SCHENCK

Spin-Testing

Rotating Components

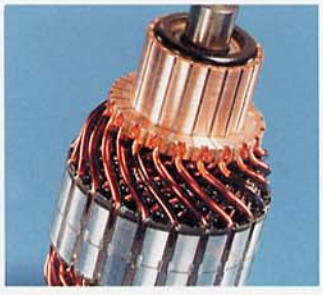
RT 1117 US e

Spin-Testing Rotating Components
Provides Safety for People and Machines

Peak performance impose special demands on modern equipment. High speeds subject the material of fast running components to stresses approaching their yield strength. The capability of the machines to function, and also to ensure human safety, depends upon the quality and dependability of such high-speed rotating components. Centrifugal forces constitute a major portion of rotational stresses. If the shape of the rotor is such that these stresses cannot be accurately predicted with the help of known models, then the calculation of these forces becomes a time-consuming and frequently inaccurate procedure.

Design optimization can only be accomplished by spin-testing the components for expansion, internal stresses, and destruction. Even later during the manufacturing process, many of the rotors developed through spin-testing techniques must be checked to ensure conformance to specifications by production spin-testing or by random spot checks. These tests are frequently required by law, for example, for grinding wheels. In other applications, some rotors are spun during production to the yieldpoint range in order to expand them prior to final machining.

To every rotor the corresponding spin-test system
The requirements encountered in spin-testing rotors are as varied as rotor designs themselves. They can only be met by several models of spin-test systems which are designed to fullfil different requirements in an efficient manner.



Schenck Spin-Test Systems
Meet all Research, Design and Production Requirements

Spin-testing Rotors to Bursting
Heavy-duty drives may reach speeds up to 250,000 rpm. The most important parts of the spin-test system are guaranteed to remain undamaged by rotor fracture. Exploding forces are contained within the system. Spin-testing is also possible in a vacuum.

Safety for Personnel and Environment
The spin-test system is designed to be burst-proof. The SCR controlled D.C. drives are equipped with trip speed and burst speed monitoring system actuating automatic shut-down in case of failure.
During operation, the chamber lid is mechanically interlocked against the vacuum chamber. The lid interlock is designed for an interior chamber pressure of 13 bar considering a safety factor of 1.5. This assures that neither disintegrating fragments nor a metal dust explosion can open the lid.

Energy Savers
Rotors are driven most economically with D.C. drives utilizing regenerative braking.

Sophisticated Design - not a Prototype
For over 30 years, Schenck has been building spin-test systems. A wide selection of models and sizes is available.

Change-Over for Different Rotor Types
The modular design spin-test systems with interchangeable drives can easily be changed over for a wide range of speeds and rotor weights.

Observing Rotor Behavior Under the Influence of Centrifugal Forces
Several types of documentation and observation systems are possible

- Computer system CAST NT for data acquisition
- Stroboscope / Video System
- Photographing System
- Telemetric System for strain and temperature measurement

Automatic Run Through Preprogrammed Tests
Latest "state-of-the-art" SCR controls and the computer system CAST NT can be programmed for automatic test cycles.

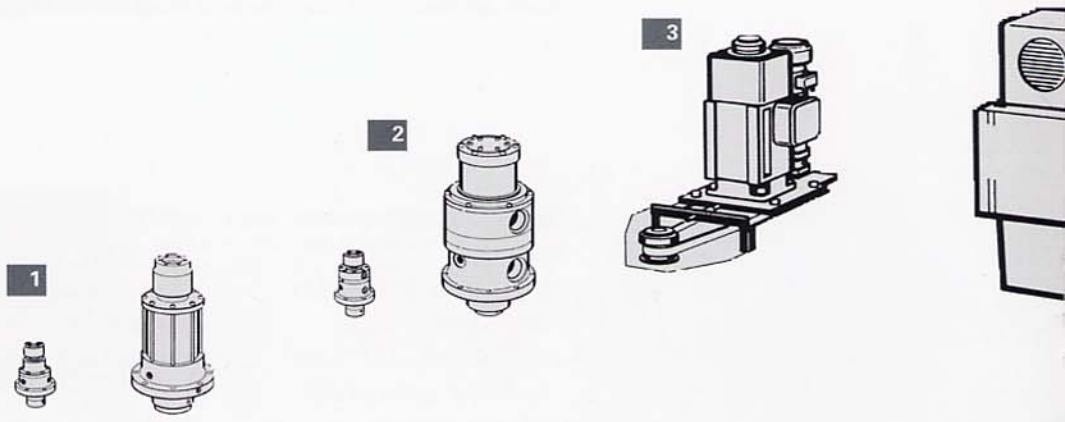
Temperature Influences on the Rotor
For the test run, the rotor can be heated up to 800°C or cooled down to -185°C.

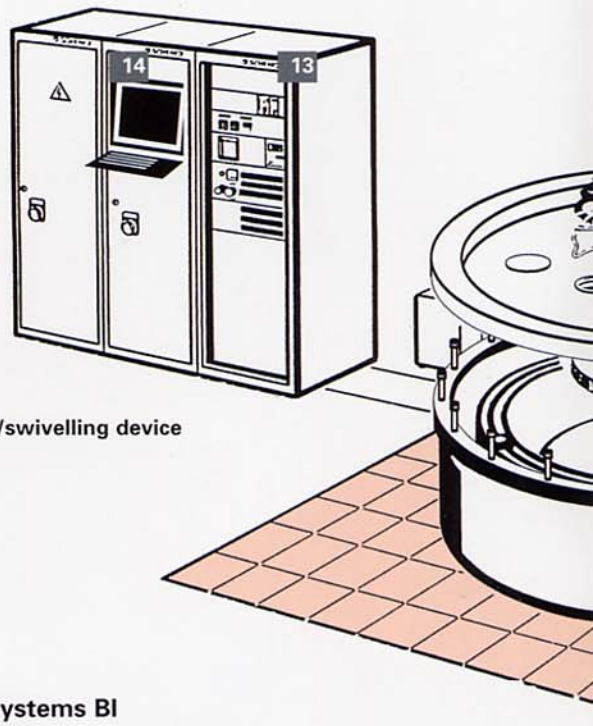
Safe and Easy Operation
Almost all operation that must take place during rotor change-over can be automated.

Arbors for Every Type of Rotor
Schenck engineers have the know-how and experience to design arbors for any kind of rotor. Proper design prevents vibration problems, which could unintentionally destroy the rotor.

The Modular Design of Spin-Test Systems

Series BI Spin-test systems feature a modular design that can easily be adapted for a wide variety of rotors. It also permits expansion for new applications whenever needed, which results in cost and time savings.



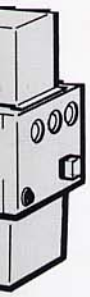


1. Drive spindles size 6 (50 KG/31,500 rpm) through 40 (6300 KG/6,300 rpm)
2. Planetary gears size 4 (10 KG/250,00 rpm) through 20 (1,250 KG/40,000 rpm)
3. Drive with electric motor
4. Oil supply system with cooler
5. Cover guide or lifting/swivelling device
6. Mounting stand
7. Spin chamber, vacuum-tight, with possibility for attachment of cover guide or lifting/swivelling device
8. Burst protection liner
9. Height adjustment for "catcher" bearing optionally with motor drive
10. "Catcher" bearing
11. Cover with support bracket
12. Vacuum pump
13. Switch and control system
14. Monitor Cast NT

Technical Data – Spin-Test Systems BI

Size	2	3	4	5	6	7
max. rotor weight in kg (including adaptor)	50	400	800	1,600	3,150	6,300
max. diameter in mm	500	710	1,000	1,500	2,000	2,700
max. speed in rpm	3,000 to 250,000 (depending on drive)					
drive power in kw	7.5 to 250 depending on drive					

For rotors with high fragment energy reinforced burst protection liners are available, leading to reduced max. diameters.



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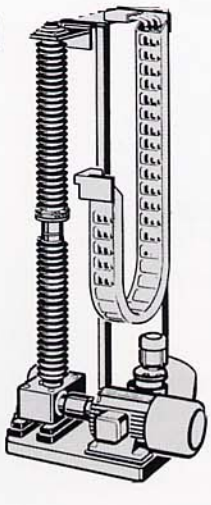

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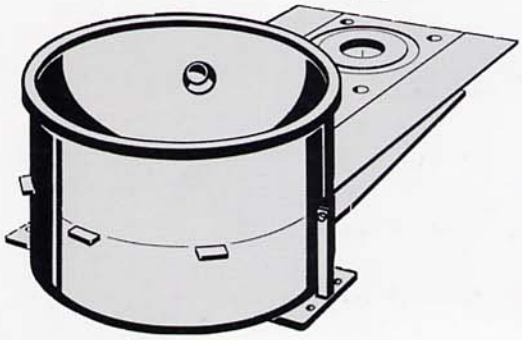

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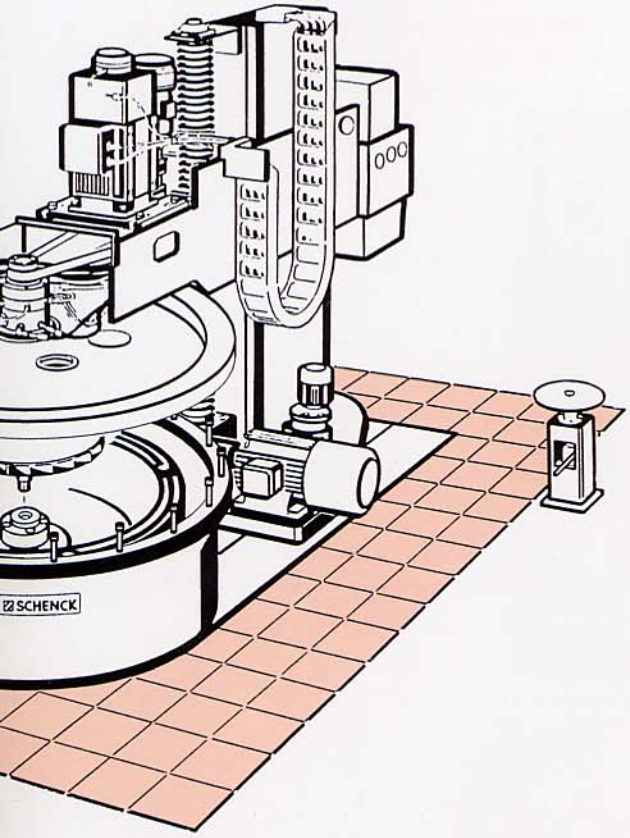

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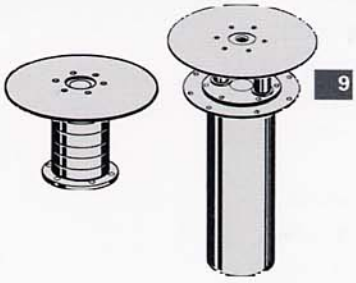

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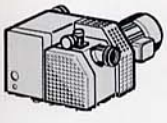

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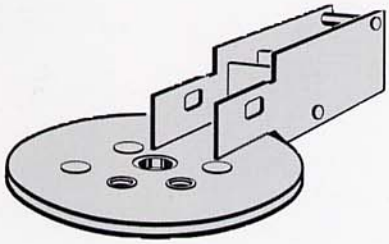

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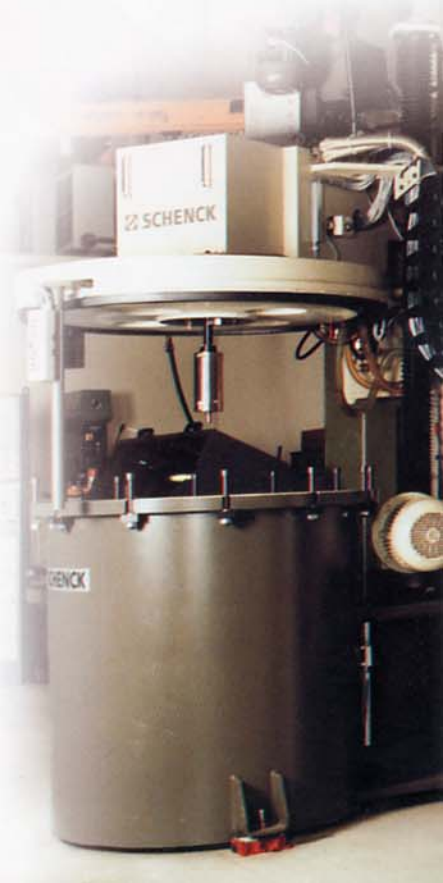
Some Examples

Gas turbine disc prepared for a hot and cold test in a Spin-Test System BI 7 U

Inducer disc installed in a Spin-Test System BI 4 U



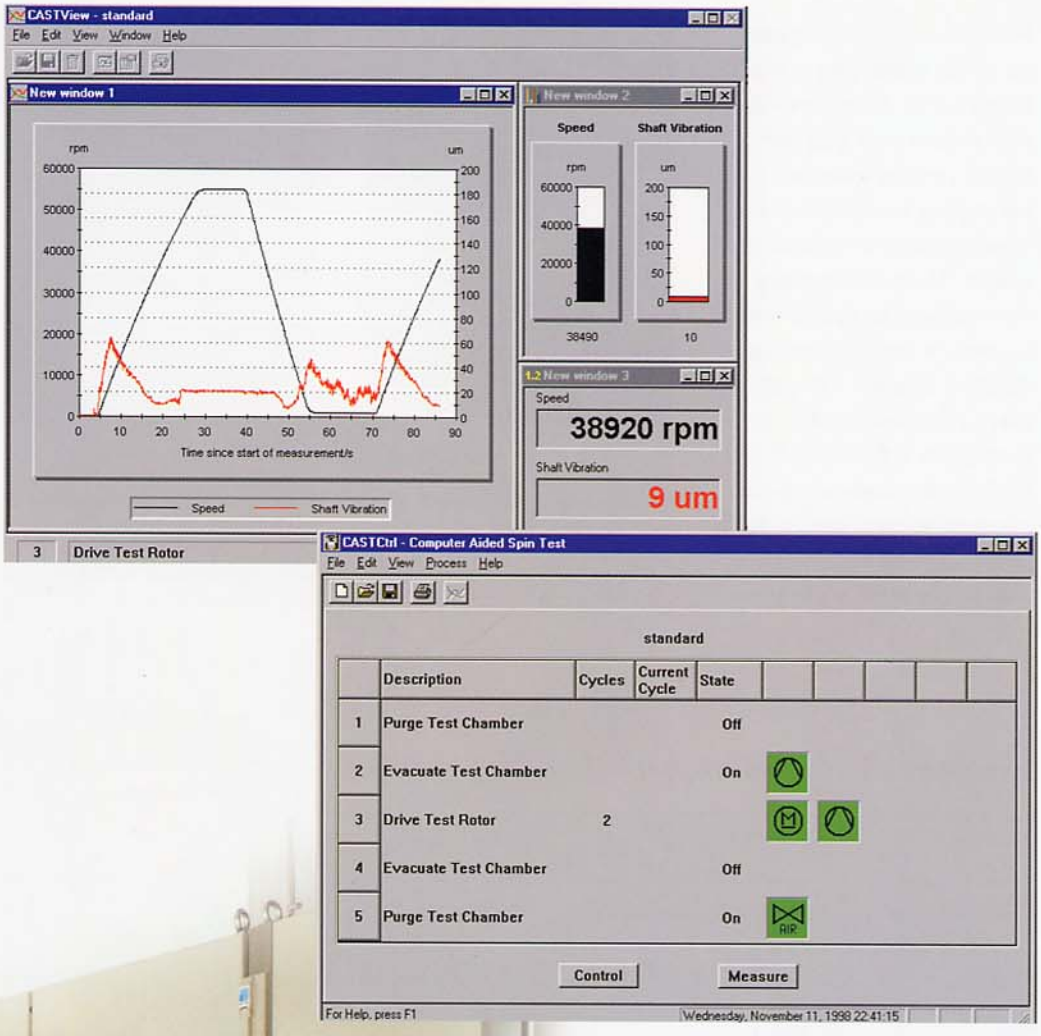
Computersystem CAST NT

The latest computersystem for data control

Schenck's CAST NT for data acquisition and automatic control offers innovative possibilities for BIU Spin-test systems. With CAST NT you can realize the acquisition and graphic evaluation of the following data:

- Test speed
- Shaft vibration
- Vacuum
- Analog signals

Optionally CAST NT also allows the preselection and control of the whole spin-test cycle. More information about CAST NT can be found on Data sheet RT 2020e.

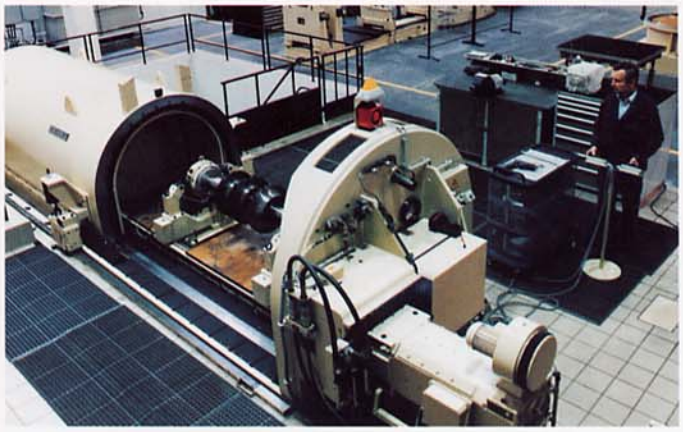


Computer system CAST NT installed in a Spin-Test System BI 3 U

Balancing and Overspeeding of Flexible Rotors

Many flexible rotors such as turbo generators, multi-stage turbo compressors, and steam and gas turbines, require special balancing procedures at speeds beyond operational speed. These rotors are normally over-speed tested to assure material and production quality. This complete process can be performed in a SCHENCK DH high-speed balancing and overspeed test facility with complete safety features and integrated burst protection.

Balancing and Overspeed Test Facility DH 11 with burst protection tunnel building. An LP turbine rotor installed in the balancing pedestals is just being moved into the tunnel.



Balancing and Overspeed Test Facility DH 4 with movable vacuum chamber and integrated burst protection liner. A three stage turbo compressor rotor is installed in the balancing pedestals.

Technical Data – Balancing and Overspeed Test Facilities DH

Size DH	2	3	30	4	5	50	6	7	70	8	9	90	10	11	12	13
max. rotor weight in t	0.16	0.32	0.63	1.25	2.5	4.5	8	12.5	20	32	50	80	125	200	320	450
max. diameter in mm	900	900	900	900	1,100	1,300	1,700	1,700	2,250	2,800	3,300	4,000	4,400	4,700	5,100	5,500
max. speed in rpm	1,500 to 63,000 depending on drive															
drive power in kW	55 to 8,000 depending on drive															

SCHENCK

Balancing and
Diagnostic Systems

For further information, please do not hesitate to contact us via the mentioned major facilities.

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