Modern Turnout Technology for High Speed

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High Speed Turnout Geometry

High Speed Turnout Technology

Switching Technology for High Speed

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**General**

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HIGH SPEED
The VAE Group as a Main Supplier of High Speed Turnout Technology Systems Worldwide

VAE - High Speed Turnouts used in:
Germany, Austria, Switzerland, Finland, Netherland, Turkey, Spain, Taiwan, China, Korea
Primary Goal of LCC Optimisation

Identification of the optimal component on the base of LCC
Three Key Factors for a Successful High Speed Turnout Technology

Minimizing of Forces
- Turnout Geometry
- Elasticity
- Inclined Running Table

Most Suitable Turnout Component Design
- TOZ Switch
- Swingnose Crossing
- Roller Systems

Robust Drive, Locking and Detection System
- Hydrostar DLD System
Force Oscillation in relation to the Spring Rate
High Speed Turnouts with Rheda Classic - Germany
Results of demonstrator installation:

- Significant reduction of contact forces by means of KGO and optimized elasticity (soft pads) in S&C
- VAE S&C has the lowest vertical force for the crossing (T/O E454)
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SYS File Railway Vehicles Model
Lateral forces

At the wheel rail interface with a speed of 160 km/h

1. Turnout

2. Turnout

- Parabolic Geometry LH-Wheel
- VAE Clothoid Geometry LH-Wheel
- Parabolic Geometry RH-Wheel
- VAE Clothoid Geometry RH-Wheel
Measuring Locations on the Vehicle

Motrice ETR 500 Politensione  404 501-2

Y31  Y41
Y32  Y42
Q31  Q41
Q32  Q42
Simulation - Measurements

Lateral forces: speed 178km/h, axle 3, deviating track
Highspeed Crossover Gallese/Italy

UIC60-7500/3000/15000-tg 0,026
Results in Comparison with the Parabolic Geometry

Turnout tg 0.022

- Maximum lateral forces are reduced by 25%
- Maximum accelerations are reduced by 36%
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Switch Device
TOZ- Comparison to Standart Design
Advantages:
- Optimal combination between switchblade thickness and stockrail thickness
- Almost no gauge widening
- Additional thickness of the switchblade in the most critical area
- Standard set of sleeper and plates are suitable
- Prolonging the service life of the product due to more material. According Swiss/SBB findings \textit{twice the lifespan}. 
TOZ- Load Rating Optimized Switch Rails

A TOZ Switch gives you double the Lifespan compared to a Standard Switch!

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4. Ergebnisse der Versuche mit hZV-TOZ

Im Jahre 1999 begonnene Versuche haben gezeigt, dass mit hZV-TOZ die Liegedauer im Vergleich zur bisherigen Bauart mindestens verdoppelt werden kann.

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**Technische Dokumentation**

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Weichen SBB IV, SBB IV/90 und SBB VI
Einführung von "Tragfähigkeitsoptimierten halben Zungenvorrichtungen TOZ"
iFAST
Elastic Inner Stock Rail Fastening with Pi Rolles

iFAST clip

PIROLL
Tandem roller

PIROLL plate integrated roller system
iFAST with PIROLL
Inner side rail fastening and switch roller

Advantages:
• Easy assembling and disassembling procedure
• Spring can be preassembled
• Flat spring rate
• Piroll fully integrated in the plate
• Plastic rollers cannot damage the switch blade when wrongly installed
Swing Nose Crossings for High Speed Turnouts

SNX with Cast Manganese Cradle:
- Sole plate consisting of:
  - 1pc Cast Manganese Cradle
  - 3pc Cast Steel Cradle
- Point and Splice Rails – Profile 60E1
- Closure Rails – Profile 60E1
- Length: 25,940m
- Geometry: 1:32,05

SNX Characteristics with Cast Manganese Cradle:
- Sole plate consisting of:
  - 1pc Cast Manganese Cradle
  - 3pc Cast Steel Cradle
- Point and Splice Rails – Profile 60E1A1
- Closure Rails – Profile 60E1
- Length: 20,390m
- Geometry: 1:38,46
Swing Nose Crossings for High Speed Turnouts

SNX with Long Wingrails:
- Long Wing Rails made out of profiles 60E1 and 60E1A1
- Point and Splice Rails – Profile 60E1
- Length: 23,013m
- Geometry: 1:38

SNX with Long Wingrails:
- Long Wing Rails made out of profile 60E1
- Forged Vee Block
- Closure Rails – Profile 60E1
- Length: 23,016m
- Geometry: 1:38
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Customer requirements for HS Setting Systems

- Pre – assembly
- One stop shop including transportation, installation, commissioning
- Easy Interface to the interlocking
- Space requirements
- Easy manual operation
- Resistant to snow, ice, heat, sand
- Others
Possible Solutions for HS Setting Systems

- **Multiple single Point machines**
  - With/without End Position Detection
  - With local intelligent interlocking
  - every motor connected to remote interlocking

- **1 point machine for the switch, 1 for the frog**
  - Hydraulic connection
  - Mechanical rods

- **1 point machine for whole turnout – “COMBI”**
  - Hydraulic connection
Multiple Single Drives
Connection to a “Local Interlocking Unit”
Multiple Single Drives
Connection to a Remote Interlocking
1 point machine for the switch
1 for the frog, hydraulic connection

4D - Interface
<= 20 Ω (up to 3 setting levels)
<= 15 Ω (>3 setting levels)

INTERLOCK
1 Module

INTERLOCK
1 Module
Space Requirements for HS Setting Systems
Space Requirements for HS Setting Systems
HYDROSTAR® - Combi

- Combines switch area and movable frog
- System solution suitable for 2+1 and 3+2 locking positions
- One active unit for switch area and movable frog

Only one electrical interface to the interlocking cabin necessary!
HYDROSTAR® - An Example

- High Performance Switching System
  - Combined modulus designed setting, locking, detection system
  - For Switch devices and Moveable Point frogs

- Requirements of innovative DLD D 3.2.5.

„…The ÖBB system has been successfully implemented on many switches. The safety level is among the highest …

Therefore thus design can be taken as a reference for the Innotrack proposal as described in the framed part…“
HYDROSTAR® - Overview

HYDROSTAR
Weichenstellsystem
turnout setting system
HYDROSTAR® - Functionality

- Applicable for turnouts with 10 setting levels in the switch device and 4 in the movable frog section
- Unique form fit locking principle
- Locks the closed and the open tongue rail => the system is not trailable
- Applicable for slab track and ballast track
- Visual end position indicators for manual operation
HYDROSTAR® - Technical Data

- Gauge ≥ 1430 mm
- Switch opening: e.g. 70 / 78 / 88 / 98 / 118 mm
- Swing nose opening: 29 to 120 mm continuously adjustable
- Not trailable
- Setting time 4 to 12 seconds
- Operational temperature range: -40°C to +70°C
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Plug and Play Turnout with JIT Supply

- Optimal Turnout Geometry
- Most suitable component design
- Preassembled Turnout in the workshop with tight tolerances
- Just in time supply

Highest Initial Quality

- Smallest maintenance requirements
- Longest Lifespan
- Life Cycle Cost Optimisation
Thank you!

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voestalpine VAE GmbH