Low-voltage switchgear
MNS Light W

Installation, handling
and operation

ABB LV Systems

MNS Light W switchgear is a flexible system that is primarily designed for motor control. The rated service voltage is 690 V and the rated current is max. 1900 A (IP21, IP31).

MNS Light W can be equipped with:
– starters and distribution units of withdrawable design (W units)
– distribution units, MCB boards and fuse boards of removable design (R units)

For further information see:
– Brochure 1TSC 2110-EN

List of contents

Handling and unpacking

The switchgear cubicles are delivered in the form of ready assembled completed units with horizontal busbars. Each cubicle is protected with plastic wrapping and securely attached to a loading pallet.

Check the delivery against the accompanying advice note.

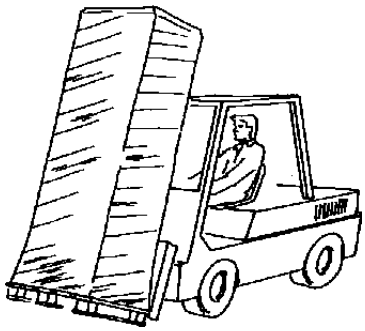
Handle the cubicles carefully. Transportation can be conveniently effected using fork-lift trucks.

When hoisting with an overhead travelling crane or other hoists:

1. Use the lifting plate attachments supplied in the installation kit.
2. Fix the lifting slings with shackles in the holes in the lifting plates.
3. Adjust the length of the slings so that the angle between them does not exceed 60°.

If the cubicles are not to be installed directly, they should be stored in a dry place protected from dust. The plastic wrapping should be kept on as a protection.

Avoid fixing adhesive marking labels to painted surfaces. If they are left on too long, the paint may become discoloured.



The cubicles are most easily transported using a fork-lift truck.

When hoisting with a crane, the lifting plate attachments should be mounted on the cubicles.

Cubicle types, overview

Circuit-breaker cubicle for ACB
Cubicle width 600 mm.

Circuit-breaker cubicle for MCCB
Cubicle width 500 mm.

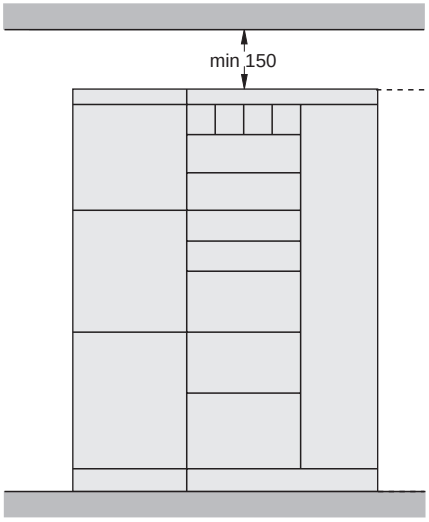
Disconnector cubicle
Cubicle width 500 or 600 mm.

Apparatus cubicle W
Cubicle width 600 + 400 or 600 + 600 mm.

Apparatus cubicle F
Cubicle width 500 mm.

The following dimensions are identical for all types of MNS light W cubicles

Height	2126 mm
Height module	50 mm
Depth	650 mm



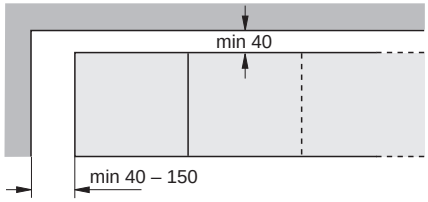
Free space above cubicle.

Free space around cubicles

There should be at least 150 mm clearance above the cubicles.

The distance between each cubicle´s rear panel and the wall, and between the end panel and the wall should be at least 40 mm.

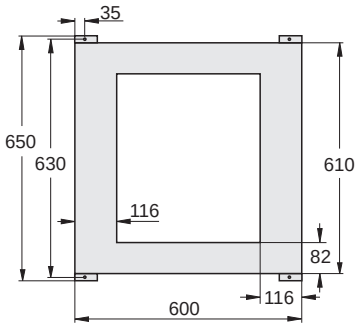
Apparatus cubicles with operating handles in the panels should be placed at a distance of at least 150 mm from the left end panel to the wall to allow the panels to be opened more than 90°.



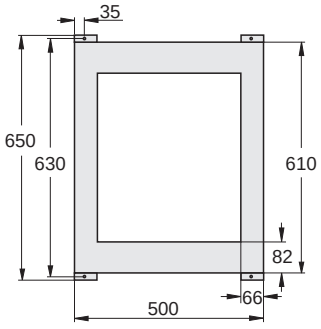
Distance to wall.

Drilling of holes

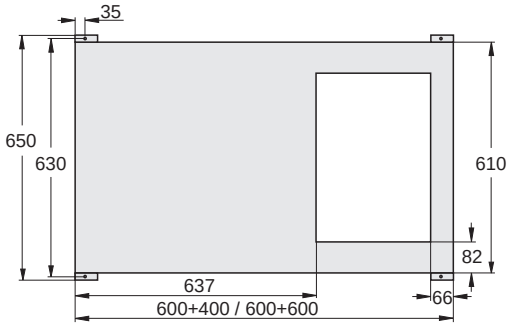
The drawing shows the maximum permissible holes that can be drilled for external cables under the cubicles, in the base plate and in the roof plate.



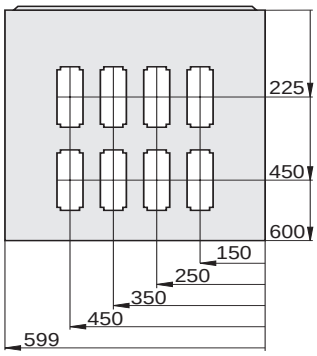
Holes in floor and base plate:
Circuit-breaker cubicle ACB
Disconnector cubicle, b = 600



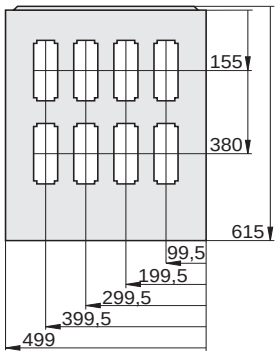
Holes in floor and base plate:
Circuit-breaker cubicle in MCCB
Disconnectror cubicle, b=500



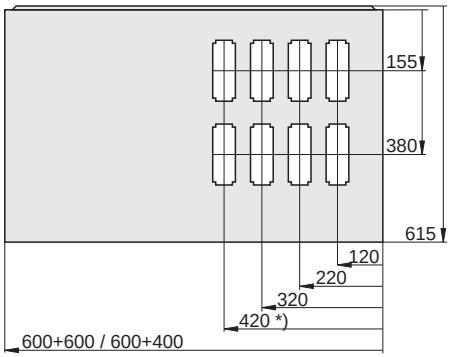
Holes in floor and base plate:
Apparatus cubicle W



Holes in roof plate:
Circuit-breaker cubicle ACB
Disconnector cubicle, b= 600



Holes in roof plate:
Circuit-breaker cubicle MCCB
Disconnector cubicle, b = 500



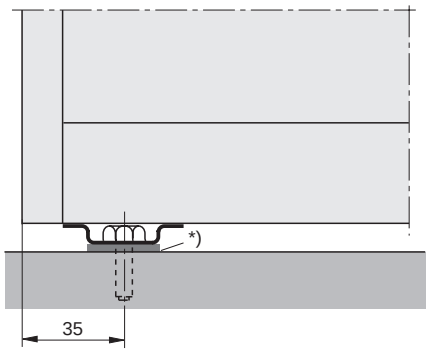
*) Only for cubicles 600 + 600 wide

Holes in roof plate:
Apparatus cubicle W

Alignment of cubicles

The flooring should be flat and even and carefully chosen for cubicle erection (Swedish House-AMA Tolerance 3B or Class 2) so that several cubicles can be bolted together without necessitating further measures.

If the floor is not sufficiently flat, this may result in panels and doors jamming. The height of the cubicles can be adjusted by inserting sheet metal shims under the attachment lugs.

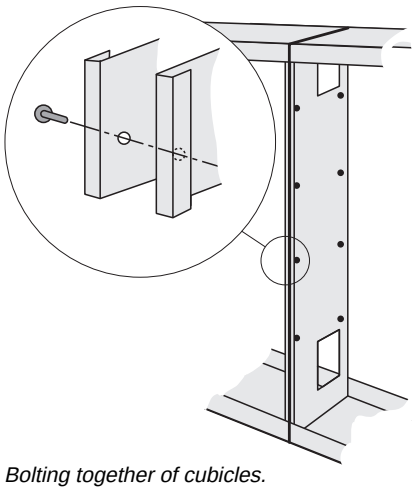


Height adjustment is effected by inserting sheet metal shims under the attachment lugs.

Bolting together of cubicles

Any height adjustment of cubicles necessary must be carried out before bolting them together.

On the right-hand end panel of the cubicles there are eight clearance holes for M6 hexagonal headed bolts and in the left-hand end panel there are corresponding threaded holes. Upon delivery, the bolts are screwed into the left end panel.



Bolting together of cubicles.

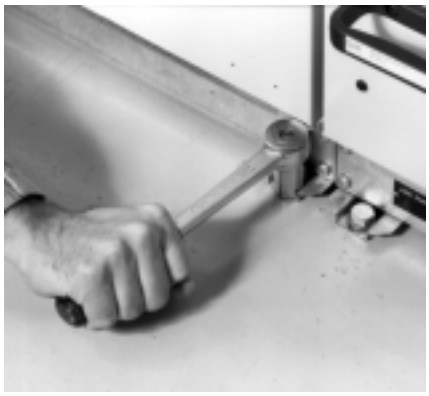
Attachment

Each cubicle has four external attachment lugs for anchoring to the floor, hole diameter 16 mm. Drilling should be done after the cubicles have been moved into their final positions. Check that no cement dust or the like gets into the cubicles when drilling.

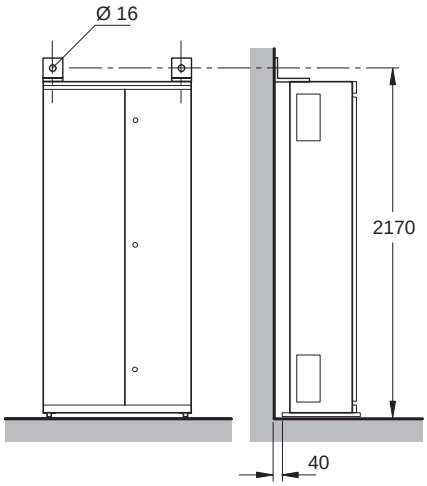
Free-standing cubicles and the first cubicle in a row should be fixed to the floor at all four attachment lugs. Other cubicles in a row should only be bolted down at one side of the cubicle (two attachment lugs).

When mounting against a wall, or back to back, the cubicles should be fixed at the top with wall mountings. Free-standing cubicles and the first cubicle in a row should be fixed with two wall mountings. Other cubicles in a row should only be fixed with one wall mounting. The wall mountings are fitted on top of the cubicles and have to be turned so that the fixing holes face upwards.

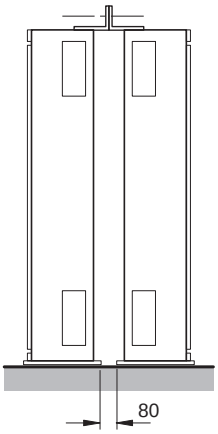
When fixing against a wall, or back to back, the cubicles should be bolted to the floor only at the front attachment lugs.



Attachment to floor.



Attachment to wall.



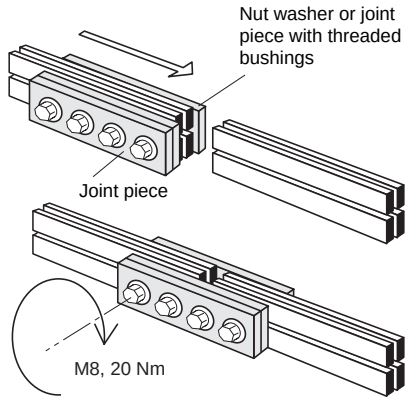
Attachment back to back.

Interconnection of horizontal busbars

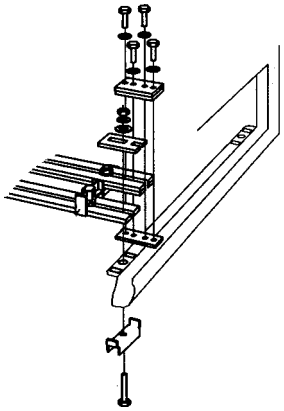
Connection of the horizontal busbars between the cubicle units should take place from the front of the cubicles. Phase bars, N bars and PE bars are all to be joined in the same manner.

1. Remove the protection plates in front of the bars to allow access to the point of interconnection.
2. Untight the bolts in the joint pieces.
3. Move over the joint pieces to the bars in the cubicle alongside.
4. Tighten the bolts with a torque wrench, 20 Nm.
5. Fit the protection plates back on.

In the case of double joint pieces, both should be placed at the front of the bars. In the case of three joint pieces, two should be placed at the front of the bars and the joint piece with threaded bushings behind the bars (replacing the nut washer).



Joining of phase bars.



Joining of N and PE bars.

Apparatus cubicle

All external cables to apparatus cubicles are to be laid in the area intended for cables.

Main cables

In the cable area there are four rails, at the rear and on the right-hand cubicle wall, for fixing of main cables using cable hangers. They are provided with holes 50 mm apart for sturdy bunching straps. Slimmer cables are best fixed to the rails by crossing two smaller bunching straps.

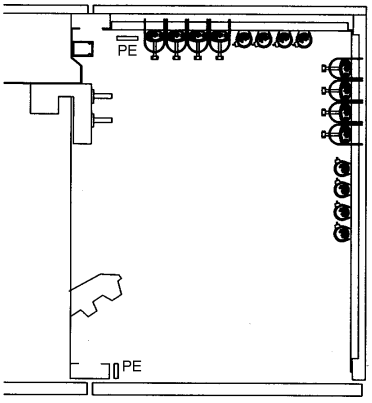
Auxiliary cables

Internal leads and operating voltage supply cables should be drawn along a cable duct placed to the left at the rear of the cable area.

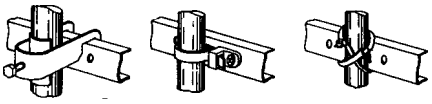
For withdrawable units, there is a strap attachment on the right hand side of the cassette plate for supporting the weight of the operating cables.

In the apparatus and cable area there is a cable duct intended for connections between cubicles.

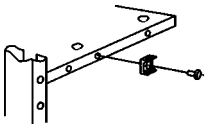
In the cable area there is an attachment rail intended for cubicle terminal boards (B50).



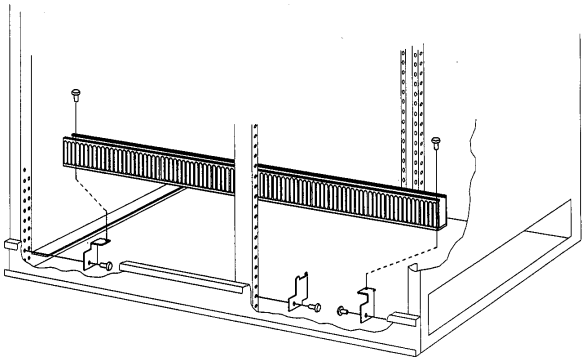
Cable area.



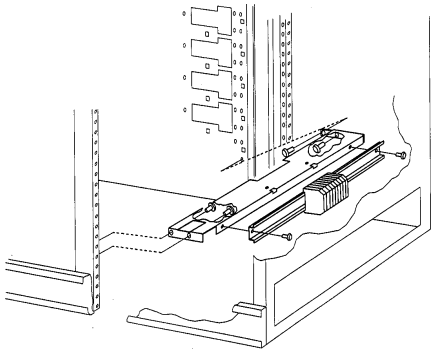
Cable clamping straps.



Strap attachment.



Cable duct for operating cables between cubicles.



Attachment rail for cubicle terminal boards.

Circuit breaker cubicles, disconnector cubicles, cubicles for extra equipment

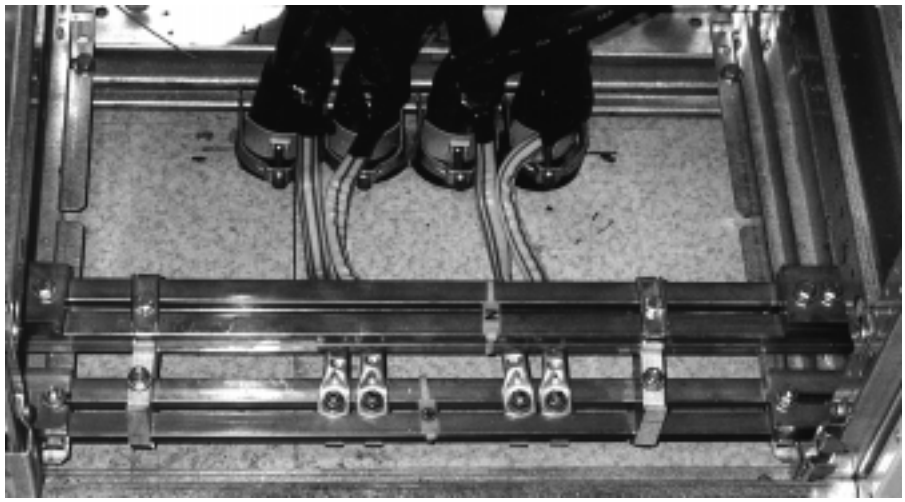
Main cables

The main cables are supported with fixing clamps in anchoring rails which can be attached in depth at different levels and matched to terminal bars and cables.

Mounting pieces for connection of PE (N) conductors to busbars are supplied strapped onto the cubicle.

Auxiliary cables

Operating cables are supported with bunching straps in the cable brackets fixed to the ends of the cubicle. Operating cables can be placed on either side, depending on where the terminal board is placed.



Connection of circuit-breaker cubicles and disconnector cubicles

Cable cross-sectional areas, main circuits

Cubicle designs A and E.
Cable connection from below or above.

Max. connectable area	mm²
Disconnector cubicle	
1250 – 1600 A	6//240
2000 A	20//240
Circuit-breaker cubicle MCCB	
1250 – 1600 A	6//240
Circuit-breaker cubicle ACB	
1250 – 2000 A	8//240

Cable cross-sectional areas, auxiliary circuits

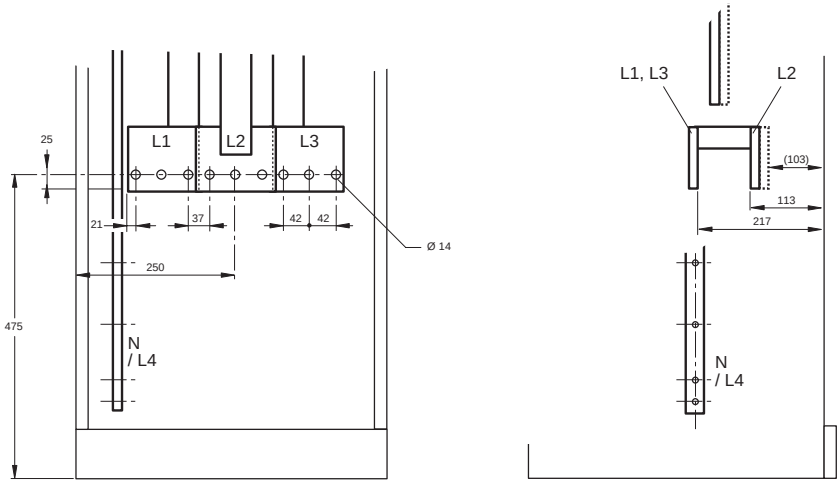
Auxiliary circuit cables are to be connected to terminal boards.

Max. connectable area	mm²
Fixed	4
Disconnectable	10

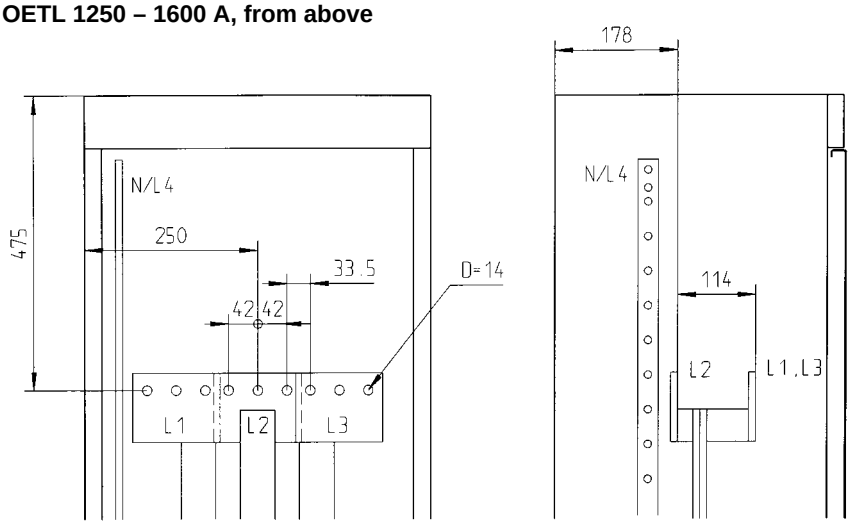
Dimension drawings

Disconnector cubicle, cable connection

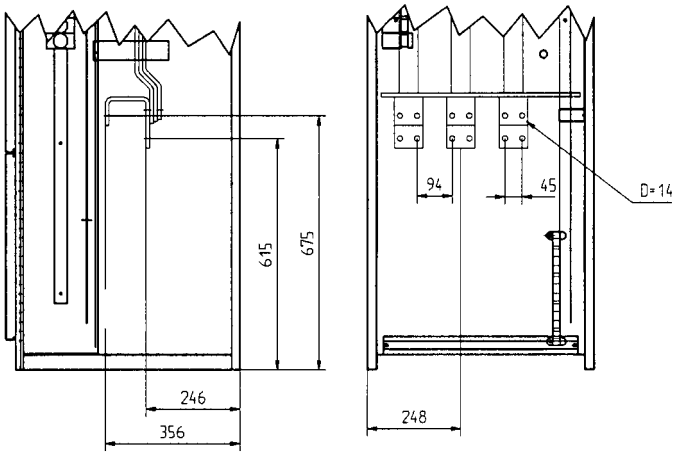
OETL 1250 – 1600 A, from below



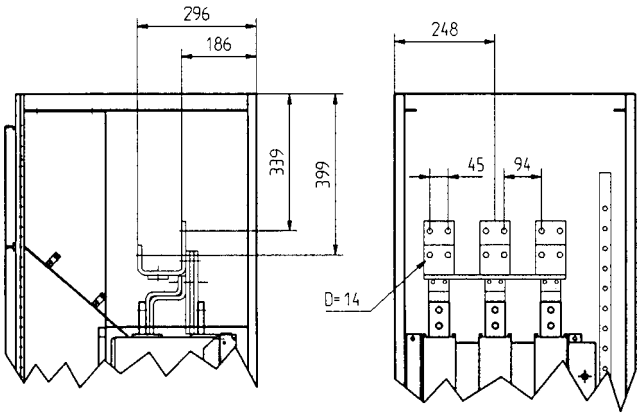
OETL 1250 – 1600 A, from above



OETL 2000 A, from below



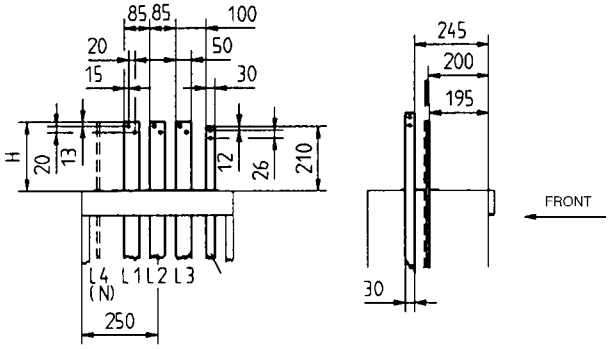
OETL 2000 A, from above



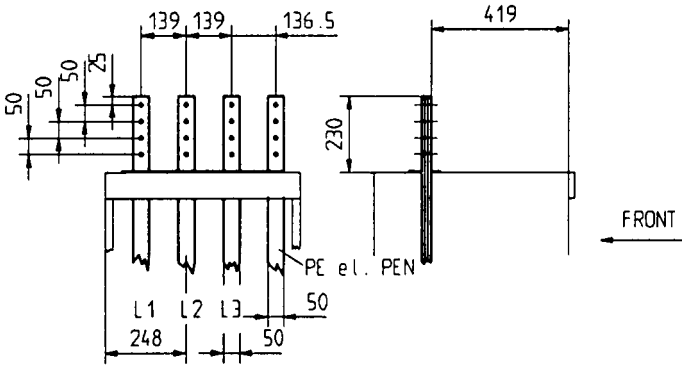
Dimension drawings

Disconnector cubicle, busbar connection from above

OETL 1250 – 1600 A



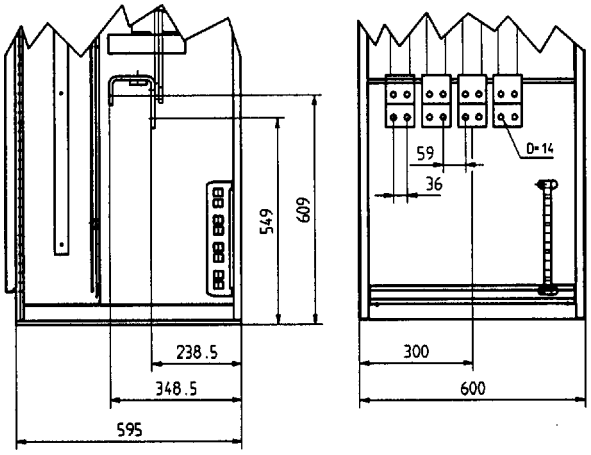
OETL 2000 A



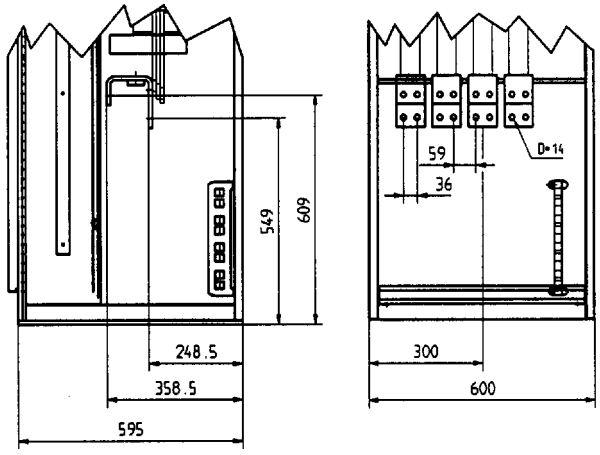
Dimension drawings

Circuit-breaker cubicle, cable connection

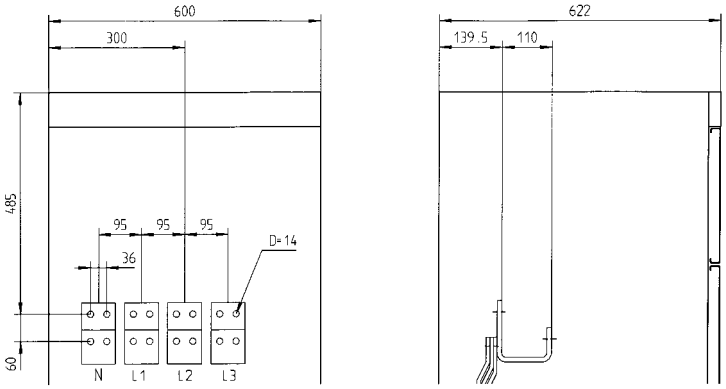
MEGAMAX 1250 - 1600 A, from below.



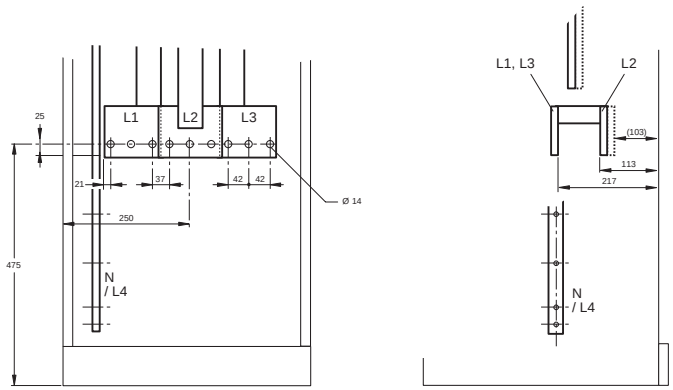
MEGAMAX 2000 A, from below



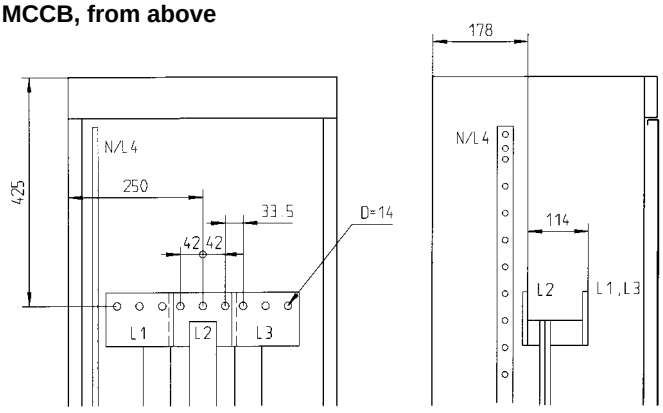
MEGAMAX, from above



MCCB. from below



MCCB, from above

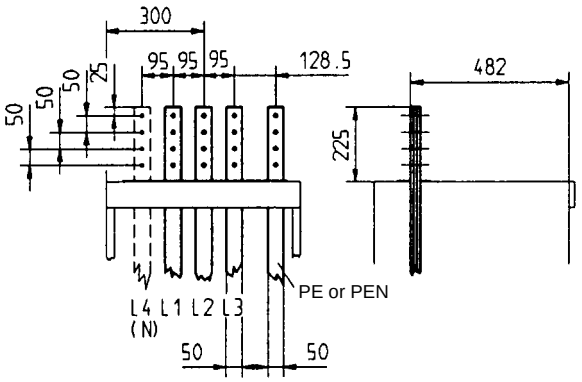


Dimension drawings

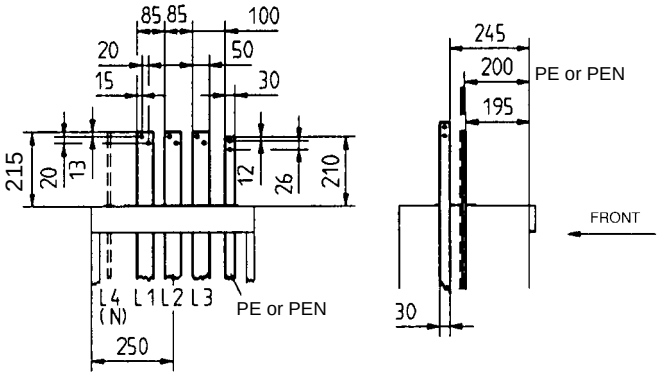
Circuit-breaker cubicle, busbar connection from above

2// busbars ≤ 1600 A
3// busbars 2000 A

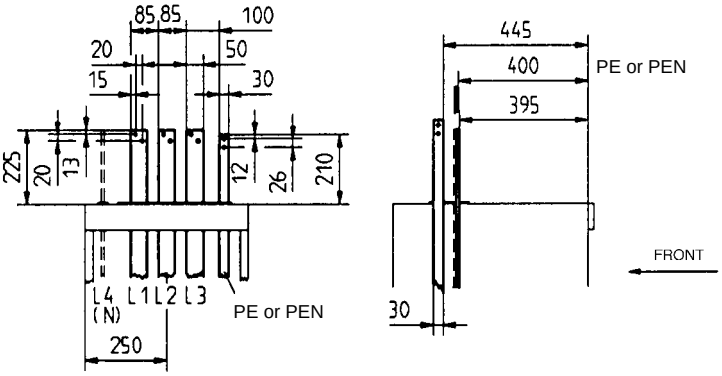
MEGAMAX 1250 - 2000 A



MCCB fixed 630 - 1600 A, withdrawable 630 - 800 A



MCCB withdrawable 630 - 1600 A



Connection of busbar trunking system

Busbar trunking connections are used for incoming or outgoing supply, or for connecting rows of switchgear together.

Each trunking unit takes up a height of 6 M in the upper part of the cubicle. Several apparatus units can therefore not be mounted in this space at the same time.

The trunking units have four conductors and are intended for connection to busbar trunking terminal units of type LD, enclosure class IP30 or IP54.

PE and N conductors

A common protective earth and neutral busbar (PEN) is connected via the fourth busbar of the trunking unit.

In the case of separate N and PE bars, the N conductor is connected via the fourth busbar of the trunking unit, whereas the PE conductor is connected via the enclosure of the trunking unit.

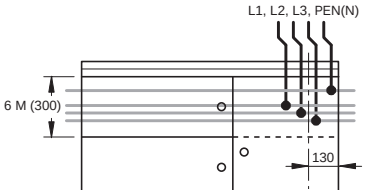
Note the phase sequence

Busbar trunking units are available in two types; 661 with phase sequence from left to right and 662 with phase sequence from right to left.

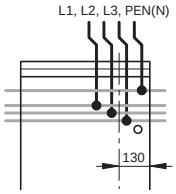
For adjacent rows of cubicles with fronts facing the same way, the one connection unit should be of type 661 and the other of type 662. The same applies if the cubicles stand front to front or back to back. If the rows of cubicles stand behind each other with their fronts facing the same way, both connection units should be of type 661.

Dimension drawings

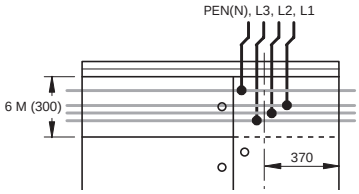
Connection units 1250 and 1600 A



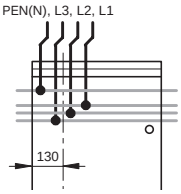
Type 661 for apparatus cubicle W.



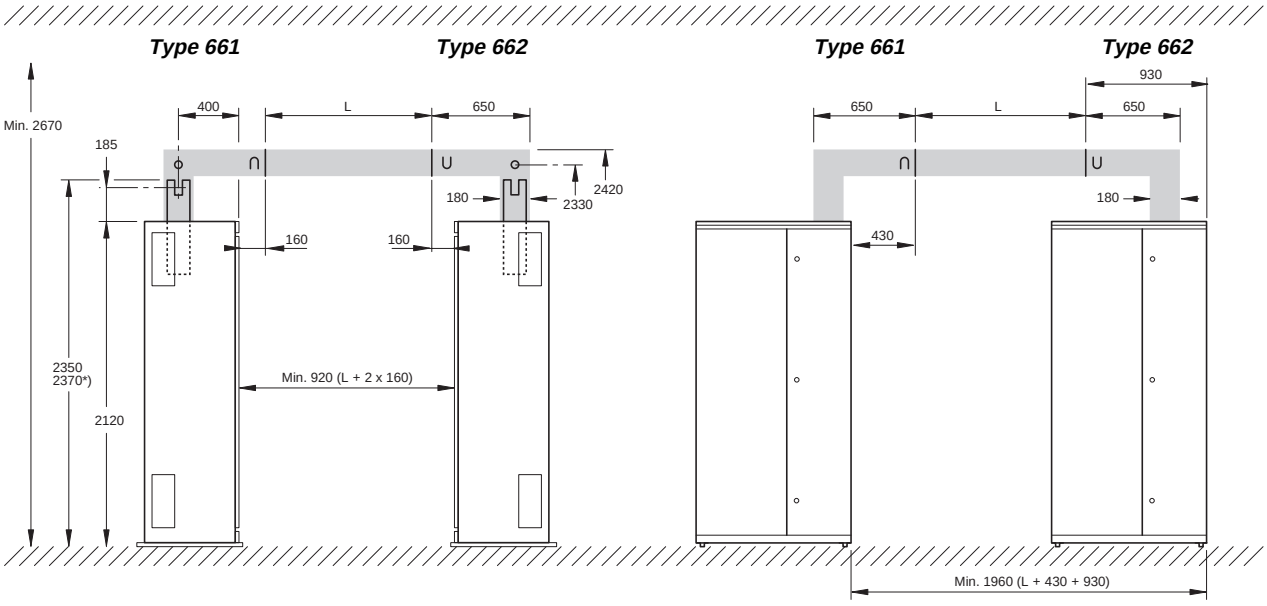
Type 661 for circuit-breaker cubicle, disconnector cubicle and apparatus cubicle F.



Type 662 for apparatus cubicle W.



Type 662 for circuit-breaker cubicle, disconnector cubicle and apparatus cubicle F.

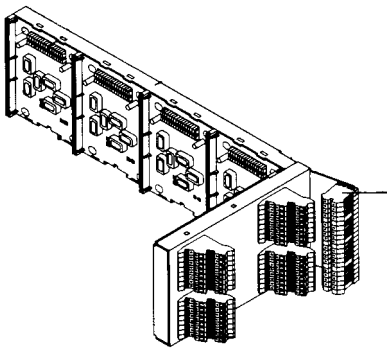


**) 2350 for size 1250 A*
2700 for size 1600 and 2000 A

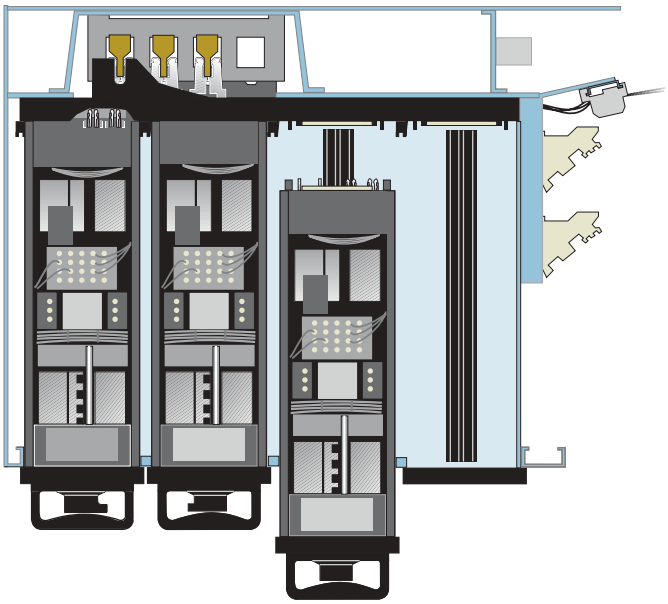
Connection of apparatus units

Withdrawable apparatus units 4 M/4, main circuits

Max connectable area	1 x 10 mm^2

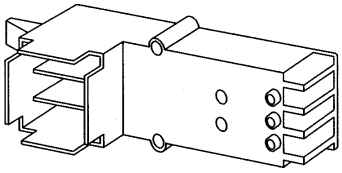


Main circuit terminal boards

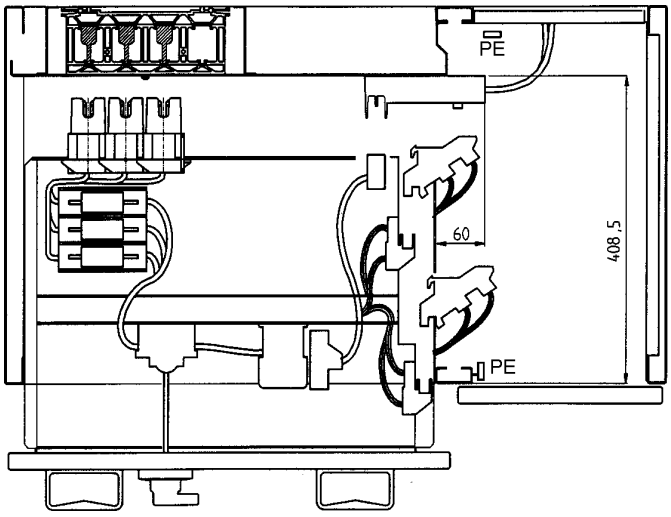


Withdrawable apparatus units 2 M, main circuits

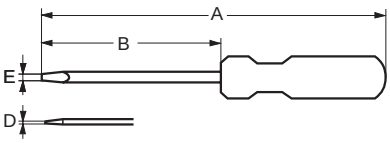
Max connectable area	1 x 25 mm^2



Connection unit for main circuits.
Phase interval = 18 mm.



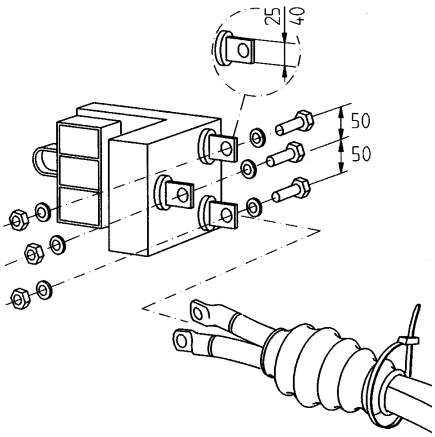
Requisite screwdriver size for connection unit's clamp		
Dimension	A	max 230 mm
	B	min 80 mm
	C	1,0 mm
	D	5,5 mm



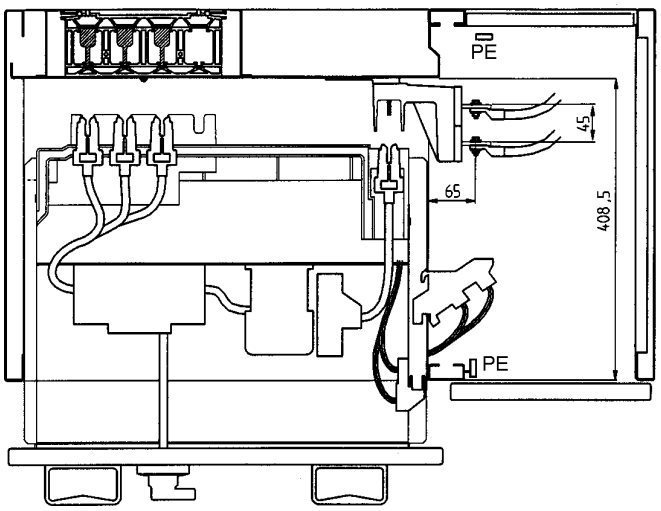
Examples of suitable screwdrivers for the connection unit		
BACHO 6000/6850	1,0 x 5,5	L = 210 mm
BACHO Ergo/850	1,0 x 5,5	L = 222 mm
BACHO Ergo S/8150 S	1,0 x 5,5	L = 222 mm
WERA 35	1,0 x 5,5	L = 223 mm
WERA 1678 A	1,0 x 5,5	L = 220 mm
WERA 335	1,0 x 5,5	L = 223 mm

Withdrawable apparatus units 4 M - 12 M ≤ 400 A, main circuits

Connection unit size	Max. connectable area	Max. bolt dimension	Max. tightening torque	Cable shields per phase
3 x 160 A (25 mm)	1 x 120 mm^2	M10 x 30	45 Nm	1 x 120 mm^2
6 x 160 A (25 mm)	1 x 120 mm^2	M10 x 30	45 Nm	1 x 120 mm^2
3 x 400 A (40 mm)	2 x 240 mm^2	M12 x 35	80 Nm	2 x 240 mm^2

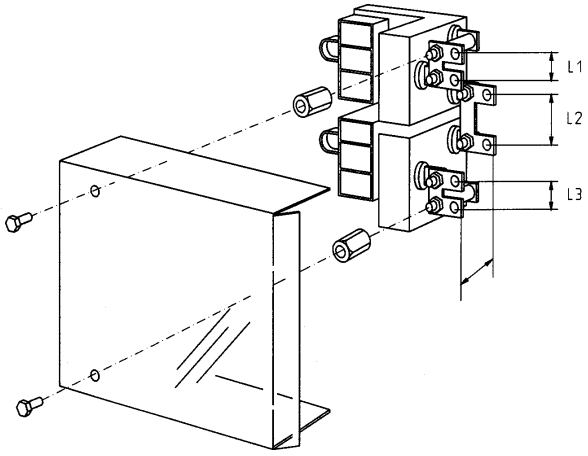


Connection unit for main circuits.
The cable shield protecting against inadvertent touching should be cut to fit the cable area. The shield should be secured with a clamping strap.

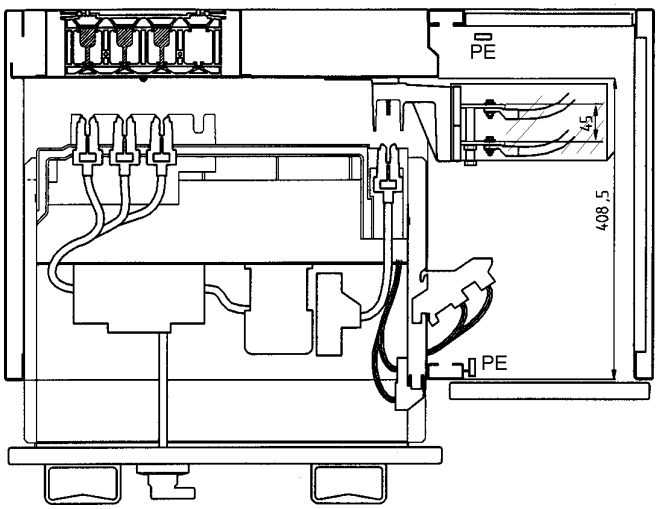


Withdrawable apparatus units 8 M - 12 M > 400 A, main circuits

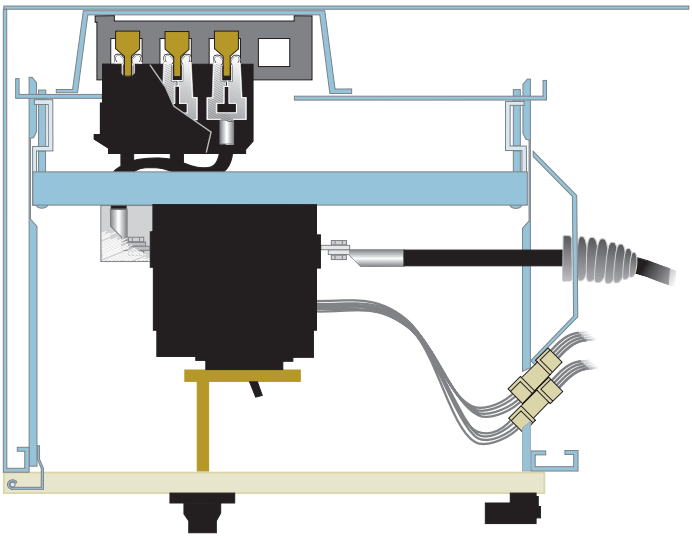
Connection unit size	Max. connectable area	Max. bolt dimension	Max tightening torque
3 x 800 A	4 x 240 mm^2	M 12 x 35	80 Nm



Connection unit for main circuits. A shield protecting against inadvertent touching should be mounted over the connection unit and cable clips.



Removable apparatus units, main circuits



The main circuits are to be connected direct to the apparatus terminals using a cable lug or cable clip. Cable shield protecting against inadvertent touching.

Apparatus unit		Connectable area, copper cable			Connectable area, aluminium cable		
Type	Size	Min. area mm^2	Max. area cable lug mm^2	Max. area cable clip mm^2	Min. area mm^2	Max. area cable lug mm^2	Max. area cable clip mm^2
MCCB Type ISOMAX N, fixed							
S3N 160	19 – 100 A	16 – 25	50	70	16 – 35	70	70
S3N 160	88 – 160 A	35 – 50	2//95	120	50 – 70	2//150	120
S3N 250	140 – 250 A	50 – 95	2//95	120	120 – 150	2//150	-
S4N 250	40 – 250 A	25 – 95	2//195	120	120 – 150	2//150	-
S5N 400	130 – 400 A	35 – 240	2//150	300	240 – 300	2//240	300
S6N 630	250 – 630 A	1x95 – 2//150	3//300	2//300	2//240	3//240	2//300
S6N 800	320 – 800 A	1x150 – 2//240	3//300	2//300	2//300	3//240	2//300
MCCB Type ISOMAX N, plug-in							
S3N 160	19 – 100 A	16 – 25	50	-	16 – 35	70	-
S3N 160	88 – 160 A	35 – 50	2//95	-	50 – 70	2//150	-
S3N 250	140 – 250 A	50 – 95	2//95	-	120 – 150	2//150	-
S4N 250	40 – 250 A	25 – 95	2//195	-	120 – 150	2//150	-
S5N 400	130 – 400 A	35 – 240	2//150	-	240 – 300	2//240	-
S6N 630	250 – 630 A	1x95 – 2//150	3//300	2//300	2//240	3//240	2//300
S6N 800	320 – 800 A	1x150 – 2//240	3//300	2//300	2//300	3//240	2//300
MCCB Type ISOMAX H, fixed							
S3H 160	19 – 100 A	25	2//95	120	25 – 35	2//150	120
S3H 160	88 – 160 A	35 – 50	2//95	120	70	2//150	120
S3H 250	140 – 250 A	50 – 95	2//95	120	120 – 150	2//150	-
S4H 250	40 – 250 A	25 – 95	2//95	120	120 – 150	2//150	-
S5H 400	130 – 400 A	35 – 240	2//185	300	240 – 300	2//240	300
S6H 630	250 – 630 A	1x95 – 2//150	3//300	2//300	2//240	3//240	2//300
S6H 800	320 – 800 A	1x150 – 2//240	3//300	2//300	2//300	3//240	2//300
MCCB Type ISOMAX H, plug-in							
S3H 160	19 – 100 A	25	70	-	25 – 35	70	-
S3H 160	88 – 160 A	35 – 50	2//95	-	70	2//150	-
S3H 250	140 – 250 A	50 – 95	2//95	-	120 – 150	2//150	-
S4H 250	40 – 250 A	25 – 95	2//95	-	120 – 150	2//150	-
S5H 400	130 – 400 A	35 – 240	2//185	-	240 – 300	2//240	-
S6H 630	250 – 630 A	1x95 – 2//150	3//300	2//300	2//240	3//240	2//300
S6H 800	320 – 800 A	1x150 – 2//240	3//300	2//300	2//300	3//240	2//300

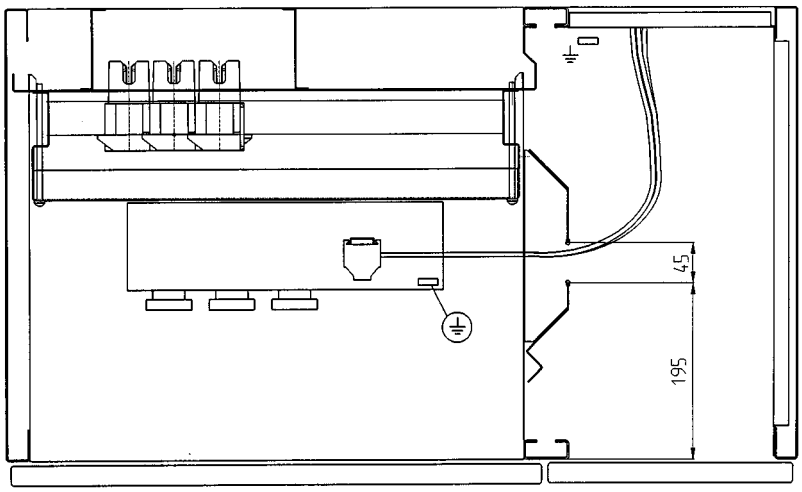
Continued on page 16

Removable apparatus units, main circuits

Continued from page 15

Apparatus unit		Connectable area, copper cable			Connectable area, aluminium cable		
Type	Size	Min. area mm²	Max. area cable lug mm²	Max. area cable clip mm²	Min. area mm²	Max. area cable lug mm²	Max. area cable clip mm²
MCCB LN, fixed							
LN 125	16 – 125 A	6 – 35	70	70	10 – 50	70	70
LN 200	125 – 200 A	50 – 70	70	70	70 – 120	70	70
LN 320	200 – 320 A	95 – 150	2//185	-	150 – 240	2//240	-
LN 500	320 – 500 A	240 – 300	2//300	-	300 – 2//150	2//240	-
LN 630	500 – 630 A	2//150	3//300	-	2//240	3//240	-
MCCB LN, plug-in							
LN 125	16 – 125 A	6 – 35	70	70	10 – 50	70	70
LN 200	125 – 200 A	50 – 70	2//95	120	70 – 120	2//150	120
LN 320	200 – 320 A	95 – 150	2//185	300	150 – 240	2//240	300
LN 500	320 – 500 A	240 – 300	2//300	2//300	300 – 2//150	2//240	2//300
Fuse/switch OESA							
	160 A	50	120	120	70	120	120
	250 A	95	300	300	150	240	300
	400 A	240	300	300	300	240	300
	630 A	2//150	3//300	2//300	2//240	3//240	2//300
	800 A	2//240	3//300	2//300	2//300	3//240	2//300

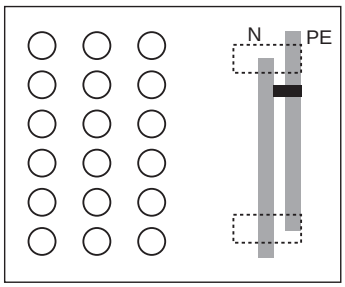
Screw-in fuse boards



Continued on page 17

Screw-in fuse boards, continued from page 16

Thread II, 25 A
With neutral and protective earth busbars.

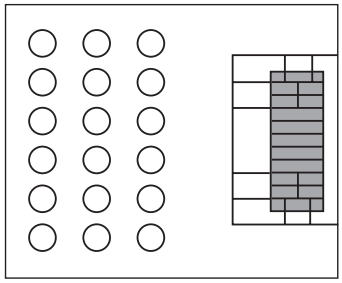


The neutral and protective earth busbars are provided with joint neutral disconnection and the requisite single-screw clamps for single-pole connection of all outgoing groups

Connectable area:
max. 10 mm^2, min. 1.5 mm^2

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
18	6	7	7
9	3	4	4

Thread II, 25A
With row of terminal boards.

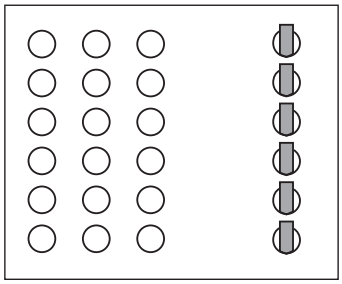


The groups are connected to a row of terminal boards which also contain disconnectable neutral boards for joint and individual disconnection of the groups. Protective earth bar with single-screw clamp and connection to the main neutral board are included.

Connectable area:
max. 6 mm^2, min. 1.5 mm^2 for 3-pole
max. 4 mm^2, min. 1.5 mm^2 for 1-pole

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
18	6	7	7
9	3	4	4

Thread II, 25 A
With group circuit-breaker 40 A

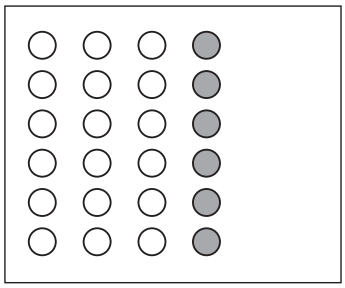


Each group is provided with a three-pole group circuit-breaker. The neutral and protective earth busbars have joint neutral disconnection and requisite single-screw clamps for connection of outgoing groups.

Connectable area:
max. 10 mm^2, min. 1.5 mm^2

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
-	6	7	7

Thread II, 25 A
With extra row of fuses.



6 fuse sockets 25 A mounted on a phase bar alongside the normal three rows.

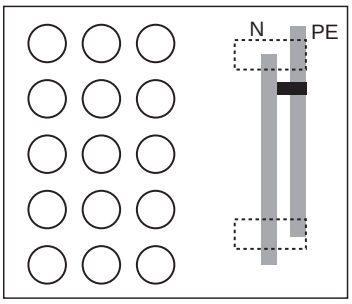
Connectable area:
max. 10 mm^2, min. 1.5 mm^2

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
24	-	7	7
6	6	7	7

Continued on page 18

Screw-in fuse boards, continued from page 17

Thread III, 63 A
With neutral and protective earth busbars

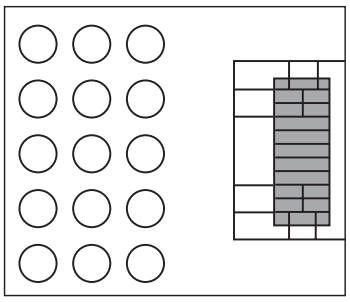


The neutral and protective earth busbars are provided with joint neutral disconnection and requisite two-screw clamps for 3-pole connection of all outgoing groups.

Connectable area:
max. 25 mm^2, min. 1.5 mm^2

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
-	5	7	7
-	2	4	4

Thread III, 63 A
With row of terminal boards

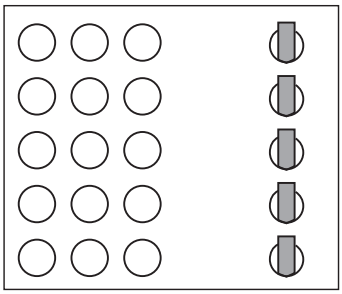


The groups are connected to a row of terminal boards which also contain disconnectable neutral boards for joint and individual disconnection of the groups. A protective conductor bar with two-screw clamp and connection the a main neutral board are included.

Connectable area:
max. 16 mm^2, min. 1.5 mm^2

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
-	5	7	7
-	2	4	4

Thread III, 63 A
With group circuit-breaker 80 A

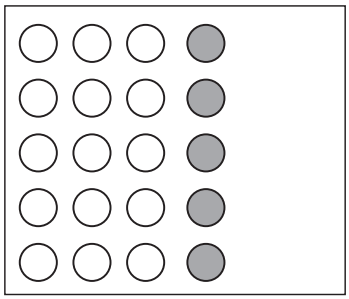


Each group is provided with a three-pole group circuit-breaker. The neutral and protective conductor busbars have joint neutral disconnection and requisite two-screw clamps for single-pole connection of outgoing groups.

Connectable area:
max. 16 mm^2, min. 1.5 mm^2

Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
-	5	7	7

Thread III, 63 A
With extra row of fuses

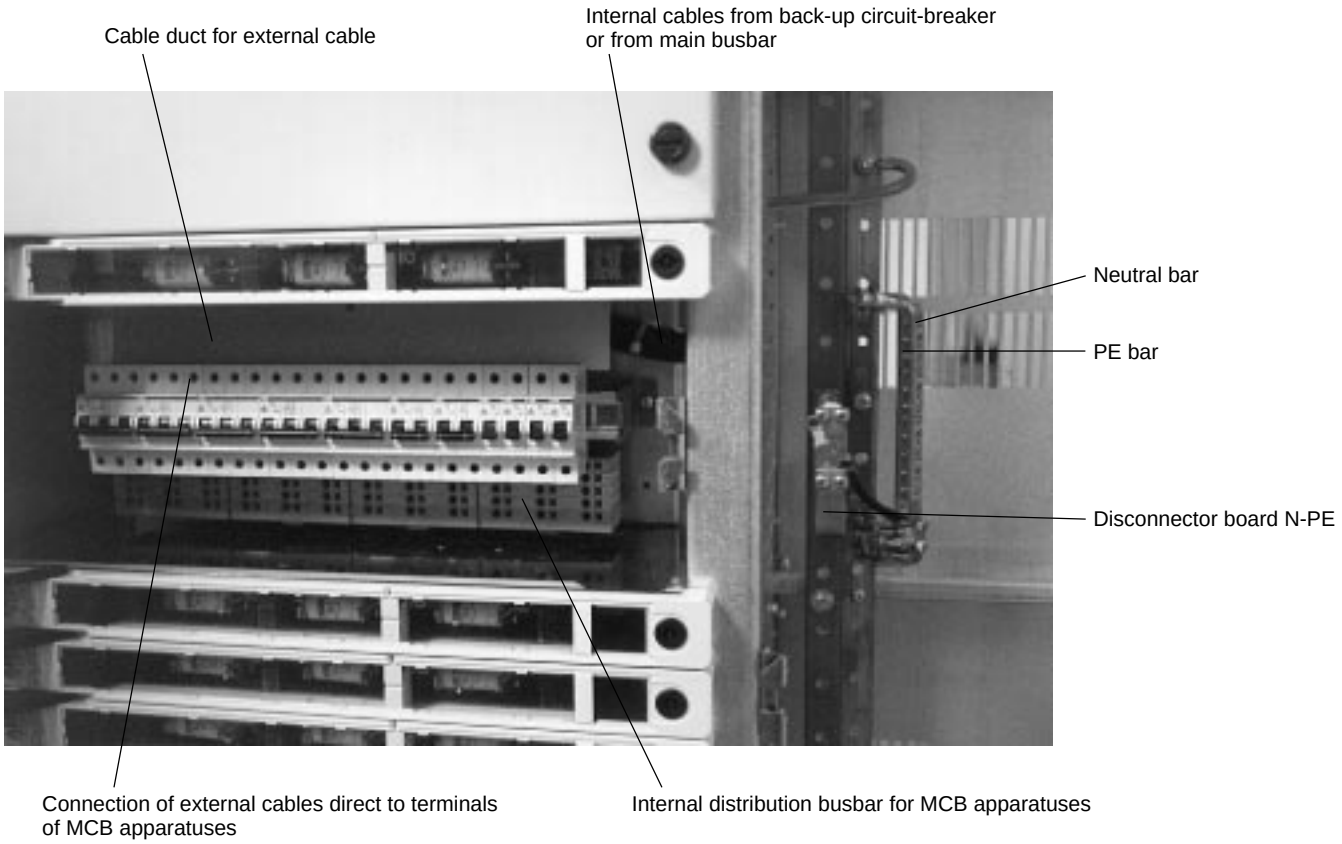


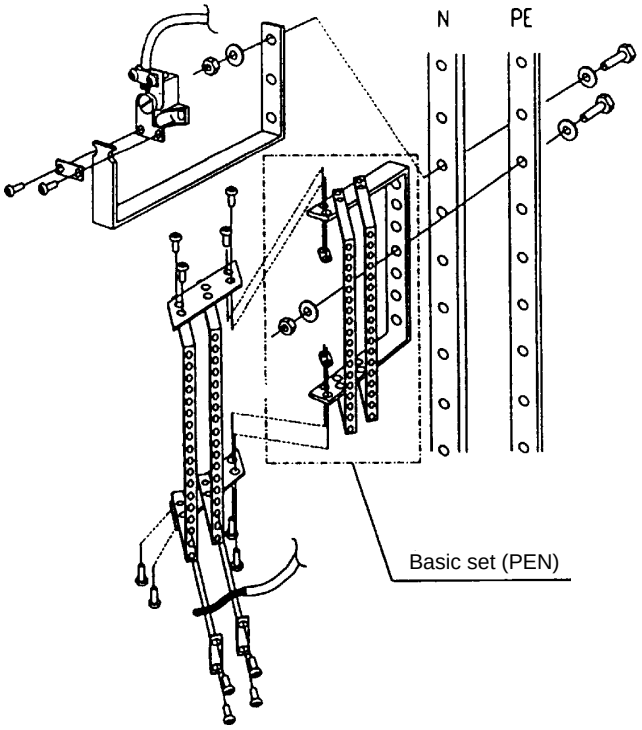
6 fuse sockets 25 A mounted on a phase bar along side the normal three rows.

Connectable area:
max. 25 mm^2, min. 1.5 mm^2 for 3-pole
max. 10 mm^2, min. 1.5 mm^2 for 1-pole

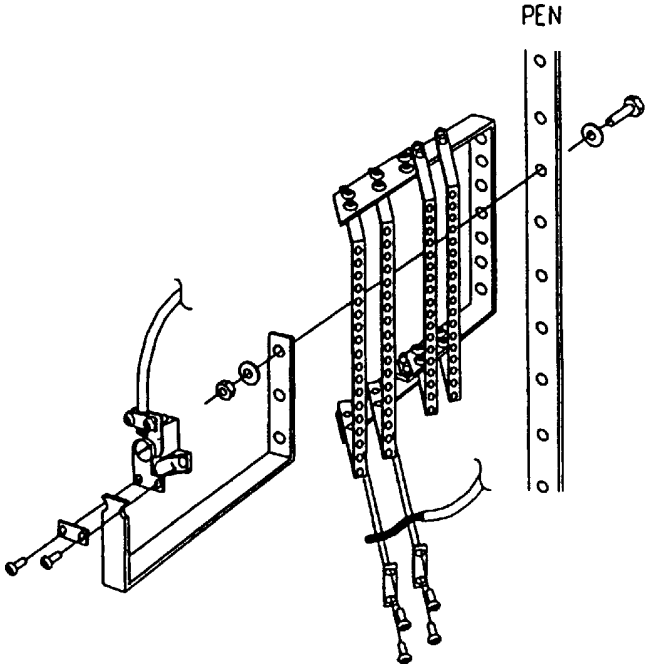
Number of groups 1-pole	3-pole	Height, modules Plug-in	Fixed
6	5	7	7

MCB boards





PE + N placed in 5-conductor system



PEN/PE +N placed in 4-conductor system (neutral bar optional)

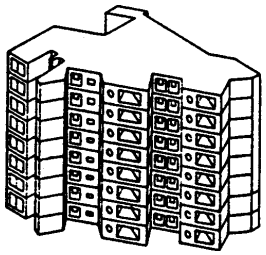
Auxiliary circuits, withdrawable units.

For withdrawable units, operating and signal cables are connected to terminal units (sliding contact units).

Max. connectable area: 1 x 2.5 mm^2 screw clamp + 2 x flat pin terminal 2.8 x 0.8.

Max. rated current/voltage: 10 A/500 V.

Connection of screen conductors is best done to an earthing bar located on the left front post in the cable area (option).



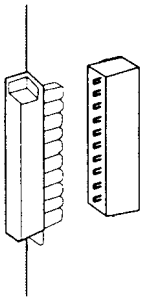
Connection unit for auxiliary circuits for withdrawable units 2M – 20M.

Auxiliary circuits, removable units

For removable units, signal cables are to be connected to plug-in ten-pole connection blocks.

Max. connectable area: 1 x 4 mm^2 screw clamp.

Max. rated current/voltage: 10 A/500 V.

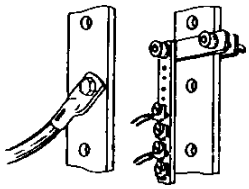


Plug-in connection block for auxiliary circuits for removable units.

Protective earthing

The vertical protective earth busbar (PE) has holes 50 mm apart for cable lug connection down to 4 mm^2 conductor area. Conductors with areas of 1 – 10 mm^2 are to be connected to a smaller bar mounted on the large bar.

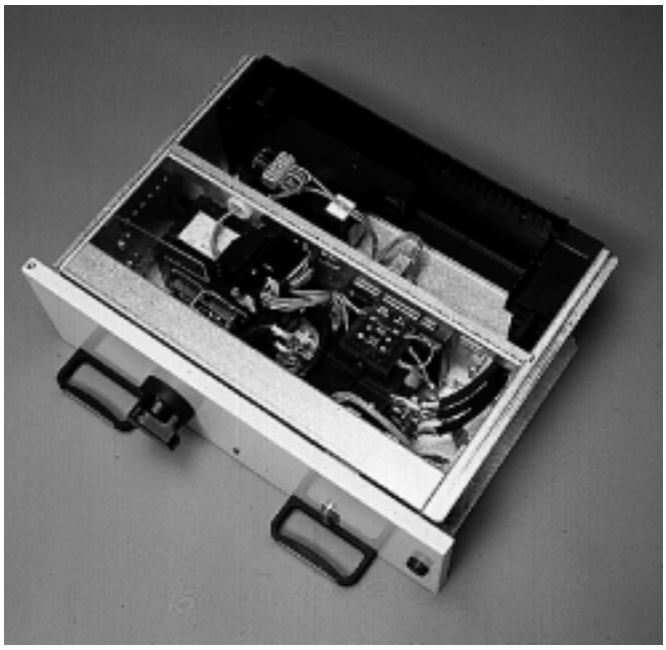
The PE busbar is located right at the back of the cable area to the left.



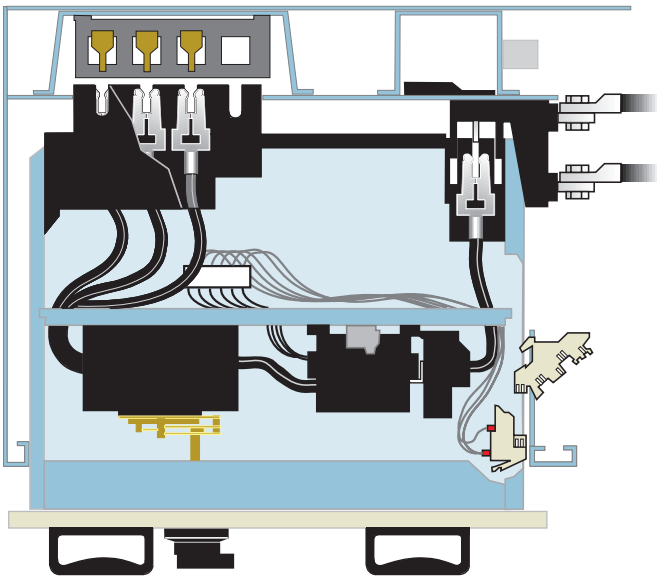
Vertical protective earth busbar (PE).

Description

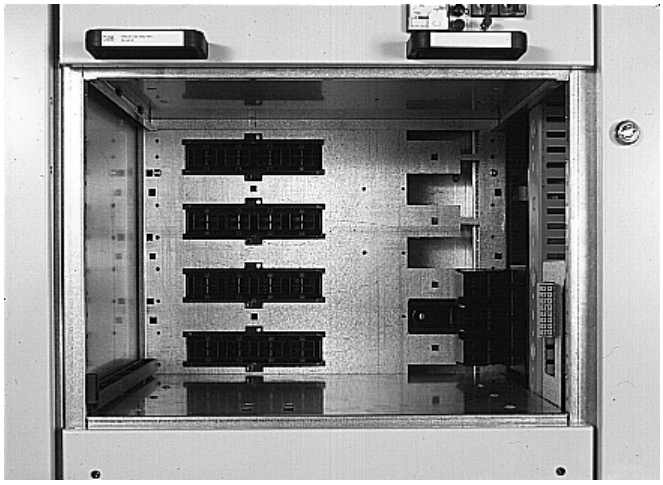
The withdrawable apparatus units have plug-in connection both for the incoming supply from the vertical busbar system and for outgoing cables. The units can be pulled out without having to unscrew any bolts. Interlocking takes place via the group´s operating handle. The auxiliary circuits are connected via multi-pole plug-in contact units. Unoccupied apparatus seats are screened off to minimise the risk of unintentional touching of live parts.



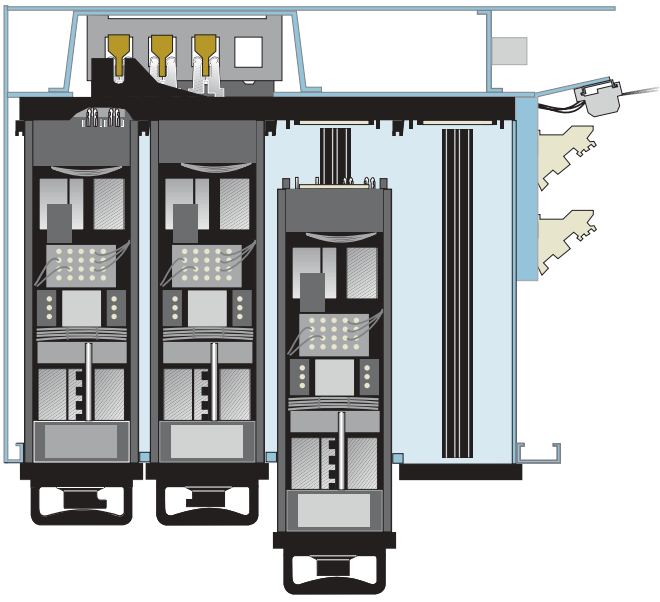
Withdrawable starter.



Withdrawable unit in disconnected position.



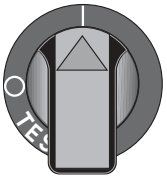
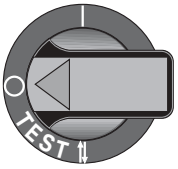
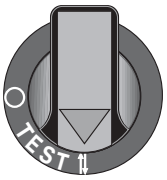
Unoccupied apparatus seat for withdrawable unit.



Compact unit with two units in operating position, one unit in disconnected position and one unoccupied apparatus seat.

Operation, normally wide unit

The unit has two fixed positions: connected position and disconnected position. The operating handle is used both for operating the power switch and for interlocking the apparatus unit. The handle has four different positions.

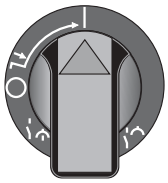
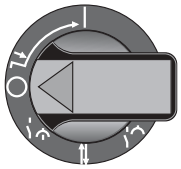
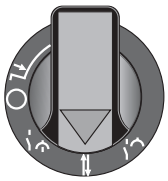
	Handle position	Unit funktion when in connected position
	On	All electrical circuits connected. Cover interlocked.
	Off	All electrical circuits disconnected.
	Test	Main circuits disconnected, auxiliary circuits connected.
	Move	All electrical circuits disconnected. The unit can be moved. When withdrawing from the run position, the unit is automatically locked when it reaches the disconnected position *). For further movement outwards, the handle must be moved back to the move position.

The handle can be locked using up to three padlocks in the positions Off and Test.

*) Where the unit is in the disconnected position (see fig. on page 28) the position of the handle is of no importance since both the main and the auxiliary circuits are disconnected.

Operation, compact unit

The unit has three fixed positions: connected position, test position and disconnected position. The operating handle is used both for operating the power switch and for mechanical interlocking of the unit. A microswitch with two making and two breaking contacts is included for electrical interlocking. The handle has five different positions.

	Handle position	Unit function when in the connected position	Unit function when in disconnected position *
	On	All electrical circuits connected. The unit interlocked in the connected position.	–
	Off To turn from ”0” to ”1”, the handle must be pressed in.	All electrical circuits disconnected. The unit interlocked in the connected position.	–
	Test	Main circuits disconnected, auxiliary circuits connected. The unit interlocked in the connected position.	–
	Move	All electrical circuits disconnected. The unit can be moved.	All electrical circuits disconnected. The unit can be moved.
	Disconnected	–	All electrical circuits disconnected. The unit can be moved. When withdrawing from the run position, the unit is automatically blocked when it reaches the disconnected position (pulled out 30 mm from the run position). For further movement outwards, the handle must be turned back to the move position.

The handle can be locked with up to three padlocks in the positions Off and Test.

Withdrawing, normally wide unit

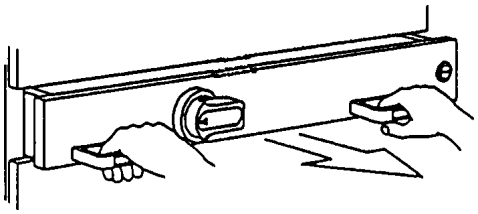
The unit is in the run position (pushed right in).

1. Move the handle to the move position.

Pull (jerk) the unit out so far that it is automatically locked by the interlocking mechanism. Use the two handles. The handle must not be used as a handle when moving the unit.

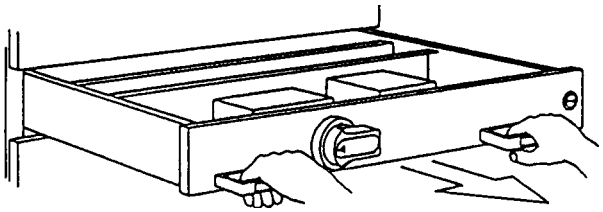
When moving the unit, the handle immediately moves back to the 0 position when the unit starts moving. This is perfectly normal; continue moving without touching the handle.

2. The unit is now in the disconnected position.



3. For further movement, turn the handle to the move position.

4. The unit is now ready to be pulled completely out of the cubicle.



Since the weight of the unit can prove to be too heavy if the hands remain on the handles, shift your grip when the unit is half-way out. For 2M and 4M units, grasp under the sides about half way along and pull the unit straight out if it is located at a level below chest height. If it is at a higher level, keep one hand on the handle and place the other underneath the unit on the guide plate.

For units bigger than 4 M, there should be two persons pulling the unit out of the cubicle. When the unit is withdrawn half-way, one person on each side takes hold of the handles on the sides and then the unit can be pulled completely out of the cubicle. Be careful when large, heavy units are handled so as to avoid injuries to persons nearby and damage to mechanical parts.

To make handling of large units easier, and also from the ventilation point of view, they should be placed as far down in the cubicle as possible.

When using the special apparatus hoist available for ABB's apparatus units, this instruction should be followed up to point 3, after which the instructions supplied with the apparatus hoist should be complied with (1TSC 232-SE).

When temporarily storing the unit, it should be placed with its left side (seen from the front) on the table or floor. The surface should be flat and smooth so as not to scratch the paintwork on the unit.

If a hoisting trolley is used for depositing the unit on, the unit can be placed on its guide plate, inserting wooden slats or similar underneath so as not to damage the front cover and mechanism.

Withdrawing, compact unit

The unit is in the run position (pushed right in).

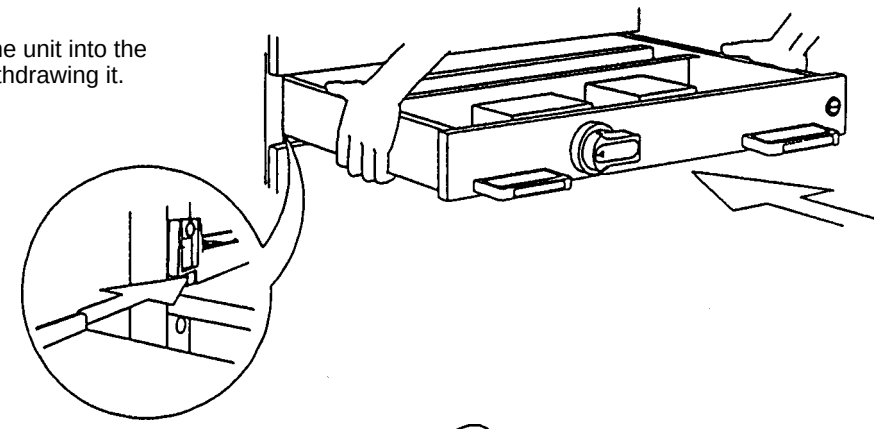
Move the handle to the Move position.

The unit is now ready to be pulled out of the cubicle completely. Use the handle (the handle must not be used as a handle when pulling out the unit).

When moving to the disconnected position, turn the handle by hand to the disconnected position while pulling (jerking) the unit out of the Run position. Pull outwards until the unit is blocked in the disconnected position. To pull the unit out completely from the disconnected position, return the handle to the Move position, whereupon the unit is free to be pulled out.

Inserting, normally wide unit

From the handling point of view, insertion of the unit into the cubicle takes place in the same manner as withdrawing it.



1. Check that the guiding edge of the unit fits into the slot in the guide rail.

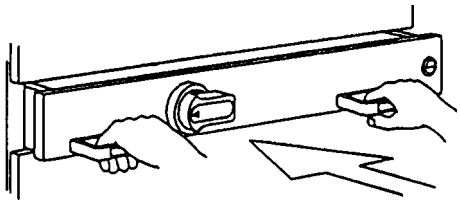
Push in the unit carefully until it is stopped by the interlocking mechanism.

The unit must not be left in this position since it is unblocked.

2. Move the handle to the Move position.

Push in the unit until it is blocked by the interlocking mechanism.

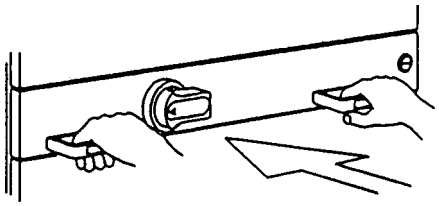
3. The unit is now in the disconnected position.



4. For further movement inwards, move the handle to the Move position.

5. The unit can now be pushed into the Run position.

Check that the unit is properly blocked by trying to pull it out without touching the handle. The handle should now be in the horizontal position.



Inserting, compact unit

From the handling point of view, insertion of a unit into a cubicle takes place in the same manner as when withdrawing it.

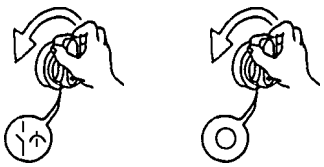
1. Check that the unit´s guiding edge fits into the slot in the control rail.

2. Move the handle to the Move position.

Push the unit in to the Run position.

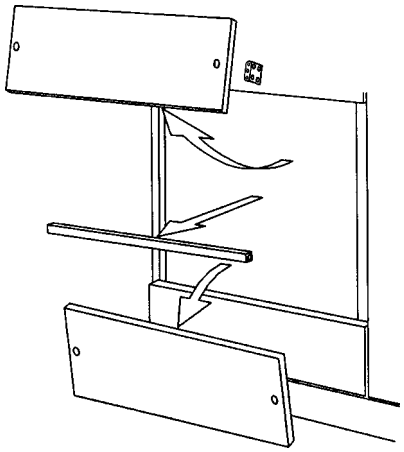
3. Move the handle to the Test position or Off position.

Check that the unit has been properly blocked by trying to pull it out without touching the handle.



Extension

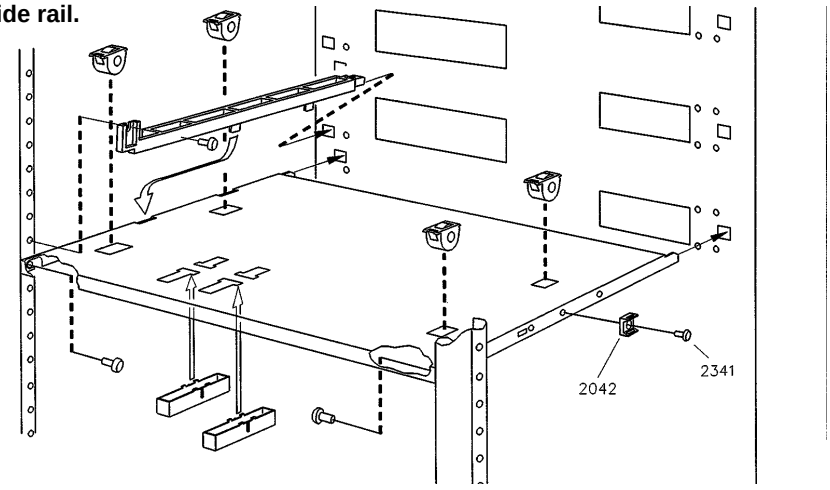
Extension of the equipment can take place with the switchgear live, but it is naturally preferable to work with the voltage switched off.



1. Remove the panel in question as well as the panel immediately below it.

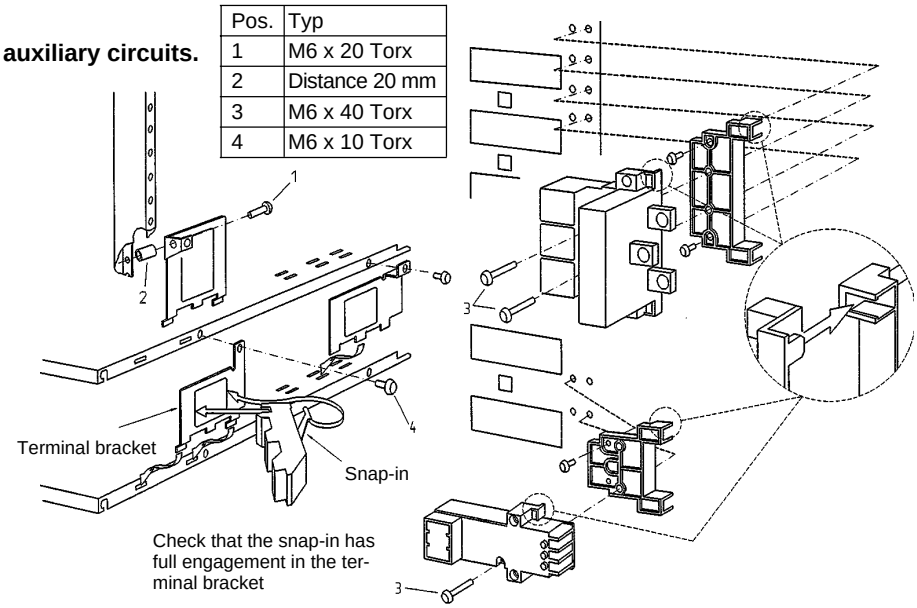
Remove the panel bar as well.

2. Insert and mount a new cassette plate and guide rail.



3. Mount connection units for main and auxiliary circuits.

Pos.	Typ
1	M6 x 20 Torx
2	Distance 20 mm
3	M6 x 40 Torx
4	M6 x 10 Torx



4. Connect up cables for main and auxiliary circuits.

Follow instructions for connecting up apparatus units.

5. Fit the panel below the new unit back in and push the unit into place.

Follow instructions for inserting units.

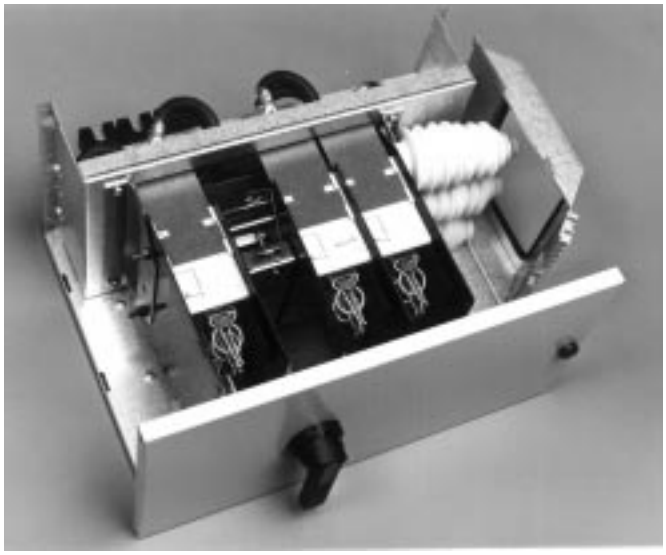
Since the units are protected against adjacent units via cassette plates, and the terminals are provided with cable shields, no further measures need be adopted when carrying out extensions with the equipment live.

Before energising the equipment, see the instructions under ”Concluding work” and ”Check-list upon commissioning”.

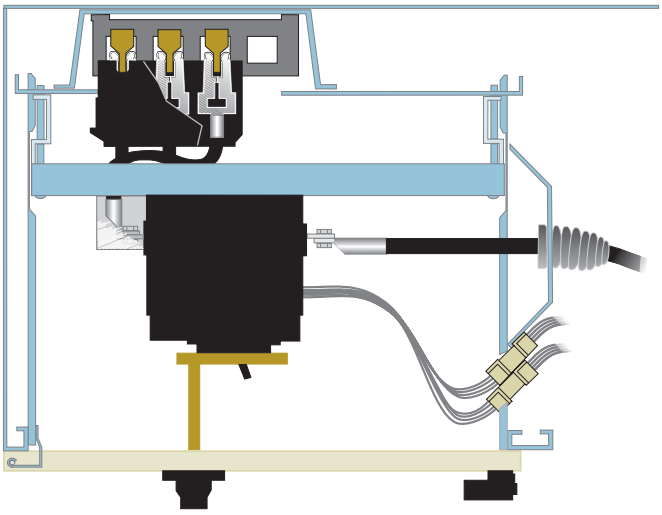
In general, it is important when extending equipment that the relevant regulations regarding measures that are to be adopted, such as marking with sign-plates, etc., are complied with.

Description

The removable apparatus units have plug-in connection for the incoming supply from the vertical busbar system, whereas the outgoing cables are connected permanently direct to the apparatus terminals. The units can be taken out after the outgoing cables have been disconnected and four fixing bolts removed. The auxiliary circuits are connected via multi-pole plug-in contact units.



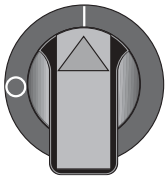
Removable R unit.



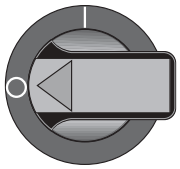
Removable unit in operating position.

Operation

The operating handle has two positions.

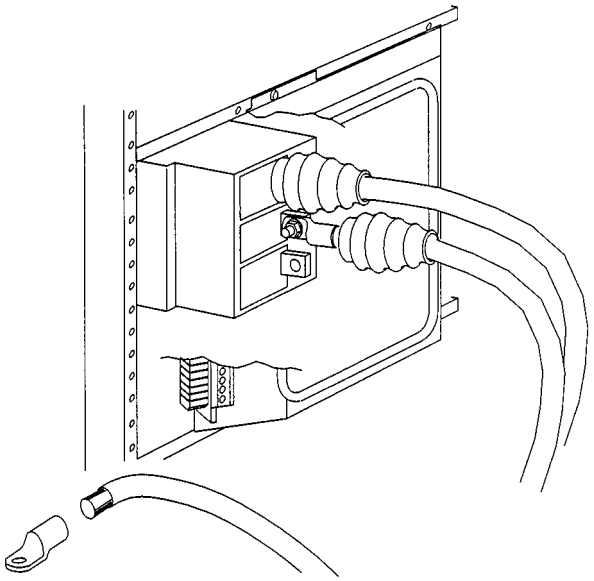


Handle position	Unit function
On	All electrical circuits connected. Panel interlocked.



Off	All electrical circuits disconnected. The unit can be removed after disconnecting cables and removing fixing bolts.

Withdrawing



1. Set the handle in the 0 position (breaker off).

2. Open the panel and remove any fuses.

3. Check that there is no voltage at the apparatus terminals (that the equipment is not live).

4. Detach the main cables.

Pull out the cables through the hole in the group's end panel. (Remove any screens and cable shields.)

Protect the cable ends against any live parts in the cable area.

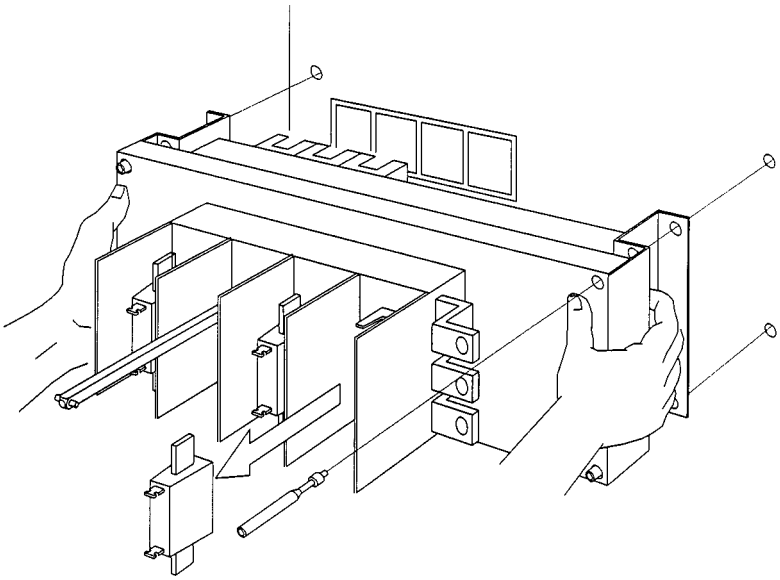
5. Disconnect any connection units for operating cables.

6. Remove the four fixing bolts.

7. The unit is now free and can be taken out.

8. Close the panel.

Inserting



1. Open the panel.

2. Set the handle in the 0 position (breaker off) and remove any fuses.

3. Insert the unit and bolt it fast (four fixing bolts).

3. Test that there is no voltage at the apparatus terminals (that they are not live).

4. Connect up the connection units for the operating cables.

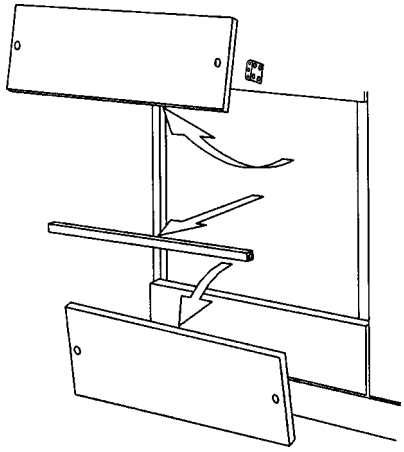
5. Connect the main cables, fit screens and cable shields.

6. Fit fuses, where applicable.

8. Close the panel.

Extension

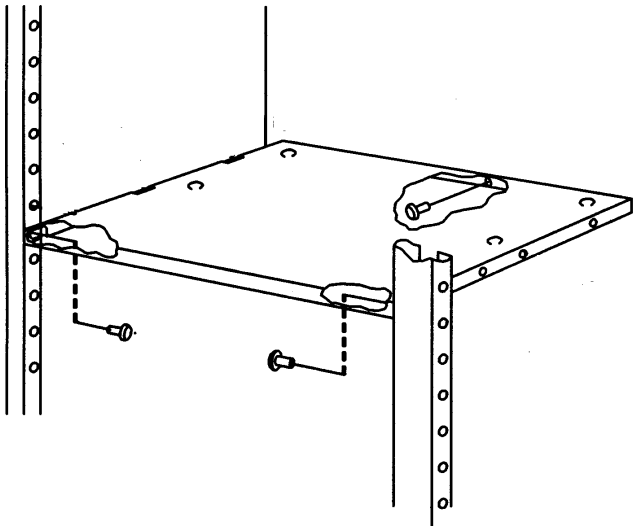
Extension of the equipment can take place with the switchgear live, but it is naturally preferable to work with the voltage switched off.



1. Remove the panel in question as well as the panel immediately below it.

Remove the panel bar as well.

2. Insert and mount a new cassette plate.



3. Fit the panel below the new unit back on.

4. Check that no main fuses are mounted in the new unit.

5. Mount the unit in the cubicle.

Follow instructions for mounting units.

6. Check that there is no voltage at the terminals after the first apparatus.

7. Connect up cables for main and auxiliary circuits

Follow instructions for connection of apparatus units.

8. Close the panel.

Since the units are protected against the adjacent units via cassette plates, and the terminals are fitted with screens against the cable cubicle, no further measures need be adopted when extending the equipment in live conditions.

Before energising the equipment, see the instructions under ”Measures to be adopted before energising”, page 30.

In general, it is important when extending equipment that the relevant regulations regarding measures that are to be adopted, such as marking with sign-plates etc., are complied with.

Concluding work

Remove wire ends and debris from cable stripping, etc.
Wipe off any grease and dirt.
Check that tools and assembly material have not been left in the cubicles.
Vacuum-clean the cubicles.

Check-list upon commissioning

There follows a list of points to be observed when inspecting and testing a directly earthed system.

In the case of indirectly earthed systems, a check must always be made that all metallic parts are correctly earthed. Check the earth fault protection signal as well.

Apart from this check-list, local and current national regulations and instructions must be complied with.

1. ❒ Insertion of fuses

Insert all necessary fuses in the main and auxiliary circuits.

2. ❒ Checking of fuses

Check that all fuses agree with the apparatus list and the circuit diagram.

3. ❒ Setting of MCCBs

Set instantaneous and thermal tripping of MCCB units, based on load and selectivity.

The instantaneous protection for incoming circuit-breakers and large distribution breakers can be temporarily set at the lowest value to ensure the fastest possible tripping in the event of a short circuit during commissioning.

4. ❒ Checking of current transformers

Check that the secondary winding in all current transformers is connected (under load). Otherwise the secondary windings must be short-circuited.

5. ❒ Setting of starters

Set the thermal over load protection at the rated current of the motor.

NB. Setting above or below the scale range is not permitted.

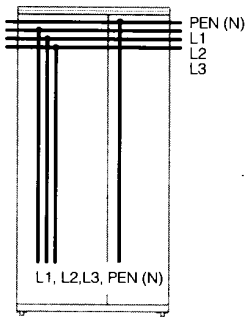
6. ❒ Check the main busbars

Make a visual inspection to see that the bolts in busbar joints between the cubicles are tight.

7. ❒ Check the PE and N bars

Carry out a visual inspection to ensure that the bolts in busbar joints between the cubicles are tight.

8. ❒ Check phase sequence and marking



9. ❒ Check internal connections

Check all internal connections between the cubicles.

10. ❒ Carry out insulation tests

10.1 Check that incoming supply is switched off.

10.2 Check that all operating voltages are switched off.

10.3 Check that all relays are switched off.

10.4 Check that all large MCCBs (incoming circuit-breakers) are disconnected.

10.5 Check the insulation on the main busbars using a megger with 1 or 0.5 kV. The insulation resistance should be ≥ 1 Mohm.

Phase	Insulation resistance Mohm
L1 – N	
L2 – N	
L3 – N	
L1 – L2	
L2 – L3	
L3 – L1	

10.6 Reconnect all relays , operating voltages and circuits that were disconnected during the insulation tests.

11. ❒ Energising the equipment

11.1 Check that incoming and outgoing circuit-breakers and disconnectors are off.

11.2 Check that all doors and covers in the switchgear are closed.

11.3 Switch on the supply and connect in the switchgear, if possible one cubicle or section at a time.

11.4 Check the phase sequence of a unit. It is enough to check one unit since the phase sequence has already been checked (point 8).

11.5 Check the units one at a time by:

- switching on the circuit-breaker
- checking the main circuit to the connected load
- checking that all important interlocking measures agree with the circuit diagram.

12. ❒ Final inspection

12.1 Check that all voltmeters, ammeters and wattmeters are in working order.

12.2 Check that all instantaneous protections that have been turned down during commissioning work are reset to their operating positions.

12.3 Check that no vibrations or noises occur in the busbar.

Warning - high currents

A short-circuit current in low-voltage switchgear is normally very high. Depending on the set tripping time, selectivity, etc., high short-circuit currents with relatively long duration can occur.

A short circuit can cause serious injuries to personnel and damage to material. It is therefore essential to use properly insulated tools and secured instruments in commissioning work.

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