GOSSEN METRAWATT

A2000

Multifunctional Power Meter
Profibus Interface

3-349-092-03
6/7.03

Contents Page

1 General Information

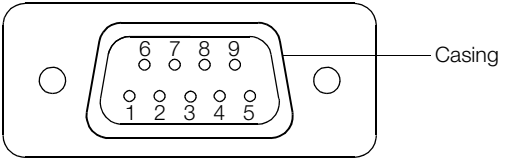
1.1 Interface Hardware

The A2000 is equipped with an RS 485 serial interface in accordance with DIN 19245, part 3 (Profibus-DP) , for communications with a master computer, an SPC etc.

All measured values, except for the saved data logger values, can be read via the bus coupling. Baud rates of up to 12 Mbit per second are supported.

The selection of a user address for Profibus operation can be performed at the keypad, or via the Profibus (set slave address).

Connection assignments of the 9-pole standard plug at the back of the instrument:



Profibus-DP
COM 2

Connection Number	Connection assignments / Use
1	Screen
2	Not assigned
3	Data received / Data to be transmitted B
4	RTS (Control-A)
5	Data import potential (Mass +5 V)
6	Supply voltage +5 V
7	Not assigned
8	Data received / Data to be transmitted A
9	Not assigned
Casing	Screen

1.2 Communications Protocol

The data transmission protocol in accordance with DIN 19245, part 3, is used for communications between the field level and the device level.

2 Telegram Formats

2.1 Primary Layout for Output Data in the Data_Exchange Send Frame (Profibus master → A2000)

Byte Number	Content	Meaning
0		Function field (FF)
1		Parameter index (PI)
2, 3	= 0000	not in use
4, 5	= 0000	not in use
6, 7		Parameter 1
8, 9		Parameter 2
10, 11		Parameter 3
12, 13		Parameter 4
14, 15		Parameter 5
16, 17		Parameter 6
18, 19		Parameter 7
20, 21		Parameter 8
22, 23		Parameter 9
24, 25		Parameter 10
26, 27		Parameter 11
28, 29		Parameter 12

2.2 Primary Layout for Input Data in the Data_Exchange Response Frame (A2000 → Profibus master)

Byte Number	Content	Meaning
0		Function field (FF)
1		Parameter index (PI)
2, 3		Error status 1 (FS1)
4, 5		Error status 2 (FS2)
6, 7		Value 1
8, 9		Value 2
10, 11		Value 3
12, 13		Value 4
14, 15		Value 5
16, 17		Value 6
18, 19		Value 7
20, 21		Value 8
22, 23		Value 9
24, 25		Value 10
26, 27		Value 11
28, 29		Value 12

2.3 Function Field

The function field contains direction and control information for transmitted user data.

2.3.1 Function Code for the Function Field in the Send Frame

Bit Number	Function	Meaning
0 ... 3	Function code (FC)	See chapter 2.3.3, page 7.
4, 5		not in use
6	S toggle	The Profibus DP master can use this bit in combination with the corresponding acknowledgement bit from the response frame's FF to monitor processing of a request to a slave to write or read a parameter. For this purpose, the master sets this bit to the inverse value of the current S toggle acknowledgement bit in its request and waits until the slave indicates processing of the request by adapting the status of the acknowledgement bit in the response frame to the status of the S toggle bit in the send frame. Use of the S toggle bit function is only absolutely essential for requests to write parameters, because the A2000 only executes internal write operations after the status of the S toggle bit has been reversed!
7		not in use

2.3.2 Function Code for the Function Field in the Response Frame

Bit Number	Function	Meaning
0 ... 3	Function code (FC)	See chapter 2.3.3, page 7.
4		not in use
5	Busy	This bit indicates that no further write operations are currently possible at the parameters EEPROM. See chapter 2.6, page 8.
6	S toggle acknowledgement	The A2000 Profibus DP slave adapts the status of this bit to the status of the S toggle bit in the response frame, after the bit has been processed.
7	L toggle	This bit is inverted after the A2000 has processed a data_exchange send frame. With the help of the L toggle bit, the master is able to determine if the requested values have been updated. The master must always retain the last bit status to this end. If the received value does not correspond to the last value, the values have been updated.

2.3.3 Function Code (FC)

Value	Function
0	Idle
1	Cyclical data acquisition
2	Read parameter with parameter index (PI)
3	Write parameter with parameter index (PI)
4 ... 5	not in use

All function codes except for 1, 2 and 3 are responded to with an empty frame (see chapter 2.4, page 7).

2.4 Parameter Index (PI)

The type of data to be transmitted is determined with the parameter index. The “PI” character is interpreted as follows:

Bit 7 ... 4	Bit 3 ... 0
0 ... F_h	0 ... F_h
Selection number for main parameters group	Selection numbers for special parameters within the main group

Functionally related data and configuration parameters are grouped together in the main parameter groups.
Only the parameter indices documented in chapter 3.2, page 13 through page 26, can be addressed with the A2000. All other parameter indices are responded to with an empty frame. An empty frame consists of a data_exchange response frame (see chapter 2.2, page 5) with:

- FF
- PI = impermissible parameter index
- FS1 and FS2 with current A2000 error status
- Data words value 1 ... 12 = 0

2.5 Data Block Length and Format

Length and format are variable and depend upon PI or FF. One or several individual values with the following formats can be transmitted:

Format	Interpretation		
8 bit	Bit array		
	Number	–128 ... +127	
	Number	0 ... +255	
16 bit	Bit array		
	Number	–32768 ... +32767	LS byte first
	Number	0 ... +65535	LS byte first
32 bit	Number	–2147483648 ... +2147483647	LS byte first
	Number	0 ... +4294967295	LS byte first

2.6 Reading and Writing Parameters

Parameters which have been assigned to groups can be read with function code 2. The desired parameters group (PI) is entered to the data_exchange send frame to this end. The desired parameters are returned with the data_exchange response frame after slave response time has expired.

With the help of the L toggle bit, the master is able to determine if the requested values have been updated. The master must always retain the last bit status to this end. If the received value does not correspond to the last value, the values have been updated.

Parameters can be written with function code 3. The desired parameters group (PI) is entered to the data_exchange send frame to this end, and the desired value is assigned to the corresponding parameters.

In order to start a write operation, the S toggle bit must first be set to the inverse value of the current S toggle acknowledgement bit (see Response Frame, chapter 2.3.2, page 6). If no errors occur, all transmitted parameters are then defined and the changed parameters are returned via the data_exchange response frame after slave response time has expired. The S toggle acknowledgement bit is set to the same value as the S toggle bit and thus indicates that the write request has been registered. The A2000 writes the changed values to the EEPROM. The busy bit in the function field indicates that the internal write operation has not yet been completed at the A2000, and that no other write operations can currently be executed. As long as this bit is set, no further write operations can be requested.

2.7 Error Status Word

2.7.1 Read Error Status Word 1 (measuring circuit)

Bit Number	Meaning	Comment
0	=1: U1 < 0.7% of measuring range or does not exist	
1	=1: U2 < 0.7% of measuring range or does not exist	
2	=1: U3 < 0.7% of measuring range or does not exist	
3	=1: I1 < 0.8% of measuring range or does not exist	
4	=1: I2 < 0.8% of measuring range or does not exist	
5	=1: I3 < 0.8% of measuring range or does not exist	
6	=1: DC offset too large (bits 0 ... 5 indicate channel)	Defective measurement input
7	=1: frequency < 40Hz / does not exist	At none of the 6 measurement inputs
8	=1: U1 overflow	
9	=1: U2 overflow	
10	=1: U3 overflow	
11	=1: I1 overflow	
12	=1: I2 overflow	
13	=1: I3 overflow	
14	=1: frequency > 70 Hz	At none of the 6 measurement inputs
15	=1: device not calibrated	Rewiring is required

2.7.2 Read Error Status Word 1 (miscellaneous)

Bit Number	Meaning	Comment
0	=1: alarm 1 (relay 1) active	
1	=1: alarm 2 (relay 2) active	
2	=1: condition for alarm 1 fulfilled (is not saved)	
3	=1: condition for alarm 2 fulfilled (is not saved)	
4	=1 3-wire connection with following sequence: L1, L3, L2	=0 after correction and renewed start-up of the device
5	=0	
6	=0	
7	=0	
8	=1: defective measurement input	=0 after correction of the error
9	=1: invalid parameter value, transmitted values will not be written to the EEPROM	=0 after reading
10	=0	
11	=1: power failure at real-time clock, false real-time value	=0 after writing to RTC, PI = 90h, 91h
12	=1: defective real-time clock	=0 after correction of the error
13	=1: incorrect configuration parameter at EEPROM	=0 after correction of the error
14	=1: incorrect energy meter reading at EEPROM	=0 after correction of the error
15	=1: defective EEPROM	=0 after correction of the error

3 Individual Functions

3.1 Cyclical Data

The A2000 responds to function code 1 with cyclical data.
The contents include a selection from the PI group 0xh. Selection is made in the request frame with parameters 1 through 12.

3.1.1 Request Frame Cyclical Data

Character Number	Function	Content	Unit / Format	Comment
0	FF	1		Function field
1	PI			Parameter index
2, 3	=0000			not in use
4, 5	=0000			not in use
6, 7	Parameter 1			Selection of cyclical data
28, 29	Parameter 12			Selection of cyclical data

The determination as to which values should be transmitted with the cyclical data is dependent upon the parameters in the send frame. Within these 12 words, the parameter index is indicated with the high byte and the number of the corresponding value is indicated with the low byte. All 12 selection parameters must be entered with valid parameter indices (00 ... 0C, 0F), as well as the respectively permissible numbers. If an invalid parameter index or number is entered, the number 0000 is returned for this parameter and bit 9 (invalid parameter value) is set in error status word 2.

Example:

Character 7	Character 6	
PI = 00	Number = 2	Transmit phase voltage U2

Character 9	Character 8	
PI = 02	Number = 6	Transmit maximum phase current $I2_{max}$

Character 11	Character 10	
PI = 07	Number = 8	Transmit minimum total power factor

If a 32 bit value is selected (energy meter), the entry in the next selection parameter word is ignored and analysis is first resumed with the following word.

Example:

PI	Number	
08	04	Transmit total power
xx	xx	Insignificant entry
0F	01	Transmit frequency

3.2 Measured Values and Parameters

3.2.1 Overview (PI = 00h bis 3Fh)

Main Group	PI	Number of Characters	Value	Comment
0			**Measured Values**	read only
	00h	16	Phase voltages	
	01h	16	Delta voltages	
	02h	16	Phase currents	
	03h	16	Averaged phase currents	
	04h	16	Active powers	
	05h	16	Reactive powers	
	06h	16	Apparent powers	
	07h	8	Power factors	
	08h	16	Active energy meter	
	09h	24	Intervalic active powers	
	0Ah	24	Intervalic reactive powers	
	0Bh	24	Intervalic apparent powers	
	0Ch	16	Reactive energy meter	
	0Dh	8	Neutral conductor currents	
	0Fh	2	Line frequency	
1			**Limit Values**	
	10h	8	Relay hysteresis / limit	
	11h	4	Relay source / configuration	
	12h	4	Pulse output rate	
	13h	2	Pulse output source	

Main Group	PI	Number of Characters	Value	Comment
2			**Control Commands / Status Queries**	
	20h	2	Control status	
	21h	4	Error status	read only
	24h	2	Max. voltages, delete currents	write only
	25h	3	Max. powers / delete FFT	write only
	26h	2	Delete energy meter	write only
	27h	2	Set standard parameters	write only
	29h	1	Data logger start / stop	only for feature R1
3			**Device Specification**	
	30h	1	Device ID	read only
	31h	1	Equipped with	read only
	32h	4	Measured value dimensions	read only
	33h	1	Connection type	
	34h	1	Synchronous interval	
	35h	1	Software version	read only
	36h	1	Energy meter mode	
	37h	4	Low tariff time interval	only for feature R1
	38h	1	Type of measurement for reactive power	
	3Bh	4	Voltage measuring range	
	3Ch	4	Current measuring range	
	3Fh	1	Display brightnesst/filter	

3.2.2 Measured Value Units of Measure, Ranges and Resolution

These entries apply to all of the contents of a frame, to the measured values as well as to the parameters.

The multipliers (decimal point position, “dim” parameter) are determined during entry of the primary measuring ranges (compare PI = 3Bh, 3Ch) and can be queried with PI = 32h.

Measured Quantity	Basic Unit	Multiplier Range	Corresponding “dim” Parameter Value PI = 32h	Data Field Value Range	Overall Physical Value Range	Display Resolution compare PI = 32h
Line frequency	Hz	0.01	—	4000 ... 7000	40.00 ... 70.00 Hz	0.01Hz
Power factor	1	0.01	—	–100 ... 0 ... +100	1.00 ... cap ... 0 ... ind ... 1.00	0.01
Voltage	V	10^{-1} ... 10^{2}	dim.U= –1 ... 2	0 ... 9999	0 V ... 999.9 V ... 999.9 kV	dim. U (V)
Current	A	10^{-3} ... 10^{2}	dim.I = –3 ... 2	0 ... 9999	0 A ... 9.999 A ... 999.9 kA	dim. I (A)
Power, intervalic power	W, VA, VAr	10^{-1} ... 10^{8}	dim.P= –1 ... 8	–9999 ... 0 ... 9999	0 ... 999.9 W / VA / VAr ... 999.9 GW / GVA / GVAr	dim. P (W)
Energy meter	Wh, VArh	10^{-1} ... 10^{8}	dim.E= –1 ... 8	–99999999 ... 0 ... 999999999	0 ... 99999999.9 Wh / VArh ... 99999999.9 GWh / GVArh	dim. E (Wh)

3.2.3 Main Group 0: Measured Values

Measured values can only be read, writing is not possible.
The unit of the measured values is indicated in the table under „Main Group 3“, see chapter 3.2.6, page 25, under PI 32h.

PI	Number	Measured Value	Format	Comment
00h		Phase voltages:		
	1	U1	16 bit	
	2	U2	16 bit	
	3	U3	16 bit	
	4	UΣ	16 bit	$= \sqrt{(U1^2 + U2^2 + U3^2)}$
	5	$U1_{max}$	16 bit	
	6	$U2_{max}$	16 bit	
	7	$U3_{max}$	16 bit	
	8	$U\Sigma_{max}$	16 bit	Max. value for UΣ
01h		Delta voltages:		
	1	U12	16 bit	
	2	U23	16 bit	
	3	U31	16 bit	
	4	UΔΣ	16 bit	= (U12 + U23 + U31) / 3
	5	$U12_{max}$	16 bit	
	6	$U23_{max}$	16 bit	
	7	$U31_{max}$	16 bit	
	8	$U\Delta\Sigma_{max}$	16 bit	Max. value for UΔΣ
02h		Phase current:		
	1	I1	16 bit	
	2	I2	16 bit	
	3	I3	16 bit	
	4	IΣ	16 bit	$= \sqrt{(I1^2 + I2^2 + I3^2)}$
	5	$I1_{max}$	16 bit	
	6	$I2_{max}$	16 bit	
	7	$I3_{max}$	16 bit	
	8	$I\Sigma_{max}$	16 bit	Max. value for IΣ

PI	Number	Measured Value	Format	Comment
03h		Averaged phase current:		Corresponds to bimetallic measuring instrument
	1	$I1_{avg}$	16 bit	
	2	$I2_{avg}$	16 bit	
	3	$I3_{avg}$	16 bit	
	4	$I\Sigma_{avg}$	16 bit	Average value derived from IΣ
	5	$I1_{avg\ max}$	16 bit	Max. value derived from respective average values
	6	$I2_{avg\ max}$	16 bit	
	7	$I3_{avg\ max}$	16 bit	
	8	$I\Sigma_{avg\ max}$	16 bit	
04h		Active power:		
	1	P1	± 15 bit	
	2	P2	± 15 bit	
	3	P3	± 15 bit	
	4	PΣ	± 15 bit	
	5	$P1_{max}$	± 15 bit	
	6	$P2_{max}$	± 15 bit	
	7	$P3_{max}$	± 15 bit	
	8	$P\Sigma_{max}$	± 15 bit	
05h		Reactive power:		
	1	Q1	16 bit	
	2	Q2	16 bit	
	3	Q3	16 bit	
	4	QΣ	16 bit	
	5	$Q1_{max}$	16 bit	
	6	$Q2_{max}$	16 bit	
	7	$Q3_{max}$	16 bit	
	8	$Q\Sigma_{max}$	16 bit	

PI	Number	Measured Value		Format	Comment
06h		Apparent power:			
	1	S1		16 bit	
	2	S2		16 bit	
	3	S3		16 bit	
	4	SΣ		16 bit	
	5	$S1_{max}$		16 bit	
	6	$S2_{max}$		16 bit	
	7	$S3_{max}$		16 bit	
	8	$SΣ_{max}$		16 bit	
07h		Power factor:			
	1	PF1		± 7 bit	PF < 0: capacitive [1)] PF > 0: inductive [1)]
	2	PF2		± 7 bit	
	3	PF3		± 7 bit	
	4	PFΣ		± 7 bit	
	5	$PF1_{min}$		± 7 bit	
	6	$PF2_{min}$		± 7 bit	
	7	$PF3_{min}$		± 7 bit	
	8	$PFΣ_{min}$		± 7 bit	
08h		Active energy meter			
		L123 mode	LTHT mode		For LTHT mode
	1	EP1	EPΣ–LT	± 31 / 32 bit	Total active energy indicated for low tariff time period
	2	EP2	EPΣ+LT	± 31 / 32 bit	Total active energy imported during low tariff time period
	3	EP3	EPΣ–HT	± 31 / 32 bit	Total active energy indicated for high tariff time period
	4	EPΣ	EPΣ+HT	± 31 / 32 bit	Total active energy imported during high tariff time period
					All displayed meter readings are positive here!

PI	Number	Measured Value		Format	Comment
09h	1	$P_{Int\,\Sigma}$		1 x ± 15 bit	Currently running interval
	1 ... 11	$P_{Int\,\Sigma}$		10 x ± 15 bit	1st to 10th preceding intervals
	12	$P_{Int\,\Sigma}$		1 x ± 15 bit	Max. interval value since start-up, or since reset of the value (see 0 PI=25h)
0Ah	1	$Q_{Int\,\Sigma}$		1 x 16 bit	Currently running interval
	2 ... 11	$Q_{Int\,\Sigma}$		10 x 16 bit	1st to 10th preceding intervals
	12	$Q_{Int\,\Sigma}$		1 x 16 bit	Max. interval value since start-up, or since reset of the value (see 0 PI=25h)
0Bh	1	$S_{Int\,\Sigma}$		1 x 16 bit	Currently running interval
	2 ... 11	$S_{Int\,\Sigma}$		10 x 16 bit	1st to 10th preceding intervals
	12	$S_{Int\,\Sigma}$		1 x 16 bit	Max. interval value since start-up, or since reset of the value (see 0 PI=25h)
0Ch		Reactive energy meter			
		L123 mode	LTHT mode		For LTHT mode:
	1	EQ1	EQΣ–LT	32 bit	Total reactive energy exported during low tariff time period
	2	EQ2	EQΣ+LT	32 bit	Total reactive energy imported during low tariff time period
	3	EQ3	EQΣ–HT	32 bit	Total reactive energy exported during high tariff time period
	4	EQΣ	EQΣ+HT	32 bit	Total reactive energy imported during high tariff time period
0Dh		Neutral conductor current			
	1	I_N		16 bit	
	2	$I_{N\,max}$		16 bit	
	3	$I_{N\,avg}$		16 bit	
	4	$I_{N\,avg\,max}$		16 bit	
0Fh	1	Line frequency		16 bit	

[1] To obtain the PF, multiply the result (± 7 bits) by 0.01.

3.2.4 Main Group 1: Limit Values

PI	Parameter	Format	Unit of Measure	Value Range	Comment
10h	Relay 1, hysteresis	16 bit	Unit of measure of the quantity to be monitored (source)	0 ... 100	
	Relay 2, hysteresis	16 bit			
	Relay 1, limit	± 15 bit		–10000 ... 9999	Observe measuring range limits at the source
	Relay 2, limit	± 15 bit			
11h	Relay 1, source	8 bit		See chapter 3.2.4.1, page 21, Source Coding ...	
	Relay 2, source	8 bit			
	Relay 1, configuration	8 bit		See chapter 3.2.4.2, page 22, Configuration Coding ...	
	Relay 2, configuration	8 bit			
12h	Pulse output 1, rate	16 bit	1 / kWh (MWh)	0 ... 5000	
	Pulse output 2, rate	16 bit	1 / kWh (MWh)		
13h	Pulse output 1, source	8 bit		See chapter 3.2.4.3, page 22, Source Coding...	
	Pulse output 2, source	8 bit			

3.2.4.1 Source Coding for Alarms (relay) - (PI = 11h)

Bit No.	Value	Meaning	Function
3 ... 0	0	Phase 1 or 1 → 2	Phase number of the source value (no function for frequency)
	1	Phase 2 or 2 → 3	
	2	Phase 3 or 3 → 1	
	3	Total	
	4	Neutral conductor current	only for source value = 2, 3 (current)
	5	for all 3 phases	only for relay (PI = 11h)
7 ... 4	0	Delta voltage	Type of source value
	1	Phase voltage	
	2	Phase current	
	3	Phase current, averaged	
	4	Active power	
	5	Reactive power	
	6	Apparent power	
	7	Power factor	
	8	Frequency [1)]	
	9	Total active power interval [2)]	
	10	Total reactive power interval [2)]	
	11	Total apparent power interval [2)]	
	12	External value (control via interface is possible)	

[1)] Frequency value independent of phase number.
[2)] Power interval values independent of phase number, the currently running interval is used for alarm output.

3.2.4.2 Configuration Coding for Relays (PI = 11h)

Bit No.	Value	Meaning	Function
0	0	Low	Low / high alarm function
	1	High	
1	0	Non-store	Alarm memory
	1	Store	
2	0	Depends upon DIP switch	Alarm release
	1	Always free	
3	0		currently no function
4 ... 7	0 ... 15	0 = none 1 = 1 s 2 = 2 s 3 = 3 s 4 = 5 s 5 = 8 s 6 = 15 s 7 = 25 s 8 = 40 s 9 = 1 min 10 = 2 min 11 = 3 min 12 = 5 min 13 = 8 min 14 = 15 min 15 = 30 min	Alarm delay

3.2.4.3 Source Coding for Pulse Output (PI = 13h)

Bit No.	Value	Meaning	Function
3 ... 0	0	Phase 1 or 1 → 2	Source value phase number
	1	Phase 2 or 2 → 3	
	2	Phase 3 or 3 → 1	
	3	Total	
4	0	Active energy	Type of source value
	1	Reactive energy	
5	0	Import	Type of source value
	1	Export (active energy only)	
6	0	Pulses per kWh	
	1	Pulses per MWh	
7	0	Pulses during high tariff	Tariff switching
	1	Pulses during low tariff	

3.2.5 Main Group 2: Control Commands and Status Queries

PI	Parameter	Format	Value Range	Comment
20h	Control status A2000	Bit array, 16 bit	See page 23.	
21h	Error status 1	Bit arrays, 2 x 16 bit	See chapter 2.7, page 9	Write data have no function. Write data function: see “Write Error Status Word 2” on page 24
	Error status 2			
24h	$U\Delta_{max}$ [0 ... 3] clear	Bit array, 16 bit	See page 24 Bit array peak values for voltage, ...	Write only
	U_{max} [0 ... 3] clear			
	I_{max} [0 ... 3] clear			
	$I_{avg\ max}$ [0 ... 3] clear			
25h	P_{max} [0 ... 3] clear	Bit array, 8 bit	See page 24 Bit array peak values for active and reactive power, ...	Write only
	Q_{max} [0 ... 3] clear			
	S_{max} [0 ... 3] clear	Bit array, 8 bit		
	PF_{min} [0 ... 3] clear			
	$P_{int\ max}$ clear	Bit array, 8 bit		
	$Q_{int\ max}$ clear			
	$S_{int\ max}$ clear			
	Max. FFT clear			
26h	Energy clear all	16 bit	=55AAh	Write only
27h	Reset default parameters	16 bit	=A965h	Write only, sets 1st and 2nd parameter sets to original default values
29h	Data logger, start / stop	8 bit	=55h: stop =AAh: start	Restart only after previous stop Only with feature R1

A2000 Control Status (PI = 20h)

Bit No.	Value	Meaning	Function
0 ... 6	0		
7	1	Pulse output active	Read only
8	0	Relay 1 active	Where source = external
	1	Relay 1 inactive	
9	0	Relay 2 active	Where source = external
	1	Relay 2 inactive	
10 ... 15	0		

Write Error Status Word 2

Bit No.	Function	Comment
0	=1: reset alarm 1	Required for alarm memory mode
1	=1: reset alarm 2	
2 ... 15	= 0	not in use

Bit Array: Peak Values for Voltage, Reset Current (PI = 24h)

Bit No.	Value	Function
0	1	$U12_{max} = 0$
1	1	$U23_{max} = 0$
2	1	$U31_{max} = 0$
3	1	$U\Delta\Sigma_{max} = 0$
4	1	$U1_{max} = 0$
5	1	$U2_{max} = 0$
6	1	$U3_{max} = 0$
7	1	$U\Sigma_{max} = 0$
8	1	$I1_{max} = 0$
9	1	$I2_{max} = 0$
10	1	$I3_{max} = 0$
11	1	$I\Sigma_{max} = 0$, $I_{N\,max} = 0$
12	1	$I1_{avg\,max} = 0$
13	1	$I2_{avg\,max} = 0$
14	1	$I3_{avg\,max} = 0$
15	1	$I\Sigma_{avg\,max} = 0$, $I_{N\,avg\,max} = 0$

Bit Array: Peak Values for Active and Reactive Power, Apparent Power / Reset Power Factor and Interval Power (PI = 25h)

Bit No.	Value	Function
0	1	$P1_{max} = 0$
1	1	$P2_{max} = 0$
2	1	$P3_{max} = 0$
3	1	$P\Sigma_{max} = 0$
4	1	$Q1_{max} = 0$
5	1	$Q2_{max} = 0$
6	1	$Q3_{max} = 0$
7	1	$Q\Sigma_{max} = 0$
0	1	$S1_{max} = 0$
1	1	$S2_{max} = 0$
2	1	$S3_{max} = 0$
3	1	$S\Sigma_{max} = 0$
4	1	$PF1_{min} = 0$
5	1	$PF2_{min} = 0$
6	1	$PF3_{min} = 0$
7	1	$PF\Sigma_{min} = 0$
0	1	$P_{int\,max} = 0$
1	1	$Q_{int\,max} = 0$
2	1	$S_{int\,max} = 0$
3	1	Max. FFT = 0
4 ... 7	0	not in use

3.2.6 Main Group 3: Device Specification

PI	Parameter	Format	Value Range	Comment
30h	Device ID	8 bit	A2h	Read only
31h	Equipped with	8 bit	See device variants on page 26	Read only
32h	Meas. value – dimension			Read only, is determined by primary voltage and current measuring ranges (PI = 3B, 3Ch)
	U in V	± 7 bit		
	I in A	± 7 bit		
	P in W	± 7 bit		
	E in Wh	± 7 bit		
33h	3-L/4-L/3L-1/3L13/4L13 connection	8 bit	55h/AAh/33h/CCh/66h	
34h	Energy synchron-interval	8 bit	0, 1 ... 60	0 = external, 1 ... 60 minutes
35h	Software version	8 bit	0 ... 255	Read only
36h	Energy meter mode	8 bit		Mode low tariff active
			00h	L123 by time setting [1)]
			04h	LTHT by time setting [1)]
			08h	L123 with SYNC input
			0Ch	LTHT with SYNC input
37h	Low tariff time period interval			Only active with feature R1
	Start time minutes	8 bit	0 ... 59	
	Start time hours	8 bit	0 ... 23	
	End time minutes	8 bit	0 ... 59	
	End time hours	8 bit	0 ... 23	
38h	Representation of reactive power	8 bit		
	per DIN 40110		00h	$Q = \sqrt{S^2 - P^2}$
	with sign		10h	$Q = \frac{1}{TN} \cdot \int_0^{TN} U(t) \cdot J\left(t - \frac{TN}{4}\right) dt$ [*)]
	Compensating reactive power		20h	
3Bh	Voltage transformer transformation ratio			
	$U_{t\,prim}$	100 V / 16 bit	1 ... 7500	= 100 V ... 750 kV
	$U_{t\,sec}$	1 V / 16 bit	100 ... 500	= 100 V ... 500 V
3Ch	Current transformer transformation ratio			
	$I_{t\,prim}$	1 A, 5 A / 16 bit	0, 1 ... 30000	= 1 A, 5 A ... 150000 A
	$I_{t\,sec}$	/ 16 bit	0, 1	= 5 A, 1A
3Fh	Display brightness	bit 0 ... 2	0 ... 7	0.5 brightness levels
	Display filter	bit 3 ... 7	0 ... 30	Time constant

[*)] TN is the period duration of the basic frequency of U or I, respectively.

Device Variants (PI = 31h)

Bit No.	Value	Function	Feature
0	1	Equipped with analog outputs 3 and 4	A1
1	1	Equipped with S0 outputs	P1
2	1	Equipped with synchronizing input	S1
3	1	Equipped with LON interface	L1
4	1	Equipped with data logger	R1
5	1	Equipped with clock	R1
6	1	Equipped with Profibus interface	L2
7	0	Reserved	

4 Product Support

When you need support, please contact:

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