TECHNICAL SPECIFICATION FOR RAILS R65 and UIC60 (60E1)
acc. EN 13674-1:2011

Rail R65 technical specification.

1. Object application area:
   Rails R65 must be produced from rails according EN 13674-1:2011 or equivalent standard requirements. Rails must be designed for train ways, which width is 1520mm and maximum axel load 250kN.

2. Technical requirements:
   Rail length – 25 meter each. Rail must be new, not used, produced not earlier than 2012 year. Rails must be hardened that would be reached determined hardness and strength during production in entire cross-section.

   2.1. Quality assurance and inspection
   Manufacturer must use independently approved and checked quality assurance system meeting EN ISO 9001 or EN ISO 9002 requirements.
   Client must have right to monitor and verify production any time and participate in all tests.
   Client also must be allowed to analyze test results.
   Manufacturer must inform about intended date of production before 15 days if all required quantity is not yet produced.

   2.2. Production
   Rails must be manufactured from continuous casting ingot according EN 13674-1:2011 standard paragraph 7.1 and 7.2

   2.3. Rail information
   2.3.1. Rail profile
   Rail profile R65
   Rail dimensions specified in table No.2

<table>
<thead>
<tr>
<th>Parameters (mm)</th>
<th>R65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>180</td>
</tr>
<tr>
<td>Head area</td>
<td>75</td>
</tr>
<tr>
<td>Neck height</td>
<td>105</td>
</tr>
<tr>
<td>Neck width</td>
<td>18</td>
</tr>
<tr>
<td>Pad width</td>
<td>150</td>
</tr>
<tr>
<td>Pad height</td>
<td>11.2</td>
</tr>
</tbody>
</table>

   2.3.2. Steel grade
   Steel grade not worse than R350HT according EN 13674-1:2011 standard table No.1 requirements.

   2.3.3. Profile class and allowed tolerance
   Rails must be manufactured so that would meet allowed tolerance applied to Y profile class according EN 13674-1:2011 standard table No.7 requirements
2.3.4. Straightness class
Rail straightness must meet B class, according EN 13674-1:2011 standard table No.8 requirements.

2.3.5. Rail length
Rail length – 25 meters, following allowed tolerance according EN 13674-1:2011 standard table No.9 requirements. Allowed to provide up to 20% shorter (not less than 20 m length) rails from all quantity.

2.3.6. Rail drilling
Rails must be provided without holes, except those which are used for transporting and safety.

2.3.7. Rail’s marking code.
Rail class must be marked at rail end with green mark according EN 13674-1:2011 standard paragraph 7.4.4 requirements or manufacturer country standard requirements first agreed with client.
Additional short rails must be marked white at both rail ends, similarly must be marked the length.

2.4. Marking
2.4.1. Manufacturer’s marking
Manufacturer must mark every rail. Rail is marked on the neck raised way according EN 13674-1:2011 standard paragraph 7.4 requirements or manufacturer country standard requirements first agreed with client. In mark must be specified: factory-manufacturer name, hardening type, rolling years, rail type. Hot stamping must be carried out according EN 16374-1:2011 standard paragraph 7.4.2 requirements or manufacturer country standard requirements first agreed with client.

2.5. Tests
2.5.1. General requirements
Must be made conditions to inspect, assess and take samples if necessary for each batch.

2.5.2. Laboratory tests
Laboratory tests must be carried out according EN 13674-1:2011 standard paragraph 9.1 requirements.

2.5.3. Chemical consumption
Must be carried out chemical analysis with solid state samples, which chemical consumption specified in table No.3.

<table>
<thead>
<tr>
<th>Chemical element</th>
<th>R65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0,70…0,82%</td>
</tr>
<tr>
<td>Silicon</td>
<td>0,13…0,60%</td>
</tr>
<tr>
<td>Manganese</td>
<td>0,65…1,25%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Up to 0,025%</td>
</tr>
<tr>
<td>Sulfur</td>
<td>Up to 0,03%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Up to 0,004%</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>Up to 0,010%</td>
</tr>
<tr>
<td>Chrome</td>
<td>Up to 0,15%</td>
</tr>
</tbody>
</table>

2.5.4. Hydrogen
Liquid hydrogen must be not more than 2,5ppm.

2.5.5. Common oxygen content
Common oxygen content must be not more than 20ppm.

2.5.6. Microstructure
Test frequency determining microstructure must be carried out according EN 13674-1:2011 standard paragraph 9.1.4 requirements. R 350 HT microstructure must be pearlitic, without martensite, benito or grained surface cementite.
2.5.7. Decarbonisation
Decarbonisation range is specified in EN 13674-1:2011 standard paragraph 9.1.5.

2.5.8. Oxygen purity
Oxygen purity requirements must meet EN 13674-1:2011 standard paragraph 9.1.6.

2.5.9. Sulfur photos
Sulfur photos must be made and must meet EN 13674-1:2011 standard paragraph 9.1.7 requirements.

2.5.10. Hardness
Rail harness must meet EN 13674-1:2011 standard paragraph 9.1.8 requirements.

2.5.11. Tensile tests
Tensile tests must meet EN 13674-1:2011 standard table No.4 and No.5 requirements.

2.6. Allowed dimension tolerance

2.6.1. Meters
Rail meters required for production inspection must be provided by supplier. Meters must meet EN 13674-1:2011 standard paragraph 9.3 requirements.
Before production supplier must provide one set of “+” and “-” meters corresponding rail cross-section configuration, pursuant to the specified maximum allowed tolerance. These meters after client approval must be stamped and left to client till the final rail batch delivery.

2.6.2. Straightness, surface smoothness and torsion
Straightness, surface smoothness and torsion must meet EN 13674-1:2011 standard paragraph 9.2.2 requirements.

2.6.3. Cutting and drilling
Rails are provide not drilled
Rail ends and their steepness must meet EN 13674-1:2011 standard paragraph 9.2.3 requirements.

2.6.4. Requirements for inspection / internal and surface quality allowed tolerance
Requirements for inspection and internal and surface allowed tolerance must meet EN 13674-1:2011 paragraph 9.4 requirements.

2.6.5. Internal quality
Supplier must detail describe exact locations in rail cross section which must be checked by ultra sound.

2.6.6. Surface quality
Rail surface must be without defects. In the places, which causing suspicion of defect in running head or pad parts must be made Eddie current test.

2.6.7. Hot marks and seams
Maximum defect depth can be:
- in running rail surface -0,35mm
- in rest rail part -0,50mm
Requirements to hot marks and seams must be the same as specified in EN 13674-1:2011 standard paragraph 9.4.2.1

2.6.8. Cold marks
Maximum defect depth can be:
- in running rail surface -0,3mm
- in lower pad part -0,3mm
- in rest pad part -0,5mm
Rails with longitudinal scratched rejected.
Requirements to cold marks and seams must be the same as specified in EN 13674-1:2011 standard paragraph 9.4.2.1

2.7. Warranty
Rails warranty must be 24 months from defects which are caused be production. Warranty applies when appear defects:
- Metal stratification and spalling in rail head top because of production technology deficiencies;
- Metal hardened layer spalling (when rail not alloyed);
- Transverse cracks in head and fractures resulting from metal inside defects;
- Hardening cracks in hardened head metal layer;
- Head vertical stratification;
- Heat horizontal stratification;
- Pad micro cracks, fractures, pad part breaks and cracks;
- Transversal rail fractures due to slag impurities and other microstructure defects.
Rail UIC60 (60E1) technical specification.

1. Object application area:
   Rails UIC60 (60E1) must be produced from rails according EN 13674-1:2011 or equivalent standard requirements. Rails must be designed for train ways, which width is 1520mm and maximum axel load 250kN.

2. Technical requirements:
   Rail length – 25 meter each. Rail must be new, not used, produced not earlier than 2012 year. Rails must be hardened that would be reached determined hardness and strength during production in entire cross-section.

2.1. Quality assurance and inspection
   Manufacturer must use independently approved and checked quality assurance system meeting EN ISO 9001 or EN ISO 9002 requirements.
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   Rail profile UIC60 (60E1)
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<tbody>
<tr>
<td>Height</td>
<td>172</td>
</tr>
<tr>
<td>Head area</td>
<td>72</td>
</tr>
<tr>
<td>Neck height</td>
<td>89,6</td>
</tr>
<tr>
<td>Neck width</td>
<td>16,5</td>
</tr>
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<td>150</td>
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