MÜLLER ZIEGLER
Elektrische Messgeräte

PANEL METERS ANALOG
N + DIN-SERIES
WAS/PAS FOR TOP HAT RAILS

TECHNICAL INFORMATION

www.mueller-ziegler.de

Product groups 5 and 6

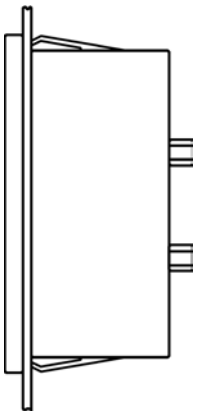
made in germany

Panel meters analog

General description

Housing

Dimensions	For all types the housing dimensions and the required panel cut-outs comply with DIN 43 700.	
Material	N-Series	Lexan 500 (self extinguishing acc. to UL 94 V-0)
	48 DIN, PK 72 DIN, PK 96 DIN	PC / ABS
	72 DIN, 96 DIN, 144 DIN	Sheet steel galvanzizted
IP code	All housing follow DIN EN 60 529 and comply with IP 52 on front side or special moduls with IP 54 if possible	
Snap-on fastening	For types of N-series and 48 DIN for panel thickness 1 mm to 3 mm no seperat fastening element required	



Fastening acc. to DIN 43 835	with screw clamp panel thickness 1 mm to 4 mm (standard type, figure 1) with DIN screw clamp shape B, panel thickness 1 mm to 40 mm for types 72 DIN, 96 DIN, 144 DIN (figure 2) against surcharge

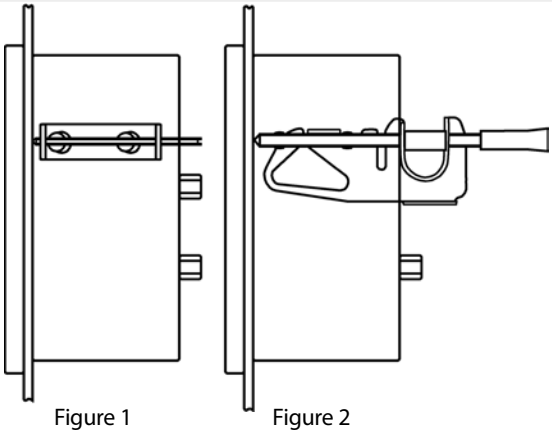


Figure 1 Figure 2

Contact protection sleeves

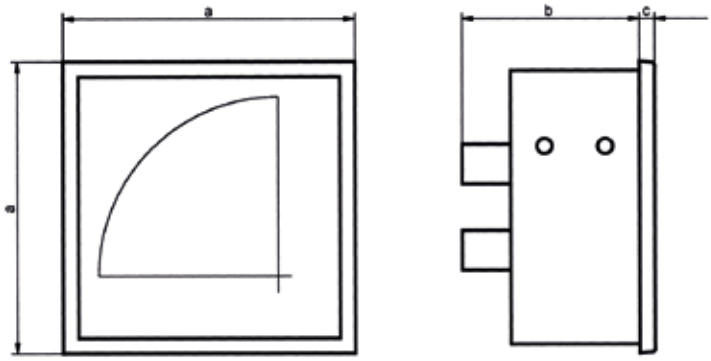
Technical data

Front panel	Dimensions acc. to DIN 43 718. The front frames are delivered as slim frame (black) for all types.
Scale, pointer	Design acc. to DIN 43 802. The scale graduation is designed as rough/fine division, the pointers as bar pointers.
Zero point setting	All analog measuring instruments offers a zero correction
Accuracy	Acc. to DIN EN 60 051. It is defined under reference conditions, referred to the full scale. With zero point offset, the sum of both full scale values applies. In case of power factor measuring instruments and resistance meters (scale characteristics highly nonlinear), the measuring error is referred to the scale length.
Reference conditions	Temperature 20°C ± 2K, nominal operating position ± 1°
Influecing quantities	Operating position normally vertical ± 5°, in case of deviating operating position, the angle of the horizontal position must be specified. Temperature influence, unless specified otherwise, is the additional error ≤ 1,5 % at 20 °C ± 10 K environmental temperature. Ferromagnetic control panels have no influence on the measuring accuracy.
Operating temperature	The measurement instruments operate faultlessly within a temperature range of –25°C bis +55°C (unless specified otherwise).
Mechanical strength	The measuring elements are designed with a steel tip bearing. Their mobile element is supported in spring-loaded ceramic stones. This guarantees a vibration resistance of up to 2.5 g and an impact resistance of up to 15. For higher levels of stress and loads, carbide tips are used.
EMC	EMC according to DIN EN 61 326
Safety regulations	According to DIN EN 61 010 part 1. Protection class acc. to DIN EN 60 529, connecting terminals with protection against contacts, back-of-hand-proof, IP10.

Types	Measuring category	Working voltage phase to neutral AC effective or DC	Test voltage/ Conditions
For all N ... types, WQ 48 DIN, PQ 48 DIN, WAS 45, SZAS 45 (Plastic housing)	CAT III	300 V	4 kV
For all PQ..., WQ..., MQ..., DWQ..., LWQ..., F..., SZ..., MWQ72, MWQ96 (Metal housing)		300 V	2,5 kV installed in grounded metal panel
Round scale indicator 240° of Pk typ Narrow profile of the device types P 48 x 24, P 72 x 24, P 96 x 24, P 144 x 36 (Plastic housing)		150 V	2,5 kV
MWQ144 (Metal housing)		150 V	2,5 kV installed in grounded metal panel
PAS 45 (Plastic housing)		100 V	2,5 kV

Dimensions

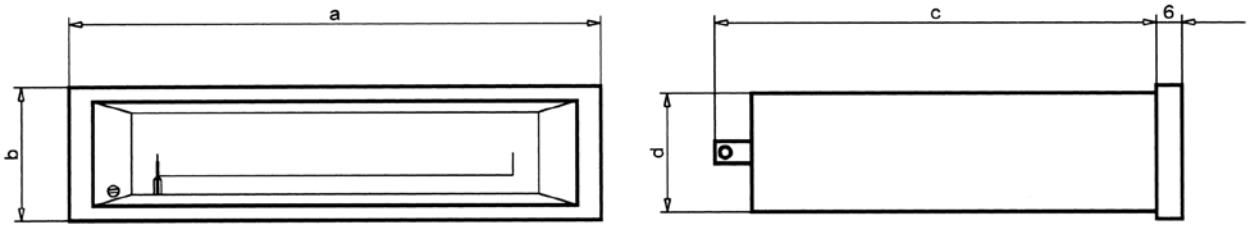
for panel meters analog, square cut-out



Types			a	b	c
NW, NP, NPG, NMW	72	-15 A	72	58	5
		> 15 - 60 A	72	64	5
NW, NP, NPG, NMW	96	-15 A	96	58	5
		> 15 - 60 A	96	64	5
WQ, PQ, PGQ	48 DIN	-15 A	48	47	5
		> 15 - 60 A	48	53	5
WQ, PQ, MQ, Fz, SZ, LWQ	72 DIN	-15 A	72	60	5
Fz, SZ, LWQ		> 15 - 60 A	72	66	5
WQ, PQ, MQ, LWQ, Fz, DWQ, SZ	96 DIN	-15 A	96	60	5
Fz, DWQ, SZ		> 15 - 60 A	96	66	5
WQ, PQ, MQ	144 DIN	-15 A	144	61	7
Fz		> 15 - 60 A	144	66	7
PK, PKG	48 DIN	- 15 A	48	68	5
		> 15 - 60 A	48	73	5
PK, PKG	72 DIN	- 15 A	72	54	5
		> 15 - 60 A	72	54	5
PK, PKG	96 DIN	- 15 A	96	54	5
		> 15 - 60 A	96	54	5
PK, PKG	144 DIN	- 15 A	144	69	7
		> 15 - 60 A	144	75	7
MWQ	72 DIN	/ 5 A	72	102	5
MWQ	96 DIN	/ 5 A	96	102	5
MWQ	144 DIN	/ 5 A	144	99	7
SM 8 / SM 16	96 DIN		96	56	5

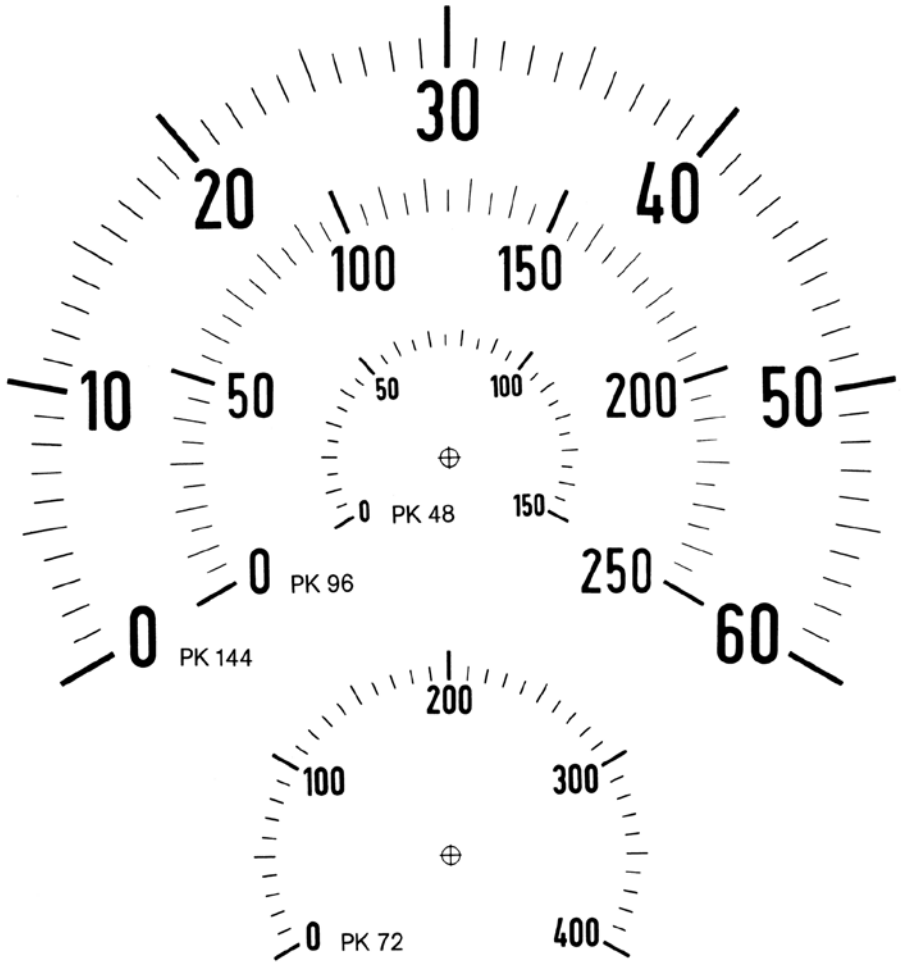
Dimensions

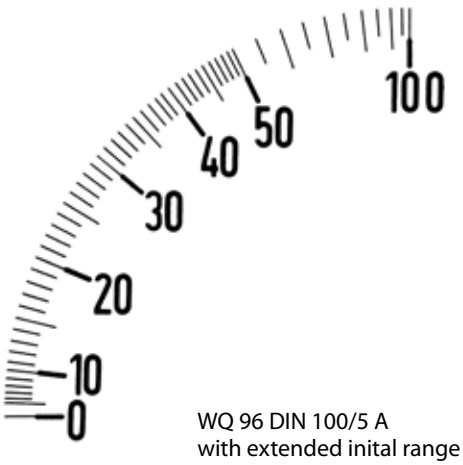
for panel meters analog, rectangular cut-out



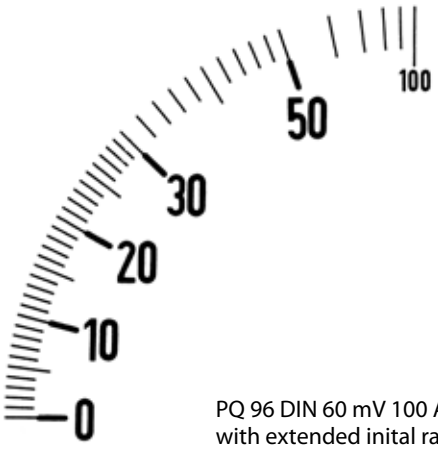
Types	a	b	c	d	Durchbruch
P 48x24	48	24	70	18	45 x 22
P 72x24	72	24	86	18	68 x 22
P 72x36	72	36	105	32	68 x 34
P 96x24	96	24	102	18	92 x 22
P 96x48	96	48	126	42	92 x 46
P 144x36	144	36	202	32	138 x 33
P 144x72	144	72	168	68	138 x 69

Scale graduation in original size

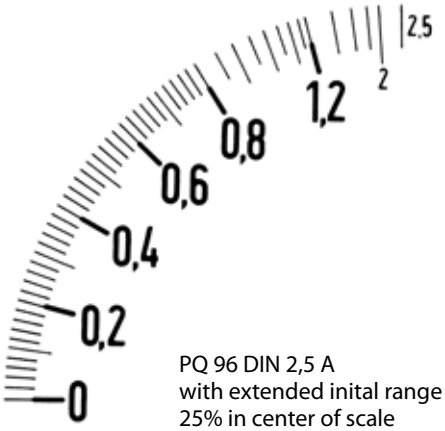




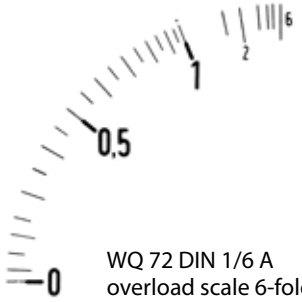
WQ 96 DIN 100/5 A
with extended inital range
30% in center of scale



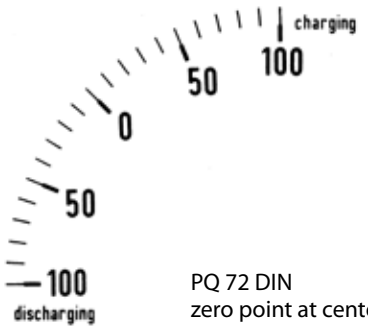
PQ 96 DIN 60 mV 100 A
with extended inital range
30% in center of scale



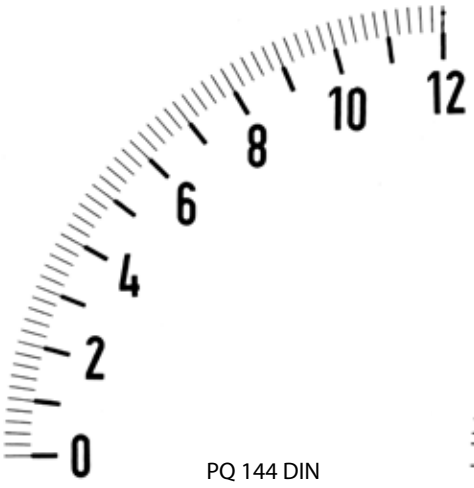
PQ 96 DIN 2,5 A
with extended inital range
25% in center of scale



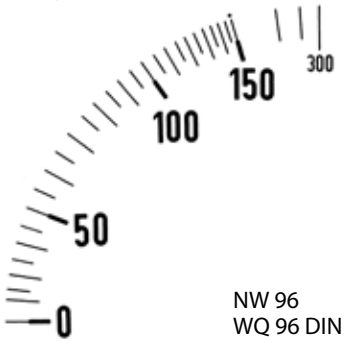
WQ 72 DIN 1/6 A
overload scale 6-fold



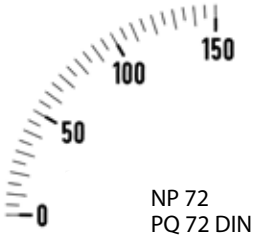
PQ 72 DIN
zero point at center



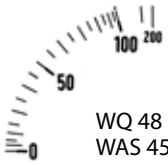
PQ 144 DIN



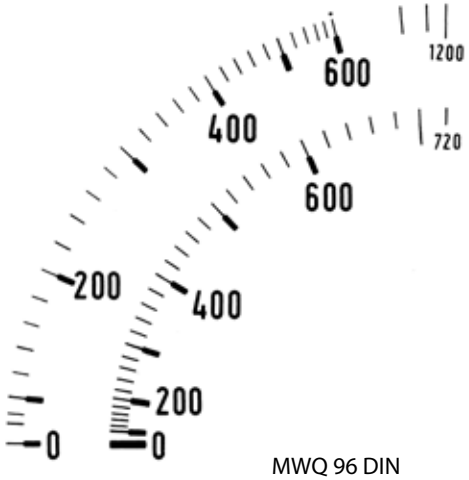
NW 96
WQ 96 DIN



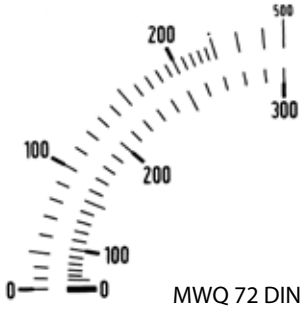
NP 72
PQ 72 DIN



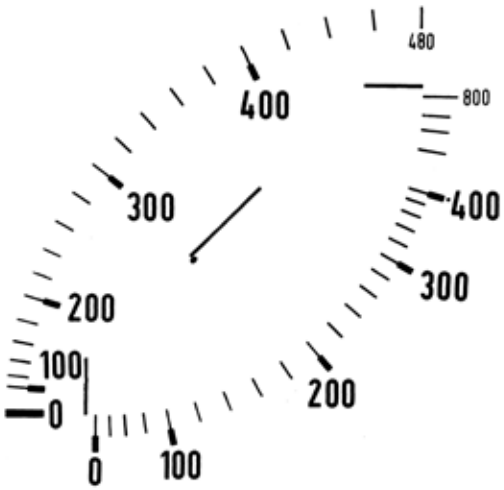
WQ 48 DIN
WAS 45

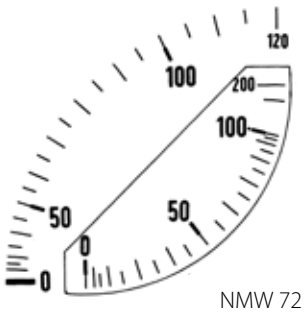


MWQ 96 DIN



MWQ 72 DIN





NMW 72

Notice

General special versions

Increased requirements	Shakeproof > 2,5 g up to 5 g from 100 µA and 100 mV	
	Acid-resistant and splash proof	
	IP 54, front side	● Types 72 DIN and 96 DIN
	(with screw fixing only)	● N-Series
	conditionally tropicalized	
Pointer	Red marker pointer, adjustable at front side, for sizes 72, 96, 144 only	
Scales	Imprint	red marking at arbitray position of scale
		colored sector at arbitray position of scale
		e.g. charge / discharge
		second scale numbering
	Double scale	
	Special calibration	according to curve or table
		in different measuring unit, e.g. min-1, bar, m/s
	Special scale	blanc scale (without scale graduation and measuring unit)
		scale black, pointer, graduation and numbering white or yellow (as far as possible)
		scale fine graduation
	Illumination	by means of 12 V or 24 V lamp plugged at rear side
		(as far as possible)
Fastening	screw clamp shape B acc. to DIN 43 835	
Front frame	grey (similar to RAL 7037, as far as possible)	
Front glass	low-glare glass	
	plexiglas	
Cover frame	with glass pane acc. to DIN 43 718 for cut-outs acc. to DIN 43 700	
	68 mm x 68 mm	
	92 mm x 92 mm	
	138 mm x 138 mm	
Blind cover	from black plastic material for cut-outs acc. to DIN 43 700	
	45 mm x 45 mm (front 48 mm x 48 mm)	
	68 mm x 68 mm (front 72 mm x 72 mm)	
	92 mm x 92 mm (front 96 mm x 96 mm)	
	92 mm x 22 mm (front 96 mm x 24 mm)	
	92 mm x 45 mm (front 96 mm x 48 mm)	
Protection cover	IP 65 protection for front 72 x 72 mm	
	IP 65 protection for front 96 x 96 mm	
Test report	up to 10 test points (depending on type)	

Moving-iron measuring instruments

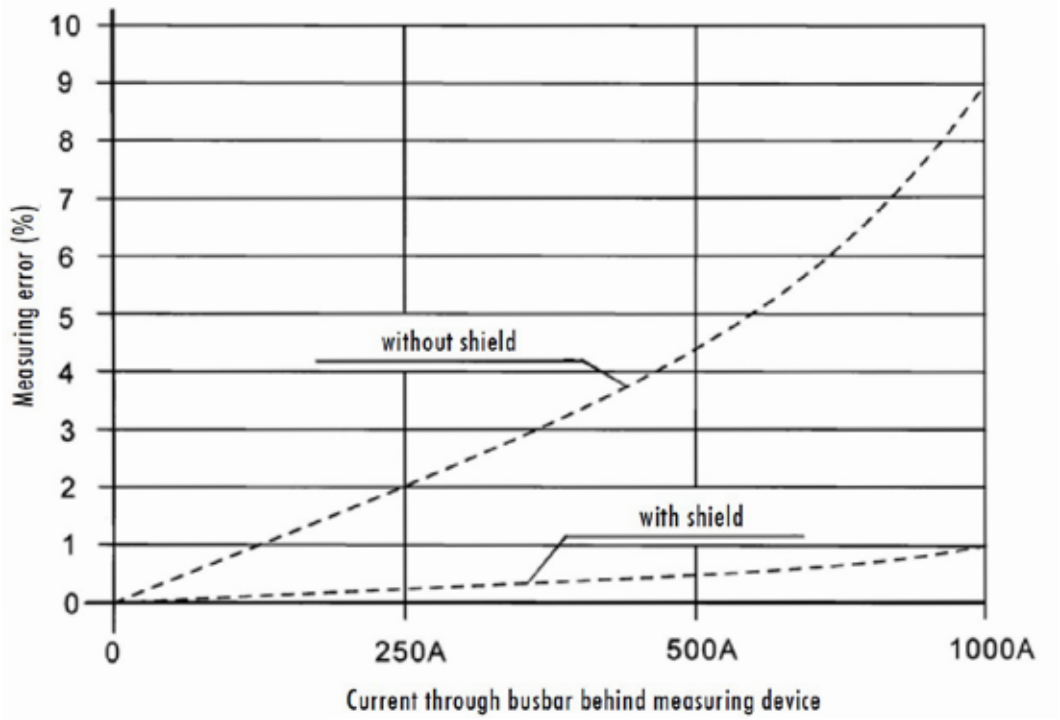
Application	Moving-iron measuring instruments are mainly used in heavy-current installation for the measurement of alternating currents and alternating voltages (direct measurement or via current or voltage transformer). Moving-iron measuring instruments also indicate the rms value in case of non-sinusoidal quantities within a frequency range of 15-100 Hz. With direct current and direct voltage, additional indication errors of approx. 1 % may occur due to magnetization errors inside the iron. As compared to moving-coil measuring instruments, the energy consumption is relatively high ranging between 0.6 VA and 2 VA. They are thus not suited for measuring small currents or voltages, like e.g. at shunts, speed sensor, thermoelements, measuring transducers.	
Measuring systems	● Robust and electrically resistant to high overloads ● Spring loaded toe bearing in ceramic stones ● Damping through silicone bearings, setting time approx. 1 s ● High torque ● Shielding against external magnetic fields	
Design	Moving-iron measuring instruments are manufactured according to DIN 60 051 as well as according to the other relevant VDE and DIN regulations. The accuracy amounts to 1.5 % referred to the full scale. The graduation of the scale of standard ammeters disposes of a 2-fold overload scale and starts at approx. 10% (20% for voltmeters) of the full scale. Moving-iron measuring elements are resistant to a permanent 1.2-fold overload, ammeters temporarily to a max. 50-fold overload, voltmeters to a max. 2-fold overload; for the rest, DIN EN 60 051 applies. Voltmeters and ammeters up to 5 A are provided with a shielding against external magnetic fields up to a strength of 4 kA/m, ammeters of 6 A up to 60 A offer a shielding up to a strength of (2 kA/m). The connection is realized using M4 screws for voltmeters and for ammeters up to 15 A max. 6 mm², M5 screws up to 60 A max. 16 mm² (back-of-hand-proof).	
Special versions	Measuring ranges	without overload range
		outside of standard series
		increased overload range for CT connection max. 6-fold, with direct measurement < 50 A max. 5-fold
		extended intial range up to 30 % of full scale in center of scale (up to 25 A and 800 V) without overload
		extended accuracy1 %
	Special calibration	for direct current
		for frequency 16 2/3 Hz
		fixed value between 100 Hz and 400 Hz
		● for ammeters
		● for voltmeters
		fixed value between 400 Hz and 1000 Hz
		● for ammeters
		● for voltmeters
	Damping	increased damping, strong aperiodic, setting time approx. 3 s

Größen 72, 96, 144

Price group A

External magnetic field influence in case of moving-iron measuring instruments

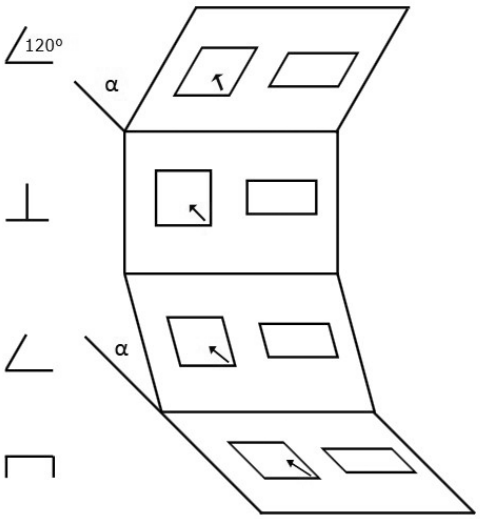
Influence of external magnetic field of a busbar at a horizontal distance of 100 mm and a vertical distance of 150 mm to the moving-iron ammeter.



Due to the capsuled measuring systems, Müller+Ziegler instruments still lie within the required accuracy class even in case of high external magnetic fields.

Operating position

In general, the operating position is indicated by a position symbol. For instruments without a position symbol, the reference area is any operating position between horizontal and vertical. The nominal operating position is 1 ° in each direction from the reference operating position, whereby the influencing effect (in addition to the display error) must not be greater than 50% of the corresponding class error.



Moving-iron measuring instruments

for alternating current and alternating voltage

Type:
NW / WQ .. DIN

Square cut-out 40 - 100 Hz, class 1,5 Ammeter with 2-fold overload scale Energy consumption: Voltmeter 2 VA Ammeter 0,6-2 VA	plastic housing		plastic housing	metal housing		
Type	**NW 72**	**NW 96**	**WQ 48 DIN**	**WQ 72 DIN**	**WQ 96 DIN**	**WQ 144 DIN**
Front frame (mm)	72x72	96x96	48 x 48	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	45 x 45	68 x 68	92 x 92	138 x 138
Scale length (mm)	62	90	42	62	90	130
Weight (kg)	0,20	0,25	0,10	0,26	0,30	0,70

€

Types and variants

Measuring ranges							
Alternating voltage							
V	10 15 25 40 60	X	X	- - X	X	X	X
	100 150 250 400 500 600	X	X	X - -	X	X	X
for use with voltage transformer	sec. 100 V sec. 110 V	X	X	X	X	X	X
Alternating current							
mA	40 60	X	X	- -	X	X	X
	100 150 250 400 600	X	X	X	X	X	X
A	1 1,5 2,5 4 6 10 15	X	X	X	X	X	X
	25 40 60	X	X	- - -	X	X	X
for use with current transformer	sec. 5A sec. 1 A	X	X	X	X	X	X

Price group A

Moving-iron measuring instruments

with integrated selector switch for measurement of the alternating voltage in 3-phase power systems phase against phase as well as phase against neutral with 6 switching positions

Type:
NW .. SU

Square cut-out
40 - 100 Hz, class 1,5
Energy consumption max. 4 VA

plastic housing

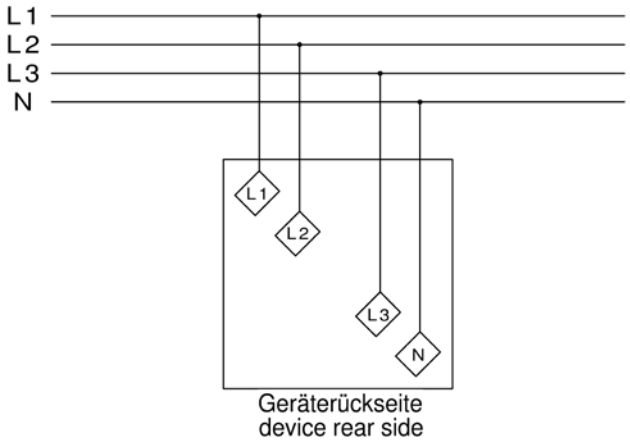
Type	NW 72 SU	NW 96 SU
Front frame (mm)	72x72	96x96
Cut-out (mm)	68 x 68	92 x 92
Scale length (mm)	62	90
Weight (kg)	0,20	0,25

€

Types and variants

Measuring ranges		
500 V	X	X

Wiring diagram NW96SU and NW72SU



Price group A

Notice

Description moving-coil panel meters

Application	Moving-coil measuring instruments serve for measuring direct current and direct voltage. For extending the measuring range, shunts, series resistors or voltage dividers are used. The energy consumption of moving-coil measuring instruments is very low; they may thus be connected to shunts, speed sensors, thermocouples, measuring transducers or similar. Moving-coil measuring instruments with rectifier serve for measuring alternating current and alternating voltage. They measure the arithmetic mean value, but are designed in a way to indicate the rms value in case of sinusoidal variables. In case of non-sinusoidal variables, an rms-value rectifier is provided. It is able to still process crest factors of max. 8 without problem. The max. error amounts to less than 1% in this case.
Measuring systems	● Core-magnet measuring system ● Spring loaded toe bearing in ceramic stones ● High damping ● Independent of external fields ● Linear scale characteristics
Design	Moving-coil measuring instruments are manufactured according to DIN 60 051 as well as according to the other relevant VDE and DIN regulations. The accuracy amounts to 1.5 % referred to the full scale. The energy consumption lies between 5 µW and 50 µW, the smallest possible measuring ranges lie around 25 µA and 10 mV. In case of smaller values than stated above, a measuring amplifier is provided. When adjusting moving-coil measuring instruments for their connection to shunts, an input lead resistance of 0.06 Ω is principally accounted for; this corresponds to an input lead of 1.3 m, 2 x 0.75 mm^2. Moving-coil measuring instruments are resistant to a permanent 1.2-fold overload, ammeters temporarily to a max. 10-fold overload voltmeters to a max. 2-fold overload; for the rest, DIN EN 60 051 applies. The connection is made using M4 screws for voltmeters and for ammeters up to 15 A max. 6 mm^2 M5 screws up to 60 A max. 16 mm^2 (back-of-hand-proof), with slim profile moving-coil measuring instruments via blade terminal.

General special designs

Measuring range	Outside of standard series
	Second measuring range
	for voltmeters and ammeters up to 15 A with additional numbering
	with additional graduation and numbering
	Electrical suppressed initial range starting from 10 V, max. 60 % of full scale
	Extended intial range, up to 10 % of full screen in center scale
	Zero point at any position of scale
	Extended accuracy 1 %
	Extended accuracy 0,5 % in case of direct current or direct voltage for sizes 96 and 144 only
Special adjustment	With ammeters Δ U ± 1 %
	With voltmeters Ri ± 1 %
	Input lead when connected to shunt different to 0,06 Ω
	Installed potentiometer for voltmeters starting from 60 mV ● setting rang ± 10 % of full scale ● setting range ± 20 % to ± 50 % of full scale
Increased input resistance	ca. 2000 Ω / V
	ca. 4000 Ω / V
	ca. 10000 Ω / V
	ca. 20000 Ω / V (as far as possible)
	> 20000 Ω / V with measuring amplifier
Averager	e.g. in case of pulse packing controls for measuring ranges from 1 A to 25 A incl. current transformer (for types PQ 72 DIN, PQ 96 DIN and PQ 144 DIN only, basic price

Moving-coil measuring instruments

for direct current

Type:
NP / PQ .. DIN

Square cut-out Class 1,5	plastic housing		plastic housing	metal housing		
Type	**NP 72**	**NP 96**	**PQ 48 DIN**	**PQ 72 DIN**	**PQ 96 DIN**	**PQ 144 DIN**
Front frame (mm)	72x72	96x96	48 x 48	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	45 x 45	68 x 68	92 x 92	138 x 138
Scale length (mm)	62	90	42	62	90	130
Weight (kg)	0,20	0,25	0,10	0,26	0,30	0,70

€

Types and variants

Measuring ranges								
		Ri / Δ U						
µA	100	4400 Ω	X	X	X	X	X	X
	150	2200 Ω						
	250	900 Ω	X	X	X	X	X	X
	400	306 Ω						
	600	177 Ω						
mA	1	53 Ω	X	X	X	X	X	X
	1,5	23 Ω						
	2,5	9 Ω						
	4	6,5 Ω						
	6	3,5 Ω						
	10	2,5 Ω						
	15	1,3 Ω	X	X	X	X	X	X
	25	60 mV						
	40	60 mV						
	60	60 mV						
	100	60 mV	X	X	X	X	X	X
	150	60 mV						
	250	60 mV						
	400	60 mV						
	600	60 mV						
A	1	60 mV	X	X	X	X	X	X
	1,5	60 mV						
	2,5	60 mV						
	4	60 mV						
	6	60 mV						
	10	60 mV						
	15	60 mV			-			
	25	60 mV	X	X	-	X	X	X
for use with shunt								
mV	60	12 Ω	X	X	X	X	X	X
	100	20 Ω						
	150	30 Ω						
for use with measuring transducer								
mA	0-20	2,2 Ω	X	X	X	X	X	X
	4-20	50 Ω	X	X	X	X	X	X
V	0-10	10 k Ω	X	X	X	X	X	X

Price group A

Moving-coil measuring instruments

for direct voltage

Type:
NP / PQ .. DIN

Square cut-out Class 1,5	plastic housing		plastic housing	metal housing		
Type	**NP 72**	**NP 96**	**PQ 48 DIN**	**PQ 72 DIN**	**PQ 96 DIN**	**PQ 144 DIN**
Front frame (mm)	72x72	96x96	48 x 48	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	45 x 45	68 x 68	92 x 92	138 x 138
Scale length (mm)	62	90	42	62	90	130
Weight (kg)	0,20	0,25	0,10	0,26	0,30	0,70

€

Types and variants

Measuring ranges								
		Ri / Δ U						
mV	40	200 Ω / V	X	X	X	X	X	X
	60	200 Ω / V	X	X	X	X	X	X
	100	200 Ω / V						
	150	200 Ω / V						
	250	200 Ω / V	X	X	X	X	X	X
	400	1000 Ω / V						
	600	1000 Ω / V						
V	1	1000 Ω / V						
	1,5	1000 Ω / V						
	2,5	1000 Ω / V						
	4	1000 Ω / V						
	6	1000 Ω / V						
	10	1000 Ω / V						
	15	1000 Ω / V						
	25	1000 Ω / V	X	X	X	X	X	X
	40	1000 Ω / V						
	60	1000 Ω / V						
	100	1000 Ω / V						
	150	1000 Ω / V						
	250	1000 Ω / V						
	400	1000 Ω / V						
	500	1000 Ω / V						
	600	1000 Ω / V						

Price group A

Moving-coil measuring instruments

for direct current

Type:
PK .. DIN

Square cut-out
class 1,5
240° scale

plastic housing | metal housing

Type		PK 48 DIN	PK 72 DIN	PK 96 DIN	PK 144 DIN
Front frame (mm)		48 x 48	72 x 72	96 x 96	144 x 144
Cut-out (mm)		45 x 45	68 x 68	92 x 92	138 x 138
Scale length (mm)		70	105	150	230
Weight (kg)		0,20	0,30	0,40	0,90

€

Types and variants

Measuring ranges						
		Ri / Δ U				
µA	100	4400 Ω				
	150	4000 Ω				
	250	2500 Ω	X	X	X	X
	400	2000 Ω				
	600	1400 Ω				
mA	1	300 Ω				
	1,5	250 Ω				
	2,5	120 Ω				
	4	80 Ω				
	6	60 mV	X	X	X	X
	10	60 mV				
	15	60 mV				
	25	60 mV				
	40	60 mV				
	60	60 mV				
	100	60 mV				
	150	60 mV				
	250	60 mV	X	X	X	X
	400	60 mV				
	600	60 mV				
A	1	60 mV				
	1,5	60 mV				
	2,5	60 mV	X	X	X	X
	4	60 mV				
for use with shunt						
mV	60	12 Ω				
	100	20 Ω	X	X	X	X
	150	30 Ω				
for use with measuring transducer						
mA	0-20	3 Ω	X	X	X	X
	4-20	45 Ω	X	X	X	X
V	0-10	10 k Ω	X	X	X	X

Price group A

Moving-coil measuring instruments

for direct voltage

Type:
PK .. DIN

Square cut-out
class 1,5
240° scale

plastic housing | metal housing

Type	PK 48 DIN	PK 72 DIN	PK 96 DIN	PK 144 DIN
Front frame (mm)	48 x 48	72 x 72	96 x 96	144 x 144
Cut-out (mm)	45 x 45	68 x 68	92 x 92	138 x 138
Scale length (mm)	70	105	150	230
Weight (kg)	0,20	0,30	0,40	0,90

€

Types and variants

Measuring ranges

		Ri / Δ U				
mV	60	200 Ω / V				
	100	200 Ω / V				
	150	200 Ω / V	X	X	X	X
	250	200 Ω / V				
	400	1000 Ω / V				
	600	1000 Ω / V				
V	1	1000 Ω / V				
	1,5	1000 Ω / V				
	2,5	1000 Ω / V				
	4	1000 Ω / V				
	6	1000 Ω / V				
	10	1000 Ω / V				
	15	1000 Ω / V				
	25	1000 Ω / V	X	X	X	X
	40	1000 Ω / V				
	60	1000 Ω / V				
	100	1000 Ω / V				
	150	1000 Ω / V				
	250	1000 Ω / V				
	400	1000 Ω / V				
	500	1000 Ω / V				
	600	1000 Ω / V				

Price group A

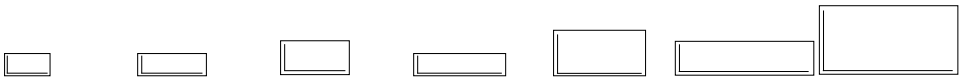
Moving-coil measuring instruments

for direct current

Type:
P ...

Rectangular cut-out
class 1,5
Horizontal scale (vertical scale possible - please specify at order)

plastic housing | metal housing



Type	P 48x24	P 72x24	P 72x36	P 96x24	P 96x48	P 144x36	P 144x72
Front frame (mm)	48x24	72x24	72x36	96x24	96x48	144x36	144x72
Cut-out (mm)	45x22	68x22	68x34	92x22	92x46	138x33	138x69
Scale length (mm)	32	52	52	60	60	95	95
Weight (kg)	0,08	0,10	0,12	0,15	0,25	0,50	0,80

€

Types and variants

Measuring ranges								
µA	100 150	X	X	X	X	X	X	X
	250 400 600	X	X	X	X	X	X	X
mA	1 1,5 2,5 4 6 10	X	X	X	X	X	X	X
	15 25 40 60	X	X	X	X	X	X	X
	100 150 250 400 600	X	X	X	X	X	X	X
A	1	X	X	X	X	X	X	X
for use with shunt								
mV	60 100 150	X	X	X	X	X	X	X
for use with measuring transducer								
mA	0-20	X	X	X	X	X	X	X
	4-20	X	X	X	X	X	X	X
V	0-10	X	X	X	X	X	X	X

Price group A

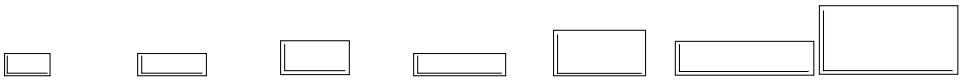
Moving-coil measuring instruments

for direct voltage

Type:
P ...

Rectangular cut-out
class 1,5
Horizontal scale (vertical scale possible - please specify at order)

plastic housing | metal housing



Type	P 48x24	P 72x24	P 72x36	P 96x24	P 96x48	P 144x36	P 144x72
Front frame (mm)	48x24	72x24	72x36	96x24	96x48	144x36	144x72
Cut-out (mm)	45x22	68x22	68x34	92x22	92x46	138x33	138x69
Scale length (mm)	32	52	52	60	60	95	95
Weight (kg)	0,08	0,10	0,12	0,15	0,25	0,50	0,80

€

Types and variants

Measuring ranges								
mV	60	X	X	X	X	X	X	X
	100 150 250 400 600	X	X	X	X	X	X	X
V	1 1,5 2,5 4 6 10 15 25 40 60 100 150 250 400 500 600	X	X	X	X	X	X	X

Moving-coil measuring instruments

with rectifier

for alternating current and alternating voltage

Type:
NPG / PGQ .. DIN

Square cut-out 40 - 100 Hz, class 1,5	plastic housing		plastic housing	metal housing		
Type	**NPG 72**	**NPG 96**	**PGQ 48 DIN**	**PGQ 72 DIN**	**PGQ 96 DIN**	**PGQ 144 DIN**
Front frame (mm)	72x72	96x96	48 x 48	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	45 x 45	68 x 68	92 x 92	138 x 138
Scale length (mm)	62	90	42	62	90	130
Weight (kg)	0,20	0,25	0,10	0,26	0,30	0,60

€

Types and variants

Measuring ranges							
V	10 15 25 40 60 100 150 250 400 500 600	X	X	X	X	X	X
A	1 1,5 2,5 4 6 10 15 25	-	-	-	X	X	X

Price group A

Moving-coil measuring instruments

with rectifier

for alternating current and alternating voltage

Type:
PKG .. DIN / PG

Square and rectangular cut-outs 40 - 100 Hz, Class 1,5 240° scale and slim profile	plastic housing			metal housing	plastic housing		
Type	**PKG 48 DIN***	**PKG 72 DIN**	**PKG 96 DIN**	**PKG 144 DIN**	**PG 48 x 24**	**PG 72 x 24**	**PG 96 x 24**
Front frame (mm)	48 x 48	72x72	96x96	144 x 144	48 x 24	72 x 24	96 x 24
Cut-out (mm)	45 x 45	68 x 68	92 x 92	138 x 138	45 x 22	68 x 22	92 x 22
Scale length (mm)	70	105	150	230	32	52	60
Weight (kg)	0,20	0,30	0,40	0,90	0,08	0,10	0,12

€

Types and variants

Measuring ranges								
V	10 15 25 40 60 100 150 250 400 500 600	X	X	X	X	X	X	X
mA	1 1,5 2,5 4 6 10 15 25 40 60	X - -	X	X	X	X	X	X
	100 150 250 400 600	-	X	X	X	X	X	X
A	1 1,5 2,5 4 5 6	-	X	X	X	X	X	X

* PKG 48 DIN - changes depth of instrument

Bimetal measuring instruments

Application	Bimetal measuring instruments are used for monitoring the load ratios and conditions of electrical distribution installations. Due to their thermal inertia, the displayed measured values equal the rms value of the current; a built-in slave pointer is used to show the maximum values.
Measuring systems	● Highly robust ● Ultra high torque ● Trunnion bearing ● Setting time 8 min or 15 min
Design	Bimetal measuring instruments are manufactured according to DIN 60 051 as well as according to the other relevant VDE and DIN regulations. The accuracy amounts to 3 % referred to the full scale. The scale graduation starts at approx. 15 % of the full scale and has a 1.2-fold overload scale. Bimetal measuring instruments show the square mean value of the current, the measured value equals the rms value and is independent of the waveform. Due to the extremely high torque, a slave pointer showing the maximum current may be used. Using a sealable reset button, the maximum pointer (slave pointer) may be reset up to the measuring element pointer. Another model combines bimetal measuring elements with moving-iron measuring elements (class 1.5) inside one housing. This allows for measuring maximum value, mean value and instantaneous value of the current on one scale at the same time. The standard type allows for measuring currents within a frequency range of 15 Hz to 100 Hz. Bimetal measuring systems are resistant to a 1.2-fold overload and moving-iron systems to a 2-fold overload, temporarily also up to a 10-fold overload, for the rest DIN EN 60 051 applies. Moving-iron measuring elements are provided with a shielding against external magnetic fields up to a strength of 4 kA/m. The connection is made using M4 screws (back-of-hand-proof).
Measuring ranges	Bimetal measuring instruments 0-5 / 6 A. If connectect to current transformer sec. 5 A the scale is designed in a way that the full scale is 20 % higher than the primary current of the current transformer, e.g. current transformer 250 / 5 A, display range 0-300 A. Moving-iron measuring instruments combined with bimetal measuring instruments 0- 5 / 10 A. If connectect to current transformer sec. 5 A the scale is designed in a way that the full scale is 100 % higher than the primary current of the current transformer, e.g. current transformer 250 / 5 A, display range 0-500 A.
Energy consumption	Bimetal measuring system1,9 VA for 5 A, 0,9 VA for 1 A combined with moving-iron measuring system 2,5 VA for 5 A, 1,5 VA for 1 A
Special versions	Fixed value between100 Hz and 1000 Hz at bimetal measuring instrument at combined bimetal / moving-iron measuring instrument Extended initial range up to 30 % of full scale in center scale (moving-iron measuring element)

Bimetal measuring instruments

with slave pointer
(maximum current ammeter)

Type:
NM / MQ .. DIN

Square cut-out
Class 3
Energy consumption 1,9 VA for 5 A,
0,9 VA for 1 A
Setting time 8 min., 15 min. on request
Reset button sealable

plastic housing | metal housing

Type	NM 48	NM 72	NM 96	MQ 72 DIN	MQ 96 DIN	MQ 144 DIN
Front frame (mm)	48 x 48	72 x 72	96 x 96	72 x 72	96 x 96	144 x 144
Cut-out (mm)	45 x 45	68 x 68	92 x 92	68 x 68	92 x 92	138 x 138
Scale length (mm)	44	62	90	62	90	130
Weight (kg)	0,10	0,12	0,17	0,20	0,25	0,75

€

Types and variants

for use with current transformer						
sec. 5 A sec. 1 A	X	X	X	X	X	X

Bimetal measuring instruments

with slave pointer, combined with
moving-iron ammeter
(maximum and instantaneous current
ammeter)

Type:
NMW / MWQ .. DIN

Square cut-out
Class 3 (bimetal) / class 1,5 (moving iron)
Energy consumption 2,5 VA for 5 A,
1,5 VA for 1 A
Setting time 8 min., 15 min. on request
Reset button sealable

plastic housing | metal housing

Type	NMW 72	NMW 96	MWQ 72 DIN	MWQ 96 DIN	MWQ 144 DIN
Front frame (mm)	72 x 72	96 x 96	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	68 x 68	92 x 92	138 x 138
Scale length (mm)	62 / 43	90 / 70	50 / 46	95 / 74	135 / 100
Weight (kg)	0,16	0,25	0,34	0,42	0,90

€

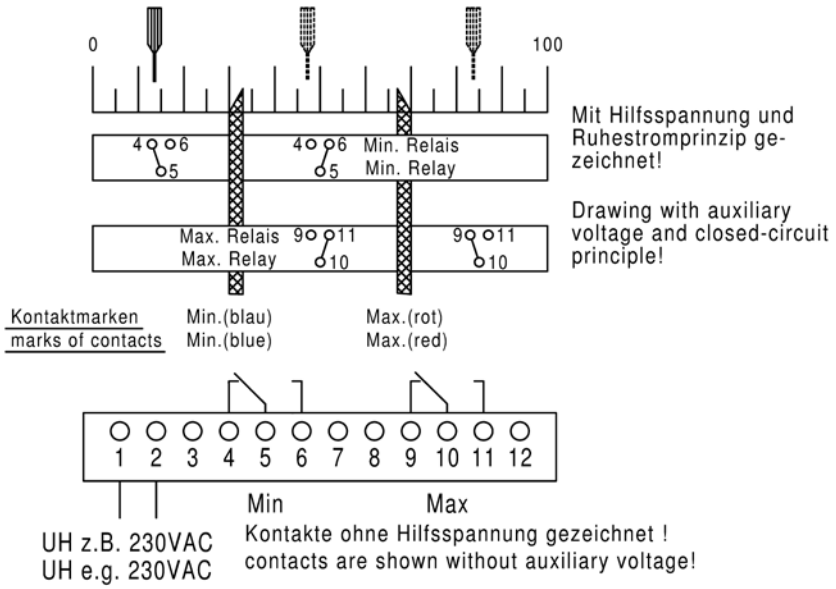
Types and variants

for use with current transformer					
sec. 5 A sec. 1 A	X	X	X	X	X

Price group A

Limit controllers

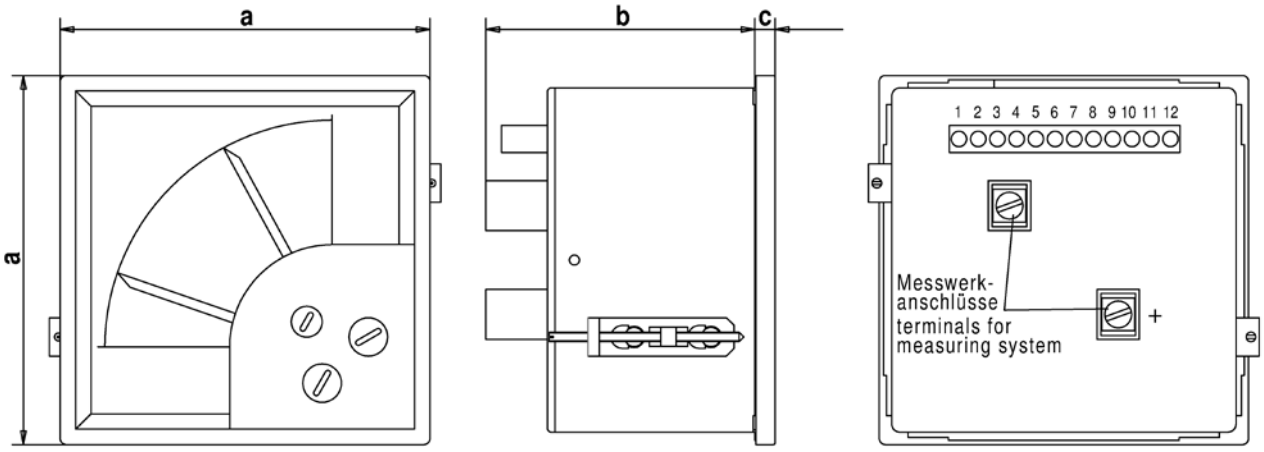
Application	Limit controllers monitor one or two limit values to be set over the entire scale range. They can be used for electrical measureable values.
Measuring system	● Moving-iron measuring system ● Moving-coil measuring system
Contact device	● Optical sampling through infrared reflected light barrier ● Nonreactive sampling ● Setting range 0-100 % (also in case of two contact marks) ● Setting of limit values at the front side
Design	For limit controllers, the same technical data and special models as for normal indicators apply. They are available in sizes 96 DIN and 144 DIN. The following variables may be measured: Direct current, direct voltage, alternating current, alternating voltage, frequency, in connection with a measuring transducer power, power factor, temperature and all other transformed non-electrical quantities. The sampling of the position of the measuring element pointer is done via a noncontact infrared reflected light barrier. A maximum of two limit values may be monitored. In case of the standard type, the relays are energized and are deenergized if the max. contact mark is exceeded or the limit value drops below the min. contact mark (closed-circuit principle). Electronics, relays and 230 V auxiliary voltage are installed; the maximum mounting depth of the device amounts to 68 mm only. The connection is made via a 12-pin terminal block for cross sections up to 4 mm². The measuring element is connected to hexagon bolts with M4 screws in case of voltmeters and ammeters up to 15 A max. 6 mm², M5 screws up to 60 A max. 16 mm² (back-of-hand-proof).
Function and connection diagram	



Technical data

	Switching accuracy	± 1 % of scale lenght, (± 0,9 mm for ..96 DIN.. or ± 1,3 mm for ..144 DIN..)
	Hysteresis	± 0,5 % of scale length, (± 0,4 mm for ..96 DIN.. or ± 0,6 mm for ..144 DIN..)
	Response delay	100 ms after limit value is exceeded
	Sampling	optical, with reflected light barrier
	Limit value adjustment	at front side via full scale range, using screwdriver
	Temperature range	-25 °C to +20 °C to +30 °C to +55 °C
	Relay contacts	1 changeover contact per limit value, max. 8 A, 250 V AC, 2000 VA
	Switching state	closed-circuit prinziple, (Relay is deengergized if limit value is exceeded)
	Auxiliary voltage	230 V AC ± 15 %, 45-65 Hz, 2 VA
	Test voltage	2,5 kV, 50 Hz, 10 s, between measuring input, housing, auxiliary voltage and relay contacts
Standards	EMC	DIN EN 61 326,
	Mechanical strength	DIN EN 61 010 part 1
	Electrical safety	DIN EN 61 010 part 1, pollution degree 2, measuring category CAT III, for working voltages up to 300 V (phase to neutral)
	Accuracy, overlaod	DIN EN 60 051
	IP code	DIN EN 60 529, housing IP 52, terminals IP 10
Special versions	Measuring range	Moving-iron measuring instruments Page 132 Moving-coil measuring instruments Page 137
	Auxiliary voltage	110 V AC ± 15 %, 45-65 Hz, 2 V 24 V AC + DC, -15 % to +25 %, 2 W, 6-30 V AC + DC, 2 VA, (EMC DIN EN 61 326 class A) 36-265 V AC + DC, 2 VA, (EMC DIN EN 61 326 class A)
	Contacts	2 max contacts or 2 min contacts
	Adjustment	using knurled knob, per contact
	Relays	Reversed switching states (open-circuit principle), per contact
	Relay contacts	2 changeover contacts (only possible for 1 contact)
	Relay delay	Fixed value between 1 and 30 s, per contact adjustable at rear side of housing 1-30 s, per contact

Dimensions



Type	Cut-out mm	a mm	b mm	c mm
WQ 96 DIN, PQ 96 DIN, PGQ 96 DIN	$92^{+0,8}$ x $92^{+0,8}$	96	70	5
WQ 144 DIN, PQ 144 DIN, PGQ 144 DIN	138^{+1} x 138^{+1}	144	70	7

Price group B

Limit controllers

for alternating current and alternating voltage

Type:
WQ .. DIN

Square cut-out
40-100 Hz, moving-iron measuring system
class 1,5
Ammeter with 2-fold overload scale
Energy consumption ammeter 0,6-2 VA
voltmeter ca. 2 VA

metal housing

Type	WQ 96 DIN	WQ 96 DIN	WQ 144 DIN	WQ 144 DIN
	Min-contact or Max-contact	Min-contact and Max-contact	Min-contact or Max-contact	Min-contact and Max-contact
Front frame (mm)	96 x 96	96 x 96	144 x 144	144 x 144
Cut-out (mm)	92 x 92	92 x 92	138 x 138	138 x 138
Scale length (mm)	90	90	130	130
Weight (kg)	0,48	0,48	0,90	0,90

€

Types and variants

Measuring ranges					
V	6 10 15 25 40 60 100 150 250 400 500 600	X	X	X	X
for use with voltage transformer mA	sec. 100 V 40 60 100 150 250 400 600	X	X	X	X
A	1 1,5 2,5 4 6 10 15 25 40 60	X	X	X	X
for use with current transformer	sec. 5 A (0,6 VA) sec. 1 A (0,6 VA)	X	X	X	X

Price group B

Limit controllers

for direct current

Type:
PQ .. DIN

Square cut-out
Class 1,5
Moving-coil measuring system

metal housing

Type			PQ 96 DIN	PQ 96 DIN	PQ 144 DIN	PQ 144 DIN
			Min-contact or Max-contact	Min-contact and Max-contact	Min-contact or Max-contact	Min-contact and Max-contact
Front frame (mm)			96 x 96	96 x 96	144 x 144	144 x 144
Cut-out (mm)			92 x 92	92 x 92	138 x 138	138 x 138
Scale length (mm)			90	90	130	130
Weight (kg)			0,48	0,48	0,90	0,90

Types and variants

Measuring ranges						
		Ri / Δ U				
µA	100	2575 Ω				
	150	955 Ω				
	250	420 Ω	X	X	X	X
	400	167 Ω				
	600	77 Ω				
mA	1	28,6 Ω				
	1,5	14,2 Ω				
	2,5	7,6 Ω				
	4	3,8 Ω				
	6	1,9 Ω				
	10	1,4 Ω				
	15	1,3 Ω				
	25	60 mV	X	X	X	X
	40	60 mV				
	60	60 mV				
	100	60 mV				
	150	60 mV				
	250	60 mV				
	400	60 mV				
	600	60 mV				
A	1	60 mV				
	1,5	60 mV				
	2,5	60 mV				
	4	60 mV				
	6	60 mV	X	X	X	X
	10	60 mV				
	15	60 mV				
	25	60 mV				
	40	60 mV				
for use with shunt						
mV	60	12 Ω				
	100	20 Ω	X	X	X	X
	150	30 Ω				
for use with measuring transducer						
mA	0-20	1,2 Ω	X	X	X	X
	4-20	50 Ω	X	X	X	X
V	0-10	10 kΩ	X	X	X	X
Alternating current:		with rectifier, type PGQ 96 DIN or PGQ 144 DIN, 40 - 10000 Hz sinusoidal				
		Measuring ranges between 100 µA and 600 mA			Surcharge:	
		Measuring ranges between 1 A and 25 A			Surcharge:	

Price group B

Limit controllers

for direct voltage

Type:
PQ .. DIN

Square cut-out
Class 1,5
Moving-coil measuring system

metal housing

Type	PQ 96 DIN	PQ 96 DIN	PQ 144 DIN	PQ 144 DIN
	Min-contact or Max-contact	Min-contact and Max-contact	Min-contact or Max-contact	Min-contact and Max-contact
Front frame (mm)	96 x 96	96 x 96	144 x 144	144 x 144
Cut-out (mm)	92 x 92	92 x 92	138 x 138	138 x 138
Scale length (mm)	90	90	130	130
Weight (kg)	0,48	0,48	0,90	0,90

€

Types and variants

Measuring ranges		Internal resistance				
mV	25	200 Ω / V				
	40	200 Ω / V				
	60	200 Ω / V				
	100	200 Ω / V				
	150	200 Ω / V	X	X	X	X
	250	200 Ω / V				
	400	1000 Ω / V				
	600	1000 Ω / V				
V	1	1000 Ω / V				
	1,5	1000 Ω / V				
	2,5	1000 Ω / V				
	4	1000 Ω / V				
	6	1000 Ω / V				
	10	1000 Ω / V				
	15	1000 Ω / V				
	25	1000 Ω / V	X	X	X	X
	40	1000 Ω / V				
	60	1000 Ω / V				
	100	1000 Ω / V				
	150	1000 Ω / V				
	250	1000 Ω / V				
	400	1000 Ω / V				
	500	1000 Ω / V				
	600	1000 Ω / V				
Alternating voltage:	with rectifier, type PGQ 96 DIN or PGQ 144 DIN, 40 - 10000 Hz sinusoidal					
	Measuring ranges between 25 mV and 600 V				Surcharge:	

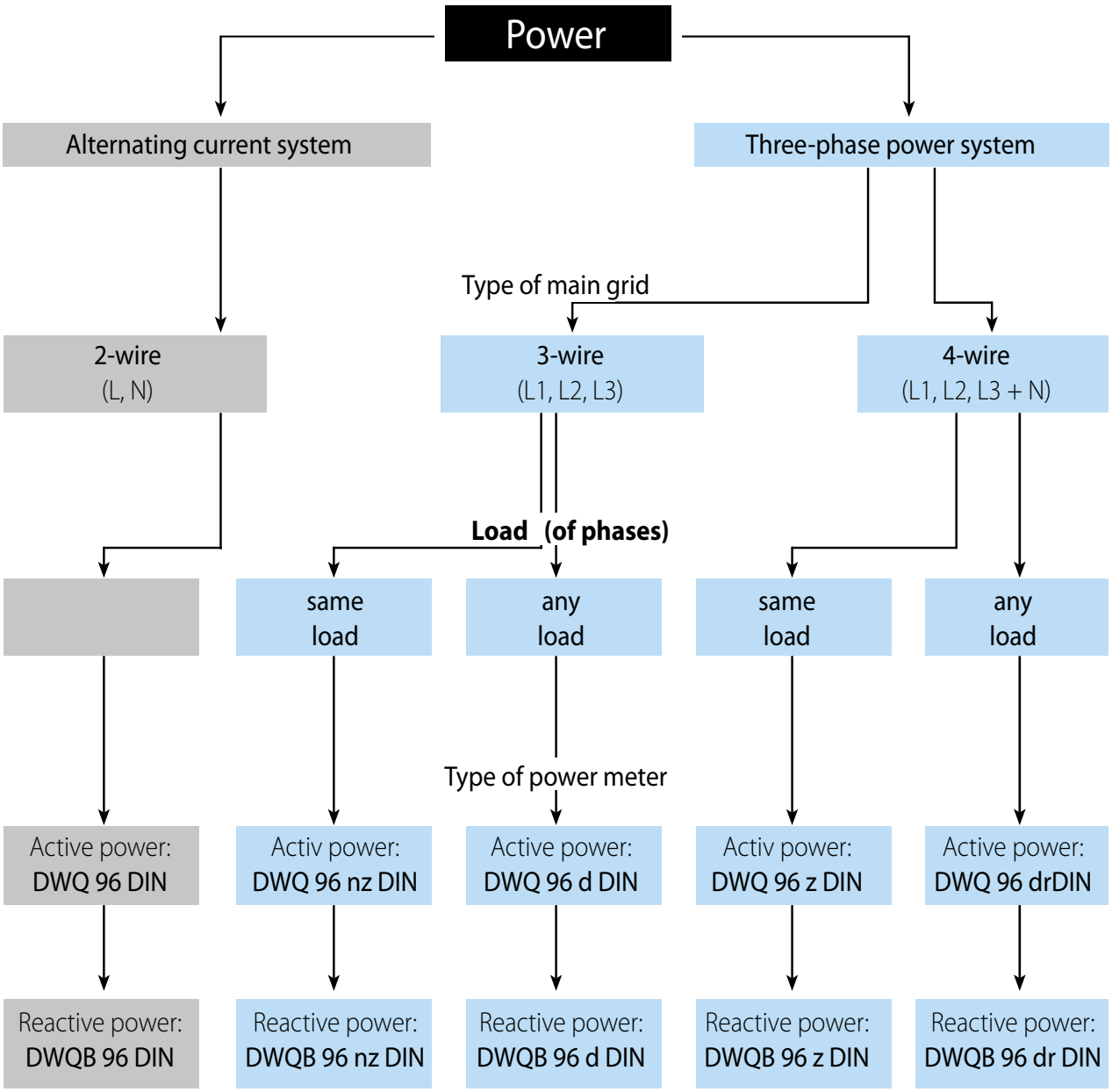
Price group B

Power meters

Application	Power meters are used for measuring active and reactive power in case of alternating current and threephase current or the active power for direct current. Sinusoidal and non-sinusoidal quantities may be measured. The frequency range amounts to 40-100 Hz, in case of special types 40-400 Hz. Power meters show the import active power for standard types, or the import and export active power if the zero point is offset, i.e. in case of bidirectional energy directions.
Measuring system and electronics	● Core magnet moving-coil measuring system ● Integrated analog multiplier ● Linear scale characteristics ● Independent of waveform ● Independent of external fields
Design	Power meters are manufactured according to DIN 60 051 as well as according to the other relevant VDE and DIN regulations. The accuracy amounts to 1.5 % referred to the full scale. The energy consumption lies at around 0.6 VA in the current path or at around 2 VA or 0.05 VA in the voltage path if a separate auxilary voltage is used. The full scale values should be adapted to the standard series 1 / 1.2 / 1.5 / 2 / 2.5 / 3 / 4 / 5 / 6 / 7.5 / 8 or a decadic multiple of these values. In case of reactive power meters for alternating current and four-wire three-phase current, the frequency range is restricted to a fixed value, normally 50 Hz. The auxiliary voltage for the supply of the electronics is gained from the measuring voltage. If the measuring voltage fluctuates by more than ± 20 % of the rated voltage, a separate auxiliary voltage is required. In case of size 96, the electronic is installed in the housing (housing depth 57 mm). For all other sizes and models, a separate measuring transducer must be used. The output to the connection of the panel meter amounts to 0-20 mA. Further technical data of the measuring transducers are specified in the relevant data sheets (from page 24). The inputs are resistant to a permanent 1.2-fold overload, the current path withstands a temporary max. 20-fold overload. For the rest, DIN EN 60 051 applies. The electrical connection is done using clamping screws max. 4 mm².
Measuring ranges	The full scale value may be selected between the 0,5-fold and 1,5-fold rated value of the apparent power. Apparent power with alternating current $S = U \times I$ with three-phase current $S = U \times I \times \sqrt{3}$ (U = external conductor voltage)
Special versions	Measuring range zero point at any point of scale (bidirectional energy direction) increased accuracy 1 % Special calibration with active power fixed value between 100 Hz and 400 Hz range between 40 Hz and 400 Hz range between 40 Hz and 1000 Hz Special calibration with reactive power fixed value between 40 Hz and 400 Hz except for 50 Hz (standard) Auxiliary voltage separate auxiliary voltage 230 V or 110 V ± 20 % 45-65 Hz 2 VA

Power meters

Power meters - finding the right type



In case of these types (DWQ 96 ... DIN) electronics are installed in general (installation depth 57 mm).
In connection with our power meter transducers (from page 27) all measuring instruments may be used for indicating the power.

Short legend		
DWQ		Power meter for active power
B		for reactive power
96		Front frame 96 x 96 mm
	...	without abbreviation, alternating current
	z	accessible neutral wire, 4-wire 3-phase current of same load
	nz	non-accessible neutral wire, 3-wire 3-phase current of same load
	d	double power meter, 3-wire 3-phase current of any load
	dr	triple power meter, 4-wire 3-phase current of any load
	DIN	built-in housing

Power meters

electronic, for alternating and three-phase current, for use with current transformers secondary 1 A and 5 A

Type:
DWQ .. DIN

Square cut-out
40 - 100 Hz, class 1,5
Installation depth 57 mm
Power consumption:
current path 0,6 VA
voltage path approx. 2 VA

metal housing

Type	D .. 96 DIN	D .. 96 DIN	D .. 96 DIN	D .. 96 DIN	D .. 96 DIN
Front frame (mm)	96 x 96	96 x 96	96 x 96	96 x 96	96 x 96
Cut-out (mm)	92 x 92	92 x 92	92 x 92	92 x 92	92 x 92
Scale length (mm)	90	90	90	90	90
Weight (kg)	0,40	0,40	0,40	0,40	0,40
	Alternating current	3-wire 3-phase current same load	3-wire 3-phase current any load	4-wire 3-phase current same load	4-wire 3-phase current any load

€

Types and variants

Rated voltage

Active power		DWQ 96 DIN	DWQ 96 nz DIN	DWQ 96 d DIN	DWQ 96 z DIN	DWQ 96 dr DIN
V	100 230 400 500	X	-	-	-	-
	3 x 100 3 x 400 3 x 500	-	X	X	-	-
	100/58 400/230 500/289	-	-	-	X	X
Surcharge	10 A direkt	X	X	X	X	X

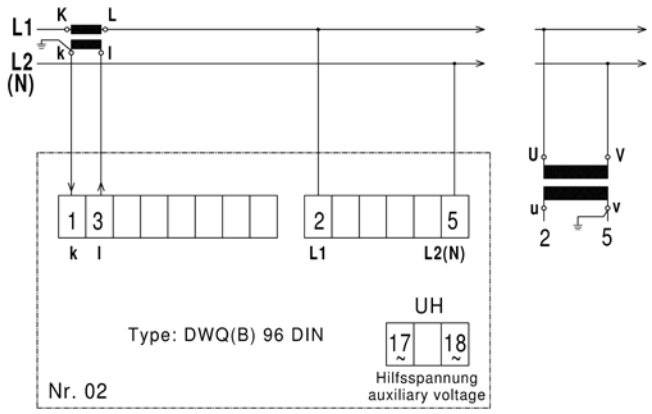
Reactive load		DWQB 96 DIN	DWQB 96 nz DIN	DWQB 96 d DIN	DWQB 96 z DIN	DWQB 96 dr DIN
V	100 230 400	X	-	-	-	-
	3 x 100 3 x 400 3 x 500	-	X	X	-	-
	100/58 400/230 500/289	-	-	-	X	X
Surcharge	10 A direct	X	X	X	X	X

In connection with measuring transducers type P ... - MU (from page 28), all measuring instruments may be used for power measurement. The advantage is that only two lines (20 mA) must be connected to the panel meter and that the measuring transducer may be mounted at a central location.

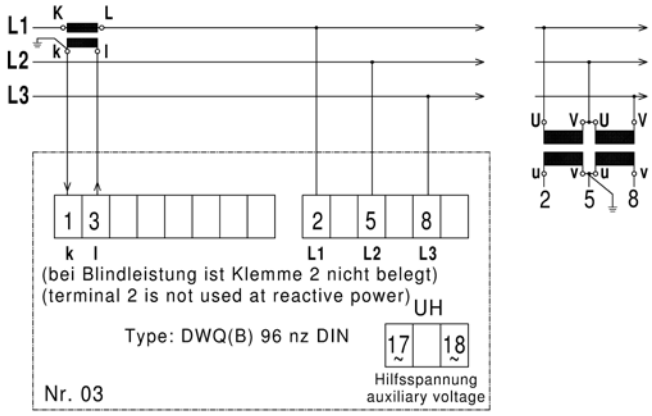
Price group B

Connection

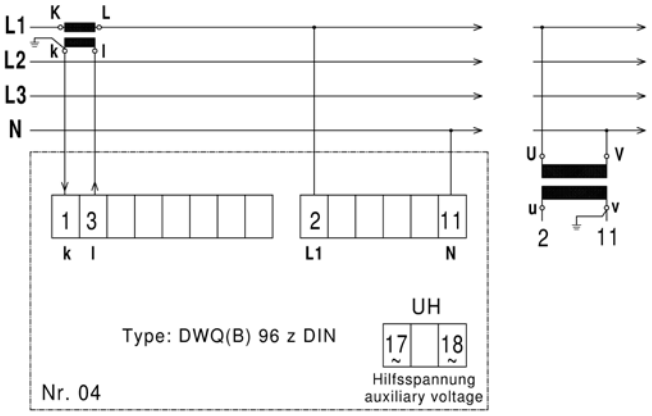
Alternating current



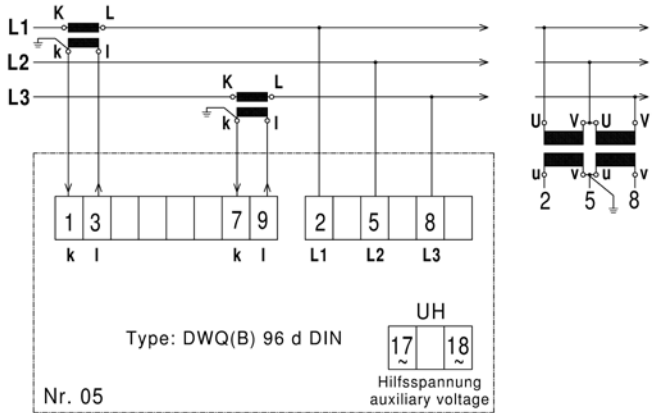
3-wire 3-phase current same load



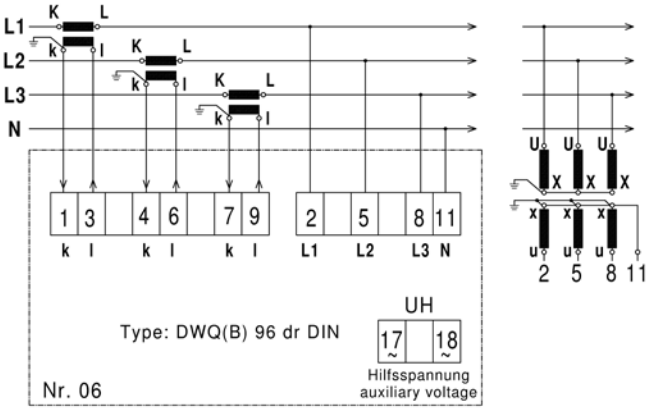
4-wire 3-phase current same load



3-wire 3-phase current any load



4-wire 3-phase current any load



Power factor meters

Application	Power factor meters serve for measuring the ratio between active and apparent power in alternating and three-phase current grids of 50 Hz, 60 Hz or 400 Hz sinusoidal.
Measuring system and electronics	● Core magnet moving-coil measuring system ● Zero point comparator of current and voltage ● Independent of external fields
Design	Power factor meters are manufactured according to DIN 60 051 as well as according to the other relevant VDE and DIN regulations. The accuracy amounts to 1.5 % referred to the scale length. The energy consumption lies at around 0.6 VA in the current path or around 2 VA in the voltage path. The auxiliary voltage for the supply of the electronics is gained from the measuring voltage. The voltage range amounts to ± 20 % of the rated voltage, the current range to 20 % to 120 % of the rated current. Exceeding these values may cause indication errors which are larger than the accuracy rating. Currents < 5 % of the rated value result in an uncontrolled indication. The inputs are resistant to a permanent 1.2-fold overload, the current path withstands a temporary max. 20-fold overload. DIN EN 60 051 applies. The electrical connection is done using clamping screws max. 4 mm^2..
Special versions	Measuring range deviating from standard measurement ranges Special calibration for 60 Hz or 400 Hz

Power factor meters

electronic, for alternating and three-phase current

Type:
LWQ .. DIN

Square cut-out
50 Hz, class 1,5
Installation depth 57 mm
For use with CT sec. 1 A or 5 A
Power consumption current path 0,6 VA
voltage path approx. 2 VA

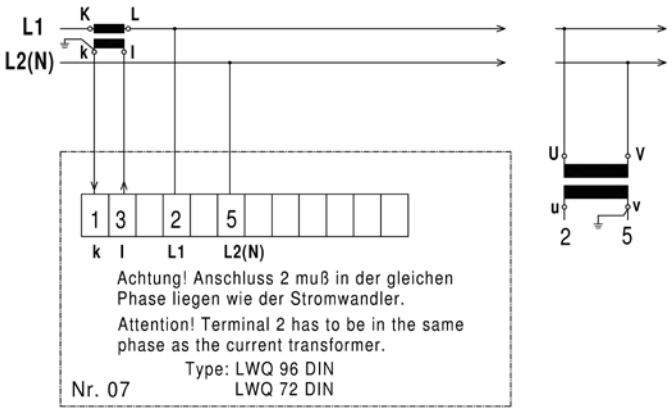
metal housing

Type	LWQ 72 DIN	LWQ 96 DIN	LWQ 72 nz DIN	LWQ 96 nz DIN
Front frame (mm)	72 x 72	96 x 96	72 x 72	96 x 96
Cut-out (mm)	68 x 68	92 x 92	68 x 68	92 x 92
Scale length (mm)	62	90	62	90
Weith (kg)	0,27	0,33	0,27	0,33
Measuring ranges	0,5 cap. - 1 - 0,5 ind. or 0,7 cap. - 1 - 0,3 ind alternating current		0,5 cap. - 1 - 0,5 ind. or 0,7 cap. - 1 - 0,3 ind 3-phase current	

Types and variants

Rated voltage				
100 V, 230 V, 400 V oder 500 V	X	X	-	-
3 x 100 V, 3 x 400 V, 3 x 500 V oder 3 x 690 V	-	-	X	X
Surcharge 10 A direct	X	X	X	X

Connection for alternating current



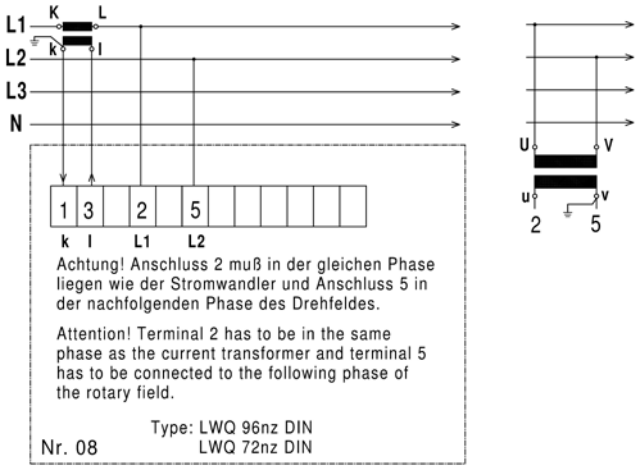
Achtung! Anschluss 2 muß in der gleichen Phase liegen wie der Stromwandler.

Attention! Terminal 2 has to be in the same phase as the current transformer.

Type: LWQ 96 DIN
LWQ 72 DIN

Nr. 07

Connection for three-phase current of same load



Achtung! Anschluss 2 muß in der gleichen Phase liegen wie der Stromwandler und Anschluss 5 in der nachfolgenden Phase des Drehfeldes.

Attention! Terminal 2 has to be in the same phase as the current transformer and terminal 5 has to be connected to the following phase of the rotary field.

Type: LWQ 96nz DIN
LWQ 72nz DIN

Nr. 08

Price group B

Notice

Frequency meters

Application	Frequency meters serve for measuring the mains frequency 50 Hz, 60 Hz, or 400 Hz. As measuring range just a selected partial range is used preferrably.
Measuring systems	Vibrating reed meter: ● Vibrating reed movement Pointer frequency meter: ● Core magnet moving-coil measuring system ● Integrated microcontroller ● Independent of waveform ● Large voltage range
Design	Frequency meters are manufactured according to DIN EN 60 051 as well as according to the other relevant VDE and DIN regulations. The accuracy amounts to 0.5 % referred to the full scale. The energy consumption lies between 1 VA and 4 VA depending on the reated voltage, measuring range and type. The measuring voltage may fluctuate between ± 20 % of the rated values without affecting the measured value indication. Pointer frequency meters offer two significant advantages over vibrating reed instruments: ● clear readability ● large voltage range, ± 20 % of rated voltage The linear scale characteristic is perfectly linear and starts at 5% of the scale length above the mechanical zero point. The temperature influence amounts to < 0.1 % with 10 K within a temperature range of - 25° to + 60 °C. The auxiliary voltage for the supply of the electronics is gained from the measuring voltage. The current draw is approx. 10 mA. Pointer and vibrating reed meters are resistant to a 1.2-fold overload, temporarily up to a 2-fold overload, DIN EN 60 051 applies. The connection is made using M4 screws (back-of-hand-proof).

Special versions

Measuring voltage	Vibrating reed meters	400 V 500 V 600 V
	Pointer frequency meters	between 12 V and 100 V 400 V 500 V 600 V
Auxiliary voltage	Pointer frequency meters with separate auxiliary voltage for measuring voltages 0-100 %, 230 V or 110 V ± 15 % 45-65 Hz 2 VA (not for size 72)	
Measuring range	Pointer frequency meters other than for standard measuring ranges e.g. 0-100 Hz	

Frequency meters

Vibrating reed meters

Type:
F .. DIN

Square cut-out
Vibrating reed movement
Class 0,5
Energy consumption 1-4 VA
Measuring voltage 100 V, 133 V, 230 V
(please specify in order)

metal housing

Type	F 72 DIN	F 96 DIN	F 144 DIN
Front frame (mm)	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	138 x 138
Weight (kg)	0,20	0,30	0,70

€

Types and variants

Hz	Number of reeds	Subdivision in Hz			
45 - 50 - 55	13	1	X	X	X
47 - 50 - 53	13	1/2			
55 - 60 - 65	13	1			
57 - 60 - 63	13	1/2			

Frequency meters

Pointer frequency meters

Type:
FZQ .. DIN

Square cut-out
Moving-coil measuring system
Class 0,5 or 0,2
Energy consumption ca. 2 VA
Measuring voltage 100 V, 133 V, 230 V
(please specify in order)

metal housing

Type	FZQ 72 DIN	FZQ 96 DIN	FZQ 144 DIN
Front frame (mm)	72 x 72	96 x 96	144 x 144
Cut-out (mm)	68 x 68	92 x 92	138 x 138
Scale length	62	90	130
Weight (kg)	0,35	0,40	0,70

€

Types and variants

Hz	Measuring range	class			
50	45 - 50 - 55	0,5	132,70	132,70	161,10
50	48 - 50 - 52	0,2	144,30	144,30	172,70
60	55 - 60 - 65	0,5	132,70	132,70	161,10
60	58 - 60 - 62	0,2	144,30	144,30	172,70
400	360 - 400 - 440	0,5	132,70	132,70	161,10
400	380 - 400 - 420	0,2	144,30	144,30	172,70

Price group A

SZ 72/96

SZ 48

Operating hour counter

for alternating and direct current

Type:
SZ .. DIN

Square cut-out

plastic housing

metal housing

Alternating current
synchroneous motor 50 Hz

Type	SZ 48	SZ 72 DIN	SZ 96 DIN
Front frame (mm)	48 x 48	72 x 72	96 x 96
Cut-out (mm)	45 x 45	68 x 68	92 x 92
Weight (kg)	0,10	0,22	0,30
Counter range (hrs.)	99.999,99	99.999,99	99.999,99
Energy consumption	approx. 1 VA	approx. 2,5 VA	approx. 2,5 VA

€

Types and variants

Operating voltage ± 15%			
230 V 50 Hz	X	X	X
400 V 50 Hz	X	X	X

plastic housing

metal housing

Direct current
Quartz-controlled

Type	SZ 48 Gs	SZ 72 Gs DIN	SZ 96 Gs DIN
Front frame (mm)	48 x 48	72 x 72	96 x 96
Cut-out (mm)	45 x 45	68 x 68	92 x 92
Weight (kg)	0,15	0,26	0,37
Counter range (hrs.)	99.999,99	99.999,99	99.999,99

€

Types and variants

Operating voltage ± 15%	Current draw			
V 12 - 80	mA 1,4 - 1,5	-	X	X
V 12 - 48	ca. 20 mW at 12 V	X	-	-

Price group A

Phase sequence indicatior

Type:
NDR

Application

Phase sequence indicator are used for determining and monitoring the rotating field (phase sequence) in electrical systems.

Design and function
The instruments comply with DIN EN 61557-7. Indication is made by LEDs:
green = right-hand rotating field
red = left-hand rotating field
Additionally, three further LEDs indicate whether all three phase voltages are present or which phase is missing.

Technical data

	Voltage range	3 x 220 V - 3 x 500 V	
	Frequency range	15 Hz - 500 Hz	
	Current draw	max. 5 mA per phase	
	Temperature range	-15 °C to +20 °C to +30 °C to +55 °C	
	Switch-on time	100 %	
Dimensions	Type	NDR 72	NDR 96
	Front frame (mm)	72 x 72	96 x 96
	Cut-out (mm)	68 x 68	92 x 92

Types and var.

NDR	X

Fault annunciators

96 x 96

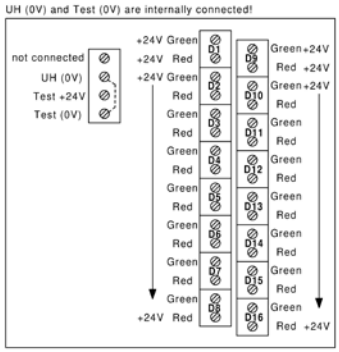
Types:
SM8 und SM16

Function

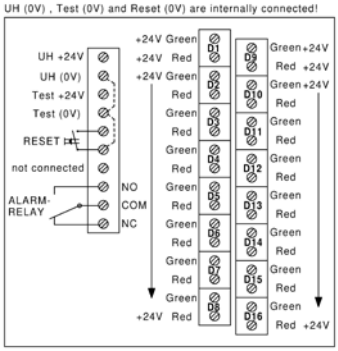
The fault annunciators use 8 (SM8) or 16 (SM16) two-color LEDs as a display. The LEDs may light up green or red. During the function test, the LEDs light up orange. The LEDs are controlled via connection terminals on the rear of the instrument. The control can take place with direct or alternating voltage, depending on the version. The scale can be easily removed and labeled through an opening on the side. The scale can also be labeled in the manufacturer's plant. An auxiliary voltage is always required for the collective alarm option. In the case of a collective alarm with storage, the reset button must be pressed to cancel the alarm and reset the alarm relay; without saving, the alarm is triggered by resetting the LEDs to green.

Connection

SM8 and SM16 at 24 VDC



SM8 and SM16 at 24 VDC with collective alarm and memory



Technical data

Input	Activation	24 VDC (Option: 60 VAC, 60 VDC or 24 V AC)
	Rated input current	6 mA per LED and colour (Option AC: 4,5 mA per LED and colour)
	Test input DC	24 VDC / 95 mA (SM16: 190 mA)
	Test input AC (Option)	24 VAC / 73 mA (SM16: 145 mA)
	Overload permanent	max. 30 V
	Temperature range	-25 °C to +20 °C to +30 °C to +55 °C
	External magnetic field influence	no (to 400 A/m)
	Electrical connection	screw terminal max. 4 mm²
	Test voltage	2,2 kV between input and housing
		2,2 kV between input and relay contacts
	Caution!	**The inputs are not galvanically isolated from each other!**
Alarm	Relay contacts	1 changeover contact
	Switching capacity	max. 250 VAC, 1250 VA
Weight		230g

Types and variants

	SM 8	
	SM 16	
Surcharges:	Operating with 24 VAC	
	Operating with 60 VAC or DC	
	Collective alarm with memory (auxiliary voltage required)	
	Collective alarm without memory (auxiliary voltage required)	
	Collective alarm for red LEDs only, with memory (auxiliary voltage required)	
	Collective alarm for red LEDs only, without memory (auxiliary voltage required)	
	Scale printed SM8	
	Scale printed SM16	

Price group B

Notice

Notice

WAS 45

PAS 45

SUAS 45/7

General description

Application

Snap-on measuring instruments are mainly used for measuring heavy-current quantities in distribution boards. They allow for snap-on fastening on top hat rails.

Measuring systems

- Moving-iron measuring system
- Moving-coil measuring system

Special features

- standard front dimensions, 45 x 45 mm
- slim design, 2.5 module widths
- quadrant scale, 43 mm scale length
- contact-proof connecting terminals

General specifications

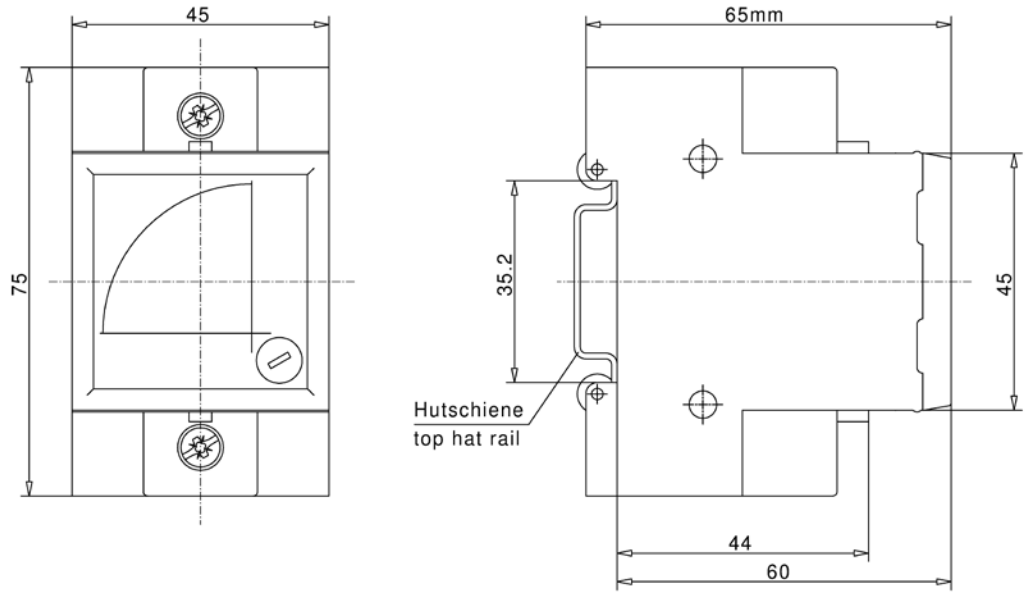
Snap-on measuring instruments are manufactured according to DIN 60 051 as well as according to the other relevant VDE and DIN regulations. The following variables may be measured: Direct current, direct voltage, alternating current, alternating voltage, operating hours. The accuracy amounts to 1.5 % referred to the full scale. Standard-type moving-iron ammeters dispose of a 2-fold overload scale.
All measuring instruments are resistant to a permanent 1.2-fold overload, ammeters temporarily to a max. 10-fold overload, voltmeters to an up to 2-fold overload. For the rest, DIN EN 60 051 applies. The measuring elements are mounted in an shock-resistant housing from polycarbonate. The housing dimensions comply with DIN 43 880 for built-in equipment for electrical installations. Connection is made to touch-proof captive M5 screws, max. 10 mm².

Special versions

Mounting on vertical top hat rail

Measuring range	without overload range (moving-iron)
	outside of the standard series
Scales	red marking at arbitray position of scale
	colored sector at arbitray position of scale

Dimensional drawing



Price group A

Moving-iron measuring instruments

for alternating current and alternating voltage

Type:
WAS 45

Snap-on fastening on top hat rail, 40-100 Hz, class 1,5
Please explicitly specify direct current!
Ammeters with 2-fold overload scale
Energy consumption: ammeters 0,6-1,5 VA, voltmeters approx. 2,5 VA

Type	WAS 45	
Installation width (mm)	45	(2.5 module width)
Scale length (mm)	43	
Weight (kg)	0,10	

€

Types and variants

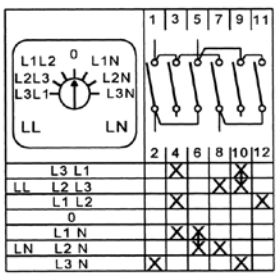
Measuring ranges		
V	100 250 500	X
A	1 1,5 2,5 4 6 10 15	X
	25	X
for use with current transformer		
	sec. 5 A (0,6 VA) sec. 1 A (0,6 VA)	X

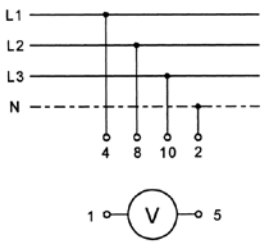
Voltmeter selector switch

Type:
SUAS 45/7

Snap-on fastening on top hat rail
for switchover between three different votlages and three phases against neutral acc. to VDE 0660

Type	SUAS 45/7
Operating voltage	max. 690 V
Operating current	max. 16 A
IP code	IP 54
Screw terminal	max. 4 mm
Installation width	52,5 mm (3 module widths)
Installation depth	45 mm
	X





Price group A

Moving-coil measuring instruments

for direct current and direct voltage

Type:
PAS 45

Snap-on fastening on top hat rail, class 1,5

Type	PAS 45	
Installation width (mm)	45	(2.5 module widths)
Scale length (mm)	43	
Weight (kg)	0,10	

€

Types and variants

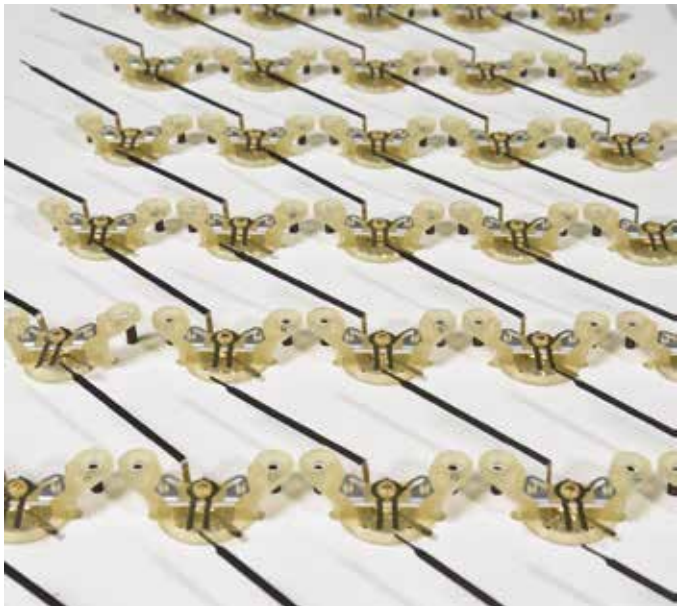
Measuring ranges		R_e / R_i / Δ U	
mV	100	200 Ω / V	
	150	200 Ω / V	
	250	200 Ω / V	X
	400	1000 Ω / V	
	500	1000 Ω / V	
V	1	1000 Ω / V	
	1,5	1000 Ω / V	
	2,5	1000 Ω / V	
	4	1000 Ω / V	
	6	1000 Ω / V	
	10	1000 Ω / V	
	15	1000 Ω / V	
	25	1000 Ω / V	X
	40	1000 Ω / V	
	60	1000 Ω / V	
	100	1000 Ω / V	
	150	1000 Ω / V	
	250	1000 Ω / V	
	400	1000 Ω / V	
	500	1000 Ω / V	
	600	1000 Ω / V	
mA	1	28,6 Ω	
	1,5	14,2 Ω	
	2,5	7,6 Ω	
	4	3,8 Ω	
	6	1,9 Ω	
	10	1,4 Ω	
	15	1,3 Ω	
	25	60 mV	X
	40	60 mV	
	60	60 mV	
	100	60 mV	
	150	60 mV	
	250	60 mV	
	400	60 mV	
	600	60 mV	
A	1	60 mV	
	1,5	60 mV	
	2,5	60 mV	
	4	60 mV	X
	6	60 mV	
	10	60 mV	
	15	60 mV	
	25	60 mV	
for use with shunt			
mV	60	12 Ω	X
foruse with measuring transducer			
mA	0-20	1,2 Ω	X
	4-20	50 Ω	X
V	0-10	10 k Ω	X

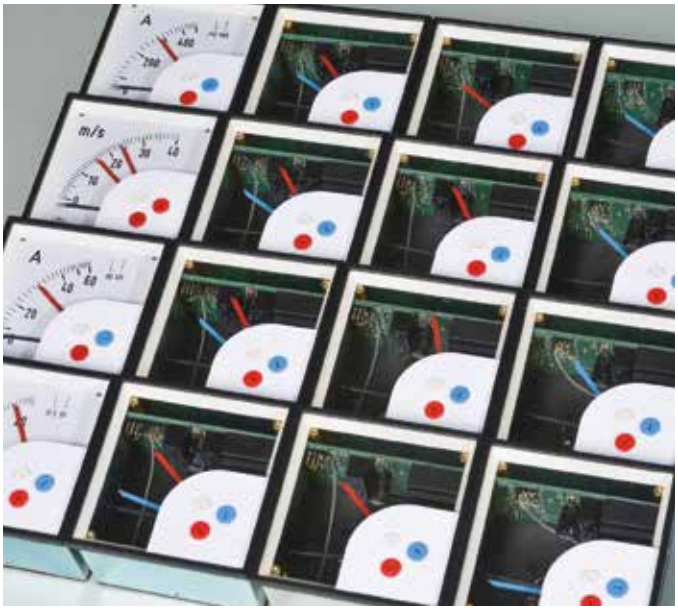
Price group A

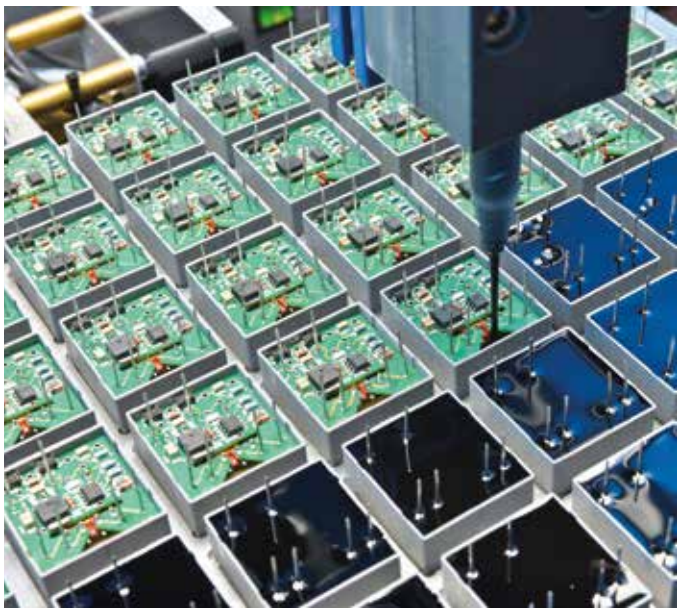
Notice

Notice

Precision and service are the measure of all things







MÜLLER + ZIEGLER
Elektrische Messgeräte

made in germany

MÜLLER + ZIEGLER GmbH
Elektrische Messgeräte
Industriestraße 23
91710 Gunzenhausen, Germany
Phone:+49 9831 5004-0
Mo - Thu 7 - 12 / 13 - 16 H
and Fr 7 - 12 H
Fax: +49 9831 5004-20
info@mueller-ziegler.de
www.mueller-ziegler.de

A member company of:
LÜBERG
Technologieholding GmbH
Marienstr. 20, 90402 Nürnberg
www. lueberg-technologie.de

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