



Tender (SELCo 05/2015) **Technical Specifications**

Lote 1 Cables and Conductors:

1. Aerial Bundle Cables (ABC Cables)

General

The Aerial Bundle Cable shall be 600/1000 V grade cross-link polyethylene and shall be of the types and construction stated in the Schedules. All cables shall be manufactured and tested to the CENELEC HD 626. Cables shall be designed for a maximum continuous conductor temperature of 90 C°, and for operation on a system with the neutral solidly earthed.

The cable shall be of self supporting type where all conductors share the load; i.e. no messenger wire or reinforced neutral conductor shall be used alone for suspension of the cable.

Conductors

The conductors shall be hard drawn stranded aluminum and shall comply with all the requirements of IEC 60228.

Insulation

The materials used in the manufacture shall be black weather-resistant cross-linked polyethylene with a high resistance to ultra violet radiation. The insulation shall fit closely on but shall not adhere to the conductors.

Cable Identification

An approved method of identifying the manufacturer and year of manufacture shall be provided throughout the length of all cables. The cable shall be numbered longitudinally.

Core Identification

Identification of individual cores of the cable shall be by longitudinal ridges on the insulation and shall be provided throughout the length of all cables.

Testing

All cables, accessories and materials shall be subjected to and satisfactorily withstand the test requirements specified herein. All materials shall withstand such routine tests as are customary in the manufacture of the cables and accessories included in the Contract.



Sealing and Drumming

The cable shall be wound on to a strong non-returnable drum with enclosed flanges and barrel arranged to take a round spindle of a section adequate to support the loaded cable drum during installation and handling. The drum shall be lagged with strong closely fitting battens, which shall be securely fixed to prevent damage to the cable. Wooden drums shall be constructed of seasoned timber to prevent shrinkage of drums during shipment and subsequent storage on site. Each drum shall be clearly marked in a manner that cannot be obliterated with the particulars of the cable, including voltage, length, conductor size, number of cores gross and net weights, together with direction for rolling.

The ends of the cables shall be sealed by enclosing them in approved caps, tight fitting and adequately secured to prevent the ingress of moisture.

The end of the cable left projecting from the drum shall at all times be securely protected against damage.

Each Drum shall contain 0.5 km quantity

2. 600/1000V, underground cable 2*6 mm² Cu

Cable 2x6mm²/Cu

Insulation level 1000 Volt

Over Head Use

Insulation Material Extruded XLPE

Average insulation thickness 0.8mm

Sheathing Material-Green Extruded PVC

Thickness of oversheath 1.8 mm.

Approximate overall diameter 12 mm.

No. of Cores 2

Comply with IEC 60228

Operating Temp. -20 - +90C°

Longitudinal Numbering Each meter

Packing and Drumming 500m/drum

3. 600/1000V, under ground cable 4*10 mm² Cu

Cable 4x10mm²/Cu

Insulation level 1000 Volt

Over Head Use

Insulation Material Extruded XLPE

Average insulation thickness 0.8mm

Sheathing Material-Green Extruded PVC

Thickness of oversheath 2 mm.

Approximate overall diameter 18 mm.

No. of Cores 4

Comply with IEC 60228

Operating Temp. -20 - +90C°



Longitudinal Numbering Each meter
Packing and Drumming 500m/drum

4. 600/1000V, under ground cable 4*16 mm² Cu

Cable 4x16mm²/Cu
Insulation level 1000 Volt
Over Head Use
Insulation Material Extruded XLPE
Average insulation thickness 0.8mm
Sheathing Material-Green Extruded PVC
Thickness of oversheath 2 mm.
Approximate overall diameter 20 mm.
No. of Cores 4
Comply with IEC 60228
Operating Temp. -20 - +90C°
Longitudinal Numbering Each meter
Packing and Drumming 500m/drum

5. Stranded Cu PVC covered 95 mm², green/yellow for earthing and outdoor usage

Conductor material	Copper
Conductor flexibility	Flexible Stranded class 5
Insulation	PVC
Sheath color	Green / Yellow
Lead free	Yes
Number of cores	1
Nominal sectional area	95 mm ²
Construction of conductor	485x0.5
Diameter of conductor	15.1 mm
Nominal Insulated thick mm	1.6 mm
Approximate Weight	980 Kg/Km
Overall Diameter	18.3 mm
Maximum DC Resistance at 20 C	0.206 ohm/km
Min insulated resistance at 70MΩ/km	0.0035
Longitudinal Numbering	Each meter
Packing and Drumming	500m/drum

6. Solid copper wire 1.5 mm²

Conductor material	Copper
Conductor flexibility	Solid class 1
Insulation	PVC
Sheath color	Green / Yellow
Number of cores	1
Nominal sectional area	3/171.5 mm ²



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Nominal Insulated thick mm	0.7 mm
Weight Kg/km	20 Kg/Km
Overall Diameter	3 mm
Packing and Drumming	100m/roll

**Lote 2 switches :****1. Switch-Disconnectors 33 kV with load breaking head, 3-phase, complete**

Item	Particulars	Unit	Required Specifications
1	Rated Voltage		33
2	Maximum Service Voltage	KV	36
3	Rated Frequency	Hz	50
4	Rated continuous current by 45 oC ambient temperature	A	630
5	Breaking Capacity	A	200
6	Rated shortcircuit current 1 sec.	kA	16
7	Impulse withstand voltage		
	(a) To earth	KV	170
	(b) Across the isolating distance	KV	195
8	Maximum temperature rise over current carrying parts	oC	90
9	Creepage distance across Polymeric insulator	mm	1050
10	Maximum bending torque at base of support insulator	KN	4
11	Equipped with Top and side mounting accessories including manual handle	Yes/No	Yes
12	3 separate, single pole	Yes/No	Yes
13	Arch champer	Yes/No	Yes

2. 36 KV Pole Mounted SF6 Switch Disconnecter**1- Site And Design Particular****1.1 Site Conditions**

The site conditions shall be assumed to be as follows:

	Description	Unit	Value
1-	Altitude of site above sea level	m	- 400 to 1000
2-	Ambient Temps: Maximum	C°	50
	Minimum	C°	- 5
3-	Wind Speed	m/s	15
4-	Isokeraunic Level		15
5-	Pollution Type		Level 3



6-	Relative Humidity Maximum	%	100
	Minimum	%	< 10
7-	Rainfall Average Annual	mm	600
8-	Hail		Yes
9-	Fog		Yes
10-	Sand Storms		Occasional

1.2 Electrical Design Data

	Description	Unit	Nominal Voltage Level
1-	Nominal system voltage phase to phase	KV	33
2-	Highest system voltage phase	KV	36
3-	System frequency	Hz	50
4-	System earth	---	Solid
5-	Impulse withstand voltage (1.2/50 u sec wave)	KV peak	170
6-	Power frequency withstand voltage 1 minute	KV	70
7-	Assumed highest switching surge		3.5

1.2 Fundamentals For The Design:

In complying with the requirements of the specifications, both with respect to arrangement and details, design is to conform to the best current engineering practice.

The materials are to be of the manufacturer's standard design provided that this design in general accordance with the specifications.

The essence of design should be simplicity and reliability in order to give long continuous service with high economy and low maintenance cost. The design, dimensions and materials of all parts are to be such that they will not suffer damage as a result of stresses under the most severe service conditions.

Fully detailed specifications of the materials are to be submitted describing particularly the materials to be used. The materials used in the manufacture of the items supplied are to be of the highest quality and selected particularly to meet the duties required of them.

Workmanship and general finish are to be of the highest class throughout.

2. Galvanizing

Galvanizing shall be applied by the hot dipped process. The preparation for galvanizing and the galvanizing process shall not affect the mechanical properties of the materials being coated.

Drilling, punching, cutting, bending, removal of burrs and all machining shall be completed before galvanizing.

The zing coating shall be smooth, clean, uniform thickness and free from defects. The preparation for galvanizing and the galvanizing itself shall not adversely affect the mechanical properties of the coated materials.

All galvanized steel, which has been cut, drilled or worked on site shall be painted with an



approved zing rich paint.

The average thickness of the zing coating shall be equivalent to not less than 0.6 kg/m² of zing for all surfaces, except steel wires, bolts and nuts. Galvanizing will be tested in accordance with appropriate British or an equivalent standard in order to determine that it complies with this requirement.

The thickness of the zing coating for steel wires shall be in accordance with a national standard and shall be approved by the Engineer. All galvanized wires on which tools have been used or cut shall be treated with approved bitumastic paint.

All bolts and screwed rods for the connection of galvanized steel parts shall be galvanized including the threaded portion (s) to a minimum average coating weight of 305 g/m². the threads of all bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for clearing the threads unless specially approved by the Engineer. All nuts shall be galvanized with the exception of the threads, which shall be oiled.

White rust formation subsequent to galvanizing must be inhibited using an approved inhibitor applied according to the manufacturer's instructions.

General Specifications

Description	Specifications
Switch Type	On-Load switch disconnecter (SF6)
Number of Poles	3
Rating KV Amps KA	36 KV working voltage 33 KV 630 Amps 16 KA / 1 seconds

Insulators	Specifications
Type	Anti – Fog insulators (silicone)
Mini Creepage (mm)	1080 mm
Impulse Rating (KV)	170

Interrupters	Specifications
Type	
Breaking capacity (Amps)	630 Amps

Main Mechanism	Specifications
Control Box for (local & Remote Operation)	Most Important
Type of mechanism	Rural Pattern Manual Reciprocating, and automatic through motor
Auxiliary Switches	Required
Interlocks	Required (most important)
Additional Items	Padlocking Facility

Mounting	Horizontal
Support Steel Work	Suitable for mounting on Steel lattice Pole



Connectors	Connector Pad Beimetalic AL/CU cable shoe suitable for connecting between the line & the switch
Insulating Link	Required
Phase Centers	(900) mm
Mounting Height	12 Meters

3.0 Particular Specifications

3.1 General

- On load switch must be with high speed closing & opening arrangements.
- The remote control of the switch should comprise mainly of the following:
ON/OFF Operation of the switch.
Switch status.
Low gas alarm contact.
Local/Remote Switched.
Control Locked/unlocked.
- The enclosure of the control box with motor controlling device should be made of Polycarbonate Plastic and should be protected to IP65-Outdoor. The recommended auxiliary voltage is 24 VDC.
- The tank of the SF6 switch should fulfill the requirement of "sealed pressure system" of the standard IEC 56. The switch should be designed according to IEC 129, IEC 265-1, and IEC 694.

3.2 The control box of the switch should consist of the following:

1. ON/OFF Bush buttons.
2. ON/OFF Indication lamps.
3. Low pressure indication lamp.
4. ON/OFF Auxiliary terminals.
5. Battery 24 Volts – 12AH.
6. Power supply (220AC /27DC Volts).
7. Terminals for remote (Closing/Opening).
8. Local Remote Switch.
9. Local Remote indication terminals.

3.3 Auxiliary voltage transformer:

The AC power supply for the control cabinet should be through 500VA single pole transformer from 33KV/0.230KV, suitable for solidly earthed network.

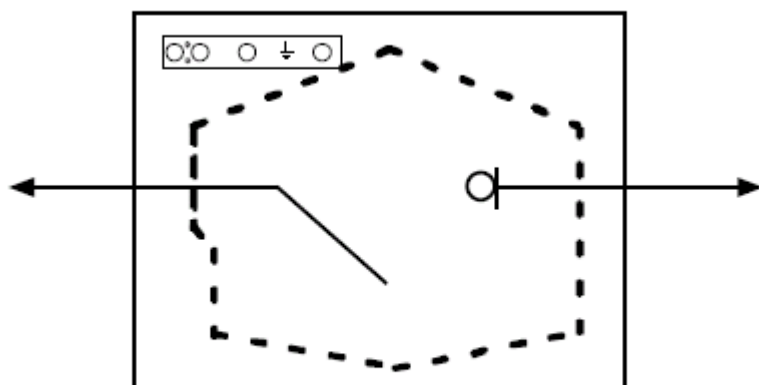


Fig.1: Two way - Two Position



Lote 3 accessories :

1. Stay Wire 8mm

The stay wires shall be hot dip zinc-coated and manufactured from steel. They shall be in accordance with internationally recognized Standard. Such information shall be submitted with the Bid. The wire shall have the following dimensions and strength:

Calculated approximate diameter	8.0 mm
Cross sectional area	52 mm ²
Class	6X7
Rated breaking strength	70 kN
Number of strands	6X7
Approximate Mass	237 kg/km
Packing and Drumming	0.5 km/drum

2. Lightning Arresters 33kV, set of three phase

Design

This section covers the design, manufacture and testing of lightning arresters for outdoor service.

The arresters shall be capable of protecting the following equipment:

- Transformers which are directly connected to a line
- Transformers which are connected to a line via cables
- Capacitors
- Cables
- Autoreclosers and sectionalisers
- Circuit breakers and isolators
- Instrument transformers

The outdoor lightning arresters shall be of the metal oxide gap-less type, complying with IEC 60099-4.

The lightning arresters shall have the following characteristics:

Description	Unit	Nominal voltage level
Rated voltage of arrester	KV	39
Nominal discharge current (8.20 μs)	KA	10
Class Distribution Min. protective ratio		1.2

The arresters shall be designed horizontally or vertically (standing or hanging) in standard lattice towers. The arresters shall be supplied complete with fixing materials and connection clamps.

The lightning arresters shall be fitted with a pressure relief device.

All arresters shall be fitted with incorrodible metal nameplates which are visible when the arrester is completely mounted and which clearly indicate the data specified in IEC in engraved or embossed characters.

All external ferrous parts shall be hot-dip 10/17galvanised.



Protection Characteristics

This is a combination of the following:

- Maximum residual voltage for steep current impulse (1/20 μ s)
- Maximum residual voltage for current impulses with waveform (8/20 μ s) and 0.5, 1.0 and 2.0 times nominal current
- Maximum residual voltage for switching impulse (30-100/60-200 μ s)

The protection level for lightening impulse is the highest of

- maximum residual voltage for steep current impulse divided by 1.15

and

- maximum residual voltage at nominal current and 8/20 μ s

The protection level for switching impulse is the maximum residual voltage at the specified switching impulse current.

The protection level shall have at least a margin of safety of 30 % compared to the BIL of the arrester housing.

Energy Requirements

The lightning arresters shall be designed to minimum line discharge class 2 according to IEC 99-4 for heavy duty arresters.

Housing

The outer housing shall be of a silicone rubber material offering high resistance to pollution. The specific creepage distance for any arrester shall not be less than 31 mm/kV system voltage, corresponding to heavy pollution according to IEC.

Tests

Lightning arresters offered or supplied to this specification shall comply with the tests detailed in IEC 99-4 including wet tests and any additional tests specified. Tests shall include requirements set out in the following:

Certified copies of type test reports shall be submitted with the bid and shall include calibrated oscillogram demonstrating that each type of arrester offered complies with the minimum specified requirements. The catalogue numbers applicable to each arrester shall appear on the oscillogram. The time to spark-over applicable to each test involving spark-over of the series gap shall be clearly shown.

Bidder should state what routine tests are carried out to prove the effectiveness of the seals of the arresters.

Bidder should state what tests are carried out to prove the capabilities of the arresters to withstand the effects of a multiple lightning strike.



3. Outdoor termination kit for 36kV, under-ground cable, single core 1x95mm² Al (XLPE/PVC) (Set of 3 phases) & Straight joint for 36kV, under-ground cable, single core (35-150)mm² Al (XLPE/PVC)

The Tender shall submit with his Tender drawings showing the types of joints proposed for the cable. The joints shall include the suitable sleeves for connecting the cable conductors.

The joints shall be of a watertight, “pull-over” heat shrink type (Raychem or similar) without molding, free from sharp points or ridges, thoroughly clean internally and externally. The sleeves shall be of sufficient diameter and length to permit color-to-color jointing without undue bending, handling or deformation of the cores.

Terminations

Detailed drawings showing the types of cable sealing ends, terminal boxes and glands and overhead line terminations shall be submitted to the Purchaser for approval.

Stress cones or other approved means shall be provided for grading the voltage stress on the core insulation of screened cables.

Terminations for Medium Voltage cable shall be of an appropriate heat shrink design (Raychem or similar) incorporating a suitable arrangement of stress control, and rain-sheds for outdoor use

Termination kits shall include suitable heat shrink tubing to effectively shroud, seal and insulate the exposed cable conductor and connector.

Terminations into cable boxes shall include brass compression glands and back nuts of the correct size, which shall secure the cable outer sheath and ensure effective electrical continuity between the cable armoring wires and the metal enclosures on which the cable is terminated. At all rising terminations the cable inner sheath shall pass through the gland to terminate not less than 6 mm above the gland.

Provision shall be made for earthing all sealing end base plates, cable boxes, glands and armor clamps.

Instructions

As soon as possible after the commencement of a contract and before materials are dispatched, copies of the jointing and termination instructions applicable to the joints and terminations to be supplied shall be submitted in English to the Purchaser for approval, together with details of the physical and electrical characteristics of the filling medium proposed.

Materials

Sets of jointing materials for terminating cables shall be complete with all miscellaneous jointing materials to complete the termination. One set of materials shall be sufficient for terminating one end of the cable or cables specified into one joint box. Each set of jointing materials shall be packed as one complete self-contained unit package.



Heat Shrink Materials

Heat shrink tubing and molded parts shall be flexible, flame retardant, polyolefin-based material of electrical insulating quality, and shall be obtained from an approved manufacturer. They shall be suitable for outdoor use in the conditions prevailing on site.

Each part shall bear the manufacturer's mark, part number and any other necessary markings to ensure correct identification for use on the correct size and type of cable. Each set of parts shall be packed as one unit with full and complete installation instructions and clearly marked to show the application.

The material shall reduce to the predetermined size and shape when heated above 120C°. The components shall also be provided with an internal coating of hot melt adhesive compound that shall not flow or exude at temperature below 85 C°. All parts and materials shall be tested to a program of tests to be agreed with the manufacturer.

4. Molded Case Circuit Breakers MCCB

3 poles Molded Case Circuit Breakers

All MCCBs shall conform to relevant standards IEC-60947-1& 2/IS-13947-1& 2.

70% - 100% adjustable overload

Adjustable short circuit setting.

Thermal-Magnetic protection

Minimum Current breaking capacity for each breaker as indicated in BOQ

Handle positions ON/OFF/TRIPPED

The MCCB comprises of switching mechanism, contact system, arc extinguishing device and tripping unit all contained in a compact Molded Case and Cover.

The insulating case and cover are made of high strength, heat resistant, flame retardant resin bonded thermo setting material which provides:-

- Interphase insulation of a high dielectric strength, making the MCCB considerably compact and light weight.
- The insulated enclosure with high withstand capacity against thermal and mechanical stresses.
- Protection against secondary fire hazards.
- Increased safety of operating personnel.

Standard conformity : IEC 60947-1& 2/IS:13947-1 & 2

Rated Operational Voltage : 415V AC

Rated Insulation Voltage : 690V AC

Type of release : Theromagnetic

Utilisation category : A

Rated Frequency : 50/60Hz

Ambient temp. : 40 C°

Operating altitude : 2000 meters

Humidity : 0 - 90%

Rated Impulse Voltage : 8 KV

Manufacturer catalogue shall be submitted with the tender for the offered items



5. Three phase 3 poles 380 VAC Contactor, 80A

Description	Specification
Rated voltage	230/400v
Rated current (Ith)	80 A
Utilization category	AC-3
Poles description	3P
Power pole contact composition	3 NO
[Ue] rated operational voltage	≤ 690 V AC for power circuit
[Ie] rated operational current	80 A (≤ 60 °C) at ≤ 440 V AC AC-3 for power circuit
Control circuit type	AC 50 Hz
Control circuit voltage	400 VAC , 50Hz
Auxiliary contact composition	1 NO + 1 NC
[Uimp] rated impulse withstand voltage	8 kV conforming to IEC 60947
Overvoltage category	III
Irms rated making capacity	1100 A at 440 V for power circuit conforming to IEC 60947
Rated breaking capacity	1100 A at 440 V for power circuit conforming to IEC 60947

6. BBI46 box (350x495x150)mm

The required box shall be made of Acrylonitrile Butadiene Styrene with polycarbonate cover, the base / cover attaching screws shall be suitable to be sealed by the technicians.

Specifications:

Cover	Transparent
Base	Gray
Dimensions (W x L x H)	350x495x150 mm ³
Min. IP	65
Cover / base attachment	Screw type
CB window	Closed
Prepayment meter card & bush button	Closed
Mounting plate	Required
CB Holder	Not Required

7. BBI4 box (250x350x150)mm

The required box shall be made of Acrylonitrile Butadiene Styrene with polycarbonate cover, plastic mounting base plate and circuit breaker holder attached with Din rail is required with the box. The base / cover attaching screws shall be suitable to be sealed by the technicians.

Specifications:

Cover	Transparent
Base	14/17 Gray



Dimensions (W x L x H)	250x350x150 mm ³
Min. IP	65
Cover / base attachment	Screw type
CB window	Open with cover
Prepayment meter card & bush button	Open with cover

8. Insulated self-piercing Tap connectors for ABC

These shall be manufactured and designed so as to provide facilities for taking services from the conductor run. These should also be suitable for aluminum to aluminum or aluminum to copper connection. These shall be fully insulated piercing clamps. All clamps shall be equipped with torque controlled bolts.

9. ABC Suspension Clamp for 4x150+2x25 mm² Al

Suspension clamp for all cable conductors
Suitable for cable Range 4x150+2x25 mm²
Used with M16 pigtail bolt
Metal parts Consist of hot dip galvanized steel and zinc-plating
Rubber insert part and weather resistant bushing.

10. ABC Suspension Clamp for 4x95+2x25 mm² Al

Suspension clamp for all cable conductors
Suitable for cable Range 4x70+2x25 – 4x95+2x25 mm²
Used with M16 pigtail bolt
Metal parts Consist of hot dip galvanized steel and zinc-plating
Rubber insert part and weather resistant bushing.

11. ABC Suspension Clamp for 4x50+2x25 mm² Al

Suspension clamp for all cable conductors
Suitable for cable Range 4x25 – 4x50+2x25 mm²
Used with M16 pigtail bolt
Metal parts Consist of hot dip galvanized steel and zinc-plating
Rubber insert part and weather resistant bushing.

12. Tension anchor for ABC cable 4x150 mm² Al

Anchoring clamp suitable for 4 conductors
Suitable for cable 4x150 mm²
Used with M16 pigtail bolt
Metal parts Consist of hot dip galvanized steel and zinc-plating
Rubber insert part and weather resistant bushing.
Complies with standard VDE 0211

13. Tension anchor for ABC cable 4x95 mm² Al

Anchoring clamp suitable for 4 conductors



Suitable for cable Range 4x70 – 4x95 mm²

Rupture: 4000 kg

Used with M16 pigtail bolt

Metal parts Consist of hot dip galvanized steel and zinc-plating

Rubber insert part and weather resistant bushing.

Complies with standard VDE 0211

14.Tension anchor for ABC cable 4x50 mm² Al

Anchoring clamp suitable for 4 conductors

Suitable for cable Range 4x25 – 4x50 mm²

Rupture: 3000 kg

Used with M16 pigtail bolt

Metal parts Consist of hot dip galvanized steel and zinc-plating

Rubber insert part and weather resistant bushing.

Complies with standard VDE 0211

15.Compression terminal lug for 150mm² conductor, Cu with 13mm hole

COPPER COMPRESSION CABLE LUGS

For the connection of Cu conductors to copper bus bars.

Materials: E-Cu, DIN 40500/3 F-25

Conductor Cross sectional area is 150 mm²

Conductor diameter is 14.5 mm

Crimping sleeve length is 40 mm

Bolt hole diameter is 13 mm

16.Compression terminal lug for 95mm² conductor, Cu with 13mm hole

COPPER COMPRESSION CABLE LUGS

For the connection of Cu conductors to copper bus bars.

Materials: E-Cu, DIN 40500/3 F-25

Conductor Cross sectional area is 95 mm²

Conductor diameter is 11.5 mm

Crimping sleeve length is 40 mm

Bolt hole diameter is 13 mm

17.Compression terminal lug for 70mm² conductor, Cu with 13mm hole

COPPER COMPRESSION CABLE LUGS

For the connection of Cu conductors to copper bus bars.

Materials: E-Cu, DIN 40500/3 F-25

Conductor Cross sectional area is 70 mm²

Conductor diameter is 9.7 mm

Crimping sleeve length is 30 mm

Bolt hole diameter is 13 mm

18.Compression terminal lug for 35mm² conductor, Cu with 13mm hole

COPPER COMPRESSION CABLE LUGS 16/17



For the connection of Cu conductors to copper bus bars.

Materials: E-Cu, DIN 40500/3 F-25

Conductor Cross sectional area is 35 mm²

Conductor diameter is 7 mm

Crimping sleeve length is 20 mm

Bolt hole diameter is 13 mm