

Revision Record: Rev:03:09.06.2000 SA 182 F91 added, Cl.2.0, 6.0 modified. Rev:04: 11/10/2000 Cl.2.0:UT reqt. added. Cl.6.0 UT reqt. altered. Cl.9.0: altered. Rev:05:req.for CE Mark included in 5.0 and 10.0; 5.0: IGCT removed, 6.0: UT for special class valves added.

## 1.0 MATERIAL

Specification: ASME {Latest on date of Purchase Order (PO)}:

(ASTM also applicable for non pressure parts / Valves)

CS : SA 105, SA 350 LF 2

AS : SA 182 F6a Class 3, F12 Class 2, F22 Class 3, SA 182 F91

SS : SA 182 Gr. F 304, 304L, 316, 316L, 316H, 321, 321H, 347 & 347H

Additional Requirement: As listed below (supplementary to Specification)

Size and Qty.: As per Purchase order & Drawing.

## 2.0 CHEMICAL COMPOSITION & PROCESS

Melting: fully killed. Product analysis per heat: CS:  $C \leq 0.25\%$

Steel for forging for IBR items to be inspected at Mill & test certificate countersigned by IBR approved Authority, if the mill is not approved under IBR as well known steel maker.

Steel for IBR items of SA 182 F12, F22 from indigenous mills to be from following manufacturers approved under IBR for creep resistant steels: i) Alloy Steel Plant, Durgapur, ii) Tata Iron & Steel Company, Jamshedpur & iii) Mahindra Ugine Steel Company, Bombay.

Steel for IBR items of SS and AS other than above shall be imported.

Forging: to ensure uniformity of structure & strength with reduction ratio in area: 1:4min. from ingot to final forging, close to final size & shape. Flow lines to be parallel to axis of openings.

Blooms / Billets used for forgings shall be UT tested as per cl.6.0. For finished bars this can be done at final stage.

## 3.0 DIMENSIONS AND TOLERANCES

Tolerances as per Drawing. Untoleranced dimensions for valve components: VL:STDC:023(latest).

## 4.0 HEAT TREATMENT(HT)

CS: SA 105: Normalised, SA 350 LF 2: Normalised at 880-900 deg.C & Tempered at 620-640 deg.C;

AS: Normalised and Tempered.

## 5.0 MECHANICAL TESTS

Extent of test: for each size/heat/HT batch from sample product or identical test coupon.

Additional requirements of tests: Bend test: CS: 1 Sample 19mm. thick(t) x 25.4mm width to be bent 180 deg. around mandrel of radius 6.35 mm. AS: Sample 25.4mm width to be bent 180 deg. around mandrel of radius =  $1.5 \times t$ .

Impact test for QCNR & CRHNR Valves: AS: 1 / HT batch: SA 370, 2mm. Charpy-U notch, at Room temperature: Acceptance: Avg of 3 specimens: 36J, single Min: 24J.

Charpy- V impact test as per ASTM A 370 for CE-marking items at 20 deg.C ,

Acceptance : Avg : 40joules, Min. single value: 27 joules.

## 6.0 NON DESTRUCTIVE TEST

Extent of test: for each product. Stage of test : After heat treatment.

UT: Bars of dia. = / > 50mm, body & yoke of special class valves, all forgings & bars of SA 182 F91:

Acceptance: AM 203.2, ASME Sec.VIII Div. 2.

MPI : CS, AS: 100%, ASTM E 709, Linear indications like cracks, folds & other injurious defects are unacceptable.

LPI: for SS: 100%: ASTM E165, No linear indications acceptable.

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## 7.0 WORKMANSHIP AND FINISH

Items to be proof machined as per drawing or shot blasted for CS/AS, Pickled & passivated as per ASTM A 380 for SS, & be free from scales & defects like laps, seams, folds, cracks, etc. Machined items (except SS) to be coated with a layer of transparent rust preventive before despatch.

#### **8.0 REPAIR**

Repairs by fusion welding are prohibited. Surface defects can be removed by mechanical means and defective areas smoothly dressed up with the adjacent surface. Minimum thickness after repair to meet drawing / Specification.

#### **9.0 MARKING AND PACKING**

Details of stamping on each item with low stress stamps: Heat number, Specification & grade, Maker's emblem/code & Inspection Authority's seal. Forgings to be properly packed and despatched to avoid damage during transit.

#### **10.0 INSPECTION AND CERTIFICATION**

The inspection and tests to be witnessed by an IBR approved inspecting agency, in case the Forge shop is not recognised as a "Well known Forger" under IBR. Test certificate countersigned by applicable inspection agency for each product with following details shall accompany the product (in format approved by Boiler inspectorate for IBR items). For CE-marking items the materials shall be inspected by M/s. LLOYD's/ TUV/ BVQI or any other agency approved for PED of CE marking, if the foundry is not certified to ISO9000 by any of the above organisations.

1. Purchase Order No.(BHEL),TDC No. & Test certificate number
2. Specification, Grade with applicable year of code, Heat Number, Drawing No.,Quantity & Size
3. Melting & forging process, Chemistry including incidental elements - Heat wise.
4. Heat treatment details of the material and test bars.
5. Mechanical test results, NDE test results with reference & acceptance standard.
6. Repair details if any, Certified copy of TC for starting material.

#### **11.0 AUDIT CHECKS AT BHEL**

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job. Supplies found defective during check or subsequent processing at BHEL are liable for rejection.

#### **12.0 END USE**

Valve bodies, bonnets, discs, socket ends, body guides etc., Pressure part fittings in boilers & low temperature service like discs, socket weld tees, ells, weld neck flanges & stubs (except drum nozzles) meeting IBR, ASME Section I, ANSI B16.34 and API.

Non pressure part items in boilers: For these, requirements on starting material, bend test, and inspection by IBR are not required.



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