MID energy meters
Product manual

Version 2.5

Janitza®

Contents

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1 General

Climate change and increasingly scarce resources are major challenges of our time. Efficient and sustainable use of energy is therefore essential. Only when armed with the knowledge of how much energy is consumed is it possible to implement expedient optimisation measures.

With the MID energy meters, Janitza offers comprehensive possibilities for logging energy data and passing this on to systems for evaluation or control.

1.1 Use of the product manual

This manual provides you with detailed technical information regarding the function, mounting and programming of the power supply. Application is explained on the basis of examples.

The manual is divided up into the following chapters:

Chapter 1	General
Chapter 2	Device technology
Chapter 3	Commissioning
Chapter 4	Communication with Modbus
Chapter 5	Communication with M-Bus
Chapter A	Annex

1.1.1 Notes

Notes and safety information are presented in this manual as follows:

Note
Operating assistance, operating tips

Examples
Example applications, example installations, programming examples

Important
This safety information is used as soon as danger of a malfunction exists, without a risk of damage or injury.

Attention
This safety information is used as soon as danger of a malfunction exists, without a risk of damage or injury.

⚠ **Danger**
This safety information is used as soon as danger to life and limb exists due to incorrect handling.

⚠ ⚠ **Danger**
This safety information is used as soon as an acute risk of death exists due to incorrect handling.

1.2 Product and function overview

The energy meters from Janitza are available in a range of different variants: Meters for single or three-phase measurement and meters for direct transformer connection.

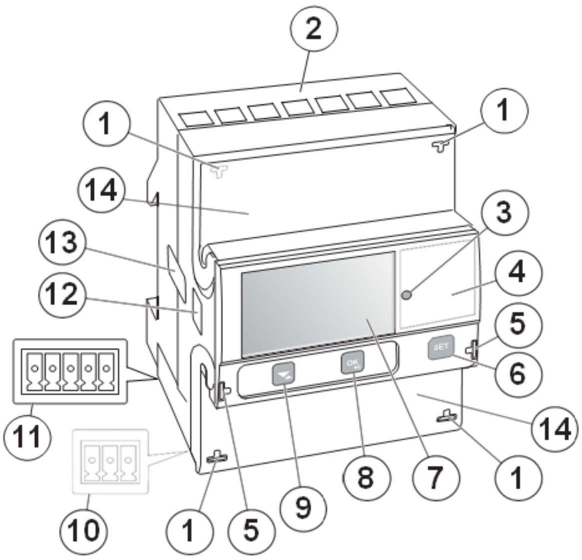
	Single-phase energy meter	Three-phase energy meter	
Type	B21	B23	B24
Connection type	Direct	Direct	Transformer
Limit current I_{max}	65 A	65 A	6 A
Connections/measuring units (configurable *)			
2-conductor connection/1 measuring unit	X		
3-conductor connection/2 measuring units*		X	X
4-conductor connection/3 measuring units*		X	X
Precision classes			
B (class 1)	X	X	X
C (class 0.5 S)			
Energy values/meter readings			
Active energy	X	X	X
Reactive energy	X	X	X
Apparent energy	X	X	X
4-quadrant measurement	X	X	X
Tariff register, 1-2	X	X	X
Diagnostics and alarms			
Measured values (e.g. W, V, A, Hz, Pf)	X	X	X
Alarm function (output 2)	X	X	X
Inputs/outputs			
Pulse output	X	X	X
1 input/2 outputs	X	X	X
Tariff control			
via inputs	X	X	X
via communication	X	X	X
Approvals			
MID (module B + D)	X	X	X
IEC	X	X	X
Communication/interfaces			
M-Bus	Optional	Optional	Optional
RS-485 (Modbus RTU)	Optional	Optional	Optional

2 Device technology

2.1 General B23/B24

B23 three-phase meter, three-phase (3 + N)
Direct connection up to 65 A
With measured values and alarm function
For 3-conductor and 4-conductor connection
Optional interfaces: M-Bus, RS-485 (Modbus RTU)
Width: 4 DIN modules.
.Tested and approved per MID and IEC

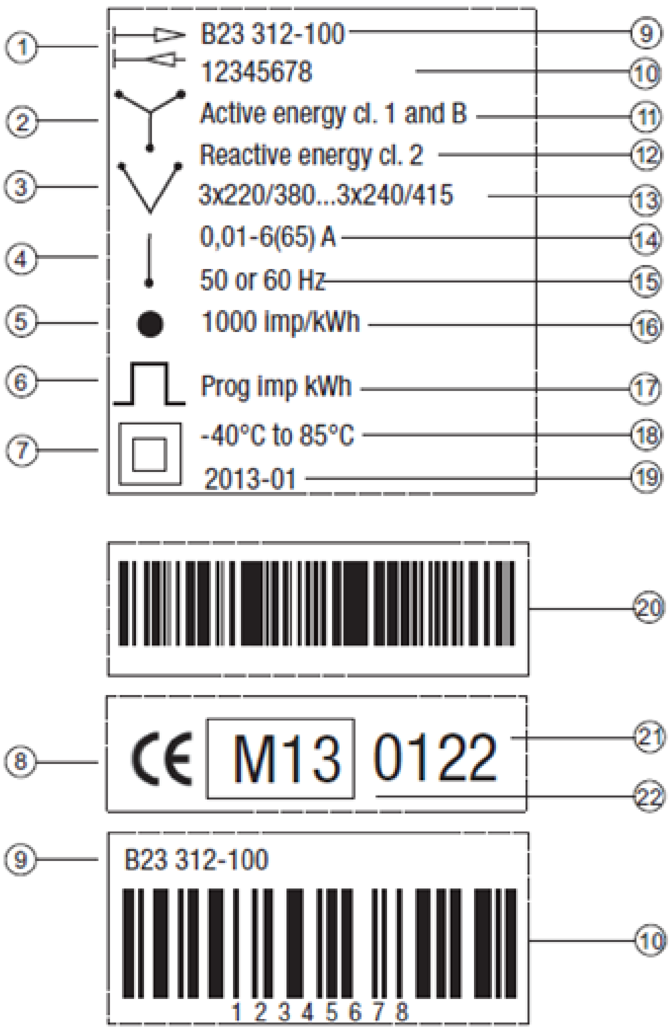
B24 measurement transformer meter, three-phase (3 + N)
Transformer connection CT, 1(6) A
With measured values and alarm function
For 3-conductor and 4-conductor connection
Optional interfaces: M-Bus, RS-485 (Modbus RTU)
Width: 4 DIN modules
Tested and approved per MID and IEC



2.1.1 Component, operating and display elements

No.	Description	Function
1	Sealing eyelets	For sealing the connection terminals
2	Connection terminals	Electrical connections
3	LED	Flashes proportionally to the measured energy
4	Product data/label	Contains information about the meter
5	Sealing eyelets	For sealing the front flap
6	SET button SET	For calling up the configuration mode
7	LC display	For displaying the energy and measured values
8	OK button OK	For confirming the selection and menu entries. Short button press: Confirm selection Long button press: Back to previous menu or change between standard and main menu
9	UP/DOWN button	For selecting a menu entry Shorter button press: Down or forwards Long button press: Up or back
10	Plug-in terminal for communication interfaces	Depending on meter type RS-485 (Modbus RTU) or M-Bus
11	Plug-in terminal for inputs and outputs	
12	Optical infra-red interface (IR)	Only for internal use!
13	Device seal	On both sides of the meter for protection against unauthorised opening of the meter
14	Cover can be lead-sealed	Protective cover for printed connection diagram on the inside

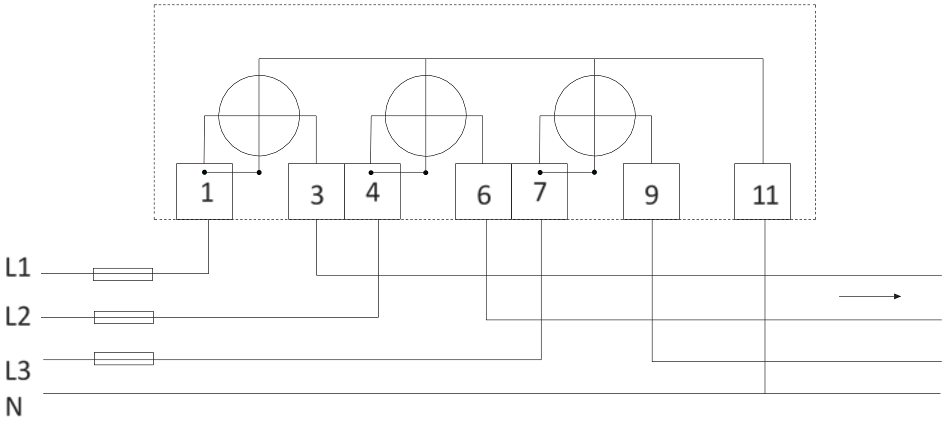
MID energy meters
Device technology



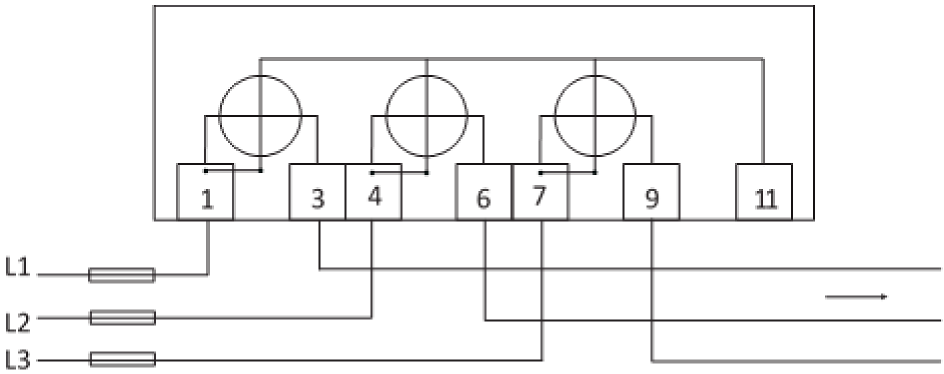
2.1.2 Product label

1	4-quadrant meter	**12**	Reactive energy accuracy class
2	3 measuring units (4-conductor connection)	**13**	Voltage
3	2 measuring units (3-conductor connection)	**14**	Current strength
4	1 measuring unit (2-conductor connection)	**15**	Frequency
5	LED	**16**	LED pulse frequency
6	Pulse output	**17**	Pulse frequency
7	Protection class II	**18**	Temperature range
8	CE test mark	**19**	Date of manufacture (year and week)
9	Type designation	**20**	Janitza ID
10	Serial number	**21**	Notified body (NMi)
11	Active energy accuracy class	**22**	MID test mark and test year

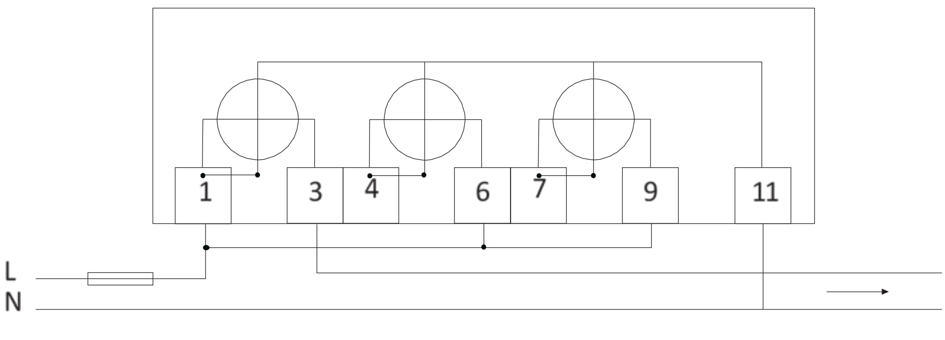
2.1.3 B23 connection diagrams



4-conductor connection / 3 measuring units

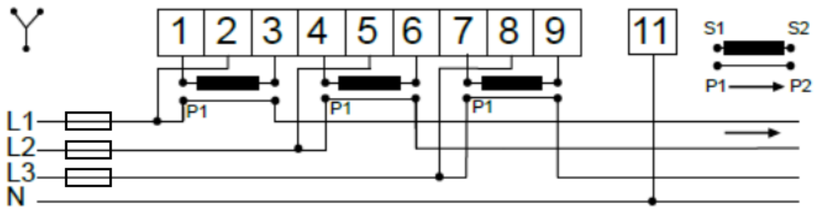


3-conductor connection / 2 measuring units

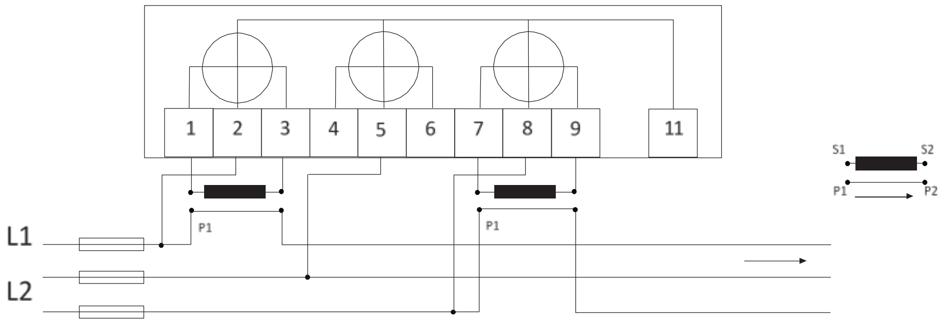


2-conductor connection / 1 measuring unit

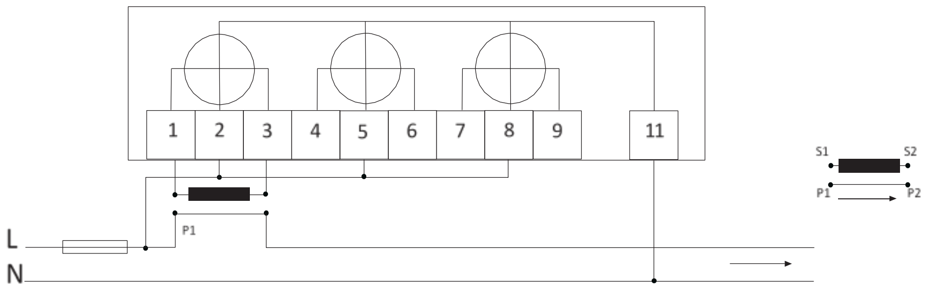
2.1.4 B24 connection diagrams



4-conductor connection / 3 measuring units

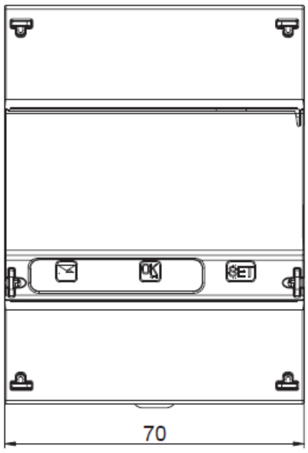


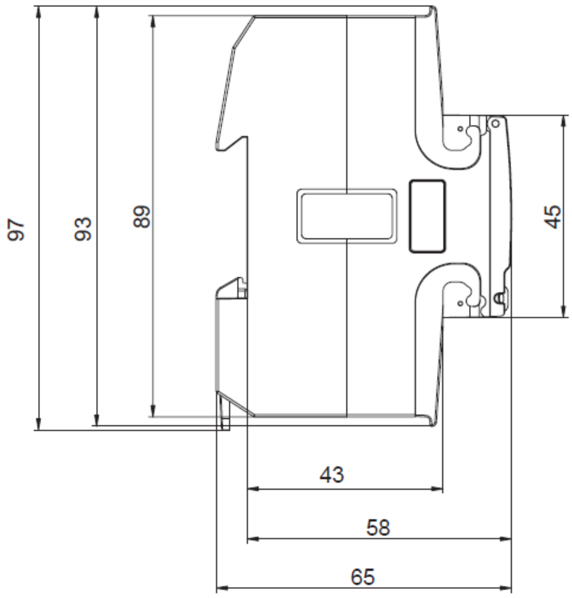
3-conductor connection / 2 measuring units



2-conductor connection / 1 measuring unit

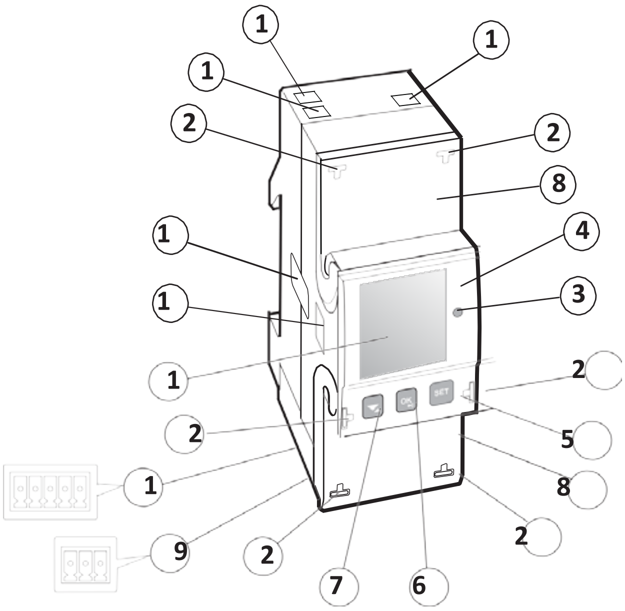
2.1.5 Scale picture





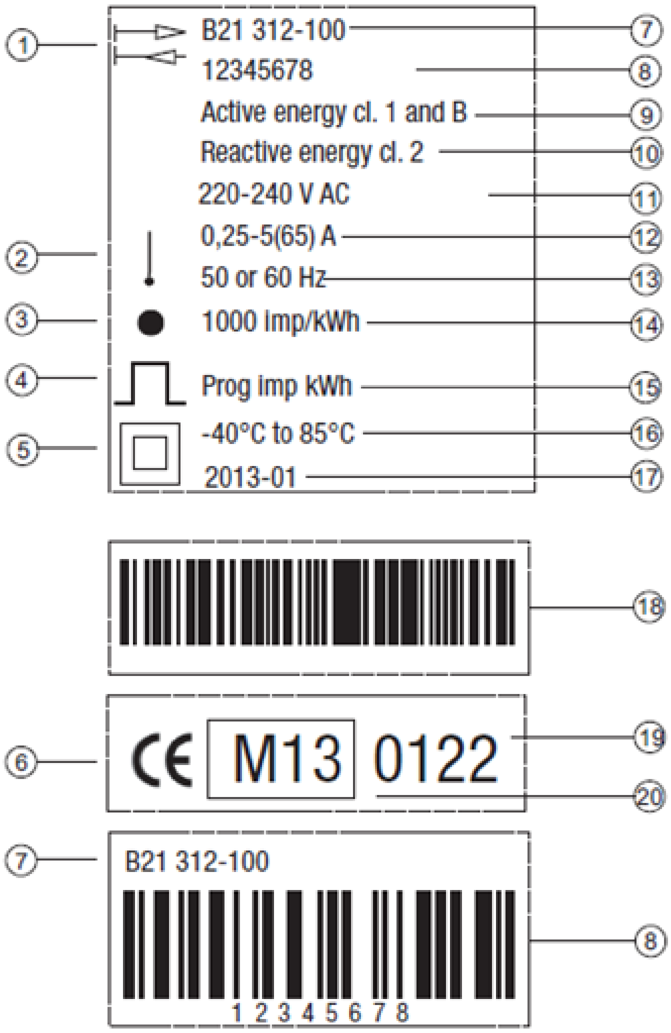
2.2 General B21

AC meter, single phase (1 + N)
Direct connection up to 65 A
With measured values and alarm function
Optional interfaces: M-Bus, RS-485 (Modbus RTU)
Width: 2 DIN modules.
Tested and approved per MID and IEC



2.2.1 Component, operating and display elements

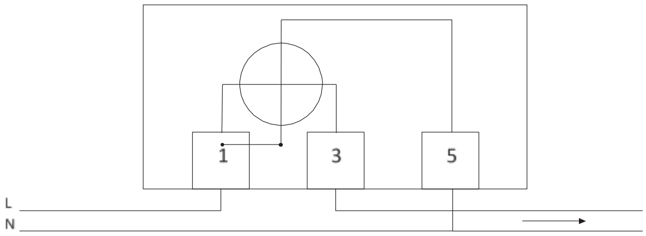
No.	Description	Function
1	Connection terminals	Electrical connections
2	Sealing eyelets	For sealing the connection terminals
3	LED	Flashes proportionally to the measured energy
4	Product data/label	Contains information about the meter
5	SET button SET	For calling up the configuration mode
6	OK button OK	For confirming the selection and menu entries. Short button press: Confirm selection Long button press: Back to previous menu or change between standard and main menu
7	UP/DOWN button	For selecting a menu entry Shorter button press: Down or forwards Long button press: Up or back
8	Cover can be lead-sealed	Protective cover for printed connection diagram on the inside
9	Plug-in terminal for communication interfaces	Depending on meter type RS-485 (Modbus RTU) or M-Bus
10	Plug-in terminal for inputs and outputs	
11	LC display	For displaying the energy and measured values
12	Optical infra-red interface (IR)	Only for internal use!
13	Device seal	On both sides of the meter for protection against unauthorised opening of the meter



2.2.2 Product label

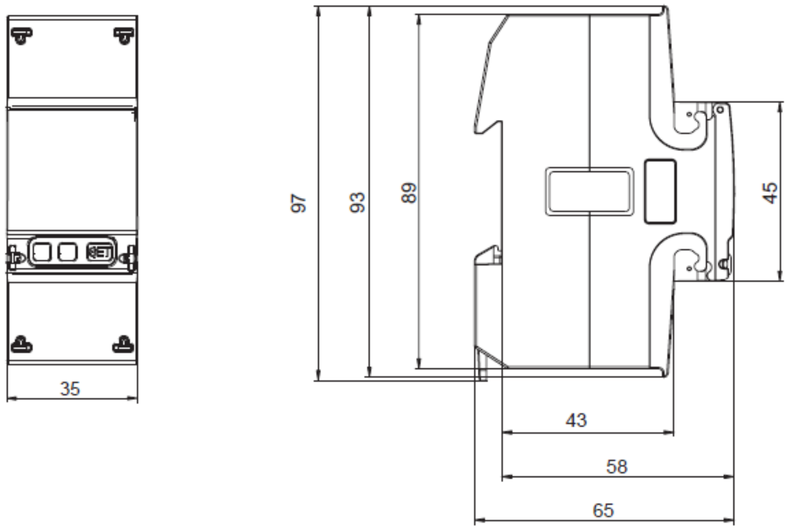
1	4-quadrant meter	**11**	Voltage
2	1 measuring unit (2-conductor connection)	**12**	Current strength
3	LED	**13**	Frequency
4	Pulse output	**14**	LED pulse frequency
5	Protection class II	**15**	Pulse frequency
6	CE test mark	**16**	Temperature range
7	Type designation	**17**	Date of manufacture (year and week)
8	Serial number	**18**	Janitza ID
9	Active energy accuracy class	**19**	Notified body (NMi)
10	Reactive energy accuracy class	**20**	MID test mark and test year

2.2.3 Connection diagram



2-conductor connection / 1 measuring unit

2.2.4 Scale picture



2.3 Technical data B21, B23, B24

	B21	B23	B24
Voltage/current input			
Rated voltage	230 V AC	3 x 230/400 V AC	
Voltage range	220…240 V AC (-20…+15 %)	3 x 220…240 V AC (-20…+15 %)	
Power dissipation, voltage circuits	1.0 VA (0.4 W) total	1.6 VA (0.7 W) total	
Power dissipation, current circuits	0.007 VA (0.007 W) at 230 V AC and I_b	0.007 VA (0.007 W) per phase at 230 V AC and I_b	
Basic current I_b	5 A		
Rated current I_n	-	-	1 A
Reference current I_{ref}	5 A		1 A
Transition current I_{tr}	0.5 A		0.05 A
Max. current I_{max}	65 A		6 A
Min. current I_{min}	0.25 A		0.02 A
Start-up current I_{st}	< 20 mA		< 1 mA
Connection cross-section	1…25 mm^2		0.5…10 mm$_2$
Recommended tightening torque	3 Nm		1.5 Nm
Communication			
Connection cross-section	0.5…1 mm^2		
Recommended tightening torque	0.25 Nm		
Transformer ratio			
Configurable current transformer ratio (CT)			1/9…9,999/1
Pulse display (LED)			
Pulse frequency	1,000 pulse/kWh		5,000 pulse/kWh
Pulse length	40 ms		
General information			
Frequency	50 or 60 Hz ± 5 %		
Precision class	B (cl. 1) and reactive power cl. 2		B (cl. 1) or C (cl. 0.5 S) and reactive power cl. 2
Active energy	1 %		1 %
Energy display	LCD with 6 digits	LCD with 7 digits	
Environmental conditions			
Operating temperature	-40 °C…+70 °C		
Storage temperature	-40 °C…+85 °C		
Humidity	75 % annual average, 95 % on 30 days/year		
Fire and heat resistance	Terminal 960 °C, covering 650 °C (IEC 60 695-2-1)		
Water and dust resistance	IP20 on terminal strip without protective housing and IP51 in protective housing, per IEC 60 529		
Mechanical environment	Class M1 per Measuring Instrument Directive (MID) (2004/22/EC)		
Electromagnetic environment	Class E2 per Measuring Instrument Directive (MID) (2004/22/EC)		

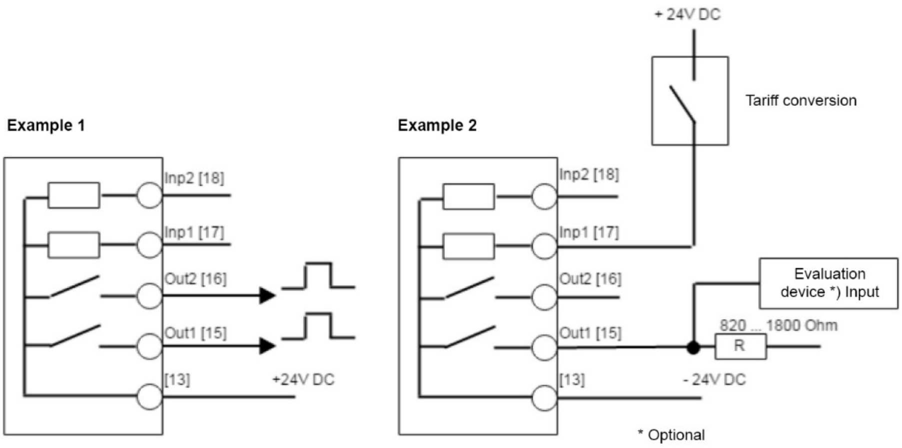
MID energy meters
Device technology

	B21	B23	B24
Outputs			
Current	2…100 mA		
Voltage	24 V AC…240 V AC, 24 V DC…240 V DC.		
Output pulse frequency	Prog. 1…999,999 pulse/kWh		
Pulse length	10...990 ms		
Connection cross-section	0.5…1 mm^2		
Recommended tightening torque	0.25 Nm		
Inputs			
Voltage	0…240 V AC/DC		
OFF	0…12 A AC/DC		
ON	57…240 V AC/24…240 V DC		
Min. pulse length	30 ms		
Connection cross-section	0.5…1 mm^2		
Recommended tightening torque	0.25 Nm		
Electromagnetic compatibility			
Surge voltage testing	6 kV 1.2/50 µs (IEC 60 060-1)		
Voltage swell testing	4 kV 1.2/50 µs (IEC 61 000-4-5)		
Rapid transient burst test	4 kV (IEC 61 000-4-4)		
Immunity from interference from electromagnetic HF fields	80 MHz…2 GHz (IEC 61 000-4-6)		
Immunity from interference from conducted interference	150 kHz…80 MHz (IEC 61 000-4-6)		
Immunity from interference with harmonics	2 kHz…150 kHz		
High frequency emissions	EN 55 022, class B (CISPR22)		
Electrostatic discharge	15 kV (IEC 61 000-4-2)		
Standards			
	IEC 62 052-11, IEC 62 053-21 class 1 & 2, IEC 62 053-22 class 0.5 S, IEC 62 053-23 class 2, IEC 62 054-21, GB/T 17 215.211-2006, GB/T 17 215.312-2008 class 1 & 2, GB/T 17 215.322-2008 class 0.5 S, GB 4208-2008, EN 50 470-1, EN 50 470-3 category A, B & C		
Material, dimensions and weights			
Material	Transparent front panel: Polycarbonate Housing: Fibre glass-reinforced polycarbonate Terminal cover: Polycarbonate		
Width	35 mm	70 mm	
Height	97 mm		
Depth	65 mm		
Width in pitch units (TE)	2	4	
Weight	approx. 0.15 kg	approx. 0.4 kg	approx. 0.3 kg

2.4 Interface connection diagrams

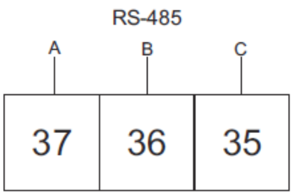
2.4.1 Inputs/outputs

- Inputs/2 outputs
- Connection via plug-in terminal provided

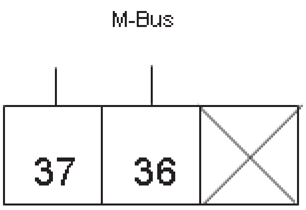


If a pulse output and tariff conversion are required, example 1 **cannot** be used.

2.4.2 RS-485 (Modbus RTU)



2.4.3 M-Bus



2.5 Display and indications

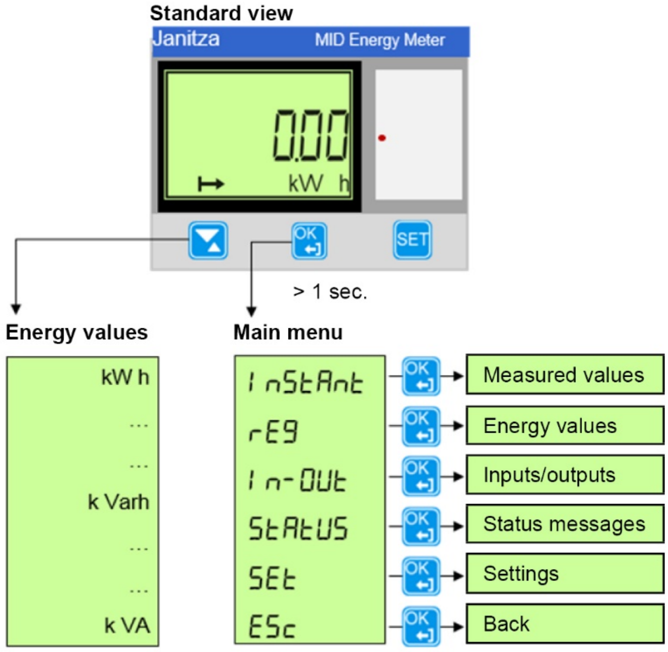
This chapter contains a description of the various displays and the display menu structure.

General

The display contains two views:

- Standard view
- Main menu

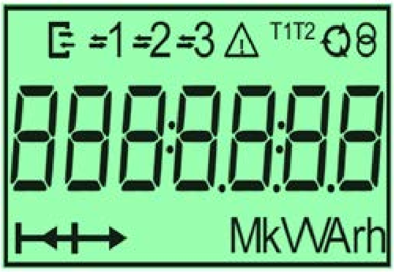
Use the OK button (button press > 1 second) to change between the views. In both views, status symbols appear in the top part of the display.



Energy values

If you are in the standard view and you press the button, the individual energy values (depending on the meter type) are displayed for consumed or supplied active energy, reactive energy and apparent energy per phase or per tariff.

Standard view



Symbol	Meaning
	Communication active The meter sends or receives information.
	Measurement runs
1→1 ←1 2→2←2 3→3←3	Arrows indicate the current direction per phase Arrow left = export Arrow right = consumption Number without arrow = Only voltage is connected to the phase
T1 T2	Active tariff
⚠ ! △	Error, warning, note
	Transformer measurement (only for measurement transformer meter B24)

Main menu

Use the  button (button press > 1 second) to change to the main menu.

The following selection options are available in the main menu:

Indication in the display	Meaning	
InStAnt	InStant:	Instruments or measured values
rEG	rEG:	Energy register
In-OUt	I_O:	Inputs and outputs
StAtUS	StAtUS:	Status messages
SEt	SEt:	Settings
ESc	ESc:	Return to main menu

rEG	InSt	I_O	StAtUS	SEt
Active energy (consumption) L1-L3	Active power	1 OUt Output 1*	FLAGS System log	Ct rAt Transformer ratio
Active energy (supply) L1-L3	Reactive power	2 OUt Output 2	Ev-LoG Event log	rS-485 RS485
Total active energy L1-L3	Apparent power	3 In Input 1	qA-LoG Net quality log	M-bUS M-Bus
Reactive energy (consumption) L1-L3	Voltage (per phase)	4 In Input 2	SY-LoG System status	PULSE Pulse length, pulse frequency, etc.
Reactive energy (supply) L1-L3	Total voltage		St-LoG ??	AL Alarm
Total reactive energy L1-L3	Current (per phase)		Ad-LoG Audit log	tAr iFF Tariff
Apparent energy (consumption) L1-L3	Power factor (per phase)		SEG CH ??	OUtPUt Output
Apparent energy (supply) L1-L3	Frequency		AboUt About	Ir SEt IR interface (only for internal use)
Total apparent energy L1-L3	Phase angle			WirES Measuring units (3 or 4-phase)
Active energy (consumption) Tariff	Quadrant			LEdPULS Pulse LED
Active energy (supply) Tariff	Mains power failure meter			UPGrAdE Authorisation for upgrades
Reactive energy (consumption) Tariff				rSt rG Intermediate meter
Reactive energy (supply) Tariff				

- *Output 1 cannot be modified.

3 Commissioning

This section contains a description of the mounting and installation process, as well as the procedure for setting the device functions.

3.1 Mounting and installation

The energy meters are designed for mounting on DIN rails (DIN 50 022). The meters are fastened by latching into the locking mechanism of the DIN rails.

Accessibility of the device for operation, testing, inspection, maintenance and repair must be ensured in accordance with DIN VDE 0100-520.

Mounting and commissioning must be performed by an electrician. When planning and installing electrical systems, it is necessary to observe the relevant standards, directives, regulations and provisions.

- Protect device from moisture, dirt and damage during transport, storage and operation.
- Only operate the device within the specified technical data!
- Only operate the device in an enclosed housing (distributor)!

Observe the following steps when installing and testing the meter:

Step	Action
1	Shut off the power supply.
2	Position the meter on the DIN rail and latch it in place.
3	Remove the cable insulation to the length specified on the meter.
4	Connect the cables to the meter in accordance with the connection diagram and tighten the screws (3.0 Nm for meters with a direct connection and 1.5 Nm for meters with a transformer connection).
5	Install the line protection: Meters with direct connection: 65 A MCB, C-system or 65 A fuse type gL-gG Meters with transformer connection: 10 A MCB, B-system or safety fuse, flink.
6	If inputs and outputs are used: Connect the cables to the meter in accordance with the connection diagram and tighten the screws (0.25 Nm). Establish the connection with the external power supply (max. 240 V).
7	If communication (M-Bus, Modbus RTU) is used: Connect the cables to the meter in accordance with the connection diagram and tighten the screws (0.25 Nm).
8	Check that the meter is connected to the correct voltage and whether the phase connections and neutral conductors (if used) are connected to the correct terminals.
9	When using measurement transformer meters, make sure the flow direction of the primary and secondary current of the external current transformer is correct. Also check that the current transformers are connected to the meter with the correct terminals.
10	Activate the current connection. If the display shows a warning symbol, refer to chapter Protocol storage logs, p. 56 ff for the description.
11	Check under the menu item "Instantaneous Values" in the meter whether the values for the voltage, current strength, energy and power factors lie within the normal range and whether the current direction is correct (the total energy should be positive for an energy-consuming load). For comprehensive testing insofar as possible, the meter should be connected to the desired load, if possible a load with a current strength greater than zero to all phases.

Delivery condition

Parameters	Display	B21	B23	B24
Current transformer ratio	Ct rAt io	-	-	5-5 5//5
Connection type/wires	WirES	-	4 tPEn 4-phase	4 tPEn 4-phase
Pulse frequency	FrEq	100 pulse/kWh	100 pulse/kWh	10 pulse/kWh
Pulse length	LEngth	100 ms	100 ms	100 ms

Cleaning

Dirty devices can be cleaned with a dry cloth. If this is insufficient then a cloth lightly dampened with soapy water can be used. Never use abrasive substances or solvents.

Maintenance

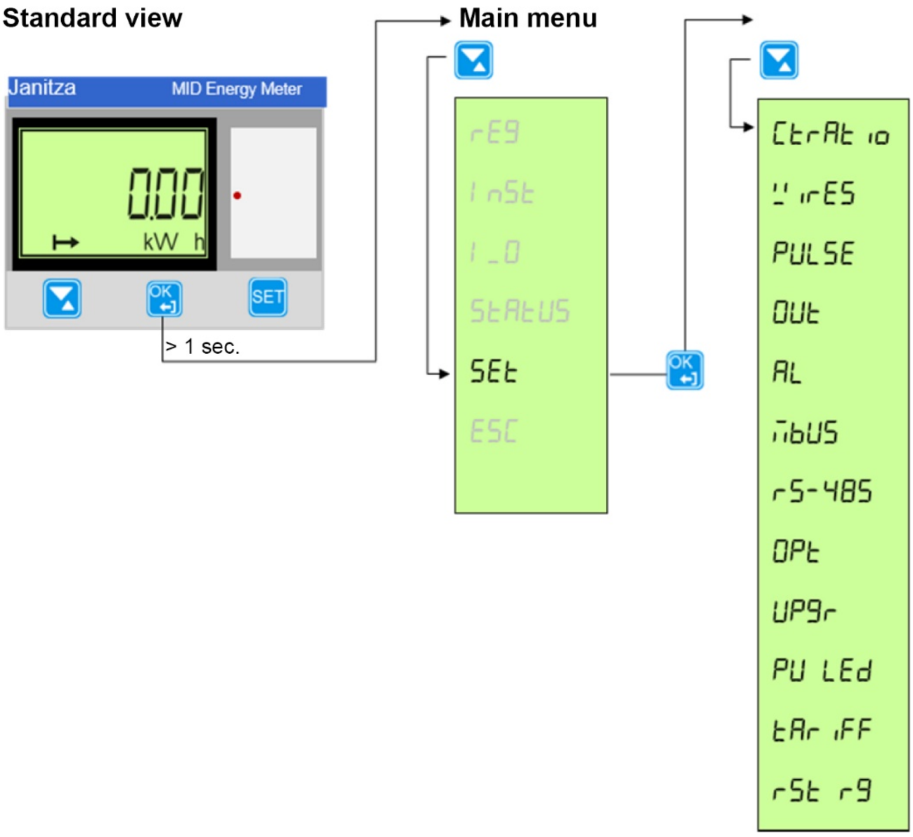
The device is maintenance-free. In case of damage, e.g. due to transport and/or storage, repairs must not be performed by external persons. If the device is opened, the warranty is voided.

3.2 Settings

Settings can only be implemented via the main menu > SEt.

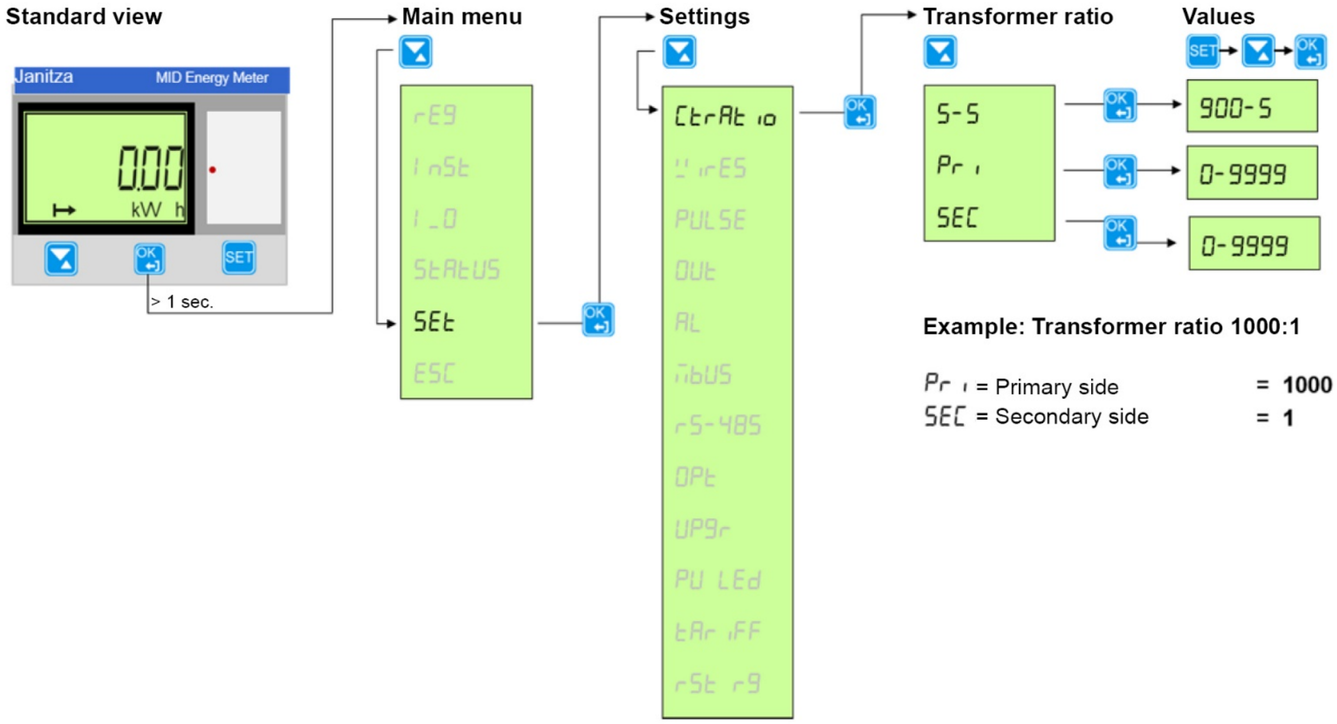
Depending on the meter type, it is possible to set all or some of the following functions:

- Transformer ratio CT (current)
- Measuring units (connection of 3 or 4 phases)
- Pulse output
- Outputs
- Alarms
- M-Bus
- RS-485
- Optical IR interface (only for internal use!)
- Authorisation for updates
- Pulse LED on the device front
- Tariff settings
- Delete/reset intermediate meter **(not available with B21, B23 and B24**)



3.2.1 Setting the transformer ratio

The transformer ratio CT (current) can only be set with measurement transformer meters of type B24.



Proceed as follows:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .

   You are now in the *settings* menu.
3. Select Ct rAt io with the button and confirm the selection with .
4. Using the button select the desired options for *meter* (primary value; display Pri) or *denominator* (secondary value; display SEC). Confirm the selection with .

   The value appears in the display.
5. After pressing the button, the digit in the display begins to flash. Using the button, change the desired value of the digit. Use to confirm the selection and change to the next digit.

Note:

The transformer meters are already equipped with pre-installed “ready to use” transformer ratios. This enables rapid selection of conventional current transformer ratios.

The table with the “ready to use“ transformer ratios contains the following values: 5/5, 75/5, 100/5, 150/5, 200/5, 250/5, 300/5, 400/5, 500/5, 600/5, 700/5, 800/5 and 900/5.

The setting of individual values for the primary and secondary side that deviate from the “ready to use” values is naturally still possible.

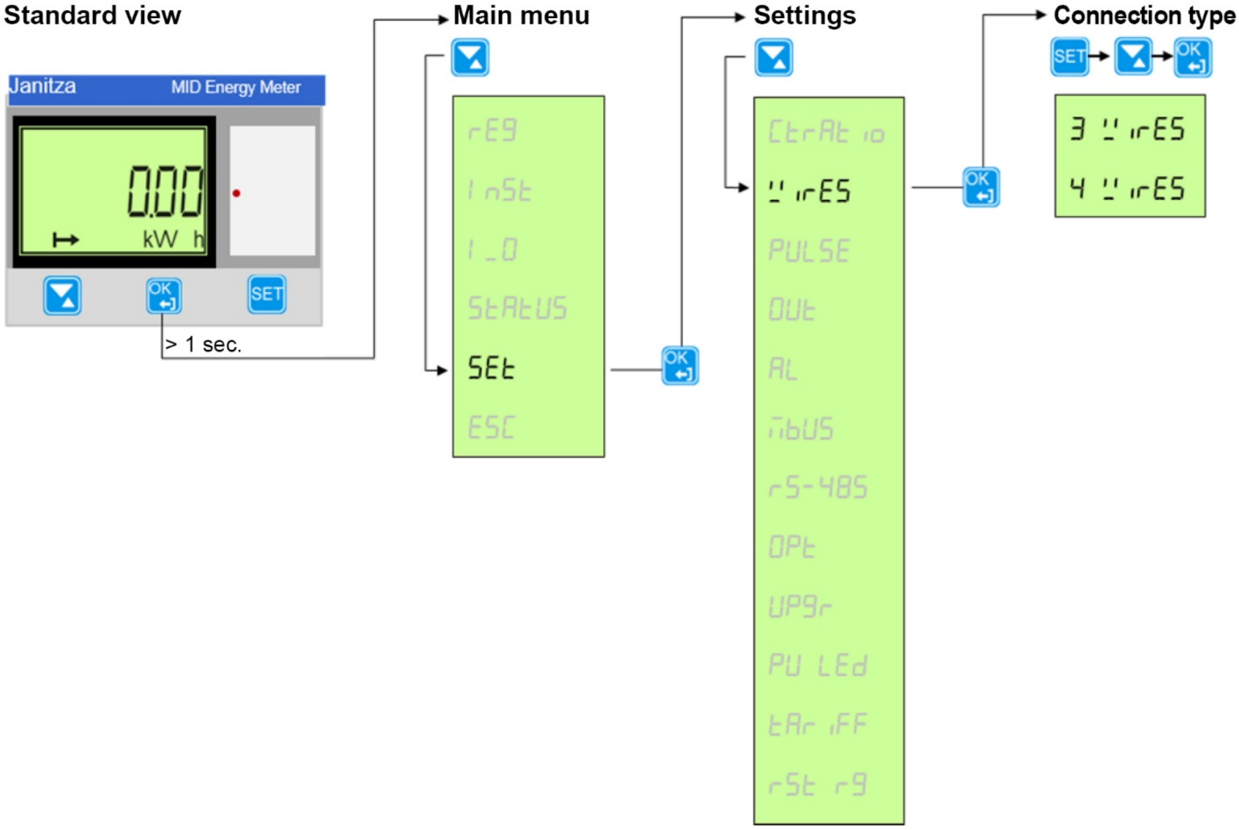
For the primary value, 4 digits are available for the values 0…9,999.

For the secondary value, one digit is available for the values 0…9.

Example			
Values greater than or equal to 1 must be set for the meter and denominator. Transformer ratio factory setting = 1. Example: Transformer ratio 1,000:1			
5-5	= Ready to use values up to 900-5		
Pri	= Primary	= Current transformer primary side	= 1,000
SEC	= Secondary	= Current transformer secondary side	= 1

3.2.2 Setting measuring units

The meters of type B23 and B24 can either be connected with three phases (3 tPE) or four phases (4 tPEn).



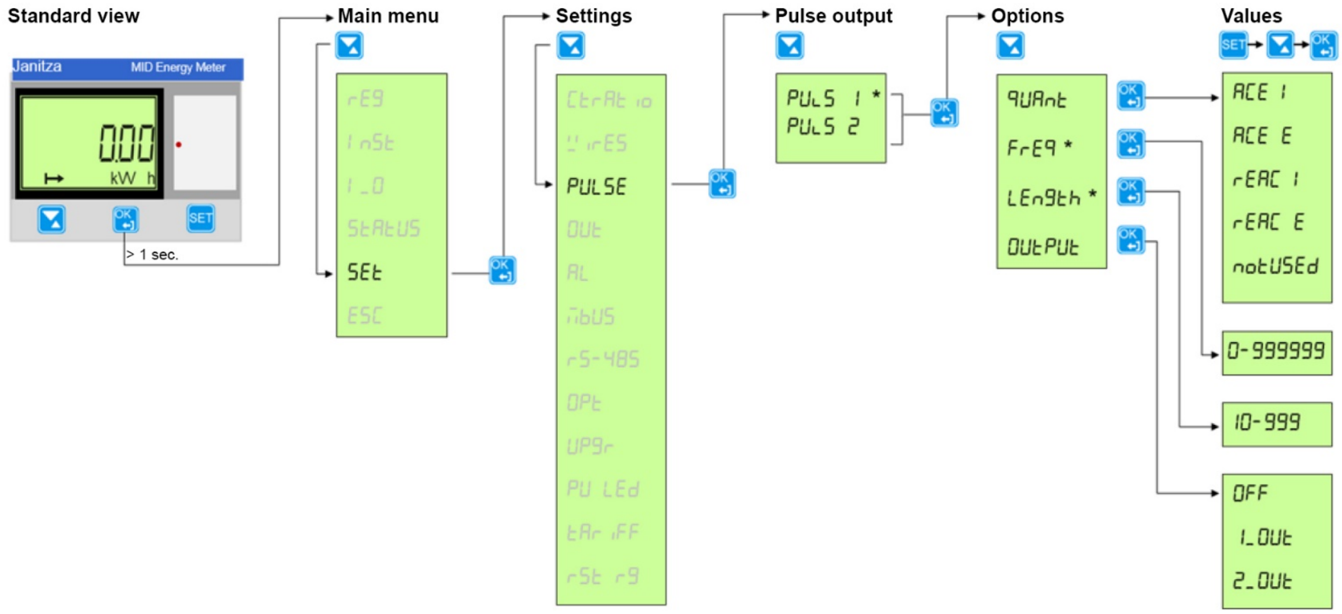
Configure the connection type in the following way:

1. Hold the OK button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with OK.
   You are now in the *settings* menu.
3. Select WIrES with the button and confirm the selection with OK.
   The display now shows the current configuration (3 tPE or 4 tPEn) of the connection type.
   Factory setting: 4 tPEn
4. After pressing the SET button, the display begins to flash. Now press the button to select the connection type.
   Confirm the selection with OK.

3.2.3 Setting the pulse output

Output 1 is defined as the active energy pulse output. The pulse frequency and length are adjustable.

Output 2 can be programmed as a pulse output or an alarm output as follows.



Set the pulse output in the following way:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .
   You are now in the *settings* menu.
3. Select PULSE with the button and confirm the selection with .
4. The display now shows the outputs 1_PU or 2_PU with meters with the *silver* functionality. Select the pulse output that you wish to configure with the button and confirm the selection with .
   The following setting options are available:

Indication in the display	Meaning	
qUAnt	qUAnt:	Energy values
FrEq	FrEq:	Pulse frequency
LEngth	Length:	Pulse length
OUtPUt	OutPUt:	Output

Energy values

1. In order to adjust the energy values to be transferred, select qUAnt with the button and confirm the selection with .

   The following types energy values are available for output 2:

Indication in the display	Meaning	
ACE I	Act IM:	Imported active energy
ACt E	Act EX:	Exported active energy
rEAC I	rEA IM:	Imported reactive energy
rEAC E	rEA EX:	Exported reactive energy
notUSEd	Not used:	Inactive

2. Press the button. The display flashes.
3. Select the energy value to be transferred with the button and confirm the selection with .

   Press and hold the button to return to the setting options.

   Now configure the pulse frequency.

Pulse frequency

1. In order to set the pulse frequency, select FrEq with the button and confirm the selection with .

   The set pulse frequency is displayed.

   The digits of the pulse frequency must be individually set.

   Possible pulse frequencies: 0…999,999 pulse/kWh or pulse/MWh

   Factory setting: 100 pulse/kWh

2. Press the button. The active digit flashes.

   Change the value of the first digit with the button and confirm with .

   Change the remaining digits as described previously, until you have set the desired value.

   Press and hold the button to return to the setting options.

   Now configure the pulse length.

Pulse length

1. In order to set the pulse length, select LEngth with the button and confirm the selection with .

   The set pulse length is displayed.

   The digits of the pulse length must be individually set.

   Possible pulse length: 10…990 ms

   Factory setting: 100 ms

2. Press the button. The active digit flashes.

   Change the value of the first digit with the button and confirm with .

   Change the remaining digits as described previously, until you have set the desired value.

   Press and hold the button to return to the setting options.

   Now configure the outputs.

Output

1. In order to select the output, select OUtPUt with the button and confirm the selection with .

   Available settings:

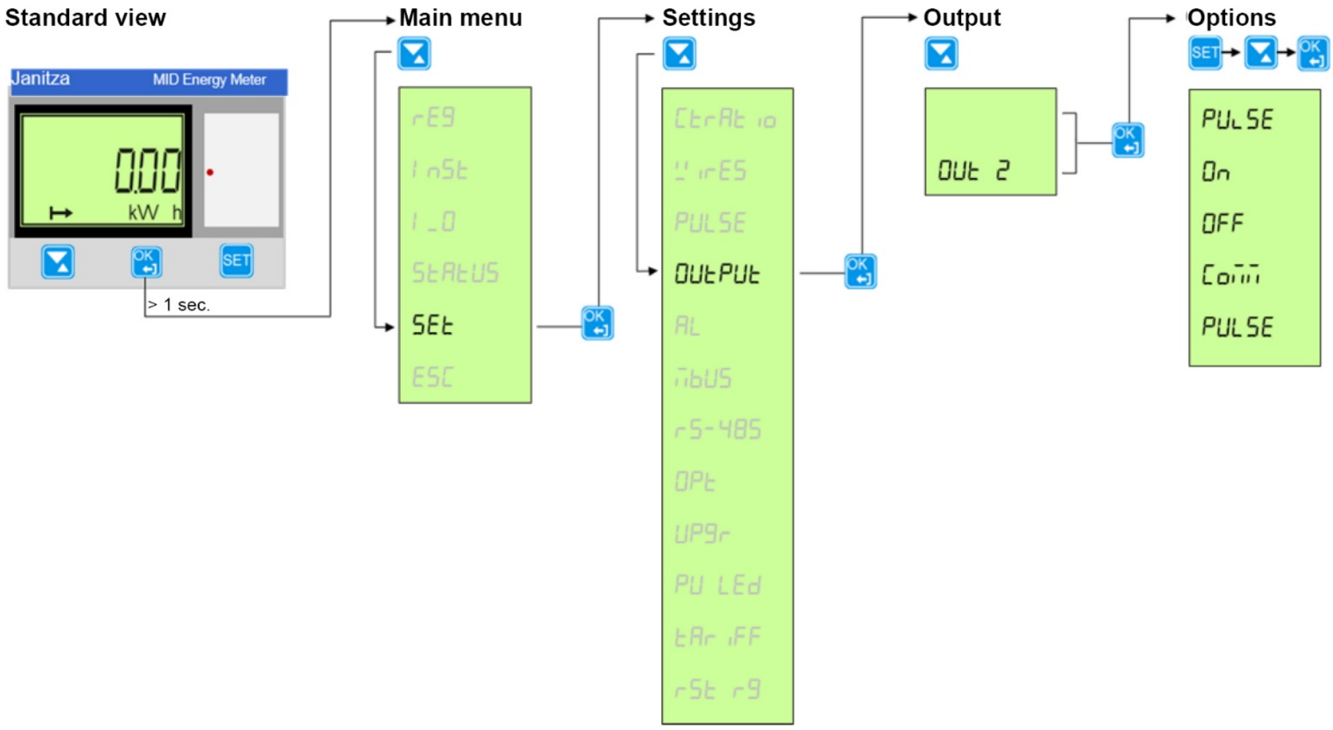
Meter	
OFF	
1 OUt	active energy pulse output
2 OUt	pulse / alarms

2. Press the button. The display flashes.

   Change the setting with the button and confirm with .

3.2.4 Setting output 2

A range of different settings can be implemented for output 2.
Note: The programming of output 1 cannot be modified. This is permanently programmed as the pulse output active energy consumption.



Set the outputs in the following way:

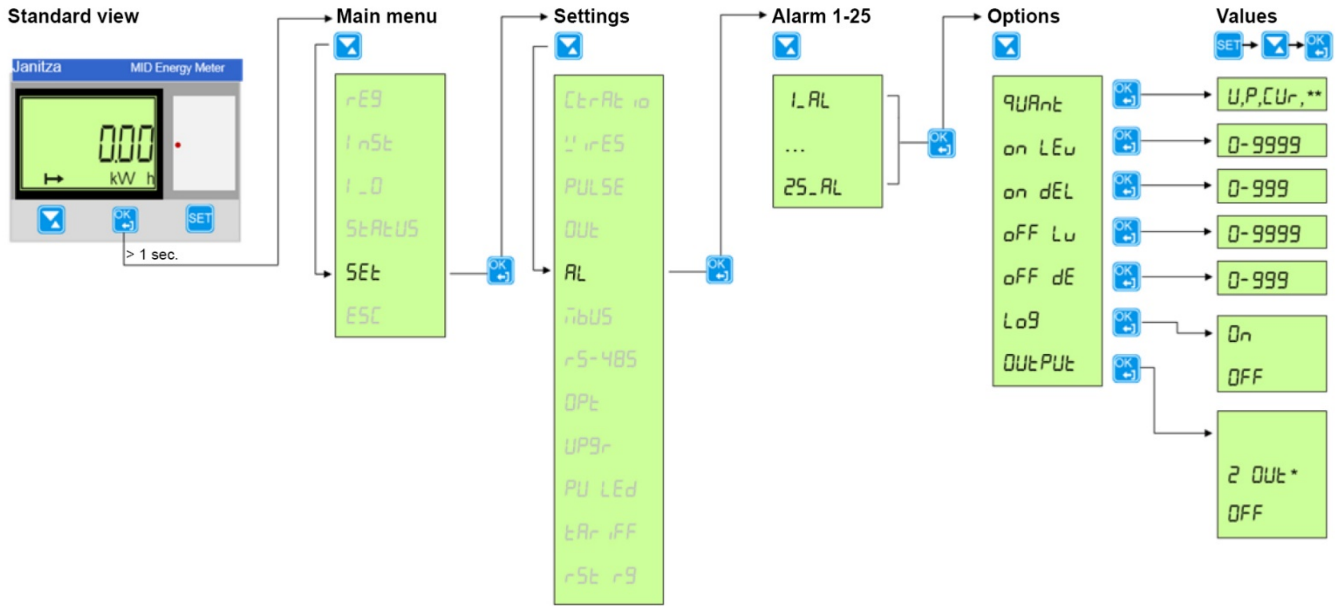
1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .
   You are now in the *settings* menu.
3. Select OUt with the button and confirm the selection with .
4. The display shows the current output set.

Select the output that you wish to configure with the button and confirm the selection with .

The following setting options are available:

Indication in the splay	Meaning	
CoMM	CoMM:	Communication output
PULSE	PULSE:	Pulse output
On	On:	Output always on
OFF	OFF:	Output always off

3.2.5 Setting alarm for output 2



If output 2 is used as an alarm output then the alarm must be configured. 25 different alarms are available for selection. One alarm can be assigned to one output.

Set the values, thresholds and delays, etc. for the alarms in the following way:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .

You are now in the *settings* menu.

3. Select AL with the button and confirm the selection with .
4. The display now shows the alarms 1_AL to 25_AL.

   Select the alarm that you wish to configure with the button and confirm the selection with .

The following setting options are available:

Indication in the display	Meaning	
qUAnt	qUAnt:	Alarm type (dependent on meter type, see table below)
On LEv	On LEv:	Trigger threshold (alarm active)
On dEL	On dEL:	Switch-on delay in seconds
oFF Lv	oFF Lv:	Trigger threshold (alarm inactive)
oFF dE	Off dE:	Switch-off delay in seconds
LoG	LoG:	Log alarm
OUtPUt	OutPUt:	Output 2, on which the alarm should act

5. In order to set the alarm type, first select qUAnt with the button and confirm the selection with .

   Press the button. The display flashes.

   Now press the button to select the desired alarm type. Confirm the selection with the button.

   The following alarm values are available:

Alarm values B21 (single phase)

Alarm type	Value	Unit
Inactive	-	-
Active power	0…9,999	W / kW / MW
Reactive power	0…9,999	Var / kVar / MVar
Apparent power	0…9,999	VA / kVA / MVA
Current L1	0.01…99.99	A / kA
Voltage L1	0.1…999.9	V / kV
Power factor	0.000…0.999	-

Alarm values B23/B24 (three-phase)

Alarm type	Value	Unit
Inactive	-	-
Total active power	0…9,999	W / kW / MW
Total reactive power	0…9,999	Var / kVar / MVar
Total apparent power	0…9,999	VA / kVA / MVA
Total power factor	0.000…0.999	-
Current L1	0.01…99.99	A / kA
Current L2	0.01…99.99	A / kA
Current L3	0.01…99.99	A / kA
Voltage L1	0.1…999.9	V / kV
Voltage L2	0.1…999.9	V / kV
Voltage L3	0.1…999.9	V / kV
Voltage L1-L2	0.1…999.9	V / kV
Voltage L2-L3	0.1…999.9	V / kV
Voltage L1-L3	0.1…999.9	V / kV
Active power L1	0.1…999.9	W / kW / MW
Active power L2	0.1…999.9	W / kW / MW
Active power L3	0.1…999.9	W / kW / MW
Reactive power L1	0.1…999.9	Var / kVar / MVar
Reactive power L2	0.1…999.9	Var / kVar / MVar
Reactive power L3	0.1…999.9	Var / kVar / MVar
Apparent power L1	0.1…999.9	VA / kVA / MVA
Apparent power L2	0.1…999.9	VA / kVA / MVA
Apparent power L3	0.1…999.9	VA / kVA / MVA
Power factor L1	0.000…0.999	-
Power factor L2	0.000…0.999	-
Power factor L3	0.000…0.999	-

6. In order to set the trigger threshold at which an alarm is activated or deactivated, select the option on LEu or oFF Lu with the button and confirm the selection with .

   Press the button. The display flashes.

   Using the button, it is now possible to select the desired value (e.g. 285 V) for the trigger threshold. Confirm the selection with the button.

7. In order that an alarm is activated or deactivated, it is possible to set a switch-on or switch-off delay. If the previously set trigger threshold is exceeded or undercut for the set time duration, the alarm is activated or deactivated. In order to set the switch-on or switch-off delay at which an alarm is activated or deactivated, select the option on dEL or oFF dE with the button and confirm the selection with .

   Press the button. The display flashes. Now press the button to select the desired time duration in seconds. Confirm the selection with the button.

8. In order to log an alarm, select the option Lo9 with the button and confirm the selection with .

   Press the button. The display flashes. Using the button, select the desired setting (ON: Log, OFF: Do not log). Confirm the selection with the button.

9. In order to set the output on which the alarm settings should act, select the option OUtPUt with the button and confirm the selection with .

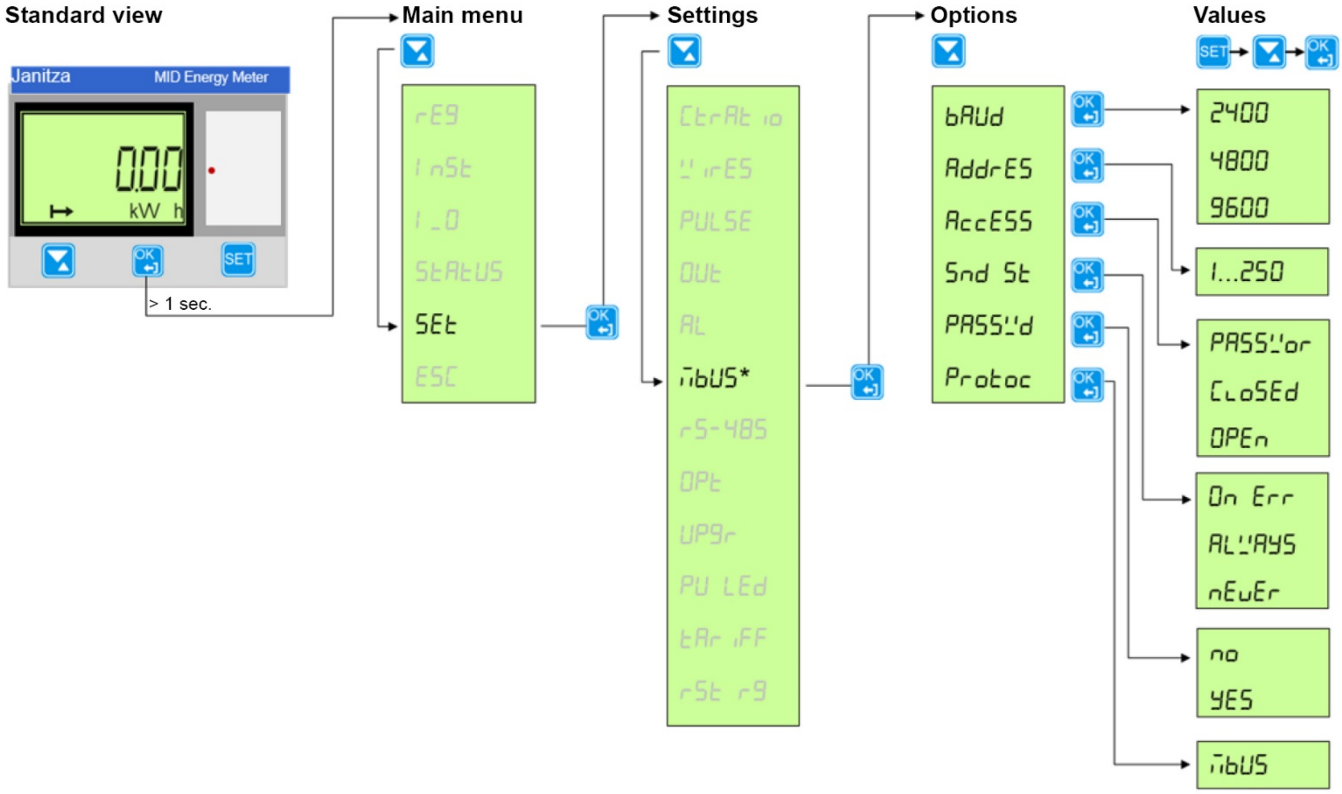
   Available settings:

Meter
OFF
2 OUt

   Press the button. The display flashes. Using the button, select the desired setting. Confirm the selection with the button.

3.2.6 Setting the M-Bus

You can set the M-Bus with meters with a hard-wired M-Bus interface.



Switch on the M-Bus as follows:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .

You are now in the *settings* menu.

3. Select mbUS with the button and confirm the selection with .

   The following setting options are available:

Indication in the display	Meaning	
bAUd	bAUd:	Baud rate
AddrES	AddrES:	M-Bus address
AccESS	AccES:	Access
Snd St	Snd St:	Send status
PASSWd	PASSWd:	Password
Protoc	Protoc:	Protocol, cannot be modified

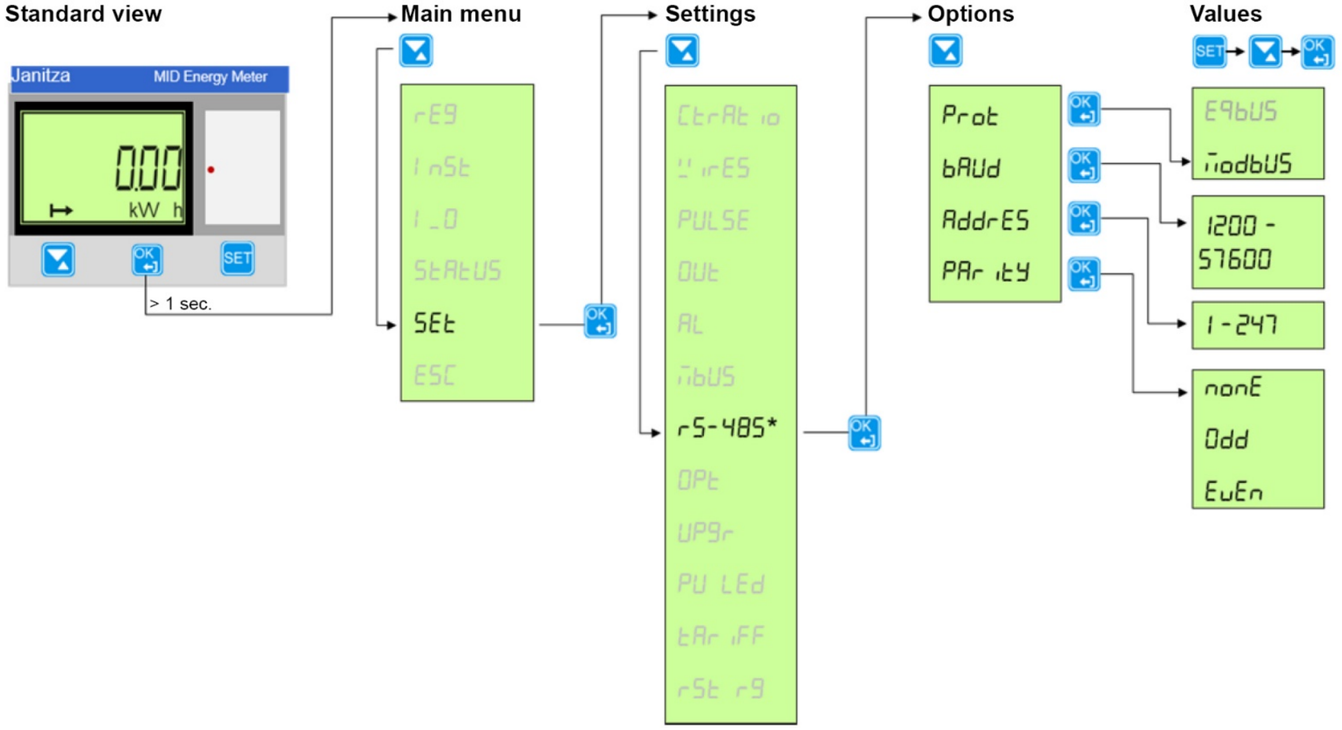
4. In order to implement a setting, select the desired option with the button and confirm the selection with . The display shows the current value set.

   Press the button. The value in the display flashes.

   Now press the button to select the desired value. Confirm the selection with the button.
5. Proceed as described in point 4, in order to implement further settings.

For further settings please refer to Table Protocol details on p. 45.

3.2.7 Modbus settings



Implement the settings as follows:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .

   You are now in the *settings* menu.
3. Select rS-485 with the button and confirm the selection with .

4. Confirm the selection with the button.

   Depending on the selected protocol type, the following setting options are available:

Modbus		
Indication in the display	**Meaning**	
bAUd	bAUd:	Baud rate
AddrES	AddrES:	Address
PAr itY	PArit Y:	Parity

5. In order to implement a setting, select the desired option with the button and confirm the selection with . The display shows the current value set.

   Press the button. The value in the display flashes.

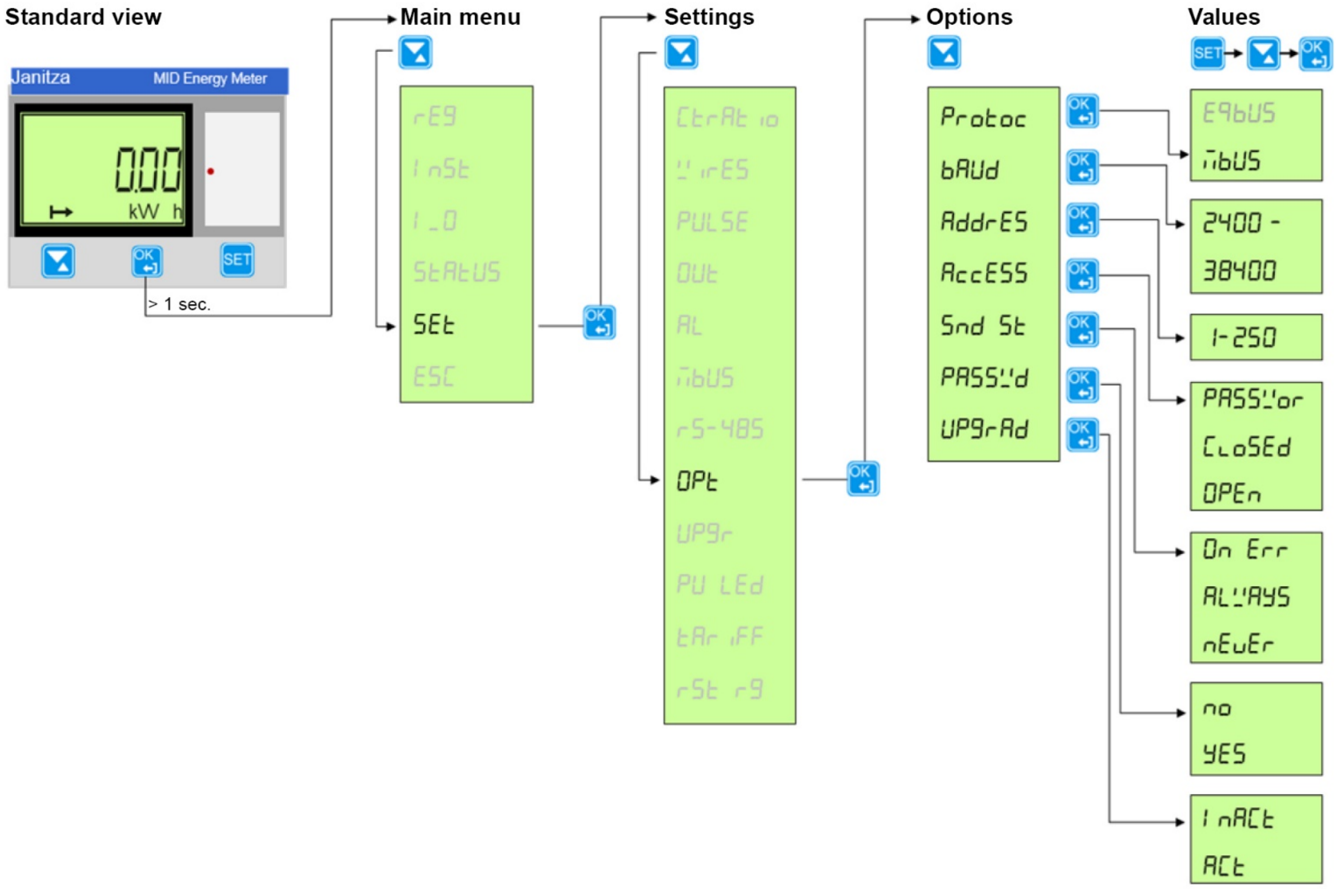
   Now press the button to select the desired value. Confirm the selection with the button.
6. Proceed as described in point 5, in order to implement further settings.

   For further settings please refer to Table Protocol details on p. 45.

3.2.8 Infra-red interface (only for internal use)

The IR interface can communicate via M-Bus and is only available for internal use!

M-Bus settings



Implement the settings as follows:

1. Hold the OK button down for > 1 second to access the main menu.
2. Select SEt with the ▼ button and confirm the selection with OK.

   You are now in the *settings* menu.
3. Select OPt with the ▼ button and confirm the selection with OK.
4. Confirm the selection with the OK button.

   Depending on the selected protocol type, the following setting options are available:

ModBus		
Indication in the display	**Meaning**	
bAUd	bAUd:	Baud rate
AddrES	AddrES:	Address

5. In order to implement a setting, select the desired option with the ▼ button and confirm the selection with OK. The display shows the current value set.

   Press the SET button. The value in the display flashes.

   Now press the ▼ button to select the desired value. Confirm the selection with the OK button.
6. Proceed as described in point 5, in order to implement further settings.

   For further settings please refer to Table Protocol details on p. 45.

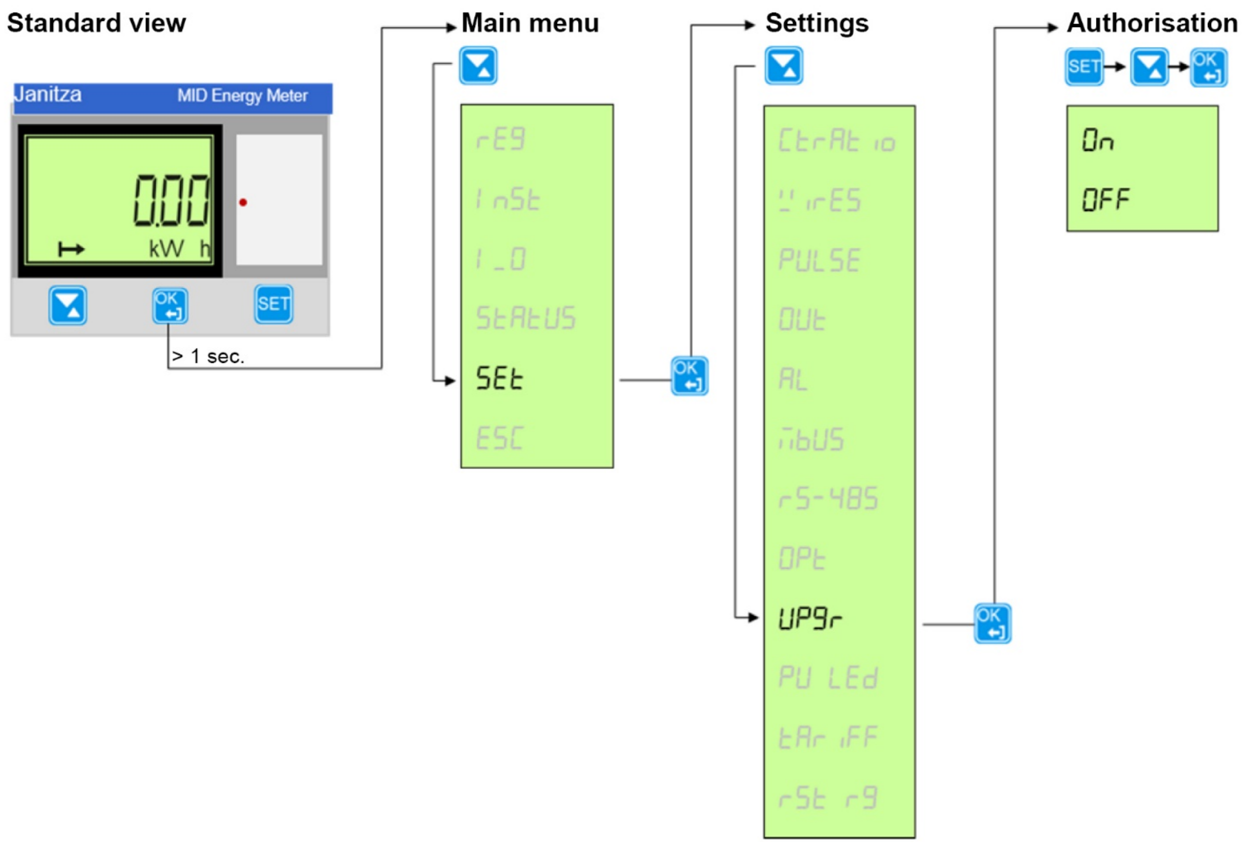
3.2.9 Protocol details

Protocol	Access level	Upgrade mode	Send status info	Reset password	Parity	Baud rate	Address	Timeout between octets (ms)	Inactivity timeout (ms)
Modbus (via RS-485)	-	-	-	-	None (default) Odd Even	*1,200*“* *2,400*“* *4,800*“* 9,600 19,200 38,400 57,600	1…247	-	-
M-Bus (via IR side)	Open Password Closed	Active Inactive	Always Never If not OK	Yes No	-	2,400 4,800 9,600 19,200 38,400	1…250	-	-

*“ = Presently not released.

3.2.10 Setting upgrade authorisation

It is possible to set authorisations for an upgrade.



Implement the settings as follows:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .

   You are now in the *settings* menu.
3. Select UP9r with the button and confirm the selection with . The display shows the current setting.

The following setting options are available:

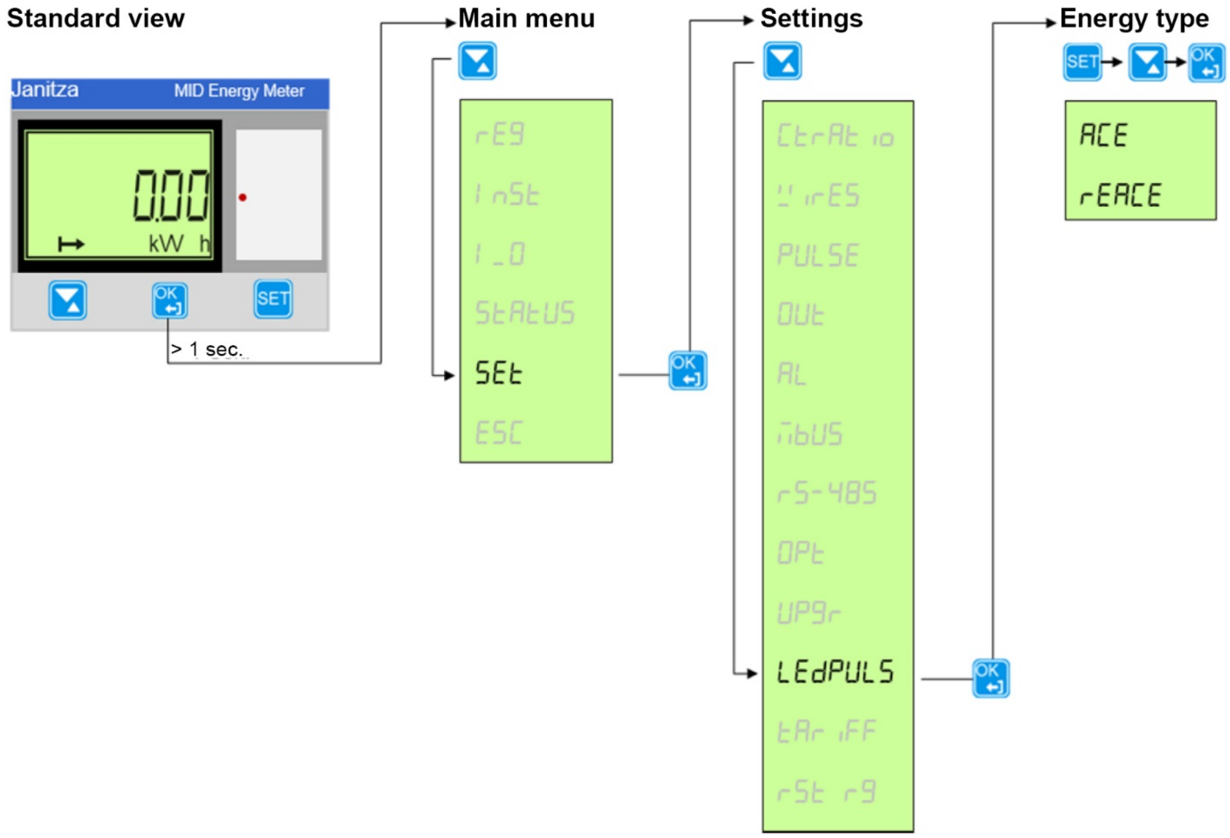
Indication in the display	Meaning	
On	On:	ON: Upgrade permitted
OFF	OFF:	OFF: Upgrade not permitted

4. Press the SET button. The value in the display flashes.

   Now press the button to select the desired option.
5. Confirm the selection with the button.

3.2.11 Setting the pulse LED

The pulse LED flashes proportionally to the measured energy. It is possible to distinguish between active and reactive energy.



Set the energy type in the following way:

1. Hold the OK button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with OK.

   You are now in the *settings* menu.
3. Select PU LEd with the button and confirm the selection with OK. The display shows the current setting.

   The following setting options are available:

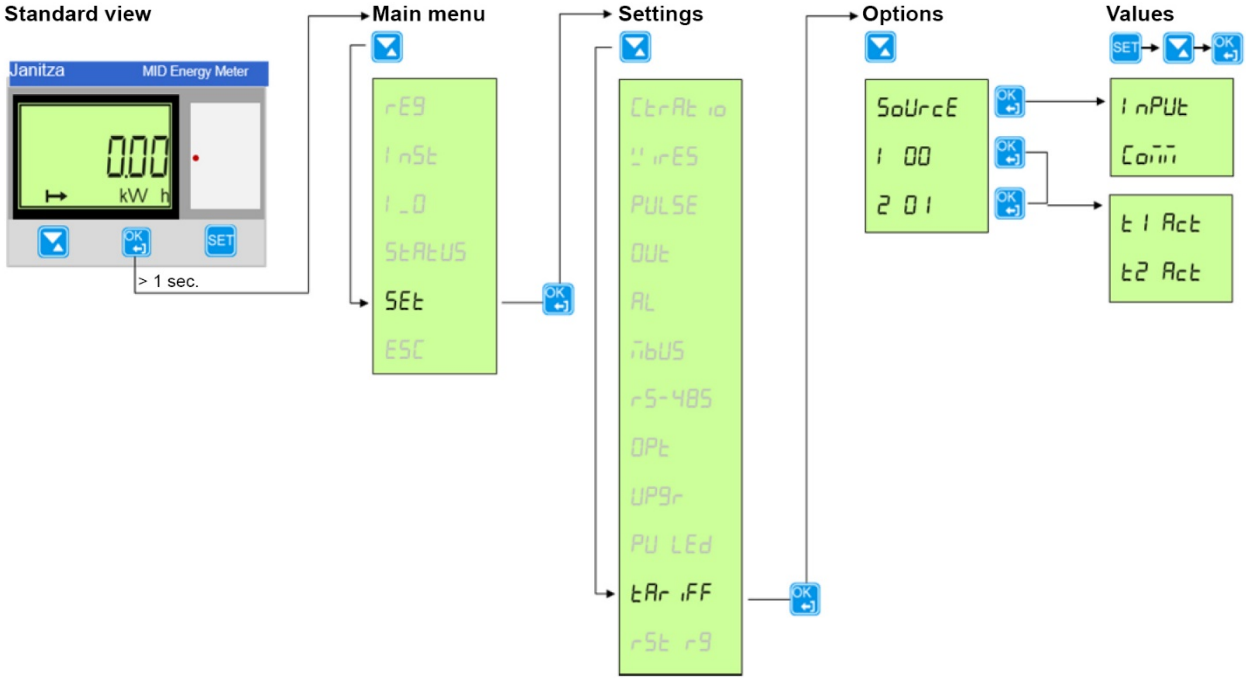
Indication in the display	Meaning	
ACE	Active:	Active energy
rEACE	Reactive:	Reactive energy

4. Press the SET button. The value in the display flashes.

   Now press the button to select the desired option.
5. Confirm the selection with the OK button.

3.2.12 Tariff settings (2 tariffs available)

Tariff conversion can take place via the communication interface or the inputs.



Set the desired tariff conversion source in the following way:

1. Hold the OK button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with OK.

You are now in the *settings* menu.

3. Select tAr iFF with the button and confirm the selection with OK. The display shows the current setting.

   The following setting options are available:

Indication in the display	Meaning
SOUrCE	SOURCE: Tariff conversion source
1 00	Tariff 1, input 1 = OFF, input 2 = OFF
2 0 1	Tariff 2, input 1 = OFF, input 2 = ON

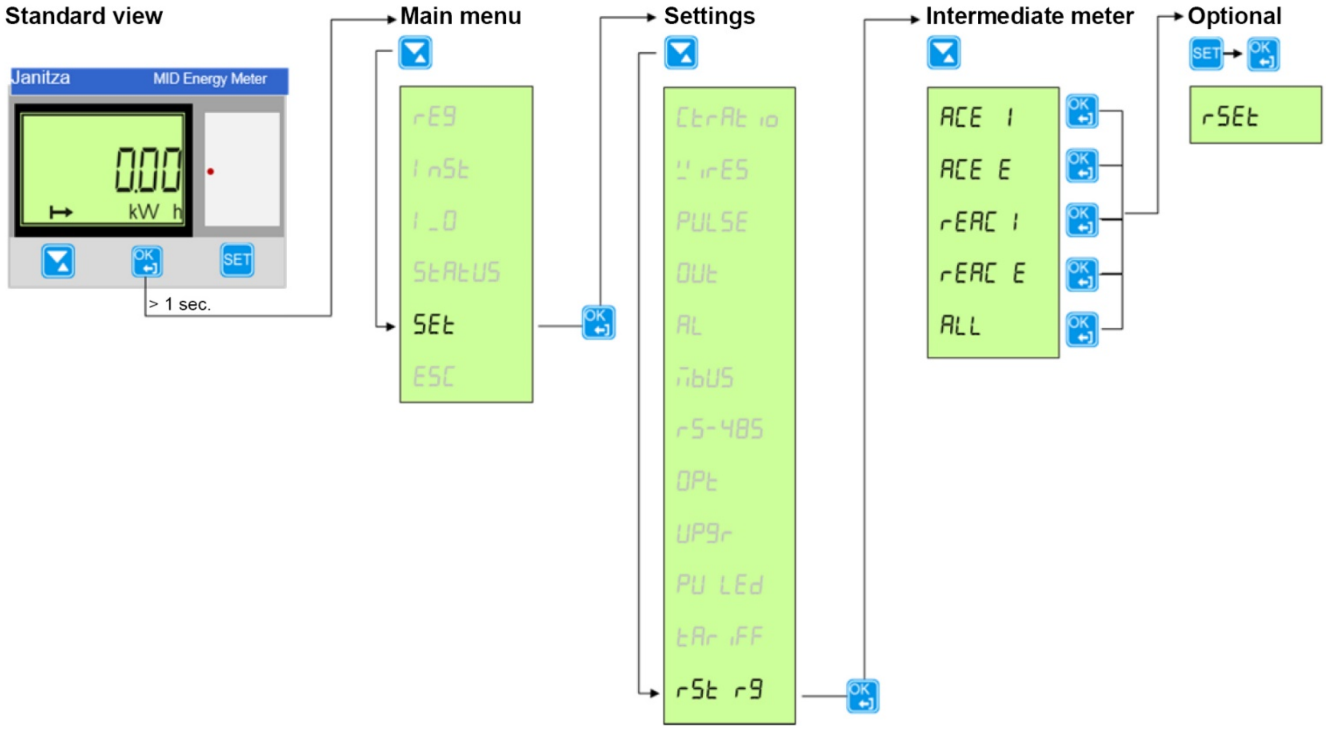
4. Press the SET button. The value in the display flashes.

   Now press the button to select the desired option.

5. Confirm the selection with the OK button.

3.2.13 Resetting intermediate meters (not available with B21, B23 and B24**).**
Note: The menu is also available with the variants B21, B23 and B24. However, the meters have no intermediate meter.

The meters have a resettable intermediate meter.



Intermediate meters can be deleted or the meter reading reset to “0” in the following way:

1. Hold the button down for > 1 second to access the main menu.
2. Select SEt with the button and confirm the selection with .

   You are now in the *settings* menu.
3. Select rSt rG with the button and confirm the selection with . The display shows the intermediate meter.

   The following intermediate meters are available, which can be reset individually or all together:

Indication in the display	Meaning	
ACt I	Act IM:	Active energy consumption
ACt E	Act EX:	Active energy supply
rEAC I	rEA IM:	Reactive energy consumption
rEAC E	rEA EX:	Reactive energy supply
ALL	ALL:	All intermediate meters

4. Select the desired option with the button and confirm the selection with . Press and hold the button to change the setting. The value (rSEt) in the display flashes.
5. Confirm the selection with the button.

3.3 Technical description

This chapter contains the technical descriptions of the meter functions.

3.3.1 Energy values

The energy values are stored in energy registers. The various energy registers are divided into:

- Registers for active, reactive and apparent energy
- Resettable registers
- Registers for current or historical values

The energy values can either be read off by communication or directly in the display with the help of the buttons.

Primary values

For transformer meters with external current transformers, the register value is multiplied by the transformer conversion ratio before display or sending via communication. This value is also referred to as the primary value.

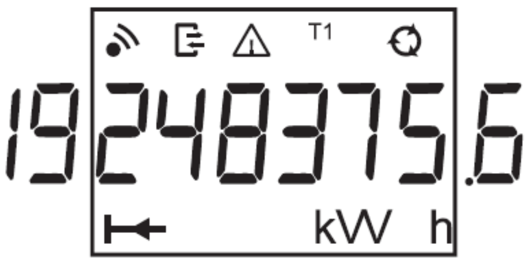
Presentation of register values

With directly connected meters the energy is usually displayed as a fixed unit and decimal value (usually kWh without decimal places).

With transformer meters that display primary values, the energy values can be very high in the case of a high current transformer conversion ratio. The meter usually adjusts the unit and the number of decimal places to be displayed automatically.

If the energy is displayed with fixed units and decimal places, the energy jumps to zeros if the display exceeds the maximum value. However, the meter contains further internal digits, which can be read out via communication if a communication interface is available. In the following example 248375 is displayed, while the internal register contains the value 19248375.6.

The following figure shows a display with fixed unit and decimal places:



3.3.2 Measured values

The following table contains all available measured values of the meter.

	B21	B23/B24	
Measured value	**1-phase, 2-conductor**	**3-phase, 4-conductor**	**3-phase, 3-conductor**
Total active power, *2*3	x	x	x
Active power, L1 *2*3		x	x
Active power, L2 *2*3		x	
Active power, L3 *2*3		x	x
Total reactive power *2*3	x	x	x
Reactive power, L1 *2*3		x	x
Reactive power, L2 *2*3		x	
Reactive power, L3 *2*3		x	x
Total apparent power *2*3	x	x	x
Apparent power, L1 *2*3		x	x
Apparent power, L2 *2*3		x	
Apparent power, L3 *2*3		x	x
Voltage, L1-N *2*3	x	x	
Voltage, L2-N *2*3		x	
Voltage, L3-N *2*3		x	
Voltage, L1-L2 *2*3		x	x
Voltage, L2-L3 *2*3		x	x
Voltage, L1-L3 *2*3		x	
Current strength, L1 *2*3	x	x	x
Current strength, L2 *2*3		x	
Current strength, L3 *2*3		x	x
Current strength, N *2*3		x	
Frequency *2*3	x	x	x
Total power factor *2*3	x	x	x
Power factor, L1 *2*3		x	x
Power factor, L2 *2*3		x	
Power factor, L3 *2*3		x	x
Total phase angle power *	x	x	x
Phase angle power, L1*		x	x
Phase angle power, L2*		x	
Phase angle power, L3*		x	x
Phase angle voltage, L1*	x	x	x
Phase angle voltage, L2*		x	
Phase angle voltage, L3*		x	x
Phase angle current strength, L1*		x	x
Phase angle current strength, L2*		x	
Phase angle current strength, L3*			
Total active quadrant*	x		
Active quadrant, L1*			
Active quadrant, L2*			
Active quadrant, L3*			

*² = Measured value in the display *³ = Measured value in GridVis * = Only via Modbus register

Accuracy

The accuracy of the data is defined within a voltage range of 20 % of the specified rated voltage and a current strength range of 5 % of the basic current to the maximum current strength.

The accuracy of all data reflects the specified accuracy for the energy measurement with the exception of the phase angle for voltage and current.

The accuracy of the phase angle for voltage and current is 2 degrees.

3.3.3 Alarms

The alarm function serves to monitor measured values of the meter. Recognition can take place for high or low values. For high values an alarm is triggered if a measured value exceeds a defined threshold. For low values an alarm is triggered if a measured value undershoots a defined threshold.

A total of 25 alarms can be configured. Configuration takes place by communication or via the buttons directly on the meter.

The following measured values can be monitored:

Voltage, L1	Total reactive power
Voltage, L2	Reactive power, L1
Voltage, L3	Reactive power, L2
Voltage, L1-L2	Reactive power, L3
Voltage, L2-L3	Total apparent power
Voltage, L1-L3	Apparent power, L1
Current strength, L1	Apparent power, L2
Current strength, L2	Apparent power, L3
Current strength, L3	Total power factor
Total active power	Power factor, L1
Active power, L1	Power factor, L2
Active power, L2	Power factor, L3
Active power, L3	

Functional description

If the value of the monitored measured variable exceeds the activation threshold for the set time interval then the alarm is triggered. If the value of the monitored measured variable undershoots the activation threshold for the set time interval again, the alarm is deactivated.

If the activation threshold is higher than the deactivation threshold, the alarm is triggered if the monitored value exceeds the activation threshold.

If the activation threshold is lower than the deactivation threshold, the alarm is triggered if the monitored value undershoots the activation threshold.

3.3.4 Inputs and outputs

Inputs and outputs have optocouplers and are galvanically separated from the remaining meter electronics. These are polarity-independent and can conduct DC and alternating current.

Inputs that are not connected are not live / connected to voltage.

Functions of the inputs

The input counts pulses, detects activity and the current status. The meter values can be read directly off the display on the meter or via communication.

The input registers can be reset via communication or via the buttons directly on the meter.

Functions of the outputs

The outputs can be controlled via communication or alarm.

3.3.5 Tariff inputs

Tariff control

In the case of meters with a tariff function, the tariffs can either be controlled via communication or via 1 tariff input.

Tariff control via the input takes place through a suitable combination of “voltage” or “no voltage” at the input or inputs. For every combination of “voltage/no voltage”, the meter counts the energy in a certain tariff register.

In 4-quadrant meters with active and reactive energy measurement, the meter readings of both energy types are controlled via the same inputs. The active tariff for active and reactive energy is always the same.

Display of the active tariff

The active tariff is shown in the LCD display by the text “Tx” in the status field, whereby x is the tariff number. The active tariff can also be read out via communication.

Input coding, meters with 2 tariffs

The inputs are coded in the binary system. The following table describes the standard coding:

Input 1	Tariff
OFF	= T1
ON	= T2

3.3.6 Pulse outputs

The meters equipped with pulse outputs have up to 2 outputs. The meter sends a certain number of pulses (pulse frequency) per kilowatt hour (kVar for reactive energy) via pulse outputs.

In the case of transformer meters (B24), the pulse outputs send primary values. This means that the pulses are sent proportional to the real primary energy, whereby the current transformer conversion ratios programmed in the meter are taken into consideration.

For directly connected meters (B21 and B23), no external transformers are used and the number of pulses sent is directly proportional to the energy that the meter measures.

Pulse frequency and pulse length

The pulse frequency and pulse length can be set with the buttons on the meter or via communication. In the case of meters with more than one pulse output, all outputs have the same pulse frequency and pulse length.

The pulse frequency can be configured and can be set to a value of 1…9,999 pulses. The value must be a whole number. The unit is variable. Available for selection are pulse/kWh, pulse/Wh and pulse/MWh.

The pulse length can be set to a value of 10…990 ms.

Specifying pulse frequency/length

If the energy is too high for a certain pulse frequency and pulse length then there is a risk of the pulses overlapping. In this case the meter sends a new pulse (relay closed), before the previous pulse ends (relay open), and the pulse is lost. In the worst case, the relay remains constantly closed. As such, the maximum permissible pulse frequency should be calculated for a location with consideration to the estimated maximum energy consumption and pulse output data of the meter.

The following formula applies to this calculation:

Max. pulse frequency = 1000*3600 / U / I /n / (Ppause + Plength)

U and I are the estimated maximum values for voltage (in volts) and current strength (in ampere) here, and n is the number of phases (1-3).

Plength and Ppause are the pulse length and required pulse pause (in seconds).

A common minimum pulse length and pulse pause is 30 ms. This reflects the S0 and IEC standards.

Note
U and I must be the primary values in transformer meters, if external current transformers are programmed in the meter.

Examples
Example 1: Directly measuring meter (3-phase) with estimated maximum voltage of 250 V, current strength of 65 A, pulse length 100 ms and required pulse pause 30 ms. The maximum permitted pulse frequency is therefore: 1000 * 3600 / 250 / 65 / 3 / (0.030 + 0.100)) = 568 pulse / kWh (kVarh) Example 2: Transformer meter (3-phase) with estimated maximum voltage of 63 V and current strength of 6 * 50 A = 300 A (CT-ratio 50), pulse length 100 ms and required pulse pause 30 ms. The maximum permitted pulse frequency is therefore: 1000 * 3600 / 63 / 300 / 3 / (0.030 + 0.100) = 488.4 pulse / kWh (kVarh)

3.3.7 Protocol storage logs

The meter has a total of five different protocol stores, also known as *logs*:

- System log
- Event log
- Power quality log
- Audit log
- Settings log

Log entries can be read directly off the display on the meter.

In the system log, event log and power quality log it is possible to store up to 500 log entries. When this maximum is reached, the oldest entries are overwritten.

In the audit log it is possible to store up to 40 log entries. When this maximum is reached, no further entries can be stored. Firmware upgrades will fail in this case, because it is not possible to save any further log entries.

In the settings log it is possible to store up to 80 log entries. When this maximum is reached, no further entries can be stored. New settings for CT or a change to the connection type (3 or 4-phase) are no longer accepted because no further log entries can be saved.

The entries in the system log, event log and power quality log can be deleted via communication.

System log

This log saves error events in the meter.

The following events are stored in this log:

- Program CRC errors - errors when testing the firmware consistency.
- Errors in the data memory - the data in the long-term memory is damaged.

Event log

This log saves alarm events and configuration warnings.

The following events are stored in this log:

- Warning: negative energy phase 1 – phase 1 measures negative energy.
- Warning: negative energy phase 2 – phase 2 measures negative energy.
- Warning: negative energy phase 3 – phase 3 measures negative energy.
- Warning: total negative energy - the total energy is negative.
- Alarm current strength, L1
- Alarm current strength, L2
- Alarm current strength, L3
- Alarm current strength, neutral
- Alarm total active power
- Alarm active power, L1
- Alarm active power, L2
- Alarm active power, L3
- Alarm, total reactive power
- Alarm reactive power, L1
- Alarm reactive power, L2
- Alarm reactive power, L3
- Alarm total apparent power
- Alarm apparent power, L1
- Alarm apparent power, L2
- Alarm apparent power, L3
- Alarm total power factor
- Alarm power factor, L1
- Alarm power factor, L2
- Alarm power factor, L3

Power quality log

This log saves alarm events and data on the power quality.

The following events are stored in this log:

- Warning: U1 missing – U1 missing
- Warning: U2 missing – U2 missing
- Warning: U3 missing – U3 missing
- Frequency warning - mains frequency is not stable
- Alarm voltage, L1
- Alarm voltage, L2
- Alarm voltage, L3
- Alarm voltage, L1-L2
- Alarm voltage, L2-L3
- Alarm voltage, L1-L3

Audit log

Firmware upgrade attempts are stored in the audit log. Firmware upgrades on the meter must be carried out by an administrator. All upgrade attempts recorded in the audit log have been triggered by the administrator.

An event contains the following data:

- Firmware version
- Active energy consumption
- Active energy consumption, L1
- Active energy consumption, L2
- Active energy consumption, L3
- Active energy consumption, tariff 1
- Active energy consumption, tariff 2
- Active energy export
- Firmware upgrade status

Settings log

Events are stored in this log, if the current transformer conversion ratio is changed.

An event contains the following data:

- Firmware version
- Active energy consumption
- Active energy consumption, L1
- Active energy consumption, L2
- Active energy consumption, L3
- Active energy consumption, tariff 1
- Active energy consumption, tariff 2
- Active energy export
- Current transformer value
- Phase

Event codes

The following table contains the event codes that may arise in the system log, event log and power quality log:

Event code	Event
41	Program CRC error
42	Data logging error
1,000	Warning: U1 missing
1,001	Warning: U2 missing
1,002	Warning: U3 missing
1,004	Warning: Negative energy element 1
1,005	Warning: Negative energy element 2
1,006	Warning: Negative energy element 3
1,007	Warning: Total negative energy
1,008	Frequency warning
2,013	Alarm 1 active
2,014	Alarm 2 active
2,015	Alarm 3 active
2,016	Alarm 4 active
2,017	Alarm 5 active
2,018	Alarm 6 active
2,019	Alarm 7 active
2,020	Alarm 8 active
2,021	Alarm 9 active
2,022	Alarm 10 active
2,023	Alarm 11 active
2,024	Alarm 12 active
2,025	Alarm 13 active
2,026	Alarm 14 active
2,027	Alarm 15 active
2,028	Alarm 16 active
2,029	Alarm 17 active
2,030	Alarm 18 active
2,031	Alarm 19 active
2,032	Alarm 20 active
2,033	Alarm 21 active
2,034	Alarm 22 active
2,035	Alarm 23 active
2,036	Alarm 24 active
2,037	Alarm 25 active

4 Communication with Modbus

This chapter describes the mapping of meter data to the Modbus, as well as reading and writing in the register.

4.1 Modbus protocol

Modbus is a master-slave communication protocol that supports up to 247 slaves organised as a multidrop bus. The communication is half-duplex.

The services on the Modbus are determined on the basis of function codes.

The function codes are used for reading or writing 16-Bit registers.

All measured data, such as active energy, voltage or firmware version, are represented by one or more such registers.

For further information regarding the relationship between the number of registers and measured data, see chapter Mapping tables, p. 68.

The Modbus protocol is described in its entirety in the Modbus application protocol specification V1.1b. The document is available under http://www.modbus.org.

Supported function codes

The following function codes are supported:

- Function code 3 (reading the holding register)
- Function code 6 (writing a single register)
- Function code 16 (writing multiple registers)

Modbus request telegram

A Modbus request telegram usually exhibits the following structure:

Slave address	Function code	Data	Error check

Slave address	Modbus slave address, 1 byte
Function code	Decides the service to be performed
Data	Dependent on the function code. The length varies.
Error check	CRC, 2 bytes

Message types

The network messages may be request response or transfer type messages. The request response command sends a request from the master to an individual slave, and a response generally follows this.

The transfer command sends a message to all slaves, and a response never follows this. The transfer is supported by the function codes 6 and 16.

4.1.1 Function code 3 (reading the holding register)

Function code 3 is used for reading the measured values or other information from the electricity meter. It is possible to read up to 125 successive registers simultaneously. This means that multiple values can be read in one request.

Request telegram

A request telegram has the following structure:

Slave address	Function code	Address	No. of registers	Error check

Example of a request (read the total energy supply, etc.):

Slave address	0x01
Function code	0x03
Start address, high byte	0x50
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x18
Error check (CRC), high byte	0x54
Error check (CRC), low byte	0xC0

Response telegram

A response telegram has the following structure:

Slave address	Function code	Byte count	Register values	Error check

Example of a response:

Slave address	0x01
Function code	0x03
Byte count	0x30
Value of register 0x5000, high byte	0x00
Value of register 0x5000, low byte	0x15
…	
Value of register 0x5017, high byte	0xFF
Value of register 0x5017, low byte	0xFF
Error check (CRC), high byte	0xXX
Error check (CRC), low byte	0xXX

With this example, the slave with the Modbus address 1 responds to a read request. The number of data Bytes is 0x30. The first register (0x5000) has the value 0x0015, and the last (0x5017) has the value 0xFFFF.

4.1.2 Function code 16 (writing multiple registers)

Function code 16 is used to adjust the settings in the meter, such as date/time, in order to control the output and reset the values, such as the power failure meter. It is possible to write up to 123 successive registers in a single request. This means that multiple settings can be adjusted in a single request, and/or multiple reset processes can be implemented.

Request telegram

A request telegram has the following structure:

Slave address	Function code	Start address	No. of registers	Byte count	Register values	Error check

Example of a request (set date/time to 11 November 2010, 12:13:14):

Slave address	0x01
Function code	0x10
Start address, high byte	0x8A
Start address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x03
Byte count	0x06
Value of register 0x8A00, high byte	0x0A
Value of register 0x8A00, low byte	0x0B
Value of register 0x8A01, high byte	0x0B
Value of register 0x8A01, low byte	0x0C
Value of register 0x8A02, high byte	0x0D
Value of register 0x8A02, low byte	0x0E
Error check (CRC), high byte	0x8C
Error check (CRC), low byte	0x82

With this example, the master sends a write request to the slave with the Modbus address 1. The first register to be written is 0x8A00, and the number of registers to be written is 0x03. This means that registers 0x8A00 to 0x8A02 are to be written. Register 0x8A00 is set to value 0x0A0B, etc.

Response telegram

A response telegram has the following structure:

Slave address	Function code	Start address	No. of registers	Error check

Example of a response:

Slave address	0x01
Function code	0x10
Register address, high byte	0x8A
Register address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x03
Error check (CRC), high byte	0xAA
Error check (CRC), low byte	0x10

In the example above, the slave with the Modbus address 1 responds to a write request. The first register is 0x8A00, and 0x03 registers have been successfully written.

4.1.3 Function code 6 (writing a single register)

Function code 6 can be used as an alternative to function code 16, if only one register is to be written. It can be used for example to reset the power failure meter.

Request telegram

A request telegram has the following structure:

Slave address	Function code	Register address	Register values	Error check

Example of a request (reset the power failure meter):

Slave address	0x01
Function code	0x06
Register address, high byte	0x8F
Register address, low byte	0x00
No. of registers, high byte	0x00
No. of registers, low byte	0x01
Error check (CRC), high byte	0x62
Error check (CRC), low byte	0xDE

Response telegram

When using function code 6 the response telegram is an echo of the request telegram.

4.1.4 Exception responses

If an error occurs when processing a request, the meter issues an exception response, which contains an exception code.

Exception telegram

A exception telegram has the following structure:

Slave address	Function code	Exception code	Error check

In the exception response, the function code is set to the function code of the request plus 0x80.

Exception codes

The exception codes used are listed in the following table:

Exception code	Exception	Definition
01	Illegal function	A funcion code that is not supported has been used.
02	Illegal data address	The requested register is outside the allowed range.
03	Illegal data value	The structure of a received message is incorrect.
04	Slave device failure	Processing the request fail due to an internal error in meter.

4.2 Reading and writing in the register

Legible registers

The legible range in the Modbus mapping comprises the registers 1000-8EFF (hexadecimal). Reading registers within this range leads to a normal Modbus response. It is possible to read an arbitrary number of registers between 1 and 125, i.e. it is not necessary to read out all registers in a telegram. All attempts to read outside of this range lead to an exception due to an impermissible data address (Modbus exception code 2).

Multiple register values

With quantities that are presented as more than 1 register, the most important Byte is in the high Byte of the first (lowest) register. The least important Byte is in the low Byte of the last (highest) register.

Unused registers

Unused registers within the mapping range, e.g. missing quantities in a connected meter, lead to a normal Modbus response, but the value of the register is set to “invalid”.

In the case of quantities with the data type “unsigned”, the value in all registers is FFFF. In the case of quantities with the data type “signed”, the value is the highest value suitable for expressing. This means that the quantity represented by just one register has the value 7FFFF. A quantity represented by two registers has the value 7FFFFFFF, etc.

Writing in the registers

Writing in the registers is only permissible for registers that are listed in the mapping tables as writable. The attempt to write in a register that is listed as writable, but that is not supported by a meter, leads to an error indication.

Note
It is not possible to modify parts of a setting.

Verification of the settings values

Once you have set a value in the meter, it is advisable to read the value in order to verify the result, because verification is not possible if a write process of the Modbus response was successful.

4.3 Mapping tables - standard register compatible with UMG devices

The aim of this section is to explain the relationship between the number of registers and measured data.

Contents of the mapping tables

The following table explains the contents of the mapping tables:

Quantity	Name of the meter quantity or other information available in the meter
Details	Refinement of the Quantity column
Start Reg (DEZ)	Decimal number for the first (lowest) Modbus Register for this quantity *
Size	Number of Modbus registers for the meter Quantity. A Modbus Register is 16 bits long.
Unit	Unit for the Quantity (if applicable)
Data type	Data type for this Quantity, i.e. how the value in the Modbus registers should be interpreted

*Is expressed exactly as it is sent on the bus. This means do not subtract 40,000 or reduce by 1, as is conventional with Modbus products.

Standard register:

Quantity	Start reg (DEZ)	Size	Unit	Data type
Voltage L1-N	19000	2	V	FLOAT (IEEE754)
Voltage L2-N	19002	2	V	FLOAT (IEEE754)
Voltage L3-N	19004	2	V	FLOAT (IEEE754)
Voltage L1-L2	19006	2	V	FLOAT (IEEE754)
Voltage L2-L3	19008	2	V	FLOAT (IEEE754)
Voltage L3-L1	19010	2	V	FLOAT (IEEE754)
Apparent current, L1-N	19012	2	A	FLOAT (IEEE754)
Apparent current, L2-N	19014	2	A	FLOAT (IEEE754)
Apparent current, L3-N	19016	2	A	FLOAT (IEEE754)
Not used	*19018*	*2*		
Real power L1-N	19020	2	W	FLOAT (IEEE754)
Real power L2-N	19022	2	W	FLOAT (IEEE754)
Real power L3-N	19024	2	W	FLOAT (IEEE754)
Real power L1+L2+L3	19026	2	W	FLOAT (IEEE754)
Apparent power L1-N	19028	2	VA	FLOAT (IEEE754)
Apparent power L2-N	19030	2	VA	FLOAT (IEEE754)
Apparent power L3-N	19032	2	VA	FLOAT (IEEE754)
Apparent power L1+L2+L3	19034	2	VA	FLOAT (IEEE754)
Reactive power L1	19036	2	var	FLOAT (IEEE754)
Reactive power L2	19038	2	var	FLOAT (IEEE754)
Reactive power L3	19040	2	var	FLOAT (IEEE754)
Reactive power L1+L2+L3	19042	2	var	FLOAT (IEEE754)
Power Factor L1	19044	2	-	FLOAT (IEEE754)
Power Factor L2	19046	2	-	FLOAT (IEEE754)
Power Factor L3	19048	2	-	FLOAT (IEEE754)
Measured frequency	19050	2	Hz	FLOAT (IEEE754)
Not used	19052	2		
Real energy L1	19054	2	Wh	FLOAT (IEEE754)
Real energy L2	19056	2	Wh	FLOAT (IEEE754)
Real energy L3	19058	2	Wh	FLOAT (IEEE754)
Real energy L1+L2+L3	19060	2	Wh	FLOAT (IEEE754)
Real energy L1, consumed	19062	2	Wh	FLOAT (IEEE754)
Real energy L2, consumed	19064	2	Wh	FLOAT (IEEE754)
Real energy L3, consumed	19066	2	Wh	FLOAT (IEEE754)
Real energy L1+L2+L3, consumed	19068	2	Wh	FLOAT (IEEE754)

Quantity	Start reg (DEZ)	Size	Unit	Data type
Real energy L1, delivered	19070	2	Wh	FLOAT (IEEE754)
Real energy L2, delivered	19072	2	Wh	FLOAT (IEEE754)
Real energy L3, delivered	19074	2	Wh	FLOAT (IEEE754)
Real energy L1+L2+L3, delivered	19076	2	Wh	FLOAT (IEEE754)
Apparent energy L1	19078	2	VAh	FLOAT (IEEE754)
Apparent energy L2	19080	2	VAh	FLOAT (IEEE754)
Apparent energy L3	19082	2	VAh	FLOAT (IEEE754)
Apparent energy L1+L2+L3	19084	2	VAh	FLOAT (IEEE754)
Reactive energy L1	19086	2	varh	FLOAT (IEEE754)
Reactive energy L2	19088	2	varh	FLOAT (IEEE754)
Reactive energy L3	19090	2	varh	FLOAT (IEEE754)
Reactive energy L1+L2+L3	19092	2	varh	FLOAT (IEEE754)
Reactive energy L1, inductive	19094	2	varh	FLOAT (IEEE754)
Reactive energy L2, inductive	19096	2	varh	FLOAT (IEEE754)
Reactive energy L3, inductive	19098	2	varh	FLOAT (IEEE754)
Reactive energy L1+L2+L3, inductive	19100	2	varh	FLOAT (IEEE754)
Reactive energy L1,capacitive	19102	2	varh	FLOAT (IEEE754)
Reactive energy L2,capacitive	19104	2	varh	FLOAT (IEEE754)
Reactive energy L3,capacitive	19106	2	varh	FLOAT (IEEE754)
Reactive energy L1+L2+L3, capacitive	19108	2	varh	FLOAT (IEEE754)
Not used	19110			
Not used	19112			
Not used	19114			
Not used	19116			
Not used	19117			
Not used	19120			

4.4 Mapping tables - special register

The aim of this section is to explain the relationship between the number of registers and measured data.

Contents of the mapping tables

The following table explains the contents of the mapping tables:

Quantity	Name of the meter quantity or other information available in the meter
Details	Refinement of the Quantity column
Start Reg (Hex)	Hexadecimal number for the first (lowest) Modbus Register for this quantity *
Size	Number of Modbus registers for the meter Quantity. A Modbus Register is 16 bits long.
Res.	Resolution of the value for this Quantity (if applicable)
Unit	Unit for the Quantity (if applicable)
Data type	Data type for this Quantity, i.e. how the value in the Modbus registers should be interpreted

*Is expressed exactly as it is sent on the bus. This means do not subtract 40,000 or reduce by 1, as is conventional with Modbus products.

Total energy values

All registers in the following table are write-protected:

Quantity	Details	Start reg (Hex)	Size	Res.	Unit	Data type
Real energy L1+L2+L3, consumed	kWh	5000	4	0,01	kWh	Unsigned
Real energy L1+L2+L3, delivered	kWh	5004	4	0,01	kWh	Unsigned
Real energy L1+L2+L3	kWh	5008	4	0,01	kWh	Signed
Reactive energy L1+L2+L3 consumed	kVarh	500C	4	0,01	kVarh	Unsigned
Reactive energy L1+L2+L3 delivered	kVarh	5010	4	0,01	kVarh	Unsigned
Reactive energy L1+L2+L3	kVarh	5014	4	0,01	kVarh	Signed
Apparent energy L1+L2+L3 consumed	kVAh	5018	4	0,01	kVAh	Unsigned
Apparent energy L1+L2+L3 delivered	kVAh	501C	4	0,01	kVAh	Unsigned
Apparent energy L1+L2+L3	kVAh	5020	4	0,01	kVAh	Signed
Active consumed CO2	kVAh	5024	4	0,001	kg	Unsigned
Active consumed currency	kVAh	5034	4	0,001	currency	Unsigned

Energy values by tariffs

All registers in the following table are write-protected:

Quantity	Details	Start reg (Hex)	Size	Res.	Unit	Data type
Real energy L1+L2+L3, consumed	Tariff 1	5170	4	0,01	kWh	Unsigned
Real energy L1+L2+L3, consumed	Tariff 2	5174	4	0,01	kWh	Unsigned
Real energy L1+L2+L3, delivered	Tariff 1	5190	4	0,01	kWh	Unsigned
Real energy L1+L2+L3, delivered	Tariff 2	5194	4	0,01	kWh	Unsigned
Reactive energy L1+L2+L3 consumed	Tariff 1	51B0	4	0,01	kVarh	Unsigned
Reactive energy L1+L2+L3 consumed	Tariff 2	51B4	4	0,01	kVarh	Unsigned
Reactive energy L1+L2+L3 delivered	Tariff 1	51D0	4	0,01	kVarh	Unsigned
Reactive energy L1+L2+L3 delivered	Tariff 2	51D4	4	0,01	kVarh	Unsigned

Energy values per phase

All registers in the following table are write-protected:

Quantity	Details	Start reg (Hex)	Size	Res.	Unit	Data type
Real energy, consumed	L1	5460	4	0,01	kWh	Unsigned
Real energy, consumed	L2	5464	4	0,01	kWh	Unsigned
Real energy, consumed	L3	5468	4	0,01	kWh	Unsigned
Real energy, delivered	L1	546C	4	0,01	kWh	Unsigned
Real energy, delivered	L2	5470	4	0,01	kWh	Unsigned
Real energy, delivered	L3	5474	4	0,01	kWh	Unsigned
Real energy	L1	5478	4	0,01	kWh	Signed
Real energy	L2	547C	4	0,01	kWh	Signed
Real energy	L3	5480	4	0,01	kWh	Signed
Reactive energy, consumed	L1	5484	4	0,01	kVarh	Unsigned
Reactive energy, consumed	L2	5488	4	0,01	kVarh	Unsigned
Reactive energy, consumed	L3	548C	4	0,01	kVarh	Unsigned
Reactive energy, delivered	L1	5490	4	0,01	kVarh	Unsigned
Reactive energy, delivered	L2	5494	4	0,01	kVarh	Unsigned
Reactive energy, delivered	L3	5498	4	0,01	kVarh	Unsigned
Reactive energy	L1	549C	4	0,01	kVarh	Signed
Reactive energy	L2	54A0	4	0,01	kVarh	Signed
Reactive energy	L3	54A4	4	0,01	kVarh	Signed
Apparent energy, consumed	L1	54A8	4	0,01	kVAh	Unsigned
Apparent energy, consumed	L2	54AC	4	0,01	kVAh	Unsigned
Apparent energy, consumed	L3	54B0	4	0,01	kVAh	Unsigned
Apparent energy, delivered	L1	54B4	4	0,01	kVAh	Unsigned
Apparent energy, delivered	L2	54B8	4	0,01	kVAh	Unsigned
Apparent energy, delivered	L3	54BC	4	0,01	kVAh	Unsigned
Apparent energy	L1	54C0	4	0,01	kVAh	Signed
Apparent energy	L2	54C4	4	0,01	kVAh	Signed
Apparent energy	L3	54C8	4	0,01	kVAh	Signed

Resettable intermediate meters (not available with B21, B23 and B24**)**

All registers in the following table are write-protected:

Quantity	Start reg (Hex)	Size	Res.	Unit	Data type
Resettable Real energy L1+L2+L3, consumed	552C	4	0,01	kWh	Unsigned
Resettable Real energy L1+L2+L3, delivered	5530	4	0,01	kWh	Unsigned
Resettable Reactive energy L1+L2+L3, consumed	5534	4	0,01	kWh	Unsigned
Resettable Reactive energy L1+L2+L3, delivered	5538	4	0,01	kWh	Unsigned

Measured values

All registers in the following table are write-protected:

Quantity	Details	Start reg (Hex)	Size	Res.	Unit	Value range	Data type
Voltage	L1-N	5B00	2	01	V		Unsigned
Voltage	L2-N	5B02	2	01	V		Unsigned
Voltage	L3-N	5B04	2	01	V		Unsigned
Voltage	L1-L2	5B06	2	01	V		Unsigned
Voltage	L3-L2	5B08	2	01	V		Unsigned
Voltage	L1-L3	5B0A	2	01	V		Unsigned
Current	L1	5B0C	2	001	A		Unsigned
Current	L2	5B0E	2	001	A		Unsigned
Current	L3	5B10	2	001	A		Unsigned
Active power	Total	5B14	2	001	W		Signed
Active power	L1	5B16	2	001	W		Signed
Active power	L2	5B18	2	001	W		Signed
Active power	L3	5B1A	2	001	W		Signed
Reactive power	Total	5B1C	2	001	Var		Signed
Reactive power	L1	5B1E	2	001	Var		Signed
Reactive power	L2	5B20	2	001	Var		Signed
Reactive power	L3	5B22	2	001	Var		Signed
Apparent power	Total	5B24	2	001	VA		Signed
Apparent power	L1	5B26	2	001	VA		Signed
Apparent power	L2	5B28	2	001	VA		Signed
Apparent power	L3	5B2A	2	001	VA		Signed
Frequency		5B2C	1	001	Hz		Unsigned
Phase angle power	Total	5B2D	1	01	°	-180°…+180°	Signed
Phase angle power	L1	5B2E	1	01	°	-180°…+180°	Signed
Phase angle power	L2	5B2F	1	01	°	-180°…+180°	Signed
Phase angle power	L3	5B30	1	01	°	-180°…+180°	Signed
Phase angle voltage	L1	5B31	1	01	°	-180°…+180°	Signed
Phase angle voltage	L2	5B32	1	01	°	-180°…+180°	Signed
Phase angle voltage	L3	5B33	1	01	°	-180°…+180°	Signed
Phase angle current	L1	5B37	1	01	°	-180°…+180°	Signed
Phase angle current	L2	5B38	1	01	°	-180°…+180°	Signed
Phase angle current	L3	5B39	1	01	°	-180°…+180°	Signed
Power factor	Total	5B3A	1	0,001	-	-1,000…+1,000	Signed
Power factor	L1	5B3B	1	0,001	-	-1,000…+1,000	Signed
Power factor	L2	5B3C	1	0,001	-	-1,000…+1,000	Signed
Power factor	L3	5B3D	1	0,001	-	-1,000…+1,000	Signed
Current quadrant	Total	5B3E	1		-	1…4	Unsigned
Current quadrant	L1	5B3F	1		-	1…4	Unsigned
Current quadrant	L2	5B40	1		-	1…4	Unsigned
Current quadrant	L3	5B41	1		-	1…4	Unsigned

Note
The currents are sent as signed 32-Bit whole numbers, which are expressed in W (or Var/VA) with two decimal places. This means that the maximum possible current that can be expressed is approx. ±21 MW. If the current is higher than this value then the user is advised to read off the current from the DMTME mapping instead, where the scale is in W without decimal places.

Inputs and outputs

The following table contains writable and write-protected registers:

Quantity	Details	Start reg (Hex)	Size	Possible values	Data type	Read/ Write
Output 1		6300	1	ON=1, OFF=0	Unsigned	R/W
Output 2		6301	1	ON=1, OFF=0	Unsigned	R/W
Input 1	Current state	6308	1	ON=1, OFF=0	Unsigned	R
Input 2	Current state	6309	1	ON=1, OFF=0	Unsigned	R
Input 1	Stored state	6310	1	ON=1, OFF=0	Unsigned	R
Input 2	Stored state	6311	1	ON=1, OFF=0	Unsigned	R
Input 1	Counter	6318	4		Unsigned	R
Input 2	Counter	631C	4		Unsigned	R

Production data and identification

All registers in the following table are write-protected:

Quantity	Start reg (Hex)	Size	Data type
Serial number	8900	2	Unsigned
Meter firmware version	8908	8	ASCII string (up to 16 characters)
Modbus mapping version	8910	1	2 bytes
Type designation	8960	6	ASCII string (12 characters, including null termination)

The firmware version of the meter is expressed as a string with three digits separated by dots, e.g. 1.0.0. Unused Bytes at the end are set to binary zero.

In the register of the **Modbus mapping version**, the high Byte reflects the higher version (1…255) and the low Byte reflects the lower version (0…255).

Miscellaneous

In the following table, the date/time and current tariff value are writable. All other registers are write-protected:

Quantity	Start reg (Hex)	Description	Size	Data type	Read/ Write
Current tariff	8A07	Tariff 1…2	1	Unsigned	R/W
Error flags	8A13	64 flags	4	Bit string	R
Information flags	8A19	64 flags	4	Bit string	R
Warning flags	8A1F	64 flags	4	Bit string	R
Alarm flags	8A25	64 flags	4	Bit string	R
Power fail counter	8A2F		1	Unsigned	R
Power outage time	8A39	Byte 0…2: days * Byte 3: hours Byte 4: minutes Byte 5: seconds	2	Date/time	R
*Reset counter for active energy consumed *1*	8A48		4	Unsigned	R
*Reset counter for active energy delivered *1*	8A4C		4	Unsigned	R
*Reset counter for active energy consumed *1*	8A50		4	Unsigned	R
*Reset counter for active energy delivered *1*	8A54		4	Unsigned	R

* Byte 0 is the highest Byte of the lowest register.
*1: **(not available with B21, B23 and B24**)

The registers for **resetting the meter** show the number of resets of the resettable intermediate meters **(not available with B21, B23 and B24**).

Settings

All registers in the following table have read and write access:

Quantity	Start reg (Hex)	Size	Res.	Unit	Data type
Current transformer ratio numerator	8C04	2		-	Unsigned
Current transformer ratio denominator	8C08	2		-	Unsigned
LED source (0 = active energy, 1 = reactive energy)	8CE4	1		-	Unsigned
Number of elements (values 1…3)	8CE5	1		-	Unsigned

Operation

All registers in the following table are write-protected:

Quantity	Details	Start reg (Hex)	Size	Action	Data type
Reset power fail counter		8F00	1	Write the value 1 to perform a reset	Unsigned
Reset power outage time		8F05	1	Write the value 1 to perform a reset	Unsigned
Reset input counter	Input 1	8F0B	1	Write the value 1 to perform a reset	Unsigned
Reset input counter	Input 2	8F0C	1	Write the value 1 to perform a reset	Unsigned
Reset stored state	Input 1	8F13	1	Write the value 1 to perform a reset	Unsigned
Reset stored state	Input 2	8F14	1	Write the value 1 to perform a reset	Unsigned
*Resettable active energy consumed *1*		8F1B	1	Write the value 1 to perform a reset	Unsigned
*Resettable active energy delivered *1*		8F1C	1	Write the value 1 to perform a reset	Unsigned
*Resettable reactive energy consumed *1*		8F1D	1	Write the value 1 to perform a reset	Unsigned
*Resettable reactive energy delivered *1*		8F1E	1	Write the value 1 to perform a reset	Unsigned
Reset system log		8F31	1	Write the value 1 to perform a reset	Unsigned
Reset event log		8F32	1	Write the value 1 to perform a reset	Unsigned
Reset net quality log		8F33	1	Write the value 1 to perform a reset	Unsigned
Reset communication log		8F34	1	Write the value 1 to perform a reset	Unsigned

*1 **(not available with B21, B23 and B24**)

5 Communication with M-Bus

This chapter contains a description of how the meter data is read and how commands are sent via the M-bus to the meters.

5.1 Protocol description

The communication protocol described in this chapter fulfils the requirements of EN 13757-2 and EN 13757-3.

The communication can be divided up into two parts. One part is the reading of data from the meter and the other part is the sending of data to the meters.

The data read-out process starts when the master sends a REQ_UD2 telegram to the meter. The meter responds with a RSP_UD telegram. A typical read-out is a multi-telegram read-out.

Some data in the meter can only be read out by first sending an SND_UD, followed by a REQ_UD2. This applies to load profiles, request files and protocol files.

Using SND_UD telegrams it is possible to send data to the meters.

Communication objects

The following quantities can be read by sending a REQ_UD2 to the meters.

B21

Readout from a B21 measurement device with comments (the readout took place with the supply of the measurement device with DC voltage, which resulted in the frequency of the status 15 “not available” being attained).

Sending NKE
10 40 FE 3E 16

Reading response
E5

Sending Request User Data 2
10 7B FE 79 16

Reading telegram 1

68 BE BE 68 08 00 72 34 12 00 00 2E 28 20 02 01 20 00 00	;Mbus header
0E 84 00 00 00 00 00 00 00	;Real energy L1+L2+L3, consumed
8E 10 84 00 00 00 00 00 00 00	;Real energy L1+L2+L3, Tarif 1 consumed
8E 20 84 00 00 00 00 00 00 00	;Real energy L1+L2+L3, Tarif 2 consumed
8E 40 84 00 00 00 00 00 00 00	;Real energy L1+L2+L3, delivered
8E 50 84 00 00 00 00 00 00 00	;Real energy L1+L2+L3, Tarif 1 delivered
8E 60 84 00 00 00 00 00 00 00	;Real energy L1+L2+L3, Tarif 2 delivered
01 FF 93 00 01	;Active tariff
04 FF A0 15 00 00 00 00	;Current transformer primary current (status 15 (“not available”) as B21 is a direct connected meter))
04 FF A1 15 00 00 00 00	;Voltage transformer primary voltage
04 FF A2 15 00 00 00 00	;Current transformer secondary current
04 FF A3 15 00 00 00 00	;Voltage transformer secondary voltage
07 FF A6 00 00 00 00 00 00 00 00	;Error flags

```
07 FF A7 00 00 01 00 00 00 00 00 00                ;Warning flags
07 FF A8 00 00 00 00 00 00 00 00 00                ;Information flags
07 FF A9 00 00 00 00 00 00 00 00 00                ;Alarm flags
0D FD 8E 00 09 38 2E 30 2E 38 2E 30 31 42          ;Firmware version
0D FF AA 00 0B 4A 30 31 2D 33 35 33 20 31 32 42    ;Type designation
1F                                                 ;Dif 1F means more telegrams exist
1C 16                                              ;Checksum and stop byte

Sending Request User Data 2
10 5B FE 59 16

Reading telegram 2
68 A4 A4 68 08 00 72 34 12 00 00 2E 28 20 02 02 20 00 00   ;Mbus header
04 FF 98 00 4D 00 00 00                            ;Power fail counter
04 A9 00 00 00 00 00                               ;Real power L1+L2+L3
84 80 40 A9 00 00 00 00 00                         ;Reactive power L1+L2+L3
84 80 80 40 A9 00 00 00 00 00                      ;Apparent power L1+L2+L3
04 FD C8 FF 81 00 5E 02 00 00                      ;Voltage, L1-N
04 FD D9 FF 81 00 00 00 00 00                      ;Apparent current, L1-N
0A FF D9 15 00 00                                  ;Measured frequency
02 FF E0 00 00 00                                  ;Power Factor L1+L2+L3
02 FF D2 00 00 00                                  ;Power Factor L1+L2+L3 angle
01 FF 97 00 00                                     ;Total active quadrant
8E 80 40 84 00 00 00 00 00 00 00        ;Reactive energy L1+L2+L3, consumed
8E 90 40 84 00 00 00 00 00 00 00        ;Reactive energy L1+L2+L3, Tariff 1 consumed
8E A0 40 84 00 00 00 00 00 00 00        ;Reactive energy L1+L2+L3, Tariff 2 consumed
8E C0 40 84 00 00 00 00 00 00 00        ;Reactive energy L1+L2+L3, export
8E D0 40 84 00 00 00 00 00 00 00        ;Reactive energy L1+L2+L3, Tariff 1 export
8E E0 40 84 00 00 00 00 00 00 00        ;Reactive energy L1+L2+L3, Tariff 2 export
01 FF AD 00 01                                     ;Number of elements
1F                                                 ;Dif 1F means more telegrams exist
67 16                                              ;Checksum and stop byte


Sending Request User Data 2
10 7B FE 79 16

Reading telegram 3
68 48 48 68 08 00 72 34 12 00 00 2E 28 20 02 03 20 00 0    ;Mbus header
81 40 FD 9A 00 00                                  ;Output 1 state
81 80 40 FD 9A 00 00                               ;Output 2 state
81 C0 40 FD 9B 00 00                               ;Input 3 state
81 80 80 40 FD 9B 00 00                            ;Input 4 state
C1 C0 40 FD 9B 00 01                               ;Input 3 stored state
C1 80 80 40 FD 9B 00 00                            ;Input 4 stored state
8E 80 80 40 FD E1 00 00 00 00 00 00 00             ;Input 4 pulse counter
1F                                                 ;Dif 1F means more telegrams exist
BB 16                                              ;Checksum and stop byte
```

Sending Request User Data 2
10 5B FE 59 16

Reading telegram 4

68 CF CF 68 08 00 72 34 12 00 00 2E 28 20 02 04 20 00 00	;Mbus header
0E 84 FF F2 00 00 00 00 00 00 00 00	*;Resettable real enery consumend *1*
8E 40 84 FF F2 00 00 00 00 00 00 00 00	*;Resettable real enery delivered *1*
8E 80 40 84 FF F2 00 00 00 00 00 00 00 00	*;Resettable reactive energy consumend *1*
8E C0 40 84 FF F2 00 00 00 00 00 00 00 00	*;Resettable reactive energy delivered *1*
04 FF F1 00 00 00 00 00	*;Reset counter for real enery consumend*1*
84 40 FF F1 00 00 00 00 00	*;Reset counter for real enery delivered*1*
84 80 40 FF F1 00 00 00 00 00	*;Reset counter for reactive energy consumend*1*
84 C0 40 FF F1 00 00 00 00 00	*;Reset counter for reactive energy delivered*1*
0E FF F9 C4 00 00 00 00 00 00 00 00	;Real enery in CO2
0E FF F9 C9 00 00 00 00 00 00 00 00	;Real enery consumend in currency
04 FF A4 00 E8 03 00 00	;Conversion factor for Real enery consumend in CO2
04 FF A5 00 E8 03 00 00	;Conversion factor for Real enery consumend in curreny
8E 80 80 40 84 00 00 00 00 00 00 00 00	;Apparent energy consumend
8E C0 80 40 84 00 00 00 00 00 00 00 00	;Apparent energy delivered
87 80 C0 40 84 00 00 00 00 00 00 00 00 00 00	;Total active net energy
87 C0 C0 40 84 00 00 00 00 00 00 00 00 00 00	;Total reactive net energy
87 80 80 80 40 84 00 00 00 00 00 00 00 00 00 00	;Total apparent net energy
0F	;Dif 0F means last telegram
0A 16	;Checksum and stop byte

*1 **(not available with B21, B23 and B24**)

B23 / B24

Readout from a B23 measurement device with comments (the readout took place with the supply of the measurement device with DC voltage, which resulted in the frequency of the status 15 “not available” being attained):

Sending NKE
10 40 FE 3E 16

Reading response
E5

Sending Request User Data 2
10 7B FE 79 16

Reading telegram 1

68 BF BF 68 08 00 72 34 12 00 00 2E 28 20 02 01 20 00 00	;Mbus header
0E 84 00 00 00 00 00 00 00 00	; Real energy L1+L2+L3, consumed
8E 10 84 00 00 00 00 00 00 00 00	; Real energy L1+L2+L3, Tarif 1 consumed
8E 20 84 00 00 00 00 00 00 00 00	; Real energy L1+L2+L3, Tarif 2 consumed
8E 40 84 00 00 00 00 00 00 00 00	; Real energy L1+L2+L3, delivered
8E 50 84 00 00 00 00 00 00 00 00	; Real energy L1+L2+L3, Tarif 1 delivered
8E 60 84 00 00 00 00 00 00 00 00	; Real energy L1+L2+L3, Tarif 2 delivered

```
01 FF 93 00 01                                       ;Active tariff
04 FF A0 15 00 00 00 00                              ;Current transformer primary current
                                                       (status 15 (“not available”) as B23 is a
                                                       direct connected meter))
04 FF A1 15 00 00 00 00                              ;Voltage transformer primary voltage
04 FF A2 15 00 00 00 00                              ;Current transformer secondary current
04 FF A3 15 00 00 00 00                              ;Voltage transformer secondary voltage
07 FF A6 00 00 00 00 00 00 00 00 00                  ;Error flags
07 FF A7 00 04 01 00 00 00 00 00 00                  ;Warning flags
07 FF A8 00 00 00 00 00 00 00 00 00                  ;Information flags
07 FF A9 00 00 00 00 00 00 00 00 00                  ;Alarm flags
0D FD 8E 00 0A 32 31 2E 30 2E 34 32 2E 31 42         ;Firmware version
0D FF AA 00 0B 4A 30 31 2D 33 35 33 20 33 32 42      ;Type designation
1F                                                   ;Dif 1F means more telegrams exist
4C 16                                                ;Checksum and stop byte

Sending Request User Data 2
10 5B FE 59 16

Reading telegram 2
68 F2 F2 68 08 00 72 34 12 00 00 2E 28 20 02 02 20 00 00   ;Mbus header
04 FF 98 00 50 00 00 00                              ;Power fail counter
04 A9 00 00 00 00 00                                 ;Real power L1+L2+L3
04 A9 FF 81 00 00 00 00 00                           ;Real power L1
04 A9 FF 82 00 00 00 00 00                           ;Real power L2
04 A9 FF 83 00 00 00 00 00                           ;Real power L3
84 80 40 A9 00 00 00 00 00                           ;Reactive power L1+L2+L3
84 80 40 A9 FF 81 00 00 00 00 00                     ;Reactive power L1
84 80 40 A9 FF 82 00 00 00 00 00                     ;Reactive power L2
84 80 40 A9 FF 83 00 00 00 00 00                     ;Reactive power L3
84 80 80 40 A9 00 00 00 00 00                        ;Apparent power L1+L2+L3
84 80 80 40 A9 FF 81 00 00 00 00 00                  ;Apparent power L1
84 80 80 40 A9 FF 82 00 00 00 00 00                  ;Apparent power L2
84 80 80 40 A9 FF 83 00 00 00 00 00                  ;Apparent power L3
04 FD C8 FF 81 00 23 18 00 00                        ;Voltage L1-N
04 FD C8 FF 82 00 5B 02 00 00                        ;Voltage L1-N
04 FD C8 FF 83 00 2A 00 00 00                        ;Voltage L1-N
04 FD C8 FF 85 00 7C 1A 00 00                        ;Voltage L1-L2
04 FD C8 FF 86 00 40 02 00 00                        ;Voltage L2-L3
04 FD C8 FF 87 00 3E 18 00 00                        ;Voltage L3-L1
04 FD D9 FF 81 00 00 00 00 00                        ;Apparent current, L1-N
04 FD D9 FF 82 00 00 00 00 00                        ;Apparent current, L2-N
04 FD D9 FF 83 00 00 00 00 00                        ;Apparent current, L3-N
0A FF D9 15 00 00                                    ;Measured frequency
1F                                                   ;Dif 1F means more telegrams exist
C9 16                                                ;Checksum and stop byte

Sending Request User Data 2
10 7B FE 79 16
```

```
Reading telegram 3
68 95 95 68 08 00 72 34 12 00 00 2E 28 20 02 03 20 00 00    ;Mbus header
02 FF E0 00 00 00                                           ;Power Factor L1+L2+L3
02 FF E0 FF 81 00 00 00                                     ;Power Factor L1
02 FF E0 FF 82 00 00 00                                     ;Power Factor L2
02 FF E0 FF 83 00 00 00                                     ;Power Factor L3
02 FF D2 00 00 00                                           ;Power Factor L1+L2+L3, angle
8E 80 40 84 00 00 00 00 00 00 00                            ;Reactive energy L1+L2+L3, consumed
8E 90 40 84 00 00 00 00 00 00 00                            ;Reactive energy L1+L2+L3, Tarif  1 consumed
8E A0 40 84 00 00 00 00 00 00 00                            ;Reactive energy L1+L2+L3, Tarif  2 consumed
8E C0 40 84 00 00 00 00 00 00 00                            ;Reactive energy L1+L2+L3, delivered
8E D0 40 84 00 00 00 00 00 00 00                            ;Reactive energy L1+L2+L3, Tarif 1 delivered
8E E0 40 84 00 00 00 00 00 00 00                            ;Reactive energy L1+L2+L3, Tarif 2 delivered
01 FF AD 00 03                                              ;Number of elements
01 FF 97 00 00                                              ;Total active quadrant
01 FF 97 FF 81 00 00                                        ;Active quadrant phase 1
01 FF 97 FF 82 00 00                                        ;Active quadrant phase 2
01 FF 97 FF 83 00 00                                        ;Active quadrant phase 3
1F                                                          ;Dif 1F means more telegrams exist
EF 16                                                       ;Checksum and stop byte

Sending Request User Data 2
10 5B FE 59 16

Reading telegram 4
68 DC DC 68 08 00 72 34 12 00 00 2E 28 20 02 04 20 00 00    ;Mbus header
81 40 FD 9A 00 00                                           ;Output 1 state
81 80 40 FD 9A 00 00                                        ;Output 2 state
81 C0 40 FD 9B 00 00                                        ;Input 3 state
81 80 80 40 FD 9B 00 00                                     ;Input 4 state
C1 C0 40 FD 9B 00 01                                        ;Input 3 stored state
C1 80 80 40 FD 9B 00 00                                     ;Input 4 stored state
8E 80 80 40 FD E1 00 00 00 00 00 00 00                      ;Input 4 pulse counter
0E 84 FF F2 00 00 00 00 00 00 00                            ;Resettable real enery consumend*1
8E 40 84 FF F2 00 00 00 00 00 00 00                         ;Resettable real enery delive *1
8E 80 40 84 FF F2 00 00 00 00 00 00 00                      ;Resettable reactive energy consumend *1
8E C0 40 84 FF F2 00 00 00 00 00 00 00                      ;Resettable reactive energy delivered *1
04 FF F1 00 00 00 00 00                                     ;Reset counter for real enery consumend *1
84 40 FF F1 00 00 00 00 00                                  ;Reset counter for real enery delivered *1
84 80 40 FF F1 00 00 00 00 00                               ;Reset counter for reactive energy consumend *1
84 C0 40 FF F1 00 00 00 00 00                               ;Reset counter for reactive energy delivered *1
0E FF F9 C4 00 00 00 00 00 00 00                            ;Real enery consumend in CO2
0E FF F9 C9 00 00 00 00 00 00 00                            ;Real enery consumend in currency
04 FF A4 00 E8 03 00 00                                     ;Conversion factor for Real enery consumend in CO2
04 FF A5 00 E8 03 00 00                                     ;Conversion factor for Real enery consumend in curreny
```

*1 **(not available with B21, B23 and B24**)

8E 80 80 40 84 00 00 00 00 00 00 00	; Apparent energy L1+L2+L3 consumend
8E C0 80 40 84 00 00 00 00 00 00 00	; Apparent energy L1+L2+L3 delivered
1F	;Dif 1F means more telegrams exist
3A 16	;Checksum and stop byte

Sending Request User Data 2
10 7B FE 79 16

Reading telegram 5

68 F7 F7 68 08 00 72 34 12 00 00 2E 28 20 02 05 20 00 00	;Mbus header
0E 84 FF 81 00 00 00 00 00 00 00	;Real energy L1, consumed
0E 84 FF 82 00 00 00 00 00 00 00	;Real energy L2, consumed
0E 84 FF 83 00 00 00 00 00 00 00	;Real energy L3, consumed
8E 40 84 FF 81 00 00 00 00 00 00 00	;Real energy L1, delivered
8E 40 84 FF 82 00 00 00 00 00 00 00	;Real energy L2, delivered
8E 40 84 FF 83 00 00 00 00 00 00 00	;Real energy L3, delivered
8E 80 40 84 FF 81 00 00 00 00 00 00 00	;Reactive energy L1, consumed
8E 80 40 84 FF 82 00 00 00 00 00 00 00	;Reactive energy L2, consumed
8E 80 40 84 FF 83 00 00 00 00 00 00 00	;Reactive energy L3, consumed
8E C0 40 84 FF 81 00 00 00 00 00 00 00	;Reactive energy L1, delivered
8E C0 40 84 FF 82 00 00 00 00 00 00 00	;Reactive energy L2, delivered
8E C0 40 84 FF 83 00 00 00 00 00 00 00	;Reactive energy L3, delivered
8E 80 80 40 84 FF 81 00 00 00 00 00 00 00	;Apparent energy L1, consumed
8E 80 80 40 84 FF 82 00 00 00 00 00 00 00	;Apparent energy L2, consumed
8E 80 80 40 84 FF 83 00 00 00 00 00 00 00	;Apparent energy L3, consumed
8E C0 80 40 84 FF 81 00 00 00 00 00 00 00	;Apparent energy L1, delivered
8E C0 80 40 84 FF 82 00 00 00 00 00 00 00	;Apparent energy L2, delivered
8E C0 80 40 84 FF 83 00 00 00 00 00 00 00	;Apparent energy L3, delivered
1F	;Dif 1F means more telegrams exist
92 16	;Checksum and stop byte

Sending Request User Data 2
10 5B FE 59 16

Reading telegram 6

68 CE CE 68 08 00 72 34 12 00 00 2E 28 20 02 06 20 00 00	;Mbus header
87 80 C0 40 84 00 00 00 00 00 00 00 00 00	;Active net energy L1+L2+L3
87 80 C0 40 84 FF 81 00 00 00 00 00 00 00 00 00	;Active net energy L1
87 80 C0 40 84 FF 82 00 00 00 00 00 00 00 00 00	;Active net energy L2
87 80 C0 40 84 FF 83 00 00 00 00 00 00 00 00 00	;Active net energy L3
87 C0 C0 40 84 00 00 00 00 00 00 00 00 00	;Reactive net energy L1+L2+L3
87 C0 C0 40 84 FF 81 00 00 00 00 00 00 00 00 00	;Reactive net energy L1
87 C0 C0 40 84 FF 82 00 00 00 00 00 00 00 00 00	;Reactive net energy L2
87 C0 C0 40 84 FF 83 00 00 00 00 00 00 00 00 00	;Reactive net energy L3
87 80 80 80 40 84 00 00 00 00 00 00 00 00 00	;Apparent net energy L1+L2+L3
87 80 80 80 40 84 FF 81 00 00 00 00 00 00 00 00 00	;Apparent net energy L1
87 80 80 80 40 84 FF 82 00 00 00 00 00 00 00 00 00	;Apparent net energy L2
87 80 80 80 40 84 FF 83 00 00 00 00 00 00 00 00 00	;Apparent net energy L3
0F	;Dif 0F means last telegram
7A 16	;Checksum and stop byte

Sending Request User Data 2
10 7B FE 79 16

Reading telegram 5
68 F7 F7 68 08 00 72 34 12 00 00 42 04 20 02 05 20 00 00

0E 84 FF 81 00 00 00 00 00 00 00	Real energy L1, consumed
0E 84 FF 82 00 00 00 00 00 00 00	Real energy L2, consumed
0E 84 FF 83 00 00 00 00 00 00 00	Real energy L3, consumed
8E 40 84 FF 81 00 00 00 00 00 00 00	Real energy L1, delivered
8E 40 84 FF 82 00 00 00 00 00 00 00	Real energy L2, delivered
8E 40 84 FF 83 00 00 00 00 00 00 00	Real energy L3, delivered
8E 80 40 84 FF 81 00 00 00 00 00 00 00	Reactive energy L1, consumed
8E 80 40 84 FF 82 00 00 00 00 00 00 00	Reactive energy L2, consumed
8E 80 40 84 FF 83 00 00 00 00 00 00 00	Reactive energy L3, consumed
8E C0 40 84 FF 81 00 00 00 00 00 00 00	Reactive energy L1, delivered
8E C0 40 84 FF 82 00 00 00 00 00 00 00	Reactive energy L2, delivered
8E C0 40 84 FF 83 00 00 00 00 00 00 00	Reactive energy L3, delivered
8E 80 80 40 84 FF 81 00 00 00 00 00 00 00	Apparent energy L1, consumed
8E 80 80 40 84 FF 82 00 00 00 00 00 00 00	Apparent energy L2, consumed
8E 80 80 40 84 FF 83 00 00 00 00 00 00 00	Apparent energy L3, consumed
8E C0 80 40 84 FF 81 00 00 00 00 00 00 00	Apparent energy L1, delivered
8E C0 80 40 84 FF 82 00 00 00 00 00 00 00	Apparent energy L2, delivered
8E C0 80 40 84 FF 83 00 00 00 00 00 00 00	Apparent energy L3, delivered

1F
82 16

Sending Request User Data 2
10 5B FE 59 16

Reading telegram 6
68 CE CE 68 08 00 72 34 12 00 00 42 04 20 02 06 20 00 00

87 80 C0 40 84 00 00 00 00 00 00 00 00 00 00	Active net energy L1+L2+L3
87 80 C0 40 84 FF 81 00 00 00 00 00 00 00 00 00 00	Active net energy L1
87 80 C0 40 84 FF 82 00 00 00 00 00 00 00 00 00 00	Active net energy L2
87 80 C0 40 84 FF 83 00 00 00 00 00 00 00 00 00 00	Active net energy L3
87 C0 C0 40 84 00 00 00 00 00 00 00 00 00 00	Reactive net energy L1+L2+L3
87 C0 C0 40 84 FF 81 00 00 00 00 00 00 00 00 00 00	Reactive net energy L1
87 C0 C0 40 84 FF 82 00 00 00 00 00 00 00 00 00 00	Reactive net energy L2
87 C0 C0 40 84 FF 83 00 00 00 00 00 00 00 00 00 00	Reactive net energy L3
87 80 80 80 40 84 00 00 00 00 00 00 00 00 00 00	Apparent net energy L1+L2+L3
87 80 80 80 40 84 FF 81 00 00 00 00 00 00 00 00 00 00	Apparent net energy L1
87 80 80 80 40 84 FF 82 00 00 00 00 00 00 00 00 00 00	Apparent net energy L2
87 80 80 80 40 84 FF 83 00 00 00 00 00 00 00 00 00 00	Apparent net energy L3

0F
6A 16

B23/B24

Read/write commands

The following tasks can be executed with the aid of the SND_UD telegram:

B21

Command
Set tariff
Set primary address
Change baudrate
Reset power fail counter
Reset power outage time
Select Status information
Reset stored state input
Reset input counters
Set output
Set date time
Set date
Send Password
Freeze Max demand
Set communication access level
Read Request Load profile
Read request previous values
Read request demand (maximum and minimum
Read request Log (System, Event, quality, audit and Transformer Logs)
Read/Write Alarm settings
Read/Write Tariff settings

B23/B24

Command
Set tariff
Set primary address
Change baudrate
Reset power fail counter
Reset power outage time
Set CT Ratio numerator
Set CT Ratio denominator
Select Status information
Reset stored state input
Reset input counters
Set output
Send Password
Set communication access level
Read request Log (System, Event, quality, audit and Transformer Logs)
Read/Write Alarm settings
Read/Write Tariff settings

5.1.1 Telegram format

The M-bus uses three different telegram formats. The formats are identified by the starting character.

Single Character	Short Frame	Long Frame
E5H	Start (10h)	Start (68h)
	C-Field	L-Field
	A-Field	L-Field
	Check Sum	Start (68h)
	Stop (16h)	C-Field
		A-Field
		CI-Field
		User Data (0…252 Bytes)
		Check Sum
		Stop (16h)

The **single character** format consists of a single character and is used for confirming the received telegrams.

The **short telegram** format is identified by its starting character (10h) and consists of five characters. In addition to the C and A field, it contains the checksum and the stop character 16h.

The **long telegram** format is identified by its starting character (68h) and consists of a variable number of characters. After the starting character, the L field is transferred twice, and then the starting character again followed by the C, A and CI field. The user data (0…252 Bytes) is transferred after the CI field, followed by the checksum and the stop character (16h).

5.1.1.1 Field description

All fields in the telegram have the length of one Byte (8 Bits).

The L field

The L field (length field) states the size of the user data (in Bytes) plus 3 (for the C, A and CI field). This is transferred twice in the telegrams if the long telegram format is used.

The C field

The C field (control field) contains information about the direction of the data flow and the error handling. In addition to the identification of the functions and the actions caused by it, the control field also specifies the flow direction of the data and is responsible for numerous parts of the incoming and outgoing communication of the meter.

The following table contains coding of the C field:

Bit no.	7	6	5	4	3	2	1	0
To the meter	0	PRM	FCB	FCV	F3	F2	F1	F0
From the meter	0	PRM	0	0	F3	F2	F1	F0

The Primary Message Bit (**PRM**) specifies the flow direction of the data. This value is set to 1 for telegrams from the master to the meter, and to 0 for the opposite direction.

The Frame Count Valid Bit (**FCV**) is set to 1 by the master, to show that the Frame Count Bit (**FCB**) is used. If FCV is set to 0 then the meter ignores the FCB.

The FCB is used for the display of correct transfer processes. The master switches the Bit after successful receipt of a response from the meter. If the anticipated response fails to appear or is not received correctly then the master sends the same telegram again with the same FCB. The meter responds to a REQ_UD2 request with a switched FCB and set FCV with a RSP_UD, which contains the next telegram of a multi-telegram message. If the FCB is not switched then the meter repeats the last telegram instead. The actual values are repeated in a repeated telegram.

Upon receipt of an SND_NKE, the meter resets the FCB. The meter uses the same FCB for primary and secondary addressing, and for point-to-point communication.

The Bits 0 to 3 (F0, F1, F2 and F3) of the control field form the function code of the message. The following table contains the function codes:

Command	C field (binary)	C field (hex)	Telegram	Description
SND_NKE	0100 0000	40	Short frame	Meter initialisation
SND_UD	01F1 0011	53/73	Long frame	Send user data to meter
REQ_UD2	01F1 1011	5b	Short frame	Request for class 2-data
RSP_UD	0000 1000	08	Long frame	Data transfer from meter to master after request.

A field

The A field (address field) is used for addressing the recipient in the invoke direction, and for identifying the sender of the data in the receipt direction. This field is one Byte in size and can therefore contain values from 0 to 255.

The following table shows the address assignment:

Address	Description
0	Standard ex works
1…250	Can be assigned as individual primary addresses to meters, either by bus (secondary addressing) or directly via the buttons on the meter.
251…252	Reserved for future use.
253	Used by the secondary addressing procedure (FDh).
254	Used for point-to-point communication (FEh). The meter responds with its primary address.
255	Used for broadcast transfers to all meters (FFh). No meter responds to broadcast messages.

CI field

The CI field (control information) contains coding of the type and sequence of the application data to be transferred in the frame. The second Bit of the CI field (starting from Bit 0, value 4) is also referred to as the M-Bit or Mode Bit and supplies information about the Byte sequence used in data structures with multiple Bytes. For communication with the meter, the Mode Bit is not set (Mode 1). This means that the lowest value Bit of a multi-Byte transfer is transferred first.

The following table shows the codes used by the master:

CI field codes	Application
51h	Send data
52h	Slave selection
B8h	Set Baud rate to 300
B9h	Set Baud rate to 600
Bah	Set Baud rate to 1200
BBh	Set Baud rate to 2400
BCh	Set Baud rate to 4800
BDh	Set Baud rate to 9600
BEh	Set Baud rate to 19200
BFh	Set Baud rate to 38400

The meter uses code 72 in the CI field to respond to requests for user data.

User data

The user data contains the data that is sent to the recipient.

The following table shows the structure of the data sent from the meter to the master:

Fixed data header	Data entries	MDH
12 Bytes	Variable number of Bytes	1 Byte

The following table shows the structure of the data sent from the master to the meters:

Data entries
Variable number of Bytes

Fixed data header

The following table shows the structure of a fixed data header:

ID no.	Manufacturer	Version	Medium	Access no.	Status	Signature
4 Byte	2 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Byte

The following table describes the contents of the fixed data header:

- **Identification no.** is the 8-digit serial number of the meter (BCD-coded).
- **Manufacturer** has the value 2E 28 and stands for Janitza (JAN).
- **Version** is the version of the protocol implementation. The meters currently use the protocol version 0x20.
- **Medium** has the value 02h and stands for electricity.
- **Access number** is a meter for successful accesses.
- **Status Byte** gives the status of the meter.

Bit	Meaning
0	Meter busy
1	Internal error
2	Low energy level
3	Permanent error
4	Temporary error
5	Installation error
6	Not used
7	Not used

- **Signature** has the value 00 00h

Data entries

The actual data is transferred in data entries together with information on the coding, length and type of data. The maximum length of a data entry is 240 Bytes.

The following table shows the structure of the data entry (transferred from left to right):

Data entry header				Data
Data Information Block (DIB)		Value Information Block (VIB)		
DIF	DIFE	VIF	VIFE	
1 Byte	0…10 Byte	1 Byte	0…10 Byte	0…n Byte

Each data entry consists of the header (DRH) and the actual data. The DRH in turn comprises the Data Information Block (DIB) for describing the length, type and coding of the data and the Value Information Block (VIB), which contains the value of the unit and the multiplier.

Data Information Block (DIB)

The DIB contains at least one Byte (Data Information Field DIF) and is sometimes expanded by up to 10 DIFEs (Data Information Field Extension).

The following table shows the structure of the Data Information Field (DIF):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Extension Bit	LSB* of storage no.	Function field		Data field			

* Lowest value Bit

The following list describes the contents of the DIF:

- The **extension Bit** is set if the next Byte is a DIFE.
- The **LSB of the storage no.** is normally set to 0, in order to quote the actual value. (1=stored value).
- The **function field** is set to 00 for immediate values, to 01 for maximum values and to 10 for minimum values.
- The **data field** provides the format of the data. The following table contains the coding of the data field:

Code	Meaning	Length
0000	No data	0
0001	8-Bit whole number	1
0010	16-Bit whole number	2
0100	32-Bit whole number	4
0111	64-Bit whole number	8
1010	4-digit BCD	2
1111	6-digit BCD	3
1100	8-digit BCD	4
1101	Variable length (ASCII)	Variable
1110	12-digit BCD	6

The following table shows the structure of the Data Information Field Extension (DIFE):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Extension Bit	Unit	Tariff		Storage no.			

The following list describes the contents of the DIFE:

- **Unit** shows the respective type of current or energy for current and energy values. This field also contains the number of inputs and outputs and an offset when accessing data of the event log.
- **Tariff** is used with energy values to specify tariff data.
- **Storage number** is set to 0, to specify momentary values. A storage number greater than 0 indicates previously stored values, which were saved at a certain point in the past.

Value Information Block (VIB)

VIB follows a DIF or DIFE without extension Bit. The VIB contains an information field (VIF) and is sometimes extended by up to 10 Value Information Field Extensions (VIFE).

The following table shows the structure of the Value Information Field (VIF):

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Extension Bit	Data values						

The data values contain information on the value (unit, status, etc.). The extension Bit is set if the next Byte is a VIFE. If VIF or VIFE = FFh, then the next VIFE is manufacturer-specific. The manufacturer-specific VIFE has the same structure as a VIF. If the extension Bit of the manufacturer-specific VIFE is set and the VIFE is lower than 1111 1000, the next Byte is a standard VIFE, otherwise it is the first data Byte. If the extension Bit of the manufacturer-specific VIFE is set and the VIFE is greater than or equal to 1111 1000, the next Byte is an extension of the manufacturer-specific VIFE.

Data

The data follows a VIF or VIFE without set extension Bit.

Manufacturer Data Header (MDH)

The Manufacturer Data Header (MDH) either consists of the combination 1Fh to specify that the further data follows in the next Bit, or 0Fh to signal the last telegram.

Checksum

The checksum is used to recognise transfer and synchronisation errors. It is calculated from the arithmetic sum total of the Bytes from the control field to the last user data, without taking carry-overs into consideration.

5.1.2 Field codes for value information

5.1.2.1 Standard VIF codes

VIF code	Description	Coding range	Range
E000 0nnn	Energy	$10^{(nnn-3)}$ Wh	0.001 Wh to 10,000 Wh
E010 1nnn	Current	$10^{(nnn-3)}$ W	0.001 W to 10,000 W
E111 1010	Bus address		0…250
E111 1000	Manufacturer number		00000000 to 99999999
1111 1011	Extension of VIF codes		Not used in the meter
1111 1101	Extension of VIF codes		The actual VIF is specified in the first VIFE and coded per table-FD
1111 1111	Manufacturer-specific		Next VIFE is manufacturer-specific

5.1.2.2 Standard codes for VIFE with connection indicator FDh

If the VIF contains the connection indicator FDh, the actual VIF is coded in the first VIFE.

VIF code	Description
E000 1010	Manufacturer
E000 1100	Version
E000 1110	Firmware version
E001 1010	Digital output (binary)
E001 1011	Digital input (binary)
E001 1100	Baud rate
E100 nnnn	$10^{(nnnn-9)}$ Volt
E101 nnnn	$10^{(nnnn-12)}$ A
E110 0001	Total meter
E001 0110	Password

5.1.2.3 Standard codes for VIFE

The following values for VIFEs are defined for extensions of VIFs with the exception of FDh and FBh:

VIF code	Description
E010 0111	Per measurement (interval)[1,2]
E011 1001	Start date(/time) from
E110 1f1b	Date(/time) from, b = 0: End from, b = 1: Start from, f is not used in meters, always 0[1,2]
1111 1111	Next VIFE is manufacturer-specific

1. Date (/time) from "or duration from" pertains to information that contains the entire data entry.
2. The information, as to whether data type F (date and time) or data type G (date) was used, can be read off from the data field (0010b: type G/0100: type F).

5.1.2.4 First manufacturer-specific VIFE codes

B21

VIF code	Description
E000 0000	Total
E000 0001	L1
E000 0100	N
E001 0000	Pulse frequency
E001 0011	Tariff
E001 0100	Installation check
E001 0101	Status of values
E001 0111	Active quadrant
E001 1000	Power failure meter
E010 0000	Current transformer conversion ratio meter (CT ratio)
E010 0010	Current transformer conversion ratio denominator (CT ratio)
E010 0101	Currency conversion factor (curr. * 10^{-3} /kWh)
E010 0110	Error flags
E010 0111	Warning flags
E010 1000	Information flags
E010 1001	Alarm flags
E100 0nnn	Phase angle voltage (degrees *$10^{(nnn-3)}$)
E100 1nnn	Phase angle current (degrees *$10^{(nnn-3)}$)
E101 0nnn	Phase angle energy (degrees *$10^{(nnn-3)}$)
E101 1nnn	Frequency (Hz *$10^{(nnn-3)}$)
E110 0nnn	Power factor (*$10^{(nnn-3)}$)
E110 1010	Change level of write access
E110 1100	Power failure time duration
E110 1111	Event type
E111 0000	Measurement period
E111 0001	Reset energy meter *1
E111 0010	Resettable register
E111 0110	Sequence number (audit log)
E111 1000	Extension of manufacturer-specific VIFEs, next VIFE(s) are used for numbering
E111 1001	Extension of manufacturer-specific VIFEs, next VIFE(s) give actual meaning
E111 1110	Extension of manufacturer-specific VIFEs, next VIFE(s) are used for manufacturer-specific error/status messages

*1 **(not available with B21, B23 and B24**)

B23/B24

VIF code	Description
E000 0000	Total
E000 0001	L1
E000 0010	L2
E000 0011	L3
E000 0100	N
E000 0101	L1-L2
E000 0110	L3-L2
E000 0111	L1-L3
E001 0000	Pulse frequency
E001 0011	Tariff
E001 0100	Installation check
E001 0101	Status of values
E001 0111	Active quadrant
E001 1000	Power failure meter
E010 0000	Current transformer conversion ratio meter (CT ratio)
E010 0010	Current transformer conversion ratio denominator (CT ratio)
E010 0100	CO2 conversion factor (kg * 10^{-3} /kWh)
E010 0101	Currency conversion factor (curr. * 10^{-3} /kWh)
E010 0110	Error flags
E010 0111	Warning flags
E010 1000	Information flags
E010 1001	Alarm flags
E100 0nnn	Phase angle voltage (degrees *$10^{(nnn-3)}$)
E100 1nnn	Phase angle current (degrees *$10^{(nnn-3)}$)
E101 0nnn	Phase angle energy (degrees *$10^{(nnn-3)}$)
E101 1nnn	Frequency (Hz *$10^{(nnn-3)}$)
E110 0nnn	Power factor (*$10^{(nnn-3)}$)
E110 1010	Change level of write access
E110 1111	Event type
E111 0001	Reset energy meter
E111 0010	Resettable register
E111 0110	Sequence number (audit log)
E111 1000	Extension of manufacturer-specific VIFEs, next VIFE(s) are used for numbering
E111 1001	Extension of manufacturer-specific VIFEs, next VIFE(s) give actual meaning
E111 1110	Extension of manufacturer-specific VIFEs, next VIFE(s) are used for manufacturer-specific error/status messages

5.1.2.5 VIFE codes for error messages (meter to master)

VIF code	Description	Error group
E000 0000	None	
E001 0101	No data available (undefined value)	
E001 1000	Data error	Data error

5.1.2.6 VIFE codes for object actions (master to meter)

B21

VIF code	Action	Description
E000 0111	Delete	Set data to zero
E000 1011	Freeze data	Freeze data in storage number

B23/B24

VIF code	Action	Description
E000 0111	Delete	Set data to zero

5.1.2.7 2nd manufacturer-specific VIFE after VIFE 1111 1000 (F8 hex):

VIF code	Description
Ennn nnnn	Used for numbering (0…127)

5.1.2.8 2nd manufacturer-specific VIFE after VIFE 1111 1001 (F9 hex):

VIF code	Description
E000 0110	Quantity specification in event log
E000 0110	Tariff source
E001 1010	Request to read out the event log
E010 1110	System log
E010 1111	Audit log
E011 0000	Power quality log
E011 0010	Event log
E011 0011	Event type system log
E011 0100	Event type audit log
E011 0101	Event type power quality log
E011 0111	Event type event log
E011 0nnn	Energy in CO2 (kg $*10^{nnn-7}$)
E011 1nnn	Energy in currency (currency $* 10^{nnn-3}$)

5.1.3 Communication process

The data linking level uses two types of transfer service:

Send/Confirm	SND/CON
Request/Respond	REQ/RSP

If a meter receives a correct telegram then it waits between 35 and 80 ms before it responds. A telegram is deemed to be correct if it passes the following tests:

- Start/parity/stop Bits per character
- Start/checksum/stop characters per telegram format
- In case of a long frame, the number of additional characters received must reflect the L field (= L-field + 6).
- The received data must make sense

The interval between a response from the meter and a new message from the master must be at least 20 ms.

Send / confirmation procedure

SND_NKE is used to initiate communication with the meter. If the meter receives an NKE followed by a REQ_UD2 (see description below) then the first telegram is sent by the meter.

If the meter has been selected for secondary addressing then the selection is rescinded. The value of the FCB is reset in the meter, i.e. the meter expects that the first telegram from a master with FCV=1 contains an FCB=1.

The meter can either confirm the correct receipt with the simple character E5h) or omit confirmation if the telegram was not received correctly.

SND_UD is used to send data to the meter. The meter can either confirm receipt of a correct message or omit confirmation if the telegram was not received correctly.

Request / response procedure

REQ_UD2 is used by the master to request data from the meter.

REQ_UD2 is used by the meter to transfer data to the master. The meter can send 1Fh as the last user data, in order to specify to the master that further data will follow in the next telegram.

If the meter does not respond to the REQ_UD2 then this means that the message was not received correctly or that the address did not match.

5.1.3.1 Selection and secondary addressing

Communication with the meter can take place via secondary addressing.

Secondary addressing takes place with the aid of a selection:

68h	0Bh	0Bh	68h	53h	FDh	52h	ID 1…4	Manufacturer 1…2	Generation1	Medium	CS	16h

1st generation has the same meaning as version.

The master sends an SND_UD with the control information 52h to the address 253 (FDh) and fills in the meter-specific secondary address fields (identification number, manufacturer, version and medium) with the values of the meter to be addressed. The address information (FDh) and control information (52h) instruct the meter to compare the following secondary addressing with its own address and change to the status “selected” in case of a match. In this case, the meter responds to the selection with a (E5h), otherwise no response is issued. The status “selected” means that the meter can be addressed via the bus address 253 (FDh).

Placeholders

During the selection, individual positions of the secondary addresses can be occupied by placeholder characters. These placeholder characters mean that the respective position is not considered during selection. Each individual digit of the identification number can be replaced with the placeholder half-Byte Fh. In contrast, the fields for the manufacturer, version and medium can be replaced with the placeholder Byte FFh. The meter remains in the status “selected” until it receives a selection command with non-matching secondary address, a selection command with CI=56h or an SND_NKE to address 253.

5.2 Standard readout of meter data

This section contains a description of how the standard telegrams can be read out. The data read-out starts when the master sends a REQ_UD2 telegram to the meters. The meter responds with a RSP_UD telegram. A typical response consists of multiple telegrams. The last DIF in the user data part either contains the value 1F to specify that the further data follows in the next telegram, or 0F if no further telegrams follow.

The meters recognise a total of 7 standard telegrams. In meters with an internal clock, further telegrams with previous data values may follow. The newest values are sent first and bear the storage number 1, followed by the next newest values with the storage number 2, etc., until all stored previous values have been read. If a meter with internal clock contains no previous values then it sends a telegram in which all data is marked with the status Byte “no data available”.

Previous values can also be read with the help of a special read request from a certain time point in the direction of the past.

Note
The meters send energy values as standard as 32-Bit whole numbers in W (or Var/VA) with 2 decimal places. The maximum energy that can be depicted is therefore approx. ± 21 MW.

After the following sections, you will find an example of the 7 standard telegrams and 2 telegrams with previous values, which contain the latest extract of the previous values. However, these are only examples. The data type and scaling of quantities vary between the different meters, likewise the assignment of the quantities to various telegrams.

5.2.1 Example for telegrams 1 to 4 with B21 (all values are hexadecimal)

Telegram 1

68	Start char		
BC	Length		
BC	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
01	Access number		
00	Status		
00 00	Signature		
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
98 02 00 00 00 00	Data	2.98 kWh	Comments: No DIFE -> Tariff 0, Unit 0 -> Total Active Energy Import
8E	DIF	Data is 12 digit BCD	
10	DIFE	Tariff 1	
84	VIF	Energy with 2 decimals	

00	VIFE	Status: No error	
45 01 00 00 00 00	Data	1.45 kWh	Comments: Tariff 1 and unit 0 in DIFE -> Tariff 1 Active Energy Import
8E	DIF	Data is 12 digit BCD	
20	DIFE	Tariff 2	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
53 01 00 00 00 00	Data		
8E	DIF	Data is 12 digit BCD	
40	DIFE	Export	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
98 01 00 00 00 00	Data	1.98 kWh	Comments: Tariff 0, Unit 1 in DIFE ->Total Active Energy Export
8E	DIF	Data is 12 digit BCD	
50	DIFE	Tariff 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
84 00 00 00 00 00	Data	0.84 kWh	
8E	DIF	Data is 12 digit BCD	
60	DIFE	Tariff 2	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
13 01 00 00 00 00	Data	1.13 kWh	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
93	VIFE	Active tariff	
00	VIFE	Status: No error	
01	Data	Active tariff is 1	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A0	VIFE	CT numerator (primary current marking of CT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		Comments: On direct connected VT's or CT's are not used and marked as "Not available"
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A1	VIFE	VT numerator (primary voltage marking of VT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A2	VIFE	CT denominator (secondary current marking of CT)	

15	VIFE	Status: No data available	
00 00 00 00	Data		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A3	VIFE	VT denominator (secondary voltage marking of VT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A6	VIFE	Error flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A7	VIFE	Warning flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A8	VIFE	Information flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A9	VIFE	Alarm flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
0D	DIF	Variable length of ASCII data	
FD	VIF	Extension of VIF-codes	
8E	VIFE	Firmware version	
00	VIFE	Status: No error	
07 30 2E 38 2E 30 31 42	Data	7 ASCII bytes containing "B10.8.0"	
0D	DIF	Variable length of data	
FF	VIF	Next byte is manufacturer specific	
AA	VIFE	Type designation	
00	VIFE	Status: No error	
0B 4A 30 31 2D 33 31 33 20 31 32 42	Data	11 ASCII bytes containing "B21 313-10J"	
1F	DIF	More data in next telegram	

F4	Checksum
16	End

Telegram 2

68	Start char		
A4	Length		
A4	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
02	Access number		
00	Status		
00 00	Signature		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
98	VIFE	Power fail counter	
00	VIFE	Status: No error	
7A 00 00 00	Data	122	
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
8D 2A 04 00	Data	2730.37 kW	Comments: No VIFE for phase number, No DIFE gives Unit 0 -> Total Active Power
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
AC 69 02 00	Data	1581.24 kvar	Comments: No VIFE for phase number, Unit 2 -> Total Reactive Power
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
52 CA 04 00	Data	3139.38 kVA	Comments: No VIFE for phase number, Unit 4 -> Total Apparent Power
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	

FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
FD 08 00 00	Data	230.6 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
33 35 00 00	Data	13.619 A	
0A	DIF	Data is 4 digit BCD	
FF	VIF	Next byte is manufacturer specific	
D9	VIFE	Frequency with 2 decimals	
00	VIFE	Status: No error	
89 49	Data	49.89 Hz	
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
00	VIFE	Status: No error	
66 03	Data	0.87	Comments: No VIFE for phase number -> Total Power Factor
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
D2	VIFE	Power factor angle with 1 decimal	
00	VIFE	Status: No error	
28 01	Data	29.6 °	Comments: No VIFE for phase number -> Total Power Factor Angle
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
00	VIFE	Status: No error	
01	Data	1	Comments: No VIFE for phase number -> Total Active Quadrant
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
37 01 00 00 00 00	Data	1.37 kvarh	Comments: Tariff 0, Unit 2 -> Total Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
90	DIFE	Tariff 1, Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	

16 00 00 00 00 00	Data	0.16 kvarh	Comments: Tariff 1 and unit 2 in DIFE -> Tariff 1 Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
A0	DIFE	Tariff 2, Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
21 01 00 00 00 00	Data	1.21 kvarh	Comments: Tariff 2 and unit 2 in DIFE -> Tariff 2 Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
05 02 00 00 00 00	Data	2.05 kvarh	Comments: Tariff 0, Unit 2 -> Total Reactive Energy Export
8E	DIF	Data is 12 digit BCD	
D0	DIFE	Tariff 1, Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
60 00 00 00 00 00	Data	0.60 kvarh	Comments: Tariff 1 and unit 2 in DIFE -> Tariff 1 Reactive Energy Export
8E	DIF	Data is 12 digit BCD	
E0	DIFE	Tariff 2, Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
44 01 00 00 00 00	Data	1.44 kvarh	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
AD	VIFE	Number of elements	
00	VIFE	Status: No error	
03	Data	3	
1F	DIF	More data in next telegram	
E1	Checksum		
16	End		

Telegram 3

68	Start char		
48	Length		
48	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
02	Access number		
00	Status		
00 00	Signature		
81	DIF	Data is 8 bit integer	
40	DIFE	Unit bit 0 = 1	
FD	VIF	Extension of VIF-codes	
9A	VIFE	Digital output	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 1 -> Output number 1
81	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9A	VIFE	Digital output	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 2 -> Output number 2
81	DIF	Data is 8 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 3 -> Input number 3
81	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	

00	Data	0	Comments: Unit 4 -> Input number 4
C1	DIF	Data is 8 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 3, storage bit 0 = 1 in DIF -> Input number 3 stored state
C1	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 4, storage bit 0 = 1 in DIF -> Input number 4 stored state
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
E1	VIFE	Cumulation counter	
00	VIFE	Status: No error	
02 00 00 00 00 00	Data	2	Comments: Unit 4 -> Input number 4 pulse counter
1F	DIF	More data in next telegram	
9E	Checksum		
16	End		

Telegramm 4

68	Start char		
CF	Length		
CF	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		

02	Medium	Electricity	
02	Access number		
00	Status		
00 00	Signature		
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
12 00 00 00 00 00	Data	0.12 kWh	Comments: No DIFE -> Unit 0 -> Resettable Active Energy Import
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
52 00 00 00 00 00	Data	0.52 kWh	Comments: Unit 1 -> Resettable Active Energy Export
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
14 00 00 00 00 00	Data	0.14 kvarh	Comments: Unit 2 -> Resettable Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
31 00 00 00 00 00	Data	0.31 kvarh	Comments: Unit 3 -> Resettable Reactive Energy Export
04	DIF	Data is 32 bit integer	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
03 00 00 00	Data	3	Comments: No DIFE gives Unit 0 -> Active Energy Import Reset Counter
84	DIF	Data is 32 bit integer	
40	DIFE	Unit bit 0 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	

00	VIFE	Status: No error	
01 00 00 00	Data	1	Comments: Unit 1 -> Active Energy Export Reset Counter
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
02 00 00 00	Data	2	Comments: Unit 2 -> Reactive Energy Import Reset Counter
84	DIF	Data is 32 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
01 00 00 00	Data		Comments: Unit 3 -> Reactive Energy Export Reset Counter
0E	DIF	Data is 12 digit BCD	
FF	VIF	Next byte is manufacturer specific	
F9	VIFE	VIF extension of manufacturer specific VIFE	
C4	VIFE	Active Energy in CO2	
00	VIFE	Status: No error	
92 29 00 00 00 00	Data	2.992 kg	
0E	DIF	Data is 12 digit BCD	
FF	VIF	Next byte is manufacturer specific	
F9	VIFE	VIF extension of manufacturer specific VIFE	
C9	VIFE	Active Energy in Currency	
00	VIFE	Status: No error	
00 03 00 00 00 00	Data	3.00	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A4	VIFE	Conversion factor for active energy import in CO2	
00	VIFE	Status: No error	
E8 03 00 00	Data	1000	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A5	VIFE	Conversion factor for active energy import in Currency	
00	VIFE	Status: No error	
E8 03 00 00	Data	1000	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	

40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
67 03 00 00 00 00	Data	3.67 kVAh	Comments: No DIFE -> Tariff 0, Unit 4 -> Total Apparent Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
69 02 00 00 00 00	Data	2.69 kVAh	Comments: No DIFE -> Tariff 0, Unit 5-> Total Apparent Energy Export
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
64 00 00 00 00 00 00 00	Data	1.00 kWh	Comments: Tariff 0, Unit 6 -> Total Active Energy Net
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 1	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
BD FF FF FF FF FF FF FF	Data	-0.67 kvarh	Comments: Tariff 0, Unit 7 -> Total Reactive Energy Net
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
61 00 00 00 00 00 00 00	Data	0.97 kVAh	Comments: Tariff 0, Unit 8 -> Total Apparent Energy Net
0F	DIF	Last telegram	
A6	Checksum		
16	End		

5.2.2 Example for telegrams 1 to 6 with B23 (all values are hexadecimal)

Telegram 1

68	Start char		
BC	Length		
BC	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
1F	Access number		
00	Status		
00 00	Signature		
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
24 01 00 00 00 00	Data	1.24 kWh	Comments: No DIFE -> Tariff 0, Unit 0 -> Total Active Energy Import
8E	DIF	Data is 12 digit BCD	
10	DIFE	Tariff 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
09 01 00 00 00 00	Data	1.09 kWh	Comments: Tariff 1 and unit 0 in DIFE -> Tariff 1 Active Energy Import
8E	DIF	Data is 12 digit BCD	
20	DIFE	Tariff 2	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
14 00 00 00 00 00	Data	0.14 kWh	
8E	DIF	Data is 12 digit BCD	
40	DIFE	Export	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
71 00 00 00 00 00	Data	0.71 kWh	Comments: Tariff 0, Unit 1 in DIFE ->Total Active Energy Export
8E	DIF	Data is 12 digit BCD	
50	DIFE	Tariff 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
51 00 00 00 00 00	Data	0.51 kWh	

8E	DIF	Data is 12 digit BCD	
60	DIFE	Tariff 2	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
20 00 00 00 00 00	Data	0.21 kWh	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
93	VIFE	Active tariff	
00	VIFE	Status: No error	
02	Data	Active tariff is 2	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A0	VIFE	CT numerator (primary current marking of CT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		Comments: B23 does not support VT's or CT's and CT and VT settings are therefore marked as "Not available"
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A1	VIFE	VT numerator (primary voltage marking of VT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A2	VIFE	CT denominator (secondary current marking of CT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A3	VIFE	VT denominator (secondary voltage marking of VT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A6	VIFE	Error flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A7	VIFE	Warning flags	

00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A8	VIFE	Information flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A9	VIFE	Alarm flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
0D	DIF	Variable length of ASCII data	
FD	VIF	Extension of VIF-codes	
8E	VIFE	Firmware version	
00	VIFE	Status: No error	
07 30 2E 34 32 2E 31 42	Data	7 ASCII bytes containing "B1.24.0"	
0D	DIF	Variable length of data	
FF	VIF	Next byte is manufacturer specific	
AA	VIFE	Type designation	
00	VIFE	Status: No error	
0B 4A 30 31 2D 33 31 33 20 33 32 42	Data	11 ASCII bytes containing "B23 313-10J"	
1F	DIF	More data in next telegram	
D3	Checksum		
16	End		

Telegram 2

68	Start char		
F2	Length		
F2	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
20	Access number		
00	Status		
00 00	Signature		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
98	VIFE	Power fail counter	
00	VIFE	Status: No error	
0D 00 00 00	Data	13	
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
9D 2E 10 00	Data	10605.09 W	Comments: No VIFE for phase number, No DIFE gives Unit 0 -> Total Active Power
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
61 68 05 00	Data	3544.01 W	Comments: VIFE for phase number, No DIFE gives Unit 0 -> Active Power L1
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
98 65 05 00	Data	3536.88 W	
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	

83	VIFE	L3	
00	VIFE	Status: No error	
A5 60 05 00	Data	3524.21 W	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
D6 4D F2 FF	Data	-8975.78 var	Comments: No VIFE for phase number, Unit 2 -> Total Reactive Power
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
C0 6C FB FF	Data	-2998.40 var	Comments: VIFE for phase number, Unit 2 -> Reactive Power L1
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
74 71 FB FF	Data	-2986.36 var	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
A3 6F FB FF	Data	-2991.01 var	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
C4 0C 15 00	Data	13795.24 VA	Comments: No VIFE for phase number, Unit 4 -> Total Apparent Power

84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
83 08 07 00	Data	4609,31 VA	Comments: VIFE for phase number, Unit 4 -> Apparent Power L1
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
68 03 07 00	Data	4596.24 VA	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
DA 00 07 00	Data	4589.70 VA	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
07 09 00 00	Data	231.1 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
00 09 00 00	Data	230.4 V	
04	DIF	Data is 32 bit integer	

FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
FC 08 00 00	Data	230.0 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
85	VIFE	L1 - L2	
00	VIFE	Status: No error	
9E 0F 00 00	Data	399.8 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
86	VIFE	L3 - L2	
00	VIFE	Status: No error	
A3 0F 00 00	Data	400.3 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
87	VIFE	L1 - L3	
00	VIFE	Status: No error	
A6 0F 00 00	Data	400.6 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
EB 4D 00 00	Data	19.947 A	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
EE 4D 00 00	Data	19.950 A	
04	DIF	Data is 32 bit integer	

FD	VIF	Extension of VIF-codes	
D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
F9 4D 00 00	Data	19.961 A	
0A	DIF	Data is 4 digit BCD	
FF	VIF	Next byte is manufacturer specific	
D9	VIFE	Frequency with 2 decimals	
00	VIFE	Status: No error	
98 49	Data	49.98 Hz	
1F	DIF	More data in next telegram	

EE Checksum
16 End

Telegram 3

68	Start char		
95	Length		
95	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
21	Access number		
00	Status		
00 00	Signature		
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
00	VIFE	Status: No error	
01 03	Data	0.769	Comments: No VIFE for phase number -> Total Power Factor
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	

00	VIFE	Status: No error	
02 03	Data	0.770	Comments: VIFE for phase number -> Power Factor L1
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
02 03	Data	0.770	
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
01 03	Data	0.769	
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
D2	VIFE	Power factor angle with 1 decimal	
00	VIFE	Status: No error	
73 FE	Data	-39.7 °	Comments: No VIFE for phase number -> Total Power Factor Angle
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
42 00 00 00 00 00	Data	0.42 kvarh	Comments: Tariff 0, Unit 2 -> Total Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
90	DIFE	Tariff 1, Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
37 00 00 00 00 00	Data	0.37 kvarh	Comments: Tariff 1 and unit 2 in DIFE -> Tariff 1 Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
20	DIFE	Tariff 2, Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
05 00 00 00 00 00	Data	0.05 kvarh	
8E	DIF	Data is 12 digit BCD	

C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
22 01 00 00 00 00	Data	1.22 kvarh	Comments: Tariff 0, Unit 2 -> Total Reactive Energy Export
8E	DIF	Data is 12 digit BCD	
D0	DIFE	Tariff 1, Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
98 00 00 00 00 00	Data	0.98 kvarh	Comments: Tariff 1 and unit 2 in DIFE -> Tariff 1 Reactive Energy Export
8E	DIF	Data is 12 digit BCD	
E0	DIFE	Tariff 2, Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
24 00 00 00 00 00	Data	0.24 kvarh	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
AD	VIFE	Number of elements	
00	VIFE	Status: No error	
03	Data	3	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
00	VIFE	Status: No error	
04	Data	4	Comments: No VIFE for phase number -> Total Active Quadrant
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
04	Data	4	Comments: VIFE for phase number -> Active Quadrant L1
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	

04	Data	4	Comments: VIFE for phase number -> Active Quadrant L2
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
04	Data	4	Comments: VIFE for phase number -> Active Quadrant L3
1F	DIF	More data in next telegram	
5D	Checksum		
16	End		

Telegram 4

68	Start char		
DC	Length		
DC	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
22	Access number		
00	Status		
00 00	Signature		
81	DIF	Data is 8 bit integer	
40	DIFE	Unit bit 0 = 1	
FD	VIF	Extension of VIF-codes	
9A	VIFE	Digital output	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 1 -> Output number 1
81	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9A	VIFE	Digital output	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 2 -> Output number 2
81	DIF	Data is 8 bit integer	

C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 3 -> Input number 3
81	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 4 -> Input number 4
C1	DIF	Data is 8 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 3, storage bit 0 = 1 in DIF -> Input number 3 stored state
C1	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 4, storage bit 0 = 1 in DIF -> Input number 4 stored state
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
E1	VIFE	Cumulation counter	
00	VIFE	Status: No error	
15 00 00 00 00 00	Data	21	Comments: Unit 4 -> Input number 4 pulse counter
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	

FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
52 00 00 00 00 00	Data	0.52 kWh	Comments: No DIFE -> Unit 0 -> Resettable Active Energy Import
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
20 00 00 00 00 00	Data	0.20 kWh	Comments: Unit 1 -> Resettable Active Energy Export
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
16 00 00 00 00 00	Data	0.16 kvarh	Comments: Unit 2 -> Resettable Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
38 00 00 00 00 00	Data	0.38 kvarh	Comments: Unit 3 -> Resettable Reactive Energy Export
04	DIF	Data is 32 bit integer	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
02 00 00 00	Data	2	Comments: No DIFE gives Unit 0 -> Active Energy Import Reset Counter
84	DIF	Data is 32 bit integer	
40	DIFE	Unit bit 0 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
01 00 00 00	Data	1	Comments: Unit 1 -> Active Energy Export Reset Counter
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	

40	DIFE	Unit bit 1 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
03 00 00 00	Data	3	Comments: Unit 2 -> Reactive Energy Import Reset Counter
84	DIF	Data is 32 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
04 00 00 00	Data	4	Comments: Unit 3 -> Reactive Energy Export Reset Counter
0E	DIF	Data is 12 digit BCD	
FF	VIF	Next byte is manufacturer specific	
F9	VIFE	VIF extension of manufacturer specific VIFE	
C4	VIFE	Active Energy in CO2	
00	VIFE	Status: No error	
51 12 00 00 00 00	Data	1.251 kg	
0E	DIF	Data is 12 digit BCD	
FF	VIF	Next byte is manufacturer specific	
F9	VIFE	VIF extension of manufacturer specific VIFE	
C9	VIFE	Active Energy in Currency	
00	VIFE	Status: No error	
26 01 00 00 00 00	Data	1.26	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A4	VIFE	Conversion factor for active energy import in CO2	
00	VIFE	Status: No error	
E8 03 00 00	Data	1000	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A5	VIFE	Conversion factor for active energy import in Currency	
00	VIFE	Status: No error	
E8 03 00 00	Data	1000	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	

63 01 00 00 00 00	Data	1.63 kVAh	Comments: No DIFE -> Tariff 0, Unit 4 -> Total Apparent Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
93 00 00 00 00 00	Data	0.93 kVAh	Comments: No DIFE -> Tariff 0, Unit 45-> Total Apparent Energy Export
1F	DIF	More data in next telegram	
99	Checksum		
16	End		

Telegram 5

68	Start char		
F7	Length		
F7	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
23	Access number		
00	Status		
00 00	Signature		
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
41 00 00 00 00 00	Data	0.41 kWh	Comments: No DIFE -> Tariff 0, Unit 0 -> Active Energy Import L1
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
41 00 00 00 00 00	Data	0.41 kWh	
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	

FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
41 00 00 00 00 00	Data	0.41 kWh	
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
23 00 00 00 00 00	Data	0.23 kWh	Comments: Unit 1 -> Active Energy Export L1
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
23 00 00 00 00 00	Data	0.23 kWh	
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
23 00 00 00 00 00	Data	0.23 kWh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
14 00 00 00 00 00	Data	0.14 kvarh	Comments: Unit 2 -> Reactive Energy Import L1
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
14 00 00 00 00 00	Data	0.14 kvarh	

8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
14 00 00 00 00 00	Data	0.14 kvarh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
41 00 00 00 00 00	Data	0.41 kvarh	Comments: Unit 3 -> Reactive Energy Export L1
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
41 00 00 00 00 00	Data	0.41 kvarh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
41 00 00 00 00 00	Data	0.41 kvarh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
54 00 00 00 00 00	Data	0.54 kVAh	Comments: Unit 4 -> Apparent Energy Import L1

8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
54 00 00 00 00 00	Data	0.54 kVAh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
54 00 00 00 00 00	Data	0.54 kVAh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
31 00 00 00 00 00	Data	0.31 kVAh	Comments: Unit 5 -> Apparent Energy Export L1
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
30 00 00 00 00 00	Data	0.30 kVAh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	

83	VIFE	L3	
00	VIFE	Status: No error	
30 00 00 00 00 00	Data	0.30 kVAh	
1F	DIF	More data in next telegram	
48	Checksum		
16	End		

Telegram 6

68	Start char		
CE	Length		
CE	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
24	Access number		
00	Status		
00 00	Signature		
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
36 00 00 00 00 00 00 00	Data	0.54 kWh	Comments: Tariff 0, Unit 6 -> Total Active Energy Net
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
12 00 00 00 00 00 00 00	Data	0.18 kWh	Comments: Tariff 0, Unit 6, L1 -> Active Energy Net L1
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	

C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
12 00 00 00 00 00 00 00	Data	0.18 kWh	
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
12 00 00 00 00 00 00 00	Data	0.18 kWh	
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 1	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
B0 FF FF FF FF FF FF FF	Data	-0.80 kvarh	Comments: Tariff 0, Unit 7 -> Total Reactive Energy Net
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
E6 FF FF FF FF FF FF FF	Data	-0.26 kvarh	Comments: Tariff 0, Unit 7, L1 -> Reactive Energy Net L1
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
E6 FF FF FF FF FF FF	Data	-0.26 kvarh	

FF			
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
E6 FF FF FF FF FF FF FF	Data	-0.26 kvarh	
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
47 00 00 00 00 00 00 00	Data	0.71 kVAh	Comments: Tariff 0, Unit 8 -> Total Apparent Energy Net
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
18 00 00 00 00 00 00 00	Data	0.24 kVAh	Comments: Tariff 0, Unit 8, L1 -> Apparent Energy Net L1
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
17 00 00 00 00 00 00 00	Data	0.23 kVAh	
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	

80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
17 00 00 00 00 00 00 00	Data	0.23 kVAh	
0F	DIF	Last telegram	
B7	Checksum		
16	End		

5.2.3 Example for telegrams 1 to 6 with B24 (all values are hexadecimal)

Telegram 1

68	Start char		
BC	Length		
BC	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
01	Access number		
00	Status		
00 00	Signature		
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
36 77 00 00 00 00	Data	77.36 kWh	Comments: No DIFE -> Tariff 0, Unit 0 -> Total Active Energy Import
8E	DIF	Data is 12 digit BCD	
10	DIFE	Tariff 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
17 38 00 00 00 00	Data	38.17 kWh	Comments: Tariff 1 and unit 0 in DIFE -> Tariff 1 Active Energy Import
8E	DIF	Data is 12 digit BCD	

20	DIFE	Tariff 2	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
19 39 00 00 00 00	Data	39.19 kWh	
8E	DIF	Data is 12 digit BCD	
40	DIFE	Export	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
39 46 00 00 00 00	Data	46.39 kWh	Comments: Tariff 0, Unit 1 in DIFE ->Total Active Energy Export
8E	DIF	Data is 12 digit BCD	
50	DIFE	Tariff 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
67 14 00 00 00 00	Data	14.67 kWh	
8E	DIF	Data is 12 digit BCD	
60	DIFE	Tariff 2	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
71 31 00 00 00 00	Data	31.71 kWh	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
93	VIFE	Active tariff	
00	VIFE	Status: No error	
02	Data	Active tariff is 2	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A0	VIFE	CT numerator (primary current marking of CT)	
00	VIFE	Status: No error	
F4 01 00 00	Data	500	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A1	VIFE	VT numerator (primary voltage marking of VT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		Comments: B24 does not support VT's or (only CT's) and VT settings are therefore marked as "Not available"
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A2	VIFE	CT denominator (secondary current marking of CT)	
00	VIFE	Status: No error	
05 00 00 00	Data	5	

04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A3	VIFE	VT denominator (secondary voltage marking of VT)	
15	VIFE	Status: No data available	
00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A6	VIFE	Error flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A7	VIFE	Warning flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A8	VIFE	Information flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
07	DIF	Data is 64 bit integer	
FF	VIF	Next byte is manufacturer specific	
A9	VIFE	Alarm flags	
00	VIFE	Status: No error	
00 00 00 00 00 00 00 00	Data		
0D	DIF	Variable length of ASCII data	
FD	VIF	Extension of VIF-codes	
8E	VIFE	Firmware version	
00	VIFE	Status: No error	
07 30 2E 34 32 2E 31 42	Data	7 ASCII bytes containing "B1.24.0"	
0D	DIF	Variable length of data	
FF	VIF	Next byte is manufacturer specific	
AA	VIFE	Type designation	
00	VIFE	Status: No error	
0B 4A 30 31 2D 33 35 33 20 34 32 42	Data	11 ASCII bytes containing "B24 313-10J"	
1F	DIF	More data in next telegram	

4F	Checksum
16	End

Telegram 2

68	Start char		
F2	Length		
F2	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
02	Access number		
00	Status		
00 00	Signature		
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
98	VIFE	Power fail counter	
00	VIFE	Status: No error	
7B 00 00 00	Data	123	
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
EB 53 53 00	Data	54609.71 W	Comments: No VIFE for phase number, No DIFE gives Unit 0 -> Total Active Power
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
72 09 1B 00	Data	17718.90 W	Comments: VIFE for phase number, No DIFE gives Unit 0 -> Active Power L1
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
A3 06 1D 00	Data	19022.43 W	
04	DIF	Data is 32 bit integer	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	

00	VIFE	Status: No error	
D7 43 1B 00	Data	17868.39 W	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
84 9F 4A 00	Data	48905.00 var	Comments: No VIFE for phase number, Unit 2 -> Total Reactive Power
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
87 A4 16 00	Data	14839.11 var	Comments: VIFE for phase number, Unit 2 -> Reactive Power L1
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
55 E9 19 00	Data	16981.33 var	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
A8 11 1A 00	Data	17084.56 var	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
00	VIFE	Status: No error	
6E EA 6F 00	Data	73345.10 VA	Comments: No VIFE for phase number, Unit 4 -> Total Apparent Power
84	DIF	Data is 32 bit integer	

80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
55 46 23 00	Data	23117.65 VA	Comments: VIFE for phase number, Unit 4 -> Apparent Power L1
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
AF E9 26 00	Data	25501.91 VA	
84	DIF	Data is 32 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
A9	VIF	Power with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
6A BA 25 00	Data	24725.54 VA	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
03 09 00 00	Data	230.7 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
0A 09 00 00	Data	231.4 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	

C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
08 09 00 00	Data	231.2 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
85	VIFE	L1 - L2	
00	VIFE	Status: No error	
9E 0F 00 00	Data	399.8 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
86	VIFE	L3 - L2	
00	VIFE	Status: No error	
A3 0F 00 00	Data	400.3 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
C8	VIFE	Volt with 1 decimal	
FF	VIFE	Next byte is manufacturer specific	
87	VIFE	L1 - L3	
00	VIFE	Status: No error	
A6 0F 00 00	Data	400.6 V	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
7C 87 01 00	Data	100.220 A	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	
D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
A8 AE 01 00	Data	110.248 A	
04	DIF	Data is 32 bit integer	
FD	VIF	Extension of VIF-codes	

D9	VIFE	Ampere with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
C5 A1 01 00	Data	106.949 A	
0A	DIF	Data is 4 digit BCD	
FF	VIF	Next byte is manufacturer specific	
D9	VIFE	Frequency with 2 decimals	
00	VIFE	Status: No error	
83 49	Data	49.83 Hz	
1F	DIF	More data in next telegram	
27	Checksum		
16	End		

Telegram 3

68	Start char		
95	Length		
95	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
02	Access number		
00	Status		
00 00	Signature		
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
00	VIFE	Status: No error	
E9 02	Data	0.745	Comments: No VIFE for phase number -> Total Power Factor
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	

FF 02	Data	0.767	Comments: VIFE for phase number -> Power Factor L1
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
EA 02	Data	0.746	
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
E0	VIFE	Power factor with 3 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
D3 02	Data	0.723	
02	DIF	Data is 16 bit integer	
FF	VIF	Next byte is manufacturer specific	
D2	VIFE	Power factor angle with 1 decimal	
00	VIFE	Status: No error	
A3 01	Data	41.9 °	Comments: No VIFE for phase number -> Total Power Factor Angle
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
60 50 00 00 00 00	Data	50.60 kvarh	Comments: Tariff 0, Unit 2 -> Total Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
90	DIFE	Tariff 1, Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
56 31 00 00 00 00	Data	31.56 kvarh	Comments: Tariff 1 and unit 2 in DIFE -> Tariff 1 Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
20	DIFE	Tariff 2, Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
04 19 00 00 00 00	Data	19.04 kvarh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	

40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
70 62 00 00 00 00	Data	62.70 kvarh	Comments: Tariff 0, Unit 2 -> Total Reactive Energy Export
8E	DIF	Data is 12 digit BCD	
D0	DIFE	Tariff 1, Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
87 13 00 00 00 00	Data	13.87 kvarh	Comments: Tariff 1 and unit 2 in DIFE -> Tariff 1 Reactive Energy Export
8E	DIF	Data is 12 digit BCD	
E0	DIFE	Tariff 2, Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
83 48 00 00 00 00	Data	48.83 kvarh	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
AD	VIFE	Number of elements	
00	VIFE	Status: No error	
03	Data	3	
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
00	VIFE	Status: No error	
01	Data	1	Comments: No VIFE for phase number -> Total Active Quadrant
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
01	Data	1	Comments: VIFE for phase number -> Active Quadrant L1
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
01	Data	1	Comments: VIFE for phase number -

			> Active Quadrant L2
01	DIF	Data is 8 bit integer	
FF	VIF	Next byte is manufacturer specific	
97	VIFE	Active quadrant	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
01	Data	1	Comments: VIFE for phase number -> Active Quadrant L3
1F	DIF	More data in next telegram	
2E	Checksum		
16	End		

Telegram 4

68	Start char		
DC	Length		
DC	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number		
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
02	Access number		
00	Status		
00 00	Signature		
81	DIF	Data is 8 bit integer	
40	DIFE	Unit bit 0 = 1	
FD	VIF	Extension of VIF-codes	
9A	VIFE	Digital output	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 1 -> Output number 1
81	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9A	VIFE	Digital output	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 2 -> Output number 2

81	DIF	Data is 8 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
00	Data	0	Comments: Unit 3 -> Input number 3
81	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 4 -> Input number 4
C1	DIF	Data is 8 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 3, storage bit 0 = 1 in DIF -> Input number 3 stored state
C1	DIF	Data is 8 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
9B	VIFE	Digital input	
00	VIFE	Status: No error	
01	Data	1	Comments: Unit 4, storage bit 0 = 1 in DIF -> Input number 4 stored state
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
FD	VIF	Extension of VIF-codes	
E1	VIFE	Cumulation counter	
00	VIFE	Status: No error	
29 00 00 00 00 00	Data	29	Comments: Unit 4 -> Input number 4 pulse counter
0E	DIF	Data is 12 digit BCD	

84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
96 44 00 00 00 00	Data	44.96 kWh	Comments: No DIFE -> Unit 0 -> Resettable Active Energy Import
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
32 31 00 00 00 00	Data	31.32 kWh	Comments: Unit 1 -> Resettable Active Energy Export
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
62 08 00 00 00 00	Data	8.62 kvarh	Comments: Unit 2 -> Resettable Reactive Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
F2	VIFE	Resettable energy *1	
00	VIFE	Status: No error	
20 55 00 00 00 00	Data	55.20 kvarh	Comments: Unit 3 -> Resettable Reactive Energy Export
04	DIF	Data is 32 bit integer	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
03 00 00 00	Data	3	Comments: No DIFE gives Unit 0 -> Active Energy Import Reset Counter
84	DIF	Data is 32 bit integer	
40	DIFE	Unit bit 0 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
02 00 00 00	Data	2	Comments: Unit 1 -> Active Energy Export Reset Counter
84	DIF	Data is 32 bit integer	

80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
04 00 00 00	Data	4	Comments: Unit 2 -> Reactive Energy Import Reset Counter
84	DIF	Data is 32 bit integer	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
FF	VIFE	Next byte is manufacturer specific	
F1	VIFE	Reset counter *1	
00	VIFE	Status: No error	
02 00 00 00	Data	2	Comments: Unit 3 -> Reactive Energy Export Reset Counter
0E	DIF	Data is 12 digit BCD	
FF	VIF	Next byte is manufacturer specific	
F9	VIFE	VIF extension of manufacturer specific VIFE	
C4	VIFE	Active Energy in CO2	
00	VIFE	Status: No error	
23 74 07 00 00 00	Data	77.423 kg	
0E	DIF	Data is 12 digit BCD	
FF	VIF	Next byte is manufacturer specific	
F9	VIFE	VIF extension of manufacturer specific VIFE	
C9	VIFE	Active Energy in Currency	
00	VIFE	Status: No error	
43 77 00 00 00 00	Data	77.43	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A4	VIFE	Conversion factor for active energy import in CO2	
00	VIFE	Status: No error	
E8 03 00 00	Data	1000	
04	DIF	Data is 32 bit integer	
FF	VIF	Next byte is manufacturer specific	
A5	VIFE	Conversion factor for active energy import in Currency	
00	VIFE	Status: No error	
E8 03 00 00	Data	1000	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	

00	VIFE	Status: No error	
14 05 01 00 00 00	Data	105.14 kVAh	Comments: No DIFE -> Tariff 0, Unit 4 -> Total Apparent Energy Import
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
94 62 00 00 00 00	Data	62.94 kVAh	Comments: No DIFE -> Tariff 0, Unit 45-> Total Apparent Energy Export
1F	DIF	More data in next telegram	
D3	Checksum		
16	End		

Telegram 5

68	Start char		
F7	Length		
F7	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
01	Access number		
00	Status		
00 00	Signature		
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
86 25 00 00 00 00	Data	25.86 kWh	Comments: No DIFE -> Tariff 0, Unit 0 -> Active Energy Import L1
0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
83 25 00 00 00 00	Data	25.83 kWh	

0E	DIF	Data is 12 digit BCD	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
73 25 00 00 00 00	Data	25.73 kWh	
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
50 15 00 00 00 00	Data	15.50 kWh	Comments: Unit 1 -> Active Energy Export L1
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
49 15 00 00 00 00	Data	15.49 kWh	
8E	DIF	Data is 12 digit BCD	
40	DIFE	Unit bit 0 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
38 15 00 00 00 00	Data	15.38 kWh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
66 16 00 00 00 00	Data	16.66 kvarh	Comments: Unit 2 -> Reactive Energy Import L1
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	

00	VIFE	Status: No error	
85 16 00 00 00 00	Data	16.85 kvarh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
12 17 00 00 00 00	Data	17.12 kvarh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
16 21 00 00 00 00	Data	21.16 kvarh	Comments: Unit 3 -> Reactive Energy Export L1
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
91 20 00 00 00 00	Data	20.91 kvarh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
40	DIFE	Unit bit 1 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
63 20 00 00 00 00	Data	20.63 kvarh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	

86 34 00 00 00 00	Data	34.86 kVAh	Comments: Unit 4 -> Apparent Energy Import L1
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
07 35 00 00 00 00	Data	35.07 kVAh	
8E	DIF	Data is 12 digit BCD	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
22 35 00 00 00 00	Data	35.22 kVAh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
25 21 00 00 00 00	Data	21.25 kVAh	Comments: Unit 5 -> Apparent Energy Export L1
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
98 20 00 00 00 00	Data	20.98 kVAh	
8E	DIF	Data is 12 digit BCD	
C0	DIFE	Unit bit 0 = 1	
80	DIFE	Unit bit 1 = 0	
40	DIFE	Unit bit 2 = 1	

84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
70 20 00 00 00 00	Data	20.70 kVAh	
1F	DIF	More data in next telegram	
EF	Checksum		
16	End		

Telegram 6

68	Start char		
CE	Length		
CE	Length		
68	Start char		
08	RSP_UD		
00	Primary address		
72	Variable data respond		
34 12 00 00	Serial number	00001234	
2E 28	Manufacturer	JAN	
20	Version		
02	Medium	Electricity	
01	Access number		
00	Status		
00 00	Signature		
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
23 0C 00 00 00 00 00 00	Data	31.07 kWh	Comments: Tariff 0, Unit 6 -> Total Active Energy Net
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
0D 04 00 00 00 00	Data	10.37 kWh	Comments: Tariff 0, Unit 6, L1 ->

00 00			Active Energy Net L1
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
09 04 00 00 00 00 00 00	Data	10.33 kWh	
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
0C 04 00 00 00 00 00 00	Data	10.36 kWh	
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 1	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
4C FB FF FF FF FF FF FF	Data	-12.04 kvarh	Comments: Tariff 0, Unit 7 -> Total Reactive Energy Net
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
3F FE FF FF FF FF FF FF	Data	-4.49 kvarh	Comments: Tariff 0, Unit 7, L1 -> Reactive Energy Net L1
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	

82	VIFE	L2	
00	VIFE	Status: No error	
6B FE FF FF FF FF FF FF	Data	-4.05 kvarh	
87	DIF	Data is 64 bit integer	
C0	DIFE	Unit bit 0 = 0	
C0	DIFE	Unit bit 1 = 1	
40	DIFE	Unit bit 2 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
A2 FE FF FF FF FF FF FF	Data	-3.50 kvarh	
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
00	VIFE	Status: No error	
80 10 00 00 00 00 00 00	Data	42.24 kVAh	Comments: Tariff 0, Unit 8 -> Total Apparent Energy Net
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
81	VIFE	L1	
00	VIFE	Status: No error	
52 05 00 00 00 00 00 00	Data	13.62 kVAh	Comments: Tariff 0, Unit 8, L1 -> Apparent Energy Net L1
87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
82	VIFE	L2	
00	VIFE	Status: No error	
81 05 00 00 00 00 00 00	Data	14.09 kVAh	

87	DIF	Data is 64 bit integer	
80	DIFE	Unit bit 0 = 0	
80	DIFE	Unit bit 1 = 0	
80	DIFE	Unit bit 2 = 0	
40	DIFE	Unit bit 3 = 1	
84	VIF	Energy with 2 decimals	
FF	VIFE	Next byte is manufacturer specific	
83	VIFE	L3	
00	VIFE	Status: No error	
AD 05 00 00 00 00 00 00	Data	14.53 kVAh	
0F	DIF	Last telegram	
46	Checksum		
16	End		

5.3 Sending data to the meters

This section contains a description of how the telegrams can be sent to the meters. Some telegrams contain data and others do not. The data from the telegrams is sometimes stored in the meter and sometimes used for the execution of certain actions. Telegrams without data usually trigger a certain action in the meter.

Level of write access

Some commands can be protected with a password. Three different write access levels exist in total:

- Open
- Open with password
- Closed

The write access level can either be set via the buttons directly on the meter or via communication with the command *level of write access*.

If the write access level is set to *open* then the meter always accepts the command, as long as the meter is correctly addressed and the syntax and checksum are correct.

If the write access level is set to *open with password* then a command *send password* must be sent to the meter before the command, so that it accepts the command.

If the write access level is set to *closed* then the meter does not accept any commands, but instead merely responds with a confirmation character (E5 hex). In order to change this access level, this must be set to *open* with the buttons directly on the meter.

Note
For commands that are not affected by the access level, a correct message with correct address, syntax and checksum is merely required.

5.3.1 Tariff setting

In case of meters with tariff control, the active tariff is set by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	07	L field, calculated from the C field to the last user data
3	1	07	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	01	DIF size, 8 Bit whole number
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	13	VIFE tariff
11	1	xx	New tariff
12	1	xx	CS checksum, calculated from the C field to the last data
13	1	16	Stop character

5.3.2 Setting the primary address

The primary address is set by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	06	L field, calculated from the C field to the last user data
3	1	06	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	01	DIF size, 8 Bit whole number
9	1	7A	VIFE bus address
10	1	xx	New primary address
11	1	xx	CS checksum, calculated from the C field to the last data
12	1	16	Stop character

5.3.3 Changing the Baud rate

The Baud rate of the electrical M-Bus interface is set by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	03	L field, calculated from the C field to the last user data
3	1	03	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	1	Bx CI field, new Baud rate (with x=>8..F)
8	1	xx	CS checksum, calculated from the C field to the last data
9	1	16	Stop character

5.3.4 Resetting the power failure meter

The power failure meter is reset to 0 by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	07	07 L field, calculated from the C field to the last user data
3	1	07	L field, repetition
4	1	68	Start character
5	1	53/73	73 C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	00	00 DIF size, no data
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	98	VIFE number of power failures
11	1	07	Delete VIFE
12	1	xx	CS checksum, calculated from the C field to the last data
13	1	16	Stop character

5.3.5 Setting the current transformer conversion ratio (CT) - meter

The current transformer conversion ratio (CT) meter is set by the following command (all values are hexadecimal). The command is influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	0a	L field, calculated from the C field to the last user data
3	1	0a	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	04	DIF size, 32 Bit whole number
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	20	VIFE CT-ratio meter
11…14	4	xxxxxxxx	New meter CT-ratio
15	1	xx	CS checksum, calculated from the C field to the last data
16	1	16	Stop character

5.3.6 Setting the current transformer conversion ratio (CT) - denominator

The current transformer conversion ratio (CT) denominator is set by the following command (all values are hexadecimal). The command is influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	0a	L field, calculated from the C field to the last user data
3	1	0a	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	04	DIF size, 32 Bit whole number
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	22	VIFE CT-ratio denominator
11…14	4	xxxxxxxx	New denominator CT-ratio
15	1	xx	CS checksum, calculated from the C field to the last data
16	1	16	Stop character

5.3.7 Selecting status information

The type of status information sent is changed by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	07	L field, calculated from the C field to the last user data
3	1	07	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	01	DIF size, 8 Bit whole number
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	15	VIFE status of values (status Byte of the values)
11	1	xx	0=never, 1=status if not OK=always
12	1	xx	CS checksum, calculated from the C field to the last data
13	1	16	Stop character

5.3.8 Resetting the stored status for input 1

The stored status for input 1 is reset by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	08	L field, calculated from the C field to the last user data
3	1	08	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	C0	DIF size, no data, storage number
9	1	40	DIFE unit=1
10	1	FD	VIF extension of VIF codes
11	1	9B	VIFE digital input
12	1	07	Delete VIFE
13	1	xx	CS checksum, calculated from the C field to the last data
14	1	16	Stop character

5.3.9 Resetting the stored status for input 2

The stored status for input 2 is reset by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	09	L field, calculated from the C field to the last user data
3	1	09	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	C0	DIF size, no data, storage number 1
9	1	80	DIFE unit=0
10	1	40	DIFE unit=2
11	1	FD	VIF extension of VIF codes
12	1	9B	VIFE digital input
13	1	07	Delete VIFE
14	1	xx	CS checksum, calculated from the C field to the last data
15	1	16	Stop character

5.3.10 Resetting the input meter 1

The input meter 1 is reset by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	08	L field, calculated from the C field to the last user data
3	1	08	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	C0	DIF size, no data
9	1	40	DIFE unit=1
10	1	FD	VIF extension of VIF codes
11	1	9B	VIFE total meter
12	1	07	Delete VIFE
13	1	xx	CS checksum, calculated from the C field to the last data
14	1	16	Stop character

5.3.11 Resetting the input meter 2

The input meter 2 is reset by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	09	L field, calculated from the C field to the last user data
3	1	09	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	80	DIF size, no data
9	1	80	DIFE unit=0
10	1	40	DIFE unit=2
11	1	FD	VIF extension of VIF codes
12	1	E1	VIFE total meter
13	1	07	Delete VIFE
14	1	xx	CS checksum, calculated from the C field to the last data
15	1	16	Stop character

5.3.12 Setting output 1

The status of output 1 is set by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	08	L field, calculated from the C field to the last user data
3	1	08	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	81	DIF size, 8 Bit whole number
9	1	40	DIFE unit=1
10	1	FD	VIF extension of VIF codes
11	1	1A	VIFE digital output
12	1	xx	Output 1, new status
13	1	xx	CS checksum, calculated from the C field to the last data
14	1	16	Stop character

5.3.13 Setting output 2

The status of output 2 is set by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	09	L field, calculated from the C field to the last user data
3	1	09	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	81	DIF size, 8 Bit whole number
9	1	80	DIFE unit=0
10	1	40	DIFE unit=1
11	1	FD	VIF extension of VIF codes
12	1	1A	VIFE digital output
13	1	xx	Output 2, new status
14	1	xx	CS checksum, calculated from the C field to the last data
15	1	16	Stop character

5.3.14 Resetting power failure time duration

The time duration of power failures is reset by the following command (all values are hexadecimal). The command is not influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	07	L field, calculated from the C field to the last user data
3	1	07	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	00	DIF size, no data
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	EC	VIFE power failure time duration
11	1	07	Delete VIFE
12	1	xx	CS checksum, calculated from the C field to the last data
13	1	16	Stop character

5.3.15 Sending a password

Passwords are sent by the following command (all values are hexadecimal).

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	0E	L field, calculated from the C field to the last user data
3	1	0E	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	Xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	07	DIF size, 8 Byte whole number
9	1	FD	VIF extension of VIF codes
10	1	16	VIFE password
11…18	8	xxxxxxxxxxxxxxxx	Password
19	1	xx	CS checksum, calculated from the C field to the last data
20	1	16	Stop character

5.3.16 Setting up a password

The password is set by the following command (all values are hexadecimal).

Note
If the meter is password-protected, it is first necessary to send the old password before a new password can be set.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	0F	L field, calculated from the C field to the last user data
3	1	0F	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	07	DIF size, 8 Byte whole number
9	1	FD	VIF extension of VIF codes
10	1	96	VIFE password
11	1	00	Write VIFE (replace)
12…19	8	xxxxxxxxxxxxxxxx	Password
20	1	xx	CS checksum, calculated from the C field to the last data
21	1	16	Stop character

5.3.17 Resetting logs

All log data is reset by the following command (all values are hexadecimal). The command is influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	08	L field, calculated from the C field to the last user data
3	1	08	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	00	DIF size, no data
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	F9	VIF extension of manufacturer-specific VIFEs, next VIFE gives the actual meaning
11	1	xx	VIFE gives data to be deleted: • 85: Event log • AE: System log • B0: Power quality log
12	1	07	Delete VIFE
13	1	xx	CS checksum, calculated from the C field to the last data
14	1	16	Stop character

5.3.18 Setting the level of write access

The level of write access is set by the following command (all values are hexadecimal). The command is influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	07	L field, calculated from the C field to the last user data
3	1	07	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	01	DIF size, 8 Bit whole number
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	6A	VIFE write control
11	1	xx	Write control (1: Closed, 2: Open with password, 3: Open)
12	1	xx	CS checksum, calculated from the C field to the last data
13	1	16	Stop character

5.3.19 Setting tariff sources

Tariffs can be controlled via inputs, communication or the internal clock.

The tariff source is set by the following command (all values are hexadecimal). The command is influenced by the set write protection level.

Byte no.	Size	Value	Description
1	1	68	Start character
2	1	08	L field, calculated from the C field to the last user data
3	1	08	L field, repetition
4	1	68	Start character
5	1	53/73	C field, SND_UD
6	1	xx	A field, address
7	1	51	CI field, send data, LSB first
8	1	01	DIF size, 8 Bit whole number
9	1	FF	Next VIF Byte is manufacturer-specific
10	1	F9	VIF extension of manufacturer-specific VIFEs, next VIFE gives the actual meaning
11	1	06	VIFE tariff source
12	1	xx	Tariff source (0: Internal clock, 1: Communication command, 2: Inputs)
13	1	xx	CS checksum, calculated from the C field to the last data
14	1	16	Stop character

MID energy meters

A Annex

A.1 Order information

Energy meter B21
AC meter, 65 A, single phase (1 + N)

Voltage V	Precision class	Inputs/outputs	Communication	Type	Order number	Pack. unit [pc.]	Wei. 1 pc. [kg]
1 x 230 V AC	Active energy: B (cl.1) Reactive energy: Cl. 2	2 outputs, 2 inputs	-	B21 311 - 10J	14.01.353	1	0.14
			RS-485	B21 312 - 10J	14.01.354	1	0.15
			M-Bus	B21 313 - 10J	14.01.355	1	0.15

Energy meter B23
Three-phase meter, 65 A, three-phase (3 + N)

Voltage V	Precision class	Inputs/outputs	Communication	Type	Order number	Pack. unit [pc.]	Wei. 1 pc. [kg]
3 x 230/400 V AC	Active energy: B (cl.1) Reactive energy: Cl. 2	2 outputs, 2 inputs	-	B23 311 - 10J	14.01.356	1	0.33
			RS-485	B23 312 - 10J	14.01.357	1	0.34
			M-Bus	B23 313 - 10J	14.01.358	1	0.35

Energy meter B24

Measurement transformer meter, 6 A, three-phase (3 + N)

Voltage V	Precision class	Inputs/outputs	Communication	Type	Order number	Pack. unit [pc.]	Wei. 1 pc. [kg]
3 x 230/400 V AC	Active energy: C (cl.0.5 S) Reactive energy: Cl. 2	2 outputs, 2 inputs	-	B24 311 - 10J	14.01.359	1	0.27
			RS-485	B24 312 - 10J	14.01.360	1	0.27
			M-Bus	B24 313 - 10J	14.01.361	1	0.29

Contact

Janitza electronics GmbH
Vor dem Polstück 6
35633 Lahnau / Germany

Tel.: +49 6441 9642-0
Fax: +49 6441 9642-30

Internet: www.janitza.de
E-mail: info@janitza.de

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