INSTALLATION
& OPERATION MANUAL
METAL ENCLOSED SWITCHGEAR
ME6 up to 17.5 kV

الفنار
alfanar

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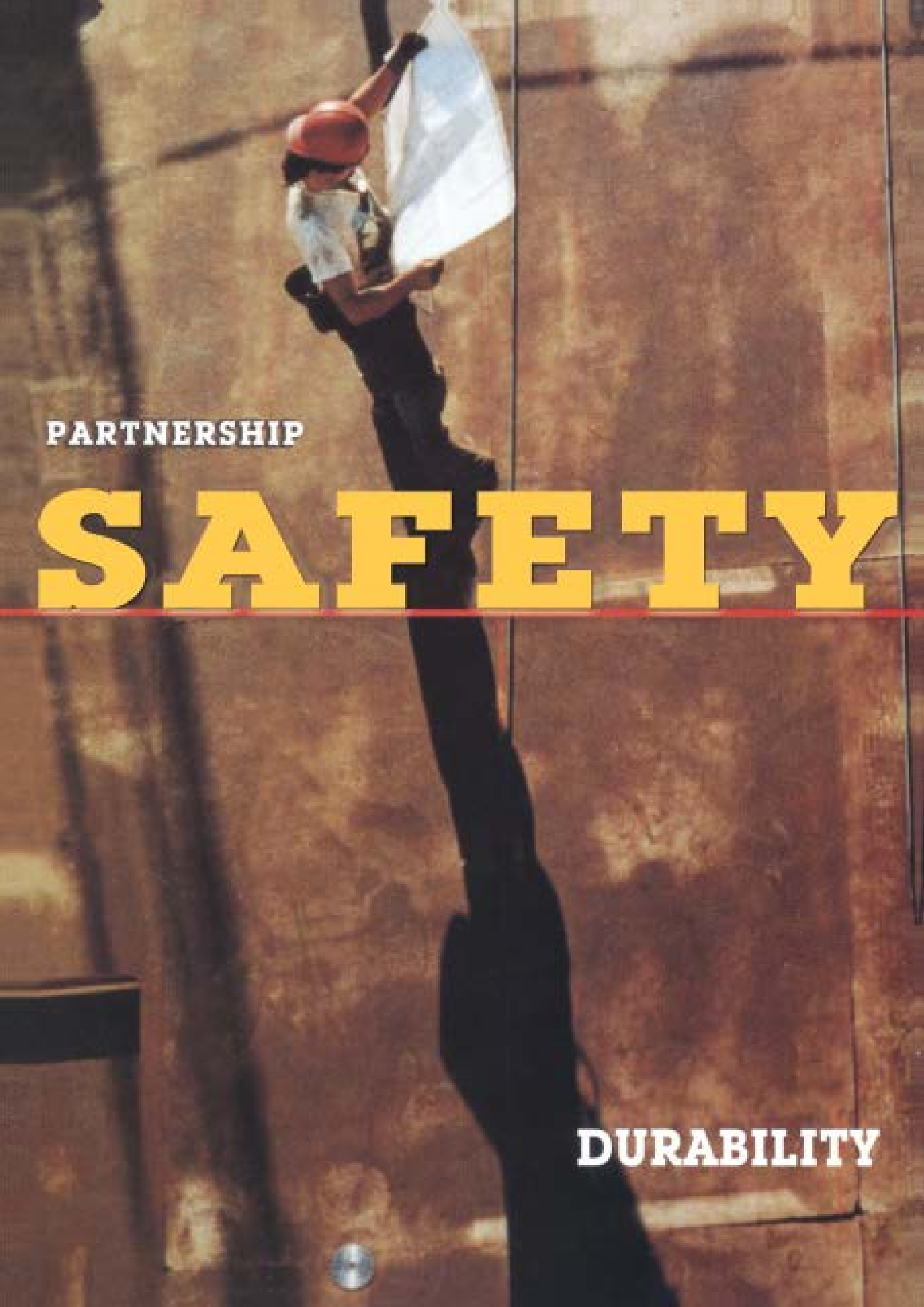

PARTNERSHIP
SAFETY
DURABILITY

Contents

الفنار alfanar

1- Safety Instructions

1.1 Information Concerning This Manual

This manual contains important information on MRMU equipment, handling, operation etc. Full compliance with the safety and service instructions given herein are important conditions for safe and smooth operations. Additionally, all applicable local safety and accident-prevention instructions and regulations should be taken into consideration in conjunction with this manual.

All persons involved must carefully read this manual before starting any work and/or operation of the equipment. This manual is an integral element of the product. It must be stored close at hand and must be available to all personnel at all times. In an attempt to make things clearer and easier to understand, pictures contained in this manual may have been magnified, or they may not show exactly what you see on your specific equipment.

The documentation accompanying this equipment may contain further instructions, manuals etc. by OEMs of components integrated with this equipment. Be sure to comply with this information (especially safety and security information), in addition to all the information contained herein.

1.2 Safety Information Symbols

This manual uses symbols to highlight information concerning health, safety and security. Such information always starts with an eye-catching title like “Danger”, “Warning” or “Caution”, indicating the degree to which life, limb or property are at risk.

Such information must be absolutely complied with. Use common sense and caution to avoid accidents and damage to persons and property.

DANGER
Indicates a dangerous situation that is imminent and direct and will cause the death of people or severe injuries unless properly avoided.

WARNING!
Indicates a situation that may become dangerous and cause death or severe injuries unless properly avoided.

CAUTION!
Indicates a situation that may become critical and cause damage to property unless properly avoided.

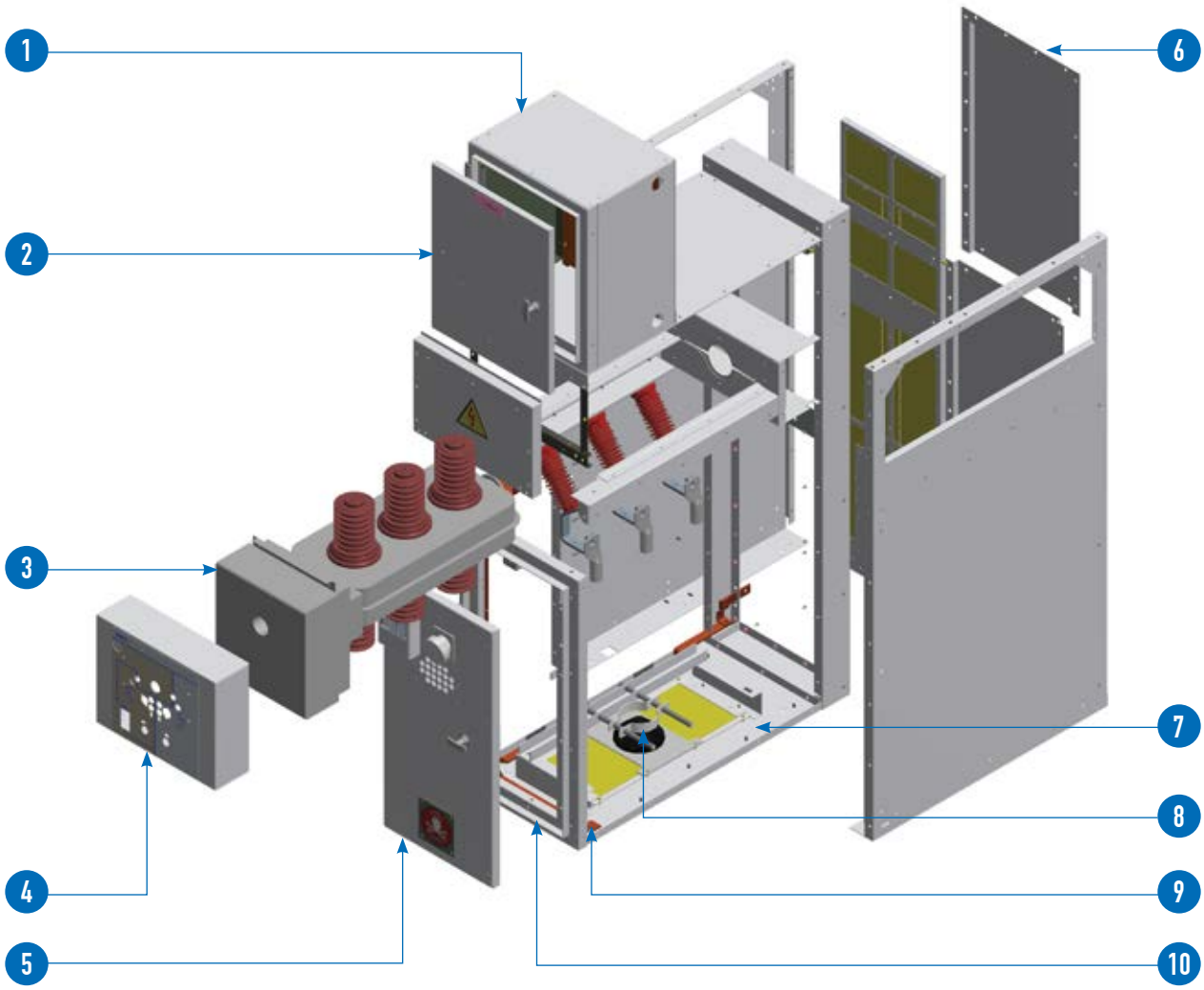
NOTE
Highlights tips, tricks and useful information to help you operate your equipment trouble-free and efficiently.

Danger to life caused by electric voltage!
Indicates life-threatening situations caused by hazardous voltages. There is a danger of serious injury or death if the safety notes are not complied with.
The work to be performed must only be carried out by qualified electricians.

CAUTION!
Important information. Failure to comply may lead to material damage due to incorrect current and/or voltage.

2 – Product Breakdown

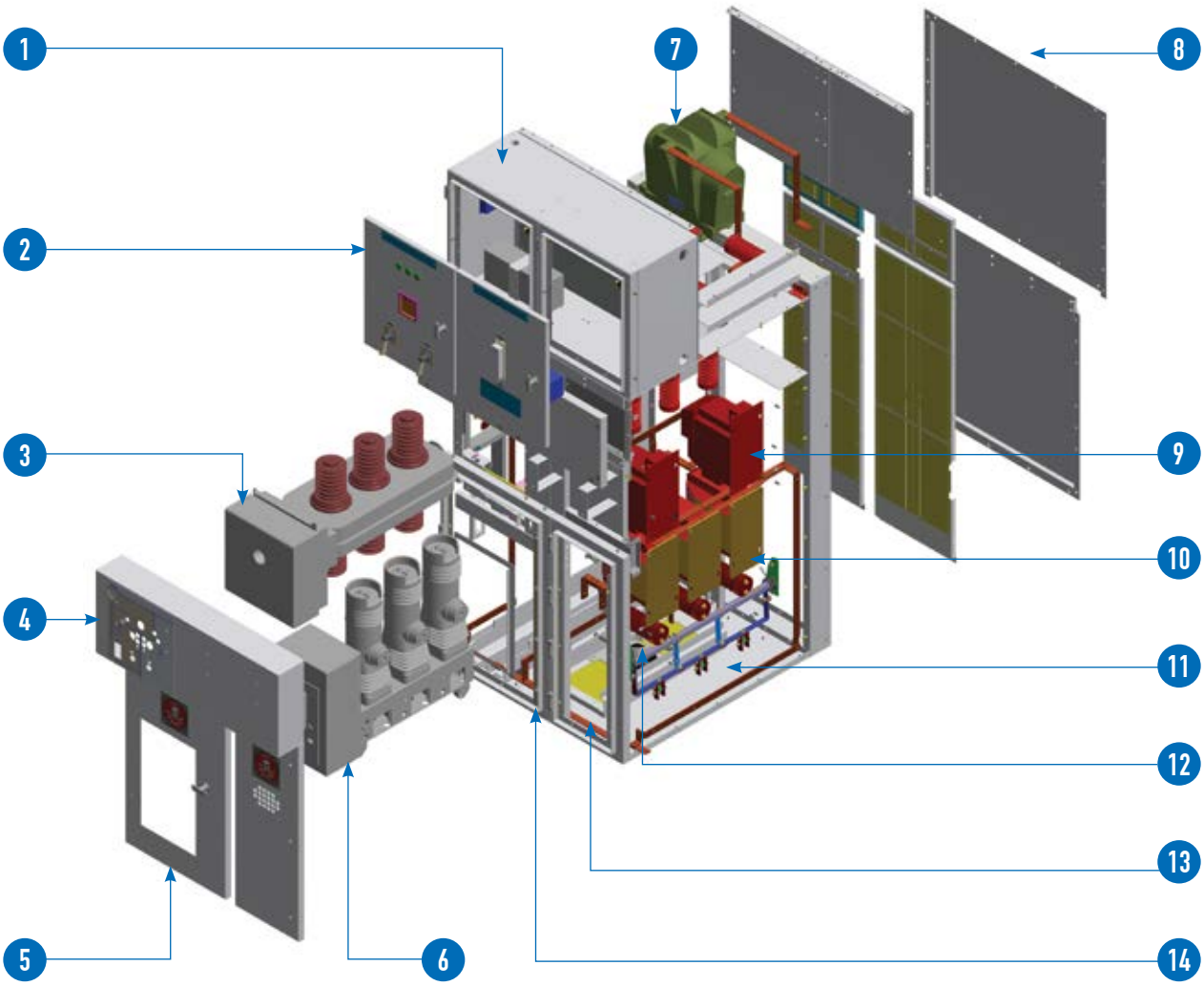
A. L5 INCOMING/OUTGOING UNIT



1 - LV box
2 - LV compartment door
3 - Load break switch
4 - Mechanism cover
5 - Cable compartment door
6 - Rear cover
7 - Gland plate
8 - Cable clamps
9 - Earth bar
10 - Frame

2 – Product Breakdown

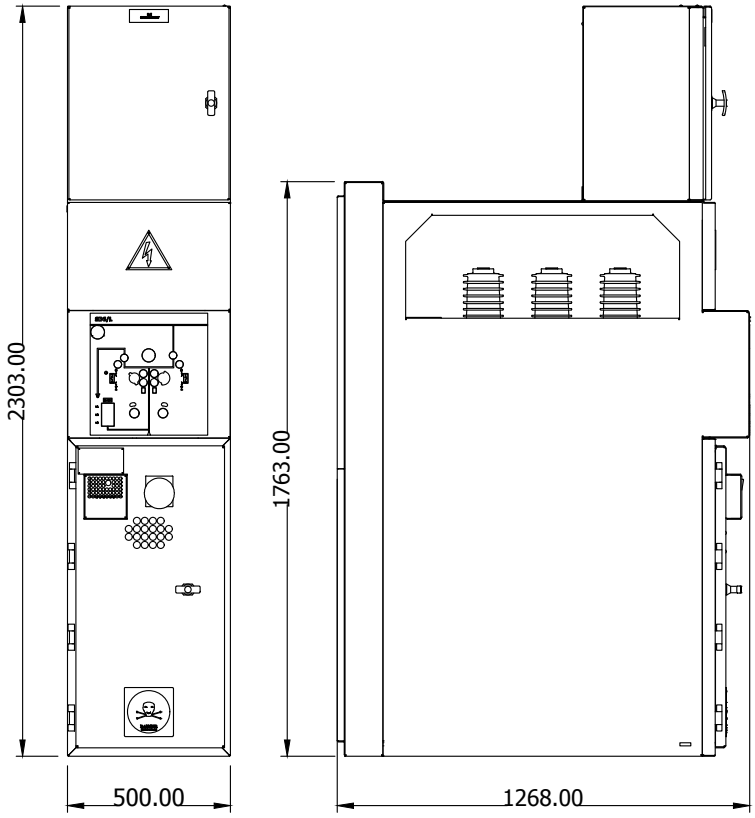
B. PG INCOMING/OUTGOING UNIT WITH VACUUM CIRCUIT BREAKER



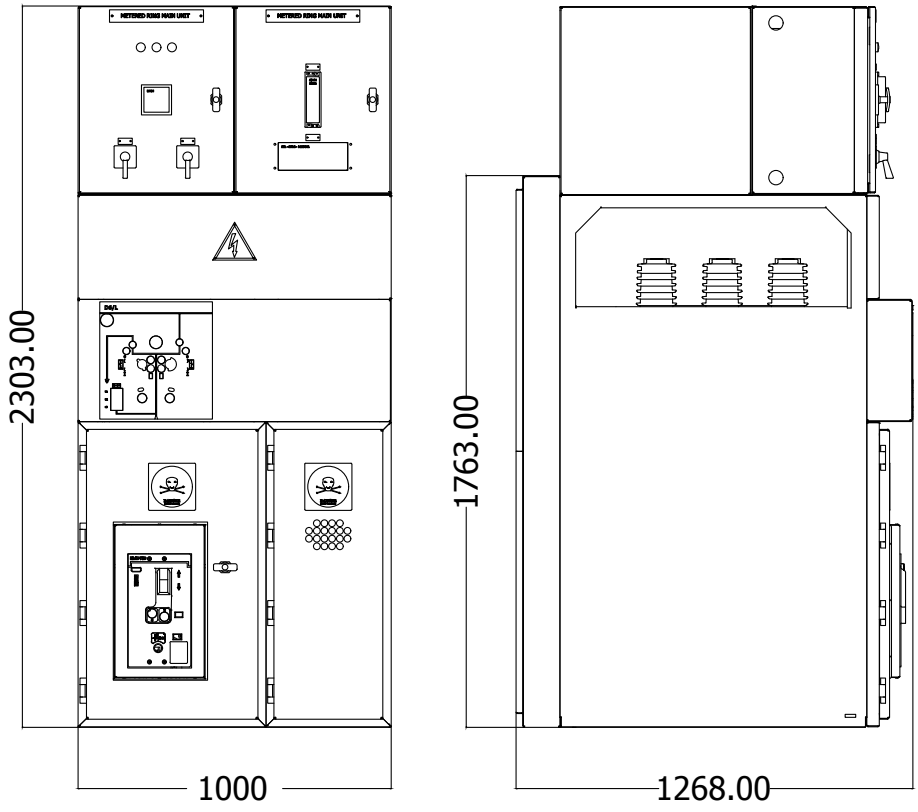
1 - LV box
2 - LV compartment door
3 - Load break switch
4 - Mechanism cover
5 - Cable compartment door
6 - VCB
7 - CPT
8 - Rear cover
9 - VT
10 - CT
11 - Gland plate
12 - VT
13 - Earth bar
14 - Frame

3 – Dimensional Drawing

A. L5 Dimension

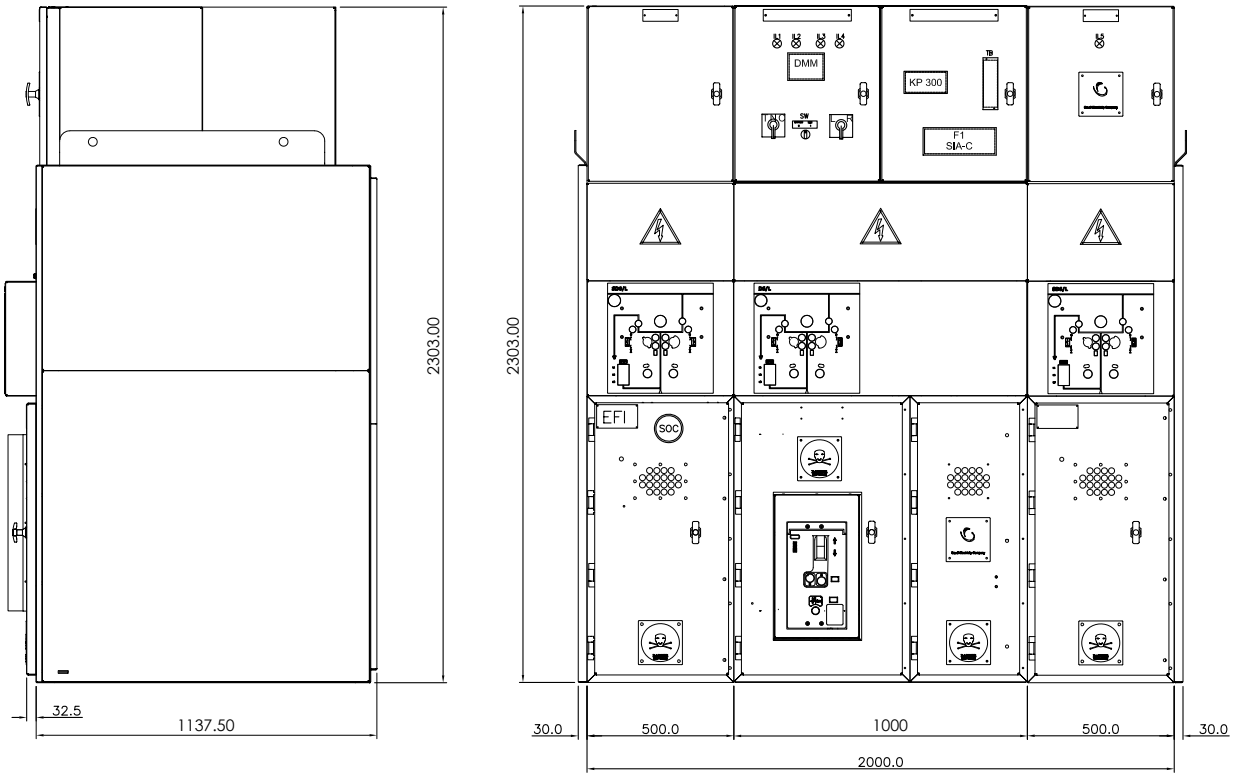


B. PG Dimension



3 – Dimensional Drawing

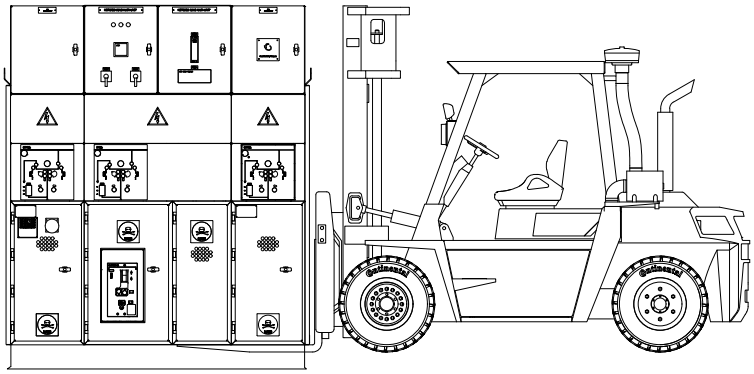
C. ME6 Dimension



4 – Transport and Handling

The different packaging alternatives depend on the transportation method.

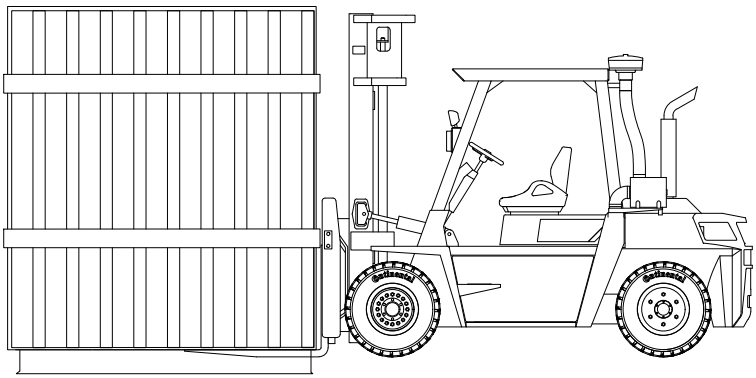
- For short distance (truck transport), wooden base and nylon cover are used.
- For long distance (air and sea), wooden base and wooden cover with nylon cover are used.

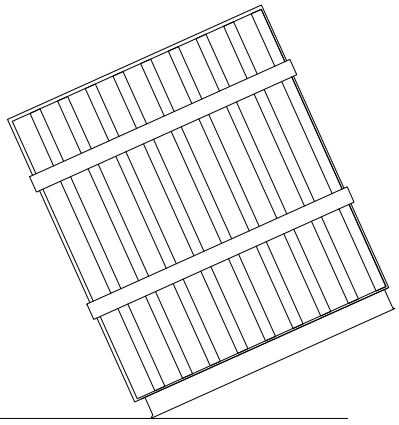


The package can be transported with a forklift.

Warning

Be sure that the forks of the truck are fully engaged throughout the entire width of the packaging base.





Warning

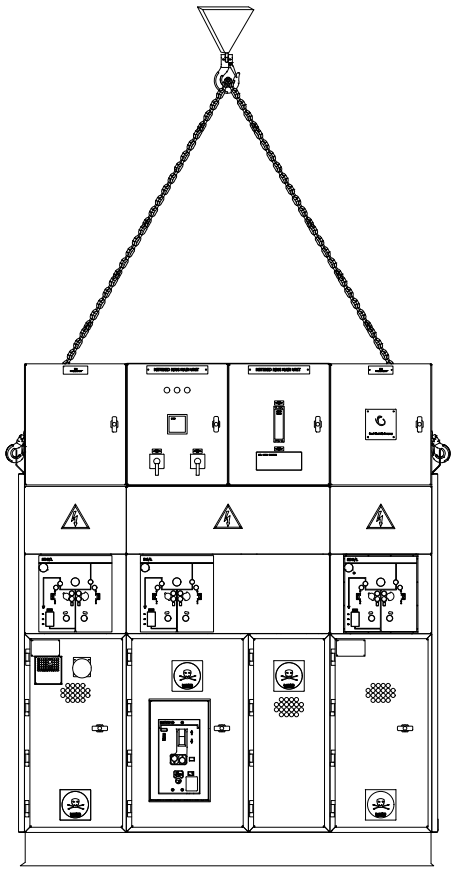
Never tip the crates over.
In order to lift or deposit the moving part on the handling table make allowance for a jib crane (not supplied).

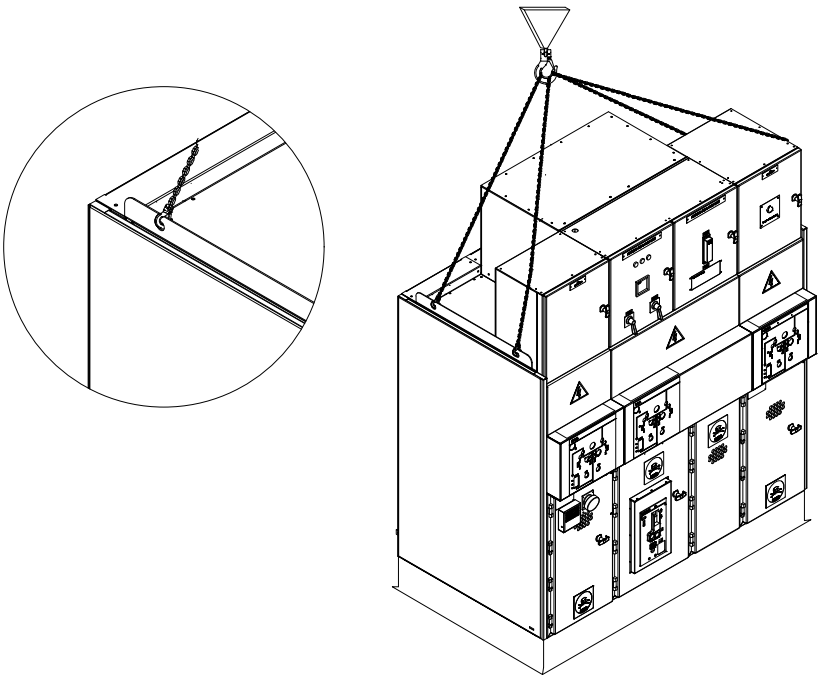
4 – Transport and Handling

ME6 switchgears can be lifted by the lifting points at the top. The hook of the lifting sling can be connected with or without U-bolt. The angle between sling and top surface shall be minimum 60 degrees.

Be sure that the lifting capacity of the rope is adequate to properly lift the product weight.

A chain rope can damage the painted surface of the product, therefore a cloth type sling is recommended to lift the product.

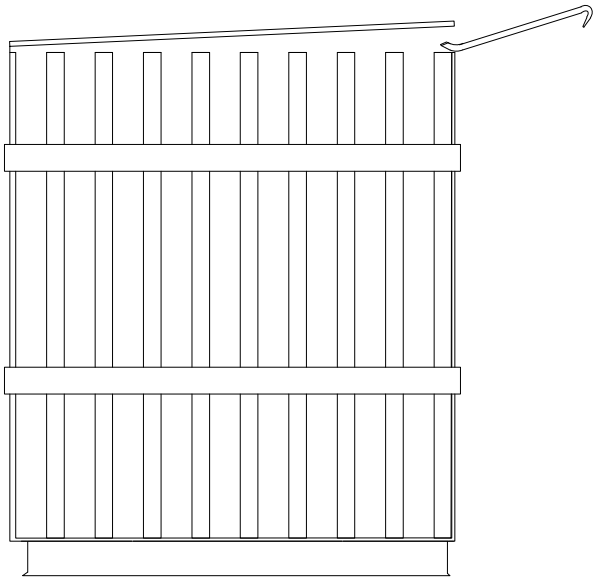


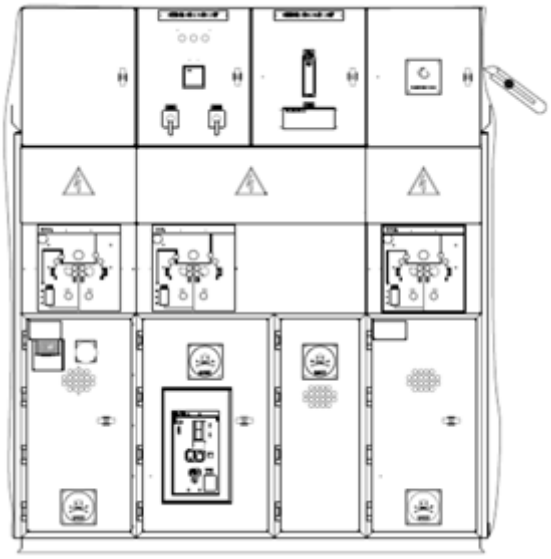


5 – Receiving Inspection

Upon receiving the ME6 please check that the equipment was not damaged during transport.

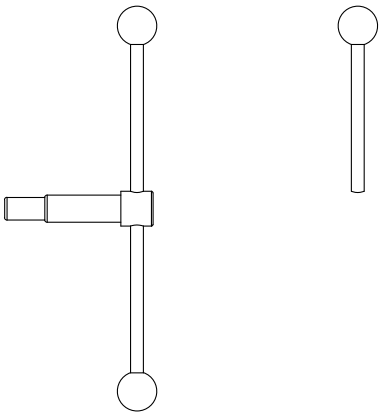
If any damage has occurred during transport a claim must be submitted to the carrier immediately.





After unpacking, the following must be checked:

Switch handle VCB handle



1. Ensure that there is a Circuit Breaker Spring Charger Handle and Switch-Disconnector Operating Handle inside the package. Normally fixed on right hand side.

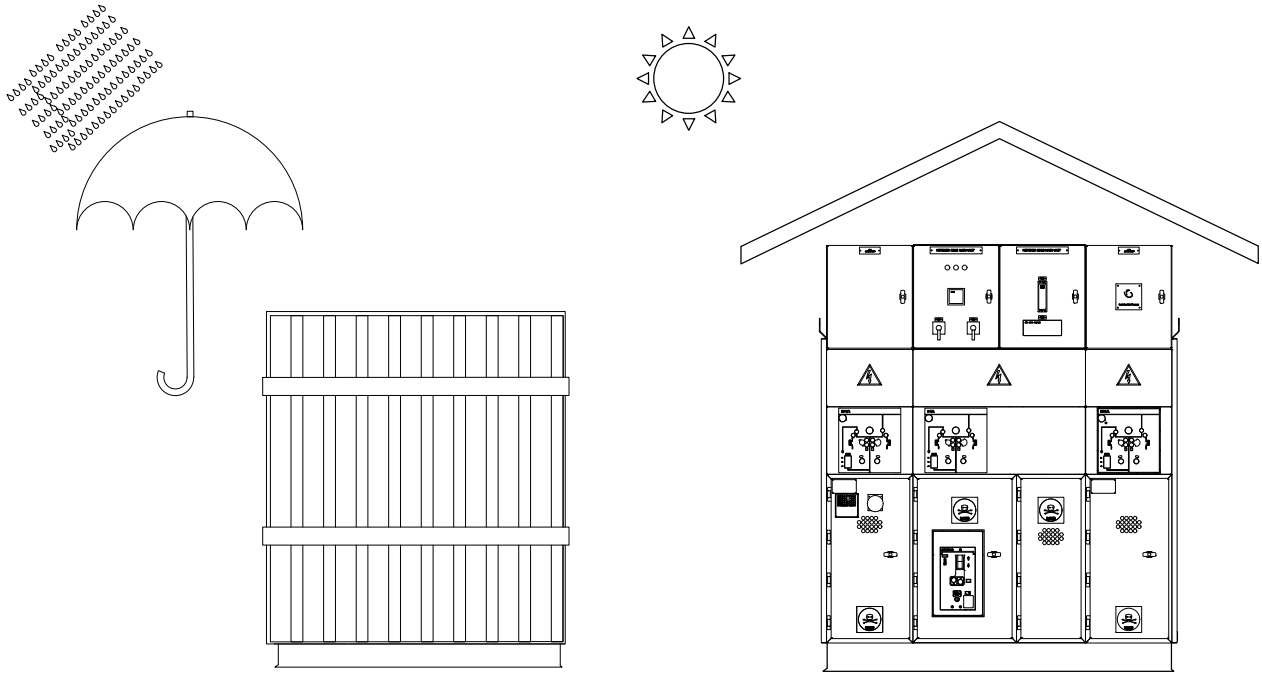
2. Check and confirm that the gas pressure is between 1.1–1.2 bar.

   If the gas pressure value is not in the specified range, contact your provider.

6 – Storage

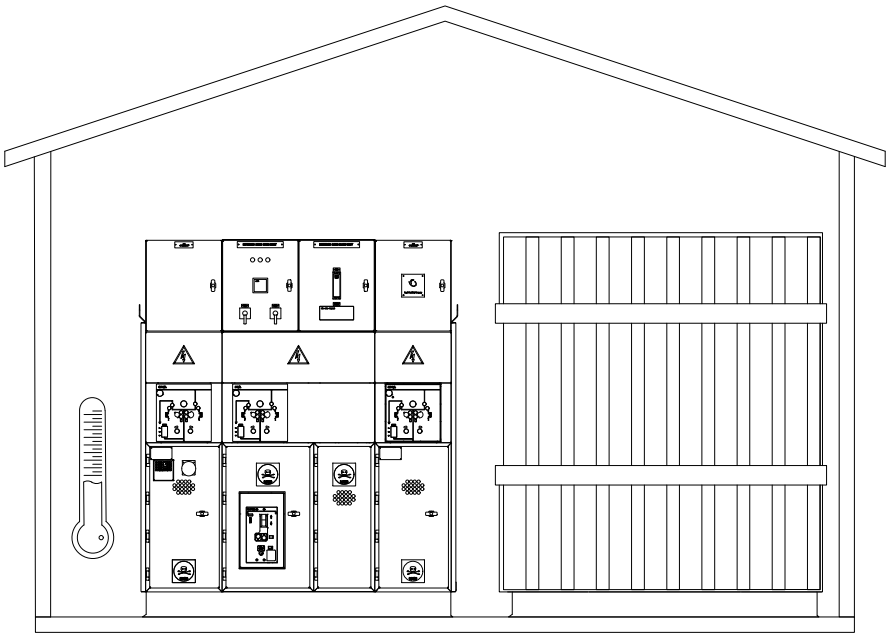
The unit should be properly stored taking the following factors into consideration:

- The units' packaging should be capable of withstanding the duration of storage time
- The package of the unit should not be removed or damaged
- Do not store the equipment where there are rapid or drastic fluctuations in temperature



Store equipment away from hazardous gases (like S02)
The storage area must protect the equipment against any eventual degradation agents such as

- Water and water vapor
- Saline atmosphere
- Pollution



7 – Technical Data Sheet

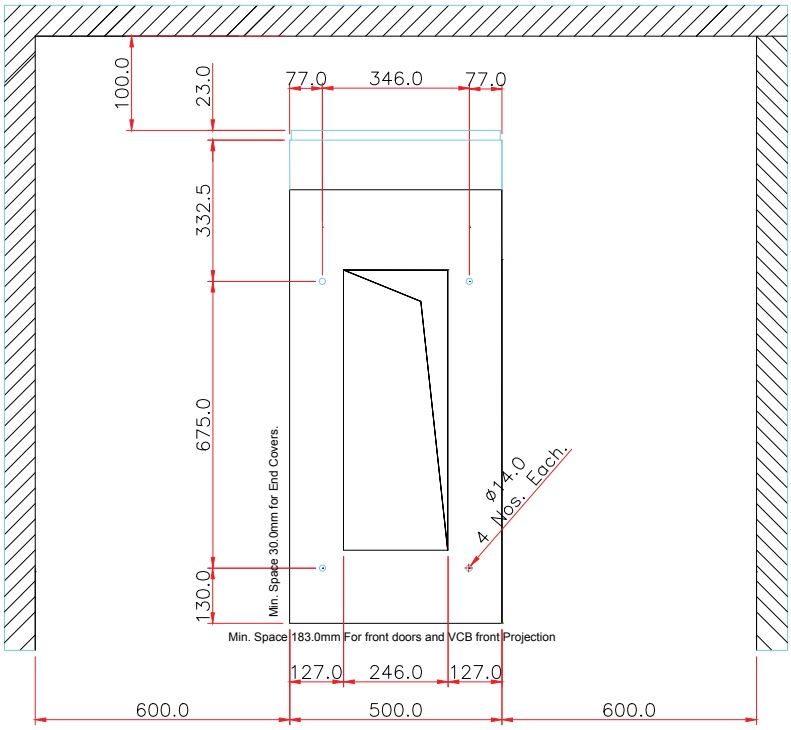
Voltage	17.5 kV
Lighting impulse withstand voltage	95 kV
Power frequency withstand voltage	38kV
Frequency	60 Hz
Normal current	630 A
Short time withstand current	25 kA
Peak withstand current	65 kA
Short circuit duration	3 s
Degree of protection	IP 41
Partition class	PM
Loss of service continuity category (LSC)	LCS2A
IAC classified sides	A FLR
Arc fault current (IA)	25 kA
Arc fault duration (tA)	1 s

8 – Installation

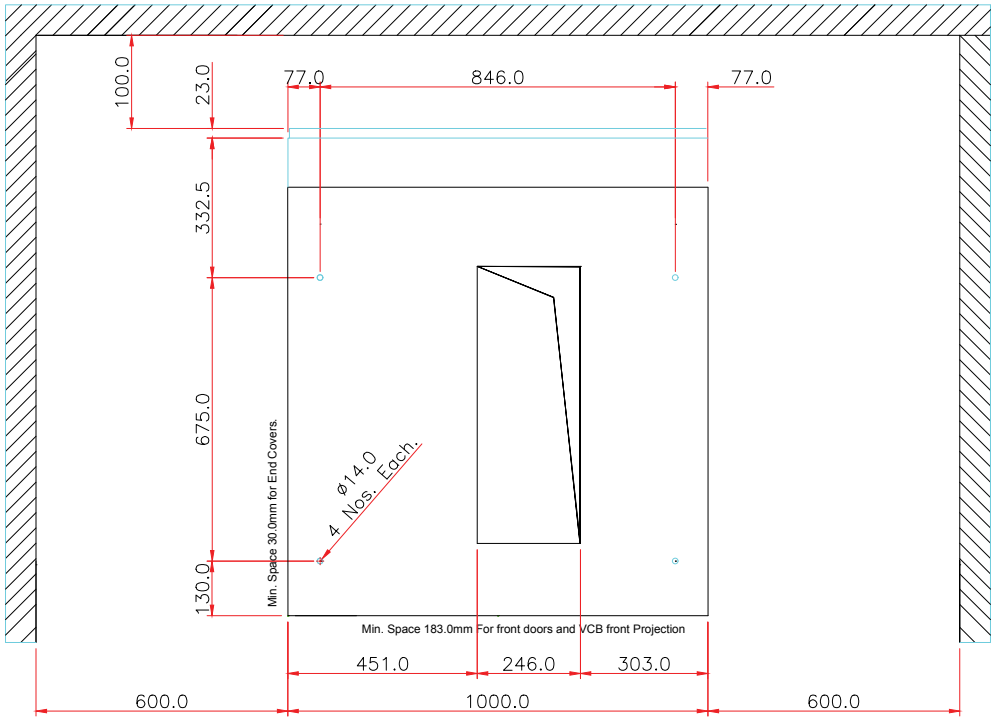
A. Foundation details

Foundation details for each unit type shall be constructed as indicated below.

L5 Foundation

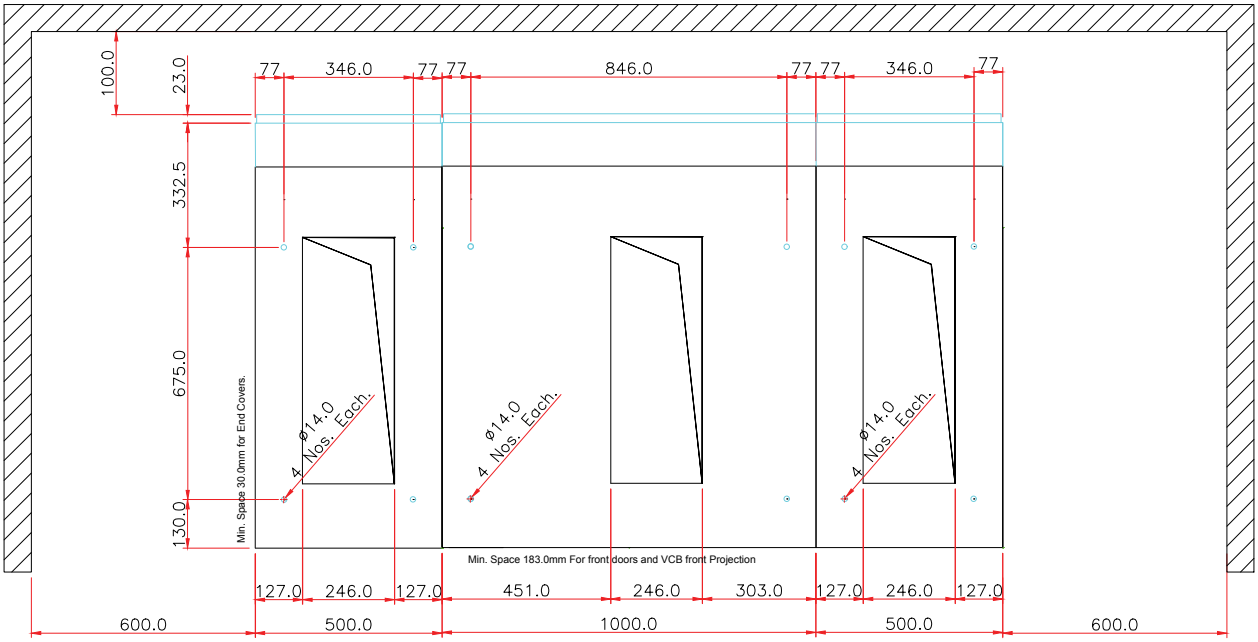


PG Foundation



8 – Installation

ME6 Foundation



B. Working clearance

The switchgear should be installed with the following working clearances:

Lateral side – 600 mm

Front side – 1000 mm

C. Cable termination

- Ensure that earth switch is in ON position and its mimic in the connected position, then open the panel door.
- Insert the cable from the base of the panel through cable gland.
- Unscrew the hex nuts on the terminal connection and fix the cable.
- Earth the metallic screen for the power cable.

9 – Operating Mechanism

Load Break Switch operating mechanism type R

The speed of the closing and opening operations does not depend on the operator.

During closing and opening operations a spring is charged and quick operations are allowed.

Motor operating mechanism, auxiliary contacts and key interlocks are available on request.

Earthing switch operating mechanism type E

The speed of the closing operation does not depend on the operator.

During closing operation a spring is charged and quick operation is allowed.

The speed of opening operation depends on the operator.

Auxiliary contacts and key interlocks are available on request.

Disconnector operating mechanism type VR

The speed of opening and closing operation depends on the operator.

Auxiliary contacts and key interlocks are available on request.

Earthing switch operating mechanism type VE

The speed of the closing operation does not depend on the operator.

During closing operation a spring is charged and quick operation is allowed.

The speed of opening operation depends on the operator.

Auxiliary contacts and key interlocks are available on request.

10 – Interlocking System

Interlocks are provided to make the following operations impossible:

- Operation of the ring switch or circuit breaker directly from ‘ON’ to ‘Earth’ or from ‘Earth’ to ‘ON’.
- Operation of the ‘Earth ON / Earth OFF’ mechanism of earth switch unless the ‘ON/OFF’ mechanism of ring switch is in the ‘OFF’ position.
- Operation of the ‘ON/OFF’ mechanism of ring switch unless the ‘Earth ON /Earth OFF’ mechanism of earth switch is in the ‘Earth OFF’ position.
- Opening / closing of cable boxes without the associated ring switch or breaker in the ‘Earth’ position.
- Opening the Earth to ‘OFF’ unless the cable door closed.
- Opening the off-load isolator switch unless the circuit breaker is in OFF position.
- Closing the circuit breaker unless the off-load isolator switch is in ON position.

11- Side Extension

alfanar ME6 can be extended from both ends. The extensions can be done by following the below procedures.

Extensions procedure

1. Remove the end cover. (Fig. 11.1)

2. Remove the busbar cover. (Fig 11.2)

3. Open rear covers.

4. Position both MRMUs together.

5. Connect busbars.

6. Conduct contact resistance test.

7. Conduct power frequency withstand voltage test.

8. Couple the panels.

9. Close rear covers.

Fig 11.1

Fig 11.2

12 – Operation Sequence

12.1 Feeder Units, L5 putting in service:

Open Earth Switch

To open the ES be sure that the cable door is closed, insert the handle into the ES operating seat and rotate in a clockwise direction. The earth switch will open and its mimic will take its disconnected position as in Fig. 12.1a and Fig. 12.1b.

Fig. 12.1a

Fig. 12.1b

Close Switch Disconnector

To close the switch disconnector SD6, insert the handle into the switch disconnector operating seat and rotate in clockwise direction.

The switch disconnector will close and its mimic will take its connected position as shown in Fig. 12.1c and 12.1d.

Fig. 12.1c

Fig. 12.1d

12.2 Feeder Units, L5 putting out of service:

Open Switch Disconnector

Insert the handle into the switch disconnector operating seat and rotate in counterclockwise direction.

The switch disconnector will open and the mimic will take its disconnected position as shown in Fig. 12.2a and Fig. 12.2b.

Fig. 12.2a

Fig. 12.2b

12 – Operation Sequence

12.2 Feeder Units, L5 putting out of service:

Close Earth Switch

For closing the earth switch, insert the handle into the earth switch operating seat and rotate in counterclockwise direction. The earth switch closes and the mimic takes its connected position as shown in Fig. 12.2c and Fig. 12.2d.

Fig. 12.2c

Fig. 12.2d

Note: *Cable compartment door can be opened only when switch disconnector is in OFF and earth switch is in the ON position*

Note: *Before closing the earth switch, ensure that the incoming cable is not live, the voltage live indicators shall be in OFF mode.*

12.3 Transformer Feeder Panel, PG putting in service:

Open Earth Switch

To open the ES be sure that the cable door is closed, insert the handle into the ES operating seat and rotate in a clockwise direction. The earth switch will open and its mimic will take its disconnected position as in Fig. 12.3a and Fig. 12.3b.

Fig. 12.3a

Fig. 12.3b

Close Disconnector

To close the disconnector D6, be sure the CB is opened, the key inserted in its position in disconnector and rotated to release the interlock. Insert the handle into the disconnector operating seat and rotate in clockwise direction. The switch disconnector will close and its mimic will take its connected position as shown in Fig. 12.3c and Fig. 12.3d.

Fig. 12.3c

Fig. 12.3d

12 – Operation Sequence

12.3 Transformer Feeder Panel, PG putting in service:

Close Circuit Breaker

The circuit breaker shall be closed as follows:

- The low voltage electrical circuits shall be switched on before attempting to close the CB.
- After closing the disconnector D6, remove the key from its position as shown inFig. 12.3e and Fig. 12.3f.

Fig. 12.3e

Fig. 12.3f

- Insert the other CB key linked with this key set into the CB key lock as shown in fig.11 and unlock the mechanical CB interlock Fig. 12.3g and Fig. 12.3h.

Fig. 12.3g

Fig. 12.3h

- The mechanical spring of the breaker will be automatically charged by the motor after supply connection. It can also be manually charged as shown in Fig. 12.3i.
- The circuit breaker is ready to close and put into service Fig. 12.3j.

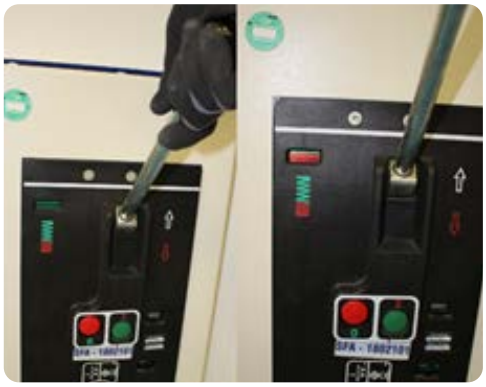


Fig. 12.3i

Fig. 12.3j

12 – Operation Sequence

12.4 Transformer Feeder Panel PG putting out of service:

Open CB

Open the CB by pushing “o”, the key can be rotated and extracted by continuously pressing on “o” as shown in Fig. 12.4a and Fig. 12.4b.

Fig. 12.4a

Fig. 12.4b

Open Disconnector

The disconnector D6 shall be opened as follows:
After opening the circuit breaker, remove the key from the circuit breaker panel as shown in Fig. 12.4a and Fig. 12.4b, insert the other key linked with this key set into key-lock of disconnector, D6 as shown in Fig. 12.4c and Fig. 12.4d and unlock the mechanical interlock. The disconnector is ready to open.

Fig. 12.4c

Fig. 12.4d

- Insert the handle into the disconnector operating seat and rotate in a counterclockwise direction.
  The disconnector opens and the mimic takes its disconnected position as shown in Fig. 12.4e and Fig. 12.4f.

Fig. 12.4e

Fig. 12.4f

12 – Operation Sequence

12.4 Transformer Feeder Panel PG putting out of service:

Close Earth Switch

For closing the earth switch, insert the handle into the earth switch operating seat and rotate in a counterclockwise direction. The earth switch closes and the mimic takes its connected position as shown in Fig. 12.4g and Fig. 12.4h.

Fig. 12.4g

Fig. 12.4h

Note:

- *Before closing the earth switch ensure that the incoming cable is not live, the voltage live indicators shall be in the OFF position.*
- *Cable compartment door can be opened only when the disconnector, D6 is in the OFF position and earth switch in the ON position.*

12.5 Cable Testing

This operation should only be performed by qualified and authorized personnel. To carry out this operation, it's necessary to proceed as follows:

Fig. 12.5a

Fig. 12.5b

- Open the electrical circuit on the upstream side of panel.
- Control capacitor lamps shall be in OFF mode.
- Close the earth switch of the section which is to be tested.
- Open the door.
- Connect the testing device, M6-bolts are shown in Fig. 12.5a.
- Tamper the earth switch interlock as shown in Fig. 12.5b (to operate ES).
- Open the earth switch.
- Carry out the test.
- Tamper the earth switch interlock again as shown in Fig. 12.5b. (to operate ES).
- Close the earth switch.
- Remove the test connections.
- Close the door.

13 - Maintenance

It is essential to conduct periodic maintenance for the product to ensure the maximum lifetime of metal enclosed switchgear.
The maintenance of alfanar metering ring main units should focus on the following:

1. Inspection and verification of the current switchgear.
2. Preventive maintenance.
3. Servicing the current switchgear to restore it to original condition.

13.1 Maintenance Procedure

The following maintenance procedures should be performed:

1. Visual inspections (to check insulators, finish of powder coating, finish of passivation, etc.)
2. Mechanical tightness (ensure all screws and bolts are tight)
3. Functional checks and lubrication (doors, interlocks, mechanisms, moving items, etc.)

13.2 Maintenance Period

To assign the proper maintenance period for the metering ring main unit, it is important to consider the following factors:

1. Climatic conditions surrounding the switchgear (temperature, humidity, AC room, etc.)
2. Metering RMU condition (short circuits, conducted operations, expected operations to come, etc.)
3. Location criticality (school, hospital, housing building, military, etc.)

We recommend the following maintenance schedule:

Action	Period	No. of Operations
Inspection	Once every 4 years	-
Preventive Maintenance	Once every 4 years	Or after 10,000 operations for VCB Or after 5,000 operations for switches
Servicing	Subject to inspection results	-

13.3 Inspection and Verification of Switchgear

It is important to ensure that the working area is suitable for the inspection team to conduct their work properly without missing any point or affecting any other work that is normally taking a place around the switchgear.

Always take safety precautions when performing inspections on switchgear. We recommend increasing periodic maintenance when the switchgear is located in an area where special climatic conditions occur.

The following parts should be inspected:

1) Disconnector switches.
2) Load Break Switches.
3) Vacuum Circuit Breakers.
4) Interlocks.
5) Protection Circuit and Devices.
6) Wiring Signals.
7) Earth Fault Indicators.
8) Capacitive Voltage Indicators.
9) Cable Connections.

13.4 Preventive Maintenance

Preventive maintenance ensures the product will perform without fail during its assigned lifetime. To prevent potential problems accumulating, the following steps should be taken:

1. Clean all copper surfaces to ensure proper insulation.
2. Clean all moving parts to prevent dust from stopping operation.
3. Lubricate all moving links.
4. Tighten all bolts.

13.5 Servicing the Switchgear to Restore it to Original Condition

Whenever a problem occurs, the switchgear shall be serviced properly to avoid increasing the criticality of the issue or the malfunction of the switchgear.

When in doubt, contact the alfanar service team to help resolve the issue. The following are some issues that may occur during the lifetime of the metering ring main unit and how to resolve them:

a) **Doors stuck.**
- Clean and lubricate the doors.

b) **Interlock is not working.**
- Clean and lubricate the interlock mechanism.

c) **VCB is not operating.**
- Clean and lubricate. Trip and closing coils may need to be replaced. Check for loose wiring. Lugs may need to be replaced.

d) **Load Break Switch is not operating.**
- Cleaning and lubrication may be required.

e) **Disconnector is not operating.**
- Cleaning and lubricating may be required.

f) **Electrical circuit is malfunctioning.**
- Check for loose wires, new lugs may be required.

g) **Insulation is broken.**
- Re-sleeving might be required.

h) **Insulators are cracked.**
- Replacement of insulators might be necessary.

i) **Earth Switch is not operating.**
- Cleaning and lubrication may be required. Earth switch replacement might be necessary in extreme cases.

Notes

Notes

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