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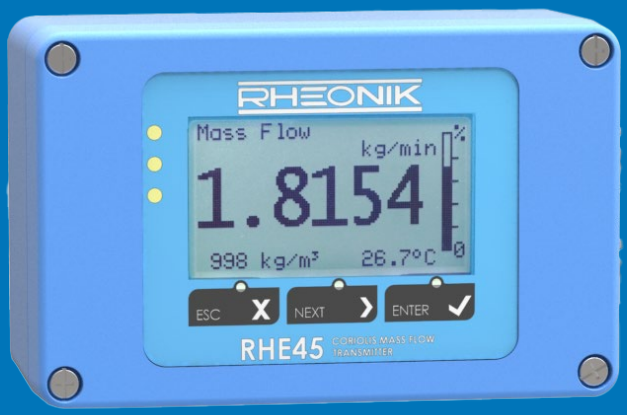

RHE45
Desktop Reference Addendum EtherCAT

GET FLOW MEASURED

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Document No.: X.X.6
Version 2.00
December 2025

RHE 45
Transmitter

Desktop Reference Addendum EtherCAT for Anybus Modules

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Table of Contents

1 Purpose

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

The EtherCAT interface offers a fast access to the main measurement variables in the transmitter via the EtherCAT 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 EtherCAT interface the RHE40 Transmitter with option “EC” also features an RS485 interface which can be used to configure the transmitter via the Modbus RTU protocol.

Section 2 of this document contains the references to the basic documentation, section 3 describes the connectors to the EtherCAT hardware interface, section 4 the identification of the RHE45 Transmitter including the reference to the respective HESI 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 EtherCAT 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 EtherCAT 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.

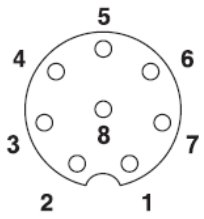

Figure 1: Pin Numbering of the RHE45 8-pin M12 Socket

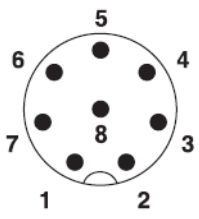

Figure 2: Pin Numbering of an 8-pin M12 Plug

For easiest connection to the EtherCAT 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

The EtherCAT option for the RHE4X transmitters does not support the Ethernet over EtherCAT (EoE) tunneling. Thus, neither Modbus TCP nor the HTML page available with other options is accessible via EtherCAT and no IP address needs to the assigned to the transmitter.

The assignment of the EtherCAT station number has to be done by the standard EtherCAT administration procedures and tools.

5 EtherCAT Identification, HESI File

The EtherCAT Vendor ID assigned to Rheonik by the ETG organization is 0x524D54 in hexadecimal representation. The RHE45 transmitter bears the Product Code 0x00000001.

Using these numbers the resulting HESI file name amounts to

RHE45_1_2_HESI.xml

for the RHE45 Transmitter.

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

6 EtherCAT Variable Access

As mentioned above the EtherCAT 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:

SDO Index	PDO Index	Modbus Name	Modbus Reference	Type
0x2100	0x1A00	ErrorStatus	See Generic / 0x401A.	BITARR32
0x2101	0x1A01	SoftError	See Generic / 0x401C.	BITARR32
0x2102	0x1A02	Warnings	See Generic / 0x401E.	BITARR32
0x2103	0x1A03	InfoStatus	See Generic / 0x4020.	BITARR32
0x2104	0x1A04	DenComp	See Density / 0x4806.	REAL
0x2105	0x1A05	MassFlowRate	See Mass Flow / 0x4900.	REAL
0x2106	0x1A06	VolumetricFlowRate	See Volumetric Flow / 0x4A00.	REAL
0x2107	0x1A07	TotalMassFwd	See Totalizer / 0x4B00.	REAL
0x2108	0x1A08	TotalVolFwd	See Totalizer / 0x4B02.	REAL
0x2109	0x1A09	TotInvenMassNet	See Totalizer / 0x4B04.	REAL
0x210A	0x1A0A	TotInvenVolNet	See Totalizer / 0x4B06.	REAL
0x210B	0x1A0B	TotalMassRev	See Totalizer / 0x4B08.	REAL
0x210C	0x1A0C	TotalVolRev	See Totalizer / 0x4B0A.	REAL

SDO Index	PDO Index	Modbus Name	Modbus Reference	Type
0x210D	0x1A0D	AdcTubeMeanTemp	See Temp. Measurement / 0x4500.	REAL
0x210E	0x1A0E	AdcTorBarMeanTemp	See Temp. Measurement / 0x4502.	REAL
0x210F	0x1A0F	OnBrdTemp	See Temp. Measurement / 0x4504.	REAL
0x2110	0x1A10	PrsMean	See Pressure / 0x4604 (RHE2X).	REAL
0x2111	0x1A11	AssuranceFactor	See Generic / 0x4026 (RHE2X).	REAL
0x2112	0x1A12	StdDensity	See Density / 0x480A.	REAL
0x2113	0x1A13	VolPercentMainSubstance	See Density / 0x480C.	REAL
0x2114	0x1A14	MassFlowRateDisplay	See Mass Flow/0x4904	REAL
0x2115	0x1A15	VolumetricFlowRateDisplay	See Volume Flow/0x4A02	REAL

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:

SDO Index	Modbus Name	Modbus Address	Type
0x2140	TemperatureUnit	0x6100	UINT
0x2141	PressureUnit	0x6102	UINT
0x2142	MassUnit	0x6104	UINT
0x2143	MassFlowUnit	0x6106	UINT
0x2144	DensityUnit	0x6108	UINT
0x2145	VolumeFlowUnit	0x610A	UINT
0x2146	VolumeUnit	0x610C	UINT
0x2147	TemperatureUnitString		STRING(8)
0x2148	PressureUnitString		STRING(8)
0x2149	MassUnitString		STRING(8)
0x214A	MassFlowUnitString		STRING(8)
0x214B	DensityUnitString		STRING(8)
0x214C	VolumeFlowUnitString		STRING(8)
0x214D	VolumeUnitString		STRING(8)

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:

SDO Index	Modbus Name	Modbus Address	Type
0x2180	UserPassword	0x6004	STRING(4)
0x2181	TotInvenReq	0x6B06	UDINT
0x2182	ZeroingRequest	0x672A	UDINT
0x2183	Squawk	0x6F1C	UDINT
0x2186	cyclicResetRequest	0x60E6	UDINT

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.

SDO Index / Address	Name	Description
0x2181 / 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.
0x2182 / 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.
0x2186 / 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:

SDO Index	Modbus Name	Modbus Address	Type
0x2184	ZeroingStatus	0x470A	UDINT
0x2185	TotalizerStatus	0x6B00	UDINT

The values in these registers have following meaning:

SDO Index / Address	Name	Description
0x2184 / 0x470A	ZeroingStatus	**State of the Zeroing Process:** Current state of the Zeroing Process: 0: Zeroing inactive. 1: Zeroing active
0x2185 / 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 Access to the RHE4X Configuration Registers

Aside from the EtherCAT protocol the RHE4X Transmitter also may be accessed via the Modbus RTU protocol via the RS485 interface when option “EC” 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 EtherCAT and the Modbus RTU protocols may be performed at the same time.

We recommend the RHEComPro PC program as an excellent means to set up and test an RHE4X 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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No matter what control system you use as the backbone in your enterprise, with our **AnyInterface Commitment**, you can be sure that connection and communication will not be a problem. Alongside a wide variety of discrete analog and digital signal connections, we can also provide just about any network/bus interface available (for example: HART, ProfibusDP, ProfiNet, EtherCAT, PowerLink, EtherNet/IP, CAN, ….) with our RHE 40 Series family of transmitters. Rheonik RHE 40 Series transmitters can connect to your system – no headache and no conversion needed.

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