Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 1 or 2 Limit Contacts

Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black

PFFN 96 x 24 M

Technical Data

Front Dimensions mm Type	96 x 24 PFFN 96 x 24 M	96 x 48 PFN 96 x 48 M	144 x 36 KODPR 144 F	144 x 72 KODPR 144 SE
Scale Length mm	65	65	96	98
Class	1.5	1.5	1.5	1.5
Weight approx. (kg)	0.2	0.5 (at U_H AC) 0.2 (at U_H DC)	0.6	1.1
Sampling	electronic	electronic	electronic	electronic
Relative Switching Speed (max. error as related to scale length)	1 %	1 %	1 %	1 %
Repetition Accuracy (at nom. aux. voltage and 23 °C)	0.1 %	0.1 %	0.1 %	0.1 %
Number of Limits	1 or 2	1 or 2	1 or 2	1 or 2
Min. Limit Separation (of scale length)	3 %	3 %	1.5 %	1.5 %
Output Relay	built in	built in	attachable on back	attachable on back
Output Contact	1 changeover per limit	1 changeover per limit	1 changeover per limit	1 changeover per limit
Switching Capacity with Restive Load				
Max. Switching Voltage	250 V AC / 250 V DC	250 V AC / 250 V DC	250 V AC / 250 V DC	250 V AC / 250 V DC
Max. Switching Current	6 A AC / 6 A DC	6 A AC / 6 A DC	3 A AC / 3 A DC	3 A AC / 3 A DC
Nominal Switching Capacity	500 VA / 50 W	500 VA / 50 W	750 VA / 50 W	750 VA / 50 W
Service Life at nominal Switching Capacity	$> 10^6$ switching cycles	$> 10^6$ switching cycles	$> 10^6$ switching cycles	$> 10^6$ switching cycles
Max. Switching Time	500 ms	500 ms	50 ms	50 ms
Auxiliary Voltage (U_H)	24 V DC (20...24...30 V) [1]	24 V DC (20...24...30 V) o. 24 ... 240 V AC. 45...65 Hz	24 V DC (20...24...30 V) [1]	24 V DC (20...24...30 V) [1]
Power Consumption	4 VA / 4.5 W	4 VA / 4.5 W	5 VA / 4 W	5 VA / 4 W
Safety Class	CAT III	CAT III	CAT III	CAT III
Pollution Degree	2	2	2	2
Operating Voltage	300 V	300 V	150 V	150 V
Operating Voltage for Measuring Ranges				
> 250 V ... ≤ 600 V	300 V	600 V	150 V	150 V
Test Voltage	3.5 kV	5.8 kV	2.2 kV	2.2 kV
Front Housing-Panel Protection	IP 52	IP 52	IP 50	IP 50
Fasteners	screw spindle	screw spindle	screw spindle	screw spindle

1) With separate power supply for following voltages: 24 V AC, 115 V AC and 230 V AC, ± 10 %; see accessories, page 130

Description

Analog indicator/controller with moving-coil movement for direct current or direct voltage

Display

Scale Division	Special Division
Pointer	Beam pointer with knife-edge for single and double Division

Mechanical Design

Housing Material	Polycarbonate, self-extinguishing and drip-proof per UL 94 V-0
Replaceable	Glass windows and front frames ⇒ May only be replaced under voltage-free conditions!
Terminals	Tab connectors (IP20 protection) 1 x 6.3 x 0.8 mm, 2 x 2.8 x 0.8 mm or 4.8 x 0.8 mm

Internal Resistance / Voltage Drop / Power Consumption

(Values only apply with zero point at let or at bottom)

Measuring Range	Internal Resistance / Voltage Drop / Power Consumption
≥ 100 µA / ≤ 10 mA	≤ 100 mV
> 10 mA / ≤ 6 A	≤ 100 mV
≥ 60 mV / ≤ 1 V	≥ 200 kΩ/V
> 1 V / ≤ 50 V	≥ 10 kΩ/V
> 50 V / ≤ 600 V	≥ 10 kΩ/V
0/4 ... 20 mA	6 Ω [1]
Connection to Shunt	6 mA [2]

1) Tolerance ± 30% 2) Tolerance ± 20%

Reference Conditions

Reference Quantities	Reference Conditions
Ambient Temperature	23 °C ± 2°C
Position of Use	control panel vertical ± 1°
Other	DIN EN 60 051

Vario-Series • Rectangular Indicator/Controllers

For Direct Current or Direct Voltage with 1 or 2 Limit Contacts

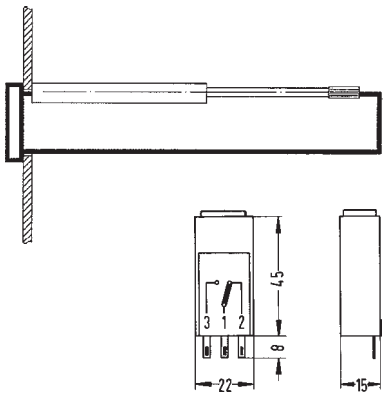
General Issues
Indicator/controllers are meters with adjustable limits.
The accuracy of the limits are not influenced by the contacts.
Our meters and indicator/controllers comply with the regulations of the European Guidelines 73/23/EWG. This is proven by the compliance with the following standards:
IEC 61010-1/A2 / EN 61010-1/A2 VDE 0411-1/A1 (Safety Regulations)
IEC 60051/EN 60051/DIN EN 60051 (Meters with Scale Display)
EN 50081-2: 1993 EMV (Emitted Interfernce, Industries)
EN 50082-2: 1995 EMV (Emitted Interfernce, Industries)
To protect the movable part of the indicator/controller against shocks, the bearings are spring mounted.

Application
Indicator/controllers display the actual value and energise with the help of one or more limits one or more relays. Their contacts can be used for monitoring, operating or controlling.
Indicator/controllers are also available with logic output (transistor output).

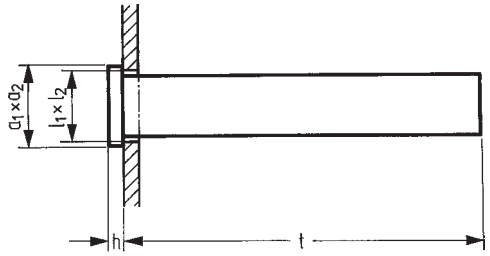
Sampling
The sampling of the indicator/controllers works contact-free.
When the pointer reaches the limit the switching operation will be disengaged.

Contacting
The max. contact disengages the switching operation when it overshoots the adjusted scale value. The min. contact disengages the switching operation when it undershoots the adjusted scale value.

Fasteners
Screw spindle
(control panel thickness 1 ... 40 mm)



Basic Dimensions **Relay**

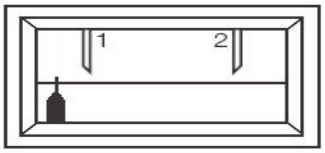


All indicator/controllers cause a permanent contact. This means that the output signal is held up as long as the pointer does not overrun the adjusted limit. The indicator/controllers are availabe as closed-circuit current model or working current model (see different Order No.).

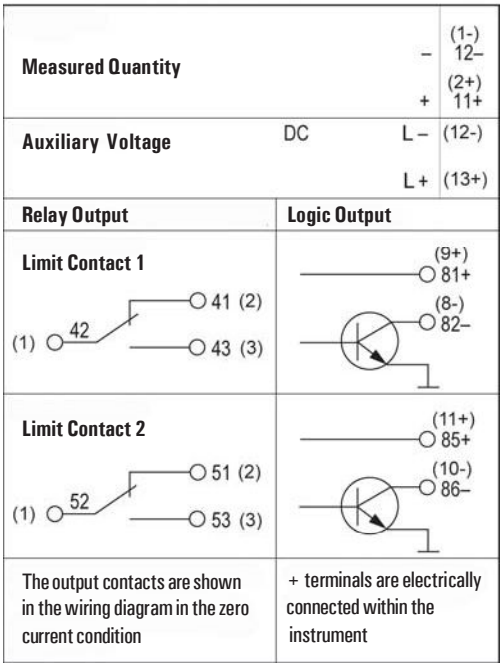
Closed-Circuit Current Model: When the indicator/controller is not-operated, a voltage is impressed on the relays (output signal H, logic output). The voltage drops as soon as one of the contact marks is undershot or overshot. The same happens when a power breakdown or an electronic breakdown occurs and no limit is overshot or undershot (self supervision). A short-term power failure leads to the same effect.

Working Current Model: When the indicator/controller is not-operated the relays are in zero current condition (output signal L, logic output). As soon as one of the limits is overshot or undershot the relays pick up (output signal H).

Position of Limits



Contact Assignments



Ordering Example:
Indicator/Controller 96 x 24 mm for direct voltage, landscape scale,
Measuring range 0 ... 100 V, direct connection, zero point at left,
Working voltage-version with 2 limit contacts (Max. - Max.)

Techn. Data	Order No.
Type: PFFN 96 x 24 M	**2524P, AM11, DC100**

Front Dim. mm	Nominal Dimensions $a_1 \times a_2$	h	Cutout Dimensions $l_1 \times l_2$	Installation Depth (t) Relay Output	Installation Depth (t) Logic Output
96 x 24	96 x 24	5	$92^{+0.8} \times 22.2^{+0.3}$	146	126
96 x 48	96 x 48	5	$92^{+0.8} \times 45^{+0.6}$	146	126
144 x 36	144 x 36	8	$137.5^{+0.8} \times 32.5^{+0.6}$	246	202
144 x 72	144 x 72	8	$137.7^{+0.8} \times 67.7^{+0.6}$	248	205

Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '–' = Not available

			Type Order No. ⇒	PFFN 96x24 M 2524P	PFN 96x48 M 2594P	KODPR 144 F 61102...	KODPR 144 SE 65102...
			+⇓			+⇓	+⇓
		Landscape	HQ1	N	N	N	N
		Portrait	HQ2	+	+	+	+
Limits							
Closed-Circuit Current Model	Max.		**AM3**	+	+	+	+
	Min.		**AM4**	+	+	+	+
	Min. - Max.		**AM5**	A	A	A	A
	Max. - Max.		**AM6**	A	A	A	A
	Min. - Min.		**AM7**	A	A	A	A
Working Current Model	Max.		**AM8**	+	+	+	+
	Min.		**AM9**	+	+	+	+
	Min. - Max.		**AM10**	A	A	A	A
	Max. - Max.		**AM11**	A	A	A	A
	Min. - Min.		**AM12**	A	A	A	A
Zero Point - left / bottom							
Direct Current							
Range	0 ... 100 μA		**CA100**	A	A	**...34240**	**...34240**
	0 ... 150 μA		**CA150**	A	A	**...34270**	**...34270**
	0 ... 250 μA		**CA250**	A	+	**...34300**	**...34300**
	0 ... 400 μA		**CA400**	A	+	**...34320**	**...34320**
	0 ... 600 μA		**CA600**	–	+	**...34350**	**...34350**
	> 100 μA ... < 1 mA [1]		**CA...**	A	A	**...31005**	**...31005**
	0 ...1 mA		**CB1**	+	+	**...35110**	**...35110**
	0 ...1.5 mA		**CB1.5**	+	+	**...35120**	**...35120**
	0 ... 2.5 mA		**CB2.5**	+	+	**...35130**	**...35130**
	0 ... 4 mA		**CB4**	+	+	**...35140**	**...35140**
	0 ... 5 mA		**CB5**	+	+	**...35150**	**...35150**
	0 ... 6 mA		**CB6**	+	+	**...35160**	**...35160**
	0 ...10 mA		**CB10**	+	+	**...35170**	**...35170**
	0 ...15 mA		**CB15**	A	+	**...35180**	**...35180**
	0 ... 20 mA		**CB20**	A	+	**...35190**	**...35190**
	0 ... 25 mA		**CB25**	A	+	**...35200**	**...35200**
	0 ... 40 mA		**CB40**	A	+	**...35210**	**...35210**
	0 ... 50 mA		**CB50**	A	+	**...35220**	**...35220**
	0 ... 60 mA		**CB60**	A	+	**...35230**	**...35230**
	0 ... 100 mA		**CB100**	A	+	**...35240**	**...35240**
	0 ... 150 mA		**CB150**	A	+	**...35270**	**...35270**
	0 ... 250 mA		**CB250**	A	+	**...35300**	**...35300**
	0 ... 400 mA		**CB400**	A	+	**...35320**	**...35320**
	0 ... 600 mA		**CB600**	A	+	**...35350**	**...35350**
	> 1 mA ... < 1A [1]		**CB...**	A	A	**...31005**	**...31005**
Electr. suppressed							
	4 ... 20 mA	landscape	**BC25**	A	A	**...35199**	**...35199**
	4 ... 20 mA	portrait	**BC27**	A	A	**...35198**	**...35198**
	0 ... 1 A		**CC1**	A	+	**...36110**	**...36110**
	0 ... 1.5 A		**CC1.5**	A	+	**...36120**	**...36120**
	0 ... 2.5 A		**CC2.5**	A	+	**...36130**	**...36130**
	0 ... 4 A		**CC4**	A	+	**...36140**	**...36140**
	0 ... 6 A		**CC6**	A	+	**...36160**	**...36160**
	> 1 A ... < 6 A [1]		**CC...**	A	A	**...31005**	**...31005**

1) Specify in clear text

Moving-coil movement, edgewise scale
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		Type / Order No. ⇒	PFFN 96x24 M 2524P	PFN 96x48 M 2594P	KODPR 144 F 61102...	KODPR 144 SE 65102...
			+⇓		+⇓	+⇓
	Landscape	HQ1	N	N	N	N
	Portrait	HQ2	+	+	+	+
Limits						
Closed-Circuit Current Model	Max.	AM3	+	+	+	+
	Min.	AM4	+	+	+	+
	Min. - Max.	AM5	A	A	A	A
	Max. - Max.	AM6	A	A	A	A
	Min. - Min.	AM7	A	A	A	A
Working Current Model	Max.	AM8	+	+	+	+
	Min.	AM9	+	+	+	+
	Min. - Max.	AM10	A	A	A	A
	Max. - Max.	AM11	A	A	A	A
	Min. - Min.	AM12	A	A	A	A
Zero Point - left / bottom						
Connection to Shunt (Direct Current)						
	... A / 60 mV	BE3 [1]	A	+	...32230	...32230
	... A / 150 mV	BE4 [1]	A	+	...32270	...32270
	... A / ...>60 mV [2]	BE981 [1]	A	A	...31005	...31005
Scale:	1 A	CG1	+	+	+	+
	1.5 A	CG1.5	+	+	+	+
	2.5 A	CG2.5	+	+	+	+
	4 A	CG4	+	+	+	+
	5 A	CG5	+	+	+	+
	6 A	CG6	+	+	+	+
	10 A	CG10	+	+	+	+
	15 A	CG15	+	+	+	+
	20 A	CG20	+	+	+	+
	25 A	CG25	+	+	+	+
	30 A	CG30	+	+	+	+
	40 A	CG40	+	+	+	+
	50 A	CG50	+	+	+	+
	60 A	CG60	+	+	+	+
	75 A	CG75	+	+	+	+
	100 A	CG100	+	+	+	+
	150 A	CG150	+	+	+	+
	200 A	CG200	+	+	+	+
	250 A	CG250	+	+	+	+
	300 A	CG300	+	+	+	+
	400 A	CG400	+	+	+	+
	500 A	CG350	+	+	+	+
	600 A	CG600	+	+	+	+
	0 ...>1 A ...<1 kA [2]	CG...	+	+	+	+
	1 kA	CH1	+	+	+	+
	1.5 kA	CH1.5	+	+	+	+
	2.5 kA	CH2.5	+	+	+	+
	4 kA	CH4	+	+	+	+
	5 kA	CH5	+	+	+	+
	6 kA	CH6	+	+	+	+
	10 kA	CH10	+	+	+	+
	15 kA	CH15	+	+	+	+
	>1 kA [2]	CH...	+	+	+	+

1) Complement with CG... or CH...
2) Specify in clear text

GMW · Kleinreuther Weg 88 · 90408 Nuremberg · Germany · Phone: +49 (0) 911 3502-0 · Fax: +49 (0) 911 3502-307 · E-Mail: info@g-mw.de

Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black

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		Type Order No. ⇒	PFFN 96x24 M 2524P	PFN 96x48 M 2594P	KODPR 144 F 61102...	KODPR 144 SE 65102...
		+ ⇓			+ ⇓	+ ⇓
	Landscape	HQ1	N	N	N	N
	Portrait	HQ2	+	+	+	+
Limits						
Closed-Circuit Current Model	Max.	AM3	+	+	+	+
	Min.	AM4	+	+	+	+
	Min. - Max.	AM5	A	A	A	A
	Max. - Max.	AM6	A	A	A	A
	Min. - Min.	AM7	A	A	A	A
Working Current Model	Max.	AM8	+	+	+	+
	Min.	AM9	+	+	+	+
	Min. - Max.	AM10	A	A	A	A
	Max. - Max.	AM11	A	A	A	A
	Min. - Min.	AM12	A	A	A	A
Zero Point - left / bottom						
Direct Voltage						
	Range					
	0 ... 60 mV	DB60	A	A	...31230	...31230
	0 ...100 mV	DB100	A	A	...31240	...31240
	0 ...150 mV	DB150	A	A	...31270	...31270
	0 ... 250 mV	DB250	A	+	...31300	...31300
	0 ... 400 mV	DB400	A	+	...31320	...31320
	0 ... 600 mV	DB600	A	+	...31350	...31350
	0 ... > 60 mV ... < 1 V [1]	DB...	A	A	...31005	...31005
	0 ... 1 V	DC1	A	+	...33110	...33110
	0 ... 1.5 V	DC1.5	A	+	...33120	...33120
	0 ... 2.5 V	DC2.5	A	+	...33130	...33130
	0 ... 4 V	DC4	A	+	...33140	...33140
	0 ... 5 V	DC5	A	+	...33150	...33150
	0 ... 6 V	DC6	A	+	...33160	...33160
	0 ... 10 V	DC10	A	+	...33170	...33170
	0 ... 15 V	DC15	A	+	...33180	...33180
	0 ... 20 V	DC20	A	+	...33190	...33190
	0 ... 25 V	DC25	A	+	...33200	...33200
	0 ... 40 V	DC40	A	+	...33210	...33210
	0 ... 50 V	DC50	A	+	...33220	...33220
	0 ... 60 V	DC60	A	+	...33230	...33230
	0 ... 100 V	DC100	A	+	...33240	...33240
	0 ... 150 V	DC150	A	+	...33270	...33270
	0 ... 250 V	DC250	A	+	...33300	...33300
	0 ... 400 V	DC400	A	+	...33320	...33320
	0 ... 500 V	DC500	A	+	...33340	...33340
	0 ... 600 V	DC600	A	+	...33350	...33350
	0 ... > 1 V ... < 600 V [1]	DC...	A	A	...31005	...31005
Measuring Inputs for thermocouple J, K, S ... / Pt100						
	Ranges and versions on request					

1) Specify in clear text

Moving-coil movement, edgewise scale
Narrow front frame per DIN 43 718, matt black

Please note when ordering:
Only one Identification No. with the same letter sequence may be chosen. Order No. with Identification No. N (standard model) can be left out.

'N' = Standard Version · 'A' = Extra Charge · '+' = Available without extra Charge · '–' = Not available

	Type Order No. ⇒	PFFN 96x24 M 2524P	PFN 96x48 M 2594P	KODPR 144 F 61102...	KODPR 144 SE 65102...
	+ ⇓				
Landscape	HQ1	N	N	N	N
Portrait	HQ2	+	+	+	+
GENERAL VARIANTS					
Zero Point					
Zero point at left (landscape)	BC1	N	N	N	N
Zero point at bottom (portrait)	BC4	+	+	+	+
Zero point at center	BC2	A	A	A	A
Zero point between bottom and center of scale [1]	BC21	A	A	A	A
Position of Use					
Control panel vertical	LA1	N	N	N	N
Control panel horizontal	LA2	+	+	+	+
Other	LA999	A	A	A	A
(Please specify angle between scale and horizontal)					
OUTPUT VARIANTS					
Relay output	AU1	N	N	N	N
Logic output (open collector) H = + 24 V (electrically isolated from U_H) L < + 1 V, I ≤ 50 mA (20 mA at U_H AC)	AU2	+	+	+	+
AUXILIARY VOLTAGE VARIANTS					
24 V DC (20...24...30 V)	IV22	N	N	N	N
24 V AC (21...24...27 V) 45...65 Hz	IV12	A [2]	+	–	–
100 V AC (90...100...110 V) 45...65 Hz	IV10	–	+	–	–
110 V AC (99...110...121 V) 45...65 Hz	IV13	–	+	–	–
115 V AC (103...115...127 V) 45...65 Hz	IV16	A [2]	+	+	+
220 V AC (198...220...242 V) 45...65 Hz	IV19	–	+	–	–
230 V AC (207...230...253 V) 45...65 Hz	IV23	A [2]	+	+	+
240 V AC (216...240...264 V) 45...65 Hz	IV24	–	+	–	–
SCALE VARIANTS					
Division and Pointer					
Single division	GD1	N	N	N	N
Double division [1]	GD2	A	A	A	A
Additional Imprint					
Second numbering, black [1]	SK982	A	A	A	A
Second numbering, red (RAL 2002) [1]	SK983	A	A	A	A
Inscription:					
Without additional inscription	SM99	N	N	N	N
Inscription ≤15 charcters German [1]	SM991	A	A	A	A
Inscription ≤15 characters other language [1] (Latin lettering)	SM993	A	A	A	A
Coloured mark red RAL 2002	ST981	A	A	A	A
Coloured sector red (RAL 2002) [1]	SU981	A	A	A	A
Coloured sector green (RAL 6018) [1]	SU982	A	A	A	A
HOUSING VARIANTS					
Application					
Standard version	LB99	N	N	N	N
Tropic resistant	LB1	A	A	–	–
Protection					
Standard (see technical data)	LH99	N	N	N	N
Housing panel IP 54, connections IP 20	LH22	A	A	–	–
Front Frame Colour					
Matt black	MA2	N	N	N	N
Matt grey RAL 7037	MA11	A	A	A	A
Glass Window					
Standard version	MG99	N	N	N	N
Anti-glare glass	MG1	A	A	A	A
Identification					
Without Identification	MZ99	N	N	N	N
Identification on the back [1]	MZ998	A	A	A	A

1) Specify in clear text
2) With external power supply unit (extra charge) for the following voltages: 24 V AC, 115 V AC and 230 V AC, ± 10 %; see accessories, page 130