Manual

# Actuator
# MK35

| Revision | 2024.4_V2.4 |
|---|---|

Technical changes may be made to improve the product without notice！

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# 1. General

## 1.1 About the manual

This manual is the mechanical and electrical installation instructions of MK35 electric linear actuator, and also includes performance data and details of the optional specifications. Please read the instructions carefully before installing the actuator. The installation work must be performed by qualified personnel, which is very important.

## 1.2 Target readers

This manual is not provided to the end user, but provides information to the system or equipment manufacturer that uses this product with information on how to install, configure and maintain this product. The system or equipment manufacturer must have qualified electromechanical personnel to perform it, and is responsible for transmitting relevant safety messages to the end user.

## 1.3 Symbol description

| Symbol | Descriptions |
|---|---|
|  | This symbol indicates important information, reminders, or safety warnings. |

## 1.4 Transport and storage

Please use the original packaging provided by MOTECK to transport and store the actuators. The temperature during transportation and storage must be between -40°C to 80°C (-40°F to +176°F) and the cargo must be protected from collision. If you find that the packaging of the delivered goods is damaged, please check whether the actuators inside are obviously damaged, and notify the transporter. If necessary, please contact the shipper or seller to discuss the disposal.

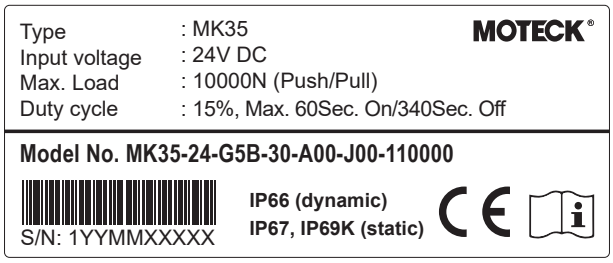
## 2. Important Information

- Only qualified personnel are allowed to carry out the mechanical and electrical installation of this product. Qualified personnel should be familiar with the mechanical or electrical installation work and have corresponding work qualifications.
- Please read this manual before installing or operating the actuators.
- Do not perform mechanical installation when the actuator is powered. Complete the mechanical installation first, and then perform the electrical installation.
- **It is forbidden to use Pulse Width Modulation (PWM) as input power to MK35, otherwise it will cause malfunction and cause permanent damage.**
- Do not hold the extension tube when the device is powered on.
- Installers and operators must wear personal safety protection according to the site conditions. And before starting to control the action of the actuator, it must be noted that the actuator and its connected mechanical moving parts are not blocked by other objects, and no one enters the dangerous area.
- Strictly follow the information in this manual and the product label of the actuators, and do not exceed the performance limits of the specification.
- Never disconnect any wires or connectors during operation or when power is applied.
- If you find the actuator any malfunction or damage, please stop using it immediately and notify qualified personnel to take corrective measures.
- Do not disassemble the actuator. Otherwise, the sealing and function of the actuator will be damaged.
- There may be grease on the extension tube. It is harmless to touch the grease, and the grease should not be removed.

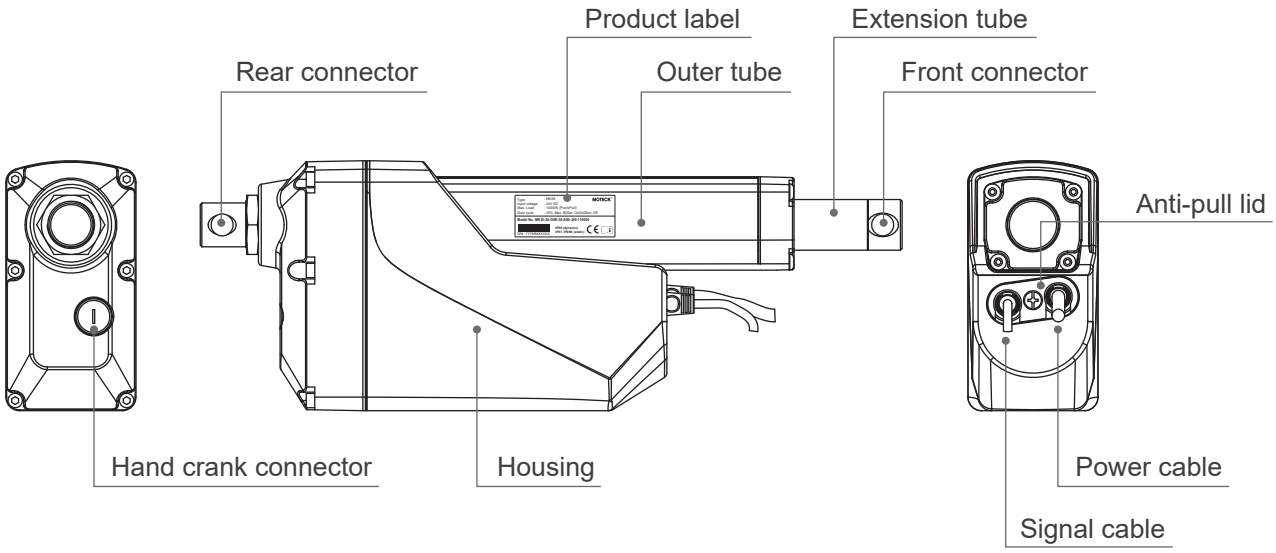
# 3. Installation

## 3.1 Product label

The product label is located on the side of the outer tube. It tells you the actuator model and basic specification. Before performing any installation or maintenance on the actuator, please check the product label to determine the actuator type. If you need any help from MOTECK, please provide the serial number and actuator model.




## 3.2 Terminology




## 3.3 Working environment

Max. temp. +80°C

Min. temp. -40°C

IP67/IP69K

Relative humidity 10 ~ 90% non-condensing

## 3.4 Mechanical installation

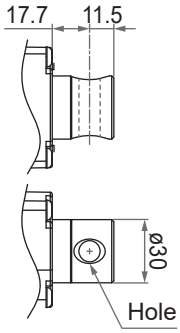
### 3.4.1 Safety notes

- Do not perform mechanical installation when the actuator is powered.
- Complete the mechanical installation properly before proceeding to the electrical installation steps.

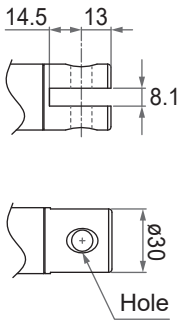
### 3.4.2 Basic installation considerations

(1) Always use only the holes of the front and rear connectors to install the actuator. First check the model number on the product label (section 3.1), and then refer to the model coding (section 6.2) to identify the connector type of the actuator, so that you can find the dimensions specification from the figures below.

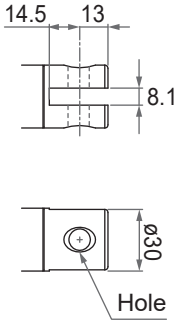
- **Front connector types**




❶ Metal solid, hole ø12.2mm
❸ Metal solid, hole ø13mm

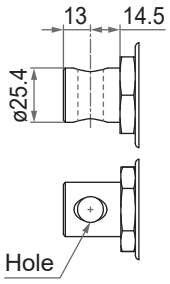



❷ Metal slot, hole ø12.2mm
❹ Metal slot, hole ø13mm

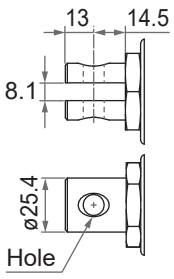



❻ SUS304 slot, hole ø12.2mm
❽ SUS304 slot, hole ø13mm

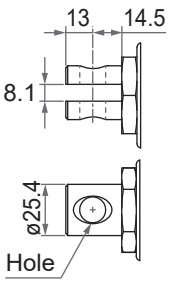
- **Rear connector types**




❶ Metal solid, hole ø12.2mm
❸ Metal solid, hole ø13mm




❷ Metal slot, hole ø12.2mm
❹ Metal slot, hole ø13mm



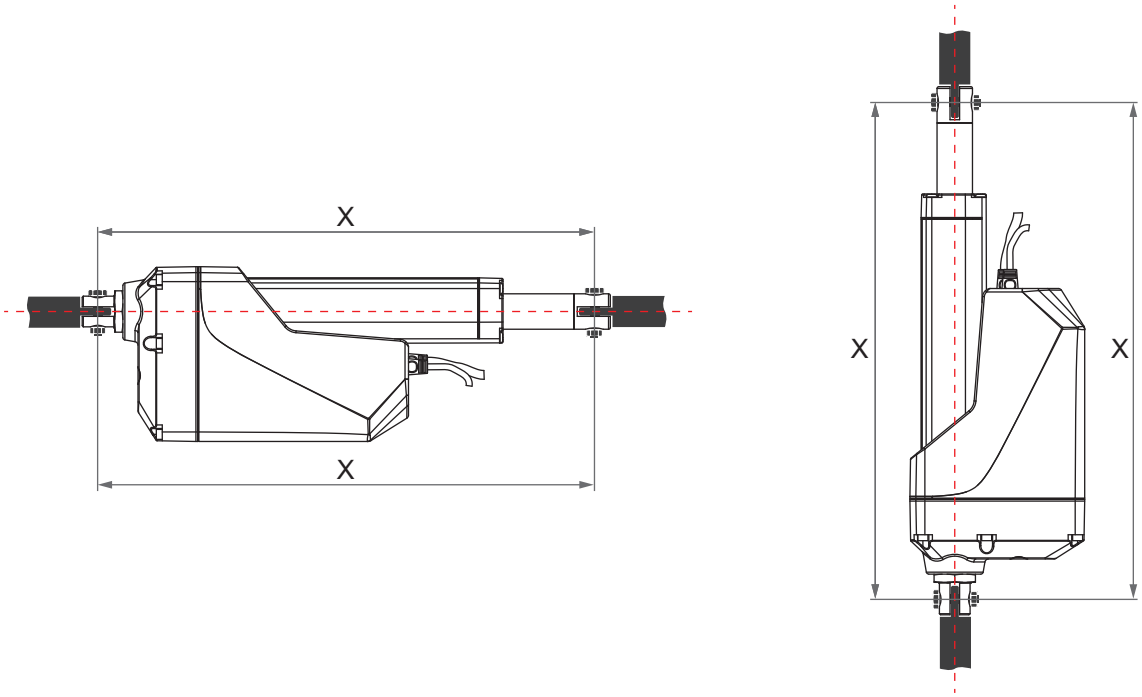

❻ SUS304 slot, hole ø12.2mm
❽ SUS304 slot, hole ø13mm

(2) Make sure the actuator is installed in a way that allows you to access the anti-pull lid so that it can be removed to plug in and out the cables (section 3.4.4)

(3) Users may need to manually adjust the actuator in the future, so there must be enough free space around the manual drive connector to operate it (section 3.4.5)

### 3.4.3 Force and orientation

(1) The actuator can be installed in any orientation and can withstand push and pull loads.
(2) When installing the actuator, make ensure that the force of the load acts on the central axis of the extension tube and rear connector.
(3) Use only solid and sized mounting pins. The mounting pins must be strong enough to support the load and prevent it from falling off after installation.
(4) The mounting pins must be parallel to each other on the same plane, as shown in the sketch below.
(5) If the actuator is used on the equipment to rotate with the mounting pin as the axis, it must be ensured the housing and other mechanical parts will not interfere and damage the actuator and equipment in the full range of movement.



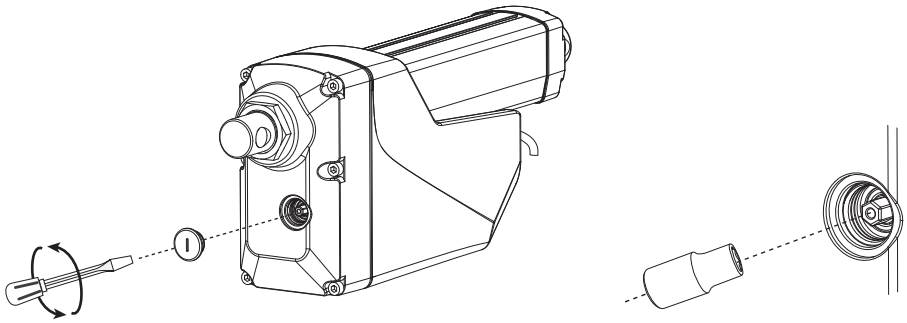

### 3.4.4 Cables and anti-pull lid

Before the actuator is shipped, the power cable and signal cable have been plugged in and the anti-pull lid has been installed. Only the CAN Bus version (control option J00) needs to remove this lid and unplug the power cable when the hardware address selection (see 4.2.2.2) is required. But please note that when installing the actuator, you must ensure that there is enough space to remove the anti-pull lid with tools.

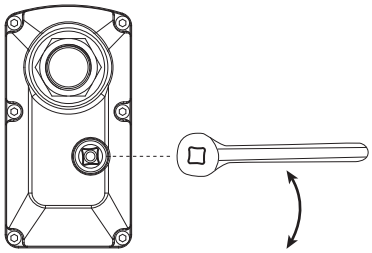
### 3.4.5 Installation and operation of hand crank

(1) When installing the actuator, please make sure that there is enough space between the rear connector and any objects behind it so that the hand crank can be operated.

(2) Please use a flat-head screwdriver to remove the cover and connect with a 6mm hexagon socket.



(3) Use a wrench to operate as a hand crank.



(4) Under the maximum load of the actuator, the maximum torque required to drive the extension tube with the hand crank is about 1.4Nm.

(5) The distance traveled by the actuator per rotation of the hand crank is related to the gear ratio options of the actuator. Please refer to the table below.

| Gear type | mm /rev |
|---|---|
| 5 | 2.247 |
| 10 | 1.349 |
| 15 | 0.804 |
| 20 | 0.609 |
| 30 | 0.386 |

- Before using the hand crank, be sure to turn off the actuator power. Do not apply torque exceeding 1.7Nm on the hand crank.
- Do not move the extension tube to both ends of the stroke, otherwise the actuator might be damaged.
- Do not use any type of automatic drill or power tools to drive the manual crank.

## 3.5 Electrical installation

### 3.5.1 Safety notes

- It is recommended to install an emergency stop switch at a suitable location of the power supply line.
- Do not install or wire the actuator without cutting off the power supply.
- Before controlling the action of the actuator, it must be noted that the actuator and its connected mechanical moving parts are not blocked by other objects, and no one enters the dangerous area.

### 3.5.2 Important information

- It is forbidden to wind the signal cable with the power cable to avoid interference with the signal.
- Avoid using the vehicle as a ground to reduce the risk of interference.
- The longer the power cord length or the smaller the wire diameter, the worse the voltage drop. When the voltage of the power supply is low, it is more likely to cause insufficient voltage and cause malfunctions.
- Relays or other coils on operating equipment should have spark protection to avoid interference.
- In order to achieve the longest service life, the actuator should not be stopped by frequent hard collisions. Before the actuator moves to the target position or both ends of the stroke, the user's automatic control device should cut off the power of the motor in advance according to the absolute position information, and use the inertia to make the actuator stop gently.

### 3.5.3 Fuse specification

Install a slow-blow fuse of this specification between the actuator and the power supply for protection.

| Input voltage | Fuse specification |
|---|---|
| 12V DC | 40A |
| 24V DC | 20A |

### 3.5.4 Electrical connections

Actuator is equipped with a power cable and a signal cable. One end of each cable has been plugged and fixed on the actuator before shipment, and the other end are bare wire contacts for customers to connect power and signal transmission. Please check the model number on the product label (section 3.1) first, then refer to the model coding (section 6.2) to identify the control options of the actuator, and connect the power cable and signal cable correctly according to the description of each control option (section 3.6).

### 3.5.5 Wire specification of power cable and extension cord

To avoid malfunctions caused by voltage drop, the cross-section of the power cable wire must be large enough. The cross-section of the MK35 power cable wire is 2.0mm² (14AWG) and the maximum length is 3 meters. If the customer must connect an extension cord, the wire requirements of the extension cord are as follows.

| Minimum cross section | Maximum length |
|---|---|
| 4mm² (AWG 12) | 4m |

### 3.5.6 Inrush current

- When the actuator starts, an inrush current of about 0.2 seconds will be generated. The starting inrush current of MK35 can reach 3 times of the maximum current under the rated load of the actuator.
- If a circuit board power supply is used, the specifications must be sufficient to handle the inrush current. If batteries are used as the power source, inrush current will not be a problem. Besides, the connectors, switches and relays selected by user must also be able to withstand the inrush current.

## 3.6 Installation and operation of control options

### 3.6.1 Determine control options

MK35 actuator is equipped with one of the control options in the table below. Please check the model number on the product label (section 3.1), and then refer to the model coding (section 6.2) to identify the control options of the actuator. Then check the corresponding sections in the table below for more details.

| Options | Control platform | Potentiometer output | Hall signal output | | EoS signal output * | Motion status feedback | Section |
|---|---|---|---|---|---|---|---|
| | | | NPN | PNP | | | |
| **D00** | Classic (DC control) | | | | | | 3.6.2 |
| **D0L** | | | | | √ | | 3.6.3 |
| **DPL** | | √ | | | √ | | 3.6.4 |
| **DHL** | | | √ | | √ | | 3.6.5 |
| **D+L** | | | | √ | √ | | 3.6.6 |
| **S0L** | Low current signal | | | | √ | | 3.6.7 |
| **SPL** | | √ | | | √ | | 3.6.8 |
| **SHL** | | | √ | | √ | | 3.6.9 |
| **J00** | J1939 CAN Bus | | | | | √ | 3.6.10 |

* **Remarks:** End of stroke signal output

### 3.6.2 Control option D00 (DC control, without positioning feedback)

Option D00 controls the actuator to extend or retract by switching the polarity of the input DC power.

(1) When the actuator reaches the limit position at both ends of the stroke, it will still stop by itself, but it will not output a signal of reaching the limit.

(2) Do not adjust the input voltage in an attempt to control the speed of the MK35 DXX control options.

(3) The D00 option does not include a signal cable, and the port has a waterproof cap.

- **Wiring**


**Remarks:** Dashed lines are connected by the customer.

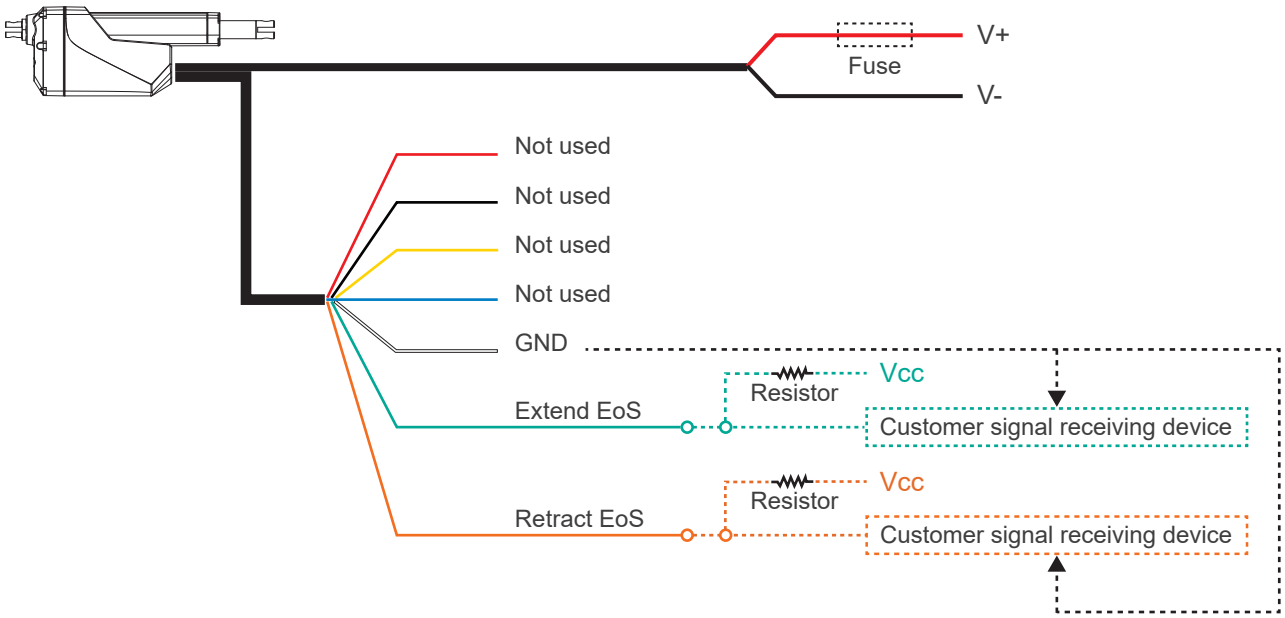
- **Wire definitions**

| | Wire color | Definition | Description |
|---|---|---|---|
| Power cable | Red | V+ | Connect red wire to “Vdc +” & black wire to “Vdc -“ of DC power to extend the actuator. Switch the polarity of DC input to retract it. Input voltage: According to actuator voltage specification |
| | Black | V- | |

### 3.6.3 Control option D0L (DC control, with EoS signal output)

In addition to all the functions included in the D00 option (section 3.6.2), the D0L option is also with an arrival signal output when it reaches the end of stroke (EoS), so that the customer system can perform corresponding control, such as light signal display, relay action, etc.

- **Wiring**




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

- **Wire definitions**

| | Wire color | Definition | Description |
|---|---|---|---|
| Power cable | Red | V+ | Connect red wire to “Vdc +” & black wire to “Vdc -“ of DC power to extend the actuator. Switch the polarity of DC input to retract it. Input voltage: According to actuator voltage specification |
| | Black | V- | |
| Signal cable | Red | Not used | |
| | Black | Not used | |
| | Yellow | Not used | |
| | Blue | Not used | |
| | White | GND | Connect to customer signal receiving device GND |
| | Green | Extend EoS output | • 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 13), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit) |
| | Orange | Retract EoS output | |

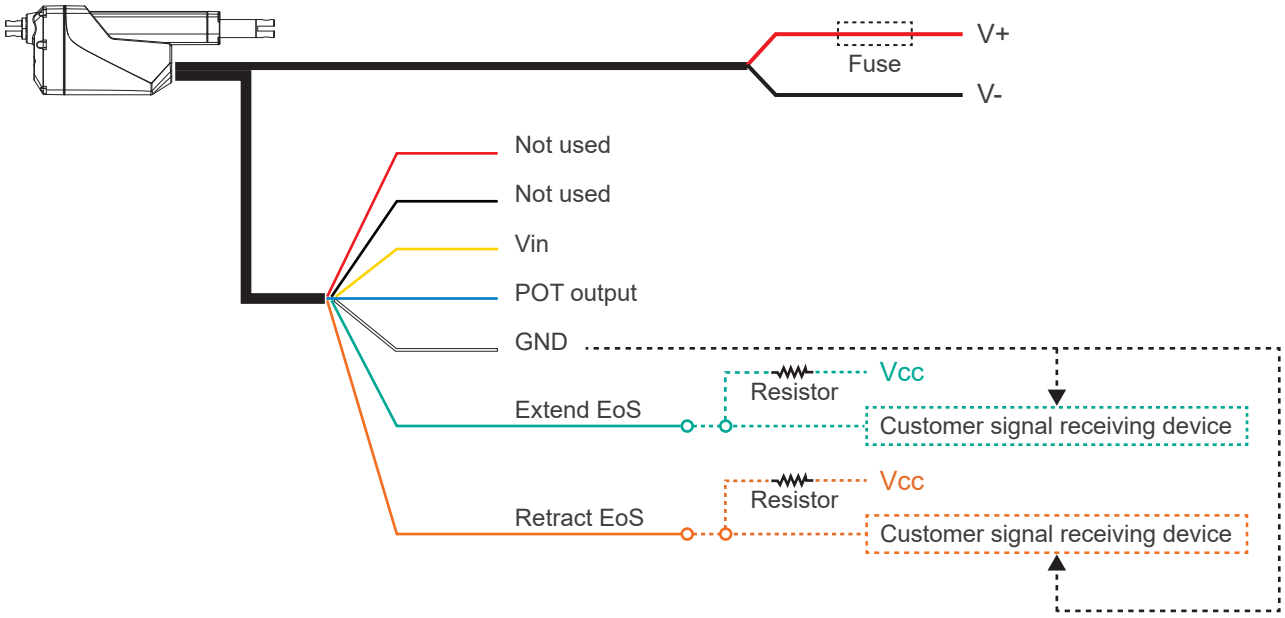
**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

### 3.6.4 Control option DPL
### (DC control, with EoS signal output and potentiometer positioning output)

In addition to all the functions included in the D00 and D0L options (section 3.6.2 & 3.6.3), the DPL option is also equipped with a potentiometer, which allows the user's control device to know the absolute position of the actuator at any time, and can be used to determine the speed and direction of the actuator's movement.

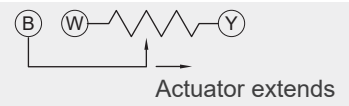
The potential value of the mechanical potentiometer can be measured through the signal wires. This value is only related to the stroke position. Even if the power supply is interrupted, it will not change the measurable potential value.

- **Wiring**




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

- **Wire definitions: DPL**

<table>
<tr><th></th><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td rowspan="2">Power cable</td><td>Red</td><td>V+</td><td rowspan="2">Connect red wire to “Vdc +” & black wire to “Vdc -“ of DC power to extend the actuator. Switch the polarity of DC input to retract it.<br>Input voltage: According to actuator voltage specification</td></tr>
<tr><td>Black</td><td>V-</td></tr>
<tr><td rowspan="8">Signal cable</td><td>Red</td><td>Not used</td><td></td></tr>
<tr><td>Black</td><td>Not used</td><td></td></tr>
<tr><td>Yellow</td><td>Vin</td><td>The recommended voltage: 5~32V</td></tr>
<tr><td>Blue</td><td>POT output</td><td>1. Potentiometer specification:<br>- 10K ohm, 10 turns.<br>- Tolerance ±5%<br>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.<br> 

<br>3. There are different resolutions according to the stroke length (as table below)
<table>
<tr><th>Stroke range (mm)</th><th>Resolution (ohm/mm)</th></tr>
<tr><td>100~450</td><td>19.685</td></tr>
<tr><td>451~950</td><td>9.843</td></tr>
</table>
4. The potential value can be measured through the POT output and GND wires.</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for POT output and customer signal receiving device.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• 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 14), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit)</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
</table>

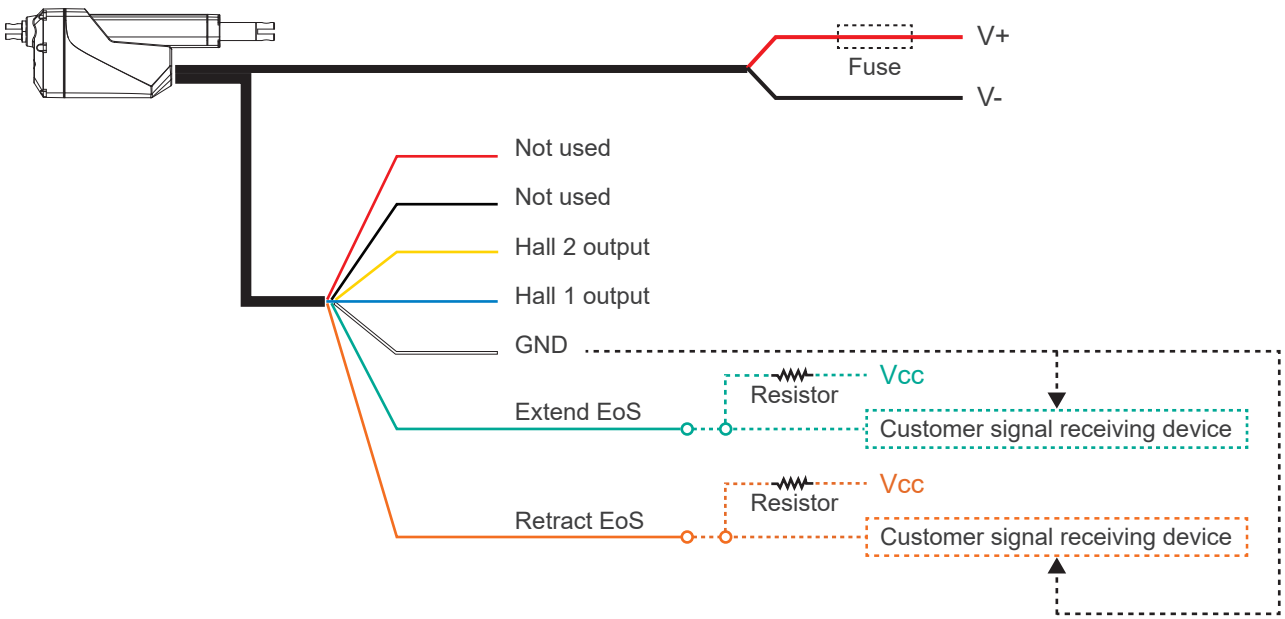
**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

### 3.6.5 Control option DHL
### (DC control, with EoS signal output and dual Hall effect sensors feedback-NPN type)

In addition to all the functions of the D00 and D0L options (section 3.6.2 & 3.6.3), the DHL option is also equipped with dual Hall effect sensors, providing an NPN-type feedback circuit.

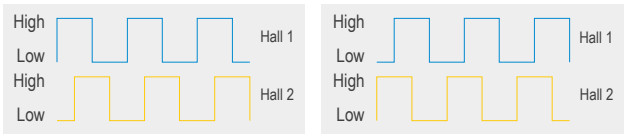
The Hall feedback is a relative positioning. DHL version of the actuator does not have built-in memory, and the position signal will disappear after power-off. The customer's control device must have the function of reading the position signal and recording it.

- **Wiring**




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

- **Wire definitions: DHL**

<table>
<tr><th></th><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td rowspan="2">Power cable</td><td>Red</td><td>V+</td><td rowspan="2">Connect red wire to “Vdc +” & black wire to “Vdc -“ of DC power to extend the actuator. Switch the polarity of DC input to retract it.<br>Input voltage: According to actuator voltage specification</td></tr>
<tr><td>Black</td><td>V-</td></tr>
<tr><td rowspan="8">Signal cable</td><td>Red</td><td>Not used</td><td></td></tr>
<tr><td>Black</td><td>Not used</td><td></td></tr>
<tr><td>Yellow</td><td>Hall 2 output</td><td rowspan="2">Vout High = Vdc+ (DC Power) - 1.2V, Imax 12.7mA<br>Vout Low = GND<br>Hall signal data:<br> 

Actuator extends Actuator retracts<br>Resolution:<br><table><tr><th>Gear ratio</th><th>Resolution (Pulse/mm)</th></tr><tr><td>05</td><td>1.0570</td></tr><tr><td>10</td><td>1.7601</td></tr><tr><td>15</td><td>2.9552</td></tr><tr><td>20</td><td>3.9028</td></tr><tr><td>30</td><td>6.1603</td></tr></table></td></tr>
<tr><td>Blue</td><td>Hall 1 output</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for Hall output and customer signal receiving device.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• 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 16), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit)</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
</table>

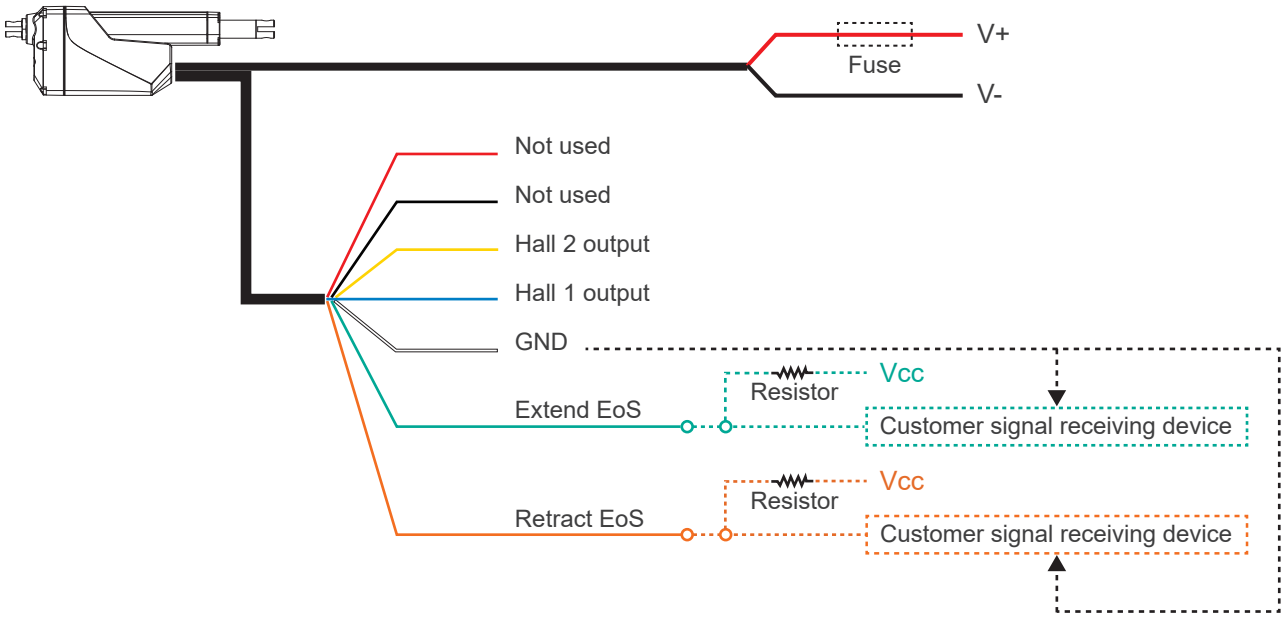
**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

### 3.6.6 Control option D+L
### (DC control, with EoS signal output and dual Hall effect sensors feedback-PNP type)

In addition to all the functions of the D00 and D0L options (section 3.6.2 & 3.6.3), the D+L option is also equipped with dual Hall effect sensors, providing an PNP-type feedback circuit.

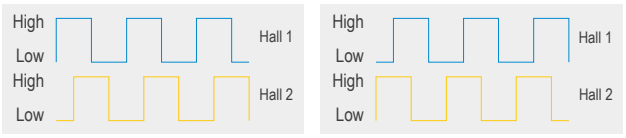
The Hall feedback is a relative positioning. D+L version of the actuator does not have built-in memory, and the position signal will disappear after power-off. The customer's control device must have the function of reading the position signal and recording it.

- **Wiring**




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

- **Wire definitions: D+L**

<table>
<tr><th></th><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td rowspan="2">Power cable</td><td>Red</td><td>V+</td><td rowspan="2">Connect red wire to “Vdc +” & black wire to “Vdc -“ of DC power to extend the actuator. Switch the polarity of DC input to retract it.<br>Input voltage: According to actuator voltage specification</td></tr>
<tr><td>Black</td><td>V-</td></tr>
<tr><td rowspan="6">Signal cable</td><td>Red</td><td>Not used</td><td></td></tr>
<tr><td>Black</td><td>Not used</td><td></td></tr>
<tr><td>Yellow</td><td>Hall 2 output</td><td rowspan="2">Vout High = Vdc+ (DC Power) - 1.2V, Imax 12.7mA<br>Vout Low = GND<br>Hall signal data:<br> 

Actuator extends Actuator retracts<br>Resolution:
<table>
<tr><th>Gear ratio</th><th>Resolution (Pulse/mm)</th></tr>
<tr><td>05</td><td>1.0570</td></tr>
<tr><td>10</td><td>1.7601</td></tr>
<tr><td>15</td><td>2.9552</td></tr>
<tr><td>20</td><td>3.9028</td></tr>
<tr><td>30</td><td>6.1603</td></tr>
</table></td></tr>
<tr><td>Blue</td><td>Hall 1 output</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for Hall output and customer signal receiving device.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• 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 18), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit)</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
</table>

**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

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

Option S0L uses a low current (<10mA) input signal to control the extension, retraction or stop of the actuator, cannot be switched the polarity of the input DC power, and there is an arrival signal output when it reaches the end of stroke (EoS). However, if the user does not need EoS signal, these two signal output wires can be ignored and unconnected. This does not affect the other functions of the actuator, and the actuator will still stop when it reaches the limit positions at both ends of the stroke.

In addition, the actuator also has the following functions:

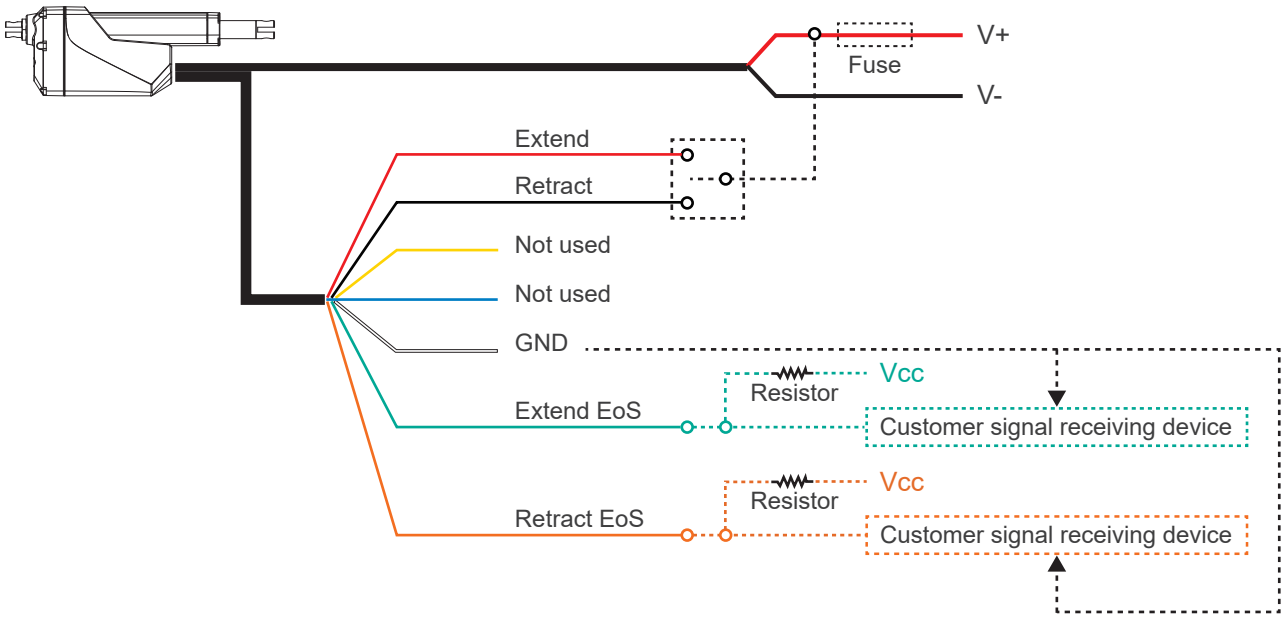
(1) At both ends of the mechanical stroke and within the full stroke range, when the current exceeds the factory preset value of the rated load (overload condition), the actuator will automatically stop.

(2) When the input voltage exceeds its normal working range, the actuator will stop running. After the correct voltage input is restored, the operation signal must be re-sent to restore control.

(3) With automatic soft start function, make the equipment move smoothly.

- The polarity of the input DC power must be fixed in accordance with the specified connection method, and the polarity cannot be switched at any time.
- It is forbidden to adjust the input voltage in an attempt to control the speed of the MK35 SXX control options. The battery or full-wave rectified DC power used must be within acceptable voltage range, otherwise the actuator will stop operating.

- **Wiring**




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

- **Wire definitions: S0L**

| | Wire color | Definition | Description |
|---|---|---|---|
| **Power cable** | Red | V+ | Connect Red to positive.<br>Connect Black to negative.<br>Do not swap the polarity.<br>Input voltage: 9~16V @12V DC; 18~32V @24V DC |
| | 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 | Not used | |
| | Blue | Not used | |
| | White | GND | Connect to customer signal receiving device GND |
| | Green | Extend EoS output | • 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 20), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit) |
| | Orange | Retract EoS output | |

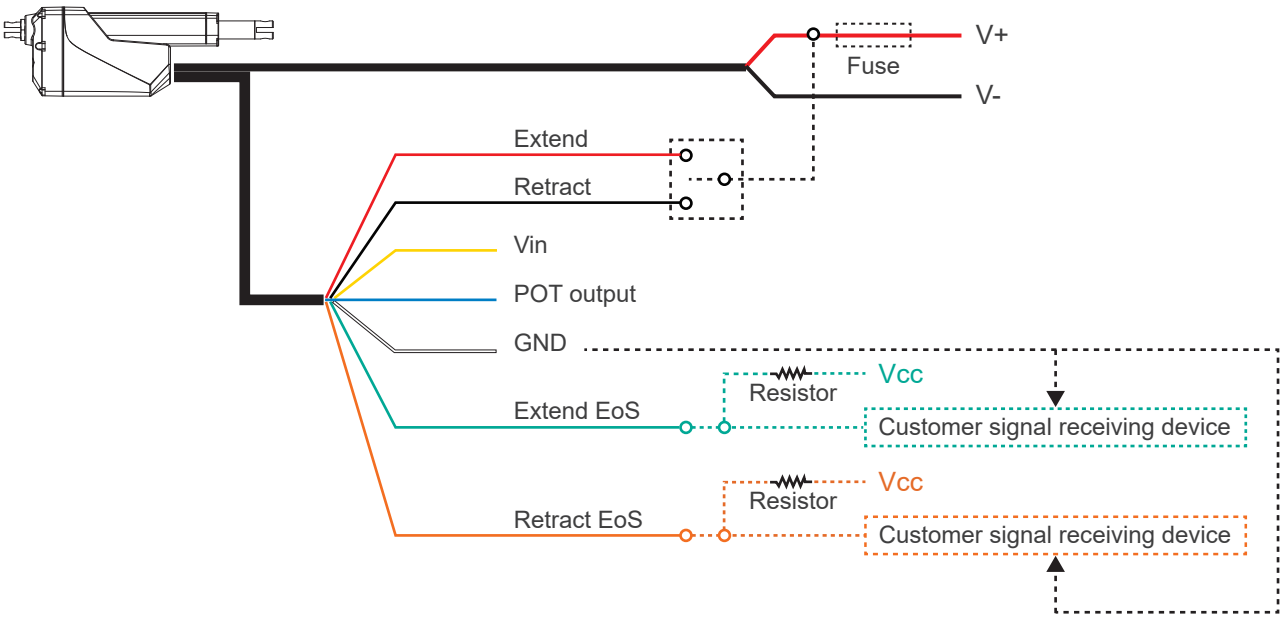
**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

### 3.6.8 Control option SPL
### (Low current signal control, with EoS signal output and potentiometer positioning output)

In addition to all the functions included in the S0L option (section 3.6.7), the SPL option is also equipped with a potentiometer, which allows the user's control device to know the absolute position of the actuator at any time, and can be used to determine the speed and direction of the actuator's movement.

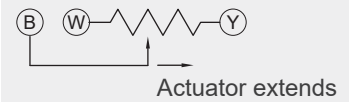
- The polarity of the input DC power must be fixed in accordance with the specified connection method, and the polarity cannot be switched at any time.
- The potential value of the mechanical potentiometer can be measured through the signal wires. This value is only related to the stroke position. Even if the power supply is interrupted, it will not change the measurable potential value.

- **Wiring**




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

- **Wire definitions: SPL**

<table>
<tr><th></th><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td rowspan="2">Power cable</td><td>Red</td><td>V+</td><td rowspan="2">Connect Red to positive.<br>Connect Black to negative.<br>Do not swap the polarity.<br>Input voltage: 9~16V @12V DC; 18~32V @24V DC</td></tr>
<tr><td>Black</td><td>V-</td></tr>
<tr><td rowspan="7">Signal cable</td><td>Red</td><td>Actuator extends</td><td>Connect Red to positive (V+) to extend, input current <10mA</td></tr>
<tr><td>Black</td><td>Actuator retracts</td><td>Connect Black to positive (V+) to retract, input current <10mA</td></tr>
<tr><td>Yellow</td><td>Vin</td><td>The recommended voltage: 5~32V</td></tr>
<tr><td>Blue</td><td>POT output</td><td>1. Potentiometer specification:<br>- 10K ohm, 10 turns.<br>- Tolerance ±5%<br>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.<br>  <br>3. There are different resolutions according to the stroke length (as table below)<br><table><tr><th>Stroke range (mm)</th><th>Resolution (ohm/mm)</th></tr><tr><td>100~450</td><td>19.685</td></tr><tr><td>451~950</td><td>9.843</td></tr></table><br>4. The potential value can be measured through the POT output and GND wires.</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for POT output and customer signal receiving device.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• 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 22), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit)</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
</table>

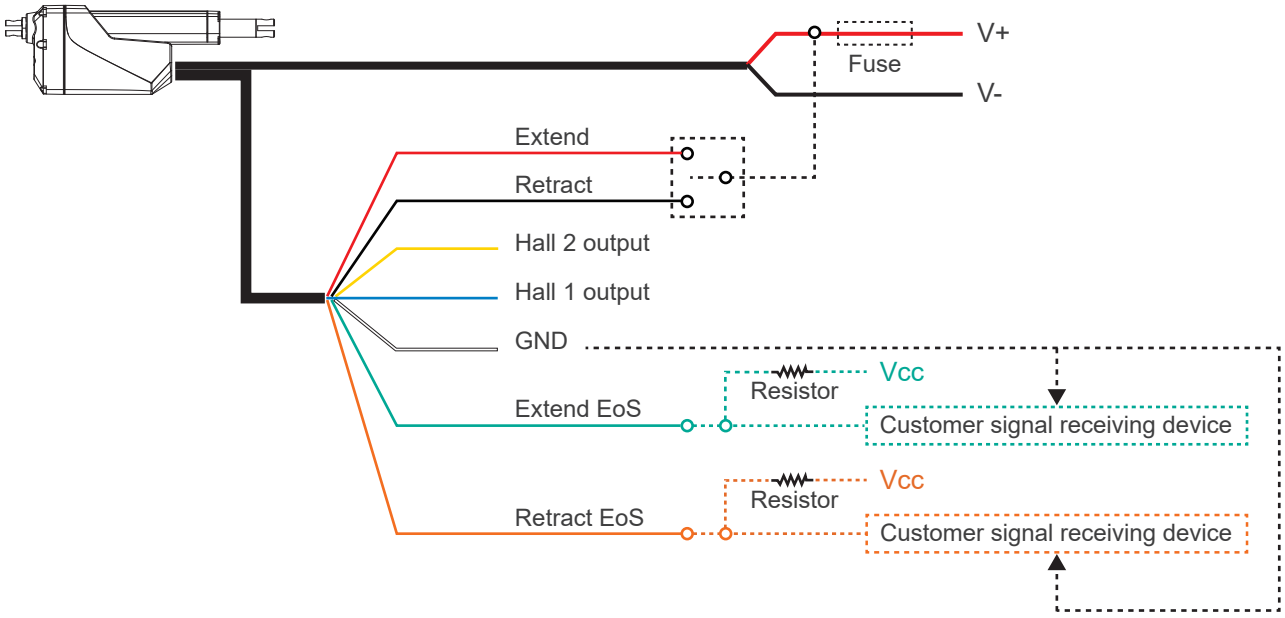
**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

### 3.6.9 Control option SHL
**(Low current signal control, with EoS signal output and dual Hall effect sensors feedback-NPN type)**

In addition to all the functions of the S0L option (section 3.6.7), the SHL option is also equipped with dual Hall effect sensors.

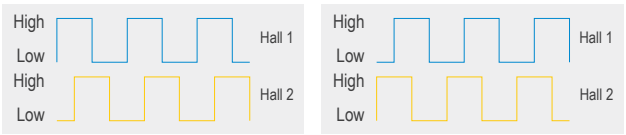
- The polarity of the input DC power must be fixed in accordance with the specified connection method, and the polarity cannot be switched at any time.
- The Hall feedback is a relative positioning. SHL version of the actuator does not have built-in memory, and the position signal will disappear after power-off. The customer's control device must have the function of reading the position signal and recording it.

- **Wiring**




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

- **Wire definitions: SHL**

<table>
<tr><th></th><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td rowspan="2">Power cable</td><td>Red</td><td>V+</td><td rowspan="2">Connect Red to positive.<br>Connect Black to negative.<br>Do not swap the polarity.<br>Input voltage: 9~16V @12V DC; 18~32V @24V DC</td></tr>
<tr><td>Black</td><td>V-</td></tr>
<tr><td rowspan="7">Signal cable</td><td>Red</td><td>Actuator extends</td><td>Connect Red to positive (V+) to extend, input current <10mA</td></tr>
<tr><td>Black</td><td>Actuator retracts</td><td>Connect Black to positive (V+) to retract, input current <10mA</td></tr>
<tr><td>Yellow</td><td>Hall 2 output</td><td rowspan="2">High = 10.8V (±0.6V)<br>Low = GND<br>Hall signal data:<br> 

<br>Resolution:
<table>
<tr><th>Gear ratio</th><th>Resolution (Pulse/mm)</th></tr>
<tr><td>05</td><td>1.0570</td></tr>
<tr><td>10</td><td>1.7601</td></tr>
<tr><td>15</td><td>2.9552</td></tr>
<tr><td>20</td><td>3.9028</td></tr>
<tr><td>30</td><td>6.1603</td></tr>
</table></td></tr>
<tr><td>Blue</td><td>Hall 1 output</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for Hall output and customer signal receiving device.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• 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 24), the resistance of 10KΩ is recommended.<br>• Recommended input voltage Vcc = 5~24V<br>• Signal voltage during the stroke = GND (Normally closed circuit)<br>• End of stroke signal voltage = Vcc (Open circuit)</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
</table>

**Remarks:** To use the limit arrival signal, you must keep the power supply of the actuator and the customer's Vcc power supply, otherwise the signal will be lost.

### 3.6.10 Control option J00 (CAN Bus J1939 control system)

J00 option has full stroke positioning and speed control function. It is designed for CAN Bus platform, adopts the SAE J1939 communication protocol and is suitable for applications of agriculture, construction and industrial automation. In addition to being controlled, the actuator can also return position, current, speed... and other status information through the CAN Bus signal cable. Therefore, the users who choose the J00 option must have established or prepared to establish the J1939 local area network control system to apply this actuator.

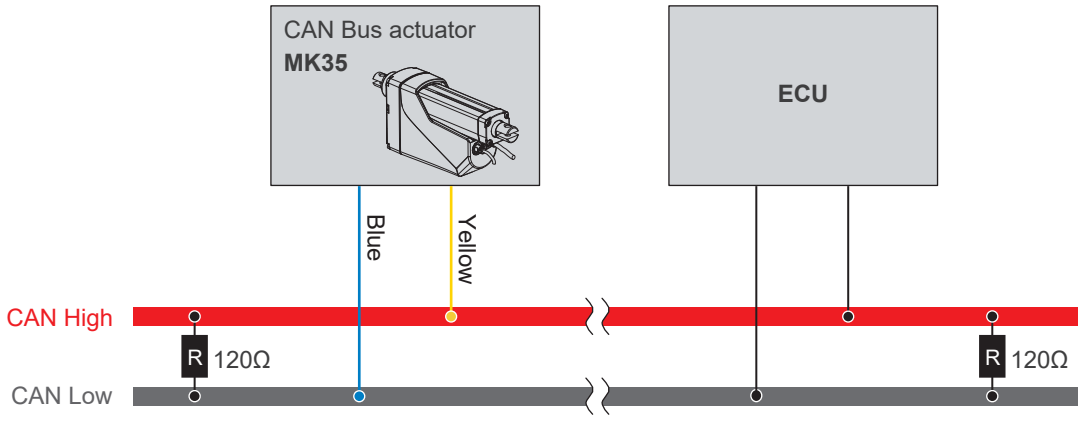
- **Preparation**

Provide an individual power supply for MK35 actuator, separate from the power supply of the CAN Bus system (if this power supply exists). All command and feedback message of the J00 option, including protection message, are processed through CAN messages transmitted by the signal cable. Refer to Chapter 4 for information on J1939 operation and communication protocol.

The polarity of the input DC power must be fixed in accordance with the specified connection method, and the polarity cannot be switched at any time.

- **Connect CAN Bus SAE J1939 system**

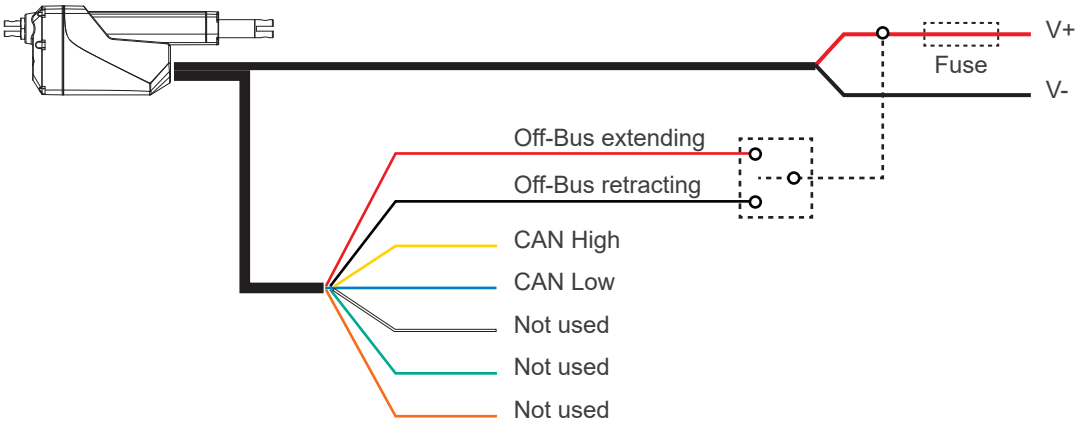
Please follow the wiring guidelines of ISO-11898 standard CAN 2.0B, protocol SAE J1939. The two ends of the CAN High / Low harness should be connected with a 120Ω terminal resistor, as shown in the figure below.




**Remarks:**

- The max. length of the CAN Bus wiring harness is 40m.
- The max. length of the stub (the yellow and blue wires from MK35 actuator connected to the Bus) is 3m.

- **Wiring: J00**




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

- **Wire definitions: J00**

| | Wire color | Definition | Description |
|---|---|---|---|
| Power cable | Red | V+ | Connect Red to positive.<br>Connect Black to negative.<br>Do not swap the polarity.<br>Input voltage: 9~16V @12V DC; 18~32V @24V DC |
| | 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 | |

- **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 which is the same as the S0L option for extending or retracting the actuator but without the EoS signal output.

(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.

Before the Off-Bus operation, the dominance of the CAN Bus and the Off-Bus operation should be well coordinated to prevent accidents caused by unanticipated commands from the CAN Bus terminal. Operators must also properly wear personal safety protective equipment for safety.

Please contact Moteck sales for information.

Please contact Moteck sales for information.

Please contact Moteck sales for information.

Please contact Moteck sales for information.

Please contact Moteck sales for information.

Please contact Moteck sales for information.

## 5. Troubleshooting

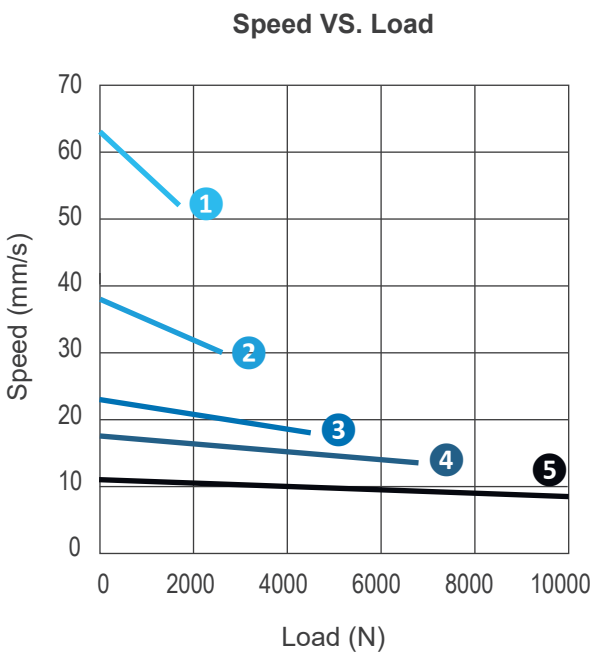
| No. | Troubles | Possible Causes | Solution Guide |
|---|---|---|---|
| 1 | The actuator does not move and makes no sound. | The actuator is not getting the correct input voltage range. | Make sure to provide the correct input voltage for the actuator. |
| 2 | The actuator hummed and did not move. | The power supply is insufficient to drive the actuator and its load. | Make sure the power supply can provide enough current to drive the rated load. |
| 3 | The actuator moves slower or faster than expected. | The input voltage is too high or too low. | Make sure to provide the correct input voltage for the actuator. |
| 4 | The fuse is blown after the actuator is powered. | The fuse specification is incompatible with the consumption current of the actuator. | Check whether the specifications of the fuse used are correct and follow the recommendations in 3.5.3. |
| 5 | When the actuator moves for about 1 second, it stops automatically, and the same is true for repeated operations. | The actuator is overloaded or blocked by obstacles. | Do not repeat the operation again and again. Please check and remove possible obstructions before retrying, or reduce the weight of the actuator load. |

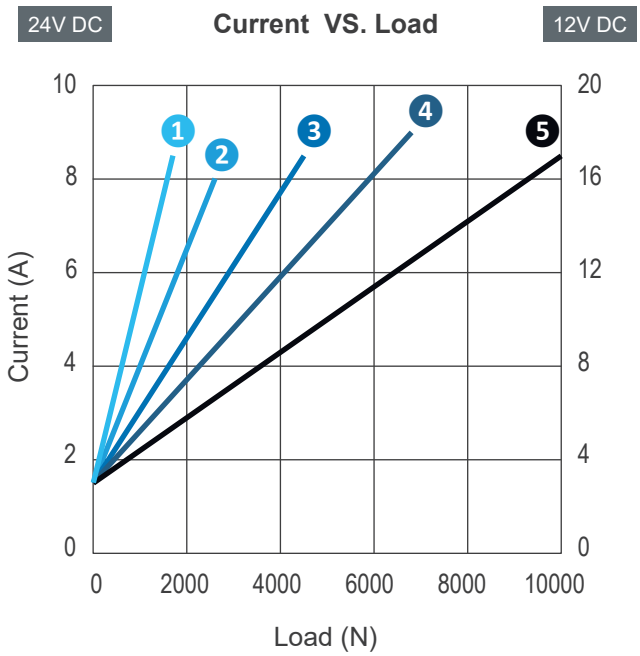
If the above description does not solve the problem, please contact the seller for assistance.

# 6. Performance and Options

## 6.1 Performance data

| No. | Gear ratio | Push / Pull Max. (N) | * Typical speed (mm/s) | | * Typical current (A) | | | | Duty cycle |
|---|---|---|---|---|---|---|---|---|---|
| | | | No load | Full load | No load | | Full load | | |
| | | | | | 24V | 12V | 24V | 12V | |
| 1 | 5:1 | 1,700 | 63 | 52 | 1.5 | 3.0 | 8.5 | 17 | 25% |
| 2 | 10:1 | 2,600 | 38 | 30 | 1.5 | 3.0 | 8.0 | 16 | 25% |
| 3 | 15:1 | 4,500 | 23 | 18 | 1.5 | 3.0 | 8.5 | 17 | 25% |
| 4 | 20:1 | 6,800 | 17.5 | 13.5 | 1.5 | 3.0 | 9.0 | 18 | 25% |
| 5 | 30:1 | 10,000 | 11 | 8.5 | 1.5 | 3.0 | 8.5 | 17 | 15% |




* **Remarks:**

1. The typical speed or 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.
2. The signal control options “S0L, SPL, SHL, J00” have stand-by current <20mA (12/24V DC).

## 6.2 Ordering key

**MK35 - 24 - G5B - 30 - A00 - J00 - 1 1 0 0 0 1**

| | |
|---|---|
| **Input voltage** | **12** : 12V DC<br>**24** : 24V DC |
| **Motor and spindle type** | **G5B** : 4500rpm / 5.08mm pitch / Ball screw |
| **Gear ratio** | **05** : 5:1 **20** : 20:1<br>**10** : 10:1 **30** : 30:1<br>**15** : 15:1 |
| **Stroke** | **XXX** : 100~950mm (one step in every 50mm) ; A00=1000mm |
| **Control options** | **D00** : DC control, without positioning feedback.<br>**D0L** : DC control + EoS<br>**DPL** : DC control + Potentiometer + EoS<br>**DHL** : DC control + Dual Hall effect sensors (NPN) + EoS<br>**D+L** : DC control + Dual Hall effect sensors (PNP) + EoS<br>**S0L** : Low current signal control + EoS<br>**SPL** : Low current signal control + Potentiometer + EoS<br>**SHL** : Low current signal control + Dual Hall effect sensors (NPN) + EoS<br>**J00** : J1939 CAN Bus |
| **Front connector** (Refer to Page 6) | **1**, **2**, **3**, **4**, **6**, **8** |
| **Rear connector** (Refer to Page 6) | **1**, **2**, **3**, **4**, **6**, **8** |
| **Connector orientation** (Refer to Page 7) | **0** : 0° (Standard)<br>**9** : 90°<br>(Front and rear connectors shown in standard 0°) |
| **Reserved** | **0** |
| **Reserved** | **0** |
| * **Cable length** | **1** : 500mm straight<br>**5** : 1500mm straight<br>**7** : 3000mm straight |

**Remarks:**

* Only option D00 has one power cable, the power/signal cables of other options are divided into two wires, equal in length, with the bare wires at both ends are tinned.