

MaxOne User Guide

www.mxwbio.com | support@mxwbio.com

© 2025 MaxWell Biosystems AG, Switzerland. All rights reserved.

MaxOne User Guide

MaxWell Biosystems AG

Publication date May 16th, 2025

Copyright © 2025 MaxWell Biosystems AG, all rights reserved.

The content of this document is provided by MaxWell Biosystems AG (MxW), "as is". MxW makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication and reserves the right to make changes to specifications and product descriptions at any time without notice.

CE Declaration of Conformity

The manufacturer

MaxWell Biosystems AG
Albisriederstrasse 253
8047 Zurich
Switzerland

Declares that the product
MaxOne System (including the MaxOne Recording Unit)
Conforms with the provisions of the relevant Directives and Regulations of the Council of the European Union:

Directive / Regulation	Relevant Harmonized Standards
Electromagnetic Compatibility - Directive 2014/30/EU	EN 55011:2016 EN 55011:2016/A1:2017 EN 55011:2016/A11:2020 EN 61326-1:2013
Low Voltage Directive 2014/35/EU	EN 61010-1:2010 EN 61010-1:2010/A1:2019/AC:2019-04 EN 61010-1:2010/A1:2019 EN IEC 61010-2-010:2020

The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on restricting the use of certain hazardous substances in electrical and electronic equipment.

Zurich, May 16th, 2025

Jan Müller, CTO

UKCA Declaration of Conformity

The manufacturer

MaxWell Biosystems AG
Albisriederstrasse 253
8047 Zurich
Switzerland

Declares that the product
MaxOne System (including the MaxOne Recording Unit)
Conforms with the provisions of the relevant UK Statutory Instruments:

Statutory Instruments	Relevant Designated Standards
Electromagnetic Compatibility Regulations 2016	EN 55011:2016 EN 55011:2016/A1:2017 EN 55011:2016/A11:2020 EN 61326-1:2013
Electrical Equipment (Safety) Regulations 2016	EN 61010-1:2010 EN 61010-1:2010/A1:2019/AC:2019-04 EN 61010-1:2010/A1:2019 EN IEC 61010-2-010:2020

The object of the declaration described above conforms with The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

Zurich, May 16th, 2025

Jan Müller, CTO

Table of Contents

Introduction 1
System components 2
Inside the box 2
Ports 5
Safety Precautions 7
Electric Safety 7
Movable Parts 7
General 8
Setting Up MaxOne 9
Placement 9
Connections 10
Cleaning MaxOne Recording Unit 11
Transporting MaxOne Recording Unit and/or Hub 11
Maintenance 11
MaxOne Status Indicators 12
Technical Specifications 14
Troubleshooting 16
Further Information 19
Contact MaxWell Biosystems 20

Introduction

Thank you for purchasing the MaxOne, MaxWell Biosystems's single-well High-Density Microelectrode Array (HD-MEA) electrophysiology platform for recording and stimulating electrogenic cells *in vitro*.

We recommend to carefully read the section Safety Precautions (p. 7, 8) before installing and using the MaxOne.

In case you do not find the information you are looking for, or experience any issue with MaxOne, please contact our support team at support@mxwbio.com.

System components

Inside the box

The following section describes the MaxOne System (Figure 1) and what is included when purchasing MaxOne (Table 1 and Table 2).



Figure 1 MaxOne Recording Unit

The MaxOne Recording Unit can be placed inside the standard cell culture (temperature-, humidity-, and gas- controlled) incubators to record from cultured samples. Alternatively, the MaxOne Recording Unit can be placed on a lab bench and combined with the Tissue Holder and/or Perfusion System to record from freshly prepared acute (retinal/brain) tissue.

Table 1 Package content for the MaxOne System

Article	Description	Qty
MX1-BRD 	MaxOne Recording Unit	1
MX1-SYS 	MaxOne Hub	1
	Exchangeable Pin Connectors Kit	1
	Power Supply (+ Power Cord) Ethernet Cable LEMO to BNC Cable	1 2 2

Table 2 Optional items in the package

Optional Article	Description	Qty
MX1-CHP-START-B incl. MX1-S/U-CHP (PSM – left, PLM – second on the left) MX1^{+}-S/U-CHP (P-PSM – second on the right, P-PLM – right) 	MaxOne or MaxOne^{+} Chips (PSM, PLM) MaxOne Chip Holders MaxOne Lids MaxOne Chip Subscription	6 (optional) 6 (optional) 6 (optional) 1 year (optional)
MX1-BRD-PIN 	Exchangeable Pin Connectors Pin Connector Holder Torx Screwdriver Torx Screws Tweezer	4 (optional) 2 (optional) 1 (optional) 4 (optional) 1 (optional)
MX-PC 	Computer with Power Cable Monitor with Power Cable Keyboard Mouse DP to mini DP Cable USB Wi-Fi Adapter	1 (optional) 1 (optional) 1 (optional) 1 (optional) 1 (optional) 1 (optional)
MX1-HLD 	Tissue Holder Tissue Holder Inserts Screws for Inserts Hexagonal Key Grounding Cable Screws for MX1-BRD Bumper Feet for MX1-BRD Absorption (Sugi) Spears Kit	1 (optional) 2 (optional) 4 (optional) 2 (optional) 1 (optional) 4 (optional) 4 (optional) 1 (optional)
MX1-PRF-SYS 	In-line Heater with Power Cable Magnetic Inflow Perfusion Port Magnetic Outflow Perfusion Port Gravity Flow Perfusion Inflow Tubing for Perfusion Outflow Grounding Cable	1 (optional) 1 (optional) 1 (optional) 1 (optional) 1 (optional) 1 (optional)
MX1-DIO-EXT 	Digital IO Extension Board HDMI to mini HDMI Cable	1 (optional) 1 (optional)

Ports

The following section describes the connectors located in the back panel of the MaxOne Recording Unit (Table 3 and Figure 2) and in the front panel of the MaxOne Hub (Table 4 and Figure 3). Note: Do not supply the MaxOne Recording Unit with inputs beyond the maximum voltage (3.3V) to potential damage to the device.

Table 3 MaxOne Recording Unit Ports

Label	Description	Port Type
System Port	Data and Power Connection	Ethernet RJ45
Aux I/O	Auxiliary Input/Output Sync. with External Devices via MX1-DIO-EXT	HDMI Mini
D0	Digital Sync. Sync. with External Devices	Lemo 00
Ext.	Extension Special Applications	Lemo 00
RefEl	Reference Electrode Ground External Devices (inflow and outflow ports of perfusion system)	Lemo 00
GND	Ground Connection	Banana Jack

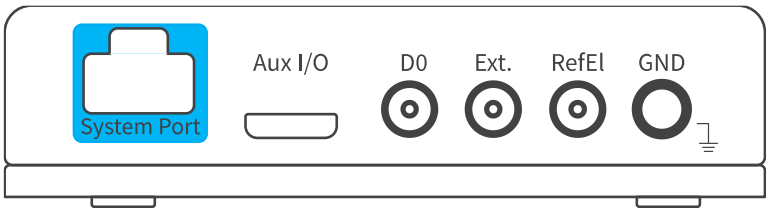


Figure 2 Schematic of Recording Unit connectors

Table 4 MaxOne Hub Ports

Label	Description	Port Type
System Port	Data Connection and Power Supply to Recording Unit	Ethernet RJ45
VGA	Not in Use	VGA DE-15
PC LAN	Data Connection to PC	Ethernet RJ45
Power	Power Supply	Barrel Connector 2.5×2.5 mm

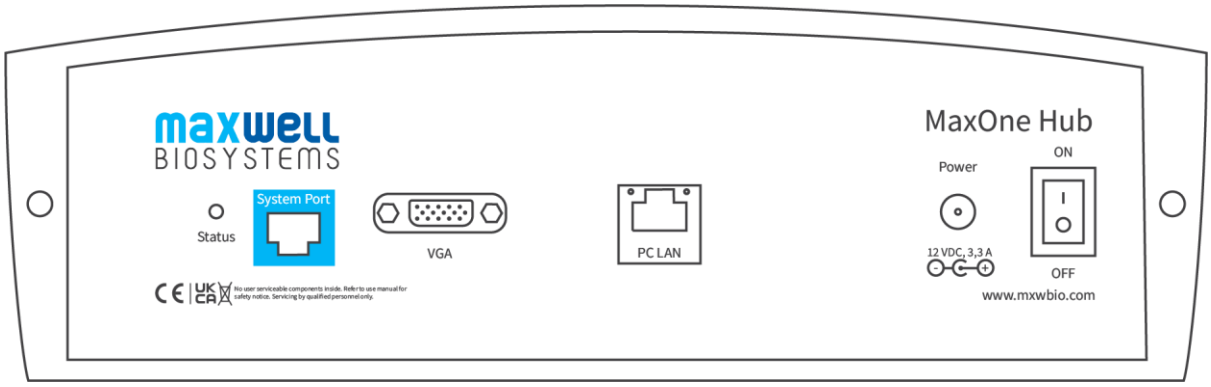


Figure 3 Schematic of the Hub ports

Safety Precautions

Electric Safety



MaxOne is an electronic device. Failure to observe the warnings may result in device damage or electric shock. It is seriously advised to respect the following safety warnings:

- The MaxOne Hub provides the power to the Recording Unit via the Ethernet RJ45 cable connected between the System Ports (Figure 2 and Figure 3).
- Never disassemble the device, as it contains current-carrying components that may be harmful.
- Avoid touching the Pin Connectors (❷, Figure 1) by hands, tools and/or metallic objects.
- Avoid bringing the Pin Connectors (❷, Figure 1) in contact with liquids. This may cause damage to the device, operators, and other equipment.
- When cleaning the device, make sure it is turned off and disconnected from the power source.
- Only use the power supply and power cord provided. Do not exceed the power input indicated on the device and on the power supply.
- Do not exceed the specified power ratings of additional inputs to the device (i.e. AUX, D0 Ext, RefEl, Figure 2) at any time.

Movable Parts



The device has movable parts (i.e. Pin Connectors ❷/ Chip Lock ❺, Figure 1). *To avoid damage to the device, make sure to respect the following precautions:*

- Leave the area around the device of obstacles, cables, and clutter. The operational area should be accessible before using the device.
- Use care when handling the Chip Lock and avoid using excessive force when locking it into position.
- Ensure that the Chip (❻, Figure 1) is appropriately inserted before closing the Chip Lock (❺, Figure 1) to avoid damage to the device and the Chip.

General

- Only operate the device on a flat and leveled surface.
- Do not store any objects or liquids on the device.
- Do not apply external forces to the device.
- MaxOne Recording Unit has a drainage system on the bottom, meant for emergency only. Overuse may cause damage to the system.
- Only trained people should operate the device. Follow the given manuals and instructions.
- Turn off the power on the MaxOne Hub when it is not in use.



Important! If you notice any damage or liquid spills, immediately disconnect the device from the power source and do not operate it.

Setting Up MaxOne

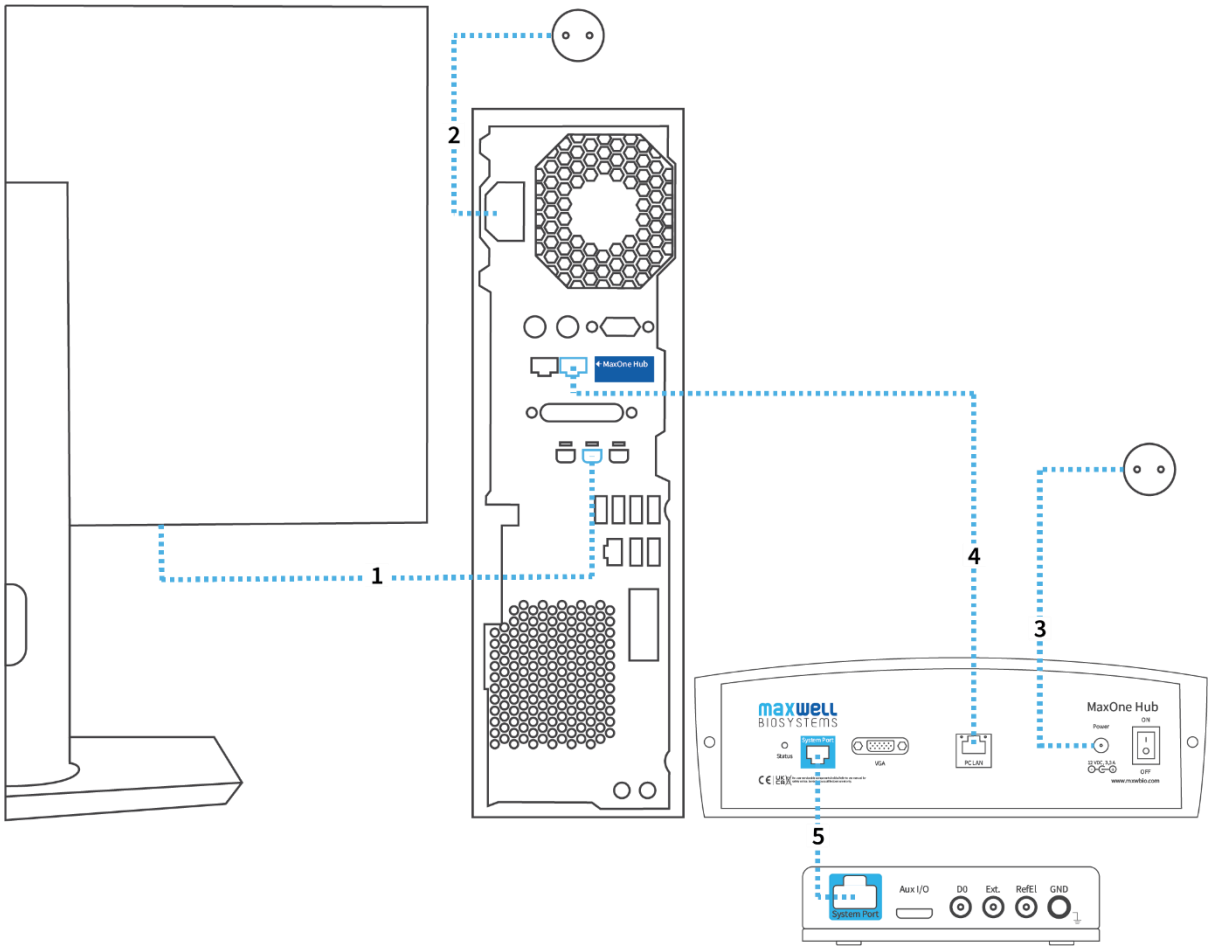


Figure 4 Connection of the MaxOne to the PC and monitor

Placement

Place the MaxOne Recording Unit on a tabletop, inside a sterile-fume hood, or inside the incubator. Place the MaxOne Hub on a tabletop and do not place it inside an incubator. For safety precautions, please refer to p. 3 and 4.

Note: Prior to placing the MaxOne Recording Unit into the incubator, it is advisable to sterilize it. Spray the Recording Unit exterior with a 70% ethanol solution. Clean and dry the MaxOne Recording Unit with a lint-free wipe. To avoid condensation, place the MaxOne Recording Unit inside the incubator at least 4 hours prior to first use.

Note: It is advisable to also sterilize the ethernet cable that connects between the MaxOne Recording Unit and Hub in the same manner as mentioned above before placing it into the incubator.

Note: If the ethernet cable connecting between the MaxOne Recording Unit and Hub is fed through the front panel rather than a dedicated cable access port, it is advisable to use a flat cable (ex. UGreen NW134) to minimize the physical footprint.

Connections

1. Connect the monitor to the recording PC by establishing a connection with the corresponding cable to the Display Port on the recording PC and to the Display Port on the monitor (**1**, Figure 4).
2. Connect power supply, mouse, and keyboard to the recording PC (**2**, Figure 4).
3. Connect the power supply to the MaxOne Hub POWER port (**3**, Figure 4). The power transformer provides a 12V / 3A output.
4. Connect the MaxOne Hub to the recording PC using the ethernet cable. Plug the ethernet cable into the Ethernet Port of MaxOne Hub (**4**, labeled PC LAN, Figure 4) and into the Ethernet Port of the PC intended for MaxOne (**4**, Figure 4).
5. Connect the MaxOne Hub to the MaxOne Recording Unit using the ethernet cable. Plug the ethernet cable into the Ethernet Port of MaxOne Hub (**5**, labeled System Port, Figure 4) and into the Ethernet Port of the MaxOne Recording Unit (**5**, labeled System Port, Figure 4).

Note: When setting up the MaxOne for the first time, it is advisable to first boot up the PC and monitor. The MaxOne Hub (and MaxOne Recording Unit) should then be turned on.

Note: In case you need to set up your own recording PC (Operating System and MaxLab Live Software), please refer to our Recording PC Setup Guide. Ethernet connection settings should be configured as shown in Table 5:

Table 5 Ethernet Settings

Setting	Value
IPv4	Manual
IP	12.0.0.1
Netmask	255.255.255.0

MaxOne Care and Maintenance

Cleaning MaxOne Recording Unit

Before cleaning the MaxOne Recording Unit, switch off the power button on the MaxOne Hub, disconnect it from the power source and disconnect the ethernet cable connecting it with the MaxOne Recording Unit. Clean the MaxOne Recording Unit with a lint-free wipe soaked in 70% ethanol solution (for sterility) or isopropanol (for Pin Connectors maintenance). When wiping the Pin Connectors, delicately wipe along its long side. Do not immerse the Recording Unit in liquid and/or do not flood the chamber. Liquids could damage the system.

Note: In case of an accidental liquid spill while in-use and the MaxOne or MaxOne+ Chip is connected, please follow the following steps. Turn off the MaxOne Hub and disconnect it from the MaxOne Recording Unit. Dry the excess liquid from the whole setup before unplugging the Chip. Then proceed with cleaning the MaxOne Recording Unit as described above.

Note: In some cases, simply cleaning the Pin Connectors may not be sufficient. Check if the Pin Connectors on the MaxOne are exchangeable (Torx T6 screws can be found the ends of the long side of the Pin Connectors). If the Pin Connectors can be exchanged, follow the *Cleaning and Replacement Protocol of Exchangeable Pin Connectors of MaxOne Recording Unit* document. If the Pin Connectors cannot be exchanged, please contact MaxWell Biosystems support.

Transporting MaxOne Recording Unit and/or Hub

Before transporting the MaxOne Recording Unit, appropriately place the Pin Connectors Placeholder and close the Chip Lock. Never move the MaxOne Recording Unit if a Chip is loaded. When transporting the MaxOne Recording Unit and Hub, make sure all cables are disconnected.

Maintenance

There are no user-serviceable parts inside the device. Please contact MaxWell Biosystems support by email (support@mxwbio.com) or through the contact form on the website (www.mxwbio.com/contact/support/) for any maintenance.

MaxOne Status Indicators

This section provides an overview of color LED status indicators on the MaxOne Hub (Table 7) and of the MaxOne Recording Unit (Table 8):

Table 7 MaxOne Hub Status Indicator Overview

LED Visualization	LED Description	Status
	No light	Hub off
	Green	System Operational (MaxOne/MaxOne+ Chips data streamed in PC)
	Green flashing	No data transfer between Hub and MaxOne/MaxOne+ Chips
	Red	No data transfer to the PC (or system booting)
	Red flashing	No data transfer between Hub and PC (or system booting)

Table 8 MaxOne Recording Unit Status Indicator Overview

LED Visualization	LED Description	Status
	No light	Recording Unit off
	Brief white light	MaxOne Chip connection
	Blue	Recording Unit on or System Operational (MaxOne/MaxOne+ Chips data streamed in PC)

MaxOne and MaxOne+ Chips Loading and Unloading

- The gap in the silver ring of the Chip Lock (❺, Figure 1) on the MaxOne Recording Unit indicates the current location of the lock. A corresponding indicator on the Recording Unit indicates the direction in which the Chip Lock should be adjusted to open or close it.
- Open the Chip Lock by turning it counterclockwise.
- Insert the Chip onto the MaxOne Recording Unit in the correct orientation. The two holes in the Chip match the two white-painted pins on the MaxOne Recording Unit.
- Close the Chip Lock by turning it clockwise, until the Chip is locked completely. Pay attention to not use excessive force to push the Chip Lock beyond the fully locked position.
- Once the Chip is properly loaded onto a Recording Unit that is properly set up and is turned on, the status indicator on the MaxOne Hub should turn to green. This indicates that the system is fully operational and the data from the Chip is sent to the PC (Table 7, p. 12).
- To unload the Chip from a Recording Unit, open the Chip Lock by turning it counterclockwise and lifting the Chip vertically up and out of the Recording Unit.

Note: When the Chip is covered with the Chip Lid, it is advisable to hold the Chip ring where the Lid does not sit.

Technical Specifications

MaxOne Recording Unit Dimensions	
Size	15 (l) x 9.5 (w) x 2.5 (h) cm^3
Rec. Space	30 (l) x 15 (w) x 15 (h) cm^3
Weight	0.36 kg
MaxOne Hub Dimensions	
Size	18.5 (l) x 28 (w) x 9 (h) cm^3
Rec. Space	30 (l) x 80 (w) x 30 (h) cm^3
Weight	0.84 kg

MaxOne Recording Unit Operating Environment	
Temperature	15°C ~ 40°C
Humidity	20 – 95 %
Light	Avoid UV Light
MaxOne Hub Operating Environment	
Temperature	15°C ~ 40°C
Humidity	20 – 80 %
Light	Avoid UV Light

MaxOne Hub Power Supply	
Supply Input Voltage	100 – 240 V
Supply Input Current	1 A
Supply Input Freq.	50 – 60 Hz
Supply Output Voltage	12 V
Supply Output Current	3 A
Supply Output Power	36 W

MaxOne Hub Power Specifications	
Device Input Voltage	12 V
Device Input Current	3 A
Power Consumption Max	36 W

MaxOne and MaxOne+ Chips Specifications		
Chip Type	MaxOne	MaxOne+
Outer Diameter	24 mm (PSM) or 35 mm (PLM)	
Inner Diameter	19 mm (PSM) or 32 mm (PLM)	
Active Sensing Area	3.85 x 2.10 mm^2	
Number of Electrodes	26'400	
Electrode Area	105 μm^2	
Electrode Dimensions	8.75 (l) x 12.00 (w) μm^2	11.50 x 11.50 μm^2
Electrode Density (per well)	3'265 / mm^2	
Electrode Pitch (center-to-center distance)	17.5 µm	
Electrode Material	Platinum (with Platinum Black), < 2.0 µm surface topography	Platinum (with PEDOT), < 0.6 µm surface topography
Sampling Rate	20 kHz / channel	
Amplifier and Electrode Noise*	3.3 (σ = 1.4) μV_{rms}	2.2 (σ = 0.9) μV_{rms}
Parallel Recording Channels	1'020	
Programmable Gain	Up to 78 dB	
Digital Signal Resolution	10 bits	
Stimulation Units	32	
Electronic ID	No	Yes
Sterilization Treatment	No	Yes

* The typical (median noise across all assessed MaxOne and MaxOne+ Chips) noise is reported with the standard deviation (across MaxOne and MaxOne+ Chips). In each assessed Chip, the median noise within the 300 and 3000 Hz range across 1020 channels is recorded and utilized calculation above.

Troubleshooting

Please refer to the following table to troubleshoot issues that you may encounter with your MaxOne system:

Table 7 Troubleshooting Guide for MaxOne Issues

Type	Problem	Possible cause	Solution
General	MaxOne Hub does not turn on (no light in Hub status indicator)	No power	1. Check that the correct power supply is used and that the cables are plugged in properly (green light on the power supply is on). 2. Unplug and re-plug the power cable into the MaxOne Hub.
MaxOne Hub	MaxLab Live shows that MaxOne System is not connected (static or flashing red light in Hub status indicator – "No System Found" on MaxLab Live Server)	No communication between MaxOne and PC	1. Check if the ethernet cable is connected properly between the PC LAN Port of the MaxOne Hub and PC (replace if necessary). 2. Unplug and re-plug the ethernet cable between the two ports. 3. Check the Ethernet settings are configured properly (Figure 5). 4. Restart the MaxOne Hub, PC, and MaxLab Live.
MaxOne Recording Unit	MaxOne Recording Unit does not turn on (no light in Recording Unit status indicator)	No communication between MaxOne Hub and MaxOne Recording Unit	1. Check that the ethernet cable is properly plugged into the System Ports of the MaxOne Hub and Recording Unit. 2. Unplug and re-plug the ethernet cable between the System Ports.
MaxOne and MaxOne+ Chips	The Chip is not detected by the MaxOne Recording Unit (flashing green light in Hub status indicator)	No communication between the Chip and MaxOne Recording Unit	1. Unlock and lock the Chip Lock on the MaxOne Recording Unit. 2. With a lint-free wipe, clean the pins on the bottom of the Chip and the Pin Connectors of the MaxOne Recording Unit. 3. Repeat the step above with a wipe dampened with 70% ethanol and dry with a second wipe. 4. Gently press down the Chip while locking the Chip Lock.

	The Chip is connected but MaxLab Live shows that it is not working properly (the Chip status indicator in the MaxLab Live Scope either show no or red-light indicator)	The Chip is not properly connected	1. Unlock and lock the Chip Lock on the MaxOne Recording Unit. 2. Gently press down the Chip while locking the Chip Lock.
		The Chip is dirty	1. With a lint-free wipe, clean the pins on the bottom of the Chip and the Pin Connectors of the MaxOne Recording Unit. 2. Repeat the step above with a wipe dampened with 70% ethanol and dry with a second wipe.
		The Chip is damaged	1. Plug in another Chip and investigate whether the same problem arises.
Chip Lock	Chip Lock on MaxOne Recording Unit does not move easily	Chip Lock is dirty	1. Spray the MaxOne Recording Unit (particularly around the Chip Lock) with de-ionized water or a 70% ethanol solution. Wipe and dry with a lint-free wipe.
		Debris and/or parts are stuck inside the Chip Lock	1. Contact MxW Support.
		Chip Lock is mounted in the wrong position	1. Contact MxW Support.
Software	MaxLab Live shows that multiple Chips (even new ones immersed in PBS) are not working properly (the Chip status indicator in the MaxLab Live Scope either show no or red-light indicator)	Chip Lock Wheel is loose	1. Gently press down the Chip and observe whether the problem is resolved. 2. Contact MxW Support.
		MaxOne Recording Unit Pin Connectors are dirty or corroded	1. With a lint-free wipe, clean the Pin Connectors of the MaxOne Recording Unit. 2. Repeat the step above with 70% ethanol or isopropanol and dry with a second wipe. 3. Exchange the Pin Connectors if applicable using the "Cleaning and Replacement Protocol of Exchangeable Pin Connectors of MaxOne Recording Unit" document.
	Noisy channels in multiple Chips, initialization failure	Connection failure or software failure	1. Restart the MaxOne Hub, PC, and MaxLab Live. 2. Follow the steps above to clean and replace the Exchangeable Pin Connectors if applicable.

Other	Spill		1. Turn off the power button of the MaxOne Hub and unplug its power cable. 2. Follow the steps above to clean and replace the Exchangeable Pin Connectors if applicable.

For any additional issue, please contact the MaxWell Biosystems support team by email (support@mxwbio.com) or through the contact form on the website (www.mxwbio.com/contact/support/).

Further Information

Discover more about our technology, applications, and supporting documents on our website:



Contact MaxWell Biosystems

Email: support@mxwbio.com

Phone: +41 44 244 24 24

Albisriederstrasse 253

8047 Zurich

Switzerland

Conditions of Use

For life science research use only.

Revision History

Version 2.1: May 2025

© MaxWell Biosystems AG. All rights reserved.