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Translation

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Technical specification for the supply of brake triangles

Spécification technique pour la fourniture de triangles de frein
Technische Lieferbedingungen für Bremsdreiecke



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- Standards withdrawn and replacement documents suggested by SC03 of CTR:

ISO/R79:1968, withdrawn on 1.9.1981 -

Suggested replacement document ISO 6506-1:1999

ISO/R80:1968, withdrawn on 1.11.1986 -

Suggested replacement document ISO 6508-1:1999

ISO 468:1982, withdrawn on 10.4.1998 -

Suggested replacement document ISO 4287:1997

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Summary

This specification governs the acceptance and supply of brake triangles used for rolling stock. A brake triangle is understood to be the structural part which uniformly transmits the braking force to the brake-shoes.

1 - Purpose

1.1 - Type of parts

This specification governs the acceptance and supply of brake triangles used for rolling stock. It concerns solid parts obtained by cutting or forging, as well as those consisting of components assembled by welding, threading and press fit.

A brake triangle is understood to be the structural part which uniformly transmits the braking force to the brake-shoes.

1.2 - Classification

Brake triangles are classified in one of the following categories:

- brake triangles suitable for a nominal load (F_n) of 60 kN,
- brake triangles suitable for a nominal load (F_n) of 120 kN.

1.3 - Reference documents

In this specification, reference is made to the following documents:

ISO Standards: *ISO 286-1*, *ISO 377*, *ISO 630*, *ISO 683-1*, *ISO 683-11*, *ISO 1052*, *ISO 4287*, *ISO 6506-1*, *6508-1* and *ISO 7438* (see [Bibliography - page 21](#)).

2 - Characteristics

2.1 - Construction materials and components

List of materials

2.1.1 - Rolled steel products

2.1.1.1 - Definition

Failing any indication to the contrary in the order or its appended documents, the brake triangles shall be manufactured from carbon steels.

Failing any indication to the contrary in the order or its appended documents, the steels used for the manufacture of brake triangles shall, bearing in mind the conditions of use to which they are to be subjected, conform to the provisions of the following documents:

Standards: <i>ISO 630</i>	:	Structural steels - Plates, wide flats, bars, sections and profiles
<i>ISO 683-1</i>	:	Direct-hardening unalloyed and low-alloyed wrought steel in form of different black products
<i>ISO 683-11</i>	:	Wrought case-hardening steels
<i>ISO 1052</i>	:	Steels for general engineering purposes

2.1.1.2 - Characteristics

The physical, geometrical, chemical and mechanical characteristics of the rolled steels used shall be, in every way, as prescribed by the ISO Standards governing their supply (or Euronorms, should there be no ISO standards in existence, and particularly Euronorm 30.69: semi-finished products for forging made of general construction steel).

2.1.2 - Forged or drop-forged components

2.1.2.1 - Physical characteristics

The parts shall have smooth surfaces completely free of scale. They shall be sound throughout and reveal no defect on any of their parts, such as cracks, flaws, folds, or lack of material, detrimental to their use.

2.1.2.2 - Mechanical characteristics

1. Brinell hardness

The Brinell hardness of forged or drop-forged components shall be within the following limits in relation to the tensile strength of the steel of which they are made.

Tensile strength between:	Brinell hardness between:
360 and 440 N/mm ²	100 and 130 HB
410 and 490 N/mm ²	115 and 140 HB
490 and 590 N/mm ²	140 and 165 HB
510 and 610 N/mm ²	145 and 175 HB

2. Capacity for cold deformation

Under the test conditions shown in point [4.3.4.2 - page 13](#), it shall be possible to deform the forged or drop-forged parts without causing fracture or incipient cracking.

2.2 - Brake triangles

2.2.1 - Physical characteristics

2.2.1.1 - Appearance

Parts remaining in the as-forged condition must be suitably trimmed and have smooth surfaces completely free from scale.

The machined parts shall have a surface finish in accordance with that indicated in the drawings or demonstrated by the specimens previously approved by the purchasing Railway.

Failing any indication on the drawings, the roughness of machined surfaces, measured as the arithmetical average variation Ra defined by *ISO Standard 4287*, shall be within the following limits:

Nature of the parts	Average variation Ra
Trunnions	3,2 µm
Parts fitted with a bush (bores or trunnions)	0,8 µm
Bores without bushes	3,2 µm

Where weld seams exist, these shall comply with the conditions of *UIC Leaflet 897-13* (see [Bibliography - page 21](#)) for the quality class requested by the purchasing Railway.

2.2.1.2 - Soundness

The brake triangles shall be sound throughout, including any welded areas, which must not contain any lack of fusion or reveal any defect such as lack of penetration, blowholes or inclusions. The welding operations must not have altered the characteristics of the base metal.

2.2.2 - Geometrical characteristics

The shape and dimensions of brake triangles shall conform throughout with those prescribed in the order or its appended documents; they must be interchangeable and comply with the provisions of *UIC Leaflet 542* (see *Bibliography - page 21*) in this respect.

Failing any specific indications, the following tolerances shall be observed for rough parts:

- as-forged parts: j_s 16 or J_s 16 according to the provisions of *ISO Standard 286-1*,
- parts consisting of rolled sections used in that form: tolerances prescribed by the ISO Standards governing the supply of the sections concerned.

In addition, failing specification in the order and its appended documents, the relative positions of the functional parts: trunnions, traction head, holes for the traction pin, shall comply with the following conditions (see *Figure 1 - page 6*).

Table 1 : Triangles

Alignment of the pins of the trunnions:

At no point must the actual centre line of each of the trunnions vary by more than 0,5 mm from the theoretical common centre line of both trunnions.

Triangles	Permissible variation
- Parallelism of the actual centre lines of the trunnions and of the bore of the traction head (xy and mn)	$\leq 5 \text{ ‰}$
- Parallelism of the actual centre line of the hole in the traction head and of the median plane containing the actual centre line of the trunnions (tu and rs)	$\leq 10 \text{ ‰}$
- Perpendicularity of the longitudinal centre line of the traction head in relation to the actual centre line of the bore (op and xy)	$\leq 3 \text{ ‰}$
- Symmetry of the surfaces of the shoulders of the trunnions in relation to the plane containing the longitudinal centre line of the traction head, measurements a	$\frac{b}{2} - a \leq 2 \text{ mm}$

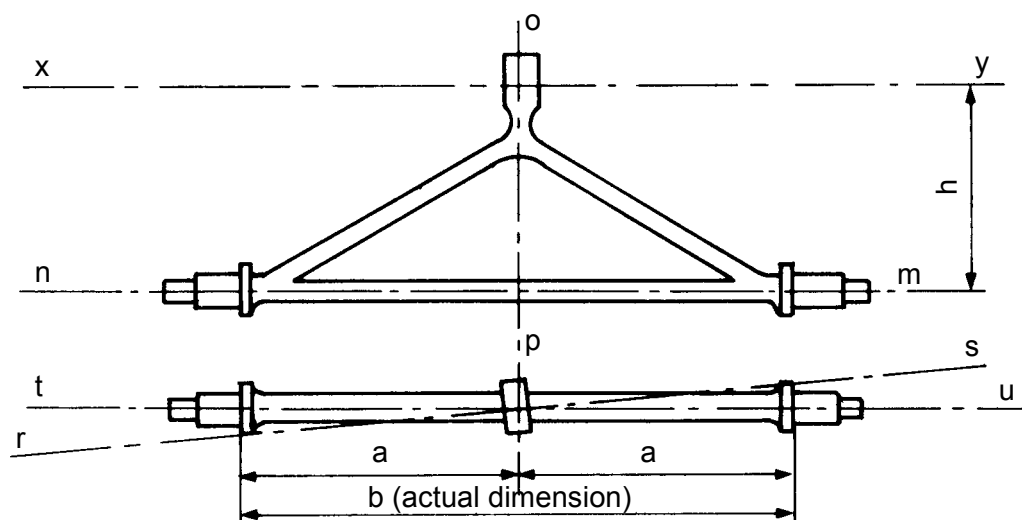


Fig. 1 - Triangles

2.2.3 - Mechanical characteristics

2.2.3.1 - Static deflection

Under a load equal to the nominal load (F_n) indicated in Table 2 - page 7, applied under the conditions defined in the load-time diagram in Figure 2, the height h of the brake triangle shall not reveal an elastic deflection greater than 2mm.

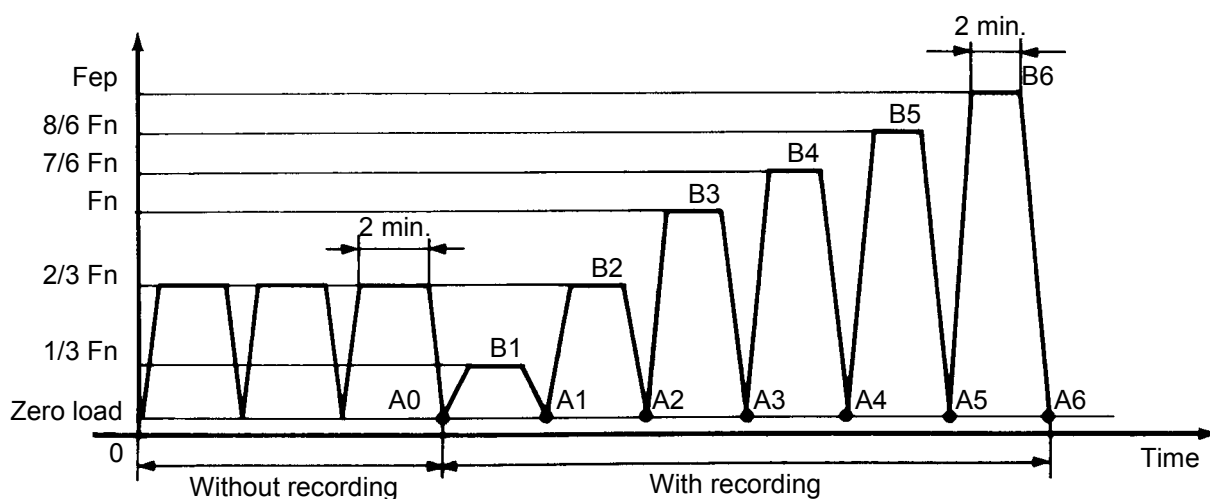


Fig. 2 - Load-time diagram

After releasing the force, this same height shall not reveal a permanent deflection greater than 0,1 mm.

In addition, no permanent deflection affecting the other parts of the triangle shall be observed.

Under a test load F_{ep} , equal to 9/6 of the nominal load F_n , applied under the conditions defined in the load-time diagram in Figure 2 - page 6, the height of the brake triangle shall not have an elastic deflection greater than 3 mm.

After release of the force, this same height shall not have a permanent deflection greater than 0,5 mm.

After testing, no defect shall be apparent.

Table 2 : Value of the loads in kN

Type of parts	"Zero" load	Nominal load (F_n)	Test load (F_{ep})	Limits of the load variations during the fatigue test
Triangle 60 kN	5	60	90	10 to 60
Triangle 120 kN	10	120	180	20 to 120

2.2.3.2 - Endurance under cyclic loading

The brake triangles shall be able to withstand, without revealing any apparent defects, 10^6 cycles of the tensile loads applied at a frequency between 2 Hz and 16 Hz, the loads varying cyclically between the limits indicated in Table 2 for the part in question.

2.2.3.3 - Localised hardening

2.2.3.3.1 - Trunnions

Irrespective of whether it is obtained by carburizing or by induction hardening, the trunnions must have a superficial hardness in the treated areas of at least 55 HRc and for a depth of at least 1 mm.

2.2.3.3.2 - Bushes and bores

The surface hardness, obtained at any point of the bushes or the bores if bushes are not used, must be between 58 and 62 HRc. The depth of the hardened part must be constant and between 1 mm and 1,5 mm.

2.2.4 - Manufacturer's marks

Each brake triangle shall be given the manufacturer's marks defined in the order or its appended documents. These marks must include the following at least:

- the manufacturer's mark,
- the last two figures of the year of manufacture,
- the mark of ownership of the purchasing Railway.

Whenever possible, the marks shall be embossed, when hot, on a drop-forged component.

The use of sharp-edged stamps is forbidden. Any cold stamping must be subject to prior agreement of the purchasing Railway.

3 - Manufacture

3.1 - Approval of suppliers

The manufacture of brake triangles shall only be entrusted to suppliers approved for this purpose by the purchasing Railway.

3.2 - Approval of prototypes and manufacturing processes

Before being accepted for use, each prototype brake triangle, and its conditions of manufacture, shall be approved by the purchasing Railway.

The approval procedure shall be repeated each time any modification likely to change the characteristics is made either to the design of the parts or to the manufacturing process.

3.3 - Steel making procedures

Steels of the following qualities:

- grade C and D to *ISO 630*,
- type 1 and type 6 to *ISO 683-11*,
- grades C 35, C 45e, C 50 to *ISO 683-1* (and, where applicable, steels of grade 2 of EN 10-250-2),

shall be obtained exclusively from casts made by the open-hearth process, the electric process or by a top blown oxygen process.

3.4 - Manufacture of parts

3.4.1 - Forging of parts

The forging and drop-forging operations shall be carried out at temperatures which ensure that no change in the characteristics can result.

After forging, the component parts or the solid brake triangles shall be normalised.

3.4.2 - Welding

Welding may only be used for assemblies and in the positions prescribed in the order or its appended documents.

Failing any indication to the contrary, the welding process shall be left to the choice of the supplier. However, automatic welding processes must be approved by the purchasing Railway and cannot be altered without its authorisation. Moreover, manual welding processes can only be used by welders whose ability has been previously verified. In both cases, the authorisations granted shall only be valid for a maximum period of 12 months.

The welding procedure shall not give rise to any distortion necessitating subsequent straightening and cannot be altered without the authorisation of the purchasing Railway.

3.4.3 - Heat treatment

The heat treatment operations shall be carried out so that uniformity of treatment is guaranteed at all points on the same part and for all parts of the same furnace load.

The temperatures of the furnaces or quenching baths shall be checked by correctly calibrated recording pyrometers.

3.5 - Retouching

No retouching or repair may be carried out without the prior agreement of the purchasing Railway.

The elimination of superficial defects by grinding, chiselling, filing or any other approved process may be authorised, subject to compliance with the dimensional tolerances.

Any retouching or repair which is unauthorised or intended to hide a defect is strictly forbidden and shall lead to rejection of the batch.

4 - Inspection

4.1 - Inspection of the manufacture

The representative of the purchasing Railway shall be able to ensure, by any checks which he considers necessary, that the manufacturing conditions are complied with. In particular, he shall be able to be present at welding operations and at the individual tensile tests carried out by the supplier, and be provided with the charts of the recording pyrometers. In addition, he shall be informed of any alteration to the manufacturing process.

4.2 - Acceptance inspection

4.2.1 - Formation of a batch of parts intended for the acceptance procedure

When the acceptance procedure is to be carried out, a batch comprising at least 10 brake triangles of the model to be accepted, manufactured by the normal production methods, shall be made available to the representative of the purchasing Railway.

4.2.2 - Condition of the parts subjected to the acceptance procedure

Before they are made available to the representative of the purchasing Railway, the brake triangles intended for the acceptance procedure shall not be subjected to any stress exceeding in value $2/3$ of the nominal load F_n indicated in Table 2 - page 7.

4.2.3 - Acceptance tests

The tests to which the brake triangles are to be subjected are indicated in Table 3 - page 12.

The brake triangles intended for the endurance test under pulsating tension shall not be chosen from those already subjected to the static deformation test.

The tests prescribed in the acceptance programme shall be carried out completely by a laboratory approved by the purchasing Railway.

4.3 - Acceptance inspection of the brake triangles

In principle, the materials and component parts shall have been previously inspected. If this inspection has not been carried out, their characteristics may, however, be checked on the assembled triangles.

4.3.1 - Submission

4.3.1.1 - Condition of the parts when submitted

The brake triangles shall be submitted for acceptance in the delivery condition, but before they have been given any protective treatment prescribed.

They shall have previously been submitted, under the responsibility of the supplier, to static deflection tests carried out under the conditions indicated in point 2.2.3.1 - page 6 on the number of parts indicated in Table 3 - page 12, and, failing any indication to the contrary in the order, tensile loading test carried out on each of the other parts in the batch, under a load equal to the load F_{ep} indicated in Table 2 - page 7 maintained for 2 minutes.

4.3.1.2 - Forming into batches

4.3.1.2.1 - Materials and component parts

The materials shall be submitted in batches formed as prescribed by the standards governing their supply.

Component parts forged or drop-forged shall, however, be submitted grouped into batches comprising a maximum of 10 t of parts of the same type, from the same batch of steel, manufactured at the same time and, where applicable, having undergone the same heat treatment.

4.3.1.2.2 - Brake triangles

The brake triangles shall be submitted in batches comprising only parts of the same type, from the same manufacture and treated under the same conditions.

4.3.1.3 - Advice of submission

The date of submission shall be advised to the representative of the Railway in a letter, signed by the Manager of the factory or his authorised representative.

This letter, which shall indicate the number of parts forming each batch, also the references to the order by which they are covered, shall be accompanied by a certificate containing the results of the tests listed in point 4.3.1.1 - page 11.

4.3.2 - Nature and proportion of the checks and tests

The brake triangles shall be submitted to the checks and tests indicated in Table 3, and carried out either at the time of acceptance, or on submission or during manufacture.

Table 3 : Checks and tests

Nature of the tests and checks	Type of inspection	Proportion of the checks and tests					
		≤ 50	51/150	151/500	501/1 200	1 201/3 200	> 3 200
Appearance and dimensions of the component parts and finished items	Approval and Acceptance	As decided by the representative of the Railway					
Hardness tests on forged parts ^a and on finished parts ^b	Approval and Acceptance	2	4	6	8	10	12
Deflection tests on forged parts	Acceptance	As decided by the representative of the Railway, with a maximum of 2 per batch of 10 t					
Inspection of welds	Approval and Acceptance	As decided by the representative of the Railway. However, the approval must be renewed at least every twelve (12) months					
Static deflection test ^c	Approval	8 parts					
	Acceptance	1	2	3	4	5	6
Endurance test under pulsating tensile loads ^c	Approval	2 parts					

- a. Before submission for acceptance, the supplier shall have checked, under his own responsibility, the Brinell hardness on at least 10% of the forged parts.
- b. Before submission for acceptance, the supplier shall have checked, under his own responsibility, the Rockwell hardness on at least 5% of the trunnions.
- c. The parts intended for these tests shall not have been submitted to a tensile force greater than 2/3 of the nominal load F_n .

4.3.3 - Selection and preparation of the samples and test pieces

4.3.3.1 - Sampling

The representative of the Railway shall select, at random, from each batch, the parts on which he wishes to carry out the checks and tests, and shall mark them indelibly.

4.3.3.2 - Preparation of the samples and test pieces

4.3.3.2.1 - Materials and component parts

Failing any indication to the contrary in the order or its appended documents, the test pieces and samples shall be prepared in accordance with *ISO Standard 377*. Their dimensions and tolerances shall be as prescribed by the ISO Standards governing the supply of the products in question. If, by reason of their shape or dimensions, the forged or drop-forged parts cannot be subjected directly to the deflection test, a test piece shall be manufactured by reducing the thickness or the section. The test piece shall be obtained by machining and shall retain at least one of the original faces of the part.

4.3.3.2.2 - Brake triangles

The triangles intended for submission to the static deflection test shall be selected as soon as their manufacture is completed. In no case shall they be subjected to a tensile force greater than 2/3 of the load F_n prescribed for the type in question.

4.3.4 - Testing and inspection procedures

4.3.4.1 - Materials and component parts

The checks and tests on the component materials shall be carried out in accordance with the instructions in the standards governing their supply.

4.3.4.1.1 - Hardness test

1. **Brinell hardness test on forged parts**

The Brinell hardness test on forged parts shall be carried out in accordance with *ISO Standard 6506-1*. The places where the impressions are to be effected shall be designated by the representative of the Railway. In these areas, surface material shall be removed to a depth of 1 mm approximately.

2. **Rockwell hardness test on case-hardened parts**

The test shall be carried out in accordance with the provisions of *ISO Standard 6508-1* concerning the diamond cone test.

4.3.4.1.2 - Bending test on forged parts

A sample, with a minimum length of 300 mm, shall be taken from the brake triangle; the cylindrical samples shall be forged so as to obtain a prismatic section.

This sample shall then be machined on three sides, so as to obtain a test piece with the following dimensions:

- thickness: 20 ± 5 mm,
- width: 25 ± 5 mm.

The longitudinal edges shall be rounded with a radius $R \leq 2$ mm. The test piece shall be bent by means of a mandrel until the two ends are parallel, the rough surface being situated in the tensioned area.

The diameter of the mandrel shall be twice the thickness of the test piece if the tensile strength of the steel forming it is less than or equal to 490 N/mm^2 , and three times the thickness of the test piece if this tensile strength exceeds 490 N/mm^2 .

4.3.4.2 - Brake triangles

4.3.4.2.1 - Appearance and dimensional checks

1. **Appearance**

The representative of the Railway shall ensure compliance with the provisions of points [2.2.1.1](#) and [2.2.1.2 - page 5](#).

2. *Dimensions*

The dimensions shall be checked by means of limit gauges made available to the representative of the Railway by the supplier.

The relative positions of the trunnions and of the hole for the traction pin shall be checked by means of models previously approved by the purchasing Railway.

The dimensional checks shall be carried out on parts after their tensile test.

4.3.4.2.2 - Inspection of welds

The inspection procedures for welds shall be determined by the purchasing Railway. The inspection may be carried out either on the parts themselves, or on mock-ups representing the types of weld seam forming the connections.

Failing any indications to the contrary, at least one micrographic examination of a cross-section of the weld seams shall be carried out.

The representative of the Railway may have recourse to methods of investigation such as dye penetrant or magnetic particle crack testing, to ensure that the welds are free from important defects such as cracks or blow-holes.

4.3.4.2.3 - Static deflection test

Test apparatus

The static testing of brake triangles is effected on a tensile machine with horizontal or vertical travel, capable of maintaining a constant load for at least 2 minutes and of measuring this load with less than 1% error.

The deflections under load shall be measured by dial gauges graduated in 1/100 mm. These gauges shall be rigidly mounted and their probes shall make contact at right angles with smooth surfaces on the triangle to be tested. If necessary, a suitable smooth surface about 1 cm² shall be prepared by filing or grinding.

The brake triangles can be tested either individually or in twos. The connections between the part (s) to be tested and the tensile machine shall conform to one of the arrangements shown in Figures 3 - page 15 to 6 - page 16.

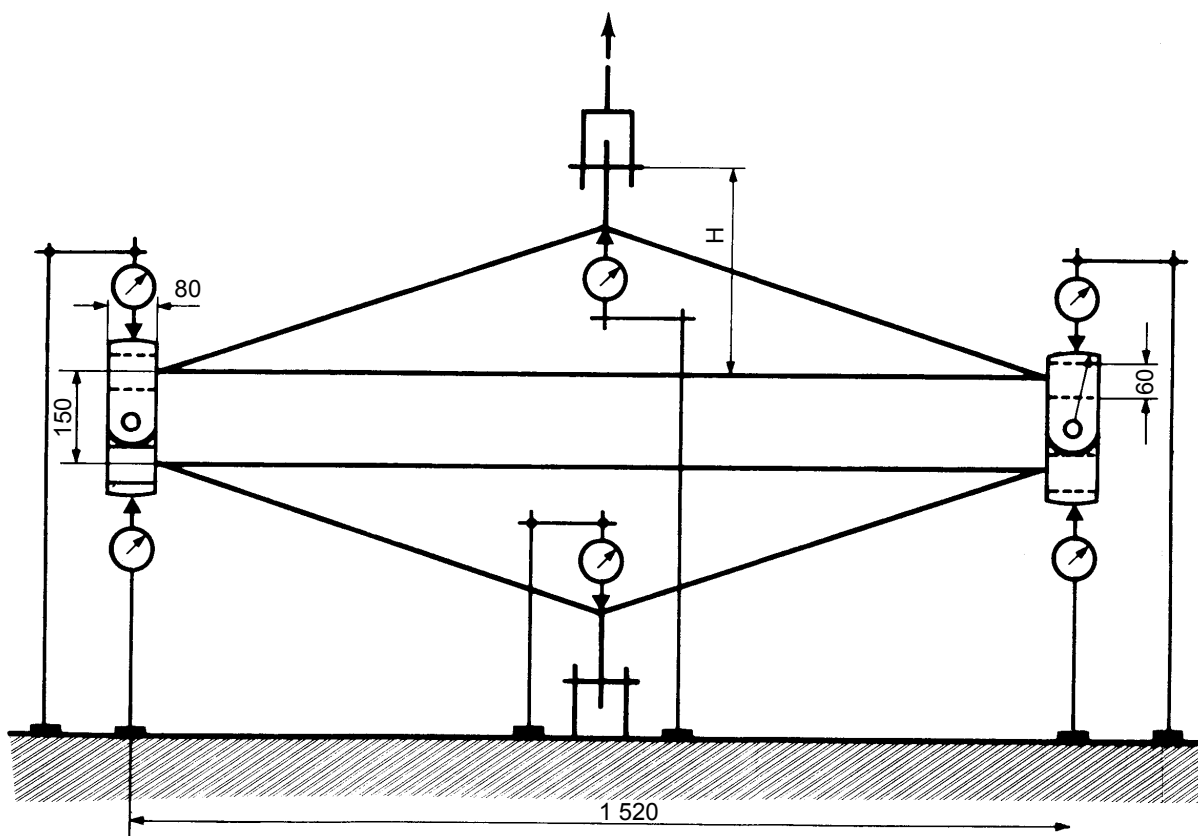


Fig. 3 -

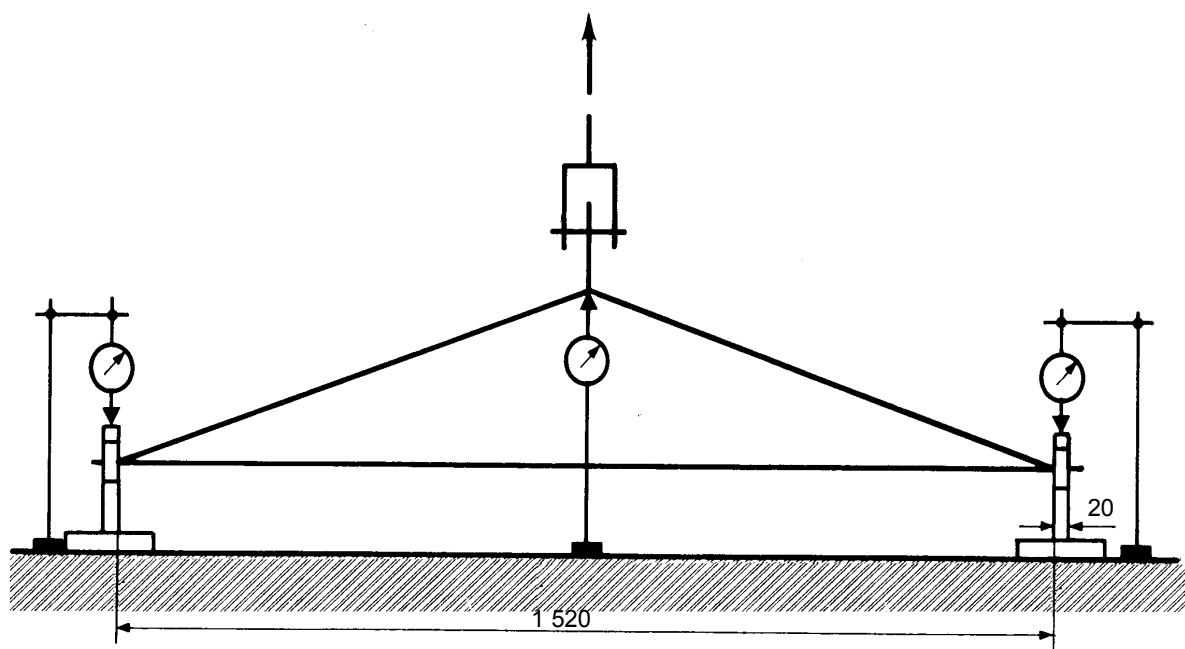


Fig. 4 -

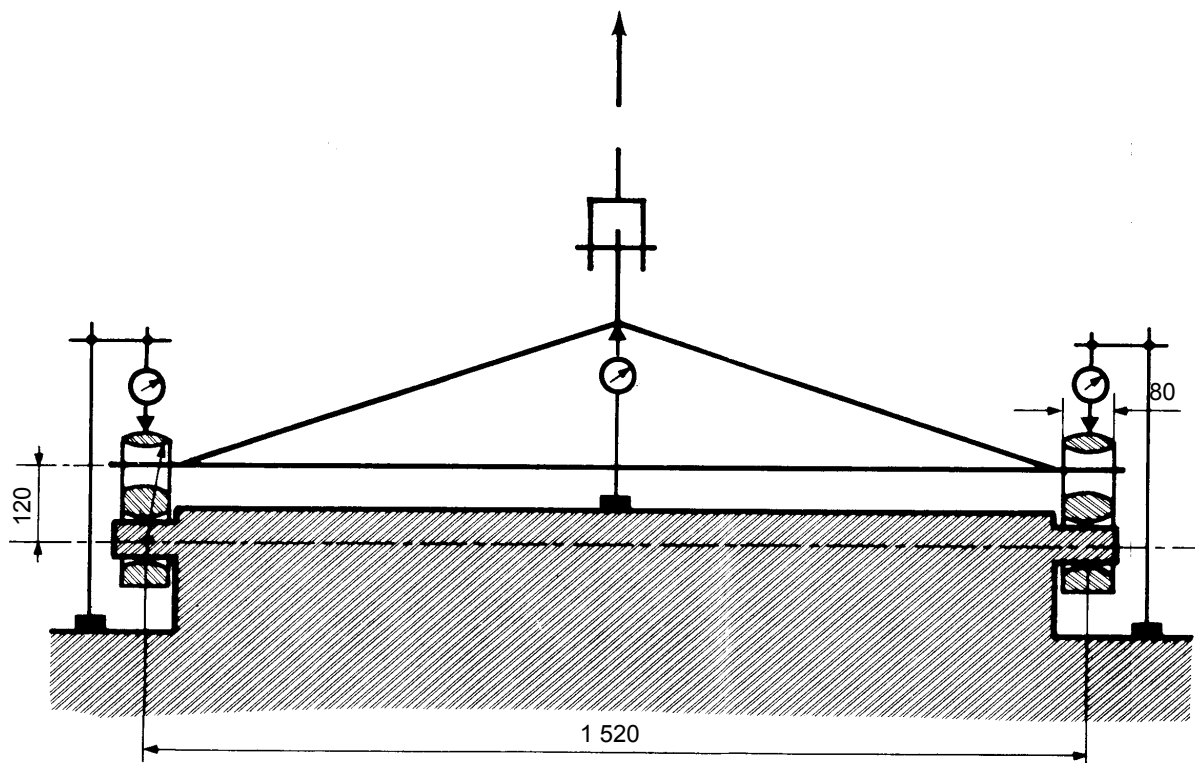


Fig. 5 -

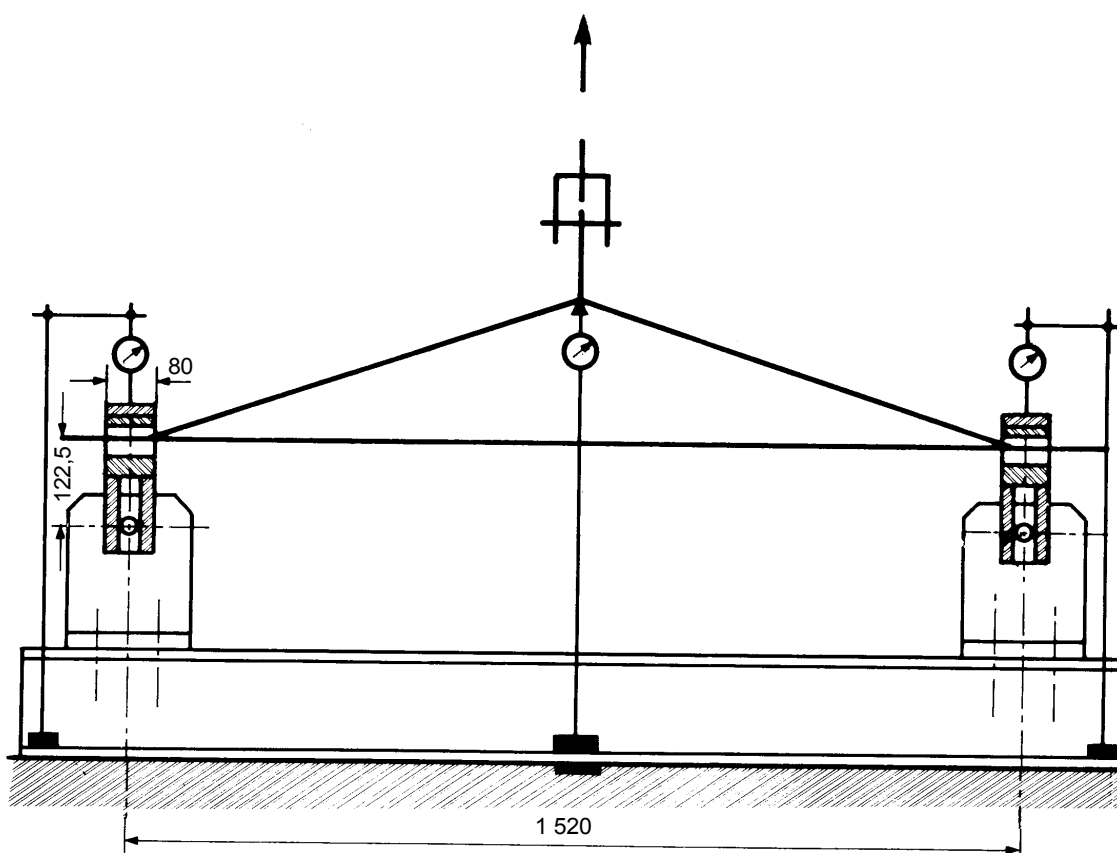


Fig. 6 -

Carrying out the test

1. *Application of the loads*

Prior to the actual test, the part(s) for testing are subjected to three consecutive preliminary loads maintained for two minutes and equivalent to $2/3$ of the normal load F_n indicated in Table 2 - page 7. After the third preliminary load, the force is returned to the "zero" load also indicated in Table 2.

Loads equal to $1/3 F_n$, $2/3 F_n$, F_n , $7/6 F_n$, $8/6 F_n$ and $9/6 F_n$ are then applied, in turn, for two minutes each. The application of each new load is preceded by reverting to a load which shall not be less than the "zero" load in accordance with the indications in Figure 2 - page 6.

A dial gauge reading is taken for each of the "zero" loads and under each of the "zero" loads, i.e. the points A0, B1, A1, B2, A2, B3, A3, B4, A4, B5, A5, B6 and A6 of Figure 2 in turn.

2. *Measurements to be effected*

a. Elastic deflection under the nominal load F_n

This is equal to the difference in measurements between B3 and A3 ($B3 - A3$).

b. Permanent deflection under the nominal load F_n

This is equal to the difference in measurements between A3 and A0 ($A3 - A0$).

c. Elastic deflection under the test load F_{ep}

This is equal to the difference in measurements between B6 and A6 ($B6 - A6$).

d. Permanent deflection under the test load F_{ep}

This is equal to the difference in measurements between A6 and A0 ($A6 - A0$).

The results to be obtained are those indicated in point 2.2.3.1 - page 6.

e. Any permanent deflection, other than that obtained in the direction in which tension was applied, is determined by comparing the measurements made to the nearest $1/10$ mm, by reference to a surface-plate, before and after the tensile test.

4.3.4.2.4 - Fatigue test under pulsating tension

1. *Test apparatus*

The fatigue test under pulsating tension is carried out on a tensile machine with vertical travel, capable of applying loads varying within the limits indicated in Table 2, at a frequency of between 2 and 16 Hz.

The machine shall be equipped with devices capable of counting the number of cycles and the value of the loads applied.

The parts to be tested, one at a time, shall be mounted in the tensile machine by one of the assemblies shown in Figures 5 or 6 - page 16.

2. *Carrying out the test*

After placing in position on the tensile machine, the triangle shall be subjected to 10^6 cycles.

The results to be obtained are those indicated in point [2.2.3.2 - page 7](#).

4.4 - Results of inspection

4.4.1 - Approval inspection

Any result not in accordance with one of the static deflection or fatigue tests under pulsating tension shall be refused approval.

4.4.2 - Acceptance inspection

Any defect in appearance or any dimensional difference affecting their satisfactory use shall result in rejection of the part(s) in question.

Any result not in conformity with "one of the other" tests prescribed shall result in rejection of the corresponding batch.

Fresh tests can only be carried out, at the request of the supplier, with or without improvement treatment, with the prior agreement of the Railway.

5 - Delivery

Protection against corrosion

After the acceptance inspection, the triangles shall be given the anti-corrosion protection prescribed in the order or its appended documents.

Failing any indication, the protection shall be carried out as follows:

- rough surfaces: after degreasing and brushing, these surfaces shall be given a layer of priming paint the composition of which has been approved by the Railway,
- machined surfaces: these surfaces shall be coated with an anti-rust product.

6 - Guarantee

Brake triangles shall be guaranteed for a period of two years against any defect imputable to manufacture. This period shall run from the end of the year, the last two figures of which are shown on the triangles.

If the brake triangles are intended for fitting to new stock, the date of delivery of the vehicles to which they are fitted shall be regarded as the beginning of the guarantee.

Brake triangles which, during the guarantee period, reveal defects rendering them unsuitable for service or likely to decrease their service life, shall be rejected.

Before being finally rejected, defective brake triangles may, however, be subjected to a check test by the purchasing Railway and the supplier, if the latter so requests.

When the check test confirms that the defects are definitely imputable either to manufacture, or to inadequate protection against corrosion, the defective brake triangles shall be finally rejected.

Should the results of the check test not enable an agreement to be reached between the Railway and the supplier, experts approved by both parties shall be appointed to settle the dispute. The costs of arbitration shall be borne by the party held responsible for the defects.

When more than 5% of the brake triangles from the same delivery show defects resulting in rejection, the purchasing Railway may reject the complete delivery.

Rejected brake triangles shall be made available to the supplier with a view to their replacement or reimbursement at their value in new condition, at the time of withdrawal.

Bibliography

1. UIC leaflets

International Union of Railways (UIC)

UIC Leaflet 542: Brake parts - Interchangeability, 4th edition of 1.1.82 and 4 Amendments

UIC Leaflet 897-13: Technical specification for the quality control of welded joints on steel rolling stock, 3rd edition of 1.1.93

2. Minutes of meetings

International Union of Railways (UIC)

Traction and Rolling Stock Committee (Bringing up to date of existing specifications: c) Preparation of a specification for the approval and acceptance of brake triangles, based on the work of the B 12 Specialists' Committee), June 1974

Sub-Committee for Specifications (Question 5/Sa/Fic - Revision of UIC Leaflet 833 "Brake triangles". Amendments needed as a result of the endurance tests carried out by a number of Railways), January 1979

3. International standards

International Organization for Standardization (ISO)

ISO 286-1: 1988: ISO system of limits and fits - Part 1: Bases of tolerances, deviations and fits, 1988

ISO 377: 1997: Steel and steel products - Location and preparation of samples and test pieces for mechanical testing, 1997

ISO 630: 1995: Structural steels - Plates, wide flats, bars, sections and profiles, 1995

ISO 683-1:1987: Heat-treatable steels, alloy steels and free-cutting steels - Part 1: Direct-hardening unalloyed and low-alloyed wrought steel in form of different black products, 1987

ISO 683-11:1987: Heat-treatable steels, alloy steels and free-cutting steels - Part 11: Wrought case-hardening steels, 1987

ISO 1052:1982: Steels for general engineering purposes, 1982

ISO 4287:1997: Geometrical Product Specifications (GPS) - Surface texture: Profile method - Terms, definitions and surface texture parameters, 1997

ISO 6506-1:1999: Metallic materials - Brinell hardness test - Part 1: Test method, 1999

ISO 6508-1:1999: Metallic materials - Rockwell hardness test - Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T), 1999

ISO 7438:1985: Metallic materials - Bend test, 1985

4. European standards

European Committee for Standardization (CEN)

EN 10-250-2:1999 : Open die steel Forgings for general engineering purposes - Part 2: non-alloy quality and specials steels, 1999

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