



## **CONTROLS AND INSTRUMENTATION/QA/FB**

### **STANDARD QUALITY PLAN FOR**

### **PNEUMATIC ACTUATOR (POWER CYLINDER) (OPEN / CLOSE AND REGULATING TYPE)**

| REV | DATE       | PREPARED                                                                                           | REVIEWED                                                                                          | APPROVED                                                                                             | REVISION HISTORY                                                                    |
|-----|------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 00  | 14/05/1993 | Sd/-                                                                                               | Sd/-                                                                                              | Sd/-                                                                                                 | Initial release.                                                                    |
| 01  | 16/06/1997 | Sd/-                                                                                               | Sd/-                                                                                              | Sd/-                                                                                                 | Format Revised.                                                                     |
| 02  | 21/06/2002 | Sd/-                                                                                               | Sd/-                                                                                              | Sd/-                                                                                                 | Department name changed, CTQ requirements added & General revision.                 |
| 03  | 08/01/2004 | Sd/-                                                                                               | Sd/-                                                                                              | Sd/-                                                                                                 | Revised to include the Comments/ Feedback of internal discussion.                   |
| 04  | 14/09/2010 | RM.VAIRAVAN<br> | N.SRINIHAR<br> | K.PALANIVEL<br> | Format Changed. Revised as per Feedbacks from QC and Engineering during discussion. |

|                                                                                   |                                                                            |                                                                                                                    |                                                     |
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|  | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br><b>TIRUCHIRAPPALLI - 620014</b> | <b>QUALITY PLAN FOR</b><br><b>PNEUMATIC ACTUATOR (POWER CYLINDER)</b><br><b>(OPEN / CLOSE AND REGULATING TYPE)</b> | <b>QA:CI:STD:QP:42</b><br>Rev: 04      Page: 2 of 4 |
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| Sl. No | Component & Operation                                      | Characteristics             | Class    | Type of Check | Quantum of check |     | Ref Doc. & Acceptance STD | Format of record | AGENCY |   |   | Remarks                                                    |
|--------|------------------------------------------------------------|-----------------------------|----------|---------------|------------------|-----|---------------------------|------------------|--------|---|---|------------------------------------------------------------|
|        |                                                            |                             |          |               | M                | B/C |                           |                  | M      | B | C |                                                            |
| A      | RAW MATERIALS & BOUGHT OUT ITEMS INSPECTION                |                             |          |               |                  |     |                           |                  |        |   |   |                                                            |
| 01     | Cylinder Piston rod                                        | a. Material                 | Critical | CHEM          | One of sample    | -   | Specification, BS 970     | TC               | V      | V | - |                                                            |
|        |                                                            | b. Dimension                | Critical | MEAS          | -do-             | -   | Mfr. Std.                 | IIR/LGB          | P      | - | - |                                                            |
| 02     | “ O “ ring                                                 | a. Material                 | Critical | CHEM          | -do-             | -   | Specification             | TC               | V      | V | - |                                                            |
|        |                                                            | b. Dimension                | Critical | MEAS          | -do-             | -   | Mfr. Std.                 | IIR/LGB          | P      | - | - |                                                            |
|        |                                                            | c. Hardness                 | Critical | MEAS          | -do-             | -   | -do-                      | TC               | V      | V | - |                                                            |
| 03     | Cylinder Barrel & End Cover                                | a. Material                 | Critical | CHEM          | -do-             | -   | Specification             | TC               | V      | V | - |                                                            |
|        |                                                            | b. Dimension                | Critical | MEAS          | -do-             | -   | Mfr. Std.                 | IIR/LGB          | P      | - | - |                                                            |
| 04     | Piston Cylinder                                            | a. Pressure Resistance Test | Major    | PHYS          | -do-             | -   | JIS B 8377                | IIR/LGB          | P      | V | - |                                                            |
| 05     | Air filter Regulator                                       | a. Make & Type              | Major    | PHYS          | 100%             | -   | Specification, Data Sheet | IIR/LGB          | P      | - | - |                                                            |
|        |                                                            | b. Output Gauge range       | Major    | PHYS          | -do-             | -   | Specification             | IIR/LGB          | P      | - | - |                                                            |
|        |                                                            | c. Process connection Size  | Major    | MEAS          | -do-             | -   | -do-                      | IIR/LGB          | P      | - | - |                                                            |
|        |                                                            | d. Filter size in Microns   | Major    | PHYS          | -do-             | -   | -do-                      | TC               | V      | V | - |                                                            |
| 06     | Limit Switches                                             | a. Make & Type              | Major    | PHYS          | -do-             | -   | Specification, Data Sheet | IIR/LGB          | P      | - | - |                                                            |
|        |                                                            | b. Functional check         | Major    | ELEC          | -do-             | -   | Mfr. Std.                 | IIR/LGB          | P      | - | - |                                                            |
| 07     | Air Lock Relay                                             | a. Make & Type              | Major    | PHYS          | -do-             | -   | Specification             | IIR/LGB          | P      | V | - |                                                            |
|        |                                                            | b. Functional check         | Major    | ELEC          | -do-             | -   | Mfr. Std.                 | IIR/LGB          | P      | - | - |                                                            |
| 08     | Solenoid valve (Applicable Only for open / close)          | a. Make & Type              | Major    | PHYS          | -do-             | -   | Specification, Data Sheet | TC               | P      | - | - |                                                            |
|        |                                                            | b. Coil Voltage             | Major    | MEAS          | -do-             | -   | -do-                      | TC               | P      | - | - |                                                            |
|        |                                                            | c. Class of Insulation      | Major    | PHYS          | -do-             | -   | -do-                      | TC               | P      | - | - |                                                            |
|        |                                                            | d. Duty                     | Major    | VISU          | -do-             | -   | Mfr. Std.                 | TC               | P      | - |   |                                                            |
|        |                                                            | e. Functional check         | Major    | ELEC & MECH   | -do-             | -   | -do-                      | IIR/LGB          | P      | - | - |                                                            |
| 09     | Positioner (Applicable only for regulating power Cylinder) | a. Make & Type              | Major    | VISU          | -do-             | -   | Data Sheet                | IIR/LGB          | P      | - | - | Performance to be checked during complete assembly testing |

M- MANUFACTURER/ SUB-VENDOR; B - BHEL / TPI ; C - CUSTOMER / TPI  
P - PERFORM; W - WITNESS V - VERIFICATION;

|                                                                                   |                                                                            |                                                                                                                    |                                                     |
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| Sl. No | Component & Operation       | Characteristics                                                                                          | Class | Type of Check | Quantum of check |               | Ref Doc. & Acceptance STD    | Format of record | AGENCY |   |   | Remarks |
|--------|-----------------------------|----------------------------------------------------------------------------------------------------------|-------|---------------|------------------|---------------|------------------------------|------------------|--------|---|---|---------|
|        |                             |                                                                                                          |       |               | M                | B/C           |                              |                  | M      | B | C |         |
| B      | INPROCESS INSPECTION        |                                                                                                          |       |               |                  |               |                              |                  |        |   |   |         |
| 01     | Complete Assembly           | a. Functional check                                                                                      | Major | PHYS & ELEC   | 100%             | -             | Mfr. Std.                    | IIR/LGB          | P      | - | - |         |
|        |                             | b. Leak test                                                                                             | Major | PHYS          | -do-             | -             | JIS B 8377                   | IIR/LGB          | P      | - | - |         |
| C      | FINISHED PRODUCT INSPECTION |                                                                                                          |       |               |                  |               |                              |                  |        |   |   |         |
| 01     | Routine Test                | a. No Load test                                                                                          | Major | PHYS          | 100%             | 20%           | Mfr. Std.                    | IIR/LGB          | P      | W | - |         |
|        |                             | b. Verification of Mounting of Accessories                                                               | Major | VISU          | -do-             | -do-          | BHEL App. Drg.               | IIR/LGB          | P      | W | - |         |
|        |                             | c. Dimensional check including Process connections                                                       | Major | MEAS          | -do-             | -do-          | BHEL App. Drg.               | LGB              | P      | W | - |         |
|        |                             | d. Verification of name plate for Type & Model Number                                                    | Major | VISU          | -do-             | -do-          | BHEL App. Drg.               | IIR/LGB          | P      | W | - |         |
|        |                             | e. Stroke length & Time                                                                                  | Major | MEAS          | -do-             | -do-          | Spec. & BHEL App. Data Sheet | IIR/LGB          | P      | W | - |         |
|        |                             | f. Verification of accessories (Make and Model number)                                                   | Major | VISU          | -do-             | -do-          | Spec. & BHEL App. Data Sheet | IIR/LGB          | P      | W | - |         |
|        |                             | g. Performance test (Sensitivity, Hysterisis, Accuracy, Repeatability)<br>Applicable for Regulating duty | Major | MEAS          | -do-             | -do-          | Specification                | IIR/LGB          | P      | W | - |         |
|        |                             | h. Stay put device Operation                                                                             | Major | PHYS          | -do-             | -do-          | Mfr. Std.                    | IIR/LGB          | P      | W | - |         |
|        |                             | i. Solenoid valve – Coil voltage rating, Insulation & duty (Applicable only for open/ close duty)        | Major | VISU & ELEC   | -do-             | -do-          | BHEL App. Data Sheet         | IIR/LGB          | P      | W | - |         |
|        |                             | j. Air Filter- Filter Element size in microns                                                            | Major | VISU          | -do-             | -do-          | Specification                | IIR/LGB          | P      | W | - |         |
| 02     | Type Tests                  | a. Load operation test                                                                                   | Major | PHYS          | One of sample    | One of sample | Mfr. Std.                    | TC               | P      | V | - |         |
|        |                             | b. Durability test                                                                                       | Major | PHYS          | -do-             | -do-          | JIS B 8377                   | TC               | P      | V | - |         |

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**D.NOTES:**

**1.LEGENDS:**

|      |   |             |      |   |                            |
|------|---|-------------|------|---|----------------------------|
| MECH | : | Mechanical  | MEAS | : | Measurement                |
| ELEC | : | Electrical  | TC   | : | Test certificate           |
| TR   | : | Test Report | CHEM | : | Chemical                   |
| VISU | : | Visual      | IIR  | : | Internal Inspection Report |

- The vendor shall arrange all testing facilities at their works. Tests for which facilities are not available are to be carried out at recognized National Test Houses like ETDC/CIL/NPL/ERTL etc., at vendor cost.
- Through Log Book / any other documents available at the vendor's works, it shall be possible to correlate the finished products with raw material and in process stage checks / inspection carried out.
- All Measuring and Testing Instruments shall be periodically calibrated from recognized test houses & certificates made available during inspection for verification.

- Test reports for routine tests are to be furnished by the vendor.
- Type test certificate shall not be earlier than 5 years from the date of Purchase enquiry.
- Vendor to give tentative inspection program in advance and confirm exact date two weeks in advance for arranging BHEL's inspection.
- Packing shall be as per the "PACKING PROCEDURE" indicated in the specification.

**E. REFERENCE STANDARDS:**

(For Indicated Standards Refer the Latest Version)

|            |   |                                                    |
|------------|---|----------------------------------------------------|
| JIS B 8377 | : | Specification for Pneumatic Cylinder               |
| BS 970     | : | Specification for Wrought Steel for Mechanical end |

SQP42R4.DOC

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