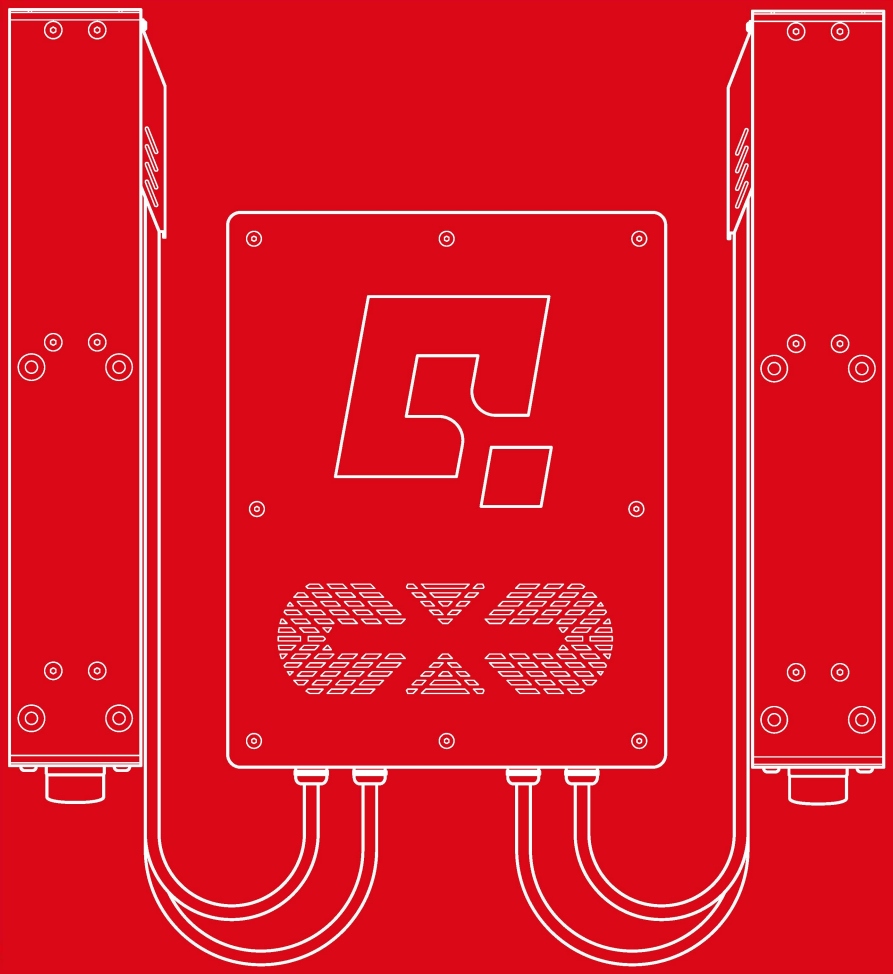
QS-220-PL

User Manual



Force2Motion
Adventures For Real Gamers

QUBICSYSTEM

The Motion Systems, manufacturer of Qubic System, would like to thank you for choosing the QS-220-PL, an innovative product that helps you 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!

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IMPORTANT SAFETY INSTRUCTIONS

INFO

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.

WARNING

QS-220-PL is not intended for use by children under 16 years of age. Close supervision and safety instruction is required when this product is used by or near children or people with reduced physical, sensory or mental capabilities. Keep the packaging away from small children as it poses a suffocation risk.

1.1 ESSENTIAL INFORMATIONS

To reduce the risk of burns, fire, electrical shock, injury or mechanical damage:

- Use the QS-220-PL only for its intended purpose, according to instructions.

WARNING

Always turn all switches off before plugging and unplugging the QS-220-PL. Dangerous voltages level can be present in Power Cabinet for a few minutes after turning off the machine.

- Unplug the QS-220-PL from the power source if it is not used for an extended period or when there is a need to perform hardware installation, maintenance, servicing or repairs.
- Turn the QS-220-PL off when it is not in use.
- The QS-220-PL was designed for indoor use only - **DO NOT** store or use the product outdoors.

- Keep the QS-220-PL away from the heat sources, high humidity, water, and other liquids. **DO NOT** store in extremely cold place where 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 vents.
- 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-PL if the ambient temperature is below 4° Celsius (39° Fahrenheit) or above 45° Celsius (113° Fahrenheit).
- **DO NOT** use the QS-220-PL 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. **DO NOT** replace the power cables provided with the product. Use certified power and USB cables only.
- Connect the QS-220-PL to a properly grounded outlet only. See grounding instructions in section 1.2 on page 7.

WARNING

Stop using the QS-220-PL immediately and contact technical support when the machine starts to emit unusual noise, smoke or any other suspicious behaviour indicating the machine is not working properly.

INFO

The maximum length of wires and cables provided by the manufacturer is 3 meters:

- the maximum length of the USB cable is 3 meters
- the maximum length of the M-BUS cable between M10 and QS is 3 meters
- the maximum length of the M-BUS cable between the QSs is 3 meters
- the maximum length of the MotionLock cable is 3 meters (both with and without the plug)

1.2 GROUNDING INSTRUCTIONS

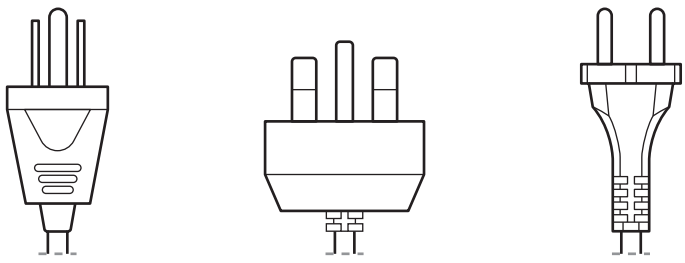
INFO

Use only a high-quality power plug adapter purchased from trusted suppliers.

In case of a system malfunction or breakdown, grounding provides a path of the least resistance for electric current to reduce the risk of electric shock. If the place (where the QS-220-PL is mounted) can not provide proper grounding, according to the description, please contact a qualified electrician for help.

The QS-220-PL is equipped with an electric cord having an equipment-grounding conductor, and a grounding plug. The plug must be plugged into a matching outlet that is properly installed, and grounded in accordance with all local codes and ordinances.

DO NOT modify the plug provided - if it will not fit the outlet, contact adequate technical support.



USA UK EU

If electrical installation and fuses can handle it, we recommend connecting PC, TV, and the QS-220-PL to the same socket (2 Actuators Setup). Information about power drawn by QS-220-PL is available in section 4.2 on page 18. Be sure, to check if the available socket can handle all devices at once from one wall socket. If not, use multiple, separately fused wall sockets.

1.3 HEALTH AND SAFETY INSTRUCTION

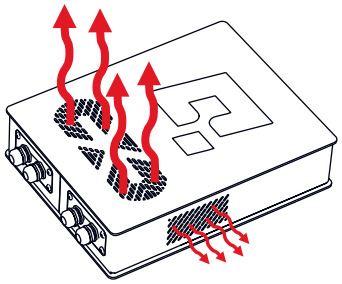
The safety of Qubic System users is the top priority. To protect users and bystanders against injuries caused by mechanical parts movement and electrical connectivity, the following instructions must be strictly performed.

WARNING

As with any mechanical device, the user is responsible for inspecting the condition of the machine prior to use and adhering to safe operating procedures.

What must be done before turning on the machine:

- Check if nothing is blocking machine movements or air vents. The minimum distance between the air vents in the power cabinets and any outside parts of the cockpit equipment is 10 cm or 4 in.



- Check if cables are mounted properly – must not be stretched or loosely connected to the socket, must not lie close to moving parts.

- Check that all elements are properly fixed.
- Check if there are no sharp edges nearby.

WARNING

Dangerous voltage level may occur in Power Cabinet and cables during the operation and for a few minutes after turning off the machine.

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

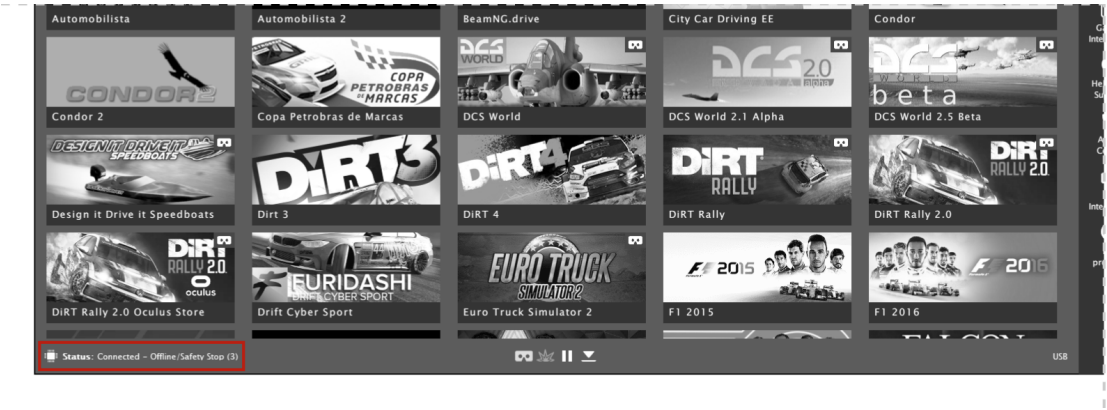
- Check if everyone around is aware of machine rapid movements.
- Make sure that no one stands in the range of motion (minimum 1.5 m).
- Kids should be kept away from the machine.
- Pets should be kept away from the machine.
- When the QS-220-PL is turned on it performs start-up calibration.

WARNING

QS-220-PL will move automatically after turning it on in order to perform start up procedure. Please be away of that movement and do not try to interrupt it.

- **DO NOT** interrupt or change the weight of payload mounted to the QS-220-PL during start-up calibration.
- Motion Lock Switch should be mounted close to the operator of the machine – it has to be easily reachable in every situation.
- Check Motion Lock Switch **AT LEAST** once a month to reduce the possibility of unknown failure – more information available in chapter 5 on page 33.
- Before getting on or off the machine, make sure to push the Motion Lock Switch.

It is also possible to check if the machine is in the Motion Lock mode in software – QubicManager – it is visible in the lower left corner of the QubicManager as "Connected - Offline/Safety Stop". More information about software in section 4.10 on page 27.



- In case of game crash the Motion Lock Switch must be used before getting off the machine.

WARNING

Motion Lock and Park Mode option **DO NOT** guarantee safety.

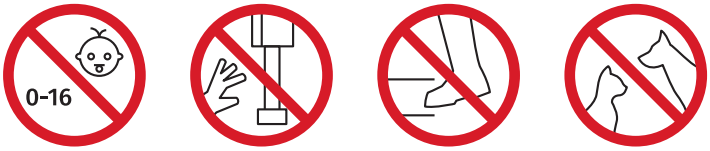
- For VR Headset users:
  - Remove the VR goggles before entering or exiting the rig.
  - Check very carefully if cables from VR Headset are not limiting the operation range of QS-220-PL.
  - Check if the whole VR setup is not in range of motion of the machine.
  - Check if cables are protected from being crushed by the QS-220-PL – **DO NOT** let them lie loosely under the motion rig.

INFO

Check if 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-PL if you are pregnant, tired, or under influence of alcohol or drugs.

- **STOP USING** the QS-220-PL immediately if pain, fatigue or any discomfort appears.
- For every two hours of playing, we recommend at least **15 MINUTES OF BREAK**.
- **DO NOT** put your hands or legs in the actuators range of motion!
- **DO NOT** use the QS-220-PL around small children or pets.
- **DO NOT** put any items between actuators and stabilization plates.



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:

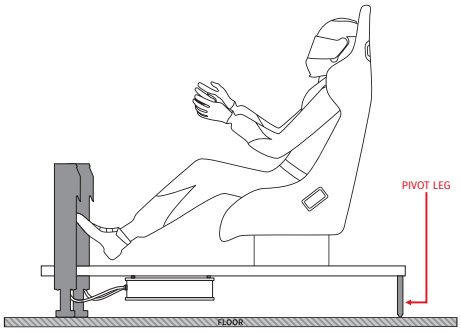
- The product has been modified, opened, or altered.
- Failure to comply with a User Manual.
- Inappropriate or abusive use, negligence, an accident (an impact, for example).
- Normal wear.

INFO

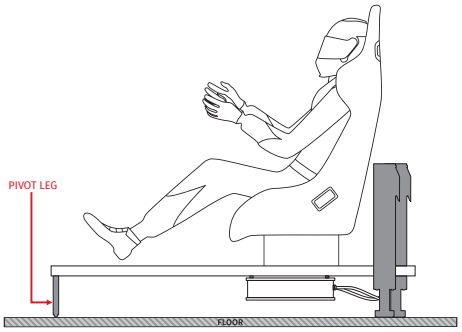
If permitted under applicable law, Motion Systems and its subsidiaries disclaim all liability for any damages unrelated to the material or manufacturing defect with respect to the product (including, but not limited to, any damages caused directly or indirectly by any software, or by combining the QS-220-PL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

SETUP AND VARIANTS

QS-220-PL is designed with upgradability in mind – it is possible to expand 2DOF Setup later on. Available variants are presented below.



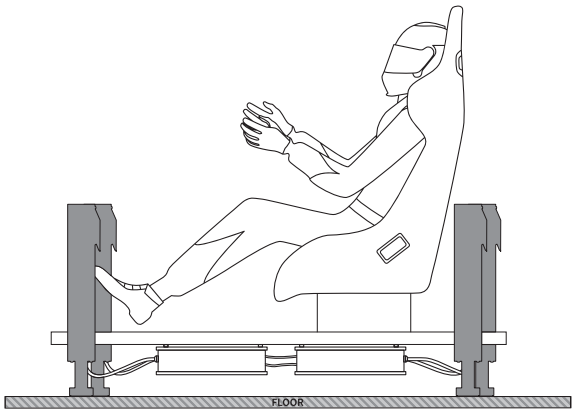
Intro set - 2DOF - Front variant



Intro set - 2DOF - Back variant

WARNING

QS-220-PL is not being delivered with pivot leg.



Extended set - 3DoF

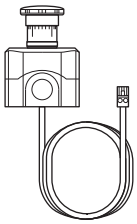
3.1 INTRO SET

WARNING

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

For beginners, two actuators variant can be sufficient and Motion Systems provides the option to buy Intro Set that contains QS-MC6 and QS-220-PL (**QS-220-PL is not delivered with pivot leg**).

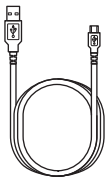
QS-MC6 contains M10, QS-MBT-1 and Motion Lock Switch. M10 device is specifically designed to use communication protocol created by Motion Systems. It allows connecting PC with the QS-220-PL. To maintain great experiences, it is required to use M10. **DO NOT** try to substitute this device. M10 requires USB 2.0 or higher (for both cable and port in PC). QS-MBT-1, will be referred to as "BUS Terminator", which is an RJ45 connector with the resistor. It is a small but very important part used to mark the last Power Cabinet in the set.



×1

Motion lock switch

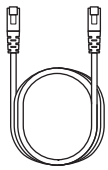
(max length = 3 m)



×1

Micro USB cable

(max length = 3 m)



×1

BUS communication cable

(max length = 3 m)

×1

M10

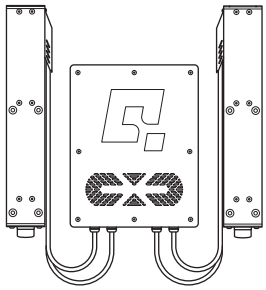
×1

QS-MBT-1

BUS terminator

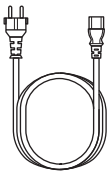
QS-220-PL is a set composed of 2 Actuators (QS-L1) and Power Cabinet (QS-SB2).

It can be used to set up various motion rigs (more information about motion rigs in section 4.9 on page 26.



×1

QS-L1 actuators
QS-SB2 power cabinet



×1

Power cord

(max length = 3 m)

×1

BUS communication cable

(max length = 3 m)

×1

Motion Lock interlink cable

(max length = 3 m)

×2

Stabilization plate

×16

M8 x 20

×8

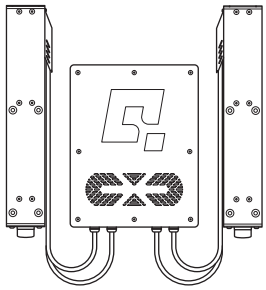
M6 x 16

3.2 EXTENDED SET

WARNING

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

For more demanding applications or clients who want to improve their experience even further, we created an Extended Set. It is designed to be connected with Intro Set - this set does not include QS-MC6 with M10 connector as there is no need to have 2 of them in motion rig - communication between Power Cabinets is done by connecting them directly to each other. Intro Set (QS-220-PL) connected with Extended Set results in 3DoF configuration.



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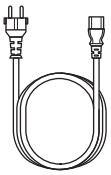
QS-L1 actuators
QS-SB2 power cabinet



×1

Power cord

(max length = 3 m)

×1

BUS communication cable

(max length = 3 m)

×1

Motion Lock interlink cable

(max length = 3 m)

×2

Stabilization plate

×16

M8 x 20

×8

M6 x 16

For more information about setup with 4 actuators, check section 4.9 on page 26.

INFO

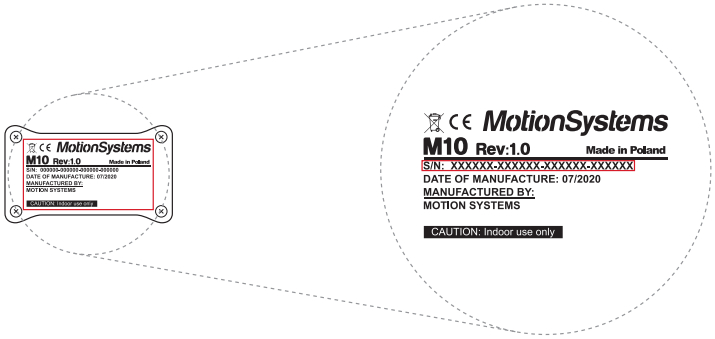
If you own Intro Set and want to expand your rig and experience by adding a second QS-220-PL please contact the distributor/reseller for more information.

SETUP AND INSTALLATION

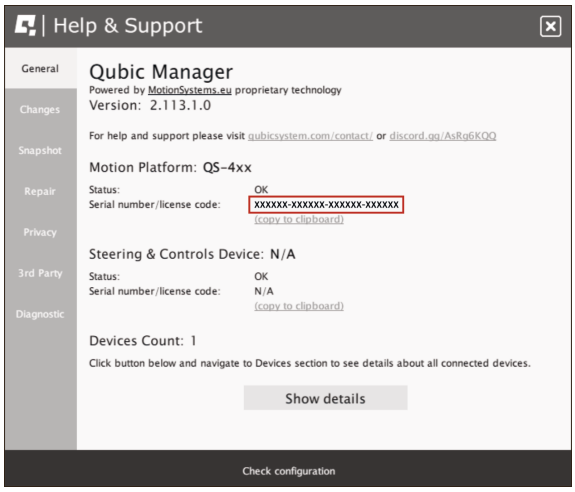
INFO

Please be sure to take note of the QS-220-PL serial number, before installation needed for the access software download page.

The **SERIAL NUMBER** can be found on the M10 identification label, and it is in **XXXXXX-XXXXXX-XXXXX-XXXXXX** format. This serial number is also used for activation of FSMI (ForceSeatMI) and MT(Motion Theater) licences.

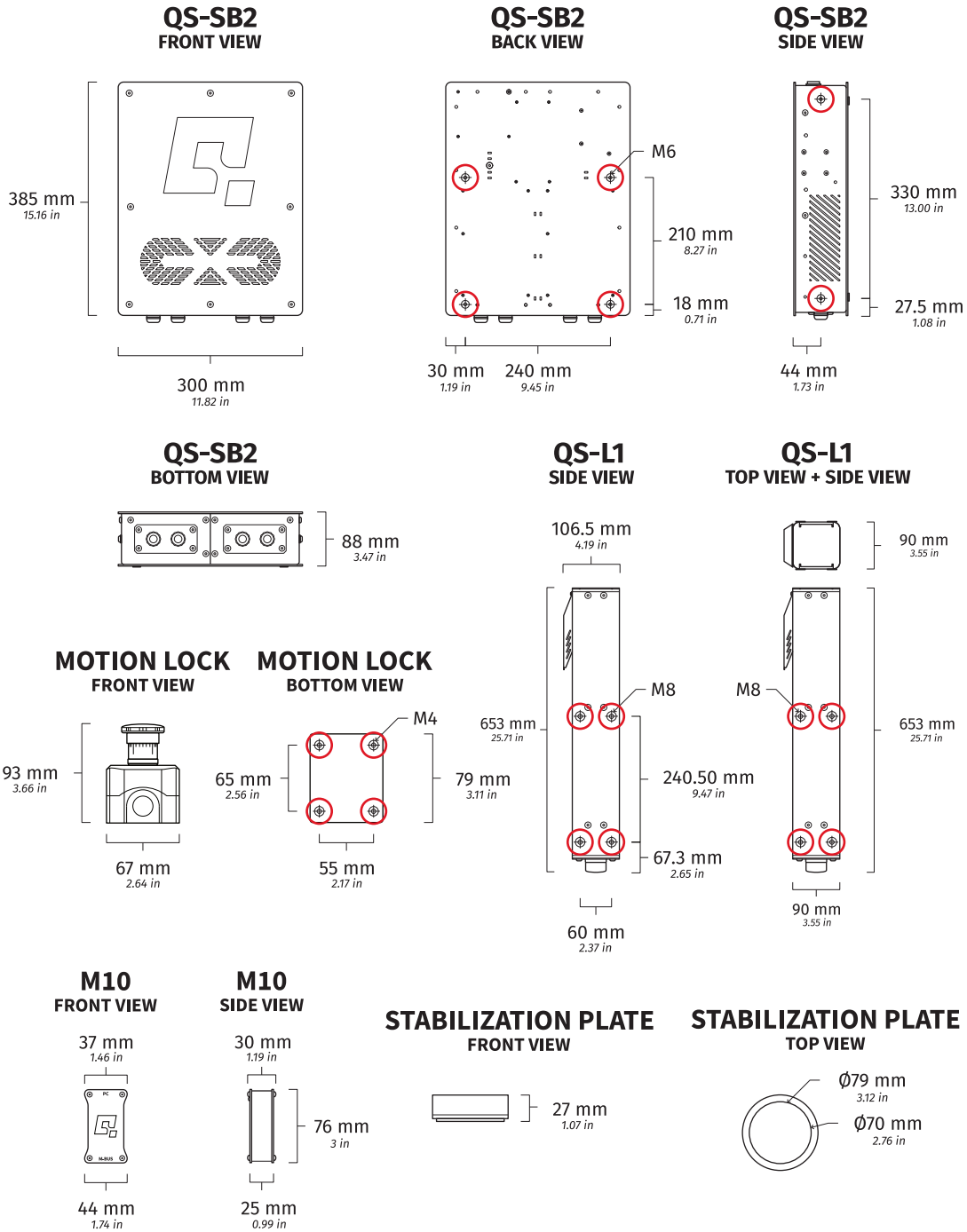


The **SERIAL NUMBER** is also visible in Help and Support - QubicManager:



To download the software visit QubicSystem.com/Download.

4.1 DIMENSIONS



4.2 POWER REQUIREMENTS

Power Cabinet (QS-SB2) contains the power supply for connected actuators. If there is no certainty if fuses or entire electrical installation can handle QS-220-PL, contact a qualified electrician.

WARNING

For safety reasons, **DO NOT** attempt to modify machines or cables by yourself. QS-220-PL can be used in 120V AC/230V AC, 50~60Hz environment. Remember to use adequate cables with proper grounding in each case!

Be aware that with heavier payload, and/or more intensive simulation, Average Power consumption may rise.

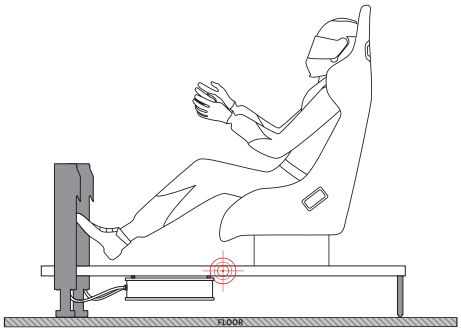
WARNING

Dangerous voltage level may occur in Power Cabinet and cables during the operation and for a few minutes after turning off the machine.

INFO

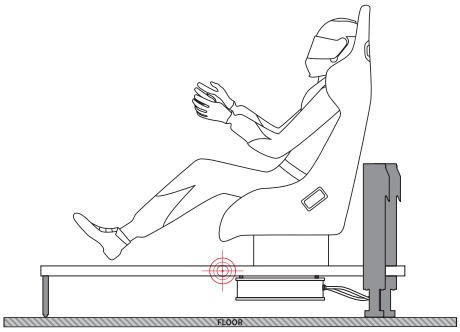
If motion rigs with two Power Cabinets (4 Actuators Setup) are connected to 120V then each Power Cabinet should be connected to the different wall socket with separate fusing - it might be required, to ensure trouble-free work of the QS-220-PL. The grounding point should be always common.

4.3 CENTER OF GRAVITY AND PAYLOAD



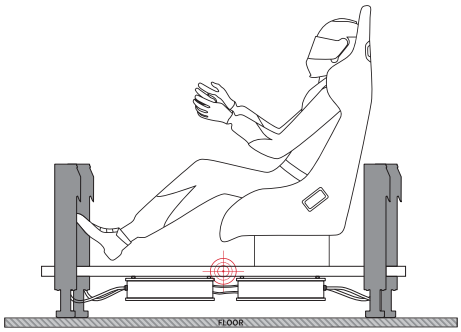
2 Actuators max recommended

load: 250kg - Front variant



2 Actuators max recommended

load: 250kg - Back variant



4 Actuators max recommended

load: 350kg

INFO

The Center of Gravity (CG) has to be in the middle of the whole motion rig and should be kept as low as it is possible to maximize lifetime of the QS-220-PL. Remember to include the user and cockpit weight in payload calculations.

4.4 BEFORE QS-220-PL INSTALLATION

WARNING

Dangerous voltage level may occure in Power Cabinet and cables during the operation and for a few minutes after turning off the machine.

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

- **DO NOT** use the actuators on very soft or fragile surfaces like rubber, glass, or foam.

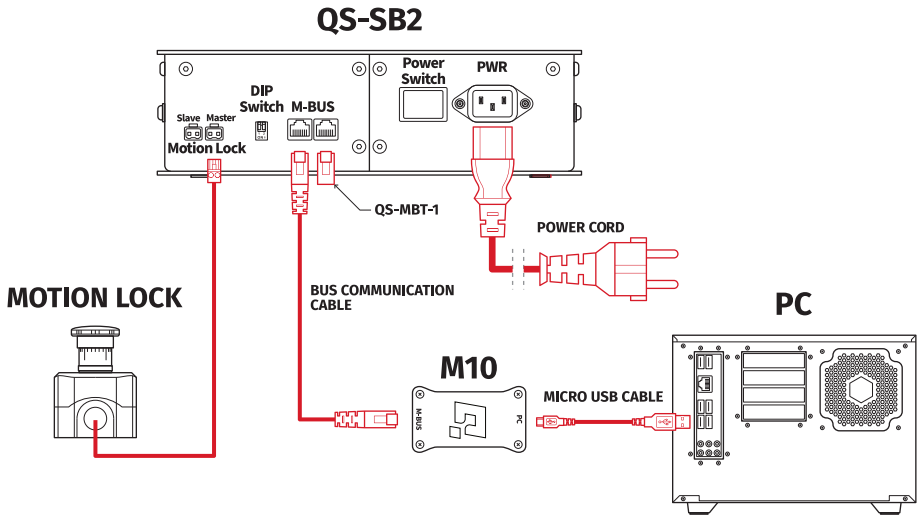
WARNING

Each Actuator has to be used with the Stabilization Plate and should be placed on a flat surface.

- Be aware that QS-220-PL will crawl a little in every direction during operation. Those 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 QS-220-PL moves and nothing should restrict its motion range.
- Seat belts and other harnesses should be mounted to parts of the motion rig that move in the same way as the seat. **DO NOT** attach them to any static part or ground.
- Cables must not be stretched and should be kept in a way that prevents them from getting under actuator or any part that can crush or tear them.
- If you want to use the QS-220-PL in an unusual application, and you are not sure, that the desired setup is feasible, please contact, the distributor/reseller.

4.5 INTRO SET: QS-SB2 CONNECTION - 2 ACTUATORS

To connect QS-220-PL with PC following steps must be taken:

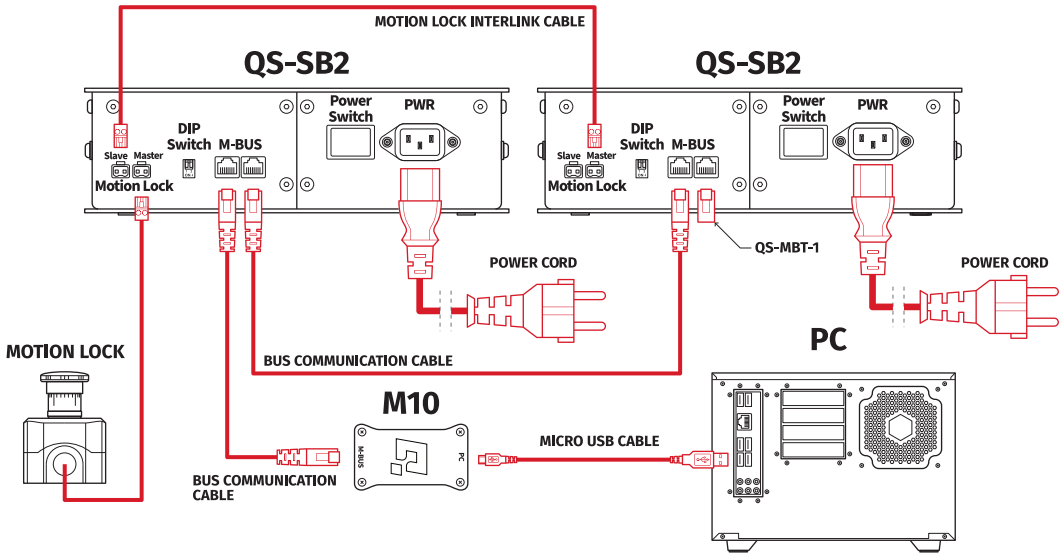


- Plug Motion Lock Switch into Motion Lock ”Master” port in Power Cabinet.
- Connect M10 to M-BUS port in Power Cabinet using a cable with RJ45 connector at both ends.
- Put BUS terminator (RJ45 plug with resistor) in second M-BUS port in Power Cabinet.
- Connect PC to QS-220-PL using USB – micro USB cable (2.0 or newer) and M10 connector.
- Plug power cable with adequate type of connector into power socket in Power Cabinet.

4.6 EXTENDED SET: QS-SB2 - 4 ACTUATORS

In rigs with 4 actuators, both Power Cabinets have to be connected to each other.

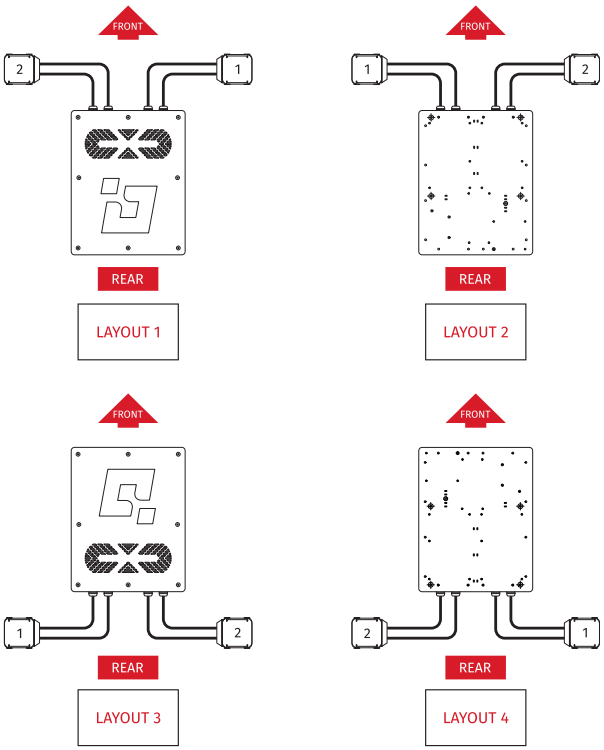
To do this, the following steps must be taken:



- Plug Motion Lock Switch into Motion Lock ”Master” port in Power Cabinet.
- Connect Motion Lock ”Slave” port to Motion Lock ”Master” port.
- Use 2m BUS cable (RJ45-RJ45) to connect M-BUS ports in Power Cabinets.
- Put BUS terminator (RJ45 plug with resistor) in last M-BUS port in second Power Cabinet.
- Connect M10 to M-BUS port in Power Cabinet.
- Connect PC to QS-220-PL using USB – micro USB cable (2.0 or newer) and M10 connector.
- In both Power Cabinets, plug power cables with adequate connectors into power sockets.
- Set the appropriate position on the Dip Switch (more information about Dip Switch position in section 4.8 on page 23).

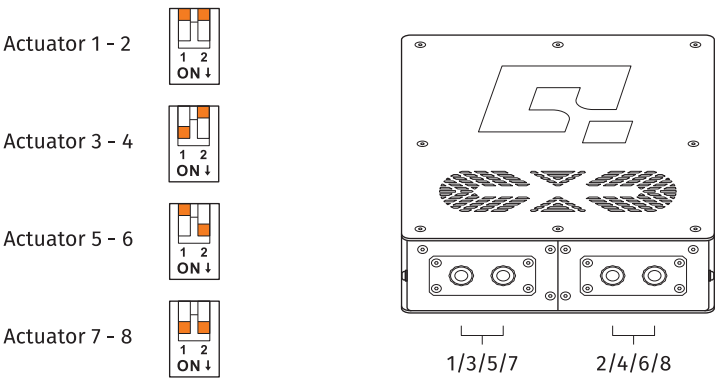
4.7 INTRO SET: SETUP LAYERS

For the Intro Set (2DOF) Layers Setup must be done using QubicManager Software - Hardware Configuration panel (check item 7 on page 29).



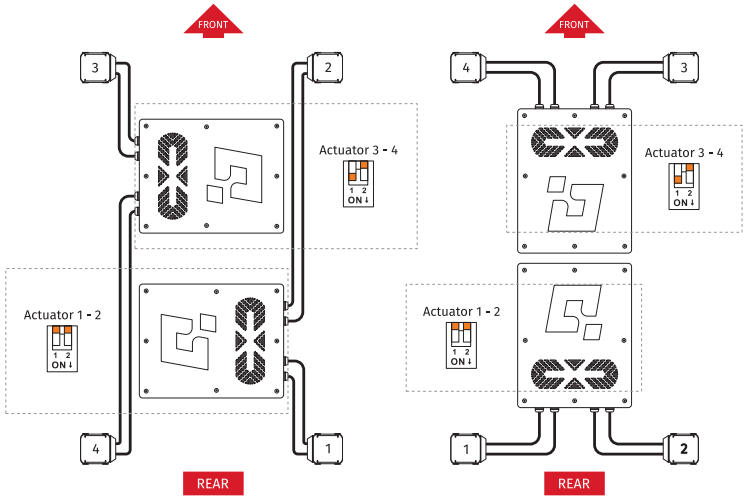
4.8 EXTENDED SET: SETUP LAYERS

Start the configuration by switching the Dip Switches to the appropriate positions in accordance with one of the eight variants of the power cabinets and actuators installation to the cockpit. Then choose the selected variant from the drop-down list in QubicManager Software - Hardware Configuration- Position Layout (check item 8 on page 30).

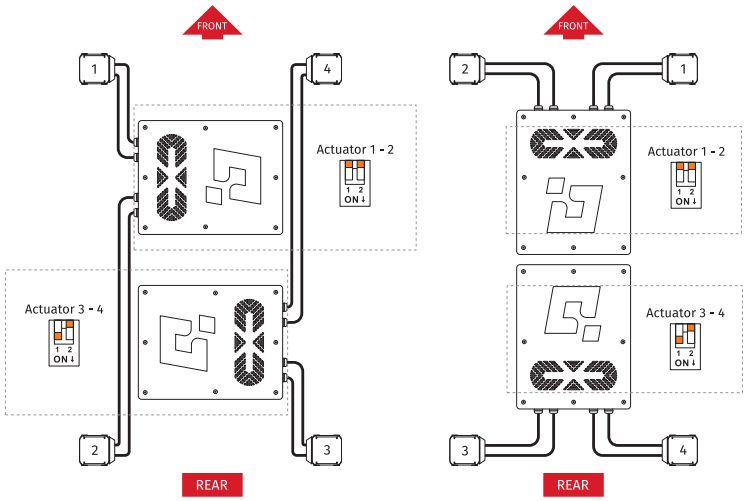


WARNING

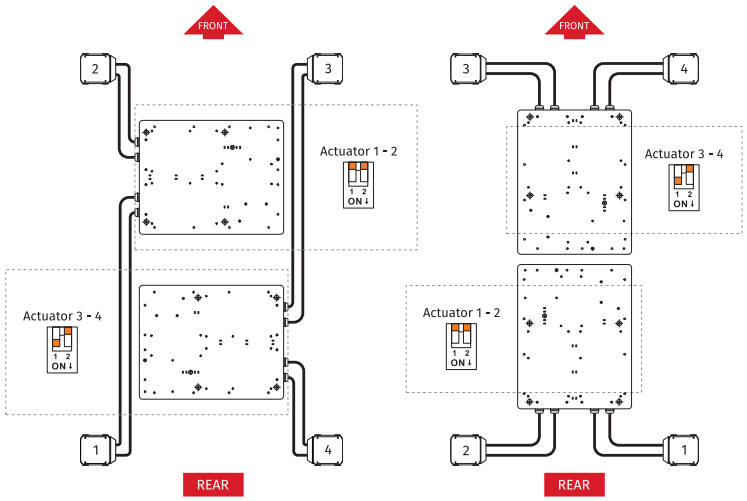
The DiP Switch **CAN NOT** be set in the same position in both Power Cabinets.



LAYOUT 1 | LAYOUT 2

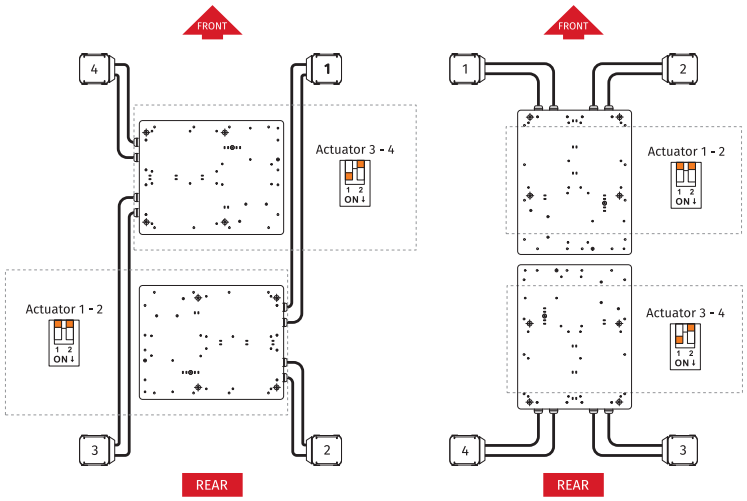


LAYOUT 3 | LAYOUT 4



LAYOUT 5

LAYOUT 6



LAYOUT 7

LAYOUT 8

4.9 QS-220-PL ASSEMBLY INSTRUCTION

INFO

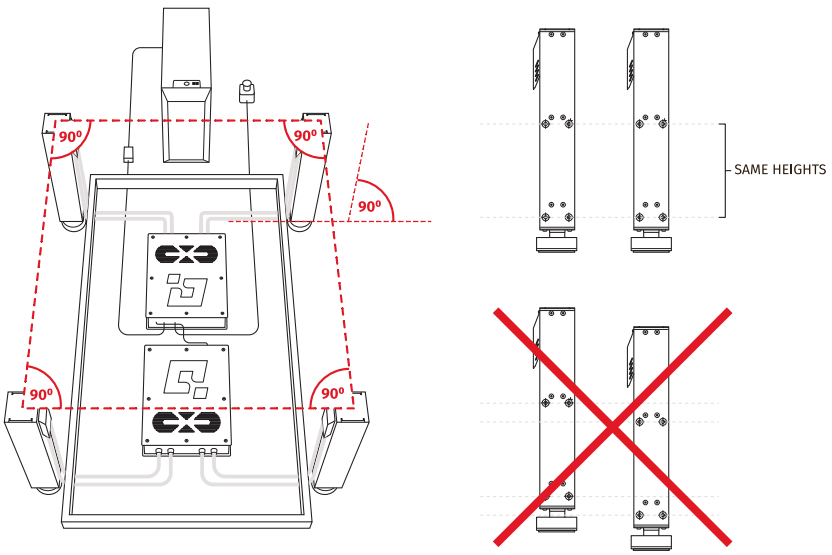
Before mounting the rig, check that the QS-220-PL is working properly. Check the positioning of the actuators and their numeration.

- Actuators should be connected to the motion rig with 8 screws (M8x20) each.
- Power Cabinet has to be mounted using at least 4 screws (M6x12) – we recommend mount it in the middle of the motion rig. It is possible to mount the power cabinets using the bottom or side mounting holes. Check section 4.1 on page 17.

WARNING

Be sure that Power Cabinet does not have a collision with the floor in any position of motion rig.

Example of connected rig – notice that Actuators have to be perpendicular to the ground:



WARNING

Ensure that Actuators are mounted at the same height.

Make sure that the motion rig does not block air vents in the Power Cabinet. The minimum distance between the air vents in the power cabinets and the elements of the

cockpit equipment is 10 cm or 4 in.

INFO

The manufacturer is not responsible for quality nor compatibility of the third-party motion rigs. We recommend using dedicated QS-CH1 motion cockpit.

4.10 SOFTWARE INSTALLATION

WARNING

Before starting the installation, make sure that the main QS-SB2 power switch is in the **O** position.

Once the QS-220-PL is installed correctly:

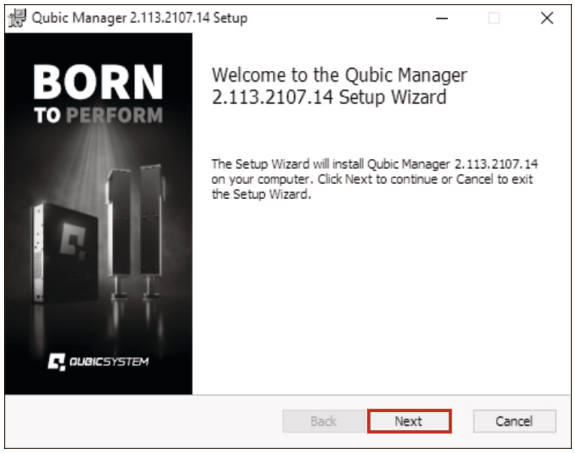
1. Connect power socket with wall outlet using a power cord, check position of Motion Lock Switch and turn on system by button on Power Cabinet. After that, connect M10 to PC. When it is turned on, QS-220-PL will perform **start-up calibration**.

WARNING

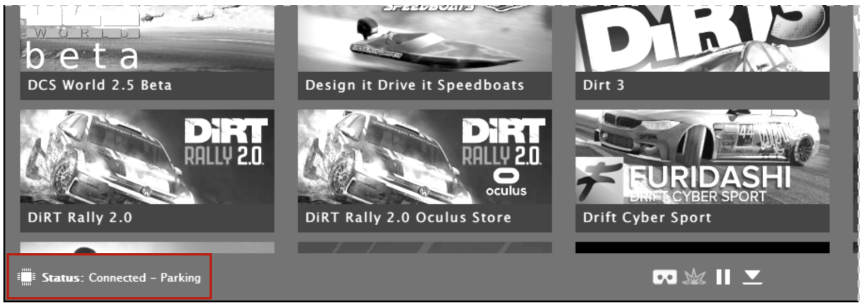
DO NOT change payload on QS-220-PL during start-up calibration.

2. Download QubicManager QubicSystem.com/Download

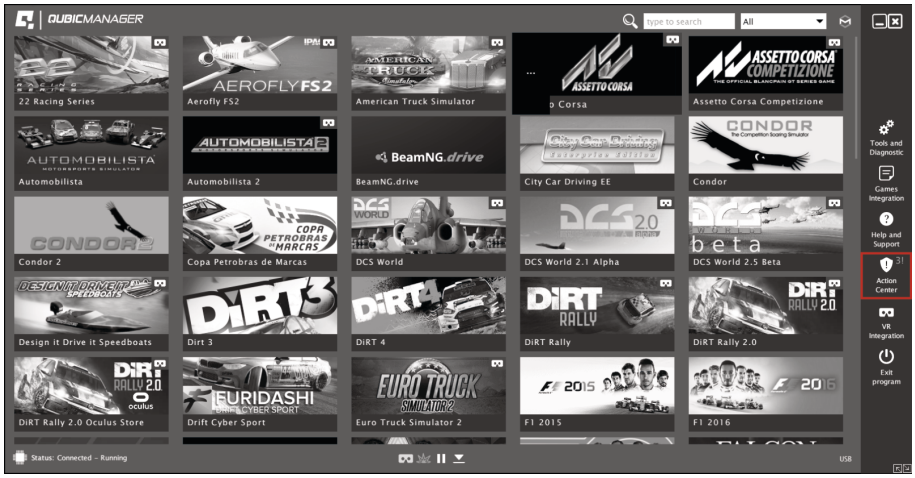
3. Install QubicManager on PC and launch it.

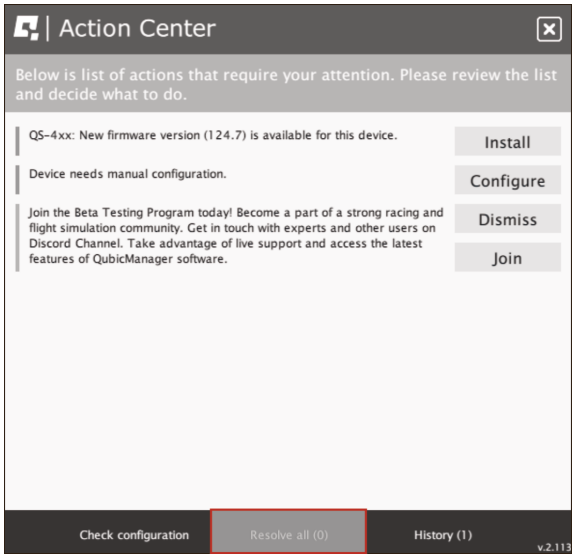


4. If QubicManager has recognized the QS-220-PL correctly, the status of the machine visible in the lower corner will change to ”connected”.

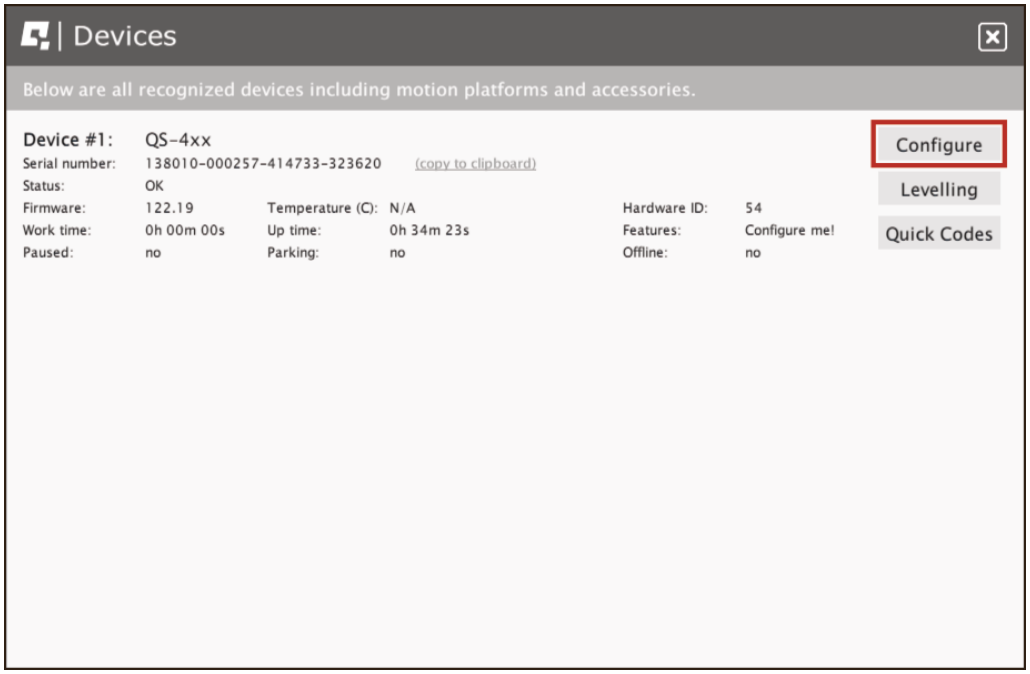


5. Check Action Center with a list of actions that requires attention. It is possible to solve them one by one or by pressing the ”Resolve All” button. Firmware update may require additional confirmation in the dialog box.

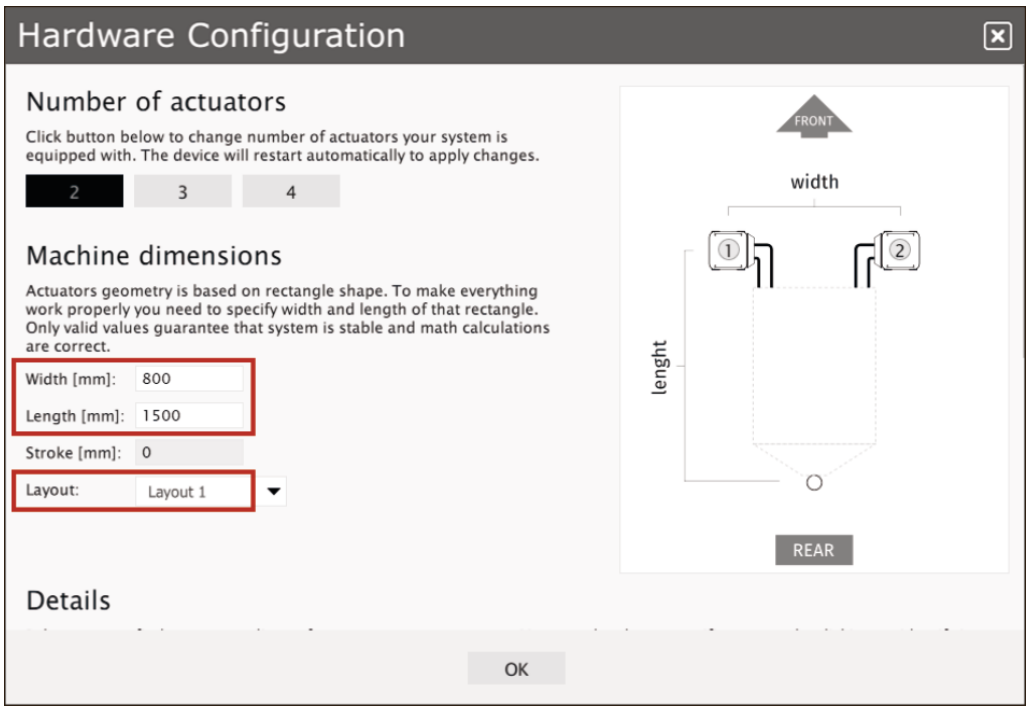




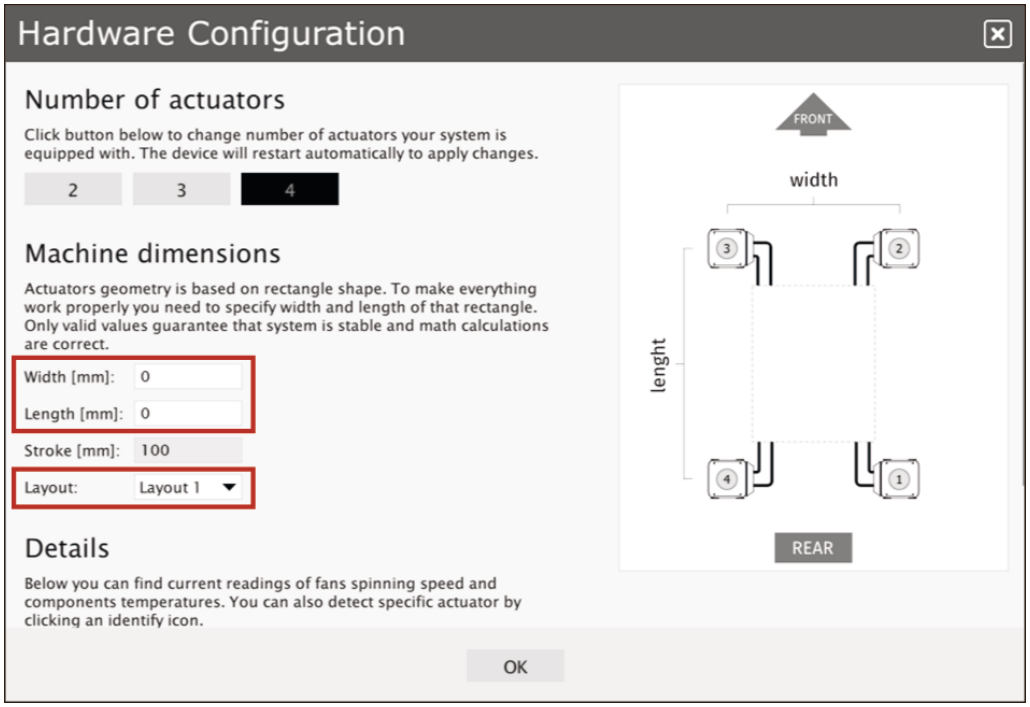
6. Choose ”Configure” in Devices (press ”Connected” in the left corner of the application or go to ”Tools and Diagnostics” then ”Devices”).



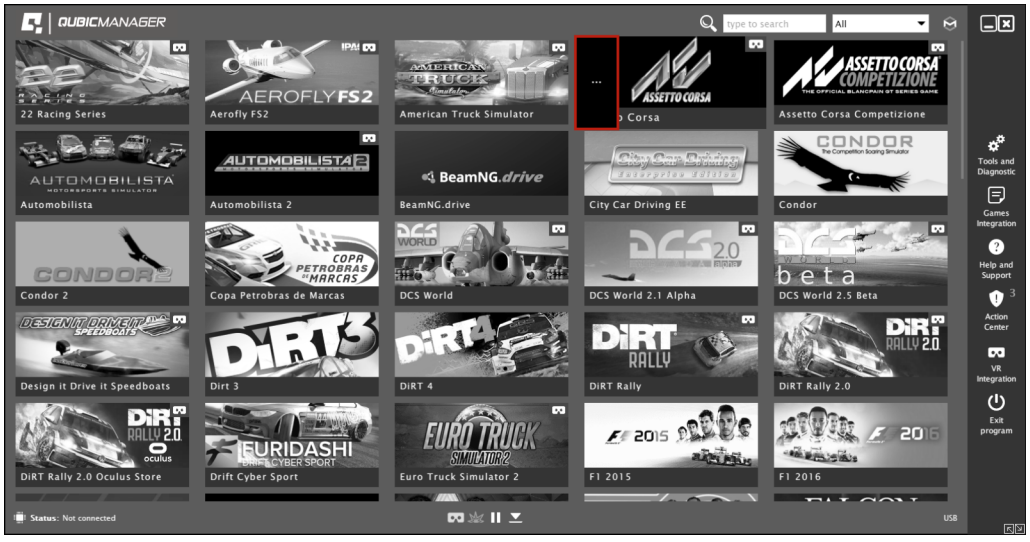
7. **FOR 2DOF CONFIGURATION:** Choose the correct layout variant from the drop-down list (**LAYOUT**). Measure the distance between actuators (width), and the distance between left and right actuators and pivot leg (length). The QubicManager has to restart to complete the installation.



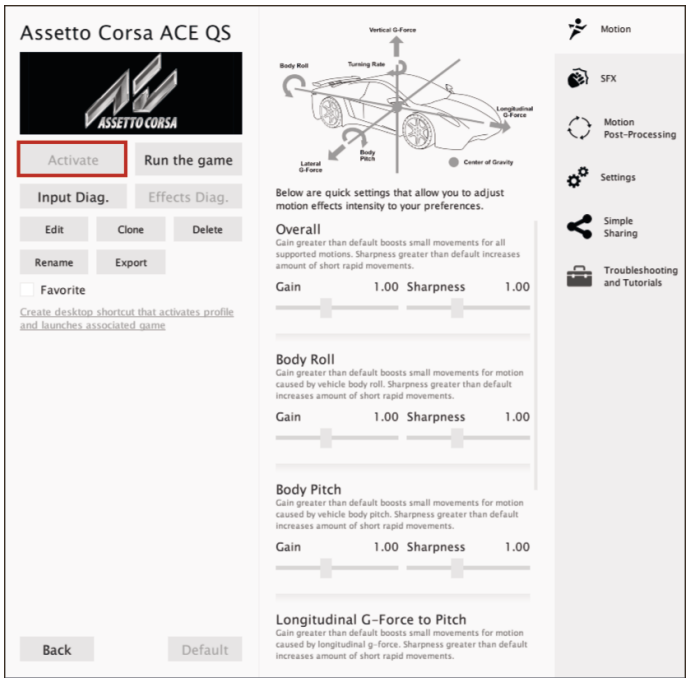
8. **FOR 3DOF CONFIGURATION:** Choose the correct layout variant from the drop-down list (**LAYOUT**). Measure distance between actuators (width and length), the QubicManager has to restart to complete the installation.



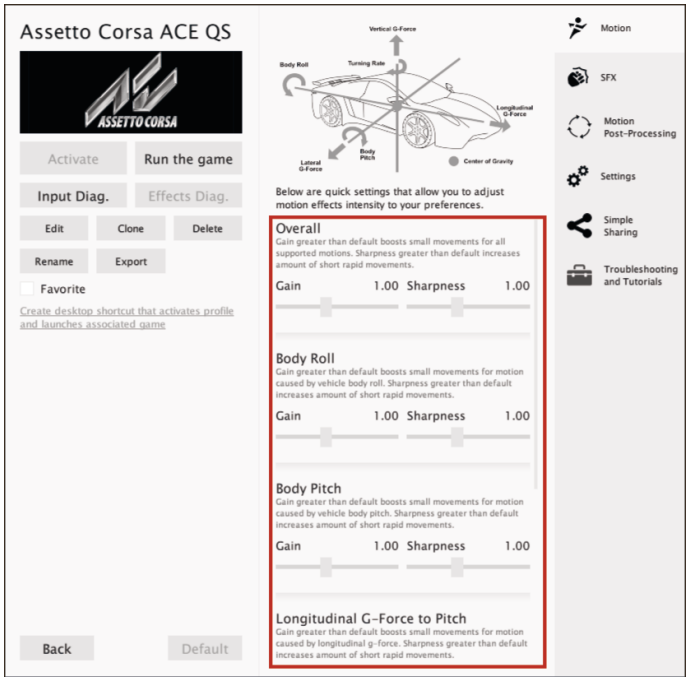
9. Choose the game and check profile details by clicking on the game thumbnail.



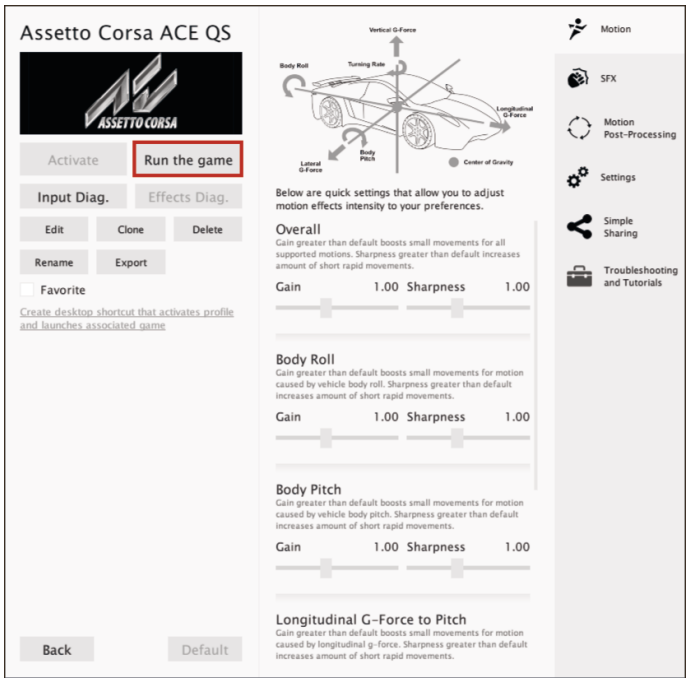
10. Activate profile by clicking the ”Activate” button.



11. Using the quick settings, adjust the intensity of the motion effect to your own preferences. Minimize the game window with a keyboard shortcut ALT+TAB.



12. Turn on the game using the ”Run the game” button.



WARNING

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MAINTENANCE AND CLEANING

To minimize the risk of abnormal heating that can result in system failure, keep the QS-220-PL uncovered, clean and dust-free. Cleaning the unit should be performed with a soft, dry cloth. **DO NOT** use solvents or cleaners that may corrode or damage materials of parts used in the QS-220-PL in any other way.

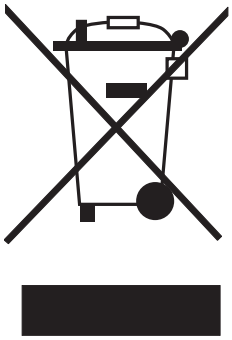
At least once a month, check if Motion Lock Switch is working correctly – turn on the QS-220-PL (when no one is using the rig) and push the red button. If the machine turns off and does not react to any signal (turn on simulation or game to check it) then Motion Lock Switch works properly. If the machine reacts in any different way, stop using it and contact the technical support immediately.

To minimize the risk of QS-220-PL failure, check the condition of the linear actuator's rubber seals once a month, and lubricate them externally, if necessary, using a viscous lubricant spray with dispenser.

CONFORMITY INFORMATION

The QS-220-PL meets the requirements of CE and relevant regulations of the EMC Directive 2014/30/EU and the RoHS Directive 2011/65/EU.

ENVIRONMENTAL IMPACT AND DISPOSAL



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

QS-220-PL is an advanced device and if stored or disposed of incorrectly, it could harm the environment or/and other people. Please contact your local authorities for information at the collection point nearest you.

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. QS-220-PL comes with two (2) years limited warranty from the original date of purchase.

For commercial customers, there is a one (1) year limited 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-PL 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 nontransferable. 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.

TROUBLESHOOTING

Before contacting technical support, try this:

- Check Action Center in QubicManager.
- Check power cables and PC QS-220-PL connection.
- Check Motion Lock Switch position and its connection cables.
- Try different USB ports.

- If a problem occurred abruptly, it could be caused by thermal protection. Turn off QS-220-PL, disconnect it from power outlets and wait at least 15 minutes to let it cool down.
- In case of every unclear electrical problem like burnt fuses or strange behaviour contact support.
- If abnormal work conditions, please immediately contact with the distributor/re-seller for technical support.

WARNING

DO NOT attempt to do any repairs by yourself. It is dangerous and voids the warranty! Repairs should be consulted with technical support and then performed by a qualified technician.

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