



## UIC CODE

Leaflet to be classified in Volumes :

V - ROLLING STOCK

VI - TRACTION

VIII - TECHNICAL SPECIFICATIONS

829-4

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PROVISIONAL TECHNICAL SPECIFICATION  
FOR THE SUPPLY OF SPRINGS  
INTENDED FOR THE UIC TYPE  
AUTOMATIC COUPLING  
WITH A CENTRE BUFFER FOR TRACTIVE  
AND TRAILING STOCK

**NUMERISATION DANS  
L'ETAT DU DOCUMENT**

(Printed on 1-10-1979)

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## Article 1

*PURPOSE*

This specification governs the supply of springs intended for the UIC type automatic coupling with a centre buffer for tractive and trailing stock.

## Article 2

*CHARACTERISTICS**2.1. Construction Materials*

The steel wire used for the manufacture of springs must comply with the conditions defined in the order or its appended documents.

2.1.1. The various types of steel used for the manufacture of the springs are as follows (1) :

No. 2, 5, 9 and 14 of the international standard ISO 683/XIV.

*2.1.2. Chemical properties (on products)*

Types of steels	C %	Mn %	Si %	Cr %	Ni %	V %	P % maxi	S % maxi
2	0.47-0.55	0.50-0.80	1.50-2.00				0.040	0.040
5	0.57-0.64	0.70-1.00	1.70-2.20				0.040	0.040
9	0.46-0.57	0.66-1.04	0.12-0.43	0.85-1.25	-	0.08-0.22	0.040	0.040
14	≤ 0.155	≤ 2.03	≤ 1.05	15.8-18.2	5.9-8.1	-	0.055	0.035

(1) List to be supplemented later. See notes.

2.13. Mechanical properties

Types of steels	Reference treatment	0.2 % Proof Stress (daN/mm <sup>2</sup> ) min.	Tensile strength (daN/mm <sup>2</sup> ) min.	Elongation % min. (1)
2	Water quench 860°C Temper at 480°C	113	132	6
5	Oil quench 845°C Temper at 480°C	118	137	5
9	Oil quench 865°C Temper at 480°C	120	135	6
14	Cold drawn	95	130	12

(1) For spring wire of diameter less than 5 mm, the drawing must state the gauge length and the results to be obtained.

The torsion characteristics are stated in the drawings.

2.2. Springs

2.21. Physical properties

2.211. Appearance

The springs must not show any crack, seam, lack of material, fold or any defect likely to prove harmful in use.

2.212. Soundness

The springs must be sound throughout.

After magnetic particle or penetrant crack detection the spring must not show any line indicative of a crack.

2.22. Geometrical properties

The shape, dimensions and tolerances allowed on the dimensions must conform to those fixed in the order or its appended documents ; failing any indications on the drawings, the following tolerances must be complied with :

<i>All categories of springs</i>	
Section dimensions : those in the corresponding UIC Leaflet or in the standard concerning the metal	
<i>Coil springs of all kinds</i>	
Height (1)	± 2.5 %
Internal diameter	± 1.5 %
External diameter	± 1.5 %
<i>Coil compression springs</i>	
Slope of the axis in relation to the bases	≤ 2 %
Slope of a base in relation to the other	≤ 3 %
<i>Torsion springs with branches</i>	
Angle of the end arms in the direction opposite to that in which spring is deflected	≤ 10 %

(1) Measured on the recumbent spring in the case of a spring of great flexibility.

The end turns of the coil springs must be wound over three quarters of a turn at least, at a pitch equivalent to the diameter or to the thickness of the wire. The wire shall be progressively thinned to obtain a flat base.

2.23. Mechanical properties

The mechanical properties mentioned above must be obtained on the springs in delivery condition. This means after shot peening and superficial treatment, where applicable, and before application of any coating.

2.231. Scragging test

The springs must be able to withstand two successive deflections, linear or angular depending on the nature of the spring (1), of one minute duration each, without cracking. On removal of the load, the spring must return to its original dimensions within the tolerances shown in 2.22.

2.232. Sustained scragging test

The springs must be able to withstand 2 successive deflections, linear or angular, depending on the nature of the springs (1), of two minutes duration for the first, and of 24 hours duration for the second, without cracking. On removal of the load, the spring must return to its original dimensions within the tolerances shown in 2.22.

2.233. Load deflection test

The springs must be able to withstand a deflection, the application of a load as indicated in the order or its appended documents, and the specified deflection must be obtained, failing special stipulations, within  $\pm 8\%$  of the specified figure.

2.24. Marks

A metal label fixed to each spring or to each packet of springs, depending on the method of delivery, must bear the following marks :

- the grade of the material
- the mark of the supplier
- the date of manufacture (month and last two figures of the year of manufacture).

(1) The deflection is :

- linear for compression springs (variation in the height of the spring
- angular for torsion springs (rotation of one base in relation to the other).

Article 3

**MANUFACTURE**

3.1. *Steelmaking*

The steel used for the manufacture of the springs must be made by the electric or open-hearth process, by a top blown oxygen process or by any other process recognised as equivalent by the Railway.

3.2. *Manufacture of the Springs*

The springs must be manufactured in accordance with the indications in the order or its appended documents.

3.21. *Forming*

The coiling of the springs can be effected cold or hot.

In this latter case, the heating must be carried out so as to avoid any overheating, any surface decarburisation, and any formation of scale or oxide harmful to use.

After hot coiling, the springs shall be left to cool slowly in still air, or in an enclosure with controlled cooling.

3.22. *Heat treatment, peening and superficial treatment*

If heat treatment is laid down in the order or its appended documents, it must take the form of oil hardening and tempering. The temperatures of the furnaces shall be controlled by correctly adjusted recording pyrometers.

When the order or its appended documents so prescribe, shot peening shall be carried out in order to obtain surface compression stresses, the methods of checking of which shall also be stated.

When the order or its appended documents prescribe the carrying out of a superficial treatment, the characteristics to be obtained shall also be stated in these documents.

### 3.23. Finishing

The end coils of compression springs must be aligned so as to obtain a flat base, perpendicular to the axis of the spring. Any burring introduced by grinding in the course of aligning must be removed and the extremity of each end turn must not show any sharp edge.

### 3.25. Retouching

No retouching may be carried out without the prior authority of the Railway.

Any retouching with the object of hiding a defect shall be strictly forbidden and shall result in refusal of the entire batch.

## Article 4

### **INSPECTION**

Failing stipulation to the contrary in the order or its appended documents, the wires and springs shall be subjected to inspection of their manufacture and of their properties by a representative of the Railway.

#### *4.1. Inspection of the manufacture*

The representative of the Railway must be able to follow particularly the manufacture of the first produced parts, on which he will subsequently effect all the examinations which he considers necessary to ensure the qualities and dimensions of the springs. He must be able to check any phase of manufacture, particularly the execution of any shot peening, by random checks.

He must have access to charts of recording pyrometers, in order to check the temperature of the heat treatment furnaces.

Before presentation, the supplier must submit each spring to the following examinations or tests :

- Magnetic particle or penetrant crack testing, if the order or its appended documents so prescribe ; this examination or test shall be carried out on the springs before any superficial treatment.

- Stragging test ; this test is made on the springs after shot peening and superficial treatment where applicable.

#### *4.2. Inspection of the wires and springs*

The properties of the constituent materials used for the manufacture of springs shall be inspected in accordance with the indications of the international standard ISO 683/XIV - type of delivery conditions : 4.

#### 4.21. Presentation

##### 4.211. Condition of the products on presentation

The wires and springs shall be presented in delivery condition, before any protection as defined in 5.1.

4.212. Grouping into batches

The wires and springs shall be presented grouped in batches.

- Wires : each batch shall comprise only wires of the same diameter and from the same cast. The size of the batch may not exceed 5 tons.

- Springs: each batch shall comprise only springs of the same type from the same cast, and having undergone the same heat treatment where applicable.

The size of the batch may not exceed 300 springs.

4.213. Advice of the presentation

The date of the presentation must be advised to the representative of the Railway by a written note signed by the Director of the producing factory or his authorised representative. This note must indicate the quantity of wires or springs presented in each batch, as well as the references in the order covering them. At the time of presentation, a certificate, certifying that the conditions of manufacture prescribed have been complied with, and that, in particular, for springs, the scragging and the magnetic particle or penetrant crack test have definitely been carried out, shall be handed to the representative of the Railway.

4.22. Nature and proportion of the checks and tests

The wires and springs shall be subjected to the following checks and tests :

Product	Nature of the checks and tests	Number of the checks and tests per batch (5)
Wire	Appearance and dimensions check	As desired by the representative of the Railway
	Chemical analysis	1
	Tensile test (1) Torsion test (2)	2 if $P \leq 0.5$ ton 3 if $0.5 < P \leq 2$ tons 4 if $P > 2$ tons
Springs	Aspect and dimensions check	As desired by the representative of the Railway
	Magnetic particle or penetrant crack test (3) (4)	On 10 % of the parts with a minimum of 5
	Scragging test (4)	On 10 % of the parts with a minimum of 2
	Sustained scrag test	On 5 % of the parts with a minimum of 2
	Load/deflection test	On 2 % of the parts with a minimum of 2
<p>(1) The tensile test is not carried out when the torsion machine enables the torque to be recorded.</p> <p>(2) The torsion test is always carried out, even if the torsion machine does not enable the torque to be recorded.</p> <p>(3) If stipulated on the order or its appended documents, the penetrant test is only carried out when it is not possible to effect the magnetic particle crack test by reason of the non-magnetic character of the steel.</p> <p>(4) All the springs must have undergone, before presentation, under the responsibility of the supplier, the scragging test and, if so prescribed in the order or its appended documents, either the magnetic particle or penetrant crack test or the sweating test (see 4.1).</p> <p>(5) P represents the weight of the batch.</p>		

4.23. Selection

The representative of the Railway shall select at random, from each batch presented, the samples which he intends to use for the tests, and shall mark them indelibly.

The samples and test pieces must retain the stamps of the representative of the Railway ; any transfer of marks can only be effected by him.

The springs subjected to the :

- Scragging test
- Load deflection test

are chosen from those on which the representative of the Railway has repeated the magnetic particle, where applicable, and the scragging test.

4.231. Chemical analysis

The sample for chemical analysis shall consist of a section of wire weighing approximately 50 g.

4.232. Tensile test

The test piece shall conform to the regulations of ISO/R 89. For spring wire of diameter of less than 5 mm, the drawing must state the gauge length and the results to be obtained.

4.233. Torsion test

The test piece shall conform to the regulations of ISO/R 136.

4.24. Carrying out of the checks and tests

4.241. Check on dimensions

The check on the dimensions is carried out by any suitable method.

4.242. Wire and bar materials

4.2421. Tensile test

The tensile test is conducted in accordance with the regulations of ISO/R 89.

4.2422. Torsion test

The torsion test is conducted in accordance with the regulations of ISO/R 136.

4.243. Springs

4.2431. Magnetic particle or penetrant crack test  
(where applicable)

The magnetic particle or penetrant crack test shall be carried out before any surface treatment of the springs in accordance with the indications in the order or its appended documents

The test procedures are those laid down by the national standards of the supplier.

In the magnetic particle test, use shall be made of magnetic ink, i.e. a suspension of magnetic powder in a suitable liquid. The sensitivity of the method shall be checked by means of a magnetisation meter. The current flow method of magnetisation is allowed provided that the electrodes are applied to the bases before finishing takes place.

#### 4.2432. Scragging test

The spring, having undergone shot peening and superficial treatment where applicable, is subjected to two successive deflections so that the coils are closed each time.

#### 4.2433. Sustained scragging test

The spring, having undergone shot peening and superficial treatment where applicable, is subjected to two successive deflections so that the coils are closed each time.

During the second deflection, a device retaining the spring is sealed with a sealed wire by the representative of the Railway.

After each deflection, the spring is released and its free height is measured.

#### 4.2434. Load/deflection test

The spring, having undergone shot peening and superficial treatment where applicable, is tested according to the indications given in the order or its appended documents.

#### 4.2435. Shot peening (where applicable)

Checking of the effectiveness of the shot peening shall be effected in accordance with the indications in the drawings.

#### 4.3. Results of the tests

Any defects of appearance and dimensions shall result in rejection of the corresponding part.

Any chemical, physical or mechanical property not in accordance with the conditions required, shall result in rejection of the corresponding batch.

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

#### Article 5

#### **DELIVERY**

##### 5.1. Protection against oxidation

Failing stipulation to the contrary in the order or its appended documents, after checking and stamping by the representative of the Railway, and before storing or despatch, the springs shall be protected against corrosion by the application of a coating agreed by the Railway.

##### 5.2. Guarantee

The springs shall be guaranteed during a period of two years against any defect imputable to the manufacture. This period shall be counted with effect from the end of the month marked on the label fixed on the spring.

If the springs are fitted to new stock, the date of delivery of the vehicles to which they are fitted, shall be considered as the beginning of the guarantee.

If the springs are fitted to materials in service, on reconversion to automatic coupling, the date of fitting, which will be advised to the supplier, shall be considered as the beginning of the guarantee.

Springs, which, during the guarantee period, show defects rendering them unsuitable for use or reducing their service life shall be rejected.

Before being finally rejected, the defective springs can, however, be subjected to a check examination between the Railway and the supplier, if this latter so requests.

When the check examination confirms that the defects are definitely imputable to the manufacture, the defective springs shall be finally rejected.

In cases where the results of the check examination do not enable any agreement to be reached between the Railway and the supplier, recourse shall be had to experts approved by both parties to settle the dispute. The costs shall then be borne by the party on whom the final responsibility devolves.

When more than 5 % of parts emanating from the same delivery show defects resulting in rejection, the Railway may reject the whole of the delivery.

The springs 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.



NOTES

on the specification for the supply of springs intended  
for the UIC type automatic coupling

Table of comparison between the grade of steel  
laid down by KNORR BREMSE, and those adopted  
in the automatic coupling specification.

Description of the parts	Grades of steel adopted in the specification	Grades of steel laid down by KNORR BREMSE
Advance spring	} International standard ISO 683/ XIV	50 Cr V4
External suspension spring		50 Cr V4
Internal suspension spring		50 Cr V4
Lateral return spring		50 Cr V4
Tubular spring		X 12 Cr Ni 17-7
Counter bolt spring		Category C
Return spring		Category 7.5 C
Stop spring		Category 4C
Valve spring		Category 4C
Internal articulation spring		
External articulation spring		

APPLICATION

All Railways in the Union.

RECORD REFERENCES

*Heading under which the question has been dealt with :*

- Preparation of specifications for the supply of automatic coupling.

(Traction and Rolling Stock Committee : Graz, June 1972 ; Trier, June 1974).