Actuator
MK25

MK25 is a compact actuator with a control board inside that can provide a thrust up to 2500N.
The aluminum housing designed with high IP degree is ideal for operation in extreme conditions.
A variety of control options can be developed to suit the user's application. MK25 is an advantageous choice for applications such as agriculture, construction and industrial automation.

Content

Features and Options

- Main applications: Agriculture, Construction and Industrial Automation.
- Input voltage: 12V DC / 24V DC
- Max. load: 2,500N (Push / Pull)
- Max. static load: 5,000N (Push / Pull)
- Max. speed at no load: 14mm/sec (Typical value)
- Spindle type: ACME screw
- Stroke: 20～300mm
- Noise level: ≦58dB
- IP level: IP66 (Dynamic) / IP69K (Static; non-action)
- Built-in stroke limit switches
- Various control options to suit the user's application
- Stainless steel extension tube
- Housing coating: Black, salt spray test for 500 hours.

Usages

- Duty cycle: Max. 20% (2 min. continuous operation in 10 min.
  and is valid for operation within an ambient temperature of +5°C～+40°C)
- Operating ambient temperature: -40°C～+85°C (Full performance +5°C～40°C)
- Storage ambient temperature: -40°C～+100°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

1. DXL options (Traditional DC control)

Directly swap the polarity of the input power to control the extension and retraction of the actuator.
There is self-braking ability in limit switch position.

	D0L	DHL	DAL	DBL
Hall signal output (1)	-	✓	-	-
Hall-POT output 0~10V	-	-	✓	-
Hall-POT output 0.5~4.5V	-	-	-	✓
EoS signal output (2)	✓	✓	✓	✓

2. Signal control / Synchronous control option

Equipped with an H-bridge circuit to control the extension and retraction of the actuator.
There is self-braking ability during the whole stroke.

	S0L	SHL	SAL	SBL	J00	SYL
Control platform	Low current signal	Low current signal	Low current signal	Low current signal	J1939 CAN bus	Low current signal
H-bridge (3)	✓	✓	✓	✓	✓	✓
Hall signal output (1)	-	✓	-	-	-	-
Hall-POT output 0~10V	-	-	✓	-	-	-
Hall-POT output 0.5~4.5V	-	-	-	✓	-	-
EoS signal output (2)	✓	✓	✓	✓	-	✓
Soft start/stop	✓	✓	✓	✓	✓	✓
Over current protection (4)	✓	✓	✓	✓	✓	✓
Voltage protection (5)	✓	✓	✓	✓	✓	✓
Temperature protection (6)	✓	✓	✓	✓	✓	✓
Low temp. response (7)	✓	✓	✓	✓	✓	✓
Action status feedback	-	-	-	-	✓	-
Current feedback	-	-	-	-	✓	-
Position feedback	-	-	-	-	✓	-
Speed/ramp feedback	-	-	-	-	✓	-
Error code feedback	-	-	-	-	✓	-

Remarks:

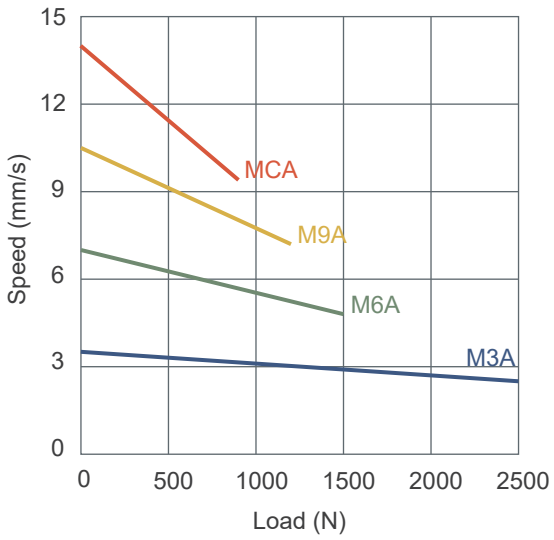
(1) The Hall feedback circuit of DHL/SHL option is NPN type.
(2) End of stroke signal output is not potential free.
(3) The polarity of input DC power for the signal control options must be fixed and cannot be switched.
(4) When the current detected reaching the following value: 8A @12V DC; 5A @24V DC and the time is accumulated to 300ms in a sampling period, 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.
(5) The allowable input voltage is 9~16V @12V DC; 18~32V @24V DC, if it exceeds the range, actuator will be stopped automatically.
(6) Temperature detection inside the actuator. When the temperature is detected higher than +85°C or below -40°C, actuator will be stopped automatically. It will resume operation until the high temperature is down to +80°C or the low temperature is raised to -35°C.
(7) 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

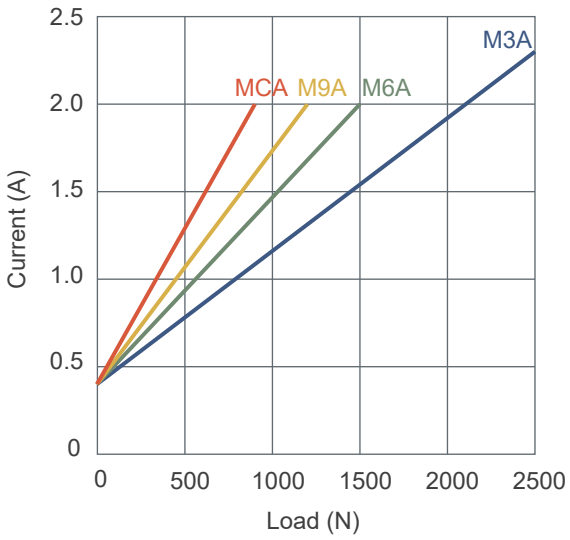
1. DXL options / Signal controls

Model	Gear type	Push / Pull Max. (N)	Typical speed (mm/s) (2)		Typical current (A) (2)			
			No load	Full load	No load		Full load	
					24V	12V	24V	12V
MK25-XX-M3A-A0 (1)	A0	2500	3.5	2.5	0.4	0.8	2.3	4.5
MK25-XX-M6A-A0	A0	1500	7.0	4.8	0.4	0.8	2.0	4.0
MK25-XX-M9A-A0	A0	1200	10.5	7.2	0.4	0.8	2.0	4.0
MK25-XX-MCA-A0	A0	900	14.0	9.4	0.4	0.8	2.0	4.0

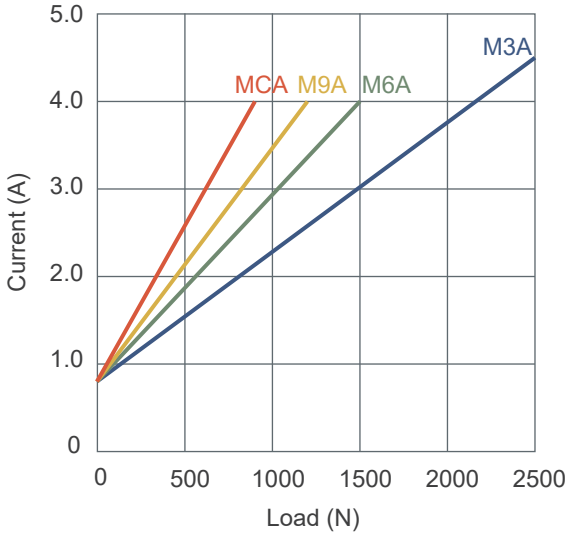
Speed VS. Load



Current VS. Load 24V DC



Current VS. Load 12V DC



Remarks:

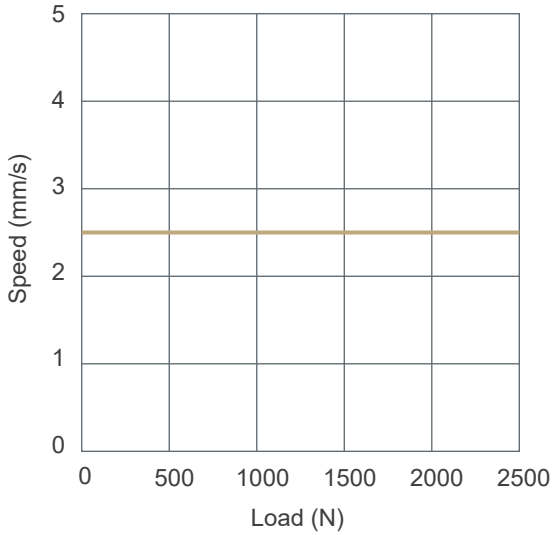
(1) Signal control / Synchronous control option is available only for MK25-24-M3A model.

(2) 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.

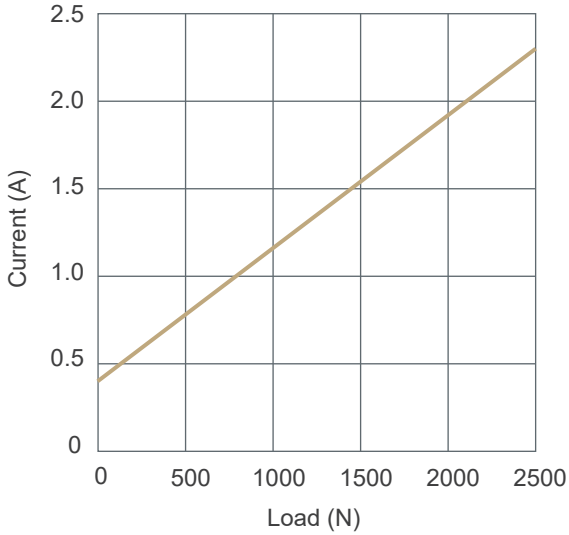
2. Synchronous control option

Model	Gear type	Push / Pull Max. (N)	Synchronous speed (1) (mm/s)	Typical current (A) (1)			
				No load		Full load	
				24V	12V	24V	12V
MK25-XX-M3A-A0	A0	2500	2.5	0.4	0.8	2.3	4.5

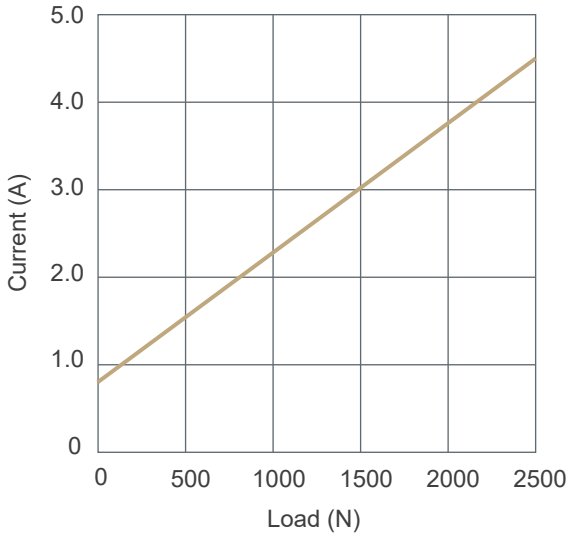
Speed VS. Load



Current VS. Load 24V DC



Current VS. Load 12V DC



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.

3. Inrush current

- When the actuator starts, an inrush current of about 0.2 seconds will be generated. The starting inrush current of MK25 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.

Dimensions

1. Installation dimension

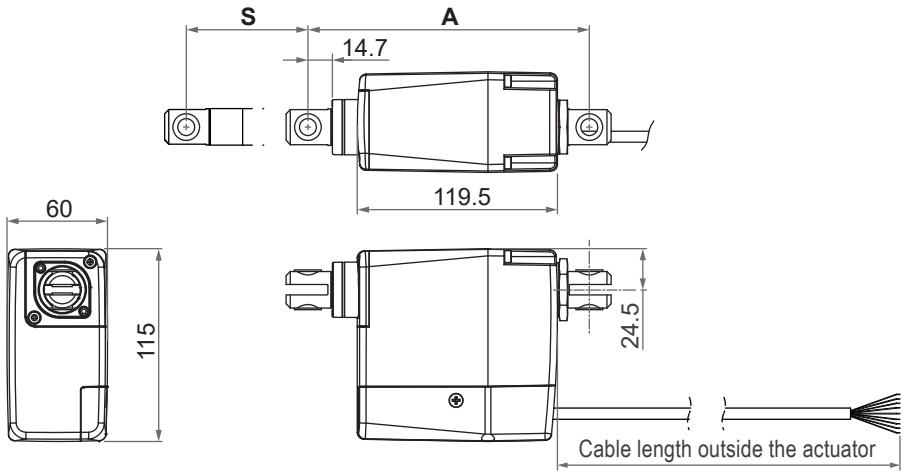
● Available stroke (S) range = 20～300mm (±3mm)

● Retracted length (A)

	Motor & Spindel type	Stroke (S)		
		20~50mm	51~200mm	201~300mm
Retracted length (A) (±3mm)	M3A	A≧168	A≧S+118	A≧S+138
	M6A, M9A, MCA	A≧160	A≧S+110	A≧S+130

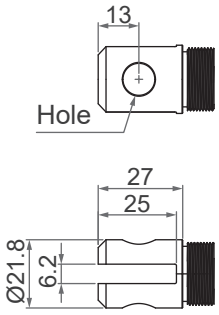
● Extended length = Retracted length (A) + Stroke (S)

2. Drawing

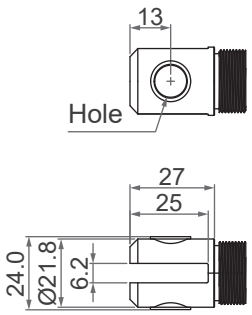


Unit: mm

3. Front connector type

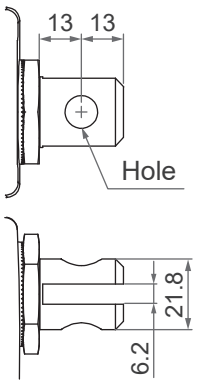


5 : SUS304 slot, hole Ø10.2mm
6 : SUS304 slot, hole Ø12.2mm

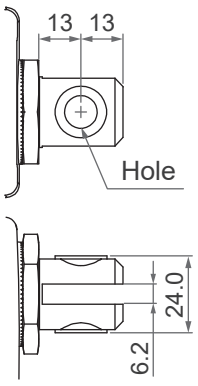


7 : SUS304 slot with bushings, hole Ø10.2mm
8 : SUS304 slot with bushings, hole Ø8.2mm

4. Rear connector type

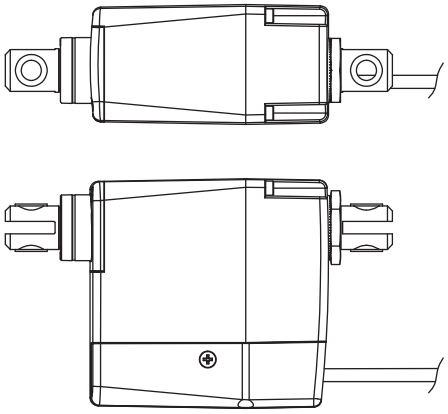


5 : SUS304 slot, hole Ø10.2mm
6 : SUS304 slot, hole Ø12.2mm



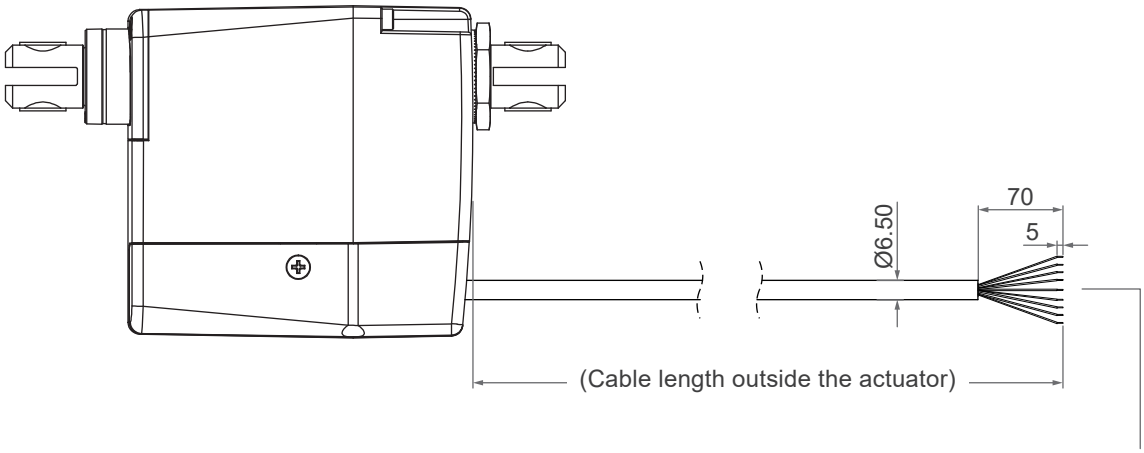
7 : SUS304 slot with bushings, hole Ø10.2mm
8 : SUS304 slot with bushings, hole Ø8.2mm

5. Connector orientation



Note: Front and rear connectors shown in 90°

6. Standard cable



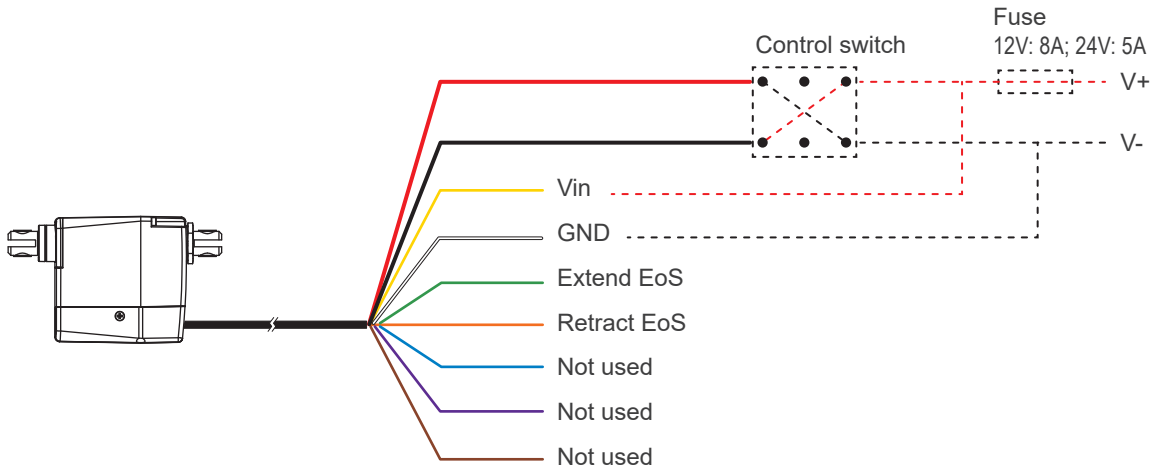
Nominal cable length	Length outside the actuator
750 mm	780 mm
1500 mm	1530 mm
3000 mm	3030 mm

Wire color	Wire gauge
Red	18AWG
Black	18AWG
Brown	22AWG
Purple	22AWG
Blue	22AWG
Yellow	22AWG
White	22AWG
Green	22AWG
Orange	22AWG

Wiring of Control Options

1. Control option D0L (DC control, with EoS signal output.)

● Wiring:



Remarks: All dashed lines are connected by the customer.

● Wire definitions:

Wire color	Definition	Description
Red Black	DC power	• Connect red wire to “V+” & black wire to “V-“ of DC power to extend the actuator. Switch the polarity of DC input to retract it. • Input voltage: According to actuator voltage specification +/-10%
Yellow	Vin	5~32V DC, same as V+ is recommended.
White	GND	Signal GND. For EoS output.
Green	Extend EoS output	• The EoS signal is an active-high signal, i.e. the signal output from low to high when the actuator reaches the limit switches. • The min. Voltage when EoS signal goes to high=Vin-2V • EoS signal output is not potential free
Orange	Retract EoS output	
Blue	Not used	
Purple	Not used	
Brown	Not used	

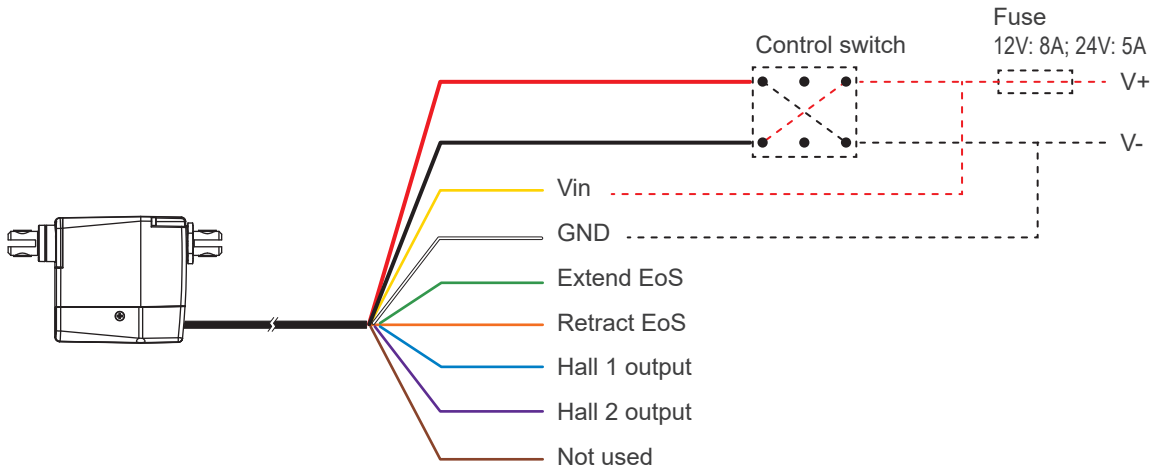
Remarks:

(1) To use the EoS signal, you must keep the power supply of the actuator and the Vin power supply, otherwise the signal will be lost.

(2) Please ensure that unused wires are well insulated to avoid damaging the internal circuit of the actuator.

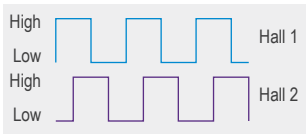
2. Control option DHL
(DC control, with EoS signal output and dual Hall effect sensors feedback-NPN type)

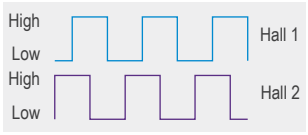
● **Wiring:**



Remarks: All dashed lines are connected by the customer.

● Wire definitions:

<table>
<tr><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td>Red
Black</td><td>DC power</td><td>• Connect red wire to “V+” & black wire to “V-“ of DC power to extend the actuator. Switch the polarity of DC input to retract it.
• Input voltage: According to actuator voltage specification +/-10%</td></tr>
<tr><td rowspan="2">Yellow</td><td rowspan="2">Vin</td><td>5~32V DC, same as V+ is recommended.</td></tr>
<tr><td>⚠ If this voltage input must share the motor's power supply, be sure to use a separate power cord to draw power from the source, not tapping it from the control board's power input. Otherwise, the motor's inrush current will cause the Hall IC circuit to malfunction.</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for Hall output and EoS signal.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• The EoS signal is an active-high signal, i.e. the signal output from low to high when the actuator reaches the limit switches.
• The min. Voltage when EoS signal goes to high=Vin-2V
• EoS signal output is not potential free</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
<tr><td>Blue</td><td>Hall 1 output</td><td rowspan="2">Vout High min = Vin - 1.2V, Imax 12.7mA
Vout Low = GND
Hall signal data:
Actuator extends
 

Actuator retracts
 

Hall effect sensor resolution:
<table>
<tr><th>Motor & Spindel type</th><th>Resolution (pulses/mm)</th></tr>
<tr><td>M3A</td><td>34.67</td></tr>
<tr><td>M6A</td><td>17.33</td></tr>
<tr><td>M9A</td><td>11.56</td></tr>
<tr><td>MCA</td><td>8.67</td></tr>
</table></td></tr>
<tr><td>Purple</td><td>Hall 2 output</td></tr>
<tr><td>Brown</td><td>Not used</td><td></td></tr>
</table>

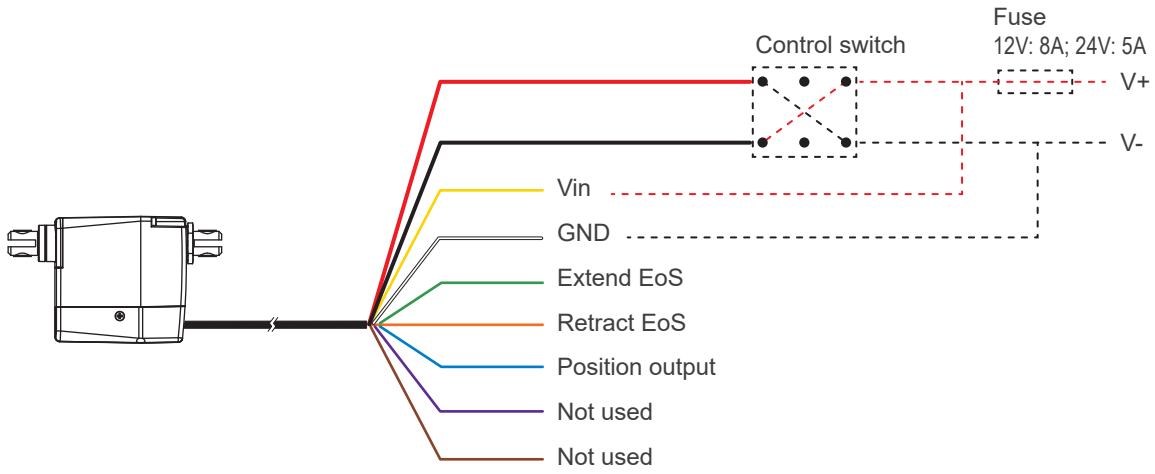
Remarks:

(1) To use the EoS signal, you must keep the power supply of the actuator and the Vin power supply, 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. Control option DAL and DBL
(DC control, with EoS signal output and Hall-POT voltage feedback)

● Wiring:



Remarks: All dashed lines are connected by the customer.

● Wire definitions:

Wire color	Definition	Description
Red Black	DC power	• Connect red wire to “V+” & black wire to “V-“ of DC power to extend the actuator. Switch the polarity of DC input to retract it. • Input voltage: According to actuator voltage specification +/-10%
Yellow	Vin	11~32V DC, same as V+ is recommended. ⚠ If this voltage input must share the motor's power supply, be sure to use a separate power cord to draw power from the source, not tapping it from the control board's power input. Otherwise, the motor's inrush current will cause the Hall IC circuit to malfunction.
White	GND	Signal GND. Both for Position output and EoS signal.
Green	Extend EoS output	• The EoS signal is an active-high signal, i.e. the signal output from low to high when the actuator reaches the limit switches. • The min. Voltage when EoS signal goes to high=Vin-2V • EoS signal output is not potential free
Orange	Retract EoS output	
Blue	Position output	• Position output is an analog output related to the actual position of the inner tube. • Output range: DAL: 0~10V / DBL: 0.5~4.5V
Purple	Not used	
Brown	Not used	

Remarks:

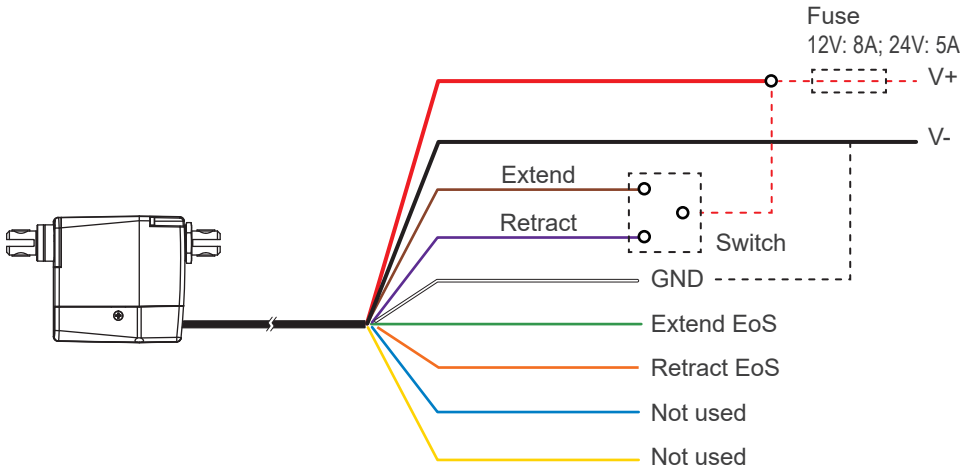
(1) To use the EoS signal, you must keep the power supply of the actuator and the Vin power supply, otherwise the signal will be lost.

(2) Please ensure that unused wires are well insulated to avoid damaging the internal circuit of the actuator.

(3) For 12V actuators, if V+ is used as the Vin power supply, it must ensure that the voltage is higher then 11V for the Hall-POT to work correctly.

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

● **Wiring:**



Remarks: All dashed lines are connected by the customer.

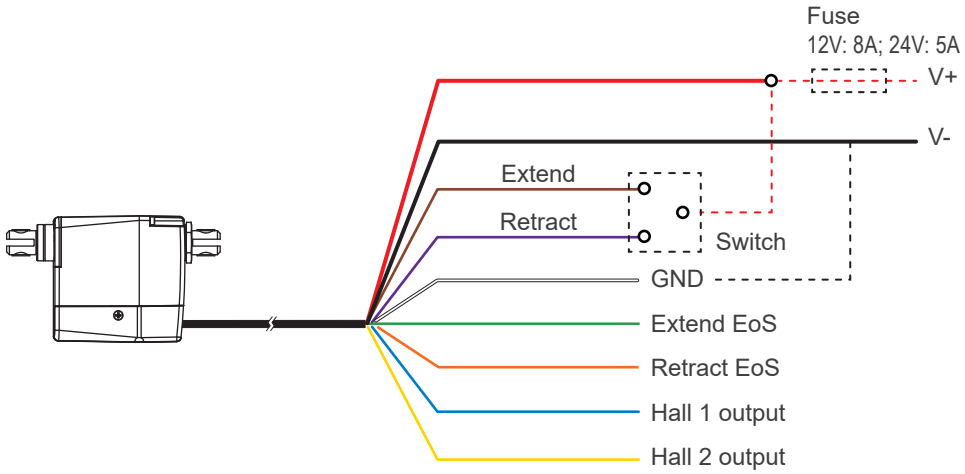
● **Wire definitions:**

Wire color	Definition	Description
Red	V+	• Connect Red to positive • Connect Black to negative • Do not swap the polarity • Input voltage: According to actuator voltage specification +/-10%
Black	V-	
Brown	Actuator extends	Connect Brown to positive (V+) to extend, input current <10mA
Purple	Actuator retracts	Connect Purple to positive (V+) to retract, input current <10mA
White	GND	Signal GND. For EoS output.
Green	Extend EoS output	• The EoS signal is an active-high signal, i.e. the signal output from low to high when the actuator reaches the limit switches. • The min. Voltage when EoS signal goes to high=Vin-2V • EoS signal output is not potential free
Orange	Retract EoS output	
Blue	Not used	
Yellow	Not used	

Remarks:
(1) To use the EoS 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.

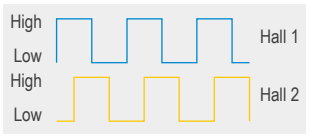
5. Control option SHL
(Low current signal control, with EoS signal output and dual Hall effect sensors feedback-NPN type)

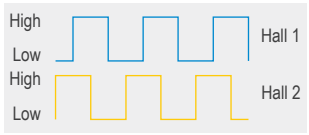
● **Wiring:**



Remarks: All dashed lines are connected by the customer.

● Wire definitions: SHL

<table>
<tr><th>Wire color</th><th>Definition</th><th>Description</th></tr>
<tr><td>Red</td><td>V+</td><td rowspan="2">• Connect Red to positive
• Connect Black to negative
• Do not swap the polarity
• Input voltage: According to actuator voltage specification +/-10%</td></tr>
<tr><td>Black</td><td>V-</td></tr>
<tr><td>Brown</td><td>Actuator extends</td><td>Connect Brown to positive (V+) to extend, input current <10mA</td></tr>
<tr><td>Purple</td><td>Actuator retracts</td><td>Connect Purple to positive (V+) to retract, input current <10mA</td></tr>
<tr><td>White</td><td>GND</td><td>Signal GND. Both for Hall output and EoS signal.</td></tr>
<tr><td>Green</td><td>Extend EoS output</td><td rowspan="2">• The EoS signal is an active-high signal, i.e. the signal output from low to high when the actuator reaches the limit switches.
• The min. Voltage when EoS signal goes to high=Vin-2V
• EoS signal output is not potential free</td></tr>
<tr><td>Orange</td><td>Retract EoS output</td></tr>
<tr><td>Blue</td><td>Hall 1 output</td><td rowspan="2">Vout High = Vin - 1.2V, Imax 12.7mA
Vout Low = GND
Hall signal data:
Actuator extends
 

Actuator retracts
 

Hall effect sensor resolution:
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<tr><td>Yellow</td><td>Hall 2 output</td></tr>
</table>

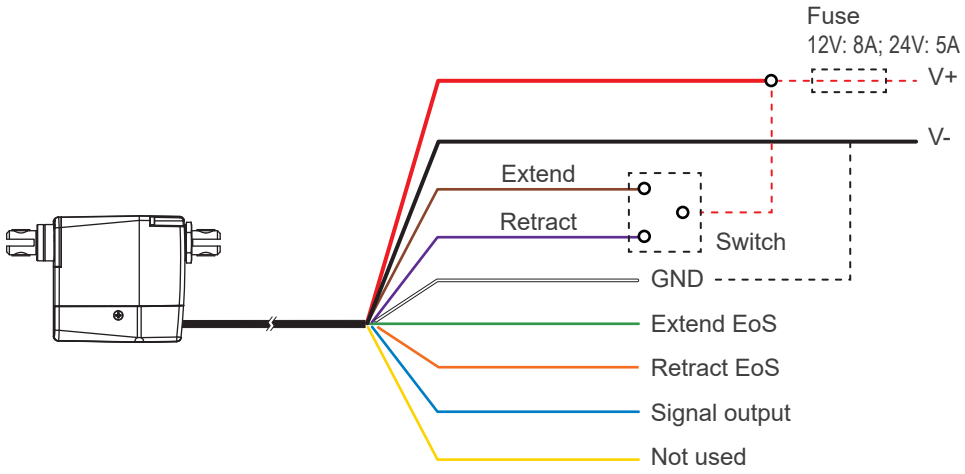
Remarks:

(1) To use the EoS 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.

6. Control option SAL and SBL
(Low current signal control, with EoS signal output and Hall-POT voltage feedback)

● **Wiring:**



Remarks: All dashed lines are connected by the customer.

● **Wire definitions:**

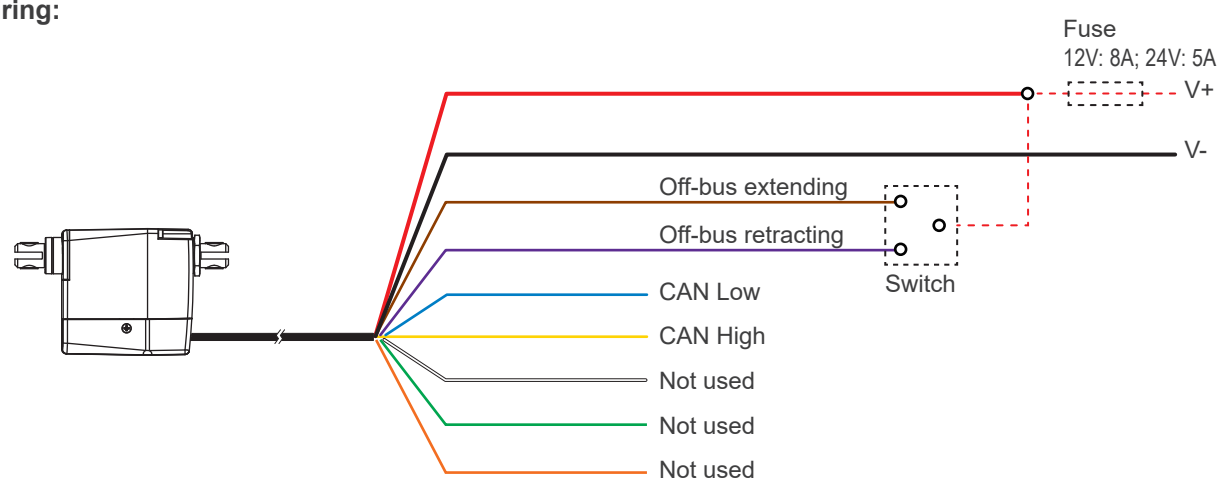
Wire color	Definition	Description
Red	V+	• Connect Red to positive • Connect Black to negative • Do not swap the polarity • Input voltage: According to actuator voltage specification +/-10%
Black	V-	
Brown	Actuator extends	Connect Brown to positive (V+) to extend, input current <10mA
Purple	Actuator retracts	Connect Purple to positive (V+) to retract, input current <10mA
White	GND	Signal GND. Both for Position output and EoS signal.
Green	Extend EoS output	• The EoS signal is an active-high signal, i.e. the signal output from low to high when the actuator reaches the limit switches. • The min. Voltage when EoS signal goes to high=Vin-2V • EoS signal output is not potential free
Orange	Retract EoS output	
Blue	Signal output	• Position output is an analog output related to the actual position of the inner tube. • Output range: SAL: 0~10V / SBL: 0.5~4.5V
Yellow	Not used	

Remarks:
(1) To use the EoS 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.

7. Control option J00 (CAN bus J1939 control system)

J00 option is designed for CAN bus platform, adopts the SAE J1939 communication protocol. 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.

● **Wiring:**



Remarks: All dashed lines are connected by the customer.

● **Wire definitions:**

Wire color	Definition	Description
Red	V+	• Connect Red to positive • Connect Black to negative • Do not swap the polarity • Input voltage: According to actuator voltage specification +/-10%
Black	V-	
Brown	Off-bus extending	Connect Brown to positive (V+) to extend, input current <10mA
Purple	Off-bus retracting	Connect Purple to positive (V+) to retract, input current <10mA
Blue	CAN Low	
Yellow	CAN High	
White	Not used	
Green	Not used	
Orange	Not used	

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

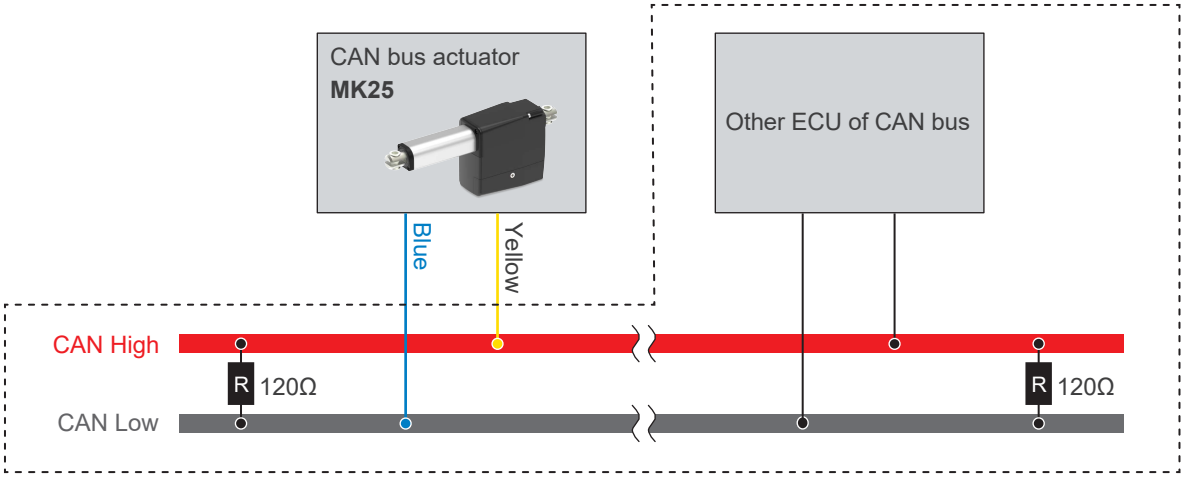
● **Off-Bus operation**

(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.

● Connect CAN bus SAE J1939 system

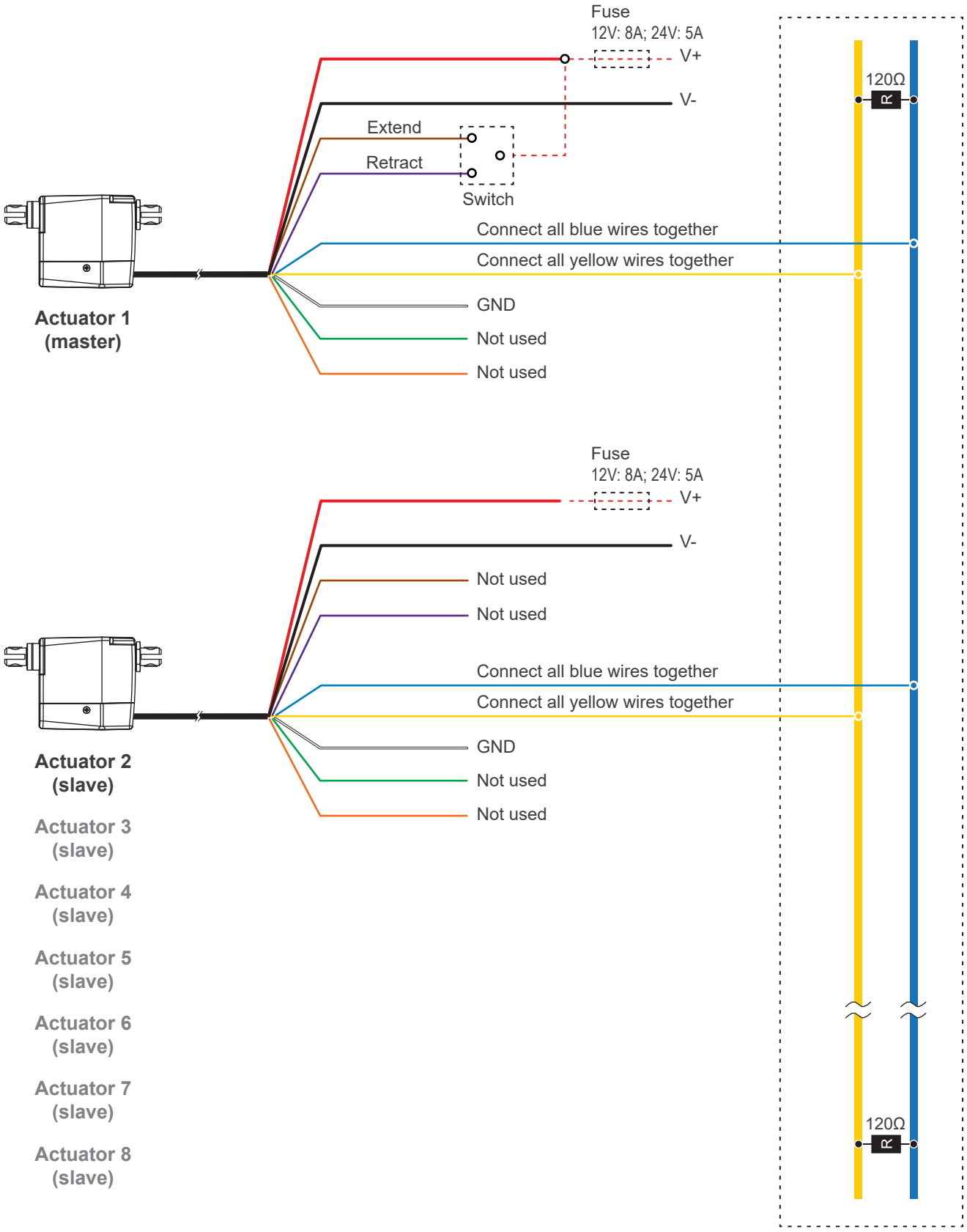
Please follow the wiring guidelines of ISO-11898 standard CAN 2.0B, protocol SAE J1939. The two ends of the CAN High / Low harness should be connected with a 120Ω terminal resistor, as shown in the figure below.



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

8. Control option SYL (Synchronous control)

● **Wiring**



Remarks:

(1) All dashed lines are connected by the customer.
(2) At least one terminal resistor 120Ω should be added by customer.
(3) Up to 8 actuators can be connected for SYL control option.
(4) Please consult MOTECK for detailed setting instruction.

● **Wire definitions: SYL**

Wire color	Definition	Description
Red	V+	• Connect Red to positive • Connect Black to negative • Do not swap the polarity • Input voltage: According to actuator voltage specification +/-10%
Black	V-	
Brown	Actuator extends	Connect Brown to positive (V+) to extend, input current <10mA. Only master actuator needs to use this wire. The other slave actuators do not use it.
Purple	Actuator retracts	Connect Purple to positive (V+) to retract, input current <10mA Only master actuator needs to use this wire. The other slave actuators do not use it.
Blue	SYL signal	Connect all Blue wires together
Yellow	SYL signal	Connect all Yellow wires together
White	GND	Connect to customer signal receiving device GND
Green	Not used	
Orange	Not used	

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

Ordering Key

MK25- 24 - M3A - A0 - 100 - D0L - 5 5 0 0 0 2

Input voltage	**12** : 12V DC **24** : 24V DC
Motor and spindle type	**M3A** : 7000rpm / 3mm pitch / ACME screw (1) **M6A** : 7000rpm / 6mm pitch / ACME screw **M9A** : 7000rpm / 9mm pitch / ACME screw **MCA** : 7000rpm / 12mm pitch / ACME screw
Gear ratio	**A0** : 104:1
Stroke	**XXX** : 020~300mm
Control options	**D0L** : DC control + EoS **DHL** : DC control + Dual Hall effect sensors (NPN) + EoS **DAL** : DC control + Hall-POT 0~10V + EoS **DBL** : DC control + Hall-POT 0.5~4.5V + EoS **S0L** : Low current signal control + EoS **SHL** : Low current signal control + Dual Hall effect sensors (NPN) + EoS **SAL** : Low current signal control + Hall-POT 0~10V + EoS **SBL** : Low current signal control + Hall-POT 0.5~4.5V + EoS **SYL** : Synchronous control **J00** : J1939 CAN Bus
Front connector (Refer to Page 7)	**5, 6, 7, 8**
Rear connector (Refer to Page 7)	**5, 6, 7, 8**
Connector orientation (Refer to Page 8)	**0** : 0° (Standard) **9** : 90° (Front and rear connectors at the same angle)
Reserved	**0**
Reserved	**0**
Cable length (Refer to Page 8)	**2** : 750mm straight **5** : 1500mm straight **7** : 3000mm straight

Remarks:

(1) Signal control / synchronous control options are available for MK25-24-M3A only.