Panel instrument cases ▪ Enclosures for top hat rail ▪ Transparent doors ▪ Injection moulding ▪ Tool manufacturing











Edition 15

... the perfect shell for valuable electronics

apra norm

apra group - we see the big picture

Our products

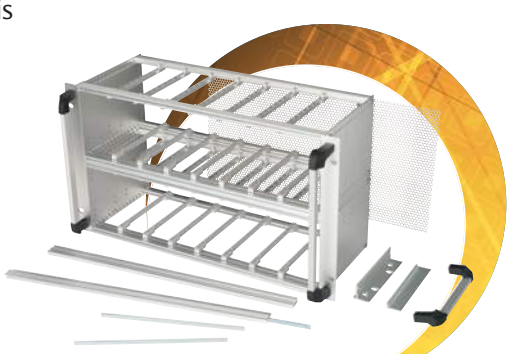
... are the result of the perfect symbiosis between the apra-group companies.

Just ask us!

We will be pleased to develop the perfect shell for valuable electronics with you.



Panel instrument cases and enclosures for top hat rail



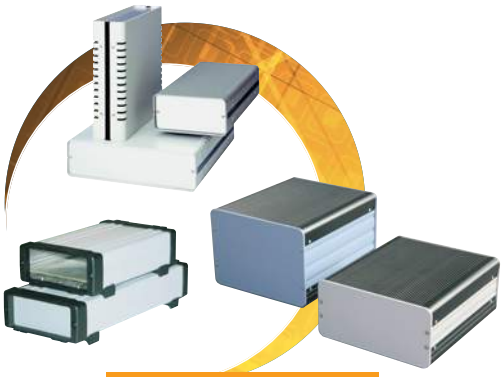
19" subracks



Customised enclosures made of plastic

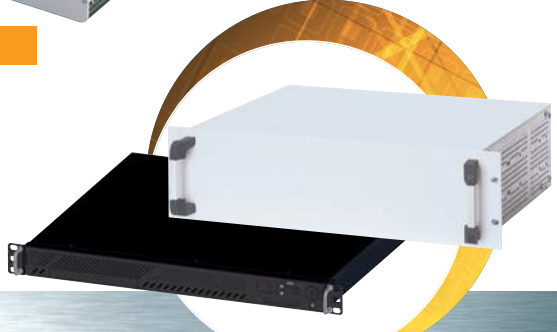


Desktop enclosures, 19" enclosure systems



Small enclosures





19" plug-in units

Content

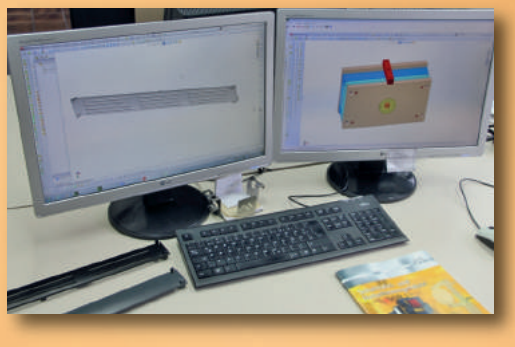
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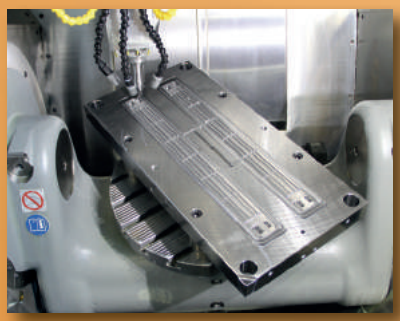


Development

1) Consulting service

Based on your ideas and information via sketches, technical drawings, CAD files, models or personal discussions with our engineers and product managers, we will advise you about possible solutions, functions, materials and properties of the injection moulding tool and the final product.





2) Design

Individual, ergonomic, functional, modern:

Our engineers support you with the best design for the injection moulding tool and support you in choosing the right raw material with the best properties for your product.

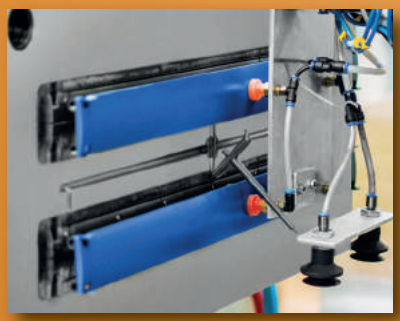
3) Engineering

Based on our more than 45 years experience in injection moulding processes, we will realise your ideas and exchange design data with you for verification and fine tuning.

Tool manufacturing

Our high precise 5 axis machining centers as well as modern EMD-equipment ensure high-quality tooling and long life injection moulding equipment.





Injection moulding

Use the advantage of our modern and fully automated injection moulding equipment and get innovative and fist-class injection moulded products from a wide range of raw materials and colours. We are prepared for quantities from 500 up to 1.000.000 pieces and can offer you also storage in our affiliated high-shelf warehouse.

Materials:
ABS / PA6 / PBT / PC / PC-ABS / PMMA / POM / PP / PPO / PS / TPE
Above mentioned materials we stock in different colours and characteristics, such as glass fiber reinforced, flame protection, temperature resistant, gliding ability, impact strength

Shot weight: 0,5 – 700,0 g · Clamping forces: 300 – 2.000 kN

Just ask us - we will be pleased to advise you!

Finishing

- milling
- pressed-in thread connectors
- thread cutting
- EMC coating
- ALU vaporing
- component assembling
- glueing
- foaming of sealings
- printing: silk screen / tampon / digital printing
- decor and keypad foils
- mounting material



Rapid Prototyping by 3D print



Fast, flexible and cost-efficient: perfect for prototypes

Based upon your IGES or STEP files, we can produce three dimensional solid objects with high stability and resolution - even in an ongoing design process. Such prototypes can also be used as master-forms for vacuum casting.

Maximum construction size: 298 x 185 x 203 mm / 203 x 203 x 152 mm
Accuracy: 0,05 mm

Customised enclosure solutions

You do not find your enclosure solution at any distributor or standard catalogue? Why don't you design and create your own perfect enclosure solution with your ideas of function and design.

Our capable engineering team with many years of experience and their vast know-how will provide you with enclosure solutions that are specifically designed for your applications. And: we do everything in-house - from prototyping to industrial series all from one hand. apra-norm: your reliable partner in development and production.

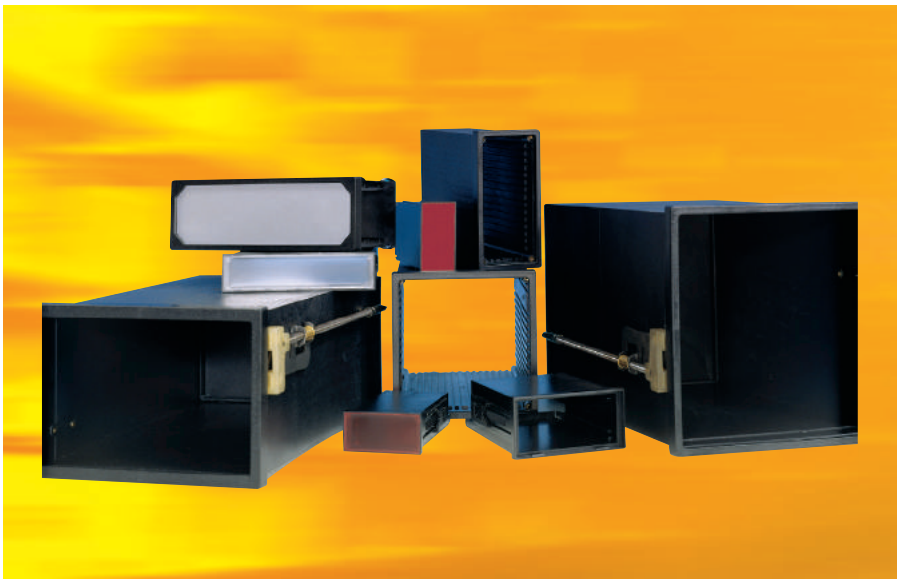






Technical information

The **apra-norm enclosure series 445/441** is perfectly suited for analog and digital controls and displays for temperature, time or counters. The internal grooves for PCBs ensure the quick and flexible mounting of electronics. On the open sides, threaded inserts (M2) are moulded in for easy fixing of back and front panels. On the side walls, cones for fixing hooks are pressed in. The front frame is included in delivery and can be snapped on easily. The very sturdy enclosures are made of glass fibre reinforced PPE/PS-GF20 and can be supplemented with useful accessories such as sealings or transparent doors.



Mechanical properties

Bending strength
as per ISO 178 ..... 125 MPa

Tenacity until break
as per ISO 527..... 80 MPa

Hardness, H 358/30
as per ISO 2039/1..... 125 MPa

Physical properties

Water absorption
as per ISO 62 ..... 0,22 %

Density .....1,25 g/cm³

Electrical properties

Electric resistivity
as per IEC 60093 ..... >10^{15} Ohm

Dielectric strength
as per IEC 60243-1..... 250 kV/cm

Observe low-voltage guidelines when installing devices that have an operating voltage above 50V.

Thermal properties

Thermal conductivity
as per ISO 8302 ..... 0,28 W/m°C

Continuous operating temperature:
up to 135 °C

Individual possibilities for modification

To avoid partly tooling cost we can adjust the depth of our standard enclosures to your specific needs (for a minimum order quantity of 500 pieces).

Same also applies for the rear panels of our panel enclosures. Preparing specific tool inserts allow us to produce your rear panel as per your needs (for example: cut outs for connectors or embossed lettering...) from one tool (for a minimum order quantity of 500 pieces).

With your tool inserts we will only produce your enclosures/panels – individuality will be granted.

For smaller quantities we suggest milling as explained on the following page.

Conductive coatings

To gain interference immunity or prevent radiation from interfering transmissions, it is usually necessary to cover these devices with a conductive enclosure. This can be done either with a metal enclosure or by applying a conductive metal coating to a plastic enclosure, which, as a rule, is non-conductive.

The latter has the advantage of lower cost and weight. A conductive coating can be added to a plastic enclosure by lining the surface with metal foil or galvanic coating, by metallizing it in a high-vacuum or by applying a metallic lacquer.

apra-norm uses a high-quality conductive lacquer that offers excellent conductivity, outstanding resistance to corrosion and an impressive cost-performance ratio since the use of costly devices and equipment is not needed.

The coating used by apra-norm was developed to shield against EMI (electromagnetic interferences) and electrostatic discharge and to earth sensitive electrical devices. Our standard lacquer is copper-based as it represents the best economical and environmental solution for high shielding performance coupled with high conductivity.

Physical properties of the conductive varnish

Sheet resistance: < 0,25 Ω/square with 50 µm layer thickness

Attenuation as per ASTM ES 7-83: >60 dB at 50 µm

Adhesion as per ASTM 3359 B: ..... 5 B

Pencil hardness:..... > 9 H

max. operating temperature: ..... 95 °C

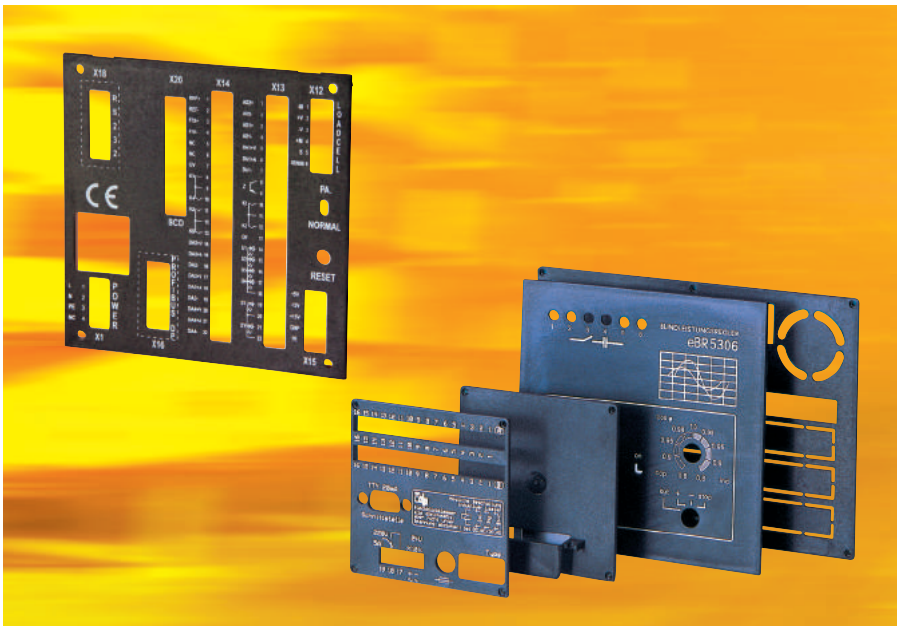
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Customised machining and printing of front panels, rear panels and enclosures

Our modern CNC milling machines allow us a cost effective realization of your requirements: cut outs, millings, ventilation slots... just like you want!

The printing of your individual rear- or front panels will be done as per your request and in regard to the technical possibilities either by screen- , tampon- or digital printing.

Just ask us - we will be pleased to advise you:
+49 (0) 65 92 / 204-0!



Front foils and keypad technology

- individual adaption of all elements to your requirements
- composed of 4 layer foils: mounting foil / distance foil / contact foil / decor foil
- different types of switching elements/buttons: flat (without embossment) / ball element / flat (with embossment) / metal snap slice
- surface varieties of upper decor foil: microstructure / glossy / matt finished / anti scratches / all colours acc. to RAL
- embossment type of decor foil: flat embossment / ball segments / frame embossment / others
- PCB connection by NON ZIF 1.25 (straight/angled) / NON ZIF 2.54 (straight/angled) / Crimpflex F 2.54 / Others
- EMC shielding (also area of display by transparent screen)
- can be assembled with LCD, LED and SMD-LED: single-colour (red, green, yellow, white) two-colour (red/green)
- pockets and cut-outs for individual components possible
- digital print or silk-screening inside of the foil possible
- excellent chemical resistance

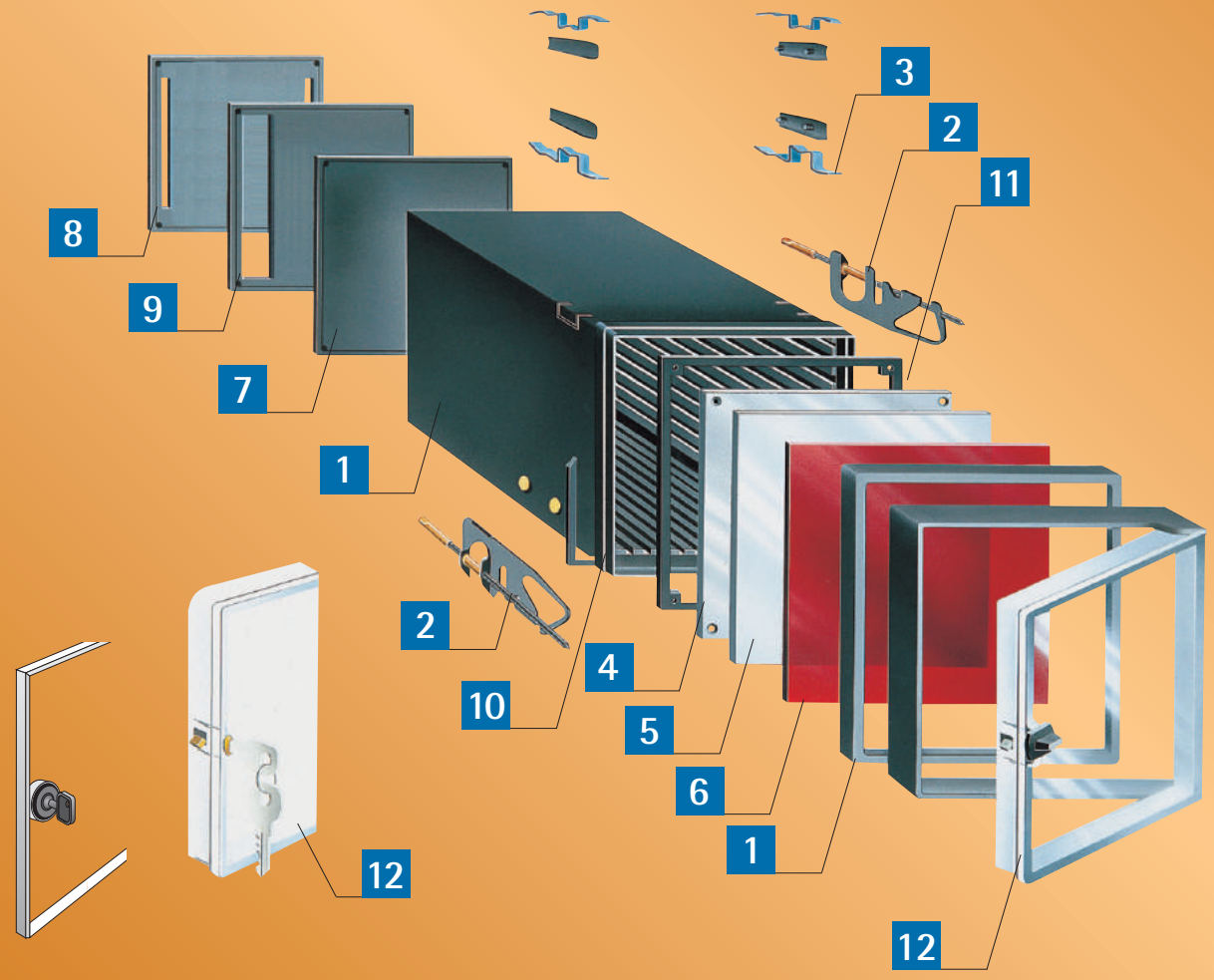
Material: PC or Polyester
Degree of protection:
possible up to IP 65



Assemble your individual panel instrument case

On the following pages, you can find the available components of the panel instrument series 445 and 441. **The order numbers of the positions 1-12 are shown in the charts of the pages 14-23** unless the order number is shown at the product itself.

For the basic enclosures 1a / 1b (page 9) and 3a / 3b (page 10) as well as the rear panels (page 10), EMC versions with conductive copper coating are available. To order, please add **-50 for inside copper-plated , -51 for outside copper-plated or -52 for inside and outside copper-plated** to the 6-digit order numbers in the charts of the pages 14-23.



www.apra.de

1 Case acc. to IEC 61554

Material:
Case: PPE/PS-GF20 black
Front frame: PC black

The part number of the cases can be found on pages 14 - 23!

EMC Cases

- cases with conductive copper plating
- for technichal information, please see page 6
- delivery time: approx. 2 weeks after order receipt

The part numbers of the EMC cases can be found on pages 14 - 23. Please add **-50 for inside copper-plated , -51 for outside copper-plated** and **-52 for inside and outside copper-plated** to the 6-digit order number.

2 Fixing clamps

- fixing clamps for assembling the cases to the panel

1a Standard case





1b Case with corner webs



- optical appealing solution
- protection against electrostatic discharge for shielded enclosure



2a Light fixing clamp



- threaded rod M2,5 x 50
- dimensions: 50 x 10 x 5,7 mm

Order no.
440-005

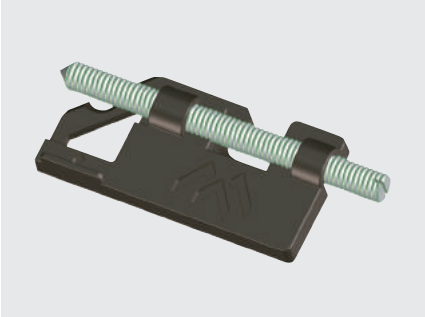
2b Heavy-duty fixing clamp



- threaded rod M5 x 186 with pressure piece
- dimensions: 198,5 x 35,9 x 7,8 mm

Order no.
443-002

2c Model B Miba (acc. to DIN 43835)



- threaded rod M4 x 60
- dimensions: 60 x 18,3 x 4,8 mm

Order no.
440-019

2d Model B (acc. to DIN 43835)



- threaded rod M4 x 96
- dimensions: 96 x 24 x 5,8 mm

Order no.
440-001

2e Model C (acc. to DIN 43835)



- threaded rod M5 x 186
- dimensions: 186 x 27 x 7,8 mm

Order no.
443-001

3 Panel Clip Case

- patented by apra-norm
- fixing clamps are eliminated
- easy mounting by clipping it into the panel

Material:
case: PPE/PS-GF20, black
front frame: PC black

The part number of the cases can be found starting on pages 14 to 23!

3a Standard case



3b Case with corner webs



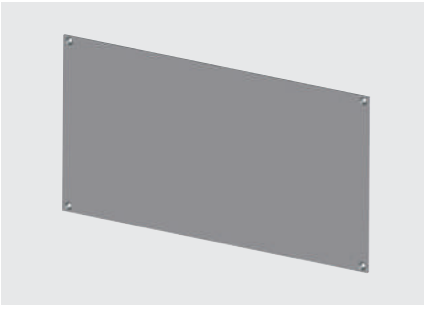
4/5 Cover plate / Front panel

- front panels with 4 mounting holes
- mounting material included

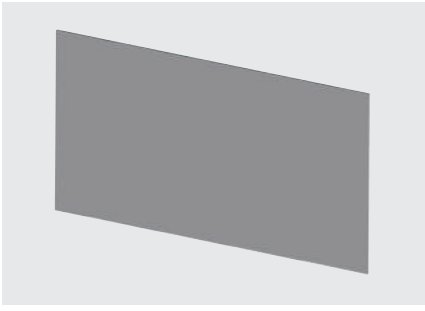
Material:
aluminium 1,5 mm, anodised

The part number of the panels can be found starting on pages 4 to 13!

4 Cover plate



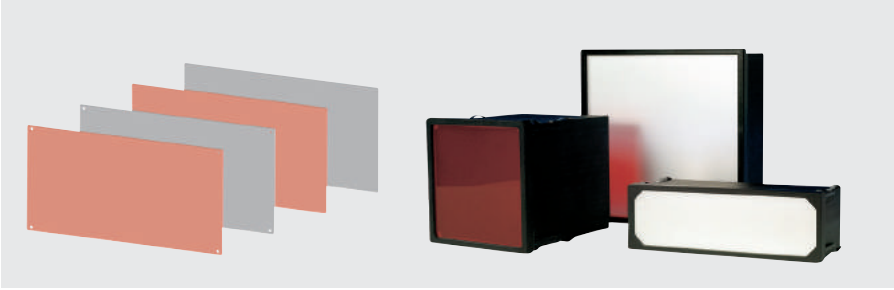
5 Front panel



6 Filter screens

- with or without mounting holes

Material:
Plexiglas® red 502,
Makrolon® transparent



The part number of the filter screens can be found on pages 4 to 13. To order, replace „-XX" with the corresponding two digits of the adjacent chart.

*minimum order quantity = 100 pieces

Material	Thickness mm	Blanks without holes: last digits	Blanks with 4 mounting holes: last digits
Makrolon, transparent	3 ± 0,5	-05	-15*
Plexiglas, rot 502	3 ± 0,5	-09	-10*

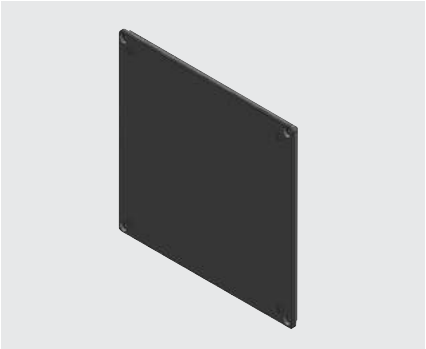
7/8/9 Rear panel

- rear panel with 4 or 6 mounting holes
- mounting material included

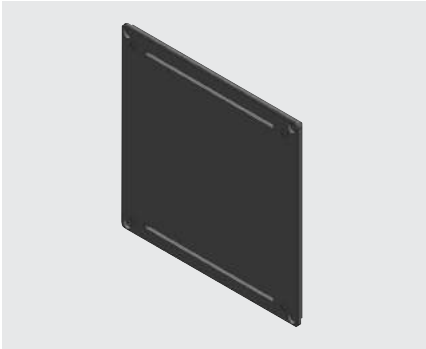
Material:
PPE / PS-Gf20, black

The part number of the rear panels can be found starting on pages 4 to 13!

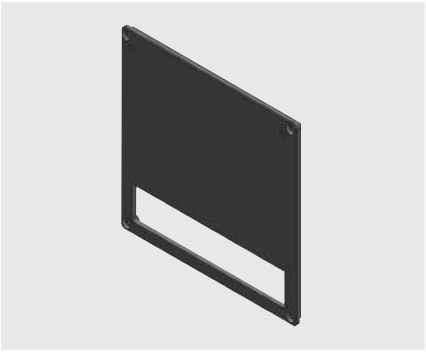
7 Rear panel, solid



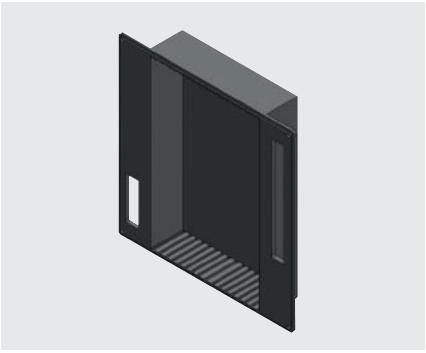
8 Rear panel with slots



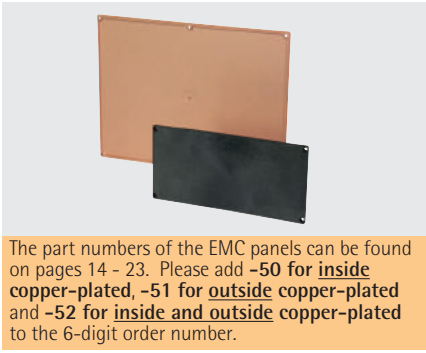
9 Rear panel for terminals



Rear panel with top (see page 21)



Rear panel EMC

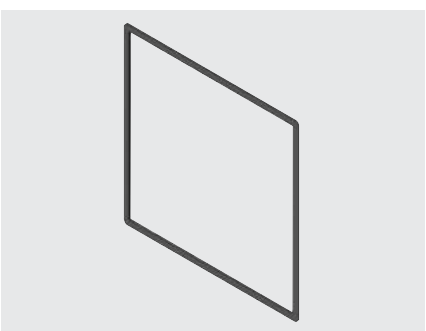


The part numbers of the EMC panels can be found on pages 14 - 23. Please add **-50 for inside copper-plated**, **-51 for outside copper-plated** and **-52 for inside and outside copper-plated** to the 6-digit order number.

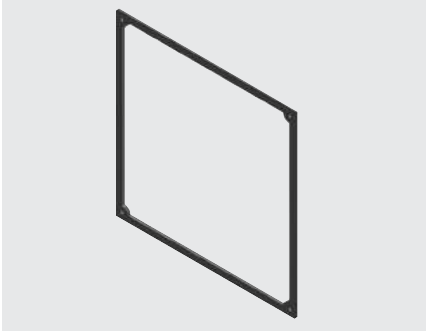
10/11 Sealings

The part number of the sealings can be found starting on pages 4 to 13!

10 Sealing between case and panel



11 Sealing behind front panel

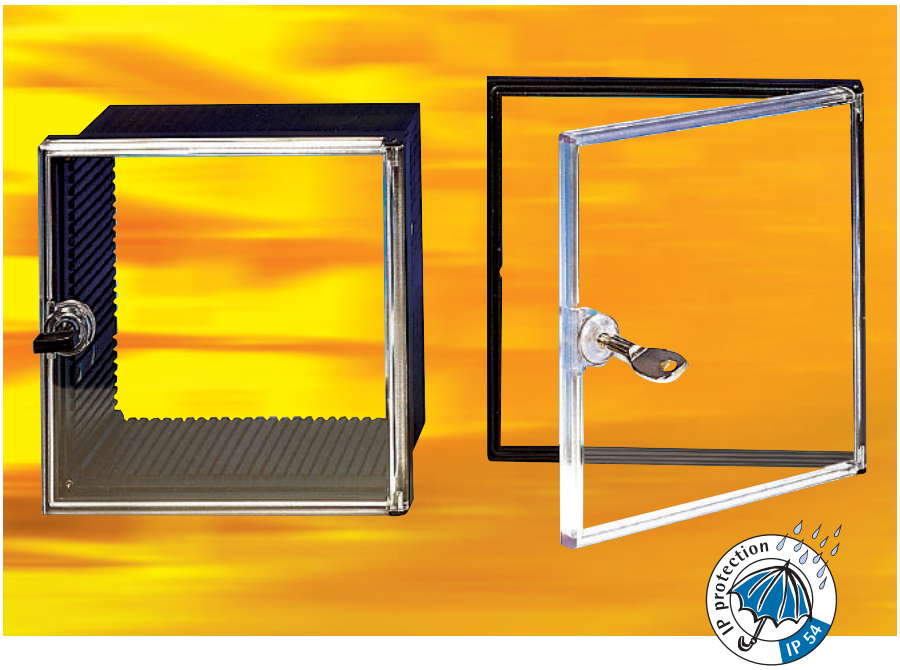


12 Transparent door with frame

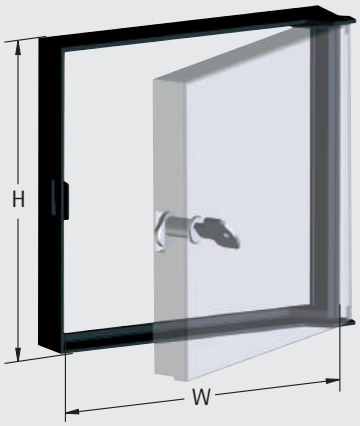
- for panel instrument cases acc. to IEC 61554
- can be mounted to the enclosure instead of a front frame
- high fitting accuracy and perfect sealing
- excellent light transmission of the doors
- deflexion temperature: 135°C (as per DIN 53461)
- high stability, impact strength and hardness, door frame fiber-glass reinforced
- excellent electric and dielectric characteristics

Material: PC, listed acc. to UL 94 V-0
Degree of protection: IP 54

After mounting, the door cannot be removed without applying force.



A Transparent door with frame



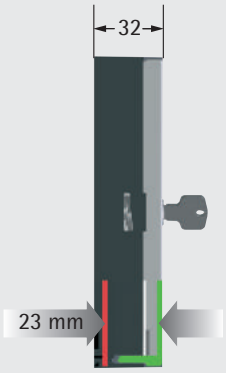


Figure shows version A1
(version A2 without figure)

clear height between front panel and inside of the door = 23 mm

W x H mm	Degree of protection	A1 Transparent door with frame and lock (lockable)	A2 Transparent door with frame and plastic sash fastener
72 x 144	IP 54	446-100-01	446-100-02
72 x 72	IP 54	446-030-01	446-030-02
96 x 144	IP 54	446-150-01	446-150-02
96 x 48	IP 54	446-090-01	446-090-02
96 x 96	IP 54	446-040-01	446-040-02
144 x 144	IP 54	446-050-01	446-050-02
192 x 144	IP 54	446-120-01	446-120-02
192 x 96	IP 54	446-110-01	446-110-02
288 x 144	IP 54	446-130-01	446-130-02

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B Flat transparent door with frame

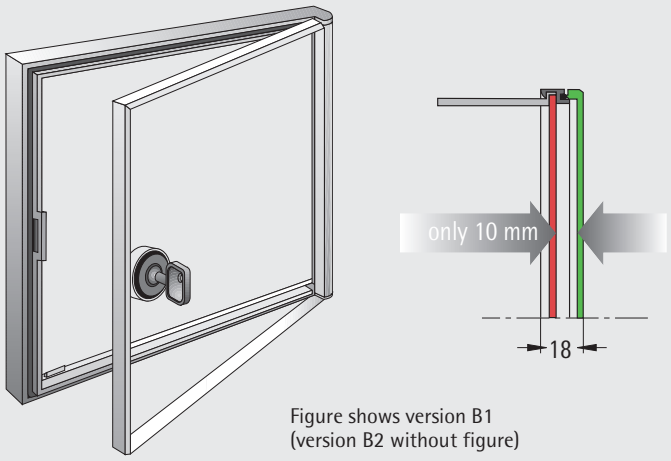


Figure shows version B1
(version B2 without figure)

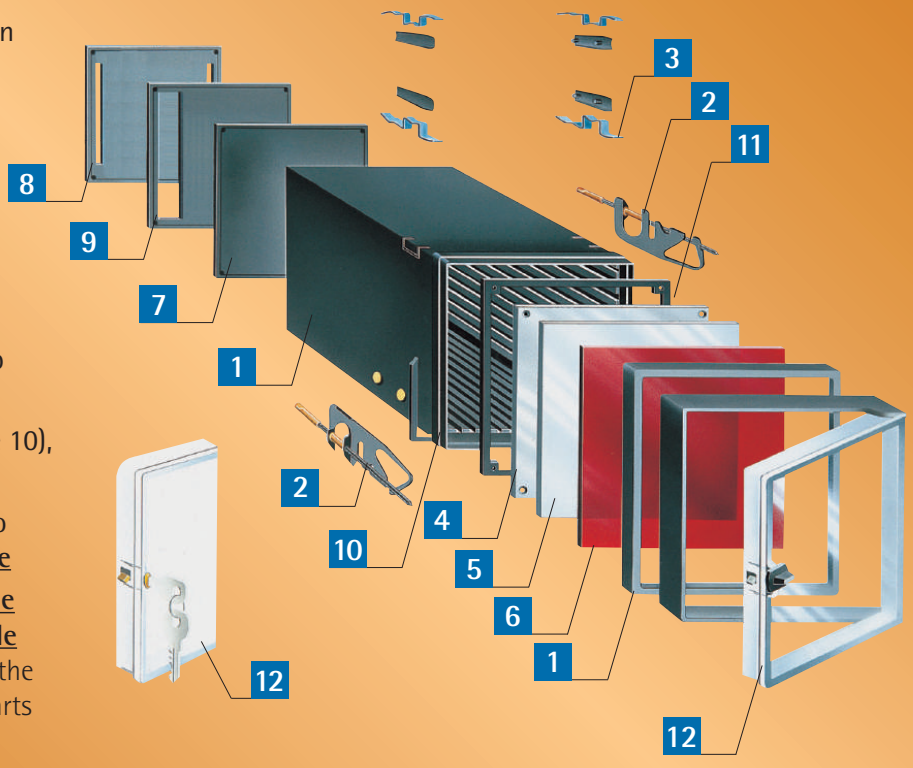
clear height between front panel and inside of the door = 10 mm

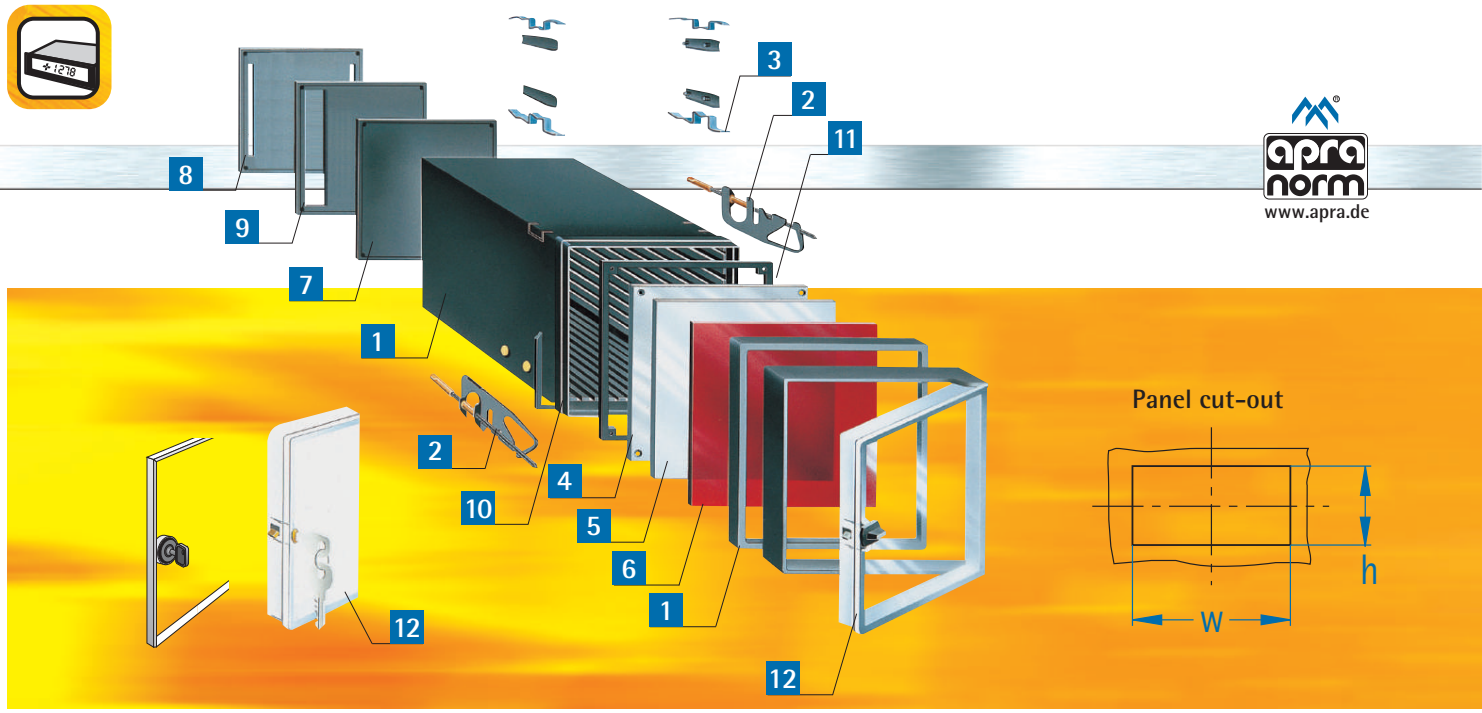
W x H mm	Degree of protection	B1 Flat transparent door with frame and lock (lockable)	B2 Flat transparent door with frame and plastic sash fastener
144 x 144	IP 54	447-050-01	447-050-02

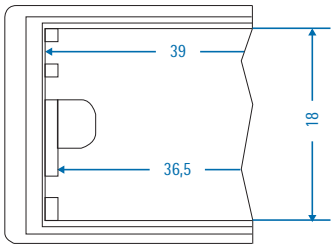
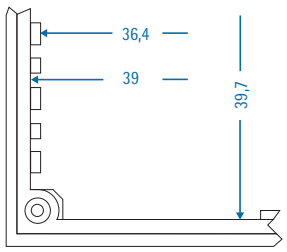
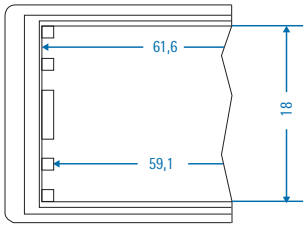
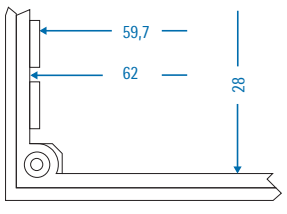
Assemble your individual panel instrument case

On the following pages, you can find the order numbers for the available components of the panel instrument series 445 and 441 as shown on the previous pages.

For the basic enclosures 1a / 1b (page 9) and 3a / 3b (page 10) as well as the rear panels (page 10), EMC versions with conductive copper coating are available. To order, please add **-50 for inside copper-plated , -51 for outside copper-plated or -52 for inside and outside copper-plated** to the 6-digit order numbers in the charts of the pages 14-23.

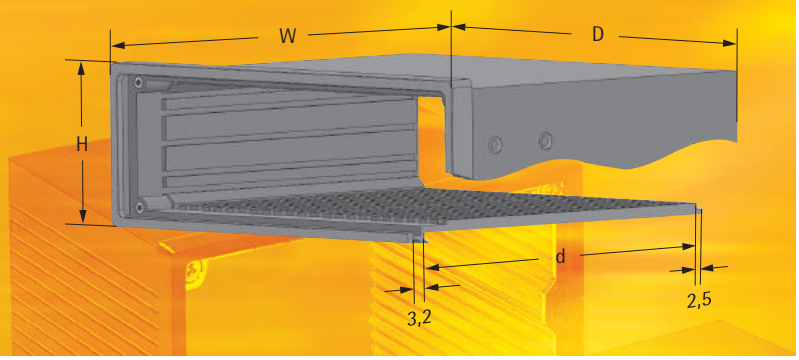




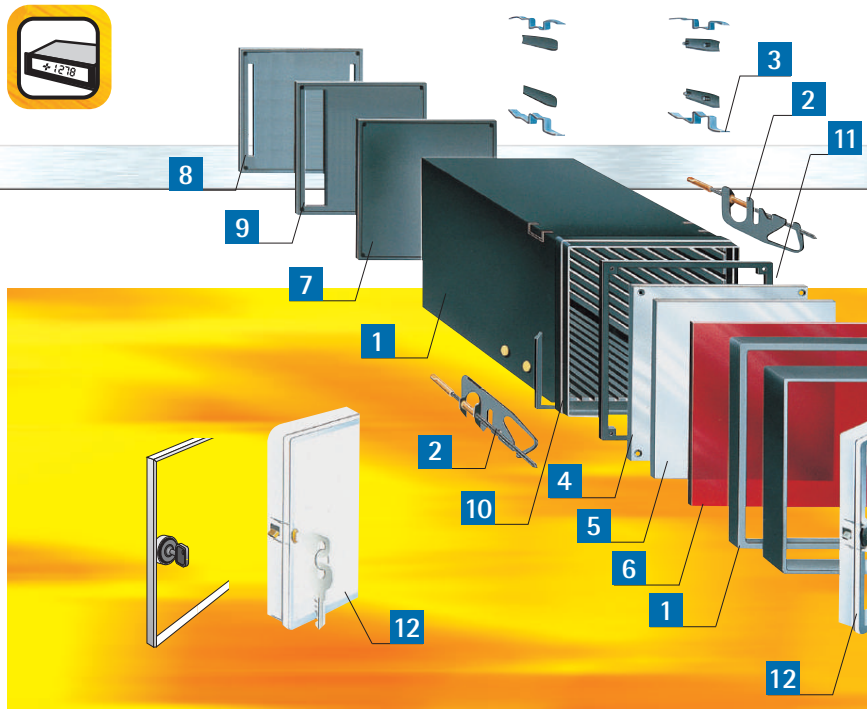
W mm	H mm	D (approx.) mm	d (approx.) mm	Case (acc. IEC 61554) standard 1a (p.9)	Case (acc. IEC 61554) with corner webs 1b (p.9)	Fixing clamp (choice) 2 (p.9+10)	Panel Clip Case standard 3a (p.10)	Panel Clip Case with corner webs 3b (p.10)	Cover plate aluminium 1,5 mm 4 (p.10)
48 x 24									
		60,0	53,0	445-440	-	440-001 440-005 440-019	441-440	-	-
		82,5	75,5	445-441	-		441-441	-	-
		107,0	100,0	445-444	-		441-444	-	-
48 x 48									
		60,5	53,5	445-120	-	440-001 440-005 440-019	441-120	-	445-130
		82,5	75,5	445-121	-		441-121	-	445-130
		116,5	109,5	445-122	-		441-122	-	445-130
		138,5	131,5	445-123	-		441-123	-	445-130
		107,0	100,0	445-124	-		441-124	-	445-130
		163,0	156,0	445-125	-		441-125	-	445-130
72 x 24									
		60,0	53,0	445-420	-	440-001 440-005 440-019	441-420	-	-
		82,5	75,5	445-421	-		441-421	-	-
		107,0	100,0	445-424	-		441-424	-	-
72 x 36									
		60,5	53,5	445-040	-	440-001 440-005 440-019	441-040	-	445-050
		82,5	75,5	445-041	-		441-041	-	445-050
		116,5	109,5	445-042	-		441-042	-	445-050
		107,0	100,0	445-044	-		441-044	-	445-050

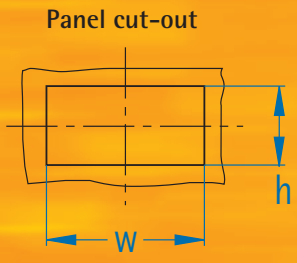
Panel instrument case acc. to IEC 61554 • 445/441

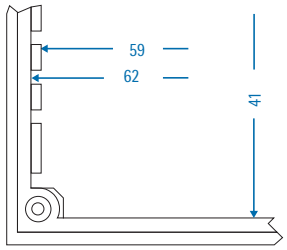
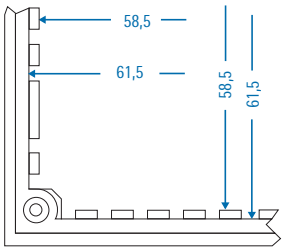
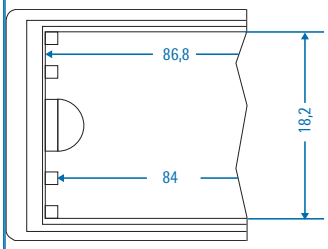
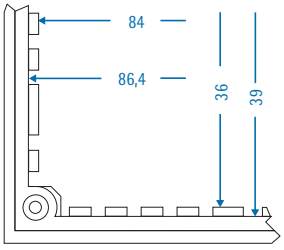
Case size		Panel cut-out			
W	H	w	perm. dev.	h	perm. dev.
mm	mm	mm	mm	mm	mm
48	24	45	+ 0.6	22.2	+ 0.3
48	48	45	+ 0.6	45	+ 0.6
72	24	68	+ 0.7	22.2	+ 0.3
72	36	68	+ 0.7	33	+ 0.6



Panel	Filter screen	Rear panel			Sealing		Transparent door with frame	
aluminium 1,5 mm	Plexiglas® red: **- 09** Makrolon® transparent: **-05**	closed	with slots	for terminals	between case and panel	behind front panel	with lock	with sash fastener
5 (p.10)	6 (p.11)	7 (p.11)	8 (p.11)	9 (p.11)	10 (p.11)	11 (p.11)	12 (p.12)	12 (p.12)
48 x 24								
445-451	445-452-xx	445-453-01	445-453-02	-	448-445-01	-	-	-
445-451	445-452-xx	445-453-01	445-453-02	-	448-445-01	-	-	-
445-451	445-452-xx	445-453-01	445-453-02	-	448-445-01	-	-	-
48 x 48								
445-131	445-132-xx	445-133-01	445-133-02	445-133-03	445-135-01	445-135-02	-	-
445-131	445-132-xx	445-133-01	445-133-02	445-133-03	445-135-01	445-135-02	-	-
445-131	445-132-xx	445-133-01	445-133-02	445-133-03	445-135-01	445-135-02	-	-
445-131	445-132-xx	445-133-01	445-133-02	445-133-03	445-135-01	445-135-02	-	-
445-131	445-132-xx	445-133-01	445-133-02	445-133-03	445-135-01	445-135-02	-	-
445-131	445-132-xx	445-133-01	445-133-02	445-133-03	445-135-01	445-135-02	-	-
72 x 24								
445-431	445-432-xx	445-433-01	445-433-02	-	448-425-01	-	-	-
445-431	445-432-xx	445-433-01	445-433-02	-	448-425-01	-	-	-
445-431	445-432-xx	445-433-01	445-433-02	-	448-425-01	-	-	-
72 x 36								
445-051	445-052-xx	445-053-01	445-053-02	445-053-03	445-055-01	-	-	-
445-051	445-052-xx	445-053-01	445-053-02	445-053-03	445-055-01	-	-	-
445-051	445-052-xx	445-053-01	445-053-02	445-053-03	445-055-01	-	-	-
445-051	445-052-xx	445-053-01	445-053-02	445-053-03	445-055-01	-	-	-

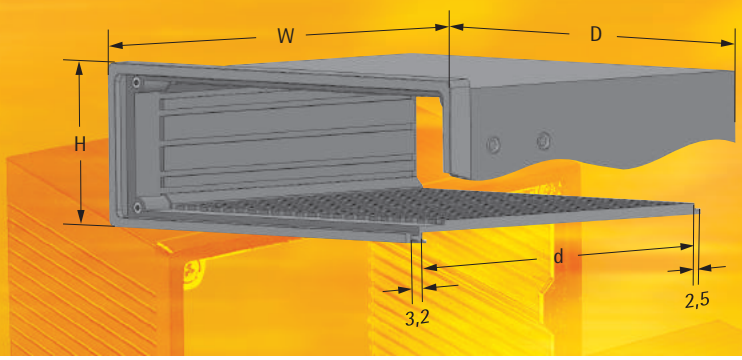




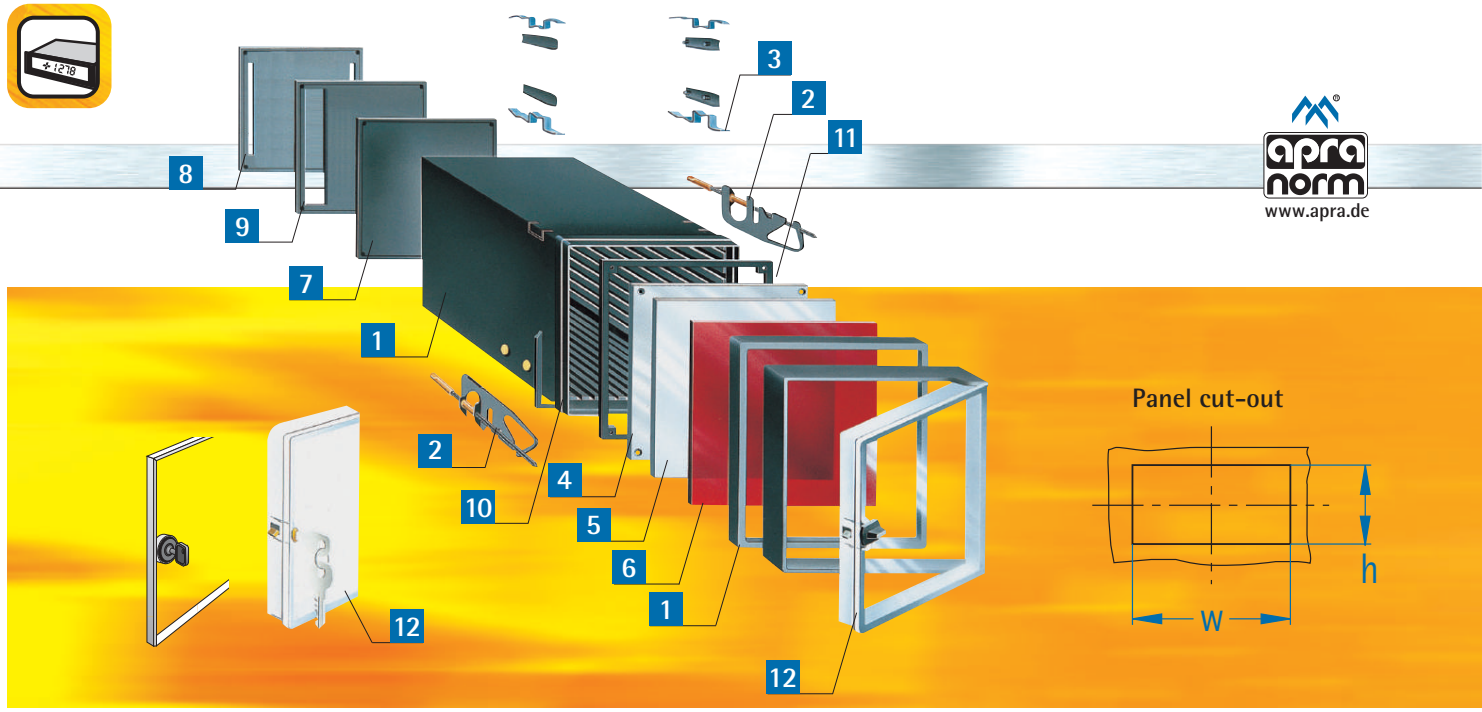
W mm	H mm	D (approx.) mm	d (approx.) mm	Case (acc. IEC 61554) standard 1a (p.9)	Case (acc. IEC 61554) with corner webs 1b (p.9)	Fixing clamp (choice) 2 (p.9+10)	Panel Clip Case standard 3a (p.10)	Panel Clip Case with corner webs 3b (p.10)	Cover plate aluminium 1,5 mm 4 (p.10)
72 x 48									
		60,5	53,5	445-140	-	440-001 440-005 440-019	-	-	445-150
		82,5	75,5	445-141	-		-	-	445-150
		116,5	109,5	445-142	-		-	-	445-150
		107,0	100,0	445-144	-		-	-	445-150
72 x 72									
		44,5	36,0	-	-	440-001 440-005 440-019	441-227	441-227-30	445-230
		60,5	53,5	445-220	445-220-30		441-220	441-220-30	445-230
		82,5	75,5	445-221	445-221-30		441-221	441-221-30	445-230
		116,5	109,5	445-222	445-222-30		441-222	441-222-30	445-230
		138,5	131,5	445-223	445-223-30		441-223	441-223-30	445-230
		107,0	100,0	445-224	445-224-30		441-224	441-224-30	445-230
		163,0	156,0	445-225	445-225-30		441-225	441-225-30	445-230
		209,0	201,0	445-226	445-226-30		441-226	441-226-30	445-230
96 x 24									
		60,5	53,5	445-100	-	440-001 440-005 440-019	441-100	-	-
		82,5	75,5	445-101	-		441-101	-	-
		116,5	109,5	445-102	-		441-102	-	-
		107,0	100.0	445-104	-		441-104	-	-
96 x 48									
		44,0	36,0	-	-	440-001 440-005 440-019	441-767	-	-
		60,5	53,5	445-160	445-160-30		441-160	441-160-30	445-170
		82,5	75,5	445-161	445-161-30		441-161	441-161-30	445-170
		116,5	109,5	445-162	445-162-30		441-162	441-162-30	445-170
		138,5	131,5	445-163	445-163-30		441-163	441-163-30	445-170
		107,0	100,0	445-164	445-164-30		441-164	441-164-30	445-170
		163,0	156,0	445-165	445-165-30		441-165	441-165-30	445-170

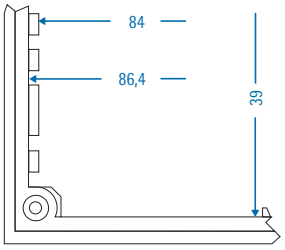
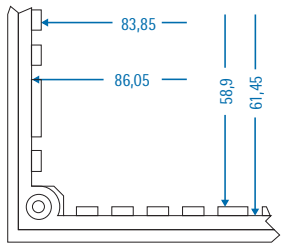
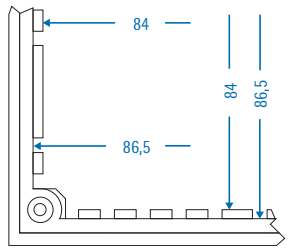
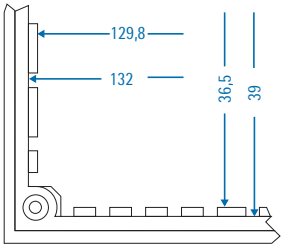
Panel instrument case acc. to IEC 61554 • 445/441

Case size		Panel cut-out			
W	H	w	perm. dev.	h	perm. dev.
mm	mm	mm	mm	mm	mm
72	48	68	+ 0.7	45	+ 0.6
72	72	68	+ 0.7	68	+ 0.7
96	24	92	+ 0.8	22.2	+ 0.3
96	48	92	+ 0.8	45	+ 0.6



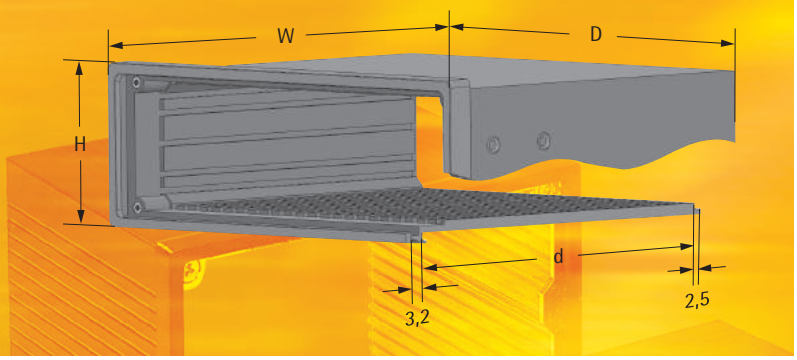
Panel aluminium 1,5 mm	Filter screen Plexiglas® red: **- 09** Makrolon® transparent: **-05**	Rear panel closed	Rear panel with slots	Rear panel for terminals	Sealing between case and panel	Sealing behind front panel	Transparent door with lock	Transparent door with sash fastener
5 (p.10)	6 (p.11)	7 (p.11)	8 (p.11)	9 (p.11)	10 (p.11)	11 (p.11)	12 (p.12)	12 (p.12)
72 x 48								
445-151	445-152-xx	445-153-01	445-153-02	445-153-03	-	-	-	-
445-151	445-152-xx	445-153-01	445-153-02	445-153-03	-	-	-	-
445-151	445-152-xx	445-153-01	445-153-02	445-153-03	-	-	-	-
445-151	445-152-xx	445-153-01	445-153-02	445-153-03				
72 x 72								
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
445-231	445-232-xx	445-233-01	445-233-02	445-233-03	445-235-01	445-235-02	446-030-01	446-030-02
96 x 24								
445-111	445-112-xx	445-113-01	445-113-02	-	448-115-01	-	-	-
445-111	445-112-xx	445-113-01	445-113-02	-	448-115-01	-	-	-
445-111	445-112-xx	445-113-01	445-113-02	-	448-115-01	-	-	-
445-111	445-112-xx	445-113-01	445-113-02	-	448-115-01	-	-	-
96 x 48								
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
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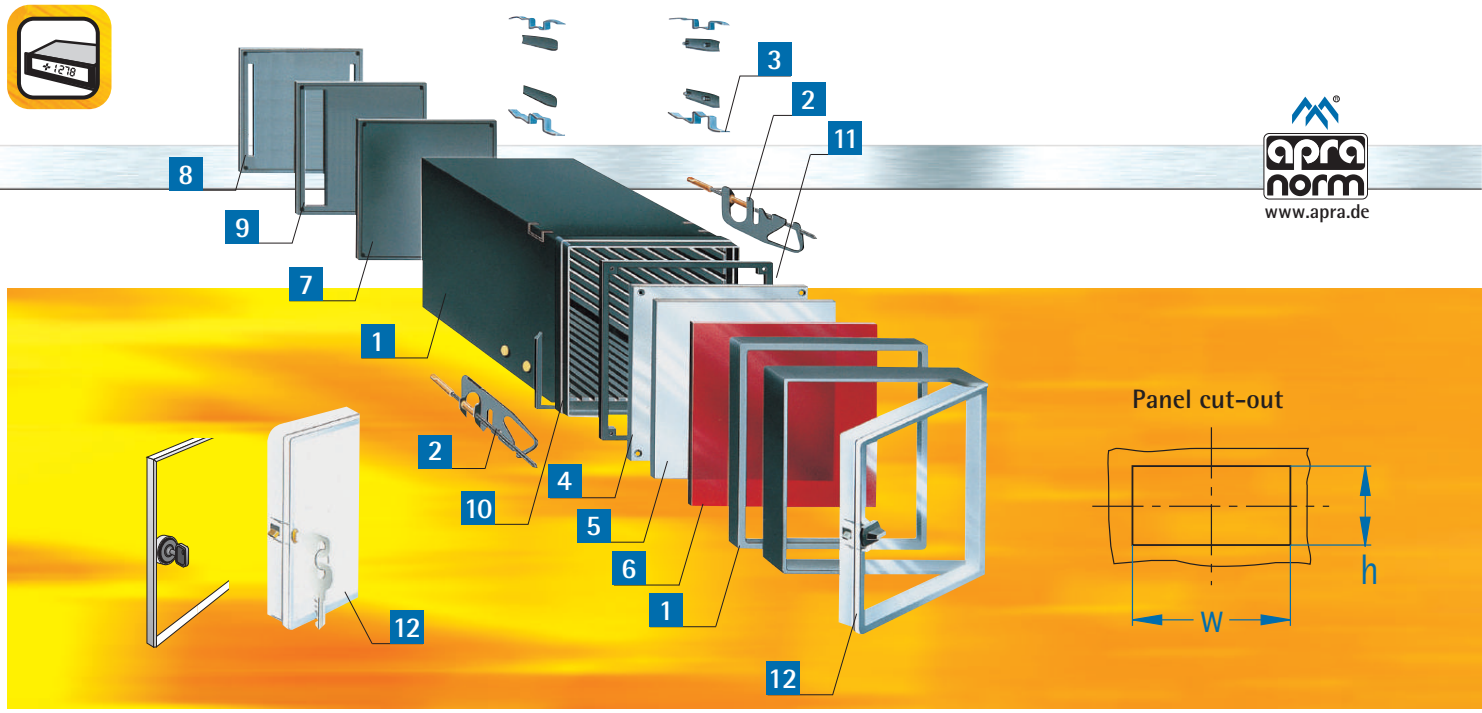
W mm	H mm	D (approx.) mm	d (approx.) mm	Case (acc. IEC 61554) standard 1a (p.9)	Case (acc. IEC 61554) with corner webs 1b (p.9)	Fixing clamp (choice) 2 (p.9+10)	Panel Clip Case standard 3a (p.10)	Panel Clip Case with corner webs 3b (p.10)	Cover plate aluminium 1,5 mm 4 (p.10)
96 x 48									
		60,5	53,5	445-760	445-760-30		441-760	441-760-30	445-170
		82,5	75,5	445-761	445-761-30	440-001	441-761	441-761-30	445-170
		116,5	109,5	445-762	445-762-30	440-005	441-762	441-762-30	445-170
		138,5	131,5	445-763	445-763-30	440-019	441-763	441-763-30	445-170
		107,0	100,0	445-764	445-764-30		441-764	441-764-30	445-170
		163,0	156,0	445-765	445-765-30		441-765	441-765-30	445-170
96 x 72									
		60,5	53,5	445-240	-		-	-	445-250
		82,5	75,5	445-241	-		-	-	445-250
		116,5	109,5	445-242	-	440-001	-	-	445-250
		138,5	131,5	445-243	-	440-005	-	-	445-250
		107,0	100,0	445-244	-	440-019	-	-	445-250
		163,0	156,0	445-245	-		-	-	445-250
		209,0	201,0	-	-		-	-	445-250
96 x 96									
		44,0	36,0	-	-		441-307	441-307-30	445-310
		60,5	53,5	445-300	445-300-30		441-300	441-300-30	445-310
		82,5	75,5	445-301	445-301-30	440-001	441-301	441-301-30	445-310
		116,5	109,5	445-302	445-302-30	440-005	441-302	441-302-30	445-310
		138,5	131,5	445-303	445-303-30	443-001	441-303	441-303-30	445-310
		107,0	100,0	445-304	445-304-30	440-019	441-304	441-304-30	445-310
		163,0	156,0	445-305	445-305-30		441-305	441-305-30	445-310
		209,0	201,0	445-306	445-306-30		441-306	441-306-30	445-310
144 x 48									
		44,5	36,0	-	-		441-187	-	445-190
		60,5	53,5	445-180	445-180-30		441-180	441-180-30	445-190
		82,5	75,5	445-181	445-181-30	440-001	441-181	441-181-30	445-190
		116,5	109,5	445-182	445-182-30	440-005	441-182	441-182-30	445-190
		138,5	131,5	445-183	445-183-30	443-001	441-183	441-183-30	445-190
		107,0	100,0	445-184	445-184-30	440-019	441-184	441-184-30	445-190
		163,0	156,0	445-185	445-185-30	443-002	441-185	441-185-30	445-190
		209,0	201,0	445-186	445-186-30		441-186	441-186-30	445-190

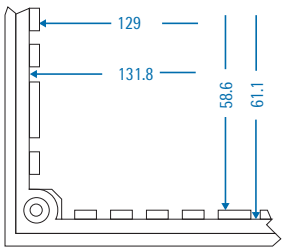
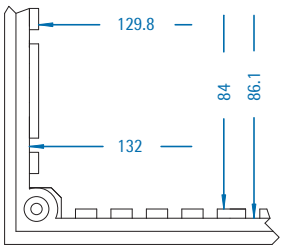
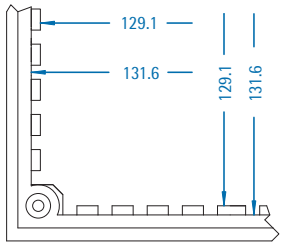
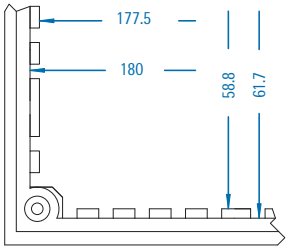
Panel instrument case acc. to IEC 61554 • 445/441

Case size		Panel cut-out			
W	H	w	perm. dev.	h	perm. dev.
mm	mm	mm	mm	mm	mm
96	48	92	+ 0.8	45	+ 0.6
96	72	92	+ 0.8	68	+ 0.7
96	96	92	+ 0.8	92	+ 0.8
144	48	138	+ 1.0	45	+ 0.6



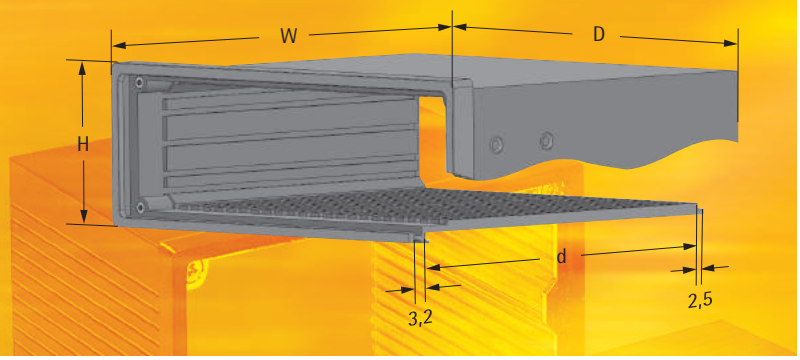
Panel aluminium 1,5 mm	Filter screen Plexiglas® red: **- 09** Makrolon® transparent: **-05**	Rear panel closed	Rear panel with slots	Rear panel for terminals	Sealing between case and panel	Sealing behind front panel	Transparent door with frame with lock	Transparent door with frame with sash fastener
5 (p.10)	6 (p.11)	7 (p.11)	8 (p.11)	9 (p.11)	10 (p.11)	11 (p.11)	12 (p.12)	12 (p.12)
96 x 48								
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
445-171	445-172-xx	445-173-01	445-173-02	445-173-03	445-175-01	445-175-02	446-090-01	446-090-02
96 x 72								
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
445-251	445-252-xx	445-253-01	445-253-02	445-253-03	445-255-01	445-255-02	-	-
96 x 96								
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
445-311	445-312-xx	445-313-01	445-313-02	445-313-03	445-315-01	445-315-02	446-040-01	446-040-02
144 x 48								
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-
445-191	445-192-xx	445-193-01	445-193-02	445-193-03	445-195-01	445-195-02	-	-



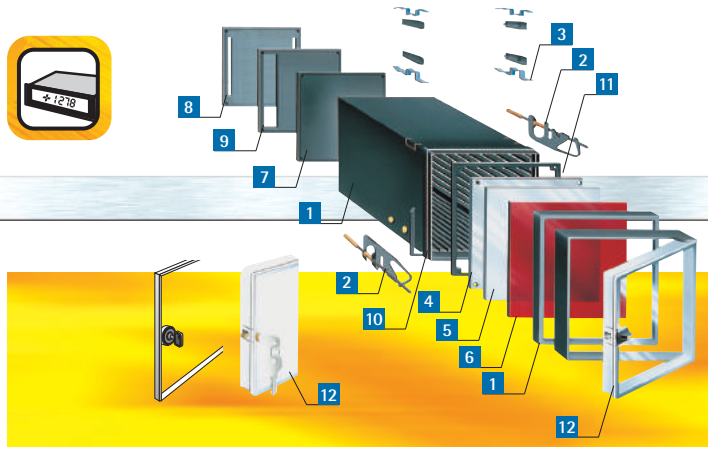
W mm	H mm	D (approx.) mm	d (approx.) mm	Case (acc. IEC 61554) standard 1a (p.9)	Case (acc. IEC 61554) with corner webs 1b (p.9)	Fixing clamp (choice) 2 (p.9+10)	Panel Clip Case standard 3a (p.10)	Panel Clip Case with corner webs 3b (p.10)	Cover plate aluminium 1,5 mm 4 (p.10)
144 x 72									
		44,0	36	-	-	440-001 440-005 440-019 443-001 443-002	441-267	441-267-30	445-270
		60,5	53,5	445-260	445-260-30		441-260	441-260-30	445-270
		82,5	75,5	445-261	445-261-30		441-261	441-261-30	445-270
		116,5	109,5	445-262	445-262-30		441-262	441-262-30	445-270
		138,5	131,5	445-263	445-263-30		441-263	441-263-30	445-270
		107,0	100,0	445-264	445-264-30		441-264	441-264-30	445-270
		163,0	156,0	445-265	445-265-30		441-265	441-265-30	445-270
		209,0	201,0	445-266	445-266-30		441-266	441-266-30	445-270
144 x 96									
		44,0	36	-	-	440-001 440-005 440-019 443-001 443-002	441-327	-	445-330
		60,5	53,5	445-320	445-320-30		441-320	441-320-30	445-330
		82,5	75,5	445-321	445-321-30		441-321	441-321-30	445-330
		116,5	109,5	445-322	445-322-30		441-322	441-322-30	445-330
		138,5	131,5	445-323	445-323-30		441-323	441-323-30	445-330
		107,0	100,0	445-324	445-324-30		441-324	441-324-30	445-330
		163,0	156,0	445-325	445-325-30		441-325	441-325-30	445-330
		209,0	201,0	445-326	445-326-30		441-326	441-326-30	445-330
144 x 144									
		44,0	36,0	-	-	440-001 440-005 443-001 440-019 443-002	441-367	441-367-30	445-370
		60,5	53,0	445-360	445-360-30		441-360	441-360-30	445-370
		82,5	75,5	445-361	445-361-30		441-361	441-361-30	445-370
		116,5	109,5	445-362	445-362-30		441-362	441-362-30	445-370
		138,5	131,5	445-363	445-363-30		441-363	441-363-30	445-370
		107,0	100,0	445-364	445-364-30		441-364	441-364-30	445-370
		163,0	156,0	445-365	445-365-30		441-365	441-365-30	445-370
192 x 72									
		60,5	53,5	445-280	-	440-001 440-005 443-001 440-019 443-002	441-280	-	445-290
		82,5	75,5	445-281	-		441-281	-	445-290
		116,5	109,5	445-282	-		441-282	-	445-290
		138,5	131,5	445-283	-		441-283	-	445-290
		107,0	100,0	445-284	-		441-284	-	445-290
		163,0	156,0	445-285	-		441-285	-	445-290

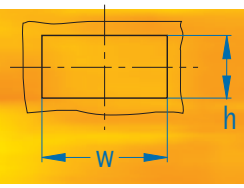
Panel instrument case acc. to IEC 61554 • 445/441

Case size		Panel cut-out			
W	H	w	perm. dev.	h	perm. dev.
mm	mm	mm	mm	mm	mm
144	72	138	+ 1.0	68	+ 0.7
144	96	138	+ 1.0	92	+ 0.8
144	144	138	+ 1.0	138	+ 1.0
192	72	186	+ 1.1	68	+ 0.7

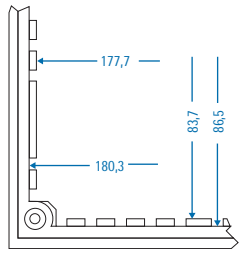
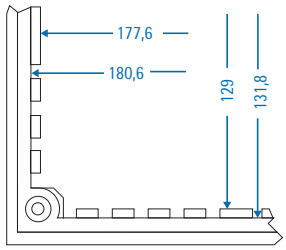
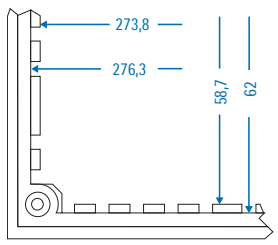
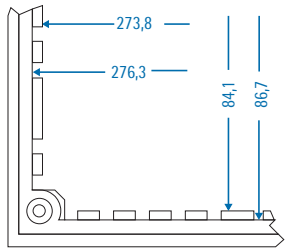
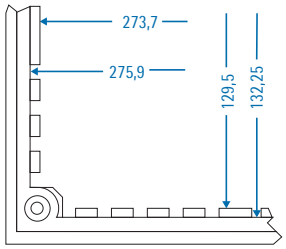


Panel aluminium 1,5 mm	Filter screen Plexiglas® red: **- 09** Makrolon® transparent: **-05**	Rear panel closed	Rear panel with slots	Rear panel for terminals	Sealing between case and panel	Sealing behind front panel	Transparent door with frame with lock	Transparent door with frame with sash fastener
5 (p.10)	6 (p.11)	7 (p.11)	8 (p.11)	9 (p.11)	10 (p.11)	11 (p.11)	12 (p.12)	12 (p.12)
144 x 72								
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
445-271	445-272-xx	445-273-01	445-273-02	445-273-03	445-275-01	445-275-02	446-100-01	446-100-02
144 x 96								
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
445-331	445-332-xx	445-333-01	445-333-02	445-333-03	445-335-01	445-335-02	446-150-01	446-150-02
144 x 144								
445-371	445-372-xx	**Available rear panels for size 144x144:**			445-375-01	445-375-02	446-050-01	446-050-02
445-371	445-372-xx				445-375-01	445-375-02	446-050-01	446-050-02
445-371	445-372-xx	• closed rear panel: 445-373-01			445-375-01	445-375-02	446-050-01	446-050-02
445-371	445-372-xx	• with slots: 445-373-02			445-375-01	445-375-02	446-050-01	446-050-02
445-371	445-372-xx	• with slots for terminal: 445-373-03			445-375-01	445-375-02	446-050-01	446-050-02
445-371	445-372-xx	• with top for bigger components like transformers or relays 445-373-04			445-375-01	445-375-02	446-050-01	446-050-02
445-371	445-372-xx				445-375-01	445-375-02	446-050-01	446-050-02
192 x 72								
445-291	445-292-xx	445-293-01	445-293-02	-	445-295-01	445-295-02	-	-
445-291	445-292-xx	445-293-01	445-293-02	-	445-295-01	445-295-02	-	-
445-291	445-292-xx	445-293-01	445-293-02	-	445-295-01	445-295-02	-	-
445-291	445-292-xx	445-293-01	445-293-02	-	445-295-01	445-295-02	-	-
445-291	445-292-xx	445-293-01	445-293-02	-	445-295-01	445-295-02	-	-
445-291	445-292-xx	445-293-01	445-293-02	-	445-295-01	445-295-02	-	-





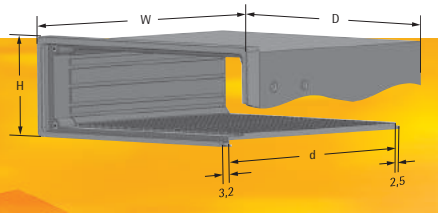
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W mm	H mm	D (approx.) mm	d (approx.) mm	Case (acc. IEC 61554) standard **1a** (p.9)	 with corner webs **1b** (p.9)	Fixing clamp (choice) **2** (p.9+10)	Panel Clip Case standard **3a** (p.10)	 with corner webs **3b** (p.10)	Cover plate aluminium 1,5 mm **4** (p.10)
192 x 96									
		60,5	53.5	445-340	445-340-30	440-001 443-001 443-002 440-005 440-019	-	-	445-350
		82,5	75.5	445-341	445-341-30		-	-	445-350
		116,5	109.5	445-342	445-342-30		-	-	445-350
		138.5	131.5	445-343	445-343-30		-	-	445-350
		107.0	100.0	445-344	445-344-30		-	-	445-350
		163.0	156.0	445-345	445-345-30		-	-	445-350
192 x 144									
		60.5	53.5	445-380	445-380-30	440-001 443-001 443-002 440-005 440-019	-	-	445-390
		82.5	75.5	445-381	445-381-30		-	-	445-390
		116.5	109.5	445-382	445-382-30		-	-	445-390
		107.0	100.0	445-384	445-384-30		-	-	445-390
288 x 72									
		60.5	53.5	445-460	-	440-001 443-001 443-002 440-005 440-019	441-460	-	445-470
		82.5	75.5	445-461	-		441-461	-	445-470
		116.5	109.5	445-462	-		441-462	-	445-470
		138.5	131.5	445-463	-		441-463	-	445-470
		107.0	100.0	445-464	-		441-464	-	445-470
		163.0	156.0	445-465	-		441-465	-	445-470
		209.0	201.0	445-466	-		441-466	-	445-470
288 x 96									
		60.5	53.5	445-600	445-600-30	440-001 440-005 440-019	-	-	445-610
		82.5	75.5	445-601	445-601-30		-	-	445-610
288 x 144									
		60.5	53,5	445-480	-	440-001 443-001 443-002 440-005 440-019	441-480	-	445-490
		82.5	75,5	445-481	-		-	-	445-490

Panel instrument case acc. to IEC 61554 • 445/441

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Case size		Panel cut-out			
W	H	w	perm. dev.	h	perm. dev.
mm	mm	mm	mm	mm	mm
192	96	186	+ 1.1	92	+ 0.8
192	144	186	+ 1.1	138	+ 1.0
288	72	282	+ 1.1	68	+ 0.7
288	96	282	+ 1.1	92	+ 0.8
288	144	282	+ 1.1	138	+ 1.0



Panel aluminium 1,5 mm	Filter screen Plexiglas® red: **- 09** Makrolon® transparent: **-05**	Rear panel closed	Rear panel with slots	Rear panel for terminals	Sealing between case and panel	Sealing behind front panel	Transparent door with frame with lock	Transparent door with frame with sash fastener
5 (p.10)	**6** (p.11)	**7** (p.11)	**8** (p.11)	**9** (p.11)	**10** (p.11)	**11** (p.11)	**12** (p.12)	**12** (p.12)
192 x 96								
445-351	445-352-xx	445-353-01	445-353-02	445-353-03	445-355-01	445-355-02	446-110-01	446-110-02
445-351	445-352-xx	445-353-01	445-353-02	445-353-03	445-355-01	445-355-02	446-110-01	446-110-02
445-351	445-352-xx	445-353-01	445-353-02	445-353-03	445-355-01	445-355-02	446-110-01	446-110-02
445-351	445-352-xx	445-353-01	445-353-02	445-353-03	445-355-01	445-355-02	446-110-01	446-110-02
445-351	445-352-xx	445-353-01	445-353-02	445-353-03	445-355-01	445-355-02	446-110-01	446-110-02
445-351	445-352-xx	445-353-01	445-353-02	445-353-03	445-355-01	445-355-02	446-110-01	446-110-02
192 x 144								
445-391	445-392-xx	445-393-01	445-393-02	445-393-03	445-395-01	445-395-02	446-120-01	446-120-02
445-391	445-392-xx	445-393-01	445-393-02	445-393-03	445-395-01	445-395-02	446-120-01	446-120-02
445-391	445-392-xx	445-393-01	445-393-02	445-393-03	445-395-01	445-395-02	446-120-01	446-120-02
445-391	445-392-xx	445-393-01	445-393-02	445-393-03	445-395-01	445-395-02	446-120-01	446-120-02
288 x 72								
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
445-471	445-472-xx	445-473-01	-	-	-	-	-	-
288 x 96								
445-611	445-612-xx	445-613-01	-	-	-	-	-	-
445-611	445-612-xx	445-613-01	-	-	-	-	-	-
288 x 144								
445-491	445-492-xx	445-493-01	-	-	445-495-01	-	446-130-01	446-130-02
445-491	445-492-xx	445-493-01	-	-	445-495-01	-	446-130-01	446-130-02

Transparent door with mounting brackets

- hight fitting accuracy and sealing
- excellent light transmission of the doors
- deflexion temperature: 135°C (as per DIN 53461)
- high stability, impact strength and hardness, door frame fiber-glass reinforced
- excellent electric and dielectric characteristics
- **optional sealing** between transparent door and panel available (**Material:** foam rubber black, 3 mm thick, self-adhesive on both sides)

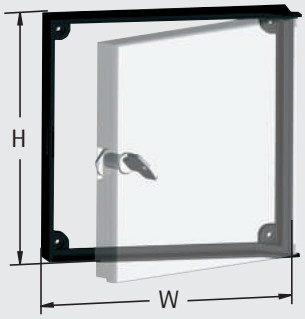


Material:
PC, listed acc. to UL 94 V-0

Degree of protection:
IP 54

Other sizes on request. Please ask us!

A Transparent door with mounting brackets



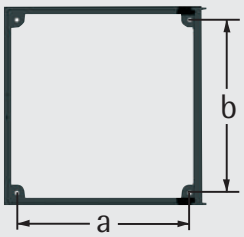
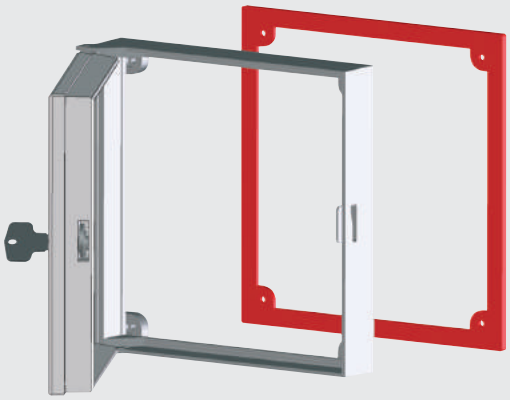


Figure shows version A1
(version A2 without figure)



clear height between front panel and inside of the door = 23 mm

W x H mm	Degree of protection	Hole pattern a x b mm	A1 Transparent door with mounting brackets and lock (lockable)	A2 Transparent door with mounting brackets and plastic sash fastener	Sealing between frame and case
72 x 144	IP 54	52,5 x 125,6	446-100-04	446-100-05	-
72 x 72	IP 54	51,6 x 51,3	446-030-04	446-030-05	-
96 x 144	IP 54	76,9 x 125,1	446-150-04	446-150-05	446-150-10
96 x 48	IP 54	76,9 x 28,8	446-090-04	446-090-05	-
96 x 96	IP 54	77,2 x 76,8	446-040-04	446-040-05	446-040-10
144 x 144	IP 54	125,9 x 125,3	446-050-04	446-050-05	446-050-10
192 x 144	IP 54	173,3 x 125,1	446-120-04	446-120-05	446-120-10
192 x 96	IP 54	173,3 x 76,9	446-110-04	446-110-05	446-110-10
288 x 144	IP 54	269,5 x 125,1	446-130-04	446-130-05	446-130-10

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B Flat transparent door with mounting brackets

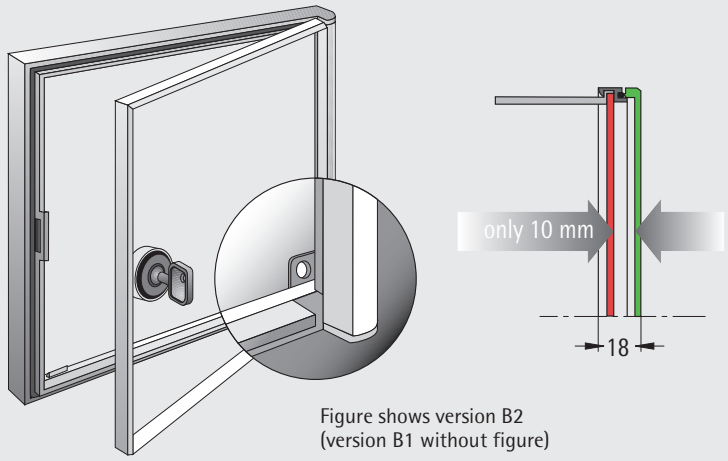


Figure shows version B2
(version B1 without figure)

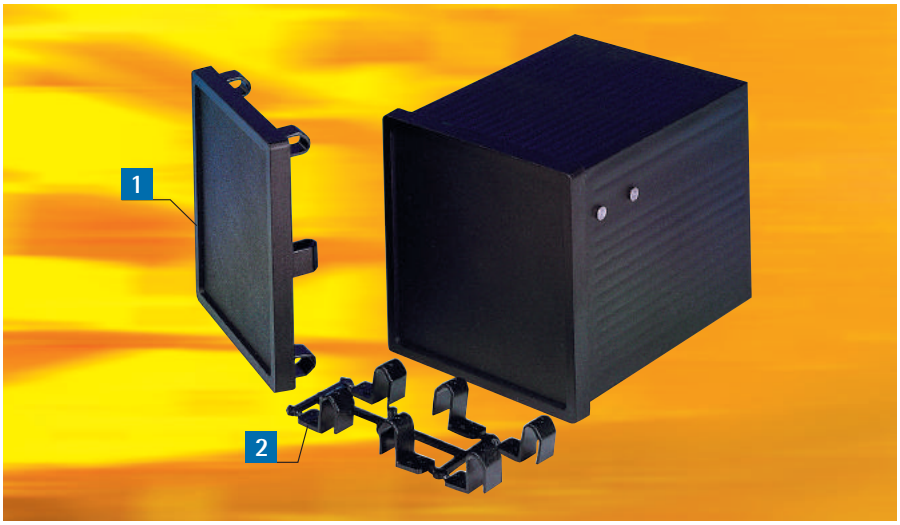
clear height between front panel and inside of the door = 10 mm

W x H mm	Degree of protection	Hole pattern a x b mm	B1 Flat transparent door with mounting brackets and lock (lockable)	B2 Flat transparent door with mounting brackets and plastic sash fastener
144 x 144	IP 54	125,5 x 125,5	447-050-04	447-050-05

Blind cover

- to cover unused panel cut-outs
- can also serve as a solid front frame for DIN enclosures

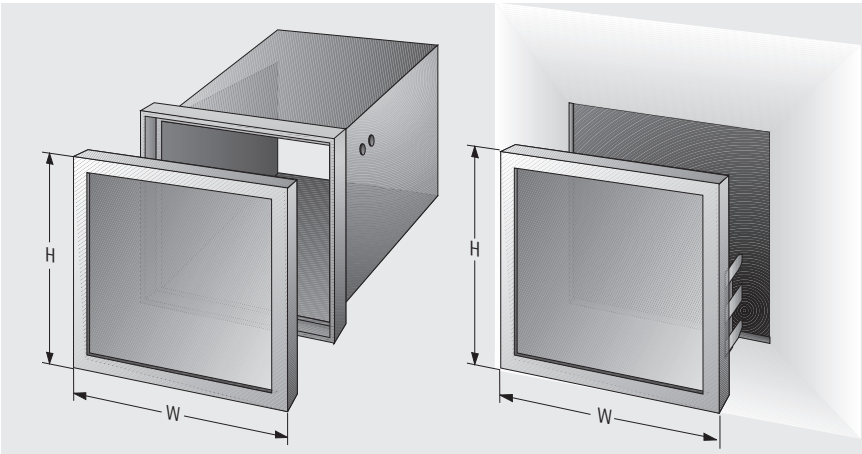
Material:
PC, black



Delivery

Item	Pc.	Description
1	1	Cover
2	6	Clip springs, not fixed

W mm	H mm	Order no.
48	24	448-457-00
96	24	448-117-00
48	48	445-137
72	36	445-077
72	72	445-237
96	48	445-177
96	96	445-317
144	72	445-277
144	96	445-337-00
144	144	445-377



application as closed front frame

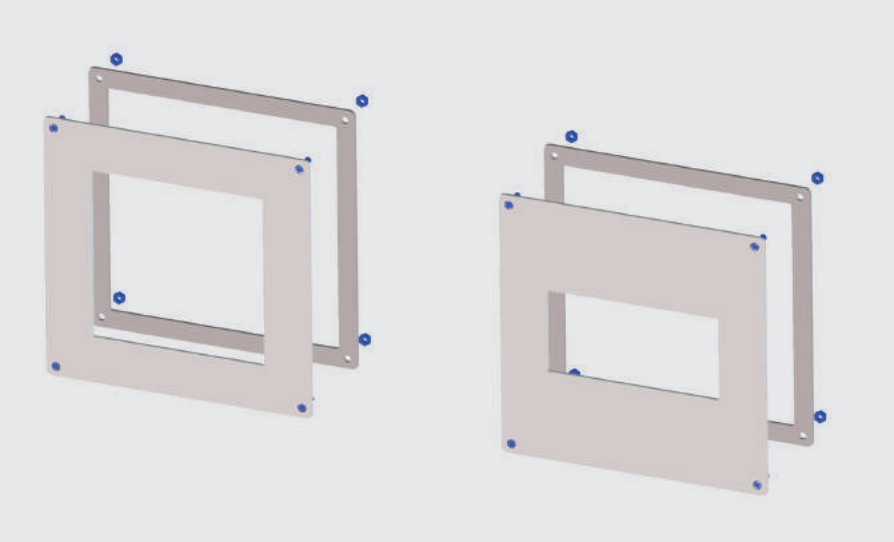
application as blind panel for panel instrument cutouts

Adapter module

- for mounting of smaller panel instrument cases to a panel cut-out for case 144 x 144 mm
- adapter module 1: 96 x 96 mm for cut-out 144 x 144 mm
- adapter module 2: 96 x 48 mm for cut-out 144 x 144 mm

Material:
adapter: sheet steel 1,5 mm
RAL 7035 light grey
fixing frame: sheet steel 1,5 mm
hot-dip galvanised

Description	Order no.
Adapter module 1	445-750-00
Adapter module 2	445-750-10

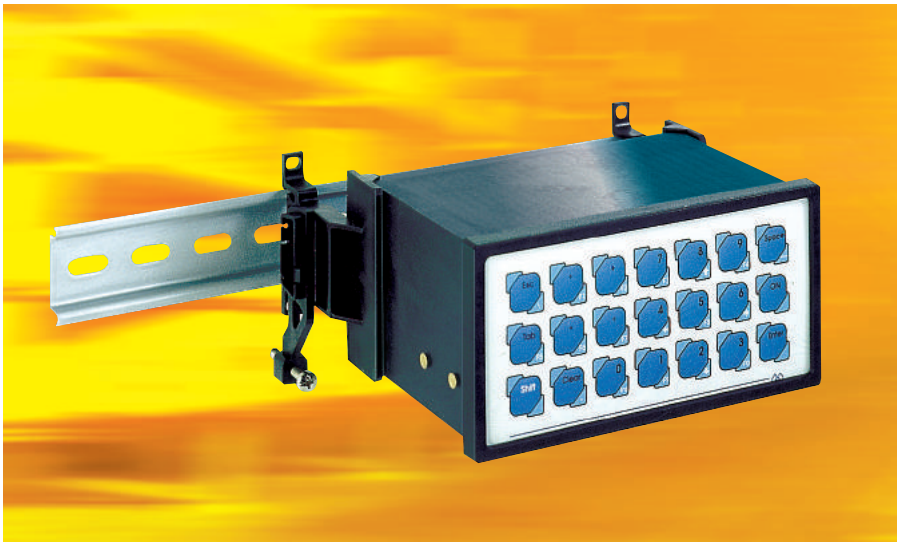


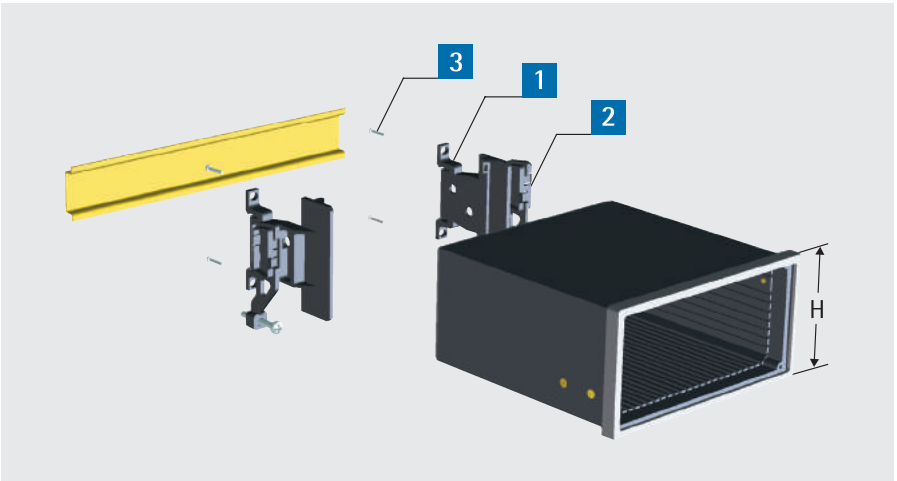
Adapter module 1 Adapter module 2

Adapter for DIN rails TS 35

- for mounting panel instrument cases on DIN rails acc. to DIN EN 50022
- a clearance of 47 mm between the rear panel of the case and the DIN rails guarantees that the connecting cable has a sufficient bending radius
- the fixing clamps, which can be clipped onto the side of the adapter, ensure that the case is properly fixed in place. The adjusting screw can be used to align the case at a right angle to the mounting plate

Material:
POM, black





Delivery

Item	Pc.	Description
1	2	Adapter
2	2	Fixing clamps
3		Mounting material

For enclosure height H mm	Complete set	1 Adapter, individual	2 Fixing clamp for adapter, individual
48	445-701-00	445-701-01	445-710-00
72	445-702-00	445-702-01	445-710-00
96	445-703-00	445-703-01	445-710-00
144	445-704-00	445-704-01	445-710-00

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Rounded front frame 96 x 96

- perfect combination of design and functionality
- injection-moulded snap-fits ensure a solid attachment to the enclosure
- integrated sealings
- with front panel IP 54 is possible

Material: PC, black

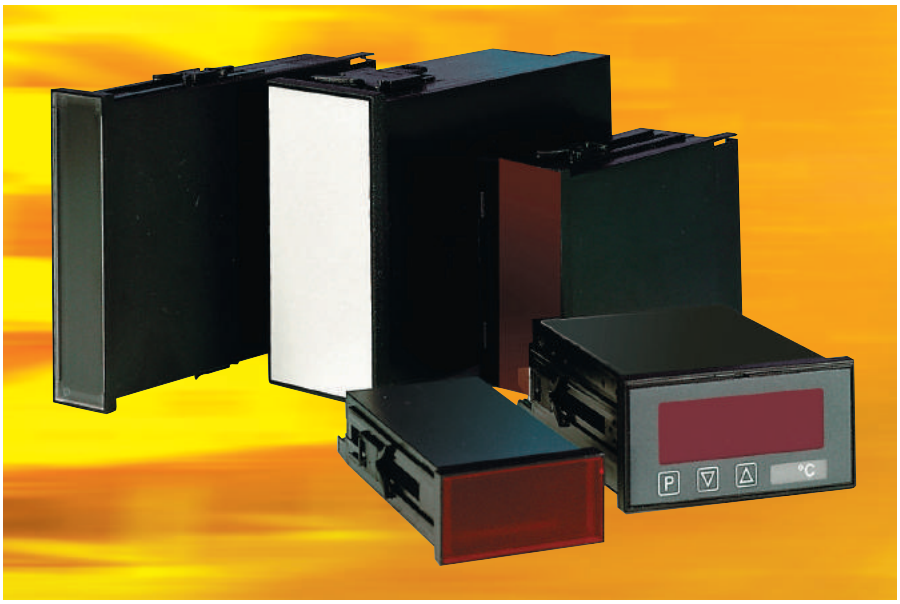
Other colours on request!

Description	Order no.
Front frame and sealings, lose	445-316-30
Matching front panel	445-316-33

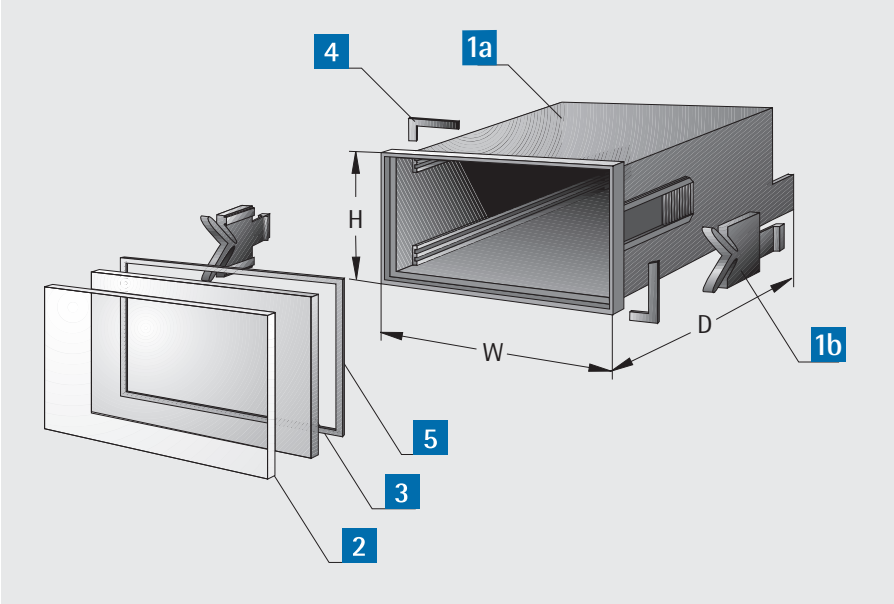


norm-case

- non-reflecting filter screen, can be clipped on for accurate fitting
- front panel can be clipped on for accurate fitting
- integrated PCB cover on the rear panel
- space for a second PCB
- quick mount via plastic clips that lock into place
- stackable both horizontally and vertically (e.g. in a grid system)
- installation in panel with thickness of up to 50 mm possible
- case and accessories can be recycled as they are mono-materials and contain no metal parts



Material:
case:
ABS black, listed acc. to UL 94 V-2
filter screen:
Plexiglass red listed acc. to UL 94 HB
front panel:
ABS grey, listed acc. to UL 94 HB



Delivery

Item	Pc.	Description
1a	1	Case
1b	2	Fixing clamps

W x H x D mm	1 Case	2 Filter screen	3 Front panel	4 Sealing between case and panel	5 Sealing between front panel / filter screen and case	6 Rear panel closed	Fixing clamp
48 x 24 x 90,5	448-441	448-452-09	448-451-01	448-445-01	448-445-02	-	448-100-10
48 x 48 x 130,5	448-121-00	448-132-09	448-131-01	448-135-01	448-135-02	-	448-200-00
72 x 24 x 96,5	448-421-00	448-432-09	-	448-425-01	448-425-02	-	448-100-10
72 x 36 x 72,0	448-062-00	448-052-09	448-051-01	448-055-01	448-055-02	448-053-01	448-100-10
72 x 36 x 96,5	448-041-00	448-052-09	448-051-01	448-055-01	448-055-02	-	448-100-10
96 x 24 x 130,5	448-102-00	448-112-09	448-111-01	448-115-01	448-115-02	-	448-100-10
96 x 48 x 122,0	448-162	448-162-09	448-162-01	448-175-01	448-175-02	-	448-200-00
96 x 48 x 130,5	448-163-00	448-162-09	448-162-01	448-175-01	448-175-02	-	448-200-00

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norm-case 48 x 24 x 82 mm

- protection system IP 65
- front panel with recess for front foil and moulded sealing (please order sealing separately!)
- safe connection of enclosure and rear panel due to moulded-in threaded inserts M2
- registered design of quick fixing to control panel
- enclosures can easily be customised with cut-outs, ventilation slots or displays by adaption of the tooling

Material:
PPE/PS-GF20, listed acc. to UL 94 V-1

Finish: RAL 9005 jet black

Special depths, colours, individual modifications or foil keypads available on request!



Delivery

Item	Pc.	Description
1	1	Case
2	2	Hook-in fixing

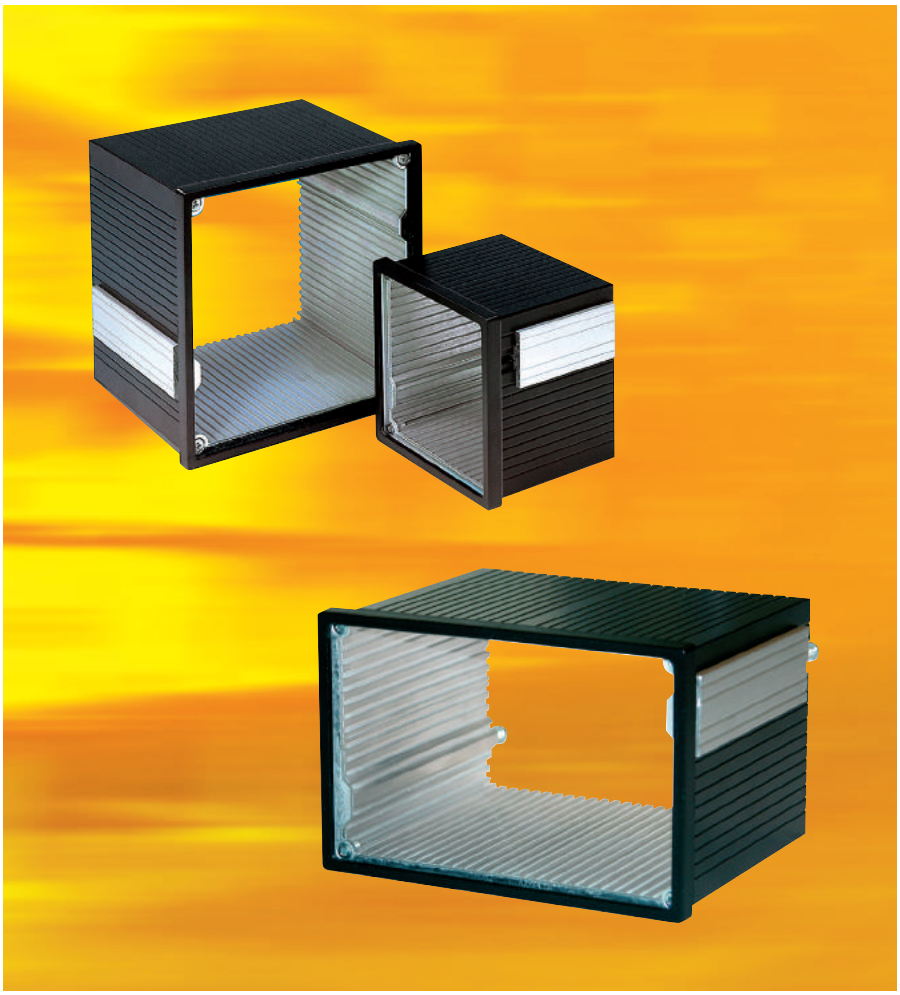
Case	Rear panel	Moulded sealing between case and panel
448-442-00	448-453-01	448-445-05

Aluminium panel instrument case

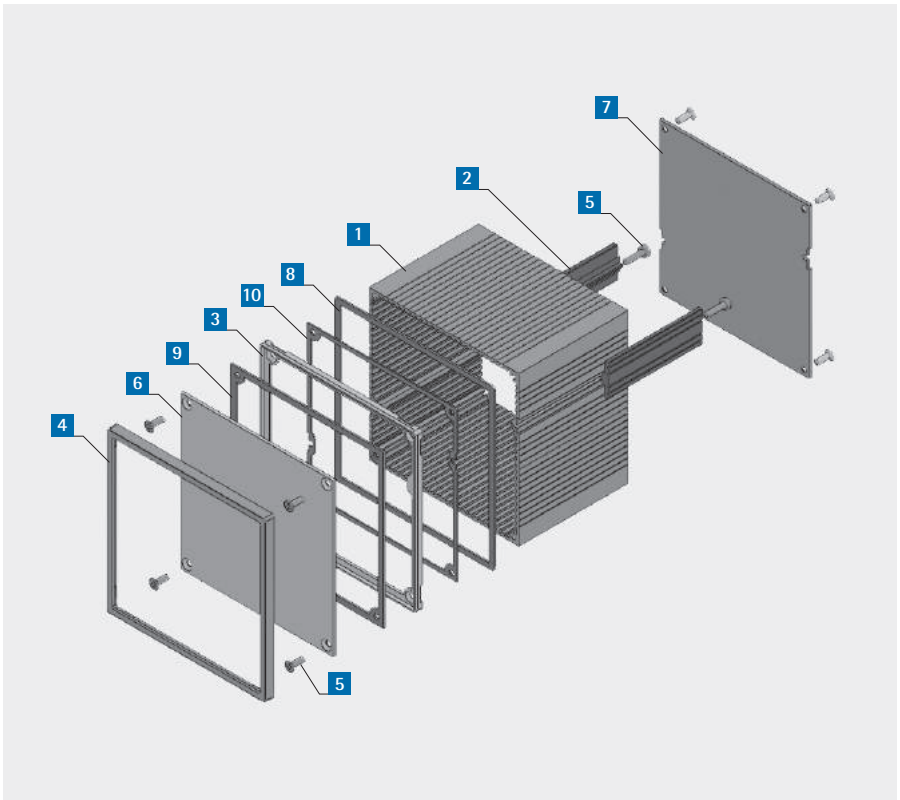
- high stability due to closed extruded aluminium profile
- well suited for EMC shielding due to conductive coating
- as an alternative to the removable plastic front frame, a transparent door from our standard product line can also be attached (see page 12)

Material:
enclosure/mounting extrusion:
aluminium
frame: Zinc, die-cast
front / rear panel: aluminium 2,5 mm
front frame: PC, black

Finish:
enclosure extrusion:
exterior finish RAL 9005 deep black,
interior conductive
mounting extrusion: anodized
zinc die-cast frame: conductive surface
front / rear panel: exterior anodized,
conductive rear



Other dimensions and individual colours and machining on request. Please order front panel, rear panel and sealings separately!



Available components

Item	Pc.	Description
1	1	Enclosure extrusion
2	2	Mounting extrusion
3	1	Frame
4	1	Front frame
5		Mounting material
6		Front panel
7		Rear panel
8		Sealing between case and panel
9		Sealing between front panel and case
10		Sealing between frame and extrusion

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Aluminium panel instrument case 96 x 96 (W x H)

D mm	d mm	1-5 Case	6 Front panel	7 Rear panel	8 Sealing between case and panel	9 Sealing between front panel and case	10 Sealing between frame and profile
60,0	51,50	442-300-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03
82,0	73,50	442-301-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03
107,0	98,50	442-304-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03
116,0	107,50	442-302-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03
138,0	129,50	442-303-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03
163,0	154,50	442-305-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03
209,0	200,50	442-306-00	442-310-00	442-313-00	442-315-01	442-315-02	442-315-03

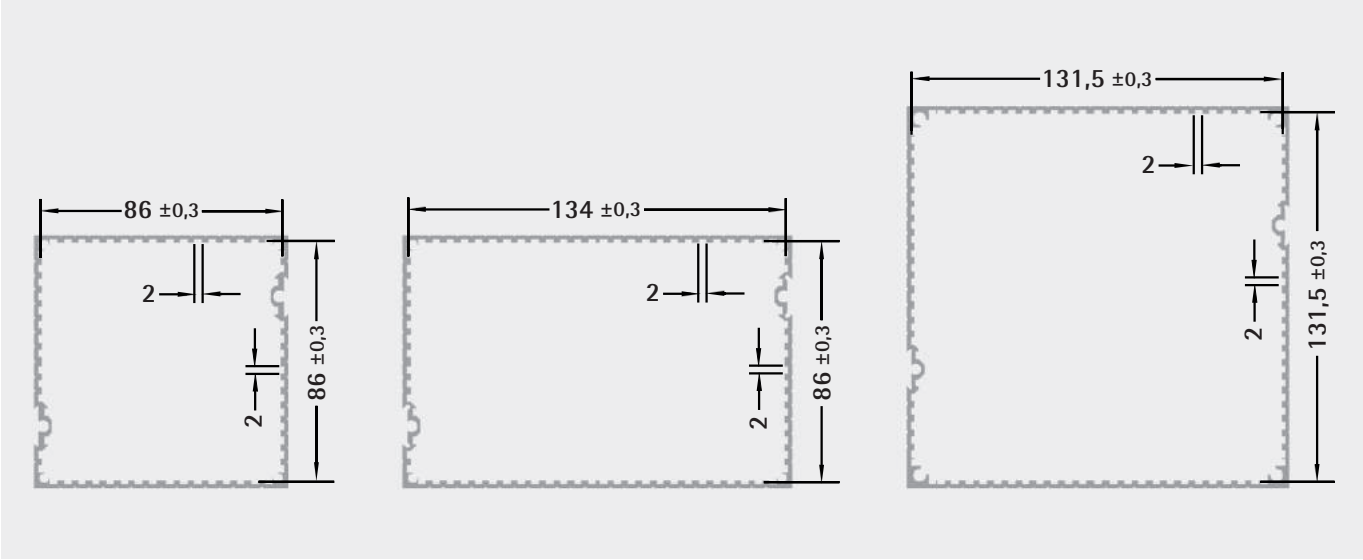
Aluminium panel instrument case 144 x 96 (W x H)

D mm	d mm	1-5 Case	6 Front panel	7 Rear panel	8 Sealing between case and panel	9 Sealing between front panel and case
60,0	51,50	442-320-00	442-330-00	442-333-00	442-335-01	442-335-02
82,0	73,50	442-321-00	442-330-00	442-333-00	442-335-01	442-335-02
107,0	98,50	442-324-00	442-330-00	442-333-00	442-335-01	442-335-02
116,0	107,50	442-322-00	442-330-00	442-333-00	442-335-01	442-335-02
138,0	129,50	442-323-00	442-330-00	442-333-00	442-335-01	442-335-02
163,0	154,50	442-325-00	442-330-00	442-333-00	442-335-01	442-335-02
209,0	200,50	442-326-00	442-330-00	442-333-00	442-335-01	442-335-02

Aluminium panel instrument case 144 x 144 (W x H)

D mm	d mm	1-5 Case	6 Front panel	7 Rear panel	8 Sealing between case and panel	9 Sealing between front panel and case	10 Sealing between frame and profile
60,0	51,50	442-360-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01
82,0	73,50	442-361-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01
107,0	98,50	442-364-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01
116,0	107,50	442-362-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01
138,0	129,50	442-363-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01
163,0	154,50	442-365-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01
209,0	200,50	442-366-00	442-370-00	442-373-00	442-375-03	442-375-02	442-375-01

Internal dimensions



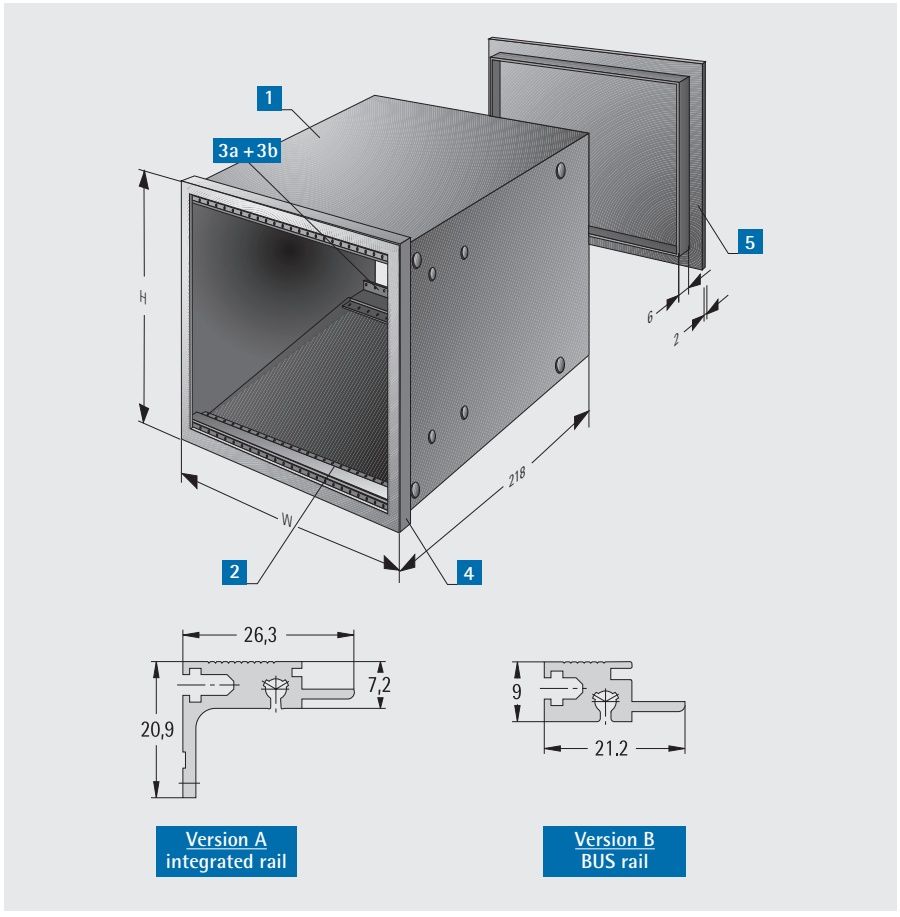
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Plastic panel instrument case with 19" plug-in system

- installation dimensions of plug-in system acc. to IEC 60297-3-101
- for installing euroboards of 100 x 160 mm
- front frame can be clipped on or glued on
- also available with transparent door
- **three versions available:**
  - **A:** case for connectors (rear: integrated module rail)
  - **B:** BUS case (rear: BUS module rail)
  - **C:** case, empty (without module rails)

Material:
PPE/PS-GF20, black





Delivery

Item	Pc.	Description
1	1	Panel instrument case with mounting pins on the sides/top and bottom
2	(2)	Front: standard module rails with threaded strips M2.5 (only types A and B)
3a	(2)	Rear: integrated module rails, 32 pole acc. to DIN 41612 (type A only)
3b	(2)	Rear: module rails „BUS" model, with threaded strips M2.5 (type B only)
4	1	Front frame
5	1	Rear panel, snap-in
6	(4)	Card guides (without fig.) (only types A and B)

W x H mm	Panel cut-out w x h	HP	A Case for connector	B Case BUS	C Case empty	Cover plate for empty case	Filter screen for empty case	Transparent door with lock	Transparent door with sash fastener
72 x144	68 x 138	12	446-102	446-106	446-101	445-271	445-272-09	446-100-01	446-100-02
96 x144	92 x 138	16	446-152	446-156	446-151	445-331	445-332-09	446-150-01	446-150-02

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Sheet steel panel instrument case with 19" plug-in system

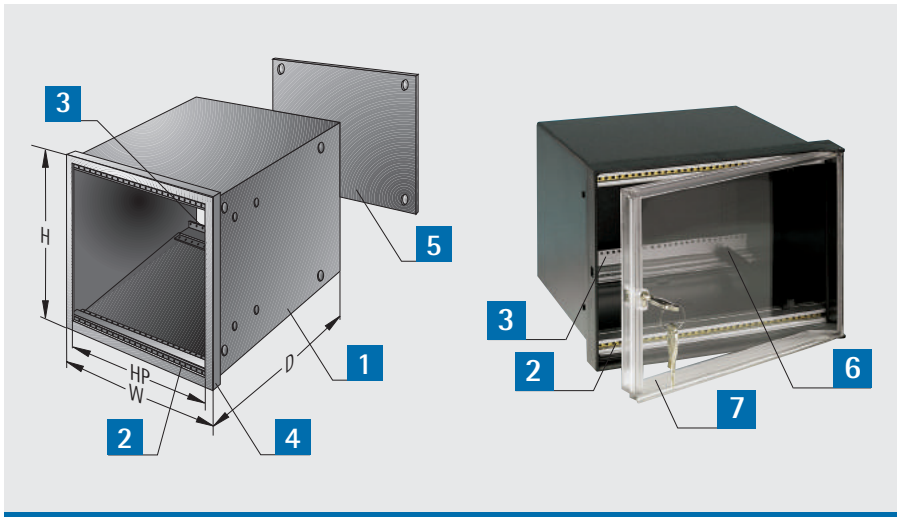
- acc. to IEC 61554
- with 19" plug-in system acc. to IEC 60297-3-101
- for euroboards and modules 100 x 160 mm and 100 x 220 mm
- also available with lockable transparent door
- **three versions available:**
  A: case without door
  B: case with door
  C: case, empty

Material:
case: sheet steel
front frame: PC, black
rear panel: PPE/PS-GF20, black

Finish: RAL 9005 black

Degree of protection:
IP 42 (from the front)





A Version without door B Version with door

Other colours available upon request for orders starting at 100 pieces.

The transparent door is permanently attached to the case. It is glued on from the back with sealing compound ensuring the case and door are securely sealed against the panel.

Delivery

Item	Pc.	Description
1	1	Case with side mounting pins
2	(2)	Front: integrated module rail with threaded strips M2.5 (only types A and B)
3	(2)	Rear: integrated module rail with threaded strips M2.5 for plug-in connectors (32/64 pole) acc. to DIN 41612 (only types A and B)
4	1	Front frame
5	1	Rear panel with 4 screws
6	(2)	Card guides 160 mm (only types A and B)
7	(1)	Transparent door with lock (only type B)

W x H mm	HP	Cut-out for instrument panel w x h mm	A Case without door D = 200 mm	A Case without door D = 260 mm	B Case with door D = 200 mm	B Case with door D = 260 mm	C Case empty D = 200 mm	C Case empty D = 260 mm
48 x 144	7	42 x 138	443-241	443-247	-	-	443-741	443-747
72 x 144	12	66 x 138	443-101	443-107	443-402	443-408	443-601	443-607
96 x 144	16	90 x 138	443-151	443-157	443-452	443-458	443-651	443-657
144 x 144	26	138 x 138	443-051	443-057	443-352	443-358	443-551	443-557
192 x 144	35	186 x 138	443-121	443-127	443-422	443-428	443-621	443-627
288 x 144	54	282 x 138	443-131	443-137	443-432	443-438	443-631	443-637

Fixing clamp Type C (acc. to DIN 43835)



- threaded rod M5 x 186
- dimensions: 186 x 27 x 7,8 mm

Order no.
443-001

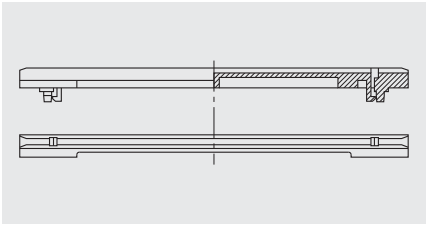
Heavy-duty fixing clamp



- threaded rod M5 x 186 with pressure piece
- dimensions: 198,5 x 35,9 x 7,8 mm

Order no.
443-002

Card guide



- for 160 mm / 220 mm long cards
- flammability tested acc. to UL 94 V-0

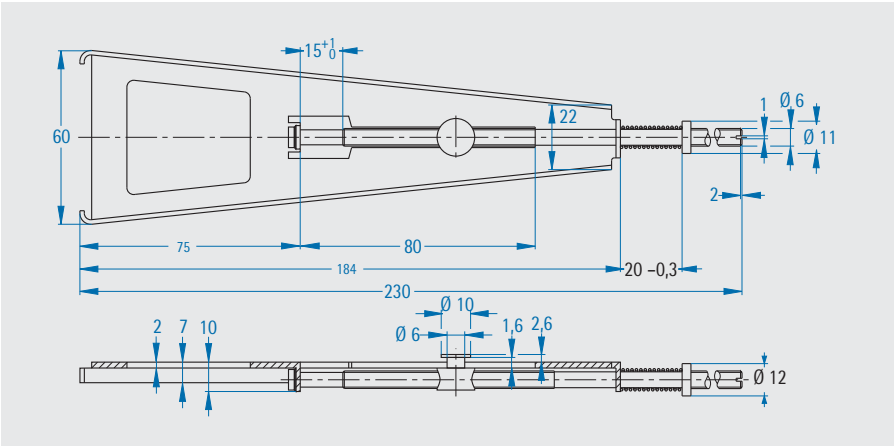
Material:
PBT

for card depth d mm	Order no.
160	240-401-00
220	240-406-00

Mounting element acc. to DIN 43834

- for heavy plug-in units, etc.

An additional ø 12mm hole on the cases is required for this!

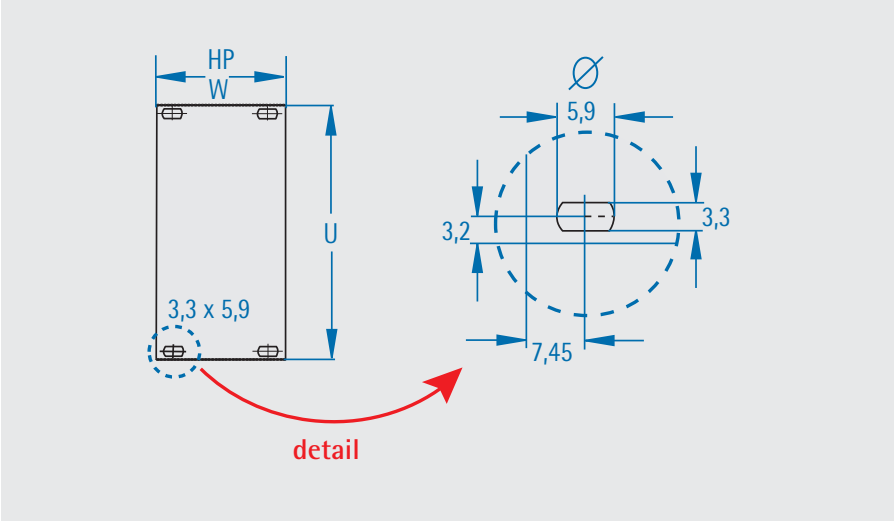


Order no.
443-003

Front panels 3 U

Material:
aluminium 2,5 mm

Finish:
front anodised, conductive rear



HP	W mm	H mm	Order no.
7	35	129	243-007-45
12	61	129	243-012-45
16	81	129	243-016-45
26	132	129	243-026-45
35	178	129	243-035-45
54	274	129	243-054-45

Enclosure system apra Rail



... the perfect shell for valuable electronics

apra norm
www.apra.de

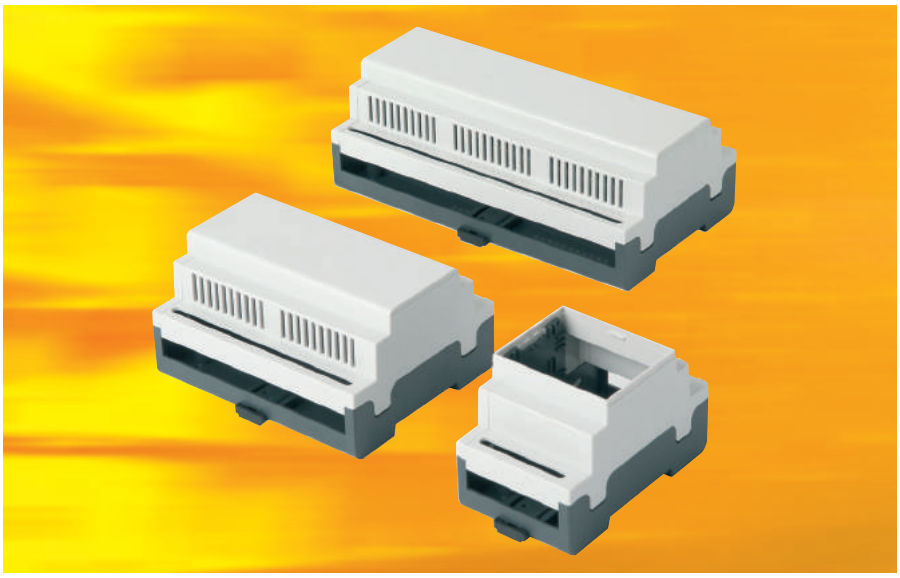
apra Rail DB

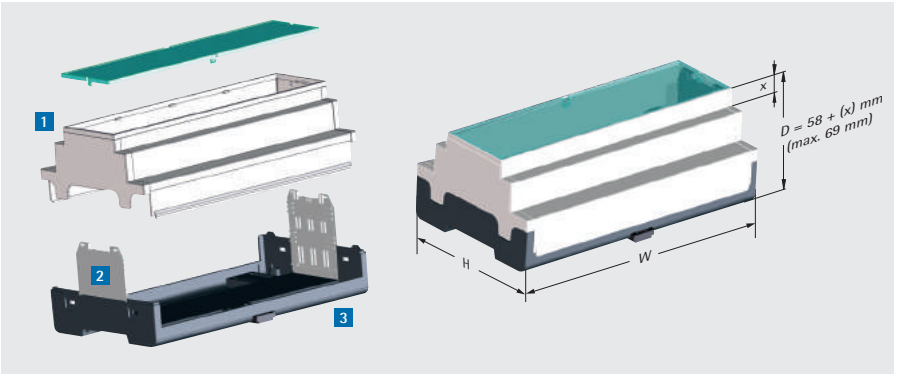
- sturdy electronic enclosure as per DIN EN 43880 (modular case)
- mounting on top hat rail or wall mounting
- parts can be mounted without tools
- snap-in front panel available (page 38)
- safe hold of horizontally or vertically mounted PCB due to separate fixings which may be used in various positions
- **Installation positions can be found on the next page.**
- possibility to screw PCB to domes on bottom part (Dome D = 2,7 x 8 mm)
- for a PCB thickness of 1,5 mm, the lenght of the screws should be between 6,5 mm and 9,5 mm
- customised adaptation and printing on request (see page 38)
- free choice of colours

Dimension W x H x D:
DB 1 module: 18 x 90 x 58 mm (max. 69 mm)
DB 2 modules: 36 x 90 x 58 mm (max. 69 mm)
DB 3 modules: 53,5 x 90 x 58mm (max. 69 mm)
DB 4 modules: 72 x 90 x 58 mm (max. 69 mm)
DB 6 modules: 107 x 90 x 58 mm (max. 69 mm)
DB 9 modules: 160,6 x 90 x 58 mm (max. 69 mm)
DB 12 modules: 211.8 x 90 x 58 mm (max. 69 mm)

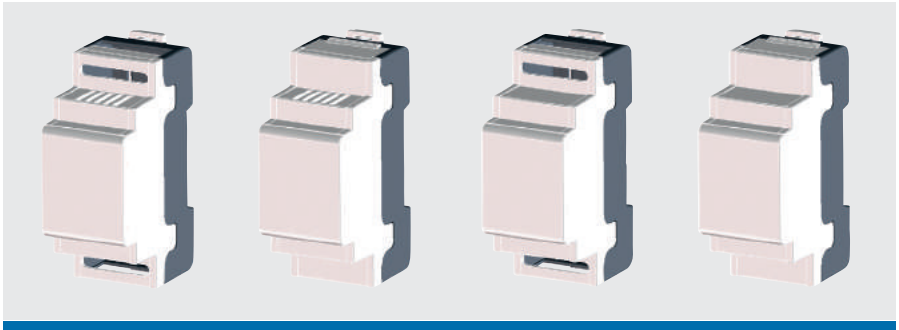
The enclosure depth can be increased by maximum 11 mm in sector x (see drawing)

Material: PC, listed acc. to UL 94 V-0
Finish:
standard top shell: RAL 7035 light grey
standard bottom shell: RAL 7016 anthracite grey

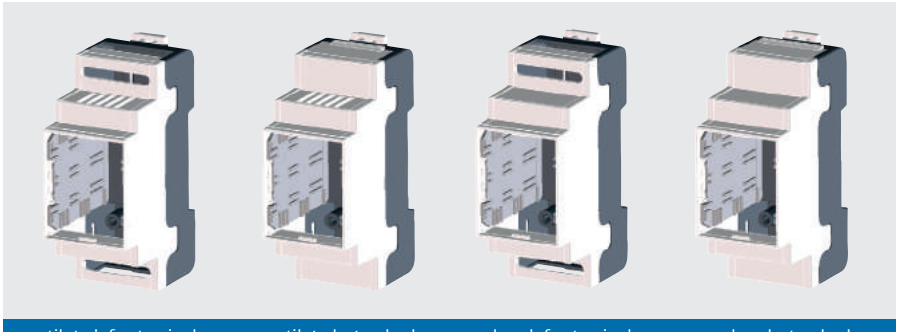




Types CLOSED (using the example of DB case 2 modules)



Types OPEN FOR FRONT PANEL (using the example of DB case 2 modules)

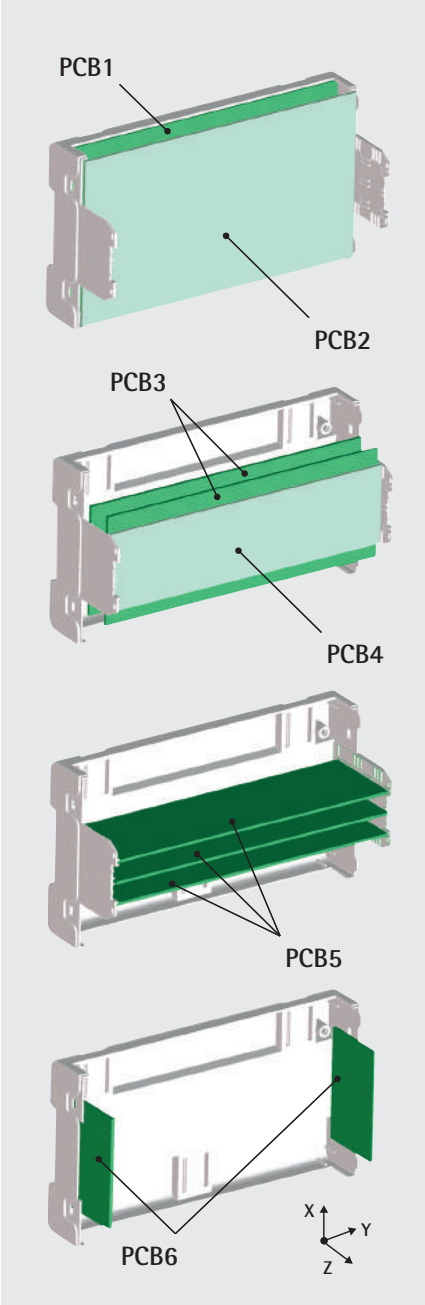


Delivery

Item	Pc.	Description
1	1	apra Rail DB, consisting of top and bottom shell
2	2	PCB fixing
3	2/3	mounting clips

No. of modules	closed, ventilated, for terminals	closed, ventilated, standard	closed, not ventilated for terminals	closed, not ventilated standard	open, ventilated, for terminals	open, ventilated, standard	open, not ventilated for terminals	open, not ventilated standard
1 module	449-310-55	449-310-50	449-310-45	449-310-40	449-310-65	449-310-60	449-310-05	449-310-70
2 modules	449-320-55	449-320-50	449-320-45	449-320-40	449-320-65	449-320-60	449-320-35	449-320-30
3 modules	449-330-55	449-330-50	449-330-45	449-330-40	449-330-65	449-330-60	449-330-15	449-330-10
4 modules	449-340-55	449-340-50	449-340-45	449-340-40	449-340-65	449-340-60	449-340-15	449-340-10
6 modules	449-360-55	449-360-50	449-360-45	449-360-40	449-360-65	449-360-60	449-360-05	449-360-00
9 modules	449-370-55	449-370-50	449-370-45	449-370-40	449-370-65	449-370-60	449-370-05	449-370-00
12 modules	449-380-55	449-380-50	449-380-45	449-380-40	449-380-65	449-380-60	449-380-05	449-380-00

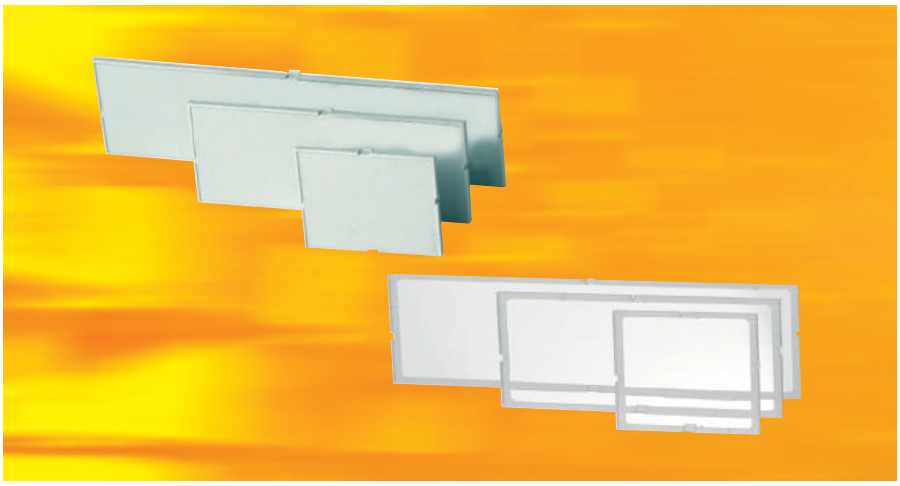
apra Rail DB PCB dimensions and installation positions



Enclosure	PCB	X	Y	Z
1 module	PCB1	86,0	13,0	-
	PCB2	85,6	12,4	-
	PCB3	56,6	12,4	-
	PCB4	40,6	12,4	-
	PCB5	-	12,4	43,0
	PCB6	58,2	-	34,3
2 modules	PCB1	86,0	31,0	-
	PCB2	85,6	30,4	-
	PCB3	56,6	30,4	-
	PCB4	40,6	30,4	-
	PCB5	-	30,4	43,0
	PCB6	58,2	-	34,3
3 modules	PCB1	86,0	48,5	-
	PCB2	85,6	47,9	-
	PCB3	56,6	47,9	-
	PCB4	40,6	47,9	-
	PCB5	-	47,9	43,0
	PCB6	58,2	-	34,3
4 modules	PCB1	86,0	67,0	-
	PCB2	85,6	66,4	-
	PCB3	56,6	66,4	-
	PCB4	40,6	66,4	-
	PCB5	-	66,4	43,0
	PCB6	58,2	-	34,3
6 modules	PCB1	86,0	102,0	-
	PCB2	85,6	101,4	-
	PCB3	56,6	101,4	-
	PCB4	40,6	101,4	-
	PCB5	-	101,4	43,0
	PCB6	58,2	-	34,3
9 modules	PCB1	86,0	155,6	-
	PCB2	85,6	155,0	-
	PCB3	56,6	155,0	-
	PCB4	40,6	155,0	-
	PCB5	-	155,0	43,0
	PCB6	58,2	-	34,3
12 modules	PCB1	86,0	207,6	-
	PCB2	85,6	207,0	-
	PCB3	56,6	207,0	-
	PCB4	40,6	207,0	-
	PCB5	-	207,0	43,0
	PCB6	58,2	-	34,3

apra Rail DB front panel

- snap-in front panel for apra Rail DB series
- free choice of colours
- individual machining and printing on request
- perfect for mounting of foils
- secure fastening due to sturdy clips



Dimensions front panel W x H x D:
for DB 1 module: 15,5 x 41,4 x 2,5 mm
for DB 2 modules: 34 x 41,6 x 2,5 mm
for DB 3 modules: 51,4 x 41,6 x 2,5 mm
for DB 4 modules: 69,8 x 41,6 x 2,5 mm
for DB 6 modules: 104,7 x 41,6 x 2,5 mm
for DB 9 modules: 158,5 x 41,6 x 2,5 mm
for DB 12 modules: 209,3 x 41,4 x 2,5 mm

Material:
PC, listed acc. to UL 94 V-0

Description	1 module	2 modules	3 modules	4 modules	6 modules	9 modules	12 modules
light grey RAL 7035	449-310-11	449-320-01	449-330-01	449-340-01	449-360-11	449-370-11	449-380-11
transparent	449-310-12	449-320-02	449-330-02	449-340-02	449-360-12	449-370-12	449-380-12

Individual adaptation? No problem for us!

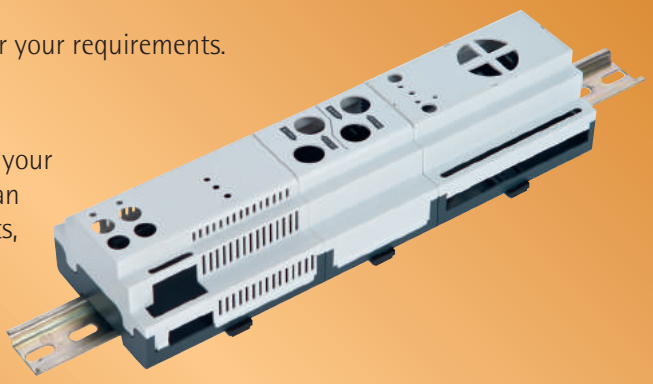
The enclosures of the apraRail DB series can be adapted to your requirements such as cutouts for terminals, ventilation slots or displays. Almost infinite possibilities!

☑ mechanical treatment

Smaller and average quantities will be machined as per your requirements.

☑ modification of tools

Average and higher quantities can be produced as per your requirements using our modular tools. Therefore we can replace single tool segments with customised segments, enabling us to offer you a cost effective, individual enclosure.



☑ printing and front foils

The printing of your individual rail enclosures will be done as per your request and in regard to the technical possibilities either by tampon- or digital printing. The specification for printing data you can find on our homepage. Unlimited scope of colours and designs can be realized. Information about foils and keypads you can find on page 7.

www.apra.de

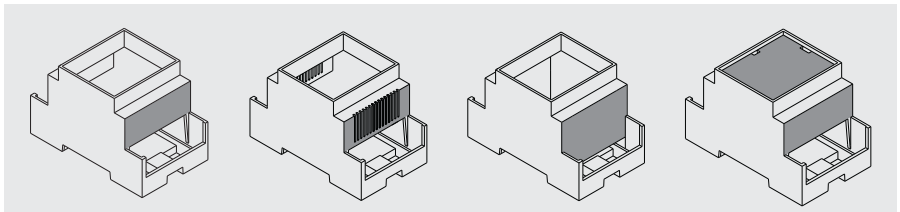
apra Rail MB

- parts can be mounted without tools
- mounting on top-hat rail or on wall
- snap-in front panel availabe (see page 41)
- terminal covers can be added as per your requirements (see page 41)
- height of enclosures can be increased using curved cover (see page 42)
- PCB installation dimensions: see page 40

Material:
PC, listed acc. to UL 94 V-0



Configuration examples



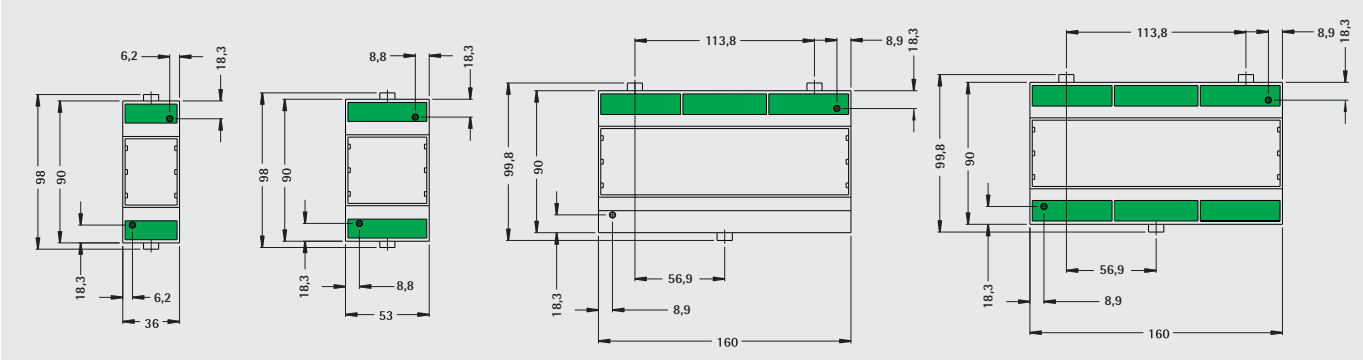
Type I: short side panel | Type II: short side panel, ventilated | Type III: long side panel | Type IV: short side panel with closed front

Accessories beginning on page 41

Delivery

Item	Pc.	Description
1	1	Top part
2	1	Bottom part
3	2/3	Snap-in mounting clip

Description	Type	No. of modules	W mm	H mm	L mm	1 side open	2 sides open
apra Rail MB	I	1 module	17,5	90	58	-	449-110-00
apra Rail MB	II	1 module	17,5	90	58	-	449-110-60
apra Rail MB	III	1 module	17,5	90	58	-	449-110-20
apra Rail MB	IV	1 module	17,5	90	58	-	449-110-40
apra Rail MB	I	2 modules	36	90	58	-	449-120-00
apra Rail MB	II	2 modules	36	90	58	-	449-120-60
apra Rail MB	III	2 modules	36	90	58	-	449-120-20
apra Rail MB	IV	2 modules	36	90	58	-	449-120-40
apra Rail MB	I	3 modules	53	90	58	-	449-130-00
apra Rail MB	II	3 modules	53	90	58	-	449-130-60
apra Rail MB	III	3 modules	53	90	58	-	449-130-20
apra Rail MB	IV	3 modules	53	90	58	-	449-130-40
apra Rail MB	I	4 modules	71	90	58	-	449-140-00
apra Rail MB	II	4 modules	71	90	58	-	449-140-60
apra Rail MB	III	4 modules	71	90	58	-	449-140-20
apra Rail MB	IV	4 modules	71	90	58	-	449-140-40
apra Rail MB	I	5 modules	88	90	58	449-150-00	449-150-10
apra Rail MB	II	5 modules	88	90	58	449-150-60	449-150-70
apra Rail MB	III	5 modules	88	90	58	449-150-20	449-150-30
apra Rail MB	IV	5 modules	88	90	58	449-150-40	449-150-50
apra Rail MB	I	6 modules	106	90	58	449-160-00	449-160-10
apra Rail MB	II	6 modules	106	90	58	449-160-60	449-160-70
apra Rail MB	III	6 modules	106	90	58	449-160-20	449-160-30
apra Rail MB	IV	6 modules	106	90	58	449-160-40	449-160-50
apra Rail MB	I	9 modules	160	90	58	449-170-00	449-170-10
apra Rail MB	II	9 modules	160	90	58	449-170-60	449-170-70
apra Rail MB	III	9 modules	160	90	58	449-170-20	449-170-30
apra Rail MB	IV	9 modules	160	90	58	449-170-40	449-170-50
apra Rail MB	I	12 modules	210	90	58	-	449-500-10
apra Rail MB	II	12 modules	210	90	58	-	449-500-70

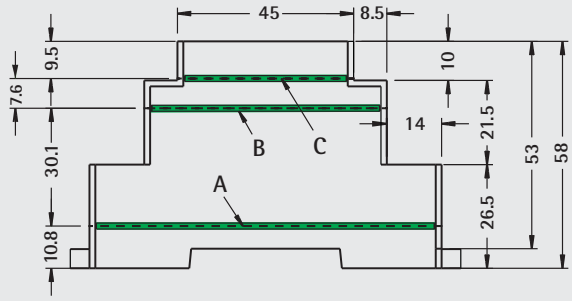


2 modules, 2 sides open | 3 modules, 2 sides open | 9 modules, 1 side open | 9 modules, 2 sides open

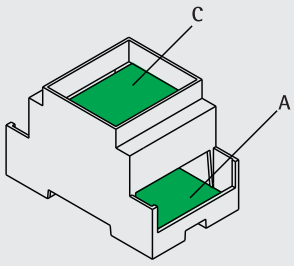
apra Rail MB PCB dimensions and installation positions

Please see the possible mounting positions for circuit boards for apra Rail MB in the drawing mentioned below.

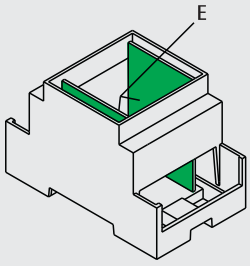
PCB mounting:
option A: fixing with screws
option B-F: PCB slides in



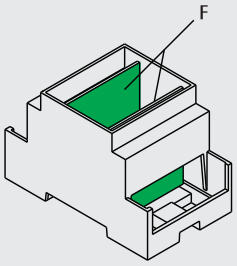
cross-section mounting position A/B/C (horizontal)



mounting position A/C (horizontal)



mounting position E (vertical)



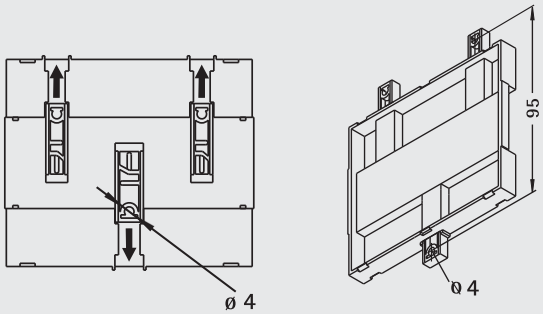
mounting position F (vertical)

No. of modules	Installation position				
	A (horizontal) mm	B (horizontal) mm	C (horizontal) mm	E (vertical) mm	F (vertical) mm
1 module	86,5 x 14	57 x 14	41,8 x 14	34 x 59,6	40 x 14,8
2 modules	86,5 x 33	57 x 32	42 x 32	34 x 59,6	40 x 33
3 modules	86,5 x 50	57 x 49	42 x 49	34 x 59,6	40 x 50
4 modules	86,5 x 68	57 x 67	42 x 67	34 x 59,6	40 x 68
5 modules	86,5 x 84	57 x 83	42 x 83	34 x 59,7	40 x 84
6 modules	86,5 x103	57 x 102	42 x 102	34 x 59,6	40 x 103
9 modules	86,5 x 155	57 x 155,4	42 x 154	34 x 59,6	40 x 155
12 modules	86,5 x 208	57 x 207	41,8 x 207	34 x 59,6	40 x 208

Snap-in mounting clip

- DIN rail fixing
- suitable for top hat rail TS 35
- can also be used for wall mounting (3 x ø 4 mm)
- **included in the delivery of apra Rail MB cases**

Description	Order no.
Snap-in clip, white	449-001-00
Snap-in clip, black	449-002-00

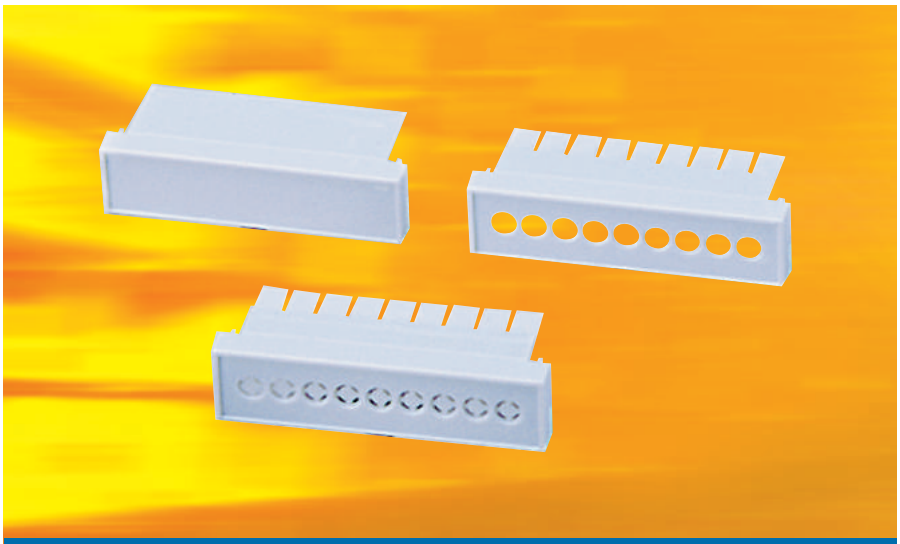


rear view | direct wall mounting

apra Rail MB terminal cover

- protection against contacts to mounted connectors
- can be used to cover unused terminals
- 3 versions available: closed, perforated or with open drillings
- machining and printing possible

Material:
PC, listed acc. to UL 94-V0



versions: closed · perforated · open for drillings

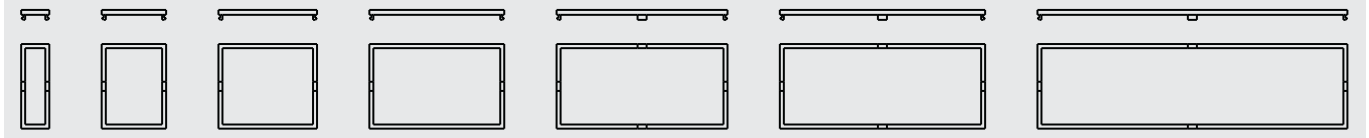
No. of modules	closed	open		perforated		open		open	
		contacts	grid 5,08 mm	contacts	grid 5,08 mm	contacts	grid 7,5 mm	contacts	grid 10,16 mm
1 module	449-110-09	3	449-110-06	3	449-110-05	2	449-110-07	2	449-110-08
2 modules	449-120-09	6	449-120-06	6	449-120-05	4	449-120-07	3	449-120-08
3/6/9/12 modules	449-130-09	9	449-130-06	9	449-130-05	6	449-130-07	5	449-130-08
4 modules	449-140-09	12	449-140-06	12	449-140-05	8	449-140-07	6	449-140-08
5 modules	449-150-09	15	449-150-06	15	449-150-05	10	449-150-07	7	449-150-08

apra Rail MB front panel

- can be clipped on enclosure
- 4 types available:
- grey
- red transparent
- transparent
- grey transparent
- foils can be integrated
- machining and printing possible

Material:
PC, listed acc. to UL 94-V0





Top view 1-9 modules

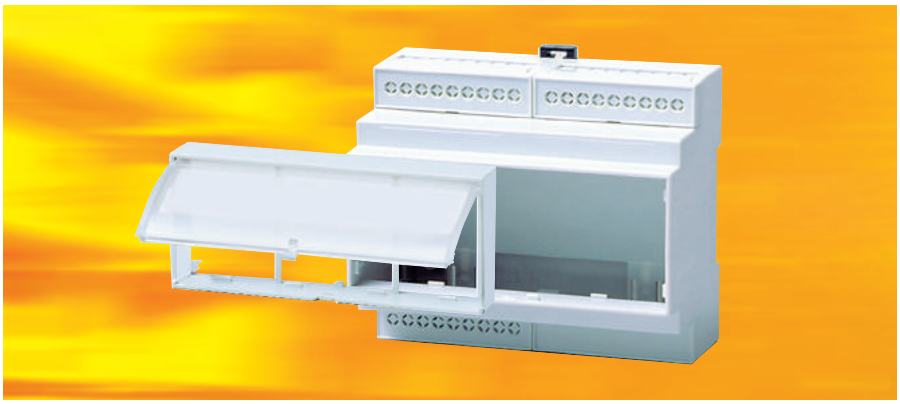
Modules	grey	grey transparent	red transparent	transparent
1 module	449-110-01	449-110-04	449-110-02	449-110-03
2 modules	449-120-01	449-120-04	449-120-02	449-120-03
3 modules	449-130-01	449-130-04	449-130-02	449-130-03
4 modules	449-140-01	449-140-04	449-140-02	449-140-03
5 modules	449-150-01	449-150-04	449-150-02	449-150-03
6 modules	449-160-01	449-160-04	449-160-02	449-160-03
9 modules	449-170-01	449-170-04	449-170-02	449-170-03
12 modules	449-500-01	-	-	449-500-03

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apra Rail MB curved cover

- protection against conctact of switching elements
- available with or without hinge

Material:
PC, listed acc. to UL 94 V-0

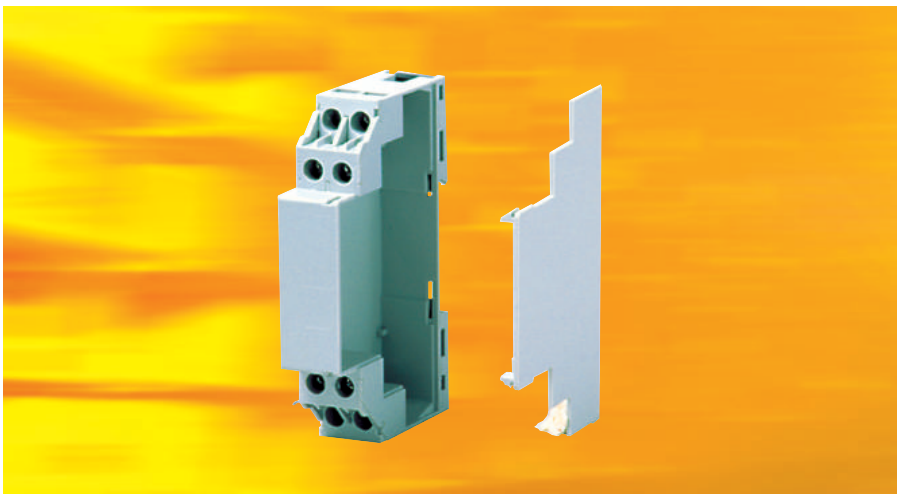


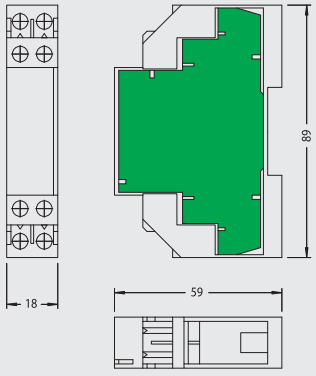
No. of modules	Curved cover without hinge (for direct enclosure mounting)			Curved cover with hinge (only to be used with mounting frame)			Mounting frame grey
	grey	red transparent	transparent	grey	red transparent	transparent	
2 modules	449-120-81	449-120-82	449-120-83	449-120-91	449-120-92	449-120-93	449-120-90
3 modules	449-130-81	449-130-82	449-130-83	449-130-91	449-130-92	449-130-93	449-130-90
4 modules	449-140-81	449-140-82	449-140-83	449-140-91	449-140-92	449-140-93	449-140-90
5 modules	449-150-81	449-150-82	449-150-83	449-150-91	449-150-92	449-150-93	449-150-90
6 modules	449-160-81	449-160-82	449-160-83	449-160-91	449-160-92	449-160-93	449-160-90
9 modules	449-170-81	449-170-82	449-170-83	449-170-91	449-170-92	449-170-93	449-170-90

apra Rail EMB

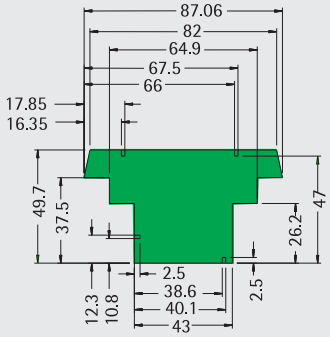
- consists of basic case and two side panels (one detachable)
- each unit with 8 removable screw type terminals
- mounting on top-hat rail or wall mounting

Material:
ABS





dimensions standard enclosure



PCB dimensions for basic enclosure

Description	Width W	Order no.
Basic enclosure	18 mm	449-180-00

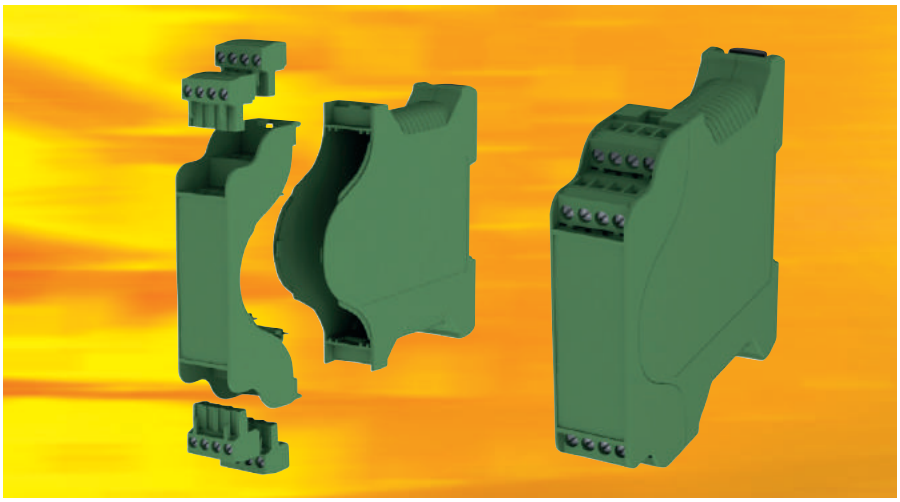
www.apra.de

apra Rail VBC PLUS

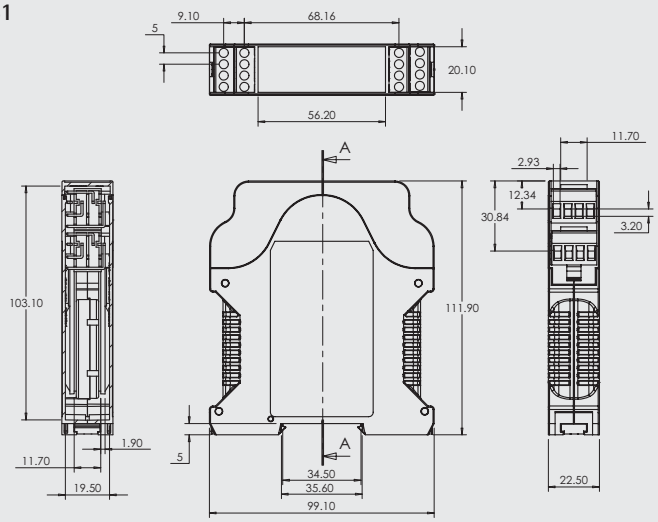
- 22.5 mm wide vertical DIN Rail mount housing
- clip together design for fast assembly
- supplied with four 4-pole 5 mm pitch pluggable terminal blocks
- 16 positions
- front and side label recesses
- solid and vented versions available
- top hat 35 mm DIN Rail or surface mounting

Dimensions H x W x D:
112 x 22,5 x 99mm

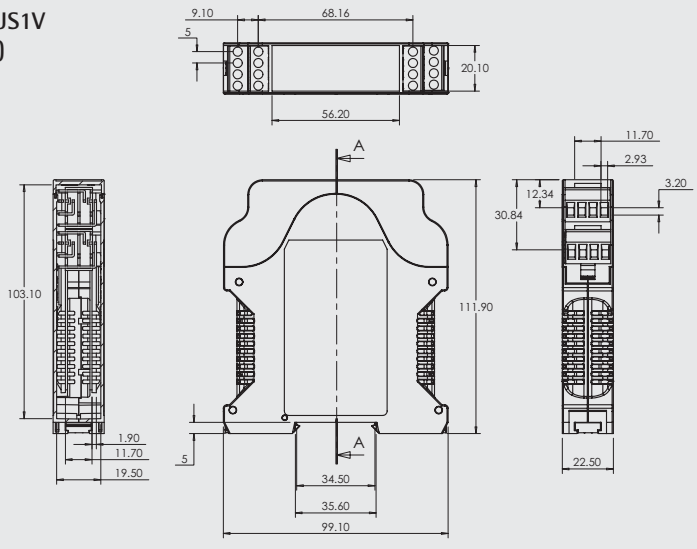
Material:
PA green, listed acc. to UL 94 V-0



VBC PLUS1 (solid)



VBC PLUS1V (vented)



Description	Feature	Order no.
DIN Rail enclosure VBC PLUS1	solid	449-180-40
DIN Rail enclosure VBC PLUS1V	vented	449-180-45

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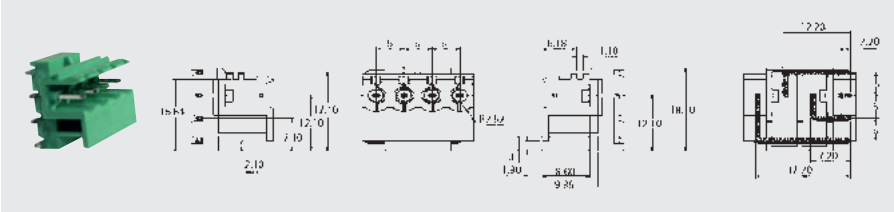
PCB Terminal blocks for VBC-PLUS

- 90° male connector allows for PCB mounting connection to CVB Plus
- professional rising clamp terminals
- 4 pole solid block
- 5 mm pitch
- polarised mouldings
- professional rising clamp terminals
- 2.5 mm² (28-14AWG)
- anti solder wicking terminals
- guided pin alignment
- captive screws

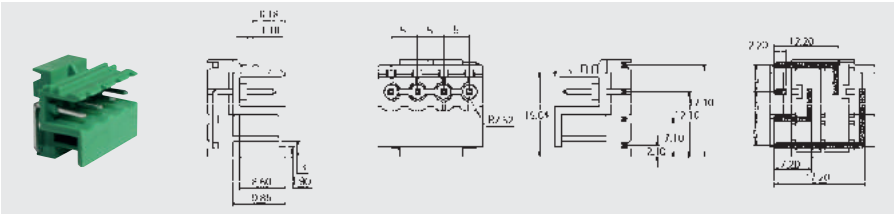
Specification:
rating Terminals: 15A 300V
contact resistance: 20mΩ
insulation resistance: 500mΩ / DC500V
withstand voltage: AC2000V/1min

Material:
pin header: brass, tin plated
housing:
PA green, listed acc. to UL94-V0

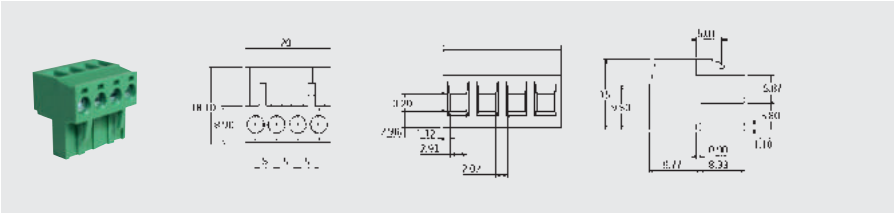
Terminal block VBC P935L/4 (included in delivery: 2 pieces)



Terminal block VBC P935R/4 (included in delivery: 2 pieces)



Terminal block VBC P9200/4 (included in delivery: 4 pieces)

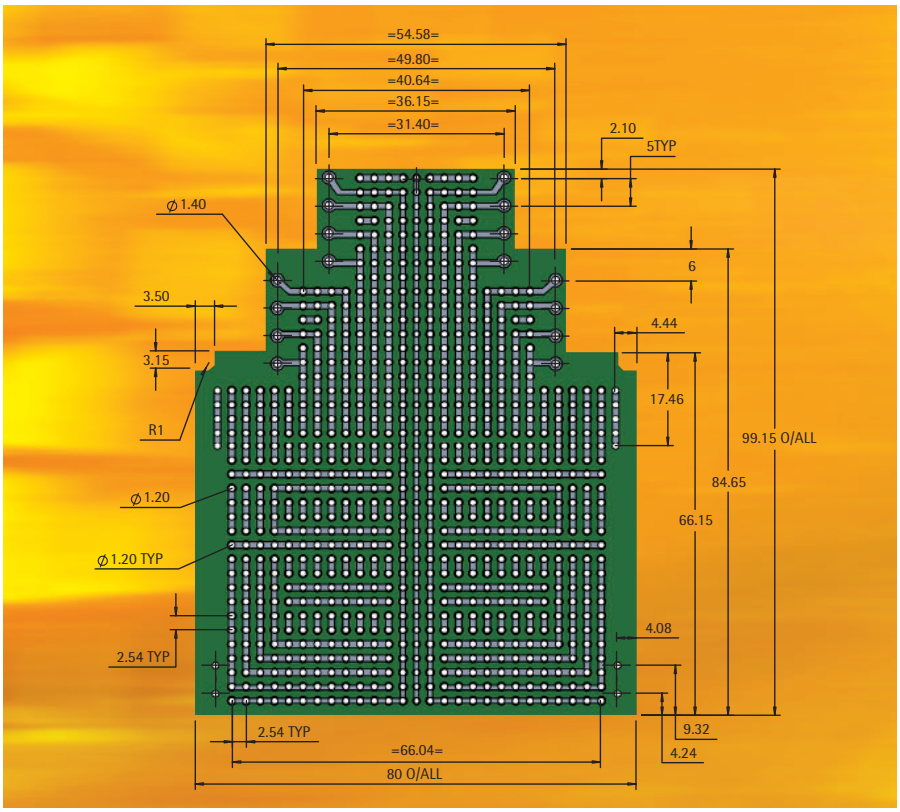


PCB for VBC PLUS

- dimensions: 80 x 99,2 x 1,6 mm
- 826 holes Ø 1,2 mm
- 16 holes Ø 1,4 mm for terminal blocks

Material:
2-layer FR4

Dimensions H x W x D:
80 x 99,2 x 1,6 mm



Description	Order no.
PCB for VBC PLUS	449-180-49

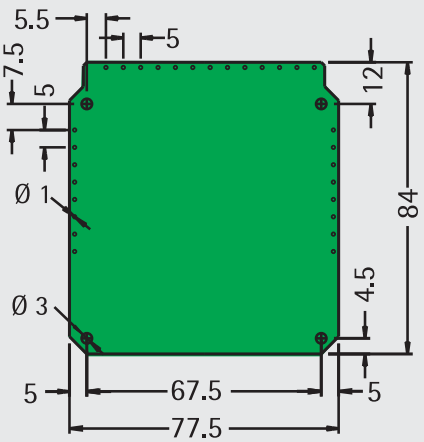
www.apra.de

apra Rail VB

- fitting TS35, TS15 and C-rail
- 2 enclosure sizes for pluggable terminals in 5 mm grid
- cover plates for unused terminal areas
- maximum 12 terminals per side

Material:
PA green, listed acc. to UL 94 V-0





PCB dimensions

Delivery

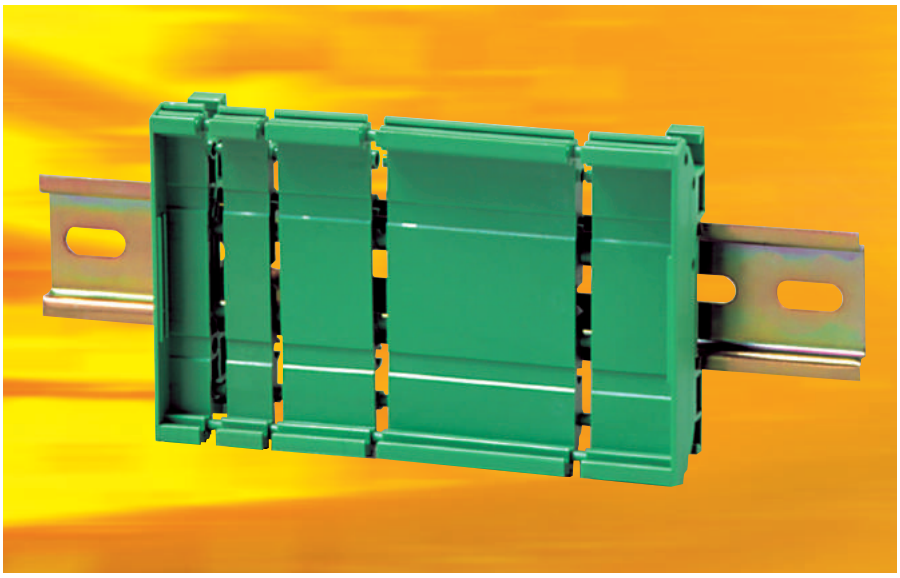
Item	Pc.	Beschreibung
1	2	Enclosure shells
2	2	Cover plates

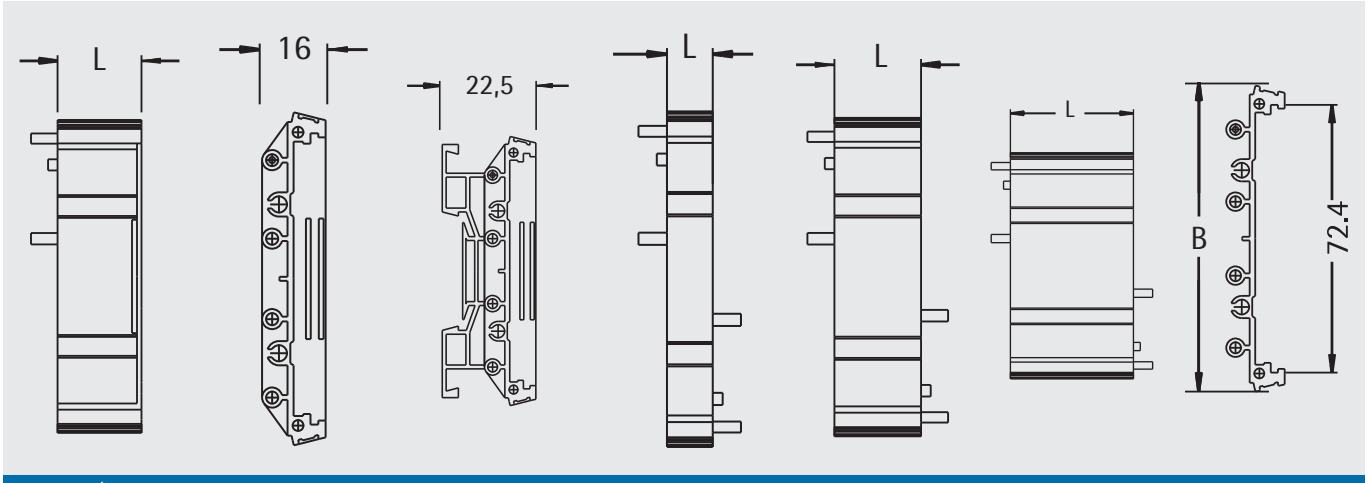
Description	Dimensions W x H x L mm	Order no.
apra Rail VB 22,5 mm	22,5 x 90 x 82	449-180-20
apra Rail VB 45 mm	45 x 90 x 82	449-180-25

apra Rail MIS 72 mm

- applicable for 72 mm wide PCBs
- high flexibility due to its modular construction
- integrated fixing
- insertion possibility for labelling

Material:
PA green, listed acc. to UL 94 V-0





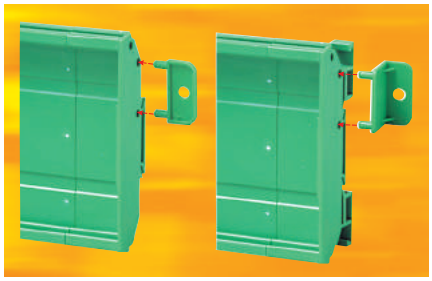
2 / 3	2	3	1	1	1	1

Position	Description	L	W	PCB dimensions l	PCB dimensions w	Order no.
1	Intermediate unit	11,25	82	11,25	72	449-310-00
1	Intermediate unit	22,5	82	22,5	72	449-320-00
1	Intermediate unit	45	82	45	72	449-330-00
2	Header unit	11,25	82	10	72	449-310-10
2	Header unit	22,5	82	21	72	449-320-10
3	Header unit with foot	11,25	82	10	72	449-310-20
3	Header unit with foot	22,5	82	21	72	449-320-20
	Foot unit					449-340-00

Adapter for wall mounting

- flat adapter: wall mounting of units without foot
- high adapter: wall mounting of units with foot
- fits to apra Rail MIS 72 mm

Description	Order no.
Adapter flat	449-350-00
Adapter high	449-350-10

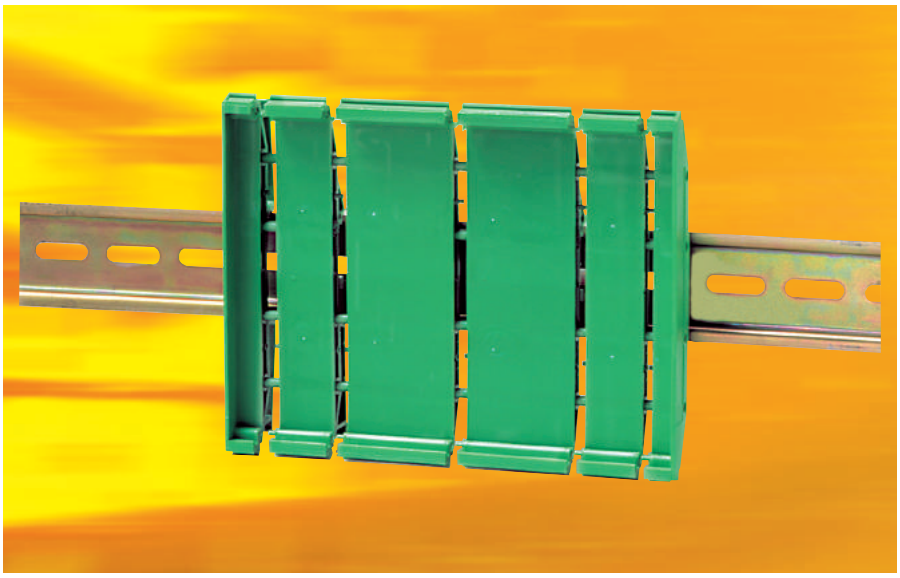


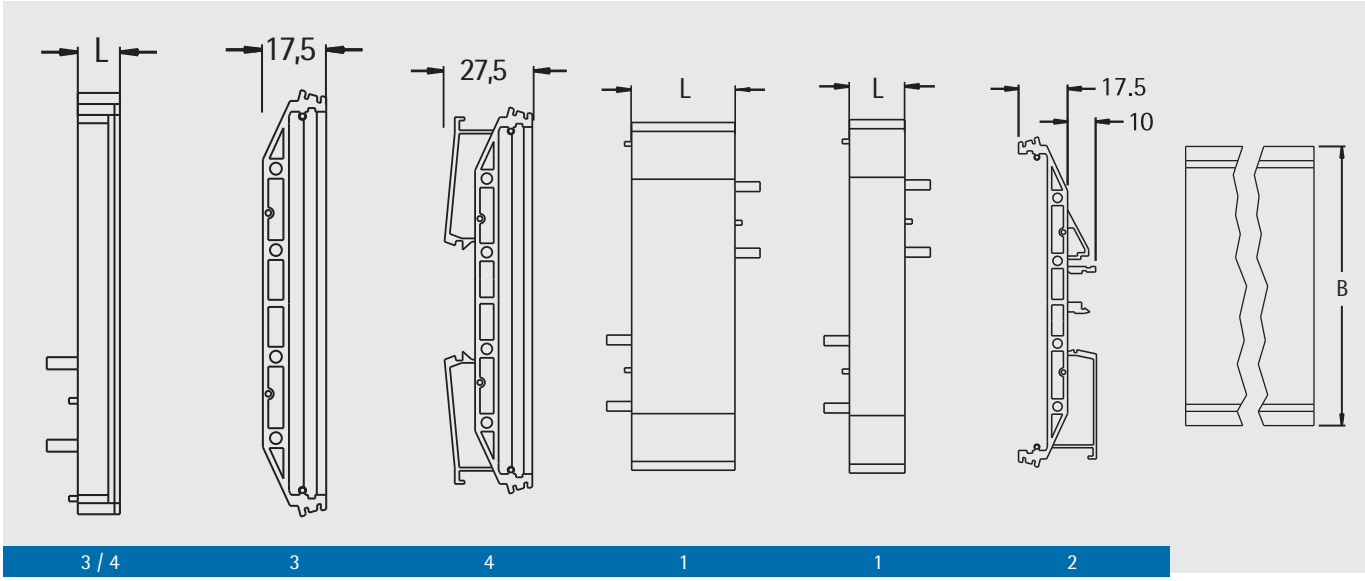
www.apra.de

apra Rail MIS 107 mm

- applicable for 107 mm wide PCBs
- high flexibility due to its modular construction
- intregrated fixing
- insertion possibility for labelling

Material:
PA green, listed acc. to UL 94 V-0





3 / 4	3	4	1	1	2

Position	Description	L	W	PCB dimensions l	PCB dimensions w	Order no.
1	Intermediate unit	18,5	118	18,5	107	449-220-00
1	Intermediate unit	35	118	35	107	449-230-00
2	Intermediate unit with foot	18,5	118	18,5	107	449-220-10
2	Intermediate unit with foot	35	118	35	107	449-230-10
3	Header unit	11,5	118	10	107	449-210-00
4	Header unit with foot	11,5	118	10	107	449-210-10

Adapter for wall mounting

- flat adapter: wall mounting of units without foot
- high adapter: wall mounting of units with foot
- fits to apra Rail MIS 107 mm

Description	Order no.
Adapter flat	449-240-00
Adapter high	449-240-10



apra Rail EIS 72 mm

- for 72 mm wide PCBs
- special lengths possible

Material:
PA green, listed acc. to UL 94 V-0



*Other lengths on request, extrusion length = PCB length - 4 mm

Description	Length mm *	Order no.
Extruded basic unit	2000	449-300-10
Header unit		449-300-20
Locating screws for header unit		449-300-40
Foot unit		449-300-30

apra Rail EIS 107 mm

- for 107 mm wide PCBs
- special lengths possible

Material:
PA green, listed acc. to UL 94 V-0



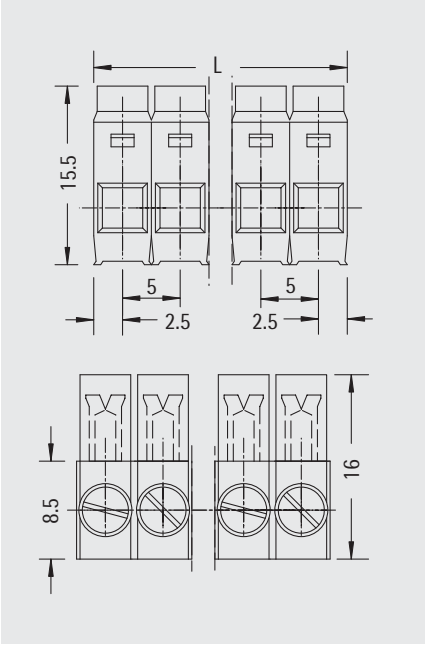
*Other lengths on request, extrusion length = PCB length - 4 mm

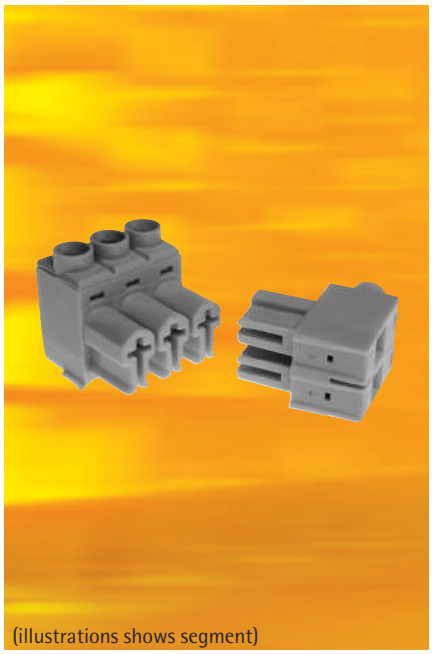
Description	Length mm *	Order no.
Extruded basic unit	2000	449-300-11
Header unit		449-300-22
Locating screws for header unit		449-300-44
Foot unit		449-300-33

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Pluggable terminal strip (length can be customised)

Nominal voltage: 380 V
Nominal current: 13,5 A
Cross section: max. 4 mm²
Material: PC grey, flammability tested acc. to UL 94 V-0
Insulating resistance: >5 MOhm
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity

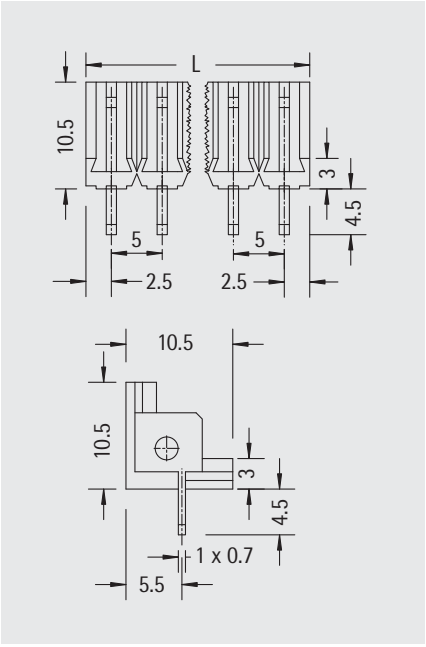


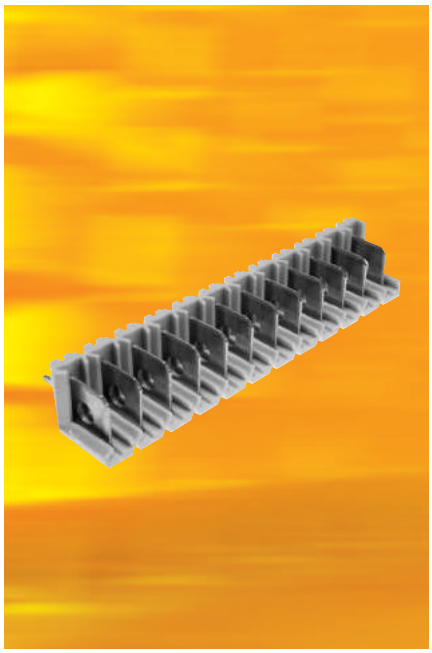

(illustrations shows segment)

Description	L mm	Grid mm	Order no.
Pluggable terminal strip, 36 contacts	180	5,00	449-410-01

Terminal pin (length can be customised)

Nominal voltage: 380 V
Nominal current: 13,5 A
Material: PC grey, flammability tested acc. to UL 94 V-0
Insulating resistance: >5 MOhm
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity





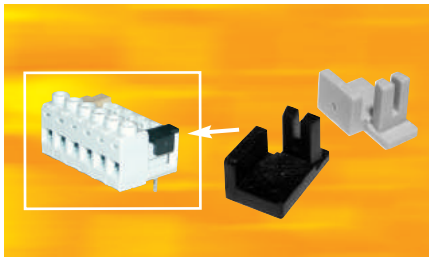
Description	L mm	Grid mm	Order no.
Terminal pin, 36 contacts	180	5,00	449-410-02

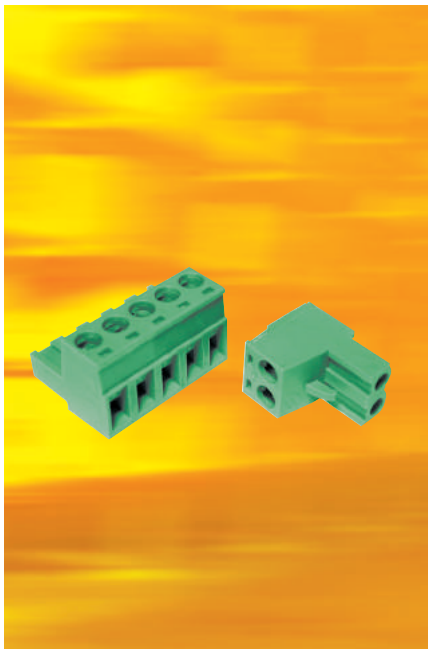
Polarising clip

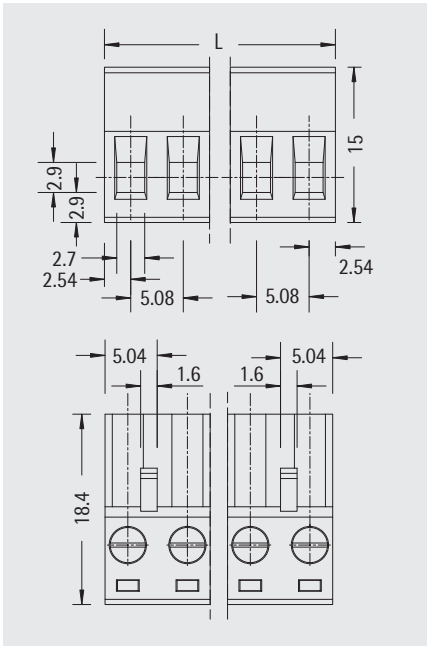
- ensures correct vertical or horizontal orientation of the pluggable terminal strip

Material: PC grey, flammability tested acc. to UL 94 V-0
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity

Order no. (pair)
449-410-03



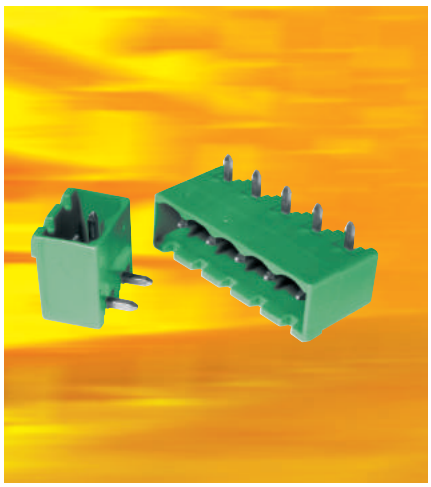


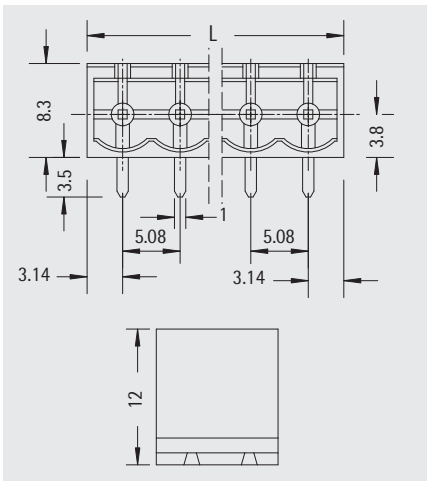


Pluggable terminal strip (length can be customised)

Nominal voltage: 380 V
Nominal current: 12 A
Cross section: max. 2,5 mm²
Material: PA green, flammability tested acc. to UL 94 V-0
Insulating resistance: >5 MOhm
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity

Description	L mm	Grid mm	Order no.
Pluggable terminal strip, 3 contacts	15,24	5,08	449-420-03
Pluggable terminal strip, 6 contacts	30,48	5,08	449-420-06
Pluggable terminal strip, 9 contacts	45,72	5,08	449-420-09
Pluggable terminal strip, 12 contacts	60,96	5,08	449-420-12





Bended terminal pin (length can be customised)

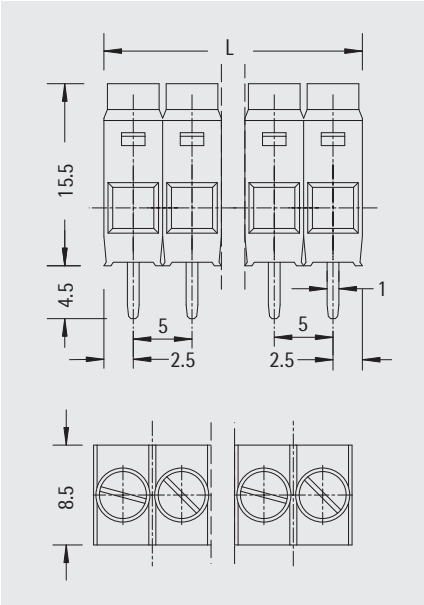
Nominal voltage: 380 V
Nominal current: 12 A
Material: PA green, flammability tested acc. to UL 94 V-0
Insulating resistance: >5 MOhm
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity

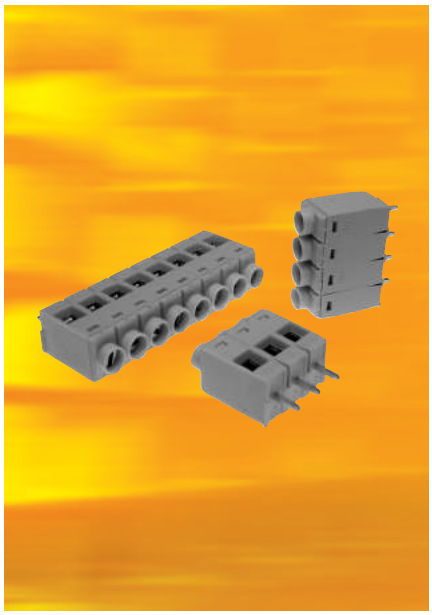
Description	L mm	Grid mm	Order no.
Bended terminal pin, 3 contacts	15,24	5,08	449-430-03
Bended terminal pin, 6 contacts	30,48	5,08	449-430-06
Bended terminal pin, 9 contacts	45,72	5,08	449-430-09
Bended terminal pin, 12 contacts	60,96	5,08	449-430-12

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Terminal clamp (length can be customised)

Nominal voltage: 380 V
Nominal current: 17,5 A
Cross section: max. 4 mm²
Material: PC grey, flammability tested acc. to UL 94 V-0
Insulating resistance: >5 MOhm
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity

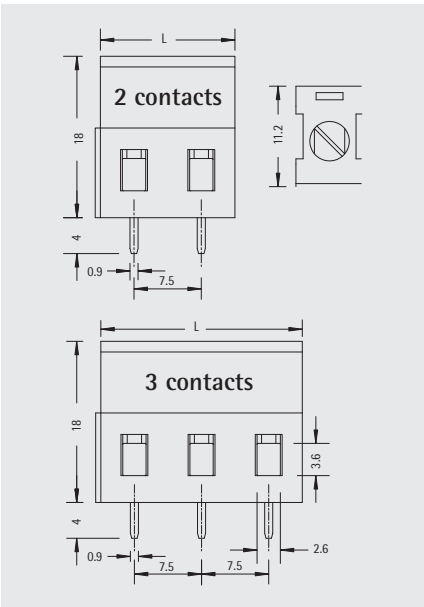




Description	L mm	Grid mm	Order no.
Terminal clamp, 36 contacts	180	5,00	449-410-00

Terminal clamp, intermateable (length can be customised)

Nominal voltage: 750 V
Nominal current: 24 A
Cross section: max. 4 mm²
Material: PA green, flammability tested acc. to UL 94 V-0
Insulating resistance: >5 MOhm
Working temperature: -20 °C up to 125 °C, 160 °C temporary
Approval: UL, , CE conformity





Description	L mm	Grid mm	Order no.
Terminal clamp, 2 contacts	15	7,50	449-440-02
Terminal clamp, 3 contacts	22,5	7,50	449-440-03

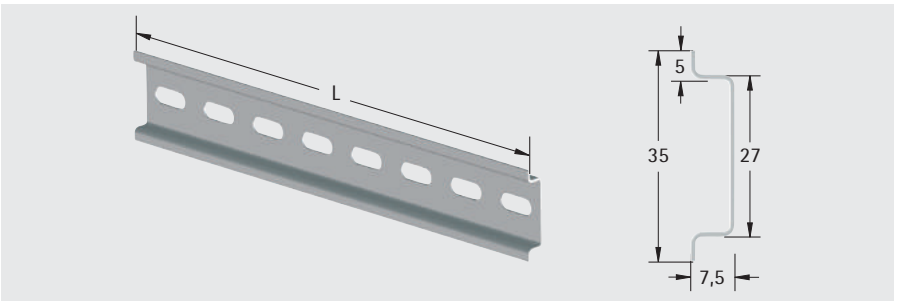
Top hat rail, type TS 35/7,5

- with perforation for M 6

Material: sheet steel, galvanised

Other lengths available on request!

L mm	Order no.
200	640-236-02
500	640-236-09
600	640-236-08



420 • DIN rail case for boards of 100 mm width

DIN rail case

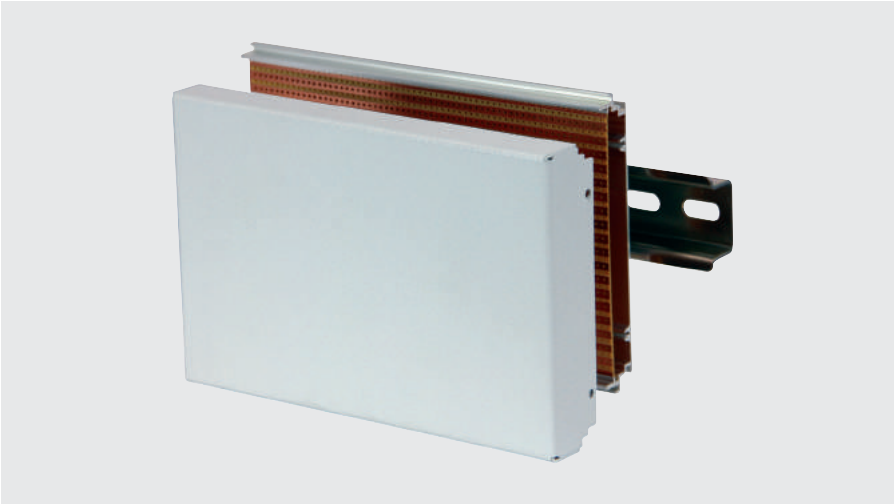
- stable and convenient clip device for mounting on DIN rails
- easy assembly
- cost-effective
- cover panel can be modified easily

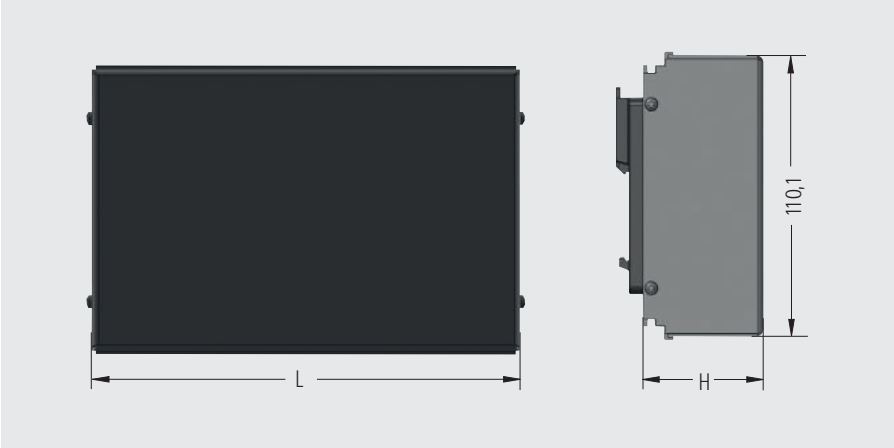
Application:
for 100 x 160 mm and 100 x 220 mm PCBs

Finish:
RAL 7035 light grey
transparent chromated interior

Construction:
aluminium extrusion rear panel,
aluminium cover shells and polyamide plastic DIN rail clips

Degree of protection: IP 30
Delivery: not assembled





Delivery

Item	Pc.	Description
1	1	Cover shell
2	1	Rear panel
3	2	Din rail clips
4		Mounting material

H mm	L mm	PCB height H mm	PCB lenght L mm	Order no.
26	164	100	160	420-001-00
26	224	100	220	420-001-10
46	164	100	160	420-002-00
46	224	100	220	420-002-10

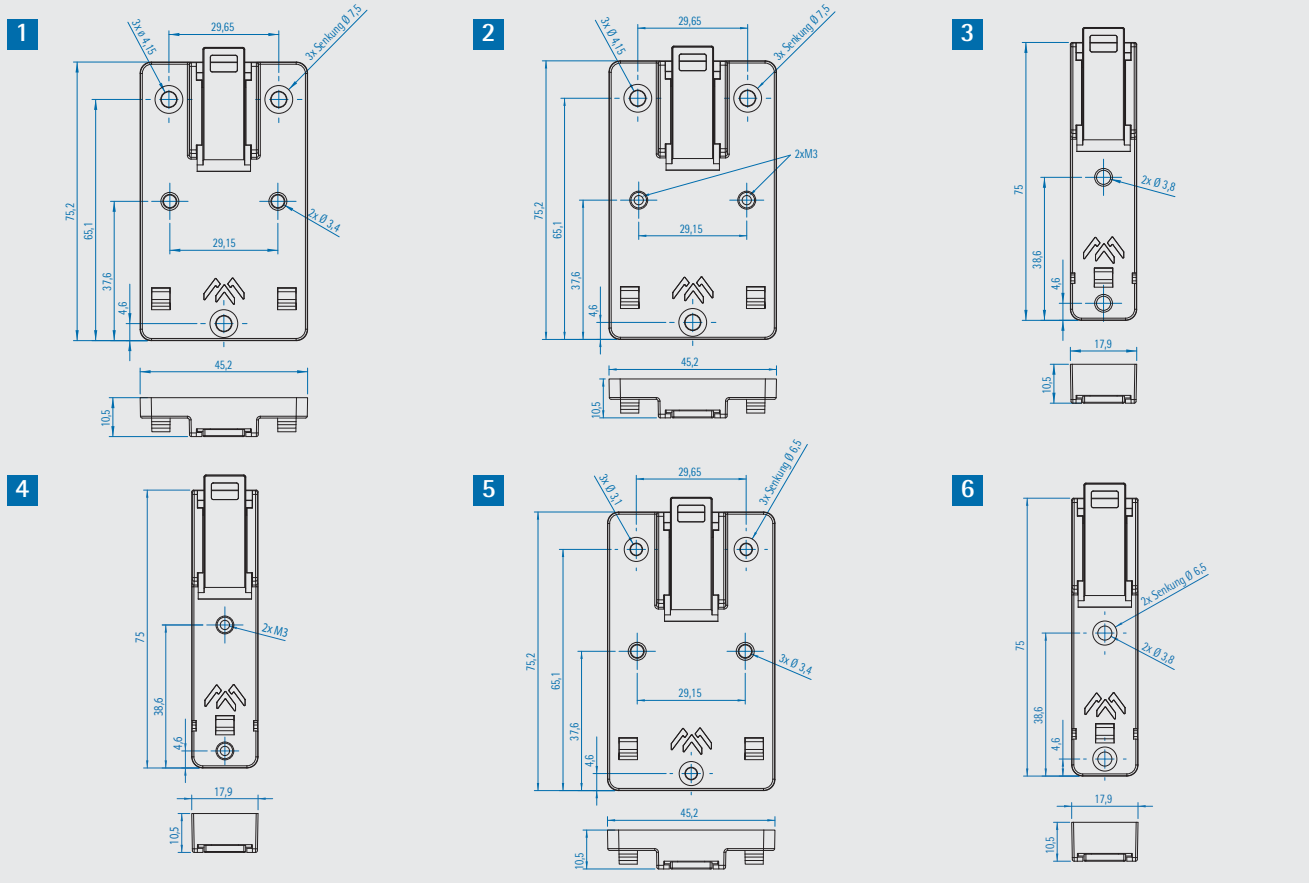
www.apra.de

Bracket for top hat rail

- quick, safe and sturdy fixing of small enclosures, circiut boards and other components to rails (TS35) and support rails
- can be easily fixed from inside or outside to the enclosure's rear panel
- set = 10 pieces
- 6 versions are available

Material: PA6 GF 30 black, listed acc. to UL 94 V-0





Version	Description	Order no.
1	Width 45 mm, with through-bore hole, counterbore M4	442-311-20
2	Width 45 mm with threaded inserts M3, counterbore M4	442-311-25
3	Width 18 mm with through-bore hole	442-311-30
4	Width 18 mm with threaded inserts M3	442-311-35
5	Width 45 mm with through-bore hole, counterbore M3	442-311-44
6	Width 18 mm with threaded inserts M3	442-311-45

205 • 19" top hat rail support U

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19" top hat rail support 3 U

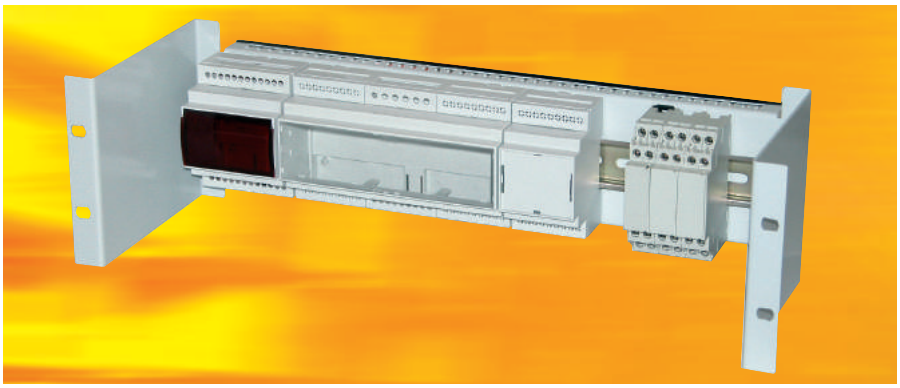
- for a recessed mounting of top hat rail enclosures at 19" levels of cabinets, racks or enclosures
- standard fitted with top hat rail TS 35 (width 425 mm)
- perfect to mount our top hat rail enclosures apraRail
- integrated cable guarding and strain-relief by cable clip bar

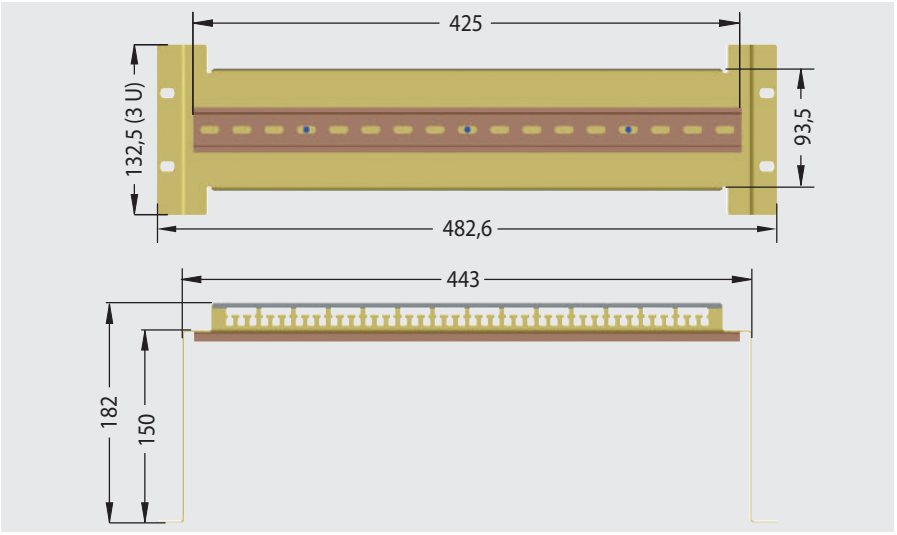
Material:
sheet metal

Finish:
galvanised or
RAL 7035 light grey/
RAL 9005 deep black

Delivery:
not assembled, with mounting material

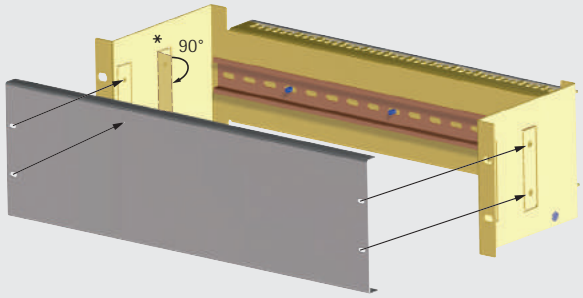
Other top hat rail types, installation widths, heights or depths available on request!





Cover (protection against contact))

* To mount the cover, the lateral flaps can be bent up by hand in two different positions.



19" top hat rail support 3 U	Order no.
galvanised	205-420-00
RAL 7035 light grey	205-420-10
RAL 9005 deep black	205-420-40

Accessories

Cover contact protection	Order no.
galvanised	205-420-20
RAL 7035 light grey	205-420-25
RAL 9005 deep black	205-420-41

Protection against contact	Order no.
galvanised	213-900-94
RAL 7035 light grey	-

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VisioDINbox

The VisioDINbox has an integrated top hat rail for front mounting in enclosure or cabinet doors. It offers the possibility to operate or read meters and control units easily without opening the door. Due to the optionally available transparent doors with an IP rating of 54 the components are perfectly protected against dust and humidity.

- protection system from front: IP 54 for combination of transparent door and VisioDINbox
- tool-free mounting owing to panel-clip technology
- enclosure offers space for 1 – 14 modules
- easy cable connection in the cabling area by a frontally screwed plastic plate
- cable entry in the rear with integrated strain relief
- unused space can be covered by separate strips

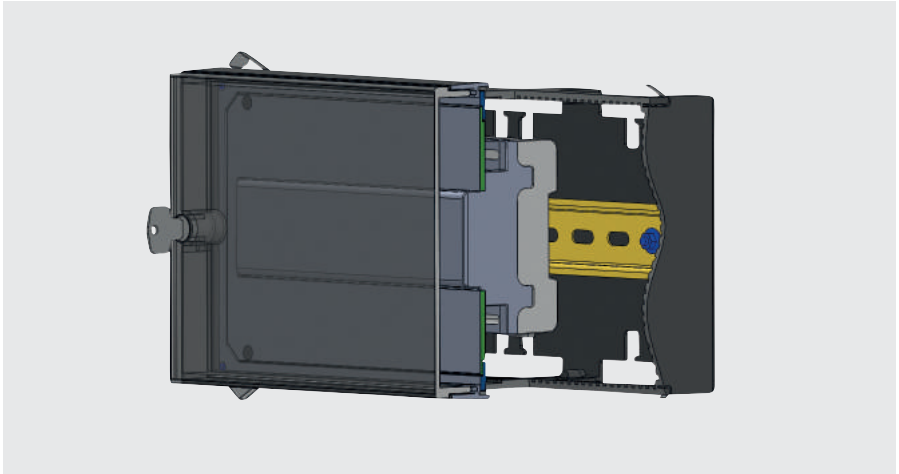
Dimensions W x H x D:
size 1: 144 x 144 x 60,5 mm
(opening: 138 +1,0 x 138 +1,0 mm)
size 2: 288 x 144 x 60,5 mm
(opening: 282 +1,1 x 139 +1,0 mm)

Material:
enclosure: PPE/PS-GF20,
listed acc. to UL 94 V-1
door: PC, listed acc. to UL 94 V-0

Finish:
RAL 9005 black

Other sizes, special depths and colours, individual machining or key pad foils available on request – contact us!





Description	Order no.
VisioDINbox 144 x 144 mm	441-360-60
Transparent door, 144 x 144 mm, with lock (lockable)	446-050-01
Transparent door, 144 x 144 mm, with sash fastener	446-050-02
VisioDINbox 288 x 144 mm	441-480-60
Transparent door, 288 x 144 mm, with lock (lockable)	446-130-01
Transparent door, 288 x 144 mm, with sash fastener	446-130-02
Cover strip S 35 G (length 219 mm, pre-stamped with 9 mm grids)	640-222-00

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VisioRAILbox

Optically appealing wall-mounting enclosure for the installation of DIN rail based controls in office or at home applications. Control lights or settings are visible through the tinted plexiglass door.

The base enclosure can easily be fixed to a wall by 4 screws and the control units may be rapidly clipped onto 2 integrated DIN rails. Cabling can be wired through the rear cable outlet.

After installation, the top part with tinted plexiglass door can easily be mounted to the base and fixed with screws.

Dimensions H x W x D:
size 12 M: 316 x 150 x 95 mm
(accommodates max. 12 modules)
size 24 M: 316 x 250 x 95 mm
(accommodates max. 24 modules)

Material and design:
base enclosure:
aluminium with 2 integrated DIN rails and rear cable outlet
top part:
metal finish alu brush surface ABS with tinted plexiglass® door

Other sizes available on request.



Description	Dimensions H x W x D mm	Order no.
VisioRAILbox 12 M	316 x 150 x 95	190-350-00
VisioRAILbox 24 M	316 x 250 x 95	190-350-10

DINcollect

Enclosure to take control units and displays mounted in panel instrument cases acc. to IEC 61554. Wiring can be done through the rear cable outlet.

The enclosure can easily be fixed to any kind of machinery or production equipment by means of an adjustable fitting which allows the operator a perfect viewing angle. The front accommodates two units of 96 x 96 mm and one unit of 48 x 96 mm size.

Material: aluminium
Finish: RAL 7035 light grey
RAL 9005 black

Other sizes available on request.



Description	Dimensions H x W x D mm	Order no.
DINcollect	130 x 370 x 260	190-300-00

www.apra.de

Enclosures for Embedded Computer - customised according to your purposes

Standard boards and additional boards, displays, hard drives... we offer a functional, fitting and nice looking enclosure made of plastic.

Either for Raspberry Pi or for any similar boards like Arduiono, Banana Pi, BeagleBone and so on – INDIVIDUALITY IS OUR STRENGTH

- specially designed for you
- unlimited colours and designs
- small, average and high quantities
- for wall-, desktop- or rail mounting
- ... and everything at favourable prices!

Just ask us - we will be pleased to advise you:
+49 (0) 65 92 / 204-0!



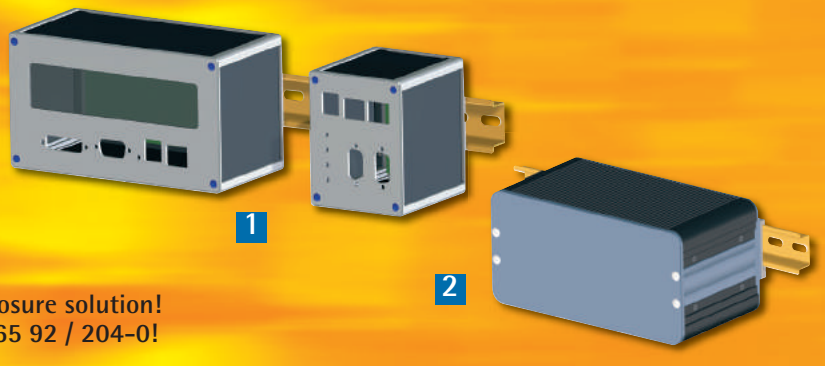
Further enclosure variations for top hat rail

1 RAIL 414

- flexible dimensions and very sturdy - the adaptable enclosure solution

2 profi-set 264 cool

- enclosure solution with heat dissipating aluminium extrusions for heated surroundings



Ask us for your individual top hat rail enclosure solution!
We will be pleased to advise you: +49 (0) 65 92 / 204-0!

Raspberry Pi enclosure “apRaspi”

The new enclosures series offers the possibility to wrap mini PC boards chic and functional.

No matter if you need an enclosure for a standard Raspberry Pi or for similar boards like Arduino, Banana Pi, BeagleBone or others - just ask us! Individuality is our strength!

Each enclosure may be modified to customer's request. You need additional contacts or cards, fixing possibilities or supports – we'll make it happen! Further more, threaded bolts and pins as well as special colours and printing are possible. **Just ask us!**

Composition:
enclosure consists of 2 half shells which can be easily stuck together

Material:
apRaspi A: aluminium 1mm
apRaspi S: sheet steel 1mm
apRaspi P1: ABS/aluminium brush
apRaspi P2/P3: polystyrene

Finish:
apRaspi A/S:
powder coated black + blue*
apRaspi P1:
fine structure black + aluminium brush
apRaspi P2/P3:
fine structure blue + grey*

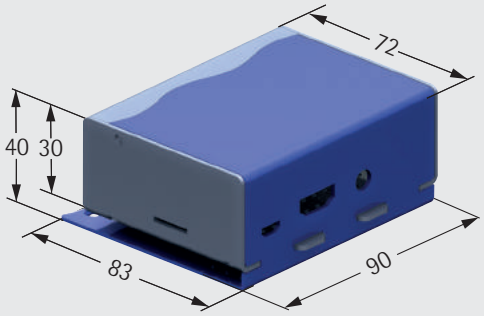
Dimensions (W x H x D):
apRaspi A/S:
90 x 40 (30) x 83 (72) mm
apRaspi P1/P2/P3:
116 (97) x 31 x 63,5 mm

Accessories:
threaded pins (apRaspi A / S), spacer bolts for tapping screws (apRaspi P1/P2/P3), mounting material

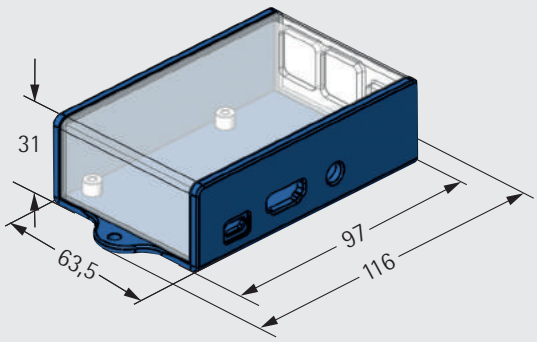
* Other colour combinations available on request!



Dimensions A/S



Dimensions P1/P2/P3



Version	Material	Colour	Order no.
apRaspi A	aluminium 1mm	powder coated black + blue*	205-480-05
apRaspi S	sheet steel 1mm	powder coated black + blue*	205-480-00
apRaspi P1	ABS / aluminium brush	fine structure black + aluminium brush	4192-744-00
apRaspi P2/P3	polystyrene	fine structure blue + grey*	4192-745-00

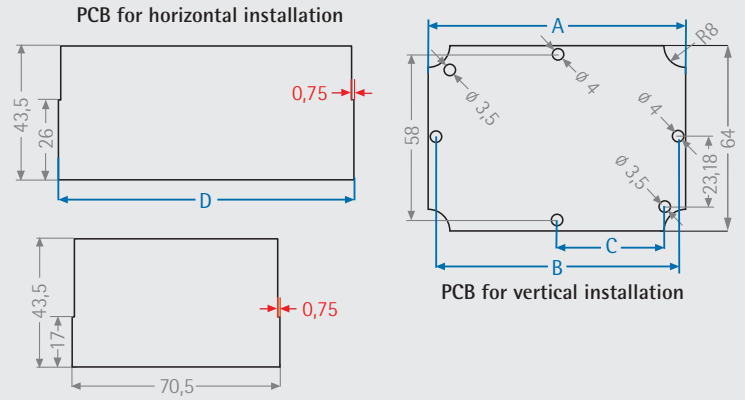
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IProtect

- robust enclosure for use in mechanical and electrical engineering
- 2 versions: well-priced version in ABS or polycarbonate version (listed acc. to UL 94 V-0) for improved resistance to shock
- top and base available in different colours
- snap closing due to specially developed captive fastening screws (included in delivery)
- moulded sealing, integrated
- rated break point for M20 connection with screw thread
- fixing points for attaching PCB's in the base part
- 3 mounting options:
  - via screw holes through the base (outside the sealing area)
  - clip-on adapter for mounting on top hat rail
  - clip-on flange for wall mounting
- customised sizes and machining on request

Protection:
IP 67 (type IPro1 and IPro2)
IP 66 (type IPro3)





PCBs

Type	A	B	C	D
IPro1	56,5	51,5	20,6	63
IPro2	89,7	84,7	37,2	96,2
IPro3	122,7	117,7	53,7	129,2

Order information ABS version

Type	Dimensions H x W x D mm	Base black			Base grey		
		Top black	Top grey	Top transparent	Top black	Top grey	Top transparent
IPro1	80,2 x 72,8 x 54,7	447-100-01	447-100-02	447-100-03	447-100-04	447-100-05	447-100-06
IPro2	80,2 x 106 x 54,7	447-200-01	447-200-02	447-200-03	447-200-04	447-200-05	447-200-06
IPro3	80,2 x 139 x 54,7	447-300-01	447-300-02	447-300-03	447-300-04	447-300-05	447-300-06

Order information Polycarbonate version

Type	Dimensions H x W x D mm	Base black			Base grey		
		Top black	Top grey	Top transparent	Top black	Top grey	Top transparent
IPro1	80,2 x 72,8 x 54,7	447-100-07	447-100-08	447-100-09	447-100-10	447-100-11	447-100-12
IPro2	80,2 x 106 x 54,7	447-200-07	447-200-08	447-200-09	447-200-10	447-200-11	447-200-12
IPro3	80,2 x 139 x 54,7	447-300-07	447-300-08	447-300-09	447-300-10	447-300-11	447-300-12

Accessories

Wall-mounting flange		Adapter for top hat rail, 1 pair		Cable gland		Screw A M 4x6 DIN 7516 zinc-plated
black	grey	black	grey	black	grey	
447-510-00	447-510-10	447-520-00	447-520-10	447-630-00	447-630-10	630-524

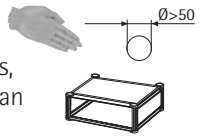
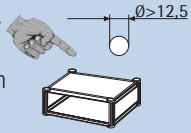
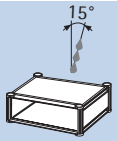
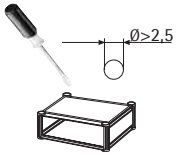
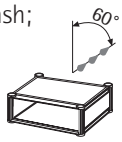
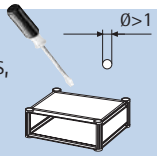
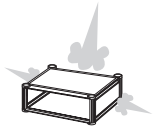
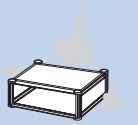
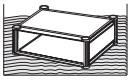
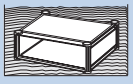
IP degrees of protection

IP degrees acc. to DIN EN 60529

All electronic devices and equipment must be protected from possible interference to ensure reliable operation. Enclosures and cabinets must therefore comply with certain protection requirements depending on their area of application.
Standard DIN EN 60529 with its IP degrees of protection (IP = international protection) specify these requirements.
Its digits specify the ability of an enclosure to protect integrated components from contact, for example from foreign objects and water. The first digit of the IP degree of protection indicates the degree of protection for shock protection and protection against foreign objects; the second indicates protection against water. See the table below for explanations of the individual digits.

IP 43
- 4 — Protects against water splash at up to 60° from the perpendicular
- 3 — Protects against contact with tools, foreign objects and wires, with diameter greater than 1mm

Degree of protection acc. to DIN EN 60529

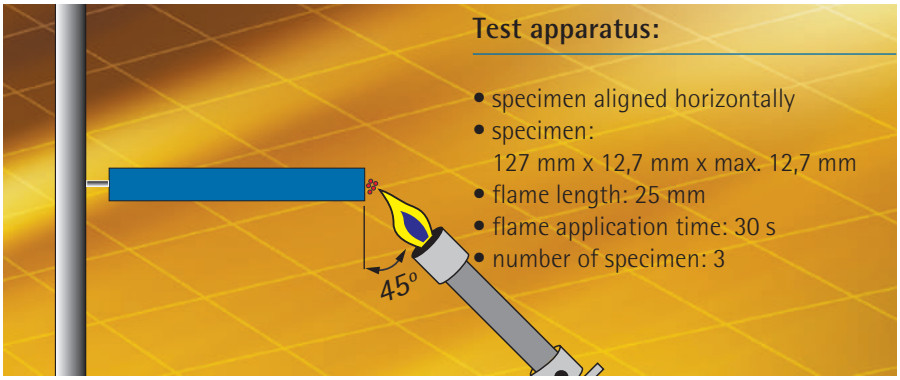
Protection against contact and foreign objects			Protection against water	
First digit	Contact	Foreign object	Second digit	Contact
0	No protection	No protection	0	No protection
1	Protects against contact with large surface area body parts	Protects against large foreign objects, diameter greater than 50mm 	1	Protects against vertical water droplets 
2	Protects against finger contact	Protects against mid-sized foreign objects, diameter greater than 12.5mm 	2	Protects against oblique falling water droplets; no more than 15° from the vertical 
3	Protects against contact with tools, foreign objects and wires, with diameter greater than 2.5mm	Protects against small foreign objects, diameter greater than 2.5mm 	3	Protects against water splash; no more than 60° from the vertical 
4	Protects against contact with tools, foreign objects and wires, with diameter greater than 1mm	Protects against granular foreign objects, diameter greater than 1mm 	4	Protects against water spraying on all sides 
5	Complete protection	Protects against dust deposits 	5	Protects against water jet on all sides 
6	Complete protection	Protects against dust entry at negative pressure of 20mbar inside the enclosure 	6	Protects against flooding 
			7	Protects against occasional submersion 
			8	Protects against permanent submersion 

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Flammability test UL94 HB

Classified acc. to UL94 HB if:

- burning rate ≤ 76 mm/min at specimen thickness of up to 3 mm, burning rate ≤ 38 mm/min at specimen thickness higher than 3 mm
- combustion distance < 102 mm



Test apparatus:

- specimen aligned horizontally
- specimen: 127 mm x 12,7 mm x max. 12,7 mm
- flame length: 25 mm
- flame application time: 30 s
- number of specimen: 3

Flammability test UL94 V-2/-1/-0

Classified acc. to UL94 V-2 if:

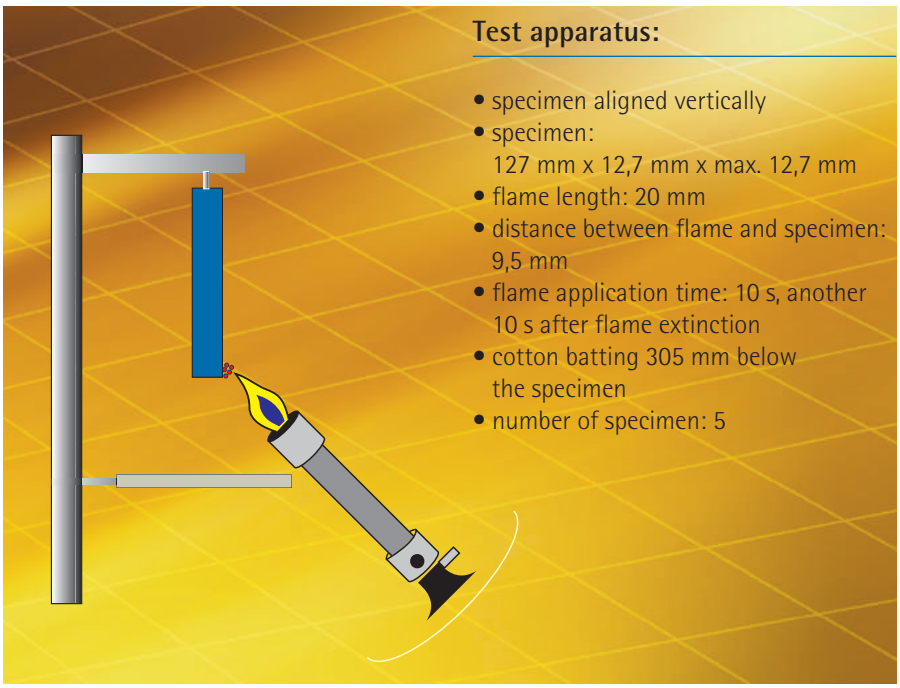
- afterglow time ≤ 30 s
- total afterglow time in 10 tests ≤ 250 s

Classified acc. to UL94 V-1 if:

- afterglow time ≤ 30 s
- no dripping of burning specimens
- total afterglow time in 10 tests ≤ 250 s

Classified acc. to UL94 V-0 if:

- afterglow time ≤ 10 s
- no dripping of burning specimens
- total afterglow time in 10 tests ≤ 50 s



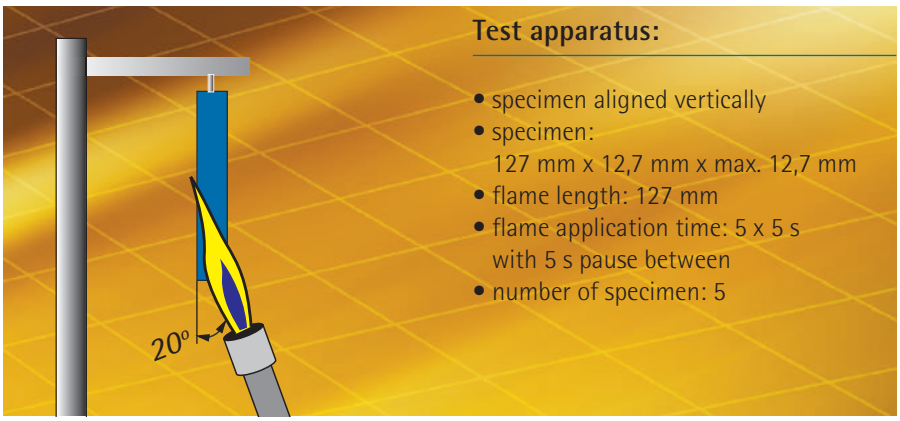
Test apparatus:

- specimen aligned vertically
- specimen: 127 mm x 12,7 mm x max. 12,7 mm
- flame length: 20 mm
- distance between flame and specimen: 9,5 mm
- flame application time: 10 s, another 10 s after flame extinction
- cotton batting 305 mm below the specimen
- number of specimen: 5

Flammability test UL94-5V

Classified acc. to UL94-5V if:

- afterglow time ≤ 60 s
- no dripping of burning specimens



Test apparatus:

- specimen aligned vertically
- specimen: 127 mm x 12,7 mm x max. 12,7 mm
- flame length: 127 mm
- flame application time: 5 x 5 s with 5 s pause between
- number of specimen: 5

Other products of the apra group



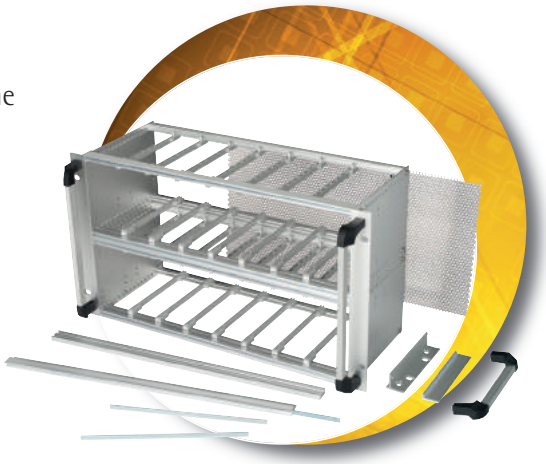
Datacenter, network engineering and industrial applications

- 19" cabinet system TiRAX
- 19" cabinet system NETcell
- 19" wall-mounting enclosures
- air conditioning technology
- power distribution systems
- cable management



19" cabinet system aprack

- for applications in audio, video or test and measurement
- light aluminium extrusion frame
- wide range of accessories
- free assembly service









19" electronic packaging

- subracks 1 – 14 U, VME, Compact PCI, Advanced TCA
- EMC-compatible subracks
- customised subracks
- cassettes, plug-in modules, front panels

… always the perfect shell for your valuable electronics



Enclosure systems

- desktop enclosures
- 19" enclosures
- 19" plug-in units
- small cases



Plastic enclosures

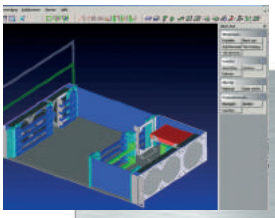
- individual plastic enclosures without tooling costs
  - even the most sophisticated requests concerning shape and materials can be realised
  - from 1 to 100.000 pieces in different production techniques
  - **3D printing:** the fast way to your protoype
  - **digital printing:** flexible, fast and economic
- foil technology
- mixed materials: the perfect combination of plastic and metal components

Whether it's metal or plastic, standard or customised, we can help you plan the perfect shell for your valuable electronics. Contact us to find out more!



A holistic approach

With our expertise and ultra-modern machinery, we can develop, produce and assemble the perfect enclosure for you.



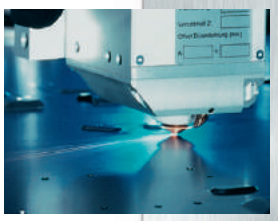
Development

- 3D design
- construction
- testing and simulation (EMC, IP, trial, etc.)
- consulting and technical support



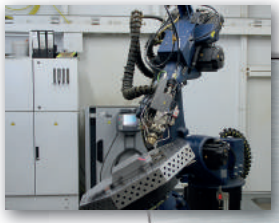
Punching, laser cutting

- laser cutting
- punching
- embossing
- marking



Welding

- laser welding
- stud welding
- customary welding

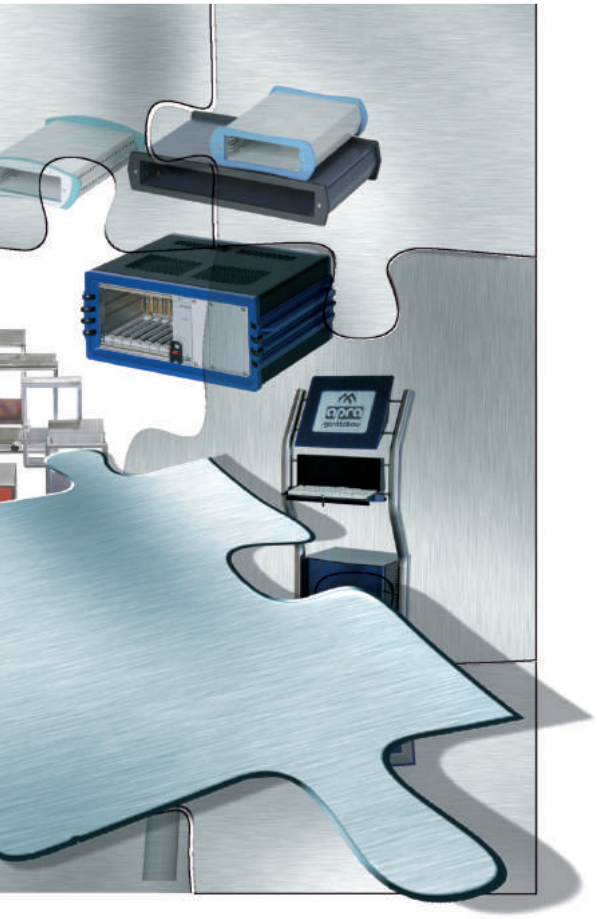


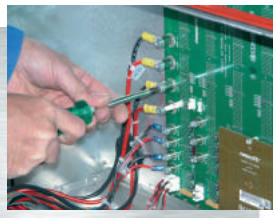
Bending

- automated bending with robots
- free bending
- clinching
- settling



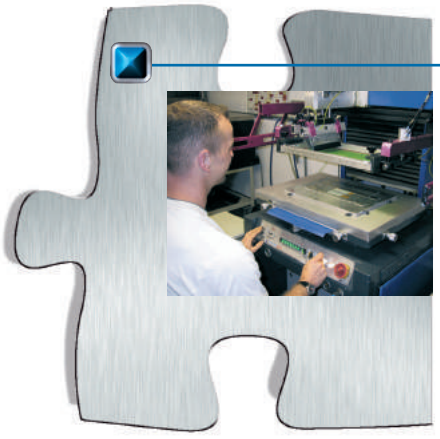
to production





Assembly

- switches, push-buttons, earthing, customised components
- cable configuration
- complete or partial assembly
- acc. to customer's specifications



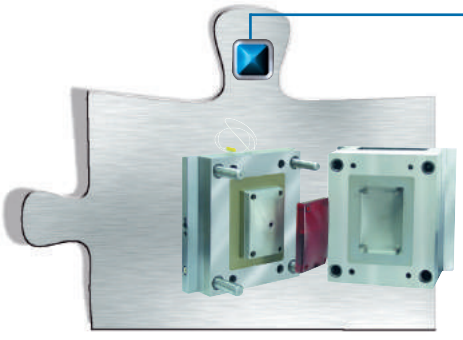
Surface technology / Printing / Foils

- powder coating
- wet painting
- anodising
- digital printing
- silk screening
- pad printing
- keypads, decor foils

Insertion

- stud bolts
- nuts
- inside thread nuts
- earthing lugs





Plastics processing

- milling and bending
- vacuum casting
- silicone moulds
- injection moulding
- 3D printing Rapid Prototyping

Certifications

Our personal commitment, feel for the requirements of the future market and high quality standard earn apra the trust of even the most demanding clients again and again. Know-how depends on the ability of people; apra-norm backs high-quality innovative products which form the basis for the constantly growing group of companies. A quality and environmental management system that functions well is therefore necessary.

This system is recognised outside of the apra-group through a certificate which is awarded when a company proves by an audit that they meet all DIN requirements.

One of these requirements is that all processes are clearly, transparently and completed documented.

The apra group has received certifications for quality and environmental management systems for all of its sites.

In addition, **DIN EN ISO 9001:2008** is a standard that describes the selection and introduction of a quality management system within a company.

DIN EN ISO 14001:2009 is the environmental standard. It is awarded when a company fulfills all environmental aspects.

The management systems described in a management manual for quality and environment define all organisational measures that ensure all products comply with the provisions and regulations as stipulated in the contract and function according to provisions.

The apra group has agreed for example to observe environmental protection requirements and to continually improve environmental protection measures.

The observance of environmental protection policy is monitored on a regular basis. The TÜV will annually check the validity of awarded certificates.





Approbations

Verein Deutscher Elektrotechniker	Underwriters Laboratories
Conformité Européenne	Canadian Standards Association
Geprüfte Sicherheit	Technischer Überwachungsverein

apra worldwide

... always at your service!



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Hungary Finland Czech republic Switzerland Denmark Sweden Austria Greece Israel

USA Canada Japan Brasil Korea

Croatia Serbia Slovakia Russia

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The apra-group · Le groupe apra · Die apra-gruppe



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