MATERIAL AND EQUIPMENT STANDARD

FOR

LOW VOLTAGE INDUSTRIAL AND FLAMEPROOF

A.C. SWITCH-FUSE ASSEMBLY

FIRST EDITION

NOVAMBER 2013

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS is based on internationally acceptable standards and includes selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS:

Throughout this Standard the following definitions shall apply.

COMPANY:

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER:

Means the “Company” where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract documents.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR:

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR:

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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1. SCOPE

1.1 This Standard Specification covers the minimum technical requirements for design, manufacture, quality control, testing, finishing and shipment of low voltage a.c. industrial and explosionproof switch fuse assemblies incorporating air break switches, air break disconnectors, air break switch disconnectors, fuse combination units, and motor circuits the rated voltage of which does not exceed 1000 volt A.C.

This Standard is applicable to both multicubicle type, and multibox type assembles.

1.2 Only the general requirements of switch fuse assemblies are given in this Standard Specification. The specific requirements of individual assemblies will be given in pertinent data sheet, relevant one line diagram and or requisition.

1.3 This Standard Specification shall be used for the preparation of requisitions and purchase orders and subsequently as a guideline for the manufacturers of the equipment described.

Note 1:

This is a revised version of this standard, which is issued as revision (1)-2013. Revision (0)-1993 of the said standard specification is withdrawn.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

BSI (BRITISH STANDARD INSTITUTION)

BS 381C	"Specification for Colours for Identification, Coding and Special Purposes"

IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)

IEC 60027	"Letters, Symbols to be used in Electrical Technology"
IEC 60050-441	"International Electrotechnical Vocabulary Chapter 441 Switchgears, Controlgear and Fuses"
IEC 60051	"Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories"
IEC 60059	"IEC Standard Current Rating"
IEC 60073	"Basic and Safety Principles for Man-Machine Interface, Marking and Identification - Coding Principles for Indicators and Actuators"
IEC 60079	"Explosive Atmospheres"
IEC 60947-1	"Low voltage switchgear and Controlgear Part 1: General Rules"
IEC 60947-2	"Low voltage switchgear and Controlgear Part 2: Circuit Breakers"
IEC 60947-3	"Low-Voltage Switchgear and Controlgear Part 3: Switches, Disconnectors, Switch-Disconnectors and Fuse-Combination Units"
IEC 60947-4-1	"Low Voltage Switchgear and Controlgear Part 4-1: Contactors and motor-starters – Electromechanical Contactors and Motor-Starters"
IEC 61869-2	"Instrument Transformers-Part 2: Additional Requirements for

	Current Transformers"
IEC 61869-5	"Instrument Transformers-Part 5: Additional Requirements for Capacitor Voltage Transformers"
IEC 60255	"Electrical Relays"
IEC 60269	"Low Voltage Fuses"
IEC 60292	"Low Voltage Motor Starter"
IEC 60947-5-1	"Low-Voltage Switchgear and Controlgear Part 5-1: Control Circuitdevics and Switching Elements-Electromechanical Control Circuitdevices"
IEC 60364.4.41	"Low-Voltage Electrical Installations-Par t 4-41: Protection for Safety Protection against Electric Shock"
IEC 60364.5.54	"Low-Voltage Electrical Installations – Part 5-54: Selection and Erection of Electrical Equipment – Earthing Arrangements and Protective Conductors"
IEC 61010-1	"Safety Requiremments for Electrical Equipment for Measurement, Control, and Labratory Use- Part 1: General Requirements"
IEC 60417	"Graphical Symbols for Use on Eqipment- Index, Survey, and Compilation of the Single Sheets"
IEC 61439	"Low Voltage Switchgear and Controlgear Assemblies"
IEC 60445	"Basic and Safety Principles for Man-Machine Interface, Marking and Identification- Identification of equipment terminals, Conductor Terminations and Conductors"
IEC 60446	"Basic and safety principles for man-machine interface, marking and identification – Identification of conductors by colours or alphanumerics"
IEC 60447	"Basic and safety principles for man-machine interface, marking and identification - Actuating principles"
IEC 61554	"Panel mounted equipment - Electrical measuring instruments - Dimensions for panel mounting"
IEC 60617-7	"Graphical Symbols for Diagrams Part: 7, Switchgear, Controlgear and Protective Devices"
IEC 60664-5	"Insulation Coordination for Equipment within Low-Voltage Systems - Part 5: Comprehensive Method for Determining Clearances and Creepage Distances Equal to or less than 2 mm"
IEC 60038	"IEC Standard Voltages"
IEC 60364-5-53	"Electrical Installations of Buildings-Part 5-53: Selection and Erection of Electrical Equipment – Isolation, Switching and Control"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-M-EL-143	"Material and Equipment Standard for Low Voltage Switchgear and Controlgear"

Notes:

1) Where standards other than IEC are used, manufacturer/supplier shall submit the applied equivalent standards and the pertinent deviations from IEC standards specified.

2) The testing and certification by following Authorities are acceptable where relevant:

a) Association of Short Circuit Testing Authorities (ASTA).

b) European Organization for Testing and Certification (EOTC).

c) Underwriters Laboratories (UL).

d) Electrical Equipment Certification Services (EECS).

e) British Approval Services for Electrical Equipment in Flammable Atmosphere (BASEEFA).

f) Physikalisch Technische Bundesanstalt (PTB).

g) For other explosive equipment authorities ref to Part II of IPS-E-EL-110.

3. DEFINITIONS

Low Voltage

Low Voltage (LV) is defined as voltage below 1000 volt in a 3 phase 4 wire 50 Hz system.

4. UNITS

This Standard is based on International Systems of Units (SI), as per IPS-E-GN-100 except where otherwise specified.

5. SERVICE CONDITIONS

5.1 Environmental Conditions

See Attachment 1.

5.2 Electricity Supply

5.2.1 Power supply in site is 400/230 Volt, 3 phase 4 wire, 50 Hz, solidly neutral earthed system.

5.2.2 Fault level

Refer to Appendix A Data Sheet.

5.2.3 Voltage variation

± 10% (Refer to IEC 60038)

5.2.4 Frequency variation

± 5% (Refer to IEC 60242)

5.3 Switch Fuse Assembly in Potentially Explosive Atmospheres

Where the Installation of switch fuse assembly in hazardous areas are unavoidable, additional requirements described in Appendix D shall be fully complied with.

5.4 Loading

The circuit loading shall not exceed 85% of the base rating. However particular attention shall be given to requirements for reliability of equipment under the arduous climatic conditions (up to 50°C) and all materials especially gaskets, plastic moulding insulation, etc. to be able to withstand the adverse climatic conditions without undue deterioration.

5.5 Switching of Capacitors

When feeders are used for the switching of capacitors, fuses require additional derating to two thirds of rating at 50°C.

6. BASIC DESIGN AND CONSTRUCTION OF SWITCH FUSE ASSEMBLY

Two types of switch fuse assemblies constructions are covered by this Standard namely:

- Multibox type assembly for outdoor use.
- Cubicle or multicubicle type assembly for indoor use.

6.1 Multibox Type Assembly

- Multibox type assembly shall comprise metal-clad box type switch fuse, mounted above and/or below metal clad unit type single busbar chamber section, the whole assembly linked together and mounted on free standing steel pedestals suitable for outdoor installation without further protection under environmental conditions specified in Attachment 1.

- The assembly shall comply with the general requirements of IEC publication 61439-1.

- Depending on the location of assembly one of the following minimum degree of protection of the enclosure against contact with live or moving parts and against ingress of solid foreign bodies and liquids as per IEC 60947-1 shall be selected:

- Indoor in enclosed building	IP 42
- Outdoor protected by canopy or shelter	IP 55
- Outdoor unprotected	IP 65

Note:

The above mentioned degree of ingress protection shall be applied only when no mention is made of degree of "IP" in data sheet.

- Electrically Identical Switching devices and components shall be of one type and make, and shall be interchangeable.

- Multibox type assembly shall be suitable for outdoor installation without any further protection as far as weatherproofing is concerned, but some form of sunshade protection is desirable if continuously exposed to full sunlight.

- Multibox type assembly may also be installed indoor in lieu of cubicle type at the discretion of purchaser.

- When outdoor assemblies are requested the supplier shall submit full detailed drawing of canopy to be provided by purchaser.

- The switch-fuse assembly to be complete with all fittings including holding-down bolts and suitable size copper earthing bar running the full length of the assembly with a terminal point at each end for connecting the external earthing system.

- The earth terminals shall be protected against corrosion.

- The height of the supporting structure of assembly to be such that the operating handles

of switches mounted above the busbars in the closed, or on position are not greater than 1750 mm above the ground level.

- Means shall be provided for lifting the complete assembly or section of it in installed position.

6.1.1 Busbars and connections

6.1.1.1 Single unit type busbar chamber shall contain the requisite number of hard drawn high conductivity electrolytic air insulated copper busbars adequately braced and secured by insulated supports.

6.1.1.2 Normal current rating shall be in accordance with the IEC publication 61439-1, however it shall be derated for ambient temperature as described in Attachment 1.

6.1.1.3 The neutral busbar shall have at least half the cross section of the phase bars under normal condition, and shall be provided with neutral link.

6.1.1.4 The neutral busbar shall be perfectly insulated from metallic surrounding however means shall be provided for earthing the neutral busbars where necessary.

6.1.1.5 The busbars shall not be tapered.

6.1.1.6 The copper connections to the outgoing circuits shall be rigidly bolted.

6.1.1.7 Busbars and connections shall be sheathed with color coded self extinguishing shrunk on sleeving.

6.1.1.8 Busbar short time rating shall not be less than 1 second.

6.1.2 Incoming Units

6.1.2.1 Incoming units which are generally similar to outgoing feeders, shall be one of the following as shown in single line diagram and or described in data sheet:

Switch-fuses

Switch disconnector/switch-isolator

Air circuit breakers

6.1.2.2 The incomer must be installed in the middle of assembly or at the electrical load center of busbar.

6.1.2.3 Incoming isolators together with their supply side and load side connections shall be capable of carrying the peak asymmetrical fault current and the short time rated fault current without damage or danger. They shall also be capable of carrying their rated current continuously.

6.1.2.4 Where air circuit breakers are specified in data sheet, as incoming units, the outdoor weatherproof capability of the switch fuse assembly shall not be impaired.

6.1.2.5 Devices shall be suitable for the particular application to which reference is made in Appendix B.

6.1.2.6 The closed and the open positions of the switching devices shall be definite and shall be clearly indicated either adjacent to the actuator or by the position of the latter.

"Closed" and "Open" shall be used to indicate the "on" and "off" position respectively.

6.1.2.7 Where fuses and switches of airbreak switch disconnectors and fuse combination units are mounted in separate enclosures, they shall be interlocked such that fuse compartment door cannot be opened unless the switch is open, and the switch cannot be closed unless the fuse compartment door is closed.

6.1.3 Outgoing Units (Feeders)

6.1.3.1 The outgoing circuits may be controlled by one of the following devices selected from data sheet in Appendix A.

Disconnector (isolator)

On load type switch disconnector

Switch disconnector with automatic

Airbreak disconnector and fuse combination unit

Switch fuse

Moulded case circuit breaker

Fuse with mechanical linkage for alarm or release

6.1.3.2 The switch fuse enclosure shall be of cast metal or heavy gage sheet steel construction, with hinged or bolted gasketed cover suitable for outdoor installation.

6.1.3.3 All enclosures shall be securely bolted to the busbar chamber and effectively bonded to the main switch fuse assembly earth bar.

6.1.3.4 The switches shall be of the load break type with the quick make, quick break spring assisted mechanism.

6.1.3.5 The operating handle of switch shall be suitable for pad locking in the "off" position and mechanically interlocked with the fuse compartment cover, so that fuses cannot be replaced unless the switch is in the "off" position.

- It should not be also possible to return the handle to the on position until the fuse compartment cover is closed and bolted tight.

- Both the "on" and "off" positions shall be positively indicated.

6.1.3.6 The fixed and moving contacts shall be silver plated unless otherwise specified in requisition, and there shall be two breaks per pole.

- Fixed contacts shall be screened to prevent accidental contact.

6.1.3.7 Isolators connected in the supply side of fuses together with their supply side and load side connections shall be rated for main incoming isolators.

6.1.3.8 Isolators connected in the load side of fuses together with their supply side and load side connections shall be capable of carrying the peak asymmetrical let through current of the fuses, and shall be capable of carrying the let through current of the fuses for the total break time, for any current throughout the current/total break time characteristic of the fuse that is fitted into the fuse base holder or carrier.

6.1.3.9 Switching devices supplying LV, 3 phase 4 wire loads, shall have a switched neutral, unless otherwise specified in data sheet.

- LV single phase and Neutral loads shall be controlled by a double pole switch, with a single pole high breaking capacity (HBC) fuse, and a solid neutral link.

- The switched neutral to make first and break last.

6.1.3.10 Fuses shall be of the high breaking capacity type to IEC publication No. 60269.

- Fuse sizes protecting circuits which supply motors shall be kept to a minimum compatible with the starting time and current of pertinent motors.

- Fuse carriers shall be such that when they are withdrawn, the operator is protected from accidental contact with any live metal of the fuse link and fuse contacts.

6.1.4 Bus section switching unit

Bus section switching device shall be similar to units selected for incoming switch device (see Clause 6.1.2 of this Standard Specification).

6.1.5 Incoming and outgoing cable connections

6.1.5.1 All incoming and outgoing switching devices shall be provided with compression type cable glands suitable for cables referred to in data sheet.

6.1.5.2 Cable plates, cable lugs, cable supports, cable clamps, and cable cleats shall be included where applicable for incoming and outgoing cables.

- Cable glands and plates shall be so located as to allow easy termination of cables.

6.1.5.3 Non-corrosive and non-ferrous stud bolts with washers, nuts and interlocks shall be provided for external power cable(s) including neutral conductor connection sized to suit the cable core size.

6.1.5.4 Provision shall be made for cable earthing at glands and positive fixing to earth busbar.

6.1.5.5 Cable entries to be preferably from below unless otherwise specified in data sheet.

6.1.6 Auxiliary circuits

6.1.6.1 The rated current of auxiliary circuit shall not be less than 6 Amps, and the rated voltage and frequency of the auxiliary circuits where specified shall be the same as those of the main circuit.

6.1.7 Prevention of condensation

6.1.7.1 A breather or similar device shall be provided to prevent the harmful accumulation of moisture inside the switch fuse assembly.

6.1.7.2 Where anti condensation heater(s) are required they shall be provided with isolating switch fuse and thermostat, unless otherwise specified in requisition.

6.1.8 Electrical indicating instruments

6.1.8.1 The number and type of instruments for the assembly shall be in accordance with the requirements stated in data sheet. (See Appendix A).

6.1.8.2 Instruments shall be of flush mounted industrial grade, enclosed, in a dust and damp proof casing, non-projecting dial, with non-glare, non-reflecting window and in compliance with requirements of pertinent parts of IEC publications 60051, and the accuracy shall be Class 2.5.

6.1.8.3 Ammeters in motor starting circuit shall have a compressed overload end scale of at least "6" times the full load motor current.

Indication shall be of the actual values.

6.1.8.4 Ammeters, voltmeters, selector switch etc. shall be contained in weatherproof cases mounted on the front of the busbar chamber or installed in a separate weatherproof mounted above or below the busbars.

6.1.8.5 Small instruments wiring shall be carried out in single core stranded copper conductor with heat resisting PVC insulation neatly laid up and securely cleated in position.

- The cross sectional area of the conductor shall not be less than 2.5 mm^2.

6.1.9 Safety and reliability

6.1.9.1 Switch fuse assembly shall be designed to minimize any risk of short circuit, and to ensure personal and operational safety during all operating conditions, inspection, maintenance, the connection of mains control and auxiliary cables and equipping and commissioning of spare boxes (sections and compartment in cubicle type) as dictated by requirements.

6.1.9.2 Under no circumstances, the safety requirements and proper functioning for the use intended, shall be less than the requirements of IEC 60364-5-53 which is for isolation and switching devices.

6.1.10 Earthing and bonding

6.1.10.1 The exposed conductive parts such as chassis framework and fixed part of metal enclosure other than those which do not constitute a danger, shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or an external protective conductor.

6.1.10.2 The protective earth shall be readily accessible and so placed that the connection of equipment to the earth electrode or to the protective conductor is maintained when the cover or any removable part is in place.

6.1.10.3 The protective earth terminal shall be suitably protected against corrosion.

6.1.11 Extension

6.1.11.1 The switch fuse assembly including the framework, busbars, bus wiring, earth bar, etc. shall be suitable in all respects for extension at both ends, so that only the minimum of work will be required to make such extension.

6.1.12 Spare boxes (units)

6.1.12.1 Where spare boxes are specified in the data sheets, they shall be equipped as required in circuit details.

6.1.12.2 Where spare boxes occur due to the layout or arrangement of the assembly, or where no specific requirements are given in the data sheet for the required spare boxes, they shall be provided with the minimum requirements to ensure safety when required to be used.

6.1.13 Rated values of switching devices

The following ratings of switching devices shall comply with the requirements of IEC 60947-3, in conjunction with data sheets in Appendix A.

- Rated voltage
- Rated currents
- Rated frequency
- Rated duty
- Rated making capacity

- Rated breaking capacity
- Rated short time withstand current
- Rated short circuit making capacity
- Rated conditional short circuit current

6.1.14 Utilization category

The intended application shall be defined as utilization category according to IEC 60947-3.

Each utilization category is characterized by the values of the currents and voltages, expressed as multiples of the rated operational current and the rated operational voltage as well as the power-factors or time-constants of the circuit.

6.1.15 Nameplates and labels

6.1.15.1 The nameplates, labels and their fixing materials shall be proven, durable under the service conditions specified for the switch fuse assembly in Attachment 1. They shall be indelible, corrosion and moisture resistant. Holes for fixing of nameplates or labels shall not influence in any way the degree of ingress protection of enclosure.

6.1.15.2 The nameplate(s) shall be attached to the equipment and shall be located in places such that they are visible and legible when equipment is installed.

The following information shall be given on nameplate(s):

a) Purchaser's name and order No.

b) The year of manufacture.

c) The manufacturer's name and trade mark.

d) The designation or serial number.

e) Number of relevant standard.

f) Rated operational voltages.

g) Utilization category and rated operational current (or rated powers), at the rated operational voltages of the equipment.

h) The value of the rated frequency.

i) Rated thermal current.

j) Degree of Ingress Protection (IP).

k) Dimensions: height, width (length), and depth.

l) Weight.

Note:

For designation of circuits see Appendix B**.**

6.2 Cubicle or Multicubicle Type Switch Fuse Assembly

- The assembly design and construction shall be in general in compliance with the requirements of IEC publication 61439.1 Part 1 Clause 7 with due consideration to environmental conditions stated in Attachment 1.

- Indoor type version shall be constructed from heavy gage sheet steel into cubicles and bolted together to form a switch-fuse assembly comprising: switching devices (specified in

data sheet) installed in tier formation and suitable for indoor installation.

- Minimum degree of protection of the enclosure against contact with live or moving parts and against ingress of solid foreign bodies and liquids as per IEC publication 60947-1 shall be IP 42 for indoors in enclosed building.

- The switch fuse assembly shall also be vermin protected.

- The assembly compartments shall have hinged steel doors or alternatively the switching devices may be of withdrawable type, but the withdrawable type is preferred.

- The number of tiered compartments per cubicle shall be so selected that the operating handles of the upper switching device in the closed or "on" position are not greater than 1750 mm above ground level.

- The sections of the assembly housing of the busbars shall be separate from the switching device compartment, and shall normally be suitable for rear access.

- The rear of the assembly shall be fitted with the removable or hinged steel sheets.

- Cable entries shall normally be vertically upward from ground level unless otherwise specified in data sheet.

- Lifting eye, bolts, lugs or angles shall be furnished for crane hook up of slings during installation.

6.2.1 Busbars and connections

Busbars and connections shall be as generally described under Clause 6.1.1 for box type assembly busbar, except that cubicle type switch fuse assembly busbars droppers and connections shall also be sheathed with color coded self extinguishing shrunk on sleeving.

6.2.2 Incoming, outgoing, and bus section switching devices

- These devices shall be as generally described for multibox type assembly but suitable for flush mounting cubicle installation.

- The operating handle shall comply with the requirements of IEC publication 60447 for action of control devices and the correlated final effects.

Note:

Sub-clauses 6.1.5 to 6.1.15 specified for multibox type switch fuse assembly are also applicable to cubicle or multicubicle version of the switch fuse assembly.

7. INSPECTION, QUALITY CONTROL AND QUALITY RECORDS

7.1 Inspection, Quality Control

7.1.1 The purchaser's inspector or his authorized representative shall have free access to the manufacturing plant engaged in the manufacture of the equipment, to carry out necessary inspection at any stage of work.

7.1.2 Inspection may include the visit to quality control laboratories, workshops, testing bay etc.

7.1.3 The supplier shall make available technical data, test pieces and samples that the purchaser's representative may require for verification in conjunction with pertinent equipment.

If required the supplier shall forward the same to any person or location that the purchaser's representative may direct.

7.1.4 The inspection and test plan shall be provided by manufacturer for purchaser approval.

7.2 Quality Records

7.2.1 The supplier shall maintain appropriate inspection and test records to substantiate conformance with specified requirements.

7.2.2 Quality record shall be legible and relevant to the product involved.

7.2.3 Quality records that substantiate conformance with the specified requirements shall be retained by manufacturer and made available on request by purchaser.

7.2.4 The supplier shall establish and maintain procedure for identification collection, indexing, filing, storage, maintenance and disposition of quality records.

7.2.5 Supplier shall submit to purchaser: at least three copies of reports, test schedules, and test certificates on completion of tests.

8. TESTS AND CERTIFICATES

8.1 General Requirements

8.1.1 Test procedure as proposed by the supplier shall be agreed upon, and approved by the purchaser before any test is carried out.

8.1.2 Purchaser may require witnessed tests to be carried out in the presence of his nominated representative who should be informed at least 4 weeks in advance of the date of the tests.

8.1.3 Test certificates and test reports shall refer to the serial No. of the equipment tested and must bear the purchaser's name, order No. and manufacturer's name and seal. The certificates shall be approved by the purchaser before shipment instruction is given.

8.1.4 Approval by the purchaser's inspector or representative shall not relieve the vendor of his commitments under the terms of this specification or any associated order.

8.1.5 The equipment may be rejected if measurement and inspection reveal any discrepancies between quoted figures resulting in purchase order and those measured actually.

8.2 Specific Requirements for Tests

The tests shall consist of but shall not necessarily be limited to:

a) Routine Tests

The switch fuse assembly shall be subject to routine test in compliance with the requirements of the following:

IEC 61439.1

IEC 60947-3

IEC 60947-4-1

IEC 60947-2

b) Type Tests

The switch fuse assembly type tests results and certificates, shall be verified for their compliance with the requirements of the following:

IEC 61439.1

IEC 60947-3

IEC 60269.1

IEC 60947-4-1

IEC 60947-2

c) Final Physical Check

In addition to verification of type tests and witness of routine tests, the following checks shall be made before shipment of assembly:

- The degree of ingress protection.
- The effectiveness of reliability of operating mechanism of Key Locks, Interlocks and Transfer switches.
- Proper functioning of control devices.
- The internal wiring and cabling for proper marking, tightness and provision of contacts for remote control (where applicable).
- The suitability of clamping, earthing termination and marking arrangement for incoming and outgoing cables.
- Simulation of remote control operation where applicable.
- Control of anti condensation heater(s) if any.
- The soundness of instruments.
- The correctness of circuit designation labels.
- The completeness of data on nameplate(s).
- The presence of danger sign in visible places.
- Verification of compliance of main and auxiliary circuits with the approved schematic circuit diagram.
- Fuse rating of individual circuits are correct and derated for site conditions.
- Interchangeability of identical switching devices.
- Soundness of the units and sections of the assembly.

d) Special Tests

The following tests shall also be considered according to IEC 60947-3.

- Mechanical durability
- Electrical durability

8.3 Approval Documents for Explosion Protection of Assembly

Where according to data sheet, electrical apparatus are considered for installation in potentially explosive atmospheres, the manufacturer in addition to requirements mentioned under type tests and routine tests, shall submit the approval documents or certification from relevant authorities mentioned in notes under Clause 2 of this Standard Specification, for both individual devices which make up the assembly and for the assembly as an integrated unit.

Note:

Complete records of the verifications, tests and checks carried out shall be accompanied with the following:

a) Tests results.

b) Certificates from testing and certifying authorities.

c) Any instruction and precautions to be followed during erection and cable connection of assemblies for installation in potentially explosive atmospheres.

9. FINISH

9.1 The equipment shall be cleaned, primed with two layers of antirust under coat and one final layer of durable paint suitable for environmental conditions given in Attachment 1.

9.2 The color of final layer shall be light grey color No. 631 BS 381C or as specified in requisition.

9.3 All unpainted surfaces (internal and external) shall have a coat of moisture and fungus resistance varnish.

9.4 All parts that are required to be left bright shall be treated and/or coated to prevent corrosion.

10. INFORMATION FOR MANUFACTURER (SUPPLIER)

10.1 Provisional single line diagram.

10.2 Data sheet.

10.3 Circuits designation.

10.4 Control power supply.

10.5 Assembly anti condensation heater supply voltage.

10.6 Explosion protection code.

10.7 Whether the equipment may be fitted to a moving device or if it may be exposed in service to abnormal shocks or vibration.

10.8 Type and dimension of electrical connections with the other panel in order to enable manufacturer to provide enclosure and terminals, meeting the conditions of installation and temperature rise allowed for and also to enable him to provide space where necessary to spread out conductors within the enclosure.

10.9 The number and type of auxiliary contacts to be fitted on switching devices to satisfy the alarm, indication, and interlocking requirements.

11. DOCUMENTATION/LITERATURE TO BE SUBMITTED BY MANUFACTURER/SUPPLIER

Manufacturer/supplier shall provide at least the following in the quantity and times detailed on the order.

11.1 At Quotation Stage

11.1.1 Supplier shall submit the following:

11.1.1.1 Report of experience background, major clients and annual sale for the similar equipment.

11.1.1.2 Reference list showing the successful operation of equipment offered in major oil industries.

11.1.1.3 Typical type tests certificate of same equipment.

11.1.2 Declaration of confirmation with the set standards and/or clear indication of deviations from the standards and the specifications.

11.1.3 Drawings and documents ticked under column required with quotation in Appendix C.

11.2 At Ordering Stage

11.2.1 Single line diagram:

a) Preliminary for approval

b) Final

11.2.2 Final certified general arrangement drawings showing floor plan elevation and end views complete with dimensions and mass of assembly.

11.2.3 Final circuit diagrams

11.2.4 Final electrical reference document covering:

- General description
- Equipment specification
- Performance data and curves
- Part and material list
- List of recommended commissioning spare parts
- List of recommended spare parts for two years of operation

11.2.5 Instruction manuals for:

- Transport and storage
- Installation
- Commissioning
- Operation
- Inspection/Test
- Maintenance
- Illustrated spare part list including special tools

11.2.6 Certificates:

- List of applicable type test certificates
- Final test certificates
- Certificate of quality assurance
- Copy of documents of certifying bodies

12. PACKING

12.1 Equipment must be carefully packed to provide necessary protection during transit to destination and shall be in accordance with any special provision contained in the order.

12.2 Special attention must be given to protection against corrosion during transit, and silica gel or

similar dehydrating compound shall be enclosed.

12.3 The method of cleaning preserving and the details of packing including moisture elimination, cushioning, blocking and crating shall be such that to protect the product against all damages or defects which may occur during handling, sea shipment to the port and rough road haulage, to site and extended tropical open air storage generally as client general conditions of purchase which will be submitted by purchaser at the time of ordering.

12.4 All bright and machined parts must be given the protection against corrosion.

12.5 Ancillary items forming an integral part of the equipment should be packed preferably in a separate container if the equipment is normally cased or crated.

Alternatively the ancillary items should be fixed securely to the equipment and adequate precautions taken to ensure that the items do not come loose in transit or be otherwise damaged.

12.6 The supplier shall provide methods of handling to prevent damage and/or deterioration during transit.

12.7 Where deemed necessary each shipping section shall be furnished with removable steel angles.

12.8 The requirements of above items shall not relieve the supplier of any of his responsibilities and his obligations for delivery of equipment in an undamaged and operable condition at site.

12.9 Identification for Shipment

The marking and labels of products should be legible durable, and in accordance to specification.

Identification should remain intact from the time of initial dispatch at work to the final destination.

Marking shall be adequate for identifying particular equipment in the event that a recall or inspection becomes necessary.

13. SHIPMENT

13.1 The supplier of the equipment under this specification is the sole responsible for packaging and preparation for shipment.

13.2 The packaging and preparation for shipment shall be adequate to avoid mechanical damage during transport and handling.

13.3 Each shipping section shall be provided with permanently attached identification tag containing necessary information together with the identification number indicated in data sheet Appendix A.

13.4 Shipping documents with exact description of equipment for custom release shall be supplied, with the equipment.

14. GUARANTEE

14.1 The supplier of the equipment under this specification shall guarantee the equipment and shall replace any damaged equipment/parts resulting from poor workmanship and/or faulty design.

14.2 The supplier shall replace any equipment failed under the following condition:

- Failure under startup and commissioning tests performed according to IEC recommendations.

- Failure under normal usage for a period of 12 months, not exceeding 18 months from the date of dispatch from the manufacturers works.

15. SPARE PARTS

15.1 All spare parts shall comply with the same standards, specification and tests of the original equipment and shall be fully interchangeable with the original parts without any modification at site.

15.2 They shall be correctly marked in accordance with client reference and manufacturer part numbers, giving also the purchaser's order number.

15.3 Spare parts shall be preserved to prevent deterioration during shipment and storage in humid tropical climate.

15.4 List of recommended spare parts and interchangeability with spare parts of similar equipment shall be submitted by supplier.

APPENDICES

APPENDIX A

TYPICAL LOW VOLTAGE A.C. SWITCH FUSE ASSEMBLY

DATA SHEETS

PROJECT NAME ……

AREA CLASSIFICATION ACCORDING TO IEC 60079:

Safe ☐ Zone 2 ☐ Zone 1 ☐

Explosion protection code:.....

STANDARD SPECIFICATION No.....

POWER SUPPLY:

Voltage .....phase.....wire.....Frequency.....Hz

Fault level.....MVA, short time withstand…….....second

Neutral Earthing System ……

TYPE OF SWITCH FUSE ASSEMBLY:

Industrial multicubicle type ☐

Industrial multibox type ☐

Flameproof/weather proof multibox ☐

(See Figs. 1, 2 and 3 in Appendix A1 which follows):

Enclosure ingress protection to IEC 60947-1 …….....

For indoor equipment ☐ For outdoor equipment ☐

TYPE OF EQUIPMENT MOUNTING:

Self supporting ☐ Wall mounting ☐

TYPE OF ACCESS:

Front access to the wall ☐ Rear access off the wall ☐

FORM OF ACCESS:

Withdrawable☐ Swing out ☐ Fixed ☐

FUNCTION OF SWITCHING DEVICE:

Incoming ☐ Bus ☐ section ☐ Outgoing feeder ☐

(to be continued)

APPENDIX A (continued)

SELECTION OF SWITCHING DEVICE:

Air Circuit Breaker (ACB) ☐

Moulded Case Circuit Breaker (MCCB) ☐

On load type switch disconnector ☐

Disconnector (isolator) ☐

Fuse switches ☐

Contactor ☐

Fuse with mechanical linkage or strike ☐

Miniature circuit breaker ☐

SPARE UNIT (S)

PROSPECTIVE FUNCTION:

Number of poles.....

Switched neutral ☐ Linked neutral ☐

Rating kW/kVA .....

Control and indication supply: (where applicable) .....Volt .....d.c .....a.c

DESCRIPTION OF SWITCHING DEVICE:

As applicable:

Reference Clause in standard spec.....

No. of poles.....

switch neutral ☐ linked neutral ☐

Circuit No. in single line diagram .....

DESCRIPTION OF LOAD: .....

Power factor of load: ……

Rated site current .....

Utilization category .....

Class of duty .....

Rated making and breaking capacity .....

Rated short time withstand current .....

Rated short time current with back up fuse .....

Back up fuses type and rating .....

AUXILIARY CONTACTS (TYPE AND NUMBER) ON SWITCHING DEVICE

FUNCTION	TYPE	NUMBER
INDICATION ALARM		

(to be continued)

APPENDIX A (continued)

CABLES

Size and type of main cable.....

Size and type of auxiliary cable.....

CABLE ENTRY:

Direct ☐ Indirect ☐ Conduit system ☐

CABLE LUGS:

For main cable: .....

For auxiliary cable:.....

INTERLOCKS BETWEEN INCOMERS AND BUS SECTION:

Whether on failure of normal incoming supply, the incoming form emergency source should feed:

a) Both sides of bus section.

b) Only left side of bus section.

INDICATING INSTRUMENTS:

Voltmeter .....

Ammeter .....

CURRENT TRANSFORMER RATIO FOR:

Remote ammeter .....

Protection (where applicable) ……..

VOLTAGE TRANSFORMER RATIO FOR:

Voltmeter .....

Indication .....

PADLOCKING FACILITY ON SWITCHING DEVICE .....

*** Only applicable points to be filled or ticked in accordance with the specific requirements.**

APPENDIX A1

EXAMPLES OF INDUSTRIAL AND FLAMEPROOF SWITCH FUSE ASSEMBLY

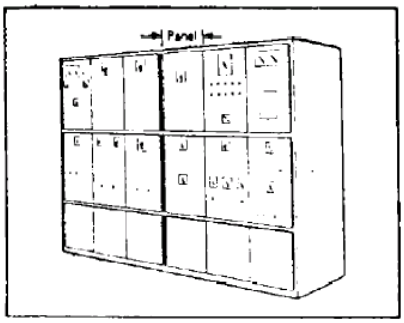


FIG.1
INDUSTRIAL MULTI- CUBICLE TYPE SWITCH-FUSE ASSEMBLY

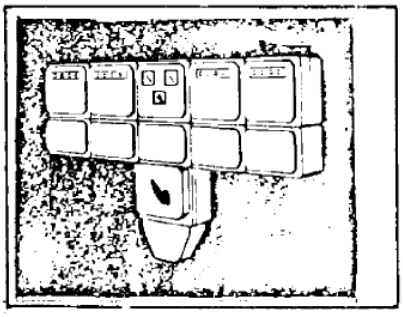


FIG .2
INDUSTRIAL MULTIBOX TYPE SWITCH-FUSE ASSEMBLY

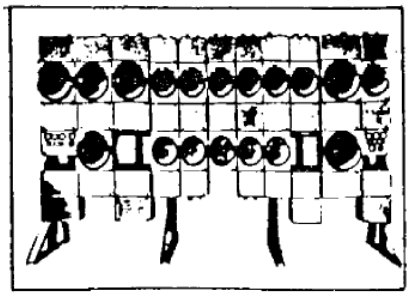


FIG .3
FLAMEPROOF / WEATHERPROOF TYPE SWITCH-FUSE ASSEMBLY

APPENDIX B

GUIDANCE FOR DESIGNATION OF CIRCUITS OF SWITCH FUSE ASSEMBLY TO BE ENGRAVED ON PERTINENT LABELS

CIRCUIT No.	DESCRIPTION OFEQUIPMENT	REFERENCE TO DATASHEET

APPENDIX C

(TYPICAL)

LIST OF DRAWINGS, DOCUMENTS, MANUALS AND CERTIFICATES TO BE SUBMITTED BY MANUFACTURER/SUPPLIER AT QUOTATION AND ORDERING STAGE

	DESCRIPTION	REQUIRED WITH QUATATION	CERTIFIED INFORM. REQ. WITH ORDER			NUMBER OF WEEKS BEFORE DELIVERY
			N0. OF COPIES		NUMBER OF WEEKS AFTER ORDER	
			REPRO-DICIBLES	PRINTED MATTER		
A	**DRAWING AND OTHER DOCUMENTS:**					
	a) ELECTRICAL EQUIPMENT:					
	1. DIMENSIONED OUTLINES AND FOUNDATION DETAILS					
	INCLUDING: CABLE ENTRIES AND CLEARANCES					
	2. DETAILS AND CROSS-SECTIONAL ARRANGEMENT					
	3. MOUNTING DETAILS					
	4. PERFORMANCE DATA (TYPICAL)					
	5. PARTS / MATERIAL LIST					
	6. RELEVANT CATALOGUES					
	7. NAME PLATES					
	8. LIST OF FINAL LABELS					
	b) TERMINATION:					
	1. CONNECTION DIAGRAM					
	2. TERMINAL BOX ARRANGEMENT					
	3. CONNECTION AND TERMINAL DESIGNATION					
	c) ELECTRICAL REFERENCE DOCUMENTS:					
	1. GENERAL DESCRIPTION					
	2. EQUIPMENT SPECIFICATION					
	3. PERFORMANCE DATA (ACTUAL)					
	4. DRAWINGS / PARTS / MATERIALS LIST					
	d) QUALITY CONTROL					
	1. QUALITY, INSPECTION AND TEST PLAN					
B	INSTRUCTION MANUALS : (FOR ALL REQUIRED ITEMS)					
	1. INSTALLATION, COMMISSIONING AND INSPECTION					
	2. OPERATION AND MAINTENANCE					
C	SPARE PARTS REQUIREMENTS:					
	1. ILLUSTRATED SPARE PARTS					
	2. RECOMMENDED COMMISSIONING SPARE PARTS LIST					
	3. RECOMMENDED SPARE PARTS FOR TWO YEARS OPERATION					
	4. SPIR: Spare Part Interchangeability Records					
D	CERTIFICATION:					
	1. PERFORMANCE TEST, MATERIALS CERTIFICATES AND					
	CURVES					

APPENDIX D

ADDITIONAL REQUIREMENTS FOR SWITCH FUSE ASSEMBLY IN POTENTIALLY EXPLOSIVE GAS ATMOSPHERES

1. Enclosure of equipment shall be certified to requirements of:

1.1 IEC Publication 60079-0

General requirements.

1.2 IEC Publication 60079-1

Construction and test of flameproof enclosure of electrical apparatus. Type Exd (EExd).

1.3 IEC Publication 60079-7

Construction and test of electrical apparatus type Exe (EExe).

2. Components for cable glands, conduit fillings and stopping plugs shall be subject to "BASEEFA" or similar authority such as "UL" or "PTB" approval. (For detailed information refer to Part II of IPS-E-EL-110)

3. Ammeters, voltage and selector switch shall be located in flameproof chamber, with type of explosion protection Exd.

4. Where indirect cable entry is dictated by design, terminal compartment shall have the type of protection Exe (EExe).

5. When single core wires through Explosion Proof conduit are connected to terminals of explosion proof equipment: sealing fittings shall be incorporated at the entrance point to prevent transmission of flame or gas/vapor to other parts of the plant.*

6. Compliance with data in conjunction with the:

- Grouping of released gas/vapor in site.
- Ignition temperature of released gas/vapor in site temperature class of equipment.

7. Prevention of condensation in potentially explosive atmospheres:

- Manufacture/supplier shall state in his quotation the measures that have been adopted to prevent the harmful accumulation of moisture inside the starter due to condensation.
- However breathing and draining devices shall be so constructed that they are not likely to become unsafe in service.
- Provision for breathing or draining shall not be made by deliberately increasing the gap of Joints.
- The dimension of the openings constituting the vent shall provide a margin of safety in relation to the dimensions that can be shown by test certificate to be flameproof.
- If the device is constructed so that it can be taken to pieces, it shall be designed so that it will not be possible to reassemble the parts in such a way as either to reduce or enlarge the vents.

*** Illustration for three types of connection of explosion protected electrical equipment to external circuit (cable entries) are given in Figs. 1, 2 and 3 in Appendix D1.**

(to be continued)

APPENDIX D (continued)

Note:

When flame path trap is provided full detail of it shall be given by manufacturer or supplier.

8. Nameplate on individual switching device for installation in potentially explosive atmospheres, shall include the following information in conjunction with explosion protection:

Explosion protection code .....

Standard No. .....

Certification No. and date .....

Maximum voltage ……

Maximum rating ……

Type No. .....

Maximum permissible ambient temp …….°C

Gas/vapor group .....

Maximum surface temp. of equipment …….°C

Certification authority and mark .....

.....

Manufacturer ……

Note:

Requirements of Clause "6.1.15.2" of this Standard Specification shall also be implemented where applicable.

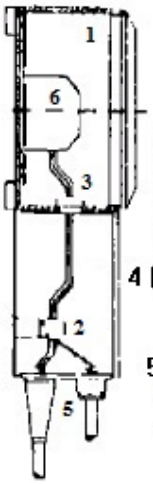
APPENDIX D1

(TYPICAL)

CONNECTION OF EXPLOSION, PROTECTED ELECTRICAL EQUIPMENT TO EXTERNAL CIRCUIT (CABLE ENTRIES)

indirect cable entry i.e.via EExe (increased safety) terminal compart - ment

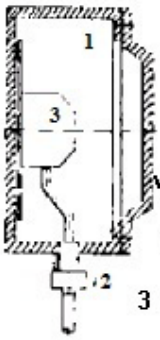
FIG 1



1 explosion proof (Flameproof) enclosure EExd
2 terminal compatment EExe (increased safety)
3 single core cable bushings between (Ex) d compartment and (Ex)e compart - ment
4 (Ex)e terminal blocks for external connections
5 cable entries into the (Ex)e compart - ment compression glands or other glands
6 electrical equipment

direct cable entry using special glands

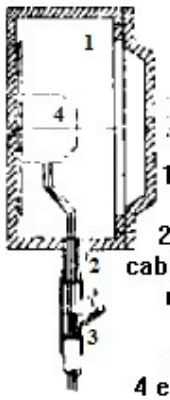
FIG 2



1 explasion (Flameproof)
2 explasion proof (Flameproof) cable entries (special glands) which together with the cables close on the explasion proof
3 electrical equipment

conduit system using explosion proof pipes

FIG 3



1 explosion proof enclosure
2 explosion proof cable entry using wires run in explosion proof conduct
3 sealing filling
4 electrical equipment

ATTACHMENTS (General)

ATTACHMENT 1

ENVIRONMENTAL CONDITIONS

1.1 Site elevation: ----- meters above sea level.

1.2 Maximum ambient air temperature: ----- degrees centigrade. Bare metal directly exposed to the sun can at times reach a surface temperature of ----- degrees centigrade.

1.3 Minimum air temperature: ----- degrees centigrade.

1.4 Relative humidity: ----- percent.

1.5 Atmosphere : saliferrous, dusty corrosive and subject to dust storms with concentration of 70-1412 mg/cubic meter, H_2S may be present, unless otherwise specified in data sheet.

1.6 Lightning storm isoceraunic level: ----- storm days/year.

1.7 Maximum intensity of earthquake ----- richters.

Note:

Blanks to be filled by client.