

# REP CONNECTOR SERIES

TEST REPORT | N° 5270



**ébauche**  
draft

**pour consultation**  
for consultation

**bon pour application**  
for application

**confidentiel**  
confidential

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### MODIFICATION FOLLOW UP

Rev.	Sheet/Chapter	Writer/Date	Summarized designation of the modification
A		21/10/10	ORIGINAL ISSUE

## 1. INTRODUCTION

### 1.1. Purpose

To meet the specification standard-related requirements, Hypertac France has established a test program and has carried out type tests (electrical, mechanical and physical/chemical) as per NFF61-030 and EN50124-1.

Vibration tests were carried out as per EN61373.

All the results contained in this report are consistent with the standard-related requirements and with the test program.

### 1.2. Reference documents

NF F 61-030 EN 50124-1	Railway rolling stock - Electrical connectors - General Railway applications - Insulation coordination - Part 1: Basic requirements - Clearance distances and creepage distances for all electrical and electronic equipment
NF C 93-400	Electronic components - Connecting devices - Basic test procedures and measuring methods.
NF EN 60068-2-11	Salt spray
NF F 16-101	Railway rolling stock fire behaviour - Selection of materials.
NF F 16-102	Railway rolling stock - Fire behaviour - Selection of materials - Electrical equipment applications.
NF EN 61373	Railway rolling stock - Electrical connectors - Shock and vibration
NFF 00-363	Crimp-type products for electrical connections
EN 50306	Railway cables
NF EN60068-2	Environmental tests
NFF 63808	Cable and insulation
NFEN 50264-2-1	Power and control cables for railway equipment

### 1.3. Description of connectors

REP (plastic sealed rectangular) connectors consist of a single-piece POLYCARBONATE insulator cast moulded with a silicon rear grommet. Connectors cables are maintained at the rear of plugs and sockets by a cable tie (Ty-Rap, for example).

**Inserts:** Polycarbonate

**Crimp-type contacts:** Copper alloy. The contacts are secured in the insulator by plastic clips moulded in the insert. The male and female contacts have a crimping shank identical to the 0151601-20XOG contact of the Hypermod connector. This contact has already been validated for the use of the cables defined by EN50306 for cross-sections from 0.5mm<sup>2</sup> to 2.5mm<sup>2</sup>.

Contact type	Contact size	Conductor permissible cross-section
	Considered as a contact of <input type="checkbox"/>	
0151832-20 (female) 0151071-20 (male)	1.50 mm	0.5 mm <sup>2</sup> to 2.5 mm <sup>2</sup> for cables As per EN50306 and from 0.6 mm <sup>2</sup> to 2.61 mm <sup>2</sup> for cables As per NFF63808

**Accessories: Blanking cap, dummy contact for use at 400Vac:**

**At 400V, the connector must be used on a 1 contact out of 2 basis as specified in the drawing:**

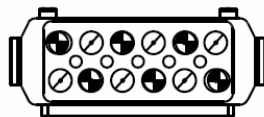
**3 contacts for the 6-way version**

**6 contacts for the 12-way version**

**Notice pour utilisation > 400V**  
**Instruction for use > 400V**

Position des contacts vue cote cablage  
Contact arrangement view from termination side

- Contact actif (015 183 2- 20-)  
Working contact (015 183 2- 20-)
- ⊗ Contact plastique (REP\_002)  
Plastic contact (REP\_002)



ELECTRIQUE ELECTRICAL	Tension assignee de service Voltage Rating	400 V selon EN-50124-1 (480V Maxi) Pollution degree 3
	Ligne de fuite Creepage distance	7.73 mm

**For use at 400V, the cables used must comply with EN50264-2-1**

**REP connector climate category:**

In accordance with chapter 5.4.1 of the NF F 61-030 standard:

-40/+100/21days, defined by the NFEN60068-2 standard corresponds to the following requirements:

- cold test at a temperature of -55°C
- dry heat test at a temperature of 100°C
- damp heat test exposure time (continuous test): 21 days

**Protection level:**

- NFEN 60068-2-17: IP66 & IP67

**The assigned voltages for use are:**

- For Polycarbonate:

Materials group: 3A

Pollution index: 3

Creepage distance 4.64 mm i.e. 290 V according to table A6 of the EN 50124-1 standard

Clearance distance: 4.02 mm i.e. between 2450V and 2900V according to table A.8 of the EN 50124-1 standard and thus extrapolated to 2725 V (4 mm = 2550 V in NF F 61-030)

For use at 400V, 1 contact out of 2:

Creepage distance 7.6 mm i.e. 480 V according to table A6 of the EN 50124-1 standard

Clearance distance: 7.19 mm i.e. between 3320V and 4260V according to table A.8 of the EN 50124-1 standard and thus extrapolated to 3790V (8 mm = 3250 V in NF F 61-030)

**Tools:**

Details of crimping and disassembly tools on the drawings.

**Cable type:**

Cross-section from 0.50 mm<sup>2</sup> to 2.50 mm<sup>2</sup> as per EN 50306

Cross-section from 0.60 mm<sup>2</sup> to 2.61 mm<sup>2</sup> as per NFF63808

Cross-section from 1.50 mm<sup>2</sup> to 2.50 mm<sup>2</sup> as per EN50264-2-1 (use at 400V)

Description	HYPERTAC part number
2-way socket, unequipped	REP202040000
6-way socket, unequipped	REP206040000
12-way socket, unequipped	REP212040000
2-way plug, unequipped	REP102040000
6-way plug, unequipped	REP106040000
12-way plug, unequipped	REP112040000
Male contact	0151071-20---
Female contact	0151832-20---
Sealing cap	REP_001
Plastic contact for use at 400V	REP_002
Mounting flange for 2-way connector	REP_003-02
Mounting flange for 6-way connector	REP_003-06
Mounting flange for 12-way connector	REP_003-12

## 2. PRODUCTSTESTED

NF F 61-030: The tests are performed on 31 pairs of connectors (plugs and sockets) using the representative midsize REP106 plug (6-way) and REP206 socket (6-way). All REP connector arrangements use the same technology for securing the contacts in the insulator, for securing the plug to the socket and for the sealing grommet. They use the same contact part numbers.

The creepage distances and clearances distances (EN 50124-1) are the same from one arrangement to another.

Table A

Type	Number of pairs (specimen)	Connector part number		Casing type	Number of contacts
		Socket	Plug		
Arrangements	1	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	2	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	3	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	4	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	5	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	6	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	7	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	8	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	9	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	10	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	11	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	12	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	13	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	14	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	15	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	16	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	17	REP202	REP102	Silicon cast molded LEXAN	two 16-size contacts
	18	REP202	REP102	Silicon cast molded LEXAN	two 16-size contacts
	19	REP202	REP102	Silicon cast molded LEXAN	two 16-size contacts
	20	REP202	REP102	Silicon cast molded LEXAN	two 16-size contacts
	21	REP202	REP102	Silicon cast molded LEXAN	two 16-size contacts
	22	REP202	REP102	Silicon cast molded LEXAN	two 16-size contacts
	23	REP212	REP112	Silicon cast molded LEXAN	Twelve 16-size contacts
	24	REP212	REP112	Silicon cast molded LEXAN	twelve 16-size contacts
	25	REP212	REP112	Silicon cast molded LEXAN	twelve 16-size contacts
	26	REP212	REP112	Silicon cast molded LEXAN	twelve 16-size contacts
	27	REP212	REP112	Silicon cast molded LEXAN	twelve 16-size contacts
	28	REP212	REP112	Silicon cast molded LEXAN	twelve 16-size contacts
	29	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	30	REP206	REP106	Silicon cast molded LEXAN	Six 16-size contacts
	31	REP212	REP112	Silicon cast molded LEXAN	twelve 16-size contacts

### 3. TEST DISTRIBUTION FOR EACH SPECIMEN

Table B

On connector assemblies mounted as per NF F 61-030.

GROUP	SAMPLE No.	PROCEDURE AS PER NFF 61-030	LOADS
<b>GROUP 0</b>			
Visual examination	All	Para 11.1.1	
Marking and condition	All	Para 11.1.2	
Geometric and weight check	All	Para 11.2	
Withstand voltage (UE)	All	Para 11.3.1	2725 V
Insulation resistance (Ri)	All	Para 11.3.2	5000 MΩ min
Contact resistance (Rc)	All	Para 11.3.3.1 and 2	2.5 mΩ max
Locking test	All	Para 11.5.3.2	<300N
Gauge retention	All	Para 11.5.6	≤40g
<b>GROUP 1</b>			
<b>Damp heat</b>	1	Para 11.4.1	21days-40°C,-90-95%
Appearance	1	Para 11.1	
Marking and condition	1	Para 11.1.2	
Insulation resistance	1	Para 11.3.2	Min 5000 MΩ
<b>Vibration</b>	2, (3) ,17,(18), 23, (24)	as per EN 61373	Category 2
Visuel	2, (3), 17, (18), 23, (24)	Para 11,1	IP67 as per NFEN60068-2
IP	2,23		IP66 as per NFEN60068-2
<b>S/C resistance</b>			Not applicable
Traction		Para 11.5.8	Not applicable
Torsion		Para 11.5.9	Not applicable
Bending		Para 11.5.10	Not applicable
<b>Fluid resistance</b>		Para 11.4.4	
Diesel fuel and mineral oil	4, 29	Para 11.4.4.1 et 2	
Acid and base	5, 30	Para 11.4.4.3	
Oxalic acid	6		
Appearance	4,5,6,29,30	Para 11.1	
Marking resistance	4,5,6,29,30	11.2.2	
Withstand voltage	4,5,6,29,30	Para 11.3.1	2,725V
Insulation resistance	4,5,6,29,30	Para 11.3.2	500 MΩ min
<b>GROUP 2</b>			
<b>Fast temperature variation</b>	7,8,19,20,25,26	Para 11.4.2	-55°C to +100°C 120 cycles
Appearance	7,19,25	Para 11.1.1	
Marking and resistance	7,19,25	11.2.2	
Contact retention in insulator	7,19,25	Para 11,5,5	70N min; 0,30mm
Contact retention in insulator	7,19,25	Para 11,5,5	70N min; 0.30mm after being removed/refitted 5 times
Contact resistances	7,19,25	Para 11.3.3.1 et 2	2.5 mΩ max
Destructive retention of contacts in insulator	7,19,25	Para 11,5,5	70N min
<b>Mechanical endurance</b>	8, 20, 26	Para 11.6.1	500 mating cycles
Appearance	8, 20, 26	Para 11.1	
Contact resistances	8, 20, 26	Para 11.3.3.1 et 2	2.5 mΩ max
Locking test	8, 20, 26	Para 11.5.3.2	insertion/extraction value ≤300N
<b>Contact retention in insulator</b>	8,20,26	Para 11.5.5	70N min; 0,30mm
<b>Insulator retention in casing</b>		Para 11.5.4	Not applicable



GROUP 3			
<b>Temperature rise</b>	9	Para 11.3.5	
Method A	9	1 pair of contacts	≥ 50 k
Method B	9	All contacts in series	≥ 50 k
<b>Corrosion: (salt spray)</b>	10,11,12,13,14,15, 21,22,27,28	Para 11.4.3	Time: 96h disconnected then 500h connected
Appearance	10,11,12,13,14,15, 21,22,27,28	Para 11.1	
Insulation resistance (RI)	10,11,12,13,14,15, 21,22,27,28	Para 11.3.2	5000 MΩ min
Marking and resistance	10,11,12,13,14,15, 21,22,27,28	Para 11.1.2.2	
Shock (acceleration)	10 , (11) , 21, (22), 27, (28)	as per EN61373	Category 2
GROUP 4			
<b>Dry heat</b>	16	Para 11.6.2	96 h 100°C
Insulation resistance	16	Para 11.3.2	5000 MΩ min
Appearance	16	Para 11.1.1	
Final contact resistances	16	Para 11.3.3.1 et 2	2.5 mΩ max
<b>Mechanical shock resistance (free fall)</b>	16	Para 11.5.11	Dropping from a height of 0.5 m
Appearance	16	Para 11.1.1	
Locking + unlocking	16	Para 11.5.3.2	insertion/extraction value ≤300N
<b>Measurement of voltage drop at crimping level</b>	16	Para 11.3.4	
GROUP 5			
<b>Fire behaviour tests</b>		Para 11.4.5	requirement 2 NFF 16-101/ 16- 102 R22 & R23 acc.to EN45545-2
<b>Ozone resistance tests</b>		Para 11.4.6	No splits or cracks
<b>Traction strength</b>		Para 11.5.7	+NFF 00363 Para 10.3.1