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

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1 Notes about this Documentation

1.1 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.

1.1 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).
1.2 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>

1.3 Font Conventions

Table 2: Font Conventions

<table>
<thead>
<tr>
<th>Font Type</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>italic</em></td>
<td>Names of paths and data files are marked in italic-type.</td>
</tr>
<tr>
<td></td>
<td>e.g.: C:\Program Files\WAGO Software</td>
</tr>
<tr>
<td>Menu</td>
<td>Menu items are marked in bold letters.</td>
</tr>
<tr>
<td></td>
<td>e.g.: <strong>Save</strong></td>
</tr>
<tr>
<td>&gt;</td>
<td>A greater-than sign between two names means the selection of a menu item from a menu.</td>
</tr>
<tr>
<td></td>
<td>e.g.: <strong>File &gt; New</strong></td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td>Designation of input or optional fields are marked in bold letters,</td>
</tr>
<tr>
<td></td>
<td>e.g.: <strong>Start of measurement range</strong></td>
</tr>
<tr>
<td>&quot;Value&quot;</td>
<td>Input or selective values are marked in inverted commas.</td>
</tr>
<tr>
<td></td>
<td>e.g.: Enter the value &quot;4 mA&quot; under <strong>Start of measurement range</strong>.</td>
</tr>
<tr>
<td>[Button]</td>
<td>Pushbuttons in dialog boxes are marked with bold letters in square brackets.</td>
</tr>
<tr>
<td></td>
<td>e.g.: [<strong>Input</strong>]</td>
</tr>
<tr>
<td>[Key]</td>
<td>Keys are marked with bold letters in square brackets.</td>
</tr>
<tr>
<td></td>
<td>e.g.: [<strong>F5</strong>]</td>
</tr>
</tbody>
</table>
1.4 Legal Bases

1.4.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications. 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.

1.4.2 Personal Qualifications

The use of the product described in this document is exclusively geared to specialists having qualifications in PLC programming, electrical specialists or persons instructed by electrical specialists who are also familiar with the appropriate current standards.

Moreover, the persons cited here must also be familiar with all of the products cited in this document, along with the operating instructions. They must also be capable of correctly predicting any hazards which may not arise until the products are combined.

WAGO Kontakttechnik GmbH & Co. KG assumes no liability resulting from improper action and damage to WAGO products and third-party products due to non-observance of the information contained in this document.

1.4.3 Limitation of Liability

This documentation describes the use of various hardware and software components in specific example applications. The components may represent products or parts of products from different manufacturers. The respective operating instructions from the manufacturers apply exclusively with regard to intended and safe use of the products. The manufacturers of the respective products are solely responsible for the contents of these instructions.

The sample applications described in this documentation represent concepts, that is, technically feasible application. Whether these concepts can actually be implemented depends on various boundary conditions. For example, different versions of the hardware or software components can require different handling than that described here. Therefore, the descriptions contained in this documentation do not form the basis for assertion of a certain product characteristic.

Responsibility for safe use of a specific software or hardware configuration lies with the party that produces or operates the configuration. This also applies when one of the concepts described in this document was used for implementation of the configuration.

WAGO Kontakttechnik GmbH & Co. KG is not liable for any actual implementation of the concepts.
## 1.5 Revision History

Table 3: Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Author</th>
<th>Description of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0.0</td>
<td>u0106633</td>
<td>First issue</td>
</tr>
</tbody>
</table>
### 2 Description

In this Application Note, two example projects for the library “WagoAppIOLink” are delivered. The WAGO electronic circuit breaker (ECB) as well as a Balluff distance sensor is connected to an IO-Link master module 750-657.

### 3 Material Used

#### 3.1 Required Libraries

Table 4: Required Libraries

<table>
<thead>
<tr>
<th>Library</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WagoAppIOLinkcompiled_library</td>
<td>Library handling IO_Link master module 750-657</td>
</tr>
<tr>
<td>IO-Link master</td>
<td>750-657</td>
</tr>
<tr>
<td>WagoFlatStyle.xml</td>
<td>Special visualization style</td>
</tr>
</tbody>
</table>

Additional Information:

WagoFlatStyle must be separately installed.

#### 3.2 Devices

Table 5: Devices

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Quantity</th>
<th>Designation</th>
<th>Item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAGO</td>
<td>1</td>
<td>PFC</td>
<td>750-8202</td>
</tr>
<tr>
<td>WAGO</td>
<td>1</td>
<td>IO-Link master module</td>
<td>750-657</td>
</tr>
<tr>
<td>WAGO</td>
<td>1</td>
<td>Electronic 4 channel circuit breaker</td>
<td>787-1664-0000-0040</td>
</tr>
<tr>
<td>Balluff</td>
<td>1</td>
<td>Distance sensor</td>
<td>BAW</td>
</tr>
<tr>
<td>WAGO</td>
<td>1</td>
<td>End module</td>
<td>750-600</td>
</tr>
</tbody>
</table>

#### 3.3 Tools

Table 6: Tools

<table>
<thead>
<tr>
<th>Designation</th>
<th>Item No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>e!COCKPIT – workstation license</td>
<td>2759-101/1110-2002</td>
</tr>
</tbody>
</table>
Setup

Figure 1: The components
5 Sample Programs

Note

Installation of Sample Projects for e!COCKPIT

Sample programs can be called up from the e!COCKPIT Backstage view by clicking the Updates & Add-ons button in the navigation bar.

5.1 WagoApp_1.5.x.x_IOLink_Example_01

This project shows the use of general function blocks as well as some visualization templates.

5.1.1 The program

The function block “FbIOL_ConfigurationAndStatus” must be used exactly once for each IO-Link master module. This block must be called cyclic.

To make use of the visualization templates it is necessary to declare a variable of typ “typIOL_VISU_Main”.
The configuration of the IO-Link master may be done by the visualisation IOL_Main.

Access of IO-Link acyclic data is done by the function block “FbIOL_Call”. This block must only be used once for each master module. If data from different ports should be required, it is necessary to use input “bEntity”.

Access of IO-Link process data, e.g. the information from the Balluff distance sensor is done by the function block “FbIOL_PortData”. Each port needs an own instance of this function block.
**Information**

**Additional Information:**
Example two is recommended, if a Wago electronic circuit breaker (ECB) with IO-Link interface is used.

```plaintext
MyPortData_1
  enablePort1 -- xEnable
  Modul -- _1_Port
  bIOL_linkPort
  adrx(Channel_1_OUT) -- pTxBuffer
  TxBytes -- udiTxBytes
  addr(Channel_1_IN) -- pRxBuffer
  sizeof(Channel_1_IN) -- udi_rxBufferSize
  myTrigger_1 -- xTxTrigger
  Channel1ConReset -- xCommunicationReset
```

Figure 5: Access to the process data via function block "FbIOL_PortData"
5.2 WagoApp_1.5.x.x_IOLink_Example_02

This project shows the use of the function block “FbIOL_MasterConfiguration”.

5.2.1 Using “FbIOL_MasterConfiguration”

The configuration of the IO-Link master module is done by the function block “MyMasterConfiguration”. Using input “typMode” with the “eMasterConfigModeStartUp.AutoConfig” setting, the connected IO-Link devices will be scanned during startup. Depending on the detected devices and their need for process data, the master module will be configured automatically.

If the size of input or output data is greater than 18 byte, the fragmentation mode will be used. All ports are assigned with 4 byte input and 4 byte output size in this case.

Input “typMode” supports additional modes like “UseExternalConfiguration” or “Fast”.

By using “UseExternalConfiguration” the configuration data must be provided through the input “aPort”. This may be useful if the automatic rule does not match the best configuration.

By using “Fast” no configuration is done by the function block. It is assumed that the module is configured in the right way, e.g. by WAGO-IO-Check. Since the function block needs information about the module settings this data must be passed into the function block by the method “SetFastParameter”. This method must be called once at startup.

Output “aIOL_DeviceInfo” will show the actual setting.

The output “aIOL_Port” provides the link to the different IO-Link devices.

![Figure 6: Configuration of the IO-Link master module](image-url)
5.2.2 Using “FbIOLink_Fuse_4Channel”

Each 4 channel ECB needs exactly one instance of function block “FbIOLink_Fuse_4Channel” from the library “WagoAppFuse”.

The function block “FbIOLink_Fuse_4Channel” allows to set the trip current as well as to enable or disable the different channels.

Input “typIOL_Device” must be linked to the master function block by selecting the appropriate channel. Since the ECB is connected to port 2 the link is established by the variable “MyDevices[2]”.

![Figure 7: Function block for the 4 channel fuse](image)

5.2.3 Using „FbGeneral_IO_Device“

This function block is available in source code since each IO-Link device needs a special block. This function block shows how the data of any IO-Link device may be processed.

![Figure 8: Function block “FbGeneral_IO_Device”](image)

Access to the process data of any IO-Link device is done by the array “aDeviceInData” for input information or “aDeviceOutData” for output data.

The balluff sensor provides 3 Byte input data (see Balluff manual). Therefore, the actual distance is calculated as:

\[ \text{diDistance} := \text{aDeviceInData}[2] + 256 \times \text{aDeviceInData}[1] \]

Access to acyclic data is done by the following methods:

“IOL_Call_Read”
“IOL_Call_ReadWord”
“IOL_Call_Write”
“IOL_Call_WriteWord”
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