High Capacity Resonant Testing Machine
RUMUL VIBROFORTE 500 kN and 700 kN

RUMUL

RUSSENBERGER PRÜFMASCHINEN AG

High Capacity Resonant Testing Machine RUMUL VIBROFORTE 500 kN and 700 kN

Advantages:

- bipolar concept of dynamic drive thus low total weight as well as a very high dynamic performance
- simple and solid construction at a very attractive price
- low total height (3060 mm with a vertical test area of 1100 mm) as well as a very ergonomic working height
- big and adjustable test area, ideal system for different specimens and components (rebars, conrods, chains, fasteners etc.)
- two spindle static drive, no restrictions regarding maximum static load of 500 kN resp. 550 kN (calibration up to nominal load possible)
- gripping devices for rebars, conrods, fasteners, chains etc. available thus reliable grips for all high load applications
- latest digital electronics RUMUL **TOPP** (**T**ests with **O**ptimized **P**ower and **P**recision) assuring highest accuracy and reliability
- **RUMUL Software** running under **LabVIEW** for easy and simple test execution and evaluation of dynamic materials testing

Technical Data:	**VIBROFORTE 500**	**VIBROFORTE 700**
Max. load peak value	500 kN	700 kN
Max. static load tension/compression	500 kN	550 kN
Max. dynamic load	500 kN (+/- 250 kN)	500 kN (+/- 250 kN)
Max. dynamic stroke	4 (+/- 2) mm	4 (+/- 2) mm
Weight	ca. 4'400 kg	ca. 4'800 kg
Separate control unit	W 600 x D 600 x H 750 mm	
Area of load frame	1346 mm x 956 mm	
Necessary area around load frame on rear and lateral sides	60 cm	
Necessary area on front = user side	120 cm	
Basic supports on floor by	4 platens of 120 x 120 mm	
Center of supports	860 mm x 690 mm	

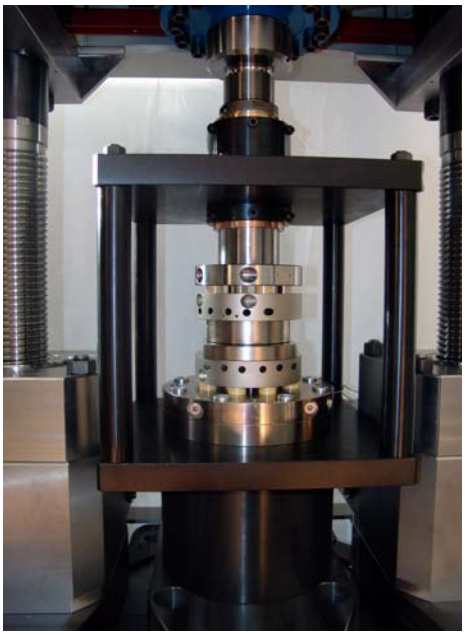
Subject to technical changes!
(March 2011)

High Capacity Resonant Testing Machine
RUMUL VIBROFORTE 500 kN and 700 kN

Tests on rebars with hydraulic clamping device PowerGrip 500 kN

Special device for connecting rods

Tests on flat specimen with hydraulic clamping device HydroGrip 500 kN



Special device for compression tests at elevated temperatures on cylinder head sealings

Chain testing gripping device

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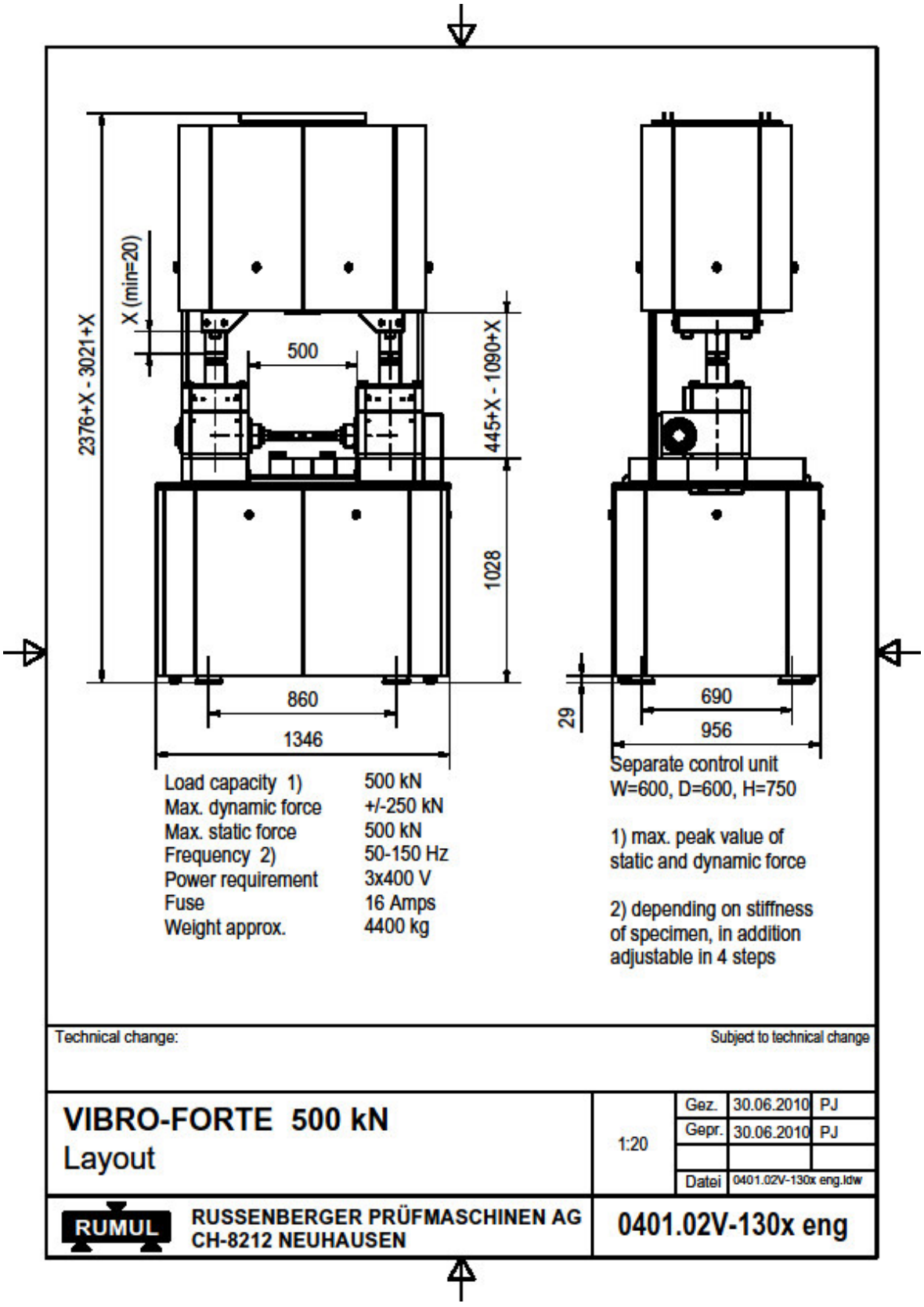
High Capacity Resonant Testing Machine
RUMUL VIBROFORTE 500 kN and 700 kN



RUMUL VIBRO-Forte
the ideal system for
Fatigue Testing up to 500 kN

feature	*advantage*
bipolar concept of dynamic drive	no countermass needed = low weight/easy installation
simple and solid construction	reliable system for high loads at a very attractive price
big and adjustable test area	ideal system for rebars, chains and fasteners
available gripping devices for rebars, fasteners, chains and standard specimens	reliable grips for all high load applications
dynamic drive „**MAGNODYN**“	very high power = very high dynamic load achievable
newest electronics RUMUL **TOPP**	**T**ests with **O**ptimized **P**ower and **P**recision
RUMUL Software	very easy operation and evaluation of tests

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RUMUL VIBROFORTE

Overview of the technical performance of the RUMUL Resonant Fatigue Testing Machine VIBROFORTE

1. The **RUMUL VIBROFORTE load frame** contains two original dynamic drives RUMUL MAGNODYN assuring the highest performance for reaching high dynamic loads even for critical test samples with high damping behaviour.

   - Low total weight of approx. 4400 kg only due to the bipolar working principle
   - Low total height and very ergonomic working height due to the bipolar working principle
   - High precision load cell with integrated accelerometer included
   - Frequency adjustable in 4 steps

2. **RUMUL fixtures:** Due to nearly 50 years of experience RUMUL can offer a wide range of fixtures for samples and components which are very reliable, easy to handle and optimized for the use with resonant fatigue testing machines at high test frequencies.

3. The **fully digital controller RUMUL TOPP** (**T**esting with **O**ptimized **P**ower and **P**recision) is the most advanced controller (we refer to the overview about our new digital controller RUMUL TOPP).
   The main advantages of RUMUL resulting from this are:

   - Static load accuracy: 0,5 %
   - Dynamic load accuracy: 0,5 %
   - Frequency measurement accuracy: 0,001 Hz
   - Frequency drop detection better/equal: 0,01 Hz
   - Alignment error less/equal 3 % according to ISO 7500-I
   - Remote control including digital display of all test parameters for easy test set-up
   - Online multichannel oscilloscope
   - 8 digital in and out channels
   - 4 analog in channels and 2 analog out channels (1x 0 to 10 V and 1x +/- 10 V)
   - Multichannel high speed data acquisition rate of 8 kHz with automatic data stream of each load cycle at test start, test stop and at any chosen event

4. The new **RUMUL fatigue software under LabVIEW** covers all needs to perform and to document high cycle fatigue tests.

   The **RUMUL block program under LabVIEW** is a universal program and allows defining any conditions to configure a really custom specific block program. Furthermore the maximum number of blocks is not limited. For more demanding testing applications the extended **RUMUL block program XP** is available.

   The **RUMUL crack growth software under LabVIEW** is based on 30 years of experience in fracture mechanics and allows all current test modes as well as the use of all existing different crack length measurement methods.

   Thanks to the very high accuracy and stability of the RUMUL resonant fatigue testing machines the **RUMUL precracking software under LabVIEW** allows to create very fast fatigue precracks according to all current standards by using the frequency drop method without the need of a crack length measurement system.

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RUMUL IK/bm 02/2014

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RUMUL VIBRO-Forte rebar application

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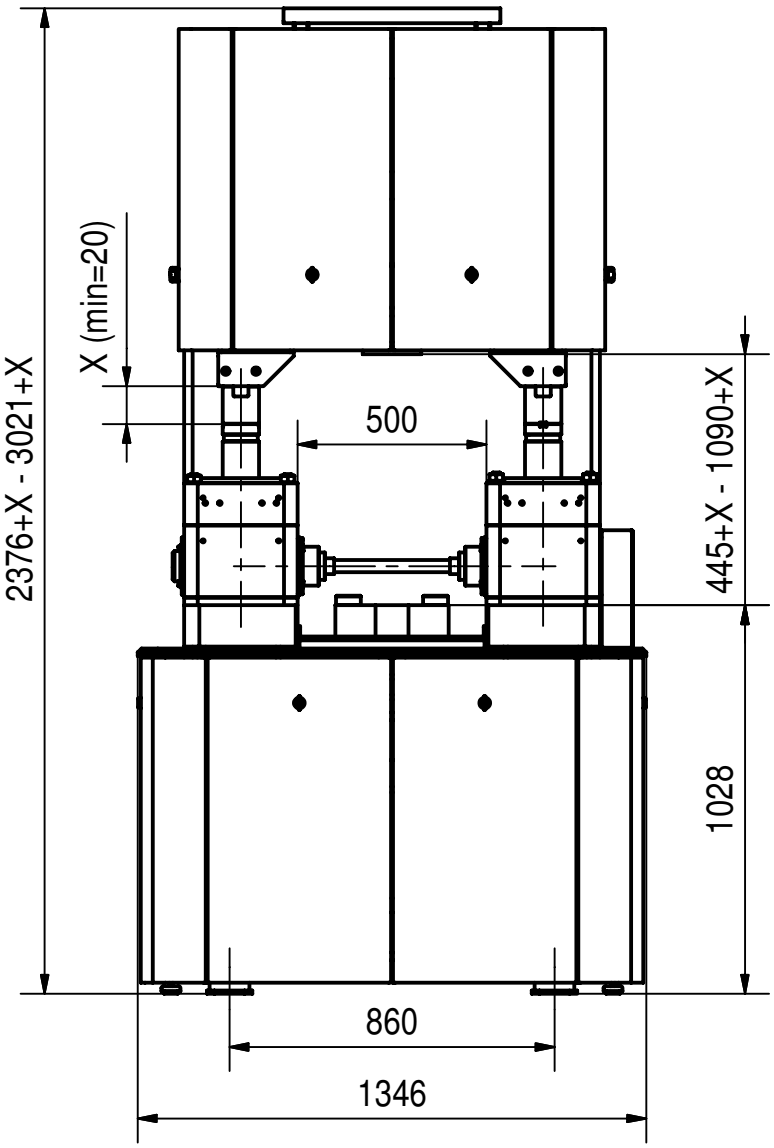

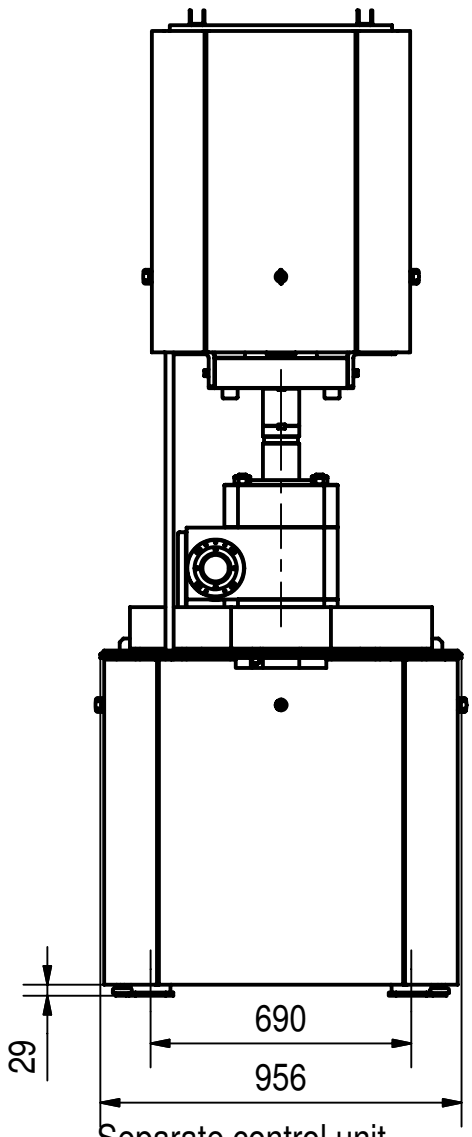

Load capacity 1)	500 kN
Max. dynamic force	+/-250 kN
Max. static force	500 kN
Frequency 2)	50-150 Hz
Power requirement	3x400 V
Fuse	16 Amps
Weight approx.	4400 kg

Separate control unit
W=600, D=600, H=750

1) max. peak value of static and dynamic force

2) depending on stiffness of specimen, in addition adjustable in 4 steps

Technical change: Subject to technical change

VIBRO-FORTE 500 kN

Layout

1:20

Gez.	30.06.2010	PJ
Gepr.	30.06.2010	PJ
Datei	0401.02V-130x eng.idw	

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CH-8212 NEUHAUSEN

0401.02V-130x eng

Available Gripping Devices for Rebars for use with Resonance Testing Systems

I. Standard Grips "type PAUL" (offered by competitor)

advantage

cheap solution

inconvenients

very high risk of rupture within gripping area for higher diameters (> 20 mm)
specimen preparation needed for all diameters

II. RUMUL HydroGrip 160 kN

advantages

very low risk of rupture within gripping area
no specimen preparation needed!

inconvenient

higher investment volume

III. RUMUL PowerGrip 300 kN and 500 kN

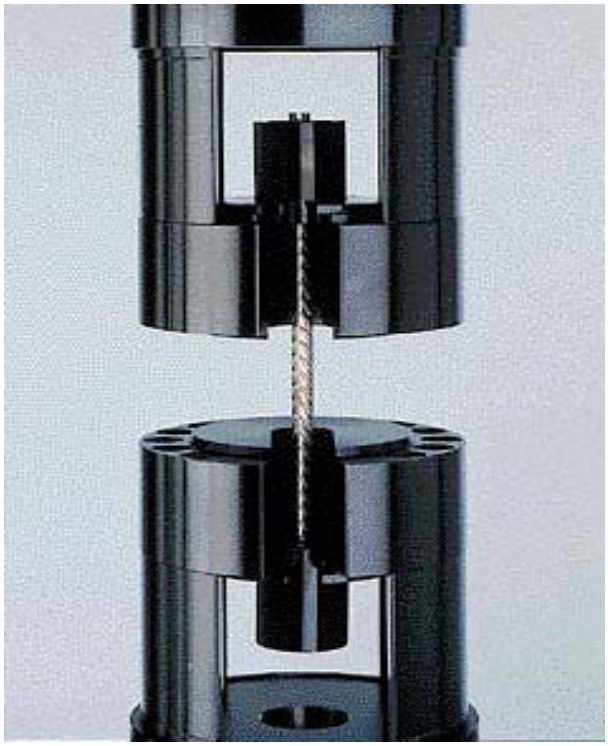
advantages

very low risk of rupture within gripping area for higher diameters (> 20 mm)
no specimen preparation needed!

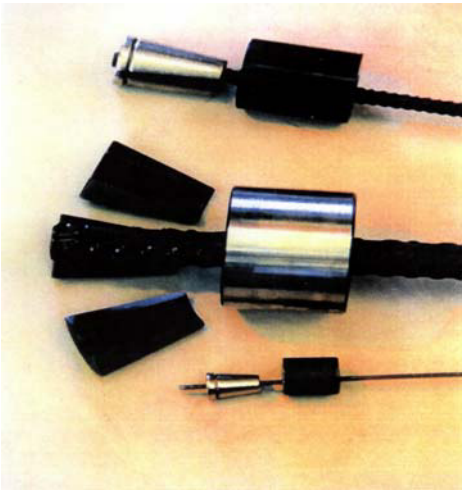
inconvenient

higher investment volume

Gripping heads 400 kN "Paul System"

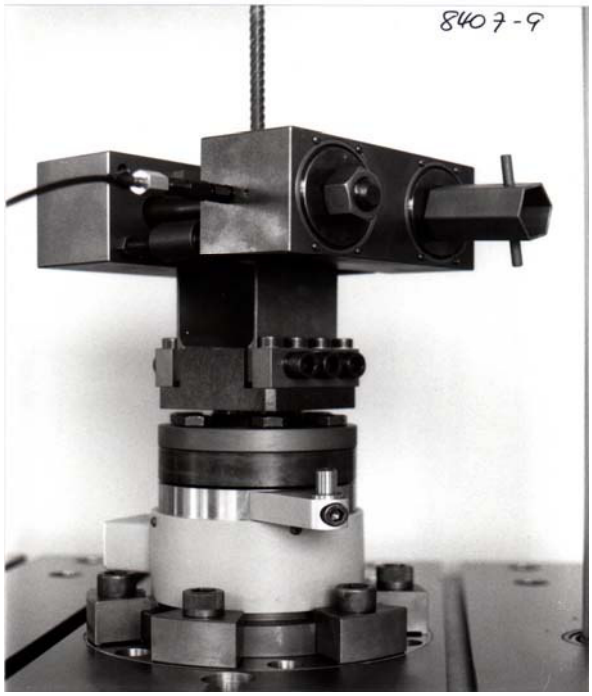


Specimen preparation for grips "PAUL-System"



RUMUL Gripping Devices for Rebars

Gripping Heads RUMUL HydroGrip 160 kN



Inserts for RUMULHydroGrip 160 kN

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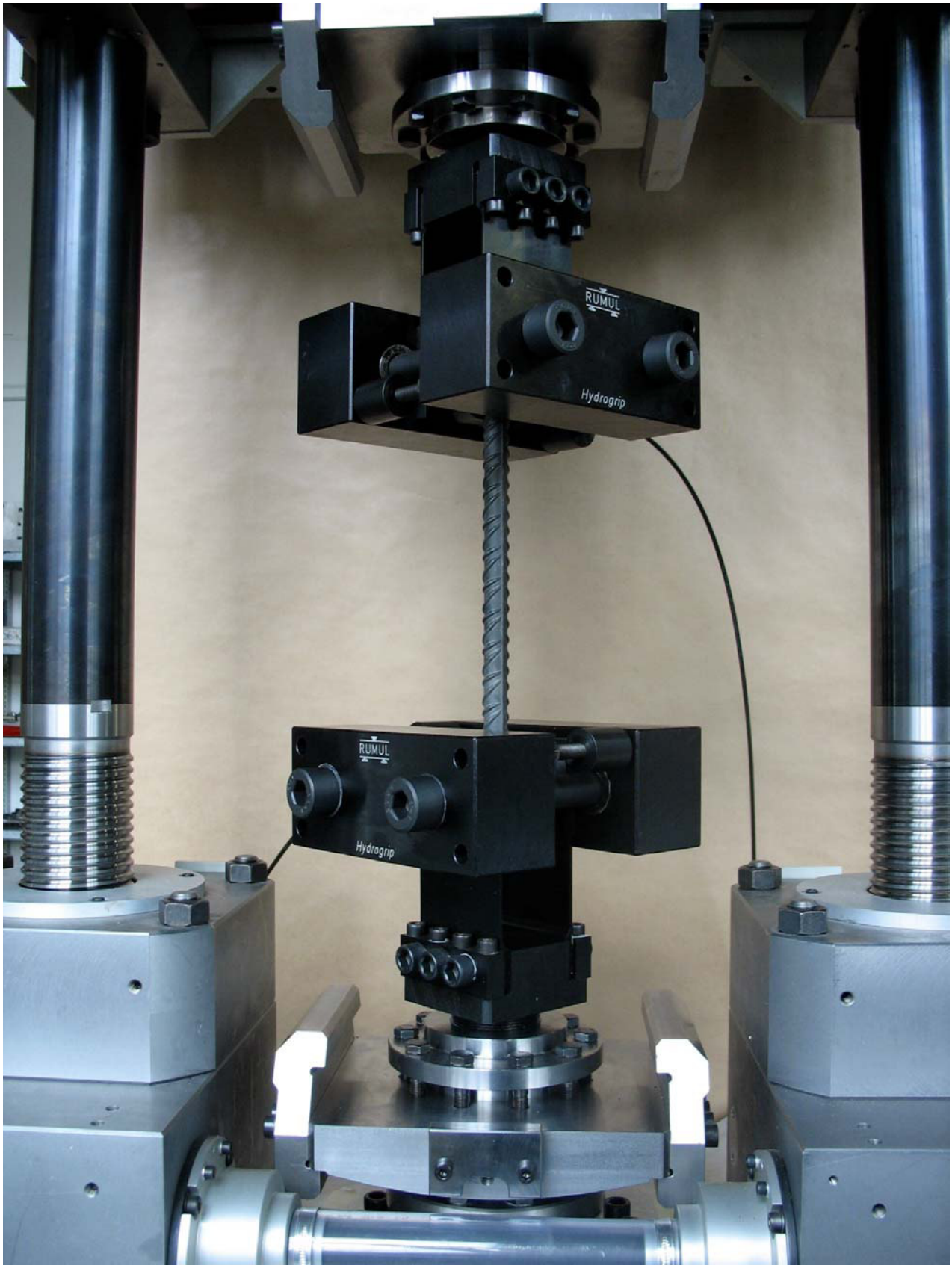
RUMUL HydroGrip rebar application



Russenberger Prüfmaschinen AG Gewerbestr. 10 / Rundbuck CH-8212 Neuhausen 2 April 2010

RUMUL HydroGrip
rebar application zoom

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RUMUL PowerGrip 300 kN resp. 500 kN

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Gripping heads RUMUL PowerGrip 500 kN

(300 kN version as well available)

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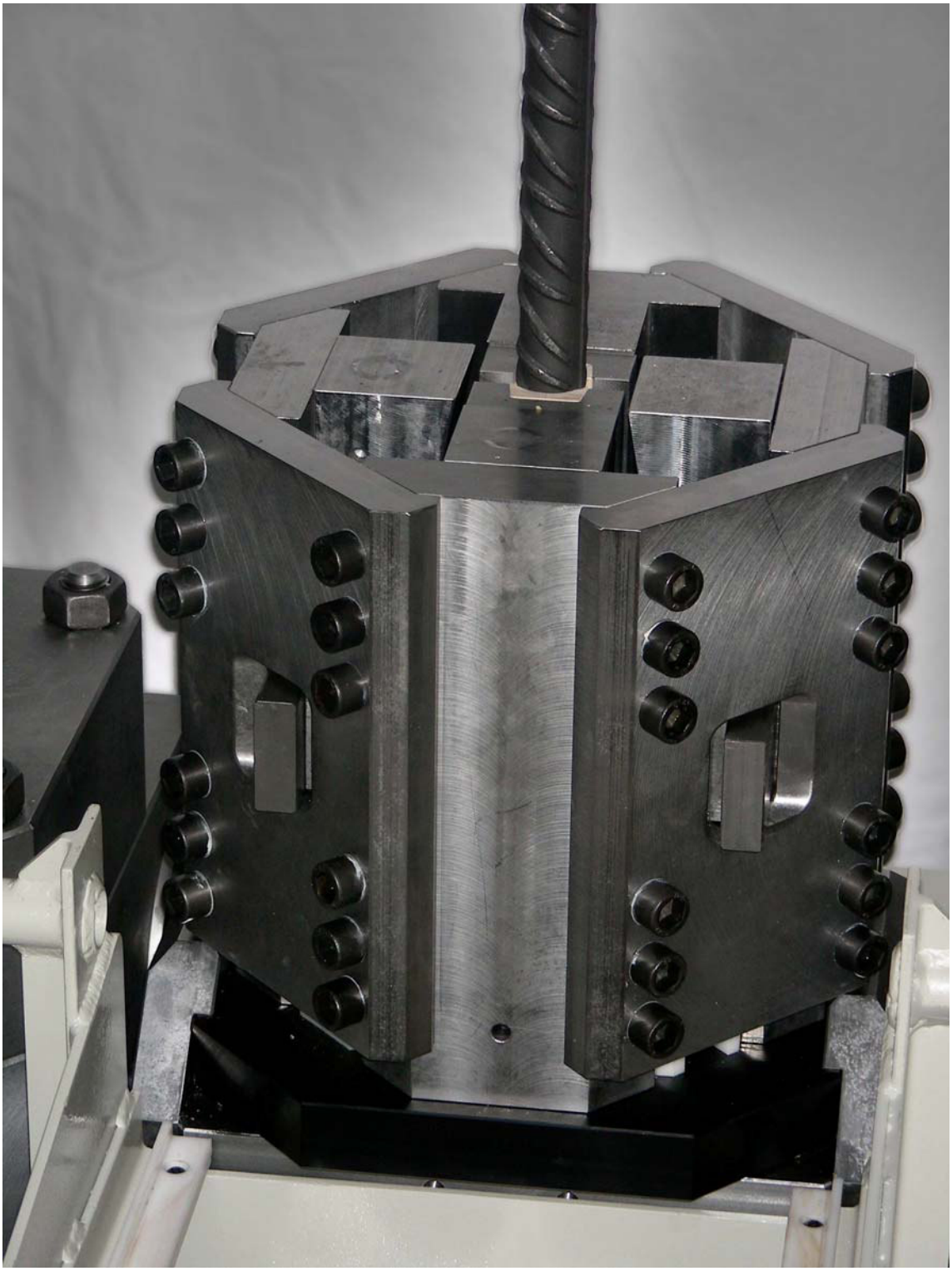
RUMUL PowerGrip 500 kN



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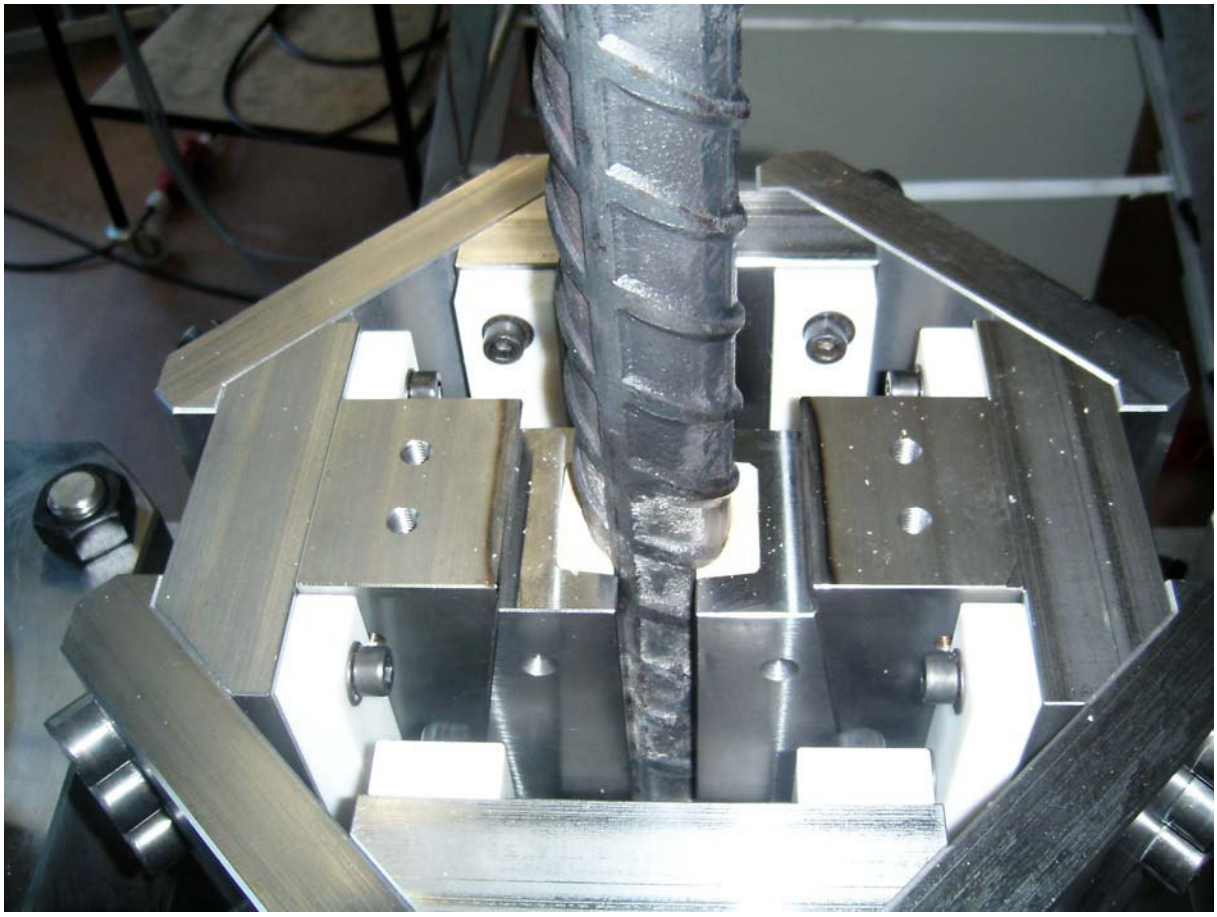
RUMUL PowerGrip 500 kN Zoom



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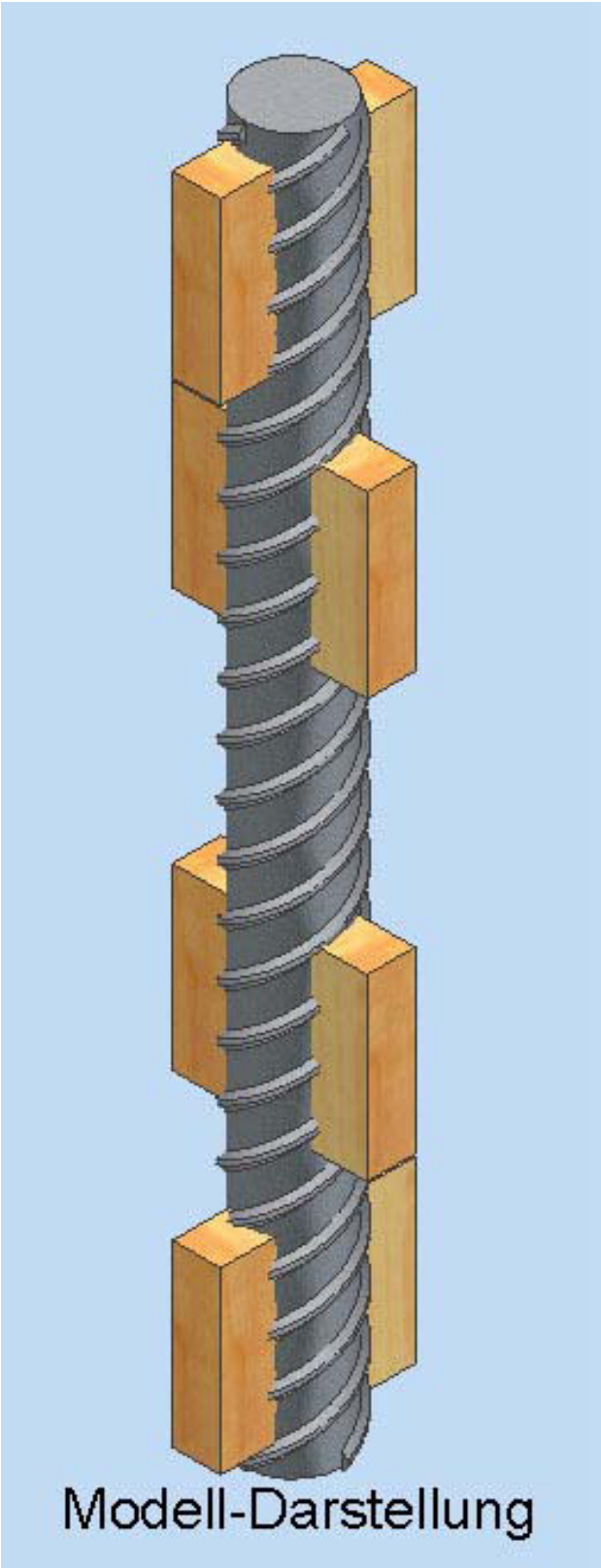
RUMUL Model View



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REFERENZLISTE LISTE DE REFERENCE REFERENCE LIST

RUMUL Resonanzprüfmaschine / RUMUL Resonant Testing Machine

VIBROFORTE

500 kN

CELSA, Cardiff, Great Britain
Fiat Powertrain, Torino, Italy
Fontana Luigi s.p.a., Veduggio (MI), Italy
Force Technology, Brondby, Denmark
Krylov Shipbuilding Research Institute, St. Petersburg, Russia
L. G. Balakrishnan & Bros. Ltd., Coimbatore, India
Mittal Steel Kryvorizhstal, Krivoy Rog, Ukraine
Politecnico di Bari, Italy
Reinz-Dichtungs-GmbH, Neu-Ulm, Germany
Renold GmbH, Einbeck, Germany
Ruhr Universität Bochum, Germany
SATA SpA, Valperga (To), Italy
Schweißtechnische Lehr- und Versuchsanstalt Halle GmbH, Halle, Germany
SSAB Tunnplat AB, Borlänge, Sweden
TU München, Germany

700 kN

August Friedberg GmbH, Finsterwalde, Germany
DAERIM CREATION & CHALLENGE CO. Ltd., Wanju-Gun, Jeonbuk, Korea (RoK)
GE India Technology Centre Pvt. Ltd., Bangalore, India

14th March 2016/bm

Fatigue Parameters for rebars to comply with current European Standards (DE, ES, PT, NO, GB)

Size	Nom Area	Lower Load	Mean Load	Upper Load	Lower Stress	Upper Stress	Specimen Length	Free Length new	Free Length Spain only
	(mm^2)	(kN)	(kN)	(kN)	(Mpa)	(Mpa)	(mm)	(mm)	(mm)
							GB only	(x 14)	140mm/x10/x15
6	28,27	3,39	5,94	8,48	120,00	300,00	180	84	140
8	50,27	6,03	10,56	15,08	120,00	300,00	240	112	140
10	78,54	9,42	16,49	23,56	120,00	300,00	300	140	140
12	113,10	13,57	23,75	33,93	120,00	300,00	360	168	140
14	153,94	18,47	32,33	46,18	120,00	300,00	420	196	140
16	201,06	24,13	42,22	60,32	120,00	300,00	480	224	140
18	254,47	30,54	53,44	76,34	120,00	300,00	540	252	180
20	314,16	37,70	65,97	94,25	120,00	300,00	600	280	200
25	490,87	58,90	103,08	147,26	120,00	300,00	750	350	250
28	615,75	73,89	129,31	184,73	120,00	300,00	840	392	280
32	804,25	96,51	168,89	241,27	120,00	300,00	960	448	480
40	1256,64	150,80	263,89	376,99	120,00	300,00	1200	560	600
		lower load levels in GB					not in practice		

FATIGUE TEST REQUIREMENTS FROM VARIOUS STANDARDS

	STANDARDS						
Requirements	**ISO 15630-1**	**ENV 10080**	**BS 4449:2005**	**DS 13080**	**NS 3576-3**	**SFS 1201**	**LNEC E-460**
Free length; mm	≥ 140 or $14D_n$	---	---	---	---	$14D_n$	≥ 140 or $14D_n$
Number of load cycles	Specified by product standard	$\geq 2\times10^6$	$\geq 5\times10^6$	$\geq 2\times10^6$	until failure	$\geq 3\times10^6$	$\geq 2\times10^6$
Frequency, f	1 ÷ 200 Hz	1 ÷ 200 Hz	1 ÷ 200 Hz (in accordance to ISO 15630-1)	---	---	1 ÷ 200 Hz	200 Hz
Upper stress, $\mathbf{R_{up}}$ $R_{up}=\frac{F_{up}}{S_0}$	Specified by product standard	300 MPa	---	$\frac{1}{3}R_{eHk}$	420 MPa 315 MPa 252 MPa 200 MPa	Determined depending on the purpose of the testing, through σ-N diagram	300 MPa
			$D_n\leq16$ 250MPa $16<D_n\leq20$ 231MPa $20<D_n\leq25$ 213MPa $25<D_n\leq32$ 200MPa $D_n>32$ 188MPa	B500BR 167 MPa B550BR 183 MPa			
Lower stress, $\mathbf{R_{low}}$ $R_{low}=\frac{F_{low}}{S_0}$	Specified by product standard	--- (120 MPa)	---	0 MPa	20 MPa 15 MPa 12 MPa 10 MPa		150 MPa
			$D_n\leq16$ 50MPa $16<D_n\leq20$ 45MPa $20<D_n\leq25$ 43MPa $25<D_n\leq32$ 40MPa $D_n>32$ 38MPa				
Stress range, $\mathbf{R_r}$ $R_r=R_{up}-R_{low}$	Specified by product standard	$2\sigma_A$=180 MPa	$\frac{\sigma_{max}}{\sigma_{min}}=0{,}2$	---	400 MPa 300 MPa 240 MPa 190 MPa		--- (150 MPa)
			$D_n\leq16$ 200MPa $16<D_n\leq20$ 185MPa $20<D_n\leq25$ 170MPa $25<D_n\leq32$ 160MPa $D_n>32$ 150MPa	B500BR 167 MPa B550B 183 MPa			
Failure distance from the grips	≥ $2D_n$	---	≥ $2D_n$	---	---	≥ $2D_n$	≥ $2D_n$
Temperature of the test piece	≤ 40°C	---	≤ 40°C (in accordance to ISO 15630-1)	---	---	---	---

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Leading through specialization

RUMUL resonant fatigue testing machines

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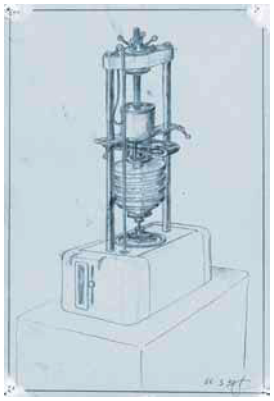
RUMUL – Pioneers in resonant fatigue testing.
A dynamic success story.



RUMUL VIBROPHORE
sketch dated 1938

In the end of the thirties of the last century Max E. Russenberger had his first contacts to the testing technology at Alfred J. Amsler & Co. who where at that time well-established manufacturers of resonant testing machines.

The young engineer was thrilled by all aspects of technology, therefore, it was not really surprising that he was very successfully attributing to many inventions with new and unconventional ideas and solutions.

He world-wide gained recognition with his contributions to the field of resonant fatigue testing technology.

In 1964 Max E. Russenberger founded his own business and Erwin Müller joined him soon as a partner. The short name RUMUL dates back to this partnership. The particular talents in inventing lead to completely new designed resonant testing machines.

In 1978 Roland Berchtold joined the company. His passion for resonant testing technology and more than 12 years of team work with Max E. Russenberger resulted in the development of a new oscillating system consisting of masses and springs which was suitable for many new applications as well as for the smallest as for the biggest testing machines. Also he was the first to introduce computer technology to the field of resonant testing.

In 1989 the company moved into new and larger premises in Neuhausen on the Rhine Falls.

In 1995 Jürg Berchtold, Roland Berchtold's son, joined the company after his graduation in engineering and several stays abroad.

In the year 2005 a fully digital state-of-the art controller for resonant testing machines directed by Jürg Berchtold was introduced to the market with great success. In the same year the innovative high capacity resonant testing machine RUMUL VIBROFORTE was developed.

In 2008 Roland Berchtold transferred the operational management to his son Jürg Berchtold. Roland Berchtold continues to support RUMUL as president of the board of directors and as senior technical consultant.

With the new software generation based on the approved and widespread LabVIEW surrounding RUMUL set in 2010 a new benchmark in resonant fatigue testing.

1938
RUMUL VIBROPHORE concept

1964
company foundation RUMUL

1970
resonant testing machine
RUMUL TESTRONIC 7001
up to 200 kN

1982
compact table model
RUMUL CRACKTRONIC

The company
RUMUL Russenberger
Prüfmaschinen AG,
Neuhausen am Rheinfall,
Switzerland

Max E. Russenberger
Founder of the company
RUMUL

Roland Berchtold
President of the Board of
Directors

Jürg Berchtold
Managing Director

Ingbert Klopfer
Sales Manager

The philosophy of the company reads:

- simple concepts
- application and user oriented solutions
- fair partnership with our customers

These principles, our concentration to the resonant testing technology as well as the increased demand for fast and at the same time energy saving and non-polluting testing systems ensure that we will remain your reliable, innovative and qualified partner in the future.

Resonant Fatigue Testing = RUMUL

1986
RUMUL TESTRONIC with new original dynamic drive „RUMUL MAGNODYN" up to 250 kN

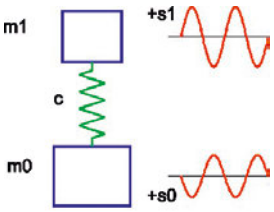
1992
RUMUL MIKROTRON 5 kN and 20 kN new generation with T-slotted table for component testing

2000
certification according to ISO 9001

2005
fully digital controller RUMUL TOPP and high capacity testing machine RUMUL VIBROFORTE 500 kN

2010
RUMUL Software based on LabVIEW

Save time and money with RUMUL resonant fatigue testing machines



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

Two-Mass-Oscillating-System (simplified)

With a resonant testing machine dynamic loads can be applied to specimens and components, which in in most cases are superimposed by a static load.
The static load is generated by a maintenance free servo motor, the dynamic load by a maintenance free oscillating system (resonator) oscillating in its natural frequency. The oscillating system consists of masses and springs, the specimen itself being part of this oscillating system.
RUMUL resonant testing machines work at full resonance, i.e. the operating point is situated on the top of the resonance curve, achieving thus a very high amplification of the applied excitation load.

A correspondingly controlled and excited electromagnet supplies as much energy to the oscillating system to reach and maintain the oscillating amplitude. Due to the resonant effect the power consumption and thus the running costs are very low (only approx. 1 % to 2 % in comparison to servo hydraulic testing systems).
The construction of the different oscillating systems allows very high test frequencies (approx. 40 Hz – 260 Hz) resulting in very short test times. According to type of specimen, test load and activated masses the test times may by reduced by the coefficient 2 to 20 in comparison to servo hydraulic test systems.

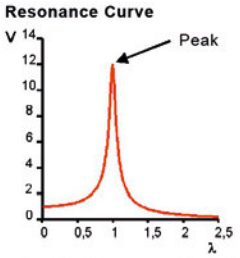
1 Fastener fatigue test
2 Chain fatigue test
3 Rebar fatigue test
4 Precracked CT-samples

High test frequencies
at extremely low running costs

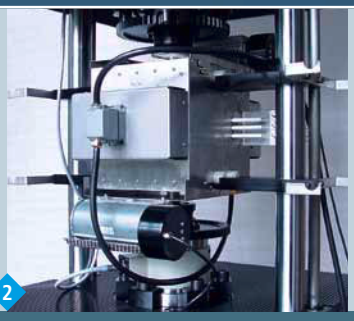
The most common applications for resonant testing machines are fatigue tests (S/N curves) on specimens and more and more on components in the High Cycle Fatigue (HCF) and Very High Cycle Fatigue (VHCF) range.

These tests may be run under ambient temperature or using special equipment under environmental simulation conditions (temperature, corrosion etc). With the software module block program block tests and blocked random tests can be executed.

In the range of fracture mechanics tests fast and economic precracking tests (generating of a fatigue crack) are possible by means of the frequency drop detection without the need of using crack length measurement systems. Fatigue crack growth tests and the determination of the ΔK-Threshold value on fracture mechanics specimens is a further application range where RUMUL has more than 25 years of experience and where the advantages of fast and economic tests with resonant testing machines satisfy our customers.

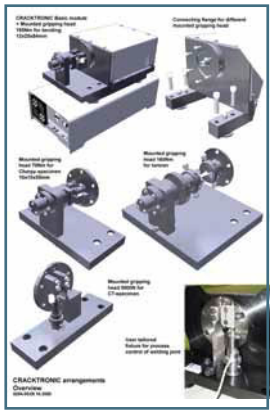


1 Temperature chamber
2 Furnace RUMUL THERMOTRON



RUMUL CRACKTRONIC

Our little one with the smart rotary drive



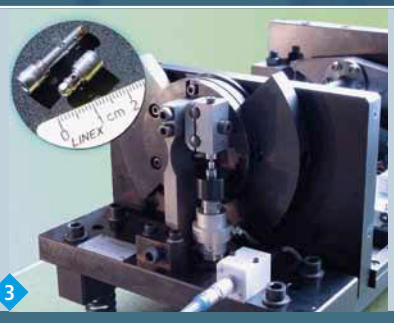
CRACKTRONIC
Module Arrangements

The RUMUL CRACKTRONIC is our table model combining minimum weight and low space requirement for fast dynamic bending load applications at low cost up to a bending moment of 160 Nm.

An electromagnetic driven resonator, built as a rotary oscillator, creates an appropriate pure bending moment. A static moment can be applied to the specimen independent from the dynamic drive by the use of a torsion rod.
Originally designed for the precracking of fracture mechanics specimens today's modular concept offers the following test possibilities:

Bending up to 160 Nm, torsion up to 160 Nm and tension up to 8 kN.
Besides the standard modules there are customer specific special modules available for the testing of small components such as valve needles, injection valves etc.
The test frequency ranges from 40 Hz to 250 Hz depending on type of specimen, test module and activated masses and can be adjusted in 6 steps.
Due to the very compact construction the RUMUL CRACKTRONIC is especially suited for the use in the nuclear industry in «hot cells» for precracking of contaminated small CT, Charpy and Mini Charpy specimens.

1 Torsion module
2 CT-module
3 Customized module for valve needles



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.

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 similar testing systems). 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).

RUMUL HydroGrip with joining technology test sample

RUMUL MIKROTRON lightweight, universal and fast

1 3-point-bending device
2 4-point-bending device
3 Torsion device

RUMUL TESTRONIC

The original with the dynamic drive MAGNODYN

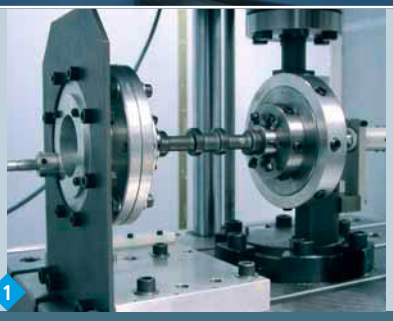
4-point-bending device
resp. 8-point-bending device
according to ISO 12108

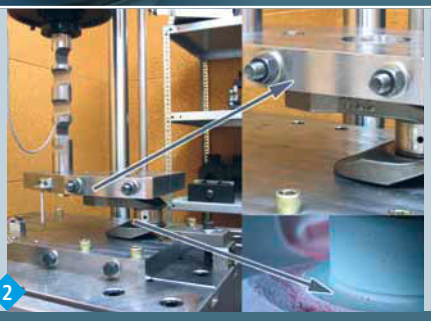
The RUMUL TESTRONIC is based on the latest technologies of engineering mechanics and electrical engineering. The machine is equipped with the high-performance dynamic drive „RUMUL MAGNODYN".

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.

1 Camshaft torsion fatigue test
2 Crankshaft bending fatigue test
3 Conrod fatigue test





RUMUL VIBROFORTE

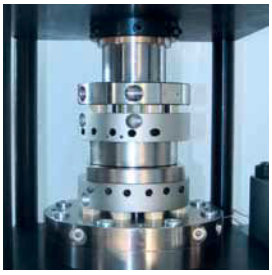
Our most powerful one with the innovative bipolar drive

In combination with the RUMUL gripping devices which are optimized for the use together with resonant testing machines the RUMUL VIBROFORTE is the ideal testing system for fast and economic dynamic testing of standard specimens and components such as conrods, chains, rebars, fasteners etc.

The arrangement of two oscillating systems working in the opposite direction and the use of two spindles for the static drive ensure the following advantages:

- surprisingly light construction for a resonant testing machine with 500 kN nominal load (approx. 4.400 kgs)
- static maximum load equals the nominal load of the machine (calibration amongst others)
- clearly increased dynamic performance by the use of two magnets
- very ergonomic working height of 1.000 mm only

The vertical test space is adjustable in a wide range to the customer specific requirements by the prolongation of the columns. Depending on type of specimen and activated masses of the oscillating system (adjustable in 4 steps) the operating frequency ranges from 50 Hz to 160 Hz.



Compression load frame for cylinder head sealings

RUMUL VIBROFORTE powerful, ergonomic, lightweight and compact

1 Truck conrod fatigue test
2 RUMUL HydroGrip 500
3 Chain fatigue test

The RUMUL TOPP Solution
with RUMUL Software under LabView

The digital RUMUL controller unit 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 testing machines built by RUMUL, Zwick (AMSLER) or SCHENCK.

Easy test setup 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:

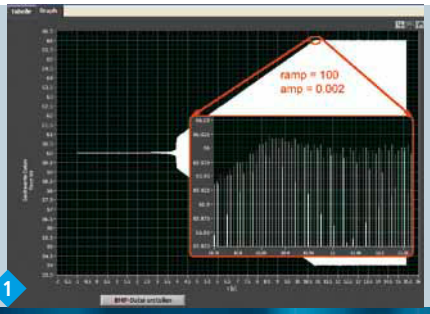
- S/N Fatigue (WOEHLER) for extended fatigue tests
- CRACK GROWTH for crack growth investigation
- PRECRACK for the precracking of fracture mechanics specimens according to all current standards
- BLOCK for fatigue tests on different load levels based on time or on number of load cycles*
- LabVIEW based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

1 Digital control unit RUMUL TOPP

* Possibility 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 program XP



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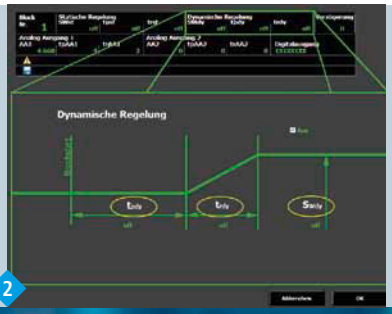

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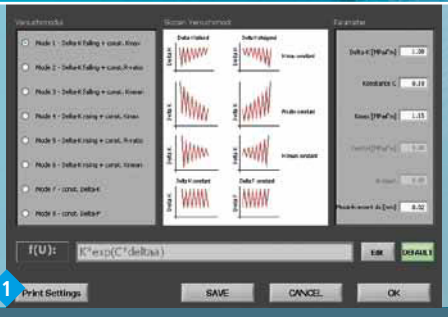
1 Test modes in the crack growth software
2 Crack closure effect when performing a da/dN test



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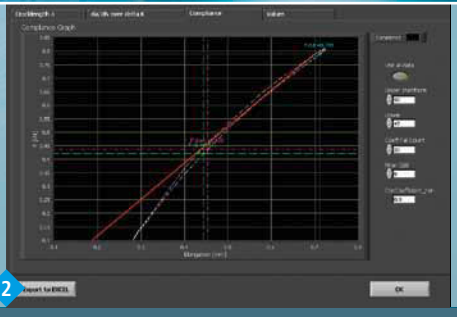

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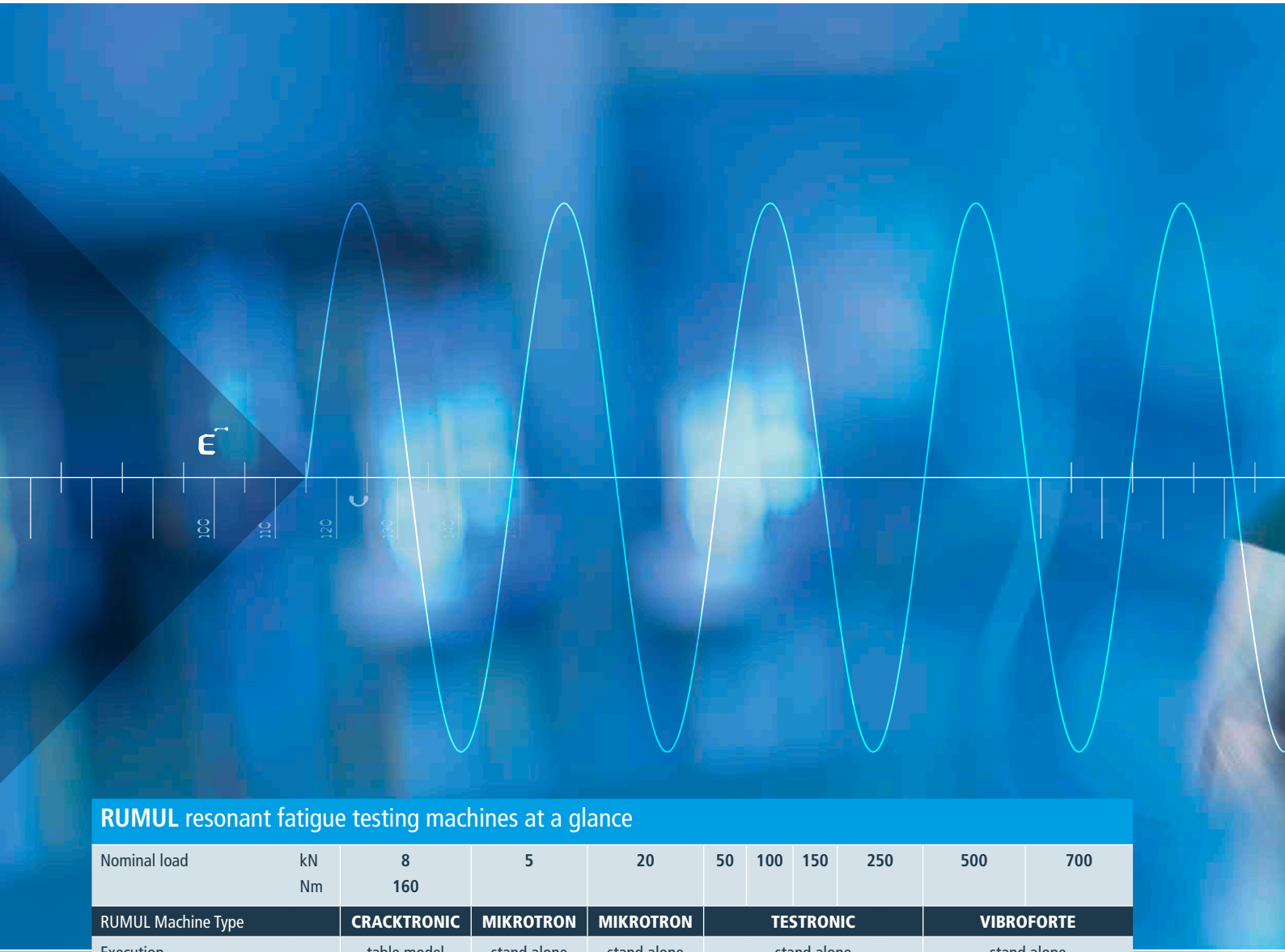
BUREAU VERITAS
Certification



RUMUL resonant fatigue testing machines at a glance

Nominal load	kN Nm	**8** **160**	**5**	**20**	**50**	**100**	**150**	**250**	**500**	**700**
RUMUL Machine Type		**CRACKTRONIC**	**MIKROTRON**	**MIKROTRON**	**TESTRONIC**				**VIBROFORTE**	
Execution		table model	stand alone	stand alone	stand alone				stand alone	
Max. static load	kN Nm	4 100	5	20	50	100	150	150 250	500	550
Max. dynamic amplitude	kN Nm	± 4 ± 80	± 2,5	± 10	± 25	± 50	± 75	± 125	± 250	± 250
Frequency range[1]	Hz	40 – 250	40 – 250	40 – 250	40 – 260				50 – 160	50 – 160
Frequency steps		6	4	5	8				4	4
Daylight between columns[2]	mm	—	500	500	500				700	700
Max. vertical test space[2]	mm	—	530	530	approx. 600				approx. 1.100	approx. 1.100
Total height approx.	mm	450	2.300	2.450	2.700				3.100	3.100
Total weight approx.	kg	80	500	600	3.000				4.400	4.800

[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.

RUSSENBERGER PRÜFMASCHINEN AG

RUMUL Fatigue Software LabVIEW

Display panel page 1:

Display panel page 2:

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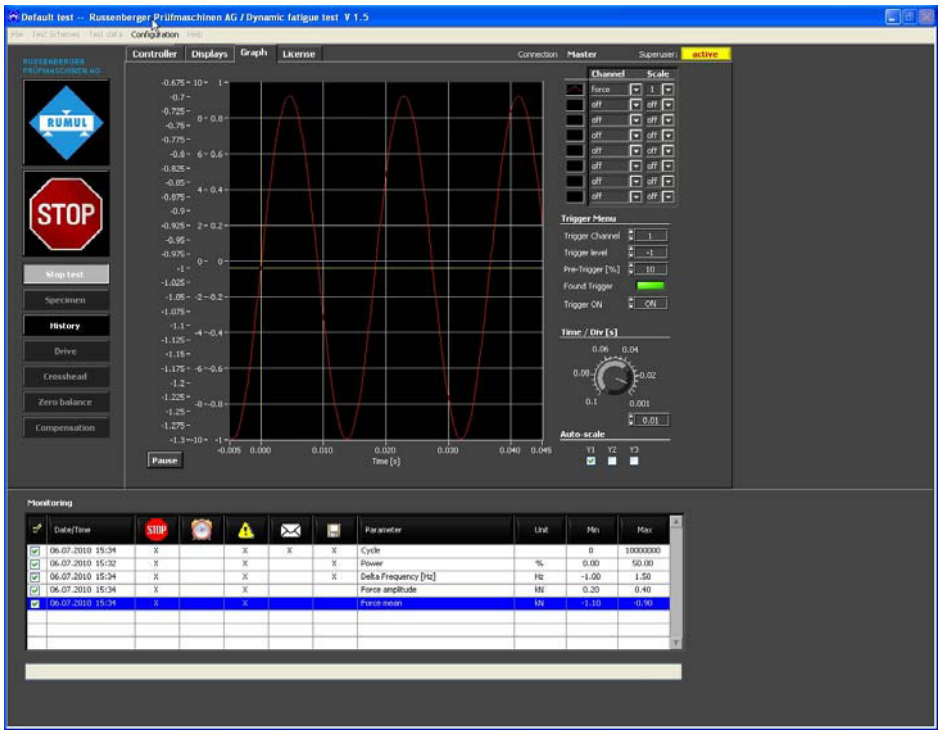
RUMUL Fatigue Software LabView

Panel Graphical Display/Oscilloscope: :



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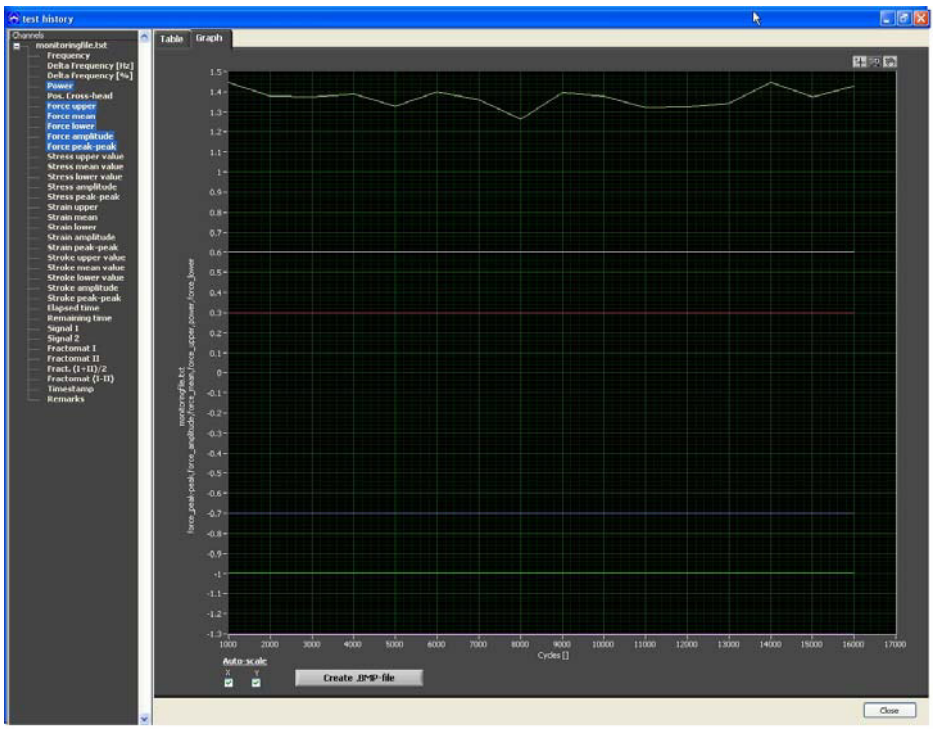

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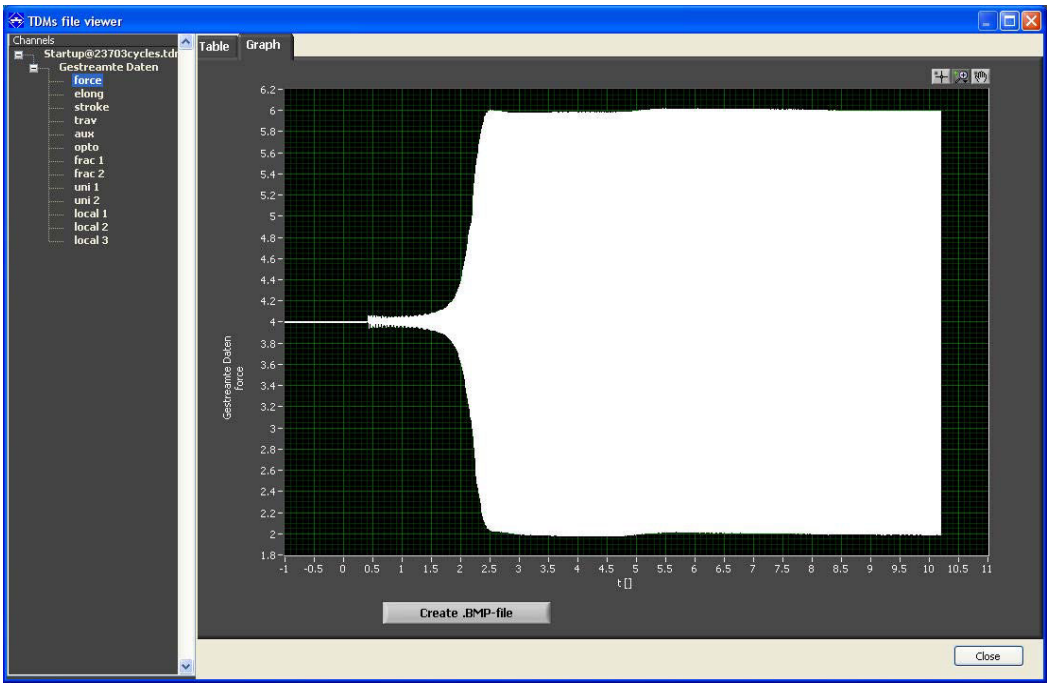
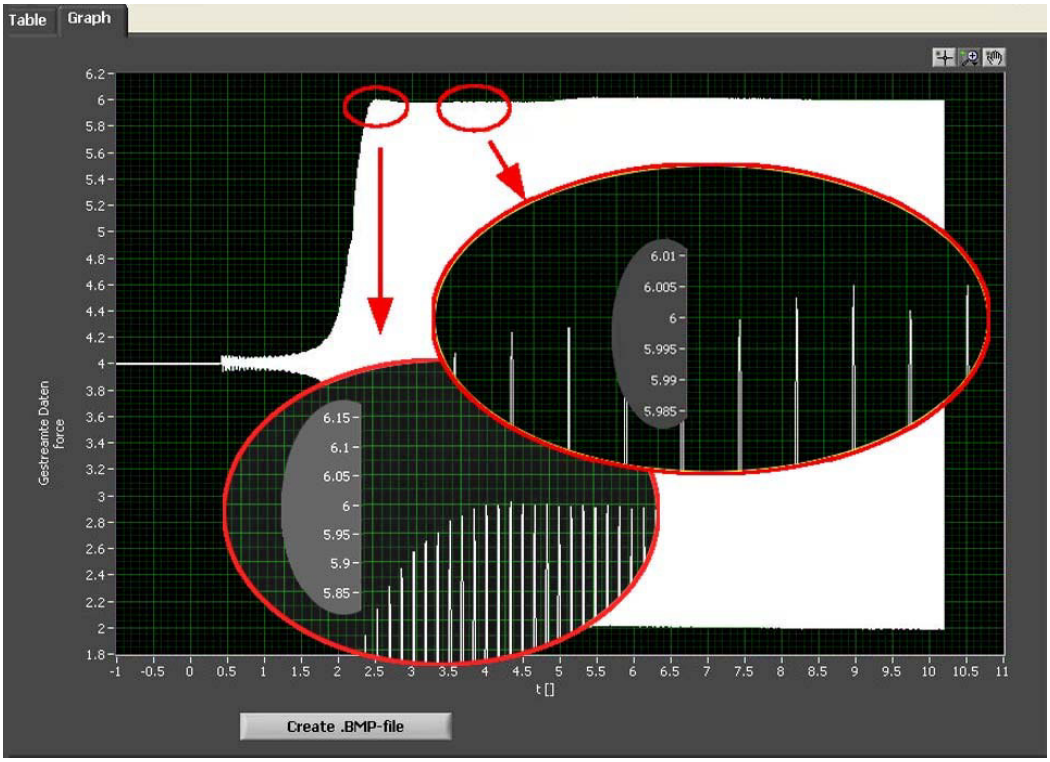
RUMUL Woehler Software LabView

Stream Data Viewer-Multichannel:



Stream Data Viewer-Zoom:



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