



NATIONAL PETROCHEMICAL COMPANY  
STANDARDS

CONSTRUCTION STANDARD  
FOR  
SHOP INSPECTION OF INSTRUMENTS

NPCS-CS-TP-05

REVISION : 0

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1 SCOPE

- 1.1 This standard covers the minimum requirements for shop inspection of instruments to be supplied to NPC for major contracts.
- 1.2 The procedures outlined in this standard are complementary to any requirements, that may also be laid down in individual NPC Standards referred to herein.
- 1.3 Waiver of any requirements specified herein requires the written approval of NPC.
- 1.4 NPC construction standard for shop inspection (NPCS-CS-TP-01), shall be used for general terms and procedure of inspection.

2 INSTRUMENT SHOP INSPECTION

2.1 GENERAL

- 2.1.1 All instruments shall conform to the requirements of all related NPC Standards.
- 2.1.2 In cases of major purchase a pre-inspection meeting shall be held in accordance with NPCS-CS-TP-01.
- 2.1.3 Generally, it is not essential to submit all the instruments to complete inspection tests (defined by the instruments characteristics), in case of standard instruments. Some points such as scale ranges shall be checked on the whole batch. In an order of *instruments* of the same type and same make, scales are often different.
- 2.1.4 Analysers and sampling systems 100% inspection, other instruments submitted to complete tests shall be selected at random, theoretically in the following proportion:
- |                |                 |
|----------------|-----------------|
| 2 to 20 = 3    | 100 to 200 = 15 |
| 20 to 40 = 5   | 200 to 300 = 20 |
| 50 to 100 = 10 | 300 to 500 = 25 |
- Control valves and safety valves as per requirements for valves (NPCS-CS-TP-02).

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- 2.1.5 No defect likely to impair the instruments operations, shall be tolerated on these samples.
- 2.1.6 The first defect noticed shall entailed doubling of the quantity to be tested.
- 2.1.7 For the second defect noticed, a 100% control shall be made. In case of satisfactory test of samples, the batch shall only be accepted upon presentation of the certificates of each instrument.
- 2.1.8 For explosion proof and intrinsic safe material:
- Check certification as per purchase order requirements for the specified hazardous area.
  - Extra visual check on required execution.
  - Check name/data plate for certificate number for explosion proof and intrinsic safe execution.
- 2.2 INSTRUMENTS
- 2.2.1 Check use of specified materials, especially for the parts to be regarded as process piping, e.g. orifice flanges, including certification.
- 2.2.2 Check workmanship; cleanliness, welding, wiring.
- 2.2.3 Check calibration data sheets.
- 2.2.4 Witness functional test including calibration (upscale and downscale) alarm settings, functional test of burn-out provisions and repeat ability check.
- 2.2.5 Complete check of vendor's data sheet for compliance with purchase order requirements, e.g. type, range, execution, etc. (special attention for change requisitions).
- 2.2.6 Witness or check hydrotest.
- 2.2.7 Dimensional check; Installation dimensions, flange/screw connections, terminal and cable gland sizes.
- 2.2.8 Check nameplate/marketing/tagging.
- 2.2.9 Check painting/coating and preparation for shipment.



- 2.3 INSTRUMENT CONTROL PANELS (MAJOR ITEMS TO BE INSPECTED)
- 2.3.1 Use of specified materials, especially for the parts to be regarded as process piping, e.g. orifice flanges, including certification.
- 2.3.2 Workmanship; accessibility of instruments for adjustment or replacements, tagging and marking, clamping, earthing, wiring, etc.
- 2.3.3 Complete functional test (both electrical and pneumatic). Random check on instrument calibration, full check on ranges, tagging and execution, including simulation of inputs and outputs.
- 2.3.4 Leakage tests of pneumatic system by means of air-soap test or pressure drop test.
- 2.3.5 Insulation resistance test.
- 2.3.6 Dielectric test on electrical wiring.
- 2.3.7 Electrical Component: Burn-in test.
- 2.3.8 Dimensional Check
- Fixation and overall dimensions, pneumatic and electrical connections.
- 2.3.9 Check painting and preparation for shipment.
- Note: It might be necessary that witnessing of functional test by the Instrument Engineer is required.

3 SUPPLEMENTARY SHOP INSPECTION OF INSTRUMENTS FOR MAJOR PURCHASE

3.1 SCOPE

- 3.1.1 This standard lists the supplementary shop inspection requirements for instrument purchase for major contracts.



- 3.1.2 NPC shall specify for each job, whether this supplementary procedure shall be followed.
- 3.1.3 If section 3 of this standard is followed, then this section shall take precedence over section 2.
- 3.2 INSTRUMENTS
- 3.2.1 Flow Instruments (Primary Elements, Orifice Plates)
- 3.2.1.1 Checking of Characteristics:
- Material (checking of certificates).
  - Diameter check.
  - Check of indications shown on tag:
    - a) identification on the upstream side.
    - b) line diameter.
    - c) orifice diameter.
    - d) identification.
  - Check or surface state on the upstream side.
- 3.2.2 Differential Pressure Flow Transmitters
- 3.2.2.1 Checking of Characteristics:
- Type.
  - Model.
  - Scale.
  - Connections.
  - Attachment.
  - Identification.
- 3.2.2. Tests:
- Calibration check 0 - 25% - 50% - 75% - 100%.
  - Static pressure tests on 1 or 2 instruments selected for test.
  - Check, hysteresis, sensitivity, reliability.

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3.2.3 Rotameters

3.2.3.1 Checking of Characteristics:

- Model.
- Body.
- Relays, connection.
- Totalizer, graduations.
- Connections.

3.2.3.2 Tests:

- Electronic relays.
- Signal duration.
- Impulse frequency.
- Insulation.
- Calibration.
- Dielectric test.

3.2.4 Positive Displacement Meters

3.2.4.1 Checking of Characteristics:

- Model.
- Body.
- Relays, connection.
- Totalizer, graduations.
- Connections.

3.2.4.2 Tests:

- Electronic relays.
- Signal duration.
- Impulse frequency.
- Insulation.
- Calibration.
- Dielectric test.



3.2.5 Level Transmitters

3.2.5.1 Torque Tubes

a) Checking of Characteristics:

- Body.
- Plunger.
- Torque tube (material).
- Output signal.
- Scale.
- Nature of fluid.
- Service pressure.
- Density.

b) Tests:

- Calibration 0 - 25% - 50% - 75% - 1.00%.
- Hysteresis, sensitivity, reliability.
- Body test according to service conditions.

3.2.5.2 Differential Pressure:

Acceptance per 3.2.2 with, in addition, zero shifting check.

3.2.6 Level Contactors (Alarms)

3.2.6.1 Checking of Characteristics on each instrument

- Service temperature.
- Service pressure.
- Liquid density.
- Body, connection.
- Float.
- Electric enclosure.

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- 3.2.6.2 Tests:
- Electric check.
  - Hydraulic test of the body by sample taking.

3.2.7 Capacitive Level

3.2.7.1 Checking of Characteristics:

- Type.
- Service temperature.
- Service pressure.
- Voltage supply.,
- Electric enclosure.
- Output signal.

- 3.2.7.2 Tests:
- Calibration.
  - Body test according to service conditions.

3.2.8 Radioactive Level

3.2.8.1 Checking of Characteristics:

- Type.
- Permissible ambient temperature.
- Voltage supply.
- Output signal.
- Source Protection.
- Electric enclosure.

- 3.2.8. Tests:
- Calibration.



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3.2.9 Magnetic Level Gauge

3.2.9.1 Checking of Characteristics:

- Type.
- Service temperature.
- Service pressure.
- Liquid density.
- Float.
- Enclosure.
- Flange connection.
- Scale.

3.2.9.2 Tests:

- Breaking at several points of the scale (0% - 25% - 50% - 100%).
- Calibration.
- Pressure test of float and body.

3.2.10 Tank Level Gauge Systems

3.2.10.1 Checking of Characteristics:

- Model.
- Measuring range.
- Float material.
- Electrical classification.
- Dial or digital local display.
- Transmitter.
- Completeness of the supply (mounting accessories as: distance piece, elbows, unions, supports, top/bottom, float anchors, etc. ).
- Calibration and accuracy check.



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- 3.2.10.2 Tests:
- Calibration (0% - 25% - 75% - 100%).
  - Hysteresis, sensitivity, reliability.
  - Body test according to service conditions.

3.2.11 Silometer

3.2.11.1 Checking of Characteristics:

- Type.
- Scale graduation.
- Output signal.'
- Supply.
- Connection.

3.2.11 Tests:

- Calibration test(0% - 100%).
- Response time.
- Temperature drift.
- Linearity error.

3.2.12 Contact Pressure Gauge

3.2.12.1 Checking of Characteristics:

- Model.
- Enclosure.
- a) Standard.
- b) Material.
- c) Connections, process, electricals.
- d) Assembly.
- Scale.
- Contact.



- a) Voltage.
- b) Rupturing capacity.
- c) Setting range.

- Fluid.
- Service temperature.

#### 3.2.12.2 Visual Examination

##### Tests:

- Breaking at several points of the scale.
- Calibration.
- Suppression.

#### 3.2.13 Local Control Instruments

##### 3.2.13.1 Pneumatic Pressure Transmitter

###### a) Checking of Characteristics:

- Type.
- Sensitive element material.
- Connections, process and supply.
- Scale.
- Supply.

###### b) Tests:

- Calibration checking, 0 - 25% - 50% - 75% - 100%.
- Sensitivity, hysteresis.

##### 3.2.13.2 Pneumatic Pressure Indicator Controller

###### a) Dito 3.2.13.1-a.

###### b) Dito 3.2.13.1-b, plus checking of proportional, rate and reset action.