MULTIFUNKTIONALE ENERGIE SYSTEME

Power measuring and protective device MES2

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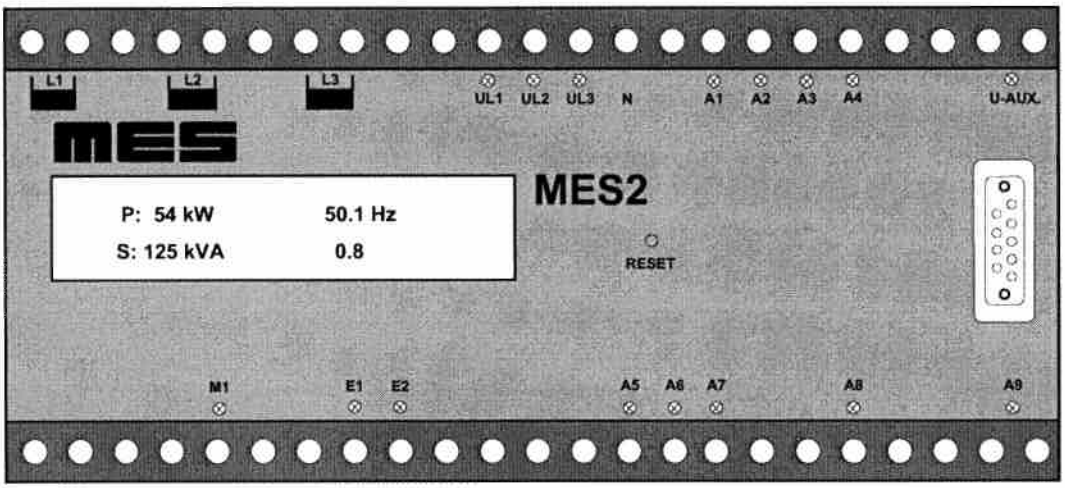


Figure 1

FEATURES

- LCD display for U, I, f, P, Q, S, cos φ and operation
- Setting of parameters for U, I, f, Q, S, cos φ and reverse power
- Setting of parameters for network protection
- Parameterized operational impulses for P and Q
- 9 parameter-set digital outputs
- 2 digital inputs
- 2 parameterized analogue outputs for U, I, kW, kVA and cos Λ
- Network protection of < U, U >, < f, f > and vector bounce
- Magnetic and thermal over-current monitoring
- Thermal trigger response according to VDE 0108
- Voltage and frequency detection for VDE 0108
- LED displays for operational, threshold and fault signals
- Illuminated LCD display
- Equipment self-monitoring
- All electrical measurement values are available at the interface
- MES interface
- Displaytext german/english
- Useable in 1A or 5A current transformer circuits

1.0 SCOPE OF APPLICATION

The MES2 power measuring and protection device collects and monitors electrical values in a three-phase circuit. In addition it is used to protect a plant against thermal and magnetic over-currents, reverse power and network disturbances in network interconnection.
Furthermore the MES2 fulfils the network interconnection mains protection conditions, as required by the German Power Authorities (VDEW).

By ordering the MES2 it is necessary to give up detailed information about the transformer current (... / 1A or ... / 5A).

2.0 METHOD OF OPERATION

The MES2 is a microprocessor controlled protection device.

The current measurement takes place as a simultaneous 3-phase scanning and is a true RMS measurement.

The voltage measurement is a true RMS measurement. All three measurement paths are measured simultaneously and, from > 10V, shown on the display.

By choosing the measurement method, the measurement can be made with or without a star neutral point. When measuring without a neutral point, it is not necessary to connect a neutral conductor.

The frequency measurement is only active with a measurement voltage greater than 45 V. With a measurement voltage < 45 V the MES2 operates with a parameter-set fundamental frequency in the range of 50 or 60 Hz (point 6, paragraph B14).

The power is calculated from the currents and voltages. The electrical values are shown on the LCD display (point 3.5) and are available at two analogue outputs (point 3.3.2). The threshold values can be adapted for the particular application (point 3.4.0). Two digital inputs and nine parameter-set digital outputs are available (point 3.3.1 and 3.3.3). All the electrical quantities can be accessed via an MES interface (point 3.3.4).

2.1 Power calculation

The calculation of the active power is performed according to the formula:

$$P = \int_0^t u(t) * i(t) dt$$

Thus the actual power is determined from the sum of the momentary power values over a time.

The apparent power is calculated from

$$U = \sqrt{\frac{1}{T}\int_0^T u^2 dt}; I = \sqrt{\frac{1}{T}\int_0^T i^2 dt} \quad \rightarrow \quad S = UxI$$

The apparent power is derived from the product of the effective values of voltage and current.

The reactive power is calculated as follows:

$$Q = \sqrt{S^2 - P^2}$$

For the integration, during the frequency measurement the period is determined. During one period 16 samples are made. The sampling is done with a resolution of 10 bits and is carried out with the correct sign. The entire interval of integration consists of 80 samples over 5 periods.

3.0 FUNCTION

3.1 Commissioning

The MES2 is to be connected in accordance with the connection diagram (figure 5).

After connecting the auxiliary voltage, the "U-AUX" LED will light, and as soon as the measurement voltages are present, LED's L1 - L3 will light and the measurement begins. The momentary measurement values are shown on the display (figure 1). Monitoring only starts at an input voltage greater than approx. 45V.

The equipment is factory pre-set and calibrated. See table under point 6 or factory test protocol.

3.2.0 Parameterization

For correct adaptation to the particular application, a number of parameters must be set. Before commissioning you have at first to parametrize the under point 6 para. B1-B5 specified values, to state the indication ranges and units of the measuring values. The values must be checked and adapted to the installation if necessary. The set ranges and trigger values can be read from the table under point 6. For leaving the parametering it is necessary to end the actual inputting.

For operating the SELECT-button, the ENTER-RESET-button and the DIP-switches, the front plate must be removed.

3.2.2 Parameter setting

Enter the parameter setting mode by switching the DIP-S2 to ON. Exit this mode by switching back to the OFF position. For leaving this mode it is first necessary to complete the inputs. For greatest possible data security, all set values are stored in an EEPROM. No buffer battery is required for this.

3.2.3 Parameter selection

Within the parameter setting mode the parameters are scrolled through the display by means of the SELECT button until the value to be modified is reached.

3.2.4 Input

Input or modification of the selected parameter is initiated by the ENTER button. The cursor position is then changed by pressing the ENTER button as well. Pressing the SELECT button causes the digit to count upwards, marked by the cursor. When all cursor positions having been scrolled through, return to the parameter selection by means of the ENTER button.

3.2.5 Measuring area selection

Parametering of measuring area for current, voltage and power follows automatically depending on the parametered transformer factors (point 6, paragraph B 1-2). The measuring area is shown in the following diagram. If measuring areas are not complying to your needs, a manual correction is possible (point 6, paragraph B 3-5).
The transformer factor results from the ratio from the primary to the secondary transformer current.
Example: Current transformer 100/5A results in a transformer factor 20.

Current (point 6, para.B1)	**Aut. area selection**	**measuring area**
Transformer factor <6	Final value 99,9A	00,1...99,9A
Transformer factor <51	Final value 999A	001...999A
Transformer factor <501	Final value 9,99kA	0,01...9,99kA
Transformer factor <5001	Final value 99,9kA	00,1...99,9kA
Transformer factor >5000	Final value 999kA	001...999kA
Voltage (point 6, para.B2)	**Aut. area selection**	**measuring area**
Transformer factor <4	Final value 999V	001...999V
Transformer factor <31	Final value 9,99kV	0,01...9,99kV
Transformer factor <301	Final value 99,9kV	00,1...99,9kV
Transformer factor >300	Final value 999kV	001...999kV
Power **Transformer factor current x voltage**	**Aut. area selection**	**measuring area**
=1	Final value 9,99kW	0,01...9,99kW
<6	Final value 99,9kW	00,1...99,9kW
<66	Final value 999kW	001...999kW
<660	Final value 9,99MW	0,01...9,99MW
<6600	Final value 99,9MW	00,1...99,9MW
>6599	Final value 999MW	001...999MW

3.2.6 Setting parameters to 50 Hz or 60 Hz power-line frequency

The MES2 can be used with 50 Hz or 60 Hz mains frequency. The mains frequency must be pre-selected (point 6, paragraph B14).

3.2.7 Active and reactive energy

The parameters of the pulses on an output relay are set: see point 6, paragraph C5 and figure 2, par. 17 and 18. The values of the active and reactive energy pulses must be adjusted to the installation (point 6, par. A24 and A25). If the energy reaches the pre-set threshold, then a pulse will be output. The pulse length is 1 s.

The active energy is displayed (point 3.5). Active and reactive power values will be stored for 24 hours after aux voltage supply failure. The values can be watched if DIP4 will be switched into ON position. Resetting this values follow by using the enter button if DIP4 is in ON position. While DIP4 is in ON position all control and measuring functions are ready for operation too.

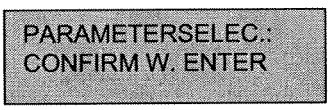
3.2.8 Mains protection

For parameter setting of mains protection limit values it is possible to select other than the manual values for voltage and frequency monitoring. These values can be changed under point 6, par. A3-6.

3.2.9 Coding

In order to avoid an unauthorized modification, entry to the parameter setting mode can be code-protected.

Text window:



and then press the ENTER- button.

Now all the parameters are protected against unauthorized or accidental modification, and can only be viewed.
If the coding is to be cancelled, the DIP-S2 has to be set to the ON position, the ENTER button kept pressed and the SELECT button pressed three times.

3.2.10 COS PHI

The indication range on the display of cos φ reaches from cap. - 0,5 to ind. + 0,5. The cap. range will be represented with a "-" before, the ind. range without algebraic sign. For correct values and indication the secondary current transformer current has to read min. 10% of nominal current transformer current. It means min. 500mA by using a .../5A current transformer. Below this value the calculation will be blocked. The display indicates cos φ = 0,00. Corresponds the cos φ to an analogue output, it will be 0VDC.

3.3.0 Inputs and outputs

3.3.1 Output relay

The MES2 has a total of nine relay outputs available. One of the 25 functions can be assigned to any output relay (point 6, par. C 1-9).

Function.-No.	Function	Display
1	Network protection: $F_{min} < F < F_{max}$; $U_{min} < U < U_{max}$; Vector bounce	MAINS PROTEC.
2	Lower frequency	F <= x
3	Upper frequency	F >= x
4	Frequency within the ranges $F_{min} < F < F_{max}$ / (quiescent current)	F OK (x<F<x)
5	Under voltage	U <= x
6	Over voltage	U >= x
7	Voltage within the ranges $U_{min} < U < U_{max}$ (quiescent current)	U OK (x<U<x)
8	Asymmetry	DELTA U MAX
9	Vector bounce	VECTORBOUNCE
10	Standby switching according to VDE0108 $U > U_{zu}$ and ($F > F_{zu}$ or Input 1)	U>Uzu&F>Fzu
11	Exceeding threshold value P1 and Time T1 or exceeding threshold value P2	(P1 & T1) I P2
12	Exceeding threshold value P3	P >=P max 3
13	Reverse power, negative power $P<P_{R1}$ and $T>T_{R1}$ or $P<P_{R2}$	(PR1&TR1) I PR2
14	Reactive power	Q >=Q max
15	Apparent power	S >=S max
16	Asymmetric load	Delta P max
17	Pulse per parameterized kWh	kWh >WPuls
18	Pulse per parameterized kVArh	KVAR>QPuls
19	Falling below a parameterized power factor	Cos<=PhiMin
20	Over-current threshold 1 magnetic/thermal	I >=I MAX 1
21	Over-current threshold 2 magnetic only	I >=I MAX 2
22	Operational Equipment O.K. (quiescent current)	PREP TO OPERA
23	Centralized fault (quiescent current)	COLLEC. FAULT
24	Digital Input 1	INPUT 1
25	Digital Input 2	INPUT 2

Figure 2

3.3.2 Analogue outputs

There are two parameterized 0 - 10V analogue outputs on the MES2. The following measurements can be assigned to the analogue outputs.

No.	Measurement	Display
1	voltage L1-N	UL1
2	Voltage L2-N	UL2
3	Voltage L3-N	UL3
4	Current L1	IL1
5	Current L2	IL2
6	Current L3	IL3
7	Active power L1	PL1
8	Active power L2	PL2
9	Active power L3	PL3
10	Total active power (kW)	P Ges
11	Total apparent power (kVA)	S Ges
12	Cos Phi	Cos Phi

Figure 3

The start and end values can be set as parameters. The parameterization is made in the valid number range (point 6, pa. B6-13).
For analogue output voltage and current have to reach the following min. values:
voltage values - phase / neutral >45VAC ; current - I > 6% of secondary nominal current transformer current. For cos φ output I > 10% of secondary nominal current transformer current.

example 1:

Analogue output is to be assigned to active power. The output is to operate in the range of 0 – 200KW.

start value : 0 KW
end value : 200 KW

The parameterized start value 0 KW corresponds to a voltage of 0 VDC and an end value of 10 VDC to 200 KW.

example 2:

Analogue output is to be assigned to cos φ. The output is to operate in the range of cap. – 0,5 to ind. + 0,5.

start value : cap. - 0,5
end value : ind. + 0,5

The parameterized start value cap. –0,5 corresponds to a voltage of 0 VDC and an end value of 10 VDC to ind. +0,5. Values between rises in-line. So a cos φ of 1 correspond to 5 VDC.

3.3.3 Inputs

The device has two inputs.

E1: The input is processed in the standby switching function. The switching is also performed at a frequency which is smaller than the set standby frequency. In addition, the input can be assigned to another output relay (figure 2, par. 24).

E2: Input can be used for two different functions. If "AUTO" is parametrized (point 6, par. B17) reset follows automatically. By setting this input mains protection trip can be suppressed (no parallel operation). If "E2" is parametrized, reset follows by setting the input (manual reset). Also it is possible to assign this input to an output (pic.2, function-nr. 25).

3.3.4 Interface

All the measurement and threshold values listed in the table can be transferred from the MES interface to a Profi-Bus DP Interface with the help of a CBK2 interface converter.

The interface must be activated by setting a number > 0 (point 6, par. C11). If there are several devices on the MES Bus, then the device number can be determined by setting different coding.

3.4.0 Trippings

If one of the measurement values exceeds or falls below one of the pre-set thresholds in at least one phase (point 6, par. A1-27) then an appropriately parametrized output relay can be activated (point 6, par. C1-9 and figure 2). In addition the corresponding LED of the output relay will light up.

If the value falls below the threshold again, the switch returns, without hysteresis, after 2s to its home position (point 6, par. B22).

3.4.1 Magnetic or thermal over-current monitoring

The threshold "I_{max} 1" can be pre-selected with a parameter to whether it should function as a magnetic or thermal trigger (point 6, par. C12).

If thermal over-current monitoring is activated for threshold "I_{max} 1", then the threshold will be determined by the characteristic of a motor protection switch, according to a current-time characteristic (figure 4). The trigger delay (point 6, par. A21) is not active. The MES2 integrates the current values of the past 12 hours and activates the appropriate threshold value relay when 110% of the nominal current has been reached for 60 minutes (e.g. point 6, par. C1). As threshold values, the selected current values for I_{nom} with 110% for 3600s = 1 hour and 400% I_{nom} for 3s are used.

The threshold "I_{max} 2" has a magnetic triggering behaviour. When the threshold value is reached, the output relay is activated (point 6, e.g. par. C2).

3.4.2 110% overload tripping according to VDE 0108

The MES2 fulfils the requirement of VDE 0108 (emergency power operation for meeting places) in which, for a maximum of 60 minutes during a 12 hour interval, 110% of the nominal current may be delivered.

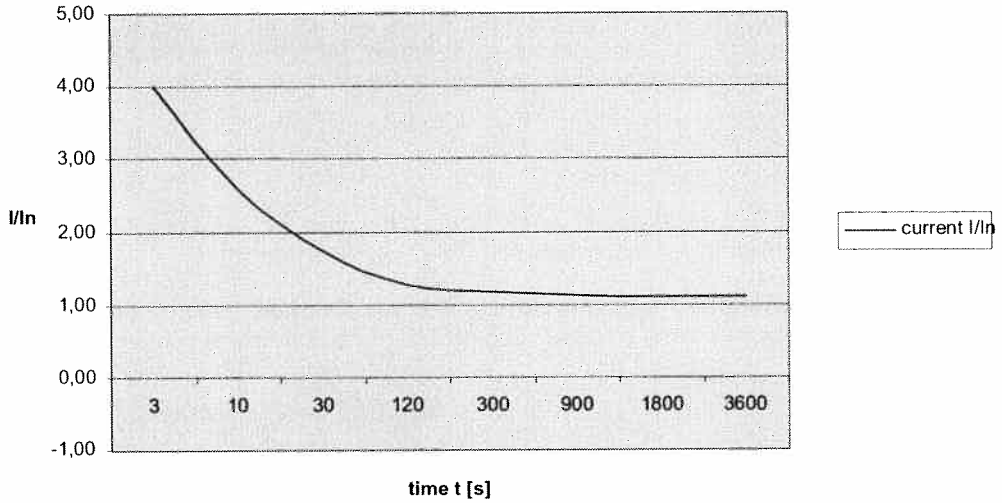


Figure 4: Overload tripping

3.4.3 Reset after tripping

Reset follows automatically if the depended measuring value is the right range again and reset time is expired. Reset time starts with beginning of tripping. If the event is longer present than reset time is long the trip relay will be deenergized immediately. If the event is shorter than reset time is long, the trip relay is energized until reset time is expired. Reset time is adjustable (point 6, par. B18)

A reset can also be performed by switching input E2. The parameter is described in point 6, par. B17.

3.4.4 Centralized fault alarm

An output relay can be pre-selected as a centralized fault alarm. If the centralized fault alarm is parameterized, for example, the output relay drops together with the first tripping event, and stays down as long as the event continues (point 6, par. C7 and figure 2, par. 23). The corresponding LED lights up.

The following thresholds lead to a centralized alarm:
Under-voltage, over-voltage, under-frequency, over-frequency, vector bounce, cos Λ, reverse power 1 and 2, over-power 1 and 2, reactive power, apparent power, load unbalance, asymmetry and operating message

3.4.5 Operating message

An output relay can be selected as an operating message. If the operating message is parameterized, for example, output relay A9 is activated after the device is supplied with auxiliary voltage, the measurement has started and the internal device monitoring has not been addressed (point 6, par. C9 and figure 2, par. 22). The corresponding LED lights up.

3.5. Scrolling in the display

During operation the standard message is displayed (figure 1). The set-up of the standard message can be modified with parameter C10 (point 6).

If the ENTER button is pressed, the following messages are possible:

Plain text	*Display*	*Parameter C10*
Active power, frequency, Apparent power, cos φ	P: 98 kW 50,2 cy S: 123 kVA 0.80	Display P total
Phase currents, Phase voltages	23 A 22 A 23 A 221 V 222 V 221 V	Display U&I L1-3
Reactive power, frequency, Apparent power, cos φ	Q: 73 kVAR 50,2 S: 123 kVA 0.80	Display Q total
Phase power, frequency	P1 98kW 50,2cy P2 96 P3 99	Display PL1-PL3
Energy, frequency Apparent power, cos φ	W: 0 kWh 50,2cy S: 123kVA 0.80	Display W total
Phase currents, Outer conductor voltages	23 A 22 A 23 A 400 V 399 V 400 V	Display U12-U31

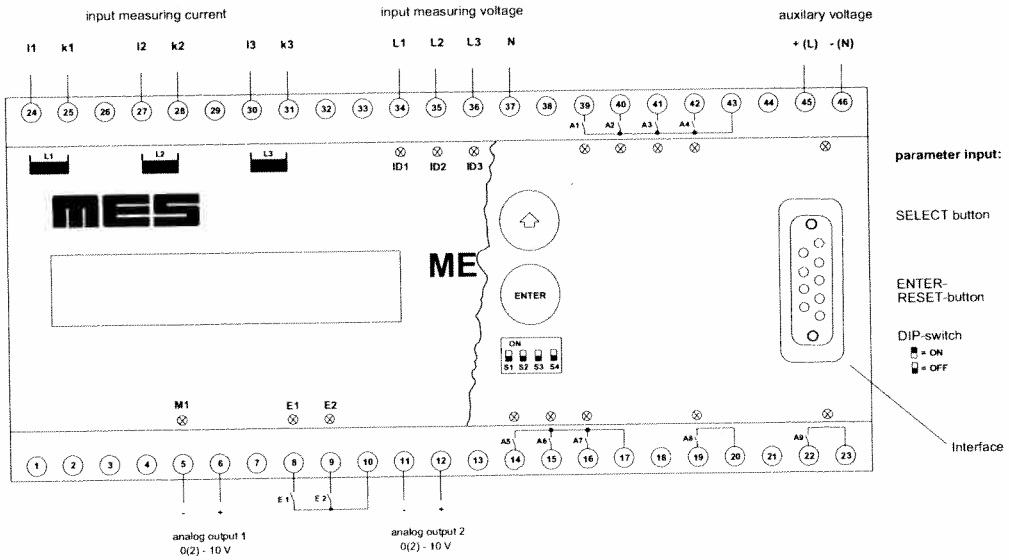
If the ENTER button is no longer pressed, then after approximately 10s the standard message is displayed again.

The following messages can be displayed with the WAHL (SELECT) button:

Transducer factors	TRANSFORM.FACTOR I 1:1 U 1:1
Date, time	DATE : 1.01 00 TIME : 9.09 06
Fundamental frequency, Output A9	NOMINAL F. 50 cy A9: PREP TO OPERA

If the WAHL (SELECT) button is no longer pressed, then after approximately 10s the standard message is displayed again.

4.0 CONNECTING DIAGRAM



digital outputs : A1 - A9 siehe 3.3.1
digital inputs : E1 - E2 siehe 3.3.3
analog outputs : AA1 und AA2 siehe 3.3.2

For access to the SELECT-, ENTER/RESET buttons and DIP-switch, the front cover must be removed

Figure 5

5.0 DIMENSIONS

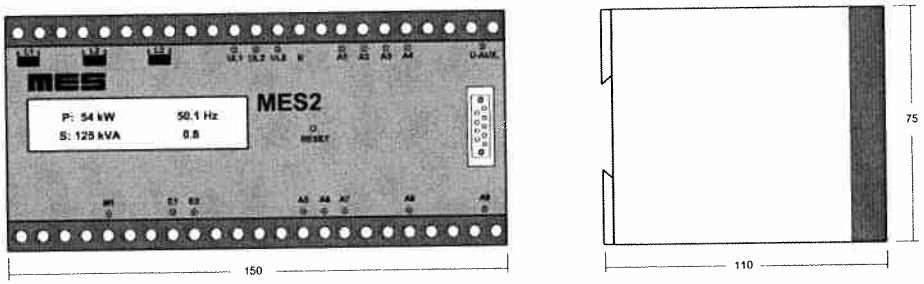


Figure 6

6.0 SET VALUES AND PARAMETER SETTINGS

Electrical values of the equipment:

Power	
Primary nominal current	I_n= A
Current transducer transmission	/ A
Voltage transducer transmission	/ V

Para. No.	Parameter	Display range	Basic pre-set	Setting Factory	Setting Comm.
B	**Pre-set values** DIP-Switches 2 and 3 = ON				
1	Current transducer ratio	I-TRANS: 1 : 9999	0001		
2	Voltage transducer ratio	U-TRANS: 1 : 3999	0001		
3	Correction for measuring area current (see 3.2.5)	FIN.VAL I: 99,9A...999kA	99,9A		
4	Correction for measuring area voltage (see 3.2.5)	FIN.VAL U: 999V...999kV	999V		
5	Correction for measuring area power (see 3.2.5)	FIN.VAL P: 9,99kW...999MW	9,99kW		
6	Analogue output 1 0 – 10 V or 2 – 10 V	ANALOG 1: 0 – 10V/ 2 – 10 V	0 - 10 V		
7	Assignment of Analogue Output 1 (see 3.3.2)	ANALOG 1: ...❶	P Ges		
8	Start value Analogue Output 1	A1START (kW)o.(MW) 0,00 – 999	0,00 kW		
9	End value Analogue Output 1	A1 END (kW)o.(MW) 0,00 – 999	1,00 kW		
10	Analogue Output 2 0 – 10 V or 2 – 10 V	ANALOG 2: 0 – 10V/ 2 – 10 V	0 – 10 V		
11	Assignment of Analogue Output 2 (see 3.3.2)	ANALOG 2: ...❶	CosPhi		
12	Start value Analogue Output 2	A2START 0,00 – 9,99	-0,50		
13	End value Analogue Output 2	A2 END 0,00 – 9.99	+0,50		
14	Fundamental frequency	NOMINAL F. 50 / 60 cy	50 cy		
15	Current correction factor	CORR. I: 0,5 – 1,5	1,000		
16	Voltage correction factor	CORR. U: 0,5 – 1,5	1,000		
17	E2: Reset function at E2 input AUTO: Autoreset and mains protection will be disabled	RESET: E2 / AUTO	AUTO		
18	Reset time	T-RESET: 0,00 – 99,9 s	2,0 s		

Para. No.	Parameter	Display range	Basic pre-set		Setting Factory		Setting Comm.	
A	**Threshold values** DIP-Switch 2 = ON							
1	Standby voltage	U-Zu: (V)o.(kV) 001...280	**A5**	207 V				
2	Standby frequency	F-Zu: 30...70 cy		48 cy				
3	Under-voltage network protection	U-Min: (V)o.(kV) 001...999	**A7**	207 V				
4	Over-voltage network protection	U-Max: (V)o.(kV) 001...999		253 V				
5	Under-frequency network protection	F-Min: 30...70 cy		49,2 cy				
6	Over-frequency network protection	F-Max: 30...70 cy		50,8 cy				
7	Under-voltage	U < x: (V)o.(kV) 001...999	–	196 V				
8	Over-voltage	U > x: (V)o.(kV) 001...999	–	253 V				
9	Under-frequency	F < x: 30...70 cy	–	48,5 cy				
10	Over-frequency	F > x: 30...70 cy	–	55 cy				
11	Vector bounce	Vektorsp: 0 – 99°	**A7**	6°				
12	Cos φ min	Cos-Min: 0,50 – 0,99	–	0,8				
13	Max. power 1	P-Max1: (kW)o.(MW) 0,01...999	–	1,00 kW				
14	Delay max. power 1	T-Max1.: 00,0...99,9 s	–	15,0 s				
15	Max. power 2	P-Max2: (kW)o.(MW) 0,01...999	–	1,00 kW				
16	Max. power 3	P-Max3: (kW)o.(MW) 0,01...999	**A3**	1,00 kW				
17	Reverse power 1	P-R1: (kW)o.(MW) 0,01...999	**A4**	1,00 kW				
18	Delay reverse power 1	T-R1: 00,0...99,9 s		10,0 s				
19	Reverse power 2 (non-delayed)	P-R2: (kW)o.(MW) 0,01...999		1,00 kW				
20	Max. current 1	I-Max 1: (A)o.(kA) 00,1...999	**A1**	00,1 A				
21	Delay max. current 1	T-I1: 00,0...99,9 s		00,0 s				
22	Max. current 2	I-Max2: (A)o.(kA) 00,1...999	**A2**	00,1 A				
23	Delay max. current 2	T-I2: 00,0...99,9 s		00,0 s				
24	Max. reactive power	Q-Max: (kVAR)o.(MVAR) 0,01...999	–	1,00 kVAR				
25	Max. apparent power	S-Max: (kVA)o.(MVA) 0,01...9,99	–	1,00 kVA				
26	Max. unbalanced load	Delta-P: 001 – 100 %	–	30 %				
27	Asymmetry	Delta-U: 0 – 100 %	–	30 %				
28	Active energy, (kWh)o.(MWh)-pulses	WPuls: (kWh)o.(MWh) 0...9999	**A6**	0001 kWh				
29	Reactive energy, (kVArh)o.(MVARh)-pulses	QPuls: (kVARh)o.(MVARh) 0...9999	–	0001 kVARh				

Para. No.	Parameter	Display range	Basic pre-set	Setting Factory	Setting Comm.
C	**Configuration** DIP-Switch 2 and 4 = ON				
1	Assignment of output relay 1 (see 3.3.1)	A1: ...	I >=Imax 1		
2	Assignment of output relay 2 (see 3.3.1)	A2: ...	I >=Imax 2		
3	Assignment of output relay 3 (see 3.3.1)	A3: ...	P >=Pmax 3		
4	Assignment of output relay 4 (see 3.3.1)	A4: ...	(PR1&TR1) I IPR2		
5	Assignment of output relay 5 (see 3.3.1)	A5: ...	U>Uzu&F>Fzu		
6	Assignment of output relay 6 (see 3.3.1)	A6: ...	KWh >Wpuls		
7	Assignment of output relay 7 (see 3.3.1)	A7: ...	MAINS PROTEC.		
8	Assignment of output relay 8 (see 3.3.1)	A8: ...	COLLEC. FAULT		
9	Assignment of output relay 9 (see 3.3.1)	A9: ...	PREP TO OPERA		
10	Standard message (see 3.3.5)	INDICA. ...	P TOTAL		
11	Indicator for data transmission 0000 = no data transmission 0001 = data transmission	CODE: 0000 oder 0001	0000		
12	Trip characteristic from max. current1 (A16) thermical or magnetical	I1 THERMICAL / I1 MAGNETICAL	I1 THERMICLAL		
13	Displaytext language	SPRACHE DEUTSCH / LANGUAGE ENGLISH	ENGLISH		

Coding Switch					
Function	**DIP S1**	**DIP S2**	**DIP S3**	**DIP S4**	
Operating condition	OFF	OFF	OFF	OFF	
Set Parameter A	OFF	**ON**	OFF	OFF	
Set Parameter B	OFF	**ON**	**ON**	OFF	
Set Parameter C	OFF	**ON**	OFF	**ON**	
Watching and resetting of active and reactive power Operation functions are ready for operation will be kept	OFF	OFF	OFF	**ON**	

7.0 TECHNICAL DATA

Measuring voltage	70/40 - 484/280 V
Nominal frequency range	30 – 70 cy. +/- 0,2 cy
Current transducer-/ Measuring range	.../1A 0,02 – 2,5A AC ... / 5 A 0,10 – 12,5A AC
Measuring inputs	50 x I_{nom} 1 ms
Burden	0,25VA at I_{nom}=5A
Overload stabil	3.5 x I_{nom} permanent
Fault at nominal measuring	U: < 1 % of final value I: < 1 % of final value P: < 1 % of final value Cos Phi: < 2 % of final value F: < 1 % of final value
Auxiliary voltage	19 – 32 VDC
Power consumption	Ca. 3 VA
Digital inputs	12 V, 8 mA (internal voltage), conductors maximum length 2.5 m
Relay outputs	230 V AC/DC, 2A, in four groups, potential separated
Analogue outputs	0-10 VDC : Burden > 3,6 kΩ No galvanic separation from the digital inputs Galvanic separation from the auxiliary voltage and the interface
Test voltage	2,5 kV
Ambient temperature	0 ... +50 °C
Casing	plastic Makrolon 8020 grey / VDE 0100 / VBG4
Dimensions	W150 x H110 x D75 mm
Mounting	snap-on rail according to DIN 50022 or screw mounting
Degree of protection	IP 20
Weight	840 g
Mounting position	any
Regulations	VDE 0160 / EN50178 ; VDE 0435 part 303 ; VDE 0110 IEC 255-6 ; VDE 0108 VDEW parallel operation with low voltage mains, 3rd edition 1991
EMC compatibility and CE-marking	interference range EN 50081-1, for industrial field interference stability range EN 50082-2, for industrial field

Subject to technical modifications!
This device is the replacement type for previous type MES1.

MULTIFUNKTIONALE ENERGIE SYSTEME

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