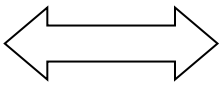
ERW700(A)
Modbus

Fuji Electric
Innovating Energy Technology

Manual
ERW700(A)
Modbus

Manual

Connecting the ERW700 and ERW700A to a Modbus Master



Modbus

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ERW700(A) Modbus

Version of: 2015-10-12

Changes:
2013-04-17:

- Ethernet TCP/IP added

2014-04-29:

- AUX counters added

2015-01-07:

- Manual for EWR700 and ERW700A joined

2015-10-12:

- Error corrected: address TAG-No.

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Contents

1 General

1.1 ERW700 and ERW700A

This document describes the Modbus functions of the ERW700 and the ERW700A. Both unit types have the same basic functionality, but differ considerably in the register assignment.

1.2 Application

The ERW700(A) has an RS 232 interface through which the Modbus master can communicate with the ERW700(A), which is then Modbus slave. Alternatively, data transfer is in ASCII, RTU or TCP/IP protocol. If the ERW700(A) is connected to a Modbus master with RS 485 interface, an additional plugin module working as a RS232 to RS485 converter is required. This must have an automatic detection of data flow direction, and should provide a galvanic isolation. For TCP/IP communication a plugin module Ethernet is required.

1.3 General information about Modbus

Modbus is an open standardized fieldbus system that is used around the world. The scope includes the production, process and building automation. This guide can be no general introduction to Modbus. Reference is made to the literature "Modicon Protocol Reference Guide" and website "http://www.modbus.org".

2 Description of the Parameter

2.1 Description of the Modbus parameters

The following parameters must be parameterized manually or via the Modbus to the ERW700(A).

2.1.1 Modbus baud rate

It supports baud rates from 2400 to 19200 baud.

2.2.1 Modbus parity

It supports parity of NO, EVEN and ODD. Default is NO.

2.3.1 Modbus data bits

It supports 7- and 8-bit data format. Default is 8-data bits. The 7-bit format is only allowed in ASCII mode.

2.4.1 Modbus ID (address)

The Modbus address specifies the ID of the device. The default address is 1.

2.5.1 Modbus Mode

There are 2 modes, ASCII and RTU. In the ASCII mode of data exchange is as readable ASCII string. Special characters serve to control the data flow. In the RTU mode, the data are encoded (binary) and the transfer control of data flow via time slot.

3 Description of the Modbus functions

3.1 General Modbus functions

Transmission mode:	RTU transmission mode ASCII transmission mode	
Data frame:	1 Start bit 7/8 Data bit no / even / odd 1 Stop bit	 (Standard 8) (Standard no)
Data coding:	Hex ASCII	(RTU-mode) (ASCII-mode)
Address range:	0 - 255	0 = Broadcast address

3.2 Error handling:

If an invalid command or invalid data is detected, the answer is with an error code. The MSBit (most significant bit) in the function code (FC) is set. In addition, an exception code (EC) is sent.

Byte No.	0	1	2	3
	ID	FC	EC	CRC

Exception Codes:	01	illegal function
	02	illegal data address
	03	illegal data value

If the data is outside the permitted range or if the access is password locked, an error message is also exception Code 3 and the data will not be accepted.

3.3 Data transmission:

The data is transmitted in accordance with the Open Modbus Specification 1.0. Each data point is as minimal a register transfer. Based on a register (integer) the most significant byte is sent first. With data types that include more than one register, the least significant register is transmitted first. (Sometimes referred to as little endian twisted.)

Functions

Function:	**Description**
03_H, Read Register:	Read Register
08_H, Diagnostics, communications test:	It supports only the sub-Function Code 00. Regardless of the sub-function code the answer is always an echo of the request (query return data)
10_H, Write Register:	It supports only the sub-Function Code 00. Regardless of the sub-function code, the answer is always an echo of the request (query return data)

Abbreviations:

ID	Slave Address 1...255
FC	Function Code
StartAdr. H	Start Address High Byte
StartAdr. L	Start Address Low Byte
Anzahl H	Count of register High Byte
Anzahl L	Count of register Low Byte
Byte count	Count of data Bytes
Data H	Data High Byte
Data L	Data Low Byte
CRC	Cyclic Redundancy Check (Modbus RTU)
LRC	Longitudinal Redundancy Checking (Modbus ASCII)

Function 03 - Read Register

Query (Master):

Byte	0	1	2	3	4	5	6-7
	ID	FC=03	StartAdr. H	StartAdr. L	Anzahl H	Anzahl L	CRC/LRC

Response (Slave):

Byte	0	1	2	3	4	...	...
	ID	FC=03	Byte count	Data(0) H	Data(0) L	More Data	CRC/LRC

Function 08 - Diagnostics (Communications-test)

Only sub-function-code 00 is supported. Regardless of the sub-function code, the answer is always an echo of the request.

Query (Master):

Byte	0	1	2	3	4	5	6-7
	ID	FC=08	SubF H	SubF L	Data H	Data L	CRC/LRC

Response (Slave):

Byte	0	1	2	3	4	5	6-7
	ID	FC=08	SubF H	SubF L	Data H	Data L	CRC/LRC

Function 16 (10 hex) - Write Multiple Registers

Query (Master):

Byte	0	1	2	3	4	5	6
	ID	FC=10	StartAdr. H	StartAdr. L	Anzahl H	Anzahl L	Byte count

Byte	7	8	9	10	...	...	...
	Data H	Data L	Data H	Data L	Data H	Data L	CRC/LRC

Response (Slave):

Byte	0	1	2	3	4	5	6-7
	ID	FC=10	StartAdr. H	StartAdr. L	Anzahl H	Anzahl L	CRC/LRC

4 Description of the registers for ERW700

4.1 ERW700 – Registers

Register from - to	Access	Data type	Description	Value range / Unit
1	R	Integer	Software version	132 = V1.32 etc.
2	R	Integer	Device type	10: ERW700 (Metrokon)
3	R	integer	Serial No	0 - 65536
1820-1827	R / W	String	TAG No.	abcd1234ijklmno
5	R	integer	CRC Code	
6	R	integer	CRC – custody transfer parameters	
7	R	integer	CRC – non custody transfer parameters	
2402	R / W	integer	Modbus baud rate	0=2400,1=4800,2=9600, 3=19200
2404	R / W	integer	Modbus parity	0=No,1=Even,2=Odd
2403	R / W	integer	Modbus data bit	0=7,1=8
2401	R / W	integer	Modbus ID	1-255
2400	R / W	integer	Modbus mode	0=AUS, 1=Modbus-ASCII, 2=Modbus-RTU
300 - 301	R	long	ERW700 error (1..32)	see manual ERW700
302 - 303	R	long	ERW700 error (33..64)	see manual ERW700
306 - 307	R	long	ERW700 state	see manual ERW700
2408 - 2409	R / W	float	Counter factor	0,0001 – 1000 (only decadal values)
1000 - 1001	R	long	ZLW Energy 1	Wh / Counter factor
1002 - 1003	R	long	ZLW Energy 2	Wh / Counter factor
1004 - 1005	R	long	ZLW Energy 3	Wh / Counter factor
1006 - 1007	R	long	ZLW Mass 1	kg / Counter factor
1008 - 1009	R	long	ZLW Mass 2	kg / Counter factor
1010 - 1011	R	long	ZLW Mass 3	kg / Counter factor
1012 - 1013	R	long	ZLW Volume 1	l / Counter factor
1014 - 1015	R	long	ZLW Volume 2	l / Counter factor
1016 - 1017	R	long	ZLW Volume 3	l / Counter factor
1018 - 1019	R	long	ZLW Standard-Volume 1	l / Counter factor
1020 - 1021	R	long	ZLW Standard-Volume 2	l / Counter factor
1022 - 1023	R	long	ZLW Standard-Volume 3	l / Counter factor
1100 - 1101	R	float	Power P 1	kW
1102 - 1103	R	float	Power P 2	kW
1104 - 1105	R	float	Mass flow Qm 1	kg/h
1106 - 1107	R	float	Mass flow Qm 2	kg/h
1108 - 1109	R	float	Volume Flow Qb 1	m^3/h

1110 - 1111	R	float	Volume Flow Qb 2	m³/h
1112 - 1113	R	float	Standard volume Flow Qn 1	m³/h
1114 - 1115	R	float	Standard volume Flow Qn 2	m³/h
1500 - 1501	R	float	Hot temp	°C
1502 - 1503	R	float	Cold temp	°C
1504 - 1505	R	float	Diff temp	K
1506 - 1507	R	float	Pressure 1	bar
1508 - 1509	R	float	Pressure 2	bar
1510 - 1511	R	float	Difference pressure	mbar
1512 - 1513	R	float	Difference pressure 1	
1514 - 1515	R	float	Difference pressure 2	mbar
				mbar
1516 - 1517	R	float	Current input 1	mA
1518 - 1519	R	float	Current input 2	mA
1520 - 1521	R	float	Current input 3	mA
1522 - 1523	R	float	Current input 4	mA
1524 - 1525	R	float	Frequency 1	Hz
1526 - 1527	R	float	Frequency 2	Hz
1528 - 1529	R	float	PT 1	Ohm
1530 - 1531	R	float	PT 2	Ohm
1534 - 1535	R	float	Density 1	kg/m³
1536 - 1537	R	float	Density 2	kg/m³
2488 - 2489	R	long	Operating hours	min
2490 - 2491	R	long	Measure hours	min
2492 - 2493	R	long	Satt. steam hours	min
2494 - 2495	R	long	Error hours	Min
2346 - 2347	R / W	long	Date	Special Date
2348 - 2349	R / W	long	Time	Special time

Special:

	Byte order as Long			
	MSB			**LSB**
Date	Year	Weekday Mo=0	Day	Month
Time	Second	-	Hour	Minute

	Byte order data transmission			
	Byte n	**Byte n+1**	**Byte n+2**	**Byte n+3**
Date	Day	Month	Year	Weekday Mo=0
time	hour	Minute	Second	-

ZLW = counter
To get the actual meter reading in the specified unit, the value must be divided by the counter factor.

4.2 ERW700 – Data logger

The structure of the data of the monthly values and the storage period depend on the settings of the calculator.

Attention! Byte order is different from the standard Modbus registers. It corresponds to the memory dump for Intel processors.

Structure data logger defined date

Address from	Address to	Format	Description	Unit
14000			Start address	
14000	14000	integer	Code	
14001	14002	unsigned long	Date 1	Unix time
14003	14006	double	Energy 1	Wh
14007	14010	double	Mass 1	kg
14011	14014	double	Volume 1	l
14015	14018	double	Standard Volume 1	l
14019	14022	double	Energy 2	Wh
14023	14026	double	Mass 2	kg
14027	14030	double	Volume 2	l
14031	14034	double	Standard Volume 2	l
14035	14035	integer	Code	
14036	14037	unsigned long	Date 2	Unix time
14038	14041	double	Energy 1	Wh
14042	14045	double	Mass 1	kg
14046	14049	double	Volume 1	L
14050	14053	double	Standard Volume 1	L
14054	14057	double	Energy 2	Wh
14058	14061	double	Mass 2	Kg
14062	14065	double	Volume 2	L
14066	14069	double	Standard Volume 2	L

Structure data logger monthly values without additional counters

Address from	Address to	Format	Description	Unit
15000			Start address	
15000	15000	integer	Code	
15001	15002	unsigned long	Month	Unix time
15003	15006	double	Energy 1	Wh
15007	15010	double	Mass 1	Kg
15011	15014	double	Volume 1	L
15015	15018	double	Standard Volume 1	L
15019	15053	Structure Month	Month 2	
…	…			

15000	+(n-1)*19	Structure Month	Month n	
			n-max = 30	

Structure data logger monthly values with additional counters

Address from	Address to	Format	Description	Unit
15000			Start address	
15000	15000	integer	Code	
15001	15002	unsigned long	Month	Unix time
15003	15006	double	Energy 1	Wh
15007	15010	double	Mass 1	kg
15011	15014	double	Volume 1	l
15015	15018	double	Standard Volume 1	l
15019	15022	double	Energy 2	Wh
15023	15026	double	Mass 2	kg
15027	15030	double	Volume 2	l
15031	15034	double	Standard Volume 2	l
15035	15069	Structure Month	Month 2	
…	…			
15000	+(n-1)*35	Structure Month	Month n	
			n-max = 16	

Structure data logger period storage only ZLW1

Address from	Address to	Format	Description	Unit
20000			Start address	
20000	20000	integer	Code	
20001	20002	unsigned long	Period	Unix time
20003	20006	double	Energy 1	Wh
20007	20010	double	Mass 1	kg
20011	20014	double	Volume 1	l
20015	20018	double	Standard Volume 1	l
20019	20053	Structure Period	Period 2	
…	…			
20000	+(n-1)*19	Structure Period	Period n	
			n-max = 800	

Structure data logger period storage ZLW1 + 2

Address from	Address to	Format	Description	Unit
20000			Start address	
20000	20000	integer	Code	

20001	20002	unsigned long	Period	Unix time
20003	20006	double	Energy 1	Wh
20007	20010	double	Mass 1	kg
20011	20014	double	Volume 1	l
20015	20018	double	Standard Volume 1	l
20019	20022	double	Energy 2	Wh
20023	20026	double	Mass 2	kg
20027	20030	double	Volume 2	l
20031	20034	double	Standard Volume 2	l
20035	20069	Structure Period	Period 2	
…	…			
20000	+(n-1)*35	Structure Period	Period n	
			n-max = 400	

Structure data logger period storage ZLW 1 und Flow 1

Address from	**Address to**	**Format**	**Description**	**Unit**
20000			Start address	
20000	20000	integer	Code	
20001	20002	unsigned long	Period	Unix time
20003	20006	double	Energy 1	Wh
20007	20010	double	Mass 1	kg
20011	20014	double	Volume 1	l
20015	20018	double	Standard Volume 1	l
20019	20020	unsigned long	Min time	Unix time
20021	20022	float	Min Power Period 1	W
20023	20024	unsigned long	Max time	Unix time
20025	20026	float	Max Power Period 1	W
20027	20028	unsigned long	Min time	Unix time
20029	20030	float	Min Mass flow Period 1	kg/h
20031	20032	unsigned long	Max time	Unix time
20033	20034	float	Max Mass flow Period 1	kg/h
20035	20036	unsigned long	Min time	Unix time
20037	20038	float	Min Volume flow Period 1	m3/h
20039	20040	unsigned long	Max time	Unix time
20041	20042	float	Max Volume flow Period 1	m3/h
20043	20044	unsigned long	Min time	Unix time
20045	20046	float	Min Standard volume flow Period 1	m3/h
20047	20048	unsigned long	Max time	Unix time
20049	20050	float	Max Standard volume flow Period 1	m3/h
20051	20102	Structure Period	Period 2	
…	…			
20000	+(n-1)*51	Structure Period	Period n	
			n-max = 300	

Structure data logger period storage ZLW 1+2 und Flow 1+2

Address from	Address to	Format	Description	Unit
20000			Start address	
20000	20000	integer	Code	
20001	20002	unsigned long	Period	Unix time
20003	20006	double	Energy 1	Wh
20007	20010	double	Mass 1	kg
20011	20014	double	Volume 1	l
20015	20018	double	Standard Volume 1	l
20019	20022	double	Energy 2	Wh
20023	20026	double	Mass 2	kg
20027	20030	double	Volume 2	l
20031	20034	double	Standard Volume 2	l
20035	20036	unsigned long	Min time	Unix time
20037	20038	float	Min Power Period 1	W
20039	20040	unsigned long	Max time	Unix time
20041	20042	float	Max Power Period 1	W
20043	20044	unsigned long	Min time	Unix time
20045	20046	float	Min Mass flow Period 1	kg/h
20047	20048	unsigned long	Max time	Unix time
20049	20050	float	Max Mass flow Period 1	kg/h
20051	20052	unsigned long	Min time	Unix time
20053	20054	float	Min Volume flow Period 1	m3/h
20055	20056	unsigned long	Max time	Unix time
20057	20058	float	Max Volume flow Period 1	m3/h
20059	20060	unsigned long	Min time	Unix time
20061	20062	float	Min standard volume flow Period 1	m3/h
20063	20064	unsigned long	Max time	Unix time
20065	20066	float	Max standard volume flow Period 1	m3/h
20067	20068	unsigned long	Min time	Unix time
20069	20070	float	Min Power Period 2	W
20071	20072	unsigned long	Max time	Unix time
20073	20074	float	Max Power Period 2	W
20075	20076	unsigned long	Min time	Unix time
20077	20078	float	Min Mass flow Period 2	kg/h
20079	20080	unsigned long	Max time	Unix time
20081	20082	float	Max Mass flow Period 2	kg/h
20083	20084	unsigned long	Min time	Unix time
20085	20086	float	Min Volume flow Period 2	m3/h
20087	20088	unsigned long	Max time	Unix time
20089	20090	float	Max Volume flow Period 2	m3/h
20091	20092	unsigned long	Min time	Unix time
20093	20094	float	Min standard volume flow Period 2	m3/h
20095	20096	unsigned long	Max time	Unix time
20097	20098	float	Max standard volume flow Period 2	m3/h
20099	20150	Structure Period	Period 2	
…	…			

20000	+(n-1)*99	Structure Period	Period n	
			n-max = 150	

5 Description of the registers for ERW700A

5.1 ERW700A – Registers

Register from – to	Access	Data type	Description	Value range / Unit
1	R	integer	Software version	132 = V1.32 etc.
2	R	integer	Device type	11 = ERW700A
3	R	integer	Serial No	0 – 65536
4000-4007	R / W	String	TAG No.	abcd1234ijklmno
5	R	integer	CRC Code	
6	R	integer	CRC – custody transfer parameters	
7	R	integer	CRC – non custody transfer parameters	
2402	R / W	integer	Modbus baud rate	0=2400,1=4800,2=9600, 3=19200
2404	R / W	integer	Modbus parity	0=No,1=Even,2=Odd
2403	R / W	integer	Modbus data bit	0=7,1=8
2401	R / W	integer	Modbus ID	1-255
2400	R / W	integer	Modbus mode	0=AUS, 1=Modbus-ASCII, 2=Modbus-RTU
300 – 301	R	long	ERW700A error (1..32)	see manual ERW700A
302 – 303	R	long	ERW700A error (33..64)	see manual ERW700A
304 – 305	R	long	ERW700A error (65..96)	see manual ERW700A
306 – 307	R	long	ERW700A error (97..128)	see manual ERW700A
308 – 309	R	long	ERW700A error (129..160)	see manual ERW700A
310 – 311	R	long	ERW700A error (161..192)	see manual ERW700A
321	R	integer	ERW700A error short	1)
312 – 313	R	long	ERW700A state	see manual ERW700A
2408 – 2409	R / W	float	Counter factor	0,0001 – 1000 (only decadal values)
1000 – 1001	R	long	ZLW Energy 1	Wh / Counter factor
1002 – 1003	R	long	ZLW Energy 2	Wh / Counter factor
1004 – 1005	R	long	ZLW Mass 1	kg / Counter factor
1006 – 1007	R	long	ZLW Mass 2	kg / Counter factor
1008 – 1009	R	long	ZLW Volume 1	l / Counter factor
1010 – 1011	R	long	ZLW Volume 2	l / Counter factor
1012 – 1013	R	long	ZLW Standard-Volume 1	l / Counter factor
1014 – 1015	R	long	ZLW Standard-Volume 2	l / Counter factor
1064 – 1065	R	long	AUX1	as basic ZLW
1066 – 1067	R	long	AUX2	as basic ZLW
1068 – 1069	R	long	AUX3	as basic ZLW
1070 – 1071	R	long	AUX4	as basic ZLW
1200 – 1201	R	float	Power P 1	kW
1202 – 1203	R	float	Power P 2	kW

1206 – 1207	R	float	Mass flow Qm 1	kg/h
1208 – 1209	R	float	Mass flow Qm 2	kg/h
1212 – 1213	R	float	Volume flow Qb 1	m³/h
1214 – 1215	R	float	Volume flow Qb 2	m³/h
1218 – 1219	R	float	Standard volume flow Qn 1	m³/h
1220 – 1221	R	float	Standard volume flow Qn 2	m³/h
1500 – 1501	R	float	Temperature 1 (hot)	°C
1504 – 1505	R	float	Temperature 2 (cold)	°C
1508 – 1509	R	float	Diff. Temp. 1	K
1510 – 1511	R	float	Pressure 1	bar
1514 – 1515	R	float	Pressure 2	bar
1518 – 1519	R	float	Diff. pressure 1	mbar
1520 – 1521	R	float	Diff. pressure 1A	mbar
1522 – 1523	R	float	Diff. pressure 1B	mbar
1524 – 1525	R	float	Current input 1	mA
1526 – 1527	R	float	Current input 2	mA
1528 – 1529	R	float	Current input 3	mA
1530 – 1531	R	float	Current input 4	mA
1532 – 1533	R	float	Frequency 1	Hz
1534 – 1535	R	float	Frequency 2	Hz
1536 – 1537	R	float	PT 1	Ohm
1538 – 1539	R	float	PT 2	Ohm
1542 – 1543	R	float	Density 1	kg/m³
1546 – 1547	R	float	Density 2	kg/m³
2488 - 2489	R	long	Operating hours	min
2490 - 2491	R	long	Measure hours 1	min
2492 - 2493	R	long	Satt. steam hours 1	min
2494 - 2495	R	long	Error hours 1	Min
2646 - 2647	R	long	Measure hours 2	min
2648 – 2649	R	long	Satt. steam hours 2	min
2650 – 2651	R	long	Error hours 2	Min
2346 - 2347	R / W	long	Date	Special Date
2348 - 2349	R / W	long	Time	Special time

Special:

	Byte order as Long			
	MSB			**LSB**
Date	Year	Weekday Mo=0	Day	Month
Time	Second	-	Hour	Minute

	Byte order data transmission			
	Byte n	**Byte n+1**	**Byte n+2**	**Byte n+3**
Date	Day	Month	Year	Weekday Mo=0
time	hour	Minute	Second	-

ZLW = counter
To get the actual meter reading in the specified unit, the value must be divided by the counter factor.

5.2 ERW700A – Registers logbook

Register from - to	Access	Data type	Description	Value range / Unit
8000	R	integer	Software version logbook	100 = V1.00 usw.
8001	R	long	Total memory	Byte
8003	R	long	Free memory	Byte
8005	R	integer	Entries	
8006	R	integer	Free entries	
8007	R	integer	Free days	
8008	R	integer	Log start address	20000
8009	R	integer	Log first Index	20000 … Log end address
8010	R	integer	Log last Index	20000 … Log end address
8011	R	integer	Log end address	28327 (2 Mbit)
8012	R / W	integer	Index selection	20000 … Log end address

Register from - to	Access	Data type	Description	Value range / Unit
20000	R	Variant	Logbook entry	Length variable
…	R	Variant	Logbook entry	Length variable
28327	R	Variant	Logbook entry	Length variable

When accessing the registers 20000 ... end address all stored event data is transmitted in a string. Values that are not selected will not be saved and therefore not transferred. The sequence of data is corresponding to the following list. To facilitate access to the individual data points, with the "index selection" data selected are directly addressable.

Index selection

Register from - to	Access	Data type	Description	Value range / Unit
8012	R / W	integer	Index selection	20000 … End of index
19500	R	integer	CRC	CRC X-Modem
+1	R	long	Batch No.	
+3	R	integer	Length	
+4	R	integer	Event	See Events
+5	R	integer	Structure	
+6	R	integer	Error / Status	See Errors
+7	R	integer	Start time	
+9	R	integer	End time	
+11	R	float	Energy 1	
+13	R	float	Energy 1 event	
+15	R	float	Energy 1 interval	
+17	R	float	Energy 1 event interval	
+19	R	float	Energy 2	
+21	R	float	Energy 2 event	
+23	R	float	Energy 2 interval	
+25	R	float	Energy 2 event interval	

+27	R	float	Mass 1	
+29	R	float	Mass 1 event	
+31	R	float	Mass 1 interval	
+33	R	float	Mass 1 event interval	
+35	R	float	Mass 2	
+37	R	float	Mass 2 event	
+39	R	float	Mass 2 interval	
+41	R	float	Mass 2 event interval	
+43	R	float	Volume 1	
+45	R	float	Volume 1 event	
+47	R	float	Volume 1 interval	
+49	R	float	Volume 1 event interval	
+51	R	float	Volume 2	
+53	R	float	Volume 2 event	
+55	R	float	Volume 2 interval	
+57	R	float	Volume 2 event interval	
+59	R	float	Standard volume 1	
+61	R	float	Standard volume 1 event	
+63	R	float	Standard volume 1 interval	
+65	R	float	Standard volume 1 event interval	
+67	R	float	Standard volume 2	
+69	R	float	Standard volume 2 event	
+71	R	float	Standard volume 2 interval	
+73	R	float	Standard volume 2 event interval	
+75	R	float	Temperature 1 interval	
+77	R	float	Temperature 2 interval	
+79	R	float	Density 1 interval	
+81	R	float	Density 2 interval	
+83	R	float	Power 1 min	
+85	R	float	Power 1 max	
+87	R	float	Power 2 min	
+89	R	float	Power 2 max	
+91	R	float	Mass flow 1 min	
+93	R	float	Mass flow 1 max	
+95	R	float	Mass flow 2 min	
+97	R	float	Mass flow 2 max	
+99	R	float	Volume flow 1 min	
+101	R	float	Volume flow 1 max	
+103	R	float	Volume flow 2 min	
+105	R	float	Volume flow 2 max	
+107	R	float	Standard volume flow 1 min	
+109	R	float	Standard volume flow 1 max	
+111	R	float	Standard volume flow 2 min	
+113	R	float	Standard volume flow 2 max	

Access to unused log entries:
Accessed over a Modbus register on blank entries in response is "FFFFh" (-1)

CRC
The CRC is formed over the whole data set, starting with the batch number (base address + 1) to the last entry (base address +113). For calculating the method CRC X-modem is used. Entries that are not used will not be used for calculation.

Monitoring days:
Number of days for which the stored log events must remain at least in the log book (usually 90 days).

Total Memory:
All memory reserved for log entries is 216,544 bytes.
Depending on the configuration, the length of a log entry varies, which also varies the number of stored log events.

Free memory:
Memory that is not occupied or the data is older than the monitoring days.

Entries:
Number of log events currently stored.

Free entries:
Entries that are not occupied or the data is older than the monitoring days.

Free log days:
Number of days for which the log memory is sufficient typical yet. Average value calculated from the last entry.

Log start address:
Start address of the log memory. First entry that is possible.

Log first index:
Oldest entry.

Log Last Index:
Recent entry.

Log end address:
End address of the log memory.

Index selection:
Selection of an entry.

Events:

Bit	Description
Bit 0	*Reserved*
Bit 1	Error raised
Bit 2	Error cleared
Bit 3	Batch
Bit 4	Interval
Bit 5	Day
Bit 6	Month
Bit 7	Fixed date
Bit 8	Bus
Bit 9 … 15	*Reserved for future enhancements*

Example:

Readout of the recent batch

- Read „Log last index“ (8010)
- Write value from „Log last index“ into „Index selection“ (8012)
- Starting from register 19500 the data of the recent entry is available.
- Check error (19500+6)
- Check event (19500+4)
- If event = „batch“ then read batch number (19500+1)
- The corresponding measured values are then available in the following registers

5.3 ERW700A – Commands

To execute a command, the value is sent via Modbus. If the required level password enabled, the calculator performs the command and sets the value to "0". If the command is successful, the computer responds with the value "0". The command is not successful, then responding with a MODBUS error message.

Register from - to	Access	Password level	Data type	Value	Description
5000	W	3	integer	1	Clear all counters
5008	W	3	integer	1	Clear all counters 1 (primary)
5009	W	3	integer	1	Clear all counters 2 (secondary)
5010	W	2	integer	1	Clear interval counters 1
5011	W	2	integer	1	Clear interval counters 2
5012	W	3	integer	1	Clear event counter 1
5013	W	3	integer	1	Clear event counter 1
5001	W	0	integer	1	Clear error messages

5.4 Details to some registers

300 – 309, ERW700A Errors:
All error messages of ERW700 A are shown. The meaning of each error bits can be read from the operating instructions for ERW700A.

321, ERW700A Error short:
Some error messages are grouped.

Bit	Function
0	Any error
1	Energy primary (if energy counter stops due to a relevant error)
2	Volume/Standard/Mass primary (if counter stops due to a relevant error)
3	Energy secondary (if energy counter stops due to a relevant error)
4	Volume/Standard/Mass secondary (if counter stops due to a relevant error)
5	EEPROM
6..15	Not used yet

312 – 313, ERW700A Status:
All status messages of ERW700 A are shown.

Bit	Function
0	Eichbrücke / calibration switch
1	Kennwort Level 1 / password level 1
2	Kennwort Level 2 / password level 2
3	Kennwort Level 3 / password level 3
4	Kennwort Level 4 / pasword level 4
5	Eich-Siegel / seal for custody transfer
6	Schleichmenge 1 (primär) / low flow 1
7	Schleichmenge 2 (sekundär) / low flow 2
8	Sattdampf 1 (primär) / saturated steam 1
9	Sattdampf 2 (sekundär) / satureted steam 2
10	Fliegende Eichung /
11	Nullabgleich 1 (primär) / balancing 1
12	Nullabgleich 2 (sekundär) / balancing 2
13	CRC1 EEProm gültig / CRC1 valid
14	CRC2 EEProm gültig / CRC2 valid
15	Logspeicher voll / data log full

6 ERW700(A) – Example for data transmission

Name	Value	Format	Byte-Value	Byte-Order	Comment
Serial No.	30256 = 7630h	word	76h	n	MSB
			30h	n+1	LSB
Energy	12345678 = 00BC614Eh	long	61h	n	
			4Eh	n+1	LSB
			00h	n+2	MSB
			BCh	n+3	
Temperature	123,751	float	80h	n	
			83h	n+1	
			42h	n+2	
			F7h	n+3	
Date	27.12.2009	Date	1Bh	n	Day
			0Ch	n+1	Month
			09h	n+2	Year
			06h	n+3	Weekday Mo=0
Time	16:44:05	Time	10h	n	Hour
			2Ch	n+1	Minute
			05h	n+2	Second
			00h	n+3	
TAG No.	123456789012345	String	31h	n	ASCII(1)
			32h	n+1	
			33h	n+2	
			34h	n+3	
			35h	n+4	
			36h	n+5	
			37h	n+6	
			38h	n+7	
			39h	n+8	
			30h	n+9	
			31h	n+10	
			32h	n+11	
			33h	n+12	
			34h	n+13	
			35h	n+14	ASCII(5)
			00h	n+15	End of String

7 Technical data

7.1 Modbus

Communication protocol	Modbus RTU, Modbus ASCII, Modbus TCP/IP
Interface	RS-232, RS-485 [1] , Ethernet [2]
galvanic isolation	Non
Baud rate (Bits / s)	2400, 4800, 9600, 19200
Data bits	7, 8 (Standard: 8)
Parity	no, even, odd (Standard: no)
cable length	RS-232 : 0...15 m RS-485 [1] : 0...1200 m
Cable type	twisted pair shielded cable (EN 50170)

[1] Plug in module or external RS232 / RS 485 converter required.
[2] Plug in module Ethernet is required

Note:
The RS232 interface is not isolated. In adverse electrical conditions - such as non-existent or faulty grounding - it could therefore be a malfunction in the ERW700. In these cases it is recommended to use a master with electrically isolated interface, or interpose an interface isolator.
When converting to RS485 converters generally should be used with galvanic isolation.