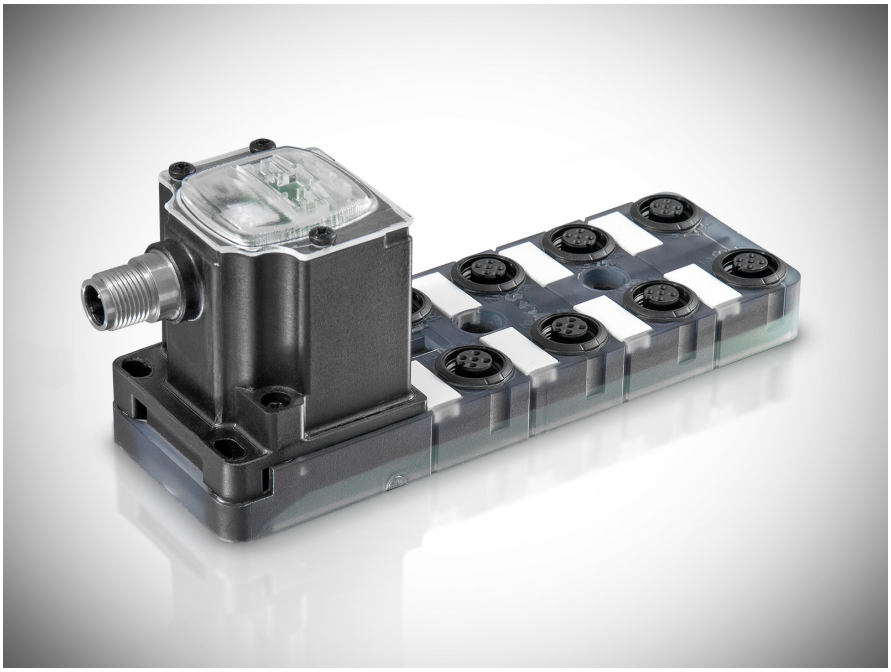
SCHILDKNECHT
SMART DATA COMMUNICATION

Installation and commissioning manual
Wireless Data System
SET DATAEAGLE® X-treme IO 2730



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DATAEAGLE X-treme IO 2730
Version: 15.02.2019

Right to make changes

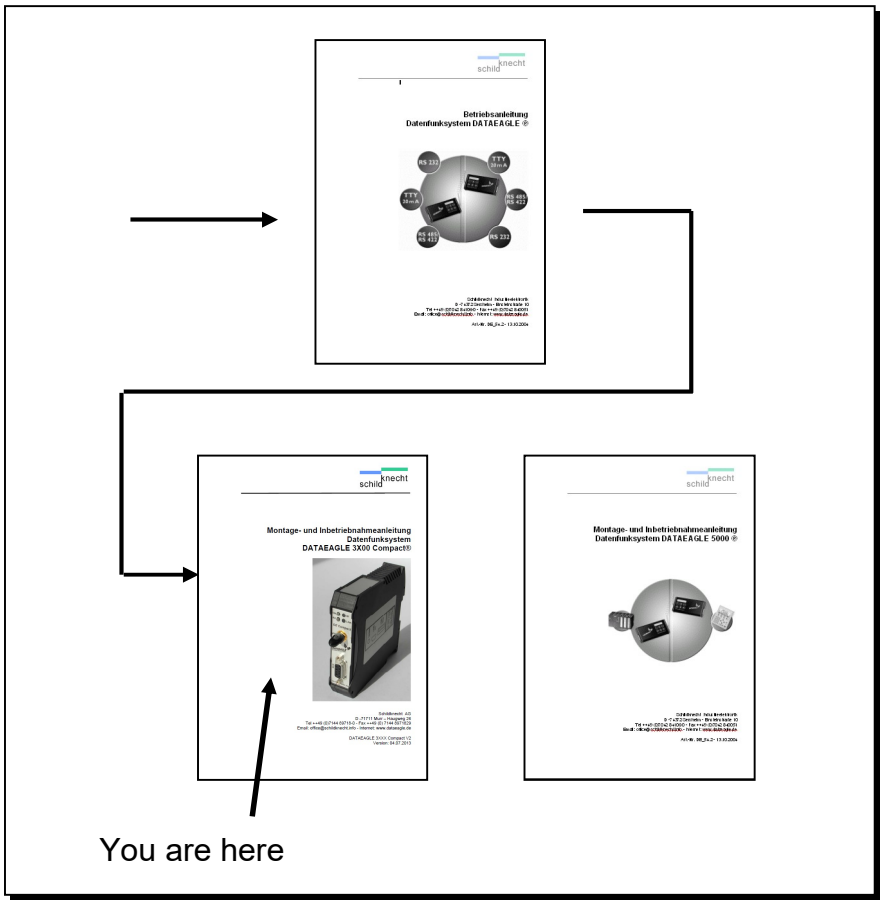
Changes may be made at any time to the form, equipment and technology of items covered in this documentation. For this reason, no claims relating to the aforementioned may be derived from the information, illustration and descriptions provided in these operating instructions for appliances or systems manufactured after the date of issue of these operating instructions.

Warranty

Schildknecht AG can accept no liability for indirect damage or direct damage, incidental damage, consequential damage or compensation for expenses incurred by performance of contract which arise from delivery, provision and use of this material.

Introduction

The technical description of the wireless data systems from Schildknecht AG consists of an operating instruction for all product families and an installation and commissioning manual for each product family. Please read both documents carefully before you start working with the wires data systems. Both documents should be considered as a single entity.



The operating instruction is intended to help you familiarize yourself with the structure and function of wireless data systems.

Here you get **general** information about the complete product family. Please read the operating instructions first if you are not familiar with the structure and function of wireless data systems.

Next, read the installation and commissioning manual of the wireless data system.

To start with, we have a few important things to say about safety. Please observe these instructions without fail, in order to avoid property damage and personal injury.

We show you step by step how to install the system, put it into operation and how to operate it.

Any questions? First, have a look in the table of contents. You will quickly find what you are looking for.

If you do need us in person: just call us or send a fax:

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SCHILDKNECHT
SMART DATA COMMUNICATION

List of contents

1. General information

1.1. Guide to symbols

This section contains an explanation of the symbols used in this manual.

⚠ DANGER

Indicates an imminently hazardous situation which, if not avoided, may result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Indicates sections which contain important information.

Indicates work operations which need to be carried out.

This symbol is followed by a description about how the status of the system changes after an operation has been carried out.

1.2. Copyright and brand names

Brand names and product names mentioned in this manual are trademarks or registered trademarks of their respective owners.

Microsoft Windows 7, Windows Vista, Windows 2000, Windows XP and Microsoft Internet Explorer are registered trademarks of Microsoft Corp.

Adobe Reader is a registered trademark of Adobe Systems Corp.

DATAEAGLE® is a registered trademark of Schildknecht AG.

1.3. Declaration of conformity and EC directives

Information about the declaration of conformity and about EC directives can be found under:
http://www.schildknecht.ag/download/dataeagle-konformitaetserklaerung

2. Safety instructions

2.1. Intended use

Information about the intended use can be found in the operating instructions wireless data systems DATAEAGLE.

2.2. General information

In order to guarantee safe use and fault-free operation, the according safety instructions have to be observed under all circumstances.

Safety instructions which apply to all product families are described in the operating instructions for wireless data systems DATAEAGLE. This manual is part of the system documentation. Read these instructions before installation and commissioning of the wireless data system.

Safety instructions which apply only to an individual wireless data system are described below and in the according section of this installation and commissioning manual.

2.3. Installations instructions

Country licenses can be found in the attached declaration of conformity.

DANGER

Risk of electrical shock.

Always disconnect the modules from the power source when working on the modules (installation, etc.)!

DANGER

Risk of injury.

Comply with the local regulations and safety instructions during installation!

CAUTION

Static charges can damage electronic devices.

Remove electrostatic discharge from your body before touching the device!

CAUTION

The modules must not be opened or modified (except the steps described in this manual). Do not repair the module yourself, replace it with an equivalent module. Repairs may only be carried out by the Schildknecht AG. The Schildknecht AG is not liable for damage resulting from a failure to comply.

2.4. Safety instructions for operation

Electromagnetic radiation.

Keep at least a distance of 20 cm to the antennas when the devices are in operation.

⚠ CAUTION	**An external current fuse up to a maximum of 10A must be provided unconditionally!**

2.5. Personnel qualification

Only qualified personnel may carry out the following tasks:

- Installation
- Commissioning
- Operation
- Maintenance

Within the context of safety regulations, qualified personnel are individuals authorized to commission, to ground, and to identify equipment and systems in accordance with the safety-engineering standards.

All operating personnel must be trained accordingly.

Personnel involved with operating the unit in conjunction with controllers must possess sound programming skills for the individual controller and programming language in question.

3. Structure

3.1. System description

The SET DATAEAGLE X-treme IO 2730 system is used for bidirectional transmission of digital or analog signals via radio. It consists of a radio master and a radio slave module.

Depending on the device version, the following signals can be transmitted:

Art.No. 12200	8 DI	---	8 DO
Art.No. 12201	4 DI/DO	---	4 DI/DO
Art.No. 12202	4 AI/AO 4-20mA	---	4 AI/AO 4-20mA
Art.Nr. 12203	4 AI/AO 0-10V	---	4 AI/AO 0-10V
Art.No. 12204	4 DI	---	4 DO

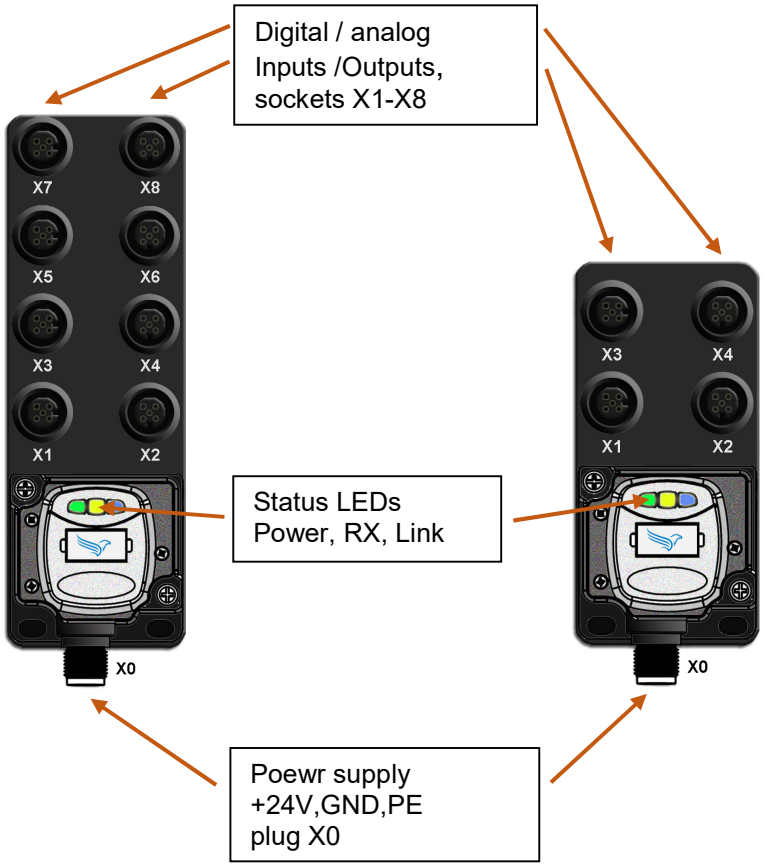
DI : digital input (24V,3-Leiter-Anschluss)
DO : digital output (24V,MOSFET)
AI : analog input (0-10V bzw. 4-20mA)
AO : analog output (0-10V bzw. 4-20mA)

3.2. Radio module

The radio module is used for the transmission of signals via radio and is available in the following radio technologies.

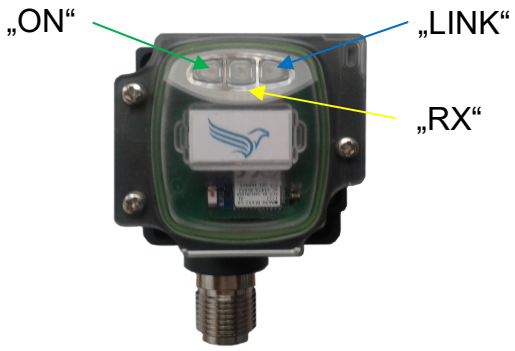
Art-No.	Radio technology	Transmitting power	Antenna
12200	2,4 GHz Bluetooth LE 4.2	2,5 mW	internal
12201	2,4 GHz Bluetooth LE 4.2	2,5 mW	internal
12202	2,4 GHz Bluetooth LE 4.2	2,5 mW	internal
12203	2,4 GHz Bluetooth LE 4.2	2,5 mW	internal
12204	2,4 GHz Bluetooth LE 4.2	2,5 mW	internal

3.3. Structure and connections of the radio module:



Status LEDs

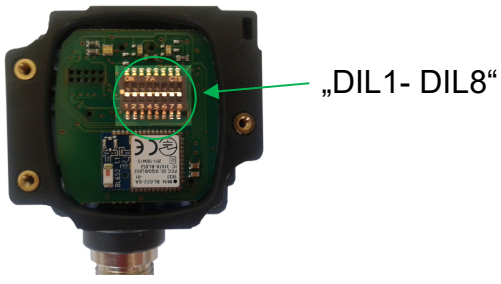
The table shows the meaning of the LEDs on the radio module:



Name	Colour	Function
ON	green red static red flashing	Power ok Input voltage too low (<9Volt) Input voltage too high (>30Volt)
RX	yellow	Radio data reception
LINK	blue	Bluetooth connection established

DIL switch

Under the transparent cover there is a DIL switch for selecting a certain operating behaviour.
To remove the cover, remove the 3 cover screws and carefully remove the cover. Please make sure that no foreign matter or moisture enters the module when the cover is open.
To close the cover, press on the cover firmly and screw in the 3 screws as well.

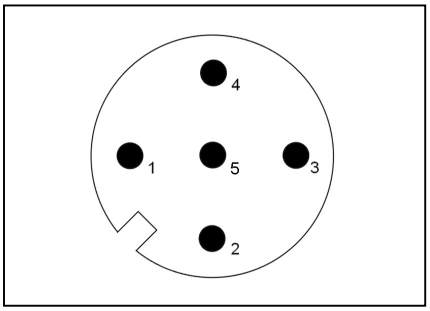


Name	Position	Function
DIL 1	„off“ „on“	Outputs switch off in case of radio interruption >2s. Outputs are held.
DIL 2-5	„off“	no function
DIL 6-8	„off“	reserved, position "off" mandatory

Connections for power supply and in-puts/outputs

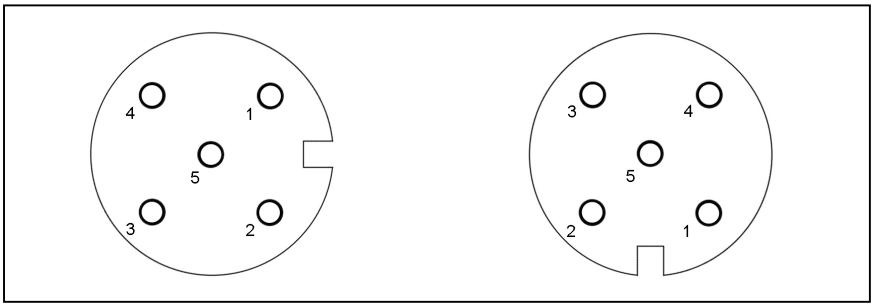
Connection "X0" Power supply

The illustrations show the pin assignment of the connectors / Sockets (view of the module):



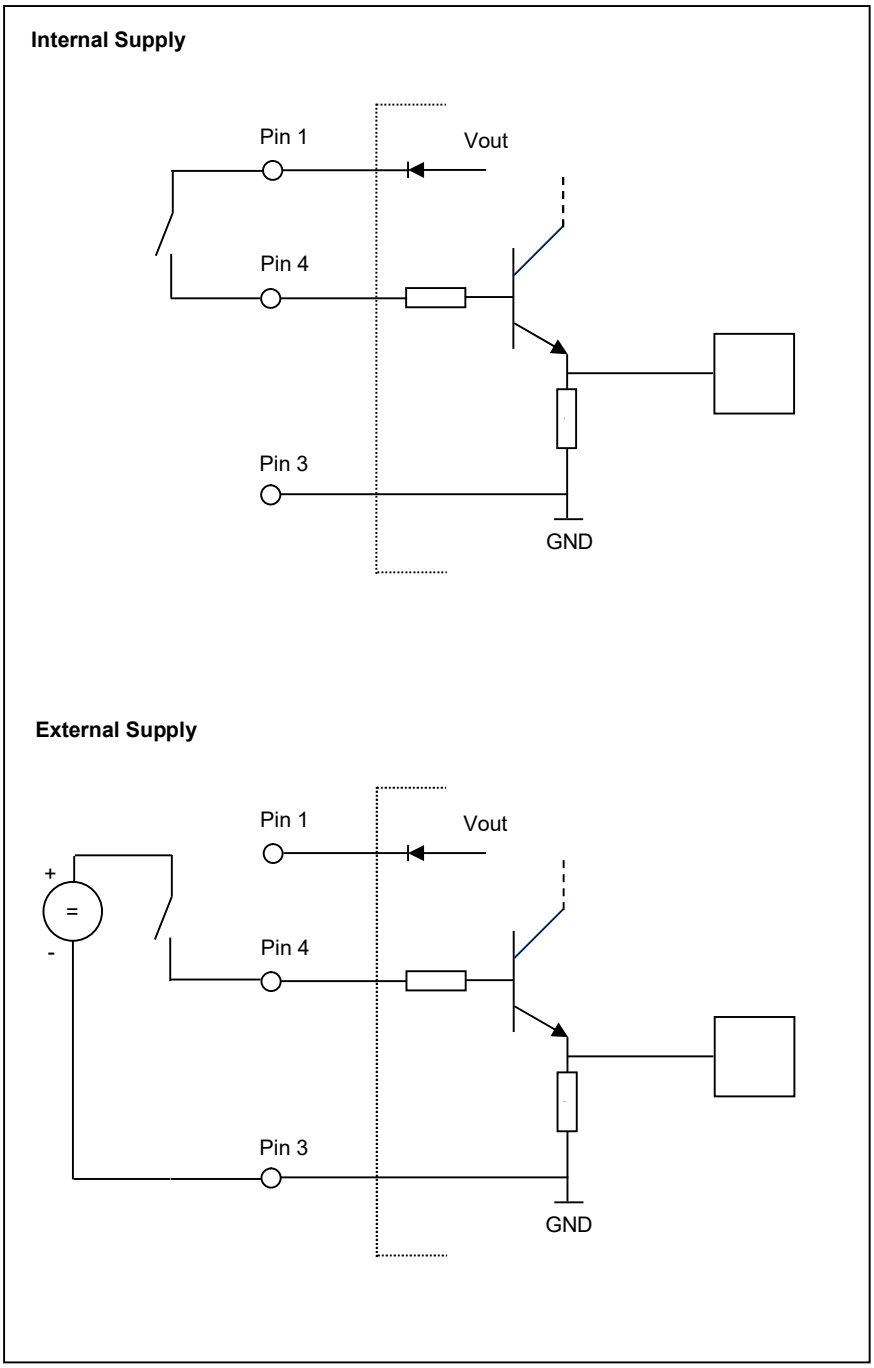
Power supply (plug) M12 A coding		Wire colour
Pin 1:	+ 24VDC	brown
Pin 2:		white
Pin 3:	GND	blue
Pin 4:	„RX“ Output 24V	black
Pin 5:	PE	green/yellow

Connection "X1-X8" Inputs/outputs

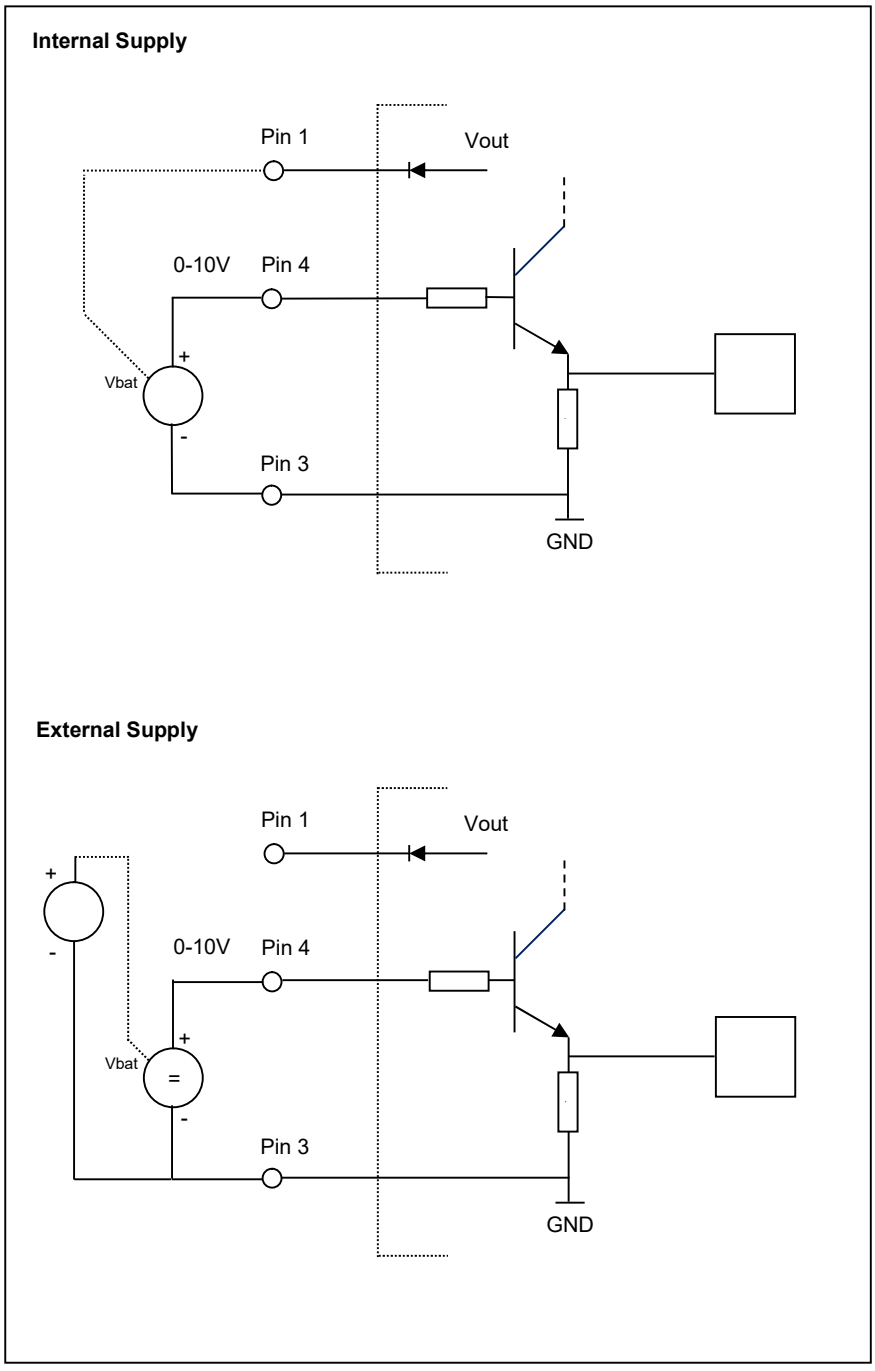


Input/output (socket) M12 A coding		Wire colour
Pin 1:	Vout (+24VDC)	brown
Pin 2:	---- (leave open)	white
Pin 3:	GND	blue
Pin 4:	Dig.IN/ OUT Analog IN/OUT (0-10V bzw. 4-20mA)	black
Pin 5:	PE	green/yellow

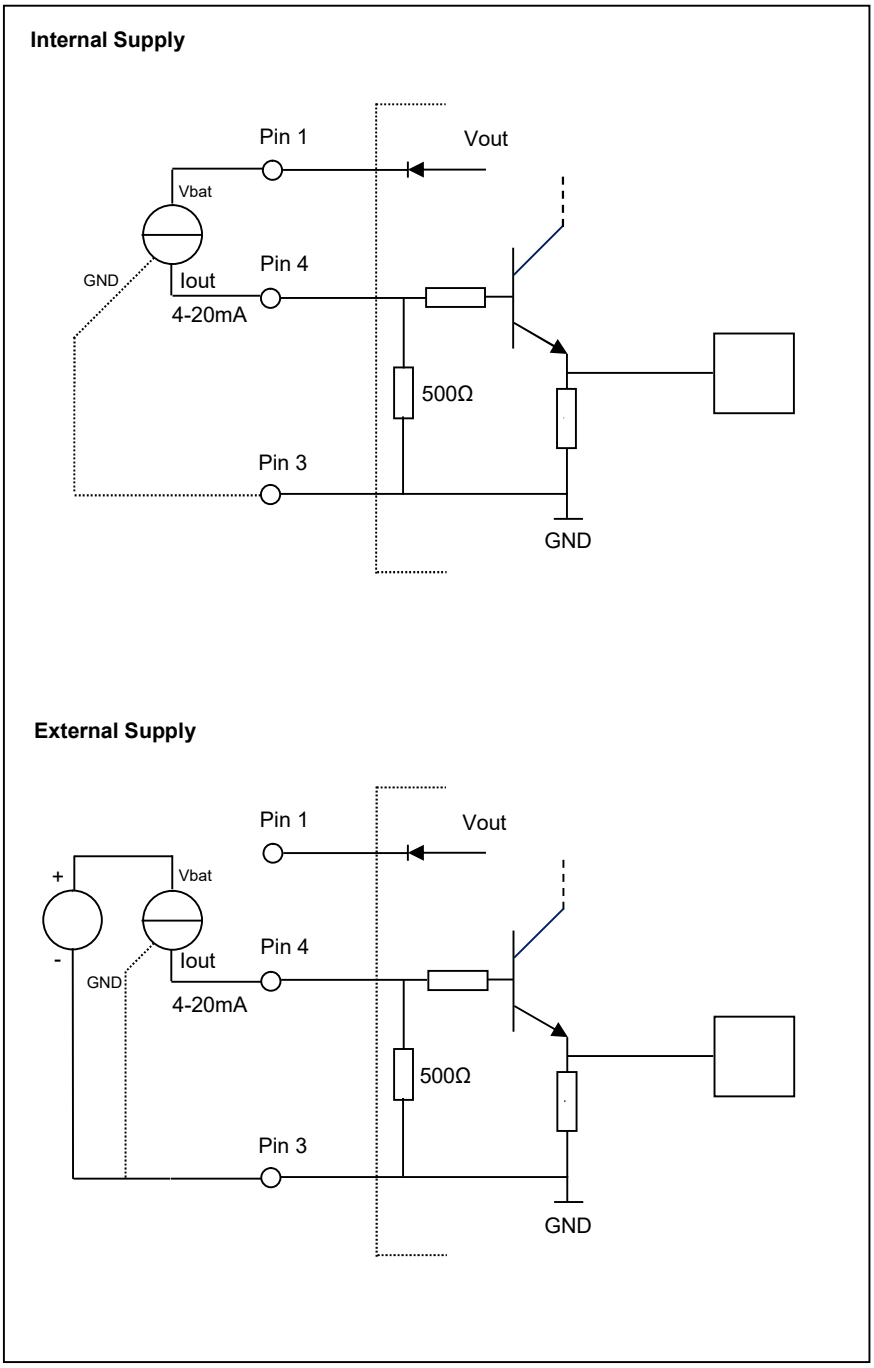
Schematic diagram digital iputs X1-X8



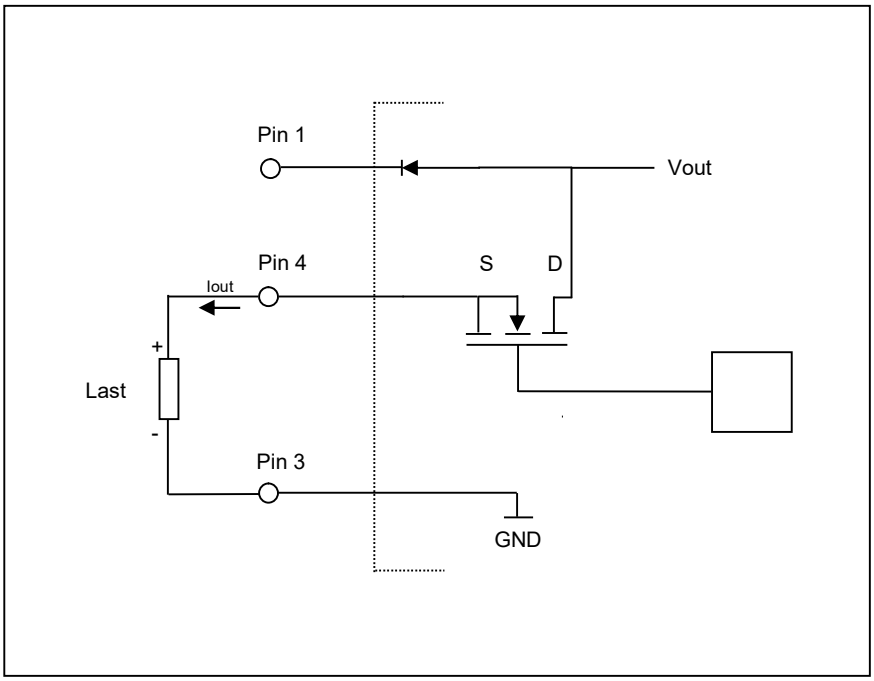
Schematic diagram analog iputs X1-X8 0-10V



Schematic diagram analog iputs X1-X8 4-20mA



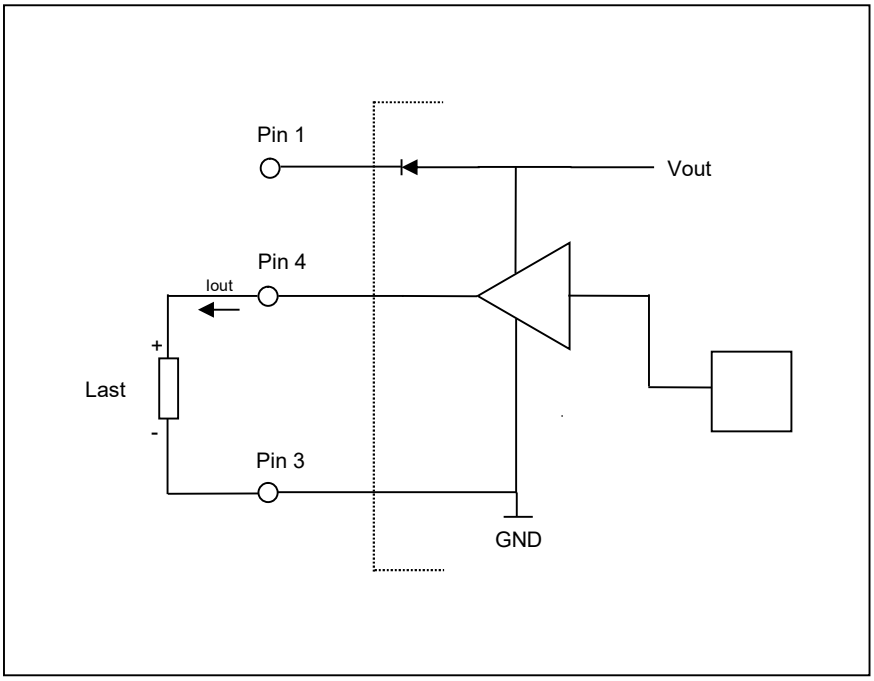
Schematic diagram digital outputs X1-X8



⚠ CAUTION

Iout < 200mA !
∑Iout < 1 A !

Schematic diagram analog outputs X1-X4 0-10V bzw. 4-20mA



⚠ CAUTION

Iout <= 20mA !

4. Installation of new devices

Please be certain to read the guidelines in chapter 6 „Tips and Tricks – improvement of the electromagnetic compatibility (EMC)“. Observe these guidelines during the complete installation procedure. Thereby you avoid electromagnetic interferences and you improve the data transmission quality.

New devices are pre-configured in the factory. Further settings are not necessary.

4.1. Overview Installation

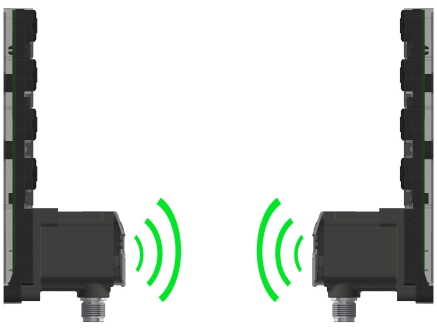
The installation is very easy and is carried out according to the procedure shown below:

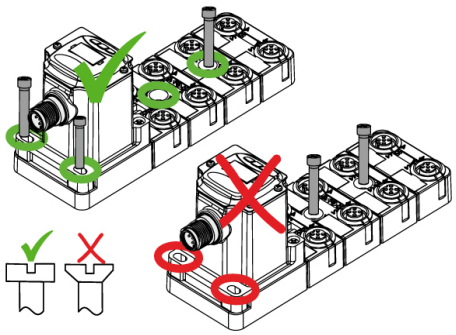
Mounting the radio module
⬇
Connecting sensors/actuators
⬇
Closing unused M12 sockets (X1-X8)
⬇
Connecting power supply (X0)

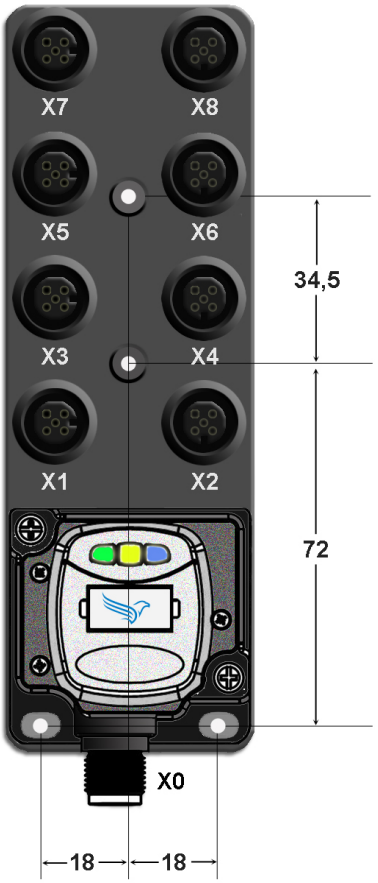
4.2. Mounting the radio module

The radio module should be installed in the desired position with at least 3 fixing screws (M4 flat head screw).

- Select the position of the radio modules so that there is ideally a line of sight between the modules.
- Ensure that the mounting surface is level for voltage-free mounting.
- Provide suitable earthing.
- If necessary, drill mounting holes.

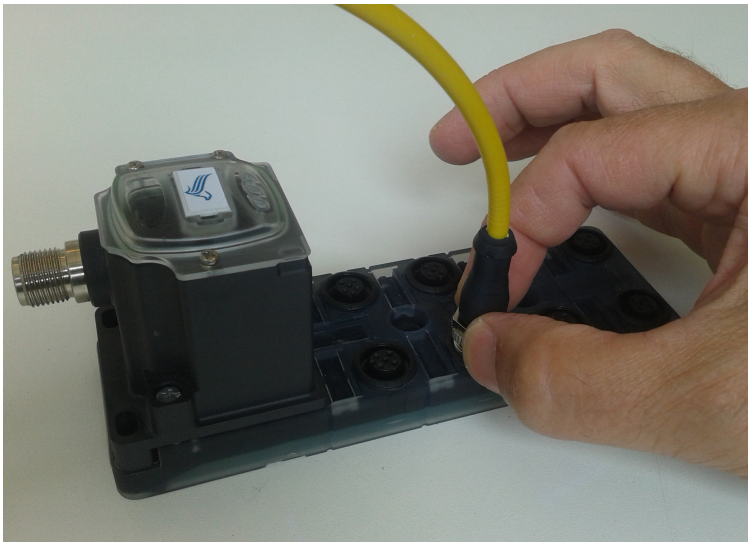






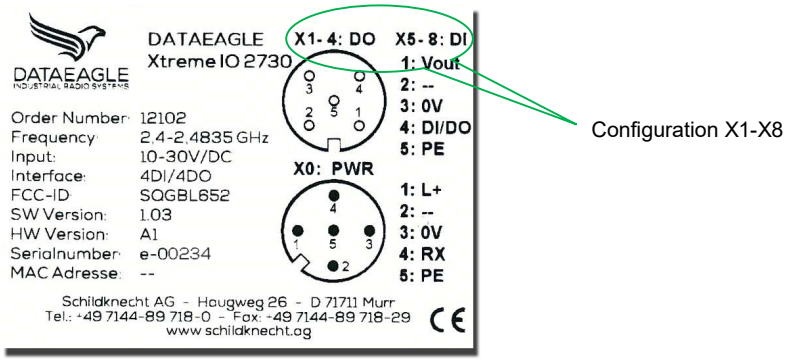
4.3. Connecting sensors/actuators

Connect your sensors/actuators to the M12 sockets X1-X8 (X1-X4). When tightening the fixing nuts of the M12 connectors, please ensure the correct tightening torque of 0.6 Nm.



4.3.1. Assignment of sockets X1-X8 by device type

The function and assignment of the connector sockets of a Dataeagle X-treme IO 2730 set depends on the set configuration. Depending on its function, a set can consist of different hardware modules.
The type plate on the back of a module provides information about the configuration of the respective individual module.

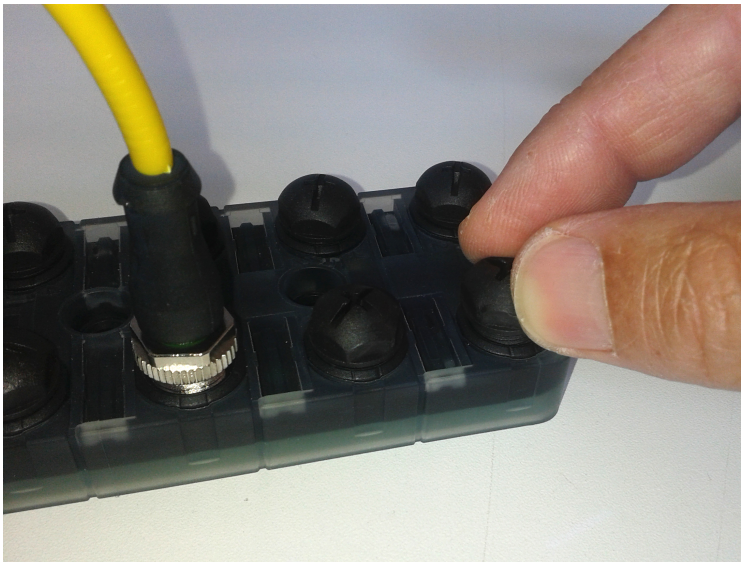


Assignment of inputs/outputs:

Art.No.	Function module 1	Function module 2
12200	8 DI *Input 1.1: X1 →* *Input 1.2: X2 →* . *Input 1.8: X8 →*	8 DO *Output 2.1: X1* *Output 2.2: X2* . *Output 2.8: X8*
12201	4DI/ 4DO *Input 1.1: X5 →* *Input 1.2: X6 →* *Input 1.3: X7 →* *Input 1.4: X8 →* *Input 1.1: X1 ←* *Input 1.2: X2 ←* *Input 1.3: X3 ←* *Input 1.4: X4 ←*	4DI/4DO *Output 2.1: X1* *Output 2.2: X2* *Output 2.3: X3* *Output 2.4: X4* *Input 2.1: X5* *Input 2.2: X6* *Input 2.3: X7* *Input 2.4: X8*
12202	4 AI/AO 4-20mA *Input 1.1: X5 →* *Input 1.2: X6 →* *Input 1.3: X7 →* *Input 1.4: X8 →* *Output 1.1: X1 ←* *Output 1.2: X2 ←* *Output 1.3: X3 ←* *Output 1.4: X4 ←*	4 AI/AO 4-20mA *Output 2.1: X1* *Output 2.2: X2* *Output 2.3: X3* *Output 2.4: X4* *Input 2.1: X5* *Input 2.2: X6* *Input 2.3: X7* *Input 2.4: X8*
12203	4 AI/AO 0-10V *Output 1.1: X1 →* *Output 1.2: X2 →* *Output 1.3: X3 →* *Output 1.4: X4 →* *Input 1.1: X5 ←* *Input 1.2: X6 ←* *Input 1.3: X7 ←* *Input 1.4: X8 ←*	4 AI/AO 0-10V *Output 2.1: X1* *Output 2.2: X2* *Output 2.3: X3* *Output 2.4: X4* *Input 2.1: X5* *Input 2.2: X6* *Input 2.3: X7* *Input 2.4: X8*
12204	4 DI *Input 1.1: X1 →* *Input 1.2: X2 →* *Input 1.3: X3 →* *Input 1.4: X4 →*	4 DO *Output 2.1: X1* *Output 2.2: X2* *Output 2.3: X3* *Output 2.4: X4*

4.4. *Closing the M12 sockets*

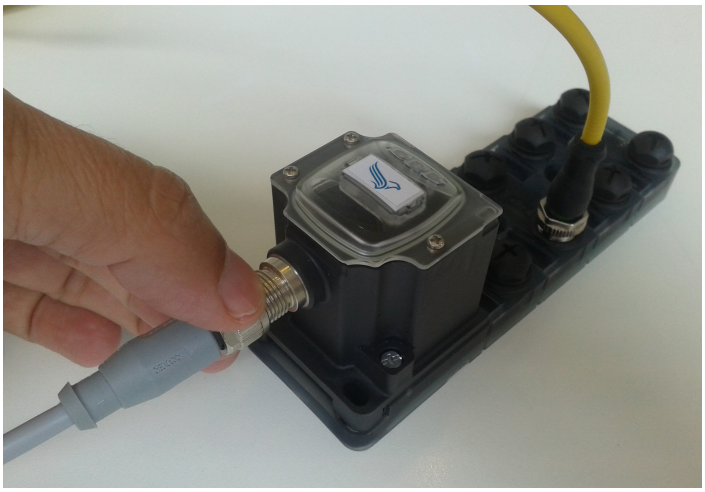
Seal all unused M12 sockets using the supplied M12 sealing caps to ensure tightness of the module. When tightening, please also pay attention to the correct tightening torque of 0.6 Nm.



4.5. Connecting the power supply (X0)

⚠ CAUTION	**Make sure that the connecting cable for the module is disconnected from the power supply before connecting!**

Now connect the power supply cable of the module to connector X0.



For optimum sealing it is recommended to tighten all plugs to a torque of 0.6 Nm (use a suitable torque wrench).

PE must be connected to the switch cabinet ground! Without wiring the PE connection, the interference filter cannot filter out interference pulses on the 24 V DC power supply line. This can lead to interference, malfunctions or destruction of the device.

The nominal operating voltage of 24 V DC falls under the category SELV (safety extra low voltage) and is therefore not subject to the EU Low Voltage Directive. The use of other power supplies is not permitted. For connection to the 230 V AC mains supply, an external LPS plug-in power supply unit with 12 -24 V DC/1 A output voltage can be used.

In the input circuit there is a self-healing 3A fuse. This fuse cannot be exchanged. If the fuse trips, the device must be removed from the supply voltage for approx. 2 minutes. Please make sure that the supply voltage supplies 9 to 33 V DC before switching on the supply voltage again.

5. Extension and exchange

There are no plans to expand the system or replace individual components.
In case of a defect, please always replace the complete set.

6. Tips and Tricks

6.1. Improving the EMC safety

6.1.1. Introduction

The wireless data systems DATAEAGLE are electronic devices which are built according to the latest state of technology. The ruggedly mechanical structure as well as the construction of the electronic components is designed for industrial applications.

Nevertheless some measurements have to be taken during installation, which are important for an error free operation. If these are not observed, the measurements which have been taken within the devices for achieving a higher interference resistance and surge immunity will become partly inefficient. The interference resistance of the complete system depends highly on the correct installation, place of installation and wiring. Before installation, always check which installation instructions are required by the supplier of the controller for a safe operation. These instructions should be consistent with the recommendations given here.

6.1.2. Basic guidlines

Noise voltages which are injected by supply and signal lines into the device as well as electrostatic voltages caused by contact will be discharged to the grounding point. The grounding point has to be connected with a preferably short copper cable (with little resistance) to the protective earth conductor connection of the device.

Shielding

Use always screened cables for the interface cable and the supply cable. Thereby you reduce the interference probability by a ratio of 100 compared to unshielded cables and even up to a ratio of 1000 if you also avoid loops.

The density of the shield netting should be at least 85%. To avoid that the injected interference current on the shielded cable becomes a source of interference itself, a connection with low impedance to the grounding point is very important.

Connect the shield always on both sides to EMC grounding (in general PE).

Bus and power cables

Place the bus cables at least 20 cm away from the power cables, if possible in separate cable ducts.

Unused leads

Connect all unused leads of a cable always on both sides to PE.

Plug housing

Use metallic or metallised plug housing. The shielding of the cable should always be connected to the plug housing.

Connections to EMC earth

Design all connections with EMC earth as short as possible and as extensive as possible. Pay attention that all metallic housings have good contact to the galvanized mounting surface.

Housing for sources of interference

Pay attention that all electronic or electric parts which should be considered as possible source of HF interferences are installed in a closed metallic housing.

Protective earth conductor

Run the protective earth conductors of the individual system components star-shaped towards the potential equalization rail. Thereby you avoid that interferences are injected by PE loops which act as antennas. Unfavourable earth protection connections and loops may bridge EMC measurements and will make them inefficiently.

Control cabinet wiring

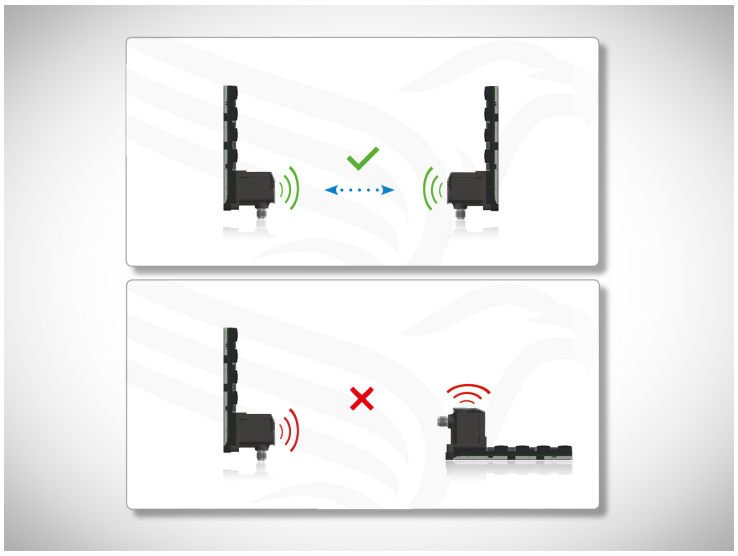
Pay unconditional attention to a separation of N (neutral conductor) and PE (earth protection) inside the control cabinet. Measure with a clamp-on ammeter if equalizing currents flow across the PE control cabinet cable. Here, no currents should flow permanently.

In case of very disturbed ambient conditions, as they can occur for example in industrial halls with induction furnaces, we recommend the PE-free construction. As the radio modem is only supplied with 24V DC, earthing is not mandatory. If a ring current flows over the screen during a direct measurement (to be measured with a current clamp), galvanic isolation should be provided via a 100nF /230V X capacitor. The capacitor has a low resistance to high-frequency interference levels but prevents ring currents.

6.2. *Guidelines for optimized installation of antennas*

Orientation

All antennas should have the same orientation, e.g. vertical.

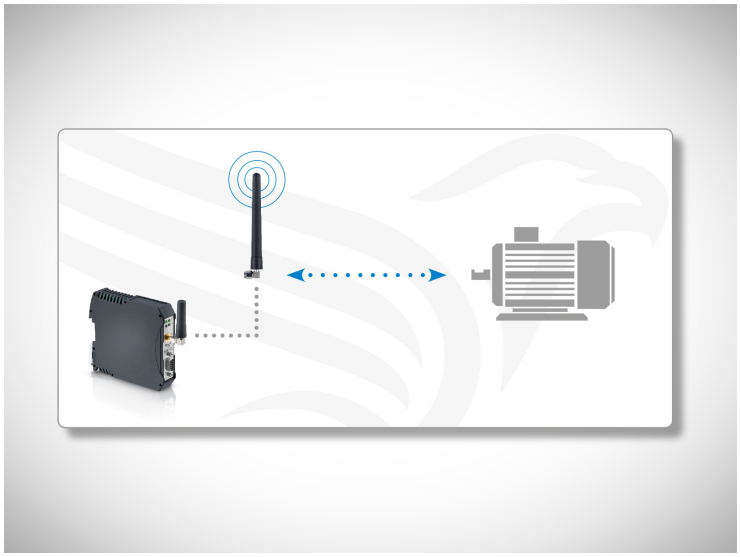


Distance and free radiation

Keep sufficient distance to metal parts and walls.

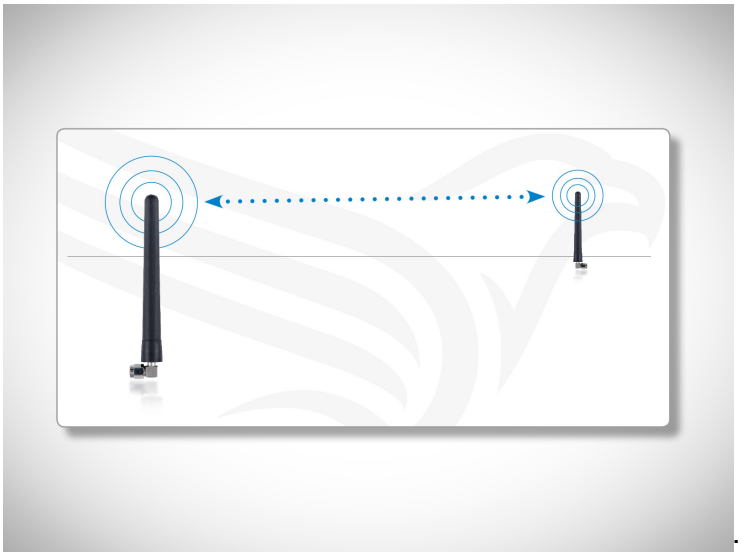
Keep maximum distance to motors and frequency converters.

Provide free radiation.

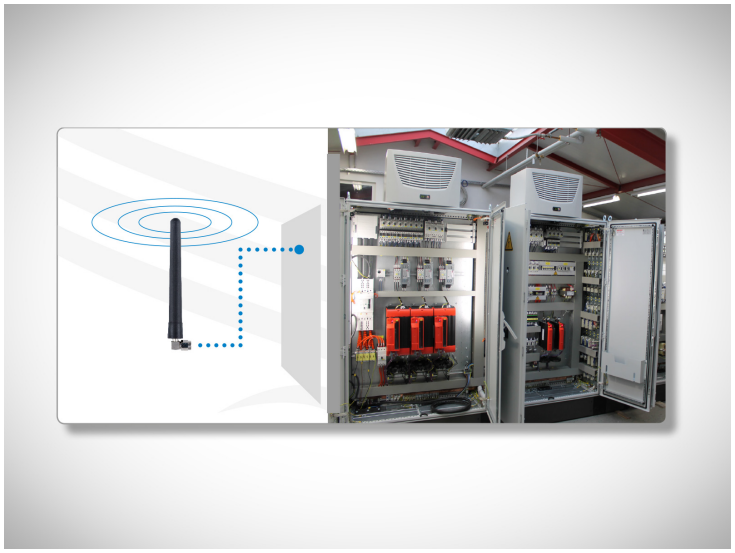


Line of sight

The best data transmission quality will be achieved when the antennas are installed in a line of sight at an elevated and free location.



Out-off the control cabinet



Keep at least a distance of 20 cm to the antennas when the devices are in operation

6.3. Advices for troubleshooting

LED indicator	Check the display of the status LEDs
Distance	Check the distance towards the partner station. Select first a distance of a few meters and increase the distance step by step up to the intended distance.
Antennas	Check the antenna connection. Check if all antennas are connected correctly. Pay attention that coax antenna cable is not flexed. Check next if all antennas are installed according to the guidelines described in chapter 6.2.
Sources of interference	Check if there are any interferences on the transmission side.

7. Technical specifications

	Set DATAEAGLE X-treme IO 2730
General	
Powe supply Input Voltage	24V DC
Connection Power supply	M 12 (plug) 5-pin A-coded
Power consumption	100 mA
Mounting	Screw fastening
Protection	IP67
Temperature range	-20°C … 60°C
Conformity	CE, FCC
Weight	190 g
Width	51 mm
Height	162 mm
Depth	62 mm
Colour	black
Radio technology	
Frequency	2,4 GHz Bluetooth LE V4.2
Transmitting power	+4dBm (2,5mW)
Max. number of radio slaves	1 pc
Max. Range	70 m
Antenna	internal
INTERFACE	
IO-interface	4x / 8x M12 (plug) 5 pin. A-coded
Sensor/actuator supply	24V , 1A ∑
Digital inputs	0-30V
Digital outputs Analog inputs	max. 200mA per output (max. 8 outputs) 0-10V or 0-20mA (Bürde 500 Ω)
Analog outputs	0-10V or 0-20mA (max. 4 outputs)