

# Actuator MK35L



MK35L is derived from MK35 actuator with a brushless DC motor (BLDC) and a more sturdy Ball screw assembly to provide a constant speed of 25mm/s and a load capacity of up to 10,000N. It has same housing and appearance as MK35 actuator as well as same ingress protection rating: IP66M/IP67 and IPX9K. A built-in control board which integrates the BLDC driver has same cable interface and wiring as MK35 series actuators. The low current signal control option and the CAN Bus option (SAE J1939 or CANopen protocol) are available to suit the user's application such as agriculture, construction and industrial automation.

## Content

<b>Features and Options</b>	<b>3</b>
<b>Usage</b>	<b>3</b>
<b>List of Control Options and Functions</b>	<b>4</b>
<b>Performance Data</b>	<b>5</b>
<b>Dimensions</b>	<b>6</b>
1. Installation dimension	6
2. Drawing	6
3. Front connector type	7
4. Rear connector type	7
5. Connector orientation	8
<b>Wiring of Control Options</b>	<b>9</b>
1. Control option SOL	9
2. Control option SPL	10
3. Control option SHL	12
4. Control option J00/N00	14
<b>Adjustable External Switch</b>	<b>16</b>
<b>Certifications</b>	<b>16</b>
<b>Ordering Key</b>	<b>17</b>

## Features and Options

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- Main applications: Agriculture, Construction and Industrial Automation.
- Motor type: 48V BLDC motor
- Various control options to suit the user's application
- Spindle type: Ball screw
- Max. load: 10,000N (Push/Pull)
- Max. static load: 18,000N (Push)
- Speed: 25mm/sec (Typical value)
- Stroke: 100~500mm (One step in every 50mm)
- Manual drive capable by an hexagon socket wrench
- Stainless steel extension tube
- IP level: IP66M/IP67, IPX9K
- Salt spray tested for 500 hours
- Built-in stroke limit switches
- Optional external switch: 1x or 2x adjustable reed switches or only magnets installed (Refer to Page 16)
- Certified: CE Marking, EMC Directive 2014/30/EU.

## Usages

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- Duty cycle: 15%, Max. 60Sec. On/340Sec. Off
- Operating ambient temperature:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$  (Full performance  $+5^{\circ}\text{C} \sim 40^{\circ}\text{C}$ )
- Storage ambient temperature:  $-40^{\circ}\text{C} \sim +100^{\circ}\text{C}$
- Relative humidity: Full performance from 20%~80% - non-condensing
- Atmospheric pressure: 700~1060hPa
- Height above mean sea level: Max. 3,000 meters



## Control Options and Functions

Equipped with BLDC driver to control the extension and retraction of the actuator.

	S0L	SPL	SHL	J00	N00
Control platform	Low current signal	Low current signal	Low current signal	CAN bus J1939	CANopen
BLDC driver <sup>(1)</sup>	✓	✓	✓	✓	✓
Potentiometer output <sup>(2)</sup>	-	✓	-	-	-
Hall signal output <sup>(3)</sup>	-	-	✓	-	-
EoS signal output <sup>(4)</sup>	✓	✓	✓	-	-
Soft start/stop	✓	✓	✓	✓	✓
Over current protection <sup>(5)</sup>	✓	✓	✓	✓	✓
Voltage range protection <sup>(6)</sup>	✓	✓	✓	✓	✓
Temperature protection <sup>(7)</sup>	✓	✓	✓	✓	✓
Low temp. response <sup>(8)</sup>	✓	✓	✓	✓	✓
Action status feedback	-	-	-	✓	✓
Current feedback	-	-	-	✓	✓
Position feedback	-	-	-	✓	✓
Speed feedback	-	-	-	✓	✓
Error code feedback	-	-	-	✓	✓

### Notes:

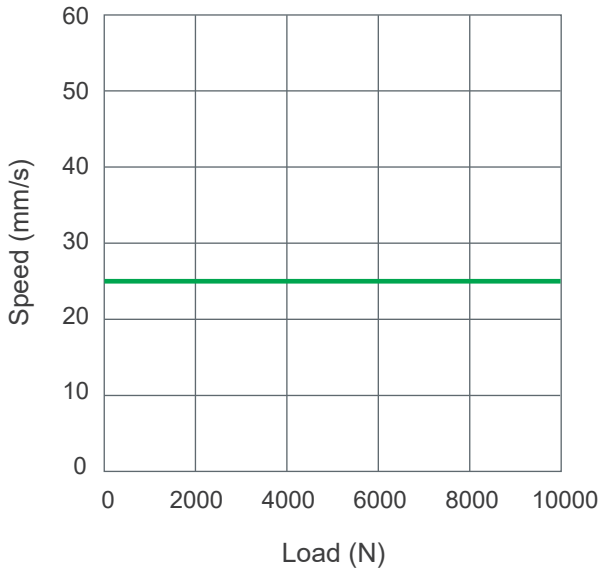
- <sup>(1)</sup> The polarity of input DC power for the MK35L must be fixed and cannot be swapped; the stand-by current <20mA.
- <sup>(2)</sup> A wire connection of voltage input (Vin) is required. The recommended voltage is 5~32V DC.
- <sup>(3)</sup> The Hall feedback circuit of SHL option is NPN type.
- <sup>(4)</sup> End of stroke signal output is not potential free. An external 5~24V power and pull-up resistor are required. (10K ohm resistor is recommended)
- <sup>(5)</sup> Over current protection: 12.5A max. Actuator will be stopped automatically.  
Over current protection is only applicable in emergency situations. It should not be used for the normal routine stopping needs of the actuator, as this may damage the actuator.
- <sup>(6)</sup> Voltage protection: The allowable input voltage is 40~68V, if it exceeds the range, actuator will be stopped automatically.
- <sup>(7)</sup> Temperature detection inside the actuator. When the temperature is detected outside the operating range, actuator will be stopped automatically. It will resume operation until the temperature return to a reasonable value range.
- <sup>(8)</sup> When the temperature inside the actuator is detected below 0°C, the overcurrent protection setting value will be automatically increased by 30%, which will reduce the over current protection caused by low temperature.



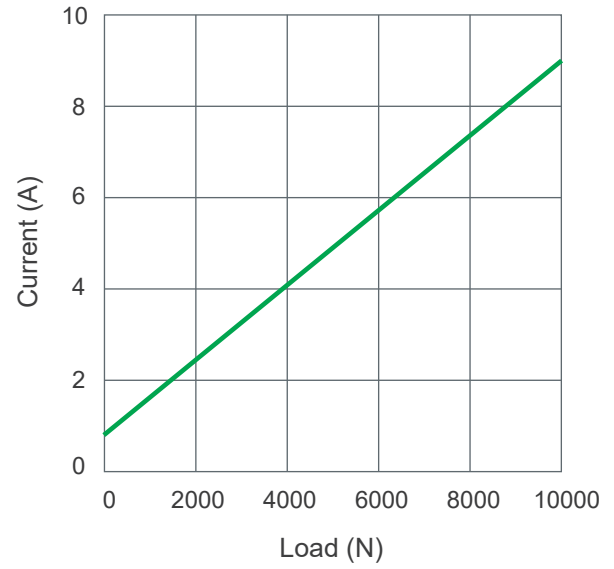
## Performance Data

Gear ratio	Push / Pull Max. (N)	Typical speed (mm/s) <sup>(1)</sup>		Typical current (A) @48V DC <sup>(2)</sup>	
		No load	Full load	No load	Full load
30:1	10,000	25	25	0.8	9.0

Speed VS. Load



Current VS. Load



### Notes:

- <sup>(1)</sup> The typical speed is the instantaneous speed of the driver board output, rather than measuring the total start-stop travel distance divided directly by the total operating time.
- <sup>(2)</sup> The typical current refers to an average value measured with a stable power supply and an ambient temperature of 20~25°C that is neither the upper limit nor the lower limit. The performance curves are made with typical values.



## Dimensions

### 1. Installation dimension

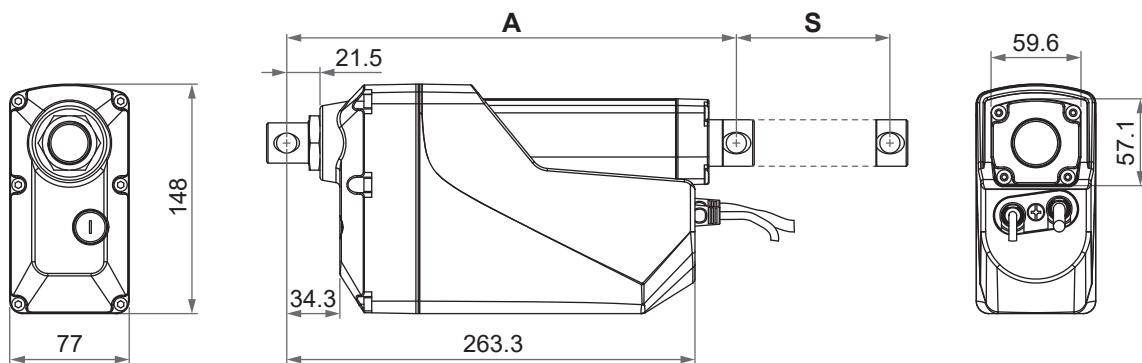
- Available stroke (S) range = 100~500 (+2/-6mm)
- Retracted length (A)

Unit: mm

	Rear connector	Front connector			
		5, 7	2, 4, 6, 8	A	B
Retracted length (A) (±4mm)	2, 4 ~ 8	$\geq S+220$	$\geq S+229$	$\geq S+215$	$\geq S+256.5$
	A	$\geq S+207$	$\geq S+216$	$\geq S+202$	$\geq S+243.5$

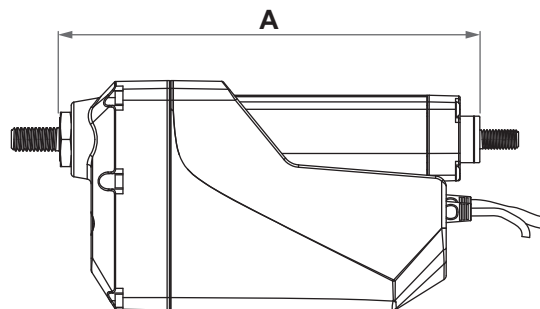
- Extended length = Retracted length (A) + Stroke (S)

### 2. Drawing

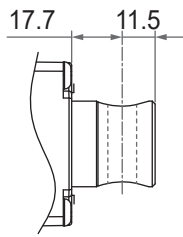


Unit: mm

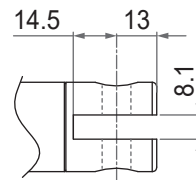
- Installation dimension (A) of front and rear connector A-type



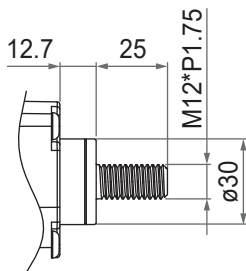
### 3. Front connector type



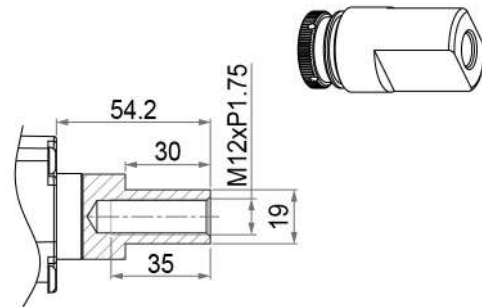
- ⑤ SUS304 solid, hole  $\varnothing 12.2\text{mm}$
- ⑦ SUS304 solid, hole  $\varnothing 13\text{mm}$



- ② Metal slot, hole  $\varnothing 12.2\text{mm}$
- ④ Metal slot, hole  $\varnothing 13\text{mm}$
- ⑥ SUS304 slot, hole  $\varnothing 12.2\text{mm}$
- ⑧ SUS304 slot, hole  $\varnothing 13\text{mm}$

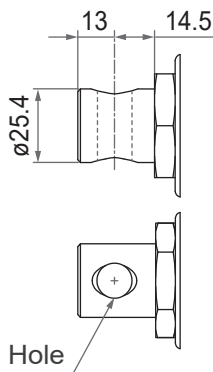


- Ⓐ SUS303 male thread M12x1.75mm

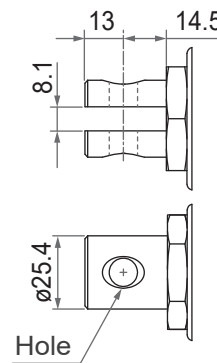


- Ⓑ SUS303 female thread M12x1.75mm

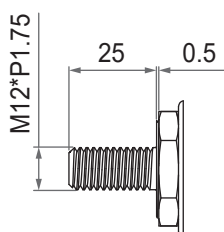
### 4. Rear connector type



- ⑤ SUS304 solid, hole  $\varnothing 12.2\text{mm}$
- ⑦ SUS304 solid, hole  $\varnothing 13\text{mm}$



- ② Metal slot, hole  $\varnothing 12.2\text{mm}$
- ④ Metal slot, hole  $\varnothing 13\text{mm}$
- ⑥ SUS304 slot, hole  $\varnothing 12.2\text{mm}$
- ⑧ SUS304 slot, hole  $\varnothing 13\text{mm}$

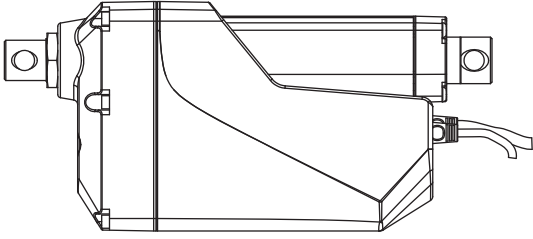


- Ⓐ SUS303 male thread M12x1.75mm

Unit: mm



## 5. Connector orientation

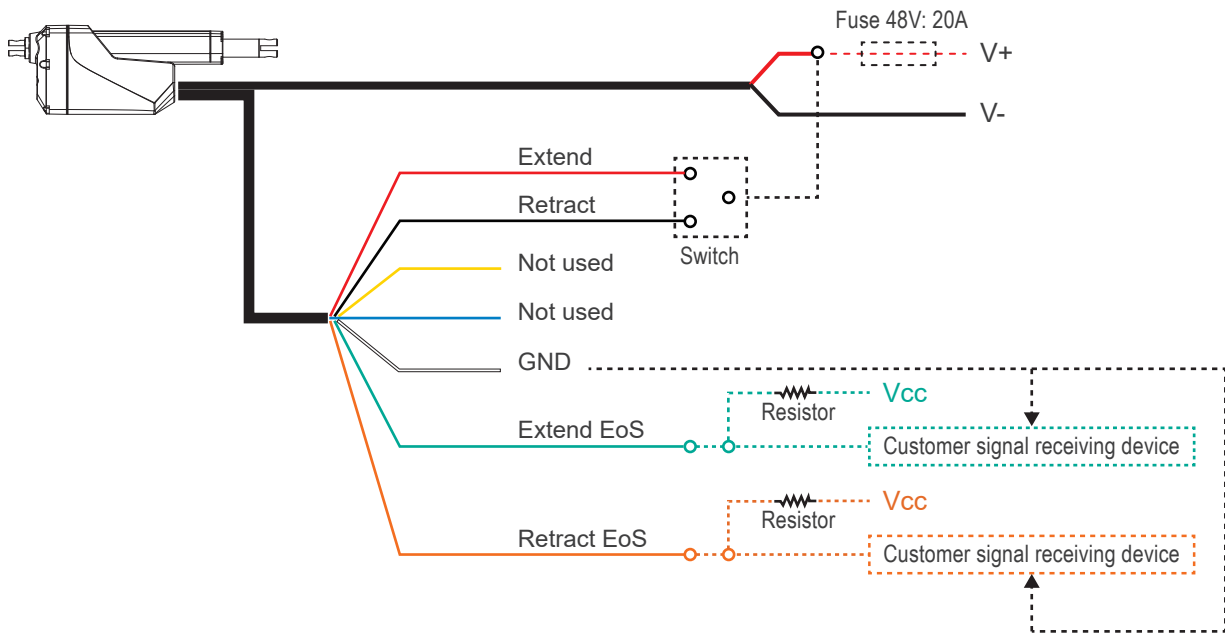


**Note:** Front and rear connectors shown in standard 0°

## Wiring of Control Options

### 1. Control option S0L (Low current signal control, with EoS signal output)

#### • Wiring



**Note:** All dashed lines are connected by the customer.

#### • Wire definitions

	Wire color	Definition	Description
Power cable	Red	V+	<ul style="list-style-type: none"> <li>• Connect Red to positive</li> <li>• Connect Black to negative</li> <li>• Do not swap the polarity</li> <li>• Input voltage: According to actuator voltage specification <math>\pm 10\%</math></li> </ul>
	Black	V-	
Signal cable	Red	Actuator extends	Connect Red to positive (V+) to extend, input current $< 10\text{mA}$ .
	Black	Actuator retracts	Connect Black to positive (V+) to retract, input current $< 10\text{mA}$ .
	Yellow	Not used	
	Blue	Not used	
	White	GND	Connect to customer signal receiving device GND
	Green	Extend EoS output	<ul style="list-style-type: none"> <li>• The stroke limit switches are open collector circuit, and the arrival signal output is not potential free. A pull-up resistor should be applied in user's control circuit (see the wiring diagram on Page 9), the resistance of <math>10\text{K}\Omega</math> is recommended.</li> <li>• Recommended input voltage <math>V_{cc} = 5\sim 24\text{V}</math></li> <li>• Signal voltage during the stroke = GND (Normally closed circuit)</li> <li>• End of stroke signal voltage = <math>V_{cc}</math> (Open circuit)</li> </ul>
	Orange	Retract EoS output	

#### Notes:

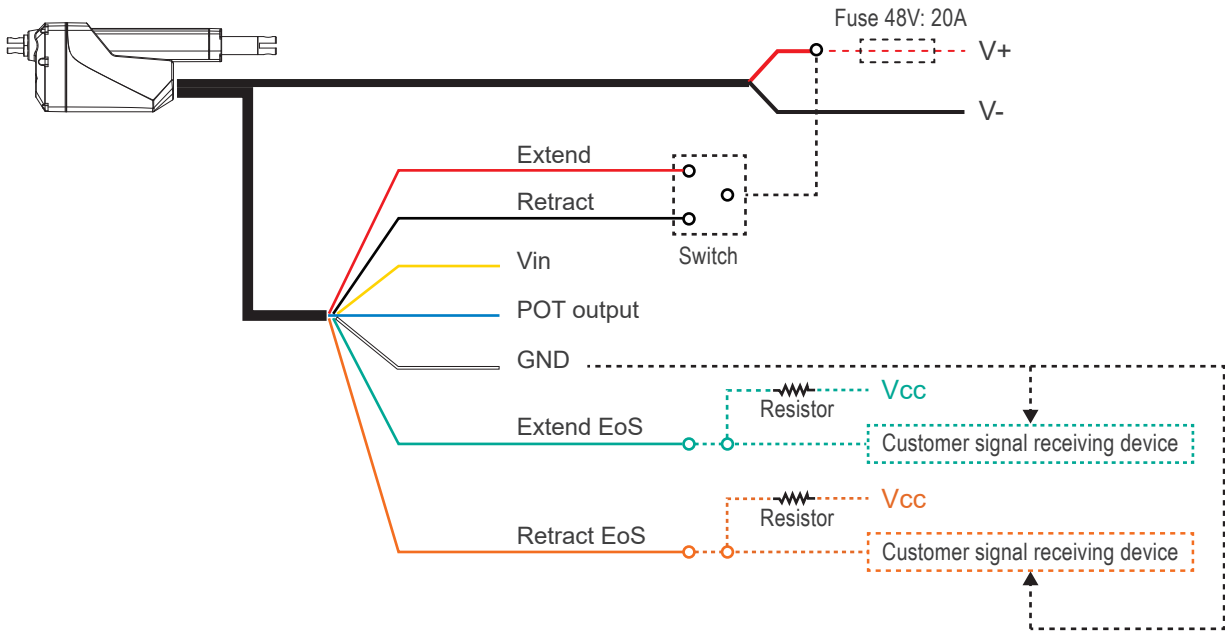
- (1) To use the limit arrival signal, you must keep the power supply of the actuator, otherwise the signal will be lost.
- (2) Please ensure that unused wires are well insulated to avoid damaging the internal circuit of the actuator.
- (3) The EoS signal output wire must not be shorted to GND to prevent the malfunction of limit switches.



## 2. Control option SPL

(Low current signal control, with EoS signal output and potentiometer positioning output)

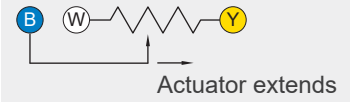
- Wiring



**Note:** All dashed lines are connected by the customer.



● Wire definitions: SPL

	Wire color	Definition	Description						
Power cable	Red	V+	<ul style="list-style-type: none"> <li>• Connect Red to positive</li> <li>• Connect Black to negative</li> <li>• Do not swap the polarity</li> <li>• Input voltage: According to actuator voltage specification <math>\pm 10\%</math></li> </ul>						
	Black	V-							
Signal cable	Red	Actuator extends	Connect Red to positive (V+) to extend, input current $< 10\text{mA}$ .						
	Black	Actuator retracts	Connect Black to positive (V+) to retract, input current $< 10\text{mA}$ .						
	Yellow	Vin	The recommended voltage: 5~32V						
	Blue	POT output	<p>1. Potentiometer specification:</p> <ul style="list-style-type: none"> <li>- 10K ohm, 10 turns.</li> <li>- Total resistance tolerance <math>\pm 5\%</math></li> <li>- Independent linearity <math>\pm 0.25\%</math></li> </ul> <p>2. Output voltage: The voltage (resistance) between Blue and White increases linearly from about 0 when the actuator extends from the lower limit position, and decreases when it retracts.</p>  <p>3. There are different resolutions according to the stroke length (as table below)</p> <table border="1" data-bbox="732 1050 1385 1178"> <thead> <tr> <th>Stroke range (mm)</th> <th>Resolution (ohm/mm)</th> </tr> </thead> <tbody> <tr> <td>100~450</td> <td>20</td> </tr> <tr> <td>451~500</td> <td>10</td> </tr> </tbody> </table> <p>4. The potential value can be measured through the POT output and GND wires.</p>	Stroke range (mm)	Resolution (ohm/mm)	100~450	20	451~500	10
	Stroke range (mm)	Resolution (ohm/mm)							
	100~450	20							
	451~500	10							
White	GND	Signal GND. Both for POT output and customer signal receiving device.							
Green	Extend EoS output	<ul style="list-style-type: none"> <li>• The stroke limit switches are open collector circuit, and the arrival signal output is not potential free. A pull-up resistor should be applied in user's control circuit (see the wiring diagram on Page 10), the resistance of 10K<math>\Omega</math> is recommended.</li> <li>• Recommended input voltage <math>V_{cc} = 5\sim 24\text{V}</math></li> <li>• Signal voltage during the stroke = GND (Normally closed circuit)</li> <li>• End of stroke signal voltage = <math>V_{cc}</math> (Open circuit)</li> </ul>							
Orange	Retract EoS output								

**Notes:**

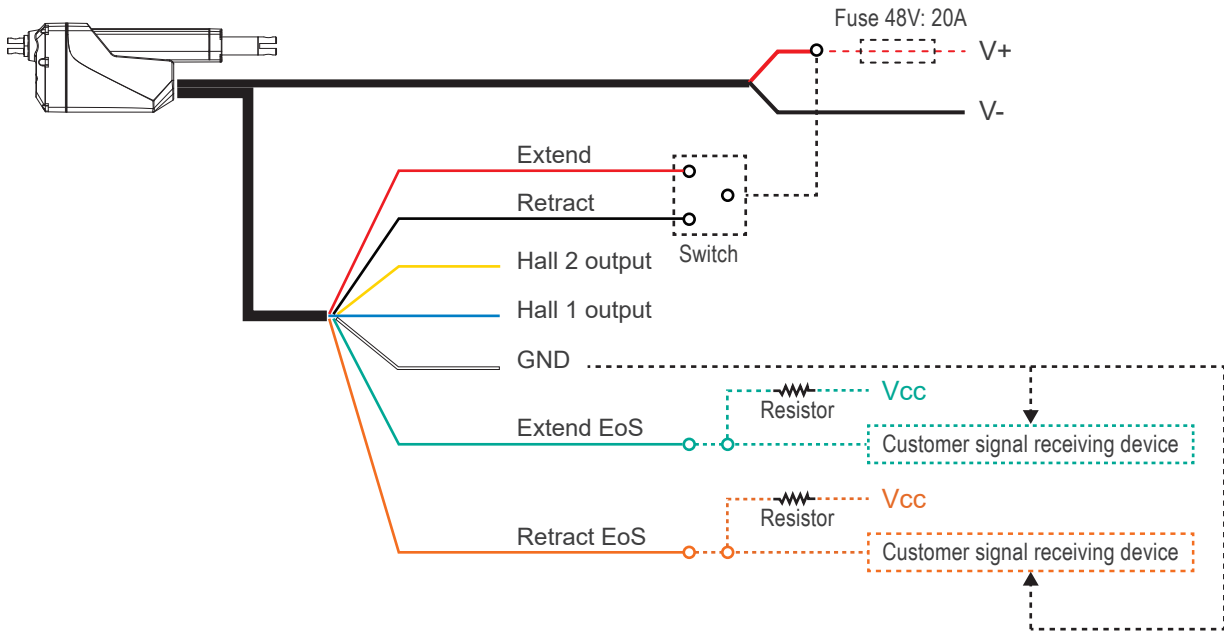
- (1) To use the limit arrival signal, you must keep the power supply of the actuator, otherwise the signal will be lost.
- (2) Please ensure that unused wires are well insulated to avoid damaging the internal circuit of the actuator.
- (3) The EoS signal output wire must not be shorted to GND to prevent the malfunction of limit switches.



### 3. Control option SHL

(Low current signal control, with EoS signal output and dual Hall effect sensors feedback-NPN type)

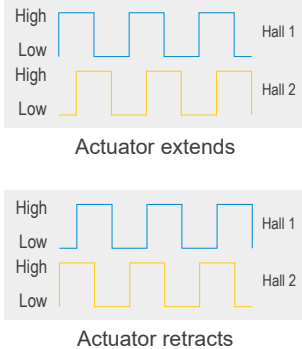
- Wiring



**Note:** All dashed lines are connected by the customer.



• Wire definitions: SHL

	Wire color	Definition	Description				
Power cable	Red	V+	<ul style="list-style-type: none"> <li>• Connect Red to positive</li> <li>• Connect Black to negative</li> <li>• Do not swap the polarity</li> <li>• Input voltage: According to actuator voltage specification <math>\pm 10\%</math></li> </ul>				
	Black	V-					
Signal cable	Red	Actuator extends	Connect Red to positive (V+) to extend, input current <10mA.				
	Black	Actuator retracts	Connect Black to positive (V+) to retract, input current <10mA.				
	Yellow	Hall 2 output	High = 10.8V ( $\pm 0.6V$ ), I <sub>max</sub> 12.7mA Low = GND Hall signal data: 				
	Blue	Hall 1 output	Resolution: <table border="1" data-bbox="746 1030 1372 1108"> <thead> <tr> <th>Gear ratio</th> <th>Resolution (Pulse/mm)</th> </tr> </thead> <tbody> <tr> <td>30</td> <td>6.2588</td> </tr> </tbody> </table>	Gear ratio	Resolution (Pulse/mm)	30	6.2588
	Gear ratio	Resolution (Pulse/mm)					
	30	6.2588					
	White	GND	Signal GND. Both for Hall output and customer signal receiving device.				
Green	Extend EoS output	<ul style="list-style-type: none"> <li>• The stroke limit switches are open collector circuit, and the arrival signal output is not potential free. A pull-up resistor should be applied in user's control circuit (see the wiring diagram on Page 12), the resistance of 10K<math>\Omega</math> is recommended.</li> <li>• Recommended input voltage V<sub>cc</sub> = 5~24V</li> <li>• Signal voltage during the stroke = GND (Normally closed circuit)</li> <li>• End of stroke signal voltage = V<sub>cc</sub> (Open circuit)</li> </ul>					
Orange	Retract EoS output						

**Notes:**

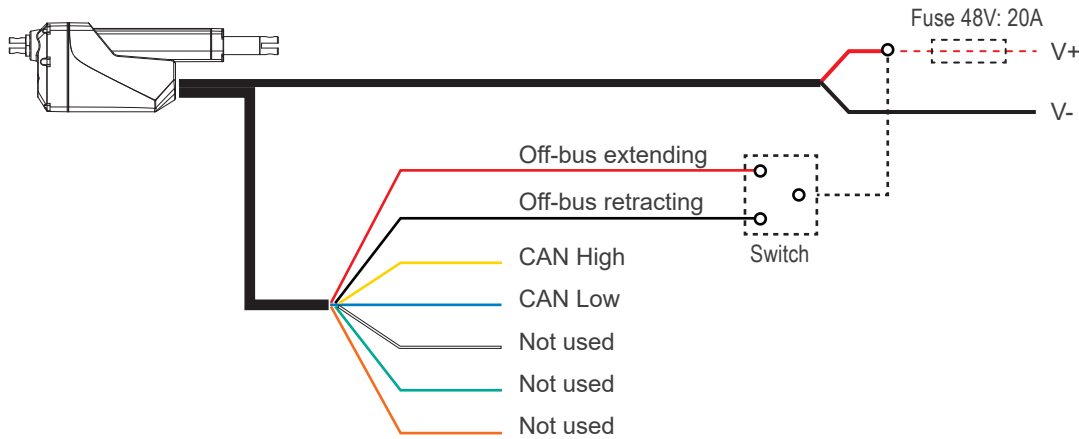
- (1) To use the limit arrival signal, you must keep the power supply of the actuator, otherwise the signal will be lost.
- (2) Please ensure that unused wires are well insulated to avoid damaging the internal circuit of the actuator.
- (3) The EoS signal output wire must not be shorted to GND to prevent the malfunction of limit switches.



#### 4. Control option J00 (CAN bus J1939) / N00 (CANopen)

The users who choose the J00 or N00 option must have already established or well prepared to establish the CAN bus J1939 or CANopen system to apply this actuator. Please refer to the manual of MOTECK Actuator with CAN bus J1939 and the manual of MOTECK Actuator with CANopen for more detailed information.

##### • Wiring



**Note:** All dashed lines are connected by the customer.

##### • Wire definitions

	Wire color	Definition	Description
Power cable	Red	V+	<ul style="list-style-type: none"> <li>• Connect Red to positive</li> <li>• Connect Black to negative</li> <li>• Do not swap the polarity</li> <li>• Input voltage: According to actuator voltage specification <math>\pm 10\%</math></li> </ul>
	Black	V-	
Signal cable	Red	Off-bus extending	Connect Red to positive (V+) to extend, input current <10mA.
	Black	Off-bus retracting	Connect Black to positive (V+) to retract, input current <10mA.
	Yellow	CAN High	
	Blue	CAN Low	
	White	Not used	
	Green	Not used	
	Orange	Not used	

**Note:** Please ensure that unused wires are well insulated to avoid damaging the internal circuit of the actuator.

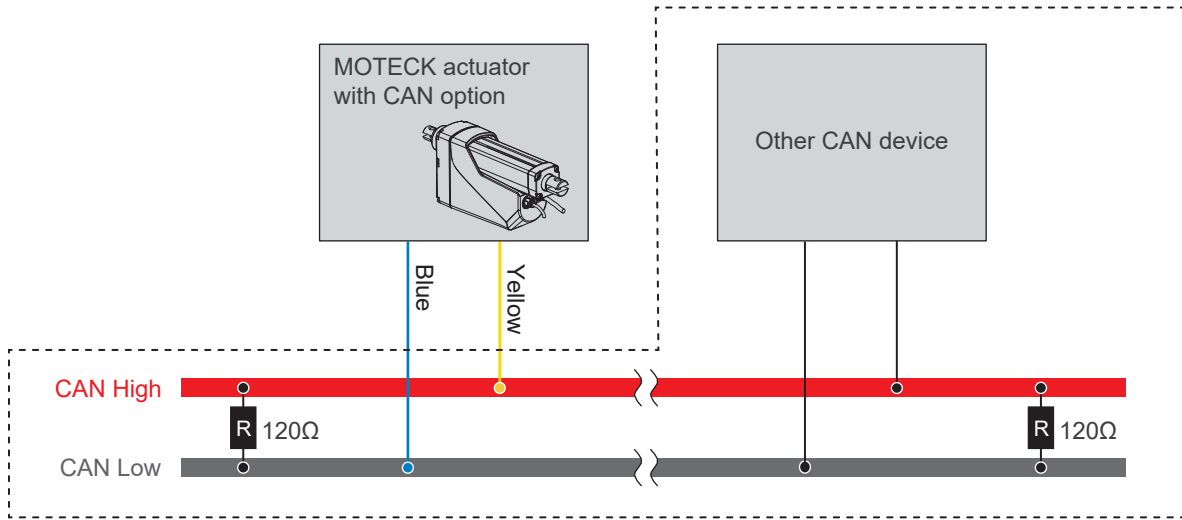
##### • Off-bus operation

- (1) When the actuator has the need to repair, maintain or test without the CAN commands.  
There are 2 separate wires to perform the off-bus operation for extending or retracting the actuator.
- (2) It is not necessary to disconnect the CAN High and CAN Low wires when the off-bus operation is required.  
The priority of CAN commands and off-bus control is that whose command comes first, it will be executed first, and the next command will be accepted after the execution is completed.



- **Bus connection**

Please follow the wiring guidelines of ISO-11898-1 / 11898-2 standard. The two ends of the CAN High / CAN Low harness should be connected with a 120Ω terminal resistor, as shown in the figure below.



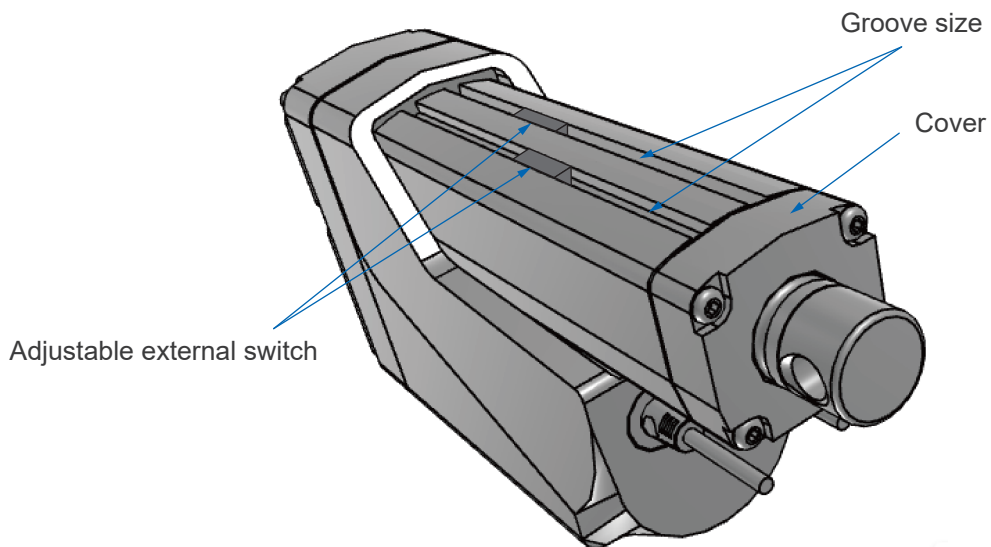
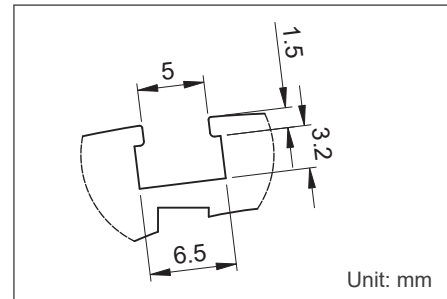
**Note:** Inside dashed lines are wirings and system of the customer.



## Adjustable External Switch

In addition to the MK35L's built-in stroke limit switches, external switches can be installed to provide additional position feedback signals for customer's application.

1. Customer can choose 1 or 2 reed switches (Normally Open), which are pre-assembled in the outer tube groove at the factory, and then adjust them to the desired position.



2. The groove size is attached for customer to prepare suitable reed switches or solid state switches and install the switches by yourself. Just ask MOTEK to assemble the magnets at factory.

## Certifications

MK35L actuator is compliant with the following regulations, in terms of the essential conformity requirements of EMC Directive of 2014/30/EU.

Emission	Immunity
EN IEC 61000-6-3:2021 BS EN IEC 61000-6-3:2021	EN IEC 61000-6-1:2019 BS EN IEC 61000-6-1:2019



## Ordering Key

	MK35L- 48 - M5B - 30 - 100 - J00 - 2 2 0 0 0 1										
<b>Input voltage</b>	48: 48V DC										
<b>Motor and spindle type</b>	M5B: 9500rpm / 5mm pitch / Ball screw										
<b>Gear ratio</b>	30: 30:1										
<b>Stroke</b>	XXX: 100~500mm (One step in every 50mm)										
<b>Control options</b>	S0L : Low current signal control + EoS SPL : Low current signal control + Potentiometer + EoS SHL: Low current signal control + Dual Hall effect sensors (NPN) + EoS J00 : CAN bus J1939 N00 : CANopen										
<b>Front connector</b> (Refer to Page 7)	2, 4, 5, 6, 7, 8, A, B										
<b>Rear connector</b> (Refer to Page 7)	2, 4, 5, 6, 7, 8, A										
<b>Connector orientation</b> (Refer to Page 8)	0: 0° (Standard) 9: 90° (Front and rear connectors shown in standard 0°)										
<b>External switch</b>	0: None (Standard)                      R: Adjustable reed switch x1 M: Only nut magnets installed        S: Adjustable reed switches x2										
<b>Reserved</b>	0										
<b>Cable length <sup>(1)</sup></b>	1: 500mm straight      5: 1500mm straight      7: 3000mm straight										

### Note:

<sup>(1)</sup> The wiring harness is divided into power cable and signal cable, equal in length, with the bare wires at both ends are tinned.



For more information about installation and use, please refer to < MK35L Manual > on Moteck official website.  
 For more information about control options J00 / N00, please refer to < Manual of MOTECK Actuator with CAN bus J1939 > and < Manual of MOTECK Actuator with CANopen > on Moteck official website.

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