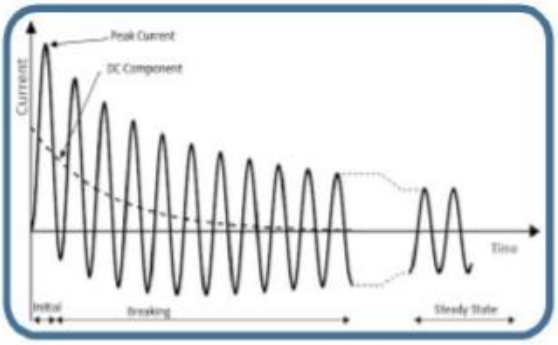
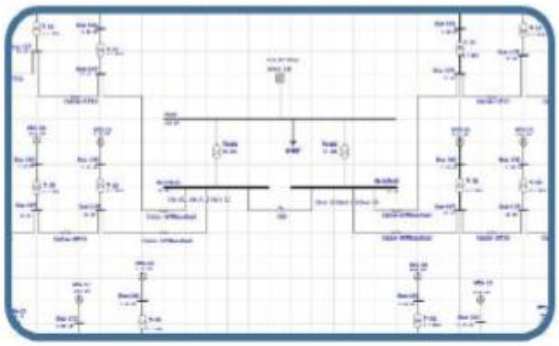
Cable list

طراحی و مستندسازی سیستم توزیع و شبکه کابل پروژه نورد وایر شرکت فولاد آلیاژی ایران





شرکت فولاد آلیاژی ایران (سهامی عام)	مونتکو ایران Monenco Iran	**Client Code**:	**REV: A0**
		Monenco Code: MT-DST-IASC-2009-DD-11-GD-001	
		Title: Cable Specifications	**Page: 1 of 41**

TECHNICAL SPECIFICATION OF MV CABLE & ACCESSORIES

Introduction

This document covers the technical specifications of MV cable systems. In this compilation, all necessary notes for preparing the technical specifications of MV cable systems are presented. Additionally, the required tables for completion are included following the explanations.

Table of Contents

1. Scope

This specification includes the construction, dimensions and test requirements of power cable for installation such as distribution network or industrial installations. Cable system shall be all cables, cable trays/ladders, cable sealing ends and cable accessories. Cables for rated AC voltage from 1 KV (U_m = 1.2 KV) up to 30 KV (U_m = 36 KV) designed and tested in accordance with this document can be used.

2. General Overview

- Cables must be designed, manufactured, and tested in accordance with the standards for cable systems.
- These specifications cover the minimum requirements for the design, testing, marking, and preparation for transportation of the cables.
- Any exceptions and discrepancies from these specifications and established standards must be clearly and specifically stated.

3. Reference Standards

Table 3-1: Reference Standards

Title	Relevant Standard
Extruded Solid Dielectric insulated power cables for rated voltage from 1 kV u to 30 kV	IEC 502
Test method for insulations and sheaths of electric cables and cords (elastomeric and thermoplastic comounds)	IEC 540
IEC Standard Voltage	IEC 38
Conductors of insulated cables (Guide to the dimensionallimits of cicular conductors)	IEC 228A
Guide to the selection of high – voltage cables	IEC 183
Tests method for insulation and sheaths of electric cables and cords	IEC 60811
International electrotechnical vocubulary	IEC 60050
Impulse test on cables and their accessories	IEC 230

Table 3-1: Reference Standards

Title	Relevant Standard
cables with extruded insulation and their accessories	IEC 840
High-voltage test techniques – Part 1 General definitions and test requirements	IEC 60-1
Conductors of insulated cables	IEC 228
Tests on cable oversheaths which have a special protective function and are applied by extrusion	IEC 229
Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre- mixed flame	IEC 332-1-2
Common test methods for insulating and sheathing materials of electric cables	IEC 811
Electrical test methods for electric cables – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables	IEC 885-3
Short-circuit temperature limits of electric cables with rated voltages from 6 kV (Um 7,2 kV) up to 30 kV (Um =36 kV)	IEC 986

All units used in this documentation, procedures, and tests must be in accordance with the International System of Units (IS).

4. Ambient Conditions

The equipment must be able to work under the following ambient conditions covering all the required design data (so the derated power of the machine shall be equal to the required nominal power).

Altitude above sea level	1250m
Outdoor Ambient temperature (min. / max.)	-16 °C / 55 °C
Outdoor design temperature	40°C
Temperature of switchgear room (min. / max.)	-10 °C / 50 °C
Indoor Design temperature	35°C
Relative humidity	<70%
Pollution (IEC 60815)	Very Heavy
Spec. creepage distance (IEC 60815)	31 mm/KV

5. Seismic Level

Base acceleration parameter A=0,25g

Response spectrum fuction:

$B=1+S(T/To)$ when $0 \leq T \leq To$

$B=S+1$ when $To \leq T \leq Ts$

$B=(S+1)(Ts/T)2/$ when $T \geq Ts$

$To=0.1$ $Ts=0.5$ $S=1.5$

Soil Type	type II
Importance of building	Group 3
Structure behaviour factor	R=2.
% of Live Loads to consider	60 %
% of Snow Loads to consider	20 %

6. Data of MV 33 kV Electrical Network

Maximum permissible system voltage	33 kV
Lightning Impulse withstand voltage	170 kV
Short duration power frequency withstand voltage	70 kV
Nominal voltage	33 Kv ±10 %
Frequency	50 Hz ±1 %
Neutral earthing system	Zig – Zag 2000A
Earth fault duration	<5 s
Rated short time withstand current	31.5 kA
Rated duration of short circuit	3 s
Rated peak withstand current	89 kA

7. Data of MV 6.6 kV Electrical Network

Maximum permissible system voltage	7.2 kV
Lightning Impulse withstand voltage	75 kV
Short duration power frequency withstand voltage	28 kV
Nominal voltage	6.6 Kv ±10 %
Frequency	50 Hz ±1 %
Neutral earthing system	NGR 400A
Earth fault duration	<5 s
Rated short time withstand current	31.5 kA
Rated duration of short circuit	3 s
Rated peak withstand current	89 kA

8. Specifications of Cables

8.1. General

Design, material and manufacture requirements and characteristics demanded to the equipment inside the scope of supply are hereafter described.

Single-core or Three-core cables MV cables, stranded annealed copper conductors, dry cured crosslinked polyethylene (XLPE) or hard ethylene (HEPR) insulated, individual screen, galvanized steel wire armoured (SWA) (and AWA for single core cables) in case of direct buried, and PVC over-sheathed (N2XY (RM)).

8.2. Design Data for MV Cables:

Medium Voltage Cables (33kV) shall be as following:

Insulation voltage	26/45 kV
Core	single / three core
Conductor	copper round stranded wire, according to IEC 60228, class 2
Conductor size for three core cables	≤70 mm2
Conductor size for single core cables	95 to 630 mm2
Max - conductor load temp.	90ºC
Short circuit temp.	250ºC
Core insulation	XLPE, cross-linked polyethylene HEPR, hard ethylene
Semiconductive layer	Extruded layer of semi-conductive Material between conductor and insulation and between insulation and screen.
Metallic Screen	Copper wire helicoidal layer
Sheath colour	Red

Medium Voltage Cables (6,6kV) shall be as following:

Insulation voltage	6/10 kV
Core	single / three core
Conductor	copper round stranded wire, according to IEC 60228, class 2
Conductor size for three core cables	≤70 mm2
Conductor size for single core cables	95 to 630 mm2
Max - conductor load temp.	90ºC
Short circuit temp.	250ºC
Core insulation	XLPE, cross-linked polyethylene HEPR, hard ethylene
Semiconductive layer	Extruded layer of semi-conductive Material between conductor and insulation and between insulation and screen.
Metallic Screen	Copper wire helicoidal layer
Oversheath insulation	PVC-ST2
Sheath colour	Red

8.3. Conductor Material

The conductors must be made of copper or aluminum and consist of stranded wires in accordance with the standards for cables such as IEC 60228.

All the materials used in the manufacturing of the assembly shall be new, without deterioratin , appropriate for the work.

8.4. Conductor screen

The conductor screen shall be consist of extruded semi-conducting compound.

8.5. Electrostatic Shieldinng of the Conductor

To prevent electrical discharge between the conductor and the insulation due to surface irregularities of the conductor, a semiconductive layer must be applied over the conductor. The properties and thickness of this layer must comply with the standards for cables.

8.6. Insulation

The cable insulation must be made of materials specified in the standards for cables and must withstand the specified rated temperature without causing any damage to the cable. The insulation must be free from any contamination, and the supplier must provide all information and documentation clarifying the methods and quality control measures used to ensure these conditions. The insulation thickness must be calculated considering the minimum voltage gradient at which breakdown occurs and in compliance with the standards for cables.

All M.V cables shall have XLPE insulation. There are different methods to XLPE curing such as Silane X-linking (curing or crosslinking the polymer by exposure to moisture), dry curing in Nitrogen gas which is at high pressure and high temperature. But only dry curing is acceptable. Also it is recommended XLPE process line will be catenary dry cure or vertical dry cure type but not Horizontal steam type.

8.7. Electrostatic Shielding of the Insulation

To prevent electrical discharge in the voids between the single conductors, an electrostatic shield must be applied over the insulation to confine the electric field within the insulation of each conductor. This layer must have uniform thickness throughout and comply with the standards for cables.

8.8. Metallic Electrostatic Shielding

For MV cables the metallic sheath shall be supplied. It may be copper wires or tape. This shielding must be applied over the electrostatic insulation shield, either individually on each conductor or over the combined three conductors. The shielding should consist of copper wires with a specified cross-sectional area, arranged concentrically, and covered with a copper tape in a spiral pattern. This layer must comply with the standards for cables.

8.9. Armor

If present, the armor must be made of galvanized round steel wire supplemented by a helix tape to keep the armor wire tight. But for single core cables the armor shall be made of non-magnetic material. The thickness of the steel tape or wire used for the armor must comply with the specified standards.

8.10. Non-Metallic Outer Sheath

The cables must be equipped with a non-metallic outer sheath. The material and thickness of this sheath must comply with the standards for medium-voltage cables. The sheath must withstand its rated temperature, and its uniformity along the length of the cable, as well as its minimum thickness, must also adhere to the specified standards.

8.11. Filler

In multi core cables, the interstices between the cores shall be filled with suitable material compatible with insulation and operating temperature of the cables.

8.12. Bedding

The bedding under armor shall be extruded or lapped layer of PVC or synthetic tapes.

9. Design

9.1. General requirements

The size and type of the cables shall be so selected that does not exceed the limiting temperature and current carrying capacity specified by IEC standards for site condition. For selecting cables the following factors shall be considered:

- Continuous current carrying capacity by considering the feeder permissible over loads
- Short circuit capacity
- Voltage drop

Table 9-1 below states the maximum permissible continuous and transient conductor temperature for various types of cable insulation.

Table 9-1: The maximum permissible continuous and transient conductor temperature for various types of cable insulation

Type of cable Insulation	Maximum permissible continuous temperature (℃)	Maximum. Permissible transient conductor temperature (℃)
XLPE	90	250
EPR	80	250
PVC	70	160

The Contractor is responsible for mutual compatibility and adequacy of all cable system and all other corresponding equipment, in any respect. Cables shall be color coded as follows:

- For phase conductors : brown, black and gray

- For AC neutrals and other connections : blue

- For ground connections : yellow and green

Cable cores belonging to different feeders or group wires may not be located in the same cable. Cable segregation table shall be provided to be approved by the Engineer. A common system

of cable numbering shall be used throughout the plant. All cables shall have a unique number and the cores within that cable shall bear the same number such that they may be easily identified after the cables have been terminated. All single phase power cables shall have 1 full sized conductors plus 1 earth continuity conductor which is ampere rated not less than 100% of the phase conductor. All three phase power cables shall have 3 full size conductors plus 1 earth continuity conductor which is rated not less than 58% of the phase conductor.

9.2. Drop voltage

At each voltage level in ac systems the size of conductors shall be such that the maximum voltage drop shall be:

- Not more than 5% when using full load current, between the Auxiliary transformer and the final equipment.
- Not more than 2% when using full load current, between the Auxiliary transformer and the main panel/board.
- Not more than 3% when using full load current, between the main panel/board and the final equipment.

9.3. Short Circuit Current Rating

The short circuit rating of cables shall be determined in accordance with:

- The rated short circuit breaking current of the source switchgear
- Short circuit breaking time of the source switchgear

9.4. Current ratings and de-rating factors for cables

These figures shall be calculated in accordance with the IEC Standards, cable manufacturer's declared current ratings, derating factors derived from the laying pattern, and local environmental conditions. For sizing of plant cables the maximum sustained nameplate rating of the consumer shall be used.

A de-rating factor, as per mentioned Standards, shall be taken into account considering method of cable installation, grouping, cable layers and depth of burring.

9.5. Cable channels

- All MV cables shall be installed on trays and ladders.
- Cable trays shall not sag more than 0.5 cm at the midpoint between supports when the tray has been loaded with cables.
- Cable trays where used shall be fabricated from hot dip galvanized steel.
- Maximum intervals between cable trays supports shall be 2 meters.
- Cables belonging to cubicle heaters or AC circuits may not be located in category of control cables.
- MV cables shall be installed in separate cable channel and not be located in LV cable channel.
- When laying cables the radius should not be smaller than the given by the manufacturer or 15 times the cables diameter. Also minimum installation temperature recommended by the manufacturer shall be considered.
- When laying cables by machine, particular attention must be paid to the permissible tensile forces submitted by manufacturer.

- MV cables which have high electromechanical forces shall be fastened on the cable ladders by appropriate accessories.
- A spare loop shall be considered for MV cables and in the cable channels appropriate area shall be considered for this purpose.
- All power cable feeders shall be of a single length with no splicing jointing.

9.6. Cable Accessories

- All cable boxes shall be of adequate proportions and designed in such a manner that they can be opened for inspection without disturbing the gland plate or incoming cable.
- Cable glands shall be suitable for the type of cable to which they are fitted.
- Cable glands shall be made of stainless steel.
- All cables shall be identified with an approved plastic or Aluminum marker at each end of the cables. Cable cores shall be ferruled with the same number at each end.
- All wirings shall be marked, except for conductors between terminals on a given item of equipment.
- Cable termination kits shall be heat shrinkable type (polymeric type) and can be non-self-supporting type.
- They shall feature high electrical insulation level, corona and tracking resistance.
- Cable termination kits shall be non-flammable, self-extinguishing and heat resistance in accordance with cable final temperature after short circuit current.
- Cable termination kits shall be UV and ozone resistant.
- Stress cones for controlling the electrical filed inside the cable sealing ends shall be considered.

- Cable termination kits shall be complete with all accessories necessary for proper installation.
- Cable joints are used to connect single-core cables with the same size.
- For armored cables, armored heat shrinkable single core cable joint with armor case must be used since the armor case provides mechanical protection against environmental hazards such as rodents.

10. **Marking**

The following information must be marked on the outer sheath of the cable.

1) Manufacturer's Name or Trademark: To identify the manufacturer of the cable.
2) Type, Material, and Cross-sectional Area of the Cable
3) Nominal Voltage Rating
4) Applicable Standard Number
5) Year of manufacture

These markings must be repeated continuously along the outer sheath of the cable, with the repetition intervals conforming to the standards for cables. The cable must also be measured from both ends, and this information must be clearly indicated on the cable.

11. **Cable Colour**

The colour of the outer layer shall be red. For three core cables, the colour of the phases shall be brown, black and grey, according to IEC 60446.

12. **Cable Drums**

Cable drums shall be made of wood, pressure impregnated against fungosity and insect attack .They shall be lagged with closely fitting battens.

On the cable drums shall be engraved in English language the following:

- Name of Manufacturer
- Drum number
- Cable identification code
- Conductor size and material
- Number of cores
- Voltage
- Length of cable
- Gross and net weight
- Identification number (Part Number)
- Purchase order number
- Handling instruction
- Shipping instruction
- Direction of cable pulling

13. **Packaging and Transportation**

- After completing the tests and verifying the cable's compliance with the specified standards, both ends of the cable must be properly sealed.

- Prior to delivery the test results shall have been approved and packaging agreed.
- The cable should be wound onto suitable reels that fully protect it against damage during transportation, including impacts caused by loading and unloading operations. The supplier must appropriately select the reel dimensions based on the type and material of the cable. Additionally, the supplier should provide detailed instructions on how to wind the cable onto the reel and how to unwind it properly for installation.
- In the Offer, prices return terms, and buying conditions of the empty drums will be Indicated. The number of drums needed to hold back the order of the demanded cable, will be also indicated.
- Manufacturer will indicate in a clear way, the minimum length to order in each drum. Otherwise, it will be supposed that the ordered length quantity included in the Offer could be supplied, at quoted price. It shall be also indicated the standard length per drum for each cable configuration.
- Supplier will fix unloading and storage conditions at site, including unloading means, auxiliary labour and indoor and outdoor maintenance instructions.
- Normally the full transport package should not exceed 4.45m from its lowest point. Contractor is responsible for ensuring that transport of the Tendered package is possible along the available routes.
- The packaging method must be designed to ensure that the cable can be transported on standard vehicles (e.g., four-wheeled vehicles or rail-mounted carriers) without any issues.
- Technical specifications of the cable, such as weight, dimensions, cable length, and other necessary information, along with the contract number, manufacturer's name, and

address, must be clearly and indelibly marked on each reel. Measurement marks shall be provided over the whole length of cable in suitable intervals.

- All cables shall be furnished on lagged reels of sufficiently large diameter to prevent modification of the physical properties of the cable. The reels shall be of such design, construction and strength as to guarantee satisfactory delivery of the conductor to its destination without displacement, chafing or other damage, incurring during shipment of field handling. The reels shall be capable of withstanding all stresses due to installation operation, each end of the conductor shall be properly and securely sealed and fastened to the reel. Each reel head shall be marked to show serial number, size and number of conductors, length of conductor, voltage and cable type and arrow showing the end of the conductors, and gross, tare and net weights. Each reel must also include appropriate markings to indicate the correct method for unwinding the cable.

- If the transport condition differs from service conditions such as temperature, humidity, etc. manufacturer shall be guaranty that conditions and special precautions shall be considered for the protection on equipment during transport, storage and installation, and prior to energization.

- All equipment shall be prepared for ocean or inland transport, as the case may govern, to prevent damage from handling, warehousing in open yard and during shipment.

- Packages shall have sufficient strength to prevent damage during handling, warehousing and shipment.

- Adequate shipping supports and packing inserts shall be provided in order to prevent internal damage during transport.

- The equipment shall be thoroughly cleaned of slag, grit, dirt, moisture and other foreign matters before packing.

- A packing list must be provided for each individual packing unit it enables the purchaser's personnel to identify the unit clearly at site.

14. Tests

14.1. General

All the equipments supplied in accordance with this specification will have to be checked, inspected and tested in accordance with the defined requirements of codes and standards. The equipment will not be considered finished until factory and on site inspections, tests and plant commissioning are finished successfully.

The Client, the buyer and/or his representative will have free entry in the workshops and buildings of the factory, during manufacturing period, in order to witness in each moment materials, work processes, inspections and tests.

The supplier will give all the means for inspector checks the equipment, and will give without paying the materials necessary for the inspections. The supplier must give any information inspector asks for about supply. The supplier will advise 15 days before the tests dates.

The wrong operation of supplied material will be responsibility of the supplier although the client or his representative does not assist to the tests. All the fees for testing or from changes of damaged materials because of tests or transport to the laboratory will be paid by the supplier.

If after the tests, any part of the equipment supplied does not operate in good conditions or does not get the guarantee values, the supplier will replace or modify the faulty parts until achieving the desired results.

These tests do not excuse the supplier from obligations respect the guarantees in the material. The approval of materials by the client or his representative does not excuse the supplier from the responsibility by the defects in material.

When the tests have finished satisfactorily and the client gives the written approval, the supplier will be able to send the equipment the agreed between parts point.

In general, for tests which aren't indicated in this specification, the chapter of tests in the standards approved by the client will be used. Type or special tests which have been carried out to prove the quality of medium voltage cables shall be supported by a Certificate to the purchaser approval, giving the description, location, date and results of the tests carried out at an approved independent testing authority or witnessed by the representative of an approved independent testing authority.

Test shall be carried out on the cables in accordance with Clause 15 to 19 of IEC Publication 60502-2 and tests indicated in the IEC 60840, unless otherwise specified below. It shall be performance the following tests:

Three types of tests are performed on cables: routine tests, special tests, and type tests.

14.2. Routine Tests

These tests must be conducted on a length agreed upon by both parties.

The routine tests will be done as indicated in IEC 60502-2 and IEC 60840 standards.

- Measurement of conductor electrical resistance, according IEC 60502-2, sub clause 16.2.
- Partial discharge test, according IEC 60502-2, sub-clause 16.3. and IEC 60840, sub-clause 9.2
- Voltage test, according IEC 60502-2, sub-clause 16.4. and IEC 60840, sub-clause 9.3

14.3. Special Test

The samples tests will be done as indicated in IEC 60502-2 and IEC 60840 standards.

- Conductor inspection , according IEC 60502-2, sub-clause 17.4 and IEC 60840, sub-clause 10.4
- Dimensional inspection, according IEC 60502-2, sub clause 17.5 to 17.8 and IEC 60840, sub-clause 10.6 to 10.8 Electrical testing of cables
- Thermal endurance test on insulation, Hot set test for EPR, HEPR and XLPE insulations and elastomeric sheaths, according IEC 60502-2, sub-clause 17.10 and IEC 60840, sub-clause 10.9
- Voltage test for cables of rated voltage above 3.6/6 kV, according IEC 60502-2, sub-clause 17.9

14.4. Type Test

The type tests will be done (upon request) as indicated in IEC 60502-2, 60811-1, 60332-3 and 60840 standards

When type test have been successfully performed on a type of cable covered by this standard with a specific conductor cross-sectional area and rated voltage, type approval shall be accepted as valid for cables of the same type with other conductor cross-sectional areas and/or rated voltages, provided the three conditions indicated in the IEC 60502-2, sub-clause 18 or the conditions indicated in the IEC 60840, sub-clause 13.1. Test's certificates made by an official laboratory, will be given in.

- Partial discharge test
- Electrical impact resistance test and voltage test
- High voltage test with alternating current (AC)

These tests don't excuse the supplier from obligations respect the guarantees in the material.

14.5. Non Electrical – Type Tests

- Measurement of insulation thickness

- Measurement of non-metallic sheath thickness
- Tests to determine the mechanical properties of insulation and sheath before and after aging
- Tests for the behavior of PVC insulation and sheath at high temperatures
- Thermal shock resistance tests on PVC insulation and sheath
- Heat resistance test
- Water absorption test
- Thermal stability test of PVC insulation

15. GUARANTEES

All the pieces of equipment shall be free from defects of design, construction of workmanship which may hamper their intended performance for a period of 12 months process equipments start up, or 18 months after the delivery of the goods to the buyer's warehouse. If the erection is delayed for reasons beyond supplier control whichever shall occur earlier.

If any such defect be detected during the terms of the guarantee, the supplier shall repair or replace the defective part or parts (according to its own judgment) with no cost to IASCO except for required labor, provided however that the existence of such defects shall promptly be reported in writing to the supplier and provided further that maintenance and operation of the equipment shall be effected according to suppliers´ instructions.

An agreed upon method of testing shall be determinative of the existence of such defects.

IASCO is not responsible for defects caused by inadequate caution when operating the equipment or non-observance of the given instructions. Nor is the supplier responsible for defects caused by IASCO improper operation and/or maintenance, faulty storing, faulty installation or repair, or changes performed without supplier's approval or any negligence by a third person.

The old pieces of equipment, machinery or components that have been replaced by the new ones are supplier's property and shall arrange return transportation for such parts at own costs. If supplier does not remove such parts within 1 month from notification, they will become IASCO's property, which may scrap them at this own cost.

16. DOCUMENTATION AND SCHEUDLE

The following documentation shall be provided by the manufacturer with in the indicated time and stage:

Offer

- Technical data sheets fully completed
- Written acceptance of the specification
- List of Exceptions to Technical Specification.
- Transportation description
- Number, size and composition of the drums
- Catalogues and technical notes that the bidder considers interesting for a correct understanding of its scope of supply
- Detailed planning of the scope of supply.
- Quality certificate

For check documentation

The following documentation will be given in the indicated time after receiving the order

- Quality Control System description and Inspection Points Plan (4 weeks)
- Detailed characteristics of each element and brochures (4 weeks)
- Final datasheets (4 weeks)
- Manufacturing, tests and commissioning planning (With contract signature)
- Tests procedures (With contract signature)

Rest of the documentation

- Test reports and Certifications (1week after tests)
- Quality Dossier, and Inspection Points Plan fulfilled (4 weeks before delivery)
- Supplier guarantees (4weeks before delivery)
- Material and component list, including final number, size and composition of the drum (8 Weeks)
- Erection and commissioning instructions (if any special) (4 weeks before delivery)
- Transport, storing and handling instructions (4 weeks before delivery)

As Built documentation

The following documentation (In addition of all the rest documents that may have changed during engineering and manufacturing phase of the equipment) will be given 2 weeks after Factory acceptance Test

- Erection, installation, training, operation, safety and maintenance manuals, instructions for cold test/commissioning Packing List
- QCTM
- Test certificates.
- Declaration of incorporation

The documents shall be presented according to following format, and for as built documents this specify copies in soft format shall be delivered to IASCO:

Type	Format	Quality	Size	Number	Language
Drawings	AutoCAD 2010	copies	A3&CD	3	English
Electrical Schemes	Eplan 8	copies	A3&CD	3	English
Bills of material	Excel	copies	A4&CD	3	English
Instructions	MS word / PDF	copies	A4&CD	3	English
Catalogues	MS word / PDF	prints	A4,A5&CD	3	English
Brochures	PDF	prints	A4,A5&CD	3	English

Appendix I. DATA SHEET OF MV CABLE & ACCESSORIES

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
I.	**General**		
	i. 630 mm² medium-voltage cable		
1	Number of Phases (One Phase/Three Phases)		3 phases
2	Rated Voltage (KV-rms)	33	
3	Highest System Voltage (KV-rms)	36	
4	Rated frequency (Hz)	50	
	ii. 400 mm2 medium-voltage cable		
5	Number of Phases (One Phase/Three Phases)		3 phases
6	Rated Voltage (KV-rms)	33	
7	Highest System Voltage (KV-rms)	36	
8	Rated frequency (Hz)	50	
	iii. **300 mm² medium-voltage cable**		
9	Number of Phases (One Phase/Three Phases)		3 phases
10	Rated Voltage (KV-rms)	6.6	
11	Highest System Voltage (KV-rms)	7.2	
12	Rated frequency (Hz)	50	
	iv. **240 mm² medium-voltage cable**		
13	Number of Phases (One Phase/Three Phases)		3 phases
14	Rated Voltage (KV-rms)	6.6	

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
15	Highest System Voltage (KV-rms)	7.2	
16	Rated frequency (Hz)	50	
	v. **185 mm² medium-voltage cable**		
17	Number of Phases (One Phase/Three Phases)		3 phases
18	Rated Voltage (KV-rms)	6.6	
19	Highest System Voltage (KV-rms)	7.2	
20	Rated frequency (Hz)	50	
II.	**Technical Specifications**		
	i. **630 mm² medium-voltage cable**		
21	Installation		Tray
22	Cable type (single-core / three-core / ...)		Single core
23	Conductor material (Al/Cu)		Copper
24	Type of conductor (stranded / Rounded)		Stranded
25	Cross-sectional area (mm^2)	630	
26	Conductor diameter (mm)	Acc to IEC Standard	
27	Type of insulation		XLPE
28	Armor (Yes/No)		NO
29	Armor material		Aluminium wire armor (if applicable)
30	Shield material		Copper wire plus copper tape applied helically
31	Inner sheath material		P.V.C (if applicable)
32	Outer sheath material		P.V.C

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
33	Max. MV cables capacity (A)	1000	Without derate factor
34	Core identification required		Yes
35	Type and routine tests required		Yes
36	Short-circuit withstand time for each conductor (s)	> 3	
37	Basic Insulation level (KV-peak)	170	
38	Permissible Operating Temperature of Conductor (℃)	90	
	ii. 400 mm2 medium-voltage cable		
39	Installation		Tray
40	Cable type (single-core / three-core / ...)		Single core
41	Conductor material (Al/Cu)		Copper
42	Type of conductor (stranded / Rounded)		Stranded
43	Cross-sectional area (mm^2)	400	
44	Conductor diameter (mm)	Acc to IEC Standard	
45	Type of insulation		XLPE
46	Armor (Yes/No)		NO
47	Armor material		Aluminium wire armor (if applicable)
48	Shield material		Copper wire plus copper tape applied helically
49	Inner sheath material		P.V.C (if applicable)
50	Inner sheath material		P.V.C

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
51	Outer sheath material		P.V.C
52	Max. MV cables capacity (A)	938	
53	Core identification required		Yes
54	Type and routine tests required		Yes
55	Short-circuit withstand time for each conductor (s)	> 3	
56	Basic Insulation level (KV-peak)	170	
57	Permissible Operating Temperature of Conductor (℃)	90	
	iii. **300 mm^2 medium-voltage cable**		
58	Installation		Tray
59	Cable type (single-core / three-core / ...)		Single core
60	Conductor material (Al/Cu)		Copper
61	Type of conductor (stranded / Rounded)		Stranded
62	Cross-sectional area (mm^2)	300	
63	Conductor diameter (mm)	20.5	
64	Type of insulation		XLPE
65	Armor (Yes/No)		NO
66	Armor material		Aluminium wire armor (if applicable)
67	Shield material		Copper wire plus copper tape applied helically
68	Inner sheath material		P.V.C (if applicable)
69	Outer sheath material		P.V.C

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
70	Max. MV cables capacity (A)	739*	* Without derate factor
71	Core identification required		Yes
72	Type and routine tests required		Yes
73	Short-circuit withstand time for each conductor (s)	> 3	
74	Basic Insulation level (KV-peak)	170	
75	Permissible Operating Temperature of Conductor (℃)	90	
	iv. **240 mm^2 medium-voltage cable**		
76	Installation		Tray
77	Cable type (single-core / three-core / ...)		Single core
78	Conductor material (Al/Cu)		Copper
79	Type of conductor (stranded / Rounded)		Stranded
80	Cross-sectional area (mm^2)	240	
81	Conductor diameter (mm)	18.4	
82	Type of insulation		XLPE
83	Armor (Yes/No)		NO
84	Armor material		Aluminium wire armor (if applicable)
85	Shield material		Copper wire plus copper tape applied helically
86	Inner sheath material		P.V.C (if applicable)
87	Outer sheath material		P.V.C

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
88	Max. MV cables capacity (A)	647*	* Without derate factor
89	Core identification required		Yes
90	Type and routine tests required		Yes
91	System grounding		Non-effective
92	Short-circuit withstand time for each conductor (s)	> 3	
93	Basic Insulation level (KV-peak)	170	
94	Permissible Operating Temperature of Conductor (℃)	90	
	v. **185 mm^2 medium-voltage cable**		
95	Installation		Tray
96	Cable type (single-core / three-core / ...)		Single core
97	Conductor material (Al/Cu)		Copper
98	Type of conductor (stranded / Rounded)		Stranded
99	Cross-sectional area (mm^2)	185	
100	Conductor diameter (mm)	16	
101	Type of insulation		XLPE
102	Armor (Yes/No)		NO
103	Armor material		Aluminium wire armor (if applicable)
104	Shield material		Copper wire plus copper tape applied helically
105	Inner sheath material		P.V.C (if applicable)
106	Outer sheath material		P.V.C

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
107	Max. MV cables capacity (A)	550*	* Without derate factor
108	Core identification required		Yes
109	Type and routine tests required		Yes
110	Short-circuit withstand time for each conductor (s)	> 2	
111	Basic Insulation level (KV-peak)	170	
112	Permissible Operating Temperature of Conductor (℃)	90	
III.	**Cable joint**		
i.	**Armored**		
113	Ambient temperature (℃)	40 up to 105 (℃)	
114	Insulation material	XLPE	
115	Applicable standard		DIN VDE 0278 CNELEC HD 629.1S1 IEC60502-4
116	UV shield layer		YES
117	Sealing tape		YES
118	Armor case		YES
ii.	**Unarmored**		
119	Ambient temperature (℃)	40 up to 105 (℃)	
120	Insulation material	XLPE	
121	Applicable standard		DIN VDE 0278 CNELEC HD 629.1S1 IEC60502-4
122	UV shield layer		YES
123	Sealing tape		YES

DATA SHEET OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
124	Armor case		NO
IV.	**Termination kit**		
i.	**Armored**		
125	Ambient temperature (℃)	40 up to 105 (℃)	
126	Insulation material	XLPE	
127	Applicable standard		DIN VDE 0278 CNELEC HD 629.1S1 IEC60502-4
128	UV shield layer		YES
129	Sealing tape		YES
130	Armor case		YES
ii.	**Unarmored**		
131	Ambient temperature (℃)	40 up to 105 (℃)	
132	Insulation material	XLPE	
133	Applicable standard		DIN VDE 0278 CNELEC HD 629.1S1 IEC60502-4
134	UV shield layer		YES
135	Sealing tape		YES
136	Armor case		NO

Appendix II. GUARRANTE TABLE OF MV CABLE & ACCESSORIES

GUARRANTE TABLE OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
I.	**Manufacturer**		
1	Manufacturer's Name		
2	Manufacture Country		
3	Year of manufacture		
4	Type designation		
II.	**Identification Code**		
5	**Code**		
III.	**Applied Standards**		
6	Standards		
IV.	**Sales list**		
7	List		
V.	**Type Test Report Number**		
8	Report Number		
VI.	**Technical specifications of components**		
9	Type of Cable (single-core / three-core / ...)		
10	Conductor type (solid / stranded)		
11	Conductor material (aluminum / copper)		
12	Number and size of conductors (mm^2)		
13	Number and size of conductor strands (mm^2)		
14	Conductor shape (round / sector)		
15	Conductor diameter (mm)		
VII.	**Electrostatic sheath over the conductor**		
16	Layer thickness (mm)		
17	Type of semiconductive layer		

GUARRANTE TABLE OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
VIII.	**Insulation type**		
18	Insulation Type		
19	Insulation thickness (mm)		
20	Outer diameter over insulation		
21	Insulation resistance of the cable at 20 (°C), 30 (°C), 40 (°C) (Ω/km)		
22	Thermal resistivity of the cable insulation at 20 (°C), 30 (°C), 40 (°C) (k.m/W)		
IX.	**Metallic electrostatic sheath (if applicable)**		
23	Type of strands (mm)		
24	Number and size of strands (mm)		
25	Equivalent cross-section (mm^2)		
26	Short-circuit current capacity (kA)		
27	Thickness and material of sheath tape (if applicable)		
X.	**Armor**		
28	Armor (Yes/No)		
29	Armor type		
30	Armor thickness (mm)		
XI.	**Filler material**		
31	Material		
XII.	**Outer sheath**		
32	Material of outer sheath		
33	Thickness of outer sheath		
XIII.	**Weight per kilometer of cable**		
34	Weight per kilometer of cable (kg/km)		
XIV.	**Minimum bend radius**		

GUARRANTE TABLE OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
35	bend radius (mm)		
XV.	**Technical and Electrical Specifications**		
36	Frequency (Hz)		
37	Rated Voltage (KV)		
38	Highest System Voltage (kV)		
39	Nominal voltage at industrial frequency (1 minute at 20°C) (kV)		
40	Impulse withstand voltage (KV-Peak) (at 20°C)		
41	Insulation strength (KV/mm)		
42	Maximum resistance of each conductor at 20°C (Ω/km)		
43	Effective resistance of each conductor at 90°C under operating conditions (Ω/km)		
44	Inductance per phase in three-phase operating condition (mH/km)		
45	Capacitance (mF/km)		
46	Leakage current per phase (A/km)		
47	Maximum continuous current (phase/A)		
48	Maximum short-circuit duration (s)		
48-1	For 50 KA		
48-2	For 40 KA		
48-3	For 30 KA		
48-4	For 20 KA		
49	Maximum allowable fault current in the metallic electrostatic sheath for one second (A)		
50	Maximum permissible conductor temperature (°C)		
50-1	Permanently		
50-2	For 300 hours per year (emergency overload)		

GUARRANTE TABLE OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
50-3	For 100 hours per year (117% overload)		
50-4	For 3 hours per year (117% overload)		
50-5	For 2 hours per year (117% overload)		
50-6	For 1 hour per year (117% overload)		
50-7	For one second (maximum short-circuit current)		
50-8	For five seconds (maximum short-circuit current)		
51	Maximum permissible temperature of the cable		
51-1	For conductor (°C)		
51-2	For insulation (°C)		
52	Maximum temperature of the metallic sheath		
52-1	For one second (°C)		
52-2	For five seconds (°C)		
53	Maximum electric field at maximum operating voltage		
53-1	On conductor (KV/mm)		
53-2	On electrostatic sheath of conductor (KV/mm)		
54	Maximum electric field at maximum impulse voltage		
54-1	On conductor (KV/mm)		
54-2	On electrostatic sheath of conductor (KV/mm)		
55	Maximum dielectric loss factor at maximum voltage at 90°C		
56	Dielectric losses in three-phase (KV/mm)		
57	Total leakage losses (KV/mm)		
58	Sheath losses in three-phase (KV/mm)		
59	Conductor losses in three-phase (KV/mm)		
60	Total three-phase losses (KV/mm)		

GUARRANTE TABLE OF MV CABLE & ACCESSORIES

No.	Parameter	Value	Description
61	Three-phase impedance of the circuit at 90°C, 30°C ambient temperature, and nominal frequency		
61-1	Positive sequence component (km/Ω)		
61-2	Negative sequence component (km/Ω)		
61-3	Zero sequence component (km/Ω)		
62	Voltage drop percentage at nominal load per kilometer		
63	Absorption coefficient and maximum solar radiation for the cable (KW/mm^2)		
64	Maximum tensile strength of the cable (N)		
65	Moisture weight per cubic millimeter of insulation (g)		
66	Expected service life under underground installation conditions (year)		
XVI. Dimensions and Weights			
67	Cable Reel Dimensions		
68	Cable Length on the Reel (m)		
69	Total Reel Weight with Cable (kg)		