

SCOPE

- I 1.1 This practice covers requirements governing the design, performance, and purchase of electronic and pneumatic instruments.
- I 1.2 **An asterisk (*)** indicates that a decision by the Owner's Engineer or purchaser is required, or that additional information is to be supplied by the purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists practices and standards which shall be used with this practice.
- I * 2.2 **Table 2** lists practices and standards which shall be used with this practice, as specified by the purchaser.

TABLE 1

PRACTICES	
IP 15-6-2	Environmental Protection for Instrumentation
IP 15-10-1	Instrument Transmission Systems
STANDARDS	
ASME / ANSI Standards	
B1.20.1	Pipe Threads, General Purpose (Inch)
B16.5	Pipe Flanges and Flanged Fittings
ANSI / ISA Standard	
S51.1	Process Instrumentation Terminology
API Standard	
RP 552	Instrumentation and Control Manuals for Refinery Service - RP 552 Transmission Systems

TABLE 2

PRACTICES	
IP 3-16-1	Flanged Joints, Gaskets, and Bolting
IP 19-7-1	Protection of Stainless Steel During Fabrication, Shipping, Storage, and Field Construction
IP 20-1-1	Inspection of Equipment and Materials
STANDARDS	
ISA Standards	
S 12.1	Definitions and Information Relating to Electrical Instruments in Hazardous (Classified) Locations
RP 12.4	Pressurized Enclosures
ANSI / ISA Standard	
S 12.12	Nonincendary Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

ENCLOSURES AND CONNECTIONS

- S 3.1 **Instrument enclosures** shall be suitable for electrical area classification and environment where installed.
- M 3.2 **All threaded pipe connections** shall be tapered in accordance with **ASME/ANSI B1.20.1**.
- M * 3.3 **Threaded process connections** shall be internally threaded 1/2 in. NPT (15 mm) minimum, unless specified otherwise by the Owner's Engineer.
- M 3.4 **Connections for air supply, pneumatic transmission, and control signals** shall be internally threaded 1/4 in. NPT (8 mm).
- M 3.5 **Electrical conduit connections** for field mounted instruments and devices shall be internally threaded.

IP 15-6-1		Electronic and Pneumatic Instruments	
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

- M,R 3.6 **The size of terminal blocks and screws** shall be consistent with the wire size used with them. **Terminations** shall be one of the type described below. Spring type terminals are not acceptable.
- Captive screw terminal strips used with spade type wire ends, **or**
 - Modular (or stacked) snap-in terminal block assemblies of the screwed, pressure clamp type. Crimp-on wire-end pins or sleeves are required for stranded wire.

MATERIALS

- R 4.1 **All atmosphere exposed parts** shall resist environmental wear. Cadmium plating is not acceptable.
- R 4.2 **All process fluid exposed parts**, such as Bourdon tubes, diaphragms, ball and tubular floats, displacers, and bellows shall resist the corrosive properties of the process fluid.
- S,R 4.3 **Instruments in flammable or toxic service** shall minimize leakage when exposed to fire. **Low melting point metal materials**, such as aluminum and brass, shall not be used for the construction of pressure bearing or body retaining parts.

DESIGN AND PERFORMANCE

- I 5.1 For transmitters and receivers, the lowest value of the rated signals shall correspond to 0% of range and the highest value shall correspond to 100% of range.
- I * 5.2 **Analog electronic signal transmission range** shall be 4-20mA. Other ranges require purchaser approval.
- I 5.3 **The means for transmission of forces or motion** through the pressure holding parts shall be of the positive seal type, such as torque tube, bellows, diaphragm, or magnetic coupling. Magnetic coupling shall not, however, be used with differential pressure instruments.
- I,O 5.4 **Transmitters, recorders, indicators, controllers, and transducers** shall meet the following performance requirements:
- Maximum measurement error shall not exceed $\pm 0.3\%$ of span.
 - Hysteresis shall not exceed $\pm 0.3\%$ of span.
 - Dead band shall not exceed 0.25% of span.
 - Output change caused by 100°F (56°C) ambient shift shall not exceed 1% of upper range limit.
- R,O 5.5 **Differential pressure instruments** shall meet the following requirements:
- Differential pressure instruments shall withstand direct or reverse over-range equal to full static pressure rating, without affecting calibration or having any zero shift.
 - Any output change caused by a change in static pressure equal to 100% of pressure element rating shall not exceed 1% of span.
- M 5.6 **A means for calibration** of transmitters, recorders, indicators, and transducers shall be provided to permit adjustment of the zero and the span of the output.
- M,O * 5.7 **Electronic transmitters** shall preferentially be microprocessor-based (smart) type for all uses. Use of smart transmitters as inputs to protective instrument systems requires prior approval by Owner's Engineer.
- O,I 5.8 Electrical transmitters utilizing two wire 24 volt DC power supplies shall be designed to operate with 12 volt DC at 20 mA to ensure enough available loop voltage loss for lengthy input wiring.

STAND ALONE CONTROLLERS

- O 5.9 **Controllers in intermittent service** shall be furnished with an adjustable reset limiter, high or low limiting type as required, to prevent saturation of the reset circuit.
- S,O 5.10 **All pneumatic controllers** shall be separate from the process measurement transmitters. The controller shall receive a signal from a pneumatic transmitter.