

# ZAI02EN0x

## Connection Boxes



EtherNet/IP™

## Operating Instructions

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# 1. General

## 1.1 Information Concerning these Instructions

- These instructions apply to products ZAI02EN01 and ZAI02EN02
- They make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national work safety regulations must be complied with as well.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.



**NOTE:**  
The operating instructions must be read carefully before using the product and must be kept on hand for later reference.

## 1.2 Explanations of Symbols

- Safety precautions and warnings are emphasized by means of symbols and attention-getting words
- Safe use of the product is only possible if these safety precautions and warnings are adhered to
- The safety precautions and warnings are laid out in accordance with the following principle:



**ATTENTION-GETTING WORD!**  
**Type and Source of Danger!**  
Possible consequences in the event that the hazard is disregarded.

- Measures for averting the hazard.

The meanings of the attention-getting words, as well as the scope of the associated hazards, are listed below.



**DANGER!**  
This word indicates a hazard with a high degree of risk which, if not avoided, results in death or severe injury.



**WARNING!**  
This word indicates a hazard with a medium degree of risk which, if not avoided, may result in death or severe injury.



**CAUTION!**  
This word indicates a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.

**ATTENTION!**

This word draws attention to a potentially hazardous situation which, if not avoided, may result in property damage.

**NOTE:**

A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.

### 1.3 Limitation of Liability

- The product has been developed in consideration of the current state-of-the-art and applicable standards and guidelines. Subject to change without notice. A valid declaration of conformity can be accessed at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.
- wenglor sensoric elektronische Geräte GmbH (hereinafter referred to as "wenglor") excludes all liability in the event of:
  - Non-compliance with the instructions
  - Use of the product for purposes other than those intended
  - Use by untrained personnel
  - Use of unapproved replacement parts
  - Unapproved modification of products
- These operating instructions do not include any guarantees from wenglor with regard to the described procedures or specific product characteristics.
- wenglor assumes no liability for printing errors or other inaccuracies contained in these operating instructions, unless wenglor was verifiably aware of such errors at the point in time at which the operating instructions were prepared.

### 1.4 Copyrights

- The contents of these instructions are protected by copyright law.
- All rights are reserved by wenglor
- Commercial reproduction or any other commercial use of the provided content and information, in particular graphics and images, is not permitted without previous written consent from wenglor.

## 2. For Your Safety

### 2.1 Use for Intended Purpose

#### Connection Boxes

Connection Boxes are used to reduce wiring effort in systems with many sensors/actuators, and to link them to an Industrial Ethernet network. The digital inputs and outputs can be addressed and evaluated directly via the network.

This product can be used in the following industry sectors:

- Special machinery manufacturing
- Heavy machinery manufacturing
- Logistics
- Automotive industry
- Food industry
- Packaging industry
- Pharmaceuticals industry
- Clothing industry
- Plastics industry
- Woodworking industry
- Consumer goods industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Printing industry
- Aviation industry
- Construction industry
- Chemicals industry
- Agriculture industry
- Alternative energy
- Raw materials extraction

## 2.2 Use for Other than the Intended Purpose

- Not a safety component in accordance with 2006/42/EC (Machinery Directive)
- The product is not suitable for use in potentially explosive atmospheres.
- The product may only be used with accessories supplied or approved by wenglor, or combined with approved products. A list of approved accessories and combination products can be accessed at [www.wenglor.com](http://www.wenglor.com) on the product detail page.



### **DANGER!**

#### **Risk of personal injury or property damage in case of use for other than the intended purpose!**

Use for other than the intended purpose may lead to hazardous situations.

- Observe instructions regarding use for intended purpose.

## 2.3 Personnel Qualifications

- Suitable technical training is a prerequisite.
- In-house electronics training is required.
- Trained personnel who use the product must have uninterrupted access to the operating instructions.



### **DANGER!**

#### **Risk of personal injury or property damage in case of incorrect initial start-up and maintenance!**

Personal injury and damage to equipment may occur.

- Adequate training and qualification of personnel.

## 2.4 Modification of Products



### **DANGER!**

#### **Risk of personal injury or property damage if the product is modified!**

Personal injury and damage to equipment may occur. Non-observance may result in loss of the CE marking and the guarantee may be rendered null and void.

- **Modification of the product is impermissible.**

## 2.5 General Safety Precautions

### **NOTE!**



- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- In the event of possible changes, the respectively current version of the operating instructions can be accessed at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.
- Read the operating instructions carefully before using the product.
- Protect the Connection Box against contamination and mechanical influences.

## 2.6 Approvals and IP Protection



## 3. Technical Data

Article Number	ZAI02EN01	ZAI02EN02
Supply power	18 to 32 V DC	
Max. device current consumption *	0.1 A	
Max. system current consumption **	1.8 A	
Temperature range	-25 to 60° C	
Voltage drop, switching outputs	< 2.5 V	
Max. Switching current, switching outputs	0.6 A	2 A
Max. total current, I/O ports	9 A	
Sensor supply voltage (pin 1)	200 mA	
Inputs per DIN EN 61131-2:2003	Type 2	
Digital I/O ports short-circuit proof	Yes	
Digital I/O ports overload proof	Yes	
Digital I/O ports reverse polarity protected	Yes	
Number of standard I/O pins	16	
Housing material	Aluminum	
Weight	1100 g	
Protection	IP 67	
Connector type, power	7/8", 5-pin	
Connector type, Industrial Ethernet ports	M12×1, 4-pin, D coded	
Connector type, I/O ports	M12×1, 4-pin, A coded	
Number of Industrial Ethernet ports	2	
Number of I/O ports	8	
Transmission speed	10 Mbit/s / 100 Mbit/s	
Transmission mode	Full/half-duplex	
Webserver	Yes	
Switch mode	Store & forward	
VLAN prioritization	Yes	
Auto-crossover	Yes	
Auto-negotiating	Yes	
Auto-polarity	Yes	
Protection class	III	
Interface	EtherNet/IP™	

\* Maximum intrinsic current consumption of the product without additional consuming devices

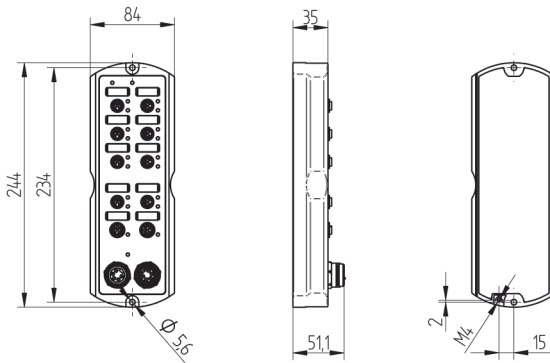
\*\* Maximum intrinsic current consumption of the product with additional consuming devices  
Fully allocation of all digital I/O ports with sensor supply power (without outputs)



The following table specifies the tightening torques of the plugs and mounting options in order to assure compliant, error-free operation:

Connector Type	Tightening Torque (Nm)
M12	0.4
7/8" plug	1.5
FE ground strap	$2.2 \pm 0.2$
Connection Box mounting	$4.0 \pm 0.2$

### 3.1 Housing Dimensions



3.2 Wiring Diagram

53


Socket 1                      Suitable Plug: 2

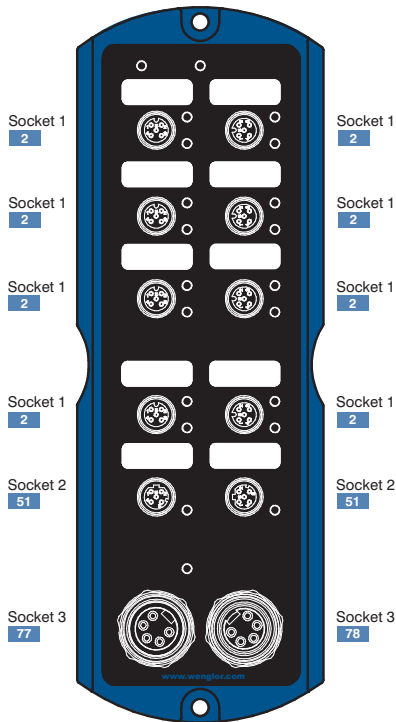
Pin	Function
1	+24 V DC
2	I/O
3	GND
4	I/O
5	

Socket 2                      Suitable Plug: 51


Pin	Function	In/Out
1	TxD (+)	Out
2	RxD (+)	In
3	TxD (-)	Out
4	RxD (-)	In

Socket 3                      Suitable Plug: 77 78

Pin	Function
1	0 V DC
2	0 V DC
3	
4	+24 V DC U <sub>System/Sensor</sub>
5	+24 V DC U <sub>Digital I/O</sub>



Legend

+	Supply Voltage +
-	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ä	Switching Output (NC)
V	Contamination/Error Output (NO)
ÿ	Contamination/Error Output (NC)
E	Input (analog or digital)
T	Teach Input
Z	Time Delay (activation)
S	Shielding
RxD	Interface Receive Path
TxD	Interface Send Path
RDY	Ready
GND	Ground
CL	Clock
E/A	Output/Input programmable
	IO-Link
PoE	Power over Ethernet
IN	Safety Input
OSSD	Safety Output
Signal	Signal Output
BLD+/-	Ethernet Gigabit bidirect. data line (A-D)
ENoRS422	Encoder 0-pulse 0-0 (TTL)

PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ü	Test Input inverted
W	Trigger Input
O	Analog Output
O-	Ground for the Analog Output
BZ	Block Discharge
Aw/	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
E+	Receiver-Line
S+	Emitter-Line
±	Grounding
SnR	Switching Distance Reduction
Rx+/-	Ethernet Receive Path
Tx+/-	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(-)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactur Monitoring
ENAR5422	Encoder A/A (TTL)
ENBR5422	Encoder B/B (TTL)

ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLt	Brightness output
M	Maintenance

Wire Colors according to DIN IEC 757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNVE	Green/Yellow

### 3.3 Accessory Products

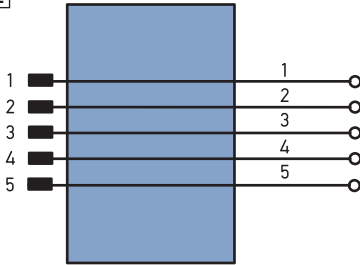
wenglor can provide you with suitable connector technology for your Connection Box.

Plug connector, 7/8", 5-pin

Order number: ZAT77NN01

**S82**

Suitable Plug: **77**

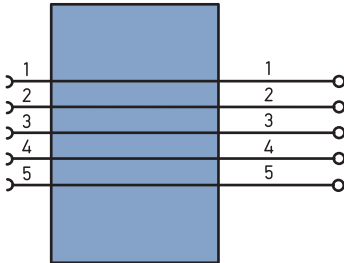


Plug connector, 7/8", 5-pin

Order number: ZAB78NN01

**S87**

Suitable Plug: **78**

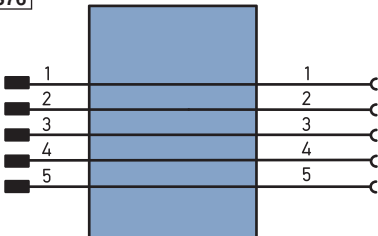


Plug connector, 7/8", 5-pin

Order number: ZAV78R201, cable length: 2 m

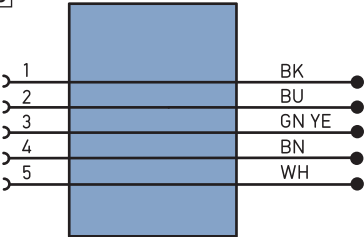
**S76**

Suitable Plug: **78**



Connecting cable, 7/8", 5-pin

S75

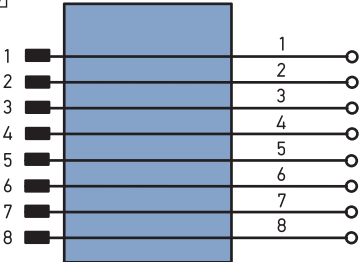


Order number: ZAS78R601, cable length: 10 m

Suitable Plug: 78

RJ45 Plug connector, 8-pin

S48

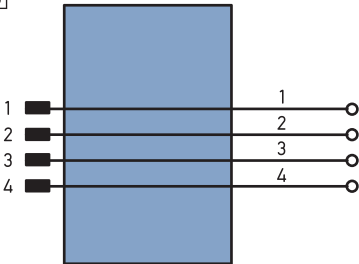


Order number: ZAT45NN01

Suitable Plug: 45

Plug connector, M12×1, 4-pin

S08

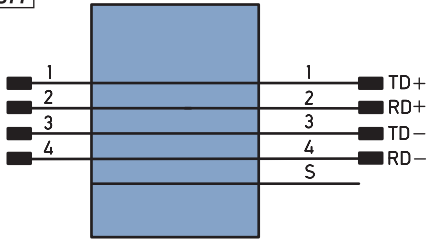


Order number: ZAT51NN01

Suitable Plug: 51

Connecting cable, M12×1, 4-pin, D coded

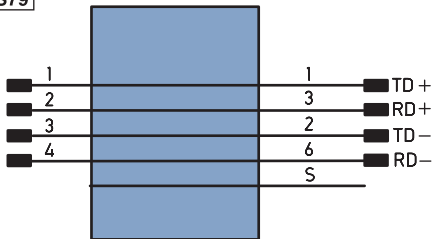
**S77**



Order number: ZAV51R201, cable length: 2 m  
Order number: ZAV51R601, cable length: 10 m

Suitable Plug: **51**

**S79**



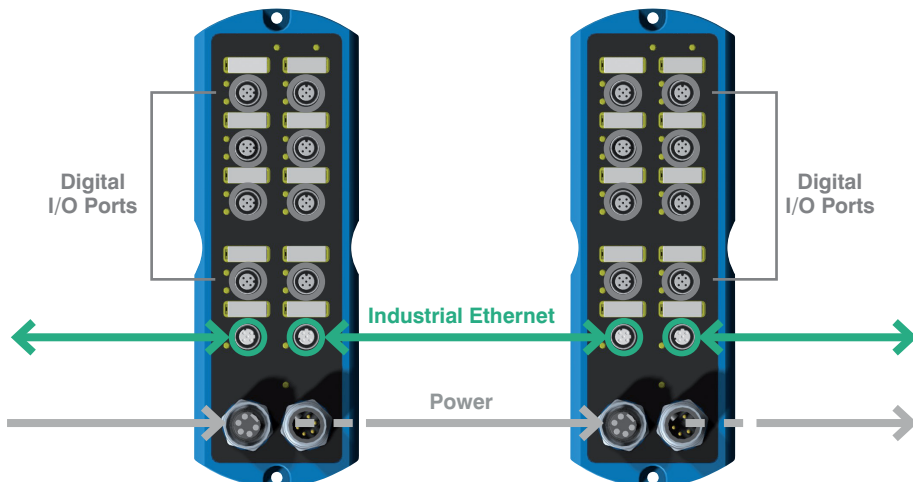
Order number: ZAV51R202, cable length: 2 m  
Order number: ZAV51R602, cable length: 10 m

Suitable Plug: **51**

## 2 Connection cables

M12×1, 4-pin, available in various lengths for connecting sensors/actuators.

## 3.4 System Layout



### 3.5 Scope of Delivery

- ZAI02EN0x
- Quick-start guide
- Mounting kit consisting of mounting screws, FE ground strap, washers, 7/8" and M12 cover caps and name plates for the ports

## 4. Transport and Storage

### 4.1 Transport

Upon receipt of shipment, inspect the goods for damage in transit. In the case of damage, conditionally accept the package and notify the manufacturer of the damage. Then return the device making reference to damage in transit.

### 4.2 Storage

The following points must be taken into condition with regard to storage:

- Do not store the product outdoors
- Store the product in a dry, dust-free place
- Protect the product against mechanical impacts
- Protect the product against exposure to direct sunlight



#### **ATTENTION!**

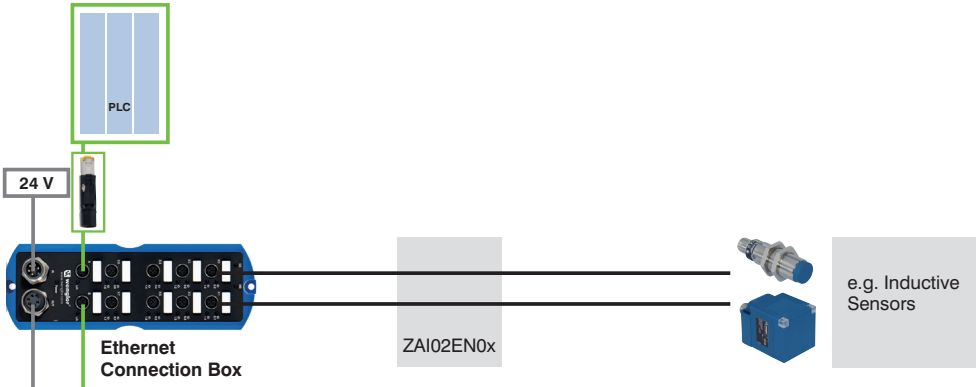
#### **Risk of property damage in case of improper storage!**


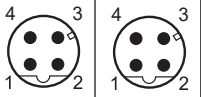






The product may be damaged.




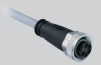





- Comply with storage instructions.
-




## 5. Installation and Electrical Connection

### 5.1 System Overview



	Order Number	Description	Cable Length	Plug Pattern
	<b>ZAV51R201</b> <b>ZAV51R601</b>	Connection cable 4-pin M12×1 plug on both ends	2 m 10 m	
	<b>ZAV51R202</b> <b>ZAV51R602</b>	Connection cable M12×1 plug, 4-pin, RJ45 plug	2 m 10 m	
	<b>ZAT51NN01</b>	Plug connector M12×1, 4-pin, field wireable	—	
	<b>ZAT45NN01</b>	Plug connector RJ45, 8-pin, field wireable	—	

	Order Number	Description	Cable Length	Plug Pattern
	ZAV78R201	Connection cable 7/8" plug, socket, 5-pin	2 m	 
	ZAS78R601	Connector Cable 7/8", socket, 5-pin	10 m	
	ZAT77NN01	Plug connector 7/8", 5-pin, field wireable	—	
	ZAB78NN01	Socket connector 7/8", 5-pin, field wireable	—	

	Description	Cable Length	Plug Pattern
	Standard cable Connection cables M12×1, 4-pin	Various lengths available	 

## 5.2 Installation

- Protect the product against contamination during installation
- Observe all applicable electrical and mechanical regulations, standards, and safety rules
- Protect the product against mechanical influences
- Make sure that the Connection Box is mounted in a mechanically secure fashion.
- Specified torque values must be complied with (see “3. Technical Data” on page 8).
- The product is laid out for use in industrial applications. Industrial environments are distinguished by the fact that power consumers are not connected directly to the public low-voltage mains. Additional measures must be implemented for use in residential, business and commercial environments.



**ATTENTION!**  
**Risk of property damage in case of improper installation!**  
 The product may be damaged.

- Comply with installation instructions.





### CAUTION!

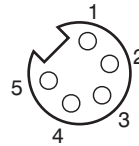
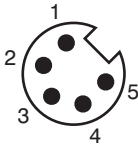
#### Risk of personal injury or property damage during installation!


Personal injury and damage to the product may occur.


- Ensure a safe installation environment.

## 5.3 Electrical Connection

- The Connection Box must be connected to 18 to 32 V DC (see “3.2 Wiring Diagram” on page 10).



Power In		
0 V	Pin 1	
0 V	Pin 2	
	Pin 3	
24 V max. 9 A	Pin 4	$U_{\text{System/Sensor}}$
24 V max. 9 A	Pin 5	$U_{\text{Digital I/O}}$

Power Out		
0 V	Pin 1	
0 V	Pin 2	
	Pin 3	
24 V max. 9 A	Pin 4	
24 V max. 9 A	Pin 5	

The 7/8" plug is laid out for a maximum current value of 9 A per pin. This must be taken into consideration when looping supply power through.

The Connection Box must be connected to supply voltage within a range of 18 to 32 V DC.

$U_{\text{System/Sensor}}$  supplies the Connection Box and all connected sensors with voltage, and  $U_{\text{Digital I/O}}$  is used to supply voltage to the digital I/O ports.

Voltage from  $U_{\text{System/Sensor}}$  must not be switched off during operation, and thus may not be connected via the emergency off circuit, because the Connection Box would otherwise no longer be able to participate in communication.

**In any event, it must be assured that supply voltage – measured at the most distant user – is no less than 18 V DC from a system power supply standpoint.**

**To be observed in the feedback mode:**

**If digital I/O power supply is combined with power supply for the Connection Box, there's a risk that communication could be interrupted in the event of a short-circuit at the I/O devices.**

5.3.1 Functional Earth

The FE terminal is located at the bottom front edge of the Connection Box. In order to assure proper functioning in accordance with the EMC requirements specified in the data sheet, we recommend using our ground strap, which is included in the scope of delivery (see “3. Technical Data” on page 8 regarding tightening torque).

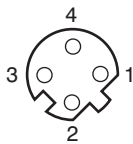
5.4 Port Assignments

Pin and port assignments for the network and the digital I/O ports are described below.

5.4.1 Industrial Ethernet Cable

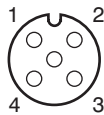
wenglor offers a range of preassembled Industrial Ethernet cables.  
In order to assure simple and reliable wiring, we recommend using out preassembled Industrial Ethernet cables.

Pin assignments for Industrial Ethernet connection (D coded):



Pin	Function
1	TxD (+)
2	RxD (+)
3	TxD (-)
4	RxD (-)

5.4.2 Connecting Digital Sensors and Actuators



Pin	Function
1	24 V
2	Freely programmable input/output
3	0 V
4	Freely programmable input/output

Unused sockets must be sealed with blanking caps (included in scope of delivery). IP 67 protection cannot otherwise be assured.

Any short-circuiting at the IO pins is displayed via the website, as well as in the controller via EtherNet/IP™. This indicates that short-circuiting to ground or  $U_{\text{Digital I/O}}$  has occurred. In the event of a short-circuit at the digital I/O ports, communication is maintained with the Connection Box via EtherNet/IP™. The inputs can still be read in as well, although separate power supply for  $U_{\text{Digital I/O}}$  and  $U_{\text{System/Sensor}}$  is required to this end.

ZAI02EN01 and ZAI02EN02 Connection Boxes are equipped with a mechanism which protects the electronics from overheating. Both of these Connection Boxes switch the digital outputs off in the case of overtemperature, for example due to excessive current output or operation outside of the specified ambient temperature range. After a cool-down phase, the Connection Boxes are started back up again automatically.

Individual output pin monitoring and overall current monitoring for digital  $U_{\text{Digital I/O}}$  has also been integrated into the ZAI02EN02.

The individual pin monitoring function detects overloading of greater than 2 A at the output pins and attempts to restart the components after a short period of time.

Overall current monitoring is necessary because current of up to 4 A can be made available at each port. However, the utilized power plug has a rating of max. 9 A. This total may not be exceeded by the sum of all digital outputs. If the limit value is nevertheless violated, the Connection Box is switched to an error status and all outputs are deactivated. The Connection Box then has to be reset in order to start it back up again. Supply power must be briefly interrupted to this end.

Looping through to the power out socket is not monitored in this case, and adherence to the specified maximum current values for the power in plug must be assured by the user.

#### NOTE!



- The Ethernet ports are equipped with overvoltage discharge protection. Internal varistors limit overvoltage to roughly 70 V.
- The connection cables for the digital I/O ports may not exceed a length of 30 meters.

## 5.5 Diagnostics

Conduct in case of fault:

#### NOTE!



- Shut down the machine.
- With the help of the diagnostics information, analyze and eliminate the cause of error.
- If the error cannot be eliminated, please contact wenglor's support department.
- Do not operate in case of indeterminate malfunctioning.
- The machine must be shut down if the error cannot be unequivocally clarified or reliably eliminated.



#### DANGER!

##### **Risk of personal injury or property damage in case of non-compliance!**

- The system's safety function is disabled. Personal injury and damage to equipment.
- Conduct in case of fault as specified.

## 6. Initial Start-Up

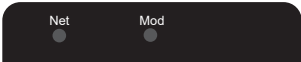
Project engineering, installation, initial start-up, maintenance and testing of the devices may only be carried out by electricians with recognized training, who are familiar with safety standards for automation technology.

All cables and accessories installed to the setup must comply with applicable safety and electromagnetic compatibility requirements and regulations, and if applicable correspond with any telecommunication terminal devices and their specifications. If damage has occurred, the product may no longer be used. The guarantee and any liability claims against the manufacturer are rendered null and void in the event of improper use.

Information regarding which cables and accessories are approved for installation is available from **[www.wenglor.com](http://www.wenglor.com)** or is included in this manual.

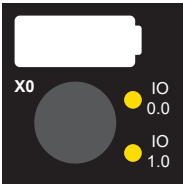
6.1 LED Display, EtherNet/IP™

The communication status indicator is identified on the Connection Box with Net and Mod.

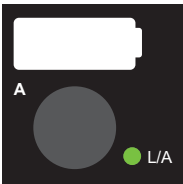


Designation	Status	Function
Net	Off	No IP address
	Green	ESM state: PRE-operational
	Green blinking	ESM state: SAFE-operational
	Red	ESM state: operational
	Red blinking	No error
Mod	Green	Ready for use
	Green blinking	Standby
	Red	Permanent error
	Red blinking	Transient error

The LED display at the M12 sockets indicates the diagnostic status of each respective socket.



Designation	Status	Function	
IO 0.0 / IO 1.0	Yellow	Input	UB to pin 2/4
		Output	Switching output to UB pin 2/4
	Red	Output	Short-circuit at pin 2/4



Designation	Status	Function
L/A	Green	Link available
	Green blinking	Communication via port

## 6.2 Operation at a Controller

If you want to place the device into service at a controller, please complete the following steps:

- Connect the Connection Box to supply power, and then connect supply power to the controller via one of the Ethernet ports. Suitable connector technology can be found on wenglor's website.
- Install the respective device-specific electronic description file (the EDS file in the case of EtherNet/IP™) to the controller's hardware manager. The required file can be downloaded from [www.wenglor.com](http://www.wenglor.com) → Product World → Product Search ("Enter the product number") → Download → Device Description File.
- The following procedure is provided as an example:
  - Add the device in the EtherNet/IP™ environment.
  - Then access the device's object attributes.
  - Assign an Ethernet address to the device. If a static IP address will be assigned, the device must be switched from DHCP (default) to static IP address.
  - Allocate the product by means of its device name / IP address (detection via MAC address).
  - Transfer the configuration to the controller.

## 6.3 Operation at a Controller Without Using an EDS File

If you want to place the device into service at a controller, please complete the following steps which are included as an example:

- Connect the Connection Box to supply power, and then connect supply power to the controller via one of the Ethernet ports. Suitable connection technology can be found at wenglor's website.
- Create a new project at the controller.
- Add a new module to this project.
- "General Ethernet module" should be selected as the communication module.
- The characteristics of the new module should coincide with the connection parameters of the respective product. In the example with the Connection Box, "Data SINT" should be selected as the communication format.
- An IP address should be assigned as well, in order to be able to address the Connection Box within the network.  
If the default settings are used, this is queried by the product via a DHCP server.
- Create the configuration assembly (not mandatory). Default configuration = I/O ports to input
- After creating the program, connect to the controller and load the program.

Exact descriptions for various controllers and instructions for installing the files, as well as for laying out the network, can be found in the help files for each respective controller. As an example, wenglor offers brief instructions for starting up an EtherNet/IP™ device ([www.wenglor.com](http://www.wenglor.com) → Product World → Product Search (order number) → Download → General Instructions).



### NOTE!

Exact descriptions for various controllers and instructions for installing the files, as well as for laying out the network, can be found in the help files for each respective controller.

## 7. Detailed Description of Object Models for EtherNet/IP™ Devices

### 7.1 Identity Object (0x01)

This object provides the device's identification.

Identity Object (0x01)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	Name	Access
1	Vendor ID	Get
2	Device Type	Get
3	Product Code	Get
4	Revision	Get
5	Status	Get
6	Serial Number	Get
7	Product Name	Get
Instance Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
0x05	Reset	

## 7.2 Message Router Object (0x02)

The message router specifies the connection paths to other objects, via which it permits access to the objects.

Message Router Object (0x02)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
4	Optional Attribute List	Get
5	Optional Service List	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	Name	Access
1	Object_list	Get
2	Number Available	Get
Instance Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	



### 7.3 Assembly Object (0x04)

The assembly object links the attributes of various objects so that they can be transmitted as a whole via a single connection.

The following assemblies are available:

Input assembly (producing) 7  
Output assembly (consuming) 37  
Configuration assembly 100

Assembly Object (0x04)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	Name	Access
3	Data	Get/Set
4	Size	Get
Instance Services		
Code	Name	
0x0E	Get_Attribute_Single	
0x10	Set_Attribute_Single	
0x18	Get_Member	
0x19	Set_Member	

## 7.4 Connection Manager Object (0x06)

This object manages internal resources for the maintenance of explicit and implicit connections.

Connection Manager Object (0x06)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
4	Optional Attribute List	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	Name	Access
1	Open Requests	Get/Set
2	Open Format Rejects	Get/Set
3	Open Resource Rejects	Get/Set
4	Open Other Rejects	Get/Set
5	Close Requests	Get/Set
6	Close Format Rejects	Get/Set
7	Close Other Rejects	Get/Set
8	Connection Timeouts	Get/Set
Instance Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
0x54	Forward_Open	
0x4E	Forward_Close	
0x52	Unconnected_Send	

## 7.5 Discrete Input Point Object (0x08)

This object manages a single physical input at the device.

Discrete Input Point Object (0x08)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
Class Services		
Code	Name	
0x0E	Get Attribute Single	
Instance Attributes		
ID	Name	Access
3	Value (0=off, 1=on)	Get
Instance Services		
Code	Name	
0x0E	Get Attribute Single	

## 7.6 Discrete Output Point Object (0x09)

This object manages a single physical output at the device.

Discrete Output Point Object (0x09)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
Class Services		
Code	Name	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	Name	Access
3	Value (0=off, 1=on)	Get/Set
4	Status (0=OK, 1=failure or alarm)	Get
5	Fault Action (0=Use fault value 1 = Hold Last state)	Get/Set
6	Fault Value (0 = Off) 1 = On	Get/Set
Instance Services		
Code	Name	
0x0E	Get_Attribute_Single	
0x10	Set_Attribute_Single	

The visibility of an instance for “explicit messaging” depends on the configuration via “Configuration Assembly” and the attribute (100, 1, 1).

## 7.7 QoS Object (0x48)

The DSCP values of the various outgoing message priorities can be configured with the QoS object (quality of service).

QoS Object (0x48)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x01	Get Attribute All	
0x0E	Get Attribute Single	
Instance Attributes		
ID	Name	Access
4	DSCP Urgent	Get/Set
5	DSCP Scheduled	Get/Set
6	DSCP High	Get/Set
7	DSCP Low	Get/Set
8	DSCP Explicit	Get/Set
Instance Services		
Code	Name	
0x0E	Get Attribute Single	
0x10	Set Attribute Single	

## 7.8 Port Object (0xF4)

This object describes the device's existing CIP ports.

Port Object (0xF4)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
8	Entry Port	Get
9	Port Instance Info	Get
Class Services		
Code	Name	
0x01	Get Attribute All	
0x0E	Get Attribute Single	
Instance Attributes		
ID	Name	Access
1	Port Type	Get
2	Port Number	Get
3	Link Object	Get
4	Port Name	Get
7	Node Address	Get
Instance Services		
Code	Name	
0x01	Get Attribute All	
0x0E	Get Attribute Single	

## 7.9 TCP/IP Interface Object (0xF5)

This object implements mechanisms for configuring the TCP/IP layer, for example IP address, subnet mask and gateway address.

TCP/IP Interface Object (0xF5)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
6	Maximum ID Number Class Attri- butes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	ID	ID
1	Status Get	
2	Configuration Capability	Get
3	Configuration Control	Get/Set
4	Physical Link Object	Get
5	Interface Configuration	Get/Set
6	Host Name	Get/Set
10	Select ACD	Get/Set
11	LastConflictDetected	Get/Set
Instance Services		
Code	Code	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
0x02	Set_Attribute_All	
0x10	Set_Attribute_Single	

## 7.10 Ethernet Link Object (0xF6)

This object configures connection-specific attributes (MAC ID, transmission rate etc.) of the Ethernet interfaces.

Ethernet Link Object (0xF6)		
Class Attributes		
ID	Name	Access
1	Revision	Get
2	Max Instance	Get
3	Number of Instances	Get
6	Maximum ID Number Class Attributes	Get
7	Maximum ID Number Instance Attributes	Get
Class Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
Instance Attributes		
ID	Name	Access
1	Interface Speed	Get
2	Interface Flags	Get
3	Physical Address	Get
6	Interface Control	Get/Set
7	Interface Type	Get
8	Interface State	Get
10	Interface Label	Get
Instance Services		
Code	Name	
0x01	Get_Attribute_All	
0x0E	Get_Attribute_Single	
0x10	Set_Attribute_Single	

### 7.11 Vendor-Specific Object (0x64)

Amongst other things, the vendor-specific object is used to configure the I/O ports.

Vendor-Specific Object (0x64)		
Class Attributes		
ID	Name	Access
No class instance. Attribute 1 unnecessary because revision == 1		
Class Services		
Code	Name	
No class instance.		
Instance Attributes		
ID	Name	Access
1	Direction register (16-bit) (see below)	Get/Set
2	Fault action (16-bit) (see below)	Get/Set
3	Fault value (16-bit) (see below)	Get/Set
4	Webserver access (BOOL), 0 = disable, 1 = enable	Get/Set
Instance Services		
Code	Name	
0x0E	Get Attribute Single	
0x10	Set Attribute Single	

Attributes layout:

Attribute ID	Attribute ID																																																																																																												
1	Direction register:																																																																																																												
	<table><tr><td colspan="9">Byte 0</td><td colspan="9">Byte 1</td></tr><tr><td colspan="9">I/O direction pin 2</td><td colspan="9">I/O direction pin 4</td></tr><tr><td>Bit</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>Bit</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr><tr><td>Port</td><td>X7</td><td>X6</td><td>X5</td><td>X4</td><td>X3</td><td>X2</td><td>X1</td><td>X0</td><td>Port</td><td>X7</td><td>X6</td><td>X5</td><td>X4</td><td>X3</td><td>X2</td><td>X1</td><td>X0</td></tr><tr><td colspan="9">Actual bit = 0 =&gt; input (default)</td><td colspan="9">Actual bit = 0 =&gt; input (default)</td></tr><tr><td colspan="9">Actual bit = 1 =&gt; output</td><td colspan="9">Actual bit = 1 =&gt; output</td></tr></table>	Byte 0									Byte 1									I/O direction pin 2									I/O direction pin 4									Bit	8	7	6	5	4	3	2	1	Bit	8	7	6	5	4	3	2	1	Port	X7	X6	X5	X4	X3	X2	X1	X0	Port	X7	X6	X5	X4	X3	X2	X1	X0	Actual bit = 0 => input (default)									Actual bit = 0 => input (default)									Actual bit = 1 => output									Actual bit = 1 => output								
	Byte 0									Byte 1																																																																																																			
	I/O direction pin 2									I/O direction pin 4																																																																																																			
	Bit	8	7	6	5	4	3	2	1	Bit	8	7	6	5	4	3	2	1																																																																																											
	Port	X7	X6	X5	X4	X3	X2	X1	X0	Port	X7	X6	X5	X4	X3	X2	X1	X0																																																																																											
	Actual bit = 0 => input (default)									Actual bit = 0 => input (default)																																																																																																			
Actual bit = 1 => output									Actual bit = 1 => output																																																																																																				
2	Fault Action:																																																																																																												
	0 = "fault value" will be used at communication loss																																																																																																												
	1 = output holds last state																																																																																																												
	Same structure as direction register.																																																																																																												
3	Fault Value:																																																																																																												
	0 = output off (default)																																																																																																												
	1 = output on (switch to Ua)																																																																																																												
	Same structure as direction register.																																																																																																												
4	Webserver access => 00 = webserver access disabled																																																																																																												
	01 = webserver access enabled (default)																																																																																																												



## 7.12 Connections

One exclusive owner connection and several input-only/listen-only connections are supported.

Producing assembly (target → originator, input data): instance 7, length: 4 bytes

Byte 0									Byte 1									Byte 2	Byte 3
Inputs, pin 2									Inputs, pin 4									Device status	
Bit	8	7	6	5	4	3	2	1	Bit	8	7	6	5	4	3	2	1		
Port	X7	X6	X5	X4	X3	X2	X1	X0	Port	X7	X6	X5	X4	X3	X2	X1	X0		

Device status layout:

Byte	Bit position	Meaning
2	0	Error (active as soon as another error bit is activated)
	1	Internal device error
	2	U <sub>digital I/O</sub> too low
	3	Outputs shut down (due to excessive temperature)
	4	Short-circuit at at least one output
	5	—
	6	Temperature too high
	7	Temperature too low
3	0–7	—

Consuming assembly (originator → target, output data): instance 37, length: 2 bytes

Byte 0									Byte 1								
Inputs, pin 2									Inputs, pin 4								
Bit	8	7	6	5	4	3	2	1	Bit	8	7	6	5	4	3	2	1
Port	X7	X6	X5	X4	X3	X2	X1	X0	Port	X7	X6	X5	X4	X3	X2	X1	X0

Configuration assembly for ZAI02EN01 and ZAI02EN02: instance 100, length: 6 bytes

Configuration Assembly (0x64)								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Direction access, pin 2 (byte 0)							
1	Direction access, pin 4 (byte 1)							
2	Fault behavior, pin 2 (byte 0)							
3	Fault behavior, pin 4 (byte 1)							
4	Fault action, pin 2 (byte 0)							
5	Fault action, pin 4 (byte 1)							

When an exclusive owner connection without configuration assembly is opened, the device's current settings are retained.

Register layout: see vendor-specific object 0x64.

## 8. Web-Based Configuration

The Connection Box is equipped with a web-based configuration interface which functions independent of the operating system.

You can configure the Connection Box conveniently at a standard web browser. When set to default values, the device expects an IP address from a DHCP server. The web-based configuration interface is not required for normal operation with a controller.



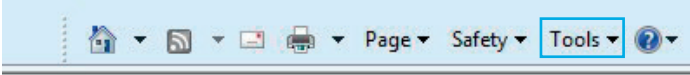
**NOTE!**

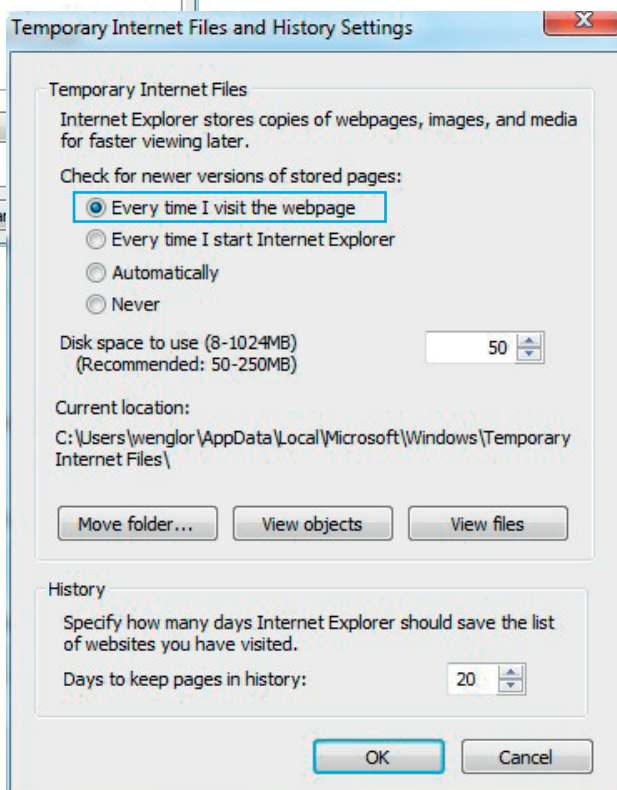
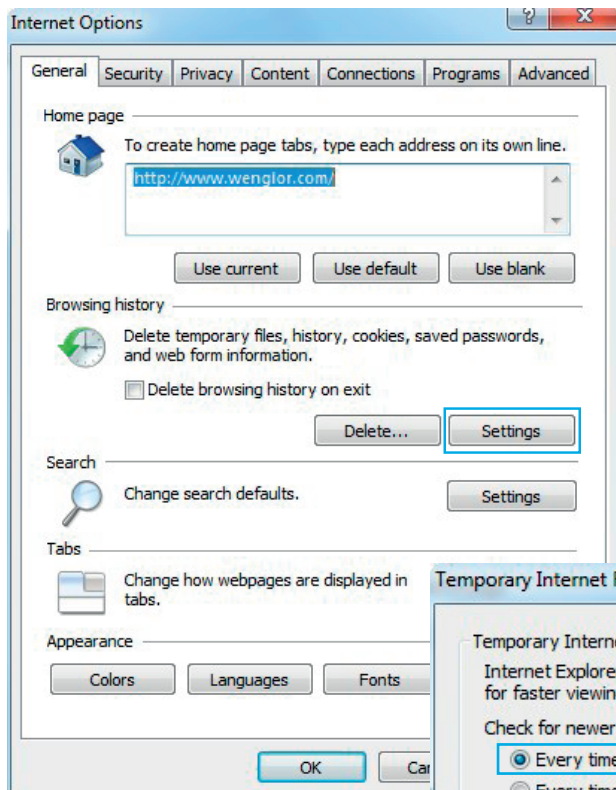
When operated with a controller, settings which have been changed via the website are overwritten by the controller.

Exception: When an exclusive owner connection without configuration assembly is opened, the device's current settings are retained.

### 8.1 Accessing the Administration Interface

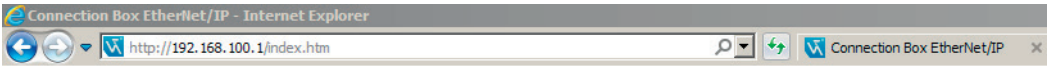
Start the web browser. Enter the switch's manually selected IP address to the address line in your browser and press the enter key. In order to assure that the browser displays the most current website settings, the respective website must always be automatically reloaded when a change is made. This setting must be changed in a browser-specific manner which is described here using the Internet Explorer as an example. Select "Every time I visit the webpage" under Tools -> Internet options -> General -> Settings. Otherwise, changes to the website might not be correctly displayed.





In order to be able to access the Connection Box's website (in this example the ZAI02EN01), the IP address must be entered to the browser's address line as described.

Example: `http://192.168.100.1`



8.2 Overview Page



Language Selection



- General device
- Device settings
- Digital I/O ports



Category Selection

General device

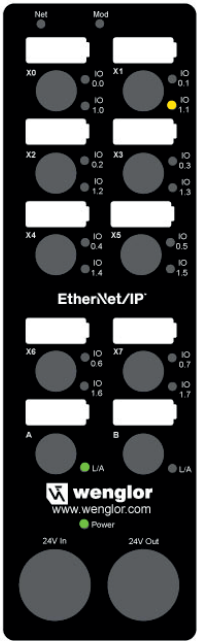


Part number	ZAI02EN01
Product version	V1.1.2
Producer	wenglor sensoric GmbH
Description	Connection Box EtherNet/IP
Serial number	700009215
MAC Address	54-4a-05-07-22-00
Real Time Ethernet Status	offline
Unit Identifier	0x0007



Page Content

Functions Overview



The “Device, General” overview page and the image of the connection overview are not password protected. A password prompt appears when other pages are accessed.

The following user data are preset upon shipment from the factory.

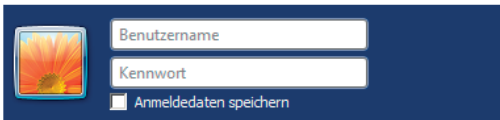
**User name: admin**

**Password: admin**

The password can be changed in the **Device Settings** page.

The server 192.168.100.1 is asking for your user name and password. The server reports that it is from device.htm.

Warning: Your user name and password will be sent using basic authentication on a connection that isn't secure.



## 8.3 Page Layout

The website is subdivided into the following four areas:

### 1. Language selection

The website can be changed from English (default language) to German, Italian, French or Spanish with the language selection function.

### 2. Category selection

The web-based settings are subdivided into 3 categories.

- Device, General
- Device Settings
- Digital I/O Ports

### 3. Page content

Depending on which category is selected, the corresponding page content is displayed.

### 4. Functions overview

Graphic overview of the LED indicators




#### NOTE!

The status LEDs (Net and Mod) are not shown

# 8.4 Device, General

After a connection has been established, the “Device, General” overview page is displayed.

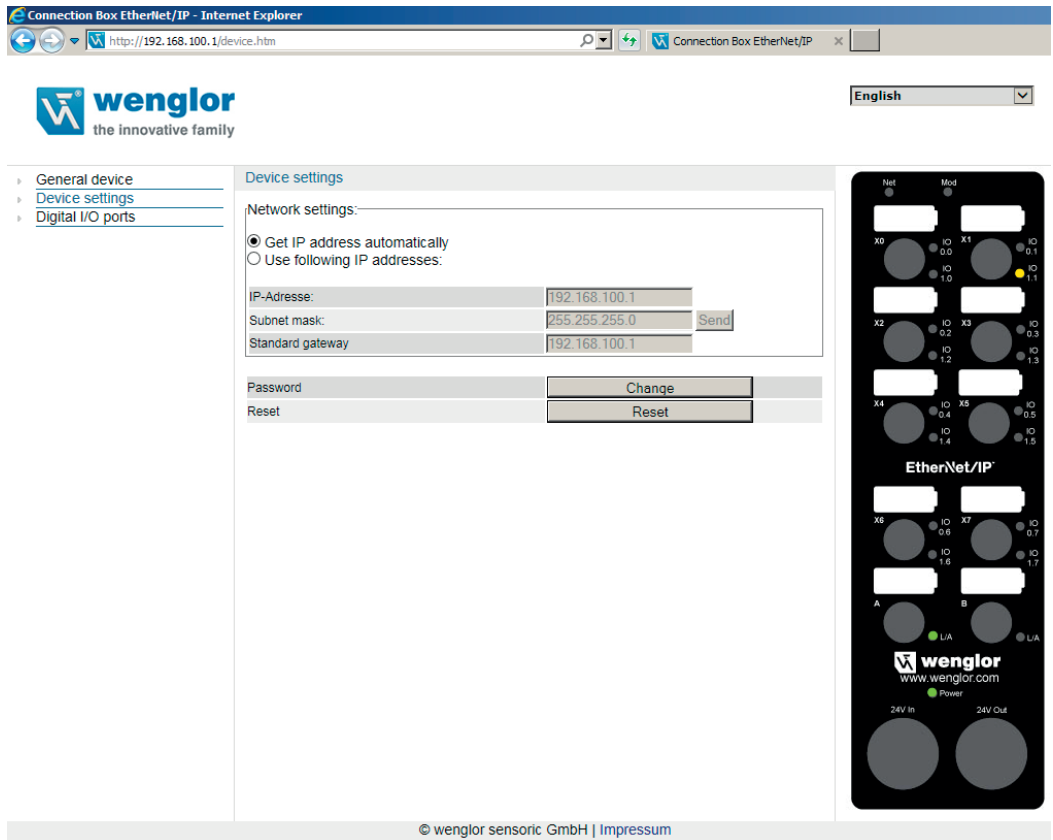
General device



Part number	ZAI02EN01
Product version	V1.1.2
Producer	wenglor sensoric GmbH
Description	Connection Box EtherNet/IP
Serial number	700009215
MAC Address	54-4a-05-07-22-00
Real Time Ethernet Status	offline
Unit Identifier	0x0007

Order Number	The order number is the article number by means of which the Connection Box can be ordered from wenglor.
Product version	The product version is the Connection Box’s version number.
Manufacturer	The manufacturer of the Connection Box is wenglor.
Description	The description indicates the type of product. The product’s Industrial Ethernet interface is also displayed.
Serial number	The serial number can be used to trace the product back to detailed manufacturing information.
MAC address	The Connection Box’s MAC address is unique and is required for the identification of Ethernet products.
Real-time Ethernet status	The status of the Ethernet connection is indicated.
Device ID	Indicates the utilized device profile (0x07 = digital I/O)

## 8.5 Device Settings



Connection Box EtherNet/IP - Internet Explorer

http://192.168.100.1/device.htm

English

General device

Device settings

Digital I/O ports

Device settings

Network settings:

☒ Get IP address automatically  
☐ Use following IP addresses:

IP-Adresse: 192.168.100.1  
 Subnet mask: 255.255.255.0   
 Standard gateway: 192.168.100.1

Password   
 Reset

EtherNet/IP

X0 X1 IO 0.0 IO 0.1  
 X2 X3 IO 0.2 IO 0.3  
 X4 X5 IO 0.4 IO 0.5  
 X6 X7 IO 0.6 IO 0.7  
 A B L/A L/B  
 24V In 24V Out  
 wenglor  
 www.wenglor.com

© wenglor sensoric GmbH | Impressum

The network settings can be changed and the device can be reset via the device settings category selection.

## Device settings

### Network settings:

☐ Get IP address automatically

☒ Use following IP addresses:

IP-Adresse:	<input type="text" value="192.168.100.1"/>	
Subnet mask:	<input type="text" value="255.255.255.0"/>	<input type="button" value="Send"/>
Standard gateway	<input type="text" value="192.168.100.1"/>	

Password	<input type="button" value="Change"/>	
Reset	<input type="button" value="Reset"/>	

If a Connection Box is not operated at a controller, the network settings can be changed. The network settings are saved by clicking the "Send" button. The Connection Box must be briefly disconnected from supply power in order to activate changes to the network settings.

### NOTE!

Error-free operation of the product can only be assured if correct network settings are entered via the web

interface. If any incorrect entries are made, it may not longer be possible to contact the device within the network.

It must be ensured that supply power is not interrupted while making changes to network settings. Furthermore, supply power must be maintained for at least an additional 5 seconds after the network settings have been saved to memory.



## Changing the password:

Password	<input type="button" value="Change"/>	
----------	---------------------------------------	--

An additional window appears to which the new password can be entered.

### NOTE!

If the password is forgotten, it's only possible to return the Connection Box to its default settings by means of a reset at the controller.



## Reset:

Reset	<input type="button" value="Reset"/>	
-------	--------------------------------------	--

The following settings are returned to their default values after activating the reset button:

- Parameters of the digital I/O ports: all digital I/O ports are switched to input.
- The password is reset to "admin".

### NOTE!

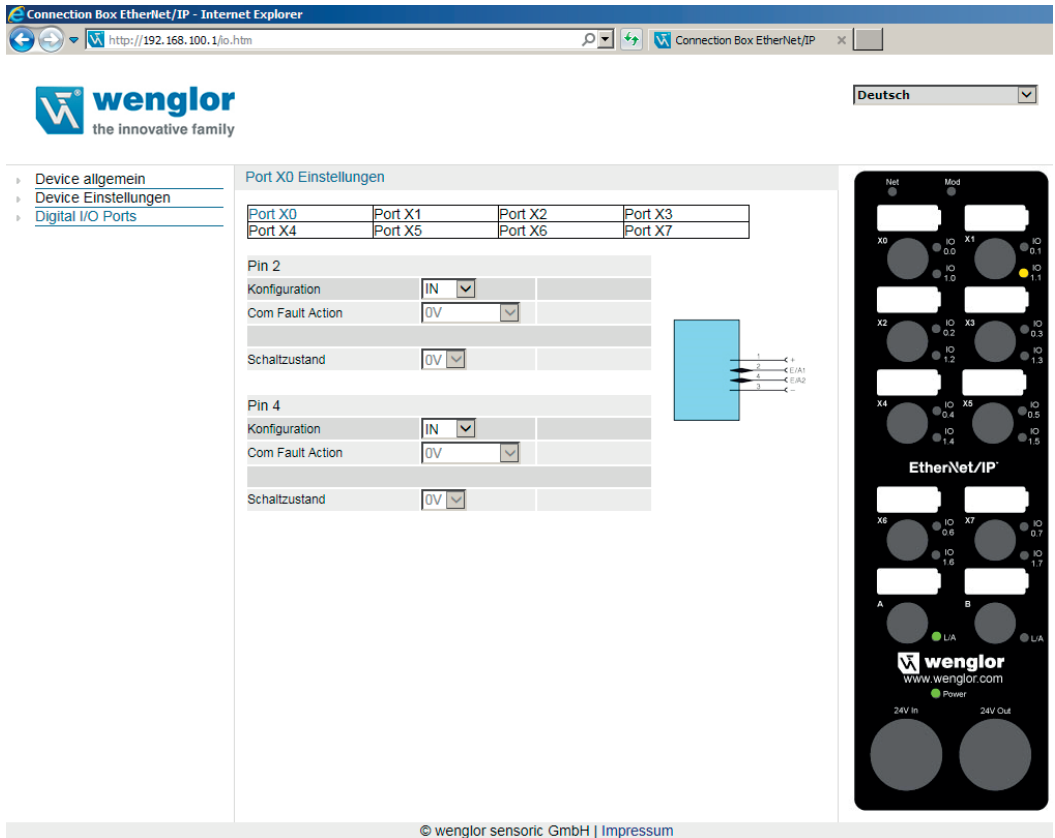
Network settings are not reset in this case! If the network settings are unknown, the device must be connected to a controller in order to restore the settings to their default values.





## 8.6 Settings for Digital I/O Ports

The Connection Box is equipped with 8 ports, each with two digital inputs/outputs. The parameters of the digital inputs/outputs are configured via the digital I/O ports page.



Connection Box EtherNet/IP - Internet Explorer

http://192.168.100.1/lo.htm

Connection Box EtherNet/IP

Deutsch

Device allgemein

Device Einstellungen

Digital I/O Ports

Port X0 Einstellungen

Port X0	Port X1	Port X2	Port X3
Port X4	Port X5	Port X6	Port X7

Pin 2

Konfiguration: IN

Com Fault Action: 0V

Schaltzustand: 0V

Pin 4

Konfiguration: IN

Com Fault Action: 0V

Schaltzustand: 0V

EtherNet/IP

24V In

24V Out

wenglor

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Pins 2 and 4 can be configured as inputs or outputs. If the pin is configured as an output, it can be set manually to 0 V or operating voltage. A red blinking LED indicates a short-circuit at the respective pin.

## Port X0 Einstellungen

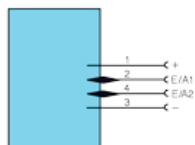
Port X0	Port X1	Port X2	Port X3
Port X4	Port X5	Port X6	Port X7

### Pin 2

Konfiguration	OUT	
Com Fault Action	0V	
Schaltzustand	0V	UB

### Pin 4

Konfiguration	IN	
Com Fault Action	0V	
Schaltzustand	0V	



### NOTE!

This function is not only available via the website: it can also be set via the controller for normal operation!

COM fault action:

This function stipulates the output function of the output pins after a network crash (exclusive owner connection). Selection can be made from amongst:

- 0V = switch outputs off (default)
- UB = switch outputs on
- Maintain (the previous state)

## Port X0 Einstellungen

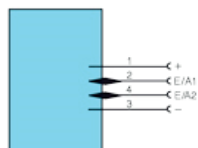
Port X0	Port X1	Port X2	Port X3
Port X4	Port X5	Port X6	Port X7

### Pin 2

Konfiguration	OUT	
Com Fault Action	0V	UB
		Beibehalten
Schaltzustand	0V	

### Pin 4

Konfiguration	IN	
Com Fault Action	0V	
Schaltzustand	0V	



## 9. Maintenance Instructions

### NOTE!

- The wenglor Connection Box is maintenance-free.
- Cleaning and inspection of the plug connections at regular intervals is advisable.
- Do not clean the Connection Box with solvents or cleansers which could damage the product.
- The product must be protected against contamination during initial start-up.
- For cleaning, always use pure water and neutral cleaning agents in combination with a soft, non-scratching, non-abrasive, non-fraying cloth – avoid excessive pressure and rubbing.
- Large areas of contamination including greasy, oily or sooty surfaces, as well as adhesive residues, can be removed with aromatic-free mineral spirits or isopropyl alcohol.
- Use cleaning agents with a temperature of no greater than 25° C.
- Do not use steam jet cleaners.
- Do not use any solvents which contain aromatics, alcohol, ketones, ester, glycol ether or halogenated hydrocarbons for cleaning.
- When cleaning with liquids, all open ports must be sealed with the protective caps intended for this purpose.



## 10. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.

# 11. Appendix

## 11.1 List of Abbreviations

Abbreviation	Meaning
CIP	Common industrial protocol
DHCP	Dynamic host configuration protocol
EDS	Electronic data sheet
FE	Functional earth
I/O	Input/output
ID	Identifier
IP	Internet protocol
IP 67	International protection
L/A	Link activity
LED	Light emitting diode
U <sub>A</sub>	U <sub>Digital</sub> /I/O
MAC	Media access control
TCP/IP	Transmission control protocol / internet protocol
UB	Operating voltage

## 11.2 Change Index, Operating Instructions

Version	Date	Description/Change	Associated Product Version
1.0.0	08.02.2016	Initial version of the operating instructions	V1.1
2.0.0	14.07.2016	Expanded to include UL and minor adaptations	V1.1
2.0.1	19.02.2018	Correction “ <a href="#">7.11 Vendor-Specific Object (0x64)</a> ”	V1.1

## 11.3 EU Declaration of Conformity

The EU declaration of conformity can be found on our website at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.