PANDROL

NABLA TRAM FASTENING SYSTEM

PRODUCT INFORMATION
The NABLA TRAM FASTENING SYSTEM, compliant with EN standard 13481-5, is designed for use on state-of-the-art tramway tracks. Combining ease-of-application with high performance levels, it is compatible with several track-laying methods, whether Top Down/Bottom Up depending on the specific needs of each project.

Components:
1. NABLA blades: compliant with standard NF F 50-015
2. Protective covers
3. GS coach screw
4. Insulators
5. Lateral Insulators: NABLA evolution
6. GS anchoring systems: pre-assembled on the baseplate
7. Composite NABLA TRAM baseplate
8. Rail pad: Rubber/Polyurethane material depending on required stiffness/different choice of dynamic stiffness
9. Shims for vertical adjustment

The NABLA TRAM baseplate is designed to allow effective insertion into a dry mix of fresh concrete thanks to an air evacuation system consisting of blow holes and channels.

The plastic cover protects the fastening system components and has been designed to:
- Avoid concrete contamination
- Improve electrical resistance 22 kΩ
- Allow for passage of road traffic thanks to high mechanical and thermal resistance

This fastening system features a composite-material baseplate, NABLA blades are compliant with NF standard F 50-015, NABLA-Evolution stops, a rubber pad, a protective cover and a GS anchoring system.
FEATURES OF ASSEMBLY

LIGHTWEIGHT
The lightweight and compact nature of composite material baseplates supports a cost effective construction for Tram LRT Infrastructure.

ELECTRICAL INSULATION
Encapsulation of the baseplates by plastic covers provides a high level of electrical insulation. Covers are compatible with most roadway linings, pavement, concrete turf, etc.

CONSTRUCTION
Baseplates can be installed by innovative slab track construction techniques into fresh dry concrete. NAPLA TRAM is also suitable for Top Down wet pour method. Special air evacuation system avoids air getting trapped under the baseplate.

HIGH PERFORMANCE DOWEL
The special GS dowel is suitable for insertion into fresh concrete and transfers loads to the concrete efficiently.

TIGHTENING TO REFUSAL
Large range of acceptable torque between 250 and 400 Nm allows coachscrew to be tightened to refusal. Toe load is achieved automatically once screw is tightened to refusal.

OPTIONAL STIFFNESS
Optional static stiffness between 35 MN/mm to 150 MN/mm, based on choice of rail pad. Measurements as per CEN 13481-5: 2012 and CEN 13146-9 Cat A.
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• Suitable for use on non-ballasted tracks (slab tracks)
• Suitable for Bottom Up automatic construction
• Suitable for Top Down construction

Application data (Standard products – special variants may differ)

| Rail inclination | Provided in the concrete as required |
| Pad type         | Rubber or polyurethane material, depending on stiffness requirements |
| Typical applications | Tram/LRT, for plain lines, depot/washing plan sections |
| Typical rail sections | 50E6, 54E1, 41GP13, 41GPU, 54G2 (options available for 60E1 and R155N) |
| Clip type        | NABLA C1 according to NFF 50-015 |
| Anchor type      | High performing GS plastic dowel suitable for insertion into fresh concrete type B30 |
| EN13481-5 track category | Cat A |
| Maximum axle load* | 130 kN |
| Minimum curve radius* | 40 m |

Typical performance data*

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Test Method</th>
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<tbody>
<tr>
<td>Assembly static stiffness</td>
<td>35 MN/mm - 150 MN/mm</td>
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<tr>
<td>Electrical insulation</td>
<td>&gt;22 kΩ</td>
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<tr>
<td>Lateral adjustment</td>
<td>+/-7.5 mm per rail with an increment of 1.25 mm</td>
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<tr>
<td>Vertical adjustment</td>
<td>-2/+3 mm (optional +/- 4 mm)</td>
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* For special applications consult PANDROL.

COMPLIANCE WITH STANDARDS:
The NABLA TRAM FASTENING SYSTEM complies with the EN 13481-5 standard

NOTE:
PANDROL is an innovator and designer of bespoke rail fastenings. The data shown above is indicative of typical performance, but is naturally dependant on external factors. Should you have different requirements, please contact us to discuss tailoring products to suit local operating conditions.
The technical information given in this brochure was correct at the time of printing, however the company undertakes a continuing programme of research and development and improvements may since have been introduced.

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