

# STT-shaft twist tester

Optical twist and lead tester



# STT - Optical twist test / lead test

## Production-related optical twist testing on radial shaft sealings

To avoid leakage on radial shaft sealings the sealing surface has to be manufactured without twist. Optical diffraction analysis can visualize twist structures with amplitudes far below the amplitude of the surface roughness. Applying this method, the quality control can be realized quickly and reliable within the production process.

Testing times of a few seconds are making the device applicable in many cases, for example at the reception control, for optimization of the manufacturing process and even for the 100%-control in the serial production.

### Highlights

- Twist test close to production
- High-precision laser technology
- Setup as a twist test bench \*
- Ideally suited for 100% control
- Optional video / digital camera

\*STT-shaft twist tester NV



#### STT-shaft twist tester NO

- Twist test close to production
- Laser technology
- Integrated magnifying glass
- High reproducibility



#### STT-shaft twist tester NK

- Adapted digital camera
- Twist test close to production
- Evaluation and archiving software
- Laser technology

### Technical information

- Measuring range: DP 20 - 500  $\mu\text{m}$
- Twist depth Dt: > 200nm \*
- Axial support dimension: 15mm
- Shaft diameter: 5 - 200mm \*\*
- Laser diode module class 2

\* Applies to roughness Ra = 0.1 - 0.5  $\mu\text{m}$

\*\* STT R150 N 300mm



#### STT-shaft twist tester NV

- Integrated video camera
- Setup as a twist test stand
- Twist test on the monitor
- Ideally suited for 100% control

# STT - Optical twist test / lead test

## STT-shaft twist tester NO (STT R100 NO und STT R150 N)



### Easy visualization of twist structures

These convenient devices STT R100 NO and STT R150 N are especially suitable for the application directly in the production environment. By placing the STT on the surface of the test object existent twist structures are immediately visible. When the shaft is fixed on a V-block or between rotatable centres, by rotating the shaft, local dependency of the sealing surface structure can be easily and quickly tested.

### Technical specifications

**Hand-held device with integrated magnifying glass for visual inspection**

**Measuring principle:** stimulation of the conical diffraction on periodic microstructures

- Version: STT R100 NO, STT R150 NO
- Measuring range:
  - Twist period:  $D_p$  20-500 $\mu$ m
  - Twist depth:  $D_t > = 200$ nm \*
- Axial support dimension: 15mm
- Shaft diameter: 5-200mm (R150 to 300mm)
- Illumination source: Class 2 laser diode module
- Power supply: 6V battery
- Weight: approx. 600g

\* Applies to roughness  $R_a = 0.1 - 0.5 \mu$ m



The device STT R100 NO is designed for shaft diameters from 5 mm to 200 mm. The device STT R150 N enables to test shaft diameters up to 300 mm. Due to the compact and robust aluminium housing and the battery powered laser the device is ready for operation even under harsh production conditions. Additional the device STT R100 NO provides the possibility to connect a tripod (1/4" 20 UNC).

## STT-shaft twist tester NK



### Documentation of the measurement results with a digital camera

The requirements on a sealing surface varies in relation to their application. Therefore it is not possible to specify universally valid and explicitly tolerable surface parameters for the sealing surface. Nevertheless the sealing property of a shaft is conditioned by the roughness and the waviness of the surface. This functionally relevant overlap of roughness and waviness is visualized within an illuminated surface region of 2mm x 2mm by the shaft twist tester.

### Technical specifications

**Hand-held device with adapted digital camera for visual inspection and documentation**

**Measuring principle:** stimulation of the conical diffraction on periodic microstructures

- Version: STT NK with MFT digital camera \*
- Measuring range:
  - Twist period:  $D_p$  20-500 $\mu$ m
  - Twist depth:  $D_t > = 200$ nm \*\*
- Axial support dimension: 15mm
- Shaft diameter: 5-200mm (R150 to 300mm)
- Special feature: direct photographing of the measurement results using a digital camera
- Illumination source: Class 2 laser diode module
- Power supply: 6V battery
- Weight: approx. 600g

\* Camera models are constantly updated and adapted

\*\* Applies to roughness  $R_a = 0.1 - 0.5 \mu$ m

The roughness causes a characteristic scattered light distribution, whereas the waviness generates a stripe pattern in the test picture. The device STT R100 NK which is connected to a digital camera captures and stores the characteristic scattered light patterns. By the use of the standard bajonett mount Micro-Four-Thirds (MFT) it is possible to connect the STT to every standard digital camera with MFT adapter. Via the LCD-display of the camera, the inspection takes place in the live image mode. The recorded pictures can be transferred to a PC through a USB-connection. The provided software makes the inclusion of the pictures into an inspection sheet possible. Using application-specified sealing surface samples (leak proof, leaky, limiting case) reference pictures of scattered light can be stated and used as reference samples for the quality inspection. production conditions. Additional the device STT R100 NO provides the possibility to connect a tripod (1/4" 20 UNC).

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## STT-shaft twist tester NV

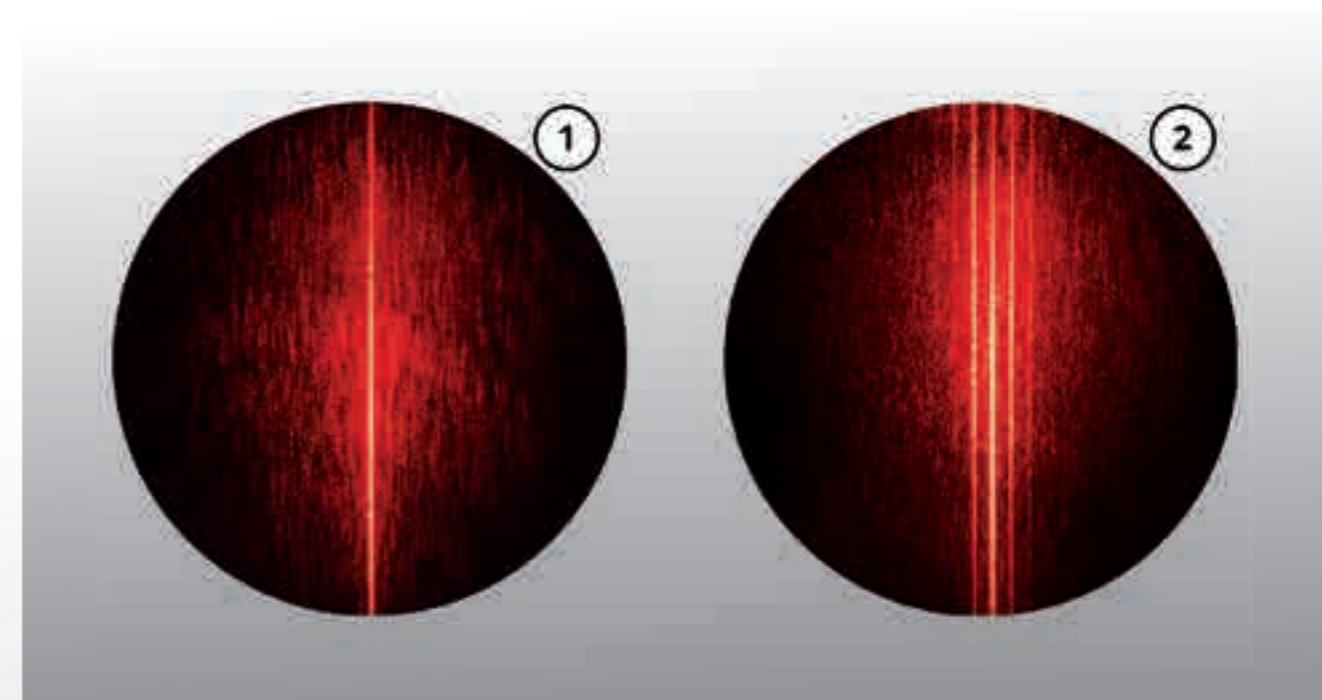


Figure: Visual inspection at a glance. The pictures show the behavior on sealing seat surfaces without twist (1) and with twist (2)

## Twist test with video camera

Twist structures can be distinctly different over the whole seal seat circumference. The local dependency is characterized by varying portions of roughness and waviness. Consequential the periodicity of the twist structure is disturbed. However the partitions of the seal seat surface with dominating twist structures cause leakage. In this case a 100%-inspection of the surface over the circumference is recommended. Especially long wave twist structures (DP 200 $\mu$ m) are difficult to prove.

## Technical specifications

### Hand-held device with video adapter for visual inspection and documentation

**Measuring principle:** stimulation of the conical diffraction on periodic microstructures

- Version: STT NV with video adapter\*
- Measuring range:
  - Twist period: Dp 20-500 $\mu$ m
  - Twist depth: Dt > = 200nm\*\*
- Axial support dimension: 15mm
- Shaft diameter: 5-200mm (R150 to 300mm)
- Special feature: direct reading of the measurement and test results on the PC / monitor
- Illumination source: Class 2 laser diode module
- Power supply: 6V battery
- Weight: approx. 600g

\* Monitor and PC not included

\*\* Applies to roughness Ra = 0.1 - 0.5  $\mu$ m

The disturbed periodicity leads to a non continuous stripe pattern. Above a period length of 200 $\mu$ m the spacing between the diffraction lines is very small and it is difficult to resolve it with human eye. The pictures recorded by the video camera are magnified by a factor 4 and displayed on a screen. That leads to a clearly improved resolution of long wave twist structures (200 $\mu$ m - 500 $\mu$ m). The STT R100 NV is principally designed for the stationary 100%-inspection of seal seat surfaces close to the manufacturing process and is connected to a video camera and a screen. The Video camera can also be readout by a PC via a standard TV tuner card. The disturbed diffraction lines pattern can be compacted to standing lines, while rotating the shaft between centres or in the lathe chuck, which indicates the presence of twist.



Figure: Device case with STT shaft twist tester NK



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