# SM6 – 36

MV distribution
factory built assemblies
at your service

English

# instructions for use

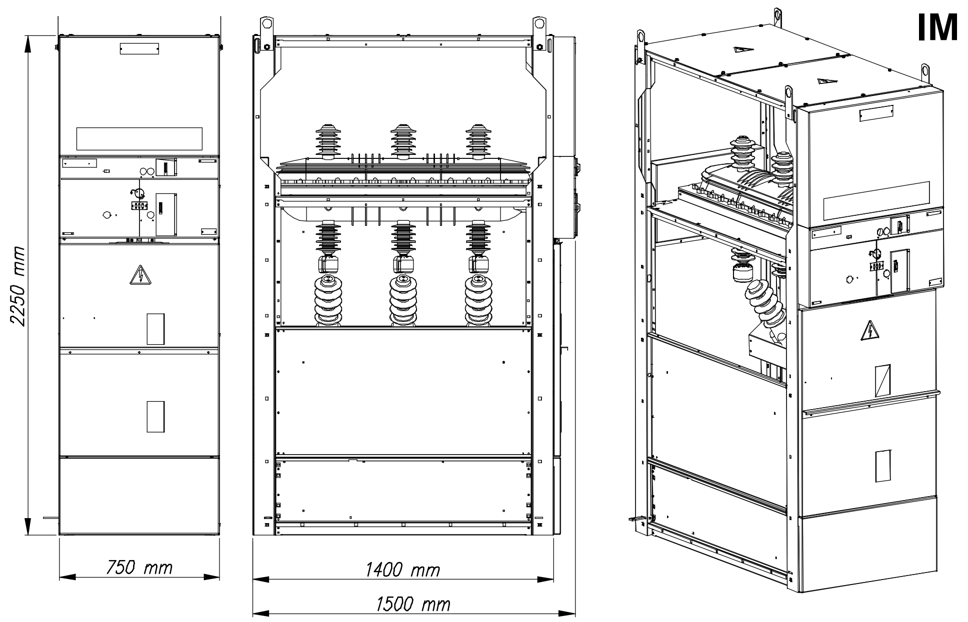
## civil engineering guide for internal arc protected cubicles

Schneider Electric

# contents

# overall dimensions and weight

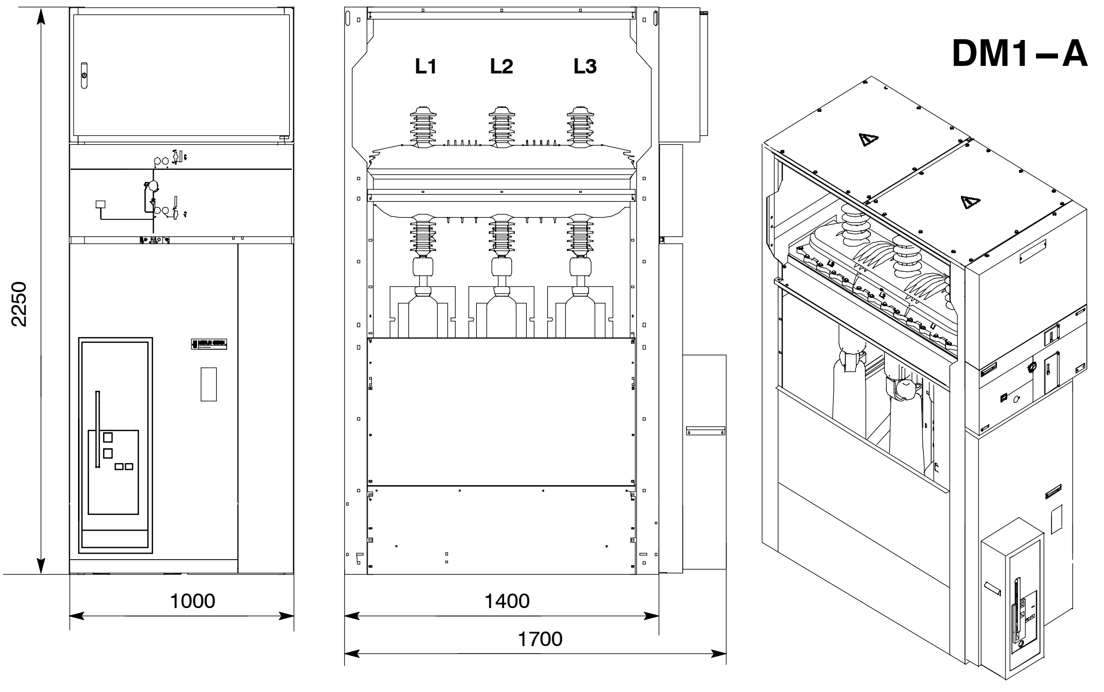
## 750 mm wide cubicles



| type of cubicle | height (mm) | width (mm) | depth in (mm) | weight (kg) |
|---|---|---|---|---|
| CM | 2250 | 750 | 1400 | 460 |
| CM2 | 2250 | 750 | 1400 | 460 |
| GAM | 2250 | 750 | 1400 | 340 |
| GAM2 | 2250 | 750 | 1400 | 310 |
| GAM2+ | 2250 | 750 | 1400 | 310 |
| GBC-A | 2250 | 750 | 1400 | 300 |
| GBC-B | 2250 | 750 | 1400 | 300 |
| GBM | 2250 | 750 | 1400 | 260 |
| IM | 2250 | 750 | 1400 | 310 |
| IMB | 2250 | 750 | 1400 | 330 |
| IMC | 2250 | 750 | 1400 | 420 |
| PM | 2250 | 750 | 1400 | 330 |
| QM | 2250 | 750 | 1400 | 330 |
| QMB | 2250 | 750 | 1400 | 460 |
| SM | 2250 | 750 | 1400 | 310 |
| TM | 2250 | 750 | 1400 | 460 |

**Note for depth of cubicles:** Dimensions are indicated without LV compartment.

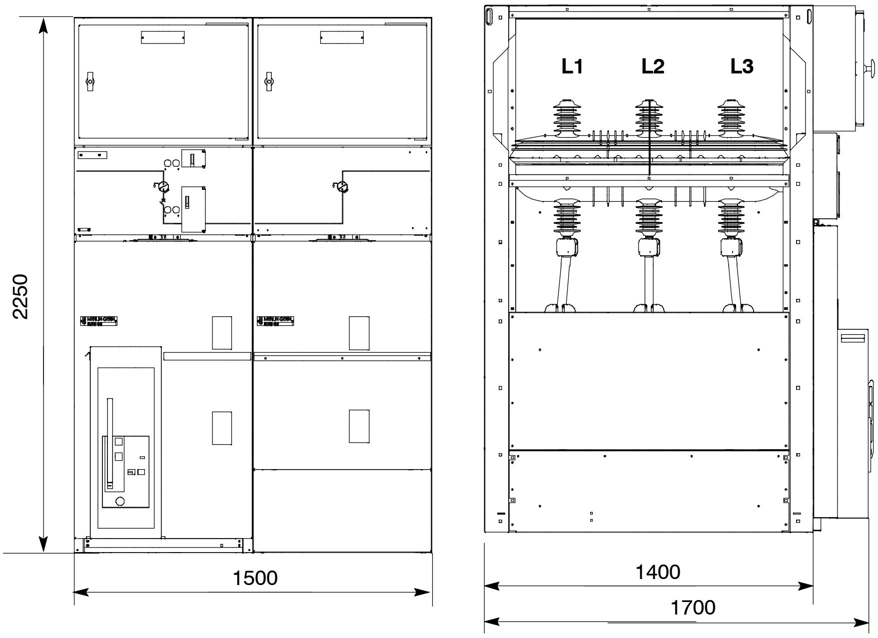
# 1000 mm wide cubicles



| type of cubicle | height (mm) | width (mm) | depth in (mm) | weight (kg) |
|---|---|---|---|---|
| DM1-A | 2250 | 1000 | 1700 | 600 |
| DM1-D | 2250 | 1000 | 1700 | 560 |
| QMC | 2250 | 1000 | 1400 | 540 |

**Note for depth of cubicles:** Dimensions are indicated without LV compartment.

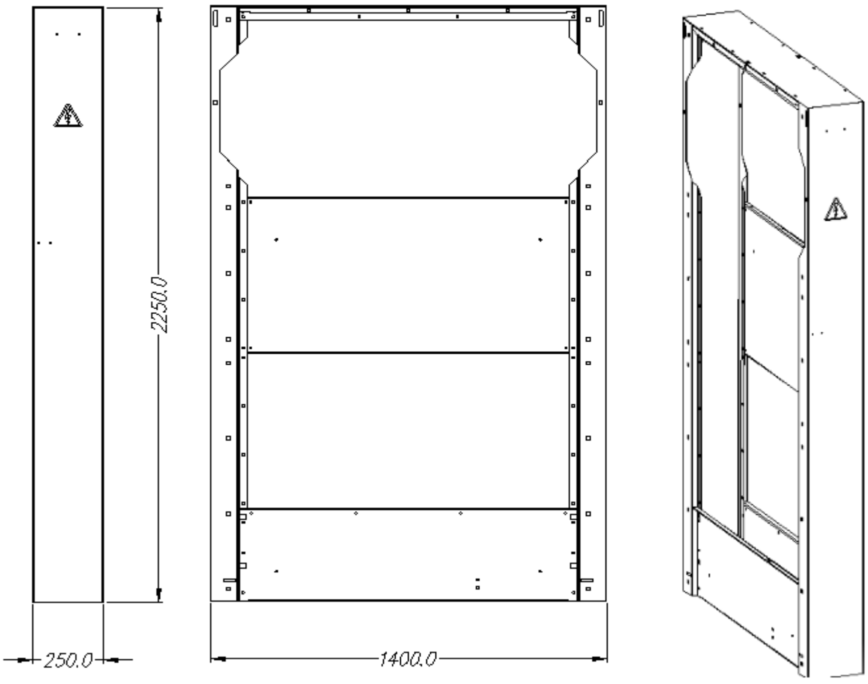
## 1500 mm wide cubicles



**DM2**

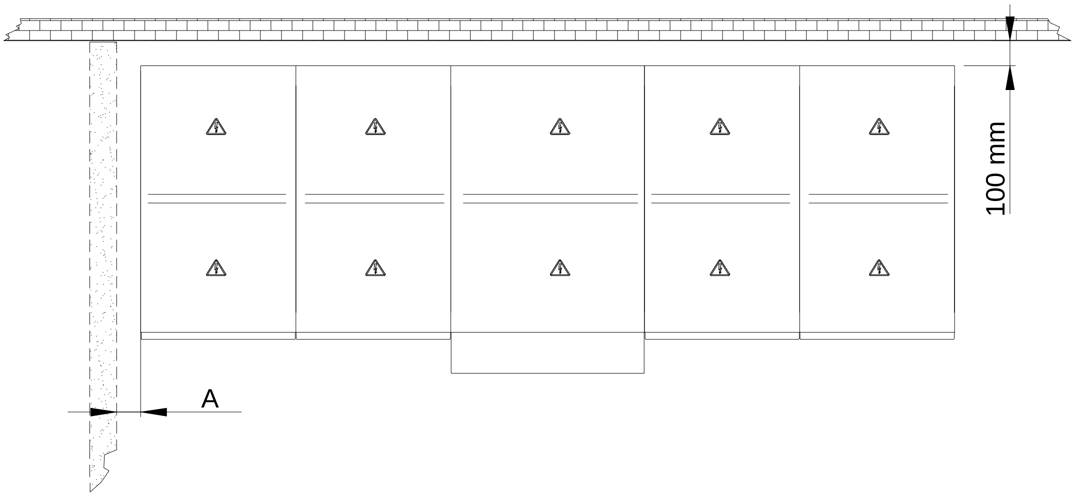
| type of cubicle | height (mm) | width (mm) | depth in (mm) | weight (kg) |
|---|---|---|---|---|
| DM2 | 2250 | 1500 | 1700 | 850 |

## 250 mm wide cubicles

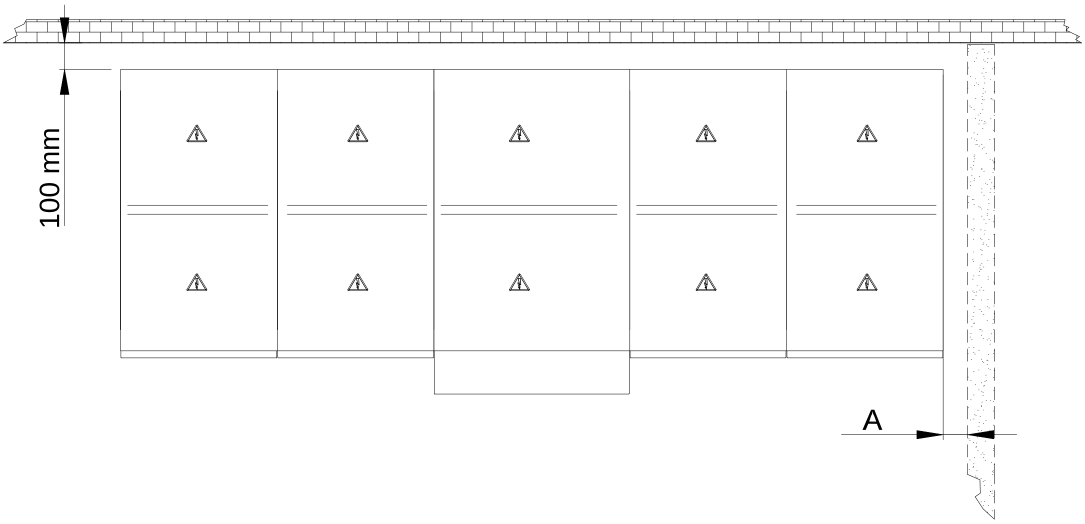


| type of cubicle | height (mm) | width (mm) | depth in (mm) | weight (kg) |
|---|---|---|---|---|
| GIM | 2250 | 250 | 1400 | 40 |

## layout in the substation



**Installation of switchboard to the right of the wall.**
A = 100 mm (minimum dimension to ensure proper operation of device )



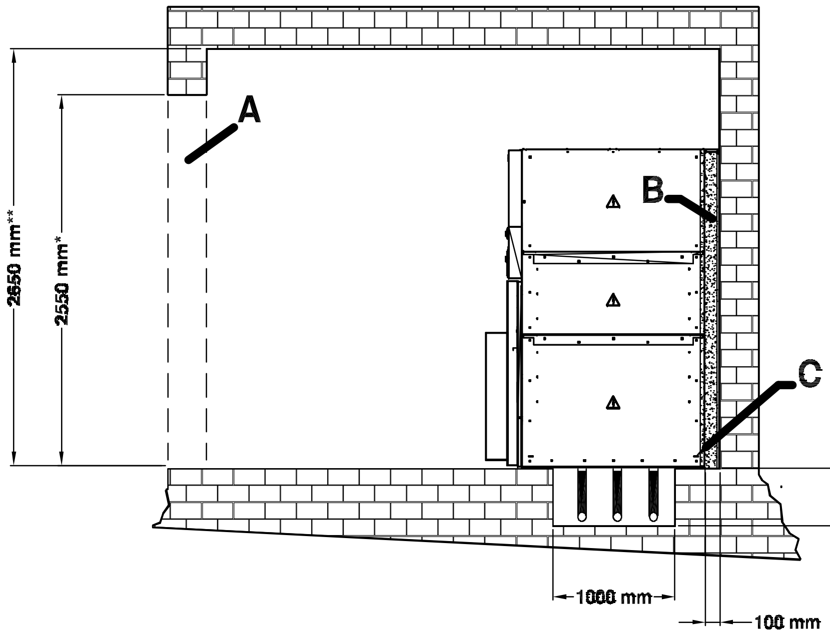
**Installation of switchboard to the left of the wall.**
A = 100 mm (minimum dimension to ensure proper operation of device )

## surface required for operation, maintenance and gas exhaust

*** :** in case of upper incomming option is used.(must be 2730 mm)

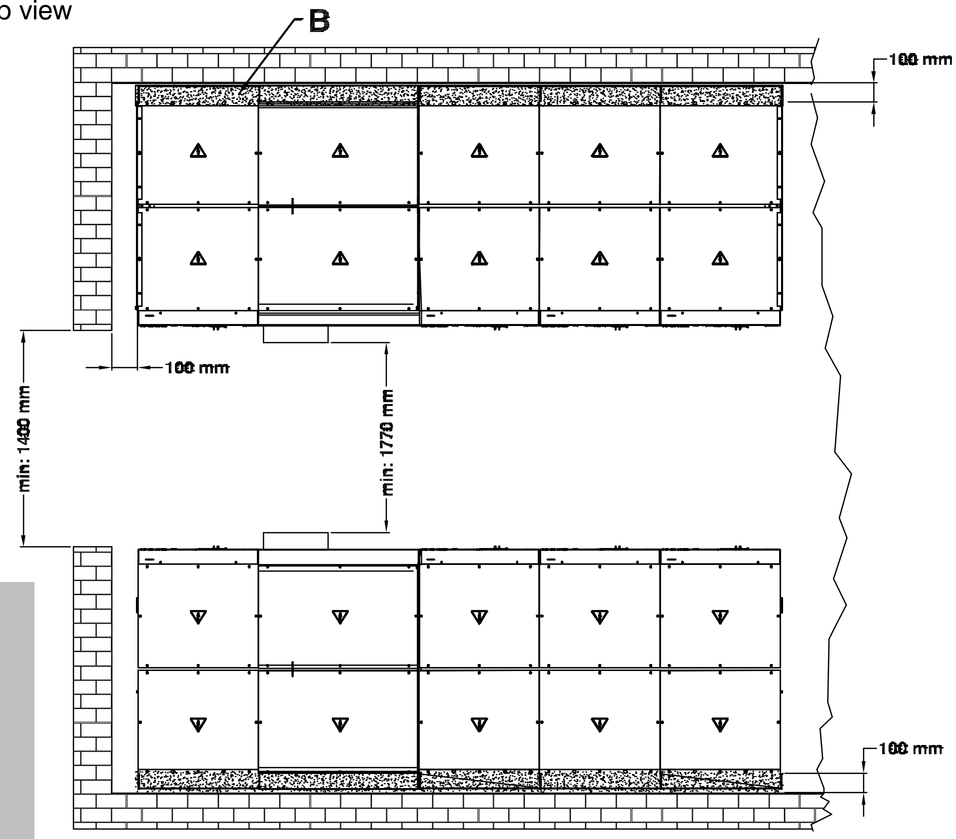
**** :** in case of upper incomming option is used (must be 2830 mm)

**C :** earthing connection busbar (see the page 17 for details)



Side view

Top view



**! NOTE :**

**B :** The space required for gas exhaust in case of internal-arc.

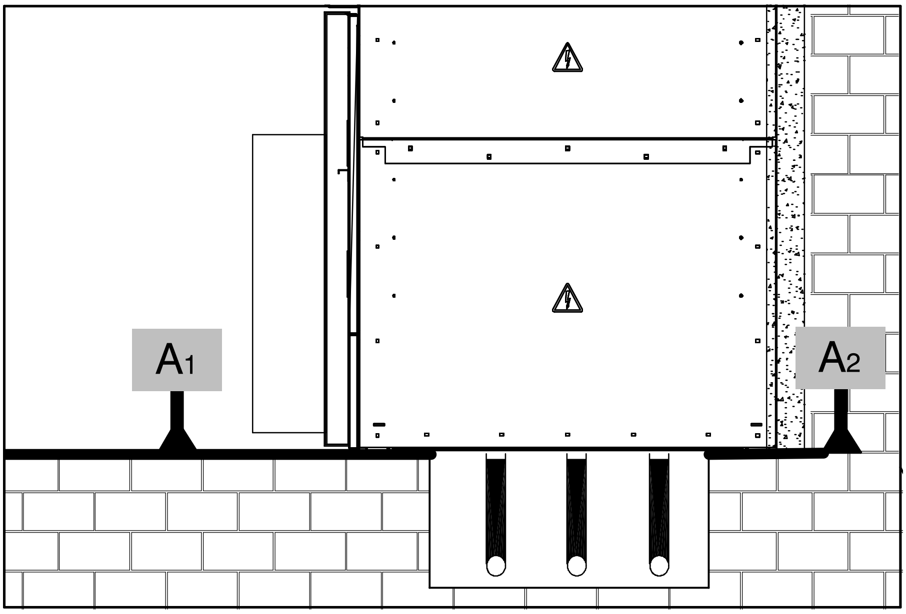
This space must be left empty.

Nothing should be placed between the wall and the cubicles.

## cable trenches

The water presence can effect the product life duration because of corrosion risk

The water presence in the cable trenches should be checked in case of flooding, heavy rain and any other water penetration in to the cable trenches



**The evenness and flatness of A1 and A2 surfaces should be provided for the sake of proper cubicle positioning**

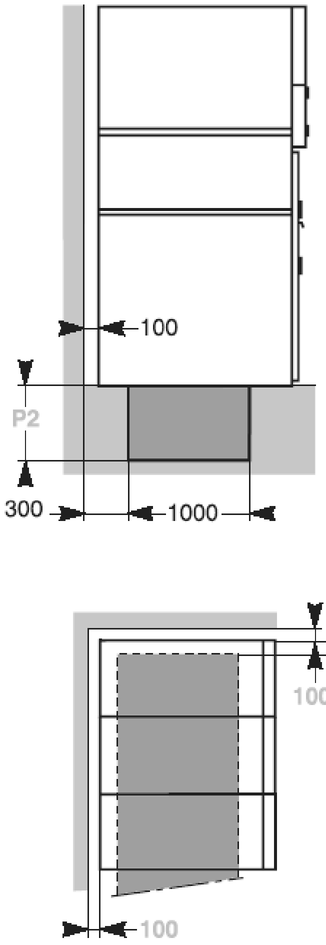
## bottom connection of cables

depth of ducts according to cables

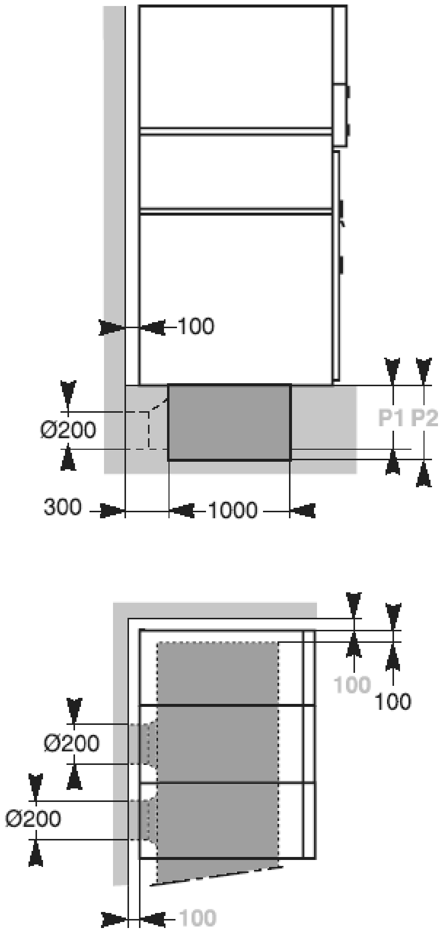
| Single-core cables | | Units 630 A | |
|---|---|---|---|
| Cable-section (mm$^2$) | Bending radius (mm) | IM, IMC, QM, CM, CM2, PM, DM1-A, GAM2, SM GAM, QMB, QMC | |
| | | Depth P (mm) | |
| | | P1 | P2 |
| 1 x 35 | 525 | 350 | 550 |
| 1 x 50 | 555 | 380 | 580 |
| 1 x 70 | 585 | 410 | 610 |
| 1 x 95 | 600 | 425 | 625 |
| 1 x 120 | 630 | 455 | 655 |
| 1 x 150 | 645 | 470 | 670 |
| 1 x 185 | 675 | 500 | 700 |
| 1 x 240 | 705 | 530 | 730 |

## duct drawings

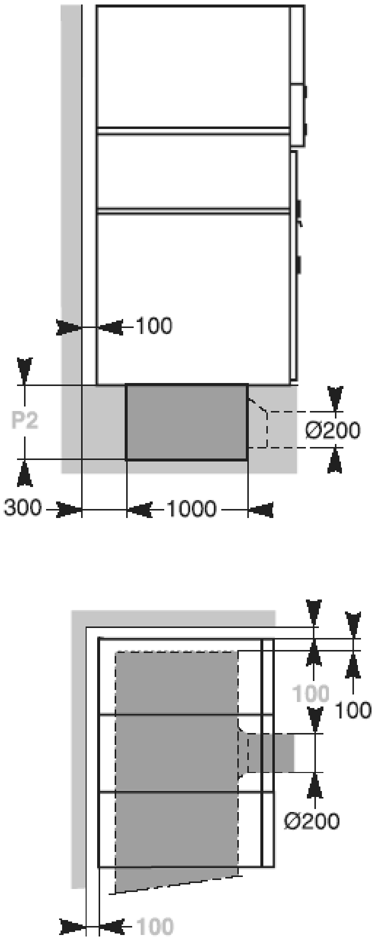
**Cable entry or exit through right or left side**



**Rear entry or exit with conduits**

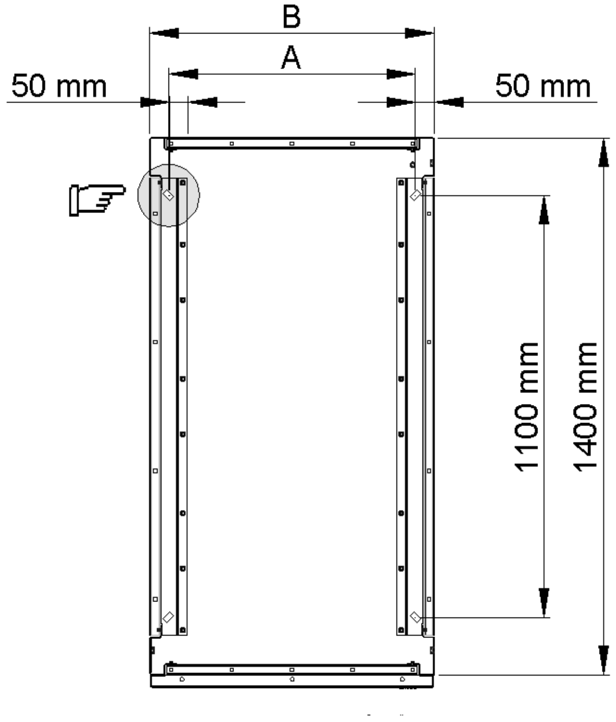


**Front entry or exit with conduits**



## fastening the cubicles to the floor

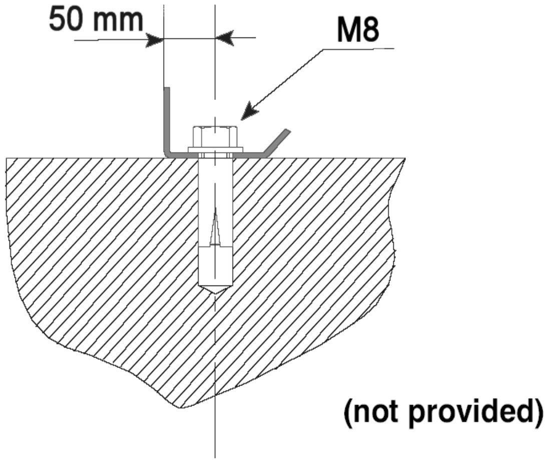
☞ 4 holes 14,2 x 25 per cubicles



**Note :** In cubicles with curcuit breakers, fastening is placed on the back side of circuit breakers.

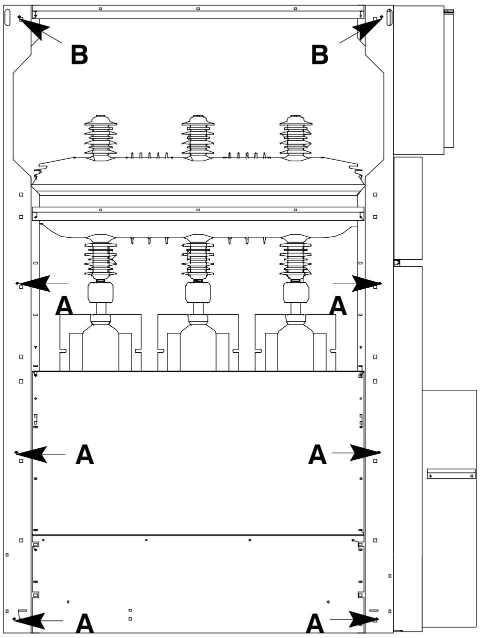
| B = cubicle width | | | | |
|---|---|---|---|---|
| A (mm) | 150 | 650 | 900 | 1400 |
| B (mm) | 250 | 750 | 1000 | 1500 |

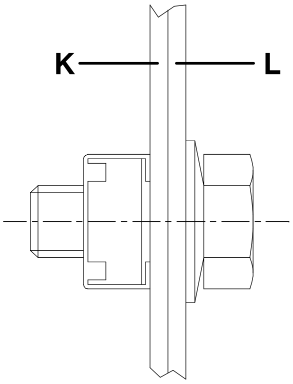
## fastening example



# cubicle fastening

## with one another





**A** :with M8x20 bolts and M8 washers in bag of intercubicle connection accessories

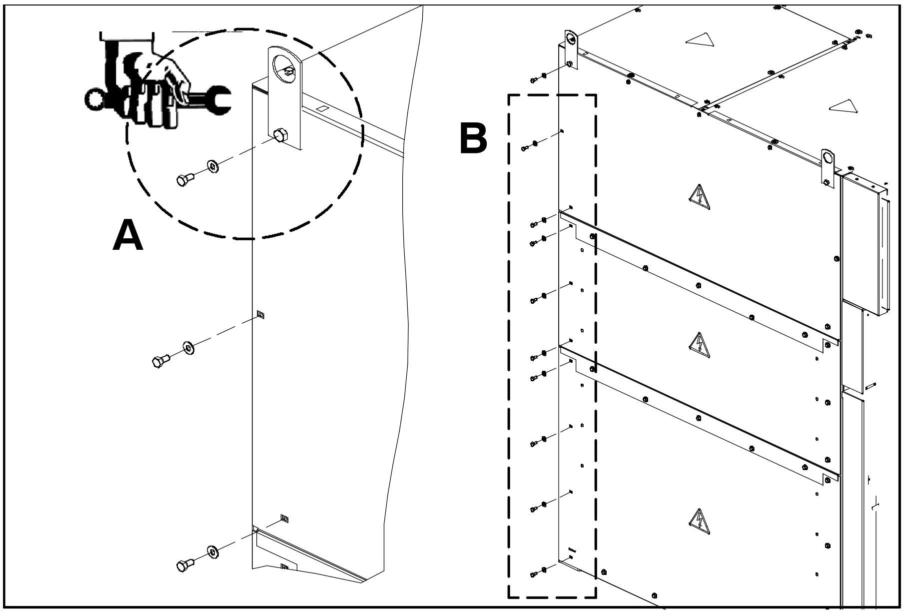
**B** :with M10x25 bolts and M10 washers remain after removing lifting rings

Mounting direction of bolts with nuts
**K** : right−hand cubicle
**L** : left−hand cubicle

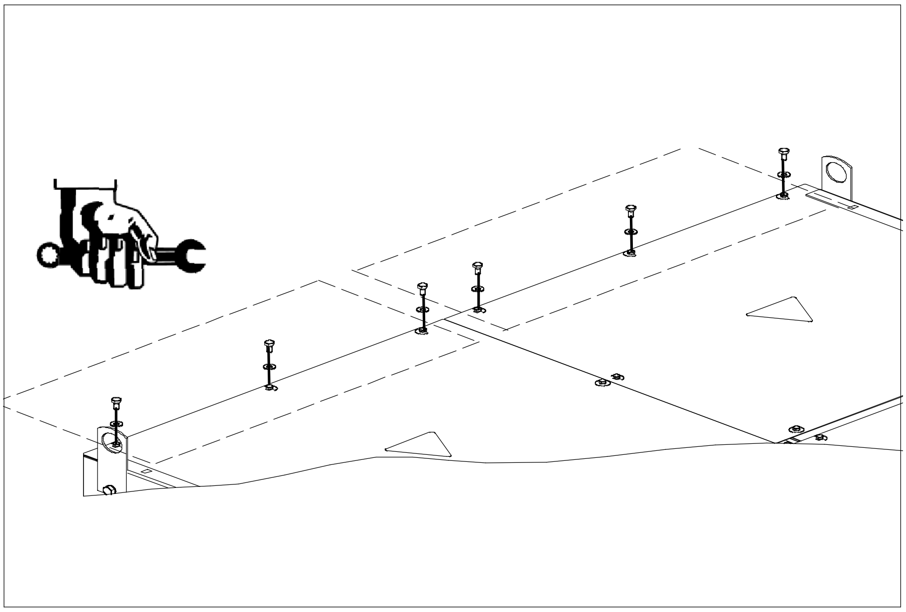
## assembly preparation of cubicle close the wall

**1 –** Firstly, remove the lifting ring b ( A ) and 9 unit M8 bolts ( B )

Those parts and bolts have to be kept, because they will be used

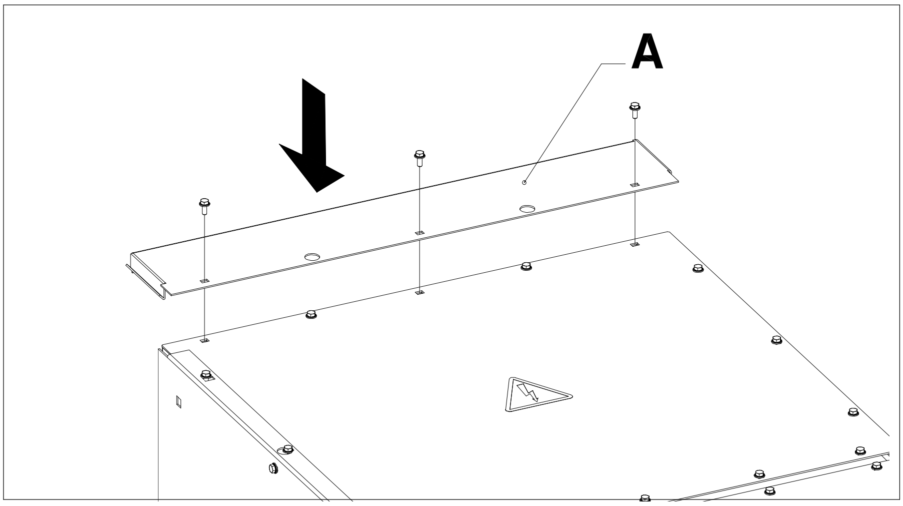


**2 –** Remove 3 pieces of M6 bolts per cubicle as indicated in figure



**3 –** Assembly the part **A** (rear closing sheet) with using removed bolts and washers,

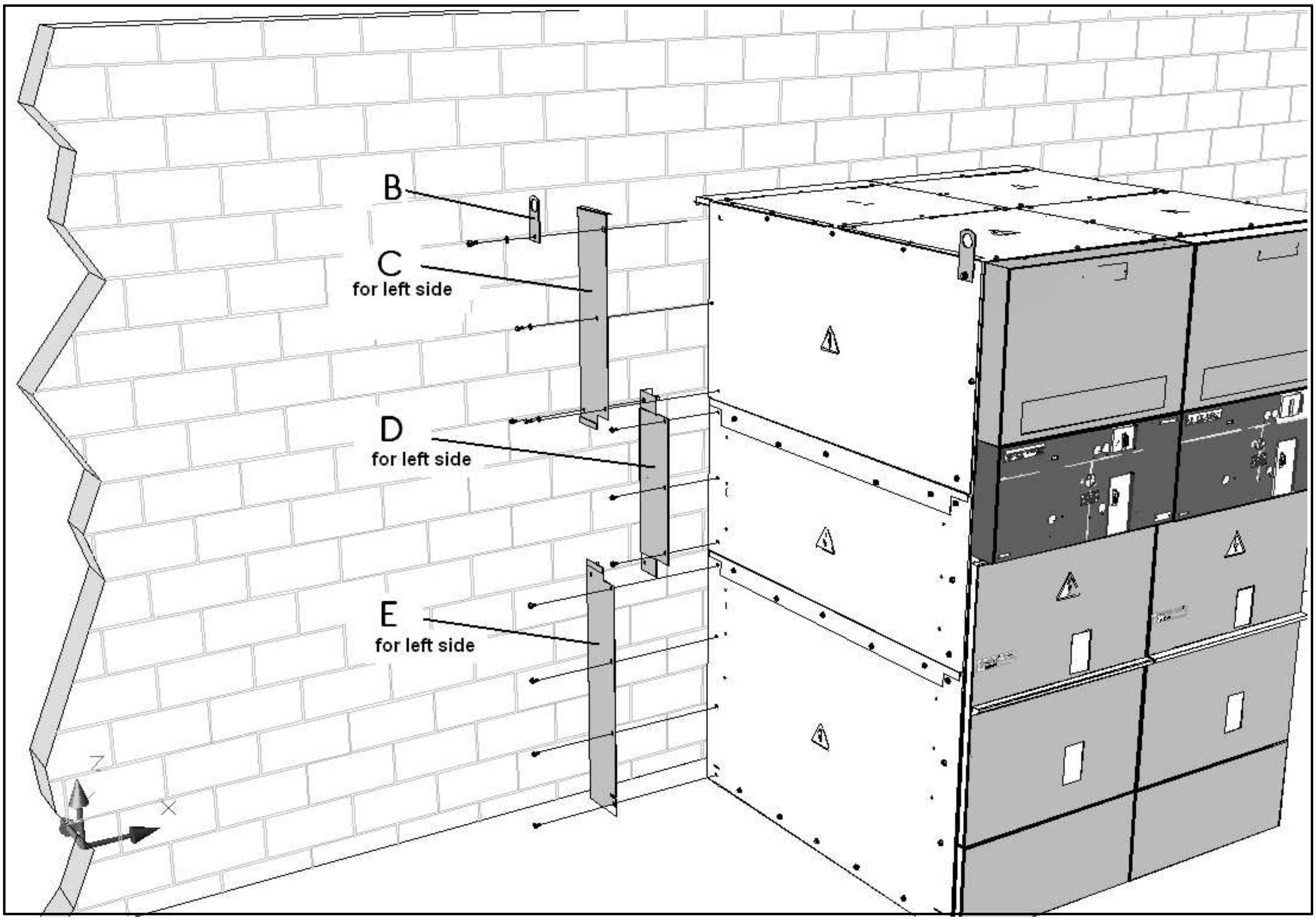
**! NOTE :** The part A must be placed without any gap between the wall.



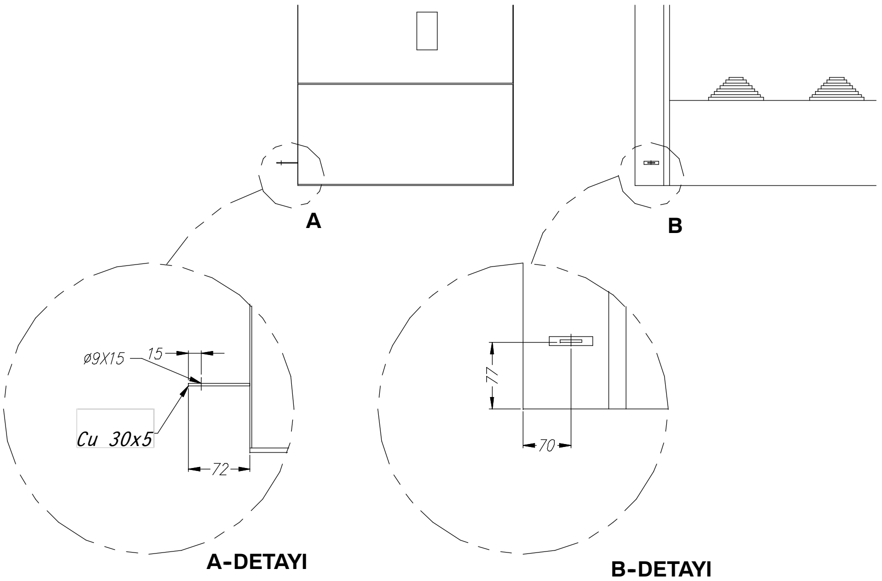
**4 –** Assembly the closing sheets and lifting ring bars with using removed bolts and washers.

**! NOTE :** The closing parts must be placed without any gap between the wall.

| DEFINATION | | INFO |
|---|---|---|
| **B** | Lifting ring bars | |
| **For rear top closing** | | |
| **A** | 750 mm wide cubicles | Existing in the cubicle |
| | 1000 mm wide cubicles | Existing in the cubicle |
| **For left side** | | |
| **C** | Left side top closing sheet | Existing in the cubicle |
| **D** | Left side middle closing sheet | Existing in the cubicle |
| **E** | Left side bottom closing sheet | Existing in the cubicle |
| **For right side** | | |
| **F** | Right side top closing sheet | Existing in the cubicle |
| **G** | Right side middle closing sheet | Existing in the cubicle |
| **H** | Right side bottom closing sheet | Existing in the cubicle |

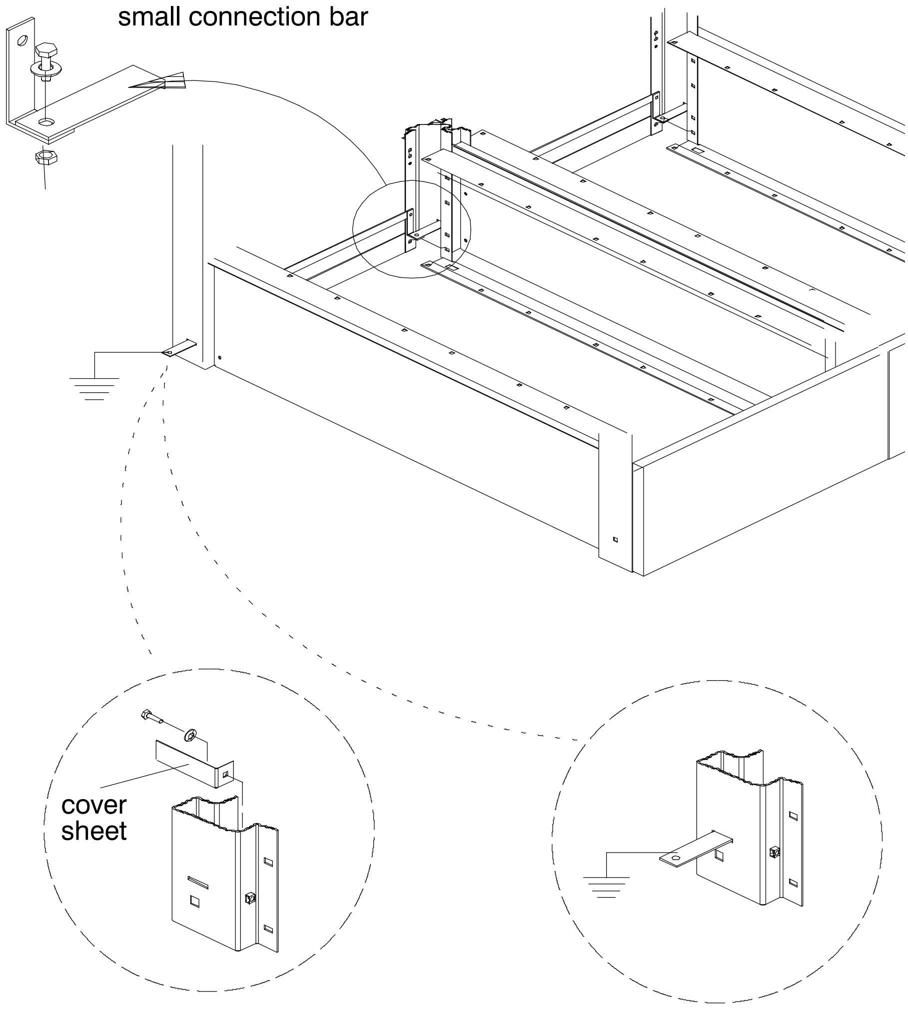


## earthing connection



Connect the earth bars with M8 bolt, nut and washer.

If the cubicle at end of the switchboard fit the cover sheet as in the illustration.



# position of M.V. cables in the cubicle

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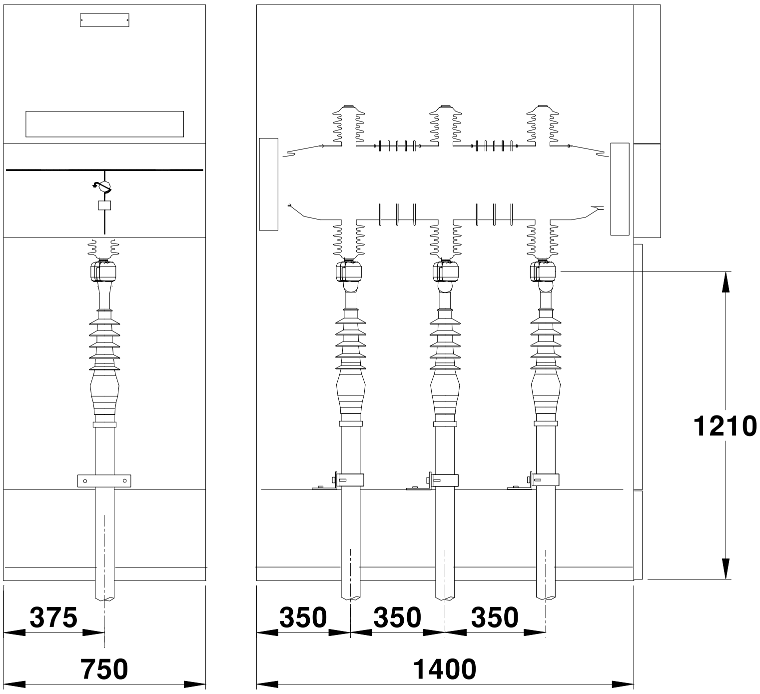
## switch cubicles

IM, SM, (750 mm)

**IM,SM**



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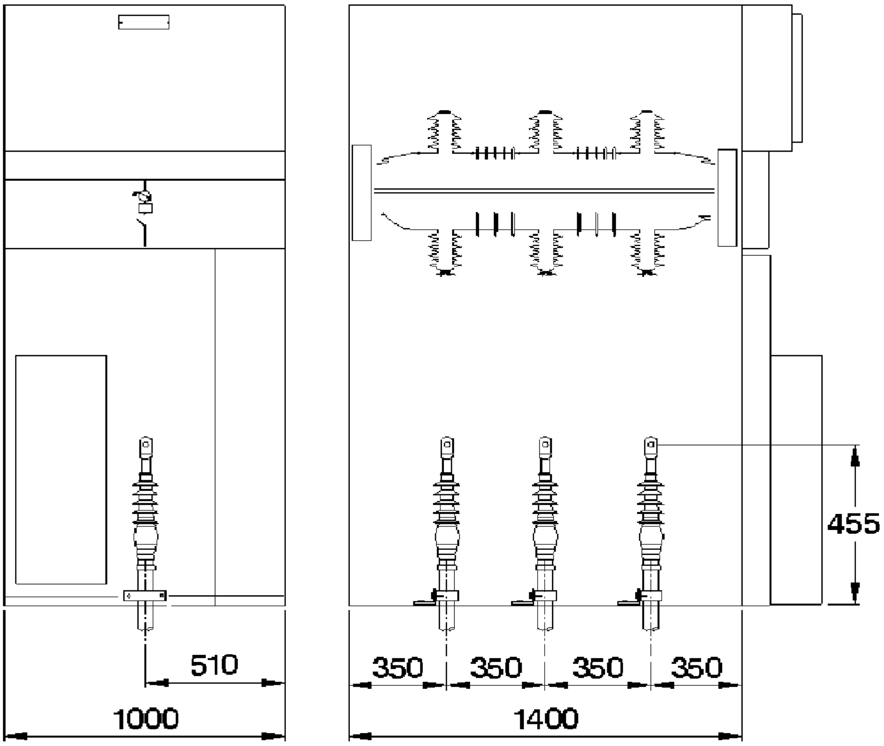
## circuit–breaker cubicles

DM1–A (1000 mm)

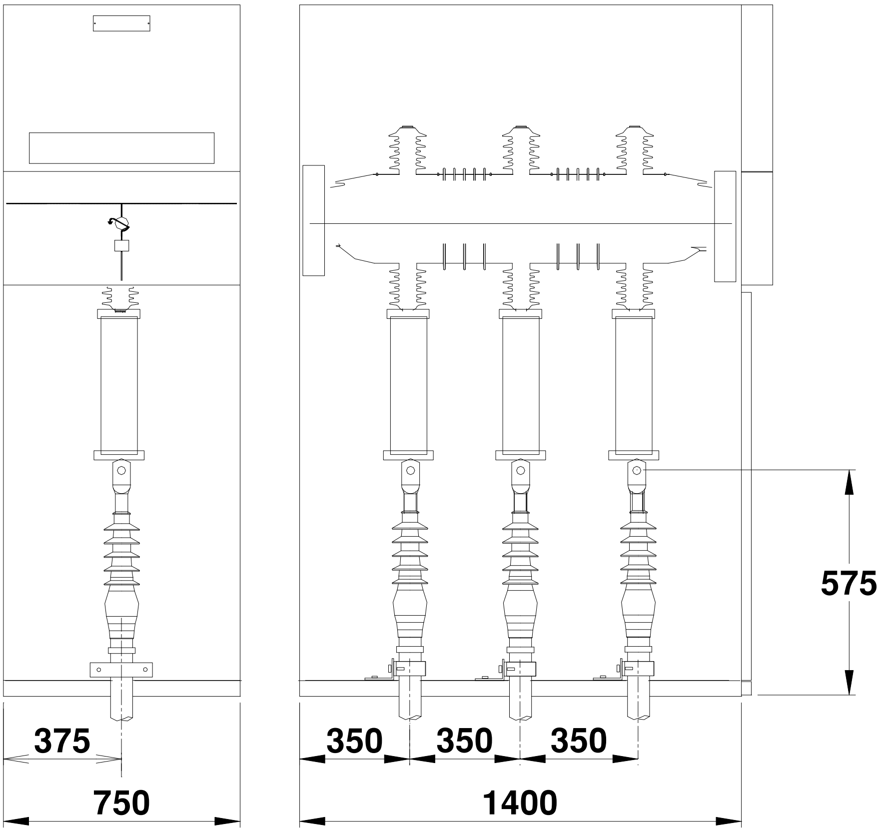
**DM1-A**



## fuse–switch cubicles

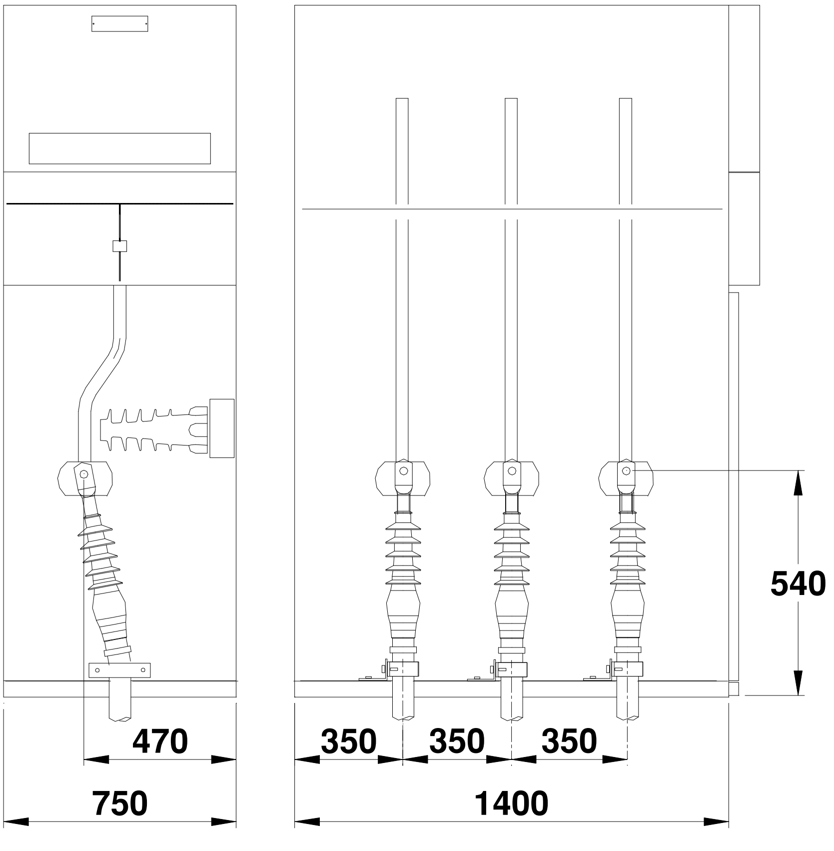
PM, QM, IMC, (750 mm)

## IMC, QM, PM

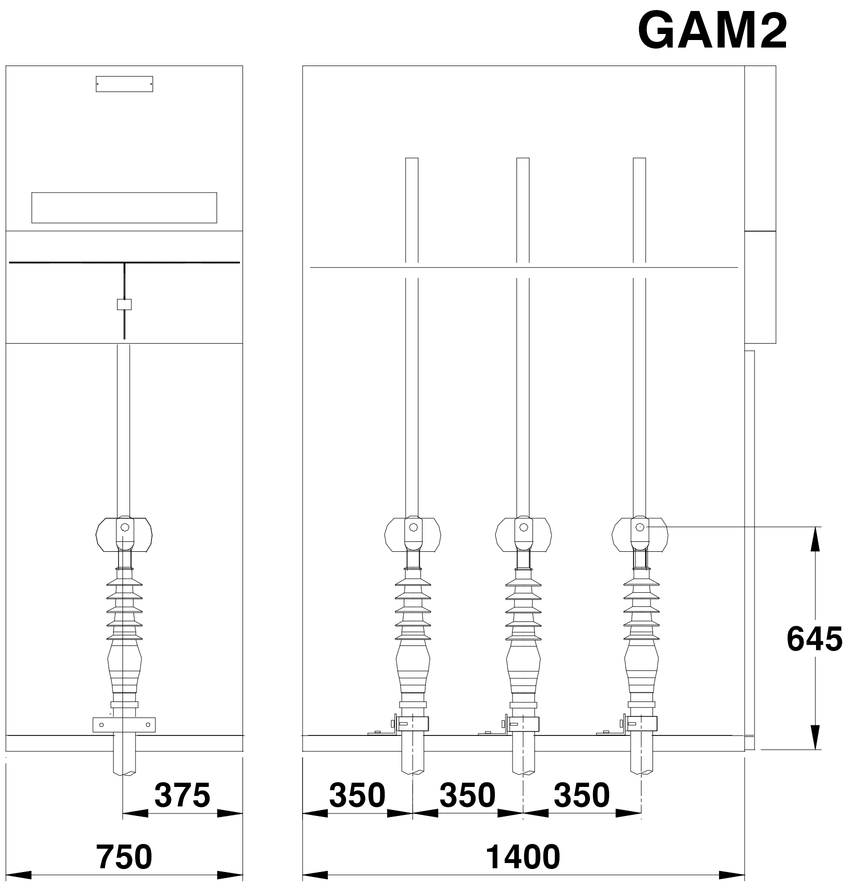


## GAM cubicles

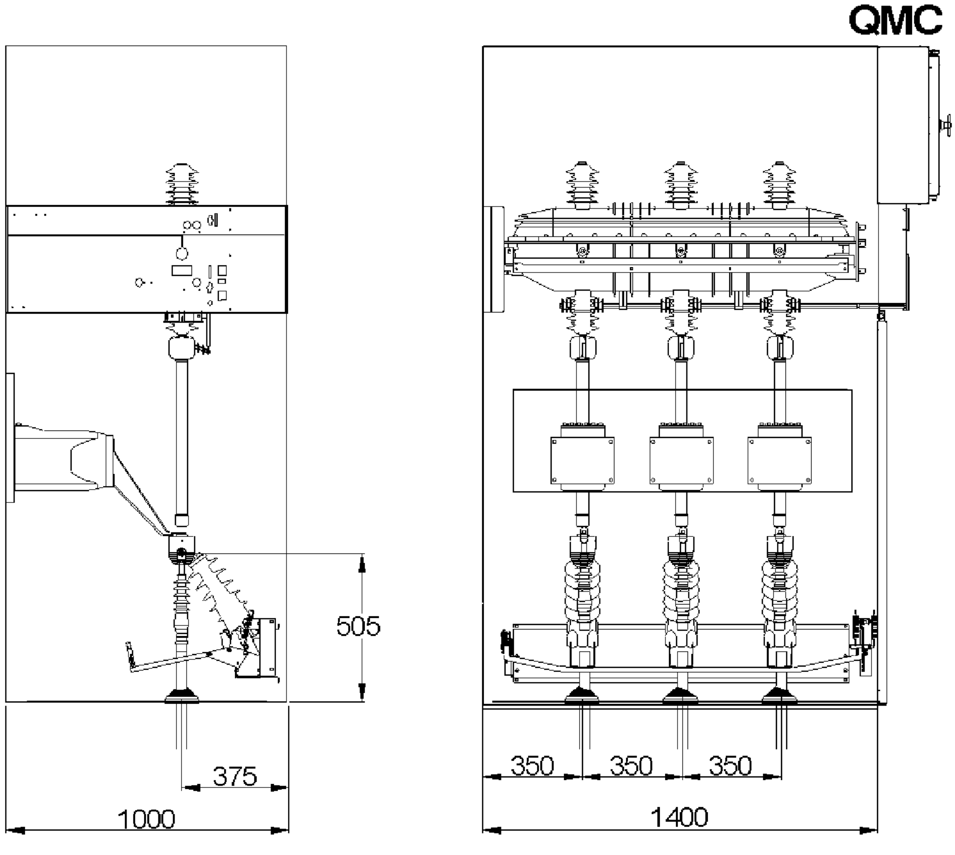
## GAM



## GAM2 cubicles



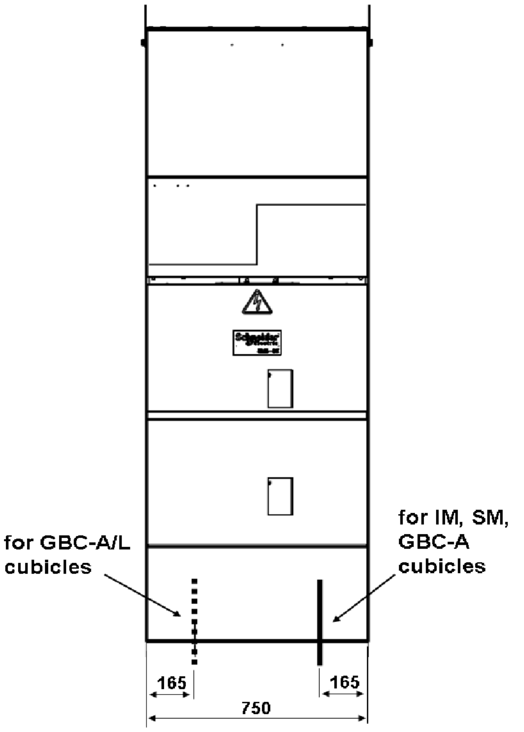
## QMC cubicles

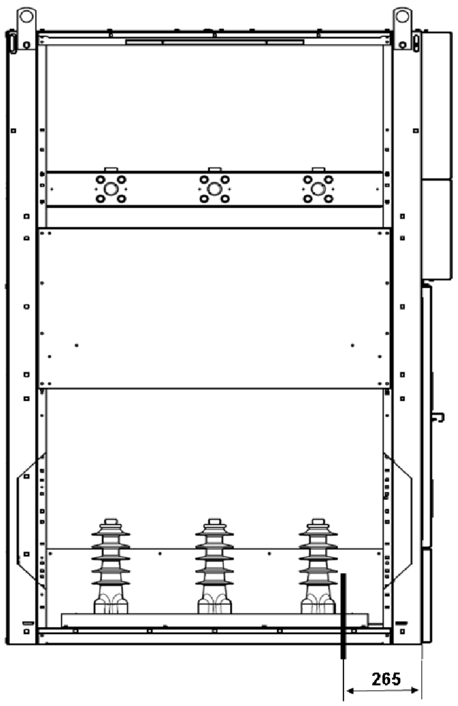


# position of L.V. cable entries in the cubicle

## for IM, SM, GBC−A cubicles

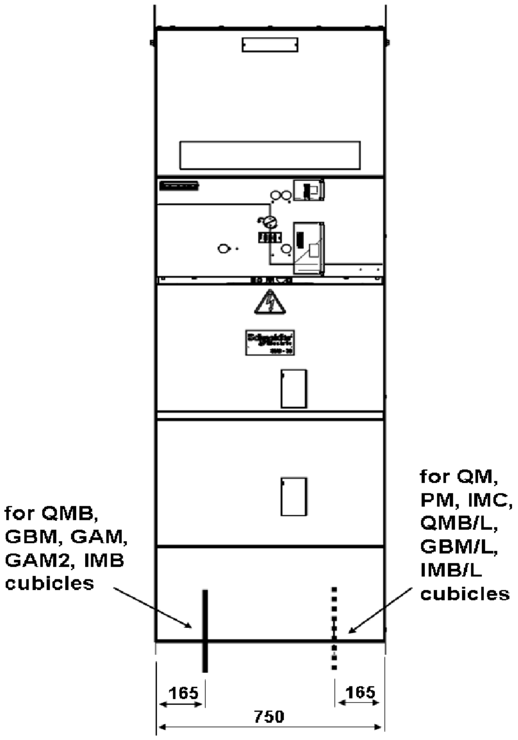
(750 mm)

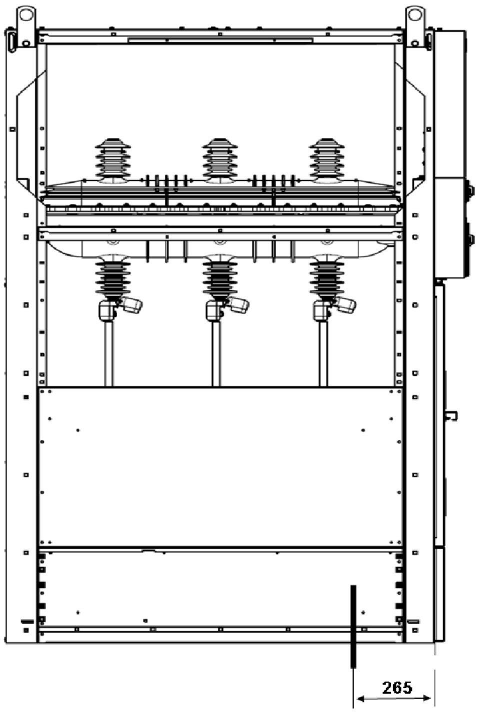




## for QM, PM, IMB, IMC, QMB, GBM, GAM, GAM2 cubicles

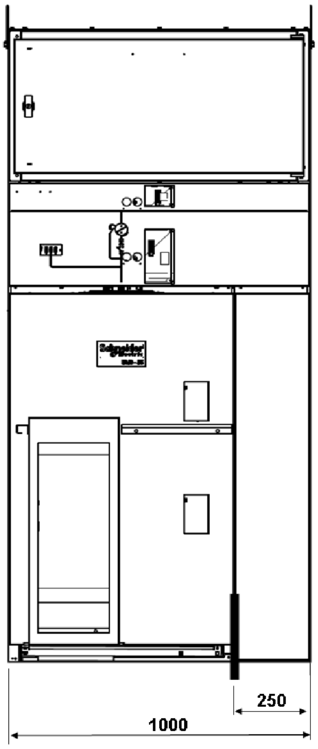
(750 mm)

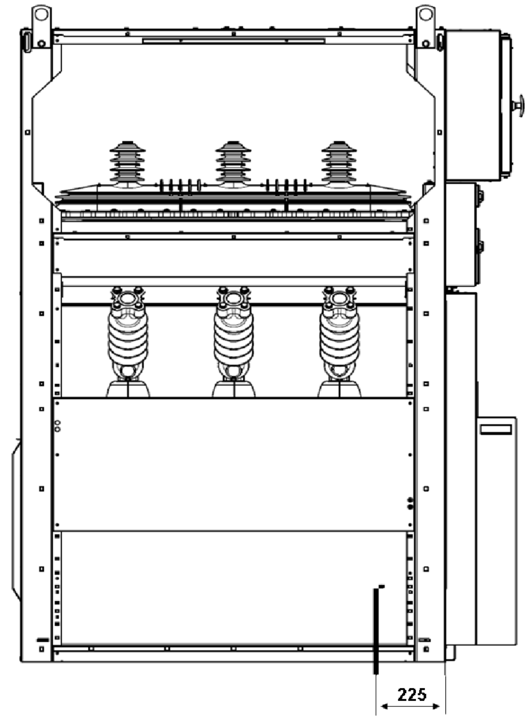




## for DM1−A, DM1−W cubicles

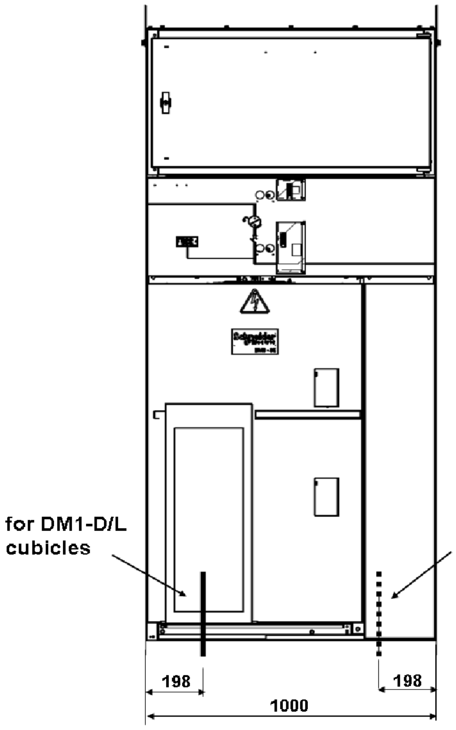
(1000 mm)

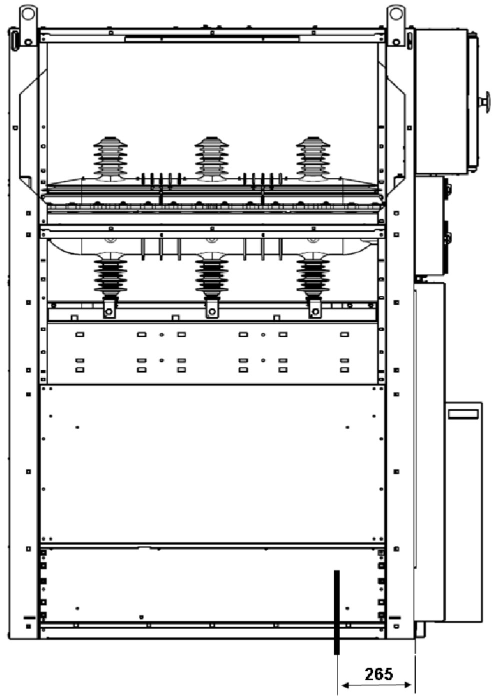




## for DM1−D cubicles

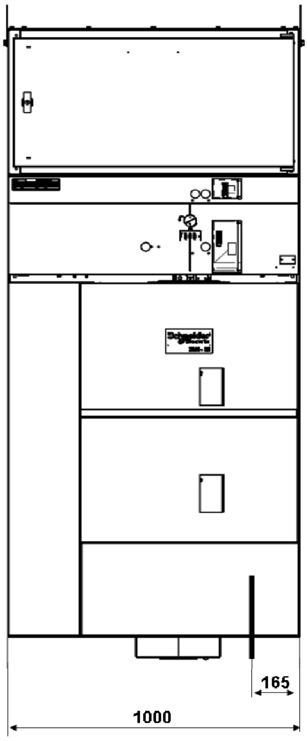
(1000 mm)

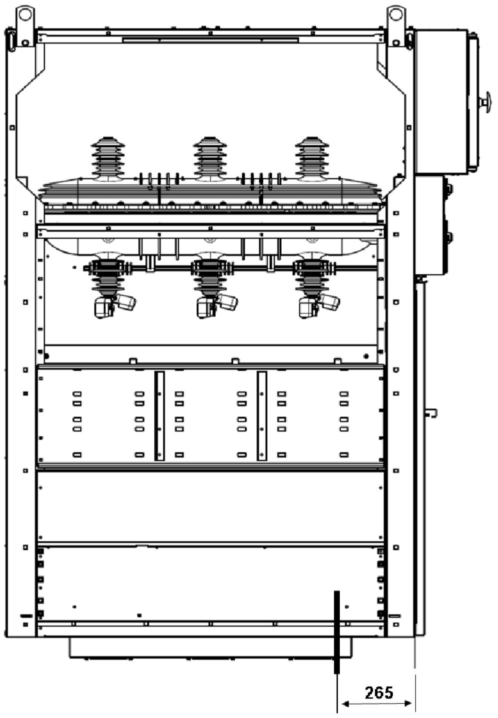




## for QMC cubicles

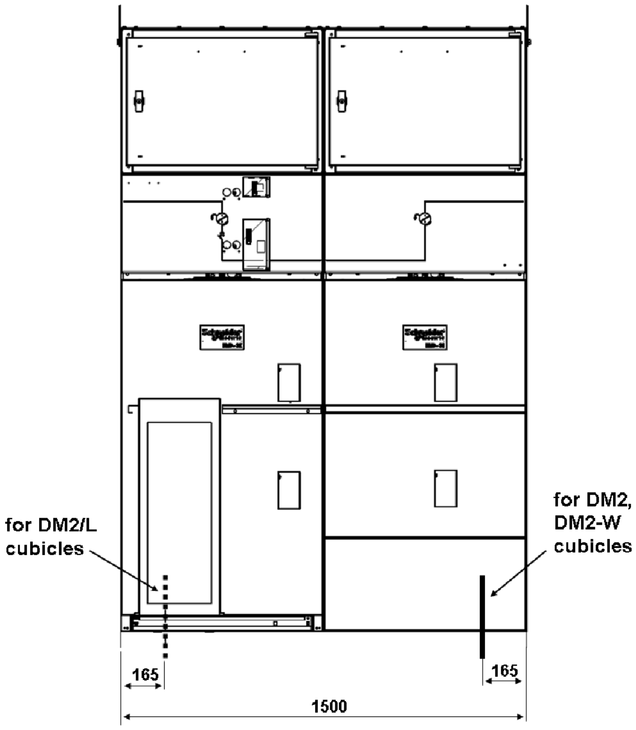
(1000 mm)

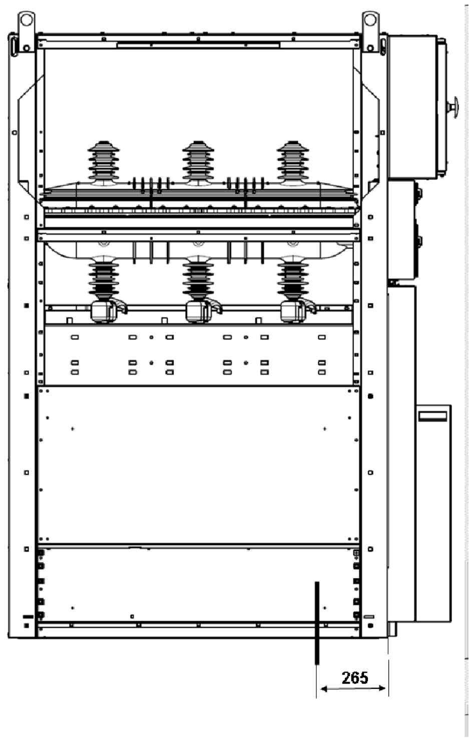




## for DM2, DM2−W cubicles

(1500 mm)

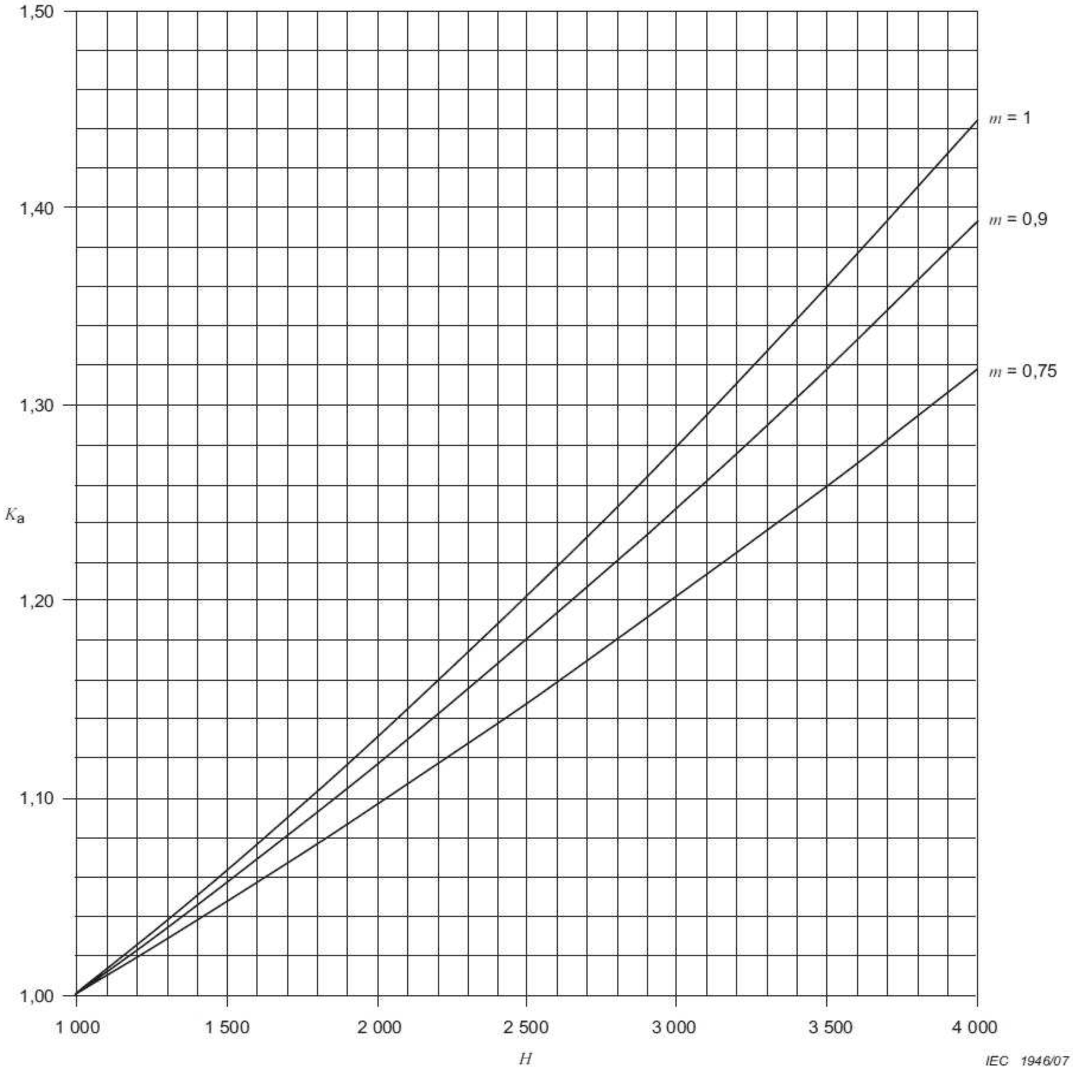




There are some precautions for the reliable operating life of the SM6-36 switchgear during the installation stage. The following conditions should be considered to increase the equipment performance;

## 1. Altitude

For installation at an altitude higher than 1000m, the insulation level of external insulation under the standardised reference atmospheric conditions shall be determined by multiplying the insulation withstand voltages required at the service location by a factor Ka in accordance with following equation.



$$K_a = e^{m(H - 1000)/8150}$$

**Where;**

**H** is the altitude in meters;
**m** is taken as fixed value in each case for simplification as follows:

**m** = 1 for power frequency, lightning impulse and phase-to-phase switching impulse voltages.

## 2. Humidity

The SM6-36 switchgear without heating resistor conform to the average value of the relative humidity, measured over a period of 24h, does not exceed 95% for the normal service conditions.
In certain regions with sudden changes of temperature may occur resulting in condensation even indoors.
IEC 62271-304 standard defines the tests realised in service conditions more severe than the normal service conditions with respect to condensation over 95% relative humidity.
Therefore, the 150W heating resistor has to be used in the SM6-36 switchgear conformed with tests to IEC 62271-304.

In case of most severe service conditions close to 100% relative humidity, consult to the technical service.

## 3. Lightning protection

The damage caused by the lightning strokes can not be completely prevented, either technically or on economic grounds. The lightning protection facilities can not therefore be specified as obligatory. On the basis of model experiments, measurements and years of observations and experience, the consequences of lightning strokes can very probably be avoided with several methods.

### Protective effect

An arrester and its earthing affords effective protection against lightning surges if it ensures that the voltage across the equipment to be protected is never higher than their dielectric capacity.
That means the total residual voltage ($U_1+U_2$) between the line conductor and the reference earth corresponding to the discharge current must remain below the impulse characteristic of the insulation to be protected, i.e. switchboards, transformers, see Fig.2.

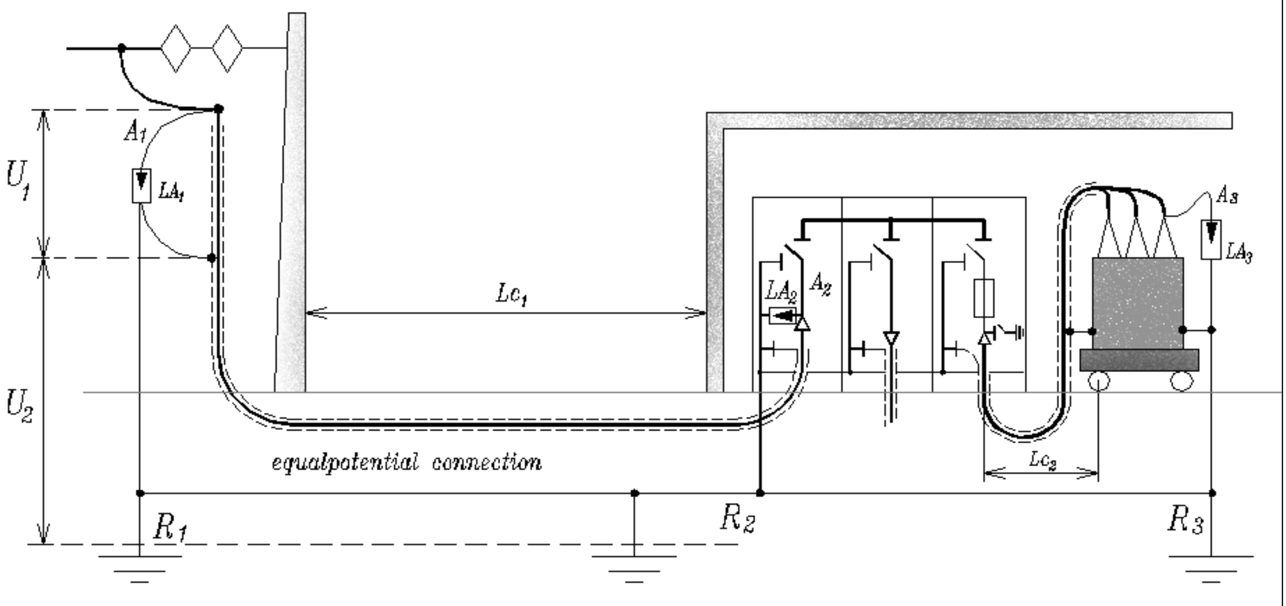


Fig.2

**Position of lightning arresters on a substation supplied by an overhead-underground network.**

This residual voltage is only not the voltage drop (U1) across the terminals of arrester, additionally the voltage drop (U2) on the earthing conductors and connections. Therefore, the earthing becomes more important under high discharge currents to limit the total residual voltage within the insulation level of equipments installed in areas with a high isokeraunic level, with a frequently exposed to atmospheric discharges and without the screening by earth wires.

**Cable terminations**

If a substation is fed from the overhead lines via short cables (Lc1<25m), it is generally sufficient to connect arrester A1 to the line side cable sealing end, and arrester A3 to the MV side of the transformer. With longer cables, it is advisable to protect the cable at both sealing ends with arrester A1 and A2. In this case, arrester A3 at the transformer can be omitted only if the cable length Lc2 between the switchboard and transformer is shorter than the cable length Lc1 connected to the overhead line. In MV installations with cable termination, overvoltages due to reflections must be taken into account, despite limitation of the travelling wave by the cable.

**Connections**

The line jumper, the connections between arresters and the downstream earthing connections should be as short and effective as possible since any additional voltage drops will reduce the protection level.

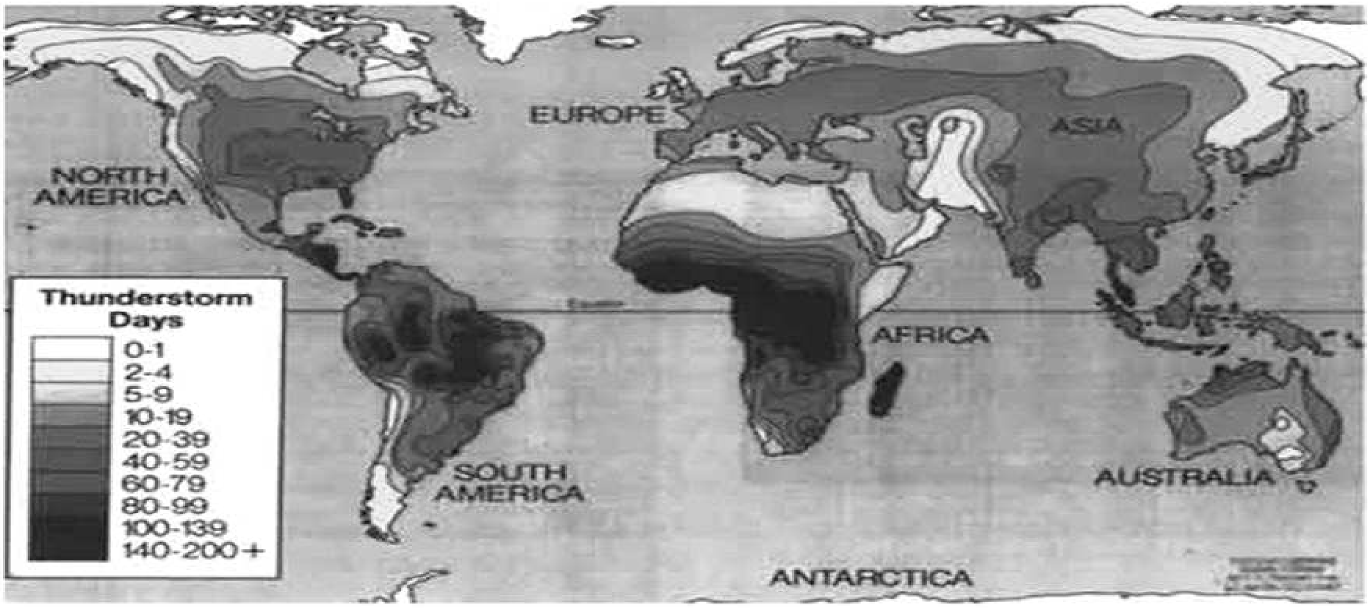
**Earthing**

The arrester earthing should be connected to the cable and substation earthing to get equalpotential condition. The earthing resistance is the total of all means and measures employed for this purpose, and should be as small as possible. Otherwise, there is a risk of back flashover (residual voltage) at high discharge currents between the points where line connections made and the reference earth.

This effect can cause damage to switch or disconnector installed in parallel in the SM6-36 switchboard either violent, for example dielectric breakdowns due to overvoltages, or in the form of premature ageing due to non-destructive, but repeated stresses.

Recommended total earthing resistances for the areas depending to the isokeraunic level and exposed to atmospheric discharges are, as/year follows;

- Low : < 10 ohms Thunderstorm Days between 0-9
- Medium : < 5 ohms Thunderstorm Days between 10-79
- High : < 1 ohm Thunderstorm Days between 80-200+



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