

Betriebsanleitung EFR4002IP

Stand: 2025-07-28 /Sc
ab Firmware: 10-22

- Modbus TCP Kommunikationsprotokoll

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1 Wichtige Hinweise



Bitte lesen Sie auch die allgemeine Betriebsanleitung des EFR4002IP sorgfältig durch und beachten Sie die Sicherheitshinweise.

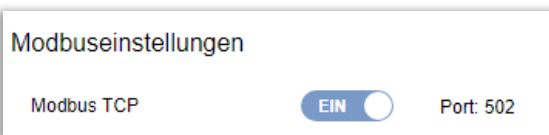
2 Schnittstellenparameter

TCP Port: 502

Max. Anzahl TCP Verbindungen (max. TCP connections): 3

Das Modbus TCP Protokoll muss über den integrierten Webserver des EFR4002IP aktiviert werden:

- Im Webbrowser (an Computer im selben Netzwerk) die IP-Adresse des Gerätes eingeben
- Menüreiter „Netzwerk“ wählen
- Modbus TCP aktivieren



3 Telegramm Aufbau

Nach Modbus TCP Spezifikation.

Details entnehmen Sie bitte der Modbus Originaldokumentation, zu finden unter <http://www.modbus.org>

4 Unterstützte Funktionscodes

Funktionscode	Bezeichnung	Verwendung
3 (03H)	Read Holding Registers	Daten aus den Registern lesen
16 (10H)	Write Multiple Registers	Daten in die Register schreiben

5 Datentypen

Folgende Datentypen werden in den Modbusregistern verwendet:

Datentyp	Größe	Zahlenbereich
signed int	16 Bit, Registerwert	-32768 ... 32767
unsigned int	16 Bit, Registerwert	0 ... 65535
signed long	32 Bit, aufgeteilt über zwei Register	-2147483648 ... 2147483647
unsigned long	32 Bit, aufgeteilt über zwei Register	0 ... 4294967296

6 Modbus Registertabellen

6.1 Messwerte, Statuswerte und Min.-/Max.-Messwerte auslesen

- Modbus Funktionscode 0x03 (Read Holding Registers)

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

Adr. Hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x00CC 0x00CD	signed long <i>low</i> <i>high</i>	Istwert Q - L1 [VAr]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x00CE 0x00CF	signed long <i>low</i> <i>high</i>	Istwert Q - L2 [VAr]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x00D0 0x00D1	signed long <i>low</i> <i>high</i>	Istwert Q - L3 [VAr]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x00D2 0x00D3	signed long <i>low</i> <i>high</i>	Istwert Q - L123 [VAr]	-99999999...	99999999	x	x	x	x	x	x	x	x	x	x
0x00D4 0x00D5	signed long <i>low</i> <i>high</i>	Istwert $\cos \varphi$ - L1 [0,0001]	-10000 ...	10000	x	x	x	x	x	x	x	x	x	x
0x00D6 0x00D7	signed long <i>low</i> <i>high</i>	Istwert $\cos \varphi$ - L2 [0,0001]	-10000 ...	10000	x	x	x	x	x	x	x	x	x	x
0x00D8 0x00D9	signed long <i>low</i> <i>high</i>	Istwert $\cos \varphi$ - L3 [0,0001]	-10000 ...	10000	x	x	x	x	x	x	x	x	x	x
0x00DA 0x00DB	signed long <i>low</i> <i>high</i>	Istwert Frequenz [0,01 Hz]	4000 ... 0 / 8000 = Freq. <, Freq. >	7000	x	x	x	x	x	x	x	x	x	x
0x00DC 0x00DD	signed long <i>low</i> <i>high</i>	Istwert $\Phi \varphi^* \angle(U-L1, U-L2)$ [0,001 °]	0 ...	360000	x	x	x	x	x	x	x	x	x	x
0x00DE 0x00DF	signed long <i>low</i> <i>high</i>	Istwert $\Phi \varphi^* \angle(U-L1, U-L3)$ [0,001 °]	0 ...	360000	x	x	x	x	x	x	x	x	x	x
0x00E0 0x00E1	signed long <i>low</i> <i>high</i>	Istwert $\Phi \varphi^* \angle(U-L2, U-L3)$ [0,001 °]	0 ...	360000	x	x	x	x	x	x	x	x	x	x
0x00E2 0x00E3	signed long <i>low</i> <i>high</i>	Istwert $\Phi \varphi^* \angle(I-L1, I-L2)$ [0,001 °]	0 ...	360000	x	x	x	x	x	x	x	x	x	x
0x00E4 0x00E5	signed long <i>low</i> <i>high</i>	Istwert $\Phi \varphi^* \angle(I-L1, I-L3)$ [0,001 °]	0 ...	360000	x	x	x	x	x	x	x	x	x	x
0x00E6 0x00E7	signed long <i>low</i> <i>high</i>	Istwert $\Phi \varphi^* \angle(I-L2, I-L3)$ [0,001 °]	0 ...	360000	x	x	x	x	x	x	x	x	x	x
0x00E8	signed int	Status Messwert I - L1	0 = Messwert in Ordnung 1 = Messbereich überschritten 2 = Messbereich unterschritten 3 = Simulation		x	x	x	x	x	x	x	x	x	x
0x00E9	signed int	Status Messwert I - L2			x	x	x	x	x	x	x	x	x	x
0x00EA	signed int	Status Messwert I - L3			x	x	x	x	x	x	x	x	x	x
0x00EB	signed int	Status Messwert U - L1			x	x	x	x	x	x	x	x	x	x
0x00EC	signed int	Status Messwert U - L2			x	x	x	x	x	x	x	x	x	x
0x00ED	signed int	Status Messwert U - L3			x	x	x	x	x	x	x	x	x	x
0x00EE	signed int	Status Messwert P - L1			x	x	x	x	x	x	x	x	x	x
0x00EF	signed int	Status Messwert P - L2			x	x	x	x	x	x	x	x	x	x
0x00F0	signed int	Status Messwert P - L3			x	x	x	x	x	x	x	x	x	x
0x00F1	signed int	Status Messwert P - L123			x	x	x	x	x	x	x	x	x	x
0x00F2 0x00F3	signed long <i>low</i> <i>high</i>	Einschaltzeit K1 [Min.]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x00F4 0x00F5	signed long <i>low</i> <i>high</i>	Einschaltzeit K2 [Min.]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x00F6 0x00F7	signed long <i>low</i> <i>high</i>	Einschaltzeit K3 [Min.]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x00F8	signed int	Aktueller Fehler (Error)	0 = aktuell kein Error 1 = Error liegt an		x	x	x	x	x	x	x	x	x	x
0x00F9	signed int	Error-Speicher (Limitfehler)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x00FA	signed int	Error-Speicher (Last Differenz)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x00FB	signed int	Error-Speicher (AD Wandler)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x00FC	signed int	Error-Speicher (Abgleichwerte)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x00FD	signed int	Error-Speicher (Parameter Bereichsüberschreitung)	0 ...	99	x	x	x	x	x	x	x	x	x	x

*Alle Winkelangaben sind im Gegenuhrzeigersinn.

Adr. Hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x00FE	signed int	Error-Speicher (Skalierung Analogausgang)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x00FF	signed int	Error-Speicher (Stromwandler prüfen)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x0100	signed int	Error-Speicher (min. 2 gleiche Lastgrößen)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x0101	signed int	Error-Speicher (reserve)	0 ...	99	x	x	x	x	x	x	x	x	x	x
0x0102	signed int	Relaisstatus K1	0 (abgefallen)	1 (angezogen)	x	x	x	x	x	x	x	x	x	x
0x0103	signed int	Relaisstatus K2	0 (abgefallen)	1 (angezogen)	x	x	x	x	x	x	x	x	x	x
0x0104	signed int	Relaisstatus K3	0 (abgefallen)	1 (angezogen)	x	x	x	x	x	x	x	x	x	x
0x0105	signed int	Alarmstatus 0 (K1 / Stufe 1)	0 = Alarm Aus 1 = Einschaltverz. läuft 2 = Alarm Ein 3 = Alarmverz. läuft 4 = Alarm verriegelt		x	x	x	x	x	x	x	x	x	x
0x0106	signed int	Alarmstatus 1 (K2 / Stufe 2)			x	x	x	x	x	x	x	x	x	x
0x0107	signed int	Alarmstatus 2 (K3* / Stufe 3)			x	x	x	x	x	x	x	x	x	x
0x0108	signed int	Alarmstatus 3 (Stufe 4)			x									
0x0109	signed int	Alarmstatus 4 (Stufe 5)			x									
0x010A	signed int	Alarmstatus 5 (Stufe 6)			x									
0x010B	signed int	Alarmstatus 6 (Stufe 7)			x									
0x010C	signed long	low high	Gerätestatus		nur für interne Service Zwecke		x	x	x	x	x	x	x	x
0x010D														
0x010E	signed long	low high	Seriennummer				x	x	x	x	x	x	x	x
0x010F														
0x0110	signed long	low high	Betriebsstundenzähler		in Stunden [h]		x	x	x	x	x	x	x	x
0x0111														
0x0112	signed int	Firmware-Version, App.	z.B. 03EA (hex) = 1002 (dez) -> 12720-1410-02		x	x	x	x	x	x	x	x	x	
0x0113	signed int	Firmware-Version, Bootl.			x	x	x	x	x	x	x	x	x	
0x0114	signed long	low high	Minwert U - L1 [0,1 V]		100 ...	250000	x	x	x	x	x	x	x	x
0x0115														
0x0116	signed long	low high	Maxwert U - L1 [0,1 V]		100 ...	250000	x	x	x	x	x	x	x	x
0x0117														
0x0118	signed long	low high	Minwert U - L2 [0,1 V]		100 ...	250000	x	x	x	x	x	x	x	x
0x0119														
0x011A	signed long	low high	Maxwert U - L2 [0,1 V]		100 ...	250000	x	x	x	x	x	x	x	x
0x011B														
0x011C	signed long	low high	Minwert U - L3 [0,1 V]		100 ...	250000	x	x	x	x	x	x	x	x
0x011D														
0x011E	signed long	low high	Maxwert U - L3 [0,1 V]		100 ...	250000	x	x	x	x	x	x	x	x
0x011F														
0x0120	signed long	low high	Minwert I - L1 [mA]		1 ...	2400000	x	x	x	x	x	x	x	x
0x0121														
0x0122	signed long	low high	Maxwert I - L1 [mA]		1 ...	2400000	x	x	x	x	x	x	x	x
0x0123														
0x0124	signed long	low high	Minwert I - L2 [mA]		1 ...	2400000	x	x	x	x	x	x	x	x
0x0125														
0x0126	signed long	low high	Maxwert I - L2 [mA]		1 ...	2400000	x	x	x	x	x	x	x	x
0x0127														
0x0128	signed long	low high	Minwert I - L3 [mA]		1 ...	2400000	x	x	x	x	x	x	x	x
0x0129														
0x012A	signed long	low high	Maxwert I - L3 [mA]		1 ...	2400000	x	x	x	x	x	x	x	x
0x012B														
0x012C	signed long	low high	Minwert P - L1 [W]		-60000000...	60000000	x	x	x	x	x	x	x	x
0x012D														
0x012E	signed long	low high	Maxwert P - L1 [W]		-60000000...	60000000	x	x	x	x	x	x	x	x
0x012F														

*Im Fall von Programm 7, 8, 9 und 10 reagiert **K3** auf drei Stufen sukzessiv gemäß der VDE-AR-N 4105.

Adr. hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x0130 0x0131	signed long <i>low</i> <i>high</i>	Minwert P - L2 [W]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x0132 0x0133	signed long <i>low</i> <i>high</i>	Maxwert P - L2 [W]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x0134 0x0135	signed long <i>low</i> <i>high</i>	Minwert P - L3 [W]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x0136 0x0137	signed long <i>low</i> <i>high</i>	Maxwert P - L3 [W]	-60000000...	60000000	x	x	x	x	x	x	x	x	x	x
0x0138 0x0139	signed long <i>low</i> <i>high</i>	Minwert P - L123 [W]	-99999999...	99999999	x	x	x	x	x	x	x	x	x	x
0x013A 0x013B	signed long <i>low</i>	Maxwert P - L123 [W]	-99999999...	99999999	x	x	x	x	x	x	x	x	x	x
0x013C 0x013D	signed long <i>low</i> <i>high</i>	Summe zugeschalteter Lasten per Relais [W]	0 ...	150000	x	x	x	x	x	x	x	x	x	x
0x013E 0x013F	unsigned long <i>low</i> <i>high</i>	Angesteuerte Last per Analogausgang I [W]	0 ...	50000	x	x	x	x	x	x	x	x	x	x
0x0140 0x0141	unsigned long <i>low</i> <i>high</i>	Angesteuerte Last per Analogausgang U [W]	0 ...	50000	x	x	x	x	x	x	x	x	x	x
0x0142	signed int	Digitaleingang Y1	0 ...	1	x	x	x	x	x	x	x	x	x	x
0x0143	signed int	Digitaleingang Y2	0 ...	1	x	x	x	x	x	x	x	x	x	x
0x0144	signed int	Digitaleingang Y3	0 ...	1	x	x	x	x	x	x	x	x	x	x
0x0145	signed int	Digitaleingang 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-Funktion K1	0 = auto/aus 1 = ein für 2 = aus für 3 = manuell ein 4 = manuell aus		x	x	x							
0x0148	signed int	Status Timer-Funktion K2			x	x	x							
0x0149	signed int	Status Timer-Funktion K3			x	x	x							
0x014A	signed int	Status Timer-Funktion Out I			x	x	x							
0x014B	signed int	Status Timer-Funktion Out U			x	x	x							
0x014C 0x014D	unsigned long <i>low</i> <i>high</i>	Ist-Zeit von Timer-Funktion K1 [s]	0 ...	86400	x	x	x							
0x014E 0x014F	unsigned long <i>low</i> <i>high</i>	Ist-Zeit von Timer-Funktion K2 [s]	0 ...	86400	x	x	x							
0x0150 0x0151	unsigned long <i>low</i> <i>high</i>	Ist-Zeit von Timer-Funktion K3 [s]	0 ...	86400	x	x	x							
0x0152 0x0153	unsigned long <i>low</i> <i>high</i>	Ist-Zeit von Timer-Funktion Out I [s]	0 ...	86400	x	x	x							
0x0154 0x0155	unsigned long <i>low</i> <i>high</i>	Ist-Zeit von Timer-Funktion Out U [s]	0 ...	86400	x	x	x							
0x0156 0x0157	signed long <i>low</i> <i>high</i>	Einspeisung L1 [Wh]	-2147483648	... 0	x	x	x	x	x	x	x	x	x	x
0x0158 0x0159	signed long <i>low</i> <i>high</i>	Einspeisung L2 [Wh]	-2147483648	... 0	x	x	x	x	x	x	x	x	x	x
0x015A 0x015B	signed long <i>low</i> <i>high</i>	Einspeisung L3 [Wh]	-2147483648	... 0	x	x	x	x	x	x	x	x	x	x
0x015C 0x015D	signed long <i>low</i> <i>high</i>	Einspeisung L123 [Wh]	-2147483648	... 0	x	x	x	x	x	x	x	x	x	x
0x015E 0x015F	signed long <i>low</i> <i>high</i>	Bezug L1 [Wh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x0160 0x0161	signed long <i>low</i> <i>high</i>	Bezug L2 [Wh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x0162 0x0163	signed long <i>low</i> <i>high</i>	Bezug L3 [Wh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x

Adr. hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x0164 0x0165	signed long <i>low</i> <i>high</i>	Bezug L123 [Wh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x0166 0x0167	signed long <i>low</i> <i>high</i>	Bezug - Einspeisung L123 [Wh]	-2147483648	2147483647	x	x	x	x	x	x	x	x	x	x
0x0168 0x0169	signed long <i>low</i> <i>high</i>	Eigenverbrauch an K1 [kWh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x016A 0x016B	signed long <i>low</i> <i>high</i>	Eigenverbrauch an K2 [kWh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x016C 0x016D	signed long <i>low</i> <i>high</i>	Eigenverbrauch an K3 [kWh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x016E 0x016F	signed long <i>low</i> <i>high</i>	Eigenverbrauch an Out I [kWh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x0170 0x0171	signed long <i>low</i> <i>high</i>	Eigenverbrauch an Out U [kWh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x0172 0x0173	signed long <i>low</i> <i>high</i>	Eigenverbrauch an K123 + Out I + U [kWh]	0 ...	2147483647	x	x	x	x	x	x	x	x	x	x
0x0174 0x0175	signed long <i>low</i> <i>high</i>	Istwert U - L1-L2 [0,1 V]	173 ...	433013	x	x	x	x	x	x	x	x	x	x
0x0176 0x0177	signed long <i>low</i> <i>high</i>	Istwert U - L1-L3 [0,1 V]	173 ...	433013	x	x	x	x	x	x	x	x	x	x
0x0178 0x0179	signed long <i>low</i> <i>high</i>	Istwert U - L2-L3 [0,1 V]	173 ...	433013	x	x	x	x	x	x	x	x	x	x
0x017A 0x017B	signed long <i>low</i> <i>high</i>	Istwert U-10-Perioden- L1 [0,1 V]	100 ...	250000							x	x	x	x
0x017C 0x017D	signed long <i>low</i> <i>high</i>	Istwert U-10-Perioden- L2 [0,1 V]	100 ...	250000							x	x	x	x
0x017E 0x017F	signed long <i>low</i> <i>high</i>	Istwert U-10-Perioden- L3 [0,1 V]	100 ...	250000							x	x	x	x
0x0180 0x0181	signed long <i>low</i> <i>high</i>	Istwert I-10-Perioden- L1 [mA]	1 ...	2400000							x	x	x	x
0x0182 0x0183	signed long <i>low</i> <i>high</i>	Istwert I-10-Perioden- L2 [mA]	1 ...	2400000							x	x	x	x
0x0184 0x0185	signed long <i>low</i> <i>high</i>	Istwert I-10-Perioden- L3 [mA]	1 ...	2400000							x	x	x	x
0x0186	signed int	Drehfeldrichtung	1 = Rechts  0 = NaN (möglicher Phasenausfall) -1 = Links 		x	x	x	x	x	x	x	x	x	x
0x0187	unsigned int	Quadrant der Scheinleistung S1	1 = 1. Quadrant 2 = 2. Quadrant 3 = 3. Quadrant 4 = 4. Quadrant		x	x	x	x	x	x	x	x	x	x
0x0188	unsigned int	Quadrant der Scheinleistung S2	1 = 1. Quadrant 2 = 2. Quadrant 3 = 3. Quadrant 4 = 4. Quadrant		x	x	x	x	x	x	x	x	x	x
0x0189	unsigned int	Quadrant der Scheinleistung S3	1 = 1. Quadrant 2 = 2. Quadrant 3 = 3. Quadrant 4 = 4. Quadrant		x	x	x	x	x	x	x	x	x	x
0x018A	unsigned int	Quadrant der Scheinleistung Sges	1 = 1. Quadrant 2 = 2. Quadrant 3 = 3. Quadrant 4 = 4. Quadrant		x	x	x	x	x	x	x	x	x	x
0x018B	signed int	Vorzeichen für Einspeisung & Bezug	-1=Verbraucherzählpfeilsystem, Einspeisung neg. / Bezug pos. -2=Erzeugerzählpfeilsystem, Einspeisung pos. / Bezug neg.		x	x	x	x	x	x	x	x	x	x

Adr. hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x018C	signed int	Status Wirkleistung P – L1	Verbraucherzählpfeilsystem: 0 = Bezug, 1 = Einspeisung		x	x	x	x	x	x	x	x	x	x
0x018D	signed int	Status Wirkleistung P – L2			x	x	x	x	x	x	x	x	x	x
0x018E	signed int	Status Wirkleistung P – L3			x	x	x	x	x	x	x	x	x	x
0x018F	signed int	Status Wirkleistung P – L123			x	x	x	x	x	x	x	x	x	x
0x0190	signed int	Status Blindleistung Q – L1	Erzeugerzählpfeilsystem: 0 = Einspeisung, 1 = Bezug		x	x	x	x	x	x	x	x	x	x
0x0191	signed int	Status Blindleistung Q – L2			x	x	x	x	x	x	x	x	x	x
0x0192	signed int	Status Blindleistung Q – L3			x	x	x	x	x	x	x	x	x	x
0x0193	signed int	Status Blindleistung Q – L123			x	x	x	x	x	x	x	x	x	x
0x0194	signed long <i>low</i>	Istwert U - L1 [0,01 V]	1000 ...	2500000							x	x	x	x
0x0195	<i>high</i>													
0x0196	signed long <i>low</i>	Istwert U - L2 [0,01 V]	1000 ...	2500000							x	x	x	x
0x0197	<i>high</i>													
0x0198	signed long <i>low</i>	Istwert U - L3 [0,01 V]	1000 ...	2500000							x	x	x	x
0x0199	<i>high</i>													
0x019A	signed long <i>low</i>	Istwert P - L1 10ms [W]	-60000000...	60000000							x	x	x	x
0x019B	<i>high</i>													
0x019C	signed long <i>low</i>	Istwert P - L2 10ms [W]	-60000000...	60000000							x	x	x	x
0x019D	<i>high</i>													
0x019E	signed long <i>low</i>	Istwert P - L3 10ms [W]	-60000000...	60000000							x	x	x	x
0x019F	<i>high</i>													
0x01A0	signed long <i>low</i>	Istwert P - L123 10ms [W]	-60000000...	60000000							x	x	x	x
0x01A1	<i>high</i>													
0x01A2	signed long <i>low</i>	Istwert Frequenz [0,001 Hz]	40000 ...	70000	x	x	x	x	x	x	x	x	x	x
0x01A3	<i>high</i>													

6.2 Parameter auslesen und schreiben

- Modbus Funktioncode 0x03 (Read Holding Registers)
- Modbus Funktioncode 0x10 (Write Multiple registers)

Adr. hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x0200	signed int	Programmnummer	1...	10	x	x	x	x	x	x	x	x	x	x
0x0201	signed int	Stromwandler-Primär [A]	1...	1000	x	x	x	x	x	x	x	x	x	x
0x0202	signed int	Stromwandler-Sekundär [0,1 A]	1...	50	x	x	x	x	x	x	x	x	x	x
0x0203	signed long	Leistung an K1 (step 10 W) [W]	0...	500000	x	x	x	x						
0x0204	low high													
0x0205	signed long	Leistung an K2 (step 10 W) [W]	0...	500000	x	x	x	x						
0x0206	low high													
0x0207	signed long	Leistung an K3 (step 10 W) [W]	0...	500000	x	x	x	x						
0x0208	low high													
0x0209	signed int	Phase an Relais K1	-5 = L123, -4 = L3, -3 = L2, -2 = L1, -1 = aus		x	x	x	x		x				
0x020A	signed int	Phase an Relais K2			x	x	x	x			x			
0x020B	signed int	Phase an Relais K3			x	x	x	x				x		
0x020C	signed int	Relaisfunktion K1	-2 = 11-12	-1 = 11-14	x	x	x	x						
0x020D	signed int	Relaisfunktion K2	-2 = 21-22	-1 = 21-24	x	x	x	x						
0x020E	signed int	Relaisfunktion K3	-2 = 31-32	-1 = 31-34	x	x	x	x						
0x020F	signed long	Verz. ein K1 [s]	0...	86399	x	x		x	x	x	x	x	x	x
0x0210	low high	Verz. ein [s]						x						
0x0211	signed long	Verz. ein K2 [s]	0...	86399	x	x		x	x	x	x	x	x	x
0x0212	low high													
0x0213	signed long	Verz. ein K3 [s]	0...	86399	x	x		x	x	x	x	x	x	x
0x0214	low high													
0x0215	signed long	Min ein K1 [s]	10...	86399	x	x		x						
0x0216	low high	Min ein						x						
0x0217	signed long	Min ein K2 [s]	10...	86399	x	x		x						
0x0218	low high													
0x0219	signed long	Min ein K3 [s]	10...	86399	x	x		x						
0x021A	low high													
0x021B	signed long	Verz. aus K1 [s]	10...	86399	x	x		x						
0x021C	low high	Verz. aus	10...	86399				x						
		Verz. aus K1 [0,01s]	0...	359999						x	x	x	x	x
0x021D	signed long	Verz. aus K2 [s]	10...	86399	x	x		x						
0x021E	low high	Verz. aus K2 [0,01s]	0...	359999						x	x	x	x	x
0x021F	signed long	Verz. aus K3 [s]	10...	86399	x	x		x						
0x0220	low high	Verz. aus K3 [0,01s]	0...	359999						x	x			
0x0221	signed long	Laständ K1 [s]	10...	86399	x	x		x						
0x0222	low high													
0x0223	signed long	Laständ K2 [s]	10...	86399	x	x		x						
0x0224	low high													
0x0225	signed long	Laständ K3 [s]	10...	86399	x	x		x						
0x0226	low high													
0x0227	signed long	Leistung K1 ein (step 10 W) [W]	-999990...	999990	x	x		x	x	x	x	x	x	x
0x0228	low high	Abschaltwert (step 10 W) [W]						x						
0x0229	signed long	Leistung K2 ein (step 10 W) [W]	-999990...	999990	x	x		x	x	x	x	x	x	x
0x022A	low high													
0x022B	signed long	Leistung K3 ein (step 10 W) [W]	-999990...	999990	x	x		x	x	x	x	x	x	x
0x022C	low high													

Adr. hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x022D 0x022E	signed long <i>low</i> <i>high</i>	Leistung K1 aus (step 10 W) [W]	-999990...	999990	x	x		x	x	x	x	x	x	x
0x022F 0x0230	signed long <i>low</i> <i>high</i>	Leistung K2 aus (step 10 W) [W]	-999990...	999990	x	x		x	x	x	x	x	x	x
0x0231 0x0232	signed long <i>low</i> <i>high</i>	Leistung K3 aus (step 10 W) [W]	-999990...	999990	x	x		x	x	x				
0x0233	signed int	Auto Reset K1	-1 = an	-2 = aus					x	x	x	x	x	x
0x0234	signed int	Auto Reset K2	-1 = an	-2 = aus					x	x	x	x	x	x
0x0235	signed int	Auto Reset K3	-1 = an	-2 = aus					x	x	x	x	x	x
0x0236	signed int	Funktion Input Y1	-13 = Aout-U 100%, -12 = Aout-U 0%, -11 = Aout-I 100%, -10 = Aout-I 0%, -9 = K3 aus, -8 = K2 aus, -7 = K1 aus, -6 = K3 an, -5 = K2 an, -4 = K1 an, -3 = K1-3 an, -2 = K1-3 aus, -1 = aus		x	x	x	x						
0x0237	signed int	Funktion Input Y2			x	x	x	x						
0x0238	signed int	Funktion Input Y3			x	x	x	x						
0x0239	signed int	Funktion Input Y4			x	x	x	x						
0x023A	signed int	Analogausgang I, Funktion	-9 = Last-L3, -8 = Last-L2, -7 = Last-L1, -6 = Last-L123, -5 = kW-L3, -4 = kW-L2, -3 = kW-L1, -2 = kW-L123, -1 = aus		x	x	x	x	x	x	x	x	x	x
0x023B	signed int	Analogausgang I, 0-20mA / 4-20 mA / Individuell	-3 = Ind, -2 = 4-20 mA, -1 = 0-20 mA		x	x	x	x	x	x	x	x	x	x
0x023C	signed int	Analogausgang I, individueller Nullpkt. [0,01 mA]	0 ...	1000	x	x	x	x	x	x	x	x	x	x
0x023D 0x023E	signed long <i>low</i> <i>high</i>	Analogausgang I, Nullpunkt (step 10 W) [W]	-999990...	999990	x	x	x	x	x	x	x	x	x	x
0x023F 0x0240	signed long <i>low</i> <i>high</i>	Analogausgang I, Fullscale (step 10 W) [W]	-999990...	999990	x	x	x	x	x	x	x	x	x	x
0x0241 0x0242	signed long <i>low</i> <i>high</i>	Analogausgang I, Sollwert (step 10 W) [W]	-999990...	999990	x	x	x	x	x	x	x	x	x	x
0x0243 0x0244	signed long <i>low</i> <i>high</i>	Analogausgang I, max. Leistung (step 10 W) [W]	0...	500000	x	x	x	x	x	x	x	x	x	x
0x0245	signed int	Analogausgang I, Regel-Geschwindigkeit [%]	20...	90	x	x	x	x	x	x	x	x	x	x
0x0246	signed int	Analogausgang I, Regel-Intervall [0,1 s]	5...	600	x	x	x	x	x	x	x	x	x	x
0x0247	signed int	Analogausgang I, Regel-Toleranz. [%]	5...	50	x	x	x	x	x	x	x	x	x	x
0x0248	signed int	Analogausgang U, Funktion	-9 = Last-L3, -8 = Last-L2, -7 = Last-L1, -6 = Last-L123, -5 = kW-L3, -4 = kW-L2, -3 = kW-L1, -2 = kW-L123, -1 = aus		x	x	x	x	x	x	x	x	x	x
0x0249	signed int	Analogausgang U, 0-10V / 2-10V / Individuell	-3=Ind, -2=2-10 V, -1=0-10 V		x	x	x	x	x	x	x	x	x	x
0x024A	signed int	Analogausgang U, individueller Nullpkt. [0,01 V]	0 ...	500	x	x	x	x	x	x	x	x	x	x
0x024B 0x024C	signed long <i>low</i> <i>high</i>	Analogausgang U, Nullpunkt (step 10 W) [W]	-999990...	999990	x	x	x	x	x	x	x	x	x	x
0x024D 0x024E	signed long <i>low</i> <i>high</i>	Analogausgang U, Fullscale (step 10 W) [W]	-999990...	999990	x	x	x	x	x	x	x	x	x	x
0x024F 0x0250	signed long <i>low</i> <i>high</i>	Analogausgang U, Sollwert (step 10 W) [W]	-999990...	999990	x	x	x	x	x	x	x	x	x	x

Adr. hex	Datentyp	Register	Wertebereich		Prog.-Nr.									
			Min.	Max.	1	2	3	4	5	6	7	8	9	10
0x0251 0x0252	signed long <i>low high</i>	Analogausgang U, max. Leistung (step 10 W) [W]	0...	500000	x	x	x	x	x	x	x	x	x	x
0x0253	signed int	Analogausgang U, Regel-Geschwindigkeit [%]	20...	90	x	x	x	x	x	x	x	x	x	x
0x0254	signed int	Analogausgang U, Regel-Intervall [0,1 s]	5...	600	x	x	x	x	x	x	x	x	x	x
0x0255	signed int	Analogausgang U, Regel-Toleranz. [%]	5...	50	x	x	x	x	x	x	x	x	x	x
0x0256	signed int	Sprache	-2 = englisch, -1 = deutsch		x	x	x	x	x	x	x	x	x	x
0x0257	signed int	TFT-Helligkeit [%]	20...	100	x	x	x	x	x	x	x	x	x	x
0x0258	signed int	TFT, dimmen nach ... [s]	10...	3600	x	x	x	x	x	x	x	x	x	x
0x0259	signed int	Displayverzögerung [0,1 s]	1...	20	x	x	x	x	x	x	x	x	x	x
0x025A	signed int	Timer-Funktion K1	0 = auto, 1 = ein für, 2 = aus für, 3 = manuell ein, 4 = manuell aus		x	x	x	x						
0x025B	signed int	Timer-Funktion K2			x	x	x	x						
0x025C	signed int	Timer-Funktion K3			x	x	x	x						
0x025D	signed int	Timer-Funktion Out I			x	x	x	x						
0x025E	signed int	Timer-Funktion Out U			x	x	x	x						
0x025F	signed int	Timer-Funktion K1, Zeit von "ein für / aus für" [Min.]	1...	1440	x	x	x	x						
0x0260	signed int	Timer-Funktion K2, Zeit von "ein für / aus für" [Min.]	1...	1440	x	x	x	x						
0x0261	signed int	Timer-Funktion K3, Zeit von "ein für / aus für" [Min.]	1...	1440	x	x	x	x						
0x0262	signed int	Timer-Funktion I, Zeit von "ein für / aus für" [Min.]	1...	1440	x	x	x	x						
0x0263	signed int	Timer-Funktion U, Zeit von "ein für / aus für" [Min.]	1...	1440	x	x	x	x						
0x0264	signed int	Timer-Funktion, Last an Out I [%]	0...	100	x	x	x	x						
0x0265	signed int	Timer-Funktion, Last an Out U [%]	0...	100	x	x	x	x						

6.3 Reset-Funktionen auslösen

- Modbus Funktioncode 0x10 (Write Multiple registers)

Adr. hex	Datentyp	Register	Wert	Prog.-Nr.									
				1	2	3	4	5	6	7	8	9	10
0x0100	signed int	Reset Min/Max U	write 1 -> Reset alle U	x	x	x	x	x	x	x	x	x	x
0x0101	signed int	Reset Min/Max I	write 1 -> Reset alle I	x	x	x	x	x	x	x	x	x	x
0x0102	signed int	Reset Min/Max P	write 1 -> Reset alle P	x	x	x	x	x	x	x	x	x	x
0x0103	signed int	Einschaltzeit K1...K3	write 1 -> Reset alle Zeiten	x	x	x	x	x	x	x	x	x	x
0x0104	signed int	Error-Speicher	write 1 -> Reset alle Errors	x	x	x	x	x	x	x	x	x	x
0x0105	signed int	Verriegelte Relais	write 1 -> Reset locked Rel.					x	x	x	x	x	x
0x0106	signed int	Reset Energiezähler	write 1 -> Reset	x	x	x	x	x	x	x	x	x	x

7 Funktionscode 0x2B - Geräteinformationen lesen

Request

Byte Nr.	Wert (hex)	Bedeutung	Beschreibung
0 1	<i>high</i> <i>low</i> 0x00 0x00	Transaction Identifier	Übertragungs-Nr. zur Identifikation (bei mehreren Anfragen gleichzeitig)
2 3	<i>high</i> <i>low</i> 0x00 0x00	Protocol Identifier	Immer 0 (Modbus Protokoll)
4 5	<i>high</i> <i>low</i> 0x00 0x05	Länge	Anzahl nachfolgende Datenbytes (High Byte ist immer 0)
6	0xFF	Unit Identifier	Identifikation einer Untereinheit (Wert hat keine Bedeutung)
7	0x2B	Funktionscode	Modbus Funktions-Code (0x2B, Geräteinformationen lesen)
8	0x0E	MEI Type	Immer 0x0E ^{*1}
9	0x01	Read Device ID code ^{*2}	
10	0x00	Object ID	Siehe Funktionscode 0x2B - Objekte

^{*1} MEI = MODBUS Encapsulated Interface (s. Modbus Dokumentation, <http://www.modbus.org>)

^{*2} 0x01: Abfrage von „Basic“ Geräteinformationen (stream access)
 0x02: Abfrage von „Regular“ Geräteinformationen (stream access)
 0x03: Abfrage von „Extended“ Geräteinformationen (stream access)
 0x04: Abfrage einzelner Geräteinformationen (individual access)

7.1 Funktionscode 0x2B – Objekte

Objekt ID (hex)	Objekt-Name / Beschreibung	Inhalt	Typ	Kategorie
0x00	Herstellername	ZIEHL industrie-elektronik GmbH + Co KG	ASCII String	Basic
0x01	Produkt- (Artikel-) Nummer	S227260		
0x02	Revision Firmware	12720-1410-xx		
0x03	Hersteller URL	www.ziehl.com	ASCII String	Regular
0x04	Produkt Name	Relay for Energy Flow		
0x05	Produkt Bezeichnung	EFR4002IP		
0x80	Seriennummer	xxxxxxx	ASCII String	Extended
0x81	Revision Hardware	xx (z. B. „01“)		
0x82	Revision Bootloader	12750-1400-xx		