PARTS OF TRACKED VEHICLES METHODS OF CHECKING AND RULES OF ACCEPTANCE AFTER HEAT TREATMENT

BRANCH STANDARD

OST 3-4704-80

EXTRACT

CONTRACT
№ PB/835606213601

PARTS OF TRACKED VEHICLES

METHODS OF CHECKING AND RULES OF

Acceptance after heat treatment
Branch standard

OST 3-4704-80

EXTRACT

Present standard deals with parts of tracked vehicles, made of structural steel grade.

Standard establishes checking parameters, methods, scope and sequence of checking, and also rules of acceptance of steel parts after heat treatment, which are stipulated in technological chart of heat treatment, instructions and other technological documentation of production-plant.

1. TYPES OF CHECKING

1.1. Parameters of parts, being checked after heat treatment, are specified in table 1.

1.2. Parameters of parts being checked are mentioned in compliance with requirements of design documentation, and also considering the conditions of manufacture and the same are specified in technological charts.

Table 1

Types of heat treatment	Parameters being checked
Hardening of isothermal hardening of parts made up of steel grade 38XC	Quality of surface Deformation Hardness Quality of micro structure Thickness of decarburized layer Impact strength

2. METHODS OF CHECKING

2.1. Checking the quality of surface of parts is carried out during the absence cracks and other surface defects:

- by inspecting the surface without using magnifying devices, or if necessary, with magnification upto 10^{10}:

- by magnetic powder method in compliance with GOST 21105-75:

- by liquid penetrate detector method in compliance with GOST 18442-80.

2.2. Checking the deformation

2.2.2. Permissible values of deformation, subjected for checking, are specified in technological chart.

2.2.3. Basic types deformation of parts after heat treatment, instruments and devices, used for checking, are specified in table 2.

Table 2

Types of deformation	Instruments and devices for checking deformation
Change in linear dimensions	Vernier caliper as per GOST 166-80
	Vernier height gauge as per GOST 164-80
	Vernier depth gauge as per GOST 162-80
	End gauges for measuring length as per GOST 9038-83
	Micrometer as per GOST 6507-78
	Snap gauge as per GOST 11098-75
Deviation from flatness	Surface plates as per GOST 10905-75 Feeler gauge as per GOST 882-75
Deviation of shape of given surface	Radius gauge as per GOST 4126-82 Feeler gauge as per GOST 882-75
Deviation from parallelism of surface	Surface plate as per GOST 10905-75 Try square as per GOST 3749-77

Continuation of table 2

Types of deformation	Instruments and devices for checking deformation
	Feeler gauge as per GOST 882-75
	Indicator type depth gauge as per GOST 7661-67
	Micrometric depth gauge as per GOST 7470-78
Radial run out and end-play of cylindrical parts	Centers as per 13215-79
	Vee block as per GOST 5641-82
	Indicators as per GOST 577-68
	Surface plate as per GOST 10905-75
	Feeler gauge as per GOST 882-75
	Try square as per GOST 3749-77
Oval shape of internal smooth cylindrical surfaces and surfaces with internal gear ring	Inside micrometer as per GOST 10-75 Plug gauge as per GOST 17736-72 - GOST 17740-72
	Venire caliper as per GOST 166-80
	Vernier height gauge as per GOST 164-80
Deviation from rectilinearity and flatness (convexity, concavity)	Surface plate as per GOST 10905-75
	Feeler gauge as per GOST 882-75 Centers as per GOST 13215-79
	Vee as per GOST 5641-82
	Indicators as per GOST 577-68

2.4. Checking of hardness

2.4.1. Measuring place of hardness on parts is specified in technological chart in compliance with requirements of drawing.

If these requirements are absent, then measuring place of hardness is indicated considering the dimensions and configuration of parts, and also conditions of heat treatment.

2.4.2. When it is not possible to measure the hardness on martial parts or when it is not possible to carryout the given test without damaging the complete

set, carryout the tests on parts or test samples with cross section, nearer to the cross section of parts, made of same grade of steel and which are undergone the heat treatment along with the parts.

Sequence of checking the hardness, quantity, shape and dimensions of samples is stipulated in technological chart.

2.4.3. Hardness should be checked by the following methods:

as per Brinell to GOST 9012-59,

as per Rockwell to GOST 9013-59.

Hardness is determined in units, specified in drawing. As an exception, hardness may be measured in other units with subsequent conversion into those given as per OST 3-1279-72 and GOST 8.064-79.

Hardness may be checked by non-destructive methods (by measuring electrical and magnetic parameters) as per OST 3-3067-75.

2.4.4. The following devices are used for measuring the hardness:

Devices for measuring the hardness according to Brinell, Rockwell methods, as per GOST 23677-79;

Portable devices as per GOST 9030-75;

Device and equipment for non-destructive checking of hardness as per OST 3-3067-76.

2.4.6. Surface of parts being checked should be cleaned before checking the hardness.

Depth of cleaning should ensure the complete removal of decarburized layer.

Depth of cleaning of parts before checking the hardness should be specified in technological chart.

2.4.7. Before checking the hardness, cleaning of surface is conducted with felt wheel as per GOST 10684-75 with silicon carbide or boron.

Other methods may be used, ensuring the removal of required layer from the surface of metal and necessary cleaning of surface.

2.4.8. Parameters of surface finish of surface in the hardness measuring place should not be more than:

Ra=3.2 micron as per GOST 2789-73 while measuring with device of Brinell type,

Ra=1.6 microns as per GOST 2789-73 while measuring with Rockwell device.

2.6. Mechanical properties are determined by the methods:

at expansion as per GOST 1497-84,

at impact bend as per GOST 9454-78 on samples with concentrates of type V.

2.7. Evaluation of quality of microstructure of parts made of steel grade 38XC after isometric hardening.

2.7.1. Microstructure is checked on micro sections, taken from parts.

Samples for micro sections are cut by methods, not causing the heating of metal: anodic-mechanical, electro or by cutting with continuous supply of cooling water, after which surface layer of metal is removed by grinding.

2.7.2. Place, from which samples are cut, is specified in technological chart, from parts of transvers cross-section – samples from maximum and minimum cross section.

2.7.3. Etching of sections is carried out in spirit solution of nitric acid or picric acid: 2-4 cm^3 of nitric acid or 2-4 g of picric acid per 100 cm^3 of sprit. Sprit as per GOST 17299-78, nitric acid as per GOST 701-78 are used.

2.7.4. Microstructure is checked at magnification 500^x or 1000^x. Microstructure is evaluated as per scale, specified in obligatory appendix 2 for present standard.

2.14. Checking for the absence of dearburization or carburization of surfaces of parts while heating for hardening in adjustable atmosphere or decarburization while heating in salt bath, is carried out on parts or test samples, made of same grade of steel, with cross section, nearer to the cross section of parts, and passed through heat treatment along with parts.

Depth of decarburization is determined as per microstructure. Preparation of samples, selection of reagents for etching and determination of thickness of decarburized layer is carried out in compliance with GOST 1763-68.

Depth and level of decarburization or carburization are determined in similar way:

As per microstructure in hardened condition,

As per content of carbon in surface layer.

3. RULES OF ACCEPTANCE

3.1. Acceptance of parts after heat treatment is carried out in reference with requirements of design documentation. Instructions for checking are stipulated in technological chart.

3.2. Part are subjected to acceptance in batches.

Batch consists of parts of same nomenclature, made of same grade of steel, and processed as per same mode.

3.3. Parts, presented for acceptance, should be subjected to visual inspection for detecting the surface defects.

Cracks (hardened or occurred while straightening), and also metallurgical defects should not be present on the surface of parts, if depth of later exceeds the allowance for machining. Dents, nicks and cleaning of defects within the tolerance limits for dimension in compliance with GOST 7505-74, GOST 7829-70, GOST 7062-79 are allowed on un-machined surfaces of stamping and forging. Marks and flaws are allowed as per GOST 1759-70.

3.4. Checking of deformation is carried out on the basis of requirements of technological chart. Deformation is eliminated by straightening/shaping in compliance with technological chart.

3.5. Scope of checking and norms of properties of parts being checked after heat treatment are specified in table 4.

Checking group of parts in compliance with table 4 is established by production-plant as per agreement with the designer.

3.6. Checking the hardness.

3.6.1. Norms of hardness values are determined by requirements of design documentation.

3.6.2. Scope and method of checking the hardness is determined by the requirements of production-plant depending upon the condition for conducting heat treatment. During this deviation from table 4 and 5 is allowed, but should guarantee the corresponding hardness of all parts as per requirements of design documentation.

3.6.3. On obtaining unsatisfactory results of checking the hardness, batch of parts is subjected to heat treatment again, after which, again presented for acceptance.

During unsatisfactory results of hardness checking after repeated heat treatment, third treatment is allowed with the permission of chief metallurgist. Result of tests after third heat treatment are final.

3.7. Checking of mechanical properties, scope of checking and norms of parameter being checked, are determined by the requirement of design documentation.

3.12. Checking the microstructure in the middle of parts.

3.12.1. Necessity for checking the microstructure of center of carburized parts and scope of checking are determined by production-plant.

3.12.2. Scope of checking the quality of microstructure of parts made of steel grade 38XC after isothermal hardening is determined by technological documentation of production-plant.

3.12.3. Lower plate-like bainite (mark 1 as per scale of mandatory appendix 2 for present standard) and lower plate-like bainite with sections of upper feather-like bainite (mark 2) are considered as required structure of parts made of steel grade 38XC after isothermal hardening.

Structures of high hardness, formed during lower temperature decomposition of austenite, and exactly: lower needle shaped bainite with sections of austenite-martenite (point 3, 4, 5) are allowed at satisfactory hardness of parts.

Presence of structure of upper feather-like bainite, sections of ferrite and troosite, which are occurred during decomposition of austenite at high temperature and which can reduce the hardness and impact strength of steel (marks 6, 7, 8, 9, 10, 11) is allowed during satisfactory values of specified parameters.

In case, if dimensions of parts does not allow to cut the sample for determining impact strength, then parts only with conditional structure and satisfactory hardness are considered as valid.

Scope of checking and norms of properties of parts being checked after heat treatment

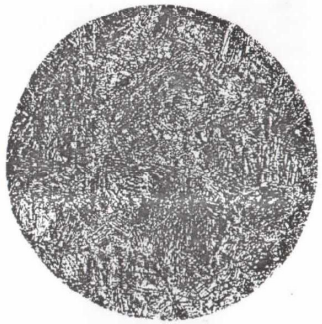
Table 4

Type of heat treatment	Purpose of parts	Checking group	Recommended scope of checking of hardness	Norms as per quality of microstructure	Checking of mechanical properties		
					Reasons for checking	Type of test	Norms of technological properties
Isothermal hardening of parts made up of steel grade 38XC	Critical parts experiencing the dynamic loads	I	100%	Marks 1, 2 as per scale of obligatory appendix 2 are allowed: a) Marks 3, 4, 5 - during satisfactory hardness) Marks 6, 7, 8 - during satisfactory hardness and impact strength) Marks 9, 10, 11 - in cross sections more than 15mm during satisfactory hardness and impact strength	Microstructure of marks 6, 7, 8. In parts with cross section more than 15 mm micro-structure should be of marks 9, 10, 11	Determination of impact strength is as per GOST 9454-78 on samples, type I	As per requirements of design documentation

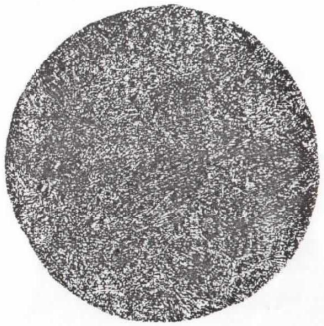
Obligatory

SCALE OF MICROSTRUCTURE OF STEEL OF GRADE 38XC AFTER ISOTHERMAL HARDENING. Magnification 500^{x}

Required structure

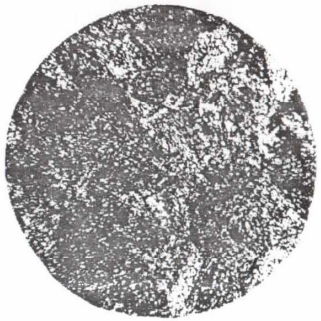


Mark 1
Lower plate like bainite



Mark 2
Lower plate like bainite with sections of upper feather like bainite

Allowed during satisfactory hardness

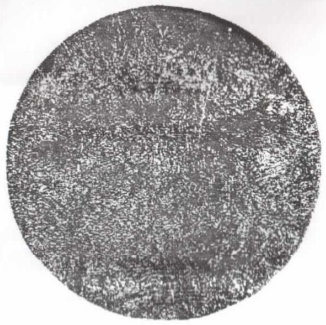


Mark 3
Lower needle shaped and plate like bainite, non-homogenous pickling ability

Mark 4
Lower needle shaped bainite

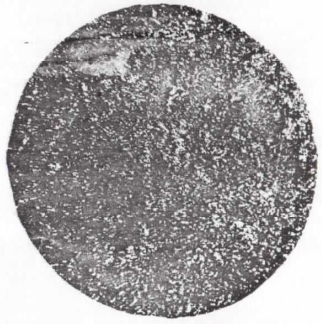
Mark 5
Lower needle shaped bainite with austenite-martensite sections (upto 10%)

Allowed during satisfactory hardness and impact strength



Mark 6
Upper feather likebainite with sections of lower plate like bainite

Mark 7
Upper feather like bainite

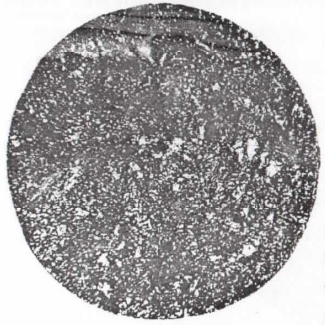


Mark 8
Upper feather like bainite with sections of martensite not more than 10%

Allowed in cross sections more than 15mm during satisfactory hardness and impact strength

Mark 9
Upper feather like bainite with sections of ferrite and troosite in total not more than 10%

Mark 10
Upper feather like bainite with ferrite along the border of granules



Mark 11
Upper feather like bainite with sections of ferrite not more than 10%