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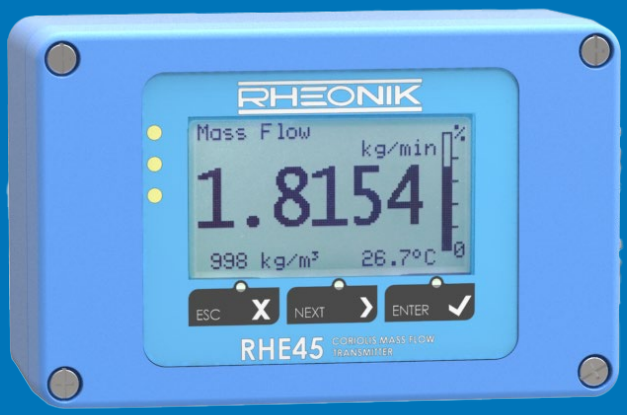

RHE45
Desktop Reference Addendum
EtherNet/IP

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Rheonik Messtechnik GmbH
Rudolf-Diesel-Straße 5
D-85235 Odelzhausen
Germany

Tel + 49 (0)8134 9341-0
info@rheonik.com

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RHE 45
Transmitter

Desktop Reference Addendum EtherNet/IP for Anybus Modules

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Table of Contents

1 Purpose

This document describes the properties of the optional EtherNet/IP interface of the RHE45 Transmitters. This interface is implemented with the help of a respective Anybus module and is installed when the “EN” option is present in the order number of the transmitter.

The EtherNet/IP interface offers a fast access to the main measurement variables in the transmitter via the EtherNet/IP protocol. Furthermore, it allows the reset of the totalizers and the start of the zeroing procedure for the mass flow measurement.

The configuration of the transmitter, however, has to be performed via the HMI interface at the display or the Modbus protocol. Aside from EtherNet/IP interface the RHE40 Transmitter with option “EN” also features an RS485 interface which can be used to configure the transmitter via the Modbus RTU protocol. A Modbus TCP protocol is available at the 100 Base TX interfaces of the EtherNet/IP connectors, as well.

Section 2 of this document contains the references to the basic documentation, section 3 describes the connectors to the EtherNet/IP hardware interface, section 5 the identification of the RHE45 Transmitter including the reference to the respective EDS file, and section 6 lists the variables resp. parameters available on the interface.

This document reflects the properties of Firmware Release 3.40 or higher,

2 Documentation

This document implicitly or explicitly references following documents:

Title	Document Number
RHE40 Desktop Reference	8.2.1.14
RHE45 Installation & Startup Guide	8.2.1.21
RHEComPro Suite User Manual	8.2.1.18

Please refer to these documents when explanations within this document remain unclear. For the meaning of the Modbus registers listed below check the RHE40 Desktop Reference Manual.

Should the current version of these documents not be available via the www.rheonik.com internet page, please contact the Rheonik Service.

3 EtherNet/IP 100 Base TX Connections

For the signals available at the 12-pin M12 connector of the RHE45 Transmitter please check section 3.2.1 of the “RHE45 Installation & Startup Guide”.

Two EtherNet/IP 100 Base TX connections are available at the 8-pin M12 connector socket of the RHE45 Transmitter, see Figure 1 for the pin numbering of the socket and Figure 2 for the pin numbering of the respective plug.

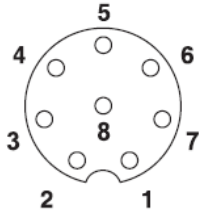

Figure 1: Pin Numbering of the RHE45 8-pin M12 Socket

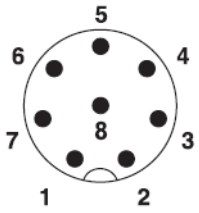

Figure 2: Pin Numbering of an 8-pin M12 Plug

For easiest connection to the EtherNet/IP interfaces use the connection cable ARHE45-MY.

Table 9 shows the pinning of the M12 connector, the cable colors (ARHE45-MY), and the corresponding RJ45 pinning.

Table 9: 8-pin M12 Socket Configuration for Options EN, EP, EC and RJ45 wiring

M12 Pin #	Signal	CAT5 Coloring	1st RJ45 Pin #, Name	2nd RJ45 Pin #, Name
1	Eth 2 TX-	white/blue		2, D1-
2	Eth 2 RX+	white/brown		3, D2+
3	Eth 2 RX-	brown		6, D2-
4	Eth 1 TX-	orange	2, D1-	
5	Eth 1 RX+	white/green	3, D2+	
6	Eth 1 TX+	white/orange	1, D1+	
7	Eth 2 TX+	blue		1, D1+
8	Eth 1 RX-	green	6, D2-	
Shield	Ground / PE		Shield	Shield

4 Network Configuration

There are at least two ways to configure the Ethernet network and the IP parameters of the RHE45 transmitter. Usually the controlling interface of an EtherNet/IP installations has a means to configure the network parameters of all attached interfaces implementing the EtherNet/IP protocol. This type of configuration is done with the help of dedicated EtherNet/IP broadcast packets.

Another method is the use of the *ipconfig* tool provided by HMS/Anybus. This tool may be downloaded from

https://www.hms-networks.com/de/support/general-downloads

and can be installed on a Windows PC. When started the program scans all devices attached to the Ethernet LAN port of the PC and displays any found Anybus module. This is shown in Figure 3.

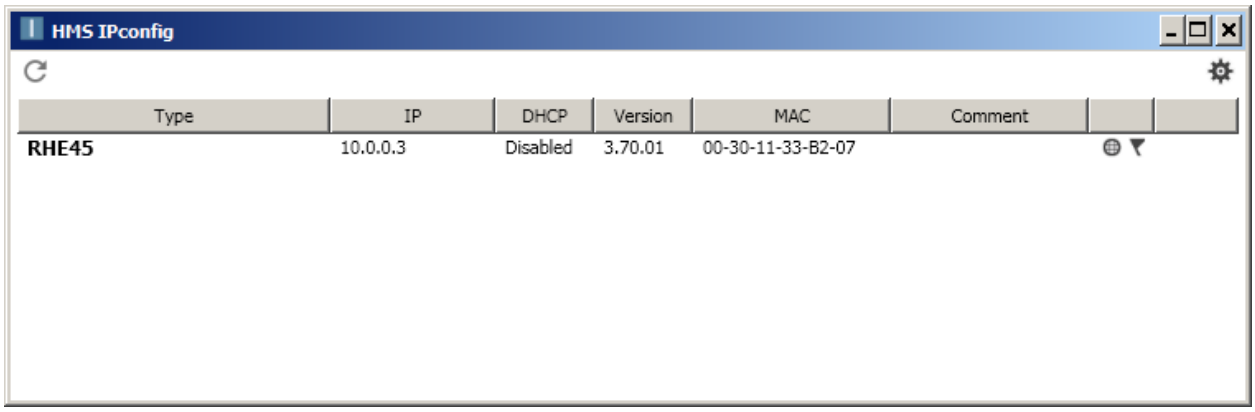

Figure 3: List of Anybus modules found by the HMS ipconfig tool.

In order to avoid confusion it is recommend to attach the RHE45 directly to the LAN port of the PC. The tool will also work via switches and routers, but then it will display all attached HMS Anybus module present on the network.

When clicking on the gear wheel symbol a configuration window is opened in which a device detected by a previous scan may be configured after a click on its entry. Figure 4 shows the respective window.

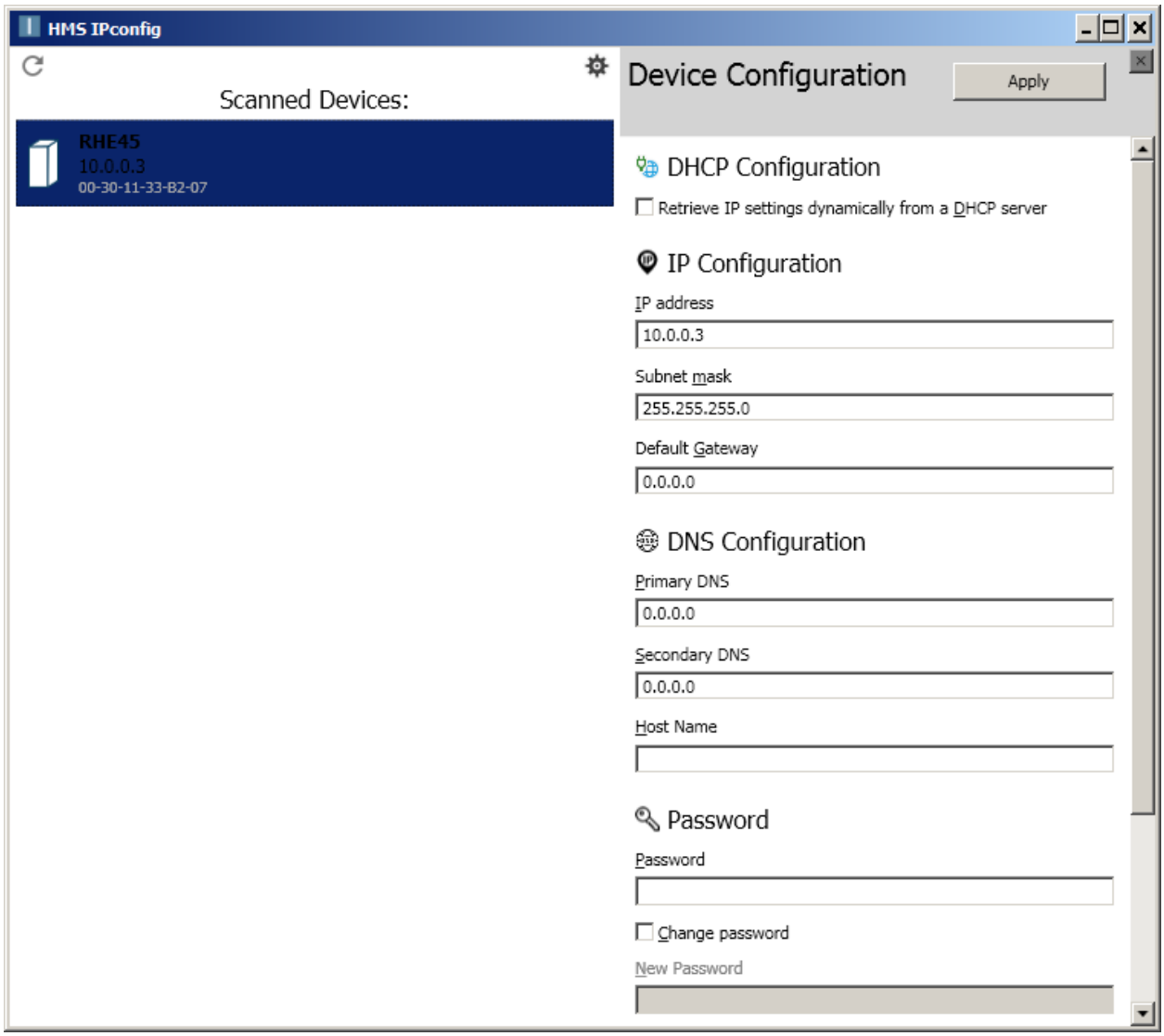

Figure 4: Configuration window of the HMS ipconfig tool.

In this window the network configuration of the RHE45 may be changed. When “Apply” is pressed the new configuration is stored in the Anybus module and will become active. As delivered by Rheonik no password is installed in the module. An installation of a password in order to protect the network parameter setup is left to the customer.

Please note, that due to a firmware change in the Anybus Modules it is not possible to change the network parameters via the HMI or Modbus register accesses as indicated in earlier versions of this document.

When the system is reachable via the IP protocol the IP configuration also may be modified using the HTML page of the EtherNet/IP interface module. An example is shown in Figure 5 below.

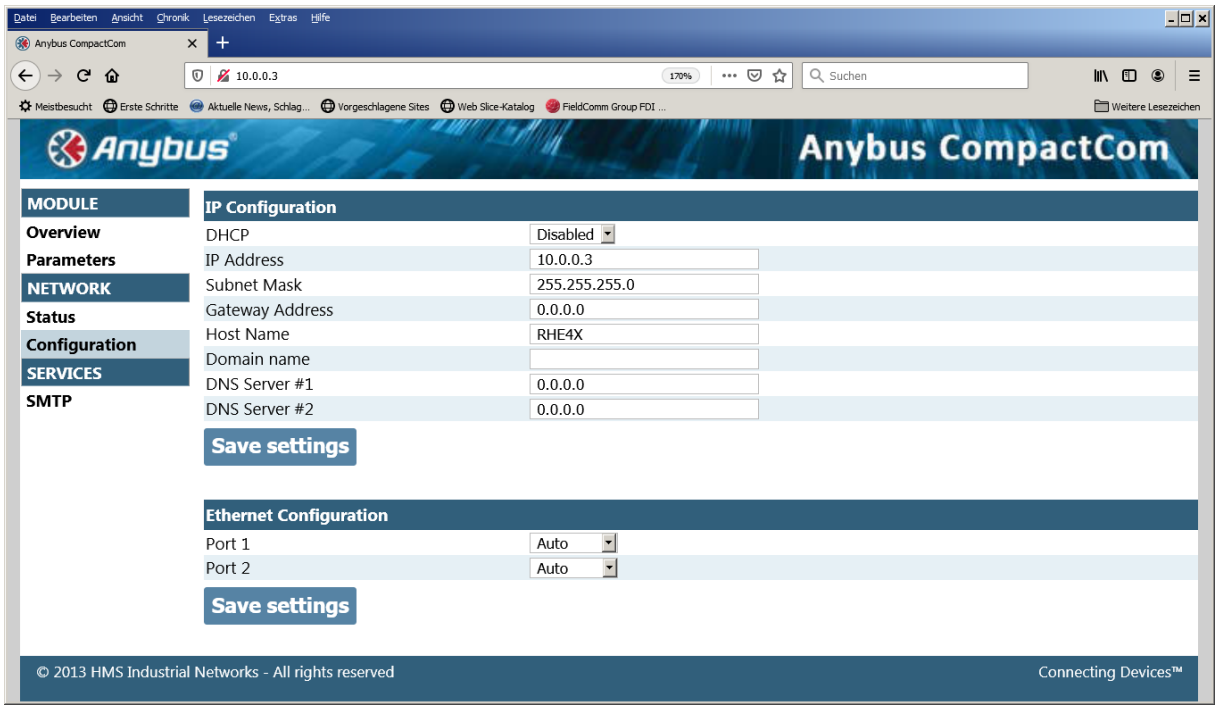

Figure 5: EtherNet/IP Network Configuration HTML Example.

An SMTP access also may be configured via the HMTL interface as a further means to obtain a working IP parameter set.

5 EtherNet/IP Identification, EDS File

The EtherNet/IP Vendor ID assigned to Rheonik by the ODVA organization is 1661 or 0x67D in hexadecimal representation. The RHE45 transmitter bears the Product Code 40 (0x28) and features the vendor specific Device Type/Profile number 100. The Mass Flow Controller profile could not be realized because the implemented variable scheme also had to match other fieldbuses.

Using these numbers the resulting EDS file name amounts to

067D010000280100.EDS

for the RHE45 Transmitter.

The EDS file contains the features of the underlying EtherNet/IP hardware and protocol interfaces and is part of the information package delivered together with the transmitter as option. It is also available from the Rheonik Service. The EDS file also contains the list of variables resp. parameters accessible via the EtherNet/IP interface as described in the next section.

6 EtherNet/IP Variable Access

As mentioned above the EtherNet/IP interface offers a limited access mainly to the measurement data maintained by the RHE transmitter. Following measurement data items are available to be read out periodically:

Parameter Index	Modbus Name	Modbus Reference	Type
1	ErrorStatus	See Generic / 0x401A.	DWORD (Unsigned32)
2	SoftError	See Generic / 0x401C.	DWORD (Unsigned32)
3	Warnings	See Generic / 0x401E.	DWORD (Unsigned32)
4	InfoStatus	See Generic / 0x4020.	DWORD (Unsigned32)
5	DenComp	See Density / 0x4806.	REAL (Float32)
6	MassFlowRate	See Mass Flow / 0x4900.	REAL (Float32)
7	VolumetricFlowRate	See Volumetric Flow / 0x4A00.	REAL (Float32)
8	TotalMassFwd	See Totalizer / 0x4B00.	REAL (Float32)
9	TotalVolFwd	See Totalizer / 0x4B02.	REAL (Float32)
10	TotInvenMassNet	See Totalizer / 0x4B04.	REAL (Float32)
11	TotInvenVolNet	See Totalizer / 0x4B06.	REAL (Float32)
12	TotalMassRev	See Totalizer / 0x4B08.	REAL (Float32)
13	TotalVolRev	See Totalizer / 0x4B0A.	REAL (Float32)
14	AdcTubeMeanTemp	See Temp. Measurement / 0x4500.	REAL (Float32)
15	AdcTorBarMeanTemp	See Temp. Measurement / 0x4502.	REAL (Float32)
16	OnBrdTemp	See Temp. Measurement / 0x4504.	REAL (Float32)
17	PrsMean	See Pressure / 0x4604 (RHE2X).	REAL (Float32)
18	AssuranceFactor	See Generic / 0x4026 (RHE2X).	REAL (Float32)
19	StdDensity	See Density / 0x480A.	REAL (Float32)
20	VolPercentMainSubstance	See Density / 0x480C.	REAL (Float32)
21	MassFlowRateDisplay	See Mass Flow/0x4904	REAL (Float32)
22	VolumetricFlowRateDisplay	See Volume Flow/0x4A02	REAL (Float32)

The measurement data is expanded by their unit codes and unit strings added for convenience. These are intended to be read out at the startup of a system:

Parameter Index	Modbus Name	Modbus Address	Type
23	TemperatureUnit	0x6100	DWORD (Unsigned32)
24	PressureUnit	0x6102	DWORD (Unsigned32)
25	MassUnit	0x6104	DWORD (Unsigned32)
26	MassFlowUnit	0x6106	DWORD (Unsigned32)
27	DensityUnit	0x6108	DWORD (Unsigned32)
28	VolumeFlowUnit	0x610A	DWORD (Unsigned32)
29	VolumeUnit	0x610C	DWORD (Unsigned32)
30	TemperatureUnitString		SHORT_STRING (8 Characters)
31	PressureUnitString		SHORT_STRING (8 Characters)
32	MassUnitString		SHORT_STRING (8 Characters)
33	MassFlowUnitString		SHORT_STRING (8 Characters)
34	DensityUnitString		SHORT_STRING (8 Characters)
35	VolumeFlowUnitString		SHORT_STRING (8 Characters)
36	VolumeUnitString		SHORT_STRING (8 Characters)

The unit strings are 8 characters long and not 0-terminated. They are encoded in the ISO 8859-1 character set and contain special characters such as ‘°’ or ‘²’ which must be translated to the target character encoding used for the display of strings.

Further output data items are specified which can be read or written and can be used to influence the RHE transmitter. These are shown in the following table:

Parameter Index	Modbus Name	Modbus Address	Type
37	UserPassword	0x6004	SHORT_STRING (4 ASCII Characters)
38	TotInvenReq	0x6B06	UDINT (Unsigned32)
39	ZeroingRequest	0x672A	UDINT (Unsigned32)
40	Squawk	0x6F1C	UDINT (Unsigned32)
43	cyclicResetRequest	0x60E6	UDINT (Unsigned32)

Since these registers may be written asynchronously or synchronously (multiple periodical writes) an action resulting from a write of a value will only take effect when the value changes. This is true for the TotInvenReq and ZeroingRequest parameters which also have a slightly different specification than their related Modbus registers. The following table shows the allowed values to be written into these registers.

Parameter Index / Address	Name	Description
38 / 0x6B06	TotInvenReq (TotInvenCmd)	**Totalizer Command:** Totalizer command from a subsystem. A write to this register will cause an action only if the value is changed. In order to repeat a command a 0 shall be written before the intended command is issued. A transition to one of the following values causes 0: No operation. 1: Totalizer Reset. 2: Totalizer Stop. 3: Totalizer Reset & Start. 4: Totalizer Reset & Stop (since Release 2.44) 5: Totalizer Start (since Release 2.44) 6: Totalizer Reset & Stop, also resets secondary totalizers (0x4B2C and 0x4B30). (since Release 2.44) 7: Totalizer Reset & Start, also resets secondary totalizers (0x4B2C and 0x4B30). (since Release 2.44) All other values are ignored without an error indication. This status of the totalizers can be obtained by reading the register TotInvenReq (0x6B00). The function of the command "Totalizer Reset" depends on the current state of the totalizers. When the state is stopped, the totalizer is reset and the stopped state is maintained. Otherwise, a running totalizer is reset and will be restarted automatically.
39 / 0x672A	ZeroingRequest	**Zeroing Request FF:** A transition from "0" to "1" starts the Zeroing Process is active. Before another Zeroing can be started a "0" must be written to this register.
43 / 0x60E6	cyclicResetRequest	**Cyclic Reset Request:** This parameter is set to the value 57005. Whenever it is modified and then set to the value 57005 again the RHE transmitter performs a reset. This allows a reset request to be issued by cyclic data writes. Using an initial write of the value 0 will cause a reset whenever this value is changed back to 57005. This parameter is intended to be used by cyclic fieldbus data transfers.

Since these a read of these registers just returns the last written value following read-only status registers are added in order to obtain the related state information:

Parameter Index	Modbus Name	Modbus Address	Type
41	ZeroingStatus	0x470A	UDINT (Unsigned32)
42	TotalizerStatus	0x6B00	UDINT (Unsigned32)

The values in these registers have following meaning:

Parameter Index / Address	Name	Description
41 / 0x470A	ZeroingStatus	**State of the Zeroing Process:** Current state of the Zeroing Process: 0: Zeroing inactive. 1: Zeroing active
42 / 0x6B00	TotalizerStatus (TotInvenReq)	**Totalizer State:** Reflects the status of the Totalizer. 1 = Stopped/Not running 3 = Started/Running

Before a Zeroing, a Cyclic Reset or the Squawk function can be initiated the currently valid user password has to be written to the UserPassword data item. The default user password is “1111”.

For further information on the referenced data items please refer to the RHE40 Desktop Reference manual.

7 Modbus TCP, Access to the RHE45 Configuration Registers

Aside from the EtherNet/IP protocol the RHE45 Transmitter also may be accessed via the Modbus TCP protocol via the Ethernet 100 Base TX ports when option “EN” (EtherNet/IP) is installed in the RHE transmitter. This allows a full access to the configuration registers and measurement results present in the transmitter as described by the RHE40 Desktop Reference Manual. The accesses to the EtherNet/IP and the Modbus TCP protocols may be performed at the same time. Since the Modbus TCP accesses may induce an additional load on the Ethernet network and thus may disturb the real-time oriented bandwidth allocation of an EtherNet/IP network, the concurrent operation is not recommended, however.

We recommend the RHEComPro PC program as an excellent means to set up and test an RHE45 Transmitter configuration during a maintenance phase of a system when the real-time properties of the network are not needed.

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Rheonik Messtechnik GmbH
Rudolf-Diesel-Straße 5
D-85235 Odelzhausen
Germany

Tel + 49 (0)8134 9341-0
info@rheonik.com