RUSSENBERGER PRÜFMASCHINEN AG

RUMUL TESTRONIC

The original with the dynamic drive RUMUL MAGNODYN

Test loads from 50 kN to 250 kN · stand alone

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The original with the dynamic drive RUMUL MAGNODYN

The RUMUL TESTRONIC is based on the latest technologies of engineering mechanics and electrical engineering. The machine is equipped with the high-performance dynamic drive RUMUL MAGNODYN.

The machine is separated into a static and a dynamic part and allows to perform dynamic tests at any selected stress ratio R. The big T-slotted machine table and the adjustable vertical test space allow testing of a wide size range of components. The RUMUL TESTRONIC is available with nominal loads of 50 kN, 100 kN, 150 kN and 250 kN.
Depending on nominal load, type of specimen and activated masses of the oscillating system (adjustable in 8 steps) the operating frequency ranges from 40 Hz to 260 Hz.

Particularly due to the very high performance of the dynamic drive RUMUL MAGNODYN tests on components – partly with high damping characters, too – may be executed in a fast and precise way.

The above picture shows a representative selection of possible applications in the most various industry sectors as e.g. automotive, aerospace, steel, aluminium, energy, construction industry, etc.

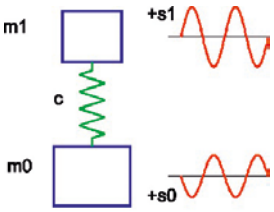
YOUR BENEFITS

- Utmost measurement and control accuracy (class 0,5 % for static and for dynamic load)
- Short test duration due to high testing frequencies (40 Hz – 260 Hz)
- Universal test applications due to the high performance dynamic drive RUMUL MAGNODYN and the big test space with big T-slotted machine table
- Easy, safe and ergonomic operation
- Marginal running costs (1 % – 2 % only in comparison to servo hydraulic test systems!)
- No maintenance
- No additional equipment such as power pack, cooling etc. required
- Minor place requirement (integrated controller)
- Top quality made in Switzerland

RUMUL TESTRONIC
powerful and universal,
energy-saving and fast

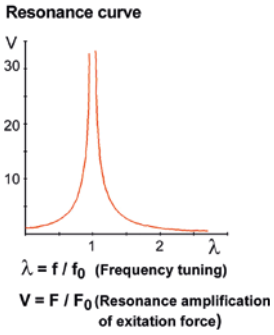
The RUMUL MAGNODYN excitation system consists of an elasticity system combined with an electro magnet which are both integrated in the dynamic load flow. Both parts work combined. The magnet is characterized by a small but constant air gap which is completely independent from the applied static preload. This allows to run demanding tests with independent load variations in the static as well as in the dynamic loops. The innovative design of the MAGNODYN system allows to generate more active power which is directly available on the specimen or component.

Powerful and universal, energy-saving and fast



$$\omega = \sqrt{c \frac{m0 + m1}{m0 * m1}}$$

Two-masses oscillator (simplified)



Static Drive

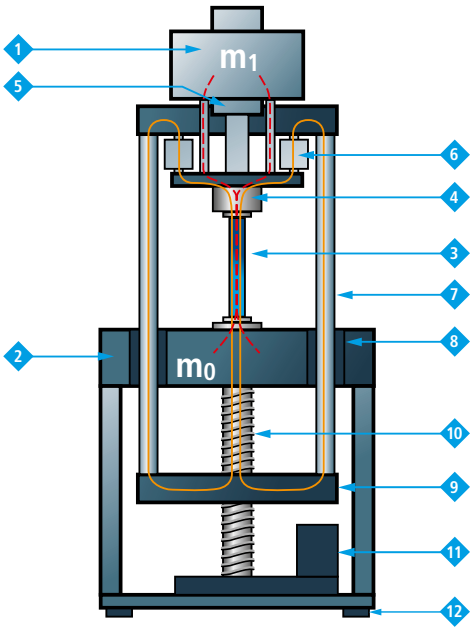
The static load is applied by a ball spindle (10) with a preloaded double-nut which is driven by a low-backlash gearbox and a servomotor. Thanks to this preloaded double-nut the static load can be adjusted during the dynamic operation in the complete range of the nominal load (100 % compression up to 100 % tension).

Dynamic Drive

The dynamic part mainly consists of the mass m_1 (1), the counter mass m_0 (2), the elasticity of specimen (3) and all other elasticities and masses within the dynamic load flow. These parts form the oscillating system which is controlled and excited by the RUMUL MAGNODYN drive in its resonant frequency.
The short and optimized load flow between the two masses assures a good transfer of the load and a high amplification of the energy fed in.

Load Measurement

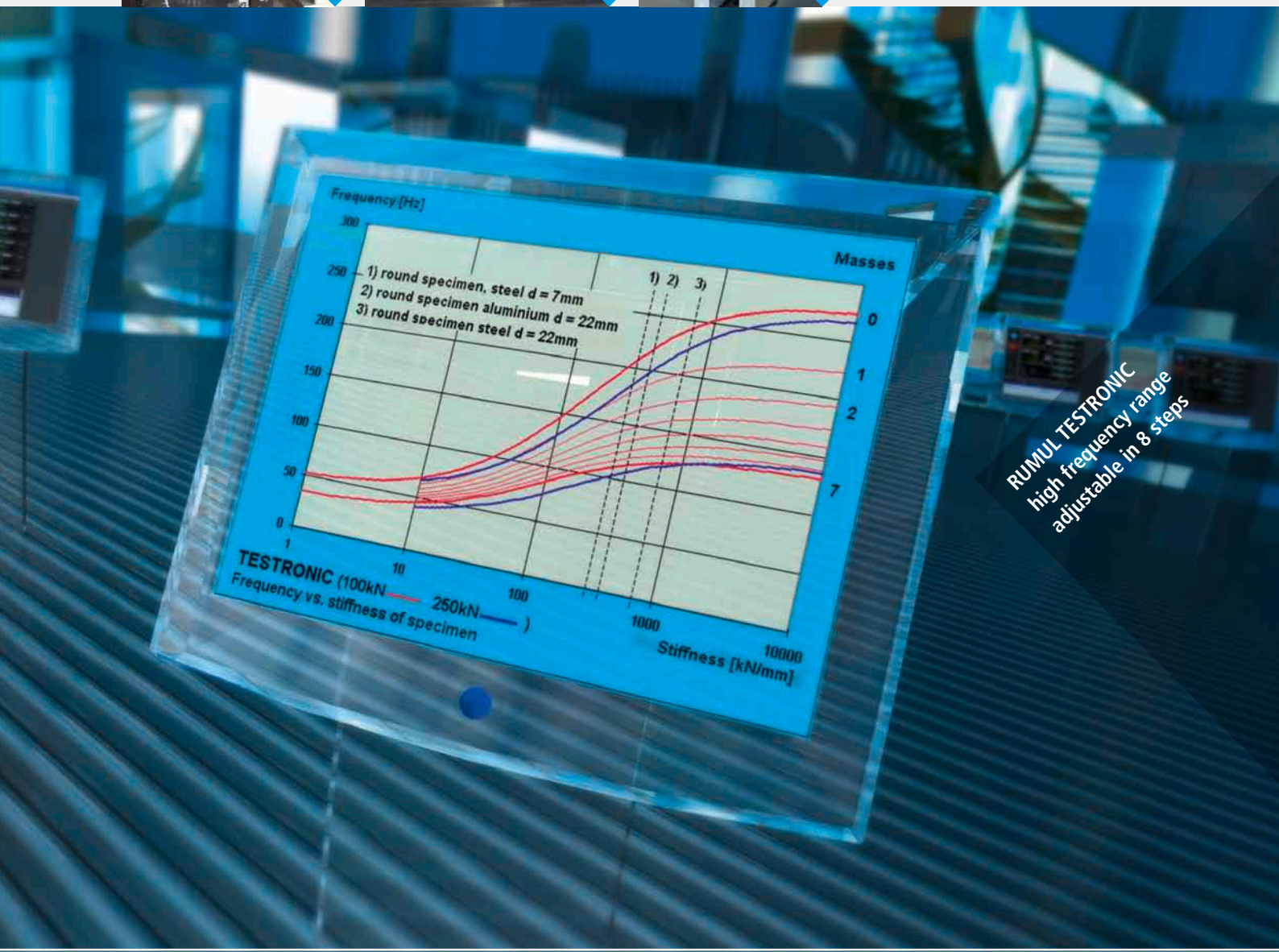
The load is measured by means of RUMUL load cells which have proved their reliability over many years. Besides their unlimited fatigue life their features are very high stiffness to tensile, compressive, bending, shearing and torsion loads. The load cells may either be fixed on the T-slotted table or on the upper cross head preferably when testing components. The RUMUL load cells are fitted with a built-in acceleration transducer for the compensation of the inertia forces resulting from oscillating gripping devices.



Legend

1 Main mass m_1 variable in 8 steps
2 Counter mass m_0 built as a T-slotted table
3 Test sample
4 RUMUL load cell with unlimited fatigue life
5 RUMUL MAGNODYN excitation system
6 Preload springs for static load
7 Columns of the load frame
8 Precise ball bushings
9 Movable lower cross head
10 Premium ground ball screw spindle
11 Spindle drive with servomotor
12 Vibration absorbing machine supports

1 Decoupled static drive and precision spindle
2 RUMUL load cell with acceleration transducer and RUMUL clamping system for easy assembly/disassembly
3 Stroke transducer integrated in the dynamic drive



Frequency response

The resonant frequency of the machine changes with the stiffness of the specimen or component and with the size of the main mass m_1.
The main mass m_1 can be adjusted in 8 steps.
The above diagram shows possible frequency ranges of a RUMUL TESTRONIC 100 kN and of a RUMUL TESTRONIC 250 kN, depending from the stiffness of the specimen as well as from the activated masses m_1.
In order to simplify the diagram for the TESTRONIC 250 kN only the upper and the lower limits (blue frequency curves) are indicated.

For the TESTRONIC 100 kN (red frequency curves) the complete number of eight curves is shown.
Changing of the mass m_1 or the resonant frequency is done by connecting or disconnecting masses integrated to the RUMUL MAGNODYN drive. This can easily be done be loosening or tightening screws.
A comparison of power consumption as well as of practical tests shows that the RUMUL MAGNODYN system shows a considerably better dynamic performance compared to any other available conventional drives.

The RUMUL TOPP Solution: RUMUL Software under LabVIEW

The digital control unit RUMUL TOPP presents itself as a compact adaptive testing system. The well-established dual computer principle provides a clear and easy to understand Windows-based user environment. The embedded device is running a powerful and robust Linux operating system to control all machine tasks in parallel.

Latest technologies like digital signal processing and FPGA integration (Field Programmable Gate Array) in connection with an embedded 32-bit processing architecture have been used to achieve a most reliable control system with best long-term stability.

This high precision and stable controller concept is not only supplied with new RUMUL resonant testing machines but also for the upgrade of existing long-standing resonant fatigue testing machines built by RUMUL, Zwick (AMSLER) or Schenck.

Based on our specialisation on resonant testing machines for more than 40 years our latest software generation under LabVIEW is perfectly suited to the technical requirements of our testing systems.

This assures for the machine operator that the handling is really easy despite of the very high functionality. Within the RUMUL software range there are the following modules available:

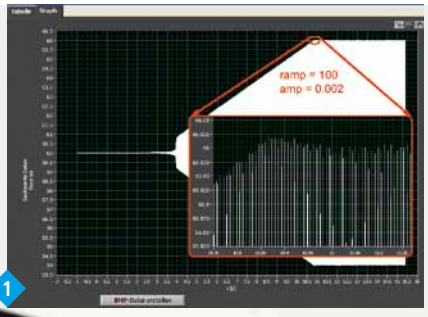
- S/N Fatigue (WOEHLER) for extended fatigue tests
- CRACK GROWTH for crack growth investigation
- PRECRACK for the precracking of fracture mechanics specimens according to all current standards
- BLOCK for fatigue tests on different load levels based on time or on number of load cycles*
- Lab-VIEW based library for user specific programme development

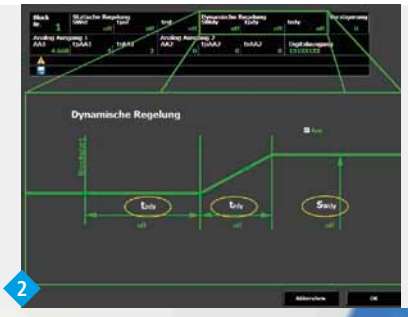
The software modules control, monitor and record one test run at a time. There are many helpful functions available such as online help system, online oscilloscope, messaging, test programmes, LAN integration, data in ASCII Code, copy and paste of diagrams, history records, etc.

Easy and safe test set-up by the RUMUL remote control

1 Digital control unit RUMUL TOPP

* With the extended block programme XP it is possible to generate complex load sequences and to react to external events by using the available digital and analog signal inputs.





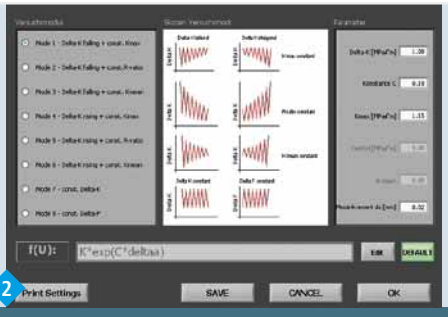
1 Precise loading ramp to the nominal dynamic load
2 Input dialog for the dynamic controller in the block programme XP

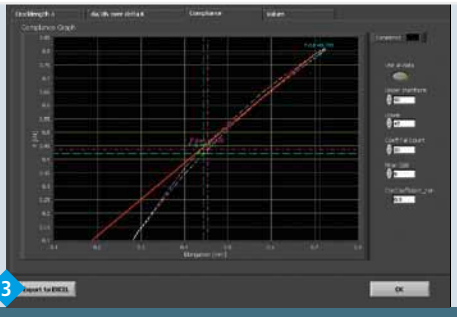
RUMUL TOPP = Testing with Optimized Power and Precision

YOUR BENEFITS

- High-precision test system, powerful and reliable due to the 2-computer-principle and latest technologies
- Universal applications due to fast data acquisition (8 kHz) and multi-channel technology (8 digital in and outputs, 4 analog inputs, 2 analog outputs)
- Reliable tests results through a particularly sensitive crack detection due to precise frequency measurement (0,001 Hz) and a sensitive frequency drop detection (0,01 Hz)
- Easy operation with the new RUMUL software under LabVIEW, especially optimized for the use with resonant testing machines
- Multi-channel oscilloscope for online display record of important test parameters
- Comfortable test set-up by remote control with digital display for all important test parameters
- Service-friendly through self-diagnosis functions and the possibility of remote diagnosis

2 Test modes in the crack growth software
3 Crack closure effect when performing a da/dN-test





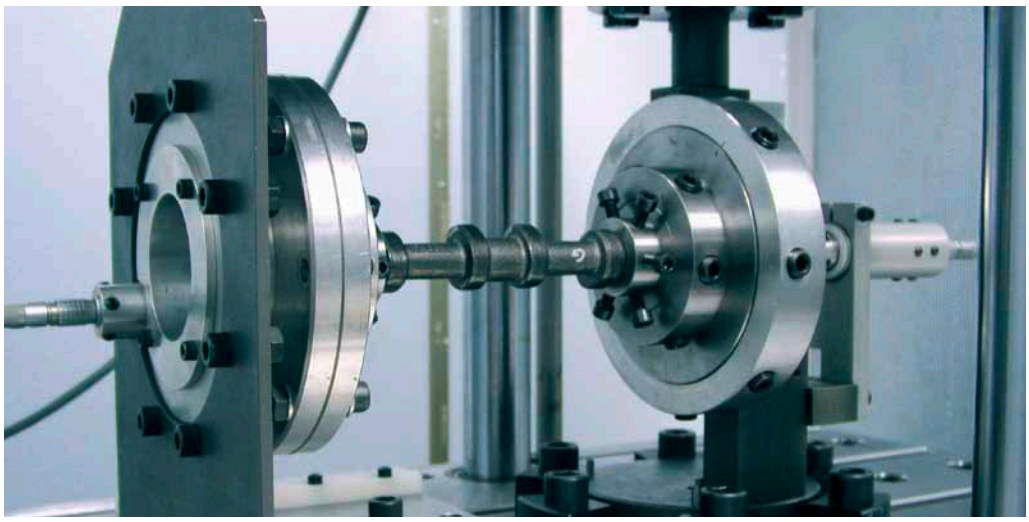
Optimized Gripping Devices
based on long lasting experience

4-Point-Bending ± 500 Nm

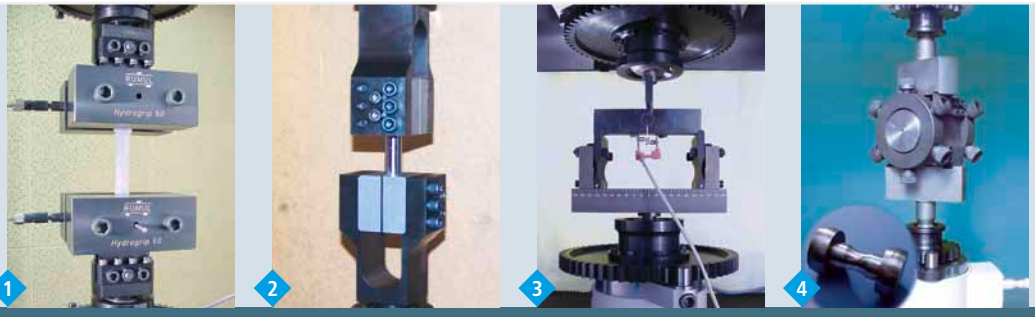
The principle of resonant testing machines and the resulting high test frequencies require professional competence regarding the design of appropriate fixtures.
Due to our experience of almost 50 years and to our specialisation on magnet excited resonant testing machines our comprehensive delivery programme consists of a wide range of optimized gripping devices for specimens and components.

The joining technology is an ideal application field. Whether bolted, riveted, clinched or welded, fast and economic test runs can be performed with the RUMUL TESTRONIC.
A selection of RUMUL standard fixtures is shown on these pages and we can supply or will find the optimal solution for your test requirements, too.

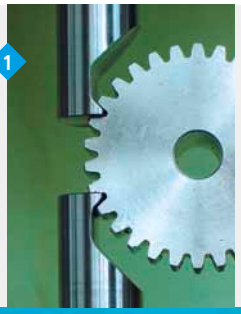
Special fixture for torsion tests performed on a camshaft



1 RUMUL HydroGrip 50 kN for flat samples
2 Fixture for round non-threaded samples
3 3-Point-Bending
4 Torsion tests



1 Gear wheel fixture
2 RUMUL HydroGrip for welded test sample
3 H-shaped test sample
4 Alternating bending test on a welded specimen




Fatigue tests performed on chains economic and fast



5 RUMUL PowerGrip for rebar fatigue tests
6 Fatigue tests on a motor block
7 Bending fatigue tests on a crankshaft

RUMUL Solutions
for environmental simulations and fracture mechanics tests

Temperature Chamber

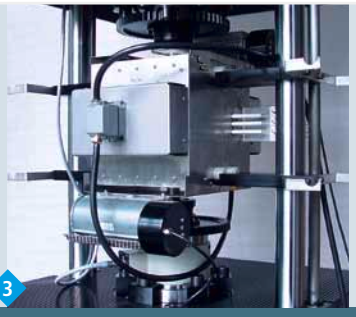
To run tests as practically as possible the simulation of certain environmental conditions is required for many specimens and components. RUMUL offers complete solutions with adequate additional accessories for all sorts of test conditions.

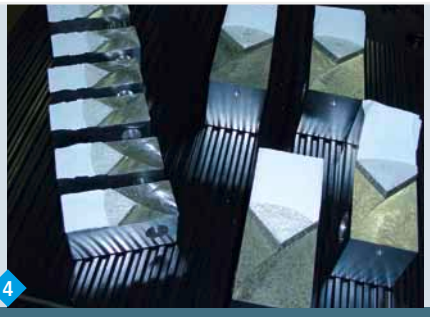
Besides the large quantity of fatigue and load block tests, fracture mechanical tests become more and more important. In the field of dynamic fracture mechanics RUMUL relies on more than 30 years' experience and we have developed optimized fixtures and modern software modules for safe and fast test runs.

With our resonant testing machines and the frequency drop method precracking of fracture mechanical specimens according to international standards can be done in a fast and easy way without using a crack length measurement system due to the precise frequency measurement and crack detection.

To perform crack growth fatigue tests RUMUL can offer modern and suitable crack length measurement systems optimized for the use at high testing frequencies as well as the corresponding software modules.

1 Conrod fatigue tests with oil supply
2 Test on cylinder head gasket at elevated temperature
3 RUMUL furnace THERMOTRON
4 Precracked CT-specimens





1 RUMUL FRACTOMAT LV
(indirect potential drop method)
2 Selection of crack length measuring
foils RUMUL KRAK GAGES

RUMUL
your competent partner
for fracture mechanics
tests

5 Clevis for CT with clip-on extensometer
RUMUL FRACTOTRON
6 Close-up view of CT-specimen with clip-on-sensor
and RUMUL KRAK GAGE
7 Crack length measurement on CT-specimen by
means of the potential drop method

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ISO 9001
BUREAU VERITAS
Certification

RUMUL – Leading through **Specialization**

RUMUL TESTRONIC at a glance

Nominal Load	**kN**	**50**	**100**	**150**	**250**	
Max. static load	kN	50	100	150	150	250
Max. dynamic amplitude	kN	±25	±50	±75	±125	
Max. dynamic stroke	mm	4	6	5	4	
Frequency range[1]	Hz	approx. 40–260				
Frequency steps		8				
Dayligh between columns[2]	mm	500				
Measurement and control accuracy static	%	<0,5				
Measurement and control accuracy dynamic	%	<0,5				
Vertical test space[2]	mm	26–612			24–531	
Max. total height	mm	2.688			2.654	
Width	mm	690				
Depth	mm	1.010				
Total weight	kg	approx. 3.000				
Electric supply	V / Amp.	1 x 230 / 16		3 x 400 / 16		

[1] The operating frequency depends on the stiffness of the specimen including fixture assembly as well as on the activated oscillating masses.
[2] Higher values available as options.

Subject to technical changes!

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