



KINGDOM OF CAMBODIA  
NATION RELIGION KING



**ELECTRICITE DU CAMBODGE**

**TECHNICAL SPECIFICATION**

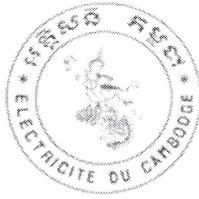
**EDC-DTS-MV011**

**Pole Mounted Load Break Switches and  
Sectionalizers**

**August 2019**

**Version 2.0**





**ELECTRICITE DU CAMBODGE**

Version	Date	Technical Specification Name	Authorized by : (name and signature)
1.0	February, 2017	Pole Mounted Load Break Switches and Sectionalizers	
2.0	August, 2019	Pole Mounted Load Break Switches and Sectionalizers	 Dr. PRAING CHULASA



Version	Drafted/reviewed by	Verified by	Approved by	Date
Draft 1	AD			
Draft 2	AD			
Final 2	EDC/AD			
Version 2	EDC/AD			August 2019

Version 2.0 : Main modifications from version 1.0 (February 2017) are below:

- Rated no load transformer breaking current is reduced.
- Rated line and cable charging breaking current is reduced.
- Modification on the remote-control function
- Load Break Switch and Sectionalizer is mentioned separately.
- And Others minor correction



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## Content

1	Scope.....	7
2	Standards.....	7
3	Definitions.....	8
4	Testing and Inspection.....	8
	4.1 General Notes for Test.....	8
	4.2 Type Tests.....	8
	4.3 Routine/Acceptance Tests.....	9
	4.4 Quality Management.....	9
5	Technical Characteristics.....	9
	5.1 Operating Conditions.....	9
	5.2 Network Characteristics.....	10
	5.2.1 35 kV Network.....	10
	5.2.2 22 kV Network.....	10
	5.3 Ratings.....	10
6	Mounting Arrangement and Fabrication.....	11
	6.1 Generalities.....	11
	6.1.1 LBS motorisation.....	12
	6.1.2 Sectionalizer automation.....	12
	6.2 Frame.....	12
	6.3 Connection.....	12
	6.4 Degree of Protection.....	12
	6.4.1 Type 1 Load Break Switches and sectionalizers.....	12
	6.4.2 Type 2 Load Break Switch.....	12
	6.5 Insulating Breaking and Disconnecting.....	12
	6.5.1 Type 1 Load Break Switches and sectionalizers.....	12
	6.5.2 Type 2 Load Break Switch.....	13
	6.6 Disconnecting.....	13
	6.6.1 Type 1 Load Break Switches and sectionalizer.....	13
	6.6.2 Type 2 Load Break Switch.....	13
	6.7 Insulators and Bushing.....	13
	6.7.1 Type 1 Load Break Switches and sectionalizer.....	13
	6.7.2 Type 2 Load Break Switch.....	13
	6.8 Creepage Distance.....	14
	6.8.1 Type 1 and type 2 Load Break Switches and sectionalizers.....	14



6.9 Surge arresters.....14

6.10 Operating Mechanism .....14

    6.10.1 Type 1 Load Break Switches and Sectionalizers .....14

    6.10.2 Type 2 Load Break Switch.....14

6.11 Position Indicator.....15

    6.11.1 Type 1 Load Break Switches and sectionalizer .....15

    6.11.2 Type 2 Load Break Switch.....15

6.12 Nameplates.....15

7 Remote Controlled Functions .....16

    7.1.1 Type 1 Load Break Switches and sectionalizers.....16

8 Packing .....17

9 Technical Data Sheets .....18

    9.1 Type 1 GIS Pole Mounted Load Break Switch.....18

    9.2 Type 1 GIS Sectionalizer.....26

    9.3 Type 2 Air Pole Mounted Load Break Switch, 22kV.....34



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# Pole Mounted Load Break Switches and Sectionalizers

## 1 Scope

This specification is applicable to 38 kV and 24 kV three phase pole mounted load break switches, intended for outdoor use by Electricity of Cambodia. The life span of these apparatuses shall be 25 years.

Pole mounted load break shall be of two types:

- Gas insulated switches : Type 1 LBS and sectionalizer for 24 kV and 38 kV
- Air insulated load break switches : Type 2 LBS for 24 kV

A sectionalizer is not rated to interrupt fault current. Each sectionalizer detects and counts fault interruptions by the upstream recloser or circuit breaker. After a pre-determined number of interruptions, the sectionalizer will open during a recloser or circuit breaker interruption, thereby isolating the faulty section of the circuit, allowing the recloser or the circuit breaker to restore supply to the upstream non-faulty section.

Type 1 GIS load break switches and sectionalizer shall be capable to be remote-controlled at installation stage or later.

Type 2 air insulated load break switch shall be manually operated only.

## 2 Standards

This equipment shall comply with the latest editions and amendments of standards/ specifications listed here after.

IEC	: International Electro Technical Commission
IEC 60050	: International Electrical Vocabulary – IEV
IEC 60056	: High voltage Alternative current circuit breakers
IEC 60059	: IEC standard current ratings
IEC 60071-1	: Insulation coordination- Part 1 Definition, principles and rules
IEC 60129	: Alternating current disconnectors and earthing switches
IEC 62271-1	: Common clauses for high voltage switchgear and control gear standards
IEC 62271-102	: Alternating current disconnectors (isolators) and earthing switches
IEC 62271-103	: Switches for rated voltage above 1 kV and less than 52 kV
IEC 62271-104	: Switches for rated voltage of 52 kV and above



IEC 62271-200 : AC metal-enclosed switchgear and control gear for rated voltages above 1kV and up to and including 52 kV

IEC-60376 : Specification of technical grade sulphur hexafluoride (SF6) for use in electrical equipment

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

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 EDC.

### 3 Definitions

The definitions of the relevant IEC standards apply to this technical specification.

### 4 Testing and Inspection

#### 4.1 General Notes for Test

Pole mounted Load break switches and sectionalizers 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 Pole mounted load break switches and sectionalizers shall be subject to tests as specified below.

#### 4.2 Type Tests

All type tests required by the relevant IEC standards 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 10 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/Acceptance Tests

The routine tests requested by relevant Standard shall be carried out on all load break switches. Routine test reports shall be sent to EDC prior the shipment for EDC acceptance.

Nevertheless, the Supplier shall make necessary arrangements for inspection by an Engineer appointed by EDC to carry out in his presence necessary Routine/Acceptance tests of the equipment.

The supplier shall include details of all acceptance/routine tests to be carried out on pole mounted load break switches and the routine test certificate shall be made available to Employer’s inspector at the end of inspection.

The following routine tests as per IEC shall be carried out on all Load Break Switch and sectionalizers then the routine test certificates shall be made available for the observation of EDC inspector at the time of inspection:

- Dielectric tests for the principal circuit
- Resistance measurement of the principal circuit
- Tightness tests
- Visual controls
- Mechanical tests

The completely assembled apparatus shall be tested in the factory.

### 4.4 Quality Management

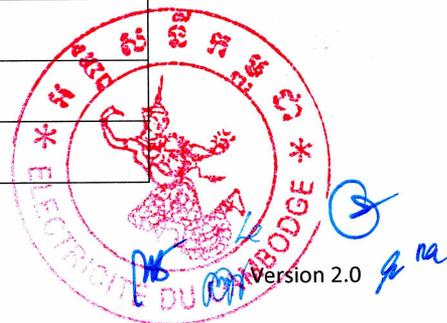
Design, development and production of the proposed equipment shall be ISO 9001 certified. The ISO 9001 certificate shall be submitted within the bid.

## 5 Technical Characteristics

### 5.1 Operating Conditions

The pole mounted LBS and sectionalizers shall be suitable to operate 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	1.20c m/W
Maximum	3.00c m/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)

## 5.2 Network Characteristics

### 5.2.1 35 kV Network

There are two kinds of 35 kV networks in Cambodia

- Three-phase, three wires with artificial neutral grounded through impedance and resistor limiting the earth fault current to 787 A.
- Three-phase, three wires with isolated neutral.

### 5.2.2 22 kV Network

Three-phase, three wires with artificial neutral grounded through impedance and resistor limiting the earth fault current to 787 A.

## 5.3 Ratings

Rated Voltage:	38 kV	24 kV	
LBS types:	Type 1 GIS	Type 1 GIS	Type 2 AIR
Sectionalizer type	Type 1 GIS	Type 1 GIS	N/A
Operating voltage:	35 kV	22 kV	22 kV
Rated impulse withstand voltage (1.2/50 $\mu$ s wave)			
- Phase to Earth:	170 kV peak	125 kV peak	125 kV peak
- Across the insulating distance	195 kV peak	145 kV peak	145 kV peak
Rated power frequency withstand voltage (1min)			
- Phase to Earth:	70kV	50 kV	50 kV

- Across the isolating distance	80kV	60 kV	60 kV
Rated frequency:	50Hz	50 Hz	50 Hz
Rated normal current:	630 A and 400 A	630 A and 400 A	200 A
Rated short time withstand current	20 kA rms/ 1s	20 kA rms/ 1s	20 kA rms/ 1s
Rated mainly active load-breaking current	630 A 400 A	630 A 400A	≥ 50 A
Rated closed loop breaking current	630 A 400 A	630 A 400 A	200 A
Rated no load transformer breaking current	6 A	6 A	4 A
Rated line and cable charging breaking current	25 A	25 A	10 A
Rated short circuit making current (peak)	31.5 kA	31.5 kA	25 kA
Electrical endurance O.C. cycle	100	100	100
Mechanical endurance O.C. cycle	M2 5000	M2 5000	M1 1000

## 6 Mounting Arrangement and Fabrication

### 6.1 Generalities

All types of LBS and sectionalizer shall be designed for outdoor use for all types of poles (round or square/rectangular) and shall be suitable for an easy mounting on the pole. The load break switch and sectionalizers shall be suitable on concrete pole with horizontal and triangular conductors lay out.

They shall be supplied complete with galvanized steel brackets, bolts, nuts and washers for mounting on a concrete pole.

The Manual operation of the LBS and sectionalizer shall be done by transmission rod and lever. The Lever shall be isolated from pole and operating rod. The operation of all type of LBS and sectionalizer shall be independent of the operator.

The Type 1 Pole mounted load break switch and sectionalizer shall be capable of remote operation later or at time of installation as required by EDC. Full technical documentation concerning this capability shall be supplied within the bid.

Type 1 LBS shall be provided in the following versions:

- Manual operating



- Fitted with motorization mechanism without remote control box
- Fitted with motorisation mechanism with remote control box

Type 1 Sectionalizers shall be provided in two versions:

- Without remote control
- With remote control

Type 2 LBS shall be manually operated only.

### 6.1.1 LBS motorisation

Motor mechanism used for shall be 24V DC powered and shall be fitted with switches that allow indication of open and closed positions.

This motorized mechanism shall be installed directly onto the LBS.

### 6.1.2 Sectionalizer automation

Sectionalizer operation shall allow the sectionalizer opening during the first or second temporized shut down of the upstream circuit breaker or recloser. Motor used for such automation shall be 24V DC powered. A control box made of stainless steel shall contain the battery, the charger and the automation electronic system and any other necessary device.

## 6.2 Frame

The load break switch and sectionalizer frame shall be provided to be installed non-insulated from a pole. One hole shall be provided for earthing connection. It shall be supplied with hot dip galvanized or stainless-steel brackets, nuts, washers or strap for mounting on pole.

The frame shall be originated from the LBS or sectionalizer manufacturer. Any frame for another origin shall be rejected.

Type 2 LBS shall be horizontally pole top mounted.

## 6.3 Connection

Suitable terminals / connectors to be provided for accommodating compression lugs for Al / Cu conductors ranging from 50 mm<sup>2</sup> to 240 mm<sup>2</sup>, and supplied with bolts, nuts, washers.

## 6.4 Degree of Protection

### 6.4.1 Type 1 Load Break Switches and sectionalizers

The tank of type 1 LBS and sectionalizers shall have a degree of protection of IP 67.

### 6.4.2 Type 2 Load Break Switch

As air insulated and air breaking, no IP is required

## 6.5 Insulating Breaking and Disconnecting

### 6.5.1 Type 1 Load Break Switches and sectionalizers

The insulating and breaking chamber of the switch shall be of SF6 GIS type. The SF6 chamber shall be sealed for life and "sealed pressure system" with a service life conforming to IEC standard 62271. The



relative pressure inside the single sealed SF6 breaking chamber made of stainless steel shall not exceed 0.5 bar (20°C).

The enclosure has to be sealed for life and meets “pressurized sealed system” criteria in conformity with the IEC standard.

For safety reasons, the absolute pressure inside the tank shall not exceed 1.5 bars at 20°C. The equipment with an absolute pressure that exceed 1.5 bar shall be rejected.

A safety valve fitted to the SF6 tank shall avoid any risk of explosion if case an internal arc occurs.

The sealed insulating/breaking chamber designed for a service life of 25 years, maintenance-free and without SF6 gas refilling.

**Load break switch and sectionalizer requiring maintenance and gas refiling are not accepted.**

### 6.5.2 Type 2 Load Break Switch

Insulation and breaking shall be of air type. Each LBS’s pole shall be fitted with fast action breaking device that shall allow the arc breaking. Opening and closing LBS operations shall be independent of the operator action.

## 6.6 Disconnecting

### 6.6.1 Type 1 Load Break Switches and sectionalizer

The disconnecting function shall be carried out when the separation of the main contacts is certain. It will be certain when a position indicator shall be shown by reliable indication device directly connected to the movable contacts. The position indicator mechanism shall be simple, robust, and it shall give a true reflection of the main contacts. This reliable indicating device shall be in accordance with IEC 62271 requirements.

### 6.6.2 Type 2 Load Break Switch

The disconnecting function shall be carried out by the separation of main contacts. When open, the contacts shall be separated of at least 30 cm.

The blade movement for opening/closing shall be vertical.

The open position of the three poles shall be clearly visible from the ground without any doubt.

## 6.7 Insulators and Bushing

### 6.7.1 Type 1 Load Break Switches and sectionalizer

The load break switches and sectionalizer shall be supplied with bushings made of silicon or polymer. Parts carrying heavy current shall be made of copper or copper alloy.

Insulating caps for covering bushings connections shall be also provided in order to make the assembly “bushing/connection” insensible to the wildlife environment.

### 6.7.2 Type 2 Load Break Switch

Insulators of Type 2 LBS shall be made of porcelain or silicon or polymer.

Terminals shall be provided for connection of aluminium copper lug (aluminium alloy conductors).



## 6.8 Creepage Distance

### 6.8.1 Type 1 and type 2 Load Break Switches and sectionalizers

The minimum creepage distance for LBS bushings shall be 25 mm/kV so 950 mm for 38 kV and 600 mm for 24 kV LBS.

## 6.9 Surge arresters

Type 1 LBS and sectionalizer shall be fitted with specific device for fixing surge arresters directly on the tank or the supporting frame. 3 surge arresters shall be installed on both side of the LBS or sectionalizer.

## 6.10 Operating Mechanism

The mechanism shall be constructed as a lever or handle to be easily operated from the ground level by means of a mechanical operating device suitable for 12 m to 14 m concrete poles (total length).

The manual control shall comprise a tube linkage made of hot dip galvanized steel linked to the independent control, and a handle for manual operations from the base of the pole.

The linkage shall assure the mechanical connection between the switch and the manual control. This shall comprise pipes allowing a simple adjustment to any pole height. The material shall be hot dip galvanized steel.

The operating handle shall be designed to be fixed to the base of the pole at about 1.30-meter-high from the soil level and shall be **insulated from the pole and the operating mechanism**.

Operating mechanism not originated from the manufacturer shall be rejected.

### 6.10.1 Type 1 Load Break Switches and Sectionalizers

The operating handle shall be able to be set to the following 2 or 3 positions:

- “open” position and lock the switch in the open position.
- “closed” position and lock the switch in the closed position.

The operating handle may include a third position: “remote control” locked position enabling remote or local electrical operations using a remote-control unit for actual or future remote control.

The operating cantilever for the manual operation shall not exceed 20 daN.

In case of remote controlled operation mode, the hand mechanical operating system shall be available as “emergency handle”.

### 6.10.2 Type 2 Load Break Switch

The operating handle shall have the following 2 positions:

- “open” position and lock the switch in the open position.
- “closed” position and lock the switch in the closed position.



## 6.11 Position Indicator

### 6.11.1 Type 1 Load Break Switches and sectionalizer

The position indicator shall be easily visible from the ground and comply with the “fully apparent opening” criterion described in the IEC standard.

The position of the principal contacts shall be certain. This shall be by a signalling device linked to the contacts. This device shall be simple, robust and exactly reflect the principal contact positions.

Despite the climate conditions, the indicator of position shall be visible by the operator from the ground below the switch.

The colours and marking of the position indicating devices for the “open” and “closed” positions shall conform to IEC 73.

The “closed” position shall be marked with “I”. The “open” position shall be marked with “O”.

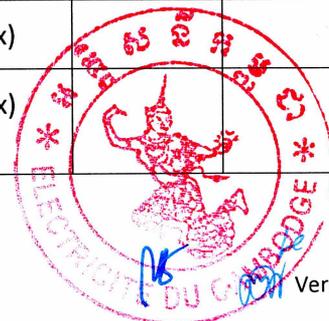
### 6.11.2 Type 2 Load Break Switch

The positions of the type 2 switch shall be indicated by the visual position of the three contact and knives in Open or Closed position from the ground level.

## 6.12 Nameplates

Switches and their operating devices shall be provided with nameplates which contain information in accordance with the following table.

Description	Abbreviation	Unit	Switch	Operating device	Condition
Manufacturer			x	x	
Designation of type and class			x	x	
Serial number			x	(x)	
Rated voltage	Ur	kV	x		
Rated impulse withstand voltage	Uw	kV	x		
Rated frequency	fr	Hz	x		
Rated normal current	Ir	A	x		
Rated short time current	Ik	kA	x		
Rated duration of short time current	tk	s	(x)		If different from 1s
Rated short circuit making current	I <sub>ma</sub>	kA	(x)		
Rated mainly active load breaking current	I <sub>l</sub>	A	(x)		



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Rated distribution line closed-loop breaking current	I 2a	A	(x)		
Rated no load transformer breaking current	I 3	A	(x)		
Rated cable charging breaking current	I 4a	A	(x)		
Rated line charging breaking current	I 4b	A	(x)		
x    The marking of these values is mandatory: blanks for these values indicate the value 0 (x)    The marking of these values is optional					

## 7 Remote Controlled Functions

### 7.1.1 Type 1 Load Break Switches and sectionalizers

The implementation of the remote controlled functions shall be done by adding motorization directly onto the equipment and a control box with an IP 55 at the base of the pole. In addition, in case the VT and CT are not integrated within the LBS tank or bushings, all necessary accessories as VT and CT (or sensors) for measurements and fault detection, etc. shall be supplied.

For sectionalizers, VT and CT already integrated (or not) shall be used for measurements and fault detection, etc.

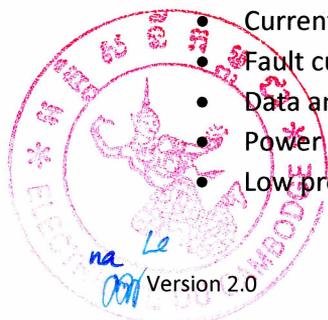
The motor powering voltage shall be 24V DC.

The control box made of stainless steel shall include:

- Battery and whole energy devices
- Electrical operation of the LBS or sectionalizer in local mode or by remote control
- Connection to the communication network and dialogue with the central remote control
- Measurement system
- detection of fault currents system
- Time storage and transmission of events that may affect the network and the control box
- Monitoring of faults occurring on the MV line or on equipment
- RTU function

In remote control mode, it shall include all transmission functions for the data exchange with the central remote control:

- Operation of LBS or sectionalizer (Open or Closed)
- Position of LBS or sectionalizer (Open or Closed)
- Current, voltage, etc. (where LBS applicable, or sectionalizer)
- Fault current and abnormal signalling (sectionalizer only)
- Data and events recorded
- Power supply failure alarm
- Low pressure alarm (if any)



- Door opening alarm

Accessibility and Support:

- Smart phone or PC
- User/Control Management
- Geographical information (if any)
- User operation event record
- Top up balance in case use local SIM card

The load break switch and sectionalizer shall be remote controlled either by radio, telecommunication line, GSM, smart phone and shall be fully operated by SCADA or mini SCADA system.

All functions of the current measurements and internal parameters: temperature etc..., shall be available by local consultation on the display, by configuration laptop and by remote control.

In local mode, a synoptic shall be available for the visualization of LBS and sectionalizer position and local control. It shall be possible to view and program the key parameters by alphanumeric display.

In addition, the verification and programming of complete parameters and configuration shall be done using a laptop PC via an Ethernet connection with a standard web browser or equivalent means. USB socket shall be also available on the front of the board.

In addition, the front face shall bear either RS232 or 485 or RJ 45 (Ethernet) port.

A general lockable power switch shall be installed in the front of the panel.

**7.1.1.1 Events recorded**

The control box shall be suitable to record 1000 events. The events shall be dated.

Two type of events shall be recorded:

- Those in relation with the operation of the control box. They shall be available locally by the configuration laptop.
- Those in relation with the operation of the network. They shall be made available locally by the configuration laptop and/or transmitted to the central remote control.

**7.1.1.2 Fault currents and measures**

The control box shall include a current acquisition module and a voltage acquisition module. This fault detector can be configured on site via a laptop.

The current detection shall comprise as a minimum:

- Earth/phase faults: configurable thresholds from 20 A to 800 A
- Phase faults: configurable thresholds from 500 A to 1600 A

**8 Packing**

Each LBS shall be delivered suitably protected in a wooden pallet case suitable to be outdoor stored.

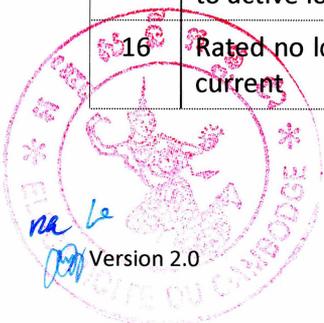


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## 9 Technical Data Sheets

### 9.1 Type 1 GIS Pole Mounted Load Break Switch

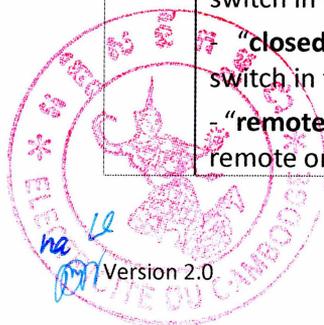
No.	Description	Unit	Requirement	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference		to be specified	
4	Type		to be specified	
5	Standards		to be specified	
6	Operating voltage	kV	35   22	
7	Rated voltage	kV	38   24	
8	Rated impulse withstand voltage (1.2/ 50 $\mu$ s) - Phase to earth - Across opening distance	kV	170   125 195   145	
9	Power frequency withstand voltage (1 mn) - Phase to earth - Across opening distance	kV	70   50 80   60	
10	<b>POLE MOUNTED LBS TO BE SUPPLIED</b>		<input type="checkbox"/> 400 A <input type="checkbox"/> 630 A	
11	<b>Version</b>		<input type="checkbox"/> Manual <input type="checkbox"/> Motorized only <input type="checkbox"/> Motorized + remote control box	
12	Rated short time withstand current (1s)	kA	20	
13	Rated short circuit making current (peak)	kA	31.5	
14	Rated mainly active load-breaking current	A	<input type="checkbox"/> 400 <input type="checkbox"/> 630	
15	Closed loop breaking current equal to active load-breaking current		Yes	
16	Rated no load transformer breaking current	A	6	



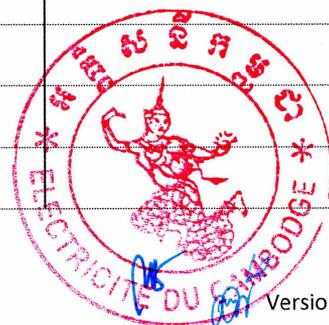
No.	Description	Unit	Requirement	Supplier's Offer
17	Rated line and cable charging breaking current	A	25	
18	Electrical endurance O.C. cycle		100	
19	Mechanical endurance		M2 class	
20	Degree of tank protection		IP 67	
21	insulating and breaking chamber		SF6 GIS type	
22	SF6 chamber		sealed for life	
23	sealed pressure system according IEC standard 62271		Mandatory	
24	Service life of		25 years without maintenance or SF6 gas refilling	
25	Relative pressure inside the single sealed SF6 breaking chamber		≤ 0.5 bar (20°C)	
26	Tank made of stainless steel		Yes	
27	"Pressurized sealed system" in conformity with the IEC standard.		Yes	
28	Tank fitted with safety valve		Yes	
29	Disconnecting function:		when the separation of the main contacts is certain	
30	Switch position indicator shown by reliable indication		device directly connected to the movable contacts	
31	The position indicator mechanism is simple, robust, and give a true reflection of the main contacts.		Yes	
32	This reliable indicating device is in accordance with IEC 62271 requirements.		Yes	
33	Position indicator		comply with the "fully apparent opening" criterion described in the IEC standard	



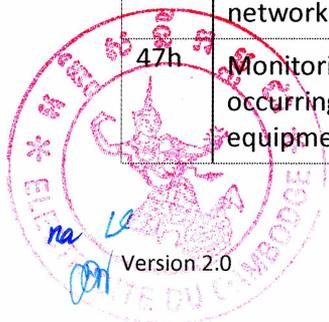
No.	Description	Unit	Requirement	Supplier's Offer
34	Colours and marking of the position indicating devices for the "open" and "closed" positions shall conform to IEC 73.		Yes	
35	The "closed" position		Marked with "1".	
36	The "open" position		Marked with "0".	
37	SF6 density switch (if any) for Low pressure switch		To be specified	
38	Bushings		silicon or polymer	
39	Bushings creepage distance	mm	≥ 950   ≥ 600	
40	Parts carrying heavy current		copper or copper alloy	
41	Insulating cover for connection		Yes	
<b>42. Mechanism</b>				
42a	Lever to be easily operated from the ground level by means of a mechanical operating device suitable for 12 m to 14 m concrete poles (total length).		Yes	
42b	Manual control comprises a tube linkage made of hot dip galvanized steel linked to the independent control, and a handle for manual operations from the base of the pole.		Yes	
42c	The linkage comprises pipes allowing a simple adjustment to any pole height.		Yes	
42d	The material shall be hot dip galvanized steel.		Yes	
42e	Operating handle at about 1,30 meter high from the soil level.		Yes	
42f	2 or 3 positions operating handle - "open" position and lock the switch in the open position. - "closed" position and lock the switch in the closed position. - "remote control" position enabling remote or local electrical operations		Yes Yes Yes/no	



No.	Description	Unit	Requirement	Supplier's Offer
	using a remote-control unit for present or future remote control.			
42g	Manual operation effort.	daN	≤ 20	
42h	Lever is isolated from pole and operating rod.		Yes	
42i	Capable of motorised and remote controlled at installation or latter.		Yes	
42j	Mechanism made by the LBS manufacturer		Mandatory	
<b>43 Frame/ Mounting</b>				
43a	Outdoor use for all types of poles (round or square/rectangular)		Yes	
43b	Easy mounting on pole.		Yes	
43c	Suitable with horizontal and triangle conductors lay out.		Yes	
43d	Frame installed non-insulated from a pole.		Yes	
43e	One hole for earthing connection		Yes	
43f	Frame		hot dip galvanized or stainless steel	
43g	The load break switch supplied complete with galvanized steel brackets, bolts, nuts and washers for mounting on a concrete pole.		Yes	
43h	Frame originated from LBS manufacturer		Mandatory	
43i	The frame or the tank include device for surge arrester installation		Mandatory	
<b>44. Minimum Marking/name plate</b>				
44a	Manufacturer		Yes	
44b	Designation of type and class		Yes	
44c	Serial number		Yes	
44d	Rated voltage		Yes	
44e	Rated impulse withstand voltage		Yes	
44f	Rated frequency		Yes	
44g	Rated normal current		Yes	



No.	Description	Unit	Requirement	Supplier's Offer
44h	Rated short time current		Yes	
<b>Motorisation version</b>				
46a	By adding 24 V DC motor and I/O contacts mechanism directly onto the load break switch		Yes	
<b>46. Remote control version</b>				
46a	By adding 24 V DC motor directly onto the load break switch		Yes	
46b	And a control box at the base of the pole.		Yes	
46c	Control box made of stainless steel		Yes	
46d	Control box IP		55	
46e	3 CT and 3 VT for measurement and records are available.		Yes/No	
46f	3 CT and 3 VT for measurement and fault detection supplied if not already integrated		If Yes, To be specified	
46g	CT ratio		If yes, To be specified	
46h	Power supply description		To be provided	
<b>47. The control box includes</b>				
47a	Battery and whole energy devices (24V)		Yes	
47b	Electrical operation means of the LBS in local mode or by remote control		Yes	
47c	Connection means to the communication network and dialogue with the central remote control		Yes	
47d	Measurement and detection mean of fault currents		Yes	
47e	Current detection means		Yes	
47g	Time storage and transmission means of events that may affect the network or the control box		Yes	
47h	Monitoring means of faults occurring on the MV line or on equipment		Yes	



No.	Description	Unit	Requirement	Supplier's Offer
47i	A general lockable power switch in the front of the panel.		Yes	
47j	Ethernet connection		Yes	
47k	USB socket		Yes	
47l	Alphanumeric display		Yes	
47m	RS232 or 485 or RJ 45 port		To be specified	
47n	Battery operation time	hour	≥ 48	
<b>48. Remote control</b>				
48a	Remote controlled interface		radio, telecommunication line, GSM or smartphone.	
48b	SCADA and mini SCADA operated capability		Mandatory	
48c	Transmission functions for the data exchange with the central remote control shall be applied. - Operation of LBS (Open or closed) - Position of LBS (Open or closed) - Current, voltage, etc. (where applicable) - Fault current and abnormal signalling (where applicable) - Data and events recorded - Power supply failure alarm - Low pressure alarm (if any) - Door opening alarm		Yes Yes To be specified To be specified Yes Yes Yes Yes	
48d	Accessibility and Support: <ul style="list-style-type: none"><li>• Smart phone or PC</li><li>• User/Control Management</li><li>• Geographical information (if any)</li><li>• User operation event record</li><li>• Top up balance in case use local SIM card</li></ul>		yes	
<b>49. Local mode</b>				
49a	synoptic for the visualization of LBS position and local control		Yes	



No.	Description	Unit	Requirement	Supplier's Offer
49b	Possible to view and program the key parameters by alphanumeric display.		Yes	
49c	Verification and programming of complete parameters and configuration shall be done using a laptop PC via an Ethernet connection with a standard web browser or equivalent		Yes	
<b>In case the measurement and records are required, the following data shall be applied.</b>			<input type="checkbox"/>	
<b>50. Events recorded</b>				
50a	Number of dated events to be recorded		1000	
50b	Event in relation with the operation of the control box. They shall be available locally by the configuration laptop		Yes	
50c	Event in relation with the operation of the network. They shall be made available locally by the configuration laptop and/or transmitted to the central remote control.		Yes	
53	All functions of the current measurements and internal parameters: 24V voltage, temperature, etc..., shall be available by local consultation on the display, by configuration laptop and by remote control.		Yes	
<b>51. Fault currents and measures</b>				
51a	Ratio of CT installed on bushings (if any)		To be specified	
51b	Includes a current acquisition module and a voltage acquisition module		Yes	
51c	This fault detector can be configured on site via a laptop.		Yes	
<b>52. Current detection</b>				
52a	Earth/phase faults (configurable thresholds)	A	from 20 to 800	
52b	phase faults: (configurable thresholds:	A	from 500 to 1600	

No.	Description	Unit	Requirement	Supplier's Offer
54	Dimension (L x W x H)	mm	to be specified	
55	Weight	kg	to be specified	
56	Delivered suitably protected in a wooden pallet case suitable to be outdoor stored.		Yes	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , 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.

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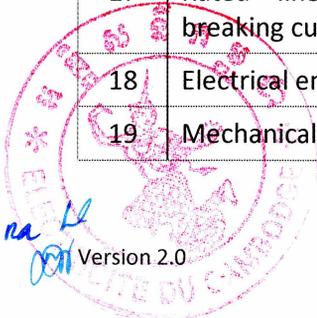
**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

Bidder signature:



## 9.2 Type 1 GIS Sectionalizer

No.	Description	Unit	Requirement		Supplier's Offer
1	Country		to be specified		
2	Manufacturer		to be specified		
3	Manufacturer's reference		to be specified		
4	Type		to be specified		
5	Standards		to be specified		
6	Operating voltage	kV	35	22	
7	Rated voltage	kV	38	24	
8	Rated impulse withstand voltage (1.2/ 50 $\mu$ s) - Phase to earth - Across opening distance	kV	170 195	125 145	
9	Power frequency withstand voltage (1 mn) - Phase to earth - Across opening distance	kV	70 80	50 60	
10	<b>POLE MOUNTED SECTIONALIZER TO BE SUPPLIED</b>		<input type="checkbox"/> 400 A <input type="checkbox"/> 630 A		
11	<b>Version</b>		<input type="checkbox"/> locally operated <input type="checkbox"/> Remote control operated		
12	Rated short time withstand current (1s)	kA	20		
13	Rated short circuit making current (peak)	kA	31.5		
14	Rated mainly active load-breaking current	A	<input type="checkbox"/> 400 <input type="checkbox"/> 630		
15	Rated close loop breaking current equal to active load breaking current		Yes		
16	Rated no load transformer breaking current	A	6		
17	Rated line and cable charging breaking current	A	25		
18	Electrical endurance O.C. cycle		100		
19	Mechanical endurance		M2 class		



No.	Description	Unit	Requirement	Supplier's Offer
20	Degree of tank protection		IP 67	
21	insulating and breaking chamber		SF6 GIS type	
22	SF6 chamber		sealed for life	
23	sealed pressure system according IEC standard 62271		Mandatory	
24	Service life of		25 years without maintenance or SF6 gas refilling	
25	Relative pressure inside the single sealed SF6 breaking chamber		≤ 0.5 bar (20°C)	
26	Tank made of stainless steel		Yes	
27	"Pressurized sealed system" in conformity with the IEC standard.		Yes	
28	Tank fitted with safety valve		Yes	
29	Disconnecting function:		when the separation of the main contacts is certain	
30	Switch position indicator shown by reliable indication		device directly connected to the movable contacts	
31	The position indicator mechanism is simple, robust, and give a true reflection of the main contacts.		Yes	
32	This reliable indicating device is in accordance with IEC 62271 requirements.		Yes	
33	Position indicator: easily visible from the ground despite the climate conditions		yes	
34	Position indicator: comply with the "fully apparent opening" criterion described in the IEC standard		yes	
35	Colours and marking of the position indicating devices for the "open" and "closed" positions shall conform to IEC 73.		Yes	
36	The "closed" position		Marked with "I".	



*na*

No.	Description	Unit	Requirement	Supplier's Offer
36.a	The "open" position		Marked with "O".	
37	SF6 density switch (if any) for Low pressure switch		To be specified	
38	Bushings		silicon or polymer	
39	Bushings creepage distance	mm	≥ 950   ≥ 600	
40	Parts carrying heavy current		copper or copper alloy	
41	Insulating cover for connection		Yes	
<b>42. Mechanism</b>				
42.a	Lever to be easily operated from the ground level by means of a mechanical operating device suitable for 12 m to 14 m concrete poles (total length).		Yes	
42.b	Manual control comprises a tube linkage made of hot dip galvanized steel linked to the independent control, and a handle for manual operations from the base of the pole.		Yes	
42.c	The linkage comprises pipes allowing a simple adjustment to any pole height.		Yes	
42.d	The material shall be hot dip galvanized steel.		Yes	
42.e	Operating handle at about 1,30 meter high from the soil level.		Yes	
42.f	2 or 3 positions operating handle - "open" position and lock the switch in the open position. - "closed" position and lock the switch in the closed position. - "remote control" position enabling remote or local electrical operations using a remote control unit for present or future remote control.		Yes Yes Yes/No	
42.g	Manual operation effort.	daN	≤ 20	
42.h	Lever is isolated from pole and operating rod.		Yes	



No.	Description	Unit	Requirement	Supplier's Offer
42.i	Capable of remote control functions at installation or latter.		Yes	
42.j	Mechanism made by the sectionalizer manufacturer		Mandatory	
42.k	Sectionalizer operation allow the sectionalizer opening during the first or second temporized shut down of the upstream circuit breaker or recloser.		Mandatory	
42.l	Motor used for such automation shall be 24V DC powered and located on the LBS part of the sectionalizer		Yes	
42.m	The control box made of stainless steel contains the battery, the charger and the automation electronic system and any other necessary device.		Yes	
42.n	Battery operation time	hours	≥ 48	
<b>43. Frame/ Mounting</b>				
43.a	Outdoor use for all types of poles (round or square/rectangular)		Yes	
43.b	Easy mounting on pole.		Yes	
43.c	Suitable with horizontal and triangle conductors lay out.		Yes	
43.d	Frame installed non-insulated from a pole.		Yes	
43.e	One hole for earthing connection		Yes	
43.f	Frame		hot dip galvanized or stainless steel	
43.g	The sectionalizer is supplied complete with galvanized steel brackets, bolts, nuts and washers for mounting on a concrete pole.		Yes	
43.h	Frame originated from sectionalizer manufacturer		Mandatory	
43.i	The frame or the tank include device for surge arresters installation		Mandatory	
<b>44. Minimum Marking/name plate</b>				



No.	Description	Unit	Requirement	Supplier's Offer
44.a	Manufacturer		Yes	
44.b	Designation of type and class		Yes	
44.c	Serial number		Yes	
44.d	Rated voltage		Yes	
44.e	Rated power frequency withstands voltage		Yes	
44.f	Rated impulse withstand voltage		Yes	
44.g	Rated frequency		Yes	
44.h	Rated normal current		Yes	
44.i	Rated short time current		Yes	
<b>45. Remote controlled functions</b>				
45.a	By adding (or using the sectionalizer) 24 V motor directly onto the onto the load break switch		Yes	
45.b	And a control box at the base of the pole.		Yes	
45.c	Control box made of stainless steel		Yes	
45.d	Control box IP		55	
45.e	Power supply description		To be provided	
<b>46. The control box includes</b>				
46.a	Battery and whole energy devices (24V)		Yes	
46.b	Electrical operation means of the LBS in local mode or by remote control		Yes	
46.c	Connection means to the communication network and dialogue with the central remote control		Yes	
46.d	Measurement and detection means of fault currents		Yes	
46.e	Current detection means		Yes	
46.g	Time storage and transmission means of events that may affect the network or the control box		Yes	



No.	Description	Unit	Requirement	Supplier's Offer
46.h	Monitoring means of faults occurring on the MV line or on equipment		Yes	
46.i	A general lockable power switch in the front of the panel.		Yes	
46.j	Ethernet connection		Yes	
46.k	USB socket		Yes	
46.l	Alphanumeric display		Yes	
46.m	RS232 or 485 or RJ 45 port		To be specified	
46.n	Battery operation time	hour	≥ 48	
<b>47. Remote control</b>				
47.a	Remote controlled interface		radio, telecommunication line, GSM or smartphone.	
47.b	SCADA and mini SCADA operated capability		Mandatory	
47.c	Transmission functions for the data exchange with the central remote control shall be applied. - Operation of Sectionalizer (Open or closed) - Position of Sectionalizer (Open or closed) - Current, voltage, etc. - Fault current and abnormal signalling - Data and events recorded - Power supply failure alarm - Low pressure alarm (if any) - Door opening alarm		Yes Yes Yes Yes Yes Yes Yes Yes	
47.d	Accessibility and Support: <ul style="list-style-type: none"><li>• Smart phone or PC</li><li>• User/Control Management</li><li>• Geographical information (if any)</li><li>• User operation event record</li><li>• Top up balance in case use local SIM card</li></ul>		yes	
<b>48. Local mode</b>				



*ne*

No.	Description	Unit	Requirement	Supplier's Offer
48.a	synoptic for the visualization of Sectionalizer position and local control		Yes	
48.b	Possible to view and program the key parameters by alphanumeric display.		Yes	
48.c	Verification and programming of complete parameters and configuration shall be done using a laptop PC via an Ethernet connection with a standard web browser or equivalent		Yes	
<b>49. Events recorded</b>				
49.a	Number of dated events to be recorded		1000	
49.b	Event in relation with the operation of the control box. They shall be available locally by the configuration laptop		Yes	
49.c	Event in relation with the operation of the network. They shall be made available locally by the configuration laptop and/or transmitted to the central remote control.		Yes	
49.d	All functions of the current measurements and internal parameters: 24V voltage, temperature, etc..., shall be available by local consultation on the display, by configuration laptop and by remote control.		Yes	
<b>50. Fault currents and measures</b>				
50.a	Ratio of CT installed on bushings (if any)		To be specified	
50.b	Includes a current acquisition module and a voltage acquisition module		Yes	
50.c	This fault detector can be configured on site via a laptop.		Yes	
<b>51. Current detection</b>				
51.a	Earth/phase faults (configurable thresholds)	A	from 20 to 800	



No.	Description	Unit	Requirement	Supplier's Offer
51.b	phase faults: (configurable thresholds:	A	from 500 to 1600	
52	Dimension (L x W x H)	mm	to be specified	
53	Weight	kg	to be specified	
54	Delivered suitably protected in a wooden pallet case suitable to be outdoor stored.		Yes	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , 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.

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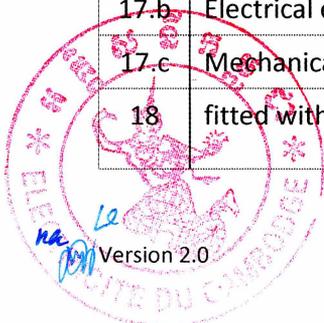
**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

Bidder signature:



### 9.3 Type 2 Air Pole Mounted Load Break Switch, 22kV

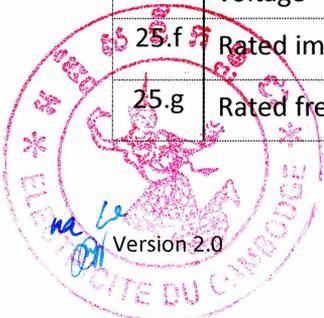
No.	Description	Unit	Requirement	Supplier's Offer
1	Country		to be specified	
2	Manufacturer		to be specified	
3	Manufacturer's reference		to be specified	
4	Type		to be specified	
5	Standards		to be specified	
6	Operating voltage	kV	22	
7	Rated voltage	kV	24	
8	Rated impulse withstand voltage (1.2/ 50 $\mu$ s) - Phase to earth - Across opening distance	kV	125 145	
9	Power frequency withstand voltage (1 mn) - Phase to earth - Across opening distance	kV	50 60	
10	Rated short time withstand current (rms 1s)	kA	10	
10.a	Peak withstand current	kA	25	
11	Rated carrying capacity	A	200	
12	Rated mainly active load-breaking current	A	$\geq 50$	
13	Rated close loop breaking current	A	200	
14	Rated no load transformer breaking current	A	4	
15	Rated line and cable charging breaking current	A	10	
16	Rated short circuit making current (peak)	kA	25	
17	Insulation and breaking of		air type	
17.a	blade movement for opening/closing		vertical	
17.b	Electrical endurance C.O cycles		100	
17.c	Mechanical endurance C.O cycles		1000	
18	fitted with		fast action breaking device	



No.	Description	Unit	Requirement	Supplier's Offer
			that shall allow the arc breaking	
18.a	LBS operation independent of the operator action		Yes	
19	disconnecting function		by the separation of main contacts	
19.a	When open, the contacts shall be separated of	mm	≥ 300	
20	The open position of the three poles		clearly visible from the ground without any doubt	
21	Insulators made of		Porcelain, silicon or composite	
21.a	Terminal pads for connection of aluminum copper bimetallic lugs		Yes	
21.b	Diameter of hole	mm	13	
21.c	6 x M12 x 40 mm stainless steel bolt		to be provided	
22	Insulators Creepage distance	mm	600	
<b>23. Mechanism</b>				
23.a	Lever to be easily operated from the ground level by means of a mechanical operating device suitable for 12 to 14 m concrete poles (total length).		Yes	
23.b	Manual control comprises a tube linkage made of hot dip galvanized steel linked to the independent control, and a handle for manual operations from the base of the pole.		Yes	
23.c	The linkage comprises pipes allowing a simple adjustment to any pole height.		Yes	
23.d	The material shall be hot dip galvanized steel.		Yes	
23.e	Operating handle at about 1,30 meter high from the soil level.		Yes	
23.f	2 positions operating handle			



No.	Description	Unit	Requirement	Supplier's Offer
	"open" position and lock the switch in the open position.		Yes	
	"closed" position and lock the switch in the closed position.		Yes	
23.g	Position of switch		visual position of the three contact and knives in Open or Closed position from the ground level.	
23.h	Operating lever isolated from pole and operating rod		Yes	
<b>24. Frame/ Mounting</b>				
24.a	Outdoor use for all types of poles (round or square/rectangular)		Yes	
24.b	Easy horizontal pole top mounting		Yes	
24.c	Suitable with horizontal conductors lay out.		Yes	
24.d	Frame installed non-insulated from a pole		Yes	
24.e	One hole for earthing connection		Yes	
24.f	Frame		hot dip galvanized or stainless steel	
24.g	The load break switch supplied complete with galvanized steel brackets, bolts, nuts and washers for mounting on a concrete pole.		Yes	
<b>25. Minimum Marking/name plate</b>				
25.a	Manufacturer		Yes	
25.b	Designation of type and class		Yes	
25.c	Serial number		Yes	
25.d	Rated voltage		Yes	
25.e	Rated power frequency withstands voltage		Yes	
25.f	Rated impulse withstand voltage		Yes	
25.g	Rated frequency		Yes	



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No.	Description	Unit	Requirement	Supplier's Offer
25.h	Rated normal current		Yes	
25.i	Rated short time current		Yes	
26	Dimension (L x W x H)	mm	to be specified	
27	Weight	kg	to be specified	
28	Delivered suitably protected in a wooden pallet case suitable to be outdoor stored.		Yes	

Supplier's offer column must be properly filled with the right figures. "Compliant, Yes, ", V , 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.

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**Full technical information shall be supplied within the bid. If not the offer shall not be considered**

Bidder signature:



*Handwritten signature in blue ink.*