MATERIAL AND QUALITY CONTROL STANDARD

FOR

LEVEL INSTRUMENTS

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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, and liquid-liquid interfaces levels normally encountered in Oil, Gas, and Petrochemical Industries.

The following types are covered in this practice:

1) Level gages (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).

2. REFERENCES

Throughout this Standard the following standards and codes are referred to. The editions of these 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-529 "Classification of Degrees of Protection Provided by Enclosures"

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

B 2.1 "Pipe Threads"
B 16.5 "Steel Pipe Flanges and Flanged Fittings"

NEC (NATIONAL ELECTRICAL CODE)

NEC-70 "National Electrical Code-Area Classification"

NEMA (NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION)

250- "Enclosures for Electrical Equipment (1000 Volts max.)"
7- "Enclosures for Hazardous (Classified) Locations"

SAMA (SCIENTIFIC APPARATUS MAKERS ASSOCIATION)

PMC-31.1 "Generic Test Methods for the Testing and Evaluation of Process Control Instrumentation, 1980"

PMC-33.1 "Electromagnetic Susceptibility of Process Control Instrumentation, 1978"

BSI (BRITISH STANDARDS INSTITUTION)

BS 1503-161 "Specification for Steel Forgings (Including Semi-Forged Products)"
BS 3463 "Observation and Gage Glasses for Pressure Vessels"
BS 3692-8-8 "Specification for ISO Metric Precision Hexagon Bolts, Screws and Nuts. Metric Units"
BS 4683 Part 2 "The Construction and Testing of Flameproof Enclosures of Electrical Apparatus"

IPS (IRANIAN PETROLEUM STANDARDS)

E-GN-100	"Units"
E-IN-100	"General-Factory Inspection and Testing of Instruments and Instrument Systems"

3. UNITS

This Standard is based on International System of Units, (SI) except where otherwise specified.

Except for temperatures, which shall be in degrees celcius instead of kelvin, and for pipes and fittings threads which shall be in inches of NPT.

4. LEVEL GAGES (GLASSES)

STANDARD FEATURES:

General

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

Liquid Chamber

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

Centre Piece

Mild steel BS 1503-161 grade 28 or stainless steel.

Covers

Mild steel BS 1503-161 grade 28 or Drop-forged steel. Heat treated and rust proofed.

Bolts

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

Gage 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.

Gage and Drain Connections

End connections ½ in. ANSI B2.1 NPT Female.

Vessel Connection

1 in. ANSI B2.1 NPT Male.

OPTIONAL FEATURES:

Connections

Side connections ½ in. ANSI B2.1 NPT or ¾ in. ANSI B2.1 NPT.

Back connections ½ in. ANSI B2.1 or ¾ in. ANSI B2.1 NPT. End connections ¾ in ANSI B2.1 NPT.

Heated Gages

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 minus temperatures.

Illuminator

Solid wedge lighting. Standard bayonet base minimum 40 W bulb. 220 V 50 Hz BASEEFA standard to BS 4683 Part 2 gas groups IIA and IIB or equivalent. Surface temperature T5 (100°C).

Protective Shields

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

Valve Handwheels

On left or right hand side of gage.

Notes:

For temperatures down to -20°C, material-Standard corbon 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 Proportional Controllers and Transmitters

STANDARD FEATURES:

General

External displacement and torque tube type level transmitter 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 in. ANSI B2.1 NPT. Indication of float centre is to be marked on the float cage. Travel stops are to be provided to limit displacer movement.

Head

Rotatable.

Displacer Cage Assembly

Carbon steel.

Transmitter Honsing

Die-cast aluminum.

Cage Connections

50 mm (2 in.) ANSI minimum 300 RF.

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).

Air Connection

Screwed ¼ in. ANSI B2.1 NPT Female.

Air Supply

1.4 barg.

Out Put

0.2-1 barg.

Range

As specified in data sheet.

Accuracy

±0.5% of full span, or better.

Ambient Temperature Limits

-30°C to 85°C.

Zero Suppression

None

Transmitter Housing Classification

shall be weatherproof according to IP 65 of IEC-529.

Transmitter Control Box

Installed on left or right hand side of the cage.

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 in. ANSI B 2.1 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, amplifier housing.

14-gage steel, transducer housing.

Cage Connections

50 mm (2 in.) ANSI, minimum 300 RF.

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)

Electrical Connection

M20 × 1.5

Electrical Power Supply

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

Output

4-20 mA.

Range

As specified in data sheet.

Accuracy

±0.5% of full spar, or better.

Ambient Temperature Limits

-30 to +85°C.

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-529.

Transmitter Control Box

Installed on left or right hand side of the cage

Control Mode

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

Notes:

Action direct or reverse (i.e. 4-20 mA or 20-4 mA) (to obtain reverse action 20-4 mA terminal connection on amplifier to be changed).
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 Pneumatic Differential Pressure Level Transmitters

6.1.1 General

These transmitters shall be force balance, mercuryless, differential pressure type, blind transmitters, capable of transmitting 0.2-1 barg, signal proprotional to the differential pressure (level).

a) Functional Specifications

- Service

liquid, gas, steam and vapor applications.

- Output

0.2-1 barg, pneumatic signal, proportional to the differential pressure.

- Air supply

1.4 barg

- **Zero elevation and suppression**

As specified in related data sheets.

- Over range protection

Shall be same as body rating, in either direction.

- **Temperature limits**

- 30°C to +120°C at cell body
- 30°C to +82°C ambient at transmitter
- 30°C to +82°C storage

b) Performance Specifications

- Accuracy: better than 1%

- Range

Shall be as specified in related data sheets.

- Span: fully adjustable

c) Physical Specifications

- Supply and output connections: screwed ¼ in. NPT (FEM).

- Process connection

Screwed ½ in. ANSI B2.1 NPT (FEM), unless otherwise flange type is specified.

- Body material

Carbon steel, with SST. internal trim, unless otherwise specified.

- Body, plug and process connections

316 SST.

- Body rating

Shall be suitable to the maximum static pressure.

- Differential diaphragm (capsule) material

316 SST, unless otherwise specified.

- Vent and drain

Screwed and plugged ¼ in. NPT

- Gaskets

Teflon (glass filled) at process, Buna-N, at seal.

- Cover

Cast aluminum, unless otherwise specified, dust and weather proof (IP-class, shall be as specified in data sheet).

- Mounting

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

- Flange mounted type

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

Rating: ANSI 300 RF, unless otherwise is specified.

Material: Carbon steel, unless otherwise is specified.

- Sealed chamber: refer to IPS-E-IN-210 "instrument protection".

6.2 Electronic Differential Pressure Level Transmitters

6.2.1 General

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

Capacitance, resonance wire, strain gage ..... etc, solid state electronic, differential pressure indicating transmitters, capable of transmitting a 4 to 20 mA 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 (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

- 30°C to +120°C at cell body
- 30°C to +82°C ambient at transmitter

- 30°C to +82°C storage
- Humidity: 0-100% RH.

b) Performance Specifications

- Accuracy

±0.25 of calibrated span, or better.

- Range

As specified in related data sheets.

- Span

Fully adjustable

- Stability

±0.25% of upper range limit for six months.

- Vibration effect

±0.05% of upper range limit per g up to 200 Hz in any axis.

- RFI effects

Shall be tested from 20 to 1000 MHz and for field strength up to 30 v/m.

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 in., stand pipe vertical.

- Flange mounted type

Same as for pneumatic transmitters.

- Calibration facility

Built-in test jack.

- Sealed chamber

Refer to IPS-E-IN-210 "Instrument protection".

6.3 Micro Processor-Based "SMART" Transmitters (Intelligent Transmitters)

6.3.1 General

These transmitters are microprocessor-based devices, capable of transmitting a 4-20 mA analogue and, digital signal, super imposed on 4-20 mA signal via a 2-Wire system, proportional to the differential pressure (level).

a) Functional Specifications

- Service

Liquid, gas, steam and vapor applications.

- Outputs

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

- Power supply

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.

- Overload protection

Shall be same as body rating in either direction.

- Temperature limit

-30 to +120°C at cell body
-30 to +82°C ambient at transmitter
-30 to +82°C storage

- Failure alarm

If self-diagnostics detect a major transmitter failure, the analogue signal will be driven either below 4 mA or above 20 mA 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.

- Stability

±0.1% of upper range limit for 6 months.

- Vibration effect

±0,05% of upper range limit per g up to 200 Hz in any axis.

- RFI effects

Shall be tested from 20 to 1000 MHz and for field strength up to 30 v/m.

c) Physical Specifications

- Electrical connection

M20 ×1.5

- Electrical terminals

Shall be in isolated compartment

- Process connection

½ in., 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 in.) stand pipe vertical.

- Flange type mounted

Same as for pneumatic transmitters.

- Calibration facility

Test and calibration shall be performed by portable 2-wire digital output calibrator (HHT-hand held terminal), which can be connected to any point of the loop, whithout disconnecting the output signal.

This HHT can be connected to the output terminals of the transmitter directly.

6.4 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 in. ANSI B2.1 NPT.

- Dimensions

54 mm (2 1/8 in.) flanged centers.

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 in. 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 in.) ANSI 300 or 600 RF, to be specified.

Displacer

316 stainless steel, unless otherwise specified.

Switch

Two mercury or 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

Maximum housing temperature 82°C.

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 scaled housing (make on high or make on low to be specified in data sheet).

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 in., ANSI 300 or 600 RF as specified in data sheet.

Displacer

316 stainless steel, unless otherwise specified upper 80 mm × 280 mm, lower 80 mm × 150 mm.

Cable Stem

3 m long, 316 stainless steel.

Displacer Clamp

316 stainless steel.

Electrical Rating

110 V, 50 Hz, 10A.

Dimensions

Clearance required above tank mounting: 380 mm, Hight 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 conduit 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 control, with ball float actuating a switch, when liquid level drops a predetermined amount. A heavy-duty liquid level control 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 mercury or snap acting SPDT micro switch (make on high or make on low shall be specified in data sheet).

Switch Housing

Normally shall be explosionproof and weatherproof (IP 65), unless otherwise specified. Approval of well-known certi-fying authorition 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 in. NPT, unless otherwise specified.

Trim

304 stainless steel, unless otherwise specified.

Electrical Rating

110 V, 50 Hz, 10 A.

Electrical Connection

M20 × 1.5 conduit 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

-20 to +60°C.

Storage and Transport Temperature

-40 to +70°C.

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-(polyethelene) fully insulated, unless otherwise specified.

Rod Length

As specified in data sheet.

8. TANK LEVEL GAGING

8.1 Ground Reading Tank Level Indicators with Gage Board (Target)

This type of float operated tank level gaging is used when very accurate reading is not required (accuracy ±25 mm). They are used for atmospheric and low pressure storage vessels. Fig. 1 shows the different parts of this type and standard materials used.

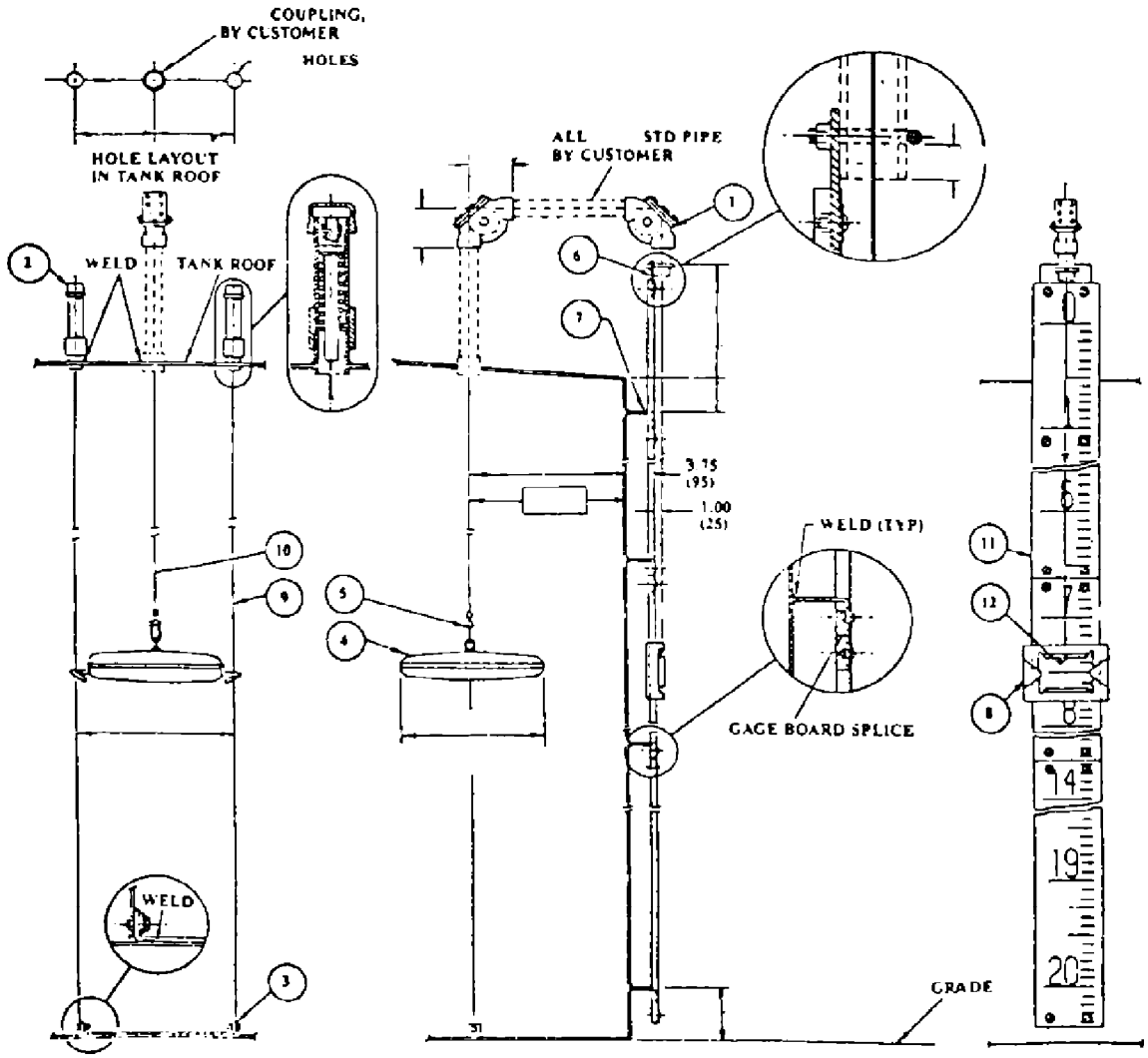
8.2 Automatic Tank Level Gaging

Automatic tank gage is a float operated instrument designed to provide continuous liquid level measurement of products stored in both above and below ground vessels.

They are used for atmospheric, low pressure, medium pressure and high pressure up to 20 barg, fixed cone roof, floating roof, fixed roof with an internal floating pan or underground tanks. It may be mounted either at top of the storage vessel, or at grade.

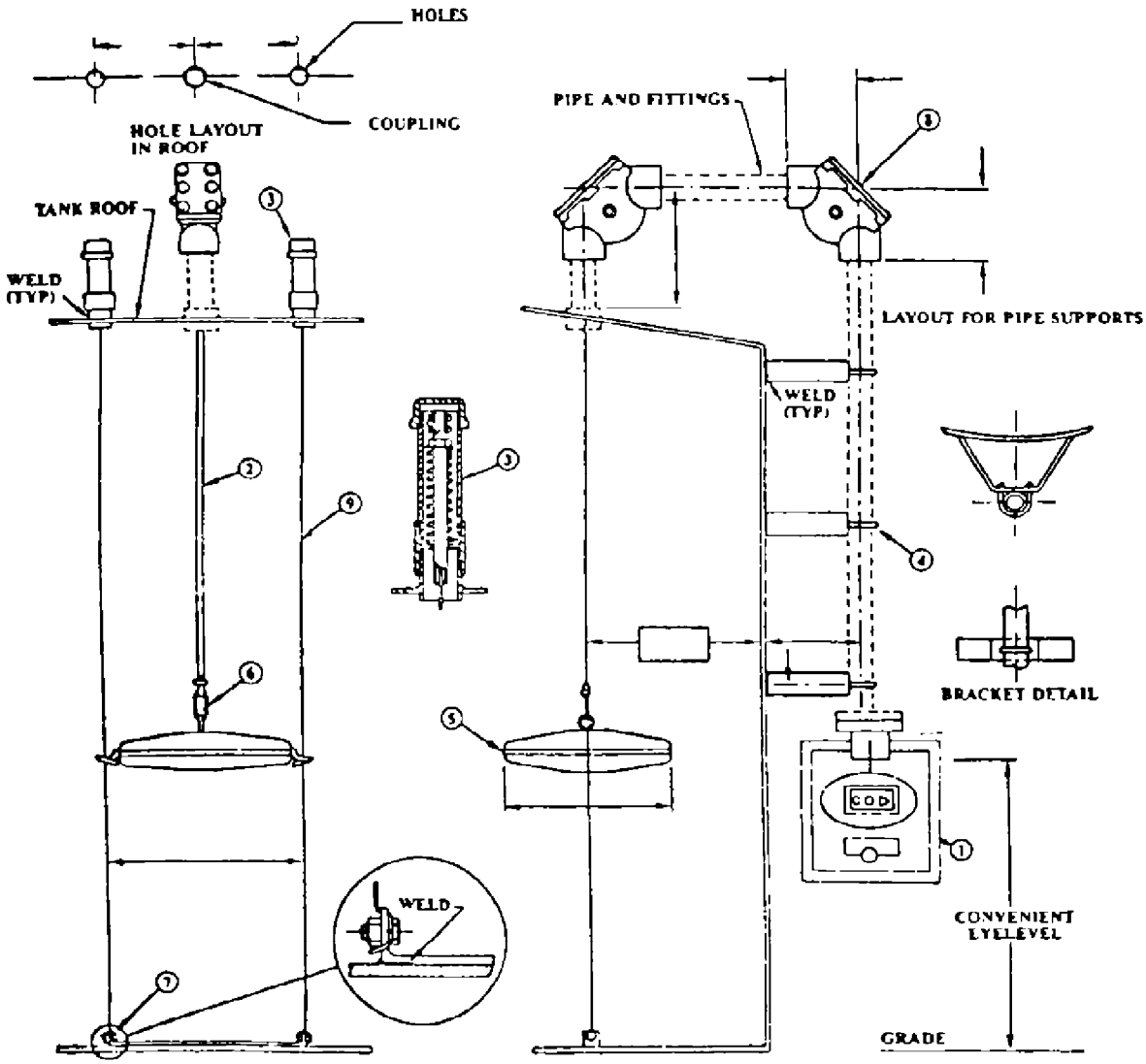
They are used with analog or digital transmitters to facilitate transmission of level data to a central location. Figs. 2 and 3 show the different parts of this type and standard materials used. (for severe applications other materials may be specified).

Item	Description	Typical Material
1	Sheave Elbow	Aluminum
2	Top Anchor	Steel
3	Bottom Anchor	Steel
4	Float	316 Stanless Steel
5	Cable Fastener	316 Stanless Steel
6	Gauge Board Connector	Steel
7	Support Bracket	Steel
8	Indicator	Aluminum
9	Float Guide Cable	316 Stanless Steel
10	Float Cable	316 Stanless Steel
11	Gauge Board	Aluminum
12	Cable Clamp	Steel



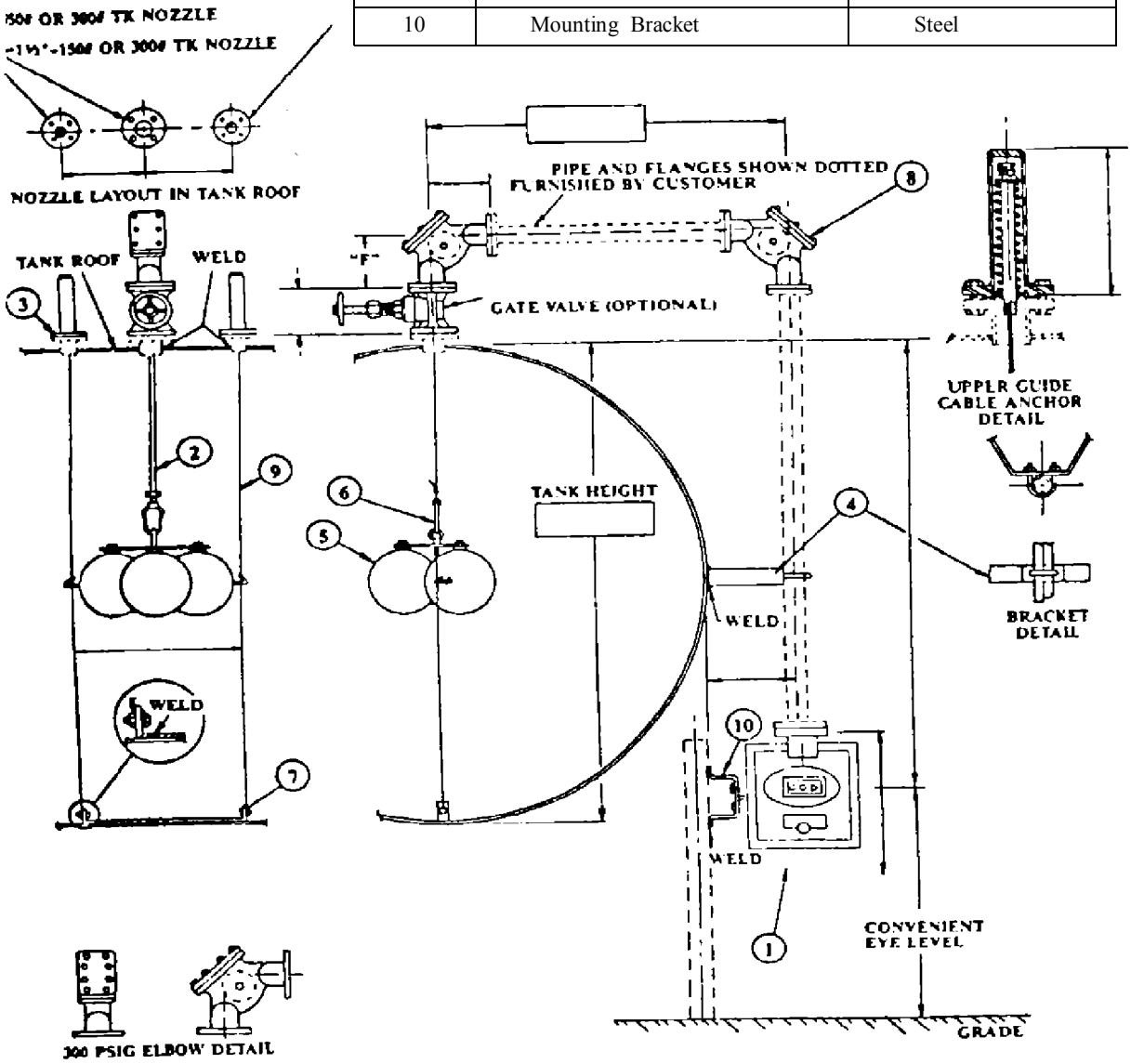
GROUND READING TANK LEVEL INDICATOR (VERTICAL TANK)
Fig. 1

Item	Description	Typical Material
1	Gauge Head	Alum. Hsg & Sheaves 304 S S Trim
2	Tape	316 Stanless Steel
3	Top Anchor	Stl. Hsg & Spring Rod. Cad PI Stl. Spring
4	Pipe Support Bkt.	Steel
5	Float	316 S S Hollow Shell
6	Tape Fastener	316 Stanless Steel
7	Bottom Anchor	Steel
8	Sheave Elbow	Alum. Hsg Delrin Sheave
9	Guide Cable	316 Stanless Steel



AUTOMATIC TANK LEVEL GAGE
CONE ROOF TANK, SERVICE RATING: ATMOSPHERIC TO 170 m barg (2.5 psig)
Fig. 2

Item	Description	Typical Material
1	Gauge Head	Steel
2	Tape	316 Stanless Steel
3	Top Anchor	Steel
4	Pipe Support Bracket	Steel
5	Multi Sphere Float	304 Stanless Steel
6	Tape Fastener	304 Stanless Steel
7	Bottom Anchor	Steel
8	Sheave Elbows, 90°	Steel
9	Guide Cable	316 Stanless Steel
10	Mounting Bracket	Steel



HIGH PRESSURE TANK GAGE-SPHERES OR CYLINDERS TO 16 DIA

Fig. 3

8.3 Servo Level Gages

General

Servo powered level gage uses a low-voltage servo motor, to eliminate measuring error induced by friction, and to improve sensitivity and repeatability. Its typical accuracy is ±0.5 mm.

They are used with analog or digital transmitters. Digital transmitters are either, rugged brush type absolute encoders, or non-contact straight line absolute see-through optical encoders.

Specifications

Measuring Range

As specified.

Accuracy

±(0.5 + 0.11 L) mm.

Where L = distance in meters between the actual liquid level and the original gage calibration reference height.

Sensitivity

Better than 0.5 mm (0.02") change in level.

Repeatability

Better than 0.5 mm (0.02"). Static Error for Change in relative density of 100 kg/m^3 (6.24 lb/cu. ft.):

±0.5 mm (0.02")

Response delay for Wave

Integration:

Preset at 6 seconds adjustable 2-15 seconds

Heater:

Manufacturer standard.

Power Requirement:

24 V a.c. ±10% , 50 Hz, unless otherwise specified.

Service Conditions:

Operating Temperature Range:

-20°C to +70°C
(-5°F to +158°F)

Operating Humidity Range:

5 to 100% R.H.

Operating Specific Gravity Range:

0.5 to 1.5, as specified.

Operating Pressure Ranges:

as specified

HOUSING FLAME PROOF/EXPLOSION PROOF CERTIFICATION

From approved associations such as:

Factory Mutual (FM)
CENELEC and BASEEFA

LEVEL ALARM SWITCHES

Switches Rated at:

0.3 A at 125 V d.c., 0.15 A at 250 V d.c. and/or 1.0 A at 125 or 250 V a.c. for resistive loads only.

MATERIALS OF CONSTRUCTION

Servo Housing and Cover: Cast Aluminum

Drum Housing and Cover:

Cast Aluminum
Carbon Steel
Type 316 Stainless Steel
} to be specified

Measuring Drum:

Cast Aluminum
Cast Type 316 Stainless Steel
} to be specified

Measuring Wire:

Type 316 S.S. Braided Cable Hastalloy-C	to be specified

Flange Connections:

Aluminum 6" 125 # ANSI F.F. Carbon Steel 6" 150 # ANSI R.F. Carbon Steel 6" 300 # ANSI R.F. Type 316 S.S. 6" 150 # ANSI R.F. Type 316 S.S. 6" 300 # ANSI R.F.	to be specified

Data Transmission

Serial Digital 4-Wire Type Serial Digital Matrix Selection 4-20 mA Current Output	as specified

Encoder Options

Brush Type, Metric, 0-20 m in 0.001 m increments Brush Type, Metric, 0-30 m in 0.001 m increments Optical Type, Metric, 0-20 m in 0.001 m increments Optical Type, Metric, 0-30 m in 0.001 m increments 4-20 mA Current Output Type-Various ranges	as specified

Transmission Electronics

Matrix Select, 16 or 24 Bit, Universal Board 4-Wire Addressable, 56 Bit, Micro 4-Wire Type Current Output Transmission Board	as specified

Drum Shaft

Type 316 S.S.

Bearing

Stainless Steel.

"O" Rings

Viton. Teflon.	as specified

Magnetic Coupling

Ceramic 5 magnets.

Displacers

145 mm (5.7") Teflon Graphite. 145 mm (5.7") Teflon Graphite-Guided. 90 mm (3.5") Teflon Graphite. 90 mm (3.5") 316 Stainless Steel. 50 mm (2.0") Teflon Graphite.	as specified

9. INSTRUMENT NAMEPLATE IDENTIFICATION

Instruments shall have the following identifying information on a nameplate permanently fastened to the instrument. Adhesive fastening is not acceptable.

a) Equipment identification number.
b) Pressure rating of pressure holding parts.
c) Manufacturer's name, model, serial number, operating range, and materials of parts exposed to process fluids.

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

10. DOCUMENTATION/LITERATURE

10.1 At Quotation Stage

Suppliers are to provide the following in the numbers requested at the time of quotation:

a) Comprehensive descriptive literature.
b) List of recommended commissioning spares with prices.
c) Details of any special tools required with prices.

10.2 At Ordering Stage

suppliers are to provide the following in quantities and at time as detailed on the order:

a) List of recommended spares for two years continuous operation.
b) Illustrated comprehensive spare parts manual with part numbers suitable for warehouse stocking.
c) Illustrated installation and operating instructions.
d) Maintenance manuals.

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 despatched 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-E-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 protection against corrosion during transit.

All bright and machined parts must 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 Iran. 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.