

USER MANUAL



QS 220

The Motion Systems, manufacturer of Qubic System, would like to thank you for choosing the QS-220, an innovative product that helps you to develop highly reliable training and entertainment solutions that reproduce key immersive elements, such as surface textures, acceleration, engine vibrations and vehicle dynamics for multiple types of land, air or sea vehicles. Our motion system has been designed to deliver the most realistic simulation experience. We hope you enjoy your new Qubic System!

Our experts are ready to assist you:

QubicSystem.com/contact



ASK SUPPORT

Our experts are ready to assist you:
MotionSystems.eu/Support



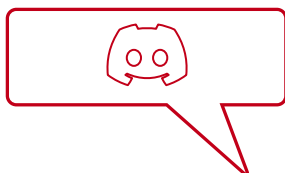
SEARCH OUR TUTORIALS

Everything you wish to know is here:
QubicSystem.com/Tutorials



SUPPORTED GAMES

Racing games and professional simulation software:
QubicSystem.com/Supported-Games



DISCORD YOU ASK, WE ANSWER

Join our discord server to ask questions:
QubicSystem.com/Discord

Contents

1	Safety precautions	7
1.1	General safety	7
1.2	Health and Safety Instruction	8
2	Technical details	12
2.1	Intended use	12
2.2	List of components	13
2.2.1	QS-MC6 set	13
2.2.2	QS-220 2DoF set	13
2.2.3	QS-220 3DoF set	14
2.2.4	Power Cord	15
2.3	Dimensions	16
2.4	Power requirements	18
2.5	Power consumption	19
2.6	Maximum payload	20
2.7	Environmental conditions	20
3	Accessories	21
3.1	QS-Pivot	21
3.1.1	Dimensions	21
3.1.2	QS-Pivot components	21
3.1.3	Mounting to an aluminum profile cockpit	22
3.1.4	Adjustment dimensions	23
4	Setup and installation	24
4.1	Before installation	24
4.2	Installing QS-220 to an aluminum profile cockpit	25
4.2.1	Mounting QS-220 actuators	26
4.2.2	Mounting the Power Cabinet	28
4.3	QS-220 2DoF layouts	30
4.4	QS-220 2DoF CFG DIP switch configuration	31
4.5	QS-220 3DoF layouts	33
4.6	QS-220 3DoF CFG DIP switch configuration	35
4.7	Actuator connection with a Power Cabinet	36
4.7.1	Actuator's cables management	38
4.8	QS-220 2DoF cable connections	38
4.9	QS-220 3DoF cable connections	40
4.10	QS-220 with QS-CH2 cable connections	42
4.11	QS-220 with QS-CH2, QS-BT1 and QS-DD-20 Motion Lock diagrams	44
4.12	Software Installation	47
5	Maintenance and Cleaning	55
5.1	Platform Level Calibration	55
5.2	Checking Motion Lock button	56
6	Troubleshooting	57
6.1	Creating a snapshot	59
6.2	Discord channel	61
7	Advanced applications	62

7.1	Adding additional devices to the motion lock circuit	62
7.2	Implementing the working zone protection	64
7.3	Increasing safety level	65
7.3.1	Assembling Motion Lock jumper	65
7.3.2	Adding power-cut circuit with E-STOP button	66
7.3.3	Implementing the working zone protection with power-cut circuit	68
7.4	Implementing non-factory Motion lock switch	69
8	Conformity information	70
9	Environmental Impact and Disposal	70
10	Liability Disclaimer	70
11	Warranty	71
12	Copyright	72
13	Manufacturer information	72

1. SAFETY PRECAUTIONS

Read all safety instructions before installing and using this product. Save this document for future reference. If ownership of this product is transferred, be sure to include this manual.

Following coloured frames are used in this manual to draw attention to important information or warnings:

INFO

The instructions included in this frame indicate information that is considered important, but not injury- or damage-related.

WARNING

The instructions included in this frame indicate a dangerous situation that, if not avoided, could result in a user injury or device damage.

1.1. GENERAL SAFETY

WARNING



Keep hands and feet away from the moving parts when device is in motion.

WARNING



Always ensure that cockpit attachment points can withstand forces generated by the QS-220 (approved construction or tested for expected load). Check the cockpit for loose mounting points.

WARNING



To reduce the risk of burns, fire, electrical shock, injury or mechanical damage always **TURN OFF THE POWER SUPPLY** before plugging and unplugging the QS-220. Dangerous voltages level can be present in Power Cabinet for a few minutes after turning off the machine.

WARNING



The device is intended solely for individuals **OVER THE AGE OF 16**. In case of use by individuals with limited physical, sensory, or mental capabilities, strict supervision is required. Read safety instructions before using the device.

- Use the QS-220 only for its intended purpose, according to instructions.
- Unplug the QS-220 from the power supply if it is not used for an extended period or when there is a need to perform hardware installation, maintenance, servicing or repairs.
- Turn off the QS-220 when it is not in use.
- The QS-220 was designed for indoor use only - **DO NOT** store or use the product outdoors.
- Keep the QS-220 away from the heat sources, high humidity, water, and other liquids. **DO NOT** store in cold place where water condensation may occur.
- **DO NOT** disassemble the product. Any tampering with or altering the product will void the warranty, poses a serious risk of electric shock, and may irreparably damage the product.
- **DO NOT** cover the ventilation holes in the Power Cabinet.
- Keep the power cord plug and the socket dry, clean and dust-free.
- Protect the power cord from damage caused by being stepped on, rubbed against, or pinched.
- **DO NOT** use the QS-220 if the ambient temperature is below 5° Celsius (41° Fahrenheit) or above 40° Celsius (104° Fahrenheit).
- **DO NOT** use the QS-220 if it has been damaged, or any component is broken or missing. Please contact technical support.
- **DO NOT** use attachments or replacement parts not recommended or approved by the manufacturer. If you must replace a power cord, use only certified products with the same rating as the one being replaced.
- Connect the QS-220 to a properly grounded outlet only.
- If you want to increase safety level of the system, you can add external safety devices. For detailed information check section 7 on page 62.

1.2. HEALTH AND SAFETY INSTRUCTION

The safety of Qubic System users is top priority. To protect users and bystanders from injuries caused by mechanical parts movement and electric shock, the following instructions **MUST BE** followed.

WARNING



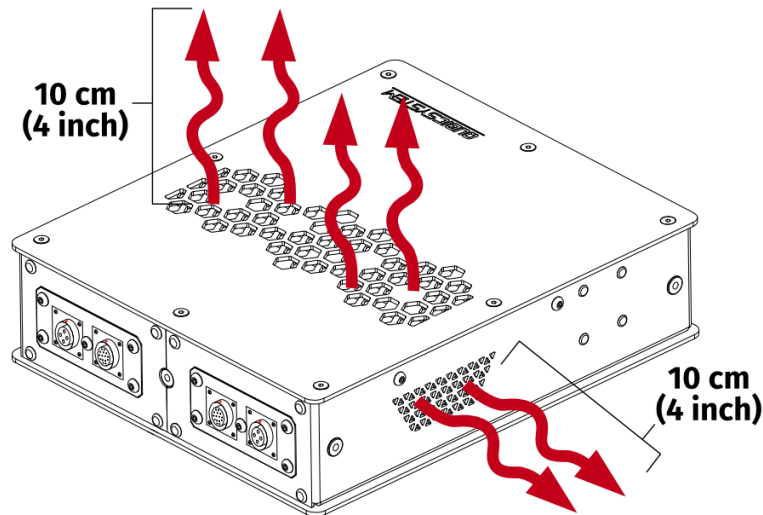
NEVER unplug the actuator with Power Cabinet's power ON, because the actuator will **launch upwards abruptly**.

WARNING

As with any mechanical device, user is the one responsible for inspecting the condition of the machine before using it and ensuring safe working conditions.

What must be checked before turning on the device:

- Ensure that nothing is blocking machine's movements or air vents. The minimum distance between the air vents in the Power Cabinet's and any outside part of the cockpit equipment is 10 cm (4 in).



- Check if cables are mounted correctly – they must **NOT** be stretched or loosely connected to the socket. Place them out of the moving range of the device components.
- Check if all components are correctly mounted.
- Check if there are no sharp edges near the moving range of the cockpit.

WARNING

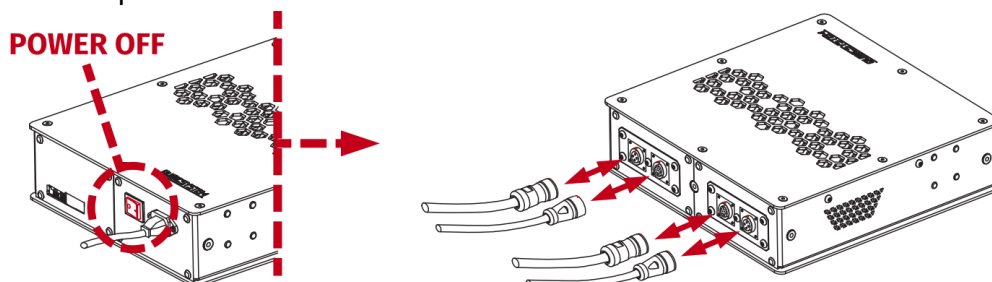


Dangerous voltage levels are present in the Power Cabinet and cables during the operation and for up to a few minutes after turning off the machine.

How to safely turn on and use the QS-220:

WARNING

Plugging and unplugging the actuator must **ALWAYS** be performed with Power Cabinet's power switched OFF.



- Ensure that everyone around is aware of cockpit's rapid movements.
- Ensure that no one stands in the range of the motion (minimum of 1.5 m [5 feet]).

WARNING

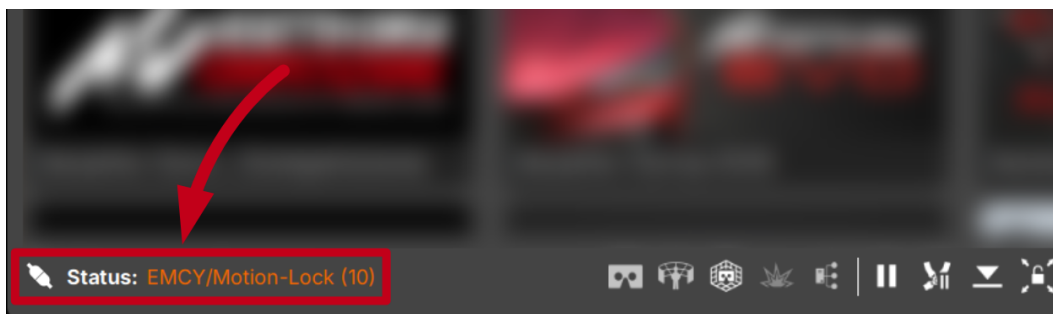


In order to perform a start-up calibration QS-220 will move automatically after turning it on. Keep hands and feet away from the moving parts when device is in motion.

- **DO NOT** change the payload weight mounted to the QS-220 during a start-up calibration.
- Motion Lock Switch should be mounted within the reach of the user – it has to be available immediately in every situation. Different seat positioning setups should be taken into account.
- Check the Motion Lock Switch **AT LEAST** once a month to reduce the possibility of unknown and unexpected failure – more information available in chapter 5 on page 55.
- Before getting on and off the machine activate Motion Lock Switch by pressing it down.
- In case of game crash or freeze - Motion Lock Switch must be triggered (pressed down) before getting off the machine.

INFO

To check if the QS-220 is in the Motion Lock mode - go to QubicManager application main window. Platform status is displayed in the lower left corner of the main application window:



INFO

Motion Lock input is not SIL/PL (safety integrity level/performance level) rated and **DOES NOT** guarantee safety. If you wish to achieve specific SIL/PL ranking, consider introducing a power cut-off device that is controlled by an external safety relay and cuts off the power to all Power Cabinets. Example application of the power cut-off contactor can be found in section **7.3.2** and **7.3.3** on pages **66** and **68**.

- For VR Headset users:
 - Remove the VR goggles before entering or exiting the rig.
 - Ensure that cables from the VR Headset are not in the movement range of the QS-220.
 - Ensure that the whole VR setup is not in the motion range of the QS-220.
 - Ensure that VR setup cables are protected from being crushed by the QS-220
 - **DO NOT** place them loosely under the motion rig.

INFO

It is **recommended** that the connected PC is capable of running the game at stable 90 frames per second or more when VR Headset is used. Lower values can cause VR sickness.

- **DO NOT** use QS-220 if you are pregnant, tired, or under the influence of alcohol or narcotic substances.
- **STOP USING** the QS-220 immediately if you start feeling pain, fatigue or any physical or mental discomfort.
- For every two hours of playing, we recommend at least **15 MINUTES OF BREAK**.
- **DO NOT** put your hands or legs in the actuator's range of motion!
- **DO NOT** use the QS-220 with small children or pets around.
- **DO NOT** put any items between actuators and stabilization pads.
- **DO NOT** pull the wires connecting the actuators with the Power Cabinets.

2. TECHNICAL DETAILS

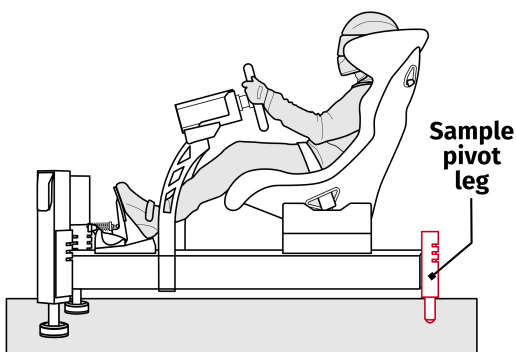
2.1. INTENDED USE

QS-220 is a set of industrial-grade linear actuators with Power cabinets and mounting and connection accessories. It enables users to introduce vertical movement into their gaming rigs to increase the immersion of the simulation.

QS-220 could be set out into two variants - 2DoF (two degrees of freedom) and 3DoF. It is designed with upgradeability in mind – it is possible to expand from 2DoF to 3DoF setup later on. Available variants are presented below (illustrations show an example assembly).

INFO

QS-220 is delivered without the pivot leg. There is an accessory Pivot bar available for purchase - go to section 3.1 on page 21 for technical details.



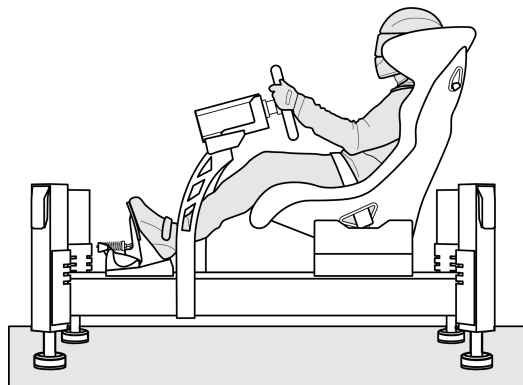
QS-220 2DoF - Front variant



QS-220 2DoF - Back variant

INFO

Single pivot leg should be mounted in the middle of the rig - in a longitudinal axis defining the center between the front or back actuators.



QS-220 3DoF

2.2. LIST OF COMPONENTS

Qubic System provides the option to buy the QS-220 motion set with **QS-MC6** controller set and **QS-220** 2DoF (**QS-220 is delivered without the pivot leg**) or 3DoF set.

INFO

Check if the box contains all listed parts. If incomplete, please contact the distributor/reseller.

2.2.1 QS-MC6 SET

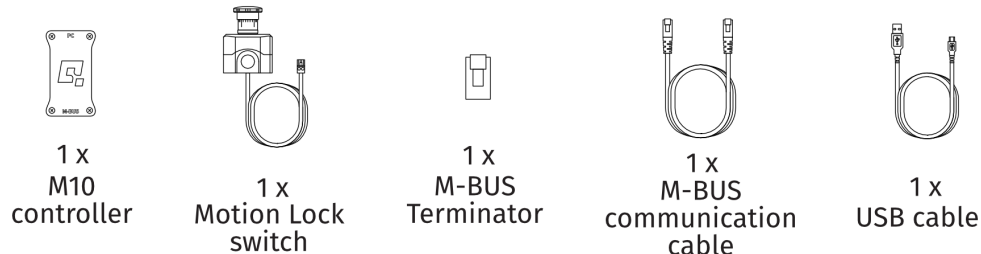
M10 controller (from the QS-MC6 set) is specifically designed to use communication protocol created by Qubic System. It allows for connecting PC with the QS-220 - **DO NOT** try to substitute this device. M10 requires USB connection (with an USB port on your PC).

INFO

M-BUS terminator, which is a RJ45 connector with a resistor, is a small but very important part used in the last Power Cabinet in the set.

For cable connections information go to section **4.8** on page **38**.

The QS-MC6 set includes following components:



2.2.2 QS-220 2DOF SET

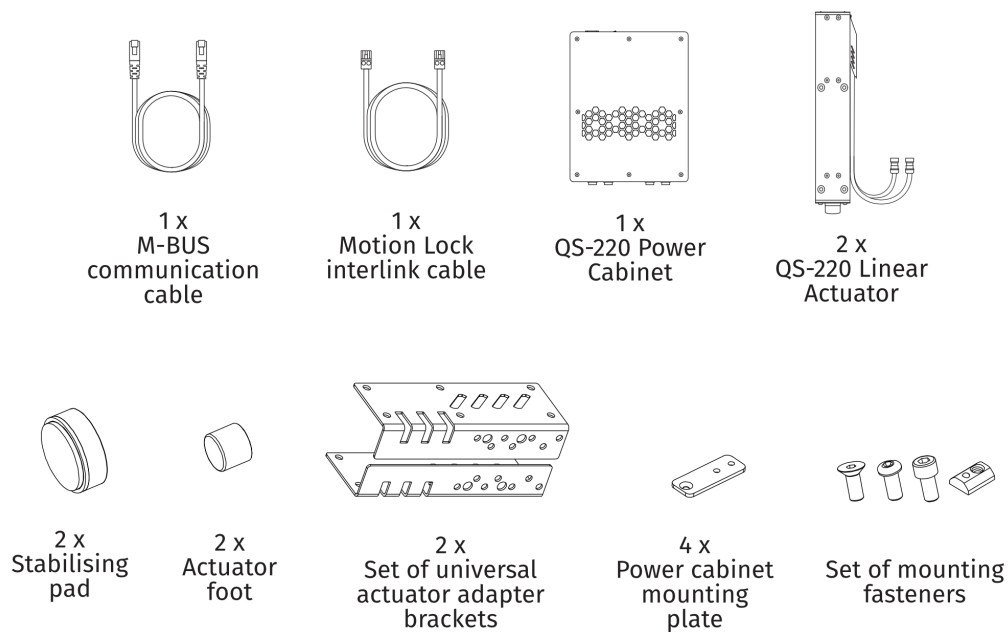
QS-220 2DoF is a set composed of two actuators and a Power Cabinet. It is possible to expand 2DoF setup into 3DoF setup later on by purchasing another QS-220 2DoF set.

It can be used to set up various motion rigs. For installation details go to section **4.2** on page **25**.

INFO

- Check if the box contains all listed parts. If incomplete, please contact the distributor/reseller.
- QS-220 is delivered without the pivot leg. There is an accessory Pivot bar available for purchase - go to section **3.1** on page **21** for technical details.

The QS-220 2DoF set includes following components:



2.2.3 QS-220 3DOF SET

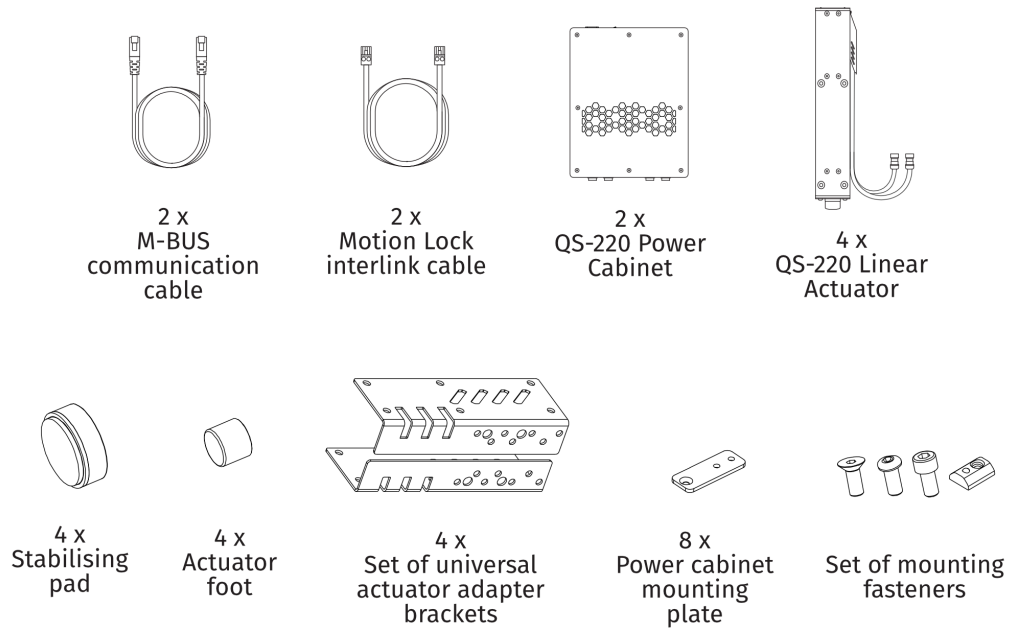
QS-220 3DoF is a set composed of four actuators and two Power Cabinets.

It can be used to set up various motion rigs. For installation details go to section **4.2** on page **25**.

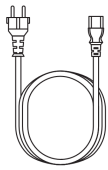
INFO

Check if the box contains all listed parts. If incomplete, please contact the distributor/reseller.

The QS-220 3DoF set includes following components:



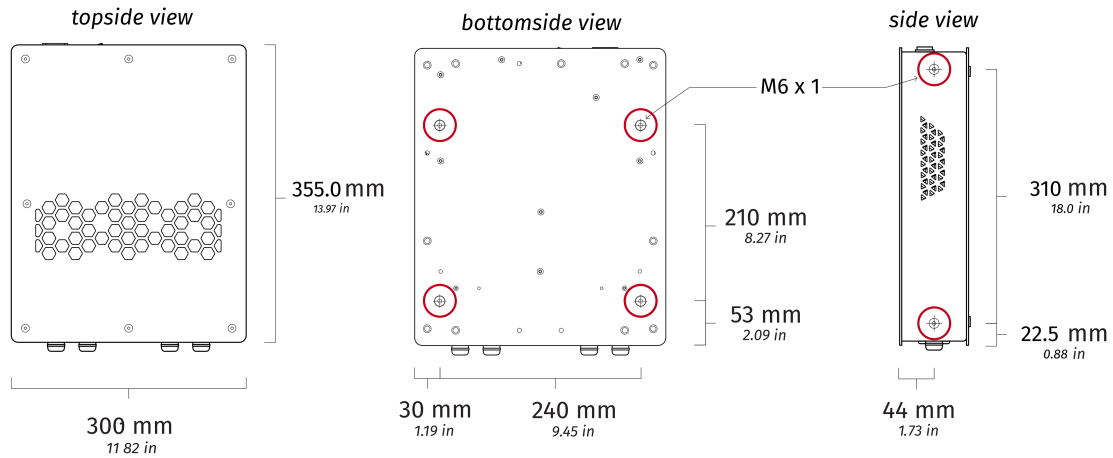
2.2.4 POWER CORD



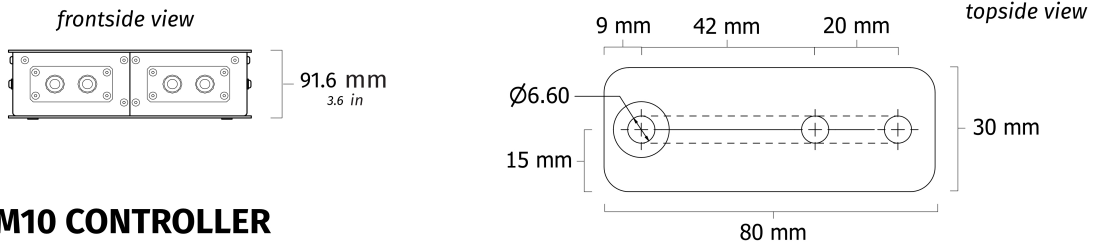
The power cord for QS-220 is provided as a separate component and is selected based on the electrical standards and socket types applicable in the target market. This ensures compatibility with regional voltage, frequency, and plug configurations.

2.3. DIMENSIONS

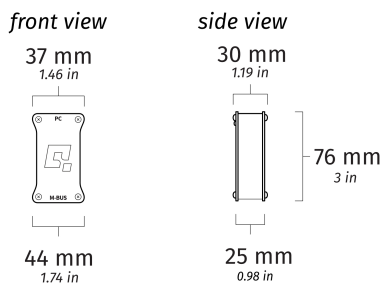
POWER CABINET



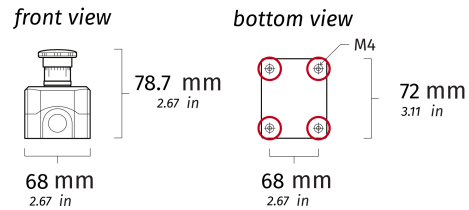
POWER CABINET ADAPTER PLATE



M10 CONTROLLER



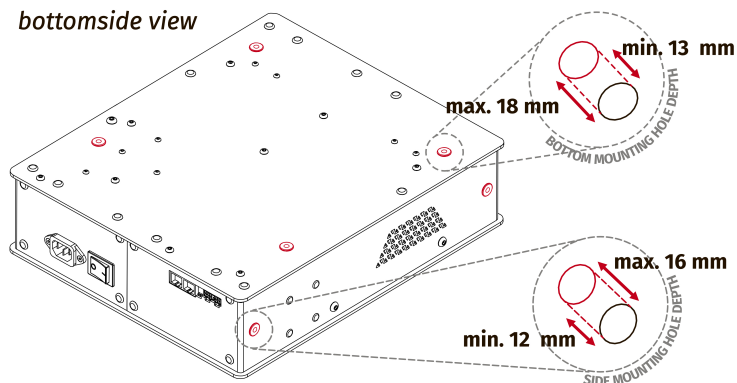
MOTION LOCK

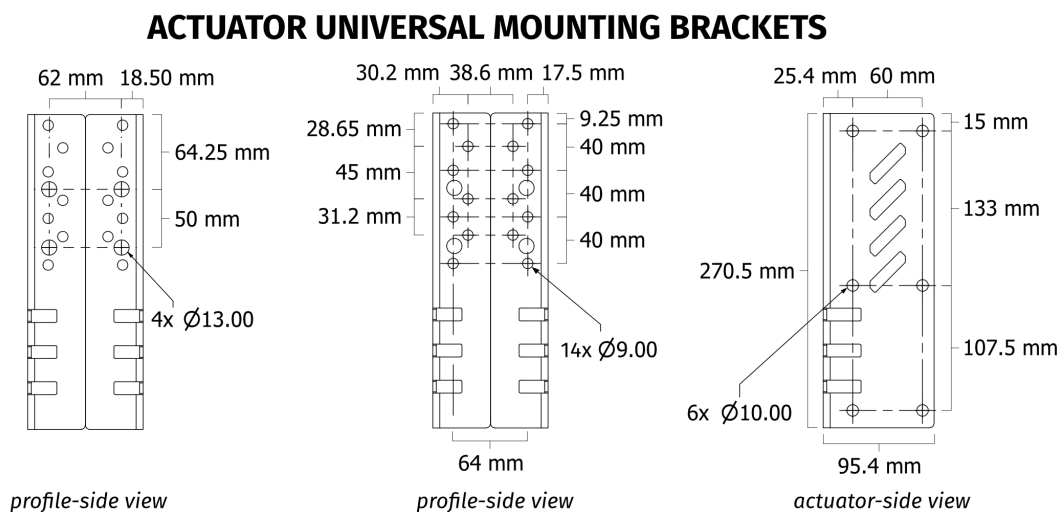
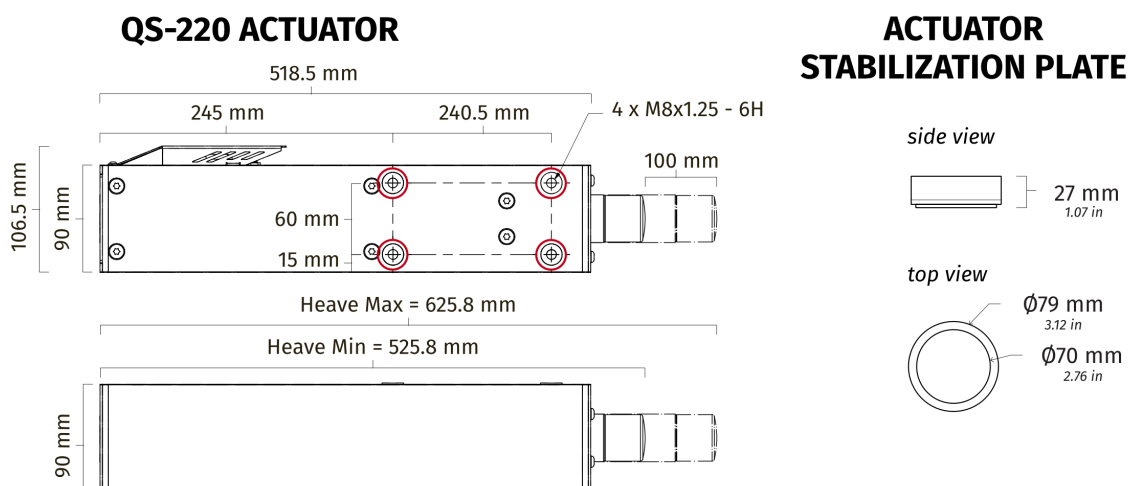


POWER CABINET'S MOUNTING HOLE DIMENSIONS

The Power Cabinet's mounting bolts insertion depth:

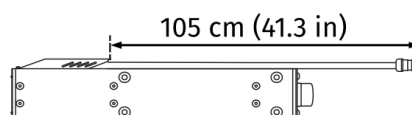
- At the bottom: **CANNOT** exceed **18 mm** and **CANNOT** be less than **13 mm**.
- On the sides: **CANNOT** exceed **16 mm** and **CANNOT** be less than **12 mm**.





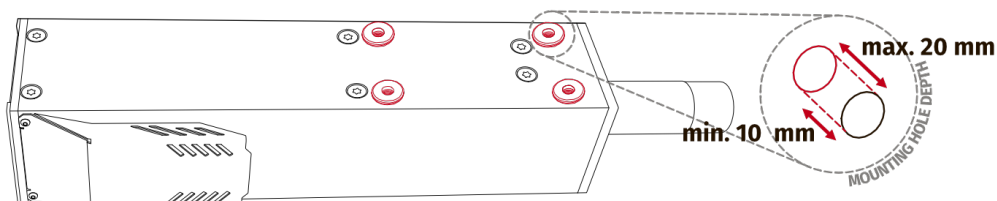
QS-220'S cables length

Actuator's cables length is 105 cm (41.3 inch):



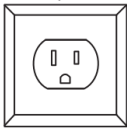


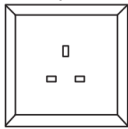
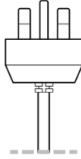

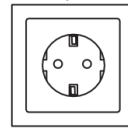
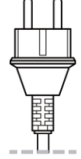

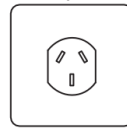
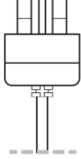

QS-220'S MOUNTING HOLE DIMENSIONS

The QS-220's mounting bolts insertion depth **CANNOT** exceed **20 mm** and **CANNOT** be less than **10 mm**.



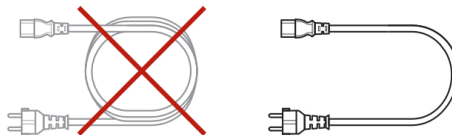
2.4. POWER REQUIREMENTS

QS-220 requires a 120/230 \pm 10% VAC 50-60 Hz single phase with ground and neutral connection.

USA/CAN 120 V/60 Hz  Type B plug Nema 5-15p  Rated for 125V/15A 3x 2.08 mm ² (14AWG)  C13 IEC-60320	UK 230 V/50 Hz  Type G plug BS 1363 P3  Rated for 250V/10A 3x 0.75 mm ²  C13 IEC-60320	EU 230 V/50 Hz  Type F plug CEE 7/7  Rated for 230V/10A 3x 0.75 mm ²  C13 IEC-60320	AU 230 V/50 Hz  Type I plug AS/NZS-3112-1  Rated for 230V/10A 3x 18 AWG  C13 IEC-60320
---	---	---	--

INFO

Always **UNWIND THE CABLE COMPLETELY** when using a cable reel and untangle an extension cord before connecting the device to the power supply.



WARNING

- The device is **NOT** intended to be used in an IT earthing/grounding system.
- The product must be connected to the mains power supply with a protective earth (**PE**) and a residual current circuit breaker (**RCCB**).

If you experience issues such as unexpected shutdowns or resets during simulation, it is recommended to inspect the power cables and power source. The use of cables that do not meet the specified requirements may lead to malfunctions. To ensure proper device operation, replace any non-compliant cables with ones that meet the required specifications.

2.5. POWER CONSUMPTION

Tables below contain power consumption data for QS-220 3DoF setup:

230V $\pm 10\%$ 50-60Hz Single phase	HEAVY DUTY	PERFORMANCE	Q-MODE
Average power consumption - stress test [W]	300	300	500
Average power consumption - typical game [W]	70	40	30
Peak power for converter specification [kVA]	1,5	1,6	2,2
Peak current for breaker specification [A]	7	7	10

INFO

- Q-MODE is unavailable for QS-220 in 120 VAC environment.
- 2DoF single set of QS-220 works only in Heavy-Duty mode.

120V $\pm 10\%$ 50-60Hz Single phase	HEAVY DUTY	PERFORMANCE
Average power consumption - stress test [W]	300	300
Average power consumption - typical game [W]	600	500
Peak power for converter specification [kVA]	1,5	1,5
Peak current for breaker specification [A]	12	13

Be aware that with heavy payload and/or more intense simulations average power consumption may rise.

INFO

For details on switching operation modes - go to point **Software Installation** in section **4.12** on page **51**.

2.6. MAXIMUM PAYLOAD

Table below contains maximum payload and acceleration data for QS-220 3DoF setup:

	Q-Mode	Performance mode	Heavy Duty mode
Max. velocity	800mm/s	400mm/s	300mm/s
Max. acceleration	limited to 0.8G	limited to 0.6G	limited to 0.4G
Max. payload in 3DoF	200 kg	250 kg	350kg

2.7. ENVIRONMENTAL CONDITIONS

The QS-220 should be operated within ambient conditions as specified below:

- Indoor use and storage only
- Temperature: 5° - 40° Celsius / 41° - 104° Fahrenheit
- Humidity: 0% - 70% (without water vapor condensation)
- Maximum altitude: up to 2000 m / 6561 ft

3. ACCESSORIES

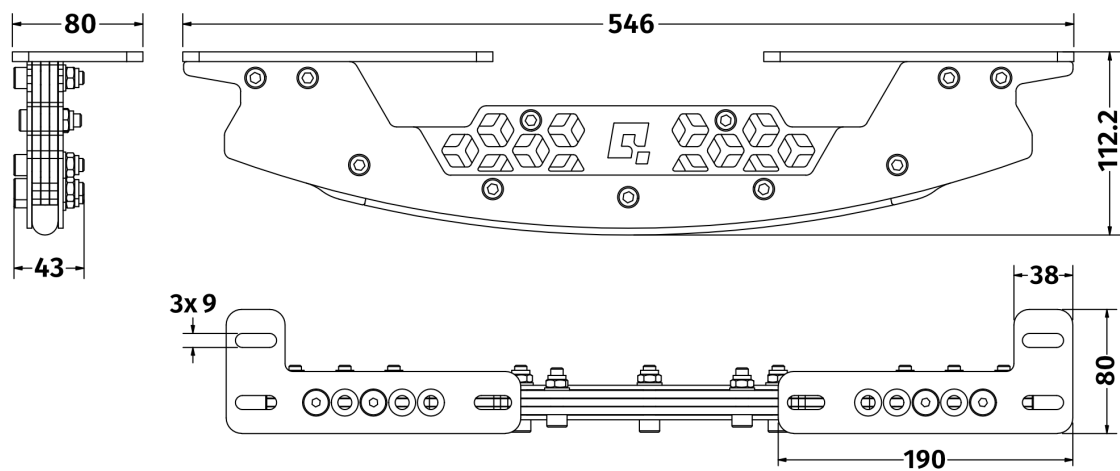
3.1. QS-PIVOT

QS-Pivot bar enables you to run a 2DoF setup - two linear actuator on the back or on the front of the platform. It can be bolted to the bottom of the aluminum frame using included hardware. The adjustment range is presented in section 3.1.4 on page 23.

INFO

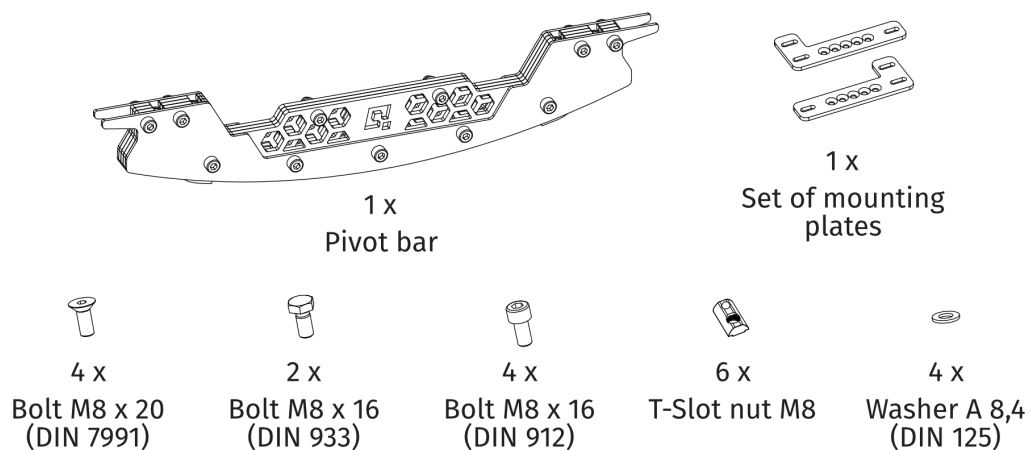
QS-Pivot bar is an accessory purchased separately.

3.1.1 DIMENSIONS



3.1.2 QS-PIVOT COMPONENTS

Included in the QS-Pivot box:

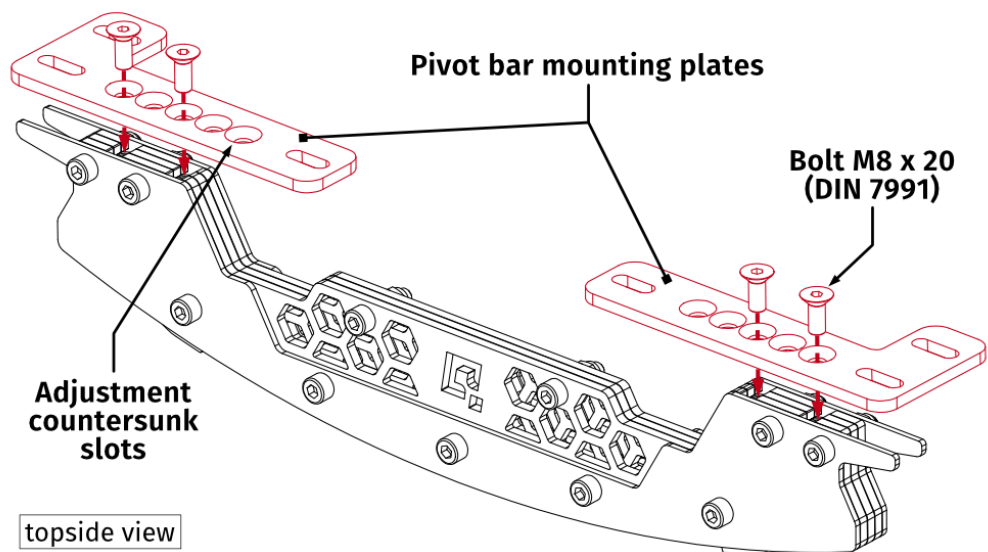


3.1.3 MOUNTING TO AN ALUMINUM PROFILE COCKPIT

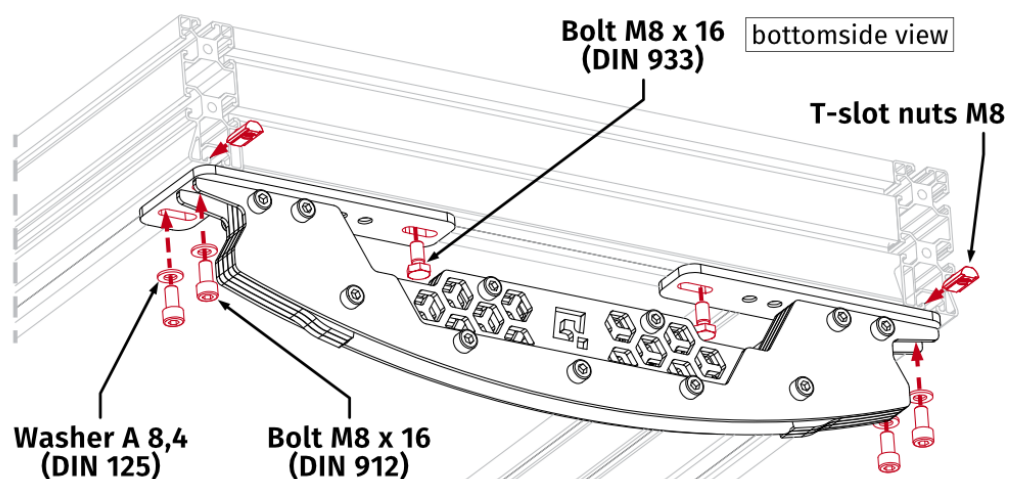
Use all of the included hardware to mount the QS-Pivot bar according to the pictures. QS-Pivot bar is to be installed to the underside of the aluminum profile. It can be installed either on the front or back of the cockpit - depending on your setup.

QS-Pivot bar can be moved closer to center of the rig to increase pitch movement **but** it **MUST** be installed to a crossbeam to increase stiffness. If there is no crossbeam in the preferred installation spot - it **MUST** be added.

1. Mount the installation plates to the QS-Pivot bar at a width that matches the cockpit. Mounting plates are not interchangeable because of countersunk holes - DIN 7991 bolts must sit flush inside them, when screwed in from the top.



2. Screw the QS-Pivot bar in under the cockpit using included bolts.

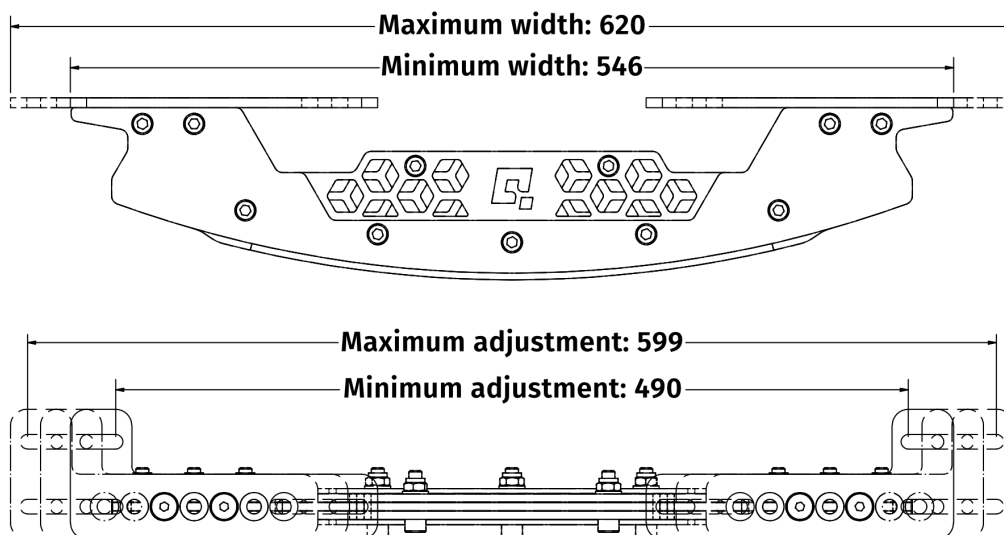


INFO

Use small amount of medium strength thread locker on all bolts.

3.1.4 ADJUSTMENT DIMENSIONS

For adjustment dimensions refer to the illustration below:



4. SETUP AND INSTALLATION

4.1. BEFORE INSTALLATION

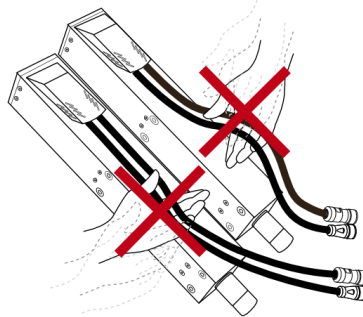
Qubic System **DOES NOT** approve exceeding or ignoring any of the points below and **IS NOT** responsible for malfunctions, failures or injuries that are results of these actions.

WARNING



Dangerous voltage level may occur in the Power Cabinet and connected cables during the operation and up for a few minutes after turning off the machine. Do not touch the device when the power switch is on.

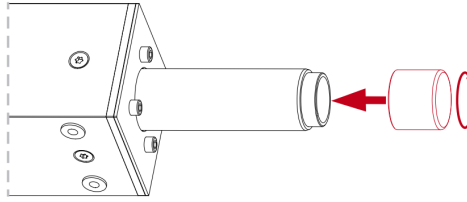
WARNING



DO NOT LIFT
BY THE CABLE

- Cables **MUST NOT** be stretched and should be arranged in a way that prevents them from getting under the actuator or any part that can crush or tear them.
- **DO NOT** place the actuators down on the cable side on any surface - always place them down with cable side up to avoid cable damage.
- Each actuator **MUST BE** placed on the Stabilization pad and should only operate on a flat surface.
- **DO NOT** use the actuators on a soft or fragile surface like rubber, glass, or foam.
- Be aware that QS-220 will crawl a little in every direction during normal operation. These movements could damage the surface in the long term. The manufacturer, its subsidiaries and their partners are not responsible for any floor damages.
- **DO NOT** mount the rig in tight or cluttered spaces - remember that actuators set motion to the cockpit and nothing should restrict its motion range.
- Seat belts and any other harness should be mounted as part of a moving cockpit and move together with the seat. **DO NOT** attach them to any stationary part of the rig or ground.
- If you want to use the QS-220 in an unusual application and you are not sure, that the desired setup is attainable - contact the distributor/reseller.

Before installing the actuators to a cockpit, actuator feet must be screwed in:



4.2. INSTALLING QS-220 TO AN ALUMINUM PROFILE COCKPIT

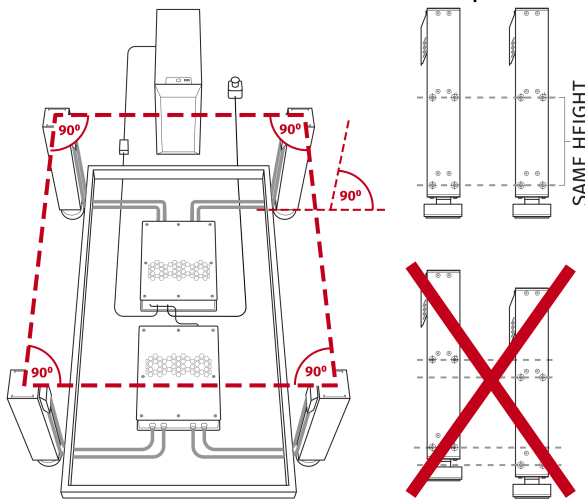
- Actuators **MUST BE** connected with the mounting brackets with 8 bolts (M8x20) each.
- Mounting brackets **MUST BE** connected with user's cockpit with 4 bolts (M8x16) each.
- Power Cabinet has to be mounted to cockpit using at least 4 bolts (M6x16) – we recommend mounting it in the middle of the motion rig. It is possible to mount Power Cabinets using the bottom or side mounting holes. Check section 4.2.2 on page 28 for details.

INFO

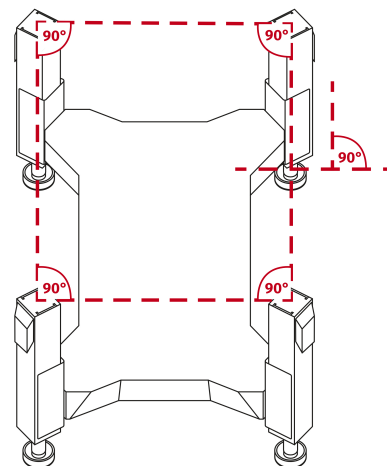
Ensure that the Power Cabinet will not collide with the floor in any position of the motion rig.

Illustrations below shows an example applications of assembled motion cockpits – notice that actuators have to be perpendicular to the ground:

VARIANT 1: Parallel actuators setup



VARIANT 2: Diagonal actuators setup



WARNING

All actuators **MUST** be mounted at the same height.

Ensure that the motion rig elements will not block air vents of the Power Cabinet. The minimum distance between the air vents and any part of the cockpit is 10 cm (4 in.).

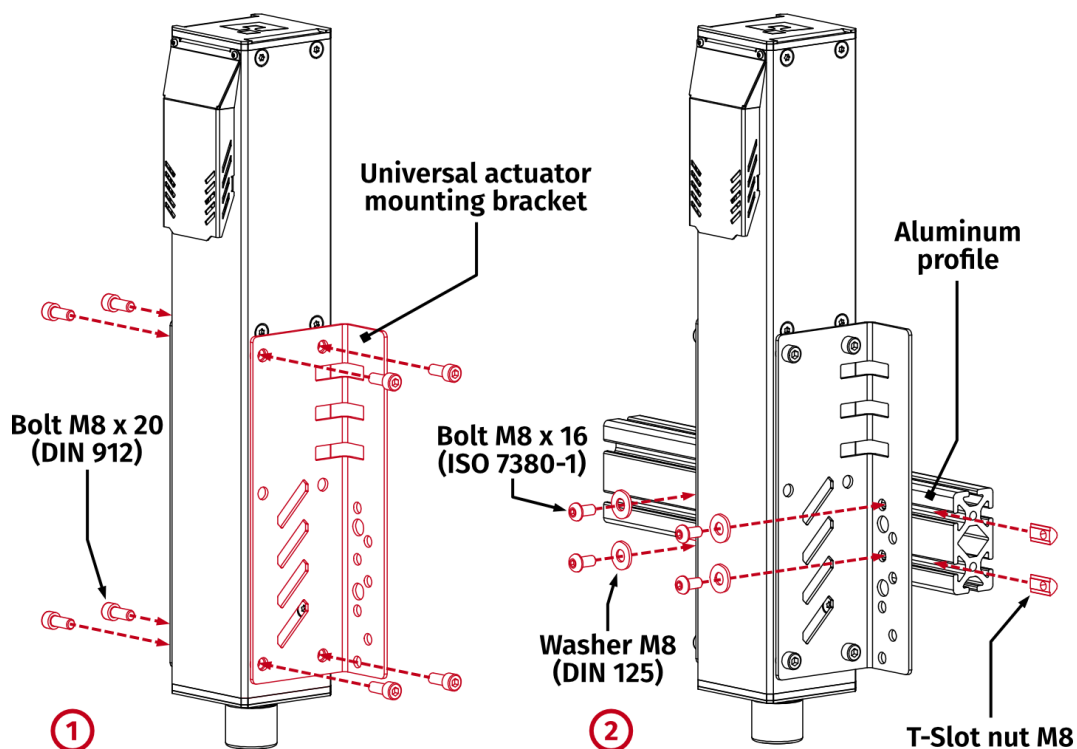
INFO

The manufacturer is not responsible for quality nor compatibility of the third-party cockpits.

4.2.1 MOUNTING QS-220 ACTUATORS

To install a single QS-220 actuator to the aluminium based profile cockpit, following hardware is provided:

No.	Part description	Qty.	Torque specs
1	Mounting bracket (2 pieces)	2	
2	Bolt M8 x 20 (DIN 912)	8	23 Nm
3	T-Slot (profile 8) nut M8	4	
4	Bolt M8 x 16 (ISO 7380-1)	4	17.5 Nm
4	Washer M8 (DIN 125)	4	



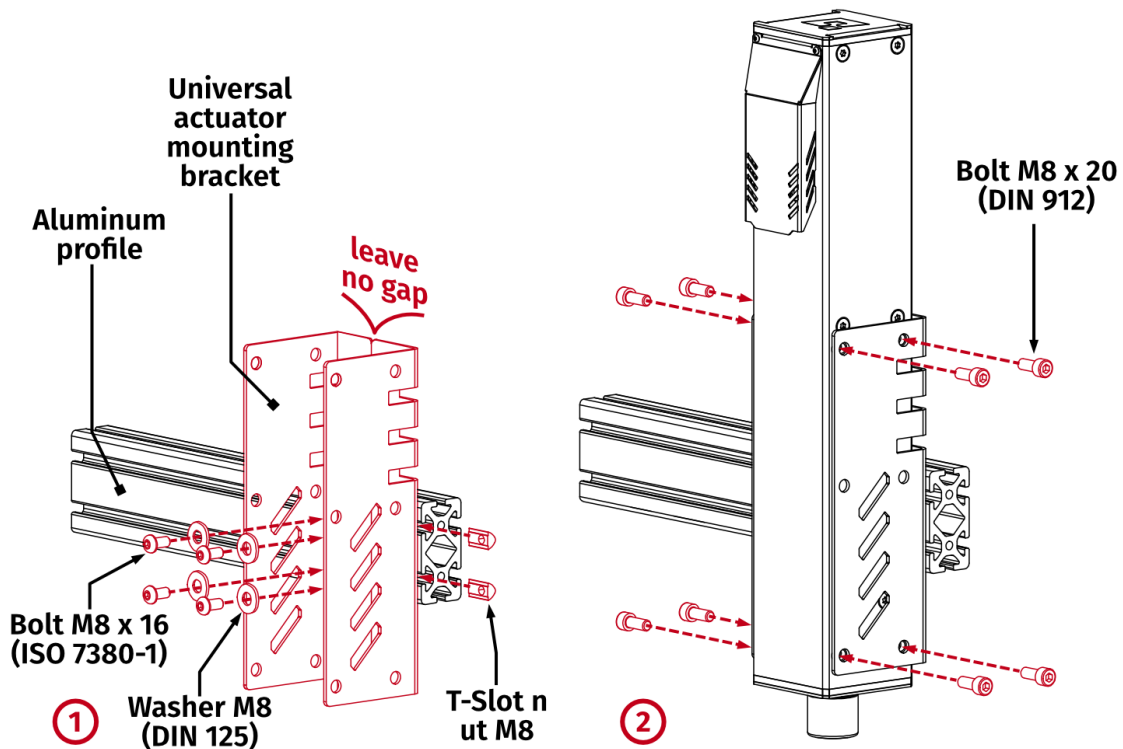
WARNING

All listed bolts **MUST** be used during assembly.

INFO

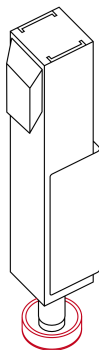
Use small amount of medium strength thread locker on all bolts.

Second variant of QS-220 mounting using Universal actuator mounting brackets:



For best fitment - in 1st step install both mounting brackets as close together as possible.

INFO



- All actuators **MUST** be placed on Stabilizing pads.
- Tolerance for piston rod misalignment relative to Stabilizing pad center point is **max. 5 mm**.

WARNING



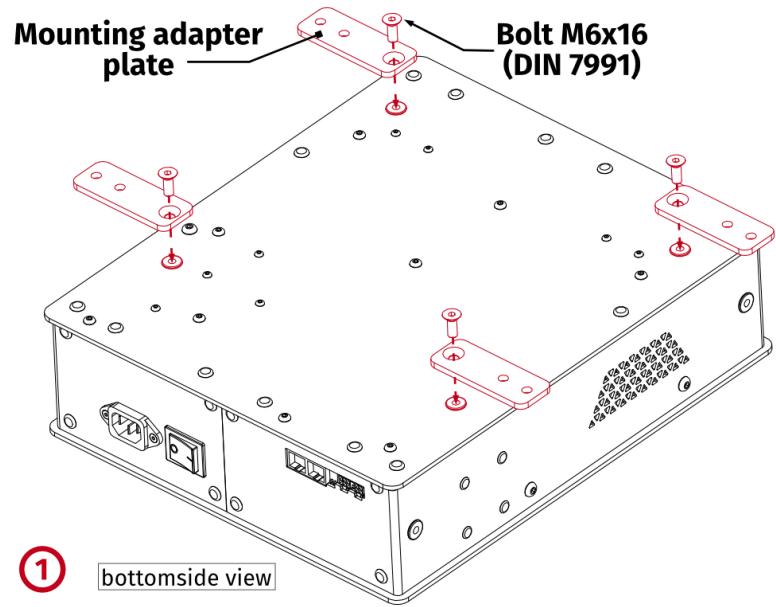
Remember to arrange the actuators cables correctly. They **MUST NOT** be stretched and should be arranged in a way that prevents them from getting under the actuator or any part that can crush or tear them.

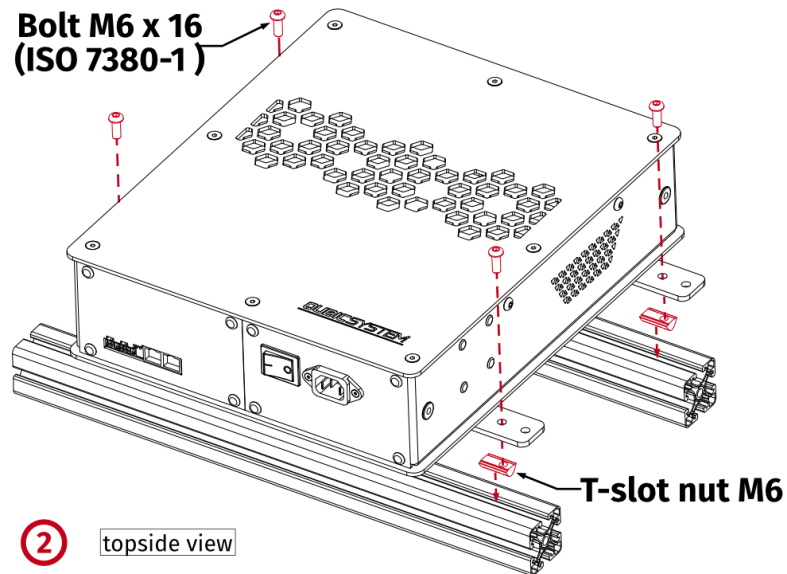
4.2.2 MOUNTING THE POWER CABINET

To connect the Power Cabinet to the aluminium based profile cockpit, following hardware is provided:

No.	Part description	Qty.	Torque specs
1	Adapter plate	4	
2	Bolt M6 x 16 (DIN 7991)	4	7 Nm
3	T-Slot (Profile 8) nut M6	4	
4	Bolt M6 x 16 (ISO 7380-1)	4	7 Nm

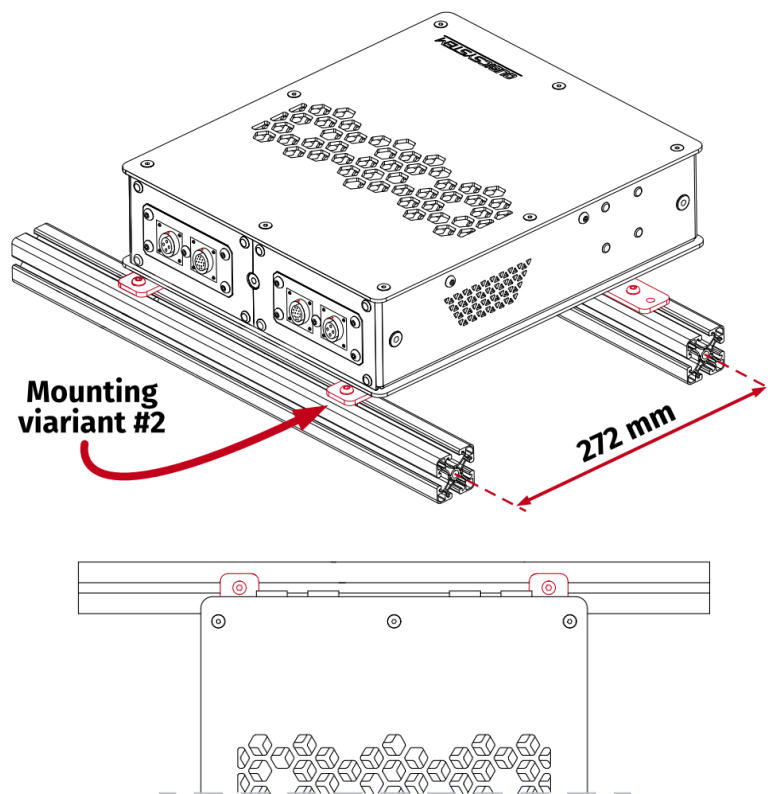
Illustrations of Power Cabinet mounting to an aluminum based profile (profile 8) cockpit (space between two profiles must be **210 mm**):





Mounting variant no. 2

Use the outer holes in the adapter plates to mount the Power Cabinet to a profile that is further away (**272 mm** between the two profiles).

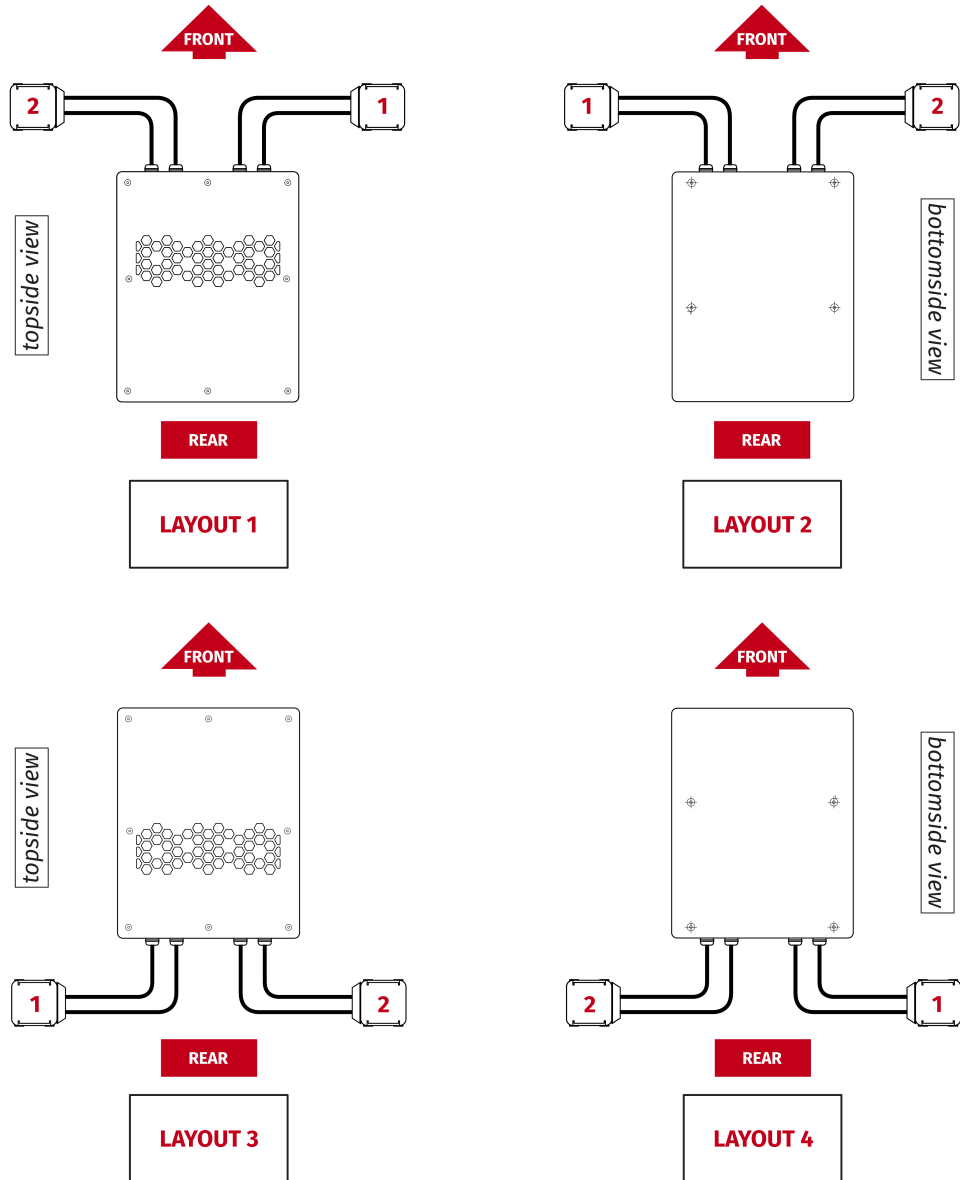


INFO

You can mount the Power Cabinet in different ways to fit your cockpit, using either the bottom or side mounting holes. Go to section **2.3** on page **16** for dimensions information.

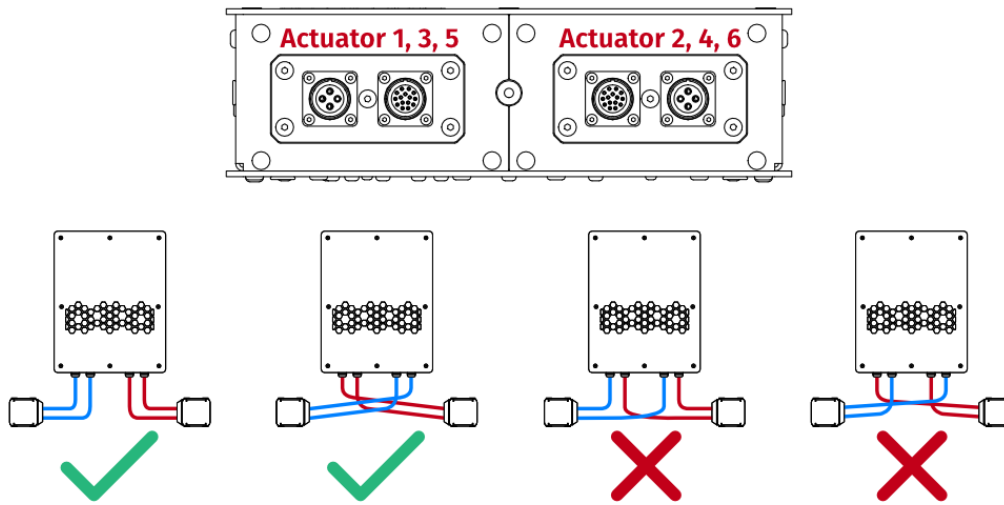
4.3. QS-220 2DOF LAYOUTS

Actuator pair number is defined by the CFG DIP switch on the Power Cabinet. For more information go to **4.4** on page **31**.



WARNING

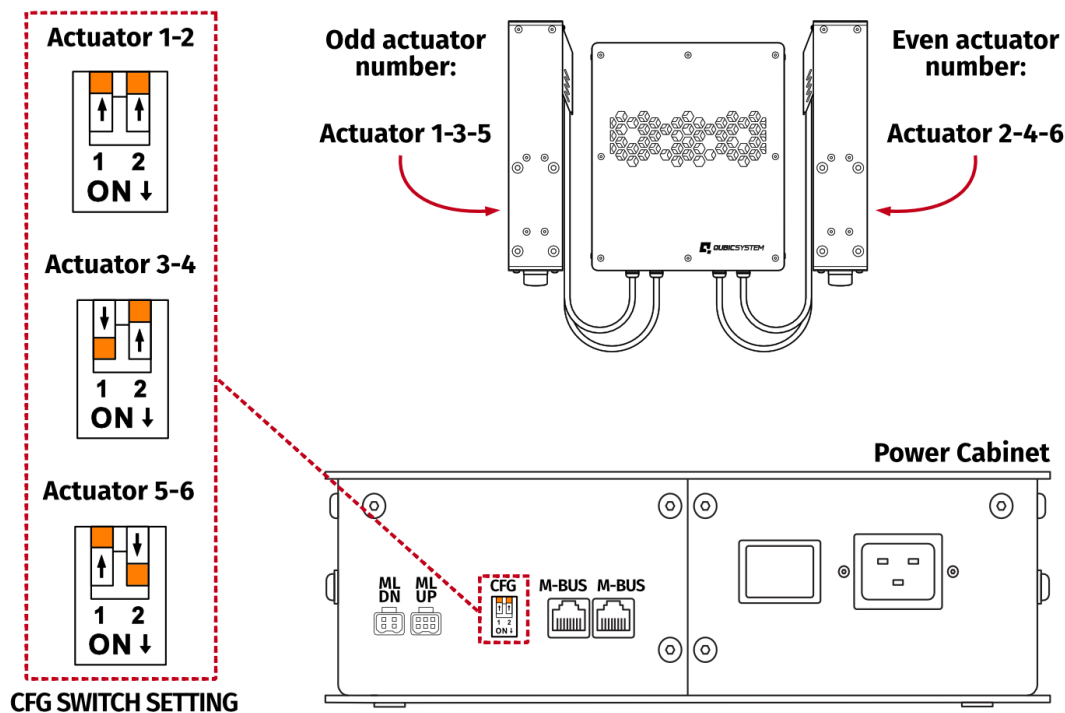
ALWAYS plug a single actuator's cables to a single socket panel.



More details on actuator cables connection - section 4.7 on page 36

4.4. QS-220 2DOF CFG DIP SWITCH CONFIGURATION

The CFG DIP switch **MUST BE** set to an appropriate position. It specifies the actuator pair number (1-2, 3-4, 5-6, etc.). Refer to layouts (section 4.3 on page 30) for 2DoF actuator numbers in a specific settings and set the CFG DIP switches accordingly.

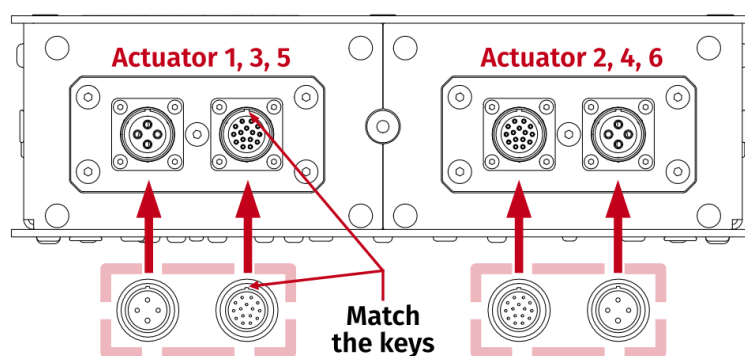


WARNING

- When changing CFG DIP switch setting the main power must be **SWITCHED OFF**.
- When changing the CFG DIP switch setting **FIRMLY SET THE SWITCH** into lower or upper position. Do not leave it in the floating position (neither up or down position), otherwise the device will not work.

INFO

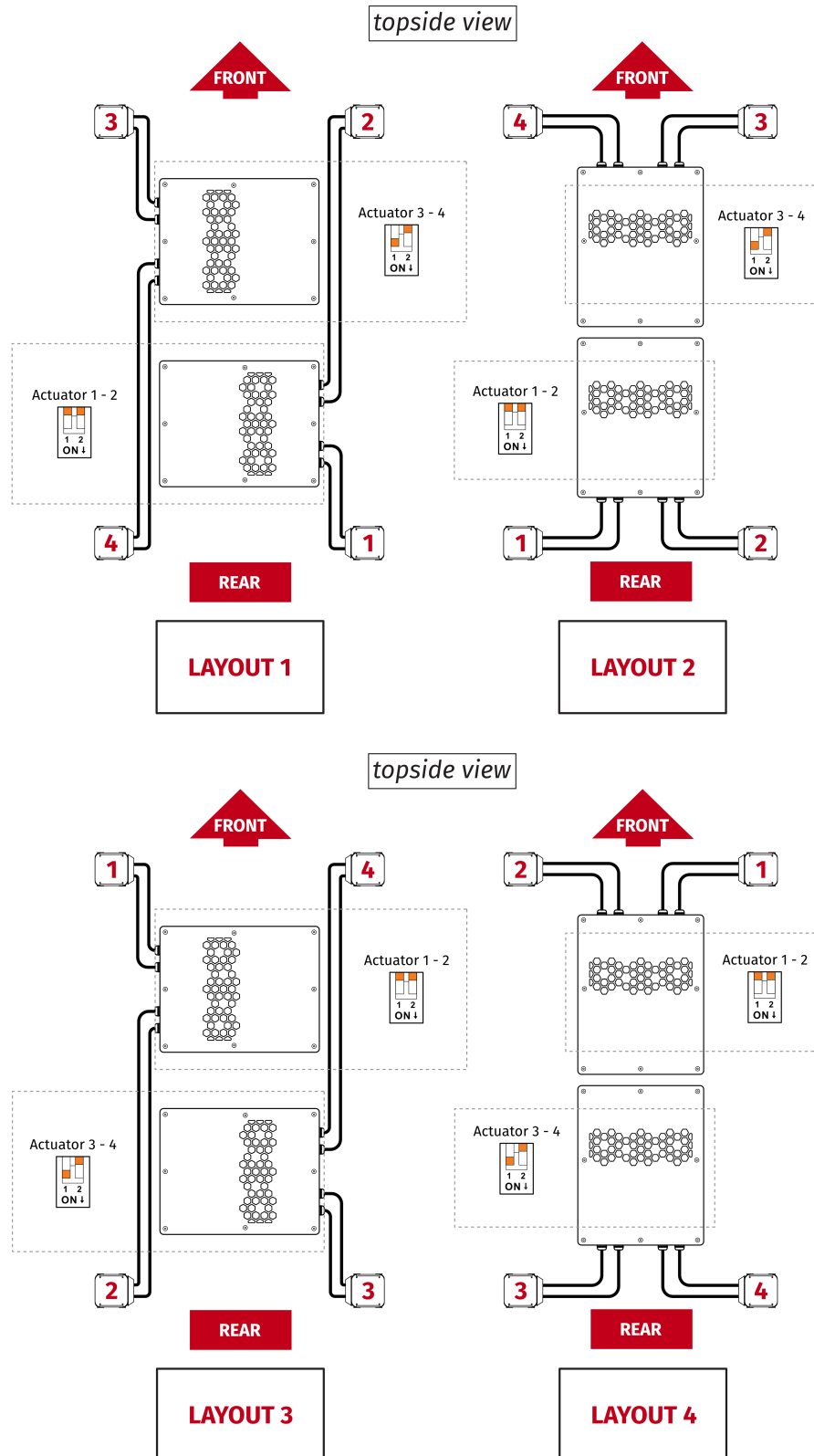
CFG switches **DO NOT** set the actuator number, but a pair of them. Actuator numbers are assigned to a left or right socket panel:

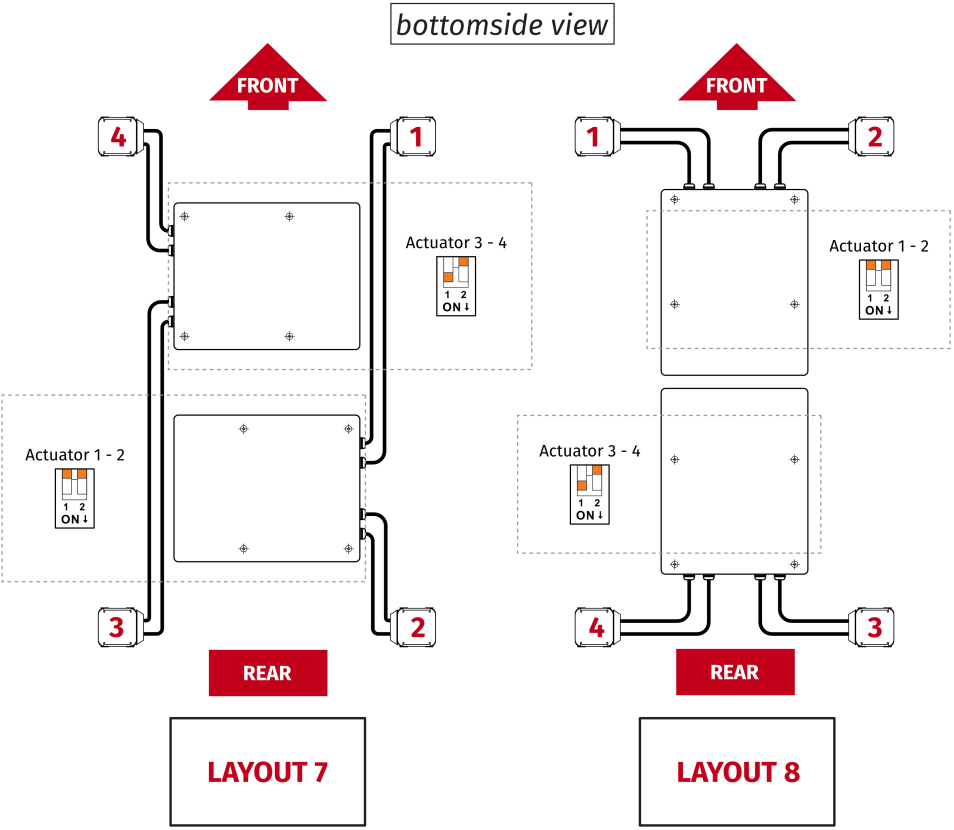
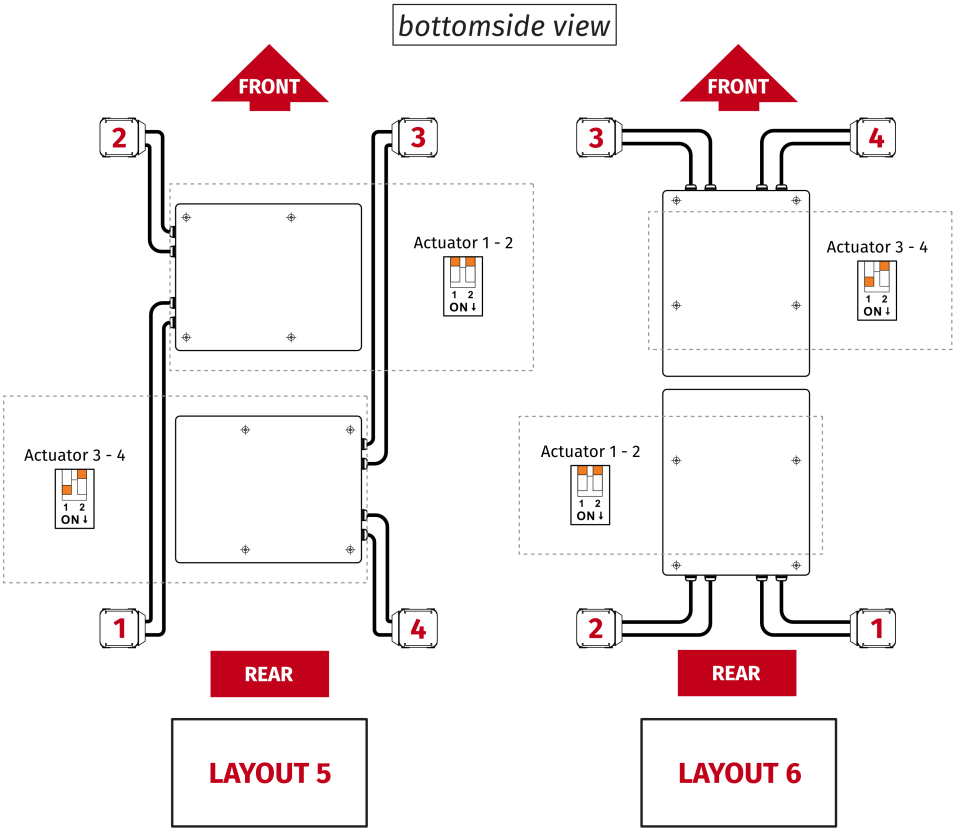
**INFO**

2DoF single set of QS-220 works only in Heavy-Duty mode.

4.5. QS-220 3DOF LAYOUTS

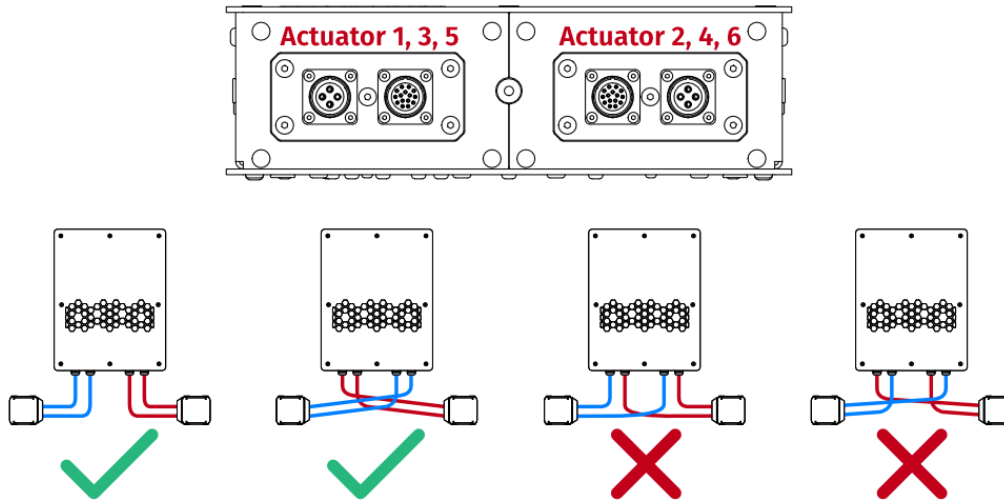
Actuator pair number is defined by the CFG DIP switch on the Power Cabinet. For more information go to **4.6** on page **35**.





INFO

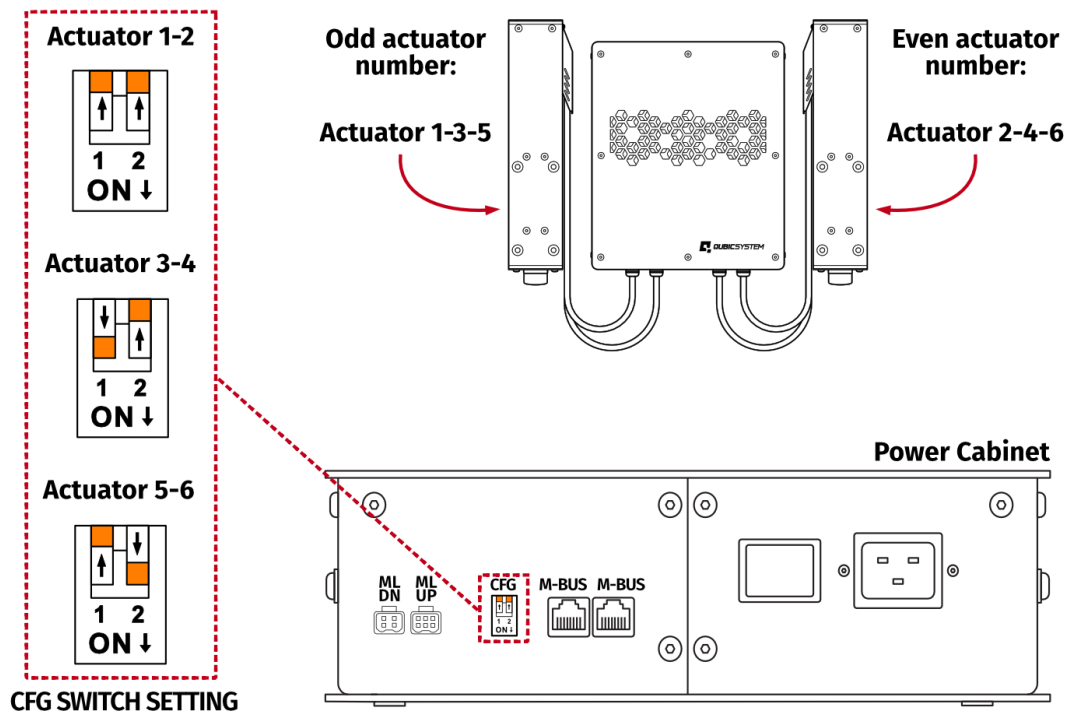
ALWAYS plug a single actuator cables to a single socket panel.



More details on actuator cables connection - section 4.7 on page 36

4.6. QS-220 3DOF CFG DIP SWITCH CONFIGURATION

The CFG DIP switch **MUST BE** set to an appropriate position. It specifies the actuator pair number (1-2, 3-4, 5-6, etc.). Refer to layouts (section 4.5 on page 33) for actuator numbers in a specific settings and set the CFG DIP switches accordingly.



INFO

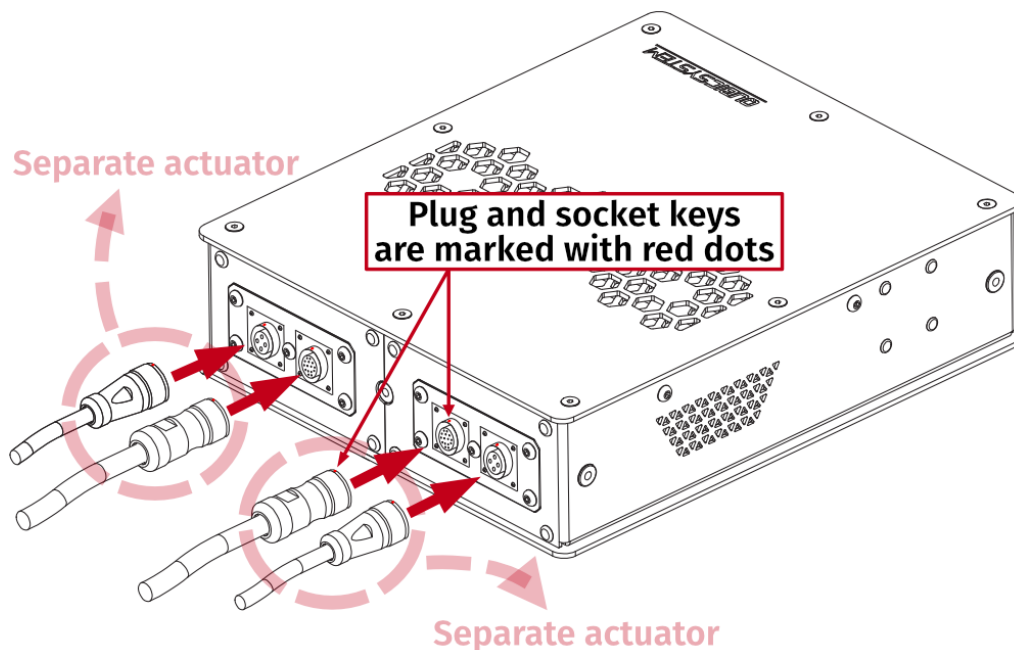
- The CFG DIP switch **CANNOT** be set in the same position in both (or more) Power Cabinets.
- When changing CFG DIP switch setting the main power must be **SWITCHED OFF**.
- When changing the CFG DIP switch setting **FIRMLY SET THE SWITCH** into lower or upper position. Do not leave the switch in the floating position (neither up or down position), otherwise the device will not work.

4.7. ACTUATOR CONNECTION WITH A POWER CABINET

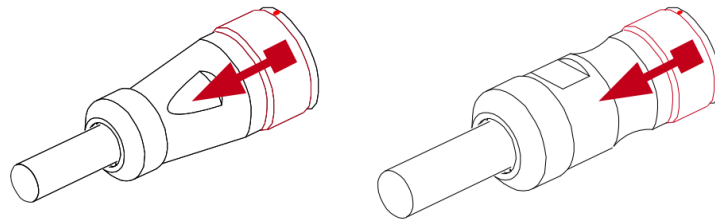
To connect the actuator to a Power Cabinet - match the plug with the socket (4 vs. 15 pin) and plug it in, matching the key at the top of the plug (also marked with a red dot). Push it in firmly until the PUSH-PULL ring lock clicks in place.

WARNING

Plugging and unplugging the actuator must **ALWAYS** be performed with Power Cabinet's power switched OFF.

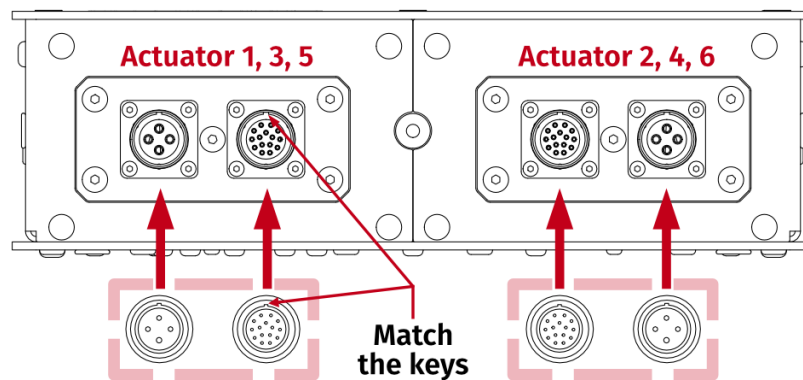


To disconnect the plug, first pull on the metal ring to release the lock and then pull the plug to disconnect:



NEVER pull on the plug by the cable

Keep in mind the order of connecting the actuators. Left socket panel is for odd number actuator, and right socket panel is for even number actuators.



More details on layouts and actuator numbering are in section 4.3 for 2DoF setup and 4.5 for a 3DoF setup.

WARNING

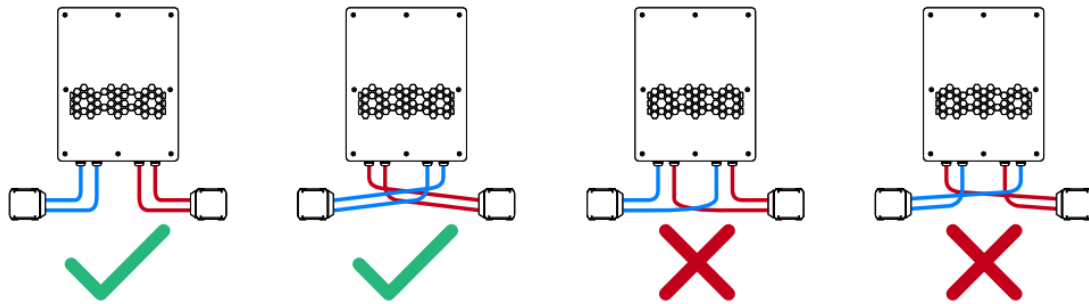


Under no circumstances **DO NOT** plug QS-210 actuator to QS-220 Power Cabinet and QS-220 actuator to QS-210 Power Cabinet. That **WILL** lead to an irreversible damage to the actuators and will **NOT** be covered by a warranty.

4.7.1 ACTUATOR'S CABLES MANAGEMENT

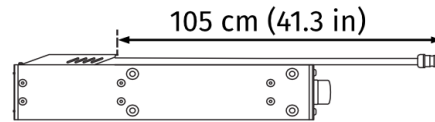
For cable management Safety precautions go to **4.1** on page **24**.

Plugging and unplugging the actuator enables you to organize your cables more easily, but **ALWAYS** ensure to plug a single actuator's cables to a single socket panel. **DO NOT** cross them between the two actuators. Refer to an illustration below:



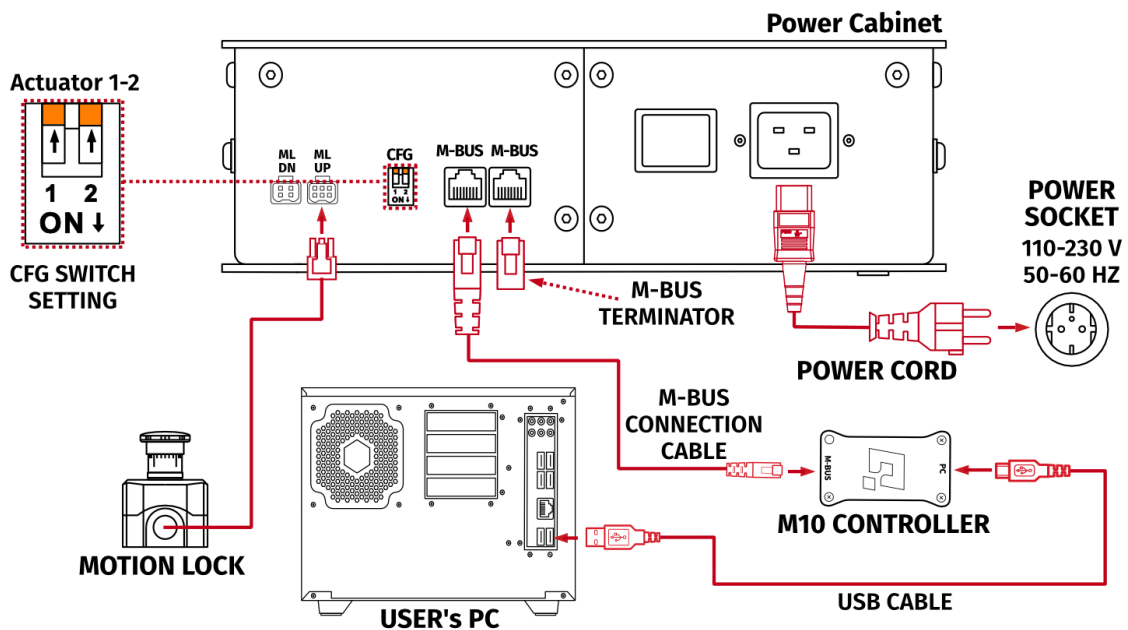
INFO

Actuator's cables length is 105 cm (41.3 inch):



4.8. QS-220 2DOF CABLE CONNECTIONS

To connect the QS-220 2DoF variant proceed with following steps and connect the cables according to the connections diagram:



INFO

The order of connecting the cables to Power Cabinet is not important. But ensure keeping the CFG DIP switches set according to appropriate layout. Check section **4.4** on page **31** for layout setup information.

1. Set the correct position of the CFG DIP switch according to the actuators layout of your choice (more information about QS-220 2DoF CFG Switch position and layout selection in section **4.4** on page **31**).
2. Plug in the actuators to the Power Cabinet.
3. Plug in the Motion Lock Switch into the "ML UP" port in the Power Cabinet.
4. In a 2DoF variant (and if you don't have any other QubicSystems devices) Motion Lock "ML DN" is not used.
5. Connect M-BUS port in Power Cabinet with M-BUS port in M10 Controller using M-BUS communication cable (Power Cabinet M-BUS ports are interchangeable).
6. Insert M-BUS terminator in the second M-BUS port in the Power Cabinet (if you have any other QubicSystems devices [Power Cabinets], M-BUS terminator will be used in the last Power Cabinet - for more information refer to section **4.10** on page **42**).
7. Connect the M10 controller with your PC using USB cable.
8. Plug in the power cord to the Power Cabinet and a correct power socket.
9. Make sure everything is connected correctly (check if the CFG DIP switches are switched all the way up or down).
10. Turn on the power by switching the Power Cabinet power switch on.
11. For the QS-220 2DoF (or any QubicSystem device) to work - QubicManager Software must be set up correctly. Go to section **4.12** on page **47** for installation details.
12. After software installation go to **QubicManager → Tools and Diagnostics → Devices** and select **Configure** (details in section **10.** on page **49**).

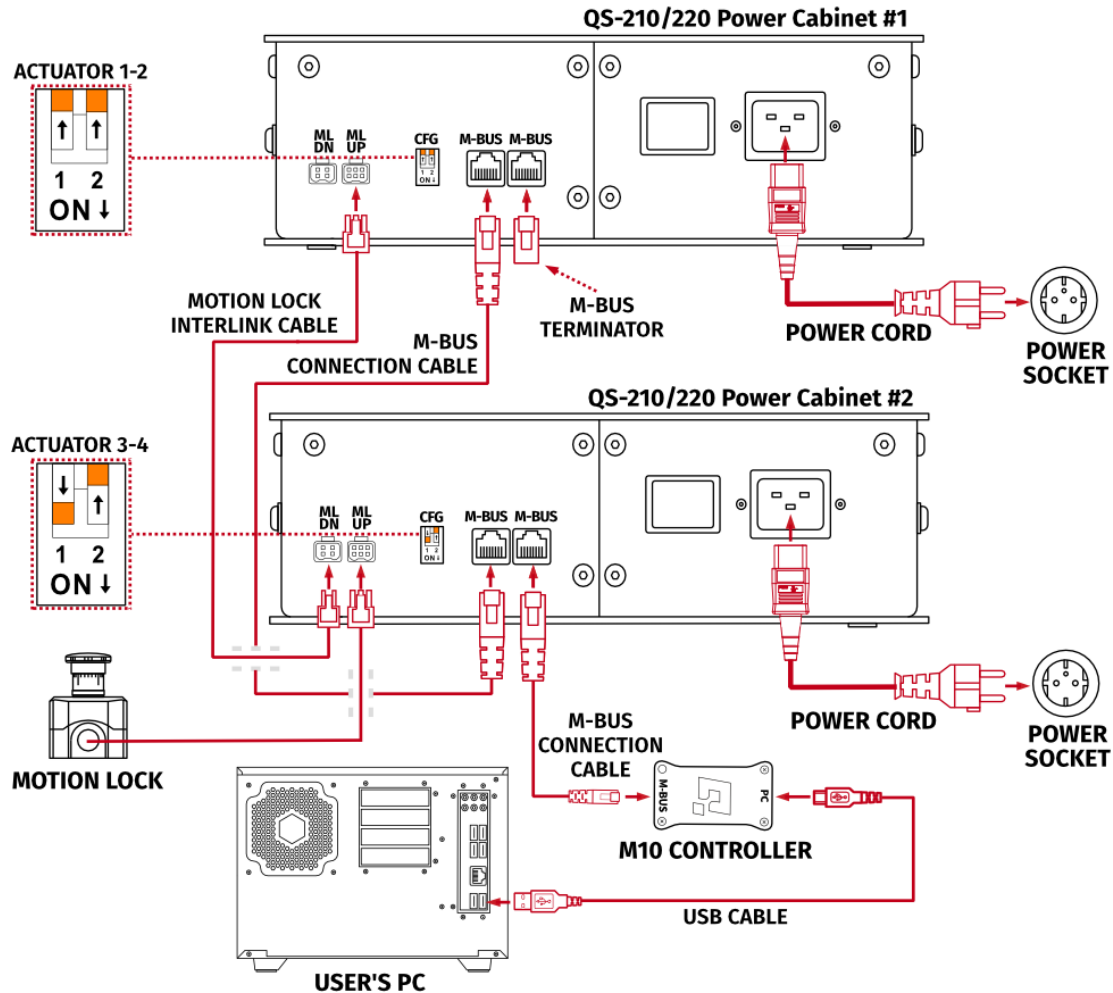
INFO



In case of any motion platform operation problem - go through all the points above to check for connection errors. After that refer to section **6** on page **57**.

4.9. QS-220 3DOF CABLE CONNECTIONS

To connect the QS-220 3DoF variant proceed with following steps and connect the cables according to the connections diagram:



INFO

Motion Lock can be plugged into any Power Cabinet in the circuit but in order to create a working safety-stop system - **ALL** Power Cabinets in circuit must be connected together with Motion Lock interlink cables (for Motion Lock connection diagrams go to section 4.11 on page 44).

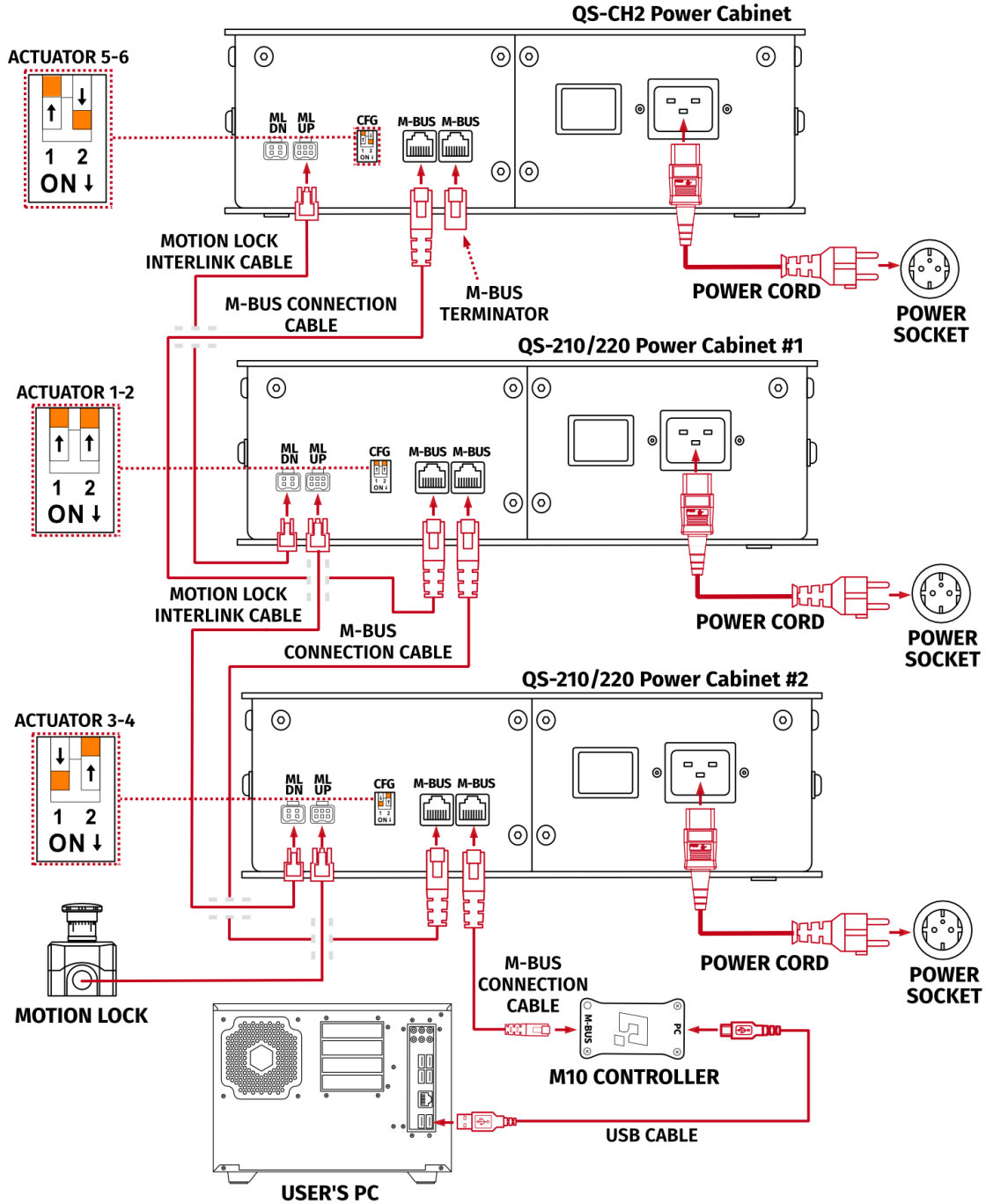
-
1. Set the correct position of the CFG DIP switches according to the actuators layout of your choice (more information about QS-220 3DoF CFG DIP switch position and layout selection in section **4.6** on page **35**).
 2. Plug in the actuators to the Power Cabinet.
 3. Plug in the Motion Lock Switch into the "ML UP" port in the first Power Cabinet.
 4. Connect first and second Power Cabinet with a Motion Lock interlink cable ("ML UP" port requires a 6 pin plug and "ML DN" port requires a 4 pin plug).
 5. If you have more than two Qubic System devices (Power Cabinets), refer to section **4.10** on page **42** for more cable connection information.
 6. Connect M-BUS port in Power Cabinet with M-BUS port in M10 Controller using M-BUS communication cable (Power Cabinet M-BUS ports are interchangeable).
 7. Connect both Power Cabinet's M-BUS ports with M-BUS cables.
 8. Insert M-BUS terminator in the second M-BUS port in the second Power Cabinet (if you have any other QubicSystems devices [Power Cabinets], M-BUS terminator will be used in the last Power Cabinet - for more information refer to section **4.10** on page **42**).
 9. Connect the M10 controller with your PC using USB cable.
 10. Plug in the power cords to both Power Cabinets and a correct power sockets (separately fused, as suggested in section **2.4** on page **18**).
 11. Make sure everything is connected correctly (check if the CFG DIP switches are switched all the way up or down).
 12. Turn on the power by switching both Power Cabinet's power switches on.
 13. For the QS-220 3DoF (or any QubicSystem device) to work - QubicManager Software must be set up correctly. Go to section **4.12** on page **47** for installation details.
 14. After software installation go to **QubicManager→Tools and Diagnostics→Devices** and select **Configure** (details in section **10.** on page **49**).

INFO

- In case of any motion platform operation problem - go through all the points above to check for connection errors. After that refer to section **6** on page **57**.
- The order of connecting the cables to Power Cabinets is not important - you can connect the M10 controller or Motion Lock Switch to either of the Power Cabinets. But ensure keeping the CFG DIP switches set according to appropriate layout. Check section **4.5** on page **33** for layout setup information.

4.10. QS-220 WITH QS-CH2 CABLE CONNECTIONS

Electrical diagram of QS-220 3DoF connecting with a traction loss system (QS-CH2).



-
1. Set the correct position of the CFG DIP switches according to the actuators layout of your choice (more information about QS-220 3DoF CFG DIP switch position and layout selection in section **4.6** on page **35**).
 2. Plug in the actuators to the Power Cabinet.
 3. Set the correct position of the QS-CH2 CFG DIP switch, according to a diagram from a previous page.
 4. Plug in the Motion Lock Switch into the "ML UP" port in the first of QS-220's Power Cabinet.
 5. Connect all Power Cabinets with a Motion Lock interlink cables ("ML UP" port requires a 6 pin plug and "ML DN" port requires a 4 pin plug).
 6. "ML DN" port in the last Power Cabinet will not be used.
 7. Connect M-BUS port in Power Cabinet with M-BUS port in M10 Controller using M-BUS communication cable (Power Cabinet M-BUS ports are interchangeable).
 8. Connect all Power Cabinet's M-BUS ports with M-BUS cables in a row (maximum amount of interconnected Power Cabinets is 12).
 9. Insert M-BUS terminator in the last M-BUS port in the last Power Cabinet.
 10. Connect the M10 controller with your PC using USB cable.
 11. Plug in the power cords to all the Power Cabinets and a correct power sockets (separately fused, as suggested in section **2.4** on page **18**).
 12. Make sure everything is connected correctly (check if the CFG DIP switches are switched all the way up or down).
 13. Turn on the power by switching all the Power Cabinet's power switches on.
 14. For the QS-220 3DoF + QS-CH2 setup (or any QubicSystem devices) to work - QubicManager Software must be set up correctly. Go to section **4.12** on page **47** for installation details.
 15. After software installation go to **QubicManager → Tools and Diagnostics → Devices** and select **Configure** (details in section **10.** on page **49**).

INFO

- Order of connecting the cables is not important - you can connect the M10 controller or Motion Lock Switch to either of the Power Cabinet. Keep the CFG DIP switches according to appropriate layout - check section **4.6** on page **35**
- When connecting QS-CH2 to other Qubic System devices which uses two Power Cabinets the CFG DIP switch on the QS-CH2 must be set to actuator 5-6 position - check section **4.10** on page **42**.

4.11. QS-220 WITH QS-CH2, QS-BT1 AND QS-DD-20 MOTION LOCK DIAGRAMS

Neither QS-DD-20 nor QS-BT1 need a M-BUS connection with any Power Cabinet. They communicate via USB cable directly with the PC.

INFO

For more information on cable connections of other Qubic System devices go to [Qubic System User Manuals](#) and find your device.

WARNING

All Motion Lock connections must be performed with **power switched OFF**.

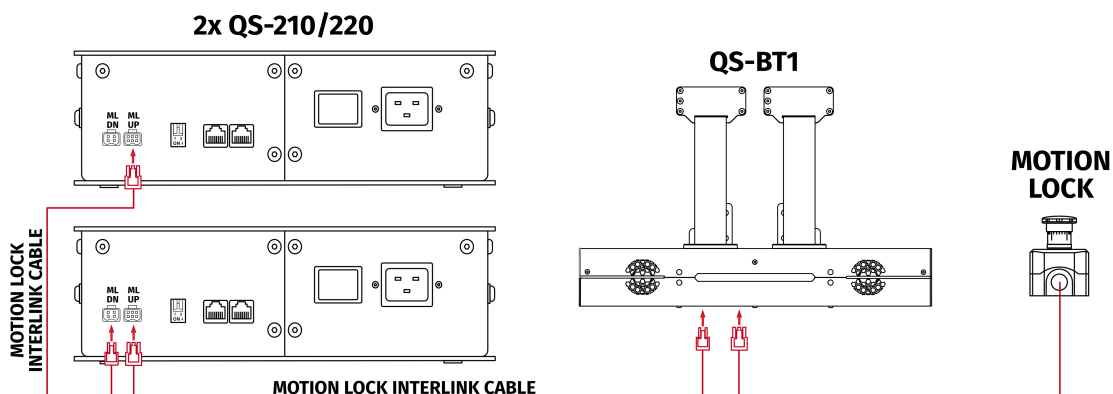
INFO

- Motion Lock interlink cables have different ML/UP (6 pin) and ML/DN (4 pin) plugs on each side.
- We recommend including QS-220 in the Motion Lock circuit, if you are running other QS-series devices. Refer to diagrams below.
- Motion Lock can be plugged into any Power Cabinet in circuit but in order to create a working safety-stop system - **ALL** Power Cabinets in circuit must be connected together with Motion Lock interlink cables.

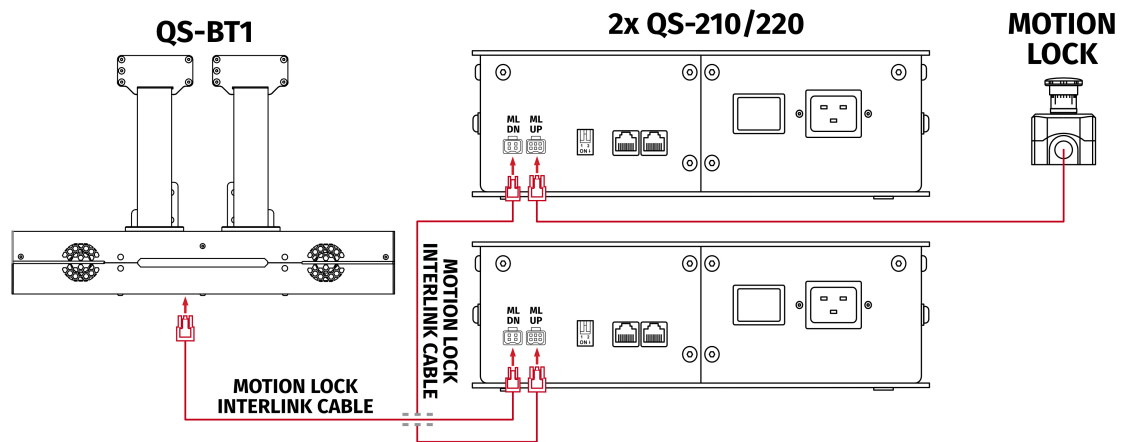
Diagrams below show Motion Lock connections with QS-220 and QS-DD-20, QS-BT1 and two of them combined in various variants.

1. QS-220 3DoF with a seat belt tensioner (QS-BT1).

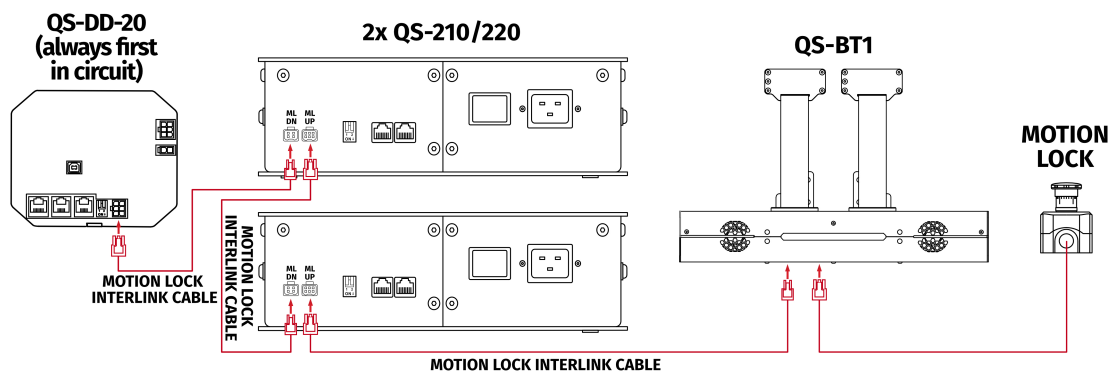
Variant #1



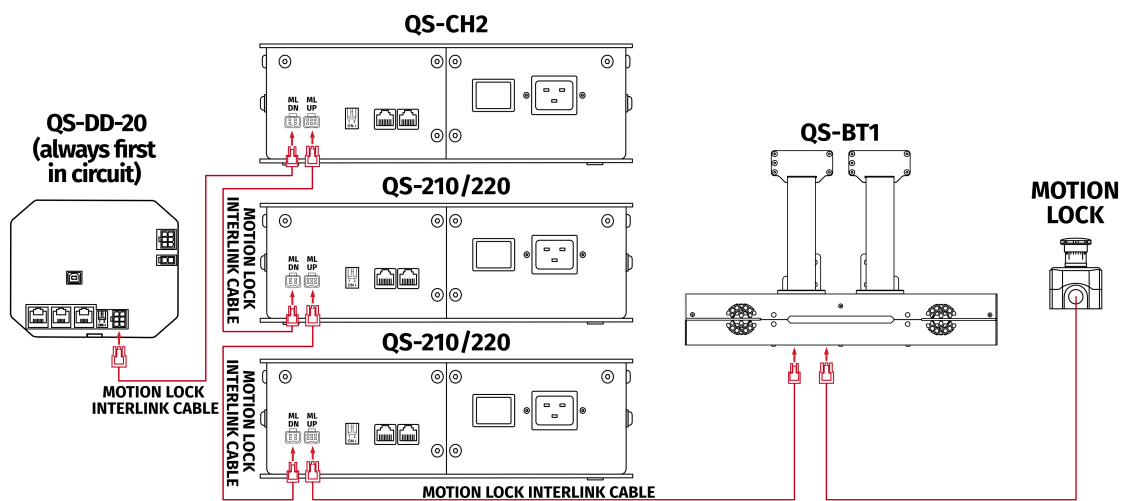
Variant #2



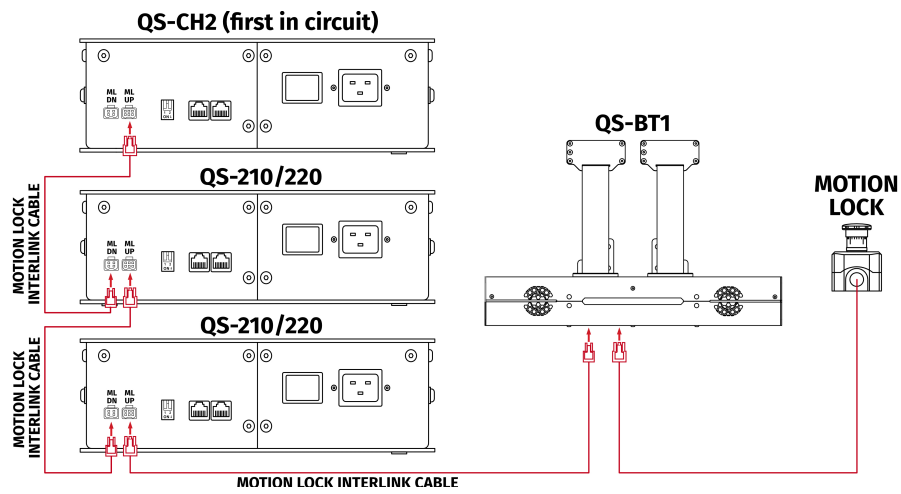
2. QS-220 3DoF with a seat belt tensioner (QS-BT1) and a direct drive steering wheel (QS-DD-20).



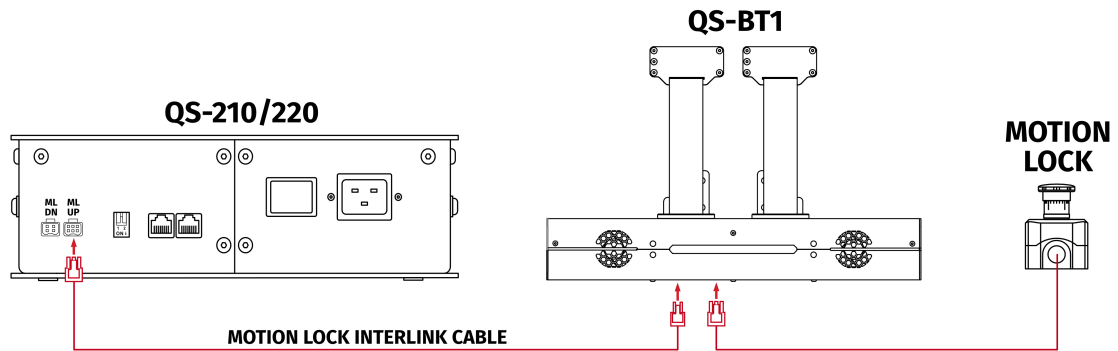
3. QS-220 3DoF with a motion platform (QS-CH2), seat belt tensioner (QS-BT1) and a direct drive steering wheel (QS-DD-20).



4. QS-220 3DoF with a motion platform (QS-CH2) and seat belt tensioner (QS-BT1).

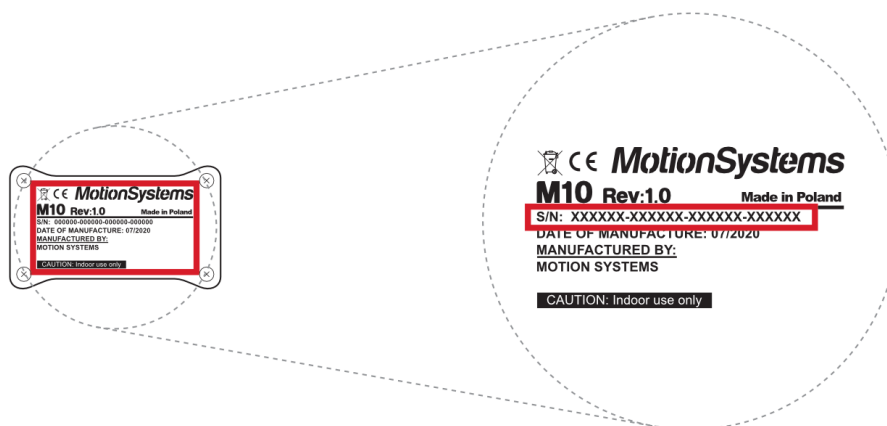


5. QS-220 2DoF with a seat belt tensioner (QS-BT1).



4.12. SOFTWARE INSTALLATION

The **SERIAL NUMBER** can be found on the M10 identification label in the **XXXXXX-XXXXXX-XXXXXX** format. This serial number is also used for activation of FSMI (ForceSeatMI) and MT (Motion Theater) licenses - check information in section 4.12 on page 54.



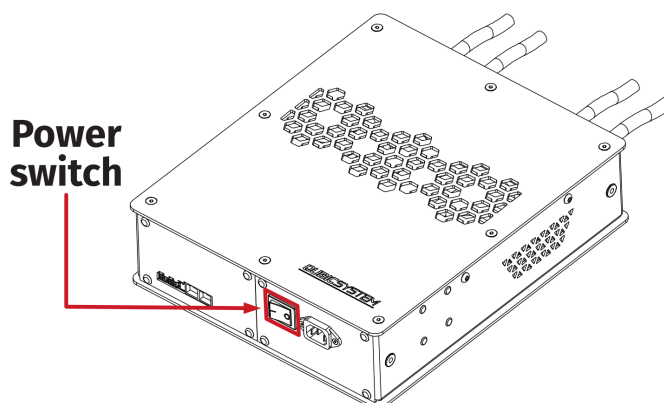
Software installation procedure:

1. Connect the devices according to the cables connection diagram - see section 4.8 for QS-220 2DoF (p. 38), section 4.9 for QS-220 3DoF (p. 40) or section 4.10 for QS-220 3DoF + QS-CH2 (p. 4.10).
2. Download QubicManager from [QubicSystem.com/Download](https://qubic-system.com/download)
3. Enter the serial number located on the identification label.

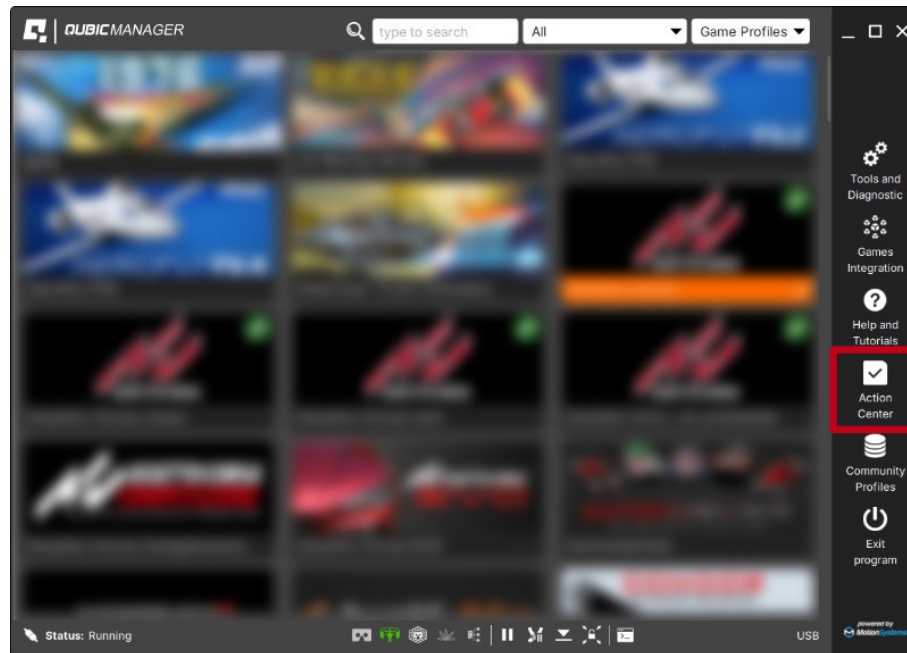
INFO

Alternatively, you can download a small application that will read the code directly from your device (if it is connected via USB): [Download link](#)

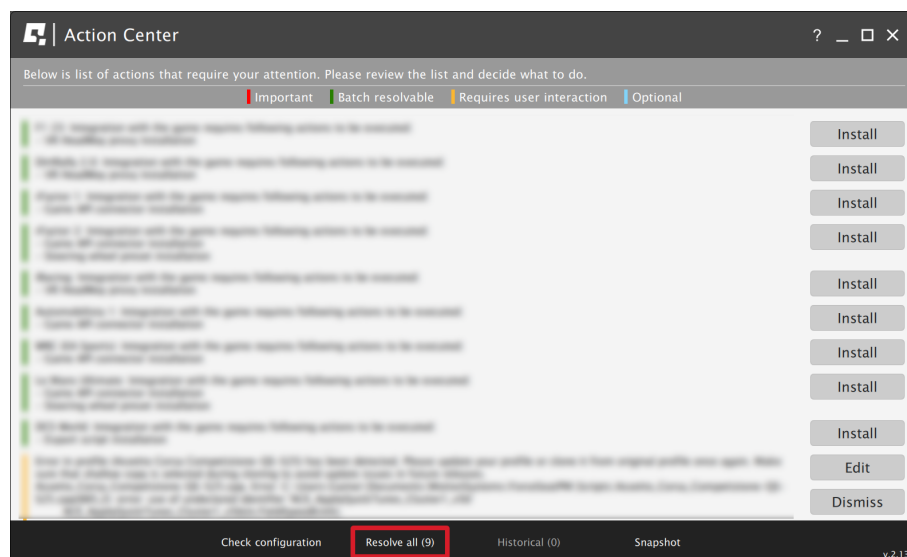
4. Proceed with the installation steps and launch the application.
5. Turn on the device by switching on the power switch button on the Power Cabinet (on all of them, if you have more than one)



6. Check position of the Motion Lock Switch - unpress if needed (go to sub-section 6 on page 57 for a reference illustration).
7. The QS-220 will perform a start-up calibration - **DO NOT** change the payload of the QS-220 until the procedure is over.
8. If QubicManager has recognized the QS-220 correctly, the status of the machine visible in the lower left corner will change to **Connected**.
9. Check **Action Center** on the right side panel for a list of actions that requires attention:



It is possible to solve them one by one or by pressing the **Resolve All** button. Firmware update may require additional confirmation in the dialogue box.

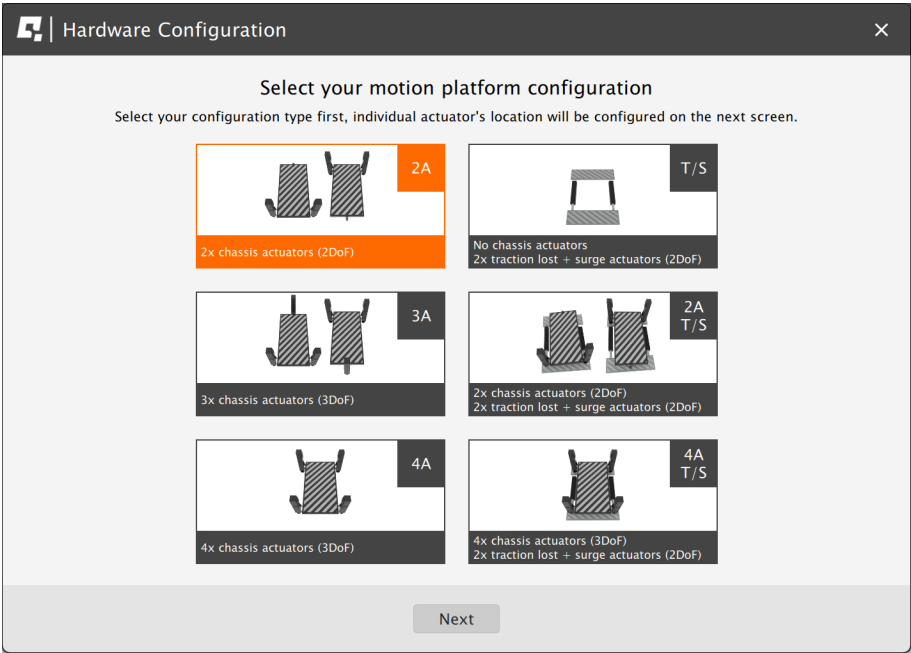


10. Go to **Tools and Diagnostics** → **Devices** and select **Configure**.

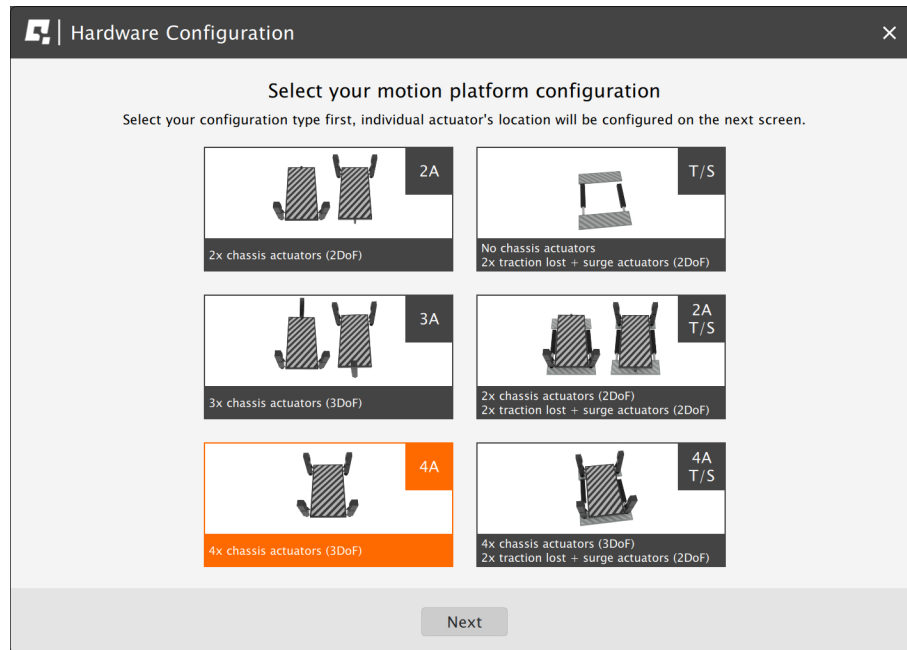
Below are all recognized devices including motion platforms and accessories.

Device #1:	OS-4xx					Configure
Serial number:	xxxxxx-xxxxxx-xxxx-xxxxxx	(copy to clipboard)				
Status:	OK					Levelling
Firmware:	141.16	Temperature (C):	N/A	Hardware ID:	54	
Work time:	1h 05m 17s	Up time:	0h 21m 02s	Features:	default	
Paused:	no	Parking:	finished (normal)	Offline:	no	Quick Codes
Device #1.1:	HVFMCI00					
Serial number:	xxxxxx-xxxxxx-xxxxxx-xxxxxx	(copy to clipboard)				
Status:	OK (33)					
Firmware:	144.30	Temperature (C):	24, 31	Hardware ID:	58	
Work time:	-	Up time:	0h 20m 29s	Features:	default	
Device #1.2:	HVFMCI00					
Serial number:	xxxxxx-xxxxxx-xxxxxx-xxxxxx	(copy to clipboard)				
Status:	OK (33)					
Firmware:	144.30	Temperature (C):	24, 31	Hardware ID:	58	
Work time:	-	Up time:	0h 20m 29s	Features:	default	

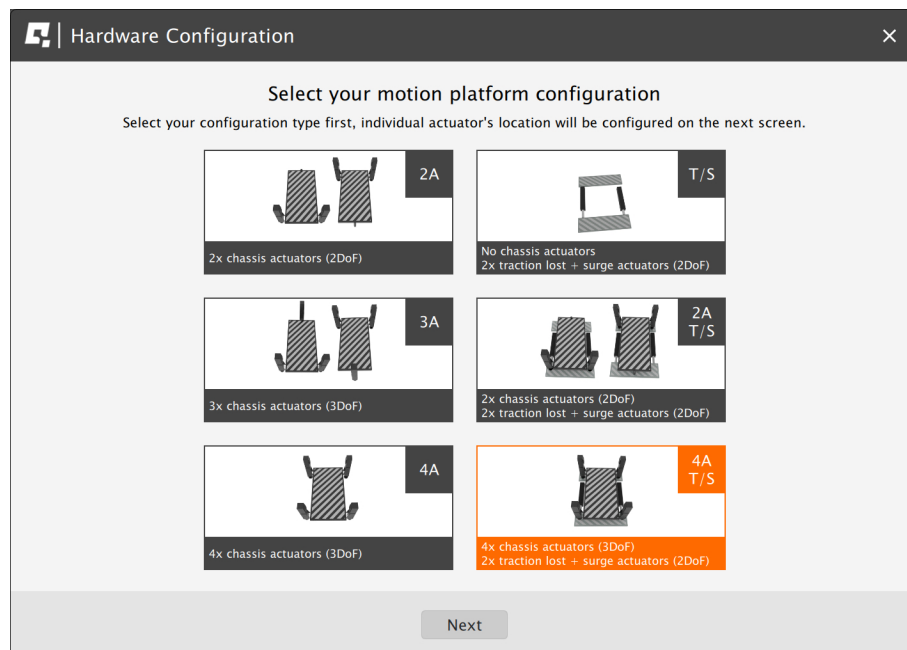
11. For **QS-220 2DoF set**: Choose the correct layout variant from the list (2 actuators setup).



For QS-220 3DoF set: Choose the correct layout variant from the list (4 actuators setup).



For QS-220 3DoF set with traction loss control (QS-CH2): Choose the correct layout variant from the list (4A+T setup).



12. Measure the width between front side actuators. Enter the value in the platform dimensions **Width** field (in millimeters).
13. Measure the length between front and rear side actuators. Enter the value in the platform dimensions **Length** field (in millimeters).

The screenshot shows the 'Hardware Configuration' window. On the left, the 'Platform dimensions' section has input fields for Width [mm], Length [mm], Stroke [mm], T-Pivot [mm], T-Width [mm], T-Min [mm], and T-Stroke [mm]. The Width and Length fields are highlighted with red boxes, and a red arrow points from the Length field to the diagram on the right. The diagram shows a top-down view of the actuator layout with six actuators numbered 1 through 6. Actuator 2 is circled in red, and a red arrow points to it with the text 'Click to make it vibrate'. The diagram also shows 'FRONT' and 'REAR' directions and 'width' and 'length' dimensions.

INFO

To locate the actuator by number - click on it to make it vibrate.

14. Scroll down and choose one of the operation modes:

The screenshot shows the 'Operation Mode' selection screen. It has three modes: Heavy-Duty, Performance, and Q-MODE. Each mode has an icon, a name, and a list of characteristics. Heavy-Duty is selected with a radio button. Performance and Q-MODE are unselected. The Q-MODE mode is marked as unavailable for QS-220 in 120 VAC environment.

Mode	Icon	Characteristics	VAC	Selected
Heavy-Duty	Truck	Moderate acceleration Moderate speed Increased payload	115/230 VAC	Yes
Performance	Car	Increased acceleration Increased speed Moderate payload	115/230 VAC	No
Q-MODE	Formula 1	Maximum acceleration Maximum speed Reduced payload	only 230 VAC	No

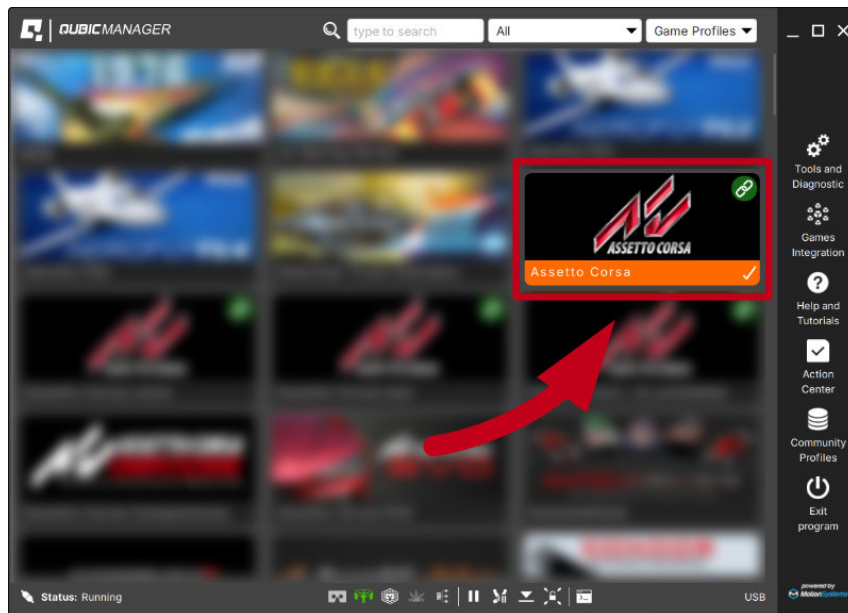
INFO

- Q-MODE is unavailable for QS-220 in 120 VAC environment.
- 2DoF single set of QS-220 works only in Heavy-Duty mode.

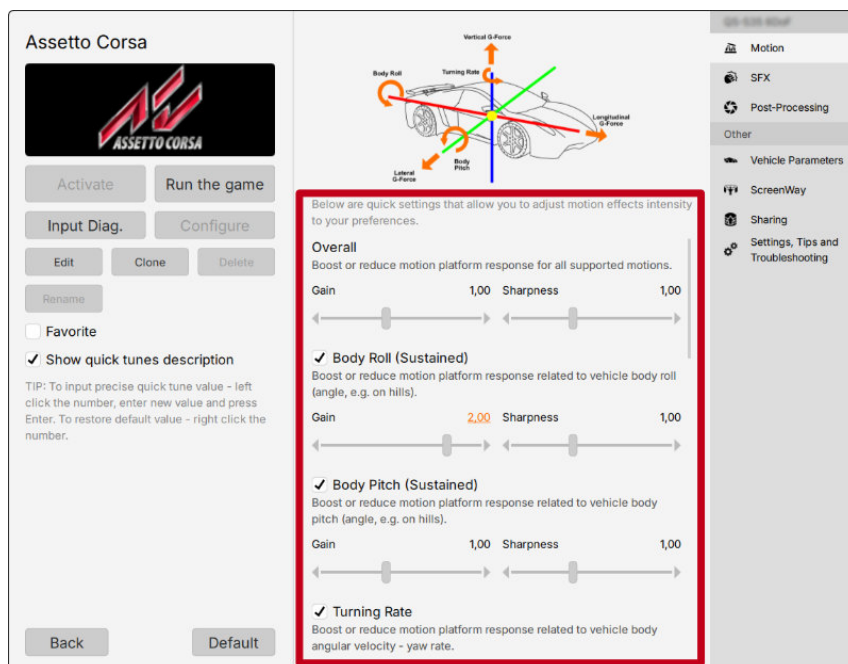
15. Close the configuration and return to the main application window. Choose the game and check profile details by clicking on the game tile.

INFO

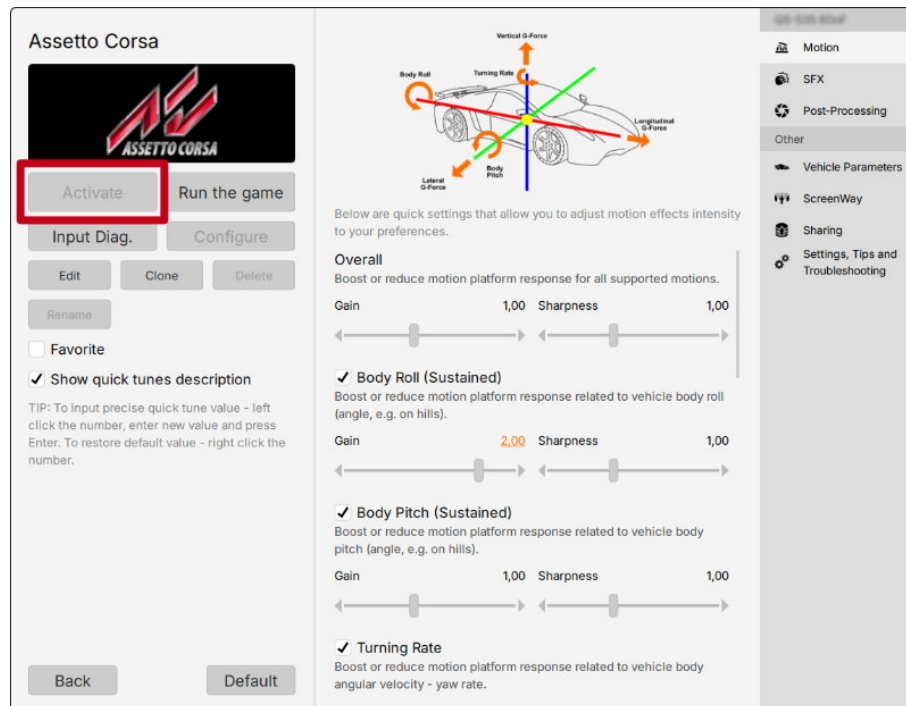
Default profiles are integrated with the software and do not require additional installation. List of supported games is available at: QubicSystem.com/Supported-games.



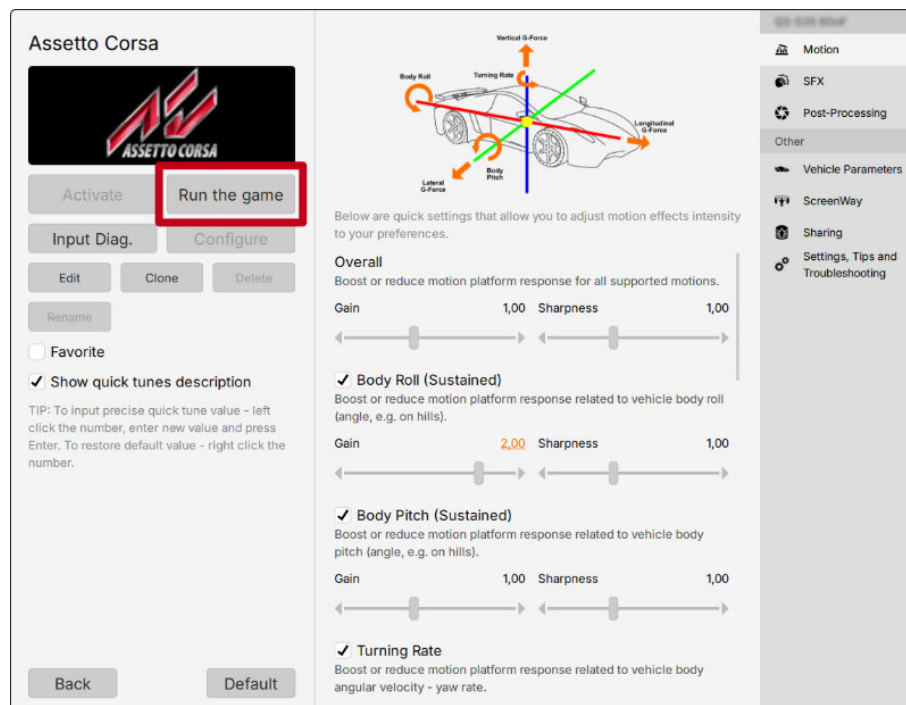
16. Adjust the motion effects intensity up to your preferences in the game profile window. Scroll down to see all of the settings.



17. Activate a profile by clicking the **Activate** button.



18. Launch the game by clicking the **Run the game** button.



19. You can also adjust the settings during the game simulation by pressing **ALT+TAB** and switching between the applications - once the profile is active changes will apply instantly.

INFO

If you need the serial number to activate other software licenses such as ForceSeatMI or ForceSeatDI, it can be found in the QubicManager. After connecting the QS-220 go to **Tools and Diagnostics** → **Devices**. Serial number is visible under the device name:

Below are all recognized devices including motion platforms and accessories.

Device #1: QS-4xx						(copy to clipboard)	Configure
Serial number:	XXXXXXXX-XXXXXX-XXXXX-XXXXXX						
Status:	OK						Levelling
Firmware:	141.16	Temperature (C):	N/A	Hardware ID:	54		Quick Codes
Work time:	1h 05m 17s	Up time:	0h 21m 02s	Features:	default		
Paused:	no	Parking:	finished (normal)	Offline:	no		
Device #1.1: HVFMC100							
Serial number:	XXXXXXXX-XXXXXX-XXXXX-XXXXXX					(copy to clipboard)	
Status:	OK (33)						
Firmware:	144.30	Temperature (C):	24, 31	Hardware ID:	58		
Work time:	-	Up time:	0h 20m 29s	Features:	default		
Device #1.2: HVFMC100							
Serial number:	XXXXXXXX-XXXXXX-XXXXX-XXXXXX					(copy to clipboard)	
Status:	OK (33)						
Firmware:	144.30	Temperature (C):	24, 31	Hardware ID:	58		
Work time:	-	Up time:	0h 20m 29s	Features:	default		
Device #1.3: HVFMC100							
Serial number:	XXXXXXXX-XXXXXX-XXXXX-XXXXXX					(copy to clipboard)	
Status:	OK (33)						
Firmware:	144.30	Temperature (C):	24, 32	Hardware ID:	58		
Work time:	-	Up time:	0h 20m 29s	Features:	default		
Device #1.4: HVFMC100							
Serial number:	XXXXXXXX-XXXXXX-XXXXX-XXXXXX					(copy to clipboard)	
Status:	OK (33)						

INFO

The software is provided "as is", without warranty of any kind, express or implied, including but not limited to the warranties of merchantability, fitness for a particular purpose, and non-infringement. In no event will the authors or copyright holders be liable for any claim, damage, or other liability, whether in an action of contract, tort or otherwise, arising from, out of, or in connection with the software or the use or other dealings in the software.

The software sends anonymous usage data to the Motion Systems company. The data is used to improve the software and game profiles. The data is not used for advertising purposes.

5. MAINTENANCE AND CLEANING

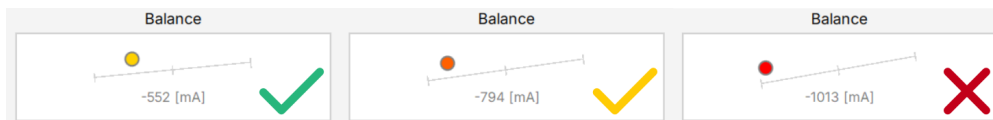
To minimize the risk of abnormal heating that can result in system failure, keep the QS-220 uncovered, clean and dust-free. The unit cleaning should be performed only with a soft, dry cloth. **DO NOT** use any chemicals, water and other liquids to clean the device.

5.1. PLATFORM LEVEL CALIBRATION

Slight imbalance may occur from uneven floor or imperfect cockpit structure.

INFO

- Minor differences in levelling will not affect the performance of the system. Platform levelling should be performed **ONLY** in case of excessive platform imbalance - more than 1000 mA difference.



- Actuators **DO NOT** hold a balanced position after switching the power OFF.

Platform levelling is available at **Tools and Diagnostics** → **Devices** → **Levelling**.

Procedure:

- Click **Generate base signal** for the platform to check the level on each actuator - it will move up and down in sinusoidal motion.

☒ Generate base signal (low rate sinus)

Left

2386 [mA]

0 [%]

Front

Balance

Probing, please wait...

Right

1710 [mA]

0 [%]

Left

1104 [mA]

-100 [%]

Rear

Balance

Probing, please wait...

Right

3058 [mA]

0 [%]

Click to move the piston neutral position up and reduce load on the actuator.

Click to move the piston neutral position down and increase load on the actuator.

INFO

User should be outside of the cockpit.

- Wait for the balance to be measured.
- Use the arrows to reduce (UP) or increase (DOWN) the load on back and front actuators.
- Wait for the balance to be measured again.

5. Continue until a satisfactory result will be achieved.

5.2. CHECKING MOTION LOCK BUTTON

At least once a month check if Motion Lock button is working correctly:

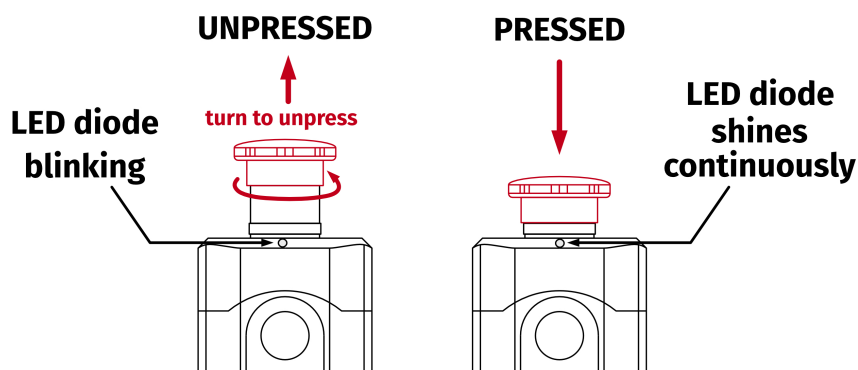
1. Before anyone steps into the platform - turn on the QS-220.
2. Push the red Motion Lock button. Device status will change:



3. The machine should stop and not react to any signal.
4. Turn on a simulation or a game to confirm that - with a correct profile activated proceed to a game or a simulation and engage movement.

✓ If the Motion Lock Button works correctly - platform does not react nor move in any way.

✗ If the Motion Lock button does not work correctly - platform proceeds to simulate motion from the game/simulation. Check the cable connection and repeat the test. If the problem persists - **DO NOT** use the platform, power it off and contact technical support immediately.



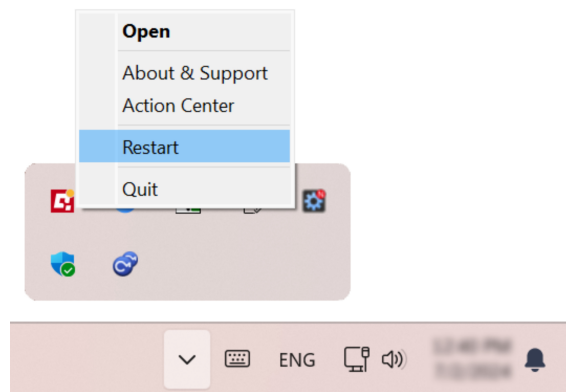
6. TROUBLESHOOTING

WARNING

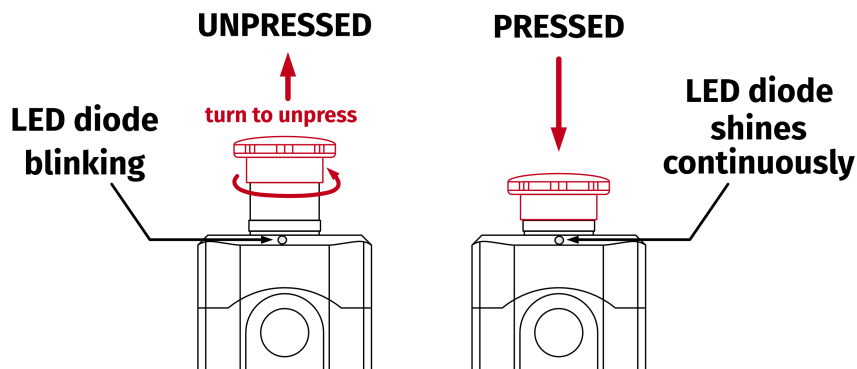
DO NOT attempt to do any repairs by yourself. It could be dangerous and will result in loss of warranty! Repairs should be consulted with technical support and then performed by a qualified technician.

Before contacting technical support, try this:

- Check Action Center in QubicManager.
- Check all cable connections in the device.
- Restart QubicManager application by right-click on the application icon in the system tray and selecting **Restart**:



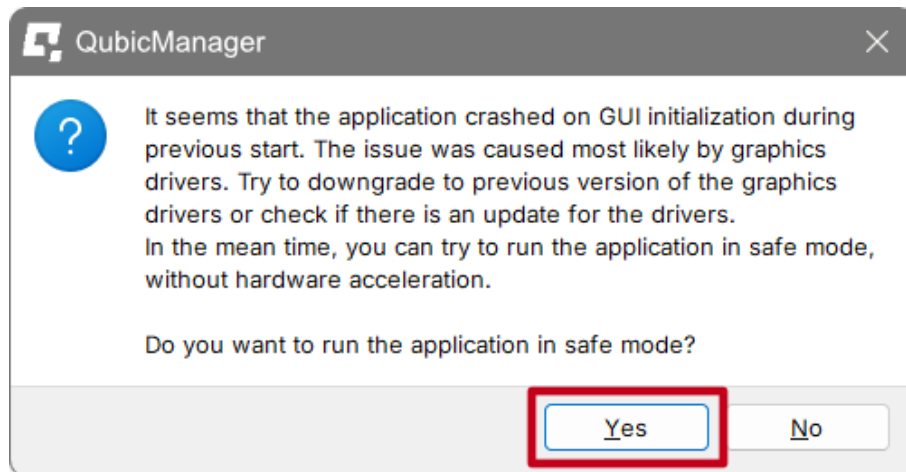
- Check Motion Lock Switch position (should be unpressed to activate the motion):



- Try different USB ports (also try bypassing the USB hub by a direct PC connection).
- If a problem occurred abruptly, it could be caused by a thermal protection. Turn off the QS-220, disconnect it from power outlets and wait at least 15 minutes to let it cool down. Try turning it on again later.
- In case of any unclear electrical issues, strange behavior or abnormal work conditions, contact technical support.

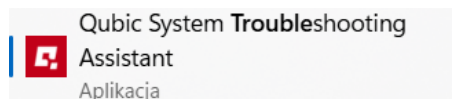
Common problem: QubicManager software crashes on launch with an OpenGL error.

Solution short-term: To open the app, click **OK** on all the operating system errors. Restart the QubicManager software and you will be presented with a window:

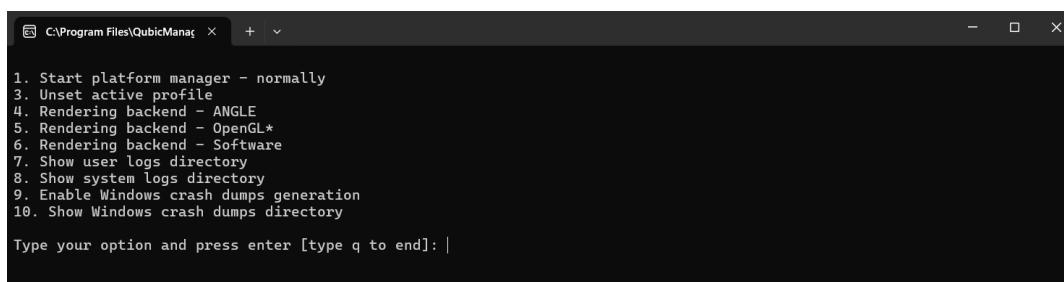


Click "YES" if you want run the application in Safe Mode (it will run a little slower).

Solution long-term #1: In order to overwrite the OpenGL rendering backend permanently, type in **troubleshooting** in Windows search bar. Select **Qubic System Troubleshooting Assistant**.



In the prompt window, type **6** on your keyboard and click **Enter**. Restart the QubicManager application.



Solution long-term #2: This issue is caused by graphics drivers. Try to downgrade to a previous version of graphics drivers or check for updates.

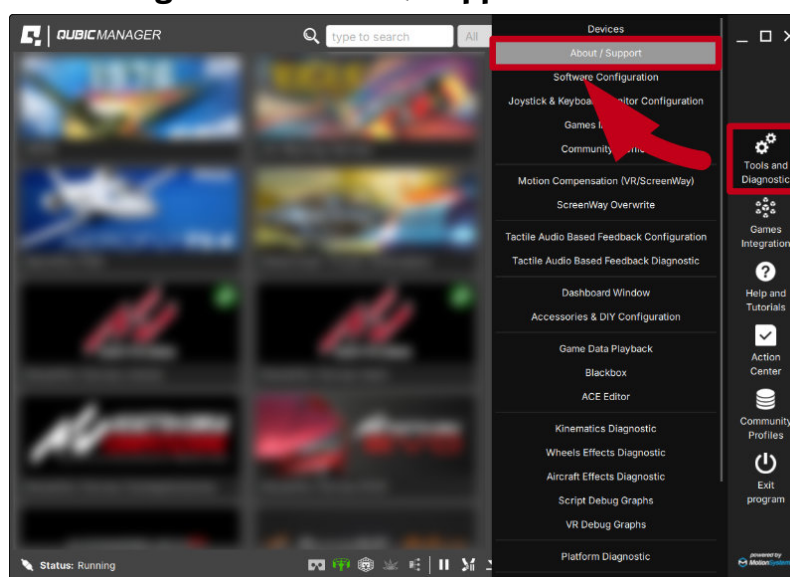
6.1. CREATING A SNAPSHOT

A snapshot is the easiest and fastest way to diagnose a problem. If you send in the zip file generated in the snapshot menu along with a description of the problem, technical support receives all the necessary information about the product and its configuration. It can be then analyzed to provide the best solution.

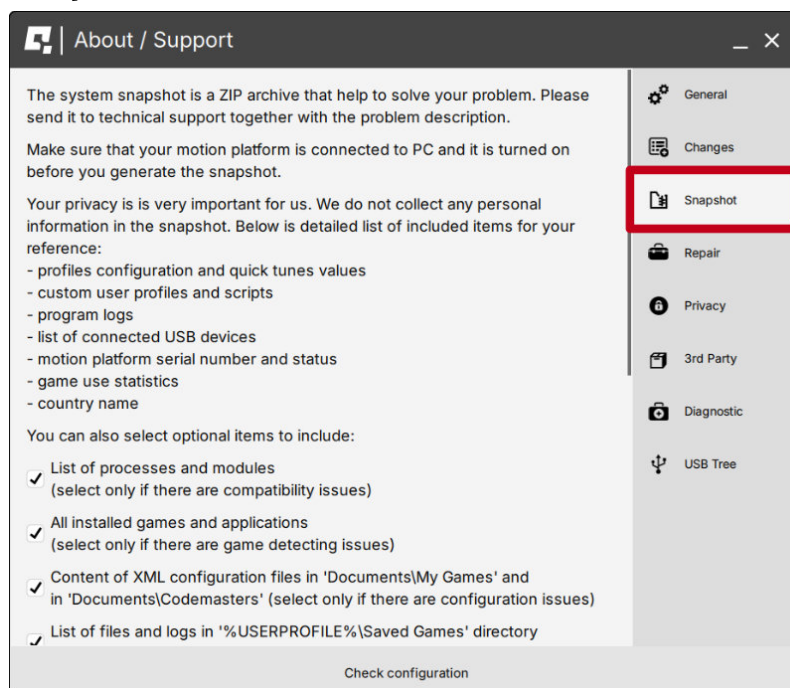
INFO

The QS-220 and all interconnected Power Cabinets **MUST BE** be powered up when creating the snapshot.

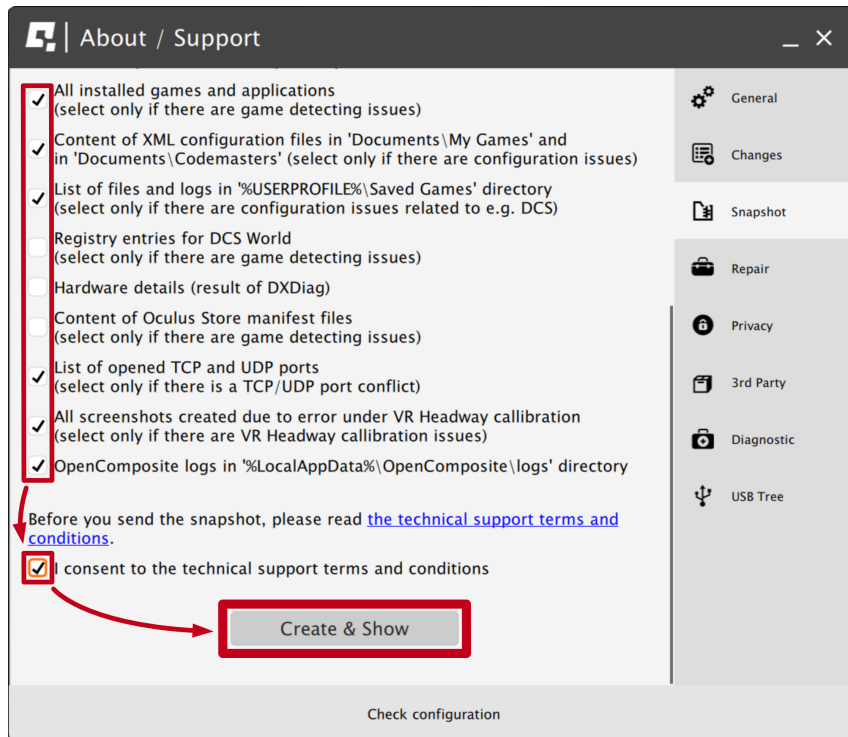
1. Open the main window of the QubicManager application.
2. Go to **Tools and Diagnostic** → **About / Support**.



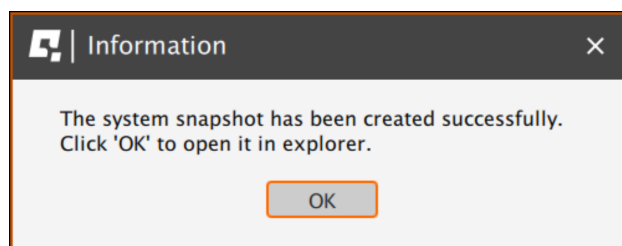
3. Open the **Snapshot** window:



4. Select data that will be included in the snapshot.
5. Scroll down, consent to the technical support terms and conditions and select **Create & Show**:



6. The snapshot has been created, click the **OK** button - the folder with the snapshot ZIP file will open.



7. Attach the snapshot ZIP file to your support request.

6.2. DISCORD CHANNEL

We strongly recommend joining our discord channel, where our growing community is sharing amazing tips and ideas of how to set up, use and tune the Qubic System products. You can also send questions for our staff or get answers directly from the community.

Join our discord channel by following the invitation link:

QubicSystem.com/Discord



7. ADVANCED APPLICATIONS

INFO

Examples shown in this section describe optional application of external safety and power cut-off devices. If you wish to expand the functionality of your motion system, read the whole section to have a good understanding of how to apply and what functionality to expect. Apply at your own discretion.

WARNING

Motion Lock input is not a SIL/PL (safety integrity level/performance level) rated and **DOES NOT** guarantee safety. If you wish to achieve specific SIL/PL ranking, consider introducing a power cut-off device that is controlled by an external safety relay and cuts off the power to all QS-SB2. Example application of the power cut-off contactor can be found in section **7.3.2** and **7.3.3**.

INFO

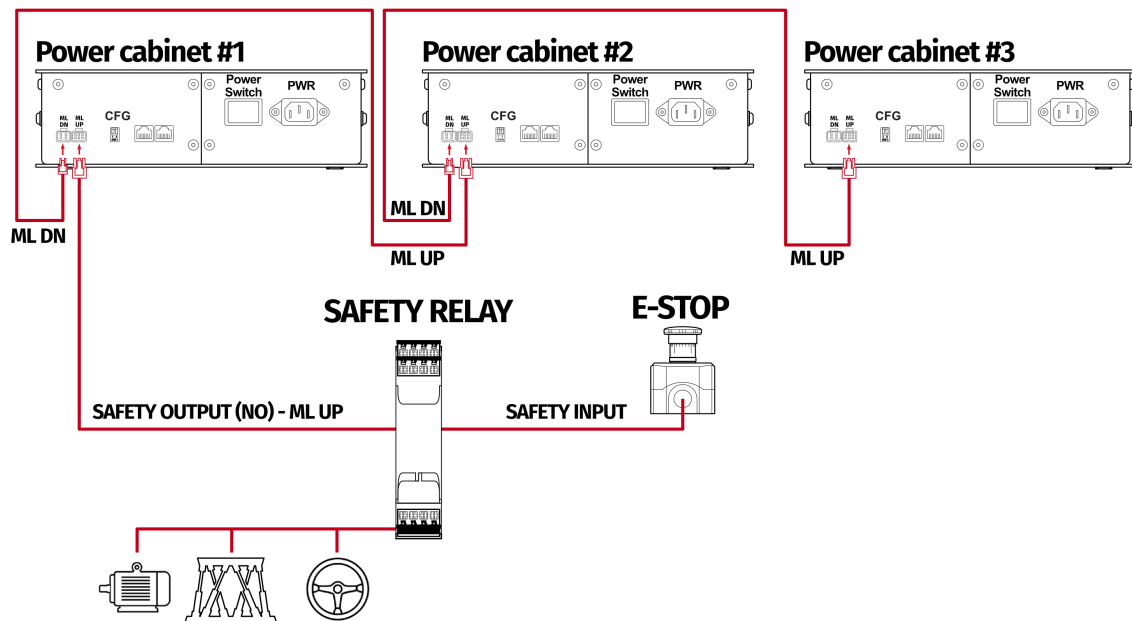
When applying safety relay to the Motion Lock :

- Use input cables according to your safety relay manual.
- Use output cables according to your safety relay manual and cross section
no less than 0,75 mm²

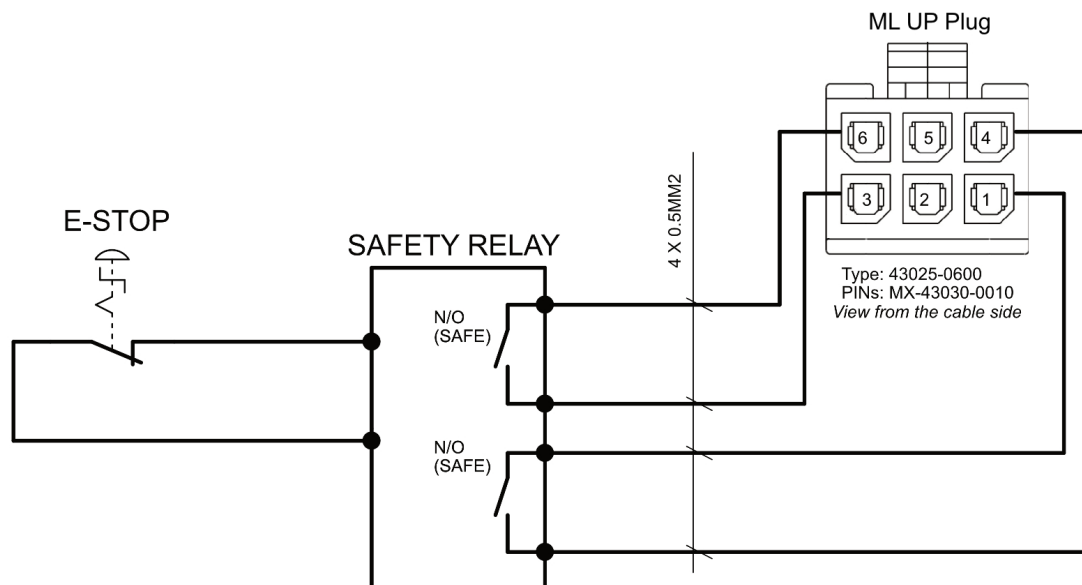
7.1. ADDING ADDITIONAL DEVICES TO THE MOTION LOCK CIRCUIT

If there is necessity to stop other devices, apart from the QS-220, ML (Motion Lock) and additional user devices can be controlled by safety relay outputs. In the example application, the E-STOP button is connected to the external safety relay. When the E-STOP is triggered, the safety relay will activate the Motion Lock function, which will stop motion of the platform and additional devices.

Example application of single-channel safety relay that controls ML and additional devices:



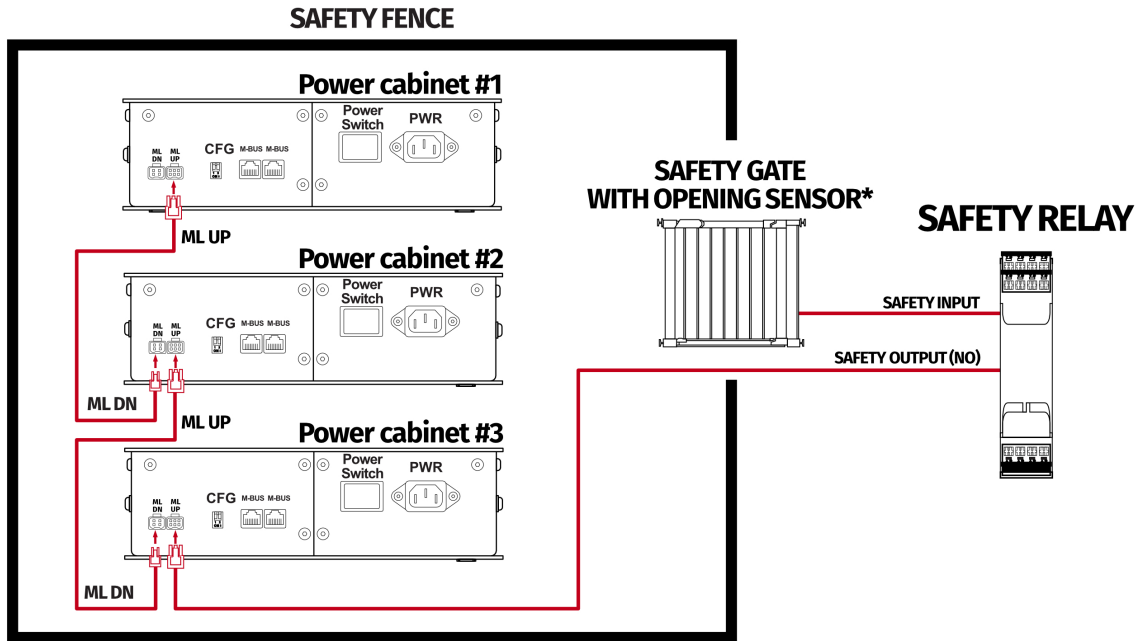
Example wiring diagram of application of one-channel safety relay with E-STOP button:



7.2. IMPLEMENTING THE WORKING ZONE PROTECTION

To protect bystanders from accidental hit from moving parts of the platform, safety gate with opening sensor* can be connected to safety relay input for activating ML function. When the gate opens, the safety relay output activates the ML (Motion Lock) function and stops the motion of the platform.

Example application of safety gate opening sensor:



*Check your safety relay manual for list of applicable sensors

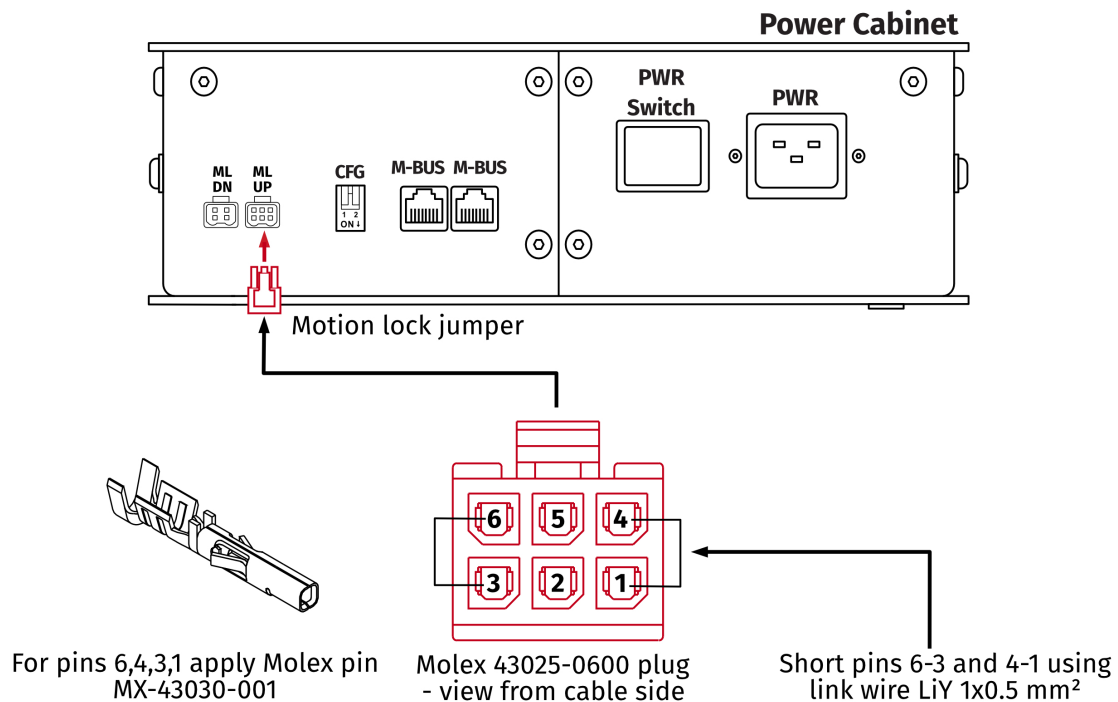
7.3. INCREASING SAFETY LEVEL

WARNING

Modifications of the safety system, involving application of the power line contactors, shall be performed only by somebody competent. A competent person is a qualified and knowledgeable person, who because of their training and experience has the knowledge required to apply those changes. It is user responsibility to commission modification of the safety system to a competent person, experienced with industrial wiring practices, which will be required to undertake the installation. Commissioning shall be undertaken by a trained electrical technician experienced in safety installations.

7.3.1 ASSEMBLING MOTION LOCK JUMPER

To apply solutions which require using power line contactors, Motion Lock connection cables in the QS-SB2 power cabinet needs to be replaced with jumpers. To prepare a jumper, you need to assemble recommended connector as shown below:



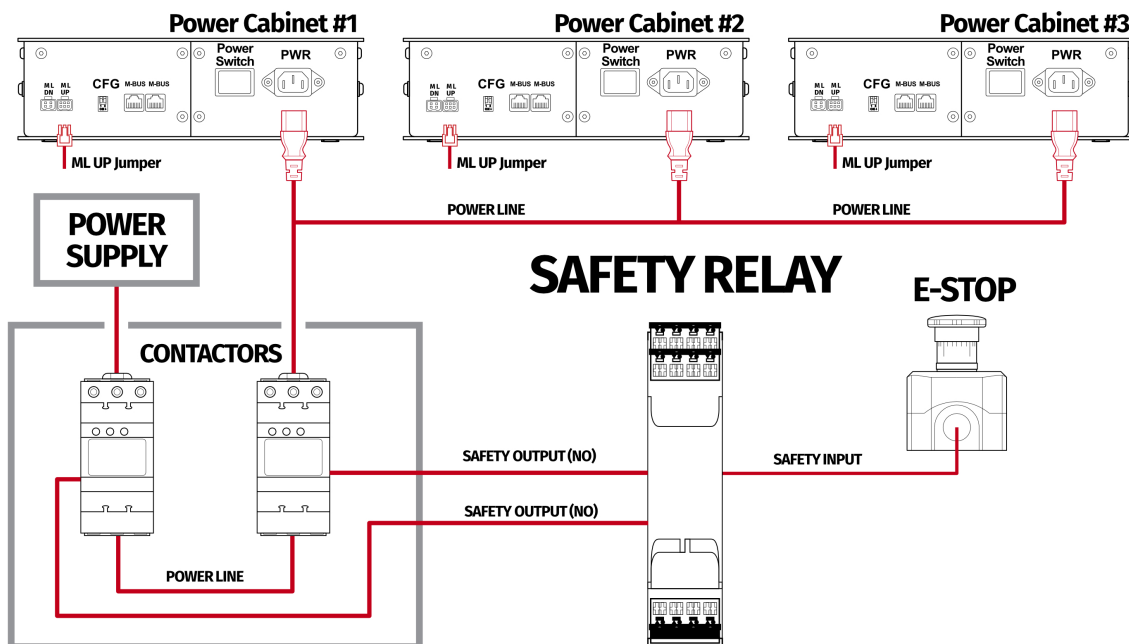
7.3.2 ADDING POWER-CUT CIRCUIT WITH E-STOP BUTTON

If specific SIL/PL rated level needs to be achieved, it might be necessary to install a power cut-off device. Two contactors connected in series and controlled by safety relay can be used to provide or cut-off power line to QS-SB2 power cabinets. When safety function on safety relay input is triggered, a safety relay will switch off the contactors, thus cutting-off the power to the platform. To apply this solution, ML UP connection cables needs to be replaced with prepared jumper as described in section 7.3.1.

INFO

To achieve required safety performance level it is necessary to perform safety risk assessment at user site.

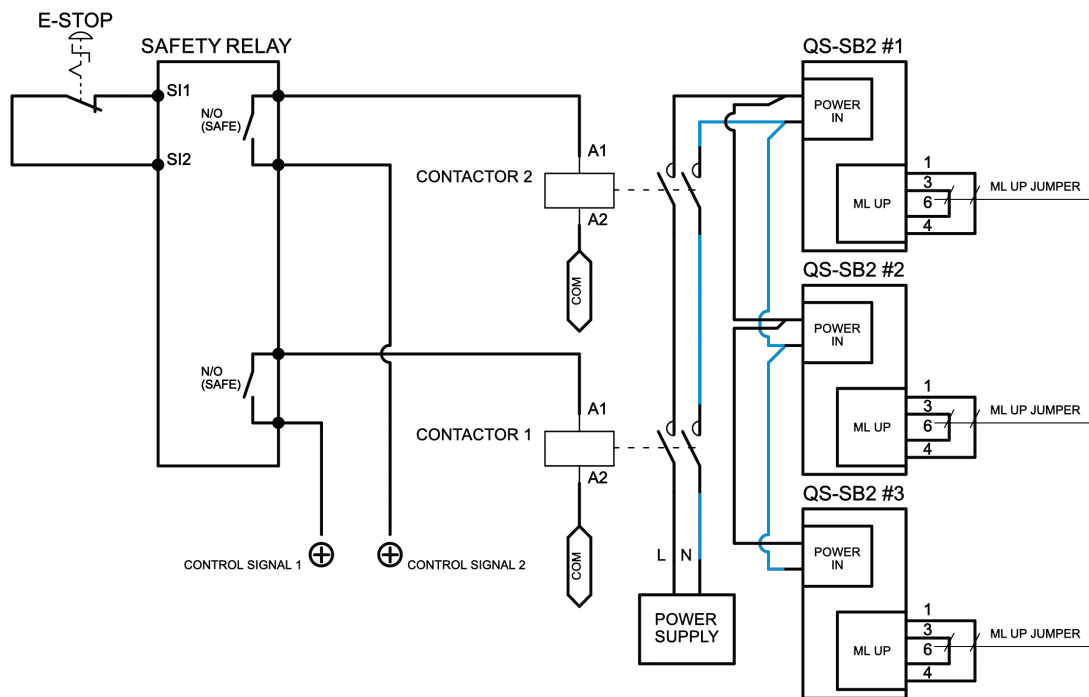
Example application of power line contactors and E-STOP button:



INFO

In order to increase SIL/PL level it's a good practice to apply well-known contactors of two different manufacturers in order to decrease probability of failure resulting from serial production.

Example wiring diagram of application of power line contactors and one-channel safety relay with E-STOP:



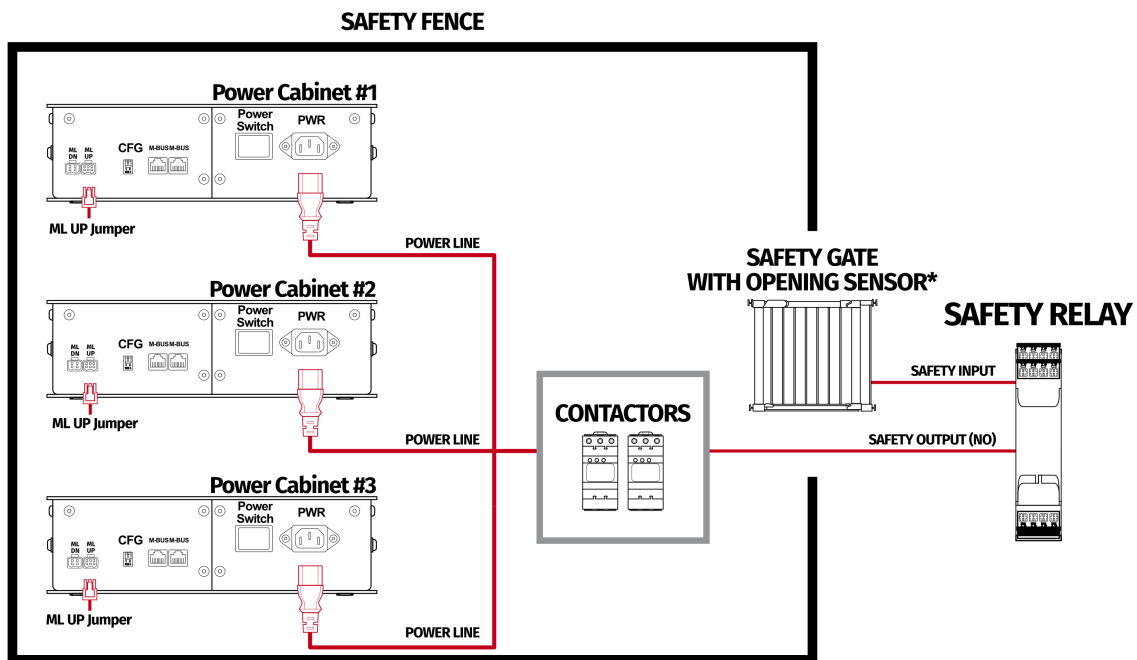
INFO

PE (protective grounding/earthing) connection is omitted for better transparency

7.3.3 IMPLEMENTING THE WORKING ZONE PROTECTION WITH POWER-CUT CIRCUIT

In example application contactors connected in series provide power line to the QS-SB2 power cabinets. When safety function on safety relay input is triggered, a safety relay will switch off the power contactors, thus cutting-off the power to the platform.

Example application of power line contactors with safety gate opening sensor:



*Check your safety relay manual for list of applicable opening sensors

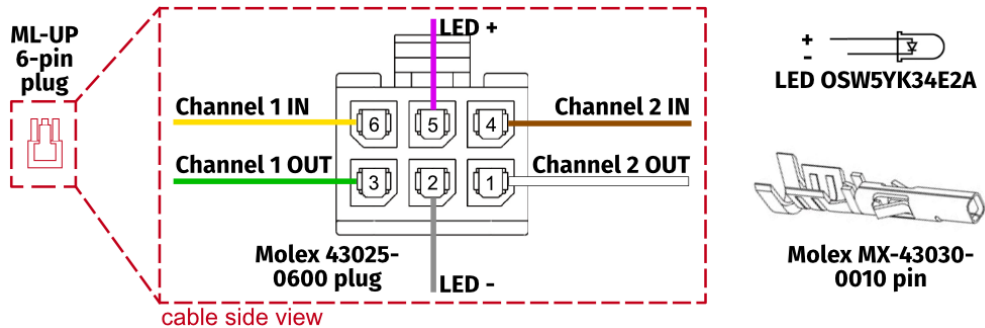
INFO

When applying safety relay and contactors to the power line remember to:

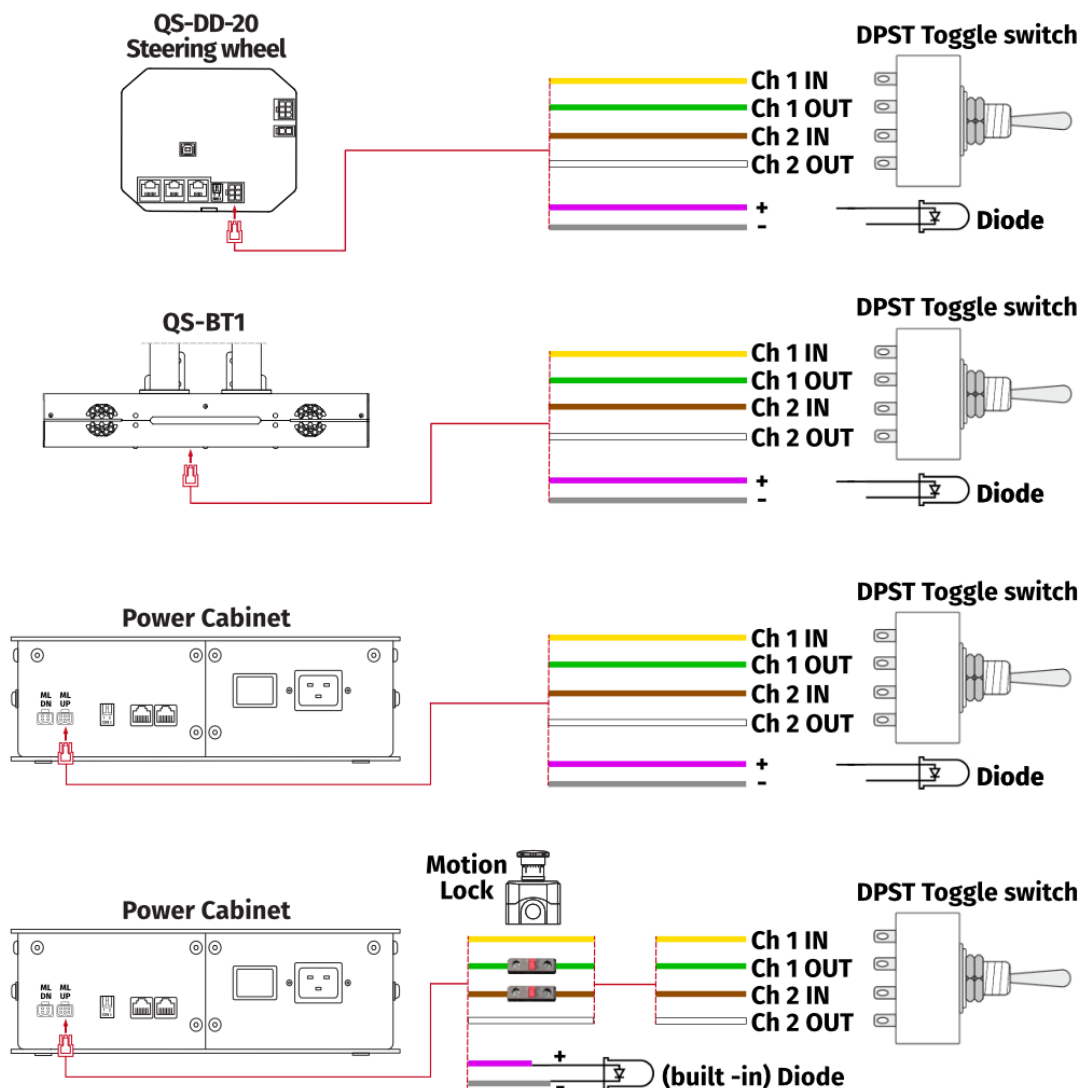
- Use control cables according to your safety relay manual
- Power line cables shall be chosen accordingly to power requirements of motion system. See power requirements of specific motion system.

7.4. IMPLEMENTING NON-FACTORY MOTION LOCK SWITCH

For non-factory Motion Lock plug setup, you must assemble plug and connectors as shown below:



If you want to assemble custom Motion Lock switch or a button box setup (only Double Pole Single Throw switch compatible) using QubicSystem Motion Lock interlink cable, follow the diagrams below:



8. CONFORMITY INFORMATION



The QS-220 meets the requirements of CE and relevant regulations of the EMC Directive 2014/30/EU.

9. ENVIRONMENTAL IMPACT AND DISPOSAL



DO NOT dispose of this product with standard household waste but drop it off at a collection point for the disposal of Waste Electrical and Electronic Equipment for recycling.

QS-220 is shipped with wooden cases/cardboard boxes. If the packaging is no longer needed, it can be fully recycled.

QS-220 is an advanced device and if stored or disposed of incorrectly it could harm the environment or/and other people. When the device is no longer in use it should be disposed in environmental safe manner in compliance with applicable local work and environmental protection regulations. If no other agreement of disposal was concluded, the device shall be dismantled for disposal as follows:

- Metal parts should be scrapped.
- Electric and electronic components should be disposed of in the specialized disposal center.
- Other materials should be sorted and disposed of accordingly to the local law and regulations.

10. LIABILITY DISCLAIMER

If permitted under applicable law, Motion Systems and its subsidiaries disclaim all liability for any damages caused by one or more of the following:

- The product has been modified, opened, or altered.
- Failure to comply with assembly instructions.
- Inappropriate or abusive use, negligence, an accident (an impact - for example).
- Normal wear.

INFO

If permitted under applicable law, Motion Systems and its subsidiaries disclaim all liability for any damages unrelated to the material or manufacturing defect with respect to the product (including, but not limited to, any damages caused directly or indirectly by any software, or by combining the QS-220 with any unsuitable element or other elements not supplied or not approved by Motion Systems for this product).

11. WARRANTY

Motion Systems warrants to the consumer that this product shall be free from defects in materials and workmanship, for a warranty period which corresponds to the time limit to bring an action for concerning this product.

For commercial customers there is a one (1) year limited warranty, starting on the original date of purchase.

For non-commercial customers there are two (2) years warranty, starting on the original date of purchase.

Within the warranty period, the product will be repaired or replaced free of charge, excluding shipping charges.

This warranty shall not apply:

- If the product has been modified, opened, altered, or has suffered damage as a result of inappropriate or abusive use, negligence, an accident, normal wear, or any other cause unrelated to a material or manufacturing defect (including, but not limited to, combining the QS-220 with any unsuitable element, including in particular power supplies, chargers, or any other elements not supplied or approved by Motion Systems for this product).
- In the event of failure to comply with the instructions provided by technical support.
- To software (said software being subject to a specific warranty).
- To accessories (cables, cases, for example).
- If the product was sold at public auction or if the product has suffered damage as a result of force majeure: flood, fire, earthquake, storm.

This warranty is non-transferable. No new warranty period commences if the product is repaired or replaced. Your statutory rights towards the seller are not affected or restricted by this warranty. Motion Systems, and their partners are not liable for any indirect, incidental, or punitive damages from use of this product. In case of malfunction during the warranty period immediately contact technical support.

12. COPYRIGHT

Qubic System is a trademark of Motion Systems. All rights reserved.

All the contents in this user manual are the intellectual property of Motion Systems. No part of this manual, including the products and software described in it, shall be modified or translated into any language without the prior written permission of Motion Systems. Specifications and information in this manual are subject to change at any time without obligation to notify any person of such revision or changes. Illustrations are not binding.

INFO

Trademark Notice - All brand names, icons, and trademarks that appeared in this manual are the sole property of their respective holders.

13. MANUFACTURER INFORMATION

Qubic System is a brand
that belongs to **Motion Systems**

HQ address:
Miedziana 7 Street
55-003 Nadolice Wielkie
Poland



Motion Systems homepage



QubicSystem homepage

INFO

In support queries please contact your reseller.

 **QUBICSYSTEM**



Q5 220