

Operating manual EFR4001IP

updated: 2023-05-12 / oa
from firmware: 0-03

- SunSpec Modbus TCP Communication Protocol

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1 Important Information



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

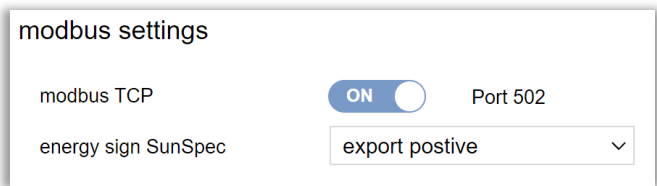
2 Interface Parameters

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.
- The sign of the exported energy is positive by default. Select "export negative" if a negative sign is desired.



3 Telegram Structure

According to Modbus TCP and SunSpec specification.

For more details, refer to the Modbus and SunSpec original documentation, available at:

<https://www.modbus.org> and <https://www.sunspec.org>

4 Supported Function Codes

Function Code	Designation	Use	Access (R/W)
3 (0x03)	Read Holding Registers	Read data from the registers	R

5 Data Types

5.1 16-bit Integer Values

16-bit integers are stored using one register in big-endian order.

Register	1															
Byte	0							1								
Bits	15	...						8	7	...						0

int16 Range: -32768 ... -32767

NOT IMPLEMENTED value: 0x8000

uint16 Range: 0 ... 65534

NOT IMPLEMENTED value: 0xFFFF

5.2 32-bit Integer Values

32-bit integers are stored using two registers in big-endian order.

Register	1 (high)								2 (low)											
Byte	0				1				2				3							
Bits	31	...			24	23	...			16	15	...			8	7	...			0

int32 Range: -2147483647 ... 2147483647

NOT IMPLEMENTED value: 0x80000000

uint32 Range: 0 ... 4294967294

NOT IMPLEMENTED value: 0xFFFFFFFF

bitfield32 Range: 0 ... 0x7FFFFFFF

NOT IMPLEMENTED value: 0xFFFFFFFF

NOT CONFIGURED value: 0x00000000

5.3 32-bit Floating-point Values

32-bit floating-point values are encoded according to the IEEE 754 floating-point standard.

Register	1 (high)								2 (low)												
Byte	0				1				2				3								
Bits	31	30	...			24	23	...			16	15	...			8	7	...			0
IEEE 754	Sign		Exponent						Mantissa												

float32 Range: see IEEE 754

NOT IMPLEMENTED value: 0x7FC00000 (NaN)

5.4 String Values

String values are stored in a fixed size register range using a NULL (0 value) to terminate or pad the string. For example, up to 16 characters can be stored in 8 contiguous registers as follows.

Register	1 (high)		2		3		4		5		6		7		8 (low)	
Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Character	E	X	A	M	P	L	E	spc	S	T	R	I	N	G	!	NULL

Strings MUST be UTF-8 encoded

NOT IMPLEMENTED value: all registers filled with NULL, or 0x0000

6 SunSpec Register Tables

The offset between register number and Modbus address amounts to one. Use the following formula to determine the Modbus address of the wanted register number.

Register number -1 = Modbus address. E.g., 40001 -1 = 40000 = 0x9C40

6.1 Table 1: Common Model (1)

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value
40001	0x9C40	SID	SunSpec ID. Uniquely identifies this as a sunspec modbus map. Value = "SunS" (0x53756E53)	uint32	high low	0x5375 = "Su"
40002	0x9C41					0x6E53 = "nS"
40003	0x9C42	ID	Model ID. Uniquely identifies this as a sunspec common model.	uint16		0x0001 = 1
40004	0x9C43	L	Length of sunspec common model.	uint16	Registers	0x0041 = 65
40005	0x9C44	Mn	Meter Manufacturer. Value = "ZIEHL industrie-elektronik"	string	high	0x5A49 = "ZI"
40006	0x9C45					0x4548 = "EH"
40007	0x9C46					0x4C20 = "L "
40008	0x9C47					0x696E = "in"
40009	0x9C48					0x6475 = "du"
40010	0x9C49					0x7374 = "st"
40011	0x9C4A					0x7269 = "ri"
40012	0x9C4B					0x652D = "e-"
40013	0x9C4C					0x656C = "el"
40014	0x9C4D					0x656B = "ek"
40015	0x9C4E					0x7472 = "tr"
40016	0x9C4F					0x6F6E = "on"
40017	0x9C50					0x696B = "ik"
40018	0x9C51					0x0000
40019	0x9C52					0x0000
40020	0x9C53					0x0000
40021	0x9C54	Md	Meter Model. Value = "EFR4001P"	string	high	0x4546 = "EF"
40022	0x9C55					0x5234 = "R4"
40023	0x9C56					0x3030 = "00"
40024	0x9C57					0x3149 = "1I"
40025	0x9C58					0x5000 = "P"
40026	0x9C59					0x0000
40027	0x9C5A					0x0000
40028	0x9C5B					0x0000
40029	0x9C5C					0x0000
40030	0x9C5D					0x0000
40031	0x9C5E					0x0000
40032	0x9C5F					0x0000
40033	0x9C60					0x0000
40034	0x9C61					0x0000
40035	0x9C62					0x0000
40036	0x9C63					0x0000
40037	0x9C64	Opt	Meter Name. Value = NOT IMPLEMENTED	string	high	0x0000
:	:					:
40044	0x9C6B				low	0x0000
40045	0x9C6C	Vr	Meter Firmware Version. E.g., Value = "12720-1410-01"	string	high	0x3132 = "12"
40046	0x9C6D					0x3732 = "72"
40047	0x9C6E					0x302D = "0-"
40048	0x9C6F					0x3134 = "14"
40049	0x9C70					0x3130 = "10"
40050	0x9C71					0x2D30 = "-0"
40051	0x9C72					0x3100 = "1"
40052	0x9C73					0x0000
					low	0x0000

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value
40053	0x9C74	SN	Meter Serial Number. E.g., Value = "123499"	string	high	0x3132 = "12"
40054	0x9C75					0x3334 = "34"
40055	0x9C76					0x3939 = "99"
40056	0x9C77					0x0000
40057	0x9C78					0x0000
40058	0x9C79					0x0000
40059	0x9C7A					0x0000
40060	0x9C7B					0x0000
40061	0x9C7C					0x0000
40062	0x9C7D					0x0000
40063	0x9C7E					0x0000
40064	0x9C7F					0x0000
40065	0x9C80					0x0000
40066	0x9C81					0x0000
40067	0x9C82					0x0000
40068	0x9C83	0x0000	low			
40069	0x9C84	DA	Modbus Device Address. Value = 1 (standard)	uint16		0x0001 = 1

6.2 Table 2: AC Meter Model (213)

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value	
40070	0x9C85	ID	Model ID. Uniquely identifies this as a sunspec AC meter model (21x). 211: Single Phase (AN or AB). 212: Split Single Phase (ABN). 213: WYE-Connect Three Phase (ABCN). 214: Delta-Connect Three Phase (ABC).	uint16		0x00D5 = 213	
40071	0x9C86	L	Length of sunspec AC meter model.	uint16	Registers	0x007C = 124	
40072	0x9C87	A	Total AC Current (sum of the active phases).	float32	high low	A	E.g., 0x403FCEDA = 2.997
40073	0x9C88						
40074	0x9C89	AphA	Phase A Current.	float32	high low	A	E.g., 0x3F7FBE78 = 0.999
40075	0x9C8A						
40076	0x9C8B	AphB	Phase B Current.	float32	high low	A	E.g., 0x3F7FBE78 = 0.999
40077	0x9C8C						
40078	0x9C8D	AphC	Phase C Current.	float32	high low	A	E.g., 0x3F7FBE78 = 0.999
40079	0x9C8E						
40080	0x9C8F	PhV	Line to Neutral AC Voltage (average of the active phases).	float32	high low	V	E.g., 0x4365E667 = 229.9
40081	0x9C90						
40082	0x9C91	PhVphA	Phase Voltage AN.	float32	high low	V	E.g., 0x4365E667 = 229.9
40083	0x9C92						
40084	0x9C93	PhVphB	Phase Voltage BN.	float32	high low	V	E.g., 0x4365E667 = 229.9
40085	0x9C94						
40086	0x9C95	PhVphC	Phase Voltage CN.	float32	high low	V	E.g., 0x4365E667 = 229.9
40087	0x9C96						
40088	0x9C97	PPV	Line to Line AC Voltage (average of active phases).	float32	high low	V	E.g., 0x43C7199A = 398.2
40089	0x9C98						

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value
40090	0x9C99	PhVphAB	Phase Voltage AB.	float32	V	E.g., 0x43C7199A = 398.2
40091	0x9C9A					
40092	0x9C9B	PhVphBC	Phase Voltage BC.	float32	V	E.g., 0x43C7199A = 398.2
40093	0x9C9C					
40094	0x9C9D	PhVphCA	Phase Voltage CA.	float32	V	E.g., 0x43C7199A = 398.2
40095	0x9C9E					
40096	0x9C9F	Hz	Frequency.	float32	Hz	E.g., 0x4247F5C2 = 49.99
40097	0x9CA0					
40098	0x9CA1	W	Total AC Active Power (sum of the active phases).	float32	W	E.g., 0x442C0000 = 688
40099	0x9CA2					
40100	0x9CA3	WphA	Watts Phase A.	float32	W	E.g., 0x43650000 = 229
40101	0x9CA4					
40102	0x9CA5	WphB	Watts Phase B.	float32	W	E.g., 0x43650000 = 229
40103	0x9CA6					
40104	0x9CA7	WphC	Watts Phase C.	float32	W	E.g., 0x43650000 = 229
40105	0x9CA8					
40106	0x9CA9	VA	Total AC Apparent Power (sum of the active phases).	float32	VA	E.g., 0x442C0000 = 688
40107	0x9CAA					
40108	0x9CAB	VAphA	VA Phase A.	float32	VA	E.g., 0x43650000 = 229
40109	0x9CAC					
40110	0x9CAD	VAphB	VA Phase B.	float32	VA	E.g., 0x43650000 = 229
40111	0x9CAE					
40112	0x9CAF	VAphC	VA Phase C.	float32	VA	E.g., 0x43650000 = 229
40113	0x9CB0					
40114	0x9CB1	VAR	Total AC Reactive Power (sum of the active phases).	float32	VAR	E.g., 0x00000000 = 0
40115	0x9CB2					
40116	0x9CB3	VARphA	VAR Phase A.	float32	VAR	E.g., 0x00000000 = 0
40117	0x9CB4					
40118	0x9CB5	VARphB	VAR Phase B.	float32	VAR	E.g., 0x00000000 = 0
40119	0x9CB6					
40120	0x9CB7	VARphC	VAR Phase C.	float32	VAR	E.g., 0x00000000 = 0
40121	0x9CB8					
40122	0x9CB9	PF	Total Power Factor (= Ptotal / Stotal).	float32	PF	E.g., 0x3F800000 = 1.0000
40123	0x9CBA					
40124	0x9CBB	PFphA	PF Phase A.	float32	PF	E.g., 0x3F800000 = 1.0000
40125	0x9CBC					
40126	0x9CBD	PFphB	PF Phase B.	float32	PF	E.g., 0x3F800000 = 1.0000
40127	0x9CBE					
40128	0x9CBF	PFphC	PF Phase C.	float32	PF	E.g., 0x3F800000 = 1.0000
40129	0x9CC0					
40130	0x9CC1	TotWhExp	Total Active Energy Exported.	float32	Wh	E.g., 0xC4340000 = -720
40131	0x9CC2					
40132	0x9CC3	TotWhExp PhA	Total Watt-hours Exported Phase A.	float32	Wh	E.g., 0xC3700000 = -240
40133	0x9CC4					

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value	
40134	0x9CC5	TotWhExp PhB	Total Watt-hours Exported Phase B.	float32	high low	Wh	E.g., 0xC3700000 = -240
40135	0x9CC6						
40136	0x9CC7	TotWhExp PhC	Total Watt-hours Exported Phase C.	float32	high low	Wh	E.g., 0xC3700000 = -240
40137	0x9CC8						
40138	0x9CC9	TotWhImp	Total Active Energy Imported.	float32	high low	Wh	E.g., 0x435E0000 = 222
40139	0x9CCA						
40140	0x9CCB	TotWhImp PhA	Total Watt-hours Imported Phase A.	float32	high low	Wh	E.g., 0x42940000 = 74
40141	0x9CCC						
40142	0x9CCD	TotWhImp PhB	Total Watt-hours Imported Phase B.	float32	high low	Wh	E.g., 0x42940000 = 74
40143	0x9CCE						
40144	0x9CCF	TotWhImp PhC	Total Watt-hours Imported Phase C.	float32	high low	Wh	E.g., 0x42940000 = 74
40145	0x9CD0						
40146	0x9CD1	TotVAhExp	Total Apparent Energy Exported.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40147	0x9CD2						
40148	0x9CD3	TotVAhExp PhA	Total VA-hours Exported Phase A.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40149	0x9CD4						
40150	0x9CD5	TotVAhExp PhB	Total VA-hours Exported Phase B.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40151	0x9CD6						
40152	0x9CD7	TotVAhExp PhC	Total VA-hours Exported Phase C.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40153	0x9CD8						
40154	0x9CD9	TotVAhImp	Total Apparent Energy Imported.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40155	0x9CDA						
40156	0x9CDB	TotVAhImp PhA	Total VA-hours Imported Phase A.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40157	0x9CDC						
40158	0x9CDD	TotVAhImp PhB	Total VA-hours Imported Phase B.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40159	0x9CDE						
40160	0x9CDF	TotVAhImp PhC	Total VA-hours Imported Phase C.	float32	high low	VAh	NOT IMPLEMENTED 0x7FC00000
40161	0x9CE0						
40162	0x9CE1	TotVARh ImpQ1	Quadrant 1: Total Reactive Energy Imported.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40163	0x9CE2						
40164	0x9CE3	TotVARh ImpQ1PhA	Total VAR-hours Imported Q1 Phase A.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40165	0x9CE4						
40166	0x9CE5	TotVARh ImpQ1PhB	Total VAR-hours Imported Q1 Phase B.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40167	0x9CE6						
40168	0x9CE7	TotVARh ImpQ1PhC	Total VAR-hours Imported Q1 Phase C.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40169	0x9CE8						
40170	0x9CE9	TotVARh ImpQ2	Quadrant 2: Total Reactive Power Imported.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40171	0x9CEA						
40172	0x9CEB	TotVARh ImpQ2PhA	Total VAR-hours Imported Q2 Phase A.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40173	0x9CEC						
40174	0x9CED	TotVARh ImpQ2PhB	Total VAR-hours Imported Q2 Phase B.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40175	0x9CEE						
40176	0x9CEF	TotVARh ImpQ2PhC	Total VAR-hours Imported Q2 Phase C.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40177	0x9CF0						
40178	0x9CF1	TotVARh ExpQ3	Quadrant 3: Total Reactive Power Exported.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40179	0x9CF2						
40180	0x9CF3	TotVARh ExpQ3PhA	Total VAR-hours Exported Q3 Phase A.	float32	high low	VARh	NOT IMPLEMENTED 0x7FC00000
40181	0x9CF4						

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value
40182	0x9CF5	TotVArh ExpQ3PhB	Total VAr-hours Exported Q3 Phase B.	float32	VArh	NOT IMPLEMENTED 0x7FC00000
40183	0x9CF6					
40184	0x9CF7	TotVArh ExpQ3PhC	Total VAr-hours Exported Q3 Phase C.	float32	VArh	NOT IMPLEMENTED 0x7FC00000
40185	0x9CF8					
40186	0x9CF9	TotVArh ExpQ4	Quadrant 4: Total Reactive Power Exported.	float32	VArh	NOT IMPLEMENTED 0x7FC00000
40187	0x9CFA					
40188	0x9CFB	TotVArh ExpQ4PhA	Total VAr-hours Exported Q4 Phase A.	float32	VArh	NOT IMPLEMENTED 0x7FC00000
40189	0x9CFC					
40190	0x9CFD	TotVArh ExpQ4PhB	Total VAr-hours Exported Q4 Phase B.	float32	VArh	NOT IMPLEMENTED 0x7FC00000
40191	0x9CFE					
40192	0x9CFF	TotVArh ExpQ4PhC	Total VAr-hours Exported Q4 Phase C.	float32	VArh	NOT IMPLEMENTED 0x7FC00000
40193	0x9D00					
40194	0x9D01	Evt	Meter Event Flags.	bitfield 32		NOT CONFIGURED 0x00000000
40195	0x9D02					

6.3 Table 3: End Block Model

Register No. (DEC)	Modbus Address (HEX)	Name	Description	Data Type	Unit	Content / Value
40196	0x9D03	ID	Model ID identifies this as end block.	uint16		0xFFFF
40197	0x9D04	L	Length of end block model.	uint16	Registers	0x0000