

# OIL AND GAS PROJECT

## MCset Technical Specification

### Medium Voltage Switchgear



**INDEX**

- 1. DESCRIPTION OF MCSET TYPE WITHDRAWABLE METALCLAD SWITCHGEAR ..... 3
- 2. APPLICABLE STANDARDS..... 3
- 3. CHARACTERISTICS ACCORDING TO IEC STANDARDS..... 4
- 4. AUXILIARY VOLTAGES ..... 5
- 5. GENERAL DESCRIPTION OF THE MCSET RANGE ..... 5
- 6. ANTI CORROSION PROTECTION AND FINISHING..... 9
- 7. LIST OF SUPPLIERS ..... 10
- 8. SWITCHBOARD ACCESORRIES ..... 10
- 9. SPECIAL APPLICATIONS..... 11
- 10. TECHNICAL COMPLEMENT OF INFORMATION..... 11
- 11. REFERENCE DOCUMENTS ..... 13
- 12. DEVIATIONS AND COMMENTS..... 13
- 13. DOCUMENTATION..... 14
- 14. ROUTINE FACTORY ACCEPTANCE TESTS ..... 14
- 15. QUALITY & ENVIRONMENT SYSTEM CERTIFICATES ..... 15

## 1 DESCRIPTION OF MCSET TYPE WITHDRAWABLE METALCLAD SWITCHGEAR

This specification is for the supply of Mcset equipment for indoor installation. Mcset is a range of functional units each made up of :

- a prefabricated air insulated panel in a metal enclosure of the Metalclad type,
- a breaking equipment either withdrawable circuit-breaker or contactor using SF6 as the breaking medium
- a protection and control system including a Sepam protection and control unit, current and voltage transformers, and auxiliaries.

Mcset offers a number of significant advantages, in order to reply efficiently to even the most stringent of requirements:

- all commissioning and operations can be carried out from the front of each functional unit, allowing them to be installed directly against a wall , no rear access corridors are therefore required
- all operations are carried out with the envelope closed (i.e.CB extraction with door closed)
- protection of the operator against the exhausting of hot gases (standard version) with metal flaps on the top of the panel for exhausting hot gases, or full and certified internal arc protection 3 sides (AFL) or 4 sides (AFLR) according to all 5 criteria defined in the IEC 62271- 200 standard
- simplification of development and increased reliability through the use of functional units, made up of elements manufactured by Schneider Electric which are designed to function together
- very low maintenance costs, and service continuity reinforced by the internal watchdogs in each functional unit
- simple and safe operation through the use of coloured mimic diagrams and a comprehensive range of internal security functions and interlocks.

## 2 APPLICABLE STANDARDS

The equipment proposed in this offer has been designed, manufactured, and tested according to the relevant IEC recommendations:

- |  |                       |
|--|-----------------------|
| ■ Common clause for high voltage switchboard     | IEC 62271-1 (60694)   |
| ■ High voltage switchgear in metallic enclosures | IEC 62271-200 (60298) |
| ■ High voltage AC circuit breakers               | IEC 62271-100 (60056) |
| ■ High voltage AC contactors                     | IEC 60470             |
| ■ Switch and earthing switch to CA               | IEC 62271-102 (60129) |
| ■ Protection index envelopes (IP)                | IEC 60529             |
| ■ High voltage switches                          | IEC 60265-1           |
| ■ High voltage fuses                             | IEC 60282-2           |
| ■ VPIS for voltage present indicator             | IEC 60598             |
| ■ Current transformers                           | IEC 61869-2 (60044-1) |
| ■ Electronic current transformer (for LCPT)      | IEC 61869-9 (60044-8) |
| ■ Voltage transformers                           | IEC 61869-3 (60044-2) |
| ■ Measurement and protection relays              | IEC 60255             |
| ■ Control-monitoring                             | IEC 60801             |

### 3 CHARACTERISTICS ACCORDING TO IEC STANDARDS

#### 3.1 Normal service conditions

<b>Temperature</b>	
- min	- 5°C
- max	+40°C (*)
- average over 24 hrs	+35°C
<b>Altitude</b>	Below or up to 1000 m (**)
<b>Humidity</b>	
- over 24 hrs	Less than or equal to 95 %
- over 1 month	Less than or equal to 90 %

(\*) Above 40°C a derating will be applied

(\*\*) As a general rule, we have to derate by 1,25% U peak every 100 meters above 1000 meters

#### 3.2 Electrical characteristics

Service voltage	kV	6,3
Rated voltage	kV	7,2
Rated insulation level (1mn)	kV rms	20
Peak withstand voltage (1.2/50µs) (*)	kV peak	60
Frequency	Hz	50
Short time withstand current for:		
- Switchboard	kA / s.	50/1
- Current transformer (**)	kA / s.	50/1
Peak withstand current	kA peak	125

(\*) Contactor R400/R400D is limited to 60kV peak for 12kV rated voltage

(\*\*) CT's for contactor are limited to 120\*In 1s.and max.16kA/1s. (CT's protected by M.V.fuses)

#### 3.3 Protection degree

Enclosure	IP3X
Between Compartments	IP2XC

#### 3.4 Internal arc protection

Internal arc version	AFLR (4 sides, free standing)
Performance	50kA/1s
Top internal arc tunnel	With external exhaust *
Internal arcing detector	Electromechanical Detector

(\*) Exhaust pipe provision and installation is not in SET scope.

### 3.5 Earthing system :

Our proposal applies to an earthing system of the type:

- unearthed network
- resistance earthed network
- network earthed by adjusted reactance
- a directly earthed network

## 4 AUXILIARY VOLTAGES

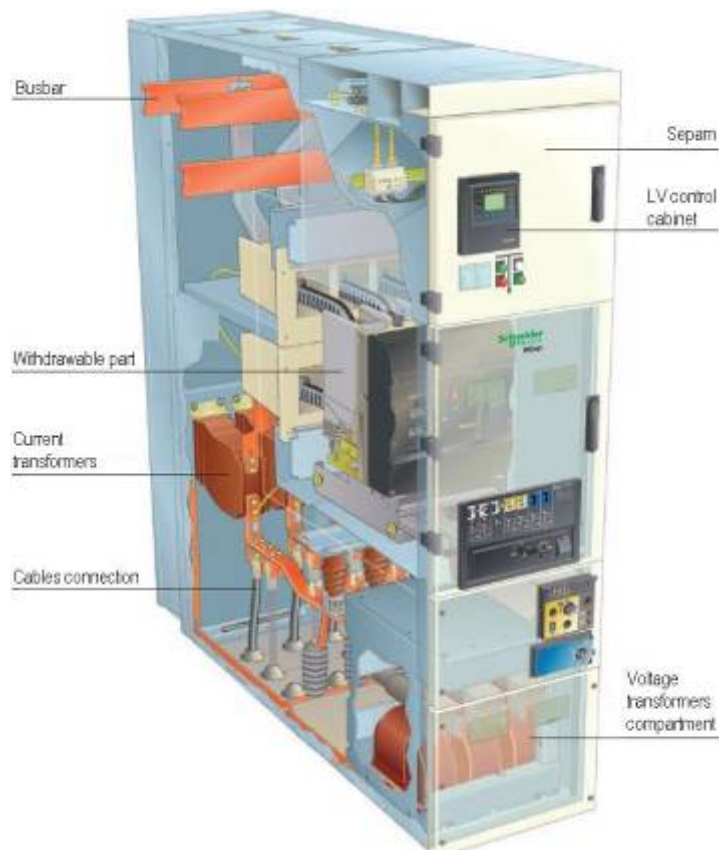
CB. spring charging motor	220Vdc	Contacting opening coil (mech. latch.)	N.A
CB. 1st opening release	220Vdc	Contacting closing coil (magnet. latch)	N.A
CB. 2 <sup>nd</sup> opening release	220Vdc	Electrical lock for earthing switch	220Vdc
CB. closing release	220Vdc	Protection relays, indicating devices	220Vdc
CB. undervoltage opening release	N.A	Cubicle anti-condensation heaters	230Vac

## 5 GENERAL DESCRIPTION OF THE MCSET RANGE

### 5.1 Panels

The panels are LSC2B (Metalclad), class PM (metallic partition) according to IEC 62271-200:

- The external enclosure and inter-compartment partitions are metal and are earthed.
- Insulating bushings between compartments allow for the passage of the main conductors.
- Earthed steel shutters, cover the fixed contacts whilst switchgear is disconnected.



Each panel is made up of 4 electrically independent compartments, described below :

#### 5.1.1 Switchgear compartment

This compartment is closed by a door and contains :

- The breaking, or switching unit, in either the disconnected, in service or test position
- The units disconnecting / connecting mechanism
- The shutter opening / closing mechanism
- The connecting plug for the unit electrical control signals

#### 5.1.2 Lower Compartment

It contains :

- The MV cable connection pads or the lower busbar
- The capacitive dividers which indicate voltage presence (VPIS)
- The earth switch (with making capacity)
- The current transformers
- The lightning arrester
- The anti-condensation heating element
- The fixed voltage transformers or the compartment containing the voltage transformers disconnectable by means of their withdrawable fuses

#### 5.1.3 Busbar compartment

It contains :

- The main busbars
- The upper tapings which also serve as busbar supports
- Flaps for evacuation overpressure to the top of the cubicle

The busbar compartment is accessible via the top of the cubicle, by removing the bolted plates.

#### 5.1.4 The low voltage compartment

The compartment may contain :

- The protection relays and control unit
- The control and signalling devices used for local and remote control of equipment
- The control synoptic
- The voltage and current test box
- The low voltage auxiliaries, including the MCB's, auxiliary relays, transducers
- Low voltage compartment door will be equipped with a key

### 5.2 Circuit Breaker

The circuit-breakers use SF6 as insulating and interrupting medium, and are of the sealed pressure system type in accordance with the IEC definition, i.e. no need to refill throughout the life of the unit, predicted as being 30 years.

It is equipped with an electrical stored energy operating mechanism, opening and closing mechanisms and auxiliary contacts for position indication. To multiply auxiliary contacts according to the diagram used, auxiliary relays could be used and they will be located in the low voltage compartment.

The circuit-breaker is mounted on the racking in/out truck and can be positioned as follows :

- in the in service position ("connected") in the switchgear compartment,
- in the test position ("disconnected") in the switchgear compartment
- in the withdrawn position ("extracted") by means of an extraction table which also enables the unit to be lowered to ground

### 5.3 Cable Earthing

Cable earthing is achieved by means of an interlocked earthing switch located in the cable compartment and operated from the front of the panel.

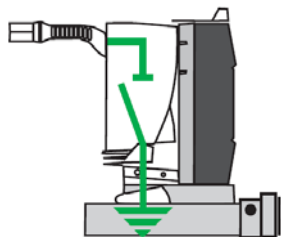
The earthing device is of the quick make type, and is able to make against the rated short-circuit current. 3 lamps situated next to the operating handle of the earthing switch, and connected to capacitive dividers, indicate whether cables are live or not. A position indication device by mechanical indicator and 3 NO and 3 NC auxiliary contacts.

Key or electromagnet locking is also available as an option.

### 5.4 Busbars Earthing (Included in the scope)

Main busbar earthing is made either with :

- A specific cubicle (busbar earthing functional unit) equipped with an earthing switch with a VPIS (the same as those used for cable earthing )
  - An earthing truck which is installed instead of the withdrawable part. Racking in the truck can be made depending on the positions of the other withdrawable parts of the switchboard, using key interlocks
- (For personnel's safety, the truck is interlocked so that it cannot be inserted unless the truck's earthing switch is open, and three neon lamps are provided for to indicate whether the busbar is live, or not.)



### 5.5 Sepam protection and control unit

The Sepam combines, in a single unit, all control, protection and measurement functions:

- the protection relays
- the measurement indicators and energy meters
- alarms and indication lamps
- control logic and remote control interfaces

#### Protection

The Sepam covers the entire range of protection functions required (current, voltage, directional, restricted earth fault) for all application : networks, busbars, transformers, motors, ...)

Each function allows for a wide range of protection curves and a wide adjustment range.

#### Measurement

The Sepam allows for dynamic measurement of current and voltage, as well as energy and power consumption (active and reactive).

It provides excellent measurement precision (below 1% for current measurement). Measurements are displayed on the LCD screen mounted on the door of the LV compartment.

#### Information display

The display gives information on the status of alarms, as well as faults and changes of state.

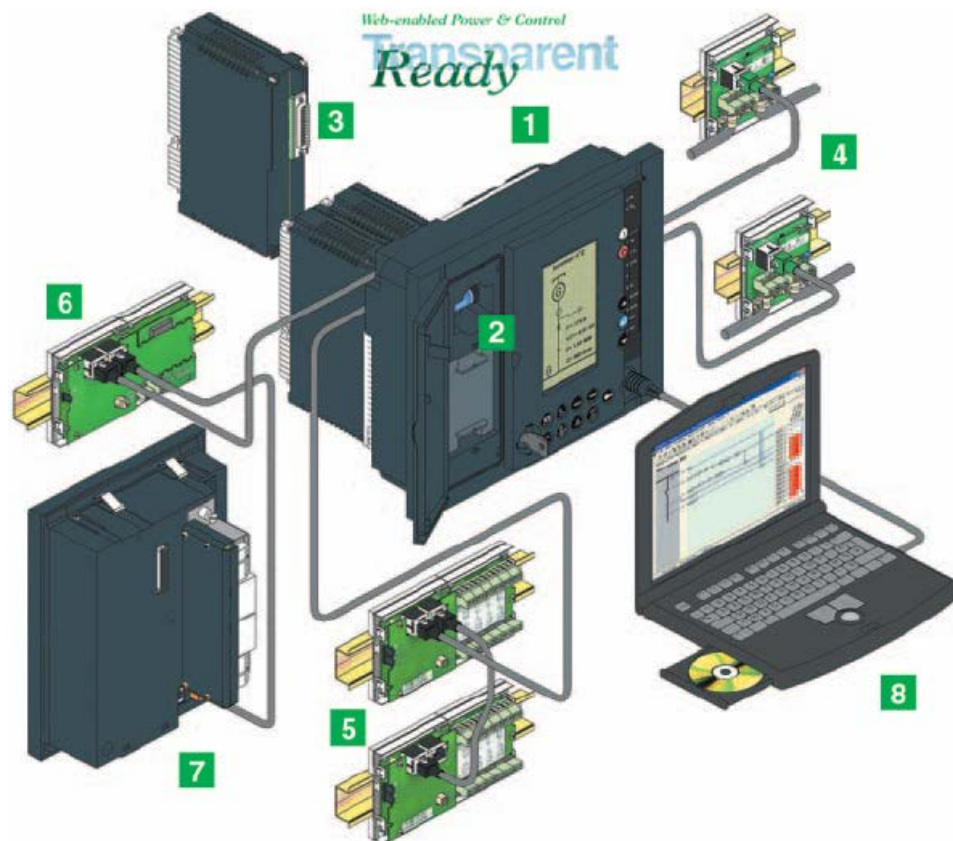
#### Communication

The Sepam can be fitted with one (or two) optional communication module which uses the Modbus RTU, DNP3, IEC 60870-5-103, Modbus TCP/IP or IEC 61850 protocols, simple, economical, and easy to connect.



This powerful communication system can be linked to existing on site supervisors or computers. It also allows for :

- remote metering and control
- data logging
- network management



### Sepam series 80 modular architecture

- 1- Base unit, with integrated or remote advanced User Machine Interface.
- 2- Parameter and protection settings saved on removable memory cartridge.
- 3- 42 logic inputs and 23 outputs relays with 3 optional modules providing 14 inputs and 6 outputs.
- 4- 2 independent Modbus communication ports.
  - Direct connection to 2-wire RS 485, 4-wire RS 485 and fiber optic networks.
  - Connection to Ethernet TCP/IP network via PowerLogic System webserver (Transparent Ready™).
- 5- Processing of data from 16 temperature sensors.
- 6- 1 low level analog output, 0-10 mA, 4-20 mA or 0-20 mA.
- 7- Synchro-check module.
- 8- Software tools:
  - Sepam parameter and protection setting and control logic customization,
  - local or remote installation operation,
  - retrieval and display of disturbance recording data.



## 5.6 Current transformers

The current transformer used for protection and metering is made by Schneider Electric and are of the conventional dry cast resin type . They are fully adapted for use the Sepam units. They comply with IEC standards.

## 5.7 Voltage transformers

The voltage transformers are made by Schneider Electric conventional and in conformity with DIN and IEC standards. They are of the disconnectable type protected by fuses

In the disconnectable version they are associated with fuses on the primary. Fusion of fuses is shown by means of a mechanical indicator and an electrical contact.

## 5.8 Low Voltage wiring

Low voltage wiring is self extinguishable and flame retardant (H07Z1-K), insulated for 750V, grade at 70°C, in specific synthetic. All cables will be black colour, only ground cables will be yellow/green.

Wires cross-section are:

- Current circuits: 2,5 mm<sup>2</sup>
- Voltage circuits: 1,5 mm<sup>2</sup>
- Other circuits : 1,5 mm<sup>2</sup>
- VPIS & circuit breaker socket to cubicle: 1,5 mm<sup>2</sup>

Type of connection:

- Terminal blocks for L.V. connection: Push-in Type

Each wire extremity is marked with a pre-printed Raychem HSI ring, solidly fixed to the wire extremity.

Wire identification is in conformity with the wiring diagrams and uses bidirectional marking.

Each wire extremity is equipped with a crimped connector.

Wires are provided with protectors where there is a risk of deterioration through contact with metal elements (i.e. rubbing).

The inter-panel cabling is connected to terminal blocks arranged in rows situated on the top of the LV compartments. These terminal blocks are identified by labels in conformity with the wiring diagrams and are also used for connection between the switchboard and any eventual remote control devices.

## 6 ANTI CORROSION PROTECTION AND FINISHING

In order to allow equipment to be installed under severe climatic conditions, the following measures are systematically adopted:

- The visible external surfaces on the front of the panels are made of electro-plated sheet steel (zinc thickness : 2,5µm).
- Painted surfaces are cleaned prior to painting using a phosphate cleaning treatment. The paint itself is a polymerised epoxy polyester powder mix (the average thickness of the polymerised film is 50µm). Surface treatment is frosted satin.
- The paint colour is RAL9003 on front face.
- For all other surfaces, continuous hot galvanised sheet metal is used (average zinc thickness 20µm) which has undergone a chrome passivation finishing treatment.

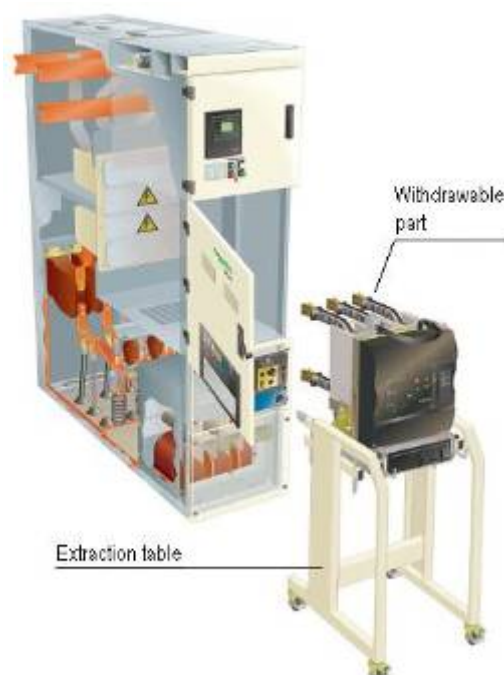
## 7 LIST OF SUPPLIERS

■ Circuit Breaker and Contactor	Schneider Electric
■ Voltage and current transformers	Schneider Electric or Alce
■ Measuring instruments	Schneider Electric or equivalent
■ Protection relay	Schneider Electric
■ Auxiliary relays	Schneider Electric or equivalent
■ Lamps, push buttons, miniature circuit breaker	Schneider Electric
■ LV switches	Schneider Electric or equivalent
■ Connectors, terminal blocks	Schneider Electric, Wago or equivalent
■ Locks for interlocking	HF Sécurité
■ Test box	Entrelec, Areva or equivalent
■ Fuses	Fusarc, Ferraz or equivalent
■ Lightning arrester	Tridelta or equivalent

## 8 SWITCHBOARD ACCESSORIES

Accessories per switchboard are as follows:

<i>Designation</i>	<i>Quantity</i>
Handle for racking withdrawable part	3 units per switchboard
Lowering extraction table	1 per switchboard
Earthing truck for busbar	Not included
Current and Voltage test cables	Not included
SFT2841 Sepam Software + Connection cord	1 per switchboard
Switchboard end sheets	Included
Civil engineering rails	1 set per switchboard
Fixation accessories	Included



## 9 SPECIAL APPLICATIONS

- .....
- .....
- .....

## 10 TECHNICAL COMPLEMENT OF INFORMATION

### 10.1 Simplicity & Safety

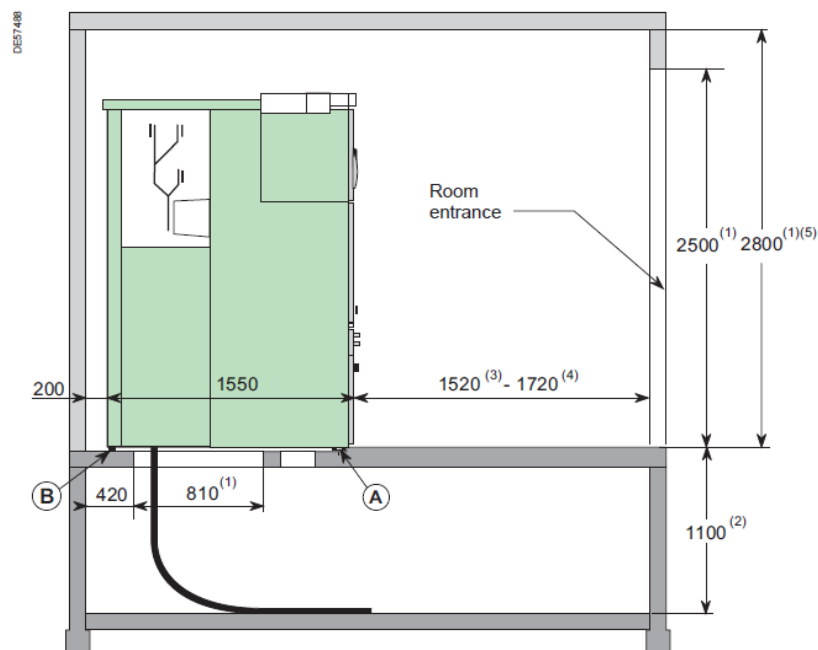
#### Simplicity



- A user interface which is easily understood by everybody.
- Interlocks and padlocks preventing operator errors.
- Sepam-type protection units enabling on-site information retrieval without any additional devices.
- Maintenance limited to simple, routine operating checks and cleaning and greasing every 5 to 10 years.
- Easy installation due to identical civil engineering dimensions for all cubicles and installation being possible against a wall.

### 10.2 General Civil Drawing

#### Civil engineering with utility space



(1) Minimum dimensions to be complied with when installing the MCset switchboard.

(2) Minimum dimensions to be defined according to the cable bending radius.

(3) Operating distance.

(4) Distance needed to extract a functional unit from the switchboard without moving the other units.

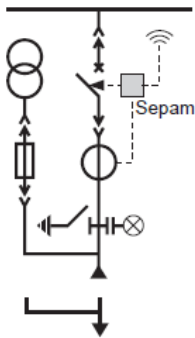
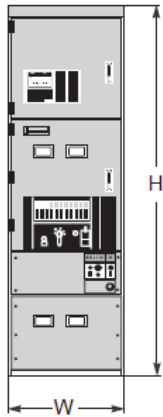
(5) Provide an exhaust tunnel above the switchboard when the room height is less than 4 metres (see page 18).

A anchor point

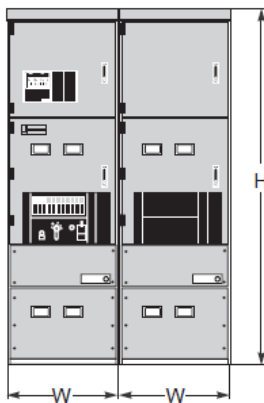
B adjustment point

**Note:** for further information, refer to the civil engineering, user and instruction manual.

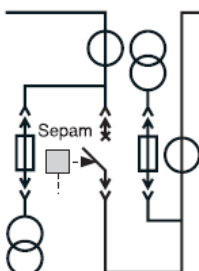
### 10.3 Front & Side View



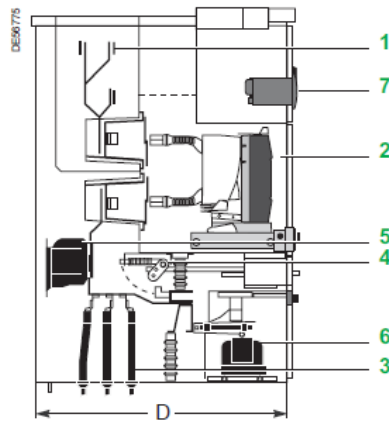
The bussectioning functional unit comprises 2 cubicles mounted side by side (one cubicle equipped with a circuit breaker, the other with a busbar return).



CL1-2-3 or GL1-2-3



#### AD1, AD2, AD3



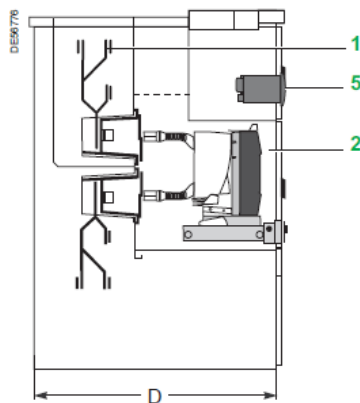
#### MV compartments

- 1 Busbars for cubicle interconnection
- 2 Withdrawable part
- 3 MV connections by cables accessible from the front face
- 4 Earthing switch
- 5 Current sensors
- 6 Voltage transformers (optionally equipped with withdrawable fuses).

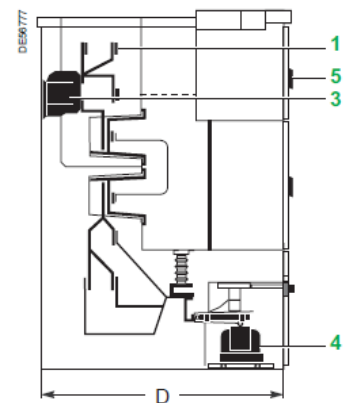
#### LV control cabinet

- 7 Low voltage auxiliaries and the protection, monitoring and control unit are in a control cabinet which is separated from the medium voltage part.

#### CL1, CL2, CL3



#### GL1, GL2, GL3



#### MV compartments

- 1 Busbars to connect the bussectioning functional unit with other switchboard functional units
- 2 Withdrawable part
- 3 Current sensors
- 4 Voltage transformers (optionally equipped with withdrawable fuses).

#### LV control cabinet

- 5 Low voltage auxiliaries and protection, monitoring and control unit are in one control cabinet, separated from the medium voltage part.

## 11 REFERENCE DOCUMENTS

Our tender has been drawn-up using the following documents contained in your request for tender.

- 60R70126.20-F0011\_03\_02\_SLD\_1BBA\_1BBB.pdf
- 60R70126.20-F0011\_03\_02\_SLD\_2BBA\_2BBB.pdf
- 60R70126.20-F0011\_03\_01\_SLD\_View.pdf
- 60R70126.20-F0011\_03 Technical specification R02.pdf

## 12 DEVIATIONS AND COMMENTS

- This technical offer is valid for the supply of Air Insulated Metal Clad Switchboard in strict compliance with Detailed Material List. All the other equipments which have not mentioned in this list are out of scope of supply.
- For 50kA/1s internal arc value, tunnel application is mandatory on top of switchboard. An exhaust pipe must be connected to the outside of building by customer in order to prevent reflection hot gases from tunnel during internal arc. Minimum cross section diameter of exhaust hole should be 0,5m<sup>2</sup>.
- Our cubicles are designed as per IEC standards. Please see current standards that we in accordance with in item 2. Any other standard is not confirmed.
- Cubicles offered will have 4-sided internal arc protection within the level of 50kA/1sec. Short circuit withstand rating is 50kA/1s .
- Regarding CT&VT's characteristics, please see "Detailed Material List". The characteristics are limited to offered CTs and VTs. All CT , VT values must be checked and approved by customer before drawing stage. The ratings might be revised according to the exact requirement with a variation in cost.
- All CT and VT values are limited by manufacturer.
- Protection and digital measuring will be done by multiprocessor type SEPAM relays. Relays will be communicated via IEC 61850 protocol.
- ANSI codes of all relays are indicated in DML. Relays can achieved all protections that indicate when all necessary inputs are obtained from system.
- 220Vdc-24Vdc converter are offered for ten motor cubicles for SIL3 interposing relays. It must be clarified which cubicle will have a converter for 24Vdc supply for relays by customer before drawing. This offer does no include any SIL3 interposing relay.
- Differential protection will be done by SEPAMT87 relays on MCSET incomers side from 1BBT10 & 2BBT10 power transformers. These relays can achieved the other protections ( earth fault, current, voltage, etc) protections with one CT protection winding. So only one protection winding is offered for incomers.
- Analog voltmeters and ammeters are offered for measuring and also Elster brand energy meters are offered for some cubicles according to customer's documents. Elster energy meter interfaces are CL0 or RS232 or RS485.
- All LV wiring and terminal applications will be in line with Schneider Electric standards and experience. LV wiring will be tinned copper. Offered wiring details can be seen in DML.
- The busbars of switchgear are offered as copper because of current and short circuit values.
- This offer does not include
  - Factory assembling and cabling
  - Transportation to the construction site
  - Erection, installation
  - Commissioning, testing of switchgears after erection, installation of equipment
  - Training
  - Any other devices like transformers, motors, compensation devices, etc.

- Documentation will be provided within Schneider Electric Turkey standards.
- Packing will be in our experience and standard as land packing type. Transportation and storage is out of scope of supply. Off-loading, setting in place, fixing down, installation and commissioning of the switchboard, testing on site and training are out of our scope of supply.
- Delivery will be Exworks Schneider Electric Manisa factory.

## 13 DOCUMENTATION

The plans will be drawn-up on See-XP software, according to Schneider Electric Turkey standards. The following drawings and documents will be provided with the panels:

- Civil engineering drawing
- Single line diagram
- Switchboard layout general front face and interlocking diagram
- Wiring diagram and material list for each typical functional unit
- Installation and commissioning manual
- Operation and maintenance manual

Drawings and documents will be prepared after the contract signed in the defined duration for the customer approval. They are to be approved, with or without comments, and returned to Schneider Electric Turkey, according to the deadlines defined in order.

## 14 ROUTINE FACTORY ACCEPTANCE TESTS

After the manufacturing in Schneider Electric Manisa Factory, the necessary controls are done internally in accordance with IEC standards.

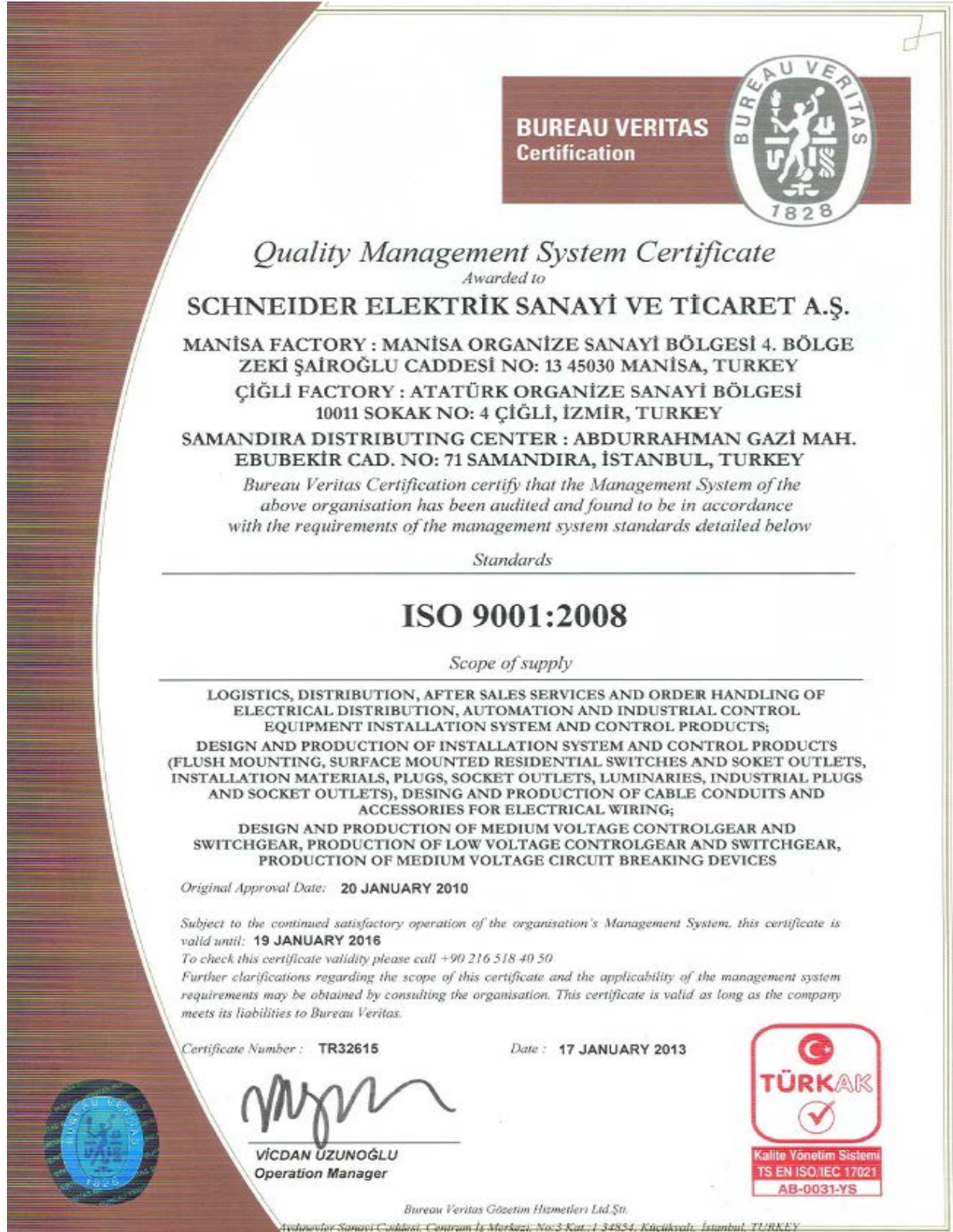
Routine factory testing, in accordance with IEC standards, is provided for in this offer and includes the following:

- Check of conformity with wiring diagrams and plans
- Mechanical operation tests, and checking of interlocks
- Testing of the interchangeability of moving parts
- High voltage dielectric tests at the power frequency
- Low voltage dielectric tests
- Low voltage functional checking



## 15 QUALITY & ENVIRONMENT SYSTEM CERTIFICATES

ISO 9001 Quality Management System Certificate, ISO 14001 Environment Management System Certificate and OHSAS 18001 Occupational Health and Safety Management System Certificate for Schneider Electric Turkey Factory is attached below.







**BUREAU VERITAS**  
Certification



*Occupational Health and Safety  
Management System Certificate*

*Awarded to*

**SCHNEIDER ELEKTRİK SANAYİ VE TİCARET A.Ş.**

**MANİSA FACTORY : MANİSA ORGANİZE SANAYİ BÖLGESİ 4. BÖLGE  
ZEKİ ŞAİROĞLU CADDESİ NO: 13 45030 MANİSA, TURKEY  
ÇİĞLİ FACTORY : ATATÜRK ORGANİZE SANAYİ BÖLGESİ  
10011 SOKAK NO: 4 ÇİĞLİ, İZMİR, TURKEY**

*Bureau Veritas Certification certify that the Management System of the  
above organisation has been audited and found to be in accordance  
with the requirements of the management system standards detailed below*

*Standard*

**OHSAS 18001:2007**

*Scope of certification*

**DESIGN AND PRODUCTION OF INSTALLATION SYSTEM AND CONTROL PRODUCTS  
(FLUSH MOUNTING, SURFACE MOUNTED RESIDENTIAL SWITCHES AND SOCKET OUTLETS,  
INSTALLATION MATERIALS, PLUGS, SOCKET OUTLETS, LUMINARIES, INDUSTRIAL PLUGS  
AND SOCKET OUTLETS), DESIGN AND PRODUCTION OF CABLE CONDUITS AND  
ACCESSORIES FOR ELECTRICAL WIRING;**

**DESIGN AND PRODUCTION OF MEDIUM VOLTAGE CONTROLGEAR AND  
SWITCHGEAR, PRODUCTION OF LOW VOLTAGE CONTROLGEAR AND SWITCHGEAR,  
PRODUCTION OF MEDIUM VOLTAGE CIRCUIT BREAKING DEVICES**

*Certification Cycle Start Date:* **22 JANUARY 2008**

*Subject to the continued satisfactory operation of the organisation's Management System,  
this certificate expires on:* **19 JANUARY 2016**

*Original Certification Date:* **22 JANUARY 2008**

*Certificate Number:* **TR32617**

*Version N, Revision Date:* **17 JANUARY 2013**

**VİCDAN UZUNOĞLU**  
**Operation Manager**



008

*Certification Body Address: Brandon House, 180 Borough High Street, London SE1 1LB, UK.*

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*Further clarifications regarding the scope of this certificate and the applicability of the management system  
requirements may be obtained by consulting the organisation.*

*To check this certificate validity please call +90 216 518 40 50*

