# MATERIAL AND QUALITY CONTROL STANDARD

# FOR

# LEVEL INSTRUMENTS

## FIRST EDITION

## MARCH 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 are based on internationally acceptable standards and include 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 document.

**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.

CONTENTS: PAGE No.

## 1. SCOPE

This Standard specifies the minimum and general requirements of the materials for the more commonly used instruments and devices of indicating, transmitting and controlling liquid- solid and liquid-liquid interfaces levels normally encountered in Oil, Gas, and Petrochemical Industries.

The following types are covered in this practice:

**1)** Level gauges (glasses).

**2)** Displacement - type level transmitters and controllers (pneumatic and electronic).

**3)** Differential - pressure level transmitters (pneumatic and electronic).

**4)** Level switches (displacement, float, and capacitance type).

**Note:**

**For tank gauging system refer to** IPS-G-IN-300**.**

**Note 1:**

**This standard specification is reviewed and updated by the relevant technical committee on Dec. 1998. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 48 on Dec. 1998. These modifications are included in the present issue of IPS.**

**Note 2:**

**This is a revised version of this standard, which is issued as revision (1)-2013. Revision (0)-1994 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.

**API (AMERICAN PETROLEUM INSTITUTE)**

RP 551 “Process Measurement Instrumentation”

**IEC (INTERNATIONAL ELECTROTECHNICAL COMMISSION)**

IEC-60529 “Classification of Degrees of Protection Provided by Enclosures”

IEC-60079 “Electrical Apparatus for Potentially Explosive Atmosphere”

**ANSI/ASME (AMERICAN NATIONAL STANDARDS INSTITUTE)**

B 20.1 “Pipe Threads General Purpose”

B 16.5 “Pipe Flanges and Flanged Fittings”

**NEMA (NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION)**

250 “Enclosures for Electrical Equipment (1000 Volts max.)”

**BSI (BRITISH STANDARDS INSTITUTION)**

| | |
|---|---|
| BS EN 10222-1 | "Steel Forging for Pressure Proposes, General requirements for Open Die Forging" |
| BS 3463 | "Specification for Observation and Gauge Glasses for Pressure Vessels" |
| BS 3692-8-8 | "ISO Metric Precision Hexagon Bolts, Screws and Nuts. Specification" |
| BS EN 60079-1 | "Explosive Atmospheres, Equipment Protection by Flame Proof Enclosures "d"" |

**IPS (IRANIAN PETROLEUM STANDARDS)**

| | |
|---|---|
| IPS-E-GN-100 | "Engineering Standards for Units" |
| IPS-I-IN-100 | "Inspection Standard for General Instrument Systems" |
| IPS-G-IN-300 | "Tank Gauging Devices for Petroleum and Petroleum Products" |

## 3. UNITS

This standard is based on international system of units (SI), as per IPS-E-GN-100 except otherwise specified.

## 4. LOCALLY MOUNTED INDICATING GAUGES

### STANDARD FEATURES:

#### General

Level gauge with one-piece liquid chamber machined from solid steel bar, or level gauge with self supporting centre piece. Interchangeable sectional gauge covers and glasses. All metal parts, including threaded areas, shall be rust proofed. Gauge to be complete with off-set valves with handwheels on left or right hand side of gauge and with bolted flanged bonnet and union gauge connection.

Typical construction consists of a float inside a sealed non-magnetic chamber, and an indicator mounted outside of the chamber, actuated or coupled magnetically to indicate level. Mounting to vessel usually is accomplished by means of flanged connections, and valves similar to flanged-type external displacement units.

#### Liquid Chamber

Machined from solid carbon steel bar having high physical properties at elevated temperatures.

#### Centre Piece

Stainless Steel or Mild steel according to BS EN10222-1.

#### Covers

Drop-forged steel or Mild steel according to BS EN10222-1. Heat treated and rust proof.

**Bolts**

Steel BS 3692-8-8 ISO or chrome molybdenum alloy steel. Heat treated and rust proof.

**Gauge Glasses**

Toughened soda lime, or toughened borosilicate, resistant to thermal and mechanical shock, free from defects that would interfere with vision or service. The other specifications (such as finish of ends, straightness, ovality, thermal shock requirements) shall be as described in BS 3463.

**Gaskets**

Die cut from highest grade material best suited for use with liquid indicated.

**Rating**

Shall be as specified

**Gauge and Drain Connections**

End connections ½ inch ANSI B1.20.1 NPT Female.

**Vessel Connection**

1 inch ANSI B1.20.1 NPT Male.

**Magnet Type Level Gauge**

To select the magnet type level gauge the following items should be considered:

The indication system shall be corrosion resistance.

Color of the flappers shall be stable against direct sunlight.

The upper and lower switches may be applied as an option.

**OPTIONAL FEATURES:**

**Connections**

Side connections ½ inch ANSI B1.20.1 NPT or ¾ inch ANSI B1.20.1 NPT.

Back connections ½ inch ANSI B1.20.1 or ¾ inch ANSI B1.20.1 NPT. End connections ¾ in ANSI B1.20.1 NPT.

**Heated Gauges**

External tube fitting for viscous liquids.

Internal tube fitting for viscous liquids.

**Non-frosting**

Perspex blocks, or special frost-preventing unit projecting beyond cover bolts for minimum temperatures.

**Illuminator**

Solid wedge lighting, standard bayonet base minimum 40 W bulb, 220 V 50 Hz BASEEFA standard to BS EN60079-1 gas groups IIA and IIB or equivalent, Surface temperature T5 (100°C).

**Protective Shields**

MICA shields for protection of gauge glasses against erosion or chemical action.

**Valve Handwheels**

On left or right hand side of gauge

**Notes:**

**For temperatures down to -20°C, material-Standard carbon steel.**

**For temperatures below -20°C, material-stainless steel.**

**For temperatures down to -50°C, low temperature carbon steel.**

## 5. DISPLACEMENT-TYPE LEVEL TRANSMITTERS AND CONTROLLERS

### 5.1 Pneumatic Displacer Type Level Transmitters and Controllers

**STANDARD FEATURES:**

**General**

External displacement and torque tube type level controller, trim and linkage material to be equal in quality to displacer material. Body flanges and all other flanges to be confined gasket type rated equal to body pressure rating or process connecting flange rating.

Vent and drain connections on types other than top and bottom to be screwed ¾ inch ANSI B1.20.1 NPT. Indication of displacer centre is to be marked on the displacer chamber. Travel stops are to be provided to limit displacer movement.

**Head**

Rotatable

**Displacer Chamber Assembly**

Carbon steel or as specified

**Housing**

Die-cast aluminum

**Torque Tube**

Material K-Monel for temperatures up to 370°C

Material inconel-for temperatures up to 455°C

or as specified.

**Displacer**

316 Stainless steel or as specified in data sheet

**Mounting**

Side/side, top/side, side/bottom or top/bottom (as specified)

**Connections to Vessels**

In most process applications, level transmitters and controllers should have 1 ½ or 2 inch flanged connections.

Drain gate valves ¾ inch or larger in size should always be provided, and if one or more vents are required or desired, they should be gate valves ¾ inch or larger in size.

**Air Connection**

Screwed ¼ inch ANSI B1.20.1 NPT Female

**Air Supply**

1.4 barg

**Output**

0.2-1 barg

**Range**

As specified in data sheet.

**Accuracy**

±0.5% of full span, or better

**Ambient Temperature Limits**

As specified in data sheet.

**Zero Suppression**

None

**Housing Classification**

Shall be weatherproof according to IP 65 of IEC-60529

**Control Box**

Installed on left or right hand side of the chamber

**Control Mode**

Proportional 1-100% adjustable, proportional plus integral action, or differential gap on-off controller (as specified).

**Notes:**

**For operating temperatures -20°C to +200°C standard torque tube is used.**

**For operating temperatures below -20°C, heating insulator is required.**

**For operating temperatures above +200°C, cooling fin is required.**

### 5.2 Electronic Displacer-Type Level Transmitter

**STANDARD FEATURES:**

**General**

Force balance, or rotary motion-type indicating transmitter, capable of transmitting a 4-20 mA output signal proportional to level. (For use with displacement level meters)

Vent and drain connections on types other than top and bottom to be screwed ¾ inch ANSI B1.20.1 NPT. Indication of float center is to be marked on the float cage. Travel stops to be provided to limit displacer movement.

**Head**

Rotatable

**Displacer Cage Assembly**

Carbon steel

**Transmitter Housing**

Die-cast aluminum

**Torque Tube**

K-monel for temperatures up to 370°C.

Inconel for temperatures up to 455°C.

or as specified.

**Displacer**

316 stainless steel, or as specified.

**Mounting**

Side/side, top/side, top/bottom or side/bottom (as specified)

**Connections to Vessels**

In most process applications, level transmitters and controllers should have 1 ½ or 2 inch flanged connections.

Drain gate valves ¾ inch or larger in size should always be provided, and if one or more vents are required or desired, they should be gate valves ¾ inch or larger in size.

**Electrical Connection**

M20 × 1.5

**Electrical Power Supply**

24V. d.c. (nominal), unless otherwise specified.

**Output**

4-20 mA dc

**Range**

As specified in data sheet

**Accuracy**

±0.5% of full span, or better

**Ambient Temperature Limits**

As specified in data sheet

**Zero Suppression**

None

**Electrical Classification**

Normally shall be intrinsically safe, and certified by acceptable association, such as BASEEFA, unless otherwise specified.

**Transmitter Housing Classification**

Shall be weather proof according to IP 65 of IEC-600529

**Transmitter Box**

Installed on left or right hand side of the cage

**Notes:**

**For operating temperatures -20°C to +200°C, standard torque tube is used.**

**For operating temperatures below -20°C, heating insulator is required.**

**For operating temperatures above +200°C, cooling fin is required.**

## 6. DIFFERENTIAL PRESSURE LEVEL TRANSMITTERS AND VALVE MANIFOLDS

### 6.1 Electronic Differential Pressure Level Transmitters

#### 6.1.1 General

These transmitters shall be of different types of sensors such as:

Capacitance, resonance wire, strain gauge, etc, solid state electronic, differential pressure indicating transmitters, capable of transmitting a 4 to 20 mA dc output signal, via a 2-wire system, proportional to the differential pressure (level).

**a) Functional Specifications**

**- Service**

Liquid, gas, steam, and vapor applications

**- Output**

Two-wire 4-20 mA dc (for 0-100% span and direct action)

- **Power supply**

Nominal, 24 V d.c, unless otherwise specified.

**- Hazardous area classification**

Normally shall be intrinsically safe and weather proof (IP 65), unless otherwise is specified. Approval of well-known certifying authorities such as BASEEFA, FM, PTB, UL ..... etc., is required.

- **Zero elevation and suppression**

Shall be provided, if specified in related data sheets

**- Over range protection**

Shall be same as body rating in either direction

**- Temperature limits**

As specified in data sheet

**- Humidity**

**0-100% RH**

**b) Performance Specifications**

**- Accuracy**

±0.25 of calibrated span, or better

**- Range**

As specified in related data sheets.

**- Zero and Span**

Fully adjustable

**c) Physical Specifications**

**- Electrical connection**

M 20 × 1.5

**- Electrical terminals**

Shall be in isolated compartment

- **Process connection**

½ NPT, unless otherwise flange-type is specified

**- Body and process connections material**

316 SST (wetted parts), unless otherwise specified.

**- Body material**

Carbon steel (non-wetted part), unless otherwise specified.

**- Body rating**

Shall be suitable to the specified range

**- Differential diaphragm (capsule)**

316 SST, unless otherwise specified.

**- Drain/vent valves**

316 SST, unless otherwise specified

**- Process flanges**

Plated carbon steel or 316 SST, unless otherwise specified

**- Gaskets**

Teflon, at diaphragm and seal

**- Amplifier housing**

Die-cast aluminum with cadmium or baked vinyl finish, dust and weather proof (IP 65).

**- Mounting**

Yoke and bracket for 2 inch, stand pipe vertical

**- Flange mounted type**

Size: shall be 3 inch, 4 inch, or 6 inch, as specified.

Rating: ANSI 300 RF, unless otherwise is specified.

Material: Carbon steel, unless otherwise is specified.

**- Calibration facility**

Built-in test jack: In addition to the above, test jack and internally mounted calibration facility shall be provided.

For classified area, type to be specified.

**- Sealed chamber**

Refer to IPS-G-IN-210 “Instrument protection”

## 6.2 Micro Processor-Based "SMART" Transmitters (Intelligent Transmitters)

### 6.2.1 General

These transmitters are microprocessor-based devices, capable of transmitting a 4-20 mA dc analogue and, digital signal, superimposed on 4-20 mA dc signal via a 2-Wire system, proportional to the differential pressure (level). The data may be transmitted via appropriate protocol such as HART, Profibus and Foundation Fieldbus according to the project job specification.

**a) Functional Specifications**

**- Service**

Liquid, gas, steam and vapor applications

**- Outputs**

Two-wire 4-20 mA dc, user-selectable for linear or square root output and digital signal superimposed on 4-20 mA dc signal

**- Power supply**

24 V dc, unless otherwise specified.

**- Hazardous area classification**

Normally shall be intrinsically safe and weather proof (IP 65), unless otherwise is specified. Approval of well-known certifying authorities such as BASEEFA, FM, PTB, UL, etc., is required.

**- Zero elevation and suppression**

Shall be provided, if specified in related data sheets

**- Overload protection**

Shall be same as body rating in either direction

**- Temperature limit**

As specified in data sheet

**- Failure alarm**

If self-diagnostics detect a major transmitter failure, the analogue signal will be driven either below 4 mA dc or above 20 mA dc to alert the user (high or low alarm signal is user-selectable by internal jumper).

**- Humidity limits**

0-100%RH

**b) Performance Specifications**

**- Accuracy**

Better than ±0.1% of calibrated span for analogue signal, ±0.07% of calibrated span for digital signal.

**- Range**

As specified in related data sheets.

**c) Physical Specifications**

**- Electrical connection**

M20 ×1.5

**- Electrical terminals**

Shall be in isolated compartment

**- Process connection**

½ inch, NPT, unless otherwise flange-type is specified

**- Process-wetted parts**

*** Differential diaphragms (capsule)**

316, SST, unless otherwise specified

*** Drain/vent valves**

316 SST, unless otherwise specified

*** Process flanges**

Plated carbon steel or 316 SST, unless otherwise specified

*** Wetted o-rings**

Glass-filled teflon

- **Non-Wetted parts**

*** Electronic housing**

Low-copper aluminum, NEMA4X, or IEC code IP 65.

*** Bolts**

Plated carbon steel ASTM A449, Grade 5.

*** Fill fluid**

Silicon oil or manufacturer standard

*** Paint**

As specified.

*** Cover o-rings**

Buna-N

**- Mounting**

Yoke and bracket for 50 mm (2 inch) stand pipe vertical.

**- Flange mounted type**

Size: shall be 3 inch, 4 inch, or 6 inch, as specified.

Rating: ANSI 300 RF, unless otherwise is specified.

Material: Carbon steel, unless otherwise is specified.

**- Calibration facility**

Test and calibration shall be performed by portable 2-wire digital output calibrator (hand held communicator), which can be connected to any point of the loop, without disconnecting the output signal.

Hand held communicator can be connected to the output terminals of the transmitter directly.

In addition to the above, test jack and internally mounted calibration facility shall be provided.

For classified area, type to be specified.

### 6.3 Valve Manifolds

**- General**

3 or 5 valve block manifold for use with differential pressure instruments (transmitters)

**- Materials**

Carbon steel drawn bar zinc or cadmium plated and passivated, unless otherwise specified.

**- Bore**

5 mm min. dia

**- Spindle packing**

P.T.F.E., unless otherwise specified.

**- Working pressure**

As specified in related data sheets.

**- Working temperature**

As specified in related data sheets.

**- Process connection**

Screwed ½ inch ANSI B1.20.1 NPT unless otherwise specified.

## 7. LEVEL SWITCHES

### 7.1 Displacement-Type Level Switches

#### 7.1.1 Displacement-type level switches (external-cage)

**General**

External displacement type level control switch.

Trim and linkage material to be equal in quality to displacer material, Body flanges and all other flanges to be confined, gasket type rated equal to body pressure rating or process connecting flange rating.

Vent and drain connections to be screwed ¾ inch NPT, indication of float centre is to be marked on float cage. Travel stops are to be provided to limit displaces movement.

**Body**

Carbon steel

**Connection**

Flanged 50 mm (2 inch) ANSI 300 or 600 RF, to be specified

**Displacer**

316 stainless steel, unless otherwise specified.

**Switch**

Two snap-acting SPDT micro switches, hermetically sealed housing, whether contacts open/close on level increase or decrease to be specified.

**Switch Housing**

Normally shall be explosion proof and weatherproof (IP 65), unless otherwise specified. Approval of well-known certifying authorities such as BASEEFA, FM, PTB, UL, etc., is required.

**Adjustment**

Setting made by internal micrometer adjusting knobs.

**Electrical Rating**

110 V, 50 Hz, 10 A

**Electrical Connection**

M20 × 1.5

**Temperature Rating**

As specified in data sheet

**Specific Gravity Rating**

Generally is from 0.5 to 1.4 as specified in data sheet.

**Range**

As specified in data sheet.

### 7.1.2 Displacement-type level switches (internal)

**General**

Displacement type liquid level control, with two separate displacers (one upper and one lower), positioned along a cable at predetermined liquid levels at which switch action takes place.

**Switch**

Two SPDT mercury or snap-acting SPDT micro switches, hermetically sealed housing (make on high or make on low to be specified in data sheet). Other type of mechanism for the switch may be used.

**Switch Housing**

Normally shall be explosionproof and weatherproof (IP 65), unless otherwise specified. Approval of well-known certifying authorities such as BASEEFA, FM, PTB, UL, etc., is required.

**Mounting**

Top mounted Flanged 4 inch, rating of the flanges shall be based on the service conditions (for example ANSI 300 RF).

**Displacer**

316 stainless steel, unless otherwise specified.

**Cable Stem**

316 stainless steel unless otherwise specified

**Displacer Clamp**

316 stainless steel unless otherwise specified

**Electrical Rating**

110 V, 50 Hz, 10A

**Dimensions**

Clearance required above tank mounting: 380 mm

Height of switch housing above tank mounting: 250 mm

Minimum distance from tank mounting to high switch actuation level: 300 mm

Minimum distance between switch actuation levels: 125 mm

**Electrical Connections**

M20 × 1.5 connection rotatable thru 360 degrees

**Specific Gravity Ranges**

Generally from 0.5 to 1.4 (as specified in data sheet)

**7.2 Float-Type Liquid Level Switch (External-Cage)**

**General**

Float type liquid level switch, with ball float actuating a switch, when liquid level drops a predetermined amount. A heavy-duty liquid level for service at pressure up to 32 barg @ 38°C or 20 barg @ 400°C. (Other rating may be specified in data sheet).

**Switch**

Two SPDT snap acting SPDT micro switch (make on high or make on low shall be specified in data sheet). Other type of mechanism for the switch may be used.

**Switch Housing**

Normally shall be explosion proof and weatherproof (IP 65), unless otherwise specified. Approval of well-known certifying authorities such as BASEEFA, FM, PTB, UL, etc., is required.

**Float**

316 stainless steel, unless otherwise specified.

**Float Chamber**

Heavy wall seamless steel section with ellipsoidal ends welded together totally enclosing float, or fabricated carbon steel float cage with heavy duty retained gasket type flanged closures, according to pressure-temperature rating.

**Mounting**

Externally mounted, side and bottom connections screwed 1 inch NPT, unless otherwise specified.

**Trim**

304 stainless steel, unless otherwise specified.

**Electrical Rating**

110 V, 50 Hz, 10 A

**Electrical Connection**

M20 × 1.5 connection, rotatable thru 360 degrees

**Specific Gravity Pressure & Temperature Rating**

Shall be specified in data sheet

**Note:**

**Pressure equalizing (self purging) float, to be used for extreme pressure-temperature requirements. For interface service, special weighted float to be used, to sink in lighter liquid while supported by heavier liquid.**

**7.3 R.F. (Radio Frequency) Capacitance Level Switches**

**General**

These switches are used for level detection. The measuring part of the capacitive compact level switch and the container wall form an electrical condenser. If the measuring part is covered by the product, the capacitance change in conjunction with the integrated switching amplifier is used to control the output relay.

**Power Supply**

Shall be 24 V d.c., unless otherwise specified.

**Housing (Enclosure) Protection**

IP 65 or NEMA 4X

**Over Voltage Protection**

Shall be provided

**Ambient Temperature on the Housing**

As specified in data sheet

**Storage and Transport Temperature**

As specified in data sheet

**Measuring Frequency**

Manufacturer standard

**Measuring Range**

As specified in data sheet.

**Terminals Size**

1.5 $mm^2$

**Cable Entry**

M20 × 1.5

**Housing Material**

Manufacturer standard

**Mounting**

Gland, boss, or flange material shall be 316 st.st. unless otherwise specified.

**Rod Insulation**

PE- (polyethylene) fully insulated, unless otherwise specified.

**Rod Length**

As specified in data sheet.

## 8. TANK LEVEL GAGING

For material selection refer to IPS-G-IN-300.

## 9. INSTRUMENT NAMEPLATE IDENTIFICATION

Instruments shall be supplied with a stainless steel nameplate permanently fastened to the casing. The following information shall be engraved on the nameplate:
- Company's assigned tag-number
- Manufacturer's name, model and serial number, operating range, and materials of parts exposed to process fluids.
- Maximum working pressure

-As applicable, nameplates shall also carry information relating to voltage, frequency, and hazardous area classification.

## 10. DOCUMENTATION/LITERATURE

Documents listed below shall be supplied as indicated herein or as defined in the inquiry, order and contract. Anyhow the following documents shall be considered as minimum. In addition to hard copies, electronic documents shall be provided.

| DESCRIPTION | WITH BID | WITH ORDER |
|---|---|---|
| DESCRIPTIVE LITERATURE | YES | YES |
| COMPLETED DATA SHEETS | YES | YES |
| DRAWINGS AND PARTS NUMBER | YES | YES |
| SPARE PARTS LIST WITH PART NUMBERS | YES | YES |
| ERECTION MANUAL | --- | YES |
| OPERATING MANUAL | --- | YES |
| MAINTENANCE MANUAL | --- | YES |
| ELECTRICAL CERTIFICATES | YES | YES |
| CODE COMPLIANCE CERTIFICATES | YES | YES |
| TEST CERTIFICATE | --- | * YES |
| MATERIAL ANALYSIS CERTIFICATE | --- | * YES |
| SPECIAL TOOLS REQUIRED WITH PRICES | YES | YES |
| COMMISSIONING SPARES WITH PRICES | YES | YES |
| **SPIR | YES | YES |

*** Items marked will be provided maximum two weeks after successful testing.**

**** SPIR: Spare Part Interchangeability Records.**

**Note:**

**The above shall include identification of all proprietary items.**

All drawings and literature (must be in the English language and show all dimensions, capacities, etc., in metric units).

The order number must be prominently shown on all documents. Drawings are to be properly protected and packed, and negatives must be dispatched in a strong cardboard cylinder. Drawings must be rolled not folded.

## 11. INSPECTION AND TEST

Inspection by user or appointed representative will consist of but not necessarily be confined to:

**1)** Visual and dimensional checks.

**2)** Hydraulic and functional tests where applicable.

For more information, see the standard of General-Factory inspection and testing of instruments and instrument systems IPS-I-IN-100.

## 12. PACKING AND SHIPPING

Equipment must be carefully protected and packed to provide adequate protection during transit to destination and shall be in accordance with any special provision contained in the specification or order.

Special attention must be given to protect against corrosion during transit.

All bright and machined parts shall be painted with a rust preventative.

Ancillary items forming and 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.

Instruments having delicate movements and assembled into panels for inspection and test must be replaced in makers special shock absorbing packages for transit, all connections being marked for remounting in site. Such instruments to be packed in same case as associated panel, but protected by a bulkhead or equivalent packing arrangement.

## 13. GUARANTEE

Vendor shall guarantee the following when the instrument is operated in accordance with the written operating instructions.

**13.1** Designed performance and quality under conditions per specification.

**13.2** Instrument is free from fault in design, workmanship and material to fulfill satisfactorily the operating conditions specified.

**13.3** Spare parts guarantee for minimum 10 years and performance guarantee for one year after installation or 18 months after shipment whichever is closer.