The TGV Trainsets

• GENERAL PRESENTATION
• TGV 1N / TGV 2N
• FUTURE DEVELOPMENTS OF THE TGV 2N
The TGV Trainsets

• GENERAL PRESENTATION

• The TGV concept

• Advantages of the “articulation”

• Adaptability for very different operation conditions

• World Speed Records

• Arrangements designed to guarantee safety and comfort

• Our references for the TGV
The TGV Trainsets

• The TGV concept

TGV R: 13 bogies
2*(1100*4) = 8800 kW

• Push-pull trainsets
  - no passengers in the end vehicles
  - adhesion demand is independent of the passenger load
  - good resistance to cross winds
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• Trailers interlinked by an articulation
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• The articulation has advantages in the following fields:

  • Economics
    - reduction of the number of bogies
    - reduction of weight
    - reduction of energy consumption
  
  • Comfort
    - noise sources are far from the passenger compartments
    - structure-borne noise transmission is very low
  
  • Safety
    - excellent behaviour in case of derailment
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• Advantages of the “articulation”
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- Adaptability for very different operation conditions

- Length of trainset: from 200 m for TGV PSE, AVE, TGV R and 2N to 400 m for the Eurostar and Korea trains

- Coupling for operation in MU is possible for:
  - two identical single units
  - TGV R, THALYS, DUPLEX intercoupling

- Gauge: suitable for operation on high-speed lines as well as conventional lines

- Maximum load per axle: 17 tonnes
Adaptability for very different operation conditions

• Electrification system: from single-voltage to quadri-voltage

• Different signalling systems, according to the network

• Passenger capacity comprised between 329 (AVE) and 935 (TGV Korea) seated places.
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- Exceptional performance levels

- Resistance to forward motion: significantly lower than for a conventional train

- Bogie design: the traction motors are placed below the carbody, which results in the critical running speed lying high above commercial operation speed

- Maximum tractive power: 1100 kW/motor axle

- High-energy brake discs ensure a braking capacity of 90 MJ per trailing axle
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• World speed record
  • May 1990  515.3 km/h

• Some figures
  • More than 500 Million passengers since 1981
  • More than 1850 Million km since 1981
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• Commercial operation
  • June 2001 Calais - Marseille:
  • 1067 km travelled in 3 h 29 min (306 km/h)
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• Arrangements designed to guarantee safety and comfort

• Redundancy of certain functions:
  - medium-voltage and low-voltage energy production,
  - compressed-air production,
  - computer equipment communication network

• UIC braking system with two air pipes, with possibilities of automatic brake application in certain cases

• Independent brake operation, bogie by bogie
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- Arrangements designed to guarantee safety and comfort

- Monitoring of driver’s vigilance and of speed instruction observance

- Automatic detection of certain malfunctions, e.g.:
  - bogie hunting,
  - tripode imbalance,
  - non-rotation of axle,
  - start of fire within a power module
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Our references for the TGV

- **PSE**
  - 100 dual-current trainsets
    - Commissioning: 1981
  - 8 three-current trainsets
    - Commissioning: 1984

- **Atlantique**
  - 105 dual-current trainsets
    - Commissioning: 1989
    - 25th trainset: Speed record
      - 515.3 km/h on 18/05/90

- **AVE**
  - 16 trainsets + 2 dual-current trains
    - Commissioning: 1992
    - 6 trainsets
      - Commissioning: 1996

- **Eurostar**
  - 31 trainsets (for the 3 capitals)
    - Commissioning: 1994
  - 7 trainsets (North of London)
    - Commissioning: 1996
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• Our references for the TGV

- **Thalys**
  - 17 quadri-current trainsets
    - Commissioning: 1997

- **Duplex**
  - 30 dual-current trainsets
    - Commissioning: 1996
    - + 52 trains
      - Commissioning: planned for 2005

- **Réseau**
  - 50 dual-current trainsets
    - Commissioning: 1995
  - 30 three-current trainsets
    - Commissioning: 1993

- **Korea**
  - 46 25kV 60Hz trainsets
    - Commissioning: 2000-2005
## References for the TGV

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<thead>
<tr>
<th>Trainset</th>
<th>Number of trainsets</th>
<th>Number of trailers</th>
<th>Start of delivery</th>
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<td>109</td>
<td>872</td>
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<td>1988</td>
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<td>TGV Réseau (TGV R)</td>
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<td>TGV Duplex</td>
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<td>240</td>
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<td>TGV AVE</td>
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<td>192</td>
<td>1991</td>
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<td>TGV EUROSTAR</td>
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<td>684</td>
<td>1993</td>
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<td>TGV THALYS</td>
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<td><strong>513</strong></td>
<td><strong>5138</strong></td>
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The TGV Trainsets

- Single-deck and double-deck TGV (‘1N’ / ‘2N’ TGV)
- Train configuration
- Passenger capacity
- Power car
- Traction performance
- Single-deck Trailers
- Double-deck trailers
The TGV Trainsets

• Train configuration
The TGV Trainsets

• Train configuration
The TGV Trainsets

• Train configuration
### TGV THALYS

<table>
<thead>
<tr>
<th></th>
<th>Number of seats</th>
<th>Pitch / In-line seats</th>
<th>Pitch / Face-to-face seats</th>
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<tr>
<td>R1 / 1st class</td>
<td>42</td>
<td>955</td>
<td>1935</td>
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<tr>
<td>R2 / 1st class</td>
<td>39</td>
<td>950</td>
<td>1900</td>
</tr>
<tr>
<td>R3 / 1st class</td>
<td>39</td>
<td>950</td>
<td>1900</td>
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<tr>
<td>(Total 1st / Total = 31.8%)</td>
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<td>R4 / bar and 2nd class</td>
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<td>-</td>
<td>1830</td>
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<tr>
<td>R5 / 2nd class</td>
<td>56</td>
<td>880</td>
<td>1845</td>
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<tr>
<td>R6 / 2nd class</td>
<td>56</td>
<td>865</td>
<td>1830</td>
</tr>
<tr>
<td>R7 / 2nd class</td>
<td>56</td>
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<td>1830</td>
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<tr>
<td>R8 / 2nd class</td>
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The TGV Trainsets

- Passenger capacity

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<th>Pitch / Face-to-face seats</th>
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<tr>
<td>R3 / 1&lt;sup&gt;st&lt;/sup&gt; class</td>
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<td>950</td>
<td>1920</td>
</tr>
<tr>
<td>(Total 1&lt;sup&gt;st&lt;/sup&gt;/ Total= 35,7%)</td>
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<tr>
<td>R4 / bar</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R5 / 2&lt;sup&gt;nd&lt;/sup&gt; class</td>
<td>76</td>
<td>920</td>
<td>1900</td>
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<tr>
<td>R6 / 2&lt;sup&gt;nd&lt;/sup&gt; class</td>
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<td>920</td>
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<tr>
<td>R7 / 2&lt;sup&gt;nd&lt;/sup&gt; class</td>
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<td>920</td>
<td>1900</td>
</tr>
<tr>
<td>R8 / 2&lt;sup&gt;nd&lt;/sup&gt; class</td>
<td>92</td>
<td>920</td>
<td>1900</td>
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<tr>
<td>(Total 2&lt;sup&gt;nd&lt;/sup&gt;/Total= 64,3%)</td>
<td></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>510</strong></td>
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</table>
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- Power car
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• Power car
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- Traction performance

**Tractive Effort Under 25 kV 50 Hz**

**Tractive Effort Under 1.5 and 3 kV DC**
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• Single-deck trailers
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• Single-deck trailers
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• Double-deck trailers
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• Double-deck trailers
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• Double-deck trailers

Photographs: SNCF
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FUTURE DEVELOPMENT OF THE DOUBLE-DECK TGV “2N”

• Meal service at seat on both decks
• Step system designed for high platforms
• New design
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- Meal service at seat on both decks
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• Step system designed for high platforms