

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale
Front frame matt black



PFFN 96 x 24

Technical Data

Front Dimensions mm Type	48 x 18.5 PFF 00	72 x 18.5 PFF 0	72 x 24 PFF 72 x 24	96 x 24 PFFN 96 x 24	144 x 36 DPR 144 F
Scale Length mm	29	50	50	65	96
Class	2.5	2.5	2.5	1.5	1.5
Weight approx. (kg)	0.05	0.09	0.1	0.13	0.5
Operating Voltage	100 V	150 V	100 V	300 V	150 V
Test Voltage	1.5 kV	2.2 kV	1.5 kV	3.5 kV	2.2 kV
Front Housing-Panel Protection	IP 50	IP 50	IP 50	IP 52	IP 50
Fasteners (see next page)	slider	slider	exp. spring	screw spindle	screw spindle
Housing Material	sheet metal	sheet metal	sheet metal	polycarbonate	sheet metal

Description

Analog panel meter with moving-coil movement

Internal Resistance / Voltage Drop / Power Consumption ¹⁾

Display

Scale Division	for sizes	} Special division
	48 x 18.5	
	72 x 18.5	
	72 x 24	
	96 x 24	
	144 x 36	} coarse-fine
Pointer	for sizes	} Bar indicator
	48 x 18.5	
	72 x 18.5	
	72 x 24	
	96 x 24	
	144 x 36	Beam pointer with knife-edge Bem pointer with knife-edge

Mechanical Design

Housing Material Polycarbonate, self-extinguishing and drip-proof per UL 94 V - 0 or sheet metal housing (see above).

Replaceable Glass window and front frame.
⇒ May only be replaced under voltage-free conditions!

Terminals for sizes

48 x 18.5	tab connectors 2.8 x 0.8
72 x 18.5	tab connectors 2.8 x 0.8
72 x 24	tab connectors 2.8 x 0.8
96 x 24	tab connectors 6.3 x 0.8 or 2 x 2.8 x 0.8 (IP20 protection)
144 x 36	tab connectors 4.8 x 0.8

Contact Protection available as option (not for 144 x 36)

Reference Conditions

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

Measuring Range	Front Dimensions mm			Tolerance	
	48 x 18.5 72 x 18.5 72 x 24	96 x 24	144 x 36		
100 µA	2400 Ω	1920 Ω	1706 Ω	± 20 %	
150 µA	1590 Ω	2177 Ω	1706 Ω		
250 µA	950 Ω	1965 Ω	525 Ω		
400 µA	283 Ω	84 Ω	290 Ω		
600 µA	140 Ω	77 Ω	110 Ω		
1 mA	66 Ω	76 Ω	110 Ω		
1.5 mA	30 Ω	72 Ω	30 Ω		
2 mA	17 Ω	75 Ω	6 Ω		
2.5 mA	11.3 Ω	90 Ω	6 Ω		
4 mA	7 Ω	74 Ω	4 Ω		
5 mA	5 Ω	60 Ω	4 Ω		
6 mA	1.8 Ω	51 Ω	3 Ω		± 30 %
10 mA	3.5 Ω	30 Ω	3 Ω		
15 mA	4 Ω	20 Ω	4 Ω		
20 mA	3 Ω	15 Ω	3 Ω		
4 ... 20 mA	3 Ω	18 Ω	4 Ω		
25 mA	2.4 Ω	12 Ω	2.4 Ω		
Voltage drop at > 25 mA / < 1A	60 mV	300 mV	60 mV	± 20 %	
	60 mV	90 mV	60 mV		
Power consumption for connection to shunt	6 mA	6 mA	5 mA		
60 mV ... 400 mV	1 kΩ/V	2.5 kΩ/V	1 Ω/mV	± 20 %	
> 400 mV	1 kΩ/V	1 kΩ/V	1 kΩ/V		

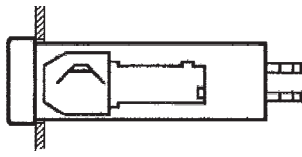
¹⁾ Indicated internal resistance is only valid for instruments with standard accuracy class. Please inquire regarding internal resistance (Ri) for moving-coil indicators with mechanical zero point at any desired scale value.

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage

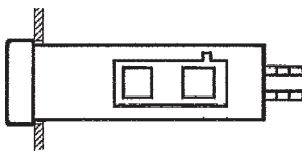


Expanding Springs



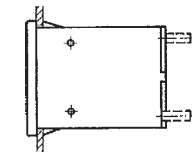
Control panel thickness ≥ 1 mm
 Size 72 x 24 for mounting in DIN-Grid,
 Siemens-Grid M 25 and Kreutzenbeck-Grid

Catch Spring I



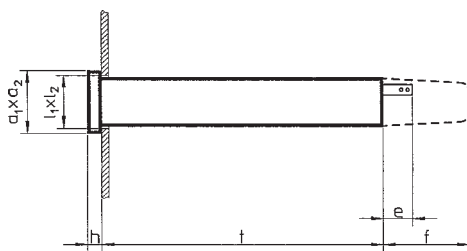
As option for size 72 x 24 for Mauell-Grid,
 H & B Unibloc-Grid and Hein-Grid

Slider

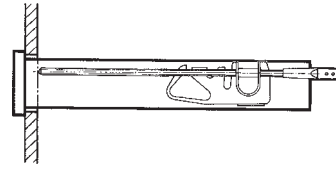


Control panel thickness 1 to 5 mm
 For sizes 48 x 18.5 and 72 x 18.5 for mounting in DIN-Grid,
 Also available as option for size 72 x 24.

Basic Dimensions

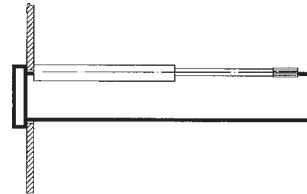


Fastener C DIN 43 835



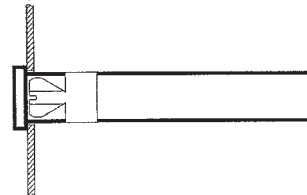
Control panel thickness 1 to 40 mm
 Screw clamp M5, longer version, for size 144 x 36 for mounting in
 DIN-Grid.

Screw Spindle



Control panel thickness up to 40 mm
 Screw spindle for size 96 x 24 for mounting in
 DIN-Grid and all remaining grids.

Clamping Springs



Control panel thickness ≥ 1 mm
 Available as option for size 96 x 24, retractable from front face,
 for mounting in DIN-Grid

Drawing to Scale (on request)

1303A1839H0 for size 96 x 24

Drawing to Scales (on request)

0101A226 for sizes 48 x 18.5 and 72 x 18.5

0101A247 for size 72 x 24

95.207-95 for size 144 x 36

Ordering Example

Size 96 x 24 mm

0 ... 40 V Direct Voltage

Techn. Data Type: PFFN 96 x 24	Order No. 1524P, DC40
-----------------------------------	--------------------------

Front in mm	Nominal Dimensions		Cutout Dimensions $l_1 \times l_2$	Inst. Depth t	Terminals e	Contact Protection at Terminals f = Full Contact Protection
	$a_1 \times a_2$	h				
48 x 18.5	48 x 18.5	5	$44.8^{+0.15} \times 17.3^{+0.15}$	56	12	—
72 x 18.5	72 x 18.5	5	$69.3^{+0.15} \times 17.3^{+0.15}$	82	12	—
72 x 24	72 x 24	5	$68^{+0.7} \times 22^{+0.3}$	90	11	31
96 x 24	96 x 24	5	$92^{+0.8} \times 22^{+0.3}$	126	0	—
144 x 36	144 x 36	8	$138^{+1} \times 32.7^{+0.6}$	202	5	—

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame matt black

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

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
	+ ↓					+ ↓
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
Zero Point - at left (landscape)						
- at bottom (portrait)						
Direct Current						
Range:						
0 ...100 μ A	CA100	A	A	A	A	...34240
0 ...150 μ A	CA150	A	A	A	A	...34270
0 ...250 μ A	CA250	A	A	A	A	...34300
0 ...400 μ A	CA400	A	A	A	A	...34320
0 ...600 μ A	CA600	A	A	A	A	...34350
0 ... > 100 μ A ... < 1 mA ¹⁾	CA...	A	A	A	A	...31005
0 ...1 mA	CB1	+	+	+	+	...35110
0 ...1.5 mA	CB1.5	+	+	+	+	...35120
0 ...2.5 mA	CB2.5	+	+	+	+	...35130
0 ...4 mA	CB4	+	+	+	+	...35140
0 ...5 mA	CB5	+	+	+	+	...35150
0 ...6 mA	CB6	+	+	+	+	...35160
0 ...10 mA	CB10	+	+	+	+	...35170
0 ...15 mA	CB15	A	A	A	A	...35180
0 ...20 mA	CB20	A	A	A	A	...35190
0 ...25 mA	CB25	A	A	A	A	...35200
0 ...40 mA	CB40	A	A	A	A	...35210
0 ...50 mA	CB50	A	A	A	A	...35220
0 ...60 mA	CB60	A	A	A	A	...35230
0 ... 100 mA	CB100	A	A	A	A	...35240
0 ... 150 mA	CB150	A	A	A	A	...35270
0 ... 250 mA	CB250	A	A	A	A	...35300
0 ... 400 mA	CB400	A	A	A	A	...35320
0 ... 600 mA	CB600	A	A	A	A	...35350
0 ... > 1 mA ... < 1 A ¹⁾	CB...	A	A	A	A	...31005
Mech. suppressed						
4...20 mA landscape :	BC10	A	A	A	A	...35195
4...20 mA portrait :	BC14	A	A	A	A	...35196
Electr. suppressed						
0/4...20 mA landscape :	BC25	A	A	A	-	...35199
0/4...20 mA portrait :	BC27	A	A	A	-	...35198
0 ...1 A	CC1	A	A	A	A	...36110
0 ...1.5 A	CC1.5	A	A	A	A	...36120
0 ...2.5 A	CC2.5	A	A	A	A	...36130
0 ...4 A	CC4	A	A	A	A	...36140
0 ... > 1 A ... < 4 A ¹⁾	CC...	A	A	A	A	...31005

1) Specify in clear text

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame matt black

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

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
	Type	PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
	Order No. ⇒	1194P	1196P	1515P	1524P	21102...
	+ ↓					+ ↓
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
Zero Point - at left (landscape)						
- at bottom (portrait)						
Connection to Shunt (direct current)						
... A / 60 mV	BE3	A	A	A	A	...32230
... A / 150 mV	BE4	A	A	A	A	...32270
... A / ... > 60 mV ¹⁾	BE981	A	A	A	A	...31005
Scale:						
1 A	CG1	+	+	+	+	+
1.5 A	CG1.5	+	+	+	+	+
2.5 A	CG2.5	+	+	+	+	+
4 A	CG4	+	+	+	+	+
6 A	CG6	+	+	+	+	+
10 A	CG10	+	+	+	+	+
15 A	CG15	+	+	+	+	+
25 A	CG25	+	+	+	+	+
40 A	CG40	+	+	+	+	+
60 A	CG60	+	+	+	+	+
100 A	CG100	+	+	+	+	+
150 A	CG150	+	+	+	+	+
250 A	CG250	+	+	+	+	+
400 A	CG400	+	+	+	+	+
500 A	CG500	+	+	+	+	+
600 A	CG600	+	+	+	+	+
0 ... > 1 A ... < 1 kA ¹⁾	CG...	+	+	+	+	+
1 kA	CH1	+	+	+	+	+
1.5 kA	CH1.5	+	+	+	+	+
2.5 kA	CH2.5	+	+	+	+	+
4 kA	CH4	+	+	+	+	+
6 kA	CH6	+	+	+	+	+
10 kA	CH10	+	+	+	+	+
> 1 kA ¹⁾	CH...	+	+	+	+	+
Direct Voltage						
Range:						
0 ... 60 mV	DB60	A	A	A	A	...31230
0 ... 100 mV	DB100	A	A	A	A	...31240
0 ... 150 mV	DB150	A	A	A	A	...31270
0 ... 250 mV	DB250	A	A	A	A	...31300
0 ... 400 mV	DB400	A	A	A	A	...31320
0 ... 600 mV	DB600	A	A	A	A	...31350
0 ... > 60 mV... < 1 V ¹⁾	DB...	A	A	A	—	...31005
0 ... > 100 mV... < 600 mV ¹⁾	DB...	—	—	—	A	...31005
0 ... 1 V	DC1	A	A	A	A	...33110
0 ... 1.5 V	DC1.5	A	A	A	A	...33120
0 ... 2.5 V	DC2.5	A	A	A	A	...33130
0 ... 3 V	DC3	A	A	A	A	...33135
0 ... 4 V	DC4	A	A	A	A	...33140
0 ... 6 V	DC6	A	A	A	A	...33160
0 ... 10 V	DC10	A	A	A	A	...33170
0 ... 15 V	DC15	A	A	A	A	...33180
0 ... 25 V	DC25	A	A	A	A	...33200
0 ... 40 V	DC40	A	A	A	A	...33210
0 ... 60 V	DC60	A	A	A	A	...33230
0 ... 100 V	DC100	A	A	A	A	...33240
0 ... 150 V	DC150	—	A	—	A	...33270
0 ... 250 V	DC250	—	—	—	A	—
0 ... 400 V	DC400	—	—	—	A	—
0 ... 500 V	DC500	—	—	—	A	—
0 ... 600 V	DC600	—	—	—	A	—
0 ... > 1 V ... < 600 V ^{1) 2)}	DC...	—	—	—	A	—

1) Specify in clear text

2) For higher voltages see voltage dividers

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame 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

Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36	
Type	PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F	
Order No. ⇒	1194P	1196P	1515P	1524P	21102...	
	+ ↓					
Landscape	HQ1	N	N	N	N	
Portrait	HQ2	+	+	+	+	
GENERAL VARIANTS						
Zero pint at left (landscape)	BC1	N	N	N	N	
Zero point at bottom (portrait)	BC4	N	N	N	N	
Zero point at center	BC2	A	A	A	A	
Zero point as desired (specify in clear text)	BC20	A	A	A	A	
Zero point at the left (landscape), mech. suppressed (not 4-20 mA)	BC16	A	A	A	A	
Zero point at bottom (portrait),	BC18	A	A	A	A	
(Max. suppression 20 %; measuring range $\geq 250 \mu\text{A}$ / $\geq 250 \text{ mV}$, Ri 1 k Ω /V; specify in clear text)						
Internal Resistance for Voltmeters						
Standard (see technical data)	IR99	N	N	N	N	
Ri approx. 10 k Ω /V (measuring input $\geq 2 \text{ V}$;	IR10	A	A	A	A	
Exception: $\geq 5 \text{ V}$ / $\leq 150 \text{ V}$ size 96 x 24)						
Ri = 1 k Ω /V $\pm 1\%$ at nominal temperature (measuring input $\geq 1 \text{ V}$)	IR30	A	A	A	A	
Ri = 10 k Ω /V $\pm 1\%$ at nominal temperature (measuring input $\geq 2 \text{ V}$)	IR40	A	A	A	A	
Potentiometer for Adjustment with Voltmeters						
Voltmeters without potentiometer for adjustment	MP99	N	N	N	N	
Voltmeters with potentiometer for adjustment	MP1	-	-	-	-	
Adjustment range $\pm 15\%$ (measuring input $\geq 6 \text{ V}$ / $\leq 400 \text{ V}$; Class 1.5 only; Ri according to list ¹⁾)						
Lead Resistor when connecting to						
Shunt resistors ...A/60 mV and ...A/150 mV						
Standard version 0.06 Ω	IG99	N	N	N	N	
Differing from 0.06 Ω (specify in clear text).	IG999	A	A	A	A	
Limiting values: ...A / 60 mV for class 1.5 max. 1 Ω ...A / 150 mV for class 1.5 max. 7 Ω						
Accuracy						
Class 2.5	IE25	N	N	N	-	
Class 1.5	IE15	A ²⁾	A ²⁾	A ²⁾	N ³⁾	
Class 1.0 (measuring input $\geq 100 \mu\text{A}$ / $\geq 60 \text{ mV}$)	IE10	-	-	-	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)						
Special Features						
Normal vibration and shock resistance	LN99	N	N	N	N	
Vibration resis. 2.5 g, shock resis. 30 g	LN56	A	A	A ⁴⁾	-	

1) Exception: The standard version (size 96 x 48) of the potentiometer for adjustment has a current consumption of approx. 100 μA

2) Available only in combination with tube pointer

3) Standard version without extra charge

4) Available only in combination with slider

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame 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

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
	+ ↓					
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
SCALE VARIANTS						
Scale						
In accordance with measuring input	GF99	N	N	N	N	N
Blank scale (lower/upper value markings, company logos, symbols)	GF28	+	+	+	+	+
Scale Characteristics						
Current / Voltage proportional	SD1	N	N	N	N	N
According to curve (not current / voltage proportional)	SD6	A	A	A	A	A
Division and Pointer						
Single division	GD1	N	N	N	N	N
Double division	GD2	A	A	A	A	A
Special division	SE5	N	N	N	N	A
Coarse-fine division	SE1	-	-	-	-	N
Bar indicator for single division	RA40	N	N	N	-	-
Tube pointer for double division	RA31	A	A	A	-	-
Beam pointer with knife-edge for single and double division	RA4	-	-	-	N	-
Knife-edge pointer for single division	RA10	-	-	-	-	N
for double division	RA11	-	-	-	-	A
Additional Imprint						
Second numbering (specify in clear text)	SK992	A	A	A	A	A
Inscription:						
Without additional inscription	SM99	N	N	N	N	N
Inscription ≤ 15 characters German	SM991	A	A	A	A	A
> 15 characters German	SM992	A	A	A	A	A
≤ 15 characters other language	SM993	A	A	A	A	A
> 15 characters other language	SM994	A	A	A	A	A
(Other language in Latin lettering, specify in clear text)						
Coloured mark red RAL 2002 (specify in clear text)	ST991	A	A	A	A	A
Coloured sector yell. RAL 1021, green RAL 6018 or red RAL 2002 (specify in clear text)	SU991	A	A	A	A	A

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame 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

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
		+ ↓				
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
SCALE VARIANTS						
Scale / Pointer Colours						
Scale white; imprint and pointer black	SG99	N	N	N	N	N
Scale black; imprint and pointer white	SG1	-	-	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint and pointer yellow	SG2	-	-	A ¹⁾	A ¹⁾	A ¹⁾
Scale black; imprint white, pointer yellow	SG3	-	-	A ¹⁾	A ¹⁾	A ¹⁾
Dial Illumination						
Without dial illumination	PA99	N	N	N	N	N
With direct dial illumination (Plexiglass scale, scale and dial illumination white)	PA1	A	A	A	A	-
Note: Completion with Voltage Order No. PB... necessary.						
Voltage for Dial Illumination						
24 V	PB5	-	-	-	+	-
28 V	PB6	-	-	-	+	-
24 V (2 x 12 V-lamps connected in series)	PB7	+	+	+	-	-
28 V (2 x 14 V-lamps connected in series)	PB8	+	+	+	-	-

1) Additional one-off costs for special scale printing on request

Vario-Series • Rectangular Panel Meters

For Direct Current or Direct Voltage



Moving-coil movement, slim-line scale

Front frame 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

	Front Dim. mm	48 x 18.5	72 x 18.5	72 x 24	96 x 24	144 x 36
Type		PFF 00	PFF 0	PFF 72 x 24	PFFN 96 x 24	DPR 144 F
Order No. ⇒		1194P	1196P	1515P	1524P	21102...
	+ ↓					
Landscape	HQ1	N	N	N	N	N
Portrait	HQ2	+	+	+	+	+
HOUSING VARIANTS						
Application						
Standard version	LB99	N	N	N	N	N
Tropic resistant	LB1	A	A	A	A	A
Protection						
Standard (see technical data)	LH99	N	N	N	N	N
Front housing-panel protection IP54, con. IP00	LH21	-	-	A	-	A
Front housing-panel protection IP54, con. IP20	LH22	-	-	-	A	-
Earthquake-proof (possible combination: LH99 or LH21)	LH10	-	-	-	A	-
Front Frame Colour						
Matt black	MA2	N	N	N	N	N
Matt grey RAL 7037	MA11	A	A	A	A	A
Matt stone grey RAL 7032	MA12	-	-	A	A	-
Matt light grey RAL 7035	MA14	-	-	A	A	-
Matt dark beige approx. RAL 1019	MA21	-	-	A	A	-
Glass Window						
Standard version	MG99	N	N	N	N	N
Anti-glare glass	MG1	A	A	A	A	A
Mounting						
Slider	MN50	N	N	A	-	-
Expanding spring	MN20	-	-	N	-	-
Catch spring	MN21	-	-	+	-	-
Screw spindle	MN22	-	-	-	N	N
Clamping Spring	MN23	-	-	-	+	-
Fastener C	MN12	-	-	-	-	-
Subklew (stiled slider)	MN32	-	-	A	-	-
Angled slider for APE-Grid	MN51	-	-	A	-	-
Identification						
Without identification	MZ99	N	N	N	N	N
Identification on the back (specify in clear text)	MZ998	A	A	A	A	A
Label Strip						
Without label strip	SS99	N	N	N	N	N
Label on front face on top (spec. in clear text)	SS991	-	-	A ¹⁾	A ¹⁾	-
Label on front face at bottom (specify in clear text)	SS992	-	-	A ¹⁾	A ¹⁾	-
Contact Protection						
Without terminal cover	VB99	N	N	N	N	N
Overall terminal cover	VB2	-	-	A	-	-
Single terminal cover	VB1	+	+	+	+	-

1) Available only for landscape format