

**MATERIAL AND EQUIPMENT STANDARD**  
**FOR**  
**BATTERY CHARGERS**

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## **1. SCOPE**

This Standard Specification covers the minimum technical requirements for design, manufacture, quality control and testing of battery chargers which shall be installed in oil, gas and petrochemical industries in Iran under the service conditions stated in Clause 4 of this Standard Specification.

Only the general requirements of battery chargers are given in this Standard Specification, the specific requirements of battery chargers will be given in pertinent data sheets (Appendix A), and or requisitions.

## **2. REFERENCES**

The edition of the following Standards and codes that are in effect at the time of publication of this Standard shall, to the extent specified herein, form a part of this Standard. The applicability of changes in standards and codes that occur after the date of this Standard shall be mutually agreed upon by the Company and the vendor/consultant.

### **IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)**

IEC 51	"Recommendations for Indicating Electrical Measuring Instruments and their Accessories"
IEC 119	"Recommendations for Polycrystalline Semiconductor Rectifier Stacks and Equipment"
IEC 146	"Semiconductor Converters"
IEC 255	"Electrical Relays"
IEC 269	"Low Voltage Fuses"
IEC 364-5-54	"Earthing Arrangements and Protective conductors"
IEC 408	"Low Voltage Airbreak Switches, Airbreak Disconnectors, Airbreak Switch Disconnectors and Fuse Combination Units"
IEC 445	"Identification of Equipment Terminals and of Terminations of Certain Designated Conductors, including General Rules of an Alphanumeric System"
IEC 446	"Identification of Insulated and Bare Conductors by Color"
IEC 529	"Classification of Degrees of Protection Provided by Enclosures"
IEC 536	"Classification of Electrical and Electronic Equipment with Regard to Protection against Electric Shock"

### **ANSI/NEMA (AMERICAN NATIONAL STANDARD INSTITUTE/NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION)**

ANSI/NEMA PE5 1985	" Utility Type Battery Chargers "
ANSI/NEMA PE7 1985	" Communication Type Battery Chargers "

#### **Notes:**

1) Where standards other than IEC are specified, it is understood that the equivalent IEC standard is acceptable.

2) The testing and certification by following authorities are acceptable where relevant. Other authorities may be considered subject to company approval.

- a) European Organization for Testing and Certification under CENELEC Administration (EOTC).
- b) Electrical Equipment Certification Services (EECS).

### **3. UNITS**

International System of Units (SI) in accordance with IPS-E-GN-100 shall be used.

### **4. SERVICE CONDITIONS**

#### **4.1 Environmental Conditions**

See Attachment I.

#### **4.2 Area Classification**

The battery chargers will be installed indoor in safe area.

### **5. BASIC DESIGN, CONSTRUCTION AND RATINGS**

#### **5.1 General Description**

**5.1.1** The static battery charger shall be fed from the mains a.c. supply and provide rectified, filtered and stabilized direct current voltage to charge and float charge the battery with simultaneous supply to the load.

**5.1.2** The battery charger rating shall be sufficient to supply the load and simultaneously charge the battery from "dis-charge" to a state of "charge" which shall suffice for repetition of duty cycle as specified in the data sheet (Appendix A).

#### **5.2 Mechanical Requirements**

##### **5.2.1 Physical installation**

The battery charger shall be either wall or floor mounted as specified in data sheet (Appendix A).

**5.2.2** The battery charger cabinet shall be of sheet steel, primed and painted to protect it against environmental conditions mentioned in Attachment 1.

**5.2.3** The battery charger cabinet shall be suitable for operation and maintenance with its rear panel against a wall.

**5.2.4** The battery charger enclosure shall be of sheet steel material, welded or bolted frame 2.5 mm thick, and shall provide a degree of protection at least IP 41 for indoor and IP 54 for outdoor (under shelter) according to IEC publication 529.

**5.2.5** Lifting Lug shall be provided for lifting the battery charger into position during installation.

### **5.2.6 Ventilation**

The battery charger cooling shall be either by natural air ventilation or by fan as specified in data sheet (Appendix A) In any case failure of the fan, blocked openings, or filters shall not allow a dangerous or destructive conditions to develop.

## **5.3 Design Considerations**

**5.3.1** Equipment, circuit boards and components located within the battery charger cabinet shall be of plug-in type.

**5.3.2** All plug-in circuit components shall have keys or other suitable provisions to prevent incorrect assembly.

**5.3.3** Test points shall be provided for maintenance purposes.

**5.3.4** The location and grouping of components and auxiliary equipment shall permit easy identification and access for operational maintenance and repair purposes.

**5.3.5** The electronic control and protection system shall be of modular design and equipped with function fault indicators.

**5.3.6** No controls or operating devices accessible to the operator shall be higher than 1750 mm.

**5.3.7** All controls accessible to the operator shall be identified with their function and status. Clockwise rotation or linear travel to the right or up direction shall increase the quantity, e.g. increase the output voltage or current and any variance from this manner of operation shall be suitably marked.

**5.3.8** Thyristors (silicon controlled rectifier) shall comply with the requirement of IEC publication 146.

## **5.4 Component Requirements**

**5.4.1** All component parts of the battery charger shall be operated within their design ratings.

### **5.4.2 Transformers**

The ratings and characteristics of transformers used in a battery charger shall comply with IEC Publication 76 plus the extra requirements laid down in IEC Publication 146 Chapter III.

### **5.4.3 Switching devices**

Switching devices used in a battery charger shall be of the airbreak type for continuous duty.

## **5.5 Safety and Reliability**

**5.5.1** The battery charger shall be designed to minimize any risk of short circuits and to ensure personnel and operational safety under all conditions of operation, inspection and maintenance.

**5.5.2** All component material used in the construction of a battery charger shall be fire resistant and non flame propagating.

**5.5.3** Electrolytes, e.g. for capacitors shall be non-toxic and totally free from poly-chlorinated biphenyls.

#### **5.5.4 Earthing**

The battery charger shall meet the earthing requirements specified by IEC Publication 364-5-54, and shall be provided with an earth terminal.

### **5.6 Protective Devices**

**5.6.1** The battery charger shall be provided with suitable fuses for input and output. Fast acting fuses to be considered for rectifier stack.

Battery charger shall be capable of withstanding short circuits with above mentioned fuses. Means shall be provided to protect battery and load against d.c. voltage rise above the value specified in data sheet.

**5.6.2** At least one of the two a.c. output leads of the battery charger shall be protected against reverse battery connection.

### **5.7 Alternating Current (a.c. Input Characteristics)**

#### **5.7.1 Rated a.c. voltage**

As indicated in data sheet (Appendix A) the main a.c. supply will be either single phase 230 volt or three phase 400 volt  $\pm 10\%$  with a frequency of 50 hz  $\pm 5\%$ .

#### **5.7.2 Input surges**

Suitable surge arrester shall be provided at input and output of battery charger.

**5.7.3** Necessary means shall be provided to stop any noise from battery charger to the main supply.

**5.7.4** A three phase battery charger shall withstand a maximum voltage unbalance of 5 percent between phases, that is, the maximum voltage shall not be more than 105 percent of the minimum voltage.

### **5.8 Direct Current (d.c. Output Characteristics)**

#### **5.8.1 Nominal output voltage**

The output voltage of the battery charger shall be as specified in the data sheet (Appendix A).

#### **5.8.2 d.c. voltage adjustment**

Controls shall be provided to enable continuous adjustment of the level of d.c output voltage for floating voltage range and equalizing voltage range.

#### **5.8.3 Floating voltage ranges**

The floating voltage ranges per battery cell at an ambient temperature of 25°C shall be:

2.15 to 2.25 volts for lead-acid batteries.

1.35 to 1.45 volts for nickel cadmium batteries.

#### 5.8.4 Equalizing voltage ranges

The equalizing voltage ranges per battery cell at an ambient temperature of 25°C shall be:

- 2.25 to 2.40 volts for lead-acid batteries.
- 1.50 to 1.60 volts for nickel-cadmium batteries.

#### 5.8.5 Effect of temperature change

The change of d.c. output voltage resulting from the change of operating ambient temperature as specified in Attachment 1, shall not exceed  $\pm\frac{1}{2}$  percent of the output voltage setting. If output voltage is automatically adjusted to meet the battery requirements at various temperatures, the above requirements need not be met.

#### 5.8.6 Output voltage deviation (regulation)

While the charger is being subjected to the a.c. input conditions specified in Sub-clause 5.7 and load variations of 0 to 100 percent, the d.c. output voltage shall be maintained as follows:

- Floating voltage deviation not exceeding  $\pm\frac{1}{2}\%$ .
- Equalizing voltage deviation not exceeding  $\pm 1\%$ .

#### 5.8.7 Dynamic response

##### a) Load change

Sudden changes in load current (battery connected) from 20 to 100 percent (rise) or from 100 to 20 percent (fall) of full load shall not result in output voltage beyond the range of 94 to 106 percent of voltage setting.

**5.8.8** The battery charger shall have manual boost charge facility when required.

#### 5.8.9 High operating temperatures

The manufacturer shall supply correction factors regarding a.c. output characteristics for the battery charger to operate at temperatures between 25°C to 65°C.

**5.8.10** Specific design shall be considered when temperature is below 0°C.

**5.8.11** The ripple voltage shall not exceed 1% rms of nominal d.c. voltage for all values of load within the charger rating.

#### 5.9 Audible Noise Limitations

With battery charger operated under all combinations of line voltages, output voltage, and load current, the highest audible sound level produced shall not exceed 65 db measured at any point about 150 centimeters from any vertical surface of the battery charger.

##### Note:

**Manufacturer/supplier shall submit full details for requirements of parallel operation of their battery chargers.**

### 5.10 Communication Type Battery Chargers

Where battery chargers are used for telecommunication, reference shall be made to ANSI/NEMA publication No. PE7-1985.

### 5.11 Alarms and Indications

**5.11.1** Provision shall be included to indicate the following abnormal conditions locally on the battery charger front panel and for remote alarm indications as specified in data sheet.

- a) Rectifier failure.
- b) d.c. under-voltage alarm.
- c) d.c. over-voltage.
- d) Power or indicating lamp/lamps.
- e) d.c. earth fault.

**5.11.2** Indicators (Neon, L.E.D.) shall be provided on the battery chargers.

Front panel to indicate the following:

- a) Battery charger float.
- b) Battery charger boost charge.

### 5.12 Measuring Instruments

**5.12.1** Unless otherwise indicated in the data sheet (Appendix A), the following measuring instruments shall be provided:

- a) d.c. voltmeter measuring rectified output voltage.
- b) d.c. ammeter, with zero at mid-scale measuring battery current.

**5.12.2** Instruments shall be of the flush mounted, industrial grade, enclosed in dust and damp proof casing, non projecting dial with non glare, non reflecting window, similar throughout in type and size, and in compliance with the requirements of pertinent parts of IEC Publications 51 and 473 from requirements and dimensions point of view.

**5.12.3** The accuracy of all measuring instruments shall be according to class index 2.5 of IEC Publication 51

### 5.13 Wiring and Connections

**5.13.1** Wiring to equipment on doors shall be carried out in flexible cables which shall be so arranged that it is not possible for the flexible cables to be trapped in the doors or mechanically strained.

**5.13.2** Cables between two connecting devices shall have no intermediate splices on joints.

**5.13.3** Terminals shall be so designed that they clamp the conductors between metal surfaces with sufficient contact pressure and without significant damage to the individual conductors.

**5.13.4** All terminals shall be numbered.

**5.13.5** Circuits and terminals operating at different voltages and or performing different functions to be segregated.

**5.13.6** Terminal blocks shall be arranged to afford easy access.

**5.13.7** Spare terminals shall be foreseen for not less than 10%.

**5.13.8** Provisions such as cable glands, cable plates, cable lugs, cable supports, cable clamps and cable cleats shall be foreseen for all incoming and outgoing cables.

**5.13.9** Glands and plates shall be so located to allow easy termination of cables.

#### **5.14 Information to be Given on the Outside of Battery Charger**

**5.14.1** Each battery charger shall be provided with one or more general nameplates located in a place such that they are visible and legible when the battery charger is installed. The information given on these general nameplates shall be as follows but not be limited to:

- a)** Purchaser's name and order No.
- b)** The year of manufacture.
- c)** The manufacturer's name or trade mark.
- d)** Type designation or serial number, making it possible to obtain relevant information from the manufacturer.
- e)** Rated d.c. output voltage, or number and type of cells, or both.
- f)** Rated d.c. output current.
- g)** Nominal a.c. supply voltage(s).
- h)** Nominal a.c. supply frequency.
- i)** a.c. input current (maximum or rated and must be so identified).
- j)** Degree of protection.
- k)** Dimensions: Height, width (Length) and depth.
- l)** Weight.

#### **5.15 Information to be Given on the Equipment and Components Mounted Inside the Battery Charger**

**5.15.1** All equipment and components such as switching devices, protection relays, transformer, measuring instruments, circuit boards, semiconductor devices, terminals, fuses, fuse holders etc. shall be marked with their ratings and all other essential data as required.

##### **5.15.2 Marking**

It shall be possible to identify all equipment components mounted inside the battery charger.

**5.15.3** Identification of all equipment and components mounted inside the battery charger shall be identical with that in the schematic and wiring diagrams supplied with the battery charger.

## **5.16 Nameplates and Labels**

### **5.16.1 General requirements**

The nameplates, labels and their fixing materials shall be proven durable under the service conditions specified for the battery charger. They shall be corrosion and moisture resistant, and provided with indelible inscription in the language specified in Attachment 8. Stainless nameplates, and traffolite labels are acceptable.

**Note:**

For material layout and lettering of labels see Attachment 13.

### **5.16.2 Fixing**

Nameplates and labels fixing shall be by means of proven durable noncorrosive self threading screws. Holes for fixing shall not influence in any way the degree of ingress protection of enclosure.

### **5.16.3 Color**

Nomenclature shall be engraved into the white layer of traffolite to give black lettering on a white background. Warning or caution plates shall be red with white inscription.

## **6. INSPECTION, QUALITY CONTROL AND QUALITY RECORD**

See Attachment 2.

## **7. TESTS AND CERTIFICATION**

### **7.1 General Requirements for Tests**

See Attachment 3.

### **7.2 Specific Requirements for Tests**

Type (design) tests and routine (production) tests shall be performed as specified in Section 8 of ANSI/NEMA publication PE5.

#### **7.2.1** Type test certificate shall be submitted for the following:

- a)** Dielectric test.
- b)** Voltage adjustment test.
- c)** Temperature rise test.
- d)** Current limit tests.
- e)** Short-circuit test.
- f)** Voltage (Regulation) test.
- g)** Efficiency measurement.
- h)** Power factor measurement.
- i)** Ripple voltage measurement.

- j) Audible noise test.
- k) Dynamic response test.
- l) Input and output surge with standability test.
- m) Auxiliary devices (measuring instruments, indicators, protective devices, alarms etc.) test.

**7.2.2** Routine tests should include but not be limited to the following:

- a) Dielectric test.
- b) Voltage adjustment test.
- c) Current-limit test.
- d) Ripple voltage measurement.
- e) Auxiliary device (measuring instruments, indicators, protective devices, alarms etc.) tests.

## **8. FINISH**

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

**8.2** The color of final layer shall be:

Light grey color, unless otherwise specified in data sheet.

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

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

## **9. INFORMATION FOR MANUFACTURER/SUPPLIER**

**9.1** For relevant information see typical data sheet in Appendix A.

## **10. DOCUMENTATION/LITERATURE TO BE SUBMITTED BY MANUFACTURER/SUPPLIER**

**10.1.1** Supplier shall submit the following:

- a) Report of experience, background, major clients and annual sale for similar equipment.
- b) Reference list showing the successful operation of equipment for at least two years and the locations of equipment offered in major oil industries.
- c) Typical type test certificate of similar equipment.
- d) Declaration of confirmation with the set standards and or clear indication of deviation from the standards and the specifications.

**10.1.2** Drawings and documents relating to:

- a) Dimensioned outlines and foundation details including weights and cable entries (size and clearance).
- b) Details of cross sectional arrangements.
- c) Mounting details.

**10.1.3** Electrical schematic diagram

**10.1.4** Electrical reference documents relating to:

- a) General description.
- b) Equipment specification.
- c) Performance data.
- d) Characteristic curves.

**10.1.5** Spare parts and special tools requirements as follows:

- a) List of recommended commissioning spares with price.
- b) List of recommended spares for three years of operation.
- c) List of special tools, testing devices and instruments.

**10.1.6** Guarantee policies.**10.1.7** Complaint and compensation policies.**Note:**

The quotation will be considered as incomplete and rejected if the above mentioned information are not included.

**10.2 At Ordering Stage****10.2.1** Final general arrangement drawings, showing floor plan, elevation and end view of assembly.**10.2.2** Mass and dimensions of the assembly and of individual shipping sections.**10.2.3** Electrical wiring documents concerning:

- a) Schematic diagrams of all circuits.
- b) Wiring diagrams.
- c) Alarms, indications and acknowledgment schemes.
- d) Circuits description indicating test points and pertinent wave forms and voltages.

**10.2.4** Final electrical reference documents relating to:

- a) General description.
- b) Equipment specification.
- c) Performance data.
- d) Characteristic curves.
- e) Drawings/Parts and material lists.

**10.2.5** Instruction manuals relating to:

- a) Transport and storage.
- b) Installation.
- c) Commissioning.
- d) Operation.
- e) Inspection/Test.
- f) Maintenance incorporating trouble shooting guide.

**10.2.6 Illustrated spare parts lists including special tools****10.2.7** Certificates concerning:

- a)** Applicable type tests.
- b)** Applicable routine tests.
- c)** Quality assurance.

**Notes:**

**1) The above mentioned documents shall include identifications of all proprietary items including order number and purchaser's name.**

**2) For instructions of purchaser about drawings, see Attachment 12.**

**11. PACKING**

For general requirements, see Attachment 4.

**12. SHIPMENT**

For general requirements, see Attachment 5.

**13. GUARANTEE**

See Attachment 6.

**14. SPARE PARTS**

See Attachment 7.

**15. LANGUAGE**

See Attachment 8.

**16. COORDINATION, RESPONSIBILITY WITH OTHERS**

See Attachment 9.

**APPENDICES**

**APPENDIX A  
TYPICAL BATTERY CHARGER DATA SHEET**

- 1 Purchasing Company :**.....
- 2 Project Name :**.....
- 3 Standard Specification No :**.....
- 4 Direct Current Output :**.....
  - a) Floating voltage range:** Nominal..... Min..... Max.....
  - b) Equalizing voltage range:** Nominal..... Min..... Max.....
  - c) Boost Charging Requirement:**.....
  - d) Current Ratings:**..... Amperes at full load.
  - e) Current limit setting:**..... Amperes.
  - f) Battery type:** Lead-acid..... Nickel-Cadmium..... Other type..... No. of cells.....
  - g) Battery Capacity:**..... Ampere hours at load of..... Amp.
  - h) External load on charger during recharge period:**  
..... Amperes Min..... Amperes Max.....
  - i) External load on the charger when battery is fully recharged:**  
..... Amperes Min..... Amperes Max.....
  - j) Parallel Operation.**
  - k) High Voltage Shut off:**..... Volts.
  - l) Over discharge cut-off point:**..... Volts.
  - m) Equalize charge timer:** 0 to 24 hours.....  
0 to 72 hours..... Other.....
- 5 Alternating-Current Input :**
  - a) Nominal system voltage:**.....  
Volts a.c. with a tolerance of  $\pm$  %
  - b) Number of phases:**.....
  - c) Frequency:** ..... Hz with a tolerance of  $\pm$  ..... Hz
- 6 Ventilation Type :** Natural..... By Fan.....

(to be continued)

**APPENDIX A (continued)**

- 7 Protection (Other than normally provided by manufacturer) :**
  - a) Input**
  - b) Output**
  - c) Surge Protection**
- 8 Metering (other than normally provided by manufacturer) :**
  - a) Voltmeters**
  - b) ammeters**
  - c) ScaleRange.....Accuracy**
- 9 Mounting :**

Floor.....Wall.....
- 10 Dimensions: Height.....Width.....Depth.....**
- 11 Finish**
- 12 Relays**
  - a) Rectifier Failure alarm**
  - b) Low d.c. voltage alarm**
  - c) High d.c. voltage alarm**
  - d) Low direct current alarm**
  - e) a.c. power failure alarm**
  - f) Low a.c. voltage alarm**

Ground detection :
- 13 Audible Alarm:Function.....Level.....**
- 14 Acknowledgment reset control.....**
- 15 Indicating light (other than normally provided by the manufacturer)**

Function.....Color.....

Other Description.....
- 16 Construction (other than normally provided by the manufacturer)**
  - a) Shockandvibration.....**
  - b) Dripproofconstruction.....**
  - c) FungusProofing.....**
  - d) InsectProofing.....**
- 17 Rectifier:**
  - a) S.C.R.....**
  - b) Selenium.....**

**(to be continued)**

**APPENDIX A (continued)**

**18 Other Requirements :**

- a) Remotealarms.....
- b) RemoteVoltageSensingDevice.....
- c) Cabinetdoorlock.....
- d) Electricaldangerlabels.....

**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 : saliferous, dusty corrosive and subject to dust storms with concentration of 70 - 1412 mg/cubic meter, H<sub>2</sub>S 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.**

**ATTACHMENT 2**  
**INSPECTION, QUALITY CONTROL AND QUALITY RECORDS**

**2.1 Inspection, Quality Control**

**2.1.1** 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.

**2.1.2** Inspection may include the visit to quality control laboratories, work shops, testing bay etc.

**2.1.3** 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.

**2.2 Quality Records**

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

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

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

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

**2.2.5** Supplier shall submit to purchaser: reports, test schedules, and test certificates (in ----- copies) on completion of tests.

**Note:**

**Blanks to be filled by client.**

**ATTACHMENT 3  
TESTS AND CERTIFICATION**

**3.1 General Requirements**

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

**3.1.2** Purchaser may require witnessed tests to be carried out in the presence of his nominated representative who should be informed at least ----- weeks in advance of the date of the tests and confirmed ----- weeks before the tests.

**3.1.3** 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 are given.

**3.1.4** 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.

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

**3.1.6** Any charges incurred by the tests quoted under heading of specific requirements for tests to be quoted as a separate item and are not to be included in the cost of the equipment.

**Note:**

**Blanks to be filled by client.**

## **ATTACHMENT 4 PACKING**

**4.1** 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.

**4.2** Special attention must be given to protection against corrosion during transit, and silica gel or similar dehydrating compound shall be enclosed.

**4.3** The method of cleaning preserving and the details of packing including moisture elimination, cushioning, blocking and crating shall be such as 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 see Attachment 10.

**4.4** All bright and machined parts must be given protection against corrosion.

**4.5** 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 item do not come loose in transit or be otherwise damaged.

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

### **4.7 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 a particular equipment in the event that a recall or inspection becomes necessary.

**ATTACHMENT 5**  
**SHIPMENT**

**5.1** Preparation for shipment shall be in accordance with manufacturer standards, unless otherwise noted on the request for quotation and/or purchase order. The manufacturer shall be solely responsible for the adequacy of the preparation for shipment employed with respect to material and application, and provide materials to their destination in ex-work condition when handled by commercial carrier system.

**5.2** Each shipping package shall be provided with a permanently attached readily visible identification tag, bearing the equipment number.

The greatest care must be taken to ensure that shipping and associated documents with exact description for customs release are accompanied with the shipment.

## **ATTACHMENT 6 GUARANTEE**

### **6.1 Clearance of Defects**

The supplier shall guarantee his equipment during commissioning and for one year operation starting from the completion of seven days continuous service test in site at full load against the following defects:

- All operational defects.
- All material defects.
- All constructional and design defects.

### **6.2 Replacement of Defective Parts**

All defective parts shall be replaced by the supplier in the shortest possible time free of charge including dismanteling reassembling at site and all transportation cost. The above mentioned period shall not however be longer than 18 months from the date of dispatch from the manufacturer's works.

### **6.3 Supply of Spare Parts**

Furthermore the supplier shall guarantee the provision of spare parts to the purchaser for a minimum period of ----- years from the date of dispatch.

### **6.4 After Sale Technical Services**

#### **6.4.1 Commissioning**

**6.4.1.1** The supplier shall quote if required for the services of competent engineer(s) and or technician(s) to assist in installation commissioning and testing of the equipment at site on a per diem basis.

**6.4.1.2** The quoted rates shall be irrespective of duration and frequency and the supplier shall guarantee the services of the engineer(s) and technician(s) on the specified date within a minimum of ----- weeks advance notice by the purchaser.

#### **6.4.2 Training**

**6.4.2.1** The purchaser may require the supplier to arrange for training of his personnel in the manufacturing plant and or in site for the operation and maintenance of the equipment offered.

**6.4.2.2** The supplier shall quote (if required) for the cost of any of above mentioned services on a per person per diem basis. The program for the training shall be prepared by mutual agreement. An advance notice of ----- weeks minimum, is required by purchaser for the commencement of training program.

**Note:**

**Blanks to be filled by client.**

**ATTACHMENT 7**  
**SPARE PARTS**

**7.1** 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.

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

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

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

**ATTACHMENT 8**  
**LANGUAGE**

**8.1** All correspondence drawings, documents, certificates, including testing operation and maintenance manuals and spare part lists etc. shall be in English.

**8.2** Offers in other languages will not be considered.

**ATTACHMENT 9**  
**COORDINATION RESPONSIBILITY WITH OTHERS**

**9.1** In case the equipment ordered should be mounted on, aligned, connected, adjusted, or tested with the equipment of other manufacturer(s) the supplier shall contact directly the said manufacturer(s) and supply and obtain all dimensional and technical informations and arrange for any interconnecting equipment and combined test that may be required.

**9.2** The supplier shall be responsible for correct and timely communication with the said manufacturer(s) and for any delay and/or cost claims arising from such communications.


**9.3** Copies of all correspondence should be sent to purchaser.

**9.4** The name and address of the manufacturer(s) will be given as soon as their orders have been confirmed.

**ATTACHMENT 10  
GENERAL CONDITIONS OF PURCHASE**

This document will be submitted by purchaser at the time of ordering.

**ATTACHMENT 11  
SAMPLES OF PURCHASER'S DRAWING TITLE BLOCK**

<b>DRAWING NO.</b>		<b>DESCRIPTION</b>			
<b>REFERENCE DRAWINGS</b>					
<b>D</b>					
<b>C</b>					
<b>B</b>					
<b>A</b>					
<b>REV</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>REF</b>	<b>CHK</b>	<b>APP</b>
<b>THE NAME OF RELEVANT COMPANY</b>					
<b>DRAWING TITLE :</b>					
<b>DRN. BY</b>		<b>SCALE</b>	<b>MICRO FILM CODE</b>	<b>PROJECT NO.</b>	<b>CHK. BY</b>
<b>JOB NO.</b>		<b>AREA CODE</b>	<b>DWG. NO.</b>	<b>SHEET</b>	<b>REV.</b>

**Note:**

Appropriate Nomenclature and Registered mark shall be used for quotation and order.

**ATTACHMENT 12**  
**INSTRUCTIONS OF PURCHASER ABOUT PERTINENT DRAWINGS**

**12.1** Purchaser's drawing title block, "the sample of which is given in Attachment 11 shall be shown in the right lower corner of the drawings.

**12.2** Drawings are to be protected and packed. Negatives must be dispatched in a strong card board cylinder.

**12.3** Drawings must be rolled and not folded.

**12.4** All drawings, documents and literatures shall be forwarded under cover of a fully detailed letter to purchaser whose addresses are given in Attachment 14.

**Note:**

**Blank to be filled by client.**

**ATTACHMENT 13**  
**MATERIAL, LAYOUT AND LETTERING OF LABELS**

Label material to be "Traffolite" 5 mm. Thick having two outer letter to be engraved into the white layer to give black lettering on a white background.

**LETTER TYPE**

TYPE	HEIGHT	WIDTH mm	STROKE	CASE		LETTERS / 25 mm	SAMPLE
A	5	WIDE	LIGHT	UPPER	CASE	$7\frac{1}{2} \pm 1.2\text{mm}$ . TOL	ABCDEFGHIJKLM
B	5	WIDE	HEAVY	"	"	$7\frac{1}{2} \pm 1.2\text{mm}$ . TOL	
C	5	NARROW	LIGHT	"	"	$11 \pm 1.2\text{mm}$ . TOL	
D	5	NARROW	HEAVY	"	"	$11 \pm 1.2\text{mm}$ . TOL	
E	3	WIDE	LIGHT	"	"	$10 \pm 1.2\text{mm}$ . TOL	
F	3	WIDE	HEAVY	"	"	$10 \pm 1.2\text{mm}$ . TOL	
G	3	NARROW	LIGHT	"	"	$15 \pm 1.2\text{mm}$ . TOL	
H	10	WIDE	HEAVY	"	"	$3\frac{1}{2}$	
J	12	WIDE	HEAVY	"	"	$2\frac{1}{2}$	

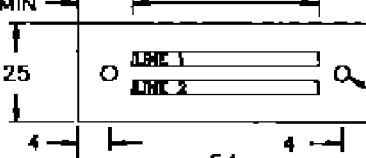
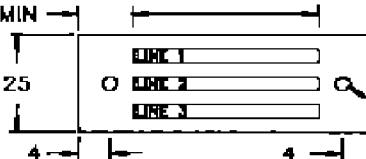
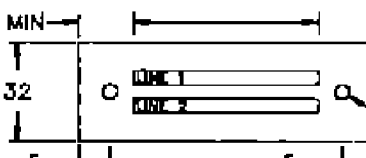
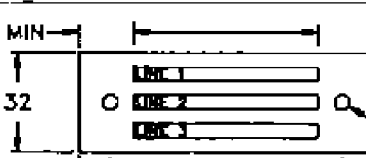
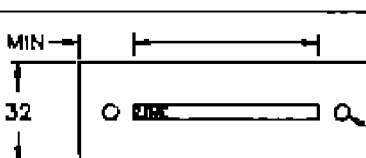
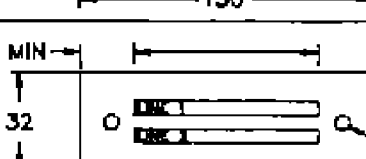
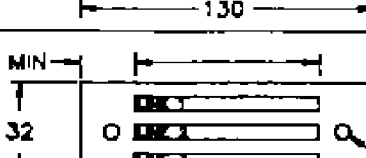
**Note:**

Height is in millimeters.

(to be continued)

ATTACHMENT 13 (continued)

LAYOUTS

<b>LAYOUT 1</b>			8 MIN		8 MIN
LETTER TYPE	G E & F	LETTERS MAX / LINE 28 19	25		4 DIA. HOLES
<b>LAYOUT 2</b>			8 MIN		8 MIN
LETTER TYPE	G E & F	LETTERS MAX / LINE 28 19	25		4 DIA. HOLES
<b>LAYOUT 3</b>			12 MIN		12 MIN
LETTER TYPE	A & B C & D E & F G	LETTERS MAX / LINE 22 23 30 45	32		4 DIA. HOLES
<b>LAYOUT 4</b>			12 MIN		12 MIN
LETTER TYPE	A & B C & D E & F G	LETTERS MAX / LINE 22 23 30 45	32		4 DIA. HOLES
<b>LAYOUT 5</b>			12 MIN		12 MIN
LETTER TYPE	H J	LETTERS MAX / LINE 15 10	32		4 DIA. HOLES
<b>LAYOUT 6</b>			12 MIN		12 MIN
LETTER TYPE	A & B C & D E & F G	LETTERS MAX / LINE 28 40 40 58	32		4 DIA. HOLES
<b>LAYOUT 7</b>			12 MIN		12 MIN
LETTER TYPE	A & B C & D E & F G	LETTERS MAX / LINE 28 40 40 58	32		4 DIA. HOLES

All dimensions are given in mm.

min = minimum

**ATTACHMENT 14  
FULL ADDRESS OF PURCHASER**

.....  
 .....  
 .....  
 .....

**P.O.BOX                      No. ....                      CODE No. ....**

**TELEPHONE                      No. ....**

**TELEX                      No. ....**

**FACSIMILE                      No. ....**

**Note:**

**Blanks to be filled by client.**