



Turbulence sensor for crack and pore detection

Product description

The turbulence sensor was developed for non-contact and non-destructive testing of the surface condition. It can be used with almost all solid materials such as metal, glass, ceramics and coatings and is resistant to external influences such as temperatures, dust/oil use or other surface properties. The detection accuracy of cracks and pores is up to 10 μm .

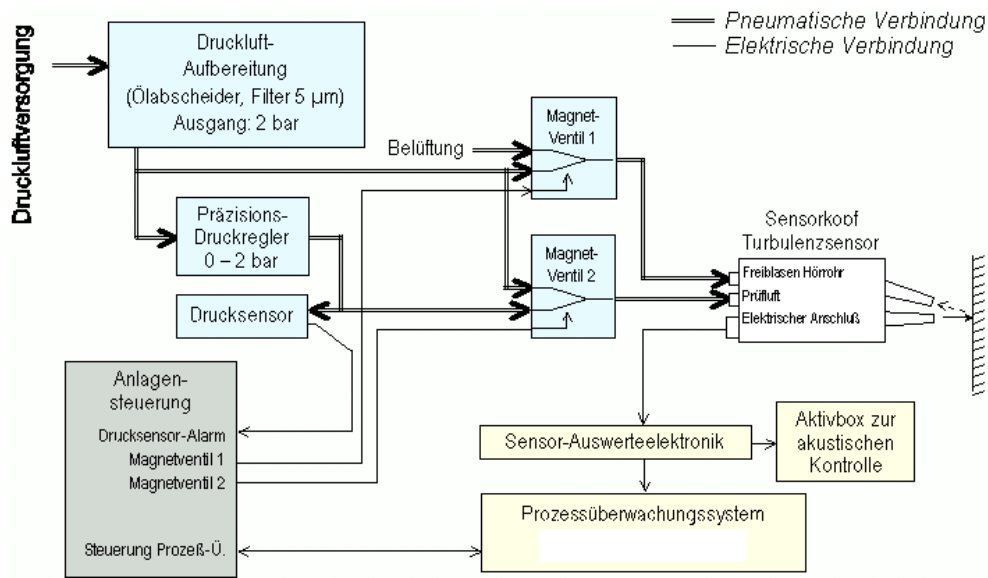
Field of application

Quality control, In-Line and End-of-line testing in the production/manufacturing area



Turbulence sensor for crack and pore detection on flat surfaces

System overview

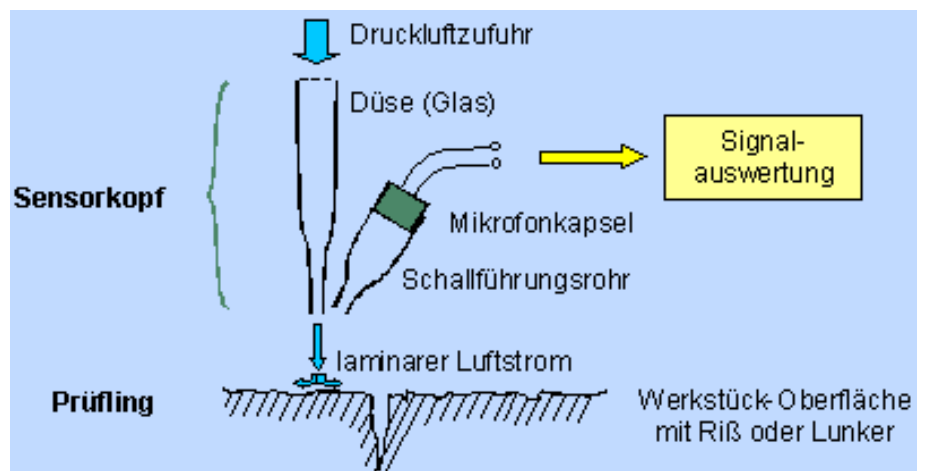


Exemplary system design

- Compressed air preparation with differential pressure supply
- Supply of test air
- Supply of free air (cleaning function)
- Sensor evaluation electronics (active box or headphones for process setup)
- Process monitoring for evaluation of sensor signals and for system control

Design of the sensor head

- Glass nozzle in steel protective jacket
- Ear tube for ambient sound shielding
- Free blow entry prevents ear tube blockage
- Microphone capsule with preamplification





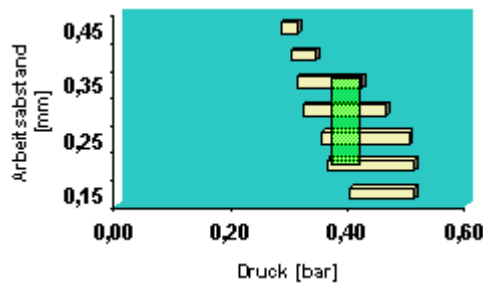
Turbulence sensor for crack and pore detection on flat surfaces

Configuration of the sensor head

Parameter: p = air pressure, d = distance

Error	Impact
P too high	Permanent noise
P too low	Only large or no defects detectable
d too long or too short	Permanent noise

Each sensor head is measured on a standard crack. The standard crack is 30 µm wide and 20 µm deep.



The horizontal bars show the pressure ranges in which the standard crack is definitely detected.

The green right-angled field marks the areas in which reliable detection of the standard crack or larger cracks is possible.

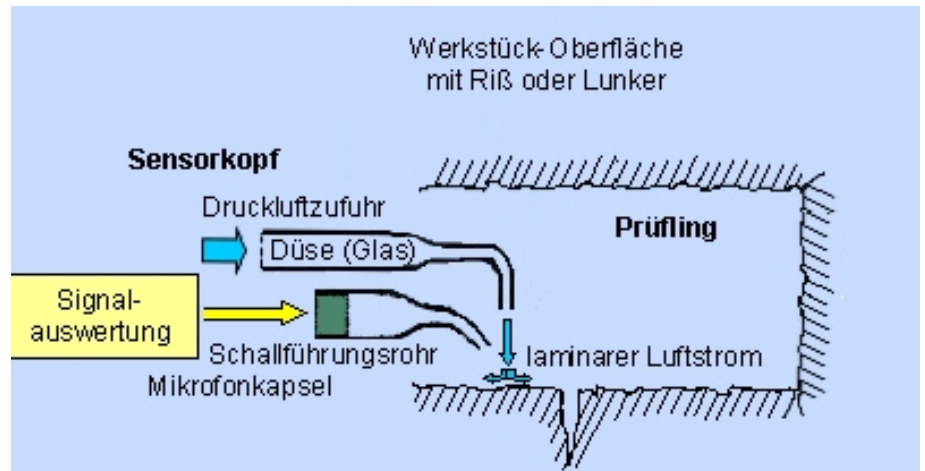


Turbulence sensor for crack and pore detection in pipes and drilled holes (TBS-R2.0)

The TBS-R2.0 can detect cracks and pores in pipes and drilled holes. For this purpose, the nozzle and the sound guide tube are angled.

Design of the sensor head

- Glass nozzle in steel protective jacket
- Ear tube for ambient sound shielding
- Free blow entry prevents ear tube blockage
- Microphone capsule with preamplification



Advantages compared to other surface condition test methods

Test method	Limitations
Eddy current testing	<ul style="list-style-type: none"> • Only usable for metallic objects • Smallest detectable size: approx. 100 µm • Small distance of the probe to the test object leads to wear/damage of the probe
Profilometer	<ul style="list-style-type: none"> • High measuring times • Wear of the probe tip • Only limited non-destructive testing
Image processing Stray light analysis Fringe light analysis Optical height profile measurement	<ul style="list-style-type: none"> • Only for homogenous optical characteristics (brightness, color, gloss, transparency, shape) • Complex, highly application-specific evaluation algorithms (white light interferometry, scanning autofocus/triangulation sensors) • High measuring times
High voltage test Leak test	<ul style="list-style-type: none"> • Only for non-conductive materials • Only for uninterrupted cracks/holes • Only for special work piece geometries
X-radiation	<ul style="list-style-type: none"> • Only for crude defects (crack depth, crack width large compared to material thickness)
Sound analysis	<ul style="list-style-type: none"> • Only for special acoustic object characteristics • Rather applicable for volume defects instead of surface defects



Turbulence sensor for crack and pore detection

Technical data

Test bench/device	
<ul style="list-style-type: none"> • Base unit <ul style="list-style-type: none"> - Test technology - Compressed air maintenance unit • Turbulence sensor 	
Task	
<ul style="list-style-type: none"> • Detection of surface defects >10 µm such as cracks and pores on any materials (metal, glass, ceramics, coatings, ...) • Detection of cracks and pores in bores and pipes • Detection of blowholes • Process assurance in production • Error and cost reduction through innovative testing technology 	
Solution/Scope of testing	
<ul style="list-style-type: none"> • Non-contact and non-destructive testing • Robust against external influences, such as optical surface properties, temperatures or dust/oil wetting • Clear, easily interpretable measuring signal, direct PLC connection possible • Detectable defect size: 50 µm • Minimum testable internal pipe diameter: 10 mm • Maximum scanning speed approx. 100 mm/s • Air jet outlet right-angled at the end (test up to 0mm hole bottom) • Measuring spot diameter: 0.5 to 1.0 mm • Working pressure: 0.25 to 0.75 bar • Working distance: 0.5 to 1.5 mm 	
Input-/visualisation units	
<ul style="list-style-type: none"> • none 	
Test time	Exemplary device type
<ul style="list-style-type: none"> • Individual, depending on test scope 	<ul style="list-style-type: none"> • 371 4401