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Operating manual EFR4001IP

updated: 2023-04-28 / oa
from firmware: 0-03

- Modbus TCP communication protocol

Table of Contents

1 Important Information

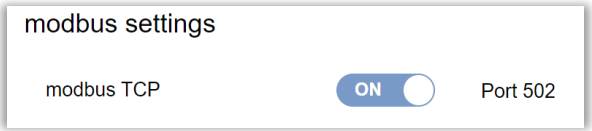
Please also read the general operating manual of the EFR4001IP carefully and observe the safety instructions.

2 Interface Parameters

TCP Port: 502
Max. TCP connections: 3

The Modbus TCP protocol must be activated via the integrated web server of the EFR4001IP:

- Enter the IP address of the device in the web browser (on computers in the same networks)
- Select the menu tab „network“
- Activate Modbus TCP



3 Telegram Structure

According to Modbus TCP specification.
For details, refer to the Modbus original documentation, available at: http://www.modbus.org

4 Supported Function Codes

Function code	Designation	Use
3 (03H)	Read Holding Registers	Read data from the registers
16 (10H)	Write Multiple Registers	Write data into registers

5 Data Types

The following data types are used in the Modbus registers:

Data type	Size	Range of numbers
signed int	16 Bit, register value	-32768 … 32767
unsigned int	16 Bit, register value	0 … 65535
signed long	32 Bit, divided over two registers	-2147483648 … 2147483647
unsigned long	32 Bit, divided over two registers	0 … 4294967296

6 Modbus Register Tables

6.1 Reading measured values, status values and min. / max. (state: EFR4001IP)

- Modbus function code 0x03 (Read Holding Registers)

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog. -Nr. 1	2	3	4	5	6	7	8	9	10
0x00B0 0x00B1	signed long	*low* *high*	Actual value U - L1 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x00B2 0x00B3	signed long	*low* *high*	Actual value U - L2 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x00B4 0x00B5	signed long	*low* *high*	Actual value U - L3 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x00B6 0x00B7	signed long	*low* *high*	Actual value I - L1 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x00B8 0x00B9	signed long	*low* *high*	Actual value I - L2 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x00BA 0x00BB	signed long	*low* *high*	Actual value I - L3 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x00BC 0x00BD	signed long	*low* *high*	Actual value P - L1 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00BE 0x00BF	signed long	*low* *high*	Actual value P - L2 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00C0 0x00C1	signed long	*low* *high*	Actual value P - L3 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00C2 0x00C3	signed long	*low* *high*	Actual value P - L123 [W]	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x00C4 0x00C5	signed long	*low* *high*	*Actual value S - L1 [VA]*	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00C6 0x00C7	signed long	*low* *high*	*Actual value S - L2 [VA]*	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00C8 0x00C9	signed long	*low* *high*	*Actual value S - L3 [VA]*	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00CA 0x00CB	signed long	*low* *high*	*Actual value S - L123 [VA]*	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog. -Nr. 1	2	3	4	5	6	7	8	9	10
0x00CC 0x00CD	signed long	*low* *high*	*Actual value Q - L1 [VAr]*	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00CE 0x00CF	signed long	*low* *high*	*Actual value Q - L2 [VAr]*	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00D0 0x00D1	signed long	*low* *high*	*Actual value Q - L3 [VAr]*	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x00D2 0x00D3	signed long	*low* *high*	*Actual value Q - L123 [VAr]*	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x00D4 0x00D5	signed long	*low* *high*	*Actual value cos φ - L1 [0,0001]*	-10000 …	10000	x	x	x	x	x	x	x	x	x	x
0x00D6 0x00D7	signed long	*low* *high*	*Actual value cos φ - L2 [0,0001]*	-10000 …	10000	x	x	x	x	x	x	x	x	x	x
0x00D8 0x00D9	signed long	*low* *high*	*Actual value cos φ - L3 [0,0001]*	-10000 …	10000	x	x	x	x	x	x	x	x	x	x
0x00DA 0x00DB	signed long	*low* *high*	Actual value frequency [0,01 Hz]	4000 …	7000	x	x	x	x	x	x	x	x	x	x
0x00DC 0x00DD	signed long	*low* *high*	*Actual value Phi φ*∠(U-L1,U-L2) [0,001 °]*	0 …	360000	x	x	x	x	x	x	x	x	x	x
0x00DE 0x00DF	signed long	*low* *high*	*Actual value Phi φ*∠(U-L1,U-L3) [0,001 °]*	0 …	360000	x	x	x	x	x	x	x	x	x	x
0x00E0 0x00E1	signed long	*low* *high*	*Actual value Phi φ*∠(U-L2,U-L3) [0,001 °]*	0 …	360000	x	x	x	x	x	x	x	x	x	x
0x00E2 0x00E3	signed long	*low* *high*	*Actual value Phi φ* ∠(I-L1, I-L2) [0,001 °]*	0 …	360000	x	x	x	x	x	x	x	x	x	x
0x00E4 0x00E5	signed long	*low* *high*	*Actual value Phi φ* ∠(I-L1, I-L3) [0,001 °]*	0 …	360000	x	x	x	x	x	x	x	x	x	x
0x00E6 0x00E7	signed long	*low* *high*	*Actual value Phi φ* ∠(I-L2, I-L3) [0,001 °]*	0 …	360000	x	x	x	x	x	x	x	x	x	x
0x00E8	signed int		Status measured value I - L1	0 = measured value ok 1 = measuring range exceeded 2= measuring range below 3= simulation		x	x	x	x	x	x	x	x	x	x
0x00E9	signed int		Status measured value I - L2			x	x	x	x	x	x	x	x	x	x
0x00EA	signed int		Status measured value I - L3			x	x	x	x	x	x	x	x	x	x
0x00EB	signed int		Status measured value U - L1			x	x	x	x	x	x	x	x	x	x
0x00EC	signed int		Status measured value U - L2			x	x	x	x	x	x	x	x	x	x
0x00ED	signed int		Status measured value U - L3			x	x	x	x	x	x	x	x	x	x
0x00EE	signed int		Status measured value P - L1			x	x	x	x	x	x	x	x	x	x
0x00EF	signed int		Status measured value P - L2			x	x	x	x	x	x	x	x	x	x
0x00F0	signed int		Status measured value P - L3			x	x	x	x	x	x	x	x	x	x
0x00F1	signed int		Status measured value P-L123			x	x	x	x	x	x	x	x	x	x
0x00F2 0x00F3	signed long	*low* *high*	On time K1 [min.]	0 …	2147483647	x	x	x	x	x	x	x	x	x	x
0x00F4 0x00F5	signed long	*low* *high*	On time K2 [min.]	0 …	2147483647	x	x	x	x	x	x	x	x	x	x
0x00F6 0x00F7	signed long	*low* *high*	On time K3 [min.]	0 …	2147483647	x	x	x	x	x	x	x	x	x	x
0x00F8	signed int		Current error (error)	0 = currently no error 1 = error		x	x	x	x	x	x	x	x	x	x
0x00F9	signed int		Error memory (limit error)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x00FA	signed int		Error memory (load difference)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x00FB	signed int		Error memory (AD converter)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x00FC	signed int		Error memory (adjustment values)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x00FD	signed int		Error memory (parameter over range)	0 …	99	x	x	x	x	x	x	x	x	x	x

*All angles are counterclockwise.

Adr. hex	Data type	Register	Range of values Min.	Max.	Prog. -Nr. 1	2	3	4	5	6	7	8	9	10
0x00FE	signed int	Error memory (scaling analogue output)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x00FF	signed int	Error memory (check current transformer)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x0100	signed int	Error memory (min. 2 same load values)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x0101	signed int	Error memory (reserve)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x0102	signed int	Relay status K1	0 (off)…	1 (on)	x	x	x	x	x	x	x	x	x	x
0x0103	signed int	Relay status K2	0 (off)…	1 (on)	x	x	x	x	x	x	x	x	x	x
0x0104	signed int	Relay status K3	0 (off)…	1 (on)	x	x	x	x	x	x	x	x	x	x
0x0105	signed int	Alarm status 0 (K1 / step 1)	0 = alarm off 1 = delay time on 2 = alarm on 3 = alarm delay 4 = alarm locked		x	x	x	x	x	x	x	x	x	x
0x0106	signed int	Alarm status 1 (K2 / step 2)			x	x	x	x	x	x	x	x	x	x
0x0107	signed int	Alarm status 2 (K3* / step 3)			x	x	x	x	x	x	x	x	x	x
0x0108	signed int	Alarm status 3 (step 4)					x							
0x0109	signed int	Alarm status 4 (step 5)					x							
0x010A	signed int	Alarm status 5 (step 6)					x							
0x010B	signed int	Alarm status 6 (step 7)					x							
0x010C 0x010D	signed long *low* *high*	Device status	Only for internal service purposes		x	x	x	x	x	x	x	x	x	x
0x010E 0x010F	signed long *low* *high*	Serial number			x	x	x	x	x	x	x	x	x	x
0x0110 0x0111	signed long *low* *high*	Operating hours	hours [h]		x	x	x	x	x	x	x	x	x	x
0x0112	signed int	Firmware version, Application	e. g. 03EA (hex) =1002(dec) -> 12720-1410-02		x	x	x	x	x	x	x	x	x	x
0x0113	signed int	Firmware version, Bootloader			x	x	x	x	x	x	x	x	x	x
0x0114 0x0115	signed long *low* *high*	Min. value U - L1 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0116 0x0117	signed long *low* *high*	Max. value U - L1 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0118 0x0119	signed long *low* *high*	Min. value U - L2 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x011A 0x011B	signed long *low* *high*	Max. value U - L2 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x011C 0x011D	signed long *low* *high*	Min. value U - L3 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x011E 0x011F	signed long *low* *high*	Max. value U - L3 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0120 0x0121	signed long *low* *high*	Min. value I - L1 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0122 0x0123	signed long *low* *high*	Max. value I - L1 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0124 0x0125	signed long *low* *high*	Min. value I - L2 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0126 0x0127	signed long *low* *high*	Max. value I - L2 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0128 0x0129	signed long *low* *high*	Min. value I - L3 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x012A 0x012B	signed long *low* *high*	Max. value I - L3 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x012C 0x012D	signed long *low* *high*	Min. value P - L1 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x012E 0x012F	signed long *low* *high*	Max. value P - L1 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0130 0x0131	signed long *low* *high*	Min. value P - L2 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x

* In the case of programs 7, 8, 9 and 10, the relay **K3** reacts in three steps successively according to VDE-AR-N 4105.

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x0132 0x0133	signed long	*low* *high*	Max. value P - L2 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0134 0x0135	signed long	*low* *high*	Min. value P - L3 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0136 0x0137	signed long	*low* *high*	Max. value P - L3 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0138 0x0139	signed long	*low* *high*	Min. value P - L123 [W]	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x013A 0x013B	signed long	*low* *high*	Max. value P - L123 [W]	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x013C 0x013D	signed long	*low* *high*	Sum of connected loads via relay [W]	0…	150000	x	x	x	x	x	x	x	x	x	x
0x013E 0x013F	unsigned long	*low* *high*	Controlled load via analogue output I [W]	0…	50000	x	x	x	x	x	x	x	x	x	x
0x0140 0x0141	unsigned long	*low* *high*	Controlled load via analogue output U [W]	0…	50000	x	x	x	x	x	x	x	x	x	x
0x0142	signed int		Digital input Y1	0…	1	x	x	x	x	x	x	x	x	x	x
0x0143	signed int		Digital input Y2	0…	1	x	x	x	x	x	x	x	x	x	x
0x0144	signed int		Digital input Y3	0…	1	x	x	x	x	x	x	x	x	x	x
0x0145	signed int		Digital input Y4	0…	1	x	x	x	x	x	x	x	x	x	x
0x0146	signed int		Hardware Version	00...		x	x	x	x	x	x	x	x	x	x
0x0147	signed int		Status timer function K1	0=auto/off, 1=on for, 2=off for, 3=manually on, 4=manually off		x	x	x							
0x0148	signed int		Status timer function K2			x	x	x							
0x0149	signed int		Status timer function K3			x	x	x							
0x014A	signed int		Status timer function Out I			x	x	x							
0x014B	signed int		Status timer function Out U			x	x	x							
0x014C 0x014D	unsigned long	*low* *high*	Actual time of Timer function K1 [s]	0…	86400	x	x	x							
0x014E 0x014F	unsigned long	*low* *high*	Actual time of Timer function K2 [s]	0…	86400	x	x	x							
0x0150 0x0151	unsigned long	*low* *high*	Actual time of Timer function K3 [s]	0…	86400	x	x	x							
0x0152 0x0153	unsigned long	*low* *high*	Actual time of Timer function Out I [s]	0…	86400	x	x	x							
0x0154 0x0155	unsigned long	*low* *high*	Actual time of Timer function Out U [s]	0…	86400	x	x	x							
0x0156 0x0157	signed long	*low* *high*	Feed-in L1 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x0158 0x0159	signed long	*low* *high*	Feed-in L2 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x015A 0x015B	signed long	*low* *high*	Feed-in L3 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x015C 0x015D	signed long	*low* *high*	Feed-in L123 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x015E 0x015F	signed long	*low* *high*	Draw L1 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0160 0x0161	signed long	*low* *high*	Draw L2 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0162 0x0163	signed long	*low* *high*	Draw L3 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0164 0x0165	signed long	*low* *high*	Draw L123 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x0166 0x0167	signed long	*low* *high*	Draw – feed-in L123 [Wh]	-2147483648	2147483647	x	x	x	x	x	x	x	x	x	x
0x0168 0x0169	signed long	*low* *high*	Own consumption at K1 [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x016A 0x016B	signed long	*low* *high*	Own consumption at K2 [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x016C 0x016D	signed long	*low* *high*	Own consumption at K3 [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x016E 0x016F	signed long	*low* *high*	Own consumption at Out I [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0170 0x0171	signed long	*low* *high*	Own consumption at Out U [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0172 0x0173	signed long	*low* *high*	Own consumption at K123 + Out I + U [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0174 0x0175	signed long	*low* *high*	Actual value U - L1-L2 [0,1 V]	173 …	433013	x	x	x	x	x	x	x	x	x	x
0x0176 0x0177	signed long	*low* *high*	Actual value U - L1-L3 [0,1 V]	173 …	433013	x	x	x	x	x	x	x	x	x	x
0x0178 0x0179	signed long	*low* *high*	Actual value U - L2-L3 [0,1 V]	173 …	433013	x	x	x	x	x	x	x	x	x	x
0x017A 0x017B	signed long	*low* *high*	Actual value U-10-Cycles - L1 [0,1 V]	100 …	250000							x	x	x	x
0x017C 0x017D	signed long	*low* *high*	Actual value U-10-Cycles - L2 [0,1 V]	100 …	250000							x	x	x	x
0x017E 0x017F	signed long	*low* *high*	Actual value U-10-Cycles - L3 [0,1 V]	100 …	250000							x x	x x	x x	x x
0x0180 0x0181	signed long	*low* *high*	Actual value I-10-Cycles- L1 [mA]	1 …	2400000							x	x	x	x
0x0182 0x0183	signed long	*low* *high*	Actual value I-10-Cycles- L2 [mA]	1 …	2400000							x	x	x	x
0x0184 0x0185	signed long	*low* *high*	Actual value I-10-Cycles- L3 [mA]	1 …	2400000							x	x	x	x
0x0186	signed int		rotating field direction	1 = right [↻] 0 = NaN (possible phase loss) -1 = left [↺]		x	x	x	x	x	x	x	x	x	x

6.2 Reading measured values, status values and min. / max. (state: EFR4000IP)

- Modbus function code 0x03 (Read Holding Registers)

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog. -Nr. 1	2	3	4	5	6	7	8	9	10
0x0000 0x0001	signed long	*low* *high*	Actual value U - L1 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0002 0x0003	signed long	*low* *high*	Actual value U - L2 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0004 0x0005	signed long	*low* *high*	Actual value U - L3 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0006 0x0007	signed long	*low* *high*	Actual value I - L1 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0008 0x0009	signed long	*low* *high*	Actual value I - L2 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x000A 0x000B	signed long	*low* *high*	Actual value I - L3 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x000C 0x000D	signed long	*low* *high*	Actual value P - L1 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x000E 0x000F	signed long	*low* *high*	Actual value P - L2 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0010 0x0011	signed long	*low* *high*	Actual value P - L3 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0012 0x0013	signed long	*low* *high*	Actual value P - L123 [W]	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x0014 0x0015	signed long	*low* *high*	Actual value frequency [0,01 Hz]	4000 …	7000	x	x	x	x	x	x	x	x	x	x
0x0016	signed int		Status measured value I - L1	0 = measured value ok 1 = measuring range exceeded 2 = measuring range below 3 = simulation		x	x	x	x	x	x	x	x	x	x
0x0017	signed int		Status measured value I - L2			x	x	x	x	x	x	x	x	x	x
0x0018	signed int		Status measured value I - L3			x	x	x	x	x	x	x	x	x	x
0x0019	signed int		Status measured value U - L1			x	x	x	x	x	x	x	x	x	x
0x001A	signed int		Status measured value U - L2			x	x	x	x	x	x	x	x	x	x
0x001B	signed int		Status measured value U - L3			x	x	x	x	x	x	x	x	x	x
0x001C	signed int		Status measured value P - L1			x	x	x	x	x	x	x	x	x	x
0x001D	signed int		Status measured value P - L2			x	x	x	x	x	x	x	x	x	x
0x001E	signed int		Status measured value P - L3			x	x	x	x	x	x	x	x	x	x
0x001F	signed int		Status measured value P - L123			x	x	x	x	x	x	x	x	x	x
0x0020 0x0021	signed long	*low* *high*	On time K1 [min.]	0 …	2147483647	x	x	x	x	x	x	x	x	x	x
0x0022 0x0023	signed long	*low* *high*	On time K2 [min.]	0 …	2147483647	x	x	x	x	x	x	x	x	x	x
0x0024 0x0025	signed long	*low* *high*	On time K3 [min.]	0 …	2147483647	x	x	x	x	x	x	x	x	x	x
0x0026	signed int		Current error (error)	0 = currently no error 1 = error		x	x	x	x	x	x	x	x	x	x
0x0027	signed int		Error memory (limit error)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x0028	signed int		Error memory (load difference)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x0029	signed int		Error memory (AD converter)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x002A	signed int		Error memory (adjustment values)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x002B	signed int		Error memory (parameter over range)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x002C	signed int		Error memory (scaling analogue output)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x002D	signed int		Error memory (check current transformer)	0 …	99	x	x	x	x	x	x	x	x	x	x

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog. -Nr. 1	2	3	4	5	6	7	8	9	10
0x002E	signed int		Error memory (min. 2 same load values)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x002F	signed int		Error memory (reserve)	0 …	99	x	x	x	x	x	x	x	x	x	x
0x0030	signed int		Relay status K1	0 (off)…	1 (on)	x	x	x	x	x	x	x	x	x	x
0x0031	signed int		Relay status K2	0 (off)…	1 (on)	x	x	x	x	x	x	x	x	x	x
0x0032	signed int		Relay status K3	0 (off)…	1 (on)	x	x	x	x	x	x	x	x	x	x
0x0033	signed int		Alarm status 0 (K1 / step 1)	0 = alarm off 1 = delay time on 2 = alarm on 3 = alarm delay 4 = alarm locked		x	x	x	x	x	x	x	x	x	x
0x0034	signed int		Alarm status 1 (K2 / step 2)			x	x	x	x	x	x	x	x	x	x
0x0035	signed int		Alarm status 2 (K3* / step 3)			x	x	x	x	x	x	x	x	x	x
0x0036	signed int		Alarm status 3 (step 4)					x							
0x0037	signed int		Alarm status 4 (step 5)					x							
0x0038	signed int		Alarm status 5 (step 6)					x							
0x0039	signed int		Alarm status 6 (step 7)					x							
0x003A 0x003B	signed long	*low* *high*	Device status	Only for internal service purposes		x	x	x	x	x	x	x	x	x	x
0x003C 0x003D	signed long	*low* *high*	Serial number			x	x	x	x	x	x	x	x	x	x
0x003E 0x003F	signed long	*low* *high*	Operating hours	hours [h]		x	x	x	x	x	x	x	x	x	x
0x0040	signed int		Firmware version, Application	e. g. 03EA (hex) =1002(dec) -> 12720-1410-02		x	x	x	x	x	x	x	x	x	x
0x0041	signed int		Firmware version, Bootloader			x	x	x	x	x	x	x	x	x	x
0x0042 0x0043	signed long	*low* *high*	Min. value U - L1 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0044 0x0045	signed long	*low* *high*	Max. value U - L1 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0046 0x0047	signed long	*low* *high*	Min. value U - L2 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x0048 0x0049	signed long	*low* *high*	Max. value U - L2 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x004A 0x004B	signed long	*low* *high*	Min. value U - L3 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x004C 0x004D	signed long	*low* *high*	Max. value U - L3 [0,1 V]	100 …	250000	x	x	x	x	x	x	x	x	x	x
0x004E 0x004F	signed long	*low* *high*	Min. value I - L1 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0050 0x0051	signed long	*low* *high*	Max. value I - L1 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0052 0x0053	signed long	*low* *high*	Min. value I - L2 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0054 0x0055	signed long	*low* *high*	Max. value I - L2 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0056 0x0057	signed long	*low* *high*	Min. value I - L3 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x0058 0x0059	signed long	*low* *high*	Max. value I - L3 [mA]	1 …	2400000	x	x	x	x	x	x	x	x	x	x
0x005A 0x005B	signed long	*low* *high*	Min. value P - L1 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x005C 0x005D	signed long	*low* *high*	Max. value P - L1 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x005E 0x005F	signed long	*low* *high*	Min. value P - L2 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x

* In the case of programs 7, 8, 9 and 10, the relay **K3** reacts in three steps successively according to VDE-AR-N 4105.

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x0060 0x0061	signed long	*low* *high*	Max. value P - L2 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0062 0x0063	signed long	*low* *high*	Min. value P - L3 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0064 0x0065	signed long	*low* *high*	Max. value P - L3 [W]	-60000000…	60000000	x	x	x	x	x	x	x	x	x	x
0x0066 0x0067	signed long	*low* *high*	Min. value P - L123 [W]	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x0068 0x0069	signed long	*low* *high*	Max. value P - L123 [W]	-99999999…	99999999	x	x	x	x	x	x	x	x	x	x
0x006A 0x006B	signed long	*low* *high*	Sum of connected loads via relay [W]	0…	150000	x	x	x	x	x	x	x	x	x	x
0x006C 0x006D	unsigned long	*low* *high*	Controlled load via analogue output I [W]	0…	50000	x	x	x	x	x	x	x	x	x	x
0x006E 0x006F	unsigned long	*low* *high*	Controlled load via analogue output U [W]	0…	50000	x	x	x	x	x	x	x	x	x	x
0x0070	signed int		Digital input Y1	0…	1	x	x	x	x	x	x	x	x	x	x
0x0071	signed int		Digital input Y2	0…	1	x	x	x	x	x	x	x	x	x	x
0x0072	signed int		Digital input Y3	0…	1	x	x	x	x	x	x	x	x	x	x
0x0073	signed int		Digital input Y4	0…	1	x	x	x	x	x	x	x	x	x	x
0x0074	signed int		Hardware Version	00...		x	x	x	x	x	x	x	x	x	x
0x0075	signed int		Status timer function K1	0=auto/off, 1=on for, 2=off for, 3=manually on, 4=manually off		x	x	x							
0x0076	signed int		Status timer function K2			x	x	x							
0x0077	signed int		Status timer function K3			x	x	x							
0x0078	signed int		Status timer function Out I			x	x	x							
0x0079	signed int		Status timer function Out U			x	x	x							
0x007A 0x007B	unsigned long	*low* *high*	Actual time of Timer function K1 [s]	0…	86400	x	x	x							
0x007C 0x007D	unsigned long	*low* *high*	Actual time of Timer function K2 [s]	0…	86400	x	x	x							
0x007E 0x007F	unsigned long	*low* *high*	Actual time of Timer function K3 [s]	0…	86400	x	x	x							
0x0080 0x0081	unsigned long	*low* *high*	Actual time of Timer function Out I [s]	0…	86400	x	x	x							
0x0082 0x0083	unsigned long	*low* *high*	Actual time of Timer function Out U [s]	0…	86400	x	x	x							
0x0084 0x0085	signed long	*low* *high*	Feed-in L1 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x0086 0x0087	signed long	*low* *high*	Feed-in L2 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x0088 0x0089	signed long	*low* *high*	Feed-in L3 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x008A 0x008B	signed long	*low* *high*	Feed-in L123 [Wh]	-2147483648	…0	x	x	x	x	x	x	x	x	x	x
0x008C 0x008D	signed long	*low* *high*	Draw L1 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x008E 0x008F	signed long	*low* *high*	Draw L2 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0090 0x0091	signed long	*low* *high*	Draw L3 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0092 0x0093	signed long	*low* *high*	Draw L123 [Wh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x0094 0x0095	signed long	*low* *high*	Draw – feed-in L123 [Wh]	-2147483648	2147483647	x	x	x	x	x	x	x	x	x	x
0x0096 0x0097	signed long	*low* *high*	Own consumption at K1 [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x0098 0x0099	signed long	*low* *high*	Own consumption at K2 [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x009A 0x009B	signed long	*low* *high*	Own consumption at K3 [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x009C 0x009D	signed long	*low* *high*	Own consumption at Out I [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x009E 0x009F	signed long	*low* *high*	Own consumption at Out U [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x
0x00A0 0x00A1	signed long	*low* *high*	Own consumption at K123 + Out I + U [kWh]	0…	2147483647	x	x	x	x	x	x	x	x	x	x

6.3 Parameter read and write

- Modbus function code 0x03 (Read Holding Registers)
- Modbus function code 0x10 (Write Multiple Registers)

Adr. hex	Data type	Register	Range of values Min.	Max.	Prog. -Nr. 1	2	3	4	5	6	7	8	9	10
0x0200	signed int	Program number	1…	10	x	x	x	x	x	x	x	x	x	x
0x0201	signed int	Current transformer-Primary [A]	1…	1000	x	x	x	x	x	x	x	x	x	x
0x0202	signed int	Current transformer - Secondary [0,1 A]	1…	50	x	x	x	x	x	x	x	x	x	x
0x0203	signed long *low*	Power at K1 (step 10 W) [W]	0…	500000	x	x	x	x						
0x0204	*high*													
0x0205	signed long *low*	Power at K2 (step 10 W) [W]	0…	500000	x	x	x	x						
0x0206	*high*													
0x0207	signed long *low*	Power at K3 (step 10 W) [W]	0…	500000	x	x	x	x						
0x0208	*high*													
0x0209	signed int	Phase on relay K1	-5=L123, -4=L3, -3=L2, -2=L1, -1=off		x	x	x	x		x				
0x020A	signed int	Phase on relay K2			x	x	x	x		x				
0x020B	signed int	Phase on relay K3			x	x	x	x		x				
0x020C	signed int	Relay function K1	-2 = 11-12	-1 = 11-14	x	x	x	x						
0x020D	signed int	Relay function K2	-2 = 21-22	-1 = 21-24	x	x	x	x						
0x020E	signed int	Relay function K3	-2 = 31-32	-1 = 31-34	x	x	x	x						
0x020F	signed long *low*	Delay on K1 [s]	0…	86399	x	x		x	x	x	x	x	x	x
0x0210	*high*	Delay on [s]					x							
0x0211	signed long *low*	Delay on K2 [s]	0…	86399	x	x		x	x	x	x	x	x	x
0x0212	*high*													
0x0213	signed long *low*	Delay on K3 [s]	0…	86399	x	x		x	x	x	x	x	x	x
0x0214	*high*													
0x0215	signed long *low*	Min. on K1 [s]	10…	86399	x	x		x						
0x0216	*high*	Min. on [s]	10…	86399			x							
0x0217	signed long *low*	Min. on K2 [s]	10…	86399	x	x		x						
0x0218	*high*													
0x0219	signed long *low*	Min. on K3 [s]	10…	86399	x	x		x						
0x021A	*high*													
0x021B	signed long *low*	Delay off K1 [s]	10…	86399	x	x		x						
0x021C	*high*	Delay off [s]	10…	86399			x							
		Delay off K1 [0,01s]	0…	359999					x	x	x	x	x	x
0x021D	signed long *low*	Delay off K2 [s]	10…	86399	x	x		x						
0x021E	*high*	Delay off K2 [0,01s]	0…	359999					x	x	x	x	x	x
0x021F	signed long *low*	Delay off K3 [s]	10…	86399	x	x		x						
0x0220	*high*	Delay off K3 [0,01s]	0…	359999					x	x				
0x0221	signed long *low*	Load regulation K1 [s]	10…	86399	x	x		x						
0x0222	*high*													
0x0223	signed long *low*	Load regulation K2 [s]	10…	86399	x	x		x						
0x0224	*high*													
0x0225	signed long *low*	Load regulation K3 [s]	10…	86399	x	x		x						
0x0226	*high*													
0x0227	signed long *low*	Power K1 on (step 10 W) [W]	-999990…	999990	x	x		x	x	x	x	x	x	x
0x0228	*high*	Switch off value (step 10 W) [W]					x							
0x0229	signed long *low*	Power K2 on (step 10 W) [W]	-999990…	999990	x	x		x	x	x	x	x	x	x
0x022A	*high*													
0x022B	signed long *low*	Power K3 on (step 10 W) [W]	-999990…	999990	x	x		x	x	x	x	x	x	x
0x022C	*high*													

Adr. hex	Data type		Register	Range of values Min.	Max.	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x022D 0x022E	signed long	*low* *high*	Power K1 off (step 10 W) [W]	-999990…	999990	x	x		x	x	x	x	x	x	x
0x022F 0x0230	signed long	*low* *high*	Power K2 off (step 10 W) [W]	-999990…	999990	x	x		x	x	x	x	x	x	x
0x0231 0x0232	signed long	*low* *high*	Power K3 off (step 10 W) [W]	-999990…	999990	x	x		x	x	x				
0x0233	signed int		Auto reset K1	-1 = on	-2 = off					x	x	x	x	x	x
0x0234	signed int		Auto reset K2	-1 = on	-2 = off					x	x	x	x	x	x
0x0235	signed int		Auto reset K3	-1 = on	-2 = off					x	x	x	x	x	x
0x0236	signed int		Function input Y1	-13=Aout-U 100%, -12=Aout-U 0%, -11=Aout-I 100%, -10=Aout-I 0%, -9=K3 off, -8=K2 off, -7=K1 off, -6=K3 on, -5=K2 on, -4=K1 on, -3=K1-3 on, -2=K1-3 off, -1=off		x	x	x	x					
0x0237	signed int		Function input Y2			x	x	x	x						
0x0238	signed int		Function input Y3			x	x	x	x						
0x0239	signed int		Function input Y4			x	x	x	x						
0x023A	signed int		Analog output I, Function	-9= load-L3, -8=load-L2, -7=load-L1, -6=load-L123, -5=kW-L3, -4=kW L2, -3=kW-L1, -2=kW-L123, -1=off		x	x	x	x	x	x	x	x	x	x
0x023B	signed int		Analog output I, 0-20mA / 4-20 mA / Individually	-3=Ind, -2=4-20 mA, -1=0-20 mA		x	x	x	x	x	x	x	x	x	x
0x023C	signed int		Analog output I, individual zero point [0,01 mA]	0 …	1000	x	x	x	x	x	x	x	x	x	x
0x023D 0x023E	signed long	*low* *high*	Analog output I, Zero point (step 10 W) [W]	-999990…	999990	x	x	x	x	x	x	x	x	x	x
0x023F 0x0240	signed long	*low* *high*	Analog output I, Full scale (step 10 W) [W]	-999990…	999990	x	x	x	x	x	x	x	x	x	x
0x0241 0x0242	signed long	low high	Analog output I, Setpoint (step 10 W) [W]	-999990…	999990	x	x	x	x	x	x	x	x	x	x
0x0243 0x0244	signed long	low high	Analog output I, max. power (step 10 W) [W]	0…	500000	x	x	x	x	x	x	x	x	x	x
0x0245	signed int		Analog output I, Regulation speed [%]	20…	90	x	x	x	x	x	x	x	x	x	x
0x0246	signed int		Analog output I, Regulation interval [0,1 s]	5…	600	x	x	x	x	x	x	x	x	x	x
0x0247	signed int		Analog output I, Regulation tolerance [%]	5…	50	x	x	x	x	x	x	x	x	x	x
0x0248	signed int		Analog output U, Function	-9=load-L3, -8=load-L2, -7=load-L1, -6=load-L123, -5=kW-L3, -4=kW L2, -3=kW-L1, -2=kW-L123, -1=off		x	x	x	x	x	x	x	x	x	x
0x0249	signed int		Analog output U, 0-10V / 2-10V / Individually	-3=Ind, -2=2-10 V, -1=0-10V		x	x	x	x	x	x	x	x	x	x
0x024A	signed int		Analog output U, individual zero point [0,01 V]	0 …	500	x	x	x	x	x	x	x	x	x	x
0x024B 0x024C	signed long	*low* *high*	Analog output U, Zero point (step 10 W) [W]	-999990…	999990	x	x	x	x	x	x	x	x	x	x
0x024D 0x024E	signed long	*low* *high*	Analog output U, Full scale (step 10 W) [W]	-999990…	999990	x	x	x	x	x	x	x	x	x	x
0x024F 0x0250	signed long	*low* *high*	Analog output U, Setpoint (step 10 W) [W]	-999990…	999990	x	x	x	x	x	x	x	x	x	x

Adr. hex	Data type	Register	Range of values Min.	Max.	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x0251 0x0252	signed long *low* *high*	Analog output U, max. power (step 10 W) [W]	0…	500000	x	x	x	x	x	x	x	x	x	x
0x0253	signed int	Analog output U, Regulation speed [%]	20…	90	x	x	x	x	x	x	x	x	x	x
0x0254	signed int	Analog output U, Regulation interval [0,1 s]	5…	600	x	x	x	x	x	x	x	x	x	x
0x0255	signed int	Analog output U, Regulation tolerance [%]	5…	50	x	x	x	x	x	x	x	x	x	x
0x0256	signed int	Language	-2=English, -1=German		x	x	x	x	x	x	x	x	x	x
0x0257	signed int	TFT brightness [%]	20…	100	x	x	x	x	x	x	x	x	x	x
0x0258	signed int	TFT, time to dim … [s]	10…	3600	x	x	x	x	x	x	x	x	x	x
0x0259	signed int	Display interval [0,1 s]	1…	20	x	x	x	x	x	x	x	x	x	x
0x025A	signed int	Timer function K1	0=auto, 1=on for, 2=off for, 3=manually on, 4=manually off		x	x	x	x						
0x025B	signed int	Timer function K2			x	x	x	x						
0x025C	signed int	Timer function K3			x	x	x	x						
0x025D	signed int	Timer function Out I			x	x	x	x						
0x025E	signed int	Timer function Out U			x	x	x	x						
0x025F	signed int	Timer function K1, Time of "on for / off for" [min.]	1…	1440	x	x	x	x						
0x0260	signed int	Timer function K2, Time of "on for / off for" [min.]	1…	1440	x	x	x	x						
0x0261	signed int	Timer function K3, Time of "on for / off for" [min.]	1…	1440	x	x	x	x						
0x0262	signed int	Timer function I, Time of "on for / off for" [min.]	1…	1440	x	x	x	x						
0x0263	signed int	Timer function U, Time of "on for / off for" [min.]	1…	1440	x	x	x	x						
0x0264	signed int	Timer function, Load at Out I [%]	0…	100	x	x	x	x						
0x0265	signed int	Timer function, Load at Out U [%]	0…	100	x	x	x	x						

6.4 Trigger reset function

- Modbus function code 0x10 (Write Multiple Registers)

Adr. hex	Data type	Register	*Value*	Prog.-Nr. 1	2	3	4	5	6	7	8	9	10
0x0100	signed int	Reset min/max U	*write 1 -> reset all U*	x	x	x	x	x	x	x	x	x	x
0x0101	signed int	Reset min/max I	*write 1 -> reset all I*	x	x	x	x	x	x	x	x	x	x
0x0102	signed int	Reset min/max P	*write 1 -> reset all P*	x	x	x	x	x	x	x	x	x	x
0x0103	signed int	On time K1…K3	*write 1 -> reset all times*	x	x	x	x	x	x	x	x	x	x
0x0104	signed int	Error memory	*write 1 -> reset all errors*	x	x	x	x	x	x	x	x	x	x
0x0105	signed int	Locked relays	*write 1 -> reset locked relays*					x	x	x	x	x	x
0x0106	signed int	Reset energy meter	*write 1 -> reset*	x	x	x	x	x	x	x	x	x	x

7 Function code 0x2B – Read device information

Request

Byte No.		Value (hex)	Designation	Description
0 1	*high* *low*	0x00 0x00	Transaction Identifier	Identification number of the request (At multiple requests at the same time)
2 3	*high* *low*	0x00 0x00	Protocol Identifier	Always 0 (Modbus protocol)
4 5	*high* *low*	0x00 0x05	Length	Number of following bytes (High Byte is always 0)
6		0xFF	Unit Identifier	Identification of a remote device (value meaningless)
7		0x2B	Function code	Modbus functions code (0x2B, Read device information)
8		0x0E	MEI Type	Always 0x0E *1
9		0x01	Read Device ID code *2	
10		0x00	Object ID	See function code 0x2B - Objects

*1 MEI = MODBUS Encapsulated Interface (see Modbus documentation, http://www.modbus.org)

*2 0x01: Query of “Basic” device information (stream access)
0x02: Query of “Regular” device information (stream access)
0x03: Query of “Extended” device information (stream access)
0x04: Querying individual device information (individual access)

7.1 Function code 0x2B – Objects

Object ID (hex)	Object name / Description	Content	Type	Category
0x00	Manufacturer name	ZIEHL industrie-elektronik GmbH + Co KG	ASCII String	Basic
0x01	Product (article) number	S225762		
0x02	Revision Firmware	12720-1410-xx		
0x03	Manufacturer URL	www.ziehl.com	ASCII String	Regular
0x04	Product Name	Relay for Energy Flow		
0x05	Product Name	EFR4001IP		
0x80	Serial number	xxxxxxxx	ASCII String	Extended
0x81	Revision Hardware	xx (e. g. “01”)		
0x82	Revision Bootloader	12750-1400-xx		