



PROVINCIAL ELECTRICITY AUTHORITY

POWER SYSTEM STANDARD DIVISION

DISCONNECTING SWITCH AND EARTHING SWITCH FOR INSTALLATION IN 115 kV SUBSTATIONS

Specification No. RPRO-031/2556

Approved date : 29 ม.ค.2556

Rev. No. : 1

Form No. 07-5_SUB

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Invitation to Bid No.:

C Material, equipment and specifications for DISCONNECTING SWITCH AND EARTHING SWITCH FOR INSTALLATION IN 115 kV SUBSTATIONS

C1 General material and packing instructions

Additional to the general instructions, the following shall be observed:

1a Scope

These specifications cover disconnecting switch and earthing switch suitable for outdoor installation in 115 kV 50 Hz substations.

1b Standard

The switches shall be manufactured and tested in accordance with the **latest edition** of the following standards:

IEC 62271-102 : High-voltage switchgear and controlgear
Part 102: Alternating current disconnectors and earthing switches

And all other relevant standard, unless otherwise specified in these specifications.

PEA will accept the type tests reports carried out according to previous standard/edition, if there is no significant change in any item or no additional test item compared with the last standard/edition.

On the other hand, if there are significant(s) and/or additional test item(s), PEA will remain to accept the type tests report which was carried out according to previous standard/edition for a period of three (3) years. After three (3) years, the type testing shall be done to complete type test reports for the changed and/or additional test item(s), including related item(s) (if any).

1c Principal requirement

1c.1 General

The disconnecting switch shall be designed to be remote controlled from Area distribution Dispatching Center, from substation control room or manually at device level.

The disconnecting switch and earthing switch with all associated equipment shall be designed and constructed for outdoor installation and operation and shall be capable of continuous operation at the specified ratings under the stated site conditions.

The supplier of the disconnecting switch and earthing switch and all associated equipment shall furnish all materials and necessary hardware, special tools for installation, commissioning, operation and maintenance and shall furnish all drawings, detailed descriptions and instructions for installation and operation of the complete disconnecting switch and earthing switch and their auxiliaries.

1c.2 Site and service conditions

The disconnecting switch and earthing switch shall be designed and constructed for outdoor installation on solid hot-dip galvanized steel supporting structures mounted on concrete foundations as shown in drawing No.OOF14N and No.OOF17N and operation under the following conditions:

Altitude	: up to 1,000 m above sea level
Ambient air temperature	: 40 ^o C maximum
Relative humidity	: up to 94%
Seismic activity	: 0.1g
Climatic condition	: tropical climate

Therefore disconnecting switch and earthing switch will have to be protected against pollution, heat and corrosion.

1c.3 Disconnecting switch and earthing switch characteristics

1c.3.1 Operating mechanism

The operating mechanism for the disconnecting switch shall be motor operated, for three phases operation. It will be remotely, from control room or area control center, or locally controlled.

The earthing switch shall be local/manual operated only.

Electrical positive interlocking shall be provided on each disconnecting switch to prevent its opening or closing if the associated circuit breaker is closed. This function shall be carried out by the hard wired and CSCS control system.

The schematic control of the disconnecting switch is shown in drawing No.OOT 32N.

The disconnecting switch shall be three-pole, rotating insulator, horizontal double-side break type.

The three poles of the switches shall be grouped and motor operated by a common operating mechanism.

The motor-operated mechanism shall be suitable for operation at 125 V DC. It shall be amply rated to perform the full closing and opening duties without vibrations or surges under the most severe conditions which could occur in service.

The operating mechanism shall be contained in a weather-proof housing with IP 55 class, or better according to IEC 60529 with a lockable hinged door at the front. The housing of the operating mechanism shall be mounted on the supporting framework of the switches in a permanently accessible position, permitting the easy and simultaneous transmission of the movements to all poles without excessive or localized stresses.

The operating mechanism shall be such that every power operation is completed upon one initiation, independently of the operator, and that subsequent initiations when the operation is in progress will neither affect its proper completion nor damage the equipment.



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All switches shall be equipped with a manual emergency operating mechanism. The manual operating mechanism shall be of torsional type for rotating insulators. The manually gang-operated mechanism shall effect a thoroughly smooth controlled movement throughout the entire operating cycle.

The operating handle shall be provided for each switch and shall be mounted on the steel supporting structures at approximately 1.25 m above ground level. Each mechanism shall be provided with an indicator showing, for rotating insulators, the direction of rotation for opening and closing, for grounding, and for padlocking in open and closed position.

The mechanism shall be provided with an electrical interlock to cut-out the motor on manual operation. Anti-condensation heater with hygrostat shall be provided in the operating mechanism housing wherever necessary.

1c.3.2 Mechanical requirements

Each disconnecting switch and earthing switch shall be positively mechanically and electrically interlocked with the corresponding disconnecting switch and earthing switch to prevent from closure of the grounding blades when the main blades are closed and closure of the main blades when the ground blades are closed. Local indication of a “safe to operate” status shall be provided.

When the earthing switch is not associated with a disconnecting switch, it will be electromechanical interlocked to prevent from mis-operation. Padlocking facilities shall be provided on the disconnecting switch and earthing switch for locking the equipment in open and closed positions.

All steel parts shall be hot-dip galvanized according to ASTM specifications after all machining and threading operations have been completed or shall be made of stainless steel.

The switches shall be designed to prevent any changing of the switch position during short-circuit conditions as rated in clause 1c.3.4. Vibration of the contacts shall not be permissible.

Exposed contacts shall be self-wiping, silver to silver and maintenance free. All other current carrying contacts shall be silver to silver, unless sealed and insulated from contamination and corrosion.

Internal sealed contacts may be either silver to silver or silver to copper. All exposed contacts, both fixed and movable, shall be replaceable in the field.

The contact finger shall be reverse loop design.

The current-carrying contacts of the switches shall be of the self-aligning, positive pressure type and shall provide self-cleaning by the wiping action of the moving contacts passing into position.

The shape of the contacts shall be such as to avoid pitting by possible residual discharge currents, and shall permit easy replacement of any element.

All pins of rotating and moving elements shall be of stainless steel. The rotating insulator columns shall be supported by ball or roller-bearings, ensuring a smooth movement at any time and under any circumstances, even after long periods of non-operation. Bearing shall be permanently lubricated to eliminate future lubrication and maintenance.

The current-carrying sections fixed on the insulators and all switch bearings and gears shall be contained in weather proof casings to ensure maximum permanent protection and efficiency.

All moving parts shall be properly balanced so that the disconnecting switch can be smoothly operated along the entire closing and opening movement without vibrations or shock.

The current-carrying blades and the earthing blades shall be self-locking both in the open and the closed positions and the position of the switch shall not be effected by gravity, wind pressure, vibration or by forces caused by the current flowing through the blades.

The columns of each pole shall be mounted on a common sturdy base frame of hot-dip galvanized steel channels, also supporting the earthing blades, where applicable. The shape of the base-frame shall prevent any accumulation of water, dust and other things which might impair the free movement of the switch elements. It shall also permit easy access at any time to the casings of the column bearings.

Material, dimensions, general contour, structural and mechanical and electrical characteristics of the insulators shall be in compliance with relevant IEC or ANSI standard. The colour of all insulators shall be brown.

1c.3.3 Electrical requirements

The main blades of all switches shall be of adequate strength and current carrying capacity conforming to the maximum rating of the switches.

The disconnecting switches shall be capable for loop current switching (on and off) in case of load transfer by means of bus coupler bay without interruption of any bay as per IEC 62271-102 (see **C3 Schedule of detailed requirement**).

Each earthing switch shall be designed to withstand full short-circuit current in the closed position.

The earthing switch shall be such designed that they firmly connect the builder or current path, directly to earth. During maintenance, there shall be no isolated dead part of current path left unearthing through earthing switch.

Each disconnecting switch and earthing switch mechanism shall be provided with a mechanically driven auxiliary switch with all necessary contacts for proper motorized disconnect operation, line and earthing switch, remote indication and control, local indication and control. All contacts shall be rated 10 A continuous, 50 A make at 125 V DC ungrounded circuit. Eight (8) normally closed and eight (8) normally open auxiliary contacts shall be provided for PEA future use.

The auxiliary switch shall be supplied in the weather-proof housing IP 55 class, or better and shall be located in an easy accessible position.

The auxiliary switch shall be wipe type self cleaning. In case of auxiliary relays are required for auxiliary contacts extension in remote control cubicle. Only mechanical latching relay type shall be acceptable.

Electronic device and Print Circuit Board (PCB) to control disconnecting switch operation in the local control cabinet **is not acceptable**.

The earthing switch shall also be capable of breaking the current induced from the parallel lines in accordance with IEC 62271-102.

1c.3.4 Ratings and features

The switches shall have rating at least as specified in **Table 1**.

Table 1

Rating and features of the 115 kV disconnecting switch with/without earthing switch and earthing switch

Description	Unit	Rating and features
Applicable standard	-	IEC 62271-102
Nominal rated voltage	kV r.m.s.	115
Maximum rated voltage	kV r.m.s.	123
Power frequency	Hz	50
Number of phases	-	3
Power frequency withstand voltage in 1 minute:		
- phase to earth	kV r.m.s.	230
- across open switching device	kV r.m.s.	265
Lightning impulse withstand voltage:		
- phase to earth	kV peak	550
- across open switching device	kV peak	630
Maximum radio interference level	μV	2,500
Rated current of the disconnecting switch:		
- line	A r.m.s.	2,000
- coupler and transfer bays	A r.m.s.	2,000
- transformer bays	A r.m.s.	2,000
Rated short time withstand current in 1 second	kA r.m.s.	40
Rated short circuit current	kA peak	100
Mechanical endurance class of the disconnecting switch	-	M0
Electrical endurance class of the earthing switch	-	E0

Description	Unit	Rating and features
Operating mechanism: - main blade - earthing blade	- -	Three-pole/motor Three-pole/manual
Power supply voltage for motor	V DC	125
Equipment minimum clearance (metal to metal): - between phase to phase - between phase to earth	mm mm	1,400 1,100
Creepage distance between live parts and ground (see C3 Schedule of detailed requirement)	mm (mm/kV)	3,070 or 3,810 (25 or 31)
Terminal connectors (NEMA Pad)	-	4-hole
Supporting insulators (Post type insulators)	-	IEC or ANSI
Porcelain insulator color	-	Brown

1d Packing

Each individual package (e.g., box, crate, case, bundle, or piece of loose material) on each shipment shall be paintly tagged and/or marked according and corresponding to the Invoice and Packing list for easy identification.

In case of supplying more than one (1) switch set, parts belong to different switch sets **must not be** packed in the same package. The packages shall be lettered and numbered by the supplier to designate switch-package number/total number of the package of each switch set being shipped;

For example: two (2) switch sets are supplied,

A-1/5, A-2/5,, A-5/5 for the first switch set.

B-1/7, B-2/7,, B-7/7 for the second switch set.

Spare parts and special tools, if ordered, shall be separately packed in other packages on which the words “**SPARE PARTS**” and “**SPECIAL TOOLS**” package number/total number of the packages being shipped shall be marked.

1e Tests and test reports

The switches shall be passed the manufacturer’s standard routine tests, and also passed of the routine tests in accordance with the latest IEC 62271-102 as follows:

- a) Dielectric test on the main circuit
- b) Dielectric test on auxiliary and control circuits
- c) Measurement of the resistance of the main circuit
- d) Design and visual check
- e) Mechanical operating tests



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The switches shall be passed the type tests in accordance with the latest IEC 62271-102 as follows :

- a) Dielectric tests
- b) Radio interference voltage (RIV) test
- c) Measurement of the resistance of circuits
- d) Temperature-rise tests
- e) Short-time withstand current and peak withstand current tests
- f) Operating and mechanical endurance tests (for disconnecting switches only)
- g) Bus transfer current switching tests (for disconnecting switches with bus transfers only)
- h) Induced current switching tests (for earthing switches only)

The supporting insulators (post type insulators) shall be passed the routine tests and the type tests in accordance with the relevant IEC or ANSI standard.

All items of the type tests shall be conducted by the acknowledged independent testing laboratories.

The following independent testing laboratories accepted by PEA:

- KEMA : KEMA Laboratories (HOLLAND)
- V' Fall : Statens Vattenfallsverk, The Swedish State Power Board (SWEDEN)
- CRIEPI : Central Research Institute of Electric Power Industry (JAPAN)
- EdF : Electricite de France (FRANCE)
- CESI : Centro Elettrotecnico Sperimentale Italiano (ITALY)
- PLI : Powertech High Power Laboratory (CANADA)
- TCA : Testing and Certification (AUSTRALIA)
- OHT : Ontario Hydro Technologies (CANADA)
- EGAT : The Electricity Generating Authority of Thailand (THAILAND)
- : Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University (THAILAND)
- SATS : Scandinavian Association for Testing Electric Power Equipment (NORWAY)
- ASTA : ASTA Certification Services (UK)

The bidder are at liberty to quote the switches which are tested by the other independent testing laboratories not mentioned above, but have to be subjected to approval of PEA before the tests are proceeded and before the bid closing date.

PEA will also accept type test reports accordance with the relevant IEC standard conducted by the manufacturer or other independent testing laboratories not mentioned above. In this case the bidder shall submit evidence of the manufacturing experience of at least twenty (20) years of the switches used in 115 kV or higher system voltage.

PEA will also accept the switches have been supplied to PEA and get the order from PEA's Procurement Department (From PEA's Head Office), without test reports by laboratories mentioned above.



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The type test certificate or test reports shall be submitted with the bid or **within fifteen (15) calendar days** after the bid closing date. The Item offered without submitting the type test reports shall be rejected.

The cost of all tests and report, including the tests and reports for acceptance inspection, shall be borne by the Contractor.

PEA reserves the right to send the representatives at PEA's expense to inspect and witness test of the material and equipment during manufacturing, at the time of shipment or at any time he deems necessary. The supplier shall provide free access to the facilities here the equipment is being manufactured and shall satisfy the representatives that the material and equipment are in accordance with this specification and the purchase contract.

C2 Material and packing data to be given by bidder

The bidder has to submit the following data and details with the bid:

2a Design data and guarantee of the switches (see detail in Table 2 and Table 3)

2b Details, catalogues and/or drawings with dimensions in mm, of:

- Complete set of the switches arranged on supporting structures
- Single pole switch unit
- Supporting structures
- Principle of operation
- Nameplate with inscriptions
- Interlocks
- Auxiliary switch units
- Etc.

2c Description of materials, and surface treatment used for the component parts of the switches and accessories, as follows:

- Insulators
- Blades
- Contacts
- Arcing horns
- Terminal pads
- Operating mechanism
- Bearings
- Etc.

2d List of routine tests

2e Type test certificates or test reports

2f List of spare parts with itemized prices

2g List of special tools for installation, commissioning, operation and maintenance with itemized prices

2h Packing details

Packing method (shown by drawing(s) and describe packing materials)

Number of units, pieces, or sets in each package

Dimensions (L x W x H) of each package in cm

Volume of each package in m³

Gross weight of each package in kg

Number of packages

If several packages are contained in one big case, further details are required:

Number of packages in each case

Dimensions of each case in cm

Volume of each case in m³

Gross weight of each case in kg

Number of cases



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Note: Conditions for documentation and consideration

1. The Contractor has to supply the following documents in **English and/or Thai**, before shipment/delivery, as follows:

1.1 Documents which shall be sent to PEA for approval before shipment:

- a) Reports of type test and routine test
- b) Three (3) sets of details and drawing's according to **2b**, schematic diagram, internal wiring diagram and terminal diagram
- c) Three (3) sets of instruction book for installation, operation, and maintenance

The above documents shall be sent to the following address:

Substation Construction and Maintenance Department

Provincial Electricity Authority
200 Ngam Wong Wan Road, Chatuchak
Bangkok Metropolis 10900
Thailand

1.2 Documents which shall be packed together with each set of the switch:

- a) One (1) set of "drawing of the switch" set arranged on supporting structures, with part list
- b) One (1) set of instruction book for installation, operation, and maintenance
- c) One (1) set of routine test

2. The Bidder has to submit sufficient reference describing the previous experience of the manufacturer (e.g. list of supply of equipment and/or materials having the same or similar design as proposed, field experience, the registration of TISI, the copies of license, and/or the inspection to supplier's factory by PEA's inspectors etc.) to the satisfaction of PEA.

3. Delivery time, and prices of spare parts and special tools are also important factors to be considered.

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Table 2

Design data and guarantee of 115 kV disconnecting switches with/without earthing switches

Description	Unit	Required Data	Proposed Data
Manufacturer	-	-	
Manufacturer's type/model	-	-	
Complete with earthing switch	YES/NO	-	
Complete with bus transfer	YES/NO	-	
Standard of the switch	-	IEC 62271-102	
Type tested certificate or report	YES/NO	YES	
Type test report No.	-	-	
Nominal rated voltage	kV r.m.s.	115	
Maximum rated voltage	kV r.m.s.	123	
Rated frequency	Hz	50	
Number of phases/Class	-	3/Outdoor	
Type of the disconnecting switch	-	Horizontal double-side break	
Power frequency withstand voltage in 1 minute:			
- phase to earth	kV r.m.s.	230	
- across open switching devices	kV r.m.s.	265	
Lightning impulse withstand voltage:			
- phase to earth	kV peak	550	
- across open switching devices	kV peak	630	
Maximum radio interference level	μ V	2,500	
Rated current of the disconnecting switch:			
- line	A r.m.s.	2,000	
- coupler and transfer bays	A r.m.s.	2,000	
- transformer bays	A r.m.s.	2,000	
Rated short time withstand current in 1 second	kA r.m.s.	40	
Rated short circuit current	kA peak	100	
Mechanical endurance class of the disconnecting switches	-	M0	
Electrical endurance class of the earthing switches	-	E0	
Equipment clearance (metal to metal):			
- between phase to phase	mm	1,400	
- between phase to earth	mm	1,100	
- between contacts in open position	mm	-	
Creepage distance between live parts and ground	mm (mm/kV)	3,070 or 3,810 (25 or 31)	
Terminal connectors (NEMA Pad)	-	4-hole	



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Description	Unit	Required Data	Proposed Data
Supporting insulators (Post type insulators)	-	IEC or ANSI	
Porcelain insulator color	-	Brown	
Operating mechanism:			
- main blade	-	Three-pole/motor	
- earthing blade	-	Three-pole/manual	
Motor drive:			
- Power supply voltage for motor	V DC	125	
- Nominal power consumption	W	-	
Hand operating facilities	YES/NO	YES	
Auxiliary switches:			
- number and type (NO/NC) of used auxiliary contacts	pcs/pcs	-	
- number and type (NO/NC) of spare auxiliary contacts for future use	pcs/pcs	8 NO/8 NC	
- voltage	VDC	125	
Protection class of housing operating mechanism and auxiliary switch	-	IP 55	
Seismic activity	-	0.1g	
Overall dimensions of the switch as per Drawing No.:			
- length with earthing switch	mm	-	
- length without earthing switch	mm	-	
- width with earthing switch	mm	-	
- width without earthing switch	mm	-	
- height with earthing switch	mm	-	
- height without earthing switch	mm	-	
Weight of the switch:			
- with earthing switch	kg	-	
- without earthing switch	kg	-	
Admissible horizontal pull on the main terminals, under dynamic short-circuit conditions	N	-	
Kind of current carrying elements bridging the movable linkages	-	(no stranded wires permissible)	
Opening time of the isolator	s	-	
Closing time of the isolator	s	-	
Number of switch-off operations between two inspections for changing the main contacts	-	-	
Contact finger design	-	Reverse loop design	
Final contact engagement and contact pressure	-	By axis rotation of blade	
Material of main contacts	-	-	



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Description	Unit	Required Data	Proposed Data
Voltages drop across main contacts per phase at rated continuous current	V	-	
Temperature rise of contacts at rated continuous current	K	-	
Foundation Drawing No:	-	-	
Weight of the heaviest part to be handled during general inspection	kg	-	
Time for changing all main contacts of the complete three-pole isolator	hours	-	
Erection time at site	days	-	

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Table 3

Design data and guarantee of 115 kV earthing switches

Description	Unit	Required Data	Proposed Data
Manufacturer	-	-	
Manufacturer's type/model	-	-	
Standards of the switch	-	IEC 62271-102	
Type tested certificate or report	YES/NO	YES	
Type test report No.	-	-	
Nominal rated voltage	kV r.m.s.	115	
Maximum rated voltage	kV r.m.s.	123	
Rated frequency	Hz	50	
Number of phases/Class	-	3/Outdoor	
Type of the earthing switch	-	-	
Power frequency withstand voltage in 1 minute:			
- phase to earth	kV r.m.s.	230	
- across open switching devices	kV r.m.s.	265	
Lightning impulse withstand voltage:			
- phase to earth	kV peak	550	
- across open switching devices	kV peak	630	
Rated short time withstand current in 1 second	kA r.m.s.	40	
Rated short circuit current	kA peak	100	
Equipment clearance (metal to metal):			
- between phase to phase	mm	1,400	
- between phase to earth	mm	1,100	
- between contacts in open position	mm	-	
Creepage distance between live parts and ground	mm (mm/kV)	3,070 or 3,810 (25 or 31)	
Supporting insulators (Post type insulators)	-	IEC or ANSI	
Porcelain insulator color	-	Brown	
Operating mechanism :	-	Manual	
Hand operating facilities	YES/NO	YES	
Seismic activity	-	0.1g	
Overall dimensions of the switch as per Drawing No.:			
- length	mm	-	
- width	mm	-	
- height	mm	-	
Weight of the earthing switch	kg	-	

C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
1	1040050200	set(s)	Disconnecting switch without earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : not less than 2,000 A Creepage distance between live part : not less than 3,070 mm and ground
2	-	1 lot	Spare parts for the disconnecting switch in item 1
3	-	1 lot	Special tools for the disconnecting switch in item 1
4	1040050201	set(s)	Disconnecting switch <u>with</u> earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : not less than 2,000 A Creepage distance between live part : not less than 3,070 mm and ground
5	-	1 lot	Spare parts for for the disconnecting switch with earthing switch in item 4
6	-	1 lot	Special tools for item the disconnecting switch with earthing switch in item 4
7	1040050202	set(s)	Disconnecting switch without earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : not less than 2,000 A Creepage distance between live part : not less than 3,810 mm and ground
8	-	1 lot	Spare parts for the disconnecting switch in item 7
9	-	1 lot	Special tools for the disconnecting switch in item 7
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C3 Schedule of detailed requirement

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Item	PEA Material No.	Quantity	Description
10	1040050203	set(s)	Disconnecting switch <u>with</u> earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : not less than 2,000 A Creepage distance between live part : not less than 3,810 mm and ground
11	-	1 lot	Spare parts for the disconnecting switch with earthing switch in item 10
12	-	1 lot	Special tools for the disconnecting switch with earthing switch in item 10
13	1040050204	set(s)	Earthing switch, three pole, single insulator per pole, with hand operate, with: Nominal rated voltage : 115 kV Creepage distance between live part : not less than 3,070 mm and ground
14	-	1 lot	Spare parts for the earthing switch in item 13
15	-	1 lot	Special tools for the earthing switch in item 13
16	1040050205	set(s)	Earthing switch, three pole, single insulator per pole, with hand operate, with: Nominal rated voltage : 115 kV Creepage distance between live part : not less than 3,810 mm and ground
17	-	1 lot	Spare parts for the earthing switch in item 16
18	-	1 lot	Special tools for the earthing switch in item 16
II			



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Item	PEA Material No.	Quantity	Description
19	1040050206	set(s)	Disconnecting switch <u>with</u> bus transfer, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : not less than 2,000 A Creepage distance between live part : not less than 3,070 mm and ground
20	-	1 lot	Spare parts for the disconnecting switch with bus transfer in item 19
21	-	1 lot	Special tools for the disconnecting switch with bus transfer in item 19
22	1040050207	set(s)	Disconnecting switch <u>with</u> bus transfer, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : not less than 2,000 A Creepage distance between live part : not less than 3,810 mm and ground
23	-	1 lot	Spare parts for the disconnecting switch with bus transfer in item 22
24	-	1 lot	Special tools for the disconnecting switch with bus transfer in item 22
			<p>Note:</p> <ol style="list-style-type: none"> 1. Enclosed Drawings No.OOF14N, No.OOF17N, and No. OOT32N 2. The bidders have to quote the unit costs. 3. The bidders have to quote spare parts and special tools with their lists of quantities and itemized prices, if any. The prices of the spare parts and special tools shall not be taken into consideration for the purpose of the bid evaluation; and PEA reserves the right to purchase some or all of items, to adjust their quantities, or to cancel them.
			II



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C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1040050200		Disconnecting switch without earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : A Creepage distance between live part : mm and ground	set(s) 1 lot		
2	-		Spare parts for the disconnecting switch in item 1 (give detail)	1 lot		
3	-		Special tools for the disconnecting switch in item 1 (give detail)			
4	1040050201		Disconnecting switch <u>with</u> earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : A Creepage distance between live part : mm and ground	set(s)		
5	-		Spare parts for for the disconnecting switch with earthing switch in item 4 (give detail)	1 lot		
6	-		Special tools for item the disconnecting switch with earthing switch in item 4 (give detail)	1 lot		
	II					



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C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
7	1040050202		Disconnecting switch without earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : A Creepage distance between live part : mm and ground	set(s)		
8	-		Spare parts for the disconnecting switch in item 7 (give detail)	1 lot		
9	-		Special tools for the disconnecting switch in item 7 (give detail)	1 lot		
10	1040050203		Disconnecting switch <u>with</u> earthing switch, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : A Creepage distance between live part : mm and ground	set(s)		
11	-		Spare parts for the disconnecting switch with earthing switch in item 10 (give detail)	1 lot		
12	-		Special tools for the disconnecting switch with earthing switch in item 10 (give detail)	1 lot		
	II					



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C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
13	1040050204		Earthing switch, three pole, single insulator per pole, with hand operate, with: Nominal rated voltage : 115 kV Creepage distance between live part : mm and ground	set(s)		
14	-		Spare parts for the earthing switch in item 13 (give detail)	1 lot		
15	-		Special tools for the earthing switch in item 13 (give detail)	1 lot		
16	1040050205		Earthing switch, three pole, single insulator per pole, with hand operate, with: Nominal rated voltage : 115 kV Creepage distance between live part : mm and ground	set(s)		
17	-		Spare parts for the earthing switch in item 16 (give detail)	1 lot		
18	-		Special tools for the earthing switch in item 16 (give detail)	1 lot		
II						



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C4 Price schedule

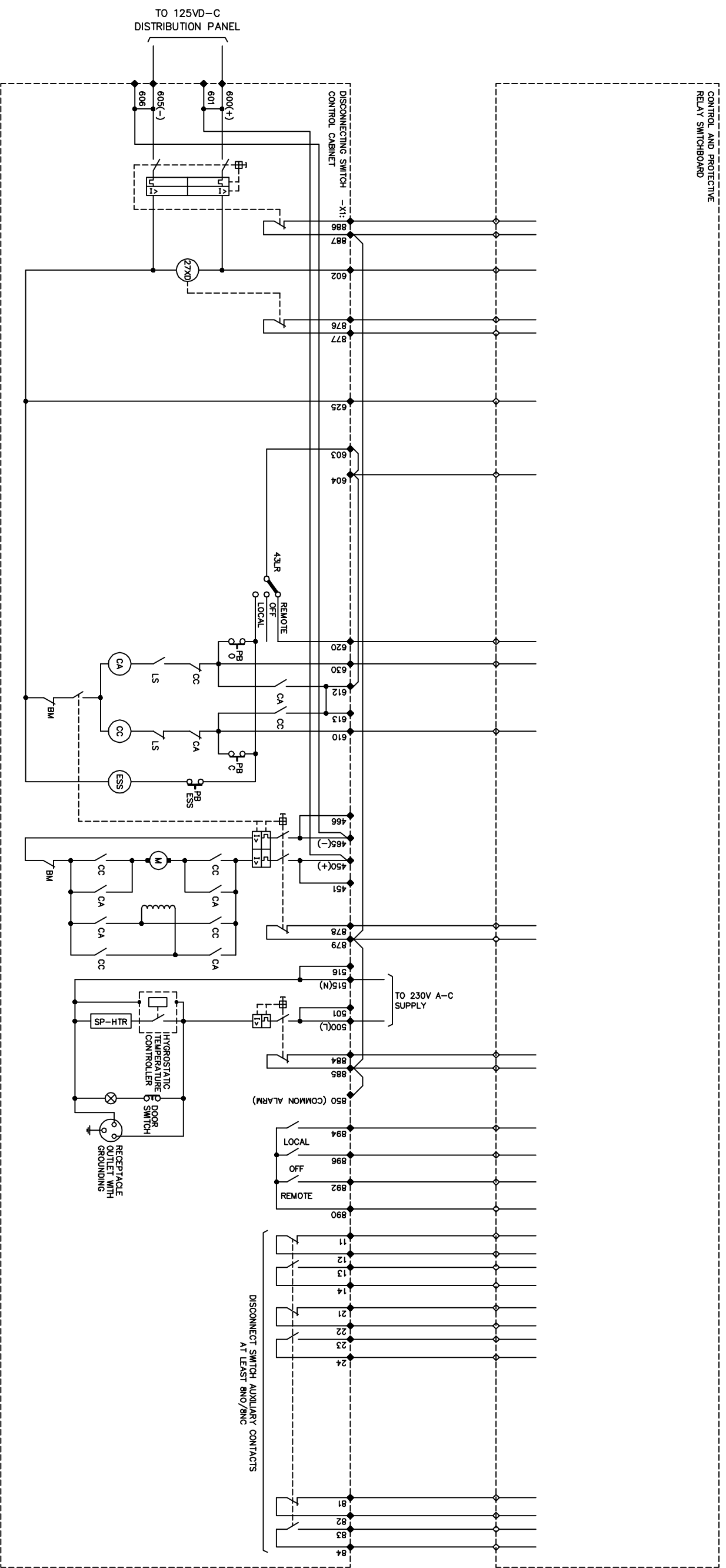
Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
19	1040050206		Disconnecting switch <u>with</u> bus transfer, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : A Creepage distance between live part : mm and ground	set(s)		
20	-		Spare parts for the disconnecting switch with bus transfer in item 19 (give detail)	1 lot		
21	-		Special tools for the disconnecting switch with bus transfer in item 19 (give detail)	1 lot		
22	1040050207		Disconnecting switch <u>with</u> bus transfer, three pole, rotating insulator, three insulator per pole, with hand operate and motor drive, with: Nominal rated voltage : 115 kV Rated current : A Creepage distance between live part : mm and ground	set(s)		
23	-		Spare parts for the disconnecting switch with bus transfer in item 22	1 lot		
24	-		Special tools for the disconnecting switch with bus transfer in item 22	1 lot		
	II					



DEVICES	EXPLANATION
43LR PB C PB O	CONTROL SELECTOR SWITCH THREE-POSITION "REMOTE-OFF-LOCAL" PUSHBUTTON SWITCH FOR CLOSING THE MOTOR OPERATED DISCONNECT SWITCH PUSHBUTTON SWITCH FOR OPENING THE MOTOR OPERATED DISCONNECT SWITCH
CC CA BM LS	CLOSING COIL OPENING COIL MECHANICAL CONTACT, OPEN WITH INSERTED THE MECHANICAL CONTROL LEVER LIMIT SWITCH

DEVICES	EXPLANATION
M SP-HTR	D-C DRIVING MOTOR, 125V SPACE HEATER FOR PREVENTION OF MOISTURE CONDENSATION INSIDE DISCONNECT SWITCH CONTROL CABINET, AND SHALL BE CONTROLLED BY THE HYDROSTATIC TEMPERATURE CONTROLLER.
27XD PB ESS	CABINET INTERIOR LIGHT LOSS OF D-C POTENTIAL ALARM RELAY WITH PROVISION FOR SLOW DROP-OUT. THE RELAY SHALL BE PROVIDED WITH TWO ELECTRICALLY SEPARATED NORMALLY CLOSED CONTACTS FOR ALARM PUSHBUTTON SWITCH FOR ENERGIZING THE ESS RELAY THIS RELAYS WILL BE PROVIDE AND OPERATED TO PERMIT THE MANUAL OPERATION OF THE MAIN BLADES

NOTE

THIS D-C SCHEMATIC DIAGRAM IS INTENDED TO SHOW FUNCTIONAL CONTROL AND PROTECTION AND EXTERNAL INTERFACE TERMINAL NAME REQUIREMENTS ONLY. ACTUAL SCHEMATIC DIAGRAM CORRESPONDING TO THIS FUNCTIONAL REQUIREMENTS SHALL BE DESIGNED BY THE MANUFACTURER.

REFERENCE DRAWINGS

- TYPICAL SUBSTATION INSTALLATION
- CONTROL, SELECTOR, CUTOFF AND PUSHBUTTON SWITCHES..... 00T18N
- ESCUTCHION PLATES AND CONTACT TABULATION
- INTERPOSING RELAY CIRCUITS FOR SUBSTATION CONTROL SWITCH FUNCTIONS..... 00T16N

NO.	DATE	REVISION	REV.
D	16/02/12	SPECIFICATION IMPROVEMENT 2nd ISSUE	
C	04/07/11	AS KUALIFIKANT COMMENTS	
B	01/07/11	SPECIFICATION IMPROVEMENT 1st ISSUE	
A	21/09/03	1st ISSUE FOR REVIEW	

DESIGNED	KAMPORN	22/03/2554	
CHECKED			
APPROVED			
POSITION	SIGNATURE	DATE	SCALE
			NOT TO SCALE
<p>115 kV MOTOR OPERATED DISCONNECT SWITCHES TYPICAL D-C SCHEMATIC CONTROL</p>			

AT AT Consultants Co., Ltd. Electricite de France
CONSULTING SERVICES FOR SUBSTATION DESIGN AND
STANDARD DRAWING AND SPECIFICATION PREPARATION

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