

# Device to Measure Applied Stresses in Rails

- **Fast**

- **Economic**

- **Simple**

- **Transportable**

- **Non  
destructive**

***Testing and measurements for your safety  
and quality of your equipment!***

To face risks of distortion in rails (coming from stresses), Ultra RS has developed a method and a device of stresses measurement with ultrasonic method. Thanks to this innovating system you will gain in **quality** and **safety**!



Moreover, this device is **transportable** and measurements are done very **quickly**, which makes it possible to test rails directly **on site**!

Finally, you will be lengthening the lifespan of your rails and by **anticipating** their deformation and/or their breakage **their will be an economic gain**. Destructive tests **won't be necessary** which will save time and materials: tests by ultrasounds are **non destructive** and **fast**!

## ULTRA-RS

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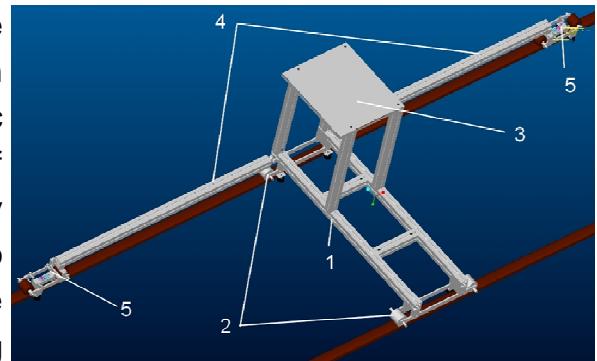
## Product Description

- **Fast**
- **Economic**
- **Simple**
- **Transportable**
- **Non destructive**



**Ultra-rail Software**

The device is composed of a **carriage** (1) to transport a generator, a tank of water and elements of testing; **travelling modules** (2) to guide the carriage on rails; a **platform** (3) to put the ultrasonic device; **two arms** (4) of 1 meter each one, linked by kneecap to the carriage to align itself perfectly with the rail; and **skates** (5) ensuring the good placement of the sensors on the rails during displacement.



*Skate with integrated sensor (5)*



*Odometer and temperature gauge*



*Ultrasonic device*

Ultrasonic signals corresponding to the value of stresses are **treated and posted on the control screen** of the electronic module.

All these steps are done in **real time** : There is no waiting to see the results.

Finally, it is possible to save and/or print results of each test to keep a **traceability**.



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## Rail Neutral Temperature

Stress free temperature or rail neutral temperature is defined as the temperature at which the longitudinal force in the rail is zero. The force in a rail of cross section S, elastic modulus E, thermal coefficient  $\alpha$ , and subjected to a temperature change of  $\Delta T$  is given by

$$\sigma = S \cdot E \cdot \alpha \cdot \Delta T$$

The direct relation between the rail neutral temperature and the longitudinal force in the rail is given by

$$T_n = T_a - \frac{\sigma}{E \cdot \alpha}$$

## Acoustoelasticity

Acoustoelasticity, i.e. the stress-dependence of the phase velocity of ultrasonic waves in deformed elastic media, provides a method for determining the stress level. A primary motivation for using the ultrasonic technique is that it can be linked to the stresses in the material. In fact, the velocity shift is proportional to the average stress in the region through which the waves are propagated. This leads to an ultrasonic technique of measure which may be used to determine applied stresses in Rails.

The distance between ultrasonic transmitter and ultrasonic receiver is maintained constant, measurement is performed with the ultrasonic travel time.

$$\sigma = \frac{t - t^0}{t \cdot K}$$

$t^0$ : travel time of the wave with zero stress ,  
 $t$ : travel time of the wave in the presence of a stress  $\sigma$   
K: acoustoelastic constant

Example of  
stresses profil  
measured  
in Rail

