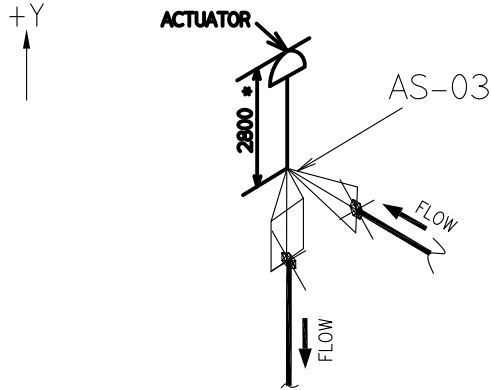


# Annexure-A

For better clarification to vendor, following documents are added as Annexure-A.

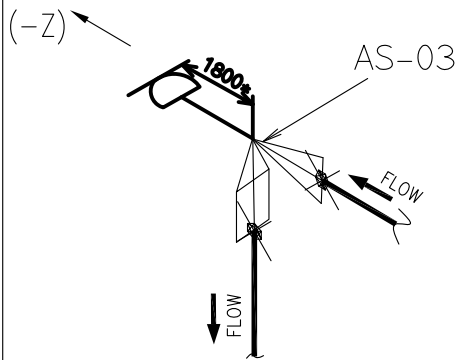
- HC PRDS ISOMETRIC WITH SPACE AVAILABLE FOR ACTUATOR
- STANDARD HOOK UP DIAGRAM FOR PNEUMATICALLY OPERATED CONTROL VALVE
- SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER
- TESTING

1-00-307-33116  
DRAWING NO.



DETAIL-A  
(OPTION-1)

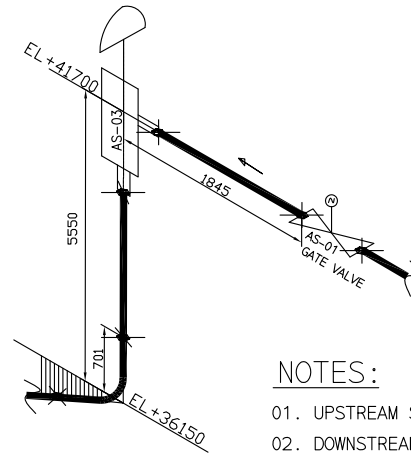
\*-DIMENSION INDICATES AVAILABLE SPACE FOR ACTUATOR (INCLUDING WITHDRAWAL SPACE) AS PER LAYOUT



DETAIL-A  
(OPTION-2)

\*-DIMENSION INDICATES AVAILABLE SPACE FOR ACTUATOR (INCLUDING WITHDRAWAL SPACE) AS PER LAYOUT

DETAIL-A



NOTES:

- UPSTREAM STRAIGHT LENGTH AVAILABLE FROM CENTRE LINE OF VALVE - 1845mm
- DOWNSTREAM STRAIGHT LENGTH AVAILABLE FROM CENTRE LINE OF VALVE INCLUDING ELBOW ARM LENGTH - 5550mm
- VENDOR TO SELECT THE VALVE ACTUATOR ORIENTATION WITH EITHER OPTION-1 OR OPTION-2 ONLY.
- SPACE FOR ACTUATOR LENGTH AVAILABLE IN +Y DIRECTION FROM CENTRE LINE OF VALVE INCLUDING WITHDRAWAL SPACE IS - 2800mm
- SPACE FOR ACTUATOR LENGTH AVAILABLE IN -Z DIRECTION FROM CENTRE LINE OF VALVE INCLUDING WITHDRAWAL SPACE IS - 1800mm

|                                                     |                  |       |              |                       |             |
|-----------------------------------------------------|------------------|-------|--------------|-----------------------|-------------|
| CUST NO.                                            | 7200             | 7201  | 7202         | REL NO.               |             |
| CUSTOMER                                            |                  |       |              |                       |             |
| NTPC LTD.<br>(A Government of India Enterprise)     |                  |       |              |                       |             |
| OWNER                                               |                  |       |              |                       |             |
| NABINAGAR POWER GENERATION COMPANY PVT. LTD         |                  |       |              |                       |             |
| NAME OF PROJECT.                                    |                  |       |              |                       |             |
| NABINAGAR SUPER THERMAL POWER PROJECT               |                  |       |              |                       |             |
| UNIT NO'S.: - 1,2&3, STAGE-1 (3X660MW)              |                  |       |              |                       |             |
| STEAM GENERATOR PACKAGE                             |                  |       |              |                       |             |
| BHARAT HEAVY ELECTRICALS LIMITED                    |                  |       |              | NAME                  | SIGN        |
| PIPING CENTRE                                       |                  |       |              | DATE                  |             |
| CHENNAI 600 017                                     |                  |       |              | DRN                   | B. SUKUMAR  |
|                                                     |                  |       |              | CHD                   | VENKAT      |
|                                                     |                  |       |              | APFD                  | SARAVANAN.C |
| DEPT                                                | GRADE OF UNTOLOM | SCALE | WEIGHT (KG.) | REF. TO ASSY/OLD DRG. | NO. OF VAR. |
| CODE                                                | C / M / F        |       |              |                       |             |
| TITLE                                               |                  |       |              | DRAWING NO.           | REV         |
| HC PRDS ISOMETRIC WITH SPACE AVAILABLE FOR ACTUATOR |                  |       |              | 1-00-307-33116        | 00          |

CAUTION: THE DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR MAKING OF DRAWINGS OR APPARATUS EXCEPT WHERE PROVIDED FOR AGREEMENT WITH SAID COMPANY.

# STANDARD HOOK UP DIAGRAM FOR PNEUMATICALLY OPERATED CONTROL VALVE

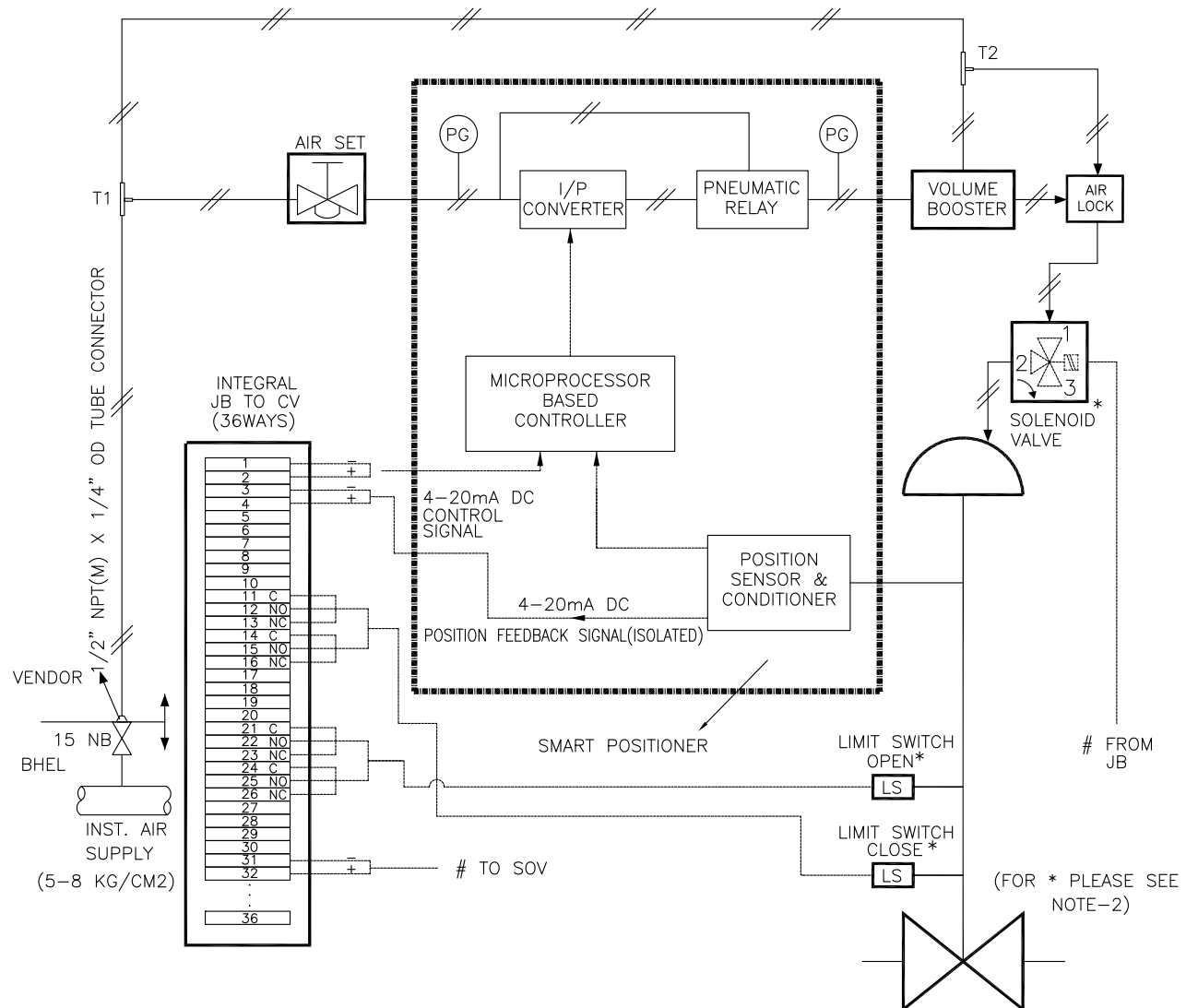


TITLE:— STANDARD  
CONTROL VALVE HOOK-UP DIAGRAM

SHEET

1 OF 4

## STANDARD CONTROL VALVE HOOK-UP DIAGRAM (WITH SMART POSITIONER)



NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:  
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.  
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS 1/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 SHALL BE PROVIDED.



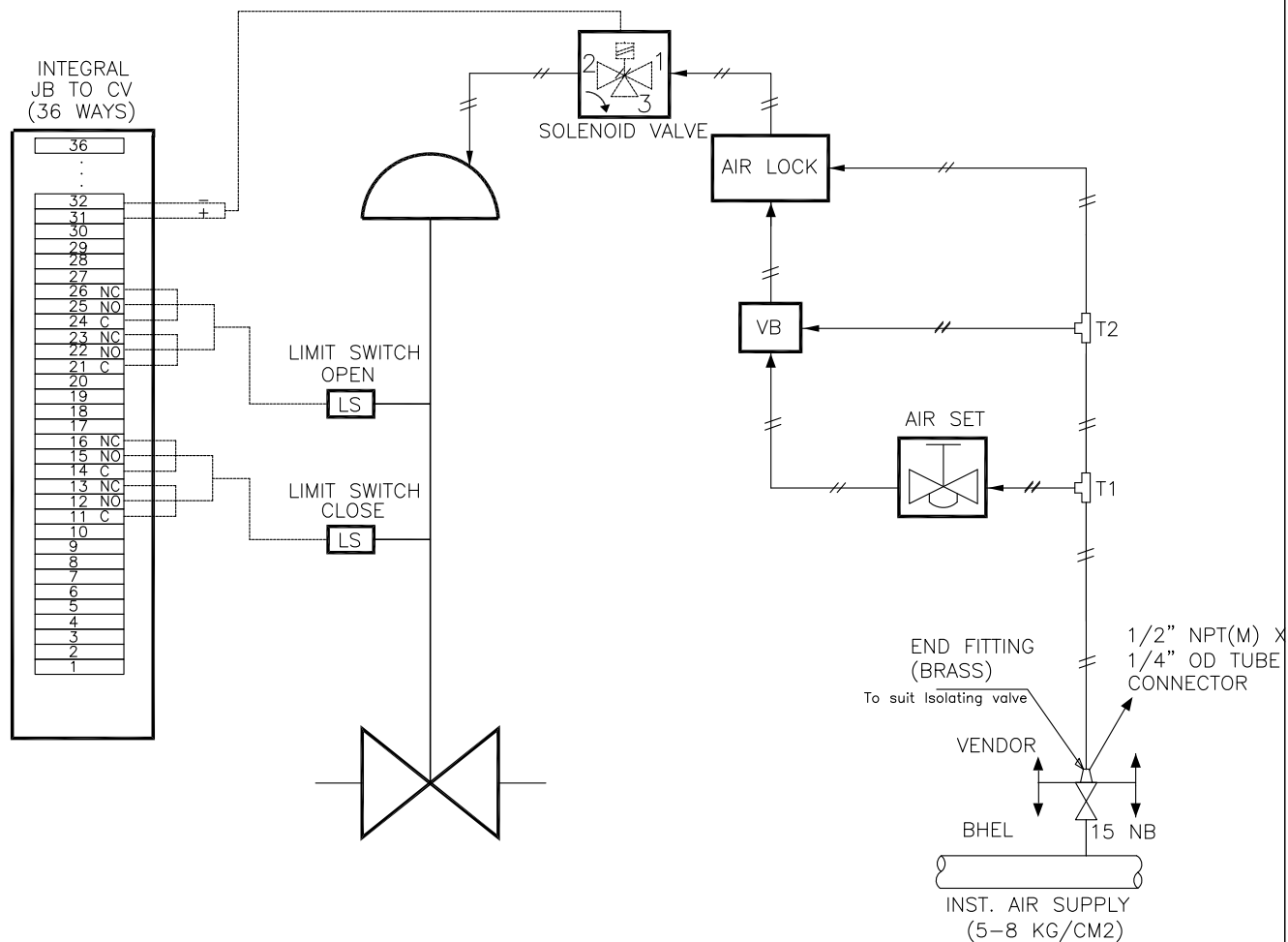
TITLE:-

## STANDARD CONTROL VALVE HOOK-UP DIAGRAM

SHEET

2 OF 4

## STANDARD CONTROL VALVE HOOK-UP DIAGRAM (FOR ON / OFF TYPE)



### NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRIC SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVES PORTS CONDITION:  
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.  
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
3. MOUNTING ACCESSORIES AS REQUIRED.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET.
5. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
6. 12 METERS 1/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.



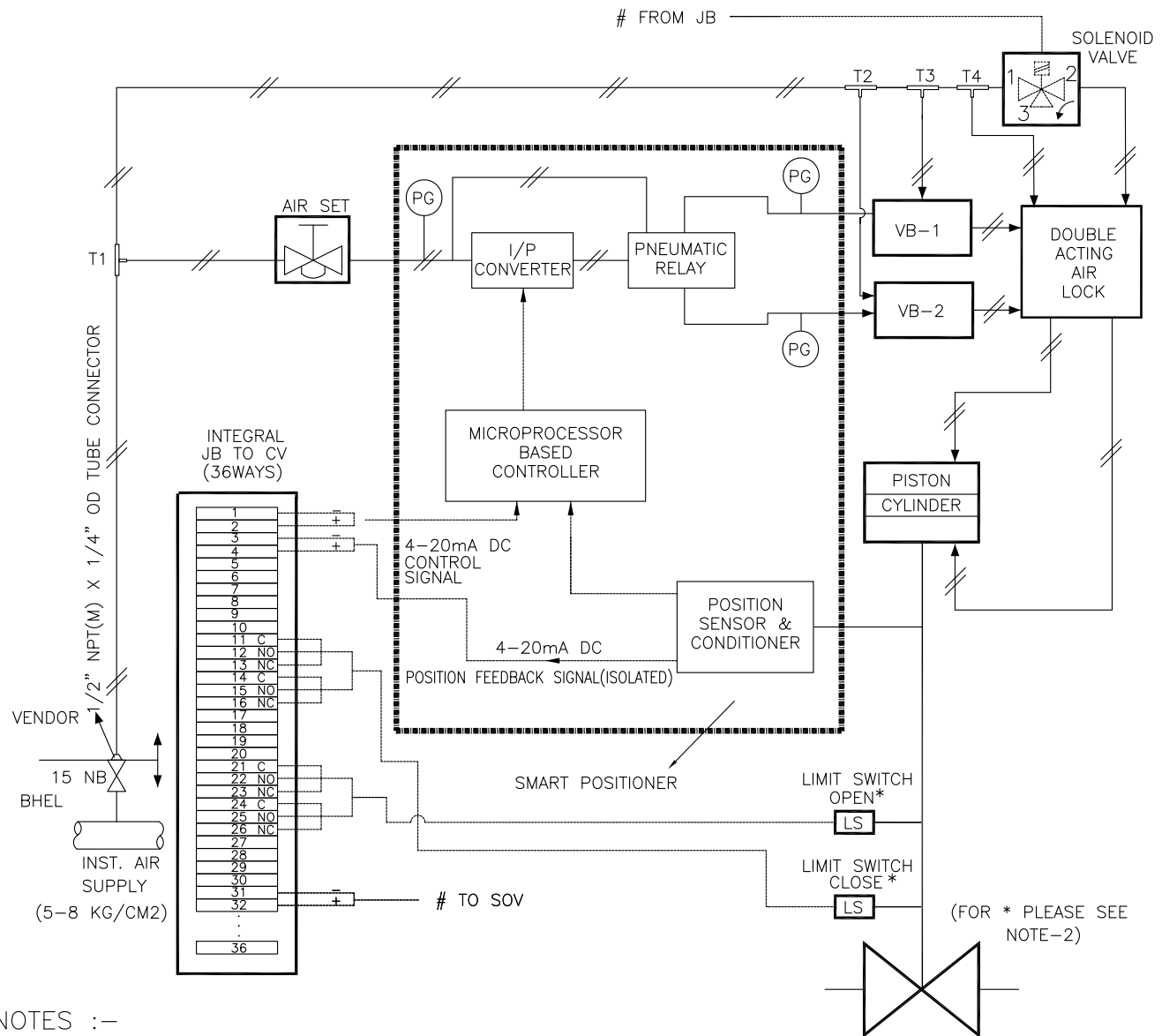
TITLE:-

STANDARD  
CONTROL VALVE HOOK-UP DIAGRAM

SHEET

3 OF 4

# STANDARD CONTROL VALVE HOOK-UP DIAGRAM (DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



## NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:  
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.  
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS 1/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 & TEE-T3 SHALL BE PROVIDED.



TITLE:-

STANDARD  
CONTROL VALVE HOOK-UP DIAGRAM

SHEET

4 OF 4

## SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER

|   |                                              |                                                                                                         |                                                                                                                                                                                               |
|---|----------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Electrical                                   | a) Input Demand Signal                                                                                  | 4-20 mA                                                                                                                                                                                       |
|   |                                              | b) Power Supply                                                                                         | Loop Powered from the output card of Control System.                                                                                                                                          |
|   |                                              | c) HART Protocol                                                                                        | Compatibility for Remote Calibration & Diagnostics (Super-imposed HART signal on input Signal (4-20 mA))                                                                                      |
|   |                                              | d) Valve Position Sensing                                                                               | Position sensing, 4-20 mA output signal to be provided for control system.                                                                                                                    |
| 2 | Environment                                  | a) Operating Temperature                                                                                | (-)30 to 80 deg C                                                                                                                                                                             |
|   |                                              | b) Humidity                                                                                             | 0-95 %                                                                                                                                                                                        |
|   |                                              | c) Protection Class                                                                                     | IP-65 Minimum                                                                                                                                                                                 |
| 3 | * Software for Configuration and Diagnostics | Software *                                                                                              | Software shall meet the requirements of Configuration, diagnostics, calibration and testing of the actuator                                                                                   |
|   |                                              | Diagnostic / Test features *                                                                            | Advanced diagnostic features like Stroke Counter or Travel Counter, Leakage in actuators, Valve Signature analysis, Step response test, Valve friction / Jamming detection etc to be provided |
| 4 | Test Reports / Certificates                  | Factory Valve Signature Tests Reports (Pr vs Valve travel and Travel vs I/P Signal ) are to be provided |                                                                                                                                                                                               |
|   |                                              | Test Certificates as per Manufacturer's standard / Relevant Standard are to be submitted                |                                                                                                                                                                                               |
| 5 | Configuration / Calibration                  | Remote and Local Calibration, Auto and Manual calibration shall be possible                             |                                                                                                                                                                                               |
| 6 | Operating Range                              | Full Range / Split Range                                                                                |                                                                                                                                                                                               |
| 7 | Modes                                        | Valve Action                                                                                            | Direct / Reverse Valve Action                                                                                                                                                                 |
|   |                                              | Flow Characterization                                                                                   | Possible to fit Valve Characteristic Curves – Linear / Equal percentage etc                                                                                                                   |

|    |                         |                                                                                                                                                                                                                             |                                                                                                                                             |
|----|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 8  | Fail Safe / Fail Freeze | Fail Safe / Fail Freeze feature is to be provided (In case the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the same externally through solenoid valve connected in the pneumatic circuit ) |                                                                                                                                             |
| 9  | Pneumatic               | Air Capacity                                                                                                                                                                                                                | Sufficient to handle the valves & actuators selected/ Boosters to be supplied, if required.                                                 |
|    |                         | Air Pressure                                                                                                                                                                                                                | To suit the air supply pressure / quality available                                                                                         |
|    |                         | Process Connection                                                                                                                                                                                                          | ¼" NPT                                                                                                                                      |
| 10 | Performance             | Characteristic Deviation                                                                                                                                                                                                    | <= 0.5% of span                                                                                                                             |
|    |                         | Ambient Temperature Effect                                                                                                                                                                                                  | <= 0.01% / deg C or better                                                                                                                  |
| 11 | EMC and CE Compliance   | Required to International Standard like EN / IEC                                                                                                                                                                            | EN 50081-2 & EN 50082 or equivalent                                                                                                         |
| 12 | Accessories             | In built Operator Panel                                                                                                                                                                                                     | Display with push buttons for configuration and display on the positioner itself ( Password protected / Hardware lock )                     |
|    |                         | Hand held HART Calibrator *                                                                                                                                                                                                 | Universal Hart Calibrator to be provided.                                                                                                   |
|    |                         | Pressure Gauge Block                                                                                                                                                                                                        | For supply & Output pressures, Air filter Regulator and other accessories shall be provided on as required basis for making system complete |
|    |                         | Electrical Cable Entry                                                                                                                                                                                                      | ½" NPT, side or bottom entry to avoid water ingress                                                                                         |
|    |                         | Valve mounting assembly                                                                                                                                                                                                     | For sliding stem / rotary / single acting / Double acting actuators on as required basis                                                    |

**\* Note:**

**The HAND held HART Calibrator and Diagnostic Software will be in the scope of BHEL. Bidder need not include the same in his scope of Supply**

The HART signals shall be picked up from marshalling terminals of DDCMIS. The positioners shall be monitored from this HART management system. Contractor shall provide the necessary software to achieve the functionalities described above under "Software for Configuration and Diagnostics", and this software shall be loaded by the Contractor in his HART management system.

## TESTING

1. All valves shall be tested in accordance with the requirements mentioned in Section VI of the Specification (Quality Assurance, Inspection and Testing) and the Tender Quality Plan furnished along with the specification in addition to the good practices followed by the Bidder.
2. Cv Testing: Cv Testing has to be carried out as per ISA 75.02 / EN60534-2-3 for each 10% of Rated Valve Travel from 0-100% of Rated Valve Travel. Any type of Computer Simulation / CFD in lieu of Cv Tests are not acceptable. Cv test has to be conducted in FCRI(India) / BHEL Approved Lab / Bidder's approved laboratory of repute. Cv Testing has to be carried out for each type (type means of same valve size, Cv and trim characteristics) of valves ordered for the first unit of the project if more than one unit is applicable. The Cv test reports will have to be submitted to BHEL / Customer for approval prior to the final inspection by BHEL / Customer.
3. Type Test Certificates: Type test Certificates for Cv test will be acceptable if Cv test has been carried out in the exact type (type means of same valve size, Cv and trim characteristics) as per ISA 75.02 / EN 60534-2-3 and results plotted as per above clause 7.2 within last ten years of bid opening. However in case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are found to be not meeting the specification requirements, the Contractor shall conduct all such tests in FCRI(India) / BHEL Approved Lab / Bidder's approved laboratory of repute in presence of Owner's representative without any extra cost and delivery implications and submit the reports for BHEL / Customer approval.