

# STT - Shaft Twist Tester



**Optical inspection of the absence of twist**

# STT - Shaft Twist Tester

## 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.

Measuring principle.....	Generation of conical diffraction pattern on periodic microstructures by coherent illumination for visual evaluation of the diffraction line pattern.
Specifications.....	STT R100 NO: Hand-held device with magnifier lens for visual inspection
	STT R100 NK: Hand-held device with digital camera and LCD-display for visual inspection and documentation of the test result.
	STT R100 NV: Hand-held device with video camera for visual inspection on a monitor screen with higher optical resolution
Range of measurement.....	Twist periode length: DP = 20 - 500µm
	Depth of twist: $D_t \geq 200\text{nm}$ (information depending on the roughness and twist period, admissible roughness: $R_a$ 0.1 - 0.5µm)
Axial length of contact area....	15mm
Shaft diameter.....	5 - 200mm (STT R150 N up to 300mm)
Illumination source.....	Laser diode component (Laser class 2 according to DIN EN 31 252)
Power requirement.....	Battery 6V
Weight.....	ca. 600g
Manufacturer.....	Matesy GmbH Wildenbruchstraße 15 07745 Jena Germany





# STT R100 NO and STT R150 N



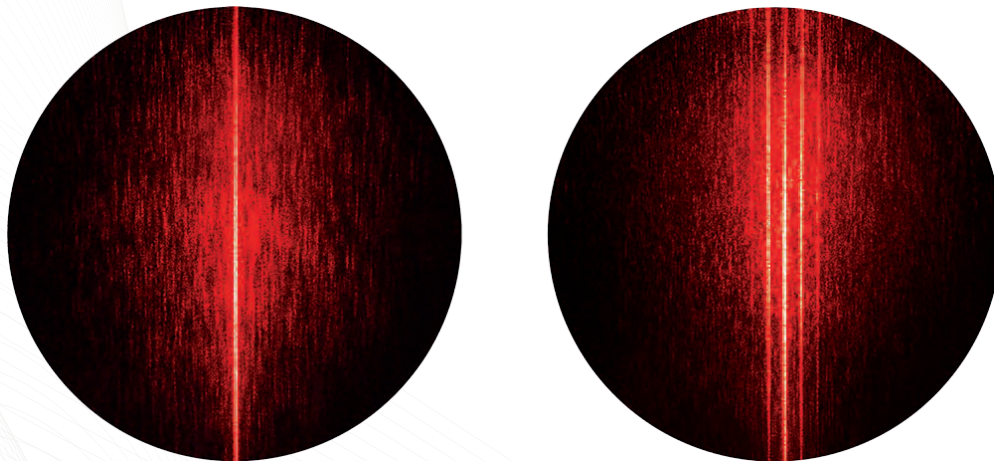
**Twist testing directly at the machine**

# STT R100 NO and 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.

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. Additionally the device STT R100 NO provides the possibility to connect a tripod (1/4" 20 UNC).



Visual testing - at a glance. These images show the behaviour on the sealing seat surface without twist (left) and with twist (right).

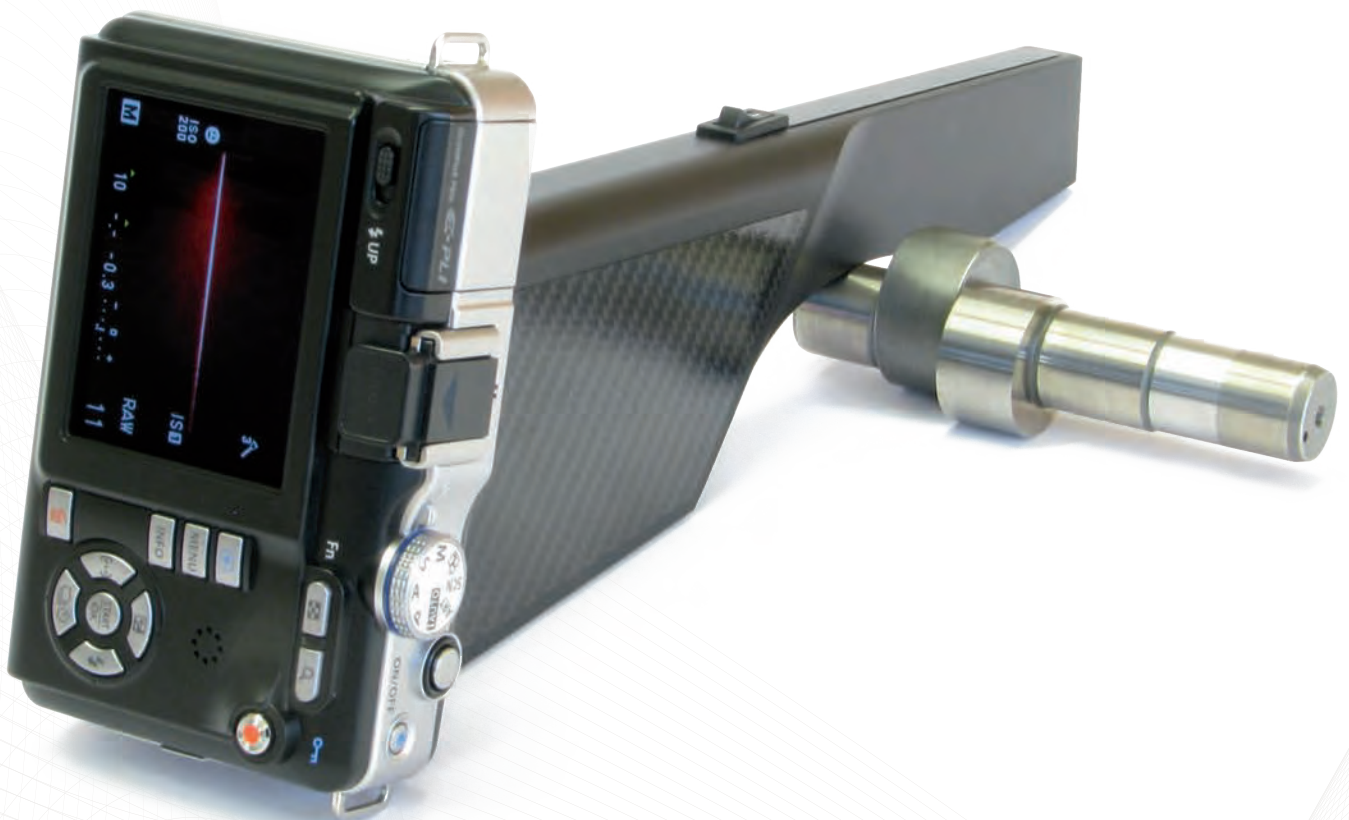
## Technical Specifications

Range of measurement.....	Twist period length:	DP = 20 - 200µm
	Depth of twist:	$D_t \geq 200\text{nm}^*$ (information depending on the roughness and twist period, admissible roughness: $R_a$ 0.1 - 0.5µm)
Axial length of contact area....		15mm
Shaft diameter.....		5 - 200mm (STT R150 N up to 300mm)
Illumination source.....		Laser diode component (Laser class 2 according to DIN EN 31 252)
Power requirement.....		Battery 6V
Weight.....		ca. 600g

\* Data for  $R_z = 2\mu\text{m}$



# STT R100 NK



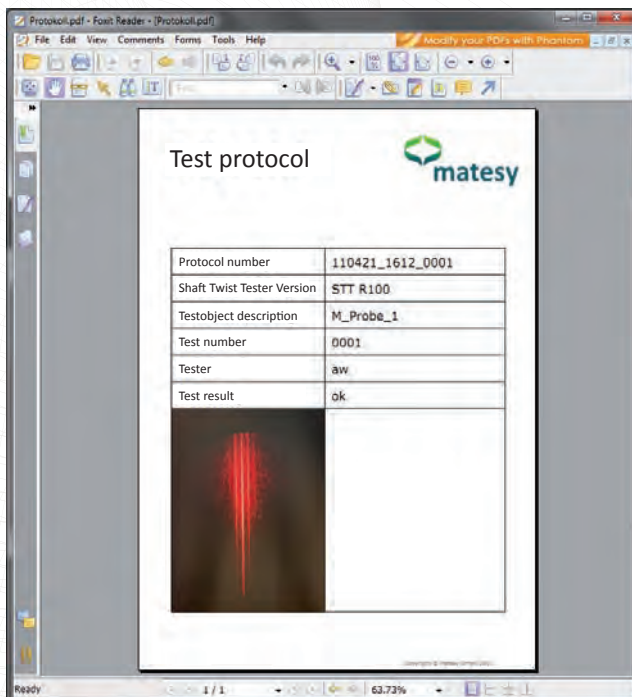
## Documentation of leak tightness of shafts

# STT R100 NK

## Define and document functional relevant surface structures

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.

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.



### Technical characteristics

- Optical twist testing device with a digital camera Olympus PEN E-PL1 to record twist test pictures
- Number of pixels 4096 x 3084
- Data transfer via USB
- Software to compile inspection sheets
- Visual twist testing on LCD display
- 2 GByte data memory



# STT R100 NV



**Twist - 100% under control**

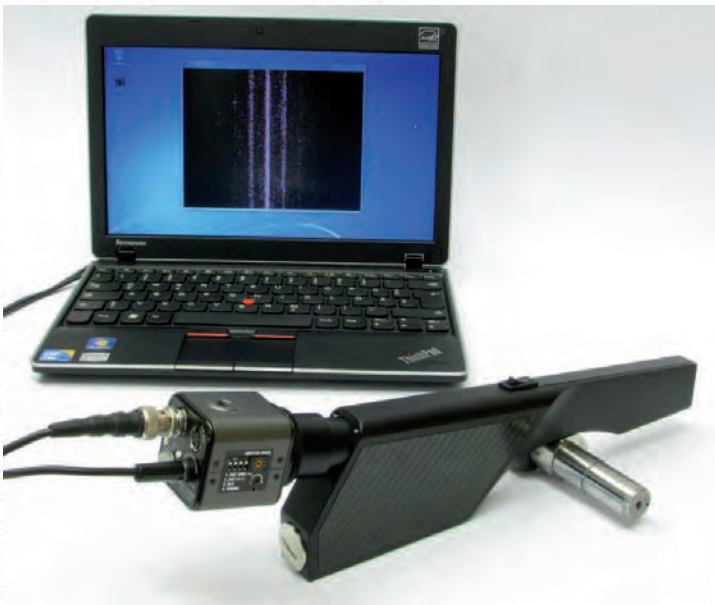
# STT R100 NV

## Twist testing on the screen

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. 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.



### Technical characteristics

- Optical twist testing device with video camera Watec WAT-231S2 for live-mode transfer to the screen
- 4-times magnified image to resolve long-wave twist structures (DP>200 $\mu$ m)
- Number of pixels 752 x 582
- PAL - Composite Video Signal (optional USB-connection available)