



MIRO / MIROdul

Installation and User Manual

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Date: Mar-22

Item: 10023203

Version: 1.3

Language: EN

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1 Preface

This manual allows for the safe and efficient use of the product. The manual is part of the product and must always be stored accessible for installation, commissioning and operating personnel.

1.1 Defects Liability Terms

A usage not according to the intended purpose, an ignorance of this documentation, the use of insufficiently qualified personnel as well as unauthorised modifications exclude the liability of the manufacturer for damages resulting from this. The liability of the manufacturer ceases to exist.

The regulations of our Delivery and Purchasing Conditions are effective. These can be found on our website (www.insys-icom.com/imprint/) under "General Terms and Conditions".

1.2 Applicability

This manual applies to the product with latest hardware and firmware revision at the time of publication.

1.3 Feedback

We are permanently improving our products and the associated technical documentation. Your feedback is very helpful for this. Please tell us what you like in particular on our products and publications and what can be improved from your point of view. We highly appreciate your suggestions and will include them in our work to support you and all our customers. We are looking forward to any of your feedback.

Please send an e-mail to support@insys-icom.de.

We'd like to know your applications. Please send us a few headwords that we know the applications you solve using products of INSYS icom.

1.4 Marking of Warnings and Notes

Symbols and Key Words

Danger!



Risk of severe or fatal injury

One of these symbols in conjunction with the key word Danger indicates an imminent danger. It will cause death or severe injuries if not avoided.



Warning!



Risk of severe or fatal injury possible

This symbol in conjunction with the key word Warning indicates a possibly hazardous situation. It might cause death or severe injuries if not avoid.

Caution!



Slight injury and / or material damage

This symbol in conjunction with the key word Caution indicates a possibly hazardous or harmful situation. It might cause slight or minor injuries or a damage of the product or something in its vicinity if not avoided.

Note



Improvement of the application

This symbol in conjunction with the key word Note indicates hints for the user or very useful information. This information helps with installation, set-up and operation of the product to ensure a fault-free operation.

1.5 Meaning of the Symbols and the Formatting in this Manual

This section describes the definition, formatting and symbols used in this manual. The various symbols are meant to help you read and find the information relevant to you. The following text is structured like a typical operating instruction of this manual.

Bold print: The objective. This will tell you what the following steps will result in

After that, there will be a detailed explanation why you could perform the following steps to be able to reach the objective indicated first. You can decide whether the section is relevant for you or not.

→ An arrow will indicate prerequisites which must be fulfilled to be able to process the subsequent steps in a meaningful way. You will also learn which software or which equipment you will need.

1. *One individual action step: This tells you what you need to do at this point. The steps are numbered for better orientation.*

✓ A result which you will receive after performing a step will be marked with a check mark. At this point, you can check if the previous steps were successful.

ⓘ Additional information which you should consider are marked with a circled "i". At this point, we will indicate possible error sources and tell you how to avoid them.

➤ *Alternative results and steps are marked with an arrow. This will tell you how to reach the same results performing different steps, or what you could do if you didn't reach the expected results at this point.*

2 Safety Instructions

The Safety Instructions section provides an overview about the safety instructions, which must be observed for the operation of the product.

The product is constructed according to the currently valid state-of-the-art technology and reliable in operation. It has been checked and left the factory in flawless condition concerning safety. In order to maintain this condition during the service life, the instructions of the valid publications and certificates must be observed and followed.

It is necessary to adhere to the general safety instructions must when operating the product. The descriptions of processes and operation procedures are provided with precise safety instructions in the respective sections in addition to the general safety instructions.

Moreover, the local accident prevention regulations and general safety regulations for the operating conditions of the device are effective.

An optimum protection of the personnel and the environment from hazards as well as a safe and fault-free operation of the product is only possible if all safety instructions are observed.

2.1 Usage According to the Regulations

The product may be used for the following purposes:

- Usage and installation in an industrial cabinet
- Switching and data transmission functions in machines according to the machine directive 2006/42/EC.
- Usage as data transmission device for a PLC.

The product may **not** be used for the following purposes and used or operated under the following conditions:

- Controlling or switching of machines and systems, which do not comply with the directive 2006/42/EC.
- Usage, controlling, switching and data transmission of machines and systems, which are operated in explosive atmospheres.
- Controlling, switching and data transmission of machines, which may involve risks to life and limb due to their functions or when a breakdown occurs.

2.2 Permissible Technical Limits

The product is only intended for the use within the permissible technical limits specified in the data sheets.

The following permissible limits must be observed:

- The ambient temperature limits must not be fallen below or exceeded.
- The supply voltage range must not be fallen below or exceeded.
- The maximum humidity must not be exceeded and condensate formation must be prevented.
- The maximum switching voltage and the maximum switching current load must not be exceeded.
- The maximum input voltage and the maximum input current must not be exceeded.

2.3 Responsibilities of the operator

As a matter of principle, the operator must observe the legal regulations, which are valid in his country, concerning operation, functional test, repair and maintenance of electrical devices.

2.4 Qualification of the Personnel

The installation, commissioning and maintenance of the product must only be performed by trained expert personnel, which has been authorised by the plant operator. The expert personnel must have read and understood this documentation and observe the instructions.

Only a person, who is able to work on electrical installations and identify and avoid possible hazards independently, based on professional training, knowledge and experience as well as knowledge of the relevant standards and regulations is permitted to carry out the electrical connection and commissioning of the product.

2.5 Instructions for Transport and Storage

The following instructions must be observed:

- Do not expose the product to moisture and other potential hazardous environmental conditions (radiation, gases, etc.) during transport and storage. Pack product accordingly.
- Pack product sufficiently to protect it against shocks during transport and storage, e.g. using air-cushioned packing material.

Check product for possible damages, which might have been caused by improper transport and storage, before installation. Transport damages must be noted down to the shipping documents. All claims or damages must be filed immediately and before installation against the carrier or party responsible for the storage.

2.6 Markings on the Product

The identification plate of the product is either a print or a label on a face of the product. Amongst other things, it can contain the following markings, which are explained in detail here.



Observe manual

This symbol indicates that the manual of the product contains essential safety instructions that must be followed implicitly.



Dispose waste electronic equipment environmentally compatible

This symbol indicates that waste electronic equipment must be disposed separately from residual waste via appropriate collecting points. See also Section Disposal in this manual.



CE marking

By applying a CE marking, the manufacturer confirms that the product complies with the European directives that apply product-specific.



UL marking

By applying a UL marking, the manufacturer confirms that the product complies with the obligatory safety requirements.



Appliance Class II – double insulated

This symbol indicates that the product complies with Appliance Class II



Appliance Class III – protection by extra low voltage

This symbol indicates that the product complies with Appliance Class III

2.7 Protection of the Environment

Dispose the product and the packaging according to the relevant environmental protection regulation. The Waste Disposal section in this manual contains notes about disposing the product. Separate the packaging components of cardboard and paper as well as plastic and deliver them to the respective collection systems for recycling.

2.8 Safety Instructions for Electrical Installation

The electrical connection must only be made by authorised expert personnel according to the wiring diagrams.

The notes to the electrical connection in the manual must be observed. Otherwise, the protection category might be affected.

The safe disconnection of circuits, which are hazardous when touched, is only ensured if the connected devices meet the requirements of VDE 0106 T.101 (Basic requirements for safe disconnection).

The supply lines are to be routed apart from circuits, which are hazardous when touched, or isolated additionally for a safe disconnection.

An easily accessible, fixed installed cut-off device must be installed prior to commissioning to be able to isolate the device from power supply completely (all poles).

2.9 General Safety Instructions

Caution!



Electrostatic discharges may damage the product!

Damage of the product.

Observe the general safety precautions when handling electrostatic-discharge-sensitive parts.

Caution!



Incomplete voltage isolation!

Damage of the product.

To isolate the voltage from the device, disconnect **any** supply circuit with its respective isolation device if a redundant power supply is used.

Caution!



Overcurrent of the device supply!

Fire hazard and damage of the product due to overcurrent.

The product must be secured with a suitable fuse against currents exceeding 6.3 A. It must be ensured that the fuse will only be replaced by a fuse with the same rating in case it needs to be replaced.

Caution!



Moisture and liquids from the environment may seep into the interior of the product!

Fire hazard and damage of the product.

The product must not be used in wet or damp environments, or in the direct vicinity of water. Install the product at a dry location, protected from water spray. Disconnect the power supply before you perform any work on a device which may have been in contact with moisture.

Caution!

Short circuits and damage due to improper repairs and modifications as well as opening of maintenance areas!

Fire hazard and damage of the product.

It is not permitted to open the product for repair or modification.

Caution!

Overvoltage and voltage peaks from the mains supply!

Fire hazard and damage of the product due to overvoltage.

Install suitable overvoltage protection.

Caution!

Damage due to chemicals!

Ketones and chlorinated hydrocarbons dissolve the plastic housing and damage the surface of the device.

Never let the device come into contact with ketones (e.g. acetone) or chlorinated hydrocarbons, such as dichloromethane.

Caution!

Distance from antennas to persons!

A too low distance from cellular antennas to persons can affect the health.

Please observe to keep a minimum distance of 20 cm between the cellular antenna and persons during operation.

3 IT Security

Note



Insecure configured router may compromise applications relevant to security!

Follow the information under IT Security – Overview for protecting your router:

https://docs.insys-icom.de/itsec/en_itsec_guide.html

You will find there a Secure Configuration Guide (https://docs.insys-icom.de/itsec/en_itsec_secure_config_guide.html) for a configuration that complies with the accelerated security certification of the German Federal Office for Information Security (BSI).

4 Using Open Source Software

4.1 General Information

Our product MIRO contains, amongst others, so-called open-source software that is provided by third parties and has been published for free public use. The open-source software is subject to special open-source software licenses and the copyright of third parties. Basically, each customer can use the open-source software freely in compliance with the licensing terms of the respective producers. The rights of the customer to use the open-source software beyond the purpose of our product are regulated in detail by the respective concerned open-source software licenses. The customer use the open-source software freely, as provided in the respective effective license, beyond the purpose that the open-source software gets in our product. In case there is a contradiction between the licensing terms for our product and the respective open-source software license, the respective relevant open-source software license takes priority over our licensing terms, as far as the respective open-source software is concerned by this.

The use of the used open-source software is possible free of charge. We do not demand usage fees or any comparable fees for the use of the open-source software contained in our product. The use of the open-source software in our product by the customer is not part of the earnings we achieve with the contractual compensation.

All open-source software programs contained in our product can be taken from the available list. The most important open-source software licenses are listed in the Licenses section at the end of this publication.

As far as programs contained in our product are subject to the GNU General Public License (GPL), GNU Lesser General Public License (LGPL), Clarified Artistic License or another open-source software license, which regulates that the source code must be made available, and if this software is not already delivered in source code on a data carrier with our product, we will send you this at any time upon request. If it is required to send this on a data carrier, the sending will be made against payment of a cost compensation of € 10,00. Our offer to send the source code upon request ceases automatically 3 years after delivery of our product to the customer. Requests must be directed to the following address, if possible under specification of the serial number:

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E-mail: support@insys-icom.de

4.2 Special Liability Regulations

We do not assume any warranty or liability, if the open-source software programs contained in our product are used by the customer in a manner that does not comply any more with the purpose of the contract, which is the basis of the acquisition of our product. This concerns in particular any use of the open-source software programs outside of our product. The warranty and liability regulations that are provided by the respective effective open-source software license for the respective open-source software as listed in the following are effective for the use of the open-source software beyond the purpose of the contract. In particular, we are not liable, if the open-source software in our product or the complete software configuration in our product is changed. The warranty granted with the contract, which is the basis of the acquisition of our product., is only effective for the unchanged open-source software and the unchanged software configuration in our product.

4.3 Used Open-Source Software

Please contact our support department (support@insys-icom.de) for a list of the open-source software used in this product. Alternatively, you'll find a list of the open-source software in the web interface of the router under Help -> Licences.

5 Version History

Version	Modification
1.0	Release
1.1	DIN rail mounting revised; temperature range amended
1.2	Update of the Operating Principle section
1.3	Addition of MIRO-L2x0 / MIROdul-L2x0

6 Device Variants

This manual describes different variants of the industrial router MIRO and the industrial router module MIROdul of INSYS icom. The routers are referred to as MIRO or MIROdul in this manual. These are:

- MIRO-L100 (router with 1 Ethernet interface and cellular frequency bands for Europe, Middle East, Africa and partly Asia-Pacific region, Australia and South America)
- MIRO-L110 (router with 1 Ethernet interface and cellular frequency bands for North America)
- MIROdul-L100 (router module with 1 Ethernet interface and cellular frequency bands for, Middle East, Africa and partly Asia-Pacific region, Australia and South America)
- MIRO-L110 (router module with 1 Ethernet interface and cellular frequency bands for North America)
- MIRO-L200 (router with 2 Ethernet interfaces and cellular frequency bands for Europe, Middle East, Africa and partly Asia-Pacific region, Australia and South America)
- MIRO-L210 (router with 2 Ethernet interfaces and cellular frequency bands for North America)
- MIROdul-L200 (router module with 2 Ethernet interfaces and cellular frequency bands for, Middle East, Africa and partly Asia-Pacific region, Australia and South America)
- MIRO-L210 (router module with 2 Ethernet interfaces and cellular frequency bands for North America)

If the routers are different, this will be mentioned explicitly in the respective sections.



Please check which cellular frequency bands are available in the planned area of operation.

7 Scope of Delivery

The scope of delivery includes all accessories listed below. Please check if all accessories are included in the box. If a part is missing or damaged, please contact your distributor.

- Industrial Router
- Quick Installation Guide (MIRO only, 1 per packing unit)
- Safety Warnings (MIRO only, 1 per packing unit)

The scope of delivery does not include optional accessories. Among other things, the following parts are available from your distributor or INSYS icom:

- Cellular antennas
- Antenna extensions
- Power supply units
- VPN service
icom Connectivity Suite - VPN
- M2M SIM card and management portal
icom Connectivity Suite - M2M SIM
- Central device management for certificates, updates and configurations
icom Router Management

The following information applies to all variants of the router. If these variants differ, the different values will be indicated separately.

7.1 Technical Data

7.1.1 Physical Features

All specified data was measured with nominal input voltage, at full load, and an ambient temperature of 25 °C. The limit value tolerances are subject to the usual variations.

Physical Feature	Value
Operating voltage	12 V ... 24 V DC ($\pm 20\%$)
Max. power of power supply	< 4 kW
Power consumption	Typ. 1,5 W (MIRO/MIROdul-L1x0) Typ. 1,8 W (MIRO/MIROdul-L2x0) Max. 5 W
Level digital input	Level HIGH = 2 ... 24 V Level LOW = 0 ... 1 V Contact open condition: HIGH
Current consumption digital input at LOW potential	Typ. 3 mA when connecting to GND
Digital output (open collector), max. load	24 V (DC), 50 mA
Max. voltage drop of the output in ON condition	< 1 V (DC) at 50 mA load
Max. transmission power cellular engine MIRO-L100: EGSM 900 GSM 1800 UMTS 900/2100 LTE 800/850/900/1800/2100/2600 MIRO-L110: UMTS 850/1900/2100 LTE 700/1700/1900	+33 dBm +30 dBm +24 dBm +23 dBm +24 dBm +23 dBm
Weight	94 g (MIRO-L1x0) 100 g (MIRO-L2x0) 42 g (MIROdul-L1x0) 48 g (MIROdul-L2x0)
Dimensions (width x height x depth) Depth on DIN rail Horizontal pitch on DIN rail	26 mm x 77 mm x 99 mm (MIRO) 82 mm x 70 mm x 17 mm (MIROdul) 92 mm (MIRO) 1.5 TE (MIRO)
Temperature range	-40 °C ... 70 °C (extended 75 °C) see ⓘ below
Maximum permissible humidity	95% non-condensing
IP rating(MIRO only)	Housing IP40

Physical Feature	Value
Environmental conditions (MIRO only)	Vibration/shock as per SPS standard EN 61131-2 and EN 60068-2-6, EN 60068-2-27 Temperature tests as per EN 60068-2-1, EN 60068-2-2, EN 60068-2-14, EN 60068-2-30
MTBF	> 1.000.000 h (25°C), as per standard SN 29500 (according to IEC 61709)

Table 1: MIRO – physical features

- i** Depending on the model, the extended temperature range allows temporary operation at elevated temperatures. Please note that temporary functional restrictions may occur in this case. A temporary cut-off of the cellular connection can occur at increased temperatures for example. This protects the device from excessive heating and occurs in the event of temporarily increased power requirements such as high cellular data rates or very unfavourable cellular coverage. For applications with generally increased power requirements, such as continuous data transmission, the upper limit of the extended temperature range is not suitable; the upper temperature limit of the standard range will apply.
- i** The following requirements for the external power supply apply:

 - PS2 classified as per IEC62368-1

When using a power supply unit with a maximum output power of > 100 watt or a PS3 power supply unit, an additional fire protection enclosure is necessary.
- i** The MIRO can also be mounted transverse in a small distribution box with a width of 4.5 TE using a DIN rail holder that is available as an accessory.

7.1.2 Technological Features

Technological Feature	Description
Ethernet port	10/100 Mbit/s full/half duplex Auto MDI-X; automatic detection of "crossover" or "patch" wiring.
LTE frequency bands (4G) Band (MHz)	1 (2100), 3 (1800), 7 (2600), 8 (900), 20 (800), 28A (700) (variants -L100/-L200) 2 (1900), 4 (2100/1700 AWS), 12 (700) (variants -L110/-L210) LTE Cat. 1 (DL: 10 Mbps, UL: 5 Mbps)
UMTS/HSPA frequency bands (3G) Band (MHz)	1 (2100), 8 (900) (variants -L100/-L200) 2 (1900), 4 (2100/1700 AWS), 5 (850) (variants -L110/-L210) HSDPA, HSUPA (DL: 42 Mbps, UL: 5.7 Mbps)
GPRS/EDGE frequencies (2G)	900, 1800 MHz (variants -L100/-L200) GPRS/EDGE Class12 (DL: max. 296 kbps, UL: max. 237 kbps)
SIM card reader	Support for 1.8 V and 3.3 V SIM cards Format: Mini-SIM (2FF), locked
SMS	Dispatch / receipt

Table 2: MIRO – technological features

- ① The available data rates depend on reception conditions and support of the respective provider (contract extent and network utilisation).
- ① In order to ensure a long function, it is necessary to use so-called M2M SIM cards. Compared to standard SIM cards, M2M SIM cards provide significantly increased write cycles and support frequent transitions with this, which may occur in M2M or IoT applications. The SIM card must not be accessible any more upon installation of the device.

7.2 Connections, display and control elements

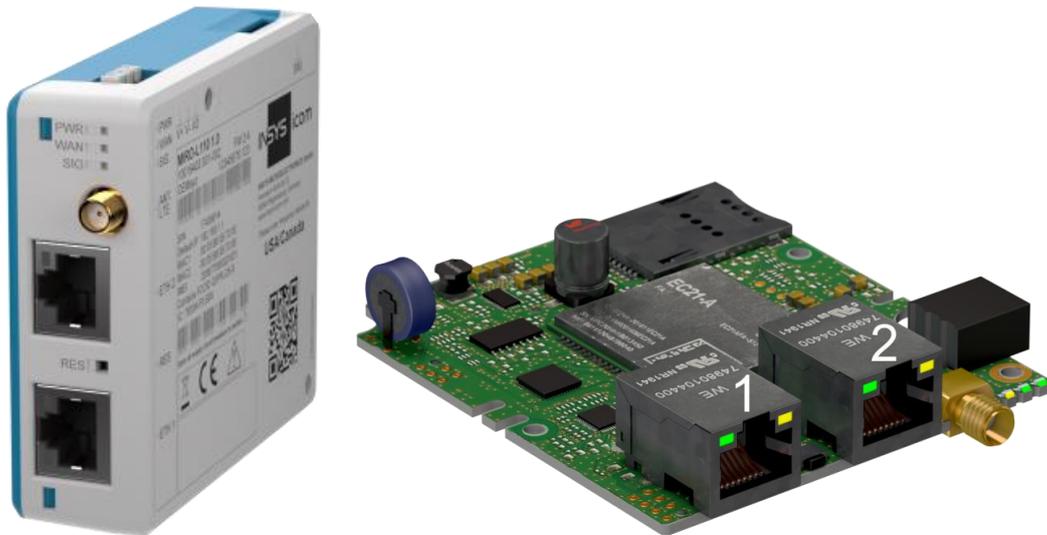


Figure 1: MIRO / MIROdul – connections, display and control elements

Connection	Description
ETH 1	Ethernet port 1 (RJ45, 10/100 BT)
ETH 2	Ethernet port 2 (RJ45, 10/100 BT, only MIRO/MIROdul-L2x0)
ANT. LTE	Cellular antenna (SMA socket) max. torque of the SMA connector 40-50 Ncm

Table 3: MIRO – connection at the front

- ⓘ The screen of the antenna system must be connected to the protective conductor when using an outside mounted antenna.

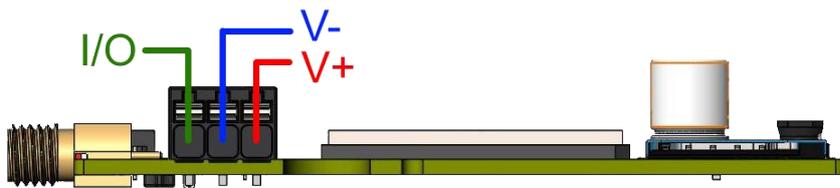


Figure 2: MIROdul – connector

Connection	Description
I/O	Input/Output
V-	Power supply, negative terminal, ground
V+	Power supply, positive terminal

Table 4: MIRO – connection at the connector

LED	Colour	Function	off	blinking	on
PWR	green	Supply	not available	1x for soft reset 3x for resetting to default settings	present
WAN	green	WAN chain	inactive	establishing	established
SIG	green	Signal	no signal or logged out	logged in (field strength see Table Table 6)	
ETH (socket)	green	Link / activity	not connected	Data traffic	connected
	yellow	Data rate	10 Mbit/s		100 Mbit/s

Table 5: MIRO – meaning of the display elements

- i** The function of the Info LED described here corresponds with the default setting, but can be configured differently.

Blinking interval LED SIG	Signal quality
900 ms on, 100 ms off	very good
200 ms on, 200 ms off	good
100 ms on, 900 ms off	poor
off	no signal or logged out

Table 6: Blinking code of the signal LED

Designation	Operation	Meaning
Reset	Press once for a short time.	Resets the software and restarts it. (Soft reset)
	Press at least 3 seconds.	Resets the hardware and restarts it. (Hard reset)
	Press three times for a short time within 2 seconds.	Deletes all settings and resets the device to the factory defaults.

Table 7: MIRO – description of the functions and meaning of the control elements

7.3 Digital input/output

The router has a switchable digital input/output. The digital input/output is configured as output in default setting.

If the input/output is configured as input, it is low-active, i.e. active, if it is connected to GND.

If the input/output is configured as output, it is designed as open collector output. You'll find more information in Table 1.

7.4 Connecting the connectors

The wires are contacted maintenance-free in the connector via a spring clip. Rigid wires (stripped) or stranded wires with end sleeves are only inserted into the connectors to clamp them. Stranded wires (braids) without end sleeve are clamped by pushing in the white opener (e.g. using a flt-blade screw-driver with max. 2.5 mm width). Unclamping a wire is also done by pushing in the opener.

The permissible wire cross-sections can be found in the following tables.

Wire	Cross-section
Nominal cross-section	1.5 mm ²
Rigid	0.2 – 1.5 mm ²
Flexible	0.2 – 1.5 mm ²
Flexible with end sleeve	0.25 – 1.5 mm ²

Table 8: Permissible wire cross-sections for connectors

7.5 Maximum line lengths

The maximum line lengths to the connections can be found in the following table.

Wire	Max. length
Antennas, power supply, inputs and outputs, other signals	30 m

Table 9: Permissible line lengths

7.6 Certifications

The router provides the following certifications:

- EMC, Emission: EN 61000-6-3, EN 55032 Class B
- EMC, Immunity: EN 61000-6-2, EN 55024
- Product safety: IEC/EN 62368-1
- CE (MIRO-L100/-L200, MIROdul-L100/-L200)
- FCC Part 15 Class B, IC (MIRO-L110/-L210, MIROdul-L110/-L210)

7.7 Antennas

- ① As per EN 2014/53/EU, the operator of a radio equipment must comply with the harmonisation legislation. This includes in particular the selection and utilisation of suitable antenna systems. It must be ensured in particular that devices with radio technology are not operated without a suitable antenna system for an extended period.

7.7.1 Outside mounted antenna

When using the outside mounted antennas offered by INSYS, the delivered mounting bracket provides sufficient distance to the wall.

7.7.2 Magnetic base antenna

The magnetic base antennas offered by INSYS are especially intended for the use on metallic surfaces, e.g. outside a switch cabinet. The metallic, reflecting under-ground is mandatory for a good antenna effect.

8 Mounting

The router MIRO can be mounted in two different ways:

- DIN rail mounting
- Screw mounting

The router module MIROdul can only be mounted via screw mounting.

This section describes how you can install the router, connect the power supply and demount it again. Observe the instructions in the "Safety" section of this manual, in particular the "Safety Instructions for Electrical Installation" for that purpose unconditionally.

Caution!



Risk due to damage of the device!

Fire hazard and damage of the product.

When using a power supply unit with a maximum output power of > 100 watt or a PS3 power supply unit, an additional fire protection enclosure is necessary. This can be a meter cabinet or an industrial distribution cabinet for example, which complies with the requirements of IEC/EN 62368-1.

Caution!



Moisture and liquids from the environment may seep into the interior of the device!

Fire hazard and damage of the product.

The device must not be used in wet or damp environments, or in the direct vicinity of water. Install the device at a dry location, protected from water spray. Disconnect the power supply before you perform any work on a device which may have been in contact with moisture.

Caution!



The device could be destroyed if the wrong power supply is used!

If the device is operated with a power supply that supplies a voltage exceeding the permissible operating voltage, it will be destroyed.

Make sure that you use the suitable power supply. Refer to the Technical Data section for the proper voltage range.

8.1 DIN rail mounting

The MIRO is usually mounted using the integrated DIN rail adapter. For mounting the MIRO with a significantly smaller installation depth (e.g. in a small distribution box), an additional DIN rail adapter is available as an accessory, which can be mounted on the front of the housing.

8.1.1 DIN rail mounting with integrated adapter

A DIN rail adapter is provided on the MIRO router for DIN rail mounting.

Mounting the device to the DIN rail

How to mount the router to a DIN rail:

1. Place the device at the DIN rail Hook the upper DIN rail groove into place behind the upper edge of the DIN rail.
2. Fold down or back the device perpendicular to the DIN rail until the lower DIN rail groove engages in the bottom of the DIN rail.

✓ The router is now readily mounted.

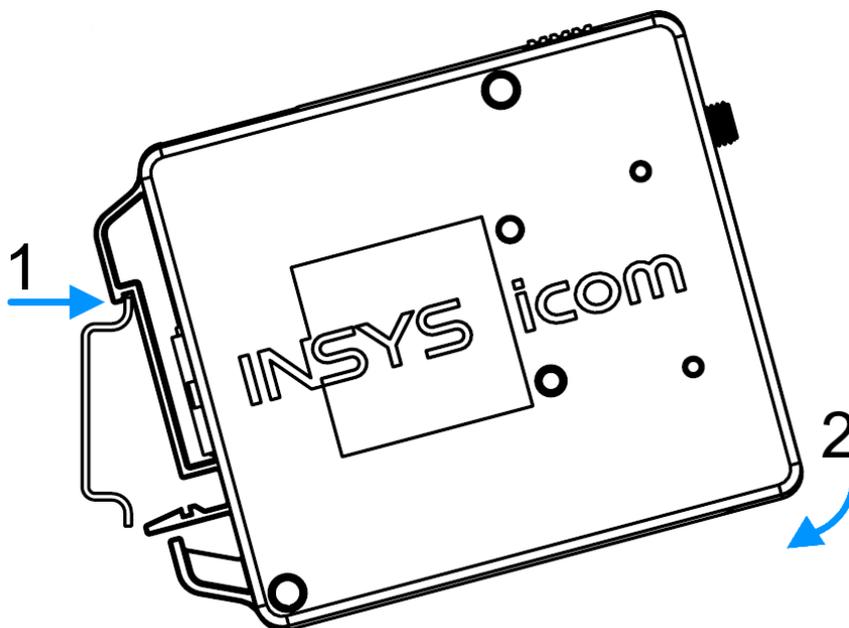


Figure 3: DIN rail mounting – mounting

Removing the device from the DIN rail

How to remove the router from a DIN rail:

The power supply of the switch cabinet is switched off and secured against being switched on accidentally.

All connectors at the device are disconnected.

1. Push the router vertically upwards on the DIN rail until the upper DIN rail groove is no longer engaged.
2. Fold down the router away from the DIN rail.

✓ The router is now removed.

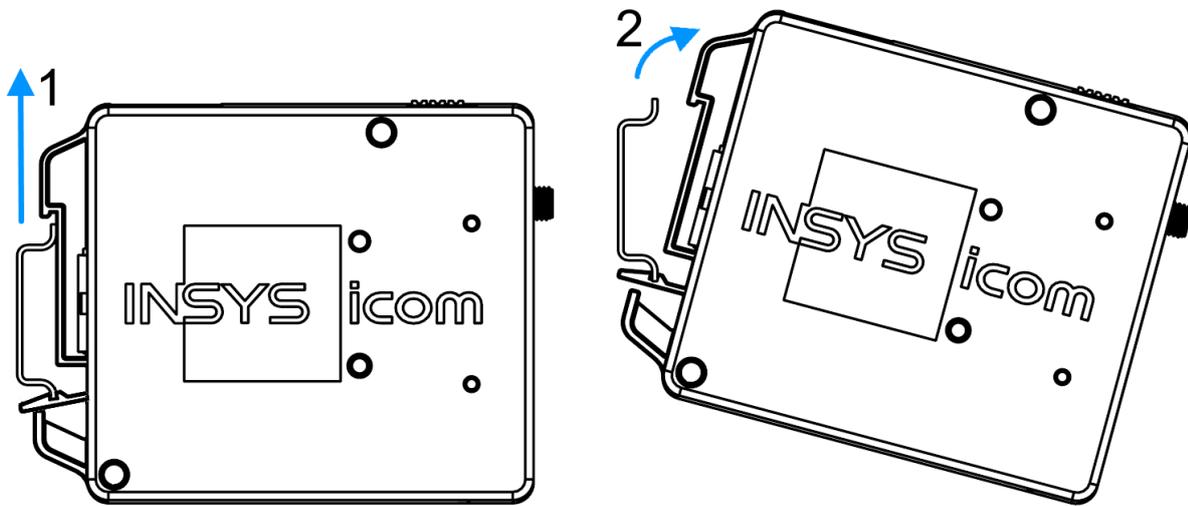


Figure 4: DIN rail mounting – removal

8.1.2 DIN rail mounting with accessory adapter

The MIRO can also be mounted in different orientation with a significantly smaller installation depth using the DIN rail adapter set MIRO that is available as an accessory (e.g. for installation in small electrical distribution boxes). To do this, the adapter must be pretensioned and mounted to the front of the MIRO housing beforehand.

Pretensioning the adapter before mounting

How to pretension the DIN rail adapter before mounting:

1. Press the retaining spring towards the bottom side of the adapters until it can be lifted across the lateral noses in the frame on both sides (step 1).
 2. Then, compress the spring, press it down again behind the noses on both sides and release the tension behind the noses (steps 2-4)
- ⓘ Take care that the adapter remains pretensioned and the retaining spring does not snap back to its initial position before mounting the adapter.
- ✓ The retaining spring is now pretensioned for mounting.

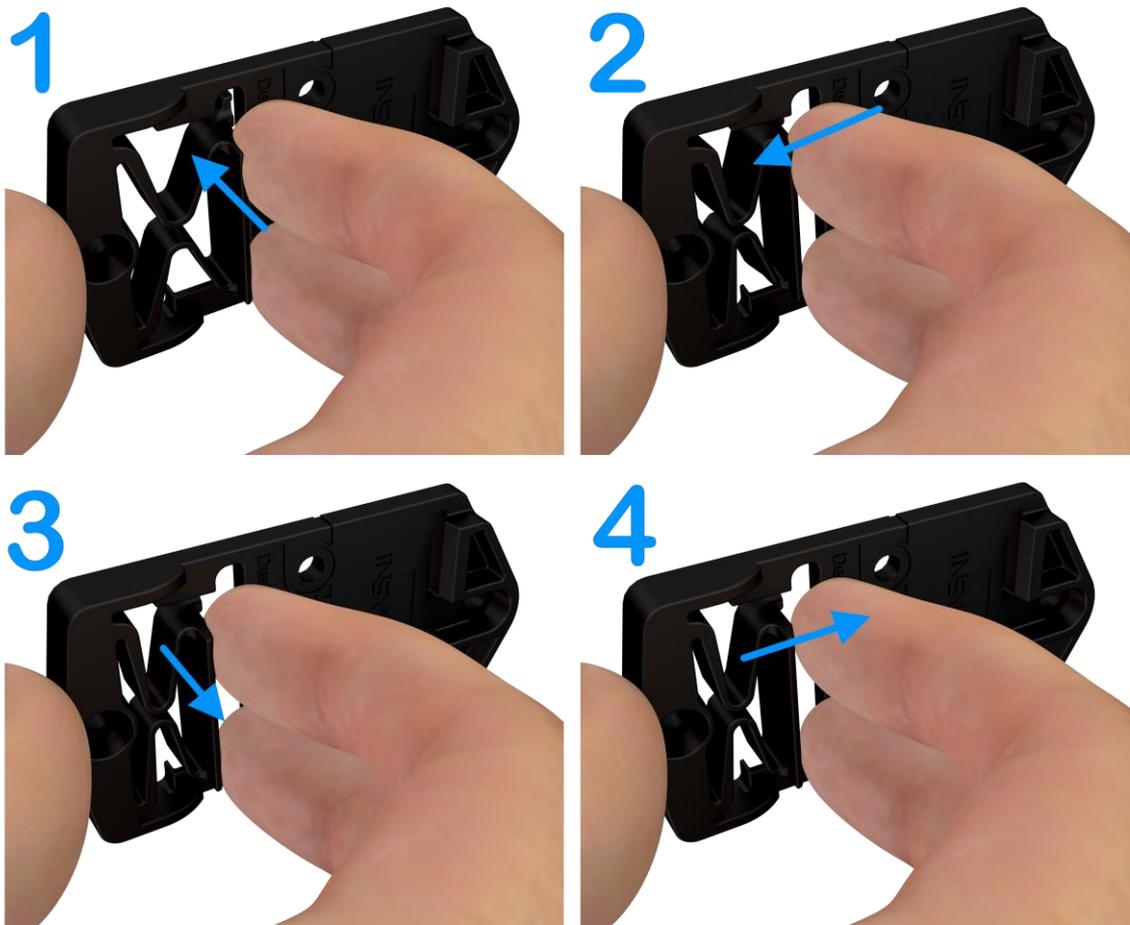


Figure 5: DIN rail mounting – pretensioning the accessory adapter

Mounting the adapter to the housing

How to mount the DIN rail adapter to the router housing:

1. Hold the adapter in a way that the retaining spring remains pretensioned and place it on the housing so that the holes for the screws are located over the designated recesses in the housing.
 - ❗ The adapter can be screwed to the housing in two orientations. Pay attention to the desired mounting direction. The arrow-shaped tip of the adapter points upwards, the clamp is at the bottom.
2. Press the supplied screws with light pressure through the provided recesses in the housing and tighten the screws using a Phillips screwdriver (PH1). Use a tightening torque of 0,25 Nm ... 0,35 Nm.
 - ✓ The DIN rail adapter is now readily mounted.



Figure 6: DIN rail mounting – mounting the accessory adapter

Caution!



Damage to the device due to wrong screws!

If the DIN rail adapter is mounted with screws that are too long, the router may be damaged.

Only use the screws supplied to attach the DIN rail adapter to the housing.

Mounting the device to the DIN rail

How to mount the router to a DIN rail:

1. Place the device at the DIN rail Hook the upper DIN rail groove into place behind the upper edge of the DIN rail.
 2. Fold down or back the device perpendicular to the DIN rail until the lower DIN rail groove engages in the bottom of the DIN rail.
- ✓ The router is now readily mounted.

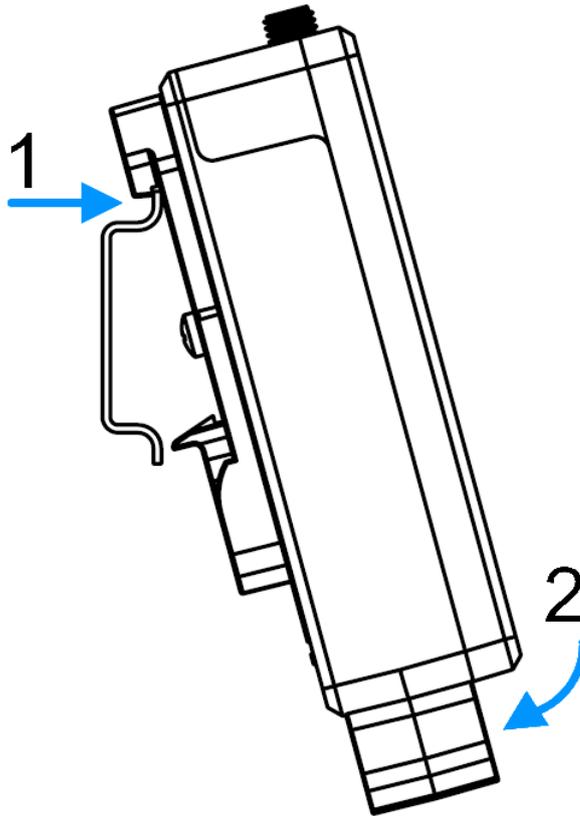


Figure 7: DIN rail mounting with accessory adapter – mounting

Removing the device from the DIN rail

How to remove the router from a DIN rail:

The power supply of the switch cabinet is switched off and secured against being switched on accidentally.

All connectors at the device are disconnected.

1. Push the router vertically upwards on the DIN rail until the upper DIN rail groove is no longer engaged.
2. Fold down the router away from the DIN rail.

✓ The router is now removed.

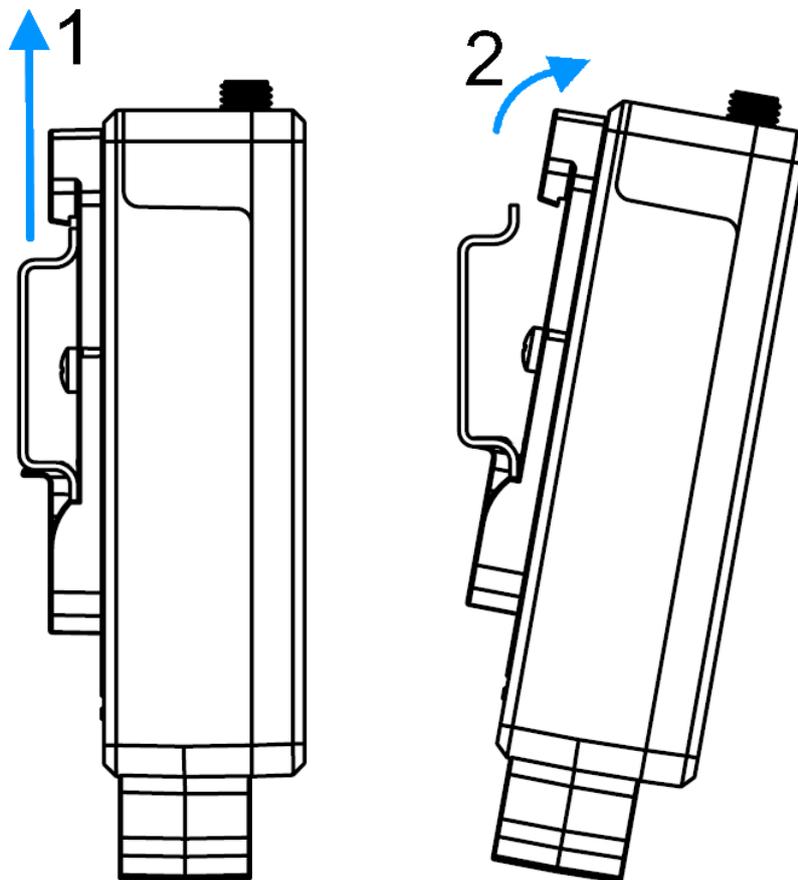


Figure 8: DIN rail mounting with accessory clip – removal

8.2 Screw mounting

The holes provided on the housing or in the board allow mounting on even and stable underground. The mounting material is not included and must be selected according to the underground.

The MIRO router must be mounted with two screws (max. Ø 4 mm) to ensure secure mounting.

The MIROdul router module is to be mounted with three screws (max. Ø 3 mm), whereby only the three holes in the board dimensioned in Figure 9 may be used for mounting. Care must be taken to ensure that no metal screw heads come into contact with conductive parts of the board. If necessary, use non-conductive plastic washers. The mounting hole provided with a contact is connected to ground (antenna ground or negative terminal of the supply) and can be used to ground the module. If this is not desired, a non-conductive plastic washer must be used for insulation.

Mounting the device using screws

How to mount the router or the module on an even underground using screws:

The underground is level (make even if required) and sufficiently stable. Non-conductive spacers of at least 5 mm must be used for the MIROdul.

You have suitable screws and, if necessary, suitable dowels.

ⓘ If the underground is not level, it might be compensated if required (e.g. by shimming with washers) to prevent the housing or board from being damaged.

1. Mark the bore holes using the router or module or a drilling template on the underground.

ⓘ Do not forget to provide sufficient space above and besides the router or module for connecting the necessary cables and inserting/removing the SIM card. The cables must not be bended excessively. The space may be reduced when using angular connectors.

2. Drill the mounting bores using a suitable drill bit in the required diameter into the underground.
3. Screw the router or the module to the underground using all mounting holes.

✓ **The router or module is now completely mounted.**

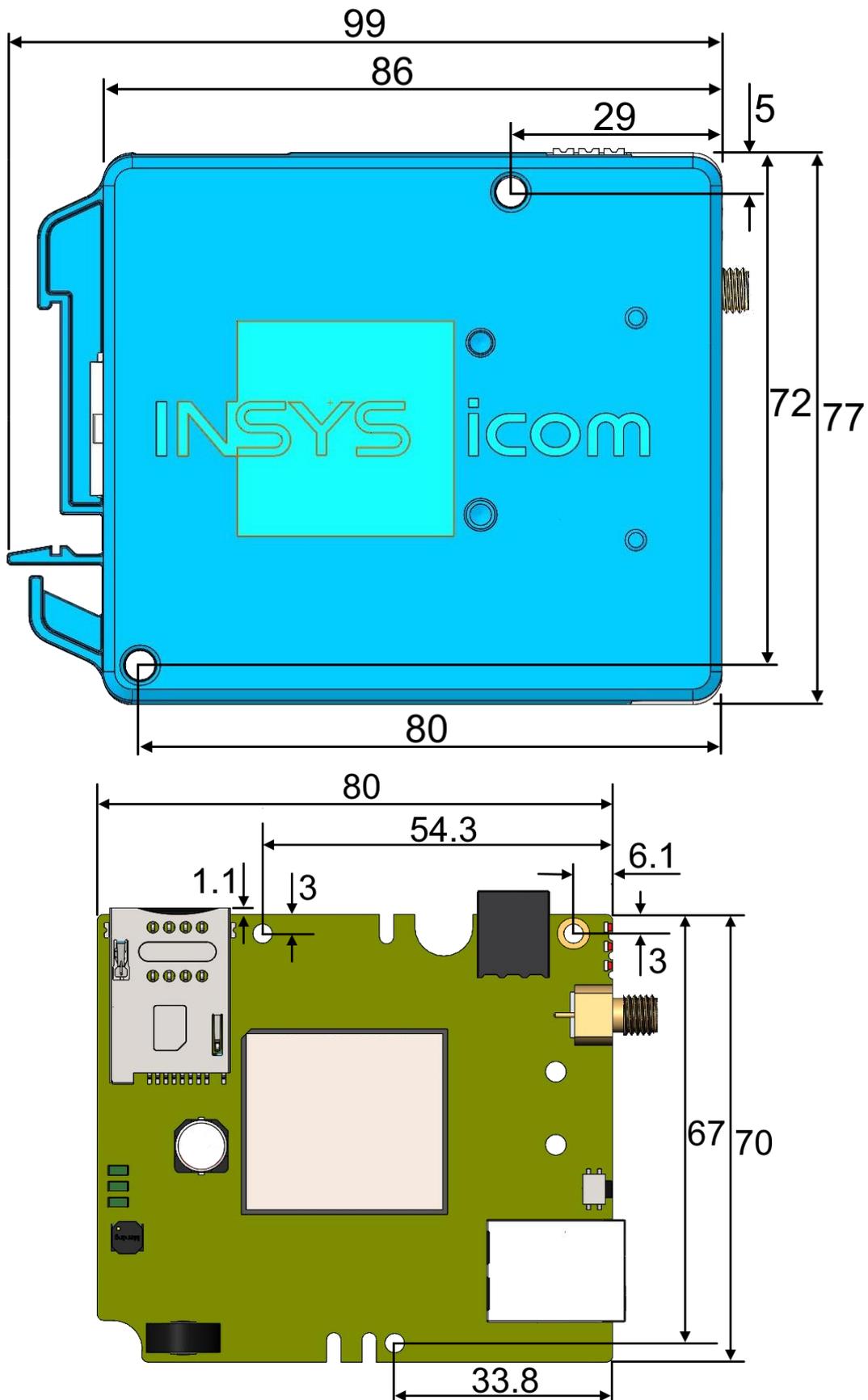


Figure 9: Screw mounting – dimensions

8.3 Connecting the power supply

Connecting the power supply

The device is already mounted.

The power supply is connected and switched off.

1. Connect the ground lead of the power supply to the terminal "V-".
2. Connect the positive lead of the power supply to the terminal "V+".

✓ **The router is now connected to the power supply.**

Disconnecting the power supply

The device is mounted.

The power supply is connected and switched off.

1. Press the opener of the terminal and pull out both power supply cables from the terminal.

✓ **The router is disconnected from the power supply.**

9 Commissioning

This chapter describes how to commission the router, i.e. how to connect it to a PC and how to prepare it for the configuration.

Insert SIM card.

How to insert the SIM card.

- The power supply is disabled.
- You will need a functionable Mini-SIM card of your mobile provider.
- You will also need the associated PIN.

1. ***Insert your SIM card into the SIM card slot.***

- ⓘ The SIM card will only fit into the SIM card slot in one position. Make sure that the SIM card contacts are facing down and the card is inserted into the SIM card slot with the chamfer facing forward.

2. ***Press the SIM card gently into the SIM card slot using a finger until it snaps in.***

- ⓘ In order to remove the SIM card, briefly press on the card. The card will then be ejected a little bit and can be removed.

3. ***Enable the power supply again.***

Connecting a cellular antenna

How to connect the device to a cellular antenna.

- The power supply is disabled.
- You will need a suitable cellular antenna (available from INSYS icom).
- ⓘ When selecting and mounting the antenna, make sure to comply with CE conformity.

1. ***Connect the cellular antenna to the antenna connection. Please observe the max. tightening torque of the SMA connector of 40-50 Ncm here.***

- ✓ The cellular antenna is connected with this.

Connecting a PC

How to connect the router to a PC via a network cable.

- The power supply is disabled.
- You will need a Cat 5 network patch cable
- You will need a network card in the PC.

- 1. Locate the RJ-45 socket of the network card at the PC.**
- 2. Plug one end of the network cable into the RJ45 socket of the PC, and the other end into the ETH 1 socket of the router.**

✓ The router is connected to the PC with this.

How to configure the router

- The device is connected to the PC.
- The power supply of the device is enabled and the device is ready for operation.
- You have the required access rights to change the IP address of the network card to which the router is connected.

- 1. Make sure that the DHCP client is enabled for the PC (Obtain an IP address automatically).**

① The integrated DHCP server of the router will then allocate an address from the according address range to your network card.

- *Alternatively, you can change the IP address of the network card to which the device is connected to an address that starts with 192.168.1. Do not use the address 192.168.1.1 here. This is the factory default IP address of the device. For example, use 192.168.1.2 as IP address for the network card in your PC.*

- 2. Open a web browser and enter the URL "https://192.168.1.1" into the address bar.**

✓ The browser loads the start page of the router.

- *If you see the message in your browser window that the page with this address cannot be found, follow the following steps: Check, whether the device is supplied with power. If yes, most probably a wrong IP address is configured in the device. Press the reset key three times within two seconds and repeat this instruction from step 2.*

✓ You should now see the start page of the web interface.

✓ The router is installed successfully and ready for configuration.

10 Operating Principle

This chapter describes how to operate and configure the router.

There are different options for configuration and operation:

- Via a web-based interface (web interface). The web interface itself is displayed and operated using a web browser. Operation via web interface and access via HTTPS protocol are described in the following.
- Via a command line interface (CLI) Configuration and operation via command line are described in detail in the online help of the router.
- Via a configuration file (binary or ASCII). Configuration and operation via a configuration file are described in detail in the online help of the router.
- Via the REST interface. Configuration and operation via the REST interface are described in detail in the online help of the router.

Profiles are used for all types of configuration. The basic handling of these profiles are described at the end of this section.

Note



Insecure configured router may compromise applications relevant to security!

Follow the information in our IT Security Guide for protecting your router:

https://docs.insys-icom.de/itsec/en_itsec_guide.html

The router **must** be connected to the computer directly for a secure initial setup since a secure TLS connection cannot be ensured otherwise.

10.1 Operation via the web interface

The web interface allows easy configuration using a web browser. All functions can be configured via the web interface. The operation is mostly self-explanatory. The Inline Help in the web interface explains the importance of possible settings. It is displayed using the ? button (Display help text) in the title bar besides language selection. An Online Help is available for further explanations that can be opened using links in the Inline Help or the Help -> Documentation menu.

- ① We urgently recommend to enable inline help for the first configurations to allow a quick and flawless configuration. If the inline help is enabled during configuration, all unsaved changes on this page will be lost.

Access to the Web Interface

How to access the web interface basically.

- The device is ready for operation and you have access to it (refer to Commissioning section).

1. Start the web browser and enter the IP address into the address bar.

i The factory default IP address is **192.168.1.1**.
Access is only possible via HTTPS in default settings.

✓ The start page of the web interface is displayed.

2. Use the menu on the left side to select the menu item, in which you want to change settings.**3. Enter the required settings.****4. Click on the **OK** button on the according configuration page to save the settings in the profile subsequently.**

i Consider the information in the profile section about the effectivity of configurations made.

i In case of a recently commissioned router in default settings, an authentication must be configured first before a profile can be activated.

Language selection in the web interface

How to change the language in the web interface.

→ The device is ready for operation and you have access to the web interface.

1. Select in the title bar the button  for German or  for English

✓ The web interface is displayed in the selected language then.

Logging out from the web interface

How to log off from the web interface in case an authentication has already been configured and you're logged in to the web interface. This prevents unauthorised access after completing the configuration.

→ The device is ready for operation and you have access to the web interface.

1. Select in the title bar the  button (Logout).

✓ You will be logged out from the web interface and returned to the login screen.

i A session will also be terminated after 15 minutes of inactivity (default setting) due to security reasons.

10.2 Access via HTTPS Protocol

The web interface only allows secure configuration using the HTTPS protocol in default settings. The HTTPS protocol allows an authentication of the server (i.e. the router) as well as an encryption of the data transmission. It is not recommended to enable access via the HTTP protocol.

10.2.1 Authentication via the device-individual certificate/key combination

Note



Increased security requirements for critical applications!

Use an Authentication via an own certificate structure for applications with particularly high requirements to security, such as critical infrastructures. Coordinate the proceeding for securing the router with the IR security department of your company.

The following describes an approach that meets common industrial safety levels at all times, taking into account known hazards.

The installation of the CA certificate of INSYS may conflict with the IT security policies of your company.

A dedicated Secure Configuration Guide (https://docs.insys-icom.de/itsec/en_itsec_secure_config_guide.html) is available for a configuration that complies with the accelerated security certification of the German Federal Office for Information Security (BSI).

The router is authenticated using a self-signed, device-individual certificate/key combination by default. In case of a first access via the HTTPS protocol, the browser indicates that the router uses an invalid security certificate. The certificate is not trusted, because the CA (certification authority) certificate is unknown. Since the connection to the router is made via a non-compromisable cable connection, you can ignore this warning message and (depending on the browser and operating system) add an exception for this server or establish the secure connection to this server anyway.

10.2.2 Authentication via an own certificate structure

A more secure alternative is to use your own certificate structure and load a self-generated certificate/key combination onto the router and then use this for access via an HTTPS connection.

Proceed as follows in coordination with the IT security department of your company to ensure a secure availability of the router:

1. Ask the DNS administrator of your company to create a DNS entry, which resolves the name of the router (e.g. router01.internal.company-domain.com) to the planned IP address of the router.
2. Ask the PKI administrator of your company responsible for the certificate structure issue and sign a certificate on the name of the router (e.g. router01.internal.company-domain.com).
3. Install this certificate and the associated key on the router as part of a secure initial setup (the router must only be connected to the configuration computer via an Ethernet cable with this). Upload these to the router in the Administration -> Certificates menu.

Select this certificate/key combination in the Administration -> Web/REST interface menu for the configuration of the web/REST interface: access via HTTPS.

10.3 Profiles and Profile Handling

The configuration of the router is called profile. Several profiles can be stored on one device so that the configuration of a device can be changed quickly.

10.3.1 Term definitions

The following terms or conditions are to be distinguished for profiles:

- running: the current configuration of the router which is used for operation at the moment
- opened: the profile that is currently displayed in the web interface (or CLI or REST interface) for editing
- last activated, changed: the last activated profile that differs from the running profile by subsequent changes
- stored: one of several possible profiles that are stored on the router by the user

Simple applications do not require the use of more than one profile. However, the router allows many applications by using several profiles. From risk-free testing of modified configurations up to time- or event-triggered switching of different profiles, there are almost no limits for your application.

If the running profile differs from the opened profile, this will be indicated by the appearance of a blinking gear symbol  with the "Activate profile" button.

Following an intentional or unintentional restart of the router (e.g. power supply interruption), the previously running profile will continue to run and the last activated profile will be opened again. If they differ, the button with the gear symbol  blinks again.

10.3.2 Working with one profile

If only one profile is used, the current (opened) profile can be configured in the web interface. Settings made in the opened profile are stored in this profile with a click on the button "OK". They will not become effective in the running profile with this.

If the current profile has been modified, the blinking gear symbol  appears in the title bar. A click on the button with the blinking gear symbol  activates the opened profile, i.e. it becomes the running profile and the modifications of the router configuration become effective. The gear symbol will disappear.



Figure 10: Profile handling – activating configuration modifications

10.3.3 Using several profiles

The versatile possible applications of the router suggest the use of several profiles. The following sections describe the profile handling.

10.3.3.1 Storing a profile

Settings made in the opened profile are stored in this profile with a click on the button "OK". They will not become effective in the running profile with this. They become only effective if the opened profile is activated, i.e. made the running profile.

10.3.3.2 Activating a profile

A click on the button with the blinking gear symbol  in the title bar activates the opened profile, i.e. it becomes the running profile.

A stored profile can be activated and opened in the "Administration" menu on the "Profiles" page by clicking the button with the gear symbol  behind the respective profile.

-  If the router is still in default settings, a changed profile cannot be activated until an authentication has been configured.

10.3.3.3 Opening a profile for editing

A stored profile can be opened in the "Administration" menu on the "Profiles" page by clicking the button with the folder symbol  behind the respective profile.

10.3.3.4 Creating a profile

A new profile can be created from:

- the running profile
- stored profiles
- the default settings

For this, you need to make the correspondent selection in the "Administration" menu on the "Profiles" page behind "Create profile from". The new profile will be created with a click on the button "OK" and it appears in the list of profiles.

The profile can then be given a descriptive name. It must first be opened to edit it.

10.3.3.5 Exporting a profile

Profiles stored on the router can be exported to the computer, i.e. downloaded in the "Administration" menu on the "Profiles" page.

A click on the button for the binary file download  behind the respective profile downloads the profile as a binary file. This is recommended to archive the profile or transmit it to another router, e.g. a backup device.

A click on the button for the ASCII file download  behind the respective profile downloads the profile as a ASCII configuration file. This is recommended if the profile is to be edited manually on the computer.

10.3.3.6 Importing a profile

Profiles (in binary format) or ASCII configuration files can be uploaded to the router in the "Administration" menu on the "Profiles" page.

You need to locate the respective file on the computer under "Import profile or ASCII configuration file" for this. The profile will be uploaded with a click on the button "OK" and it appears in the respective list.

10.3.3.7 Deleting a profile

A stored profile can be deleted in the "Administration" menu on the "Profiles" page by clicking the button with the recycle bin symbol  behind the respective profile.

10.3.3.8 Comparing two profiles

To show the differences between two profiles, it is possible to compare the default settings, the running profile and the stored profiles to each other.

For this, you need to select the two profiles to be compared in the "Administration" menu on the "Profiles" page under "Compare profiles". The different settings of both profiles are displayed side by side when clicking the button "OK".

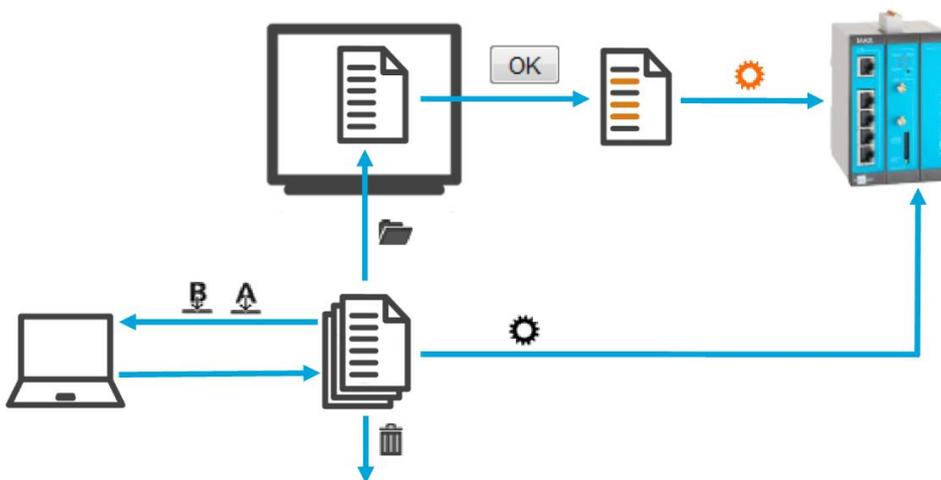


Figure 11: Profile handling – scheme

10.3.4 ASCII Configuration

ASCII configurations are a sequence of commands as they could also be entered in the CLI. Each line contains a command that modifies the opened profile.

Syntax and parameters can be taken from a downloaded profile in ASCII format for example. Refer to the CLI description for further information about the syntax.

Commands that affect plug-in cards that are not installed will be taken over to the profile, but will have no effect.

11 Maintenance, Repair and Troubleshooting

11.1 Maintenance

The product is maintenance-free and does not require special regular maintenance.

11.2 Troubleshooting

If a failure occurs during the operation of the product, you will find troubleshooting tips on our support page (<https://www.insys-icom.com/en/help/>). If you need further support, please contact your reseller or INSYS icom. You can contact our support team via e-mail under support@insys-icom.de.

11.3 Repair

Information for proceeding in case of repair or complaints are available on our support page (<https://www.insys-icom.com/en/help/>).

Before dispatching the device:

- Remove any inserted SIM cards.
- Backup the configuration on the device and any other stored data if required.
- Backup any sandbox applications running on the device.

Caution!



Short circuits and damage due to improper repairs and modifications of products.

Fire hazard and damage of the product.

It is not permitted to open the product for repair or modification exceeding the exchange of plug-in cards.

12 Waste Disposal

12.1 Repurchasing of legacy systems

According to the new WEEE guidelines, the repurchasing and recycling of INSYS legacy devices for our clients is regulated as follows:

Please send your legacy devices to the following address:

Frankenberg-Metalle
Gärtnersleite 8
96450 Coburg
Germany

This regulation applies to all devices which were delivered after August 13, 2005.

- ① Please consider possible stored passwords or security certificates before disposing the device. It is recommended to block possible existing access rights for the device (e.g. on your VPN server) and reset the device to default settings (if possible), before passing it on or disposing it.

13 Declaration of Conformity

Hereby, INSYS Microelectronics GmbH declares that the device types MIRO and MIROdul are in compliance with Directives 2014/53/EU and 2011/65/EU. The full text of the EC Declaration of Conformity is available under the following Internet address:

www.insys-icom.com/manual

For compliance with CE conformity, it is also necessary to comply with DIN EN62311. This controls the exposure of persons to electromagnetic fields.

Adherence to the following boundary condition is necessary for this:

- Persons do not come closer to the antenna than 20 cm for a prolonged time in normal use.
- Only use antennas that we have been approved for the use with this product in our evaluation procedure.

14 FCC Statement

Note: Certain variants of this device comply with part 15 of the FCC Rules (this is indicated by the FCC symbol on the label). Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

15 Export Restriction

The chip sets for analogue modems and cellular radio adapters used by INSYS Microelectronics GmbH are subject to export restrictions as per US ECCN classification (5A991).

Therefore, it is not allowed to export these communication devices into the following countries (at the time when this publication has been issued): Cuba, Iran, North Korea, Sudan, Syria

The currently effective country list can be found in section „Country Group E“ in the document "Supplement No. 1 to Part 740" of the Export Administration Regulations (EAR) (<https://www.bis.doc.gov>). Please contact the US authorities directly for a special permit.

We want to make you aware that the US legislation may have an effect in Germany. Amongst others, it may happen that US companies may be precluded from supplying foreign violators of the EAR on the basis of US legislation.

Note



Export restriction!

Possible violation of export regulations.

This device uses encryption technology and is therefore subject to export control as per German (AL classification 5A002) and European law (EG-DUAL-USE VO 428/2009). The export from Germany requires a permission of the Bundesamt für Wirtschaft und Ausfuhrkontrolle (Federal Office of Economics and Export Control).

This device may contain components with US origin. Possible export conditions as per US law (ECCN classification) will be mentioned explicitly on receipts, if possible, or can always be requested.

16 Glossary

This describes the most important terms and abbreviations of this manual.

- APN:** Access Point Name, computer name that provides cellular subscribers of the GPRS network with Internet access.
- AT command:** Commands to devices such as modems to set up this device.
- Broadcast:** Data packet that is sent to all participants of a network.
- Caller ID:** Phone number transmitted by the caller that can be evaluated by the called device.
- Client:** Device that requests services from another device (server).
- DHCP:** Dynamic Host Configuration Protocol; DHCP servers can dynamically design an IP address and other parameters to DHCP clients on request.
- DNS:** Domain Name System; service used for the translation of domain names into IP addresses.
- Domain name:** The domain is the name of an Internet site (e.g. insys-icom). It consists of the name and an extension (Top Level Domain, e.g. .com), (e.g. insys-icom.com).
- EDGE:** Enhanced Data Rates for GSM Evolution designates a technology for increasing the data rate in GSM cellular networks by introducing an additional modulation process. EDGE enhances GPRS to E-GPRS (Enhanced GPRS) and HSCSD to ECSD.
- Firewall:** Network rules that block in particular data packets to certain sources or destinations.
- Gateway:** This is a machine that works like a router. In contrast to the router, a gateway can also route data packets from different hardware networks.
- GPRS:** General Packet Radio Service; advancement of the -> GSM cellular network to achieve higher data transmission rates.
- GSM:** Global System for Mobile communications; cellular network for voice and data transmission.
- ICMP:** Internet Control Message Protocol; protocol that is often used to control a network. The program "ping" uses ICMP for example.
- Interface:** A network device that can transport IP connections.
- IP address:** Internet Protocol address; The IP address of a device in a network under which it can be accessed. It consists of four bytes and is indicated decimal, (e.g. 192.168.1.1)

- IP net:** An Ethernet-based interface that can become a LAN or a WAN interface.
- LAN:** Local Area Network; a network of computers which are located relatively close to each other.
- LAN interface:** An interface that is assigned to a local network (plant network, machine network, local network); it is connected to a WAN via the router.
- MAC address:** Media Access Control Address. A MAC is a part of an Ethernet interface. Each Ethernet interface has a unique global number, the MAC address.
- Netmask:** Defines a logical group of IP addresses in net address and device addresses.
- Net address:** Consists of the overlap of IP address and netmask. It always ends with "0". The netmask (e.g. 255.255.255.0) is applied in binary form to an IP address (e.g. 192.168.1.1); the still "visible" part of this overlapping (masking) is the net address (here: 192.168.1.0).
- Network rules:** You decide how the different data packets are handled in a network device. You can block or redirect data packets to or from certain network participants for example.
- Port:** (1) Socket at the switch for connecting Ethernet devices.
(2) Part of a socket for data connections
- Port-Forwarding:** Network rules that redirect data packets from certain senders to special recipients of a network.
- PPP:** Point to Point Protocol; a protocol, which connects two machines via a serial line to enable the exchange of TCP/IP packets between those two machines.
- PPPoE:** Point to Point Protocol over Ethernet; a protocol, which connects two devices via an Ethernet line to enable the exchange of TCP/IP packets between those two machines.
- Router:** This is a machine in a network, which is responsible for the incoming data of a protocol to be forwarded to the planned destination or sub network.
- SCN:** Service Center Number, phone number of the computer that accepts short messages (->SMS) via the GSM network and forwards them to the recipients.
- Server:** Device that provides services, e.g. web server, to other devices (client).
- SMS:** Short Message Service; short messages can be sent via the GSM cellular network.

- Socket:** Data connections that are established using ->TCP or ->UDP use sockets for addressing. A socket consists of an IP address and a port (cf. address: street name and number)
- Switch:** A device that can connect several machines with the Ethernet. In contrast to a hub, a switch will "think" by itself, i.e. it can remember the MAC addresses connected to a port and directs the traffic more efficiently to the individual ports.
- TCP:** Transmission Control Protocol; a transport protocol to enable data exchange between network devices. It operates "connection-based", i.t. the data transmission is protected.
- UDP:** User Datagram Protocol; a transport protocol to enable data exchange between network devices. It operates "without connection", i.t. the data transmission is not protected.
- UMTS:** Universal Mobile Telecommunications System stands for the third generation cellular standard (3G) that allows significantly higher data transmission rates (384 kbit/s to 7,2 Mbit/s) than the second generation cellular standard (2G), the GSM standard (9,6 kbit/s to 220 kbit/s).
- URL:** Uniform Resource Locator; this is the address used by a service to be found in the web browser. In this manual, an URL is mostly entered as the IP address of the device.
- VPN:** Virtual Private Network; logical connections (so-called tunnels) are established via existing unsafe connections. The end points of these connections (tunnel ends) and the devices behind can be considered as an independent logical network. A very high degree of tap- and tamper-resistance can be achieved with the encryption of the data transmission via the tunnels and the previous two-way authentication of the participants at this logical network.
- WAN:** Wide Area Network; a network consisting of computers, which are located far away from each other.
- WAN group:** Defines a collection of WAN interfaces that can be started or stopped in parallel.
- WAN interface:** An interface that serves to connect the local network (or one of the local networks) with a superordinate network.
- WAN chain:** Defines a WAN by arranging WAN interfaces or WAN groups in a sequence.

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