Track measuring technique products/ devices
Gleismesstechnikprodukte/-geräte

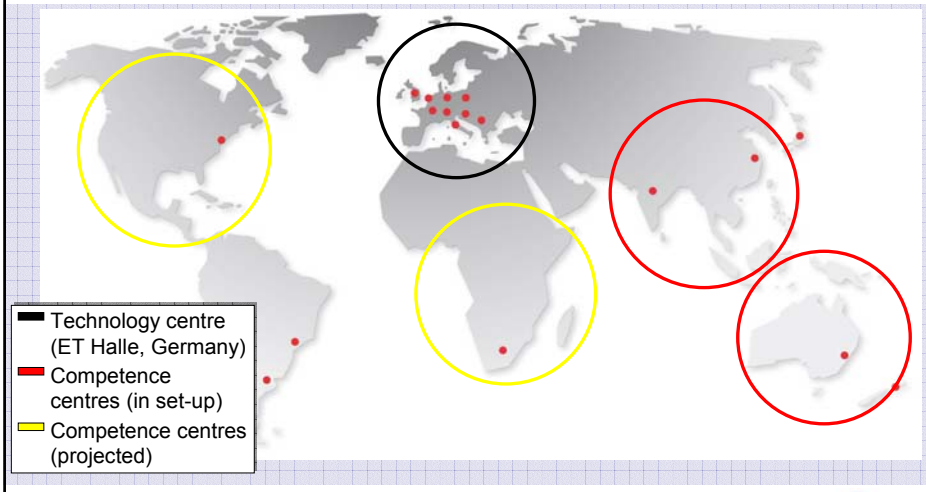
Swedish Welding Commission AG 60 Meeting
Halle (Saale), 17th-18th November 2008

Goldschmidt-Thermit-Group

ET MEAUSING TECHNIQUE TODAY – ET MESSTECHNIK HEUTE

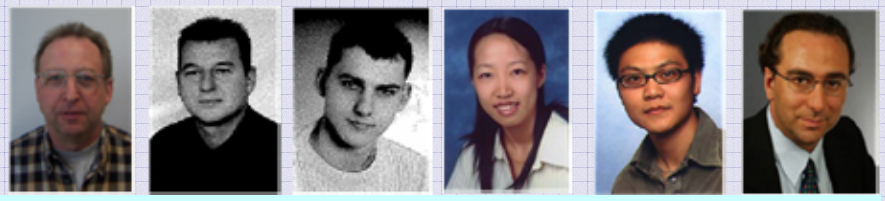
Trading business Measuring devices	Expert services	Standard services
• **Longitud. rail profile** - El. Straightedges SEC, R2S, SED, LSED • **Track geometry** - Measuring trolleys TrackScan 3 & 4 - Track gauge K700 - Track clearance • **Temperature** - MO40LC - Special applications • **Bridge/component testing**	• **RailScan SFT service** • **Consulting** e.g. for track maintenance & strategy etc. • Stress & displacement monitoring/ supervising (Strain gages, lasers, telescopes) ▪ Short-/ Long-time ▪ Bridge testing ▪ Other components	• Geometry (e. g. with TrackScan) • Straigthness SEC, SED • Corrugation R2S • Long waved straightness LSED • Ultrasound

COMPETENCE CENTRES AND SERVICE REGIONS



Goldschmidt-Thermit Measurement Services
Metrology Center Teams 2007

Elektro-Thermit Technology Centre - Staff



Mr. Schyra | Mr. Hofmann | Mr. Behnert | (Mrs. Yang) | (Mr. Wang) | Dr. Wegner

Mr. Wei

Thermit China	Thermit Australia
Mr. Y. Wang	Mr. Zhang
Dr. L. Cao	N. N.
Mr. Y. Ge	
Mr. J. Tiang	

Goldschmidt-Thermit Measurement Services
Messtechnik Teams 2008

Thermit China Technical Service Station Kunshan (Shanghai)




Overview of the equipment – Übersicht Equipment

1. **Longitudinal rail profile and corrugation – El. Straightedges**
   Schienenlängsprofil und Riffel – El. Lineale
2. **Rail and track geometry – TrackScan measuring trolley**
   Schienen- und Gleisgeometrie – Messwagen TrackScan
3. **Temperature**
   Temperatur
4. **Components testing equipment**
   Equipment für die Komponentenprüfung

Product family Electronic Straightedges – Produktfamilie Elektronische Lineale

I. Straightness measuring device
Straightedge Compact – SEC

II. SEC with corrugation measuring modus
Rail Surface Scanner – R2S

New: All devices available with PSION and PDA handheld computers

III. Duale Straightness measuring device
Straightedge Dual – SED

Electronic Straightedges – Elektronische Lineale

SEC - Straight Edge Compact

Straightness measuring device

1m based straightness measurement on final grinded welds

- Sampling rate **200** points per meter
- Vertical accuracy ± **0.05 mm**

Electronic Straightedges – Elektronische Lineale

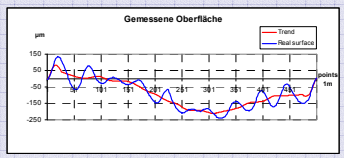
R2S – Rail Surface Scanner

Straightness & Corrugation measuring device

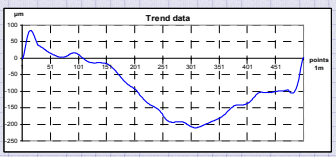
1m based measurement

- Sampling rate **500** points per meter
- Vertical accuracy ± **0.005 mm**

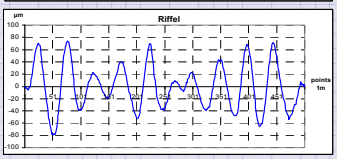
R2S Straightness & Corrugation measurement
R2S Ebenheits- & Riffelmessung



Real surface
(all data are stored)



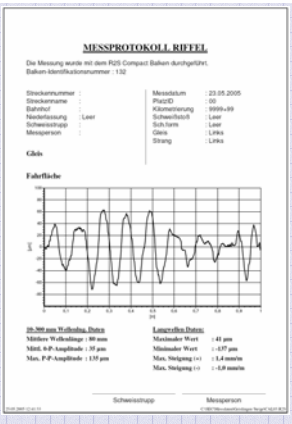
Long waved data



Short waved data
(=corrugation)
Real surface data
minus
long wave data

Measuring reports
Messberichte

SEC / R2S



R2S

New development - SEC RC with PDA computer

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China Straightedge Project - SEC RC &PDA computer

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- Simultaneous measurement of running and directing surface

Electronic Straight-Edge Dual SED

Straight-Edge Dual SED – Positionning by means of permanent magnets

Selcection of magnets

- Ferrum-Nickel- Cobalt
- Aluminium-Nickel-Cobalt
- Neodym-Ferrum-Bor

Straight-Edge Dual SED – Safe Positionning by means of switcheable magnets

Running surface:

✓ **Measurement possible**

Running edge:

❖ **Limited use**

✓ **Unlimited use possible**

Measurement of long waved straightness
Messung langwelliger Ebenheiten

15 m Laser Straightedge LSED

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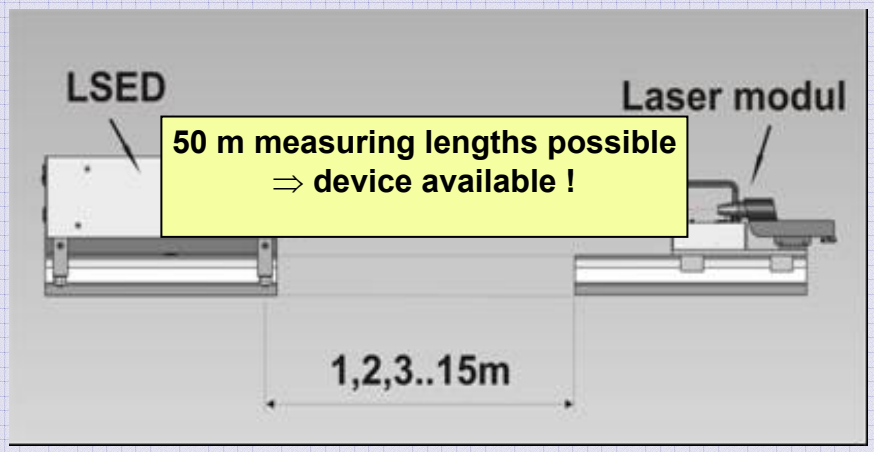
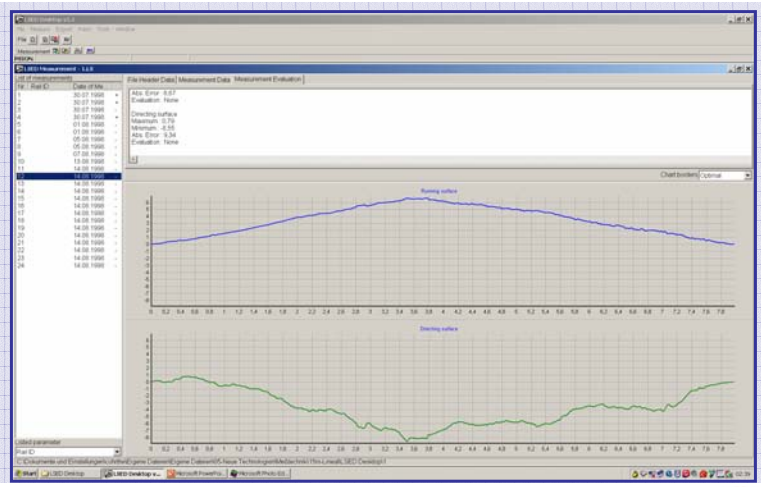
Measurement of long waved straightness
Messung langwelliger Ebenheiten



15 m Laser Straightedge LSED

Measurement of long waved straightness
Messung langwelliger Ebenheiten



15 m Laser Straightedge LSED

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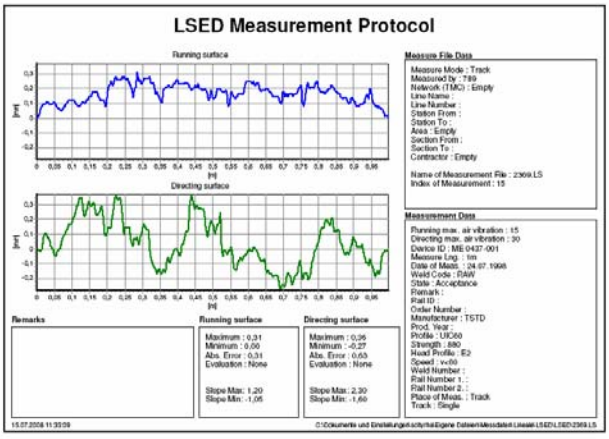
Measurement of long waved straightness
Messung langwelliger Ebenheiten

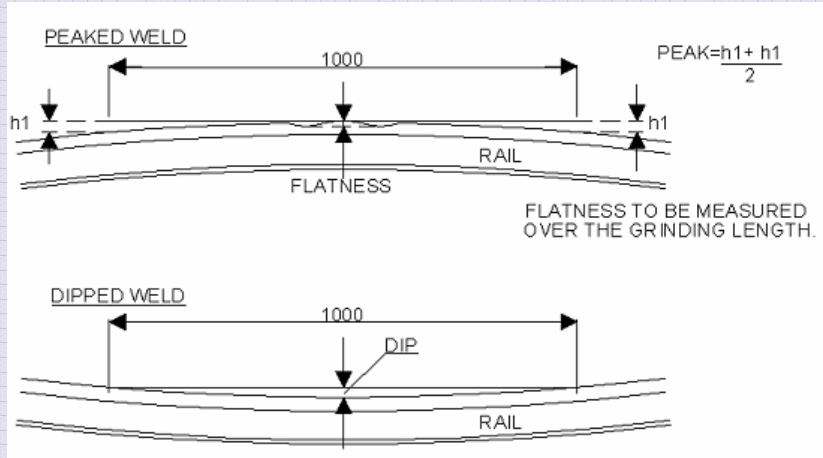


Measuring record

Possible evaluations by means of electronic straightedges

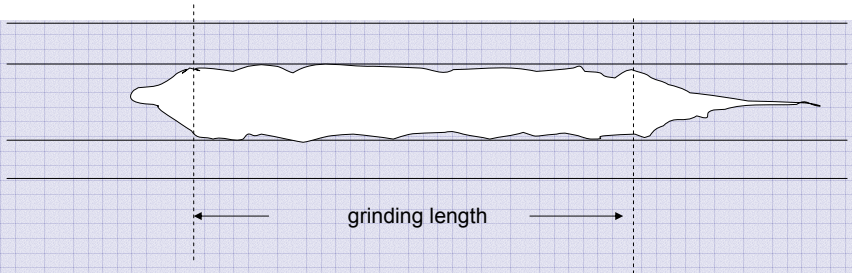
- Statistics
- Judgment of technologies
- Rail-wheel force interactions
- Rail wear monitoring
- Control of work exectution

Future tolerances for grinded AT welds in Europe



New CEN standard draft

Future tolerances for grinded AT welds in Europe

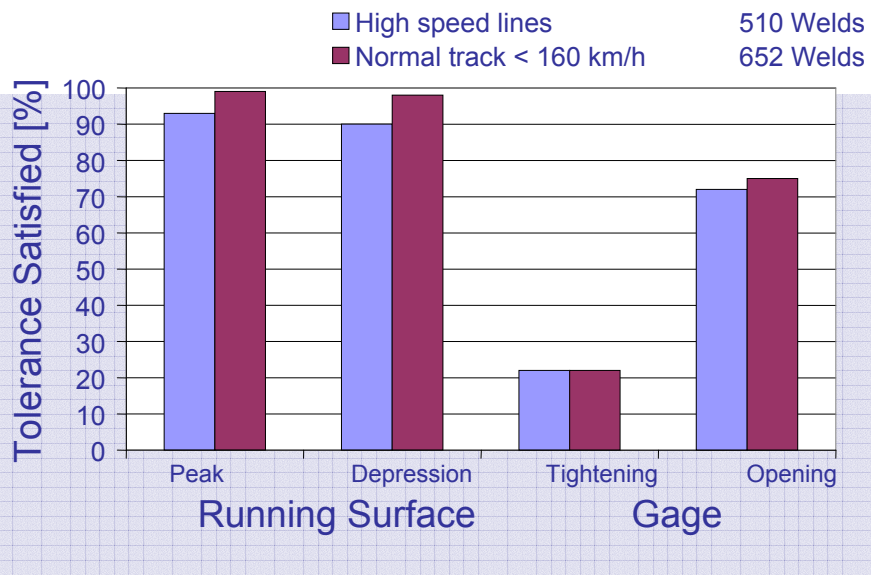


Track category		A	B	C	D	E	F	G	H
Peak / mm	max.	1.0	1.0	0.5	0.5	0.3	0.3	0.2	0.3
	min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Straightness mm	-0.20	-0.20	-0.20	-0.20	-0.20	-0.15	-0.10	-0.15
Dip / mm		-1.0	-0.5	-0.5	0.0	-0.2	-0.15	-0.1	0.0
Max. grinding length mm		900	900	900	900	600	600	600	600

New CEN standard draft

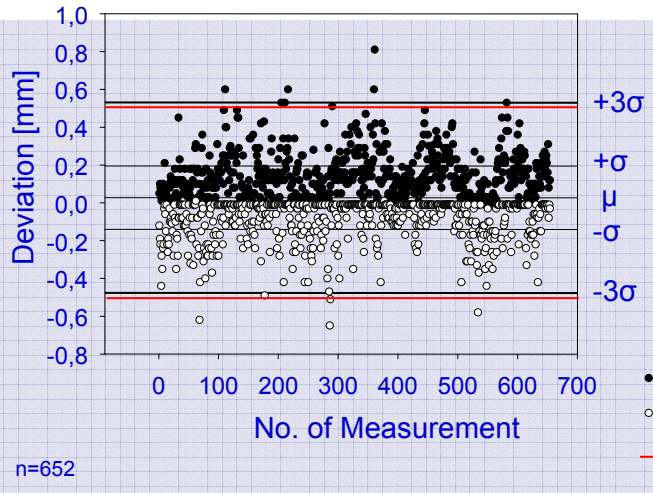
Alignment instrumentality-
Alignment of rail ends on running & directing surface

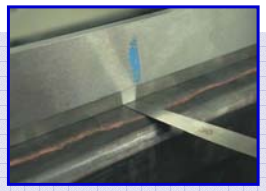
- **By means of steel wedges:**
  flexible, universal, usual and approved practice
- **By means of alignment frames:**
  very accurate, simple use, not usable in switches
- **Crown check units:**
  adjustable distance plates in 0.1mm steps
- **Feeler gauge**
- **Crown measuring wedge**
- **Gap measuring wedge**



Test results Straight- Edge Compact

Normal track (v < 160km/h), running surface



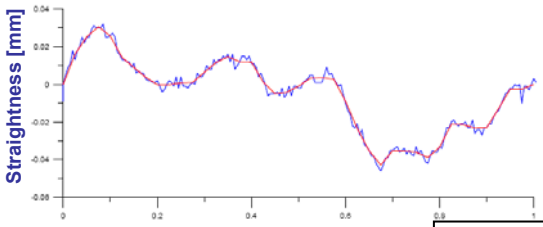


All the welds have been accepted by measuring the straightness using the standard straight edge

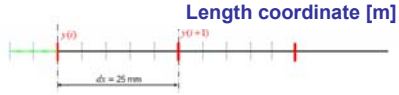
• Peaks
◦ Dips
— USp/LSp

Test results Straightedge Compact

Electronic Straightedges enabling acceptance specification for AT welds including wheel-rail-force interactions

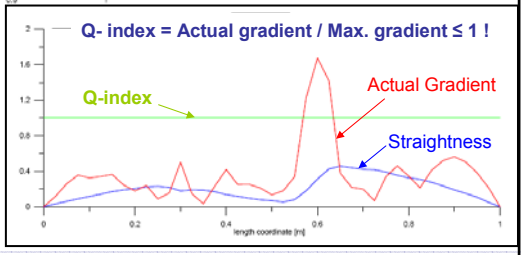


Speed category	Max. Gradient [mrad]
$v \leq 40$ km/u:	3.2 mrad
$40 \leq v \leq 80$ km/u:	2.4 mrad
$80 \leq v \leq 140$ km/u:	1.8 mrad
$140 \leq v \leq 200$ km/u:	0.9 mrad
$200 \leq v \leq 300$ km/u (HSL):	0.7 mrad



Gradient on 25 mm length:

$$D(i) = \frac{y(i+1) - y(i)}{dx} \quad \text{[mrad]}$$



Current acceptance standard at Prorail, The Netherlands

Continuous measurement of tracks and turnout structures

Track geometry parameters

- Length of track
- Track gauge
- Flangeway
- Superelevation
- Twist
- Straightness

TrackScan

Continuous measurement of tracks and turnout structures
Kontinuierliche Vermessung von Gleisen und Weichenanlagen

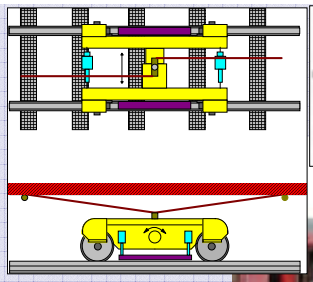
Introduction of a modular structure for TrackScan design

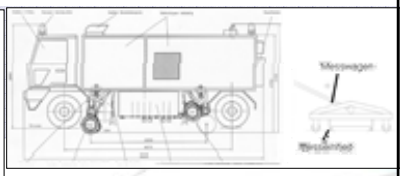
- Basic design (track geometry parameters)
- optional features: Determination of
  - o track axis coordinates (via fixpoint total station)
  - o track clearance (manual scanner)
  - o track clearance (mobile autoscanner)
  - o continuous corrugation measurement

Advantages:
- All in one solution
- High ROI

TrackScan

Continuous corrugation measuring units





Integration in

- **TrackScan**
- **Rail-road vehicles**
- **Measuring trains**

Rail height and wear measuring device VKBF 10 -
Schienenhöhen- und Verschleißmessgerät VKBF 10

Track gauge & Superelevation measuring device K700 –
Spurweiten- und Überhöhungsmessgerät

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Analogue Rail Thermometers

- Simple
- Robust
- Mechanical machinery
- Reading accuracy (Parallax)
- Long response time

Digital Rail Thermometers

- Simple
- Robust
- Directly readable
- Short response time

✓ In-track trials
✓ Further developments
✓ New developments

Digital Recorders for the documentation of welding temperature parameters

Rail thermometers for cw-rail production

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Bridge and components testing products- Determination of displacements and forces

Inductive and laseroptical measuring devices

Bridge and components testing products – Displacement measurement from long distances

Digital camera telescope DEDITEC

Thank you for your attention !

Danke für Ihre Aufmerksamkeit !