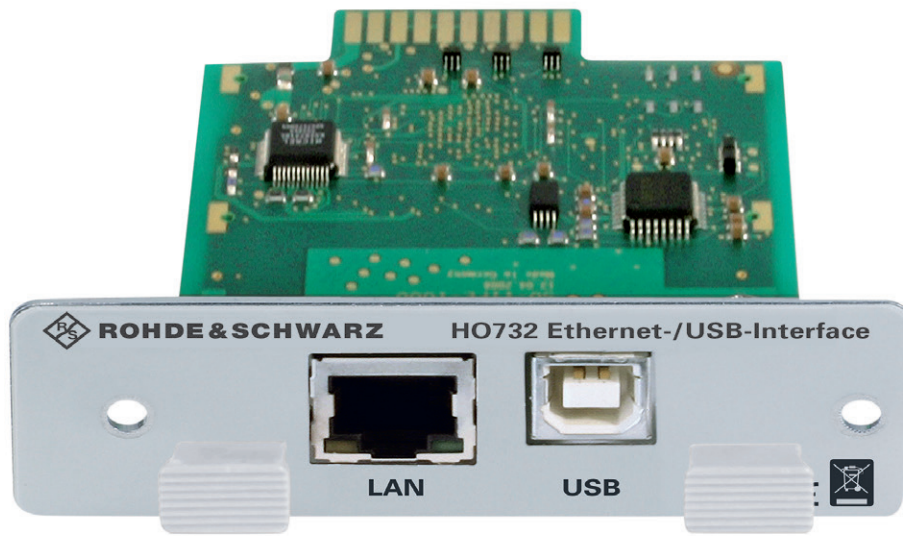


R&S® H0732

Dual Interface

Installation Guide



5800549902

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1 General Information

1.1 Safety hints

Notice

All interface connections are galvanically connected to the instrument.

Measurement at high potentials is prohibited and endangers the instrument, the interface and all equipment connected to the interface.

If the safety rules are disregarded, any damage to we will not take any responsibility for damage to people or R&S equipment of other make.

1.2 Interface Description

In addition to a LAN interface, the instrument includes an USB device port. For this interface, the user can select if the instrument is accessed via virtual COM port (VCP) or via USB TMC class.

Notice

The USB TMC class is not supported with the R&S®HMS-X, the R&S®HMP series and the R&S®HMF series. In this case only the virtual COM port connection (VCP) is supported.

The traditional version of the VCP allows the user to communicate with the instrument using any terminal program via SCPI commands once the corresponding Windows drivers have been installed. For further information about the USB TMC class (if supported) please refer to the user manual of the respective instrument.

Additionally, the free of charge software „HMExplorer“ can be used. This Windows software application provides a terminal function, a screenshot function, a software module to create arbitrary waveforms as well as a software module to read-out the measured data storage.

The R&S®HO732 interface can be used with the following instruments:

- R&S®HMF series
- R&S®HMP series
- R&S®HMS-X
- R&S®HMO72x...202x
- R&S®HMO3000 series

1.2.1 USB

The interface is equipped with a Type A USB female connector. For direct connection with a host controller or an indirect connection via an USB hub, a USB cable equipped with type B male connector at one end and type A male connector at the other end is required.

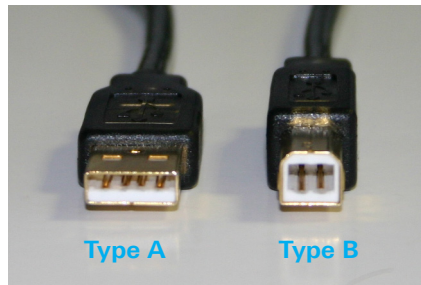


Fig. 1.1: USB type A and type B

1.2.2 Ethernet

For the direct connection with a host (PC) or indirect connection over a SWITCH, a doubly protected network cable (e.g. CAT.5, CAT.5e, CAT.5+, CAT.6 or CAT.7) is required, equipped with an Ethernet plug type the RJ-45 at each end. Either an uncrossed or a crossed network cable (cross over cable) can be used.

1.3 Interface selection

The interface which will be used (USB or Ethernet) will be chosen and activated in the SETUP resp. MENU (R&S®HMP series) menu with the respective soft menu key resp. with the knob (R&S®HMP series). The interface parameters will be set via soft menu key PARAMETER resp. the soft menu SETTINGS (R&S®HMP series) with the knob.

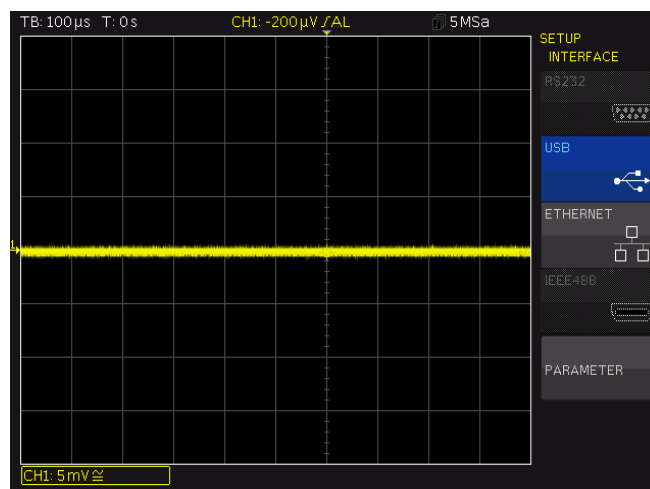


Fig. 1.2: Setup menu R&S®HMO3000 series

1.4 Fitting Instruction

Notice

During the R&S®HO732 interface fitting the mains (line) power cable may not be connected to the instrument. All test leads have to be removed from the measuring inputs.

To avoid interface damage during removing and fitting by electrostatic discharge, please link a metal part of the instrument to equalise potentials between instrument and your body. Maintain this connection during the fitting/removing.

The R&S®HO732 interface card can be changed by the user. To change the interface card remove the fastening screws of the built-in interface and pull out the interface via mounting panel. Insert the R&S®HO732 interface card via the visible guide bars into the interface card slot and push it in completely. Fit the interface with the fastening screws previously removed.

2 USB driver Installation (VCP)

Notice

The following requirements for USB-VCP driver installation are necessary:

1. An instrument with an activated USB (VCP) interface.
2. A PC with operating system Windows XP™, VISTA™, Windows 7™, Windows 8™ or Windows 10™ (32 or 64Bit).
3. Administrator rights are necessary for the installation of the driver. If an error message regarding spelling errors appears, the rights to install the driver are not given. In this case, please contact your IT department to obtain the necessary rights.

The actual USB-VCP driver can be downloaded and extracted from the Rohde & Schwarz Website for free.

If a connection between PC and the instrument has been established and no USB-VCP driver is installed, the operating system answers with "Found New Hardware". In addition, the "Found New Hardware Wizard" is displayed. Only in this case the USB-VCP driver must be installed.

2.1 Driver Installation

If the window „New Hardware found“ appears, please click on „Skip downloading the driver with Windows Update“ (menu bar).

If the window is disappeared, you have to open the device manager via Windows control panel --> device manager. The instrument will be displayed with a yellow exclamation mark in the PC device manager. Choose the „unknown“ instrument and update the driver software via right click.

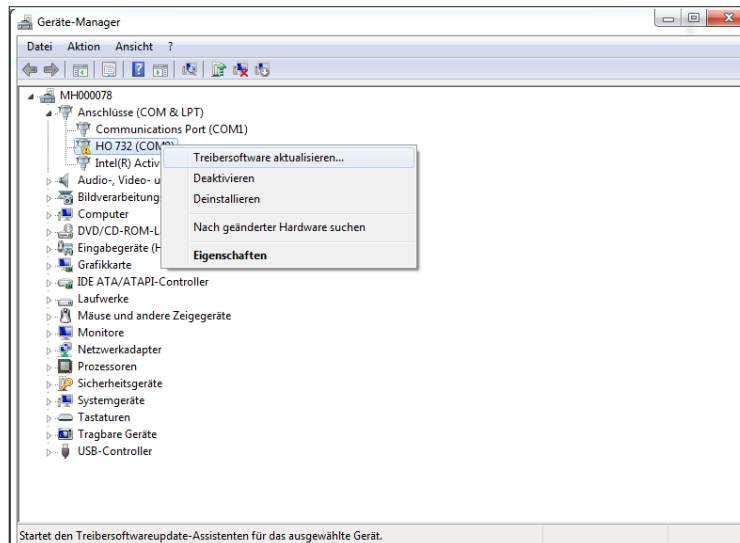


Fig. 2.1: Device manager

Choose „Browse my computer for driver software“.

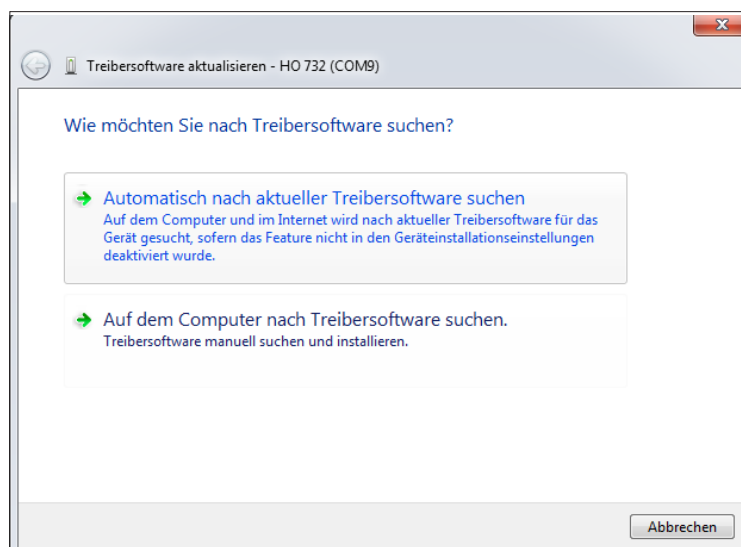


Fig. 2.2: Searching driver software

„Browse“ the respective folder where the USB VCP driver was extracted and saved. Afterwards, press „Next“.

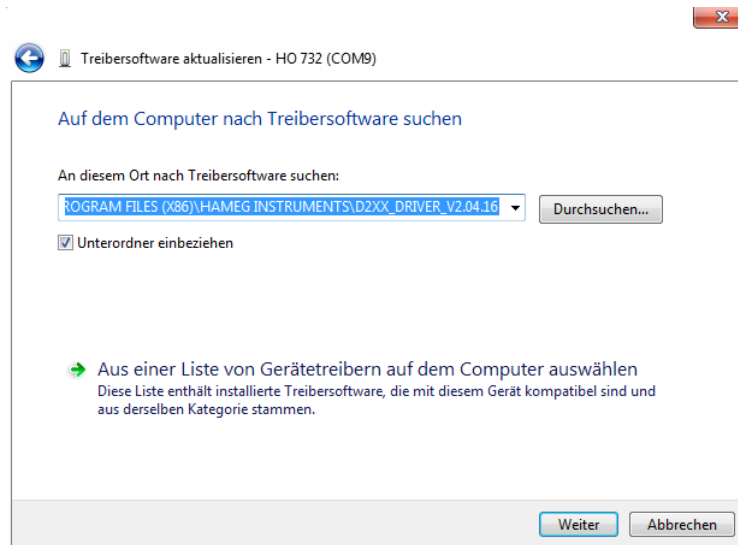


Fig. 2.3: Allocation of the driver folder

After successful installation of the USB-VCP driver the instrument will be displayed as COM connection (virtual COM port).

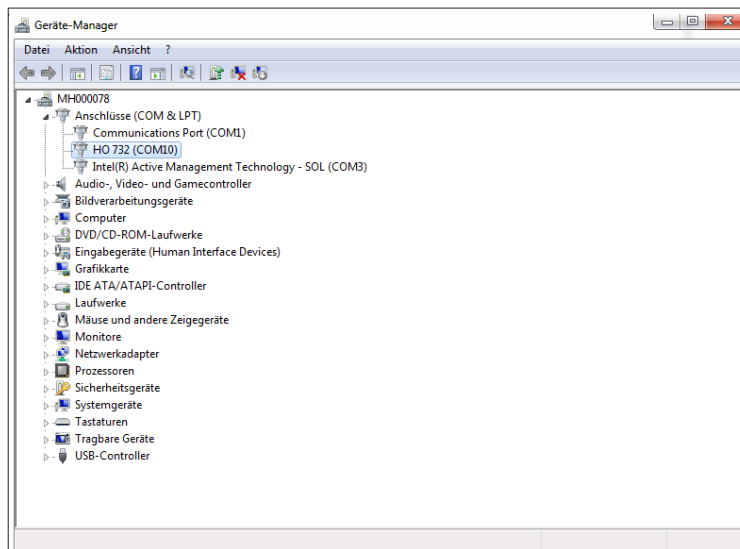


Fig. 2.4: Instrument display in the device manager as COM port

Double click on the new installed COM port will open the „Properties“ window. Choose the tab „Port Settings“ to select the RS-232 settings for the virtual COM port (including hardware / software handshake).

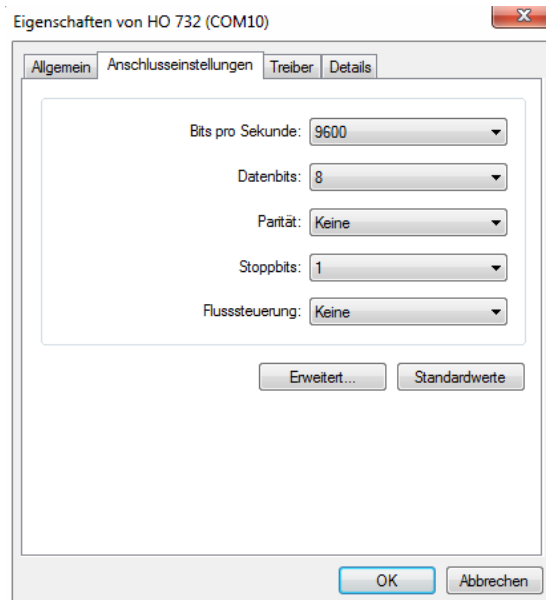


Fig. 2.6: COM port properties

Further settings may be selected via „Advanced“ tab, e.g. assignment of the virtual COM port from COM1 to COM256.

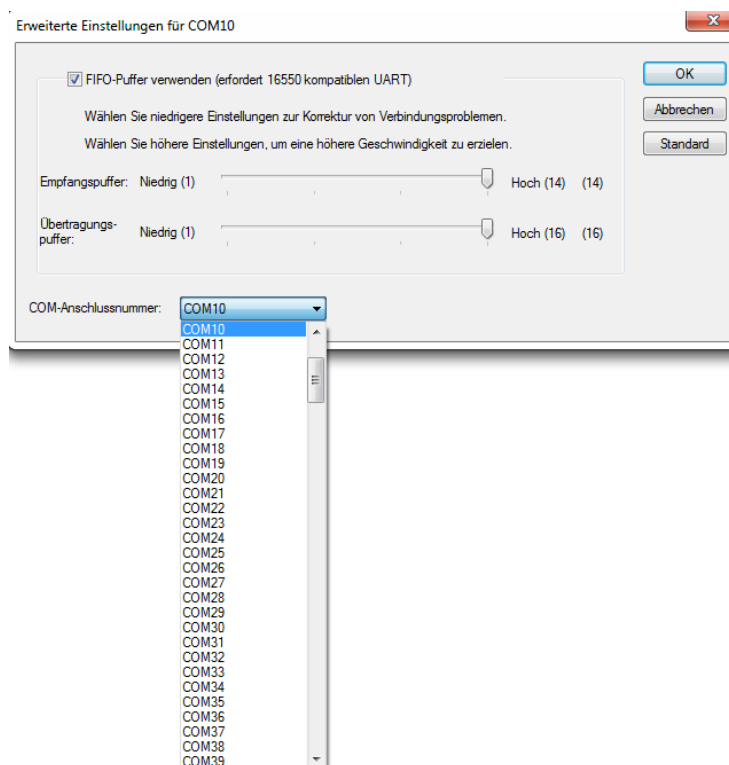


Fig. 2.7: Advanced COM port properties

3 Ethernet Configuration

Notice

The host (PC) must have an Ethernet LAN interface inserted. For the configuration of this interface you will find further information in its PC manual or in the manual of your network interface

3.1 IP networks (IP – Internet protocol)

In order that two or several network elements (e.g. measuring instruments, host/PC's, ...) can communicate over a network with one another, some fundamental connections have to be considered, so that data communication is error free and unimpaired.

For each element in a network an IP address has to be assigned, so that they can exchange data among themselves. IP addresses are represented (with the IP version 4) as four decimal numbers separated by points (e.g. 192.168.15.1). Each decimal number is represented by a binary number of 8 bits. IP addresses are divided into public and private address ranges. Public IP addresses will be able to route by the Internet and an Internet service Provider (ISP) can to be made available. Public IP addresses can be reached directly over the Internet to directly exchange internet data. Private IP addresses are not routed by the Internet and are reserved for private networks. Network elements with private IP addresses cannot be reached directly over the Internet so no data can be directly exchanged over the Internet. To allow network elements with a private IP address to exchange data over the Internet, they require a router for IP address conversion (English NAT; Network address translation), before connection to the Internet. The attached elements can then data exchange over this router, which possesses a private IP address (LAN IP address) and also a public IP address (WAN IP address), via the Internet.

If network elements exchange data only over a local network (without connection with the Internet), appropriate use private IP addresses. Select in addition e.g. a private IP address for the instrument and a private IP address for the host (PC), with which you would like to control the instrument. If you might connect your private network with the Internet later via a router, the private IP addresses used in your local network can be maintained. Since within each IP address range the first IP address is used as network IP address and the last IP address is used as Broadcast IP address, in each case two IP addresses have to be taken off from the "number of possible host addresses" (see table 1: Private IP address ranges).

Apart from the organization of IP addresses into public and private address ranges, IP addresses are also divided into classes (Class: A, B, C, D, E). Within the classes A, B, and C are also include the private IP of address ranges described before. The categorisation from IP addresses is for the assignment of public IP address ranges of importance and essentially depends on the size of a local network (maximum number of hosts in the network), which is to be connected with the Internet (see table 2: Classes of IP addresses).

Ethernet Configuration

| Address range | Subnet mask | CIDR way of writing | Number of possible host addresses |
|------------------------------|------------------------------|----------------------------------|--|
| 10.0.0.0 –10.255.255.255 | 255.0.0.0 | 10.0.0.0/8 | $2^{24} - 2 = 16.777.214$ |
| 172.16.0.0 –172.31.255.255 | 255.240.0.0 | 172.16.0.0/12 | $2^{20} - 2 = 1.048.574$ |
| 192.168.0.0 –192.168.255.255 | 255.255.0.0 255.255.255.0 | 192.168.0.0/16 192.168.0.0/24 | $2^{16} - 2 = 65.534$ $2^8 - 2 = 254$ |

Tab. 5.1: Private IP address ranges

| Class | Address range | Net quota | Host quota | Max. number of networks | Max. number of hosts |
|-------|-----------------------------|-------------------------------------|------------|-------------------------|----------------------|
| A | 0.0.0.1 - 127.255.255.255 | 8 Bit | 24 Bit | 126 | 16.777.214 |
| B | 128.0.0.1 - 191.255.255.255 | 16 Bit | 16 Bit | 16.384 | 65.534 |
| C | 192.0.0.1 - 223.255.255.255 | 24 Bit | 8 Bit | 2.097.151 | 254 |
| D | 224.0.0.1 - 239.255.255.255 | Reserved for multicast applications | | | |
| E | 240.0.0.1 - 255.255.255.255 | Reserved for special applications | | | |

Tab. 5.2: Classes of IP addresses

IP addresses can fix (statically) or variable (dynamically) to be assigned. If IP addresses in a network are assigned fix, an IP address must be preset manually with each network element. If IP addresses in a network are assigned to the attached network elements automatically (dynamically), a DHCP server (English DHCP becomes; Dynamic Host Configuration Protocol) is required for the dispatching of IP addresses. With a DHCP server an IP address range for the automatic dispatching of IP addresses can be preset. A DHCP server is usually already integrated in a router (DSL router, ISDN router, Modem router, WLAN router, ...) integrated. If a network element (e.g. an instrument) is connected by a network cable directly with a host (PC), the IP addresses cannot be assigned to the instrument and the host (PC) automatically, since no network with DHCP server is present here. They have to be preset therefore at the instrument and at the host (PC) manually.

IP addresses are divided by using subnet mask into a network quota and into a host quota, so similarly e.g. a telephone number is divided in pre selection (land and local area network number) and call number (user number). Subnet mask have the same form as IP addresses. They are represented with four decimal numbers separated by points (e.g. 255.255.255.0). As is the case for the IP addresses here each decimal number represents a binary number of 8 bits. The separation between network quota and host quota is determined by the subnet mask within an IP address (e.g. the IP address 192.168.10.10 by the subnet mask 255.255.255.0 is divided into a network quota 192.168.10.0 and a host quota of 0.0.0.10). The allocation takes place via the transformation of the IP address and the subnet mask in binary form and afterwards a bit by bit one logical AND operation between IP address and subnet mask. The result is the network quota of the IP address. The host quota of the IP address takes place via the bit by bit logical NAND operation between IP address and subnet mask. By the variable allocation of IP addresses in network quota and host quota via subnet masks, one can specify IP address ranges individually for large and small networks. Thus one can operate large and small IP networks and connect if necessary to the Internet via a router. In smaller local networks the subnet mask 255.255.255.0 is mostly used. Network quota (the first 3 numbers) and host quota (the last number) are simple here without much mathematical expenditure to determine and it can with these subnet mask up to 254 network elements (e.g. measuring instruments, hosts/PC's...) in a network be operated at the same time.

Often also a standard gateway is present in a network. In most local networks is this gateway with the router to the Internet (DSL router, ISDN router, ...) ... is identical. Using this (gateway -) router a connection can be manufactured with another network. Thus also network elements, which are not in the same (local) network, can be reached and/or network elements from the local network are able to exchange data with network elements from other networks. For a network-spreading data exchange the IP address of the standard gateway must also be preset. In local networks, mostly the first IP address within a network for this (gateway -) router is used. Mostly routers in a local network to be used as gateway have an IP address with a „1“ in the last place of the IP address (e.g. 192.168.10.1).

3.2 Ethernet Settings

Notice

PC and instrument have to be connected to the same network. Otherwise a remote connection is not possible.

Select ETHERNET as interface and press the soft menu key PARAMETER resp. choose the menu item SETTINGS with the knob (R&S®HMP) to determine the settings for the necessary parameters directly. You can specify all parameters and assign a fixed IP address. You can also assign a dynamic IP address with the activated DHCP function. Please contact your IT management to configure the settings properly.

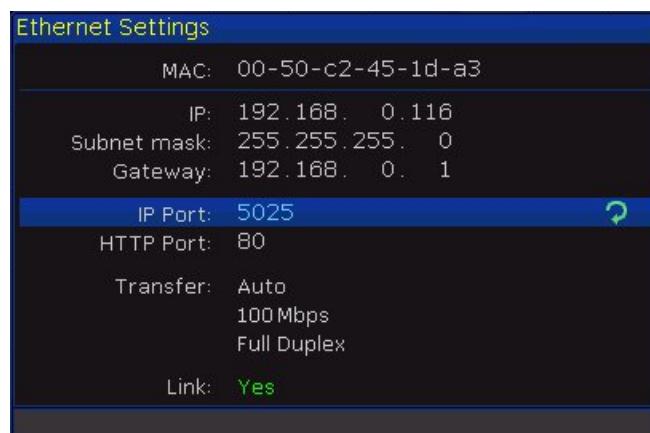


Fig. 3.1: Ethernet settings HMO3000 series

If the device has an IP address, it can be accessed via web browser at this IP since the Ethernet interface includes an integrated web server. Enter the IP address in the browser's address bar (<http://xxx.xxx.xxx.xxx>). This will open a window including the instrument type and the serial number.

Notice

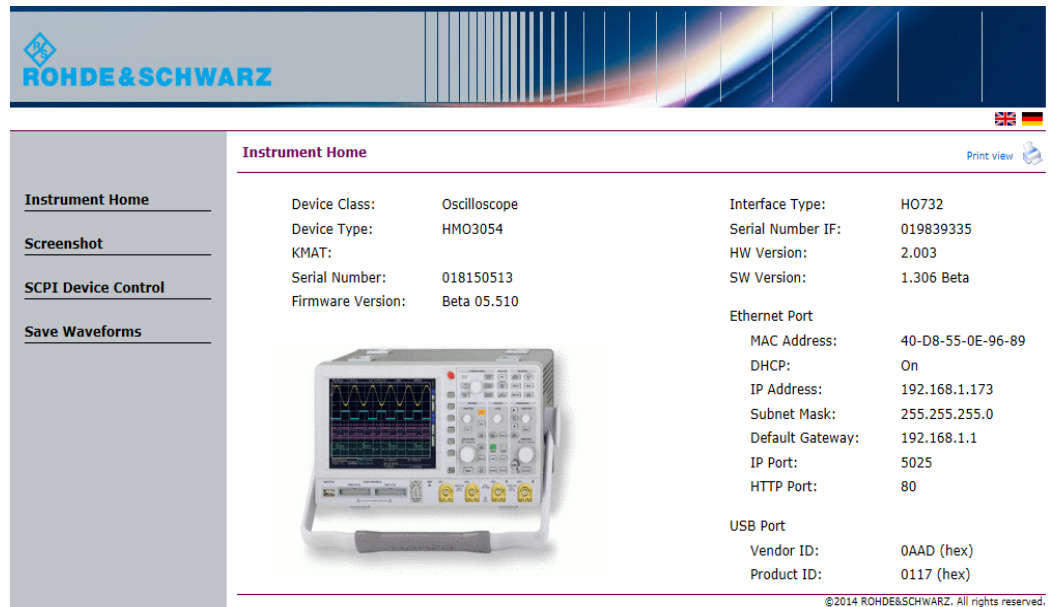
If DHCP is used and the system cannot assign an IP address to the instrument (for instance, if no Ethernet cable is connected or the network does not support DHCP), it may take up to three minutes until a timeout allows the interface to be configured again.

Ethernet Configuration

3.3 Webserver

The Ethernet interface offers a web server, which can be used with a web browser (e.g. Internet Explorer). The following functions are supported (depending on the instrument type) by the Web-server:

- Display of the device and Ethernet information (Instrument Home)



The screenshot shows the 'Instrument Home' web page. On the left is a navigation menu with options: Instrument Home, Screenshot, SCPI Device Control, and Save Waveforms. The main content area is titled 'Instrument Home' and contains the following information:

| | | | |
|-------------------|--------------|-------------------|------------|
| Device Class: | Oscilloscope | Interface Type: | HO732 |
| Device Type: | HMO3054 | Serial Number IF: | 019839335 |
| KMAT: | | HW Version: | 2.003 |
| Serial Number: | 018150513 | SW Version: | 1.306 Beta |
| Firmware Version: | Beta 05.510 | | |

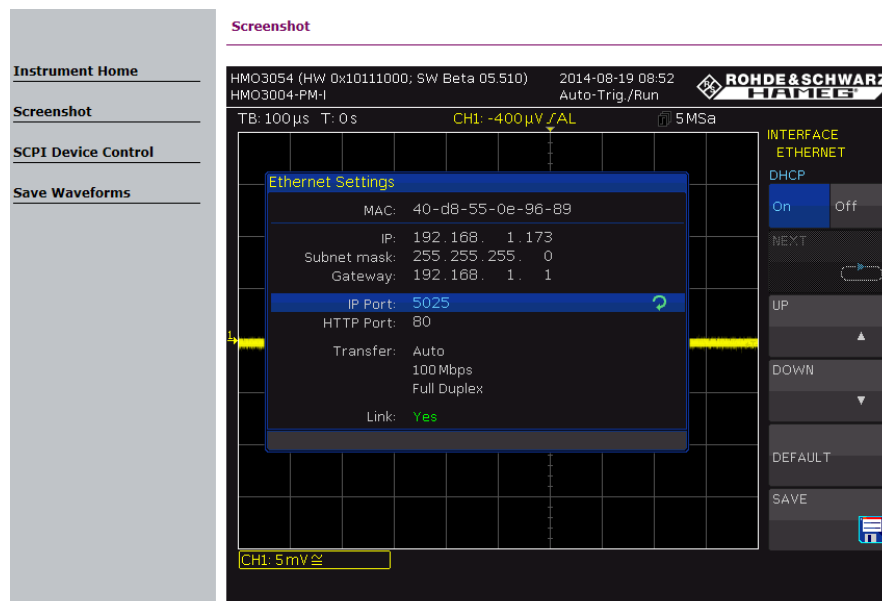
Below the table is an image of the HMO3054 oscilloscope. To the right of the image, the Ethernet and USB port information is displayed:

| | |
|----------------------|-------------------|
| Ethernet Port | |
| MAC Address: | 40-D8-55-0E-96-89 |
| DHCP: | On |
| IP Address: | 192.168.1.173 |
| Subnet Mask: | 255.255.255.0 |
| Default Gateway: | 192.168.1.1 |
| IP Port: | 5025 |
| HTTP Port: | 80 |
| USB Port | |
| Vendor ID: | 0AAD (hex) |
| Product ID: | 0117 (hex) |

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Fig. 3.2: Display of the device and Ethernet information

- Screenshot function



The screenshot shows the oscilloscope's 'Screenshot' function. The main display area shows the 'Ethernet Settings' menu with the following configuration:

| | |
|--------------|-------------------|
| MAC: | 40-d8-55-0e-96-89 |
| IP: | 192.168.1.173 |
| Subnet mask: | 255.255.255.0 |
| Gateway: | 192.168.1.1 |
| IP Port: | 5025 |
| HTTP Port: | 80 |
| Transfer: | Auto |
| | 100 Mbps |
| | Full Duplex |
| Link: | Yes |

The background shows the oscilloscope waveform with settings: TB: 100µs, T: 0s, CH1: -400µV / AL, 5MSa. The interface also shows 'INTERFACE ETHERNET' with 'DHCP' set to 'On' and 'Link' status 'Yes'.

Fig. 3.3: Screenshot function

- Remote control via SCPI commands (SCPI Device Control)

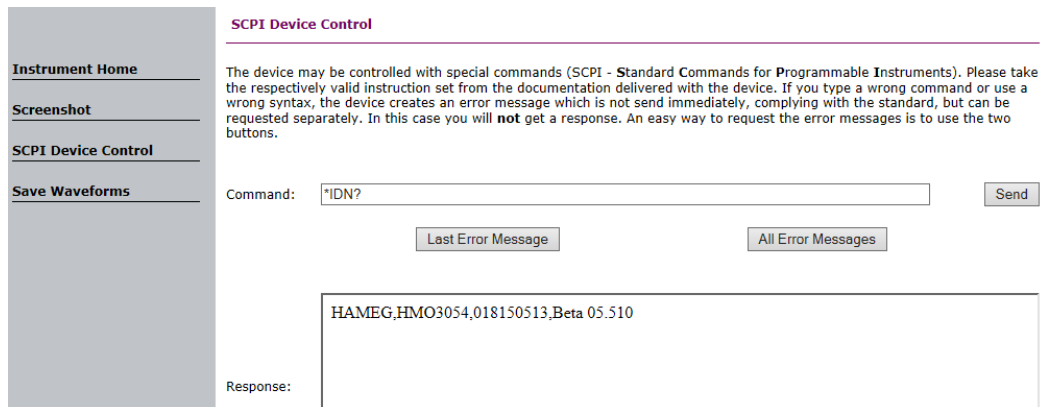


Fig. 3.4: Remote control via SCPI commands

- Read-out and save waveform data (R&S®HMO series only)

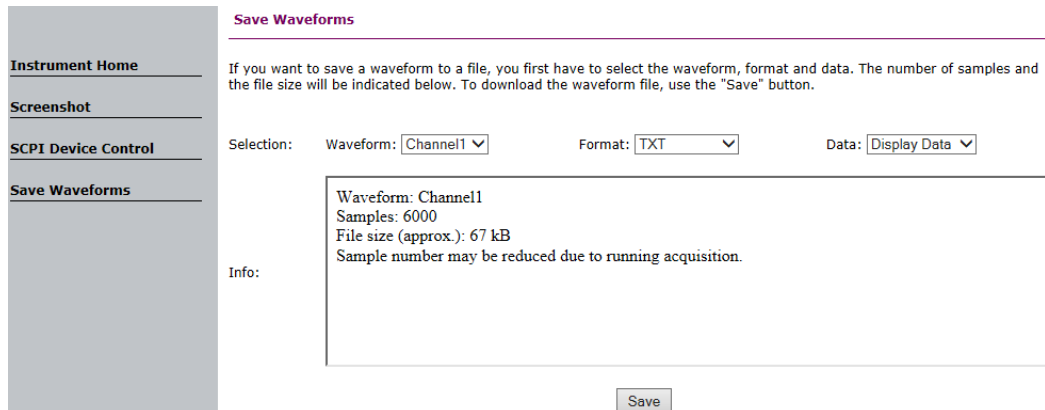
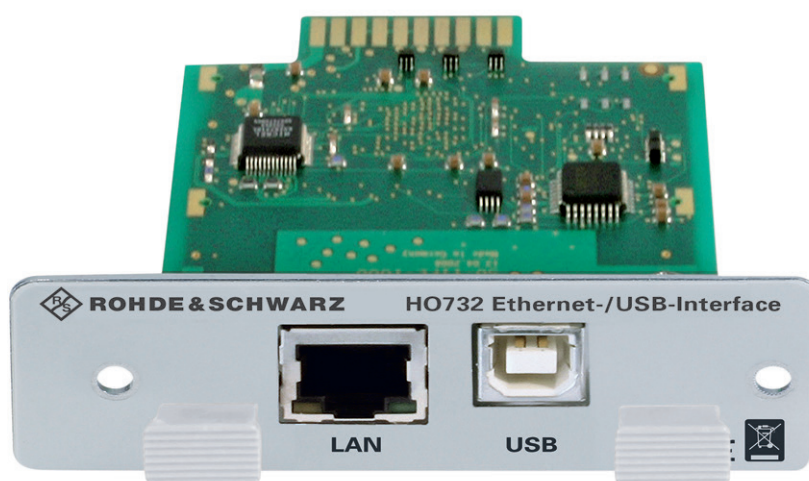


Fig. 3.5: Read-out and save waveform data (R&S®HMO series only)

4 Technical Data



- ▮ Ethernet 10/100 Mbit/s
supports raw socket and VXI-11 communication
- ▮ Integrated web server
- ▮ Screenshot function using web server
- ▮ USB Hi-Speed (480 Mbit/s), USB type B connector
supports USB-TMC and USB-CDC (VCP)
- ▮ For instrument series HMF, HMO, HMP and HMS



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