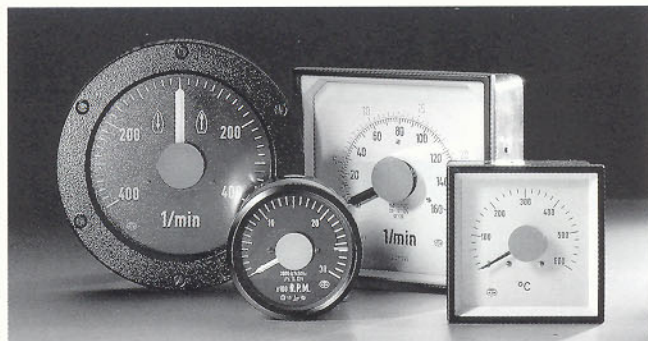


Analogue Indicators with Moving-coil Movements



F 71E

For Different Levels of Requirements

NORIS supplies 3 different movements:

These analogue indicating instruments use moving-coil movements with 250 angular pointer deflection. The physical design of the moving part of the system (mechanical strength, sizing of spiral springs, in particular, the type of bearings

installed) and the magnetic circuit provides movements for different levels of requirements with respect to mechanical loadability, temperature error and price.

Application:	MS 2 *)	MS 3 *)	R 5 *)
	Normal requirements	Increased requirements	Severe requirements
Bearings:	jewel	jewel	ring-jewel
Power consumption:	1 mA	1 mA	5 mA
Full scale deflection:	250°	250°	250°
Zero:	bottom left	bottom left	optional
Resistance of coil:	585 Ω	270 Ω	240 Ω
Permissible vibration:	0.7 g	2.5 g	4.0 g
Accuracy class:	1.5	1.5	1.0
Linearity error:	+/- 2%	+/- 2%	+/- 1,5%
Temperature error per 0 °K:	0.5 %	0.5 %	0.5 %
Reproducibility error:	+/- 1 %	+/- 1 %	+/- 1 %
Operating temperature range:	0 - 60 °C	0 - 70 °C	- 30 - + 80 °C
Shelf temperature:	- 40 - + 80 °C	- 40 - + 80 °C	- 40 - + 80 °C
Climatic application class (DIN40040)	90% rh (50 days/y)	90% rh (50 days/y)	90% rh (50 days/y)
Position in use:	vertical, +/-30% off-vertical	vertical, +/-30% off-vertical	optional
Approvals:	GL	-	GL/LR/ABS

Standard specifications

Built-in passive components enable the indicators to be matched to different electrical parameters, the basic data being as follows: Customized versions are available in a wide range of variations (enquiries invited).

*) The movements are also available in low-ohmic versions, specifically for current-based indicators. The internal resistance of the MS2 and MS3 movements is 50 ohm and that of the R5 movement 20 ohm. Further information available on request.

	MS 2	MS 3	R 5
Internal resistance Ri:	1000 Ω/V	1000 Ω/V	200 Ω/V
Overload:	2.5 times	2.5 times	2.5 times
DC voltage input:			
Minimum for full-scale deflection:	5V DC	5V DC	5V DC
Maximum for full-scale deflection:	60 V	60 V	60 V
Power consumption:	1 mA	1 mA	5 mA
DC current input:			
Minimum for full-scale deflection:	1 mA	1 mA	5 mA
Maximum for full-scale deflection:	20 mA **)	20 mA **)	20 mA **)
AC voltage input:			
Minimum for full-scale deflection:	10 V ~	10 V ~	10 V ~
Maximum for full-scale deflection:	60 V ~	60 V ~	60 V ~
Frequency min.:	6 Hz ***)	6 Hz ***)	6 Hz ***)

**) In the DC current measuring range 0-20 mA or 4-20 mA, the low-ohmic version of the movement is used. Voltage drop with MS2 and MS3 movements = 1 V. Voltage drop with R5 movement = 0.4 V.

***) Only with built-in damping elements and restricted accuracy class.

Off-standard specifications

Transducers can be incorporated for temperature, speed (frequency) and pressure (resistance) to afford direct reading of certain measured variables. Separate leaflets are available for these instruments.



Standard Scales and Special Graduations

Dials

Scale subdivisions and numbers for standard dials.

The preferred series of maximum scale values (to DIN 5375 and DIN 43780) is as follows: 1 - 1.2 - 1.5 - 2 - 2.5 - 3 - 4 - 5 - 6 - 7.5 - 8 or a decadic multiple or fraction thereof.

Examples of scale markings and legends: Indication 0 - 300 (Fig. 1), 300 - 0 - 300 (Fig. 2) for scale lengths greater than 180 mm.

The scale markings and legends are matched to the scale arc and the size of the particular indicating instrument. A large variety of special dials can be provided. Details will be found on the following pages describing the indicators.

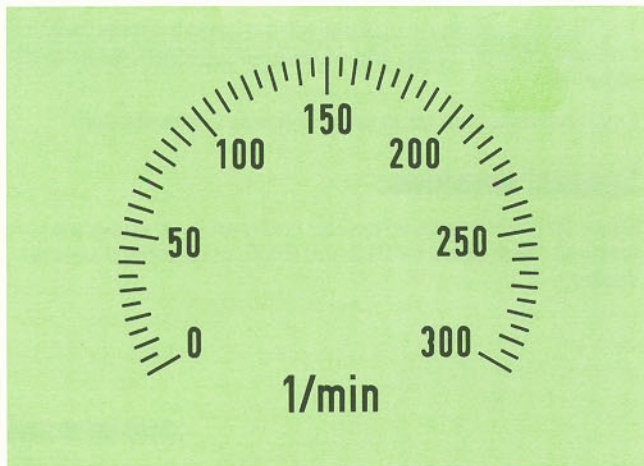


Fig. 1

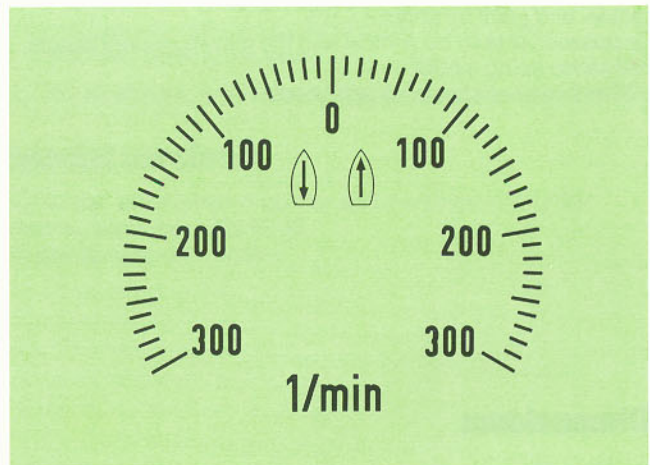


Fig. 2

Notes:

Explosion protection:

Enquiries are invited for analogue indicators in explosion-proof construction (Exe, Exi).

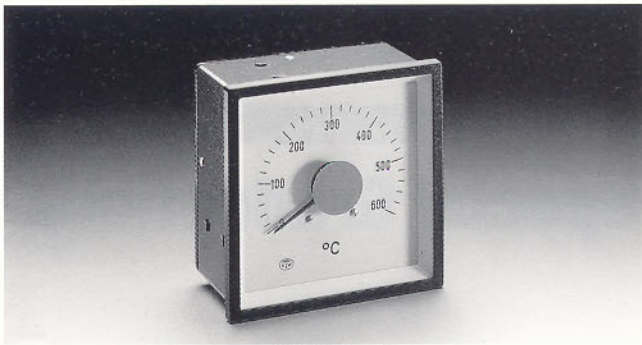
Magnetically screened indicators:

Certificates issued by the German Hydrographic Institute are available in respect of the indicators RQ96, RQ144, PRQ144.

Standards applied.

The NORIS indicators are designed in conformance with the following DIN Standards and IEC Specifications:

- DIN 43780 (IEC 51, 3rd edition) Indicating instruments
- DIN 43700 Cases and panel cut-outs
- DIN 43718 Bezels
- DIN 43802 Dials - pointers - markings
- DIN 43835 Fastening elements
- DIN 40050 Protection classes
- DIN 5375 Speed indicators for machinery
- DIN 40040 Application classes and reliability ratings of electronic components
- DIN 57 VDE 0410 and, respectively, IEC 414 Safety Regulations



Meeting Normal Requirements with MS 2 Movement

Circular and square-bezel flush-mounting indicators with MS2 movement Types R60, R800, RQ72, RQ96, RQ960

These flush-mounting instruments are designed for normal duties on control boards and in central control rooms. A facility is provided at the back of the indicator to adjust the upper scale-end point by about +/- 5%. Installation should be vertical with the maximum permissible deviation being +/- 30°. Other positions should be specified.

Standard design:

White dial, black pointer and markings.
R60, R800 have chrome-plated bezel.
RQ72, RQ96, RQ960 have black bezel.

Measuring ranges are available for DC voltage, DC current or AC voltage. Scale subdivisions, e.g. for speed, pressure, temperature are preferably to DIN 5375, zero being invariably at the bottom left (0-n). Zero suppression is possible up to 20%.

The RQ960 indicator is optional with an open or closed terminal box with different cable entries (see Accessories, Sealing set, page 10).

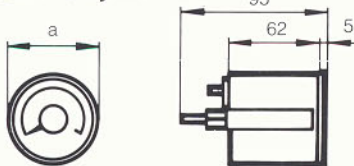
Electrical data: See table for MS2 (page 2, Movements).

Special versions:

Black dial, white (yellow) pointer and markings, anti-glare window, black bezel for R60 and R800; off-standard special scales.

Dimensions:

Type: R60, R800

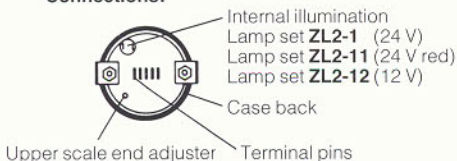


Scale length "c"
Panel cutout "b"

	a	b	c
R60	64	61 dia	96
R800	84	81 dia	160

Panel thickness 4 mm maximum

Connections:

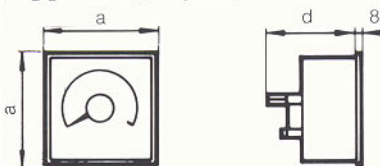


Connection is by means of push-on connectors A 2.8-0.5 No. 1 + 2 -
Protection class: Case IP 54
Terminals IP 00

Fixing: Screw clamp

For ordering example, see page 10

Type: RQ72, RQ96

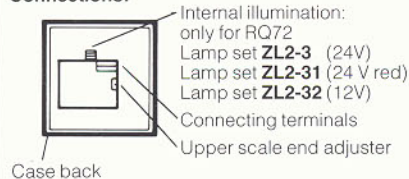


Scale length "c"
Panel cutout "b"

	a	b	c	d
RQ72	72	68 x 68	112	82
RQ96	96	92 x 92	140	75

Panel thickness 4 mm max.

Connections:

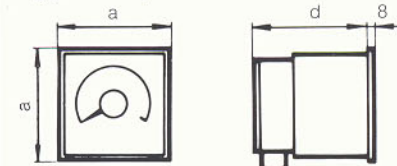


Connection is by means of terminals 1 + and 2 -
Protection class: Case IP 54
Terminals IP 00

Fixing element according to DIN 43835

For ordering example, see page 10

Type: RQ960

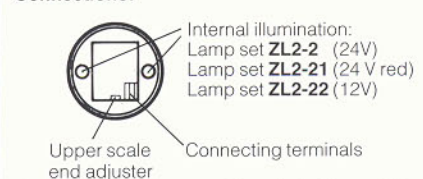


Scale length "c"
Panel cutout "b"

	a	b	c	d
RQ960	96	92 x 92	140	95

Panel thickness 4 mm max.

Connections:



Connection is by means of terminals 1 + and 2 -
Protection class: Case IP 54
Terminals IP 00
with sealing set ZL1- up to IP54

Fixing element according to DIN 43835

For ordering example, see page 10



Meeting Increased Requirements with MS 3 Movement

Circular and square-bezel flush-mounting indicators with MS3 movement Types R100, RQ144

The MS3 movement is designed to meet increased requirements. A facility is provided at the back of the instrument to adjust the upper scale end point by about +/- 5%.

Installation should be vertical with a permissible deviation of +/- 30°. Other positions should be specified.

Standard design:

White dial, black pointer and markings.
R100 has chrome-plated bezel, RQ144 black bezel.

Measuring ranges are possible for DC voltage, DC current or AC voltage. Scale divisions are preferably to DIN 5375, zero is invariably at bottom left (0-n), zero suppression possible up to 20%.

The indicators are optionally available with an open or closed terminal box with different types of cable entries (see Accessories, Sealing set, page 10).

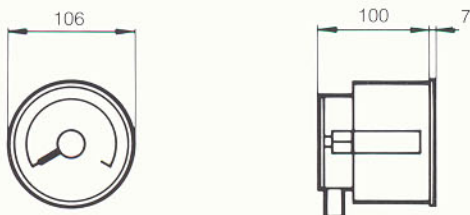
For electrical data, see table for MS3 (page 2, Movements).

Special versions:

Black dial, white (yellow) pointer and markings, anti-glare window, black bezel for R100, off-standard special scales.

Dimensions:

Type: R100



Scale length 160 mm

Panel thickness 4 mm maximum

Panel cutout 101 mm dia

Connections R100

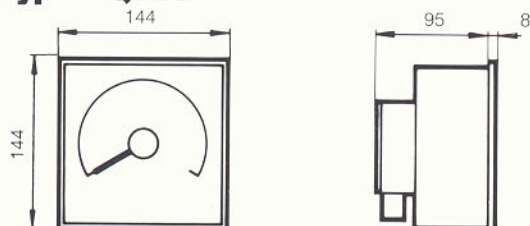


Upper scale end adjuster Connecting terminals

Connection is by means of terminals 1 + and 2-
Protection class: Case IP 54
Terminals IP 00
with sealing set ZL1... up to IP 54
Fixing: Large screw clamp

For ordering example, see page 10

Type: RQ144



Scale length 236 mm

Panel thickness 4 mm maximum

Panel cutout 138 x 138

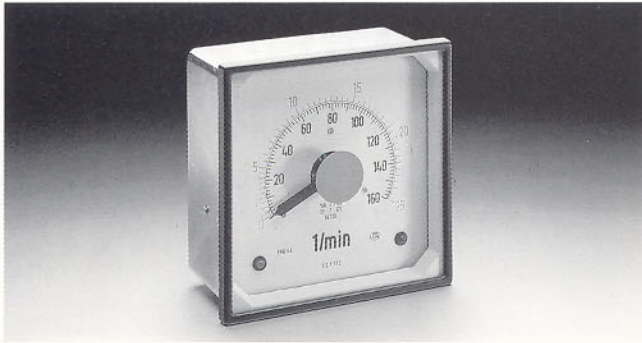
Connections RQ144



Upper scale end adjuster Connecting terminals

Connection is by means of terminals 1 + and 2-
Protection class: Case IP 54
Terminals IP 00
with sealing set ZL1... up to IP 54
Fixing element to DIN 43835

For ordering example, see page 10



Meeting Severe Requirements with R 5 Movement

Circular and square-bezel flush-mounting indicators with R5 movement

For rough environments. Manifold possibilities afforded by special construction.

Types PR100, PRQ96, PRQ144, PR160

The ring-jewel bearings of the R5 moving coil instrument with sapphires make these indicator highly immune to shocks and constant vibration. Their performance is independent of the position in which they are installed and they feature a specially low temperature error. The accuracy of these instruments is distinctly better than Class 1 to DIN 43780. Optionally, calibration can be provided, depending on the measured variable, according to Class 1.5 (standard version) or Class 1 (extra charge). Rugged construction ensures good performance over a long service life. A facility is provided at the back of the instruments to adjust the upper scale end point by +/- 5%.

Standard design:

White dial, black pointer and markings, preferred measuring ranges to DIN 5375, zero at bottom left.

Measuring ranges can be provided for DC voltage, DC current or AC voltage. The indicators are optionally available with an open or closed terminal box with different types of cable entries (see Accessories: Sealing set, page 10).

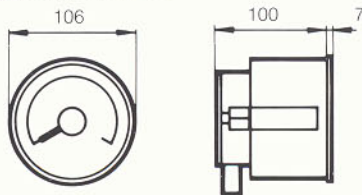
Electrical data: See table for R5 (page 2, Movements).

Special versions:

- Black dial, white, red or yellow pointer and markings.
- Anti-glare window, white or red dial illumination.
- Scale subdivisions to suit individual requirements.
- Multiple measuring ranges
- Centre zero (n-0-n).
- Expanded/compressed scale.
- Coloured scale arcs.
- Suppressed zero or upper end point.
- Dial designs to user's requirements.

Dimensions:

Type: PR 100



Scale length 160 mm Panel thickness 4 mm max.

Panel cutout:
101 mm dia

Connections PR100

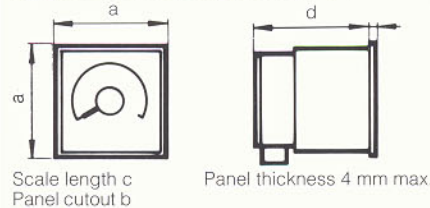


Upper scale end adjuster Connecting terminals

Connection is by means of terminals 1 + and 2-
Protection class: Case IP 54
Terminals IP 00
with sealing set ZL1-.. up to IP 54
Fixing: By large screw clamp

For ordering example, see page 10

Types: PRQ96, PRQ144



Scale length c
Panel cutout b

Panel thickness 4 mm max.

	a	b	c	d
PRQ96	96	92 x 92	160	95
PRQ144	144	138 x 138	236	95

Connections PRQ96, PRQ144

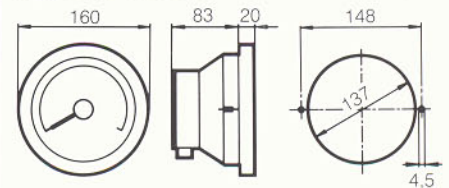


Upper scale end adjuster Connecting terminals

Connection is by means of terminals 1 + and 2-
Protection class: Case IP 54
Terminals IP 00
with sealing set ZL1-.. up to IP 54
Fixing element according to DIN 43835

For ordering example, see page 10

Type: PR160



Scale length 238 mm

Panel cutout
Panel 10 mm max.

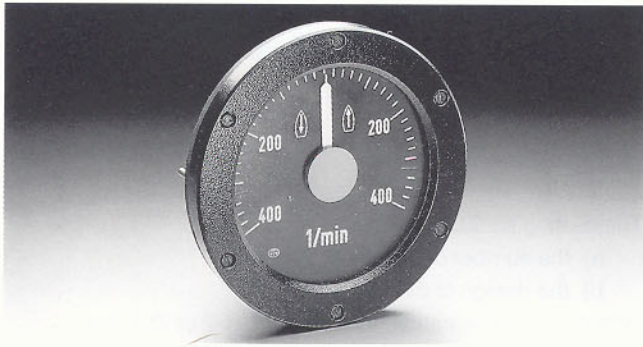
Connections PR160



Upper scale end adjuster Connecting terminals

Connection is by means of terminals 1 + and 2-
Protection class: Case IP 54
Terminals IP 00
with sealing set ZL1-.. up to IP 54
Fixing: By means of screws

For ordering example, see page 10



Water-tight Indicators with R 5 Movement

Circular and square-bezel indicators with R5 movement Types PRK16, PRQ192MIR

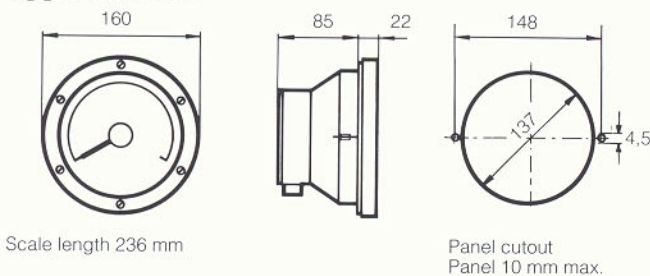
With general quality features and the options with respect to design equivalent to those of the indicators PR100, PRQ96, PRQ144 and PR160 described on page 6, NORIS manufactures water-tight indicators to protection class IP 66. These instruments are suitable for outdoor applications, e.g. for deck control positions aboard seagoing ships.

For electrical data, see table for R 5 (page 2, Movements).

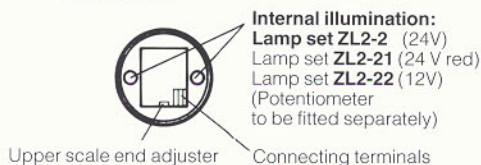
The flush-mounting indicator PRK16 has a deep-drawn, passivated steelplate case with solid chrome-finish, brass bezel (optionally available in black), positive rubber gasket and 5 mm thick window. Control of internal illumination is by a separate potentiometer.

Dimensions:

Type: PRK16



Connections:



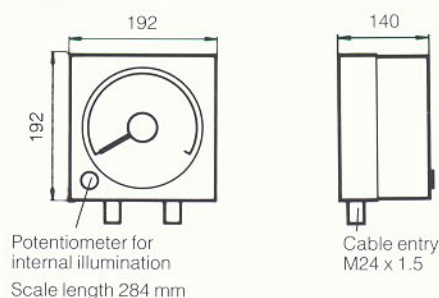
Connection is by means of terminals 1 + and 2-
Protection class IP 66
Sealing set loose supply

Fixing: By means of screws

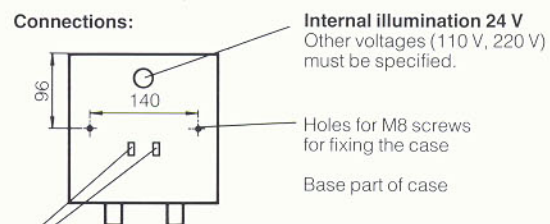
For ordering example, see page 10

The surface-mounting indicator PRQ192 MIR has a split case made of seawater-resistant aluminium. The base part serves for fixing and wiring, while the upper or front part houses the movement and an integral potentiometer which is accessible from the front for operating and dimming the internal illumination.

Type: PRQ192MIR



Connections:



Connection is by means of terminals 1 + and 2-
Protection class IP 66

For ordering example, see page 10

Specification Overview

Movement	MS 2					MS 3		R 5					
Indicator	R60	R800	RQ72	RQ96	RQ960	R100	RQ144	PR100	PR160	PRQ96	PRQ144	PRK16	PRQ192 MIR

Measuring ranges (with standard dials and standard ranges)

0-5V... 60V DC	●	●	●	●	●	●	●	●	●	●	●	●	●
0-5V... 60V AC	●	●	●	●	●	●	●	●	●	●	●	●	●
0-5mA... 20mA DC	●	●	●	●	●	●	●	●	●	●	●	●	●
0-1mA... 20mA DC	●	●	●	●	●	●	●						

Special dial designs

Black dial, white or yellow pointer and markings	●	●	●	●	●	●	●	●	●	●	●	●	●
Coloured scale arcs	●	●	●	●	●	●	●	●	●	●	●	●	●
Multiple ranges								●	●	●	●	●	●
Centre zero scale								●	●	●	●	●	●
compr./exp. scale								●	●	●	●	●	●

Accessories

Internal illumination	●	●	●		●	●	●	●	●	●	●	●	●
Sealing set					●	●	●	●	●	●	●		

Accessories

Internal illumination (List of accessories ZL2-..)

Internal illumination may be white or red.

Long-wave red light is glare-free and facilitates quick adaptation of the eyes under conditions of changing objects and lighting conditions. Red internal illumination calls for a

black dial with white markings, white legend and a white pointer.

Also recommended: anti-glare glass window.

Lamp set

Article number	consisting of:	for indicators
ZL2-1 ZL2-11 ZL2-12	2 insulation sleeves, 2 push-on connectors, lamp socket, 1 bulb, 24V 2 insulation sleeves, 2 push-on connectors, lamp socket, 1 bulb, 24V, red 2 insulation sleeves, 2 push-on connectors, lamp socket, 1 bulb, 12V	R60, R800
ZL2-2 ZL2-21 ZL2-22	4 insulation sleeves, 4 push-on connectors, 2 lamp sockets, 2 bulbs, 24V 4 insulation sleeves, 4 push-on connectors, 2 lamp sockets, 2 bulbs, 24V, red 4 insulation sleeves, 4 push-on connectors, 2 lamp sockets, 2 bulbs, 12V	R100, PR100, PR 160, PRK16, RQ960, PRQ96, RQ144, PRQ144
ZL2-3 ZL2-31 ZL2-32	2 push-on connectors, lamp socket, 1 glass-base bulb, 24V 2 push-on connectors, lamp socket, 1 glass-base bulb, 24V, red 2 push-on connectors, lamp socket, 1 glass-base bulb, 12V	RQ72

These parts are supplied detached.

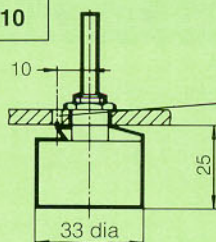
Potentiometers

Various potentiometers are available for dimming the internal illumination. These are to be installed separately from the indicators in the control panels.

Potentiometer,
open design

Article number:

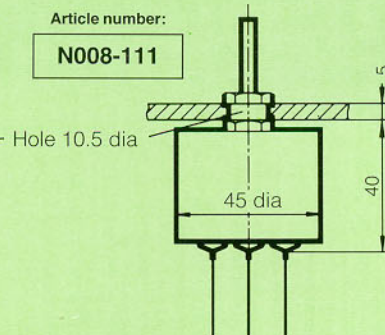
N008-110



Potentiometer,
water-tight design

Article number:

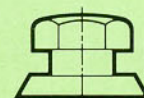
N008-111



Knob for open
and water-tight designs

Article number:

250015



The potentiometers are suitable for all of the abovementioned lamp sets.

Accessories

Sealing set (List of Accessories ZL1-. .)

Sealing set ZL1-, permits the protection class of the indicators with a terminal box to be upgraded to IP 54 (PRK 16-IP 66).

The sealing set **ZL1-**, differs in

- a) the number of cable entries
- b) the design of the cable entry

With internal illumination, sealing set ZL1-2 or ZL1-4 is preferred.

Article number	consisting of:
ZL1-1	1 cover, 1 gasket, 1 screwed gland DIN 46320-APG 11 x 6-11-FS , 1 plug 2 hexagon nuts, 3 lenti-head self-tapping screws
ZL1-2	1 cover, 1 gasket, 2 screwed glands DIN 46320-APG 11 x 6-11-FS , 2 hexagon nuts, 3 lenti-head self-tapping screws
ZL1-3	1 cover, 1 gasket, 1 cable entry M18 x 1.5 (187 Pg 11-Z10) 1 plug, 2 hexagon nuts, 3 lenti-head self-tapping screws
ZL1-4	1 cover, 1 gasket, 2 cable entries M18 x 1.5 (187 Pg 11-Z10) 2 hexagon nuts, 3 lenti-head self-tapping screws
ZL1-5	Only intended for covering the terminal boxes (1 cover, 1 gasket, 3 lenti-head self-tapping screws)

The parts are supplied detached.

Ordering examples for indicating instruments:

a. Standard design

Indicator: state type, e.g. R800
Measuring range: 0-250
Unit: rpm
Calibration: Indication 250 ± 10 VDC

b. Special design:

Indicator: state type, e.g. PRQ144
Measuring range: 300 - 0 - 300
Unit: rpm
Calibration: indication 300 ± 35 V AC
Special marker: green for 250
Dial: black
Pointer: white
Legend: white
Scale marks: white
Window: anti-glare glass

Accessories

Sealing set: ZL1-1

Accessories:

Internal illumination: lamp set ZL2-21 red
Sealing set: ZL1-2

Other products in our range:

- Electronic (non-contacting) speed monitoring systems
- Speed monitoring systems with tachogenerators
- Temperature monitoring systems (sensors, indicators, converters, limit switches)
- Pressure transducers
- Measured data acquisition systems
- Marine automation systems



Automatisierungs-
und Meßtechnik

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