

**TECHNICAL REQUIREMENTS FOR MANUFACTURING, HEAT TREATMENT,
DRIFTING/MACHINING AND MECHANICAL TESTINGS OF TRACK SHOE CASTING TO
DRG NO. 613 - 44 - 030 - 4A**

1. Description:

Manufacturing of Track Shoe casting as per drg. no. 613-44-030-4A , from Steel grade $\Gamma 13\pi A$ (Non magnetic), specification no. 613 TY 3 and Quality Assurance Instruction no.CQA(HV)/QAI/55/ Track Assembly for Tracks of Tank T-72.

2. Chemical Composition of Steel Grade $\Gamma 13\pi A$:

C%	Mn%	Si%	Cr%	Ni%	P%	S%
1.22 - 1.40	13.0 - 15.0	0.40 - 1.0	≤ 1.8	≥ 0.5	0.045 Max.	0.050 Max.

The Ratio of Mn/C ≥ 10 and Ni/Cr ≥ 1 should be maintained.

3. Fracture Test:

One casting from each heat is to be selected and broken for columnar structure test by fracture as per Instruction no.102-45-003-00074 of **Quality Assurance Instruction no.CQA(HV)/QAI/55/ Track Assembly for Tracks of Tank T-72.**

4. Heat Treatment Cycle:

Furnace should be equipped with self recording system which records the readings of thermocouple as a time temperature diagram/graph.

The castings are to be coated by Anti scaling compound before charging in furnace. Castings should be loaded in furnace in such a manner so that the castings should not get bend during heat treatment. Bend / Misaligned eyeholes are to be corrected manually or by hydraulic press. Alignment of eye holes is to be ensured by passing a pin gauge. The detail of Heat treatment cycle for reference is as follows:-

- i) Loading of castings in furnace at temperature 650 °C.
- ii) Soaking time 2 hrs. at 650 °C.
- iii) Soaking time 2 hrs. at 850 °C.
- iv) Soaking time 1½ hrs. at 1050 – 1080 °C.

These drawings are only for reference actual drawings may be different and shall be issued at the time for procurement.

Quenching in water immediately. Temperature of water should not rise above 40°C. If castings not satisfying the requirements i.e. hardness, structure, bend test are subjected to repeated hardening with subsequent checking of these parameters.

Castings should be heat treated in controlled environment to prevent oxidation during heating. After heat treatment castings are subjected to drifting operation in eye holes. Hence castings are to be shot blasted and properly cleaned to remove scales, fused sand and extra material. One HT batch will comprise of the number of castings heat-treated at a time.

5. Drifting / Machining:

Heat Treated castings having hardness BHN ≥ 170 HB are subjected to drifting/sizing operation to accurately maintain the axis and bore diameter of 07 nos. eye holes (04 and 03 nos. on either side) within specified limit.

6. Inspection for Drifting / Sizing:

After drifting/sizing operation all the Track Shoe castings will be checked for following critical dimensions:-

- a) Bore Dia. $\varnothing 38.0^{+0.34}$ mm
- b) Pitch dimension $137.0^{+0.2}_{-0.8}$ mm.
- c) Relative position of eye holes is to be checked by passing round gauge of $\varnothing 37.3^{+0.00}_{-0.05}$ and length 600mm through every hole by hand effort and ensure free movement of tracks when joined together.

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7. **Testing:**

As per **Quality Assurance Instruction no.CQA(HV)/QAI/55/ Track Assembly for Tracks of Tank T-72**, castings are to be tested for hardness, micro structure, depth of decarburization, bend test, and finally all the castings will be checked for crack detection through dye penetrate inspection (DPI). Cracks & Hot tears are not permitted.

All castings will be checked for **Hardness**: BHN \geq 170HB at a load P = 750 Kgf with a ball dia. D = 5.00 mm on Brinell Press.

RG Test:

Castings are to be checked for internal defects such as shrinkages, gas holes, sand /slag inclusion etc. through Radiographic test, conforming to ASTM level II by the firm.

100% castings of pilot batches are to be subjected for RG test. For bulk supply at least 20% of each cast selected at random should be subjected to RG test. 20% of each supply will also be tested at OFM.

Non conformance of any casting would render the lot unacceptable and it may be weeded out by 100% RG at manufacturer's cost, if firm so desire.

8. **Pilot Batch:**

Sample castings are to be approved before bulk supply. Firm should submit 05 nos. castings (01 no. without heat treatment and 04 nos. heat treated castings) for further tests at OFM, along with the test reports i.e. fracture, hardness, dimensional, micro structure, depth of decarburization, radiography, DPI.

9. **Bend Test:**

If the bend test results are satisfactory in all the three positions conducted in pilot, one number casting per HT batch is subjected to bend test in horn down position.

No fracture or crack should occur during the test, if the bending strength is less than the permissible one, double nos. of Tracks will be tested. If the value of strength again is less than the permissible one, batch is to be rejected. If castings not satisfying the requirements i.e. hardness, structure, bend test are subjected to repeat hardening with subsequent checking of these parameters at manufacturer's cost.

10. **Test Certificates:**

The firm shall furnish test certificates along with Heat Treated castings.

- i) Chemical composition of each melt.
- ii) Report of columnar structure test by fracture heat wise.
- iii) 100% gauging & dimensions report, dye penetrant inspection (DPI) report, Hardness report and weight of each casting heat number and serial number wise.
- iv) Radiography plates/films along with RG test certificate.
- v) Microstructure, Grain size and Decarburisation report with photograph / images for each heat treatment batch.
- vi) Heat treatment cycle details along with time temperature diagram/graph for each batch.
- vii) Number of components supplied.
- viii) Challan number.
- ix) After receipt of material final inspection and bend test will be carried out at OFM for acceptance.


Jt. GM / P


DGM / FP