

USER MANUAL

MAS-100 Libra® Settle Plate Changer



THANK YOU VERY MUCH!

Dear customer,

congratulations and thank you very much for choosing a product from MBV AG. We are pleased to make a contribution to your success.



MBV AG develops and produces precision devices for microbial contamination monitoring for more than 20 years. Our uncompromising quest for the best possible quality has convinced globally leading companies to rely on our solutions for their most demanding applications. Our superior product quality is backed by global availability of application and service support.

For best performance of your product please read this instruction manual carefully. The manual will provide you with the necessary information for correct and safe use of your new instrument.

If you need additional technical or application information, do not hesitate to contact us at welcome@mbv.ch or find more information on www.mbv.ch.

MANUFACTURER

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Note

Up-to-date product information – such as Service Information Letters (SIL) – are available in the [expert center](#) section of the MBV AG homepage: www.mbv.ch.

Moreover, important product after-sales information about changes, issues, instructions as well as news are provided in the corresponding expert center [MAS-100 Libra](#).

DOCUMENT HISTORY

VERSION	RELEASED	HISTORY
4.0	2026-04-29	FW 1.2.0 added to the scope of the document; new api function for last sampling result added in chapter 4.10.3. Elongated timer check to 300s updated in chapter 5.4.2. Better explanation of LAN reset in 3.2.5. Addition of software security chapter 1.8.
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2.0	2025-08-25	FW 1.0.1 added to scope of the document Chapter 5.4.2. Details for NTP in fixed IP settings added
1.0	2025-02-19	First released version

TRADEMARKS

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1. GENERAL INFORMATION

This chapter provides information of general interest regarding the instrument.

1.1. SCOPE OF THIS DOCUMENT

The information in this manual is valid for the following configurations:

INSTRUMENT	FIRMWARE VERSION
MAS-100 Libra®	1.0.0, 1.0.1, 1.1.0, 1.2.0

The passive microbial air sampler **MAS-100 Libra®** is hereafter referred to as «instrument».

A comprehensive list of all used abbreviations can be found in the APPENDIX D – Glossary.

1.2. RELATED DOCUMENTS

The following documents provide additional information:

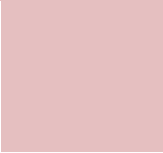
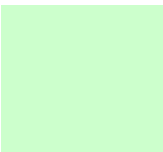
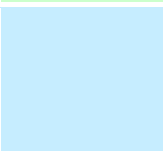
DOCUMENT	SCOPE
MAS-100 Libra® IQ/OQ template	Installation qualification and operational qualification of the instrument.
MAS-100 Libra® Declaration of Conformity (DoC)	Information on compliance to regulatory requirements.

1.3. SAFETY INFORMATION

1.3.1. SYMBOLS

	Warning
	Prohibition
	Mandatory Action

1.3.2. SEVERITY LEVELS

	Danger A red box indicates hazardous situations that, if not avoided, will result in death or serious injury.
	Warning An orange box indicates a hazardous situation that, if not avoided, could result in death or serious injury.
	Caution A yellow box indicates a hazardous situation that, if not avoided could result in minor or moderate injury.
	Safety Instructions A green box indicates specific safety related instructions or procedures that are related to safe work practices.
	Note A blue box indicates information considered important but not hazard related. This may be situations resulting in irreparable damage to the instrument or unreliable sampling results.

1.3.3. SPECIFIC SAFETY INFORMATION FOR THE INSTRUMENT

	It is important to read these instructions before using this instrument. Please read the safety data sheet and the instrument-specific safety information in this manual carefully before using the instrument and/or any accessory supplied with this product. Keep this manual in a designated place, accessible for all users for future reference. Ensure that all personnel have read and understood the content of this manual.
	Hazard of explosion and/or fire Do not use the instrument in explosion hazard areas.
	Overvoltage protection The instrument does not come with internal overvoltage protection. Any connected power supply must therefore handle the supply voltage such that it always meets the instruments input voltage specifications.
	Hazard of heavy equipment Handle the MAS-100 Libra settle plate changer with care. Its weight can cause harm when being dropped from elevated heights.
	Moving parts MAS-100 Libra has moving parts. Even though low maximum forces of motors and moving parts pose minimal risk for injuries, take care that moving parts do not get into contact with body parts.
	Hazard of damage to the instrument Any cleaning/disinfection solution must be completely dried before using the instrument.
	Hazard of inappropriate supply voltage An external power supply with $24\text{VDC} \pm 10\%$ is necessary for instrument operation. Wiring of the instrument must follow EN 60204.
	Hazard of wrongful operating conditions The settle plate changer is a precision instrument for industrial and laboratory use. The instrument shall only be operated by trained, qualified and authorized personnel as stated in chapter 1.4.2, in conditions matching the instrument specifications listed in chapter 9.
	Hazard of wrongful service There are no user-serviceable parts inside the instrument. Do not perform any intervention inside the instrument. Only trained, qualified and authorized technicians can perform repair and maintenance activities.
	Hazard of liquid damage to the instrument The instrument is not IP-protected.

	Do not spill liquids into the electric connections or into the instrument housing.
	Risk of warranty expiration Any application other than the intended use is not covered by warranty. For additional information, please consult warranty chapter 1.5 .
	Hazardous substances This product contains certain hazardous substances and can be used safely during its environmental protection use period in years (typically 50 years and indicated by the number in the centre of the logo on the type label) which should enter the recycling system after its environmental protection use period.
	Risk of damage to the instrument Open the installation cover to connect cabling for power and control only in clean environments and in agreement with all aspects of the user manual.
	Risk of handling errors It is recommended to check the instruments functionality in a periodicity of 12 months though in internal self-test routine.
	Risk of cross contamination The FDA considers the separation of penicillin production from other drug products for human use as a GMP requirement (21 CFR 211.46(d)), therefore MBV AG recommends taking any precaution for installing and handling the MAS system accordingly.

1.4. INTENDED USE

The MAS-100 Libra is used during microbiological quality control as part of a risk-based quality assurance. The instrument is used to determine the airborne microbial contamination via gravimetric deposition onto an agar plate (passive air sampling). For details about the application and its restrictions refer to chapter [2.3](#).

1.4.1. AREA OF APPLICATION

The MAS-100 Libra is a precision instrument for industrial and laboratory use. It can be used in non-controlled and controlled environments. The latter includes cleanrooms qualified according to ISO 14644 classes 5 to 8, pharmaceutical cleanrooms qualified according to GMP grades A to D respectively.

1.4.2. INTENDED USERS

The use of MAS-100 Libra should be restricted to trained, qualified and authorized personnel only.

1.4.3. OPERATING CONDITIONS

The instrument must be operated in defined environmental conditions. Please consult the operating conditions in chapter [9 «Technical specifications»](#).

1.4.4. «DUAL-USE» STATEMENT

The instrument is designed solely for civilian purposes. It is excluded in the scope of the European «Dual-Use» regulation (EU) 2021/821.

1.5. WARRANTY

1.5.1. GENERAL

This chapter informs about the warranty of the instrument and the procedures to follow if the instrument is not working as described in the user manuals.

For products listed in this publication purchased directly from MBV AG the applicable warranty may be found at: www.mbv.ch/about-us/gtc.

1.5.2. QUALITY STATEMENT

The instrument has been designed and manufactured to the highest quality levels.

The manufacturer guarantees the instrument's impeccable quality for a period of 24 months (starting from shipping date).

The quality of original MBV AG spare parts is guaranteed by the manufacturer 3 months after the repair or service.

1.5.3. EXCLUSION CLAUSES

The warranty covers exclusively material and manufacturing defects which occurred during the above described periods of time. The warranty does not cover the natural wear and tear of parts, or any damage caused by improper handling, negligence, or non-observance of the user manuals or the service information letters. The warranty expires immediately if any of the following conditions are infringed:

- The instrument shall only be serviced or repaired by qualified, trained and authorized technicians. A list of certified service centers can be found on www.mbv.ch/en/services/support/
- The instrument shall only be serviced or repaired as described in the MBV AG service manual.
- The instrument shall only be serviced or repaired using original MBV AG spare parts.
- The instrument shall only be operated according to the defined intended use.
- The instrument shall only be operated and updated with original application software from MBV AG.
- The instrument shall not be modified physically in any way.

1.5.4. CONTACT

If a warranty case occurs, customers may contact the instrument manufacturer directly:

MBV AG	Worldwide	www.mbv.ch/en/services/support/
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1.6. PRODUCT LABELING

1.6.1. PRODUCT TYPE PLATE

The information imprinted on the type plate identifies the instrument and its manufacturer. The type plate is located on the front of the instrument, on the right side, and includes the following information:



- Manufacturer name and contact data
- Instrument type
- Instrument description
- Instrument serial number
- Date of manufacture
- Country of origin
- Regulatory information
- Input voltage

Significance of the icons on the type plate

	Indicates the serial number of the instrument.
	Identifies the manufacturer of the instrument.
	With the CE symbol the manufacturer declares conformity with the relevant directives of the European Union as stated on the «Declaration of Conformity» which can be found on instrument specific download page MAS-100 Libra .
CAN ICES-1(A) / NMB-1(A)	The CAN ICES-1(A)/NMB-1(A) compliance label declares conformity of the instrument with the following Canadian Interference-Causing Equipment Standard "CES-001 — Industrial, Scientific and Medical (ISM) Radio Frequency Generators".
	This symbol indicates that the product does contain toxic or hazardous substances or elements above the maximum concentration value established by the Chinese standard SJ/T113632006 as stated in chapter APPENDIX A – Chinese RoHS, and can be recycled after being discarded and should not be casually discarded



Read the instructions before using the instrument.



With this symbol the manufacturer declares conformity with the WEEE directive as described in the «Declaration of Conformity» which can be found as printout delivered with the instrument. It should not be disposed of as household waste at the end of its life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this instrument from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. Users should either send the instrument back to the supplier or dispose it locally in accordance with the applicable local waste legislations.



Indicates the date of manufacture.

1.6.2. HOUSING LABELS

The electrical interfaces of the instrument are labelled with port labels and port icons where applicable. For detailed information on the electrical interface, please see chapter [3.2](#).

Significance of the icons on the housing



Indicates the connecting terminals of the ethernet network.

1.7. REGULATORY AND COMPLIANCE INFORMATION

1.7.1. 21 CFR PART 11

To achieve data integrity for the MAS-100 Libra, the instrument is treated as a probe integrated in a 21 CFR part 11 compliant superordinate system.

1.7.2. AIR TRANSPORTATION (IATA)

No special provisions necessary.

1.8. SOFTWARE SECURITY

1.8.1. DATA REMOVAL FOR INSTRUMENT DISPOSAL

When the MAS-100 Libra reaches the end of its lifecycle, the instrument can be disposed of according to local regulations or returned to MBV. Prior to disposal, MBV recommends archiving and deleting any data stored on the instrument. This includes exporting the instrument's log data where applicable (see 5.3.1) and resetting the instrument to factory defaults (see 5.4). These steps help ensure that no sensitive data remains on the device before disposal.

1.8.2. FIRMWARE UPDATES AND SECURITY MAINTENANCE

MBV may release firmware updates, including security patches, for MAS-100 Libra during the defined support period. Updates are distributed through official MBV after-sales channels, such as Service Information Letters (SIL), the MBV expert center, or directly via MBV service. To check the currently installed firmware version, refer to the instrument's information screen.

For information on available updates, visit the MBV expert center and review the downloads area for MAS-100 Libra, or consult Service Information Letters. Your supplier or MBV service can advise whether an update is recommended for your specific firmware version.

If a firmware update is relevant for your product configuration, it must be installed using official MBV procedures (see section 5.4.3). After installing an update, record the new firmware version for your records. For further details or assistance, contact MBV service at service@mbv.ch.

1.8.3. DEFAULT SECURITY CONFIGURATION

MAS-100 Libra is designed and delivered with secure settings enabled by default, offering a minimal attack surface suitable for laboratory and industrial environments. The intended use is within controlled laboratory or industrial settings, and the instrument should only be connected to trusted networks and equipment. Connections to unknown or public networks are not recommended.

To maintain security, prevent unauthorized physical access to the instrument and its connectors, as physical access may allow misuse of available interfaces. Restrict access to configuration functions as required by your site procedures. If abnormal behavior is observed, disconnect the instrument from the network and any connected equipment and contact MBV support, providing the firmware version and a description of the issue.

1.8.4. REPORTING SECURITY VULNERABILITIES

If you suspect a cybersecurity vulnerability in MAS-100 Libra, please report your findings to MBV for evaluation and resolution. The preferred method of contact is via email to cybersecurity@mbv.ch, using English for communication.

When submitting a report, include the product name, serial number (if available), firmware version, a description of the issue, steps to reproduce the problem, and any relevant logs or screenshots. MBV will acknowledge your report and may request additional information to facilitate assessment and resolution.

Please do not publicly disclose any vulnerability until MBV has provided an assessment and mitigation plan, following a coordinated vulnerability disclosure process.

1.8.5. THIRD-PARTY SOFTWARE COMPONENTS

This product may incorporate third-party software or components. MBV actively monitors publicly known vulnerabilities related to these components and provides security updates as necessary throughout the defined support period.

2. INSTRUMENT DESCRIPTION

The MAS-100 Libra automated settle plate changer is a robotic instrument able to manipulate up to six agar plates with 90mm diameter for passive air monitoring of the airborne microbial contamination. The instrument eliminates the need for human intervention during continuous passive environmental monitoring for up to 24 h.

It is important to note that the MAS-100 Libra is intended for use only in environment where oxidizing (O₂), toxic, flammable, or combustible gases or mixtures are absent. This restriction is important to prevent the risk of fire or explosion.

2.1. PARTS DESIGNATION

The figure below shows the main components of the instrument and their designation:

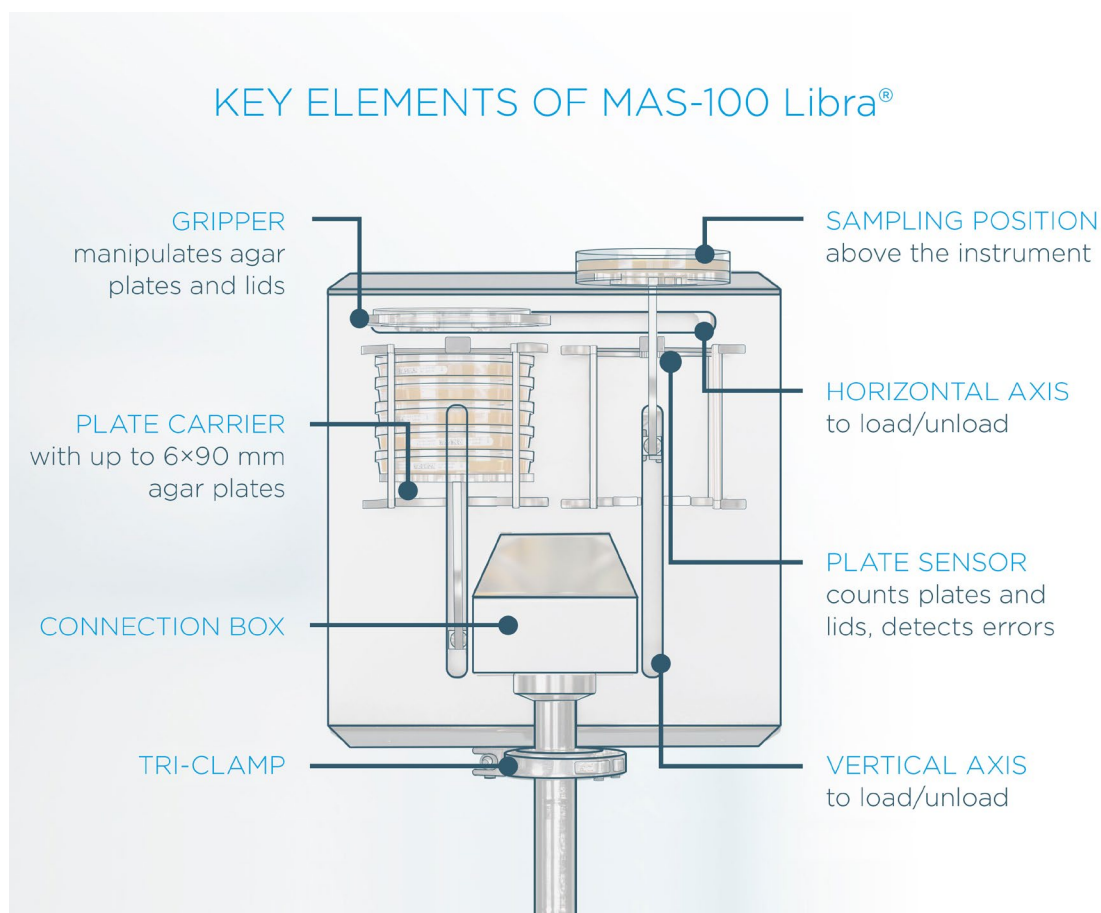
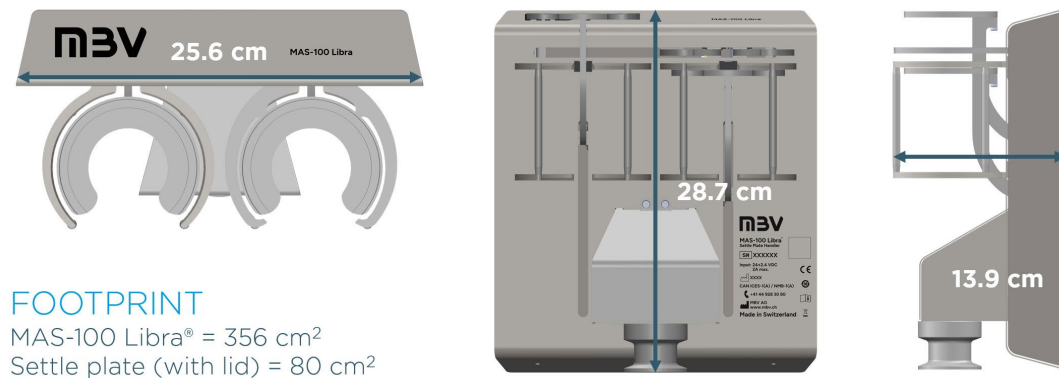


Figure 1: Schematic representation of the MAS-100 Libra instrument with its key elements and explaining their functions.

Dimension and footprint of the MAS-100 Libra instrument are illustrated in the figure below:



2.2. MAIN FEATURES

- Automated handling of up to six 90mm agar plates and lids
- Continuous passive air sampling for up to 24 hours
- Compact design and easy-to integrate instrument for isolator and RABS Systems
- Available as standalone version
- Configurable sampling time
- Intuitive status indication
- Sampling position above instrument
- Small footprint covering three agar plate positions
- Remote control via Modus TCP / external Button / digitale IO interface
- Configuration via browser user interface without external software
- Compatible to VHP decontamination
- High-quality stainless-steel parts with low environmental footprint
- Developed according to GAMP 5
- Low maintenance requirements

2.3. APPLICATION

The process of passive microbial air sampling involves the use of standard 90mm agar plates, which are placed at critical locations within processing facilities. These plates are left uncovered for a predetermined period, during which airborne microbial contaminants naturally settle onto the exposed surface of the culture media. The duration of sampling time is carefully selected based on specific monitoring requirements, with a maximum sampling time of 4 hours as per EU GMP Annex 1 Manufacture of Sterile Medicinal Products.

After the sampling time has elapsed, the plates are securely covered to prevent any additional contamination. They are then transferred to an incubator, where they remain for a set incubation time under controlled temperature conditions. During incubation, microbial particles that settled on the plates during sampling will proliferate, forming visible colonies.

These colonies are then counted, with each visible colony representing a colony forming unit (CFU). The number of CFUs is used to quantify the level of airborne microbial contamination present in the environment during the plate sampling period.

2.4. FUNCTIONAL DESCRIPTION

Once powered up, the instrument requires initialization of its internal components. During the initialization process, both the vertical and horizontal axes move to their respective end switch positions. Subsequently, the vertical axis ascends towards the optical plate sensors. Finally, the instrument transitions to the predefined loading position.



As soon as a set of agar plates is loaded to the specified loading position of the instrument, the handling process can be started either by pressing the optional remote button, via sending a specific command using one of the communication interface protocols through the ethernet connection, or by sending a positive edge on the digital input port.



Upon receiving the start request, the instrument moves all loaded plates to determine the number of loaded plates with the help of the optical sensors. Once it is confirmed that at least one but not more than six plates are present, the first plate and/or lid will be moved with the help of the horizontal gripper arms from the «loading position» to the «sampling position». The gripper arms will remove the lid of the plate to allow the start of passive air sampling at the pre-defined sampling position. As soon as the defined sampling time has passed, the exposed plate is covered with its lid before the handling operation of the next plate is started.



The instrument will check the number of plates located on either arm of the instrument in between each plate exchange to raise an error and inform the user of handling failures. In addition, the user can request a plate change before the start of the next sampling session.

Once all plates are handled, the instrument will shuffle the plates back to the loading position. However, please note, that the handling process may deviate from this default routine depending on your instrument's configuration regarding loading, unloading and sampling position.



After the finished process, the instrument waits for the user to confirm plate retrieval. Once the user has confirmed plate removal, the instrument automatically reinitializes its sensors

and axes and remains ready for the next passive air sampling session. The complete state machine diagram is depicted in chapter 4.3.



The plate handling process

The handling process can be adapted using the instrument configuration. This includes the side of the instrument for loading and sampling as well as settings such as sampling time or optional delay until the process is starting after being triggered.



Agar plate compatibility

The handling process can be adapted to different plate geometries and plate types. The instrument can handle lockable agar plates if they are loaded in an unlocked configuration. Please note, that the handling success rate can be reduced when using lockable plates as they demand higher positional accuracy.

2.5. VALIDATION AND QUALIFICATION

Validation consists of a series of tests to show the instrument consistently meets quality standards, product requirements, specifications and produces reproducible sampling results.

Validation is in the responsibility of MBV as manufacturer of the instrument. All validation activities follow good engineering practices and development is compliant with GAMP®5.

The following relevant validation criteria have been selected:

- Planning & specification (URS, FDS, MS)
- Design (hardware & software design specifications)
- Construction (assembly, software, electronics)
- Testing (module testing, functional and integration testing, requirements testing)
- Installation & hardware acceptance tests (EMC, ESD...)
- Operation (maintenance, change control)

Qualification of the instrument for the intended use, the verification of the suitability or applicability of the method in a given customer situation is the responsibility of the customer. However, following support is available for installation qualification (IQ) and operational qualification (OQ) of the instrument:

- Order an on-site IQ/OQ service, performed by a service engineer expert from MBV. For MBV service: Please go to <https://www.mbv.ch/de/service/iq-oq/> for more information or write service@mbv.ch to make an appointment.

2.6. SCOPE OF DELIVERY

The instrument is shipped in a carton box. The packaging can be reused for shipping if handled with care:

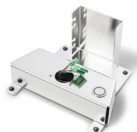


Unpack the instrument carefully and verify whether all items listed below are present. Contact your local representative immediately if items are missing or show signs of defect.

DESCRIPTION	ARTICLE NUMBER	PICTURE
MAS-100 Libra®	200950	
Tri-clamp connector	101.984	
Tri-clamp sealing gasket	108.541	
Safety sheet (paper printout)	130.0804	n.a.
Quick start guide (paper printout)	201505	n.a.
Test report (paper printout)	201189	n.a.

2.7. ACCESSORIES

Accessories for MAS-100 Libra can be purchased optionally.

DESCRIPTION	ARTICLE NUMBER	PICTURE
Tri-clamp connector	101.984	
Tri-clamp sealing gasket	108.541	
Instrument stand	201122	
Remote button	201187	
Connector set	201194	

3. INSTALLATION

3.1. SECURE MOUNTING AND ORIENTATION

MAS-100 Libra comes with a tri-clamp mounting port that facilitates installation and simultaneously aids as a cable feedthrough with IP67 and IP69K rating.

The instruments housing has a bevelled shape that guides the air flow towards the instruments front and contributes to a homogenous air flow pattern towards and around the agar plate. It effectively counteracts the flow disturbances created by its own non-zero footprint.

3.2. ELECTRICAL CONNECTIONS

Make sure to follow the instructions and recommendations below when setting the system up for its first use.

The electrical interfaces are located at the front of the instruments. To access the connecting ports, remove the protective stainless-steel cover that is held in place with two torx pin-head screws.

The following image depicts the layout of the electrical ports of the instrument:



ID	FUNCTION
X1	Power and ground connector supplying the instrument with 24VDC
X2	Port for the optional remote button with LED indicators
X3	Ethernet port (RJ45)
X4	Digital input and output interface



MBV recommends connecting the instruments 0V connection to both the 0V port and the protective earth of the power supply.



The maximum length for cables that are to be connected to either port must not exceed 30m.

3.2.1. POWER SUPPLY PORT

To render the instrument ready for use, it is necessary to connect the power supply to the power supply port X1. The power supply must deliver a voltage of 24 VDC $\pm$ 10% with a minimal power rating of 48 W. The 3.5 mm pitched terminal connector has two poles. For polarity of the connectors, please follow the laser marking on the device.

3.2.2. EXTERNAL LED BUTTON

As an alternative to superordinate control via LAN, the instrument can be controlled using an external button. The external button can be connected using the six-port terminal connector X2 with 3.5mm pitch.

MBV offers a stainless-steel power button with optical feedback (RGB LED status indication) as well as an instrument stand that includes a similar control button (see chapter 2.7).

PIN	COLOR	FUNCTION
1	Black	Common ground
2	Red	LED red
3	Green	LED green
4	Blue	LED blue
5	White	Button 1
6	White	Button 2

3.2.3. ETHERNET PORT

The X3 ethernet connection (RJ-45 connector) is used to establish network connection for the instrument. Via this network one may configure the instrument using the browser-based user interface (see chapter 5) or control the instrument using the RESTful API or Modbus protocol (see chapter 4.7).

3.2.4. DIGITAL I/O PORT

To control the instrument with digital inputs and outputs, port X4 is used. This interface provides a superordinate control option with lower complexity than the interfaces established via the ethernet port.

The corresponding connector is a 10-pole PCB terminal block with 3.5 mm pitch. For more details, please refer to section 4.9.

3.2.5. RESET BUTTONS

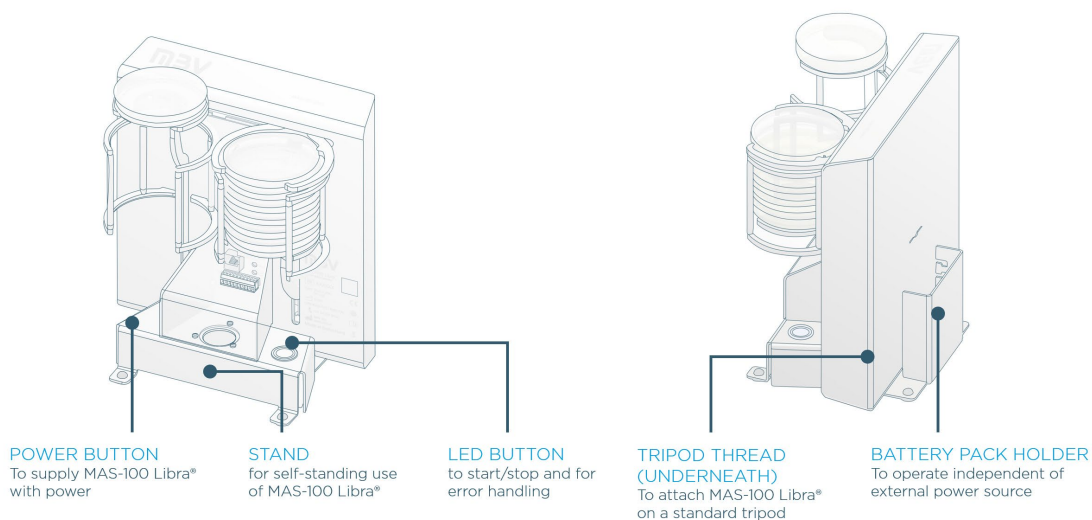
The instrument needs an input in specific situations. Three buttons are accessible for this purpose:

- LAN reset: In cases where the active interface configuration is rendering the device inaccessible, the device IP can be reset to the default configuration (DHCP enabled). To do this, shortly press the reset button while you keep the LAN reset button pressed until instrument startup.
- Reset: In case the instrument becomes unresponsive, the reset button provides an option to trigger a hard reset and resolve the error state similar to removing the supply voltage for a short amount of time.
- Boot: Needed for Service in cases where the firmware update via the browser-user interface is not possible.

3.3. OPTIONAL MOUNTING AS A STANDALONE EQUIPMENT

A mobile stainless-steel stand is available as an accessory. The stand can be mounted to the instrument replacing the tri-clamp connector and allows the instrument to be used as a portable device. The stand comes with an integrated remote button and power plug that can be connected to the corresponding ports as described above.

On top, the stand forms a pocket on the back of the instrument housing to allow storage of a 24VDC power bank. However, please note that MBV does not offer 24VDC power banks.



Please make sure to confirm the correct polarity before attaching a power source to the stand as wrong polarity of the supply voltage may harm the instrument.

4. OPERATION

4.1. GETTING STARTED

4.1.1. INSTRUMENT POSITIONING

The instrument shall only be stored and used in an upright position.

4.1.2. CLEANING AND DECONTAMINATION

Make sure that the instrument and its accessories have been properly disinfected, and that the disinfectant has dried completely. Refer to chapter [7.3](#).

4.2. INSTRUMENT STATUS

The instruments status lamps indicate the instruments status by different color, continuous or flashing lights.

SIGNAL	INSTRUMENT STATUS	DESCRIPTIONS
Yellow flashing	Power On state	The instrument needs to initialize after power On. Or if configuration has been changed (e.g. loading position has been changed).
	Awaiting user intervention	If selected, the instrument will remain in this state and wait for user intervention in cases of unclear success cover lid process.
Yellow continuous	Initialization state	The instrument initializes. The decontamination mode is on. Timer check is running. Instrument self-test running.
	Decontamination state	
	Timer check state	
	Instrument self-test state	
Green flashing	Ready	Instrument waits for user to load plates and trigger start sampling. Instrument waits for user to confirm plate unload.
	Finish state	
Green continuous	Sampling state	Sampling, uncover plate, cover exposed plate, return plate stack to unloading position.
Red flashing	Error state	The error message can be taken from the instrument log files (accessible through the BUI).
No color light	Offline	The instrument is switched off and disconnected from the power supply.

4.3. STATE MACHINE

The control interfaces Modbus, RESTful API, the digital input/output port, and the external button are used to trigger state changes of the instrument and/or retrieve status information.

The following graph depicts the instruments state machine diagram; colors of states represent the illumination color of the internal instrument LEDs as well as for the optional external button with status LED:

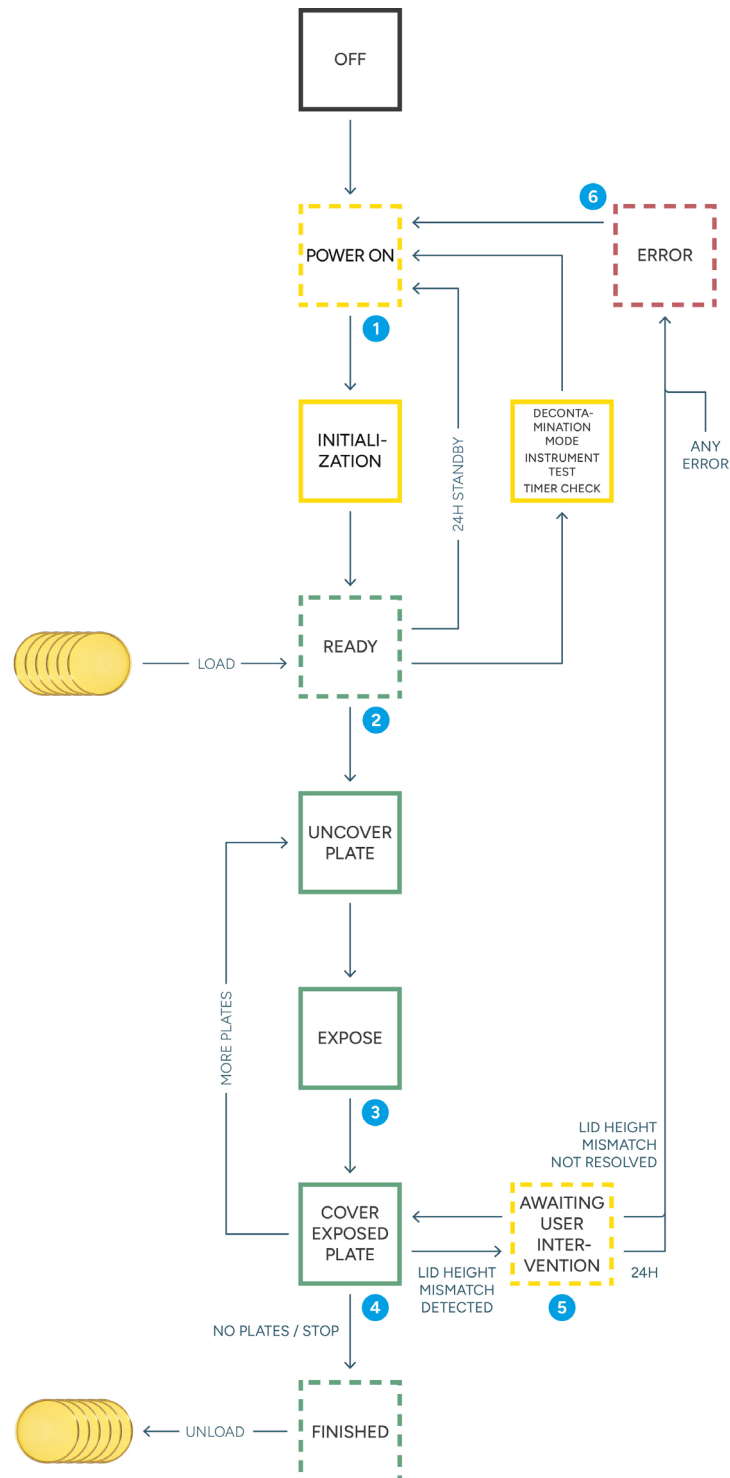


Figure 2: Instrument state machine depicting different instrument statuses, workflows and the corresponding LED indications.

ID	ACTION	DESCRIPTION
1	Initialize	Initialize the instrument. All axes are homed, and instrument is going into loading position.
2	Start sampling	Start sampling procedure. All loaded plates are successively exposed with the parameters defined in the instrument configuration.
3	Next plate	When a plate is exposed, this command can trigger a plate exchange prior to the pre-defined sampling time.
4	Stop sampling	When this action is triggered during covering a plate, the process is finished with this plate and optional shuffle back to the unloading position is performed.
5	Confirm intervention	The user confirms that the potential error during the «cover plate» phase has been resolved. The instrument will check if the error was prevented and continue with the sampling of the next plate right after confirmation.
6	Acknowledge error	The error state can be acknowledged, and the instrument state will change to the power up state.

4.4. SETTLE PLATE HANDLING

4.4.1. START-UP OF THE INSTRUMENT

As soon as the 24V power is supplied, the instrument's internal electronics is starting up. Thereafter, the instrument is available for use, but its axes are not yet initialized. This status is indicated with a flashing yellow status LED.

Prior to starting the handling routine, the instrument is initialized. The standard usage routine consists of the following steps:

	Do not interfere with the initialization routine and make sure no body parts or other obstructions are in the way of moving axes.
	Make sure the instrument settings for plate and loading position match your loading routine.
	The maximum handling capacity for the system is six agar plates.
	The start of the handling process can be triggered using the appropriate digital input port or the Modbus TCP interface protocol.
	The automated handling process starts by exposing the first settle plate from the loaded stack. After the predefined delay time has passed, the system will automatically exposed plate and expose a new settle plate from the stack. This process is iterated until all plates from the loading stack are processed.

INSTRUMENT STATE	DESCRIPTION OF THE PROCESS
Power On	1. After starting up the indicator LED flashes yellow. A button click triggers the initialization.
Initialization	2. The initialization of stages and internal sensors is performed. Here, horizontal gripper and vertical axes are moved successively. The LED illuminates in green during this procedure.
Ready	3. Once the instrument is successfully initialized, the indicator LED is flashing green. The instrument may now be loaded with plates for a handling routine.
Sampling	4. Once the plates are loaded, trigger the automated plate handling with a button click. Once the routine starts, the LED illuminates in green.
Finished	5. At the end of the automated sampling routine, the operator can retrieve all processed plates. This state is indicated with a flashing green LED. Once the plate removal is confirmed, the instrument enters the «initialization» state to get ready for the next handling process.

4.5. STANDBY

The instrument has a no separate standby state as it comes with inherently low power consumption at times without stage movements. However, for extended periods without use, the system may be powered down by disconnection or disabling the 24VDC power supply.

Whenever the instrument was in the “ready” state without triggering a handling process for 24h or longer, it will automatically change from the “ready” to the “power on” state (blinking green to blinking yellow color indication) which requires a renewed initialization of all axes prior to use.

4.6. POSITION OF PLATES AND BARCODE HANDLING

The agar plate orientation on the MAS-100 Libra instrument is depicted in below image. There, the uppermost plate of the loaded plate is considered “first” as this plate will be the first to be exposed, followed by the one underneath; the process ends after at most six plates with the bottom plate of the plate stack.

After the sampling process is finished, all plates are optionally shuffled back to the plate carrier where they have been loaded, thereby rearranging the plates such that the first exposed plates are again the one on top of the stack.

Many agar plates do come with a plate barcode. While MAS-100 Libra cannot scan these barcodes itself, the barcodes can be submitted to the system using the Modbus interface (see section 4.11.4 for more details). These barcodes will subsequently be stored in the log of the instrument to facilitate tracing back the exact timepoints when individual plates were exposed and covered (see section 5.3.1 for more details to the instrument log).

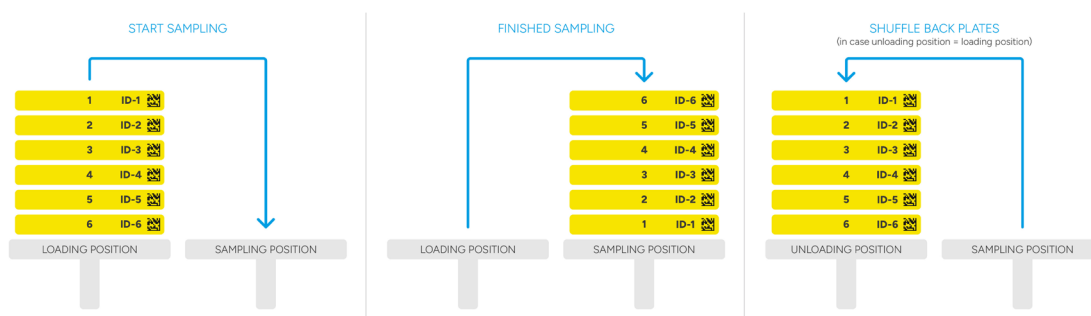




Plate serial numbers must be composed of numerical characters with maximum length of 48 characters only. The displayed barcode in the log entries then contains the plate barcode preceded by zeros to either a 10 digit or 48-digit numerical ID.

4.7. OPERATION USING A REMOTE BUTTON

The instrument can be controlled using an optional LED button as user interface. This button can then be used to trigger User Actions such as initializing the instrument or starting a sampling procedure. The LED button is the simplest form of instrument control and status display (all state changes listed in section 4.3 can be triggered).

MBV offers a respective part as accessory for the MAS-100 Libra (see section 2.6 for more details).

4.8. OPERATION USING SUPERORDINATE CONTROL

MAS-100 Libra is designed for use in pharmaceutical isolator and RABS units. Here, integration of the instrument operation into the HMI of the isolator are often desired. For these cases the instrument provides two control interfaces – digital input/output channels as well as superordinate control using Modbus TCP or RESTful API commands via the RJ45 ethernet cable.

4.9. DIGITAL INPUT/OUTPUT

4.9.1. GENERAL INFO

The digital port X4 can be used for simple external control. The following section describes its use. Please refer also to the instrument state machine to determine the instrument states based on the output pins and the correct states to trigger the respective input pins.

4.9.2. ELECTRICAL SPECIFICATIONS

- Nominal external supply voltage: 24VDC $\pm$ 10%
- Output voltage for all channels: 24VDC $\pm$ 10%, reflects input voltage
- Maximum output current for all channels: 0.5A
- Maximum output current per channel: 0.5A
- Reverse polarity protection
- Short-circuit protection
- Overload protection (internal self-resetting fuse)
 • To reset fuse, disconnect the supply voltage
- Functional insulation between I/O and main circuit
- Connector: MC 1,5/9-STF-3,5 Mini-Combicon, Phoenix Contact.
- Digital input signal: rising edge

4.9.3. PIN ASSIGNMENT OF DIGITAL INPUTS

PIN	TYPE	COMMAND	APPLICABLE IN STATES
1	Digital Input 1	Initialize	Power on Finished
2	Digital Input 2	Start	Ready
		Next plate	Sampling
		Confirm intervention	Awaiting user intervention
3	Digital Input 3	Stop	Sampling
4	Digital Input 4	Acknowledge error	Error



All digital inputs are only effective in the applicable states. State changes delete the previous ineffective input signals.

4.9.4. PIN ASSIGNMENT OF DIGITAL OUTPUTS

STATE	PIN 5	PIN 6	PIN 7	PIN 8
Power Off	-	-	-	-
Power On	-	X	-	X
Decontamination Mode	-	X	-	X
Timer check	-	X	-	X
Instrument Test	-	X	-	X
Init	-	-	-	X
Ready	-	X	-	-
Sampling	-	-	X	-
Finished	-	X	X	-
Awaiting User intervention	-	-	X	X
Error state	X	-	-	-

4.9.5. SCHEMATIC

The digital input and output interface uses a common ground for all channels via one self-resetting safety fuse. This means that the maximum current over one channel (while the others are off) equals the maximum current on all channels when used simultaneously. The external circuit may be supplied with either $24V \pm 10\%$ or $12V \pm 10\%$. The electrical circuit schematics can be found in below image.

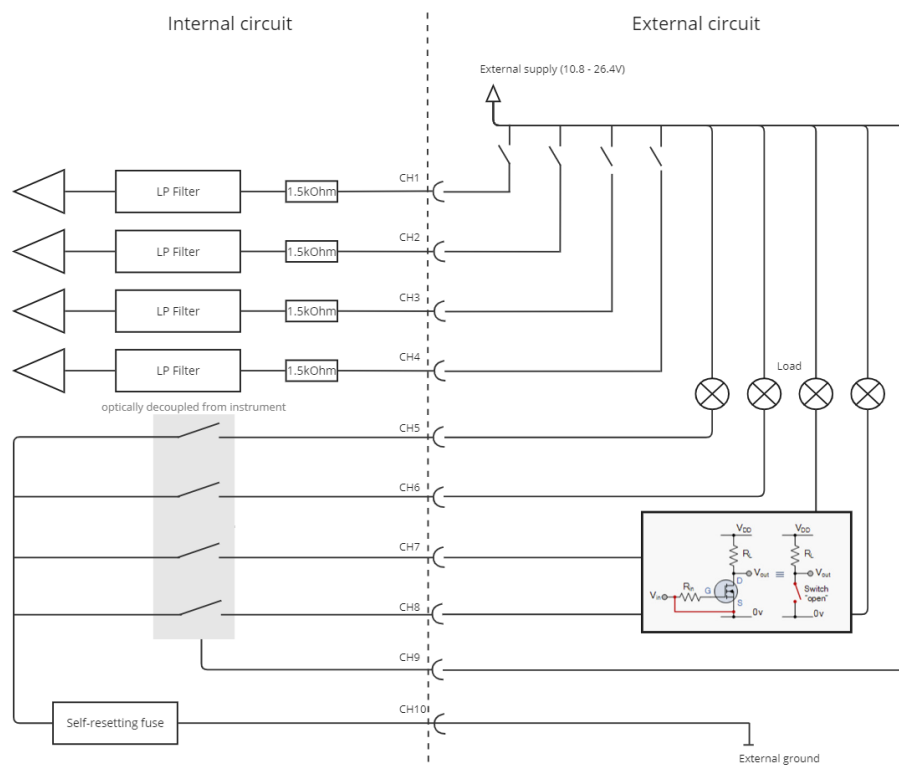


Figure 3: Schematic of the electrical interface for external control using the digital input and output port.

4.10. RESTFUL API INTERFACE

4.10.1. GENERAL INFO

A RESTful API, or Representational State Transfer Application Programming Interface uses standard HTTP methods for communication and is widely used in web development to enable communication between different systems or applications.

RESTful APIs are designed to be stateless, meaning that each request from a client to a server contains all the information needed to understand and fulfil that request. The server does not store any information about the client's state between requests.

The MAS-100 Libra instrument uses two kinds of commands: get and put to retrieve information from the system or trigger actions. The interface is used for the instruments Browser-based user interface. However, its commands can also be used for automation purposes.

4.10.2. FUNCTIONALITY

The functions for the user are dependent on the instrument configuration. In case the instrument access is restricted to users with the password, only the instrument information can be retrieved. Direct process control is however not realized with this interface. To do so, please use the Modbus protocol explained in section 4.11.

All API endpoints are accessible under the "/api" route. All JSON requests shall have the Content-Type header set to application/json. The response for requests contains at least the following JSON data:

- Successful request: { "status": "success" }
- Erroneous request { "status": "error", "message": "some error message" }

All requests return with a status code that contains additional information. The following three statuses are possible:

- 400 "Bad request" indicating requests with invalid body data
- 401 "Unauthorized" indicating insufficient access rights
- 200 "OK" indicating successful requests return status

A coding example showing the implementation of various commands using python as programming language can be found on the instruments internal [download section](#) on the mbv.ch homepage.

4.10.3. LIST OF COMMANDS

- /api/ping:
method: GET
returns Status 200 OK in case connection is established.
- /api/status (method: GET)

JSON KEY	VALUE TYPE	DESCRIPTION
date_time	string	The instrument's date/time in the format 'YYYY-MM-DDThh:mm:ssZ'.
state	string	The instrument's current state.
errors	array	List of currently set error messages.

- /api/instrument (method: GET)

JSON KEY	VALUE TYPE	DESCRIPTION
serial	string	The instrument's serial number.
label	string	The customer defined label.
manufac_date	string	The manufacturing date.
hw_version	string	The hardware version of the mainboard.
fw_version	string	The version of the instrument firmware.
build_version	string	The build version of the instrument firmware.
mac_address	string	The MAC address.

- /api/config/time (method: GET, POST)

JSON KEY	VALUE TYPE	DESCRIPTION
ntp	boolean	True if an NTP server is used.
ntp_server	string	The address of the ntp server.
year	number	The year
month	number	The month
day	number	The day
hour	number	The hour
minute	number	The minute

- /api/config/process (method: GET, POST)

JSON KEY	VALUE TYPE	DESCRIPTION
load_pos	number	Loading position (0=left, 1=right)
unload_pos	number	Unloading position (0=left, 1=right)
exposure_pos	number	Sampling position (0=left, 1=right)
load_top	boolean	Un(load) from top (false=no, true=yes)
align_plate	boolean	Use gripper to facilitate lid placement for certain lockable plate types (false=no, true=yes)
press_lid	boolean	Compress lid during uncover process to release lids stuck due to condensation (false=no, true=yes)
user_intervention	boolean	In case of handling irregularities during the covering of an exposed plate, allow user intervention (false=no, true=yes)
delay	number	Delay in seconds (integer)
exp_time	number	Sampling time in minutes (integer)

- /api/config/plate (method: GET, POST)

JSON KEY	VALUE TYPE	DESCRIPTION
lid_diam	number	Lid diameter in mm
plate_diam	number	Plate diameter in mm
plate_height	number	Plate height without lid in mm
total_height	number	Lid and plate height in mm

- From FW 1.1.0 onwards: /api/instrument/sensors (method: GET)

JSON KEY	VALUE TYPE	DESCRIPTION
sensor_x1	boolean	Init sensor gripper leftt (false=not activated, true=activated)
sensor_x2	boolean	Init sensor gripper right (false=not activated, true=activated)
sensor_z11	boolean	Init sensor left vertical axis (false=not activated, true=activated)
sensor_z21	boolean	Init sensor right vertical axis (false=not activated, true=activated)
sensor_o1	boolean	Left optical sensor (false=not activated, true=activated)
sensor_o2	boolean	Right optical sensor (false=not activated, true=activated)

- From FW 1.1.0 onwards: /api/instrument/axes (method: GET)

JSON KEY	VALUE TYPE	DESCRIPTION
pos_x1	number	Position of the left gripper arm in mm
pos_x2	number	Position of the right gripper arm in mm
pos_z1	number	Position of the left vertical axis arm in mm
pos_z2	number	Position of the right vertical axis arm in mm

- From FW 1.2.0 onwards: /api/sampling/last-result (method: GET)

JSON KEY	VALUE TYPE	DESCRIPTION
starttime	number	UTC timestamp of the process start time
endtime	number	UTC timestamp of the process end time
number_of_plates	number	Number of handled plates during this process
result_status	String	- Successful - successful with manual intervention - successful - stopped manually - error

4.11. MODBUS TCP INTERFACE

4.11.1. GENERAL INFO

Modbus TCP (Transmission Control Protocol) is a widely used industrial communication protocol that enables communication between industrial control systems (ICS), programmable logic controllers (PLCs), and other devices in a network. It is an extension of the original Modbus protocol, which was designed for serial communication (RS-232/RS-485).

Communications with the MAS-Libra is possible via Modbus TCP. The instrument presents a TCP/IP Ethernet connection at port 502 using the standard Modbus protocol.

The instrument supports two types of registers: coils and input registers. The supported function codes are:

- 04 Read Input Registers
- 05 Write Single Coil



Using an unsupported function code will generate an illegal function exception (0x01). Accessing a register that is not defined will generate an illegal data address exception (0x02).



The response time of the instrument is generally below 1s. During certain instrument motions, the handling operation is prioritized over the response such that the response time can increase to <4s.

4.11.2. COILS

To trigger actions, the following coil registers are supported (please note that commands are ignored if the device is not in the required state):

PLC ADDRESS	REGISTER/ COMMAND	DESCRIPTION
00001	init	Triggers initialization of the device if the device is in one of the states *PowerOn* or *Finished*.
00002	start	Starts the sampling process if the device is state Ready.
00003	stop	Stops the sampling process.
00004	next	When sampling is executed, the command closes the lid of the current plate and proceeds with the next one.
00005	ack	Confirms an error in case the device is in state Error. This causes a transition to the state *PowerOn*.
00006	startDeco	Triggers an endless loop with axis movements every ~60s for optimized decontamination. This is only possible in the state *Ready*.
00007	stopDeco	Stops the decontamination mode. This is only possible in the state *DecontaminationMode* when the Decontamination mode is running. Once stopped, the instrument enters the state *PowerOn*.
00008	Confirm intervention	Instrument has detected irregularity during the cover Plate state. The user may intervene, manually rectify the irregularity and triggers a continuation of the process with the next plate (only possible if corresponding setting is enabled).

4.11.3. INPUT REGISTERS

Each input register is 16bits wide. There are two kinds of input registers - runtime registers and info registers.

The bit flag pattern of runtime registers looks as follows: | ... | 2 | 1 | 0 | .

PROTOCOL ADDRESS	PLC ADDRESS	DESCRIPTION	UNITS
0	30001	Motion control error states as a bit pattern (1) - Bit 0: Axis motion timeout - Bit 1: Unexpected limit sensor triggered - Bit 2: Not homed	-
1	30002	General error states (2) <i>Warnings</i> - Bit 0: NTP update not executed - Bit 1: No DNS lookup is available - Bit 2: Failed to resolve NTP server address	-
2	30003	Processing error states (3) - Bit 0: No plates loaded - Bit 1: Plate count exceeds limits - Bit 2: Lid loss during expose plate - Bit 3: Lid loss during cover plate - Bit 4: Plate loss during expose plate - Bit 5: Plate loss during cover plate - Bit 6: Initialization started with plates - Bit 7: Plates loaded to wrong side - Bit 8: Shuffle back failure - Bit 9: User intervention needed (warning)	-
3	30004	Remaining plates	#
4	30005	Finished plates	#
5	30006	Remaining sampling time (until all plates are processed)	Min
6	30007	Device state (4): - PowerOff = 0 - PowerOn = 1 - Error = 2 - Init = 3 - Ready = 4 - ExposePlate = 5 - Sampling = 6 - CoverExposedPlate = 7 - Finished = 8 - DecontaminationMode=9 - InstrumentTest=10 - TimerCheck=11 - UserIntervention=12	-

The info registers can be requested to assess instrument parameters. Even-indexed characters (e.g., 00, 02, etc.) are stored in the most significant byte of a register, while odd indexed characters are stored in the least significant byte.

PROTOCOL ADDRESS	PLC ADDRESS	DESCRIPTION	UNITS
100	30101	Serial number (char 00, 01)	-
101	30102	Serial number (char 02, 03)	-
102	30103	Serial number (char 04, 05)	-
103	30104	Serial number (char 06, 07)	-
104	30105	Serial number (char 08, 09)	-
105	30106	Serial number (char 10, 11)	-
106	30107	Serial number (char 12, 13)	-
107	30108	Serial number (char 14, 15)	-
108	30109	Instrument label (char 00, 01)	-
109	30110	Instrument label (char 02, 03)	-
110	30111	Instrument label (char 04, 05)	-
111	30112	Instrument label (char 06, 07)	-
112	30113	Instrument label (char 08, 09)	-
113	30114	Instrument label (char 10, 11)	-
114	30115	Instrument label (char 12, 13)	-
115	30116	Instrument label (char 14, 15)	-
116	30117	Instrument HW version (char 00, 01)	-
117	30118	Instrument HW version (char 02, 03)	-
118	30119	Instrument HW version (char 04, 05)	-
119	30120	Instrument HW version (char 06, 07)	-
120	30121	Instrument HW version (char 09, 08)	-
121	30122	Instrument HW version (char 10, 11)	-
122	30123	Instrument HW version (char 12, 13)	-
123	30124	Instrument HW version (char 14, 15)	-
124	30125	Instrument FW version (char 00, 01)	-
125	30126	Instrument FW version (char 02, 03)	-
126	30127	Instrument FW version (char 04, 05)	-
127	30128	Instrument FW version (char 06, 07)	-
128	30129	Instrument FW version (char 08, 09)	-
129	30130	Instrument FW version (char 10, 11)	-
130	30131	Instrument FW version (char 12, 13)	-
131	30132	Instrument FW version (char 14, 15)	-
132	30133	Instrument FW build number (char 00, 01)	-
133	30134	Instrument FW build number (char 02, 03)	-
134	30135	Instrument FW build number (char 04, 05)	-
135	30136	Instrument FW build number (char 06, 07)	-
136	30137	Instrument FW build number (char 08, 09)	-

137	30138	Instrument FW build number (char 10, 11)	-
138	30139	Instrument FW build number (char 12, 13)	-
139	30140	Instrument FW build number (char 14, 15)	-

4.11.4. HOLDING REGISTERS FOR SAMPLING BARCODES

Holding registers are used to enable the MAS-100 Libra to process the agar plate barcodes it was submitted to store the plate barcodes together with the start and stop sampling timestamps in its internal log. As up to six agar plates can be processed by the instrument, at maximum six plate barcodes can be submitted and stored.

The Plate barcodes can only be composed of numeric values (and the '/' termination byte) and are stored in BCD format (4bit per digit).

PLC ADDRESS	PROTOCOL ADDRESS	DESCRIPTION
400001	0	Barcode slot for plate 1
400026	25	Barcode slot for plate 2
400051	50	Barcode slot for plate 3
400076	75	Barcode slot for plate 4
400101	100	Barcode slot for plate 5
400126	125	Barcode slot for plate 6



Plate serial numbers must be composed of numerical characters with maximum length of 48 characters only and have to zero-terminated.
Example: '463847104825370582359428563209462948328438934593
/0

5. CONFIGURATION

5.1. INSTRUMENT CONFIGURATION

The instrument can be configured to a variety of use cases. Customization includes the handling process parameters as well as instrument address, time, access password and important parameters for the agar plate that is to be used.

5.2. BROWSER USER INTERFACE

The Browser User Interface (BUI) can be accessed through an RJ45 ethernet connection and allows device configuration, testing, and instrument log retrieval via a standard internet browser without the need for installation of external software.

5.2.1. ACCESS TO THE BROWSER USER INTERFACE

The default configuration of the instrument has DHCP activated. The network will therefore assign an IP address to the instrument at the moment the instrument is connected to the network. To determine the actual IP of your device, please consult your local IT department or follow APPENDIX C – Determining the instrument IP. The necessary steps are first to scan your local network for all currently available devices and then search the Vendor and MAC addresses for devices registered to MBV AG in the form of "8C-1F-64-8D-8X-XX".

When determined, simply type this IP address into your preferred internet browser to access the browser-based user interface of your MAS-100 Libra.



The functionality of the browser user interface was validated for the following web browsers:

- Google Chrome Version 121.0.6167.86 (64-Bit)
- Mozilla Firefox Version 130.0.1 (64-Bit)
- Microsoft Edge for Business Version 131.0.2903.63 (64-Bit)

5.3. DASHBOARD TILE

The dashboard tile is the initial access point to the browser user interface of MAS-100 Libra.

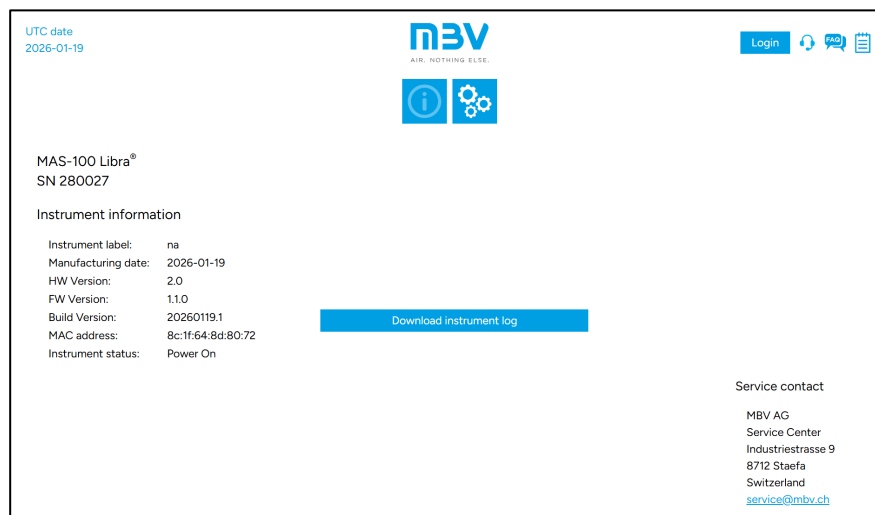


Figure 4: Dashboard tile of the browser user interface.

General Information

The instrument information screen provides access to general details such as the instrument type, serial number, manufacturing date, HW and FW version, build address, MAC address,

instrument state and contact data of the manufacturer and its affiliates. The instrument log file can be downloaded from this screen.

Support links available to every user



Click on the headset symbol to reach out to MBV service and support.



Click on the FAQ symbol to access the section of frequently asked questions.



Click on the user manual symbol to access the download page.

5.3.1. INSTRUMENT LOG

The instrument stores all internal handling operations in a technical instrument log together with the timestamp of each action. The technical log cannot be altered or deleted and has a storage capacity of 25'200 entries internally stored in 12 partitions. When the logs storage capacity limit is reached and the oldest partition including the oldest 7% of log entries is deleted and subsequently filled with the new entries.

The user is advised to retrieve and store the instrument log at regular intervals not exceeding 365 days. The log is a chronological record that provides documentary evidence of the sequence of all instrument actions as well as user activities (such as setting changes).

UTC Time	Category	Message
2025-03-12 06:20:41	Technical	Power On
2025-03-12 06:20:41	User Action	Acknowledge error request
2025-03-12 05:54:00	Setting Change	Time settings changed
2025-01-30 17:26:54	Technical	Error
2025-01-30 17:26:54	Error	E-8801: Lid loss during handling
2025-01-30 17:26:26	Technical	Expose next plate
2025-01-30 17:26:09	Technical	Cover exposed plate
2025-01-30 17:26:09	Sampling	Plate nr.5 sampling finished
2025-01-30 17:26:09	Technical	Sampling
2025-01-30 17:26:09	Sampling	Plate nr.5 sampling started
2025-01-30 17:25:35	Technical	Expose next plate
2025-01-30 17:25:17	Technical	Cover exposed plate
2025-01-30 17:25:17	Sampling	Plate nr.4 sampling finished
2025-01-30 17:25:17	Technical	Sampling
2025-01-30 17:25:17	Sampling	Plate nr.4 sampling started
2025-01-30 17:24:44	Technical	Expose next plate
2025-01-30 17:24:26	Technical	Cover exposed plate
2025-01-30 17:24:26	Sampling	Plate nr.3 sampling finished
2025-01-30 17:24:26	Technical	Sampling
2025-01-30 17:24:26	Sampling	Plate nr.3 sampling started
2025-01-30 17:23:52	Technical	Expose next plate
2025-01-30 17:23:34	Technical	Cover exposed plate
2025-01-30 17:23:34	Sampling	Plate nr.2 sampling finished
2025-01-30 17:23:34	Technical	Sampling
2025-01-30 17:23:34	Sampling	Plate nr.2 sampling started
2025-01-30 17:23:00	Technical	Expose next plate
2025-01-30 17:22:42	Technical	Cover exposed plate
2025-01-30 17:22:42	Sampling	Plate nr.1 sampling finished
2025-01-30 17:22:42	Technical	Sampling
2025-01-30 17:22:42	Sampling	Plate nr.1 sampling started
2025-01-30 17:21:46	Technical	Expose next plate
2025-01-30 17:21:46	User Action	Start request
2025-01-30 17:21:39	Technical	Ready
2025-01-30 17:21:16	Technical	Initialization

The exported technical log has a .xml format. The file can be viewed, imported and analysed with a wide range of third-party software tools such as most standard web browsers or Microsoft Excel.

5.3.2. LOGIN

On the top right corner of the dashboard, a login button may be used to authenticate as system administrator. After clicking on this button, the following pop-up will appear:

User:

Password:



Please note that besides the user-defined System Administrator role, there exists one more specialized user, the Service Engineer.

The Service Engineer role is constrained to trained individuals from the MBV service department and inaccessible to the user.



The MBV service department may issue a temporary password to the System Admin user role in case the user-defined password was lost or forgotten. The user may then use this device-specific temporary password to log in, access the configuration page, and set a new password for the System Admin role.

5.4. CONFIGURATION TILE

To access the instrument configuration tile, click on the blue box in the top centre housing the “gearbox” icon on the dashboard. When trying to access the instrument settings of an instrument that is configured to block access to unauthorized users, login (button on top right) is a prerequisite to accessing the configuration tile.

UTC date
2026-01-19

mbv
AIR. NOTHING ELSE.

Login

Configuration

Instrument label:

Customer label:

Interface:

DHCP: ☒

Device address:

Netmask:

Def. Gateway:

Instrument access:

Old password:

New password:

Confirm password:

Password protection: ☐

Advanced functions:

Instrument time:

Date and time:

Use NTP: ☒

NTP Server:

Timer check:

Last timer check result:

UTC Date: 2026-01-16

Duration: 100s

Deviation*: 0.180s

Result*: passed

*Timer check maximum tolerable deviation is 0.5% or 0.5s for a 100s test duration.

Test report:

Sampling process:

Loading position:

Unloading position:

(Un)load from top:

Sampling position:

Sampling time (min):

Delay (s):

Allow init with plates:

Align plate:

Press lid:

Allow intervention:

Agar plate:

Lid diameter (mm):

Plate diameter (mm):

Plate height (mm):

Lid & plate height (mm):

Figure 5: Instrument configuration tile of the browser user interface.
Please note that the timer check duration is 300s from FW version 1.2 onwards.

5.4.1. SETTING CHANGES

The following settings can be customized within the instrument configuration tile:

Instrument label:

Customer label:

Set label

Interface:

DHCP: ☒

Device address:

Netmask:

Def. Gateway:

Save interface configuration

Instrument access:

Old password:

New password:

Confirm password:

Password protection: ☐

Save access configuration

Instrument time:

Date and time:

Use NTP: ☒

NTP Server:

Set date and time

Sampling process:

Loading position:

Unloading position:

(Un)load from top:

Sampling position:

Sampling time (min):

Delay (s):

Allow init with plates:

Align plate:

Press lid:

Allow intervention:

Save process configuration

1. The user may set an instrument label
2. Device ethernet port address:
This includes IP address, netmask, default gateway, and DHCP usage status.
The default configuration has DHCP enabled.
3. Instrument access password for the user «System Admin».
4. Instrument time:
This includes manual entries of date, time and time zone or the selection to use an external NTP as reference time.
5. Plate handling process parameters:
 - Plate stack loading position
 - Plate stack unloading position
 - Move axis up for loading
 - Sampling position
 - Sampling time for each plate
 - Delay before exposing first plate
 - From FW 1.1.0 onwards: Allow initialization with plates on instrument
 - Align plate and lid to facilitate (suggested for lockable plates)
 - Press lid when opening plate to release stuck lids due to condensation
 - Allow user intervention (see chapter 8.2).

Agar plate:

Lid diameter (mm):	94
Plate diameter (mm):	89
Plate height (mm):	14.7
Lid & plate height (mm):	15.5

Save plate information

6. Agar plate parameters:

- Agar plates lid diameter
- Agar plates plate diameter
- Height of individual plate
- Height of agar plate covered with lid

(see [APPENDIX B](#) – Reference table of plate).



Note:

In order to change the password, you have to enter the old password as well as the new password. The new password has to be entered twice for confirmation.

5.4.2. TIMER CHECK

Timer check:

Start automatic timer check

Last timer check result:

UTC Date: 2026-04-22
Duration: 300s
Deviation*: 0.038s
Result*: passed

*Timer check maximum tolerable deviation is 0.5% or 1.5s for a 300s test duration.

MAS-100 Libra is a precision instrument for automated settle plate handling. To make sure the predefined plate sampling and delay times are held; the instrument is equipped with the functionality to check the accuracy of its internal timer against an external reference NTP server. This feature requires accessibility of the defined NTP server address through its network connection.

The timer check uses proprietary MBV technology and returns the deviation of the internal timer against the specified reference. The tests are passed if the measured deviation over a 300 s test interval is less than 1.8 s or 0.5%.



Note:

If the MAS-100 Libra interface configuration uses a fixed IP and gateway setting instead of DHCP, the instrument may not have access to a DNS server in certain setups. In such cases, one must enter the IP address of the reference server to ensure a successful timer check. For example, at the time of writing *ntp.metas.ch* corresponds to the IP address 195.176.26.215.

5.4.3. UPDATING THE INSTRUMENT FIRMWARE

Updating the instrument firmware does not influence the data stored in the instrument log. However, to prepare for unexpected malfunction after firmware updates, MBV recommends to make sure that all relevant log information from the instrument is downloaded.

Thereafter, click on the firmware update button in the configuration tile and select the appropriate firmware file. After the update, the instrument restarts itself.



Check the MBV AG website www.mbv.ch for the latest instrument firmware and/or firmware updates. Release Notes can be found in the corresponding SIL.



The firmware update should be managed under change control, according to the company's quality policy. If applicable, an impact assessment on the qualification status of the instrument is recommended.

6. CALIBRATION

Unlike other MAS-100 active microbial air samplers from MBV, MAS-100 Libra cannot be calibrated. This is because MAS-100 Libra is not a measuring instrument and does not involve any physical quantities that require calibration. Therefore, there is no calibration option available for this instrument.

To ensure the proper functioning of critical components of the MAS-100 Libra instrument, an instrument test can be performed. This test will help verify that all essential parts, including the sensor and axis, are operating correctly (see chapter [7.2](#)).

7. CARE AND MAINTENANCE

7.1. GENERAL

The instrument does require moderate care and maintenance to remain in good working condition. Please pay attention to the following aspects:

- Follow the general safety information (see chapter [1.3](#))
- Always follow the cleaning and decontamination procedures (see chapter [7.3](#))
- The instrument must be serviced periodically (see chapter [7.4](#))

7.2. INSTRUMENT TEST

The instrument is able to perform a self-test routine that validates the functionality of critical instrument components required for correct operation. The instrument test can be started from the configuration tile of the browser UI under section «advanced functions».

Before starting the instrument test, remove all agar plates from the instrument and make sure all axis paths are free of obstructions. The instrument test may be started from «Power On» or «Ready» state.

The instrument test has a total duration of less than four minutes and starts with a timer check based on the predefined reference NTP server (indicated by the timer check state – yellow continuous LED color) followed by movement tests of sensors and actuators (indicated by the instrument test state – yellow continuous LED color). An additional button triggers the display of the test protocol. The test protocol can then be printed out using the browser print function or using the shortcut «ctrl+p». After finishing the test procedure, the instrument requires re-initialization and is enters the state «power on».

STEP	OBJECT UNDER TEST	EXPECTED BEHAVIOUR	EXPLANATION
1	Instrument re-sponse	successful	The instrument responded the call for self-testing.
2	Instrument status	successful	The instrument state was successfully transmitted.
3	Left gripper arm initialization	successful	Gripper initialization is successful.
4	Right gripper arm initialization	successful	Gripper initialization is successful.
5	Left vertical axis initialization	successful	Axis initialization is successful.
6	Right vertical axis initialization	successful	Axis initialization is successful.
7	Plate sensor 1 response	successful	Optical sensor responsive.
8	Plate sensor 2 response	successful	Optical sensor responsive.
9	Handling speed of initialization	< 25 s	Initialization (steps 3-8) finished in less than 25s.
10	Timer check deviation	< 0.5%	Timer check deviation is less than 0.5%.
11	Max sampling position deviation	< 2 mm	Sampling axis position check. Multiple movements to the sampling position are accurate. Cumulative deviation after 5 up and down movements is depicted.

Report number SN280008-47547-20241205-1627

Test report

Object

Examinee	Settle plate changer	Hardware version	2.0
Instrument type	MAS-100 Libra	Firmware version	1.0.0
Instrument serial number	280008	MAC Address	8c1f:64:8d:80:34
Manufacturing date ¹	2024-12-05		

Test results

Step	Object under test	Expected behaviour	Actual behaviour	Pass/Fail indication
1	Instrument response time	<2.0s	0.03s	Pass
2	Instrument status	Instrument check	Instrument check	Pass
3	Left gripper arm initialization	Successful	Successful	Pass
4	Right gripper arm initialization	Successful	Successful	Pass
5	Left vertical axis initialization	Successful	Successful	Pass
6	Right vertical axis initialization	Successful	Successful	Pass
7	Plate sensor 1 response	Successful	Successful	Pass
8	Plate sensor 2 response	Successful	Successful	Pass
9	Handling speed of initialization	<25.00s	19.20s	Pass
10	Deviation of 100s timer check	<0.50s	0.12s	Pass
11	Max exposure position deviation	<2.00mm	0.00mm	Pass

 Test date¹ 2024-12-05 Overall test result Pass

This test report was created using the instrument test of MAS-100 Libra®.

¹The date is displayed in the format YYYY-MM-DD

Figure 6: Instrument test report of MAS-100 Libra depicting the results of the self-test triggered from the browser user interface.

7.3. CLEANING AND DECONTAMINATION

	Hazard of damage to the instrument Do not perform wipe and spray disinfection when the instrument is in operation. Please take care to not trigger any externally connected button during wiping actions.
	Hazard of damage to the instrument The instrument is not IP-protected. Do not pour any liquids into the instrument or its electrical connections.
	Hazard of damage to the instrument Any remaining cleaning/disinfection solution must be properly removed/wiped off before using the instrument.
	Hazard of damage to the instrument Do not wipe the optical sensors for plate detection with scratchy tissues to retain optimal instrument performance.

7.3.1. DEDICATED DECONTAMINATION MODE

In order to move the axes of the instrument from time to time during an ongoing VHP decontamination, the MAS-100 Libra can be set to a dedicated decontamination mode indicated with a continuous yellow LED color. In this mode, the vertical and horizontal axes move in fixed time intervals of ~60 seconds in order to facilitate active decontamination. All moveable parts are actuated during this procedure to make sure all surfaces get exposed to the decontamination agent.

The decontamination mode however is only available for the superordinate control using Modbus (see section 4.11.2). After ending the decontamination mode, the instrument requests re-initialization of its axes and enters the instrument state "power on".

	It is recommended to use the decontamination mode only during times of active decontamination phases to reduce the impact of mechanical wear on the instrument.
	During the decontamination mode, the axes move at the same speed as they do during the plate handling process.

7.3.2. MAIN INSTRUMENT

The housing of the instrument is made from stainless steel sheet metal type 1.4404; protruding parts such as the plate carriers and the gripper arms are made from 1.4435. The following disinfectants can be used for wiping:

ACTIVE INGREDIENT	CONCENTRATION (V/V)	DILUTION
Ethyl alcohol	70%	In water, ready to use
Isopropanol	70%	In water, ready to use
N,N-Didecyl-N, N-dimethylammoniumchloride	0.04%	In water, ready to use

Hydrogen peroxide	1%	In water, ready to use
Peracetic acid	0.08%	
Peracetic acid	0.07%	In water, ready to use
Hydrogen peroxide	6%	In water, ready to use

Clean the housing of the instrument using a clean non-abrasive, soft tissue moistened with surface sanitizer listed in the table above. Carry out a wipe down of the settle plate changer housing including gripper and plate carriers. Use the pull and lift technique and do overlap paths to make sure no surface area is missed. Wait until the disinfectant has dried completely.



Spraying directly into instrument openings is not recommended.

7.3.3. HOTTEST POINT OF THE INSTRUMENT

Due to their short periods of use followed by longer waiting times, the motors are not the hottest points of the instrument. The hottest point (important for VHP decontamination) is a component located on the instrument's mainboard responsible for the power supply.

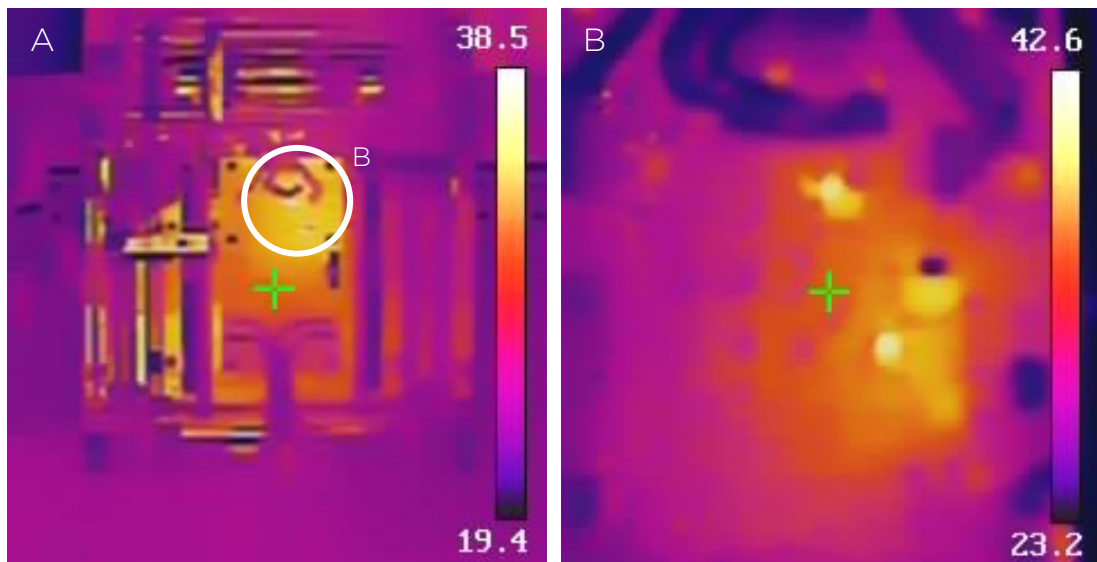


Figure 7: Thermal image of internal electronics of the instrument. A) overview on complete instrument with removed back cover. B) Focus on the section with the hottest spot labelled in A) revealing the maximum temperature of the hottest point on the electronics.

Detailed studies found that this location is about 5x5mm in diameter and reaches maximum temperatures of 42.6°C at a room temperature of 23°C. This means that the hottest point of the instrument during operation is effectively 19.6°C above room temperature.

To enable the user to validate VHP effectiveness, the instrument housing comes with a slot on the back that allows placing a bioindicator or an enzyme indicator at precisely this location.



7.3.4. ACCESSORIES

The available accessories (packaging excluded) can be cleaned and decontaminated as follows:

ACCESSORY	MATERIAL	METHODS
Tri-clamp connector	Stainless steel, galvanized steel	– Spray or wipe disinfection with 70% Ethanol or 70% IPA – VHP decontamination
Tri-clamp sealing gasket	Silicone	– Spray or wipe disinfection with 70% Ethanol or 70% IPA – VHP decontamination
Stand with integrated button interface	Stainless steel 1.4404	– Spray or wipe disinfection with 70% Ethanol or 70% IPA – VHP decontamination
Remote button	Stainless steel 1.4462, Polyamide, Cable: polyurethane	– Spray or wipe disinfection with 70% Ethanol or 70% IPA – VHP decontamination
Connector set	Polyamide, Pins: hot-dip tin-plated copper alloy	– Spray or wipe disinfection with 70% Ethanol or 70% IPA – VHP decontamination

7.4. MAINTENANCE

Always ensure that the instrument is well maintained. Therefore, we advise the user to perform an instrument test, a self-test routine at least once every 12 months (see chapter 7.2).

In five years, intervals or in case of instrument malfunction, the instrument should be sent for external maintenance and repair to the MBV AG service department.

7.5. SERVICE CONTACT

For service of MAS-100 Libra please send the instrument to:

Contact address

MBV AG
Service
Industriestrasse 9
CH-8712 Stäfa
Switzerland



Do not send a potentially contaminated instrument to service.



The initial cardboard packaging received at the time of purchase might be re-used if handled with care.

8. ERRORS AND WARNINGS

The instrument issues error and warning messages. Error events trigger an instrument state change to the “error” state indicated with a flashing red internal LED color. Warnings are for information only and listed in the internal log, but do not trigger an error event including a state change to the “error” state. The “error” state is optically indicated through the internal LED (red flashing color).

8.1. ERROR AND WARNING LIST

All error and warning events are logged in the instrument log (see chapter 5.3.1). The following table lists all possible errors (E-XXXX) and warnings (W-XXXX) and information on how to handle them. In case the problem is not solved after an instrument restart including a re-initialization and careful reading of this manual, please download the instrument log and contact the MBV AG Service department for advice.

ID	NAME	TROUBLESHOOTING
E-1200	Unexpected limit sensor triggered	The instrument detected a sensor event when it was not supposed to occur. Please restart the instrument and retry.
E-1201	Not homed	Axis movement was requested before the initialization routine was finished. Please contact the service center for further assistance.
E-1202	Axis motion timeout - no end switch signal detected	Axis did not reach desired position. Please restart the instrument, make sure all axes are free of obstructions and retry. If the problem persists, please contact the service center.
W-2101	No DNS lookup is available, NTP cannot be used	Connection to the NTP server could not be established. Make sure internet and firewall settings allow connection to the configured NTP server. If not possible, use the internal instruments real time clock and set date/time manually.
W-2102	Failed to resolve NTP server address	Connection to the NTP server could not be established. Make sure internet and firewall settings allow connection to the configured NTP server. If not possible, use the internal instruments real time clock and set date/time manually.
W-2103	NTP update not executed	Internal clock could not be corrected using the specified NTP server. Internal clock will continue to maintain time. Please make sure the NTP server can be reached.
E-6401	No plates loaded	Acknowledge error, initialize instrument, load plates and start sampling process.
E-6402	Plate count exceeds limits	Make sure the loaded plate stack does not block the optical sensor when the vertical axes are moved down. Generally, a maximum of 6 agar plates can be loaded.
E-6403	Plates present during initialization	Remove plates prior initializing the instrument. Remove plates, acknowledge the error and reinitialize.
E-6404	Plate stack loaded to wrong plate carrier	Unload instrument, reinitialize and load plates again. Make sure that instrument configuration fits your desired mode of operation.

E-7601	No command found	Restart instrument and try action again. If the problem persists, please contact the service centre.
E-8801	Lid loss during expose plate	Please acknowledge error and retry handling process. Please make sure the plate handling parameters are fitting the plate in use.
E-8811	Lid loss during cover plate	Please acknowledge error and retry handling process. If using lockable plates, please consider using the align-plate and allow user-intervention configurations.
E-8802	Plate loss during expose plate	Please acknowledge error and retry handling process. Please make sure the plate handling parameters are fitting the plate in use.
E-8812	Plate loss during cover plate	Please acknowledge error and retry handling process. Please make sure the plate handling parameters are fitting the plate in use.
E-8803	Shuffle back failure	Please remove all processed plates, acknowledge error and retry handling process. Please make sure the plate handling parameters are fitting the plate in use
W-8803	Awaiting user intervention	Instruments waits for manual intervention to rectify lid on agar plate. This warning arises only if the corresponding process configuration is selected. After confirmation, the process is continued.

8.2. MULTILEVEL-EXCEPTION HANDLING

MAS-100 Libra offers variety of process configurations to enable the user to define his/her own multilevel exception-handling preferences. This enables the user to define how to react on warnings and when an error is issued.

The related settings are particularly recommended when using lockable agar plates, as they offer a smaller error margin during handling of the lid. This generally results in higher error rates.

The following exception-handling functionalities are available:

LEVEL	FUCTION	HOW TO USE
0	Handling routines and agar plate dimensions allow optimization of the handling routine for the agar plate type and vendor of use.	Select appropriate agar plate parameters. See section APPENDIX B – Reference table of plate configuration for more details.
1	To improve the error rate for lockable agar plates, the instrument can be configured to align the lid and plate after each handling step. This additional movement takes about 5 seconds for each plate exposure or plate covering process.	Enable the «Align plate» process configuration in the BUI.
2	In cases where the instrument detects a too small or too high increase of the plate stack after covering a previously exposed plate - even after the optional «align plate» step was performed - it will perform a second «align plate» process during plate exposure or covering.	User cannot disable this feature.

- | | | |
|---|--|--|
| 3 | <p>In cases where all previous exception handling steps were unsuccessful during the «cover exposed plate» step, the instrument can be configured to enter an «Awaiting user intervention» state. This state is then part of the sampling process (image below shows a representative handling anomaly).</p> | <p>Enable the «Allow user intervention» process configuration.</p> |
|---|--|--|



Herein, the instrument stays idle until the user confirms that the previously exposed plate was manually covered correctly. If this feature is disabled or the intervention was unsuccessful, the corresponding error E-8811 is issued as level 4.

- | | | |
|---|--|--|
| 4 | <p>If all previous steps were either disabled or unsuccessful, an instrument error is triggered.</p> | <p>User cannot disable this feature.</p> |
|---|--|--|

While handling levels 0 to 2 are considered part of the standard handling procedure, step 3 is considered a warning and reflected in the instrument log accordingly. Only level 4 is considered an error case and triggers an immediate state change to the «Error» state indicating a deviation from the configured handling routine.



After staying idle for 24h in the «Awaiting user intervention» state, the system automatically changes into the error state.



The system will check the success of the intervention before continuing the process with the next plate and trigger an error in case the user intervention was deemed unsuccessful.

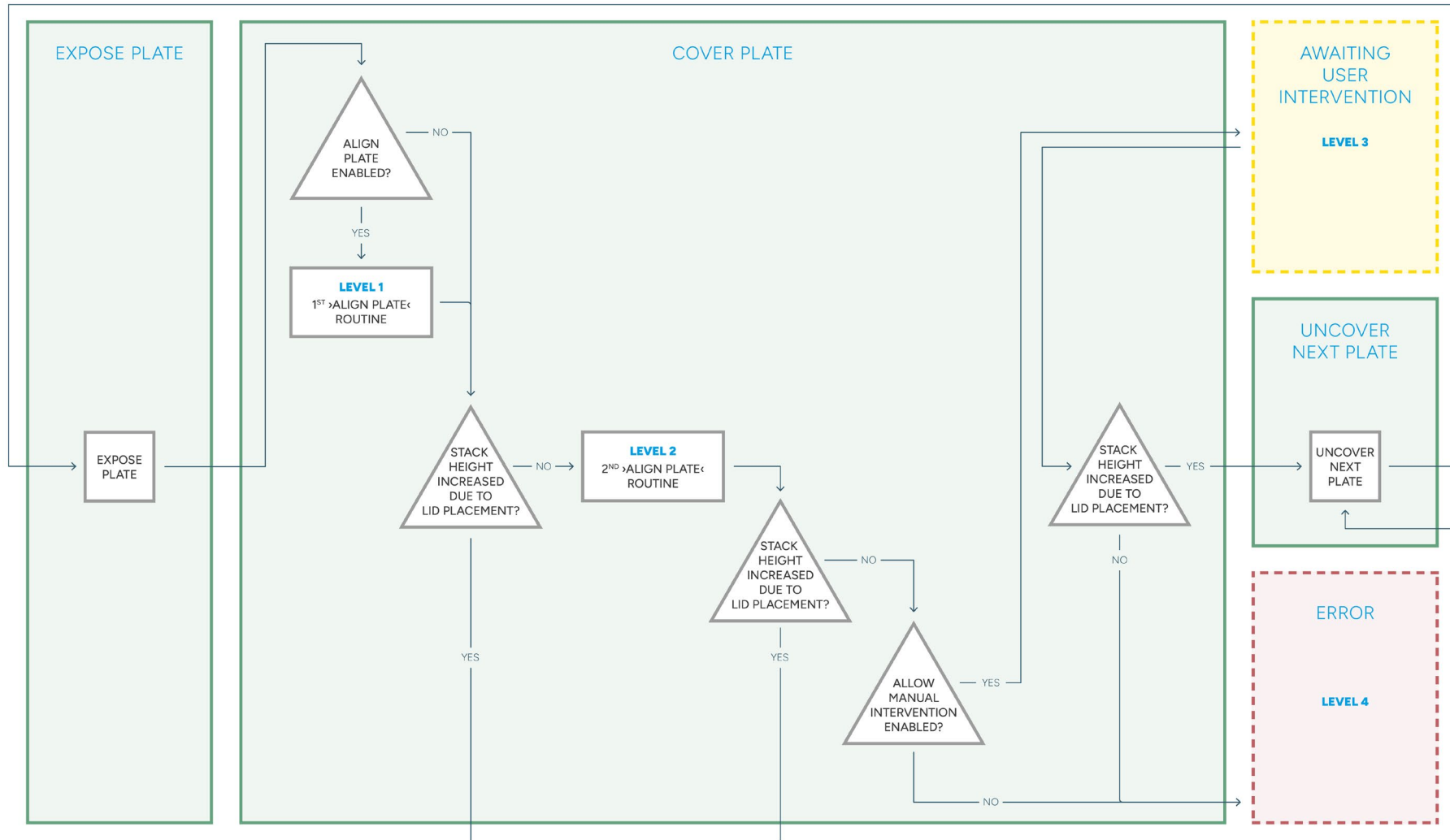


Figure 8: Multilevel exception-handling as part of the «Cover plate» state on MAS-100 Libra.

8.3. TROUBLESHOOTING

This list gives an overview of problems that may occur during use and suggests possible solutions:

PROBLEM	TROUBLESHOOTING
System Administrator password forgotten/lost	Contact MBV AG Service to issue a temporary password that is only valid for that instrument. Log in with this temporary password and reset the System Administrator password.
Plate handling unsuccessful	Check and adapt the plate configuration of the instrument to match the plate dimensions of the agar plates in use as well as the process configuration.
With six loaded plates, the instrument is unable to finish the initialization	Make sure the stack height of the six plates is less than the maximum stack height the instrument can handle (90mm). Using most vendors, a six-plate stack should be below this limit.
Plates are stuck to the lid due to condensation	Make sure to avoid condensation as much as possible by properly equilibrate the plates to their surrounding temperature before unpacking them. If condensation continues to negatively influence the handling success rate, use the «press plate» process setting to release stuck lids by compressing the lid during plate handling.

9. TECHNICAL SPECIFICATIONS

General	
Plate handling speed	Average time for plate change: 1 min
Internal timer accuracy	0.5%
Decontamination	Resistant against volatile and micro-nebulized volatile hydrogen peroxide
Environmental impact over lifetime (excluding agar plates)	UBP: 632'000 points EF3.0: 0.0671 GWP100: 270 kg CO ₂ -eq
Physical instrument	
Length, width, height	137mm, 256mm, 287mm
Weight (without agar plates)	5.3kg
Main materials	Sheet metal: stainless steel 1.4404 Milled parts: stainless steel 1.4435
Power supply	
Mains supply requirements	Input: 24V (regulated), 2A, overvoltage category 1
Mains supply voltage fluctuations	Fluctuations must not exceed $\pm 10\%$ of the nominal value; power outages are not internally buffered.
Communication	
Interfaces	Digital input/output channels. Modbus TCP, RESTful API
Environmental conditions	
Altitude	Up to 3'000 m above sea level ¹
Temperature	Storage: -10 to +50 °C Operation: +0 to +40 °C
Relative humidity	Max. 80 % RH for temperatures up to 31 °C, decreasing linearly to 50 % RH at 40 °C; non-condensing
Ingress protection	IP20
Others	
Electromagnetic compatibility	EMC (CISPR 11) Group 1, Pollution degree 2, Class B (industrial electromagnetic environment) following IEC 61326-1:2020
Sound emissions	< 80dB

¹ Altitude was calculated from pressure vs. altitude formulae given in ISO 2533

APPENDIX A – CHINESE ROHS



Hazardous substances

This product contains certain hazardous substances and can be used safely during its environmental protection use period in years (typically 50 years and indicated by the number in the center of the logo on the type of label) which should enter the recycling system after its environmental protection use period.

The instrument is compliant with the Chinese RoHS regulation SJ/T11363 2006.

The table below lists the instruments' hazardous substances.

部件名称 Component name	有害物质或元素 Hazardous substances or elements					
	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr(VI)	多溴联苯 PBB	多溴联苯醚 PBDE
Main PCB	x	o	o	o	o	o
O: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下 X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求 (企业可在此处, 根据实际情况对上表中打“×”的技术原因进行进一步说明。) O: Indicates that this toxic or hazardous substance contained in all the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006 X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006 (Company can explain technical reason to mark «X»).						

APPENDIX B – REFERENCE TABLE OF PLATE CONFIGURATION

The agar plate diameters can be determined to configure the instrument for use with agar plates from a wide variety of different vendors. Four dimensional properties define the plate type for the handling routine.

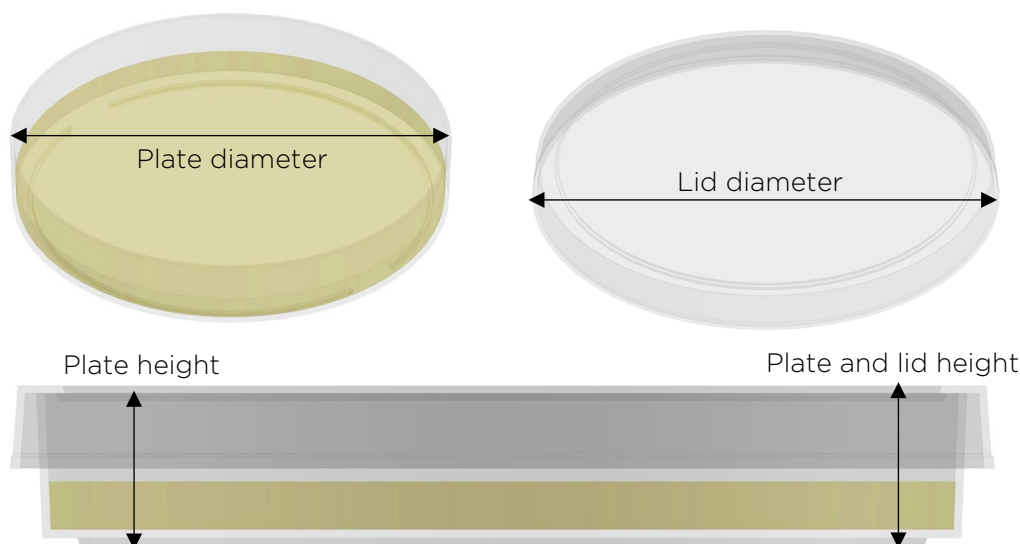


Figure 9: Agar plate dimensions.

The following table lists the agar plate dimensions of four typical agar plate types determined during instrument validation.

PLATE TYPE	LID DIAMETER	DIAMETER	PLATE DIAMETER	PLATE HEIGHT	PLATE AND LID HEIGHT	PARAMETER SET
Merck 90mm standard	92.7mm		88.3mm	13.6mm	14.7mm	1
Merck 90mm lockable	92.6 mm		86.9 mm	13.1mm	14.6mm	2
PMM 90mm lockable	92.7mm		86.9mm	13.1mm	14.4mm	3
bioMérieux 90mm lockable	92.2mm		87.2mm	13.8mm	15.4mm	4



Please note that plate dimensions given above are under sole control of the individual manufacturer.



Please note that lockable plates can only be handled when loaded with unlocked lids. However, this is the standard configuration of lockable plates when taken from their packaging.

The following table lists the sets of parameters that have been tested for functionality with the pilot run of MAS-100 Libra. Testing included at least 1000 individual plate handling processes with the error rate given in the below table.

PARAMETER SET	LID DIAMETER	PLATE DIAMETER	PLATE HEIGHT	PLATE AND LID HEIGHT	ERROR RATE ²
1	92.5mm	88.0mm	13.7mm	14.5mm	≤0.1%
2	92.5mm	87.0mm	13.7mm	14.5mm	≤0.3%
3	92.5mm	87.0mm	13.7mm	14.5mm	≤0.4%
4	92.5mm	87.0mm	14.0mm	15.0mm	≤0.2%



Lockable agar plates do provide a smaller error margin during handling and placement. Hence, the lowest error rates during automated plate handling procedures will be obtained by using non-lockable settle plates. To mitigate this issue, please use the "align plate" process setting for lockable plates.



Each step during the handling routine increases the risk of failure. The best reliability during handling is therefore obtained using same sides for loading and the opposing side for unloading the agar plate stack combined with deactivated top loading.



Pronounced condensation on the agar plate lid can occur, when the plates are used without prior acclimatization and may impact the handling success rate. To counteract this issue, please activate the "press_lid" setting. Alternatively, the lid diameter setting can be reduced to increase grip strength of the lid and overcome the capillary forces holding agar plate and lid together.

² Error rates were determined using the instruments default process settings on four different instruments. Lockable plates were handled using the «align plate» process setting activated.

APPENDIX C – DETERMINING THE INSTRUMENT IP

Prerequisite of the determination of the instruments IP address is the connection of the MAS-100 Libra to your local network. Therefore, make sure to connect the Ethernet port of the instrument to your local network.

The instruments default interface configuration is that DHCP is active in the connected network. As a result, the MAS-100 Libra instrument will be assigned an IP address by your local network. The first step to determine this IP is therefore to scan the network for devices and their corresponding unique MAC addresses.



In case your local device does not permit you accessing or retrieving the IP address of your MAS-100 Libra or in cases where you need additional assistance accessing your instrument, please consult your internal IT department or contact the MBV Service Center for support



Make sure the scan range of the is defined such that it includes the DHCP address range of the network where both the MAS-100 Libra as well as the used PC are connected to.

The following lists the options that may be used to determine the instrument IP in your local network

1. Use a network scanner tool:

- Tools like **Angry IP Scanner** or **Advanced IP Scanner** can scan the network and list all active IP addresses.
- Download and run one of these tools on a computer connected to the same network (some tools may allow execution without prior installation). Therefore, open the network scanner tool and start a scan of the network range (e.g., 192.168.1.1 to 192.168.1.254).

2. Use command line tools:

- On a Windows computer, open Command Prompt and use the arp -a command to list all devices on the network.
- On a Linux or macOS computer, use the arp -a command in the terminal.

3. Use a separate router and access the router's DHCP client list:

- Access your network router's admin interface (usually via a web browser).
- Navigate to the DHCP client list or connected devices section to find the IP address assigned to the instrument.

After you have access to the list of devices present in your network, search for those with a MAC address in the form "8C-1F-64-8D-8X-XX", where the three "X" are device specific unique hexadecimal characters.

Assuming you have only one MAS-100 Libra with unknown IP and MAC address available in your local network, open the respective IP with an appropriate internet browser.

Depending on your local IT policies, you may then proceed to configure the instruments interface settings as appropriate for your needs (see section 5).

COMMAND LINE

The list of all devices in your local subnet can be obtained using the command line. Use the command shown below and adapt the subnet address marked in bold to your local configuration.

On a Windows device use:

```
for /L %i in (1,1,254) do @ping -n 1 -w 100 192.168.1.%i > nul
```

On a Mac device use:

```
for i in {1..254}; do ping -c 1 -W 1 192.168.1.$i > /dev/null; done
```

Once all potential IP's were scanned, you can use the "arp-a" command and filter the list of devices for the MAC address prefix of the MAS-100 Libra instruments as seen below.

On a Windows device use:

```
arp -a | findstr "8c-1f-64-8d"
```

On a Mac device use:

```
arp -a | grep "8c:"
```

The command line then displays all available devices within the MAC-Address range assigned to MAS-100 Libra.

USING A SEPARATE ROUTER

If you are setting up a separate LAN network through a dedicated router to access the instrument, the following steps may aid in determining the IP Address assigned to the instrument.

1. Find your router's IP address:

- On a Windows computer, open Command Prompt and type ipconfig. Look for the "Default Gateway" address.
- On a Mac, go to System Preferences > Network, select your network connection, and click "Advanced". Go to the "TCP/IP" tab to find the router's IP address.
- The IP address of your router may also be printed on its type label.

2. Access the router's admin Interface:

- Open a web browser and enter the router's IP address in the address bar (e.g., 192.168.1.1 or 192.168.0.1).
- You will be prompted to log in. The default username and password are often "admin" and "admin" or "password". If these don't work, check the router's manual or the type label on the router for login details.

3. Navigate to the DHCP client list:

- Once logged in, look for a section labeled "DHCP", "LAN", or "Connected Devices". This section might be under "Advanced Settings" or "Network Settings".
- The exact location and terminology can vary depending on the router model and manufacturer.

4. Identify the Instrument's IP Address:

- In the DHCP client list, you will see a list of all devices currently connected to the network, along with their IP addresses and MAC addresses.
- Match the MAC address of your instrument ("8C-1F-64-8D-8X-XX") with the MAC addresses listed in the DHCP client list to find the corresponding IP address.

APPENDIX D – GLOSSARY

TERM	MEANING
ATEX	European directive for equipment in explosive environments
BUI	Browser-based User Interface
CFR	Code of Federal Regulations (USA)
CFU	Colony Forming Units
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
EAC	Eurasian conformity mark
EMC	ElectroMagnetic Compatibility
ESD	Electrostatic Discharge
FDA	Food and Drug Administration (USA)
FDS	Functional Design Specification
GAMP	Good Automated Manufacturing Practice,
GMP	Good Manufacturing Practice
HMI	Human-Machine Interface
IATA	International Air Transport Association
ICS	Industrial Control Systems
ID	IDentification number
IEC	International Electrotechnical Commission
IP	International Protection marking
IPA	Isopropanol
ISO	International Organization for Standardization (standards)
LAN	Local Area Network
LED	Light-Emitting Diode
LIMS	Laboratory Information Management System

MS	Master Specification
NTP	Network Time Protocol
OV	Output Voltage
PCB	Printed Circuit Board
QR (code)	Quick Response code (2D barcode)
RABS	Restricted Access Barrier System
RGB	Red Green Blue
RoHS	Restriction of Hazardous Substances (directive)
SIL	Service Information Letter (MBV AG)
SJ	Chinese standard for electronic equipment
S/N	Serial Number
URS	User requirement specification
USA	United States of America
USB	Universal Serial Bus
VHP	Vaporized Hydrogen Peroxide
WEEE	Waste Electrical and Electronic Equipment (European directive)