# PRODUCT SPECIFICATIONS

RENAULT

**31 - 02 - 510 / - - E**

**STEERING AND SUSPENSION**

**BALL JOINTS**


**Normalisation Renault Automobiles**
**Service 60201**
**Section Normes et Cahiers des Charges**

This document is to be considered as a whole, the parts of which must not be separated.



**DATE OF ISSUE**

| | |
|---|---|
| May 1986 | - - - |

**REVISIONS**

| | | |
|---|---|---|
| November 1991 | - - B | Modification to paragraphs 2.2. and 3.2.5. |
| January 1992 | - - C | Modification to paragraph 3.2.5. |
| April 1993 | - - D | Modification to paragraph 3.2.5.<br>Paragraph 3.2.6. added. |
| June 1996 | - - E | Modification to paragraphs 2., 4.2.1. et 4.2.2.<br>Paragraph 4.2.7. added.<br>This issue originates from draft NC 95 110 / - - B. |

**REFERENCED DOCUMENTS**

| | | |
|---|---|---|
| Standards | : | 00-10-001, 00-10-003, 00-10-004, 00-10-040, 00-10-415, 00-10-420, 01-00-510, 01-33-200, 02-40-120, 03-80-200. |
| Product Specifications | : | 30-00-001, 47-01-003, 47-03-006. |
| Test Procedures | : | 31-02-501, 31-02-511, 31-02-512, 31-02-533, 31-02-549, 31-05-932, 31-05-971. |
| AFNOR Standard | : | NF A 55-010 (06/87). |
| ISO Publication | : | 301 (1981). |
| Foreign Standards | : | ASTM B86 (1988), ASTM B240 (1988). |
| United Nations Regulation | : | 79. |
| EEC Directive | : | 70-311. |

## 1. SCOPE

This document defines the required characteristics of steering and suspension ball joints. It concerns the assembled part together with its components (pivot, steering gear, bellows, etc.).

## 2. GENERAL CONDITIONS

### 2.1. SUPPLIER RESPONSIBILITY

The provisions of Standard 00-10-415 "Manufacture and supply of products - General requirements" are wholly applicable to these product specifications unless express and written instructions have been given to the contrary.

### 2.2. CONDITIONS OF APPROVAL

The provisions of Standard 00-10-001 "Product approval process and legal provisions » are wholly applicable to these product specifications unless express and written instructions are given to the contrary.

#### 2.2.1. Approval

Approval signifies that the RENAULT Engineering Department acknowledges that the product is capable of meeting given utilisation requirements defined on the basis of the characteristics stated on the functional drawings and in these product specifications.

All the items defining the an accepted product constitute **the reference file.**

In addition to the documents cited in the corresponding paragraph of Standard 00-10-001, the Supplier shall submit a file containing all the information he considers useful in demonstrating that the product is capable of meeting quality requirements.

In particular, the Supplier shall submit an estimated reliability analysis file (FMECA*, ADEPT **, failure trees, calculations from data banks, etc.).

* Failure Modes their Effects and Criticality Analysis (see Standard 01-33-200).

** Analyse des Défaillances et Estimation Prévisionnelle des Taux : Failure Analysis and Failure Rate.

**Note :** To be acknowledged, the test procedures used by the Supplier shall be in conformity with the test procedures defined by the RENAULT Testing Departments.

If the Supplier has been accorded Laboratory self-approval (Standard 00-10-003) or self-certification (Standard 00-10-004), he shall provide the RENAULT Testing Department with the test report together with a sufficient number of parts to enable RENAULT to perform any necessary controls, this being applicable for each test procedure or method for which the Supplier has been accorded self-approval or self-certification.

#### 2.2.2. Acceptance (PAEI)

Acceptance is a testing procedure which checks that the series-produced part has remained in conformity with the **reference file**.

In addition to the documents cited in the corresponding paragraph of Standard 00-10-001, the Supplier shall provide all additional test results, where necessary. Such information can be requested by the RENAULT Quality, Engineering or Purchasing Departments.

### *2*.2.3. Modification

The RENAULT Engineering Centre and the Supplier shall keep eachother informed of all modifications. Drawings shall be updated according to each modification, whatever the origin.

Modifications liable to affect the tierod performances shall be subject to approval. The tests and controls necessary for renewed approval are defined jointly by the Supplier and the RENAULT Engineering Centre.

### 2.3. QUALITY ASSURANCE

The quality assurance file shall be subject to the approval of the RENAULT Purchasing Quality Department according to the characteristics defined by the RENAULT Engineering Department.

### 2.4. MARKING

In addition to the marking defined in Standard 00-10-415, each part shall bear the name or the trademark of the ball joint Supplier and the name or trademark of the bellows Supplier. The ball joint shall bear its date of assembly (day/month/year or day/year).

### 2.5. PACKAGING

The bellows and the end of the pivot shall be fitted with a protector.

Axial ball joints shall be delivered in containers protecting them from external damage.

The threaded end of steering ball joints shall be protected against shocks.

### 2.4.6. DRAWINGS

The parts are produced in conformity with the functional drawing, according to the Supplier drawing accepted and validated by the RENAULT Engineering Centre.

Accordingly, the Supplier shall submit assembly and detail drawings on polyester medium, including:

- the indication « in conformity with RENAULT functional drawing No..... change letter... »,
- the indication « in conformity with Product Specifications 31-05-952, change letter ... »,
- the list of product specifications and standards cited in this document,
- all the dimensions of the functional drawing and their tolerances,
- the list of requirements which have not been complied with or complied with differently to the manner specified in the product specifications and / or on the functional drawing. In particular, dimensions different to those on the functional drawing shall be marked and listed in tabular form,
- indication of the Supplier name or trademark and marking,
- the regulatory requirements,
- the safety/regulation symbol in accordance with Standard 00-10-040,
- a nomenclature including :
    - . the list of all constituent parts and their change letter,
    - . the clear identification of materials used together with their type of anti-corrosion protections,
    - . the various treatments made,

. the standardized designation of lubricants used, defined in accordance with Standard 03-80-200, and the sales reference.

The detail drawings of components shall be approved by the Materials Engineering Department in accordance with Standard 01-00-510.

### 2.7. PRESENTATION - APPEARANCE

The ball joints shall be free of all defects (impact marks, oxidation, tearing of bellows, etc.)

### 2.8. MATERIALS USED

Zinc-alloy parts (sales designation "ZAMAK") as per Standards 02-40-120, NF A 55-010, ISO 301, ASTM B86 and ASTM B240, are prohibited.

Zinc based surface protections are permitted.

#### 2.8.1. Lubricants

Each ball joint shall be greased for life.

The lubricant used shall be approved by RENAULT.

#### 2.8.2. Bellows

The bellows mixture shall be approved by RENAULT according to Product Specifications 30-00-001 and shall be the subject of a Materials Reference Sheet according to Standard 00-10-420.

## 3. REGULATIONS

The steering function is subject to homologation according to United Nations regulation No 79 and EEC regulation 70-311.

## 4. REQUIRED CHARACTERISTICS

### 4.1. FUNCTIONAL CHARACTERISTICS

#### 4.1.1. Operating temperatures

The ball joint function (rotation, swivelling, sealing) shall be ensured for ambient rated temperatures of between - 40 °C and 80 °C, and peak temperatures of 120 °C, unless otherwise stated on the drawing.

#### 4.1.2. Movements

Movements shall be equal to or greater than the minimum envelope stated on the functional drawing.

#### 4.1.3. Friction

Friction is measured according to Test Procedure 31-02-511.

| | | Rotational torque (N.m) | Tilting torque (N.m) | Separation torque (N.m) |
|---|---|---|---|---|
| | **Off-load** | **0,5 < C < 3** | **0,5 < C < 5** | **0,5 < C < 8** |
| At ambient temperature | Under axial load ± 500 daN | < 10 | < 15 | Equal to or less than 1,2 times the rotational torque or the tilting torque |
| | Under radial load + 500 daN | | | |
| Hot + 80 °C | Off-load | < 10 | < 15 | |
| Cold - 40 °C | Off-load | < 15 | < 20 | |

**NOTE 1** : For steering ball joints :

- wheel side : only the measurement under radial load is performed,
- axial : only the measurement under axial load is performed.

**NOTE 2** : After the hot and cold tests and return to ambient temperature, the torque values shall be in conformity with those specified at ambient temperature.

#### 4.1.4. Protection

When fitted to the vehicle, the protection on ball joints shall meet the requirements of Product Specifications 47-01-003 (designation stated on the functional drawing) or Product Specifications 47-03-006 for solid or cast forged parts.

### 4.2. MECHANICAL CHARACTERISTICS

#### 4.2.1. Pivot pull-off force

The test is performed according to Test Procedure 31-02-549.

**Objective :** Pulling off.

**Acceptance criteria :**

- Pull-off force greater than :
  - . 25 000 N for wheel-side gear (point H),
  - . 30 000 N for an axial ball joint (point L),
  - . 25 000 N for a suspension ball joint (point E).
- The ball joint shall be extracted by flaring, without breaking or tearing the holding part

#### 4.2.2. Pivot shock resistance

The test method is given in annex 1.

**Objectives :**

To obtain a deflection of:

. 2,5 mm for a wheel-side gear (point H) and an axial ball joint (point L),

. 4 mm for a suspension ball joint (point E).

**Acceptance criteria :**

After impacting the pivot, there shall be no rupture in the deformed area for a minimum deflection value specified above.

#### 4.2.3. Fatigue resistance

The test is performed according to Test Procedure 31-02-512.

**Objective and acceptance criteria :**

B10 to 200 000 cycles on six parts minimum.

#### 4.2.4. Wear test

The test is performed according to a test procedure to be defined.

**Objective :** (to be defined).

**Acceptance criteria** : There shall be no play in the ball joints (see annex 2).

#### 4.2.5. Resistance of suspension ball joint on lower arm

The test is performed according to Test Procedure 31-02-533.

**Objective :**

10 000 cycles without failure on six parts.

**Failure criteria** :

- slipping of more than 0,02 mm at 500 cycles and on reaching the objective,
- loss of torque greater than 25% on reaching the objective,
- abnormal breaking or cracking on reaching the objective.

#### 4.2.6. Fatigue resistance of bellows and ball joint sealing

Fatigue resistance is checked according to Test Procedure 31-05-932.

**Objective :**

$N_1$ = 150 000 cycles for phase 1, followed by $N_2$ = 150 000 cycles for the first part of phase 2, followed by $N_3$ = 50 000 cycles for the second part of test phase 2.

**Acceptance criteria :**

At the end of the three phases performed on four parts, there shall be no ingress of water and wear on the bellows shall not exceed a quarter of the rubber thickness.

#### 4.2.7. Resistance to cold

Resistance to cold is checked according to Test Procedure 31-05-971.

**Objective :**

N1 = 140 cycles at temperature T1 = - 40 °C for phase 1, followed by N2 = 2080 cycles at temperature T2 = - 20 °C, unless otherwise specified on the functional drawing.

#### 4.2.8. Protector anchorage (wheel-side gear and suspension ball joint)

Axial pulling force on the ball joint protector shall be greater than 250 N.

## 5. OTHER TESTS

### 5.1. ON-VEHICLE TESTING

The Engineering Centre may perform on-vehicle tests in parallel with the bench tests, while according approval on a case-by-case basis afterwards.

### 5.2. BENCH TESTS

Additional tests, such as impact tests on a 1 / 2 axle according to Test Procedure 31-02-501, may be specified depending on the design (e.g. for plastic or sintered housings).

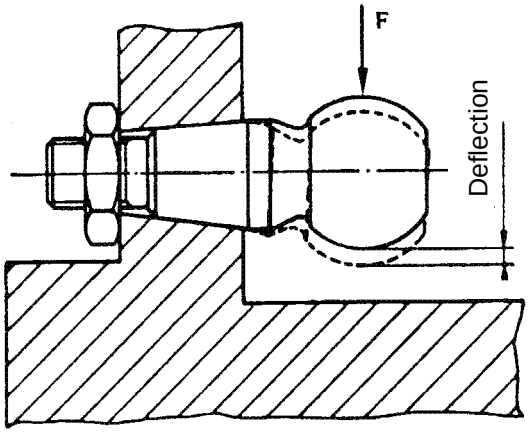
In addition, RENAULT reserves the right to complete or modify these specifications, at any time, by means of additional clauses.

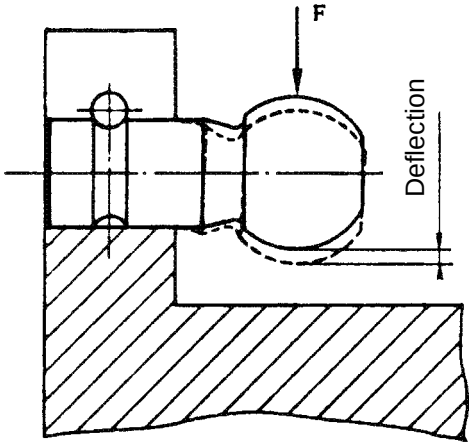
 

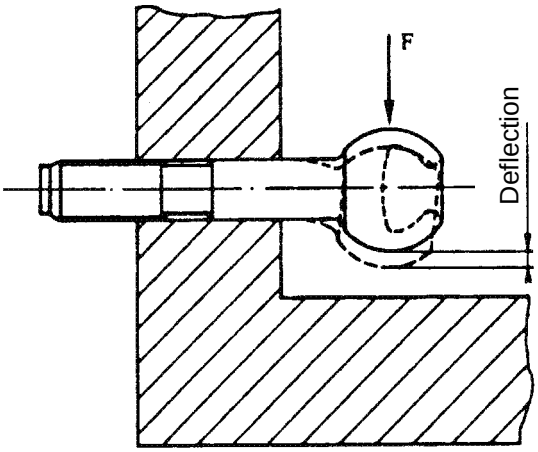
**ANNEX 1**

## RESISTANCE TO SHOCKS

### Test fixtures




### Test Method

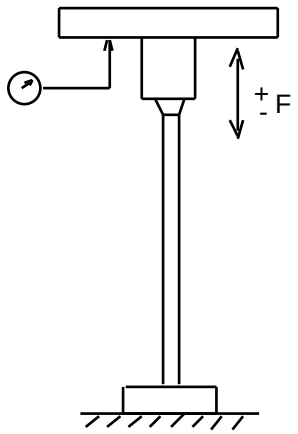
The ball joint is inserted in the test fixture.

The shock is applied to the sphere using a vertical striker, the energy of which is determined so as to obtain the minimum deflection specified on the functional drawing.

**ANNEXE 2**

**PLAY MEASURED IN STEERING TIEROD**




**Test parameters:**
F = +/- 1 000 N
Temp. = 20 °C
Test at 3rd cycle

**Representation scale parameters:**
X axis : 1 mm play for 500 mm on graph
Y axis : 150 N for 10 mm on graph

**Maximum displacement:**
Maximum displacement of axial ball joint at +/- 1000 N shall not exceed 0,3 mm

**Acceptance criteria** : Effective play is the smaller value « a » or « b ».