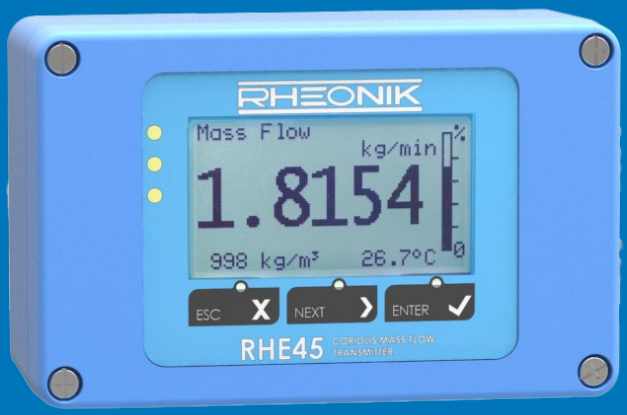
RHEONIK.



RHE45
Desktop Reference Addendum
PROFINET

GET FLOW MEASURED

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RHE 45
Transmitter

Desktop Reference Addendum Profinet for Anybus Modules

RHEONIK.

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1 Purpose

This document describes the properties of the optional Profinet interface of the RHE45 Transmitters. This interface is installed when the “EP” option is present in the order number of the transmitter.

The Profinet interface offers a fast access to the main measurement variables in the transmitter via the Profinet 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 the Profinet interface the RHE40 Transmitter with option “EP” 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 Profinet connectors.

Section 2 of this document contains the references to the basic documentation, section 3 describes the connectors to the Profinet hardware interface, section 5 the identification of the RHE45 Transmitter including the reference to the respective GSDML 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 Profinet 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 Profinet 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.

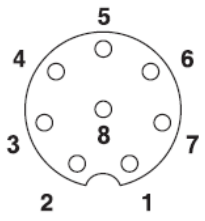
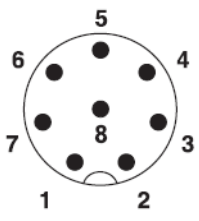


Figure 1: Pin Numbering of the RHE45 8-pin M12 Socket



Top View Plug

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

For easiest connection to the Profinet 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 a Profinet installations has a means to configure the network parameters of all attached interfaces implementing the Profinet protocol. This type of configuration is done with the help of dedicated Profinet 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.

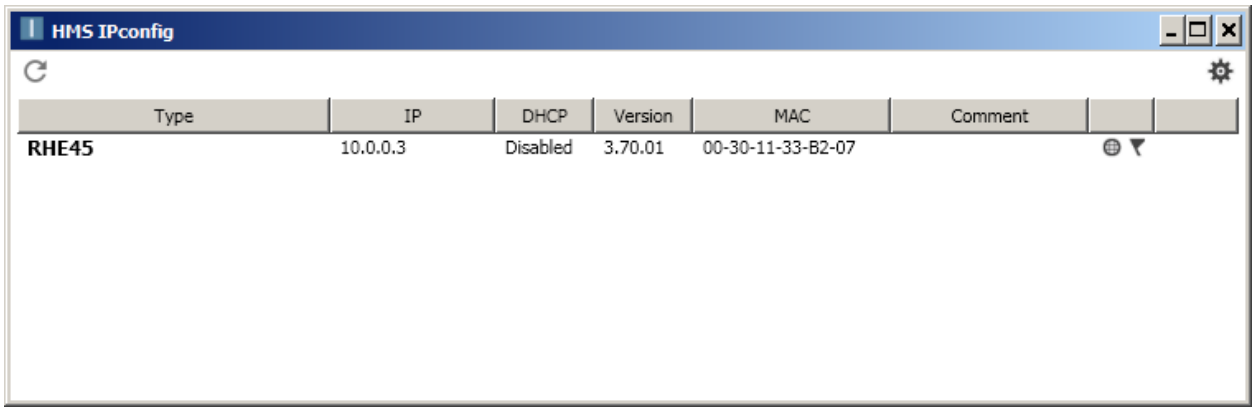


Figure 3: List of Anybus modules found by the HMS ipconfig tool.

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.

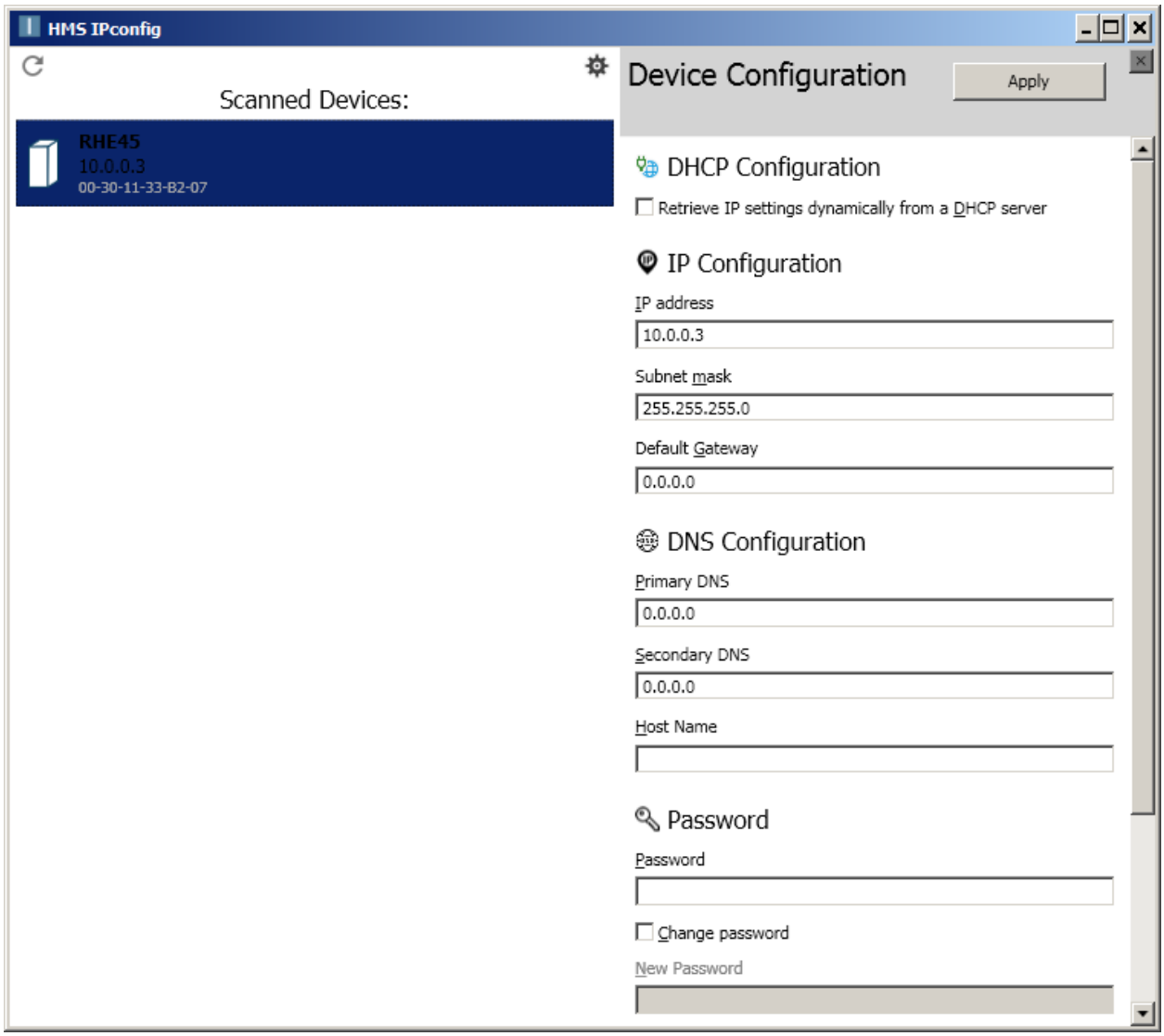


Figure 4: Configuration window of the HMS ipconfig tool.

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 Profinet interface module. An example is shown in Figure 5 below.

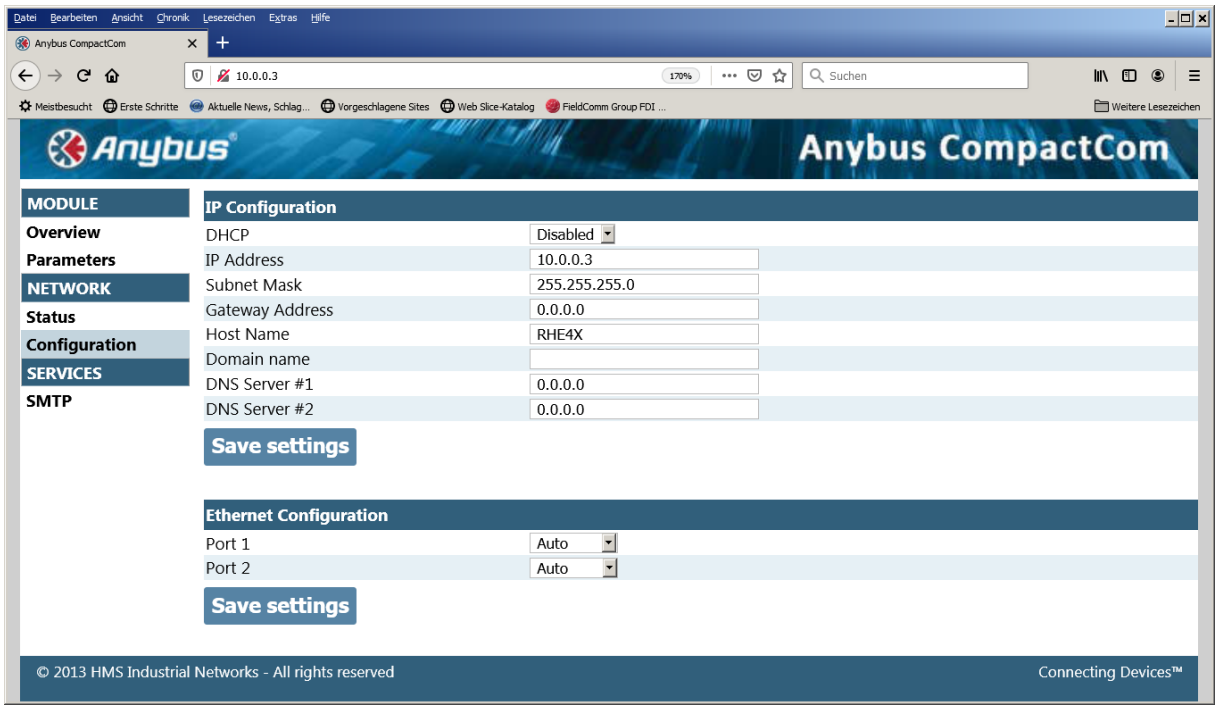


Figure 5: Profinet Network Configuration HTML Example.

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

5 Profinet Identification, GSDML File

The Profinet Vendor ID assigned to Rheonik by the PI organization is 1388 or 0x056C in hexadecimal representation. The GDSML file bears the name

GSDML-V2.35-Rheonik Messtechnik GmbH-RHE45-20211219.xml

for the RHE45 Transmitter. The Device ID assigned to the RHE45 Transmitter is 0x0001 when the Profinet functionality is implemented with the help of an Anybus Module.

The GSDML file contains the features of the underlying Profinet 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 GSDML file also contains the list of variables resp. parameters accessible via the Profinet interface as described in the next section.

6 Profinet IO and RT Variable Access

As mentioned above the Profinet 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:

ADI #	Modbus Name	Modbus Reference	Type
256	ErrorStatus	See Generic / 0x401A.	Unsigned32
257	SoftError	See Generic / 0x401C.	Unsigned32
258	Warnings	See Generic / 0x401E.	Unsigned32
259	InfoStatus	See Generic / 0x4020.	Unsigned32
260	DenComp	See Density / 0x4806.	Float32
261	MassFlowRate	See Mass Flow / 0x4900.	Float32
262	VolumetricFlowRate	See Volumetric Flow / 0x4A00.	Float32
263	TotalMassFwd	See Totalizer / 0x4B00.	Float32
264	TotalVolFwd	See Totalizer / 0x4B02.	Float32
265	TotInvenMassNet	See Totalizer / 0x4B04.	Float32
266	TotInvenVolNet	See Totalizer / 0x4B06.	Float32
267	TotalMassRev	See Totalizer / 0x4B08.	Float32
268	TotalVolRev	See Totalizer / 0x4B0A.	Float32
269	AdcTubeMeanTemp	See Temp. Measurement / 0x4500.	Float32
270	AdcTorBarMeanTemp	See Temp. Measurement / 0x4502.	Float32
271	OnBrdTemp	See Temp. Measurement / 0x4504.	Float32
272	PrsMean	See Pressure / 0x4604 (RHE2X).	Float32
273	AssuranceFactor	See Generic / 0x4026 (RHE2X).	Float32
274	StdDensity	See Density / 0x480A.	Float32
275	VolPercentMainSubstance	See Density / 0x480C.	Float32
276	MassFlowRateDisplay	See Mass Flow/0x4904	Float32
277	VolumetricFlowRateDisplay	See Volume Flow/0x4A02	Float32

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

ADI #	Modbus Name	Modbus Address	Type
320	TemperatureUnit	0x6100	Unsigned16
321	PressureUnit	0x6102	Unsigned16
322	MassUnit	0x6104	Unsigned16
323	MassFlowUnit	0x6106	Unsigned16
324	DensityUnit	0x6108	Unsigned16
325	VolumeFlowUnit	0x610A	Unsigned16
326	VolumeUnit	0x610C	Unsigned16

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:

ADI #	Modbus Name	Modbus Address	Type
384	UserPassword	0x6004	Unsigned32
385	TotInvenReq	0x6B06	Unsigned32
386	ZeroingRequest	0x672A	Unsigned32
387	Squawk	0x6F1C	Unsigned32
390	cyclicResetRequest	0x60E6	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.

ADI # / Address	Name	Description
385 / 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.
386 / 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.
390 / 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:

ADI #	Modbus Name	Modbus Address	Type
387	ZeroingStatus	0x470A	Unsigned32
388	TotalizerStatus	0x6B00	Unsigned32

The values in these registers have following meaning:

ADI # / Address	Name	Description
387 / 0x470A	ZeroingStatus	**State of the Zeroing Process:** Current state of the Zeroing Process: 0: Zeroing inactive. 1: Zeroing active
388 / 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 0x31313131 (represents the 4-digit string“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 Profinet protocol the RHE45 Transmitter also may be accessed via the Modbus TCP protocol via the Ethernet 100 Base TX ports when option “EP” (Profinet) 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 Profinet 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 a Profinet 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.

About Rheonik

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Our research and engineering resources are dedicated to finding new and better ways to provide cost effective accurate mass flow solutions that provide value to our customers. Our manufacturing group care for each and every meter we produce from raw materials all the way to shipping, and our service and support group are available to help you specify, integrate, start-up and maintain every Rheonik meter you have in service. Whether you own just one meter or have hundreds, you will never be just another customer to us. You are our valued business partner.

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