WAGO-I/O-SYSTEM 750 XTR
Manual

750-xxxx/0040-xxxx
Design Notes /XTR
Guidelines and Recommendations
for Increasing Operational Safety
Version 1.2.0
Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

E-Mail: documentation@wago.com

We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.
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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 WAGO-I/O-SYSTEM 750 XTR series.

The WAGO-I/O-SYSTEM 750 XTR shall only be installed and operated according to the instructions in this system description and the manuals for the used fieldbus coupler/controller and I/O modules.

**NOTICE**
Consider power layout of the WAGO-I/O-SYSTEM 750 XTR!
In addition to these operating instructions, you will also need the manual for the used fieldbus coupler/controller and I/O modules, which can be downloaded at [www.wago.com](http://www.wago.com). There, you can obtain important information including information on electrical isolation, system power and supply specifications.

1.2 Copyright

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.
1.3 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).
1.4 Number Notation

Table 1: Number Notation

<table>
<thead>
<tr>
<th>Number Code</th>
<th>Example</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decimal</td>
<td>100</td>
<td>Normal notation</td>
</tr>
<tr>
<td>Hexadecimal</td>
<td>0x64</td>
<td>C notation</td>
</tr>
<tr>
<td>Binary</td>
<td>'100'</td>
<td>In quotation marks, nibble separated with dots (.)</td>
</tr>
<tr>
<td></td>
<td>'0110.0100'</td>
<td></td>
</tr>
</tbody>
</table>

1.5 Font Conventions

Table 2: Font Conventions

<table>
<thead>
<tr>
<th>Font Type</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>italic</td>
<td>Names of paths and data files are marked in italic-type. e.g.: C:\Program Files\WAGO Software</td>
</tr>
<tr>
<td>Menu</td>
<td>Menu items are marked in bold letters. e.g.: Save</td>
</tr>
<tr>
<td>&gt;</td>
<td>A greater-than sign between two names means the selection of a menu item from a menu. e.g.: File &gt; New</td>
</tr>
<tr>
<td>Input</td>
<td>Designation of input or optional fields are marked in bold letters, e.g.: Start of measurement range</td>
</tr>
<tr>
<td>“Value”</td>
<td>Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under Start of measurement range</td>
</tr>
<tr>
<td>[Button]</td>
<td>Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: [Input]</td>
</tr>
<tr>
<td>[Key]</td>
<td>Keys are marked with bold letters in square brackets. e.g.: [F5]</td>
</tr>
</tbody>
</table>
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 Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik 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 WAGO-I/O-SYSTEM 750 in Compliance with Underlying Provisions

Fieldbus couplers, fieldbus 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 programmable controllers, the signals can also be (pre-) processed.

The devices have been developed for use in an environment that meets the IP20 protection class criteria. Protection against finger injury and solid impurities up to 12.5 mm diameter is assured; protection against water damage is not ensured. Unless otherwise specified, operation of the devices in wet and dusty environments is prohibited.

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

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. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of devices.

Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik 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 the device only in appropriate housings, cabinets or in electrical operation rooms!
The WAGO-I/O-SYSTEM 750 and its components are an open system. As such, install the system and its components exclusively in appropriate housings, cabinets or in electrical operation rooms. Allow access to such equipment and fixtures to authorized, qualified staff only by means of specific keys or tools.

---

**DANGER**

Only connect or disconnect lines when power is safely isolated!
The lines to the device can carry hazardous voltages and currents. Contact with the lines when live can result in severe injury or death. Therefore, read and observe the following safety rules before you perform work on the device:

1. Disconnect the respective system component from the power supply.
2. Secure the system component against unintentional restart.
3. Check if the voltage is positively isolated.

---

**CAUTION**

Hot surface!
The surface of the housing can become hot during operation. If the device was operated at high ambient temperatures, allow it to cool off before touching it.

---

**NOTICE**

Replace defective or damaged devices!
Replace defective or damaged device/module (e.g., in the event of deformed contacts), since the long-term functionality of device/module involved can no longer be ensured.
**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 soiled contacts using oil-free compressed air or with ethyl alcohol and leather cloths.

**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.

**NOTICE**

Perform insulation tests with direct current (DC)!
Both the supply voltage and control voltage side are capacitively coupled to the DIN rail. If the modules are mounted on the DIN rail, application of an AC voltage between the two potentials can lead to the destruction of the device. Use only direct current (DC) for insulation testing. To avoid destroying the device, discharge the device completely before applying the test voltage again.
3 System Description

The 750 XTR Series is part of the WAGO-I/O-SYSTEM 750.

The WAGO-I/O-SYSTEM 750 is a modular, fieldbus-independent input/output system (I/O system). The configuration described here consists of a fieldbus coupler/controller (1) and the modular I/O modules (2) for any signal shapes that form the fieldbus node together. The end module (3) completes the node and is required for correct operation of the fieldbus node.

![Figure 1: Fieldbus Node (Example)](image)

Fieldbus couplers/controllers are available for different fieldbus systems.

The standard fieldbus couplers/controllers contain the fieldbus interface, electronics and a power supply terminal. The fieldbus interface forms the physical interface to the relevant fieldbus. The electronics process the data of the I/O modules and make it available for the fieldbus communication. The 24 V system supply and the 24 V field supply are fed in via the integrated power supply terminal.

The fieldbus coupler/controller exchanges process data with the respective control via the respective fieldbus. The programmable fieldbus controllers (PFC) allow implementation of additional PLC functions. WAGO-I/O-PRO is used to program the fieldbus controllers according to IEC 61131-3.

I/O modules for diverse digital and analog I/O signals as well as special functions can be connected to the fieldbus coupler/controller. The communication between the fieldbus coupler/controller and the I/O modules is carried out via an internal bus.

The components of the WAGO-I/O-SYSTEM 750 have clear termination points, light emitting diodes for status display, plug-in mini WSB tags and group marker cards for labeling.

The 1, 2 or 3 wire technology supplemented by a ground wire connection allows for direct sensor or actuator wiring.
The distinctiveness of the 750 XTR Series lies in its area of application in extreme environmental conditions. It is extremely temperature-resistant, immune to interference, as well as insensitive to vibrations and impulse voltages. The components of the 750 XTR Series are easily recognizable by their dark-gray housing color.
3.1 Manufacturing Number

The serial number indicates the delivery status directly after production. This number is part of the labeling on the side of each component.

In addition, the serial number is printed on the cover cap of the configuration and programming interface of the fieldbus coupler/controller, so that it can also be read when installed.

![Marking Area for Serial Numbers](image)

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…

<table>
<thead>
<tr>
<th>01</th>
<th>14</th>
<th>01</th>
<th>01</th>
<th>01</th>
<th>(additional positions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW</td>
<td>YY</td>
<td>FW</td>
<td>HW</td>
<td>FL</td>
<td>Internal information</td>
</tr>
</tbody>
</table>

Calendar week | Year | Firmware version | Hardware version | Firmware loader version |

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.
3.2 Component Update

For the case of an update of one component, the lateral marking on each component contains a prepared matrix.

This matrix makes columns available for altogether three updates to the entry of the current update data, like production order number (NO), update date (DS), software version (SW), hardware version (HW) and the firmware loader version (FWL, if available).

<table>
<thead>
<tr>
<th>Current Version data for</th>
<th>1. Update</th>
<th>2. Update</th>
<th>3. Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Order Number</td>
<td>NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Datestamp</td>
<td>DS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software index</td>
<td>SW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware index</td>
<td>HW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firmware loader index</td>
<td>FWL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the update of a component took place, the current version data are registered into the columns of the matrix.

Additionally with the update of a fieldbus coupler or controller also the cover of the configuration and programming interface of the fieldbus coupler or fieldbus controller is printed on with the current manufacturing and production order number.

The original manufacturing data on the housing of the component remain thereby.

3.3 Storage, Assembly and Transport

Whenever possible, the components are to be stored in their original packaging. Likewise, the original packaging provides optimal protection during transport.

When assembling or repacking the components, the contacts must not be soiled or damaged. The components must be stored and transported in appropriate containers/packaging. Thereby, the ESD information is to be regarded.

3.4 Assembly Guidelines/Standards

- DIN 60204 Electrical equipment of machines
- DIN EN 50178 Electronic equipment for use in power installations (replacement for VDE 0160)
- EN 60439 Low-voltage switchgear and controlgear assemblies
3.5 **Technical Data**

### Note

Refer to the relevant manuals for current values!
If the technical data of components differ from the values described here, the technical data shown in the manuals of the respective components shall be valid.

#### 3.5.1 Mechanics

Table 3: Technical Data – Mechanics

<table>
<thead>
<tr>
<th>Material</th>
<th>Polycarbonate, polyamide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions W × H × D:</td>
<td></td>
</tr>
<tr>
<td>Fieldbus coupler/controller (standard)</td>
<td>51 mm × 65 mm × 100 mm</td>
</tr>
<tr>
<td>Fieldbus coupler/controller (ECO)</td>
<td>50 mm × 65 mm × 100 mm</td>
</tr>
<tr>
<td>Fieldbus coupler (expanded ECO)</td>
<td>62 mm × 65 mm × 100 mm</td>
</tr>
<tr>
<td>PLC - Controller (PFC200)</td>
<td>79 mm × 65 mm × 100 mm</td>
</tr>
<tr>
<td></td>
<td>112 mm × 65 mm × 100 mm</td>
</tr>
<tr>
<td>I/O module, single</td>
<td>12 mm × 62 mm × 100 mm</td>
</tr>
<tr>
<td>I/O module, double</td>
<td>24 mm × 62 mm × 100 mm</td>
</tr>
<tr>
<td>I/O module, quadruple</td>
<td>48 mm × 62 mm × 100 mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>On TS 35 with locking</td>
</tr>
<tr>
<td>stackable due to</td>
<td>Double slot and key connection</td>
</tr>
<tr>
<td>Mounting position</td>
<td>Any</td>
</tr>
<tr>
<td>Marking</td>
<td>Standard labels and labels for labeling holders</td>
</tr>
<tr>
<td>Protection type</td>
<td>IP20</td>
</tr>
</tbody>
</table>

*) From upper-edge of DIN 35 rail

#### 3.5.2 Electrical Safety

Table 4: Technical Data – Electrical Safety

<table>
<thead>
<tr>
<th>Clearance/creepage distances</th>
<th>Acc. EN 60255-5, EN 60664-1, EN 50178, IEEE C37.90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution degree</td>
<td>2</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>III</td>
</tr>
<tr>
<td>Rated voltage AC/ DC $U_B$</td>
<td>$&lt; 50$ V $50$ V $&lt; U_B &lt; 250$ V</td>
</tr>
<tr>
<td>Test voltage</td>
<td>775 VDC $3.5$ kVDC</td>
</tr>
<tr>
<td>Rated surge voltage</td>
<td>1 kV (EN 60870-2-1 / Class VW1) $5$ kV (EN 60870-2-1 / Class VW3)</td>
</tr>
</tbody>
</table>
3.5.3 Connection Type

Table 5: Technical Data – Field Wiring

<table>
<thead>
<tr>
<th>Wire connection</th>
<th>CAGE CLAMP® / Push-in CAGE CLAMP®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross section</td>
<td>0.25 mm² … 2.5 mm², AWG 24 … 14 / 0.25 mm² … 1.5 mm², AWG 24 … 16</td>
</tr>
<tr>
<td>Stripped lengths</td>
<td>8 mm … 9 mm / 0.33 in</td>
</tr>
</tbody>
</table>

Table 6: Technical Data – Power Jumper Contacts

<table>
<thead>
<tr>
<th>Power jumper contacts</th>
<th>Blade/spring contact, self-cleaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage drop at I_{max.}</td>
<td>&lt; 1 V/64 modules</td>
</tr>
<tr>
<td>Current over power jumper contacts_{max.}</td>
<td>10 A</td>
</tr>
</tbody>
</table>

Table 7: Technical Data – Internal Bus

<table>
<thead>
<tr>
<th>Data contacts</th>
<th>Slide contact, hard gold plated, self-cleaning</th>
</tr>
</thead>
</table>

3.5.4 Climatic Environmental Conditions

Table 8: Technical Data – Climatic Environmental Conditions

| Operating temperature range | −40 °C … +70 °C |
| Storage temperature range   | −40 °C … +85 °C |
| Relative humidity 1)         | 95 %           |
| Elevation above sea level without temperature derating with temperature derating max. | 0 m … 2000 m |
|                            | 2000 m … 5000 m: 0.5 K per 100 m |
|                            | 5000 m         |
| Stress due to contaminants | Acc. IEC 60068-2-42 and IEC 60068-2-43 |
| Max. contaminant concentration at a relative humidity < 75% SO₂ | ≤ 25 ppm |
|                            | H₂S | ≤ 10 ppm |
| Special conditions          | The components may not be used without additional measures at locations in which dust, corrosive fumes, gases or ionized radiation can occur. |

1) Short-term condensation acc. class 3K7 / IEC EN 60721-3-3 (except wind-driven precipitation, water and ice formation) permitted
3.5.5 Residential Use

The system with the fieldbus coupler/controller meets the requirements for interference emissions in residential areas:

- **ETHERNET**
  - 750-352/040-000
  - 750-880/040-000
  - 750-880/040-001
  - 750-8202/040-000
  - 750-8202/040-001
  - 750-8206/040-000
  - 750-8206/040-001

- **CANopen**
  - 750-338/040-000
  - 750-838/040-000

With individual approval, the system can also be used for residential use (residential, business and commercial areas, small business) with other fieldbus couplers/controllers. The individual approval can be obtained from a governmental or testing agency. In Germany, the Federal Office for Post and Telecommunications and its extensions issue the individual approval.

Use of other fieldbus couplers/controllers is possible under certain conditions. Please contact WAGO Kontakttechnik GmbH & Co. KG.
3.5.6 Example Dimensions

Figure 3: Dimensions – Nodes with Fieldbus Coupler/Controller (Example)
4 Standards and Approvals

The WAGO-I/O-SYSTEM 750 XTR series was tested according to the following standards and guidelines. The test values are available in the manual of the respective I/O module or fieldbus coupler/controller:

Table 9: Climatic and Mechanical Environmental Conditions

<table>
<thead>
<tr>
<th>Range</th>
<th>Acc. Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental testing</td>
<td>EN 61131-2</td>
<td>Programmable logic controller, testing</td>
</tr>
<tr>
<td></td>
<td>EN 60721-3-1</td>
<td>Environmental conditions – long-term storage</td>
</tr>
<tr>
<td></td>
<td>EN 60721-3-3</td>
<td>Environmental conditions – stationary use, weather-protected</td>
</tr>
<tr>
<td></td>
<td>EN 60870-2-2</td>
<td>Telecontrol equipment – environmental conditions</td>
</tr>
<tr>
<td></td>
<td>EN 61850-3</td>
<td>Communication networks and systems in stations</td>
</tr>
<tr>
<td></td>
<td>IEEE 1613</td>
<td>Environmental and Testing Requirements in Power Substations</td>
</tr>
<tr>
<td></td>
<td>Shipbuilding</td>
<td>Systems for maritime shipping</td>
</tr>
</tbody>
</table>

Note

Compliance with the standards is component-dependent
Depending on the selected components, there may be limitations in the performance of individual EMC standards. Therefore, observe the section “Standards and Guidelines” in the manual of your I/O modules or fieldbus coupler/controller!
### Table 10: EMC

<table>
<thead>
<tr>
<th>Range</th>
<th>acc. standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC immunity to interference</td>
<td>EN 61000-6-1</td>
<td>EMC – Generic Standard – Immunity for residential environments</td>
</tr>
<tr>
<td></td>
<td>EN 61000-6-2</td>
<td>EMC – Generic Standard – Immunity for industrial environments</td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>EN 61131-2</td>
<td>Programmable logic controller – testing</td>
</tr>
<tr>
<td></td>
<td>EN 50121-3-2</td>
<td>EMC – Railway applications – Apparatus</td>
</tr>
<tr>
<td></td>
<td>EN 50121-4</td>
<td>Railway applications – EMC – Emission and immunity</td>
</tr>
<tr>
<td></td>
<td>EN 50121-5</td>
<td>Railway applications – EMC – Emission and immunity</td>
</tr>
<tr>
<td></td>
<td>EN 60255-26</td>
<td>Measuring relays and protection equipment – EMC</td>
</tr>
<tr>
<td></td>
<td>EN 60870-2-1</td>
<td>Telecontrol equipment – EMC</td>
</tr>
<tr>
<td></td>
<td>EN 61850-3</td>
<td>Communication networks and systems in stations – General requirements</td>
</tr>
<tr>
<td></td>
<td>IEC 61000-6-5</td>
<td>Immunity for power station and substation environments</td>
</tr>
<tr>
<td></td>
<td>IEEE 1613</td>
<td>Environmental and Testing Requirements in Power Substations</td>
</tr>
<tr>
<td></td>
<td>VDEW: 1994</td>
<td>Digital station technology – Recommendations</td>
</tr>
<tr>
<td>EMC emission of interference</td>
<td>EN 61000-6-3</td>
<td>EMC – Generic standard – Emission standard for residential environments</td>
</tr>
<tr>
<td></td>
<td>EN 61000-6-4</td>
<td>EMC – Generic standard – Emission standard for industrial environments</td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>EN 61131-2</td>
<td>Programmable logic controller – testing</td>
</tr>
<tr>
<td></td>
<td>EN 50121-3-2</td>
<td>EMC – Railway applications – Apparatus</td>
</tr>
<tr>
<td></td>
<td>EN 50121-4</td>
<td>Railway applications – EMC – Emission and immunity</td>
</tr>
<tr>
<td></td>
<td>EN 50121-5</td>
<td>Railway applications – EMC – Emission and immunity</td>
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<tr>
<td></td>
<td>EN 60255-26</td>
<td>Measuring relays and protection equipment – EMC</td>
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<td></td>
<td>EN 60870-2-1</td>
<td>Telecontrol equipment – EMC</td>
</tr>
<tr>
<td></td>
<td>EN 61850-3</td>
<td>Communication networks and systems in stations – General requirements</td>
</tr>
</tbody>
</table>
5 Assembly

5.1 Mounting Position

The following mounting positions are approved:

- Lying horizontal
- Standing horizontal
- Vertical

---

Note

Use an end stop in the case of vertical installation!
When installed vertically, also mount an end stop below the fieldbus node to protect the fieldbus node against sliding.

WAGO item number 249-116  end stop for TS 35, 6 mm wide
WAGO item number 249-117  end stop for TS 35, 10 mm wide

5.2 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 may not exceed 780 mm.
Also note the limitations of individual fieldbus couplers/controllers.
5.3 Mounting onto Carrier Rail

5.3.1 Carrier Rail Properties

All system components can be snapped directly onto a carrier rail in accordance with the European standard EN 50022 (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 electromagnetic 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 medal springs on the bottom of the housing must have low-impedance contact with the DIN rail (wide contact surface is possible).
5.3.2 WAGO DIN Rail

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

Table 11: WAGO DIN Rail

<table>
<thead>
<tr>
<th>Order number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-112 /-113</td>
<td>35 × 7.5; 1 mm; steel yellow chromated; slotted/unslotted</td>
</tr>
<tr>
<td>210-197 /-114</td>
<td>35 × 15; 1.5 mm; steel yellow chromated; slotted/unslotted</td>
</tr>
<tr>
<td>210-118</td>
<td>35 × 15; 2.3 mm; steel yellow chromated; unslotted</td>
</tr>
<tr>
<td>210-198</td>
<td>35 × 15; 2.3 mm; copper; unslotted</td>
</tr>
<tr>
<td>210-196</td>
<td>35 × 8.2; 1.6 mm; aluminum; unslotted</td>
</tr>
</tbody>
</table>

For vibration loads > 4g, observe the following installation instructions:
- Use pan-head screws or blind rivets at least every 60 mm (12 mm pin spacing) to secure the DIN rail.
- Make the open conductor length between strain relief and wire connection as short as possible.
- Use the reinforced end stop 249-197.
- When using the PFC200 CS 2ETH RS/XTR (750-8202/040-00x), carrier rails without an oblong hole must also be used. Alternatively, a material thickness of min. 1.5 mm must be maintained.
- When using the PFC200 CS 2ETH RS CAN DPS/XTR (750-8206/040-00x), carrier rails without an oblong hole with a material thickness of min. 2.3 mm must also be used.

Table 12: Permissible WAGO Carrier Rails When Using XTR PFC200

<table>
<thead>
<tr>
<th>Item Number</th>
<th>750-8202/040-00x</th>
<th>750-8206/040-00x</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-113</td>
<td>×</td>
<td>–</td>
</tr>
<tr>
<td>210-114</td>
<td>×</td>
<td>–</td>
</tr>
<tr>
<td>210-197</td>
<td>×</td>
<td>–</td>
</tr>
<tr>
<td>210-118</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>
5.4 Spacing

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

![Spacing Diagram](image)

Figure 4: 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.
5.5 Mounting Sequence

Fieldbus couplers/controllers and I/O modules of the WAGO-I/O-SYSTEM 750/753 are snapped directly on a carrier rail in accordance with the European standard EN 50022 (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/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.

---

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.

---

NOTICE

XTR sections begin with XTR supply modules exclusively!
The power jumper contacts of XTR products use a contact material different than other WAGO-I/O-SYSTEM 750 products. Connecting power jumper contacts of XTR products to power jumper contacts of non-XTR products leads to irreversible deterioration in contact characteristics in the long run. Therefore, start sections of XTR I/O modules with an XTR supply module. Only connect XTR I/O modules after XTR supply modules, never otherwise.
Note

Don't forget the bus end module!
Always plug a bus end module 750-600/040-000 onto the end of the fieldbus node! You must always use this bus end module at all fieldbus nodes with the WAGO I/O System 750 XTR fieldbus couplers/controllers to guarantee proper data transfer.
5.6 Inserting and Removing Devices

**NOTICE**
Perform work on devices only if they are de-energized!
Working on energized devices can damage them. Therefore, turn off the power supply before working on the devices.

5.6.1 Inserting the Fieldbus Coupler/Controller

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

2. Snap the fieldbus coupler/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 fieldbus coupler/controller from canting on the carrier rail.

With the fieldbus coupler/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 5: Release Tab Standard Fieldbus Coupler/Controller (Example)](image)

5.6.2 Removing the Fieldbus Coupler/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 fieldbus coupler/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 fieldbus coupler/controller.
5.6.3 Inserting the I/O Module

1. Position the I/O module so that the tongue and groove joints to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are engaged.

![Figure 6: Insert I/O Module (Example)](image)

2. Press the I/O module into the assembly until the I/O module snaps into the carrier rail.

![Figure 7: Snap the I/O Module into Place (Example)](image)

With the I/O module snapped in place, the electrical connections for the data contacts and power jumper contacts (if any) to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are established.
5.6.4 Removing the I/O Module

1. Remove the I/O module from the assembly by pulling the release tab.

![Figure 8: Removing the I/O Module (Example)](image)

Electrical connections for data or power jumper contacts are disconnected when removing the I/O module.

---

**DANGER**

Use caution when interrupting the FE!

With I/O modules for 220/230 VAC, make sure that people or equipment are not placed at risk when removing an I/O module and the associated FE interruption (function grounding). To prevent interruptions, provide ring feeding of the ground conductor, see section “Grounding”.

---
6 Connect Devices

**DANGER**

Only connect or disconnect lines when power is safely isolated!
The lines to the device can carry hazardous voltages and currents. Contact with the lines when live can result in severe injury or death. Therefore, read and observe the following safety rules before you perform work on the device:

1. Disconnect the respective system component from the power supply.
2. Secure the system component against unintentional restart.
3. Check if the voltage is positively isolated.

6.1 Data Contacts/Internal Bus

Communication between the fieldbus coupler/controller and the I/O modules as well as the system supply of the I/O modules is carried out via the internal bus. It is comprised of 6 data contacts, which are available as self-cleaning gold spring contacts.

![Figure 9: Data Contacts](image)

**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**

Ensure that the environment is well grounded!
The devices are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the devices, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. data contacts.
6.2 Power Contacts/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.

Self-cleaning power jumper contacts used to supply the field side are located on the right side of most of the fieldbus couplers/controllers and on some of the I/O modules. These contacts come as touch-proof spring contacts. As fitting counterparts the I/O modules have male contacts on the left side.

<table>
<thead>
<tr>
<th>Power jumper contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade</td>
</tr>
<tr>
<td>Spring</td>
</tr>
</tbody>
</table>

Figure 10: Example for the Arrangement of Power Contacts
6.3 Connecting a Conductor to the CAGE CLAMP®

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

**Note**

Only connect one conductor to each CAGE CLAMP®!

Only one conductor may be connected to each CAGE CLAMP®. 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. For opening the CAGE CLAMP® insert the actuating tool into the opening above the connection.
2. Insert the conductor into the corresponding connection opening.
3. For closing the CAGE CLAMP® simply remove the tool. The conductor is now clamped firmly in place.

![Figure 11: Connecting a Conductor to a CAGE CLAMP®](image-url)
6.4 Connecting a Conductor to the Push-in CAGE CLAMP®

The Push-in CAGE CLAMP® connection is appropriate for solid, stranded and finely stranded conductors.

**Note**

**Only connect one conductor to each Push-in CAGE CLAMP® connection!**

Only one conductor may be connected to each Push-in 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.

Terminate both solid and stranded or ferruled conductors by simply pushing them in - no tool required. For all other types of conductors, Push-in CAGE CLAMP® must be opened for connection with an operating tool with a 2.5 mm blade (order no. 210-719).

1. To open the Push-in 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 Push-in CAGE CLAMP® simply remove the tool - the conductor is then clamped firmly in place.

![Figure 12: Connecting a Conductor to a Push-in CAGE CLAMP®](image-url)
6.5 Power Supply

6.5.1 Isolation

Within the fieldbus node, there are three electrically isolated potentials:

- Electrically isolated fieldbus interface via transformer
- Electronics of the fieldbus couplers/controllers and the I/O modules (internal bus)
- All I/O modules have an electrical isolation between the electronics (internal bus, logic) and the field electronics. Some digital and analog input modules have each channel electrically isolated, please see catalog.

![Diagram of isolation for fieldbus couplers/controllers](image)

Figure 13: Isolation for Fieldbus Couplers/Controllers (Example)
6.5.2 System Supply

6.5.2.1 Connection

The WAGO-I/O-SYSTEM 750 requires a 24 V direct current system supply. The power supply is provided via the fieldbus coupler/controller and, if necessary, in addition via internal system supply modules 750-613. The power supply is reverse voltage protected.

**NOTICE**

*Do not use an incorrect voltage/frequency!*

The use of an incorrect supply voltage or frequency can cause severe damage to the components.

![Diagram](image)

Figure 14: System Voltage for Fieldbus Couplers/Controllers (Example)

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>System supply DC 24 V</td>
</tr>
<tr>
<td>2</td>
<td>System supply 0 V</td>
</tr>
</tbody>
</table>

Table 13: Legend for Figure “System Voltage for Fieldbus Couplers/Controllers”

The fed DC 24 V supplies all internal system components, e.g. fieldbus coupler/controller electronics, fieldbus interface and I/O modules via the internal bus (5 V system voltage). The 5 V system voltage is galvanically connected to the 24 V system supply.
Figure 15: System Supply for Fieldbus Coupler/Controller

Note

Only reset the system simultaneously for all supply modules!
Reset the system by switching the system supply simultaneously at all supply modules (fieldbus coupler/controller and potential supply module with bus power supply) off and on again.

6.5.2.2 Dimensioning

Note

Recommendation
A stable power supply cannot always be assumed. Therefore, you should use regulated power supplies to ensure the quality of the supply voltage.

The supply capacity of the fieldbus coupler/controller or the internal system supply module can be taken from the technical data of the components.

Table 14: Alignment

<table>
<thead>
<tr>
<th>Internal current consumption*)</th>
<th>Current consumption via system voltage (5 V for electronics of I/O modules and fieldbus coupler/controller).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total current for I/O modules*</td>
<td>Available current for the I/O modules. Provided by the bus power supply unit. See fieldbus coupler/controller and internal system supply module</td>
</tr>
</tbody>
</table>

*) See current catalog, manuals, Internet
Example:

Calculating the current consumption on an Example Coupler:

- Internal current consumption: 380 mA at 5 V
- Residual current for bus modules: 1620 mA at 5 V
- Sum $I_{(5\text{ V})\text{ total}}$: 2000 mA at 5V

The internal current consumption is indicated in the technical data for each bus terminal. In order to determine the total requirement, add together the values of all I/O modules in the node.

Note

Please note the aggregate current for I/O modules. It may be necessary to supply potential!

When the sum of the internal current consumption for the I/O modules exceeds their aggregate current, you must use a supply module with bus power supply. Install it before the position where the permissible aggregate current would be exceeded.

Example:

Calculating the total current on the Example Coupler described above:

A node with the example coupler, which is described above, consists of:
- 20 relay modules (750-517/xxx-xxx)
- 10 digital input modules (750-1415/xxx-xxx).

- Internal current consumption: $20 \times 90\text{ mA} = 1800\text{ mA}$
- $10 \times 6\text{ mA} = 60\text{ mA}$
- Sum: 1860 mA

The example coupler can provide 1620 mA (see previous example) for the bus modules. This value is given in the associated data sheet. Consequently, an internal system supply module (750-613/xxx-xxx), e. g. in the middle of the node, should be added.

The maximum input current of the 24 V system supply is 500 mA. The exact electrical consumption ($I_{(V)}$) can be determined with the following formulas:
Fieldbus coupler or controller
\[ I_{(5 \text{ V})_{\text{total}}} = \text{Sum of all the internal current consumption of the connected bus modules} + \text{internal current consumption fieldbus coupler/controller} \]

Internal system supply module
\[ I_{(5 \text{ V})_{\text{total}}} = \text{Sum of all the internal current consumption of the connected bus modules at internal system supply module} \]

Input current \( I_{(24 \text{ V})} = \frac{5 \text{ V}}{24 \text{ V}} \times \frac{I_{(5 \text{ V})_{\text{total}}}}{\eta} \)

\[ \eta = 0.87 \]  
(87 % Efficiency of the power supply at nominal load 24 V)

---

**Note**

Activate all outputs when testing the current consumption!

If the electrical consumption of a power supply point for the 24 V system supply exceeds 500 mA, then the cause may be an improperly dimensioned node or a defect.

During the test, you must activate all outputs.
6.5.3 Field Supply

6.5.3.1 Connection

Sensors and actuators can be directly connected to the relevant channel of the I/O module in 1, 2, 3 or 4 conductor connection technology. The I/O module supplies power to the sensors and actuators. The input and output drivers of some I/O modules require the field side supply voltage.

The fieldbus coupler/controller provides field side power (DC 24 V). In this case it is a passive power supply without protection equipment.

Power supply modules with or without diagnostic capability are available for the power supply of other field potentials (e.g. 24 VDC, 0 VAC/DC … 230 VAC/DC, 120 VAC, 230 VAC). The power supply modules can also be used to set up various potential groups. The connections are connected in pairs to a power contact.

![Diagram of Field Supply for Fieldbus Couplers/Controllers](image)

**Figure 16: Field Supply for Fieldbus Couplers/Controllers (Example)**

**Table 15: Legend for Figure “Field Supply for Fieldbus Couplers/Controllers”**

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Field supply 24 VDC</td>
</tr>
<tr>
<td>2</td>
<td>Field supply 0 V</td>
</tr>
<tr>
<td>3</td>
<td>Power jumper contacts (potential distribution to adjacent I/O modules)</td>
</tr>
</tbody>
</table>

The field-side power supply is automatically derived from the power jumper contacts when snapping an I/O module.

The current load of the power contacts must not exceed 10 A on a continual basis.
By inserting an additional power supply module, the field supply via the power contacts is disrupted. From there a new power supply occurs which may also contain a new voltage potential.

---

**Note**

Re-establish the ground connection when the connection to the power jumper contacts is disrupted!

Some I/O modules have no or very few power contacts (depending on the I/O function). Due to this, the passing through of the relevant potential is disrupted. If you require a field supply via power jumper contacts for subsequent I/O modules, then you have to use a power supply module.

Note the data sheets of the I/O modules.

---

**Note**

Use a spacer module when setting up a node with different potentials!

In the case of a node setup with different potentials, e.g. the alteration from DC 24 V to AC 230 V, you should use a spacer module. The optical separation of the potentials acts as a warning to heed caution in the case of wiring and maintenance works. Thus, you can prevent the results of wiring errors.

---

### 6.5.3.2 Fusing

Fusing has to be done externally. The fuse modules of the WAGO series 281 and 282 are suitable for this purpose.

![Figure 17: Fuse Modules for Automotive Fuses, Series 282](image1)

![Figure 18: Fuse Modules for Automotive Fuses, Series 2006](image2)
Figure 19: Fuse Modules with Pivotable Fuse Carrier, Series 281

Figure 20: Fuse Modules with Pivotable Fuse Carrier, Series 2002
6.5.4 Power Supply for Mixed Operation

In a node, WAGO-I/O-SYSTEM 750 XTR and WAGO-I/O-SYSTEM 750 products can be used in mixed operation. The permitted environmental conditions of the node, e.g., the temperature range, then follow the components with the least ruggedness.

In mixed operation, it should also be noted that an XTR power supply must be connected before an XTR section and a standard supply module before a standard section.

Table 16: XTR Supply Modules for Powering XTR Sections

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>750-626/040-000</td>
<td>Power supply filter</td>
<td>System and field supply with filtering (24 V, 0 V), i.e., fieldbus coupler/ controller and bus power supply (750-613/040-000)</td>
</tr>
<tr>
<td>750-624/040-001</td>
<td>Field-side power supply filter</td>
<td>24V field supply with filtering</td>
</tr>
<tr>
<td>750-602/040-000</td>
<td>Supply module</td>
<td>24 VDC power supply</td>
</tr>
<tr>
<td>750-612/040-000</td>
<td>Supply module</td>
<td>0-240 VAC/DC power supply</td>
</tr>
<tr>
<td>750-613/040-000</td>
<td>Supply module</td>
<td>24 VDC bus power supply</td>
</tr>
</tbody>
</table>

**NOTICE**

XTR sections begin with XTR supply modules exclusively!
The power jumper contacts of XTR products use a contact material different than other WAGO-I/O-SYSTEM 750 products. Connecting power jumper contacts of XTR products to power jumper contacts of non-XTR products leads to irreversible deterioration in contact characteristics in the long run.
Therefore, start sections of XTR I/O modules with an XTR supply module.
Only connect XTR I/O modules after XTR supply modules, never otherwise.
6.5.5 Supplementary Power Supply Regulations

The WAGO-I/O-SYSTEM 750 XTR can also be used in shipbuilding applications and onshore/offshore installations (e.g., platforms, loading facilities), as well as in telecontrol applications. This is possible via certification under the standards of leading agencies such as Germanischer Lloyd and Lloyds Register.

For standard-compliant application in substation instrumentation and control, telecontrol systems, railway technology or shipbuilding certified operation, field-side power supply filter 750-624/040-001 or power supply filter 750-626/040-000 are generally to be used for XTR module groups.

Table 17: Filter Modules for 24 V Power Supply

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>750-626/040-000</td>
<td>Power supply filter</td>
<td>System and field supply with filtering (24 V, 0 V), i.e., fieldbus coupler/controller and bus power supply (750-613/040-000)</td>
</tr>
<tr>
<td>750-624/040-001</td>
<td>Field-side power supply filter</td>
<td>24 V field supply with filtering</td>
</tr>
</tbody>
</table>

Therefore, the following power supply requirements must be observed:

Figure 21: Power Supply Concept

The 24 V system power supply for the fieldbus coupler/controller must be filtered and protected against overvoltage. Therefore, the power must be supplied via power supply filter 750-626/040-000.
The 24 V field power supply systems must be protected against overvoltage. Therefore, the power must be supplied via field-side power supply filter 750-624/040-001 or power supply filter 750-626/040-000.

For this potential group, only the supply module 750-612/040-000 is required for a 230 V field power supply.
6.5.6 Supply Example

**Note**
The system supply and the field supply shall be separated!
You should separate the system supply and the field supply in order to ensure bus operation in the event of a short-circuit on the actuator side.

---

Figure 22: Power Supply Example
Table 18: Legend for Figure “Power Supply Example”

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply on the fieldbus coupler/controller via external system supply module</td>
</tr>
<tr>
<td>2</td>
<td>Supply module 24 V</td>
</tr>
<tr>
<td>3</td>
<td>Supply module with bus power supply 24 V</td>
</tr>
<tr>
<td>4</td>
<td>Separation module recommended</td>
</tr>
<tr>
<td>5</td>
<td>Supply module 230 V</td>
</tr>
</tbody>
</table>
6.5.7 Power Supply Units

The WAGO-I/O-SYSTEM 750 XTR requires 24 VDC voltage (system supply) for operation.

**Note**

**Recommendation**
A stable power supply cannot always be assumed everywhere. Therefore, you should use regulated power supplies to ensure the quality of the supply voltage (see also table “WAGO power supply units”).

For brief voltage dips, a buffer (200 µF per 1 A load current) must be provided.

**Note**

**Buffer for system power supply!**
The system power 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.

The power demand must be determined individually depending on the entry point of the field supply. All loads through field devices and I/O modules must be taken into account. The field supply also impacts the I/O modules because the input and output drivers of some I/O modules require the voltage of the field supply.

**Note**

**System and field supply must be isolated!**
The system supply and field supply must be isolated to ensure bus operation in the event of short circuits on the actuator side.

<table>
<thead>
<tr>
<th>Item number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>787-822/xxx-xxx</td>
<td>Primary switch-mode power supply EPSITRON® PRO Power, 24 VDC / 5 A*, nominal input voltage 100 VAC … 240 VAC</td>
</tr>
<tr>
<td>787-832/xxx-xxx</td>
<td>Primary switch-mode power supply EPSITRON® PRO Power, 24 VDC / 10 A*, nominal input voltage 110 VAC … 240 VAC</td>
</tr>
<tr>
<td>787-840/xxx-xxx</td>
<td>Primary switch-mode power supply EPSITRON® PRO Power, 24 VDC / 10 A*, nominal input voltage 3× 400 VAC … 500 VAC</td>
</tr>
</tbody>
</table>

*) Derating -3 %/°K > +50 °C
6.6 Grounding

6.6.1 Grounding the DIN Rail

6.6.1.1 Framework Assembly

When setting up the framework, the carrier rail must be screwed together with the electrically conducting cabinet or housing frame. The framework or the housing must be grounded. The electrical connection is established via the screw. Thus, the carrier rail is grounded.

![DANGER]

Ensure sufficient grounding is provided!
You must take care to ensure the flawless electrical connection between the carrier rail and the frame or housing in order to guarantee sufficient grounding.

6.6.1.2 Insulated Assembly

Insulated assembly has been achieved when there is constructively no direct ohmic contact between the cabinet frame or machine parts and the carrier rail. Here, the earth ground must be set up via an electrical conductor in accordance with valid national safety regulations.

**Note**

**Recommendation**
The optimal setup is a metallic assembly plate with grounding connection which is electrically conductive linked to the carrier rail.

The separate grounding of the carrier rail can be easily set up with the aid of the WAGO ground wire terminals.

Table 20: WAGO Ground Wire Terminals

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>283-609</td>
<td>1-conductor ground (earth) terminal block make an automatic contact to the carrier rail; conductor cross section: 0.2 mm² … 16 mm²</td>
</tr>
</tbody>
</table>

*Note:* Also order the end and intermediate plate (283-320).
6.6.2 Grounding Function

The grounding function increases the resistance against electro-magnetic interferences. Some components in the I/O system have a carrier rail contact that dissipates electro-magnetic interferences to the carrier rail.

![Carrier Rail Contact (Example)](image)

Ensure sufficient grounding is provided!
You must take care to ensure the direct electrical connection between the carrier rail contact and the carrier rail. The carrier rail must be grounded. For information on carrier rail properties, see section “Mounting” > … > “Carrier Rail Properties”.

The bottom CAGE CLAMP® connectors of the supply modules enable optional connection of a field-side functional ground. This potential is made available to the I/O module arranged on the right through the spring-loaded contact of the three power contacts. Some I/O modules are equipped with a knife-edge contact that taps this potential. This forms a potential group with regard to functional ground with the I/O module arranged on the left.
6.7 Shielding

6.7.1 General

Use of shielded cables reduces electromagnetic interference and thus increases signal quality. Measurement errors, data transmission errors and interference due to excessive voltage can be prevented.

---

**Note**

Connect the cable shield to the ground potential!

Integrated shielding is mandatory to meet the technical specifications in regards to measuring accuracy. Connect the cable shield and ground potential at the inlet to the cabinet or housing. This allows induced interference to dissipate and to be kept away from devices in the cabinet or housing.

Figure 24: Cable Shield at Ground Potential

---

**Note**

Improve shielding performance by placing the shield over a large area!

Higher shielding performance is achieved via low-impedance connection between shield and ground. For this purpose, connect the shield over a large surface area, e.g., WAGO shield connecting system. This is especially recommended for large-scale systems where equalizing current or high impulse-type currents caused by atmospheric discharge may occur.

---

**Note**

Keep data and signal lines away from sources of interference!

Route data and signal lines separately from all high voltage cables and other sources of high electromagnetic emission (e.g., frequency converter or drives).

---

6.7.2 Bus Cables

The shielding of the bus line is described in the respective configuration guidelines and standards of the bus system.
### 6.7.3 Signal Lines

I/O modules for analog signals and some interface I/O modules are equipped with shield clamps.

---

**Note**

**Use shielded signal lines!**

Only use shielded signal lines for analog signals and I/O modules which are equipped with shield clamps. Only then can you ensure that the accuracy and interference immunity specified for the respective I/O module can be achieved even in the presence of interference acting on the signal cable.

---

### 6.7.4 WAGO Shield Connecting System

The WAGO shield connecting system consists of shield clamping saddles, busbars and various mounting carriers. These components can be used to achieve many different configurations.

Figure 25: Examples of the WAGO Shield Connecting System

Figure 26: Application of the WAGO Shield Connecting System
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