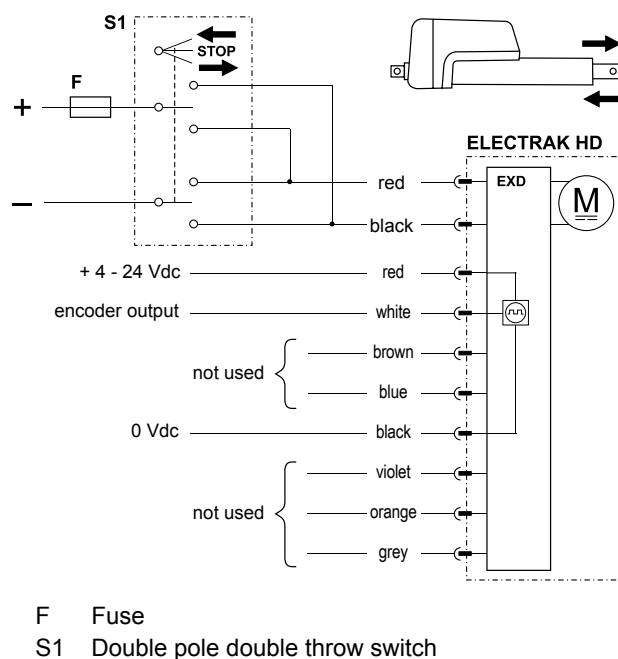| ELP Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 -
Max. actuator current draw [A]		see product label
Output contact type		potential free
Limit switch max. voltage [Vdc/ac]		30/120
Limit switch max. current [mA]		100
Potentiometer type		wirewound
Potentiometer max. input voltage [Vdc]		32
Potentiometer max. power [W]		1
Potentiometer linearity [%]		± 0.25
Potentiometer output resolution [ohm/mm] 50 - 100 mm stroke 150 - 250 mm stroke 300 - 500 mm stroke 550 - 1000 mm stroke		 65.62 32.81 19.69 9.84

F   Fuse
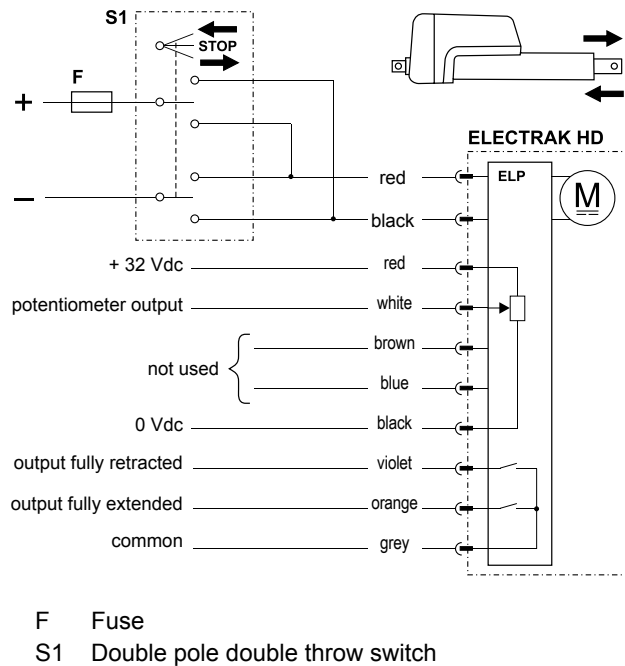S1 Double pole double throw switch

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4.6.9 Control option ELD

In addition to all of the features included in the EXX version (section 4.6.4), the ELD has both end of stroke indication and an encoder providing a single pulse train signal to determine position and speed.

To extend the actuator apply +Vdc to red and -Vdc to black. To retract apply -Vdc to red and +Vdc to black.

ELD Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 -
Max. actuator current draw [A]		see product label
Output contact type		potential free
Limit switch max. voltage [Vdc/ac]		30/120
Limit switch max. current [mA]		100
Encoder type		gear tooth
Encoder input voltage [Vdc]		4 - 24
Encoder output low [Vdc] voltage levels (logical zero) typical / max.		0.1 / 0.25
Encoder resolution [mm/ HDxx-BO17 pulse] HDxx-B026 HDxx-B045 HDxx-B068 HDxx-B100 HDxx-B160		0.277 0.154 0.092 0.068 0.040 0.027

F   Fuse
S1   Double pole double throw switch

4.6.10 Control option LXX

In addition to all of the features included in the EXX version (section 4.6.4), the LXX option allows the end user to extend, retract or stop the actuator using low current (<22 mA) input signals instead of switching the polarity of the input power voltage.

It also includes:

• An automatic soft start capability reducing the inrush current (section 4.5.5).
• A "sleep" mode function is activated when no motion is commanded for 15 seconds. In sleep mode the current draw is less than 1 mA for a 12 Vdc actuator and less the 2 mA for a 24 Vdc actuator. The sleep mode will exit and return to normal operation when the next move command is received.
• Dynamic braking throughout the entire stroke length whenever a motion command is removed.

Power the actuator by connecting red to + Vdc and black to - Vdc in the power cable. To extend the actuator apply +Vdc to violet and to retract apply +Vdc to orange in the signal cable.

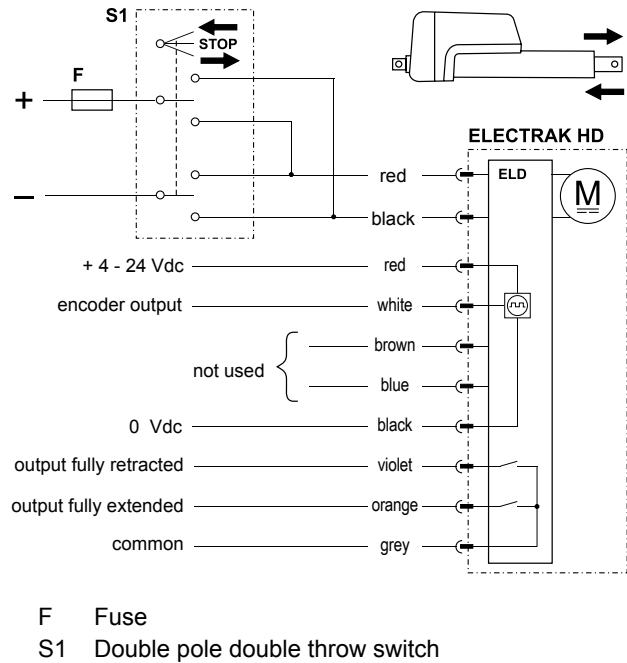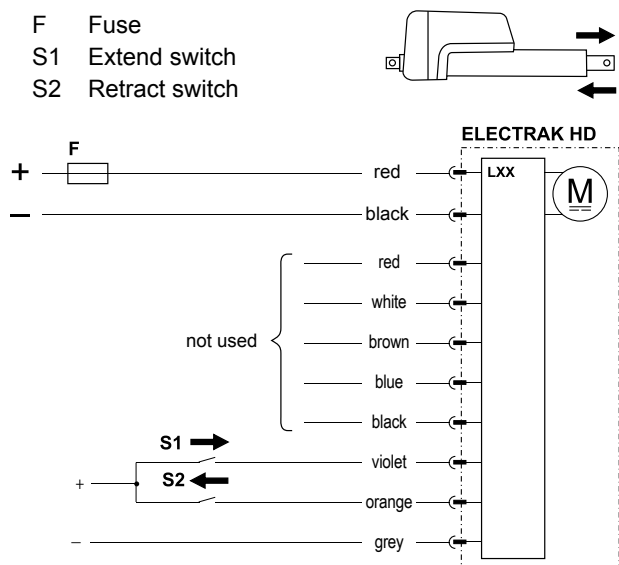| LXX Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 36 - 64
Max. actuator current draw [A]		see product label
Extend / retract input voltage [Vdc] HD12(24) HD48		9 - 32 12 - 64
Extend / retract input current [mA]		6 - 22

F   Fuse
S1   Extend switch
S2   Retract switch

4.6.11 Control option LLX

In addition to all of the features included in the LXX version (section 4.6.10), LLX also includes end of stroke indication. These normally open outputs can be used to provide feedback that the actuator has reached it's mechanical minimum or maximum stroke.

Power the actuator by connecting red to + Vdc and black to - Vdc in the power cable. To extend the actuator apply +Vdc to violet and to retract apply +Vdc to orange in the signal cable.

LLX Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 36 - 64
Max. actuator current draw [A]		see product label
Output contact type		potential free
Limit switch max. voltage [Vdc/ac]		30/120
Limit switch max. current [mA]		100
Extend / retract input voltage [Vdc] HD12(24) HD48		9 - 32 12 - 64
Extend / retract input current [mA]		6 - 22

F   Fuse
S1   Extend switch
S2   Retract switch

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4.6.12 Control option LXP

In addition to all of the features included in the LXX version (section 4.6.10), LXP also includes a potentiometer providing a voltage signal for the customer to use to determine position, speed and direction.

Power the actuator by connecting red to + Vdc and black to - Vdc in the power cable. To extend the actuator apply +Vdc to violet and to retract apply +Vdc to orange in the signal cable.

LXP Control Option Specifications		

Input voltage [Vdc]
  HD12
  HD24
  HD48
		9 - 16
		18 - 32
		36 - 64

Max. actuator current draw [A]		see product label
Potentiometer type		wirewound
Potentiometer max. input voltage [Vdc]		32
Potentiometer max. power [W]		1
Potentiometer linearity [%]		± 0.25

Potentiometer output [ohm/mm] resolution
  50 - 100 mm stroke
  150 - 250 mm stroke
  300 - 500 mm stroke
  550 - 1000 mm stroke
		
		65.62
		32.81
		19.69
		9.84

Extend / retract input voltage [Vdc]
  HD12(24)
  HD48
		9 - 32
		12 - 64

Extend / retract input current [mA]		6 - 22

F   Fuse
S1   Extend switch
S2   Retract switch

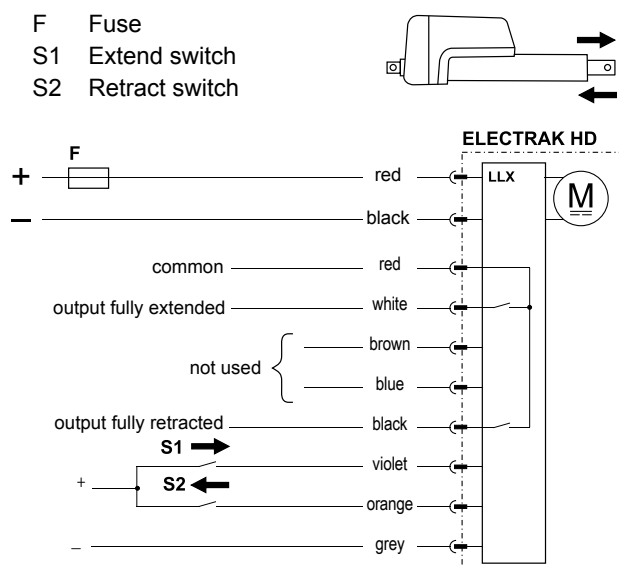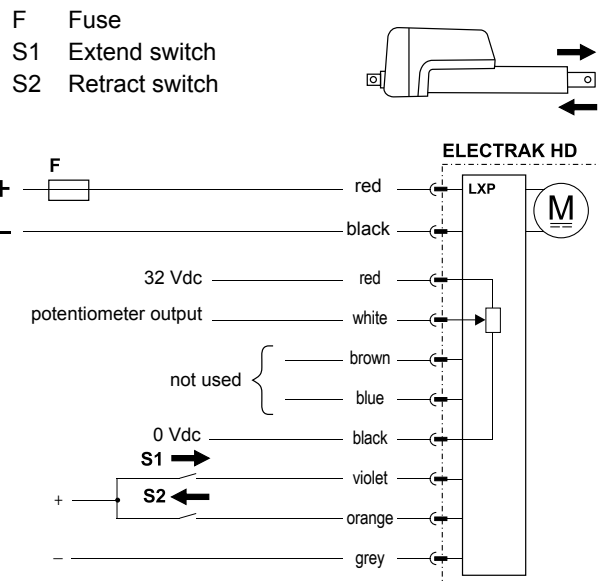### 4.6.13 Control option LPS
In addition to all of the features included in the LXX version (section 4.6.10), LPS includes programmable mid-stroke software extend and retract limits as well as a signal-follower input that allows the extension tube position to be controlled from a potentiometer or other voltage control.

LPS Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 -
Max. actuator current draw [A]		see product label
Signal-follower input voltage [Vdc]		0.5 - 4.5
Signal-follower max. current [A]		0.8
Signal-follower movement [mm/Vdc]		stroke* [mm] / 4
Signal-follower repeatability [± mm]		0.1
Programming inputs voltage [Vdc] HD12(24) HD48		9 - 32 -
Extend / retract input voltage [Vdc] HD12(24) HD48		9 - 32 -
Extend / retract input current [mA]		6 - 22

* ordering stroke of the actuator or the stroke between any set programmable extend or retract limits.

4.6.13.1 General installation data
Power the actuators by connecting red to + Vdc and black to - Vdc in the power cable.

#### 4.6.13.2 Extend and retract inputs
To extend the actuator, apply +Vdc to violet and to retract ,apply +Vdc to orange in the signal cable.

4.6.13.3 Signal-follower input
When the actuator is powered, the extension tube will move to the position that corresponds to the voltage applied to the signal-follower input on white and black in the signal cable. The span is 0.5 - 4.5 volts where 0 - 0.5 Vdc means fully retracted and 4.5 - 5 Vdc means fully extended. Any voltage in between will move the extension tube to the position relative to the voltage applied (e.g. a 100 mm stroke unit at 2 volts will position the tube at 50 mm). Also see 4.6.13.5.

4.6.13.4 Programmable extend and retract limits
Programmable extend and retract limits can be set to reduce the stroke. An extend limit will be programmed when applying 9 - 32 Vdc between brown and grey for at least 5 seconds. A retract limit can be set using the blue instead. To reset any programmed limits, simultaneously connect both brown and blue for at least 5 seconds to

F   Fuse
S1   Extend switch
S2   Retract switch
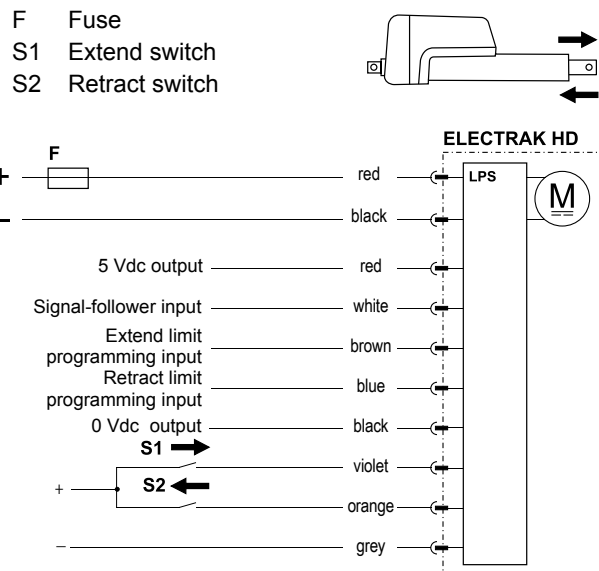
9 - 32 Vdc and grey to 0 Vdc. Note that the actuator must be powered, at stand still and have the signal-follower input (white) below 0.5 or above 4.5 Vdc during all programming.

⚠ Never try to set a retract position that is at a more extended position than the set extend position or vice versa.

4.6.13.5 Using both programmable limits and the signal-follower input
Make sure to set the programmable limits first before determining any signal-follower positions as any change of the programmable limits will alter the resulting position for a given voltage on signal-follower input. For example, on a 100 mm stroke actuator without any programmable limits, the signal-follower will use the entire 100 mm of stroke, and 0 - 0.5 Vdc will mean fully retracted and 4.5 - 5 Vdc fully extended. If the stroke then is limited to 50 mm (where this 50 mm is set on the 100 mm total length does not matter) the signal-follower input will only move the extension tube along these 50 mm. Hence, 0 - 0.5 Vdc equals the tube being at the beginning and 4.5 - 5 Vdc at the end of these 50 mm wherever they are situated along the 100 mm of total possible stroke.

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4.6.14 Control option SYN
In addition to all of the features included in the LXX version (section 4.6.10), SYN also includes a synchronization feature allowing two or more actuators to be synchronized.

SYN Control Option Specifications		
Input voltage [Vdc] HD12 HD24 HD48		9 - 16 18 - 32 36 - 64
Max. actuator current draw [A]		see product label
Extend / retract input voltage [Vdc] HD12(24) HD48		9 - 32 12 - 64
Extend / retract input current [mA]		6 - 22

4.6.14.1 General installation data
Power the actuators by connecting red to + Vdc and black to - Vdc in the power cable. Make sure the input voltage supplied to each actuator do not differ more than ± 1 V.

4.6.14.2 Determining master and slave
Wire the actuator you want as master as actuator 1 and the slave(s) as actuator 2+.

4.6.14.3 Normal master/slave operation
Close switch S1 to extend the actuators in a synchronized motion. Close switch S2 to retract the actuators in a synchronized motion. If actuators are not in synchronized positions when starting up, fully extend or retract them to align.

4.6.14.4 Override feature
Closing switch S3 will put actuator 1 in an override state. In this state the actuator can be extended and retracted independently of the other using switches S1 and S2. Opening S3 will enable synchronized motion again.

Note! If it is required to be able to override all actuators, then all actuators has to be wired as actuator 1. In that case all actuators can be put in override state individually of each other. If none of them are in override state, the actuator you select to send an extend or retract command to will move and the other will follow.

4.6.14.5 Loading recommendations
Uneven loading is acceptable as long as no individual actuator is loaded past its rated load.

Actuator 1 (master)

Actuator 2 + (slaves)
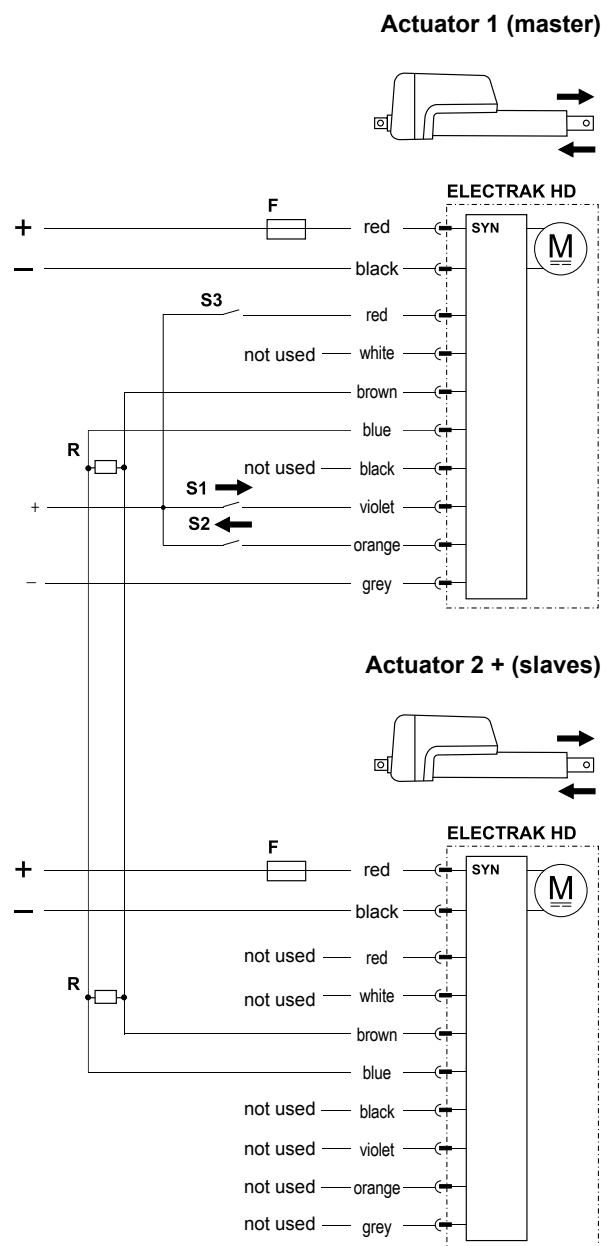
F   Fuses
S1   Extend switch
S2   Retract switch
S3   Override switch
R   Resistors 120 Ohm

4.6.14.6 Speed reduction
For units with the synchronization option, the speed at any load is 25% lower than the full-load rated speed of the actuator without the synchronization option.

4.6.14.7 Overload
If one actuator encounters an overload condition, it will trip the overload protection and send a signal to each actuator on the network to stop. The units can be immediately reversed (unless they bind up the system), or they can continue in the same direction after a power reset.

4.6.14.8 Power loss
If power is lost at any time to any actuator, the actuators still powered will continue their last commanded move until told to stop, either by an individual current overload trip, or a stop signal sent from the master actuator.

4.6.14.9 Communication loss
If communication is lost (i.e. brown/blue wires cut), the slaves will continue their last commanded move until they reach end of stroke or trip current overload. The master will continue its last commanded move unless commanded to stop with the switching leads, reaching end of stroke, or tripping current overload.

4.6.14.10 Re-alignment procedure
After a large number of mid-stroke movements, the time difference between each unit receiving a signal to move (master vs. slave) will add to small variances in when the units start and stop. Since they are designed to run at the same speed, these small differences amount to a variance of position over time – even when load is applied. To address this concern, Thomson suggests running the units either to a fully extended or fully retracted position each cycle to re-align the units with each other to take out these added variances.

4.6.14.11 Minimum motion command reaction time
In order to give the master and slave(s) enough time to communicate there must be at least 250 ms between each start and stop command.

4.6.15 Control options CNO and COO

⚠ This document assumes the user is familiar with the SAE J1939 and CANopen standards. Terminology from the standard is used, but not described in detail. See sections 5 and 6 for information on J1939 and CANopen operation and communication protocols, respectively.

4.6.15.1 General installation data

Voltage is to be directly connected to the actuator. All motion and protection on the CAN bus option is handled through the CAN messages including overload protection. Please see sections 5 and 6 for more details on the messages.

CNO/COO Control Option Specifications	
Input voltage [Vdc] HD12 HD24 HD48	9 - 16 18 - 32 36 - 64
Max. actuator current draw [A]	see product label
Extend / retract input voltage [Vdc] HD12(24) HD48	9 - 32 12 - 64
Extend / retract input current [mA]	6 - 22

F   Fuse
S1   Manual extension switch (optional)
S2   Manual retraction switch (optional)

ELECTRAK HD
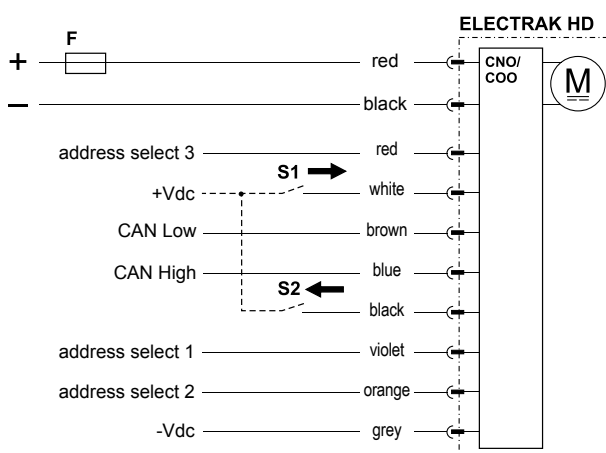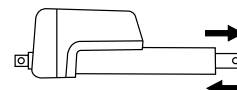
4.6.15.2 CANopen and SAE J1939 CAN bus installation data

Follow wiring guidelines per ISO-11898 Standard CAN 2.0B. Proper termination resistors (120 Ohm) should be placed in mating wire harness, see below. Please refer to section 5 for SAE J1939 communication details, and section 6 for CANopen communication details.
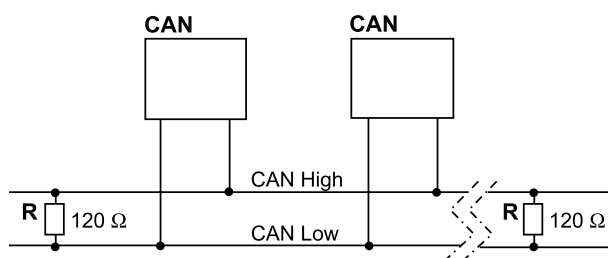
CAN   CAN bus device in actuator or other equipment
R   Resistor

4.6.15.3 Manual control

The actuator can be manually forced to extend or retract by using the inputs on white and black wires. When the manual control inputs are used, CAN bus control messages are ignored, but the unit will still provide CAN bus feedback messages. When the inputs are left floating, CAN bus functionality for control messages is restored.

5. CAN bus SAE J1939 information

5.1   Introduction to CAN bus SAE J1939

This document assumes the reader is familiar with the SAE J1939 standard. Terminology from the standard is used, but not described in detail. The default baud rate is 250kbit/s. The Electrak® HD actuator is compliant with the standard SAE J1939, and supports the following PGNs (Parameter Group Number) from the standard.

SAE J1939-21 – Data Link Layer
• Proprietary A   61184 (0x00EF00)
• Proprietary A2   126720 (0x01EF00)
SAE J1939-81 – Network Management
• Address Claimed/Cannot Claim   60928 (0x00EE00)
• Commanded Address   65240 (0x00FED8)

5.2   CAN bus SAE J1939 communications protocol

5.2.1 SAE J1939 NAME

The Electrak HD has the following defaults for the SAE J1939 NAME. Please refer to the SAE J1939/81 standard for more information on these parameters.

SAE J1939 NAME Defaults	
Arbitrary Address Capable	Yes
Industry Group	0, Global
Vehicle System Instance	0
Vehicle System	0, Non-specific system
Function	255, Not available
ECU Instance	0, First instance
Manufacture Code	547, Thomson Linear LLC
Identity Number	1

5.2.2 Address

The Electrak HD uses a default address value of 19 (0x13). In applications where the default address is not available, there are three additional methods in choosing a new address.
1. The Electrak HD device is arbitrary address capable, if another device with a higher priority NAME contends for the selected address, the actuator will continue to request other addresses until it finds one that it can claim.
2. The Electrak HD device can also use the commanded address PGN to select a specified address. See SAE J1939/81 for more details about address claiming.
3. In some applications it may be more convenient to select an address through hardware switches. Activate the desired address select input by connecting it to positive and address select common to negative. This allows the user to change the default address using the address select inputs as defined in section 4.6.15. Activating individual select pins will create a binary adder to the default address. This method can allow up to 8 individual actuator addresses on a single bus. The below chart shows some examples on how this can be implemented. Note that conflicting messages produce arbitrary execution.

Address Select					
Address select common	Address select 3	Address select 2	Address select 1	Binary adder	Default address
Gnd	0	0	0	0	19 (0x13)
Gnd	0	0	1	1	20 (0x14)
Gnd	0	1	0	2	21 (0x15)
...					
Gnd	1	1	1	7	26 (0x1A)

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5.2.3 Sleep operation

The Electrak HD utilizes a sleep mode operation when positioning is no longer required. This feature allows for a constant battery connection with minimal drain while the engine or vehicle is not running. After 5 seconds of bus inactivity, the actuator will put itself in a state of sleep. During this state the quiescent current is <1 mA for 12 Vdc models, <2 mA for 24 Vdc models and <2.5 mA for 48 Vdc models. When bus activity is restored the actuator will begin a wake up phase, followed by an address claim request.

5.2.4 SAE J1939 actuator control message (ACM)

All actuator control parameters are adjustable through the proprietary A message (PGN 61184). The preferred transmission repetition rate is 100ms (can also be sent as required by the application). Additional message specific information can be found in the table below, all other Proprietary A information can be found in the SAE J1939/21 specification.

Actuator Control Message Signal Information		
Start position	Length	Parameter name
1.1	14 bits	Position command
2.7	9 bits	Current limit
3.8	5 bits	Speed command
4.5	1 bit	Motion enable
4.6	35 bits	Factory use

The least significant bit of each message is indicated by the start position column

5.2.4.1 Position command

This 14-bit signal is used to set the target position for the next actuator motion. Although resolution of the signal is represented as 0.1 mm/bit, true positional accuracy will be dependent on the stroke length of the given model. The actuator uses an internally calculated deadband value to determine when within a target position range. The 0.0 mm and full extend stroke values represent 0 to 100% stroke and are only relative to the actual available stroke of the individual unit.

Range: 0.0 mm to 1000.0 mm
Resolution: 0.1 mm/bit, 0 offset

5.2.4.2 Current limit

This 9-bit signal is used to set a current at which the actuator will cease motion. In the event a force is applied to the actuator that causes the motor current to exceed this settable value for more than 50 ms, the actuator will stop any current motion and activate a dynamic braking effect on the motor. This current limit does not apply during the motor starting phase where in rush current can be significantly higher than normal running.

Range: 1.0 A to 25.0 A (12 Vdc models), 1.0 A to 12.5 A (24 Vdc models), 1.0 A to 6.5 A (48 Vdc models)
Note: values less than 1.0 A will send a parameter error
Resolution: 0.1 A/bit, 0 offset

5.2.4.3 Speed command

This 5-bit signal is used to set the speed of the actuator. The signal adjusts the PWM driver within the actuator and the voltage applied to the motor. The resultant actuator speed will be a ratio of the actuators max speed and also dependent on the load applied to the actuator.

Range: 20% to 100% motor duty cycle
Note: The PWM driver will not provide enough voltage for the motor to operate properly below 20% utilization, therefore, 20% shoud be considered a lower limit for speed control.
Resolution: 5%/bit, 0 offset

5.2.4.4 Motion enable

This 1-bit signal is used to enable motion from the actuator. If this bit is low (0), no motion will be allowed. This signal can be used to define the next actuator movement message without starting the motor. When movement is required this bit can be changed to high (1) and motion will begin using the other parameter signals encoded in the ACM.

5.2.4.5 Factory use
The remaining 35 bits of the ACM are used for factory calibration use only and should be filled with 0x00 or 0xFF when sending this message.

5.2.5 SAE J1939 actuator feedback message (AFM)
All actuator feedback data can be retrieved through the proprietary A2 message (PGN 126720). This message is transmitted every 100ms. Additional message specific information can be found in Table 2, all other Proprietary A2 information can be found in the SAE J1939/21 specification.

Actuator Feedback Message Signal Information		
Start position	Length	Parameter name
1.1	14 bits	Measured position
2.7	9 bits	Measured current
3.8	5 bits	Running speed
4.5	2 bits	Voltage error
4.7	2 bits	Temperature error
5.1	1 bit	Motion flag
5.2	1 bit	Overload flag
5.3	1 bit	Backdrive flag
5.4	1 bit	Parameter flag
5.5	1 bit	Saturation flag
5.6	1 bit	Fatal error flag
5.7	26 bits	Factory use

The least significant bit of each message is indicated by the start position column

5.2.5.1 Measured position
This 14-bit signal is used to inform the user of the actual actuator stroke position. Although resolution of the signal is represented as 0.1 mm/bit, true positional accuracy will be dependent on the stroke length of the given model. The actuator uses an internally calculated deadband value to determine when it is within a target position range. The 0.0 mm and ordered full extend stroke values represent 0 to 100% stroke but the signaled value does not take in to account any mechanical tolerances or play in the actuator.

Range: 0.0 mm to 1000.0 mm
Resolution: 0.1 mm/bit, 0 offset

5.2.5.2 Measured current
This 9-bit signal is used to inform the user of the actual current being drawn used by the actuator.

Range: 0.0 A to 51.1 A
Resolution: 0.1 A/bit, 0 offset

5.2.5.3 Running speed
This 5-bit signal is used to inform the user of the actual duty cycle being applied to the motor through the internal actuator controller.

Range: 0% to 100% motor duty cycle
Resolution: 5%/bit, 0 offset

5.2.5.4 Voltage error
This 2-bit signal is used to inform the user that the operational voltage is outside of allowable running parameters. Any motion already in progress will continue until completed, but additional movement request will not be allowed until the operational voltage returns within the normal operating range.

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Voltage Error Message	
00	Input voltage within operational range
01	Input voltage below operational range
10	Input voltage above operational range
11	Not used

5.2.5.5 Temperature error

This 2-bit signal is used to inform the user that the operational temperature is outside of allowable running parameters. Any motion already in progress will continue until completed, but additional movement request will not be allowed until the operational temperature returns within the normal operating range.

Temperature Error Message	
00	Temperature within operational range
01	Temperature below operational range
10	Temperature above operational range
11	Not used

5.2.5.6 Motion flag

This 1-bit signal is used to inform the user that the actuator is currently in motion.

5.2.5.7 Overload flag

This 1-bit signal is used to inform the user that thelast motion the actuator attempted caused an over load condition. This occurs when the actuator determines the current set in the Current Limit signal from the ACM is exceeded for a consecutive 50 ms. When this flag is set by the actuator the user must reset the Motion Enable flag in the ACM before attempting additional motion from the actuator.

5.2.5.8 Backdrive flag

This 1-bit signal is used to inform the user that the actuator has determined positional movement in the extension tube that was not commanded from the user. This can be caused from excessive static load or vibration being applied to the actuator.

5.2.5.9 Parameter flag

This 1-bit signal is used to inform the user that one of the parameter signals in the ACM is outside the allowed parameters the specific model will allow. To prevent damage to the actuator motion is not allowed after this flag is set.

5.2.5.10 Saturation flag

This 1-bit signal is used to inform the user that the actuator is currently running within 10% of its maximum capability. Additional speed or current needed from the application may not be able to be obtained with the chosen actuator model.

5.2.5.11 Fatal error flag

This 1-bit signal is used to inform the user that the actuator needs service. If this flag is set power can be reset to determine if the flag is resettable, but it is suggested to contact the factory for additional support. To prevent possible additional damage motion is prohibited while this flag is set.

5.2.5.12 Factory use

The remaining 26 bits of the Actuator Feedback Message are used for factory calibration use only and under normal operation will be returned with 0x00.

6. CAN bus CANopen information

6.1   Introduction to CANopen

6.1.1 CANopen standard
This document assumes the reader is familiar with the CiA 301 specification released by CAN in Automation. Terminology from the standard is used, but not described in detail. The Electrak® HD actuator is compliant with the standard. The default baudrate is 500kbit/s and it will only support the standard CAN frame with 11-bit identifier field.

6.1.2 EDS file
Thomson provides an electronic data sheet file (EDS) to integrate the Electrak HD into a specific CANopen network. The EDS file can be downloaded at www.thomsonlinear.com/en/support/docs-linear-actuators-literature under the Configuration Files section.

6.1.3 Node ID
The Electrak HD uses a default node ID of 19 (0x13). In applications where the default address is not available, it is possible to select an address through hardware switches. Activate the desired address select input by connecting it to positive and address select common to negative. This allows the user to change the default address using the address select inputs as defined in section (CANopen connection diagram). Activating individual select pins will create a binary adder to the default address. This method can allow up to 8 individual actuator addresses on a single bus. The below chart shows some examples on how this can be implemented.

Address Select					
Address select common	Address select 3	Address select 2	Address select 1	Binary adder	Default address
Gnd	0	0	0	0	19 (0x13)
Gnd	0	0	1	1	20 (0x14)
Gnd	0	1	0	2	21 (0x15)
...					
Gnd	1	1	1	7	26 (0x1A)

6.1.4 NMT State
The Electrak HD support the CANopen network management (NMT) slave state machine. It needs to be put in the operational state before operating properly.

Example
Sending a CAN message with id 0x0, containing the data 0x01 0x00 will put all connected actuators in the operational state. Sending a CAN message with id 0x0, containing the data 0x01 0x13 will put an actuator with the default Node ID in the operational state.
Ensure that the proper node ID is used when referencing multiple actuators on a single bus network.

6.1.5 Sleep operation
The Electrak HD utilizes a sleep mode operation when positioning is no longer required. This feature allows for a constant battery connection with minimal drain while the engine or vehicle is not running. After 120 seconds of bus inactivity, the actuator will put itself in a state of sleep. During this state the quiescent current is <1 mA for 12 Vdc models, <2 mA for 24 Vdc models and <2.5 mA for 48 Vdc models. The actuator will leave the sleep mode when bus activity is restored.

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6.2 Actuator control

6.2.1 Control PDO properties
Operational control of the actuator is achieved by sending the statically mapped RPDO with COB-ID 0x200 + Node ID. It will have the following layout:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Target Position		Current Limit		Target Speed		Movement Profile	Control Bits

The preferred transmission repetition rate is 100ms (can also be sent as required by the application).

6.2.2 Control PDO entries
The Object Dictionary entries mapped to the RPDO are:

Index	0x2100
Name	Target Position
Object Type	VAR
Data Type	UNSIGNED16
Description	The target position for the next actuator motion. The 0.0 mm and full extend stroke values represent 0 to 100% stroke and are only relative to the actual available stroke of the individual unit. Resolution: 0.1mm/bit, 0 offset.

Index	0x2101
Name	Current Limit
Object Type	VAR
Data Type	UNSIGNED16
Description	The current at which the actuator will cease all motion. In the event a force is applied to the actuator that causes the motor current to exceed this settable value for more than 8 ms, the actuator will stop any current motion and activate a dynamic braking effect on the motor. This current limit does not apply during the motor starting phase where in rush current can be significantly higher than normal running. Range: 0.0 A to 25.0 A (12 Vdc models), 0.0 A to 12.5 A (24 Vdc models), 0.0 A to 6.5 A (48 Vdc models). Resolution: 0.1 A/bit, 0 offset

Index	0x2102
Name	Target Speed
Object Type	VAR
Data Type	UNSIGNED16
Description	Controls the PWM driver within the actuator and the voltage applied to the motor. The resultant actuator speed will be a ratio of the actuators max speed, and also dependent on the load applied to the actuator. Range: 20% to 100% duty cycle. Resolution: 0.1%/bit, 0 offset.

Index	0x2103
Name	Movement Profile
Object Type	VAR
Data Type	UNSIGNED8
Description	Controls the behavior of the actuator when trying to reach the target position. Value set to 0: Normal operation, the actuator will run towards the target position at the target speed. It will stop when the target position is reached. This should be the preferred value for most application. Value set to 1: Precise operation, the actuator will perform an extra move after the target position is reached, this will increase accuracy in some applications. Value set to 2: Small step operation, the actuator will run with reduced speed towards the target position. This will allow proper movement during very small positional increments.

Index	0x2104
Name	Control bits
Object Type	VAR
Data Type	UNSIGNED8
Description	Bit 0 (LSB) – Enable bit: This bit is used to enable motion from the actuator. If it is low (0), no motion will be allowed. This bit can be used to define the next actuator movement message without starting the motor. When movement is required this bit can be changed to high (1) and motion will begin using the values of the other objects contained in the RPDO.

6.2.3 Control PDO example

Sending a CAN message with ID 0x213 containing the data 0xE8 0x03 0x7D 0x00 0x20 0x03 0x00 0x01 will make an actuator to move to position 100mm, at 80% duty cycle, with the current limit set to 12.5A. The example will work on an actuator with the default Node ID, if it is in the operational NMT state.

6.3 Actuator feedback

6.3.1 Feedback PDO properties

Operational feedback of the actuator is achieved by receiving the statically mapped TPDO with COB-ID 0x180 + Node ID. It will have the following layout:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Measured Position		Measured Limit		Measured Speed		Motion Flags	Error Flags

6.3.2 Feedback PDO entries

The Object Dictionary entries mapped to the TPDO are:

Index	0x2200
Name	Measured Position
Object Type	VAR
Data Type	UNSIGNED16
Description	The measured position of the actuator. The 0.0 mm and ordered full extend stroke values represent 0 to 100% stroke but the signaled value does not take in to account any mechanical tolerances or play in the actuator. Resolution: 0.1mm/bit, 0 offset.

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Index	0x2201
Name	Measured Current
Object Type	VAR
Data Type	UNSIGNED16
Description	The actual current being used by the actuator. Resolution: 0.1 A/bit, 0 offset

Index	0x2202
Name	Measured Speed
Object Type	VAR
Data Type	UNSIGNED16
Description	The actual duty cycle being applied to the motor through the internal actuator controller. Resolution: 0.1%/bit, 0 offset.

Index	0x2203
Name	Motion Flags
Object Type	VAR
Data Type	UNSIGNED8
Description	Contains information about the current actuator motion. Bit 0 (LSB) – Extending: 1 if currently extending, 0 otherwise. Bit 1 – Retracting: 1 if currently retracting, 0 otherwise.

Index	0x2204
Name	Error Flags
Object Type	VAR
Data Type	UNSIGNED8
Description	Contains information about actuator errors. Bit 0 (LSB) - Parameter Error: This flag is used to inform the user that one of the object values in the RPDO is outside the allowed ranges the specific model will allow. To prevent damage to the actuator motion is not allowed after this flag is set. Bit 1 – Current Overlaod: This flag is used to inform the user that the last motion the actuator attempted caused an overload condition. This occurs when the actuator determines the current set in the Current Limit object from the RPDO is exceeded for a consecutive 8 ms. When this flag is set by the actuator the user must reset the Motion Enable bit in the RPDO before attempting additional motion from the actuator. Bit 2 – Voltage Error: This flag is used to inform the user that the operational voltage is outside of allowable running parameters. Any motion already in progress will continue for 10 seconds, but additional movement request will not be allowed until the operational voltage returns within the normal operating range. Bit 3- Temperature Error: This flag is used to inform the user that the operational temperature is outside of allowable running parameters. Any motion already in progress will continue for 10 seconds, but additional movement request will not be allowed until the operational temperature returns within the normal operating range. Bit 4 – Backdrive Detected: This flag is used to inform the user that the actuator has determined positional movement in the extension tube that was not commanded from the user. This can be caused from excessive static load or vibration being applied to the actuator. Bit 5 – Message Timeout: This flag is used to inform the user that no RPDO has been received within the time specified in the PDO timeout time object(0x2005). When this flag is set by the actuator the user must reset the Motion Enable bit is the RPDO before attempting additional motion from the actuator. The default value is 5000ms. Bit 6 – Fatal Error: This flag is used to inform the user that the actuator was unable to detect any motion while trying to run the motor, or that the position was updating in the wrong direction. When this flag is set by the actuator the user must reset the Motion Enable bit in the RPDO before attempting additional motion from the actuator. Repeated activation of this flag indicates problems with the actuator, and it is recommended to contact the factory for additional support. Bit 7(MSB)- Memory Error: This flag is used to inform the user that the internal memory of the actuator is corrupted.

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7. Troubleshooting

7.1   Troubleshooting

Troubleshooting list		
Issue	Problem	Solution
Actuator does not move, makes no sound.	Actuator is not receiving proper input voltage.	Ensure the actuator is being supplied with proper rated input voltage.
Actuator makes buzzing sound, does not move.	Actuator does not have enough power and is stalled.	Ensure your power supply can provide enough current to move the rated load.
Actuator moves slower/faster than expected.	Actuator is receiving too low/too high input voltage.	Ensure that actuator is provided with proper nominal input voltage amount (i.e. 12 Vdc for a 12 Vdc rated actuator).
The actuator, when powered, is causing my fuse to blow.	Fuse is not rated for current draw of the actautor.	Make sure that the fuse is rated for the in-rush current of the actuator, which is typically 1.5 times the rated current draw of the actuator at full load. Slow-blow fuses are also recommended.
The actuator is not stopping at the right place.	Actuator is coasting due to helping load/lack of dynamic braking.	Consider shorting the motor leads together when stopping the actuator to dynamically brake the motor, especially in circumstances where the load applied would "help" move the extension tube.
Actuator is sending a "fatal error" message.	The actuator has encountered an uncommanded change in the stroke feedback device (potentiometer).	The actuator will need to be analyzed as an RMA (Return Material Authorization) at the manufacturing facility.
My actuator is not responding to any of the messages I send.	The actuator may have fallen asleep.	The sleep functionality of Electrak HD will engage after 5 seconds of bus inactivity. Send messages to the actuator every 100 ms - 2 s to avoid this from happening. If it has already happened, a "safe state" message will first have to be sent to "wake up" the actuator before it can interpret any other messages.
I am getting an erroneous Overload Flag with no load or current draw on my CNO actuator. How do I fix this?	The actuator control message PGN was set up incorrectly.	"The proper command message should be 18EF1300, where 0x13 is the address of the actuator (default). Keep in mind that if the customer changes the address of the actuator with the physical addressing leads, then the command message will change as well. The address of the CAN controller should be set as something different than the actuator to prevent errors. If an ELS error (C2 on the feedback message) is encountered and the PGN is addressed correctly, simply reset the bus by sending a command message with the enable bit off, then another with it on.".

8. Technical specifications

8.1 Technical data

Technical Specification		HD • •		
Input voltage	[VDC]	12	24	48
Input voltage tolerance	[VDC]	9 - 16	18 - 32	36 - 64
Stroke length	[mm]	see product label		
Static load at fully retracted (Fx), maximum	[kN (lbs)]	18 (4050)		
Dynamic load (Fx), maximum	[N]	see product label		
Speed, no load / max. rated load [1] HDxx-B017 HDxx-B026 HDxx-B045 HDxx-B068 HDxx-B100 HDxx-B160	[mm/s (inch/s)]	71 / 58 (2.8/2.28) 40 / 32 (1.6 / 1.3) 24 / 19 (0.94 / 0.75) 18 / 14 (0.71 / 0.55) 11 / 9 (0.43 / 0.35) 7 / 5 (0.27 / 0.21)		
Current draw @ rated max. load	[A]	see product label		
Weight	[kg (lbs)]	see table below		
End play, maximum	[mm (in)]	1.2 (0.047)		
Operating temperature limits, standard units	[°C (°F)]	- 40 to + 85 (- 40 to + 185)		
Full load duty cycle @ 25 °C	[%]	see product label		
Restraining torque	[Nm (lbf-in)]	0 (internally restrained)		
Motor cable lead cross section	[mm² (AWG)]	2 (14)		
Signal cable lead cross section	[mm² (AWG)]	0.5 (20)		
Cable length (depending on option)	[mm (in)]	0.3 (11.8), 1.5 (59) or 5 (197)		
Protection class - static		IP67 / IP69K		
Protection class - dynamic		IP66		

Safety features
    static load holding brake
    internal end-of-stroke limit switches
    overload protection
    temperature monitoring
    temperature compensation
    voltage monitoring
		yes
		 yes
		 yes
		 yes
		 yes
		 yes		

Compliances		CE, RoHS		

(1) For units with the synchronization option, the speed is 25% lower at any load.

Actuator Weight [kg]*																				
Actuator model	Stroke (see product label) [mm]																			
	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
HDxx-B017	6,5	6,5	6,7	7,0	7,2	7,5	7,7	8,0	8,2	8,5	8,7	9,0	9,2	9,5	9,7	10,0	10,2	10,5	10,7	11,0
HDxx-B026	6.5	6.5	6.7	7.0	7.2	7.5	7.7	8.0	8.2	8.5	8.7	9.0	9.2	9.5	9.7	10.0	10.2	11.6	11.9	12.2
HDxx-B045	6.5	6.5	6.7	7.0	7.2	7.5	7.7	8.0	8.2	8.5	8.7	9.0	9.2	10.4	10.7	11.0	11.3	11.6	11.9	12.2
HDxx-B068	6.5	6.5	6.7	7.0	7.2	7.5	7.7	8.0	8.2	8.5	9.5	9.8	10.1	10.4	10.7	11.0	11.3	11.6	11.9	12.2
HDxx-B100	6.7	6.7	7.0	7.2	7.5	7.7	8.0	8.2	9.1	9.4	9.7	10.0	10.3	10.6	10.9	11.2	11.5	11.8	12.1	12.4
HDxx-B160	8.1	8.1	8.3	8.5	8.7	8.9	9.1	9.3	9.5	9.7	✕	✕	✕	✕	✕	✕	✕	✕	✕	✕

* Conversion factor for kilogram to pound: 1 kg = 2.204623 lbs

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8.2 Ordering key

Ordering Key									
Position	1	2	3	4	5	6	7	8	9
Example	HD12	B026-	0300	LXX	2	M	M	S	D

1. Actuator type and supply voltage
HD12 = Electrak HD, 12 Vdc
HD24 = Electrak HD, 24 Vdc
HD48 = Electrak HD, 48 Vdc

2. Screw type, dynamic load capacity
B017- = ball screw, 1.7 kN (382 lbs)
B026- = ball screw, 2.6 kN (585 lbs)
B045- = ball screw, 4.5 kN (1012 lbs)
B068- = ball screw, 6.8 kN (1529 lbs)
B100- = ball screw, 10 kN (2248 lbs)
B160- = ball screw, 16 kN (3584 lbs)

3. Ordering stroke length
0050 = 50 mm
0100 = 100 mm
0150 = 150 mm
0200 = 200 mm
0250 = 250 mm
0300 = 300 mm
0350 = 350 mm
0400 = 400 mm
0450 = 450 mm
0500 = 500 mm
0550 = 550 mm
0600 = 600 mm
0650 = 650 mm
0700 = 700 mm
0750 = 750 mm
0800 = 800 mm
0850 = 850 mm
0900 = 900 mm
0950 = 950 mm
1000 = 1000 mm

4. Electrak® Modular Control System options

Options available for HD12 and HD24 only
EXX = Electronic Monitoring Package only
ELX = EXX + end-of-stroke indication output
EXP = EXX + analog (potentiometer) position output
EXD = EXX + digital position output
ELP = ELX + analog (potentiometer) position output
ELD = ELX + digital position output
LPS = EXX + LXX + programmable limit switches + signal-follower

Options available for HD12, HD24 and HD48
LXX = EXX + low-level signal motor switching
LLX = EXX + LXX + end-of-stroke indication output
LXP = EXX + LXX +analog (potentiometer) position output
CNO = SAE J1939 CAN bus + open-loop speed control
COO = CANopen CAN bus + open-loop speed control
SYN = LXX + synchronization option

5. Harness option
1 = 0.3 m long cables with flying leads
2 = 1.5 m long cables with flying leads
3 = 5.0 m long cables with flying leads

6. Rear adapter/mounting flange options
A = rear mounting flange
M = cross hole for 12 mm pin
E = cross hole for ½ inch pin
N = forked cross hole for 12 mm pin
F = forked cross hole for ½ inch pin

7. Front adapter options
A = metric M16 male thread
M = cross hole for 12 mm pin
E = cross hole for ½ inch pin
N = forked cross hole for 12 mm pin
F = forked cross hole for ½ inch pin
P = metric M12 female thread
G = inch 1/2-20 UNF-2B female thread

8. Adapter orientation
S = standard
M = 90 ° turned

9. Connection options
D = flying leads

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