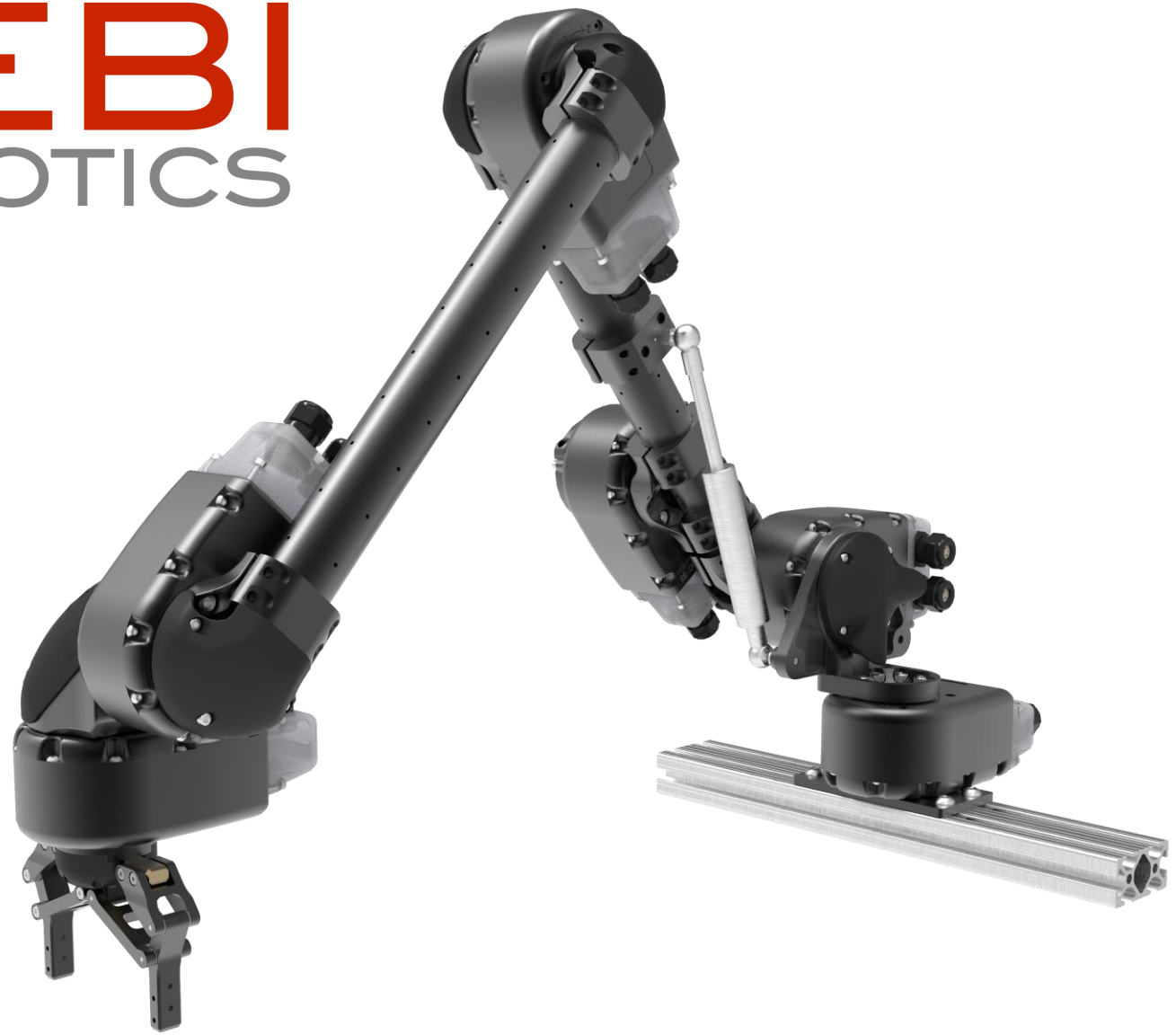
HEBI ROBOTICS



# R-Series 5-DoF Arm Kit

Assembly Instructions

# General Warnings and Cautions

**Danger (May cause serious injury or death)**

- Keep water, flammables, solvents and other liquids clear from **unsealed** actuator.
- Keep fingers away from moving parts during operation.
- Cut power immediately if actuator emits strange odors or smoke.
- Keep actuator out of reach of children.

**Warning (May cause injury or damage to actuator)**

- Do not expose the actuator to permanent and strong magnetic fields.
- Do not force screws into the bottom of the actuator. R8 = 8mm Tap Depth
- Use provided hardware with accessories and hand tighten as needed.
- Attempts to disassemble actuator will void the warranty and may cause permanent damage.

***Sealing (R-Series Actuators are IP67 when properly used)***

- Please refer to all online documentation for proper sealing techniques of the actuator.

For more information please visit: ***docs.hebi.us***

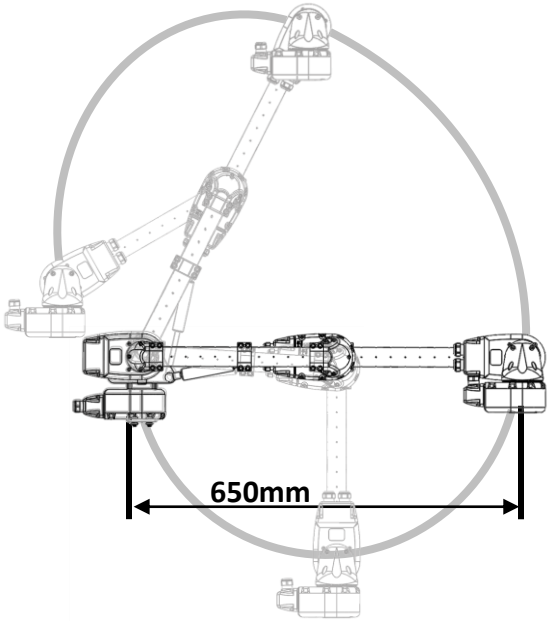
# Technical Specifications

| Specifications | Value |
|---|---|
| **Weight** | 6.00 kg |
| **Reach** | 700 mm |
| **Payload at Max Reach*** | 1.00 kg |
| **Payload at Half Reach*** | 5.00 kg |

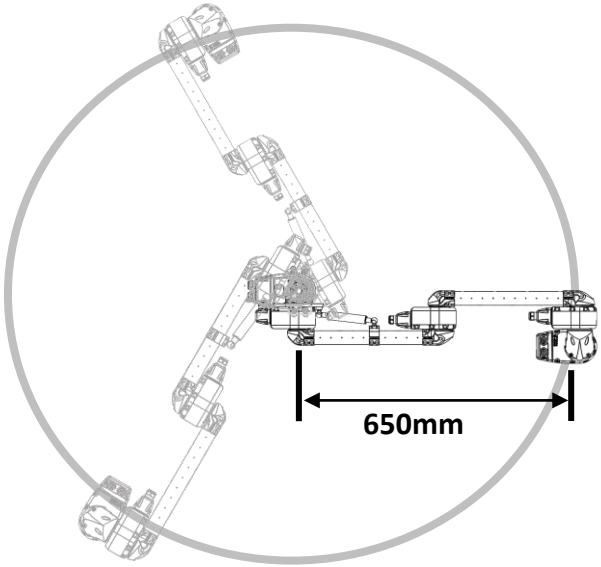
*Calculated using Default Configuration with Gas Spring.* Using a different configuration of R-Series Actuators will provide different payload capacities.

| Movement | Working Range | Speed |
|---|---|---|
| **Axis 1 – Base [Default: R8-16]** | Continuous (limited by wiring) | 90°/s |
| **Axis 2 – Shoulder [Default: R8-16]** | 0° to +70° (limited by gas spring) | 90°/s |
| **Axis 3 – Elbow [Default: R8-16]** | -155° to +155° (avoid end effector collisions) | 90°/s |
| **Axis 4 – Wrist 1 [Default: R8-3]** | Continuous (avoid end effector collisions) | 504°/s |
| **Axis 5 – Wrist 2 [Default: R8-3]** | Continuous (limited by wiring) | 504°/s |

***Side View***



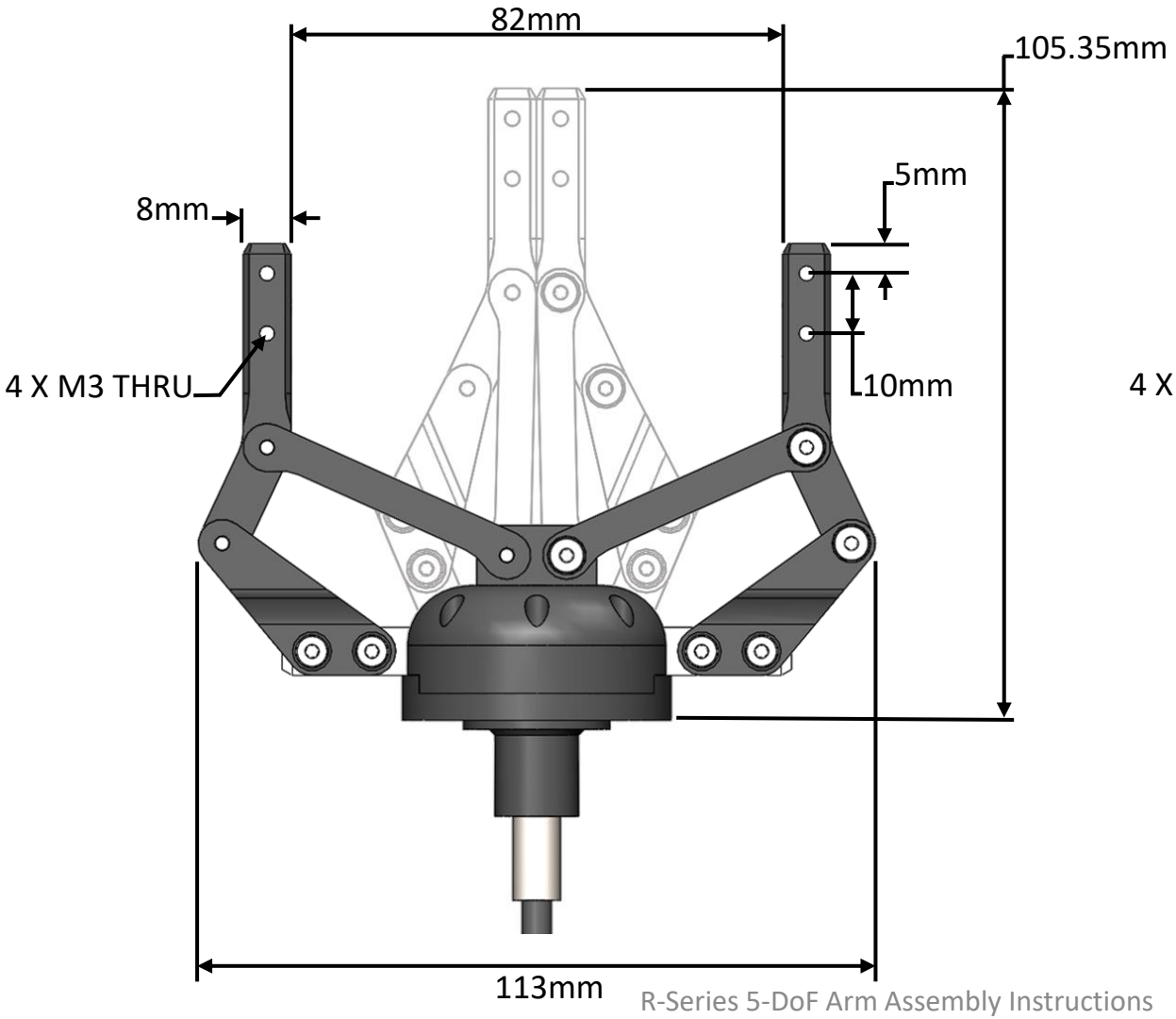

***Top View***

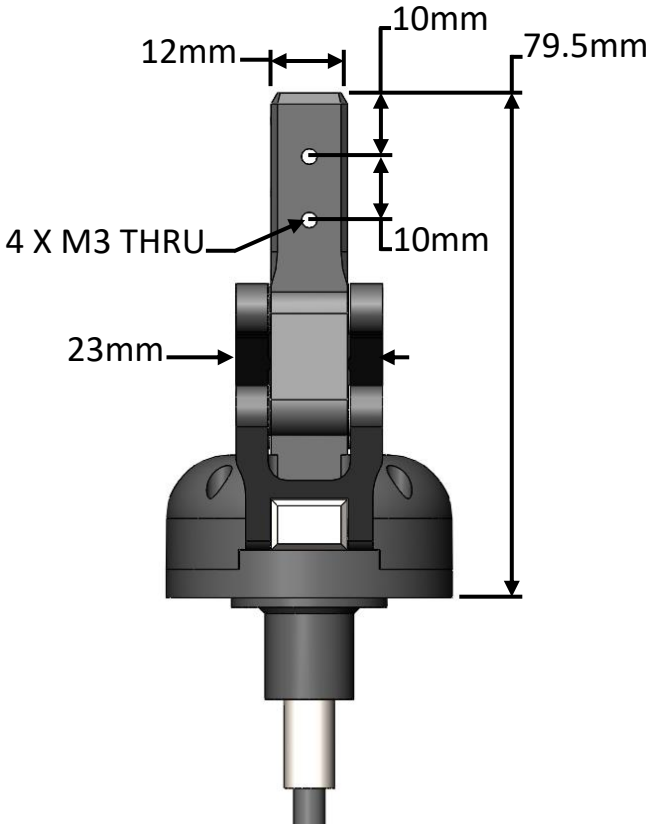


# Technical Specifications

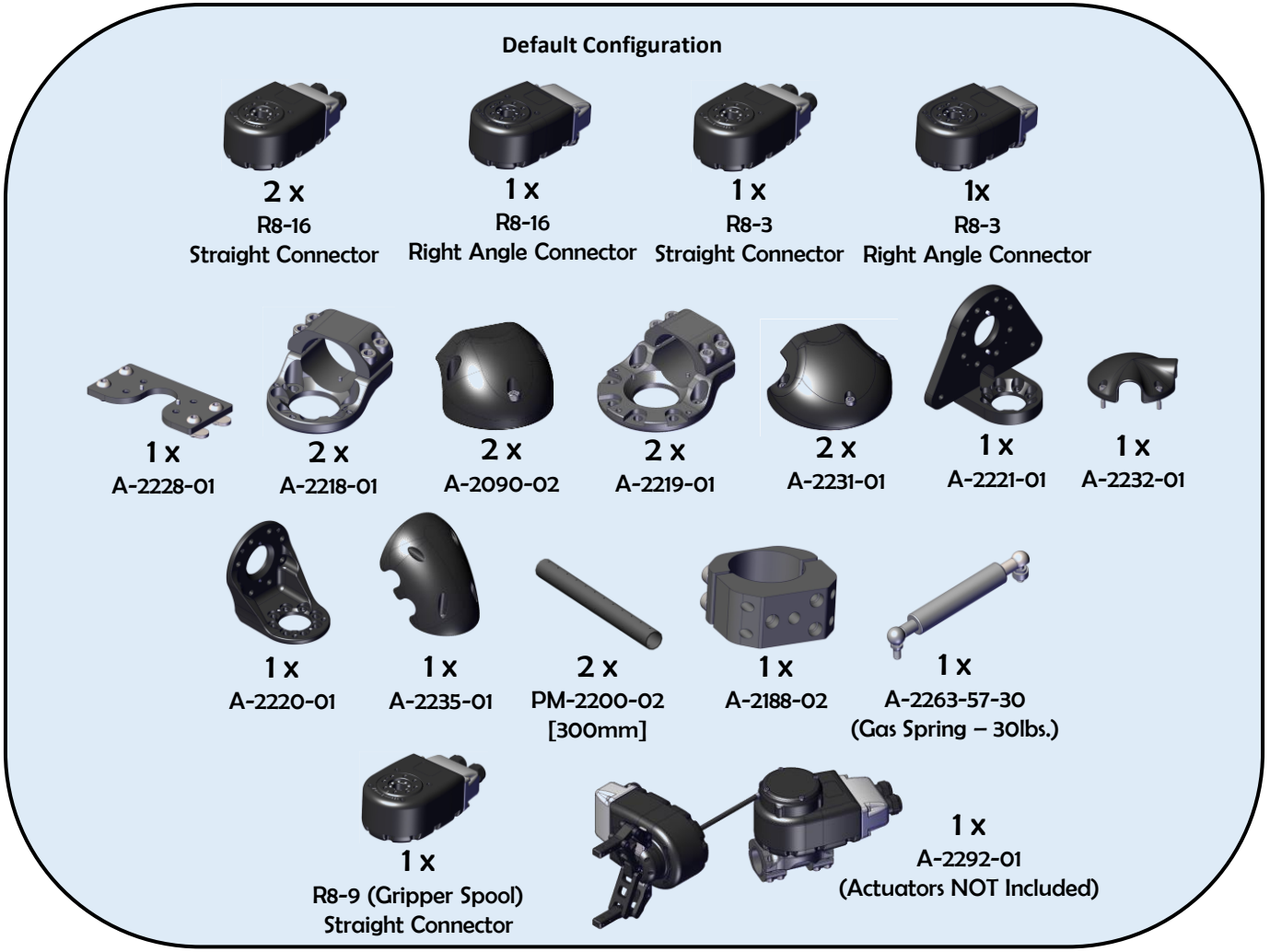
| Spool Module | Max Finger Torque | Max Finger Force at 50mm |
|---|---|---|
| **R8-3** | 0.4 Nm | 8 N |
| **R8-9**** | 1.1 Nm | 23 N |
| **R8-16** | 2.0 Nm | 40 N |

* Values assume a symmetric two-finger grasp
** Default Module



# Bill of Materials – Mechanical*




*fasteners included, not shown*

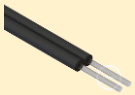
# Bill of Materials - Electrical

PP-2349-RED
18AWG Power Wire, Red

PP-2349-BLK
18AWG Power Wire, Black

PP-2358-YEL
22AWG M-Stop Cable, Yellow

PP-2358-BLU
22AWG M-Stop Cable, Blue

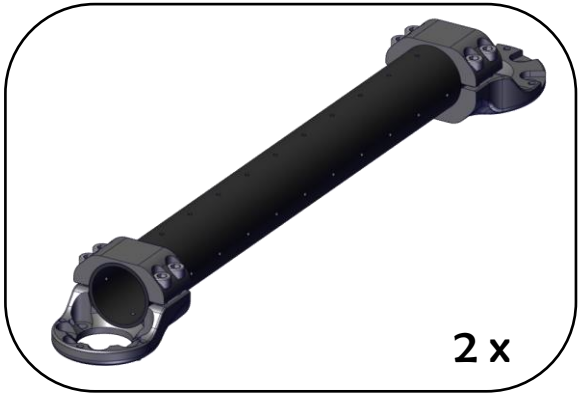


PP-2401-DUP
POF Duplex Cable

A-2256-01
POF Ethernet Media Converter

*all items are included in R-Series Connection Toolbox*

# Table of Contents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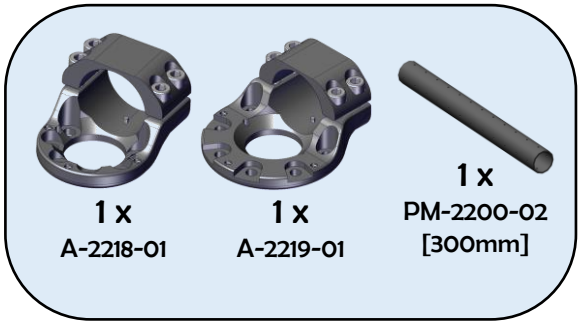
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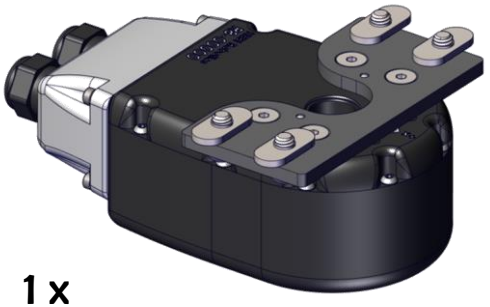
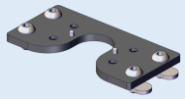
1 x
A-2219-01
1 x
PM-2200-02
[300mm]


M5 x 16mm
M5 x 16mm



1 x

1 x
R8-16
Straight Connector



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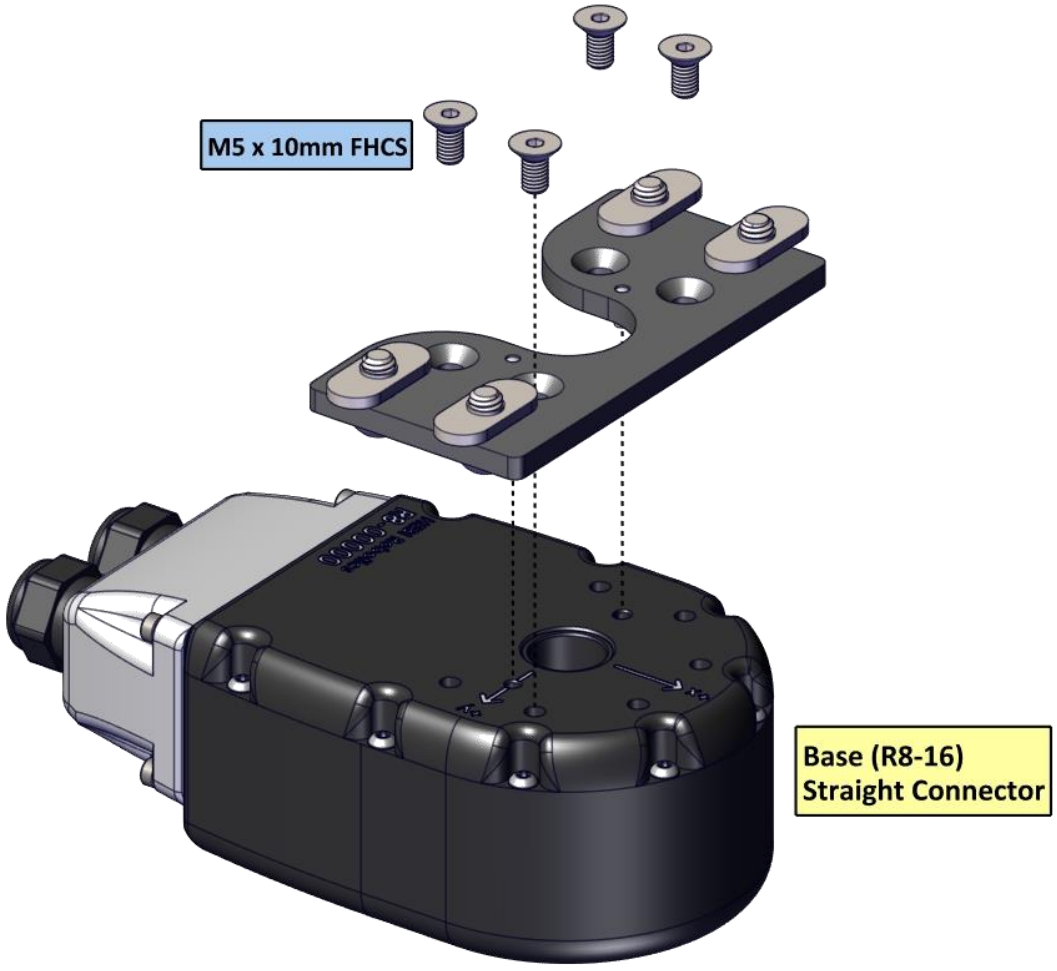

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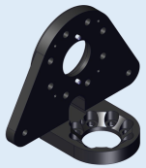

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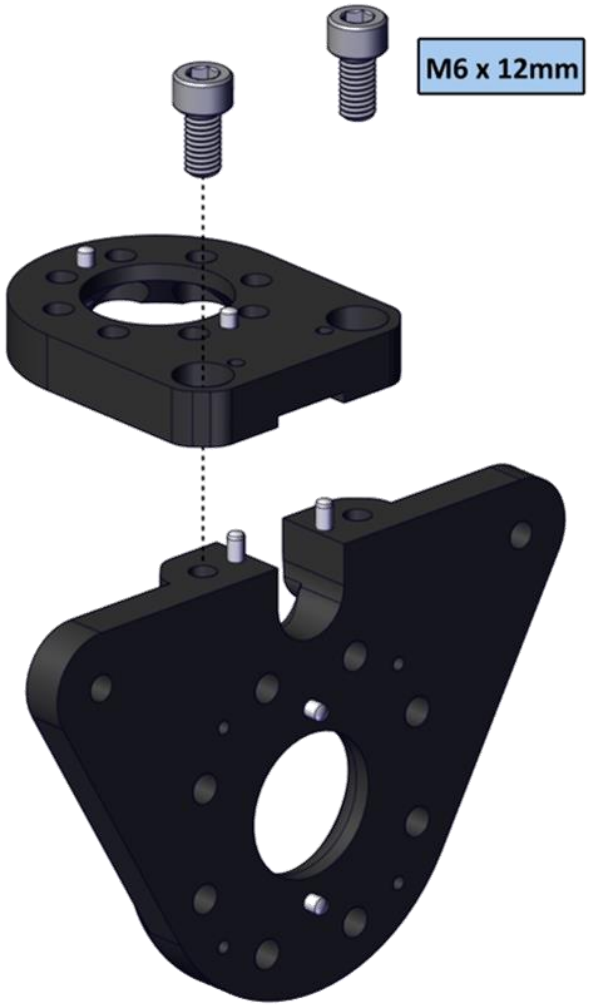
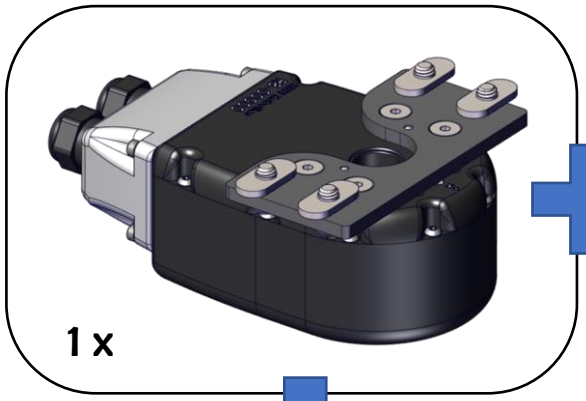
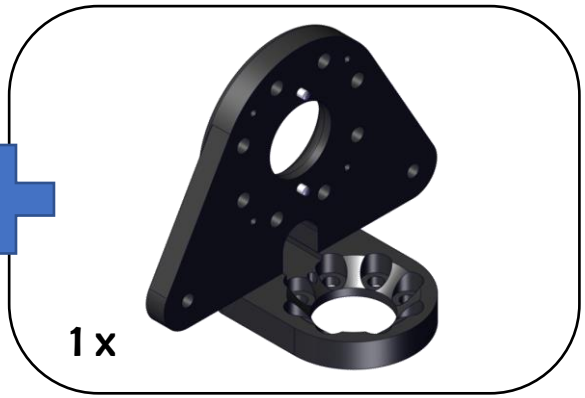
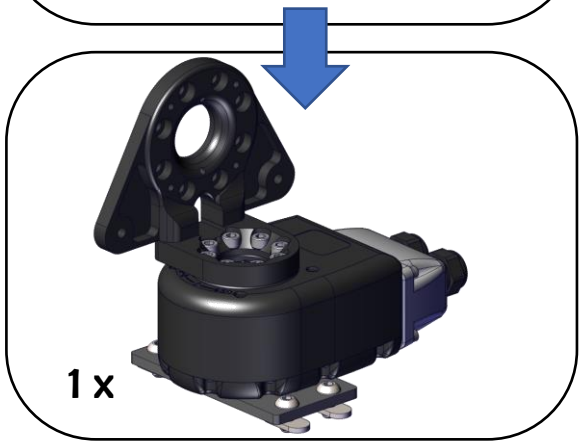
A-2221-01

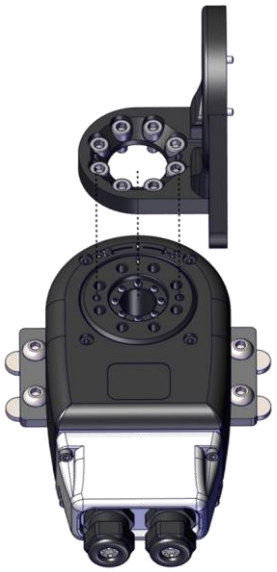



**Flat face towards outside**



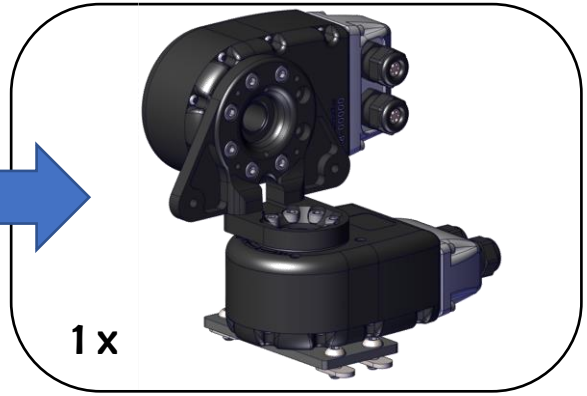



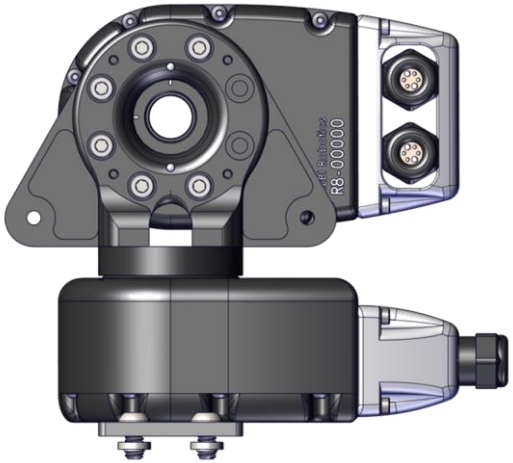



**Align with actuator output hub tick mark**
**(Flat face parallel with tick mark)**

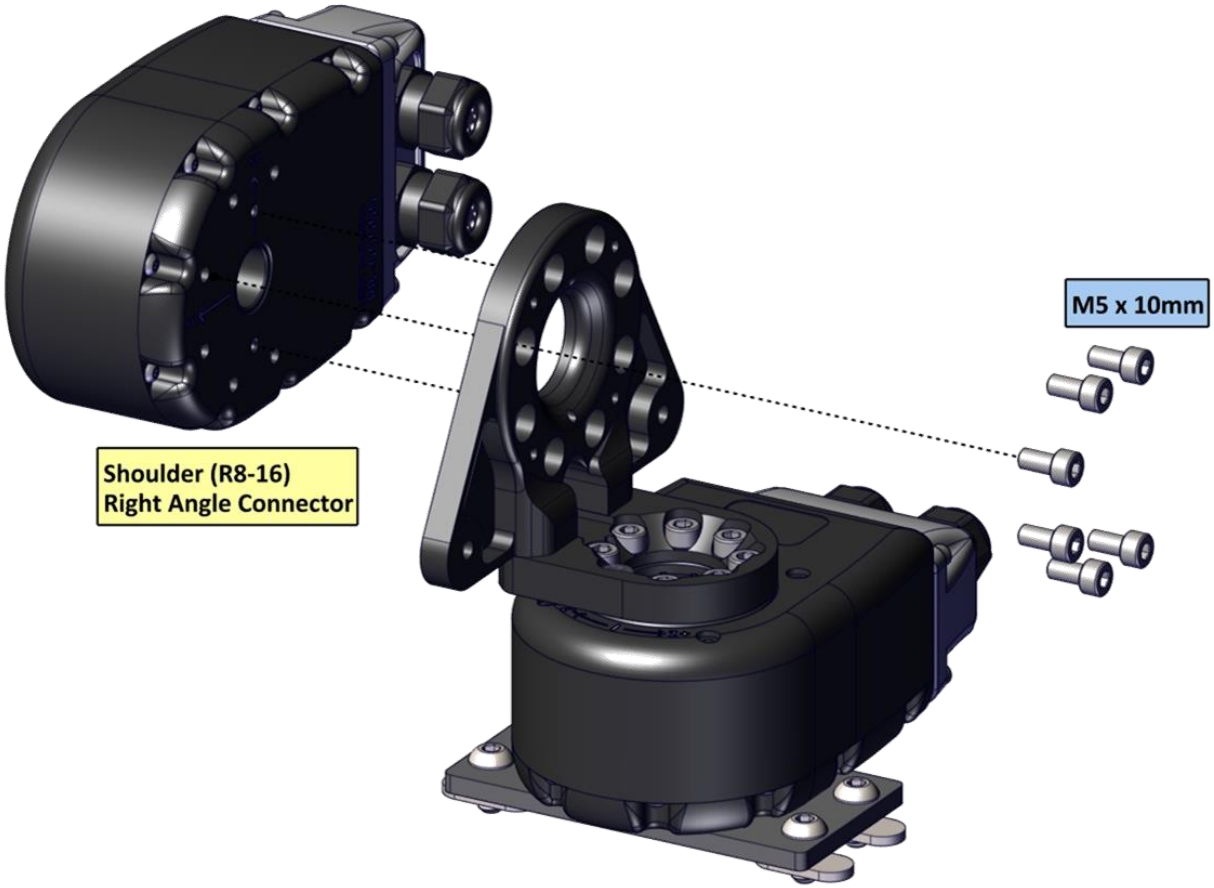


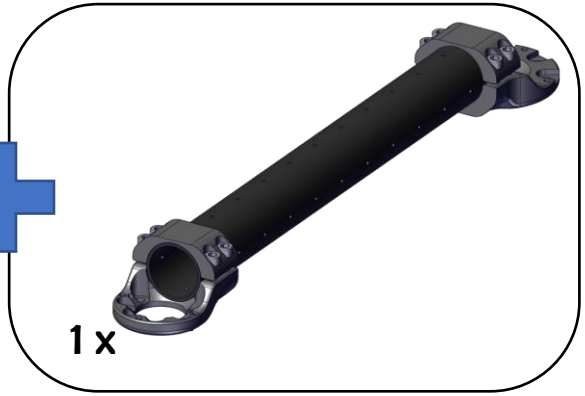


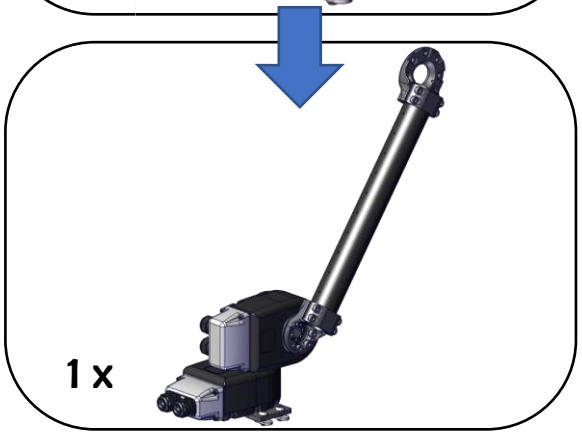

1 x
R8-16
Right Angle Connector

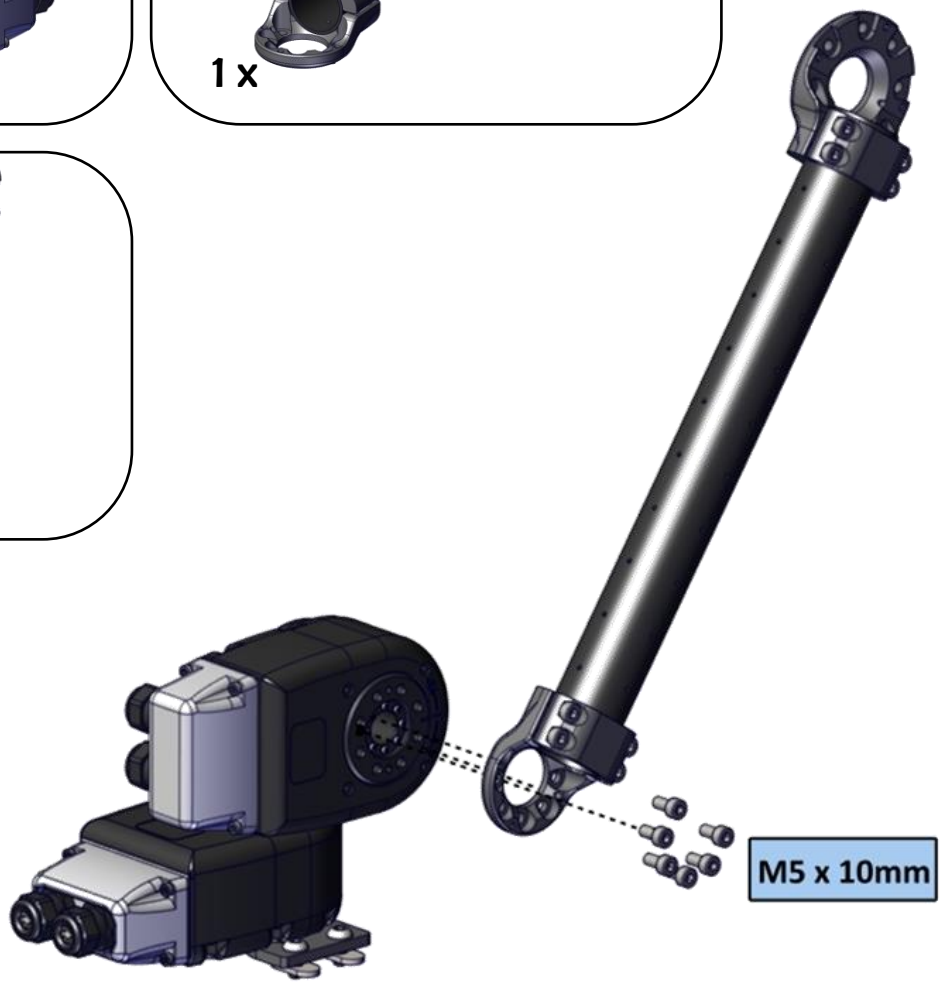


Connectors of both modules point the same way



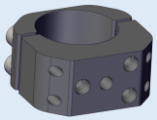




**Align with actuator output hub tick mark**

**(Tube aligns with tick mark)**

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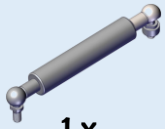
A-2188-02



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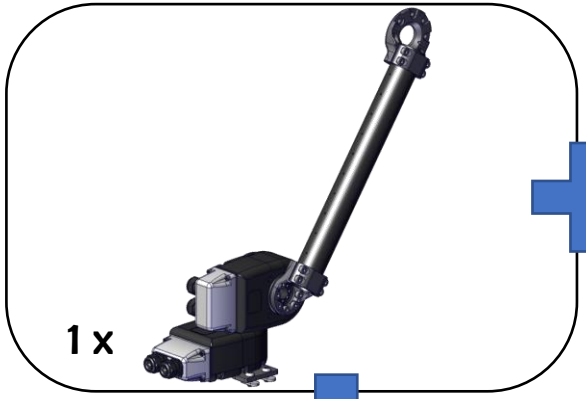
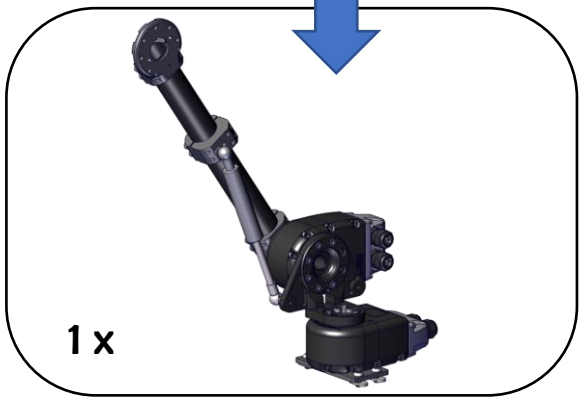
A-2263-57-30
(Gas Spring – 30lbs.)


1 x


1 x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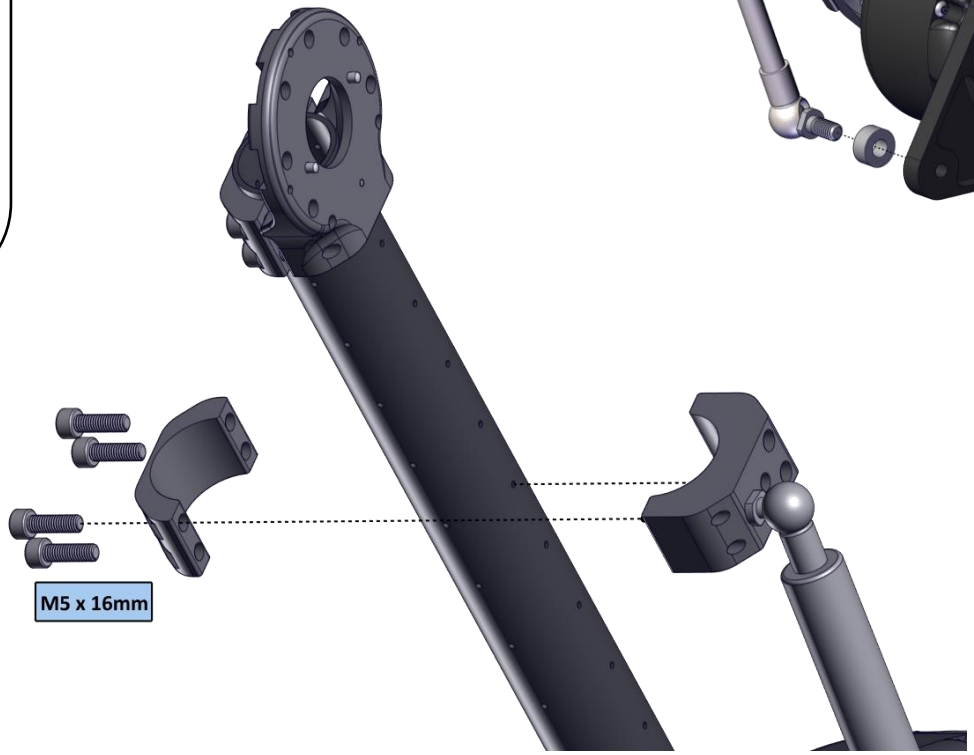
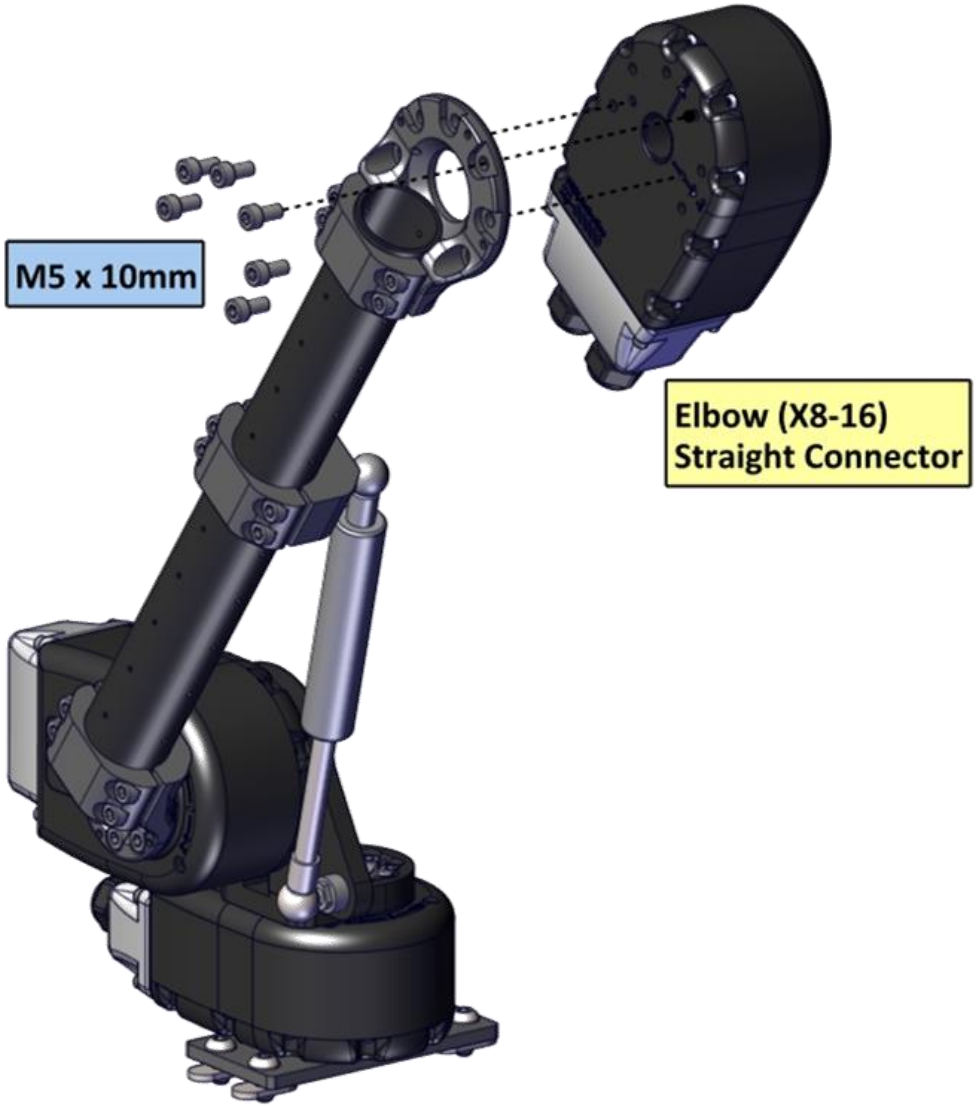
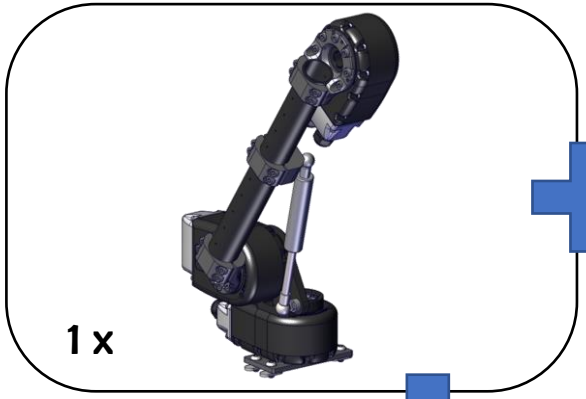
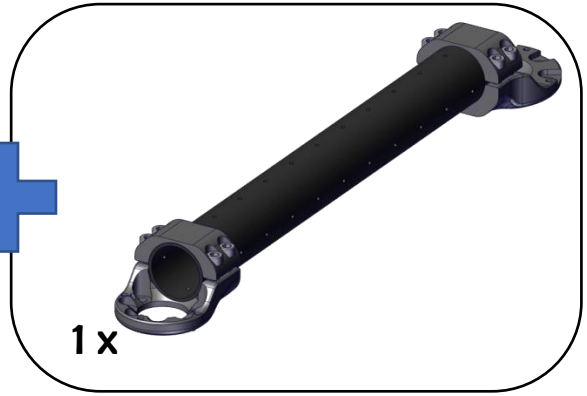

M5 x 16mm

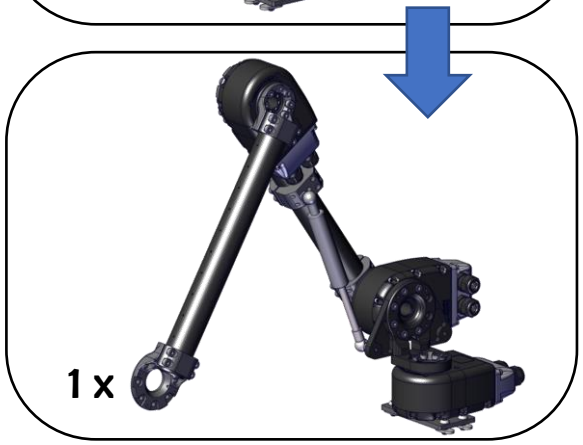
1 x

1 x
R8-16
Straight Connector



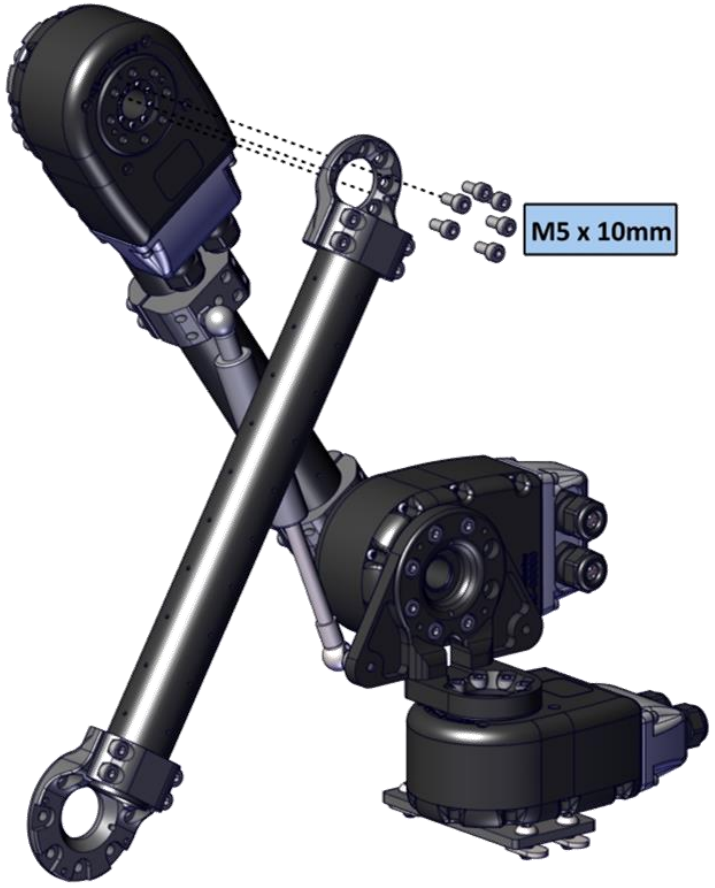


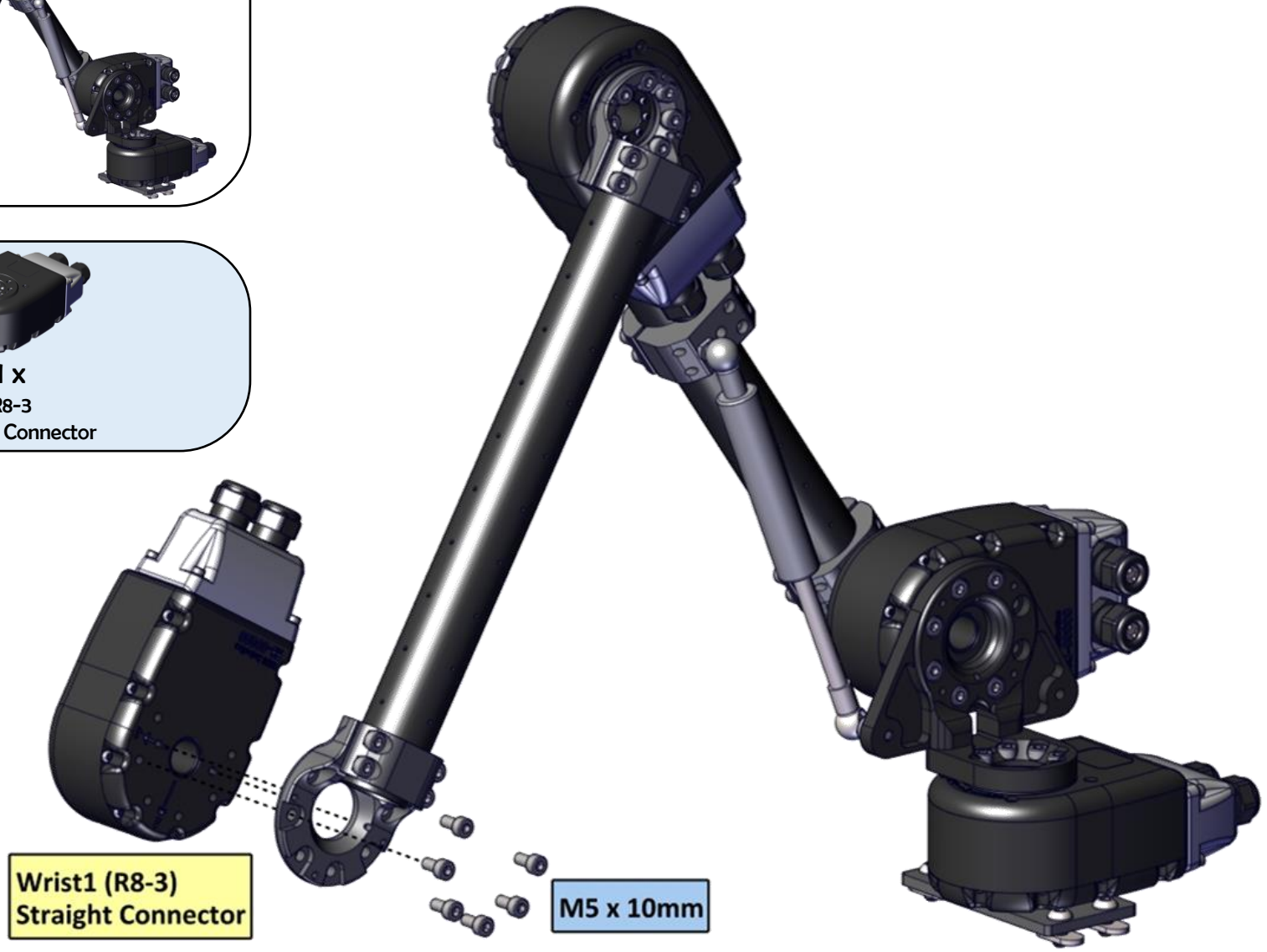




**Align with actuator output hub tick mark**

**(Tube aligns with tick mark)**




1 x
R8-3
Straight Connector



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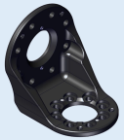


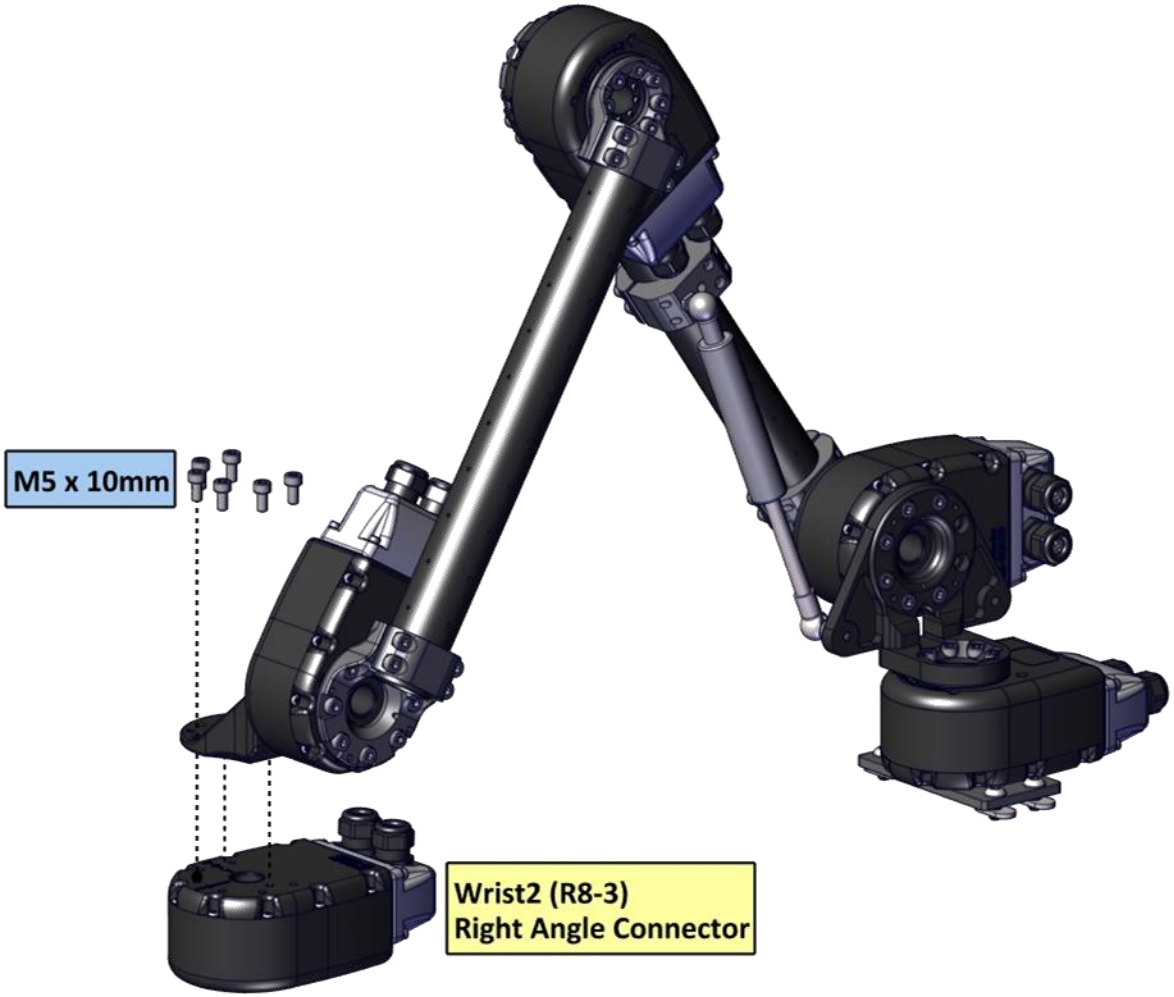
1 x
A-2220-01

Align with actuator output hub tick mark
(Flat face parallel with tick mark)

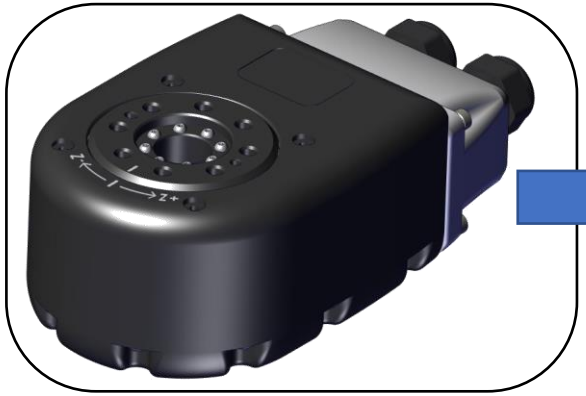
M5 x 10mm

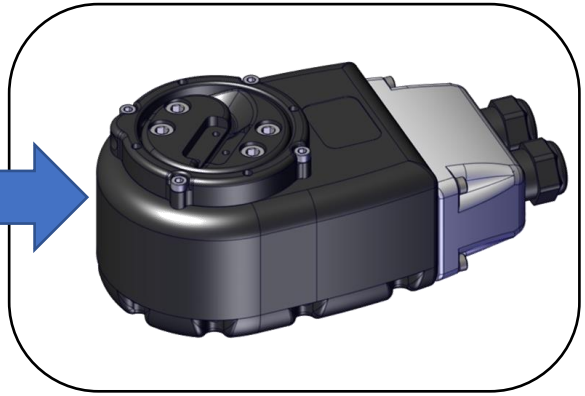

1 x
R8-3
Right Angle Connector


**Connectors of both modules point the same way**



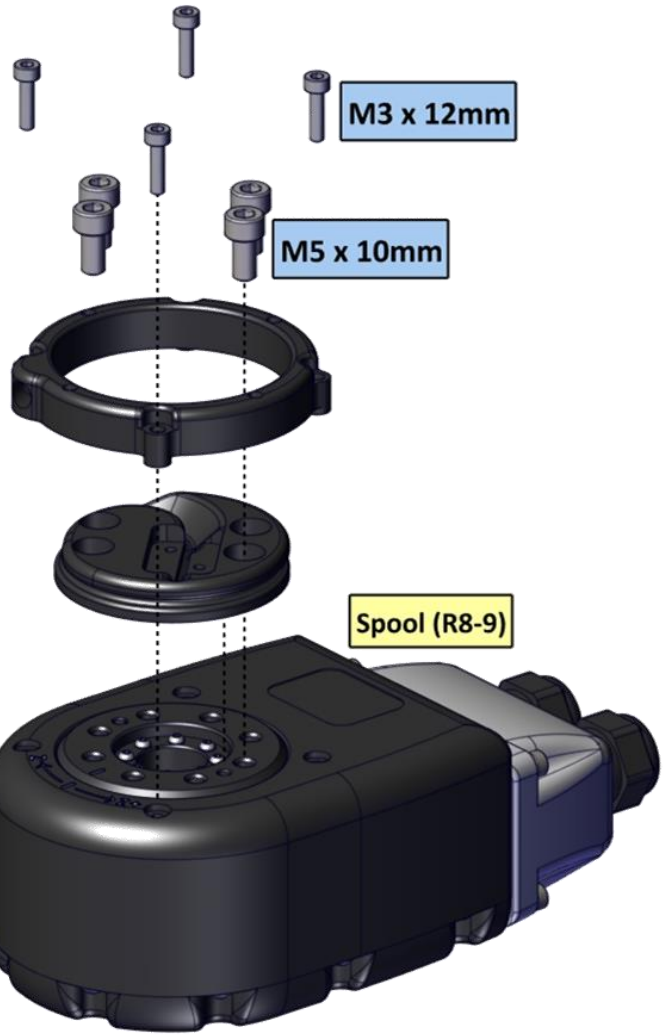
# Gripper

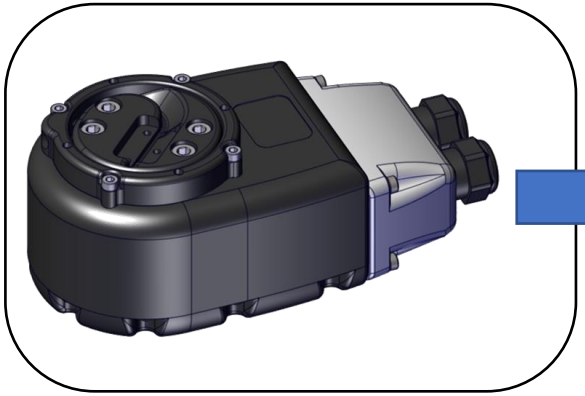


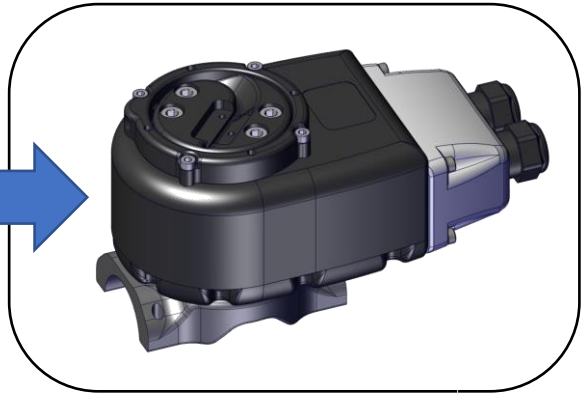


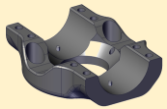
1 x
PM-2292-01
Spool

1 x
PM-2546-01
R-Series Spool Housing





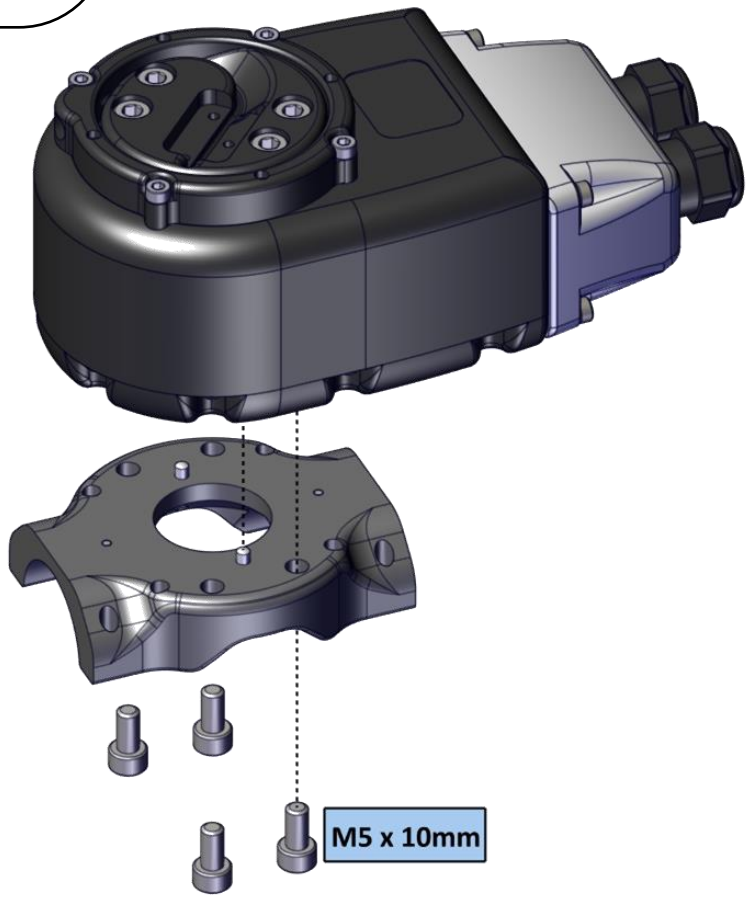


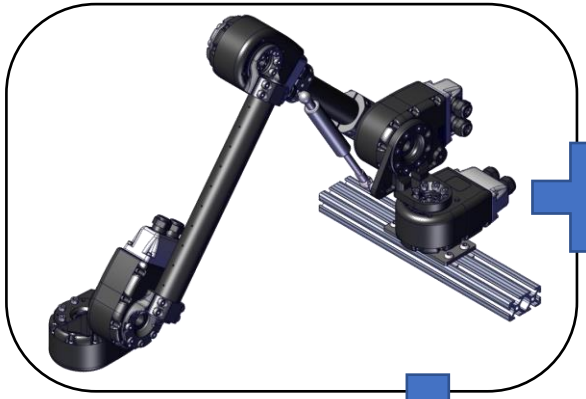


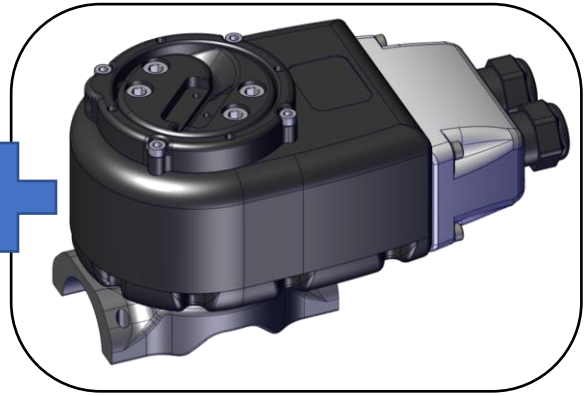
**1 x**

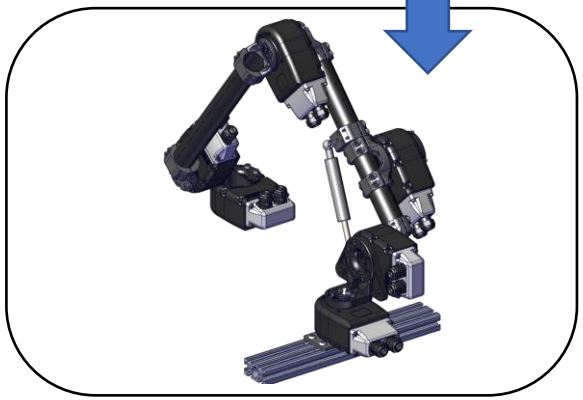
PM-2519-01

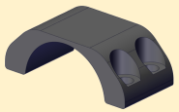
Housing Mid-Tube Mount



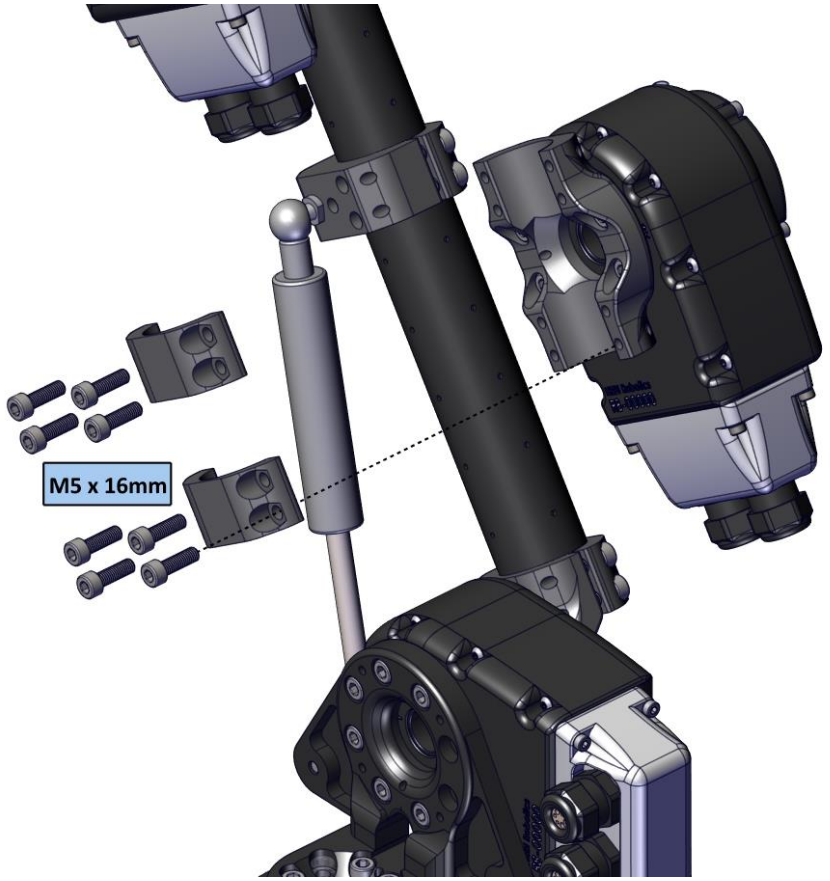


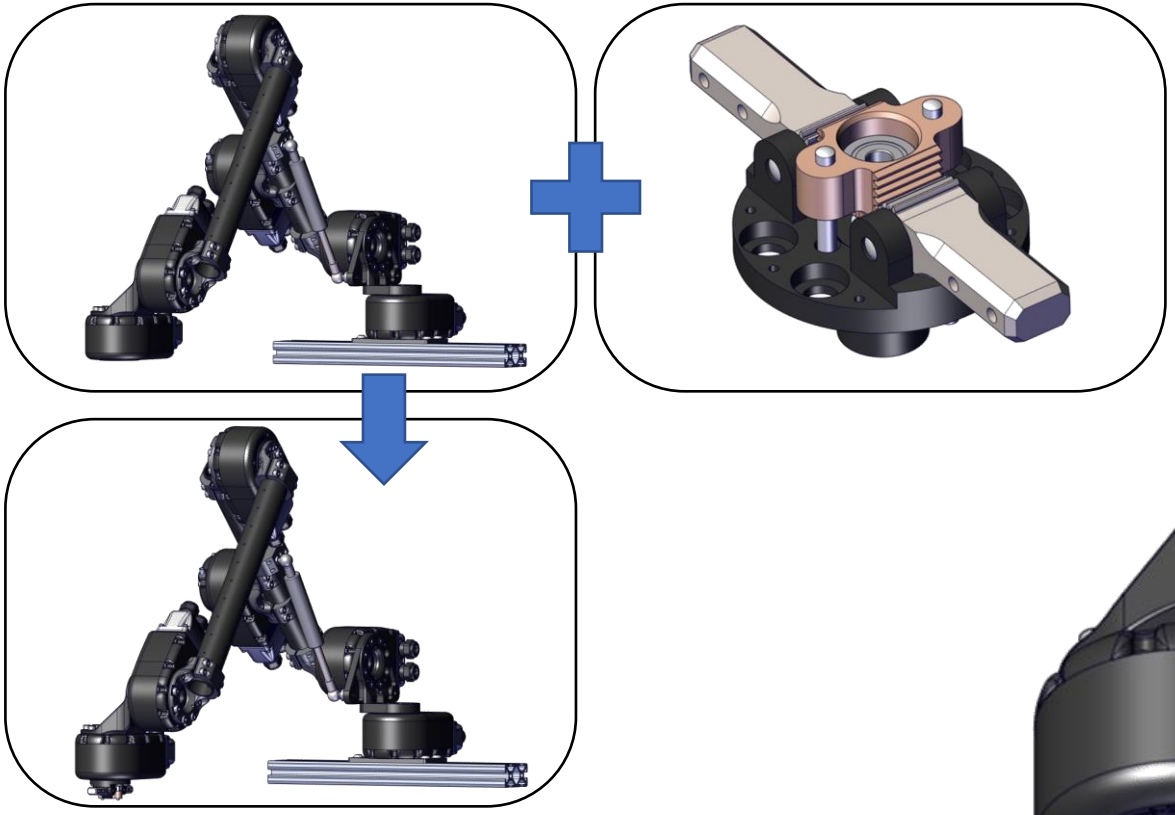


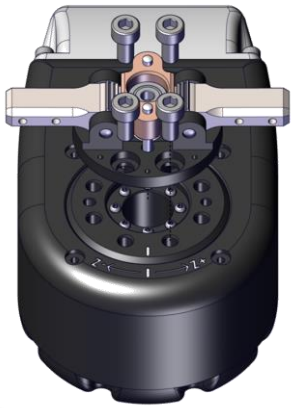




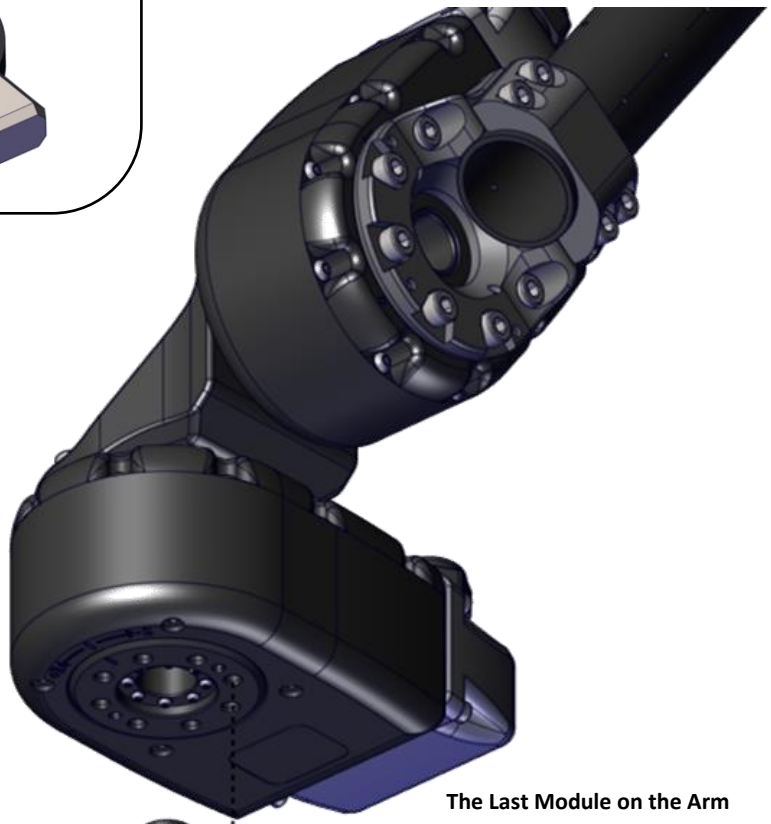
**2 x**
**PM-2148-02**
Tube Clamp



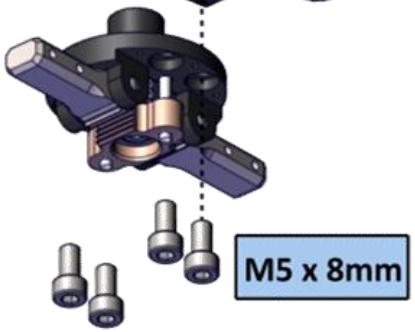




**Align with actuator output hub tick mark**
**(Fingers perpendicular to the tick mark)**



**The Last Module on the Arm**

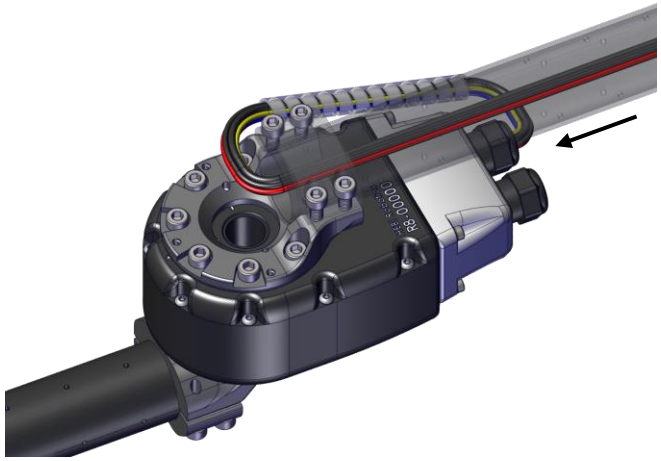


# Wiring Notes

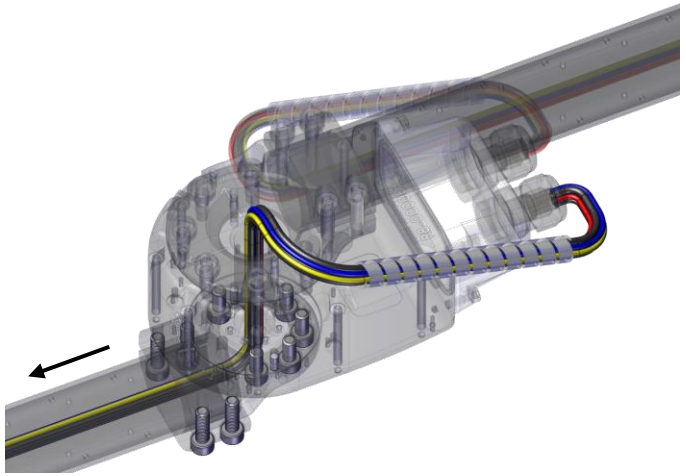
- Keeping wires organized will help prevent tangling and add a nice aesthetic.
  - Spiral sleeving is a good accessory for organizing loose wires
- Visit the following link to see detailed instruction on connecting wires to R-Series Modules.
  http://docs.hebi.us/#r-series-quickstart

For more information visit: ***docs.hebi.us***

[Spiral sleeving]

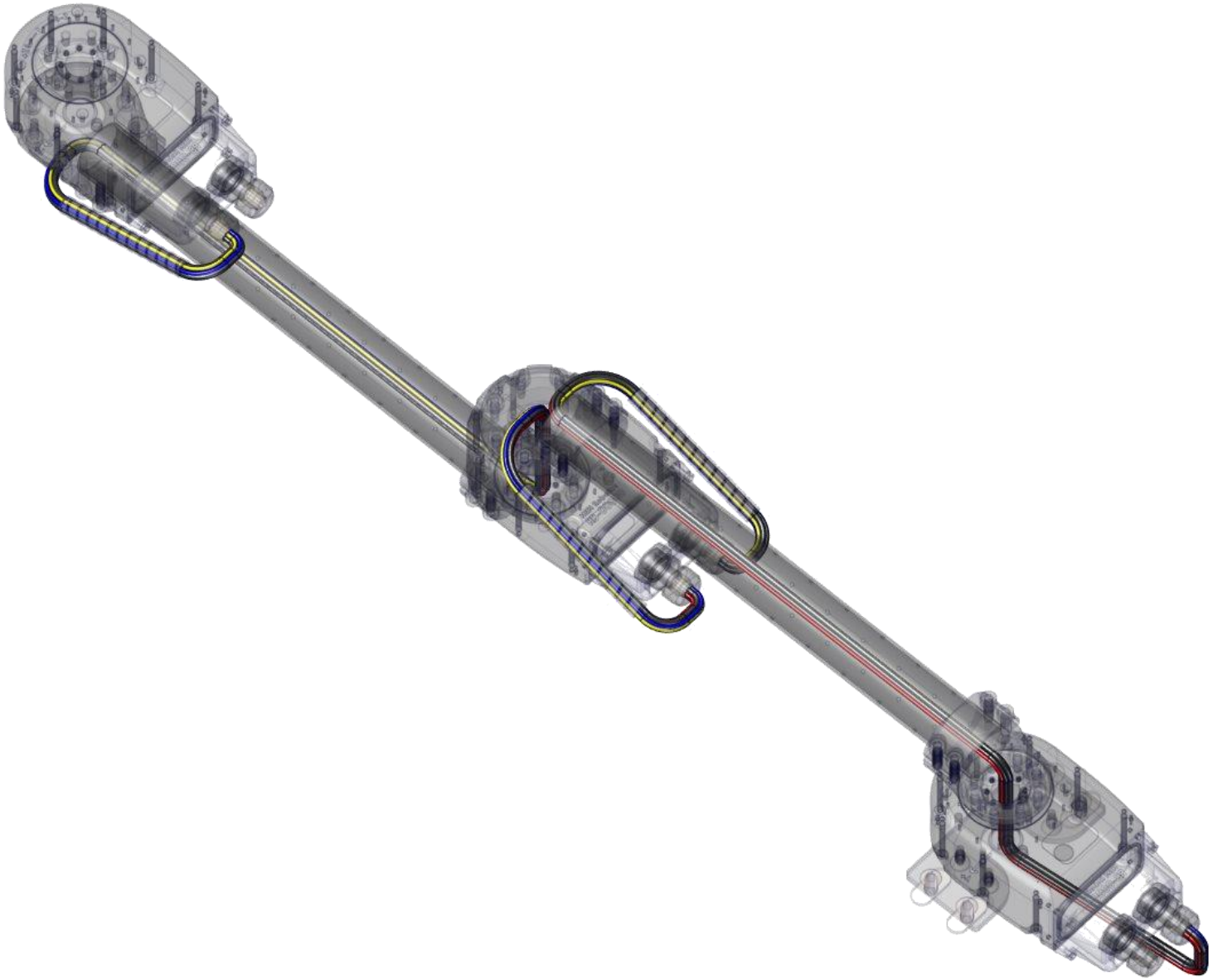


Wires that come from the previous joint should be inserted directly to actuator ports.

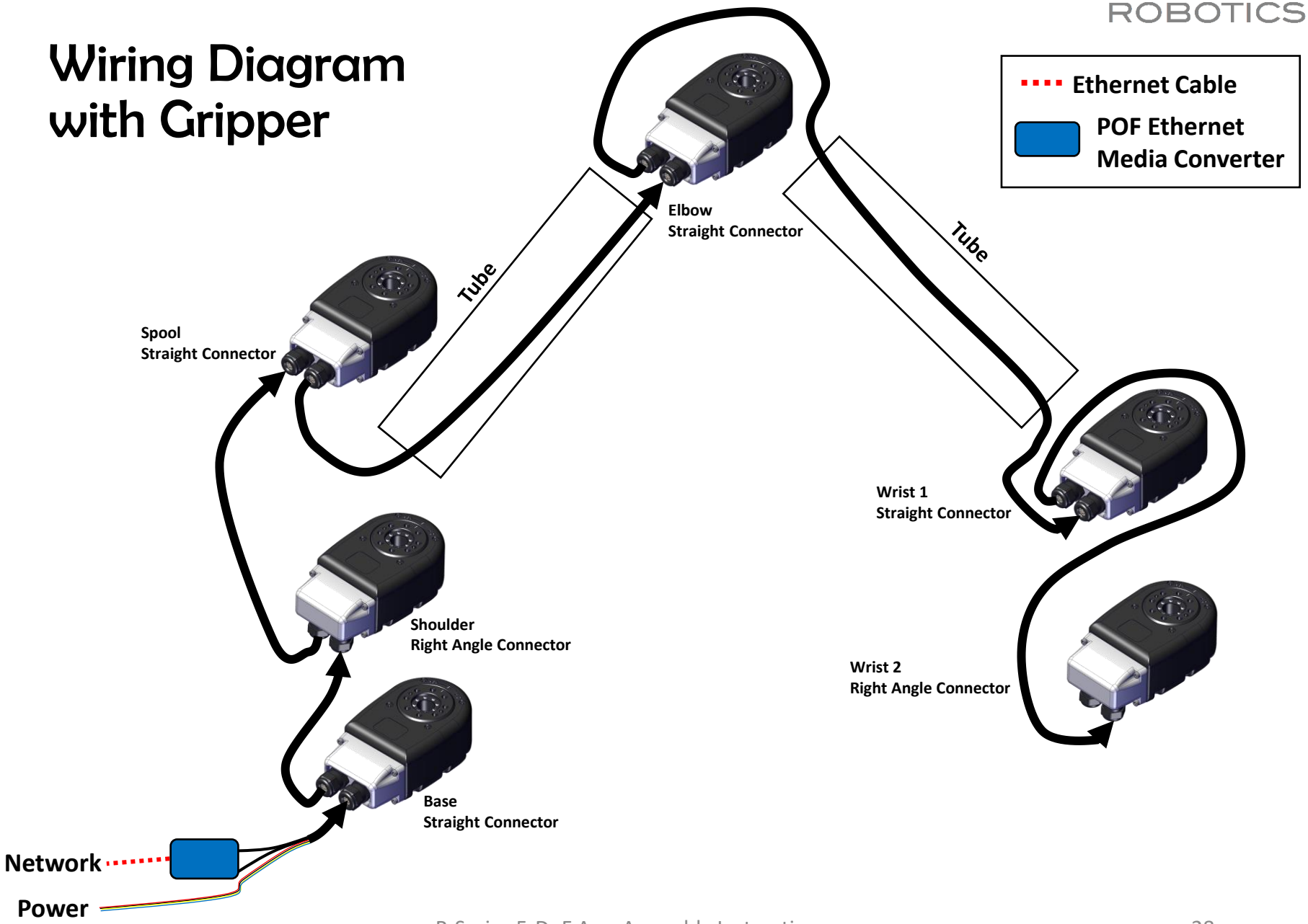


Wires that connect to the next joint should be threaded through the actuator's bore hole.

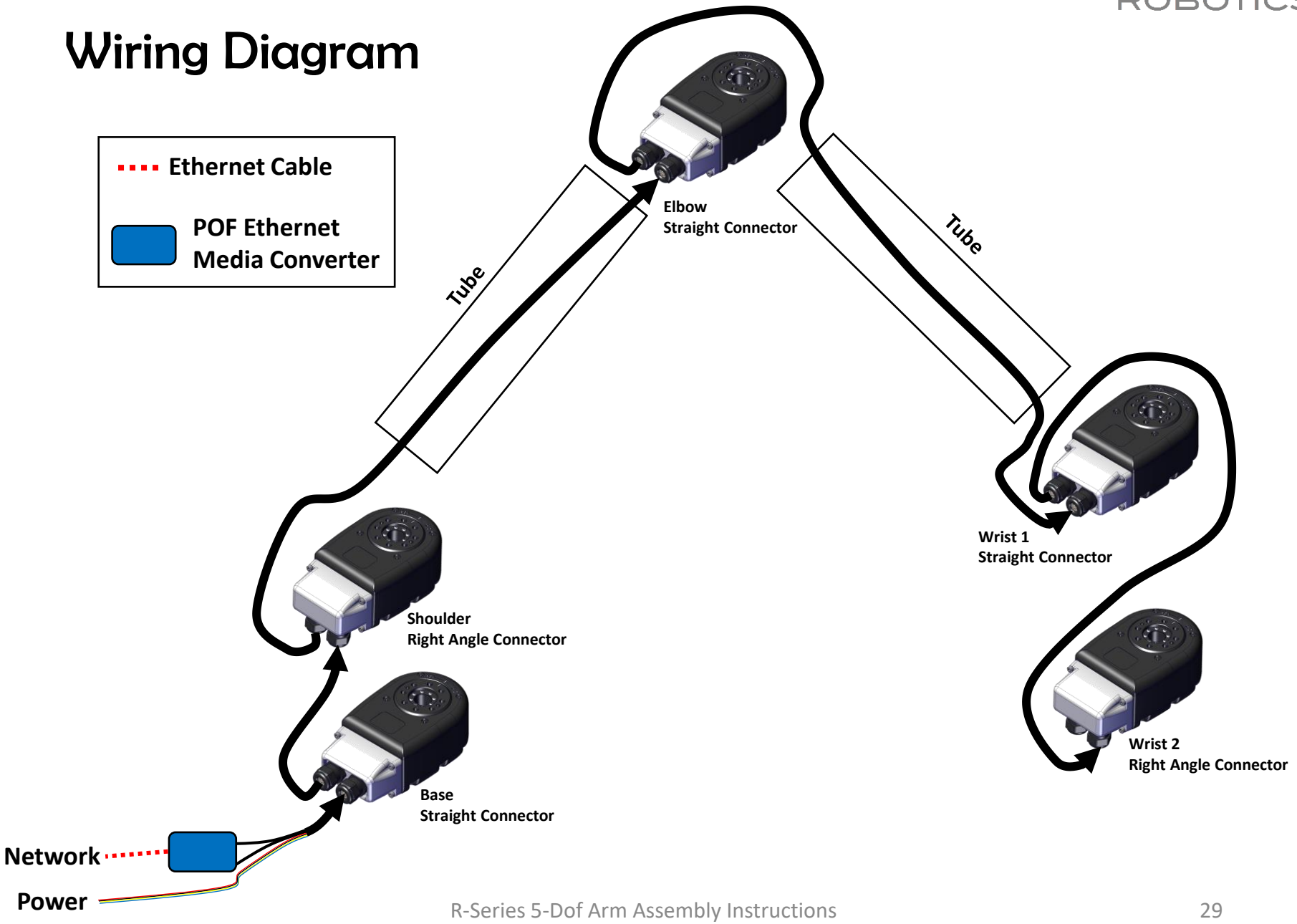
# Wiring Example



# Wiring Diagram with Gripper

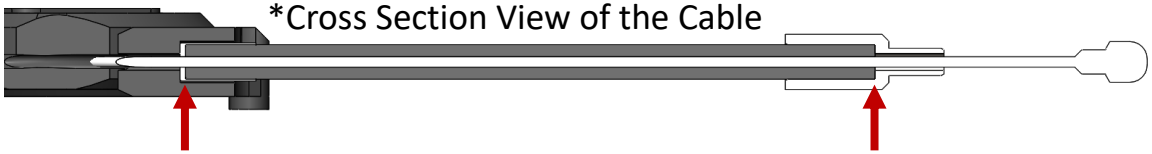


# Wiring Diagram

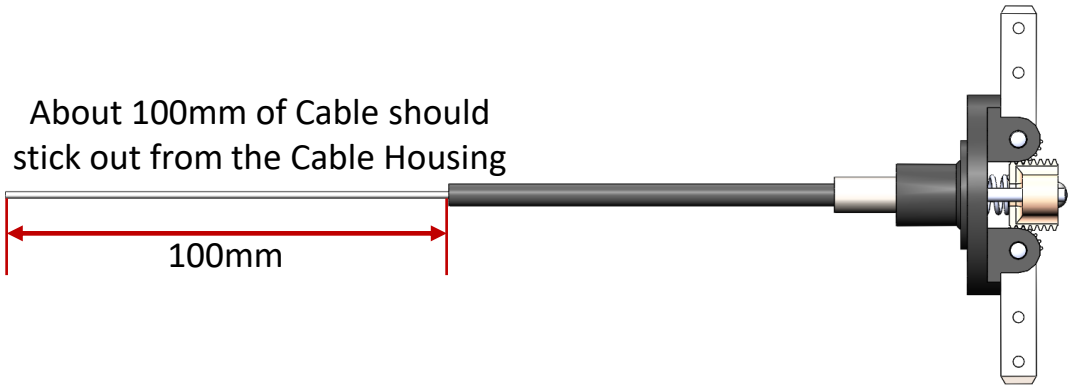


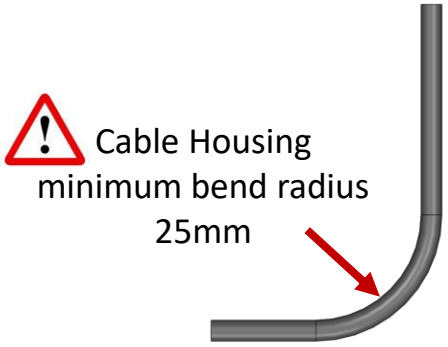
# Running the Cable Through

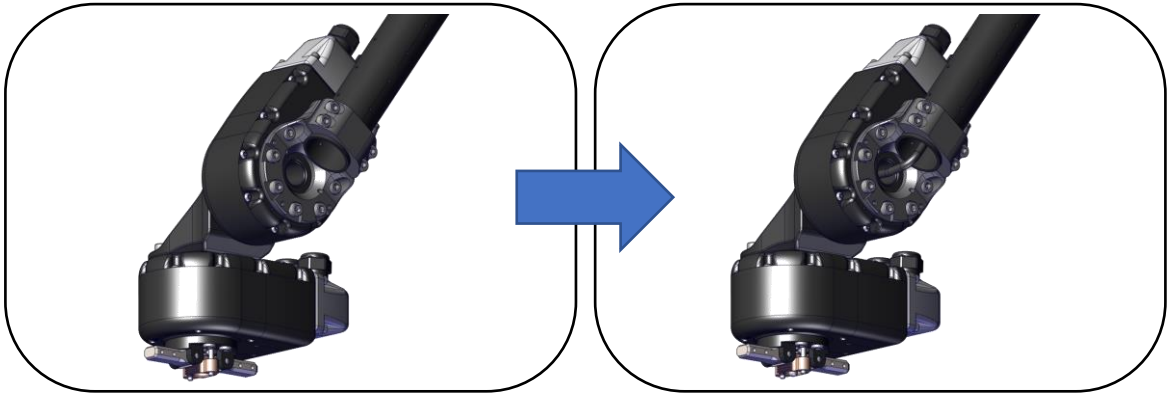
- Make sure to use a Standard Road Bike Brake Cable.
- Run the cable to fit your system.
- Run both the cable and the cable housing before cutting them to ensure that the cable is long enough.
- Cut the cable housing first, and then cut the cable.

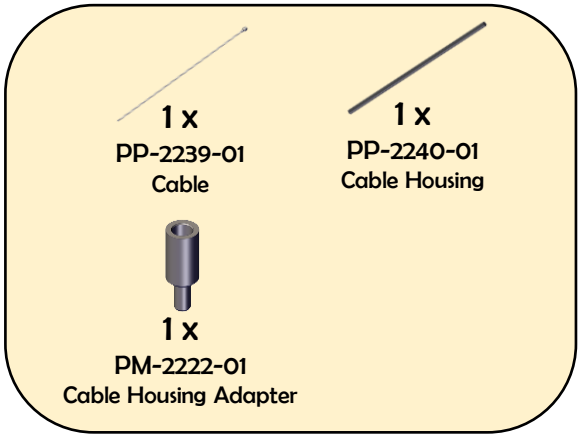



Make sure that the Cable Housing is long enough to be fully inserted into the Housing End Cap and the Housing Adapter

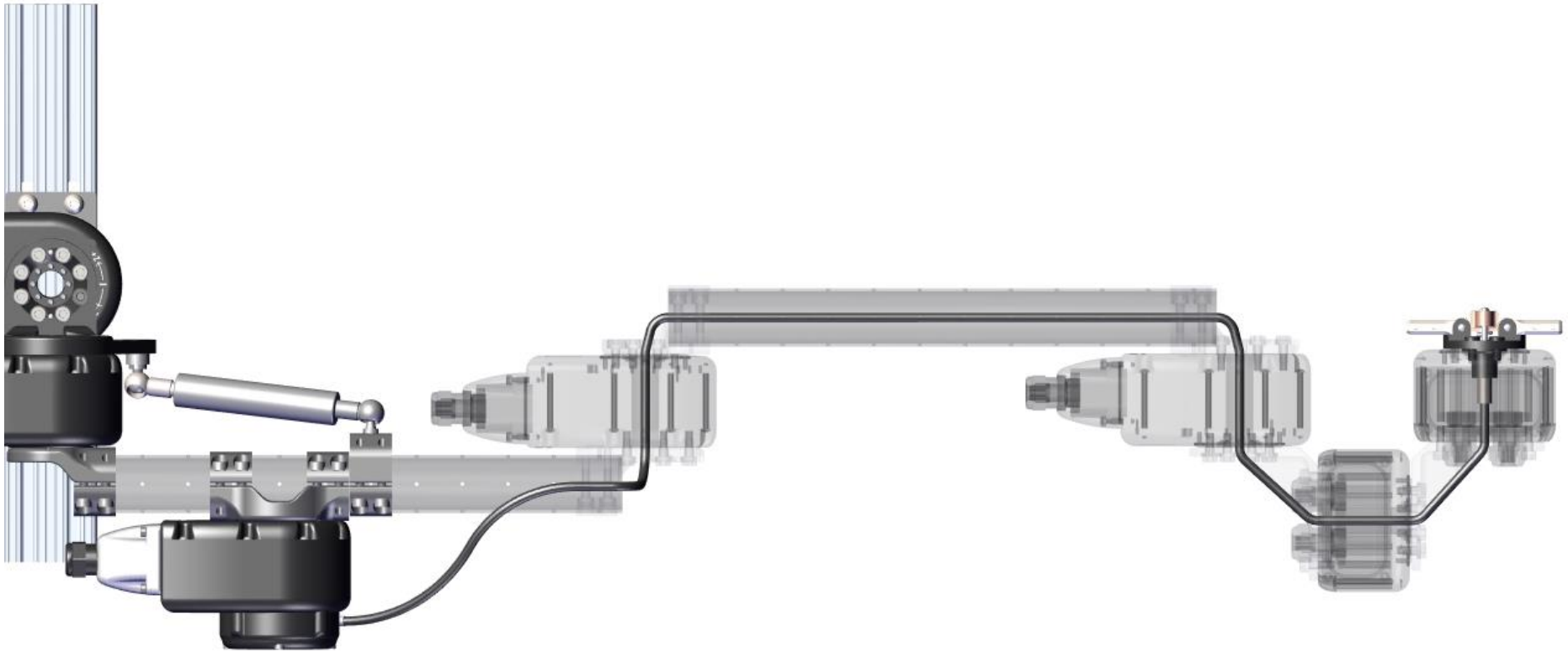


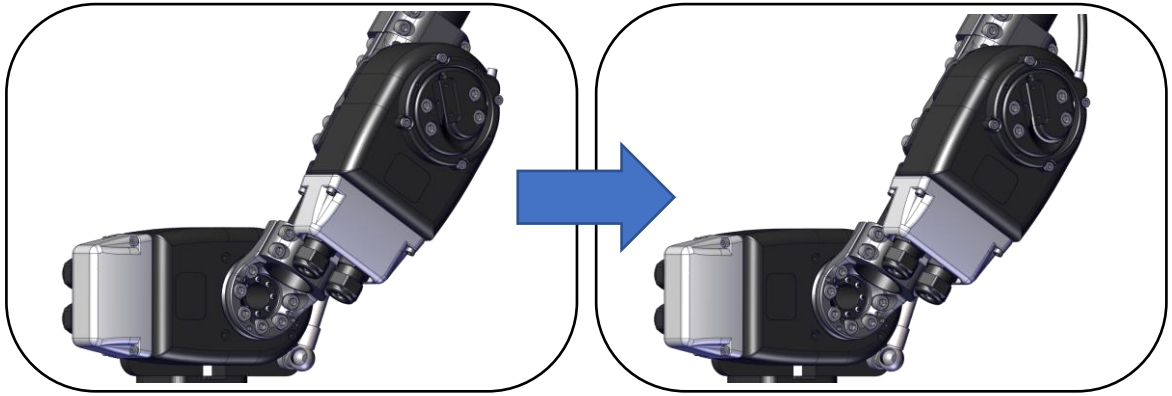



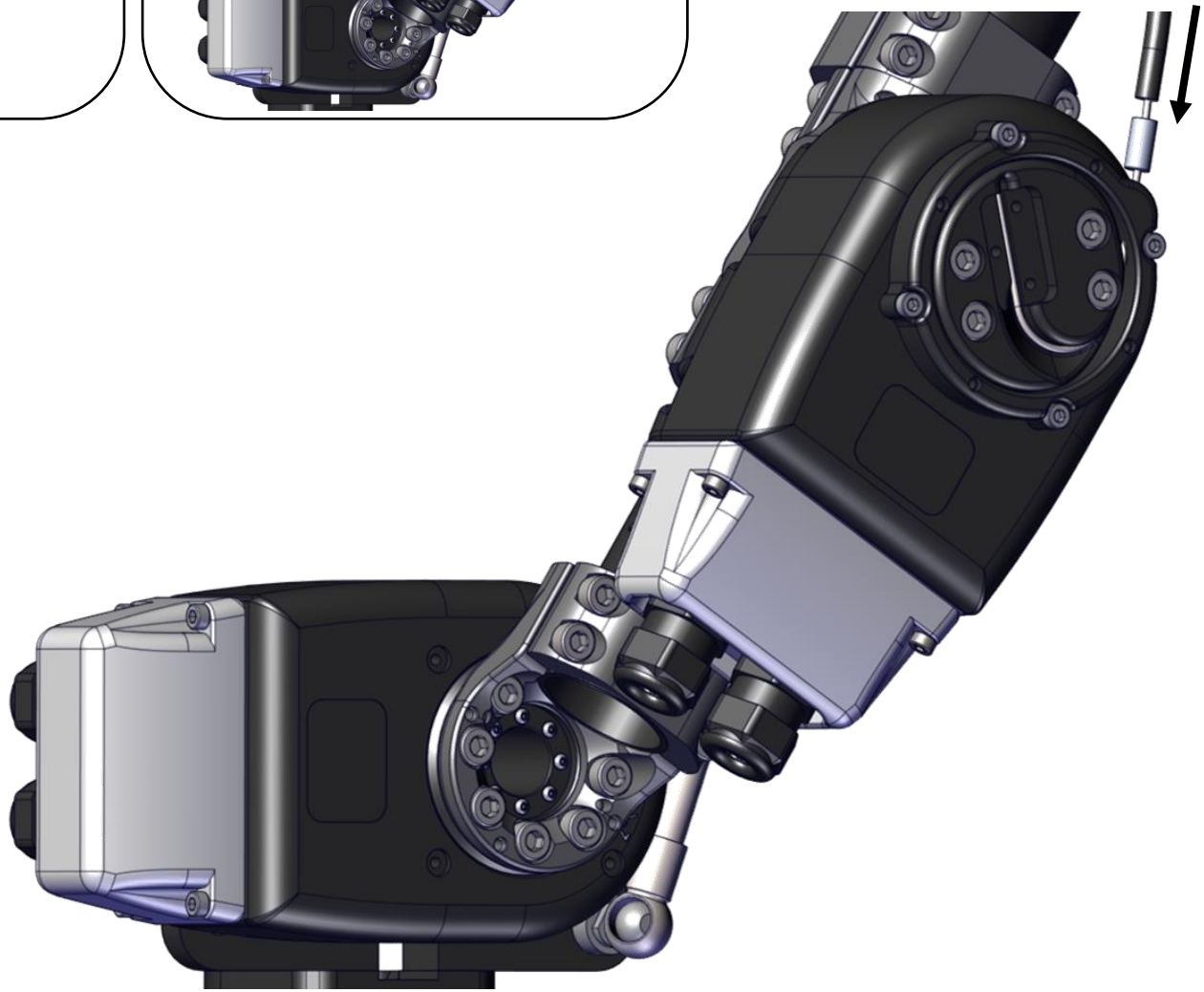


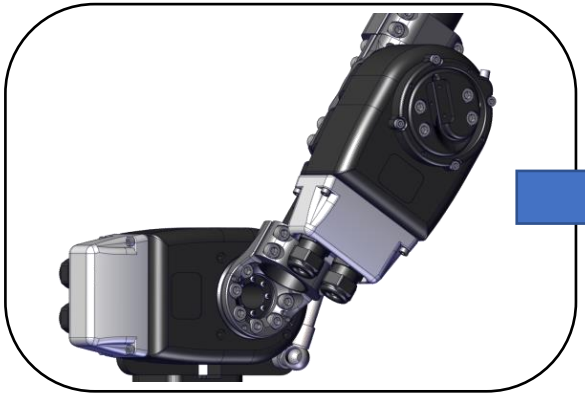

1 x
PP-2239-01
Cable
1 x
PP-2240-01
Cable Housing
1 x
PM-2222-01
Cable Housing Adapter

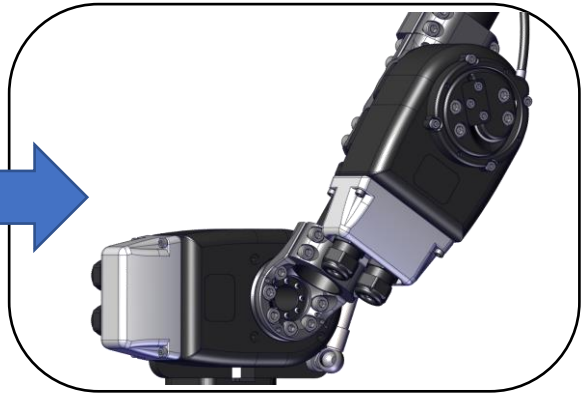
# Cable Routing Example (6-Dof Arm)

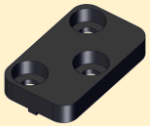




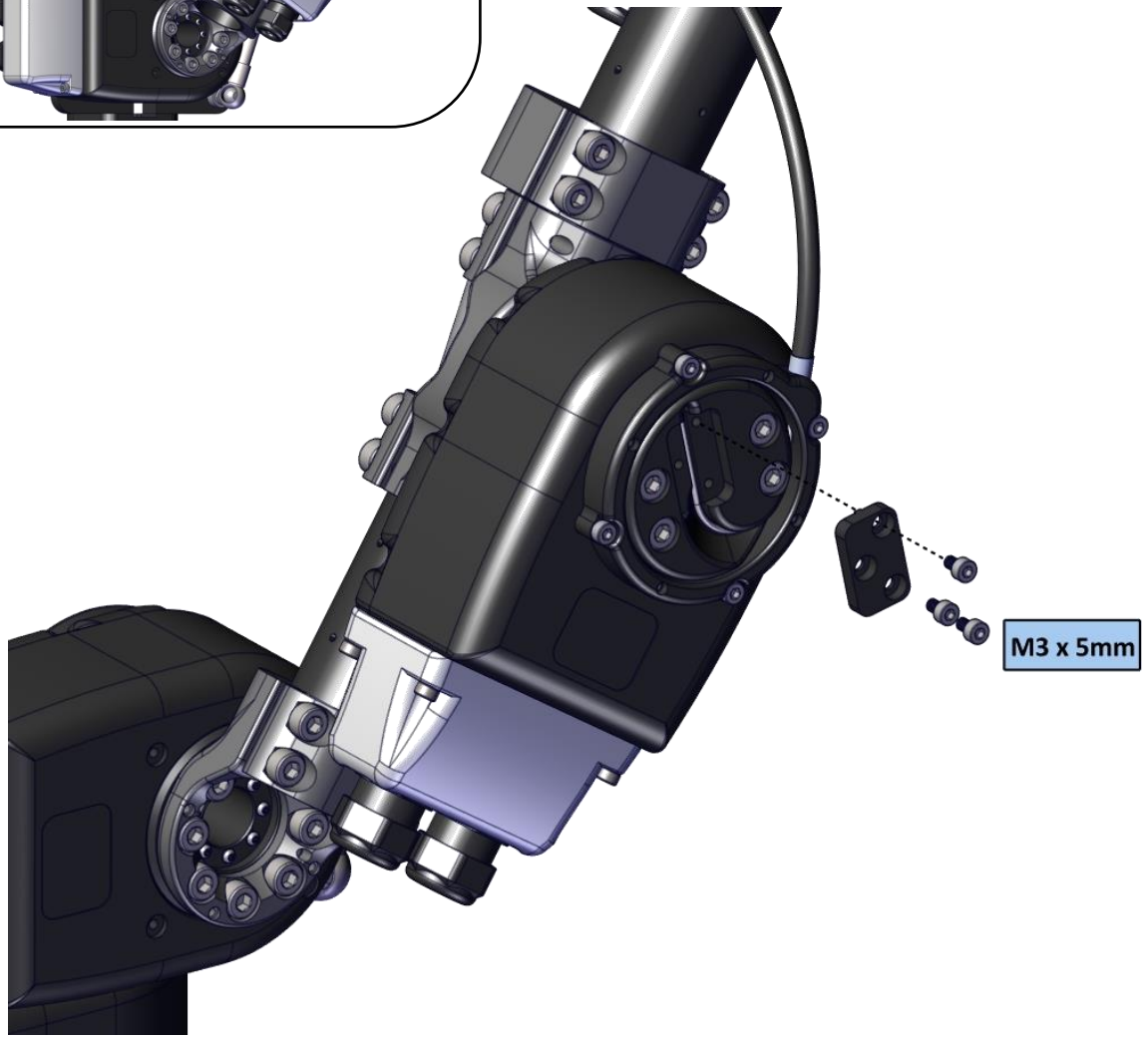








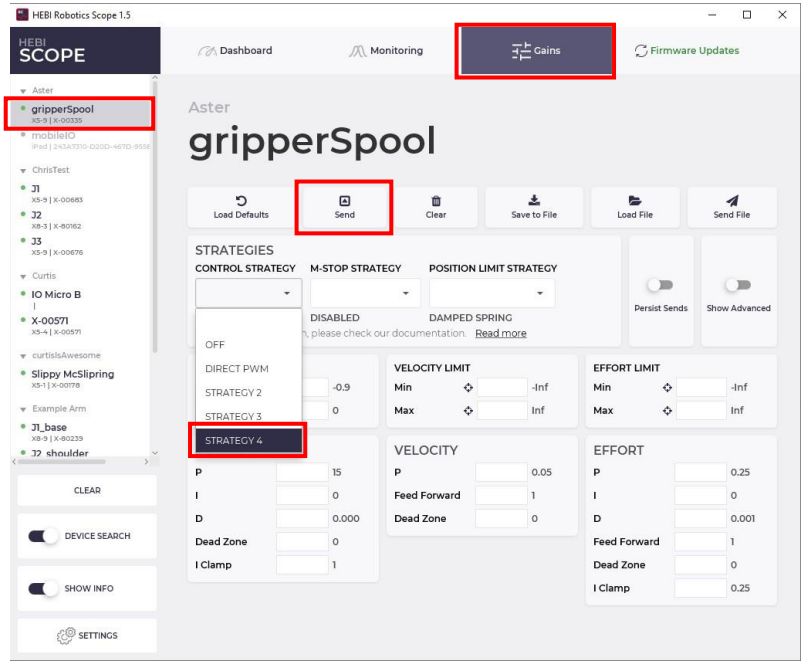
1 x
PM-2292-01
Spool



# Initializing the Spool, pt. 1

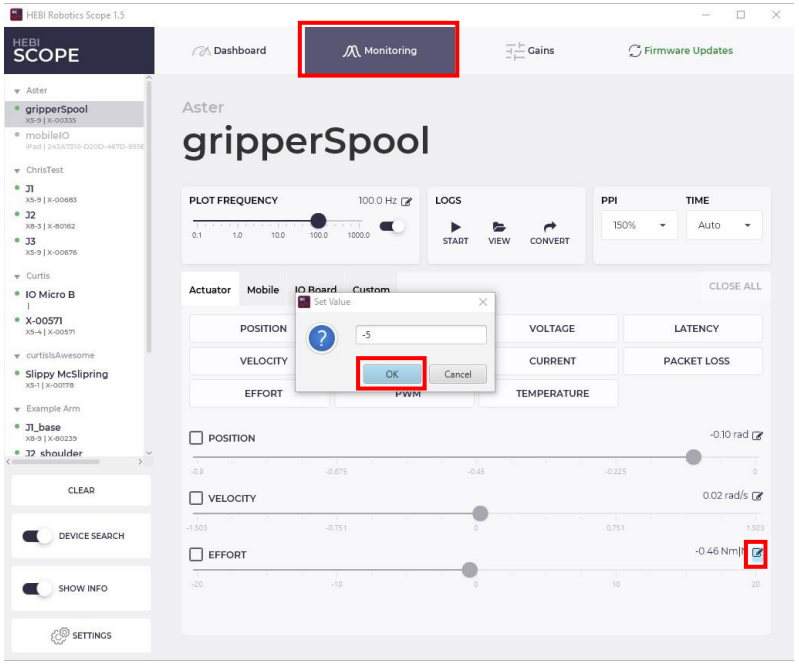
I. Connect the Spool Module into the network, and turn it on

II. Open HEBI Scope GUI




III. Set the Strategy of the Spool Module to "STRATEGY_4"

1. Click on your Spool Module
2. Go to "Gains" tab
3. Use the Control Strategy drop down menu to select a Suitable Strategy for your Application
4. Click "Send"

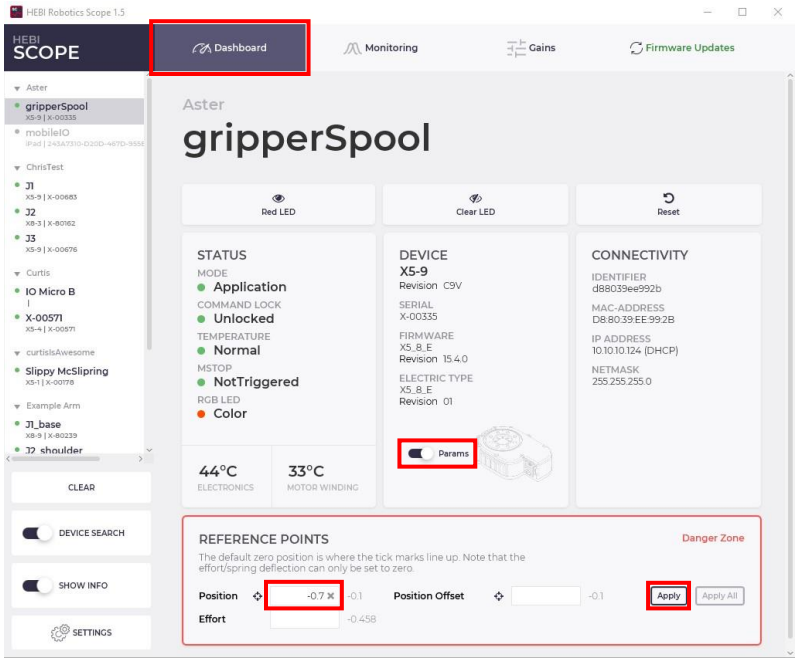



IV. Command the Effort to -5 Nm

1. Go to "Monitoring" tab
2. Click the "Target Button" for the Effort
3. Type "-5" and Click "OK"

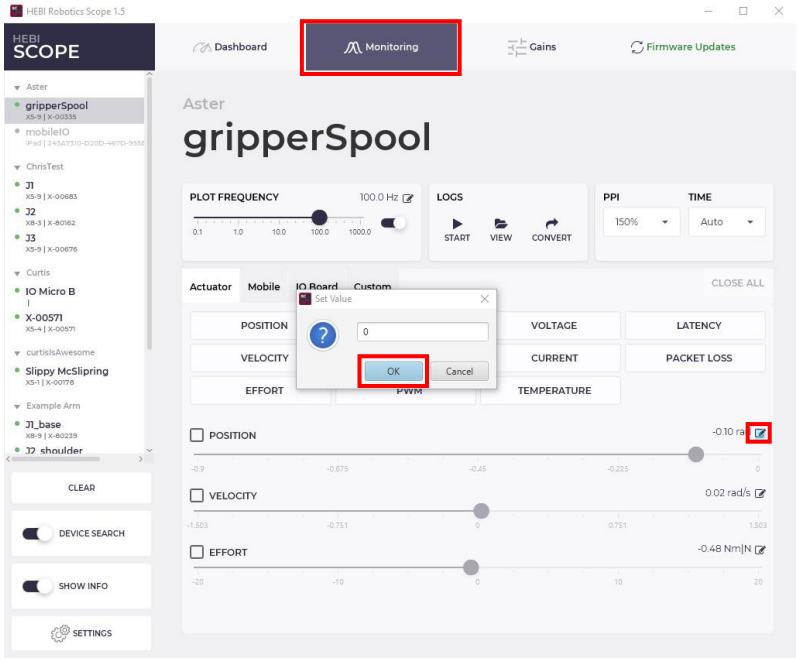
The Spool will wind the Cable and close the Fingers.

# Initializing the Spool , pt. 2




V. While Commanding the Effort, set the current position to "-0.7"

1. Go to "Dashboard" tab
2. Toggle "Params" as shown
3. Type "-0.7" for Position
4. Click "Apply"




VI. Stop commanding the effort, and command the position to 0.

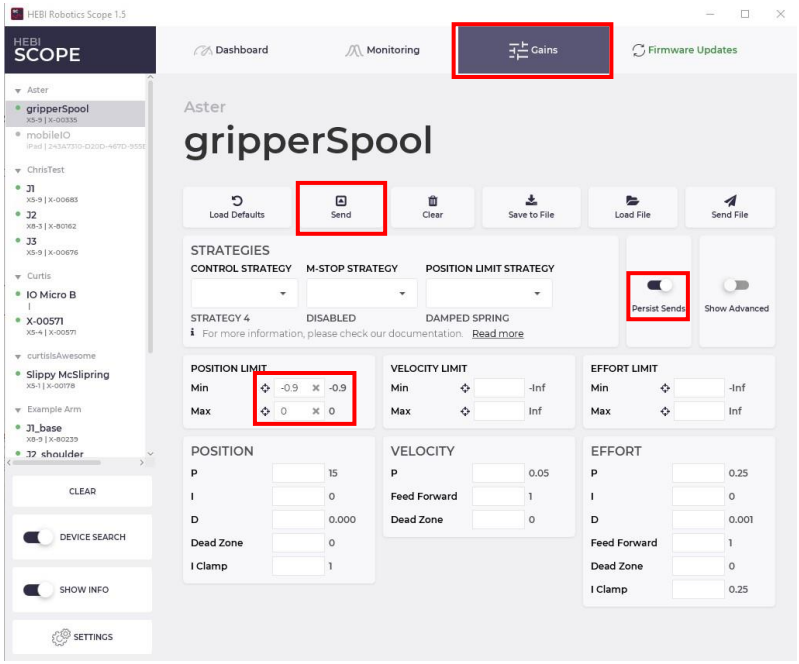
1. Go to "Monitoring" tab
2. Click the "Target Button" for Position
3. Type "0" and Click "OK"

⚠ The Spool will unwind the Cable and open the Fingers.

*To close the gripper, turn the spool clockwise.*

*To open the gripper, command the spool to zero position.*

# Initializing the Spool, , pt. 3



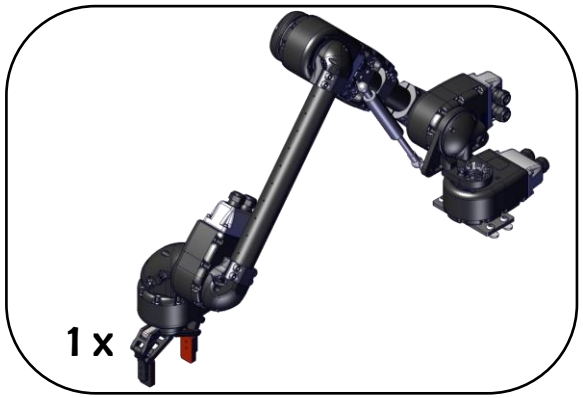

VII. Set Safety Limits for the Spool

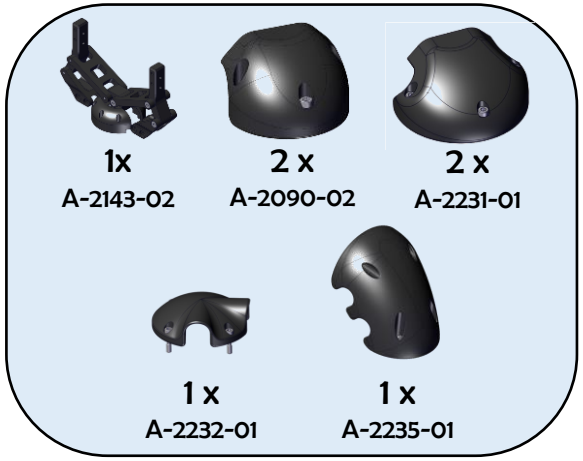
1. Go to “Gains” tab
2. Type “-0.9” for Min Position
3. Type “0” for Max Position
4. Toggle “Persist Sends” as shown
5. Click “Send”

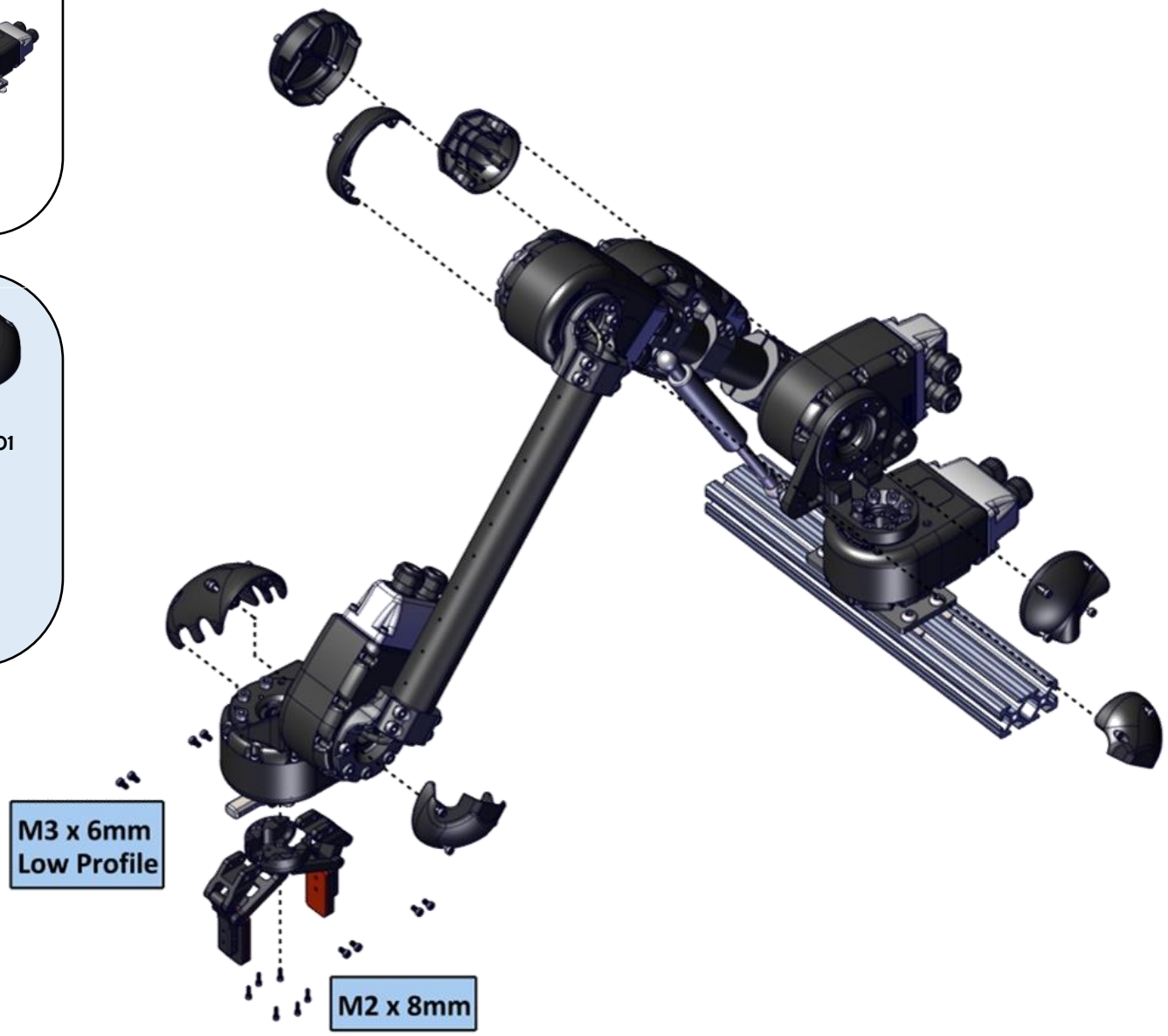
*If the Safety Limits are not set, the spool can turn to a position greater than zero, and break the cable.*

*To close the gripper, turn the spool clockwise (negative effort).*

*To open the gripper, turn the spool counter-clockwise (positive effort)*




**Install cables before adding caps**

# Additional Accessories

- Power Supply, 36V 220W (A-2098-36)
  - Comes with correct Molex Minifit Jr 2 connector

- HEBI I/O Board (A-2116-01)
  - Integrate with 3rd party end effectors or tools using HEBI APIs

- HEBI Gripper
  - Cable driven gripper keeps weight away from end of arm
  - *Modules sold separately*

HEBI ROBOTICS