Ziegler

Redefine Innovative Metering

Technical Datasheet

ZOT MF20|MF42|MF24

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

www.ziegler-instrument.com

ZOT MF20|MF42|MF24

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

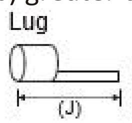
Product Features

- For all heavy-current power system variables , Up to 6 outputs (2A+ 4D or 4A+ 2D or 2Aor 3A) , Input voltage up to 693 V (phase-to-phase) , Universal analogue outputs (programmable)
- Simultaneous measurement of several variables of a heavy-current power system / full supervision of an asymmetrically loaded four-wire power system, rated current 1 to 6 A, rated voltage 57 to 400 V(phase to neutral) or 100 to 693 V (phase-to- phase)
- High accuracy: U/I 0.2%, Frequency 0.15% and P 0.25% (under reference conditions)
- Universal digital outputs (meter transmitter, limits)
- Up to 2 or 4 integrated power meters.
- AC/DC power supply/universal (24-60V AC/DC or 85-230V AC/DC)
- Provision for either snapping the transducer onto top - hat rails or securing it with screws to a wall or panel
- Windows software with password protection for programming, data analysis, power system status simulation, acquisition of meter data and making settings

Technical Specifications

Input	
Waveform	Sinusoidal
Rated frequency	50...60 Hz; 16 2/3 Hz
Own consumption	Voltage circuit: ≤ U^2 / 400 kΩ Condition: external power supply Current circuit: 0.3 VA I/5 A
Digital outputs, pulse outputs, limit outputs	
Type of contact	Open collector
Number of pulses	see "Ordering information"
Pulse duration	≥ 100 ms
Interval	≥ 100 ms
Power supply	8 ... 40 V
Output current	ON 10 ... 27 mA OFF ≤ 2 Ma
System Response	
Accuracy class	(the reference value is the full- scale value Y2)
Duration of the measurement cycle	Approx. 0.25 to 0.5 s at 50 Hz,,depending on measured variable & programming
Response time	1 ... 2 times the measurement cycle
Reference Conditions	
Ambient temperature	+ 23 °C ± 1 K
Pre-conditioning	30 min. acc. to DIN EN 60 688
Input variable	Rated useful range
Power supply	H =Hn + 1%
Active/reactive factor	Cos = 1 resp. sin = 1
Frequency	50 ... 60 Hz, 16 2/3 Hz

Waveform	Sinusoidal, form factor 1.1107
Output load	DC current output: $R_n = \frac{7.5\ V}{Y2} + 1\%$ DC voltage output: $R_n = \frac{Y2}{1\ mA} + 1\%$
Miscellaneous	DIN EN 60 688
Power Supply	
AC voltage	100, 110, 230, 400, 500 or 693 V, + 10%, 45 to 65 Hz Power consumption approx 10VA
Consumption	< 9 W resp. <10VA
Ambient conditions	
Climatic rating	Climate class 3 acc. To VDI/VDE3540
Variations due to ambient temperature	± 0.1% / 10 K
Nominal range of use for temp.	0...15...30...45 °C(usage group II)
Storage temperature	- 40 to + 850 C
Annual mean relative humidity	< 75%
Safety	
Protection class	II
Enclosure protection	IP 40, housing; IP 20, terminals
Overvoltage category	III
Insulation test (versus earth)	Input voltage : AC 400 V Input current : AC 400 V Output : DC 40 V Power supply : AC 400 V DC 230 V
Surge test	5 KV; 1.2/50 µs;0.5 Ws
Test voltages	50 Hz, 1 Min. according to DIN EN 61 010-1 5550 V, inputs versus all other circuits as well as outer surface 3250 V, input circuits versus each other 3700 V, power supply versus outputs and SCI as well as outer surface 490 V, outputs and SCI versus each other and versus outer surface
Vibration withstand(tested according to DIN EN 60 068-2-6)	
Acceleration	± 2g
Frequency range	10...150 10 Hz, rate of frequency sweep: 1 octave/minute
Number of cycles	10 in each of the three axes
Result	No faults occurred, no loss of accuracy and no problems with the snap fastener
Installation data	
Housing	See Section "Dimensional drawings”
Housing material	Lexan 940 (polycarbonate), flammability

	class V-0 acc. to UL 94, self-extinguishing, non- dripping, free of halogen
Mounting	For snapping onto top-hat rail (35X15 mm or 35X7.5 mm) acc. to EN 50 022 or directly onto a wall or panel using the pull-out screw hole brackets
Orientation	Any
Weight	With supply transformer approx. 1.1 kg With AC/DC powerpack approx. 0.7 kg
Terminals	
Type	Screw terminals with wire guards
Max. wire gauge	≤ 4.0 mm^2 single wire or 2 X 2.5 mm^2 fine wire (use Taparia Screw driver-type 902)
Lugs	To use flat head lugs with total metal length (J) greater than or equal to 17mm. 

Measured variables	Output	Types
Current, voltage (rms), active/reactive/ apparent power cos, sin, power factor RMS value of the current with wire setting range (bimetal measuring function)	2 analogue outputs	ZOTM20
	3 analogue outputs	ZOTM30
	2 analogue outputs and 4 digital outputs or	ZOTM24
	4 analogue outputs and 2 digital outputs	ZOTM42
Slave pointer function for the measurement of the RMS value IB Frequency	4 analogue outputs and bus RS 485 (MODBUS)	ZOT M40 *
	Data bus (LON) M00	ZOTM00 *
	Bus RS 485 (MODBUS)	ZOTM01 *
Average value of the currents with sign of the active power (power system only)		

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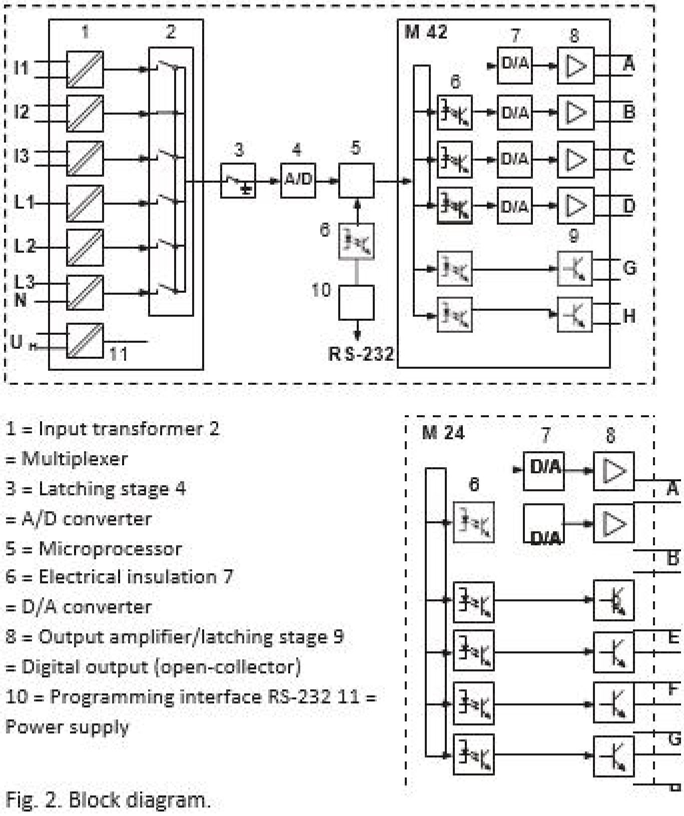

Fig. 2. Block diagram.

Models	Analog Output	Digital Output	Communication type	Programming Port
M42	4(A,B,C,D)	(G,H)	-	RS 232
M24	2(A,B)	(E,F,G,H)	-	RS 232
M20	2(A,B)	-	-	RS 232
M30	3(A,B,C)	-	-	RS 232
M00	-	-	LON Bus	RS 232
M40	4(A,B,C,D)	-	RS 485	RS 232
M01	-	-	RS 485	RS 232

Symbols And Their Meenings

Symbols	Meaning
X	Measured variable
X0	Lower limit of the measured variable
X1	Break point of the measured variable
X2	Upper limit of the measured variable

Y	Output variable
Y0	Lower limit of the output variable
Y1	Break point of the output variable
Y2	Upper limit of the output variable
U	Input voltage
Ur	Rated value of the input voltage
U 12	Phase-to-phase voltage L1 - L2
U 23	Phase-to-phase voltage L2 - L3
U 31	Phase-to-phase voltage L3 - L1
U1N	Phase-to-neutral voltage L1 - N
U2N	Phase-to-neutral voltage L2 - N
U3N	Phase-to-neutral voltage L3 - N
UM	Average value of the voltages
	(U1N + U2N + U3N) / 3
I	Input current
I1	AC current L1
I2	AC current L2
I3	AC current L3
Ir	Rated value of the input current
IM	Average value of the currents (I1+ I2 + I3) / 3
IMS	Average value of the currents and sign of the active power (P)
IB	RMS value of the current with wire setting range (bimetal measuring function)
IBT	Response time for IB
BS	Slave pointer function for the measurement of the RMS value IB

BST	Response time for BS
	Phase-shift between current and voltage
F	Frequency of the input variable
Fn	Rated frequency
P	Active power of the system P = P1 + P2 + P3
P1	Active power phase 1 (phase-to-neutral L1 - N)
P2	Active power phase 2 (phase-to-neutral L2 - N)
P3	Active power phase 3 (phase-to-neutral L3 - N)
Q	Reactive power of the system Q = Q1 + Q2 + Q3
Q1	Reactive power phase 1 (phase-to-neutral L1-N)
Q2	Reactive power phase 2 (phase-to-neutral L2-N)
Q3	Reactive power phase 3 (phase-to-neutral L3-N)
S	Apparent power of the system S = I 2 + I 2+ I 2 U 2 + U 2+ U 2 1 2 3 1 2 3
S1	Apparent power phase 1 (phase-to-neutral L1-N)
S2	Apparent power phase 2 (phase-to-neutral L2-N)
S3	Apparent power phase 3 (phase-to-neutral L3-N)
Sr	Rated value of the apparent power of the system
PF	Active power factor cos =P/S
PF1	Active power factor phase1 P1/S1
PF2	Active power factor phase2 P2/S2
PF3	Active power factor phase3 P3/S3
QF	Reactive power factor sin j =Q/S
QF1	Reactive power factor phase1 Q1/S1
QF2	Reactive power factor phase2 Q2/S2

QF3	Reactive power factor phase3 Q3/S3
LF	Power factor of the system LF = sgnQ (1- PF)
LF1	Power factor phase 1 sgnQ1 (1 - PF1)
LF2	Power factor phase 2 sgnQ2 (1 - PF2)
LF3	Power factor phase 3 sgnQ3 (1 - PF3)
c	Factor for the intrinsic error
R	Output load
Rn	Rated burden
Symbols	Meaning
H	Power supply
Hn	Rated value of the power supply
CT	c.t. ratio
VT	v.t. ratio

Continuous Thermal Ratings Of Inputs

Current circuit	10 A 400 V single-phase AC system 693 V three-phase system
Voltage circuit	480V single-phase AC system 831V three-phase system

Short Time Thermal Rating Of Inputs

Input variable	Number of inputs	Duration of overload	Interval between two overloads
Current circuit	400 V single-phase AC system 693 V three-phase system		
100 A	5	3 s	5 min.
250 A	1	1 s	1 hour
Voltage circuit	1 A, 2 A, 5 A		
Single-phase AC system 600 V Hintern: 1.5 Ur	10	10 s	10 s.
Three-phase system 1040 V Hintern: 1.5 Ur	10	10 s	10 s.

Analog Ouput

Output variable Y		Impressed DC current	Impressed DC voltage
Full scale Y2		see "Ordering information”	see "Ordering information”
Limits of out signal for in overload and/or	put put R=0	see "Ordering information” 1.25 Y2	see "Ordering information” 40 mA
	R	30V	1.25 Y2
Rated useful range of output load		0 7.5 V / Y2 15 V / Y2	Y2 / 1 mA

AC component of output signal (peak-to-peak)	0.005 Y2	0.005 Y2

Measured variable	Condition	Accuracy class*
System: Active, reactive and apparent power	0.5 X2/Sr 1.5 0.3 X2/Sr < 0.5	0.25 c 0.5 c
Phase: Active, reactive and apparent power	0.167 X2/Sr 0.5 0.1 X2/Sr < 0.167	0.25 c 0.5 c
Power factor, active power and reactive power	0.5Sr S 1.5 Sr, (X2 - X0) = 2 0.5Sr S 1.5 Sr, 1 (X2 - X0) < 2 0.5Sr S 1.5 Sr, 0.5 (X2 - X0) < 1 0.1Sr S< 0.5 Sr, (X2 - X0) = 2 0.1Sr S< 0.5Sr, 1 (X2 - X0) < 2 0.1Sr S < 0.5Sr, 0.5 (X2 - X0) < 1	0.25 c 0.5 c 1.0 c 0.5 c 1.0 c 2.0 c
AC Voltage	0.1 Ur U 1.2 Ur	0.2 c
AC current/ current averages	0.1 Ir I 1.5 Ir	0.2 c
System frequency	0.1 Ur U 1.2 Ur resp. 0.1 Ir I 1.5 Ir	0.15+ 0.03 c (f_N =50...60 Hz) 0.15 + 0.1 c (f_N =16 2/3 Hz)
Pulse	acc. to IEC 1036 0.1 Ir I 1.5 Ir	1.0 c

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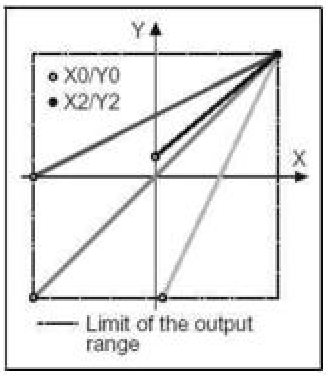

Fig. 3. Examples of settings with linear characteristic.

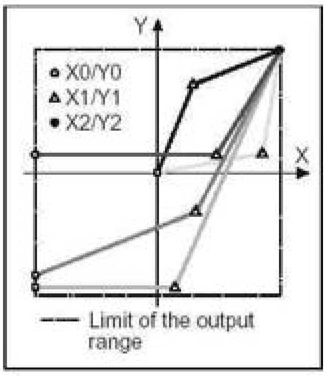

Fig. 4. Examples of settings with bent characteristic.

Linear characteristic

$$c = \frac{1 - \frac{Y0}{Y2}}{1 - \frac{X0}{X2}} \text{ or } c = 1$$

Bent characteristic

$X0 \leq X \leq X1$

$$c = \frac{Y1 - Y2}{X1 - X2} \cdot \frac{X2}{Y2} \text{ or } c = 1$$

$X1 \leq X \leq X2$

$$c = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}} \text{ or } c = 1$$

Rated Voltages And Tolerances

Rated voltage U_N	Tolerance
24 ... 60 V DC/AC	DC -15 ... + 33% AC ±10%
85 ... 230 V DC/AC	

Applicable Standards

DIN EN 60 688	Electrical measuring transducers for converting AC electrical variables into analogue and digital signals
IEC 1010 or EN 61 010	Safety regulations for electrical measuring, control and laboratory equipment
EN 60529	Protection types by case (code IP)
IEC 255-4 Part E5	High-frequency interference test (solid-state relays only)
IEC 1000-4-2,3,4,6	Electromagnetic compatibility for industrial process measurement & control equipment
VDI/VDE 3540, page2	Reliability of measuring and control equipment (classification of climates)
DIN 40 110	AC quantities
DIN 43 807	Terminal markings
IEC 68 /2-6	Basic environmental testing procedures, vibration, sinusoidal
IEC 1036	Solid state AC watt hour meters for active power (Classes 1 and 2)

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DIN 43864	Current interface for the transmission of impulses between impulse encoder counter and tariff meter
UL 94	Tests for flammability of plastic materials for parts in devices and appliances

ZOT MFXX STANDARD VERSION : The two versions of the transducer below with the **basic** programming are available AC Aux. & AC/DCAux.

Description / Basic programming		**M 42**	**M 24**	**M20**	**M30**	**M40**	**M00**	**M01**
Mechanical design: Rated frequency:	Housing T24 for rail and wall mounting 50 Hz (60 Hz admissible without additional error, re-programming by user for 16 2/3Hz possible, but with additional error 1.25 c)				□ □			
Power supply:	**230 VAC** **85...230 V DC/AC**				□ □			
Power supply:	External connection (standard)	□	□	□	□	□	□	□
Full-scale output signal, output A:	Y2 = 20 mA	□	□	□	□	□	N. A.	N. A.
Full-scale output signal, output B:	Y2 = 20 mA	□	□	□	□	□	N. A.	N. A.
Full-scale output signal, output C:	Y2 = 20 mA	□	N. A.	N. A.	N. A.	□	N. A.	N. A.
Full-scale output signal, output D:	Y2 = 20 mA	□	N. A.	N. A.	N. A.	□	N. A.	N. A.
Test certificate:	None supplied	□	□	□	□	□	□	□
Programming:	Basic	□	□	□	□	□	□	□
Optional Display: See Table 15 : "Ordering information for MXX models" RISH Ducts		N. A.	N. A.	N. A.	N. A.	N. A.	N. A.	N. A.
Basic programming Application: Input voltage: Input current:	4-wire,3-phase system, asymmetric load(NPS) Design value Ur = 400 V Design value Ir = 5 A without specification of primary ratings				□ □ □			
Measured variable, output A: Output signal, output A:	P1; X0= 115.47 W; X2 = 115.47 W # DC current Y0 = - 20 mA; Y2 = 20 mA Linear characteristic Standard limits	□	□	□	□	□	N. A.	N. A.
Measured variable, output B: Output signal, output B:	P2; X0 = - 115.47; X2 = 115.47 W # DC current Y0 = - 20 mA; Y2 = 20 mA Linear characteristic Standard limits	□	□	□	□	□	N. A.	N. A.
Measured variable, output C: Output signal, output C:	P3; X0 = 115.47 W; X2 = 115.47 W # DC current Y0 = - 20 mA; Y2 = 20 mA Linear characteristic Standard limits	□	N. A.	N. A.	□	□	N. A.	N. A.
Measured variable, output D: Output signal, output D:	P; X0 = - 346.41; X2 = 346.41 W# DC current Y0 = - 20 mA; Y2 = 20 mA Linear characteristic Standard limits	□	N. A.	N. A.	N. A.	□	N. A.	N. A.
Output signal, output E:	Limit P; XI = 311.77 W # Output ON if X>XI Min. pick-up delay	N. A.	□	N. A.	N. A.	N. A.	N. A.	N. A.
Output signal, output F:	Limit Q; XI= 34.64 var # Output ON if X>XI Min. pick-up delay	N. A.	□	N. A.	N. A.	N. A.	N. A.	N. A.
Measured variable, output G:	Limit P1; XI= 115.47 W # Output ON if X> XI Min. pick-up delay	□	□	N. A.	N. A.	N. A.	N. A.	N. A.
Measured variable, output H:	Limit I1; XI = 2 A # Output ON if X> X1 Min. pick-up delay	□	□	N. A.	N. A.	N. A.	N. A.	N. A.

Other specifications on request contact to Factory

Connection Diagram and Installation

Function		Connection
Meas. input AC current Meas. input AC Voltage	IL1 IL2 IL3 UL1 UL2 UL3 N	1 / 3 4 / 6 7 / 9 2 5 8 11
Outputs Analogue A B C D	Digital + + E + F + G + H +	15 16 17 18 19 20 21 22 23 24 25 26
Power Supply AC DC +	~ ~ -	13 14 13 14

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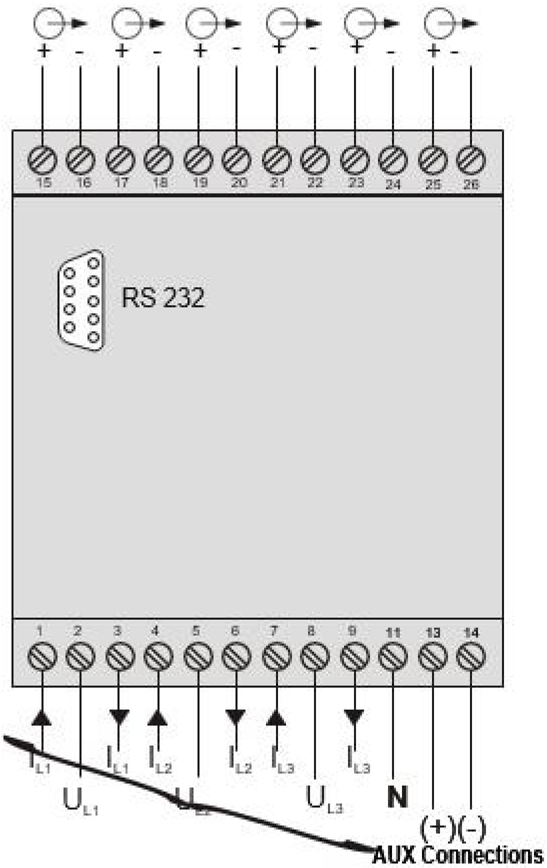
If power supply is taken from the measured voltage internal connections are as follow:

Application (system)	Internal connection Terminal / System
Single phase AC current	2 / 11 (L1 - N)
4-wire 3-phase symmetric load	2 / 11 (L1 - N)
All other *	2 /5 (L1 - L2)



	Modbus
M40	23, 24, 25, 26 (RS 485)
M00	15, 16 LON Bus
M01	23, 24, 25, 26 (RS 485)

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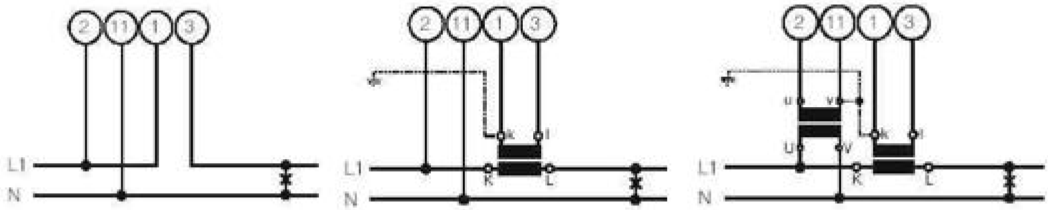
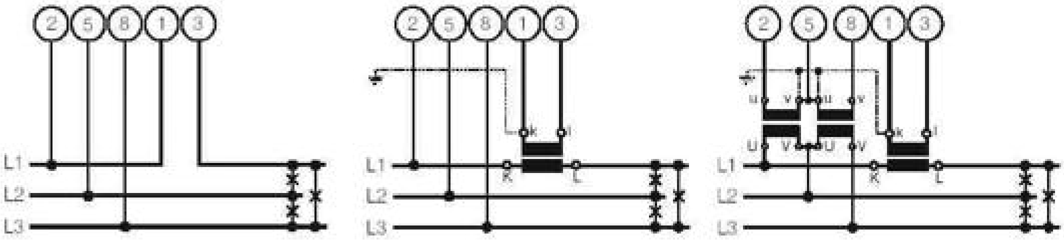
Single phase AC System

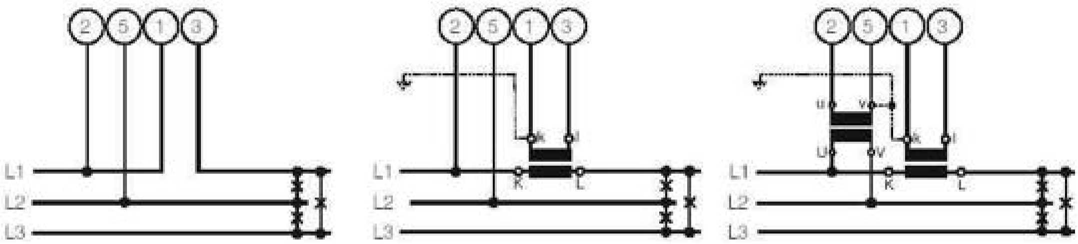


3 wire 3 phase symmetric load 1: L1



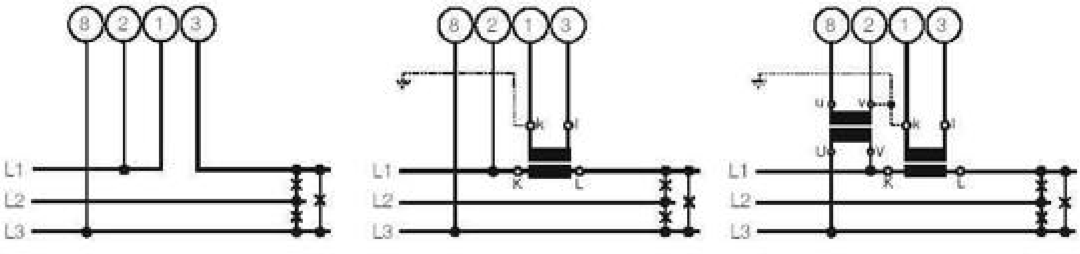
Current transformer	Terminals		2	5	8
L1	1	3	L2	L3	L1
L3	1	3	L3	L1	L2

3 phase 3 wire symmetric load phase-shift U: L1 - L2 1 : L1



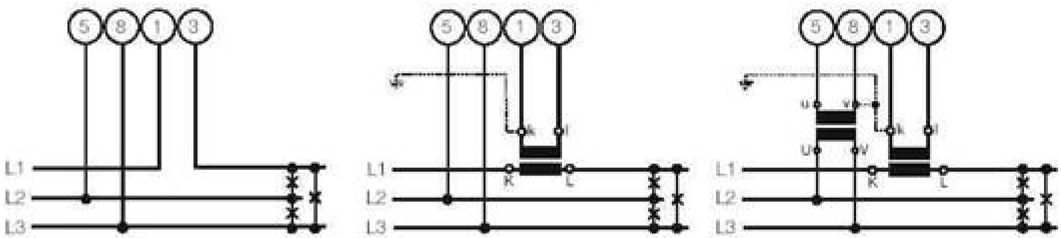
Current transformer	Terminals		2	5
L2	1	3	L2	L3
L3	1	3	L3	L1

3 phase 3 wire symmetric load phase-shift U: L3– L1 1 : L1



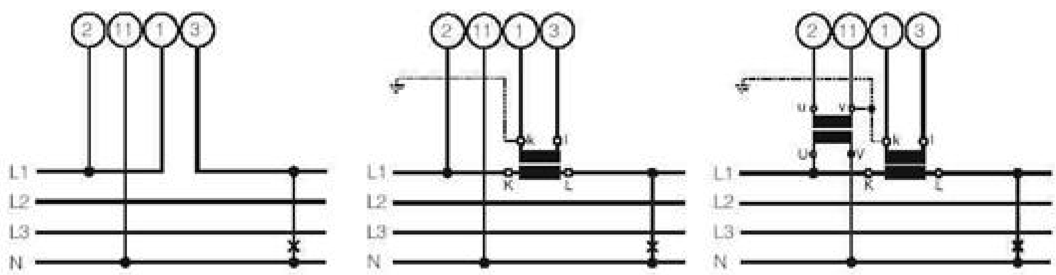
Current transformer	Terminals		8	2
L2	1	3	L1	L2
L3	1	3	L2	L3

3 phase 3 wire symmetric load phase-shift U: L2– L3 1 : L1



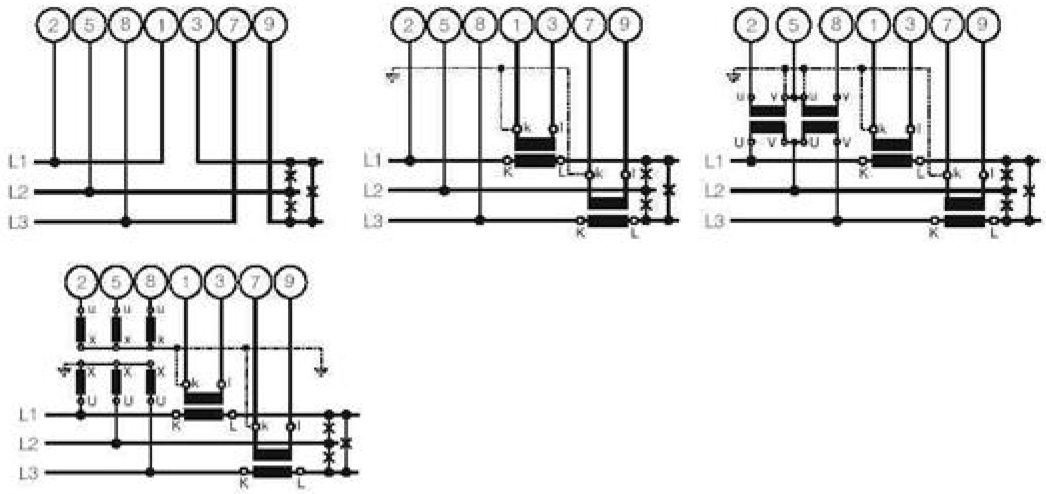
Current transformer	Terminals		5	8
L2	1	3	L3	L1
L3	1	3	L1	L2

4 wire 3 phase symmetric load I:L1

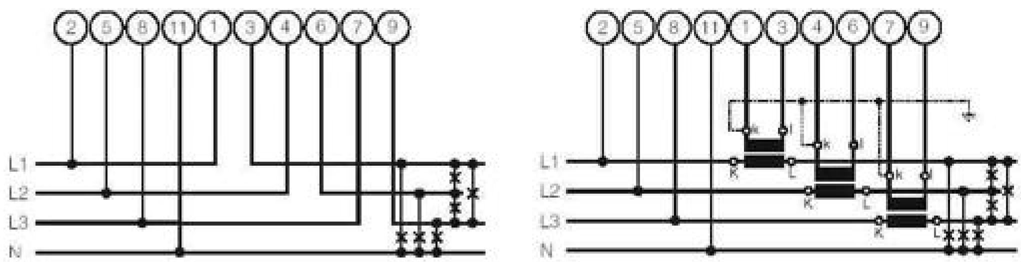


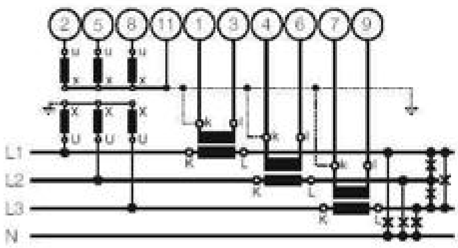
Current transformer	Terminals		2	11
L2	1	3	L2	N
L3	1	3	L3	N

3 phase 3 wire asymmetric load



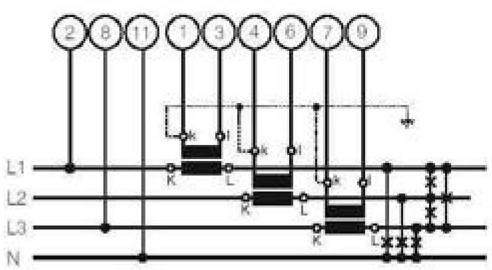
3 phase 3 wire asymmetric load



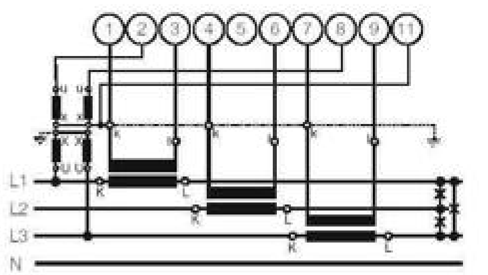


3 single-pole insulated voltage transformers
in high-voltage system

4 wire asymmetric load 3 phase open Y-connection



Low-voltage system



2 single-pole insulated voltage transformers
in high-voltage system

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Relationship between PF, QF and LF

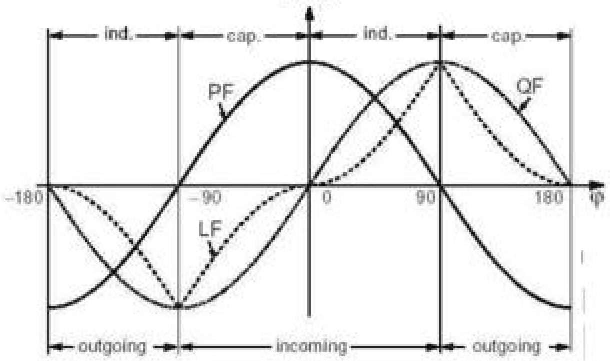

Fig. 5. Active power PF----- , reactive power QF-- ,
power factor LF- -- .

Dimensions

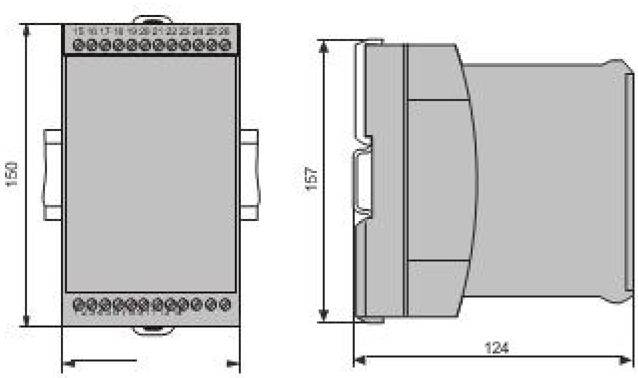

Fig. 6. ZOTMXX in housing T24 clipped onto a top-hat rail (35 X 15 mm or 35 X 7.5 mm, acc. to EN 50 022).

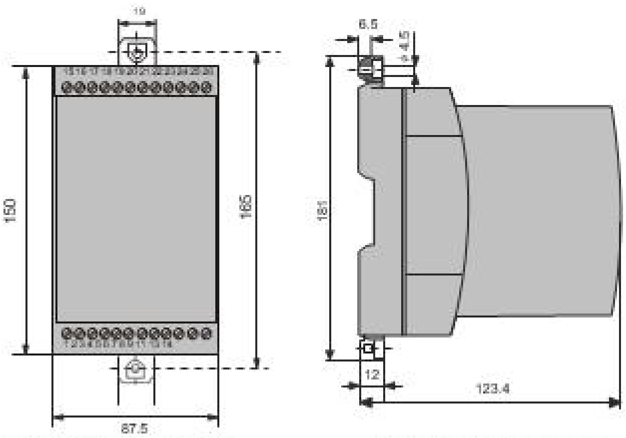

Fig. 7.ZOT MXX in housing T24, screw hole mounting brackets pulled out.

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Ordering Information

DESCRIPTION	MF42	MF24	MF20	MF30	MF40	MF00	MF01
1. Specify the type of system (1 phase, 3 phase 3 wire / 3 phase 4 wire / balanced / unbalanced etc.) C.T. / P.T. Ratio	☐	☐	☐	☐	☐	☐	☐
2. Rated frequency							
1) 50 Hz (60 Hz possible without additional error; 16 2/3 Hz, additional error 1.25 c)				☐			
2) 60 Hz (50 Hz possible without additional error; 16 2/3 Hz, additional error 1.25 c)				☐			
3) 16 2/3 Hz (not re-programming by user, 50/60 Hz possible, but with additional error 1.25 c)				☐			
3. Power supply							
1) DC/AC 24 ... 60 V				☐			
2) DC/AC 85 ... 230V				☐			
4. Power supply connection							
1) External (standard)				☐			
2) Internal from voltage input** Line 2: Not available for rated frequency 16 2/3 Hz Contact Factory for further details				☐			
5. Full-scale output signal, output A	N. A.	N. A.	N. A.	N. A.	N. A.	N. A.	N. A.
1) Output A, Y2 =20 mA (standard)						N. A.	N. A.
9) Output A, Y2 [mA] *						N. A.	N. A.
Z) Output A, Y2 [V] *						N. A.	N. A.
Line 9: Full-scale current Y2 [mA] 1 to 20 Line Z: Full-scale voltage Y2 [V] 1 to 10							
6.Full-scale output signal, output B							
1) Output B, Y2 =20 mA (standard)	☐	☐	☐	☐	☐	N.A.	N.A.
						N.A.	N.A.
	☐	☐	☐	☐	☐	N.A.	N.A.
	☐	☐	☐	☐	☐		
9) Output B, Y2 [mA] *							
Z) Output B, Y2 [V] *							
7. Full-scale output signal, output C							
1) Output C, Y2 = 20 mA (standard)	☐	N.A.	N.A.	☐	☐	N.A.	N.A.
9) Output C, Y2 [mA] *	☐	N.A.	N.A.	☐	☐	N.A.	N.A.
Z) Output C, Y2 [V] *	☐	N.A.	N.A.	☐	☐	N.A.	N.A.
8. Full-scale output signal, output D							
1) Output D, Y2 =20 mA (standard)	☐	N.A.	N.A.	N.A.	☐	N.A.	N.A.
9) Output D, Y2 [mA] *		N.A.	N.A.	N.A.		N.A.	N.A.

Z) Output D, Y2 [V] *	□ □	N.A.	N.A.	N.A.	□ □	N.A.	N.A.
9. Digital Output E Specify output i) Limit control or ii) Pulse output Also specify the parameter and their details separately	N.A. N.A.	□ □	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.
10. Digital Output F Specify output i) Limit control or ii) Pulse output Also specify the parameter and their details separately	N.A. N.A.	□ □	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.
11. Digital Output G Specify output i) Limit control or ii) Pulse output Also specify the parameter and their details separately	□ □	□ □	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.
12. Digital Output H Specify output i) Limit control or ii) Pulse output Also specify the parameter and their details separately	□ □	□ □	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.	N.A. N.A.
13. Test certificate 0) None supplied 1) Supplied	□ □						
14. Programming 0) Basic 9) According to specification Line 0: Not available if the power supply is taken from the voltage input	□ □						

Ziegler

Redefine Innovative Metering

Ziegler Instrumentation UK Ltd.

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Ziegler

Redefine Innovative Metering

Technical Datasheet

ZOT MF30|MF40

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

www.ziegler-instrument.com

ZOT MF30|MF40

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Product Features

- Simultaneous measurement of several variables of a heavy- current power system / Full supervision of an asymmetrically loaded four-wire power system, rated current 1 to 6 A, rated voltage 57 to 400 V (phase to neutral) or 100 to 693 V (phase-to-phase)

- For all heavy-current power system variables
- 4 analogue outputs
- Input voltage up to 693 V (phase-to-phase)
- Universal analogue outputs (programmable)
- High accuracy: U/I 0.2% and P 0.25% (under reference conditions)
- 4 integrated energy meters, storage every each 203 s, storage for: 20 years
- Windows software with password protection for programming, data analysis, power system status simulation, acquisition of meter data and making settings
- DC-,AC-power pack with wide power supply tolerance / universal
- Provision for either snapping the transducer onto top-hat rails or securing it with screws to a wall or panel

Technical Specifications

Inputs	
Waveform	Sinusoidal
Rated frequency	50.....60 Hz ; 16 2/3 Hz
Own Consumption [VA]	Voltage circuit: $\leq U^2$ / 400 k Condition: Characteristic XH01 … XH10 Current circuit: 0.3 VA · I/5 A
MODBUS	
Terminals	Screw terminals, terminals 23, 24, 25 and 26
Connecting cable	Screened twisted pair
Max. distance	Approx. 1200 m (approx. 4000 ft.)
Baudrate	1200 ... 9600 Bd (programmable)
Number of bus stations	32 (including master)

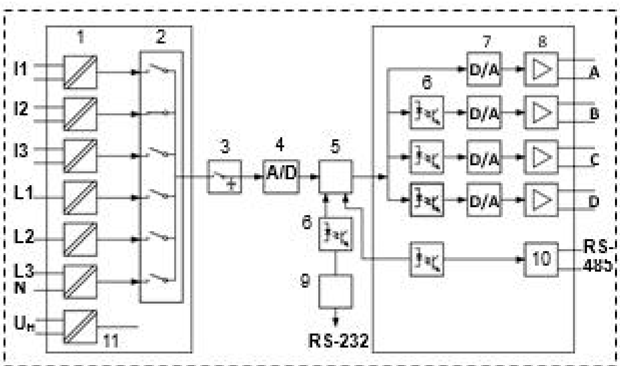
Dummy load	Not required
System Response	
Duration of the measurement cycle	Approx. 0.5 to s 1.2 s at 50 Hz, depending on measured variable and programming
Response time	1 … 2 times the measurement cycle
Reference Conditions	
Ambient temperature	± 23^{0}C + 1 K
Pre-conditioning	30 min. acc. to DIN EN 60 688
Input variable	Rated useful range
Power supply	H = Hn + 1%
Active/reactive factor	Cos phi, sin phi
Frequency	50 … 60 Hz, 16 2/3 Hz
Waveform	Sinusoidal, form factor 1.1107
Output load	DC current output $R_N = \frac{7.5\ V}{Y2} \pm 1\%$ DC voltage output $R_N = \frac{Y2}{1\ mA} \pm 1\%$
Miscellaneous	DIN EN 60 688
Ambient Conditions	
Climatic rating	Climate class 3 acc. to VDI/VDE 3540
Variations due to ambient temperature	±0.1% / 10 K
Nominal range of use for temperature	0...15...30...45^{0}C(usage group II)
Storage temperature	– 40 to + 85^{0}C
relative humidity	$\leq$ 75%
Safety	
Protection class	II
Enclosure protection	IP 40, housing ; IP 20, terminals
Overvoltage category	III
Insulation test (versus earth)	Input voltage AC 400 V

	Input current AC 400 V Output DC 40 V Power supply AC 400 V DC 230 V
Surge test	5 kV; 1.2/50s; 0.5 Ws
Test voltages	50 Hz, 1 min. according to DIN EN 61 010-1 5550 V, inputs versus all other circuits as well as outer surface 3250 V, input circuits versus each other 3700 V, power supply versus outputs and SCI as well as outer surface 490 V, outputs & SCI versus each other & versus outer surface
Vibration withstand	
Acceleration	±2g
Frequency range	10 … 150 … 10 Hz, rate of frequency sweep: 1 octave/minute
Number of cycles	10 in each of the three axes
Result	No faults occurred, no loss of accuracy and no problems with the snap fastener
Installation data	
Housing	HousingT24; See Section “Dimensioned drawings”
Housing material	Lexan 940 (polycarbonate),flammability class V-0 acc. to UL 94, self-extinguishing, non- dripping, free of halogen
Mounting	For snapping onto top-hat rail (35 x15 mm or 35 x 7.5 mm)acc. to EN 50 022 or directly onto a wall or panel using the pull-out screw hole brackets
Orientation	Any
Weight	Approx. 0.7 kg
Terminals	
Type	Screw terminals with wire guards
Max. wire gauge	< 4.0 mm^2 single wire or 2 x 2.5 mm^2 fine wire

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Output variable Y	Impressed DC current	Impressed DC voltage
Full scale Y2	see “Ordering information”	see “Ordering information”
Limits of output signal for input overload and/or R =0	1.25 · Y2	40 mA
R	30 V	1.25 Y2
Rated useful range of output load	$0 \le \frac{7.5\ V}{Y2} \le \frac{15\ V}{Y2}$	$\frac{Y2}{2\ mA} \le \frac{Y2}{1\ mA} \le \infty$
AC component of output signal (peak-to-peak)	$\le$ 0.005 Y2	$\le$ 0.005 Y2

Measured variables	Output	Types
Current, voltage (rms), active/ reactive/ apparent power cos , sin , power factor RMS value of the current with wire setting range (bimetal measuring function) Slave pointer function for the measurement of the RMS value IB Frequency Average value of the currents with sign of the active power (power system only)	4 analogue outputs and bus interface RS 485 (MODBUS)	M40
	2 analogue outputs and 4 digital outputs or	M24
	4 analogue outputs and 2 digital outputs see Data Sheet DME 424/442-1 Le	M42
	Data bus LON see Data Sheet DME 400-1 Le	M00



1 = Input transformer
2 = Multiplexer
3 = Latching stage
4 = A/D converter
5 = Microprocessor
6 = Electrical insulation
7 = D/A converter
8 = Output amplifier / Latching stage
9 = Programming interface RS-232
10 = Bus RS 485 (MODBUS)
11 = Power supply

Symbols

Symbols	Meaning
X	Measured variable
X0	Lower limit of the measured variable
X1	Break point of the measured variable
X2	Upper limit of the measured variable
Y	Output variable
Y0	Lower limit of the output variable
Y1	Break point of the output variable
Y2	Upper limit of the output variable
U	Input voltage
Ur	Rated value of the input voltage
U 12	Phase-to-phase voltage L1 – L2
U 23	Phase-to-phase voltage L2 – L3
U 31	Phase-to-phase voltage L3 – L1
U1N	Phase-to-neutral voltage L1 – N
U2N	Phase-to-neutral voltage L2 – N
U3N	Phase-to-neutral voltage L3 – N
UM	Average value of the voltages
	(U1N + U2N + U3N) / 3
I	Input current
I1	AC current L1
I2	AC current L2
I3	AC current L3

Ir	Rated value of the input current
IM	Average value of the currents (I1 + I2 + I3) / 3
IMS	Average value of the currents and sign of the
	active power (P)
IB	RMS value of the current with wire setting range (bimetal measuring function)
IBT	Response time for IB
BS	Slave pointer function for the measurement of the RMS value IB
BST	Response time for BS
	Phase-shift between current and voltage
F	Frequency of the input variable
Fn	Rated frequency
P	Active power of the system P = P1 + P2 + P3
P1	Active power phase 1
	(phase-to-neutral L1 –N)
P2	Active power phase 2
	(phase-to-neutral L2 –N)
P3	Active power phase 3 (phase-to-neutral L3 – N)
Symbols	Meaning (Continuation)
Q	Reactive power of the system Q = Q1 + Q2 + Q3
Q1	Reactive power phase 1 (phase-to-neutral L1 – N)

Q2	Reactive power phase 2 (phase-to-neutral L2 – N)
Q3	Reactive power phase 3 (phase-to-neutral L3 – N)
S	Apparent power of the system S = I 2 + I 2 + I 2 · U 2 + U 2 + U 2 1 2 3 1 2 3
S1	Apparent power phase 1 (phase-to-neutral L1 – N)
S2	Apparent power phase 2 (phase-to-neutral L2 – N)
S3	Apparent power phase 3 (phase-to-neutral L3 – N)
Sr	Rated value of the apparent power of the system
PF	Active power factor cos j = P/S
PF1	Active power factor phase 1 P1/S1
PF2	Active power factor phase 2 P2/S2
PF3	Active power factor phase 3 P3/S3
QF	Reactive power factor sin j = Q/S
QF1	Reactive power factor phase 1 Q1/S1
QF2	Reactive power factor phase 2 Q2/S2
QF3	Reactive power factor phase 3 Q3/S3
LF	Power factor of the system LF = sgnQ · (1 – PF)
LF1	Power factor phase 1 sgnQ1 · (1 – PF1)
LF2	Power factor phase 2 sgnQ2 · (1 –

	PF2)
LF3	Power factor phase 3 sgnQ3 · (1 – PF3)
c	Factor for the intrinsic error
R	Output load
Rn	Rated burden
H	Power supply
Hn	Rated value of the power supply
CT	c.t. ratio
VT	v.t. ratio

Continuous thermal ratings of inputs

Current circuit	10 A 400 V single-phase AC system 693 V three-phase system
Voltage circuit	480 V single-phase AC system 831 V three-phase system

Short time thermal rating of inputs

Input variable	Number of inputs	Duration of overload	Interval between two overloads
Current circuit 400 V single-phase AC system 693 V three-phase system			
100 A	5	3 s	5 min.
250 A	1	1 s	1 hour
Voltage circuit	1 A, 2 A, 5 A		

Single-phase AC system 600 V H_{intern}: 1.5 Ur	10	10 s	10 s
Three-phase system 1040 V H_{intern} : 1.5 Ur	10	10 s	10 s

Measured variable	**Condition**	**Accuracy class***
System: Active, reactive and apparent power	0.5 ≤ X2/Sr ≤ 1.5 0.3 ≤ X2/Sr < 0.5	0.25 c 0.5 c
Phase: Active, reactive and apparent power	0.167 ≤ X2/Sr ≤ 0.5 0.1 ≤ X2/Sr < 0.167	0.25 c 0.5 c
Power factor, active power and reactive power	0.5Sr ≤ S ≤ 1.5 Sr, (X2 - X0) = 2 0.5Sr ≤ S ≤ 1.5 Sr, 1 ≤ (X2 - X0) < 2 0.5Sr ≤ S ≤ 1.5 Sr, 0.5 ≤ (X2 - X0) < 1 0.1Sr ≤ S < 0.5Sr, (X2 - X0) = 2 0.1Sr ≤ S < 0.5Sr, 1 ≤ (X2 - X0) < 2 0.1Sr ≤ S < 0.5Sr, 0.5 ≤ (X2 - X0) < 1	0.25 c 0.5 c 1.0 c 0.5 c 1.0 c 2.0 c
AC voltage	0.1 Ur ≤ U ≤1.2 Ur	0.2 c
AC current/ current average	0.1 Ir ≤ I ≤ 1.5 Ir s	0.2 c

System frequency	0.1 Ur ≤ U ≤ 1.2 Ur resp. 0.1 Ir ≤ I ≤ 1.5 Ir	0.15 + 0.03 c (f_N = 50...60 Hz) 0.15 + 0.1 c (f_N = 16 2/3 Hz)
Pulse	acc. to IEC 1036 0.1 Ir ≤ I ≤ 1.5 Ir	1.0

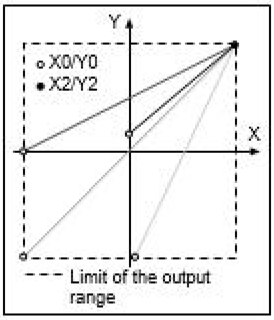


Fig. 3. Examples of settings with linear characteristic.

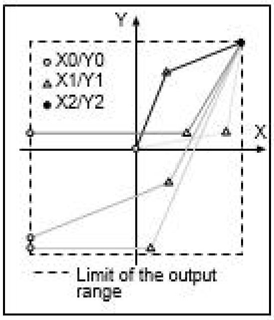


Fig. 4. Examples of settings with bent characteristic.

Linear characteristic

$$c = \frac{1 - \frac{Y0}{Y2}}{1 - \frac{X0}{X2}} \quad \text{or } c = 1$$

Bent characteristic X0 ≤ X ≤ X1

$$c = \frac{Y1 - Y0}{X1 - X0} \cdot \frac{X2}{Y2} \quad \text{or } c = 1$$

X1 < X ≤ X2

$$c = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}} \quad \text{or } c = 1$$

Rated voltages and tolerances

Rated voltage U_N	Tolerance
24 ... 60 V DC/AC	DC – 15 ... + 33%
85 ... 230 V DC/AC	AC 10%

Applicable Standards and Regulations

DIN EN 60 688	Electrical measuring transducers for converting AC electrical variables into analogue and digital signals
IEC 1010 or EN 61 010	Safety regulations for electrical measuring, control and laboratory equipment
EN 60529	Protection types by case (code IP)
IEC 255-4 Part E5	High-frequency disturbance test (static relays only)
IEC 1000-4-2, 3, 4, 6	Electromagnetic compatibility for industrialprocess measurement and control equipment
VDI/VDE 3540, page 2	Reliability of measuring and control equipment (classification of climates)
DIN 40 110	AC quantities

DIN 43 807	Terminal markings
IEC 68 /2-6	Basic environmental testing procedures, vibration, sinusoidal
	Electromagnetic compatibility of data processing and telecommunication equipment Limits and measuring principles for radio interference and information equipment
IEC 1036	Alternating current static watt-hour meters for active energy (classes 1 and 2)
DIN 43864	Current interface for the transmission of impulses between impulse encoder counter and tarif meter
UL 94	Tests for flammability of plastic materials for parts in devices and appliances

Programming

DESCRIPTION	**Application**		
	A11 … A16	**A34**	**A24 / A44**
1. Application (system) Single-phase AC	A11	——	——
3-wire, 3-phase symmetric load, phase-shift U: L1-L2, I: L1 *	A12	——	——
3-wire, 3-phase symmetric load	A13	——	——
4-wire, 3-phase symmetric load	A14	——	——
3-wire, 3-phase symmetric load, phase-shift U: L3-L1, I: L1 *	A15	——	——
3-wire, 3-phase symmetric load, phase-shift U: L2-L3, I: L1 *	A16	——	——
3-wire, 3-phase asymmetric load	——	A34	——
4-wire, 3-phase asymmetric load	——	——	A44
4-wire, 3-phase asymmetric load, open-Y	——	——	A24
2. Input voltage Rated value Ur = 57.7 V	U01	——	——

Rated value Ur = 63.5 V		U02	——	——
Rated value Ur = 100 V		U03	——	——
Rated value Ur = 110 V		U04	——	——
Rated value Ur = 120 V		U05	——	——
Rated value Ur = 230 V		U06	——	——
Rated value Ur	[V]	U91	——	——
Rated value Ur = 100 V		U21	U21	U21
Rated value Ur = 110 V		U22	U22	U22
Rated value Ur = 115 V		U23	U23	U23
Rated value Ur = 120 V		U24	U24	U24
Rated value Ur = 400 V		U25	U25	U25
Rated value Ur = 500 V		U26	U26	U26
Rated value Ur	[V]	U93	U93	U93
Lines U01 to U06: Only for single phase AC current or 4-wire, 3-phase symmetric load Line U91: Ur [V] 57 to 400 Line U93: Ur [V] > 100 to 693				
3. Input current Rated value Ir = 1 A V1		V1	V1	
Rated value Ir = 2 A V2		V2	V2	
Rated value Ir = 5 A V3		V3	V3	
Rated value Ir > 1 to 6	[A]	V9	V9	V9

DESCRIPTION	Application		
	A11 … A16	A34	A24 / A44
4. Primary rating (primary transformer) Without specification of primary rating	W0	W0	W0
CT = A / A VT = kV / V	W9	W9	W9
Line W9: Specify transformer ratio prim./sec., e.g. 1000/5 A; 33 kV/110 V			
5. Measured variable, output A			

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Not used				AA000	AA000	AA000
		Initial value X0	Final value X2			
U	System	X0 = 0	X2 = Ur*	AA001	——	——
U12	L1-L2	X0 = 0	X2 = Ur*	——	AA001	AA001
U	System	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur ≤ X2 ≤ 1.2 · Ur*	AA901	——	——
U1N	L1-N	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur/ 3 ≤ X2 ≤ 1.2 · Ur/ 3 *	——	——	AA902
U2N	L2-N	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur/ 3 ≤ X2 ≤ 1.2 · Ur/ 3 *	——	——	AA903
U3N	L3-N	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur/ 3 ≤ X2 ≤ 1.2 · Ur/ 3 *	——	——	AA904
U12	L1-L2	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur X2 ≤ 1.2 · Ur*	——	AA905	AA905
U23	L2-L3	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur X2 ≤ 1.2 · Ur *	——	AA906	AA906
U31	L3-L1	0 ≤ X0 ≤ 0.9 · X2	0.8 · Ur X2 ≤ 1.2 · Ur *	——	AA907	AA907
I	System	0 ≤ X0 ≤ 0.8 · X2	0.5 · Ir ≤ X2 ≤ 1.5 · Ir	AA908	——	——
I1	L1	0 ≤ X0 ≤ 0.8 · X2	0.5 · Ir ≤ X2 ≤ 1.5 · Ir	——	AA909	AA909
I2	L2	0 ≤ X0 ≤ 0.8 · X2	0.5 · Ir ≤ X2 ≤ 1.5 · Ir	——	AA910	AA910
I3	L3	0 ≤ X0 ≤ 0.8 · X2	0.5 · Ir ≤ X2 ≤ 1.5 · Ir	——	AA911	AA911
P	System	−X2 ≤ X0 ≤ 0.8 · X2	0.3 ≤ X2 / Sr 1.5	AA912	AA912	AA912
P1	L1	−X2 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA913
P2	L2	−X2 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA914
P3	L3	−X2 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA915
Q	System	−X2 ≤ X0 ≤ 0.8 · X2	0.3 ≤ X2 / Sr 1.5	AA916	AA916	AA916
Q1	L1	−X2 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA917
Q2	L2	−X2 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA918
Q3	L3	−X2 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA919
PF	System	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	AA920	AA920	AA920
PF1	L1	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	——	——	AA921
PF2	L2	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	——	——	AA922
PF3	L3	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	——	——	AA923
QF	System	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	AA924	AA924	AA924
QF1	L1	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	——	——	AA925
QF2	L2	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	——	——	AA926
QF3	L3	−1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1	——	——	AA927
F		15.3 Hz ≤ X0 ≤ X2 – 1 Hz	X0 + 1 Hz ≤ X2 ≤ 65 Hz	AA928	AA928	AA928
S	system	0 ≤ X0 ≤ 0.8 · X2	0.3 ≤ X2 / Sr 1.5	AA929	AA929	AA929
S1	L1	0 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA930
S2	L2	0 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA931
S3	L3	0 ≤ X0 ≤ 0.8 · X2	0.1 ≤ X2 / Sr 0.5	——	——	AA932

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

IM	System	$0 \le X0 \le 0.8 \cdot X2$		$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA933	AA933
IMS	System	$-X2 \le X0 \le 0.8 \cdot X2$		$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA934	AA934
LF	System	$-1 \le X0 \le (X2 - 0.5)$		$0 \le X2 \le 1$	AA935	AA935	AA935
LF1	L1	$-1 \le X0 \le (X2 - 0.5)$		$0 \le X2 \le 1$	——	——	AA936
LF2	L2	$-1 \le X0 \le (X2 - 0.5)$		$0 \le X2 \le 1$	——	——	AA937
LF3	L3	$-1 \le X0 \le (X2 - 0.5)$		$0 \le X2 \le 1$	——	——	AA938
IB	System	$X0 = 0$	$1 < IBT \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	AA939	——	——
IB1	L1	$X0 = 0$	$1 \le IBT \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA940	AA940
IB2	L2	$X0 = 0$	$1 \le IBT \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA941	AA941
IB3	L3	$X0 = 0$	$1 \le IBT \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA942	AA942
BS	System	$X0 = 0$	$1 \le BST \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	AA943	——	——
BS1	L1	$X0 = 0$	$1 \le BST \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA944	AA944
BS2	L2	$X0 = 0$	$1 \le BST \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA945	AA945
BS3	L3	$X0 = 0$	$1 \le BST \le 30$ min	$0.5 \cdot Ir \le X2 \le 1.5 \cdot Ir$	——	AA946	AA946
UM	System	$0 \le X0 \le 0.8 \cdot X2$		$0.8 \cdot Ur \le X2 \le 1.2 \cdot Ur$*	——	——	AA947

DESCRIPTION	**Application**		
	A11 … A16	**A34**	**A24 / A44**
6. Output signal, output A Initial value Y0 / Final value Y2 DC current: $Y0 = 0$, $Y2 = 20$ mA $-Y2 \le Y0 \le 0.2 \cdot Y2$, $1 \text{ mA} \le Y2 \le 20 \text{ mA}$ DC voltage: $-Y2 \le Y0 \le 0.2 \cdot Y2$, $1 \text{ V} \le Y2 \le 10 \text{ V}$	AB01 AB91 AB92	AB01 AB91 AB92	AB01 AB91 AB92
7. Characteristic, output A Linear Bent $(X0 + 0.015 \cdot X2) \le X1 \le 0.985 \cdot X2$, $Y0 \le Y1 \le Y2$	AC01 AC91	AC01 AC91	AC01 AC91
8. Limits, output A Standard $Ymin = Y0 - 0.25\,Y2$, $Ymax = 1.25\,Y2$ $(Y0 - 0.25\,Y2) < Ymin \le Y0$, $Y2 \le Ymax \le 1.25\,Y2$	AD01 AD91	AD01 AD91	AD01 AD91
9. Measured variable, output B Same as output A, but markings start with a capital B	BA …	BA …	BA …
10. Output signal, output B Same as output A, but markings start with a capital	BB ..	BB ..	BB ..

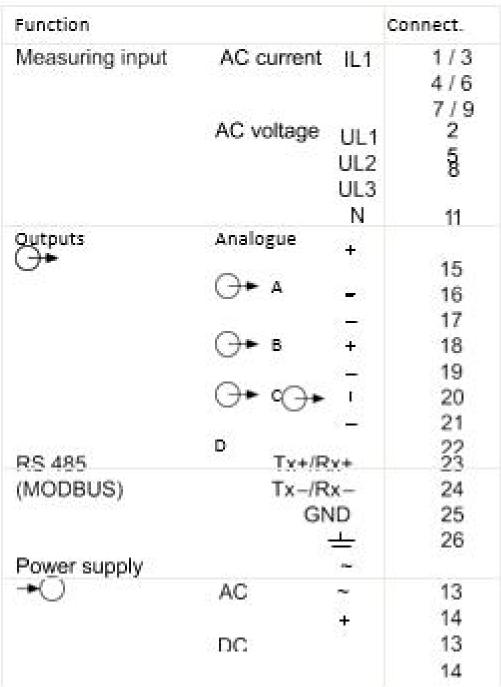
B			
11. Characteristic, output B Same as output A, but markings start with a capital B	BC ..	BC ..	BC ..
12. Limits, output B Same as output A, but markings start with a capital B	BD ..	BD ..	BD ..
13. Measured variable, output C Same as output A, but markings start with a capital C	CA ...	CA ...	CA ...
14. Output signal, output C Same as output A, but markings start with a capital C	CB ..	CB ..	CB ..
15. Characteristic, output C Same as output A, but markings start with a capital C	CC ..	CC ..	CC ..
16. Limits, output C Same as output A, but markings start with a capital C	CD ..	CD ..	CD ..
17. Measured variable, output D Same as output A, but markings start with a capital D	DA ..	DA ..	DA ..
18. Output signal, output D Same as output A, but markings start with a capital D	DB ..	DB ..	DB ..

DESCRIPTION	**Application**		
	A11 ... A16	**A34**	**A24 / A44**
19. Characteristic, output D Same as output A, but markings start with a capital D	DC ..	DC ..	DC ..
20. Limits, output D Same as output A, but markings start with a capital D	DD ..	DD ..	DD ..

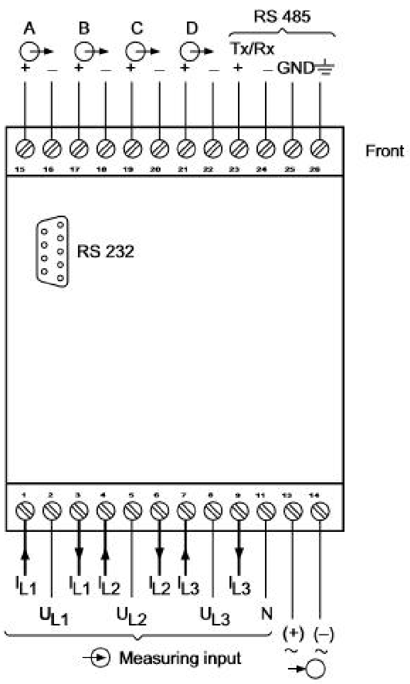
21. Power meter 1 Not used			EA00	EA00	EA00
I	System	[Ah]	EA50	—	—
I1	L1	[Ah]	—	EA51	EA51
I2	L2	[Ah]	—	EA52	EA52
I3	L3	[Ah]	—	EA53	EA53
S	System	[VAh]	EA54	EA54	EA54
S1	L1	[VAh]	—	—	EA55
S2	L2	[VAh]	—	—	EA56
S3	L3	[VAh]	—	—	EA57
P	System (incoming)	[Wh]	EA58	EA58	EA58
P1	L1 (incoming)	[Wh]	—	—	EA59
P2	L2 (incoming)	[Wh]	—	—	EA60
P3	L3 (incoming)	[Wh]	—	—	EA61
Q	System (inductive)	[Varh]	EA62	EA62	EA62
Q1	L1 (inductive)	[Varh]	—	—	EA63
Q2	L2 (inductive)	[Varh]	—	—	EA64
Q3	L3 (inductive)	[Varh]	—	—	EA65
P	System (outgoing)	[Wh]	EA66	EA66	EA66
P1	L1 (outgoing)	[Wh]	—	—	EA67
P2	L2 (outgoing)	[Wh]	—	—	EA68
P3	L3 (outgoing)	[Wh]	—	—	EA69
Q	System (capacitive)	[Varh]	EA70	EA70	EA70
Q1	L1 (capacitive)	[Varh]	—	—	EA71
Q2	L2 (capacitive)	[Varh]	—	—	EA72
Q3	L3 (capacitive)	[Varh]	—	—	EA73
22. Energy meter 2 Same as energy meter 1, but markings start with a capital F			FA ..	FA ..	FA ..
23. Energy meter 3 Same as energy meter 1, but markings start with a capital G			GA ..	GA ..	GA ..

24. Energy meter 4 Same as energy meter 1, but markings start with a capital H	HA ..	HA ..	HA ..

Connection Diagram and Installation



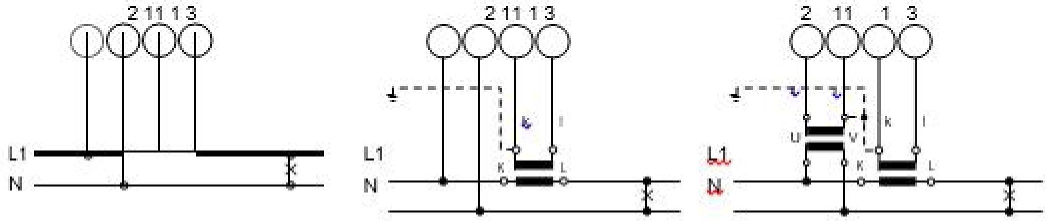
Function				Connect.
Measuring input	AC current		IL1	1 / 3
				4 / 6
				7 / 9
	AC voltage		UL1	2
			UL2	5
			UL3	8
			N	11
Outputs	Analogue		+	
		A	-	15
			–	16
		B	+	17
			–	18
		C	I	19
			–	20
		D		21
				22
RS 485			Tx+/Rx+	23
(MODBUS)			Tx–/Rx–	24
			GND	25
			⏚	26
Power supply			~	
	AC		~	13
			+	14
	DC			13
				14



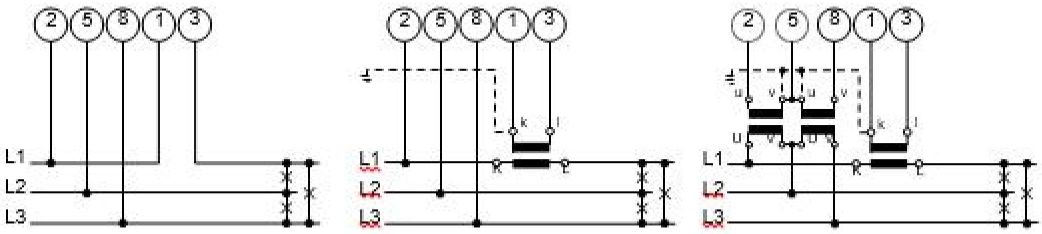
Application (system)	Internal connection Terminal / System	
Single-phase AC current	2 / 11	(L1 – N)
4-wire 3-phase symmetric load	2 / 11	(L1 – N)
All other (apart from A15 / A16 / A24)	2 / 5	(L1 – L2)

Single phase AC System

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

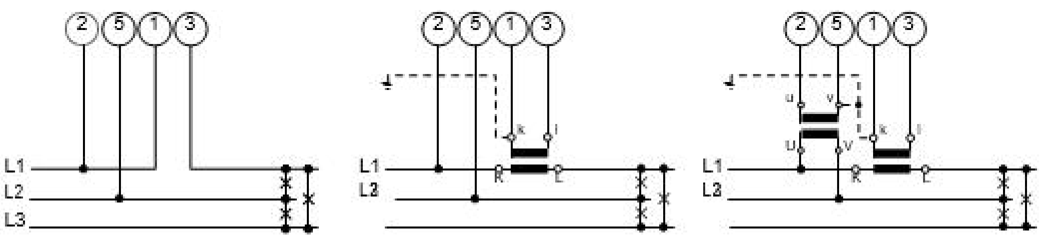


3 wire 3 phase symmetric load I:L1



Current transf.	Terminals		2	5	8
L2	1	3	L2	L3	L1
L3	1	3	L3	L1	L2

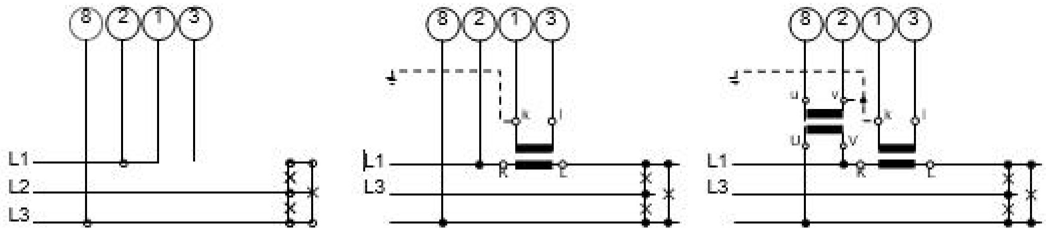
3 wire 3 phase symmetric load Phase Shift U:L1-L2 I :L1



Current transf.	Terminals		2	5
L2	1	3	L2	L3
L3	1	3	L3	L1

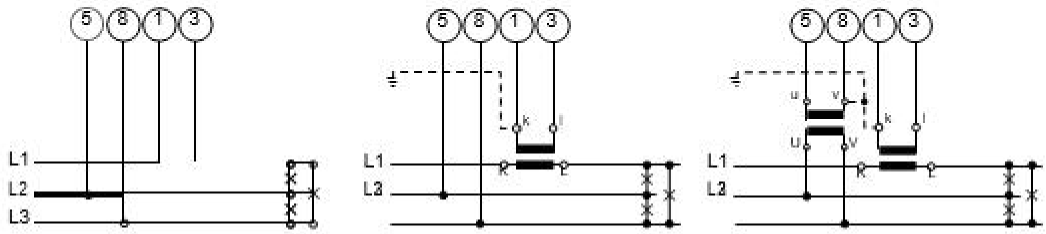
ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

3 wire 3 phase symmetric load Phase Shift U:L3-L1 I :L1



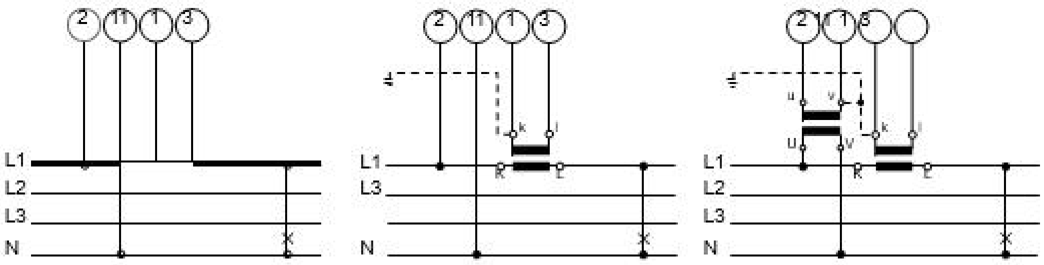
Current transf.	Terminals		8	2
L2	1	3	L1	L2
L3	1	3	L2	L3

3 wire 3 phase symmetric load Phase Shift U:L2-L3 I :L1



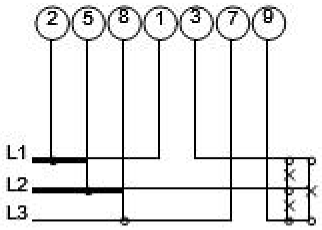
Current transf.	Terminals		5	8
L2	1	3	L3	L1
L3	1	3	L1	L2

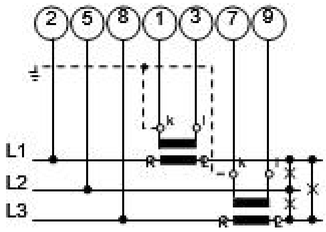
4 wire 3 phase symmetric load I:L1

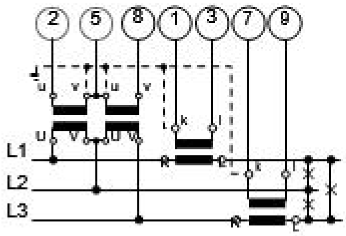


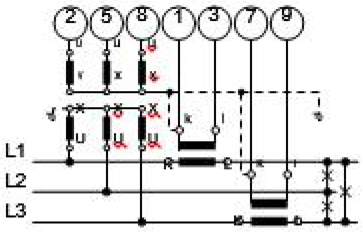
Current transf.	Terminals		2	11
L2	1	3	L2	N
L3	1	3	L3	N

3 wire 3 phase asymmetric load

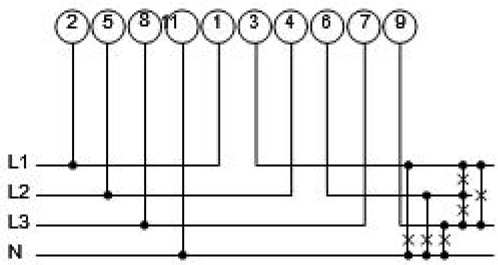


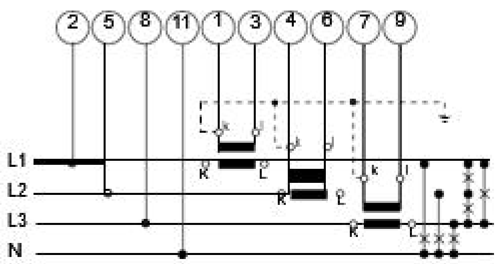


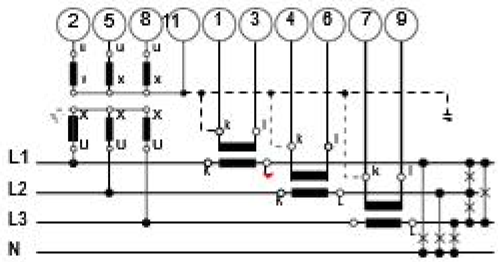




3 phase 3 wire asymmetric load

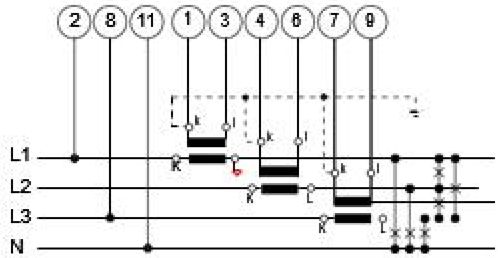




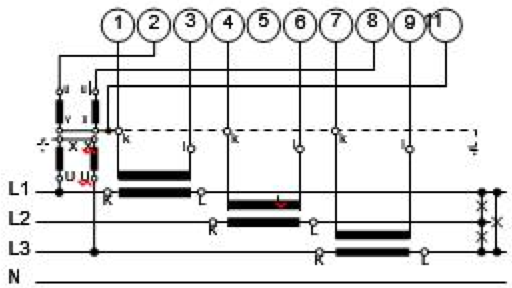


3 single-pole insulated voltage transformers
in high-voltage system

4 wire asymmetric load 3 phase Open Y Connections

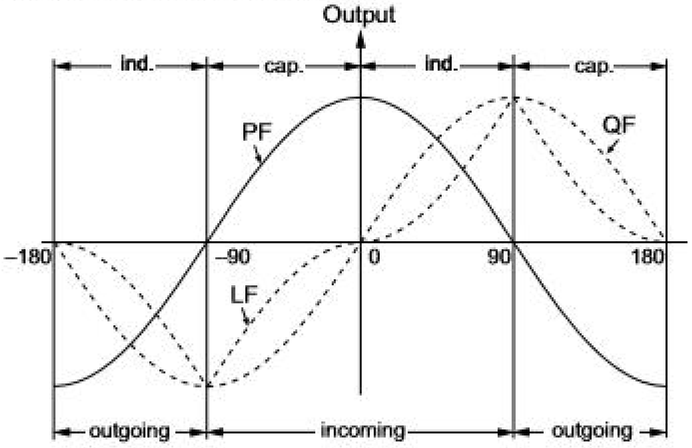


Low-voltage system

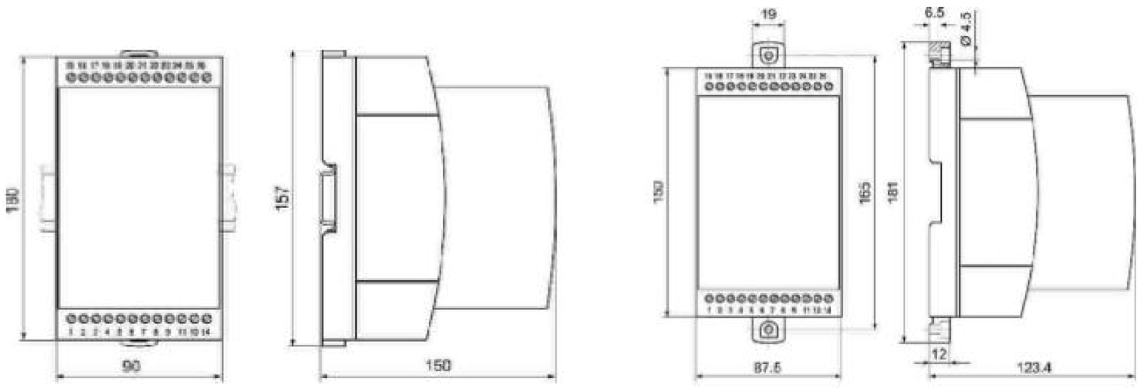


2 single-pole insulated voltage transformers
in high-voltage system

Relationship between PF, QF and LF



Dimensions



Ordering Information

DESCRIPTION	MARKING
1. Mechanical design Housing T24 for rail and wall mounting	M40 / M30# - 1
2. Rated frequency 1) 50 Hz (60 Hz possible without additional error; 16 2/3 Hz, additional error 1.25 · c)	1
2) 60 Hz (50 Hz possible without additional error; 16 2/3 Hz, additional error 1.25 · c)	2
3) 16 2/3 Hz (not re-programming by user, 50/60 Hz possible, but with additional error 1.25 · c)	3

3.	Power supply Nominal range 7) DC/AC 24 … 60 V		7
	8) DC/AC 85 … 230 V		8
4.	Power supply connection 1) External (standard)		1
	2) Internal from voltage input		2
	Line 2: Not available for rated frequency 16 2/3 Hz and applications A15 / A16 / A24 (see Table 3) Caution: The power supply voltage must agree with the input voltage (Table 3)		
5.	Full-scale output signal, output A 1) Output A, Y2 = 20 mA (standard)		1
	9) Output A, Y2 [mA]		9
	Z) Output A, Y2 [V]		Z
	Line 9: Full-scale current Y2 [mA] 1 to 20 Line Z: Full-scale voltage Y2 [V] 1 to 10		
6.	Full-scale output signal, output B 1) Output B, Y2 = 20 mA (standard)		1
	9) Output B, Y2 [mA]		9
	Z) Output B, Y2 [V]		Z
7.	Full-scale output signal, output C 1) Output C, Y2 = 20 mA (standard)		1
	9) Output C, Y2 [mA]		9
	Z) Output C, Y2 [V]		Z
8.	Full-scale output signal, output D 1) Output D, Y2 = 20 mA (standard)		1
	9) Output D, Y2 [mA]		9
	Z) Output D, Y2 [V]		Z
9.	Test certificate 0) None supplied		0
	1) Supplied		1
10.	Programming		

	0) Basic		0
	9) According to specification		9
	Line 0: Not available if the power supply is taken from the voltage input Line 9: All the programming data must be entered on Form W 2389e and the form must be included with the order.		

Ziegler

Redefine Innovative Metering

Ziegler Instrumentation UK Ltd.

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Ziegler

Redefine Innovative Metering

Technical Datasheet

ZOT MFMB

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

ZOT MFMB

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Product Features

- Simultaneous measurement of several variables of a heavy- current power system / full supervision of an asymmetrically loaded four-wire power system, rated current 1 to 6 A, rated voltage 57 to 400V (phase to neutral) or 100 to 693V (phase- to-phase)
- Input voltage up to 693 V (phase-to-phase)
- Universal programmable analogue outputs
- Transfer of data via MODBUS® interface
- High accuracy: U/I 0.2%, (under reference conditions)
- Universal digital outputs (meter transmitter, limits)
- 4 integrated energy meters, storage every each 203 s, storage for : 20 years
- Windows software with password protection for programming, data analysis, power system status simulation, acquisition of meter data and making settings
- DC-, AC- power pack with wide power supply tolerance

Technical Specifications

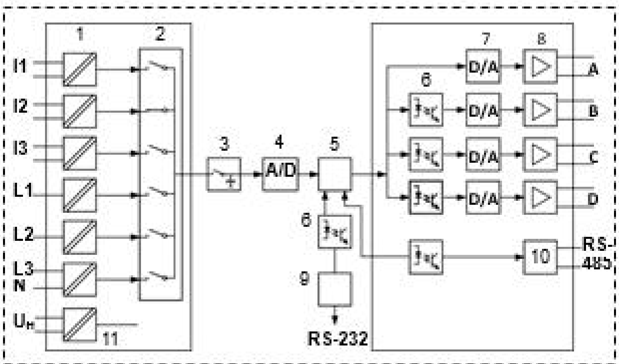
Inputs	
Waveform	Sinusoidal
Rated frequency	50…..60 Hz ; 16 2/3 Hz
Own Consumption [VA]	Voltage circuit: $\leq U^2$ / 400 kohm Condition: Characteristic XH01 …XH10 Current circuit £ I2 0.01 OHM
MODBUS	
Terminals	Screw terminals, terminals 23, 24, 25 and 26
Connecting cable	Screened twisted pair
Max. distance	Approx. 1200 m (approx. 4000 ft.)
Baudrate	1200 … 9600 Bd (programmable)
Number of bus stations	32 (including master)
Dummy load	Not required

System Response	
Duration of the measurement cycle	Approx. 0.5 to s 1.2 s at 50 Hz, depending on measured variable and programming
Response time	1 … 2 times the measurement cycle
Reference Conditions	
Ambient temperature	± 23^{0}C + 1 K
Pre-conditioning	30 min. acc. to DIN EN 60 688
Input variable	Rated useful range
Power supply	H = Hn + 1%
Active/reactive factor	Cos phi, sin phi
Frequency	50 … 60 Hz, 16 2/3 Hz
Waveform	Sinusoidal, form factor 1.1107
Output load	DC current output $R_N = \frac{7.5\ V}{Y2} \pm 1\%$ DC voltage output $R_N = \frac{Y2}{1\ mA} \pm 1\%$
Miscellaneous	DIN EN 60 688
Ambient Conditions	
Climatic rating	Climate class 3 acc. to VDI/VDE 3540
Variations due to ambient temperature	±0.1% / 10 K
Nominal range of use for temperature	0…15…30…45^{0}C(usage group II)
Storage temperature	– 40 to + 85^{0}C
relative humidity	≤ 75%
Safety	
Protection class	II
Enclosure protection	IP 40, housing ; IP 20, terminals
Overvoltage category	III
Insulation test (versus earth)	Input voltage AC 400 V Input current AC 400 V

	Output DC 40 V Power supply AC 400 V DC 230 V
Surge test	5 kV; 1.2/50s; 0.5 Ws
Test voltages	50 Hz, 1 min. according to DIN EN 61 010-1 5550 V, inputs versus all other circuits as well as outer surface 3250 V, input circuits versus each other 3700 V, power supply versus outputs and SCI as well as outer surface 490 V, outputs & SCI versus each other & versus outer surface
Installation data	
Housing	HousingT24; See Section "Dimensioned drawings"
Housing material	Lexan 940 (polycarbonate),flammability class V-0 acc. to UL 94, self-extinguishing, non-dripping, free of halogen
Mounting	For snapping onto top-hat rail (35 x15 mm or 35 x 7.5 mm)acc. to EN 50 022 or directly onto a wall or panel using the pull-out screw hole brackets
Orientation	Any
Weight	Approx. 0.7 kg
Terminals	
Type	Screw terminals with wire guards
Max. wire gauge	< 4.0 mm^2 single wire or 2 x 2.5 mm^2 fine wire

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Measured variables	**Output**	**Types**
Current, Voltage (rms), active/reactive/apparent power Cos , sin , power factor RMS value of the current with wire setting range (bimetal measuring function) Slave pointer function for the measurement of the RMS value IB Frequency Average value of the currents with sign of the active power (power symbol only)	**Without analogue outputs, with bus interface RS 485 (MODBUS)**	Ducer **M01**
	4 analogue and bus interface RS 485 (MODBUS)	Ducer **M40**
	2 analogue and 4 digital outputs or	Ducer **M24**
	4 analogue and 2 digital outputs see Data sheet	Ducer **M42**
	Data bus LON see Data Sheet M00	Ducer **M00**



1 = Input transformer
2 = Multiplexer
3 = Latching stage
4 = A/D converter
5 = Microprocessor
6 = Electrical insulation
7 = D/A converter
8 = Output amplifier / Latching stage
9 = Programming interface RS-232
10 = Bus RS 485 (MODBUS)
11 = Power supply

Symbols

Symbols	Meaning
X	Measured variable

X0	Lower limit of the measured variable
X1	Break point of the measured variable
X2	Upper limit of the measured variable
Y	Output variable
Y0	Lower limit of the output variable
Y1	Break point of the output variable
Y2	Upper limit of the output variable
U	Input voltage
Ur	Rated value of the input voltage
U 12	Phase-to-phase voltage L1 – L2
U 23	Phase-to-phase voltage L2 – L3
U 31	Phase-to-phase voltage L3 – L1
U1N	Phase-to-neutral voltage L1 – N
U2N	Phase-to-neutral voltage L2 – N
U3N	Phase-to-neutral voltage L3 – N
UM	Average value of the voltages
	(U1N + U2N + U3N) / 3
I	Input current
I1	AC current L1
I2	AC current L2
I3	AC current L3
Ir	Rated value of the input current
IM	Average value of the currents (I1 + I2 + I3) / 3
IMS	Average value of the currents and sign of the
	active power (P)

IB	RMS value of the current with wire setting range (bimetal measuring function)
IBT	Response time for IB
BS	Slave pointer function for the measurement of the RMS value IB
BST	Response time for BS
	Phase-shift between current and voltage
F	Frequency of the input variable
Fn	Rated frequency
P	Active power of the system P = P1 + P2 + P3
P1	Active power phase 1
	(phase-to-neutral L1 –N)
P2	Active power phase 2
	(phase-to-neutral L2 –N)
P3	Active power phase 3 (phase-to-neutral L3 – N)
Symbols	Meaning (Continuation)
Q	Reactive power of the system Q = Q1 + Q2 + Q3
Q1	Reactive power phase 1 (phase-to-neutral L1 – N)
Q2	Reactive power phase 2 (phase-to-neutral L2 – N)
Q3	Reactive power phase 3 (phase-to-neutral L3 – N)
S	Apparent power of the system S = I 2 + I 2 + I 2 · U 2 + U 2 + U

	2 1 2 3 1 2 3
S1	Apparent power phase 1 (phase-to-neutral L1 – N)
S2	Apparent power phase 2 (phase-to-neutral L2 – N)
S3	Apparent power phase 3 (phase-to-neutral L3 – N)
Sr	Rated value of the apparent power of the system
PF	Active power factor cos j = P/S
PF1	Active power factor phase 1 P1/S1
PF2	Active power factor phase 2 P2/S2
PF3	Active power factor phase 3 P3/S3
QF	Reactive power factor sin j = Q/S
QF1	Reactive power factor phase 1 Q1/S1
QF2	Reactive power factor phase 2 Q2/S2
QF3	Reactive power factor phase 3 Q3/S3
LF	Power factor of the system LF = sgnQ · (1 – PF)
LF1	Power factor phase 1 sgnQ1 · (1 – PF1)
LF2	Power factor phase 2 sgnQ2 · (1 – PF2)
LF3	Power factor phase 3 sgnQ3 · (1 – PF3)
c	Factor for the intrinsic error
R	Output load
Rn	Rated burden

H	Power supply
Hn	Rated value of the power supply
CT	c.t. ratio
VT	v.t. ratio

Standard Network Variable Types(ZOT MFLB)

Symbols	Meaning	Application (see Table 4)		
		A11 ... A16	A34	A24 / A44
U	Input voltage	●	—	—
U12	Phase-to-phase voltage L1 – L2	—	●	●
U23	Phase-to-phase voltage L2 – L3	—	●	●
U31	Phase-to-phase voltage L3 – L1		●	●
U1N	Phase-to-neutral voltage L1 – N	—	—	●
U2N	Phase-to-neutral voltage L2 – N	—	—	●
U3N	Phase-to-neutral voltage L3 – N	—	—	●
UM	Average value of the voltages	—	—	●
I	Input current	●	—	—
I1	AC current L1	—	●	●
I2	AC current L2	—	●	●
I3	AC current L3	—	●	●
IM	Average value of the currents	—	●	●
IMS	Average value of the currents and sign of the active power	—	●	●

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Symbols	Meaning	Application (see Table 4)		
		A11 … A16	A34	A24 / A44
IB	RMS value of the current with wire setting range (bimetal measuring function)	●	—	—
IB1	RMS value of the current with wire setting range (bimetal measuring function), phase 1	—	●	●
IB2	RMS value of the current with wire setting range (bimetal measuring function), phase 2	—	●	●
IB3	RMS value of the current with wire setting range (bimetal measuring function), phase 3	—	●	●
BS	Slave pointer function for the measurement of the RMS value IB	●	—	—
BS1	Slave pointer function for the measurement of the RMS value IB, phase 1	—	●	●
BS2	Slave pointer function for the measurement of the RMS value IB, phase 2	—	●	●
BS3	Slave pointer function for the measurement of the RMS value IB, phase 3	—	●	●
F	Frequency of the input variable	●	●	●
P	Active power of the system	●	●	●
P1	Active power phase 1 (phase-to-neutral L1 – N)	—	—	
P2	Active power phase 2 (phase-to-neutral L2 – N)	—	—	●
P3	Active power phase 3 (phase-to-neutral L3 – N)	—	—	●
PF	Active power factor cos = P/S	●	●	●
PF1	Active power factor phase 1, P1/S1	—	—	●
PF2	Active power factor phase 2, P2/S2	—	—	●
PF3	Active power factor phase 3, P3/S3	—	—	●

Q	Reactive power of the system	●	●	●
Q1	Reactive power phase 1 (phase-to-neutral L1 – N)	—	—	●
Q2	Reactive power phase 2 (phase-to-neutral L2 – N)	—	—	●
Q3	Reactive power phase 3 (phase-to-neutral L3 – N)	—	—	●
S	Apparent power of the system	●	●	●
S1	Apparent power phase 1 (phase-to-neutral L1 – N)	—	—	●
S2	Apparent power phase 2 (phase-to-neutral L2 – N)	—	—	●
S3	Apparent power phase 3 (phase-to-neutral L3 – N)	—	—	●
LF	Power factor of the system	●	●	●
LF1	Power factor phase 1	—	—	●
LF2	Power factor phase 2	—	—	●
LF3	Power factor phase 3	—	—	●
QF	Reactive power factor sin = Q/S	●	●	●
QF1	Reactive power factor phase 1, Q1/S1	—	—	●
QF2	Reactive power factor phase 2, Q2/S2	—	—	●
QF3	Reactive power factor phase 3, Q3/S3	—	—	●
EA	Energy meter 1	●	●	●
EB	Energy meter 2	●	●	●
EC	Energy meter 3	●	●	●
ED	Energy meter 4	●	●	●

Continuous thermal ratings of inputs

Current circuit	10 A 400 V single-phase AC system 693 V three-phase system
Voltage circuit	480 V single-phase AC system 831 V three-phase system

Short time thermal rating of inputs

Input variable	Number of inputs	Duration of overload	Interval between two overloads
Current circuit	400 V single-phase AC system 693 V three-phase system		
100 A	5	3 s	5 min.
250 A	1	1 s	1 hour
Voltage circuit	1 A, 2 A, 5 A		
Single-phase AC system 600 V Hintern: 1.5 Ur	10	10 s	10 s
Three-phase system 1040 V Hintern : 1.5 Ur	10	10 s	10 s

Programming

Description / Basic programming		Marking	Order No.
1. Mechanical design:	Housing T24 for rail and wall mounting	M01 - 1	
2. Rated input frequency:	50 Hz	1	
3. Power supply:	24… 60 V DC, AC	7	
	85…230 V DC, AC	8	
4. Power supply connection: 5. Test certificate: 6. Configuration:	External connection (standard) None supplied Programmed basic configuration	1 0 0	
See Table 4: "Ordering information"			
Basic configuration			
1. Application (system):	4-wire, 3-phase system, asymmetric load	A 44	
2. Input voltage: 3. Input current: 4. Primary rating: 5. Energy meter 1: 6. Energy meter 2: 7. Energy meter 3: 8. Energy meter 4:	Design value Ur = 400 V Design value Ir = 5 A Without specification of primary rating Not used Not used Not used Not used	U 21 V 2 W 0 EA 00 FA 00 GA 00 HA 00	
See Table 3: "Programming"			

Description / Basic programming	Application		
	A11 … A16	A34	A24 / A44
(system) Single-phase AC	A11	—	—
3-wire, 3-phase symmetric load, phase-shift U: L1-L2, I: L1 *	A12	—	—
3-wire, 3-phase symmetric load	A13	—	—
4-wire, 3-phase symmetric load	A14	—	—
3-wire, 3-phase symmetric load, phase-shift U: L3-L1, I: L1 *	A15	—	—
3-wire, 3-phase symmetric load, phase-shift U: L2-L3, I: L1 *	A16	—	—
3-wire, 3-phase asymmetric load	—	A34	—
4-wire, 3-phase asymmetric load	—	—	A44
4-wire, 3-phase asymmetric load, open-Y	—	—	A24

Description / Basic programming	Application		
	A11 … A16	A34	A24 / A44
Rated value Ur = 57.7 V	U01	—	—
Rated value Ur = 63.5 V	U02	—	—
Rated value Ur = 100 V	U03	—	—
Rated value Ur = 110 V	U04	—	—
Rated value Ur = 120 V	U05	—	—
Rated value Ur = 230 V	U06	—	—
Rated value Ur [V]	U91	—	—
Rated value Ur = 100 V	U21	U21	U21
Rated value Ur = 110 V	U22	U22	U22
Rated value Ur = 115 V	U23	U23	U23
Rated value Ur = 120 V	U24	U24	U24
Rated value Ur = 400 V	U25	U25	U25
Rated value Ur = 500 V	U26	U26	U26
Rated value Ur [V]	U93	U93	U93
Lines U01 to U06: Only for single phase AC current or 4-wire, 3-phase symmetric load Line U91: Ur [V] 57 to 400 Line U93: Ur [V] > 100 to 693			
Rated value Ir = 1 A V1	V1	V1	

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Rated value Ir = 2 A V2		V2	V2	
Rated value Ir = 5 A V3		V3	V3	
Rated value Ir > 1 to 6	[A]	V9	V9	V9
Without specification of primary rating		W0	W0	W0
VT = kV CT = A		W9	W9	W9
Line W9: Specify transformer ratio primary, e.g. 33 kV, 1000 A The secondary ratings must correspond to the rated input voltage and current specified for feature 2, respectively 3.				
Not used		EA00	EA00	EA00
I System	[Ah]	EA50	——	——
I1 L1	[Ah]	——	EA51	EA51
I2 L2	[Ah]	——	EA52	EA52
I3 L3	[Ah]	——	EA53	EA53
S System	[VAh]	EA54	EA54	EA54
S1 L1	[VAh]	——	——	EA55
S2 L2	[VAh]	——	——	EA56
S3 L3	[VAh]	——	——	EA57
P System (incoming)	[Wh]	EA58	EA58	EA58
P1 L1 (incoming)	[Wh]	——	——	EA59
P2 L2 (incoming)	[Wh]	——	——	EA60
P3 L3 (incoming)	[Wh]	——	——	Ea61

Description / Basic programming			Application		
			A11 … A16	**A34**	**A24 / A44**
Q	System (inductive)	[Varh]	EA62	EA62	EA62
Q1	L1 (inductive)	[Varh]	——	——	EA63
Q2	L2 (inductive)	[Varh]	——	——	EA64
Q3	L3 (inductive)	[Varh]	——	——	EA65
P	System (outgoing)	[Wh]	EA66	EA66	EA66
P1	L1 (outgoing)	[Wh]	——	——	EA67
P2	L2 (outgoing)				EA68

P3	L3 (outgoing)	[Wh] [Wh]	— —	— —	Ea69
Q Q1 Q2 Q3	System (capacitive) L1 (capacitive) L2 (capacitive) L3 (capacitive)	[Varh] [Varh] [Varh] [Varh]	EA70 — — —	EA70 — — —	EA70 EA71 EA72 EA73
Same as energy meter 1, but markings start with a capital F			FA ..	FA ..	FA ..
Same as energy meter 1, but markings start with a capital G			GA ..	GA ..	GA ..
Same as energy meter 1, but markings start with a capital H			HA ..	HA ..	HA ..

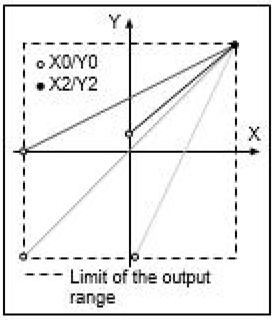


Fig. 3. Examples of settings with linear characteristic.

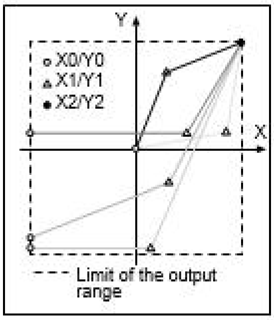


Fig. 4. Examples of settings with bent characteristic.

Linear characteristic

$$c = \frac{1 - \frac{Y0}{Y2}}{1 - \frac{X0}{X2}} \quad \text{or } c = 1$$

Bent characteristic

$X0 \leq X \leq X1$

$$c = \frac{Y1 - Y0}{X1 - X0} \cdot \frac{X2}{Y2} \quad \text{or } c = 1$$

$X1 < X \leq X2$

$$c = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}} \quad \text{or } c = 1$$

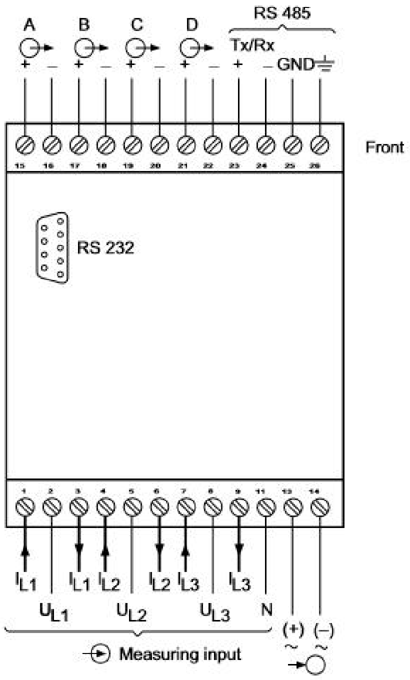
Applicable Standards and Regulations

DIN EN 60 688	Electrical measuring transducers for converting AC electrical variables into analogue and digital signals
IEC 1010 or EN 61 010	Safety regulations for electrical measuring, control and laboratory equipment
EN 60529	Protection types by case (code IP)
IEC 255-4 Part E5	High-frequency disturbance test (static relays only)
IEC 1000-4-2, 3, 4, 6	Electromagnetic compatibility for industrialprocess measurement and control equipment

VDI/VDE 3540, page 2	Reliability of measuring and control equipment (classification of climates)
DIN 40 110	AC quantities
DIN 43 807	Terminal markings
IEC 68 /2-6	Basic environmental testing procedures, vibration, sinusoidal
	Electromagnetic compatibility of data processing and telecommunication equipment Limits and measuring principles for radio interference and information equipment
IEC 1036	Alternating current static watt-hour meters for active energy (classes 1 and 2)
DIN 43864	Current interface for the transmission of impulses between impulse encoder counter and tarif meter
UL 94	Tests for flammability of plastic materials for parts in devices and appliances

Connection Diagram and Installation

Function			Connect.
Measuring input	AC current	IL1	1 / 3 4 / 6 7 / 9
	AC voltage	UL1 UL2 UL3 N	2 5 8 11
Outputs	Analogue A	+ –	15 16
	B	+ –	17 18
	C	+ –	19 20
	D	+ –	21 22
RS 485 (MODBUS)		Tx+/Rx+ Tx–/Rx– GND ⏚	23 24 25 26
Power supply	AC	~ ~	13 14
	DC	+ –	13 14



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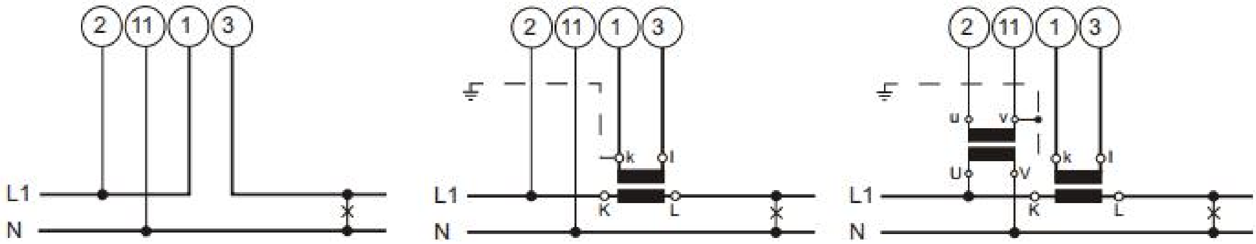
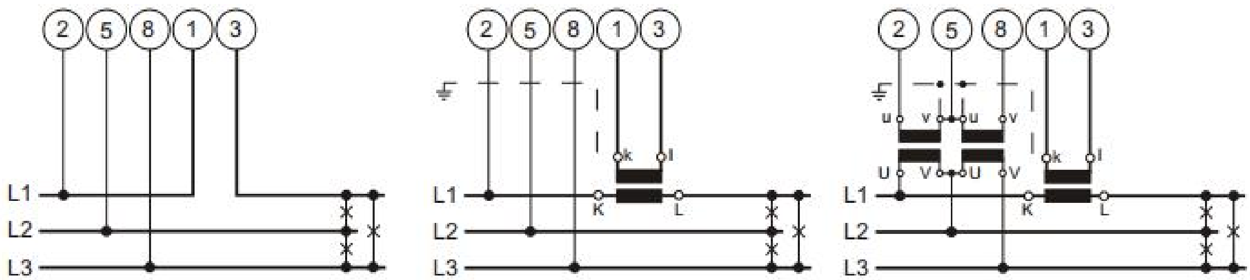
Application (system)	Internal connection Terminal / System	
Single-phase AC current	2 / 11	(L1 – N)
4-wire 3-phase symmetric load	2 / 11	(L1 – N)
All other (apart from A15 / A16 / A24)	2 / 5	(L1 – L2)

Single phase AC System



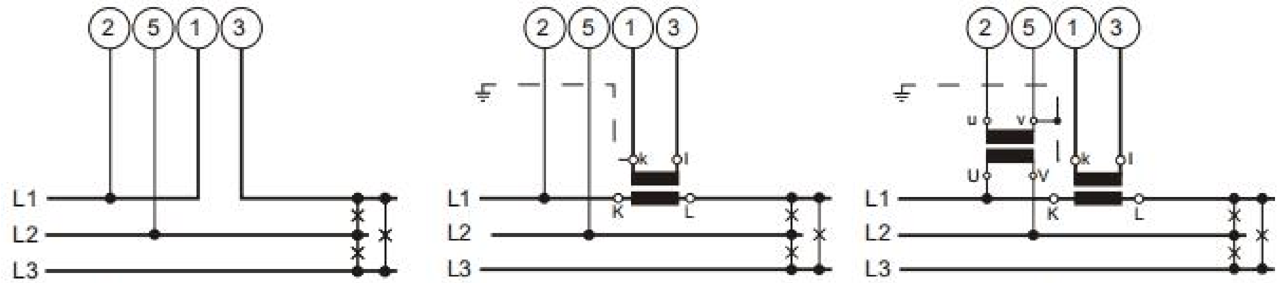
3 wire 3 phase symmetric load I:L1



Connect the voltage according to the following table for current measurement in L2 or L3:

Current transf.	Terminals		2	5	8
L2	1	3	L2	L3	L1
L3	1	3	L3	L1	L2

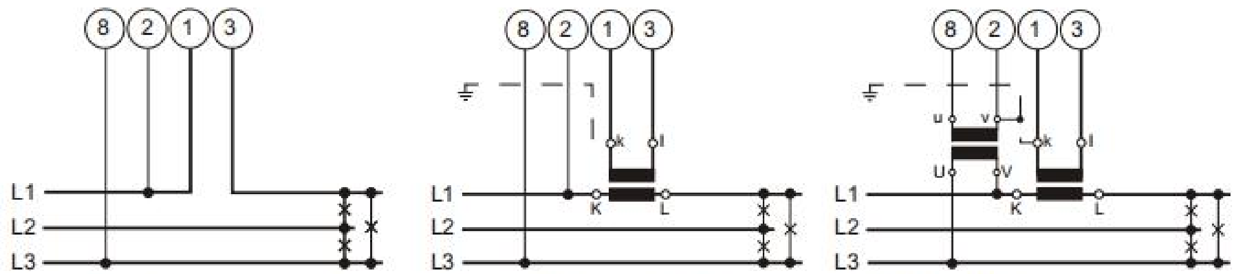
3 wire 3 phase symmetric load Phase Shift U:L1-L2 I :L1



Connect the voltage according to the following table for current measurement in L2 or L3:

Current transf.	Terminals		2	5
L2	1	3	L2	L3
L3	1	3	L3	L1

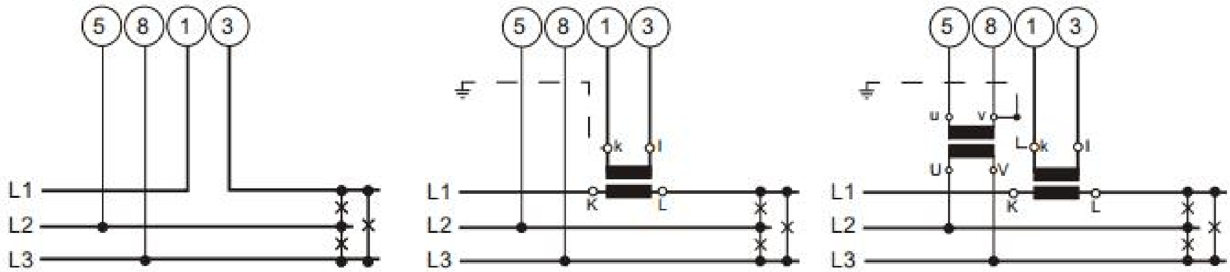
3 wire 3 phase symmetric load Phase Shift U:L3-L1 I :L1



Connect the voltage according to the following table for current measurement in L2 or L3:

Current transf.	Terminals		8	2
L2	1	3	L1	L2
L3	1	3	L2	L3

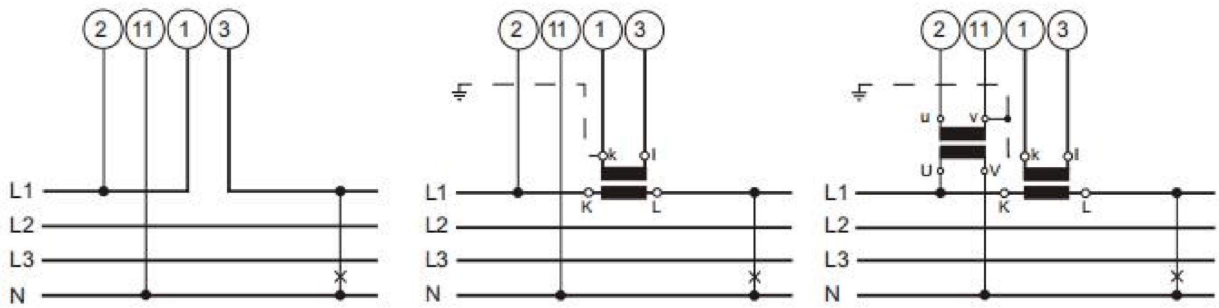
3 wire 3 phase symmetric load Phase Shift U:L2-L3 I :L1



Connect the voltage according to the following table for current measurement in L2 or L3:

Current transf.	Terminals		5	8
L2	1	3	L3	L1
L3	1	3	L1	L2

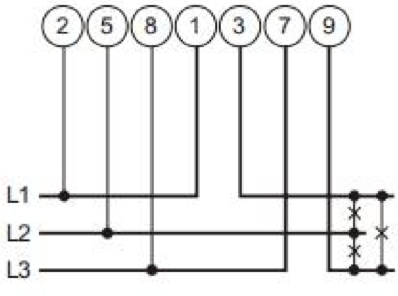
4 wire 3 phase symmetric load I:L1

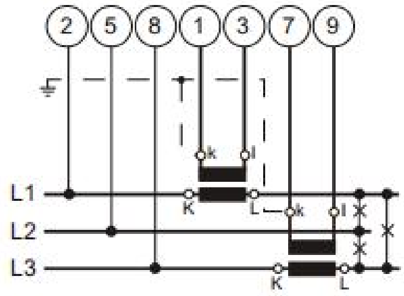


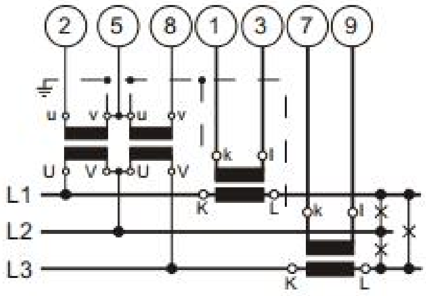
Connect the voltage according to the following table for current measurement in L2 or L3:

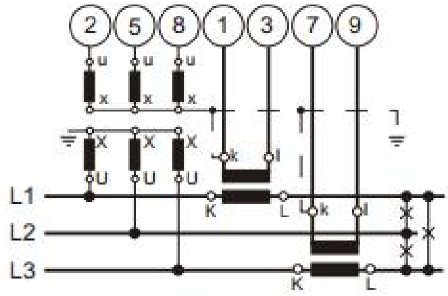
Current transf.	Terminals		2	11
L2	1	3	L2	N
L3	1	3	L3	N

3 wire 3 phase asymmetric load

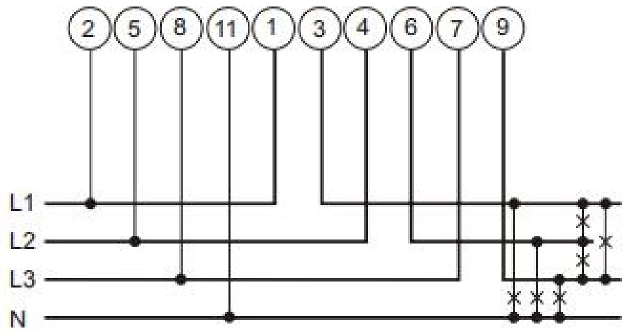


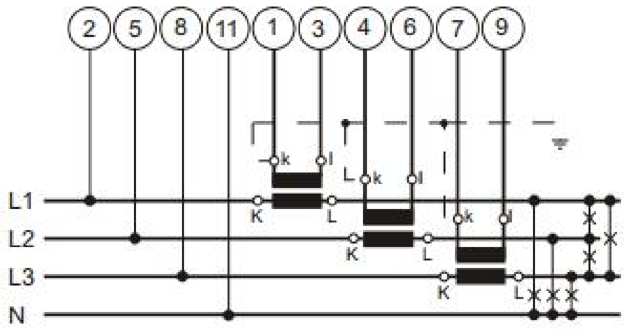


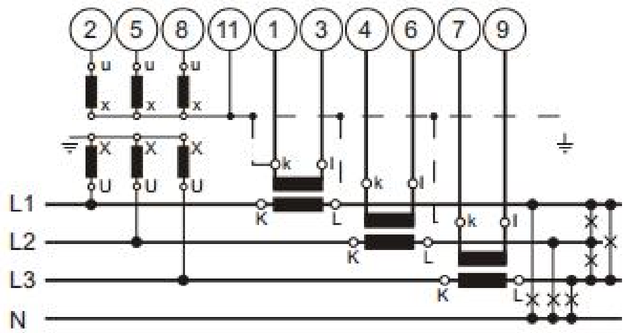




3 phase 4 wire asymmetric load







3 single-pole insulated voltage transformers
in high-voltage system

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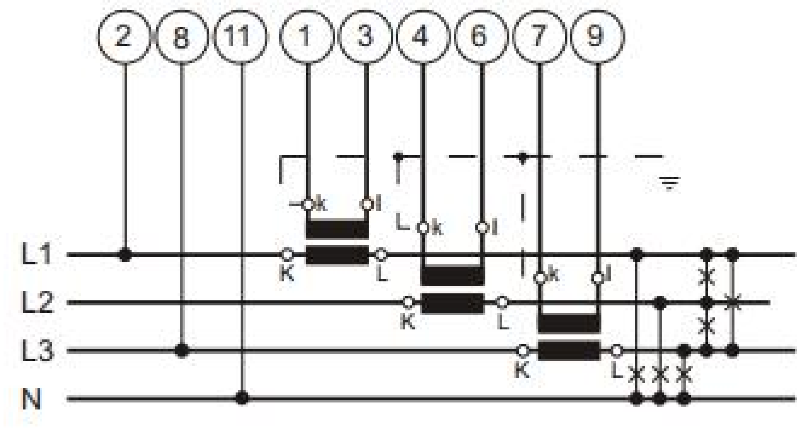
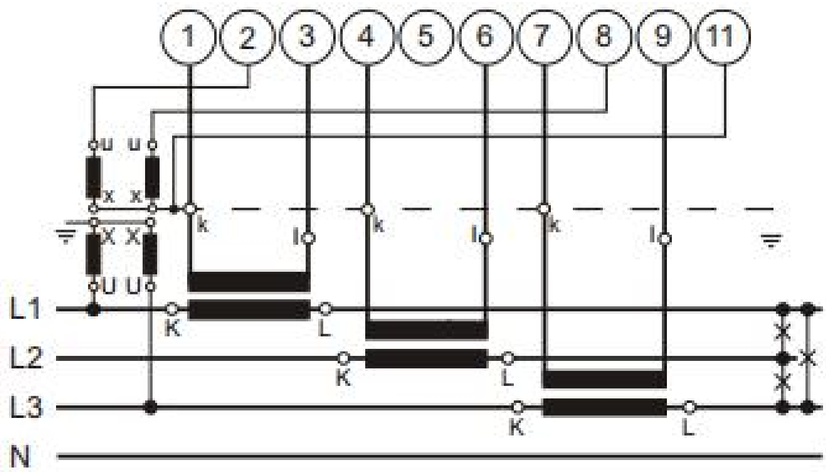
4 wire asymmetric load 3 phase Open Y Connections



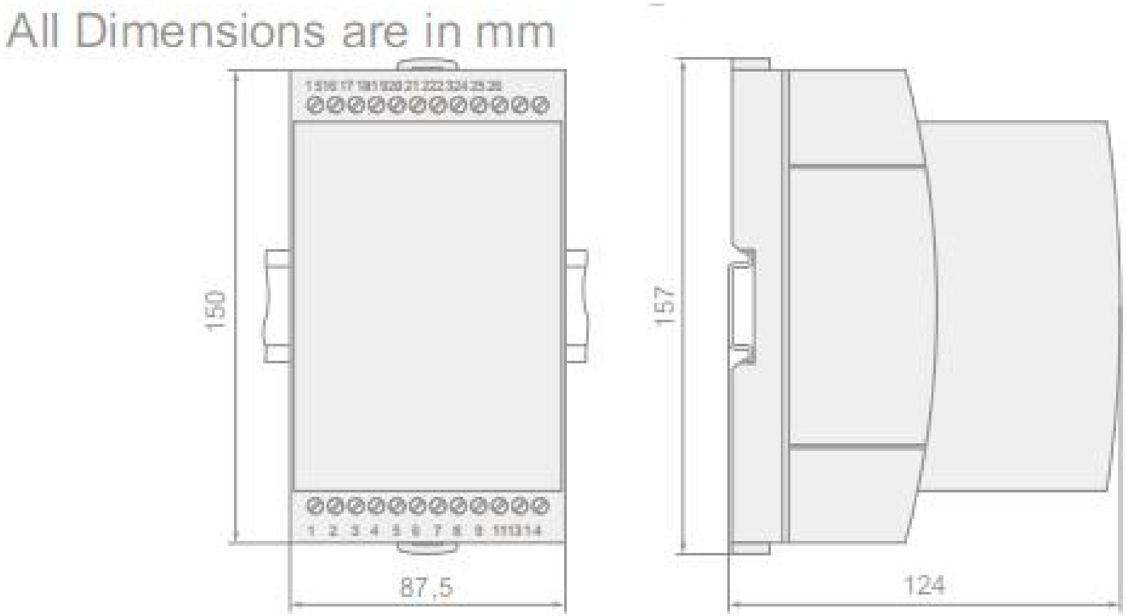
Low-voltage system



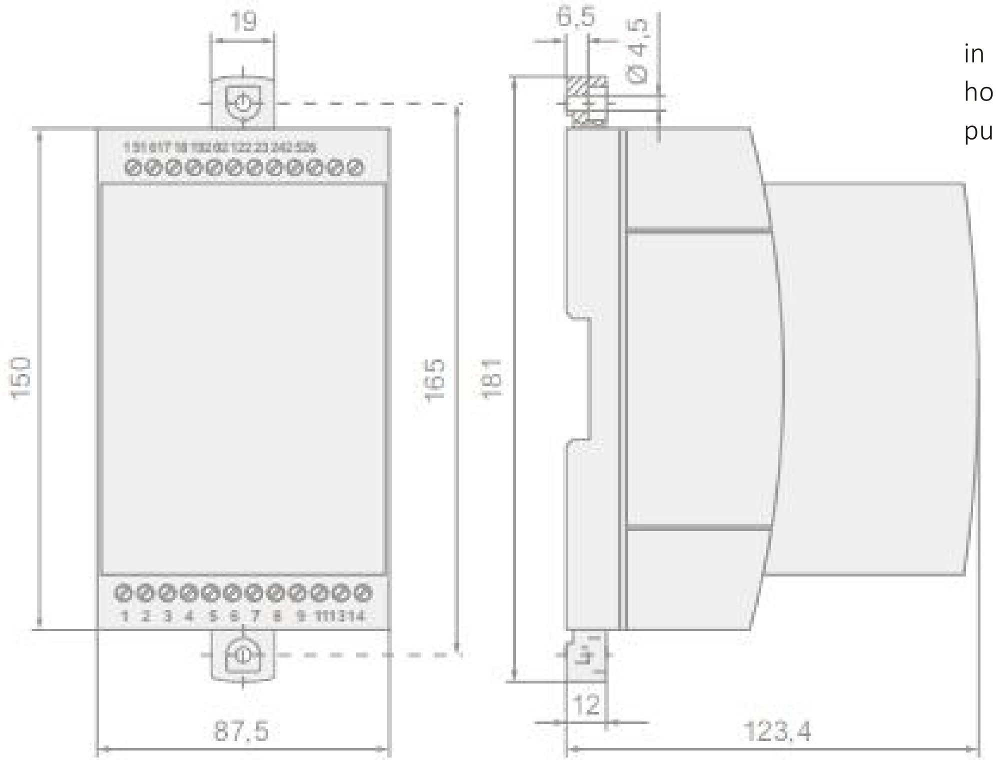
2 single-pole insulated voltage transformers
in high-voltage system

ELECTRICAL SIGNAL CONVERTER – MULTI PARAMETER MFXX

Dimensions



in housing T24 clipped onto a top-hat rail
(35 X 15 mm or 35 X 7.5 mm, acc. to EN 50 022)



in housing T24, screw hole mounting brackets pulled out.

Ordering Information

Description	(/)
1. Mechanical design	
Housing T24 for rail and wall mounting 01 - 1	
2. Rated input frequency	
1) 50 Hz (60 Hz possible without additional error; 16 2/3 Hz, additional error 1.25)	
2) 60 Hz (50 Hz possible without additional error; 16 2/3 Hz, additional error 1.25)	
3) 16 2/3 Hz (not re-programming by user, 50/60 Hz possible, but with additional error 1.25)	
3. Power supply	
7) Nominal range 24 … 60 V DC, AC	
8) Nominal range 85 … 230 V DC, AC	
4. Power supply connection	
1) External (standard)	
2) Internal from measuring input	
Line 2: Not available for rated frequency 16 2/3 Hz and applications A15 / A16 / A24 (see Table 4) Caution: The power supply voltage must agree with the input voltage (Table 4)!	
5. Test certificate	
0) None supplied	
E) With test certificate in English	
6. Configuration	
0) Basic configuration, programmed	
9) Programmed acc. to specification	
Line 0: Not available if the power supply is taken from the measuring input Line 9: All the programming data must be entered on Form W 2408e and the form must be included with the order.	

Ziegler

Redefine Innovative Metering

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