

# Subrack *RFI-SHIELDED*



## Description

The system dimensions of the *RFI-SHIELDED* subrack are based on those of the *FLEXIBLE* subrack as a logical further development to produce the perfectly shielded subrack. This allows unrestricted use of the extensive and complete range of accessories.

The special design features of the *RFI-SHIELDED* subrack:

- ✓ The refined RFI shielding concept enables high shielding effectiveness.
- ✓ The stable stainless steel contact springs ensure permanent and reliable bonding, even after a large number of plug-in cycles.
- ✓ The perforated RFI cover plates guarantee optimal air flow for improved heat dissipation.
- ✓ The use of high-quality, seawater-resistant aluminum alloys and stainless steel materials removes, for the most part, the need for unnecessary, environmentally harmful surface treatment.
- ✓ There are three versions of this subrack:

1. Subrack *RFI-SHIELDED*  
The standard RFI-shielded version.

2. Subrack *RFI-SHIELDED IEEE*  
The front is in accordance with IEEE 1101.10. The special profile rail is designed for the use of insertion and removal handles (optionally with a hot-swap function) for overcoming high insertion and removal resistance.

The card guides are fitted with mechanical coding systems and special bonding for electrostatic discharge.

3. Subrack *RFI-SHIELDED IEEE / Rear I/O*  
The front and the rear are in accordance with IEEE 1101.10/11. This enables insertion and removal of modules with a front panel from both the front and the rear of the subrack.

## Mixed forms

For vertical mounting PCB's of varying heights, divider kits are available.

## Delivery

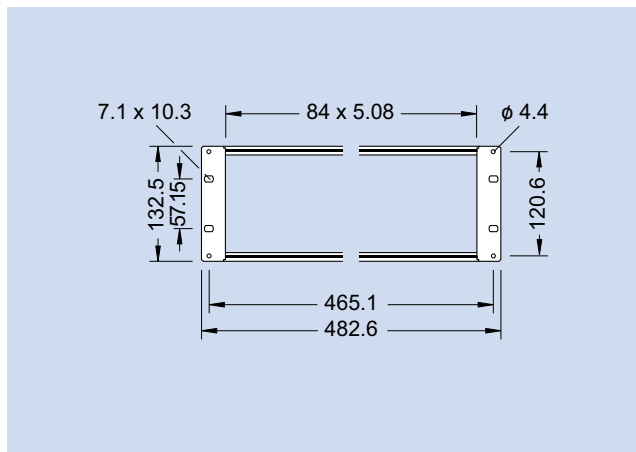
Supplied as unassembled kits. These are either packed as a kit of parts for one unit or as individual components, whereby parts of similar type are packed together.

On request, delivered as assembled and wired subrack according your requirements.

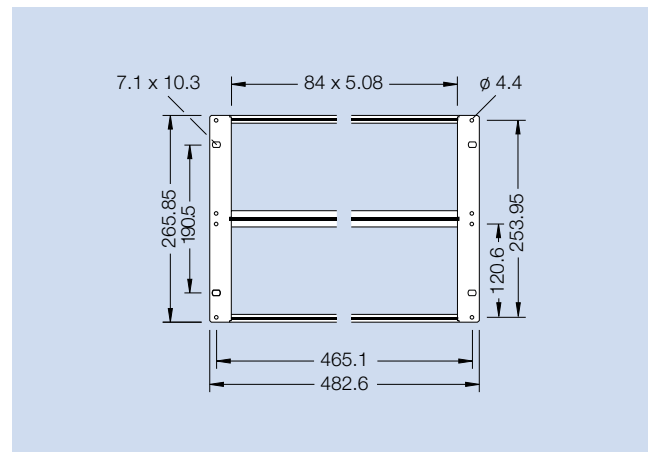
## Technical data

Standards	compliant with DIN 41 494 D IEC 60297-3, IEEE 1101.10
Width / horizontal pitch	84 usable HP / 5.08 mm
Depth of the inserted board	160, 220, 280 mm (nom. depth), 80 mm at the rear
Depth increment-side panel	10 mm
Connector mounting	M 2.5 in increments of 5.08 mm for DIN 41 612, VG 95 324 and EC 60603-2 connectors
Materials	screws: steel contact springs: stainless steel other parts: aluminum
Finish	screws: galvanized und chromated side panels and cover plates: blank (seawater-resistant) other parts: chromated
Protection class	DIN 40050 IP 00, IP 20 with cover panels contact protection in accordance with VDE 0160
Utilization category	-25 °C, +70 °C, 75% relative humidity
Protective grounding	all metal parts are electrically bonded to one another following assembly in accordance with VDE 100 D 12.65, § 6 Nb.

## Dimensions

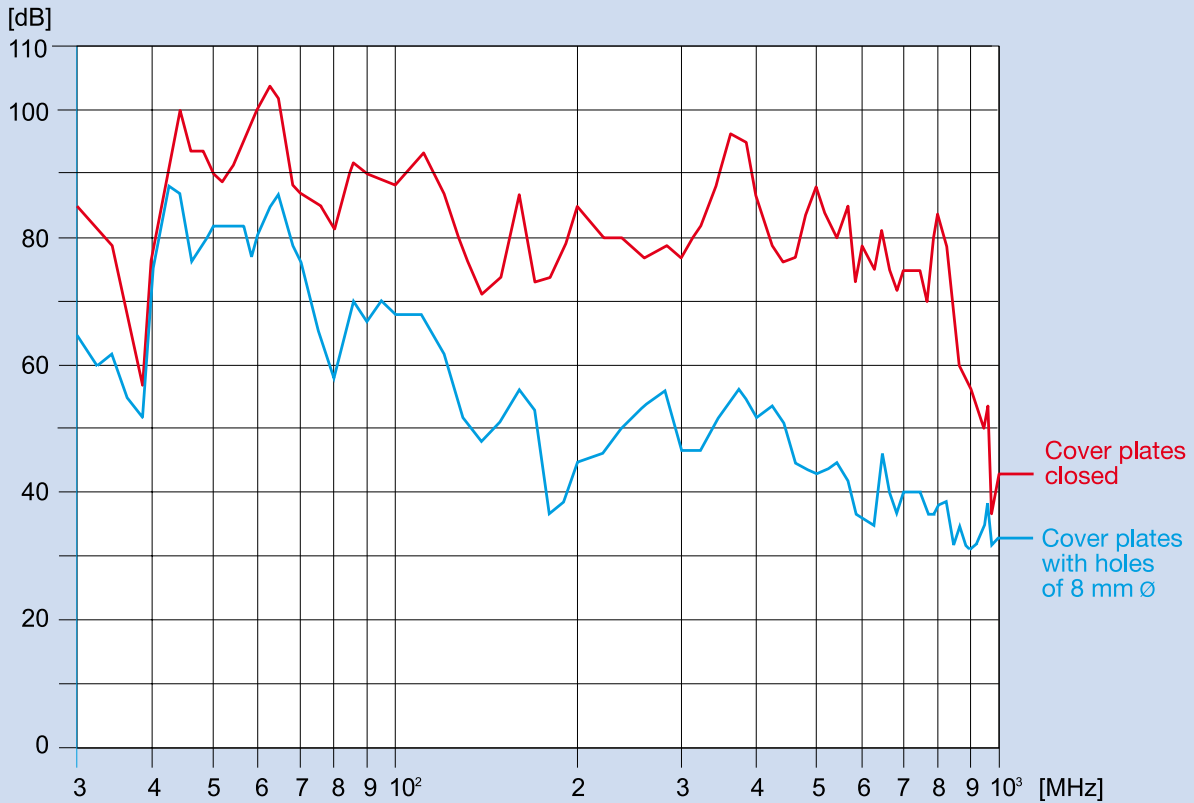


Front of subrack 3 U



Front of subrack 6 U

# Measurement Configuration, Tests, Measurement Results



Shielding efficiency as function of grade of perforation of the covers

## 1. Measurement configuration

The measurement configuration fundamentally complied with the requirements of VG 95 373, Part 15, measurement method KS 04 G.

The subrack stood in the middle of a shielded anechoic chamber. The receiver antenna was in the center of the subrack and the transmitter antenna was mounted at a distance of 1 m from it.

The subrack was positioned such that the perforated cover panel faced the transmitter antenna.

The measurement receiver was located inside the measurement chamber, approximately 2 m from the test object; the measurement transmitter and amplifier were outside the chamber.

## 2. Tests

All measurements were performed at a constant transmitter output of -5 dBm at 50 V. The first series of measurements was performed with a free-standing receiver antenna. The next measurements were then performed with the receiver antenna inside the subrack. The shielding effectiveness SE [dB] is the difference between the measurement levels obtained.

Two subrack types were tested, one with a perforated cover panel and one with a solid cover panel. Perforation diameters of 3-8 mm essentially lead to the same result:

The two related measurement curves can be seen in the diagram above.

## Frequency steps

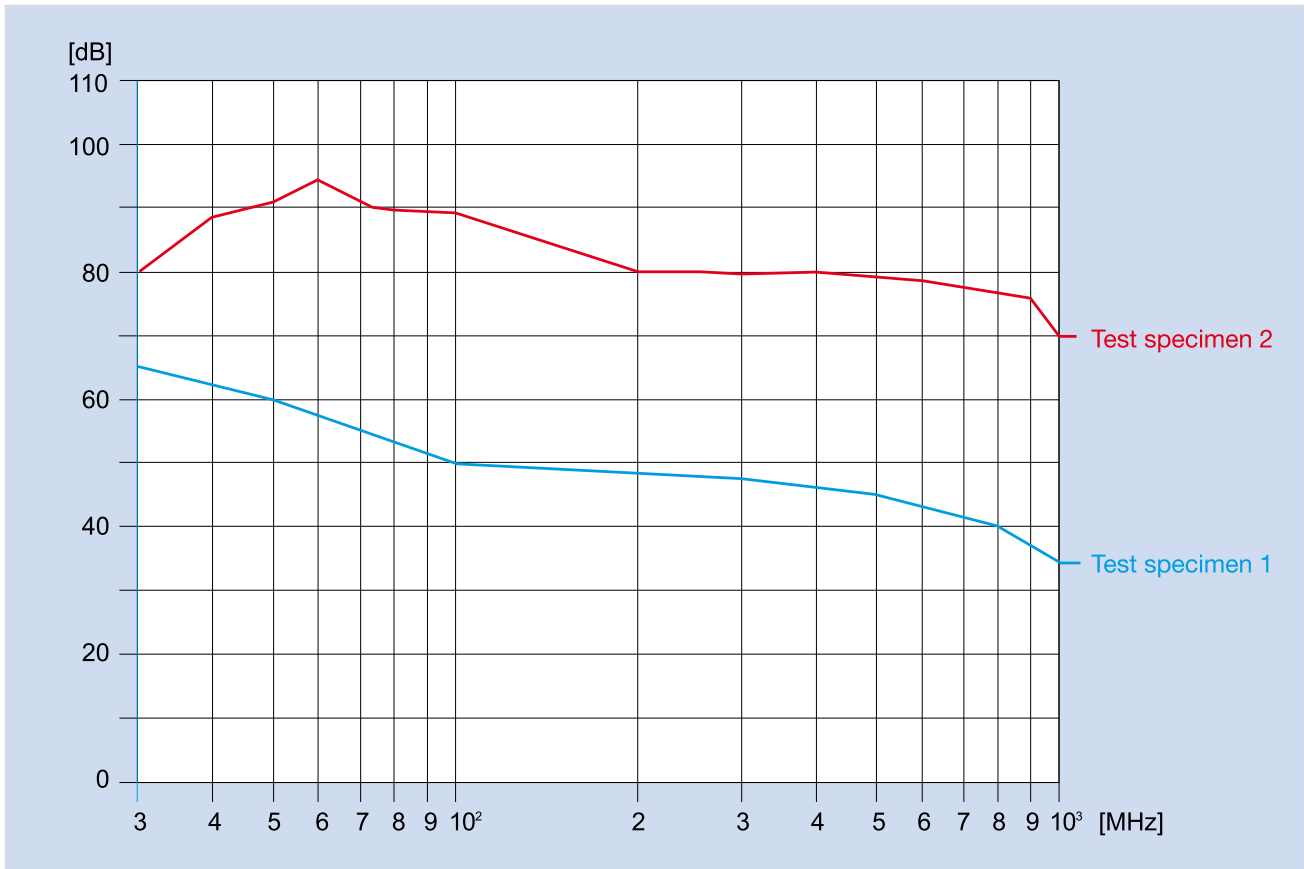
Frequency range [MHz]	Measurement step [MHz]
30 - 70	2
70 - 100	5
100 - 200	10
200 - 1000	20

## 3. Measurement results, summary

Compared to the subrack with a perforated cover panel the subrack with a solid cover panel exhibits a significantly higher level of shielding effectiveness, on average 20 dB higher in the lower frequency range (30 - 180 MHz) and on average 40 dB higher in the upper range (180 MHz - 1 GHz).

Above approximately 800 MHz the shielding effectiveness is determined by the distances between the contact points between the subrack and the front panels.

For subracks in accordance with IEEE P 1101.10 this boundary frequency lies at 1.2 to 1.5 GHz depending on the subrack design.



Shielding effectiveness

## Shielding effectiveness

The shielding effectiveness of the empty subrack was determined in accordance with VG 95 373, Part 15.

## Testing organisation

The measurements were performed in the Siemens Institute for Quality Engineering, Testing and Certification in Munich, Germany.

## Test object

Two subracks with a height of 6 U, a width of 84 HP and a depth of 320 mm were tested:

## Test specimen 1

Subrack 1 was closed at the top and bottom with perforated cover panels ( $\varnothing$  4/5 x 4 mm), at the rear with an 85 HP front panel and at the front with twenty-one 4 HP profile front panels.

The elements were bonded to each other via stainless steel RFI gaskets.

## Test specimen 2

Subrack 2 was closed at the top and bottom with solid cover panels and at the front and the rear with an 85 HP front panel. The elements were bonded to each other via stainless steel RFI gaskets.

## Advice on use

To achieve optimal shielding the subrack must be closed at all sides using RFI gaskets, i.e. it must be fitted at the front and the rear with front panels or sub-assemblies.

# Implementation of the Shielding

The RFI-SHIELDED subrack is fitted with stainless steel springs on all sides for defined bonding of all individual elements to each other. The only exceptions are the transitions of the cover plates to the side panel. In this case the bonding is performed using multiple screw connections at short distances from one another. The use of RFI front panels with bonding points at the side and bonding areas in the case of the extruded profile front panel results in a shielded subrack with shielding effectiveness levels as shown in the diagram below.

The details of the technical implementation using stainless steel springs:

1. Bonding of the cover panel to the profile channel via the RFI spring A2 which is inserted into the groove of the profile.
2. The RFI spring P2 is snapped onto the profile channel at both the front and the rear and at its front face creates the bonding to the front panels and the rear wall.

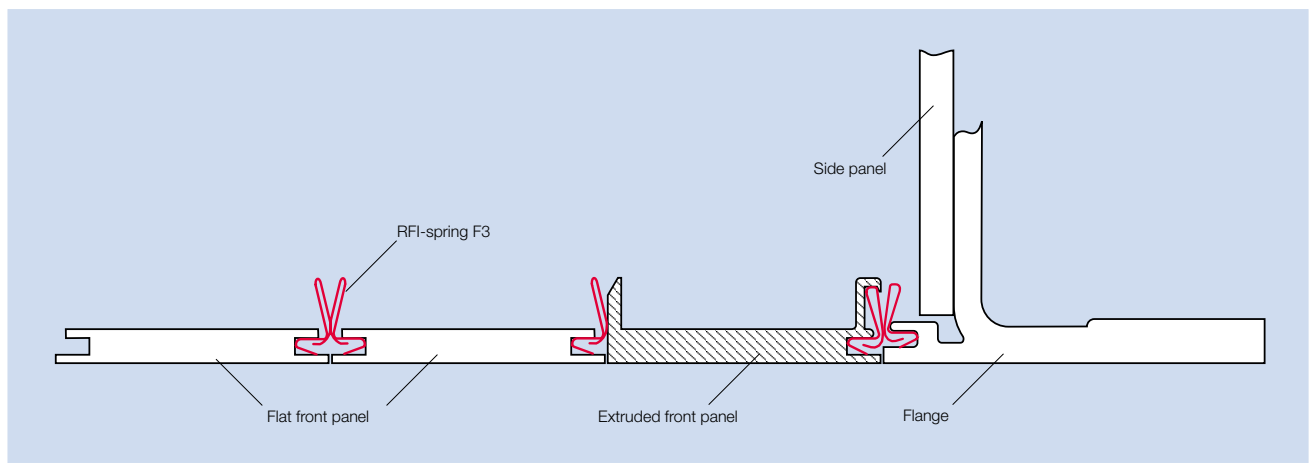
3. The RFI spring F3 is used in the subrack flange. This spring is also used at the sides of the RFI front panels and creates the bonding between the front panels and between the front panel and the flange or side panel.

4. The cover panel is screwed directly to the side panel; springs are thus not necessary here.

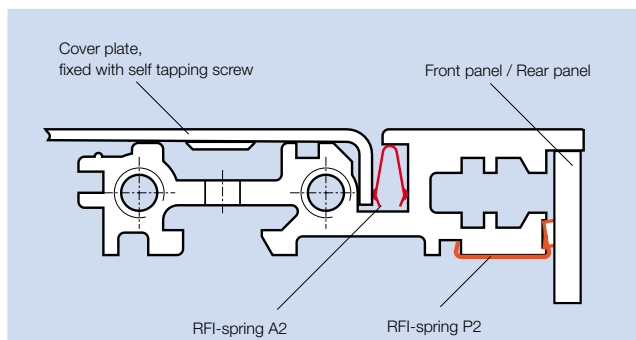
The subrack, its paneling elements and the cover panels are made of high-quality seawater-resistant aluminum alloys.

The spring strips are made of stainless steel.

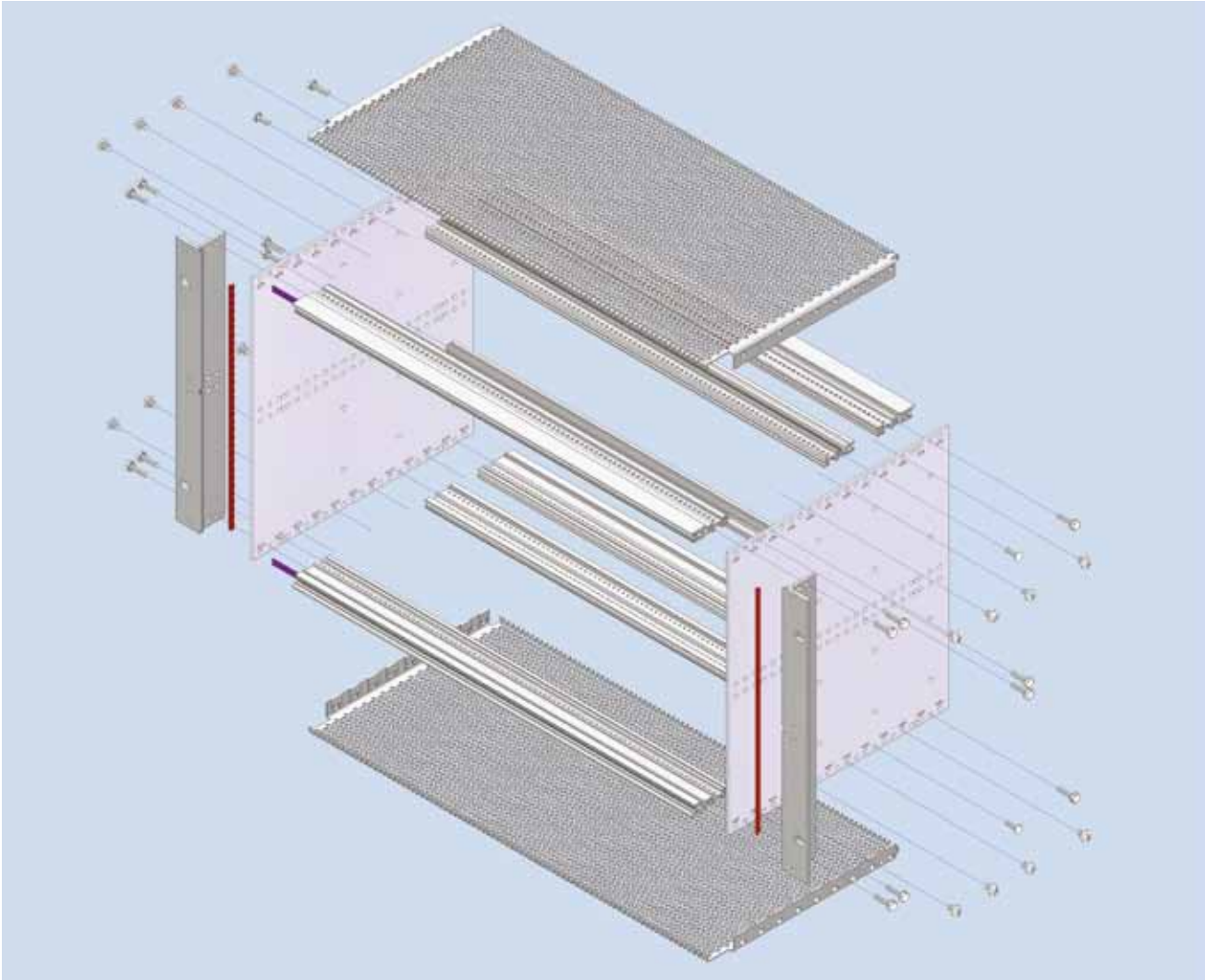
This well-balanced combination of materials and surface treatment ensures high corrosion and ageing resistance and achievement of the necessary low contact resistance between the individual elements.



Sealing of the vertical splices between the front panels and between front panel und flange



Bonding with RFI-springs

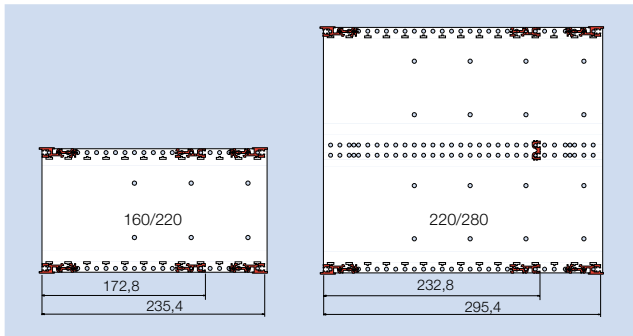


Assembling example

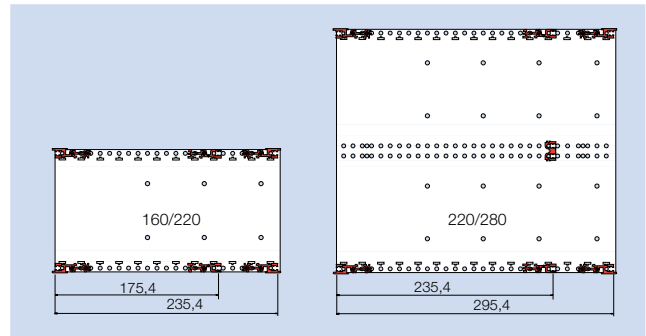
### Delivery example

	pieces
	6 U
Side panel	2
Flange	2
RFI-spring F3 (flange/front panel)	2
Threaded strip (front only)	2
Cover plates punched holes Ø 4 / 5.2x4 mm	2
RFI-spring A2 (cover plate/profile)	4
Mounting parts	1
Front profile	2
Rear profile	2
Inside profile	2
Center profile	1

# Subrack *RFI-SHIELDED*



Depth dimensions type alpha 3 U and 6 U



Depth dimensions type delta 3 U and 6 U

## Ordering details for kits

	PCB depth/ nom. depth [mm]	type <i>alpha</i> order no. <b>409.</b>	type <i>delta</i> order no. <b>409.</b>
3 U - subrack			
<i>RFI-SHIELDED</i> - 84-3-220	160/220	<b>162 708</b>	<b>162 710</b>
<i>RFI-SHIELDED</i> - 84-3-280	220/280	<b>162 709</b>	<b>162 711</b>
6 U - subrack			
<i>RFI-SHIELDED</i> - 84-6-220	160/220	<b>162 712</b>	<b>162 714</b>
<i>RFI-SHIELDED</i> - 84-6-280	220/280	<b>162 713</b>	<b>162 715</b>

## Delivery

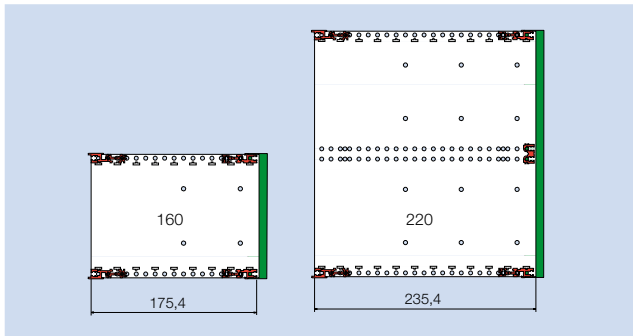
	pieces per kit <i>alpha</i> 3 U	pieces per kit <i>alpha</i> 6 U	pieces per kit <i>delta</i> 3 U	pieces per kit <i>delta</i> 6 U
Side panel	2	2	2	2
Flange	2	2	2	2
RFI-spring F3 (flange/front panel)	2	2	2	2
Threaded strip (front only)	2	2	2	2
<small>For your custom subrack please order threaded strips separately.</small>				
Cover plate punched holes Ø 4 / 5.2 x 4 mm	2	2	2	2
RFI-spring A2 (cover plate/profile)	4	4	4	4
Mounting parts kit	1	1	1	1
Front profile/rear V12-RFI-85	4	4	4	4
Inside profile-HE1-85	2	2	-	-
Center profile ME1-85	-	1	-	-
Inside profile-HE2-85	-	-	2	2
Center profile ME2-85	-	-	-	1

## Accessories

	order no. 409.
Threaded strip 84 x M 2.5	091 255
Insulating strip 84 HP	051 981
RFI-spring P2 - 84 (profile/front panel)	106 547

Further details and possibilities of other applications are in the chapter *Subrack-Accessories*.

# Subrack *RFI-SHIELDED* with Rear Cover



Depth dimensions type delta 3 U and 6 U

## Ordering details for kits

	PCB depth [mm]	type <i>delta</i> order no. <b>409.</b>
3 U - subrack		
<i>RFI-SHIELDED</i> - 84-3-160	160	<b>162 716</b>
<i>RFI-SHIELDED</i> - 84-3-220	220	<b>162 717</b>
6 U - subrack		
<i>RFI-SHIELDED</i> - 84-6-160	160	<b>162 718</b>
<i>RFI-SHIELDED</i> - 84-6-220	220	<b>162 719</b>

## Delivery

	pieces per kit <i>delta</i> 3 U	pieces per kit <i>delta</i> 6 U
Side panel	2	2
Flange	2	2
Cover	1	1
RFI-spring F3 (flange/front panel)	2	2
Threaded strip (front only)	2	2
<small>For your custom subrack please order threaded strips separately.</small>		
Cover plates punched holes Ø 4 / 5.2 x 4 mm	2	2
RFI-spring A2 (cover plate/profile)	4	4
Mounting parts kit	1	1
Front profile V12-RFI-85	2	2
Rear profile H22-RFI-85 for screw on cover	2	2
Center profile ME2-85	-	1

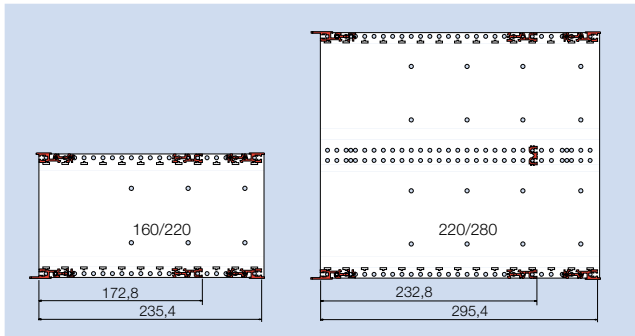
## Accessories

	order no. 409.
Threaded strip 84 x M 2.5	091 255
Insulating strip 84 HP	051 981
RFI-spring P2 - 84 (profile/front panel)	106 547

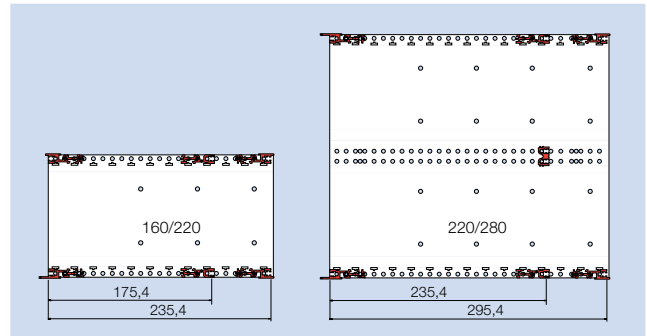
Further details and possibilities of other applications are in the chapter *Subrack-Accessories*.



# Subrack *RFI-SHIELDED IEEE*



Depth dimensions IEEE type alpha 3 U and 6 U



Depth dimensions IEEE type delta 3 U and 6 U

## Ordering details for kits

	PCB depth/ nom. depth [mm]	type <i>alpha</i> order no. <b>409.</b>	type <i>delta</i> order no. <b>409.</b>
3 U - subrack			
<i>RFI-SHIELDED - IEEE - 84-3-220</i>	160/220	<b>162 720</b>	<b>162 722</b>
<i>RFI-SHIELDED - IEEE - 84-3-280</i>	220/280	<b>162 721</b>	<b>162 723</b>
6 U - subrack			
<i>RFI-SHIELDED - IEEE - 84-6-220</i>	160/220	<b>162 724</b>	<b>162 726</b>
<i>RFI-SHIELDED - IEEE - 84-6-280</i>	220/280	<b>162 725</b>	<b>162 727</b>

## Delivery

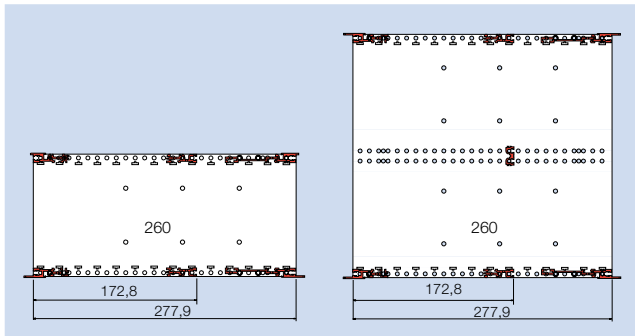
	pieces per kit <i>alpha</i> 3 U	pieces per kit <i>alpha</i> 6 U	pieces per kit <i>delta</i> 3 U	pieces per kit <i>delta</i> 6 U
Side panel	2	2	2	2
Flange	2	2	2	2
RFI-spring F3 (flange/front panel)	2	2	2	2
Threaded strip (front only)	2	2	2	2
<small>For your custom subrack please order threaded strips separately.</small>				
Cover plates punched holes $\varnothing 4 / 5.2 \times 4\text{mm}$	2	2	2	2
RFI-spring A2 (cover plate/profile)	4	4	4	4
Mounting parts kit	1	1	1	1
Front profile/rear V12-IEEE-85	1	2	1	2
Front profile/rear V12-RFI-85	3	2	3	2
Inside profile-HE1-85	2	2	-	-
Center profile inside ME1-85	-	1	-	-
Inside profile-HE2-85	-	-	2	2
Center profile inside ME2-85	-	-	-	1

## Accessories

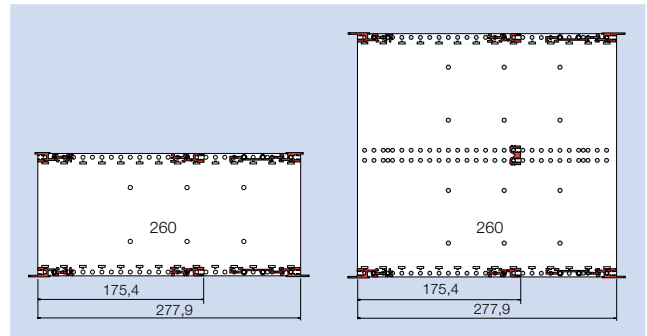
	order no. <b>409.</b>
Threaded strip 84 x M 2.5	091 255
Insulating strip 84 HP	051 981
RFI-spring P2 - 84 (profile/front panel)	106 547

Further details and possibilities of other applications are in the chapter Subrack-Accessories.

# Subrack RFI-SHIELDED Rear I/O



Depth dimensions Rear I/O type alpha 3 U and 6 U



Depth dimensions Rear I/O type delta 3 U and 6 U

## Ordering details for kits

	nom. depth [mm]	type <i>alpha</i> order no. 409.	type <i>delta</i> order no. 409.
3 U - subrack			
<i>RFI-SHIELDED Rear I/O-84-3-160+80</i>	260	<b>162 728</b>	<b>162 729</b>
6 U - subrack			
<i>RFI-SHIELDED Rear I/O-84-6-160+80</i>	260	<b>116 484</b>	<b>161 034</b>

## Delivery

	pieces per kit <i>alpha</i> 3 U	pieces per kit <i>alpha</i> 6 U	pieces per kit <i>delta</i> 3 U	pieces per kit <i>delta</i> 6 U
Side panel	2	2	2	2
Flange	2	2	2	2
RFI-spring F3 (flange/front panel)	2	2	2	2
Threaded strip (front only)	2	2	2	2
<small>For your custom subrack please order threaded strips separately.</small>				
Cover plates punched holes $\varnothing 4 / 5.2 \times 4\text{mm}$	2	2	2	2
RFI-spring A2 (cover plate/profile)	4	4	4	4
Mounting parts kit	1	1	1	1
Front profile V12-IEEE-85	1	2	1	2
Front profile V12-RFI-85	1	-	1	-
Rear profile-V1HUCK-IEEE-85	1	2	1	2
Rear profile-V1HUCK-85	1	-	1	-
Inside profile-HE1-85	2	2	-	-
Inside profile-HE2-85	-	-	2	2
Support profile for card guide	2	2	2	2

## Accessories

	order no. 409.
Threaded strip 84 x M 2.5	091 255
Insulating strip 84 HP	051 981
RFI-spring P2 - 84 (profile/front panel)	106 547

Further details and possibilities of other applications are in the chapter Subrack-Accessories.