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MFR 300 K55

Option Manual | Multifunction Relay

MFR 300

Release 1.0215

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Manual (original)

This is no translation but the original Technical Manual in English.

Designed in Germany.

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1 General Information

1.1 About This Manual

1.1.1 Revision History

Rev.	Date	Editor	Changes
B	2024-06-01	VK	**Manual** • Release with software version 1.0219 The present publication (#37933) describes the changes and additional functions for option K55, in comparison to the MFR-300 standard device and documentation. The following MFR-300 Technical Manual is a mandatory part of the Option K55 device description: • MFR 300 Technical Manual (#37538 Revision B or higher) **Option K55 specific device features & updates** • Addition of 6 parameters for power correction
A	2021-06-21	VK	**Manual** • Release with software version 1.0215 The present publication (#37933) describes the changes and additional functions for option K55, in comparison to the MFR-300 standard device and documentation. The following MFR-300 Technical Manual is a mandatory part of the Option K55 device description: • MFR 300 Technical Manual (#37538 Revision B or higher) **Option K55 specific device features & updates** • Addition of 13 CAN TDOs, TPDO 4 … TPDO16 • addition of parameters to configure these TPDOs

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1.1.2 Depiction Of Notes And Instructions

Safety instructions

Safety instructions are marked with symbols in these instructions. The safety instructions are always introduced by signal words that express the extent of the danger.

DANGER!

This combination of symbol and signal word indicates an immediately-dangerous situation that could cause death or severe injuries if not avoided.

WARNING!

This combination of symbol and signal word indicates a possibly-dangerous situation that could cause death or severe injuries if it is not avoided.

CAUTION!

This combination of symbol and signal word indicates a possibly-dangerous situation that could cause slight injuries if it is not avoided.

NOTICE!

This combination of symbol and signal word indicates a possibly-dangerous situation that could cause property and environmental damage if it is not avoided.

Tips and recommendations

This symbol indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

Additional markings

To emphasize instructions, results, lists, references, and other elements, the following markings are used in these instructions:

Marking	Explanation
▶	Step-by-step instructions
⇨	Results of action steps
▷	References to sections of these instructions and to other relevant documents
•	Listing without fixed sequence

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Marking	Explanation
»Buttons«	Operating elements (e.g. buttons, switches), display elements (e.g. signal lamps)
»Display«	Screen elements (e.g. buttons, programming of function keys)

1.2 Copyright And Disclaimer

Disclaimer

All information and instructions in this manual have been provided under due consideration of applicable guidelines and regulations, the current and known state of the art, as well as our many years of in-house experience. Woodward GmbH assumes no liability for damages due to:

- Failure to comply with the instructions in this manual
- Improper use / misuse
- Willful operation by non-authorized persons
- Unauthorized conversions or non-approved technical modifications
- Use of non-approved spare parts

The originator is solely liable to the full extent for damages caused by such conduct. The agreed upon obligations in the delivery contract, the general terms and conditions, the manufacturer’s delivery conditions, and the statutory regulations valid at the time the contract was concluded, apply.

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Actions to the contrary exact damage compensation. We reserve the right to enforce additional claims.

1.3 Service And Warranty

Our Customer Service is available for technical information. Please see page 2 for the contact data.

In addition, our employees are constantly interested in new information and experiences that arise from usage and could be valuable for the improvement of our products.

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Warranty terms

Please enquire about the terms of warranty from your nearest Woodward representative.

For our contact search webpage please go to: ⟹ http://www.woodward.com/Directory.aspx

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2 Safety

2.1 Intended Use

The multifunction relay unit has been designed and constructed solely for the intended use described in this manual.

The multifunction relay unit must be used exclusively for power measurement applications.

- Intended use requires operation of the control unit within the specifications listed in the full manual (chapter "Specifications").
- All permissible applications are outlined in the full manual (chapter "Application").
- Intended use also includes compliance with all instructions and safety notes presented in this manual.
- Any use which exceeds or differs from the intended use shall be considered improper use.
- No claims of any kind for damage will be entertained if such claims result from improper use.

NOTICE!

Damage due to improper use!

Improper use of the multifunction relay unit may cause damage to the control unit as well as connected components.

Improper use includes, but is not limited to:

- Operation outside the specified operation conditions.

2.2 Personnel

WARNING!

Hazards due to insufficiently qualified personnel!

If unqualified personnel perform work on or with the control unit hazards may arise which can cause serious injury and substantial damage to property.

- Therefore, all work must only be carried out by appropriately qualified personnel.

This manual specifies the personnel qualifications required for the different areas of work, listed below:

- Well trained for electrical installations.
- Skilled and competent to be aware especially of the local safety regulations.
- Experienced in working on electronic measuring and control devices.
- Allowed to manage the controlled (engine/generator) system.

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The workforce must only consist of persons who can be expected to carry out their work reliably. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are prohibited.

When selecting personnel, the age-related and occupation-related regulations governing the usage location must be observed.

2.3 General Safety Notes

Electrical hazards

DANGER!

Life-threatening hazard from electric shock!

There is an imminent life-threatening hazard from electric shocks from live parts. Damage to insulation or to specific components can pose a life-threatening hazard.

- Only a qualified electrician should perform work on the electrical equipment.
- Immediately switch off the power supply and have it repaired if there is damage to the insulation.
- Before beginning work at live parts of electrical systems and resources, cut the electricity and ensure it remains off for the duration of the work. Comply with the five safety rules in the process:
  - cut electricity;
  - safeguard against restart;
  - ensure electricity is not flowing;
  - earth and short-circuit; and
  - cover or shield neighboring live parts.
- Never bypass fuses or render them inoperable. Always use the correct amperage when changing fuses.
- Keep moisture away from live parts. Moisture can cause short circuits.

Modifications

WARNING!

Hazards due to unauthorized modifications

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment.

Any unauthorized modifications:

- constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage
- invalidate product certifications or listings.

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Electrostatic discharge

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- Protective equipment: ESD wrist band

NOTICE!

Damage from electrostatic discharge

All electronic equipment sensitive to damage from electrostatic discharge, which can cause the control unit to malfunction or fail.

- To protect electronic components from static damage, take the precautions listed below.

1. ▷ Avoid build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as easily as synthetics.

2. ▷ 

Before working on terminals on the control unit, ground yourself by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.) to discharge any static electricity.

Alternatively wear an ESD wrist band connected to ground.

3. ▷ 

Before any maintenance work on the control unit, ground yourself by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.) to discharge any static electricity.

Alternatively wear an ESD wrist band connected to ground.

4. ▷ Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, etc.) away from the control unit, modules and work area.

5. ▷ Opening the control cover may void the unit warranty. Do not remove the printed circuit board (PCB) from the control cabinet unless instructed by this manual.

If instructed by this manual to remove the PCB from the control cabinet, follow these precautions:

- Ensure that the device is completely voltage-free (all connectors have to be disconnected).
- Do not touch any part of the PCB except the edges.
- Do not touch the electrical conductors, connectors, or components with conductive devices or with bare hands.
- When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

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For additional information on how to prevent damage to electronic components caused by improper handling, read and observe the precautions in:

- "Woodward manual 82715, Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules".

2.4 Protective Equipment And Tools

Protective gear

Personal protective equipment serves to protect risks to the safety and health of persons as well as to protect delicate components during work.

Certain tasks presented in this manual require the personnel to wear protective equipment. Specific required equipment is listed in each individual set of instructions.

The cumulative required personal protective equipment is detailed below:

Protective equipment: ESD wrist band

The ESD (**e**lectro**s**tatic **d**ischarge) wrist band keeps the user's body set to ground potential. This measure protects sensitive electronic components from damage due to electrostatic discharge.

Tools

Use of the proper tools ensures successful and safe execution of tasks presented in this manual.

Specific required tools are listed in each individual set of instructions.

The cumulative required tools are detailed below:

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3 Configuration

All parameters are assigned a unique parameter identification number.

The parameter identification number may be used to reference individual parameters listed in this manual.

This parameter identification number is also displayed in the ToolKit configuration screens next to the respective parameter.

3.1 Power correction function

3.1.1 Description and parameters

Functionality

Power correction allows a customer to change the measured active power, for example to cater for local setup variations like external transformer inaccuracies. This also affects the KWh calculation, but not the reactive power and apparent power. There are six configurable parameters for that, described below. By default this function is off.

Power correction is done in different regions of the measured power, it corrects the measured power with a configurable gain, depending on the region.

- Region 1 starts at 0% rated power and ends with P-Threshold 1. The gain linearly changes between P-Gain 1 and P-Gain 2.
- Region 2 starts at P-Threshold 1 and ends with P-Threshold 2. The gain linearly changes between P-Gain 2 and P-Gain 3.
- Region 3 starts at P-Threshold 2 and ends with P-Threshold 3. The gain linearly changes between P-Gain 3 and 0.

corrected power is calculated from the measured power like:

corrected = measured * (1+Gain)

So for example, a gain of 15.00% will correct a measured power of 100kW to 115kW, a gain of 20.00% will correct a measured power of 100kW to 80kW.

Parameters:

ID	Parameter	CL	Setting range [Default]	Description
6670	**P-Threshold 1**	3	0.00% to 150.00% **[0%]**	End of correction region 1. Percent of nominal power.
6671	**P-Threshold 2**	3	0.00% to 150.00% **[0%]**	End of correction region 2. Percent of nominal power.
6672	**P-Threshold 3**	3	0.00% to 150.00% **[0%]**	End of correction region 3. Percent of nominal power.

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ID	Parameter	CL	Setting range [Default]	Description
6673	**P-Gain 1**	3	-99.99% to 99.99% **[0%]**	relative Power correction at P=0%
6674	**P-Gain 2**	3	-99.99% to 99.99% **[0%]**	relative Power correction at P-Threshold 1
6674	**P-Gain 3**	3	-99.99% to 99.99% **[0%]**	relative Power correction at P-Threshold 2

the power correction is only active, if P-Threshold 3 > P-Threshold 2 > P-Threshold 1.

3.2 New Parameters for additional PDOs

3.2.1 Additional PDOs

General notes

To configure additional 13 PDOs (PDO4 .. PDO 16), appropriate parameters were added.

COB -IDs:

ID	Parameter	CL	Setting range [Default]	Description
9950	**COB-ID**	3	1 to 2047 **[904]**	The COB ID of the TPDO 4
9951	**COB-ID**	3	1 to 2047 **[905]**	The COB ID of the TPDO 5
9952	**COB-ID**	3	1 to 2047 **[906]**	The COB ID of the TPDO 6
9953	**COB-ID**	3	1 to 2047 **[907]**	The COB ID of the TPDO 7
9954	**COB-ID**	3	1 to 2047 **[908]**	The COB ID of the TPDO 8
9955	**COB-ID**	3	1 to 2047 **[909]**	The COB ID of the TPDO 9
9956	**COB-ID**	3	1 to 2047 **[910]**	The COB ID of the TPDO 10
9957	**COB-ID**	3	1 to 2047 **[911]**	The COB ID of the TPDO 11
9958	**COB-ID**	3	1 to 2047 **[912]**	The COB ID of the TPDO 12
9959	**COB-ID**	3	1 to 2047 **[913]**	The COB ID of the TPDO 13
9960	**COB-ID**	3	1 to 2047 **[914]**	The COB ID of the TPDO 14
9961	**COB-ID**	3	1 to 2047 **[915]**	The COB ID of the TPDO 15
9962	**COB-ID**	3	1 to 2047 **[916]**	The COB ID of the TPDO 16

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Transmission types:

ID	Parameter	CL	Setting range [Default]	Description
9970	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 4. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9971	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 5. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9972	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 6. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.

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ID	Parameter	CL	Setting range [Default]	Description
9973	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 7. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9974	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 8. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9975	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 9. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.

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ID	Parameter	CL	Setting range [Default]	Description
9976	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 10. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9977	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 11. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9978	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 12. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.

Released

ID	Parameter	CL	Setting range [Default]	Description
9979	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 13. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9980	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 14. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.
9981	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 15. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.

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ID	Parameter	CL	Setting range [Default]	Description
9982	**Transmission type**	3	0 to 255 **[0]**	The Transmission type of the TPDO 16. A value of 0, means the TPDO is off. A value of 1..240 means the number of SYNC messages which have to be received until the MFR300 sends a PDO. A value of 254 or 255 means free running, the MFR300 will send a PDO approximately every 20msec.

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4 Fixed TPDOs

The added PDOs 4..16 contain visualization data which is not multiplexed.

CAN		Parameter ID	Description	Multiplier	Units
PDO	Data byte				
4	0,1		heartbeat. This is a overrunning 16 bit counter which increments with every send.		
4	2	1912	Overfrequency 1 triggered	Mask: 01h	Bit
		1913	Overfrequency. 2 triggered	Mask: 02h	Bit
		1962	Underfrequency 1 triggered	Mask: 04h	Bit
		1963	Underfrequency 2 triggered	Mask: 08h	Bit
		2012	Overvoltage 1 triggered	Mask: 10h	Bit
		2013	Overvoltage 2 triggered	Mask: 20h	Bit
		2062	Undervoltage 1 triggered	Mask: 40h	Bit
		2063	Undervoltage 2 triggered	Mask: 80h	Bit
4	3	2314	Positive load 1 triggered	Mask: 01h	Bit
		2315	Positive load 2 triggered	Mask: 02h	Bit
		2412	Unbalanced load 1 triggered	Mask: 04h	Bit
		2413	Unbalanced load 2 triggered	Mask: 08h	Bit
		2218	Overcurrent 1 triggered	Mask: 10h	Bit
		2219	Overcurrent 2 triggered	Mask: 20h	Bit
		3907	Voltage asymmetry 1 triggered	Mask: 40h	Bit

CAN		Parameter ID	Description	Multiplier	Units
PDO	Data byte				
		3936	Voltage asymmetry 2 triggered	Mask: 80h	Bit
4	4	4958	Time-dependent voltage monitoring 1 triggered	Mask: 01h	Bit
		4959	Time-dependent voltage monitoring 2 triggered	Mask: 02h	Bit
		9138	Time-dependent voltage monitoring 3 triggered	Mask: 04h	Bit
		9139	Time-dependent voltage monitoring 4 triggered	Mask: 08h	Bit
			LED 1	Mask: 10h	Bit
			LED 2	Mask: 20h	Bit
			Reserve (0)	Mask: 40h	Bit
			Reserve (0)	Mask: 80h	Bit
4	5		Relay 1	Mask: 01h	Bit
			Relay 2	Mask: 02h	Bit
			Relay 3	Mask: 04h	Bit
			Relay 4	Mask: 08h	Bit
			Relay 5	Mask: 10h	Bit
			Reserve (0)	Mask: 20h	Bit
			Reserve (0)	Mask: 40h	Bit
			Reserve (0)	Mask: 80h	Bit
4	6,7		Reserve (0)		
5	0,1		Total active power This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of	PT Primary voltage * CT primary	W

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CAN		Parameter ID	Description	Multiplier	Units
PDO	Data byte				
			the PT primary voltage, the power value has to be considered as zero. This is a two's complement value and may be positive or negative.	current / 1616.58	
5	2,3		Total reactive power This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the reactive power value has to be considered as zero. This is a two's complement value and may be positive or negative.	PT Primary voltage * CT primary current / 1616.58	var
5	4,5		Frequency	0.01	Hz
5	6,7		df/dt This is the measured change of frequency, df/dt.If the frequency is lower than 30Hz or higher than 80Hz, it is set to zero. This is a two's complement value and may be positive or negative.	0.1	Hz/sec
6	0,1		Current L1 This value is calculated new after every voltage cycle. It is not filtered.	CT primary current / 5000	A
6	2,3		Current L2 This value is calculated new after every voltage cycle. It is not filtered.	CT primary current / 5000	A
6	4,5		Current L3 This value is calculated new after every voltage cycle. It is not filtered.	CT primary current / 5000	A
6	6,7		Power factor	0.001	
7	0,1	139	Voltage L1-L2 This value is calculated new after every voltage cycle. It is not filtered. Values smaller than 1.5% of the PT primary voltage have to be considered as zero.	PT Primary voltage / 4000	V
7	2,3	108	Voltage L2-L3 This value is calculated new after every voltage cycle. It is not filtered. Values	PT Primary voltage / 4000	V

CAN		Parameter ID	Description	Multiplier	Units
PDO	Data byte				
			smaller than 1.5% of the PT primary voltage have to be considered as zero.		
7	4,5	203	Voltage L3-L1 This value is calculated new after every voltage cycle. It is not filtered. Values smaller than 1.5% of the PT primary voltage have to be considered as zero.	PT Primary voltage / 4000	V
7	6,7	162	Angle wye voltage L1-L2	0.1	°
8	0,1		Voltage L1-N This value is calculated new after every voltage cycle. It is not filtered. Values smaller than 1.5% of the PT primary voltage have to be considered as zero.	PT Primary voltage / 4000	V
8	2,3		Voltage L2-N This value is calculated new after every voltage cycle. It is not filtered. Values smaller than 1.5% of the PT primary voltage have to be considered as zero.	PT Primary voltage / 4000	V
8	4,5		Voltage L3-N This value is calculated new after every voltage cycle. It is not filtered. Values smaller than 1.5% of the PT primary voltage have to be considered as zero.	PT Primary voltage / 4000	V
8	6,7	163	Angle wye voltage L2-L3	0.1	°
9	0,1		Active power L1 This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the power value has to be considered as zero. This is a two's complement value and may be positive or negative.	PT Primary voltage * CT primary current / 1616.58	W
9	2,3		Active power L2 This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the power value has to be considered as zero. This is a two's	PT Primary voltage * CT primary current / 1616.58	W

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CAN		Parameter ID	Description	Multiplier	Units
PDO	Data byte				
			complement value and may be positive or negative.		
9	4,5		Active power L3 This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the power value has to be considered as zero. This is a two's complement value and may be positive or negative.	PT Primary voltage * CT primary current / 1616.58	W
9	6,7	164	Angle wye voltage L3-L1	0.1	°
10	0,1		Reactive power L1 This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the reactive power value has to be considered as zero. This is a two's complement value and may be positive or negative.	PT Primary voltage * CT primary current / 1616.58	var
10	2,3		Reactive power L2 This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the reactive power value has to be considered as zero. This is a two's complement value and may be positive or negative.	PT Primary voltage * CT primary current / 1616.58	var
10	4,5		Reactive power L3 This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the reactive power value has to be considered as zero. This is a two's complement value and may be positive or negative.	PT Primary voltage * CT primary current / 1616.58	var
10	6,7		Total apparent power This value is calculated new after every voltage cycle of each phase. It is not filtered. If the voltage is lower than 1.5% of the PT primary voltage, the power value has to be considered as zero.	PT Primary voltage * CT primary current / 1616.58	VA

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CAN		Parameter ID	Description	Multiplier	Units
PDO	Data byte				
11	0,1,2,3	2520	Positive energy	0.1	kWh
11	4,5,6,7	2522	Positive reactive energy	0.1	kvarh
12	0,1,2,3	2524	Negative energy	0.1	kWh
12	4,5,6,7	2526	Negative reactive energy	0.1	kvarh
13	0..7		Reserve (0)		
14	0..7		Reserve (0)		
15	0..7		Reserve (0)		
16	0..7		Reserve (0)		

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