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1. About this document

This document describes the coupling of BOSCH CISS sensors to a DATAEAGLE 7050 / 2730 Compact device + DATAEAGLE Pi.

2. Basic settings

The connection settings of the BOSCH CISS are configured via the DATAEAGLE Wizard Software tool on the DATAEAGLE Compact 2730 / 7050.

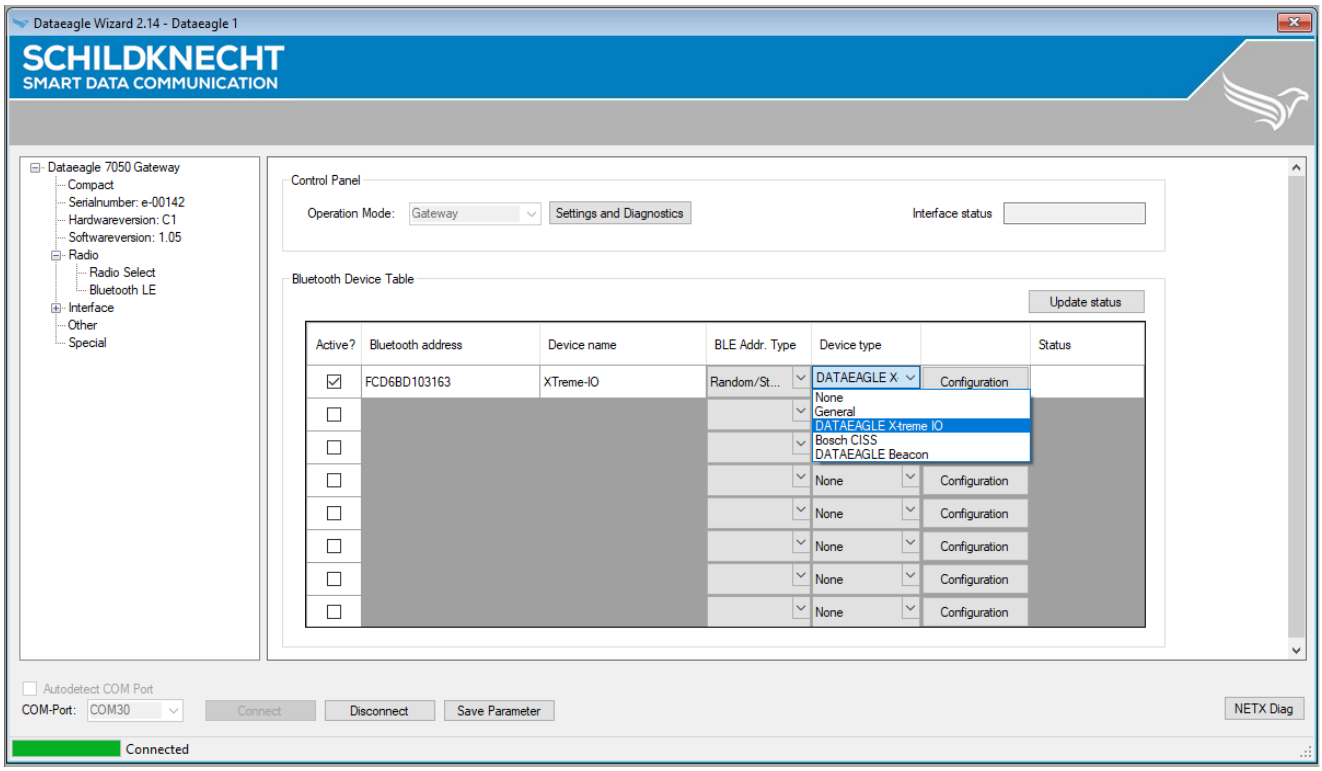

Figure 1: Connection settings from CISS sensor (See Table 1)

Table 1: Connection settings of the CISS sensor

Active ?	BLE device active / not active
Bluetooth Address	Bluetooth MAC address of the BLE device
Device name	Name of the BLE device. Only required if the connection is established via a scan operation.
BLE Addr. Type	Address type of the BLE device. For CISS sensors, "Fixed/Global" must be selected.
Device type	Device type of the BLE device as preconfiguration (template) of the data settings of the BLE device. For the CISS sensor, please select "Bosch CISS".

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!!! ATTENTION !!!

➔ A maximum of eight BLE devices or X-treme IO modules can be configured in the DATAEAGLE Compact 7050 / 2730 gateway.

➔ After completing the configuration, the DATAEAGLE Compact 2730 / 7050 device must be restarted to apply the settings.

3. Data processing

After successful configuration, the DATAEAGLE Compact 2730 / 7050 gateway will establish the Bluetooth connection to the CISS sensor(s) and read out the sensor signals. This data is then exchanged with the PLC via the field bus interface and/or transferred to the DATAEAGLE Cloud Portal, depending on the device variant ordered. These two variants are described in more detail below.

3.1. Data coupling via field bus

!!! ATTENTION!!!

➔ Depending on the PLC and fieldbus system, different data structures are created for the data exchange via the fieldbus interface. This can result in memory gaps. It must be ensured that the transmitted data is transferred without gaps on the fieldbus interface.

➔ Depending on the PLC and fieldbus system, data structures are transferred in a different byte order. It must be ensured that the byte sequence corresponds to this document.

3.1.1. Basic data structure

The basic structure for the send and receive data that is exchanged with the PLC via the fieldbus interface is independent of which Bluetooth station has been configured.

3.1.1.1. Send data structure

Table 3 describes the structure of the data transmitted from the PLC to the DATAEAGLE Compact 7050 / 2730. The format of the "SEND DATA" depends on the Bluetooth device (e.g. DATAEAGLE X-treme IO variant, CISS sensor, ...).

Table 3: Basic structure of send data from PLC

Name	Datatype	Description
ORDER_NUMBER	BYTE	Order counter
TARGET_ADDRESS	BYTE	Destination address of the BLE device
REQUESTED_BYTES	BYTE	Number of requested bytes

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SENT_BYTES	BYTE	Number of bytes sent
MAIN_COMMAND	BYTE	Main Command
SPECIAL_COMMAND	BYTE	Special command (not used for CISS)
SEND DATA	-----	BLE device data

Via "MAIN_COMMAND" different functions/commands can be triggered between the DATAEAGLE Comapct 2730 / 7050 and the connected Bluetooth device. These functions are described in table .

!!! ATTENTION !!!
Functions that are triggered via "MAIN_COMMAND" and "SPECIAL_COMMAND" are only accepted by DATAEAGLE Compact 2730 / 7050 as a new function if the job counter also increases.

Table 4: Possible commands to the DATAEAGLE

Name	Coding	Description
Empty Command	0x08	Empty command - useful to trigger data exchange between PLC and DATAEAGLE.
Read Command	0x06	Reads all configured read characteristics from the BLE device
Write Command	0x05	Writes all configured write characteristics to the BLE device

3.1.1.2. Receive data structure

Table 5 describes the structure for the receive data that is read from the DATAEAGLE Compact 2730 / 7050 by the PLC via the fieldbus interface. The format of the "RECEIVE DATA" depends on the Bluetooth participant (e.g. DATAEAGLE X-treme IO variant, CISS, ...).

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Table 5: Basic structure received data in PLC

Name	Data type	Description
ORDER_NUMBER	BYTE	Order counter
SOURCE_ADDRESS	BYTE	Destination address of the BLE device
RECEIVED_BYTES	BYTE	Number of requested bytes
SEND_BYTES	BYTE	Number of bytes sent
DEVICE_IDX	BYTE	Device Index (same as SOURCE_ADDRESS)
BLE_STATUS	BYTE	Status of the BLE device
BLE_RSSI	DINT	RSSI value of the existing BLE connection.
RECEIVE DATA	-----	Data of the BLE device

The byte "BLE_STATUS" reports the current state of the BLE connection. Table 6 describes the possible BLE states.

Table 6: Possible values for the BLE state

Name	Kodierung	Description
None	0x00	
Error	0x01	Error.
Inactive	0x02	Device is not activated
First Boot	0x03	
Idle	0x04	
Test	0x05	
Init	0x06	
Scan	0x07	Scanning process running
Reset	0x08	
Data	0x09	Interface data traffic running
Disconnected	0x0A	Device disconnected

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Disconnecting	0x0B	Device disconnecting
Found	0x0C	Device found
Not found	0x0D	Device not found
Active	0x0E	Interface active
Connecting	0x0F	Connection is established
Init Pairing	0x10	Pairing is initialized
Pair Code	0x11	Pair code is transmitted
Preparing	0x12	
Configuring	0x13	Notifications are activated
Startup	0x14	Startup commands are executed
Receiving	0x15	Data is read by the participant.
Sending	0x16	Data is transferred to the device
Command/Transceiving	0x17	Connection successful and device now accepts commands

3.1.2. CISS send and receive data

Send Data: PLC → DATAEAGLE Compact

Name	Data type	Description
ORDER_NUMBER	BYTE	Order counter
TARGET_ADDRESS	BYTE	Destination address of the BLE device
REQUESTED_BYTES	BYTE	Number of requested bytes
SENT_BYTES	BYTE	Number of bytes sent
MAIN_COMMAND	BYTE	Main Command
SPECIAL_COMMAND	BYTE	Special command (not used for CISS)

Description of MAIN_COMMAND and SPECIAL_COMMAND can be found in chapter 3.1.1.1

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Example with 2 CISS sensors:

Name	Data type	Data
ORDER_NUMBER – CISS 1	BYTE	0x01
TARGET_ADDRESS – CISS 1	BYTE	0x01
REQUESTED_BYTES – CISS 1	BYTE	0x00
SENT_BYTES – CISS 1	BYTE	0x02
MAIN_COMMAND – CISS 1	BYTE	0x08
SPECIAL_COMMAND – CISS 1	BYTE	0x00
ORDER_NUMBER – CISS 2	BYTE	0x01
TARGET_ADDRESS – CISS 2	BYTE	0x02
REQUESTED_BYTES – CISS 2	BYTE	0x00
SENT_BYTES – CISS 2	BYTE	0x02
MAIN_COMMAND – CISS 2	BYTE	0x08
SPECIAL_COMMAND – CISS 2	BYTE	0x00

Receive data: DATAEAGLE Compact → PLC

Name	Data type	Description
ORDER_NUMBER	BYTE	Order counter
SOURCE_ADDRESS	BYTE	Destination address of the BLE device
RECEIVED_BYTES	BYTE	Number of requested bytes
SEND_BYTES	BYTE	Number of bytes sent
DEVICE_IDX	BYTE	Device Index (same as SOURCE_ADDRESS)
BLE_STATUS	BYTE	Status of the BLE device
BLE_RSSI	SINT32	RSSI value of the existing BLE connection.
CISS – Acceleration X	SINT16	Acceleration X-axys

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CISS - Acceleration Y	SINT16	Acceleration Y-axys
CISS - Acceleration Z	SINT16	Acceleration Z-axys
CISS – Gyroscope X	SINT16	Gyroscope X-axys
CISS – Gyroscope Y	SINT16	Gyroscope Y-axys
CISS – Gyroscope Z	SINT16	Gyroscope Z-axys
CISS – Magnet. X	SINT16	Magnetometer X-axys
CISS – Magnet. Y	SINT16	Magnetometer Y-axys
CISS – Magnet. Z	SINT16	Magnetometer Z-axys
CISS – empty	SINT16	empty
CISS – Temperature	SINT16	Temparture (Faktor 10 – 212 -> 21,2)
CISS – Humidity	UINT16	Humidity (Faktor 100 – 99812 -> 998,12)
CISS – Pressure	SINT32	Pressure
CISS – Microphone	UINT16	Microphone level
CISS – Light	SINT32	Light level
CISS – empty	INT	empty

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3.2. Data connection to the cloud

If the DATAEAGLE Compact 2730 / 7050 also has a cloud interface, the data from the CISS sensors can be displayed in the DATAEAGLE portal.

In the DATAEAGLE portal, this data can be configured via the output channels of the DATAEAGLE Compact 2730 / 7050. See in figure 3.

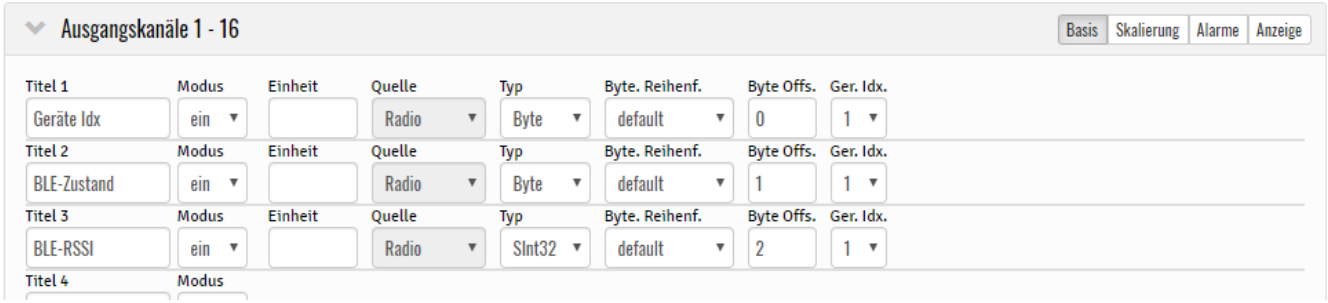

Figure 3: Output channels for BLE data

Name	Byteoffset	Data type	Description
DEVICE_IDX	0	BYTE	Device Index
BLE_STATUS	1	BYTE	Status of the BLE device
BLE_RSSI	2	DINT	RSSI value of the existing BLE connection.
DATA	6	-----	Data of the BLE device

The structure of the DATA block from byte offset (6) has the same structure as the CISS PLC interface. To be found in this document at 3.1.2

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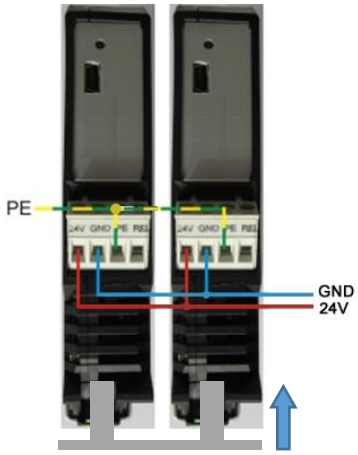
3.3. Data connection to the DATAEAGLE Pi – local Dashboard (Grafana)

If the DATAEAGLE Compact 2730 / 7050 also has a DATAEAGLE Pi interface, the data from the CISS sensors can be displayed on a local dashboard by using a Webbrowser.

3.3.1. Electrical settings

Ethernet Connection



Backplane Connector

3.3.2. Network settings

The default IP setting of the DATAEAGLE Pi is DHCP.

→ The IP address can be changed or the network setting can be altered using PuTTY-Tool

i. Logon to the DATAEAGLE Pi using the current IP Address.

The username is „pi“
The password is „raspberry“

ii. In order to change the network settings, we have to change the settings or add the settings to the file "/etc/dhcpcd.conf". To open this file on the PuTTY, using the following command

sudo nano /etc/dhcpcd.conf

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iii. If you are changing the network settings, find the line with "interface eth0". You will find the current settings under this line. For example you can set a new IP-Address with the following lines.

```
interface eth0
static ip_address=192.168.1.2/24

static routers=192.168.1.1
static domain_name_servers=192.168.1.1
```

iv. Once you have entered the desired setting save this file with the keyboard combination "Ctrl + x" and then confirm the file name by selecting "y" when prompted.

v. Restart the DATAEAGLE Pi by entering the following command so that the device starts with the new settings :

```
sudo reboot
```

3.3.2.1. Local dashboard (Grafana)

The URL for the Special springs Dashboard can be constructed using the following template.

http://<ip_adresse>:3000/login

The username is „user"
The password is „dataeagle"