

KINGDOM OF CAMBODIA
NATION RELIGION KING



ELECTRICITE DU CAMBODGE

TECHNICAL SPECIFICATION

EDC-DTS-MV003 22 kV Ring Main Units

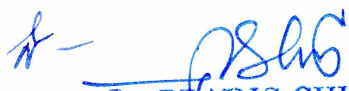
August 2019

Version 2.0





ELECTRICITE DU CAMBODGE

Version	Date	Technical Specification Name	Authorized by : (name and signature)
1.0	February, 2017	22 kV Ring Main Units	
2.0	August, 2019	22 kV Ring Main Units	 Dr. PRAING CHULASA



Version	Drafted/reviewed by	Verified by	Approved by	Date
DRAFT 2	AD			
FINAL Approve	AD EDC/AD			
V2 draft	AD/EDC			August 2018
V2 Final	AD/EDC			August 2019

Main modifications from version 1.0 to version 2.0

- Maximum number of electrical functions from 5 to 4 in one SF6 tank
- Introduction of SS functions in one SF6 tank
- Circuit breaker functions only by extension unit
- Vacuum CB (inside SF6 tank) in addition to Low Pressure SF6
- Introduction of CB protection for 800 kVA transformers
- Type C bushing for CP function
- Modifications on remote control and its motorisation.
- Connection for cable fault location with or without opening cable compartment
- CB relay self-powered or AC powered with mandatory internal power supply
- Rated secondary voltage of VT for M function is 100/V₃ V
- Modification of RMU MV metering function
- Introduction of MV metering panel connected by in and out cables
- Correction of minor typing mistakes and wording



Contents

Contents	5
1 Scope	9
2 Standards	9
3 Definitions	10
4 Testing and Inspection	10
4.1 General Notes for Test	10
4.2 Type Tests	10
4.3 Routine Tests	10
5 Quality Management	11
6 Ambient Conditions	11
7 Technical Requirements	11
7.1 Electrical functions	11
7.1.1 General	11
7.1.2 Incomer switch function: S	12
7.1.3 Transformer protection function: P	12
7.1.4 Transformer circuit breaker function: CP	13
7.1.5 Feeder circuit breaker function: CF	14
7.1.6 MV metering function: M (air insulated)	15
7.1.7 Assembly in one SF6 enclosure	16
7.1.8 RMU on site extensibility	18
8 Rated Characteristics	18
8.1 Rated Voltage	18
8.2 Rated Insulation of MV Circuit	18
8.2.1 Rated lightning impulse withstand Voltage	18
8.2.2 Rated withstand voltage at power frequency	18
8.3 Rated Insulation of LV Auxiliary Circuits	18
8.4 Rated Frequency	18
8.5 Rated Busbar Current	18
8.6 Internal Arc Current Withstand	19
8.7 Characteristics of Each Function	19
8.7.1 Incomer switch function: S	19
8.7.2 Transformer protection function: P	19
8.7.3 Transformer circuit breaker function: CP	19
8.7.4 Feeder circuit breaker function: CF	19



8.7.5	MV metering function: M (air isolated)	20
8.8	Earthing circuit.....	20
9	General Requirements Relative to Design and Manufacture	20
9.1	General Prescriptions	20
9.2	RMU Coupling with Extension	20
9.3	Compartments.....	21
9.3.1	SF6 tank compartment.....	21
9.3.2	Cable separable connector's compartment.....	21
9.3.3	Specific requirement for fuse's compartment.....	22
9.4	Degree of Protection and Internal Fault.....	22
9.4.1	Degree of protection.....	22
9.4.2	Internal fault	22
9.5	Operating Mechanism	23
9.5.1	Position of switches and circuit breakers	23
9.5.2	Interlocking	23
9.5.3	Padlocking	24
9.6	Connections	24
9.7	Cable Insulation Test and Cable Fault Research.....	24
9.8	Circuit Breaker Function Protection Relay.....	24
9.9	Mimic Diagram.....	25
9.9.1	Voltage presence indicators lamps	25
9.9.2	SF6 pressure indicator.....	25
9.10	LV Auxiliary	25
9.11	Fault Current Indicators (option).....	26
10	Indoor MV metering panel	26
10.1	General	26
10.2	Electrical characteristics	26
10.2.1	VT and CT	27
11	Identification.....	27
12	Corrosion Resistance and Finishing	27
13	MV Fuses for Transformer Protection Function	28
14	Instructions	28
15	Packing.....	28
16	Technical Data Sheets.....	29
16.1	22 kV Ring Main Units.....	29
16.2	Indoor MV Metering Panel	39

16.3 22kV Fuse for Ring Main Unit..... 41





22 kV Ring Main Units

1 Scope

The following specification applies to compact factory built indoor metal enclosed switchboard including busbar and several functions in one SF6 enclosure with or without possibility of extension latter. The switchboard shall be suitable for mounting above cable trench and shall be installed on the 22 kV underground network of Electricité du Cambodge (EDC) with a life expectancy of 25 years.

The equipment to be supplied shall satisfy the following criteria:

- Easy to install,
- Safe and easy to operate,
- Compact and monobloc design with one SF6 enclosure including busbar and several electrical functions,
- Possibility of future extension,
- Low maintenance,
- Active parts insensible to the environment and support temporary immersion (IP 67).

2 Standards

The switchgear shall comply with the latest issues of the following standards.

IEC : International Electro-technical Commission

- IEC 62271-200 : High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltage above 1 kV and up to and including 52 kV
- IEC 62271-1 : High-voltage switchgear and controlgear – Part 1: Common specifications
- IEC 62271-103 : High voltage switches for rated voltages above 1 kV and less or equal to 52 kV
- IEC 62271-105 : High voltage alternating current switch-fuse combinations
- IEC 60255 : Electrical relays
- IEC 62271-100 : High-voltage alternating current circuit breakers
- IEC 62271-102 : High-voltage alternating current disconnectors and earthing switches
- IEC 62271-105 : Alternating current switch fuse combinations
- IEC 60282 : High Voltage Fuses
- IEC 61869-2 : Instrument transformers - Part 1: current transformers
- IEC 61869-3 : Instrument transformers - Part 2: voltage transformers
- IEC 62271-206 : High-voltage prefabricated switchgear and controlgear assemblies - Voltage presence indicating systems
- IEC 60376 : Specification and acceptance of new Sulphur Hexafluoride
- IEC 600529 : Degree of protection procured by enclosures (IP code)

EN : European Standards



EN 50180	: Bushings above 1 kV up to 52 kV and from 250 A to 3.15 kA
ISO	: International Standard Organization
ISO 2063	: Metallic coating-protection of iron and steel against corrosion
ISO/IEC 17025	: General requirements for the competence of testing and calibration laboratories
ISO 9001	: Quality management systems – Requirements

Unless if standard year is specified, the latest version of the above standards apply.

The supplier may propose alternative standards, provided it is demonstrated that they give an equivalent degree of quality as the referenced standard. Acceptability of any alternative standard is at the discretion of the EDC.

3 Definitions

The definition of the relevant IEC standards applies to this technical specification.

4 Testing and Inspection

4.1 General Notes for Test

RMU may be inspected at the manufacturer's factory by EDC's representatives.

The inspection and routine tests shall be carried out in accordance with the provisions of the relevant IEC recommendations.

The RMU shall be subjected to test as specified below.

4.2 Type Tests

All type tests required by the relevant IEC shall be carried out.

Type test reports shall be carried out by internationally recognized electrical testing laboratories.

Full copies of type test reports shall be submitted within the bid of the manufacturer/supplier. Type test reports older than 15 years will not be accepted.

If the manufacturer is certified by EDC, it is not necessary to submit type test reports for the considered equipment.

Nevertheless, in case the testing laboratory is not internationally recognized, the testing laboratory shall be mandatorily accredited ISO/IEC 17025 by an international or national accreditation body specialized in testing laboratories accreditation/acceptance. In that case, the testing laboratory shall prove mandatorily its capability/capacity to carry out all type tests mentioned in the type tests reports by supplying: Full description of all tests the laboratory can carry out, list of testing equipment with full characteristics, drawing of testing rooms with location of testing equipment, ...etc., supported by pictures and copy of the ISO/IEC 17025 accreditation certificate.

Acceptability of any accredited testing laboratory is at the discretion of the EDC.

4.3 Routine Tests

The routine tests requested by relevant IEC standards shall carried out on all equipment. Routine test reports (on the base of pass/fail table) shall be sent to EDC prior the shipment for EDC acceptance.

5 Quality Management

Design, development and production of the proposed equipment shall be ISO 9001 certified. The ISO 9001 certificate shall be submitted within the bid.

6 Ambient Conditions

The RMU shall be suitable to operate inside built or compact substation in the ambient conditions described here after:

Altitude	Sea level to 1,000 meters
Climate	Tropical
Annual Rainfall	1,300 mm.140 days
Monsoon Period	June to November
Ambient Air Temperatures:	
Average	27.5°C
Minimum	13.3°C
Maximum	40.5°C
Relative Air Humidity	65-100%
Soil Thermal Resistivity:	
Average	1.20 cm/W
Maximum	3.00 cm/W
Solar Emissivity	0.8
Solar absorption	0.8
Wind Velocity:	
Average	37 km/h (10.3 m/s)
Maximum	72 km/h (20 m/s)

7 Technical Requirements

7.1 Electrical functions

7.1.1 General

The Ring Main Unit shall of one block type including busbar and several electrical functions in one SF₆ tank. This compact switchgear block shall be extensible or not depending the future needs.

The following electrical functions shall be available:



7.1.2 Incomer switch function: S

The function of "incomer-switch" is to supply energy to the MV switchboard from the MV underground network or to supply energy to a MV underground cable from the MV switchboard busbar. A SF6 switch allows the operations of opening, closing and earthing of the circuit. These operations shall be carried out on or off load and exceptionally, the closing should be carried out on short-circuit.

Means shall be provided for the following operations:

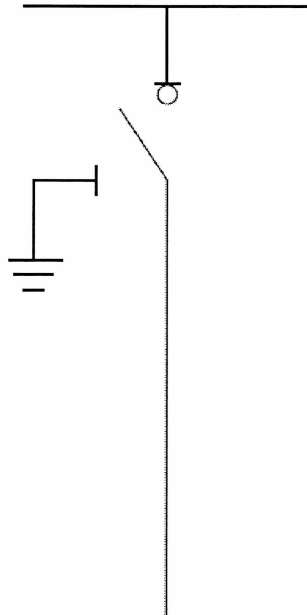
- Grounding and short-circuiting of incomer cable,
- Voltage indication of incomer cable,
- Phase comparison testing with other function,

7.1.2.1 Remote control

The S function shall be suitable to be motorized and ready to be remotely controlled by SCADA, mini SCADA, GSM and Smartphone, etc. system at installation stage or in the future.

Motors or electric actuators (if any) for remote controlled operations shall be powered with 48 V DC.

7.1.2.2 Scheme



7.1.3 Transformer protection function: P

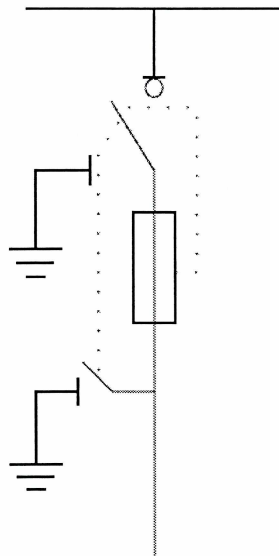
The Transformer protection function is to supply energy to a MV/LV transformer from the busbar of the RMU. A SF6 switch allows the operations of opening or closing, on or off load (exceptionally, the closing shall be carried out on short-circuit) of the transformer tap circuit. MV fuses protect the MV network against short-circuit on tap circuit. Fuse and switch shall be of combined type.

Means shall be provided for the following operations:

- Grounding and short-circuiting on each side of fuses with earthing switch,
- Voltage indication downstream the fuses,
- Opening of the switch if one fuse blows.

The access to the fuses will be possible only if the switch is opened and the earthing closed. In the earthing position the fuses will be earthed on both sides: upstream and downstream.

7.1.3.1 Scheme



7.1.4 Transformer circuit breaker function: CP

The Transformer circuit breaker function is to supply energy from the busbar of the RMU to a MV/LV transformer of 800 kVA and more. A circuit breaker allows the operations of opening or closing, on or off fault of the transformer tap circuit. The rated current of the transformer circuit breaker function is 200 Ampere.

The circuit breakers shall be low pressure SF6 interrupter type or vacuum interrupter inside SF6 tank. It shall be maintenance free.

The circuit breakers switch shall have 3 positions: open-disconnected, closed and earthed or 2 positions (open, closed) plus one earthing switch. Nevertheless, all type shall be constructed in such a way that natural interlocks prevent all unauthorised operations.

Transformer Circuit breakers operated by push bottom and a lever shall allow charging of the operating spring.

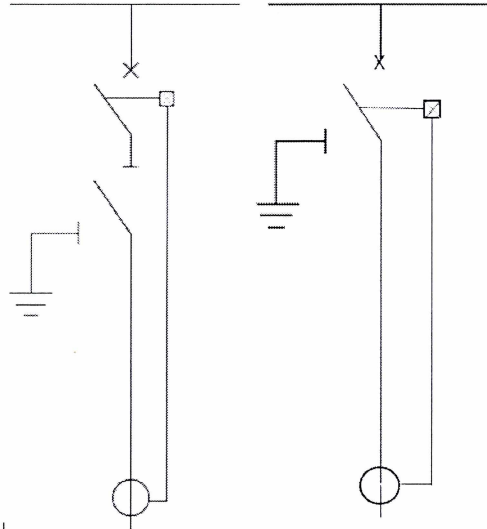
There will be no automatic reclosing.

Means shall be provided for the following operations:

- Grounding and short-circuiting of incomer cable,
- Voltage indication of incomer cable,
- Phase comparison testing with other function,



7.1.4.1 Scheme



7.1.5 Feeder circuit breaker function: CF

The Feeder circuit breaker function is to supply energy to an MV feeder or a feeder branch from the busbar of the RMU. A circuit breaker allows the operations of opening or closing, on or off fault of the MV tap circuit. The rated current of the feeder circuit breaker function is 630 Ampere. The CF function shall be supplied with necessary protection relay.

The circuit breakers shall be low pressure SF6 interrupter type or vacuum interrupter inside SF6 tank. It shall be maintenance free.

The circuit breakers switch shall have 3 positions: open-disconnected, closed and earthed or 2 positions (open, closed) plus one earthing switch. Nevertheless, all type shall be constructed in such a way that natural interlocks prevent all unauthorised operations.

Feeder circuit breaker shall be operated manually on site by push bottom and with motorized spring charging. The spring motor charging shall be powered from the LV circuit of the MV/LV substation (220V AC).

There will be no automatic reclosing.

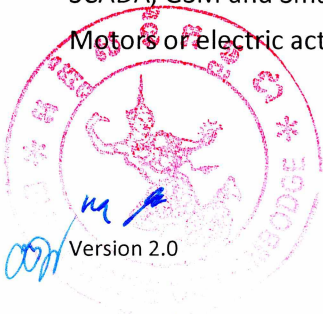
Means shall be provided for the following operations:

- Grounding and short-circuiting of incomer cable,
- Voltage indication of incomer cable
- Phase comparison testing with other function,

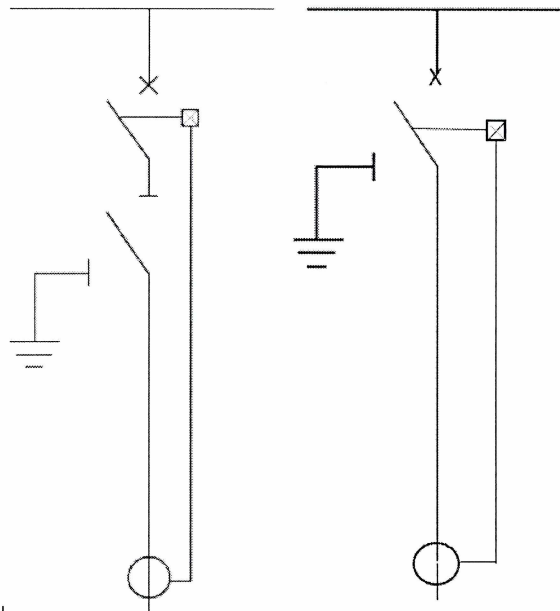
7.1.5.1 Remote control

The CF function shall be suitable to be motorized and ready to be remotely controlled by SCADA, mini SCADA, GSM and Smartphone, etc. system at installation stage or in the future.

Motors or electric actuators (if any) for remote controlled operations shall be powered with 48 V DC.



7.1.5.2 Scheme



7.1.6 MV metering function: M (air insulated)

This air insulated function shall be used for metering of big consumers. This function shall include 3 current transformers and 3 voltage transformers.

Current transformers shall be of ring or bloc type and its rated characteristics shall be following the 24kV system.

The secondary of CT and VT's are cabled to the customer terminal in an LV compartment.

Connection of equipment inside Metering function can be done with 630 A busbar, cables or other means provided all requested electrical characteristics are fulfilled. It must be possible to install the metering function on "left or right" side as well as in the "middle" of a switchboard. In case of left or right-side location it must be possible to connect the outgoing cable onto the side of the function.

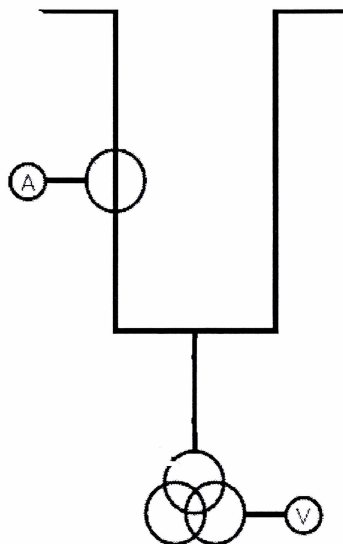
The metering function shall include LV compartment and the wiring (current and voltage) shall be done in factory. Meters shall be installed in the LV compartment that shall be sealable. A glass (or equivalent) shall be provided on the front of that compartment for meter reading.

The metering function shall be fitted with heating resistor (220V AC) in order to avoid moisture disposal on internal equipment.

Means shall be provided for the following operation: Voltage presence indication

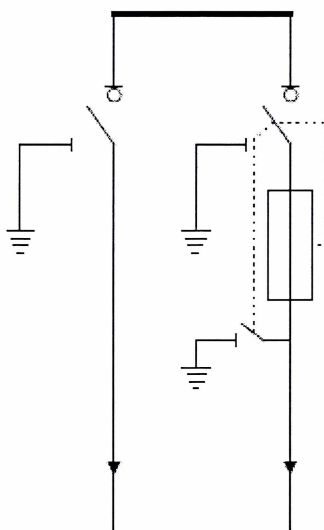
The total (all including) height of the metering function shall be less than 1.8 m and the width less than 1m.

7.1.6.1 Scheme

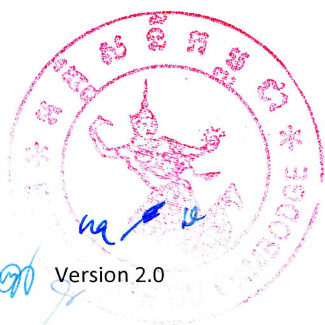


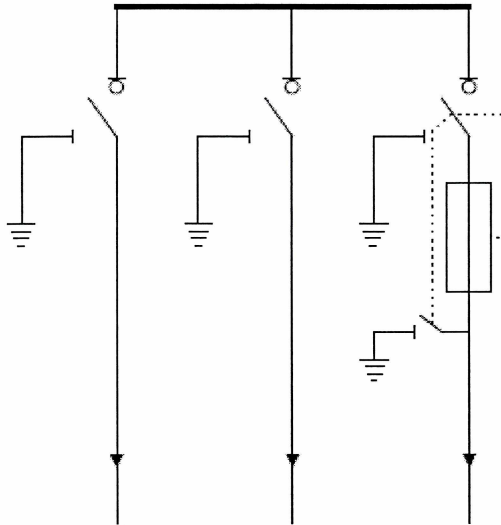
7.1.7 Assembly in one SF6 enclosure

The above functions with exception of MV metering function are combined inside only one RMU SF6 gas enclosure with different combinations up to 4 electrical functions.

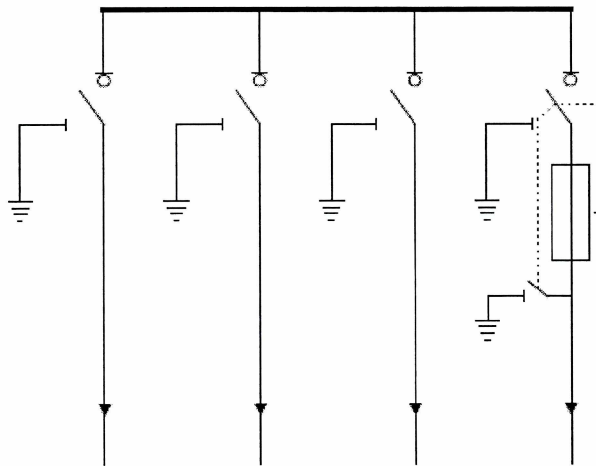


One incomer switch plus one transformer protection (SP)

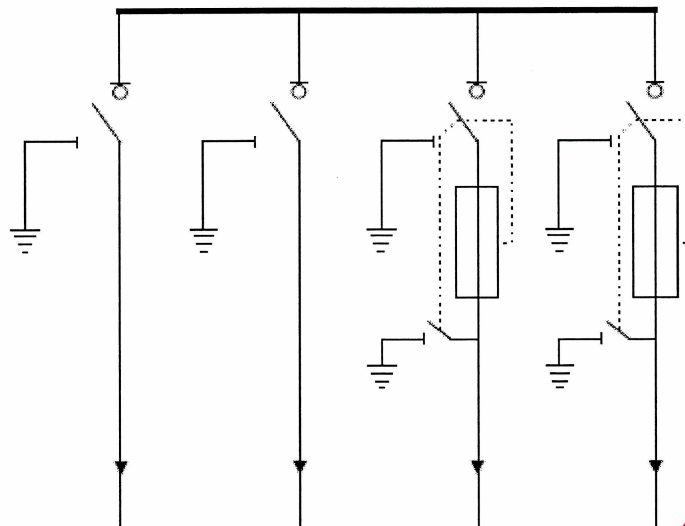




Two incomer switch functions plus one transformer protection function (SSP)



Three incomer switch functions plus transformer protection (SSSP)



Two incomer switch functions plus two transformer protection functions (SSPP)

The scheme above are only examples.

7.1.8 RMU on site extensibility

Four type of RMU shall be supplied:

- Not extensible type
- Left side extensible type
- Right side extensible type
- Both side extensible type

In all cases, extensible type means that the addition of one or more electrical function **shall be made on site** without the need of the manufacturer.

Assembling in factory before transportation is strictly forbidden.

8 Rated Characteristics

8.1 Rated Voltage

The rated voltage (U_r) of Ring Main Unit shall be: 24 kV

The service voltage shall be 22 kV.

8.2 Rated Insulation of MV Circuit

8.2.1 Rated lightning impulse withstand Voltage

In accordance with IEC recommendations, the Modular switchboard defined in this specification shall have the following rated lightning impulse withstand Voltage:

- Phase to Earth and Phase to Phase (1.2/50 μ s wave) : 125 kV peak
- Over sectioning distance (1.2/50 μ s wave) : 145 kV peak

8.2.2 Rated withstand voltage at power frequency.

- Phase to Earth and Phase to Phase (50 Hz, 1 minute) : 50 kV rms
- Over sectioning distance (50 Hz, 1 minute) : 60 kV rms

8.3 Rated Insulation of LV Auxiliary Circuits

The auxiliary circuits of the Compact RMU shall have a rated short time withstand voltage for power frequency of 2 kV rms.

8.4 Rated Frequency

The rated frequency shall be 50 Hz.

8.5 Rated Busbar Current

The rated busbar current of RMU shall be 630 A at 40°C.



8.6 Internal Arc Current Withstand

The internal arc withstands of the SF6 tank as well as the cable compartment shall be 16 kA during 1 second.

8.7 Characteristics of Each Function

8.7.1 Incomer switch function: S

Short time withstand current	16 kA rms 1 second
Rated current	630 A
Breaking capacity	
- Active load	630 A
- Cable charging	40 A
Switch and earthing switch making capacity	40 kA peak
Number CO cycles at rated current and 0.7 pf	100
Number of mechanical operations	1000
IEC 62271-103 class (switch)	M1/E3

8.7.2 Transformer protection function: P

Rated current	200 A
No-load transformer breaking capacity	16 A
Short-circuit breaking capacity	16 kA
Making capacity	40 kA peak
Number of mechanical operations	1000
IEC 62271-103 class (switch)	M1/E3

8.7.3 Transformer circuit breaker function: CP

Rated current	200 A
No-load transformer breaking capacity	16 A
Short Circuit Breaking capacity	16 kA
Making capacity	40 kA peak
Number of mechanical opening operations	2000
IEC 62271-100 class (circuit breaker)	M1/E2

8.7.4 Feeder circuit breaker function: CF

Rated current	630 A
Short Circuit Breaking capacity	16 kA
Making capacity	40 kA peak
Number of mechanical opening operations	2000
IEC 62271-100 class (circuit breaker)	M1/E2

8.7.5 MV metering function: M (air isolated)

Voltage transformer Primary Voltage Secondary Voltage Rated output and accuracy class	$22/\sqrt{3}$ kV $100/\sqrt{3}$ V 10 VA cl 0.5
Ring or Bloc (DIN) current transformer Rated voltage Rated output with class 0.5, FS 5 Insulation Class Transformation Ratio (A)	24 kV 5 VA E 100/5, 200/5, 400/5, 600/5 as required ...

8.8 Earthing circuit

The rated short time withstand current of general Earthing circuit and its connection shall be 16 kA/ 1s.

9 General Requirements Relative to Design and Manufacture

9.1 General Prescriptions

The Monobloc compact RMU and RMU extension units with exception of the MV metering function shall be a completely sealed system with a SF6 tank containing all the live parts, busbar and switching functions. The sealed SF6 tank with constant atmospheric conditions shall ensures a high level of reliability as well as personnel safety and a **maintenance-free system** when indoor installed.

The Monobloc compact RMU shall be based on at minimum, the combination of 2 electrical functions and can be configured to a maximum of 4 electrical functions in one SF6 tank with internal busbar.

The RMU extension unit shall comprise only one electrical function and busbar included in one SF6 tank. When one (or more) RMU extension unit(s) is connected to a monobloc compact RMU, the assembly shall be fully insulated with the same protective indexes than the monobloc compact RMU and the SF6 tank alone without extension.

Four type of RMU shall be available:

- Not extensible type,
- Left side extensible type,
- Right side extensible type,
- Both side extensible type,

as well as all RMU extension unit electrical function.

9.2 RMU Coupling with Extension

The extension unit shall be a simple, easy and quick operation without the need of the manufacturer. All coupling accessories as double plug in insulated busbar adapters shall be supplied attached with the extension unit.



When installed, the extension and the RMU shall be firmly fixed together with the two side in firm contact.

Assembling of extension(s) in factory before transportation is strictly forbidden. Assembling shall be done on site only when equipment is in final position.

9.3 Compartments

The monobloc Compact RMU and extension units shall be designed with three or four compartments housed in a single enclosure:

- SF6 tank compartment housing busbar, switch and earthing switch, or circuit breaker
- Cable separable connectors' compartment
- Fuse compartment only in case of transformer protection function. This fuse compartment can be distinct from or included in the SF6 tank.
- In all cases, access to the fuses shall be located from the front of the monobloc RMU or the extension unit.
- LV compartment for any LV wiring or equipment.

9.3.1 SF6 tank compartment

The SF6 enclosure shall be sealed for life with "sealed pressure system" in accordance with relevant IEC.

Leakage rate shall not be more of 0.1% during the life span that is at least 25 years. No refilling of the SF6 gas or maintenance shall be required during this period.

RMU requiring maintenance or gas refilling will not be accepted.

The SF6 tank shall be made of stainless steel, aluminium or epoxy. It shall be fitted with an over pressure relief device that will operate in case of internal arc.

All gaskets shall be made of resilient material which will not deteriorate under the action of SF6 and the tank will remain sealed for the life expectancy of the RMU.

All gaskets and sealing devices shall be able to maintain the seal for extreme operating temperatures of the RMU.

The SF6 system shall be of low-pressure type and the SF6 relative pressure inside the tank shall not exceed 0.5 bar.

Any RMU with a tank with absolute pressure over than 1.5 bars will be rejected.

The SF6 gas shall be new and conform to the requirements of IEC 60376.

9.3.1.1 Switches

The switches located inside the SF6 tank shall be of the high operating frequency type. They shall have three positions; closed, open and earthed with exception of the circuit breakers that can be three position or two position associated with earthing switch.

9.3.2 Cable separable connector's compartment

The bushings shall be fixed onto the SF6 tank or the fuse canister(s) in case of separate fuse compartment. They shall be accessible only when removing an interlocked door.

Bushings shall be of the following type as defined by the EN 50180 standard or fully equivalent standard:



Electrical functions	Type of bushing (EN 50180)
Incomer switch (S)	Type C: 630 A: 25 kA for 1 s, and 62.5 kA peak (Elbow or Tee disconnectable M16).
Transformer protection (P)	Type A: 200 A: 12.5 kA for 1 s and 31.5 kA peak (straight or elbow plug-in type)
Circuit breaker Transformer protection (CP)	Type C: 630 A: 25 kA for 1 s, and 62.5 kA peak (Elbow or Tee disconnectable M16)
Circuit breaker feeder protection (CF)	Type C: 630 A: 25 kA for 1 s, and 62.5 kA peak (Elbow or Tee disconnectable M16).

Bushings shall be accessible from the front of the monobloc compact RMU or extension unit.

The bushings of each electrical function shall be located at the **same height (horizontal)** in order to make easier a phase cable permutation. Equipment that does not meet this requirement shall not be accepted.

The cable separable connector's compartment shall be designed to accept fielded separable connector and cables up to 400 mm².

9.3.3 Specific requirement for fuse's compartment

In/on the cover of the fuse's compartment shall be **mentioned fuses choice according the transformer capacity in the form of a table**. In case there is no cover, this table shall be located on the front of ring main unit near the fuse's compartment.

9.4 Degree of Protection and Internal Fault

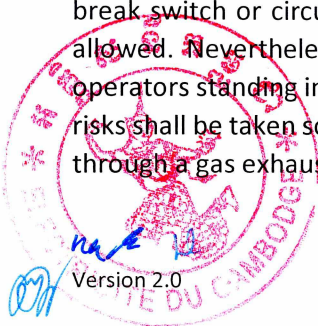
9.4.1 Degree of protection

The monobloc RMU and RMU extension units shall meet the following protection index according IEC 60529.

High voltage live parts	IP67
Front face	IP3X
Low voltage compartment	IP3X
Mechanism (switch drive compartment)	IP2XC/IP3X
Cable compartment	IP2XC/IP3X
Protection against mechanical impact	IK07

9.4.2 Internal fault

In case of load break switch or circuit breaker flashover, fuse canister flashover, non-opening of load break switch or circuit breaker or cable connection flashover, the destruction of the switchboard is allowed. Nevertheless, faults in the RMU or RMU extension unit shall be of no consequences to operators standing in front of the switchboard. All construction arrangements necessary to avoid such risks shall be taken so hot gases and pressure shall be evacuated downwards in the cable trench or through a gas exhaust channel above or behind the switchboard.



According the requirement of the IEC 62271-200, the internal arc classification of the monobloc RMU and extension units shall be: class A-FL up to 16 kA 1 second (access restricted to authorized personnel only, for front and lateral access)

9.5 Operating Mechanism

Operation of switching devices shall be carried out from the front of the switchboard without entering the switchgear compartment. The operating mechanisms shall provide all the necessary means for operating the load break switches, the circuit breaker and earthing switches.

Load break switches shall be fitted with independent manual opening and closing operating mechanism.

Transformer Circuit breakers shall be operated by push bottom and a lever shall allow charging of the operating spring.

Feeder circuit breaker shall be operated by push bottom and with motorized spring charging. They shall be suitable to be remote control operated at installation time or later. This shall be mentioned at tender stage.

Earthing switch operations shall be carried out with an anti-reflex device lever.

Earthing switches shall be fitted with independent manual closing operating mechanism. The closing operation of the two earthing switches of transformer protection cubicles shall be simultaneous by only one operation of the operator.

Opening and closing operations of all switches shall be carried out by fast-acting mechanism independent of the operator action.

For each electrical function, operations of load break switch and earthing switch shall be carried out from two separate locations on the front of the switchboard.

Each incomer switch shall be suitable for installation of an electrical operating mechanism (48 V DC motorization) with or without de-energizing the switchboard at installation time or in the future.

The switchboard shall be capable to be remote controlled at installation stage of later.

9.5.1 Position of switches and circuit breakers

The indication of load break switch, earthing switch and circuit breaker position shall be clear and sure. The position of main contacts and earthing contacts must be certain. The position indicator shall be shown by a reliable indication device directly connected to the movable contacts on shaft by means of a strong linkage that cannot be put of adjustment of forced and clearly visible from the front of switchboard. The position indicator mechanism shall be simple, robust and it shall give a true reflection of the main contacts.

9.5.2 Interlocking

Interlocking between different equipment of the cubicle shall be implemented for operation and safety reasons. This interlocking shall be done with mechanical connection or other.

The use of keys or electric locks to actuate the above-mentioned interlocking system shall not be accepted.

The following interlocking shall be provided:



- Closing operation of an earthing switch could be performed only when the load break switch or circuit breaker is in Open position.
- Closing operation of load break switch or circuit breaker could not be performed when the earthing switch is in closed position.
- Access to the fuse canister only when both side of fuses are earthed.
- Access to the cable compartment only when the switch or the circuit breaker is in earthed position.

9.5.2.1 Robustness of interlocking

The interlocking mechanism shall be sufficiently robust to withstand against possible attempt of prohibited operation.

9.5.3 Padlocking

Padlocking facilities shall be provided to lock the load break switch, the circuit breaker and the earthing switches in either open or closed position.

9.6 Connections

The ends of the cables shall be accessible from the front of the device. The type of connection shall be separable connectors for dry-type cables.

The separable connectors shall be as per EN 50181 standard requirement.

As defined in 9.3.2 the separable connectors shall be of Type A or C depending the electrical function.

The cable compartment shall be suitable to accommodate straight, elbow and tee separable connectors according the way and method of connection.

Tee separable connectors are preferred for S, CP and CF functions.

Separable connectors are not included in the supply.

9.7 Cable Insulation Test and Cable Fault Research

In order to test cable insulation or look for cable faults, it shall be possible to inject a direct voltage in the connected cables directly from the Electrical function with or without opening the cable compartment.

In case of connection directly onto the RMU, one set of necessary connecting devices such as connection fingers or special connectors shall be supplied with the mono-bloc compact RMU.

9.8 Circuit Breaker Function Protection Relay

The circuit breakers functions shall be associated with a micro-processor type (numerical Relay for setting and display) for protection unit. Setting and Electrical data (event logs, records, etc.) shall be displayed on a screen.

The protection relay shall be self-powered or powered from the substation LV circuit but in all cases, the relay shall mandatorily include **internal power supply** in order to set, read events, display type of fault, etc... in case of power shut down.

Auxiliary power supply (external battery, USB from PC, etc.) used for setting, reading event, display, etc... in case of power shut down are not accepted.



The current sensors or current transformers shall be mounted on the bushings or on the MV cables inside the cable compartment.

The minimum activation current of the relay shall be adjustable from 20 to 200 Amperes for transformer protection and 50 to 500 A for feeder protection.

Each relay shall have following features:

- 50/51 : maximum current function
- 50N/51N : maximum earth current function
- Thermal overload protection from thermometer contact installed on the transformer
- Display with indication of flow load current, maximum load current
- Display of maximum fault current
- Event recording for maximum load current, fault current, as a minimum
- Feature to neutralize the inrush current of power transformer
- Trip indication, with origin and type of the fault
- USB data download (with software provided if necessary)

The protection system shall be installed, wired, tested at factory.

The relay for CF function shall be capable to transmit information and data to the remote control system at installation.

9.9 Mimic Diagram

The front of the switchboard shall include a mimic diagram. Opening and closing positions of each switch (Load break switch, earthing switch) or circuit breaker shall be automatically indicated in the mimic diagram.

The levers operating directions shall be clearly indicated.

9.9.1 Voltage presence indicators lamps

The front face of each electrical function shall include a presence of cable voltage indicator lamp for each phase. This voltage presence indicating system shall be compliant with IEC 62271-206 standard.

This voltage indicator shall also allow the phase comparison with 3 inlets with other electrical function. The device for phase comparison with is not included in the scope of supply.

9.9.2 SF6 pressure indicator

The front of the switch board shall include a SF6 gas pressure indicator. It shall clearly indicate by two colour the pressure of the gas inside the SF6 tank:

- Green: correct pressure
- Red: Low pressure. Switching operations forbidden.

9.10 LV Auxiliary

Auxiliary equipment shall satisfy the relevant section of IEC 62271 recommendations.

The LV cables shall be of the flame-retardant type with a 600/1 000 V insulation level. They shall be marked at each end for easy verification during maintenance or servicing work. The cable cross sections shall not be less than 2.5 mm² for circuits carrying high currents, or 1 mm² for other circuits.

Circuit breaker functions shall be supplied with all necessary CTs, protection relay and tripping coil.

9.11 Fault Current Indicators (option)

It shall be possible to fit the Incomer cable switch functions with a fault current indicator for 22 kV networks with resistive neutral and a phase/earth fault current limited to 800 A.

The fault current indicators shall be powered through AC 230 V and internal batteries for indication. The lifespan of the battery, shall be of at least 8 years.

Fault indicators can be installed at factory or later on site.

For site installation, the current sensors or current transformers shall be designed for cable installation without the need to disconnect the cable separable connector. They shall be located inside the cable compartment.

Fault indicator shall be capable to detect:

- Phase/phase and phase/earth faults.

The setting of the equipment shall be easily done on site without the need of a PC or a special tool.

Means and waterproof outdoor led light shall be provided for fault current passage indication. This light shall be located outdoor on the front of the substation.

10 Indoor MV metering panel

10.1 General

This indoor metering panel shall be used alone without RMU direct connection inside a substation for customer metering.

Input and output shall be connected by MV cables using cable terminations.

This panel shall include 3 current transformers and 3 voltage transformers.

Current transformers shall be of ring or bloc type and its rated characteristics shall be following the 24kV system.

The secondary of CT and VT's are cabled to the customer meters in a LV compartment.

Connection of equipment inside Metering function can be done with 630 A busbar, cables or other means provided all requested electrical characteristics are fulfilled.

The metering panel shall include LV compartment and the wiring (current and voltage) shall be done in factory. Meters shall be installed in the LV compartment that shall be sealable. A glass (or equivalent) shall be provided on the front of that compartment for meter reading.

The metering panel shall be fitted with heating resistor (220V AC) in order to avoid moisture disposal on internal equipment.

Means shall be provided for the following operation: Voltage presence indication.

The total (all including) height of the metering panel shall be less than 1.8 m and the width less than 1m.

10.2 Electrical characteristics

The panel shall include 3 compartments:

- Cable compartment: suitable to receive incoming and outgoing cable terminations,
- "busbar" compartment that includes busbar, VT and CT

- LV compartment that includes LV wiring and meters

10.2.1 VT and CT

Voltage transformer Primary Voltage Secondary Voltage Rated output and accuracy class	22/ $\sqrt{3}$ kV 100/ $\sqrt{3}$ V 10 VA cl 0.5
Ring or Bloc (DIN) current transformer Rated voltage Rated output with class 0.5, FS 5 Insulation Class Transformation Ratio (A)	24 kV 5 VA E 100/5, 200/5, 400/5, 600/5 as required ...

11 Identification

Each Monobloc compact RMU, RMU extension unit and MV metering panel shall be fitted with an easily readable nameplate of weatherproof material giving the following details in English language:

- Type of cubicle
- Manufacturer's name
- Manufacturer's serial number
- Year of manufacture
- Standard
- Rated frequency
- Rated voltage
- Rated continuous current
- Rated symmetrical interrupting current
- Rated symmetrical making current
- Rated power frequency withstands voltage
- Rated impulse withstand voltage
- SF6 weight
- Net weight

12 Corrosion Resistance and Finishing

RMU and metering panels shall be fully designed for use in hot and humid atmosphere. All metallic parts shall be carefully protected against corrosion.

Salt spray test duration with defined criteria shall be at least 400 hours under test condition of ISO 9227 standard.

Corrosion criteria: appearance of red rust corrosion on main frame surface less than the Ri2 value according to ISO 4628.

The colour of front shall correspond to the RAL colour range.

13 MV Fuses for Transformer Protection Function

MV fuses shall be HRC type meeting with DIN 43625 Standard and shall comply IEC 60282.1 and IEC 62271-105 standard.

Recommended Fuse choice table according transformer ratings:

Rated voltage	Operating voltage	Transformer rating (kVA)				
		100	160	250	400	630
24 kV	22 kV	10 A	10 A	16 A	25 A	40 A

Nevertheless, fuses rating shall be chosen according the fuses choice table mentioned inside the cover of the fuses compartment by the manufacturer.

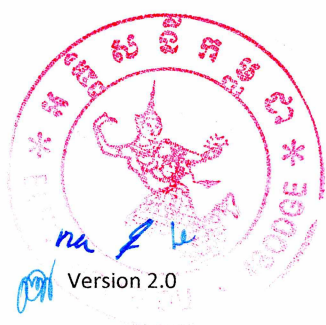
Transformers of 800 kVA and more shall be protected by circuit breaker.

14 Instructions

One installation and operating instruction book shall be delivered with each monobloc compact RMU, extension unit and metering panel. The manufacturer shall provide an installation drawing to serve as guide for the civil works.

15 Packing

RMU and metering panels shall be delivered in suitably protected wooden case pallet.



- LV compartment that includes LV wiring and meters

10.2.1 VT and CT

Voltage transformer Primary Voltage Secondary Voltage Rated output and accuracy class	$22/\sqrt{3}$ kV $100/\sqrt{3}$ V 10 VA cl 0.5
Ring or Bloc (DIN) current transformer Rated voltage Rated output with class 0.5, FS 5 Insulation Class Transformation Ratio (A)	24 kV 5 VA E 100/5, 200/5, 400/5, 600/5 as required ...

11 Identification

Each Monobloc compact RMU, RMU extension unit and MV metering panel shall be fitted with an easily readable nameplate of weatherproof material giving the following details in English language:

- Type of cubicle
- Manufacturer's name
- Manufacturer's serial number
- Year of manufacture
- Standard
- Rated frequency
- Rated voltage
- Rated continuous current
- Rated symmetrical interrupting current
- Rated symmetrical making current
- Rated power frequency withstands voltage
- Rated impulse withstand voltage
- SF6 weight
- Net weight

12 Corrosion Resistance and Finishing

RMU and metering panels shall be fully designed for use in hot and humid atmosphere. All metallic parts shall be carefully protected against corrosion.

Salt spray test duration with defined criteria shall be at least 400 hours under test condition of ISO 9227 standard.



Corrosion criteria: appearance of red rust corrosion on main frame surface less than the Ri2 value according to ISO 4628.

The colour of front shall correspond to the RAL colour range.

13 MV Fuses for Transformer Protection Function

MV fuses shall be HRC type meeting with DIN 43625 Standard and shall comply IEC 60282.1 and IEC 62271-105 standard.

Recommended Fuse choice table according transformer ratings:

Rated voltage	Operating voltage	Transformer rating (kVA)				
		100	160	250	400	630
24 kV	22 kV	10 A	10 A	16 A	25 A	40 A

Nevertheless, fuses rating shall be chosen according the fuses choice table mentioned inside the cover of the fuses compartment by the manufacturer.

Transformers of 800 kVA and more shall be protected by circuit breaker.

14 Instructions

One installation and operating instruction book shall be delivered with each monobloc compact RMU, extension unit and metering panel. The manufacturer shall provide an installation drawing to serve as guide for the civil works.

15 Packing

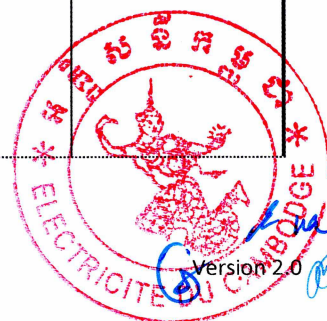
RMU and metering panels shall be delivered in suitably protected wooden case pallet.



16 Technical Data Sheets

16.1 22 kV Ring Main Units

No.	Descriptions	Unit	Requirement	Supplier's Offer
	22 kV Ring Main Units			
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference (s)		to be specified	
4	Standard		IEC 62271	
5	Type test reports as per standard		To be provided	
6	ISO 9001 for design, development and production		Yes. Certificate to be provided	
I. General				
1	Factory built indoor metal enclosed switchboard including busbar and several functions in one SF6 enclosure with or without possibility of extension latter		Yes	
2	25 years life expectancy		Yes	
3	Ambient conditions as per §6		Yes	
4	RMU can include from 2 up to 4 electrical function in one SF6 tank		Yes	
5	Manufacturer Available functions: <ul style="list-style-type: none"> Incomer switch: S Transformer Protection: P Transformer circuit breaker: CP Feeder circuit breaker: CF MV metering: M (air insulated) 		Yes Yes Yes Yes Yes	
6	RMU extension availability: <ul style="list-style-type: none"> Not extensible type Left side extensible type Right side extensible type Both side extensible type 		Yes Yes Yes Yes	
7	RMU extension unit available: <ul style="list-style-type: none"> Incomer switch: S Transformer Protection: P Transformer circuit breaker: CP 		Yes Yes Yes	

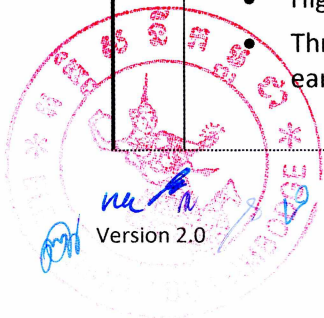


	<ul style="list-style-type: none"> Feeder circuit breaker: CF MV metering: M (air insulated) 		Yes	
			Yes	
8	RMU extension on site without need of the manufacturer and SF6 gas (re)filling		Yes	
9	RMU suitable to be installed indoor on trench.		Yes	
II. Technical Requirements				
1	Rated voltage	kV	24	
2	Operating voltage	kV	22	
3	Rated insulation Voltage (1.2/50 μ s wave) <ul style="list-style-type: none"> Phase to Earth and Phase to Phase Over sectioning distance 	kV peak kV peak	125 145	
4	Rated withstand voltage at power frequency (50 Hz, 1 minute) <ul style="list-style-type: none"> Phase to Earth and Phase to Phase Over sectioning distance 	kV rms kV rms	50 60	
5	Rated insulation of LV auxiliary circuits <ul style="list-style-type: none"> lightning impulse withstand Voltage rated short time withstand voltage 	kV peak kV rms	5 2	
6	Rated frequency	Hz	50	
7	Rated busbar rated current at 40°C.	A	630	
8	SF6 tank internal arc withstand 1 second	kA	16	
9	Earthing circuit Rated short time withstand current	kA/1s.	16	
10	- Incomer switch function: S <ul style="list-style-type: none"> Short time withstand current (1s) Rated current Active load Breaking capacity Cable charging Breaking capacity Switch and earthing switch making capacity CO cycles at rated current and 0.7 p.f. Number of mechanical operations IEC 62271-103 class (switch) Transformer protection function: P <ul style="list-style-type: none"> Rated current 	kA rms A A A kA peak A	16 630 630 40 40 100 1000 M1/E3 200	

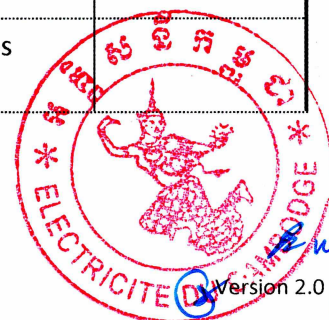
<ul style="list-style-type: none"> Rated breaking current No-load transformer breaking capacity Short-circuit breaking capacity Making capacity Number of mechanical operations IEC 62271-103 class (switch) 	A A kA kA peak 	200 16 16 40 1000 M1/E3	
- Transformer circuit breaker function: CP			
<ul style="list-style-type: none"> Rated current No-load transformer breaking capacity Short Circuit Breaking capacity Making capacity Number of mechanical opening operations IEC 62271-100 class (circuit breaker) 	A A kA kA peak CO	200 16 16 40 2000 M1/E2	
- Feeder circuit breaker function: CF			
<ul style="list-style-type: none"> Rated current Short Circuit Breaking capacity Making capacity Number of mechanical opening operations IEC 62271-100 class (circuit breaker) Interrupter type (Vacuum or SF6) 	A kA kA peak CO	630 16 40 2000 M1/E2 To be specified	
- MV metering function: M (air isolated)			
a. Voltage transformer			
<ul style="list-style-type: none"> Primary Voltage Secondary Voltage N°1 Rated output and accuracy class 	kV V	22/ $\sqrt{3}$ 100/ $\sqrt{3}$ 10 VA cl 0.5	
b. Current transformer			
<ul style="list-style-type: none"> Design type Rated voltage Rated output with class 0.5, FS 5 Transformation Ratio 	 kV VA A	To be specified 24 5 100/5, 200/5, 400/5, 630/5, <input type="checkbox"/> other to be specified	
<ul style="list-style-type: none"> Thermal withstands current Continuous operation 		120%	



	<ul style="list-style-type: none"> – Short time withstand 1 min • Insulation Class 		150% E	
11	Number of RMU compartments <ul style="list-style-type: none"> • SF6 tank compartment • Separable connectors compartment • LV compartment • MV fuses (P function) compartment • MV fuses (P function) inside SF6 tank compartment 		to be specified 3 or 4 Yes Yes Yes/No Yes/No	
12	SF6 tank compartment			
a.	sealed pressure system		Yes	
b.	Fully sealed for life SF6 tank with leakage less than 0.1% during lifespan		Yes	
c.	No gas refilling during life span		Yes	
d.	One tank of compact RMU includes several functions		Yes	
e.	The tank of RMU extension includes one function (S, P, CP and CF)		Yes	
f.	The tank includes all live parts (busbar, switch, CB, ...)		Yes	
g.	Material of the tank envelop		To be specified	
h.	Tank fitted with over pressure relief device that will operate in case of internal arc		Yes	
i.	All gaskets made of resilient material which will not deteriorate under the action of SF6		Yes	
j.	The tank will remain sealed for the life expectancy of the RMU.		Yes	
k.	Gaskets and sealing devices able to maintain the seal for extreme operating temperatures		Yes	
l.	SF6 relative pressure inside the tank	bar	≤ 0.5	
m.	New SF6 gas conforms to the IEC 60376. With certificate provided		Yes	
13	Switches <ul style="list-style-type: none"> • High operating frequency type • Three positions; closed, open and earthed S, P 		Yes Yes	

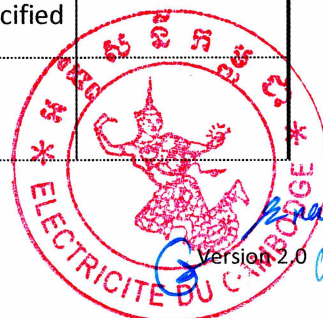


	<ul style="list-style-type: none"> Three position CP, CF Two position plus earthing CP, CF 		Mandatory <input type="checkbox"/> <input type="checkbox"/>	
14	Cable separable connector's compartment <ul style="list-style-type: none"> Bushings fixed onto the SF6 tank for S, CP, CF functions Bushings fixed onto the SF6 tank or the fuse canister for P function Bushings accessible only when removing the door of the cable compartment. Compartment designed to accept fielded separable connectors and cables up to 400 mm² 	mm ²	Yes Yes Yes to be specified	
	<ul style="list-style-type: none"> Bushings conform to EN 50180 Type A (200 A) for P functions (for straight or elbow plug in separable connectors) Type C (630) for S, CP and CF functions (for elbow or Tee M16 separable connectors) Bushings accessible from the front of the monobloc compact RMU or extension unit Bushings located at the same height (horizontal) in order to make easy a phase cable permutation. 		Yes Yes Yes Yes Yes	
15	Degree of protection <ul style="list-style-type: none"> High voltage live parts Front face Low voltage compartment Mechanism Cable compartment Protection against mechanical impact 		IP67 IP3X IP3X IP2XC/IP3X IP2XC/IP3X IK07	
16	Internal arc fault classification IEC 62271-200		class A-FL up to 16 kA 1 second	
17	Operation of switching devices carried out from the front of the switchboard		Yes	



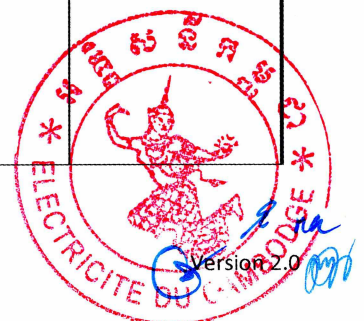
18	Load break switches fitted with independent manual opening and closing operating mechanism.		Yes	
19	Transformer Circuit breakers operated by push bottom and a lever shall allow charging of the operating spring.		Yes	
20	Feeder circuit breaker shall be operated by push bottom and with motorized spring charging (220V AC).		Yes	
21	Earthing switch operations carried out with an anti-reflex device lever and independent manual closing operating mechanism		Yes	
22	the two earthing switches of P function cubicles shall be simultaneous by only one operation		Yes	
23	Opening and closing operations of all switches carried out by fast-acting mechanism independent of the operator action		Yes	
24	operations of load break switch and earthing switch carried out from two separate locations on the front of the switchboard		Yes	
25	The RMU (S and CF function) is suitable to be Remote controlled (48V DC Motorization) at installation or later stage.		Yes	
26	Indication of load break switch, earthing switch and circuit breaker position shall be clear and sure and clearly visible from the front of switchboard		Yes	
27	The position indicator mechanism shall be simple, robust and it shall give a true reflection of the main contacts.		Yes	
28	Interlocking <ul style="list-style-type: none"> Closing operation of an earthing switch can be performed only when the load break switch or circuit breaker is in Open position. Closing operation of load break switch or circuit breaker cannot be performed when the earthing switch is in closed position 		Yes Yes	

	<ul style="list-style-type: none"> Access to the fuse canister only when both side of fuses are earthed Access to the cable compartment only when the switch or the circuit breaker is in earthed position. 		Yes	
			Yes	
29	Padlocking facilities shall be provided to lock the load break switch, the circuit breaker and the earthing switches in either open or closed position		Yes	
30	Cable insulation test and cable fault research <ul style="list-style-type: none"> It is possible to inject a direct voltage in the connected cables directly from the Electrical function with or without opening the cable compartment In case of connection directly onto the RMU, one set of necessary connecting devices such as connection fingers or special connectors shall be supplied with the mono-bloc compact RMU. 		Yes	
			Yes	
31	Circuit breaker function protection relay <ul style="list-style-type: none"> Numerical (setting and display) micro-processor type protection unit. The protection relay is self-powered or powered from the substation LV circuit but in both cases, the relay includes internal power supply in order to set, read events, display type of fault, etc... in case of power shut down The current sensors or CT are mounted on the bushings or MV cables CT ratio (if any CT) Setting and Electrical data are available on front face of relay by a digital display. Type of relay 		Yes	
			To be specified	
			Yes	
			To be specified	
			To be specified	
			Yes	
			To be specified	
32	The minimum activation current of the relay shall be adjustable from Amperes for:			



	- transformer protection	A	20 to 200	
	- feeder protection.	A	50 to 500	
	Each relay shall have following features:			
	<ul style="list-style-type: none"> • 50, 51 : maximum current function 		Yes	
	<ul style="list-style-type: none"> • 50N, 51N : maximum earth current function 		Yes	
	<ul style="list-style-type: none"> • Thermal overload protection from thermometer contact installed on the transformer 		Yes	
	<ul style="list-style-type: none"> • Display with indication of flow load current, maximum load current 		Yes	
	<ul style="list-style-type: none"> • Display of maximum fault current 		Yes	
	<ul style="list-style-type: none"> • Event recording for maximum load current, fault current, as a minimum 		Yes	
	<ul style="list-style-type: none"> • Feature to neutralize the inrush current of power transformer 		Yes	
	<ul style="list-style-type: none"> • Trip indication, with origin and type of the fault 		Yes	
	<ul style="list-style-type: none"> • USB data download (with software provided if necessary) 		Yes	
33	The protection system is installed, wired, tested at factory and is capable to transmit information to the remote control system		Yes	
34	Mimic diagram <ul style="list-style-type: none"> • The front of the switchboard includes a mimic diagram. • Opening and closing positions of each switch (Load break switch, earthing switch) or circuit breaker is automatically indicated on the mimic diagram. • The lever operating directions is clearly indicated. 		Yes Yes Yes	
35	The front face of each electrical function includes a presence of cable voltage indicator lamp for each phase compliant with EIC 622711-206		Yes	
36	The voltage indicator allows the phase comparison with 3 inlets		Yes	
37	Fault current passage indicators: (option) <ul style="list-style-type: none"> • It shall be possible to fit the Incomer cable switch functions with a fault 		<input type="checkbox"/>	

	<p>current indicator for 22 kV networks with resistive neutral and a phase/earth fault current limited to 800 A.</p> <ul style="list-style-type: none"> The fault current indicators shall be powered through AC 230 V and internal batteries for indication. The lifespan of the battery, shall be of at least 8 years. Fault indicators can be installed at factory or later on site. For site installation, the current sensors or current transformers shall be designed for cable installation without the need to disconnect the cable separable connector. They shall be located inside the cable compartment. Fault indicator shall be capable to detect: phase/phase and phase/earth faults. The setting of the equipment shall be easily done on site without the need of a PC or a special tool. Means and waterproof outdoor led light shall be provided for fault current passage indication. This light shall be located outdoor on the front of the substation. 		<p>Yes</p> <p>To be specified</p> <p>To be specified</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	
38	<p>Identification</p> <p>-Each RMU or extension is identified with easily readable nameplate of weatherproof material with the following information:</p> <ul style="list-style-type: none"> -Type of cubicle -Manufacturer's name -Manufacturer's serial number -Year of manufacture -Standard -Rated voltage -Rated continuous current -Rated symmetrical interrupting current -Rated symmetrical making current -Rated power frequency withstands voltage -Rated impulse withstand voltage -SF6 weight -Gross weight 		<p>Yes</p>	



39	Corrosion resistance and finishing as per §11		Yes	
40	One installation and operating instruction book is delivered with each monobloc compact RMU and extension unit. The manufacturer provides an installation drawing to serve as guide for the civil works.		Yes	
40b	Fuse selection table to be provided at tender stage		Yes	
41	RMU, are delivered suitably protected in wooden case pallet.		Yes	
42	Dimensions -SS RMU -SPS RMU -SSPS RMU -SSPP RMU -S extension unit -P extension unit -CP extension unit -CF extension unit -M extension unit (max L:1m, Max H: 1.80m)	mm	H x L x W H x L x W H x L x W H x L x W H x L x W H x L x W H x L x W H x L x W H x L x W	
43	Weight -SS RMU -SPS RMU -SSPS RMU -SSPP RMU -S extension unit -P extension unit -CP extension unit -CF extension unit -M extension unit	kg	To be specified	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", etc..." are not accepted.

Deviation from the technical specification:

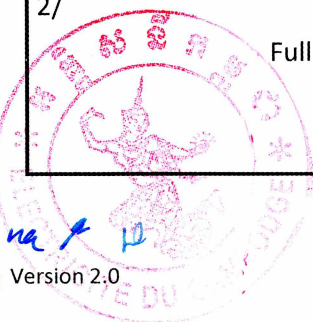
The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/

2/

Full technical information shall be supplied within the bid.

Bidder signature:



16.2 Indoor MV Metering Panel

No.	Descriptions	Unit	Requirement	Supplier's Offer
	<i>Indoor MV metering panel</i>			
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference (s)		to be specified	
4	Standard		IEC 62271	
5	Type test reports as per standard		To be provided	
6	ISO 9001 for design, development and production		Yes. Certificate to be provided	
7	Factory built indoor metal enclosed panel		Yes	
8	25 years life expectancy		Yes	
9	Ambient conditions as per §6		Yes	
10	Short time withstand current (1s)	kA	16	
11	Installed alone without RMU inside a substation for customer metering.		Yes	
11.a	Connection by simplified terminations for incoming and outgoing		Yes	
12	Includes 3 current transformers and 3 voltage transformers.		Yes	
13	Current transformers are of: ring type bloc type		To be mentioned	
14	The secondary of CT and VT's are cabled to the customer meters in a LV compartment.		Yes	
15	Connection of equipment inside Metering function can be done with 630 A busbar, cables or other means provided all requested electrical characteristics are fulfilled.		To be mentioned	
16	The metering panel shall include LV compartment and the wiring (current and voltage) shall be done in factory.		Yes	
17	Meters shall be installed in the LV compartment that shall be sealable.		Yes	



18	A transparent window (or equivalent) shall be provided on the front of that compartment for easy meter reading		Mandatory	
19	The metering panel shall be fitted with heating resistor (220V AC) in order to avoid moisture deposal on internal equipment		Mandatory	
20	Voltage presence indication on the front face of the panel		Mandatory	
21	The total (all including) height of the metering panel shall be less than 1.8 m and the width less than 1m.		Mandatory	
21.a	Dimensions		HxLxW	
7	Voltage transformer <ul style="list-style-type: none"> • Primary Voltage • Secondary Voltage • Rated output and accuracy class 	kV V	$22/\sqrt{3}$ $100/\sqrt{3}$ 10 VA cl 0.5	
8	Ring or Bloc (DIN) current transformer <ul style="list-style-type: none"> • Rated voltage • Rated output with class 0.5, FS 5 • Insulation Class • Transformation Ratio (A) 	kV VA	24 5 E To be mentioned	
9	Weight	kg	To be mentioned	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, " $\sqrt{}$ ", etc..." are not accepted.

Deviation from the technical specification:

The bidder shall list point after point and explain here in after all deviation from the requested technical specification.

1/
2/

Full technical information shall be supplied within the bid.

Bidder signature:



16.3 22kV Fuse for Ring Main Unit

No.	Description	Unit	Requirement	Supplier's Offer
	22 kV Fuse for Ring Main Unit			
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference (s)		to be specified	
4	Standard		DIN 43625 IEC 60282.1 IEC 62271-105	
5	Type test reports as per standard		To be provided	
6	ISO 9001 for design, development and production		Yes. Certificate to be provided	
7	HRC Type		Yes	
8	Rated voltage	kV	24	
9	Operating Voltage	kV	22	
10	Available in 10, 16, 25, 40, 50 Amp		Yes	
11	Body material		To be mentioned	
12	Maximum diameter	mm	To be mentioned	
13	Contact diameter	mm	To be mentioned	
14	Length	mm	To be mentioned	
Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, √, etc..." are not accepted.				
<p>Deviation from the technical specification:</p> <p>The bidder shall list point after point and explain here in after all deviation from the requested technical specification.</p> <p>1/ 2/ 3/ x/</p> <p>Full technical information shall be supplied within the bid.</p> <p>Bidder signature:</p>				

