

Translation of the original
instruction manual
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Instruction manual

Industrial router & firewall

IRF1000 series



Industrial IT

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1 Notes

1.1 General remark

This instruction manual is intended to ensure safe and efficient handling of the *industrial router and firewall* of type IRF14x1, referred to in the following as "device".

The instruction manual must be read carefully by personnel before commencing any type of work.

All of the safety instructions and handling instructions given in the manual must be obeyed in order to ensure that work is carried out safely.

Operation of the device is subject to the laws and regulations which are applicable in the respective country at national, federal, European and international level.

The generally accepted rules of technology, usually in the form of standards, directives, regulations, conditions and technical rules specified by national and federal organisations as well as trade associations and committees for the field of specialisation concerned, shall apply.

Figures used in this instruction manual are provided for basic understanding and may differ from the actual design.

The operator/operating company is independently responsible for compliance with and observance of any subsequently introduced technical innovations or new legal requirements, as well as for all usual obligations of the operator/operating company.

The original version of this instruction manual was written in German. All non-German versions of this instruction manual are translations of the German instruction manual.

1.2 Limitation of liability

ads-tec Industrial IT GmbH shall not be liable for personal injury, property damage or damage caused to the device as well as consequential damage that is/was the result of non-compliance with this instruction manual, improper use of the device, repairs and other actions on the device by unqualified electricians and electricians not certified by ads-tec Industrial IT GmbH, or that is/was the result of using unapproved replacement parts. Failure to observe the maintenance intervals shall also result in exclusion from liability. Furthermore, it is strictly forbidden to make any unauthorised alterations or technical modifications to the device.

1.3 Manufacturer

The manufacturer of the product is ads-tec Industrial IT GmbH. The company is referred to in the following as ADS-TEC.

1.4 Relevant device documentation

The following documents are decisive to device setup and operation:

- This instruction manual contains information for installation, commissioning and operation of the device along with technical data of the device hardware.
- Technical data sheet (in English, see download area)
- Website: You can download drivers, software, user manuals, leaflets and flyers from the **Download** area of our website www.ads-tec.de.


2 Safety instructions

2.1 Structure of safety instructions

The signal word classifies the hazard.

Reference to the type/consequences and source of the hazard is made underneath the signal word.

Information on how to avoid the hazard is indicated by an arrow (➔).




 SIGNAL WORD
Type/consequences of hazard! <ul style="list-style-type: none">- Source of hazard➔ Measures to prevent hazard


2.2 Graduation of risk level


The signal word classifies the hazard.


Instructions for preventing the hazard are identified by an arrow (➔).


2.3 Explanation of used symbols




 DANGER
Indicates an imminent danger. If not avoided, death or severe injury will result.



 WARNING
Indicates a possible danger. If not avoided, death or severe injury could result.



 CAUTION
Indicates a possible danger. If not avoided, light or minor injuries could result.




ATTENTION
Indicates a possibly damaging situation. If not avoided, the system or something in its surroundings could be damaged.



Recommendation for use:

The symbol "Recommendation for use" indicates terms and/or conditions that strictly need to be observed to ensure optimised and/or zero-defect operation. Tips and suggestions for the efficient use of the device and software optimisation are also provided.

2.4 Symbols

Symbol	Meaning
	Label on batteries. The batteries may not be disposed of with household waste, but must rather be disposed of separately. Used batteries must be returned to the point of sale or a disposal system.
	Label on electrical and electronic devices. Electrical and electronic devices must not be disposed of with household waste, but must rather be taken to a collection point for waste electrical equipment. Such a collection point is generally operated by public waste management authorities, i.e., by municipalities.
	Symbol for the protective earth connection

2.5 Data, figures and modifications

All data, text and figures were prepared to the best of our knowledge. They do not represent any assurance for the properties themselves. Despite taking utmost care, no liability can be assumed for accuracy, completeness and actuality of the information. Subject to changes.

2.6 Trademarks

It is noted that any software and/or hardware trademarks and any company brand names mentioned in this documentation are all subject to the general trademark protection rights.

Big-LinX® is a registered trademark of ADS-TEC.

All other third-party trademarks used are hereby acknowledged.

In the case of infringement of trademark rights, ADS-TEC reserves the right to exercise all rights.

2.7 Copyright

This instruction manual is protected by copyright. For the authorised user, simple usage rights are granted within the scope of the intent of the contract. Any modified use or exploitation of the provided content, particularly duplication, modification or publishing in whatever form is permitted only with the prior consent of ADS-TEC.

In the case of copyright infringement, ADS-TEC reserves the right to exercise all rights.

2.8 Conformity

The manufacturer hereby declares that this device has been marked with the CE mark in accordance with the basic requirements and other relevant conditions of the following European Directives:

- 2011/65/EU, RoHs Directive
- 2014/30/EU, EMC Directive
- 2014/53/EU, RED Directive
- 2014/35/EU, Low Voltage Directive



The following applies with respect to electromagnetic compatibility: The device is a **Class A** device (industrial sector).

The EU conformity declaration is available for download at

<https://www.ads-tec.de/en/support/download/industrial-it/ec-declaration.html>.



Recommendation for use:

For full compliance with the EMC legislation, all components and cables used for device connection must also be compliant with these requirements. It is therefore necessary to employ BUS and LAN cables with shielded connectors and these must be installed as per the instructions contained in the instruction manual.

Devices with FCC marking on the type plate:

Compliance with the requirements of the FCC (USA)



Class A digital device

This device has been tested and found to comply with the limits for a **Class A** digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when used in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference. In such a case, the user must correct the interference at his own expense.

Compliance applies for models with a corresponding FCC marking on the type plate.

3 Operating and safety instructions

The device operates under electrical voltage and contains highly sensitive components. Intervention by the user is required only for connecting the power supply lines. Should any further modifications be required, it is necessary to consult either with the manufacturer directly or with service personnel authorised by the manufacturer. The device must be de-energised during work. Appropriate measures must be taken to prevent electrostatic discharges on components. If the device is opened up by an unauthorised person, the user may be subject to hazards and the warranty is invalidated.

General information

Installation, commissioning and operation may only be performed by qualified and trained personnel.

The safety instructions and the instruction manual are to be observed by all persons who work with the device.

At the installation site the valid guidelines and regulations for accident prevention must be observed.

The instruction manual contains the most important information for safely operating the device.

Appropriate storage, proper transport, installation and commissioning, as well as careful operation are prerequisites for ensuring safe and proper operation of the device.

3.1 Safety instructions

ATTENTION

To prevent damage to the device, all cable lines (power supply, interface cables) must only be connected while the device is switched off.

ATTENTION

All installation work performed on the device must be performed only under safe, secure and de-energised conditions.



Recommendation for use:

Always adhere to the safety measures applicable when handling components at risk of being damaged by electrostatic discharges (EN 61340-5-1 / EN 61340-5-2).

3.2 Operating location

This device is designed for industrial use. Make certain that the specified environmental conditions are maintained at all times. Use in non-specified environments, i.e., on board ships, in explosive atmospheres or at extreme elevations, is prohibited. See also chapter 8 Technical data.

ATTENTION

Damage caused by condensation!

To prevent short circuits and malfunctions caused by the formation of water condensate, the device may only be turned on after it has reached the specified ambient temperature. This also applies if the device is exposed to extreme temperature fluctuations.

Damage caused by heat!

→ Do not expose the device to direct radiation by sunlight or any other light or heat source!

3.3 Damage due to improper use

Should the control system have evident signs of damages caused, e.g., by improper operation or storage conditions or due to improper use or handling, the device must be shut down immediately. Ensure that it is secured against being started up accidentally.

3.4 Warranty / repairs

During the device warranty period, any repairs must only be performed by the manufacturer or by service personnel that has been authorised by the manufacturer.

3.5 Intended use

The device was developed especially for IT security in machines and plants and for secure remote maintenance via the Internet.

The following application areas are realised with the industrial firewall:

Remote maintenance, NAT router, mobile radio router, machine firewall

The device is only to be assembled, installed and operated within the permissible specifications. Use in non-specified environments is prohibited.

3.6 Improper use

Operation other than or beyond that described for the device shall be deemed improper use.

The device is not allowed to be used to control vehicles or for applications for which further approvals beyond the manufacturer's declaration are necessary, e.g. applications with explosion hazard, medical technology, shipping industry. The device must not be put into operation in the case of transport damage or nonconformity with the specifications and, if necessary, must be taken out of operation in the case of changing conditions.

In the case of improper use, ADS-TEC shall not accept responsibility or liability for injury or damage that is directly or indirectly attributable to the handling of the device. Should the device have evident signs of damages caused, e.g., by improper operation or storage conditions or due to improper use or handling, it must be shut down immediately. Ensure that it is secured against being started up accidentally.

3.7 Safety instructions

ATTENTION

Damage due to electrostatic discharge!

Damage to the device can be caused by electrostatic discharge.

- Always adhere to the relevant safety measures applicable when handling components at risk of being damaged by electrostatic discharge (e.g. EN 61340-5-1 / EN 61340-5-2).
- All installation and service work performed on the device must be performed only under safe, secure and de-energised conditions.

3.8 Safety instructions on mobile radio

WARNING



Radio interference may have unforeseeable effects in certain environments!

- The wireless card must NOT be operated in the following environments:
 - in the vicinity of medical and life-saving equipment,
 - in explosive atmospheres (e.g. in the vicinity of fuel depots or chemical plants),
 - in the vicinity of blasting operations.
- In these environments, switch the device OFF and safeguard it against unintentional startup.

WARNING



Communication via wireless connections cannot be guaranteed.

- The device must not be used for applications in which people could be injured or objects damaged due to interference of the wireless connection.

WARNING



Risk of lightning strikes if the antenna is installed in an exposed position!

- Check whether lightning protection is required at the installation location (protection from direct lightning strikes and protection from induced voltages in the event of distant lightning strikes).

WARNING



Electromagnetic radiation could be hazardous to health.

- Per the requirements of the U.S. Federal Communications Commission (FCC) and ISED (Industry Canada), maintain a minimum distance of 20 cm between the transmitting antennas and people.

 **WARNING**

Radio interference and possible damage to health due to exceeding the permitted transmission power!

The maximum permitted field strength can be exceeded when using directional antennas with a high level of antenna gain.

- Comply with the **maximum permitted signal strength (EIRP)** as per the national or local regulations (see calculation example for EIRP).
- Observe the regulations and standards which apply at the installation site (e.g. the standards for antenna erection VDE 0855 and for lightning protection VDE 0185-305).
- Always have the planning, installation and acceptance of antenna systems carried out by a specialist with electro-technical qualifications.
- Per the requirements of the U.S. Federal Communications Commission (FCC) and the Canadian ISED (Industry Canada), the **antenna gain** (including power losses) must not exceed the following values when operating in North America:

LTE

Band 2 (1850–1910 MHz)	6 dBi
Band 4 (1710–1755 MHz)	6 dBi
Band 5 (824–849 MHz)	6 dBi
Band 7 (2500–2570 MHz)	9 dBi
Band 12 (699–716 MHz)	6 dBi
Band 13 (777–787 MHz)	6 dBi
Band 25 (1850–1915 MHz)	6 dBi
Band 26 (814–849 MHz)	6 dBi
Band 30 (2305–2315 MHz)	1 dBi (external vehicle antennas not permitted!)
Band 41 (2496–2690 MHz)	9 dBi

UMTS

Band 2 (1850–1910 MHz)	6 dBi
Band 4 (1710–1755 MHz)	6 dBi
Band 5 (824–849 MHz)	6 dBi

3.9 Calculation example for the transmission power (EIRP)

$$\text{EIRP} = P_{\text{out}} - C_{\text{loss}} + \text{Ant}_{\text{gain}} = 22 \text{ dBm} - 8 \text{ dB} + 9 \text{ dBi} = 23 \text{ dBm} (\triangleq 200 \text{ mW})$$

EIRP = Equivalent Isotropically Radiated Power

P_{out} = Transmission power of the wireless card (see data sheet of the device)

C_{loss} = Losses caused by attenuation in coaxial cables and connectors

Ant_{gain} = Antenna gain

3.10 Notes on using the device according to UL approval

- Indoor use only!
- The communication cables may only be installed inside a building or a maximum of 42.7 m (140 feet) outside buildings.
- The device contains an internal fuse at the voltage input. This fuse and all other internal components must not be replaced by service personnel, but only by the manufacturer.

4 Introduction

The industrial firewall forms the link between the IT world and the automation system and meets the requirements of IT security as well as of the maintenance personnel in the production facility. It allows the network as well as access to this network to be monitored. A fundamental protective mechanism is situation-dependent and physical network disconnection. It additionally provides safe access for service purposes.

4.1 Equipment versions

Version	WAN	LAN	4G/LTE
IRF1401	RJ45	RJ45	-
IRF1421	RJ45	RJ45	x

4.2 Digital input

In critical commissioning or production phases, the Ethernet uplink can be disconnected via a 24 V input. Deliberate or inadvertent external manipulation is thereby made impossible.

The uplink is reconnected via the same input. This function makes integration in an automation concept extremely easy.

4.3 Eventlog

If the firewall is not disconnected from the power supply, an event log saves all events. The event log can be read out both locally and via a central syslog server.

4.4 Mobile radio modem (optional)

The integrated LTE modem enables mobile radio connections.

4.5 Scope of delivery

Please check that the contents of the package are complete and that they are free of damage:

Scope of delivery

- 1 x Industrial router and firewall, type IRF14x1
- 1 x 4-pin plug for power supply and digital input
- 1 x 3-pin plug for RS-485
- 1 x Quick-start guide
- Optional: 1 x Mobile communications antenna

4.6 Environmental conditions

The device can be put into operation and used under the following conditions. Failure to observe any one of these conditions will invalidate the warranty of the device. ADS-TEC cannot be held liable for any damages arising from improper use and handling. See also chapter 8 Technical data.

Ambient temperature

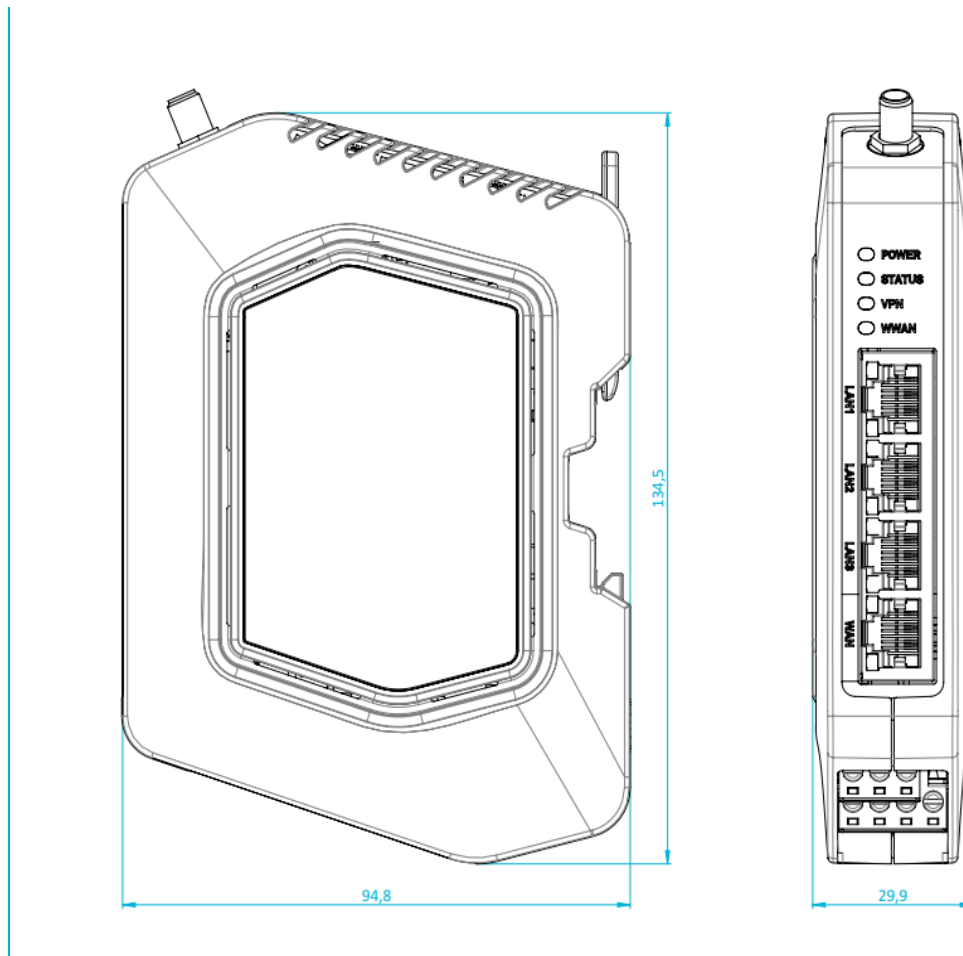
in operation	-30 ... +70°C
for storage	-40 ... +85°C

Humidity

in operation	5 ... 90 %, without condensation
for storage	5 ... 90%, without condensation

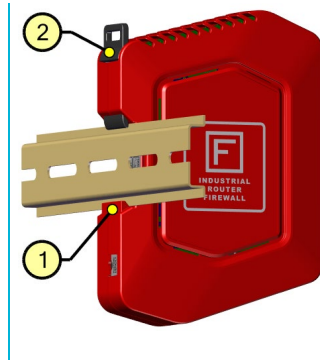
5 Installation

5.1 External device dimensions



5.2 Top-hat rail mounting

1. Position the IRF on the top-hat rail from below at an angle (1).
2. Pull the top-hat rail locking mechanism (2) upwards using a screwdriver, push the device from above onto the top-hat rail and remove the screwdriver.
3. The top-hat rail locking mechanism springs back to its original position.
4. Check that the IRF is seated securely on the top-hat rail.



To release the device from the top-hat rail, proceed in the reverse order.



When removing, take care not to damage the top-hat rail adapter of the device.

5.3 Optional: Attaching mobile communications antenna







- Screw the mobile communications antenna to the antenna connection directly or via an SMA extension cable.



6 System features

6.1 General LED status displays

The integrated LEDs indicate the status of the various interfaces. This makes diagnosis possible at the installation site.

LED status	Representation
Off	
Illuminates green	
Flashes green	
Illuminates red	
Illuminates orange	
Flashes orange	

6.1.1 Front LEDs



	Signal	Action
Power	<input type="checkbox"/>	This device is not supplied with voltage.
	<input checked="" type="checkbox"/>	Voltage was switched on, device booting. LED flashes slowly (1 Hz).
	<input checked="" type="checkbox"/>	Firmware is being updated. LED flashes rapidly (5 Hz).
	<input checked="" type="checkbox"/>	The device is ready for operation.
Status	<input type="checkbox"/>	This device is not supplied with voltage.
	<input checked="" type="checkbox"/>	Error during the boot-up process / recovery image
VPN	<input type="checkbox"/>	No VPN tunnel is active.
	<input checked="" type="checkbox"/>	The tunnel activated via VPN key is active.
WWAN	<input type="checkbox"/>	No mobile radio connection active.
	<input checked="" type="checkbox"/>	Network search (1 Hz)
	<input checked="" type="checkbox"/>	Login declined (2 Hz)
	<input checked="" type="checkbox"/>	Firmware update of the radio module (5 Hz)
	<input checked="" type="checkbox"/>	Logged in, offline
	<input checked="" type="checkbox"/>	Logged in, standby (dial-on-demand)
	<input checked="" type="checkbox"/>	Logged in, online
LANx / WAN	<input checked="" type="checkbox"/>	Link/activity
	<input checked="" type="checkbox"/>	Speed (down: 100 Mbit/s; up: 10 Mbit/s)

6.2 Operating-related LED status displays

6.2.1 Behaviour of the status displays during the boot-up process

The boot-up process begins as soon as the device is supplied with power. The PWR-LED flashes slowly.

6.2.2 Behaviour of the status displays when resetting to default settings

The **Factory Default** button is used to reset the firewall back to the default factory settings at any time, independent of its configuration.

To reset the firewall to the default settings, the Factory Default button must be pressed prior to the boot-up process and held down for approx. 10 seconds during the boot-up process. The PWR LED flashes rapidly while resetting to factory settings.

As soon as the PWR LED illuminates constantly, it is possible to access the web interface.

6.2.3 Behaviour of the status displays during the firmware update


A firmware update can be performed via the web interface.

- The **PWR-LED** flashes rapidly during a firmware update of the **firewall**. The actual update procedure takes a few minutes. Initialisation begins after the update procedure has been performed successfully. The PWR-LED flashes slowly during this process.
- During a firmware update of the **mobile radio module**, the yellow WWAN-LED flashes with a frequency of 5 Hz.

6.3 Interface overview

6.3.1 24 VDC power supply

Power is fed to the device via a lead-through terminal (figure shows connector on the device).

Pin	Signal
DI	Digital input +24 VDC \pm 20 % (function configurable)
FE	 Functional earth (required for EMC)
0V	Reference potential 0 V
V+	Supply voltage +24 VDC \pm 20 %



Requirements on the power supply

- Conformity:
 - Class PS2 acc. to IEC 62368-1 *or*
 - Limited Power Source (LPS) acc. to IEC 60950-1
 - For devices with UL-Certification: NEC Class 2
- Voltage: 24 VDC \pm 20 %
- Short-circuit current: < 8 A

Informations on using the device acc. to UL certification (Underwriter Laboratories, USA):

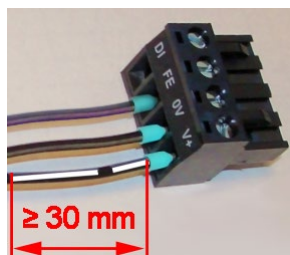
- For the power supply of the device, a power adapter acc. to **NEC Class 2** must be used (LPS = Limited Power Source).
- Only use copper conductors to connect the power supply.



Recommendation for use:

Use flexible cables with a wire cross section of 0.5 mm² / AWG20 and appropriate cable end sleeves.

To minimise mechanical strain between the individual wires and the plug, the distance between jacket and plug should be at least 30 mm.



6.3.2 RS-485 (EIA-485) for Modbus RTU

The fieldbus node is electrically isolated from the power supply of the IRF. Its electrical bus load is 1/8 unit load.

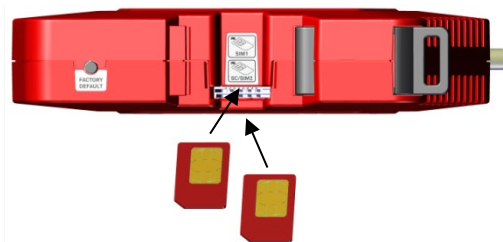
Pin	Signal
GND	Reference potential (common) for the data signals
D-	Inverted data signal
D+	Non-inverted data signal

6.3.3 Smart card reader and slot for SIM card

SIM cards and smart cards (SC) in the ID-000 format as defined in ISO 7816 (25x15 mm) can be used.

- The **SIM card** for mobile communications must be inserted into the **top slot** (SIM1).
- The **smart card** is intended for **backing up the configuration data** or for connecting to **Big-LinX®** and must be inserted into the bottom slot.

Insert the card(s) into the dual slot the right way round as shown in the figure:



The **configuration data** of a device can be stored on the smart card. If service is required, the saved configuration can be transferred to the new device. The setup procedure does not need to be repeated.



Complex IT infrastructures with a large number of devices can be managed, monitored and controlled easily and conveniently using **Big-LinX®**. Further information on Big-LinX can be found at:

<http://www.ads-tec.de/industrial-it/cloud-big-linx/big-linx.html>

7 Commissioning

7.1 Initial configuration

**Recommendation for use:**

For the initial configuration, a connection to a PC is required.

Connecting the 24 VDC power source

The device can be supplied via a 24 VDC power source. The corresponding plugs are included in the scope of delivery (4-pin plugs).

Connect the device with the appropriate power source.

Connecting the RJ45 network cable

When placing into operation for the first time, a connection is required between the device and a PC via an RJ45 network cable.

Connect the device to a PC:

Device LAN connection ↔ PC LAN connection

7.2 Manual configuration of the network adapter



Recommendation for use:

The procedure described in the following was prepared using the Microsoft Windows operating system as an example. If you are using another operating system, the paths and properties described here may vary.

Open the properties of your network adapter. The path is as follows:

Network connections > LAN connection > Properties (right mouse-key).

In the dialogue tab that appears, select option: **Internet protocol (TCP/IP)** and then click on **Properties**.

In the following window, select: **Use the following IP address**

Access to the device is only enabled if the following parameters are entered as the fixed IP address or if the computer is located in the same subnet space:

IP address: 192.168.0.100



Recommendation for use:

The last set of digits must be a number between 1 and 253. In the example, "100" has been selected.

Once the IP address has been entered, the **subnet mask address** must be entered. Click on the **Subnet mask** field and the correct address is entered automatically.

Subnet mask: 255.255.255.0

Confirm your entries by clicking on **OK**.

7.3 Calling up the device web interface



Recommendation for use:

The web interface of the device was optimised for the **Mozilla Firefox** browser.
There may be functional limitations if a different browser is used.

To access and open the device web interface, start up your web browser. In the browser's address bar, enter the following IP address and then confirm with **Enter**

http://192.168.0.254

Login

Once the IP address has been entered with success, the login prompt appears.

The default settings are to be entered in the login prompt.

The default configuration on delivery is:

User name: admin

Password: admin

Confirm your entries by clicking on OK.

**Recommendation for use:**

If the login prompt does not appear, check to ensure that the device has been connected via a RJ45 connection cable.

Otherwise, connect the device to a PC


(Device LAN connection \leftrightarrow PC LAN connection).

If there is still no connection to the firewall login screen, check the proxy and local firewall settings. Often, local subnet addresses (e.g. 192.168.x.x) are also diverted to a proxy server.

In this case, it is possible to select the "Bypass proxy server for local addresses" option to enter the address in question.

The device web interface then appears

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Industrial IT



IRF1401

▼ Diagnostics

- System State
- Big-LinX
- Eventlog
- WAN
- LAN
- Ping test
- Remote capture

▸ Configuration

▸ System

▸ Information

System data

System name:	IRF1401-AX20088735
Device type:	IRF1401
Serial-No.:	AX20088735
Firmware version:	1.0.1 (Build 96050)
MAC-Address WAN:	2A:18:92:07:D0:67
MAC-Address LAN:	00:18:92:07:D0:67
Device mode:	IP router

8 Technical data

IRF1000 series	
Operating system	Embedded Linux
Configuration protocol	http, https
Interfaces	1 x WAN RJ45 (10/100 Mbit/s Autocrossover) 3 x LAN RJ45 (10/100 Mbit/s Autocrossover) 1 x digital input (electrically isolated) 1 x RS-485 for Modbus RTU (electrically isolated)
External device dimensions	See dimensional drawings in chapter 5
Weight	Approx. 0.2 kg
Protection class	IP30 (tested by ADS-TEC, not evaluated by UL)
Over voltage category	I as per DIN EN 60664-1 (max. 1500 V)
Pollution degree	2 as per IEC 61010-1
Altitude during operation	2000 m or less
Power supply	Voltage: 24 VDC \pm 20 % Requirements on the power adapter: <ul style="list-style-type: none"> • Class PS2 acc. to IEC 62368-1 – or – Limited Power Source (LPS) acc. to IEC 60950-1 • Short-circuit current: < 8 A • For devices with UL-Certification: NEC Class 2
Max. current consumption	IRF1401: 0.5 A (\cong 12 W @ 24 V) IRF1421: 0.8 A (\cong 19.2 W @ 24 V)
Ambient temperature	in operation -30 ... +70°C for storage -40 ... +85°C



You can find further information about the device in the data sheet on our website:

<http://www.ads-tec.de>

9 Service & support

ADS-TEC and its partner companies offer you comprehensive maintenance and support services, ensuring quick and competent support should you have any questions or concerns with regard to ADS-TEC products and equipment.

Because ADS-TEC products are also used by partner companies, these devices may have customised configurations. Should any questions arise with regard to these specific configurations and software installations, please contact them as ads-tec will not be able to answer such questions.

ADS-TEC does not provide support services for any device that was not purchased directly from ADS-TEC. In this case, maintenance and support is provided by the partner company.

9.1 ADS-TEC support

The ADS-TEC support team is available for inquiries from direct customers between 8:30am and 5:00pm, Monday to Friday.

The support team can be reached via phone, fax or e-mail:

Phone: +49 7022 2522-202

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