WAGO TECHDOCS

Manual

# WAGO I/O System 750




# 750-8102(/xxx-xxx)

## PFC100; 2ETH RS

## Controller PFC100; 2 x ETHERNET, RS-232/-485

**Version 1.12.0, valid from FW Version 03.10.08(22)**

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# 1 Notes about this Documentation

**Note**

**Always retain this documentation!**
This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user. In addition, ensure that any supplement to this documentation is included, if necessary.

## 1.1 Validity of this Documentation

This documentation is only applicable to the “PFC100; 2ETH RS” controller (750-8102) and the variants listed in the table below.

Table 1: Variants

| Item Number/Variant | Designation |
|---|---|
| 750-8102 | PFC100; 2ETH RS |
| 750-8102/025-000 | PFC100; 2ETH RS; T |

**Note**

**Documentation Validity for Variants**
Unless otherwise indicated, the information given in this documentation applies to listed variants.

This documentation is only applicable from FW Version 03.10.08(22).

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## 1.4 Symbols

**⚠ DANGER**

**Personal Injury!**
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.



**⚠ DANGER**

**Personal Injury Caused by Electric Current!**
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

**⚠ WARNING**

**Personal Injury!**
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

**⚠ CAUTION**

**Personal Injury!**
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**NOTICE**

**Damage to Property!**
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.



**NOTICE**

**Damage to Property Caused by Electrostatic Discharge (ESD)!**
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.



**Note**

**Important Note!**
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.



**Information**

**Additional Information:**
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

## 1.5 Number Notation

Table 2: Number Notation

| Number Code | Example | Note |
|---|---|---|
| Decimal | 100 | Normal notation |
| Hexadecimal | 0x64 | C notation |
| Binary | '100'<br>'0110.0100' | In quotation marks, nibble separated with dots (.) |

## 1.6 Font Conventions

Table 3: Font Conventions

| Font Type | Indicates |
|---|---|
| *italic* | Names of paths and data files are marked in italic-type.<br>e.g.: *C:\Program Files\WAGO Software* |
| **Menu** | Menu items are marked in bold letters.<br>e.g.: **Save** |
| **>** | A greater-than sign between two names means the selection of a menu item from a menu.<br>e.g.: **File** > **New** |
| **Input** | Designation of input or optional fields are marked in bold letters,<br>e.g.: **Start of measurement range** |
| “Value” | Input or selective values are marked in inverted commas.<br>e.g.: Enter the value “4 mA” under **Start of measurement range**. |
| **[Button]** | Pushbuttons in dialog boxes are marked with bold letters in square brackets.<br>e.g.: **[Input]** |
| **[Key]** | Keys are marked with bold letters in square brackets.<br>e.g.: **[F5]** |

# 2 Important Notes

This section includes an overall summary of the most important safety requirements and notes that are mentioned in each individual section. To protect your health and prevent damage to devices as well, it is imperative to read and carefully follow the safety guidelines.

## 2.1 Legal Bases

### 2.1.1 Subject to Changes

WAGO GmbH & Co. KG reserves the right to provide for any alterations or modifications. WAGO GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

### 2.1.2 Personnel Qualifications

All sequences implemented on WAGO I/O System 750 devices may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current norms and guidelines for the devices and automated environments.

All changes to the coupler or controller should always be carried out by qualified personnel with sufficient skills in PLC programming.

### 2.1.3 Use of the 750 Series in Compliance with Underlying Provisions

Fieldbus couplers, controllers and I/O modules found in the modular WAGO I/O System 750 receive digital and analog signals from sensors and transmit them to actuators or higher-level control systems. Using controllers, the signals can also be (pre-) processed.

The devices fulfill the requirements of protection type IP20 and are designed for use in dry interior spaces. There is protection against finger injury and solid impurities ≥ 12.5 mm diameter is assured; protection against water damage is not ensured.
The devices represent open-type devices. They may only be installed in enclosures (tool-secured enclosures or operating rooms) which fulfil the listed requirements specified in the safety instructions in chapter “Safety Advice (Precautions)”. Use without additional protective measures in environments within which dust, corrosive fumes, gases or ionized radiation can occur is considered improper use.

Operating the WAGO I/O System 750 devices in home applications without further measures is only permitted if they meet the emission limits (emissions of interference) according to EN 61000-6-3. You will find the relevant information in

the section “Device Description” > “Standards and Guidelines” in the manual for the used device.

Appropriate housing (per 2014/34/EU) is required when operating the WAGO I/O System 750 in hazardous environments. Please observe the installation regulations! Please note that a prototype test certificate must be obtained that confirms the correct installation of the system in a housing or switch cabinet.

The implementation of safety functions such as EMERGENCY STOP or safety door monitoring must only be performed by the F I/O modules within the modular WAGO I/O System 750. Only these safe F I/O modules ensure functional safety in accordance with the latest international standards. WAGO's interference-free output modules can be controlled by the safety function.

### 2.1.4 Technical Condition of Specified Devices

The devices to be supplied ex works are equipped with hardware and software configurations, which meet the individual application requirements. These modules contain no parts that can be serviced or repaired by the user. The following actions will result in the exclusion of liability on the part of WAGO GmbH & Co. KG:

- Repairs,
- Changes to the hardware or software that are not described in the operating instructions,
- Improper use of the components.

Further details are given in the contractual agreements. Please send your request for modified and new hardware or software configurations directly to WAGO GmbH & Co. KG.

## 2.2 Safety Advice (Precautions)

For installing and operating purposes of the relevant device to your system the following safety precautions shall be observed:



**DANGER**

**Do not work on devices while energized!**
All power sources to the device shall be switched off prior to performing any installation, repair or maintenance work.

**DANGER**

**Install device in a suitable enclosure!**
The device is an open system. Install the device in a suitable enclosure. This enclosure must:

- Guarantee that the max. permissible degree of pollution is not exceeded.
- Offer adequate protection against contact.
- Prevent fire from spreading outside of the enclosure.
- Offer adequate protection against UV irradiation.
- Guarantee mechanical stability
- Restrict access to authorized personnel and may only be opened with tools



**DANGER**

**Ensure disconnect and overcurrent protection!**
The device is intended for installation in automation technology systems. Disconnect protection is not integrated. Connected systems must be protected by a fuse.
Provide suitable disconnect and overcurrent protection on the system side!

**DANGER**

**Ensure a standard connection!**
To minimize any hazardous situations resulting in personal injury or to avoid failures in your system, the data and power supply lines shall be installed according to standards, with careful attention given to ensuring the correct terminal assignment. Always adhere to the EMC directives applicable to your application.



**⚠ CAUTION**

**Inadequate wire cross sections can cause temperature increases!**
To avoid increasing thermal risks, only use conductor cross-sections sufficient for the required maximum load current. The conductor cross-sections specified in the technical data refer exclusively to the mechanical connection capacity of the clamping points.

**NOTICE**

**Do not use in telecommunication circuits!**
Only use devices equipped with ETHERNET or RJ-45 connectors in LANs. Never connect these devices with telecommunication networks.

**NOTICE**

**Ensure proper contact with the DIN-rail!**
Proper electrical contact between the DIN-rail and device is necessary to maintain the EMC characteristics and function of the device.

**NOTICE**

**Replace defective or damaged devices!**
Replace defective or damaged device/module (e.g., in the event of deformed contacts).

**NOTICE**

**Protect the components against materials having seeping and insulating properties!**
The components are not resistant to materials having seeping and insulating properties such as: aerosols, silicones and triglycerides (found in some hand creams). If you cannot exclude that such materials will appear in the component environment, then install the components in an enclosure being resistant to the above-mentioned materials. Clean tools and materials are imperative for handling devices/modules.

**NOTICE**

**Clean only with permitted materials!**
Clean housing and soiled contacts with propanol.

**NOTICE**

**Do not use any contact spray!**
Do not use any contact spray. The spray may impair contact area functionality in connection with contamination.

**NOTICE**

**Do not reverse the polarity of connection lines!**
Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

**NOTICE**



**Avoid electrostatic discharge!**
The devices are equipped with electronic components that may be destroyed by electrostatic discharge when touched. Please observe the safety precautions against electrostatic discharge per DIN EN 61340-5-1/-3. When handling the devices, please ensure that environmental factors (personnel, work space and packaging) are properly grounded.

## 2.3 Licensing Terms of the Software Package Used

The firmware for the “PFC100; 2ETH RS” controller (750-8102) contains open-source software.

The licence conditions of the software packages are stored in the controller in text form. They can be accessed via the WBM page “Legal Information” > “Open Source Software.”
You can obtain the source code with licensing terms of the open-source software from WAGO GmbH & Co. KG on request. Send your request to support@wago.com with the subject “Controller Board Support Package.”

## 2.4 Special Use Conditions for ETHERNET Devices

If not otherwise specified, ETHERNET devices are intended for use on local networks. Please note the following when using ETHERNET devices in your system:

- Do not connect control components and control networks directly to an open network such as the Internet or an office network. WAGO recommends putting control components and control networks behind a firewall.
- In the control components (e.g., for WAGO I/-CHECK and CODESYS) close all ports and services not required by your application to minimize the risk of cyber attacks and to enhance cyber security.
  Only open ports and services during commissioning and/or configuration.
- Limit physical and electronic access to all automation components to authorized personnel only.
- Change the default passwords before first use! This will reduce the risk of unauthorized access to your system.
- Regularly change the passwords used! This will reduce the risk of unauthorized access to your system.
- If remote access to control components and control networks is required, use a Virtual Private Network (VPN).
- Regularly perform threat analyses. You can check whether the measures taken meet your security requirements.
- Use “defense-in-depth” mechanisms in your system's security configuration to restrict the access to and control of individual products and networks.
- Please note the risks of using cloud services!
  If you use third-party cloud services, sensitive data is transferred to the cloud service provider at one's own responsibility. External access may result in manipulated data and/or unwanted control commands affecting the

performance of your control system.
Use encryption methods to protect your data and observe the information provided by the Federal Office for Information Security – “Cloud: Risks and Security Tips”.
Observe comparable publications of the competent, public institutions of your country.

# 3 Overview

The controller 750-8102(PFC100; 2ETH RS) is an automation device that can perform control tasks of a PLC. It is suitable for mounting on a DIN rail and stands out on account of its various interfaces.

This controller can be used for applications in mechanical and systems engineering, in the processing industry and in building technology.

You can connect all available I/O modules of the WAGO-I/O-SYSTEM 750 (750 and 753 Series) to the controller, enabling it to internally process analog and digital signals from the automation environment, or to supply these signals to other devices via one of the available interfaces.

Automation tasks can be executed in all IEC 61131-3-compatible languages with the ***e!****COCKPIT* programming system.
The implementation of the task processing in the runtime system for Linux® has been optimized with real-time extensions in order to provide maximum performance for automation tasks. Web visualization is also provided as visualization in addition to the development environment.

For IEC-61131-3 programming in CODESYS applications, the controller provides 12 MB of program and data memory (dynamically distributed) and 128 kB of retentive memory (retain and flag variables) in an integrated NVRAM.

The controller has a slot for an SD card. The SD card can be used to transfer device parameters, boot projects and other files from one controller to another. The SD card can be accessed via FTP as an additional drive.



**Note**

**Memory card is not included in the scope of delivery!**
Note, the controller is delivered without memory card.
To use a memory card, you must order one separately. The controller can also be operated without memory card expansion, the use of a memory card is optional.



**Note**

**Only use recommended memory cards!**
Use only the microSD memory card available from WAGO (item No. 758-879/000-3102) as it is suitable for industrial applications subjected to environmental extremes and for use in this device.
Compatibility with other commercially available storage media cannot be guaranteed.

Two ETHERNET interfaces and the integrated, configurable switch enable wiring in all necessary configurations with one common network where both ports share

a common IP address or with two separate networks where each port has its own IP address.

The physical interfaces (ports) are assigned via logical bridges and can be e.g., configured via the WBM.

Both of these interfaces support:

- 10BASE-T / 100BASE-TX
- Full/Half duplex
- Autonegotiation
- Auto-MDI(X) (automatic uplink and crossover switching)

The following fieldbus circuits are implemented for exchange of process data:

- Modbus TCP Master/Slave
- Modbus UDP Master/Slave
- Modbus RTU Master/Slave (via RS-232 or RS-485)

In the controller, all input signals from the sensors are combined. After connecting the controller, all of the I/O modules on the bus node are detected and a local process image is created from these. Analog and specialty module data is sent via words and/or bytes; digital data is sent bit by bit.



**Note**

**No direct access from fieldbus to the process image for I/O modules!**
Any data that is required from the I/O module process image must be explicitly mapped in the CODESYS program to the data in the fieldbus process image and vice versa! Direct access is not possible!

***e!****COCKPIT* makes configuring the fieldbus possible.

A Web-based management system (WBM) is also available as a configuration aid. This system includes various dynamic HTML pages from which, among other things, information about configuration and the status of the controller can be called up. The WBM is already stored in the device and is presented and operated using a web browser. You can also save your own HTML pages in the implemented file system, or call up programs directly.

In the controller's initial state, the installed firmware is based on Linux®, with special real-time extensions of the RT-Preempt patch. In addition, the following application programs are also installed on the controller, along with a number of different auxiliary programs:

- a SNMP server/client

- a FTP server, a FTPS server (explicit connections only)
- a SSH server/client
- a Web server
- a NTP client
- a BootP and DHCP client
- a DHCP server
- a DNS server
- an ***e!****RUNTIME* Runtime Environment

Based on IEC-61131-3 programming, data processing takes place on site in the controller. The logical process results can be output directly to the actuators or transmitted via a connected fieldbus to the higher level controller.

# 4 Properties

## 4.1 Hardware Description

### 4.1.1 View

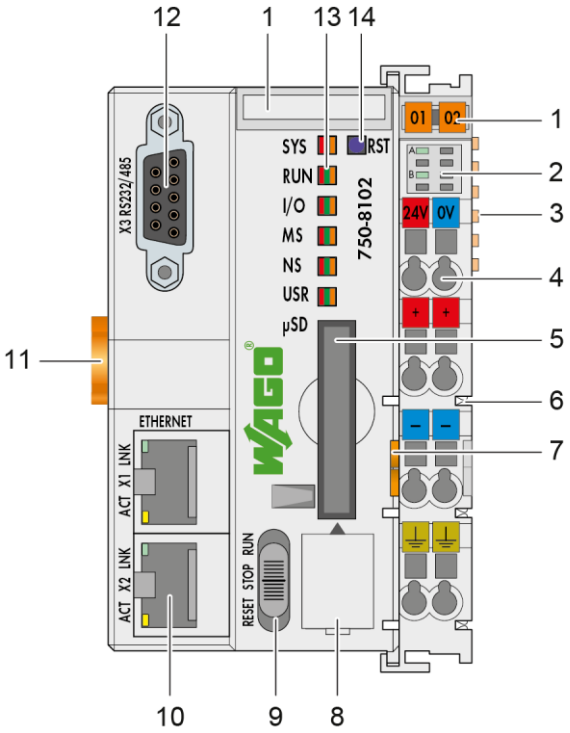



Figure 1: View

Table 4: Legend for Figure “View”

| Item | Description | See section |
|---|---|---|
| 1 | Marking options (Mini WSB) | --- |
| 2 | LED indicators – power pupply | “Display Elements” > “Power Supply Indicating Elements” |
| 3 | Data contacts | “Connectors” > “Data Contacts/Local Bus” |
| 4 | CAGE CLAMP® connectors for power supply | “Connectors” > “CAGE CLAMP® connectors” |
| 5 | Slot for memory card | “Slot for Memory Card” |
| 6 | Power contacts for power supply of down-circuit I/O modules | “Connectors” > “Power Jumper Contacts/Field Supply” |
| 7 | Releasing strap | “Mounting” > “Inserting Devices”<br>“Removal” > “Removing Devices” |

| | | |
|---|---|---|
| 8 | Service Interface (behind the flap) | “Connectors” > “Service Interface” |
| 9 | Mode selector switch | “Operating elements” > “Operating Mode Switch” |
| 10 | ETHERNET connectors – X1, X2 | “Connectors” > “Network connectors” |
| 11 | Safe locking feature | “Mounting” > “Inserting Devices”<br>“Removal” > “Removing Devices” |
| 12 | Communication interface – X3 | “Connectors” > “Communication Interface” |
| 13 | LED indicators – system | “Display Elements” > “Fieldbus/System Indicating Elements” |
| 14 | Reset button (in hole) | “Operating Elements” > “Reset Button” |

## 4.1.2 Labeling

The front labeling includes:
- Device designation
- Name of the display elements, connections and control elements
- Serial number with hardware and firmware version

The side labeling includes:
- Manufacturer's identification
- Connector pin assignment
- Serial number
- Approval information

### 4.1.2.1 Production Code

The serial number indicates the delivery status directly after production.

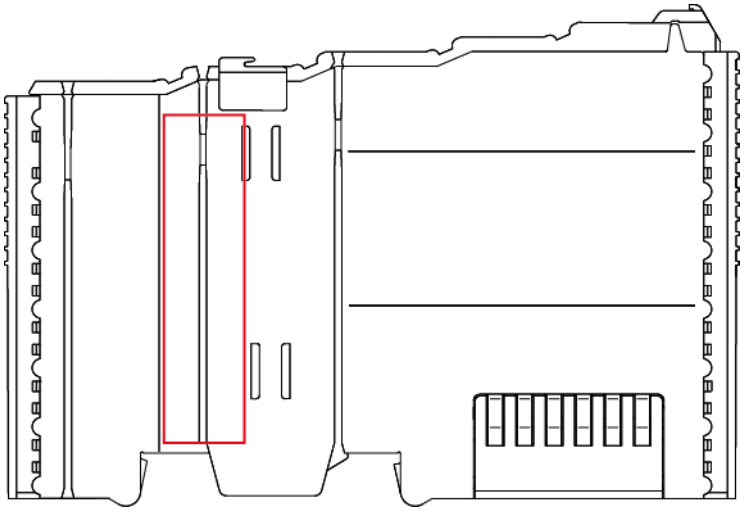


Figure 2: Marking Area for Serial Numbers

There are two serial numbers in two rows in the side marking. They are left of the release tab. The first 10 positions in the longer row of the serial numbers contain version and date identifications.

Example structure of the rows: 0114010101…

| **01** | **14** | **01** | **01** | **01** | **(additional positions)** |
|---|---|---|---|---|---|
| **WW** | **YY** | **FW --** | **HW** | **FL** | **-** |
| Calendar week | Year | Firmware version | Hardware version | Firmware loader version | Internal information |

The row order can vary depending on the production year, only the longer row is relevant. The back part of this and the shorter row contain internal administration information from the manufacturer.

## 4.1.3 Connectors

### 4.1.3.1 Wiring Level

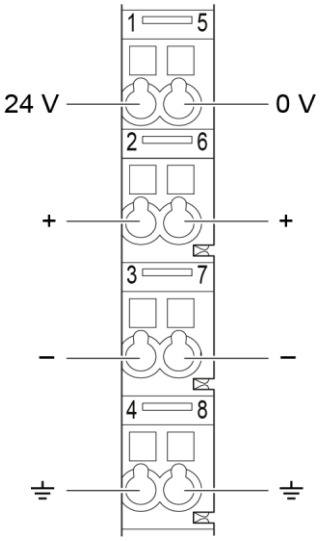



Figure 3: CAGE CLAMP® connections

Table 5: Legend for figure “CAGE CLAMP® connections”

| Contact | Description | Description |
|---|---|---|
| 1 | 24 V | System power supply voltage +24 V |
| 2 | + | Field-side power supply voltage $U_V$ |
| 3 | - | Field-side power supply voltage 0 V |
| 4 | Ground | Field-side power supply voltage, ground |
| 5 | 0 V | System power supply voltage 0 V |
| 6 | + | Field-side power supply voltage $U_V$ |
| 7 | - | Field-side power supply voltage 0 V |
| 8 | Ground | Field-side power supply voltage, ground |

### 4.1.3.2 Service Interface

The service interface is located behind the flap.

The Service interface is used for communication with WAGO-I/O-*CHECK* and “WAGO Ethernet Settings”.

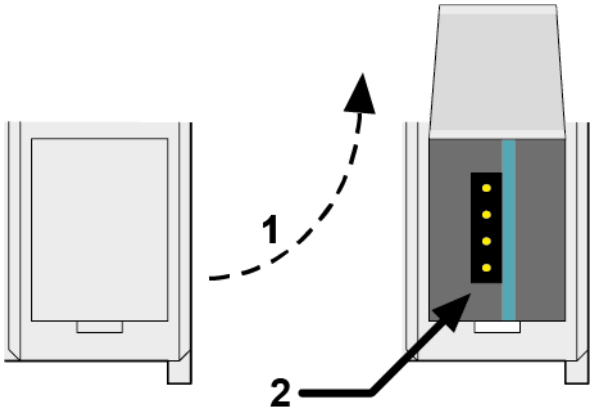



Figure 4: Service Interface (Closed and Open Flap)

Table 6: Service Interface

| Number | Description |
|---|---|
| 1 | Open flap |
| 2 | Service interface |

**NOTICE**

**Device must be de-energized!**
To prevent damage to the device, unplug and plug in the communication cable only when the device is de-energized!

The connection to the 4-pin header under the cover flap can be realized via the communication cables with the item numbers750-920 and 750-923 or via the WAGO radio adapter with the item number 750-921.

#### 4.1.3.3 Network Connectors

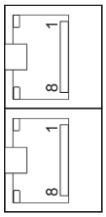



Figure 5: Network Connections – X1, X2

Table 7: Legend for Figure “Network Connections – X1, X2”

| Contact | Signal | Description |
|---|---|---|
| 1 | TD + | Transmit Data + |
| 2 | TD − | Transmit Data − |
| 3 | RD + | Receive Data + |
| 4 | NC | Not assigned |
| 5 | NC | Not assigned |
| 6 | RD − | Receive Data − |
| 7 | NC | Not assigned |
| 8 | NC | Not assigned |

### 4.1.3.4 Communication Interface

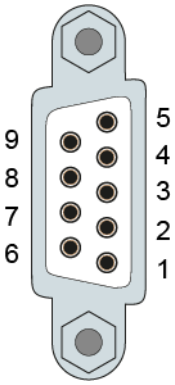



Figure 6: RS-232/RS-485 – Communication Interface – X3

Table 8: Legend for Figure “RS-232/RS-485 – Communication Interface – X3”

| Contact | RS-232 (DCE) | | RS-485 | |
|---|---|---|---|---|
| | Signal | Description | Signal | Description |
| 1 | NC | Not assigned | NC | Not assigned |
| 2 | RxD (out) | Receive Data | NC | Not assigned |
| 3 | TxD (in) | Transmit Data | A (Tx/Rx+) | Transmit/receive data + |
| 4 | NC | Not assigned | NC | Not assigned |
| 5 | FB_GND | Ground | FB_GND | Ground |
| 6 | NC | Not assigned | FB_5V | Power Supply |
| 7 | RTS (in) | Request to Send | NC | Not assigned |
| 8 | CTS (out) | Clear to Send | B (Tx/Rx−) | Transmit/receive data − |
| 9 | NC | Not assigned | NC | Not assigned |
| Enclosure | Shield | Shielding | Shield | Shielding |

If the communication interface is opened as an RS-232 interface, the controller represents data communication equipment (DCE). The RxD and CTS signals are sent to the communication partner (out), and the TxD and RTS signals are received by the communication partner (in).

**NOTICE**

**Incorrect parameterization can damage the communication partners!**
The voltage levels are −12 V and +12 V for RS-232, and −5 V and +5 V for RS-485.
If the controller interfaces differ from those of the communication partners (RS-232 <> RS-485 or RS-485 <> RS-232), this may damage the interface of the communication partner.
Therefore, always ensure that the controller interface matches those of its communication partners when configuring these items!

DC/DC converters and optocouplers in the fieldbus interface electrically isolate the fieldbus system and the electronics.

#### 4.1.3.4.1 Operating as an RS-232 Interface

Depending on the device type DTE (Data Terminal Equipment, e.g., PC) or DCE (Data Communication Equipment, e.g., PFC, modem), the RS-232 signals have different data directions.

Table 9: Function of RS-232 Signals for DTE/DCE

| Contact | Signal | Data Direction | |
|---|---|---|---|
| | | DTE | DCE |
| 2 | RxD | Input | Output |
| 3 | TxD | Output | Input |
| 5 | FB_GND | --- | --- |
| 7 | RTS | Output | Input |
| 8 | CTS | Input | Output |

For a DTE-to-DCE connection, the signals are connected directly (1:1).

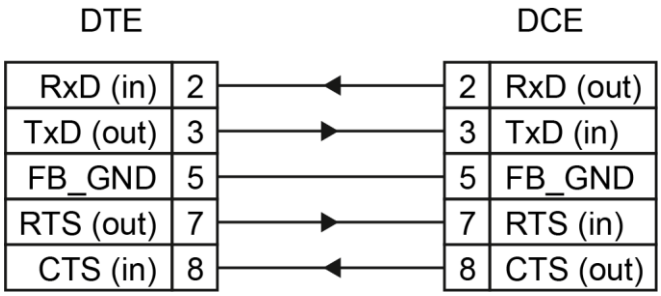



Figure 7: Termination with DTE-DCE Connection (1:1)

For a DCE-to-DCE connection, the signal connections are crossed (cross-over).

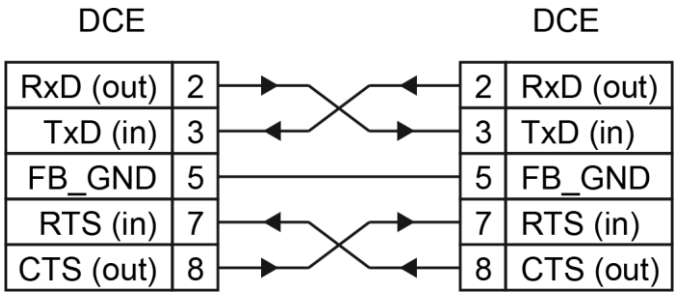



Figure 8: Termination with DCE-DCE Connection (Cross-Over)

#### 4.1.3.4.2 Operating as an RS-485 Interface

To minimize reflection at the end of the line, the RS-485 line must be terminated at both ends by a cable termination. If required, one pull-up or pull-down resistor may be used. These resistors ensure a defined level on the bus when no subscriber is active, i.e., when all subscribers are in “Tri-state”.

**Note**

**Attention — bus termination!**
The RS-485 bus must be terminated at both ends!
No more than two terminations per bus segment may be used!
Terminations may not be used in stub and branch lines!
Drop cables must be kept as short as possible!
Operation without proper termination of the RS-485 network may result in transmission errors.

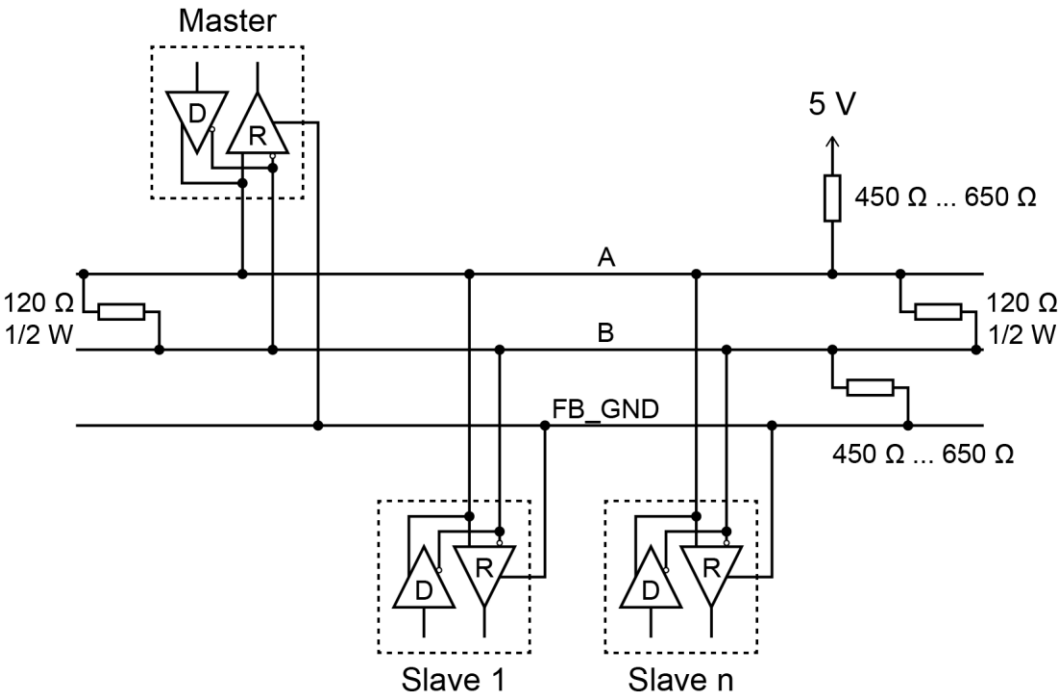



Figure 9: RS-485 Bus Termination

**Note**

**Transmission error with ineligible RS-485 configuration!**
For baud rates lower than 115200 baud, configure the RS-485 interface with two stop bits and enabled parity (even or odd) to avoid transmission errors.

## 4.1.4 System Contacts

### 4.1.4.1 Data Contacts

Communication between the controller and the I/O modules and system power supply for the I/O modules is provided via the local bus, which consists of 6 data contacts designed as self-cleaning gold spring contacts.

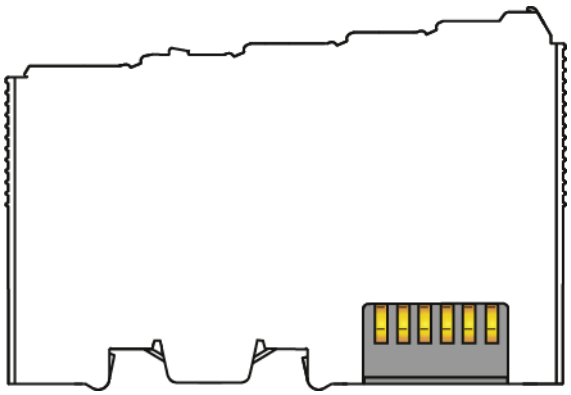


Figure 10: Data Contacts

**NOTICE**

**Do not place the I/O modules on the gold spring contacts!**
Do not place the I/O modules on the gold spring contacts in order to avoid soiling or scratching!

**NOTICE**



**Pay attention to potential equalization from the environment!**
The devices are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the devices, please ensure that environmental factors (personnel, work space and packaging) are properly equalized. Do not touch any conducting parts, e.g., data contacts.

**NOTICE**

**Do not exceed the maximum total current for I/O modules (5 VDC) via data contacts!**
The maximum permissible total current for internal system supply of the I/O modules may not be exceeded. The permissible total current is specified in the technical data of the head station and power supply. The data contacts for internal system supply can be damaged and the permissible operating temperature can be exceeded by higher values.
When configuring the system, do not exceed the permissible total current. If there is a higher power requirement, you must use an additional supply to provide the system voltage (5 VDC)!

### 4.1.4.2 Power Jumper Contacts

The controller 750-8102is equipped with 3 self-cleaning power contacts for transferring of the field-side power supply to down-circuit I/O modules. These contacts are designed as spring contacts.

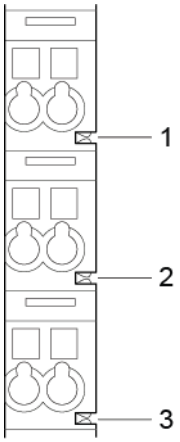



Figure 11: Power Jumper Contacts

Table 10: Legend for Figure “Power Jumper Contacts”

| Contact | Type | Function |
|---|---|---|
| 1 | Spring contact | Potential transmission ($U_V$) for field supply |
| 2 | Spring contact | Potential transmission (0 V) for field supply |
| 3 | Spring contact | Potential transmission (ground) for field supply |

**⚠ CAUTION**

**Risk of injury due to sharp-edged blade contacts!**
The blade contacts are sharp-edged. Handle the I/O module carefully to prevent injury. Do not touch the blade contacts.

**NOTICE**

**Do not exceed maximum values via power contacts!**
The maximum current that can flow through the power jumper contacts is 10 A. The power jumper contacts can be damaged and the permissible operating temperature can be exceeded by higher current values.

When configuring the system, do not exceed the permissible maximum current value. If there is a higher power requirement, you must use an additional supply module to provide the field voltage.

## 4.1.5 Display Elements

### 4.1.5.1 Power Supply LEDs

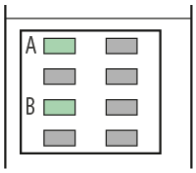



Figure 12: Power Supply Indicating Elements

Table 11: Legend for Figure “Power Supply Indicating Elements”

| Designation | Color | Description |
|---|---|---|
| A | Green/off | Status of system power supply voltage |
| B | Green/off | Status of field-side power supply voltage |

### 4.1.5.2 System/Fieldbus LEDs




Figure 13: Indicating elements for fieldbus/system

Table 12: Legend for Figure “Fieldbus/System Indicating Elements”

| Designation | Color | Description |
|---|---|---|
| SYS | Red/Green/ Orange/Off | System status |
| RUN | Red/Green/ Orange/Off | PLC program status |
| I/O | Red/Green/ Orange/Off | Local bus status |
| MS | Red/Green/ Orange/Off | Module status |
| NS | Red/Green/ Orange/Off | Without function |
| USR | Red/Green/ Orange/Off | User LED, programmable using function blocks from the WAGO libraries to control the LEDs |

#### 4.1.5.3 Network Connector LEDs

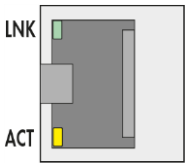



Figure 14: Indicating Elements, RJ-45 Jacks

Table 13: Legend for Figure “Indicating Elements, RJ-45 Jacks”

| Designation | Color | Description |
|---|---|---|
| LNK | Green/Off | ETHERNET connection status |
| ACT | Yellow/Off | ETHERNET data exchange |

### 4.1.5.4 Memory Card Slot LED

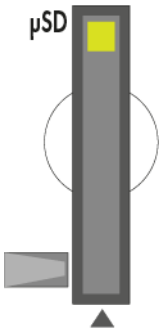



Figure 15: Indicating Elements, Memory Card Slot

Table 14: Legend for Figure “Indicating Elements, Memory Card Slot”

| Description | Color | Description |
|---|---|---|
| µSD | Yellow/Off | Memory card status |

## 4.1.6 Operating Elements

### 4.1.6.1 Operating Mode Switch

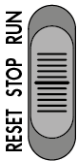



Figure 16: Mode Selector Switch

Table 15: Mode Selector Switch

| Position | Actuation | Function |
|---|---|---|
| RUN | Latching | **Normal operation**<br>***e!****RUNTIME* applications running. |
| STOP | Latching | **Stop**<br>All ***e!****RUNTIME* applications have stopped. |
| RESET | Spring-return | **Reset warm start** or<br>**Reset cold start**<br>(depending on length of actuation, see Section “Starting” > “Initiating Reset Functions”) |

Other functions can also be initiated using the reset button.

### 4.1.6.2 Reset Button

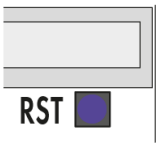



Figure 17: Reset Button

The Reset button is installed behind drilling to prevent operating errors. It is a shortstroke button with a low actuating force of 1.1 N … 2.1 N (110 gf … 210 gf). The button can be actuated using a suitable object (e.g., pen).

You can initiate different functions using the Reset button depending on the position of the mode selector:

- Temporarily set a fixed IP address (“Fixed IP Address” mode, see section “Commissioning” > “Setting an IP Address” > “Temporarily Setting a Fixed IP Address”)
- Perform a software reset (restart, see section “Commissioning” > “Initiating Reset Functions” > “Software Reset”)
- Restore factory setting (factory reset, see section “Service” > “Firmware Changes” > “Factory Reset”)

## 4.1.7 Memory Card Slot

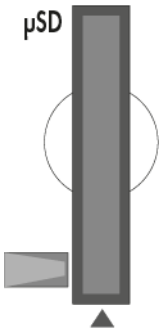



Figure 18: MicroSD Card Slot

The microSD card is locked in the enclosure by a push/push mechanism.
Inserting and removing the card is described in the Section “Service” > “Inserting and Removing the Memory Card”.
The microSD card is protected by a cover flap, which can also be sealed.

The microSD card is locked in the enclosure by a push/push mechanism.
Inserting and removing the card is described in the Section “Service” > “Inserting and Removing the Memory Card”.
The microSD card is protected by a cover flap, which can also be sealed.

**Note**

**Memory card is not included in the scope of delivery!**
Note, the controller is delivered without memory card.
To use a memory card, you must order one separately. The controller can also be operated without memory card expansion, the use of a memory card is optional.

**Note**

**Only use recommended memory cards!**
Use only the microSD memory card available from WAGO (item No. 758-879/000-3102) as it is suitable for industrial applications subjected to environmental extremes and for use in this device.
Compatibility with other commercially available storage media cannot be guaranteed.

## 4.2 Schematic Diagram

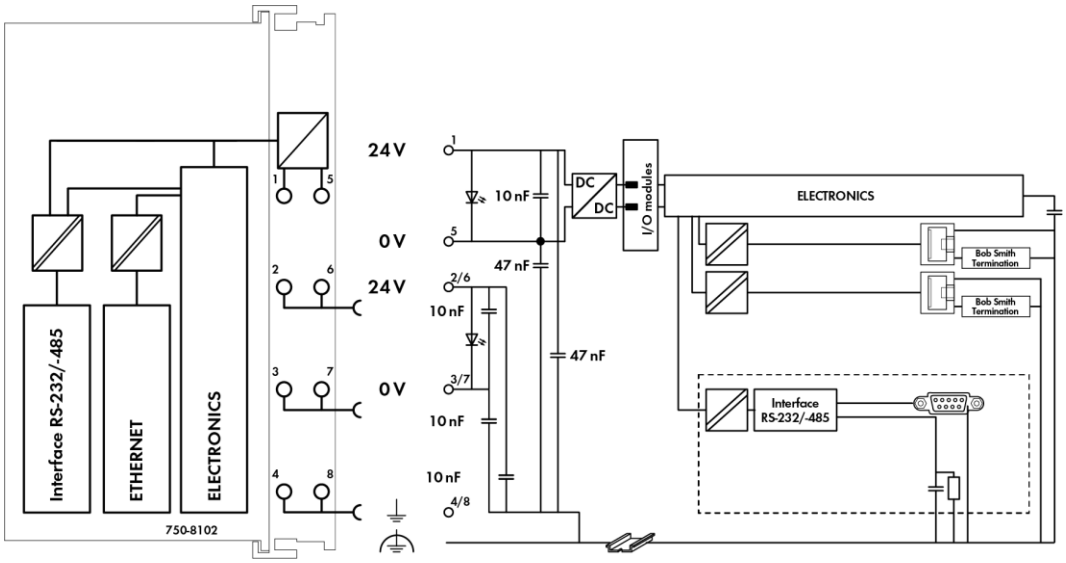



Figure 19: Schematic switching diagram

# 4.3 Technical Data

## 4.3.1 Mechanical Data

Table 16: Technical Data – Mechanical Data

| | |
|---|---|
| Width | 61.5 mm / 2.421 inch |
| Height | 100 mm / 3.937 inch |
| Depth | 71.9 mm / 2.831 inch |
| Depth from upper edge of DIN-rail | 64.7 mm / 2.547 inch |
| Weight | 163 g |

## 4.3.2 System Data

Table 17: Technical Data – System Data

| | |
|---|---|
| CPU | Cortex A8, 600 MHz |
| Operating System | Real-time Linux® 4.9.47-rt37<br>(with RT Preemption Patch) |
| MicroSD card slot | Push-push mechanism,<br>sealable cover lid |
| Type of memory card | microSD up to 32 Gbytes<br>(All guaranteed properties are valid only in connection with the WAGO 758-879/000-3102 memory card.) |

## 4.3.3 Power Supply

Table 18: Technical Data – Power Supply

| | |
|---|---|
| Power supply | 24 VDC (-25 % … +30 %) |
| Max. input current (24 V) | 550 mA |
| Power failure time acc. IEC 61131-2 | Depending on external buffering |
| Total current for I/O modules (5V) | 1700 mA |
| Isolation | 500 V system/supply |

**Note**

**Buffer for system power supply!**
The system power supply and, if necessary, the field supply must be buffered to bridge power outages.
As the power demand depends on the respective node configuration, buffering is not implemented internally.
To achieve power outages of 1 ms to 10 ms according to IEC61131-2, determine the buffering appropriate for your node configuration and structure it as an external circuit.

### 4.3.4 Clock

Table 19: Technical Data – Clock

| | |
|---|---|
| Drift - system clock (25 °C) | 20 ppm |
| Drift - RTC (25 °C) | 3 ppm |
| Buffer time RTC (25 °C) | 7 days |

### 4.3.5 Programming

Table 20: Technical Data – Programming

| | |
|---|---|
| Programming | ***e!****COCKPIT* |
| IEC 61131-3 | LD, FBD (CFC), ST, FC |
| Program and data memory | 12 MB (dynamically distributed) |
| Non-volatile memory (NVRAM, retain + flag) | 128 Kbytes |

### 4.3.6 Local Bus

Table 21: Technical Data – Local Bus

| | |
|---|---|
| Number of I/O modules (per node) | 64 |
| with bus extension | 250 |
| Input and output process image (max.) | Not specified |

### 4.3.7 ETHERNET

Table 22: Technical Data – ETHERNET

| | |
|---|---|
| ETHERNET | 2 x RJ-45 (switched or separated mode) |
| Transmission medium | Twisted Pair S-UTP, 100 Ω, Cat 5, 100 m maximum cable length |
| Baud rate | 10/100 Mbit/s; 10Base-T/100Base-TX |
| Protocols | DHCP, DNS, SNTP, FTP, FTPS (only explicit connections), SNMP, HTTP, HTTPS, SSH, Modbus (TCP, UDP) |
| Modbus – input and output process image max. | 32000 words |



**Note**

**No direct access from fieldbus to the process image for I/O modules!**
Any data that is required from the I/O module process image must be explicitly mapped in the CODESYS program to the data in the fieldbus process image and vice versa! Direct access is not possible!

### 4.3.8 Communication Interface

Table 23: Technical Data – Communication Interface

| | |
|---|---|
| Interface | 1 x serial interface per TIA/EIA 232 and TIA/EIA 485 (switchable), 9-pole D-sub female connector |
| Protocols | WAGO Service Communication, Linux console as well as application-specific protocols (Modbus RTU, etc.) |

### 4.3.9 Connection Type

Table 24: Technical Data – Field Wiring

| | |
|---|---|
| Connection technology | CAGE CLAMP® |
| Conductor cross-section | 0.08 mm² … 2.5 mm², AWG 28 … 14 |
| Strip length | 8 mm … 9 mm / 0.33 in |

Table 25: Technical Data – Power Jumper Contacts

| | |
|---|---|
| Power jumper contacts | Spring contact, self-cleaning |

Table 26: Technical Data – Data Contacts

| | |
|---|---|
| Data contacts | Slide contact, hard gold plated, self-cleaning |

## 4.3.10 Climatic Environmental Conditions

Table 27: Technical Data – Climatic Environmental Conditions

| | |
|---|---|
| Surrounding air temperature (operation) | 0 °C … 55 °C |
| Surrounding air temperature (operation) for components with extended temperature range (750-xxx/025-xxx) | −20 °C … +60 °C |
| Surrounding air temperature (storage) | −25 °C … +85 °C |
| Surrounding air temperature (storage) for components with extended temperature range (750-xxx/025-xxx) | −40 °C … +85 °C |
| Relative humidity | 5 % … 95 % without condensation |
| Operating altitude | 0 … 2000 m |
| Pollution degree | 2 |
| Overvoltage category | II |
| Protection type | IP20 |
| Resistance to harmful substances | Acc. to IEC 60068-2-42 and IEC 60068-2-43 |
| Maximum pollutant concentration at relative humidity < 75 % | $SO_2 \leq 25$ ppm<br>$H_2S \leq 10$ ppm |
| Special conditions | • Ensure that additional measures for components are taken, which are used in an environment involving:<br>– dust, caustic vapors or gases<br>– ionizing radiation<br>• The permissible temperature range of the connecting cable must be dimensioned based on the mounting position and current intensity, as the temperature of the terminal connection can be up to 25 °K above the maximum expected surrounding air temperature (at 10 A). |

## 4.4 Approvals

For current approvals, please go to: www.wago.com/<Item number>.

The following approvals have been granted to the basic version and the variants of the “PFC100; 2ETH RS” controller (750-8102) described in this document:

Conformity Marking

UL508

The following Ex approvals have been granted to the basic version and the variants of the “PFC100; 2ETH RS” controller (750-8102) described in this document:

| | |
|---|---|
| Hazardous Locations | UL 121201 for Use in Hazardous Locations<br>Cl I Div 2 |

TÜV 14 ATEX 148929 X

II 3 G Ex nA IIC T4 Gc

IECEx TUN 14.0035 X

Ex nA IIC T4 Gc

2020312310000213

Ex nA IIC T4 Gc

Ex nA IIC T4 Gc

EAC RU C-DE.AM02.B.00163/19

2Ex e IIC T4 Gc X

The following ship approvals have been granted to the basic version and the variants of the “PFC100; 2ETH RS” controller (750-8102) described in this document:

ABS (American Bureau of Shipping)

DNV GL
[Temperature: B, Humidity: B, Vibration: B, EMC: B, Enclosure: (*)]
(*) Required protection according to the rules shall be provided upon installation on board.

LR (Lloyd’s Register) Env. 1, 2, 3, 4

PRS (Polski Rejestr Statków)

The following ship approvals have been granted to the basic version of the “PFC100; 2ETH RS” controller (750-8102):

BV (Bureau Veritas)

RINA (Registro Italiano Navale)

**Information**

**For more information about the ship approvals:**
Note the “Supplementary Power Supply Regulations” section for the ship approvals.

## 4.5 Standards and Guidelines

The “PFC100; 2ETH RS” controller (750-8102) fulfills the following EMC standards:

| | |
|---|---|
| EMC CE-Immunity to interference | EN 61000-6-2 |
| EMC CE-Emission of interference | EN 61000-6-3 |

# 5 Function Description

## 5.1 Network

### 5.1.1 Interface Configuration

The X1 and X2 network interfaces of the controller are connected with an integrated configurable 3-port switch, in which the third port is connected to the CPU.

The two interfaces and configurable switch enable wiring for:

- One common network where both ports share a common IP address.
- Two separate networks where each port has its own IP address.

The physical interfaces (ports) are assigned via logical bridges and can be e.g., configured via the WBM.

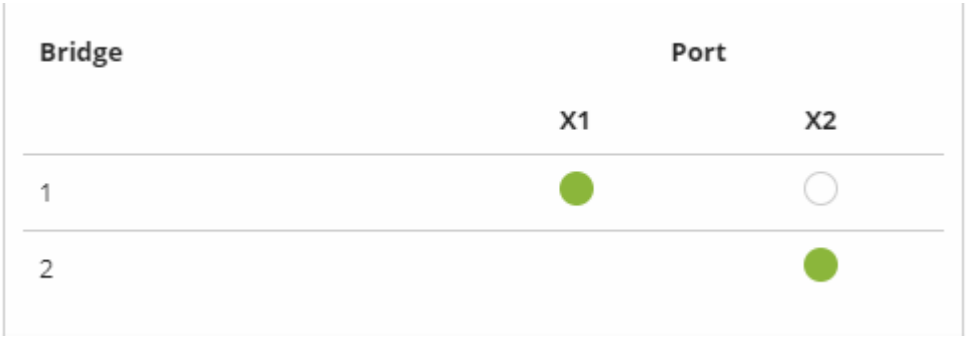



Figure 20: Example of Interface Assignment via WBM

#### 5.1.1.1 Operation in Switch Mode

For operation in Switch mode, the TCP/IP settings such as the IP address or subnet mask apply to both X1 and X2.

When switching to Switch mode, the X1 settings are applied as a new common configuration for X1 and X2.
The device is then no longer accessible via the IP address previously set for X2. This must be taken into account for CODESYS applications that use X2 for communication.

#### 5.1.1.2 Operation with Separate Network Interfaces

When operating with separate network interfaces, both ETHERNET interfaces can be configured and used separately.
Note that the two interfaces still have the same MAC address. Therefore, they must not be operated in the same network segment.

When switching to operating with separate interfaces, interface X2 is initialized with the setting values last valid for it. The connections on the X1 interface persist.

When operating with separate interfaces and fixed IP address, the device can still be accessed via the interface X2 via the regular IP address.

## 5.1.2 Network Security

### 5.1.2.1 Users and Passwords

Several groups of users are provided in the controller which can be used for various services.

Default passwords are set for all users. We strongly recommend changing these passwords on startup!



**Note**

**Change passwords**
Default passwords are documented in these instructions and therefore do not offer adequate protection! Change the passwords to meet your particular needs.

#### 5.1.2.1.1 Services and Users

All password-protected services and their associated users are listed in the following table.

Table 28: Services and Users

| Service | Users | | | |
|---|---|---|---|---|
| | Linux | | | SNMP |
| | root | admin | user | |
| Web Based Management (WBM) | X | X | X | |
| Linux console | X | X | X | |
| Console Based Management (CBM) | X | | | |
| CODESYS | | X | | |
| Telnet | X | X | X | |
| FTP | X | X | X | |
| FTPS | X | X | X | |
| SSH | X | X | X | |
| SNMP | | | | X |

#### 5.1.2.1.2 WBM User Group

The WBM uses part of the Linux users.

Table 29: WBM Users

| Users | Permissions | Default Password |
|---|---|---|
| root | All (administrator) | wago |
| admin | All (administrator) | wago |
| user | Supported to a limited extent | user |
| guest | Display only | --- |



**Note**

**General Rights of WBM Users**
The WBM users “root”, “admin” and “user” have rights beyond the WBM to configure the system and install software.



**Note**

**Change passwords**
Default passwords are documented in these instructions and therefore do not offer adequate protection! Change the passwords to meet your particular needs.

More information is available in the Section “WBM User Administration”.

#### 5.1.2.1.3 Linux User Group

The Linux user group includes the actual users of the operating system, which is likewise used by most services.

Table 30: Linux Users

| User | Special Feature | Home Directory | Default Password |
|---|---|---|---|
| root | Super user | /root | wago |
| admin | CODESYS user | /home/admin | wago |
| user | Normal user | /home/user | user |

You can configure passwords for these users via a terminal connection.



**Note**

**Change passwords**
Default passwords are documented in these instructions and therefore do not offer adequate protection! Change the passwords to meet your particular needs.



**Note**

**Note password length!**
For CODESYS, the password length must be greater than or equal to 1 character and less than 60 characters!

#### 5.1.2.1.4 SNMP User Group

The SNMP service manages its own users. In its initial state, no users are stored in the system.

#### 5.1.2.2 Web Protocols for WBM Access

The HTTP and HTTPS web protocols can be used to access the WBM pages for the controller. HTTPS is preferred because it uses the SSL/TLS protocol. The SSL/TLS protocol ensures secure communication through encryption and authentication

The default setting for the controller allows strong encryption, but uses only simple authentication methods. As authentication for any secure communication channel plays a central role, it is strongly recommended that you use secure authentication. The security certificate saved on the controller is the basis for authentication. The default location for the security certificate is: /etc/lighttpd/https-cert.pem

As delivered, the controller uses a generic security certificate based on x509. To allow secure authentication, you must replace the generic security certificate with a security certificate specific for the individual device.

##### 5.1.2.2.1 TLS Encryption

When an HTTPS connection is established, the Web browser and Webserver negotiate what TLS version and what cryptographic method are to be used.

The “TLS Configuration” group of the WBM page “Security” can be used to switch the cryptographic methods allowed for HTTPS and the TLS versions that can be used.

The settings “Strong” and “Standard” are possible.
If “Strong” is set, the Webserver only allows TLS Version 1.2 and strong algorithms.
Older software and older operating systems may not support TLS 1.2 and encryption algorithms.
If “Standard” is set, TLS 1.0, TLS 1.1 and TLS 1.2 are allowed, as well as cryptographic methods that are no longer considered secure.



**Information**

**BSI Technical Guidelines TR-02102**
The rules for the “Strong” setting are based on technical guidelines TR-02102 of the German Federal Office for Information Security.
You can find the guidelines on the Internet at: https://www.bsi.bund.de > “Publications” > “Technical Guidelines.”



**Information**

**BSI Guidelines on Migration to TLS 1.2**

The German Federal Office for Information Security guidelines on migration to TLS 1.2 contain “compatibility matrices” that show what software is comparable with TLS 1.2.

You can find the guidelines on the Internet at: https://www.bsi.bund.de > “Topics” > “Standards and Criteria” > “Minimum Standards“.

#### 5.1.2.3 Root Certificates

For communication encrypted with TLS, root certificates are used to verify the authenticity of the communication partner.
A root certificate, which is signed by a certificate authority, serves to verify the validity of all certificates issued by this certificate authority.

The root certificates stored on the controller (root CA bundle) form the basis for authentication of services hosted on the Internet (e.g., email providers and cloud services).

The standard storage location for the root certificates is /etc/ssl/certs/ca-certificates.crt.

This file contains the certificates provided by Mozilla. A list of the included root certificates and their respective validity periods can be requested from the following address:

https://hg.mozilla.org/releases/mozilla-release/raw-file/79f079284141/security/nss/lib/ckfw/builtins/certdata.txt

The root certificates can be updated on the controller by updating the file /etc/ssl/certs/ca-certificates.crt (see section “Service” > “Updating Root Certificates”).

## 5.1.3 Network Configuration

### 5.1.3.1 Host Name/Domain Name

Without a host name configuration, the controller is assigned a default name which includes the last three values of the controller's MAC address, e.g., “PFCx00-A1A2A3.” This name is valid for as long as a host name was not configured, or host name was not supplied to the controller via DHCP (for configuration of the controller see Section “Startup” > “Configuring”). When the host name is set, a host name supplied by a DHCP response is immediately active and displaces the configured or default host name.

For multiple network interfaces with DHCP, the hostname is taken from the network interface (bridge or Wwan) with the highest priority. The priority is specified alphanumerically by the name of the network interface. Thus, Bridge1 has the highest priority, followed by Bridge2, Bridge3, ..., Wwan0.

If only the configured name is to be valid, the network administrator must adjust the configuration of the active DHCP server so that no host names are transferred in the DHCP response.

The default host name or the configured name is active again if the network interfaces are set to static IP addresses or if a host name is not received via the DHCP response.

A similar mechanism is used for a domain name as for the host name. The difference is that a default domain name is not set. As long as a domain name is not configured or supplied by DHCP, the domain name is empty.

### 5.1.3.2 Routing

As part of the TCP/IP configuration, the controller allows you to configure static routes, IP masquerading and port forwarding. Default gateways are configured via static routes, since default gateways are a special case of static routes.

A network station transmits to a gateway all network data packets for systems outside of its local network. This gateway is responsible for the appropriate routing of the data packets so that they reach the target system. To allow access to different target systems, it may be necessary to configure multiple gateways. This is configured by adding routing entries.
A routing entry consists of the following information:

- Destination address,
- Destination mask,
- Gateway address,
- Gateway metric.
- Interface

On the basis of the target system configuration, consisting of the destination address and destination mask, a decision is made about which gateway a network data packet should be forwarded to. The target system can be specified through an individual IP address or an IP address range. For a network data packet to forward, the routing entry with the most specific destination address and destination mask entries is always selected. The default gateway corresponds to the least specific routing entry. All network data packets such that no specific routing entry exists for their destination address and destination mask are sent to this default gateway.

**Default gateway:**
Default gateways, also called default routes, are always set in connection with the IP configuration.
Each default gateway has a metric that is unique among all default gateways. Bridge <n> has the metric 19+<n>.
A default gateway can also be defined via the routing configuration, e.g., to define an individual metric. The value “default” must be set for “Destination Address” and the value “0.0.0.0” for Destination Mask.

**Route:**
If an IP address or IP address range is entered in the “Destination Address” field, then all network data packets that are directed to the network address or network address range are sent to the gateway address corresponding to the entry. Alternatively, a bridge, a modem or a VPN interface can be specified in the “Interface” field, via which all data packets that are directed to the destination address are routed. Specifying an interface is optional. However, either a gateway address, an interface or both must be specified.

If the IP address of the gateway is outside the IP address space that the controller can reach, the associated route is not enabled. This also applies to routes in which an interface is specified, which e.g., is not enabled in the current bridge configuration.

A metric is assigned to each routing entry. If multiple routing entries are configured for the same destination address and destination mask, the metric specifies how the routing entries are prioritized. In this case, routing entries with a lower value for the metric are preferred over routing entries with a higher metric value. The metric value of the configured routing entries can be specified for the controller.

Besides the manually configurable routes, default gateways can also be set via DHCP replies. A unique metric is assigned to all default gateways assigned by DHCP.

The metric is assigned starting at 10 and depends on the network interface via which the DHCP response was received. The metric is assigned in ascending order based on the alphanumeric sorting of the network interface names (e.g., br0, br1, … wwan0).

Metric example:
A controller obtains its IP configuration via a DHCP server and receives both the

IP address and the network mask 192.168.1.10/24. Furthermore, a gateway with IP address 192.168.1.2 and metric value 20 is set up on the controller. Therefore, when no specific routing entry exists for the target address of network data packets, the controller sends them to gateway 192.168.1.2. Besides the IP address and network mask, the DHCP server is now instructed to allocate a default gateway of 192.168.1.1. The controller gives this default gateway a metric value of 10. Therefore, the default gateway received via DHCP is preferred over the manually configured gateway.

The routing entries are used to specify which gateways the network data packets are sent. If the controller is running in switched mode and only has one network interface, all network traffic passes through this network interface. If the controller is running in separated mode or contains a modem, it has more than one network interface. Therefore, it is possible for a network data packet to arrive at the controller on one network interface and depart on a different network interface. This forwarding between different network interfaces must be explicitly enabled; it is disabled when the controller is delivered. To enable the forwarding, “Enabled” must be enabled in the “IP Forwarding through multiple interfaces” group. In this case, the controller can function as a router.

For forwarding network communication through a router, it is necessary to note that corresponding routing entries must be provided not only for the router, but also for the respective endpoints of the communication. The routing entries of the endpoints must ensure that the desired network data packets are sent via the router, both when the connection is established and with the replies.

Host route example:
A host route is a route to an individual host. In the following example, a route to a host with IP address 192.168.1.2 is to be specified. The route passes through a gateway that can be reached via address 10.0.1.3. To configure a host route to the destination host on a controller connected to the gateway, the following settings must be made:

| | | |
|---|---|---|
| Destination Address: | 192.168.1.2 | IP address of the destination host |
| Destination Mask: | 255.255.255.255 | Subnet mask of an individual host |
| Gateway Address: | 10.0.1.3 | IP address of the gateway |
| Gateway Metric | 20 | Route priority |

Network route example:
A network route is a route to a subnet, which can contain multiple hosts. In the following example, a route to a subnet should be specified with network address 192.168.1.0. The route passes through a gateway that can be reached via address 10.0.1.3. To configure a network route to the destination network on a controller connected to the gateway, the following settings must be made:

| | | |
|---|---|---|
| Destination Address: | 192.168.1.0 | IP address of the destination network |
| Destination Mask: | 255.255.255.0 | Subnet mask of the destination network |
| Gateway Address: | 10.0.1.3 | IP address of the gateway |
| Gateway Metric | 20 | Route priority |

Example of a route via an interface:
In the following example, a route to a host with IP address “192.168.1.2” is to be specified. The route runs via the br1 interface, which corresponds to Bridge 2. To configure a host route to the target host via Bridge 2 on a controller with an activated Bridge 2, the following settings must be made.

| | | |
|---|---|---|
| Destination address: | 192.168.1.2 | IP address of the target host |
| Destination mask: | 255.255.255.255 | Subnet mask of an individual host |
| Gateway Metric | 20 | Route priority |
| Interface | br1 | Interface through which the packet is to be routed |

Besides configuration of static routes, the controller also supports IP masquerading. This can be enabled for selected network interfaces of the controller. Network data packets that depart the controller through a network interface for which IP masquerading has been enabled are given the IP address of the network interface as their sender address. If network data packets are forwarded through the controller, the network behind the controller is encapsulated under a single address.

Furthermore, the controller permits configuration of port forwarding entries. For port forwarding, the destination address and, if relevant, destination port of a network data packet that arrived at the controller via a previously configured network interface are overwritten. This makes it possible to forward network data packets through the controller to other addresses and ports. Forwarding can be configured for the TCP or UDP protocols.

## 5.1.4 Network Services

### 5.1.4.1 DHCP-Client

The controller can get network parameters from an external DHCP master via the DHCP Client service.

The following parameters can be obtained:

- IP address
- SubNet mask
- Router/gateway
- Hostname
- Domain
- DNS server
- NTP server

For the IP address, SubNet mask and router/gateway parameters, the entries are stored per ETHERNET port.

For multiple network interfaces with DHCP, the hostname is taken from the network interface (bridge or Wwan) with the highest priority. The priority is specified alphanumerically by the name of the network interface. Thus, Bridge1 has the highest priority, followed by Bridge2, Bridge3, ..., Wwan0.

### 5.1.4.2 DHCP Server

The controller provides the DHCP server service for the automatic configuration of IP addresses of network stations on the same subnet.
Generally, only one DHCP server can be active on a subnet at one time.

The following can be set for the DHCP server:

- The service itself (active/not active)
- The range of dynamically assigned IP addresses
- The lease time of the dynamically assigned IP addresses
- A list with static assignments of IP addresses to MAC addresses

In “switched” mode, these settings are possible for both interfaces together and in “separated” mode for each interface separately.

The settings are made, for example, in the WBM via the “DHCP Configuration” page.

The DHCP server also passes other parameters in addition to the IP address. The following table shows the complete list.

Table 31: List of Parameters Transmitted via DHCP

| Parameters | Explanation |
|---|---|
| IP address | An IP address from the range of permitted address; the range can be configured in the WBM.<br>The DHCP server determines the IP address to be passed to the requesting network subscriber (client) from the MAC address of the network subscriber and the range of addresses to be assigned. As long as the configured address range does not change and no bottlenecks occur when assigning IP addresses, the DHCP server continuously reassigns the same IP addresses to requesting network subscribers.<br>When a subscriber connects to the network, for whose MAC address a fixed IP address has been configured in the WBM, this address is passed to it. Such a fixed IP address can also be outside the range of freely-assignable IP addresses.<br>A hostname can also be specified instead of the MAC address for identifying the requesting network subscriber. |
| Subnet mask | The subnet mask configured in the network settings of the DHCP server for the local network concerned is passed.<br>The subnet mask and IP address determine the range of valid IP addresses on the local network. |
| Broadcast address | IP address with which an IP packet can be sent to all network subscribers on the subnet at the same time |
| Lease time | Determines the validity period of the DHCP parameters passed to a network subscriber:<br>Per protocol, the network subscriber is required to request the network settings again after half the period of validity.<br>The lease time is configured in the WBM. |
| Host name | The network name is passed to the network subscriber.<br>The network subscriber normally sends its own name with its request for the IP address. It is then used by the DHCP server in its response. |
| Name server | The DHCP server passes its own IP address as the DNS name server to the network subscriber. |
| Default gateway | The DHCP server passes its own IP address as the default gateway to the network subscriber.<br>The default gateway is required to communication with subscribers outside the local network. |

Not all parameters can be set in the WBM. If you want to set other values for the existing parameters or want to pass other parameters via DHCP, the DHCP server must be manually configured. For the controller, the DHCP server service is handled by the program "dnsmasq".

From a Linux® command line, an editor must be used to change the file “/etc/dnsmasq.d/dnsmasq_default.conf” to set the configuration.

### 5.1.4.3 DNS Server

The controller offers the DNS server service for the automatic assignment of hostnames to IP addresses of network stations.
The DNS server takes over the names and IP addresses of local network stations from the DHCP server. This DNS server routes requests for non-local names, such as from the Internet, to higher-level DNS servers if configured and accessible.

The following settings are possible for the DNS server:

- The service itself (enabled/disabled)
- Access type to the assignments
  The requests are buffered in “Proxy” mode (throughput optimized).
  In Relay mode the requests are routed directly to higher-level name servers.
- A list with up to 15 static assignments of IP addresses to hostnames
  If only the hostname is used, the configured or default domain is added to the hostname automatically to ensure FQDN name resolution.

The settings are made, e.g., in the WBM, via the “Configuration of DNS Service” page.

## 5.1.5 Cloud Connectivity Functionality

With the cloud connectivity functionality and an IEC library, the controller is available as a gateway for Internet-of-Things (IoT) applications. This means the controller can collect the data from all the connected devices, access the Internet via the built-in Ethernet interface or the mobile communications module and send the data to the cloud.

You can specify the cloud service to use: Microsoft Azure, Amazon Web Services and IBM Cloud are available.

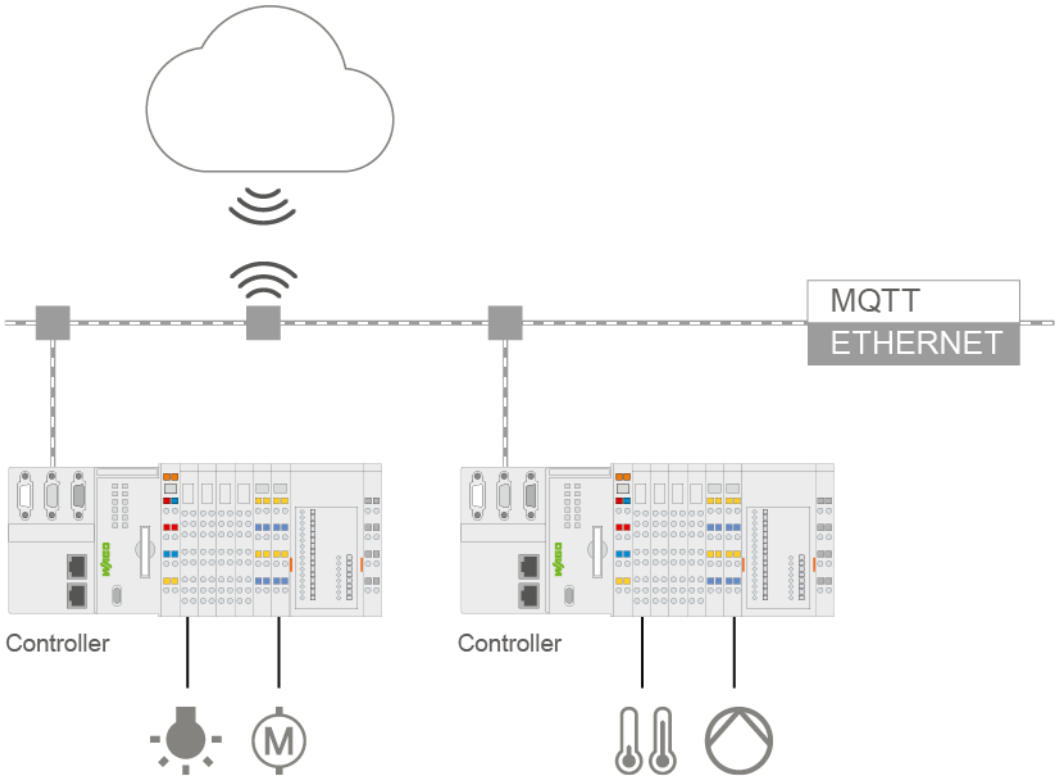



Figure 21: Connecting the Controller to a Cloud Service (Example)

Data is transmitted from the controller to the cloud service as JSON files. The connection can be encrypted with TLS; see the section “Functional Description” > … > “TLS Encryption.”

You can find the settings that must be configured in the controller in order to use the cloud connectivity functionality in the section “Start-Up” > … > “Configuration Using Web-Based Management.

The communication parameter is configured in the WBM; the data to exchange between the cloud and controller is configured with the libraries for ***e!****COCKPIT*.

**Note**

**Please note the risks of using cloud services!**
If you use third-party cloud services, sensitive data is transferred to the cloud service provider at one's own responsibility. External access may result in manipulated data and/or unwanted control commands affecting the performance of your control system.

Use encryption methods to protect your data and observe the information provided by the Federal Office for Information Security – “Cloud: Risks and Security Tips”.
Observe comparable publications of the competent, public institutions of your country.

**Information**

**Observe the additional documentation!**
You can find a detailed description of the cloud connectivity software package with a controller and information on PLC programming in Application Note A500920 in the Downloads area: www.wago.com.

**Information**

**Observe the necessary data protection and security settings!**
Before using the cloud connectivity functionality, consult the corresponding handbook and familiarize yourself with data protection and security issues.
You will find this in the Downloads area at www.wago.com.

#### 5.1.5.1 Components of the Cloud Connectivity Software Package

Table 32: Components of the Cloud Connectivity Software Package

| Components | Description |
|---|---|
| ***e!****COCKPIT*: WagoAppCloud | IEC library to create the PLC application; function blocks make it possible to exchange data between the PLC and cloud service. The data transmission variables are definable. |

## 5.2 Memory Card Function

**Note**

**Only use recommended memory cards!**
Use only the microSD memory card available from WAGO (item No. 758-879/000-3102) as it is suitable for industrial applications subjected to environmental extremes and for use in this device.
Compatibility with other commercially available storage media cannot be guaranteed.

The memory card is optional and serves as an additional memory area in addition to the internal memory or drive in the controller. The user program, user data, source code of the project or device settings can be saved to the memory card, and thus already existing project data and programs can be copied to one or more controllers.

If the memory card is inserted, this is incorporated under /media/sd in the directory structure of the file system inside the controller. This means that the memory card can be addressed like a removable medium on a PC.

The function of the memory card in normal operation and possible faults that may occur when the memory card is used are described in the following sections for different operating modes.

### 5.2.1 Formatting

**Note**

**Note the pre-formatting of the memory card!**
Please note that memory cards ≤ 2 GB are often formatted with the “FAT16” file system type and can generate up to 512 entries in the root directory. For over 512 entries create these in a subdirectory or format the memory card with “FAT32” or “NTFS.”

**Note**

**Memory card access from CODESYS only possible with FAT16, FAT32 or NTFS!**
If the CODESYS user “admin” (see the section “Network” > “Network Security” > “Users and Passwords” > “Services and Users“) is supposed to be able to access files created on the memory card, the memory card must be formatted with FAT16, FAT32 or NTFS.
If the Linux® file system formats EXT2 or EXT3 are used, “root” rights are required for data access. Therefore, access via CODESYS is not possible.

## 5.2.2 Data Backup

The controller has a backup function and a restore function.

In the WBM, the required settings can be made in the “Configuration” tab on the “Package Server” > “Firmware Backup” or “Firmware Restore” pages and the functions can be executed.

Settings can also be made in the CBM menu “Package Server” > “Firmware Backup” or “Firmware Restore”.

The storage medium (internal memory or SD card) and, if applicable, the storage location on the network can be set.

The data to be backed up and restored can also be selected:

- the CODESYS project (“PLC Runtime project,” boot project)
- the device settings (“Settings”)
- the controller operating system and the root file system (“System”)
- all of the above (“All,” only visible if not saved on the network)



**Note**

**Note the firmware version!**
Restoring the controller operating system (“System” selection) is only permissible and possible if the firmware versions at the backup and restore times are identical.
If necessary, skip restoring the controller operating system, or match the firmware version of the controller to the firmware version of the backup time beforehand.

### 5.2.2.1 Backup Function

The backup function enables the data of the internal memory and device settings to be saved on the memory card during operation.

The backup function can be called up the WBM page “Firmware Backup” in the “Configuration” tab, selection “Package Server” > “Firmware Backup” or in the CBM menu “Package Server” > “Firmware Backup”.

The network or the inserted memory card can be selected as the target medium.

The files of the internal drive are stored on the target medium in the directory media/sd/copy and in the corresponding subdirectories.
The information that is not present as files on the controller is stored in XML format in the directory media/sd/settings/.

If the memory card is selected as the target medium, the LED above the memory card slot flashes yellow during the save operation.

The device settings and files of the internal drive are then saved on the target medium.

The controller has an automatic update function. If this function is activated on a memory card before the data backup and a controller is booted from this memory card, this data is restored automatically on the internal memory of the controller.

**Note**

**Only one package may be copied to the network!**
If you have specified “Network” as the storage location, only one package may be selected for each storing process.

**Note**

**No backup of the memory card!**
Backup from the memory card to the internal flash memory is not possible.

**Note**

**Account for backup time**
Generation of backup files can take several minutes. Stop the CODESYS program before you start the backup procedure to help shorten the time required.

#### 5.2.2.2 Restore Function

The restore function is used to load the data and device settings from the memory card to the internal memory during operation.

The restore function can be called up the WBM page “Firmware Restore” in the “Configuration” tab, selection “Package Server” > “Firmware Restore” or in the CBM menu “Package Server” > “Firmware Restore”.

The network or, if it is inserted, the memory card can be selected as the source medium.

If the memory card is selected as the source medium, the LED above the memory card slot flashes yellow during the load operation.

When loading the data, the files are copied from the directory media/sd/copy/ of the source medium to the appropriate directories on the internal memory.

The device has an active and an inactive root partition. The system backup is stored on the inactive partition. Startup is then performed from the newly written partition. If the startup process can be completed, the new partition is switched to active. Otherwise, booting is performed again from the old active partition during the next boot process.

The boot project is loaded automatically and the settings automatically activated after a restart. The “Home directory on memory card enabled” setting determines whether the boot project of the internal drive or the memory card is loaded. This setting can be called up on the WBM page “PLC Runtime Configuration” in the “Configuration” tab, selection “PLC Runtime”.



**Note**

**File size must not exceed the size of the internal drive!**
Note that the amount of data in the media/sd/copy/ directory must not exceed the total size of the internal drive.



**Note**

**Restoration only possible from internal memory!**
If the device was booted from the memory card, the firmware cannot be restored.



**Note**

**Reset by restore**
A reset is performed when the system or settings are restored by CODESYS!



**Note**

**Connection loss through restore**
If the restore changes the parameters of the ETHERNET connection, the WBM may then no longer be able to open a connection to the device. You must call the WBM again by entering the correct IP address of the device in the address line.



**Note**

**Note the restore time!**
The restore process takes approx. 2 … 3 minutes.
After the restore process, the controller is restarted and is then ready for use again.

### 5.2.3 Inserting a Memory Card during Operation

The fieldbus nodes and the PLC program are running.

Insert a memory card during ongoing operation.

During normal operation, the memory card is incorporated into the file system of the controller as a drive.
No automatic copy procedures are triggered.

The LED above the memory card flashes yellow during the access.

The memory card is then ready for operation and available under /media/sd.

### 5.2.4 Removing the Memory Card during Operation

The fieldbus node and the PLC program are in operation and the memory card is plugged in.

Remove the memory card during ongoing operation.



**Note**

**Data can be lost during writing!**
Note that if you pull the memory card out during a write procedure, data will be lost.

The LED above the memory card flashes yellow during the attempted access.

The controller then works without a memory card.

### 5.2.5 Setting the Home Directory for the Runtime System

The home directory for the runtime system is located in the controller's internal memory by default. An existing boot project may be saved in the home directory.

You can use the WBM to move the home directory for the runtime system to the memory card, e.g., to make more memory available for a large boot project or other files.

This setting can be activated using the check box “Home directory on memory card enabled” on the WBM page “PLC Runtime”. Click the **[Submit]** button to apply the setting, which takes effect after the next restart.
No files are applied from the old to the new home directory.

After moving the directory, a project must be loaded and a boot project created.

It should be noted that the memory card may not be removed under any circumstances as long as the home directory is there. If an application is running, system safety can be endangered by an uncontrolled controller crash.

Switching the home directory has no effect if the controller was botted from a memory card. The configuration state is saved, but only takes effect if the content of the memory card is copied to the internal memory.

### 5.2.6 Load Boot Project

If a boot project exists, it may be loaded, depending on the home directory setting for the runtime system. The following table shows the possible results:

Table 33: Loading a Boot Project

| Boot Project Stored in Internal Flash Memory | Memory Card with Boot Project Inserted | "Home Directory on Memory Card Enabled" Checked | Boot Project is Loaded ... |
|---|---|---|---|
| No | No | No | No, no boot project exists |
| | | Yes | No, no boot project exists |
| | Yes | No | No, no boot project exists in the internal flash memory |
| | | Yes | Yes, from memory card |
| Yes | no | No | Yes, from internal flash memory |
| | | (Yes) invalid | No, invalid combination, since no boot project is allowed to exist in the internal flash memory for this setting |
| | Yes | No | Yes, from internal flash memory |
| | | (Yes) invalid | No, invalid combination, since no boot project is allowed to exist in the internal flash memory for this setting |

# 6 Mounting

## 6.1 Installation Position

Along with horizontal and vertical installation, all other installation positions are allowed.



**Note**

**Use an end stop in the case of vertical mounting!**
In the case of vertical assembly, an end stop has to be mounted as an additional safeguard against slipping.
WAGO order no. 249-116 End stop for DIN 35 rail, 6 mm wide
WAGO order no. 249-117 End stop for DIN 35 rail, 10 mm wide

## 6.2 Overall Configuration

The maximum total length of a fieldbus node without fieldbus coupler/controller is 780 mm including end module. The width of the end module is 12 mm. When assembled, the I/O modules have a maximum length of 768 mm.

**Examples:**

- 64 I/O modules with a 12 mm width can be connected to a fieldbus coupler/controller.
- 32 I/O modules with a 24 mm width can be connected to a fieldbus coupler/controller.

**Exception:**

The number of connected I/O modules also depends on the type of fieldbus coupler/controller is used. For example, the maximum number of stackable I/O modules on one PROFIBUS DP/V1 fieldbus coupler/controller is 63 with no passive I/O modules and end module.

**NOTICE**

**Observe maximum total length of a fieldbus node!**
The maximum total length of a fieldbus node without fieldbus coupler/controller and without using a 750-628 I/O Module (coupler module for internal data bus extension) may not exceed 780 mm.
Also note the limitations of individual fieldbus couplers/controllers.



**Note**

**Increase the total length using a coupler module for internal data bus extension!**

You can increase the total length of a fieldbus node by using a 750-628 I/O Module (coupler module for internal data bus extension). For such a configuration, attach a 750-627 I/O Module (end module for internal data bus extension) after the last I/O module of a module assembly. Use an RJ-45 patch cable to connect the I/O module to the coupler module for internal data bus extension of another module block.

This allows you to segment a fieldbus node into a maximum of 11 blocks with maximum of 10 I/O modules for internal data bus extension.

The maximum cable length between two blocks is five meters.

More information is available in the manuals for the 750-627 and 750-628 I/O Modules.

# 6.3 Mounting onto Carrier Rail

## 6.3.1 Carrier Rail Properties

All system components can be snapped directly onto a carrier rail in accordance with the European standard EN 60175 (DIN 35).

**NOTICE**

**Do not use any third-party carrier rails without approval by WAGO!**
WAGO Kontakttechnik GmbH & Co. KG supplies standardized carrier rails that are optimal for use with the I/O system. If other carrier rails are used, then a technical inspection and approval of the rail by WAGO Kontakttechnik GmbH & Co. KG should take place.

Carrier rails have different mechanical and electrical properties. For the optimal system setup on a carrier rail, certain guidelines must be observed:

- The material must be non-corrosive.
- Most components have a contact to the carrier rail to ground electro-magnetic disturbances. In order to avoid corrosion, this tin-plated carrier rail contact must not form a galvanic cell with the material of the carrier rail which generates a differential voltage above 0.5 V (saline solution of 0.3 % at 20°C).
- The carrier rail must optimally support the EMC measures integrated into the system and the shielding of the I/O module connections.
- A sufficiently stable carrier rail should be selected and, if necessary, several mounting points (every 20 cm) should be used in order to prevent bending and twisting (torsion).
- The geometry of the carrier rail must not be altered in order to secure the safe hold of the components. In particular, when shortening or mounting the carrier rail, it must not be crushed or bent.
- The base of the I/O components extends into the profile of the carrier rail. For carrier rails with a height of 7.5 mm, mounting points are to be riveted under the node in the carrier rail (slotted head captive screws or blind rivets).
- The metal springs on the bottom of the housing must have low-impedance contact with the DIN rail (wide contact surface is possible).

### 6.3.2 WAGO DIN Rails

WAGO carrier rails meet the electrical and mechanical requirements shown in the table below.

Table 34: WAGO DIN Rails

| Item No. | Description |
|---|---|
| 210-112 | 35 × 7.5; 1 mm; steel; bluish, tinned, chromed; slotted |
| 210-113 | 35 × 7.5; 1 mm; steel; bluish, tinned, chromed; unslotted |
| 210-197 | 35 × 15; 1.5 mm; steel; bluish, tinned, chromed; slotted |
| 210-114 | 35 × 15; 1.5 mm; steel; bluish, tinned, chromed; unslotted |
| 210-118 | 35 × 15; 2.3 mm; steel; bluish, tinned, chromed; unslotted |
| 210-198 | 35 × 15; 2.3 mm; copper; unslotted |
| 210-196 | 35 × 8.2; 1.6 mm; aluminum; unslotted |

**NOTICE**

**Observe the mounting distance of the DIN rail when the load is increased!**
With increased vibration and shock load, mount the DIN rail at a mounting distance of max. 60 mm.

## 6.4 Spacing

The spacing between adjacent components, cable conduits, casing and frame sides must be maintained for the complete fieldbus node.

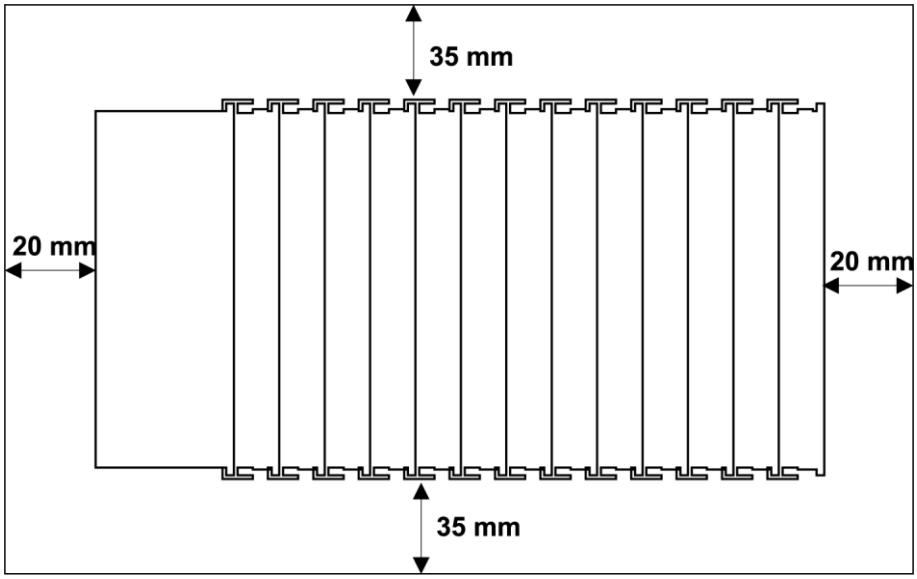



Figure 22: Spacing

The spacing creates room for heat transfer, installation or wiring. The spacing to cable conduits also prevents conducted electromagnetic interferences from influencing the operation.

## 6.5 Mounting Sequence

Fieldbus couplers, controllers and I/O modules of the WAGO I/O System 750 are snapped directly on a carrier rail in accordance with the European standard EN 60175 (DIN 35).

The reliable positioning and connection is made using a tongue and groove system. Due to the automatic locking, the individual devices are securely seated on the rail after installation.

Starting with the fieldbus coupler or controller, the I/O modules are mounted adjacent to each other according to the project design. Errors in the design of the node in terms of the potential groups (connection via the power contacts) are recognized, as the I/O modules with power contacts (blade contacts) cannot be linked to I/O modules with fewer power contacts.

**⚠ CAUTION**

**Risk of injury due to sharp-edged blade contacts!**
The blade contacts are sharp-edged. Handle the I/O module carefully to prevent injury. Do not touch the blade contacts.

**NOTICE**

**Insert I/O modules only from the proper direction!**
All I/O modules feature grooves for power jumper contacts on the right side. For some I/O modules, the grooves are closed on the top. Therefore, I/O modules featuring a power jumper contact on the left side cannot be snapped from the top. This mechanical coding helps to avoid configuration errors, which may destroy the I/O modules. Therefore, insert I/O modules only from the right and from the top.



**Note**

**Don't forget the bus end module!**
Always plug a bus end module (e.g. 750-600) onto the end of the fieldbus node! You must always use a bus end module at all fieldbus nodes with WAGO I/O System 750 fieldbus couplers or controllers to guarantee proper data transfer.

# 6.6 Inserting Devices

**DANGER**

**Do not work when devices are energized!**
High voltage can cause electric shock or burns.
Switch off all power to the device prior to performing any installation, repair or maintenance work.

## 6.6.1 Inserting the Controller

1. When replacing the controller for an already available controller, position the new controller so that the tongue and groove joints to the subsequent I/O module are engaged.

2. Snap the controller onto the carrier rail.

3. Use a screwdriver blade to turn the locking disc until the nose of the locking disc engages behind the carrier rail (see the following figure). This prevents the controller from canting on the carrier rail.

With the controller snapped in place, the electrical connections for the data contacts and power contacts (if any) to the possible subsequent I/O module are established.

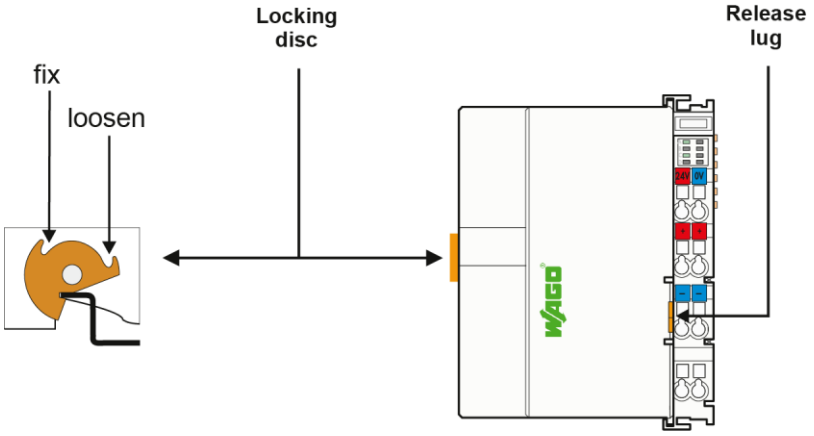



Figure 23: Release Tab of Controller (Example)

# 7 Connect Devices

## 7.1 Connecting a Conductor to the CAGE CLAMP®

The WAGO CAGE CLAMP® connection is appropriate for solid, stranded and finely stranded conductors.

**NOTICE**

**Select conductor cross sections as required for current load!**
The current consumed for field-side supply may not exceed 10 A. The wire cross sections must be sufficient for the maximum current load for all of the I/O modules to be supplied with power.

**Note**

**Only connect one conductor to each CAGE CLAMP® connection!**
Only one conductor may be connected to each CAGE CLAMP® connection.
Do not connect more than one conductor at one single connection!

If more than one conductor must be routed to one connection, these must be connected in an up-circuit wiring assembly, for example using WAGO feed-through terminals.

1. To open the CAGE CLAMP® insert the actuating tool into the opening above the connection.
2. Insert the conductor into the corresponding connection opening.
3. To close the CAGE CLAMP® simply remove the tool - the conductor is then clamped firmly in place.

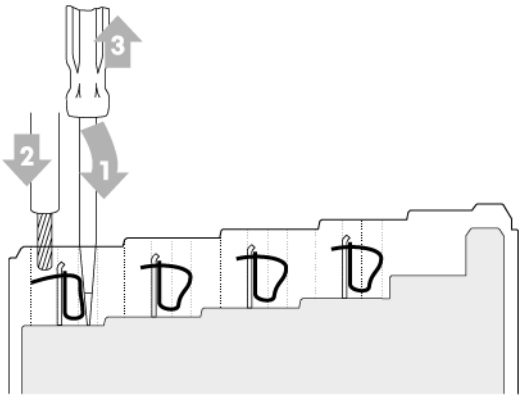



Figure 24: Connecting a Conductor to a CAGE CLAMP®

# 7.2 Power Supply Concept

## 7.2.1 Overcurrent Protection

**⚠ WARNING**

**Possible fire hazard due to insufficient overcurrent protection!**
In the event of a fault, insufficient overcurrent protection can present a possible fire hazard. In the event of a fault, excessive current flow in the components can cause significant overheating. Therefore, you should always dimension the overcurrent protection according to the anticipated power usage.

The system and field voltage of the WAGO-I/O-SYSTEMs 750 is supplied on the head stations and bus supply modules.
For components that work with extra low voltage, only SELV/PELV voltage sources should be used.

A single voltage source supplying multiple components must be designed according to the component with the strictest electrical safety requirements.
For components which are only allowed to be supplied by SELV voltage sources, these requirements are listed in the technical data.

Most components in the WAGO-I/O-SYSTEM 750 have no internal overcurrent protection. Therefore, appropriate overcurrent production must always be implemented externally for the power supply to these components, e.g. via fuses.
The maximum permissible current is listed in the technical data of the components used.

**NOTICE**

**System supply only with appropriate fuse protection!**
Without overcurrent protection, the electronics can be damaged.
If you implement the overcurrent protection for the system supply with a fuse, a fuse, max. 2 A, slow-acting, should be used.

**NOTICE**

**Field supply only with appropriate fuse protection!**
Without overcurrent protection, the electronics can be damaged.
If you alternatively implement the overcurrent protection for the field supply with an external fuse, a 10 A fuse should be used.

## 7.2.2 Supplementary Power Supply Regulations

The WAGO-I/O-SYSTEM 750 can also be used in shipbuilding or offshore and onshore areas of work (e. g. working platforms, loading plants). This is demonstrated by complying with the standards of influential classification companies such as Germanischer Lloyd and Lloyds Register.

Filter modules for 24 V supply are required for the certified operation of the system.

Table 35: Filter Modules for 24 V Supply

| Order No. | Name | Description |
|---|---|---|
| 750-626 | Supply Filter | Filter module for system supply and field supply (24 V, 0 V), i. e. for fieldbus coupler/controller and bus power supply (750-613) |
| 750-624 | Supply Filter | Filter module for the 24 V field supply (750-602, 750-601, 750-610) |

Therefore, the following power supply concept must be absolutely complied with.

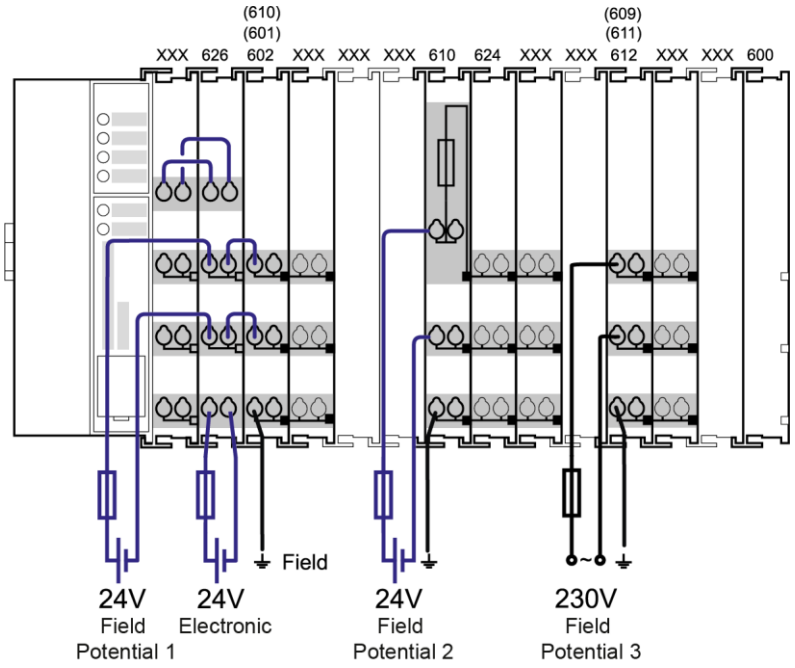



Figure 25: Power Supply Concept

**Note**

**Use a supply module for equipotential bonding!**
Use an additional 750-601/ 602/ 610 Supply Module behind the 750-626 Filter Module if you want to use the lower power jumper contact for equipotential bonding, e.g., between shielded connections and require an additional tap for this potential.

# 8 Commissioning



**Note**

**Close any ports and services that you do not need!**
Unauthorized persons may gain access to your automation system through open ports.
To reduce the risk of cyber attacks and, thus, enhance your cyber security, close all ports and services in the control components (in particular Port 6626 for WAGO I/O-*CHECK*, Port 2455 for CODESYS 2 and Port 11740 for ***e!****COCKPIT*) not required by your application.
Only open ports and services during commissioning and/or configuration.

## 8.1 Switching On the Controller

Before switching on the controller ensure that you

- have properly installed the controller (see section “Installation”),
- have connected all required data cables (see section “Connections”) to the corresponding interfaces and have secured the connectors by their attached locking screws,
- have connected the electronics and field-side power supply (see section “Connections”),
- have mounted the end module (see Section “Installation”),
- have performed appropriate potential equalization at your machine/system (see System Description for 750-xxx) and
- have performed shielding properly (see System Description for 750-xxx).

To switch on both the controller and the connected I/O modules, switch on your power supply unit.

Starting of the controller is indicated by a brief orange flashing of all LEDs. After a few seconds the SYS LED will indicate successful boot-up of the controller.
The runtime system ***e!****RUNTIME* is started at the same time.

Once the entire system has been successfully started, the SYS and I/O LEDs light up green.

If there is an executable IEC 61131-3 program stored and running on the controller, the RUN LED will light up green.

If no executable program is stored on the controller, or the mode selector switch is set to STOP, this is likewise indicated by the RUN LED (see Section “Diagnostics”> … > “Fieldbus/System Indication Elements”).

## 8.2 Determining the IP Address of the Host PC

To ensure that the host PC can communicate with the controller via ETHERNET, both devices must be located in the same subnet.

To determine the IP address of the host PC (with the Microsoft Windows® operating system) using the MS DOS prompt, proceed as follows:

1. Open the MS DOS prompt window.
   To do this, enter the command “cmd” in the input field under **Start** > **Execute…** > **Open:** (Windows® XP) or **Start** > **Search programs/files** (Windows® 7) and then click **[OK]** or press **[Enter]**.

2. In the MS DOS prompt enter the command “ipconfig” and then press **[Enter]**.

3. The IP address, subnet mask and standard gateway, including the appropriate parameters, are displayed.

## 8.3 Setting an IP Address

In the controller's initial state, the following IP addresses are active for the ETHERNET interface (Port X1 and Port X2):

Table 36: Default IP Addresses for ETHERNET Interfaces

| ETHERNET Interface | Default Setting |
|---|---|
| X1/X2<br>(switched mode) | Dynamic assignment of IP address using DHCP<br>("Dynamic Host Configuration Protocol") |

Adapt IP addressing to your specific system structure to ensure that the PC and the controller can communicate with one another using one of the available configuration tools (see section "Configuration").

**Example for incorporating the controller (192.168.2.17) into an existing network:**

- The IP address of the host PC is **192.168.1.2**.
- The controller and host PC must be in the same subnet (regardless of the IP address of the host PC).
- With a subnet mast of **255.255.255.0**, the first three digits of the IP address of the host PC and controller must match so that they are located in the same subnet.

Table 37: Network Mask 255.255.255.0

| Host PC | Subnet Address Range for the Controller |
|---|---|
| **192.168.1**.2 | **192.168.1**.1 or **192.168.1**.3 … **192.168.1**.254 |

### 8.3.1 Assigning an IP Address using DHCP

The Controller can obtain dynamic IP addresses from a server (DHCP/BootP). In contrast to fixed IP addresses, dynamically assigned addresses are not stored permanently. Therefore, a BootP or DHCP server must be available each time the controller is restarted.

If an IP address has been assigned by means of DHCP (default setting), it can be determined through the settings and the output of the specific DHCP server.

In the example figure shown here, the corresponding output of “Open DHCP” is presented.

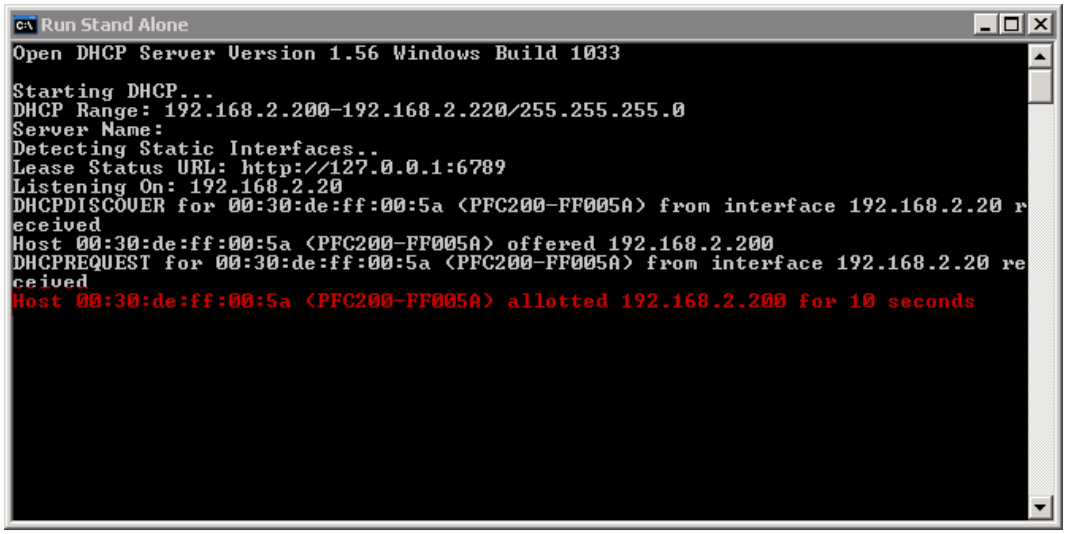



Figure 26: “Open DHCP”, Example Figure

In conjunction with the DNS server associated with DHCP, the device can be reached using its host name.
This name consists of the prefix “PFCx00-“ and the last six places of the MAC address (in the example shown here: “00:30:DE:FF:00:5A”). The MAC address of the device can be printed on the label on the side of the device.

The host name of the device in the example shown here is thus “PFC200-FF005A”.

### 8.3.2 Changing an IP Address Using the “CBM” Configuration Tool and a Terminal Program

You can also assign a new IP address to the ETHERNET interfaces X1 and X2 using the “CBM” configuration tool provided on the Linux® console. More information about “CBM” is given in the Section “Configuration.”

1. Connect a PC to the ETHERNET interface X1 of the controller using an SSH terminal program.

2. Start the terminal program.

3. Select “SSH” as the connection type, and enter the IP address of the controller and port 22 as the connection parameters.

Alternatively, you can also connect the controller via a serial interface:

1. Connect a PC to the X3 serial interface of the controller using a terminal program.

2. Start the terminal program.

3. Select “Serial” as the connection type and enter a baud rate of 115200 bauds as the connection parameter. The settings for data bits, stop bits and parity do not need to be adjusted.

4. Log in to the Linux® system as a “super user.”
The user name and the password are provided in the Section “Users and Passwords” > “Linux® User Group.”

5. Start the configuration tool by entering the command “cbm” (case sensitive) on the command line and then press **[Enter]**.

```
================================================================================
 WAGO Console Based Management Tool
================================================================================
 Main Menu
--------------------------------------------------------------------------------
 0. Quit
 1. Information
 2. PLC Runtime
 3. Networking
 4. Firewall
 5. Clock
 6. Administration
 7. Package Server
 8. Mass Storage
 9. Software Uploads
 10. Ports and Services
 11. SNMP
 12. PROFIBUS DP
--------------------------------------------------------------------------------
 Select an entry or Q to quit
--------------------------------------------------------------------------------
```

Figure 27: CBM main menu (example)

6. In the **Main menu** use the keyboard (arrow keys or numeric keypad) to move to and select **Networking** and then press **[Enter]**.

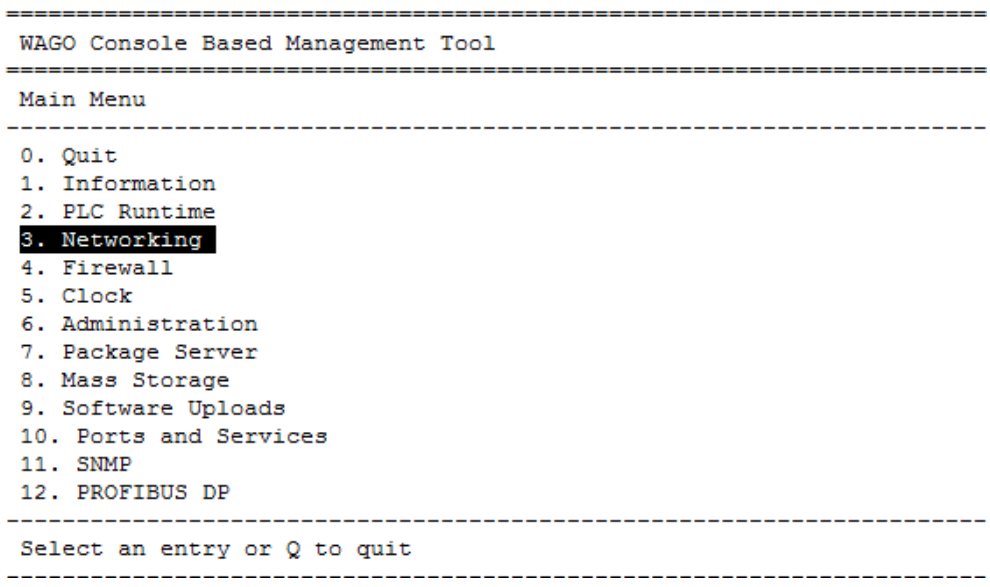



Figure 28: CBM – Selecting “Networking”

7. In the **Networking** menu select **TCP/IP** and press **[Enter]**.

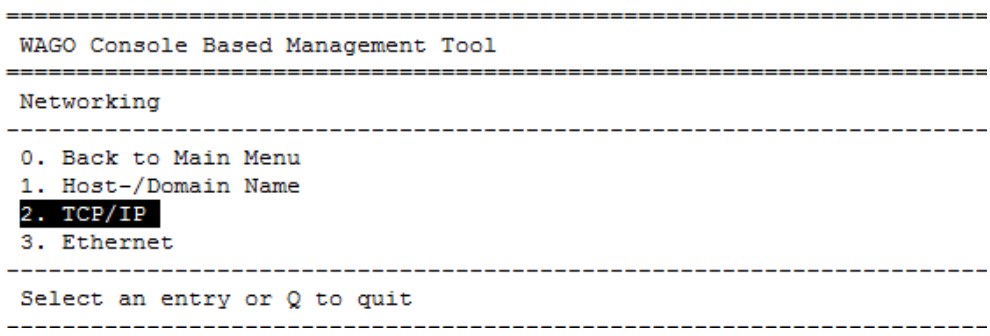



Figure 29: CBM – Selecting “TCP/IP”

8. In the menu **TCP/IP** select **IP Address** and press **[Enter]**.

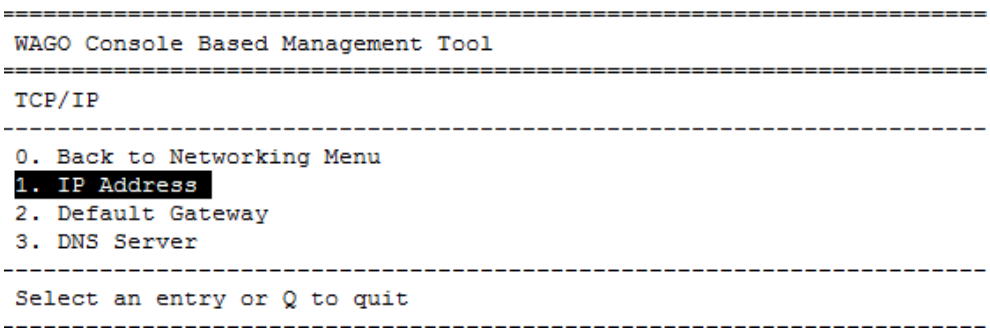



Figure 30: CBM – Selecting “IP address”

9. In the menu **TCP/IP Configuration** select **IP Address** and press **[Enter]**.

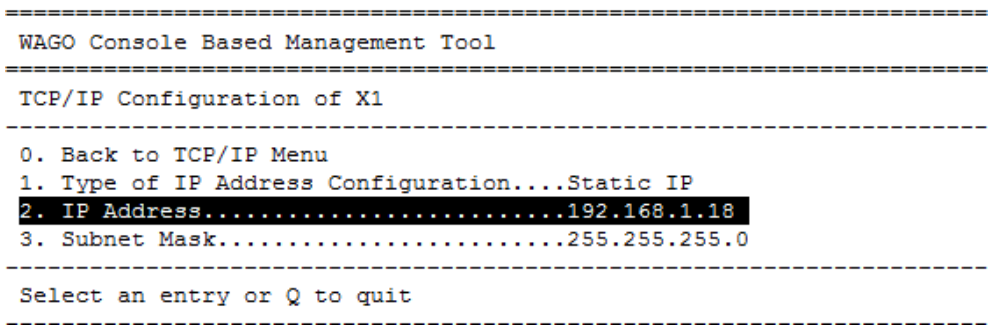



Figure 31: CBM – Selecting the IP Address

10. In the menu **Change IP Address** enter the new IP address and confirm by clicking **[OK]**. If you want to return to the main menu without making changes, click **[Abort]**.

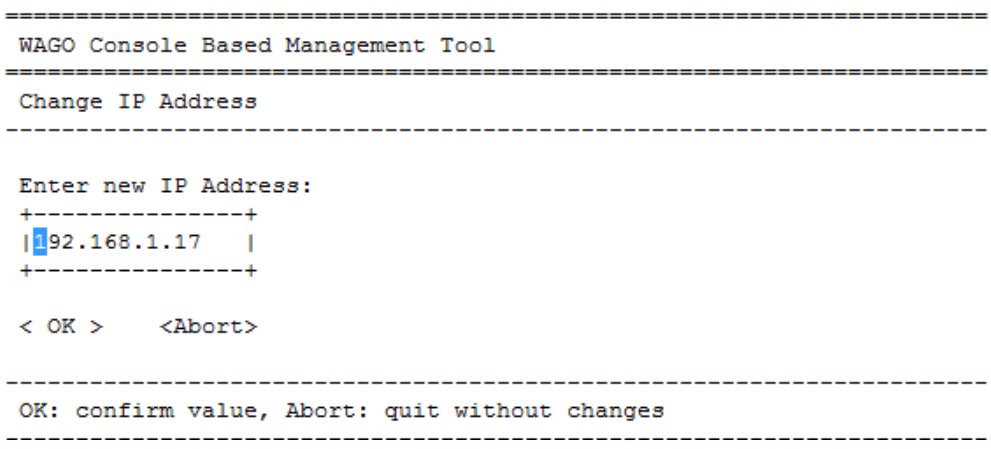



Figure 32: CBM – Entering a New IP Address

### 8.3.3 Changing an IP Address using “WAGO Ethernet Settings”

The Microsoft Windows® application “WAGO Ethernet Settings” is a software used to identify the controller and configure network settings.

**Note**

**Observe the software version!**

To configure the controller use at least Version 6.4.1.1 dated 2015-06-29 of “WAGO Ethernet Settings”!

You can use WAGO communication cables or WAGO radio adapters or even the IP network for data communication.

1. Switch off the power supply to the controller.
2. Connect the 750-920 communication cable to the Service interface on the controller and to a serial interface of your PC.
3. Switch the power supply to the controller on again.
4. Start the “WAGO Ethernet Settings” program.

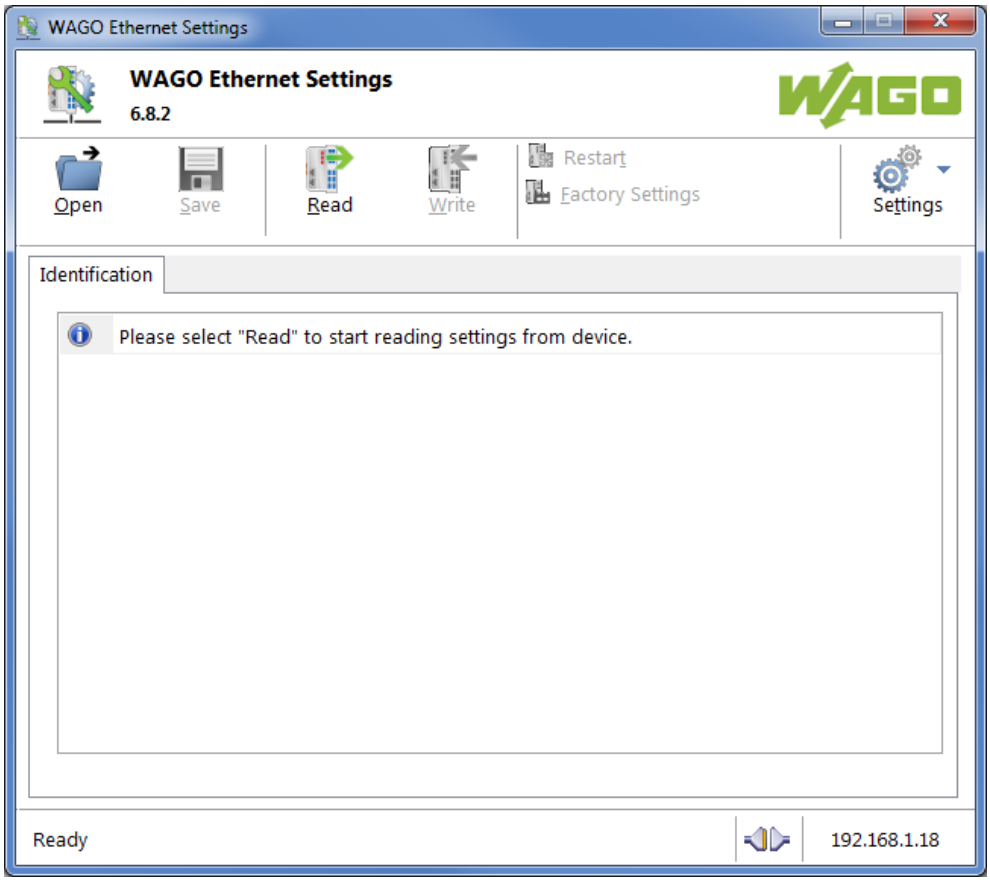



Figure 33: “WAGO Ethernet Settings” – Starting Screen (Example)

5. Click **[Read]** to read in and identify the connected controller.

6. Select the “Network” tab:

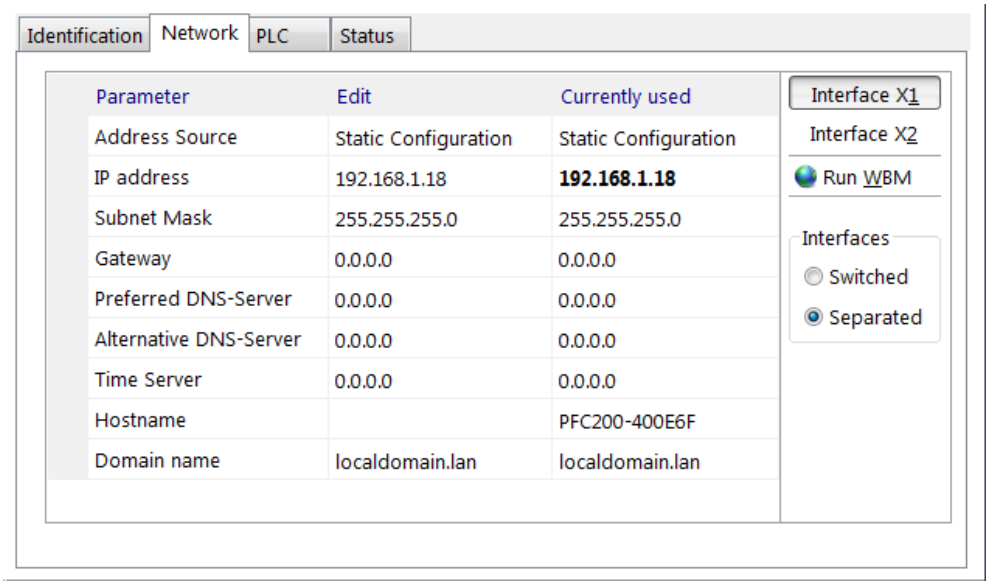



Figure 34: “WAGO Ethernet Settings” – “Network” Tab

7. To assign a fixed address, select “Static configuration” on the “Source” line under “Input”. DHCP is normally activated as the default setting.

8. In the column “Input” enter the required IP address and, if applicable, the address of the subnet mask and of the gateway.

9. Click on **[Write]** to accept the address in the controller. (If necessary, “WAGO Ethernet Settings” will restart your controller. This action may require about 30 seconds.)

10. You can now close “WAGO Ethernet Settings”, or make other changes directly in the Web-based Management system as required. To do this, click on **[Run WBM]** at the right in the window.

### 8.3.4 Temporarily Setting Fixed IP Addresses

This process temporarily sets the IP addresses for the network interfaces X1 … X<n> to fixed IP addresses.
For each bridge used, the assigned interfaces are assigned their own address, whereby bridge 1 receives the IP address “192.168.1.17”, bridge 2 the IP address “192.168.2.17” and so on.

No reset is performed.

To set temporary fixed IP addresses, proceed as follows:

1. Set the mode selector switch to STOP and

2. Press and hold the Reset button (RST) for longer than 8 seconds.

Execution of the setting is signaled by the “SYS” LED flashing orange.

If you make changes to the IP configuration of a bridge after activating the temporary IP addresses, the new settings are permanently adopted and applied immediately. The configured bridge exits the temporary IP address mode. The other bridges keep the temporarily set IP address until restart / reset.

To cancel this setting, proceed as follows:

- Perform a software reset or

- Switch off the controller and then switch it back on.

## 8.4 Testing the Network Connection

Carry out a ping network function to check whether you can reach the controller at the IP address you have assigned in the network.

1. Open the MS DOS prompt window.
   To do this, enter the command “cmd” in the input field under **Start** > **Execute…** > **Open:** (Windows® XP) or **Start** > **Search programs/files** (Windows® 7) and then click **[OK]** or press **[Enter]**.

2. In the MS DOS window, enter the command “ping” and the IP address of the controller (for example, `ping 192.168.1.17`) and then press **[Enter]**.

**Note**

**Host entries in the ARP table!**

It may also be useful to delete the current host entries in the ARP table with the command “arp -d *” before executing the “ping” command (as administrator in Windows® 7). This ensures that older entries will not impair the success of the “ping” command.

3. Your PC sends out a query that is answered by the controller. This reply appears in the MS DOS prompt window. If the error message “Timeout” appears, the controller has not responded properly. You then need to check your network settings.

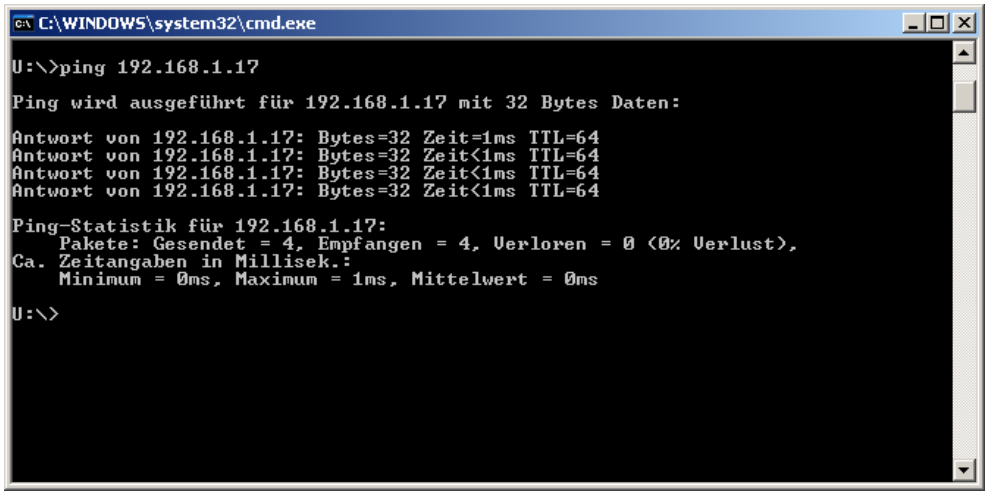



Figure 35: Example of a Function Test

4. If the test is completed successfully, close the MS DOS window.

## 8.5 Changing Passwords



**Note**

**Change standard passwords**
The standard passwords are documented in these instructions and therefore do not offer adequate protection! Change the passwords to meet your particular needs!

To increase security all passwords should contain a combination of lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), spaces and special characters: (]!"#$%&'()*+,./:;<=>?@[\^_`{|}~-). Passwords should not contain generally known names, dates of birth and other information that is easy to guess.

Change the standard passwords before commissioning the controller.
Standard passwords are issued for the user groups “WBM Users” and “Linux® Users.”

The table in the Section “Function Description” > ... > “Users and Passwords” > “WBM Users Group” shows the standard passwords for the WBM users. Proceed as follows to change these passwords:

1. Connect the controller to a PC via one of the network interfaces (X1, X2).
2. Start a web browser program on the PC and call up the WBM of the controller (see Section “Commissioning” > … > “Configuration via Web-Based-Management (WBM)”).
3. Log in on the controller as “admin” user with the standard password.
4. Change the password for all users on the WBM “Configuration of the users for the WBM” page.
5. Select each user and enter a new password and confirm it.

The table in the Section “Functional Description” > ... > “Users and Passwords” > “Linux® Users Group” shows the standard passwords for the Linux® users. Proceed as follows to change these passwords:

1. Connect the controller to a PC via the network interfaces X1.
2. Start a terminal program on the PC (see Section “Commissioning” > … > “Configuration via Console-Based-Management-Tool (CBM) using a Terminal Program”).
3. Log in on the controller as user “root” with the standard password.
4. Change the password for all users with the “passwd root,” “passwd admin” and “passwd user” commands.

## 8.6 Shutdown/Restart

Switch off the power supply to shut down the controller.

To perform a controller restart, press the Reset button as described in the Section “Triggering Reset Functions” > “Software Reset (Restart).”
Alternatively, you can switch off the controller and switch it back on again.



**Note**

**Do not power cycle the controller after changing any parameters!**
Some parameter changes require a controller restart for the changes to apply. Saving changes takes time.
Do not power cycle the controller to perform a restart, i.e., changes may be lost by shutting down the controller too soon.
Only restart the controller using the software reboot function. This ensures that all memory operations are completed correctly and completely.

# 8.7 Initiating Reset Functions

You can initiate various reset functions using the mode selector switch and the Reset button (RST).

## 8.7.1 Warm Start Reset

All ***e!****RUNTIME* applications are reset with a warm start reset. All global data is set to its initialization values. This corresponds to the ***e!****COCKPIT* IDE “Reset warm” command.

To perform a warm start reset, set the mode selector switch to "Reset" and hold it there for two to seven seconds.
Execution of the reset is signaled by the red “RUN LED” briefly going out when the mode selector switch is released.

## 8.7.2 Cold Start Reset

All ***e!****RUNTIME* applications are reset with a cold start reset. All global data and the retain variables are set to their initialization values.
This corresponds to the ***e!****COCKPIT* IDE “Reset Cold” command.

To perform a cold start reset, set the mode selector switch to “Reset” and hold it there for more than seven seconds.
Execution of the reset is signaled after seven seconds by the “RUN” LED going out for an extended period. You can then release the mode selector switch.

## 8.7.3 Software Reset

The controller is restarted on a software reset.

To perform a software reset, set the mode selector switch to RUN or STOP and then press the Reset button (RST) for one to eight seconds.

Reset completion is indicated by a brief orange flashing of all LEDs. After a few seconds the SYS LED will indicate successful boot-up of the controller.

## 8.7.4 Controller Reset

**NOTICE**

**Do not switch the controller off!**
The controller can be damaged by interrupting the controller reset process.
Do not switch the controller off during the controller reset process, and do not disconnect the power supply!

**Note**

**Parameters and passwords are overwritten!**
Parameters and passwords for the Linux® and WBM users of the controller are overwritten by a controller reset.
Stored boot projects are deleted, including existing web visualizations.
Subsequently installed firmware functions are not overwritten.
Software licenses are retained.
The inactive system is not changed by the reset.
If you have any questions, contact WAGO Support.

The controller is restarted after the controller reset.
Proceed as follows to reset the controller:

1. Press the Reset button (RST).
2. Set the mode selector switch to the “RESET” position.
3. Press and hold both buttons until the “SYS” LED alternately flashes red/green after approx. 8 seconds.
4. When the “SYS” LED flashes red/green alternately, release the mode selector switch and Reset button.

**Note**

**Do not interrupt the reset process!**
If you release the Reset button (RST) too early, then the controller restarts without performing the controller reset.

# 8.8 Configuration



**Note**

**Check firmware version and update if required!**
At the beginning of initial configuration check to ensure that you have the latest firmware version for the controller.
The firmware version installed on the controller is given on the WBM page “Status Information”, or in the CBM menu “Information” under “Controller Details”.
Perform an update to install the latest firmware version.
To do this, follow the instructions given in section “Service” > “Firmware Changes” > “Perform Firmware Upgrade”.

The following methods are available for configuring the controller:

- Access to the Web-based management system via the PC using a web browser (section “Configuration Using Web-Based Management [WBM]”)
- Access to the “Console-Based Management” tool via the PC using a terminal program (section “Configuration Using a Terminal Program [CBM]”)
- Access via the PLC program CODESYS using the “WagoAppConfigTool.lib” library.
- Access via the PC using “WAGO Ethernet Settings” (section “Configuration Using ‘WAGO Ethernet Settings’”).

The CBM is basically for the initial configuration and startup of the controller. Therefore, it only provides a subset of the WBM parameters. For example, parameters that cannot be displayed in a terminal window in a reasonable way and are not necessary for initial startup are not displayed. You can find the explanations of the parameters starting with the section “‘Information’ Page.”

### 8.8.1 Configuration via Web-Based-Management (WBM)

The HTML pages (from here on referred to as “pages”) of the Web-Based Management are used to configure the controller. Proceed as follows to access the WBM using a web browser:

1. Connect the controller to the ETHERNET network via the ETHERNET interface X1.

2. Start a Web browser on your PC.

3. Enter “https://” followed by the controller's IP address and “/wbm-ng” in the address line of your web browser, e.g., “https://192.168.1.17/wbm-ng”.
   Note that the PC and the controller must be located within the same subnet (see Section “Setting an IP Address”).
   If you do not know the IP address and cannot determine it, switch the controller temporarily to the pre-set address “192.168.1.17” (“Fixed IP address” mode, see Section “Commissioning” > … > “Temporarily Setting a Fixed IP Address”).

**Note**

**Take usage by the CODESYS program into account**
If the controller is at capacity due to a CODESYS program, this may result in slower processing in the WBM. As a result, timeout errors are sometimes reported in some circumstances. It is therefore important to stop the CODESYS application prior to performing complicated configurations using WBM.

→ When the connection has been established, a login window opens.

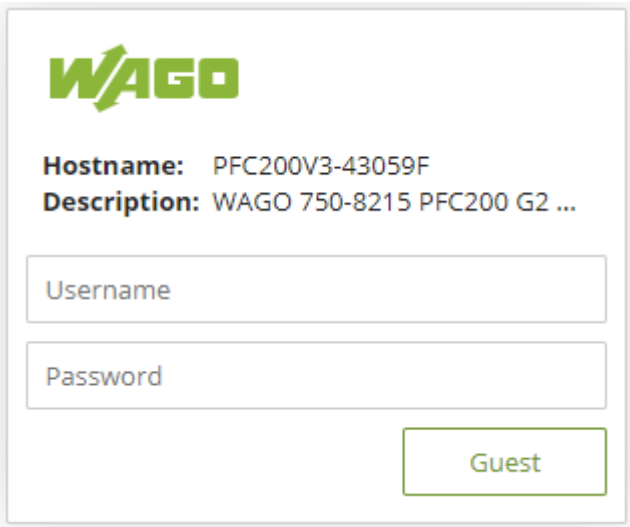



Figure 36: Entering Authentication

4. Enter the username and password.

5. Click the **[Login]** button.

6. If you only want to log in as a guest, click the **[Guest]** button.

→ Depending on the user selected, the navigation bar and the tabs of the WBM are displayed.

If you have disabled cookies in your web browser, you can continue to use the WBM as long as you move directly inside it. However, if you fully reload the website (e.g., with **[F5]**), you must log in again since the web browser is then not able to store the data of your login session.

### 8.8.1.1 WBM User Administration

To allow settings to be made only by a select number of users, limit access to WBM functions through User Administration.

**Note**

**Change passwords**
Default passwords are documented in these instructions and therefore do not offer adequate protection! Change the passwords to meet your particular needs.

If you do not change these passwords, a warning will appear each time you call up a website after logging in.

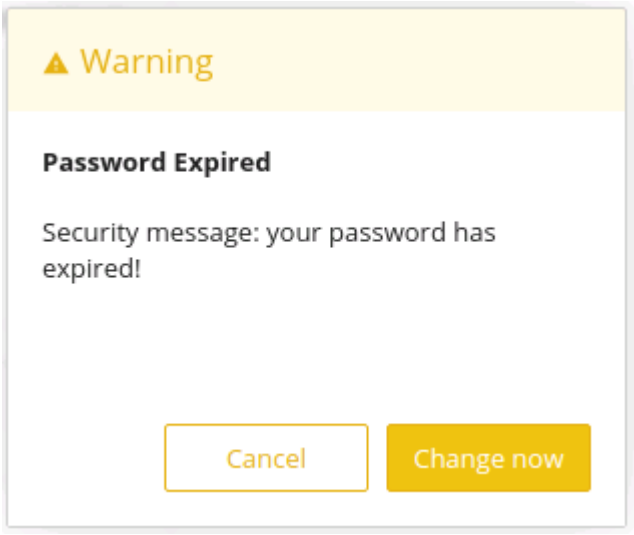



Figure 37: Password Reminder

Table 38:User Settings in the Default State

| Users | Permissions | Default Password |
|---|---|---|
| root | All (administrator) | wago |
| admin | All (administrator) | wago |
| user | Supported to a limited extent | user |
| guest | Display only | --- |

**Note**

**General Rights of WBM Users**
The WBM users “root”, “admin” and “user” have rights beyond the WBM to configure the system and install software.

User administration for controller applications is configured separately.

Access rights for the WBM pages are shown in the table below.
The “root” user has the same rights as the “admin” user and is therefore not listed separately.

Table 39: Access Rights for WBM Pages

| Tab/Navigation | WBM Page Title | User |
|---|---|---|
| Information | | |
| Device Status | Device Status | guest |
| Vendor Information | Vendor Information | guest |
| PLC Runtime | PLC Runtime Information | guest |
| Legal Information | | |
| WAGO Licenses | WAGO Software License Agreement | guest |
| Open Source Licenses | Open Source Licenses | user |
| WBM Licenses | WBM Third Party License Information | user |
| Trademarks Information | Trademarks Information | guest |
| WBM Version | WBM Version Info | guest |
| Configuration | | |
| PLC Runtime | PLC Runtime Configuration | user |
| Networking | | |
| TCP/IP Configuration | TCP/IP Configuration | user |
| Ethernet Configuration | Ethernet Configuration | user |
| Host/Domain Name | Configuration of Host and Domain Name | user |
| Routing | Routing | user |
| Clock | Clock Settings | user |
| Administration | | |
| Serial Interface | Configuration of Serial Interface RS232/RS485 | admin |
| Service Interface | Configuration of Service Interface | admin |
| Create Image | Create bootable Image | admin |
| Package Server | | |
| Firmware Backup | Firmware Backup | admin |
| Firmware Restore | Firmware Restore | admin |
| Active System | Active System | admin |
| Mass Storage | Mass Storage | admin |
| Software Uploads | Software Uploads | admin |
| Ports and Services | | |
| Network Services | Configuration of Network Services | admin |
| NTP Client | Configuration of NTP Client | admin |
| PLC Runtime Services | PLC Runtime Services | admin |
| SSH | SSH Server Settings | admin |

Table 39: Access Rights for WBM Pages

| Tab/Navigation | | | WBM Page Title | User |
|---|---|---|---|---|
| | TFTP | | TFTP Server | admin |
| | DHCP Server | | DHCP Server Configuration | admin |
| | DNS | | Configuration of DNS Service | user |
| | Cloud Connectivity | | | |
| | | Status | Overview | admin |
| | | Connection 1 | Configuration | admin |
| | | Connection 2 | Configuration | admin |
| | SNMP | | | |
| | | General Configuration | Configuration of general SNMP parameters | admin |
| | | SNMP v1/v2c | Configuration of SNMP v1/v2c parameters | admin |
| | | SNMP v3 | Configuration of SNMP v3 Users | admin |
| | Users | | WBM User Configuration | admin |
| Fieldbus | | | | |
| | OPC UA | | | |
| | | Status | OPC UA Status | admin |
| | | Configuration | OPC UA Configuration | admin |
| | | Server Certificates | OPC UA Server Certificates | admin |
| | Modbus | | Modbus Services Configuration | user |
| Security | | | | |
| | OpenVPN / IPsec | | OpenVPN / IPsec Configuration | admin |
| | Firewall | | | |
| | | General Configuration | General Firewall Configuration | admin |
| | | Interface Configuration | Interface Configuration | admin |
| | | MAC Address Filter | Configuration of MAC Address Filter | admin |
| | | User Filter | Configuration of User Filter | admin |
| | Certificates | | Certificates | admin |
| | TLS | | Security Settings | admin |
| | Integrity | | Advanced Intrusion Detection Environment (AIDE) | admin |
| Diagnostic | | | Diagnostic Information | guest |

### 8.8.1.2 General Information about the Page

The IP address of the active device is displayed in the entry line of the browser window.

The WBM pages are only displayed after logging in. To log in, enter your username and password in the login window and click the **[Login]** button.

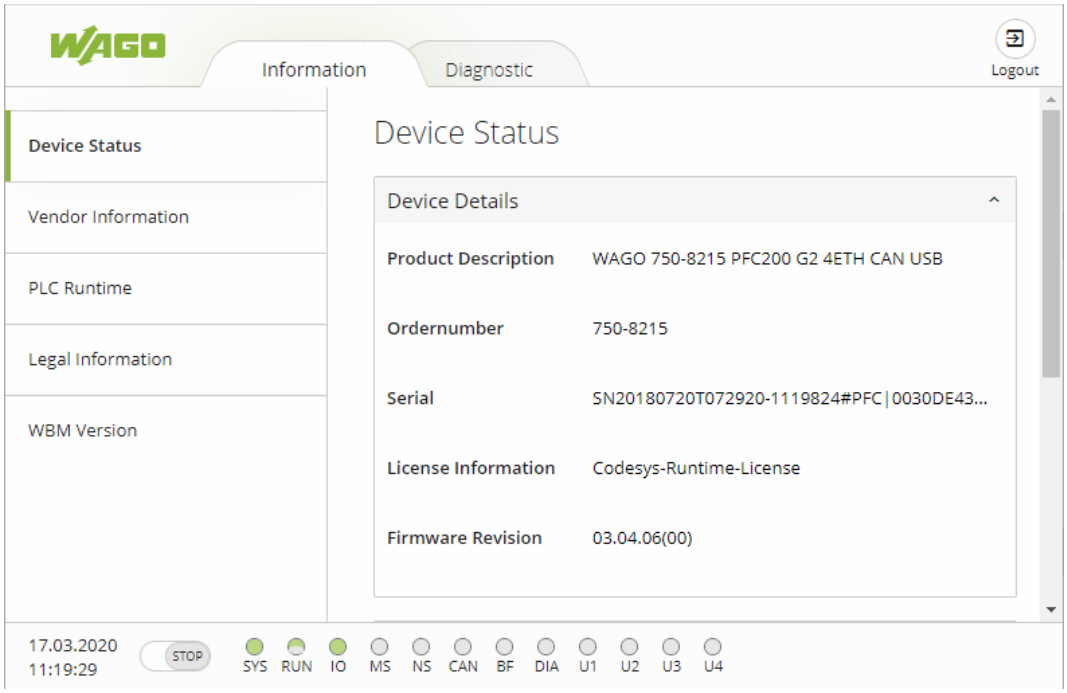



Figure 38: WBM Browser Window (Example)

The tabs for the various WBM areas and the **[Reboot]** and **[Logout]** buttons are displayed in the header of the browser window. The **[Reboot]** button only appears if you are logged in as an administrator.

If not all tabs can be displayed in the selected width of the window, a tab with ellipsis (...) is displayed instead of the tabs that cannot be displayed. This allows you to select the tabs (not shown) using a pull-down menu.

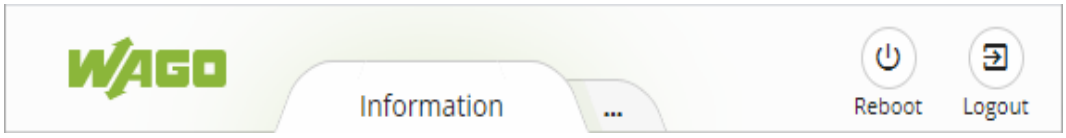



Figure 39: WBM Header with Tabs that Cannot be Displayed (Example)

The navigation tree is shown on the left of the browser window. The content of the navigation tree depends on the selected tab.
You can use this navigation tree to go to the individual pages and, where provided, subpages included in these pages.

The current device status is displayed in the status bar.

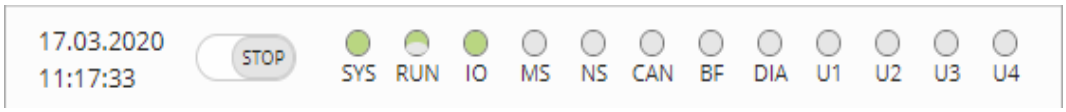



Figure 40: WBM Status Bar (Example)

- Date and Time - Local date and local time and on the device
- Setting of the mode selector switch
- LED status of the Device:
  All LEDs are graphically represented and are labeled with their particular designation (e.g., SYS, RUN, …). The following colors are possible:

  - gray: LED is off.
  - full color (green, red, yellow, orange): The LED is activated in the particular color.
  - half color:
    The LED is flashing in the corresponding color. The other half of the surface is then either gray or also colored. The latter case indicates that the LED is flashing sequentially in different colors.

  A tooltip containing more detailed information opens as long as the cursor is positioned over an LED. The text that is displayed also contains the message that put the LED into its current status. The time of the message is also shown.
  The states displayed in the WBM will not always correspond at the precise time to those on the controller. Data has a runtime during transmission and can only be queried at a certain interval. The time period between two queries is 30 seconds.

**Note**

**Do not power cycle the controller after changing any parameters!**
Some parameter changes require a controller restart for the changes to apply. Saving changes takes time.
Do not power cycle the controller to perform a restart, i.e., changes may be lost by shutting down the controller too soon.
Only restart the controller using the software reboot function. This ensures that all memory operations are completed correctly and completely.

A description of the WBM pages and the respective parameters can be found in the appendix in Section “Configuration Dialogs” > “Web-Based Management (WBM)”.

## 8.8.2 Configuration via Console-Based-Management-Tool (CBM) using a Terminal Program

The Console-Based Management Tool (CBM) is basically used for the initial configuration and startup of the controller via a terminal program.
Therefore, it only provides a subset of the controller parameters. For example, parameters that cannot be displayed in a terminal window in a reasonable way and are not necessary for initial startup are not displayed.

1. Connect a PC to the ETHERNET interface X1 of the controller using an SSH terminal program.

2. Start the terminal program.

3. Select “SSH” as the connection type, and enter the IP address of the controller and port 22 as the connection parameters.

Alternatively, you can also connect the controller via a serial interface:

1. Connect a PC to the X3 serial interface of the controller using a terminal program.

2. Start the terminal program.

3. Select “Serial” as the connection type and enter a baud rate of 115200 bauds as the connection parameter. The settings for data bits, stop bits and parity do not need to be adjusted.

4. Log in to the Linux® system as a “super user.”
The user name and the password are provided in the Section “Users and Passwords” > “Linux® User Group.”

5. Start the configuration tool by entering the command “cbm” (case sensitive) on the command line and then press **[Enter]**.

```
================================================================================
 WAGO Console Based Management Tool
================================================================================
 Main Menu
--------------------------------------------------------------------------------
 0. Quit
 1. Information
 2. PLC Runtime
 3. Networking
 4. Firewall
 5. Clock
 6. Administration
 7. Package Server
 8. Mass Storage
 9. Software Uploads
 10. Ports and Services
 11. SNMP
 12. PROFIBUS DP
--------------------------------------------------------------------------------
 Select an entry or Q to quit
--------------------------------------------------------------------------------
```

Figure 41: CBM main menu (example)

### 8.8.2.1 CBM Menu Structure Overview

Table 40: CBM Menu Structure

| Menu Hierarchy |
|---|
| 0. Quit |
| 1. Information |
| 0. Back to Main Menu |
| 1. Controller Details |
| 2. Network Details |
| 2. PLC Runtime |
| 0. Back to Main Menu |
| 1. Information |
| 2. General Configuration |
| 3. WebVisu |
| 3. Networking |
| 0. Back to Main Menu |
| 1. Host-/Domain Name |
| 2. TCP/IP |
| 0. Back to Networking Menu |
| 1. IP Address |
| 2. Default Gateway |
| 3. DNS Server |
| 3. Ethernet |
| 0. Back to Networking Menu |
| 1. Switch Configuration |
| 2. Ethernet Ports |
| 0. Back to Ethernet Menu |
| 1. Interface X1 |
| 2. Interface X2 |
| 4. Firewall |
| 0. Back to Main Menu |
| 1. General Configuration |
| 2. MAC Address Filter |
| 3. User Filter |
| 5. Clock |
| 0. Back to Main Menu |
| 1. Date on device (local) |
| 2. Time on device (local) |
| 3. Time on device (UTC) |
| 4. Clock Display Mode |
| 5. Timezone |
| 6. TZ-String |
| 6. Administration |
| 0. Back to Main Menu |

Table 40: CBM Menu Structure

| Menu Hierarchy |
|---|
| 1. Users |
| 2. Create Image |
| 3. Owner of Serial Interface |
| 4. Reboot Controller |
| 7. Package Server |
| 0. Back to Main Menu |
| 1. Firmware Backup |
| 2. Firmware Restore |
| 3. System Partition |
| 8. Mass Storage |
| 0. Back to Main Menu |
| 1. Internal Flash (active partition) |
| 9. Software Uploads |
| 0. Back to Main Menu |
| 1. Update Script |
| 10. Ports and Services |
| 0. Back to Main Menu |
| 1. Telnet |
| 2. FTP |
| 3. FTPS |
| 4. HTTP |
| 5. HTTPS |
| 6. NTP |
| 7. SSH |
| 8. TFTP |
| 9. DHCPD |
| 10. DNS |
| 11. IOCHECK PORT |
| 12. Modbus TCP |
| 13. Modbus UDP |
| 14. PLC Runtime Services |
| 11. SNMP |
| 0. Back to Main Menu |
| 1. General SNMP Configuration |
| 2. SNMP v1/v2c Manager Configuration |
| 3. SNMP v1/v2c Trap Receiver Configuration |
| 4. SNMP v3 Configuration |
| 5. SNMP firewalling |
| 6. Secure SNMP firewalling |

**Note**

**Do not power cycle the controller after changing any parameters!**
Some parameter changes require a controller restart for the changes to apply. Saving changes takes time.
Do not power cycle the controller to perform a restart, i.e., changes may be lost by shutting down the controller too soon.
Only restart the controller using the software reboot function. This ensures that all memory operations are completed correctly and completely.

A description of the CBM menus and the respective parameters can be found in the appendix in Section “Configuration Dialogs” > “Console-Based Management (CBM)”.

## 8.8.3 Configuration using “WAGO Ethernet Settings”

The “WAGO Ethernet Settings” program enables you to read system information about your controller, make network settings and enable/disable the Web server.

**Note**

**Observe the software version!**
To configure the controller, use at least Version 6.4.1.1 dated 2015-06-29 or newer of “WAGO Ethernet Settings”!

You must select the corresponding interface after launching the “WAGO ETHERNET Settings”.

A connection can be established via the service interface using communication cable 750-920, *Bluetooth*® Adapter 750-921, configuration cable 750-923 or 750-923/000-001 or via the ETHERNET interfaces.

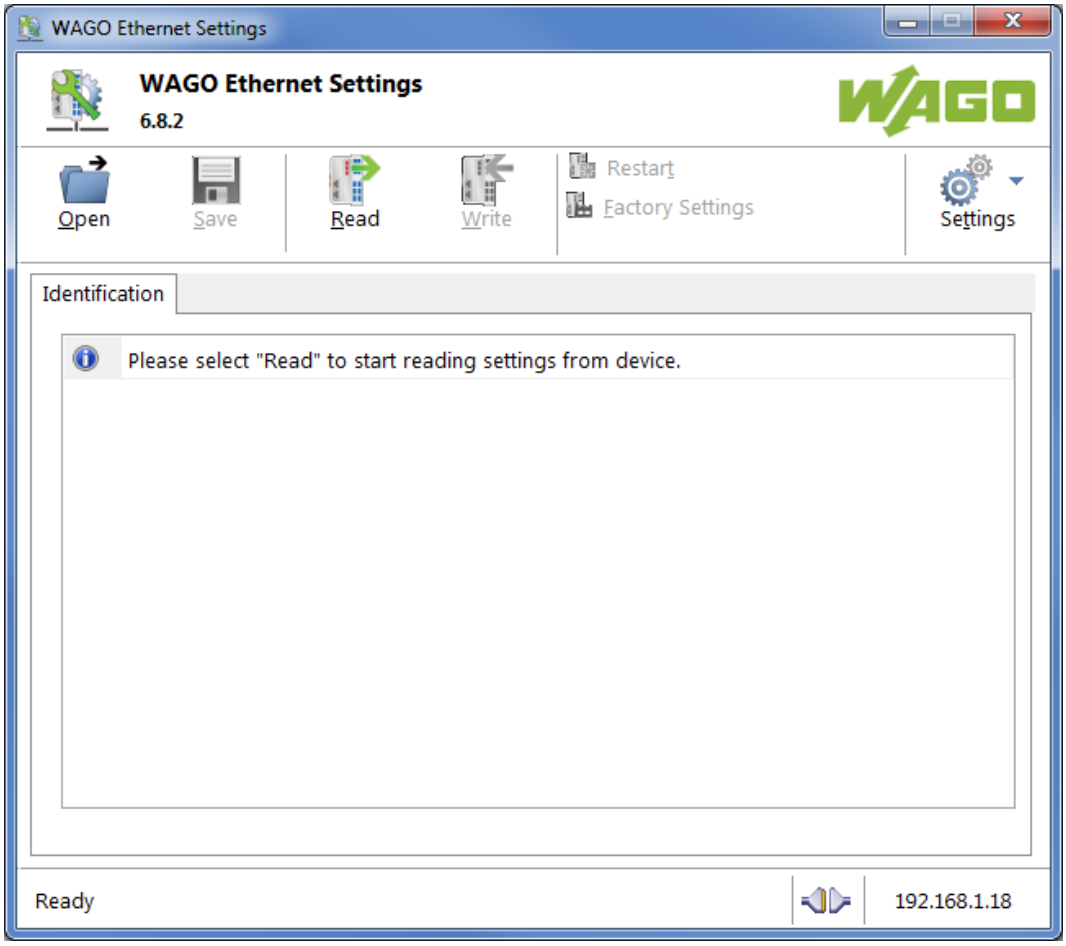



Figure 42: “WAGO Ethernet Settings” – Start Screen

For this, click “Settings” and then “Communication”.

In the “Communication settings” window that then opens, adapt the settings to your needs.

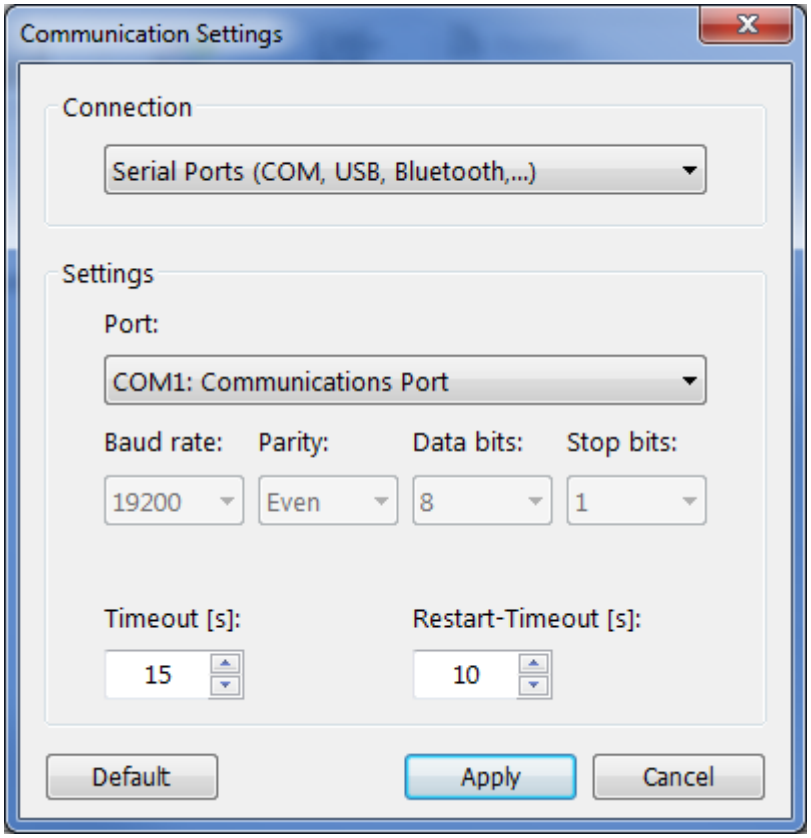



Figure 43: “WAGO Ethernet Settings” – Communication Link

Once you have configured “WAGO Ethernet Settings” and have clicked **[Apply]**, connection to the controller is established automatically.

If “WAGO Ethernet Settings” has already been started with the correct parameters, you can establish connection to the controller by clicking **[Read]**.

### 8.8.3.1 Identification Tab

An overview of the connected device is given here.

Besides some fixed values — e.g., item No., MAC address and firmware version — the currently used IP address and the configuration method are also shown here.

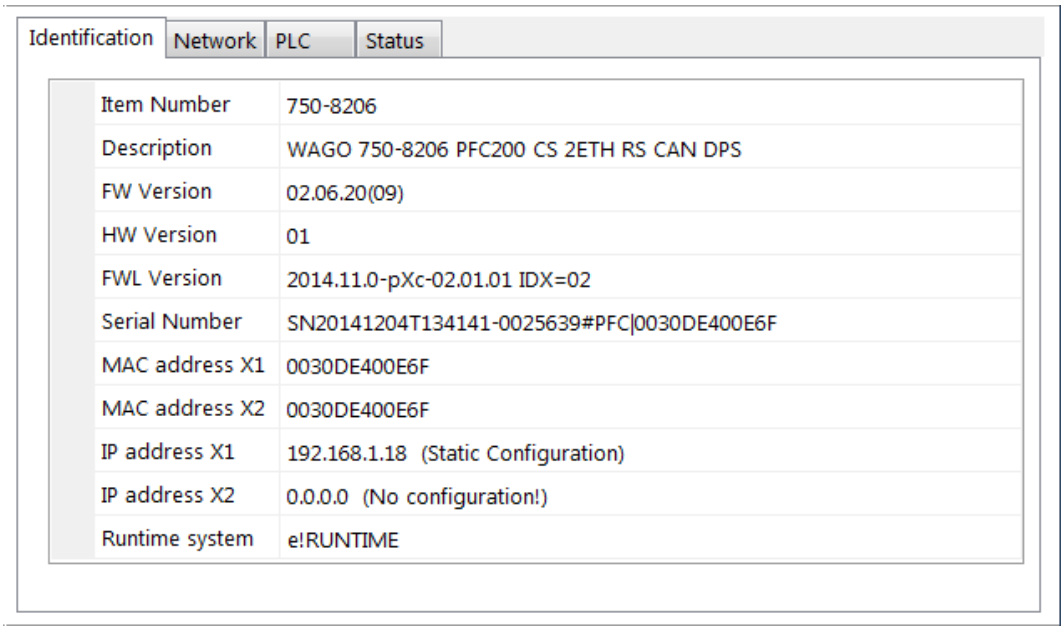



Figure 44: “WAGO Ethernet Settings” – Identification Tab (Example)

### 8.8.3.2 Network Tab

This tab is used to configure network settings.

Values can be changed in the “Input” column, while the parameters in use are shown in the “Currently in use” column.

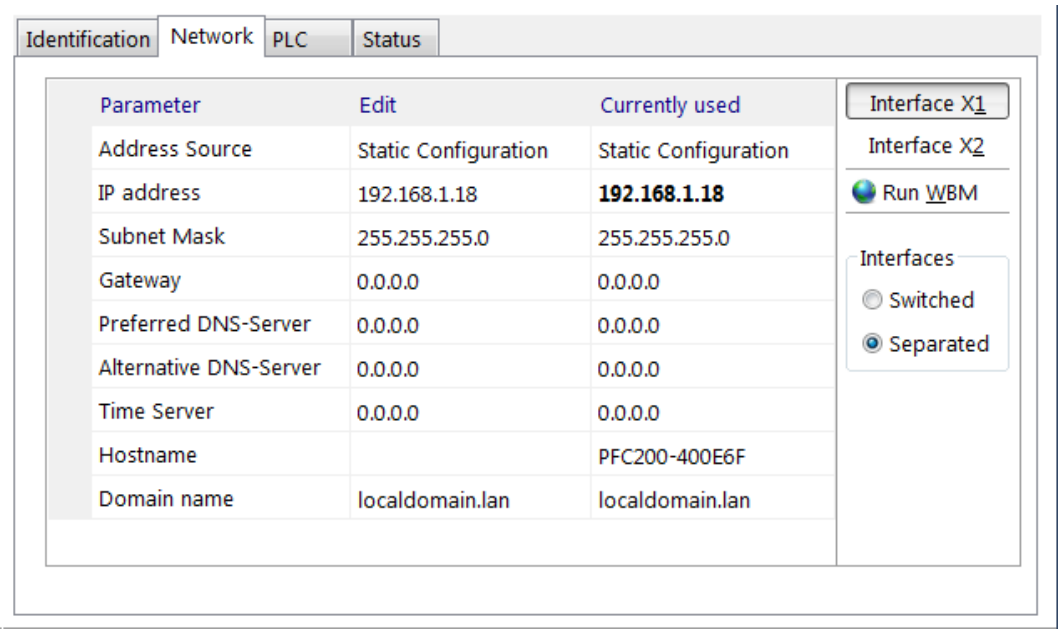



Figure 45: “WAGO Ethernet Settings” – Network Tab

**Address Source**
Specify how the controller will determine its IP address: Static, via DHCP or via BootP.

**IP address, subnet mask, gateway**
Specify the specific network parameters for static configuration.

**Note**

**Restricted setting for default gateways!**
Only the default gateway 1 can be set via “WAGO Ethernet Settings.”
The default gateway 2 can only be set in the WBM!

**Preferred DNS server, alternative DNS server**
Enter the IP address (when required) for an accessible DNS server when identifying network names.

**Time server**
Specify the IP address for a time server if setting the controller's system time via NTP.

**Hostname**
The host name of the controller is displayed here. In the controller's initial state, this name is composed of the string “PFCx00” and the last three bytes of the

MAC address.
This standard value is also used whenever the chosen name in the “Input” column is deleted.

**Domain name**
The current domain name is displayed here. This setting can be automatically overwritten with dynamic configurations, e.g., DHCP.

### 8.8.3.3 PLC Tab

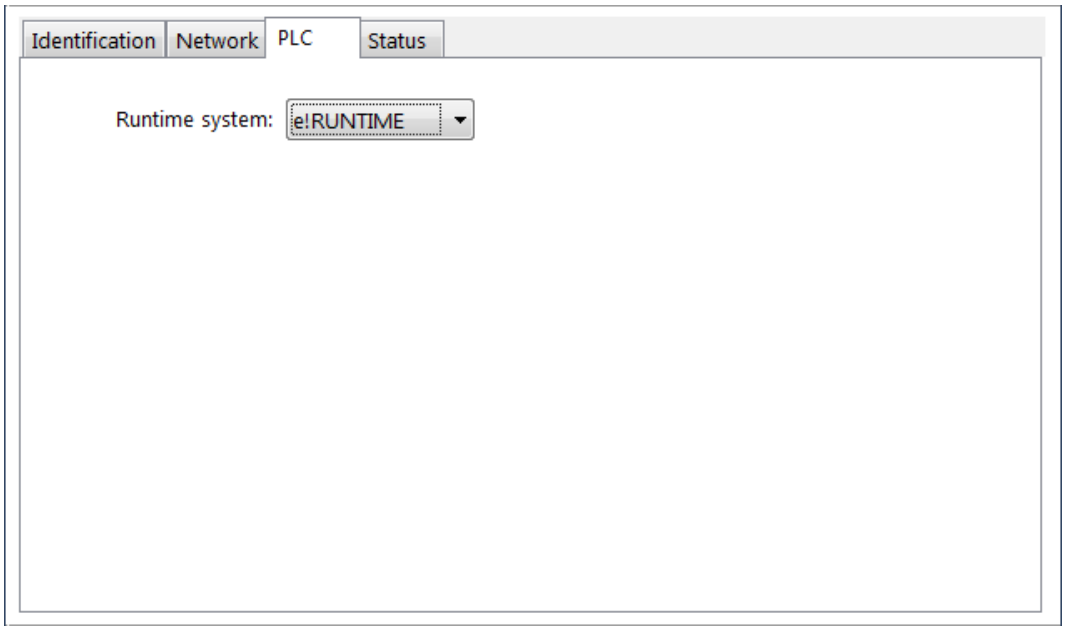



Figure 46: “WAGO Ethernet Settings” – Protocol Tab

Here you can select the runtime system.

### 8.8.3.4 Status Tab

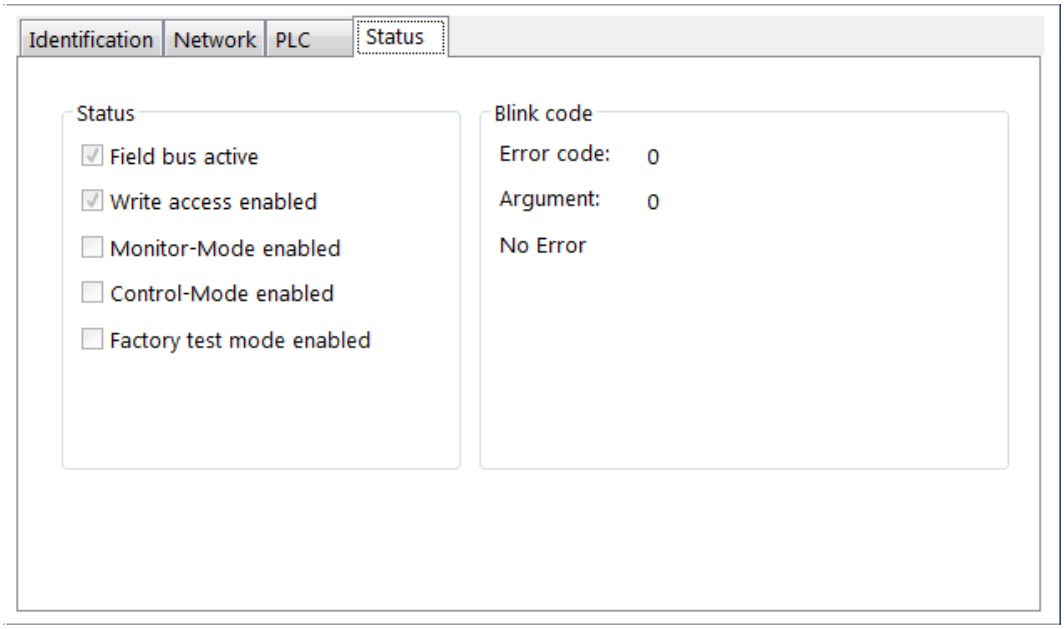



Figure 47: “WAGO Ethernet Settings” – Status Tab

General information about the controller status is displayed here.

# 9 *e!RUNTIME* Runtime Environment

## 9.1 General Notes



**Note**

**Additional Information**
Information on the installation and startup of ***e!****COCKPIT* is provided in the corresponding manual.
Information on programming is provided in the CODESYS 3 documentation.

## 9.2 CODESYS V3 Priorities

A list of priorities implemented for the controller is provided below as supplementary information to the CODESYS 3 documentation.

Table 41: CODESYS V3 Priorities

| Scheduler | Task | Linux® Priority | IEC Priority | Remark |
|---|---|---|---|---|
| Preemptive scheduling - Real-time range | Local bus or fieldbus - HIGH | -95 … -86 | | Local bus (-88) |
| | Mode selector switch monitoring | -85 | | Task registers changes to the mode selector switch and changes the state of the PLC application. (start, stop, reset warm/cold) |
| | CODESYS watchdog | -83 | | Execution of the watchdog functions |
| | Cyclic and event-controlled IEC task | -55 … -53 | 1 … 3 | For real-time tasks which must not be influenced in execution by external interfaces (e.g., fieldbus). |
| | Local bus or fieldbus - MID | -52 … -43 | | CAN (-52 … -51)<br>PROFIBUS (-49 … -45)<br>Modbus® slave/master (-43) |
| | Cyclic and event-controlled IEC task | -42 … -32 | 4 … 14 | For real-time tasks which must not influence fieldbus communication during execution. |
| | Local bus or fieldbus – LOW | -13 … -4 | | |
| Fair scheduling - None real-time range | CODESYS communication | Back-ground (20) | | Communication with the CODESYS development environment |
| | Cyclic, event-controlled and freewheeling IEC task | | 15 | Incl. standard priority of the visualization task |

# 9.3 Memory Spaces under *e!RUNTIME*

The memory spaces in the controller under ***e!****RUNTIME* have the following sizes:

- Program and data memory: 12 Mbytes
- Input data: 64 kbytes
- Output data: 64 kbytes
- Flags: 24 kbytes
- Retain: 104 kbytes
- Function block limitation: 12 * 4096 bytes = 48 kbytes

## 9.3.1 Program and Data Memory

The program (also code) and data memory has a size of 12 Mbytes.
This space has already been requested in the system after a successful program download and can be fully utilized.
The memory space is dynamically divided up into program and data space.

## 9.3.2 Function Block Limitation

Together with the data memory to be used by the application, memory is required for the individual program function blocks in the system.

The size of the administration space is calculated from the function block limitation * 12 (i.e., 4096 Byte * 12).

The actual size of the main memory required in the system for data is the sum of global program and data memory and function block limitation memory.

## 9.3.3 Remanent Memory

A total of 128 kbytes of remanent memory is available for the IEC-61131 application.
The remanent section is subdivided into the flag area (memory) and the retain area.

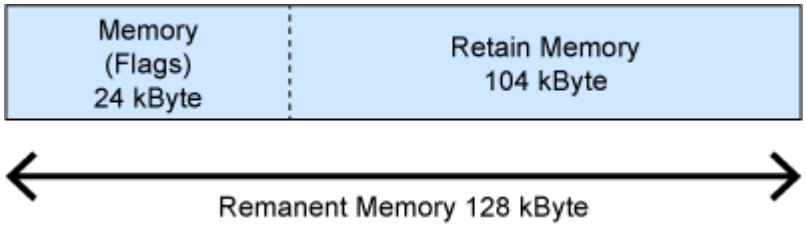



Figure 48: Remanent Main Memory

# 10 Modbus – *e!RUNTIME*

## 10.1 Modbus Address Overview

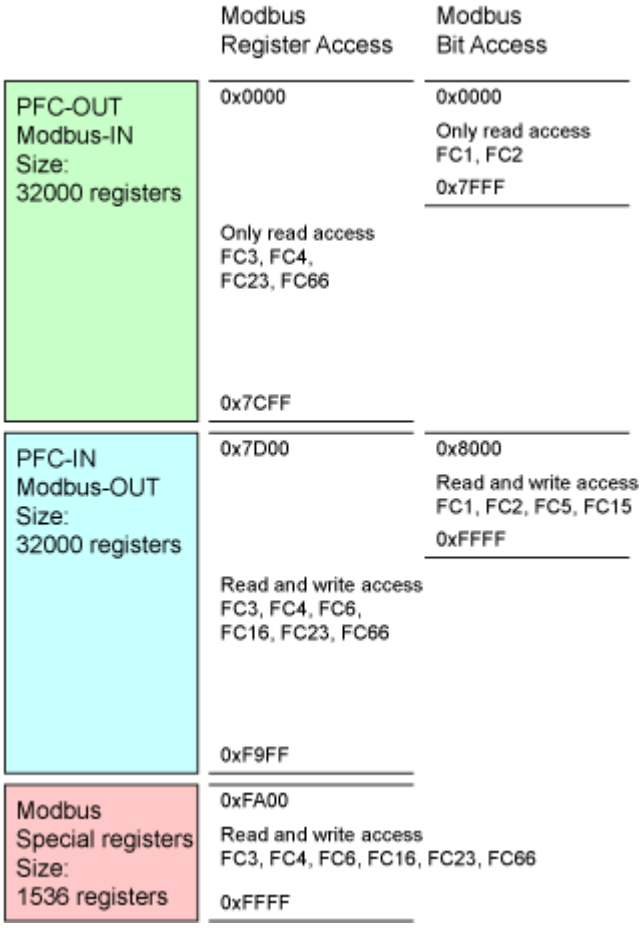



Figure 49: Modbus Address Overview

## 10.2 Modbus Registers

Table 42: WAGO Modbus Registers

| Modbus Address | | Data Length in Words | Access | Description |
|---|---|---|---|---|
| Dec. | Hex. | | | |
| **Watchdog Configuration Registers** | | | | |
| 64,000 | 0xFA00 | 1 | w | Watchdog command register |
| 64,001 | 0xFA01 | 1 | rw | Watchdog timeout register |
| 64,002 | 0xFA02 | 1 | ro | Watchdog status register |
| 64,003 | 0xFA03 | 1 | rw | Watchdog config register |
| 64,004 | 0xFA04 | 1 | rw | Modbus TCP connection watchdog register |
| **Status Registers** | | | | |
| 64,010 | 0xFA0A | 1 | ro | LED flash code I/O-LED (sequence 1 of 3) |
| 64,011 | 0xFA0B | 1 | ro | LED flash code I/O-LED (sequence 2 of 3) |
| 64,012 | 0xFA0C | 1 | ro | LED flash code I/O-LED (sequence 3 of 3) |
| 64,013 | 0xFA0D | 1 | ro | PLC State : 1 = Stop; 2 = Run |
| **Electronic Type Label** | | | | |
| 64,016 | 0xFA10 | 4 | ro | Order number, e.g., 0750810100400001 |
| 64,020 | 0xFA14 | 1 | ro | Firmware status |
| 64,021 | 0xFA15 | 1 | ro | Hardware version |
| 64,022 | 0xFA16 | 1 | ro | Firmware loader |
| **Process Image Version** | | | | |
| 64,023 | 0xFA17 | 1 | ro | Version of the Modbus process image |
| **Network Configuration** | | | | |
| 64,032 | 0xFA20 | 3 | ro | MAC-ID 1 |
| **Process Image Registers** | | | | |
| 64,064 | 0xFA40 | 1 | ro | Number of input registers, analog and digital (total size of the Modbus IN space) 0x7D00 |
| 64,065 | 0xFA41 | 1 | ro | Number of input registers, analog 0x7D00 |
| 64,066 | 0xFA42 | 1 | ro | Number of input registers, digital 0x8000 |
| 64,067 | 0xFA43 | 1 | ro | Number of output registers, analog and digital (total size of the Modbus OUT space) 0x7D00 |
| 64,068 | 0xFA44 | 1 | ro | Number of output registers, analog 0x7D00 |
| 64,069 | 0xFA45 | 1 | ro | Number of output registers, digital 0x8000 |

Table 42: WAGO Modbus Registers

| Modbus Address | | Data Length in Words | Access | Description |
|---|---|---|---|---|
| Dec. | Hex. | | | |
| **Constants Registers** | | | | |
| 64,160 | 0xFAA0 | 1 | ro | Constant 0x1234 |
| 64,161 | 0xFAA1 | 1 | ro | Constant 0xAAAA |
| 64,162 | 0xFAA2 | 1 | ro | Constant 0x5555 |
| 64,250 | 0xFAFA | 1 | ro | Live register |

The WAGO Modbus registers are described in more details in the following sections.

## 10.2.1 Modbus Watchdog

The Modbus watchdog monitors in the Modbus slave the ongoing Modbus communication with the Modbus master. All valid Modbus requests of a Modbus master from all the services supported by the Modbus slave are trigger events (see chapter “Modbus Mapping”). Exceptions here are the Explicit Trigger mode and the access to the register 0xFA02 (Watchdog Status), which can be configured via the register 0xFA03 (Watchdog Config).

The “Watchdog Timeout” response is initiated if no trigger occurs within the timeout set in the register 0xFA01 (Watchdog Timeout) with the watchdog running. The closing of all Modbus TCP connections can be configured as a response, see register 0xFA03 (Watchdog Config).

The Modbus watchdog supports two different operation modes ADVANCED_WATCHDOG and SIMPLE_WATCHDOG. The operation mode can be selected via Bit 7 in the register 0xFA03 (Watchdog Config).

The following diagrams show the possible states of the Modbus watchdog and status transitions for the particular operation mode.

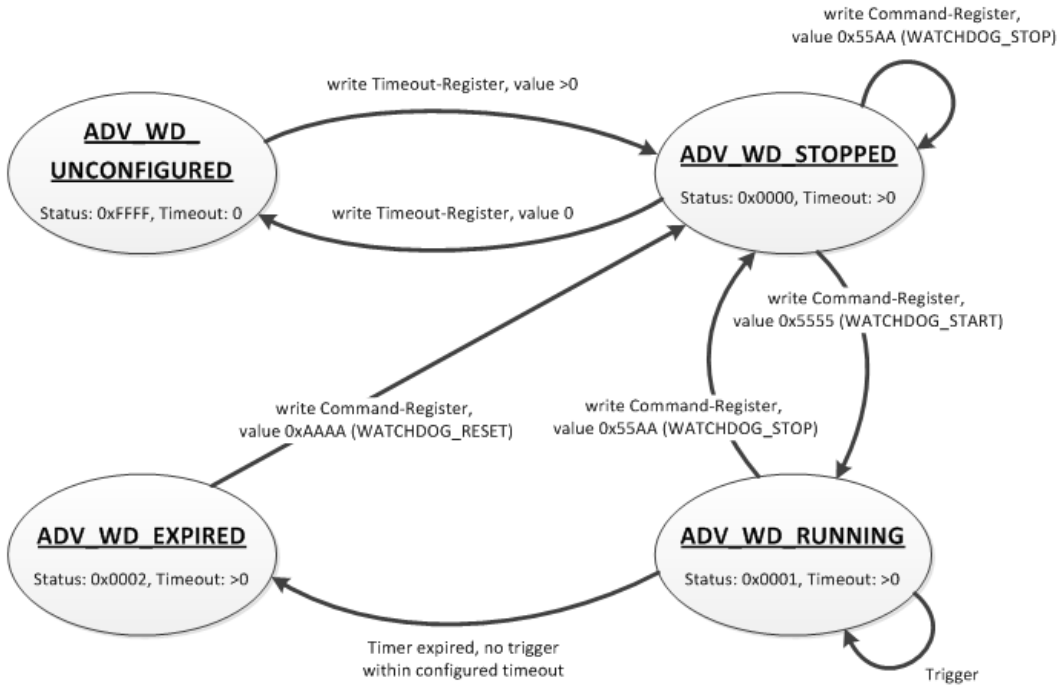



Figure 50: State Diagram, ADVANCED_WATCHDOG Operation Mode

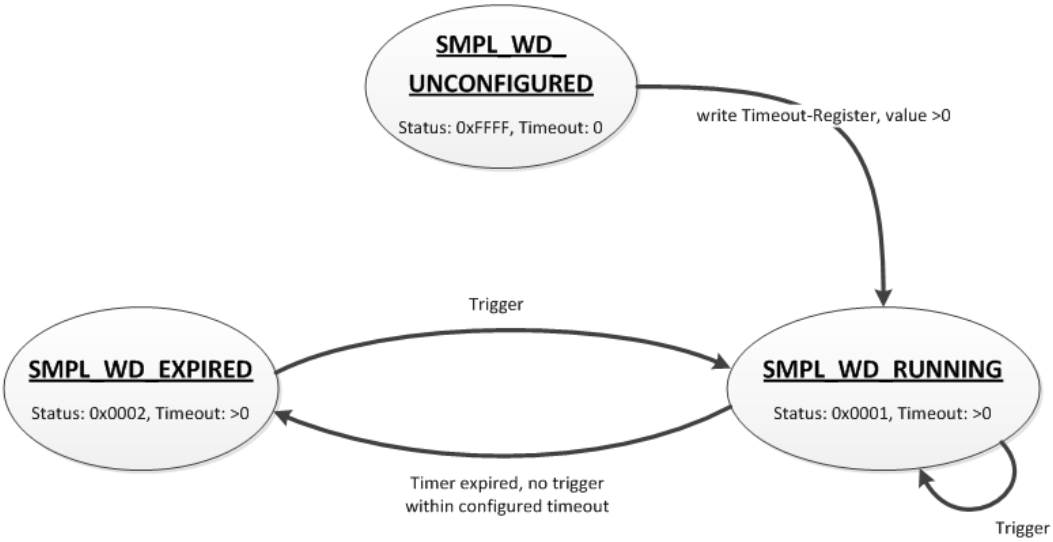



Figure 51: State Diagram, SIMPLE_WATCHDOG Operation Mode

The state diagram for the SIMPLE_WATCHDOG operation mode shows that the watchdog is always active as soon as a timeout > 0 is set in the register 0xFA01 (Watchdog Timeout). The writing of commands in the register 0xFA00 (Watchdog Command) is restricted in this operation mode. Only the WATCHDOG_START command is permitted as a possible trigger. The only possibility to deactivate and stop the watchdog in operation mode SIMPLE_WATCHDOG, is the switching back to the operation mode ADVANCED_WATCHDOG.

The following diagram shows the possible state transitions when operation modes are switched.

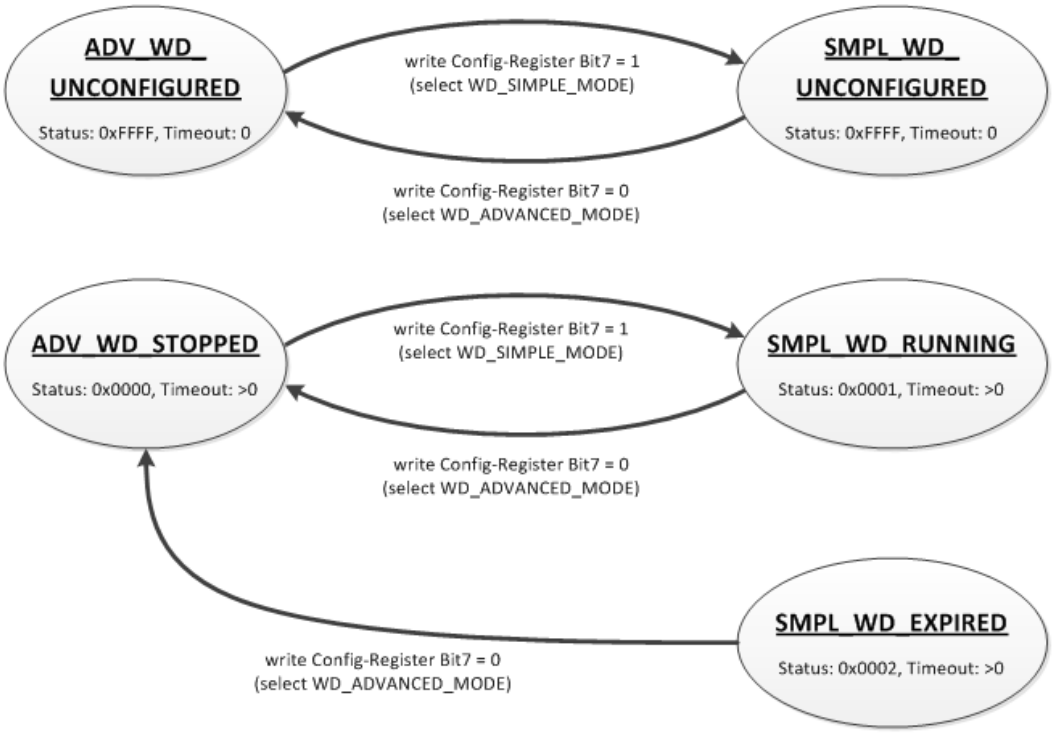



Figure 52: State Diagram, Switching Operation Modes

#### 10.2.1.1 Register 0xFA00 – Watchdog Command

This register receives commands for the Modbus watchdog. It cannot be read, i.e. it is not possible to read out the last command written.
The following commands are accepted depending on watchdog status:

Table 43: Watchdog Commands

| Value | Name | Explanation |
|---|---|---|
| 0x5555 | WATCHDOG_ START | Starts the configured watchdog; in the WATCHDOG_UNCONFIGURED state if no timeout is configured, the response is an ILLEGAL_DATA_VALUE (0x03) exception. The same exception is returned even if the watchdog has expired (WATCHDOG_EXPIRED) in the ADVANCED_ WATCHDOG operation mode. The watchdog must in this case be reset first with the command WATCHDOG_RESET to the WATCHDOG_STOPPED state. In all other cases the watchdog is restarted and the WATCHDOG_RUNNING state is set. |
| 0x55AA | WATCHDOG_ STOP | Stops the running watchdog; in the WATCHDOG_UNCONFIGURED state, the response is an ILLEGAL_DATA_ VALUE (0x03) exception if no timeout time is set. The same exception is returned even if the watchdog has expired (WATCHDOG_EXPIRED) in the ADVANCED_ WATCHDOG operation mode. The watchdog must in this case be reset first with the command WATCHDOG_RESET to the WATCHDOG_STOPPED state. In the SIMPLE_ WATCHDOG operation mode the response is an ILLEGAL_DATA_VALUE (0x03) exception. The command is not generally permitted in this operation mode. In all other cases, the watchdog is stopped and the WATCHDOG_STOPPED state is set. In the WATCHDOG_STOPPED state a stop command received several times in a row does not have any impact on the behavior of the watchdog and is therefore not acknowledged with an error response. |
| 0xAAAA | WATCHDOG_ RESET | Resets the expired watchdog; in the WATCHDOG_EXPIRED state the ADVANCED_WATCHDOG operation mode resets the watchdog. The watchdog is then in the WATCHDOG_STOPPED state. In all other cases the response is an ILLEGAL_ DATA_VALUE (0x03) exception. |

#### 10.2.1.2 Register 0xFA01 – Watchdog Timeout

This register contains the value for the watchdog timeout. The step width is 1 ms and the maximum value is 65535 (corresponds to 65.535 s). The default value is 0. In this case the watchdog cannot be started and will have the WATCHDOG_UNCONFIGURED state.

The register can be read and written in the states WATCHDOG_UNCONFIGURED and WATCHDOG_STOPPED. However, if the watchdog is active or expired (WATCHDOG_RUNNING and WATCHDOG_EXPIRED state), only read access to this register is possible. The response to a write operation is an ILLEGAL_FUNCTION (0x01) exception.

#### 10.2.1.3 Register 0xFA02 – Watchdog Status

This register provides the current state of the Modbus watchdog.
The following states are possible:

Table 44: Watchdog Status

| Value | Name | Explanation |
|---|---|---|
| 0xFFFF | WATCHDOG_ UNCONFIGURED | The Modbus watchdog is not configured, i.e., register 0xFA01 (Watchdog Timeout) contains the value 0. Only the setting of a timeout > 0 s can close this state. |
| 0x0000 | WATCHDOG_ STOPPED | The Modbus watchdog is configured, the register 0xFA01 (Watchdog Timeout) contains a value >0. In the ADVANCED_WATCHDOG operation mode, the watchdog can be activated in this state with the WATCHDOG_START command. In the SIMPLE_WATCHDOG operation mode, this state cannot be accessed since the watchdog is automatically started. |
| 0x0001 | WATCHDOG_ RUNNING | The Modbus watchdog is active, i.e. configured and started. The set timeout has not yet expired. |
| 0x0002 | WATCHDOG_ EXPIRED | The timeout set in register 0xFA01 (Watchdog Timeout) has expired. In the ADVANCED_WATCHDOG operation mode, the watchdog in this state must be reset to the WATCHDOG_STOPPED state with the WATCHDOG_RESET command. In the SIMPLE_WATCHDOG operation mode, the watchdog is automatically restarted with the next trigger. |

#### 10.2.1.4 Register 0xFA03 – Watchdog Config

This register contains the configuration parameters for the watchdog. The register is organized in bits, see following table.

The register can be read and written irrespective of the watchdog state in the SIMPLE_WATCHDOG operation mode.
However, in the ADVANCED_WATCHDOG operation mode, the register can only be read and written in the WATCHDOG_UNCONFIGURED and WATCHDOG_STOPPED states.
If the watchdog is active (WATCHDOG_RUNNING or WATCHDOG_EXPIRED state), only a read access is permissible. The response to a write request in this case is an ILLEGAL_FUNCTION (0x01) exception.

Table 45: Watchdog Configuration

| Bit | Name/Bit Identifier | Explanation | |
|---|---|---|---|
| 0 | EXPLICIT_ TRIGGER_ONLY | Activates the Explicit Trigger mode | |
| | | 0* | All valid Modbus requests are considered as watchdog triggers. Access to register 0xFA02 (Watchdog Status) is the only exception. |
| | | 1 | Only the writing of register 0xFA00 (Watchdog Command) with the value 0x5555 (WATCHDOG_START) is considered as the watchdog trigger. The exception is also here the access to the register 0xFA02 (Watchdog Status). |
| 1 | TRIGGER_ON_ STATUS_REG | Activates the watchdog trigger by (read) access to register 0xFA02 (Watchdog Status) | |
| | | 0* | The reading of the watchdog status is not considered as a watchdog trigger. |
| | | 1 | The reading of the watchdog status triggers the watchdog. |
| 2 | CLOSE_ALL_TCP_ CONNECTIONS | Activates the closing of all Modbus TCP connections with the expiry of the timeout (transition to WATCHDOG_EXPIRED state) | |
| | | 0 | Existing Modbus TCP connections remain open. |
| | | 1* | All existing Modbus TCP connections are closed. |
| 7 | SELECT_ ADVANCED_ SIMPLE_MODE | Determines the watchdog operation mode | |
| | | 0* | Advanced Mode: The watchdog must be controlled explicitly via commands (see register 0xFA00 Watchdog Command). |
| | | 1 | Simple Mode: The watchdog is activated directly with a timeout > 0 in register 0xFA01 (Watchdog Timeout). Each trigger restarts the running as well as the expired watchdog. The watchdog can only be stopped by switching to Advanced mode. |
| *Default setting | | | |

The individual options are activated if the relevant bit or bit combination is set.

#### 10.2.1.5 Modbus TCP Connection Watchdog Register

The 0xFA04 register contains the time for the Modbus TCP connection watchdog. Time base is 10 ms. This enables the time to be set up to 655350 ms. If the register contains a value > 0 s when a new TCP connection from a Modbus master is accepted, the watchdog for this connection is started. Later changes to the register have no effect on the monitoring of existing connections. If the watchdog is started and no telegram is received from the connected Modbus master within the set time, this connection is closed from one side with a reset.

## 10.2.2 Status Registers

### 10.2.2.1 PLC Status Register

The register 0xFA0D supplies the current status of the controller.
Possible values:

1 = PLC Stop - PLC is in STOP status.
2 = PLC Run - PLC is in RUN status

## 10.2.3 Electronic Nameplate

Registers 0xFA10–0xFA17 contain information from the electronic nameplate. It is possible to read the entire nameplate or a consecutive portion of it all at once.

### 10.2.3.1 Order Number

The registers 0xFA10–0xFA13 contain the WAGO order number of the controller.

Example: 0750-8202/0025-0001.

0xFA10 = 0750,
0xFA11 = 8202,
0xFA12 = 0025,
0xFA13 = 0001

### 10.2.3.2 Firmware Version

The register 0xFA14 contains the firmware version of the controller.

### 10.2.3.3 Hardware Version

The register 0xFA15 contains the hardware version of the controller.

### 10.2.3.4 Firmware Loader/Boot Loader

The register 0xFA16 contains the firmware loader/boot loader version of the controller.

## 10.2.4 Modbus Process Image Version

The register 0xFA17 contains the Modbus process image version of the controller.

## 10.2.5 Modbus Process Image Registers

The registers 0xFA40–0xFA45 contain size information for the process image spaces of the controller for bit and register accesses.

### 10.2.6 Constant Registers

Registers 0xFAA0 … 0xFAA2 provide constants based on the “WAGO Modbus Registers” table. It is possible to read all of the constants, or a consecutive portion of them at once.

0xFAA0 = 0x1234,
0xFAA1 = 0xAAAA,
0xFAA2 = 0x5555

### 10.2.7 Live Register

The register 0xFAFA can only be read and contains a counter that is incremented with each cycle of a task of the runtime environment with read and write access to the Modbus process data.

## 10.3 Estimating the Modbus Master CPU Load

Due to the real-time characteristics of the Linux kernel used, many data points can generate many context changes.
For a one-off update (transmitting and receiving of a function code), a CPU time of approx. 800 µs can be assumed.
The CPU load (cpu_load) in percent can be estimated from the cycle time (t_z) for a query with the following rule of thumb:

cpu_load = 800 µs / t_z * 100

A cycle time of 100 ms thus results in a CPU load of 0.8%.
A maximum load of approx. 20% can be generated per connection, as this is limited by the network protocol. To minimize the CPU load:

- The cycle time must be as high as possible.
- As many data points as possible must be combined in a query.
- The minimum query interval can be increased (default value: 0 ms).

# 11 Diagnostics

## 11.1 Operating and Status Messages

The following tables contain descriptions of all operating and status messages for the controller which are indicated by LEDs.

### 11.1.1 Power Supply LEDs

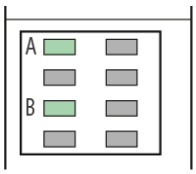



Figure 53: Power Supply Indicating Elements

#### 11.1.1.1 A LED

The A LED (system power supply) indicates following diagnostics:

Table 46: System Power Supply Diagnistics

| Status | Explanation | Solution |
|---|---|---|
| Green | 24V system power supply voltage present | --- |
| Off | No 24V system power supply voltage present | Switch on the power supply. Check the supply voltage. |

#### 11.1.1.2 B LED

The B LED (field-side power supply) indicates following diagnostics:

Table 47: Field-Side Supply Diagnostics

| Status | Explanation | Solution |
|---|---|---|
| Green | 24V field-side supply voltage present | --- |
| Off | No 24V field-side supply voltage present | Switch on the power supply. Check the supply voltage. |

## 11.1.2 System/Fieldbus LEDs




Figure 54: Indicating elements for fieldbus/system

### 11.1.2.1 SYS LED

The SYS LED indicates following diagnostics:

Table 48: Diagnostics via SYS LED

| Status | Explanation | Remedy |
|---|---|---|
| Green | Ready to operate - System start completed without errors | --- |
| Orange | Device is in startup/boot process and the RST button is not pressed. | --- |
| Orange flashing | “Fix IP Address” mode, temporary setting until the next reboot | Connect to the device via the standard address (192.168.1.17) or restart the device to restore the original value set. |
| Green/red flashing | Firmware update mode | --- |

### 11.1.2.2 RUN LED

The RUN LED indicates following diagnostics:

Table 49: RUN LED Diagnostics

| Status | Explanation | Remedy |
|---|---|---|
| Green | Applications loaded and all in the “RUN” status | --- |
| Green flashing | No application and now boot project loaded | Load an application or boot project. |
| Red | Applications loaded and all in the “STOP” status | Set the mode selector switch to “RUN” to start the application. |
| Green/red flashing | At least one application in the “RUN” status and one in the ”STOP” status | Start the stopped application. |
| Red,<br>goes out briefly | Warm start reset completed | --- |
| Red,<br>goes out longer | Cold start reset completed | --- |
| Red, flashing | At least one application after in the “STOP” status after exception (e.g., memory access error) | Start the application with a reset via the mode selector switch or in the connected IDE.<br>If the application cannot be started, restart the controller.<br>Contact WAGO Support if the error occurs again. |
| Orange/green flashing | Load above threshold value 1 | Try to reduce the load on the system:<br>- Change the CODESYS program.<br>- End any fieldbus communication that is not essential, or reconfigure the fieldbuses.<br>- Remove any non-critical tasks from the RT area.<br>- Select a longer cycle time for IEC tasks. |
| Orange | Runtime system in debug state (breakpoint, single step, individual cycle) | Resume the application in the connected IDE with single step or start.<br>Remove the breakpoint if necessary.<br>If the connection has been interrupted, set the mode selector switch to “STOP” and then back to “RUN” to enable the application to continue |
| OFF | No runtime system loaded | Enable a runtime system, e.g., via the WBM. |

### 11.1.2.3 I/O LED

The I/O LED indicates following diagnostics:

Table 50: Diagnostics I/O LED

| Status | Explanation | Solution |
|---|---|---|
| Green | Data cycle on the local bus, normal operating status. | --- |
| Orange flashing | Startup phase; the local bus is being initialized. The startup phase is indicated by rapid flashing for about 1 ... 2 seconds. | Wait until initialization has been completed. |
| Red | A hardware fault is present. | Contact WAGO Support. |
| Red flashing (2 Hz) | An error which may be able to be eliminated is present. | First, try to eliminate the error by switching the device (power supply) off and then back on. Check the entire node structure for any errors. If you cannot eliminate the error, contact WAGO Support. |
| Red flashing (flashing sequence) | A local bus error is present. | An explanation of the flashing sequence is given in the section “Diagnostics Messages via Flashing Sequences”. |
| Off | A library was not loaded, or a library function was not called up. | Restart the device. If you cannot eliminate the error, contact WAGO Support. |

#### 11.1.2.4 MS LED

The MS LED indicates following diagnostics:

Table 51: MS-LED Diagnostics

| Status | Explanation | Remedy |
|---|---|---|
| Off | No error | --- |
| Red flashing (flashing sequence) | A configuration error exists. | An explanation of the flashing sequence is given in the section “Diagnostics via Flashing Sequences.” |

## 11.1.3 Network Connection LEDs

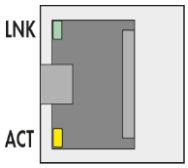



Figure 55: Indicating Elements, RJ-45 Jacks

### 11.1.3.1 LNK LED

The LNK LED indicates following diagnostics:

Table 52: LNK-LED Diagnostics

| Status | Explanation | Remedy |
|---|---|---|
| Off | 10 Mbit/s | --- |
| Green | 100 Mbit/s | --- |

### 11.1.3.2 ACT LED

The ACT LED indicates following diagnostics:

Table 53: ACT-LED Diagnostics

| Status | Explanation | Remedy |
|---|---|---|
| Off | No network communication via port | Check network connections and network settings. |
| Yellow flashing | Network communication via port | --- |

### 11.1.4 Memory Card Slot LED

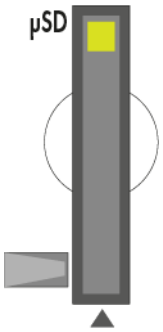



Figure 56: Indicating Elements, Memory Card Slot

The memory card slot LED indicates following diagnostics:

Table 54: Diagnostics via Memory Card Slot LED

| Status | Explanation | Remedy |
|---|---|---|
| Off | No memory card access | --- |
| Yellow | Memory card access | --- |
| Yellow flashing | | |

# 11.2 Diagnostics Messages via Flashing Sequences

## 11.2.1 Flashing Sequences

A diagnosis (fault/error) is always displayed as three flashing sequences in a cyclic manner:

1. The first flashing sequence (flickering) initiates reporting of the fault/error.

2. After a short break (approx. 1 second), the second flashing sequence starts. The number of blink pulses indicates the **error code**, which describes the type of error involved.

3. After a further break the third flashing sequence is initiated. The number of blink pulses indicates the **error argument**, which provides an additional description of the error, e.g., which of the I/O modules connected to the controller exhibits an error.

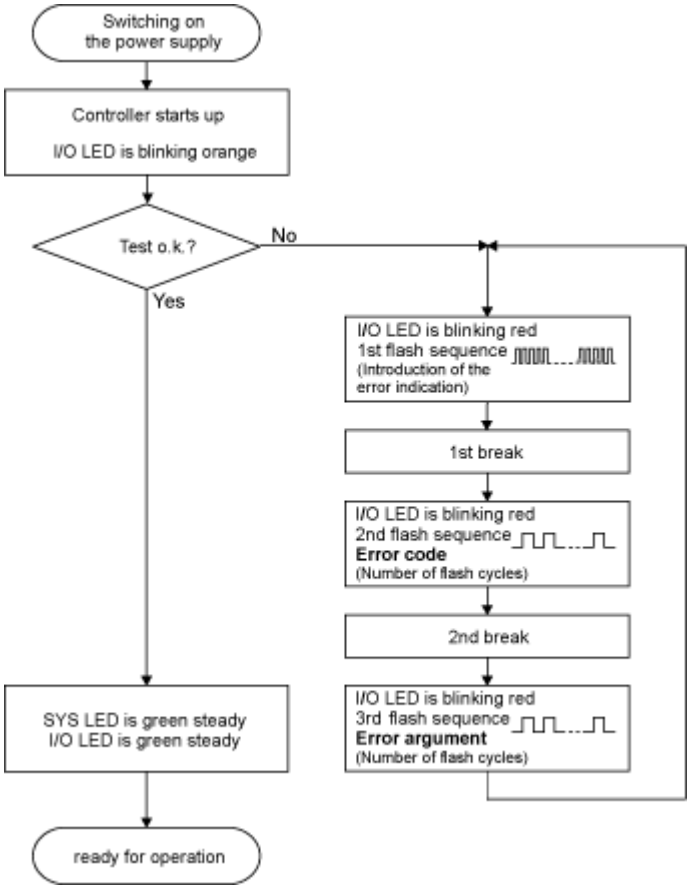



Figure 57: Flashing Sequence Process Diagram

## 11.2.2 Example of a Diagnostics Message Indicated by a Flashing Sequence

The example below illustrates the representation of a diagnostics message via a flashing sequence. The I/O LED indicates a data error on the local bus. The data error is caused by the removal of an I/O module located at the 6th position of the bus node.

**Initiation of the Start Phase**

1. The I/O LED flashes for 1 cycle at about 10 Hz (10 flashes/second).

2. This is followed by a pause of about one second.

**Error Code 4: Data Error in the Local Bus**

3. The I/O LED flashes for 4 cycles of about 1Hz.

4. This is followed by a pause of about 1 second.

**Error Argument 5: I/O Module at the 6th Slot**

5. The I/O LED flashes for 5 cycles at 1 Hz.
   This indicates that a disruption has occurred at the local bus downcircuit of the 5th I/O module.

6. The blink code starts flickering when the start phase is initiated again. If there is only one error, this process is repeated.

### 11.2.3 Meaning of Blink Codes and Procedures for Troubleshooting

This section describes the diagnostics presented as blink codes via the I/O LEDs.

If the diagnostics cannot be cleared by the measured specified for them, contact WAGO support. Be ready to explain to them the blink code that is displayed.

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E-mail: support@wago.com

Table 55: Overview of Error Codes, I/O LED

| Error code | Explanation |
|---|---|
| 1 | Hardware and configuration error |
| 2 | Configuration error |
| 3 | Local bus protocol error |
| 4 | Physical error on the local bus |
| 5 | Local bus initialization error |
| 6 | Not used |
| 7 | Not supported I/O module |
| 8 | Not used |
| 9 | CPU exception error |

Table 56: Error Code 1, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Remedy |
|---|---|---|
| - | Invalid parameter checksum for local bus interface | - Switch off the power to the controller and replace it.<br>- Then switch the power back on. |
| 1 | Internal buffer overflow (max. amount of data exceeded) during inline code generation. | - Switch off the power to the controller.<br>- Reduce the number of I/O modules.<br>- Switch the power back on. |
| 2 | Data type of the I/O module(s) is not supported | - Update the controller firmware. If this error persists, there is an error in the I/O module. Identify the error as follows:<br>- Switch off the power supply.<br>- Place the end module in the middle of the I/O modules connected to the system.<br>- Switch the power back on.<br>- If the I/O flashes red switch off the power supply again and place the end module in the middle of the first half of the I/O modules (toward the controller).<br>- If the LED is no longer flashing, switch off the power supply and place the end module in the middle of the second half of the I/O modules (away from the controller).<br>- Switch the power back on.<br>- Repeat this procedure until you establish which I/O module is defective. Then replace that module. |
| 3 | Unknown module type of the flash program memory | - Switch off the power to the controller and replace it.<br>- Then switch the power back on. |
| 4 | Error occurred while writing to the flash memory | - Switch off the power to the controller and replace it.<br>- Then switch the power back on. |
| 5 | Error occurred while erasing a flash sector | |
| 6 | The I/O module configuration after a local bus reset differs from the one after the last controller startup. | - Restart the controller by first switching off the power supply and then switching it back on, or by pressing the Reset button on the controller. |

Table 56: Error Code 1, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Remedy |
|---|---|---|
| 7 | Error occurred while writing to the serial EEPROM | - Switch off the power to the controller and replace it.<br>- Then switch the power back on. |
| 8 | Invalid hardware/ firmware combination | |
| 9 | Invalid checksum in the serial EEPROM | |
| 10 | Fault when initializing the serial EEPROM. | |
| 11 | Error occurred while reading from the serial EEPROM | - Switch off the power supply to the controller and reduce the number of I/O modules.<br>- Then switch the power back on. |
| 12 | Time to access the serial EEPROM exceeded | - Switch off the power to the controller and replace it.<br>- Then switch the power back on. |
| 14 | Maximum number of gateway or mailbox modules exceeded. | - Switch off the power to the controller.<br>- Reduce the number of gateway or mailbox modules.<br>- Then switch the power back on. |
| 16 | Maximum number of I/O modules exceeded | - Switch off the power to the controller.<br>- Reduce the number of I/O modules.<br>- Then switch the power back on. |

Table 57: Error Code 2, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Remedy |
|---|---|---|
| 2 | Maximum size of the process image exceeded | - Switch off the power to the controller.<br>- Reduce the number of I/O modules.<br>- Switch the power back on. |

Table 58: Error Code 3, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Solution |
|---|---|---|
| -- | Local bus communication error; defective I/O module cannot be identified | If a power supply module (e.g., 750-602) is connected to the controller, ensure that this module functions properly (see Section “LED Signaling”). If the supply module does not exhibit any errors/faults, the I/O module is defective. Identify the defective I/O module as follows:<br><br>- Switch off the power supply.<br>- Place the end module in the middle of the I/O modules connected to the system.<br>- Switch the power back on.<br>- If the I/O LED continues to flash red switch off the power supply again and place the end module in the middle of the first half of the I/O modules (toward the controller).<br><br>If only one I/O module is left and the LED continues to flash, either this module or the controller local bus interface is defective. Replace the defective module or the controller.<br><br>- If the LED is no longer flashing, switch off the power supply and place the end module in the middle of the second half of the I/O modules (away from the controller).<br>- Switch the power back on.<br>- Repeat this procedure until you establish which I/O module is defective. Then replace that module. |

Table 59: Error Code 4, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Solution |
|---|---|---|
| -- | Maximum permissible number of I/O modules exceeded. | - Switch off the power to the controller.<br>- Reduce the number of I/O modules to an acceptable value.<br>- Switch the power back on. |
| n* | Local bus disruption after the $n^{th}$ process data module. | - Switch off the power to the controller.<br>- Replace the $(n+1)^{th}$ process data module.<br>- Switch the power back on.<br><br>I/O modules that do not provide any data are ignored (e.g., supply module without diagnostics). |

Table 60: Error Code 5, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Solution |
|---|---|---|
| n* | Register communication error during local bus initialization | - Switch off the power to the controller.<br>- Replace the $(n+1)^{th}$ process data module.<br>- Switch the power back on.<br><br>I/O modules that do not provide any data are ignored (e.g., supply module without diagnostics). |

Table 61: Error Code 7, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Solution |
|---|---|---|
| n | First unsupported I/O module in place of n. | - Switch off the power to the controller.<br>- Replace the nth I/O module containing process data or reduce the number of modules to the number of n-1.<br>- Switch the power back on. |

Table 62: Error Code 9, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Remedy |
|---|---|---|
| 1 | Invalid program statement | Malfunction of the program sequence:<br>- Contact WAGO Support. |
| 2 | Stack overflow | Malfunction of the program sequence:<br>- Contact WAGO Support. |
| 3 | Stack underflow | Malfunction of the program sequence:<br>- Contact WAGO Support. |
| 4 | Invalid event (NMI) | Malfunction of the program sequence:<br>- Contact WAGO Support. |
| 5 | Local bus watchdog has triggered. | For ***e!****RUNTIME* applications:<br>- Check the system load by IEC tasks with priorities 1 ... 14 in the runtime system (see Section “***e!****RUNTIME*” Runtime Environment > “CODESYS V3 Priorities”).<br>For C applications:<br>- Check the time monitoring settings. |

### 11.2.4 Meaning of Blink Codes and Procedures for Troubleshooting

This section describes the diagnostics presented as blink codes via the MS LEDs.

If the diagnostics cannot be cleared by the measured specified for them, contact WAGO support. Be ready to explain to them the blink code that is displayed.

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E-mail: support@wago.com

Table 63: Overview of MS-LED Error Codes

| Error Code | Explanation |
|---|---|
| 1 | Configuration error |

Table 64: Error Code 1, Explanation of Blink Codes and Procedures for Troubleshooting

| Error Argument | Cause | Remedy |
|---|---|---|
| 5 | Error when synchronizing the controller configuration with the local bus | - Check the information of the connected I/O modules in the CODESYS controller configuration.<br>- Adjust this to match the I/O module that is actually inserted.<br>- Recompile the project.<br>- Reload the project into the controller. |

# 12 Service

## 12.1 Inserting and Removing the Memory Card

### 12.1.1 Inserting the Memory Card

1. Use an actuating tool or a screwdriver to open the transparent cover flap by flipping it upwards. The point where to position the tool is marked with an arrow.
2. Hold the memory card so that the contacts are visible on the right and the diagonal edge is at the top, as depicted in the figure below.
3. Insert the memory card in this position into the slot provided for it.
4. Push the memory card all the way in. When you let go, the memory card will move back a little and then snap in place (push-push mechanism).
5. Close the cover flap by flipping it down and pushing it in until it snaps into place.
6. You can seal the closed flap through the hole in the enclosure next to the flap.

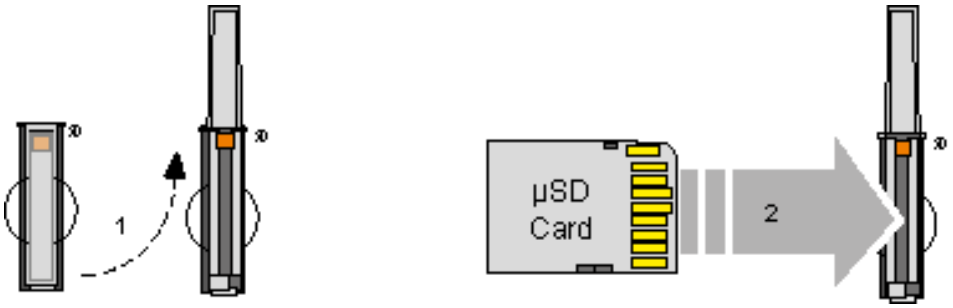



Figure 58: Inserting the Memory Card

### 12.1.2 Removing the Memory Card

1. First, remove any seal that may be in place.
2. Use an actuating tool or a screwdriver to open the transparent cover flap by flipping it upwards. The point where to position the tool is marked with an arrow.
3. To remove the memory card you must first push it slightly into the slot (push-push mechanism). This releases the mechanical locking mechanism.
4. As soon as you let go of the memory card, the memory card is pushed out a bit and you can remove it.
5. Remove the memory card.

6. Close the cover flap by flipping it down and pushing it in until it snaps into place.

## 12.2 Firmware Changes

**NOTICE**

**Do not switch the controller off!**
The controller can be damaged by interrupting the factory reset process.
Do not switch the controller off during the factory reset process, and do not disconnect the power supply!

**Note**

**Obtain documentation appropriate for the firmware target version!**
A firmware change can modify, remove or add controller properties and functions. As a result, described properties or functions of the controller may not be available or available properties or functions may not be described in the documentation.

Therefore, use only documentation appropriate for the target firmware after a firmware change.

If you have any questions, feel free to contact our WAGO Support.

**Note**

**Note the firmware version**
For devices with a factory installation of a firmware >= FW 05, a simple downgrade to a version <= FW 04 is not possible!
Use a special downgrade image.

You can update the firmware in two different ways using:

- ***e!****COCKPIT*
- WAGOupload
- Memory card and WBM

### 12.2.1 Use *e!COCKPIT* to Update/Downgrade the Firmware

1. Launch ***e!****COCKPIT*.
2. Create a new project or open an existing project.
3. Add at least one controller to your ***e!****COCKPIT* project either by scanning the network or going to the device catalog and entering the IP address of your controller in the settings dialog.

   Your controller is now displayed in the Device View of the project.
4. Select the displayed controller and click “Apply Selection” in the “SCAN” tab.
5. Click **[Add]** in the dialog.
6. Then click **[Replace Firmware]**. in the “DEVICE” tab.

   The “Replace Firmware” dialog opens.
7. In the “Replace Firmware” dialog, select the required firmware under “Available firmware on the PC” or click the “Select File” entry and select the * .wup firmware file for the required firmware.
8. Click **[Replace Firmware]** to transfer the firmware to the controller.
9. Wait until the operation ends with a status message and only then click **[OK]** to close the window.

The newly installed firmware is now available on your controller.

## 12.2.2 Use WAGOupload to Update/Downgrade the Firmware

1. Launch WAGOupload.
2. Click the **[Update Firmware]** action.
3. In the “Select Target Controllers” dialog, enter the IP address of your controller in the “Transfer via TCP/IP” option.
4. Click **[Find Controller]**.

   Your controller is now displayed in the list.
5. Select the displayed controller and click **[Next]**.
6. In the “Select Update File” dialog, select the *.wup firmware file for the required firmware.
7. Click **[Next]**.
8. Click **[Next]** to confirm the summary.
9. Wait until the operation ends with a status message and only then click **[Exit]** to close the window.

The newly installed firmware is now available on your controller.

### 12.2.3 Perform Firmware Update/Downgrade

Proceed as follows if you want to update the controller to a later firmware version or to downgrade the controller to an earlier firmware version:

1. Copy the firmware image (*.img file) of the required firmware to the memory card using a suitable PC tool.
2. Save your application and the controller settings.
3. Switch off the controller.
4. Insert the memory card with the new firmware image into the memory card slot. Use a special downgrade image if necessary (see above).
5. Switch on the controller.
6. After booting the controller, launch the WBM “Create Boot Image” page (you may have to temporarily change the IP address).
7. Create a new boot image on the internal memory.
8. Switch off the controller after completing the process.
9. Remove the memory card.
10. Switch on the controller.

The controller can now be started with the new firmware version.

## 12.3 Updating Root Certificates

If you want to update the root certificates on the controller, proceed as follows:

1. Download the current root CA bundle from https://curl.haxx.se/ca to your PC.
2. Rename the file “ca-certificates.crt.”
3. Transfer the file to the /etc/ssl/certs directory on the controller with an SFTP or FTP client.
4. Restart the controller. To do so, use the reboot function in WBM or CBM.

# 13 Removal

**⚠ CAUTION**

**Risk of injury due to sharp-edged blade contacts!**
The blade contacts are sharp-edged. Handle the I/O module carefully to prevent injury. Do not touch the blade contacts.

## 13.1 Removing Devices

**⚠ DANGER**

**Do not work when devices are energized!**
High voltage can cause electric shock or burns.
Switch off all power to the device prior to performing any installation, repair or maintenance work.

### 13.1.1 Removing the Controller

1. Use a screwdriver blade to turn the locking disc until the nose of the locking disc no longer engages behind the carrier rail.

2. Remove the controller from the assembly by pulling the release tab.

Electrical connections for data or power contacts to adjacent I/O modules are disconnected when removing the controller.

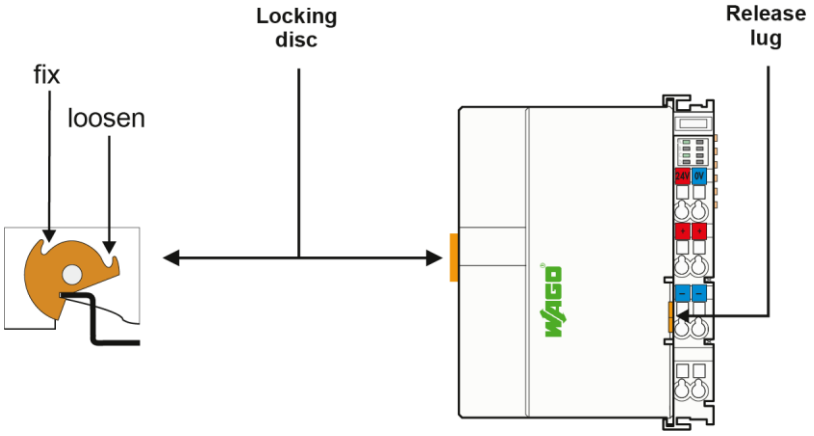



Figure 59: Release Tab of Controller (Example)

**Note**

**Do not take the controller enclosure apart!**
The enclosure sections are firmly joined. The feed-in section with the CAGE CLAMP® connections cannot be separated from the other enclosure section.

# 14 Disposal

## 14.1 Electrical and electronic equipment



Electrical and electronic equipment may not be disposed of with household waste. This also applies to products without this symbol.

Electrical and electronic equipment contain materials and substances that can be harmful to the environment and health. Electrical and electronic equipment must be disposed of properly after use.
WEEE 2012/19/EU applies throughout Europe. Directives and laws may vary nationally.



Environmentally friendly disposal benefits health and protects the environment from harmful substances in electrical and electronic equipment.

- Observe national and local regulations for the disposal of electrical and electronic equipment.
- Clear any data stored on the electrical and electronic equipment.
- Remove any added battery or memory card in the electrical and electronic equipment.
- Have the electrical and electronic equipment sent to your local collection point.

Improper disposal of electrical and electronic equipment can be harmful to the environment and human health.

## 14.2 Packaging

Packaging contains materials that can be reused.
PPWD 94/62/EU and 2004/12/EU packaging guidelines apply throughout Europe. Directives and laws may vary nationally.

Environmentally friendly disposal of the packaging protects the environment and allows sustainable and efficient use of resources.

- Observe national and local regulations for the disposal of packaging.

- Dispose of packaging of all types that allows a high level of recovery, reuse and recycling.

Improper disposal of packaging can be harmful to the environment and wastes valuable resources.

# 15 Use in Hazardous Environments

The **WAGO I/O System 750** (electrical equipment) is designed for use in Zone 2 hazardous areas and shall be used in accordance with the marking and installation regulations.

The following sections include both the general identification of components (devices) and the installation regulations to be observed. The individual subsections of the “Installation Regulations” section must be taken into account if the I/O module has the required approval or is subject to the range of application of the ATEX directive.

# 15.1 Marking Configuration Examples

## 15.1.1 Marking for Europe According to ATEX and IECEx

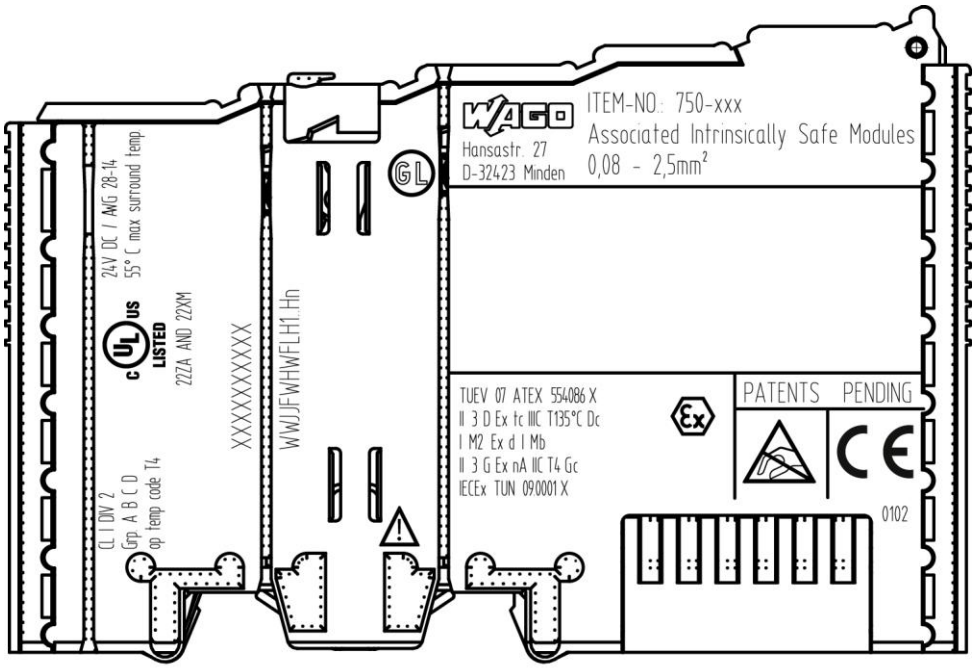



Figure 60: Marking Example According to ATEX and IECEx

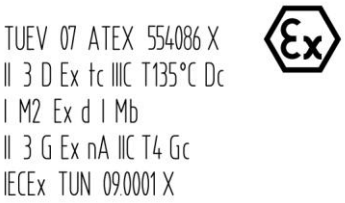



Figure 61: Text Detail – Marking Example According to ATEX and IECEx

Table 65: Description of Marking Example According to ATEX and IECEx

| Marking | Description |
|---|---|
| TUEV 07 ATEX 554086 X<br>IECEx TUN 09.0001 X | Approving authority resp. certificate numbers |
| **Dust** | |
| II | Equipment group: All except mining |
| 3 D | Category 3 (Zone 22) |
| Ex | Explosion protection mark |
| tc | Type of protection: Protection by enclosure |
| IIIC | Explosion group of dust |
| T135°C | Max. surface temperature of the enclosure (without a dust layer) |
| Dc | Equipment protection level (EPL) |
| **Mining** | |
| I | Equipment group: Mining |
| M2 | Category: High level of protection |
| Ex | Explosion protection mark |
| d | Type of protection: Flameproof enclosure |
| I | Explosion group for electrical equipment for mines susceptible to firedamp |
| Mb | Equipment protection level (EPL) |
| **Gases** | |
| II | Equipment group: All except mining |
| 3 G | Category 3 (Zone 2) |
| Ex | Explosion protection mark |
| nA | Type of protection: Non-sparking equipment |
| IIC | Explosion group of gas and vapours |
| T4 | Temperature class: Max. surface temperature 135 °C |
| Gc | Equipment protection level (EPL) |

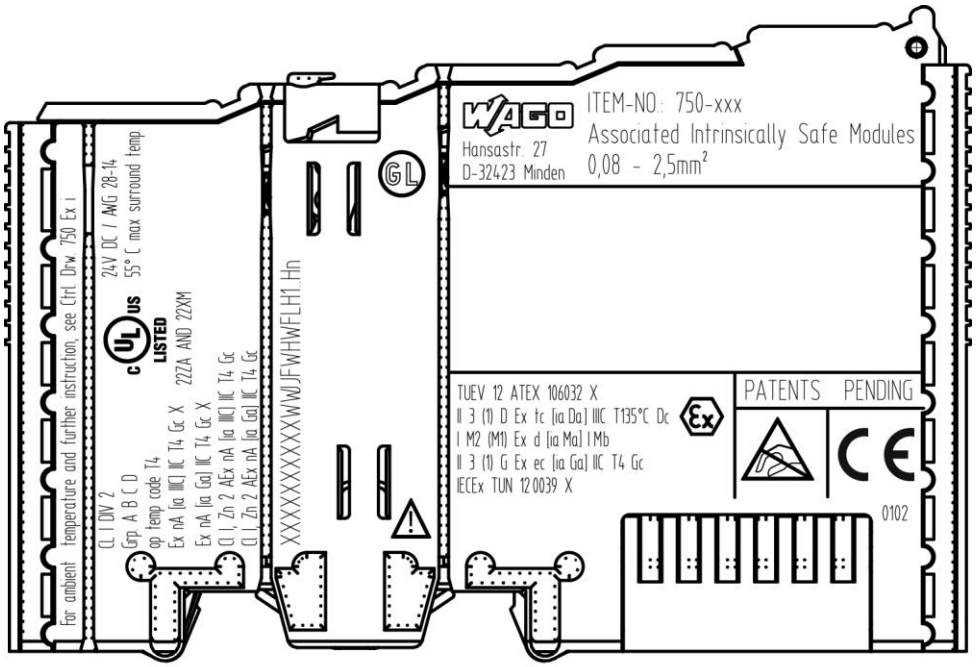



Figure 62: Marking Example for Approved I/O Module Ex i According to ATEX and IECEx




Figure 63: Text Detail – Marking Example for Approved I/O ModuleEx i According to ATEX and IECEx

Table 66: Description of Marking Example for Approved I/O Module Ex I According to ATEX and IECEx

| Marking | Description |
|---|---|
| TUEV 12 ATEX 106032 X<br>IECEx TUN 12 0039 X | Approving authority resp. certificate numbers |
| **Dust** | |
| II | Equipment group: All except mining |
| 3 (1) D | Category 3 (Zone 22) equipment containing a safety device for a category 1 (Zone 20) equipment |
| Ex | Explosion protection mark |
| tc | Type of protection: Protection by enclosure |
| [ia Da] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20 |
| IIIC | Explosion group of dust |
| T135°C | Max. surface temperature of the enclosure (without a dust layer) |
| Dc | Equipment protection level (EPL) |
| **Mining** | |
| I | Equipment Group: Mining |
| M2 (M1) | Category: High level of protection with electrical circuits which present a very high level of protection |
| Ex | Explosion protection mark |
| d | Type of protection: Flameproof enclosure |
| [ia Ma] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety electrical circuits |
| I | Explosion group for electrical equipment for mines susceptible to firedamp |
| Mb | Equipment protection level (EPL) |
| **Gases** | |
| II | Equipment group: All except mining |
| 3 (1) G | Category 3 (Zone 2) equipment containing a safety device for a category 1 (Zone 0) equipment |
| Ex | Explosion protection mark |
| ec | Equipment protection by increased safety “e” |
| [ia Ga] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 0 |
| IIC | Explosion group of gas and vapours |
| T4 | Temperature class: Max. surface temperature 135 °C |
| Gc | Equipment protection level (EPL) |

## 15.1.2 Marking for the United States of America (NEC) and Canada (CEC)

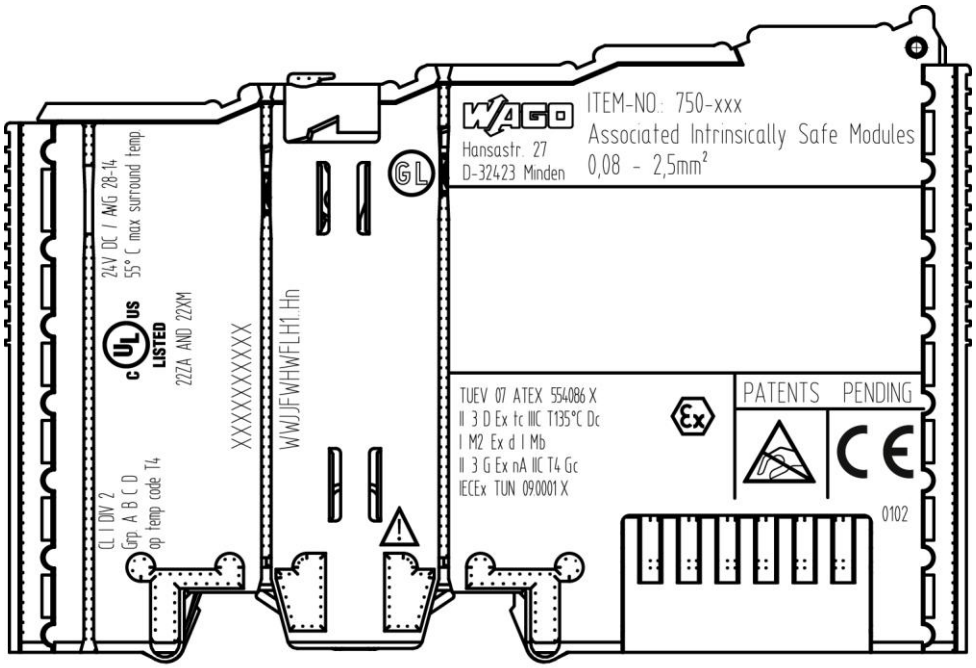



Figure 64: Marking Example According to NEC

CL I DIV 2
Grp. A B C D
op temp code T4

Figure 65: Text Detail – Marking Example According to NEC 500

Table 67: Description of Marking Example According to NEC 500

| Marking | Description |
|---|---|
| CL I | Explosion protection (gas group) |
| DIV 2 | Area of application |
| Grp. A B C D | Explosion group (gas group) |
| op temp code T4 | Temperature class |




Figure 66: Text Detail – Marking Example for Approved I/O Module Ex i According to NEC 505

Table 68: Description of Marking Example for Approved I/O Module Ex i According to NEC 505

| Marking | Description |
|---|---|
| Cl I, | Explosion protection group |
| Zn 2 | Area of application |
| AEx | Explosion protection mark |
| nA | Type of protection |
| [ia Ga] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20 |
| IIC | Group |
| T4 | Temperature class |
| Gc | Equipment protection level (EPL) |




Figure 67: Text Detail – Marking Example for Approved I/O Module Ex i According to NEC 506

Table 69: Description of Marking Example for Approved I/O Module Ex i According to NEC 506

| Marking | Description |
|---|---|
| Cl I, | Explosion protection group |
| Zn 2 | Area of application |
| AEx | Explosion protection mark |
| nA | Type of protection |
| [ia IIIC] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20 |
| IIC | Group |
| T4 | Temperature class |
| Gc | Equipment protection level (EPL) |

Ex nA [ia IIIC] IIC T4 Gc X
Ex nA [ia Ga] IIC T4 Gc X

Figure 68: Text Detail – Marking Example for Approved I/O Module Ex i According to CEC 18 attachment J

Table 70: Description of Marking Example for Approved I/O Module Ex i According to CEC 18 attachment J

| Marking | Description |
|---|---|
| **Dust** | |
| Ex | Explosion protection mark |
| nA | Type of protection |
| [ia IIIC] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 20 |
| IIC | Group |
| T4 | Temperature class |
| Gc | Equipment protection level (EPL) |
| X | Symbol used to denote specific conditions of use |
| **Gases** | |
| Ex | Explosion protection mark |
| nA | Type of protection |
| [ia Ga] | Type of protection and equipment protection level (EPL): Associated apparatus with intrinsic safety circuits for use in Zone 0 |
| IIC | Group |
| T4 | Temperature class |
| Gc | Equipment protection level (EPL) |
| X | Symbol used to denote specific conditions of use |

## 15.2 Installation Regulations

For the installation and operation of electrical equipment in hazardous areas, the valid national and international rules and regulations which are applicable at the installation location must be carefully followed.

### 15.2.1 Special Notes including Explosion Protection

The following warning notices are to be posted in the immediately proximity of the WAGO I/O System 750 (hereinafter “product”):

**WARNING – DO NOT REMOVE OR REPLACE FUSED WHILE ENERGIZED!**

**WARNING – DO NOT DISCONNECT WHILE ENERGIZED!**

**WARNING – ONLY DISCONNECT IN A NON-HAZARDOUS AREA!**

Before using the components, check whether the intended application is permitted in accordance with the respective printing. Pay attention to any changes to the printing when replacing components.

The product is an open system. As such, the product must only be installed in appropriate enclosures or electrical operation rooms to which the following applies:

- Can only be opened using a tool or key
- Inside pollution degree 1 or 2
- In operation, internal air temperature within the range of 0 °C ≤ Ta ≤ +55 °C or −20 °C ≤ Ta ≤ +60 °C for components with extension number …/025-xxx or −40 °C ≤ Ta ≤ +70 °C for components with extension number …/040-xxx
- Minimum degree of protection: min. IP54 (acc. to EN/IEC 60529)
- For use in Zone 2 (Gc), compliance with the applicable requirements of the standards EN/IEC/ABNT NBR IEC 60079-0, -7, -11, -15
- For use in Zone 22 (Dc), compliance with the applicable requirements of the standards EN/IEC/ABNT NBR IEC 60079-0, -7, -11, -15 and -31
- For use in mining (Mb), minimum degree of protection IP64 (acc. EN/IEC 60529) and adequate protection acc. EN/IEC/ABNT NBR IEC 60079-0 and -1
- Depending on zoning and device category, correct installation and compliance with requirements must be assessed and certified by a “Notified Body” (ExNB) if necessary!

Explosive atmosphere occurring simultaneously with assembly, installation or repair work must be ruled out. Among other things, these include the following activities

- Insertion and removal of components
- Connecting or disconnecting from fieldbus, antenna, D-Sub, ETHERNET or USB connections, DVI ports, memory cards, configuration and programming interfaces in general and service interface in particular:
  - Operating DIP switches, coding switches or potentiometers
  - Replacing fuses

Wiring (connecting or disconnecting) of non-intrinsically safe circuits is only permitted in the following cases

- The circuit is disconnected from the power supply.
- The area is known to be non-hazardous.

Outside the device, suitable measures must be taken so that the rated voltage is not exceeded by more than 40 % due to transient faults (e.g., when powering the field supply).

Product components intended for intrinsically safe applications may only be powered by 750-606 or 750-625/000-001 bus supply modules.

Only field devices whose power supply corresponds to overvoltage category I or II may be connected to these components.

## 15.2.2 Special Notes Regarding ANSI/ISA Ex

For ANSI/ISA Ex acc. to UL File E198726, the following additional requirements apply:

- Use in Class I, Division 2, Group A, B, C, D or non-hazardous areas only
- ETHERNET connections are used exclusively for connecting to computer networks (LANs) and may not be connected to telephone networks or telecommunication cables
- **WARNING** – The radio receiver module 750-642 may only be used to connect to external antenna 758-910!
- **WARNING** – Product components with fuses must not be fitted into circuits subject to overloads!
  These include, e.g., motor circuits.
- **WARNING** – When installing I/O module 750-538, “Control Drawing No. 750538” in the manual must be strictly observed!



*Information*

**Additional Information**
Proof of certification is available on request.
Also take note of the information given on the operating and assembly instructions.
The manual, containing these special conditions for safe use, must be readily available to the user.

# 16 Appendix

## 16.1 Configuration Dialogs

### 16.1.1 Web-Based-Management (WBM)

#### 16.1.1.1 “Information” Tab

##### 16.1.1.1.1 “Device Status” Page

The “Device Status” page shows information about product identification and the most important network properties.

**“Device Details” Group**

This group shows information about product identification.

Table 71: WBM “Device Status” Page – “Device Details” Group

| Parameters | Explanation |
|---|---|
| Product Description | Product Designation |
| Order Number | Product Item Number |
| Serial | Unique Product Serial Number |
| License Information | Notification that the CODESYS runtime system is available |
| Firmware Revision | Firmware Version |

### “Network TCP/IP Details” Group

The network and interface properties of the product are displayed in this group.

Table 72: WBM “Device Status” Page – “Network TCP/IP Details” Group

| Parameter | Meaning | |
|---|---|---|
| Bridge <n> | Bridge currently configured;<br>the properties are displayed in a separate area for each configured bridge. | |
| MAC Address | MAC address used for product identification and addressing | |
| IP Source | Current reference type of the IP address | |
| | None | No IP allocation method is selected; this occurs, for example, if a bridge was added due to changes to the bridge configuration.<br>Select a source in the **Configuration** tab on the **Networking** > **TCP/IP Configuration** page. |
| | static IP | Static IP address assignment |
| | dhcp | Dynamic IP address assignment via DHCP |
| | bootp | Dynamic IP address assignment via BootP (if BootP is supported) |
| | external | The IP address may be assigned by the fieldbus application; this occurs e.g., if the IP address is controlled by the application. |
| IP Address | Current product IP address | |
| Subnet Mask | Current product subnet mask | |

#### 16.1.1.1.2 “Vendor Information” Page

You can find the manufacturer and address on the “Vendor Information” page.

#### 16.1.1.1.3 “PLC Runtime Information” Page

All information about the enabled runtime system and PLC program created in the programming software is provided on the “PLC Runtime Information” page. You will also find a link here to open WebVisu.

**“Runtime” Group**

Table 73: WBM “PLC Runtime Information” Page – “Runtime” Group

| Parameter | Explanation | |
|---|---|---|
| Version | The version of the currently enabled runtime system is shown.<br>If the runtime system is disabled, “None” is displayed and the subsequent fields of this group are hidden. | |
| Webserver Version | This shows the version number of the Webserver.<br>This field appears if the controller supports the CODESYS V2 runtime system and CODESYS V2 is set as the runtime system. | |
| State | The PLC operating state is displayed.<br>This field appears if the controller supports the CODESYS V2 runtime system and CODESYS V2 is set as the runtime system. | |
| | STOP | PLC program is not executed. |
| | RUN | PLC program is executed. |
| Number of Tasks | The number of tasks in the PLC program is shown.<br>This field appears if the controller supports the CODESYS V2 runtime system and CODESYS V2 is set as the runtime system. | |

**“WebVisu” Group**

You will find a link that you can use to open WebVisu.

### “Project Details” Group

This group appears if the controller supports the CODESYS V2 runtime system and CODESYS V2 is set as the runtime system.

Table 74: WBM “PLC Runtime Information” Page – “Project Details” Group

| Parameter | Explanation |
|---|---|
| Date | The last save date of the project is displayed. |
| Title | The project information that the programmer has entered in the PLC program is displayed here (in the programming software under Project > Project Information ...).<br>The information only appears in an executed PLC program.<br>Descriptive texts up to 1024 characters long are given under “Description.” |
| Version | |
| Author | |
| Description | |
| Checksum | The calculated checksum of the project is displayed. |

### “Task <n>” Group(s)

One dedicated group is displayed for each task when the PLC program is executed. As a rule, only the group title is displayed with the task number, the task name and the task ID.

This group(s) appear(s) if the controller supports the CODESYS V2 runtime system and CODESYS V2 is set as the runtime system.

Table 75: WBM “PLC Runtime Information” Page – “Task n” Group(s)

| Parameter | Explanation |
|---|---|
| Cycle count | Number of task cycles since the system start |
| Cycle time (µsec) | Currently measured task cycle time for the task |
| Cycle time min (µsec) | Minimum task cycle time for the task since the system start |
| Cycle time max (µsec) | Maximum task cycle time for the task since the system start |
| Cycle time avg (µsec) | Average task cycle time since the system start |
| Status | Task status (e.g., RUN, STOP) |
| Mode | Task execution mode (e.g., in cycles) |
| Priority | Set task priority |
| Interval (msec) | Set task interval |

#### 16.1.1.1.4 “WAGO Software License Agreement” Page

The “WAGO Software License Agreement” page lists the license terms for the WAGO software used in the product.

#### 16.1.1.1.5 “Open Source Licenses” Page

The license conditions for the open source software used for the product are listed in alphabetical order on the “Open Source Licenses” page.

#### 16.1.1.1.6 “WBM Third Party License Information” Page

On the “WBM Third Party License Information” page, you can find the license text of the open source licenses that apply to the WBM itself.

#### 16.1.1.1.7 “Trademarks Information” Page

On the “Trademarks Information” page you will find a list of property and trademark rights.

#### 16.1.1.1.8 “WBM Version” Page

On the “WBM Version” page, you can find the version information for the various sections (“Plug-ins”) that the WBM contains. This information may be useful for support if an error is found in the WBM.

### 16.1.1.2 “Configuration” Tab

#### 16.1.1.2.1 “PLC Runtime Configuration” Page

On the "PLC Runtime Configuration" page, you will find the settings for the boot project created with the programming software and the settings for the web visualization created in the runtime system.

**“General PLC Runtime Configuration” Group**

Table 76: WBM “PLC Runtime Configuration” Page – “General PLC Runtime Configuration” Group

| Parameter | Meaning | |
|---|---|---|
| PLC runtime version | Select here the PLC runtime system to be enabled. | |
| | None | No runtime system is enabled. |
| | CODESYS 2 | CODESYS V2 runtime system is enabled.<br>This value only appears if the controller supports the CODESYS V2 runtime system. |
| | ***e!****RUNTIME* | ***e!****RUNTIME* runtime system is enabled.<br>This value only appears if the controller supports the ***e!****RUNTIME* runtime system. |
| Home directory on memory card enabled | Define if the home directory for the runtime system should be moved to the memory card. | |
| | Disabled | The home directory is stored in the internal memory. |
| | Enabled | The home directory is moved to the memory card. |

**Note**

**All data is deleted when switching the runtime system!**
The runtime system’s home directory is completely deleted when switching the runtime system!

**Note**

**Only the first partition can be used as the Home directory!**
Only the first partition of a memory card can be accessed at **/media/sd** and used as the home directory.

Click **[Submit]** to apply the change. The runtime system change is effective immediately.
The home directory change only takes effect after the product restarts. For this purpose, use the WBM reboot function. Do not switch off the product too early!

### “Webserver Configuration” Group

Table 77: WBM “PLC Runtime Configuration” Page – “Webserver Configuration” Group

| Parameter | Meaning | |
|---|---|---|
| CODESYS V2 Webserver State | This displays the status (enabled/disabled) of the CODESYS V2 Webserver.<br>This field only appears if the controller supports the CODESYS V2 runtime system. | |
| ***e!****RUNTIME* Webserver State | This indicates the status (enabled/disabled) of the ***e!****RUNTIME* Webserver.<br>This field only appears if the controller supports the ***e!****RUNTIME* runtime system. | |
| Default Webserver | Choose here whether the Web-based Management or web visualization of the runtime system should be displayed when only entering the IP address of the controller. | |
| | Web-Based Management | The Web-based Management is displayed. |
| | WebVisu | The web visualization of the runtime system is displayed. |

Click **[Submit]** to apply the change. The change takes effect immediately.

In its default setting, the WBM is called up when only entering the IP address.

To update the display after switching, enter the IP address again in the address line of the Web browser.

To display the web visualization, the Webserver must be enabled (in WBM under “Ports and Services” -> “PLC Runtime Services”) and there must be a suitably configured application.

Regardless of the default Webserver setting, the WBM can be called up at any time with “https://<IP address>/wbm” and the Web visualization with “https://<IP address>/webvisu”.

**Note**

**Possible error messages when calling up the web visualization**
The “500 − Internal Server Error” message indicates that the Webserver is not enabled.
A page with the header “WebVisu not available” means that no application has been loaded in the product using web visualization.

#### 16.1.1.2.2 “TCP/IP Configuration” Page

The TCP/IP settings for the ETHERNET interfaces are shown on the “TCP/IP configuration” page.

**“TCP/IP Configuration” Group**

The properties are displayed in a separate area for each configured bridge.

Table 78: WBM “TCP/IP Configuration” Page – “TCP/IP Configuration” Group

| Parameter | Meaning | |
|---|---|---|
| Network Details Bridge <n> | Settings for the bridge currently configured | |
| Current IP Address | This displays the current IP address. | |
| Current Subnet Mask | This displays current subnet mask. | |
| Current Default Gateway | The IP address of the current default gateway is displayed. | |
| IP Source | You can specify whether to use a static or dynamic IP address. | |
| | Static IP | Static IP addressing |
| | DHCP | Dynamic IP addressing via DHCP |
| | BootP | Dynamic IP addressing via BootP |
| IP Address | Enter a static IP address. This is enabled if “Static IP” is enabled in the **IP Source** field. | |
| Subnet Mask | Enter the subnet mask. This is enabled if “Static IP” is enabled in the **IP Source** field. | |
| Default Gateway | Enter the IP address of the default gateway here. | |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

### “DNS Server” Group

Table 79: WBM “TCP/IP Configuration” Page – “DNS Server” Group

| Parameters | Explanation |
|---|---|
| Active | The active DNS servers are displayed.<br>Up to 3 active DNS servers can be used.<br>The index reflects the query order.<br>The first DNS server assigned via DHCP is given the highest priority. |
| Assigned by DHCP | The DNS servers assigned if necessary by DHCP (or BootP) are displayed. If no DNS server has been assigned by DHCP (or BootP), “No DNS Servers assigned by DHCP” is displayed. |
| Assigned by user | The addresses of the defined DNS servers are displayed. If no server has been entered, “No DNS Servers configured” is displayed. |
| New Server IP | Add additional DNS server addresses.<br>You can enter as many addresses as you like, but a maximum of three entries are used.<br>The entries actually used result from an alternating combination of the “Assigned by DHCP” and ”Assigned by user” lists. |

Click the **[Delete]** button to delete the selected DNS server. The change takes effect immediately.

Click the **[Add]** button to add the entered DNS server. The change takes effect immediately.

#### 16.1.1.2.3 “Ethernet Configuration” Page

The settings for ETHERNET are located on the “Ethernet Configuration” page.

**“Bridge Configuration” Group**

Table 80: WBM “Ethernet Configuration” Page – “Bridge Configuration” Group

| Parameter | Meaning |
|---|---|
| Bridge 1 … <n> | Assign the physical ports X1… X <n> to a logical bridge.<br>To do so, click the respective option button. The assignment is marked in color.<br>A port can only be assigned to one bridge at a time. |

Click the **[Submit]** button to apply the change. The change takes effect immediately.

### “Switch Configuration” Group

This group only appears if parameter configuration is supported.

Table 81: WBM “Ethernet Configuration” Page – “Switch Configuration” Group

| Parameters | Explanation | |
|---|---|---|
| Port Mirror | Enable or disable mirroring of the data traffic between the ports. | |
| | None | Both ETHERNET ports are operating normally. |
| | X1 | The entire data traffic between X1 and the PFC system is mirrored at port X2. |
| | X2 | The entire data traffic between X2 and the PFC system is mirrored at port X1. |
| Broadcast Protection | You can set the broadcast limit for protection against overloads. | |
| | Disabled | No broadcast packet limit |
| | 1 % … 5 % | Limits incoming broadcast packets to the selected percentage of the total possible data throughput (10/100 Mbit) |
| Rate Limit | You can set the basic limitation of the incoming data traffic. | |
| | Disabled | No limitation of the incoming data traffic |
| | 64 kbps … 99 mbps | Limits the incoming data traffic to the entered value |

Click **[Submit]** to apply the change. The change takes effect immediately.

### “Ethernet Interface Configuration” Group

Table 82: WBM “Ethernet Configuration” Page – “Ethernet Interface Configuration” Group

| Parameter | Meaning |
|---|---|
| Interface X<n> | A separate area is displayed for each interface in the controller. |
| Enabled | You can enable or disable the interface. |
| MAC Learning | You can disable or enable “MAC Learning”. |
| Speed/Duplex | Select the transmission speed and the transmission method.<br>The drop-down menu is generated depending on the device and interface.<br>When “Autonegotiation” is selected, the connection modalities are negotiated automatically between the peer devices. |

Click **[Submit]** to apply changes. The changes take effect immediately.

#### 16.1.1.2.4 Configuration of Host and Domain Name" Page

The settings for the hostname and domain are displayed on the "Configuration of Host/Domain Name" page.

**"Hostname" Group**

Table 83: WBM "Configuration of Host and Domain Name" Page – "Hostname" Group

| Parameter | Explanation |
|---|---|
| Currently used | If you have selected dynamic assignment of an IP address via DHCP, the name of the host currently being used is displayed. |
| Configured | Enter the product hostname here; it is then used if the network interface is changed to a static IP address or if no hostname is assigned per DHCP response. |

Click the **[Submit]** button to apply a change.

Click the **[Clear]** button to reset the input field.

The change takes effect immediately.

If the controller has been assigned a host name via DHCP, it is given preference and the manually configured host name is not used.
To accept the manually configured host name, the configuration of the DHCP server may have to be reduced by assigning the host name.

**"Domain Name" Group**

Table 84: WBM "Configuration of Host and Domain Name" Page – "Domain Name" Group

| Parameter | Explanation |
|---|---|
| Currently used | If you have selected dynamic assignment of an IP address via DHCP, the name of the domain currently being used is displayed. |
| Configured | Enter the product domain name here; it is then used if the network interface is changed to a static IP address or if no domain name is assigned per DHCP response. |

Click the **[Submit]** button to apply a change.

Click the **[Clear]** button to reset the input field.

The change takes effect immediately.

If the controller has been assigned a domain name via DHCP, it is given preference and the manually configured domain name is not used.
To accept the manually configured domain name, the configuration of the DHCP server may have to be reduced by assigning the domain name.

### 16.1.1.2.5 “Routing” Page

On the “Routing” page you can find settings and information on the routing between the network interfaces.

#### “IP Forwarding through multiple interfaces” Group

Table 85: WBM “Routing” Page – “IP Forwarding through multiple interfaces” Group

| Parameter | Explanation |
|---|---|
| Enabled | Specify whether forwarding of IP data packets is allowed between different network interfaces.<br>If the box is not checked, the settings under “Static Routes” are used, without allowing IP data packets that arrive at the controller on one network interface to leave the controller on different network interface.<br>If the box is checked, IP packets can be forwarded between the interfaces.<br>Other settings may be necessary on this WBM page. |

Click the **[Submit]** button to apply the change. The changes take effect immediately.

### “Custom Routes” Group

Each configured static route has its own area in the display. If no static routes have been entered, “(no custom routes)” is displayed.

Table 86: WBM “Routing” Page – “Custom Routes“ Group

| Parameter | Explanation | |
|---|---|---|
| Enabled | Specify whether the selected route should be used. | |
| | Disabled | The route is not used. |
| | Enabled | The route is used. |
| Destination Address | Specify whether any network devices or only a specific network device or device pool should be accessible. | |
| | Default | Any network devices can be reached. |
| | Network address | Only a specific network device or device from the specified address pool can be reached. |
| Destination Mask | Enter the subnet mask of the device.<br>If “default” is entered for Destination Address, the value “0.0.0.0” must be entered. | |
| Gateway Address | Enter the address of the gateway.<br>If the “Interface” input field is empty, an entry is required here. If a value is entered in the “Interface” input field, the input here is optional. | |
| Gateway Metric | Set the number used as the metric.<br>When there are multiple routes with the same destination address and destination mask, the metric specifies the gateway to which network data packets are first sent. Priority is given to routes with a lower value for the metric.<br>The lowest value is 0.<br>The highest value is $2^{32} - 1 = 4294967295$. | |
| Interface | Enter an interface via which the packets sent to the destination address are routed. Bridges (br0-br3) as well as modems (wwan0) or VPN interface names can be used.<br>If the “Gateway Address” input field is empty, an entry is required here. If a value is entered in the “Gateway Address” input field, the input here is optional. | |

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

To add a new route, click the **[Add]** button. The change takes effect immediately.

Click the **[Delete]** button to delete an existing route. The change takes effect immediately.

### “Dynamic Routes” Group

All default gateways received via DHCP are displayed.
Default gateways configured via DHCP are given the metric value 10, which means that they are normally used before the statically configured default gateways.

Each dynamic route has its own area in the display. If no dynamic routes are received via DHCP, “(no dynamic route)” appears.

### “IP-Masquerading” Group

Each entry has its own area in the display.

Table 87: WBM “Routing” Page – “IP-Masquerading” Group

| Parameters | Explanation | |
|---|---|---|
| Enabled | Specify whether IP masquerading should be used. | |
| | Disabled | IP masquerading is not used. |
| | Enabled | IP masquerading is used. |
| Interface | You can select the specified name of a network interface. Alternatively, selecting “other” allows you to specify any network interface name. | |

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

Click the **[Add]** button to add a new entry. The change takes effect immediately.

Click the **[Delete]** button to delete an existing entry. The change takes effect immediately.

An entry is only transferred to the system if “Enabled” is enabled in the “General Routing Configuration” group. This allows you to configure a default setting that is not applied until the general switch-on.

### “Port-Forwarding” Group

Each entry has its own area in the display.

Table 88: WBM “Routing” Page – “Port Forwarding” Group

| Parameters | Explanation | |
|---|---|---|
| Enabled | Specify whether port forwarding should be used. | |
| | Disabled | Port forwarding is not used. |
| | Enabled | Port forwarding is used. |
| Interface | You can select the specified name of a network interface. Alternatively, selecting “other” allows you to specify any network interface name. | |
| Port | Enter the port here on which the product receives network data packets to be forwarded. | |
| Protocol | You can select the protocol to be used for the port forwarding. The options are TCP, UDP or both protocols. | |
| Destination Address | Specify the network address of the destination device. This address replaces the original destination address of the network data packet. | |
| Destination Port | Specify the port number of the destination device. This value replaces the original destination port of the network data packet. | |

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

Click the **[Add]** button to add a new entry. The change takes effect immediately.

Click the **[Delete]** button to delete an existing entry. The change takes effect immediately.

An entry is only transferred to the system if “Enabled” is enabled in the “General Routing Configuration” group. This allows you to configure a default setting that is not applied until the general switch-on.

### 16.1.1.2.6 “Clock Settings” Page

The date and time settings are displayed on the “Clock Settings” page.

#### “Timezone and Format” Group

Table 89: WBM “Clock Settings” Page – “Timezone and Format” Group

| Parameter | Explanation | |
|---|---|---|
| Timezone | Select the appropriate time zone for your location. Default setting: | |
| | AST/ADT | “Atlantic Standard Time,” Halifax |
| | EST/EDT | “Eastern Standard Time,” New York, Toronto |
| | CST/CDT | “Central Standard Time,” Chicago, Winnipeg |
| | MST/MDT | “Mountain Standard Time,” Denver, Edmonton |
| | PST/PDT | “Pacific Standard Time”, Los Angeles, Whitehouse |
| | GMT/BST | “Greenwich Mean Time”, GB, P, IRL, IS, … |
| | CET/CEST | “Central European Time,” B, DK, D, F, I, CRO, NL, … |
| | EET/EEST | “Eastern European Time,” BUL, FI, GR, TR, … |
| | CST | “China Standard Time” |
| | JST | “Japan/Korea Standard Time” |
| TZ string | For time zones that cannot be selected with the “Time Zone” parameter, enter the name of the time zone or the country or city applicable to you. You can determine a valid name for the time zone here: http://www.timeanddate.com/time/map/ | |
| Time Format | For switching between 12-hour and 24-hour time display | |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

#### “UTC Time and Date” Group

Table 90: WBM “Clock Settings” Page – “UTC Time and Date” Group

| Parameter | Explanation |
|---|---|
| UTC Date | Set the date. |
| UTC Time | Set GMT time. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

### “Local Time and Date” Group

Table 91: WBM “Clock Settings” Page – “Local Time and Date” Group

| Parameter | Explanation |
|---|---|
| Local Date | Set the date. |
| Local Time | Set the local time. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

### 16.1.1.2.7 “Configuration of Serial Interface RS232/RS485” Page

The settings for the serial interface are shown on the “Configuration of Serial Interface RS232/485” page.

**“Serial Interface assigned to” Group**

The application that the serial interface is currently assigned to is displayed.

**“Assign Owner of Serial Interface” Group**

You can specify the application that the serial interface is to assigned after the next controller reboot.

Table 92: WBM “Configuration of Serial Interface RS232” Page – “Assign Owner of Serial Interface” Group

| Parameters | Explanation |
|---|---|
| Linux® Console | Specify that the serial interface is assigned to the Linux® console. |
| Unassigned (usage by applications, libraries, CODESYS) | Specify that the serial interface is not to be assigned to any application and is available, so that the CODESYS program, for example, can access it via function blocks. |

**NOTICE**

**Remove RS-485 devices before switching to “Linux Console”!**
Connected RS-485 devices can be damaged when switching to “Linux Console”. Remove these devices before switching!

Click **[Change Owner]** to apply the change. The change only takes effect once the controller restarts. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

### 16.1.1.2.8 “Configuration of Service Interface” Page

The settings for the service interface are shown on the “Configuration of the Service Interface” page.

**“Service Interface assigned to” Group**

The application that the service interface is currently assigned to is displayed.

**“Assign Owner of Service Interface” Group**

You can specify the application to which the service interface is assigned after the next controller reboot.

Table 93: WBM “Configuration of Service Interface” Page – “Assign Owner of Service Interface” Group

| Parameters | Explanation |
|---|---|
| WAGO Service Communication | Specify that the service interface is used for the WAGO Service communication or runtime system communication. |
| Linux Console | Specify that the service interface is assigned to the Linux® console. |
| Unassigned (usage by applications, libraries, CODESYS) | Specify that the service interface is not to be assigned to any application and is available, so that the CODESYS program, for example, can access it via function blocks. |

Click **[Submit]** to apply the change. The change only takes effect once the controller restarts. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

### 16.1.1.2.9 “Create Bootable Image” Page

You can create a bootable image on the “Create Bootable Image” page.

**“Create bootable image from boot device” Group**

Once the destination has been determined and output, it is then checked and the results of this check are displayed below the settings:

Table 94: WBM “Create Bootable Image” Page – “Create bootable image from active partition” Group

| Parameters | Meaning | | |
|---|---|---|---|
| Boot Device | The medium from which the boot was made is displayed. | | |
| Destination | Depending on which medium has been booted, the following destination is available for selection after boot-up for the image to be generated: | | |
| | System was booted from | | Target partition for “bootable image” |
| | Memory Card | → | Internal Flash |
| | Internal memory | → | Memory Card |

- Free space on target device:
  If the available memory space is less than 5% a warning is displayed. You can still start the copy process despite the warning. If the available space is too low, a corresponding message is displayed and copying cannot be started.

- Device being used by CODESYS:
  If the device is being used by CODESYS, a warning is displayed. Although it is not recommended, you can still start the copying procedure despite this warning.

Click **[Start Copy]** to start the copying procedure. If the outcome of the test is positive, copying begins immediately. If errors have been detected, a corresponding message is displayed and copying is not started. If warnings have been issued, these are displayed again and you must then confirm that you still wish to continue.

### 16.1.1.2.10 “Firmware Backup” Page

You can find the controller data backup settings on the “Firmware Backup” page.

**“Firmware Backup” Group**

Table 95: WBM “Firmware Backup” Page – “Firmware Backup” Group

| Parameter | Explanation | |
|---|---|---|
| Boot Device | The storage medium from which the device was booted is displayed here. | |
| Destination | Select the storage location for the backup here. | |
| | Memory Card | The data is written to the memory card.<br>This selection only appears if a memory card is inserted and the device has not been booted from the memory card. |
| | Network | The data is saved in the file system and then made available as a download on the PC. |
| PLC runtime project | If you want to save the PLC runtime project, select this checkbox. | |
| Settings | If you want to save the device settings, select this checkbox. | |
| System | If you want to back up the operating system of the device and the root file system, select this checkbox. | |
| Encryption | If you want to save the data in encrypted form, select this button. | |
| Encryption passphrase | Enter the encryption password here.<br>This input field only appears if the “Encryption” checkbox is selected. | |
| Confirm passphrase | Enter the encryption password again here to check it.<br>This input field only appears if the “Encryption” checkbox is selected. | |

**Note**

**Note the firmware version!**
Restoring the controller operating system (“System” selection) is only permissible and possible if the firmware versions at the backup and restore times are identical.
If necessary, skip restoring the controller operating system, or match the firmware version of the controller to the firmware version of the backup time beforehand.

**Note**

**Only one package may be copied to the network!**
If you have specified “Network” as the storage location, only one package may be selected for each storing process.

**Note**

**No backup of the memory card!**
Backup from the memory card to the internal flash memory is not possible.

**Note**

**Account for backup time!**
Generation of backup files can take several minutes. Stop the CODESYS program before you start the backup procedure to help shorten the time required.

Click the **[Create Backup]** button to start the backup operation.

#### 16.1.1.2.11 “Firmware Restore” Page

The settings for restoring the controller data are shown on the “Firmware Restore” page.

**“Firmware Restore” Group**

Table 96: WBM “Firmware Restore” Page – “Firmware Restore” Group

| Parameter | Explanation | |
|---|---|---|
| Source | Select the data source for the restore here. | |
| | Memory Card | The data is read from the memory card.<br>This selection is only enabled if a memory card is inserted and the device has not been booted from the memory card. |
| | Network | The data is uploaded from the PC and restored. |
| Boot Device | The storage medium from which the device was booted is displayed here. | |
| PLC runtime project | Enter the name of the backup file for the CODESYS project here.<br>The input field only appears if the network is selected as the data source. | |
| Settings | Enter the name of the backup file for the settings here.<br>The input field only appears if the network is selected as the data source. | |
| System | Enter the name of the backup file for the system data and the root file system here.<br>The input field only appears if the network is selected as the data source. | |
| Decryption | If you have backed up the data in encrypted form, select this checkbox. | |
| Decryption passphrase | Enter the encryption password here.<br>This input field only appears if the “Decryption” checkbox is selected. | |



**Note**

**Note the firmware version!**

Restoring the controller operating system (“System” selection) is only permissible and possible if the firmware versions at the backup and restore times are identical.

If necessary, skip restoring the controller operating system, or match the firmware version of the controller to the firmware version of the backup time beforehand.

**Note**

**File size must not exceed the size of the internal drive!**
Note that the amount of data in the media/sd/copy/ directory must not exceed the total size of the internal drive.

**Note**

**Restoration only possible from internal memory!**
If the device was booted from the memory card, the firmware cannot be restored.

**Note**

**Reset by restore**
A reset is performed when the system or settings are restored by CODESYS!

**Note**

**Connection loss through restore**
If the restore changes the parameters of the ETHERNET connection, the WBM may then no longer be able to open a connection to the device. You must call the WBM again by entering the correct IP address of the device in the address line.

**Note**

**Note the restore time!**
The restore process takes approx. 2 … 3 minutes.
After the restore process, the controller is restarted and is then ready for use again.

Click the **[Restore]** button to start the restore operation.

### 16.1.1.2.12 “Active System” Page

The settings for specifying the partition from which the system is started are shown on the “Active System” page.

#### “Boot Device” Group

Table 97: WBM “Active System” Page – “Boot Device” Group

| Parameter | Explanation |
|---|---|
| Boot Device | The storage medium from which the device was booted is displayed here. |

#### “System <n> (Internal Flash)” Groups

Table 98: WBM “Active System” Page – “System <n> (Internal Flash)” Group

| Parameter | Explanation | |
|---|---|---|
| Active | This shows whether the system is active. | |
| Configured | This shows whether the system should be active after the next reboot. | |
| State | The system status is displayed here. | |
| | good | The system is valid and can be used. |
| | bad | The system is not valid and cannot be used. |

Click the respective **[Activate]** button to start the required system at the next reboot.



**Note**

**Provide a bootable system!**
A functional firmware backup must be available on the boot system!

#### 16.1.1.2.13 “Mass Storage” Page

The “Mass Storage” page displays information and settings for the storage media.

The group title contains the designation for the storage media (“Memory Card” or “Internal Flash”) and, if this storage medium is also the active partition, the text “Active Partition”.

**“Devices” Group**

An area with information on the storage medium is displayed for each storage medium found.

Table 99: WBM “Mass Storage” Page – “Devices” Group

| Parameter | Explanation |
|---|---|
| <Device> | The storage medium is displayed. |
| Boot device | This shows whether the device has booted from this storage medium. |
| Volume name | The name of the storage medium is displayed. |

**“Create new Filesystem on Memory Card” Group**

Table 100: WBM “Mass Storage” Page – “Create new Filesystem on Memory Card” Group

| Parameter | Meaning | |
|---|---|---|
| Filesystem type | You can select the format in which the filesystem should be created on the memory card. | |
| | Ext4 | The filesystem is created in Ext4 format. The files are not readable under Windows! |
| | FAT | The filesystem is created in FAT format. |
| Label | Specify the name for the storage medium when formatted. | |



**Note**

**Data is deleted!**
Any data stored in the storage medium is deleted during formatting!

To format the specified storage medium, click **[Start]**.

#### 16.1.1.2.14 “Software Uploads” Page

On “Software Upload” page, you can install software packages on the product from your PC.

Table 101: WBM “Software Uploads” Page – “Upload New Software” Group

| Parameters | Explanation |
|---|---|
| Software file | The file name of your selected software package is displayed, as long as you have not yet transferred it to the product.<br>If you have not yet selected a package, “Choose ipk file...” appears. Click the input field and select a file with a software package on your PC. |

To install the package, click **[Install]**.

The file with the software package is deleted from the device again after the installation process. If this is not possible due to a processing error, it is deleted no later than the next time the product restarts.

### 16.1.1.2.15 “Configuration of Network Services” Page

The settings for various services are shown on the “Configuration of Network Services” page.



**Note**

**Close any ports and services that you do not need!**
Unauthorized persons may gain access to your automation system through open ports.
To reduce the risk of cyber attacks and thus increase cyber security, close all ports and services not required by your application in the control components (e.g., port 6626 for WAGO-I/O-*CHECK*, port 2455 for CODESYS V2 and port 11740 for ***e!****COCKPIT*).
Only open ports and services during commissioning and/or configuration.

#### “FTP” Group

Table 102: WBM “Configuration of Network Services” Page – “FTP” Group

| Parameters | Explanation |
|---|---|
| Service active | Enable/disable the FTP service.<br>This service is disabled by default. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

#### “FTPES (explicit FTPS)” Group

Table 103: WBM “Configuration of Network Services” Page – “FTPS (explicit FTPS)” Group

| Parameters | Explanation |
|---|---|
| Service active | Enable/disable the FTPS service.<br>This service is disabled by default. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

### “HTTP” Group

Table 104: WBM “Configuration of Network Services” Page – “HTTP” Group

| Parameters | Explanation |
|---|---|
| Service active | Enable/disable the HTTP service.<br>This service is disabled by default. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.



**Note**

**Disconnection abort on disabling**

If the HTTP service is disabled, the connection to the product may be interrupted. In that case, reopen the page.

### “HTTPS” Group

Table 105: WBM “Configuration of Network Services” Page – “HTTPS” Group

| Parameters | Explanation |
|---|---|
| Service active | This displays the status (enabled/disabled) of the HTTPS service. |

### “I/O-*CHECK*” Group

Table 106: WBM “Configuration of Network Services” Page – “I/O-*CHECK*“ Group

| Parameters | Explanation |
|---|---|
| Service active | Enable/disable the WAGO-I/O-*CHECK* service. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.

#### 16.1.1.2.16 “Configuration of NTP Client” Page

The settings for the NTP service are shown on the “Configuration of NTP Client” page.

**“NTP Client Configuration” Group**

Table 107: WBM “Configuration of NTP Client” Page – “NTP Client Configuration” Group

| Parameters | Explanation |
|---|---|
| Service enabled | Enable/disabled time update. |
| Update interval (sec) | Specify the update interval of the time server. |
| Time Server <n> | Enter here the IP addresses of up to 4 time servers. Time server No. 1 is queried first. If no data is accessible via this server, time server No. 2 is queried, etc. |
| Additionally assigned (DHCP) | The NTP servers assigned if necessary by DHCP (or BootP) are displayed. If no NTP server has been assigned by DHCP (or BootP), “(No additional servers assigned)” is displayed. |

To update the time regardless of interval, click the **[Update Time]** button.

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

#### 16.1.1.2.17 “PLC Runtime Services” Page

The settings for various services of the runtime systems are displayed on the “PLC Runtime Services” page.

**“CODESYS V2” Group**

This group only appears if the controller supports the CODESYS V2 runtime system.

Table 108: WBM “PLC Runtime Services” Page – “CODESYS V2” Group

| Parameter | Explanation |
|---|---|
| CODESYS 2 State | This displays the status (enabled/disabled) of the CODESYS V2 runtime system. |
| Webserver enabled | Enable or disable the CODESYS V2 Webserver for the CODESYS web visualization. |
| Communication enabled | Enable or disable the communication between the CODESYS V2 runtime system and the CODESYS V2 programming system. |
| Communication Port Number | Enter here the port number for communication with the CODESYS V2 programming system. The default value is 2455. |
| Port authentication enabled | Define here whether port authentication is enabled. If this is enabled, the password specified under “General Configuration” must be entered when logging in via CODESYS V2 IDE. |

Click the **[Submit]** button to apply the change.
The change in authentication takes effect after the next restart.
All other changes take effect immediately.

### “*e!RUNTIME*” Group

This group only appears if the controller supports the ***e!****RUNTIME* runtime system.

Table 109: WBM “PLC Runtime Services” Page – “***e!****RUNTIME*” Group

| Parameter | Explanation |
|---|---|
| ***e!****RUNTIME* State | This displays the status of the ***e!****RUNTIME* system (enabled/disabled). |
| Webserver enabled | Enable or disable the Webserver for the ***e!RUNTIME*** web visualization. |
| Port authentication enabled | Enter here whether a login is required for connecting to the device. The user name is admin and the password specified at “General Configuration.” |

Click the **[Submit]** button to apply the change.
The change in authentication takes effect after the next restart.
All other changes take effect immediately.

### 16.1.1.2.18 “SSH Server Settings” Page

The settings for the SSH service are shown on the “SSH Server Settings” page.

#### “SSH Server” Group

Table 110: WBM “SSH Server Settings” Page – “SSH Server” Group

| Parameters | Explanation |
|---|---|
| Service active | You can enable/disable the SSH server. |
| Port Number | Enter the port number. |
| Allow root login | You can enable or inhibit root access. |
| Allow password login | Enable or disable the password query function. |

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

### 16.1.1.2.19 “DHCP Server Configuration” Page

The “DHCP Server Configuration” page displays the DHCP service settings.

#### “DHCP Server Configuration Bridge <n>” Group

Table 111: WBM “DHCP Server Configuration” Page – “DHCP Configuration Bridge <n>” Group

| Parameter | Explanation |
|---|---|
| Service active | Enable or disable the DHCP service for the interface X<n>. |
| Start IP for Range | Enter the start value of the available IP address range. |
| End IP for Range | Enter the end value of the available IP address range. |
| Lease time (min) | Specify the lease time here in seconds. 120 minutes are entered by default. |
| Static Hosts | This displays the static assignments of MAC IDs to IP addresses. If no assignment was defined, “No static hosts configured” is displayed. |
| Add Static Host | You can add static MAC addresses or host names and IP addresses. |
| MAC Address or Hostname | Enter a new static assignment, e.g., “01:02:03:04:05:06=192.168.1.20” or “hostname=192.168.1.20”.<br>You can enter 15 assignments or host names. |
| Ip Address | Enter the IP address.<br>You can enter 15 IP addresses. |

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

To accept a new assignment click the **[Add]** button. The change takes effect immediately.

Click **[Delete]** to delete an existing assignment. The change takes effect immediately.

### 16.1.1.2.20 “Configuration of DNS Server” Page

The “Configuration of DNS Server” page displays the DNS service settings.

**“DNS Server” Group**

Table 112: WBM “Configuration of DNS Server” Page – “DNS Server” Group

| Parameter | Explanation | |
|---|---|---|
| Service active | You can enable/disable the DNS server service. | |
| Mode | Select the operating mode of the DNS server. | |
| | Proxy | Requests are buffered to optimize throughput. |
| | Relay | All requests are routed directly. |
| Static Hosts | This displays the names for IP addresses. If no assignment was defined, “No static hosts configured” is displayed. | |
| Add Static Host | You can add static IP addresses and host names below. | |
| IP Address | Enter a new static assignment,<br>e.g., “192.168.1.20:hostname”.<br>You can enter 10 assignments. | |
| Hostname | Enter a host name. | |

Click the **[Submit]** button to apply the changes. The changes take effect immediately.

To accept a new assignment click the **[Add]** button. The change takes effect immediately.

Click **[Delete]** to delete an existing assignment. The change takes effect immediately.

#### 16.1.1.2.21 “Status overview” Page

On the “Status overview” page, you can find information about cloud access.

**“Service” Group**

Table 113: WBM “Status Overview” Page – “Service” Group

| Parameter | Explanation |
|---|---|
| Version | The cloud plug-in version is displayed. |

**“Connection <n>” Group**

A group is displayed for each cloud access.

Table 114: WBM “Status Overview” Page – “Connection <n>” Group

| Parameter | Explanation |
|---|---|
| Operation | The status of the cloud connectivity application is displayed. |
| Data from PLC Runtime | This shows how many data collections have been registered on the IEC application side for transfer to the cloud. |
| Cloud Connection | The status of the connection to the cloud service is shown. |
| Heartbeat | This shows the current heartbeat interval setting in seconds. |
| Telemetry Data Transmission | This indicates whether transfer of data is enabled or disabled. |
| Cache fill level (QoS 1 and 2) | This shows the fill level of the memory cache for outgoing messages as a percentage. |

### 16.1.1.2.22 “Configuration of Connection <n>” Page

You can find settings and information for cloud access on the “Configuration of Connection <n>” page.

A page is displayed for each cloud access.

**“Configuration” Group**

The parameters indicated depend on the cloud platform setting and, if applicable, on other settings in this group.
The dependencies are shown in a separate table.

Table 115: WBM “Configuration of Connection <n>” Page – “Configuration” Group

| Parameter | Explanation |
|---|---|
| Enabled | You can enable/disable the cloud connectivity function. |
| Cloud platform | Select the cloud platform. |
| Hostname | Enter the host name or IP address for the selected cloud platform. |
| Port number | Enter the port here to which a connection is to be established.<br>Typical values are 8883 for encrypted connections and 1883 for unencrypted connections. |
| Device ID | Enter the device ID for the selected cloud platform. |
| Client ID | Enter the client ID for the selected cloud platform. |
| Authentication | Select the authentication method.<br>Possible settings are “Shared Key Access” or “X.509 Certificate”. |
| Activation Key | Enter the activation key for the selected cloud platform. |
| Clean Session | Specify whether clean session should be enabled during the connection to the cloud service. If clean session is enabled, the information and messages on this connection are not stored persistently on the cloud service. |
| TLS | You can specify whether TLS encryption should be used for the connection to the cloud platform.<br>Amazon Web Services (AWS) always uses TLS. |
| CA file | Enter the path here to the file encoded in PEM format that contains the trusted CA certificate to use to establish an encrypted connection. The default value is the CA certificate /etc/ssl/certs/ca-certificates.crt that is already installed on the controller. |
| Users | Enter the user name for cloud service authentication. |
| Password | Enter the password for cloud service authentication. |

Table 115: WBM “Configuration of Connection <n>” Page – “Configuration” Group

| Parameter | Explanation |
|---|---|
| Certification file | Enter the path here to the file encoded in PEM format that is used for cloud service authentication. |
| Key file | Enter the path to the file encoded in PEM format that contains the private key for cloud service authentication. |
| Use websockets | Here, you can specify whether the connection to the cloud platform is to be set up using the Websocket protocol via Port 443.<br>If this checkbox is not selected, the connection to the cloud platform is set up using the MQTT protocol via Port 8883. |
| Proxy Type | Select which type of proxy should be used. |
| HTTP Proxy Host | Enter the host name or IP address of the proxy. |
| HTTP Proxy Port | Enter the port number of the proxy. |
| HTTP Proxy User | Enter the name of the proxy user. |
| HTTP Proxy Password | Enter the password for the proxy user. |
| Use compression | Here, you can set whether the data is to be compressed using GZIP compression. |
| Data Protocol | Here you can select the data protocol. |
| Cache mode | Specify in which memory the cache for the data telegrams should be created.<br>This selection field is only enabled if a correctly formatted SD card is inserted (more information is available in Application Note A500920). |
| Last Will | You can specify whether a last will message should be enabled/disabled. |
| (Last Will) Topic | You can specify the topic under which the last will messages should be sent. |
| (Last Will) Message | You can enter the message you wish to use as the last will message. |
| (Last Will) QoS | You can specify the “Quality of Service” (QoS) of the last will message. |
| (Last Will) Retain | Here, you can set whether the previous last-will message sent under a topic from the broker is to be handled as a retained message. |
| Device info | Specify whether a device info message should be generated that informs the cloud service of the basic configuration of the controller (more information is available in the Application Note A500920). |
| Device status | Specify whether device state messages should be generated that inform the cloud service about changes in the mode selector switch and the LEDs (more information is available in the Application Note A500920). |

Table 115: WBM “Configuration of Connection <n>” Page – “Configuration” Group

| Parameter | Explanation |
|---|---|
| Standard commands | Specify whether the integrated standard commands should be supported (list of standard commands is available in the Application Note A500920).<br>If the checkbox is disabled, only the commands defined in the IEC program are supported. |
| Application property template | You have the option of creating your own property for the individual MQTT messages to the Azure cloud.<br>This parameter is optional; i.e., if the field is left blank, this property is not sent.<br>The following placeholders are available to create this property:<br>• <m>: Message type<br>• <p>: Protocol version<br>• <d>: Device ID<br>Examples:<br>• MyKey=HelloWorld_<m><br>• TestKey=<m>/<p>/<d><br>• DeviceId=<d> |

Click the **[Submit]** button to apply a change.

The changes only take effect after the controller restarts. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

The following tables show the dependencies of the selection and input fields as well as the possible settings.

Table 116: Display of the Selection and Input Fields Depending on the Selected Cloud Platform

| Selection or Input Field | Cloud Platform | | | | | |
|---|---|---|---|---|---|---|
| | WAGO Cloud | Azure | MQTT AnyCloud | IBM Cloud | Amazon Web Services | SAP IoT Services |
| Enabled | X | X | X | X | X | X |
| Cloud platform | X | X | X | X | X | X |
| Hostname | X | X | X | X | X | X |
| Port number | | | X | X | (X) | X |
| Device ID | X | X | | | | |
| Client ID | | | X | X | X | X |
| Authentication | | X | | | | |
| Activation Key | X | X2 | | | | |
| Clean Session | | | X | (X) | (X) | X |
| TLS | | | X | X | (X) | X |
| CA file | | | X | X | X | X |

Table 116: Display of the Selection and Input Fields Depending on the Selected Cloud Platform

| Selection or Input Field | Cloud Platform | | | | | |
|---|---|---|---|---|---|---|
| | WAGO Cloud | Azure | MQTT AnyCloud | IBM Cloud | Amazon Web Services | SAP IoT Services |
| User | | | X | X | | |
| Password | | | X | X | | |
| Certification file | | X2 | X | | X | X |
| Key file | | X2 | X | | X | X |
| Use websockets | X | X1 | | | | |
| Proxy Type | X4 | X4 | | | | |
| HTTP Proxy Host | X5 | X5 | | | | |
| HTTP Proxy Port | X5 | X5 | | | | |
| HTTP Proxy User | X5 | X5 | | | | |
| HTTP Proxy Password | X5 | X5 | | | | |
| Data Protocol | | X | X | X | X | (X) |
| Use compression | X | X1 | X1 | | | |
| Cache mode | X | X | X | X | X | X |
| Last Will | | | X | X | X | X |
| Last Will Topic | | | X3 | X3 | X3 | X3 |
| Last Will Message | | | X3 | X3 | X3 | X3 |
| Last Will QoS | | | X3 | X3 | X3 | X3 |
| Last Will Retain | | | X3 | X3 | (X3) | X3 |
| Device info | | X1 | X1 | X1 | X1 | |
| Device status | | X1 | X1 | X1 | X1 | |
| Standard commands | | X1 | X1 | | X1 | |
| Application property template | | X1 | | | | |

X: Visible and enabled
(X): Visible, but disabled
X1: Visible and enabled, depending on the selected data protocol
X2: Visible and enabled, depending on the selected authentication
X3: Visible and enabled when “Last Will” is switched on
(X3): Visible, but disabled when “Last Will” is switched on
X4: Enabled if “Use websockets” is switched on.
X5: Visible and enabled if “Use websockets” is switched on and if “HTTP” is set as the “Proxy Type”.

Table 117: Choice of Data Protocol Depending on the Selected Cloud Platform

| Data Protocol | Cloud Platform | | | | | |
|---|---|---|---|---|---|---|
| | WAGO Cloud | Azure | MQTT AnyCloud | IBM Cloud | Amazon Web Services | SAP IoT Services |
| WAGO Protocol | | X | X | X | X | |
| WAGO Protocol 1.5 | | X | X | X | X | |
| Native MQTT | | | X | X | X | (X) |
| Sparkplug payload B | | X | X | | X | |

X: Selection possible
(X): Fixed setting

Table 118: Display of the Selection and Input Fields Depending on the Selected Data Protocol

| Selection or Input Field | Data Protocol | | | |
|---|---|---|---|---|
| | WAGO Protocol | WAGO Protocol 1.5 | Native MQTT | Sparkplug payload B |
| Client ID | X | X | X | X |
| Use compression | X | X | X | |
| Device info | X | X | | |
| Device status | X | X | | |
| Standard commands | X | X | | |
| Application property template | X | X | | |

X: Visible and enabled

Table 119: Choice of Cache Mode Depending on the Selected Data Protocol

| Cache Mode | Data Protocol | | | |
|---|---|---|---|---|
| | WAGO Protocol | WAGO Protocol 1.5 | Native MQTT | Sparkplug payload B |
| RAM | X | X | X | (X) |
| SD-Card | X1 | X1 | X1 | |

X: Selection possible
X1: Selection only possible if “Compression” is not switched on
(X): Fixed setting

Table 120: Display of the Selection and Input Fields Depending on the Selected Authentication

| **Selection or Input Field** | Authentication | |
|---|---|---|
| | **Shared Access Key** | **X.509 Certificate** |
| Activation Key | X | |
| Certification file | | X |
| Key file | | X |

X: Visible and enabled

#### 16.1.1.2.23 “Configuration of General SNMP Parameters” Page

The general settings for SNMP are given on the “Configuration of General SNMP Parameters” page.

**“General SNMP Configuration” Group**

Table 121: WBM “Configuration of General SNMP Parameters” Page – “General SNMP Configuration” Group

| Parameter | Explanation |
|---|---|
| Service active | Activate/deactivate the SNMP service. |
| Name of device | Enter here the device name (sysName). |
| Description | Enter here the device description (sysDescription). |
| Physical location | Enter here the location of the device (sysLocation). |
| Contact | Enter here the email contact address (sysContact). |
| Object ID | Enter here the object ID (sysOID). |

Click the **[Submit]** button to apply the changes. The changes only take effect after restarting the controller. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

#### 16.1.1.2.24 “Configuration of SNMP v1/v2c Parameters” Page

The general settings for SNMP v1/v2c are shown on the “Configuration of SNMP v1/v2c Parameters” page.

**“SNMP v1/v2c Manager Configuration” Group**

Table 122: WBM “Configuration of SNMP v1/v2c Parameters” Page – “SNMP v1/v2c Manager Configuration” Group

| Parameters | Explanation |
|---|---|
| Protocol enabled | It is displayed the SNMP protocol for v1/v2c is enabled. The local community name is deleted when the protocol is disabled. |
| Local Community Name | Specify the community name for the SNMP manager configuration. The community name can establish relationships between SNMP managers and agents who are respectively referred to as “Community” and who control identification and access between SNMP participants.<br>The community name can be up to 32 characters long and must not include spaces.<br>To use the SNMP protocol, a valid community name must always be specified. The default community name is “public.” |

Click the **[Submit]** button to apply the changes. The changes only take effect after the controller restarts. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

### “Actually configured Trap Receivers” Group

Table 123: WBM “Configuration of SNMP v1/v2c Parameters” Page – “Actually Configured Trap Receivers” Group

| Parameters | Meaning |
|---|---|
| Each configured trap receiver has its own area in the display. If no trap receiver has been configured, “(no trap receivers configured)” is displayed. | |
| IP Address | The IP address for the trap receiver (management station) is displayed. |
| Community Name | This displays the community name for the trap receiver configuration. The community name can be evaluated by the trap receiver. |
| Version | This displays the SNMP version, via which the traps are sent: v1 or v2c (traps higher than v3 are displayed in a separate form). |
| Add new Trap Receiver | In this area, you can enter a new trap receiver. |
| IP Address | Specify the IP address for the new trap receiver (management station). |
| Community Name | Specify the community name for the new trap receiver configuration. The community name can be evaluated by the trap receiver.<br>The community name can be up to 32 characters long and must not include spaces. |
| Version | Specify the SNMP version that will send the traps: v1 or v2c (traps higher than v3 are configured in a separate form). |

Click the corresponding **[Delete]** button to delete an existing trap receiver.

Click the **[Add]** button to add a new trap receiver.

The changes only take effect after the controller restarts. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

### 16.1.1.2.25 “Configuration of SNMP v3 Users” Page

The general settings for SNMP v3 are shown on the “Configuration of SNMP v3 Users” page.

#### “Actually configured v3 Users” Group

Table 124: WBM “Configuration of SNMP v3” Page – “Actually configured v3 Users” Group

| Parameters | Meaning |
|---|---|
| User <n> | Each configured v3 user has its own area in the display. If no v3 user has been configured, “(no trap receivers configured)” is displayed. |
| Security Authentication Name | The user name is displayed. |
| Authentication Type | The authentication type for the SNMP v3 packets is displayed.<br><br>Possible values:<br>- Use no authentication (“None”)<br>- Message Digest 5 (“MD5”)<br>- Secure Hash Algorithm (“SHA”) |
| Authentication Key | The authentication key is displayed. |
| Privacy | The encryption algorithm for the SNMP message is displayed.<br><br>Possible values:<br>- No encryption (“None”)<br>- Data Encryption Standard (“DES”)<br>- Advanced Encryption Standard (“AES”) |
| Privacy Key | The key for encryption of the SNMP message is displayed. If nothing is displayed, the “authentication key” is automatically used. |
| Notification Receiver IP | The IP address of a trap receiver for v3 traps is displayed. If no v3 traps are to be sent for this user, this field remains blank. |
| Add new v3 User | In this area, you can enter a new v3 user. You can create up to 10 users. |
| Security Authentication Name | Enter the user name. This name must be unique; a pre-existing user name is not accepted when entered. The name must be min. 8 and max. 32 characters long and contain lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), special characters !()*~'.-_ but no spaces. |

Table 124: WBM “Configuration of SNMP v3” Page – “Actually configured v3 Users” Group

| Parameters | Meaning |
|---|---|
| Authentication Type | Specify the authentication type for the SNMP v3 packets.<br><br>Possible values:<br>- Use no authentication (“None”)<br>- Message Digest 5 (“MD5”)<br>- Secure Hash Algorithm (“SHA”) |
| Authentication Key (min. 8 char.) | Specify the authentication key. The key must be min. 8 and max. 32 characters long and contain lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), special characters !()*~'.-_ but no spaces. |
| Privacy | Specify the encryption algorithm for the SNMP message.<br><br>Possible values:<br>- No encryption (“None”)<br>- Data Encryption Standard (“DES”)<br>- Advanced Encryption Standard (“AES”) |
| Privacy Key (min. 8 char.) | Enter the key for encryption of the SNMP message. If nothing is specified here, the “authentication key” is automatically used. The key must be min. 8 and max. 32 characters long and contain lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), special characters !()*~'.-_ but no spaces. |
| Notification Receiver IP | Specify an IP address for a trap receiver for v3 traps. If no v3 traps are to be sent for this user, this field remains blank. |

Click the respective **[Delete]** button to delete an existing user.

Click **[Add]** to add a new user.

The changes only take effect after the controller restarts. For this purpose, use the WBM reboot function. Do not shut down the controller too early!

### 16.1.1.2.26 “WBM User Configuration” Page

The settings for user administration are displayed on the “WBM User Configuration” page.

**“Change Password” Group**



**Note**

**Changing Passwords**
The initial passwords as delivered are documented in this manual and therefore do not provide sufficient protection. Change the passwords to meet your particular needs!

Table 125: WBM “WBM User Configuration” Page – “Change Password” Group

| Parameter | Explanation |
|---|---|
| Old Password | Enter the current password here for authentication. |
| New Password | Enter the new password here.<br>Permitted characters for the password are the following ASCII characters: a … z, A … Z, 0 … 9, blank spaces and special characters:<br>! ? % + = ( ) _ # " - / ` < > * ; , : . |
| Confirm Password | Enter the new password again here for confirmation. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.



**Note**

**Note the permitted characters for WBM passwords!**
If passwords with invalid characters are set for the WBM outside the WBM (e.g., from a USB keyboard), access to the pages directly on the display is no longer possible because only permitted characters are available from the virtual keyboard.



**Note**

**General Rights of WBM Users**
The WBM users “admin” and “user” have rights beyond the WBM to configure the system and install software.

User administration for controller applications is configured and managed separately.

### 16.1.1.3 “Fieldbus” Tab

#### 16.1.1.3.1 “OPC UA Status” Page

You can find the status information on the OPC UA service on the “OPC UA Status” page.

**“OPC UA Server” Group**

Table 126: WBM “OPC UA Status” Page – “OPC UA Server” Group

| Parameter | Explanation |
|---|---|
| State | The current status (enabled / disabled) of the WAGO OPC UA server is displayed. |
| Version | The installed version of the WAGO OPC UA Server is displayed here. |
| License | Any existing OPC UA server license is displayed. Some features of the WAGO OPC UA server require a paid special license. |

#### 16.1.1.3.2 “OPC UA Configuration” Page

The settings for the OPC UA service are shown on the “OPC UA Configuration” page.

**“General OPC UA Server Configuration” Group**

Table 127: WBM “OPC UA Configuration” Page – “General OPC UA Server Configuration” Group

| Parameter | Explanation | |
|---|---|---|
| Service enabled | Enable or disable the WAGO OPC UA Server here. | |
| Ctrl Configuration name | Enter the configuration names the controller contains in the PLC Open Device Set. | |
| Log level | Select the log level. The following values can be set: Info / Debug / Warning / Error.<br>With log level “Error,” only error messages are read out; with log level “Info,” status messages are read out too. The specific log level selection affects server reaction time. Therefore, select the lowest level necessary; e.g., “Debug” for in-depth analyses. | |
| Unlimited anonymous access | Access rights to the data provided by the server are set here. | |
| | Enabled | An unregistered user can view, read and write all variables. |
| | Disabled | Complete access to the data requires user logon with the appropriate rights. |

Click the **[Submit]** button to apply the changes.

**Group “OPC UA Endpoint URL”**

Table 128: WBM page “OPC UA Configuration” – group “OPC UA Endpoint URL”

| Parameter | Meaning |
|---|---|
| Interface | Select the endpoint URL of the OPC UA server. The hostname or a bridge or IP address is possible. |

### “OPC UA Endpoints” Group

Table 129: WBM “OPC UA Configuration” Page – “OPC UA Endpoints” Group

| Parameter | Meaning |
|---|---|
| Security Policy - None | Enable or disable the OPC UA endpoint “None”. This allows an unsecured connection to the OPC UA server to be established. |
| Security Policy - Basic128Rsa15 | Enable or disable the “Basic128Rsa15” security policy.<br>**Note:**<br>This policy is no longer classified as secure. |
| Security Policy - Basic256Sha256 | The “Basic256Sha256” security policy allows a secure connection to be established with the OPC UA server. |

Click the **[Submit]** button to apply the changes.

### “OPC UA Security Settings” Group

Table 130: WBM Page “OPC UA Configuration” – “OPC UA Security Settings” Group

| Parameter | Explanation | |
|---|---|---|
| Trust all clients | The verification is enabled or disabled here. | |
| | Enabled | A connection to all clients is permitted. → No security! |
| | Disabled | Connection is only allowed to clients with secure certificates. |
| URI Check Application | The URI check can be enable or disable here.<br>A disabled URI check enables connection to an OPC server even if the URI on the server URI is different from the URI in the certificates. | |
| Error Certificate Time | The time can be enabled or disabled here.<br>Certificates may have an expiration date. This date is checked against the current usage time on the device. The check cannot be run successfully if the time is incorrectly set on the device. | |
| Certificate Issuer Time Invalid | The time stamp check can be enabled or disabled here.<br>CA certificates contain a validity time stamp from the manufacturer. This stamp is used when checking the time on the server hardware. If the time setting on the server hardware is incorrect or is missing entirely, the certificate may be indicated as invalid. | |
| Certificate Revocation Unknown | The accessibility check of the saving location for withdrawn certificates can be enabled or disabled here.<br>Each certificate can have a location for withdrawn certificates. If network problems or other causes prevent access to the specified location, the certificate is not accepted. | |
| Certificate Issuer Revocation Unknown | The accessibility check of the storage location for withdrawn certificates can be enabled or disabled here.<br>Each certificate of a certification location (CA certificate) can contain an entry for the withdrawn certificate saving location. If the location cannot be reached, the server will refuse the certificate. | |

Click the **[Submit]** button to apply the changes.

#### 16.1.1.3.3 “OPC UA Server Certificates” Page

The “OPC UA Server Certificates” provides options to install or delete OPC UA server certificates and keys.

**“OPC UA Server Own Certificate” Group**

Table 131: WBM Page “OPC UA Server Certificates” – “OPC UA Server Own Certificate” Group

| Parameter | Meaning |
|---|---|
| <certificate name><br>e.g., “certificate.der” | The certificate currently used by the server is displayed. If no certificate is being used, “No certificates existing” is displayed. |

To delete the certificate, click the **[Delete]** button. The change applies immediately.

To select a certificate file on the PC, click the **Choose file …** selection field.

To transfer the selected certificate file to the product, click the **[Upload]** button. The change applies immediately.

**“OPC UA Server Private Keys” Group**

Table 132: WBM Page “OPC UA Server Certificates” – “OPC UA Server Private Keys” Group

| Parameter | Meaning |
|---|---|
| <private key name><br>e.g., “key.pem” | The key currently used is displayed. If not key has been loaded, “No private keys existing” is displayed. |

To delete the key, click the **[Delete]** button. The change applies immediately.

To select a key file on the PC, click the **Choose file …** selection field.

To transfer the selected key file to the product, click the **[Upload]** button. The change applies immediately.

### “OPC UA Server Trusted / Rejected Certificates” Group

Table 133: WBM Page “OPC UA Server Certificates” – “OPC UA Server Trusted / Rejected Certificates” Group

| Parameter | Meaning |
|---|---|
| Trusted | The certificates of clients marked as trustworthy are listed in this area. If not certificate exists, “No certificates existing” is displayed. |
| Rejected | This area lists the certificates of OPC UA devices that have not yet been classified as trustworthy or that have been marked as “Rejected”. If not certificate exists, “No certificates existing” is displayed. |

To move a certificate from the “Trusted” area to the “Rejected” area, click the **[Reject]** button. The change applies immediately.

To delete a certificate, click the **[Delete]** button. The change applies immediately.

To select a certificate file on the PC, click the **Choose file …** selection field.

To transfer the selected certificate file to the product, click the **[Upload]** button. The change applies immediately. The loaded certificate is first listed in the “Rejected” area.

### 16.1.1.3.4 “MODBUS Services Configuration” Page

The “Modbus Services Configuration” page displays the settings for various Modbus® services. The groups only appear if the ***e!****RUNTIME* system is enabled. Otherwise an information text is displayed.

#### “Modbus TCP Slave” Group

Table 134: WBM “Modbus Services Configuration” Page – “Modbus TCP” Group

| Parameters | Explanation |
|---|---|
| Service active | Disable or enable the Modbus/TCP service. |

Click the **[Submit]** button to apply the changes. The change takes effect immediately.

#### “Modbus UDP Slave” Group

Table 135: WBM “Modbus Services Configuration” Page – “Modbus UDP” Group

| Parameters | Explanation |
|---|---|
| Service active | Disable/enable the Modbus UDP service. |

Click the **[Submit]** button to apply the changes. The change takes effect immediately.

### 16.1.1.4 “Security” Tab

#### 16.1.1.4.1 “OpenVPN / IPsec Configuration” Page

The “OpenVPN / IPsec Configuration” page displays the settings for OpenVPN and IPsec.

**“OpenVPN” Group**

Table 136: WBM “OpenVPN / IPsec Configuration” Page – “OpenVPN” Group

| Parameter | Explanation | |
|---|---|---|
| Current State | The current status of the OpenVPN service is displayed. | |
| | stopped | The service is disabled. |
| | running | The service is enabled. |
| OpenVPN enabled | Enable or disable the OpenVPN service. | |
| openvpn.config | Select an OpenVPN configuration file to be transferred from PC to product or vice versa. | |

Click the **[Submit]** button to apply a change.

To select a file on the PC, click the **Choose file …** selection field.

To transfer the selected file from the PC to the product, click **[Upload]** button.

To transfer a file from product to PC, click the **[Download]** button.

The changes only take effect after the product restarts. For this purpose, use the WBM reboot function. Do not switch off the product too early!

### “IPsec” Group

Table 137: WBM “OpenVPN / IPsec Configuration” Page – “IPsec” Group

| Parameter | Explanation | |
|---|---|---|
| Current State | The current status of the IPsec service is displayed. | |
| | stopped | The service is disabled. |
| | running | The service is enabled. |
| IPsec enabled | Enable or disable the IPsec service. | |
| ipsec.conf | Select an IPsec configuration file to be transferred from PC to product or vice versa. | |
| ipsec.secrets | Select an IPsec configuration file to be transferred from PC to product or vice versa. | |

Click the **[Submit]** button to apply a change.

To select a file on the PC, click the **Choose file …** selection field.

To transfer the selected file from the PC to the product, click **[Upload]** button.

To transfer a file from product to PC, click the **[Download]** button.

The changes only take effect after the product restarts. For this purpose, use the WBM reboot function. Do not switch off the product too early!

### 16.1.1.4.2 “General Firewall Configuration” Page

The “General Firewall Configuration” page displays the global firewall settings.

#### “Global Firewall Parameter” Group

Table 138: WBM “General Firewall Configuration” Page – “Global Firewall Parameter” Group

| Parameter | Explanation |
|---|---|
| Firewall enabled entirely | Enables/disables the complete functionality of the firewall. This setting has the highest priority. If the firewall is disabled, all other settings have no direct effect. The configuration of the other parameters is possible nevertheless so that you can set the firewall parameters correctly before you enable the firewall.<br>This setting is independent of the “Filter enabled” setting in the “MAC address filter state bridge <n>” group on the “MAC address filter state bridge <n>” page. |
| ICMP echo broadcast protection | Enable or disable the “ICMP echo broadcast” protection. |
| Max. UDP connections per second | You can specify the maximum number of UDP connections per second. |
| Max. TCP connections per second | You can specify the maximum number of TCP connections per second. |

Click **[Submit]** to apply the change. The change takes effect immediately.

### 16.1.1.4.3 “Interface Configuration” Page

The individual interfaces for the firewall settings are displayed on the “Interface Configuration” page.

**“Firewall Configuration Bridge <n> / VPN / WAN” Group**

A separate group is displayed for each configured bridge.
The settings in this group are based on the firewall configuration on the IP level.

Table 139: WBM “Interface Configuration” Page – “Firewall Configuration Bridge <n> / VPN / WAN” Group

| Parameter | Explanation | |
|---|---|---|
| Firewall enabled for Interface | Enable or disable the firewall for the respective bridge. | |
| ICMP echo protection | Enable or disable the “ICMP echo” protection for the respective bridge. | |
| ICMP echo limit per second | You can specify the maximum number of “ICMP pings” per second.<br>“0” = “Disabled” | |
| ICMP burst limit<br>(0 = disabled) | You can specify the maximum number of “ICMP echo bursts” per second.<br>“0” = “Disabled” | |
| Service enabled | FTP/FTPES | Enable or disable the firewall for the respective service. The services themselves must be enabled or disabled separately on the “Ports and Services” page. |
| | FTPS (implicit) | |
| | HTTP | |
| | HTTPS | |
| | I/O-CHECK | |
| | PLC Runtime | |
| | PLC WebVisu – direct link (port 8080) | |
| | SSH | |
| | BootP/DHCP | |
| | DNS | |
| | Modbus TCP | |
| | Modbus UDP | |
| | SNMP | |
| | OPC UA | |
| | BACnet (Port 47808) | |
| | PROFINET IO | |
| | DNP3 (port 20000) | |
| | IEC60870-5-104 (port 2404) | |
| | IEC61850 (port 102) | |

Click the **[Submit]** button to apply the change. The change takes effect immediately.

### 16.1.1.4.4 “Configuration of MAC Address Filter” Page

The “Configuration of MAC address filter” page displays the firewall configuration on the ETHERNET level.

The “MAC Address Filter Whitelist” contains a default entry with the following values:

MAC address: 00:30:DE:00:00:00
MAC mask: ff:ff:ff:00:00:00

If you enable the default entry, this already allows communication between different WAGO devices in the network.



**Note**

**Enable the MAC address filter before activation!**
Before activating the MAC address filter, you must enter and activate your own MAC address in the “MAC Address Filter Whitelist.”
Otherwise you cannot access the device via the ETHERNET. This also applies to other services that are used by your device, e.g., the IP configuration via DHCP.
If the “MAC Address Filter Whitelist” does not contain the MAC address of your DHCP server, your device will lose its IP settings after the next refresh cycle and is then no longer accessible.
If the “MAC Address Filter Whitelist” does not contain an entry, the activation of the filter is prevented.
If at least one enabled address is entered, you will receive an appropriate warning before activation, which you have to acknowledge.
The check described above is only performed in the WBM but not in the CBM!

#### “Global MAC address filter state” Group

Table 140: WBM “Configuration of MAC Address Filter” Page – “Global MAC address filter state” Group

| Parameters | Explanation |
|---|---|
| Filter enabled | Enable or disable the global MAC address filter. |

Click the **[Submit]** button to apply the change. The change takes effect immediately.

### “MAC address filter state Bridge <n>” Group

A separate group is displayed for each configured bridge.

Table 141: WBM “Configuration of MAC Address Filter” Page – “MAC address filter state Bridge <n>” Group

| Parameter | Explanation |
|---|---|
| Filter enabled | Enable or disable here the MAC address filter for the specific bridge.<br>This setting is independent of the “Firewall enabled entirely” setting on the General Firewall Configuration page. |

Click the **[Submit]** button to apply the change. The change takes effect immediately.

### “MAC address filter whitelist” Group

Each list entry has its own area in the display.

Table 142: WBM “Configuration of MAC Address Filter” Page – “MAC address filter whitelist” Group

| Parameters | Explanation |
|---|---|
| MAC address | Displays the MAC address of the relevant list entry. |
| MAC mask | This displays the MAC mask of the relevant list entry. |
| Filter enabled | Enable or disable the filter for the relevant list entry. |
| Add filter to whitelist | Create a new list entry. |
| MAC address | Enter here the MAC address for a new list entry.<br>You can enter 10 filters. |
| MAC mask | Enter the MAC mask for the new list entry. |
| Filter enabled | Enable or disable the filter for the new list entry. |

Click the **[Submit]** button to apply the change. The change takes effect immediately.

Click the appropriate **[Delete]** button to remove an existing list entry. The change takes effect immediately.

Click **[Add]** to accept a new list entry. You can enter 10 filters. The change takes effect immediately.

### 16.1.1.4.5 “Configuration of User Filter” Page

The “Configuration of User Filter” page displays the settings for custom firewall filters.

**“User filter” Group**

Each configured filter has its own area in the display.

Table 143: WBM “Configuration of User Filter” Page – “User Filter” Group

| Parameters | Meaning | |
|---|---|---|
| Policy | This displays whether the network participant is permitted or excluded by the filter. | |
| Source IP address | The source IP address for the respective filter is displayed. | |
| Source Netmask | This displays the source netmask for the respective filter. | |
| Source Port | The source port number for the respective filter is displayed. | |
| Destination IP address | The destination IP address for the respective filter is displayed. | |
| Destination Netmask | The destination netmask for the respective filter is displayed. | |
| Destination Port | The destination port number for the respective filter is displayed. | |
| Protocol | The permitted protocols for the respective filter is displayed. | |
| Input interface | The permitted interfaces for the respective filter are displayed. | |
| Add new user filter | You can create up to 10 filters.<br>You only have to enter values in the fields that are to be set for the filter. At least one value must be entered, all other fields can remain empty. | |
| Policy | Select here whether the network devices is to be allowed or excluded by the filter. | |
| | Allow | The network device is permitted. |
| | Drop | The network device is excluded. |
| Source IP address | Enter here the source IP address for the new filter. | |
| Source netmask | Enter here the source network mask for the new filter. | |
| Source port | Enter here the source port address for the new filter. | |
| Destination IP address | Enter here the destination IP address for the new filter. | |
| Destination subnet mask | Enter here the destination network mask for the new filter. | |
| Destination port | Enter here the destination port address for the new filter. | |

Table 143: WBM “Configuration of User Filter” Page – “User Filter” Group

| Parameters | Meaning | |
|---|---|---|
| Protocol | Enter here the protocols for the new filter. | |
| | TCP/ UDP | The TCP service and UDP service are filtered. |
| | TCP | The TCP service is filtered. |
| | UDP | The UDP service is filtered. |
| Input interface | Enter here the interfaces for the new filter. | |
| | Any | All interfaces are filtered. |
| | Bridge <n> | The interfaces assigned for bridge <n> are filtered. Only the configured bridges are displayed. |
| | VPN | The VPN interface is filtered. |

Click **[Add]** to apply the new filter. The change takes effect immediately.

Click the **[Delete]** button to delete an existing filter. The change takes effect immediately.

### 16.1.1.4.6 “Certificates” Page

On the “Certificates” page, you will find options to install or delete certificates and keys.

#### “Installed Certificates” Group

Table 144: WBM “Configuration of OpenVPN and IPsec” Page – “Certificate List” Group

| Parameters | Explanation |
|---|---|
| <certificate name> | The loaded certificates are displayed. If no certificate has been loaded. “No certificates existing” is displayed. |

To select a file on the PC, click the **Choose file …** selection field.

To transfer the selected file PC to the product, click the **[Upload]** button. The changes take effect immediately.

The certificates are stored in the directory “/etc/certificates/” and the keys in the directory “/etc/certificates/keys/”.

Click **[Delete]** to delete an entry. The changes take effect immediately.

#### “Installed Private Keys” Group

Table 145: WBM “Configuration of OpenVPN and IPsec” Page – “Private Key List” Group

| Parameters | Meaning |
|---|---|
| <private key name> | The loaded keys are displayed. If no key has been loaded, “No private keys existing” is displayed. |

To select a file on the PC, click the **Choose file …** selection field.

To transfer the selected file PC to the product, click the **[Upload]** button. The changes take effect immediately.

The certificates are stored in the directory “/etc/certificates/” and the keys in the directory “/etc/certificates/keys/”.

Click **[Delete]** to delete an entry. The changes take effect immediately.

### 16.1.1.4.7 “Security Settings” Page

The network security settings are found on the “Security Settings” page.

#### “TLS Configuration” Group

Table 146: “Security Settings” WBM Page – “TLS Configuration” Group

| Parameters | Explanation | |
|---|---|---|
| TLS Configuration | You can set what TLS versions and cryptographic methods are allowed for HTTPS. | |
| | Standard | The Webserver allows TLS 1.0, TLS 1.1 and TLS 1.2, as well as cryptographic methods that are no longer considered secure. |
| | Strong | The Webserver only allows TLS Version 1.2 and strong algorithms. Older software and older operating systems may not support TLS 1.2. |

Click the **[Submit]** button to apply a change. The change takes effect immediately.



**Note**

**BSI TR-02102 Technical Guidelines**
The rules for the “Strong” setting are based on the TR-02102 technical guidelines of the German Federal Office for Information Security (BSI).
You can find the guidelines on the Internet at: https://www.bsi.bund.de > “Publications” > “Technical Guidelines.”

### 16.1.1.4.8 “Advanced Intrusion Detection Environment (AIDE)” Page

The network security settings are available on the “Advanced Intrusion Detection Environment (AIDE)” page.

#### “Run AIDE check at startup” Group

Table 147: WBM “Advanced Intrusion Detection Environment (AIDE)” Page – “Run AIDE check at startup” Group

| Parameter | Explanation |
|---|---|
| Service active | Here, you can activate/deactivate the “AIDE check” when the controller is started. |

Click the **[Submit]** button to apply the changes. The changes only take effect when the controller restarts.

#### “Refresh Options” group

Table 148: WBM “Advanced Intrusion Detection Environment (AIDE)” Page – “Control AIDE and show log” Group

| Parameter | Explanation | |
|---|---|---|
| Select Action | Select here the action to be executed. | |
| | readlog | The log data are displayed. |
| | init | The database is initialized and filled with the current values. |
| | check | The current values are compared against the values stored in the database. |
| | update | The current values are compared with the values stored in the database and the database then updated. |
| Read only the last n | Activate display of only the last n messages. You also specify the number of messages to be displayed. | |
| Automatic refresh interval (sec) | Select the checkbox to enable cyclic refresh. Enter the cycle time in seconds in which a cyclic refresh is performed. The label of the button (“Refresh”/“Start“/“Stop”) changes depending on status. | |

Click **[Refresh]** to update the display. The button is only displayed if the cyclic refresh is not enabled.

To enable cyclic refresh, click the **[Start]** button. The button is only displayed if cyclic refresh is enabled and has not yet started.

To stop cyclic refresh again, click the **[Stop]** button. The button only appears if cyclic refresh is enabled.

The cyclical refresh is performed for as long as the “Advanced Intrusion Detection Environment (AIDE)” page is open. If you change the WBM page, the

update is stopped until you call up the “Advanced Intrusion Detection Environment (AIDE)” page again.

The messages are displayed below the settings.

### 16.1.1.5 “Diagnostic” Tab

#### 16.1.1.5.1 “Diagnostic Information” Page

The settings for displaying diagnostic messages are shown on the “Diagnostic Information” page.

Table 149: WBM “Diagnostic Information” Page

| Parameters | Meaning | |
|---|---|---|
| Read only the last | Activate display of only the last n messages. You also specify the number of messages to be displayed. | |
| Automatic refresh interval (sec) | Select the checkbox to enable cyclic refresh. Enter the cycle time in seconds in which a cyclic refresh is performed. The label of the button (“Refresh”/“Start“/“Stop”) changes depending on status. | |
| Source | Select the source of the diagnostic messages. The drop-down list depends on the user who is logged in. | |
| | user | Default diagnostic messages only |
| | admin | Default diagnostic messages and all log files in the folder `/var/log/*` |

To refresh the display or to enable cyclic refresh, click the **[Refresh]** button. This button is only displayed if the cyclic refresh is not enabled.

To enable cyclic refresh, click the **[Start]** button. The button is only displayed if cyclic refresh is enabled and has not yet started.

To stop cyclic refresh again, click the **[Stop]** button. The button only appears if cyclic refresh is enabled.

The cyclical refresh is performed for as long as the “Diagnostic Information” page is open. If you change the WBM page, the refresh is stopped until you call up the “Diagnostic Information” page again.

The messages are displayed below the settings.

## 16.1.2 Console-Based-Management (CBM)

### 16.1.2.1 “Information” Menu

This menu contains other submenus with information on the controller and network.

Table 150: “Information” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Controller Details | Opens a submenu with controller properties |
| 2. Network Details | Opens a submenu with controller network and interface properties |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.1.1 “Information” > “Controller Details” Submenu

In this submenu, the controller properties are displayed.

Table 151: “Information” > “Controller Details” Submenu

| Parameters | Explanation |
|---|---|
| Product Description | Controller identification |
| Order Number | Item number of the controller |
| License Information | Notification that the CODESYS runtime system is available |
| Firmware Revision | Firmware status |

To return to the higher-level menu, press **[Q]** or **[Return]**.

#### 16.1.2.1.2 “Information” > “Network Details” Submenu

In this submenu, the network and interface properties of the controller are displayed.

If the EHERNET interfaces are operated in “Switched” mode, a common table (“X1/X2”) is displayed for both connections.
If the EHERNET interfaces are operated in “Separated” mode, an individual table (“X1” / “X2”) is displayed for each connection.

Table 152: “Information” > “Network Details” Submenu

| Parameters | Explanation |
|---|---|
| State | Status of the ETHERNET interface (enabled/disabled) |
| Mac Address | MAC address identifies and addresses the controller |
| IP Address | Current IP address of the controller and (in brackets) the reference type (static/bootp/dhcp) |
| Subnet Mask | Current subnet mask of the controller |

To return to the higher-level menu, press **[Q]** or **[Return]**.

#### 16.1.2.2 “PLC Runtime” Menu

This menu contains other submenus with information and settings for the runtime system.

Table 153: “PLC Runtime” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Information | Opens a submenu with information on the runtime system |
| 2. General Configuration | Opens a submenu with settings for the runtime system |
| 3. WebVisu | Opens a submenu with settings for the Web visualization |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

##### 16.1.2.2.1 “PLC Runtime” > “Information” Submenu

This submenu contains other submenus with information on the runtime system and PLC program.

Table 154: “PLC Runtime” > “Information” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Runtime Version | Opens a submenu to display the runtime version |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

##### 16.1.2.2.2 “Information” > “Runtime Version” Submenu

In this submenu, the runtime version is displayed.

Table 155: “PLC Runtime” > “Information” > “Runtime Version” Submenu

| Parameters | Explanation |
|---|---|
| Version | The version of the currently enabled runtime system is shown. If the runtime system is disabled, “None” is displayed. |

To return to the higher-level menu, press **[Q]** or **[Return]**.

#### 16.1.2.2.3 “PLC Runtime” > “General Configuration” Submenu

This submenu contains other submenus with general settings for the runtime system.

Table 156: “PLC Runtime” > “General Configuration” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. PLC Runtime Version | Opens a submenu for the CODESYS runtime system settings |
| 2. Home Dir On SD Card | Opens a submenu for the home directory settings |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.2.4 “General Configuration” > “PLC Runtime Version” Submenu

In this submenu, select which PLC runtime system is enabled.

Table 157: “PLC Runtime” > “General Configuration” > “PLC Runtime Version” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. None | No runtime system is enabled. |
| 2. e!RUNTIME | The ***e!****RUNTIME* runtime system is enabled. |



***Note***

**All data is deleted when switching the runtime system!**
The runtime system’s home directory is completely deleted when switching the runtime system!

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.2.5 “General Configuration” > “Home Dir On SD Card” Submenu

In this submenu, define if the home directory for the runtime system should be moved to the memory card.

Table 158: “PLC Runtime” > “General Configuration” > “Home Dir On SD Card” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Enable | The home directory is moved to the memory card. |
| 2. Disable | The home directory is stored in the internal memory. |



**Note**

**Insert a memory card before switching the home directory!**

When moving the home directory to the memory card, insert a memory card formatted to support file system. Only the first partition of a memory card can be accessed at /media/sd and can be used as the home directory.



**Note**

**Perform a reset before switching the home directory!**

Stop IEC-61131 applications in use before switching the home directory of the runtime system.

Restore the device to its initial state using the “Reset” function. Any boot project is deleted.

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.2.6 “PLC Runtime” > “WebVisu” Submenu

This submenu contains information and settings for the Web visualization.

Table 159: “PLC Runtime” > “WebVisu” Submenu

| Menu Item | Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. e!RUNTIME Webserver State | The status of the ***e!****RUNTIME* Webserver is displayed. | |
| 2. Default Webserver | Choose here whether the Web-based Management or web visualization of the runtime system should be displayed when only entering the IP address of the controller. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Web-based Management | The Web-based Management is displayed. |
| | 2. CODESYS WebVisu | The web visualization of the runtime system is displayed. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.3 “Networking” Menu

This menu contains other submenus with settings for the network configuration.

Table 160: “Networking” Menu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Host/Domain Name | Opens a submenu with setting options for the general TCP/IP parameters |
| 2. TCP/IP | Opens a submenu with TCP/IP settings for the ETHERNET interfaces |
| 3. Ethernet | Opens a submenu with settings for the ETHERNET configuration |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

##### 16.1.2.3.1 “Networking” > “Host/Domain Name” Submenu

This submenu contains the “Hostname” and “Domain Name” submenu with setting options for the general TCP/IP parameters.

Table 161: “Networking” > “Host/Domain Name” Submenu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Hostname | Opens a submenu with the hostname settings<br>In addition to the menu item, the configured and current hostname are displayed. |
| 2. Domain Name | Opens a submenu hostname settings<br>In addition to the menu item, the configured and current domain name are displayed. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.3.2 “Host/Domain Name” > “Hostname” Submenu

In this submenu, you can set the hostname of the controller.

Table 162: “Networking” > “Hostname” Submenu

| Parameters | Explanation |
|---|---|
| Enter new Hostname | Enter here the hostname of the controller to be used if the network interface is changed to a static IP address or if no hostname is transmitted with a DHCP response. |

Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.3.3 “Host/Domain Name” > “Domain Name” Submenu

In this submenu, you can set the domain name of the controller.

Table 163: “Networking” > “Host/Domain Name” > “Domain Name” Submenu

| Parameters | Explanation |
|---|---|
| Enter new Domain Name | Enter the domain name.<br>The default entry is “localdomain.lan”. |

Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.3.4 “Networking” > “TCP/IP” Submenu

This submenu contains other submenus with the TCP/IP settings for the ETHERNET interfaces.

Table 164: “Networking” > “TCP/IP” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. IP Address | Opens a submenu with settings for the IP address(es) |
| 2. Default Gateway | Opens a submenu with settings for the default gateway |
| 3. DNS Server | Opens a submenu with settings for the DNS server(s) |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.3.5 “TCP/IP” > “IP Address” Submenu

This submenu contains other submenus with settings for the ETHERNET interfaces.

The submenu only appears if the controller is operated in “Separated” mode. If the controller is operated in “Switched” mode, then the “IP Address” > “X1” submenu is displayed directly.

Table 165: “Networking” > “IP Address” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. X1 | Opens a submenu with settings for the X1 interface |
| 2. X2 | Opens a submenu with settings for the X2 interface |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.3.6 “IP Address” > “Xn“ Submenu

This submenu contains the settings for the selected interface.

Table 166: “Networking” > “TCP/IP” > “IP Address” Submenu > “Xn”

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Type of IP Address Configuration | Select a static or dynamic IP address. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Static IP | Static IP addressing<br>When selecting static addressing, the IP address and subnet mask are then retrieved. |
| | 2. DHCP | Dynamic IP addressing |
| | 3. BootP | Dynamic IP addressing |
| 2. IP Address | Enter here a static IP address. | |
| 3. Subnet Mask | Enter the subnet mask. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.3.7 “TCP/IP” > “Default Gateway” Submenu

This submenu contains other submenus with settings for the default gateway.

Table 167: “Networking” > “TCP/IP” > “Default Gateway” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Default Gateway 1 | Opens a submenu with settings for default gateway 1<br>In addition to the menu item, the current status of the gateway is displayed. |
| 2. Default Gateway 2 | Opens a submenu with settings for default gateway 2<br>In addition to the menu item, the current status of the gateway is displayed. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.3.8 “Default Gateway” > “Default Gateway n” Submenu

This submenu contains the settings for the selected gateway.

Table 168: “Networking” > “TCP/IP” > “Default Gateway” > “Default Gateway n” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Set here whether the selected default gateway is to be used. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Disabled | The default gateway is not used. |
| | 2. Enabled | The default gateway is used. |
| 2. Gateway IP Address | Enter the address of the default gateway. | |
| 3. Gateway Metric | Set here a number as the metric.<br>The default value for the metric is 20, the lowest value is 0, the highest value is 4.294.967.295. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.3.9 “TCP/IP” > “DNS Server” Submenu

This submenu contains the settings for the DNS server.

Table 169: “Networking” > “TCP/IP” > “DNS Server” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| n. DNS Server n | The addresses of the defined DNS servers are displayed. Other submenus are available for the server entered. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Edit | You can change the selected DNS server address. |
| | 2. Delete | You can delete the selected DNS server address. |
| (n+1). Add new DNS Server | Add additional DNS server addresses.<br>You can enter 10 addresses. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.3.10 “Networking” > “Ethernet” Submenu

This submenu contains other submenus with settings for the ETHERNET configuration.

Table 170: “Networking” > “Ethernet” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Switch Configuration | Opens a submenu with settings for the Switch Configuration |
| 2. Ethernet Ports | Opens a submenu with settings for the ETHERNET interfaces |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.3.11 “Ethernet” > “Switch Configuration” Submenu

This submenu contains the settings for the Switch configuration.

Table 171: “Networking” > “Ethernet” > “Switch Configuration” Submenu

| Submenu | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Network interfaces | Enable or disable the switch. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Separated | Each interface is operated with its own IP address. |
| | 2. Switched | Both interfaces are operated with one IP address. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.3.12 “Ethernet” > “Ethernet Ports” Submenu

This submenu contains other submenus with settings for the ETHERNET interfaces.

Table 172: “Networking” > “Ethernet” > “Ethernet Ports” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Interface X1 | Opens a submenu with settings for the X1 interface |
| 2. Interface X2 | Opens a submenu with settings for the X2 interface |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.3.13 “Ethernet Ports” > “Interface Xn” Submenu

This submenu contains the settings for the selected ETHERNET interface.

Table 173: “Networking” > “Ethernet” > “Ethernet Ports” > “Interface Xn” Submenu

| Submenu | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Port | Set here whether the selected port is to be used. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Disabled | The port is not used. |
| | 2. Enabled | The port is used. |
| 2. Autonegotiation | Set here whether the Autonegotiation function is enabled for the selected port. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Disabled | Autonegotiation is disabled. |
| | 2. Enabled | Autonegotiation is enabled. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.4 “Firewall” Menu

This menu contains other submenus for the firewall functionality settings.

Table 174: “Firewall” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. General Configuration | Opens a submenu with general firewall settings |
| 2. MAC Address Filter | Opens a submenu with MAC address filter settings |
| 3. User Filter | Opens a submenu with user filter settings |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.4.1 “Firewall” > “General Configuration” Submenu

This submenu contains the general settings for the firewall.

Table 175: “Firewall” > “General Configuration” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Firewall enabled entirely | Enables/disables the complete functionality of the firewall. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | Firewall is enabled. |
| | 2. Disable | Firewall is disabled. |
| 2. ICMP echo broadcast protection | Enable or disable the “ICMP echo broadcast” protection. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | “ICMP echo broadcast” protection is enabled. |
| | 2. Disable | “ICMP echo broadcast” protection is disabled. |
| 3. Max UDP connections per second | You can specify the maximum number of UDP connections per second.<br>“0” = “Disabled” | |
| 4. Max TCP connections per second | You can specify the maximum number of TCP connections per second.<br>“0” = “Disabled” | |
| 5. Interface VPN | Opens a submenu with firewall settings on the IP level for the selected interface | |
| 6. Interface WAN | | |
| 7. Interface X1 | | |
| 8. Interface X2 | | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.4.2 “General Configuration” > “Interface xxx” Submenu

This submenu contains the firewall settings on the IP level for the selected interface.

Table 176: “Firewall” > “General Configuration” > “Interface xxx” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Interface state | Enable or disable the firewall for the selected interface. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Open | The firewall for the selected interface is disabled. |
| | 2. Filtered | The firewall for the selected interface is enabled. |
| 2. ICMP Policy | Enable or disable the “ICMP echo” protection for the respective interface. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Accept | The “ICMP echo” protection is disabled. |
| | 2. Drop | The “ICMP echo” protection is enabled. |
| 3. ICMP Limit | You can specify the maximum number of “ICMP pings” per second.<br>“0” = “Disabled” | |
| 4. ICMP Burst | You can specify the maximum number of “ICMP echo bursts” per second.<br>“0” = “Disabled” | |
| 5. Telnet | Enable or disable the firewall for the respective service.<br>The services themselves must be enabled or disabled separately on the “Ports and Services” page. | |
| 6. FTP | | |
| 7. FTPS | | |
| 8. HTTP | | |
| 9. HTTPS | | |
| 10. I/O-CHECK | | |
| 11. PLC Runtime | | |
| 12. PLC WebVisu – direct link (port 8080) | | |
| 13. SSH | | |
| 14. TFTP | | |
| 15. BootP/DHCP | | |
| 16. DNS | | |
| 17. Modbus TCP | | |
| 18. Modbus UDP | | |
| 19. SNMP | | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.4.3 “Firewall” > “MAC Address Filter” Submenu

This submenu contains the settings for the MAC address filter.

Table 177: “Firewall” > “MAC Address Filter” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Global MAC address filter state | Enable or disable the global MAC address filter. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Filtered | The global MAC address filter is enabled. |
| | 2. Open | The global MAC address filter is disabled. |
| 2. MAC address filter whitelist | Opens a submenu to edit the MAC address filter whitelist | |
| 3. MAC address filter state X1 | Enable or disable the MAC address filter for the X1 interface. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Open | The MAC address filter for the X1 interface is disabled. |
| | 2. Filtered | The MAC address filter for the X1 interface is enabled. |
| 4. MAC address filter state X2 | Enable or disable the MAC address filter for the X2 interface. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Open | The MAC address filter for the X2 interface is disabled. |
| | 2. Filtered | The MAC address filter for the X2 interface is enabled. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.4.4 “MAC Address Filter” > “MAC address filter whitelist” Submenu

This submenu displays all available filter entries.

Table 178: “Firewall” > “MAC Address Filter” > “MAC address filter whitelist” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Add new | Opens a submenu to add a new filter entry<br>You can enter 10 filters. |
| 2. Previous page | Displays the previous page of the list (if more than one page is filled) |
| 3. Next Page | Displays the next page of the list (if more than one page is filled) |
| (n + 3.) No (n): | Opens a submenu to edit an existing filter entry |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.4.5 “MAC address filter whitelist” > “Add new / No (n)” Submenu

In this submenu, you can create, change or delete filter entries.

Table 179: “Firewall” > “MAC Address Filter” > “MAC address filter whitelist” > “Add new / No (n)” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. MAC address | Enter the MAC address. | |
| 2. MAC mask | Enter the MAC mask. | |
| 3. Filter state | Enable or disable the filter. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. on | The filter is enabled. |
| | 2. off | The filter is disabled. |
| 4. accept | To apply the changes for the selected filter entry, choose this menu item. | |
| 5. delete | To delete the selected filter entry, choose this menu item. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.4.6 “Firewall” > “User Filter” Submenu

This submenu displays all available filter entries.

Table 180: “Firewall” > “User Filter” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Add new | Opens a submenu to add a new filter entry |
| 2. Previous page | Displays the previous page of the list (if more than one page is filled) |
| 3. Next Page | Displays the next page of the list (if more than one page is filled) |
| (n + 3.) No (n): | Opens a submenu to edit an existing filter entry |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.4.7 “User Filter” > “Add New / No (n)” Submenu

In this submenu, you can create, change or delete filter entries.

Table 181: “Firewall” > “User Filter” > “Add New / No (n)” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Policy | Select here whether the network devices is to be allowed or excluded by the filter. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Allow | The network device is permitted. |
| | 2. Drop | The network device is excluded. |
| 2. Source IP address | Enter the source IP address. | |
| 3. Source netmask | Enter the source network mask. | |
| 4. Source port | Enter the source port number. | |
| 5. Destination IP address | Enter the destination IP address. | |
| 6. Destination netmask | Enter here the destination netmask. | |
| 7. destination port | Enter the destination port number. | |
| 8. protocol | Select the permitted protocols. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. tcp | The TCP protocol is permitted. |
| | 2. udp | The UDP protocol is permitted. |
| | 3. tcp & udp | Both protocols are permitted. |
| 9. interface | Select the permitted interfaces. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. all | All interfaces are permitted. |
| | 2. VPN | The VPN interface is permitted. |
| | 3. WAN | The WAN interface is permitted. |
| | 4. X1 | The X1 interface is permitted. |
| | 5. X2 | The X2 interface is permitted. |
| 10. state | Enable or disable the filter. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. on | The filter is enabled. |
| | 2. off | The filter is disabled. |
| 11. accept | To apply the changes for the selected filter entry, choose this menu item. | |
| 12. delete | To delete the selected filter entry, choose this menu item. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.5 “Clock” Menu

This menu contains other submenus for the date and time settings.

Table 182: “Clock” Menu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Date on device (local) | Set date. | |
| 2. Time on device (local) | Set local time. | |
| 3. Time on device (UTC) | Set GMT time. | |
| 4. Clock Display Mode | Select the display format for the time. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. 24 hours | The time is displayed in 24-hour format. |
| | 2. 12 hours | The time is displayed in 12-hour format. |
| 5. Timezone | Specify the appropriate time zone for your location. Basic setting: | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. AST/ADT | “Atlantic Standard Time,” Halifax |
| | 2. EST/EDT | “Eastern Standard Time,” New York, Toronto |
| | 3. CST/CDT | “Central Standard Time,” Chicago, Winnipeg |
| | 4. MST/ MDT | “Mountain Standard Time,” Denver, Edmonton |
| | 5. PST/PDT | “Pacific Standard Time”, Los Angeles, Whitehouse |
| | 6. GMT/BST | Greenwich Mean Time,“ GB, P, IRL, IS, … |
| | 7. CET/ CEST | “Central European Time,” B, DK, D, F, I, CRO, NL, … |
| | 8. EET/ EEST | “East European Time,” BUL, FI, GR, TR, … |
| | 9. CST | “China Standard Time” |
| | 10. JST | “Japan/Korea Standard Time” |
| 6. TZ String | Enter the name of your time zone or country and town if the time zone is not available for selection using the “Timezone” parameter. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.6 “Administration” Menu

This menu contains settings for controller administration.

Table 183: “Administration” Menu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Users | Opens a submenu with settings for the user passwords | |
| 2. Create Image | Opens a submenu for creating a bootable image | |
| 3. Owner of Serial Interface | Select the serial interface assignment. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Linux Console | The serial interface is assigned to the Linux® console. |
| | 2. Un-assigned | The serial interface is not assigned and is available for applications or CODESYS. |
| 4. Reboot Controller | Restart the controller following a security challenge. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Reboot | Restarts the controller |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.6.1 “Administration” > “Users” Submenu

This submenu contains settings for the user passwords.

Table 184: “Administration” > “Users” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. user | Enter a new password for the “user” user. |
| 2. admin | Enter a new password for the “admin” user. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.6.2 “Administration” > “Create Image” Submenu

This submenu contains the selection for creating the image.

In addition to the menu item for the enabled storage medium, the current status is displayed.

Table 185: “Administration” > “Create Image” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. SD Card | To create an image on the memory card, select this menu item. Enter the reserved memory size in another step.<br>This menu item only appears if the memory card is inserted. |
| 2. Internal Flash | To create an image on the internal memory, select this menu item. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.7 “Package Server” Menu

This menu contains other submenus with functions for firmware backup and restore, as well as information and setting options for the current system partition.

Table 186: “Package Server” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Firmware Backup | Opens a submenu with functions for the firmware backup |
| 2. Firmware Restore | Opens a submenu with functions for the firmware restore |
| 3. System Partition | Opens a submenu with information and setting options for the current system partition |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

##### 16.1.2.7.1 “Package Server” > “Firmware Backup” Submenu

This submenu contains a selection option for the data to be saved.

The submenu only appears if a memory card is inserted that does not contain a bootable system. Otherwise, a message is displayed.

Table 187: “Package Server” > “Firmware Backup” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. All | All data is saved. |
| 2. PLC Runtime project | The PLC runtime project is saved. |
| 3. Settings | The controller settings are saved. |
| 4. System | The controller operating system is saved. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

You are taken to the following submenu after making the selection.

### 16.1.2.7.2 “Firmware Backup” > “Auto Update Feature” Submenu

This submenu contains a setting option for the Auto Update function.

The submenu only appears if the data for the firmware backup has been selected.

Table 188: “Package Server” > “Firmware Backup” > “Auto Update Feature” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. No | The Auto Update function is OFF for the selected data. |
| 2. Yes | The Auto Update function is ON for the selected data. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

You are taken to the following submenu after making the selection.

### 16.1.2.7.3 “Firmware Backup” > “Destination” Submenu

This submenu contains a selection option for the backup destination drive.

Table 189: “Package Server” > “Firmware Backup” > “Auto Update Feature” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. SD Card | The selected data is copied to the memory card. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

The copy progress is displayed during the backup process.

#### 16.1.2.7.4 “Package Server” > “Firmware Restore” Submenu

This submenu contains a selection option for the restore source drive.

In addition to the enabled partition, the current status is displayed.

Table 190: “Package Server” > “Firmware Restore” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. SD Card | The data is copied from the memory card. |
| 2. Internal Flash | The data is copied from the internal memory. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

You are taken to the following submenu after making the selection.

#### 16.1.2.7.5 “Firmware Restore” > “Select Package” Submenu

This submenu contains a selection option for the data to be restored.

Table 191: “Package Server” > “Firmware Restore” > “Select Package” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. PLC Runtime project | The PLC runtime project is loaded. |
| 2. Settings | The controller settings are loaded. |
| 3. System | The controller operating system is loaded. |
| 4. System + Setting | The controller operating system and settings are loaded. |
| 5. All | All data is loaded. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

The copy progress is displayed during the restore process.

### 16.1.2.7.6 “Package Server” > “System Partition” Submenu

This submenu contains information and setting options for the current system partition.

Table 192: “Package Server” > “System Partition” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Current active partition | The partition currently in use is displayed. |
| 2. Set inactive NAND partition active | Select this menu item to start the system from a different partition at the next controller reboot. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.8 “Mass Storage” Menu

This menu contains information on the internal flash memory and, if inserted, on the external memory card.

In addition to the menu item, the status is displayed for the enabled partition.

Table 193: “Mass Storage” Menu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. SD Card | Opens a submenu with information on the memory card and its formatting<br>This menu item only appears if a memory card is inserted in the controller. |
| 2. Internal Flash | Opens a submenu with information on the internal flash memory |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

##### 16.1.2.8.1 “Mass Storage” > “SD Card” Submenu

This submenu contains information on the external memory card and its formatting.

This submenu only appears if a memory card is inserted in the controller.

Table 194: “Mass Storage” > “SD Card” Menu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Show information | Displays information on the memory card |
| 2. FAT format medium | To format the memory card in FAT format, select this menu item. Then specify a volume name. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.9 “Software Uploads” Menu

This menu contains choices and settings for the device update.

You can select fieldbus software, program licenses and update scripts, for example, for transfer from a PC to the controller.
You can also enable transmitted packages or delete from the controller.

### 16.1.2.10 “Ports and Services” Menu

This submenu contains other submenus with settings for the respective services.

Table 195: “Ports and Services” Menu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. Telnet | Opens a submenu with settings for the Telnet service |
| 2. FTP | Opens a submenu with settings for the FTP service |
| 3. FTPS | Opens a submenu with settings for the FTPS service |
| 4. HTTP | Opens a submenu with settings for the HTTP service |
| 5. HTTPS | Opens a submenu with settings for the HTTPS service |
| 6. NTP | Opens a submenu with settings for the NTP service |
| 7. SSH | Opens a submenu with settings for the SSH server |
| 8. TFTP | Opens a submenu with settings for the TFTP server |
| 9. DHCPD | Opens a submenu with settings for the DHCPD service |
| 10. DNS | Opens a submenu with settings for the DNS service |
| 11. IOCHECK PORT | Opens a submenu with settings for the WAGO-I/O-CHECK port |
| 12. Modbus TCP | Opens a submenu with settings for the Modbus TCP service |
| 13. Modbus UDP | Opens a submenu with settings for the Modbus UDP service |
| 14. OPC UA | Opens a submenu with settings for the OPC UA service |
| 15. PLC Runtime Services | Opens a submenu with settings for the PLC runtime system services |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.10.1 “Ports and Services” > “Telnet” Submenu

This submenu contains the settings for the Telnet service.

Table 196: “Ports and Services” > “Telnet” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the Telnet service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The Telnet service is enabled. |
| | 2. Disable | The Telnet service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.10.2 “Ports and Services” > “FTP” Submenu

This submenu contains the settings for the FTP service.

Table 197: “Ports and Services” > “FTP” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the FTP service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The FTP service is enabled. |
| | 2. Disable | The FTP service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.10.3 “Ports and Services” > “FTPS” Submenu

This submenu contains the settings for the FTPS service.

Table 198: “Ports and Services” > “FTPS” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the FTPS service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The FTPS service is enabled. |
| | 2. Disable | The FTPS service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.10.4 “Ports and Services” > “HTTP” Submenu

This submenu contains the settings for the HTTP service.

Table 199: “Ports and Services” > “HTTP” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the HTTP service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The HTTP service is enabled. |
| | 2. Disable | The HTTP service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.5 “Ports and Services” > “HTTPS” Submenu

This submenu contains the settings for the HTTPS service.

Table 200: “Ports and Services” > “HTTPS” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the HTTPS service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The HTTPS service is enabled. |
| | 2. Disable | The HTTPS service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.6 “Ports and Services” > “NTP” Submenu

This submenu contains the settings for the NTP service.

Table 201: “Ports and Services” > “NTP” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the NTP service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The NTP service is enabled. |
| | 2. Disable | The NTP service is disabled. |
| 2. Port | Enter the port number of the NTP server. | |
| 3. Time Server 1 | Enter here the IP addresses of up to 4 time servers. Time server No. 1 is requested first of all. If no data can be accessed via time server No. 1, time server No. 2 is requested. | |
| 4. Time Server 2 | | |
| 5. Time Server 3 | | |
| 6. Time Server 4 | | |
| 7. Update Time | Specify here the update interval of the time server. | |
| 8. Issue immediate update | To update the time immediately, irrespective of the update interval, select this menu item. | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.10.7 “Ports and Services” > “SSH” Submenu

This submenu contains the settings for the SSH service.

Table 202: “Ports and Services” > “SSH” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | You can enable/disable the SSH server. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The SSH server is enabled. |
| | 2. Disable | The SSH server is disabled. |
| 2. Port | Enter the port number. | |
| 3. Allow root login | You can enable or inhibit root access. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | Root access is permitted. |
| | 2. Disable | Root access is not permitted. |
| 4. Allow password login | Enable or disable the password query function. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | Password query is enabled. |
| | 2. Disable | Password query is disabled. |
| 5. Status of firewalling | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.8 “Ports and Services” > “TFTP” Submenu

This submenu contains the settings for the TFTP service.

Table 203: “Ports and Services” > “TFTP” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable or disable the TFTP server. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The TFTP server is enabled. |
| | 2. Disable | The TFTP server is disabled. |
| 2. Transfer Directory | Specify here the path for downloading the server directory. | |
| 3. Status of firewalling | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.10.9 “Ports and Services” > “DHCPD” Submenu

This submenu contains the settings for the DHCPD service.

Table 204: “Ports and Services” > “DHCPD” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. DHCPD firewalling | Opens a submenu with firewall settings for the this service for the interfaces |
| 2. X1 | Opens a submenu with the DHCPD settings for the selected interface |
| 3. X2 | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.10 “DHCPD” > “Xn” Submenu

This submenu contains the settings for the DHCPD service for the selected interface.

Table 205: “Ports and Services” > “DHCPD” > “Xn” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the DHCPD service for the Xn interface. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The DHCPD service is enabled. |
| | 2. Disable | The DHCPD service is disabled. |
| 2. Range | Enter a range of available IP addresses. | |
| 3. Lease Time (min) | Specify the lease time here in seconds. 120 seconds are entered by default. | |
| 4. Add static hostname | Enter a new static assignment of MAC ID to IP address,<br>e.g., “01:02:03:04:05:06=192.168.1.20” or “hostname=192.168.1.20”.<br>You can enter 10 assignments. | |
| (5 + n). Static Host (n) | This displays the static assignments. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Edit | Opens a submenu to change the selected assignment |
| | 2. Delete | Deletes the selected assignment |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.10.11 “Ports and Services” > “DNS” Submenu

This submenu contains the settings for the DNS service.

Table 206: “Ports and Services” > “DNS” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the DNS service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The DNS service is enabled. |
| | 2. Disable | The DNS service is disabled. |
| 2. Mode | Select the operating mode of the DNS server. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Proxy | The requests are buffered to optimize throughput. |
| | 2. Relay | All requests are routed directly. |
| 3. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |
| 4. Add static hostname | Enter a new static assignment of IP address to hostname,<br>e.g., “192.168.1.20:hostname”.<br>You can enter 10 assignments. | |
| (5 + n). Static Host (n) | This displays the hostnames for IP addresses. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Edit | Opens a submenu to change the selected assignment |
| | 2. Delete | Deletes the selected assignment |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.10.12 “Ports and Services” > “IOCHECK PORT” Submenu

This submenu contains settings for the WAGO-I/O-*CHECK* port.

Table 207: “Ports and Services” > “IOCHECK PORT” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Enable/disable the WAGO-I/O-*CHECK* port. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The WAGO-I/O-*CHECK* port is enabled. |
| | 2. Disable | The WAGO-I/O-*CHECK* port is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.13 “Ports and Services” > “Modbus TCP” Submenu

This submenu contains the settings for the Modbus TCP service.

Table 208: “Ports and Services” > “Modbus TCP” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Disable or enable the Modbus/TCP service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The Modbus TCP service is enabled. |
| | 2. Disable | The Modbus TCP service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.14 “Ports and Services” > “Modbus UDP” Submenu

This submenu contains the settings for the Modbus UDP service.

Table 209: “Ports and Services” > “Modbus UDP” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Disable/enable the Modbus UDP service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The Modbus UDP service is enabled. |
| | 2. Disable | The Modbus UDP service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.15 “Ports and Services” > “OPC UA” Submenu

This submenu contains the settings for the OPC UA service.

Table 210: “Ports and Services” > “OPC UA” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. State | Disable/enable the OPC UA service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The OPC UA service is enabled. |
| | 2. Disable | The OPC UA service is disabled. |
| 2. Firewall status | Opens a submenu with firewall settings for the this service for the interfaces | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.16 "…" > "Firewall Status" Submenu

This submenu contains firewall settings for the selected service.

Table 211: "Ports and Services" > "Firewall Status" Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. VPN | Enable or disable the firewall for the VPN interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the VPN interface is permitted. |
| | 2. close | Data traffic via the VPN interface is not permitted. |
| 2. WAN | Enable or disable the firewall for the WAN interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the WAN interface is permitted. |
| | 2. close | Data traffic via the WAN interface is not permitted. |
| 3. X1 | Enable or disable the firewall for the X1 interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the X1 interface is permitted. |
| | 2. close | Data traffic via the X1 interface is not permitted. |
| 4. X2 | Enable or disable the firewall for the X2 interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the X2 interface is permitted. |
| | 2. close | Data traffic via the X2 interface is not permitted. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.10.17 “Ports and Services” > “PLC Runtime Services” Submenu

This submenu contains the settings for the PLC runtime system services.

Table 212: “Ports and Services” > “PLC Runtime Services” Submenu

| Menu Item | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. General Configuration | Enter the password for port authentication. |
| 2. e!RUNTIME | Opens a submenu with service settings for ***e!****RUNTIME* |
| 3. Change CODESYS Runtime firewalling settings | Opens a submenu with firewall settings for the this service for the interfaces |
| 4. Change CODESYS WebVisu firewalling settings | Opens a submenu with firewall settings for the this service for the interfaces |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.10.18 “PLC Runtime Services” > “e!RUNTIME” Submenu

This submenu contains the settings for the ***e!****RUNTIME* service.

Table 213: “Ports and Services” > “PLC Runtime Services” > “e!RUNTIME” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Webserver enable/disable | Enable or disable the Webserver for the ***e!****RUNTIME* web visualization. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The Webserver is enabled. |
| | 2. Disable | The Webserver is disabled. |
| 2. Port Authentication enable/disable | Enter here whether a login is required for connecting to the device. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | Authentication via login is required. |
| | 2. Disable | Authentication is not required. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

### 16.1.2.11 “SNMP” Menu

This menu contains other submenus with the SNMP settings.

Table 214: “SNMP” Menu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| 1. General SNMP Configuration | Opens a submenu with general SNMP settings |
| 2. SNMP v1/v2c Manager Configuration | Opens a submenu with settings for the SNMP v1/v2c Manager |
| 3. SNMP v1/v2c Trap Receiver Configuration | Opens a submenu with settings for the SNMP v1/v2c trap receivers |
| 4. SNMP v3 Configuration | Opens a submenu with settings for the SNMP v3 configuration |
| 5. SNMP firewalling | Opens a submenu with firewall settings for SNMP |
| 6. Secure SNMP firewalling | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

#### 16.1.2.11.1 “SNMP” > “General SNMP Configuration” Submenu

This submenu contains the general SNMP settings.

Table 215: “SNMP” > “General SNMP Configuration” Submenu

| Parameters | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. SNMP status | Enable or disable the SNMP service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The SNMP service is enabled. |
| | 2. Disable | The SNMP service is disabled. |
| 2. Name of device | Enter here the device name (sysName). | |
| 3. Description | Enter here the device description (sysDescription). | |
| 4. Physical location | Enter here the location of the device (sysLocation). | |
| 5. Contact | Enter here the email contact address (sysContact). | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.11.2 “SNMP” > “SNMP v1/v2c Manager Configuration” Submenu

This submenu contains the SNMP v1/v2c Manager settings.

Table 216: “SNMP” > “SNMP v1/v2c Manager Configuration” Submenu

| Parameters | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. Protocol state | Enable or disable the SNMP v1/v2c protocol. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. Enable | The SNMP v1/v2c protocol is enabled. |
| | 2. Disable | The SNMP v1/v2c protocol is disabled. |
| 2. Local community name | Specify here the community name for the SNMP manager configuration (max. 32 characters, no spaces). | |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.11.3 “SNMP” > “SNMP v1/v2c Trap Receiver Configuration” Submenu

This submenu contains settings for the v1/v2c trap receivers.

Table 217: “SNMP” > “SNMP v1/v2c Trap Receiver Configuration” Submenu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| (n). Trap Receiver (n) | Opens a submenu with information on the selected v1/v2c trap receiver to delete the trap receiver |
| (n + 1). Add new Trap Receiver | Opens a series of submenus to create a new v1/v2c trap receiver<br>You can enter 10 trap receivers.<br>The following entries/selections are possible:<br>• IP address of the new trap receiver (management station)<br>• Community name for the new trap receiver configuration (max. 32 characters, no spaces)<br>• SNMP version via which the traps are sent (v1/v2c) |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

#### 16.1.2.11.4 “SNMP” > “SNMP v3 Configuration” Submenu

This submenu contains settings for SNMP v3.

Table 218: “SNMP” > “SNMP v3 Configuration” Submenu

| Parameters | Explanation |
|---|---|
| 0. Back to … | Back to the higher-level menu |
| (n). Username | Opens a submenu with information on the selected v3 user and to delete the user |
| (n + 1). Add new v3 User | Opens a series of submenus to create a new v3 user<br>You can enter 10 users.<br>The following entries/selections are possible:<br>• Authentication name (The name can have a min. 8 and max. 32 characters and may contain lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), special characters !()*~'.-_ but no spaces.)<br>• Authentication type (None/MD5/SHA)<br>• Authentication key (The key can have a min. 8 and max. 32 characters and may contain lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), special characters !()*~'.-_ but no spaces.)<br>• Privacy type (None/DES/AES)<br>• Privacy key (The key can have a min. 8 and max. 32 characters and may contain lower case letters (a … z), upper case letters (A … Z), numbers (0 … 9), special characters !()*~'.-_ but no spaces.)<br>• IP address for a trap receiver for v3 traps |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.
Click **[<OK>]** to apply the entry.
Click **[<Abort>]** to discard the entry.

### 16.1.2.11.5 “SNMP” > “(Secure)SNMP firewalling” Submenu

These submenus contain the SNMP firewall settings.

Table 219: “SNMP” > “(Secure )SNMP firewalling” Submenu

| Menu Item | Submenu Item / Explanation | |
|---|---|---|
| 0. Back to … | Back to the higher-level menu | |
| 1. VPN | Enable or disable the firewall for the VPN interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the VPN interface is permitted. |
| | 2. close | Data traffic via the VPN interface is not permitted. |
| 2. WAN | Enable or disable the firewall for the WAN interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the WAN interface is permitted. |
| | 2. close | Data traffic via the WAN interface is not permitted. |
| 3. X1 | Enable or disable the firewall for the X1 interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the X1 interface is permitted. |
| | 2. close | Data traffic via the X1 interface is not permitted. |
| 4. X2 | Enable or disable the firewall for the X2 interface and respective service. | |
| | 0. Back to … | Back to the higher-level menu |
| | 1. open | Data traffic via the X2 interface is permitted. |
| | 2. close | Data traffic via the X2 interface is not permitted. |

To make a selection, choose the appropriate menu item.
To return to the higher-level menu, press **[Q]**.

## 16.2 Process Data Architecture

The process image for the I/O modules on the local bus is built up word-by-word in the controller (with word alignment). The internal mapping method for data greater than one byte conforms to Intel formats.

The following section describes the representation for WAGO-I/O SYSTEM 750 (750 and 753 Series) I/O modules in the process image, as well as the configuration of the process values.

**NOTICE**

**Equipment damage due to incorrect address!**

To prevent any damage to the device in the field you must always take the process data for all previous byte or bit-oriented I/O modules into account when addressing an I/O module at any position in the fieldbus node.

**Note**

**No direct access from fieldbus to the process image for I/O modules!**

Any data that is required from the I/O module process image must be explicitly mapped in the CODESYS program to the data in the fieldbus process image and vice versa! Direct access is not possible!

## 16.2.1 Digital Input Modules

Digital input modules supply one bit of data per channel to specify the signal state for the corresponding channel. These bits are mapped into the Input Process Image.

Some digital modules have an additional diagnostic bit per channel in the Input Process Image. The diagnostic bit is used for detecting faults that occur (e.g., wire breaks and/or short circuits).

When analog input modules are also present in the node, the digital data is always appended after the analog data in the Input Process Image, grouped into bytes.

### 16.2.1.1 1 Channel Digital Input Module with Diagnostics

750-435

Table 220: 1 Channel Digital Input Module with Diagnostics

| Input Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | | | Diagnostic bit S 1 | Data bit DI 1 |

### 16.2.1.2 2 Channel Digital Input Modules

750-400, -401, -405, -406, -407, -410, -411, -412, -427, -438, (and all variations),
753-400, -401, -405, -406, -410, -411, -412, -427, -429

Table 221: 2 Channel Digital Input Modules

| Input Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | | | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |

### 16.2.1.3 2 Channel Digital Input Module with Diagnostics

750-419, -421, -424, -425,
753-421, -424, -425

Table 222: 2 Channel Digital Input Module with Diagnostics

| Input Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | Diagnostic bit S 2 Channel 2 | Diagnostic bit S 1 Channel 1 | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |

### 16.2.1.4 2 Channel Digital Input Module with Diagnostics and Output Process Data

750-418,
753-418

The digital input module supplies a diagnostic and acknowledge bit for each input channel. If a fault condition occurs, the diagnostic bit is set. After the fault condition is cleared, an acknowledge bit must be set to re-activate the input. The diagnostic data and input data bit is mapped in the Input Process Image, while the acknowledge bit is in the Output Process Image.

Table 223: 2 Channel Digital Input Module with Diagnostics and Output Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | Diagnostic bit S 2 Channel 2 | Diagnostic bit S 1 Channel 1 | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | Acknowledge-ment bit Q 2 Channel 2 | Acknowledge-ment bit Q 1 Channel 1 | 0 | 0 |

### 16.2.1.5 4 Channel Digital Input Modules

750-402, -403, -408, -409, -414, -415, -422, -423, -428, -432, -433, -1420, -1421, -1422, -1423
753-402, -403, -408, -409, -415, -422, -423, -428, -432, -433, -440

Table 224: 4 Channel Digital Input Modules

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | Data bit DI 4 Channel 4 | Data bit DI 3 Channel 3 | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |

### 16.2.1.6 8 Channel Digital Input Modules

750-430, -431, -436, -437, -1415, -1416, -1417, -1418,
753-430, -431, -434, -436, -437

Table 225: 8 Channel Digital Input Modules

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Data bit DI 8 Channel 8 | Data bit DI 7 Channel 7 | Data bit DI 6 Channel 6 | Data bit DI 5 Channel 5 | Data bit DI 4 Channel 4 | Data bit DI 3 Channel 3 | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |

### 16.2.1.7 8 Channel Digital Input Module NAMUR with Diagnostics and Output Process Data

750-439

The digital input module NAMUR provides via one logical channel 2 byte for the input and output process image.

The signal state of NAMUR inputs DI1 … DI8 is transmitted to the fieldbus coupler/controller via input data byte D0.
The fault conditions are transmitted via input data byte D1.

The channels 1 … 8 are switched on or off via the output data byte D1.
The output data byte D0 is reserved and always has the value “0“.

Table 226: 8 Channel Digital Input Module NAMUR with Diagnostics and Output Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Input byte D0** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Signal status DI 8 Channel 8 | Signal status DI 7 Channel 7 | Signal status DI 6 Channel 6 | Signal status DI 5 Channel 5 | Signal status DI 4 Channel 4 | Signal status DI 3 Channel 3 | Signal status DI 2 Channel 2 | Signal status DI 1 Channel 1 |
| **Input byte D1** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Wire break /short circuit Data bit DI 8 Channel 8 | Wire break /short circuit Data bit DI 7 Channel 7 | Wire break /short circuit Data bit DI 6 Channel 6 | Wire break /short circuit Data bit DI 5 Channel 5 | Wire break /short circuit Data bit DI 4 Channel 4 | Wire break /short circuit Data bit DI 3 Channel 3 | Wire break /short circuit Data bit DI 2 Channel 2 | Wire break /short circuit Data bit DI 1 Channel 1 |

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Output byte D0** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Output byte D1** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| DI Off 8 Channel 8 *) | DI Off 7 Channel 7 *) | DI Off 6 Channel 6 *) | DI Off 5 Channel 5 *) | DI Off 4 Channel 4 *) | DI Off 3 Channel 3 *) | DI Off 2 Channel 2 *) | DI Off 1 Channel 1 *) |

*) 0: Channel ON
1: Channel OFF

### 16.2.1.8 8 Channel Digital Input Module PTC with Diagnostics and Output Process Data

750-1425

The digital input module PTC provides via one logical channel 2 byte for the input and output process image.

The signal state of PTC inputs DI1 … DI8 is transmitted to the fieldbus coupler/controller via input data byte D0.
The fault conditions are transmitted via input data byte D1.

The channels 1 … 8 are switched on or off via the output data byte D1.
The output data byte D0 is reserved and always has the value “0“.

Table 227: 8 Channel Digital Input Module PTC with Diagnostics and Output Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Input Byte D0** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Signal status DI 8 Channel 8 | Signal status DI 7 Channel 7 | Signal status DI 6 Channel 6 | Signal status DI 5 Channel 5 | Signal status DI 4 Channel 4 | Signal status DI 3 Channel 3 | Signal status DI 2 Channel 2 | Signal status DI 1 Channel 1 |
| **Input Byte D1** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Wire break /short circuit Data bit DI 8 Channel 8 | Wire break /short circuit Data bit DI 7 Channel 7 | Wire break /short circuit Data bit DI 6 Channel 6 | Wire break /short circuit Data bit DI 5 Channel 5 | Wire break /short circuit Data bit DI 4 Channel 4 | Wire break /short circuit Data bit DI 3 Channel 3 | Wire break /short circuit Data bit DI 2 Channel 2 | Wire break /short circuit Data bit DI 1 Channel 1 |

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Output Byte D0** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Output Byte D1** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| DI Off 8 Channel 8 *) | DI Off 7 Channel 7 *) | DI Off 6 Channel 6 *) | DI Off 5 Channel 5 *) | DI Off 4 Channel 4 *) | DI Off 3 Channel 3 *) | DI Off 2 Channel 2 *) | DI Off 1 Channel 1 *) |

*) 0: Channel ON
1: Channel OFF

### 16.2.1.9 16 Channel Digital Input Modules

750-1400, -1402, -1405, -1406, -1407

Table 228: 16 Channel Digital Input Modules

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Input Byte D0** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Data bit DI 8 Channel 8 | Data bit DI 7 Channel 7 | Data bit DI 6 Channel 6 | Data bit DI 5 Channel 5 | Data bit DI 4 Channel 4 | Data bit DI 3 Channel 3 | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |
| **Input Byte D1** | | | | | | | |
| Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 |
| Data bit DI 16 Channel 16 | Data bit DI 15 Channel 15 | Data bit DI 14 Channel 4 | Data bit DI 13 Channel 13 | Data bit DI 12 Channel 12 | Data bit DI 11 Channel 11 | Data bit DI 10 Channel 10 | Data bit DI 9 Channel 9 |

## 16.2.2 Digital Output Modules

Digital output modules use one bit of data per channel to control the output of the corresponding channel. These bits are mapped into the Output Process Image.

Some digital modules have an additional diagnostic bit per channel in the Input Process Image. The diagnostic bit is used for detecting faults that occur (e.g., wire breaks and/or short circuits). For modules with diagnostic bit is set, also the data bits have to be evaluated.

When analog output modules are also present in the node, the digital image data is always appended after the analog data in the Output Process Image, grouped into bytes.

### 16.2.2.1 1 Channel Digital Output Module with Input Process Data

750-523

The digital output module delivers 1 bit via a process value Bit in the output process image, which is illustrated in the input process image. This status image shows "manual mode".

Table 229: 1 Channel Digital Output Module with Input Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | | | not used | Status bit “Manual Operation“ |

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | | | not used | controls DO 1 Channel 1 |

### 16.2.2.2 2 Channel Digital Output Modules

750-501, -502, -509, -512, -513, -514, -517, -535, -538, (and all variations),
753-501, -502, -509, -512, -513, -514, -517

Table 230: 2 Channel Digital Output Modules

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | | | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

### 16.2.2.3 2 Channel Digital Input Modules with Diagnostics and Input Process Data

750-507 (-508), -522,
753-507

The digital output modules have a diagnostic bit for each output channel. When an output fault condition occurs (i.e., overload, short circuit, or broken wire), a diagnostic bit is set. The diagnostic data is mapped into the Input Process Image, while the output control bits are in the Output Process Image.

Table 231: 2 Channel Digital Input Modules with Diagnostics and Input Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | | | Diagnostic bit S 2 Channel 2 | Diagnostic bit S 1 Channel 1 |

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | | | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

750-506,
753-506

The digital output module has 2-bits of diagnostic information for each output channel. The 2-bit diagnostic information can then be decoded to determine the exact fault condition of the module (i.e., overload, a short circuit, or a broken wire). The 4-bits of diagnostic data are mapped into the Input Process Image, while the output control bits are in the Output Process Image.

Table 232: 2 Channel Digital Input Modules with Diagnostics and Input Process Data 75x-506

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | Diagnostic bit S 3 Channel 2 | Diagnostic bit S 2 Channel 2 | Diagnostic bit S 1 Channel 1 | Diagnostic bit S 0 Channel 1 |

Diagnostic bits S1/S0, S3/S2: = ‘00’ standard mode
Diagnostic bits S1/S0, S3/S2: = ‘01’ no connected load/short circuit against +24 V
Diagnostic bits S1/S0, S3/S2: = ‘10’ Short circuit to ground/overload

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | not used | not used | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

### 16.2.2.4 4 Channel Digital Output Modules

750-504, -515, -516, -519, -531,
753-504, -516, -531, -540

Table 233: 4 Channel Digital Output Modules

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | controls DO 4 Channel 4 | controls DO 3 Channel 3 | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

### 16.2.2.5 4 Channel Digital Output Modules with Diagnostics and Input Process Data

750-532, -539

The digital output modules have a diagnostic bit for each output channel. When an output fault condition occurs (i.e., overload, short circuit, or broken wire), a diagnostic bit is set. The diagnostic data is mapped into the Input Process Image, while the output control bits are in the Output Process Image.

Table 234: 4 Channel Digital Output Modules with Diagnostics and Input Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | Diagnostic bit S 4 Channel 4 | Diagnostic bit S 3 Channel 3 | Diagnostic bit S 2 Channel 2 | Diagnostic bit S 1 Channel 1 |

Diagnostic bit S = ‘0’ no Error
Diagnostic bit S = ‘1’ overload, short circuit, or broken wire

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | | | | controls DO 4 Channel 4 | controls DO 3 Channel 3 | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

### 16.2.2.6 8 Channel Digital Output Module

750-530, -536, -1515, -1516,
753-530, -534, 536

Table 235: 8 Channel Digital Output Module

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| controls DO 8 Channel 8 | controls DO 7 Channel 7 | controls DO 6 Channel 6 | controls DO 5 Channel 5 | controls DO 4 Channel 4 | controls DO 3 Channel 3 | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

### 16.2.2.7 8 Channel Digital Output Modules with Diagnostics and Input Process Data

750-537,
753-537

The digital output modules have a diagnostic bit for each output channel. When an output fault condition occurs (i.e., overload, short circuit, or broken wire), a diagnostic bit is set. The diagnostic data is mapped into the Input Process Image, while the output control bits are in the Output Process Image.

Table 236: 8 Channel Digital Output Modules with Diagnostics and Input Process Data

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Diagnostic bit S 8 Channel 8 | Diagnostic bit S 7 Channel 7 | Diagnostic bit S 6 Channel 6 | Diagnostic bit S 5 Channel 5 | Diagnostic bit S 4 Channel 4 | Diagnostic bit S 3 Channel 3 | Diagnostic bit S 2 Channel 2 | Diagnostic bit S 1 Channel 1 |

Diagnostic bit S = '0' no Error
Diagnostic bit S = '1' overload, short circuit, or broken wire

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| controls DO 8 Channel 8 | controls DO 7 Channel 7 | controls DO 6 Channel 6 | controls DO 5 Channel 5 | controls DO 4 Channel 4 | controls DO 3 Channel 3 | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

### 16.2.2.8 16 Channel Digital Output Modules

750-1500, -1501, -1504, -1505

Table 237: 16 Channel Digital Output Modules

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Output Byte D0** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| controls DO 8 Channel 8 | controls DO 7 Channel 7 | controls DO 6 Channel 6 | controls DO 5 Channel 5 | controls DO 4 Channel 4 | controls DO 3 Channel 3 | controls DO 2 Channel 2 | controls DO 1 Channel 1 |
| **Output Byte D1** | | | | | | | |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| controls DO 16 Channel 16 | controls DO 15 Channel 15 | controls DO 14 Channel 14 | controls DO 13 Channel 13 | controls DO 12 Channel 12 | controls DO 11 Channel 11 | controls DO 10 Channel 10 | controls DO 9 Channel 9 |

### 16.2.2.9 8 Channel Digital Input/Output Modules

750-1502, -1506

Table 238: 8 Channel Digital Input/Output Modules

| **Input Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| Data bit DI 8 Channel 8 | Data bit DI 7 Channel 7 | Data bit DI 6 Channel 6 | Data bit DI 5 Channel 5 | Data bit DI 4 Channel 4 | Data bit DI 3 Channel 3 | Data bit DI 2 Channel 2 | Data bit DI 1 Channel 1 |

| **Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| controls DO 8 Channel 8 | controls DO 7 Channel 7 | controls DO 6 Channel 6 | controls DO 5 Channel 5 | controls DO 4 Channel 4 | controls DO 3 Channel 3 | controls DO 2 Channel 2 | controls DO 1 Channel 1 |

## 16.2.3 Analog Input Modules

The analog input modules provide 16-bit measured data and 8 control/status bits per channel.

The controller only uses the 8 control/status bits internally for configuration/parameterization (e.g., via WAGO-I/O-*CHECK*).

Therefore, only the 16-bit measurement values for each channel are in Intel format and are mapped by word in the input process image for the controller.

When digital input modules are also present in the node, the analog input data is always mapped into the Input Process Image in front of the digital data.



**Information**

**Information on the structure of control and status bytes**
For detailed information on the structure of a particular I/O module's control/status bytes, please refer to that module's manual. Manuals for each module can be found on the Internet at www.wago.com.

### 16.2.3.1 1 Channel Analog Input Modules

750-491, (and all variations)

Table 239: 1 Channel Analog Input Modules

| Input Process Image | | | |
|---|---|---|---|
| Offset | Byte Destination | | Description |
| | High Byte | Low Byte | |
| 0 | D1 | D0 | Measured Value $U_D$ |
| 1 | D3 | D2 | Measured Value $U_{ref}$ |

### 16.2.3.2 2 Channel Analog Input Modules

750-452, -454, -456, -461, -462, -464 (2-Channel Operation) -465, -466, -467, -469, -470, -472, -473, -474, -475, 476, -477, -478, -479, -480, -481, -483, -485, -487, -492, (and all variations),
753-452, -454, -456, -461, -465, -466, -467, -469, -472, -474, -475, -476, -477, -478, -479, -483, -492, (and all variations)

Table 240: 2 Channel Analog Input Modules

| Input Process Image | | | |
|---|---|---|---|
| Offset | Byte Destination | | Description |
| | High Byte | Low Byte | |
| 0 | D1 | D0 | Measured Value Channel 1 |
| 1 | D3 | D2 | Measured Value Channel 2 |

#### 16.2.3.3 2 Channel Analog Input Modules HART

750-482, -484, (and all variations),
753-482

The HART I/O module provides two different process images depending on the set operating mode.

For the pure analog values 4 mA ... 20 mA, the HART I/O module transmits 16 bit measured values per channel as an analog input module, which are mapped by word.

In operating mode "6 Byte Mailbox", the HART I/O module provides the fieldbus coupler / controller with a 12-byte input and output process image via a logical channel. For the control/status byte and the dummy byte, an acyclic channel (mailbox) for the process value communication is embedded in the process image, which occupies 6 bytes of data. This is followed by the measured values for channels 1 and 2.

HART commands are executed via the WAGO-IEC function blocks of the "WagoLibHart_0x.lib" library. The data is tunneled to the application via the mailbox and decoded by means of the library, so that the evaluation and processing takes place directly at the application level.

The operating mode is set using the WAGO-I / O-*CHECK* commissioning tool.

Table 241: 2-Channel Analog Input Modules HART

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | D1 | D0 | Measured Value Channel 1 |
| 1 | D3 | D2 | Measured Value Channel 2 |

Table 242:: 2 Channel Analog Input Modules HART + 6 bytes Mailbox

| Input Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | Internal Use | S0 | Internal used | Status byte |
| 1 | MBX_RES | MBX_RES | Response data from mailbox | |
| 2 | MBX_RES | MBX_RES | | |
| 3 | MBX_RES | MBX_RES | | |
| 4 | D1 | D0 | Measured Value Channel 1 | |
| 5 | D3 | D2 | Measured Value Channel 2 | |

| Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | C0 | Control byte |
| 1 | MBX_REQ | MBX_REQ | Request data from mailbox |
| 2 | MBX_REQ | MBX_REQ | |
| 3 | MBX_REQ | MBX_REQ | |
| 4 | - | - | Not used |
| 5 | - | - | |

### 16.2.3.4 4 Channel Analog Input Modules

750-450, -453, -455, -457, -459, -460, -463, -464 (4-Channel Operation), -468, -471, -468, (and all variations),
753-453, -455, -457, -459

Table 243: 4 Channel Analog Input Modules

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | D1 | D0 | Measured Value Channel 1 |
| 1 | D3 | D2 | Measured Value Channel 2 |
| 2 | D5 | D4 | Measured Value Channel 3 |
| 3 | D7 | D6 | Measured Value Channel 4 |

### 16.2.3.5 8 Channel Analog Input Modules

750-451, 750-458, 750-496, 750-497

Table 244: 8 Channel Analog Input Modules

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | D1 | D0 | Measured Value Channel 1 |
| 1 | D3 | D2 | Measured Value Channel 2 |
| 2 | D5 | D4 | Measured Value Channel 3 |
| 3 | D7 | D6 | Measured Value Channel 4 |
| 4 | D9 | D8 | Measured Value Channel 5 |
| 5 | D11 | D10 | Measured Value Channel 6 |
| 6 | D13 | D12 | Measured Value Channel 7 |
| 7 | D15 | D14 | Measured Value Channel 8 |

### 16.2.3.6 3-Phase Power Measurement Module

750-493

The above Analog Input Modules have a total of 9 bytes of user data in both the Input and Output Process Image (6 bytes of data and 3 bytes of control/status). The following tables illustrate the Input and Output Process Image, which has a total of 6 words mapped into each image.
Word alignment is applied.

Table 245: 3-Phase Power Measurement Module

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | S0 | Status byte 0 |
| 1 | D1 | D0 | Input data word 1 |
| 2 | - | S1 | Status byte 1 |
| 3 | D3 | D2 | Input data word 2 |
| 4 | - | S2 | Status byte 2 |
| 5 | D5 | D4 | Input data word 3 |

| Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | C0 | Control byte 0 |
| 1 | D1 | D0 | Output data word 1 |
| 2 | - | C1 | Control byte 1 |
| 3 | D3 | D2 | Output data word 2 |
| 4 | - | C2 | Control byte 2 |
| 5 | D5 | D4 | Output data word 3 |

750-494, -495, (and all variations)

The 3-Phase Power Measurement Modules 750-494, -495, (and all variations) have a total of 24 bytes of user data in both the Input and Output Process Image (16 bytes of data and 8 bytes of control/status).

Table 246: 3-Phase Power Measurement Modules 750-494, -495, (and all variations)

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | S1 | S0 | Status word |
| 1 | S3 | S2 | Extended status word 1 |
| 2 | S5 | S4 | Extended status word 2 |
| 3 | S7 | S6 | Extended status word 3 |
| 4 | D1 | D0 | Process value 1 |
| 5 | D3 | D2 | |
| 6 | D5 | D4 | Process value 2 |
| 7 | D7 | D6 | |
| 8 | D9 | D8 | Process value 3 |
| 9 | D11 | D10 | |
| 10 | D13 | D12 | Process value 4 |
| 11 | D15 | D14 | |

| Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | S1 | S0 | Control word |
| 1 | S3 | S2 | Extended control word 1 |
| 2 | S5 | S4 | Extended control word 2 |
| 3 | S7 | S6 | Extended control word 3 |
| 4 | - | - | - |
| 5 | - | - | |
| 6 | - | - | - |
| 7 | - | - | |
| 8 | - | - | - |
| 9 | - | - | |
| 10 | - | - | - |
| 11 | - | - | |

## 16.2.4 Analog Output Modules

The analog output modules provide 16-bit output values and 8 control/status bits per channel.

The controller only uses the 8 control/status bits internally for configuration/parameterization (e.g., via WAGO-I/O-*CHECK*).

Therefore, only the 16-bit measurement values for each channel are in Intel format and are mapped by word in the output process image for the controller.

When digital output modules are also present in the node, the analog output data is always mapped into the Output Process Image in front of the digital data.

**Information**

**Information on the structure of control and status bytes**
For detailed information on the structure of a particular I/O module's control/status bytes, please refer to that module's manual. Manuals for each module can be found on the Internet at www.wago.com.

### 16.2.4.1 2 Channel Analog Output Modules

750-550, -552, -554, -556, -560, -562, 563, -585, -586, (and all variations),
753-550, -552, -554, -556

Table 247: 2 Channel Analog Output Modules

| Output Process Image | | | |
|---|---|---|---|
| Offset | Byte Destination | | Description |
| | High Byte | Low Byte | |
| 0 | D1 | D0 | Output Value Channel 1 |
| 1 | D3 | D2 | Output Value Channel 2 |

### 16.2.4.2 4 Channel Analog Output Modules

750-553, -555, -557, -559,
753-553, -555, -557, -559

Table 248: 4 Channel Analog Output Modules

| Output Process Image | | | |
|---|---|---|---|
| Offset | Byte Destination | | Description |
| | High Byte | Low Byte | |
| 0 | D1 | D0 | Output Value Channel 1 |
| 1 | D3 | D2 | Output Value Channel 2 |
| 2 | D5 | D4 | Output Value Channel 3 |
| 3 | D7 | D6 | Output Value Channel 4 |

## 16.2.5 Specialty Modules

WAGO has a host of Specialty I/O modules that perform various functions. With individual modules beside the data bytes also the control/status byte is mapped in the process image.

The control/status byte is required for the bidirectional data exchange of the module with the higher-ranking control system. The control byte is transmitted from the control system to the module and the status byte from the module to the control system.
This allows, for example, setting of a counter with the control byte or displaying of overshooting or undershooting of the range with the status byte.

The control/status byte always is in the process image in the Low byte.



**Information**

**Information about the structure of the Control/Status byte**
For detailed information about the structure of a particular module's control/status byte, please refer to that module's manual. Manuals for each module can be found on the Internet under: www.wago.com.

### 16.2.5.1 Counter Modules

750-404, (and all variations except of /000-005),
753-404, -404/000-003

The above Counter Modules have a total of 5 bytes of user data in both the Input and Output Process Image (4 bytes of counter data and 1 byte of control/status). The counter value is supplied as 32 bits. The following tables illustrate the Input and Output Process Image, which has a total of 3 words mapped into each image. Word alignment is applied.

Table 249: Counter Modules 750-404, (and all variations except of /000-005), 753-404, -404/000-003

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | S | Status byte |
| 1 | D1 | D0 | Counter value |
| 2 | D3 | D2 | |

| Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | C | Control byte |
| 1 | D1 | D0 | Counter setting value |
| 2 | D3 | D2 | |

750-404/000-005,
753-404/000-005

The above Counter Modules have a total of 5 bytes of user data in both the Input and Output Process Image (4 bytes of counter data and 1 byte of control/ status). The two counter values are supplied as 32 bits. The following tables illustrate the Input and Output Process Image, which has a total of 3 words mapped into each image. Word alignment is applied.

Table 250: Counter Modules 750-404/000-005, 753-404/000-005

| **Input Process Image** | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | S | Status byte |
| 1 | D1 | D0 | Counter Value of Counter 1 |
| 2 | D3 | D2 | Counter Value of Counter 2 |

| **Output Process Image** | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | C | Control byte |
| 1 | D1 | D0 | Counter Setting Value of Counter 1 |
| 2 | D3 | D2 | Counter Setting Value of Counter 2 |

750-633

The above Counter Module has a total of 5 bytes of user data in both the Input and Output Process Image (4 bytes of counter data and 1 byte of control/ status). The following tables illustrate the Input and Output Process Image, which has a total of 3 words mapped into each image. Word alignment is applied.
The meaning of the output data depends on the set operating mode:

1 Up counter with enable input
2 Up/down counter with U/D input
3 Frequency counter
4 Gate time counter

Table 251: Counter Modules 750-633

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | S | Status byte |
| 1 | D1 | D0 | Counter Value |
| 2 | D3 | D2 | |

| Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | C | Control byte |
| 1 | D1 | D0 | Counter Setting Value [1,2)]<br>watchdog time [3)]<br>reserved [4)] |
| 2 | D3 | D2 | Counter Setting Value [1,2)]<br>reserved [3)]<br>reserved [4)] |

[1,2)] Up counter with enable input, Up /down counter with U / D input
[3)] Frequency counter
[4)] Gate time counter

750-638,
753-638

The above Counter Modules have a total of 6 bytes of user data in both the Input and Output Process Image (4 bytes of counter data and 2 bytes of control/status). The two counter values are supplied as 16 bits. The following tables illustrate the Input and Output Process Image, which has a total of 4 words mapped into each image. Word alignment is applied.

Table 252: Counter Modules 750-638, 753-638

| Input Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | S0 | Status byte of Counter 1 |
| 1 | D1 | D0 | Counter Value of Counter 1 |
| 2 | - | S1 | Status byte of Counter 2 |
| 3 | D3 | D2 | Counter Value of Counter 2 |

| Output Process Image | | | |
|---|---|---|---|
| Offset | Byte Designation | | Description |
| | High Byte | Low Byte | |
| 0 | - | C0 | Control byte of Counter 1 |
| 1 | D1 | D0 | Counter Setting Value of Counter 1 |
| 2 | - | C1 | Control byte of Counter 2 |
| 3 | D3 | D2 | Counter Setting Value of Counter 2 |

### 16.2.5.2 Pulse Width Modules

750-511, (and all variations),
753-511

The above Pulse Width modules have a total of 6 bytes of user data in both the Input and Output Process Image (4 bytes of channel data and 2 bytes of control/ status). The two channel values are supplied as 16 bits. Each channel has its own control/status byte. The following table illustrates the Input and Output Process Image, which has a total of 4 words mapped into each image. Word alignment is applied.

Table 253: Pulse Width Modules 750-511, /xxx-xxx, 753-511

| Input and Output Process | | | |
|---|---|---|---|
| Offset | Byte Designation | | Description |
| | High Byte | Low Byte | |
| 0 | - | C0/S0 | Control/Status byte of Channel 1 |
| 1 | D1 | D0 | Data Value of Channel 1 |
| 2 | - | C1/S1 | Control/Status byte of Channel 2 |
| 3 | D3 | D2 | Data Value of Channel 2 |

### 16.2.5.3 Serial Interface Modules with Alternative Data Format

750-650, (and the variations /000-002, -004, -006, -009, -010, -011, -012, -013),
750-651, (and the variations /000-001, -002, -003),
750-653, (and the variations /000-002, -007),
753-650, -653

**Note**

**The process image of the / 003-000-variants depends on the parameterized operating mode!**
With the freely parameterizable variations /003 000 of the serial interface modules, the desired operating mode can be set. Dependent on it, the process image of these modules is then the same, as from the appropriate variation.

The above Serial Interface Modules with alternative data format have a total of 4 bytes of user data in both the Input and Output Process Image (3 bytes of serial data and 1 byte of control/status). The following table illustrates the Input and

Output Process Image, which have a total of 2 words mapped into each image. Word alignment is applied.

Table 254: Serial Interface Modules with Alternative Data Format

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | D0 | C/S | Data byte | Control/status byte |
| 1 | D2 | D1 | Data bytes | |

### 16.2.5.4 Serial Interface Modules with Standard Data Format

750-650/000-001, -014, -015, -016,
750-651/000-001,
750-653/000-001, -006

The above Serial Interface Modules with Standard Data Format have a total of 6 bytes of user data in both the Input and Output Process Image (5 bytes of serial data and 1 byte of control/status). The following table illustrates the Input and Output Process Image, which have a total of 3 words mapped into each image. Word alignment is applied.

Table 255: Serial Interface Modules with Standard Data Format

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | D0 | C/S | Data byte | Control/status byte |
| 1 | D2 | D1 | Data bytes | |
| 2 | D4 | D3 | | |

### 16.2.5.5 Serial Interface Modules

750-652,
753-652

The size of the process image for the Serial Interface Module can be adjusted to 12, 24 or 48 bytes.
It consists of two status bytes (input) or control bytes (output) and the process data with a size of 6 to 46 bytes.

Thus, each Serial Interface Module uses between 8 and 48 bytes in the process image. The sizes of the input and output process images are always the same.

The process image sizes are set with the startup tool WAGO-I/O-*CHECK*.

Table 256: Serial Interface Modules 750-652, 753-652

| Input and Output Process Image | | | | | |
|---|---|---|---|---|---|
| **Process image size** | **Offset** | **Byte Designation** | | **Description** | |
| | | **High Byte** | **Low Byte** | | |
| 8 bytes | 0 | C1/S1 | C0/S0 | Control/Status byte C1/S1 | Control/Status byte C0/S0 |
| | 1 | D1 | D0 | Prozess data (6-46 bytes) | |
| | 2 | D3 | D2 | | |
| | 3 | D5 | D4 | | |
| 24 bytes* | 4 | D7 | D6 | | |
| | … | | | | |
| | 11 | D21 | D20 | | |
| 48 bytes | 12 | D23 | D22 | | |
| | … | | | | |
| | 23 | D45 | D44 | | |

*) Factory setting

### 16.2.5.6 Data Exchange Module

750-654, -654/000-001

The Data Exchange modules have a total of 4 bytes of user data in both the Input and Output Process Image. The following tables illustrate the Input and Output Process Image, which has a total of 2 words mapped into each image.
Word alignment is applied.

Table 257: Data Exchange Module 750-654, -654/000-001

| Input and Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | D1 | D0 | Data bytes |
| 1 | D3 | D2 | |

### 16.2.5.7 SSI Transmitter Interface Modules

750-630, and the variations /000-001, -002, -006, -008, -009, -011, -012, -013

**Note**

**The process image of the / 003-000-variants depends on the parameterized operating mode!**
The operating mode of the configurable /003-000 I/O module versions can be set. Based on the operating mode, the process image of these I/O modules is then the same as that of the respective version.

The above SSI Transmitter Interface modules have a total of 4 bytes of user data in the Input Process Image, which has 2 words mapped into the image.
Word alignment is applied.

Table 258: SSI Transmitter Interface Modules

| Input Process Image | | | |
|---|---|---|---|
| Offset | Byte Designation | | Description |
| | High Byte | Low Byte | |
| 0 | D1 | D0 | Data bytes |
| 1 | D3 | D2 | |

750-630/000-004, -005, -007

In the input process image, SSI transmitter interface modules with status occupy 5 usable bytes, 4 data bytes, and 1 additional status byte. A total of 3 words are assigned in the process image via word alignment.

Table 259: SSI Transmitter Interface I/O Modules with an Alternative Data Format (/000-004, -005, -007)

| Input Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Destination | | Description | |
| | High Byte | High Byte | | |
| 0 | - | S | not used | Status byte |
| 1 | D1 | D0 | Data bytes | |
| 2 | D3 | D2 | | |

### 16.2.5.8 Incremental Encoder Interface Modules

#### Incremental Encoder Interface Modules

750-631/000-004, -010, -011

The above Incremental Encoder Interface modules have 5 bytes of input data and 3 bytes of output data. The following tables illustrate the Input and Output Process Image, which have 4 words into each image. Word alignment is applied.

Table 260: Incremental Encoder Interface Modules 750-631/000-004, --010, -011

| Input Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Designation | | Description | |
| | High Byte | Low Byte | | |
| 0 | - | S | not used | Status byte |
| 1 | D1 | D0 | Counter word | |
| 2 | - | - | not used | |
| 3 | D4 | D3 | Latch word | |

| Output Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Designation | | Description | |
| | High Byte | Low Byte | | |
| 0 | - | C | not used | Control byte |
| 1 | D1 | D0 | Counter setting word | |
| 2 | - | - | not used | |
| 3 | - | - | not used | |

750-634

The above Incremental Encoder Interface module has 5 bytes of input data (6 bytes in cycle duration measurement mode) and 3 bytes of output data. The following tables illustrate the Input and Output Process Image, which has 4 words mapped into each image. Word alignment is applied.

Table 261: Incremental Encoder Interface Modules 750-634

| Input Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | S | not used | Status byte |
| 1 | D1 | D0 | Counter word | |
| 2 | - | (D2) *) | not used | (Periodic time) |
| 3 | D4 | D3 | Latch word | |

*) If cycle duration measurement mode is enabled in the control byte, the cycle duration is given as a 24-bit value that is stored in D2 together with D3/D4.

| Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | C | not used | Control byte |
| 1 | D1 | D0 | Counter setting word | |
| 2 | - | - | not used | |
| 3 | - | - | | |

750-637, (and all variations)

The above Incremental Encoder Interface Module has a total of 6 bytes of user data in both the Input and Output Process Image (4 bytes of encoder data and 2 bytes of control/status). The following table illustrates the Input and Output Process Image, which have 4 words mapped into each image. Word alignment is applied.

Table 262: Incremental Encoder Interface Modules 750-637, (and all variations)

| Input and Output Process Image | | | |
|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** |
| | **High Byte** | **Low Byte** | |
| 0 | - | C0/S0 | Control/Status byte of Channel 1 |
| 1 | D1 | D0 | Data Value of Channel 1 |
| 2 | - | C1/S1 | Control/Status byte of Channel 2 |
| 3 | D3 | D2 | Data Value of Channel 2 |

**Digital Pulse Interface module**

750-635,
753-635

The above Digital Pulse Interface module has a total of 4 bytes of user data in both the Input and Output Process Image (3 bytes of module data and 1 byte of control/status). The following table illustrates the Input and Output Process Image, which have 2 words mapped into each image. Word alignment is applied.

Table 263: Digital Pulse Interface Modules 750-635, 753-635

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Designation | | Description | |
| | High Byte | Low Byte | | |
| 0 | D0 | C0/S0 | Data byte | Control/status byte |
| 1 | D2 | D1 | Data bytes | |

### 16.2.5.9 DC-Drive Controller

750-636, -636/000-700, -636/000-800

The DC-Drive Controller maps 6 bytes into both the input and output process image. The data sent and received are stored in up to 4 input and output bytes (D0 ... D3). Two control bytes (C0, C1) and two status bytes (S0/S1) are used to control the I/O module and the drive.

In addition to the position data in the input process image (D0 … D3), it is possible to display extended status information (S2 … S5). Then the three control bytes (C1 … C3) and status bytes (S1 … S3) are used to control the data flow.

Bit 3 of control byte C1 (C1.3) is used to switch between the process data and the extended status bytes in the input process image (Extended Info_ON). Bit 3 of status byte S1 (S1.3) is used to acknowledge the switching process.

Table 264: DC-Drive Controller 750-636, -636/000-700, -636/000-800

| Input Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Designation | | Description | |
| | High Byte | Low Byte | | |
| 0 | S1 | S0 | Status byte S1 | Status byte S0 |
| 1 | D1*) / S3**) | D0*) / S2**) | Actual position*) / Extended status byte S3**) | Actual position (LSB) / Extended status byte S2**) |
| 2 | D3*) / S5**) | D2*) / S4**) | Actual position (MSB) / Extended status byte S3**) | Actual position*) / Extended status byte S4**) |

*) ExtendedInfo_ON = ‘0’.
**) ExtendedInfo_ON = ‘1’.

| Output Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Designation | | Description | |
| | High Byte | Low Byte | | |
| 0 | C1 | C0 | Control byte C1 | Control byte C0 |
| 1 | D1 | D0 | Setpoint position | Setpoint position (LSB) |
| 2 | D3 | D2 | Setpoint position (MSB) | Setpoint position |

### 16.2.5.10 Stepper Controller

750-670, -671, -672

The Stepper controller provides the fieldbus coupler/controller 12 bytes input and output process image via 1 logical channel. The data to be sent and received are stored in up to 7 output bytes (D0 … D6) and 7 input bytes (D0 … D6), depending on the operating mode.

Output byte D0 and input byte D0 are reserved and have no function assigned.

One I/O module control and status byte (C0, S0) and 3 application control and status bytes (C1 ... C3, S1 ... S3) provide the control of the data flow.

Switching between the two process images is conducted through bit 5 in the control byte (C0 (C0.5). Activation of the mailbox is acknowledged by bit 5 of the status byte S0 (S0.5).

Table 265: Stepper Controller 750-670, -671, -672

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| Offset | Byte Designation | | Description | |
| | High Byte | Low Byte | | |
| 0 | Reserviert | C0/S0 | reserved | Control/Status byte C0/S0 |
| 1 | D1 | D0 | Process data*) / Mailbox**) | |
| 2 | D3 | D2 | | |
| 3 | D5 | D4 | | |
| 4 | S3 | D6 | Control/Status byte C3/S3 | Process data*) / reserved**) |
| 5 | C1/S1 | C2/S2 | Control/Status byte C1/S1 | Control/Status byte C2/S2 |

*) Cyclic process image (Mailbox disabled)

**) Mailbox process image (Mailbox activated)

### 16.2.5.11 RTC Module

750-640

The RTC Module has a total of 6 bytes of user data in both the Input and Output Process Image (4 bytes of module data and 1 byte of control/status and 1 byte ID for command). The following table illustrates the Input and Output Process Image, which have 3 words mapped into each image. Word alignment is applied.

Table 266: RTC Module 750-640

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | ID | C/S | Command byte | Control/status byte |
| 1 | D1 | D0 | Data bytes | |
| 2 | D3 | D2 | | |

### 16.2.5.12 DALI Multi-Master Module

753-647

The DALI Multi-Master module occupies a total of 24 bytes in the input and output range of the process image.

The DALI Multi-Master module can be operated in "Easy" mode (default) and "Full" mode. "Easy" mode is used to transmit simply binary signals for lighting control. Configuration or programming via DALI master module is unnecessary in "Easy" mode.

Changes to individual bits of the process image are converted directly into DALI commands for a pre-configured DALI network. 22 bytes of the 24-byte process image can be used directly for switching of electronic ballasts (ECG), groups or scenes in "Easy" mode. Switching commands are transmitted via DALI and group addresses, where each DALI and each group address is represented by a 2-bit pair.

In full mode, the 24 bytes of the process image are used to tunnel a protocol using a mailbox interface. The process image consists of 1 byte for control / status and 23 bytes for the acyclic data.

The structure of the process data is described in detail in the following tables.

Table 267: DALI Multi-Master Module 753-647 in the "Easy" Mode

| Input Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Note** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | S | res. | Status, activate broadcast<br>Bit 0: 1-/2-button mode<br>Bit 2: Broadcast status ON/OFF<br>Bit 1,3-7: - |
| 1 | DA4…DA7 | DA0…DA3 | Bit pair for DALI address DA0:<br>Bit 1: Bit set = ON<br>Bit not set = OFF<br>Bit 2: Bit set = Error<br>Bit not set = No error<br>Bit pairs DA1 … DA63 similar to DA0. | |
| 2 | DA12…DA15 | DA8…DA11 | | |
| 3 | DA20…DA23 | DA16…DA19 | | |
| 4 | DA28…DA31 | DA24…DA27 | | |
| 5 | DA36…DA39 | DA32…DA35 | | |
| 6 | DA44…DA47 | DA40…DA43 | | |
| 7 | DA52…DA55 | DA48…DA51 | | |
| 8 | DA60…DA63 | DA56…DA59 | | |
| 9 | GA4…GA7 | GA0…GA3 | Bit pair for DALI group address GA0:<br>Bit 1: Bit set = ON<br>Bit not set = OFF<br>Bit 2: Bit set = Error<br>Bit not set = No error<br>Bit pairs GA1 … GA15 similar to GA0. | |
| 10 | GA12…GA15 | GA8…GA11 | | |
| 11 | - | - | Not used | |

DA = DALI address
GA = Group address

| Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Note** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | C | res. | Bit 0: Broadcast ON<br>Bit 1: Broadcast OFF<br>Bit 2: (1 button operation):<br>- short: Broadcast ON/OFF<br>- long: Broadcast dimming brighter/darker<br>Bit 2: (2 buttons operation):<br>- short: Broadcast ON/OFF<br>- long: Broadcast dimming brighter<br>Bit 3: (1 button operation):<br>Broadcast ON/OFF<br>Bit 3: (2 buttons operation):<br>- short: Broadcast ON/OFF<br>- long: Broadcast dimming darker<br>Bit 4: Watchdog toggling (starting from FW06 of the DALI Multi-Master)<br>Bit 5…7: reserved |
| 1 | DA4…DA7 | DA0…DA3 | Bit pair for DALI address:<br>Bit 1 (1 button operation):<br>- short: DA switch ON/OFF<br>- long: dimming brighter/darker<br>Bit 1 (2 buttons operation):<br>- short: DA switch ON<br>- long: dimming brighter<br>Bit 2 (1 button operation):<br>DA switch ON/OFF<br>Bit 2 (2 buttons operation):<br>- short: DA switch OFF<br>- long: dimming darker | |
| 2 | DA12…DA15 | DA8…DA11 | | |
| 3 | DA20…DA23 | DA16…DA19 | | |
| 4 | DA28…DA31 | DA24…DA27 | | |
| 5 | DA36…DA39 | DA32…DA35 | | |
| 6 | DA44…DA47 | DA40…DA43 | | |
| 7 | DA52…DA55 | DA48…DA51 | | |
| 8 | DA60…DA63 | DA56…DA59 | | |
| 9 | GA4…GA7 | GA0…GA3 | Bit pair for DALI group address:<br>Bit 1 (1 button operation):<br>- short: GA switch ON/OFF<br>- long: dimming brighter/darker<br>Bit 1 (2 buttons operation):<br>- short: GA switch ON<br>- long: dimming brighter<br>Bit 2 (1 button operation):<br>GA switch ON/OFF<br>Bit 2 (2 buttons operation):<br>- short: GA switch OFF<br>- long: dimming darker | |
| 10 | GA12…GA15 | GA8…GA11 | | |
| 11 | Bit 8…15 | Bit 0…7 | Switch scene 0…15 | |

DA = DALI address
GA = Group address

Table 268: DALI Multi-Master Module 753-647 in the "Full" Mode

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Note** | |
| | **High Byte** | **Low Byte** | | |
| 0 | MBX_C/S | C0/S0 | Mailbox control/status byte | control/status byte |
| 1 | MBX1 | MBX0 | Mailbox | |
| 2 | MBX3 | MBX2 | | |
| 3 | MBX5 | MBX4 | | |
| 4 | MBX7 | MBX6 | | |
| 5 | MBX9 | MBX8 | | |
| 6 | MBX11 | MBX10 | | |
| 7 | MBX13 | MBX12 | | |
| 8 | MBX15 | MBX14 | | |
| 9 | MBX17 | MBX16 | | |
| 10 | MBX19 | MBX18 | | |
| 11 | MBX21 | MBX20 | | |

### 16.2.5.13 LON® FTT Module

753-648

The process image of the LON® FTT module consists of a control/status byte and 23 bytes of bidirectional communication data that is processed by the WAGO-I/O-*PRO* function block "LON_01.lib". This function block is essential for the function of the LON® FTT module and provides a user interface on the control side.

Table 269: LON® FTT Module 753-648

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Designation** | | **Note** | |
| | **High Byte** | **Low Byte** | | |
| 0 | MBX_C/S | C0/S0 | Mailbox control/status byte | control/status byte |
| 1 | MBX1 | MBX0 | Mailbox | |
| 2 | MBX3 | MBX2 | | |
| 3 | MBX5 | MBX4 | | |
| 4 | MBX7 | MBX6 | | |
| 5 | MBX9 | MBX8 | | |
| 6 | MBX11 | MBX10 | | |
| 7 | MBX13 | MBX12 | | |
| 8 | MBX15 | MBX14 | | |
| 9 | MBX17 | MBX16 | | |
| 10 | MBX19 | MBX18 | | |
| 11 | MBX21 | MBX20 | | |

### 16.2.5.14 EnOcean Radio Receiver

750-642

The EnOcean radio receiver has a total of 4 bytes of user data in both the Input and Output Process Image (3 bytes of module data and 1 byte of control/status). The following tables illustrate the Input and Output Process Image, which have 2 words mapped into each image. Word alignment is applied.

Table 270: EnOcean Radio Receiver 750-642

| Input Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | D0 | S | Data byte | Status byte |
| 1 | D2 | D1 | Data bytes | |

| Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | C | not used | Control byte |
| 1 | - | - | not used | |

### 16.2.5.15 MP Bus Master Module

750-643

The MP Bus Master Module has a total of 8 bytes of user data in both the Input and Output Process Image (6 bytes of module data and 2 bytes of control/status). The following table illustrates the Input and Output Process Image, which have 4 words mapped into each image. Word alignment is applied.

Table 271: MP Bus Master Module 750-643

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | C1/S1 | C0/S0 | Extended Control/ Status byte | Control/status byte |
| 1 | D1 | D0 | Data bytes | |
| 2 | D3 | D2 | | |
| 3 | D5 | D4 | | |

### 16.2.5.16 *Bluetooth*® RF-Transceiver

750-644

The size of the process image for the *Bluetooth*® module can be adjusted to 12, 24 or 48 bytes.
It consists of one control byte (input) or status byte (output); an empty byte; an overlay able mailbox with a size of 6, 12 or 18 bytes (mode 2); and the *Bluetooth*® process data with a size of 4 to 46 bytes.
Thus, each *Bluetooth*® module uses between 12 and 48 bytes in the process image. The sizes of the input and output process images are always the same.

The first byte contains the control/status byte; the second contains an empty byte.

Process data attach to this directly when the mailbox is hidden. When the mailbox is visible, the first 6, 12 or 18 bytes of process data are overlaid by the mailbox data, depending on their size. Bytes in the area behind the optionally visible mailbox contain basic process data. The internal structure of the *Bluetooth*® process data can be found in the documentation for the *Bluetooth*® 750-644 RF Transceiver.

The mailbox and the process image sizes are set with the startup tool WAGO-I/O-*CHECK*.

Table 272: *Bluetooth*® RF-Transceiver 750-644

| Input and Output Process Image | | | | | |
|---|---|---|---|---|---|
| **Process image size** | **Offset** | **Byte Destination** | | **Description** | |
| | | **High Byte** | **Low Byte** | | |
| 12 bytes | 0 | - | C0/S0 | not used | Control/status byte |
| | 1 | D1 | D0 | Mailbox (0, 6, 12 or 18 words)/ Process data (4 … 46 words) | |
| | … | … | … | | |
| | 5 | D9 | D8 | | |
| 24 bytes | 6 | D11 | D10 | | |
| | … | … | … | | |
| | 11 | D21 | D20 | | |
| 48 bytes*) | 12 | D23 | D22 | | |
| | ... | ... | ... | | |
| | 23 | D45 | D44 | | |

*) Factory Setting

### 16.2.5.17 Vibration Velocity/Bearing Condition Monitoring VIB I/O

750-645

The Vibration Velocity/Bearing Condition Monitoring VIB I/O has a total of 12 bytes of user data in both the Input and Output Process Image (8 bytes of module data and 4 bytes of control/status). The following table illustrates the Input and Output Process Image, which have 8 words mapped into each image. Word alignment is applied.

Table 273: Vibration Velocity/Bearing Condition Monitoring VIB I/O 750-645

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | C0/S0 | not used | Control/status byte (log. Channel 1, Sensor input 1) |
| 1 | D1 | D0 | Data bytes (log. Channel 1, Sensor input 1) | |
| 2 | - | C1/S1 | not used | Control/status byte (log. Channel 2, Sensor input 2) |
| 3 | D3 | D2 | Data bytes (log. Channel 2, Sensor input 2) | |
| 4 | - | C2/S2 | not used | Control/status byte (log. Channel 3, Sensor input 1) |
| 5 | D5 | D4 | Data bytes (log. Channel 3, Sensor input 3) | |
| 6 | - | C3/S3 | not used | Control/status byte (log. Channel 4, Sensor input 2) |
| 7 | D7 | D6 | Data bytes (log. Channel 4, Sensor input 2) | |

### 16.2.5.18 KNX/EIB/TP1 Module

753-646

The KNX/TP1 module appears in router and device mode with a total of 24-byte user data within the input and output area of the process image, 20 data bytes and 2 control/status bytes. Even though the additional bytes S1 or C1 are transferred as data bytes, they are used as extended status and control bytes. The opcode is used for the read/write command of data and the triggering of specific functions of the KNX/EIB/TP1 module. Word-alignment is used to assign 12 words in the process image. Access to the process image is not possible in router mode. Telegrams can only be tunneled.

In device mode, access to the KNX data can only be performed via special function blocks of the IEC application. Configuration using the ETS engineering tool software is required for KNX.

Table 274: KNX/EIB/TP1 Module 753-646

| Input and Output Process Image | | | | |
|---|---|---|---|---|
| **Offset** | **Byte Destination** | | **Description** | |
| | **High Byte** | **Low Byte** | | |
| 0 | - | C0/S0 | not used | Control/Status byte |
| 1 | C1/S1 | OP | extended Control/Status byte | Opcode |
| 2 | D1 | D0 | Data byte 1 | Data byte 0 |
| 3 | D3 | D2 | Data byte 3 | Data byte 2 |
| 4 | D5 | D4 | Data byte 5 | Data byte 4 |
| 5 | D7 | D6 | Data byte 7 | Data byte 6 |
| 6 | D9 | D8 | Data byte 9 | Data byte 8 |
| 7 | D11 | D10 | Data byte 11 | Data byte 10 |
| 8 | D13 | D12 | Data byte 13 | Data byte 12 |
| 9 | D15 | D14 | Data byte 15 | Data byte 14 |
| 10 | D17 | D16 | Data byte 17 | Data byte 16 |
| 11 | D19 | D18 | Data byte 19 | Data byte 18 |

### 16.2.5.19 AS-interface Master Module

750-655,
753-655

The length of the process image of the AS-interface master module can be set to fixed sizes of 12, 20, 24, 32, 40 or 48 bytes.
It consists of a control or status byte, a mailbox with a size of 0, 6, 10, 12 or 18 bytes and the AS-interface process data, which can range from 0 to 46 bytes.

The AS-interface master module has a total of 6 to maximally 24 words data in both the Input and Output Process Image. Word alignment is applied.

The first Input and output word, which is assigned to an AS-interface master module, contains the status / control byte and one empty byte.

Subsequently the mailbox data are mapped, when the mailbox is permanently superimposed (Mode 1).

In the operating mode with suppressible mailbox (Mode 2), the mailbox and the cyclical process data are mapped next.
The following words contain the remaining process dat.

The mailbox and the process image sizes are set with the startup tool WAGO-I/O-*CHECK*.

Table 275: AS-interface Master Module 750-655, 753-655

| **Input and Output Process Image** | | | | | |
|---|---|---|---|---|---|
| **Process image size** | **Offset** | **Byte Designation** | | **Description** | |
| | | **High Byte** | **Low Byte** | | |
| 12 bytes | 0 | - | C0/S0 | Not used | Control-/ Status byte |
| | 1 | D1 | D0 | Mailbox (0, 6, 10, 12 or 18 bytes)/ Process data (0-46 bytes) | |
| | … | | | | |
| | 5 | D9 | D8 | | |
| 20 bytes | 6 | D11 | D10 | | |
| | … | | | | |
| | 9 | D17 | D16 | | |
| 24 bytes * | 10 | D19 | D18 | | |
| | 11 | D21 | D20 | | |
| 32 bytes | 12 | D23 | D22 | | |
| | … | | | | |
| | 15 | D29 | D28 | | |
| 40 bytes | 16 | D31 | D30 | | |
| | … | | | | |
| | 19 | D37 | D36 | | |
| 48 bytes | 12 | D39 | D38 | | |
| | … | | | | |
| | 23 | D45 | D44 | | |

*) Factory Setting

## 16.2.6 System Modules

### 16.2.6.1 System Modules with Diagnostics

750-606

The modules provide 2 bits of diagnostics in the Input Process Image for monitoring of the internal power supply.

Table 276: System Modules with Diagnostics 750-606, -611

| Input Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | | | Diagnostics bit S_out | Diagnostics bit S_in |

750-610, -611

The modules provide 2 bits of diagnostics in the Input Process Image for monitoring of the internal power supply.

Table 277: System Modules with Diagnostics 750-610, -611

| Input Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bit 7** | **Bit 6** | **Bit 5** | **Bit 4** | **Bit 3** | **Bit 2** | **Bit 1** | **Bit 0** |
| | | | | | | Diagnostics bit S 2 Fuse | Diagnostics bit S 1 Fuse |

### 16.2.6.2 Filter Module

750-624/020-002, -626/020-002

The Filter Module 750-624/020-002 and 750-626/020-002 equipped with surge suppression for the field side power supply have a total of 8 bits in both the Input and Output Process Image.

Table 278: Filter Modules 750-624/020-002, 750-626/020-002

| Input Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| 0V_MA | 0V_PA | 24V_MA | 24V_PA | not used | PWR_DIAG | not used | VAL |

| Output Process Image | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| not used | not used | not used | not used | not used | not used | not used | GFT |

### 16.2.6.3 Binary Space Module

750-622

The Binary Space Modules behave alternatively like 2 channel digital input modules or output modules and seize depending upon the selected settings 1, 2, 3 or 4 bits per channel. According to this, 2, 4, 6 or 8 bits are occupied then either in the process input or the process output image.

Table 279: Binary Space Module 750-622 (with Behavior like 2 Channel Digital Input)

| **Input and Output Process Image** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| (Data bit DI 8) | (Data bit DI 7) | (Data bit DI 6) | (Data bit DI 5) | (Data bit DI 4) | (Data bit DI 3) | Data bit DI 2 | Data bit DI 1 |

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