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EQS 48 / EQS 72 / EQS 96

Analogue measuring instrument with moving-iron instrumentation 90° scale

Description

Analogue moving-iron measuring instrument with plastic housing is mainly used to measure alternating currents and voltages in the common
frequency range of 50 / 60 Hz.

They display the RMS value almost independently of the waveform, even with a high harmonic content.

Functional principle

Moving-iron element with strip core system,
silicone oil damping and spring-loaded tip bearing

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable		
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0		
Front panel	low-glare glass		
Colour of bezel	black (RAL9005)		
Installation position	vertical ±5°		
Attachment	screw spindle		
Mounting	close packing possible		
Panel thickness	≤ 25 mm		
Indicator	Schneiderbalken (tailors' beam) indicator		
Indicator deflection	0 ... 90°		
Scale progression	approximately linear starting at 10% Nominal measuring range value		
Scale division	coarse / fine		
Scale length	EQS 48	EQS 72	EQS 96
	41 mm	61 mm	97 mm
Overload scale current meters	2 times rated current		
Voltmeters for transformer connection	1.2 times Nominal voltage		

Connections

Voltmeters and ammeters up to 30 A	hexagonal bolt with M4 screw and clamping bracket type E3
Ammeter ≥ 40 A	M6 threaded bolt with nut
Ammeter > 60 A	M8 threaded bolt with nut

Electrical data

Measured variable	Alternating current or alternating voltage	
Frequency range	50 / 60 Hz	
Internal consumption voltage meters	< 4.5 VA	
Ammeters ≤≤ 15 A	< 0.5 VA	
Ammeters >> 15 A	< 0.8 VA	
Overload limit according to DIN EN 60051		
continuous	1.2-fold	
Voltage meters max. 5 s	2 times, max. 1000 V	
Ammeters	EQS 48	EQS 72 / 96
max. 5 s	10-fold, max. 200 A	10-fold
max. 1 s	-	40-fold, max. 250 A
Measurement category	CAT III	
Operating grid voltage	see measuring ranges	
Degree of pollution	2	
Protection class	IP 52 casing at the front	
	IP 00 connections without contact protection	
	IP 20 connections with contact protection	

Accuracy at Nominal conditions

Precision class	1.5 according to DIN EN 60051

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal range value
Curve shape	sine, distortion factor <5%
Frequency	45 ... 65 Hz

Influencing variables

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
Frequency	15 ... 100 Hz (voltage)
	15 ... 400 Hz (current)
magn. external field	0.5 mT

Ambient conditions

Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Measurement range

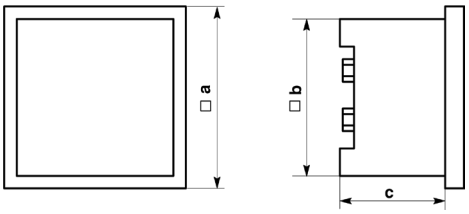
Alternating current	Alternating current
6 V	100 mA
10 V	150 mA
15 V	250 mA
25 V	400 mA
40 V	600 mA
60 V	1 A
100 V	1.5 A
150 V	2.5 A
250 V	4 A
400 V	5 A
500 V	6 A
600 V	10 A
	15 A
	25 A

for transformer connection
N/1A, N/5A[1]
N/100 V, N/110 V[2]

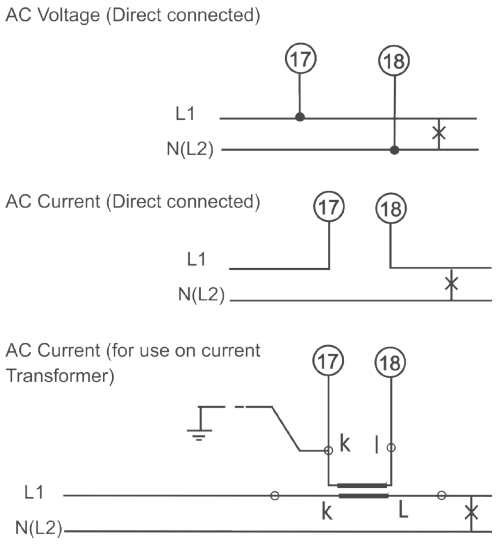
1 Measuring range end value = 2 times the nominal value (overload scale)
2 Measuring range end value = 1.2 times the nominal value (-"-)

Additional measuring ranges available on request

Dimensions & pin assignment



	EQS 48	EQS 72	EQS 96
Front bezel (a)	48	72	96
Housing (b)	42.5	66	90
Installation depth (c)	53	53	53
Control panel cut-out	$45^{+0.6}$	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.1 kg	0.15 kg	0.2 kg



Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	Clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

Blank scale	Start and end value
Scale division and numbering	0 ... 100%, End values according to standard series, measured variable inscription as desired
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Scale illumination (scale translucent)

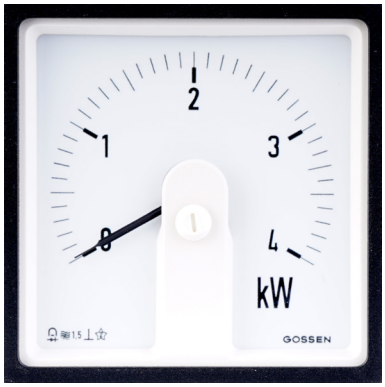
for EQS 48 / 72 / 96	LED internal 24 V DC

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16257	Nominal positions and position symbols for measuring instruments
DIN EN 60051	Direct acting indicating electrical measuring instruments and their accessories - measuring instruments with scale indicators
-1	Part 1: Definitions and general requirements for all parts of this standard
-2	Part 2: Special requirements for ammeters and voltmeters
-9	Part 9: Recommended test methods
DIN EN 60529	Degrees of protection provided by enclosures (IP Code)
DIN EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring and control equipment (classification of climates)

EQS 48 / EQS 72 / EQS 96

Analogue measuring instruments with moving coil and rectifier 240° scale



Description

Analogue moving coil instrument with rectifier in a plastic housing is mainly used for measuring AC currents and AC voltages in the usual technical frequency range of 40 ... 10 000 Hz.

They display the RMS value almost independently of the waveform, even with a high harmonic content.

Functional principle

Moving-iron element with strip core system, silicone oil damping and spring-loaded tip bearing

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable		
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0		
Front panel	low-glare glass		
Colour of bezel	black (RAL9005)		
Installation position	vertical ±5°		
Attachment	screw spindle		
Mounting	close packing possible		
Panel thickness	≤ 25 mm		
Indicator	Schneiderbalken (tailors' beam) indicator		
Indicator deflection	0 ... 240°		
Scale progression	approximately linear starting at 10% nominal measuring range value		
Scale division	coarse / fine		
Scale length	EQS 48	EQS 72	EQS 96
	70 mm	106 mm	142 mm
Overload scale current meters	2 times rated current		
Voltmeters for transformer connection	1.2 times nominal voltage		

Connections

Voltmeters and ammeters up to 30 A	hexagonal bolt with M4 screw and clamping bracket type E3
Ammeter ≥ 40 A	M6 threaded bolt with nut
Ammeter > 60 A	M8 threaded bolt with nut

Electrical data

Measured variable	Alternating current or alternating voltage	
Frequency range	50 / 60 Hz	
Internal consumption voltage meters	< 4.5 VA	
Ammeters ≤ 15 A	< 0.5 VA	
Ammeters > 15 A	< 0.8 VA	
Overload limit pursuant to DIN EN 60051-1		
continuous	1.2-fold	
Voltage meters max. 5 s	2 times, max. 1000 V	
Ammeters	EQS 48	EQS 72 / 96
max. 5 s	10-fold, max. 200 A	10-fold
max. 1 s	-	40-fold, max. 250 A
Measurement category	CAT III	
Operating grid voltage	see measuring ranges	
Degree of pollution	2	
Protection class	IP 52 casing at the front	
	IP 00 connections without contact protection	
	IP 20 connections with contact protection	

Accuracy at nominal conditions

Precision class	1.5 according to DIN EN 60051

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal range value
Curve shape	sine, distortion factor < 5%
Frequency	45 ... 65 Hz

Influencing variables

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
Frequency	15 ... 100 Hz (voltage)
	15 ... 400 Hz (current)
magn. external field	0.5 mT

Ambient conditions

Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Measurement range

Alternating current		Alternating current	
Nominal value	Voltage drop	Nominal value	Internal resistance (±10%)
100 mA	1.8 V	6 V	900 Ω/V
1 A	75 mV	10 V	900 Ω/V
5 A	75 mV	15 V	900 Ω/V
10 A	75 mV	25 V	900 Ω/V
		30 V	900 Ω/V
		40 V	900 Ω/V
		60 V	900 Ω/V
		100 V	900 Ω/V
		150 V	900 Ω/V
		250 V	900 Ω/V
		300 V	900 Ω/V
		400 V	900 Ω/V
		500 V	900 Ω/V
		600 V	900 Ω/V

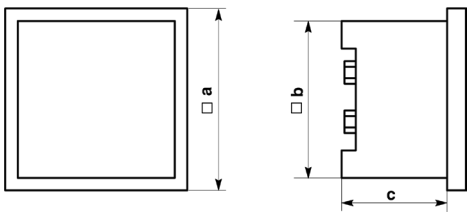
for transformer connection
N/1A, N/5A [1]
N/100 V, N/110 V [2]

1 Measuring range end value = 2 times the nominal value (overload scale)

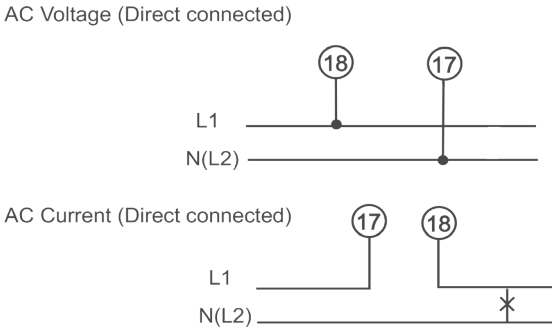
2 Measuring range end value = 1.2 times the nominal value (-"-)

Additional measuring ranges available on request

Dimensions & pin assignment



	EQS 48	EQS 72	EQS 96
Front bezel (a)	48	72	96
Housing (b)	43.5	66	90
Installation depth (c)	53	53	53
Control panel cut-out	$45^{+0.6}$	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.13 kg	0.25 kg	0.30 kg



Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

blank scale	start and end value
Scale division and numbering	0 ... 100%, end values according to standard series, measured variable inscription as desired
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Scale illumination (scale translucent)

for EQS 48 / 72 / 96	LED internal 24 V DC

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16257	Nominal positions and position symbols for measuring instruments
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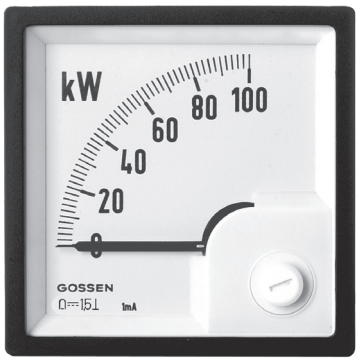
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring and control equipment (classification of climates)

DQS 48 / DQS 72 / DQS 96

Analogue measuring instruments with moving-coil measuring element 90° - scale



Description

Analogue moving coil instrument with plastic housing, suitable for measuring direct current and direct voltage.

The units can be installed in control panels, mosaic grids or machines.

Functional principle

The moving-coil measuring element consists of a core magnet system with spring-loaded tip bearings on both sides.

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable		
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0		
Front panel	low-glare glass		
Colour of bezel	black(RAL 9005)		
Installation position	vertical ±5°		
Attachment	screw spindle		
Mounting	close packing possible		
Panel thickness	≤ 25 mm		
Indicator	Schneiderbalken (tailors' beam) indicator		
Indicator deflection	0 ... 90°		
Scale progression	linear		
Scale division	coarse / fine		
Scale length	DQS 48	DQS 72	DQS 96
	41 mm	63 mm	97 mm

Connections

Voltmeters and Ammeter ≤ 4 A	hexagonal bolt with M4 screw and clamping bracket type E3
Ammeter ≤ 60 A	M6 threaded bolt with nut
Ammeter ≤ 100 A	M8 threaded bolt with nut

Electrical data

Measured variable	Direct current or direct voltage
Overload limit according to DIN EN 60051	
continuous max. 5 s	1.2-fold
Voltmeters	2-fold
Ammeters	10-fold
Measurement category	CAT III
Operating grid voltage	see measuring ranges
Degree of pollution	2
Protection class	IP 52 casing at the front
	IP 00 connections without contact protection
	IP 20 connections with contact protection

Accuracy at nominal conditions

Precision class	1.5 according to DIN EN 60051

Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT

Ambient conditions

Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Measurement range

Direct current		Direct voltage	
	Voltage drop	Nominal value	Internal resistance (±10%)
100 µA	400 mV	75 mV[2]	1 kΩ/V
150 µA	600 mV	100 mV[2]	1 kΩ/V
250 µA	140 mV	150 mV[2]	1 kΩ/V
400 µA	540 mV	250 mV[2]	1 kΩ/V
600 µA	540 mV	600 mV[2]	1 kΩ/V
1 mA	37 mV	1 V	1 kΩ/V
1.5 mA	196 mV	1.5 V	1 kΩ/V
2.5 mA	196 mV	2.5 V	1 kΩ/V
4 mA	196 mV	4 V	1 kΩ/V
5 mA	196 mV	6 V	1 kΩ/V
6 mA	196 mV	10 V	1 kΩ/V
10 mA	196 mV	15 V	1 kΩ/V
15 mA	11 mV	25 V	1 kΩ/V
20 mA	60 mV	40 V	1 kΩ/V
25 mA	60 mV	60 V	1 kΩ/V
40 mA	60 mV	100 V	1 kΩ/V
60 mA	60 mV	150 V	1 kΩ/V
100 mA	60 mV	250 V	1 kΩ/V
150 mA	60 mV	400 V	1 kΩ/V
250 mA	60 mV	500 V	1 kΩ/V
400 mA	60 mV	600 V	1 kΩ/V
600 mA	60 mV	-	-
1 A	60 mV	-	-
1.5 A	60 mV	-	-
2.5 A	60 mV	-	-
4 A	60 mV	-	-
6 A	72 mV	for use on external shunt resistor	
10 A	60 mV		
15 A	60 mV	60 mV	1 kΩ/V
25 A	60 mV	150 mV	1 kΩ/V
40 A	60 mV	-	-
60 A	60 mV	-	-
100 A[1]	60 mV	-	-
for connection to measuring transducer			
4 ... 20 mA	60 mV	-	-

1 not for DQS 48

2 Calibrated lead resistance 0.035 Ω

Additional measuring ranges available on request

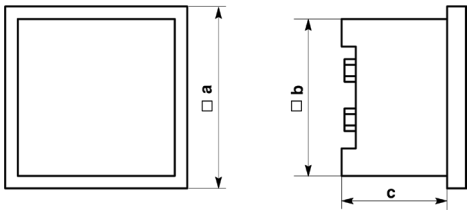
for connection to separate shunt resistor

60 mV; 150 mV	Current consumption approx. 15 mA calibrated lead resistance 0.035 Ω for connecting cable 1 m, 2 x 1 mm²

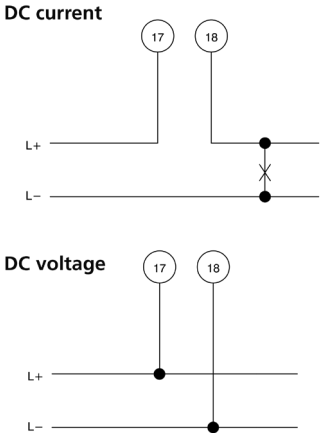
Working voltages

Measurement range	Operating grid voltage		
Direct current	DQS 48	DQS 72	DQS 96
100 µA 1; 1.5; 2.5; 4; 5; 6; 10; 15; 20; 25; 40; 60 mA	150 V	150 V	150 V
1; 1.5; 2.5; 4; 6; 10; 15; 25 A	150 V	150 V	150 V
40; 60; 100 A	-	150 V	150 V
Direct voltage			
60; 100; 150; 250; 400; 600 mV	150 V	150 V	150 V
1; 1.5; 2.5; 4; 6; 10; 15; 25; 40; 60; 100 V	150 V	150 V	150 V
150 V	150 V	150 V	150 V
250 V	300 V	300 V	300 V
400; 500; 600 V	-	-	600 V

Dimensions & pin assignment



	DQS 48	DQS 72	DQS 96
Front bezel (a)	48	72	96
Housing (b)	42.5	66	90
Installation depth (c)	53	53	53
Control panel cut-out	$45^{+0.6}$	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.11 kg	0.15 kg	0.2 kg



Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

without scale	
blank scale	start and end value
Scale division and numbering	0 ... 100%, linear, final values according to standard series, measured variable inscription as desired
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Scale illumination (scale translucent)

for DQS 48 / 72 / 96	LED internal 24 V DC

Other

modified zero point	in the centre

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
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DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring, control and regulating equipment (climate classes for equipment and accessories) (no condensation)

DQS 48 / DQS 72 / DQS 96

Analogue measuring instruments with moving-coil measuring element 240° - scale

Description

Analogue moving coil instrument with plastic housing, suitable for measuring direct current and direct voltage.

The units can be installed in control panels, mosaic grids or machines.

Functional principle

The moving-coil measuring element consists of a core magnet system with spring-loaded tip bearings on both sides.

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable		
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0		
Front panel	low-glare glass		
Colour of bezel	black (RAL 9005)		
Installation position	vertical ±5°		
Attachment	screw spindle		
Mounting	close packing possible		
Panel thickness	≤ 25 mm		
Indicator	Schneiderbalken (tailors' beam) indicator		
Indicator deflection	0 ... 240°		
Scale progression	linear		
Scale division	coarse / fine		
Scale length	DQS 48	DQS 72	DQS 96
	70 mm	106 mm	142 mm

Connections

Voltmeters and Ammeter ≤ 4 A	hexagonal bolt with M4 screw and clamping bracket type E3
Ammeter ≤ 60 A	M6 threaded bolt with nut
Ammeter ≤ 100 A	M8 threaded bolt with nut

Electrical data

Measured variable	Direct current or direct voltage
Overload limit according to DIN EN 60051	
continuous max. 5 s	1.2-fold
Voltmeters	2-fold
Ammeters	10-fold
Measurement category	CAT III
Operating grid voltage	see measuring ranges
Degree of pollution	2
Protection class	IP 52 casing at the front
	IP 00 connections without contact protection
	IP 20 connections with contact protection

Accuracy at nominal conditions

Precision class	1.5 according to DIN EN 60051

Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT

Ambient conditions

Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Measurement range

Direct current		Direct voltage	
	Voltage drop	Nominal value	Internal resistance (±10%)
100 µA	400 mV	75 mV[2]	1 kΩ/V
150 µA	600 mV	100 mV[2]	1 kΩ/V
250 µA	140 mV	150 mV[2]	1 kΩ/V
400 µA	540 mV	250 mV[2]	1 kΩ/V
600 µA	540 mV	600 mV[2]	1 kΩ/V
1 mA	37 mV	1 V	1 kΩ/V
1.5 mA	196 mV	1.5 V	1 kΩ/V
2.5 mA	196 mV	2.5 V	1 kΩ/V
4 mA	196 mV	4 V	1 kΩ/V
5 mA	196 mV	6 V	1 kΩ/V
6 mA	196 mV	10 V	1 kΩ/V
10 mA	196 mV	15 V	1 kΩ/V
15 mA	11 mV	25 V	1 kΩ/V
20 mA	60 mV	40 V	1 kΩ/V
25 mA	60 mV	60 V	1 kΩ/V
40 mA	60 mV	100 V	1 kΩ/V
60 mA	60 mV	150 V	1 kΩ/V
100 mA	60 mV	250 V	1 kΩ/V
150 mA	60 mV	400 V	1 kΩ/V
250 mA	60 mV	500 V	1 kΩ/V
400 mA	60 mV	600 V	1 kΩ/V
600 mA	60 mV	-	-
1 A	60 mV	-	-
1.5 A	60 mV	-	-
2.5 A	60 mV	-	-
4 A	60 mV	-	-
6 A	72 mV	for use on external shunt resistor	
10 A	60 mV		
15 A	60 mV	60 mV	200 Ω/V
25 A	60 mV	150 mV	200 Ω/V
40 A	60 mV	-	-
60 A	60 mV	-	-
100 A[1]	60 mV	-	-
for connection to measuring transducer			
4 ... 20 mA	60 mV	-	-

1 not for DQS 48

2 Calibrated lead resistance 0.035 Ω

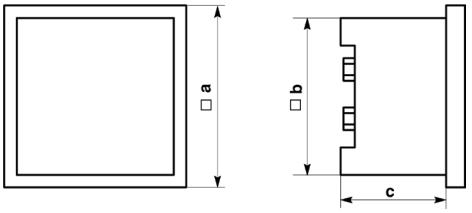
for connection to separate shunt resistor

60 mV; 150 mV	Current consumption approx. 15 mA calibrated lead resistance 0.035 Ω for connecting cable 1 m, 2 x 1 mm²

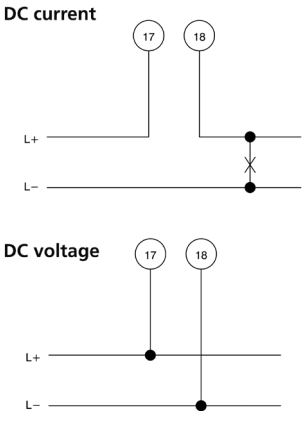
Working voltages

Measurement range	Operating grid voltage		
Direct current	DQS 48	DQS 72	DQS 96
100 µA 1; 1.5; 2.5; 4; 5; 6; 10; 15; 20; 25; 40; 60 mA	150 V	150 V	150 V
1; 1.5; 2.5; 4; 6; 10; 15; 25 A	150 V	150 V	150 V
40; 60; 100 A	-	150 V	150 V
Direct voltage			
60; 100; 150; 250; 400; 600 mV	150 V	150 V	150 V
1; 1.5; 2.5; 4; 6; 10; 15; 25; 40; 60; 100 V	150 V	150 V	150 V
150 V	150 V	150 V	150 V
250 V	300 V	300 V	300 V
400; 500; 600 V	-	-	600 V

Dimensions & pin assignment



	DQS 48	DQS 72	DQS 96
Front bezel (a)	48	72	96
Housing (b)	43.5	66	90
Installation depth (c)	53	53	53
Control panel cut-out	$45^{+0.6}$	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.13 kg	0.25 kg	0.3 kg



Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

without scale	
blank scale	Start and final values marked with pencil
Scale division and numbering	0 ... 100%, linear, final values according to standard series, measured variable inscription as desired
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Scale illumination (scale translucent)

for DQS 48 / 72 / 96	LED internal 24 V DC

Other

modified zero point	in the centre

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
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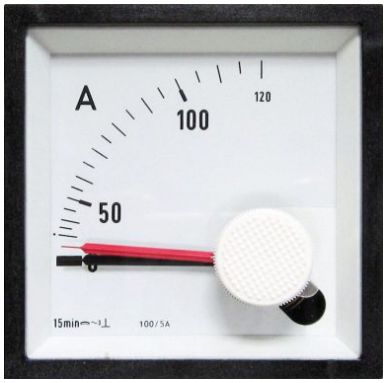
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring, control and regulating equipment (climate classes for equipment and accessories) (no condensation)

MQS 48 / MQS 72 / MQS 96

Analogue measuring instruments with bimetallic measuring element 90°- scale



Description

The bimetal ammeter is particularly suitable for monitoring the thermal load of transformers and cables.

The bimetal element is thermally inert and displays the average RMS value, i.e. only continuous loads and no current peaks.

It has a high torque, so the movement indicator can pull a red slave pointer along with its movement. This means that a maximum value that has been reached can be read at any time. The slave pointer can be reset to the position of the measurement indicator by means of a sealable knob.

Functional principle

Bimetallic movement with resettable slave pointer and thermally delayed display for measuring the average RMS value during the settling time (8 min. or 15 min.).

Mechanical data

Design	Square housing for installation in control panels Machine consoles or mosaic grids (not MQS 48) , stackable		
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0		
Front panel	low-glare glass		
Colour of bezel	black (RAL 9005)		
Installation position	vertical ±5°		
Attachment	screw spindle		
Mounting	close packing possible		
Panel thickness	MQS 48	MQS 72 / MQS 96	
	1 ... 15 mm	≤ 25 mm	
Indicator	Schneiderbalken (tailors' beam) indicator		
Indicator deflection	0 ... 90°		
Scale length	MQS 48	MQS 72	MQS 96
Bimetal	44 mm	62 mm	98 mm
Overload scale	Bimetal		
	with 1.2 times the rated current		
Settling time bimetal	MQS 48	MQS 72	MQS 96
	15 min.	15 min.	15 min.

Connections

hexagonal bolt with M4 screw and clamping bracket type E3

Electrical data

Measured variable	Alternating current		
Frequency range	50 ... 100 Hz		
Internal consumption in VA	MQS 48	MQS 72	MQS 96
at 1 A rated current	< 0.5	< 1	< 1
at 1 A rated current	< 2.2	< 2.5	< 2.5
Overload limit according to DIN EN 60051			
continuous	1.2-fold		
max. 1 s	10-fold		
For larger overloads, connect upstream protective current transformers			
Measurement category	CAT III		
Operating grid voltage	MQS 48	MQS 72	MQS 96
	600 V	600 V	150 V
Degree of pollution	2		
Protection class	IP 52 casing at the front		
	IP 00 connections without contact protection		
	IP 20 connections with contact protection		

Accuracy at nominal conditions

Accuracy class in accordance with DIN EN 60051	Bimetal
	3 (relative to the slave pointer)

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal range value

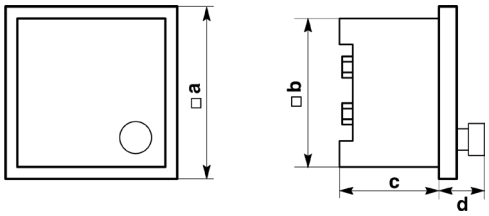
Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT

Ambient conditions

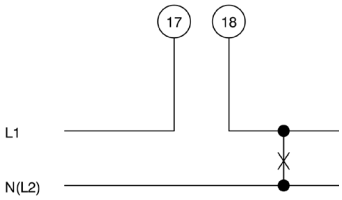
Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Dimensions & pin assignment

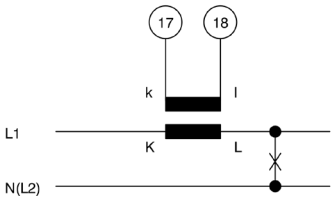


	MQS 48	MQS 72	MQS 96
Front bezel (a)	48	72	96
Housing (b)	45	66	90
Installation depth (c)	48	53	60
Deep reset (d)	11	11	20
Control panel cut-out	$45.2^{+0.3}$	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.1 kg	0.2 kg	0.3 kg

Direct - connected



For use on current Transformer



Measuring ranges alternating current

Available measuring devices

		MQS 48	MQS 72	MQS 96
Bimetal	N/1, 2 A	•	•	•
Bimetal	N/5, 6 A	•	•	•

Special versions

Housing

Attachment	Leaf springs top and bottom
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

blank scale	Start and final values
without scale	
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Overload scale	without overload range or with 1.5 times the rated current
Company logo	without or according to specification

Other

Acquisition time	8 min.

Contact protection for connection

full-surface rear panel cover

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
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DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring, control and regulating equipment (climate classes for equipment and accessories) (no condensation)

MEQS 72 / MEQS 96

Analogue measuring instruments with bimetallic moving-iron measuring element 90°- scale

Description

The bimetal ammeter is particularly suitable for monitoring the thermal load of transformers and cables.

The bimetallic movement is thermally inert and displays the average RMS value, i.e. only continuous loads and no current peaks.

It has a high torque, so the movement indicator can pull a red slave pointer along with its movement. This means that a maximum value that has been reached can be read at any time. The slave pointer can be reset to the position of the measurement indicator by means of a sealable knob.

In the MEQS 72 / MEQS 96 units, a bimetal measuring element is installed opposite the moving-iron element. In addition to the average and maximum values, these ammeters also display the instantaneous value.

Functional principle

Bimetallic movement with resettable slave pointer and thermally delayed display for measuring the average RMS value during the settling time (8 min. or 15 min.).

Moving-iron mechanism with strip core system, silicone oil damping and spring-loaded tip bearings (settling time approx. 1 s)

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable	
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0	
Front panel	low-glare glass	
Colour of bezel	black (RAL 9005)	
Installation position	vertical ±5°	
Attachment	screw spindle	
Mounting	close packing possible	
Panel thickness	≤ 25 mm	
Indicator	Schneiderbalken (tailors' beam) indicator	
Indicator deflection	0 ... 90°	
Scale starting at 1/5 of nominal range value	Bimetal	Moving-iron instrument
	square	approximately linear
Scale division	coarse / fine	
Scale length	MEQS 72	MEQS96
Bimetal	44 mm	71 mm
Moving-iron instrument	62 mm	98 mm
Overload scale	Bimetal	Moving-iron instrument
	with 1.2 times the rated current	with 2 times the rated current
Acquisition time	MEQS 72	MEQS 96
Bimetal	15 min.	15 min.
Moving-iron instrument	approx. 1 s	approx. 1 s

Connections

hexagonal bolt with M4 screw and clamping bracket type E3

Electrical data

Measured variable	Alternating current	
Frequency range	50 ... 100 Hz	
Internal consumption in VA	MEQS 72	MEQS 96
at 1 A rated current	< 1.6	< 1.6
at 1 A rated current	< 2.7	< 3.4
Overload limit pursuant to DIN EN 60051-1		
continuous	1.2-fold	
max. 1 s	10-fold	
For larger overloads, connect upstream protective current transformers		
Measurement category	CAT III	
Operating grid voltage	MEQS 72	MEQS 96
	150 V	150 V
Degree of pollution	2	
Protection class	IP 52 casing at the front	
	IP 00 connections without contact protection	
	IP 20 connections with contact protection	

Accuracy at nominal conditions

Accuracy class in accordance with DIN EN 60051	Bimetal
	3 (relative to the slave pointer)

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal range value

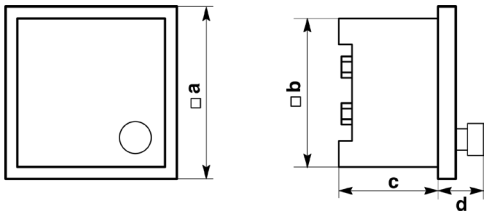
Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT

Ambient conditions

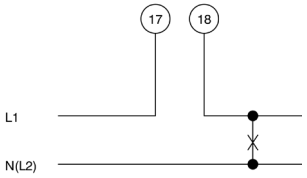
Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Dimensions & pin assignment

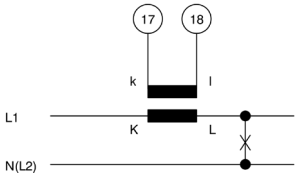


	MEQS 72	MEQS 96
Front bezel (a)	72	96
Housing (b)	66	90
Installation depth (c)	53	60
Deep reset (d)	20	20
Control panel cut-out	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.2 kg	0.3 kg

Direct - connected



For use on current Transformer



Measuring ranges alternating current

Bimetal	0 ... 1 / 1.2 A or 0 ... 5 / 6 A
Moving-iron instrument	0 ... 1 / 2 A or 0 ... 5 / 10 A

Special versions

Housing

Attachment	Leaf springs top and bottom
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

blank scale	Start and final values
without scale	
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Special versions

Other

Acquisition time	8 min.

Contact protection for connection

full-surface rear panel cover

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
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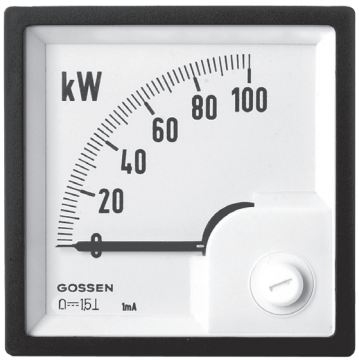
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring, control and regulating equipment (climate classes for equipment and accessories) (no condensation)

DLMQS 96

Analogue measuring instruments for active or reactive power 90°- scale



Description

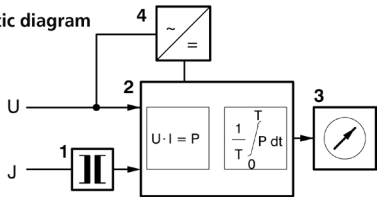
Electronic moving-coil power meter with 90° scale in a plastic housing, suitable for measuring active or reactive power in single-phase Alternating current or three-phase grids.

A distinction between energy output and energy consumption is possible, as is the differentiation between inductive and capacitive reactive power. The measuring devices are suitable for both sinusoidal and non-sinusoidal currents.

Functional principle

The measuring instruments consist of a moving-coil element with a core magnet system, or a swivel-coil system with spring-loaded tip bearings on both sides and a measuring attachment. Both assemblies are built into a shared plastic housing.

Schematic diagram



Depending on the type of unit, the measuring attachment consists of one, two or three multiplier systems **2**.
Each multiplier system is preceded by a current transformer **1** which adapts the input current to the electronics.
The multiplier forms the product of the instantaneous values of current and voltage (TDM method).
During the subsequent integration, the AC component is suppressed so that a DC voltage proportional to the power is present at the moving-coil instrument **3**.
The supply voltage is taken from the measuring voltage in function block **4**.

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0
Front panel	low-glare glass
Colour of bezel	black (RAL9005)
Installation position	vertical ±5°
Attachment	screw spindle
Mounting	close packing possible
Panel thickness	≤ 25 mm
Indicator	Schneiderbalken (tailors' beam) indicator
Indicator deflection	0 ... 90° (240° on request)
Scale progression	linear
Scale division	coarse / fine
Scale length	DLMQS 96
	97 mm

Connections

Hexagon bolt with M4 screw

Electrical data

Measured variable		Active or reactive power
Acquisition time		4 s
Overload limit according to DIN EN 60051		
continuous		1.2-fold
max. 5 s	Voltage	2-fold
max. 5 s	Current	10-fold
Internal consumption		
per current path		≤ 0.2 VA
per voltage path type		
P1W, P3Wg, P3Bg		≤ 3.0 VA
P1B		≤ 3.5 VA
P3Wu, P3Bu		≤ 3.4 VA
P4Wu		≤ 3.9 VA
P4Bu		≤ 4.3 VA
Measurement category		CAT III
Operating grid voltage		see measuring ranges
Degree of pollution		2
Protection class		IP 52 casing at the front
		IP 00 connections without contact protection
		IP 20 connections with contact protection

Accuracy at nominal conditions

Precision class	1.5 according to DIN EN 60051

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal measuring range final value P_N
Calibration factor	$\lambda = P_N / P_S$
Power factor	$\cos \varphi = \lambda / 0{,}6$ or $\sin \varphi = \lambda / 0.6$
	for $0.3 \leq \lambda < 0.6$
	$\cos \varphi = 1$ or $\sin \varphi = 1$
	for $0.3 \leq \lambda \leq 1.5$
Voltage	Rated voltage
Frequency	50 Hz ± 2%
Warm-up time	≥ 15 min.
Other	DIN EN 60051-1

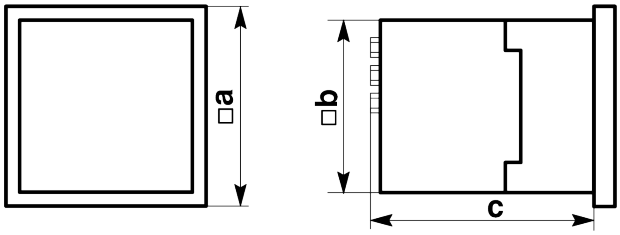
Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT
Power factor (4 quadrants)	-1 ind. (output) ... 1 (supply) ... -1 cap. (output)

Ambient conditions

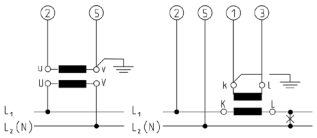
Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Dimensions & pin assignment

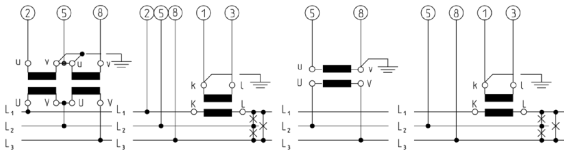


	DLMQS 96
Front bezel (a)	96
Housing (b)	90
Installation depth (c)	106
Control panel cut-out	$92^{+0.8}$
Weight approx.	1.1 kg

Single-phase alternating current
Active or reactive power
DLMQS 96 P1W/P1B

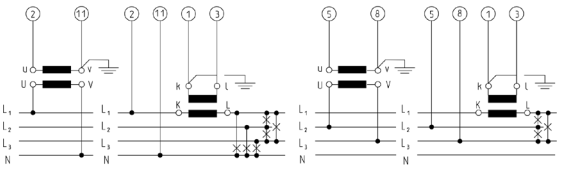


Three-conductor three-phase current under equal load
Active power
DLMQS 96 P3Wg



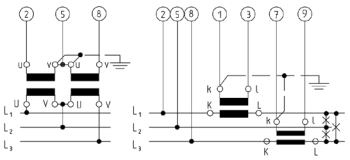
Three-conductor three-phase current under equal load
Reactive power:
DLMQS 96 P3Bg

Four-wire three-phase current of equal load Active power
DLMQS 96 P4Wg

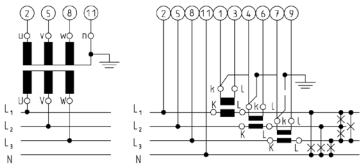


Four-wire three-phase current of equal load Reactive power:
DLMQS 96 P4Bg

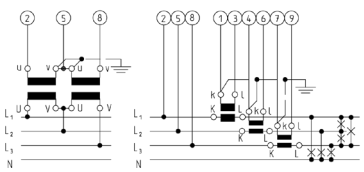
Three-wire three-phase current of any load
Active or reactive power
DLMQS 96 P3Wu/P3Bu



Four-wire three-phase current of any load
Active power
DLMQS 96 P4Wu



Four-wire three-phase current of any load
Reactive power:
DLMQS 96 P4Bu



Measurement range

The apparent power P_s results from the primary values of the current and voltage transformers:	
Single-phase AC grid	$P_S = U \cdot I$
Three-phase grid	$P_S = \sqrt{3} \cdot U \cdot I$
Select measuring range's final value between 0.5 and 1.2 times the value of the calculated apparent power, preferably from the standard series 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 7.5 - 8 and their decadic multiples.	

Rated voltage

Single-phase AC grid Three-wire three-phase grid		Four-wire three-phase grid	
Rated voltage	Operating grid voltage	Rated voltage	Operating grid voltage
	DLMQS 96		DLMQS 96
57.7 V (100 V:√3)	150 V	57.7/100 V	150 V
63.5 V (110 V:√3)	150 V	63.5/110 V	150 V
100 V	150 V		
110 V	150 V		
120 V	150 V		
127 V (220 V:√3)	150 V	127/220 V	150 V
230 V (400 V:√3)	300 V		
289 V (500 V:√3)	300 V		
400 V	600 V	230/400 V	600 V
440 V	600 V	254/440 V	600 V
500 V	600 V	289/500 V	600 V

Other nominal voltages on request

Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

additional marking	according to specification e.g. "generator"
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16257	Nominal positions and position symbols for measuring instruments
DIN EN 60051	Direct acting indicating electrical measuring instruments and their accessories - measuring instruments with scale indicators
-1	Part 1: Definitions and general requirements for all parts of this standard
-3	Part 3: Special requirements for active and reactive power measuring instruments
-9	Part 9: Recommended test methods
DIN EN 60529	Degrees of protection provided by enclosures (IP Code)
DIN EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements (IEC 61000-4-3 evaluation criterion B)
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring and control equipment (classification of climates)

DLQS 96

Analogue measuring instruments for power factor 90° - scale

Description

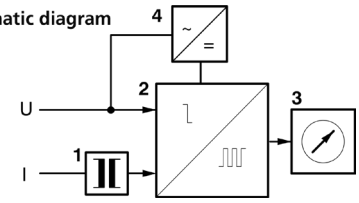
Electronic moving-coil measuring device with 90° scale in plastic housing that is suitable for measuring the power factor as the ratio of active and apparent power in single-phase alternating current grids or in equally loaded three-wire three-phase grids. Alternating current or three-phase grids.

The units can be installed in control panels, mosaic grids or machines.

Functional principle

The moving coil mechanism consists of a core magnet system or rather a swivel-coil system (LSC) with spring-loaded tip bearings on both sides and a measuring attachment. Both assemblies are built into a shared plastic housing.

Schematic diagram



The measuring attachment consists of a bistable flip-flop **2** with an upstream current transformer **1**, which adapts the input current to the electronics.

The duty factor of the bistable flip-flop is proportional to the phase angle φ . A low-pass filter forms the average which drives the moving-coil element **3**. The standard scale is labelled with the cosine of the phase angle φ .

The supply voltage is taken from the measuring voltage in function block **4**.

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0
Front panel	low-glare glass
Colour of bezel	black (RAL9005)
Installation position	vertical ±5°
Attachment	screw spindle
Mounting	close packing possible
Panel thickness	≤ 25 mm
Indicator	Schneiderbalken (tailors' beam) indicator
Indicator deflection	0 ... 90° (240° on request)
Scale progression	not linear
Scale division	coarse / fine
Scale length	97 mm

Connections

Hexagon bolt with M4 screw

Electrical data

Measured variable		Power factor (phase angle φ)
Frequency range		45 Hz ... 50 Hz ... 65 Hz (three-phase grid)
Overload limit pursuant to DIN EN 60051-1		
continuous		1.2-fold
max. 5 s	Voltage	2-fold
	Current	10-fold
Internal consumption		
Current path		≤ 0.1 VA
Voltage path		≤ 3.0 VA
Measurement category		CAT III
Operating grid voltage		see measuring ranges
Degree of pollution		2
Protection class		IP 52 casing at the front
		IP 00 connections without contact protection
		IP 20 connections with contact protection

Accuracy at nominal conditions

Precision class	1.5 according to DIN EN 60051

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Curve shape	sinusoidal
Distortion factor	≤ 0.1 %
Current	95 ... 100% rated current
Voltage	Rated voltage
Frequency	50 Hz ± 0.1 %
Warm-up time	≥ 5 min.
Other	DIN EN 60051

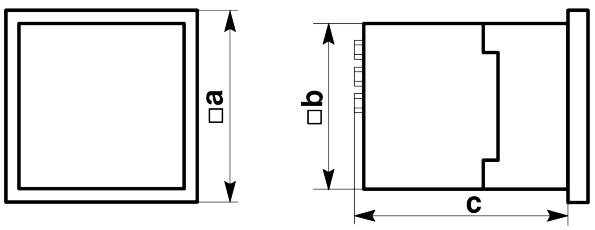
Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT

Ambient conditions

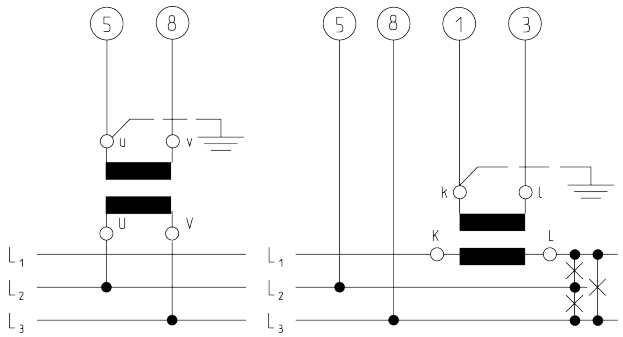
Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Dimensions & pin assignment



	DLQS 96
Front bezel (a)	96
Housing (b)	90
Installation depth (c)	106
Control panel cut-out	$92^{+0.8}$
Weight approx.	0.55 kg

Three-phase current with equal load DLQS 96



Measurement range

cos φ	cap 0.5 ... 1 ... 0.5 ind

Additional measuring ranges available on request

Rated voltage

Three-wire three-phase grid	
Rated voltage	**Operating grid voltage**
57.5 V	150 V
63.5 V	150 V
100 V[1]	150 V
110 V[1]	150 V
120 V	150 V
127 V	150 V
220 V	300 V
230 V	300 V
240 V	300 V
289 V	600 V
380 V	600 V
400 V	600 V
415 V	600 V
440 V	600 V
500 V	600 V

Rated current

1 A
5 A

1 also for connection to voltage transformers

Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16257	Nominal positions and position symbols for measuring instruments
DIN EN 60051	Direct acting indicating electrical measuring instruments and their accessories - measuring instruments with scale indicators
-1	Part 1: Definitions and general requirements for all parts of this standard
-5	Part 5: Special requirements for phase shift angle measuring instruments, power factor meters and synchroscopes
-9	Part 9: Recommended test methods
DIN EN 60529	Degrees of protection provided by enclosures (IP Code)
DIN EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements (IEC 61000-4-3 evaluation criterion B)
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring and control equipment (classification of climates)

If you have any questions or suggestions, we will be glad to hear them!

You can find more information on our website.

FQS 48 / FQS 72 / FQS 96

Analogue measuring instruments indicator for frequency measurement 90° - scale

Description

Moving-coil frequency meter with 90° scale in a plastic housing, suitable for measuring the frequency of mains voltages from 45 to 450 Hz.

In order to improve accuracy, the instruments only display a small range around the selected frequency range.
The frequency range that is not of interest is electronically suppressed.

The bezel, front screen and the scale can be easily replaced.

Functional principle

Moving-coil element with core magnet system or swivel-coil system and spring-loaded tip bearings on both sides.

Electronic measuring attachment based on the capacitor discharge principle.

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable		
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0		
Front panel	low-glare glass		
Colour of bezel	black (RAL 9005)		
Installation position	vertical ±5°		
Attachment	screw spindle		
Mounting	close packing possible		
Panel thickness	≤ 25 mm		
Indicator	Schneiderbalken (tailors' beam) indicator		
Indicator deflection	0 ... 90°		
Scale progression	linear		
Scale division	coarse / fine		
Scale length	FQS 48	FQS 72	FQS 96
	41 mm	63 mm	97 mm

Connections

Hexagon bolt with M4 screw

Electrical data

Measured variable	Frequency
permissible voltage fluctuation	-15% ... +10%
Internal consumption	≤ 3 VA
Measurement category	CAT III
Operating grid voltage	see measuring ranges
Degree of pollution	2
Protection class	IP 52 casing at the front
	IP 00 connections without contact protection
	IP 20 connections with contact protection

Accuracy at nominal conditions

Precision class	0.5 according to DIN EN 60051

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal range value
Voltage	Rated voltage

Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
magn. external field	0.5 mT

Ambient conditions

Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	2.5 g; 5...55 Hz

Measurement range

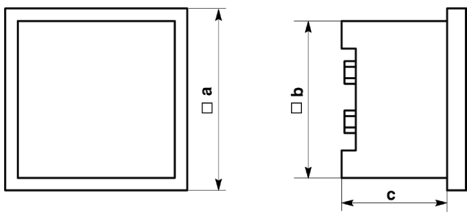
Frequency range

45 ... 50 ... 55 Hz
45 ... 50 ... 65 Hz
55 ... 60 ... 65 Hz
360 ... 400 ... 440 Hz
380 ... 400 ... 420 Hz

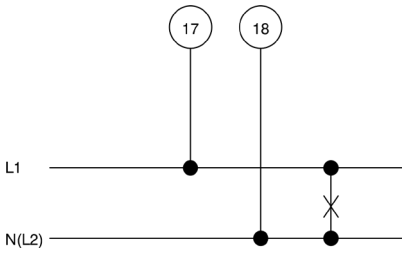
Rated voltage

57.7 V
63.5 V
100 V
110 V
115 V
120 V
127 V
208 V
220 V
230 V
240 V
289 V
380 V
400 V
415 V
440 V
500 V
Other measuring ranges available on request

Dimensions & pin assignment



	FQS 48	FQS 72	FQS 96
Front bezel (a)	48	72	96
Housing (b)	42.5	66	90
Installation depth (c)	53	53	53
Control panel cut-out	$45^{+0.6}$	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.13 kg	0.3 kg	0.3 kg



Special versions

Housing

Shipbuilding version	Type approval in accordance with DNV
Indicator pointer	red, adjustable from the front
Attachment	clamping spring
Protection class	IP 54 at the front (IP 65 only in combination with protective cap)

Scale

without scale	
blank scale	start and end value
Scale division and numbering	0 ... 100%, linear, final values according to standard series, measured variable inscription as desired
additional marking	according to specification e.g. “generator”
additional numbering	according to specification
Marking line	red, green for important scale value
coloured area	red, green within the scale division
Company logo	without or according to specification

Contact protection

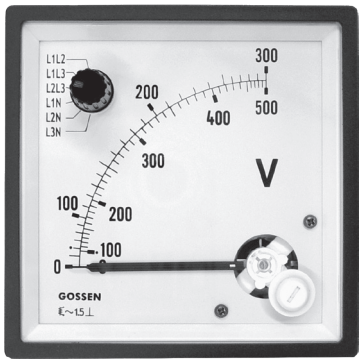
full-surface rear panel cover

Requirements

DIN 43718	Measurement and control; front-frames and front panels of measurement and control equipment; principal dimensions
DIN 43802	Line scales and pointers for indicating electrical measuring instruments; general requirements
DIN 16257	Nominal positions and position symbols for measuring instruments
DIN EN 60051	Direct acting indicating electrical measuring instruments and their accessories - measuring instruments with scale indicators
-1	Part 1: Definitions and general requirements for all parts of this standard
-4	Part 4: Special requirements for frequency measuring instruments
-9	Part 9: Recommended test methods
DIN EN 60529	Degrees of protection provided by enclosures (IP Code)
DIN EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements
DIN EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements Part 1: General requirements (IEC 61000-4-3 evaluation criterion B)
DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring and control equipment (classification of climates)

EQS 72/U6 / EQS 96/U6

Analogue measuring instruments with moving-iron mechanism and change-over switch 90° - scale



Description

Analogue moving-iron mechanism with plastic housing is used to measure alternating voltages in the common three-phase grid.

They display the RMS value almost independently of the waveform, even with a high harmonic content. Only for extreme curve shapes (e.g. phase-angle controls) and frequencies >100 Hz can the class accuracy no longer be maintained.

All voltages in the four-wire three-phase grid can be displayed using the built-in 6-position changeover switch.

Functional principle

Moving-iron element with strip core system,
silicone oil damping and spring-loaded tip bearing.

Mechanical data

Design	Square housing for installation in control panels in machine consoles or mosaic grids, stackable	
Housing material	polycarbonate, self-extinguishing and non-dripping in accordance with UL 94 V-0	
Front panel	low-glare glass	
Colour of bezel	black (RAL 9005)	
Installation position	vertical ±5°	
Attachment	screw spindle	
Mounting	close packing possible	
Panel thickness	≤ 25 mm	
Indicator	Schneiderbalken (tailors' beam) indicator	
Indicator deflection	0 ... 90°	
Scale progression	approximately linear starting at 10% nominal measuring range value	
Scale division	coarse / fine	
Scale length	EQS 72/U6	EQS 96/U6
	54 mm	97 mm
Overload scale	1.2 times rated voltage (voltmeters for transformer connection).	

Connections

hexagonal bolt with M4 screw and clamping bracket type E3

Electrical data

Measured variable	Alternating current
Frequency range	16 2/3 ... 100 Hz
Internal consumption	< 4.5 VA
Overload limit (DIN EN 60051-1)	
continuous	1.2-fold
max. 5 s	2 times, max. 1000 V
Measurement category	CAT III
Operating grid voltage	see measuring ranges
Degree of pollution	2
Protection class	IP 52 casing at the front
	IP 00 connections without contact protection
	IP 20 connections with contact protection

Accuracy at nominal conditions

Precision class	1.5 according to DIN EN 60051

Nominal conditions

Ambient temperature	23 °C
Installation position	Nominal mounting position ± 1°
Input variable	Nominal range value
Curve shape	sine, distortion factor < 5%
Frequency	45 ... 65 Hz

Influencing variable

Ambient temperature	23 °C ± 2 K
Installation position	Nominal mounting position ± 5°
Frequency	15 ... 100 Hz
magn. external field	0.5 mT

Ambient conditions

Climate suitability	Climate class 3 according to VDE/VDI 3540 Sheet 2
Operating temperature range	-10 ... +55 °C
Storage temperature range	-25 ... +65 °C
Relative humidity	≤ 75% annual average, no condensation
Shock resistance	15 g, 11 ms
Vibration resistance	10-55-10 Hz and 0.15 mm amplitude (1.5 g, 50 Hz)

Measurement range

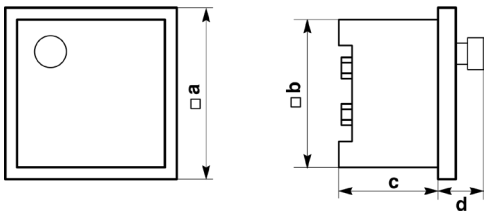
Alternating current	Operating grid voltage
500 V	600 V

Please specify nominal transformer ratio.

Switch positions for the four-wire three-phase grid

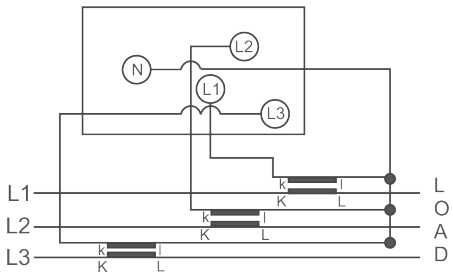
6 switch positions	L1L3; L2L3; L1L2; L1N; L2N; L3N

Dimensions & pin assignment

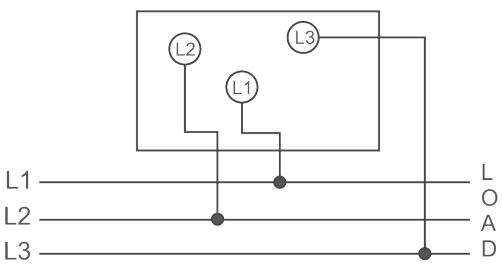


	EQS 72/U6	EQS 96/U6
Front bezel (a)	72	96
Housing (b)	66	90
Installation depth (c)	53	53
Depth switch (d)	13	13 C
Control panel cut-out	$68^{+0.7}$	$92^{+0.8}$
Weight approx.	0.19 kg	0.23 kg

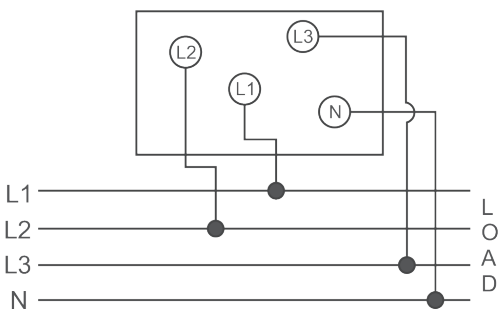
With selector switch



AC voltmeter 3 phases 3 wire



AC voltmeter 3 phases 4 wire



Contact protection

full-surface rear panel cover
(for types with connection using hexagonal bolts with M4 screws and clamping bracket))

Requirements

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DIN IEC 61554	Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting
VDE/VDI 3540 Sheet 2	Reliability of measuring and control equipment (classification of climates)

Gilgen, Müller & Weigert (GMW) GmbH & Co. KG

Am Farrnbach 4A
90556 Cadolzburg, Germany

Tel.: 0049 9103 71290,
Fax: 0049 9103 7129 207
info@g-mw.de

Managing Director: Prof. Dr. h.c. Wolfgang Gilgen
VAT identification number: DE 815 535 316

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