empowering communication

User manual

netFIELD Unity

NFX86-D8-N128-021

Hilscher Gesellschaft für Systemautomation mbH
www.hilscher.com

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1 Introduction

1.1 About this document

This user manual describes Hilscher's netFIELD Unity edge gateway (NFX86-D8-N128-021).

1.2 List of revisions

Revision	Date	Change
1	2025-06-10	Document created.
2	2025-12-16	Section *Digital input* [page 22]: Logic 0 is „10 VDC … 30 VDC“ and logic 1 is „0 VDC … 3 VDC”
		Section *BIOS settings to boot from USB device* [page 46] added.

Table 1: List of revisions

1.3 Brief description

netFIELD Unity is an edge gateway for running custom software, close-to-machine deployment of workloads and distributing IIoT logic and intelligence.

Connecting your netFIELD Unity via the Internet to the netFIELD Cloud (https://www.netfield.io) allows you to manage your device via remote control functions from the netFIELD Portal (which is the web-based user interface of the netFIELD Cloud) and to control the distribution of its IIoT applications from remote via the Internet.

You can also stream MQTT messages from this edge gateway to third party applications via the data service of netFIELD Cloud using the MQTT over WebSocket secure protocol.

Key features hardware

- Intel Atom® Processor x6413E 1.5 GHz
- 8 GByte DDR3L RAM
- 128 GByte SSD BiCS5
- 2 x Ethernet ports: 10/100/1000 Mbit/s (RJ45 connectors)
- 3 x USB 3.2, 1 x USB 2.0 (type A connectors)
- 2 x COM ports: RS-232, RS-422, or RS-485 (switchable) serial interface (terminal block connector)
- 8-channel digital inputs, 8-channel digital outputs (terminal block connector)
- TPM 2.0 (Trusted Platform Module)
- Programmable LED
- Compact aluminum housing
- Protection class IP20
- Removable mounting bracket for DIN top hat rail mounting
- Wide input voltage range of +10 V DC to +36 V DC (typical: +24 V DC)
- Wide ambient temperature range of –20 °C to +70 °C with 0.7 m/s airflow
- Real-time clock buffering via on-board coin cell battery
- 2 x Display port, V1.2

Key features software

- Preinstalled and non-removable **netFIELD OS** (netFIELD Operating System) with **Local Device Manager** (web GUI) for local configuration and administration of the device.
- Applications for data acquisition, analytics, processing or connectivity (to cloud or other enterprise systems) do not run natively under the netFIELD OS, but as “containers” in a Docker runtime. netFIELD OS provides two Docker runtimes that are running simultaneously on the device:
  - **IoT Edge Docker** for remote and automatic deployment and maintenance of containers. These containers are deployed (“pulled”) and managed over the netFIELD Cloud. This requires your device to be onboarded in the netFIELD Cloud. Note that you need an account/subscription for the netFIELD Cloud (https://www.netfield.io) for this.
  - **Standard Docker** for manual and local deployment and maintenance of containers.
    Those containers can be pulled from official registries like Docker Hub (https://hub.docker.com) or any locally hosted Docker registry. In case you do not have an account/subscription for the *netFIELD Cloud*, the standard Docker is the only way to pull and run container applications on your device.
- Options for users/subscribers of the **netFIELD Cloud** (https://www.netfield.io):
  - **Remote device management** and container deployment via netFIELD Portal.
  - In the netFIELD Portal, the MQTT message data can be visualized in customized dashboards (which can be created in the Portal’s **Dashboard Manager** app) or it can be consumed by third party apps or systems (featuring an MQTT client) via the netFIELD Portal’s **Data Service** using the **MQTT over WebSocket secure** protocol.
  - **Software updates** for the device (application containers and netFIELD OS) can be conveniently initialized and managed via the netFIELD Portal.

For a detailed description of the netFIELD Portal, see operating instruction manual *netFIELD Portal*, DOC190701OIxxEN.

1.4 netFIELD OS

The edge gateway is equipped with an operating system: netFIELD OS. The netFIELD OS features the **Local Device Manager**, which is a web-based GUI for local device configuration.

For a description about the netFIELD OS including the Local Device Manager, see „Operating instruction manual, netFIELD OS, DOC250302OIxxEN“.

2 Safety

2.1 Intended use

netFIELD Unity (NFX86-D8-N128-021) is an edge gateway for running custom software, close-to-machine deployment of workloads and distributing IIoT logic and intelligence. Additionally, it allows you to connect it with netFIELD Cloud in order to control the device itself and the distribution of those applications from remote over the Internet.

The device complies with protection class IP20 and is suitable for indoor use, e.g. in industrial automation plants.

Any use other than specified here is not permitted.

2.2 General note

To avoid personal injury or property damage to your system or to this product, you must read and understand all instructions in this manual before using the product.

This manual was written for the use of the product by educated personnel. When using the product, all safety instructions and all valid legal regulations must be observed. Technical knowledge is presumed.

Keep this manual for future reference.

2.3 Personnel qualification

Only qualified personnel is allowed to install, configure, operate, and remove the edge gateway. Personnel professionally working with electricity must have job-specific technical skills concerning:

- Safety and health at work
- Mounting and attaching of electrical equipment
- Measurement and analysis of electrical functions and systems
- Evaluation of the safety of electrical systems and equipment
- Installing and configuring IT systems

2.4 Device destruction by exceeding the allowed supply voltage

Observe the following notes concerning the voltage supply:

- The device may only be operated with the specified supply voltage of +10 V DC ... +36 V DC. Make sure that the limits of the allowed range for the supply voltage are not exceeded.
- A supply voltage above the upper limit can cause severe damage to the device!
- A supply voltage below the lower limit can cause malfunction of the device.

2.5 Risk of denial of service due to extensive memory usage close to limits

Using applications that exceed the memory resources of the device can cause an out-of-memory situation (OOM) in the Linux kernel leading to temporary delayed application reaction times and limited overall device responsiveness.
You must therefore consider the memory requirements of your Docker containers carefully before deploying them on the device. We also recommend you to configure the logging behavior (e.g. log levels) of your containers accordingly.

For information on the memory resources of the egde gateway, see section *Technical data* [page 40].

2.6 Modification reserved

Changes or modifications to hardware or software of the device by the user are not permitted.
The device does not contain any parts that are serviceable by the user.
Do not open or damage the housing.

3 Hardware description

3.1 Device overview

The following figure shows the positions of the interfaces, LEDs, and operating elements. The left part of the figure shows the front view (positions 1 to 20). The right part of the figure shows the top view (positions 21 and 22).

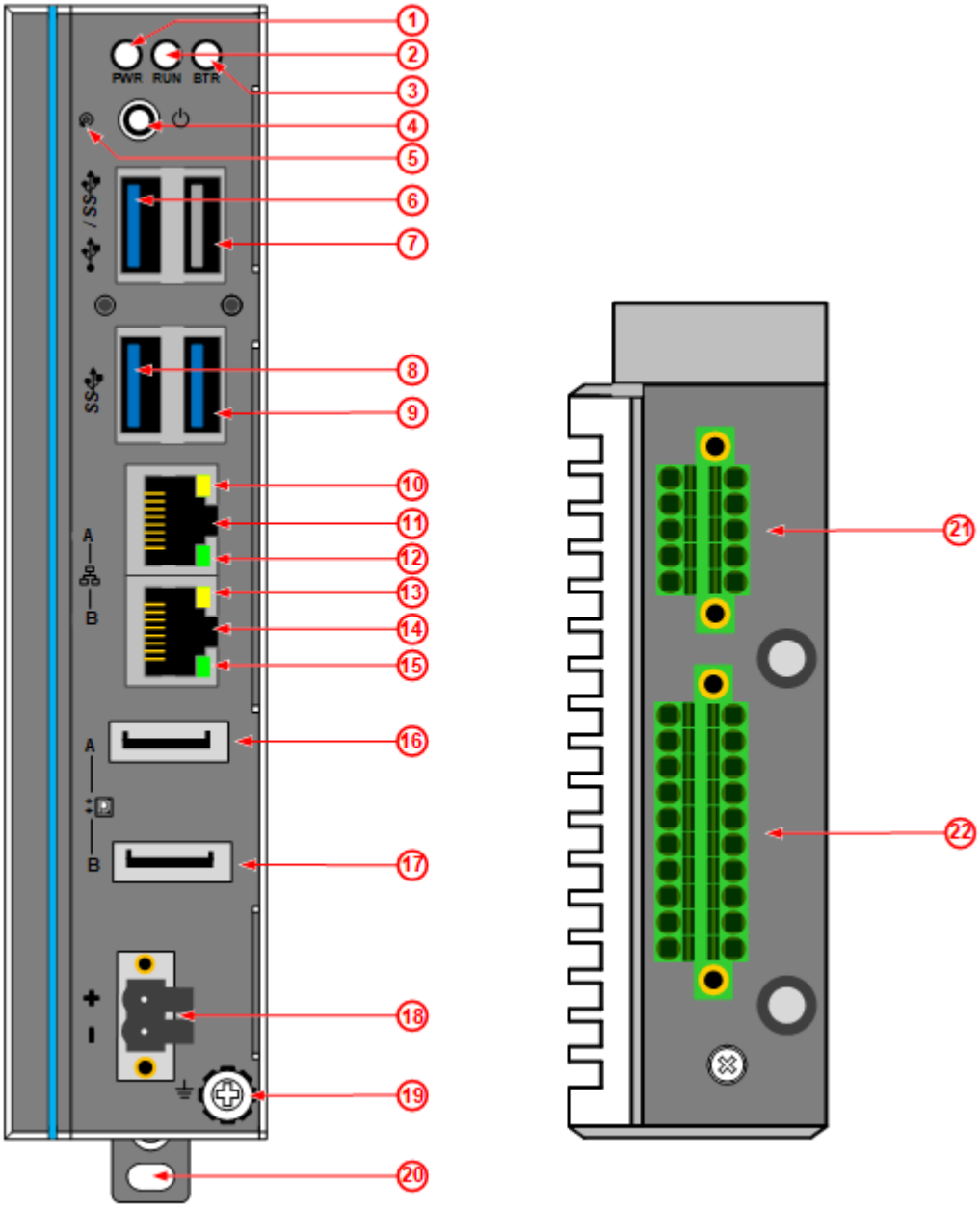


Figure 1: Device overview with position numbers

Position	Name	Description	For details see section
(1)	PWR	PWR LED (Power): orange, green	*PWR LED (Power)* [▷ page 27]
(2)	RUN	RUN LED (programmable): green	*RUN LED (Programmable)* [▷ page 27]
(3)	BTR	BTR LED (Battery): red	*BTR LED (Battery)* [▷ page 27]
(4)	-	Power button (On/Off)	*Power button* [▷ page 15]
(5)	-	Reset button	*Reset button* [▷ page 15]
(6)	-	USB 3.2 Gen 2	*USB connectors* [▷ page 26]
(7)	-	USB 2.0	
(8)	-	USB 3.2 Gen 2	
(9)	-	USB 3.2 Gen 2	
(10)	-	Link (A): green, orange	*LEDs of the LAN interface* [▷ page 28]
(11)	-	Ethernet interface (A)	*Ethernet interface (LAN)* [▷ page 17]
(12)	-	Activity (A): green	*LEDs of the LAN interface* [▷ page 28]
(13)	-	Link (B): green, orange	*LEDs of the LAN interface* [▷ page 28]
(14)	-	Ethernet interface (B)	*Ethernet interface (LAN)* [▷ page 17]
(15)	-	Activity (B): green	*LEDs of the LAN interface* [▷ page 28]
(16)	-	Display Port (A)	*Display port connectors* [▷ page 26]
(17)	-	Display Port (B)	
(18)	-	Power supply connector	*Supply voltage connector* [▷ page 16]
(19)	-	Grounding (Housing ground)	*Grounding* [▷ page 16]
(20)	-	Latch	
(21)	COM1, COM2	COM ports: COM1 and COM2 for RS-232, RS-422, or RS-485	*Serial interface (COM port)* [▷ page 17]
(22)	DI, DO	Digital input, digital output	*Digital I/O (DIO connector)* [▷ page 22]

Table 2: Positions on netFIELD Unity (NFX86-D8-N128-021)

3.2 Dimensions

The following figure shows the front view including the dimensions.

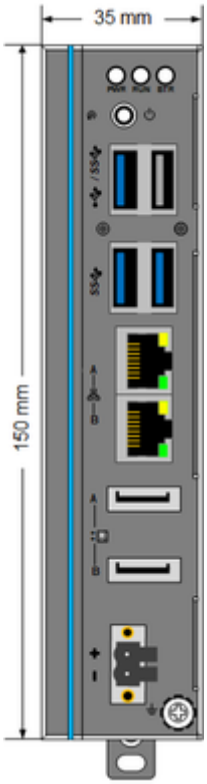


Figure 2: Front view

The following figure shows the top view including the dimensions.

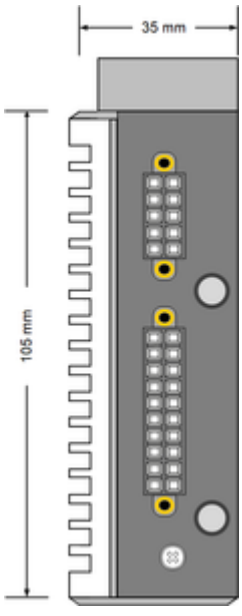


Figure 3: Top view

The following figure shows the side view from the right including the dimensions.

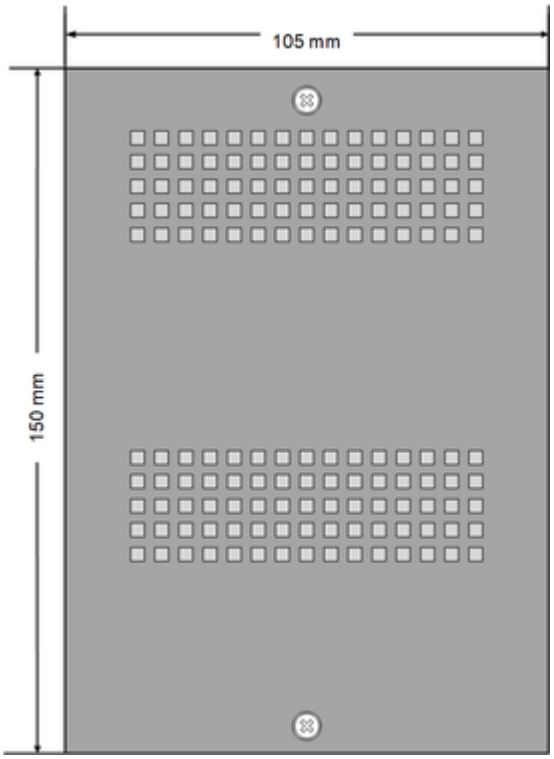


Figure 4: Side view from the right

The following figure shows the side view from the left including the dimensions.

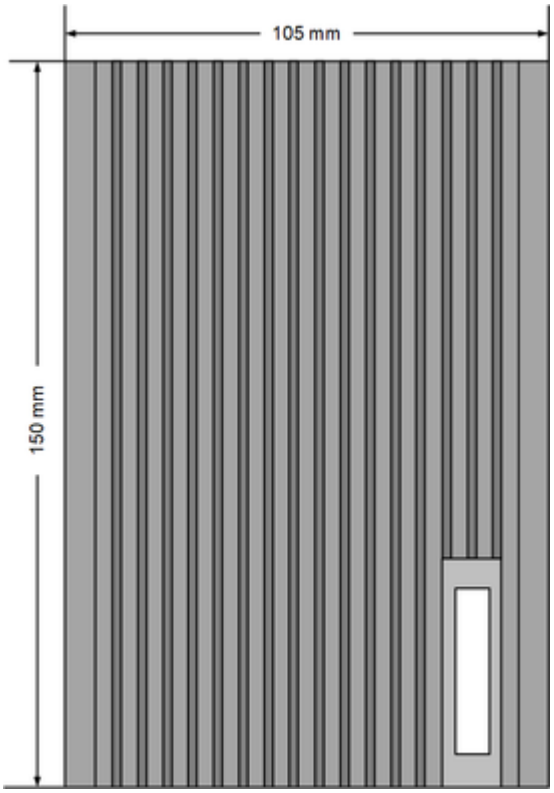


Figure 5: Side view from the left

3.3 Device label

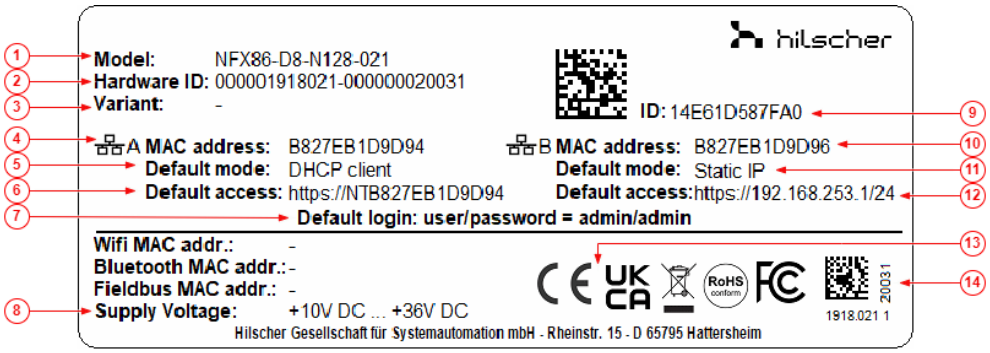


Figure 6: Device label

Number	Name	Description
(1)	Model	Model name: NFX86-D8-N128-021
(2)	Hardware ID	Hardware ID for identification the edge gateway in the cloud with part number and serial number
(3)	Variant	-
(4)	MAC address	MAC address of LAN port A
(5)	Default mode	Default mode to obtain an IP address on LAN port A: DHCP client. The mode is configurable after first login.
(6)	Default access	Default host name. Host name is configurable after first login.
(7)	Default login	User name and password for first login
(8)	Supply voltage	Supply voltage rating
(9)	ID	ID for identification the edge gateway in the cloud
(10)	MAC address	MAC address of LAN port B
(11)	Default mode	Static IP address The mode is configurable after first login.
(12)	Default access	Default IP address on LAN port B IP address is configurable after first login.
(13)	Signs	Signs and certificates
(14)	Identification	Matrix label containing part number, hardware revision and serial number

Table 3: Device label

3.4 Operation elements

3.4.1 Power button

The edge gateway offers a push button to switch the power on or off. For identifying the power button on the edge gateway, see position (4) in section *Device overview* [page 10].

A short push turns the power on or off. A long push (at least 3 s) turns the power off.

3.4.2 Reset button

The egde gateway offers a reset button to reset the gateway. For identifying the reset button on the edge gateway, see position (5) in section *Device overview* [page 10].

To push the reset button, you need a screw driver or a wire with a maximum diameter of 1 mm.

3.5 Interfaces and connectors

3.5.1 Supply voltage connector

The power supply connector allows you to connect supply voltage between +10 V DC and +36 V DC (typical: 24 V DC). For identifying the power supply connector on the edge gateway, see position (18) in section *Device overview* [page 10].

The edge gateway is shipped with a 2-pin terminal block. Use copper wire with 12 – 24 AWG.

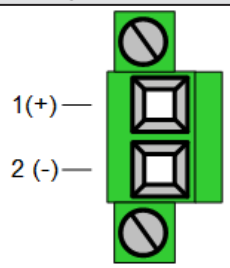
Power supply connector	Pin	Description
	1	+10 V DC to +36 V DC (typical: 24 V DC)
	2	Ground

Table 4: Power supply connector

Note:
The maximum length of the power supply cable to the power supply unit must not exceed 30 m.

3.5.2 Grounding

The edge gateway offers a screw connection for grounding the housing. For identifying the screw for grounding the edge gateway, see position (19) in section *Device overview* [page 10].

The edge gateway is shipped with a grounding cable of 16 AWG. Functional grounding is essential for a trouble-free operation of the egde gateway.

3.5.3 Ethernet interface (LAN)

The two RJ45 Ethernet connectors allow you to connect the edge gateway to your local IT network and/or to the Internet (e.g. the netFIELD Cloud). The MAC addresses of the ports are printed on the device label. Note that you can change the IP address configuration of these ports in the Local Device Manager.

LAN A

Primary 1 Gbit/s Ethernet port (see position (11) in section *Device overview* [page 10]). The logical name of Ethernet port LAN A in netFIELD OS is **eth0.** The “factory setting” of the IP address of this port is DHCP mode (“fallback” is *link-local*, i.e. address block `169.254.0.0/16`).

LAN B

Secondary 1 Gbit/s Ethernet port (see position (14) in section *Device overview* [page 10]). The logical name of Ethernet port LAN B in netFIELD OS is **eth1.** The “factory setting” of the IP address of this port is `192.168.253.1/24`.

3.5.4 Serial interface (COM port)

For identifying the COM port connector on the edge gateway, see position (21) in section *Device overview* [page 10]. The COM port connector offers two serial interfaces: COM1 and COM2. Each COM port can be used as RS-232, RS-422, or RS-485 serial interface.

To configure the COM port, you have to set DIP switch SW1 accordingly. For a description of the setting of SW1, see section *Hardware configuration of COM ports* [page 29].

Pin assignment

The following figure shows the pin assignment of the COM port connector.

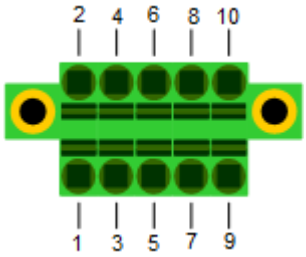


Figure 7: COM port connector (pin assignment)

COM1 is on pins 1, 3, 5, 7, and 9.

COM2 is on pins 2, 4, 6, 8, and 10.

RS-232 on COM1

The following table shows the settings for DIP switches 1 to 5 on SW1 to configure COM1 as RS-232 interface and the pin assignment on the COM port connector.

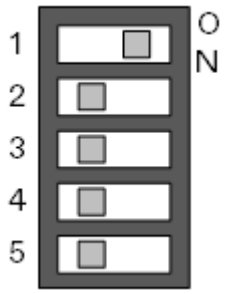
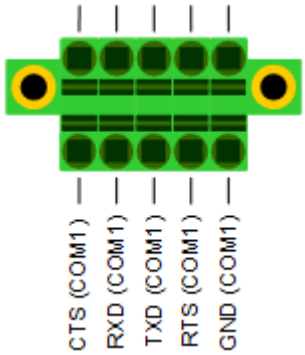
Settings on SW1 for RS-232 on COM1	RS-232 on COM1	Pin	Signal	Description
		1	CTS	Clear to send
		3	RXD	Receive data
		5	TXD	Transmit data
		7	RTS	Request to send
		9	GND	Reference potential

Table 5: RS-232 on COM1

RS-232 on COM2

The following table shows the settings for DIP switches 6 to 0 on SW1 to configure COM2 as RS-232 interface and the pin assignment on the COM port connector.

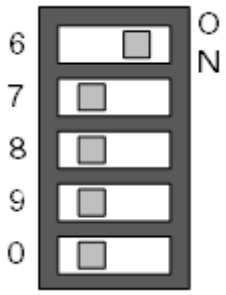
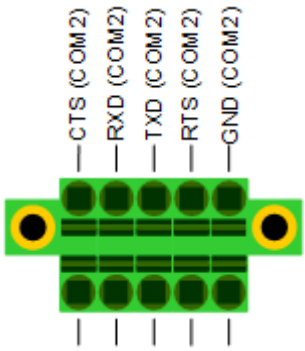
Settings on SW1 for RS-232 on COM2	RS-232 on COM2	Pin	Signal	Description
		2	CTS	Clear to send
		4	RXD	Receive data
		6	TXD	Transmit data
		8	RTS	Request to send
		10	GND	Reference potential

Table 6: RS-232 on COM2

RS-422 on COM1

The following table shows the settings for DIP switches 1 to 5 on SW1 to configure COM1 as RS-422 interface and the pin assignment on the COM port connector.

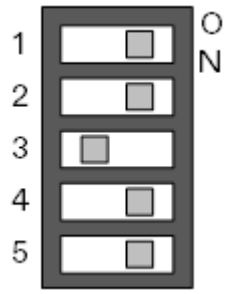
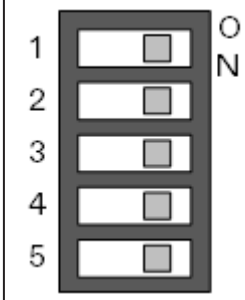
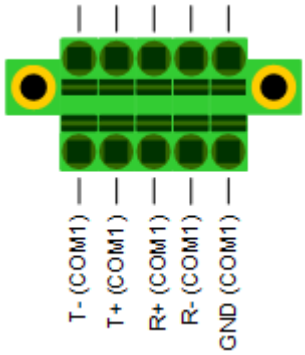
Settings on SW1 for RS-422 on COM1 (no termination)	Settings on SW1 for RS-422 on COM1 (with termination)	RS-422 on COM1	Pin	Signal	Description
			1	T-	Send data negative
			3	T+	Send data positive
			5	R+	Receive data positive
			7	R-	Receive data negative
			9	GND	Reference potential

Table 7: RS-422 on COM1

When DIP switch 3 is set to OFF, the termination resistor is deactivated.

When DIP switch 3 is set to ON, a 120 Ohm termination resistor is activated.

RS-422 on COM2

The following table shows the settings for DIP switches 6 to 0 on SW1 to configure COM2 as RS-422 interface and the pin assignment on the COM port connector.

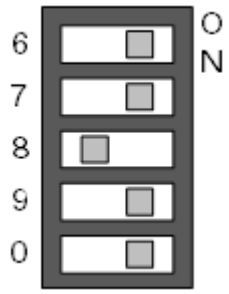
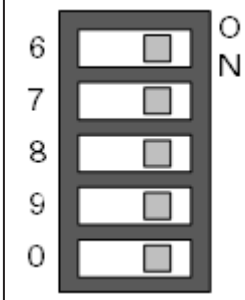
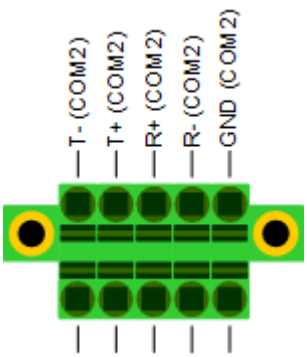
Settings on SW1 for RS-422 on COM2 (no termination)	Settings on SW1 for RS-422 on COM2 (with termination)	RS-422 on COM2	Pin	Signal	Description
			2	T-	Send data negative
			4	T+	Send data positive
			6	R+	Receive data positive
			8	R-	Receive data negative
			10	GND	Reference potential

Table 8: RS-422 on COM2

When DIP switch 8 is set to OFF, the termination resistor is deactivated.

When DIP switch 8 is set to ON, a 120 Ohm termination resistor is activated.

RS-485 on COM1

The following table shows the settings for DIP switches 1 to 5 on SW1 to configure COM1 as RS-485 interface and the pin assignment on the COM port connector.

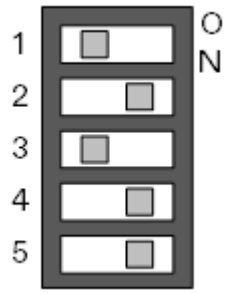
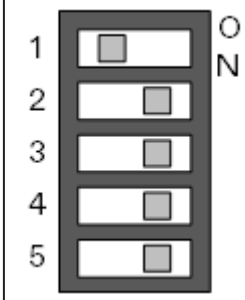
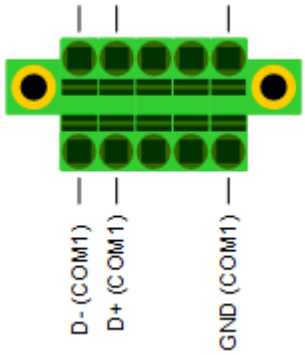
Settings on SW1 for RS-485 on COM1 (no termination)	Settings on SW1 for RS-485 on COM1 (with termination)	RS-485 on COM1	Pin	Signal	Description
			1	D-	Receive/transmit data, negative
			3	D+	Receive/send data, positive
			5	-	-
			7	-	-
			9	GND	Reference potential

Table 9: RS-485 on COM1

When DIP switch 3 is set to OFF, the termination resistor is deactivated.

When DIP switch 3 is set to ON, a 120 Ohm termination resistor is activated.

RS-485 on COM2

The following table shows the settings for DIP switches 6 to 0 on SW1 to configure COM2 as RS-485 interface and the pin assignment on the COM port connector.

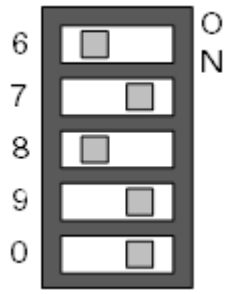
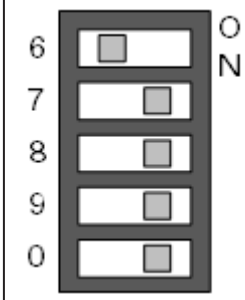
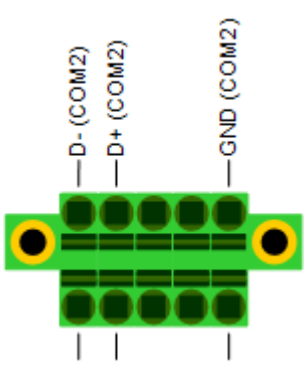
Settings on SW1 for RS-485 on COM2 (no termination)	Settings on SW1 for RS-485 on COM2 (with termination)	RS-485 on COM2	Pin	Signal	Description
			1	D-	Receive/transmit data, negative
			3	D+	Receive/send data, positive
			5	-	-
			7	-	-
			9	GND	Reference potential

Table 10: RS-485 on COM2

When DIP switch 3 is set to OFF, the termination resistor is deactivated.

When DIP switch 3 is set to ON, a 120 Ohm termination resistor is activated.

Accessing COM1 and COM2

COM1 is `/dev/ttyS0`

COM2 is `/dev/ttyS1`

Enabling access for application containers

netFIELD OS supports the serial interfaces as standard Linux devices.

Docker application containers accessing the `ttyS0` or `ttyS1` interfaces must be either running as `root` user or as a member of the `dialout` group in Linux. If your container is not a `root` user, you can add the container to the `dialout` group with the `--group-add dialout` parameter in your `docker run` command during container deployment.

Note that you must also map the `/dev/ttyS0` respectively `/dev/ttyS1` interface into the corresponding container.

The following example shows a `docker run` command for a Node-RED container that would allow the container to access the COM1 interface:

```
docker run -d -p 1880:1880 --device=/dev/ttyS0:/dev/ttyS0 --group-
add dialout nodered/node-red
```

If the container is deployed via Docker Compose, you would have to add the following lines in the *.`yml` file:

```
devices:
    - "/dev/ttyS0:/dev/ttyS0"
group_add:
    - dialout
```

3.5.5 Digital I/O (DIO connector)

The device offers 8 channels for digital input (DI0 … DI7) and 8 channels for digital output (DO0 … DO7). The digital inputs and digital outputs are isolated.

For identifying the digital I/O connector on the edge gateway, see position (22) in section *Device overview* [page 10].

The following figure shows the pin assignment for the DIO connector.

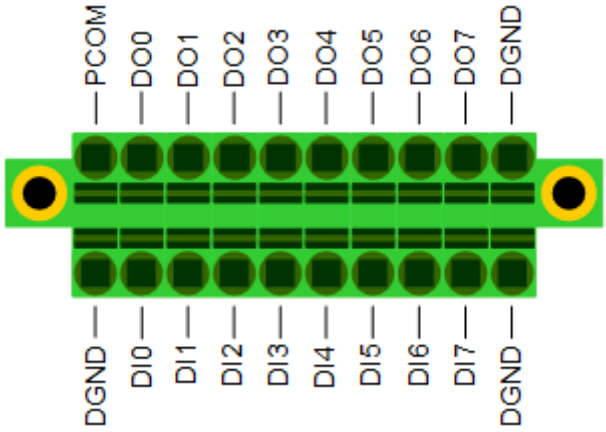


Figure 8: DIO connector

Pin	Description
DI0, DI1, …, DI7	Digital input, channel 0 … 7
DO0, DO1, …, DO7	Digital output, channel 0 … 7
DGND	Ground for digital input/output
PCOM	Common power supply

Table 11: DIO signal names

3.5.5.1 Digital input

The digital inputs are isolated. The permitted range of the input voltage is 0 VDC …. 30 VDC.

There are two options to use the digital inputs:

- Option A: With external power supply
- Option B: Voltage-free (default)

You have to configure slide switch SW3 to set option A or B. For a description, see section *Hardware configuration of digital input* [page 32].

Digital input with external power supply

The following figure shows a wiring example for a digital input using an external power supply.

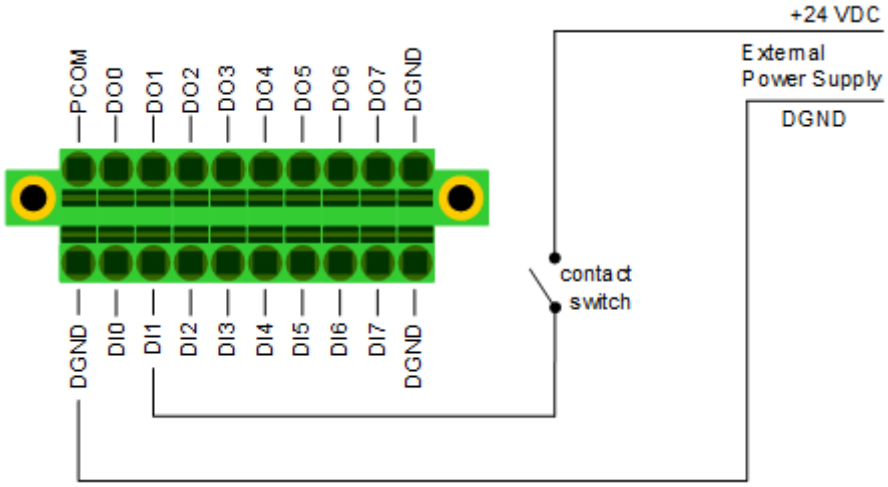


Figure 9: Digital input (wiring example with external power supply)

Signal	Input voltage
Logic 0	10 VDC … 30 VDC
Logic 1	0 VDC … 3 VDC

Table 12: Input voltage

Voltage-free digital input

The following figure shows a wiring example for a voltage-free digital input.

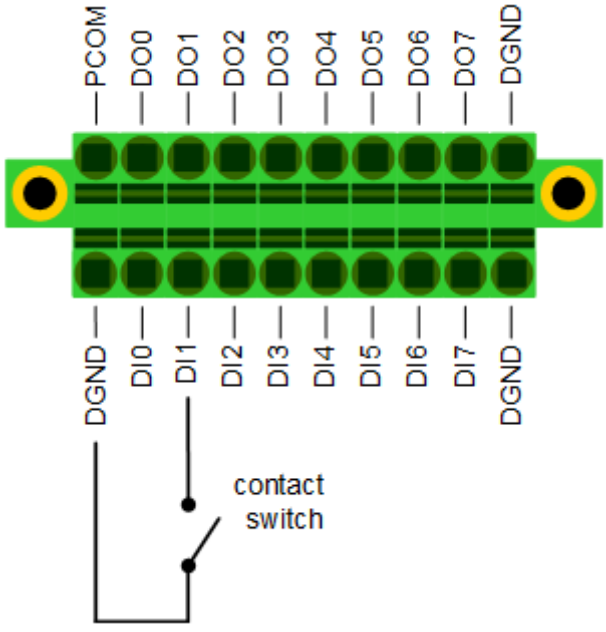


Figure 10: Digital input (wiring example, voltage free)

Signal	Digital input
Logic 0	Connected to DGND
Logic 1	Open

Table 13: Digital input

Accessing the digital inputs

The digital inputs/outputs can be accessed via `/var/platform`.

Digital input	Access
IN0	/var/platform/in_di0
IN1	/var/platform/in_di1
IN2	/var/platform/in_di2
IN3	/var/platform/in_di3
IN4	/var/platform/in_di4
IN5	/var/platform/in_di5
IN6	/var/platform/in_di6
IN7	/var/platform/in_di7

Table 14: Access to digital input

Read/write access: To read the digital inputs, standard file access functions are used to access the sysfs interface.

You can use the following command line to read digital input IN1.

```
cat /var/platform/in_di1
```

3.5.5.2 Digital output

The following figure shows a wiring example to connect a digital output using an external power supply.

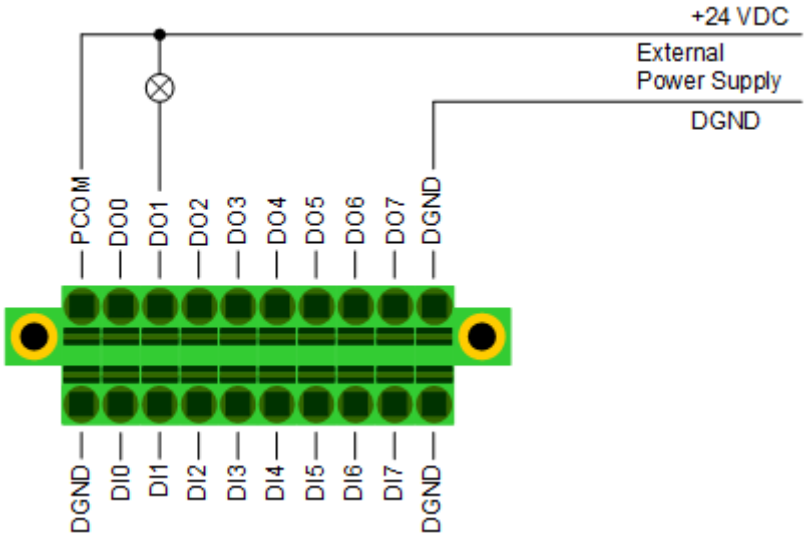


Figure 11: Digital output (wiring example)

Accessing the digital outputs

The digital outputs can be accessed via `/var/platform`.

Digital output	Access
OUT0	/var/platform/out_do0
OUT1	/var/platform/out_do1
OUT2	/var/platform/out_do2
OUT3	/var/platform/out_do3
OUT4	/var/platform/out_do4
OUT5	/var/platform/out_do5
OUT6	/var/platform/out_do6
OUT7	/var/platform/out_do7

Table 15: Access to digital output

Write access: To write the digital outputs, standard file access functions are used to access the sysfs interface.

You can use the following command line to set the digital output OUT2 to “1”.

```
echo 1 | sudo tee /var/platform/out_do2
```

You can use the following command line to set the digital output OUT2 to “0”.

```
echo 0 | sudo tee /var/platform/out_do2
```

3.5.6 USB connectors

The USB type-A connectors allow you to connect external devices. For identifying the USB connectors on the edge gateway, see positions (6), (7), (8), and (9) in section *Device overview* [page 10].

3.5.7 Display port connectors

The edge gateway offers two display ports to connect a monitor. For identifying the display port A and B on the edge gateway, see positions (16) an (17) in section *Device overview* [page 10].

3.6 LED

3.6.1 PWR LED (Power)

The PWR LED (Power) indicates voltage supply. For identifying the PWR LED on the edge gateway, see position (1) in section *Device overview* [page 10].

LED	Color	State	Description
PWR	**LED orange/green**		
Power	● (green)	On	Device is operating “normal”.
	● (orange)	On	Device is booting or in “standby”.
	● (off)	Off	No power supply or device has been turned off.

Table 16: PWR LED (Power)

3.6.2 RUN LED (Programmable)

The RUN LED is programmable. For identifying the RUN LED on the edge gateway, see position (2) in section *Device overview* [page 10].

The RUN LED is green.

Accessing the RUN LED

The digital outputs can be accessed via `/var/platform/led_green_run`.

You can use the following command line to turn the RUN LED on.

```
echo 1 | sudo tee /var/platform/led_green_run
```

You can use the following command line to turn the RUN LED off.

```
echo 0 | sudo tee /var/platform/led_green_run
```

3.6.3 BTR LED (Battery)

The BTR LED (battery) indicates battery status. For identifying the BTR LED on the edge gateway, see position (3) in section *Device overview* [page 10].

LED	Color	State	Description
BTR	**LED red**		
Battery	(red)	On	Battery is low. Check battery. Battery has to be replaced.
	(off)	Off	Battery is ok.

Table 17: BTR LED (battery)

3.6.4 LEDs of the LAN interface

The LEDs of the RJ45 Ethernet connectors indicate the state of the Ethernet connection. For identifying the Link LED (A) and (B) on the edge gateway, see positions (10) and (13) in section *Device overview* [page 10] and for Activity LED (A) and (B), see positions (12) and (15).

LED	Color	State	Description
Link	**LED orange**		
	● (orange)	On	1 Gbit network connection
	● (off)	Off	10 Mbit or 100 Mbit network connection
Activity	**LED green**		
	● (green)	On	The device has a link. The device does not send/receive Ethernet frames.
	✺ (green)	Flickering (load dependent)	The device has a link. The device sends/ receives frames.
	● (off)	Off	The device has no link. The device does not send/receive Ethernet frames.

Table 18: LEDs LAN interface

3.7 TPM

The device is equipped with a Trusted Platform Module (TPM) compliant with the *TPM 2.0 Library Specification* of the *Trusted Computing Group* (TCG).

To learn more about the TPM 2.0 specification, go to https://trustedcomputinggroup.org/resource/tpm-library-specification

The TPM driver is included in the netFIELD OS and is automatically loaded during device booting. The TPM is set up as `/dev/tpm0` device in the underlying Linux allowing raw API access via Linux shell and/or from application containers.

4 Commissioning

4.1 Hardware configuration

4.1.1 Hardware configuration of COM ports

The COM port connector offers two serial interfaces: COM1 and COM2. Each COM port can be used as RS-232, RS-422, or RS-485 serial interface. Deactivate unused COM ports.

Use DIP switch SW1 to configure the COM ports. The following figure shows the location of SW1 on the PCB.

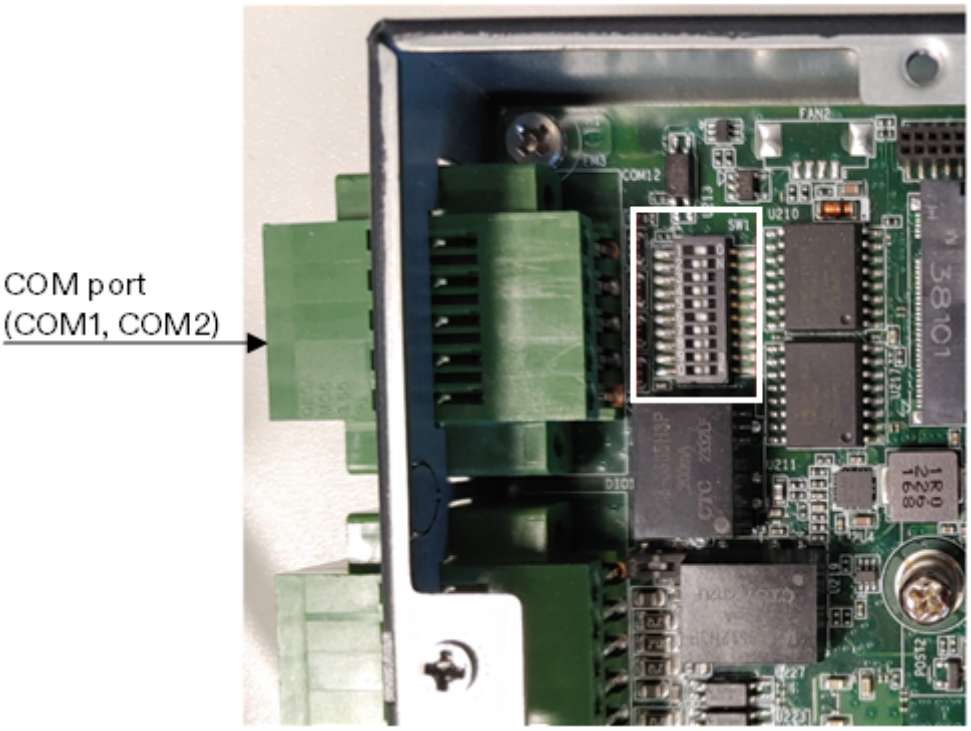


Figure 12: COM port (settings SW1)

Open the housing of the edge gateway and move the DIP switches with a screwdriver.

The following figure shows the default settings for SW1. By default, COM1 is set to RS-232 and COM2 is set to RS-232.

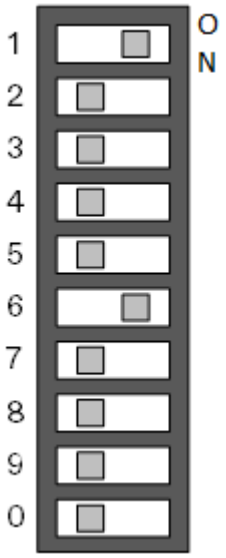


Figure 13: SW1 (default settings)

DIP switches 1 to 5 configure COM1. DIP switches 6 to 10 configure COM2.

COM1

The following table shows the settings for DIP switches 1 to 5 on SW1 to configure COM1 as RS-232, RS-422 (with or without termination), RS-485 (with or without termination), or to deactivate COM1.

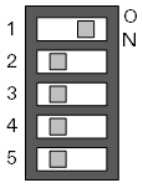
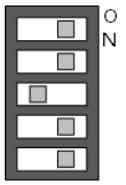
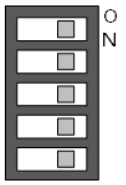
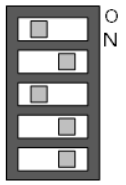
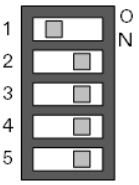
Settings on SW1 for RS-232 on COM1	Settings on SW1 for RS-422 on COM1 (no termination)	Settings on SW1 for RS-422 on COM1 (with termination)	Settings on SW1 for RS-485 on COM1 (no termination)	Settings on SW1 for RS-485 on COM1 (with termination)	COM1 deactivated
					
-	The termination resistor is deactivated.	A 120 Ohm termination resistor is activated.	The termination resistor is deactivated.	A 120 Ohm termination resistor is activated.	-

Table 19: Settings on SW1 for COM1

COM2

The following table shows the settings for DIP switches 6 to 0 on SW1 to configure COM2 as RS-232, RS-422 (with or without termination), RS-485 (with or without termination), or to deactivate COM2.

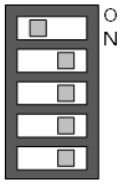
Settings on SW1 for RS-232 on COM2	Settings on SW1 for RS-422 on COM2 (no termination)	Settings on SW1 for RS-422 on COM2 (with termination)	Settings on SW1 for RS-485 on COM2 (no termination)	Settings on SW1 for RS-485 on COM2 (with termination)	COM2 deactivated
					
-	The termination resistor is deactivated.	A 120 Ohm termination resistor is activated.	The termination resistor is deactivated.	A 120 Ohm termination resistor is activated.	-

Table 20: Settings on SW1 for COM1

4.1.2 Hardware configuration of digital input

In case you intend to use a digital input, set option A or B:

- Option A: With external power supply
- Option B: Voltage free (default)

You have to configure DIP switch SW3 in the edge gateway to set option A or B.

Open the housing of the edge gateway and use a screwdriver to move the DIP switch.

Position of digital input setting SW3

The following figure shows the position of SW3 in the edge gateway.

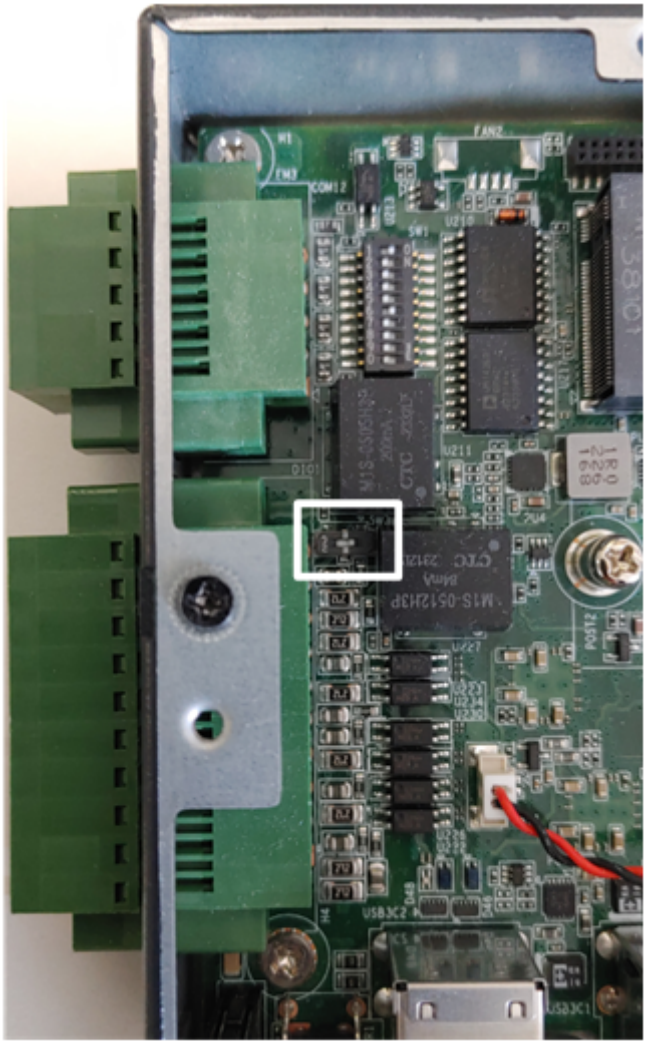


Figure 14: SW3 position

Digital input with external power supply

To use this option, set DIP switch SW3 to “left”.

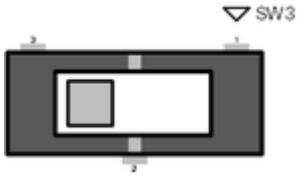


Figure 15: SW3 settings for digital input with external power supply

Voltage-free digital input

To use this option, set DIP switch SW3 to “right”.

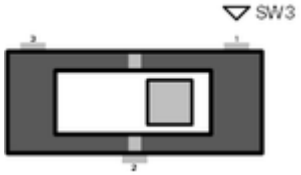


Figure 16: SW3 settings for voltage-free digital input

4.2 Installation: Mounting the edge gateway and connecting cables

Use the bracket to mount the edge gateway on the DIN rail. Use the latch to remove it from the DIN rail.

Mounting and connecting

- Mount the edge gateway to a DIN rail.
- Connect one end of the grounding cable to the grounding point of the housing (see position (19) in section *Device overview* [page 10]) and the other cable end to function earth (FE).
- Connect an Ethernet cable from LAN A (position (11)) to the network (IT network 1).
- Connect an Ethernet cable from LAN B (position (14)) to the network (IT network 2).
- If you intend to use digital inputs/outputs, wire the cables of the digital inputs/outputs to the DIO connector (position (22)) and connect the DIO connector to the edge gateway.
- If you intend to use the COM ports, wire the cables to the COM port connector (position (21)) and connect the COM port connector to the edge gateway.
- Connect the +24 V DC power supply to the edge gateway (position (18)).

4.3 Establishing LAN connection

4.3.1 Overview

You have two possibilities to establish an initial LAN connection with the **Local Device Manager** (which is the web-based management GUI of the device):

- Via DHCP at LAN A port (`eth0` in netFIELD OS)
  ("Fallback" of LAN A is *IPv4 link local*)
- Via direct (one-to-one) connection to LAN B port (`eth1` in netFIELD OS)

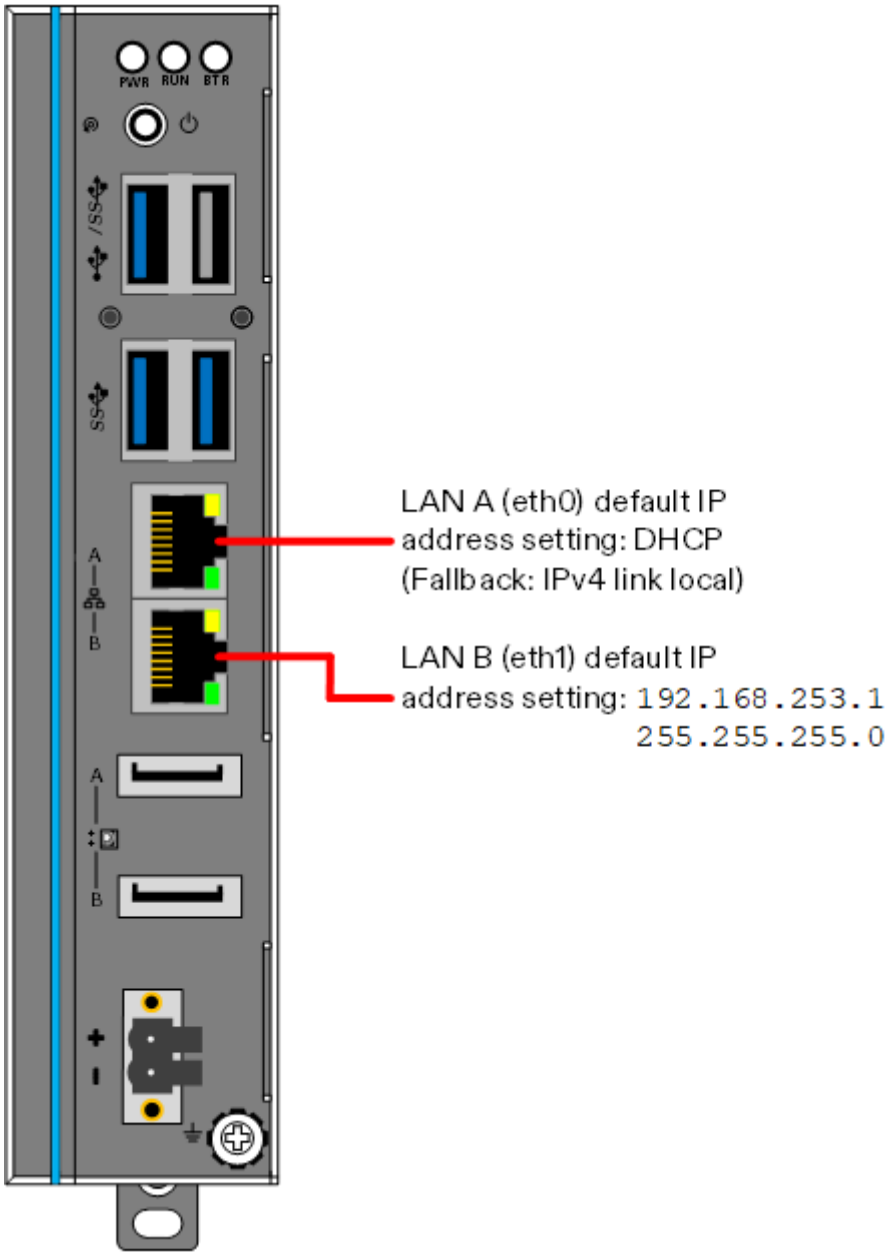


Figure 17: Factory IP address settings of LAN interfaces

Note:

The edge gateway contains a certificate issued by Hilscher. Therefore, your browser will probably issue an "unsecure connection" warning message when connecting to the device for the first time. You can ignore the warning and – depending on your browser model – select the option to proceed to the website of the device (or add an “exception rule” for this website).

On the **Certificate** page of the **Local Device Manager** of the device, you can upload your own certificate to the device. The automatically created certificate is valid for one year. On the **Certificate** page of the **Local Device Manager**, you can upload your own certificate to the netFIELD OS. The corresponding root certificate should be rolled out on each of your PC/devices that you use for connecting to the netFIELD OS.

4.3.2 Using DHCP server

In the egde gateway state of delivery, port LAN A (`eth0` in netFIELD OS) is set to DHCP mode.

If a DHCP server is available in your local IT network, you can thus use the DHCP service to assign an IP address to the LAN A interface.

- ➢ Make sure that a DHCP service is available in your local network.
- ➢ Plug an Ethernet cable into the LAN A port on the front panel of the device (see position (11) in section *Device overview* [page 10]), to connect it to your local network and to the DHCP server.
- ↬ Your device should now automatically obtain an IP address from the DHCP server. This may take a few minutes.
  If you know the IP address that the DHCP server has assigned to your device, you can now access the **Local Device Manager** directly by entering the assigned IP address into the address bar of your web browser. If you do not know the IP address, you can use the Windows network environment (see “Alternative A” below) or the “host name” of the device (see “Alternative B” below) to connect to it.
- ➢ Enter the IP address that the DHCP server has assigned to the device into the address bar of your browser.
- ↬ Your browser connects to the **Local Device Manager** the graphical user interface of the device.

Note:
Your browser will issue an "unsecure connection" warning message.
You can ignore the warning and – depending on your browser – select the option to proceed to the website of the device (or add an “exception rule” for this website).
On the **Certificate** page of the Local Device Manager, you can later upload your own trusted certificate to the device.

Alternative A: Connecting via Windows network environment

Since the device supports the UPnP technology (Universal Plug and Play), it will be displayed in the **Windows** network environment panel after having received its IP address from the DHCP server. This allows you to connect to it by a simple mouse-click.

Note:
Make sure that the network discovery feature on your Windows PC is enabled for your LAN security zone and that your engineering PC and the device must be located in the same subnet.

- ➢ To display all devices in the network, open your **Windows Explorer** and select **Network**.
- ➢ You will find the device listed under **Other Devices**. You can recognize it by its model name followed by its host name in brackets:


NFX86-D8-N128-021
(ntcc827f481e24)

➢ Double-click this entry to connect to the Local Device Manager of the device.

Alternative B: Connecting via host name

➢ As a second alternative, you can connect to the **Local Device Manager** by entering the host name of the device into the address bar of your browser. You will find the host name printed on the device label next to **DHCP client**, as shown in this example:

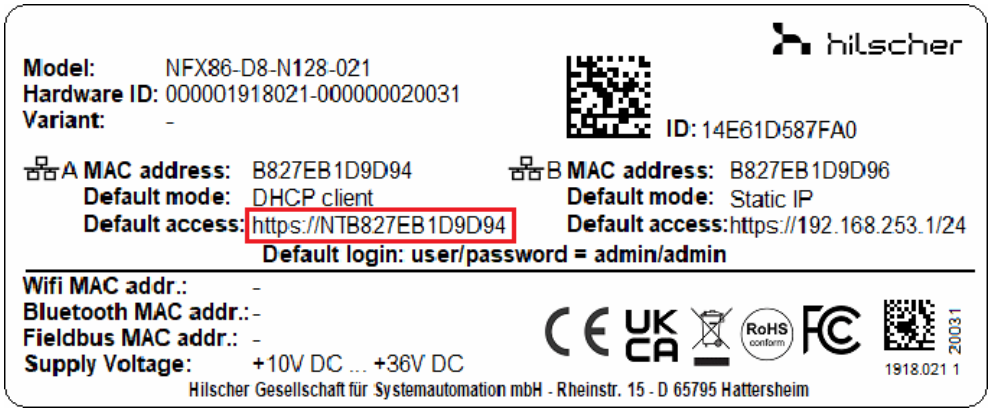


Figure 18: Device label

Note:
Your PC and your device must be located in the same subnet.

4.3.3 Establishing a one-to-one connection to the device (without DHCP server)

If no DHCP server is available in your network, you can connect your engineering PC or notebook via Ethernet cable directly to port LAN B (`eth1` in netFIELD OS) of the device (see position (14) in section *Device overview* [page 10]).

For this purpose, you must set an IP address on your PC or notebook that is compatible with the preset IP address and subnet mask of port LAN B.

In the state of delivery of the device, the IP address of port LAN B is preset to `192.168.253.1`, the subnet mask is `255.255.255.0`.

1. Connect the Ethernet cable.
   - ➢ Use an Ethernet cable to connect the LAN B interface directly to your PC or notebook:
2. Set the IP address on your PC or notebook (under Microsoft Windows).
   - ➢ Open Windows **Start** menu > **Settings**.
   - ➢ In the **Windows settings**, select **Network and Internet**.
   - ↬ A list of network connections, including the network status, opens.
   - ➢ Click **Properties** of the Ethernet connection you want to set the IP address.
   - ➢ Go to **IP settings** > **IP assignment** and click **Edit**.
   - ↬ The window **Edit IP settings** opens.
   - ➢ From the selection list, select **Manual**.
   - ➢ Activate **IPv4**.
   - ↬ Enter `192.168.253.2` in the field **IP address**.
   - ➢ Enter `24` in the field **Subnet prefix length**.
   - ➢ Enter `192.168.253.254` in the field **Gateway**.

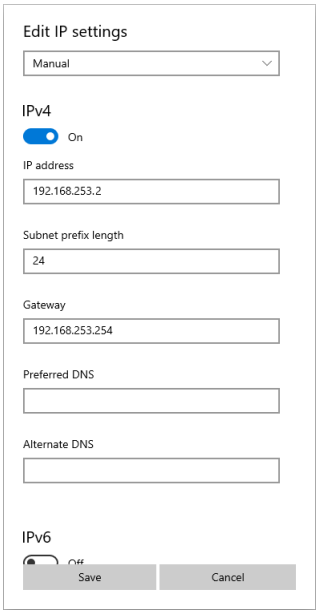


Figure 19: IP settings (manual)

   - ➢ Click **Save**.
   - ➢ Close the settings window.
3. Open the browser and connect to the device.
   - ➢ You can now access the device from your PC or notebook via web browser by entering the following address into the address bar of your browser:
     `https://192.168.253.1`
   - ↬ A connection is established and the Local Device Manager opens in your browser window.

4.3.4 Login to the Local Device Manager

After having established a LAN connection to the device, the **Sign In** dialog of the **Local Device Manager** will be displayed.

When connecting to the device for the first time, your browser will issue a security warning before displaying the Login screen of the Local Device Manager. You can ignore the warning and – depending on your browser – select the option to proceed to the website of the device (or add an “exception rule” for this website).

The default credentials for user and password are printed on the device label of the edge gateway. With the first login and for security reasons, you are forced to change the default `admin` password immediately.

For a description about the netFIELD OS including the Local Device Manager, see „Operating instruction manual, netFIELD OS, DOC250302OIxxEN“.

4.4 Managed or unmanaged edge gateway

Unmanaged edge gateway

The operating system of the edge gateway offers a **Standard Docker** for manual and local deployment and maintenance of containers. Those containers can be pulled from official registries like Docker Hub (https://hub.docker.com) or any locally hosted Docker registry. In case you do not have an account/subscription for the *netFIELD Cloud*, the standard Docker is the only way to pull and run container applications on your device.

Managed edge gateway

The operating system of the edge gateway offers the **IoT Edge Docker** for remote and automatic deployment and maintenance of containers. These containers are deployed (“pulled”) and managed over the netFIELD Cloud. This requires your edge gateway to be onboarded in the netFIELD Cloud. Note that you need an account/subscription for the netFIELD Cloud (https://www.netfield.io) for this.

The onboarding of the edge gateway to the netFIELD Cloud is part of the Local Device Manager.

For a description about the netFIELD OS including the Local Device Manager, see „Operating instruction manual, netFIELD OS, DOC250302OIxxEN“.

The netFIELD Cloud has a web-based GUI, the netFIELD Portal, for remote and automatic deployment and maintenance of containers.

For a description about the netFIELD Portal, see „Operating instruction manual, netFIELD Portal, DOC190701OIxxEN“.

5 Technical data

Category	Parameter	Value
Product	Part number	1918.021
	Product name	NFX86-D8-N128-021
	Function	IT/OT edge gateway for IIoT, Industry 4.0, Integrated Industry and automation projects with optional cloud connectivity
Processor	CPU	Intel Atom® Processor x6413E 1.5 GHz
Memory	RAM	8 GByte DDR3L
	Storage	128 GByte SSD BiCS5
Software	Operating system	Based on Security Enhanced YOCTO Linux
	Container engines	Engine 1 for manual and local deployment and maintenance of containers
		Engine 2 for centralized, remote, and automatic deployment and maintenance of containers
Configuration	Local Device Manager	Web-based GUI for local device configuration
	Remote management	Via Cloud platform (optional)
Security	TPM	TPM 2.0 SLB9672
Power supply	Supply voltage	+10 V DC ... +36 V DC IN (typical: +24 V DC) **Note**: Voltages above 36 V may cause damage to the device. Voltages below 10 V may cause a shutdown of the device. **Note:** The maximum length of the power supply cable to the power supply unit must not exceed 30 m.
	Reverse wiring protection	Yes
	Current consumption	Typical: 800 mA at 24 V DC Maximum: 1800 mA at 24 V DC
	Connector	2-pin terminal block
	Wire	Copper, 12 – 24 AWG
Real-time clock	Buffering	Battery powered
Ethernet LAN interfaces	Type	Ethernet port A: 10/100/1000 Mbit/s (eth0 in the operating system) Ethernet port B: 10/100/1000 Mbit/s (eth1 in the operating system)
	Controller	Intel® i226
	Connector	2 x RJ45 sockets
USB interfaces	USB	3x USB 3.2, 1x USB 2.0
	Connector	Type A
Serial interfaces	COM ports	2 x RS-232/RS-422/RS-485 (COM1 and COM2)
	Connector type	2 x 5 terminal block
	Baud rate	50 kbps … 115.2 kbps
	Isolated	Yes
	Isolation voltage	2500 VDC

Category	Parameter	Value
Digital I/O	Input	8 digital input channels
	Input voltage	Configurable: Voltage-free or with external power supply
	Input overvoltage protection	30 V DC
	Output	8 digital output channels
	Output voltage	5 V DC … 30 V DC
	Output current	Max. 500 mA / channel
	Connector type	2 x 10 terminal block
	Isolated	Yes
	Opto isolator response	50 µs
	Isolation voltage	2500 VDC
Display interface	Display	2 x Display Port, V1.2
	Resolution	Max. 4096 x 2160 @ 60 Hz
LED indicators	PWR	Power LED (orange, green)
	RUN	Programmable LED (green)
	BTR	Battery LED (red)
	Ethernet LAN	LINK (green, orange): Ethernet Link status ACT (green): Ethernet Activity status
Device	Dimensions of device	35 mm x 105 mm x 150 mm (without connectors)
	Weight of device with mounting bracket	Approx. 800 g
	Housing material	Aluminum
	Degree of protection	IP20
	Mounting type	DIN top hat rail mounting
Admissible ambient conditions	Ambient temperature	Operation: –40 °C … +70 °C (0.7 m/s airflow) Storage: –40 °C … +85 °C
	Relative humidity	Operation: 10 % … 95 % @ 40 °C(non-condensing) Storage: 5 % … 95 % (non-condensing)
Conformance with EMC directives	CE sign	Yes
	UKCA sign	Yes
	Emission	EN 61000-6-3 / BS EN 61000-6-3
	Immunity	EN 61000-6-2 / EN BS 61000-6-2 (for industrial environments)
		EN 61131-2 / BS EN 61131-2
		EN 61000-4-2 / EN BS 61000-4-2: (Electrostatic discharge test)
		EN 61000-4-3 / EN BS 61000-4-3 (Radiated, radio-frequency, electromagnetic field test)
		EN 61000-4-4 / EN BS 61000-4-4 (Burst Electrical fast transients/burst test)
		EN 61000-4-5 / EN BS 61000-4-5 (Surge test)
		EN 61000-4-6 / EN BS 61000-4-6 (to conducted disturbances, induced by radio- frequency fields)

Category	Parameter	Value
Conformity declarations	FCC	Yes
	CCC	Yes
	BSMI	Yes
	UL	UL 61010-2-201
	RoHS	Yes
Tests	Shock resistance	Operating, IEC 60068-2-27, 50 G, half sine, 11 ms
	Vibration resistance	Operating, IEC 60068-2-64, 2 Grms, random, 5 … 500 Hz, 1 hr/axis

Table 21: Technical data NFX86-D8-N128-021

The netFIELD Unity edge gateway is based on the Advantech UNO 137 V2 device.

6 Decommissioning, dismounting and disposal

6.1 Putting the device out of operation

NOTICE

Danger of Unsafe System Operation!

To prevent personal injury or property damage, make sure that the removal of the device from your plant during operation will not affect the safe operation of the plant.

- ➢ Disconnect all communication cables from the device.
- ➢ Disconnect the power supply plug.
- ➢ Remove the device from the DIN top hat rail.

6.2 Removal of battery

If you do not want to return the device to Hilscher, you have to remove the battery and dispose of it properly prior to the disposal of the device.

To remove the battery, proceed as follows:

Open the housing of the device by unscrewing the fastening screws.

Remove the battery from the device. The mounting position of the battery is marked in the following photo of the opened device by the white rectangle:

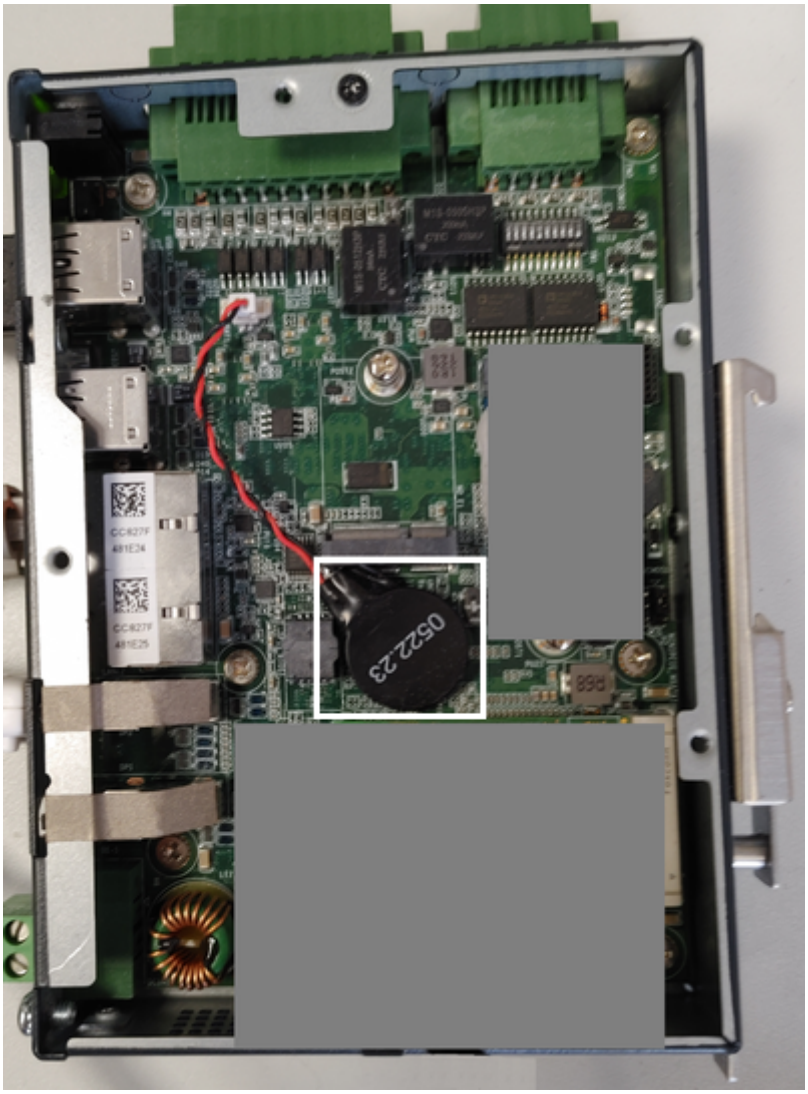


Figure 20: Position of the battery

6.3 Disposal and recycling of waste electronic equipment

Waste electronic equipment must be disposed of properly after the end of use.

Waste electronic equipment

This product must not be disposed of with household waste.

Dispose of this product in accordance with local regulations in your country.

When disposing of the product, observe the following:

- Observe national and local regulations for the disposal of waste electronic equipment, batteries and packaging.
- Delete personal data stored in the waste electronic device.
- Remove the battery from the waste electronic device and dispose it separately.
- Dispose of this product in an environmentally friendly manner at a local collection point for waste electronic equipment.
- Dispose of packaging in such a way that a high level of recycling is possible.

Alternatively, you can return our products to us for disposal. The prerequisite is that no additional foreign substances are contained. Before returning, please contact us via the Return Merchandise Authorization (RMA) form on www.hilscher.com.

In Europe, the directive 2012/19/EU waste electrical and electronic equipment applies. Different policies and laws may apply nationally.

7 Appendix

7.1 BIOS

The edge gateway is equipped with an AMI BIOS.

BIOS setup

Connect a monitor to the display port and connect a keyboard to one of the USB ports.

To enter the BIOS setup, press and hold the <ESC> key after power on.

7.2 BIOS settings to boot from USB device

In case you want the edge gateway to boot from a USB device you have to change the BIOS settings. This is necessary, if you want to recover the operating system of the edge gateway from a USB device.

- Connect a keyboard to one USB connector of the edge gateway.
- Connect a monitor to the DP connector of the edge gateway.
- Connect the USB drive to one USB connector of the edge gateway.
- Power the edge gateway.
- Directly at the beginning of the boot process of the edge gateway, press the ESC key on the keyboard to enter the BIOS settings.
- Use the Right key (4 times) to move to the Boot menu.
- Use the Down key to move to Boot option #1.
- Press the Enter key.
- With the Down key, select the USB drive. **Note:** The USB drive is only displayed when the USB drive has been connected to the edge gateway before booting the edge gateway. If the USB drive is not listed you have to connect the USB drive to the edge gateway and reboot the edge gateway.
- If the USB drive is selected, press the Enter key.
- Press F4 key to save the settings and to exit the BIOS.
- Select Yes and then press the Enter key.

⇨ The edge gateway boots from the USB drive.

7.3 Legal notes

Terms and conditions

Please read the terms and conditions under
https://www.netfield.io/termsOfUse.

netFIELD OS

netFIELD OS is a YOCTO project based Linux operating system released and licensed by Hilscher.
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HILSCHER netFIELD Source Code/Software LICENSE AGREEMENT.
netFIELD OS may include 3rd party software or software declared as Open Source. The licensing information of all included software components are provided in textual form in the netFIELD OS under the folder `/usr/share/common-licenses` and subfolders.
Open Source software is released under Open Source License usually. The official verbatim texts can be read and checked under
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Copyright

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- Flight control systems in aviation and aerospace;
- Nuclear fission processes in nuclear power plants;
- Medical devices used for life support and
- Vehicle control systems used in passenger transport

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