



User Manual
netMIRROR
NMR-TFE-RE



Hilscher Gesellschaft für Systemautomation mbH
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1 About the user manual

This user manual describes the features, the installation and the operation of the reactionless, real zero-delay 10/100 Mbit Ethernet Mirror TAP netMIRROR NMR-TFE-RE for passive network diagnosis and data acquisition during operation in arbitrary Real-Time Ethernet networks:

It can be used as a permanently installed access point into the Real-Time Ethernet network. It allows precise in-depth analysis and data acquisition of the network data traffic at any time; even under production conditions.

The netMIRROR NMR-TFE-RE offers you the following advantages:

- The netMIRROR NMR-TFE-RE can be used as a permanent test access point for diagnosis.
- The network connection remains preserved even in voltage-free state.
- Full passive network access without any feedback from measurement.
- Real Zero-Delay at network side (< 1 ns)
- Suitable for 10BASE-T and 100BASE-TX networks
- Suitable for all usual real-time Ethernet systems (such as PROFINET, EtherNet/IP, EtherCAT, Sercos, Modbus/TCP, Ethernet Powerlink or Varan).

Also see about this

- 📖 Why should I use test access points (such as Ethernet mirror TAPs) within my network? [▶ 11]
- 📖 Are the Ethernet signals delayed by the mirror TAP? [▶ 14]

1.1 List of revisions

Index	Date	Chapter	Changes
1	2017-01-16	All	Created document

Table 1: List of revisions

1.2 Hardware version

Device name	Device type	Part no.	Revision
netMIRROR Ethernet Mirror-TAP (10/100 MBit)	NMR-TFE-RE	7.340.100	2

Table 2: netMIRROR Hardware

1.3 Obligation to read and understand the manual



Important:

To avoid personal injury and to avoid property damage to your system or to your device, you must read and understand all instructions in the manual and all accompanying texts to your PC card, before installing and operating your device.

- First read the **Safety instructions** in the *Safety chapter*.
- Obey to all **Safety messages** in the manual.

1.4 Legal notes

1.4.1 Copyright

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- for the design, construction, maintenance or operation of nuclear facilities;
- in air traffic control systems, air traffic or air traffic communication systems;
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1.5 Registered trademarks

Wireshark® and the "fin" logo are a registered trademark of Gerald Combs.

All other mentioned trademarks are property of their respective legal owners.

1.6 References

[1] PROFINET Design Guideline, Version 1.14, December 2014, PROFIBUS Nutzerorganisation e.V., Karlsruhe, Order No.: 8.062
(Cost-free Download at <http://www.profibus.com/nc/download/installation-guide/downloads/profinet-installation-guide/display/>)

[2] PROFINET Commissioning Guideline, Version 1.36, December 2014, PROFIBUS Nutzerorganisation e.V., Karlsruhe, Order No.: 8.082
(Cost-free Download at <http://www.profibus.com/nc/download/installation-guide/downloads/profinet-installation-guide/display/>)

2 Safety

2.1 General note

The user manual, the accompanying texts and the documentation are written for the use of the products by educated personnel. When using the products, all safety instructions and all valid legal regulations have to be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended use

The netMIRROR **NMR-TFE-RE** device described in this manual is a communication device connecting two separate Real-Time Ethernet networks with each other. The device thus serves as a “gateway” between the two networks.

The device is equipped with a compact housing and is intended for DIN rail mounting according to DIN EN 60715.

2.3 Personnel qualification

The 10/100 Mbit Ethernet Mirror-TAP netMIRROR **NMR-TFE-RE** must be installed, configured and removed only by qualified personnel. Job-specific technical skills for people professionally working with electricity must be present concerning the following topics:

- Safety and health at work
- Mounting and connecting 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 Safety instructions to avoid personal injury

To ensure your own personal safety and to avoid personal injury, you must read, understand and follow the safety instructions and all safety messages in this manual about danger that might cause personal injury, before you install and operate your netMIRROR **NMR-TFE-RE** device.

2.4.1 Danger of unsafe system operation

To prevent personal injury, make sure that the removal of the netMIRROR **NMR-TFE-RE** device from your plant during operation will not affect the safe operation of the plant.

2.5 Safety instructions to avoid property damage

To avoid property damage to your system or to the netMIRROR **NMR-TFE-RE** device, you must read, understand and follow the safety instructions and all safety messages in this manual about danger that might cause property damage, before you install and operate your device.

2.5.1 Device destruction by exceeding allowed supply voltage

Observe the following notes concerning the supply voltage:

- The netMIRROR **NMR-TFE-RE** device may only be operated with the specified supply voltage. 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.

The allowed range for the supply voltage of the netMIRROR **NMR-TFE-RE** device is specified in section .

Also see about this

 Technical data [[▶ 33](#)]

2.5.2 Danger of unsafe system operation



To prevent property damage, make sure that the removal of the netMIRROR **NMR-TFE-RE** device from your plant during operation will not affect safe operation of the plant.

2.6 Labeling of safety messages

In this document the safety instructions and property damage messages are designed according both to the internationally used safety conventions as well as to the **ANSI Z535** standard.

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly and highlighted by a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text and optionally by a specific safety sign.
- The **Integrated Safety Messages** embedded in operating instructions are highlighted by a signal word according to the degree of endangerment. In the safety message, the nature of the hazard is indicated.

Signal words and safety signs in safety messages on personal injury

Signal word	Meaning
 DANGER	Indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it is not avoided.
 WARNING	Indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it is not avoided.


Signal word	Meaning
 CAUTION	Indicates a minor hazard with medium risk, which could have as consequence personal injury if it is not avoided.

Table 3: Signal words in safety messages on personal injury



Safety sign	Sort of warning or principle
	Warning of lethal electrical shock
	Principle: Disconnect the power plug

Table 4: Safety signs in messages on personal injury

Signal words and safety signs in safety messages on property damage


Signal word	Meaning
 NOTICE	Indicates a property damage message

Table 5: Signal words in safety messages on property damage


Safety sign	Sort of warning or principle
	Warning of property damage by electrostatic discharge

Table 6: Safety signs in safety messages on property damage

3 Frequently asked questions

3.1 Why should I use test access points (such as Ethernet mirror TAPs) within my network?

Thanks to the use of the proven Ethernet technology, Ethernet-based industrial networks have become very robust against interference. Nevertheless, also Ethernet based industrial networks require the possibility to have a quick and easy to use trouble-shooting access in case of disturbance. Unlike the traditional field busses, Ethernet based systems are connected in daisy-chain topologies, thus a diagnostic device cannot be connected at any point of the network, as not the whole telegram traffic can be observed at every network node. Due to this fact, network access is typically done directly behind the controller. In order to connect to a diagnostic device, Ethernet's point-to-point connection must be disconnected shortly, this leads to a disruption of the controller-device-communication, and thus to a breakdown of the plant. This is also illustrated within the following two figures:

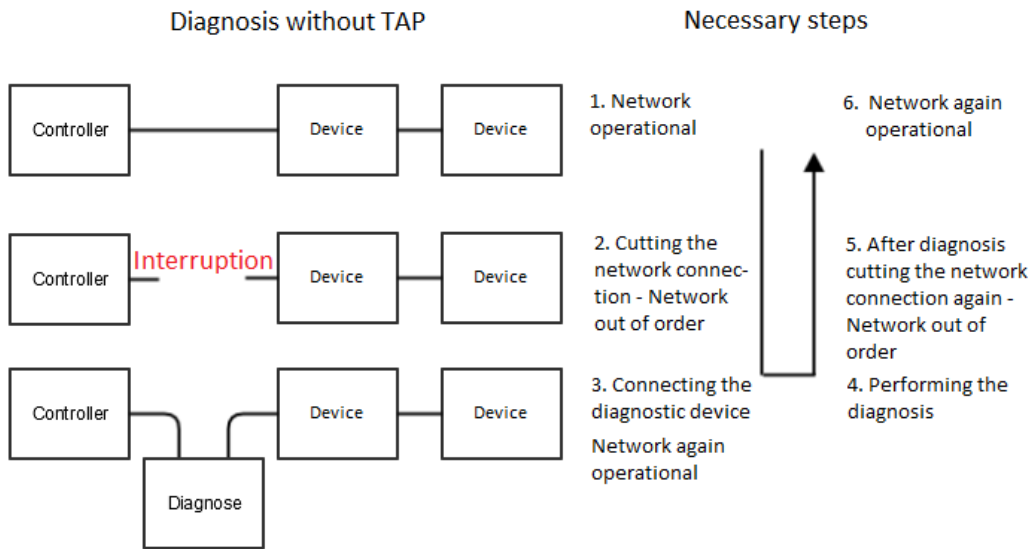


Figure 1: Diagnosis without TAP

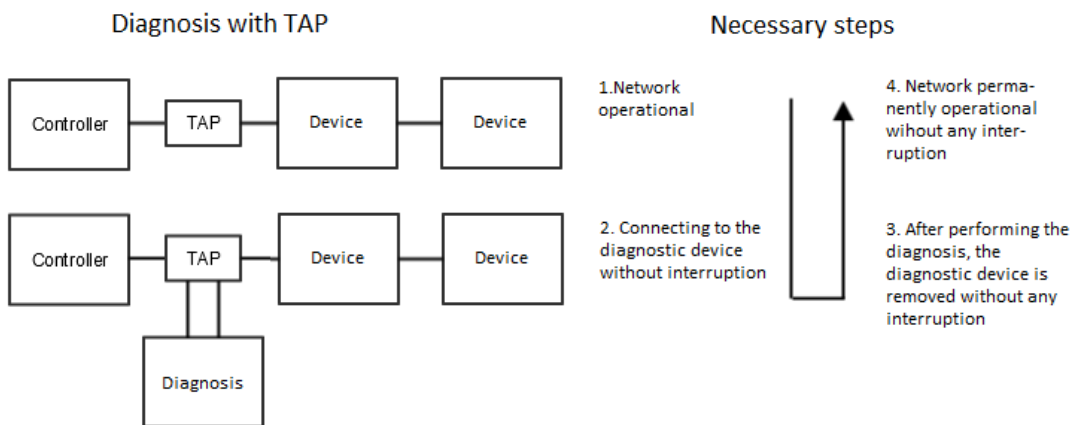


Figure 2: Diagnosis with TAP

In order to eliminate the need of interrupting Ethernet connections, permanent test access points (TAPs) for the analysis of network traffic at special defined locations should be considered already at design time. Such TAPs can be applied providing many advantages during

- commissioning of the network
- maintenance
- trouble shooting
- long-term diagnosis of the network status

Such TAPs should be placed at all locations within the network where an extraordinarily high data traffic is to be expected. So, without any interruption of network and plant operation revealing short- or long-term measurements can be performed at these points, if necessary. Typically, such a TAP should be located directly behind the Master or Controller.

3.2 Which requirements should a test access point fulfill?

A test access point (= TAP) should disturb the result of the measurement as little as possible. From this point of view, it should be passive. This means, it should have the following properties:

- Absence of feedback
- Absence of delay

The principle of the passive TAP is illustrated within the next figure:

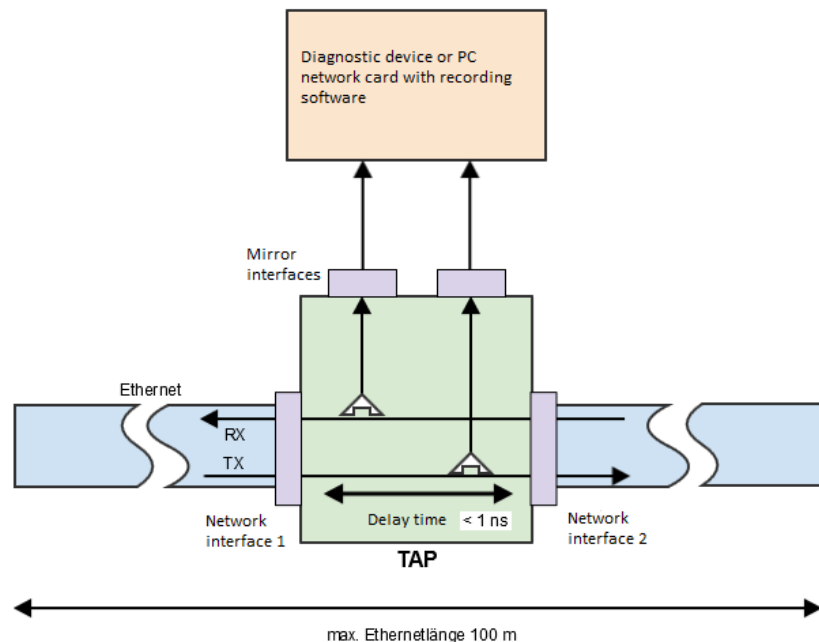


Figure 3: Principle of the passive TAP



Note:

Information concerning the topic "Absence of delay" can be found in subsection *Are the Ethernet signals delayed by the mirror TAP?* [▶ page 14]

3.3 Why should I not use port mirroring?

Passive Ethernet mirror TAPs offer the following advantages compared to port mirroring (i.e. activation of mirror ports at Ethernet switches):

- Real-zero delay: The chronological sequence of network traffic always remains preserved.
- Absence of feedback: Under any condition, no change occurs within the contents of data packets.
- Even at high network load or telegram errors no telegrams are rejected. Also even erroneous telegrams will be transmitted.
- No effort for setting up the mirror port is required.
- No additional load of the switch caused by mirroring.
- No accidental introduction of undesired network traffic by connected diagnostic PCs.
- Prevention against accidental operating errors at the switch

Port mirroring should therefore be restricted to a first rough analysis of network traffic. In any case, TAPs should be installed to allow performing a precise analysis without data corruption.

3.4 Which system requirements have to be fulfilled in order to operate the Ethernet mirror TAP?

In order to operate the netMIRROR NMR-TFE-RE, the following prerequisites have to be fulfilled.

- For mounting the device, free space on the top hat rail according to DIN EN 60715 is required.
- In order to connect an analysis device such as the netANALYZER or a PC for diagnosis, the input power supply sockets (POWER IN) have to be connected with a power supply with a nominal voltage of 24 V.

3.5 Can I use the netMIRROR NMR-TFE-RE for commissioning measurements, too?

The netMIRROR NMR-TFE-RE can also be used for commissioning measurements. For instance, the PROFIBUS/PROFINET user organization recommends doing so when commissioning PROFINET networks. within the PROFINET Design Guidelines (Reference [1], see section 4.5 and the PROFINET Commissioning Guidelines (Reference [2], see section 2.3.4.1 Passive Diagnosis).

3.6 Are the Ethernet signals delayed by the mirror TAP?

The netMIRROR NMR-TFE-RE works as passive real zero-delay TAP within an Ethernet line. Real-zero-delay in this context means there is no significant additional delay above the transmission time of the equivalent additional cable length.

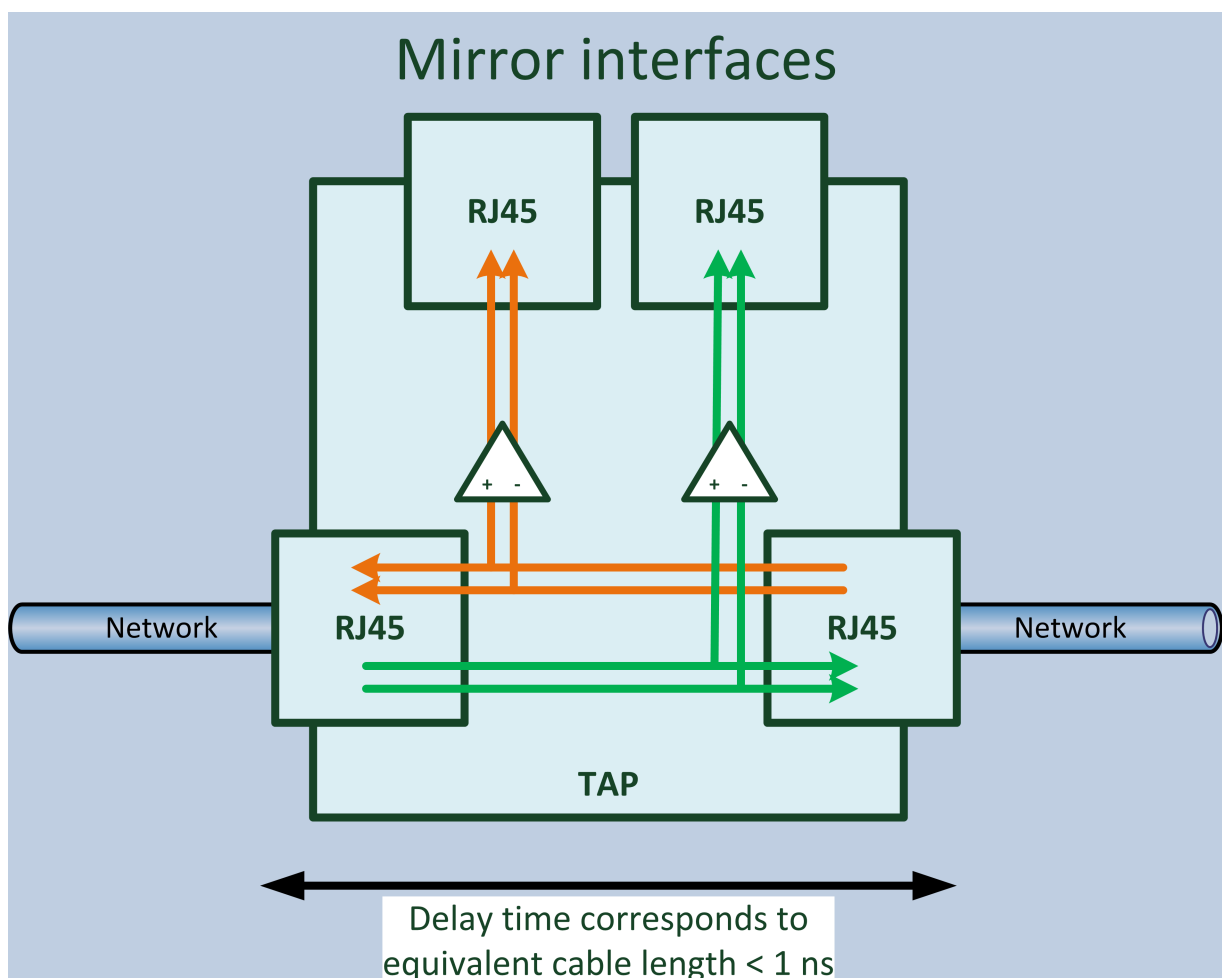


Figure 4: TAP - Mirror interfaces/ delay time

3.7 Will the network connection to be analyzed be disrupted in power-down state?

No! The network connection remains preserved even in powerless state. In this case, only at the mirror ports MIRROR A and MIRROR B no signals will be observed then.

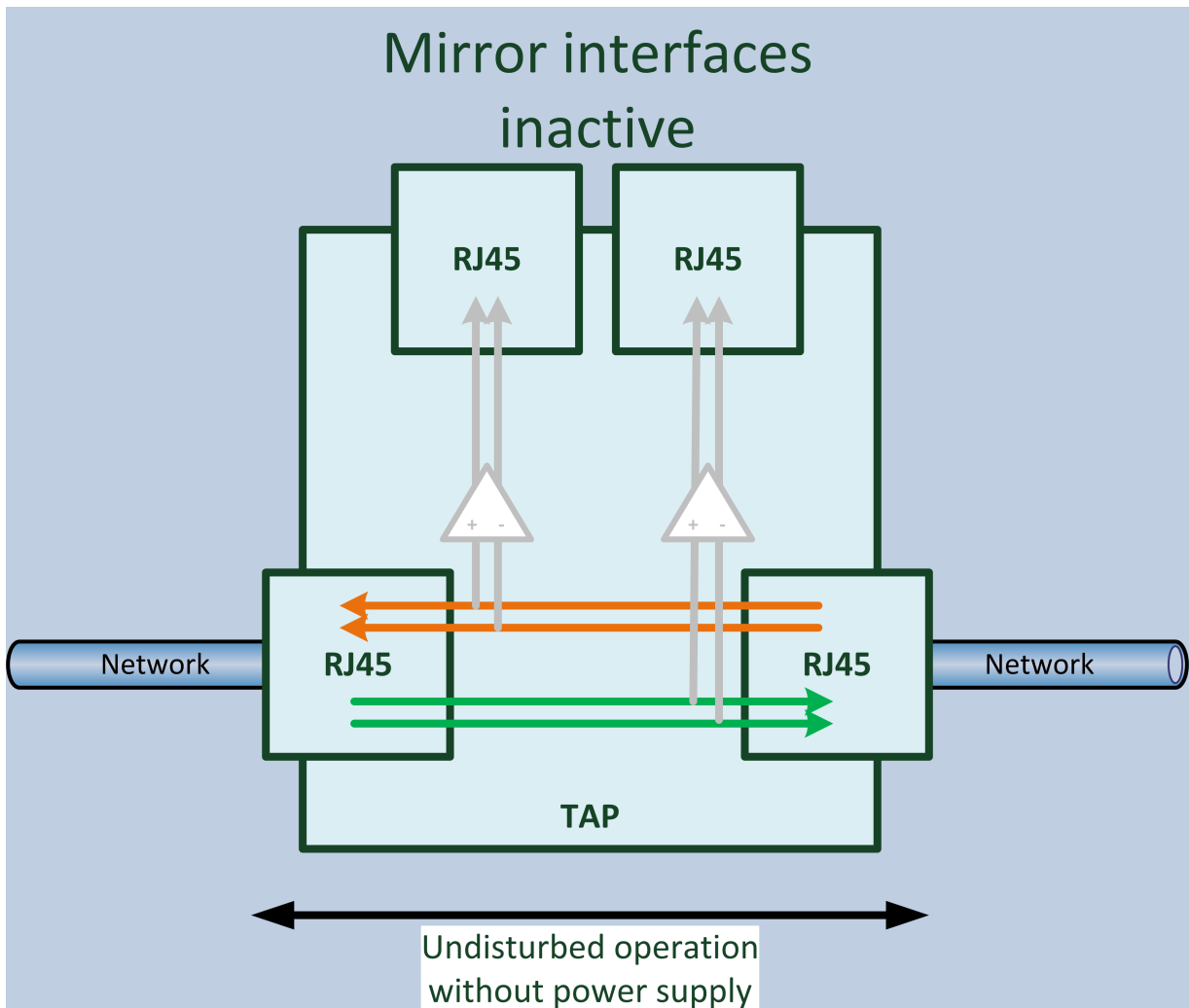


Figure 5: TAP - inactive mirror interface

3.8 Are the mirror TAP connectors galvanically isolated from the network TAP connectors?

Yes! The connectors MIRROR A and MIRROR B are galvanically isolated from the connectors NETWORK A and NETWORK B.

3.9 How does the internal schematics of the netMIRROR NMR-TFE-RE look like?

The following figure shows a block diagram of the internal structure of the netMIRRORNMR-TFE-RE with some important additional information:

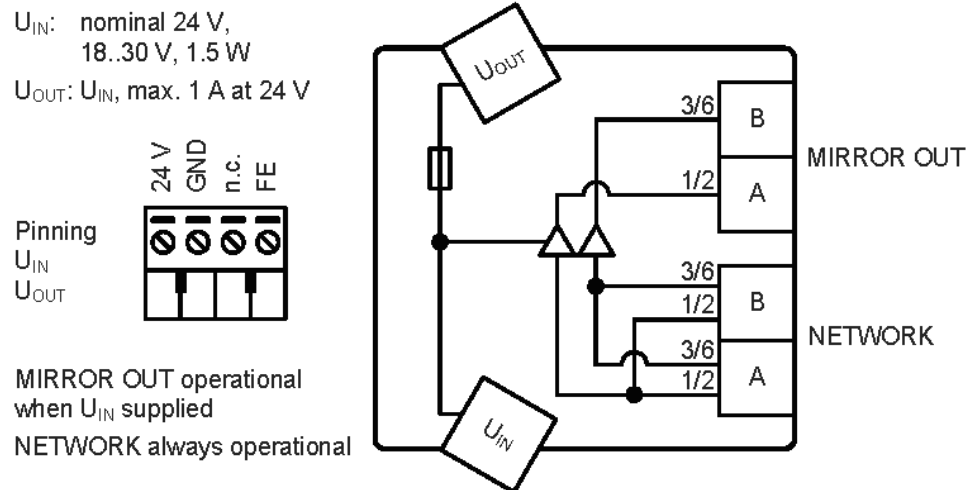


Figure 6: Internal schematics (block diagram) of the netMIRRORNMR-TFE-RE

This figure is also attached at the left side of the device's housing in order to be used as quick instructions.

3.10 What does it mean if the LED POWER IN is lit, while LED POWER OUT is not lit at the same time?

If the LED POWER OUT is not lit although the POWER IN LED is lit and a supply voltage has been applied to power supply input POWER IN, this is in most cases caused by tripping of the self-resetting fuse between power supply input and power supply output due to overcurrent.

Resetting the polyfuse

- In this case, remove the cause of the overload and separate the power supply of device for a short time in order to reset the polyfuse.

4 Device drawings

4.1 Device drawings and photo

With the following figures, we supply you with a photo of the netMIRROR NMR-TFE-RE and drawing showing the netMIRROR NMR-TFE-RE in views from different directions.



Figure 7: Device photo

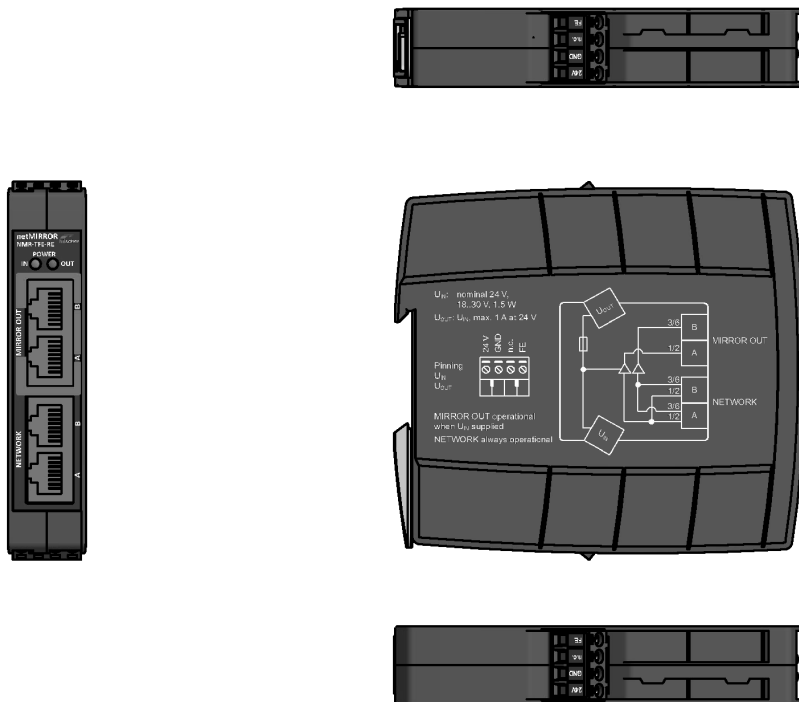


Figure 8: Drawings of netMIRROR NMR-TFE-RE in views from different directions

4.1.1 Dimensioned drawings

The following dimensioned drawings show the outer dimensions of the netMIRRORNMR-TFE-RE:

4.1.1.1 Front view

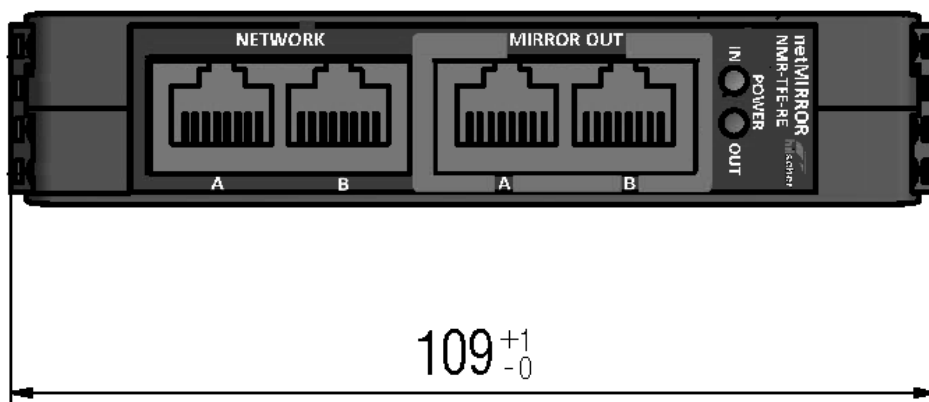


Figure 9: netMIRRORNMR-TFE-RE - Front view

4.1.1.2 Top view



Figure 10: netMIRROR NMR-TFE-RE - Top view

4.1.1.3 View from left side

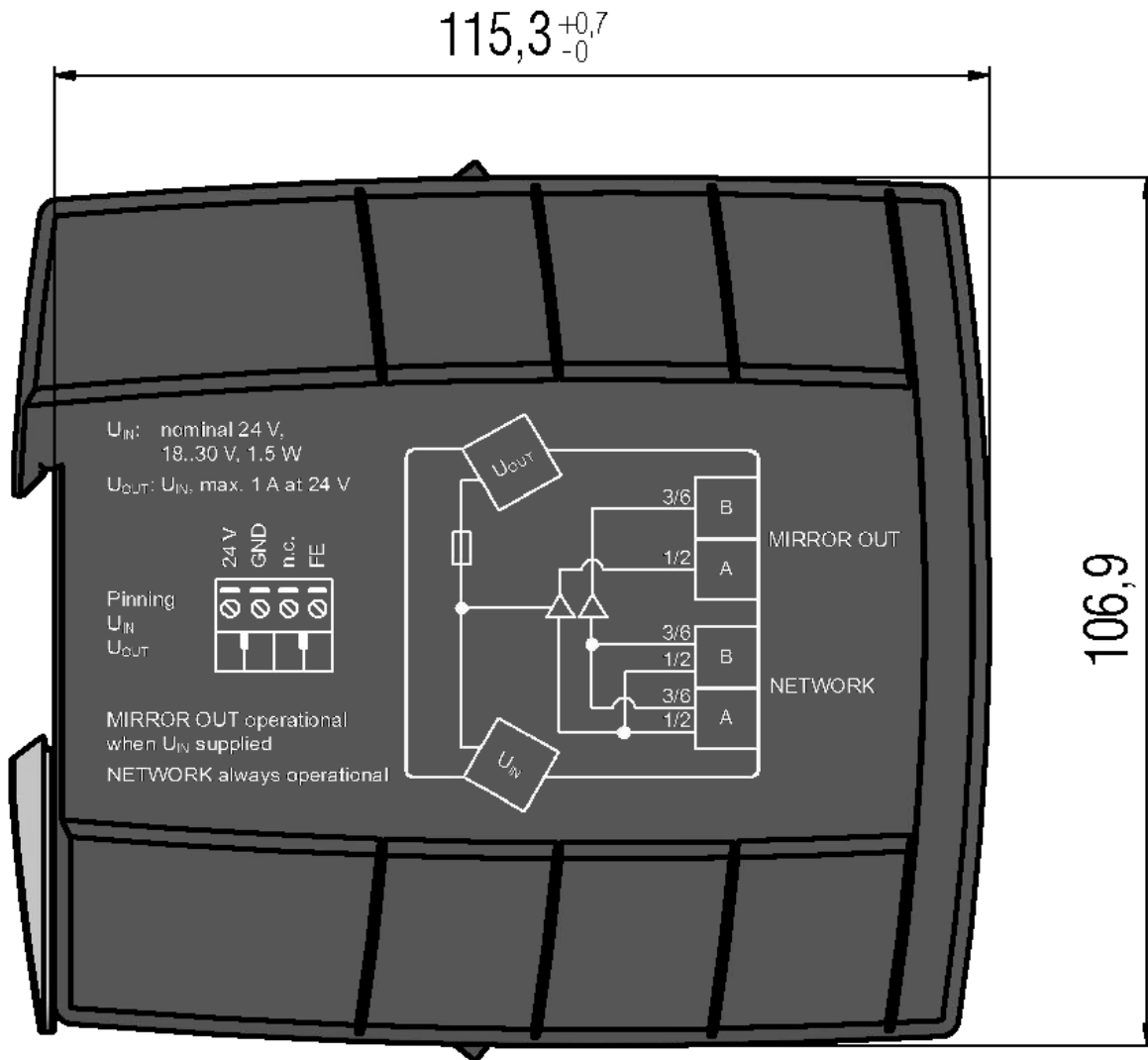


Figure 11: netMIRROR NMR-TFE-RE - View from left side

4.1.1.4 Bottom view

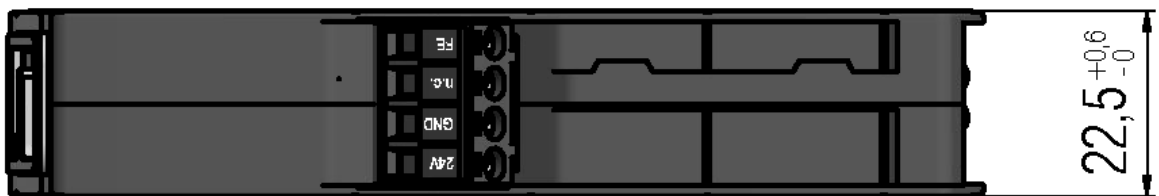


Figure 12: netMIRROR NMR-TFE-RE - Bottom view

4.2 Device label

At the right side, the netMIRROR NMR-TFE-RE is fitted with a device label providing the following information:

(1) Denomination of device type
 (2) Part number
 (3) Serial number of the device
 (4) Number of hardware revision
 (5) Matrix label

Table 7: Device label netMIRROR NMR-TFE-RE

You can identify your device by means of the device label.



Note:

The position of the device label on your device can be seen from the device drawing.

The 2D code (Data Matrix Code) contains the following information:

- ① Part number: 1234.567
- ② Hardware revision: 1
- ③ Serial number: 20000 (for mini matrix code 20001)

The device label with matrix code can be designed as mini-sticker.

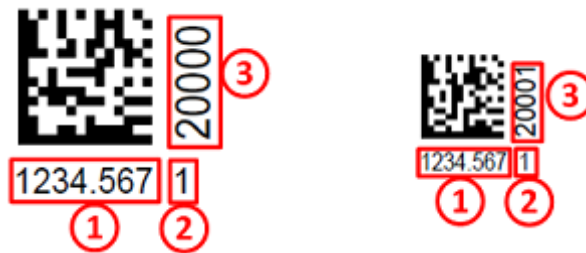
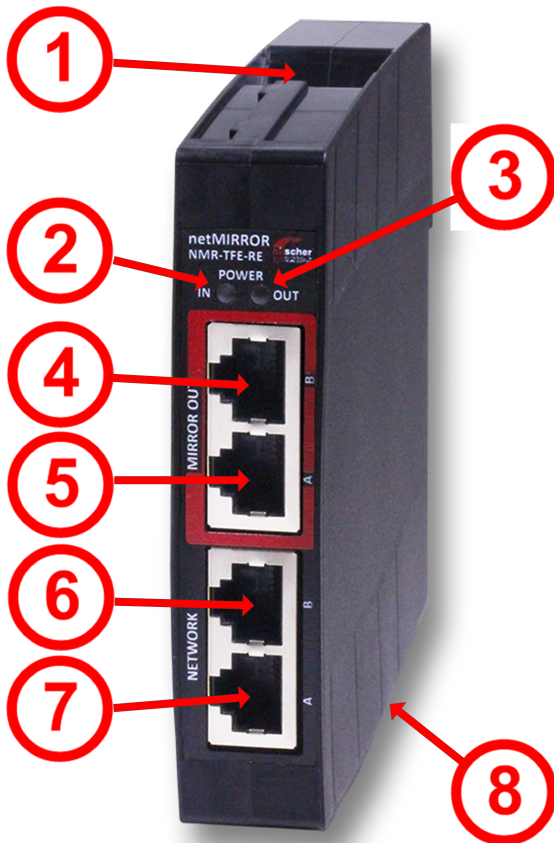


Figure 13: Example 2D Label (mini sticker on the right)

5 Interface connectors and displays

5.1 Positions of the interface connectors and LEDs

Take the positions of the interfaces and LEDs of the netMIRROR NMR-TFE-RE from the following figure:



- (1) Connector for supplying voltage (24 V) to netANALYZER or other analyzer device / Output POWER OUT
- (2) POWER IN-LED
- (3) POWER OUT-LED
- (4) Real-Time Ethernet connector MIRROR OUT B (RJ45 socket)
- (5) Real-Time Ethernet connector MIRROR OUT A (RJ45 socket)
- (6) Real-Time Ethernet connector NETWORK B (RJ45 socket)
- (7) Real-Time Ethernet connector NETWORK A (RJ45 socket)
- (8) Power supply connector (for netMIRROR) POWER IN

NMR-TFE-RE front view

Table 8: Interface connectors and LEDs of netMIRROR NMR-TFE-RE

5.2 Connectors and interfaces

5.2.1 24V power supply connector

The netMIRROR NMR-TFE-RE is equipped with two power supply connectors, POWER IN and POWER OUT. Both have been designed as 4-pin CombiCon connectors and generally use the same pin assignment.

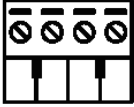
Supply voltage	Pin	Signal	Description
Pinning U_{IN} U_{OUT} 	1	-FE	Functional Earth
	2	n.c.	N.c.
	3	0 V / GND	GND of supply voltage
	4	+24 V	+24 V supply voltage

Table 9: Pin assignment of power supply connectors (Input POWER IN/ Output POWER OUT, CombiCon 4-pin)

The connectors differ as follows:

- Over the connector POWER IN (8) the netMIRROR NMR-TFE-RE itself is supplied with power. This connector is located at the bottom side of the housing. The supply voltage for the netMIRROR NMR-TFE-RE must not exceed the allowed range of 24 V DC \pm 6 V DC. It is connected to pin 3 and pin 4 of the 4-pin CombiCon power supply socket.
- The connector POWER OUT (1) at the top of the housing provides an output voltage for supplying a netANALYZER or another 24 V network analyzing device that is connected to the netMIRROR NMR-TFE-RE. The output voltage exactly matches the input voltage supplied at connector POWER IN (8). The connector POWER OUT (1) is protected by a self-resetting fuse.

Also see about this

 Positions of the interface connectors and LEDs [▶ 21](#)


5.2.2 Ethernet connectors

For the Real-TimeEthernet interface (see positions (4), (5) (6) and (7)) use RJ45 plugs and twisted pair cable of category 5 (CAT5) or higher, which consists of 4 twisted cores and has a maximum transmission rate of 100 MBit/s (CAT5).

The figures within the subsequent subsections show the RJ45 pin assignments for the Ethernet-Ports NETWORK A / NETWORK B, MIRROR A and MIRROR B:

Please also consider the subsection concerning Auto-crossover and port-switching.

Also see about this

 Positions of the interface connectors and LEDs [▶ 21](#)

5.2.2.1 Pin assignment RJ45 Ethernet connectors NETWORK A and NETWORK B

The RJ45 Ethernet connectors **NETWORK A** and **NETWORK B** have the following pin assignment:

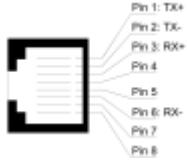
Ethernet	Pin	Signal	Meaning
 <p>RJ45 socket</p>	1	TX+	Transmit data +
	2	TX-	Transmit data -
	3	RX+	Receive data +
	4	-	Not used, only connection between ports NETWORK A and NETWORK B.
	5	-	Not used, only connection between ports NETWORK A and NETWORK B.
	6	RX-	Receive data -
	7	-	Not used, only connection between ports NETWORK A and NETWORK B.
	8	-	Not used, only connection between ports NETWORK A and NETWORK B.
	Shield		Connected with FE via varistor, 1M Ω and 15nF (parallel circuit)

Table 10: Pin assignment RJ45 Ethernet connectors NETWORK A and NETWORK B

5.2.2.2 Pin assignment of RJ45 Ethernet connector MIRROR A

The RJ45 Ethernet connector **MIRROR A** has the following pin assignment:

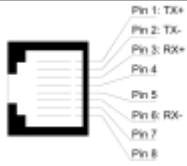
Ethernet	Pin	Signal	Meaning
 <p>RJ45 socket</p>	1	TX+	Transmission data + (Mirror of signal of pair 1/2 of the network)
	2	TX-	Transmission data - (Mirror of signal of pair 1/2 of the network)
	3	-	Connected to pin 6 over 100 Ω (Termination)
	4	-	Connected to shield of socket via RC element (75 Ω / 1nF) *
	5	-	Connected to shield of socket via RC element (75 Ω / 1nF) *
	6	-	Connected to pin 3 over 100 Ω (Termination)
	7	-	Connected to shield of socket via RC element (75 Ω / 1nF) *
	8	-	Connected to shield of socket via RC element (75 Ω / 1nF) *
	Shield		Connected to FE via varistor, 1M Ω and 15nF (parallel circuit)
		* Bob Smith termination	

Table 11: Pin assignment Port MIRROR A

5.2.2.3 Pin assignment of RJ45 Ethernet connector MIRROR B

The RJ45 Ethernet connector **MIRROR B** has the following pin assignment:

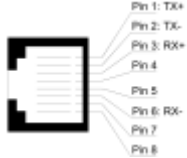
Ethernet	Pin	Signal	Meaning
 <p>RJ45 socket</p>	1	-	Connected to pin 2 over 100 Ω (Termination)
	2	-	Connected to pin 1 over 100 Ω (Termination)
	3	TX+	Transmission data + (Mirror of signal of pair 1/2 of the network)
	4	-	Connected to shield of socket via RC element (75 Ω / 1nF) *
	5	-	
	6	TX-	Transmission data - (Mirror of signal of pair 3/6 of the network)
	7	-	Connected to shield of socket via RC element (75 Ω / 1nF) *
	8	-	
	Shield		Connected to FE via varistor, 1M Ω and 15nF (parallel circuit)
			* Bob Smith termination

Table 12: Pin assignment Port MIRROR B

5.2.2.4 Auto-crossover and port-switching

In a system with for example one netMIRROR device and two RTE devices, the assignment of ports NETWORK A, NETWORK B, MIRROR A and MIRROR B can change between different test runs. This is due to the auto-crossover feature of most RTE systems. For auto-crossover the cable assignment by the devices is given randomly. The assignment of the lines as a "transmission line" or "receiving line" is random.

5.3 LEDs

5.3.1 Power LEDs

The following LEDs inform about the current state of the power supply.

Name	Color	Description
POWER IN	● green	Power supply input active Meaning: Voltage 5 V internally present, i.e. external input voltage of 24 V \pm 6 V DC is supplied.
POWER OUT	● green	Power supply output active Meaning: 24 V output voltage for analyzer device such as netANALYZER is present.

Table 13: Power LEDs of netMIRROR NMR-TFE-RE

Usually, the LEDs POWER IN and POWER OUT always should have the same state. However, it may happen that LED POWER OUT is not lit although an input voltage has been applied and thus LED POWER IN is lit. In this case, the self-resetting fuse for overcurrent protection has tripped and not yet been reset.

6 Mounting and dismounting

6.1 Safety messages

Please observe the following safety messages:

NOTICE**Device destruction due to compensating currents !**

Please pay attention to the grounding and shielding concept of your plant. The concept should prevent the flowing of compensating currents via signal and power supply lines between the used devices. Otherwise device destruction of the netMIRROR is possible

**NOTICE****Free space for sufficient heat dissipation**

If neighbouring devices on the DIN top hat rail produce too much heat, we recommend to leave enough free space between the devices for a sufficient heat dissipation.

6.2 Mounting the device onto the DIN top hat rail

- Mount the top hat rail according to DIN EN 60715 which shall carry the device horizontally at the intended location.

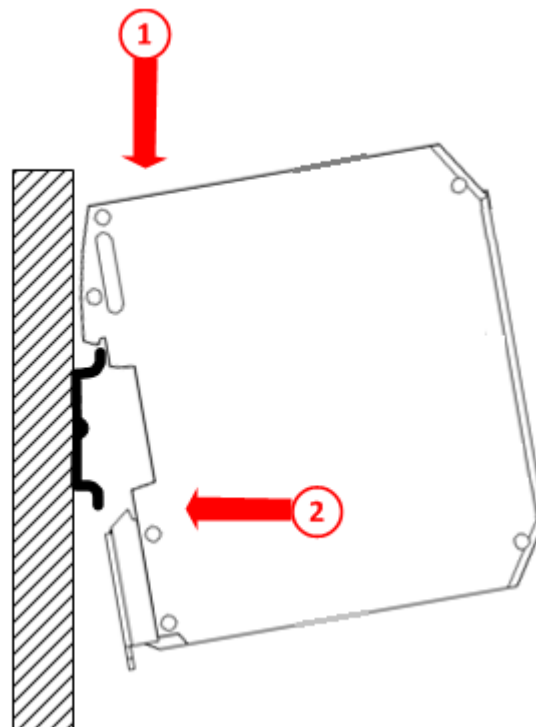


Figure 14: Mounting netMIRRORNMR-TFE-RE

- Hook the device from above (1) into the upper guide of the top hat rail.

- Subsequently, press the device against the top hat rail (2) until the latch of the lower holder snaps.

6.3 Power supply

6.3.1 Connecting the power supply

Now you can connect the lines for the power supply to the netMIRROR NMR-TFE-RE.

- Connect the power line for supplying the netMIRROR NMR-TFE-RE to the 4-pin CombiCon connector POWER IN (8) at the bottom of the device. You can find the circuit for this connector in section *Pin assignment of power supply connectors (Input POWER IN/ Output POWER OUT, CombiCon 4-pin)* [▶ page 22]. The supply voltage U_{IN} must amount 18 V at minimum and 30 V at maximum. A value of 24 V can be considered as best value. The power consumption under these conditions amounts 1.5 W at maximum.
- ⇒ As soon as the supply voltage U_{IN} has been connected, the Ethernet mirror ports MIRROR OUT A and B are operational. Contrary to this, the Ethernet ports NETWORK A and B are always operational, even in case of no voltage (U_{IN}) being supplied at CombiCon connector POWER IN .

NOTICE

Device destruction by exceeding allowed supply voltage

The supply voltage may not exceed 30 V, otherwise device destruction is possible.

- Connect the power supply cable for analyzing or diagnostic devices (such as the netANALYZER) to the 4-pin CombiCon connector POWER OUT (1) at the top of the device. You can find the circuit for this connector in section *Pin assignment of power supply connectors (Input POWER IN/ Output POWER OUT, CombiCon 4-pin)* [▶ page 22]. The analyzing or diagnostic device can take its supply voltage from the netMIRROR NMR-TFE-RE. The voltage at this point U_{OUT} has the same value as the input voltage U_{IN} . The current may amount 1 A at maximum at a voltage of 24 V. The power taken from this connector must be taken into account when dimensioning the power supply (for U_{IN}).

6.3.2 Reverse polarity protection

The netMIRROR NMR-TFE-RE is equipped with a reverse polarity protection so that the device itself is protected against damage from reversal of polarity. However, this protection does not include the power supply output POWER OUT! In case of polarity reversal the reversed voltage will be present here and might probably cause damage to any analyzing devices without reverse polarity protection of its own which are connected there.

6.3.3 Self-resetting fuse

The power supply output POWER OUT is protected against overload by a self-resetting fuse (Polyfuse). In case of overload the power supply output POWER OUT is shut down (LED PWR Out is not lit anymore). In order to reset the polyfuse, the overload situation must be removed and the supply voltage must shortly be interrupted (approx. 1 s).

6.4 Grounding

The netMIRROR should be connected over connector „FE“ of the power supply input (8) with a suitable ground connection.

The following schematics show the internal use of the FE connector.

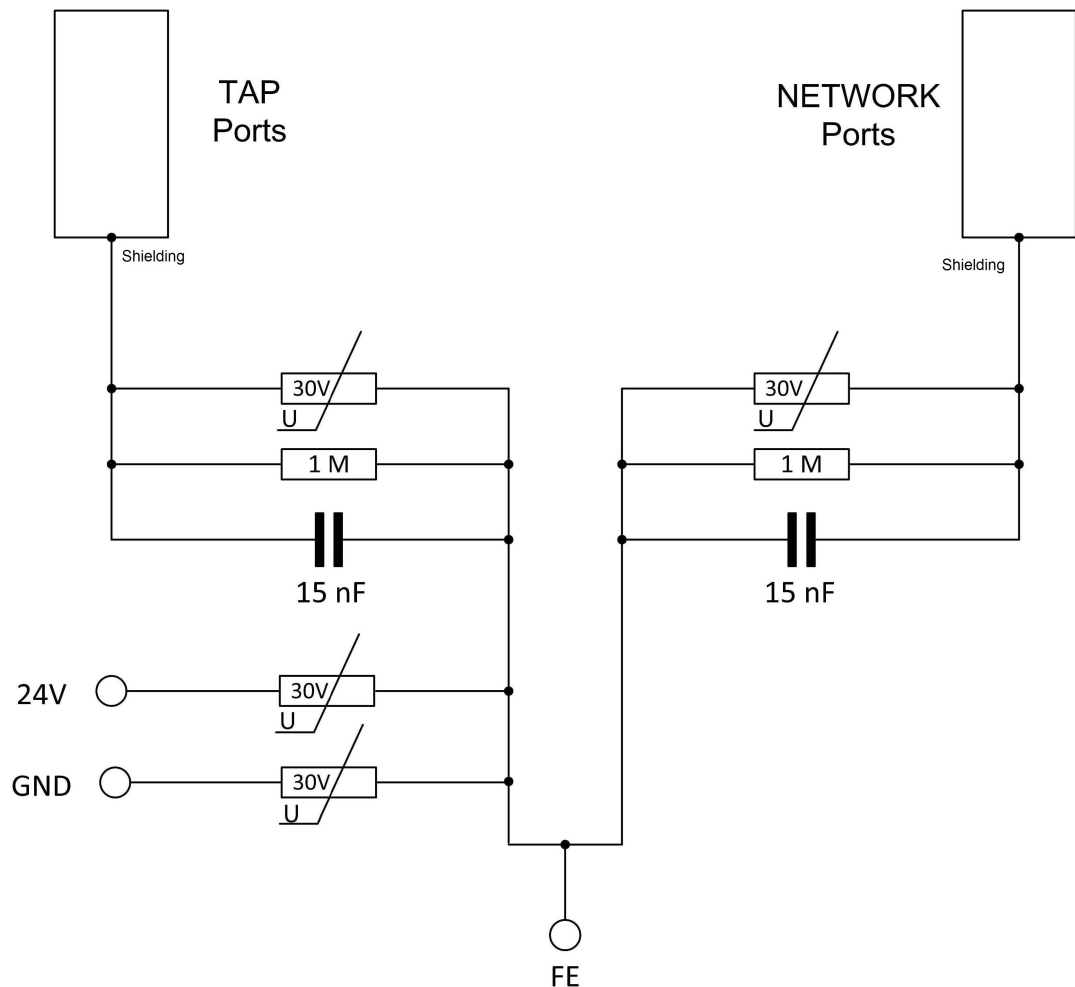


Figure 15: Grounding schematics (internal use of FE connector)

6.5 Ethernet connectors

Connect the NMR-TFE-RE to the netANALYZER (or to a diagnosis PC equipped with two network adapters) for passive diagnosis:

- (1) Connect the RJ45 socket NETWORK A with the master or controller.
- (2) Connect the RJ45 socket with the slave or device which was formerly connected with the master or controller.
- (3) Connect the RJ45 sockets MIRROR A and MIRROR B with the RJ45 connectors of a TAP at the netANALYZER (either TAP a or TAP B).

**Note:**

For cabling of TAP A and TAP B also these special cables have to be used, if the connected analyzing device is a netANALYZER. If a PC with standard Ethernet connectors is used, a cross-over cable might be necessary at port TAP B if the PC does not support the auto-crossover function.

**Note:**

Due to the wholly passive character of the device within the NETWORK branch, there is no termination of the wires 4,5 and 7,8 which are not used at 10/100MBit Ethernet. Therefore, at both sides (NETWORK A and NETWORK B) of the TAP either fully-connected (8 wires) cables or cables with only two pairs of wires (1,2 and 3,6) can be used. Mixing of both cable types is not allowed as this might cause network disruptions!

Also see the figure in chapter *Diagnosis using a TAP within a Master/Slave connection* [▶ page 29].

7 Application examples

In the following two application examples are explained:

7.1 Diagnosis using a TAP within a Master/Slave connection

The simplest application example consists in putting a netMIRROR into the connection between Master/Controller and Device/Slave (NETWORK TAP A and B) and connecting a netANALYZER, a similar network diagnosis device or a PC with two network adapters with two lines to the MIRROR TAP.

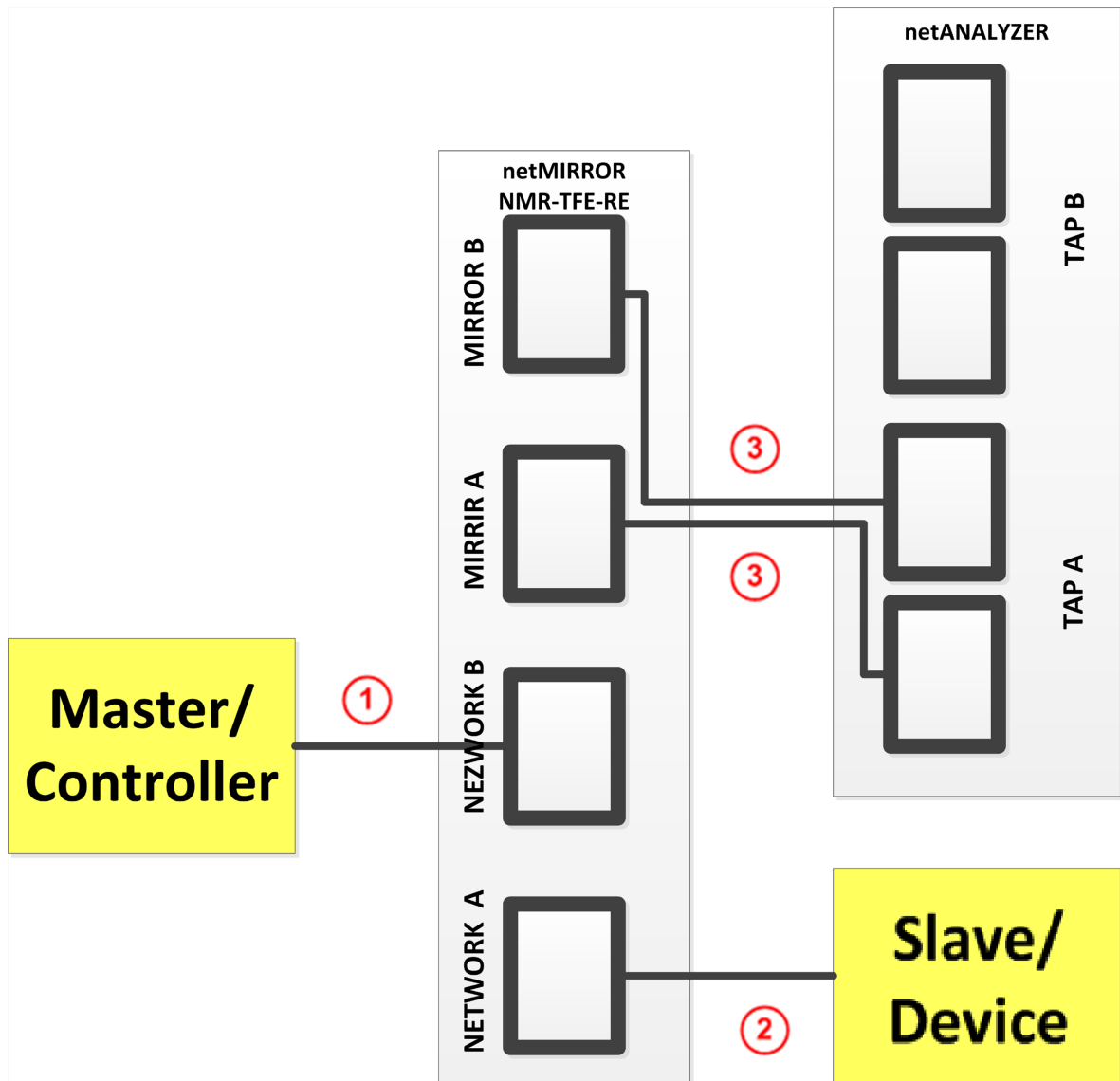


Figure 16: TAP within a Master/Slave connection



Note:

The connection cables plugged into MIRROR A and MIRROR B must be patch cables!

7.2 Diagnosis in systems with line redundancy

The second application example explains the use of netMIRROR in systems with line redundancy such as a double ring structure.

The basic idea is to integrate an NMR-TFE-RE into each direction of a double ring between the Master and the first slave (NETWORK TAP A and B) and to connect their MIRROR TAPs with two lines each to a netANALYZER, a similar network diagnosis device or a PC with two network adapters in order to supervise and capture the data traffic from the master to both directions of the double ring.

This is illustrated in figure *Diagnosis in systems with line redundancy* [▶ page 30].

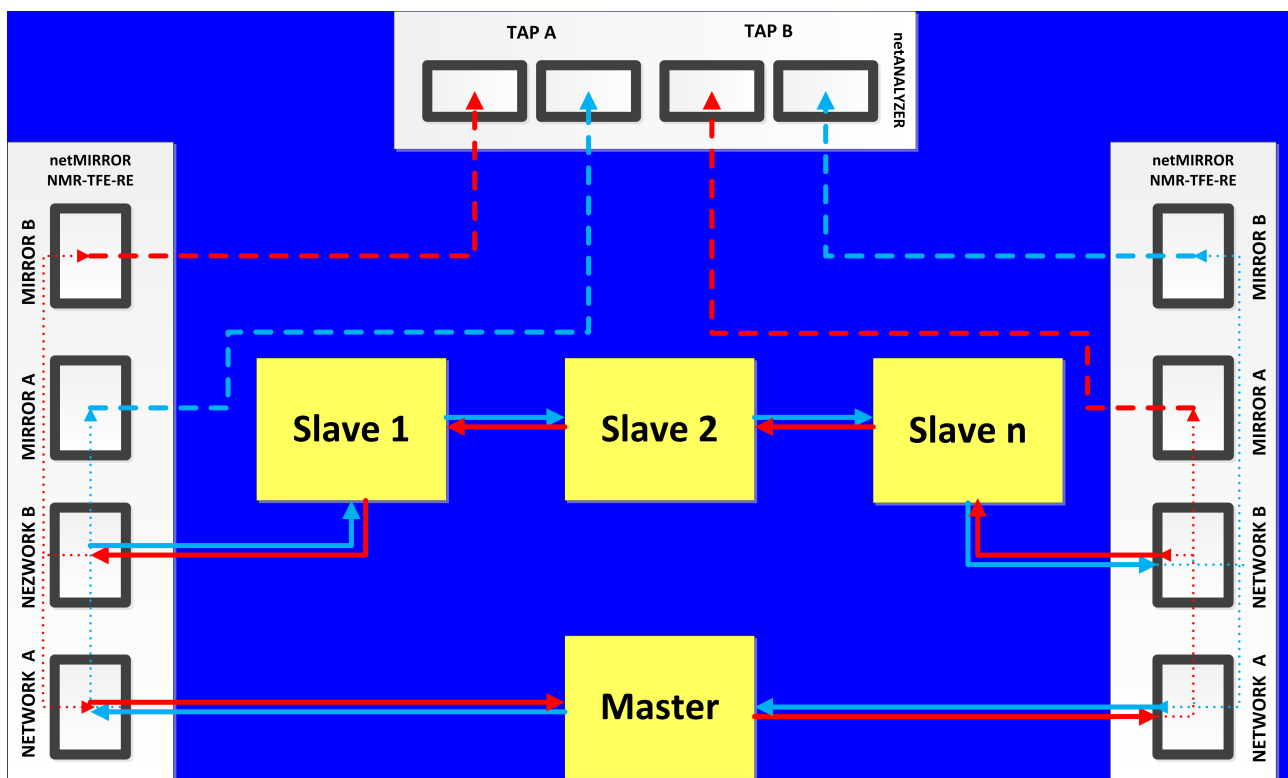


Figure 17: Diagnosis in systems with line redundancy

Take care of the following:

1. The blue arrows represent the first ring within the double ring. The NMR-TFE-RE is located between the master and the first slave of the first ring.
2. The red arrows represent the second ring within the double ring. The NMR-TFE-RE is located between the master and the last slave of the first ring.
3. The dashed blue and red arrows represent the connections to the netANALYZER (or a similar network analysis device or a PC equipped with two network adapters).
4. The dotted blue and red arrows represent internal connections within the NMR-TFE-RE.
5. In this case, for all cable connections beginning at the ports MIRROR A or MIRROR B of a NMR-TFE-RE patch cables have to be used, too!

8 Decommissioning, dismantling and disposal

8.1 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 as described in section *Removing device from top hat rail* [▶ page 31].

8.2 Removing device from top hat rail

- Before dismantling the netMIRROR from the top hat rail, first remove the power supply cable and all data cables from the device.

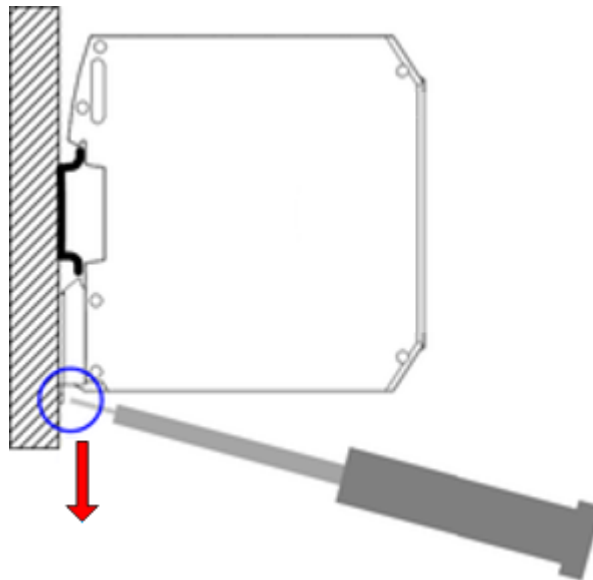


Figure 18: Dismount netMIRROR NMR-TFE-RE

- Put a screw driver into the slot of the latch at the bottom of the device.
- To disengage the lock of the hook, pull down the latch with the screw driver.
- Take the device off the top hat rail.

8.3 Disposal of waste electronic equipment

Important notes from the European Directive 2002/96/EU “Waste Electrical and Electronic Equipment (WEEE)”



Waste electronic equipment

Disposal of waste electronic equipment

This product must not be treated as household waste.

This product must be disposed of at a designated waste electronic equipment collecting point.

Waste electronic equipment may not be disposed of as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.

9 Technical data

netMIRROR 10/100 Mbit Ethernet Mirror-TAP NMR-TFE-RE	
Parameter	Value
Network ports	10BASE-T or 100BASE-TX Ethernet, 2x RJ45 e.g. PROFINET, EtherNet/IP, EtherCAT, Sercos, Modbus/TCP, Ethernet POWERLINK, Varan
Mirror ports	10BASE-T or 100BASE-TX Ethernet, 2x RJ45, receive only, send suppressed
Forwarding delay (network side)	Real Zero-Delay TAP < 1 ns signal delay
Operation without power supply	Network ports operational even without power supply Mirror ports disabled without power supply
Power supply input	24 V ± 6V, CombiCon 4pin socket
Power supply output	24 V ± 6V , 1A, CombiCon 4pin socket, for powering an attached diagnostic device
Max. current at 24 V	60 mA
Max. power dissipation at 24 V	1.5 W
LEDs	POWER IN: Power supply input active POWER OUT: Power supply output active
Mounting	DIN top hat rail according to DIN EN 60715
Protection class	IP20
Operating temperature	-20 to +70 °C
Ambient temperature range for storage	-40 to +85 °C (without packaging)
Humidity range	10 % ... 85 % relative humidity (non-condensing)
Dimensions (L x B x H)	120 mm x 22,5 mm x 107 mm
Weight	120 g
CE sign	yes
RoHS conformance	yes

Table 14: Technical data

9.1 Emission and immunity

netMIRROR NMR-TFE-RE Emission / Immunity	
Parameter	Value and fulfilled criterion
ESD air discharge (DIN EN 61131-2 und EN61000-4-2:2009)	8 kV (Criterion B)
ESD contact discharge (DIN EN 61131-2 und EN61000-4-2:2009)	6 kV (Criterion B)
Burst (DIN EN 61131-2 und EN61000-4-4:2004 + A1:2010)	2,2 kV (Criterion B)
Surge (DIN EN 61131-2 und EN61000-4-5:2006)	1 kV (Criterion B) 0,5 kV (Criterion A)

Table 15: Emission/Immunity netMIRROR NMR-TFE-RE

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Contacts

HEADQUARTERS

Germany

Hilscher Gesellschaft für
Systemautomation mbH
Rheinstrasse 15
D-65795 Hattersheim
Phone: +49 (0) 6190 9907-0
Fax: +49 (0) 6190 9907-50
E-Mail: info@hilscher.com

Support

Phone: +49 (0) 6190 9907-99
E-Mail: de.support@hilscher.com

SUBSIDIARIES

China

Hilscher Systemautomation (Shanghai) Co. Ltd.
200010 Shanghai
Phone: +86 (0) 21-6355-5161
E-Mail: info@hilscher.cn

Support

Phone: +86 (0) 21-6355-5161
E-Mail: cn.support@hilscher.com

France

Hilscher France S.a.r.l.
69500 Bron
Phone: +33 (0) 4 72 37 98 40
E-Mail: info@hilscher.fr

Support

Phone: +33 (0) 4 72 37 98 40
E-Mail: fr.support@hilscher.com

India

Hilscher India Pvt. Ltd.
Pune
Phone: +91 8888 750 777
E-Mail: info@hilscher.in

Italy

Hilscher Italia S.r.l.
20090 Vimodrone (MI)
Phone: +39 02 25007068
E-Mail: info@hilscher.it

Support

Phone: +39 02 25007068
E-Mail: it.support@hilscher.com

Japan

Hilscher Japan KK
Tokyo, 160-0022
Phone: +81 (0) 3-5362-0521
E-Mail: info@hilscher.jp

Support

Phone: +81 (0) 3-5362-0521
E-Mail: jp.support@hilscher.com

Korea

Hilscher Korea Inc.
Seongnam, Gyeonggi, 463-400
Phone: +82 (0) 31-789-3715
E-Mail: info@hilscher.kr

Switzerland

Hilscher Swiss GmbH
4500 Solothurn
Phone: +41 (0) 32 623 6633
E-Mail: info@hilscher.ch

Support

Phone: +49 (0) 6190 9907-99
E-Mail: ch.support@hilscher.com

USA

Hilscher North America, Inc.
Lisle, IL 60532
Phone: +1 630-505-5301
E-Mail: info@hilscher.us

Support

Phone: +1 630-505-5301
E-Mail: us.support@hilscher.com