



RIVO™ III AQUATICS

Electronics Module



NOTE

- Device Name:
Rivo™ III Aquatics Electronics Module
 - Software version:
Rivo OS, Version 2.1.0
 - Original language of the operating instructions: German (DE)
 - Release note:
This user manual applies exclusively to Rivo OS version 2.1.0
For older versions, menus and functions may differ.
-

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1 General notes



WARNING



Danger of non-observance of the operating instructions

Possible consequences:

Death or serious injury as well as significant property damage



Validity and application

These operating instructions apply exclusively in conjunction with the instructions for the following flow modules of the Rivo™ series (mod. D10):

- DEPOLOX®-R
- DEPOLOX® Pool-R
- Varia Sens™

Compatible components such as sensors, output and measurement modules, sensor kits and cable kits are subject to product-specific instructions that are part of the technical documentation. They contain safety-relevant and functional information and must be read and understood in full before commissioning.



WARNING

Obligations of the Operator and Users

All persons working with the Rivo™ III Aquatics electronic module (model E30) or the Rivo™ III system must have read and understood these operating instructions and all related documents in full.

The plant operator is responsible for compliance with:

- all safety and warning notices
- accident prevention regulations
- legal and generally accepted safety regulations

Software and firmware updates

The operator must regularly check whether software updates for the electronics module are available. These updates may include security-related improvements, bug fixes, or functional enhancements. Regular updating contributes to the operational safety and optimal performance of the system.

1.1 Equal treatment policy

For better readability, this guide avoids the simultaneous use of gender-specific forms of language (male, female, diverse – m/f/d)

. All personal designations apply equally to all genders.

1.2 Target group and activities

This operating instruction is aimed at different target groups, which differ according to knowledge, authority and responsibilities. The content is structured accordingly to ensure safe and effective use of the Rivo™ III system.

Target group	Authorised activities
Trained and authorized professionals	Work on the Rivo™ III Aquatics electronic module (E30 model) and on the entire Rivo™ system
Trained and authorized electricians	Electrical installation and connection, for example module assembly (Rivo™ Flex Mod)
Trained specialists	Assembly, mechanical installation, commissioning, system messages, faults, maintenance, decommissioning and disassembly
Instructed staff	Service, storage, transport, disposal

1.3 Terms used

A Rivo™ III system consists of:

- Electronic Module Rivo™ III Aquatics (Mod. E30)
- Rivo™ series components (Output Module, Measurement Module, Sensor Kit, Cable Kit)
- Optional flow module of the Rivo™ series (mod. D10)
- Sensors

The following terms are used in this operating instruction:

Original name	Term used
Rivo™ III System	System
Electronic-Module Rivo™ III Aquatics (Mod. E30)	Electronics Module, Device or Product Name
Rivo™ Series Flow Modules (D10 Model): • DEPOLOX®-R • DEPOLOX® Pool-R • Varia Sens™	Flow Module, Flow Valve or Product Name
Electrode 3-Electrode measuring chain single rod measuring chain membrane sensor	Sensor

Original name	Term used
Rivo™ series components: • Output module • Measurement module • Sensor kit • Cable kit	Module or product name

Component examples:

- Output module:
 - Rivo™ Flex Mod 2AO-mA
- Sensor kit with measurement module – connection to the "Rivo Flexboard":
 - Rivo™ Flex Sens pH Kit
- Cable Kit – Connection to the "Rivo Flexboard":
 - Rivo™ Chlorine Sens Pt
 - Rivo™ pH Sens



NOTE

The article number corresponds to the order number.
Images may differ from the delivered product.

1.4 Note on the original version

This operating instructions is available in several languages. The German version is the original version. All other language versions are translations of the original version.

1.5 Storing the instructions

The operating instructions are part of the device and must be kept accessible at all times. If the device is passed on to a third party, the operating instructions must be handed over with the device.

1.6 Applicable documents

All operating, assembly, and installation instructions for the components and parts, as well as quick guides, must be observed. These documents are enclosed with the respective components and supplementary components.

1.7 Digital operating instructions

To promote sustainability and to access up-to-date safety-relevant and product-specific information, we recommend that you only use the complete original digital operating instructions for the Rivo™ III Aquatics electronics module.

Access to the original digital owner's manual:

Scan the QR code or call up the following link to access the complete original digital operating instructions directly:
<http://qr.evoqua.com/bgQt7W>



NOTE

Only use the applicable operating instructions – especially for safety-relevant changes, software and firmware updates or new functions.

1.8 Software and firmware version

To continuously improve the product, the manufacturer regularly provides new software and firmware versions. These may contain additional or optimized functions that are not yet described or only partially described in this operating instruction.

Before commissioning and as part of maintenance work, it should be checked whether a more up-to-date version is available. Updates can improve system performance, expand the range of functions or fix bugs.

Access to current versions:

Scan the QR code or go to the link to access the latest software and firmware version:

<http://qr.evoqua.com/bfMd9w>



1.9 Warnings on the device

There is a nameplate on the device that contains safety-relevant information. This nameplate must not be removed, covered or made unrecognizable. The information given on it must be read carefully before commissioning and must be observed permanently throughout operation. If the nameplate is missing or illegible, the responsible contractual partner or the manufacturer must be contacted immediately.

1.10 Nameplate

For clear identification, there is a nameplate on the device with safety and product-related information. In case of queries or service, the information on the nameplate must be used.

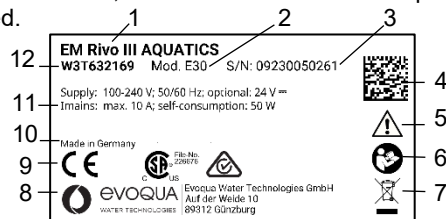


Fig. 1 Example of a nameplate

- 1 Device name: Rivo™ III Aquatics
- 2 Serial code or model code: Model E30
- 3 Sales order, position and serial number
- 4 Data matrix-code
(includes part or serial number)
- 5 Safety and warnings
- 6 Read the operating instructions icon
- 7 "Disposal" symbol
- 8 Manufacturer's address
- 9 Conformity marks (CE, CSA and RCM)
- 10 Country of origin
- 11 Power supply specification
- 12 Article number

1.11 System identification and access information

1.11.1 System login and access data

On the bottom of the case cover, next to the USB connector socket, there is a label that says "Default System Information". This label contains the device-specific system data as well as the app's default credentials.

The access data is required for the first login as well as for the login after a factory reset via the recovery key. The password provided serves as the factory administrator password for login.

The Default System Information label contains two areas of information:

1. System information

The system information contains the following elements:

- System name
- Serial number
- Ethernet-MAC-address

2. App default – credentials

The app default contains the following data:

- Username: admin
- Password: factory preset

These credentials are required for the first login and after each factory reset (via the recovery key).

The password serves as the factory administrator password.

The login credentials are:

- Required for the first login
- Valid again after each factory reset – exclusively via the recovery key and necessary for login
- Identical on both labels: "Important System Information" and "Default System Information"



NOTE

The "Default System Information" label does not contain a recovery key.

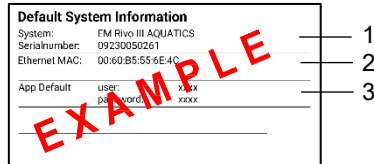


Fig. 2 Sample label "Default System Information"

- 1 System name and serial number
- 2 Ethernet MAC address
- 3 App default – access data

1.11.2 Label "Important System Information" – system data and recovery key

The label "Important System Information" is supplied loose and stored inside the electronics module. It contains the device-specific system data as well as the app default access data, which are required both for the first login and after each factory reset via the recovery key.

The Important System Information label contains three areas of information:

1. System information

The system information contains the following elements:

- System name
- Serial number
- Ethernet MAC address

2. App default – access data

The app default contains the following data:

- Username: admin
- Password: factory preset

The login credentials are:

- required for the first login
- valid again after each factory reset – exclusively via the recovery key and necessary for login
- identical on both labels: "Important System Information" and "Default System Information"

3. Recovery key

- Key to restore user management in case of loss of credentials.
- Module-specific and not transferable to other electronics modules.
- Allows you to reset to factory settings. All user-specific settings and passwords will be deleted.
- After recovery, the app default access data (username = admin, password preset at the factory) is required again.



SAFETY NOTICE

The "Important System Information" label must be kept in a secure place that is not accessible to the public and protected from unauthorized access.

The access data to the software must be stored securely in accordance with your IT guidelines and must not be passed on to unauthorized persons.

In case of loss of the recovery key, the contractual partner must be contacted.

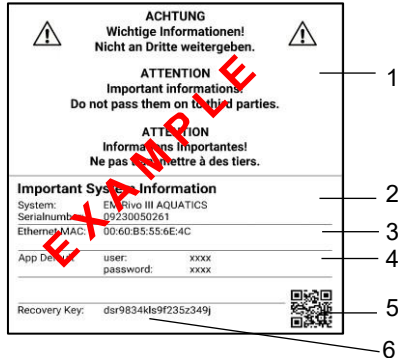


Fig. 3 Sample label “Important System Information” – system data and recovery key

- 1 Trilingual safety advice
- 2 System name and serial number
- 3 Ethernet MAC Address
- 4 App Default – access data
- 5 QR Code for “Important System Information”
- 6 Recovery Key – Used to reset login credentials (example)

1.12 Warnings and safety instructions

Warnings and safety instructions are classified by a signal word and a pictogram.

The clues follow a three-stage model:

- Type and source of the hazard
- Consequences of non-compliance
- Hazard prevention measures (if applicable)

 DANGER	
	Immediate danger to life and limb Failure to follow these safety instructions may result in fatal or serious injury.

 DANGER	
	Danger to life due to electric shock Failure to follow these safety instructions may result in fatal or serious injury.

! WARNING**Possible hazard**

Failure to follow these safety instructions may result in fatal or serious injury, as well as significant property damage.

! WARNING**Exposure to toxic substances**

Failure to follow these safety instructions may result in fatal or serious injury.

! WARNING**Hazard from fire or explosive substances**

Failure to follow these safety instructions may result in fatal or serious injury.

! WARNING**Exposure to chemical agents during calibration work**

Failure to wear the prescribed personal protective equipment can result in fatal or serious injury as well as significant property damage.

**! CAUTION****Low-risk hazard**

Failure to follow these safety instructions may result in minor injuries.

ATTENTION**Hazard with risk of property damage**

Failure to follow these safety instructions may result in significant property damage and impair the functioning of the device.

1.13 Additional information

**NOTE**

Supplementary information and hints that are important for a specific topic or goal.

**NOTE**

Before commissioning, the operating and installation instructions must be read in full.

1.14 Design features

The following representations are presented in this Instructions used:

Instructions for action:

1. Execute action
2. Sequence of action
3. Further sequence of action
→ goal, result, or open tasks

List:

- Bulleted list and list item
 - Bullet and list sub-item
 - Bullet and list sub-item

Menu display:

- For example:
 - "Operating Mode" menu
 - Menu < Tconst >
 - Menu sequence: "System Menu" > "User Management" > "..."

2 Safety

 DANGER	
	Danger to life due to electric shock Even when the operating voltage is switched off, external voltages can be connected. Possible consequences: Death or serious injury. • All electrical work may only be carried out by a qualified electrician. • The electronic module does not have a power switch and is in operation as soon as the supply voltage is applied. • An external switch or circuit breaker with clearly recognizable "Off" switching position. This external switch or protective switch should be installed directly next to the electronics module.

 DANGER	
	• The electronic module may only be operated with the supply and control voltage specified on the nameplate and in the technical data. • In the event of faults in the electrical power supply, switch off the device immediately. • Do not carry out any work on live parts and equipment.

**WARNING****Danger of uncontrolled chemical dosing in the event of circulation disturbances**

In the event of a shortage of sample water, too low flow and switched off or too low circulation capacity, there is a risk of uncontrolled dosing of chemicals.

Possible consequences:

Death or serious injury.

- Never disable water monitoring monitoring, even temporarily, for example by bridging the signal input.
- If the circulation capacity or flow is switched off or too low, the dosing of chemicals must be switched off. Therefore, a monitoring of the circulation capacity or flow must be installed in the system and connected to the electronics module.

**WARNING**

- A safety shutdown of the dosing system if defined limit values are exceeded is recommended. Appropriate security functions are available for this purpose. In addition, digital inputs can be used to switch off the dosing, for example via a limit value relay.

**WARNING****Danger from chemicals**

Dosing fluids are corrosive and oxidizing.

Possible consequences:

Death or serious injury.

- Observe safety regulations and prescribed protective clothing when handling chemicals.
- All instructions in the product data sheet of the dosing medium used must be observed.

2.1 Intended use

- The Rivo™ III Aquatics electronic module (model E30) is intended exclusively for the measurement and control of disinfectants such as free chlorine, combined chlorine, total chlorine, pH value, redox voltage, conductivity and temperature in swimming and bathing pool water.
- The electronics module is part of our Rivo™ III systems.
- The Rivo™ III Aquatics electronic module is intended exclusively for operation with the specified flow modules of the Rivo™ series (model D10). The use requires the observance of the respective operating instructions in advance. Deviating use can lead to malfunctions or safety-related risks.
 - Compatible Rivo™ Series Flow Cell Modules (D10 Model):
 - DEPOLOX®-R
 - DEPOLOX® Pool-R
 - Varia Sens™
- The Rivo™ III system is intended exclusively for use with compatible components of the Rivo™ series (sensors, output modules, measurement modules, sensor kits, cable kits). The intended use requires compliance with the respective product-specific operating instructions. Different use can lead to malfunctions or safety-relevant risks.
- Operational safety is only guaranteed if the device is used in accordance with its intended purpose.
- The device may only be used for the intended use defined in the order and under the installation, operating and environmental conditions specified in these operating instructions.
- No substances, chemicals and prescribed calibration chemicals other than those described in these operating instructions may be used.

- System access must be prevented for insufficiently qualified persons by restricting access and assigning passwords. Appropriate security concepts must be provided for remote access in order to prevent unauthorised access.
- All inspection and maintenance work must be carried out at the prescribed time intervals. The frequency of inspections and control measures must be adhered to and documented.
- The intended use also includes reading these operating instructions and complying with all safety instructions and information contained therein. The operator alone is liable for use that does not comply with the provision.

2.2 Improper use

- It is not used for its intended purpose if the Rivo™ III Aquatics electronic module (model E30) is operated with components other than those expressly approved – in particular with flow modules of the Rivo™ series (D10 model), sensors, sensor cables, output modules, measurement modules, sensor kits or cable kits that are not part of the Rivo™ series or are not compatible with the Rivo™ III system.
- Do not use damaged or outdated sensors or sensor cables.
- Any use that goes beyond the intended use is considered not to be in accordance with its intended purpose.
- Use different from what is specified in the technical data.
- Changes to the device or parts of the device.
- Assembly, installation or work on electrical components may only be carried out by a qualified electrician.
- The Rivo™ III system must not be operated with flammable liquids.

2.3 Safety instructions

The manufacturer attaches particular importance to safety when working on the device. This is already taken into account during the design phase and promoted by the installation of safety devices.

This operating instruction describes the safe and proper handling of the device.

The specified safety instructions and instructions as well as the local accident prevention regulations and general safety regulations applicable to the area of operation must be observed.

Additional inter-company or operational safety regulations remain in force.

The operator is obliged to maintain operating instructions that comply with local, national or international normative requirements, regulations and laws.

Changes beyond what is described in this operating instruction are not permitted.

2.4 State of the art

The device was designed and manufactured in accordance with the state of the art and in accordance with recognized safety regulations.

Improper use or deployment by personnel who have not been instructed can result in hazards to persons and damage to the equipment or other property.

Work that is not described in these operating instructions may only be carried out by authorised personnel.

Before commissioning and at regular intervals, it is important to check whether a current or newer firmware version is available. Firmware updates can contain security-related improvements, bug fixes, or functional enhancements.

The current software and the valid operating instructions are available in the download area of the manufacturer's website under www.xylem.com.

2.5 Personnel qualification and safety responsibility

 WARNING	
 	Danger from unqualified personnel Possible consequences: Death or serious injury as well as significant property damage. • The operator of the entire system must ensure that only trained and authorised specialist personnel work with and on the equipment within the framework of the defined responsibilities. • Unqualified personnel must be kept away from the work area. • System access must be prevented for insufficiently qualified persons by assigning passwords or other access restrictions. • Work on electrical components may only be carried out by qualified electricians.

It is assumed that all persons entrusted with work on the device are aware of and comply with the applicable regulations on occupational safety and accident prevention.

The operator is obliged to train all persons handling the plant, device, system, components or substances accordingly and to instruct them about possible hazards. The operator is responsible for monitoring the qualification.

If the staff does not have the necessary knowledge, they must be trained accordingly. Responsibilities for activities such as assembly, installation, interface installation or deinstallation, operation, fault rectification, commissioning, decommissioning, maintenance, dismantling, storage, transport and disposal must be clearly defined and adhered to in order to avoid safety-relevant competence gaps.

Only people who can be expected to work reliably may work on and with the device. Any way of working that endangers the safety of persons, the environment or equipment must be refrained from.

Persons under the influence of drugs, alcohol or reaction-impairing medication are generally not allowed to work on or with the device. When selecting personnel, the age- and occupation-specific regulations applicable at the place of assignment must be observed.

The operator must ensure that no unauthorized persons are in the danger area of the device. The staff is obliged to report any safety-relevant changes to the device to the operator immediately.

- **Instructed person:**
A person who has been instructed is a person who has been instructed and, if necessary, trained about the tasks assigned and the possible dangers associated with them, as well as instructed about the necessary protective devices and protective measures.
- **Trained user:**
A trained user is considered to be someone who fulfils the requirements for a trained person and has also received plant-specific training.

- **Trained specialist:**
A trained specialist is anyone who fulfils the requirements of a trained user and is also able to assess the work assigned to him or her and identify possible hazards on the basis of his or her training, knowledge and experience as well as knowledge of the relevant standards and regulations. For the assessment of the professional training, several years of activity in the relevant field of work can also be taken into account.
- **Electrician:**
A qualified electrician is anyone who, on the basis of his or her professional training, knowledge and experience as well as knowledge of the relevant standards and regulations, is able to carry out work on electrical systems and independently identify and avoid possible hazards. The qualified electrician must comply with the provisions of the applicable legal regulations on accident prevention.

- IT Specialist:
An IT specialist (IT = information technology) is anyone who, due to his or her professional training, knowledge and experience as well as knowledge of the relevant standards and regulations, is able to carry out work on computer systems, networks and network components and to independently identify and avoid possible dangers.

2.6 Spare parts and components

Proper operation of the device is only guaranteed if original spare parts and components are used in the combination described in this operating instruction. Otherwise, there is a risk of malfunction or damage to the device.

2.7 Additions/conversions

Do not make any changes, additions or modifications to the device that could impair safety without the written permission of the manufacturer.

2.8 Electrical power

Only qualified electricians or instructed persons may carry out work on electrical components under the direction and supervision of a qualified electrician in accordance with the electrical engineering rules.

During normal use, the electronic module and the flow valve must be closed.

The electronic module may only be operated with the housing closed and must be connected to the protective conductor.

Electrical wiring must be connected according to the connection diagram.

2.9 IT Security

The manufacturer offers IT security mechanisms for its products to support the safe operation of the systems. We recommend that you regularly inform yourself about the IT security developments in your products, information on which can be found on the Internet.

In order to operate a system safely, it is also necessary to integrate the automation components into a holistic IT security concept for the entire system that corresponds to the current state of IT technology. Products from other manufacturers must also be taken into account.

Insecure connections via the Internet or Wi-Fi are not allowed.

When commissioning the device, it is important to ensure that the factory passwords and user names are replaced by individual ones.

2.10 Safety instructions for certain operating phases

- Refrain from any safety-questioning way of working!
- All system components must be correctly assembled and meet the requirements.
- Only operate the electronics module with the housing closed!
- The device poses dangers to people and objects! The dangers arise from live parts or incorrect dosing of chemicals.
- Work on electrical components may be only electricians or instructed persons under the direction and supervision of a qualified electrician carry out the work in accordance with the electrotechnical rules.
- Avoid installation and operation under the influence of strong electromagnetic fields. Electromagnetic compatibility (EMC) to other devices by appropriate measures.
- Check the device at least once a day for externally recognizable damage and defects! Report any changes that have occurred (including those of the company's behaviour) immediately to the responsible body/person!

- In case of malfunctions, switch off the system immediately! Have faults rectified immediately!
- Connect disconnected cables according to the connection diagram!
- Secure the device against re-switching during assembly or maintenance work!
- If required, de-energize parts of the device on which inspection, maintenance and repair work is being carried out. First check the unlocked parts for freedom from voltage.
- Only use original fuses with prescribed amperage!
- When handling auxiliary materials and chemical substances, observe the safety regulations applicable to the device! Remove spilled additives immediately with a suitable binder or wipe up with a cloth. There is a risk of slipping! Collect auxiliary materials or separately according to the applicable state regulations and dispose of them properly!
- No aggressive cleaning agents (e.g. isopropanol, spirits, abrasives) and do not use high-pressure steam for cleaning!

2.11 Warranty conditions

The following conditions must be met for the maintenance of the warranty. If one of the above points is not met, the warranty expires.

- Assembly, installation, commissioning, troubleshooting, maintenance, decommissioning and disassembly by manufacturers or qualified specialists, e.g. from contracting companies
- Intended use
- Compliance with operating parameters and setting values
- Operation, storage, transport and disposal of the device by qualified personnel or instructed persons
- Use of prescribed calibration chemicals
- The device must not be exposed to frost and explosive environments.
- Carrying out the prescribed maintenance
- Use of original spare parts

2.12 Liability for defects

Liability for defects is regulated by the General Terms and Conditions of Delivery or by special contractual agreements.

The prerequisite for maintaining liability for defects is compliance with the operating and environmental conditions described in this operating instruction as well as operating and maintenance regulations. If these are not complied with, the claim for liability for defects expires.

2.13 Disclaimer for software components

The software integrated in the product has been developed and tested with the greatest possible care. Nevertheless, it cannot be ruled out that errors may occur under certain circumstances.

The manufacturer assumes no liability for damage caused by software errors, data loss, system failures or incorrect operation, unless these are due to intentional or grossly negligent conduct.

3 Delivery, transport and storage

3.1 Scope of delivery

Depending on the order, the Rivo™ III Aquatics (model E30) is supplied either as a pre-assembled complete system with pre-wired components or as a single component for individual configuration.

3.1.1 Rivo™ III aquatics electronics module (Mod. E30)

The following components are included in the scope of delivery of the electrical module:

Article number	Description
W3T632169	Electronics Module Rivo™ III Aquatics (Mod. E30)
W3T632172	Accessory Set EM E30
W3T173182	Mounting accessories
W3T566853	Operating instructions (original language: German). A digital version is available.
W3T649591	Quick Guide, multilingual

Article number	Description
-	Label "Important Safety Information" – system data and recovery key

3.1.2 Complete system with flow module DEPOLOX® Pool-R

The following complete systems are available:

Article number	Description
W3T660311	Electronics Module Rivo™ III Aquatics (Model E30) – Chlorine, pH and Redox with 2x 2REL-2DO, 1x 2REL-FB, Flow DEPOLOX® Pool-R module, Pressure less design
W3T660312	Electronics Module Rivo™ III Aquatics (Model E30) – Chlorine, pH and Redox with 2x 2REL-2DO, 1x 2REL-FB, Flow DEPOLOX® Pool-R module, Pressure resistant design

3.2 Required components, retrofit kits and extensions

Additional components are required for the complete and intended commissioning of the measurement and control system. The selection depends on the system concept and the desired range of functions.

Typical additional components:

- Rivo™ Series Flow Module
- Sensors for chlorine, pH, Redox, conductivity, total chlorine and temperature
- Rivo™ Flex Module
- Rivo™ Flex Kits
- Dosing pumps, control valves
- Interface modules for system integration



NOTE

Depending on the system ordered, certain components may be included in the standard scope of delivery or must be selected for specific applications, professionally installed and safely integrated into the overall system.

For proper system configuration: contact technical support or use the e-commerce store.

Further information can be found in the chapter Spare Parts, Retrofit Kits and Optional Accessories, including the corresponding article numbers for the respective components.

3.3 Goods receipt

After receipt of the delivery, the following tests must be carried out:

Check transport packaging

Check the packaging for external damage. Report transport damage to the transport company immediately.



NOTE

Failure to report damage may result in the loss of your right to compensation.

Check the scope of delivery

Check all delivered components for completeness and integrity.

Pay special attention to small parts that can easily be overlooked.

In the event of damaged components, please contact your contractual partner immediately.

3.4 Packaging

Packaging is recyclable material and must not be disposed of with household waste, but must be sent to separate collection, for example public collection points.

If necessary, contact your regional or municipal administration for collection points and the possibilities of separate collection.

3.5 Transport



CAUTION



Danger of impact or breakage

Possible consequences:

Injury or property damage.

- Follow the instructions and warnings on the packaging.
- Shockproof and transport the device in its original packaging. Store the packaging until the system is properly put into operation.
- Make sure that it is positioned correctly on the right side, as indicated on the packaging.
- Do not expose the device to shock, moisture, rain, frost, heat or direct sunlight.
- transport and storage temperatures. Detailed information is listed in the Technical Data section .

3.6 Storage



CAUTION



Danger due to incorrect storage

Incorrect storage can impair the function of the device.

Possible consequences:
Injury or property damage.

- Store the appliance in a dry and dust-free place in a frost and away from moisture.
- Do not store the device outdoors, do not expose it to aggressive media, and protect it from direct sunlight and mechanical damage.
- transport and storage temperatures. Detailed information is listed in the Technical Data section .
- Regularly check the general condition of the device and packaging.

4 Technical data

4.1 Electronics module

Parameter	Value and Description	
Description	Electronic Module Rivo™ III Aquatics (Mod. E30)	
Article number	W3T632169	
Scope of application	Swimming and bathing pool water	
Case	Dimensions (WxHxD)	320 x 311 x 153 mm
	Weight	approx. 3.5 kg
	Degree of protection	IP66
Grid connection	- Supply voltage (AC): 100 to 240 V AC $\pm 10\%$, 50 to 60 Hz Current consumption: 0.5 to 0.2 A Power consumption: max. 50 W - Supply voltage (DC): 24 V DC, tolerance: -15 % / +20 %	
	 NOTE The DC supply voltage must have double or reinforced insulation compared to mains circuits and meet the requirements of IEC/EN/UL/CSA 61010-1, Section 6.3.	
Display	7" graphic color display with LED backlighting and capacitive touchscreen	
Isolation	Surge Category	2
	Degree of contamination	2
	Protection class	I
Approvals	CE, CSA	

Operating conditions	Ambient temperature	0°C to 50°C (32°F to 122°F)
	Relative humidity	< 80%, non-condensing, humid environment
	Environmental conditions	No direct sunlight; Indoor use
	Air pressure	75 to 106 kPa
	Maximum Operating Height (Deployment Height)	2000 m
	Noise emission	<45 dB
Transport and storage temperature	• -20°C to +70°C (-4°F to 158°F) • Store the appliance in a dry and dust-free place in a place protected from frost and moisture. • Do not store the device outdoors, do not expose it to aggressive media or protect it from direct sunlight and mechanical damage.	
Digital Inputs	• 6x for potential free contact (internal power supply 24 V) • Function freely selectable in the menu	
Signal output	• 1x RGB output for LED light stick in flow valve	
Measurement inputs	• 1x Temperature input for PT1000, measuring range: 0°C to 100°C (32°F to 212°F) • "Rivo Flexboard Dis-pH" with measuring input for 3-electrode or membrane sensor for disinfection measurement and measurement input for pH sensor	
Module slots	• 12x module slot for Rivo™ Flex Mod modules	
Other slots	• 1x slot "key" – without function	

Relay Outputs	Relays (2x)	- Interchangeable contact with integrated fuse, replaceable - Fuse type: Type TR5, 3.15 A slow (T)
	Rated breaking capacity	3 A at 250 V AC, max. 1250 VA (resistive load) 1 A at 250 V AC, max. 250 VA (last inductive, $\cos \varphi = 0.4$) 3 A at 30 V DC, max. 150 W (resistive load)
	Maximum switching voltage	250 V AC / 30 V DC
	UL/CSA approval	3 A at 125/250 V AC (General Purpose) 3 A at 30 V DC (resistive load)
	 NOTE If inductive or capacitive loads are connected (e.g. pump with integrated switching power supply), an additional power relay with a suitable specification must be provided. The relay outputs each have a 3.15 A fuse integrated as an overcurrent protection device. Typical use of the relay: Release contact for external alarm or control of the dosing devices or dosing pumps. If the relays are used to switch inductive loads at DC voltage, a protective circuit against overvoltage (e.g. freewheeling diode) must be provided on the load.	
Interfaces	- RS485 interface with Wallace & Tiernan protocol or Modbus RTU Optionally with installed "Rivo™ COM-Board USB 485" for communication via USB - Ethernet interface Supports HTTP protocol and Modbus TCP protocol - USB Interface For firmware updates as well as for uploading and downloading parameters	

4.2 Output modules

4.2.1 Rivo™ Flex Mod 2AO-mA

Parameter	Value and Description
Description	Rivo™ Flex Mod 2AO-mA
Article number	W3T557912 (Module Part Number W3T557869)
Description	mA signal output module 2-channel
Features	• 2-fold mA output module 0/4 to 20 mA • Freely configurable signal assignment via menu • Load max. 500 ohms, accuracy < 0.05 % FS • Integrated load monitoring • galvanically isolated up to 50 V against earth

4.2.2 Rivo™ Flex Mod 2 Rel-2DO

Parameter	Value and Description	
Description	Rivo™ Flex Mod 2 Rel-2DO	
Article number	W3T557914 (Module Part Number W3T557870)	
Description	Relay module for controlling dosing devices and alarms	
Features	Execution	• 2x changeover contact with integrated fuse (5 A, non-replaceable)
	Rated breaking capacity	• 3 A at 250 V AC, max. 1250 VA (resistive load) • 1 A at 250 V AC, max. 250 VA ($\cos \varphi = 0.4$) • 3 A at 30 V DC, max. 150 W (resistive load)
	Switching voltage max.	• 250 V AC / 30 V DC
	UL/CSA approval	• 3 A at 125/250 V AC (General Purpose) • 3 A at 30 V DC (resistive load)
2x digital output (open-collector switching output)	For connecting release inputs to dosing systems, dosing pumps or electrolysis plants. Maximum current: 10 mA Maximum external voltage: 24 V DC Maximum switching frequency: 200 Hz	

**NOTE**

When connecting inductive or capacitive loads (e.g. pump with integrated switching power supply), either an additional power relay with a suitable specification or the "Rivo™ Flex Mod 2SRel" must be provided. The relay outputs each have a 5 A fuse integrated as an overcurrent protection device.

Typical use of the relay:

Release contact for external alarm or control of the dosing devices or dosing pumps.

4.2.3 Rivo™ Flex Mod 2Rel-FB

**NOTE**

Module for controlling actuators.
 The switching outputs are each equipped with an integrated 5A fuse as an overcurrent protection device.
 The fuse is permanently installed and cannot be replaced.

Parameter	Value and Description	
Description	Rivo™ Flex Mod 2Rel-FB	
Article number	W3T557915 (Module Part Number W3T584182)	
Description	Switching module for controlling actuators with actuator feedback input (e.g. V10K)	
Relay outputs (2x)	Execution	Relay contact "open/closed"
	Rated breaking capacity	3 A at 250 V AC, max. 1250 VA (resistive load) 1 A at 250 V AC, max. 250 VA ($\cos \varphi = 0.4$) 3 A at 30 V DC, max. 150 W (resistive load)
	Max. switching voltage	250 V AC / 30 V D
	UL/CSA approval	3 A at 125/250 V AC (General Purpose) 3 A at 30 V DC (resistive load)

Actuator Feedback	Signal	• Potentiometer 1 KOhm • Potentiometer 5 KOhm • 0/4 to 20 mA active • 0 to 1 V • 0 to 10 V
	Measuring principle	• Potentiometer: Constant current with voltage measurement • mA: Current Measurement • V: Voltage measurement
	Temperature drift	• < 0.25% / 10k
	Calibration	• Pre-calibrated
	Input Resistance	• mA: < 100 Ohm • V: > 1 MOhm

4.2.4 Rivo™ Flex Mod 2SRel

**NOTE**

Module for controlling inductive and capacitive loads with special wear-free hybrid switching outputs.

The switching outputs are each equipped with an integrated 3 A fuse as an overcurrent protection device.

The fuse is permanently installed and cannot be replaced.

Parameter	Value and Description	
Description	Rivo™ Flex Mod 2SRel	
Article number	W3T557916 (Module Part Number W3T584183)	
Description	Switching module for controlling dosing devices and alarms, suitable for inductive and capacitive loads	
Features	Execution	• 2x working contact with integrated fuse
	Rated breaking capacity	• 105 to 253 V AC, 50 to 60 Hz, 3 A max, resistive, inductive and capacitive load
	Switching voltage max.	• 250 V AC
	UL/CSA-rating	• 3 A, 125/250 V AC (general use)

4.3 Measurement modules (optional)

4.3.1 Rivo™ Flex Mod Dis

**NOTE**

Extension module of the Rivo™ system for the measurement of total chlorine by means of a membrane sensor.

Parameter	Value and Description
Description	Rivo™ Flex Mod Dis
Article number	W3T557878 (Module Part Number W3T557862)
Description	Measurement module for total chlorine measurement with membrane sensors
Dimensions	65 x 23 x 71 mm (LxBxT)
Ambient temperature	0°C to +70°C (32°F to 158°F)
Storage Temperature	-20°C to +70°C (-4°F to 158°F)

Measurement input	
Sensor Type	3-electrode sensor, membrane covered sensors
Measuring principle	Potentiostatic amperimetry
Temperature drift	< 0.5% / 10k
Linearity error	< 0.1% FS
Calibration	Pre-calibrated
Cell voltage Upot 3 electrode sensor	-2000 mV to +2000 mV
Supply voltage for membrane sensors	10 V
Input signal	-10 µA to +1000 µA
Measuring ranges	10 µA / 100 µA / 1000 µA

4.3.2 Rivo™ Flex Mod mV

**NOTE**

Expansion module of the Rivo™ system for redox measurement.

Parameter	Value and Description
Description	Rivo™ Flex Mod mV
Article number	W3T557901 (Module Part Number W3T559953)
Description	Measurement module for redox potential (mV)
Dimensions	65 x 23 x 71 mm (LxBxT)
Ambient temperature	0°C to + 70°C (32°F to 158°F)
Storage Temperature	-20°C to +70°C (-4°F to 158°F)
Measurement input	
Sensor Type	Redox single rod measuring chain
Measuring principle	mV Voltage Measurement
Temperature drift	< 0.1% / 10k
Calibration	Pre-calibrated
Input signal	-1500 mV to +1500 mV
Measuring ranges	-1500 mV to +1500 mV
Input impedance	>10 ¹² Ohm

4.3.3 Rivo™ Flex Mod 2AI

**NOTE**

Expansion module with two mA signal inputs for the Rivo™ system.

Parameter	Value and Description
Description	Rivo™ Flex Mod 2AI
Article number	W3T557906 (Module Part Number W3T557867)
Description	Measuring module for the acquisition of up to two sensors or input signals with mA or V measurement signal
Dimensions	65 x 23 x 71 mm (LxBxT)
Ambient temperature	0°C to +70°C (32°F to 158°F)
Storage Temperature	-20°C to +70°C (-4°F to 158°F)
Measurement input 1 and 2	
Sensor Type	0/4 to 20 mA active, 4 to 20 mA passive 0 to 10 V active
Measuring principle	mA current measurement; Voltage measurement
Temperature drift	< 0.25% / 10k
Calibration	Pre-calibrated
Input signal	0/4 to 20 mA scalable or 0 to 10 V
DC Output	24 V / 25 mA max.
Input Resistance	mA: <100 Ohm V: >1 MOhm

4.3.4 Rivo™ Flex Mod Con

**NOTE**

Expansion module for the Rivo™ system for conductivity measurement.

Parameter	Value and Description
Description	Rivo™ Flex Mod Con
Article number	W3T557907 (Module Part Number W3T584168)
Description	Measurement module for conductivity measurement
Dimensions	65 x 23 x 71 mm (LxBxT)
Ambient temperature	0°C to +70°C (32°F to 158°F)
Storage Temperature	-20°C to +70°C (-4°F to 158°F)
Measurement input	
Sensor Type	LF325
Measuring principle	Conductive, 4-electrode
Temperature measurement	NTC or PT1000
Temperature measurement range	0°C to 100°C / 32°F to 212°F
Temperature drift	< 0.5% / 10k
Calibration	Pre-calibrated
Measuring range	60 µS/cm to 300 mS/cm with LF325 electrode

4.4 Expansion board (optional)

4.4.1 Rivo™ COM-Board USB 485

Parameter	Value and Description
Description	Rivo™ COM-Board USB 485
Article number	W3T639691 (PCB Part Number W3T632875)
Interface	1x RS485 interface with Wallace & Tiernan protocol or Modbus RTU protocol 1x USB interface (not used)

5 Structure

5.1 General

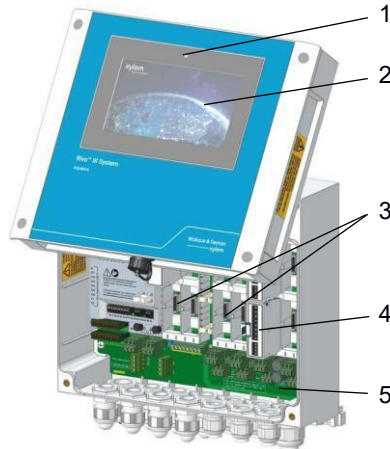


Fig. 4 Rivo™ III Aquatics Electronics Module

- 1 Status LED on the device
- 2 HMI with 7-inch touchscreen
- 3 Module Slot
- 4 "Rivo™ Flex Mod" Module
- 5 Rivo Backboard 12

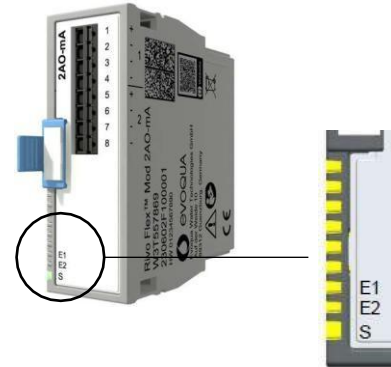


Fig. 5 Example "Rivo™ Flex Mod 2AO-mA" module with cut-out, status, LEDs and designation



NOTE

See chapter Function – Status LEDs States for an overview of the LED displays.

5.2 Rivo Backboard 12

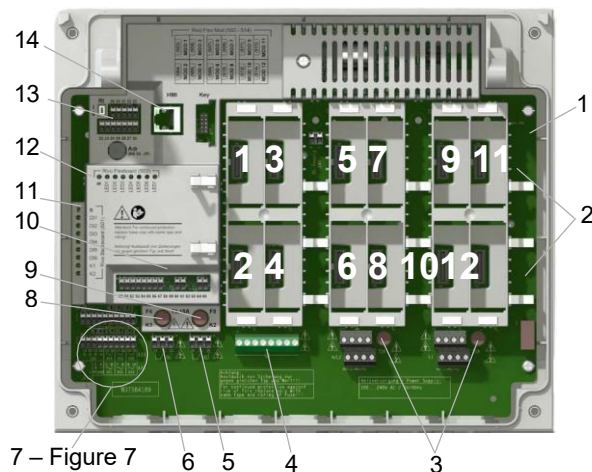


Fig. 6 Interior view of the base case with "Rivo Backboard 12" installed

- 1 Rivo Backboard 12
- 2 Module Slot 1 to 12 (Slot 03 to Slot 14)
- 3 Power Input Fuses Type TR5
- 4 PE Connection Terminals
- 5 Terminals for Relay 2
- 6 Terminals for Relay 1
- 7 See Figure 7
- 8 Fuse for Relay 1
- 9 Fuse for Relay 2
- 10 "Rivo Flexboard Dis-pH" sensor connection for:
 - 3-electrode single-rod measuring chain or Membrane sensor for disinfection measurement
 - pH-Sensor
- 11 Status LED's "Rivo Backboard (SO1)"
- 12 Status LED's "Rivo Flexboard (SO2)"
- 13 Terminals for wiring HMI and "Rivo Backboard 12"
- 14 HMI Connector



NOTE

For details on module configuration (module slots 1 to 12), see chapter Description – Module Configuration.

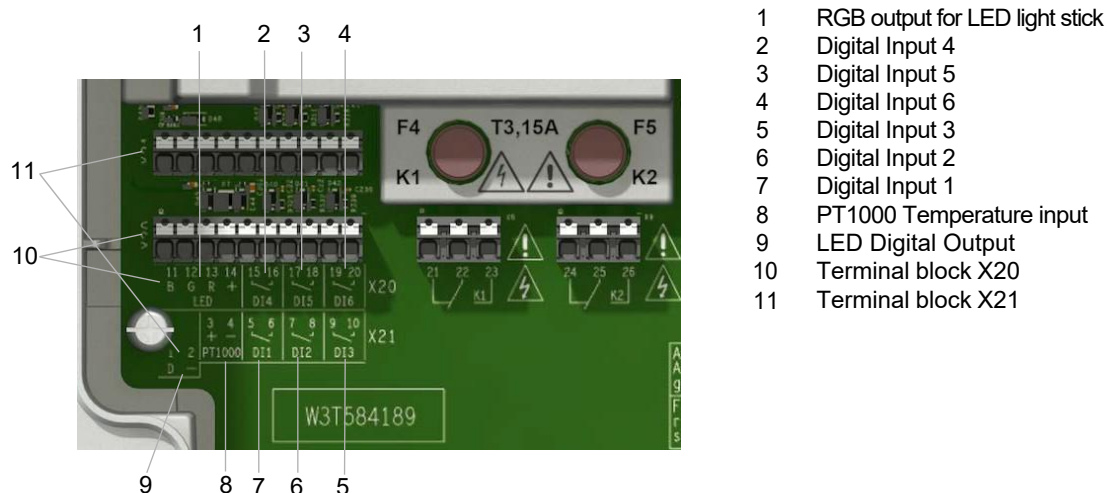
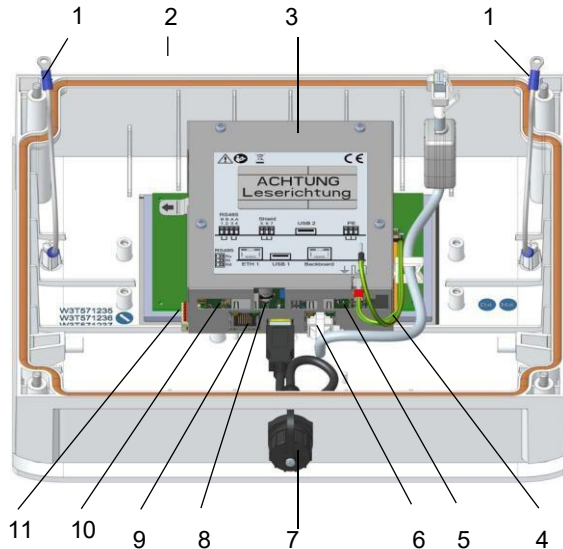


Fig. 7 Detailed visualization of the inputs and outputs for peripheral connection

5.3 HMI

The HMI is built into the housing cover.



- 1 Strain relief cable for housing securing
- 2 Discharge protection film of the lithium button cell
- 3 HMI Coverage
- 4 Grounding cable
- 5 Optional Rivo™ COM Board Expansion Board USB 485", installed under HMI protective cover
- 6 Connection to the "Rivo™ Backboard 12"
- 7 USB 1
- 8 Shielded connection RS485 bus cable (potential-free)
- 9 Ethernet 1
- 10 RS485 Terminals
- 11 RS485 Switch Bus Termination/Balancing

Fig. 8 HMI (Inside view of the housing cover)

6 Description

6.1 System requirements

For the proper operation of the system, the following main components are mandatory:

- Rivo™ III Aquatics Electronics Module
- Rivo™ Series Flow Module (D10 Model):
 - DEPOLOX®-R
 - DEPOLOX® Pool-R
 - Varia Sens™
- Compatible Modules and Kits
 - Rivo™ Flex Module
 - Rivo™ Flex Sensor Kits
 - Rivo™ Flex Mem Kits
 - Rivo™ Cable Kits

**NOTE**

The operation of the electronics module is only possible in conjunction with a suitable flow module and compatible sensors.

6.2 General

The electronic module continuously records and regulates the hygiene parameters of the swimming and bathing pool water. These include free chlorine, combined and total chlorine, pH value, redox potential, conductivity and temperature depending on the sensors and measurement modules used.

The number of supported measurement inputs varies depending on the application and configuration of the measurement modules.

A measurement input for disinfectant, pH value and temperature is available as standard via the integrated "Rivo Flexboard DIS-pH" available. Additional measurement inputs can be added via expansion modules. Optional I/O modules allow the system to be expanded to include relays, hybrid relays, or analog mA outputs.

**NOTE**

For configuration details, see chapter Description – Module Configuration.

The disinfection of swimming and bathing pool water is usually carried out by adding chlorine, sodium hypochlorite or inorganic chlorine compounds. Precise dosing is required because underdosing impairs efficacy and overdosing can lead to corrosion, odor formation and material damage.

The presence of chlorine stabilizers (isocyanurate), such as those used in outdoor pools, affects the accuracy of chlorine measurement. Chloroisocyanurates are available as granules or tablets and are not permitted for public swimming pools according to DIN 19643.

**NOTE**

Chlorine stabilizers such as isocyanurates are not permitted in public swimming pools according to DIN 19643. Different regulations may apply in other countries.

When organic chlorine products are used, control after excess chlorine is only possible if the hydrolysis equilibrium is taken into account. Standard chloro-electric rods only capture the chlorine released by hydrolysis (DPD method). Special sensors are required for this application.

6.3 Module configuration

The electronics module is approved for operation with various measurement and output modules. The selection of supported modules depends on the respective application and the specific system requirements.

6.3.1 Application for a pool

The module configuration of the Rivo™ III Aquatics System for a tank is predefined and supports the following six measurement inputs:

- Free Chlorine
- pH
- Redox
- Total or Bound Chlorine
- Conductivity
- Universal mA sensor input

The "Rivo Flexboard Dis-pH" is integrated into the electronics module as standard and thus provides measurement inputs for disinfection and pH sensors at the factory.

The following module variants are supported as switching outputs for alarms and controllers:

- Module with relay (2REL-2DO)
- Module for actuator control (2REL-FB)
- Module with hybrid switching output (2SREL) for high inductive and capacitive loads

**NOTE**

The number of relay switching outputs is limited to a maximum of 12 relays.

The installation of mA output modules (2mA) is supported for mA signal forwarding or control of metering devices with mA signal.

**NOTE**

Depending on the order, further modules are already included or can be optionally retrofitted. See chapter Spare Parts, Retrofit Kits and Optional Accessories.

6.3.2 Assignment of the slot reference (S01 to S14) and IO's

The slot reference is used to configure inputs and outputs as well as messages in the user interface to refer to the corresponding assembly or module assembly.

The IO reference is shown for IO assignments of relays, inputs and outputs.

Typically, the code is shown in the following format:
XXXX YYY ZZ

Example: BB00 S14 K1

BB00 refers to Backboard with Address 00 (Default address)

S14 refers to Slot Address 14 (=Module 12)

K1 refers in this example to Relay K1 of Module 12.

XXXX refers to the Backboard which is always BB00 for a Rivo 3 Aquatics

YYY refers to the Slot address S01...S14 of the Backboard (see table below)

ZZ refers to component IO. e.g. K1 (Relay K1), AI1 (Analog Input 1), AO1 (Analog Output 1), DI1 (Digital Input 1) and so on

Component	Slot-Address
Rivo Backboard 12	S01
Rivo Flexboard	S02
Modules 1 to 12	S03 to S14

6.3.3 Module installation – bathing water application with a pool

For single basin bathing water applications, process measurement and signal acquisition modules shall be installed as follows. The module configuration is optional and depends on the desired measurement parameters.



NOTE

Installation Note

- The Flexboard DIS-pH is already pre-installed.
- Modules with mains voltage switching or control outputs are to be installed from module slot 5 in ascending order. This ensures that the required separation distances between measuring and signal cables as well as mains voltage cables are maintained in order to avoid interference and hazards.
- The number of relay outputs of the entire system is limited to a maximum of 12.

Module	Function	Module designation
Flexboard	Disinfection and pH value measurement	Flexboard DIS-pH
Module 1	REDOX Measurement	Rivo™ Flex Mod mV
Module 2	Total chlorine measurement	Rivo™ Flex Mod DIS
Module 3	Conductivity measurement	Rivo™ Flex Mod Con
Module 4	mA measurements for turbidity and flow (e.g. circulation), other water parameters	Rivo™ Flex Mod 2AI
Module 5	mA Analog Outputs	Rivo™ Flex Mod 2AO-mA
Module 6	mA Analog Outputs	Rivo™ Flex Mod 2AO-mA
Module 7	Actuator control of chlorine gas dosing system	Rivo™ Flex Mod 2REL-FB
Module 7	mA Analog Outputs	Rivo™ Flex Mod 2AO-mA

Module	Function	Module designation
Module 8	Actuator control pH control	Rivo™ Flex Mod 2REL-FB
Module 8	mA Analog Outputs	Rivo™ Flex Mod 2AO-mA
Module 9	Control conductivity control or other controller outputs	Rivo™ Flex Mod 2REL-2DO (already equipped)
Module 10	Control of total chlorine control or other regulator outputs	Rivo™ Flex Mod 2REL-2DO (already equipped)
Module 11	Controller or alarm outputs	Rivo™ Flex Mod 2REL-2DO
Module 11	Controller or alarm outputs	Rivo™ Flex Mod 2SRel
Module 12	Controller or alarm outputs	Rivo™ Flex Mod 2REL-2DO
Module 12	Controller or alarm outputs	Rivo™ Flex Mod 2SRel

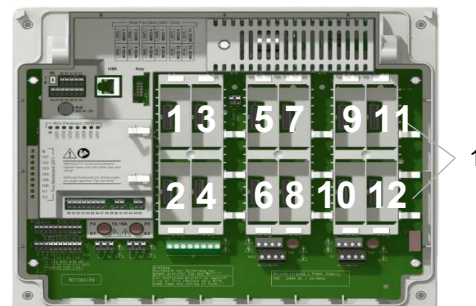


Fig. 9 Occupancy of module slots

1 Module slots 1 to 12

Module slot and marking

1	2	3	4	5	6	7	8	9	10	11	12
S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14

7 Function

7.1 General function

The Rivo™ III Aquatics electronic module (E30 model) is used for the following applications.

Measurement and control of:

- Free chlorine with 3-electrode measuring cell or membrane sensor (temperature compensated)
- Total chlorine and combined chlorine with membrane sensor (temperature compensated)
- Conductivity - This measurement is automatically temperature compensated.
- pH value (temperature compensated)
- Redox voltage
- Temperature measurement

Other applications:

- Dosage of disinfectant either conventionally or CEDOX-controlled
- Adaptation to the circulation capacity (ECO operation)
- Control of the powdered activated carbon plant or UV system

- Addition and calculation of flocculant, circulator-controlled and pH monitored
- Control of conductivity in brine applications
- pH control
- Limit Values Monitoring
- Data transfer to higher-level systems
- Time-controlled, regulated high chlorine function
- Dosing quantity display, e.g. for chlorine gas systems

7.2 System overview

The Rivo™ III Aquatics is a measurement and control system for water treatment in swimming pools and bathing pools.

The system records and regulates hygiene-relevant auxiliary parameters in the following areas of application:

- Swimming and bathing pool water (according to DIN 19643)
- Aquaparks
- Adventure pools
- Private baths
- Other water applications

7.3 Measurement inputs

The electronic module allows the installation of up to four Rivo™ Flex modules for the measurement of hygiene relevant auxiliary parameters for the 1-basin application.

Supported Rivo™ Flex Modules

Module Type	Measurement function
Rivo™ Flex Mod Dis	Measurement of total chlorine with membrane sensors
Rivo™ Flex Mod mV	Measurement of Redox
Rivo™ Flex Mod 2AI	Measurement of up to two sensors or input signals with mA or V measurement signal
Rivo™ Flex Mod Con	Measurement of conductivity



NOTE

See chapter Description – Module Configuration for more details.



NOTE

Installation Note

- A maximum of one module can be installed per measurement module type.
- The modules can only be combined according to the module configuration of the selected application.

Maximum System Configuration

The following parameters can be recorded simultaneously:

- DIS (disinfectants, such as chlorine)
- pH
- Redox
- Total chlorine
- Conductivity
- mA sensor (e.g. turbidity or circulation capacity)

7.3.1 Measurement of disinfectant (DIS)

The following sensors can be connected directly to the electronics module:

- 3-electrode single rod measuring chain for chlorine (DEPOLOX® Pool-R flow through module)
- Integrated 3-electrode measuring cell (flow module DEPOLOX®-R)
- Membrane Sensor FC2 M12 (Chlorine)
- Membrane sensor FCC (free chlorine in (iso-)cyanic acid)

**NOTE**

The total chlorine sensor (TC3 M12 membrane sensor) is connected to the associated "Rivo™ Flex Mod DIS".

7.3.1.1 3-electrode single rod measuring chain for chlorine (DEPOLOX® Pool-R flow module)

The 3-electrode single rod measuring chain for chlorine is typically used for the treatment of swimming and bathing pool water. Disinfection is mainly carried out by adding chlorine.

To determine the free chlorine content, the DEPOLOX® Pool-R flow module is used in combination with the measuring chain.

The 3-electrode single rod measuring chain is intended exclusively for installation in the DEPOLOX® Pool-R.

A controlled flow rate and continuous sand cleaning of the measuring electrodes ensure a stable and reliable measurement signal.

How the 3-electrode single rod measuring chain chlorine works

The 3-electrode single rod measuring chain for chlorine is maintenance-free and has a service life of about two years.

A special electrode cleaning sand, which is filled into the DEPOLOX® Pool-R flow module, continuously cleans the glass electrodes. The sand is permanently swirled around the electrodes by the flow and mechanically removes deposits.

The cleaning sand must be replaced regularly, depending on the degree of contamination of the measuring water.

The measurement is pH dependent and follows the HClO characteristic curve.

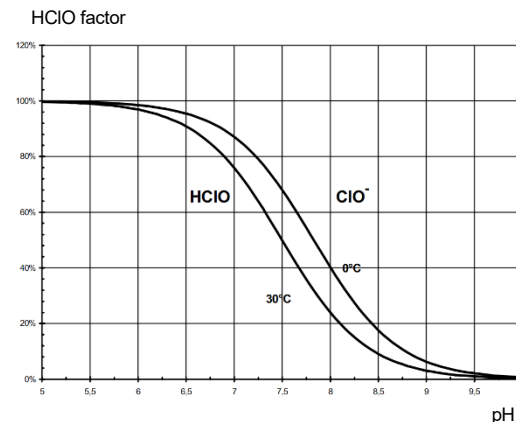


Fig. 10 HClO characteristic curve

Multi-sensor in the DEPOLOX® Pool-R flow module

For temperature measurement and monitoring of the flow rate, a multi-sensor is integrated in the DEPOLOX® Pool-R flow module. This must be connected to the electrical module.

7.3.1.2 Integrated 3-electrode measuring cell (flow module DEPOLOX®-R)

The DEPOLOX®-R flow module is typically used for the treatment of swimming and bathing pool water under demanding conditions, such as thermal water.

Disinfection is carried out by adding disinfectants, especially chlorine.

The disinfectant content is precisely recorded via the integrated 3-electrode measuring cell in the DEPOLOX®-R flow module.

How the integrated 3-electrode measuring cell works

The integrated measuring cell is a potentiostatic 3-electrode measuring cell with an external control loop.

The working and counter electrodes are made of a special platinum alloy as half-ring electrodes.

The reference electrode consists of silver and silver chloride and is connected to the measuring water via two diaphragms (membranes). It is housed in a PVC holder and immersed in an electrolyte solution, the supply of which can be replenished during operation if necessary.

The measurement is pH-dependent and follows the HClO characteristic curve.

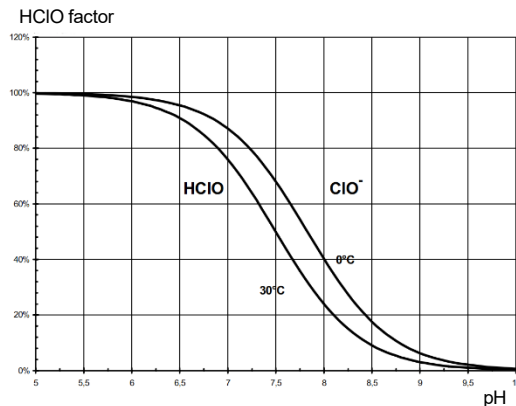


Fig. 11 HClO characteristic curve

7.3.1.3 pH Compensation of 3-electrode measuring cell – Cl_2^{++} measurement

When measuring free chlorine with the DEPOLOX®-R flow module and additional pH measurement, pH compensation can be activated or deactivated in the Measurement menu.

pH compensation is possible in the range of pH 6.00 to pH 8.75 via the menu selection. The prerequisite for this is a pH sensor installed in the electronics module, which is located in the same measuring water as the 3-electrode measuring cell. If the pH value is outside this range, an error message is displayed.

This function is only guaranteed up to a maximum content of 10 mg/l of free chlorine.

7.3.1.4 Measuring principle of the 3-electrode measuring cell

By connecting the measuring cell to the electronics module, an adjustable cell voltage (Upot) is output between the working electrode (red) and the reference electrode (white) via a potentiostatic control loop.

Proportional to the concentration of the disinfectant in the sample water, a measuring current (μA signal) is established, which is electrochemically evaluated by the electronics module.

Cleaning and additional functions

A special electrode cleaning sand is filled into the flow module. This circulates with the sample water flow and continuously cleans the electrodes mechanically.

Multi-sensor in the DEPOLOX® Pool-R flow module

For temperature measurement and monitoring. In order to increase the flow rate, a multi-sensor is integrated into the DEPOLOX®-R flow module. This must be connected to the electronics module.

7.3.1.5 Setting the potential voltage Upot

The potential voltage Upot can only be configured when using a 3-electrode measuring cell.

An adjustable potential voltage (Upot) is output between the working electrode and the reference electrode. This voltage depends on the disinfectant used and must be adjusted accordingly:

Disinfectants	Recommended Potential Voltage (Upot)
Chlorine	250 mV (factory setting)

The potential voltage is set via the Sensor Type menu of the respective measurement input. There, the parameter "Upot" can be individually adjusted.

7.3.1.6 Membrane sensors

Membrane sensors can also be used to measure disinfectants in water.

They are available in different versions – for measuring free chlorine or total chlorine.

7.3.1.7 Setting the μA signal input

The μA signal input is configured at the measurement input as follows:

- The measuring current of the 3-electrode measuring cell, the 3-electrode single-rod measuring chain for chlorine or the membrane sensors (μA current signal) is directly proportional to the concentration of the disinfectant in the measuring water.
- Depending on the application, the μA measuring range at the sensor input can optionally be adapted to the operating conditions.
- As a rule, this is not necessary due to the preset "Auto Range" function.



NOTE

The setting of the μA measuring range depends on the measurement, the concentration of the disinfectant and the type of disinfectant used.

- The "Dis Measurement Input" has three selectable measuring ranges for recording the sensor current:
 - 0 to 10 μA
 - 0 to 100 μA
 - 0 to 1000 μA

The measurement range can be selected either manually or via the "Auto" setting.

In the auto function, the input automatically adjusts to the measured signal (auto-range) to ensure optimal resolution and measurement accuracy.

**NOTE**

At high concentrations of disinfectants, a larger μA measurement range is required to correctly record the sensor current. The parameter μA measurement range can be adjusted in the "Sensor Settings" menu of the respective measurement module.

As a rule, however, this is not necessary, as the preset "Autorange" function automatically selects the appropriate measuring range.

Guideline values for sensor current per 1 mg/l chlorine or disinfectant:

Sensor type	Typical μA value per 1 mg/l
3-electrode measuring cell (DEPOLOX®-R)	30 μA
3-electrode single-rod measuring chain for chlorine	8 μA
Membrane sensor	10 μA

7.3.2 pH measurement

The pH value is a central control variable for determining the acidity or alkaline content in water. It influences the effectiveness of the disinfection and is continuously monitored by means of a pH sensor.

The pH sensor is intended for installation in the DEPOLOX®-R, DEPOLOX® Pool-R, Varia Sens-R™ modules as well as in compatible flow valves.

Sensor Connector

The sensors are connected as follows:

- pH sensor: directly on the "Rivo Flexboard"

7.3.3 Redox measurement

The redox voltage in swimming and bathing pool water is a measure of the oxidation power of the water and plays a central role in disinfection. It is measured in millivolts (mV) and indicates how effectively the water can oxidize organic substances, bacteria and viruses and thus inactivate them.

The measurement is carried out via a low-maintenance redox single rod measuring chain with silver-silver chloride reference system.

The REDOX sensor is intended for installation in the DEPOLOX®-R, DEPOLOX® Pool-R, Varia Sens-R flow modules as well as matching flow valves™.

Sensor Connector

The sensor is connected as follows:

- REDOX sensor: via expansion module "Rivo™ Flex Mod mV"

7.3.4 Conductivity measurement

The conductivity serves as a sum parameter to determine the total mineralization or brine concentration in the water. Due to the strong temperature dependence, a temperature sensor is integrated directly into the conductivity sensor. The measured values are temperature-compensated and output in relation to a reference temperature. The international reference temperatures are 20°C or 25°C. The reference temperature can be selected.

The conductivity sensor consists of a 4-electrode system with an integrated temperature sensor. The graphite electrodes are therefore very robust and abrasion-resistant. The cell constant is 0.48 cm^{-1} .

The conductivity sensor is designed for installation in the flow modules DEPOLOX®-R, DEPOLOX® Pool-R, Varia Sens-R™.

Sensor Connector

The sensor is connected as follows:

- Conductivity sensor: via expansion module "Rivo™ Flex Mod Con"

7.3.5 Sensors with universal mA signal output

Standard sensors with analog mA signal output can be used to record additional process parameters. Various sensor types are available for this purpose, such as turbidity sensors.

The mA signal input is configured at the measurement input as follows:

- Input signal: 0/4 to 20mA
Direction input signal: direct or inverse
- Measuring range beginning
(lower limit of the sensor measuring range)
- End measuring range
(upper limit of the sensor measuring range)
- Display Format
(numerical representation on the display)
- Display unit – see menu

Sensor Connector

The sensor is connected as follows:

- mA sensor: via "Rivo™ Flex Mod 2AI" expansion module

7.4 Control parameters

Control parameters are setting variables for defining the control behavior of a controller. The type and number of parameters depend on the type of controller.

Automatic actuator calibration

This parameter is only possible with dosing output servomotor with feedback.

The calibration is used to adjust the actuator feedback signal to 0 % and 100 % dosing performance.

When the automatic Ym calibration starts, the actuator moves to the 0% and 100% positions and calibrates both positions with the electronic device.

To start the calibration, press the "Start" button.

In the case of manual calibration of 0% and 100%, positions must be approached individually and the respective dosing capacities must be entered manually. For this procedure, see chapter Function – Manual Actuator Calibration.

Dosing delay time

The dosing delay time delays the start of dosing after the device is switched on and after a change of operating mode.

The expiration of the set delay time can be ended prematurely via the "Start" button. The delay time prevents incorrect dosing outputs until the system is supplied with correctly treated sample water again.

Actuator feedback threshold

Unit: Percent (%)

This parameter defines the accuracy of the positioning of the servomotor with feedback.

A value that is too low should be avoided, otherwise there is a risk that the servo motor will permanently readjust or be constantly controlled.

Release relay

This parameter enables the additional use of a release relay for the dosing device when the dosing output is controlled via an mA signal (continuous actuators) – for example, to switch off the operating voltage or to switch an additional release input.

If unused, free relays are available, they can be selected and assigned to the dosing device.



NOTE

Documentation for the operator is required.

max. pulse/min (maximum number of pulses)

Setting range: 10 to 250 pulses/min.

The max. pulse/min parameter is only relevant for pulse pumps. Depending on the type of pump used, it determines the maximum number of pulses per minute.

When controlling pulse pumps, it is recommended to use the digital switching outputs of the "Rivo™ Flex Mod 2Rel 2DO" instead of relays as switching outputs. Relays are subject to increased wear and thus a shortened service life during high switching cycles.

Source setpoint

This parameter defines the source of the setpoint used for control. The source can be either the internally set setpoint from the menu setting or an external setpoint provided via mA signal input 2 or via an interface interface.

Control direction

Meaning: Effect of the regulation Indication:
inverse

The control direction defines the medium used to correct the control value.

Example – pH control:

- Effect: inversely active
→ The pH value is lowered by adding acid.
- Sense of action: inversely inactive
→ The pH value is increased by adding lye.

Control activated

This parameter allows the activation (ON) or deactivation (OFF) of the control for the selected measurement parameter.

Regulator type

This parameter shows the available controller type (fixed value control).

Bumpless transfer

When switching between operating mode and controller mode, this parameter enables the current dosing capacity to be transferred to the new operating mode or the new controller mode. This keeps the dosage stable, which in turn ensures constant measurement.

The feature can be one-time, permanent, or disabled.

Safe manual operation

If this parameter is set to "On", the dosing is also stopped in manual mode – either if the sample water flow is too low or by an external stop signal.

Setpoint

Specified target value that the controller is to maintain by means of a corresponding dosing capacity. The setting range of the setpoint corresponds to the respective measuring range.

Tn – adjustment time (I-part)

Unit: Minutes (min) Setting Range: 0 to 100 minutes

The adjustment time Tn causes a continuous adjustment of the dosing capacity as long as the target value is not reached.

- Larger Tn value: The controller reacts more slowly – the control behavior becomes sluggish.
- Smaller Tn value: The controller adapts faster – the control behavior becomes sharper.

A value of Tn = 0 deactivates the I component, resulting in pure P control behavior. In this case, it may happen that the target value is not fully reached.

Tp (Cycle Period)

Validity: Only for metering pumps

Unit: seconds(s) Setting range: 10 to 180 seconds

The cycle period Tp determines the switching frequency of the metering pump and must be adapted to the respective pump type.

Example:

- Small Tp values: suitable for high-speed metering pumps
- Large Tp values: suitable for slow-running dosing pumps

**NOTE**

The Tp control parameter must always be adapted to the mechanical properties of the dosing pump used in order to ensure stable and precise control behaviour.

Dosing pump strokes/min	Tp Value
up to 20	120
20 to 40	100
40 to 80	60
80 to 125	30
125 to 200	15

Ts (Loop rise time)

Setting range: 1 s to 8 h

This parameter describes the behavior of the control loop. The parameter Ts indicates the amount of time required to reach the final value of the measuring range at maximum dosing agent addition.

**NOTE**

If the Tu and Ts values are changed manually, the control parameters Xp and Tn are automatically recalculated.

Tu (Loop Dead Time)

Setting range: 1 to 59 seconds

This parameter describes the behavior of the control loop. The parameter Tu defines the time span between the start of dosing and the clearly recognizable increase in the control variable in the measuring system.

**NOTE**

If the Tu and Ts values are changed manually, the control parameters Xp and Tn are automatically recalculated.

Ty

Validity: Only for positioners

Setting range: 10 to 180 seconds (manual or automatic)

The parameter Ty describes the time it takes for the positioner to fully adjust from 0% to 100%.

Ty can either be set manually in the range of 10 to 180 seconds or automatically determined by pressing the "Calibration positioner" start button. During automatic determination, the system moves to the end positions and calculates the actual running time of the positioner from this.

Xp (Proportional Coefficient)

Adjustment range: 1% (factor 100) to 1000% (factor 0.1)

The proportional coefficient Xp determines the control amplification. The smaller the value of Xp in percentage, the more a deviation from the setpoint value is amplified – the controller reacts more quickly to deviations from the setpoint.

The amplification factor is calculated according to the following formula:

Factor = $(1/Xp) \times 100\%$

Xsh (Neutralzone)

Validity: Only with 3-point controllers

Adjustment range: 1 to 5 % (based on the measuring range)

Within the neutral zone, no control output occurs. The neutral zone is the defined area between setpoint + Xsh and setpoint - Xsh.

Y Max (dosing capacity limitation – only with fixed value control)

Validity:

The parameter Y Max is only relevant for:

- Positioner with feedback
- Dosing pumps
- Solenoid pumps
- Controllers with mA output

Adjustment range: 0 to 100%

Ymax defines the maximum control output to the actuator.

The parameter corresponds to an electronic limitation of the dosing capacity of the actuator.

Assignment

This parameter enables the customer specific assignment of a dosing output to a free relay if the factory configuration is to be adapted.

**NOTE**

Appropriate documentation for the operator is required.

Y Min (dosing capacity base load – only with fixed value control)

The parameter Y Min is only relevant for:

- Positioner with feedback
- Dosing pumps 2p
- Pulse Pumps 2p
- Controllers with mA output

Adjustment range: 0 to 100%

A basic dosing capacity is output to the actuator via Ymin. The parameter is used to limit the lower control range.

**NOTE**

- Ymin and Ymax are only available with single feedback control.
- The Ymax and Ymin parameters are used to restrict the control range.
- Ymax must not be chosen smaller than Ymin.
- A Ymin value greater than 0 can lead to an overdose.
- The base load dosage is also carried out if the chlorine setpoint value in the pool is exceeded.

Shutdown condition

It is possible to trigger a dosing shutdown after the max. dosing time has elapsed. This can be done either by monitoring the dosing time for 100% dosing capacity or by not reaching the target value within the defined max. dosing time. This function can be switched off.

Actuator

This parameter allows you to select an actuator type when control is activated.

7.5 Control connections – digital inputs

 WARNING	
	Exposure to external voltages on the digital inputs Possible consequences: Severe property damage. • External voltages must not be applied to the digital inputs.

7.5.1 Digital inputs – Rivo Backboard 12

Six digital inputs are integrated on the "Rivo Backboard 12". These are intended for the connection of potential-free contacts (< 100 ohms) and are supplied internally with 24 V.

The menu System Settings - Hardware - Digital Inputs can be used to assign names (labels) to the digital inputs and to define the switching behavior.

Inverse: active when contact is open (NC)
Direct: active when contact is closed (NO contact)

To avoid contact bounces, a debounce time can be set.

7.5.2 Function and application

The digital inputs enable:

- Targeted influence of the controller
- Triggering alarms
- Container monitoring
- Controller Stop

Each digital input can be assigned a specific function. Various control functions can be implemented via a potential-free contact (e.g. "external stop").

7.5.3 Assignable functions

Function	Description
Alarm (freely configurable)	User-defined alarm, flexibly configurable.
Controller Stop	Dosage is deactivated, positioner moves to 0 %.
Max. dosage	Controller output is set to 100%.
Freeze regulation	Controller output remains constant, no control activity
2x Yout	Regulator output is doubled.
Ignore external setpoint	Switching to internal setpoint
Freeze Application	All measurements and controller outputs are kept constant.
Application in standby	Measured values are hidden, no active control.
Boost dosing	Activates boost dosing as long as the input is active.



NOTE

- The digital inputs are deactivated at the time of delivery.
- To activate it, the desired function must be configured in the system menu.
- Digital inputs can also be used as alarms.
- The digital inputs can be configured directly or inversely, so that they work as normally closed or normally open when active.
- The operation of the digital inputs can be configured such as debounce time, direct direction or inverse (NO/NC)
- The restart of the control system can be delayed by the set dosing delay time.

7.6 Sample water monitoring

 WARNING	
	Danger of uncontrolled chemical dosing in the absence of sample water monitoring In the event of a lack of sample water, insufficient flow or switched off or too low circulation capacity, this can lead to uncontrolled dosing of chemicals. Possible consequences: Death or serious injury. • The sample water monitoring must never be deactivated – not even temporarily – for example by bridging the signal input.

 WARNING	
	Automatic shutdown of chemical dosing required • If the circulation capacity is switched off or too low, as well as if the flow rate is insufficient, the chemical dosing must be switched off automatically. Therefore, monitoring of the circulation capacity and flow is mandatory and must be connected to the electronics module.

7.7 Connections to visualization systems

The following options are available for connecting the electronics module to higher-level visualization or control systems:

- Ethernet interface with Modbus TCP and HTTP protocol (standard)
- Optional dual mA signal output module: "Rivo™ Flex Mod 2AO-mA"
- Optional Expansion Board: "Rivo™ COM-Board USB 485" with RS485 interface (also Modbus RTU protocol).



NOTE

Further technical details can be found in the chapter Interfaces.

7.8 Controller outputs and dosing systems

The electronic module controls dosing systems via relay outputs and mA signal outputs. Additional relay functions can be expanded via optional module slots. Depending on the dosing device used, the corresponding expansion modules can be individually adapted and integrated.

The following dosing outputs can be controlled:

Regulator Type	Parameter	Output Type	Task
Positioner with feedback signal	3-point with Ym	Relays	Dosage ↑ ↓
Positioner without feedback signal	3-point without Ym	Relays	Dosage Cl2 Correction: pH ↑
Motor dosing pump (pulse length regulator)	2-point	Dosing pump 2P	Dosage Cl2 Correction: pH ↓ ↑ Conductivity ↑

Regulator Type	Parameter	Output Type	Task
2 motor dosing pump (pulse-length controller)	3-point	Dosing pump 3P	Correction: pH ↓ ↑
Pulse pump (pulse-frequency controller)	2-point	Pulse pump 2P	Dosage Cl2 Correction: pH ↓ ↑ Conductivity ↑
2 pulse pump (pulse frequency control)	3-point	Pulse pump 3P	Correction: pH ↓ ↑
Dosing pump with mA input	2-point	steady mA 2P	Dosage Cl2 Correction: pH ↓ ↑ Conductivity ↑
2 dosing pumps with mA input	3-point	steady mA 3P	Correction: pH ↓ ↑

7.8.1 Actuator with or without feedback

By selecting a suitable actuator, chlorine gas dosing can be implemented.

To control a positioner with or without feedback – a "Rivo™ Flex Mod 2REL-FB" is required for each actuator.

If there is feedback, it must be calibrated during commissioning.

Potentiometers with a resistance of 1 kΩ can be connected as feedback elements.

7.8.2 2-point or 3-point pulse length controller for dosing pumps

Within an adjustable cycle period T_p , the dosing pump is switched on for the calculated time (relay contact).

The cycle period T_p is determined primarily by the reaction time of the connected system and entered as the cycle period T_p .

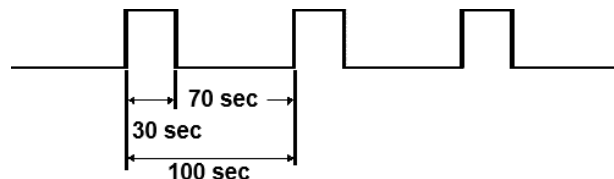


Fig. 12 Cycle period T_p – time flow diagram

Example:

- Takt period $T_p = 100$ s
→ output value $Y_{out} = 30\%$
- Duty cycle 30 s
→ switch-off time 70 s

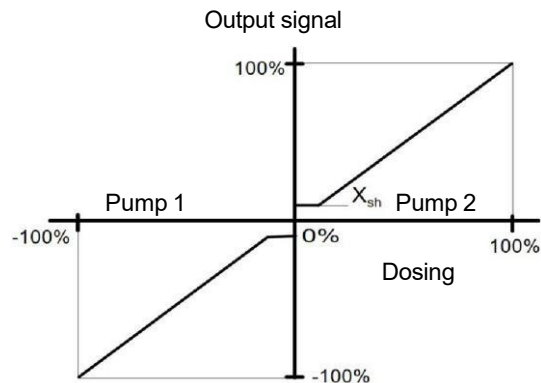


Fig. 13 3-Point pulse length controller

7.8.3 2-point or 3-point pulse frequency controller for pulse pumps

Pulse pumps are controlled with 0 to max. 200 pulses per minute, depending on the specification of the connected pump. The number of the max. pulse rate can be adjusted. The minimum pulse time is 0.15 seconds. The number of pulses per minute depends on the dosing capacity.

When controlling pulse pumps, it is recommended to use the electronic switching outputs instead of relays "DO" of the "Rivo™ Flex Mod 2Rel 2DO". Relays are subject to increased wear during high switching cycles, which leads to a shortened service life. A connection example for the electronic switching output is shown in the connection diagrams.

7.8.4 Continuous 2-point output and continuous 3-point output

The electronics module can optionally be equipped with a Dual mA output module "Rivo™ Flex Mod 2AO-mA". These mA outputs can be configured either as transmission of measured values or control output.

If you select "Dosing → Actuator = Analogue output 2P", the mA output is permanently assigned as the control output.

With a control output of 0 %, the output current is 0 or 4 mA, with a larger Yout the output current reaches up to 20 mA.

If you select "Dosing → Actuator = Analogue output 3P (single)", an mA output is assigned as the control output. With a control output of 0%, the output current is 10 or 12 mA. Depending on whether the regulator output is positive or negative, a mA output greater or less than 10 or 12 mA is output.

For example, metering pumps with mA control input, control valves with mA signal input can be used.

The analog output is accordingly in the menu "Actuator Settings" (selection of analysis output, measuring range 0/4 to 20mA).

If you select "Dosing → Actuator = Analogue output 3P (dual)", two separate mA outputs are assigned as control outputs. Depending on the dosing capacity, from 0 to 100% one mA output is controlled for lifting and from 0 to -100% one mA output for sinking is controlled.

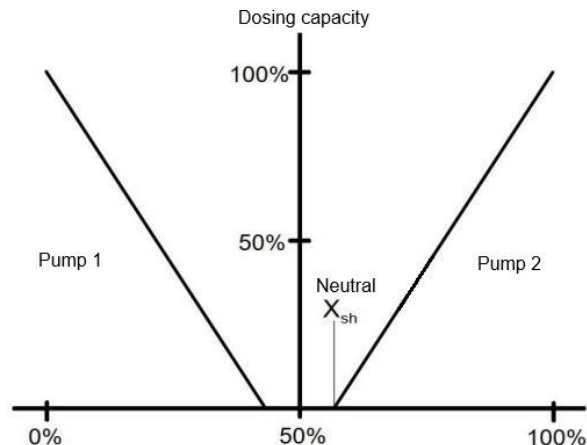


Fig. 14 Steady regulator

If the mA outputs are used to control positioners or dosing pumps, it is possible to configure one enable relay per dosing device.

The assignment of an enable relay enables an additional safe release or shutdown of the respective dosage. The selection or assignment of a relay is possible on a customer-specific basis, provided that free relays are available.

**NOTE**

Customer specific relay assignments must be documented accordingly to ensure traceability.

7.9 mA outputs

Optionally, the electronics module can be equipped with a 2-channel output module "Rivo™ Flex Mod 2AO-mA". Both mA outputs are galvanically isolated and can be freely assigned to transmit the measured values or controller outputs. The output channel can be configured as 0 to 20 mA and 4 to 20 mA.

If a mA value of 3.4 mA is not reached at the 4 to 20 mA setting, this is detected as a line break and an error is generated.

7.10 Control

In the Basic Settings menu of the various measurements, it is possible to activate or deactivate a control. Furthermore, different types of controllers and actuators can be selected.

7.10.1 Single feedback control

A PI controller is used for control to keep the content of disinfectant in the water stable at the specified set point by continuously comparing the target value with the measured actual value and calculating a dosing capacity from this.

7.10.2 Dosing contact

A dosing contact can be used to control electrolysis plants for chlor dosing. In order to control these plants, a special controller is required to avoid switching on or off too often (reason: start-up times of electrolysis plants).

Within the set control parameters, contact is released or blocked.

If the entered setpoint is not reached, minus hysteresis (e.g. 0.20 mg/l), the regulator output switches on at least for the minimum switch-on time. As long as the setpoint is not reached, the controller output remains switched on.

If the setpoint value is exceeded, the controller output switches off immediately (provided that the minimum switch-on time has expired).

It is only possible to switch it on again when the setpoint hysteresis falls below the minimum switch-off time.

**NOTE**

In manual mode, the minimum switch-on time and the minimum switch-off time are not observed!

In the case of dosing contact, the max. dosing time is not monitored.

7.11 Actuator

Different outputs can be selected as an actuator to dose disinfectant.

7.12 Actuator feedback

If a positioner with feedback (positioner with Ym) is used as the dosing output, the actual position of the actuator/dosing power is transmitted to the controller via selectable input signals in order to obtain the best possible control result.

To control actuators with feedback signal, the "Rivo Flex Mod 2REL-FB" is to be used.

Potentiometers with 1kΩ are supported as feedback input.

In the Actuator menu, the feedback signal used can be set. In order to achieve an optimal control result, the position feedback must be compared (calibrated) with the controller.

Basically, the endpoints 0% and 100% of the feedback must be calibrated.

The actuator feedback can be carried out automatically. During automatic calibration, the controller automatically moves to the 100% and 0% position and stores the corresponding measured values of the feedback signal internally.

During the calibration process, the running time of the positioner (Ty) is automatically determined. The positioner must not be in manual control during calibration.

7.12.1 Automatic calibration (2-point)

The automatic calibration runs between the limits set by the positioner's microswitches and calculates the most important parameters for the positioner's behavior.

Start the automatic calibration as follows:

1. Login with user/password.
2. Click on the measurement channel menu field.
3. Settings icon .
4. Click on the "Dosing" menu.
5. Click on the "Settings Actuator" menu.

6. Click on the "Start" button during the servomotor calibration.
→ the positioner moves to 100% and then to 0% and calibrates the two endpoints.
7. Click the information button to view the measurements taken during calibration.

**NOTE**

After executing the automatic calibration, the controller calculates the output by interpolating between the points 0% and 100%.

7.13 Container monitoring

The electronic module allows the activation of a container monitoring system for each controller output. This is based on calculated consumption and summation of the dosing outputs as well as on the set dosing capacities of the dosing outputs. Additionally, use the configurable level switches to activate minimum and empty level detection.

The displayed dosing quantity is based on a calculated dosing quantity display, which may deviate from the actual dosing quantity under certain circumstances – for example, due to runtime delays, tolerances or other system-related influences.

7.14 Maintenance reminder

The system allows the configuration of a maintenance reminder for certain sensors such as membrane sensors. The maintenance reminder can be set up or activated/deactivated by the customer. The time limit can be defined in days, weeks, months or years and a description of the report and the level of the report can be specified.

7.15 Calibration reminder

The system allows the configuration of a calibration reminder for sensors. The calibration reminder can be set up or activated/deactivated by the customer. The time interval can be defined in days, weeks, months or years, and a description of the message and the level of the message can be specified.

7.16 Calibration archive

The Rivo system has integrated a calibration archive for all sensors. In the calibration archive, the last 5 customer calibrations are visualized with date and time as well as the corresponding sensor measurement signals. This calibration archive cannot be deleted and can be accessed via the calibration menu of the individual measurements.

7.17 Relay outputs and digital outputs

The electronic module can optionally be expanded with additional switching outputs. Depending on the type and power of the load to be switched, the following expansion modules are available:

- **Rivo™ Flex Mod 2SREL**
This module provides two additional switching outputs in hybrid technology. It has been specially developed for switching inductive or capacitive loads.
- **Rivo™ Flex Mod 2REL-FB**
This module offers special switching outputs for controlling actuators with integrated feedback signal. In addition, it has an input for recording the current actuator position.
- **Rivo™ Flex Mod 2Rel-2DO**
This module has two relay outputs (changeovers) and two digital switching outputs for controlling dosing devices with digital release input, such as pulse pumps or dosing pumps. The digital switching outputs are specially designed for pulse frequency outputs with high switching frequency.

7.18 Relay outputs

The electronics module has two on-board relays and can be expanded with relay modules. Additional relays can be added as a module. To do this, the "Rivo™ Flex Mod 2Rel-2DO" must be installed. The modules are configured via the menu setting. Depending on the application, different switching tasks are assigned to these contacts.

Connecting and switching non-approved devices or loads destroys the relay contacts. As a result, the device works uncontrollably!

For switching inductive loads or capacitive loads that exceed the technical characteristics of the relay contact, an additional switching element, such as contactor, load relay with suitable specification, must be installed. The relay contacts are internally protected by suppressor diodes for radio interference suppression.

All on-board relays are protected by fuses. These are used to limit the overcurrent of the terminal or relay connections.

- The fuses of the "Rivo Backboard 12" are interchangeable (type: TR5, T3,15A).
- The fuses of the "Rivo™ Flex Mod 2Rel-2DO" are not replaceable.

**NOTE**

If the internal power supply L1 and N/L2 is used for dosing pumps or other devices, the current consumption must not be greater than the value of the selected pre-fuse.

The relay numbers in the menu view are assigned in ascending order from the module or slot address. The relays of the backboard K1 and K2 are assigned as Rel 1 and Rel 2. Further relays depending on the module slot ascending.

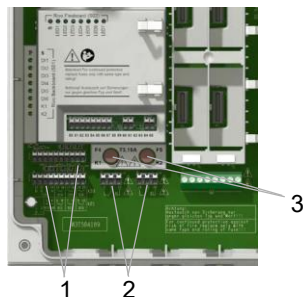


Fig. 15 Cut-out PCB - relay outputs

- 1 Terminal strips for control inputs
- 2 Terminal Strips for Relays
- 3 Fuses of the "Rivo Backboard 12" relays

7.19 Alarms and messages

Alarms, warnings, messages and errors are indicated by a coloured message symbol (🔔 alarm bell red) and by means of an RGB LED above the display. The reporting window opens by tapping the alarm bell. All active messages are displayed with text and the corresponding color. Acknowledgeable messages are confirmed or acknowledged with the ACK button.

7.19.1 Alarm configuration

The electronics module enables the creation of freely configurable alarms. The alarms are output optionally via:

- Relay contacts
- Colour optical signalling system
- Reporting in the integrated reporting system

The number of available relay contacts depends on the system configuration.

Alarm relays can be used, for example, to safely shut down dosing if defined limit values are exceeded or not reached.

The assignment of a relay as a switching function is optional and can be done individually.

Each alarm is individually configurable. Multiple assignments are possible. The following parameters can be set:

Parameter	Description
Message	Freely configurable text
Description	Freely configurable text
Delay Time	Format: hh:mm:ss Range: 00:00:00 to 10:49:59
Notification Level	Error / Warning
Acknowledgment	Without / Simple Acknowledgment / Acknowledgment with Reset
Assignment	Single or multiple assignment to limit values or digital inputs, warnings or errors
Relay Mapping	Single or multiple assignment to digital switching outputs or relays

Relay Assignment	Relay availability depends on configuration Depending on the system configuration, a different number of relay outputs may be available: • Rel1 and Rel2: Integrated on "Rivo Backboard 12". Connection diagram: K1 = Rel1, K2 = Rel2 • Other relays via optional expansion modules: "Rivo™ Flex Mod 2Rel-2DO" or "Rivo™ Flex Mod 2SREL". Connection diagram: K1 = Rel3, K2 = Rel4.
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7.19.2 Without acknowledgment

- The alarm symbol and the message symbol lit up when the alarm was sounded and went out automatically when the condition was removed.
- Non-saving alarms are signaled as a message in yellow.
- The relay is active when the alarm symbol is displayed or the alarm is active.

7.19.3 Acknowledgment with reset

- The alarm symbol as well as the alarm message symbol and the relay are active until acknowledgement.
- The alarm icon and the message go out as soon as the set conditions are no longer active.
- Saving alarms are signalled in colour as a message.
- The relay becomes inactive after acknowledgment if the condition is still present.

7.19.4 Simple acknowledgment

- The relay becomes active as soon as the alarm becomes active.
- The alarm symbol and the message symbol appear in the event of an alarm until the alarm is acknowledged.
- If the condition is no longer met at the time of acknowledgment, the alarm symbol and the message go out.
- If the condition is still present at the time of acknowledgment, the alarm symbol and the message change from flashing to a static state. The alarm symbol and the message continue to light up until the condition is eliminated (auto reset).
- Saving alarms are displayed as a message in red.
- The relay does not become inactive until the condition is eliminated and acknowledged.

7.20 Features and safety functions

To ensure plant safety and minimize accident risks, various safety functions are integrated or configurable via control links.

The following functions contribute to safe operation:

- **Controller STOP for dosing**
Dosing is stopped if the digital inputs are configured accordingly.
- **Safe manual operation**
In manual mode, the dosing is automatically stopped if there is insufficient sample water flow or if there is an external stop signal.
- **Safe calibration**
Dosing is deactivated if a calibration is not completed properly.

7.20.1 pH lockout function

This function interrupts the dosage of the disinfectant if the pH value of the pool water is outside the pH Min and pH Max limits defined in the function.

An adjustable hysteresis prevents premature switching on or off in the immediate vicinity of the threshold value.

As soon as the monitoring function is triggered, a message is generated that must be acknowledged.

7.20.2 Redox lockout function

This function interrupts the dosage of the disinfectant if the redox value is outside the Redox Min and Redox Max limits defined in the function.

An adjustable hysteresis prevents premature switching on or off of the dosage in the range of the threshold value.

As soon as the monitoring function is triggered, a message is generated that must be acknowledged.

7.20.3 Sample water monitoring

This function monitors the sample water inlet in the flow module and switches off the controller outputs with a time delay as soon as a lack of sample water is detected and the measured values are no longer considered valid.

In the menu, the digital input provided for this purpose (typically DI1) can be selected and a switch-off delay and switch-on delay can be defined:

- The shut-off delay determines the amount of time after which the dosing is deactivated when a lack of sample water is detected.
- The switch-on delay determines the amount of time after which the dosing is reactivated once the lack of sample water has been resolved.

An adjustable debounce time reliably filters out short term signal changes.

The current status of the sample water flow is displayed via the "Flow Status" parameter.

7.20.4 Circulation monitoring

This function monitors the circulation in the tank or filter circuit and switches off the controller outputs with a time delay as soon as no or too low circulation capacity is detected and no more dosing is permitted.

In the menu, the digital input provided for this purpose (typically DI2) can be selected and a switch-off delay and switch-on delay can be defined:

- The shutdown delay determines the period of time after which all dosages are deactivated if the required circulation rate is exceeded.
- The switch-on delay determines the period of time after which the dosages are reactivated as soon as the minimum circulation quantity is exceeded again.

An adjustable debounce time reliably filters out short-term gear changes.

The current circulation status is determined by the parameter "Flow Status".

7.21 Auto tune



NOTE

Only valid for the Cl₂ single feedback control.

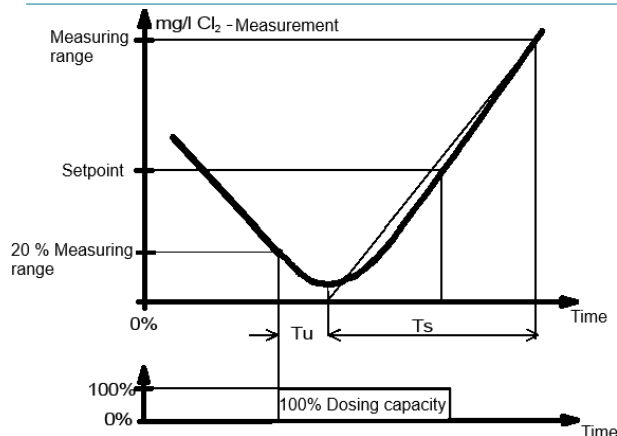


Fig. 16 Diagram adaptation

Auto tune is used to automatically determine the reaction times of the control system (loop dead time T_u and loop rise time T_s) and the resulting control parameters X_p and T_n .

The control parameters X_p and T_n determined by auto tune must be regarded as a recommendation for initial commissioning!

For maximum control quality, the control parameters X_p and T_n can be manually optimized.

Prerequisites are:

- Positioner on automatic (handwheel engaged)
- Dosing pump on automatic
- Calibrated Cl₂ measurement (zero point and DPD value)
- Loop dead time < 60 min
- Loop rise time < 480 min (8 h) for 0 to 100 % measurement range
- Distance consumption time < 480 min (8 h) from the current measured value to 20 % from 2x setpoint
- Correct menu setting of final value, effective sense (direct or inverse), actuator (e.g. servo motor), actuator running time (T_y)

Auto tune must not be started:

- With high fresh water addition
- When the measuring cell is not run in
- During cleaning work
- During filter backwashes
- In case of flow fluctuations

Start auto tune:

1. Measurement channel menu field "Cl2 single feedback control".
2. Settings icon .
3. Click on "Controller".
4. Click on "Auto tune".
→ The status and loop parameters Tu and Ts are displayed.
5. Click the "Start" button.
→ adaptation starts.



CAUTION



Danger of disruptions to the control system

Possible consequences:

Injury or property damage.

- The adaptation can take up to 13 hours, depending on the control loop.
- During this time, no disturbances must occur in the control system (e.g. filter backwashing, change in circulation capacity or strongly fluctuating bathing operation).

Depending on the choice of actuator, various status messages can be omitted. Likewise, different status messages also have different execution times. It is possible that some status messages are only shown in the display for a very short time or not at all due to the short execution time.

Status messages

Abort Completed

Dosing 0 %

Waiting for X = 20%

Dosing 100%

Measurement dead time

Measurement rise time

7.21.1 Completion of auto tune without errors

After the determination of the loop times (dead time T_u and rise time T_s) has been completed without errors, the calculation of the control parameters X_p and T_n begins. This is indicated by the "Auto tune ok" indicator.

The calculated parameters are entered in the menus. After completion of the auto tune, the measuring amplifier regulates with the newly calculated control parameters and continues to run in the selected operating mode (e.g. automatic).

To check the determined loop times, they are entered in the "Tu" and "Ts" menus.

If disturbances occur in the control loop during auto tune, incorrect loop times and thus also incorrect control parameters can result.

CAUTION



Danger of over or under chlorination

Possible consequence:
Injury or property damage.

- Executing the auto tune does not affect the remaining control parameters Y_{min} , Y_{max} and T_p .
- The control parameters X_p and T_n are determined for $Y_{min} = 0 \%$ (no base load) and $Y_{max} = 100 \%$ (no dosing capacity limit). If a base load Y_{min} or a dosing capacity limitation Y_{max} is required due to the system, it should be noted that this restricts the control range. There is a risk of over-chlorination (Y_{min} too high) or under chlorination (Y_{max} limited too strong).

7.21.2 Termination of auto tune with error

If disturbances occur in the control line during auto tune (e.g. filter backwashing, change in circulation capacity or strongly fluctuating bathing operation) or if the reaction times of the control system are too long, auto tune is stopped.



NOTE

If one of the error conditions listed below occurs, auto tune is aborted. The amplifier displays an error message. The "old" parameters Xp and Tn are not changed.

Error conditions that may occur

- Initial value not reached
(display: "T = > 8h")
 - After starting the adaptation and the dosing system has closed or the dosing pump has switched off, the measuring amplifier waits until the actual value has fallen below the initial value (0.2 x measuring range value). This waiting time is indicated by the display "2: X = 20 %" and may not exceed 8 hours.

- Loop dead time too high (display: "Tu = > 1h")
 - The value determined by a time measurement between the start-up of the dosing system or the switching on of the dosing pump and the increase in the actual value may not exceed 1 hour. This timing is indicated by "6: Tu!".
- Loop rise time too long
(display: "Ts = > 8h")
 - A measurement is used to determine the time it takes for the control system to increase the actual value to 50% of the measuring range at 100% of the dosing capacity of the dosing system or the dosing pump. This measurement is indicated by the display "9: Ts!" and may not exceed 4 hours.

Determination of the control parameters with known Tu and Ts times

If the loop times Tu and Ts are already known or cannot be determined automatically due to certain circumstances of the system, the loop times can be entered in the menus "Tu" and "Ts".

When saving Tu or Ts, the control parameters Xp and Tn are also calculated and entered into the menus.

7.22 Flocculation control

The electronic module enables the control of a flocculation pump. This outlet is used to control a dosing pump for flocculant dosing, for example.

- The dosing capacity in % is automatically calculated via the input parameters, dosing capacity of the pump and the addition of the amount of flocculant, which the flocculant output uses to dose the chemical.
- For reduced circulation, a second dosing capacity (e.g. 50%) is calculated at the same time. Both dosing capacities can also be entered directly. To activate the second dosing capacity (ECONOMIC), the "ECO Switching" function must be configured.
- When a dynamic circulation is detected, the dosing capacity of the flocculation pump is dosed linearly according to the measured flow signal.
An output for dosing pump 2P, pulse pump 2 or a continuous mA output (optional) is available for dosing.
Clock period, pulse rate or mA signal can be selected.



NOTE

Flocculation is only active if the measured pH value is within a defined range (6.00 to 8.00). These values can be set in the "Flocculation" menu.

If the pH measurement is not available, the flocculation function is not supported!

7.23 DIN monitoring function

The electronics module enables the output of a DIN monitoring function.

When activated, it is possible to:

- Generate a message,
- Assign a switching output that is switched when DIN monitoring is active.

Limit values can be activated and set for all available measurands – free chlorine (Cl₂ free), bound chlorine (Cl₂ generated), pH value, redox value and turbidity – and if they are exceeded or undercut, the DIN monitoring function is triggered.

The contact is activated when the following parameters of water quality according to DIN (German Industrial Standard) are reached:

Measurement variable	Limit values
Free chlorine (Cl ₂)	0.3 to 0.6 mg/l
pH	6.5 to 7.6
REDOX value	750 mV
Combined chlorine (Cl-N)	0.2 mg/l
Turbidity	adjustable
Hysteresis	Configurable for all measurements

These limit values can be set individually in the respective measuring range menu. The parameters of the DIN monitoring function can be optionally activated or deactivated.

Using the DIN contact

The DIN function can activate the ECO function via the internal ECO timer, DIN function or digital input.

The DIN contact can be used for the following functions:

- Release for circulation reduction in conjunction with a filter control.
- Visual signal "Water quality good/poor".
- Switching to ECO parameters via an adjustable digital input.



NOTE

The function is only available if chlorine, pH and REDOX measurement is available. If there is no Cl-N measurement or turbidity measurement, the DIN function is provided without a Cl-N reading. The DIN contact remains active even with "Regulator STOP" as long as the measured values are within the DIN limits.

7.24 ECO operation

The electronics module offers several options for switching to ECO mode. The following operating parameters can be changed:

- Switching to an alternative setpoint (ECO setpoint)
- Adjustment of control parameters (ECO parameters)
- Switching to CEDOX operation (if configured).

Typical applications are, for example, night-time operation, in which the circulation is lowered. In this case, the switch is made to ECO parameters, ECO setpoint or – depending on the setting – to CEDOX operation. The flocculant dosage is also automatically adjusted in ECO mode.

The ECO switch is configured via the "Application –> Functions" menu.

Switching Conditions for ECO operation

The switch to ECO operation can be initiated by the following conditions:

- Internal system conditions
- A configurable digital input
- A defined flow threshold value

A switching delay can be set individually.

- When switching via a digital input, this can be selected in the menu.
- In the case of flow-dependent switching, the threshold value at which the ECO operating mode is activated can be determined.

Triggering and timing

The ECO function can be triggered by:

- A digital input
- A timer
- The DIN function

Logical links between several release signals are possible.

The timer function allows the following settings:

- Start time and end time
- Day of the week
- Number of switches
- Single suspension of ECO switching.

Up to four timers can be configured.

7.25 Peak dosing

This function is mainly used as a supplement in combination with the CEDOX control or when low chlorine concentrations occur frequently. The "peak dosing" function can be used to ensure that even with low chlorine levels and compliance with DIN parameters, pool hygiene is ensured or algae growth is prevented.

By means of freely definable switching times, the electronic module can automatically control a higher chlorine value that can also be defined beyond the measuring range.

These switch-on times can be activated daily, weekly, bi-weekly, tri-weekly or every four weeks.

The duration of the high chlorination is freely definable and starts when the high chlorine setpoint is reached.

As a safety, a time limit is integrated, which defines the maximum duration for regulating this high chlorine value. If the high chlorine value is not reached during this time, the process is aborted and an error is displayed.

It is possible to switch off the limit value monitoring and the overall chlorine control during high chlorination.

Only after the chlorine value is back at the target value, the limit value monitoring and the total chlorine control are reactivated and the high chlorination symbol is no longer displayed.

As long as the high chlorination setpoint is approached and maintained, the status message is displayed as the operating mode symbol of the chlorine control system. The chlorine dosage then stops until the normal chlorine target value is reached again and the high chlorine symbol is no longer displayed.

7.26 CEDOX regulation

In this operating mode, the chlorine setpoint of a PI fixed value control system is continuously and automatically optimized in order to obtain a constant redox value. In this case, a Cl₂ setpoint is not set as usual, but the desired redox voltage is specified as the setpoint. A specially developed CEDOX mode determines the required amount of free chlorine in the water depending on demand. This internal chlorine setpoint is used to dose the disinfectant with the help of the PI fixed value controller. The variable or optimized Cl₂ setpoint must only be within the set limit values

Move "Min Setpoint" and "Max Setpoint".

**NOTE**

DIN 19643 (DIN = German Industrial Standard) prescribes the following Cl₂ limit values:

Min = 0.30 mg/l and Max = 0.60 mg/l

**NOTE**

The CEDOX control only works if the pH value does not deviate more than 0.30 pH from the pH setpoint.

The prerequisites for the CEDOX regulation are:

- Chlorine measurement and chlorine control
- pH measurement and pH control
- mV measurement

The CEDOX control concept is based on the following principle:

CEDOX Characteristic Curve System

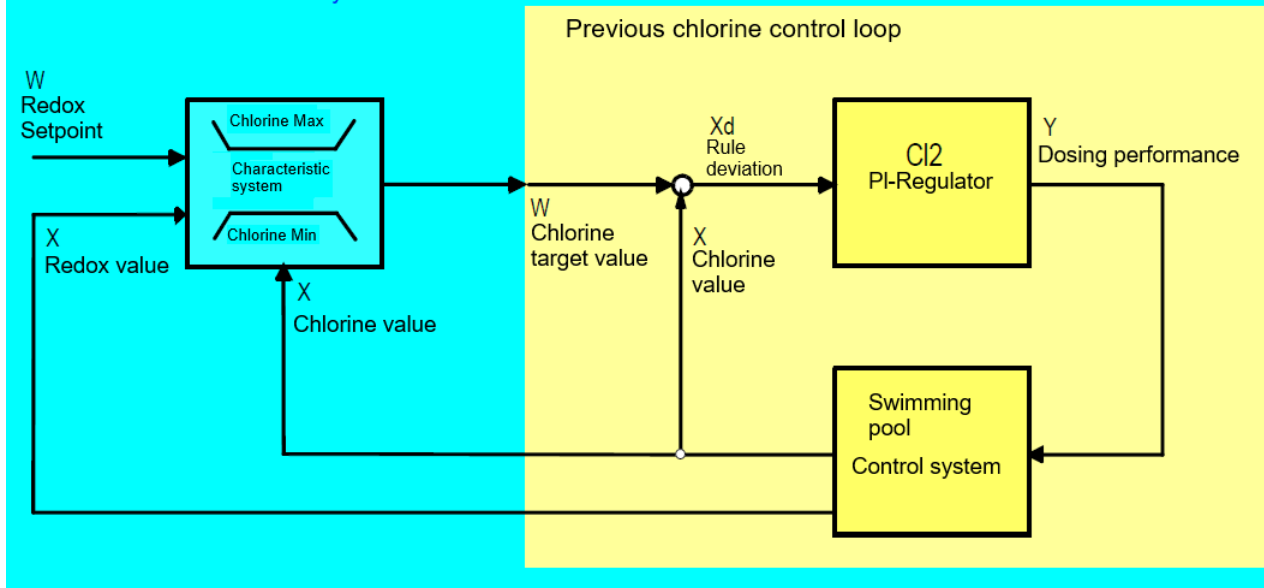


Fig. 17 CEDOX characteristic curve system

The following example diagram shows the operation of the CEDOX operating mode:

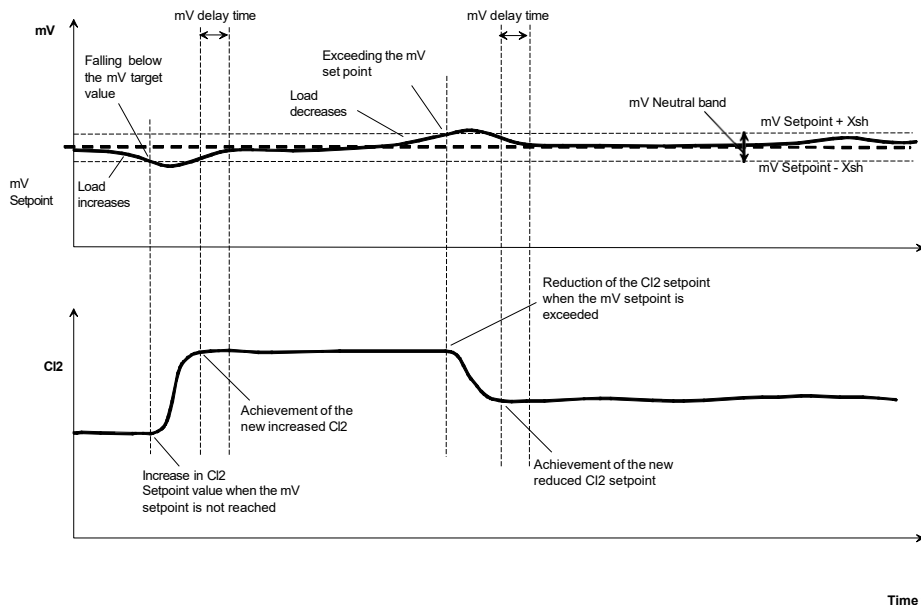


Fig. 18 Method of operation CEDOX mode of operation

Notes for the settings of the CEDOX control

- In the CEDOX operating mode, a redox setpoint is generally specified. A neutral band Xsh defines the maximum deviation from the mV setpoint that is permissible. If the deviation is greater than Xsh, the electronics module determines a new Cl2 setpoint.
- The parameter "mV delay time" defines the reaction time of the redox electrode and has a time delaying effect in the setpoint optimization of the chlorine control.
- The Cl2 setpoints determined by the CEDOX operating mode must only be between the limit values
Cl2 Min Setpoint and Cl2 Max Setpoint. If these setpoint limits are reached, it can cause the mV reading to deviate from the mV setpoint.

Instructions for commissioning and calibration of the CEDOX control system

- After calibration of the redox electrode, the setpoint optimization is out of service for two hours, as the redox electrode does not provide a reliable signal during this time.
- During this time, the electronics module regulates a fixed temporary Cl2 setpoint. This temporary Cl2 setpoint is the last Cl2 setpoint before calibration (can be changed manually).
- When calibrating the chlorine measurement, the electronics module automatically determines a new Cl2 setpoint if there are control deviations. By using CEDOX, the following is achieved:
- Reduction of disinfectant consumption (as much chlorine as necessary, as little chlorine as possible).

- Due to the optimally controlled Cl₂ setpoint due to the redox potential, the lowest necessary Cl₂ setpoint is always approached and thus disinfectants are saved.
- Optimisation of water quality, especially in swimming pools with strongly fluctuating loads (e.g. outdoor pools) or with long load breaks.

**NOTE**

CEDOX does not mean that disinfection systems can be designed smaller!

7.27 Boost dosing

Boost dosing serves to achieve a high disinfection capacity to combat increased microbiological contamination in the pool. The pH value must be in a range of pH 6.8 and pH 7.6. Boost dosing is started manually in the device if necessary. For this purpose, the desired chlorine content and the running time are selected. By pressing the "Start" button, dosing is done at full power at the beginning. Only in the further course is the chlorine content regulated to the specified target value. A short-term overdose is therefore possible. The dosage of larger amounts of chlorine causes a pH value shift. It must be ensured that sufficient pH corrective agent is available. After boost dosing, the pH value must be checked. The swimming pool must not be used again until the levels of free chlorine and pH are within the normal range. It is possible to switch off the alarms and the total chlorine control during boost dosing. Only after the chlorine value is back at the set value, the alarms and the total chlorine control are activated again and the symbol boost dosing is no longer displayed. After boost dosing, a filter backwash should take place to remove chlorine residues.

 WARNING	
	Risk of injury – Safety note on boost dosing Possible consequences: Serious injuries. - Boost dosing may only be carried out outside of bathing operations. During chlorination, access to the pool area is strictly prohibited in order to avoid health risks for bathers and staff. - Bathing operations may only be resumed when the values for free chlorine and pH value are demonstrably within the safe, standard-compliant range (for example in accordance with DIN 19643).

7.28 Safe calibration

When the function is activated, chemical dosing is automatically stopped as soon as a timeout is detected in the calibration menu. This prevents unintentional dosing during calibration.

7.29 Import and export parameters

The device settings can be backed up or restored via the "Settings Import/Export" submenu.

- Export
 - The settings file is saved as a ZIP file on a USB memory stick.
- Download
 - If there is network access, the file can be downloaded directly from the browser.
- Import
 - The settings file can be read from a USB memory stick.
- Select file
 - Alternatively, it can be uploaded directly via the browser. To do this, select the corresponding file and click on the "Upload" to start the import.

8 Interfaces



WARNING



Danger from unqualified personnel

Possible consequences:
Death or serious injury as well as significant property damage.

- For safe operation and to avoid serious personal injury, the device must only be installed by trained and authorized personnel.

8.1 USB interface

The electronics module is equipped with a USB interface that supports the following functions:

- **Firmware updates:**
Transmission of software updates to update the device software.
→ The current firmware file can be downloaded from the manufacturer's website.
- **Configuration data transfer:**
Export and import device configurations for backup and reproduction.
→ Use is only permitted for devices with identical configurations.



NOTE

The USB stick must be formatted as FAT32. The memory capacity should be between 1 GB and 32 GB. Use high-quality, industrial-grade USB flash drives with high write-cycle endurance and low access time.
Evoqua part number: W2T866279



NOTE

The USB interface may only be used for the above purposes.
Use with incompatible device configurations can lead to malfunctions, data loss or safety-related operational disruptions.

8.2 Firmware update (software version)

The device software (firmware) can be updated either via a USB memory stick or via an Internet browser using a network connection.

For details on how to carry it out, see chapter Installation – Firmware Update (Software Version).

The currently installed firmware version can be viewed in the system menu under "System Information" – "Software Information".



NOTE

The current firmware file is available for download free of charge from the manufacturer's website. A firmware update is only possible if the new version is higher or newer than the installed version. An update to an older version is not possible.

8.3 RS485 interface (optional)

The electronics module can be equipped with the optional "Rivo™ COM-Board USB 485" expansion board. This expansion board has a built-in RS485 interface.



NOTE

The expansion board is installed under the protective cover of the HMI.

The RS485 interface is used for data transmission to higher-level control systems or to other systems that support the Wallace & Tiernan RS485 protocol and Modbus RTU.

The interface is galvanically isolated.

For integration into a Wallace & Tiernan bus system, the following components are integrated:

- Connection terminals
- A terminating resistor Rt
- Two balancing resistors

The RS485 communication interface includes compatible data reference list of Wallace & Tiernan Depolox Pool and Depolox Pool E 700P and 3 Address operation MFA/PCS.

**NOTE**

Detailed information as well as the address reference list can be found in the installation instructions "Rivo™ Communication Interfaces" (article number W3T606371) and in the quick guide (article number W3T591365). Both documents can be downloaded from the manufacturer's website or requested directly from the manufacturer.

8.4 Ethernet interface

**NOTE**

This operating instruction does not deal with installation and commissioning in connection with routers or wireless routers. The responsibility for this lies with the operator.

- For security reasons, only authorized personnel should be allowed access to the device.
- Permanent insecure connections via the Internet or Wi-Fi are not permitted. Secure connections can be set up, for example, via a VPN-secured communication channel or an encrypted Wi-Fi connection.
- The electronics module only supports the unencrypted communication protocol "http" and is designed for operation in an Intranet (closed network).

An Ethernet port is integrated into the electronics module.

The built-in LAN interface enables data visualization with an Internet-enabled device and HTTP protocol or standard browser.

The LAN interface also supports data communication via Modbus TCP protocol with higher-level control systems.

Visualization and operation is carried out via the webserver integrated in the electronics module.

The on-site use of a wireless router in conjunction with the electronics module also enables wireless access via mobile devices such as tablets or smartphones.

In order to be able to access the websites of the electronics module with an Internet-enabled device and Internet browser, the IP address of the device must be entered in the address bar of the Internet browser.

The electronics module can be connected to a local network/intranet via the Ethernet connection.

Example of browser address input: 10.26.70.149:8080/slint

The IP address must be determined or requested by the network administrator.

The Ethernet interface supports 100 Mbps transmission speed.

The Ethernet interface is galvanically isolated.

The connection is made via standard Ethernet connection cables.

In order to be able to use pre-assembled Ethernet cables with connectors, a special M25 cable gland with slotted sealing rubber and larger feedthroughs is installed. The Ethernet plugs can be inserted through this fitting.

The Ethernet port is designed in accordance with IEEE 802.3. There is an RJ45 socket built into the HMI. Connecting to a network works with a patch cable (1:1) or a cross-over cable (crossed network cable). The LEDs are housed in the RJ45 socket. These show the interface states.

The connection works in the Auto-Negotiation mode. The data transfer speed and full or half-duplex are automatically set with the connected switch/HUB.

LED Color	Condition	Significance
green	illuminated	Ethernet connection is available
green	Flashing	Data is transferred
yellow	Off	10 Base-T
yellow	illuminated	100 Base-T

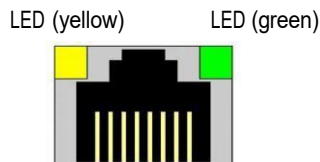


Fig. 19 Ethernet connection

8.5 Modbus TCP interface

The built-in Ethernet interface supports data communication via the Modbus TCP protocol. Various data points are available for data exchange (see reference list).



NOTE

Detailed information as well as the complete list of references can be found in the installation guide "Rivo™ Communication Interfaces" (item number W3T606371).

The installation instructions can be downloaded from the manufacturer's website or downloaded directly from the requested from the manufacturer.

9 Installation



DANGER



Danger or fatal injury caused by electric shock

Even when the operating voltage is switched off, dangerous external voltages can be present.

Possible consequences:

Death or serious injury.

- The electrical installation of the electronic module as well as all electrical work (e.g. installation of Rivo™ Flex modules) may only be carried out by authorised and qualified electricians.
- Work may only be carried out with equipment in a de-energized state.
- Work on live parts is not permitted.
- In the event of malfunctions, the device must be switched off immediately and secured against reconnection.



WARNING



Improper installation

Possible consequences:

Death or serious injury as well as significant property damage.

- The device works with liquids. The requirements of DIN EN IEC 62368-1 (formerly DIN EN 60950) must be observed for electrical connections in order to avoid risks from moisture and conductive media.
- All local installation regulations, general guidelines, technical data, building law requirements and the specifications of the responsible water authority or building law authority must be observed.
- In addition, all applicable national and local regulations must be observed.

9.1 Mounting location and environment requirements

 WARNING	
	Danger from fire or explosive substances Possible consequences: death or serious injury • The appliance must not be used in areas where flammable or conductive gases, vapours or dusts are present. • Smoking, open fires, welding work and work with flying sparks in the vicinity are prohibited.

9.1.1 Access and operating authorization

- The installation site must not be accessible to the public.
- Operation by untrained personnel must be excluded.
- The installation site must not be used as a permanent work place.

9.1.2 Environmental conditions

- The device must be protected from moisture, rain, frost, heat and direct sunlight.
- The device must not be mounted outdoors.
- The room air must not be condensing.
- The operating and ambient temperature must be between 0°C to +50°C (32°F to 122°F).

9.1.3 Mechanical requirements

- The device must not be exposed to strong vibrations, shocks, magnetic fields or electromagnetic radiation.
- The mounting wall must be vertical, load-bearing and level.
- The minimum room height must be observed.
- The device must be accessible and visible from the front and side for installation, operation and maintenance.

9.1.4 Ventilation

- Sufficient ventilation must be ensured.
- Air circulation must not be obstructed by installations.

9.1.5 Electrical connection

- The electronics module is not suitable for connection with permanently installed cable ducts.
- If the cable glands do not comply with local installation regulations, they must be replaced with suitable components.

9.2 Mounting the device

The electronic module and the flow module can be attached either to a mounting rail or by means of pan head screws for wall mounting.

Several devices can be mounted directly next to each other.

A special variant is available for installation in control cabinet systems.



NOTE

- The flow module must be mounted to the left of the electronics module.
- If both modules are mounted separately, sensor cable extensions with a maximum length of 30 m may be used. In doing so, attention must be paid to the correct cable specification (see chapter Spare Parts, Retrofit Kits and Optional Accessories – Plug-Cable Combinations for Sensor).

Required materials and tools:

- DIN rail (optional)
- Screws and dowels (mounting accessories)
- Drills
- Screwdriver



CAUTION



Danger due to unsuitable fastening material

Possible consequences: injuries or property damage

- Only the mounting accessories included in the scope of delivery must be used for installation.
- For attachment to solid construction walls, suitable dowels and screws or pan head screws are included in the scope of delivery
- When mounting on suitable lightweight walls, mounting material depending on the wall material must be used. This is not included in the scope of delivery and must be provided on site.

9.2.1 Mounting with DIN rail

Procedure:

1. Attach the mounting rail with the enclosed dowels and screws to a vertical, load-bearing and flat solid construction wall.
2. Attach the electronics module to the DIN rail in a right-aligned manner.
3. Attach the flow module to the left of the electronics module on the DIN rail.
4. Secure both modules to the solid wall at the bottom of the brackets with dowels and screws.

9.2.2 Wall mounting without mounting rail

**NOTE**

The drilling dimensions (in mm and inch) are applied to the back of the plastic housing. The housing back panel can be used as a drilling template.

Procedure:

1. Attach pan head screws with dowels to a vertical, load-bearing and flat solid construction wall.
2. Attach the electronics module and flow module to the pan head screws.
3. Secure both modules to the solid wall at the bottom of the brackets with dowels and screws.

9.2.3 Assembly drawing

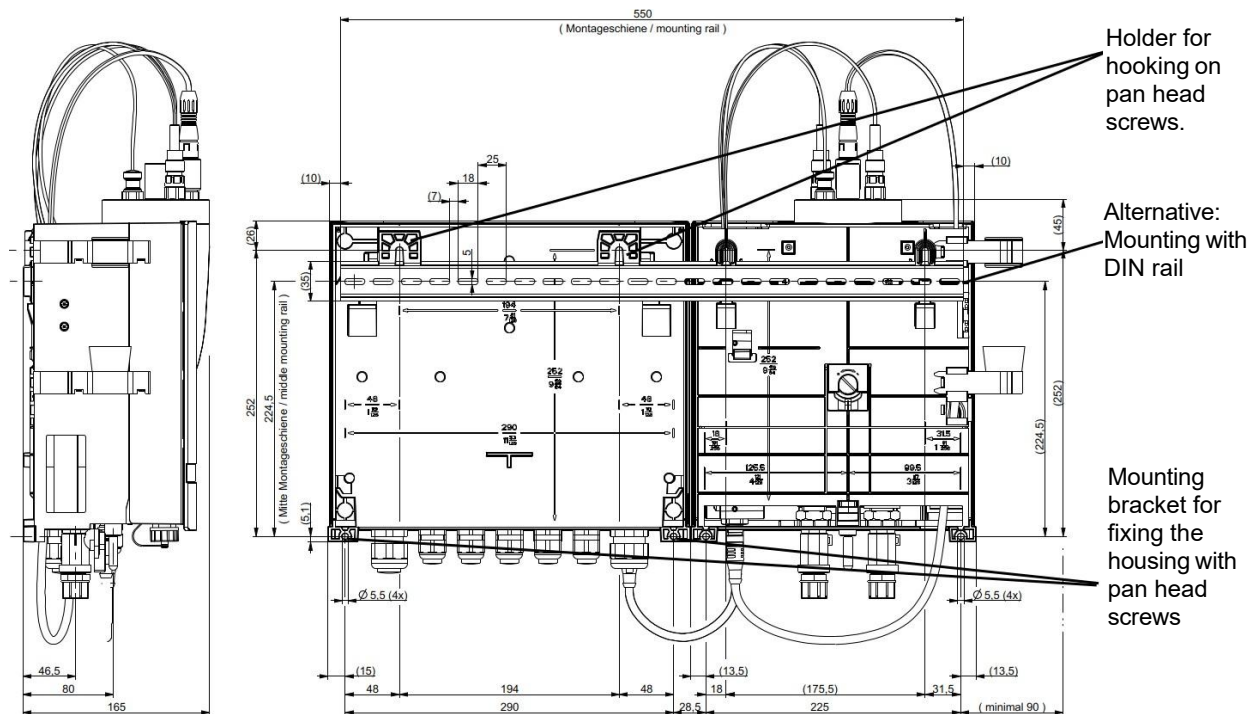


Fig. 20 Flow module and electronics module

9.3 Remove the housing cover and setting up

9.3.1 Remove the housing cover

Procedure:

1. Use suitable tools to loosen the four screws on the housing cover.
2. Carefully lift and remove the housing cover.
3. Attach the housing cover to the brackets provided on the base housing.



NOTE

In the housing, two strain relief cables serve as mechanical restraints that secure the lid when opened and can be released for disassembly if necessary.

9.3.2 Putting on the housing cover

Procedure:

1. Carefully unhook the case cover from the brackets on the base case.
2. Place the housing cover on the base housing and align it correctly.
3. Tighten four housing screws hand-tight.
 - Maximum torque: 0.7 Nm
± 0.15 Nm

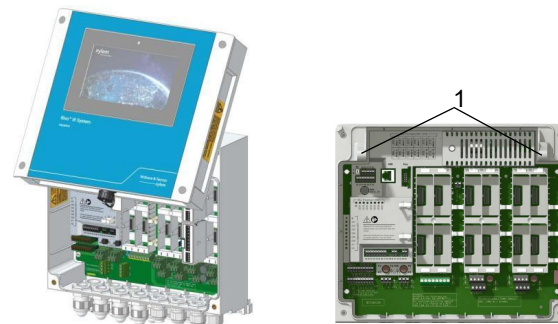


Fig. 21 Hook in the case cover – brackets for illustration.

- 1 Brackets on the base housing

9.4 Installation and retrofitting of Rivo™ flex module

ATTENTION

Risk of equipment damage

Possible consequence: considerable property damage.

- The "Rivo™ Flex Mod" modules and the HMI must not be plugged in or out when the power supply is switched on.

Procedure:

1. Disconnect the electronics module from the power supply.
2. Check that the electronics module is de-energized.
3. Remove the housing cover of the electronic module.
4. Plug modules into the module slots provided.
5. Make sure that the blue module lock is engaged or pushed down.



NOTE

The positions of the modules must be selected according to the selected application. Depending on the requirements, modules can be optionally installed or retrofitted.

Module configuration for 1 basic application

Measuring modules

Mod 1	Rivo™ Flex Mod mV (REDOX measurement)
Mod 2	Rivo™ Flex Mod DIS (Total Chlorine Measurement)
Mod 3	Rivo™ Flex Mod CON (Conductivity Measurement)
Mod 4	Rivo™ Flex Mod 2AI (mA Signal input)

Output modules

Mod 5	Rivo™ Flex Mod 2AO-mA
Mod 6	Rivo™ Flex Mod 2AO-mA
Mod 7	Rivo™ Flex Mod 2REL-FB Rivo™ Flex Mod 2AO-mA
Mod 8	Rivo™ Flex Mod 2REL-FB Rivo™ Flex Mod 2AO-mA
Mod 9	Rivo™ Flex Mod 2REL-2DO Rivo™ Flex Mod 2SREL
Mod 10	Rivo™ Flex Mod 2REL-2DO Rivo™ Flex Mod 2SREL
Mod 11	Rivo™ Flex Mod 2REL-2DO Rivo™ Flex Mod 2REL-FB Rivo™ Flex Mod 2SREL
Mod 12	Rivo™ Flex Mod 2REL-2DO Rivo™ Flex Mod 2REL-FB Rivo™ Flex Mod 2SREL

6. Route the connection cables into the hosing through the cable glands.
7. Use the cable holders to route the cables to the required module and make connections to the module.
8. Tighten the cable gland.
9. Ensure that all cable glands are installed correctly.
10. Turn on the power supply.
11. When the device has booted a scan must be carried out. To do this, open System Menu -> "System Setup" -> "Hardware" and press the "Scan" button. Accept any changes.
12. After the hardware scan, check in the application settings under Measurements or check or activate available measurements.

**NOTE**

To remove a module, pull the blue module lock upwards and carefully remove the module.

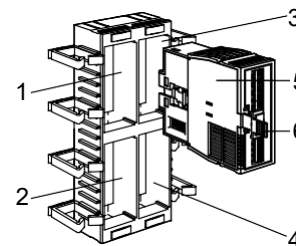


Fig. 22 Example – Cut-out module slots

- | | |
|---|--|
| 1 | Module Slot 1 |
| 2 | Module Slot 2 |
| 3 | Module Slot 3 |
| 4 | Module Slot 4 |
| 5 | Module |
| 6 | Module lock (blue) – to secure or release the module |

9.5 Removing the plastic insulation of the battery

ATTENTION

Remove the discharge protection film

Possible consequence: malfunction or device failure
During initial commissioning, the discharge protection film of the lithium coin cell must be removed from the HMI.

This is the only way to activate the buffer battery, which ensures that the time is maintained in the event of a power failure.

Procedure:

1. Use a non-conductive pin to fix the battery in the battery holder.
2. Carefully pull out the anti-discharge film to the left sideways.
 - Make sure that the battery is not pulled out with it.
3. Set or check the date and time when commissioning.

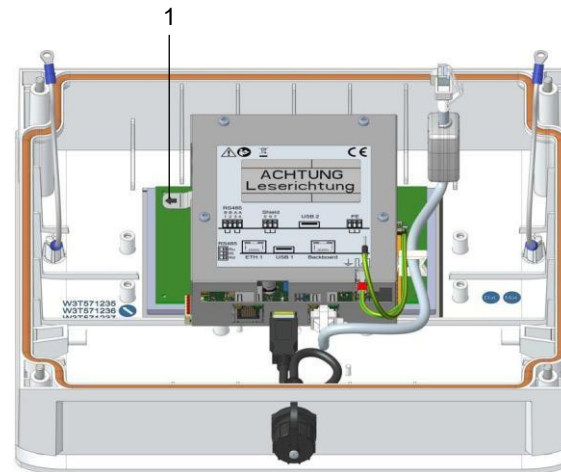


Fig. 23 HMI (Inside view of the housing cover)

- 1 Discharge protection film of the lithium button cell.

9.6 Connect the ethernet cable



NOTE

- The cable glands on the electronics module are pre-assembled at the factory.
- Only one Ethernet cable can be connected – the M25 gland on the left side is intended for Ethernet connectors.
- Blind plugs are used at the factory for sealing, which must be removed during installation in order to be able to connect cables.

Procedure:

1. Remove the blanking plug from the M25 cable gland.
2. Insert the Ethernet cable into the housing through the M25 gland connection.
3. Connect the Ethernet cable to the HMI according to the connection diagram.
4. Other cable glands can be used freely.
5. Matching multi-sealing inserts (4×5 mm, 2×6 mm) are included in the accessories.

9.7 RS485 interface (optional)

The device can optionally be connected to the expansion board "Rivo™ COM-Board USB 485". This extension provides an RS485 interface.

There are several communication protocols to choose from, including:

- Wallace & Tiernan Protocol
- Modbus RTU

The protocols are selected and configured via the corresponding menu in the device system.



NOTE

Details on the RS485 interface and the address reference list can be found in the installation instructions "Rivo™ Communication Interfaces" (article number W3T606371) and in the Quick Guide (article number W3T591365). Both documents are available on the manufacturer's website or on request.

9.8 Electrical installation

The electrical connection of the electronic module shall be made exclusively in accordance with the connection diagrams in the Wiring Diagram chapter.

 DANGER	
	Danger to life due to electric current Immediate danger from electric current! Danger to life due to contact of live parts. Possible consequences: Death or serious injury as well as significant property damage. • Dangerous external voltages can also be present when the operating voltage is switched off. • Before opening the electronic module, switch off all poles and secure against re-switching. • The connection may only be made by qualified electricians. • The connected load values must match the information on the nameplate.

 WARNING	
	Risk of injury and property damage Possible consequences: injuries as well as considerable property damage. • Installation, connection work and opening of the housing may only be carried out by authorised and qualified qualified electricians. • National and local safety regulations must be complied with. • The electronic module may only be operated when the housing is completely closed. • The electrical connection must be made exclusively in accordance with the supplied connection diagram and in compliance with all relevant safety regulations. • The electronics module has no power switch and is ready for use as soon as voltage is applied. • An external power or circuit breaker with a clearly recognizable "off" position must be provided and installed directly next to the electronics module.

**WARNING****Connection conditions****Wiring of the mains connection terminals:**

- External miniature circuit breaker max. 20A
- Cable cross-section up to 5.5A load current min. 0.75mm² (AWG18)
- Cable cross-section up to 9.5A load current min. 1.0mm² (AWG16)
- Max. current carrying capacity per terminal 10 A (UL/CSA 10A)
- Self-current consumption 0.5A

Wiring of the X35 and X36 distribution terminals:

- External miniature circuit breaker max. 20A
- Cable cross-section up to 6A load current min. 0.75mm² (AWG18)
- Cable cross-section up to 10A load current min. 1.0mm² (AWG16)
- Cable cross-section up to 16A load current min. 1.5mm² (AWG14)
- Max. current carrying capacity per terminal 16 A

Note: In the case of additional supply of external loads, the total connected load increases accordingly.

**WARNING**

- Miniature circuit breakers:
Only use miniature circuit breakers with trip characteristic C.
- Pipe cross-section must comply with national and local installation regulations.
- When connecting components (e.g. motors, pumps) and entering operating data, the components must be switched off to avoid uncontrolled start-up or malfunctions.
- The connected cables must be designed to be temperature-resistant according to the ambient temperature:

Ambient temperature**Minimum cable heat resistance rating**

< 30 °C

≥ 60 °C

< 40 °C

≥ 70 °C

> 40 °C

≥ 80 °C

- Terminals are only suitable for connection with copper conductors.

**WARNING****Handling and environment**

- The Rivo™ Flex modules and the HMI may only be plugged or unplugged when the power supply is switched off.
- Plugging or unplugging under voltage can lead to defects in the electronics.

**NOTE****Installation Note**

- The electronic module is not suitable for connection via permanently installed cable duct systems.
- Cable glands that do not comply with standards must be replaced by suitable components that comply with regulations.
- The electronic module has a flexible supply input and accepts AC voltages from 100 to 240 V.
- The power consumption of the electronics module must be taken into account when designing the installation.
- The correct polarity of the voltage connections and the correct dimensioning of the cable cross-sections must be ensured in accordance with the applicable regulations.

9.9 Installation steps

The electrical installation is carried out in the following steps:

1. Remove the housing cover of the electronic module.
2. Unhook any existing strain relief cable to secure the housing.
3. Connect the power supply according to the connection diagram.
4. Optional: Install and connect "Rivo™ Flex Mod" modules according to the information in the chapter Installation – Installation and Retrofitting of Rivo™ Flex Modules and according to the connection diagram in the chapter Connection diagram .
5. Connect the HMI and "Rivo Backboard 12" according to the connection diagram .
6. Ensure that all cable glands are installed correctly.
7. Remove the discharge protection film of the lithium coin cell on the HMI.
 - See chapter Installation – Removing the plastic insulation of the battery.
8. Put the housing cover back on.
9. Put the electronics module again into operation.



NOTE

Module scan on configuration change

If the module configuration is changed, a scan must be performed.

Menu path:

"System Preferences" => "Hardware" => button
Click on "Scan" (hardware).

The device scans the changed module configuration and automatically configures itself accordingly.

Safety shutdowns

For safe operation, we recommend switching off the dosing pumps for chlorine and, if necessary, pH via an alarm contact. This contact can be used as "Chlorine Max Alarm", "pH Min Alarm" or "pH Max Alarm". See also connection example "Safety shutdown" in the connection diagram.

In the event of a fault, the chlorine and pH dosing is automatically switched off to prevent incorrect dosing of chemicals and to ensure system safety.

Another possibility for emergency shutdown would be via digital input and controller stop function.

9.10 Firmware update (software version)

The firmware update (software version) can be performed via a USB memory stick, a web browser or an Ethernet connection.



NOTE

- The firmware file is available for download free of charge from the manufacturer's website.
- There is no need to download and upload the device configuration.
- The device automatically adopts the previous configuration after the update.
- The currently installed firmware version can be viewed in the "System Information" menu.
- Before updating, make sure that the electronics module is set to the current date and time.
- The update process can take several minutes.

**NOTE**

The firmware file is available for download under the following file name:

EAE1283-RivoOS-x.x.x.rvup

(x.x.x stands for the respective software version)

9.10.1 Firmware update via USB memory stick

**NOTE**

The USB memory stick must have a storage capacity that is at least equal to the size of the firmware file.

Procedure:

1. Copy the firmware file to the USB memory stick. → Do not use subdirectories!
2. Insert the USB memory stick into the USB socket on the bottom of the device.
3. Log in as administrator.
4. Open the System Update menu and press the Update button.
5. Follow the on-screen instructions.
6. The device will perform an automatic restart.

7. The firmware update starts.
 - The LED above the display flashes during the update.
 - After completion, the device will reboot.
8. Remove the USB flash drive.
9. Check the menu to see if the new firmware version is displayed.
10. Check settings and adjust them if necessary.

9.10.2 Firmware update via web browser

Procedure:

1. Copy firmware file to a drive.
2. Log in as administrator.
3. Open the System Update menu.
4. button "Select file" and select the firmware file from the drive.
5. Follow the on-screen instructions.
6. The device will perform an automatic restart after the firmware update.

10 Commissioning



WARNING



Danger from unqualified personnel and incorrectly connected devices

Possible consequences:

Death or serious injury as well as significant property damage.

- Safe and successful commissioning requires extensive knowledge of the connected equipment and machines, in particular with regard to:
 - Operation, electrical load connected, measurement signals, cable assignment, fuse and safety regulations
- The commissioning of the electronics module may only be carried out by trained and authorised qualified electricians.
- Incorrectly connected devices can be damaged or destroyed when turned on or during operation, causing malfunctions in other systems.



WARNING

Danger of confusion with cables

- Measurement and control cables must not be confused or brought into contact with each other.
- Lines under voltage must never be connected or disconnected.



DANGER



Danger of injury or death!

Possible consequences:

Death or serious injury.

- The electronic module must not be operated with flammable liquids.

 DANGER**Danger to life due to electric current**

Even when the operating voltage is switched off, external voltages can be present.

Possible consequences:

Death or serious injury.

The electronic module does not have its own power switch and is active as soon as the supply voltage is applied.

- An external switch or circuit breaker with clearly recognizable "OFF" position is required.
- This external switch or protective switch must be installed directly next to the electronics module.

10.1 Check software status and instructions

The following steps must be taken before commissioning:

1. Checking the software and firmware version:
The currently installed version can be viewed via the device menu "Information -> Software". In case of deviations from the recommended Please download the appropriate version at: <http://qr.evoqua.com/bfMd9w>



2. Using the digital operating instruction:
For safety-relevant information and up-to-date content, the use of the original digital operating instructions is recommended.
Access: <http://qr.evoqua.com/bgQt7W>



10.2 Initial and recommissioning



NOTE

Before commissioning, the operating and installation instructions must be read in full and carefully checked.



NOTE

At the time of delivery, the language setting of the electronics module is set to English by default.

The following work steps are to be carried out before the first commissioning as well as after maintenance work or system changes.

Item	Work steps	Note
1.	Install flow module and electronics module	with or without DIN rail
2.	Install an external switch or circuit breaker with the "OFF" identified	right next to the electronics module
3.	Optional: Installing fine filters	only for the flow module
4.	Optional: Install an strainer	
5.	Optional: Install pressure booster pump	if the inlet pressure is too low

Item	Work steps	Note
6.	Optional: Installing pressure reducing valve	if the inlet pressure is too high
7.	Installing Shut-off Ball Valve	only for inclined flow valve
8.	Sample water inlet and outlet	with fixed screw connection or with hose connection
9.	Prepare DEPOLOX®-R: • Remove felt ring • Remove and replace transport plugs • Fill electrode cleaning sand	only with DEPOLOX®-R flow-through module
	DEPOLOX® Pool-R preparations: • Fill electrode cleaning sand	only with DEPOLOX® Pool-R flow-through module
10.	Prepare sensors according to the instructions	
11.	Installing sensors in the flow through adapter	

Item	Work steps	Note
12.	Optional: Install and lock Rivo™ Flex modules in the corresponding module slots	
13.	Optional: Connect the Rivo™ Cable Kit to the Rivo Flexboard	
14.	Optional: Connect impedance converter for pH and mV sensors	only when the sensor lines are extended
15.	Optional: Wiring the plug-cable combination for sensor according to the connection diagram	
16.	Optional: Install and configure the USB interface, "Rivo™ COM-Board USB 485" and Ethernet interface	
17.	Check sample water monitoring is active	
18.	Integrate or activate safety shutdown	

Item	Work steps	Note
19.	Check circulation or flow monitoring	
20.	Putting the electronics module into operation	see chapter 10.3

10.3 Commissioning of the electronic module



NOTE

- The electronic module may only be operated with the supply and control voltages specified in the technical data and on the nameplate.
- Before commissioning, check whether a current firmware version is available. Updates can include security-related improvements, bug fixes, or functional enhancements.
- The latest software and operating instructions are available in the download area of the manufacturer's website under www.xylem.com.
- For details on how to perform the update, see chapter Installation – Firmware Update (Software Version).

The following steps are used to commission the electronics module.

Item	Work steps
1.	Ensure that all modules supplied for the operation of the device are correctly installed and connected.
2.	Turn on the power supply
3.	☰ Open system menu and select language (no password required)
4.	Login as administrator
5.	Check the installed software version: ☰ Open System Menu – > select "System Information"
6.	Start System Configuration ☰ Open System Menu Select operating mode (manual or automatic), ensure that no uncontrolled dosing takes place.

Item	Work steps
7.	Configuring Application Settings - Enter "Application Menu" -> > -> ⋮ -> "Basic Settings" -> "Application Name" -> system name. "Alarm configuration" -> select alarms "Functions" -> define input/output connections and special functions
8.	Enter System Preferences - Basic Settings - Enter "Settings Menu" > -> "System Setup" -> "General" -> device name. - Enter "Time configuration". - Enter "Global unit settings". - Select "Calibration" -> "Secure calibration". - Configure hardware - Configuring Digital Outputs, Digital Inputs, and Analog Outputs - Set up connections
9.	Setting up user management User login and enable password protection

Item	Work steps
10.	View System Information • Check installed software versions and serial numbers • Menu - Open System Information
11.	Perform a scan and check I/O modules •  Open System Menu → "System Setup" → "Hardware" → "Scan" • Verify that all Rivo™ I/O modules have been detected
12.	• Application Settings for measurement and control • Enable or disable measurement 1 and 2 • Activating or deactivating the control of measuring channels 1 and 2

Item	Work steps
	• Controller type for measuring channels 1 and 2 • Positions • Configuring mA outputs (optional) • Configuring the Signal Input for Flow • Configure measurement channels 1 and 2 (measuring range, unit, etc.) • Setting the dosage and control parameters for measuring channels 1 and 2 • Perform the first positioner calibration (if necessary)
13.	Make other settings • Configure digital inputs and alarms as needed • Configure interfaces • In "Hand" mode, check all dosing devices for correct function • Test safety shutdowns • Finally, configuring user management

11 Decommissioning



WARNING



Danger from unqualified personnel

Possible consequences:
Fatal or serious injuries as well as significant property damage.

- For safe operation and to avoid serious personal injury, the device may only be taken out of operation by trained and authorized specialists.



NOTE

The corresponding operating instructions for the flow valves and sensors must be observed.



WARNING



Danger from chemicals

Dosing fluids are corrosive and oxidizing.

Possible consequences:
Death or serious injury.

- Observe safety regulations and prescribed protective clothing when handling chemicals.
- All instructions in the product data sheet of the dosing medium used must be observed.

Procedure:

1. De-energize the electronic module.
2. Decommission sensors.
3. Decommission flow valves.
4. Disconnect all cables from the electronics module.

12 Operation

12.1 Introduction

 DANGER	
	Danger to life due to electric current Even when the operating voltage is switched off, external voltages can be present. Possible consequences: Death or serious injury. The electronic module does not have its own power switch and is active as soon as the supply voltage is applied. • For safe disconnection, an external switch with clearly recognizable "OFF" position.

The electronics module is operated via the menu navigation with display and control elements as well as symbols on the touchscreen. This chapter describes the menu structure and the functions of the individual controls.

For the first login and after a factory reset via the recovery key, the factory-specified app default credentials are required.

See chapter Operation – Initial Registration.

ATTENTION
Damage to the touchscreen Touching the touchscreen with pointed or sharp objects and abruptly tapping hard objects can damage the glass surface and impair the function of the device. Possible consequence: Considerable property damage. • The touchscreen may only be operated with your finger or a suitable operating pen for touch panels.

12.2 Display and control elements

The color touch display serves as the central display and control unit of the electronics module. It displays operating states, parameters and system messages and enables inputs via the touch-sensitive interface.

The displayed content depends on the connected measurement modules and their configuration.

Alternatively, the electronics module can be operated remotely via an Ethernet connection with an internet-enabled terminal and a standard web browser.

The web-based interface corresponds to the local display and control unit.

User login is required to access settings features and change operating modes.

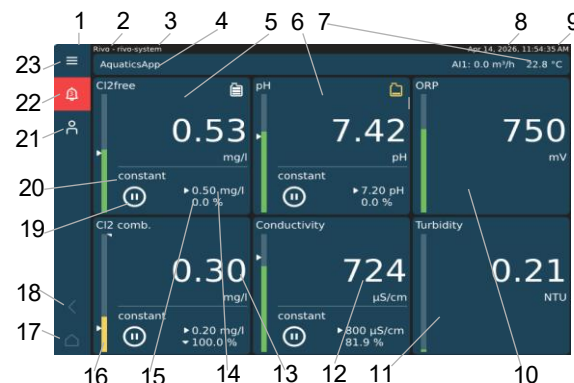


Fig. 24 Main display (example)

- 1 Menu bar
- 2 Rivo (Rivo cannot be changed)
- 3 Device name (individual input)
- 4 Application Bar
- 5 Free Chlorine measuring channel menu field (mg/l) (depending on the measurement module)
- 6 pH measuring channel menu field (depending on the measurement module)
- 7 Temperature display and unit (°C/°F and L/h)
- 8 Date
- 9 Time
- 10 REDOX measuring channel menu field (mV) (depending on the measurement module)

- 11 Turbidity measuring channel menu field (NTU)
- 12 Conductivity measuring channel menu field ($\mu\text{S}/\text{cm}$)
- 13 Example: Total chlorine value display (mg/l)
- 14 Control setpoint
- 15 Feed rate of control output
- 16 Bar graph display with limit value indication
- 17 Home button (main display)
- 18 Back button
- 19 Operating mode (example: automatic operation) in stop
- 20 Status sample water flow stop
- 21 Log in
- 22 Alarm – status
- 23 System Menu

12.3 Abbreviations

Menu display	Significance
DIS	Measurement of disinfectants free chlorine
pH	pH measurement
ORP	REDOX Measurement
DIS_M	Total chlorine measurement with membrane sensors
Cond	Conductivity measurement
AI 1	Measurement of up to two sensors or input signals with mA or V measurement signal

12.4 Menu bar

The menu bar is located on the left side of the display and is visible at all menu levels. The following functions can be accessed via the menu bar:

- System menu
- Alarm messages (display/acknowledgement, ACK)
- User Login
- Jump back one level
- Return to main display

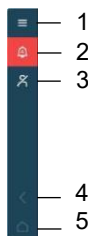


Fig. 25 Menu bar (section of the main display)

- 1 System Menu
- 2 Alarm messages (ACK)
- 3 Sign Up
- 4 Back button
- 5 Home button (main display)

12.5 System menu

The system menu includes the central functions for configuration, control and management of the electronics module.

It is hierarchically structured and divided into several sub-menus, which are described individually below.

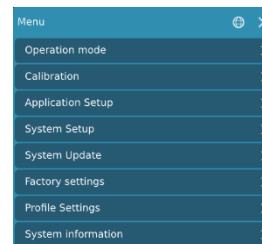


Fig. 26 View system menu

Overview of submenus

Submenu	Function and description
 Language selection	Choice of languages: English (US), German, Čeština, English (British), Español, Français, Russian, Dutch, Polski, Svenska, Chinese
Operating mode	Selection of the desired operating mode
Calibration	Settings for temperature, Flow, DIS, pH, ORP, DIS_M, Cond, and AI2
Application Setup	Overview, alarm configuration and function assignment
System Setup	Basic settings, hardware parameters , connections, and Settings Import/Export
System Update	Software and firmware update
Factory Settings	Reset the application settings to factory settings
Profile Settings	Change passwords and configure users
System Information	View version data, software version, Yaml information, and licenses

12.6 Menus, icons, and buttons

Menus, icons and buttons either have pure display functions or trigger a stored function or selection. Input fields are used to enter, change and store values.

Symbol	Significance
	System Menu
	Alarm - ACK
	Log in / Log out
	Back button
	Home-Taste
	Select operating mode
	Automatic mode Symbol blue = automatic mode inactive Symbol green = automatic mode active
	Operating mode: manual operation Symbol blue = manual operation inactive Symbol green = manual operation active

Symbol	Significance
	More information
	Removes the selected object or selected data.
	Calibration Archive
	Calibration
	Calibration settings
	Trend View
	Settings
	Open detailed view
	This means that all active alarm messages are irrevocably acknowledged.
	Set up users
	Calibrate

12.7 Registration and user management

The login to the electronics module is done with the factory-preset access data – "App Default" and enables the first system access. User accounts with roles and authorizations can then be set up.

After a factory reset, the recovery key is required to access the system again with the default data.

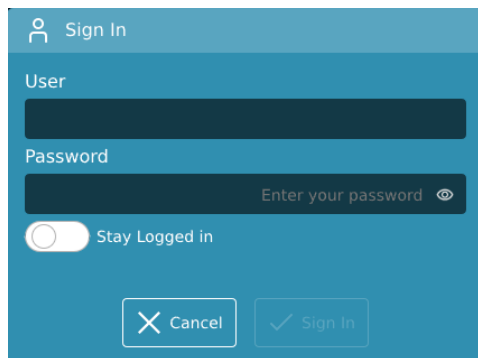
A screenshot of a mobile application's login screen. At the top, there is a header bar with a person icon and the text "Sign In". Below this, the word "User" is displayed above a dark blue rectangular input field. Underneath, the word "Password" is displayed above another dark blue rectangular input field. To the right of the password field, there is a small eye icon. Below the password field, there is a toggle switch that is currently turned off, followed by the text "Stay Logged in". At the bottom of the screen, there are two buttons: a "Cancel" button with a white 'X' icon on a blue background, and a "Sign In" button with a white checkmark icon on a blue background.

Fig. 27 Registration window

12.7.1 Initial registration

ATTENTION

Unauthorized access

Possible consequences: property damage

The factory access data is only valid for the first login or after a reset to factory settings.

The factory password must be replaced with a custom password immediately after the first login to prevent unauthorized access and possible damage to the system or data.

Requirements for the first registration

The access data can be found under the heading "App Default" on the following labels:

- "Default System Information" (bottom of the case cover, next to the USB port socket)
- "Important System Information" (enclosed in the case)

App Default – Access Data:

- Username: admin
- Password: factory preset (see sticker on the bottom of the lid)
Required for the first login and after each factory reset via the recovery key.

Procedure:

1. Click on the "Login and Logout"  icon.
2. Click on the "Login" button.
3. Under "Select user", select the user Admin and confirm with OK.
4. Enter the factory password in the "Password" field (see the "App Default" section on the labels).
5. Click on the "Login" icon to complete the registration.

6. Open the profile settings menu and assign a new password.
 - Minimum requirements: 8 characters, combination of upper and lower case letters, numbers and special characters.
7. Enable the "Stay Logged in" option to stay logged in after closing the application.

**Note on user management**

- The initial configuration must be performed by a user with the Administrator role.
- Other user accounts can only be set up by the administrator.

12.7.2 Password protection & user management

After the initial login, additional user accounts can be created with individual passwords and roles with defined authorizations can be assigned. This enables safe and controlled use of the electronics module by different user groups.

Prerequisites

- The initial configuration of the electronics module must be carried out by a person with the Administrator role.
- Additional user accounts can only be set up by the administrator.
- New passwords must be at least 8 characters long and contain a combination of uppercase and lowercase letters, numbers and special characters.



Note on user management

- Roles and authorizations must be assigned according to the tasks of the respective users.
- Passwords must be changed regularly to ensure system security.
- The administrator is responsible for setting up and maintaining the user accounts.

12.7.3 User roles and permissions

Three user roles are available, each with different permissions.

User role	Meaning and rights	Write Access
Administrator	Read rights for all settings	Calibration Easy to use Position Operating-Modes (for example, Operating mode)
Administrator	Default user: admin / password set by the factory, must be changed after the initial login. Read rights for all settings	User Assignment Configurations Applications Factory Reset Configuration System Type
Operator	Read rights for all settings	All Settings Setup Operating-Modes Calibration

Procedure to set up new users:

1. Click on the "Login and Logout" icon.
2. Open the profile settings menu and click the User Management button
3. Click the icon .
4. Create a new user and enter the following information and then confirm:
 - Name (of the user)
 - Password
 - Confirm Password
5. Click the icon  and assign a user role. The following roles are available:
 - Manager - Limited operating rights
 - Administrator - Extended Operating and Maintenance Rights
 - Operator - Full access including system configuration
6. Click the **Apply** button to accept the entries.

12.7.4 Log out

Logging out ends the current session on the electronics module and protects it from unauthorized access.

- You can unsubscribe manually at any time using the "Login and Logout" icon.
- If the user remains inactive for an extended period of time, the system automatically ends the session and logs the user off.

Procedure:

1. Click on the "Login and Logout" icon.
2. Click the Log Out button.

12.7.5 Reset password

**NOTE**

If the access data has been forgotten, the system can be reset using the recovery key. The factory password is required for the recovery process.

The recovery key is on the label "Important System Information" (included).

After the recovery process, the factory access data is valid again and must be changed again.

Procedure:

- If access data is no longer known, enter the wrong PW
- Press "Restore"
- Recovery key of the included sticker
Enter "Important System Information"
- Press the "OK" button Then create a new user.

12.8 Application bar

The application bar is located at the top of the main display.



Fig. 28 Application bar (cut-out main display)

Clicking on the application bar activates the bar and displays the following icons:

Symbols	Significance
	Alarms - ACK confirm alarm messages
	Open trend view
	Application menu: • Basic Settings • Measurements • Features • Alarm Configuration

12.9 Operating mode

The Operating Mode menu allows you to choose between automatic and manual operation of the electronic module.

The bumpless transfer option supports trouble-free switching between operating modes.

The setpoint is displayed for checking.

When selecting operating mode = Manual, a dosing time (hours, minutes, seconds) and a dosing value can also be set to precisely control the dosing.

After the time has elapsed, the system switches to the operating mode set under Next operating mode

If no dosing time is selected in manual mode (0:00:00), the device will run continuously in the selected operating mode.

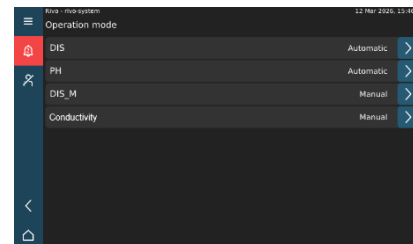


Fig. 30 Example operating mode

12.10 Calibration

The calibration menu includes various sensors and functions. Each menu item offers specific options for performing, managing and documenting the calibration.

There are two ways to access the calibration of the individual measurements via the dashboard: Press the corresponding measured value and then press the calibration symbol.

Press the menu icon and select calibration. Then select the appropriate measurement to be calibrated.

The calibration of the individual measurements is described in Chapter 13.

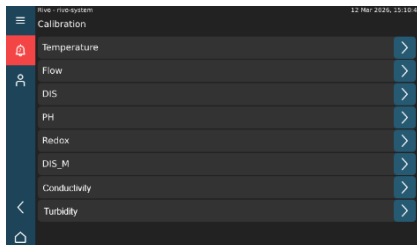


Fig. 31 Example calibration

12.11 Data logger

The Rivo™ system has an integrated data logger that records all measured values with a fixed sample rate of two minutes. The recorded data is stored in a circulation archive with a duration of one year. After this time, older data is automatically deleted from the archive.

12.12 Archive data export

Data can be exported via a USB drive or via network access via a web browser. For this purpose, a corresponding download function is available in the trend diagram.

Procedure:

1. Open trend chart.
2. Select time interval (30, 60 or 90 days or define age-native customer-specific time interval).
3. If download to USB memory stick is desired:
 - Insert the USB memory stick into the USB interface.
4. To download, select the "Export to USB" or "Download" function.
 - The data is exported to a csv file.
 - The archive file contains all main measurements, temperature, dosing capacities and the switching states of the available digital inputs.

13 Calibration

13.1 General

Calibration of the sensors is necessary to ensure reliable and precise measurement results.

- An initial calibration can be carried out after about two to three hours of operation.
- A mandatory calibration after 24 hours is required.



NOTE

All installed measuring devices are subject to regular inspection.
Test and calibration intervals must be observed in accordance with the applicable legal regulations.

13.2 Safety requirements



WARNING



Exposure to chemical agents during calibration work

When calibrating sensors, irritating or harmful chemicals can be released.

Possible consequences:

Death or serious injury as well as significant property damage.



- Calibration work may only be carried out by instructed specialists.
- Wear protective equipment (PPE):
 - Chemical Protective Gloves
 - Safety Glasses
 - Lab coats (if needed)
- Calibrate only in well-ventilated areas.
- Observe safety data sheets of the chemicals used.
- Emergency shower and eyewash station ready.

13.3 Calibration specifications

- The sampling point for the measuring water must be chosen in such a way that a perfect mixing of the disinfectant and a bubble-free water flow are guaranteed.
- The pipe for the sample water withdrawal should be as short as possible.
- Copper pipes must not be used as they can falsify the measurement.

13.4 Function: safe calibration

To prevent incorrect control signals from being output during calibration, the controller outputs are kept at a constant value throughout the calibration process.

The Safe Calibration feature is available and provides the following protections:

- Prevents uncontrolled dosing of chemicals.
- Automatically switches off dosing when calibration menus are permanently active.

13.5 Calibration testing

To ensure the functionality and accuracy of the system, the following measures must be carried out:

- Comparative measurements
 - At fixed intervals (e.g. daily or weekly).
 - With a suitable and calibrated test device.
 - Used for functional testing and accuracy control of the sensors.
- Recalibration in case of deviations
 - In the event of detected deviations in the measured values.
 - Calibration of the sensors in question to comply with tolerance limits.

13.6 Calibration procedure

Starting from the basic display, there are several ways to get into the calibration of the measurements:

- Press the menu button in the menu bar and select the Calibration menu. Select the desired measured value and press the calibration button.
- Select the menu field of the desired measuring channel or click on the measured value and then press the calibration button

13.7 Calibration reminder

For each measurement there is the possibility to activate a calibration reminder. When activated, a time in-tervall can be defined in weeks, months, days or years. Furthermore, the importance of the message can be defined as info, warning or error as well as a customer-specific description of it.

13.8 Temperature calibration

Temperature calibration is carried out via the application settings. In the "Temperature" menu, the calibration can be carried out if a deviation between the comparative measurement and the measured value displayed on the electronics module is detected.

To start the calibration process, the calibration tone must be activated



NOTE

In the "Temp. Unit" menu, °C or °F can be selected. In the "Temp. Sensor" menu, the desired temperature input can be selected or switched off.

13.9 Chlorine calibration

Calibration of the 3-electrode measuring cell (DEPOLOX®-R) or 3-electrode single-rod measuring chain (DEPOLOX® Pool-R) for Cl₂, and Cl₂++ (pH compensated).

**NOTE**

The order of calibration must not be reversed.

Before the Cl₂++ calibration, it must be ensured that the pH measurement is correctly calibrated and already provides stable measured values in the sample water. When calibrating the 3-electrode measuring cell, a zero-point calibration must first be carried out and then a measured value calibration (DPD).

Depending on the disinfectant, the measurement must be carried out with the photometer or colorimeter with the appropriate reagents.

How to: Zero Point Calibration

1. From the basic display, select the "Calibration" menu in the main menu.
2. Select the measurement to be calibrated in the menu, e.g. Cl₂ free.
3. Select the "Zero Point" parameter and follow the prompts on the display.

Procedure: Zero-point calibration with disinfectant-free water

4. If disinfectant-free water is available (e.g. by switching the measuring water), the zero-point calibration can also be carried out with it. In this case, do not close the sample water inlet during zero point calibration.

Procedure: Measured value calibration (DPD)

5. After zero point calibration, wait at least 2 minutes.
6. Select the parameter "DPD" and the content of free chlorine, e.g. with a photometer. Follow the prompts on the display.

**NOTE**

For the DPD calibration of the Cl₂++ measurement, the calibration value should be greater than or equal to 25% of the measuring range.

13.10 Diaphragm sensor calibration

Calibration is almost identical for all membrane sensors. The difference lies in the manual measurement with the photometer or colorimeter with the different chemicals.

For membrane sensor calibration, there is the option of a one-point calibration or a two-point calibration. In the calibration settings, the expert mode can be switched on or off:

- Expert Mode On = Two-Point Calibration
- Expert Mode Off = Single-Point Calibration

13.10.1 Total chlorine

For the total chlorine calibration, the "DPD" calibration must be carried out.

Procedure:

1. Open calibration menu.
2. Follow the prompts on the display.

13.10.2 Combined chlorine (optional)

When calibrating the bound chlorine measurement, the free chlorine value is also taken into account, so it is important to ensure that the free chlorine display is correctly calibrated.

After that, the calibration of the value determined by comparative measurement can be carried out according to the instructions in the display.

13.10.3 Zero point calibration for membrane sensor for free chlorine) – zero point calibration for 2-point calibration



NOTE

Instead of the zero point, a DPD value determined by comparative measurement can also be calibrated.

13.10.4 DPD calibration for membrane sensor for free chlorine

For calibration, determine the free chlorine content, for example with a photometer and follow the instructions on the display.

13.11 pH calibration

**NOTE**

During pH calibration, the buffer solution and the sample water should be at the same temperature. If there is a temperature difference $> 5\text{ }^{\circ}\text{C}$, the temperature of the buffer solution must first be set in the "Calibration" - "pH" menu under "Cal. at Temp." can be entered.

For pH calibration, there is the option of a one-point calibration (offset) or a two-point calibration with buffer solutions. In the calibration settings, the expert mode can be switched on or off:

- Expert Mode On = Two-Point Buffer Calibration
- Expert Mode Off = One-Point Offset Calibration

How to: pH-7 balancing

1. Starting from the basic display in the main menu, select the "Calibration" menu and follow the instructions in the display under pH7 calibration.

How to: Slope Adjustment

2. Rinse the sensor in distilled water to avoid spreading buffer solution.
3. Select the parameter "pH X".

**NOTE**

If buffer solutions other than those specified are used, the pH value of the buffer solution must be less than 6 pH or higher pH 8.

4. Dip the pH sensor at least 2 cm deep into the buffer solution until the pH value displayed no longer changes.

pH Correction - Offset

If external influences result in a constant difference between the displayed pH value and a pH value measured by hand, this difference can be compensated.

Procedure:

1. From the basic display, select the "Calibration" menu in the main menu.
2. Select the "Offset" parameter and follow the instructions on the display.

**NOTE**

With each new pH-7 adjustment or slope adjustment, the offset shift is deleted.

13.12 Redox calibration (mV)

**NOTE**

REDOX sensors have long run-in times. After calibration with buffer solution, it can take several hours for the reading to stabilize.

Procedure:

1. Starting from the basic display, select the "Calibration" menu in the main menu.
2. Then select the menu item "ORP/Redox" and select the Cal. Open the value and follow the instructions on the display.

13.13 Conductivity calibration

**NOTE**

The conductivity sensor has a built-in temperature sensor and thus automatic temperature compensation.

Procedure:

1. From the basic display, select the "Calibration" menu on the main menu.
2. Select "Cal. value" and follow the instructions on the display.

Measuring range dependent:

- 600 $\mu\text{S/cm}$ calibration solution at 2500 $\mu\text{S/cm}$ measuring range
- 60 mS/cm calibration solution for all mS/cm measuring ranges

14 System messages

**NOTE**

If system messages cannot be resolved on your own, please contact your contractor or an authorized specialist.

The device distinguishes between system messages in the categories Error, Warning, Information and Status.

System messages are displayed via the colored alarm symbol (bell) in the menu bar. The number in the icon indicates the number of active reports. Clicking on the icon opens the registration list.

In addition, the status LED above the display signals active messages or alarms.

Statement on the report:

For detailed information about a report, click on the information icon (i) within the respective message.

The notification contains the following information:

- **Type:** Type of message (error, warning, information, status message)
- **Timestamp:** Time of occurrence
- **Duration:** Duration of the active notification
- **Description:** Cause of the message and, if necessary, instructions for remedying it

14.1 Error codes

The system generates errors dedicated to error codes. The error codes are displayed with the message.

The error codes are described in the error code list which is possible to download from the manufacturer's homepage.

14.2 Status LEDs states

The electronics module, the "Rivo™ Flex Mod" modules and the "Rivo Backboard 12" use LEDs.

The LEDs signal the operating status by changing colors (RGB colors) and different frequencies.



NOTE

The state with the highest priority is always displayed.

Alarms and messages	Significance
red	Error active
yellow	Warning active
neutral	General information
blue	Update

Status LED (LED above the display)	Description (HMI)
flashing white	Device works correctly. No pending errors or currently no message in the reporting system.
flashing red	Alarm active
flashing yellow	Warning active
green permanent	HMI update completed
flashing blue	Update: • HMI • Rivo™ Flex Mod • Rivo Flexboard • Rivo Backboard 12

Explanation of the status LED

Status LED	Mode	Description
White	BOOT	Only appears briefly at system startup. The assembly will be new started.
Permanent red	STOP	Assembly in stop mode. No outputs active or output according to StopBehavior.
Permanent green	RUN	Assembly in Run mode. All outputs are active. This is the normal state.
Flashing red	STOP, TIMEOUT	After the communication timeout has expired, the module automatically switches to stop mode due to an interrupted connection to the controller.
Flashing blue	UPDATE	Update mode active. Firmware update is in progress.

Rivo™ Flex Mod Dis

LED	LED Color	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	Up	green Active Upot
7	M	green Active membrane
8	E	red Error: Hardware Range Below Hardware Range Exceeded Hardware Error Factory Calibration Error
S	S	yellow red green red / from blue / from burgundy- red/violet purple (purple) / from Status Boot Stop Run Com Error Update Firmware Update First Stage Btl Update Second Stage Btl

Rivo™ Flex Mod mV

LED	LED Color	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	E red	Error: Hardware Range Below Hardware Range Exceeded Hardware Error Factory Calibration Error
S	S yellow red green red / from blue / from burgundy- red/violet purple (purple)/fr om	Status Boot Stop Run Com Error Update Firmware Update First Stage Btl Update Second Stage Btl

Rivo™ Flex Mod 2AI

LED	LED Color	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	E1 red	Error Input 1: Hardware Range Below Hardware Range Exceeded Hardware Error Factory calibration error
8	E2 red	Error Input 2: Hardware Range Below Hardware Range Exceeded Hardware Error Factory Calibration Error
S	S white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update

Rivo™ Flex Mod Con

LED	LED Color	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	E red	Error: • Voltage error • Hardware range undercut • Current Error Hardware Range Exceeded • Current hardware range undercut • Overload error • Hardware Failure • Factory calibration error
S	S white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update

Rivo™ Flex Mod 2AO-mA

LED	LED Color	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	E1 red	Error output 1: • Burden error • Hardware Failure • Factory calibration error
8	E2 red	Error output 2: • Burden error • Hardware Failure • Factory calibration error
S	S white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update

Rivo™ Flex Mod 2Rel-2DO

LED	LED Color	Description
1 -	-	-
2 -	-	-
3 -	-	-
4 -	-	-
5 1	green	Relay 1 active
6 2	green	Relay 2 active
7 3	green	Opto output 1 active
8 4	green	Opto output 2 active
S S	white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update

Rivo™ Flex Mod 2SRel

LED	LED Color	Description
1 -	-	-
2 -	-	-
3 -	-	-
4 -	-	-
5 -	-	-
6 -	-	-
7 1	green	Output 1 active
8 2	green	Output 2 active
S S	white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update

Rivo™ Flex Mod Flow

LED	LED Color	Description
1 -	-	-
2 -	-	-
3 -	-	-
4 -	-	-
5 -	-	-
6 -	-	-
7 TE	red	Temperature error
8 OF	green	Digital input active
S S	white red green flashing red blue	Status Boot Stopp Run Stopp, Timeout Update

Rivo™ Flex Mod 2Rel-FB

LED	LED Color	Description
1 -	-	-
2 -	-	-
3 -	-	-
4 -	-	-
5 -	-	-
6 ▲	green	Actuator increase
7 ▼	green	Actuator decrease
8 E	red	Error Feedback
S S	white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update

Flexboard Dis-pH Filter

LED	LED Color	Description
1	-	-
2	LED7	-
3	LED6	-
4	LED5	-
5	LED4	red
6	LED3	red
7	LED2	Green
8	LED1	Green
S	S	white red green flashing red blue
		Status Boot Stopp Run Stopp, Timeout Update

Rivo Backboard 12

LED	LED Color	Description
S	white red green flashing red blue	Status Boot Stop Run Stop, Timeout Update
DI1	orange	Digital Input 1 Active
DI2	orange	Digital Input 2 Active
DI3	orange	Digital input 3 active
DI4	orange	Digital input 4 active
DI5	orange	Digital input 5 active
DI6	orange	Digital input 6 active
K1	orange	Relay 1 active
K2	orange	Relay 2 active

15 Troubleshooting



NOTE

If faults cannot be rectified independently, please contact your contractual partner or an authorised specialist.

Warnings	Cause	Remedy
Device does not display.	No mains voltage.	Turn on the external switch or fuse.
	Device fuse defective.	Check mains voltage, replace fuse (only by qualified electrician).
	Housing cover not installed correctly.	Check the housing cover and install it correctly.
Actuator/pump does not run.	Actuator in manual mode.	Snap the hand button into place.
	Dosing device incorrectly selected.	Choose the dosing device correctly.
	Actuator or pump incorrectly connected.	Connect correctly (only by qualified electrician).
	Relay defective.	Testing (only by qualified electrician).
Actuator is going in the wrong direction.	Actuator connected incorrectly.	Correct connections (only by qualified electrician).
Actuator closes.	Actuator feedback interrupted	Correct connections (only by qualified electrician).
Digital inputs without function.	Digital inputs not enabled.	Enable digital inputs.

16 Maintenance



WARNING



Danger from unqualified personnel

Possible consequences:

Death or serious injury as well as significant property damage.

- For safe operation and to avoid serious personal injury, the device must only be serviced by trained and authorized personnel.
- Maintain maintenance intervals.
- Appropriate standards, regulations and applicable local regulations must be observed.

16.1 General

To ensure the functionality and measurement accuracy of the system, the following maintenance measures must be carried out at regular intervals.

If deviations in the measured values are detected, calibration of the sensors concerned is necessary to ensure compliance with the specified tolerance limits.

16.2 Maintenance intervals

Regularly

- Sample water monitoring (Chapter 3.5.7)
- Circulation monitoring (Chapter 3.5.7)

Daily

Comparative measurements must be carried out at fixed intervals in accordance with the applicable specifications – daily or according to specifications – with a suitable and calibrated test device. They are used to check the accuracy of the measurement and to test the function of the sensors.

- Check the measurement and control system for damage
- Check the flow module including all screws for leaks

Weekly

- Testing electrode cleaning sand

Semi-annually

- Changing electrode cleaning sand

As needed

- Cleaning or replacing mud flaps
- every 4 to 6 weeks or according to local regulations
- Testing of redox in calibration solution (operating instructions sensor)
- Testing conductivity measurement with comparative measurement and/or calibration solution (operating instructions sensor)

According to standards or local regulations

- Comparative measurement of chlorine and pH
Carry out calibration if necessary

16.2.1 Battery replacement

To ensure long-term reliable operation of the electronic module, the battery must be replaced no later than five years after the initial installation.

16.2.2 Firmware version note

As part of maintenance work, it should be checked whether a current firmware version is available. Updates can extend functionality, improve performance, or fix known bugs.

The latest software and operating instructions are available in the download area of the manufacturer's website under www.xylem.com.

For details on how to carry out the update, see chapter Installation – Firmware Update (Software Version).

16.3 Calibration of the sensors



NOTE

The calibration of sensors is not part of this maintenance chapter.

All safety-relevant and procedure-specific information on calibration can be found in the separate chapter Calibration. The measures described there must be observed in all maintenance work related to calibration, especially when handling chemical calibration solutions.

16.4 Changing the battery

The battery powers the real-time clock in the event of a power failure. If the time is incorrect or the time-controlled functions are faulty, it must be replaced.

Procedure:

1. De-energize the electronic module and check that it is de-energized.
2. Remove the housing cover of the electronic module.
3. Unscrew the sheet metal cover on the HMI.
4. Remove the battery from the HMI holder.
5. Insert the new lithium button cell type CR1632 (article number W2T555401).
It is essential to pay attention to the correct polarity.
6. Reassemble the sheet metal cover on the HMI.
7. Put on the housing cover.
8. Restore power supply.
9. Set the date and time.
No further adjustments are to be made.

16.5 Fuse replacement on the backboard board

The mains input as well as all relays on the Rivo backboard are fused with TR5 fuses of the inert type.

- Relay circuits:
Fused with fuse, rated current 3.15 A
- Power input:
Fused with a slow-blowing fuse, rated current 2 A

In the case of a ruptured fuse, only a fuse type with identical properties, operating data, trip characteristics and certifications may be used. This is the only way to ensure compliance with safety and performance requirements. Replacement fuses are included in the scope of delivery and are included in the accessory package.

Procedure:

1. De-energize the electronic module and check that it is voltage-free.
2. Carefully remove the housing cover.
3. Pull out the defective fuse, insert new ones with identical nominal data.
Important: Only use fuses with the same rated current and characteristics!
4. Put the housing cover on correctly.
5. Restore the power supply.

16.6 Cleaning

ATTENTION**Property damage due to incorrect cleaning agent**

Damage to housing, seals, cables and touchscreen due to incorrect cleaning agents. Possible consequence: Severe property damage.

- Do not use aggressive cleaning agents (e.g. isopropanol, spirits, abrasives)!

16.6.1 Cleaning the housing

Clean the housing, seals and cables with a damp cloth, if necessary with the addition of a commercially available neutral cleaning agent, and then dry them.

16.6.2 Clean the display

Clean the touchscreen with a lint-free microfiber cloth. In case of heavy soiling, slightly dampen one corner of the cloth and wipe over the touchscreen. Then wipe immediately with the dry side.

17 Dismantling and disposal

 WARNING	
	Danger from unqualified personnel Possible consequences: Death or serious injury as well as significant property damage. • For safe operation and to avoid serious personal injury, the device must only be dismantled and disposed of by trained and authorised specialists.

17.1 Disassembly

1. Before disposal, all personal data stored on the old device must be deleted.
2. The device must be de-energized.
3. The device must then be dismantled and disposed of professionally and taking into account the recycling of raw materials.

17.2 Disposal

17.2.1 General

Ensure the safe and environmentally friendly disposal of old appliances, replacement parts, auxiliary materials, chemicals and their containers.
Disposal must be carried out in accordance with local, regional, national and international regulations.



NOTE

The symbol with the crossed out waste bin indicates that the product – electrical and electronic products as well as batteries and accumulators – must not be disposed of with household waste. The product must be properly disposed of or recycled at the end of its service life. The legal guidelines of the country in which the product is used apply.

17.2.2 Waste electrical and electronic equipment

Electrical or electronic equipment is marked with the symbol of the crossed-out waste bin and may not be disposed of with household waste, but must be collected and recycled separately. The legal guidelines of the country in which the product is used apply.

Used batteries, accumulators and lamps must be separated from the old appliance before being handed over to a collection point and sent to the collection points provided for this purpose.

If the old equipment purchased from us cannot be handed in to a collective take-back system, we offer the option of returning.

Details can be found on the official manufacturer's website.

- Scan the QR code.
- OR enter the following link into your browser
<http://qr.evoqua.com/bdYxgi>



17.2.3 Waste batteries and accumulators

Batteries and accumulators are marked with the symbol of the crossed-out waste bin. If the marking on the battery itself is not possible for technical reasons, the marking can be made on its packaging.

Used batteries and accumulators must not be disposed of with household waste, but must be collected and recycled separately. The legal guidelines of the country in which the product is used apply.

If necessary, contact your regional or municipal administration about collection points and the possibilities of separate collection.

**DANGER****Risk of injury due to damaged batteries and rechargeable batteries!**

Possible consequences: death or serious injury as well as considerable property damage

- A short circuit, for example caused by contact between the outer battery terminals (metal to metal), can lead to fire or explosion. In the case of batteries and rechargeable batteries, tape off the terminals before disposal to avoid an external short circuit.
- In the case of damaged and leaked batteries, the potential danger is increased.
- If possible, do not touch "greasy" or leaked batteries and rechargeable batteries with your bare hand, and if you have come into contact with the leaked components, wash your hands thoroughly.
- Pay attention to the respective safety instructions, especially for lithium-containing batteries and rechargeable batteries.

18 Spare parts, retrofit kits and optional accessories



WARNING



Danger of unapproved spare parts

The use of unapproved spare parts, accessories, retrofit kits, maintenance parts kits and wear parts may result in malfunctions or damage to the appliance.

Possible consequences:

Death or serious injury as well as significant property damage.

- For safety reasons, only original spare parts, accessories, retrofit kits, maintenance parts kits and wear parts may be used.
- If necessary, please contact our customer service or visit our e-commerce store.

18.1 Spare parts

Article number	Description
W3T584189	Rivo Backboard 12
W3T582385	F1/F2, TR5, T2A fuse
W2T839300	Fuse F4/F5, TR5, T3.15A
W2T555401	HMI Battery, CR1632
W3T632176	Control front with 7-inch capacitive touchscreen
W3T607253	Patch cable to display
W3T587503	HMI Protective Grounding
W3T632172	Accessory Set EM E30
W3T639692	Rivo Flexboard Dis-pH
W3T657645	Electronic Module Rivo III AQUATICS for chlorine, pH, Redox with 2x 2REL-2DO, 1x 2REL-FB

18.2 Flow cell module

Article number	Flow Module (Mod. D10) – Designation
W3T565860	DEPOLOX®-R – Pressure less design with integrated 3-electrode measuring cell
W3T566011	DEPOLOX®-R – Flame proof design with integrated 3-electrode measuring cell
W3T565858	DEPOLOX® Pool-R – Pressure less design
W3T565859	DEPOLOX® Pool-R – Pressure resistant design
W3T566012	Varia Sens-R™ – pressure less version
W3T566013	Varia Sens-R™ – flame proof version

18.2.1 Sensor

Article number	Sensors – Designation
W3T160652	3-electrode single-rod measuring chain for chlorine with glass electrode (platinum version), compatible with DEPOLOX® Pool-R system
W3T160991	3-electrode single-rod measuring chain for chlorine with glass electrode (gold version), compatible with DEPOLOX® Pool-R System
W3T169297	pH-Sensor
W3T169298	REDOX single-rod measuring chain (platinum version)
W3T172356	REDOX single-rod measuring chain (gold version)
W3T172052	Conductivity sensor
W3T570398	Membrane sensor TC3 M12 (total chlorine)

18.2.2 Rivo™ flex mod – measurement module for module slot

Article number	Name – Description
W3T557878	Rivo™ Flex Mod Dis Measurement module for measuring disinfectants with membrane sensors for total chlorine
W3T557901	Rivo™ Flex Mod mV Measurement module for measuring the REDOX value
W3T557906	Rivo™ Flex Mod 2AI Measurement module for measurement of up to two sensors or input signals with mA or V measurement signal
W3T557907	Rivo™ Flex Mod Con Measurement module for measuring conductivity

18.2.3 Rivo™ flex mod – output module for module slot

Article number	Name – Description
W3T557912	Rivo™ Flex Mod 2AO-mA mA signal output module 2-channel
W3T557914	Rivo™ Flex Mod 2Rel-2DO Relay module for controlling dosing outputs and alarms
W3T557915	Rivo™ Flex Mod 2Rel-FB Switching module for controlling a positioner with feedback, e.g. for chlorine gas systems with position feedback
W3T557916	Rivo™ Flex Mod 2SRel Switching module for controlling inductive or capacitive loads

18.2.4 Rivo™ sensor kit with measurement module

- Rivo™ Sensor Kit with Measurement Module: contains: measurement module, sensor, sensor cable, locking bolt and calibration solution.

Article number	Sensor Kit Designation
W3T585526	Rivo™ Flex Sens Redox Kit
W3T585527	Rivo™ Flex Sens Redox G Kit
W3T585530	Rivo™ Flex Sens with Aqua Kit
W3T585290	Rivo™ Flex Mem TC Kit



NOTE

For disinfection with inline electrolysis or hydrogen input into the pool water, a chlorine sensor or redox sensor in gold design is required. The gold version is also known as the "G Kit" or "Au Kit". Standard sensors are not suitable for this.

18.2.5 Rivo™ cable kit – connection to "Rivo Flexboard"

- Cable Kit – Diaphragm Sensor: contains: membrane sensor, sensor cable and sealing kit.

Article number	Cable Kit – Designation
W3T642313	Rivo™ Mem FC Sens
W3T642316	Rivo™ Mem FCC Sens

- Cable Kit – Sensor: contains: sensor, sensor cable, locking bolt and electrode cleaning sand.

Article number	Cable Kit – Designation
W3T638771	Rivo™ Chlorine Sens Pt (Platin)
W3T638772	Rivo™ Chlorine Sens Au (Gold)
W3T638773	Rivo™ pH Sens

18.2.6 Module slot input module

Article number	Input Module Designation
W3T557906	Rivo™ Flex Mod 2AI

18.2.7 Module slot output module

Article number	Output Module Designation
W3T557912	Rivo™ Flex Mod 2AO-mA
W3T557914	Rivo™ Flex Mod 2Rel-2DO
W3T557915	Rivo™ Flex Mod 2Rel-FB
W3T557916	Rivo™ Flex Mod 2SRel

18.2.8 Expansion board for HMI installation

Article number	Extension Board – Name
W3T639691	Rivo™ COM-Board USB 485

18.3 Optional accessories

18.3.1 Impedance transducer for pH and mV sensor

Article number	Impedance converter designation
W3T165563	Impedance converter for use with pH or mV sensors with extended cables

18.3.2 Plug-cable combinations for sensor

Article number	Connector-cable combination – designation
W3T364410	For 3-electrode single-rod measuring cell chlorine, length 1.5 m
W3T173161	For pH and REDOX electrode, length 1.5 m
W3T571274	For conductivity sensor, length 1.5 m

18.3.3 Cable specifications for sensor cables extension

For sensor cable extensions up to a maximum cable length of 30 m, different cable design requirements apply depending on the sensor type. The following specifications are recommended:

Sensor Type	Cable Specification
DIS	LIYCY 3×0.25 mm ²
Conductivity	LIYCY 6×0.25 mm ² or 6×0.34 mm ²
Multi-Sensor	LIYCY 4×0.25 mm ² or 4×0.34 mm ²

18.3.4 Connection cable for membrane sensor

Article number	Length	Connection cable – designation
W3T558964	2 m	Connection cable

18.3.5 DIN rail

**NOTE**

A DIN rail is required for professional installation.

Article number	Description
W3T322483	DIN rail, length 225 mm for flow module individually
W2T504213	DIN rail, perforated 275 mm for electronics module individually

19 Documentation of the module configuration

Overview of module assembly

The installed modules are documented in the tables below.

The tables form the basis for electrical connection, service, maintenance and later extensions.

Registration by the service technician

- Each module slot (MOD 1 to MOD 12) is checked.
- The type of module used is marked in the column provided:
 - by ticking, or
 - by entering the module type.
- Unoccupied slots remain free.

Assignment of module slots (MOD1 to MOD12)

Module slot and marking

1	2	3	4	5	6	7	8	9	10	11	12
S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14

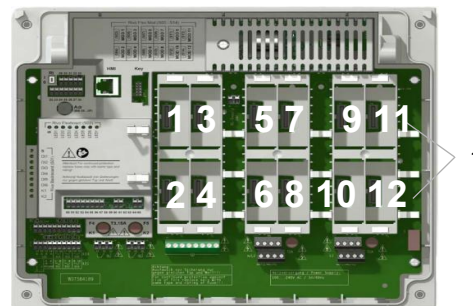


Fig. 32 Occupancy of module slots

1 Module slots 1 to 12

Installation and Connection Overview - Module Types for Slots MOD 1 to MOD 12

Modultype	MOD 1	MOD 2	MOD 3	MOD 4	MOD 5	MOD 6	MOD 7	MOD 8	MOD 9	MOD 10	MOD 11	MOD 12	Comments
Rivo™ Flex Mod DIS													
Rivo™ Flex Mod mV													
Rivo™ Flex Mod 2AI													
Rivo™ Flex Mod Con													
Rivo™ Flex Mod 2AO-mA													
Rivo™ Flex Mod 2 Rel-2DO													
Rivo™ Flex Mod 2REL-FB													
Rivo™ Flex Mod 2SRel													

20 Wiring diagram



NOTE

- The connection diagram WBE2157, Edition B-09/25, shows the recommended factory setting.
- In the case of individual relay assignments, these must be clearly documented and handed over to the operator.
- The wiring diagram only indicates the part number of the modules used.

Module overview (factory setting and adjustment)

The following table is an example and is overlaid on top of the wiring diagram section. It shows the factory module assembly. Individual adjustments can be entered in the right-hand column.

Module (Factory Default)	Individual equipment
MOD1 (S02)	

- Note**



The terminal assignment described is based on the standard configuration of the device. The assignment of the relay outputs to the dosing outputs can be changed on a customer-specific basis. In this case, the changed configurations must be documented in detail.
- Note**



Observe permissible contact load!
See chapter Relay outputs and technical data.
- Note**



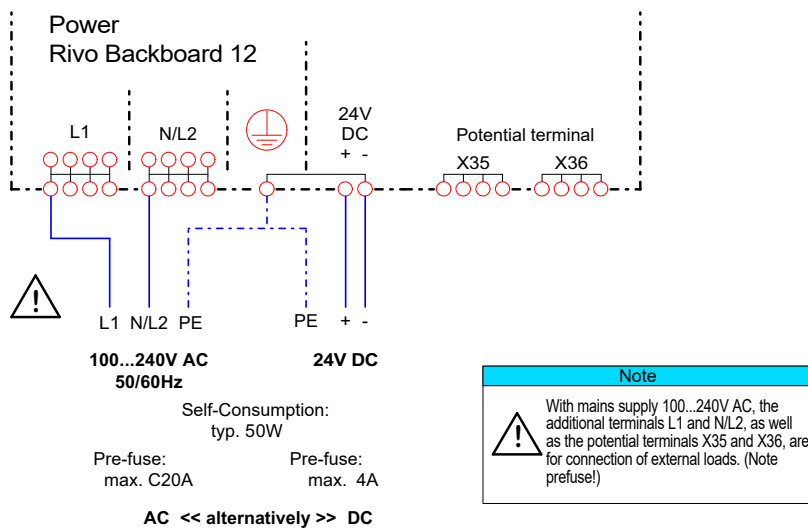
External voltage must not be connected to the digital inputs !
- Caution**



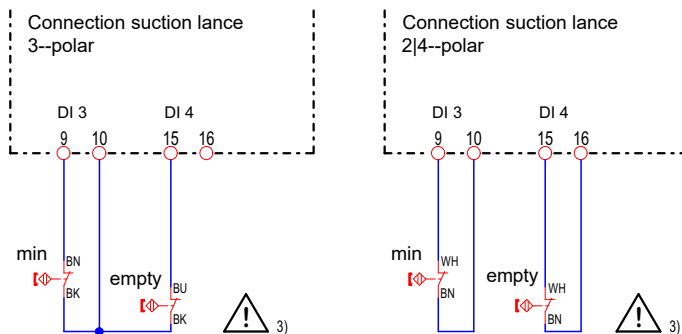
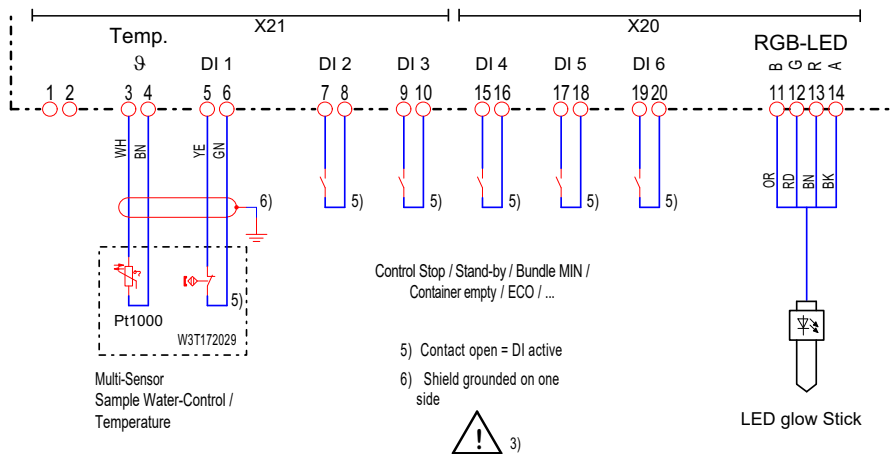
External voltage may still be connected even when the main switch is set to OFF !

Fig. 33 Legend for the notes and warnings in the wiring diagram

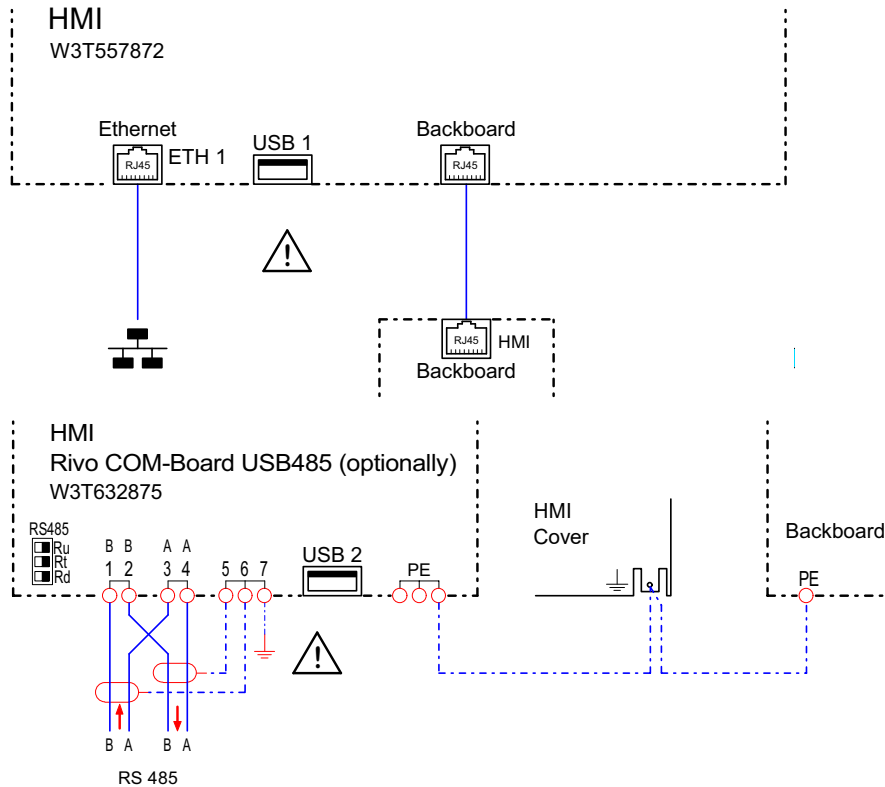
Rivo Backboard 12



Rivo Backboard 12

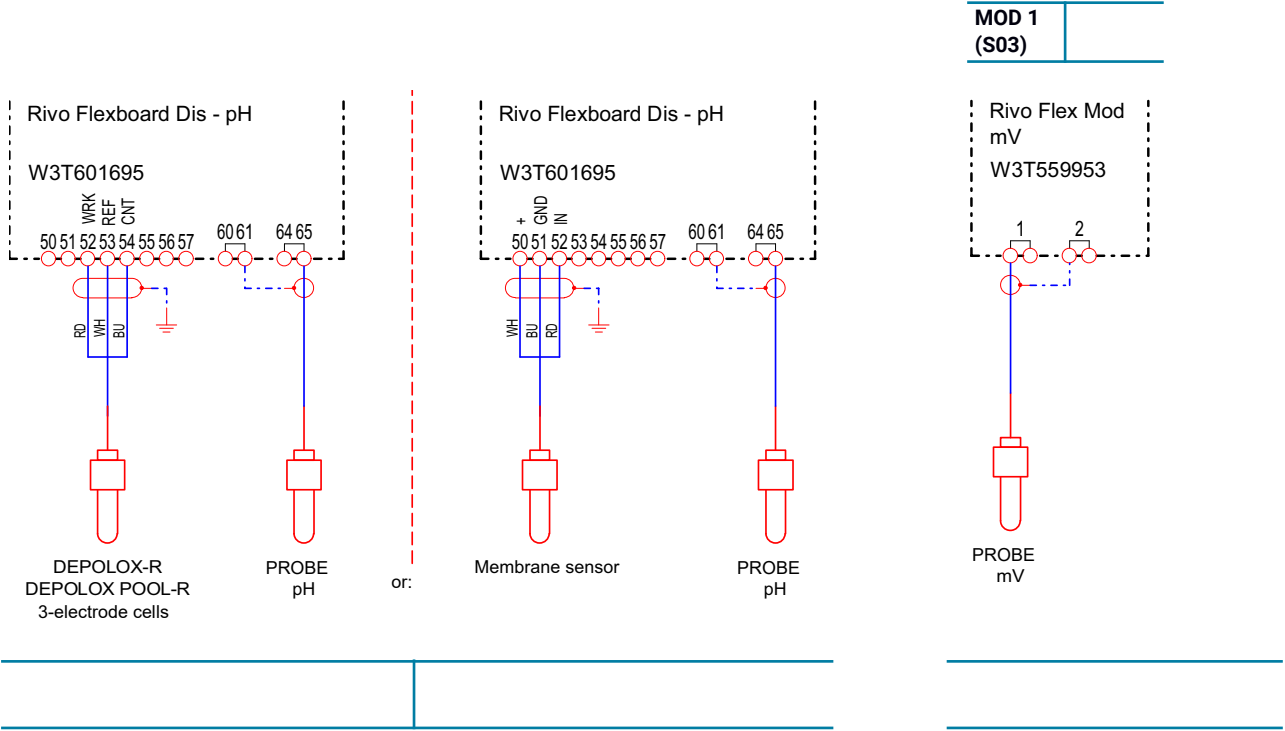


HMI



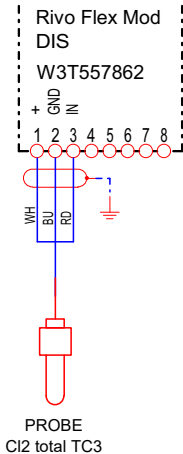
Note
 Do not unplug or plug in interface connectors while they are in operation!
Note
 Terminals 5-7 (no potential reference) for connecting the shielding establish. An additional PE connection at the start or end of the bus.

Standard application 1 pool

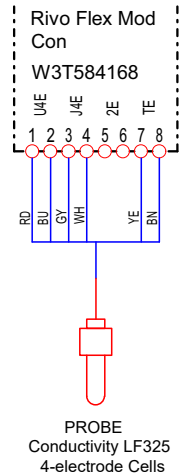


Standard application 1 pool

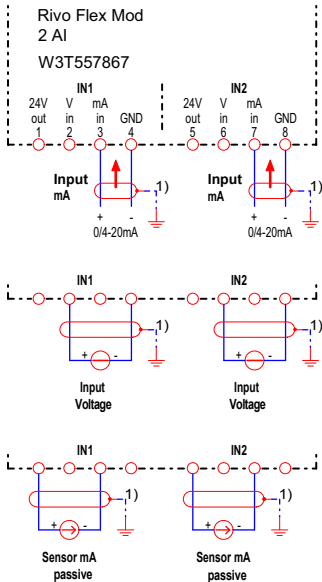
MOD 2
(S04)



MOD 3
(S05)



MOD 4
(S06)



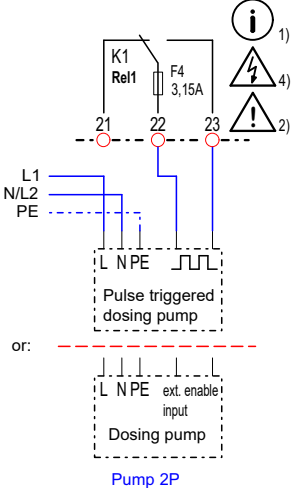
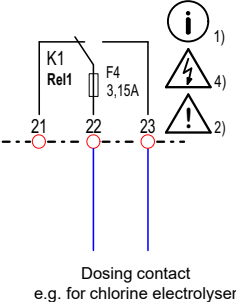
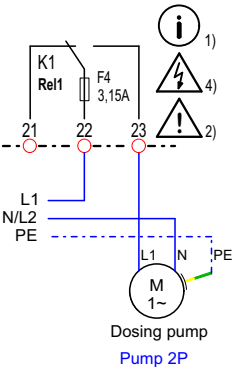
e.g. mA signal circulation e.g. mA signal turbidity

Standard application 1 pool

Chlorine control controller outputs

Chlorine dosing via backboard relay

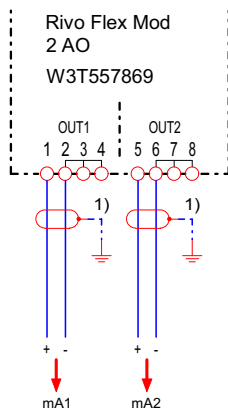
Pump 2P increase or decrease



Standard application 1 pool

Chlorine control controller outputs

MOD 5/6 (S07/S08)

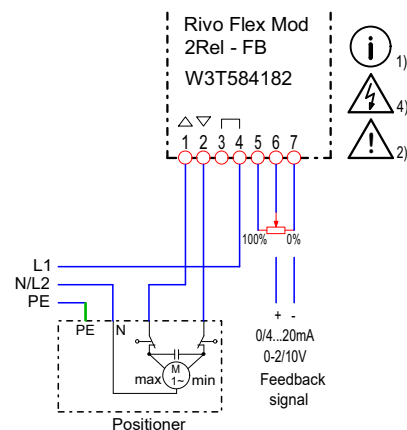


Load max. 500 Ohm

1) Shield grounded on one side

Control of actuators via mA signal transmission
See chapter Function – Continuous 2-point output and
Continuous 3-point output and mA outputs

MOD 7 to 12 (S09 to S14)

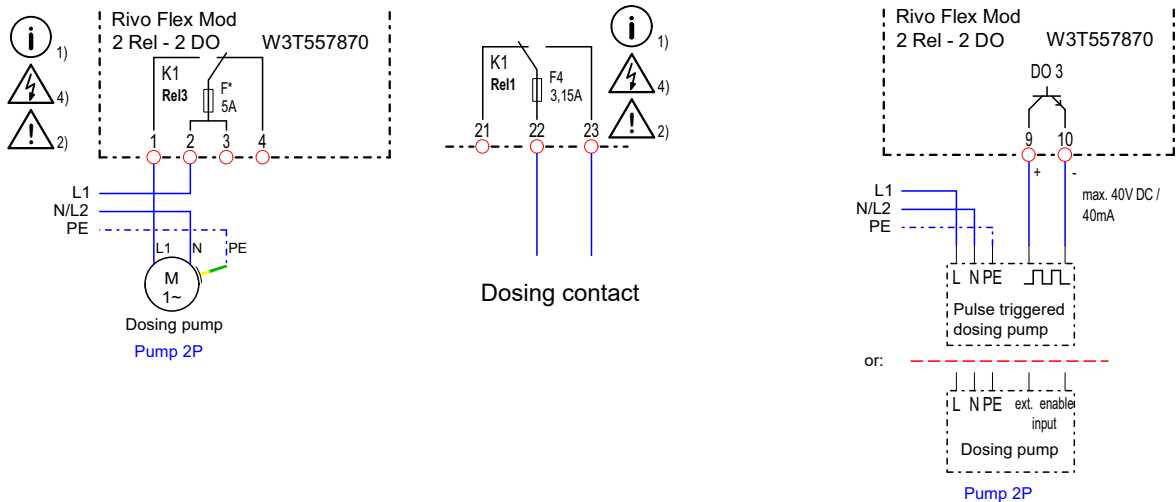


Actuator with or without feedback (chlorine control)

Standard application 1 pool

Chlorine control controller outputs – Rivo™ Flex Mod 2REL-2DO

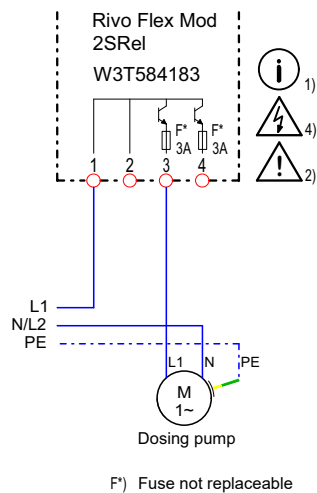
MOD 7 to 12 (S09 to S14)	
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Standard application 1 pool

Chlorine control controller outputs– Rivo™ Flex Mod 2SRel

MOD 7 to 12
(S09 to S14)

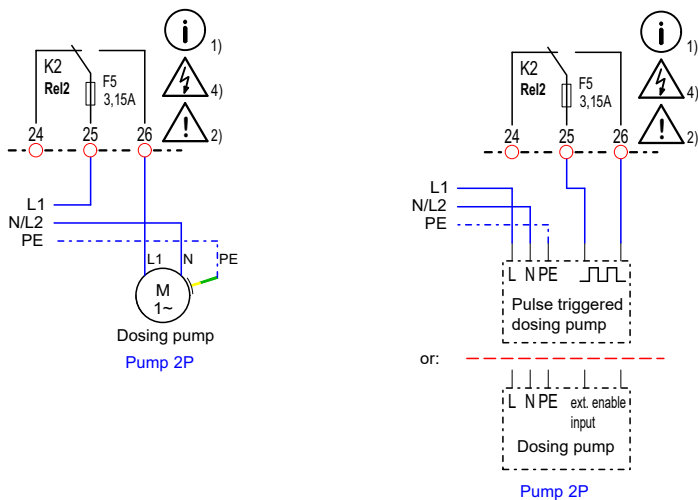


Standard application 1 pool

Controller outputs pH control

Control via backboard relays

Pump 2P increase or decrease

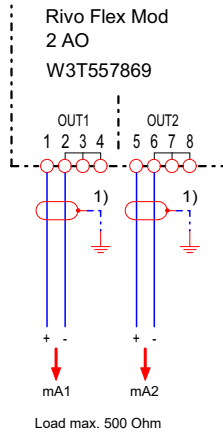


Standard application 1 pool

Controller outputs pH control

Control via Rivo™ Flex Module

MOD 5/6
(S07/S08)

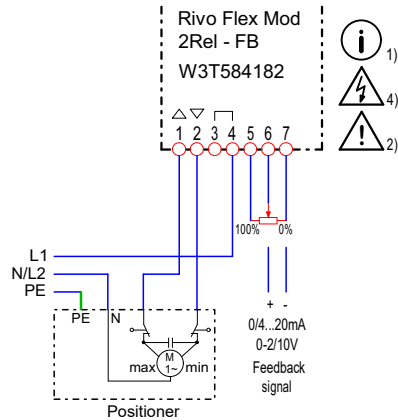


1) Shield grounded on one side

Control of actuators via mA measured value transmission

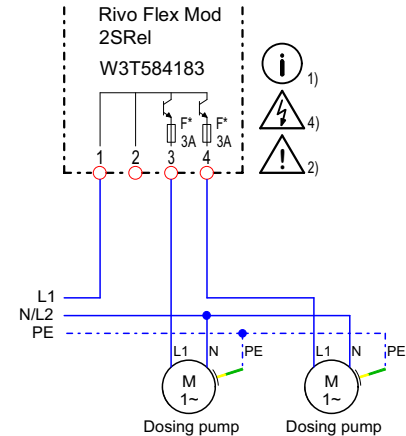
See chapter Function – Continuous 2-point output and Continuous 3-point output and mA outputs

MOD 7 to 12
(S09 to S14)



Actuator with or without feedback pH control

MOD 7 to 12
(S09 to S14)

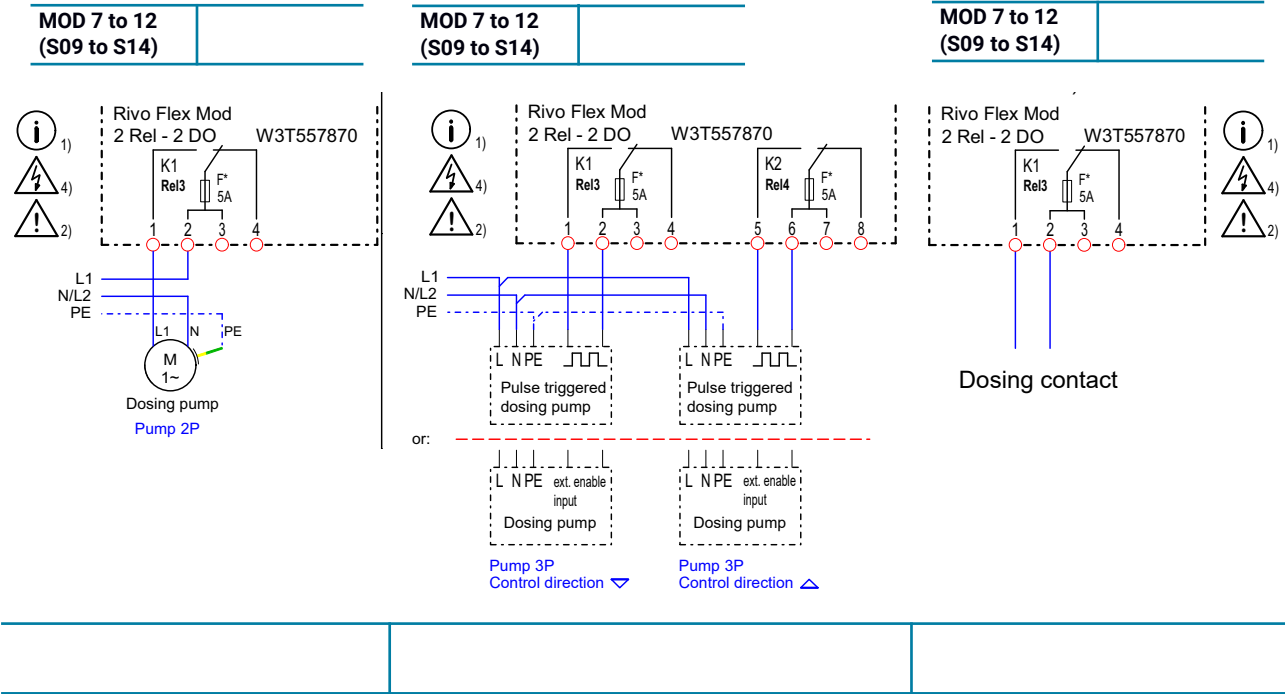


F*) Fuse not replaceable

Dosing pumps pH control

Standard application 1 pool

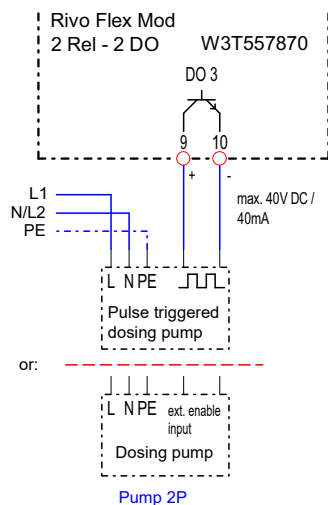
Controller outputs pH control – controlled via Rivo™ Flex Mod 2REL-2DO



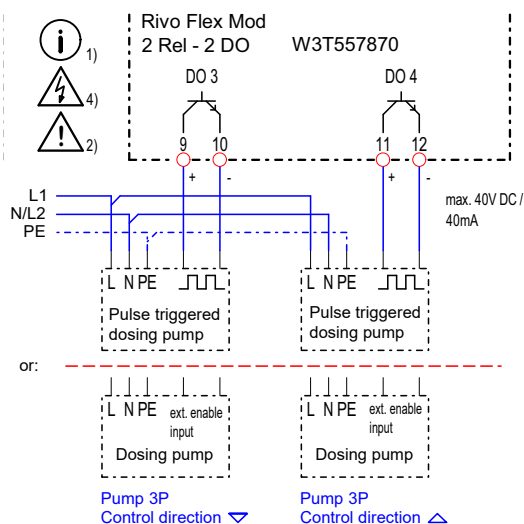
Standard application 1 pool

Controller outputs pH control – controlled via Rivo™ Flex Mod 2REL-2DO

MOD 7 to 12
(S09 to S14)



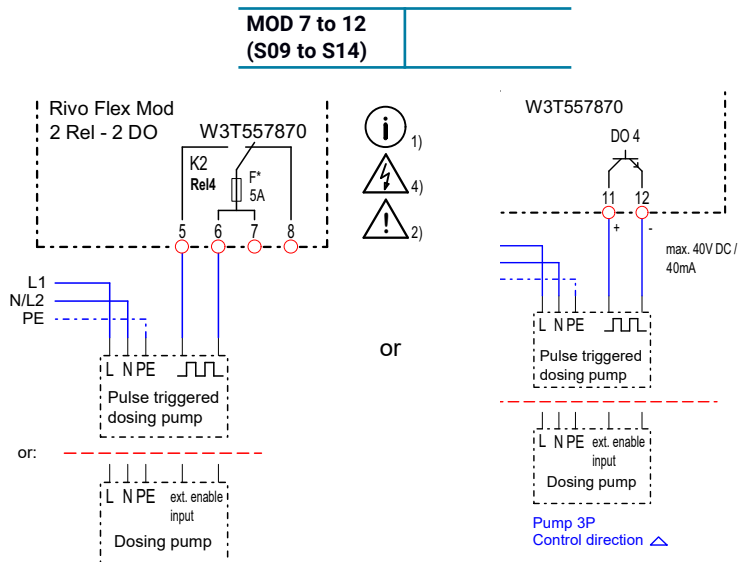
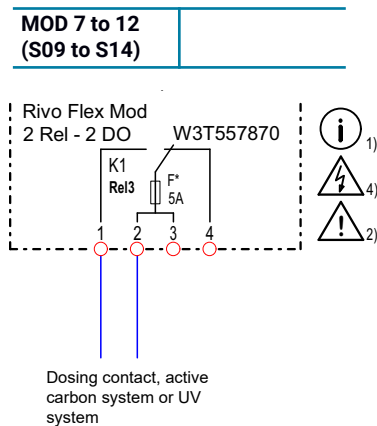
MOD 7 to 12
(S09 to S14)



Standard application 1 pool

Controller outputs: Total or combined chlorine via Rivo™ Flex Mod 2REL-2DO

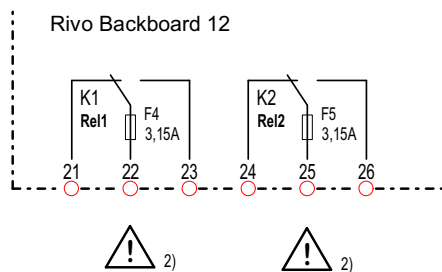
Controller output conductivity via Rivo™ Flex Mod 2REL-2DO



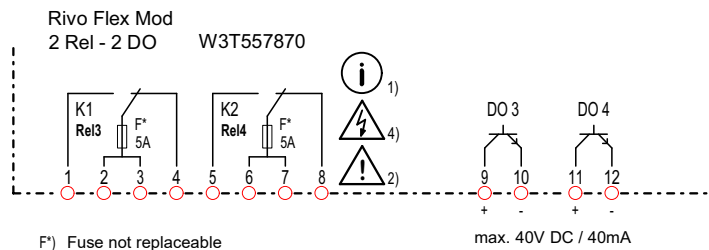
Standard application 1 pool

Switching outputs general

Relay outputs Rivo Backboard IO12



Outputs Rivo™ Flex Mod 2REL-2DO

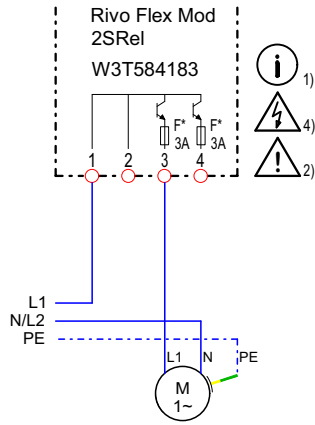


Standard application 1 pool

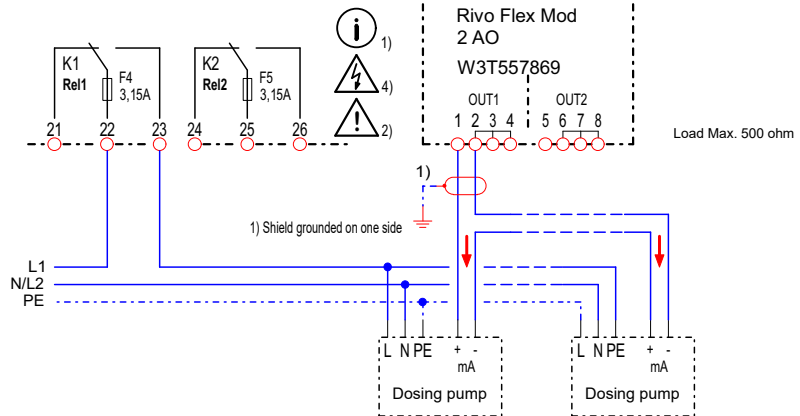
Switching outputs general

Relay outputs

Rivo™ Flex Mod 2SREL

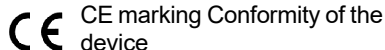


mA Signal with release contact



21 Marking and approval

21.1 CE marking



CE marking Conformity of the device

The Rivo™ III electronic module (model E30) with the flow module (model D10) meets the requirements of the harmonized European standards and thus meets the legal requirements of the EU directives. The manufacturer confirms the successful testing of the device by affixing the CE mark.

The following harmonised European standards have been applied:

- EMV/EMC: 2014/30/EU
- NRL/LVD: 2014/35/EU
- RoHS: 2011/65/EU and 2015/863/EU

21.2 CSA marking



Canadian Standards Association
CSA Labeling

The Rivo™ III electronic module (E30 model) with the flow module (D10) has been tested against applicable North American standards. The device meets the requirements for the Canadian and American markets. The manufacturer confirms the successful testing of the device by affixing the CSA mark.

The CSA designation refers to the following certificate:
Master Contract: 226676

22 License agreements

The Rivo™ III electronics module (E30 model) contains copyrighted software components that are available under various open source licenses.

Detailed information can be read out via the menu => System Information => Licenses.

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