RUSSENBERGER PRÜFMASCHINEN AG

RUMUL MIKROTRON

Our most universal lightweight

Test loads up to 5 kN and 20 kN · stand alone

www.rumul.ch

RUMUL MIKROTRON
Our most universal lightweight

The RUMUL MIKROTRON is the smaller and more compact execution of the RUMUL TESTRONIC for loads up to 5 kN resp. up to 20 kN and – if necessary – for higher dynamic stroke values.
The main feature of this construction is the big stroke of the oscillating mass leading to a particularly low total weight for a resonant testing machine (only approx. 30 % in comparison with other testing systems in the market).
Thanks to the T-slotted machine table the range of applications is extended to the more and more required testing of components.
Due to the control unit being located in the load frame the RUMUL MIKROTRON is a very compact and thus space saving testing solution.
The operating frequency ranges from 40 Hz to 250 Hz depending on specimen stiffness and activated masses of the oscillating system (adjustable in 4 resp. 5 steps).

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

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, medical engineering, etc.

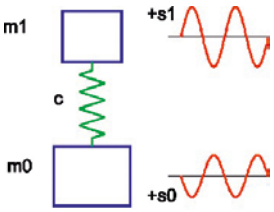
YOUR BENEFITS

- Utmost measurement and control accuracy (class 0.5 % for static and for dynamic load)
- Short test duration due to high testing frequencies (40 Hz – 250 Hz)
- Universal test applications due to the high performance dynamic drive RUMUL MIKROTRON and the big test space with 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 footprint due to integration of controller in load frame
- Top quality made in Switzerland

RUMUL MIKROTRON
lightweight, universal and fast

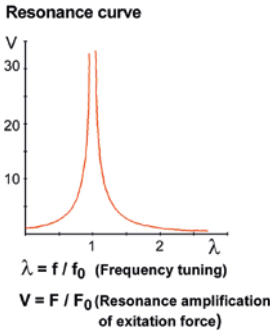
The RUMUL MIKROTRON excitation system consists of an elasticity system combined with an electro magnet which are both integrated in the dynamic load flow.
Both parts work combined. The magnet is characterized by a small but constant air gap which is completely independent from the applied static preload.
This allows to run demanding tests with independent load variations in the static as well as in the dynamic loops.

Powerful and universal, energy-saving and fast



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

Two-masses oscillator (simplified)



Static Drive

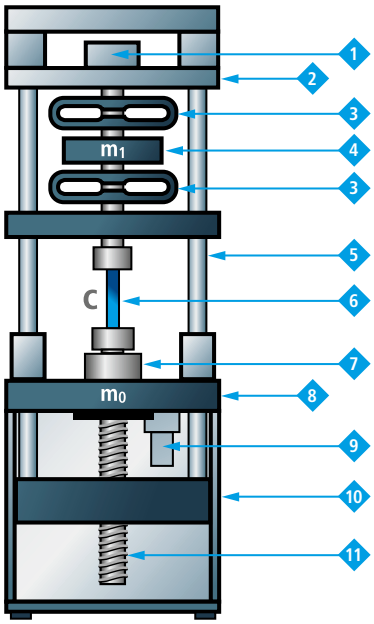
The static load is applied by a ball spindle (10) with a preloaded double-nut which is driven by a low-backlash gearbox and a servomotor.
Thanks to this preloaded double-nut the static load can be adjusted during the dynamic operation in the complete range of the nominal load (100 % compression up to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

Dynamic Part

The dynamic part mainly consists of the oscillating mass m_1 (4), the counter mass m_0 (8), the elasticity c (6) of the specimen 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 MIKROTRON 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

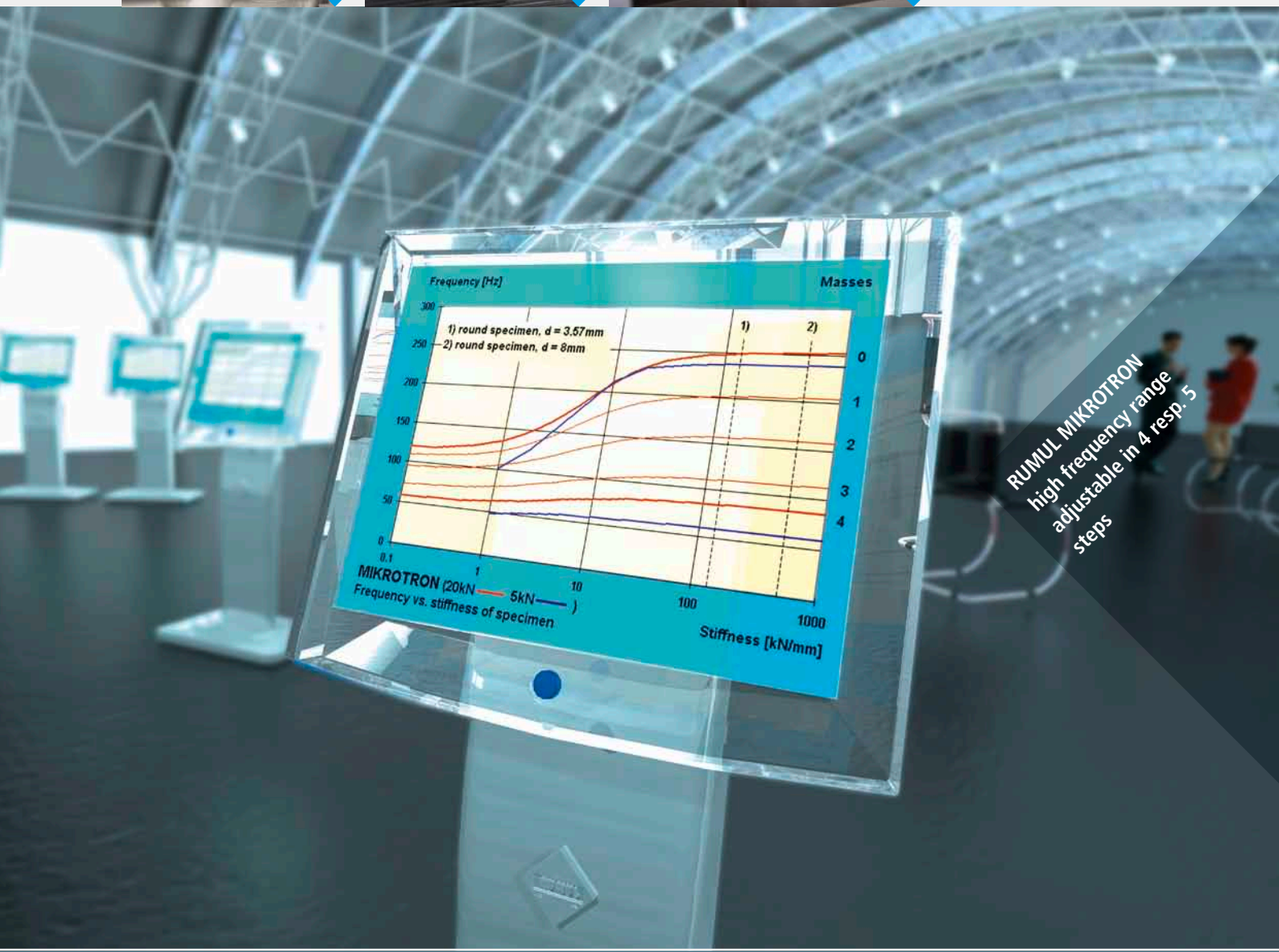
The load is measured by means of RUMUL load cells which have proved their reliability over many years. Besides their unlimited fatigue life their features are very high stiffness to tensile, compressive, bending, shearing and torsion loads. The load cells may either be fixed on the T-slotted table or 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 Magnet for dynamic drive
2 Cross head
3 Preload springs for static load
4 Oscillating mass m_1
5 Columns
6 Specimen / component c
7 Load cell
8 Counter mass m_0 built as T-slotted table
9 Spindle drive with servo motor
10 Movable lower cross head
11 Premium ground ball screw spindle

1 Decoupled static drive and precision spindle
2 RUMUL load cell with integrated acceleration transducer
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 oscillating mass m_1.
The oscillating mass m_1 can be adjusted in 4 resp. 5 steps. The above diagram shows possible frequency ranges of a RUMUL MIKROTRON 5 kN and of a RUMUL MIKROTRON 20 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 MIKROTRON 5 kN (blue frequency curves) only the upper and the lower limits are indicated.

For the MIKROTRON 20 kN (red frequency curves) the complete number of five curves is shown. Changing of the mass m_1 respectively of the frequency is done by connecting or disconnecting weights to the machine.
A comparison of power consumption as well as of practical tests proves that the RUMUL MIKROTRON 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.

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

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.

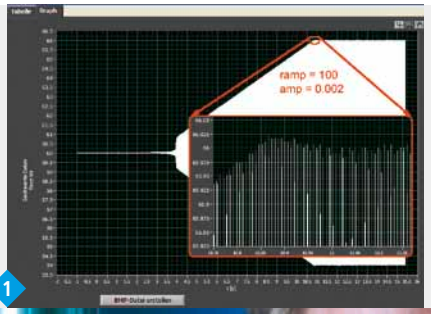
This assures for the machine operator that the handling is really easy despite of the very high functionality. Within the RUMUL software range there are the following modules available:

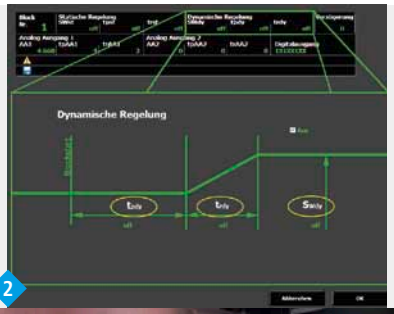
- S/N Fatigue (WOEHLER) for extended fatigue tests
- CRACK GROWTH for crack growth investigation
- PRECRACK for the precracking of fracture mechanics specimens according to all current standards
- BLOCK for fatigue tests on different load levels based on time or on number of load cycles*
- LabVIEW based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

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.



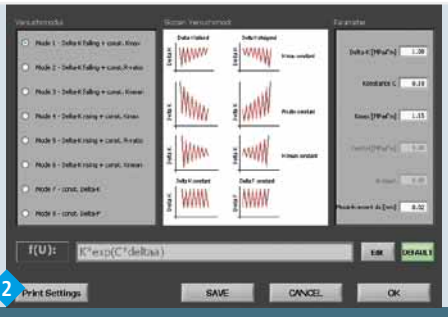


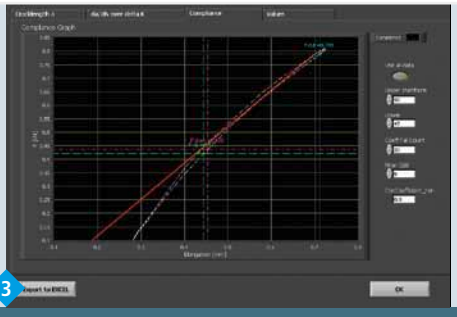
1 Precise loading ramp to the nominal dynamic load
2 Input dialog for the dynamic controller in the block programme XP

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 and 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 ±100 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.

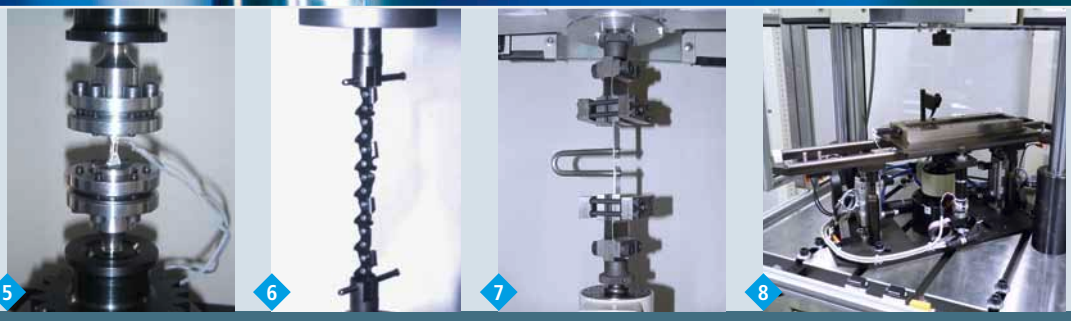
The joining technology is an ideal application field. Whether bolted, riveted, clinched or welded, fast and economic test runs can be performed with the RUMUL MIKROTRON.
A selection of RUMUL standard fixtures is shown on these pages and we can supply or we will find the optimal solution for your test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

Automatic fatigue tests on rocker arm with manipulator

1 Tests on aluminium foil
2 Fixture for round non-threaded specimens
3 3-Point-Bending
4 Torsion tests

1 Gear wheel fixture
2 Tests on fasteners
3 Clinched flat specimen
4 Alternating bending test on welded specimen

Fatigue tests on gear wheels – economic and fast



5 Instrumented test on midget flat specimen
6 Saw tooth tests (chainsaw)
7 Tube clip
8 Chain link tests with robot system

RUMUL Solutions
for environmental simulations and fracture mechanics tests

Temperature Chamber

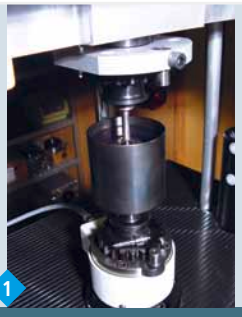
To run tests as practically as possible the simulation of certain environmental conditions is required for many specimens and components. RUMUL offers complete solutions with adequate additional accessories for all sorts of test conditions.

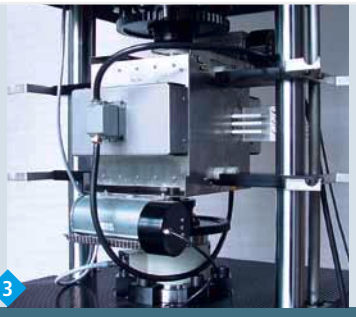
Besides the large quantity of fatigue and load block tests, fracture mechanical tests become more and more important. In the field of dynamic fracture mechanics RUMUL relies on more than 30 years' experience and we have developed optimized fixtures and modern software modules for safe and fast test runs.

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 advanced and suitable crack length measurement systems optimized for the use at high testing frequencies as well as the corresponding software modules.

1 Tests on fuel injector with oil supply
2 Tests on midget flat specimens at high temperature
3 RUMUL furnace THERMOTRON
4 Tests on round specimens at high temperature with induction heating





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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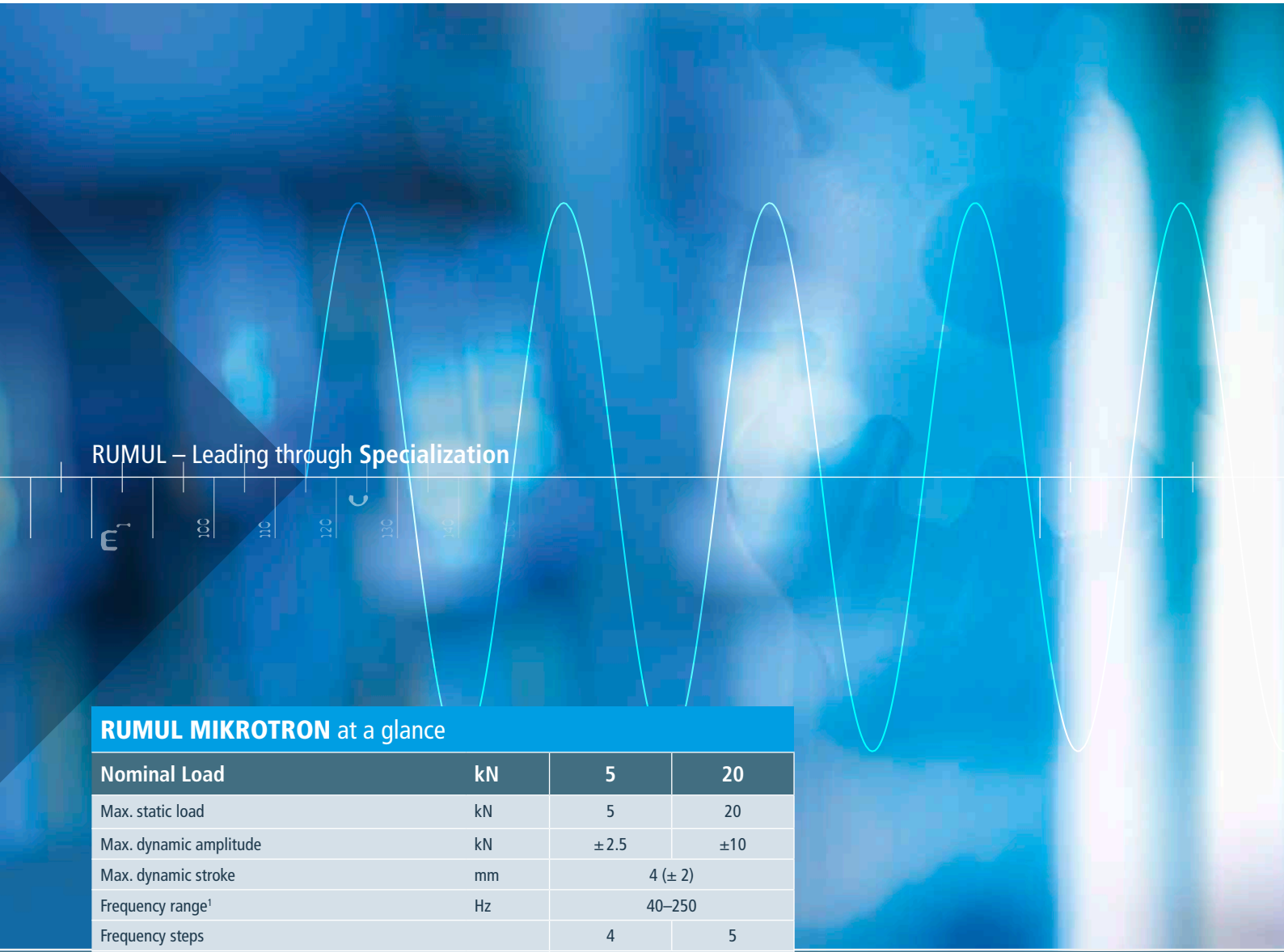

RUMUL – Leading through **Specialization**

RUMUL MIKROTRON at a glance

Nominal Load	kN	5	20
Max. static load	kN	5	20
Max. dynamic amplitude	kN	±2.5	±10
Max. dynamic stroke	mm	4 (± 2)	
Frequency range[1]	Hz	40–250	
Frequency steps		4	5
Daylight between columns[2]	mm	500	
Measurement and control accuracy static	%	< 0.5	
Measurement and control accuracy dynamic	%	< 0.5	
Vertical test space[2]	mm	26–460	80–540
Max. total height	mm	2,290	2,450
Width	mm	740	
Depth	mm	550	
Total weight	kg	approx. 500	approx. 580
Electric supply	V / Amp.	1x 230 V / 10 A	

Subject to technical changes!

[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.