We thank you very much for your visit and would be pleased to welcome you again at the testXpo 29th International Forum for Materials Testing, 12th-15th October 2020.
We welcome you to our ZwickRoell premises!

This info will ensure you a pleasant stay at our factory premises. This is to inform you about possible dangers, our safety regulations and safety devices. Please read them carefully and adhere strictly to them. This information is valid for all our visitors and customers. We would like to wish you a pleasant and safe stay with us.

General Safety and Security Information:

- No smoking in buildings
- No photography on the factory premises
- Video control on the factory premises
- No unauthorized copying. We herewith refer to the copyright of all drawings and circuit diagrams.

When you are visiting our production facilities (mechanical manufacturing and assembly halls):

- Do not leave the indicated routes. Do not go near the machines.
- When entering the halls please make yourself familiar with the escape routes in case of emergency.
- In case of an accident please follow the instructions on the information boards.
- Please do not forget that trucks and forklifts are driving on the premises. Therefore before crossing the road please pay special attention to the moving traffic.
- Do not walk under raised loads.
Visit our homepage:
www.zwickroell.com

Visit our YouTube channel:
www.youtube.de/ZwickRoellTV

Follow us on Twitter:
www.twitter.com/ZwickRoellGroup

Follow us on LinkedIn:
www.linkedin.com/company/363210

Follow us on Instagram:
www.instagram.com/zwickroell
Dear Visitors,

When 2,000 people from over 50 countries travel to Ulm, Germany in the middle of October, you know it must be testXpo time again. We are excited to be able to welcome you as our guest this year.

Whether it is at one of our 250 exhibits, at one the 50 presentations that will be held, or with one of our 25 co-exhibitors, we encourage you to take this opportunity to speak with an on-site expert about your specific test tasks. We would also greatly appreciate your feedback on our latest testing solutions while you are here so that we can incorporate it into our future product developments.

We hope you have an exciting and informative visit. Thank you for joining us at this year's testXpo!

Christine Dübeler
Managing Director
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Auswerte-Software SAFD

Statistical Analysis of Fatigue Data

Sie wollen Versuchsresultate schnell nutzen und nicht langwierig manuell auswerten und darstellen? SAFD, die Software zur statistischen Auswertung von Schwingversuchen erspart Ihnen täglich wertvolle Arbeitszeit.

In Sekunden präsentiert Sie mit SAFD Ihre aktuellen Auswertungsergebnisse. Sie können Ihre Ermüdungsversuche rationell begleiten, was sich auf die Versuchsleistung, den Probeneinsatz und die Qualität Ihres Resultats positiv auswirkt. Auf Mausklick lässt sich die Performance der gebotenen Verteilungsgesetze und Auswertungsvarianten beurteilen oder Vergleiche Ihrer Ergebnisse zu anderen Wöhlerkurven herstellen.

Programm:

* (Windows) zur universellen Auswertung von spannungskontrollierten Schwungfestigkeits- und Ermüdungsversuchen im Zeitfestigkeitsgebiet (High Cycle Fatigue) und im Übergangsbereich zur Dauerfestigkeit (Long Life Fatigue).
* Darstellung der Auswertungsergebnisse und der Versuchsdaten im Wöhler-Diagramm (einfach / doppelogarithmisch) und im Wahrscheinlichkeitsnetz.

Verteilungsgesetze und Auswertung nach:

Implementation von Log.- / Normal- , Sin- und Weibull-Verteilung, Standards nach:

* ISO 12107 (2017-E)
* DIN 50100 (2018)
* DIN 969 (1997-12)
* ISO 3800 (1993- E)

Optimierte (Verteilungs-) Korrelation über variable Schätzfunktion und globale Verteilung im HCF-Bereich mit zur Neigungslinie der mittleren Lebensdauer normierter Streuspanne.

Prüfverfahren:

* Praxisgerechte Kompatibilität von Wöhler- / Perfschärverfahren,
* vollständige Zufallsmatrix,
* Horizontverfahren (z.B. Abgrenzungsverfahren),
* Treppenstufenverfahren
* Kombinations- bzw. Mischverfahren.
Program

09:00 a.m.
Start of the testXpo trade fair for testing technology

11:45 a.m.
Official welcome followed by lunch in the marquee

17:00 p.m.
End of the testXpo trade fair for testing technology

Presentations:
Notable speakers from industry and research have put together interesting presentations for you on the topic of materials testing.
Exhibitors, Exhibits & Applications
## Applications and exhibits

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# Exhibitors and exhibits

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</table>
Addresses of exhibitors

4lab GmbH
Zeissstrasse 5, D-89264 Weissenhorn
Tel.: +49 (0) 7309 95 919 - 60, Fax: +49 (0) 7309 95 919 - 59
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e-Mail: braun.christoph@4lab.de

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e-Mail: info@atlas-mts.com, Web: www.atlas-mts.com

CaTs³ Limited
The Priory, Priory Road, Wolston, Warwickshire, CV8 3FX, United Kingdom
Tel +44 (0) 2476 – 546 159
e-Mail: info@cats3.net, Web: www.cats3.net

GmbH
Friedrich-Ebert-Straße, D-51429 Bergisch Gladbach
Tel.: +49 (0) 2204-84 2430, Fax: +49 (0) 2204-84 2431
e-Mail: info@gmbh.com, Web: www.metrology.com

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e-Mail: haver@haverboecker.com, Web: www.haver-partikelanalyse.com

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e-Mail: Achim.Frick@hs-aalen.de
Web: www.hs-aalen.de / www.hs-aalen.de/de/facilities/181
Addresses of exhibitors

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e-Mail: info@hbm.com, Web: www.hbm.com

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e-Mail: office@iew.eu, Web: www.iew.eu

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e-Mail: safd@iapk.rwth-aachen.de, Internet: www.rwth-aachen.de

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e-Mail: sales@indentec.com, Web: www.indentec.com

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e-Mail: info@iNDTact.de, Web: www.iNDTact.de

ITA Academy - Institut für Textiltechnik der RWTH Aachen University
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e-Mail: ita@ita.rwth-aachen.de, Web www.ita.rwth-aachen.de

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e-Mail: info@karldeutsch.de, Web: www.karldeutsch.de

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Tel.: +49 (0) 21 91-698-0, Fax: +49 (0) 21 91-6 00 23
e-Mail: info.de@kistler.com, Web: www.kistler.com
Addresses of exhibitors

**Mahr GmbH**
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Tel.: +49 (0) 711-9312 785, Fax: +49 (0) 711-9312 756
Email: info@mahr.de, Web: www.mahr.com

**Malvern Panalytical GmbH**
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E-Mail: info@malvernpanalytical.com, Web: www.malvernpanalytical.com

**NETZSCH-Gerätebau GmbH**
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E-Mail: at@netzsch.com, Web: www.netzsch-thermal-analysis.com

**OLYMPUS Deutschland GmbH**
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E-Mail: mikroskopie@olympus.de, Web: www.olympus.de

**Open Hybrid LabFactory e.V.**
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**QDA SOLUTIONS GmbH**
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E-Mail: info@qda-solutions.com, Web: www.qda-solutions.com

**Toni Technik Baustoffprüfsysteme GmbH**
Gustav-Meyer-Allee 25, D-13355 Berlin
Tel.: +49 (0) 30-46 40 39-21, Fax: +49 (0) 30-46 40 39-22
E-Mail: sales@tonitechnik.com, Web: www.tonitechnik.com

**W.S. Werkstoff Service GmbH**
Katernberger Str. 107, D-45327 Essen
Tel.: +49 (0) 201-316 844-0, Fax: +49 (0) 201-316 844-18
E-Mail: info@werkstoff-service.de, Web: www.werkstoff-service.de
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Tel.: +49 (0) 73 05-10-0, Fax: +49 (0) 73 05-10-200
e-Mail: info@zwickroell.com, Web: www.zwickroell.com

ZwickRoell Fuerstenfeld
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Tel: +43 (0)3382-54060-0, Fax: +43 (03)3382-54060-27
e-Mail: office@messphysik.com, Web: www.messphysik.com
From Monday, 28th October 2019
you can download the lectures here

www.testxpo.com
Monday, 14th October 2019

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| V1   | 09:30 - 10:00 | SUNTEST – der Allrounder der Material-Lebensdauerprüfung stellt sich vor  
Uwe Wendt, Atlas Material Testing Technology GmbH KU  |
|      | 10:15 - 10:45 | Reibungszahlprüfung mit testXpert III  
Christoph Bodensteiner, Kistler Instrumente GmbH  |
|      | 11:00 - 11:30 | Interessante Funktionen in testXpert III – Ein Schnupperkurs der ZwickRoell Academy  
Mathias Glashauser, ZwickRoell GmbH & Co. KG  |
|      | 2:15 - 2:45 | testXpert III – Unsere Lösungen für Ihre Anforderungen  
Manfred Goblirsch, ZwickRoell GmbH & Co. KG  |
|      | 3:00 - 3:30 | Kunststoffprüfung: Pendelschlagwerke und Fließprüfgeräte mit neuen Funktionen  
Helmut Fahrenholz, ZwickRoell GmbH & Co. KG  |
| V2   | 09:30 - 10:00 | Servicesicherheit und Zukunftsfähigkeit für ältere Materialprüfmaschinen  
Wolfgang Richardt, ZwickRoell GmbH & Co. KG  |
|      | 10:15 - 10:45 | Sichere Prüfergebnisse  
Aleksander Koprivc, ZwickRoell GmbH & Co. KG  |
|      | 1:30 - 2:00 | Wie lang ist die Faser?  
Knut Laumen, polymerphys IK GmbH  |
|      | 2:15 - 2:45 | Microindentation mit einer konventionellen Dynamischen Mechanischen Analyse zur Bestimmung der lokalen mechanischen Materialeigenschaften von Polymeren  
Esther van Dorp, Hochschule Bonn Rhein Sieg, Fachbereich Angewandte Naturwissenschaften  |
|      | 3:00 - 3:30 | Wie finde ich den passenden Extensometer für meine Anwendung?  
Dr. Erhard Reimann, Katja Müller, ZwickRoell GmbH & Co. KG  |
| V3   | 09:30 - 10:00 | testXpert III – Our solutions for your requirements  
Manfred Goblirsch, ZwickRoell GmbH & Co. KG  |
|      | 10:15 - 10:45 | Practical testing and evaluation of plastics  
Prof. Dr.-Ing. Achim Frick, Hochschule Aalen  |
|      | 11:00 - 11:30 | Pendulum Impact Instruments and Melt Flow Plastometers with new functions  
Helmut Fahrenholz, ZwickRoell GmbH & Co. KG  |
|      | 1:30 - 2:00 | Determination of the Aging Resistance of Polymers with Standardized Tests for Thermo-Oxidative Aging, OIT Determination with Differential Scanning Calorimeter (DSC)  
Jürgen Janoschek, Netzsch Gerätebau GmbH  |
|      | 2:15 - 2:45 | Characterizing the failure properties of materials from the statistical analysis of their fracture surfaces  
Dr. Laurent Ponson, Tortoise  |
|      | 3:00 - 3:30 | Mysterious Ways – The path to Measurement Uncertainty  
Dr. Andreas Balster, Kunststoff-Institut Lüdenscheid  |
## Lectures

**Tuesday, 15th October 2019**

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| V1   | 09:30 - 10:00 | Prüfung und Schadensanalyse von Kunststoffen und Formteilen  
Prof. Dr.-Ing. Achim Frick, Hochschule Aalen                                      |
|      | 10:15 - 10:45 | Kalibrierung als Grundlage für sichere Prüfergebnisse – Interpretation, Messunsicherheit und Klasseneinteilung bei der Kalibrierung  
Stephan Baumann, ZwickRoell GmbH & Co. KG                                           |
|      | 11:00 - 11:30 | Wirbelstromprüfung - Schnelle und kostengünstige Qualitätssicherung in der Fertigung von Einzel- und Massenteilen  
Manfred Cierpinski/Lutz Lindeke, Gallub Werkstoffprüfung GmbH & Co. KG               |
|      | 1:30 - 2:00  | Berührungslose Oberflächenmesstechnik für Produktion, Qualitätssicherung und Forschung  
Uwe Schosser, GmbH                                                                |
|      | 2:15 - 2:45  | testXpert III – Unsere Lösungen für Ihre Anforderungen  
Manfred Goblirsch, ZwickRoell GmbH & Co. KG                                         |
|      | 3:00 - 3:30  | Erprobte ZwickRoell Prüflösungen für Injektionssysteme in der Medizintechnik- und Pharmaindustrie  
Peter Schmidt, Erik Berndt, ZwickRoell GmbH & Co. KG                               |
| V2   | 09:30 - 10:00 | Interessante Funktionen in testXpert III  
– Ein Schnupperkurs der ZwickRoell Academy  
Mathias Glashauser, ZwickRoell GmbH & Co. KG                                        |
|      | 10:15 - 10:45 | Mysterious Ways – Wege zur Messunsicherheit  
Dr. Andreas Balster, Kunststoff-Institut Lüdenscheid                                |
|      | 11:00 - 11:30 | Möglichkeiten der Längen- und Breitenänderungsmessung für Faserverbundwerkstoffe  
Dr. Hannes Körber, ZwickRoell GmbH & Co. KG                                        |
|      | 1:30 - 2:00  | Nanoindentation und mehr: Ein Überblick zur mechanischen Charakterisierung von Oberflächen und Beschichtungen  
Dr. Erhard Reimann, ZwickRoell GmbH & Co. KG                                       |
|      | 2:15 - 2:45  | Optische 3D Messtechnik zur Materialkennwertermittlung und Deformationsanalyse in der Bauteilprüfung  
Christoph Blumenthal, GOM GmbH                                                   |
|      | 3:00 - 3:30  | Messunsicherheit in der mechanischen Prüfung  
Dr. Eduard Schenuit, ZwickRoell GmbH & Co. KG                                     |
| V3   | 09:30 - 10:00 | Mechanical testing solutions for lithium ion batteries in electric vehicles  
Aleksander Koprivc, ZwickRoell GmbH & Co. KG                                     |
|      | 10:15 - 10:45 | New testing device to evaluate edge cracking resistance and crashworthiness of thin metallic sheets  
Dr. Daniel Casellas Padro, Eurecat                                               |
|      | 11:00 - 11:30 | testXpert III – Our solutions for your requirements  
Manfred Goblirsch, ZwickRoell GmbH & Co. KG                                      |
|      | 1:30 - 2:00  | Ultrafast miniaturised assessment of high-temperature creep properties of metals  
Dr. Daniel Barba, University of Oxford                                          |
|      | 2:15 - 2:45  | Measurement uncertainty in mechanical testing  
Dr. Eduard Schenuit, ZwickRoell GmbH & Co. KG                                  |
## Lectures

**Wednesday, 16th October 2019**

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| V1   | 09:30 - 10:00 | Interessante Funktionen in testXpert III – Ein Schnupperkurs der ZwickRoell Academy  
Mathias Glashauser, ZwickRoell GmbH & Co. KG |
|      | 10:15 - 10:45 | „Damit die Maschine gerade zieht“ – Alignment-Überprüfung und -ausrichtung im Rahmen von Nadcap  
Jörg Bennemann, ZwickRoell GmbH & Co. KG |
|      | 11:00 - 11:30 | Metallzugversuch: Warum die Dehngeschwindigkeit wichtig ist  
Dr. Christoph Henkel, AMAG Rolling GmbH |
|      | 2:15 - 2:45 | testXpert III – Unsere Lösungen für Ihre Anforderungen  
Manfred Goblirsch, ZwickRoell GmbH & Co. KG |
|      | 3:00 - 3:30 | Messunsicherheit in der mechanischen Prüfung  
Dr. Eduard Schenuit, ZwickRoell GmbH & Co. KG |
| V2   | 09:30 - 10:00 | Eigenspannungsmessung mittels Ultraschall – eine Kombination mechanisch-technologischer und zerstörungsfreier Prüfverfahren  
M.Sc. Andreas Leitner, W.S. Werkstoffservice GmbH |
|      | 10:15 - 10:45 | Metallzugversuch: Neue Erkenntnisse aus Ringversuchen – Ist die Dehngeschwindigkeit auch für die Zugfestigkeit Rm wichtig?  
Christian Weißmüller, Institut für Eignungsprüfung IfEP GmbH |
|      | 11:00 - 11:30 | Von der Herausforderung, eine Prägung in Karton objektiv zu bewerten  
Jennes Hünniger, Hochschule für Technik, Wirtschaft und Kultur Leipzig |
|      | 2:15 - 2:45 | Die digitale Transformation entlang der textilen Wertschöpfungskette  
Gesine Köppe, M.Sc., ITA Academy GmbH |
| V3   | 09:30 - 10:00 | testXpert III – Our solutions for your requirements  
Manfred Goblirsch, ZwickRoell GmbH & Co. KG |
|      | 10:15 - 10:45 | The journey of additive manufacturing into 3D industrial printing solutions  
Jose Maria Bondia/Lars Bertenbreiter, Hewlett Packard 3D Printing |
|      | 11:00 - 11:30 | Application of Micro-Mechanical Testing for Coating Characterization  
Bipasha Bose, Ph.D., McMaster University |
|      | 1:30 - 2:00 | Capillary Rheometry – A Method to Predict Flow Properties under Processing Conditions  
Torsten Remmler, Malvern Panalytical GmbH |
|      | 2:15 - 2:45 | Material characterization of advanced composites  
Dr. Hannes Körber, ZwickRoell GmbH & Co. KG |
|      | 3:00 - 3:30 | Compression testing of fiber-reinforced polymer matrix composites  
Dr. Hannes Körber, ZwickRoell GmbH & Co. KG |
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<td>V1</td>
<td>09:30 - 10:00</td>
<td><strong>Sichere und nachvollziehbare Prüfungen für die Medizintechnik- und Pharmaindustrie</strong>&lt;br&gt;<strong>Erik Berndt, ZwickRoell GmbH &amp; Co. KG</strong></td>
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<td><strong>Interessante Funktionen in testXpert III – Ein Schnupperkurs der ZwickRoell Academy</strong>&lt;br&gt;<strong>Mathias Glashauser, ZwickRoell GmbH &amp; Co. KG</strong></td>
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<td>2:15 - 2:45</td>
<td><strong>Eigenschaften einer für nationale und internationale Vergleichsmessungen optimierten Referenzmesskette</strong>&lt;br&gt;<strong>Dr. André Schäfer, Hottinger Baldwin Messtechnik GmbH</strong></td>
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<td>3:00 - 3:30</td>
<td><strong>Sichere Prüfergebnisse in der Härteprüfung</strong>&lt;br&gt;<strong>Sascha Latzke, LATZKE Härteprüfung GmbH</strong></td>
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<tr>
<td>V2</td>
<td>09:30 - 10:00</td>
<td><strong>Zuverlässige Messung des Indentationsmoduls superharter Schichten durch verbesserte Extrapolation</strong>&lt;br&gt;<strong>Martin Zawischa, Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS</strong></td>
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<td></td>
<td>10:15 - 10:45</td>
<td><strong>Characterisierung von Blechwerkstoffen im ebenen Torsionsversuch</strong>&lt;br&gt;<strong>M.Sc. Heinrich Traphöner, Technische Universität Dortmund</strong></td>
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<td>11:00 - 11:30</td>
<td><strong>Viskositätsmessungen in der Qualitätssicherung – Worauf muss man achten?</strong>&lt;br&gt;<strong>Torsten Remmler, Malvern Panalytical GmbH</strong></td>
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<td><strong>testXpert III – Unsere Lösungen für Ihre Anforderungen</strong>&lt;br&gt;<strong>Manfred Goblirsch, ZwickRoell GmbH &amp; Co. KG</strong></td>
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<td>3:00 - 3:30</td>
<td><strong>Mehrkomponenten-Kraftaufnehmer Kalibrierung in der Praxis</strong>&lt;br&gt;<strong>Gerhard Schuder, GTM Testing and Metrology GmbH</strong></td>
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<tr>
<td>V3</td>
<td>09:30 - 10:00</td>
<td><strong>Service reliability and upgradeability for older testing machines</strong>&lt;br&gt;<strong>Wolfgang Richardt, ZwickRoell GmbH &amp; Co. KG</strong></td>
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<td>10:15 - 10:45</td>
<td><strong>testXpert III – Our solutions for your requirements</strong>&lt;br&gt;<strong>Manfred Goblirsch, ZwickRoell GmbH &amp; Co. KG</strong></td>
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<td><strong>New testing device to evaluate edge cracking resistance and crashworthiness of thin metallic sheets</strong>&lt;br&gt;<strong>Dr. Daniel Casellas Padro, Eurecat</strong></td>
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<td>1:30 - 2:00</td>
<td><strong>How do I find the right extensometer for my application?</strong>&lt;br&gt;<strong>Dr. Erhard Reimann, Katja Müller, ZwickRoell GmbH &amp; Co. KG</strong></td>
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<td>2:15 - 2:45</td>
<td><strong>Digital transformation along the textile value chain</strong>&lt;br&gt;<strong>Gesine Köppe, M.Sc., ITA Academy GmbH</strong></td>
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<td>3:00 - 3:30</td>
<td><strong>Metal Tensile Test: Recent findings out of Round Robin tests – How important is the strain rate for Tensile Strength Rm?</strong>&lt;br&gt;<strong>Christian Weißmüller, Institut für Eignungsprüfung IfEP GmbH</strong></td>
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More information: www.zwickroell.com/academia

On display for universities and other higher education institutes are machine and software solutions suitable for thorough training in engineering and materials sciences. More than 500 universities and teaching institutes rely on our expertise. Also under the spotlight in this exhibition area are solutions for research and development.
001 Determination of Edge Tear Strength during Tensile Testing

Testing solution:
- AllroundLine Z050 TH, Fmax 50 kN
- Additional top crosshead for use of the second test area
- Hydraulic grips, Fmax 50 kN
- laserXtens 2-220 HP

Advantages and benefits:
- The use of more than one test area allows for quick changes between different applications, eliminating reconfiguration time.
- Easy adaptation of your own test tools is simple with the ZwickRoell T-slotted system.
- laserXtens' unique technology eliminates the need for specimen marking.

002 Tensile Test on Composites with Acoustic Emission Analysis

Testing solution:
- AllroundLine Z050 TH, Fmax 50 kN
- Body over wedge grips, Fmax 50 kN
- makroXtens II type HP
- Drive unit for setting the gauge length

Advantages and benefits:
- With the use of different interfaces, a wide variety of external signals can be easily and synchronously integrated in testXpert, without operator influence.
iNDTact GmbH

smartPREDICT

Application:
Laboratory, test bench and equipment measurement for acoustic emission, vibration and motion, customized condition monitoring solutions.

Technical Data:
• Microcontroller Unit: ARM Cortex M7, 2 MB Flash, 512 kB RAM
• LxWxH [mm]: 83 x 42 x 23 mm
• Frequency Range (Acoustic Emission): 6 ... 48.000 Hz
• Signal to Noise Ratio: 99 dB
• Temperature resistance: - 40 ... 85 °C
• Connector: RJ45 / Ethernet UDP
• Other sensors: Acceleration, Angular Velocity

Special features:
SmartPREDICT is a multi-sensor system for all kinds of measurement applications. It is used in laboratories, on test benches or customer specific applications in condition monitoring of production machines, buildings or power plants. Due to high bandwidth, the scope of industries in which condition monitoring with smartPREDICT may be used, is endless.

With smartPREDICTs vast frequency band of 6 Hz to 48 kHz and a very high sensitivity, the multi sensor system is made for precise broadband measurement. It is able to detect very low amplitude noise in through structures and materials. In the tensile test application, acoustic events can be related to stress parameters of materials which leads to a deeper understanding of component behavior.
004 Software SAFD

Statistical Analysis of Fatigue Data
You want to use test results quickly and do not want to take a long time to evaluate and display them manually. SAFD, the software for statistical evaluation of vibration tests, saves you valuable working time every day.

With SAFD, you can present your current evaluation results in seconds. You can accompany your fatigue tests rationally, which will have a positive effect on test performance, sample use and the quality of your results. At the click of a mouse, you can evaluate the performance of the distribution laws and evaluation variants offered or compare your results with other S-N-curves.

Software:
- Windows) for universal evaluation of stress controlled fatigue tests in the high cycle fatigue (HCF) and the long life fatigue region (LLF).
- Presentation of the evaluation results and test data as S-N diagram (semi- or double logarithmic) and in probability graphics.

Probability distributions and statistical methods:
Implementation of log- / normal, sine and Weibull distribution, standards according to:
- ISO 12107 (2017-E)
- DIN 50100 (2018)
- DIN 969 (1997-12)
- ISO 3800 (1993-E)

Alternative tools with variable estimator function for correlation optimum and global HCF-distribution with scatter normalized to the mean slope.

Supported testing methods:
- Practice oriented compatibility of Wöhler- / step down test
- complete test matrix
- level tests (e.g. boundary method)
- staircase tests and combined test procedures
ZwickRoell GmbH & Co. KG

Two in One Functionality—Static and Dynamic Testing with the Vibrophore for Example on CT Specimens (ASTM E399)

Testing solution:
- Vibrophore 250kN
- Two-part test process: Part 1: Specimen pre-cracking (=create a crack) Part 2: Static tensile test to determine the critical stress intensity factor K1C
- testControl II measurement and control electronics
- testXpert Research software for illustration of the complete test sequence

Advantages and benefits:
- Full-fledged static and dynamic testing machine allows for pre-cracking (=crack creation) as well as the implementation of the static tensile test for determination of the K1C to ASTM E399
- High test frequencies lead to fast crack growth even with lower stress intensity → high specimen throughput
- Universities have no-cost access to hundreds of test programs for static and dynamic applications.
- If new requirements develop from future research projects, the scope of functions of the Vibrophore can be expanded by retrofitting diverse specimen grips, extensometers, fixtures, temperature chambers and high temperature furnaces.

Coming soon

TSens for Thermal Determination of the Onset of Yielding in Tensile Testing

Testing solution:
- AllroundLine Z100 SN , Fmax 100 kN
- testControl II Xtension
- Additional height-adjustable crosshead
- Hydraulic grips, Fmax 100 kN
- makroXtens II type HP

Advantages and benefits:
- With the use of different interfaces, a wide variety of external signals can be easily and synchronously integrated in testXpert, without operator influence.
- The new TSens determines the transition to plastic deformation directly via the specimen temperature, with accuracy and without operator influence. With these procedures the component design is more reliable and economical.
Multi-Axial Tensile Test on Sheet Metal

Testing solution:
- AllroundLine Z250 SN, Fmax 250 kN
- Multi-axial tensile device
- Test area lighting

Advantages and benefits:
- The use of more than one test area allows for quick changes between different applications, eliminating reconfiguration time.
- The high level of flexibility of the AllroundLine allows for easy installation of complex test arrangements, such as a fixture for multi-axial tensile tests.
- The five load cells required for this test are connected to a standard AllroundLine, which then still provides further plug-in slots for additional signals.

Intelligent and Reliable Management of Research Data

Testing solution:
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Pneumatic grips, Fmax 2.5 kN
- zwickiLine longstroke extensometer

Advantages and benefits:
- The testXpert testing software meets all requirements for the handling of research data, including traceability, archiving, as well as further processing.

testControl II Interface Solutions for National Instruments and HBM

Testing solution:
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Wedge Grips, Fmax 2.5kN
- Multi-function module with digital and analog inputs and outputs
- HBM QuantumX measurement amplifier

Advantages and benefits:
- In addition to the testControl II electronics interfaces, it is also easy to synchronously integrate external measurement amplifiers in testXpert.

Mobile Testing Machine for Academia

Testing solution:
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Wedge Grips, Fmax 2.5kN
- videoXtens modular system with one camera
- Cart

Advantages and benefits:
- With teachXpert ZwickRoell offers a complete and mobile testing machine for use in the classroom or lecture hall, and allows students to experience materials testing live and in person.
More information: www.zwickroell.com/modernization
www.zwickroell.com/service

In this area you will learn how ZwickRoell supports you in operating your testing machine and in addressing all of your After Sales questions. Discover the benefits of our calibration offerings, learn about training opportunities, and see modernization examples for older testing machines. You will also want to visit the After Sales Center if you have specific questions regarding a current project.
Plan of site After Sales Center A1
Hall plan After Sales Center A1
Our After Sales Center is the central point of contact for modernizations, retrofitting, services and training courses, regardless of whether your testing requirements are static or dynamic.

What are the benefits of modernization? Which accessories can be retrofitted? Which services are important for a testing machine?
Here you will find answers to all of these questions addressing your existing materials testing machines.

The ZwickRoell team will gladly go over:
- The processes and requirements for modernization in the areas of static and dynamic testing
- Which specimen grips or extensometers can be retrofitted
- Any questions concerning testXpert
- The operating principle of our new machine monitoring system
- Interfaces and data connectivity possibilities with your IT environment
- Which training courses can help with an even more efficient use of the software
- The benefits provided by our services
- Our comprehensive calibration portfolio.

Use your dossier/order number to discuss current projects with ZwickRoell experts directly at the computer terminal.

ZwickRoell Modernization of a Third Party Machine
Instron 4505 retroLine testControl II

Modernization of a 100 kN Instron 4505 using ZwickRoell technology.
ZwickRoell modernizes materials testing machines regardless of manufacturer and updates your machines with state-of-the-art technology. Materials testing machines from over 50 different manufacturers can now be modernized by ZwickRoell.

Key features:
- Refurbishing and painting of the load frame
- Installation of a new drive and new safety components
- Update of electronics with testControl II and implementation of the testXpert III intelligent testing software

Advantages and benefits:
- Service and upgrade availability for the testing machine are ensured for at least 10 years.
- New warranty terms apply to the complete materials testing machine (with modernization completed in-house by ZwickRoell).
- Accessory options can be expanded with our comprehensive portfolio.
ZwickRoell GmbH & Co. KG

OLD vs. NEW – 1984 Zwick 1488 -> Zwick 1488 retroLine testControl II, Modernized 2019

Experience a direct comparison between a Zwick 1488 materials testing machine from 1984 and a modernized Zwick 1488 materials testing machine.

Key features:
- What happens to the old load frame? – It stands out with new paint and new design
- Is operational safety improved with the modernization? – the materials testing machine is equipped with new safety components—for example, the old protective pane is replaced with a latest generation pane
- Which machine components are renewed? – A machine-specific modernization set is on display

Advantages and benefits:
- Service and upgrade availability for the testing machine are ensured for at least 10 years.
- Compatibility with current Windows operating systems, such as Windows 10, is ensured.
- Operator safety is improved and in some cases re-established.

Obtain the Service Security and Long-Term Upgradeability for your Materials Testing Machines Zwick 1445 with the electronics generation DUPS and testControl II

For materials testing machines with DUPS measurement and control electronics, the 10-year replacement parts warranty and corresponding support expired in 2014. As you know, we are always committed to helping you keep your machines and instruments fully functional. This becomes more and more difficult when replacing individual electronics and electromechanical components. To avoid system failures we recommend modernizing your machines with the latest measurement and control electronics testControl II.

Questions:
- What is the current spare parts availability?
- With which software is my current operating system compatible?
- Are new software features available for my testing system?

Advantages and benefits:
- Guaranteed spare parts availability and corresponding support for the next 10 years, providing long-term investment security.
- Expanded retrofitting possibilities in areas including non-contact optical extensometers
- Precise control and high positioning accuracy broaden the application range for extremely demanding tests.
With the new ZwickRoell machine monitoring system, machine data such as the current machine status or upcoming services are displayed on a user-friendly dashboard. The data from a cyclical test is collected and reported in real time throughout the duration of the measurement.

Features:
- Always keep your materials testing machine's important data within view: display of the current machine status such as next calibration date, overloads, time in operation and much more
- Indication of upcoming services, including calibration, services, and maintenance
- Conventional, manual checklists are a thing of the past—electronic service checklists with editable service intervals are now at your disposal
- Information on both active and inactive accessories and their conditions, are clearly visualized.

ZwickRoell Software Services

We offer a wide range of services in connection with our testing software:
- Upgrade from testXpert or testXpert II to testXpert III
- Customized software adaptations
- Training courses

Our software engineers will assist you in implementing customized solutions, including:
- Integrating testXpert II and testXpert III into your IT environment (ERP systems, CAQ systems such as qs-STAT, etc.)
- Creation or customization of test standards in line with individual requirements
- Database-supported management of test programs
- Database connection (Oracle, MySQL, etc.)

Training courses at ZwickRoell Academy

The ZwickRoell Academy offers an interesting and wide-ranging training program - we will transform you and your employees into testing specialists! Our portfolio includes courses on testXpert II and testXpert III testing software, metals, plastics, extrusion and hardness testing, together with courses tailored to your organization's individual needs.

Key features:
- Modular, practically based training portfolio
- Courses for beginners and advanced students
- Over 7,000 customers successfully trained
- Courses at various locations, also near you or directly at your premises
- Courses headed by experienced service and laboratory engineers
- Courses can be tailored to customers' individual needs

Advantages and benefits:
- Small teaching groups for optimum transfer of knowledge
- Both practical and theoretical content to ensure efficient handling of testing software and static testing systems
- Course exercises based on set examples to reinforce acquired knowledge
- Comprehensive course documentation, providing an ideal reference work for day-to-day operation
ZwickRoell GmbH & Co. KG

Demand-Based Retrofitting with ZwickRoell
For low and high nominal loads

ZwickRoell offers a wide product portfolio of various specimen grips, fixtures, non-contact extensometers, and systems for testing under temperature. ZwickRoell’s wide range of accessories covers test loads from a few N right up to several MN. In conjunction with suitable extensometers, fixtures, and adapters, testing machines with higher nominal loads can also be used for tests involving lower test loads.

On our Accessory Tree you will find the right accessories for your testing application. Stop by and chat with us!

Calibration of materials testing machines

Dependable calibration of a testing system is a fundamental requirement for reliable testing results. This is why so many customers rely on ZwickRoell as a DAkkS-accredited calibration laboratory with over 120 highly qualified service technicians.

With a comprehensive calibration portfolio backed by the expertise and experience gained from over 10,000 inspections and calibrations annually, ZwickRoell is first choice for testing system calibrations, including systems by other manufacturers.

Key features:
- EN ISO/IEC 17025 accredited calibration laboratory
- Professional, traceable calibration of static and dynamic testing machines, pendulum impact testers, extrusion plastometers, hardness testers and many others, including testing systems by other manufacturers
- Independent and impartial, precise and efficient calibration, with internationally recognized calibration certificates

Advantages and benefits:
- ZwickRoell’s comprehensive calibration portfolio allows us to offer one-stop service while covering a wide range of different standards and requirements
- ZwickRoell calibrations feature a large number of measuring points, covering the full force and measurement ranges
- Low measurement uncertainty delivers high-accuracy test results
- Fast, flexible service delivered by a comprehensive support network, with over 120 service technicians providing on-the-spot assistance
- Inspection and adjustment of ZwickRoell testing systems during calibration reduces the risk of malfunctions or machine downtime, securing productivity
Dynamic modernization showroom

Through modernization services ZwickRoell updates older servo-hydraulic testing systems and Vibrophores to state-of-the-art testing technology—regardless of manufacturer. Our new machines are equipped with innovative and industry proven ZwickRoell components. Modernization of a testing machine usually includes renewal of the measurement and control electronics, as well as the testing software. If necessary, modernization can involve a complete solution with replacement and modification of the hydraulic components. In our Dynamic Modernization showroom you will see products from Schenck, RoellAmsler, and of course ZwickRoell.

When should you modernize?
- The current testing software is outdated
- The operating system is no longer supported (Windows XP, Windows 7)
- Your test requirements or applications have changed
- Improvement or re-establishment of operational safety

Key features of a modernization:
- New digital measurement and control electronics testControl II with corresponding testXpert Research testing software (for single-channel testing machines)
- New Control Cube servo controller with testing software Cubus (for multi-channel and/or complex servo hydraulic applications; optimal for frequent test-arrangement changes)
- Retrofit kits for the adaptation of existing sensors such as load cells and extensometers
- Comprehensive accessory portfolio for demand-based retrofitting

Exhibited products:
- Servo-hydraulic testing machine Schenck, type PC 160N, 63 kN, retroLine testControl II
  - Modernization with testControl II and testXpert Research
  - Overhaul of the load frame
  - Optional: Overhaul of the hydraulic actuator and the servo valve
  - Optional: Retrofitting a protective device
- Servo-hydraulic testing machine RoellAmsler HC25, retroLine testControl II
  - Modernization with testControl II and testXpert Research
  - Overhaul of the load frame
  - Optional: Overhaul of the hydraulic actuator and the servo valve
  - Optional: Retrofitting a protective device
- High speed testing machine Schenck HTM 25/20, 25 kN / 20 m/s, retroLine testControl II
  - Modernization with testControl II and testXpert
  - Overhaul of the load frame
  - Optional: Overhaul of the hydraulic actuator and the servo valve
  - Retrofitting a protective device
- Booth with Control Cube servo controller
  Let our partner CaTs³ show you the Control Cube servo controller in action, and experience the high flexibility and easy expandability of these high-performance measurement and control electronics. The corresponding testing software Cubus is extremely versatile, user friendly, and stands out with its easy, intuitive and well-structured user interface.
Control Cube servo controller and Cubus testing software

Application:
Fatigue and fatigue strength testing, e.g. in the automotive and aerospace sectors

Key features
• Basic controller in 1 or 2-channel versions
• Can be expanded to up to 32 channels
• Modular design
• Large range of expansion options, including additional measurement amplifiers, analog I/O, digital I/O
• Cubuslight basic software for test-bench configuration and routine cyclic tests
• Cubus testing software for advanced requirements such as block programs, ramp tests
• QanTIM simulation software for simulation tests
• Expandable software options, e.g. Autotune function, digital displays etc. etc.

Advantages and benefits
• Simple, flexible operation of complex test benches
• Modular software structure allows optimum adaptation to testing requirements or applications
• Extremely user-friendly operating concept caters for individual test sequence requirements

CaTs³ Limited
A2

Testing Services
Plan of site Testing Services A2
Hall plan Testing Services A2
ZwickRoell Materials and Component Testing Laboratory

The ZwickRoell's Materials and Component Testing Laboratory performs quasi-static, cyclic and dynamic impact tests to customers’ orders. Torsion, hardness and extrusion tests also form part of the portfolio.

With over 50 testing systems, 2,000 accessory parts and experienced and competent materials testing technicians the ZwickRoell testing laboratories are the first choice when it comes to the external testing of various materials and components. Our ZwickRoell testing laboratories provide diverse systems and solutions for your static, dynamic and fatigue tests.

ZwickRoell rely on the test engineers and materials testing technicians’ many years of experience and sound expertise. With ZwickRoell testing laboratories’ expertise and comprehensive equipment, we offer the ideal solution flexibly, quickly and cost effectively relying on reliable test results.

From preparation of the specimen material, to testing, to evaluation and analysis of test results, the ZwickRoell Testing Laboratory offers an expert materials testing service from -40°C to +1,200°C.

Key features:
• ZwickRoell’s Materials and Component Testing Laboratory carries out all types of test precisely, efficiently and in accordance with standards
• Long-term experience and solid expertise in all sectors, including automotive, medicine, mechanical engineering, plastics, composites etc.
• ZwickRoell’s testing laboratories are equipped with state-of-the-art testing systems for a varied range of tests on components and materials of all kinds

Advantages and benefits:
• fast, standard-compliant testing helps to overcome capacity bottlenecks
• contract testing of a wide range of materials and components with precise test results and efficient test performance
• cost-flexibility through the possibility to outsource your tests to the ZwickRoell testing laboratories
• cross-validation to safeguard your test results
• design and modification of test devices
• interim solutions until delivery of newly acquired testing machines and accessories

Modern and comprehensive laboratory equipment for your project-related and contract tests

We perform all types of project-related and contract tests at our testing laboratories for materials and components testing. Continued investments in our laboratory equipment and further training of our staff enables us to guarantee reliable test results.

As the manufacturer, our laboratories are equipped with state-of-the-art, versatile machinery with a comprehensive range of accessories. Take advantage of our expertise for your testing of individual materials and complex components.

Key features:
• Static materials testing machines to 1,200 kN
• Hardness testing machines for all established methods
• Vibrophores up to 500 kN
• Servo-hydraulic materials testing machines up to 250 kN
• Linear motor testing machines up to 10 kN
• High speed testing machines
ZwickRoell GmbH & Co. KG

- Pendulum impact testers with multi-channel systems to gather test data (for example, single strain gage)
- Melt index testers, HDT/Victat stereo microscope
- Comprehensive range of accessories including specimen grips, extensometers, specimen preparation, and temperature conditioning

ZwickRoell Applications Test Laboratory

Comprehensive and expert advice is essential in finding the right materials testing machine solution for your individual testing requirements. Our experts provide you with individual consultations and we invite you to visit our fully equipped Applications Test Laboratories.

ZwickRoell supports you in planning and implementing new or modified testing requirements and with the setup or upgrading of your testing laboratory.

Our Applications Test Laboratories in Ulm are equipped with permanent materials testing machine displays and instruments including a comprehensive portfolio of accessories such as specimen grips, test tools, sensors, and temperature chambers.

Key features:
- Consultation and support by experienced ZwickRoell application engineers
- Demonstrations of different solution options for your test requirements
- Preliminary tests for new, altered or complex applications are possible

Advantages and benefits:
- Various technical solutions for your application at a glance
- Competence thanks to many years of experience and sound expertise
- Demonstrations and preliminary tests in the ZwickRoell Applications Test Laboratory are free of charge

Modular portal frame test bench for dynamic component testing

Cyclic compression test on oversized concrete channels according to customer specifications

Key features:
- Test bed with portal frame with hydrostatic-bearing single testing actuator
- Test area height 2,340 mm, clear horizontal test area 2,000 x 4,000 mm
- Dynamic nominal force Fmax ±250 kN, stroke 100 mm
- Static nominal force Fmax ±250 kN
- Control Cube measurement and control electronics
- Cubus testing software

Advantages and benefits:
- Modular test bed plus portal frame allows even large and oversized components to be tested to order in ZwickRoell’s testing laboratories
- The modular portal-frame test bench allows cyclic dynamic fatigue strength tests up to 250 kN, both uniaxial and multiaxial, for example on large components
- The hydrostatic-bearing single testing actuator also enables biaxial (multiaxial) testing on components. Static tensile and compression tests up to 250 kN are possible
Fatigue test on plate springs according to customer specifications

Key features:
- Type HB 250 servo-hydraulic materials testing machine with T-slotted platform
- Dynamic nominal force $F_{\text{nom}} \pm 250 \text{ kN}$, stroke 250 mm
- testControl II digital measurement and control electronics
- Test fixture for mounting crankshaft elements
- testXpert R and testXpert III testing software

Advantages and benefits:
- Used for fatigue tests under pulsating or alternating load or for tests under quasi-static to static load
- Flexible design of test assembly covers wide range of applications
- Large selection of fixtures for static and dynamic testing
- Customized solution with regard to dimensions, capacity and flexibility

High-speed tensile test on metal specimens according to customer specifications

Key features:
- 50kN HTM 5020 high-speed testing machine with T-slotted platform
- Hydraulic nominal force 50 kN
- Hydrostatic actuator for speeds up to 20 m/s
- Piston stroke 250 mm plus 2 x 50mm end cushioning
- Double-rod actuator for tensile and compression loading
- Digital piston transducer
- Safety housing and hydraulic safety-circuit
- Extremely stiff load-frame, designed for high impulse peaks

Advantages and benefits:
- Tests can be performed over a very wide loading rate range from quasi-static to 20 m/s
- Crash tests on components can also be performed using the optional T-slotted platform
- With testXpert a uniform software platform is available, from test definition right through to evaluation
- Easy integration of optical extensometers
- Clamping of very short tensile specimens also possible
- Machine is mounted on pneumatic springs, allowing installation almost anywhere

Fatigue test on rubber dampers according to customer specifications

Key features:
- HC 25 compact servo-hydraulic materials testing machine 25 kN
- Low-noise hydraulic power pack incorporated into machine base
- Hydrostatic-bearing hydraulic actuator mounted in upper crosshead
- Stiff two-column load frame with mechanical or hydraulic crosshead adjustment
- Hard-chromed T-slotted platform for component testing incorporated into machine base
- ZwickRoell Xforce dynamic load cell with integral accelerometer
- testXpert R and testXpert III testing software
ZwickRoell GmbH & Co. KG

Advantages and benefits:

• Extremely compact, space-saving testing system with small footprint
• Extra-quiet low-noise power pack
• Extra-stiff two-column load frame with integrated T-slotted platform for flexible component testing
• Uses hydrostatic-bearing, sealless actuators for virtually frictionless and maintenance-free operation
• Easy to operate via testXpert R and testXpert III test programs

Highlight

testXpert III Condition Monitoring

With the new ZwickRoell machine monitoring system, machine data such as the current machine status or upcoming services are displayed on a user-friendly dashboard.

Features:

• Always keep your materials testing machine’s important data within view: display of the current machine status such as next calibration date, overloads, time in operation and much more
• Indication of upcoming services, including calibration, services, and maintenance
• Conventional, manual checklists are a thing of the past - electronic service checklists with editable service intervals are now at your disposal
• Information on both active and inactive accessories and their conditions, are clearly visualized

ZwickRoell Customer Portal

With the ZwickRoell customer portal, you always have an overview of your service documents and machines. All data can be accessed easily and comfortably online at any time.

Features:

• Your test systems at a glance
• All service documents available at any time
• All calibration dates at a glance
• Save website content as favorites
• Overview of your customer data
**025 Upper test area: Testing of metal samples**

Lower test area: Tensile tests on castings according to customer specifications

**Key features:**
- Z100 SW materials testing machine, Fmax. 100 kN
- Wide design with second test area for additional testing setup
- Hydraulic specimen grips Type 8802, Fmax. 100 kN
- Wedge screw grips, Fmax. 10 kN
- makroXtens II type HP extensometer
- T-slot plates in the lower test area
- testXpert III testing software with Condition Monitoring

**Advantages and benefits:**
- The T-slot plate in the lower test area allows a quick change to different sample shapes at any time, this guarantees a higher and more efficient testing performance.
- The second working area and the wide design ensure versatile and efficient operation without long changeovers for changing test tasks.
- The adjustable working height guarantees an efficient and ergonomic operation for sitting or standing use.

**026 Determination of notch impact or tensile impact strength; Charpy impact tests (ISO 180, ASTM D256, ASTM D4812)**

**Key features:**
- 750 Joule instrumented pendulum hammer
- Digital and analog display
- Automatic lifting unit (electric motor drive)
- Height-adjustable pendulum hammer
- Safety device

**Advantages and benefits:**
- The basic unit consists of a vibration-damping steel casting, providing a high level of mechanical stiffness and ensuring stable, reliable test results up to 750 joules.
- Central operating elements ensure efficient and ergonomic operation by simply inserting the specimen and releasing the pendulum.
- Quick fixture and pendulum changes, coupled with straightforward access for maintenance and calibration plus easy removal of specimen remains.
- Charpy and tensile impact tests and wedge impact tests to all current standards.

**027 Determination of notch impact or tensile impact strength; Charpy impact tests (ISO 148, EN 10045, ASTM E23)**

**Key features:**
- 450 Joule instrumented pendulum hammer
- Digital and analog display
- Automatic lifting unit (electric motor drive)
- Height-adjustable pendulum hammer
- Safety device

**Advantages and benefits:**
- Safe impact testing in accordance with EN954-1, Category 3 requirements.
- Stable, reliable test results up to 750 joules notched impact energy.
- Central operating elements ensure efficient and ergonomic operation by simply inserting the specimen and releasing the pendulum.
- Charpy, Izod, Brugger tests, tensile impact tests and wedge impact tests to all current DIN, EN, ASTM, ISO and BS standards.
ZwickRoell GmbH & Co. KG

Component test on universal pens

Key features:
- 2.5 kN zwickiLine Z2.5 TN+ materials testing machine with Fmax. 2.5 kN and 20 Nm torsion drive
- Two test axes for independent or combined axial/torsion tests
- Flange connection system and alignment unit for improved concentricity
- testControl II digital measurement and control electronics
- Proven testXpert III testing software

Advantages and benefits:
- Available in various force (up to 5 kN) and torque (up to 20 Nm) ranges
- Flexible software for straightforward programming of expanded test programs
- Easy access to test results and simple data analysis
- Optional software extension in accordance with FDA 21 CFR Part 11
- Extensive DQ IQ OQ experience with a wide range of customers

Fatigue test on threaded fasteners to DIN 969 and ISO 3800

Key features:
- Vibrophore 250 Two in One materials testing machine, Fmax. 250 kN
- With Vibrophore Two in One option for upgrading to a full-fledged static testing machine
- 250 kN Xforce dynamic load cell with integral accelerometer
- testControl II digital measurement and control electronics with 10kHz control frequency and 24-bit resolution
- Screw grips
- testXpert R and testXpert III testing software

Advantages and benefits:
- Two in One function creates a full-fledged static and dynamic testing machine with stiff four-column load frame
- Easy to install - no ancillary units or systems (e.g. hydraulics, coolant) needed
- Maintenance free system thanks to wear-free components
- Clamping table at convenient working height for operator-friendly testing
- Remote control with color display showing measurement channels, machine and test status; also used for machine setup
- Easy to operate via testXpert R and testXpert III test programs

Rotating bar bending fatigue test on metallic round specimens as per DIN 50113, ISO1143-2010 and GB/T 4337-2008

Key features:
- Rotary bending machine Type ARBM 120 for bending moments from 2.5 Nm to 120 Nm
- Rotational speed steplessly adjustable up to 5000 rpm
- Angle of rotation up to 7°
- Deadweights for application of bending moment in variable steps
- Specimen diameter 2 to 20 mm
- Constant bending moment over test length

Advantages and benefits:
- Simple design makes the rotary bending machine a commercially attractive entry to fatigue testing
- Rotating bar bending fatigue test allows fast, easy, cost-effective fatigue testing
- Fast, easy set-up
A2 - Testing Services

Notes
A6

Materials and Component Testing Laboratory
ZwickRoell Materials and Component Testing Laboratory

The ZwickRoell’s Materials and Component Testing Laboratory performs quasi-static, cyclic and dynamic impact tests to customers’ orders. Torsion, hardness and extrusion tests also form part of the portfolio.

With over 50 testing systems, 2,000 accessory parts and experienced and competent materials testing technicians the ZwickRoell testing laboratories are the first choice when it comes to the external testing of various materials and components. Our ZwickRoell testing laboratories provide diverse systems and solutions for your static, dynamic and fatigue tests.

ZwickRoell rely on the test engineers and materials testing technicians’ many years of experience and sound expertise. With ZwickRoell testing laboratories’ expertise and comprehensive equipment, we offer the ideal solution flexibly, quickly and cost effectively relying on reliable test results.

From preparation of the specimen material, to testing, to evaluation and analysis of test results, the ZwickRoell Testing Laboratory offers an expert materials testing service from -40°C to +1,200°C.

Key features:
- ZwickRoell’s Materials and Component Testing Laboratory carries out all types of test precisely, efficiently and in accordance with standards
- Long-term experience and solid expertise in all sectors, including automotive, medicine, mechanical engineering, plastics, composites etc.
- ZwickRoell’s testing laboratories are equipped with state-of-the-art testing systems for a varied range of tests on components and materials of all kinds

Advantages and benefits:
- fast, standard-compliant testing helps to overcome capacity bottlenecks
- contract testing of a wide range of materials and components with precise test results and efficient test performance
- cost-flexibility through the possibility to outsource your tests to the ZwickRoell testing laboratories
- cross-validation to safeguard your test results
- design and modification of test devices
- interim solutions until delivery of newly acquired testing machines and accessories

Modern and comprehensive laboratory equipment for your project-related and contract tests

We perform all types of project-related and contract tests at our testing laboratories for materials and components testing. Continued investments in our laboratory equipment and further training of our staff enables us to guarantee reliable test results.

As the manufacturer, our laboratories are equipped with state-of-the-art, versatile machinery with a comprehensive range of accessories. Take advantage of our expertise for your testing of individual materials and complex components.

Key features:
- Static materials testing machines to 1,200 kN
- Hardness testing machines for all established methods
- Vibrophores up to 500 kN
- Servo-hydraulic materials testing machines up to 250 kN
- Linear motor testing machines up to 10 kN
- High speed testing machines
• Pendulum impact testers with multi-channel systems to gather test data (for example, single strain gage)
• Melt index testers, HDT/Vicat stereo microscope
• Comprehensive range of accessories including specimen grips, extensometers, specimen preparation, and temperature conditioning

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Key features:
• Consultation and support by experienced ZwickRoell application engineers
• Demonstrations of different solution options for your test requirements
• Preliminary tests for new, altered or complex applications are possible

Advantages and benefits:
• Various technical solutions for your application at a glance
• Competence thanks to many years of experience and sound expertise
• Demonstrations and preliminary tests in the ZwickRoell Applications Test Laboratory are free of charge
More information: www.zwickroell.com/metals

The main focus in metals testing, in addition to our static testing machines, is on the topics of Optical Strain Measurement, High-Temperature Testing and Nanoindentation. This exhibition area is divided into segments for metal forming, pipes and springs. Here you can learn more about the benefits of having ZwickRoell as your turnkey supplier for metals testing.
Hall plan Metal A3
**Coating Thickness Gauge LEPTOSKOP 2042**

**Application**
Measurement of non-magnetic coatings on (ferro)magnetic substrates (EN ISO 2178) and measurement of non-conductive layers on non-magnetic, (electrically) conductive substrates (EN ISO 2360), especially for complicated geometries and testing-problems.

**Technical Data**
- **Measuring principle:** Magnetic-inductive (Fe) (EN ISO 2178)
- **Eddy current (NFe) (EN ISO 2360)**
- **Measuring range:** 0 - 20000 µm (dependent on probe)
- **Measuring rate:** Up to 2 readings per second
- **Measurement accuracy:**
  - Coating < 100 µm: 1 % of reading +/- 1 µm (after calibration)
  - Coating > 100 µm: 1..3 % of reading +/- 1 µm
  - Coating > 1000 µm: 3..5 % of reading +/- 10 µm
  - Coating > 10000 µm: 5 % of reading +/- 100 µm
  (valid for single-pole probes and micro-probes)
- **Data storage:** 9900 measured values in up to 140 batches

**Special Features**
- Large graphical display 48 mm x 24 mm, illuminated
- Modern, small, lightweight
- Large selection of intelligent probes
- Convenient user-guidance in understandable plaintext
- Individual: 10 user languages selectable
- Calibration:
  - a) Calibration ex works: Immediately ready for measurement.
  - b) Calibration on unknown coating*
  - c) Zero calibration
  - d) Single and multi-foil calibration on uncoated substrate*
  - e) Calibration on coated material*
  - f) Load and store calibration*
- **Statistics**
  - a) Statistical evaluation for up to 999 readings
  - b) Minimum, maximum, mean, number of readings
  - standard deviation, limit monitoring
  - c) Local coating thickness and mean coating thickness (DIN EN ISO 2808)
  - d) Online statistics, all values at a glance*
- Variable modes for optimum adaptation to the measuring task*
- Limit input
- Storage of readings with convenient file management as under Windows
- Serial interface (RS232C) / USB for data transfer
- Power supply optionally via primary cells or rechargeable batteries, USB or mains unit
- Can be used with PC software STATWIN 2002 and EasyExport

*availability depending on module level

**Portable Digital Ultrasonic Flaw Detector**
**ECHOGRAPH 1095 Basic**

**Application**
New Portable, digital ultrasonic flaw detector with time corrected gain (TCG) and back wall echo attenuation (BEA) as well as extended memory functions.

**Technical Data**
- **Type of display:** Colour-TFT-LCD, transmissive, with LED display illumination
KARL DEUTSCH Prüf- und Messgerätebau GmbH + Co KG

Ultrasonic Wall Thickness and Sound Velocity Gauge – also for Coated Material ECHOMETER 1077

Application
Determination of wall thickness and sound velocity in nearly all sound-conductive materials – also for coated materials.

Technical Data
Measuring principle: Time-of-flight measurement with ultrasound (transmitter/receiver (T/R) technique: Best method for corroded inner walls)
Measuring range: Wall thickness measurement through up to 8 mm varnish or plastic coatings: 2 to 28 mm
Sound velocity: 100 - 19999 m/s
Display resolution: 0.1/0.01 mm, 0.001 inch resp. 1 m/s
Data Storage: Up to 9999 readings, can be structured into files with up to 999 readings each
Housing protection: IP 54
Size / weight: 131 mm x 81 mm x 32 mm, 250 g

Special Features
- Measurement of wall thickness and sound velocity with one instrument
- Convenient user-guidance in easy to understand clear text
- Variable display modes for optimum adaptation to the measurement task (standard display, difference values, minimum value)
- Automatic recognition of probes
- Built-in calibration standard
- Calibration as well with unknown sound velocity (300 – 19999 m/s)
- Windows®-like storage of readings with convenient file management
- Individual memorization of calibration in the associated files
- Adaptation of sensitivity to the sound damping of different materials
- Graphic representation of the course of readings and quick navigation through the individual readings
- Large, clear graphic display with bright background illumination (50 mm x 27 mm)
- Display illumination with additional coupling control
- Limit indication and monitoring (alarm mode)
- Serial interface for data transfer (RS232C) with printer, PC and caliper
- Data transfer to PC with the PC software iCom
- Shock absorbing protective rubber holster with pop-up stand
Proof of capability of universal testing machines using certified reference materials for the tensile test according EN ISO 6892-1

The Institut für Eignungsprüfung is a DAkkS (German Accreditation Body) accredited provider for proficiency tests and an accredited producer of certified reference materials. In the last years the question of proof of capability of a testing machine became more relevant.

What are the questions in detail?
A lab ordered a new / used testing machine. This machine was calibrated by a competent institution. The basis of the proof of capability is therefore given by the corresponding standards.

But some aspects are still unanswered:
Is the complete system, as a combination of machine, software and procedure able to fulfil its function? What is the corresponding measurement uncertainty? How stable works the machine between the calibration intervals? What is / was the exact status of the machine before important tests or in case of controversy?

The following application range is presentable:
- Acceptance tests
- Voting between different laboratories.
- Quality assurance between the calibration intervals
- Proof of stability in QA processes.
- Software validation according to EN ISO 6892, clause A.5.
- Useful completion of calibration.
- Continuous proof of homogeneity in a group of testing labs.

Range of products:
- Steel, different ranges of strength (Rm:300 – 1,500 MPa).
- Aluminium (Rm: 250 MPa).
- Steel, round specimen (d0 = 10 mm).
- Flat specimen (b0 = 20
ZwickRoell GmbH & Co. KG

Homogeneity Testing in Accordance with DIN EN ISO/IEC 17043 and ISO 13528 on Aluminum Reference Material

Testing solution:
- AllroundLine Z100 THW, Fmax 100 kN
- Body over wedge grips, Fmax 50 kN
- Clip-on extensometer 5025-1
- Clip-on extensometer 8040-1

Advantages and benefits:
- The high repeatability of ZwickRoell testing machines supports the collection of very accurate information on homogeneity testing of reference materials.
- The testXpert III testing software and testControll II control electronics guarantee precise maintenance of crosshead speeds and qualify the strain rate dependency of reference materials.
Plan of site Metal A3
Hall plan Metal A3
**A3 - Metal**

**Olympus Deutschland GmbH**

034 **High-Resolution upright motorized opto-digital microscope DSX1000**

**Application:**
2D and 3D observation

**Highlights:**
Guaranteed Measurement Accuracy and Precision

**IPLEX GL – versatile compact videoscope**

**Application:**
documentation with brilliant and detailed images

**Highlights:**
4 mm and 6 mm diameter, 2 m to 10 m length

**Inspection-Microscope BX53M with documentation system STREAM**

**Application:**
Digital Materialographie

**Highlights:**
Datamangement-System, developed for microscopy applications

**IPLEX GX/GT – versatile videoscope**

**Application:**
Turbines and Manufacturing inspection

**Highlights:**
Interchangeable Scopes and Light Sources

**IPLEX NX - The world smallest articulating videoscope**

**Application:**
documentation with brilliant and detailed images, measurement function

**Highlights:**
4 mm and 6 mm diameter, 2 m to 7.5 m length and interchangeable scope units
Olympus Deutschland GmbH

Vanta – Handheld XRF Analyzer

Application:
Non-destructive elemental analysis of materials

Highlights:
Handheld X-Ray Fluorescence

Omniscan MX2 - advanced portable UT Phased Array

Application:
Weld Inspection, CFRP Inspection

Highlights:
Portability, Modularity, Colour imaging, Data storage

Epoch650 – Ultrasonic Flaw Detector

Application:
Material Testing

Highlights:
Rugged and compact design, EN12668 certified

38DLP - Ultrasonic Thickness Gage

Application:
Corrosion and Precision Thickness gaging

Highlights:
Dual- and Single Element Transducers

MagnaMike 8600 - Magnetic Method Precision Thickness gage

Application:
For nonferrous Materials

Highlights:
Range: 0-25 mm

SZX16 – Stereomicroscope

Application:
Quality Insurance

Highlights:
Optical Superiority, Versatile Illumination Solutions
**Indentec Hardness Testing Machines Limited**

**035 Vickers and Knoop Hardness Tests to ISO 6507-1 and ISO 4545-1 on Pipe/Tube Wall Cross Sections (i.e. Sequence Tests)**

**Testing solution:**
- Hardness testing machine ZHVµ-A
- Vickers indenter
- Knoop indenter
- HD software for automatic sequence testing
- X-Y table with specimen mount for embedded specimens

**Advantages and benefits:**
- In the case of fully automatic sequence tests, the indentations are quickly and conveniently defined in the overview image.
- The automated measurement is precise and operator independent—an efficient solution for high specimen throughput.
- With the 6-position turret, quick and automatic reconfiguration of Vickers and Knoop hardness test methods is possible, without the use of tools.

**036 Vickers Hardness Test to ISO 6507-1 on Pipe/Tube Surfaces**

**Testing solution:**
- Hardness testing machine ZHVµ-M
- Vickers indenter
- Specimen mount with V-slot for pipe/tube specimens, for lengthwise centering of the pipe/tube apex

**Advantages and benefits:**
- Reliable and fast testing of cylindrical surfaces: with the table stored in the testing machine, automatic correction of the surface curvature is established—without the need for manual calculations!
- Proven, solid technology: with the stable and precise alignment of the indenters with the lenses, and the robust mechanics, the testing system delivers highly reliable test results.

**037 Hardness Testing to ISO 6507-1 and 6508-1 on Pipe/Tube Surfaces and Pipe/Tube Wall Cross Sections**

**Testing solution:**
- Hardness testing machine ZHU250CL-S
- Vickers indenter
- Rockwell HRC indenter (Diamond cone 120°)
- Diamond software for automatic indentation measurement
- Large support table for pipe rings, horizontal (Vickers and Rockwell) with specimen mount; flat V-slot for pipe rings, vertical (Vickers)

**Advantages and benefits:**
- The universal hardness tester quickly and flexibly performs a wide variety of hardness tests, each according to task. The unique 4-plus-4 turret provides enough space to hold up to four indenters and four lenses at the same time—change your test method with a single click in the software.
- Image analysis is carried out with a self-learning algorithm, which uses testing experience on specimens with complex surfaces and therefore, for example recognizes indentations on low contrast surfaces. Not only are the efforts in specimen preparation minimized, it also achieves perfect conditions for high repeatability and reproducibility among different operators.
ZwickRoell GmbH & Co. KG

**Tensile Test in Accordance to ISO 6892-1 on Small Thin Tubes (i.e. for Medical Technology Nitinol Tubing)**

**Testing solution:**
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Pneumatic grips, Fmax 2.5 kN
- laserXtens 1-15 HP
- testXpert III, tensile test on metallic materials

**Advantages and benefits:**
- The special jaw inserts for the pneumatic grips allow for secure gripping of the specimen and in turn reliable results without failed attempts.
- The laserXtens 1-15 HP optical extensometer provides a non-contact measurement of the specimen deformation. This results in reliable and traceable test results, since no parasitic forces influence the specimen.
- The testXpert III testing software logs all actions and changes—before, during and after the test—guaranteeing complete traceability.

**Compression Test to ISO 8492 on Tubes in Longitudinal Direction**

**Compression Tests to DIN 50106 and ASTM E9 on Cylindrical Specimens**

**Testing solution:**
- ProLine Z100 TN, Fmax 100 kN
- Ergonomic safety device
- Compression platen, rectangular

**Advantages and benefits:**
- The ergonomic safety device fulfills all EU guidelines and guarantees the highest required level of safety for the operator and the machine.
- The Standard Test Program in testXpert III guarantees a fast, reliable, and standard-compliant test process.

**Tensile Test to ISO 6892-1 on Steel Pipes from 28 to 40 mm Diameters**

**Testing solution:**
- ProLine Z100 TN, Fmax 100 kN
- Wedge grips, Fmax 100 kN
- ProLine makroXtens P
- Clip-on extensometer 5025-1
- Clip-on extensometer 8040-1

**Advantages and benefits:**
- The wedge grip provides easy, secure gripping and holding of the pipes and therefore ensures efficient testing.
- ZwickRoell extensometers can be easily attached and changed for different tests.
- The ProLine is ideal for standard-compliant testing with strain rate control to ISO 6892-1 Method A2 (open loop). Correct and controlled strain rate ensures reproducible results.
A3 - Metal

ZwickRoell GmbH & Co. KG

041 Tensile Test to ISO 6892-1 on Copper and Aluminum Pipes

Testing solution:
- AllroundLine Z100 THW, Fmax 100 kN
- Wedge screw grips, Fmax 100 kN
- laserXtens 7-220 HP

Advantages and benefits:
- The wedge screw principle of the specimen grips builds up targeted, intended compression forces on the full end of the pipe. Reproducible results are achieved without the need for plugs.
- The laserXtens 7-220 HP optical extensometer determines the correct strain at break over the specimen length, even for varying break points. This is made possible by the parallel measurement of various initial gauge lengths along the specimen.
- With the optical measurement, use of the laser speckle technology makes specimen marking unnecessary, providing significant savings in time and effort.

042 Tensile Test to ISO 6892-1 on Steel Pipes and Steel Pipe Sections

Testing solution:
- AllroundLine Z250 SNS, Fmax 250 kN, side Fmax 50 kN
- Main test area: Hydraulic grips, Fmax 250 kN
- Side test area: Wedge grips, Fmax 50 kN
- makroXtens II type P
- Clip-on extensometer 5025-1

Advantages and benefits:
- The double-actuator hydraulic grip guarantees secure gripping of the specimen. This leads to efficient testing without failed attempts.
- The side test area expands the testing possibilities, saves reconfiguration time, and provides more reliable results.
- One extensometer can be used for all test areas, saving investment costs and simplifying the test.
HÄRTI P3123 – Non-destructive (!] RHT measuring device
(edge hardening depths)

In a few seconds it is possible to determine the hardening depth nondestructively. This means no
time-consuming and costly cutting, embedding, grinding, polishing the parts - and especially no
losses of the most expensive components!

ELOTEST M2 – mobile eddy current tester

The ELOTEST M2 is a universal one-hand tester for surfaces, bores and concealed structures.
It also measures the conductivity and layer thickness of all materials. The ELOTEST M2 allows a
DUAL frequency test with mix and covers the entire test frequency range from 10 Hz to 12 MHz. It
has all filter functions (LP, HP, BP) for signal optimization for static and dynamic tests. The crisp and
even in direct sunlight deployable LCD display with back LED lighting guarantees optimal display of
the test signals. Integrated calibration bodies simplify and accelerate the work on site. Operation is
via a clearly structured keypad with a clear function assignment. So even inexperienced users can
handle the device quickly and safely. The user-friendliness is supported by plain text messages on
the screen.

ELOTEST M3 – mobile eddy current tester

Highly Qualified Universal Testing Technology - Anyone familiar with the ELOTEST M2 V3, the
world’s smallest full eddy current tester, will most certainly welcome the latest addition to the
product family: the new ELOTEST M3 has the same performance characteristics as the M2 V3, but
has a much larger size display. Whenever a particularly high resolution is required on the screen,
when difficult tasks have to be done or when both hands are needed and the device has to be
switched off, or when several examiners want to track the display at the same time, the new ELO-
TEST M3 is unbeatable. The ELOTEST M3 is mainly used in the manual testing of surfaces, bore-
holes and hidden structures as well as in the measurement of conductivities and layer thicknesses.

ELOTEST B300 – mobile and/or stationary eddy current tester

The universal tester Elotest B300 is equally suitable for stationary as for mobile use. Its versatility
(version with 1, 2, 3 or 4 test channels), the numerous interfaces and a multitude of available func-
tions make both simple tests and complex applications possible.

ELOTEST IS3 – stationary eddy current tester

Single-channel eddy current testing device for automated testing tasks The ELOTEST IS3 is desi-
gned for installation in automated testing machines. The single-channel tester, which is designed in
protection class IP54, can be integrated directly into the production process eg. B. be integrated
in Schraubenprüfautomaten. It can be incorporated into existing mechanisms with little effort. With
a frequency range of 10 Hz to 12 MHz, universal signal filter and I / O interface, this tester is an
efficient alternative for fast crack detection and sorting tasks.
ELOTEST PL600 – stationary eddy current tester

The PL600 is a new generation eddy current tester. It is characterized by a continuous digital signal processing and is able to realize different methods of signal excitation and evaluation (classical eddy current testing, pulsed magnetization, harmonic analysis). On the basis of a modular hardware and a user-specific configurable software platform, the complete spectrum of inspection tasks can be covered, e. Crack test, material and confusion test and grinding burn test.

APPLICATION - „FAST SORT“

Ultrafast 1-frequency sorting on materials or microstructure (with option harmonic analysis) as reversal point evaluation. FAST SORT allows a sorting speed of > 100 parts / second under appropriate mechanical conditions.

APPLICATION - „ROTATING TULIP SENSOR“

A permanently rotating sensor with approx. 3,000-6,000 rpm is „slipped“ over a round component by means of a bell shape in order to scan the surface for defects. This solution enables very short cycle times. In screw testing systems such solutions are used multiple times where you can reach a tested number of about 180-250 parts / minute. Other rotationally symmetrical components can and are tested very quickly for surface defects in this way and manner.

APPLICATION - „EMDC – ELECTRO-MECHANICAL-DISTANCE-CONTROL“

EMDC (Electro Mechanical Distance Control) technology, which is an international patent, makes it easy to solve even difficult test tasks. In the case of non-round parts, complex geometries, parts which are difficult to center or in the case of fundamental concentricity problems, the distance between the sensor and the test piece is controlled electromechanically. That is why our electromechanical distance control offers you a consistently high test sensitivity and almost perfect compensation, even with large changes in distance. The combination with the ELOTEST PL600 makes it a test system with maximum flexibility.
Hottinger Baldwin Messtechnik GmbH

Universal amplifier QuantumX

HBM’s modular QuantumX data acquisition system comprises an extensive range of amplifiers and specialized modules. It is the ideal choice for typical test and measurement systems used for the testing of functionality, durability, overload behavior, efficiency, life, wear, and temperature behavior. QuantumX acquires mechanical, electrical and thermal quantities such as force, torque, displacement, acceleration, rotational speed, pressure, temperatures, voltage, current, etc. The amplifiers’ compact size makes them the first choice for test benches where space is very limited.

Every amplifier is a small, standalone measuring system and can be expanded with additional modules and synchronized to suit any application. In addition to amplifiers providing universal inputs, specialized modules for highly dynamic signals, strain, and temperature or CANbus are available. Gateway modules enable acquired quantities to be output in real time, for example, analog, CAN signal or EtherCAT. With the new QuantumX data recorder (also with WiFi) measurement data can be collected, evaluated and stored without a PC connection. An extensive range of transducer technologies is supported: bridge circuits (strain-gage or inductive half and full bridges), voltage, current, thermocouples, resistance thermometers, as well as frequency or pulse counting. Transducers featuring innovative TEDS technology are automatically identified by QuantumX upon connection. Transducers without TEDS functionality are easily configured via the expandable sensor database.

Since processes are becoming faster and faster, as for example in dynamic and fatigue testing of materials, the force measurand changes very greatly over time. This “dynamic condition” thus requires a corresponding frequency response from the measurement chain that represents the force independently of the frequency in which it occurs. As the result of elaborate optimization measures for digital filter functions in the context of a research program, the MX410B module, a four-channel universal amplifier of the QuantumX DAQ series, meets these requirements, making it suitable for dynamic calibration.

Digital measuring system MGCplus

MGCplus is a modular amplifier system with plug-in cards for universal applications in industry, in the laboratory and the research field. The MGCplus is expandable up to 128 channels in one 19” housing. To measure dynamic and static quantities, the measuring system is offering independent sampling rates, thus reducing noticeably the amount of data to be transmitted. The ML70 computing module gives you the option to process your measurement data in real time and make your computing results available to other systems over a wide choice of connections. The module uses programs based on the international standard PLC language IEC61131-3.

Specifications
- Accuracy class: 0.0025/0.03
- Menu-controlled transducer adaptation for easy device operation
- Definable function keys
- Display resolution: 1 000 000 digit
- Self-reliant carrier frequency and DC amplifiers for all usual types of transducers: strain gauge, inductive piezoelectric and piezoresistive transducers, potentiometers, thermocouples, DC voltage and DC current
- 19200 values/s per channel, synchronous daq (20 bit)
- Up to 128 channels in one 19” housing
- Simultaneous and parallel measurement with all channels
- Each unit: 2 analogue outputs, 4 limit value switches, 2 peak value buffers, 8 remote control
contacts, Butterworth and Bessel characteristic low-pass filter, 8 parameter sets
- Computing module for processing measurement data in real time
- Interface unit for bi-directional data exchange with an external computer
- Interfaces: RS232, RS485, IEEE488, Centronics-Parallelport, Ethernet, Profibus DP, CANopen
- 2 PCMCIA-PC card slots for optional expansion modules (e.g. hard disk)

Measurement software catman®AP

catman®AP is an integrated software package for acquiring, visualizing, and analyzing measurement data from HBM that has several new modules to enhance the easy-to-use catman®Easy base module. EasyMath, EasyPlan, EasyLog, EasyScript, AutoSequence, and video analysis are all included in the software.

EasyMath provides many mathematical functions for evaluating measurement data while EasyPlan simplifies the preparation of measurement tasks without having to connect an amplifier. EasyLog is used with the MGCplus amplifier system to automatically save measurement data to a Flash card or hard disk and EasyScript creates customized scripts for individual measurement tasks. Each of these new modules allows the software to be quickly and easily programmed for special solutions with customized functions.

The advantage of the AutoSequence module is that all the steps in a measurement sequence, including data evaluation, can be easily automated. Function blocks that are organized graphically define recurring measurement and analysis steps. This readily understood method allows customized solutions, for example for function test benches, to be found without requiring any programming knowledge.

The video analysis enables measurement data to be visualized synchronously with video sequences that are recorded at the same time. The cursor visualizes and controls the current video sequence in the measurement data. Any time offset between video and data can be graphically corrected.

Vibration-proof force transducer U10M

The U10M force transducer from HBM is constructed according to the „pancake“ system. This design combines a number of advantages: low overall height, high vibration load capacity, and excellent overload capability.

The U10M offers additional advantages: The force transducer is made entirely of rustless materials (aluminum or stainless steel). In addition to its outstanding mechanical properties, it is therefore extremely sturdy, even under harsh ambient conditions. U10Ms are available with nominal forces of from 1.25 kN to 500 kN. In addition to standard versions, which are available very quickly, force transducers can also be configured to specific requests. This also allows for calibration at 200% of the nominal load for static applications with a high output signal of up to 4 mV. A version equipped with two Wheatstone bridges is also available to supply two measuring systems with one transducer. Of course TEDS (Transducer Electronic Data Sheet) is also optionally available. Plug variants can also be selected or mechanical plug protection can be ordered.

Another special feature is bending moment alignment. This is performed mechanically with conventional pancakes. The process is electrical for the U10M, so that in cases where a force transducer has two Wheatstone bridges (double bridge) both measuring bridges are adjusted to compensate for bending moments. The U10M is hermetically welded with a nominal force of 12.5 kN and up.
W.S. Werkstoff Service GmbH

Services

Werkstoff Service GmbH located in Essen (Germany) has its professional main focus in the division of materials, material testing, heat treatment and material engineering as well as conventional rail and rolling stock.

Our offer of services:

- certified advanced training on destructive and non-destructive testing
- material testing by our accredited test laboratory
- failure analysis, consulting services, expert reports and audits by our accredited inspection body
- approval of non-destructive test methods and test techniques in conventional rail and rolling stock
- maintenance by our technical appropriated body (Fachlich zuständige Stelle) of DIN 27201-7
**ZwickRoell Fürstenfeld**

**046 Tensile Test for High Temperature to ISO 6892-2**

**Testing system:**
- AllroundLine Z250 SN, Fmax 250 kN
- Test fixture for high temperature tests
- Test fixture for tests at room temperature
- Non-contact extensometer laserXtens 2-120 HP/TZ with videoXtens add-on
- testXpert III test program for metal tensile test

**Advantages and Benefits:**
- HT tensile test to ISO 6892-2: if the test material is suitable (pre-tests) also to Method A
- Automatic 3-zone control for accurate specimen temperature
- Measurement up to specimen break without damage to the extensometer

**047 Creep and Relaxation Test up to 1,200 °C**

**Testing system:**
- Patented creep testing machine Kappa 50 LA
- 3-zone high-temperature furnace up to 1,200 °C
- Contact HT extensometer up to 1,200 °C
- testXpert III test program for creep testing

**Advantages and Benefits:**
- Flexible creep testing machine for creep and relaxation test
- Automatic 3-zone control for accurate specimen temperature
- 4-rod ceramic extensometer for use up to 1,200°C
- Wide force measurement range allows for tests with various specimen sizes

**048 Creep Testing in Air up to 1,500 °C**

**Testing system:**
- Creep testing machine Kappa 50 SS
- 3-zone high-temperature furnace up to 1,500 °C
- Ceramic load string up to 1,500 °C for round and flat specimens
- Non-contact extensometer laserXtens 2-120 HP/TZ with videoXtens add-on
- testXpert III test program for creep testing

**Advantages and Benefits:**
- Testing up to 1,500 °C in air - as in the practical use of the material
- 3-zone control for accurate specimen temperature
- Measurement up to specimen break without damage to the extensometer

**Highlights:**
- Need for materials for higher temperatures in air environment
- HT metals are not suitable as test tool material >1,200 °C
ZwickRoell Fürstenfeld

**Highlight**

**Fatigue and Creep-Fatigue**

**Test Growth Testing**

**Testing system:**
- Patented creep testing machine Kappa 100 SS-CF
- 3-zone furnace up to 1,200°C
- Testing system for LCF and CF tests
- Testing system for FCGR and CFCGR tests
- Water-cooled HT extensometer
- testXpert R test program for LCF, CF, FCGR and CFCGR

**Advantages and Benefits**
- Simulation of material fatigue through variable cyclical mechanical load
- Simulation of crack growth through variable cyclical mechanical load
- Precise control with patented EM machine

**Highlights**
- Government project in India
- Strength characteristic values for gas power plant materials at higher temperatures

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**Thermo-Mechanical Fatigue**

**Testing system:**
- Patented creep testing machine Kappa 100 SS-CF
- TMF controller for synchronization of mechanical and thermal loading
- Induction heating and air cooling incl. temperature measurement and control
- Water-cooled hydraulic grips
- Water-cooled HT extensometer
- testXpert III test program for TMF

**Advantages and Benefits**
- Simulation of material fatigue through combined mechanical and thermal loading
- Standard system to CoP
- Precise control with patented EM machine

**Highlights**
- Interval load of combustion and engine drives require new material characteristics
- Modular system for the Kappa SS-CF EM machine (can later also be used for servo-hydraulic machines)
**TTH10 (TIP THERM INDUCTION HEATING UNIT)**

TTH10 incl. PLC sequence control integrated in a testing machine of ZwickRoell to simulate a hot tensile test of electrical conductive specimen with forced air cooling for defined heating and cooling processes.

**TTH10 (TIP THERM INDUCTION HEATING UNIT)**

The induction heating unit TTH10 consists of two components, the high frequency generator and the stationary heating station with the corresponding inductor. The TTH10 has been designed with state of the art semiconductor technology and therefore enables an optimal overall efficiency of the unit. The generator automatically selects the resonance frequency for any inductor and thereby always achieves maximum output.

### Generator
- TTH10 HF-output: 10kW
- Total input power: 12kVA
- Power supply 3 x 400 V/N+PE 32A, 50-60 Hz
- Internal control voltage 230 V/N AC 50-60 Hz
- Amount of heating stations 1 (stationary)
- Power-on time 100% (= continuous operation)
- Frequency 70 kHz to 450 kHz
- Dimensions [W x H x D] 450 x 150 x 650 mm
- Dimensions [W x H x D] with handles 450 x 150 x 690 mm
- Weight approx. 20 kg

### Heating station
- Dimensions [W x H x D] 230 x 230 x 400 mm
- Mounting holes [W1 x D1] 180 x 380 mm
- Inductor level h 110 (± 5mm)
- Connecting system inductor [a x b] 4 x M6, 30 x 30 mm
- Weight approx. 25 kg

### PLC-Automatic sequence control

The automatic sequence control of the iew GmbH enables you to realize induction heating processes with up to 100 different programs (10 in quick dial) with an alphanumeric input of the program name as well as the corresponding temperature profiles (set temperature, ramp rate, hold time, etc.). The automatic sequence control consists of a 7" TFT-Touch-Panel where the desired parameters can be set up. But this PLC is not only suitable for fully automated production facilities but also for small and manual workplaces where peripheral devices such as hoist cylinders and magnetic valves should be activated.

### The advantages at a glance
- contact-free heating method
- low space requirements
- high efficiency
- exact temperature control
ARAMIS: Optical 3D Deformation Analysis

Task
Non contact measurement of 3D deformations (3D displacements and strains) in material testing and testing of components

Applications
• Deformation analysis under mechanical and thermal load of specimens
• Measurement of material parameters
• Verification of finite element calculations

Features
• Non contact and non invasive
• Point-based and full-field results
• Adaptation to any testing machine
• Easy to use
• Useful also at extreme specimen temperatures (-100°C…1500°C)
• High accuracy and spacial resolution
• Import of FE data / tomography data and full-field comparison
• Vibration analysis
• Positioning of components

ARAMIS FLC: Optical 3D Deformation Analysis

Task
Non contact measurement of 3D deformations (3D displacements and strains) adapted to sheet metal testing machine (BUP)

Applications
• Deformation analysis under mechanical and thermal load of specimens
• Forming-Limit-Curve (FLC) by ISO-12004
• Yield curve from bulge test

Features
• Non contact and non invasive
• Full field results
• Adaptation to any testing machine
• Easy to use
• High accuracy and spacial resolution

ARGUS: Optical sheet metal forming measuring system

Task
Measurement of deformations on metal sheet in the stamping process

Applications
• Failure analysis in the stamping process
• Verification of numerical simulations in sheet metal forming
• Support of the try out process on dies
• Determination of forming limit curves and diagrams (FLD)
A3 - Metal

GOM GmbH

Features
- Full field results
- Easy to use
- High reproducibility
- High accuracy and spacial resolution

ATOS: Optical 3D Digitizing

Task
Non contact and full field measurement (3D Digitizing) on any objects (styling models, dies, sheet metal parts, mould injection parts, etc.)

Applications
- Reverse Engineering
- Quality control, Inspection
- Rapid Prototyping, Milling

Features
- Full field results
- Non contact measurement
- Fast data acquisition
- High accuracy and lateral density of data
- Mobile system
- ATOS ScanBox as a fully automated system variant

TRITOP: Optical 3D Coordinate Measurement

Task
Fast, non contact measurement of 3D point coordinates on any objects (styling models, dies, sheet metal parts, mould injection parts, etc.)

Applications
- 3D coordinate measurement
- Deformation analysis
- Quality control, inspection
- Measurement of contours and hole patterns

Features
- Non contact measurement
- Fast data acquisition
- High accuracy and spacial resolution
- Flexible and exceptionally mobile system
Testing the ductility of sheet metals - forming limit curve (FLC) to ISO 12004

Testing solution:
- Sheet metal testing machine BUP 600
- FLC – Nakajima tool
- High-temperature furnaces (950°C) and feed system
- testControl II electronics
- Testing software: testXpert III test program for sheet metal testing

Advantages and benefits:
- Temperature stability since the specimen, drawing die, blank holder, and the punch are heated together in furnace
- Reliable test results
- Feed system ensures user-friendly and reliable performance of tests without endangering the operator.

Hole expansion test on sheet metals to ISO 16630

Testing solution:
- Sheet metal testing machine BUP 200
- Hole expansion test fixture
- testControl II electronics
- videoXtens
- Testing software: testXpert III test program for sheet metal testing

Advantages and benefits:
- Reliable test results achieved through non-contact crack detection and results determination
- Easy operation since the software guides the operator through the test sequence
- System can be expanded to include the function for measuring the surface strain to prepare specimens according to the VW Volkswagen company standard PV 1054.

Tensile Test on High Strength Steel Sheets Class AHSS to ISO 6892-1 ISO Standards Tests Type 1 with Short Specimens

Testing solution:
- AllroundLine Z250 SN, Fmax 250 kN
- Hydraulic grips, Fmax 250 kN
- laserXtens 7-220 HP
- testXpert III, tensile test with strain rate control to ISO 6892-1 Method A (1)

Advantages and benefits:
- ZwickRoell's short clamping hydraulic grips are wear-resistant, even with high strength materials. This supports their long service life and minimal maintenance costs.
- Even small specimens taken from building components can be confidently tested and used as a reliable proof of product quality.
- The strain distribution ensures the homogeneous behavior of the entire specimen.
A3 - Metal

ZwickRoell GmbH & Co. KG

056 Flexure Test to VDA 238-100 on Advanced High Strength Steel (AHSS)

Testing solution:
- AllroundLine Z100 THW, Fmax 100 kN
- 3-point flexure test to VDA 238-100 (disk flexure test)
- videoXtens 1-120

Advantages and benefits:
- The 3-point flexure test to VDA 238-100 (2017) allows for reproducible results with defined minimum thickness.
- With the help of Video Capture, proof of a correct test process is created. Verification of the bending angle under load can be performed as needed.

057 Tensile Test on Steel Sheet Metal Joints According to ISO 6892-1 Tailored Blanks - Glued or Welded Sheet Metals, Riveted or Clinched Sheet Metals

Testing solution:
- AllroundLine Z100 THW, Fmax 100 kN
- Hydraulic grips, Fmax 100 kN
- videoXtens modular system with 2 cameras
- testXpert III, tensile test on metallic materials

Advantages and benefits:
- The one-sided closing hydraulic grip generates parallel force distribution on the specimen and provides reproducible test results.
- The videoXtens modular system is characterized by the locally central and global field of vision. Precise results are achieved, allowing for efficient testing.
- The specimen marking set can be used to manually mark specimens with ease and efficiency.

058 Tensile Test to ISO 6892-1 and r- and n-Value Determination to ISO 10113 and ISO 10275 on Thin Aluminum Sheet Metal

Testing solution:
- AllroundLine Z100 THW, Fmax 100 kN
- Wedge screw grips, Fmax 100 kN
- makroXtens II type HP
- videoXtens transverse strain extensometer
- testXpert III, tensile test on aluminum alloys with determination of vertical anisotropy and hardening exponent

Advantages and benefits:
- The wedge screw grip guarantees secure gripping of the specimen without damaging it and therefore avoiding falsification of test results.
- Through the combination of the makroXtens contact extensometer and the videoXtens non-contact extensometer for transverse strain, operator influence is significantly reduced and high test repeatability is achieved.
- The special test program for aluminum materials is specified and validated by the authorized work group of the GDA (German aluminum manufacturer’s association) and the VDA (German automotive industry association). This test program is performed according to Method A1 and delivers reproducible results.
Indentec Hardness Testing Machines Limited

Rockwell Hardness Testing to ISO 6508-1 on Circular Metal Blanks

Testing solution:
• Hardness tester ZHR8150SK
• Rockwell HRC indenter (Diamond cone 120°)
• Safety enclosure with side touch screen

Advantages and benefits:
• The fully automatic specimen feeding system holds up to 36 circular metal blanks, onto which several Rockwell test methods can be applied with ease and precision.
• The hardness tester is equipped with a special diamond table, to meet the standard requirement for testing of thin specimens.
• Operators and the machine are protected by the system’s CE compliant housing; external influences are suppressed, which allows for reliable test results.
060 Tensile Test to ISO 6892-1 on Thin Aluminum Sheet Metal for Production Control

Testing solution:
- ProLine Z050 TN, Fmax 50 kN
- Body over wedge grips, Fmax 50 kN
- ProLine makroXtens P
- testXpert III, tensile test on aluminum alloys with determination of vertical anisotropy and hardening exponent

Advantages and benefits:
- The ProLine offers a cost efficient investment for simple and standardized tests.
- The automatic L0 setting of the ProLine makroXtens P facilitates fast and reliable testing.
- The special test program for aluminum materials is specified and validated by the authorized work group of the GDA (German aluminum manufacturer’s association) and the VDA (German automotive industry association). This test program is performed according to Method A2 and delivers reproducible results.

061 Tensile test to ISO 6892-1 on Thin Steel Sheet Metal for Production Control

Testing solution:
- ProLine Z050 TN, Fmax 50 kN
- Wedge Grips, Fmax 50 kN
- Clip-on extensometer 5025-1
- Clip-on extensometer 8040-1
- testXpert III, tensile test on metallic materials

Advantages and benefits:
- The ProLine offers a cost efficient investment for simple and standardized tests.
- Both clip-on extensometers, 5025-1 and 8040-1, can be easily changed for standard type specimens.
- With the preset Standard Test Program for tensile tests on metals in testXpert III, Method A2 can be easily activated to perform the standard-compliant test reliably and efficiently.

062 Tensile Test in Accordance with ISO 6892-1 on Copper and Aluminum Foils

Testing solution:
- zwickiLine Z0.5 TN, Fmax 500 N
- Screw grips, Fmax 1 kN
- videoXtens 1-120
- testXpert III, tensile test on metallic materials

Advantages and benefits:
- With the screw grips for metallic foils, reliable testing is achieved without failed attempts.
- The non-contact videoXtens 1-120 extensometer is ideal for repeatable results, since the specimens are not subjected to any additional load.
- The specimen marking set can be used to manually mark specimens with ease and efficiency.
Mahr GmbH

**MarSurf M 400**

**Applications**
Mobile Surface Measuring Station in measuring room and/or production area

- On shafts, housing components, large machines
- In automotive engineering
- On large workpieces
- On milled and turned parts
- On ground and honed workpieces
- At the production site on the machine for fast testing of roughness depth, waviness and profile parameter of the workpiece in or on the machine
- Can be expanded to a small measuring station in the workshop with the measuring stand

**Features:**
- Free tracing with high precision probe system
- Fast probe change due to magnetic probe arm holder
- Protection for damage
- Flexible movement due to cable-free Bluetooth connection
- Mobile use due to operation with power supply or storage battery
- International up to date due to all common parameters as per ISO, JIS, ASME, many integrated languages

**MarSurf XR 1**

**Applications**
- PC-based mobile surface measuring station
- The MarSurf XR 1 combines mobile surface metrology with the advantages of a MarWin evaluation software. This means, for a roughness or waviness measurement, a simple all-in-one PC as well as the suitable drive unit suffice. Depending upon the customer’s needs, laptops or industrial PCs can also be implemented.
- On shafts, housing components, large machines
- In automotive engineering
- On large workpieces
- On milled and turned parts
- On ground and honed workpieces
- At the production site on the machine for fast testing of roughness depth, waviness and profile parameter of the workpiece in or on the machine
- Can be expanded to a small measuring station in the workshop with the measuring stand

**Features**
- Over 80 parameters selectable for R, P, W profile as per current standards ISO/JIS or MOTIF (ISO 12085) Comprehensive recording records
- Quick and Easy measuring programs can be quickly created in the teach-in procedure
- Automatic function for the standardized selection of cutoff and probe length (patented)
- Support of different calibration methods (static and dynamic) with specificaiton of the parameter Ra or Rz
- Band-pass filter Ls according to current standard, LS can also be switched off or freely varied
MarForm MMQ100

Portable measuring instrument for assessing form and location deviations as per DIN ISO 1101, more easy and more accurate thanks to EasyForm software

Applications:
- Satisfies most form analysis situations
- Roundness (also in a sector)
- Flatness (out of one circle)
- Concentricity
- Coaxiality
- Radial run-out
- Axial run-out
- Circular parallelism of top and bottom faces
- Harmonic Analysis

Features:
- Simplest to use roundness gage on the market
- Touch Screen user interface
- No keyboard or mouse required
- Precise and fast measurement results
- Mobile due to its low weight and convenient size
- Fast workpiece alignment thanks to computer support
- Centering and tilting screws for rough and fine adjustment
- Suitable for use in workshop since no compressed air connection is required
- Encoders in X and Z feed position directly to the sw
4lab GmbH

Pneumatic Cutting Press 7108

Application:
Cutting press are used to manufacture specimens from rubber, elastomers, foam rubber, plastic foils, and paper with a hardness up to 85 Shore A (according to ISO 868). The primary specimen shape classifications are as follows:
- Rectangular specimen
- Dumbbell specimen
- Round specimen
- Special specimen

Technical Data:
- Max compressive force: 35 kN
- Max distance between cutting table and push-rod: 93 mm
- Projection: 110 mm
- Cutting table: 350 x 215 mm
- Compressed air supply: 6 bar
- Dimensions: 350 x 450 x 650 mm (width x depth x height)
- Weight: 75 kg

Special Features:
- Specimen production in accordance with standards
- Can be used flexibly for different materials with hardness up to 85 Shore A
- Easy operation
- High operational safety due to integrated ejector system
- Long tool lifetime
- Two-handed operation with a safety interlock

Abrasion Tester 6103

Application:
The Zwick 6103 abrasion tester is designed to meet the requirements of ISO 4649 and ASTM D5963. The abrasion tester is used to determine the abrasive resistance of rubber and elastomers. The abrasive resistance is defined as the volume loss of a round specimen. At a constant pressure and speed, the specimen travels a pre-set distance over the abrasive paper. Every specimen will be weighed out before and after the testing accurately to 1 mg.
For comparison measurements, the abrasion tester can also be used for other materials such as plastics, chalk, or paints.

Technical Data:
- Specimen loading:
  - 2.5 N
  - 5 N
  - 7.5 N
  - 10 N
  - extendible to:
    - 12.5 N
    - 15 N
    - 17.5 N
    - 20 N
- Test distance: 40 m at 84 drum revolutions
- Half distance possible: 20 m at 42 drum revolutions
- Specimen diameter: 16 mm
- Specimen length: 6 ... 15 mm
- Max. gripping length: 13 mm
- Speed of specimen fixture: 0.9 U/min (for rotating specimens)
- Travel speed: 0.32 m/s
- Lateral displacement of specimen per drum revolution: 4.2 mm
- Drum dimensions (diameter x length): 150 x 480 mm
- Drum speed (RPM): 40 U/min
A3 - Metal

4lab GmbH

- Power supply: 100 – 240 V / 50 or 60 Hz / 1 A
- Case dimensions (length x depth x height): 760 x 360 x 320 mm
- Weight: 50 kg

Special Features:
- Versatile tester suitable for testing of fixed or rotating specimens
- Test distance adjustable (half the standard distance) for soft specimens
- Automatic OFF when protective cover is raised or the test distance travelled
- Thermal protection switch to prevent overloading
- Loading of 2.5 N to 10 N through exchangeable weights

High Precision CNC Measuring Microscope for CT-Specimens, Impact Test Specimens & other complex components for material testing

Application:
The Measuring Microscope delivers high precision repeatable measurement of CT Specimens, Impact Test Specimens & complex components of all materials. The 3-axis-CNC-control is realized via servomotors and joystick and can be used for automatic measurement of multiple complex components.

Technical Data:
- Measuring Range X-, Y-Axis: 250 x 170 mm
- Length Deviation: 1.9 µm + L/100 (L in mm)
- Measuring Range Z-Axis: 200 mm
- Camera: USB 25 images/s, 1.3 megapixels
- Object Lens: Fixed lens / Zoom lens 0.7x-4.5x motorized
- Magnification: 35x – 225x
- Field of view: 9mm – 1.5mm
- Surface Light: 4 segment LED ring light (optional coaxial surface light)
- Transmitted Light: LED (optional telecentric)
- Positioning: Laserpointer
- Max. Table Load Capacity: max. 20 kg
- Included in Delivery: 23" touchscreen PC, keyboard, mouse, calibration certificate, instruction manual

Description: Hardness Tester Pusey & Jones

Application:
It serves for determination of the penetration depth and elasticity on rubber and rubberlike materials, such as rubber rollers and standard blocks made of rubber with a minimum material thickness of 13 mm, as well as paper rollers.
The hardness tester works according to ISO 7267-3 and ASTM D 531.

Technical Data:
- Indentor: Ball Ø 3.175 mm
- Total force: 9.8 N
- Loading weight: 1000 +/- 2g
- Reading of the measured values (in Pusey & Jones): 0-300, 1 Wert = 0.01mm
- Net weight: 3.30 kg
- Dimensions: 250 x 90 x 130 mm (h x w x d)
A5 Metal
Hardness Testing to ISO 6507-1 and ISO 6508-1 on Pipe Wall Specimens and Welded Joint Specimens

Testing solution:
- Hardness testing machine ZHU250CL-S
- Vickers indenter
- Rockwell HRC indenter (Diamond cone 120°)
- Diamond software for automatic indentation measurement
- T-slotted platform

Advantages and benefits:
- The universal hardness tester quickly and flexibly performs a wide variety of hardness tests, each according to task. The unique 4-plus-4 turret provides enough space to hold up to four indenters and four lenses at the same time—change your test method with a single click in the software.
- Image analysis is carried out with a self-learning algorithm, which uses testing experience on specimens with complex surfaces and therefore, for example recognizes indentations on low contrast surfaces. Not only are the efforts in specimen preparation minimized, it also achieves perfect conditions for high repeatability and reproducibility among different operators.
- The lighting settings are automatically adjusted according to the reflection of the material. Among other things, this allows for convenient and fast adjustment of estimations of the quality of welded joints, i.e. in the heat-affected zone (HAZ).

Rockwell Hardness Test to ISO 6508-1 on Pipe/Tube Specimens

Testing solution:
- Hardness tester ZHR8150CLK
- Rockwell HRC indenter (Diamond cone 120°)
- Connection to testXpert III for test reports

Advantages and benefits:
- The ZHR8150CLK combines all hardness test methods via depth measurement on metals and is ideal for quick individual tests, as well as the integration with automated handling systems.
- The special closed loop system of the force application provides a better and more stable load onto the specimen (without overshooting). With this, reliable test results are achieved for a wide variety of specimen types.
- The high-precision direct calibration of force and indentation depth guarantee excellent reproducibility of the test results.
- With the testXpert III connection for user-defined report creation, normative conversion, and flexible database connection, an innovative and modern testing system is achieved.

Vickers Hardness Test to ISO 6507-1 on Pipe Wall Cross Sections and Welded Joint Cross Sections (Sequence Tests)

Testing solution:
- Hardness testing machine ZHV30-A
- Vickers indenter
- HD software for automatic sequence testing
- X-Y table with specimen mount for flat welded joint specimens
Advantages and benefits:
- During the automated sequence test on welded joints, the measurement of indentations is quick, precise and operator independent due to the software.
- The modular specimen support surface with special clamping device provides a flat surface on a level plane, allowing for efficient testing of special specimen shapes.

Hardness Testing to ISO 6507-1 and 6506-1 on Pipe-Wall Specimens and Welded Joint Specimens

Testing solution:
- Universal hardness tester ZHU250
- Indenter, Vickers diamond pyramid 136°
- Indenter, hard metal ball Ø 2.5 mm
- Indenter, Rockwell diamond 120°
- Table for ZHU250

Advantages and benefits:
- The ZHU250 is a highly robust, yet accurate hardness tester for a number of application scenarios within a wide range of applications.
- It features intuitive operation, and is therefore ideally suited for use in manufacturing and production.
- The optical measurement of indentations is realized through a digital precision measuring system on a highly tempered, non-reflective focusing screen. The conversion to other hardness scales is integrated in the instrument and displayed on the operating electronics in a simple and tamper-proof manner.

Tensile Test on Pipe Sections

Testing solution:
- Electromechanical high-capacity machine Z2000ES, Fmax 2000 kN with lateral test area (Fmax 600 kN)
- Parallel closing hydraulic grips
- Specimen grips for threaded head specimens in lateral test area
- makroXtens HP extensometer
- testXpert III testing software, Master Test Program for tensile tests

Advantages and benefits:
- Convenient operating height of testing machine due to top-mounted drive
- No jaw replacement necessary for flat specimens from 0-100 mm thanks to parallel closing specimen grips
- Additional fixtures can be mounted in the additional test area. No need for mounting and dismantling heavy components. Tests can be performed more quickly, ergonomically, and reliably.

Tensile Tests on Pipes

Testing solution:
- Electromechanical high-capacity machine Z600E, Fmax 600 kN
- Parallel closing hydraulic grips
- makroXtens HP extensometer
- testXpert III testing software, Master Test Program for tensile tests
Advantages and benefits:

- Fully automatic extensometer measures the strain up to specimen break. Strain at break is determined automatically.
- Gripping pressure can be adapted to the specimen via the testing software. Prevents invalid tests due to slippage or specimen break during gripping.

**Automatic Determination of the Specimen Cross-Section**

**Testing solution:**

- CMU30 cross-section measuring device for dimensionally stable, flat specimens up to 30 mm thick
- Color touch-panel for operation and for displaying measured values; includes language swapping
- Direct transfer of measured values to testXpert III via RS232 interface
- Optional: Use as a central measuring station using CMUshare software

Advantages and benefits:

- Accurate: Two measuring transducers each for thickness and width, which follow a differential method, provide correct and precise measured values
- Repeatable: Periodic comparative measurements with a gauge guarantee repeatable results
- Reproducible: Centering and an automatic measurement sequence ensure repeatable results without operator influence
- Traceable: Together with the CMUshare software, specimens can be identified by their barcodes/2D codes and results are assigned without the risk of errors

**Automatic Determination of the Specimen Cross-Section**

**Testing solution:**

- CMU80 cross-section measuring device for dimensionally stable, flat specimens up to 80 mm
- Color touch-panel for operation and for displaying measured values; includes language swapping
- Automatic sequence for single or triple measurement
- Direct transfer of measured values to testXpert III via RS232 interface
- Optional: Use as a central measuring station using CMUshare software

Advantages and benefits:

- Accurate: Two measuring transducers each for thickness and width, which follow a differential method, provide correct and precise measured values
- Repeatable: Periodic comparative measurements with a gauge guarantee repeatable results
- Reproducible: Centering and an automatic measurement sequence ensure repeatable results without operator influence
- Traceable: Together with the CMUshare software, specimens can be identified by their barcodes/2D codes and results are assigned without the risk of errors
Automated Tensile Tests on Metal Specimens

Testing solution:
- Robotic testing system roboTest L for automatic feeding of metal specimens
- 100 kN materials testing machine Z100 including MakroXtens extensometer, transverse videoXtens and hydraulic grips for tensile tests to ISO 6892
- Cross-section measuring device
- testXpert III testing software and autoEdition 3 automation software

Advantages and benefits:
- Upon start of the robotic testing system with autoEdition 3, the user immediately experiences the benefits of intuitive operation from a look and feel that is consistent with the testXpert III user interface.
- The robotic testing system requires no supervision (even during breaks or overnight), allowing high specimen throughput of around 20 specimens per hour.

Notch Impact Flexure Test to ISO 148-1 and ASTM E23

Testing solution:
- HIT450P pendulum impact tester
- Safety housing, electrically interlocked
- Motorized pendulum lift
- Charpy version 450 J

Advantages and benefits:
- Through the combination of analog and digital display of the absorbed impact energy, redundant, reliable and traceable results are achieved.
- Specimens with the smallest amount of absorbed impact energy of up to 2.5 joules or less, can be tested with the large 450 joule pendulum hammer and still deliver standard-compliant and reliable test results.
- With the four-way reversible anvils and use of special materials with anvils and tups, the service life is increased and the maintenance costs are significantly lowered.
Automated Tensile Tests on Metal Specimens

Testing solution:
- Robotic testing system roboTest L with AGV (Automated Guided Vehicle) for specimen transport
- 100 kN materials testing machine Z100 including MakroXtens extensometer, transverse videoXtens and hydraulic grips for tensile tests to ISO 6892
- Cross-section measuring device
- testXpert III testing software and autoEdition3 automation software

Advantages and benefits:
- Upon start of the robotic testing system with autoEdition 3, the user immediately experiences the benefits of intuitive operation from a look and feel that is consistent with the testXpert III user interface.
- The robotic testing system requires no supervision (even during breaks or overnight), allowing high specimen throughput of around 20 specimens per hour.
- The Automatic Guided Vehicle (AGV) is the fully automated interface between specimen preparation and testing laboratory, and guarantees completely unmanned operation of the robotic testing system for tensile tests.
- The autonomous testing lab can operate around the clock 24 hours a day, 7 days a week (24/7).
ZwickRoell has developed a wide range of specimen grips and accessories specifically for the textile industry, which are easy to change according to application. In this exhibition area we will present these solutions and show how they can support you in achieving reliable test results and reducing test times.
Hall plan Textile A3
076  Sensor-based input of test orders

Application in laboratories and production plants for textile products. Reduction of operating errors. Manual input by automatically loading the test specification and saving the test reports together with production data in real time.
Highlight

DIN 53835-13 Tensile Load on Elastic Fabrics

Testing solution:
- zwickiLine Z1.0 TN, Fmax 1 kN
- Pair ring specimen grips, Fmax 50 N
- Pneumatic grips, Fmax 1 kN
- Clip-on extensometer 8040-1

Advantages and benefits:
- The specimen grips allow for easy insertion as well as secure gripping of elastic fabrics.
- The clip-on extensometer features ergonomic handling (single-handed operation), ensuring an efficient and reliable test sequence.

Tensile Tests to DIN EN ISO 13934-1, ISO 1421
Tensile Test, Grab Method to DIN EN ISO 13934-2
Push-Through Test to ISO 3303

Testing solution:
- AllroundLine Z020 TN, Fmax 20 kN
- Ball burst test device, Fmax 10 kN
- Pneumatic grips type 8397, Fmax 10 kN
- videoXtens 1-270

Advantages and benefits:
- With the pneumatic grips, technical textiles are traceably tested according to standards since the clamping pressure on the different materials can be steplessly adjusted.
- The videoxtens extensometer features simple handling and wear-free operation.
- The test environment concept in testXpert III allows for a quick start of a new test following the change of a test program and the corresponding test tools.

Tensile Test on Rope to ISO 2307

Testing solution:
- AllroundLine Z100 TEW, Fmax 100 kN
- Protective pane, front
- Specimen grips for Rope, Fmax 50 kN
- lightXtens 2-1000

Advantages and benefits:
- With the use of optical measuring systems such as the lightXtens, the strain up to failure for ropes can be determined.
- Due to the load reduction rollers, ropes can be tested without jaw breaks and without slipping effects.
- In the case of whipping specimens, the protective pane guarantees operator safety.
DIN EN ISO 2062 Tensile Test on Yarns
DIN EN ISO 13934-1 Tensile Test on Textile Fabrics

Testing solution:
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Pneumatic grips, Fmax 2.5 kN
- Load reduction curves with 180° deflection

Advantages and benefits:
- With 180° deflection, high-strength yarns can be tested according to standards.
- The pneumatic foot control unit allows for quick and traceable gripping of the specimen, independent of the operator.
- If the application changes, the jaws can be changed quickly and easily without tools. The jaws are then automatically centered.
ZwickRoell Junior
ZwickRoell Junior Division

The ‘ZwickRoell Junior’ division was established in 1995 to provide training in an appealing and realistic setting.

What is ZwickRoell Junior?

Around 70 highly motivated young people enthusiastically undergoing training or following a course of study at ZwickRoell.

In this independently run division, all the commercial activities of a ‘full-sized’ company are carried out on a smaller scale. This helps to provide a better understanding of business management processes and relationships within the company.

Individual products available include:

- models of testing machines in different types
- business card case
- napkin rings
- candlesticks
- memo tree
- pinboard
- Nine Men’s Morris, Peg Solitaire, Ludo; Super Six and different types of puzzle
- rings
- picture ladder
- bottle-holders + bottle-openers
- metal birds (large or small)

Visit our Online Shop at www.zwickjunior.de.
What options does the zwickiLine testing machine offer for testing applications from our everyday lives? Learn more about the benefits of high-performance, space-saving testing machines.
Flexure Test on Sandwich Specimens

Testing solution:
- ProLine Z010 TN, Fmax 10 kN
- 4-point flexure test kit
- Displacement transducer for compression tests and 3 or 4-point flexure tests

Advantages and benefits:
- The ProLine is a cost-efficient testing system, which in combination with testXpert III, is fast and easy to operate.
- Two steel columns provide highly accurate guidance for ProLine’s moving crosshead, enabling precise force application to the specimen. This is particularly beneficial for flexure tests.
- Accurate test results are achieved with the extensometer’s extremely high measurement accuracy.

4-point Flexure Test to DIN SPEC 91351

Testing solution:
- ProLine Z010 TH, Fmax 10 kN
- 4-point flexure test kit for testing of wafers
- Ergonomic safety device

Advantages and benefits:
- The CE compliant testing system offers the highest level of protection against splintering specimens for both the operator and the testing system. This is guaranteed, among other safety features, by the safety door with two channel electrical monitoring and mechanical guard-locking.
- The integrated mechanical overload protection of the load cell optimally protects it from unexpected tensile forces, compression forces and bending moments.

Charpy Impact Test to ISO 179-1 and -2

Testing Solution:
- HIT5.5P pendulum impact tester
- Instrumentation
- Partial safety device, right and left
- Charpy version 5 J

Advantages and benefits:
- The ZwickRoell electronics, testControl II and the instrument electronics, are a secure, future-proof investment. With their high level of flexibility and unique variety of interfaces, the electronics can be easily adapted for growing testing requirements.
- The new instrument electronics with new functionality feature intuitive workflow oriented operation.
- High flexibility is achieved with our without the use of a PC. This allows complete configuration and testing processes to be performed with the Touch Display or via testXpert III.
Determination of MFR Method A and MVR Tests Method B to ISO 1133, ASTM D1238, ASTM D3364, JIS K 7210

Testing solution:
- Mflow extrusion plastometer
- 2.16 kg and 5 kg weights
- Cleaning device
- Piston displacement transducer

Advantages and benefits:
- The automated optimization of the measurement parameters for the corresponding plastics material (APC function) controls the measurement time and travel, and ensures utmost accuracy and precision of the determined flow rates.
- Movement of the weight lifting unit can be used to pre-compact the plastics material and to simplify the cleaning process.

Tensile Test to ISO 24334 Section 6+7

Testing solution:
- ProLine 2005 TN, Fmax 5 kN
- Screw grips type 8253, Fmax 2.5 kN
- ProLine markoXtens P
- Drive unit for motorized attaching and detaching of the sensor arms

Advantages and benefits:
- Secure hold of the specimen is achieved even with low operating forces.
- If a different specimen has to be used, the jaws can be changed quickly and easily without tools. The jaws are then automatically centered.
- The drive unit option for motorized attaching and detaching of the sensor arms for the ProLine markoXtens P reduces operator influences and provides easy handling.
Determination of Dynamic Stiffness on Impact Sound Insulation to EN ISO 9052 // DIN-EN 29052

**Testing solution:**
- Electrodynamic testing machine LTM 3 (HR)
- Standard-compliant, hardened compression platens with spherical mounting
- Digital measurement and control electronics testControl II with 10kHz control frequency allows for quick reaction to spontaneous events
- Testing software: testXpert R

**Advantages and benefits:**
- With the integrated T-slotted platform for easy and flexible mounting of test devices, specimens and components
- The travel measuring system is coaxial and mounted near the specimen in the piston rod. This results in high positioning repeatability and precise piston travel measurement.
- Intelligent testing software featuring intuitive operation
  - testXpert R for dynamic tests and testXpert III for static tests

With the introduction of the LTM1 and LTM2, the ZwickRoell LTM series was expanded to include smaller load forces. The LTM3 now completes the ZwickRoell product portfolio between 1 and 10kN. In the HR version with enhanced performance.

Compression Test to DIN EN 826
Compression Test to EN 1608

**Testing solution:**
- AllroundLine Z010 THW, Fmax 10 kN
- Special grips for insulating materials, Fmax 10 kN
- Complete compression test kit, 400 x 400 mm

**Advantages and benefits:**
- With the use of a second test area, the type of test can be quickly and efficiently changed, without having to change any tools.
- The specimen grip 8330 ensures that the insulating material is not squeezed, but rather held in place with the pins, according to standard.
- The compressive strength, the compressive strain, and the elasticity are important values for insulating materials and are determined through the use of two compression platens in the second test area. Here, a separate displacement transducer is not required.
3-Point Flexure Test on Components

Testing solution:
- ProLine Z010 TN, Fmax 10 kN
- Ergonomic safety device
- 3-point flexure test kit
- Upper anvil/support can be turned R=5

Advantages and benefits:
- The safety housing ensures operator safety in the case of high-energy breaks resulting from flexure testing, since the test can only be performed with a closed safety door.
- The stiffness of the test arrangement is determined through a correction curve and stored in testXpert III. This helps to increase the resolution of the testing machine, making the results more precise, and no additional external travel measuring system is required.
- The tilting elements are used to level out possible unevenness in the parallelism of the specimens. The test arrangement therefore adapts to the specimen shape, avoiding overload of specific points, which can lead to premature break.

Tensile Test to DIN EN ISO 10319

Testing solution:
- AllroundLine Z100 SN, Fmax 100 kN
- Hydraulic grips for geotextiles, Fmax 100 kN
- videoXtens 1-120

Advantages and benefits:
- With the use of a geotextile specimen grip the specimens are held over the entire surface width with even gripping force. With this, slipping effects in the border areas of the specimen are avoided, and standard-compliant testing is ensured.
- The extension of the specimen is determined with the use of a videoXtens 1-120 extensometer in the middle of the specimen. Therefore the extension is not influenced by any occurrence of transverse contraction (neck down effect).
- With the use of a work panel, the specimens are centrally aligned to the test axis, and with the rail system in the specimen grip the specimens can be easily inserted.
A3

Building materials
Hall plan Building A3
091 Compressive strength test on cement, mortar etc. according to EN 196 and international standards

Solution:
- ToniZEM model 1547, Fmax 300 kN
- Automated servo-hydraulically controlled test sequence
- CE-compliant protective device
- ToniTROL II and testXpert III document secure test results

Benefit for the customer:
- Directly integrated standard-compliant printing plates
- Ball seat in high-quality strain cylinder execution, low standard deviation
- Attractive price-performance ratio

092 Cement sample compaction according to EN 196, ASTM C 109 and other international standards

Solution:
- ToniVIIB model 5543
- closed loop control for compliance with the required compaction parameters with fast MEMS sensor technology
- with digital control via touch screen and digital display of frequency, amplitude, acceleration and test duration
- Database with storable test sequences and individual parameterization
- Conforming to DIN EN 196-1 and ASTM C109 standard

Benefit for the customer:
- The control electronics ensure reproducible manufacturing conditions for cement sample compaction according to EN 196-1, ASTM C109.
- This largely eliminates the effects of local power supply conditions.
- According to the state of the art, smaller deviations for compaction results and thus smaller deviations for strength values

093 Automatic, freely programmable mortar mixer with integrated viscosity measurement, individual automatic water dosing, speed and intuitive menu navigation with touchscreen operation.

Solution:
- ToniMIX Visco Expert, model 6226
- Freely programmable in sequence, speed and water dosage
- Integrated control system for automatic fine dosing of water to achieve a predetermined final viscosity
- Robust, high-quality design for continuous use

Benefit for the customer:
- Reproducible mixing conditions due to stored automatic sequences
- Maximum level of availability and reproducibility due to reputed high quality and wear resistance
- Standard mixing processes (EN/ASTM) pre-programmed, the mixer can be used automatically for both standards
Toni Technik Baustoffprüfsysteme GmbH

Mortar mixer with standard test procedures conforming to EN 196, Part 1, ISO 679, ASTM C305 and other standards

Solution:
- ToniMIX Standard, model 6224
- User friendly and clear program selection via touch screen
- Model 6224.300 with automatic water quantity dosing according to EN or ASTM standard
- Robust, high-quality design for continuous use

Benefit for the customer:
- Reproducible mixing conditions due to stored automatic sequences
- Maximum level of availability and reproducibility due to reputed high quality and wear resistance
- Standard mixing processes (EN/ASTM) pre-programmed, the mixer can be used automatically for both standards

Automatic Le Chatelier water bath for the determination of the soundness according to EN 196-3 (microprocessor controlled water bath)

Solution:
- ToniCHAT, model 4706.025
- Exact standard-compliant sequence control
- High quality design and availability

Benefit for the customer:
- Safe and ergonomic sample handling
- Low personnel effort
- Precisely reproducible test conditions and thus test results

Automatic free lime determination device for cement and clinker

Solution:
- ToniLIME, model 6750
- Measurement via conductivity determination, no use of chemicals as in the wet chemical process procedure
- Automated measuring sequence with reproducible measuring conditions
- Very fast available measurement result

Benefit for the customer:
- Attractive price-performance ratio
- Minimal laboratory staff commitment, no chemical laboratory technician required
- Very fast available measurement result
097 Testing the fineness of a powdery material

Testing the fineness of a powdery material is important in many industry sections. In addition to the cement test, which describes this measurement procedure in the EN 196 or the ASTM C 204 standard, this measurement procedure is used in the pharmaceutical industry, in the sintering technology and in the fine coal sector.

Solution:
- ToniPERM- Standard, model 6578 fully standard compliant
- ToniPERM II „System Dyckerhoff“ model 6575, adapted for easy handling, e.g. in the shift laboratory of a cement plant
- Intuitive user interface with new operator guidance via touch screen
- Database with memory function for recurring test sequences
- Automatic transfer of measurement results e.g. to a LIMS

Benefit for the customer:
- Reduced personnel effort compared to the manual procedure
- Reproducible test results
- Storage of measurement data over a longer period of time

098 Automatic Blaine instrument „System Dyckerhoff“ for the determination of the fineness according to EN 196-6 and ASTM C204

Solution:
- ToniPERM II, model 6575
- automated test sequence
- Touch screen with display of all relevant parameters and intuitive operation
- Low standard deviation due to minimized error influences in test preparation
- Reliable test preparation due to the option of a volume bed height correction
- Averaging of two separately produced samples in one test run, as required by the standard for a representative measured value
- Second measuring cell belongs to the standard scope of delivery of the device
- Data export to a LIMS

Benefit for the customer:
- Simple test preparation with weighing in of grams instead of milligrams
- Reliable availability without significant maintenance requirements
- Simple automated and safe calibration with reference material

099 Cement production to several international standards

Cement production and trading is a cross-border business. Therefore more and more cement producers are forced to carry out their quality control according to several international standards.

In addition to different mixing processes, this also requires the correct dosing of two different amounts of water during sample preparation.
This automatic water dosing functionality distinguishes our completely new standard mixer, next to its new operator friendly interface via touch screen.
Toni Technik Baustoffprüfsysteme GmbH

Solution:
• ToniMIX Standard, model 6224.300
• ToniMIX Expert, model 6225/26/27

Benefit for the customer:
• Instead of two different mortar mixers to produce cement mortar samples automatically according to EN and ASTM only one mixer is now required.
• After selecting the desired mixture via touch screen, the corresponding water quantity is automatically added.
• Reduced space requirements and service effort in the laboratory

Compressive and flexural strength testing in accordance with EN 196, as well as the possibility of connecting a concrete test frame, e.g. for quality monitoring.

Solution:
• ToniPRAX model 1543, Fmax. 300/20 kN
• Automated servo-hydraulically controlled test sequence
• CE-compliant protective device
• ToniTROL II and testXpert III document secure test results

Benefit for the customer:
• High investment security due to expandability according to requirements
• Expandable with all relevant additional functions; MOE; deformation control
• Investment in budget and requirement compliant individual steps

Compressive strength test on concrete according to ASTM C039 and EN 12390, 2000 kN concrete testing machine with strain cylinder ball seat according to EN 12390, part 4, ToniTROL II and optional testXpert III

Solution:
• ToniCON model 2039, Fmax 2000 KN
• Automated servo-hydraulically controlled test sequence
• CE-compliant protective device
• ToniTROL II and testXpert III document secure test results

Benefit for the customer:
• Attractive price-performance ratio
• Documentation-safe test results, optionally with testXpert III
• Expandable with all relevant additional functions; MOE; deformation control
• LIMS connection

Flexural tensile testing of fibre reinforced building materials according to various national and international standards with video capturing

Solution:
• ToniNORM model 2078, Fmax 300 kN
• Automatic test sequences controlled by force, displacement and deformation
Extremely rigid load frame for sophisticated deformation control beyond the initial fracture
Recording of the entire test with a video camera in the test specification

Benefit for the customer:
- All relevant test procedures implemented in testXpert III
- All international standards can be applied with corresponding measurement accessories and will be evaluated in testXpert including videos (video capturing).
- Subsequent extension for other or new test applications and procedures possible at any time

One or Two station automatic Vicat device for the determination of the setting time of cement, gypsum or mortar according to all important international standards like EN 196-3, EN 13279-2, EN 480-2, ASTM C191, ASTM C472 and ASTM C807

Solution:
- ToniSET ONE, model 7301 / ToniSET TWO, model 7302
- Integrated regulated water temperature control in a range of +/- 3°C to ambient temperature, adjustable +/- 0.1°C

Benefit for the customer:
- Exact standard-compliant test conditions
- Change between application for cement, mortar or gypsum by simply replacing the drop bar
- Effective cleaning and drying (gypsum) of the needle

Solidification of the pumpable building materials highlight

3D printing will revolutionize residential construction in many areas and demands special requirements to the setting behavior, to the pressure mix design resp. to the solidification of the pumpable building materials.

If the material has escaped from the pressure nozzle, solidification should occur as quickly as possible. In order to be able to precisely adjust this process in the laboratory, a test method is required that provides a continuous statement about the hardening process with little intervention in the existing microstructure.

Solution:
- For this application, Toni Technik has developed the high-resolution penetration penetrometer ToniSET „Force“ 7327 by means of an academic environment.
- The device guides an indenter into the mixture (test material) at a very low, adjustable feed rate and continuously records the increase in force during the setting process.
- If force measurement is not required, the one- and two-station Vicat instrument, model 7301/02 can also be used for this application by activating the „quick measurement function“.

Benefit for the customer:
- Fast and high-resolution force increase measurement over the complete setting time, without alterations in the microstructure, e.g. due to vibrations.
- Reproducible measurement results due to automated procedure
- Test graphics for each measurement
Toni Technik Baustoffprüfsysteme GmbH

6-station calorimeter for the quantitative measurement of the heat of hydration of cement and other binding agents

Solution:
• ToniCAL HEXA model 7334 with new control unit and operating software, ToniCAL DCA-Analytics
• 6 measuring stations which can be used independently of each other and are located in a common, uniformly tempered housing, which, for example, enables measurements in an external tempering device not only under standard laboratory conditions in accordance with all relevant international standards
• A post-injection module (option) can be used for each measuring point, with which the influence of admixtures (accelerators and decelerators) in the running hydration process can be determined very precisely.
• Internal mixing of the reagents

Benefit for the customer:
• Visualization of the hydration energy in a Joule/g vs time diagram with interpolation function for early estimation of the total evolved heat of hydration quantity.
• Extremely high accuracy due to the combination of the mixing components in the inside of the temperature-controlled calorimeter sample vessel (initial peak)
Analysis functions for further interpretation of the recorded data

6-station automatic Vicat device for determination of the setting time of cement or gypsum according to EN 196-3, EN 13279-2, ASTM C191 and ASTM C472

Solution:
• ToniSET Compact, model 7306
• Minimum space requirement
• Software functions like 7312

Benefit for the customer:
• Attractive price-performance ratio
• Compact dimensions

8-station automatic Vicat device for the determination of the setting time of cement or gypsum according to EN 196-3 and EN 13279-2

Solution:
• ToniSET Classic, model 7308
• Device specially optimized for cement testing
• Identical software function as model 7312

Benefit for the customer:
• Good accessibility to the test stations
• Attractive price-performance ratio
12-station automatic Vicat device for the determination of the setting time of cement, gypsum, mortar or other binding agents, according to EN 196-3, EN 13279-2, EN 480-2, ASTM C187 and ASTM C191 and other international standards

Solution:
• ToniSET Expert, model 7312
• Fully automatic operation with needle cleaning and drying (for gypsum)
• Storable test sequences for certain cement types
• Automatic determination and evaluation of all desired characteristic values via software
• Digital determination of relevant data with database function and export option (LIMS)

Benefit for the customer:
• Reproducible test results with minimum personnel costs
• Testing according to different standards can be carried out in a few simple steps
• Determination of test results also outside the usual laboratory working hours

Laboratory furniture range for rational and ergonomic sample preparation with integrated performance units in building materials laboratories

Solution:
• Toni Performance Unit, model 5000xx
• Individually planned according to customer-specific requirements
• Integrated functions, such as sedimentation tank and sample storage, etc.
• Extreme durability due to optimized corrosion protection
• Available over many years in the same design for laboratory extensions

Benefit for the customer:
• High efficiency in repetitive workflows
• Occupational safety through ergonomically planned work modules
• Durability with low maintenance requirements
Haver & Boecker OHG – Particle Analysis

HAVER EML 200 Pure
HAVER EML 200 Premium
HAVER EML 200 Premium Remote

Applications
- Industrial rocks and minerals (Gravel, Sand, Grit, Ore, Quartz, Calcium)
- Food (Coffee, Cocoa, Tea, Sugar, Salt, Cereals)
- Chemistry (Silicon, Metal shavings, Fertilizer, Coloring)
- Animal Feed (Litter, Pet food, Chicken Feed)

Technical Data
- Measurement range: 20µm – 125 mm
- max. sieving material batch: approx. 3 kg
- Sieve tower weight: max. 8.7 kg
- Sieve diameter: 50 – 203 mm

Special Features HAVER EML Pure
- Amplitude: fine and coarse
- Operation type: Interval
- Interval: fixed, 10 sec.

Special Features HAVER EML Premium
- Amplitude: freely selectable up to 3 mm
- Operation type: Interval / constant
- Interval: adjustable
- Interface: yes

Special Features HAVER EML Premium Remote
- Amplitude: freely selectable up to 3 mm
- Operation type: Interval / constant
- Interval: adjustable
- Interface: yes
- For wet sieving
- Integrated full-cone nozzle
- Separate control gear
Central themes for tests on plastics and rubber on our static testing machines include Extension Measurement, Testing under Temperature and Automation. Learn more about the benefits of a testing laboratory under one roof: You can see the product ranges of our extrusion plastometers, pendulum impact testers and hardness testers in action and explore more specialized test methods such as abrasion testing or rebound resilience.
More information: www.zwickroell.com/plastics

Central themes for tests on plastics and rubber on our static testing machines include Extension Measurement, Testing under Temperature and Automation. Learn more about the benefits of a testing laboratory under one roof: You can see the product ranges of our extrusion plastometers, pendulum impact testers and hardness testers in action and explore more specialized test methods such as abrasion testing or rebound resilience.
**Malvern Panalytical GmbH**

**Kinexus – Rheometer**

**Applications:**
Unique rSpace software provides a user interface that offers total flexibility of test set-up for research and development, through to Standard Operating Procedure (SOP) driven testing for more routine rheological requirements. Across all material types, from solids to weakly-structured low viscosity samples to systems with critical time-dependent behaviour, Kinexus captures the true material properties.

**Features:**
Kinexus incorporates technological innovations in the most critical areas of rheometer design, from sample preparation and loading, through measurement set-up and operation, to data analysis and reporting. Adaptive intelligence allows Kinexus to actively guide users at every stage.

A true applications-led interface revolutionises and eases user interaction, bringing ‘expert system’ guidance and SOP-driven processes to rheological measurement. A unique and intelligent sample loading system takes all the guesswork and error out of this process, for accurate results.

An intelligent software system invites users to work at the level most appropriate to them.

Environmental controllers and geometries are truly ‘plug and play’, so setting up the rheometer has never been easier. Results and analysis can be tailored specifically to a particular measurement, material type or application.

[www.malvernpanalytical.com/kinexus](http://www.malvernpanalytical.com/kinexus)

**Rosand RH7, RH10 & RH2000 Capillary rheometers for process-relevant material testing**

**Application and Features:**
High-pressure capillary rheometry is a well-established method for simulating the processing conditions of molten polymers at high temperatures.

Malvern Rosand capillary rheometers RH7 and RH10 are research grade, floor standing twin bore systems that enable the widest range of shear rates to be tested, as well as complex rheological properties such as die swell and melt tension. These rheometers are used extensively for a range of applications including polymers, foods, coatings and ceramics.

Malvern Rosand capillary rheometers are also available as bench top systems (RH2000) for more routine measurement of shear viscosity for QC purposes.

Low temperature control options enable capillary rheometry to be applied to an extended range of materials. They comprise cooling coils with fluids circulator for measurements from 5°C to 50°C and an option for cryogenic cooling using liquid nitrogen for measurements to minus 40°C.

Temperature control at ambient or below is ideal for low viscosity materials (such as inks, paints, paper coating emulsions, plastisols and foods) when extension of the accessible range of shear rates to more than 100,000 s⁻¹ may be necessary to simulate processing conditions, such as pumping or extrusion.

[www.malvernpanalytical.com/rosand](http://www.malvernpanalytical.com/rosand)
polymerphys IK GmbH

Laboratory für plastics testing

„Whatever you give us, we will destroy. Promised!“

To imagine, we are a young, innovative, owner managed test laboratory with core competence
determination of physical properties on polymers with latest equipment predominantly from
ZwickRoell.

Professional consulting service at the area of production and preparation of test specimens.
Longtime experiences at the sector of fiber-reinforced plastic material as soon as material identifi-
cation by infrared spectroscopy.

Execution of practical seminars and workshops.

Active collaboration in executive function in national and international standards committee.
The test laboratory is located centrally at the industrial park hoechst, near the airport Frankfurt on
the Main / Germany.

Awarded by BG RCI with seal of approval „Sicher mit System“.

Main focus: mechanical testing methods, fibre length analysis, infrared spectroscopy

Testing methods:

• Tensile test
• Flexural test
• Creep test (tensile flexural modus)
• Impact test
• Tensile impact test
• Puncture test instrumented
• Hardness
• Density
• Vicat softening temperature
• Heat deflection temperature
• Mineral filler content
• Fogging behaviour
• Heat aging
• Melt flow rate MFR & MVR
• Test specimen preparation
• Light microscopy
• Picture analysis
• Fibre length analysis
• FTIR-Analysis

More information:
www.polymerphysik.de
113 **Puncture Testing to ISO 6603-2**

**Testing solution:**
- Drop weight tester HIT1100F
- Acceleration unit
- Temperature chamber
- Tooling for ISO 6603-2, ISO 7765-2

**Advantages and benefits:**
- The drop weight tester is ideally suited for standard-compliant testing of puncture, Charpy, Izod and high-speed tensile tests, as well as instrumented testing of components.
- An integrated acceleration unit allows for testing at high impact velocities, which cannot be achieved with a free fall.
- In addition to tests on standard-compliant specimens, the sturdy guides for the tup-holder also allow for measurements on components for which lateral forces caused by uneven impact surfaces can occur.

114 **Tensile test ISO 527-2, ASTM D638, flexure test ISO 178**

**Testing solution:**
- AllroundLine Z010 TEW, Fmax 10 kN
- Body over wedge specimen grip, temperature chamber version, Fmax 10kN
- Temperature chamber for materials testing machines
- multiXtens with 2 measurement carriages

**Advantages and benefits:**
- With the use of parallel closing pneumatic grips, a constant and reproducible strain rate progression is ensured.
- The new versatile multiXtens extensometer allows for accurate and precise measurement of the tensile modulus to ISO 527-1/-2, as well as the measurement of high specimen strain.
- ZwickRoell temperature chambers, with accurate temperature regulation, ensure high repeatability and reproducibility of the measurement results. By preconditioning the specimens in the specimen magazine, the test sequence is significantly accelerated.
NETZSCH-Gerätebau GmbH

DSC 214 Polyma
The System Solution for Efficient Characterization of Polymers

Technical data
- Temperature range: -170°C to 600°C
- Heating/Cooling rate: 0.001 K/min to 500 K/min*
- Indium Response Ratio: > 100 mW/K**
- Resolution (technical): 0.1 µW
- Enthalpy precision: ±0.1% for indium, ±0.05% to ±0.2% for most samples
- Specific heat determination: Optional
- Temperature modulation: Optional
- Cooling device options: Compressed air cooling (RT to 600°C) · IC40 (−40°C to 600°C) · IC70 (−70°C to 600°C) · LN2, automatically controlled (−170°C to 600°C)
- Gas atmospheres: Inert, oxidizing, static and dynamic operation
- Gas controller: Switches for 3 gases included · MFC for 3 gases, optional
- ASC: Up to 20 samples and references, optional
- Software Proteus®: The software runs under the operating systems Windows XP, Windows 7 and Windows 8.1.

Advantages and benefits:
- The New All-Inclusive Product Package for DSC Measurements
- Easy-to-use, robust, precise, optimized for everyday use – these are the features of the innovative DSC 214 Polyma. The unique design of this instrument encompasses everything needed for successful DSC investigations – regardless of whether the user is a beginner or an experienced professional. Above all, it is the two new software developments that are setting new standards: AutoEvaluation and Identify. These have the potential to revolutionize DSC analysis.

TG 209 F3 Tarsus
The easy-to-use and cost-effective thermo-microbalance

Technical data
- Design: Top-loading
- Temperature range: RT to 1000°C
- Heating rate: 0.001 K/min to 200 K/min
- Cooling time: Approx. 25 min (free cooling in inert atmosphere); 12 min in He*
- Max. sample weight/measuring range: 2 g
- TGA resolution: 0.1 µg
- Motorized sensor lift: For easy and safe handling of sensor change
- Interchangeable sensor types: ∙ High volume samples / large masses ∙ High sensitivity (c-DTA®) ∙ Corrosion-resistant
- Gas atmospheres: Inert, oxidizing, static and dynamic
- Gas flow control: Integrated frits -Optional: mass flow controllers, free-standing gas control device
- Time-controlled auto-cycle evacuation: Prior to measurement
- Temperature calibration: c-DTA®, also for detection of endo- and exothermal effects; Curie standards
- Mass calibration: Automated routine via integrated mass of 2 g ± 0.006 mg
- Calorific effects: Endothermal and exothermal effects by c-DTA®
- Crucibles: Pt, A203, Au, SiO2, Ag, ZrO2, Al, etc. More upon request.
- Automatic sample changer (ASC): Up to 20 samples (optional)
- Crucibles for use in ASC: Various types in one sample deposit
Advantages and benefits:

- The thermo-microbalance, TG 209 F3 Tarsus, represents a cost-effective overall concept, tailored not only to the quality assurance of polymers, but also to routine applications in the fields of organic, chemistry, pharmaceuticals, cosmetics and food.
Hochschule Aalen

Aalen University, Polymer Technology

Prof. Dr.-Ing. Achim Frick is head of the Institute Polymer Science and Processing and involved in polymer technology field since more than 3 decades. He is an senior expert in Polymer Engineering, Polymer Testing and Failure Analysis, also he is an author of related books „Praktische Kunststoffprüfung“ and „DSC-Prüfung in der Anwendung“ published by Hanser.

Prof. Frick provides services for industry, cooperative research and also training courses in polymer technology field.

Contact address: Achim.Frick@htw-aalen.de
**117 Creep Test on Plastics to ISO 899-1,-2**

**Testing system:**
- Creep testing machine Kappa Multistation 5 to 10kN
- Temperature chamber (if necessary incl. cooling unit and humidity control)
- Non-contact strain measurement
- Test fixture for tensile, compression, and flexure tests
- testXpert III test program for creep testing

**Advantages and Benefits**
- Flexible creep testing machine with 5 individual test stations
- Automatic control of the specimen temperature incl. temperature steps
- Compliance with standards requirement: no influence on plastic specimen due to non-contact strain measurement
SUNTEST CPS+ - The Practical Solution

SUNTEST CPS+ is the Original since more than 40 years. It is the most compact and most widely used xenon instrument for accelerated aging testing of polymers and photostability testing of cosmetics and pharmaceuticals.

The SUNTEST is used to check in a short period of time for property changes of polymers caused by sunlight, temperature and moisture. Changes happening outdoors or indoors over months or years, such as fading, yellowing or embrittlement can often be simulated inside a SUNTEST within weeks.

**Benefits:**
- Premium full-spectrum sunlight according to CIE85 reference sun
- User friendly interface in 11 selectable languages
- Pre-programmed 300 hour tests for Quick-starters or as test drafts
- Black Standard Temperature Sensor (BST) according to ISO 4892-1
- Dimmable irradiance either between 30-65 W/m² (300-400 nm) or 250-765 W/m² (300-800 nm) for high testing flexibility

**Accessories:**
- Immersion unit for testing materials under extreme moisture conditions
- Chiller unit for testing at low temperatures (e.g. cosmetics)
- Humidity sensor for measuring relative humidity in %
- SunCal sensors for simultaneous calibration of light and BST

SUNTEST CPS+ is the xenon instrument for newcomers in weathering testing or users with only occasional testing needs.

**Applications:**
Plastics, Additives, Colors, Inks, Coatings, Sealants, Cosmetics, Pharmaceuticals
Determination of MFR Method A and MVR Tests Method B to ISO 1133, ASTM D1238, ASTM D3364, JIS K 7210

Testing solution:
- Aflow extrusion plastometer
- Cleaning function
- Cleaning and pre-compacting function
- Die plug

Advantages and benefits:
- With the Aflow operator influence is reduced to a minimum: automation of the entire measuring sequence ensures high measurement accuracy as well as high reproducibility.
- The instrument is optimal for work reliability among several workers in multi-shift operations.
- The design of the instrument with electronically regulated force application allows for intelligent control of the test sequence as well as operation with minimal effort.

Determination of MFR Method A and MVR Tests, Method B to ISO 1133, ASTM D1238, ASTM D3364, JIS K 7210

Testing solution:
- Mflow extrusion plastometer
- Weight selector up to 21.6 kg
- Die plug
- Weight lifting unit
- Piston displacement transducer

Advantages and benefits:
- Once the specimen material has been added, the test can be performed without further operator intervention.
- The automated optimization of the measurement parameters for the corresponding plastics material (APC function) controls the measurement time and travel, and ensures utmost accuracy and precision of the determined flow rates.
- An adjustable catch, which stops the piston at a predefined position during the pre-heating phase, is available for measurement of very high MFR values.
- The test weight is selected by simply marking it with the weight selector. This ensures utmost operator safety.
**Determination of MFR Method A and MVR Tests Method B to ISO 1133, ASTM D1238, ASTM D3364, JIS K 7210**

**Testing solution:**
- Mflow extrusion plastometer
- 2.16 kg and 5 kg weights
- Cleaning device
- Piston displacement transducer

**Advantages and benefits:**
- Once the specimen material has been added, the test can be performed without further operator intervention.
- The automated optimization of the measurement parameters for the corresponding plastics material (APC function) controls the measurement time and travel, and ensures utmost accuracy and precision of the flow rates.
- Movement of the weight lifting unit can be used to pre-compact the plastics material, as well as simplifying the cleaning process.

**Determination of MFR Method A to ISO 1133, ASTM D1238, ASTM D3364, JIS K 7210**

**Testing solution:**
- Cflow extrusion plastometer
- 2.16 kg and 5 kg weights
- Motorized extrudate cutter
- Analytical scale

**Advantages and benefits:**
- Compact and simple device for occasional testing without compromising measurement accuracy.
- Absolute standard compliance with the implementation of all standardized weight levels from 0.325 kg to 21.6 kg, as well as exact adjustment option and control of the test temperature in the extrusion barrel.
- With easy access to change nozzles and for cleaning, minimal effort is required within the manually performed measurement series.
Tensile Test ISO 527-2 with Tensile Modulus

Testing solution:
- ProLine Z010 TN, Fmax 10 kN
- Xforce K load cell, Fmax 10 kN
- Body over wedge grips, Fmax 10kN
- Makro extensometer for ProLine
- Clip-on extensometer 7537-1

Advantages and benefits:
- The combination of the ProLine materials testing machine with the body over wedge grips allows for efficient testing in the context of in-house quality assurance.
- Accurate extensometers provide a simple and efficient solution with high resolution, and meet the specific requirements for modulus measurement to ISO 527-1, Appendix C.
- The test sequence defined in the standard, is implemented with the testXpert III test program, in exact accordance with ISO 527-1 and 527-2.

Tensile Test ISO 527-2 and ASTM D638

Testing solution:
- AllroundLine Z010 TH, Fmax 10 kN
- Xforce HP load cell, Fmax 10 kN
- Pneumatic grips (body over wedge), Fmax 10 kN
- makroXtens II type HP
- videoXtens 2-120 HP

Advantages and benefits:
- The increased requirements for modulus measurement to ISO 527-1 Appendix C are met and exceeded with the videoXtens 2-120 HP and makroXtens II type HP extensometers.
- With the use of parallel closing pneumatic grips, a constant and reproducible strain rate progression is ensured.
- To maintain a standard-compliant test sequence, testXpert III offers pre-configured and proven test programs.
Charpy Impact Test to ISO 179-1

Testing solution:
- HIT5P pendulum impact tester
- Partial safety device
- Charpy version 1 J and 5 J
- Specimen temperature conditioning box

Advantages and benefits:
- Because of the short lengths of the pendulums, the HIT5P pendulum impact tester has small space requirements and fits in any laboratory.
- Quick changes of the pendulum hammer, without the need for tools, as well as automatic detection of the new pendulum and its correction data support highly efficient testing.
- Operation can be carried out quickly and easily via the instrument electronics, all the way to well-documented testing with data backup through the testXpert III testing software.

Charpy Impact Test to ISO 179-1 and -2, Izod Impact Test to ISO 180

Testing solution:
- HIT5.5P pendulum impact tester
- Instrumentation
- Partial safety device, right and left
- Charpy version 0.5 J conventional and 5 J instrumented
- Izod version 0.5 J conventional and 5 J instrumented

Advantages and benefits:
- The HIT5.5P with an energy capacity of 5.5 joules is optimal for testing to ASTM, while also meeting the corresponding ISO and DIN standards.
- Reliable test results are achieved through interesting features such as specimen and tool stops, easy and tool-free changing of the pendulum hammer, and detection of the new pendulum being used.
- The instrumentation allows for high resolution measurement of force-time-travel curves, recording of additional characteristics, and detection of the type of specimen break.
Charpy Impact Test to ISO 179-1, Izod Impact Test to ISO 180, Dynstat Impact Bending Test to DIN 53435

Testing solution:
- HIT25P pendulum impact tester
- Full safety device
- Charpy version 7.5 J and 25 J
- Dynstat version 2 J

Advantages and benefits:
- The HIT25P is universally applicable for Charpy, Izod, impact tensile and Dynstat methods to ISO, ASTM and DIN.
- Easy operation in all aspects: secure specimen positioning with the use of specimen centering stops, easy changing of the pendulum hammer and test tools, and expandable with motorized pendulum lift.
- This pendulum impact tester offers many expansion options, for example for instrumented impact testing, installation of a motorized pendulum lift, specimen temperature conditioning and automation.

Dynstat Flexure Test to DIN 53435:2018

Testing solution:
- zwickiLine Z1.0 TS, Fmax 1 kN
- Dynstat flexure tool for 4-point flexural loading
- testXpert III testing software

Advantages and benefits:
- With this method, small specimens such as those obtained from building components, are reproducibly characterized in a static flexure test.
- Transfer of the method to electronic measurement in a materials testing machine, produces complete measured value curves, which not only display the result, but also enable the recognition of errors.
ZwickRoell GmbH & Co. KG

Notches on Impact Specimens to ASTM D256, ASTM D6110, EN ISO 179, EN ISO 180 and EN ISO 8256

Testing solution:
- ZNO 2010 notch cutting machine
- Universal clamping fixture for max. 12 specimens

Advantages and benefits:
- Ideal for frequent routine tests through easy and convenient notching of up to 10 standard specimens in a pack.
- All single and double notches types A, B, C and D can be prepared in accordance with the test standards.
- A high level of operator safety is achieved with the use of a safety hood and low mounted cutter.


Testing solution:
- Manual notch cutting plane
- Specimen magazine for manual notch cutting plane

Advantages and benefits:
- Quick and easy notching of up to 4 standard specimens for small test series.
- All single and double notches types A, B, C and D can be prepared in accordance with the test standards.
- High repeatability and reproducibility are achieved through high notch quality and even notch depth with help from the mechanically fixed end positions.
Automated Tensile Testing of PE/PP Materials

Testing solution:
- Robotic testing system roboTest N (testing assistant) with lightweight robot
- Magazine for 2 x 15 tensile specimens
- autoEdition3 automation software
- Reliable operation due to CE-compliant safety device

Advantages and benefits:
- With the automated testing system, the tensile modulus and tensile properties of up to 20 specimens can be measured to ISO 527-1/-2 with precision and accuracy.
- Whether it is used for simple programming of the robot or on various testing machines in the same laboratory, the roboTest N can be individualized and cost efficient for many test requirements.
- Automation from specimen insertion, to the tensile test and disposal of the specimen remains ensures consistent processes, and in turn better reproducibility of results when compared to work performed by multiple operators.

Cyclic test on engine mount to determine the dynamic properties

Testing solution:
- Electrodynamic testing machine LTM 3 (HR)
- Customized device for testing of an engine mount
- Load cell is mounted on the drive side
- Digital measurement and control electronics testControl II with 10kHz control frequency allows for quick reaction to spontaneous events
- Testing software: testXpert R

Advantages and benefits:
- With the integrated T-slotted platform for various mounting options for test devices and components, different size engine mounts for example can be easily adapted.
- The travel measuring system is coaxial and mounted near the specimen in the piston rod. This results in high positioning repeatability and precise piston travel measurement.
- Intelligent testing software featuring intuitive operation - testXpert R for dynamic tests and testXpert III for static tests

With the introduction of the LTM1 and LTM2, the ZwickRoell LTM series was expanded to include smaller load forces. The LTM3 now completes the ZwickRoell product portfolio between 1 and 10kN. In the HR version with enhanced performance.
Ball Indentation Hardness to ISO 2039-1

Testing solution:
- Hardness tester ZHR8150CLK
- Ball indenter 5 mm for Ball Indentation Hardness
- Ball indenter 6.35 mm for Rockwell L, M
- Connection to testXpert III for test reports

Advantages and benefits:
- With interchangeable indenters different test methods can be set, which measure depth either at pre-load (Rockwell), or under test load (Ball Indentation Hardness).
- All measured values are transferred to testXpert III, allowing for comprehensive evaluation of all test data.
- Reproducible measurements are achieved with automatically controlled test sequences.

Determination of Shore Hardness to ISO 868 and DIN 53505

Testing solution:
- Analog Shore A hardness tester in test stand, incl. test weight
- Analog Shore D hardness tester in test stand, incl. test weight

Advantages and benefits:
- Exact and tilt-free placement safely helps avoid a number of errors.
- The use of dead weights ensures surface pressing in compliance with standards requirements.

Determination of IRHD to ISO 48, ASTM D1415, DIN 53519 and Shore Hardness to ISO 868 and DIN 53505

Testing solution:
- Digital Shore A hardness tester in test stand, incl. test weight
- 3103 IRHD micro compact in test stand with centering unit for O-rings
- 3105 combiTest

Advantages and benefits:
- Exact and tilt-free placement safely helps avoid a number of errors.
- The use of dead weights ensures surface pressing in compliance with standards requirements.
- With the combiTest various hardness scales are measured using a testing instrument.
136 Tensile and Tear Growth Tests on Rubber to ISO 37 and ISO 34

**Testing solution:**
- ProLine Z010 TH, Fmax 10 kN
- Xforce HP load cell, Fmax 1kN
- ProLine lightXtens 2-1000
- Marking device for specimens
- Thickness measuring device
- testXpert III testing software

**Advantages and benefits:**
- The testing machine provides long crosshead travel for tests on highly extensible elastomers.
- Correct positioning and secure holding of the specimen are achieved with the centering stops and pneumatic grips.
- The specimen elongation is measured reliably and without contact using the lightXtens optical extensometer.

137 Specimen Preparation to ISO 37 type 1 and 2, ISO 34

**Testing solution:**
- ZCP020 manual cutting press
- Cutting press for ISO 37 type 1 and 2
- Cutting press for ISO 34

**Advantages and benefits:**
- With the cutting press a wide variety of specimen shapes can be quickly, easily, and safely produced.
- The specimens have clean edges, ensuring exact and reliable test results.
- Due to the bent-lever principle with adjustable pressure point, the activation force required for cutting is minimal.
Intelligent Testing is not just our slogan, it is the foundation for our daily work, from product development to consultation to service. In this exhibition area we will present numerous application examples where intelligent testing technology is applied to help you with your daily test tasks.
Plan of site Competence A5
Strain Control to ISO 6892-1 A1

**Testing solution:**
- AllroundLine Z100 THW, Fmax 100 kN
- Body over wedge grips, Fmax 100 kN
- laserXtens 2-220 HP

**Advantages and benefits:**
- With the adaptive controller, high positioning accuracy, precise speed control, and therefore optimal reproducibility of the tests are guaranteed.
- For specimens with nonlinear ratios of force and deformation the control parameters automatically adapt in real time, therefore meeting extremely demanding test standards such as ISO 6892-1 A1
- The unique technology of the laserXtens eliminates the need for specimen markings, saving time and increasing specimen throughput.

Charpy Impact Test to ISO 179-1 and -2, Izod Impact Test to ISO 180

**Testing solution:**
- HIT5.5P pendulum impact tester
- Partial safety device, right and left
- Charpy version 1 J and 5 J, conventional
- Local operator protection

**Advantages and benefits:**
- The ZwickRoell electronics, testControl II and the instrument electronics, are a secure, future-proof investment. With their high level of flexibility and unique variety of interfaces, the electronics can be easily adapted for growing testing requirements.
- The new instrument electronics with new functionality feature intuitive workflow oriented operation.
- High flexibility is achieved with our without the use of a PC. This allows complete configuration and testing processes to be performed with the Touch Display or via testXpert III.
Coaxial Elongation of Elastomers

Testing solution:
- AllroundLine Z010 TEW, Fmax 10 kN
- Pneumatic grips, Fmax 30 kN
- Pincer grips, Fmax 500 N
- videoxxtens modular system
- Tensile fixture for multi-axial testing, Fmax 5 kN

Advantages and benefits:
- Especially in the case of customized solutions, that in part include completely new test requirements, an in-depth understanding of the five core technologies (drive technology, specimen grips/test fixtures, sensors, electronics, and software), their interaction and their optimal implementation, is the basis for customer-oriented testing systems.
Notes
Among testing solutions for the automotive industry, the primary focus is on dynamic testing machines, together with static testing machines for quality control. On display here are four different drive concepts from ZwickRoell for performing fatigue tests on components and materials. We will also present testing solutions to help you with the challenges of e-mobility. We are ready to support you with standard solutions as well as with custom testing systems.
Hall plan Automotive A5
Automated Multi-Axis Function Testing on Load Cells

Testing solution:
- Robotic testing system roboTest N (testing assistant) with lightweight robot
- autoEdition3 automation software
- Reliable operation due to CE-compliant safety device

Advantages and benefits:
- Simple operation through a standardized user interface and full integration with autoEdition 3 and testXpert III software
- Easy adaptation to various specimens (load cells) through an intuitive teaching interface (no programming knowledge required)
- With compact design and space saving safety measures, automation can be easily retrofitted to existing machines.
- Modular design of the robotic testing system allows for manual testing whenever required.
GTM Testing and Metrology GmbH

6-Component Calibration Platform Serie MPF

Application precision multi-component measurement/calibration:
For the calibration of multi-component measuring systems, the highest accuracies and maximum
decoupling are the main requirements for the reference standard. The Serie MPF measuring
platforms contain several individual force transducers that are carefully aligned and mechanical-
decoupled from each other. The number, nominal load and position of the force transducers
depend on the requirement and is usually six, seven or eight.

Advantages
• Greatest flexibility and highest precision for multi-axial calibrations
• For highest demands on accuracy
• Integrated mechanical decoupling

Measuring Amplifier Serie MCMpro

Application Industrial multi-component measurement:
The MCMpro amplifier represents the consistent, practical ongoing development of the MCM
series.
Completely modular in hardware and software, the MCMpro allows a very cost-effective adjustment
of the operating interface and measured value processing through simple configuration. Program-
ming knowledge is not required.
Wherever multi-axis tests are carried out, e.g. in the automotive, tire, wind power or railway indus-
tries, the MCMpro accelerates the development processes and simplifies the application.

Advantages:
• Accuracy class 0.0025
• Modular structure of hardware and software
• Special architecture for multi-component measurements
• Software configurable without programming knowledge

Options:
• Various digital and analog interfaces
• DAkkS calibration Voltage ratio
• 14 channels allow use for calibration tasks in multi-component metrology

Multicomponent Transducers Series LVS

Application Industrial multi-component measurements:
When it comes to mechanical testing of components, the requirements of measuring multiaxial
forces and torques in industrial applications are very difficult to reconcile. That is why GTM, with its
MKA and MPF series, offers application-specific solutions that can be optimized and manufactured
in accordance with requirements.
With the LVS series, GTM has now come up with a concept for a standardized multicomponent
transducer series. The series is based on more than 20 years of experience in hundreds of appli-
cations in a very wide range of industrial sectors. With the LVS series, users thus benefit from a
quickly available and reliable product with a good price-performance ratio.
Advantages:
- Accuracy class 0.1
- Continuous vibration resistant up to ±100% nominal load
- For static and dynamic loads
- Most compact design
- Durable combination of forces and moments

Options for the
- Optional fixed cable connection or plug connection
- Available as 3- or 6-component transducer

Product Announcement: 2-Channel Carrier Frequency Measuring Amplifier

Application Calibration purposes:
NEW: GTM presents the new 2-channel carrier frequency amplifier in compact design for calibration applications.
High accuracy, high resolution and impressive stability guarantee reliable calibration results.

Advantages:
- Exceptionally high stability
- Resolution 2,000,000 parts
- Compact design
Automated Compression Testing of Rubber Specimens

Testing solution:
- Robotic testing system roboTest N (testing assistant) with lightweight robot
- Electrodynamic testing machine LTM2, dynamic test load +/- 2 kN with compression platens for performing fatigue tests
- Temperature chamber -80 ... 250 °C for performing tests under the influence of temperature
- Magazine for 2 x 100 specimens
- testXpert III testing software and autoEdition3 automation software
- Reliable operation due to CE-compliant safety device

Advantages and benefits:
- Simple operation through a standardized user interface and full integration with autoEdition 3 and testXpert III software
- Easy adaptation to various specimen shapes through an intuitive teaching interface (no programming knowledge required)
- With compact design and space saving safety measures, automation can be easily retrofitted to existing machines.

Tensile Test on Hot-Rolled High-Strength Sheet Metal (ISO 6892)
Compression Test on Extruded Aluminum Profiles (VW TL116)

Testing solution:
- AllroundLine Z250 SN, Fmax 250 kN
- Hydraulic grips, Fmax 250 kN
- laserXtens 2-220 HP
- Additional height-adjustable crosshead implemented as mounting platform
- Compression platen, round

Advantages and benefits:
- The use of more than one test area allows for quick changes between different applications, eliminating reconfiguration time.
- The patented double-actuator hydraulic grip guarantees secure gripping of even small high-strength specimens.
- Due to easy accessibility of the lower test area, even larger and heavier components can be optimally tested.
Open Hybrid LabFactory

145 Multiaxial fabrics (NFC)

Made of two layers of glass fiber and one layer of load path optimised structure of carbon fibers.

Metal plastic hybrid backrests (structural seating component)

Weight reduction of 30% (1kg) without additional costs compared with the reference steel design.

The Research Campus – Partnership of science and industry on an equal footing

The Open Hybrid LabFactory e. V. (OHLF), TU Braunschweig and the Fraunhofer Gesellschaft provide this common platform for industrial partners and public institutions to accelerate research and development projects.

The LeichtbauCampus is one of the top facilities in Germany for research and development of future hybrid components.

The funding initiative “Research Campus – Public-Private Partnership for Innovation” from the Federal Ministry of Education and Research was the initial impulse for the Open Hybrid LabFactory, which today is one of only nine Research Campuses nationwide.
Crush tests on crash boxes

**Testing solution:**
- HTM16020 with tCII
- Fully enclosed safety device
- Compression fixture for high-speed testing with transverse force support
- Testing software testXpert HTM edition

**Advantages and benefits:**
- Long actuator stroke of 350 mm (incl. 50 mm end cushioning on both sides). This allows for testing of crash elements with long deformation paths or tensile tests on materials with high deformation until break.
- The solid construction of the load frame and the large column diameter of the four-column load frame minimize interfering vibrations of the frame, which negatively influence test results.
- testXpert HTM edition software integrates system control, high-speed data recording, and data transfer to a DIC system, into one user friendly software program.

Determination of Resultant Forces and their Points of Penetration (Entry and Exit Points) for a Helical Spring under Compressive Load

**Testing solution:**
- Z050 SW, Fmax. 50 kN, floor-standing model
- 3 and 6-component force measurement device (50 kN) for each
- Mechanical overload protection, 50 kN
- testXpert III Master Test Program for helical spring testing

**Advantages and benefits:**
- 3D online display of resultant forces for fast, reliable component evaluation
- Results calculated and displayed online

Compression Testing on Power Window Switches

**Testing solution:**
- EZ001 electromechanical servo testing actuator, Fmax. 1 kN
- ZwickRoell load frame for loads up to 5 kN
- I/O module for reading of electrical signals
- testXpert III testing software, Master Test Program for cyclic tests

**Advantages and benefits:**
- Mounted in ZwickRoell load frame, but can also be used in testing benches or in product lines for a wide range of specifications.
- Variable mounting via head or foot flange or via side trunnion
- One system for development and production
- High speed combined with high repeat accuracy
- Compact design, with measurement and control electronics optionally located in IP54 electrical cabinet.
ZwickRoell GmbH & Co. KG

149 Dynamic Testing on Engine Mounts

Testing solution:
- Type HA 100 servohydraulic materials testing machine
- Test fixture for rubber-metal elements
- testControl II digital measurement and control electronics
- testXpert® R and testXpert III testing software

Advantages and benefits:
- Used for fatigue tests on rubber-metal engine mounts, under pulsating or alternating load
- Flexible design of the test assembly covers a wide range of applications
- Reliable protection for the operator, data, specimen and testing system (for example, load limitation in set-up mode, automatic sensor recognition, and so on)

150 Fatigue Testing on Electrical Fuses for the Automotive Sector

Testing solution:
- LTM 1 kN electrodynamic testing machine
- Mechanical T-specimen grips for gripping of electrical fuses
- Digital measurement and control electronics testControl II with 10kHz control frequency
  allows for quick reaction to spontaneous events
- Intuitive testXpert Research testing software

Advantages and benefits:
- Maintenance free system with wear-free components and no need for additional supply feeds
  (oil, compressed air, coolant).
- Long piston stroke of 60 mm and built-in T-slotted platform enable a wide variety of tests.
- With its low weight and small dimensions, installation of the LTM is very flexible. It only
  requires a regular 220V power connection.
- A standardized mechanical interface allows flexible use of specimen grips and fixtures over
  the entire dynamic product range.

151 Testing on Dampers

Testing solution:
- HC 25 compact servohydraulic materials testing machine, Fmax. 25kN
- Low-noise hydraulic power pack incorporated into machine base
- Hydrostatic-bearing hydraulic actuator mounted in upper crosshead
- testControl II digital measurement and control electronics with 10kHz control frequency and
  24-bit resolution
- testXpert R and testXpert III testing software

Advantages and benefits:
- With an installation area of <1 m² and max. 720 mm wide, we help you utilize your laboratory
  area optimally by maximizing your testing capacity with a minimal footprint.
- Setting up and controlling automatic extensometers and specimen grips via a display remote
  control is simple and allows you to focus on the test task at hand. The extremely quiet low-
  noise power pack creates a relaxed work environment.
- The integrated hydraulic power pack does not require separate hydraulic piping and thus
  reduces costs related to infrastructure and commissioning, providing you with newfound
  freedom.
- The integrated T-slotted platform optimally meets the requirements for components testing.
ZwickRoell GmbH & Co. KG

Durability Testing on Timing Chains

**Testing solution:**
- Testing system: Vibrophore 50 with 4-column load frame and T-slotted platform
- ZwickRoell 50 kN load cell with integrated accelerometer
- Test fixture for timing chains
- testControl II digital measurement and control electronics with 10kHz control frequency and 24-bit resolution
- Testing software: testXpert Research

**Advantages and benefits:**
- The resonance drive achieves very high frequencies with minimal energy consumption, which enables efficient durability testing on timing chains.
- Clamping table at convenient working height for operator-friendly testing, and fast adaptation of components and component-specific devices.
- Full-fledged static and dynamic testing machine with rigid four-column load frame and large test area (1,315mm test area height) allows for testing of short and long chains.

Seat Testing to DIN 53579

**Testing solution:**
- cLine Z005, Fmax 5 kN
- Test table extension
- Indenter for testing flexible foam to DIN 53579

**Advantages and benefits:**
- With easy accessibility, the cLine supports testing of a wide variety of specimen sizes, from small foam cubes to entire bench seats.
- The height-independent laser crosshair facilitates exact positioning of the specimen.
- A variety of standard fixtures and different test programs ensure standard-compliant testing.

Various Tests on Electric Cables

**Testing solution:**
- ProLine Z010 TH, Fmax 10 kN
- Test fixture for determining the notch strength of insulations
- Test fixture for determining the glide behavior of cables
- Test fixture for determining the flexibility of cables
- Test fixture for determining the stripping force of the insulation material

**Advantages and benefits:**
- ZwickRoell offers a wide range of standardized test tools for testing of electrical components. Customized solutions are available for individual tests.
- It is easy to switch between different test arrangements using the testXpert test environment.
Kistler Analyse with testXpert III

Systematically check of bolted joins

The friction coefficient is the critical quality factor, when it comes to achieving the desired quality of bolting in the production process, the surface friction coefficients of the fastening components are among the key criteria.

That’s why it’s essential to test and monitor these variables. End-to-End Quality Assurance – All along the Line All Kistler Analyse Systems are complete testing systems to determine the functional characteristics of individual fastening components and/or complete sub-assemblies. From measurement and control of the bolting process through to comprehensive documentation of the process parameters and results: these systems cover the entire range of requirements for a vast variety of function tests. This end-to-end testing and documentation provides proof of the quality of the bolted joint. But that’s not all: it also facilitates targeted monitoring of tolerance limits, making it possible to detect process deviations at an early stage.

Fasteners from M2 to M72 are our standard specimen. Choose your way of testing with freely definable test-procedures, which allow to realize complicated tasks or use the already predefined, standardized test-procedures. Only the geometric data of the fastener has to be chosen in a database and the measurement can start. Never before could be checked so fast and efficient.

Convince yourself of the overall concept of the ANALYSE-BASIC, with the innovative software package testXpert III without having to forego the advantages of a full-fledged laboratory software.

Inspect Pro

Mobile measuring and evaluation unit now in wireless version

In screw assembly, it is important to constantly optimize manufacturing processes in order to achieve high quality assurance and increase productivity. This is achieved with Kistler inspection systems: Inspect systems for process testing monitor the entire screwing process, check and document its process parameters and provide proof of quality of the screw connection - in the process or after the connection has been made. In this way, tolerance limits can be monitored in a targeted manner, errors can be detected early and remedied during the process.

Together with the Analyse wrench for torque and angle measurement tasks, this results in an unbeatable team for simple measuring tasks, “break away torque”-functions according to VDI / VDE 2645 sheet 3 or the fastening point-related tests with CEUS. The now presented wireless version eliminates the measuring cable. Discover the new possibilities.
Rockwell Hardness Testing on Constant Velocity Joint (CVJ)

Testing solution:
- Hardness tester ZHR8150CLK
- Rockwell indenter
- Connection to testXpert III for test reports

Advantages and benefits:
- The ZHR8150CLK with its robust construction and simple operation offers optimal conditions for the highest level of requirements in quality assurance.
- The automatic test sequence and automatic conversion to alternative hardness scales save time and guarantee a very high level of repeat accuracy.
- A wide variety of adaptable specimen fixtures is available, providing an ideal specimen fixture for every test requirement.

Highlight

Elasticity of Electrode Coatings

Testing solution:
- ZHN universal nanomechanical testing machine
- ZHN2.0 normal force unit (NFU)
- Lateral force unit (LFU)
- Long distance lens 50x

Advantages and benefits:
- The ZHN nanoindenter allows for high accuracy measurements of mechanical properties of thin electrode coatings in the nano range.
- Both measuring heads operate in both tensile and compression directions, enabling indentation tests with superimposed oscillation as well as cyclic fatigue tests.
- The sophisticated design principle minimizes parasitic environmental influences such as temperature variations and vibrations.

Testing on Fuel Cell Stacks

Testing solution:
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Xforce HP load cell, Fmax 2.5 kN
- Pneumatic grips, Fmax 2.5 kN

Advantages and benefits:
- The zwickiLine is ideal for high accuracy determination of peel strength.
- The testXpert III All-In-Suite software package offers a full range of settings for a wide variety of research tasks.
Laboratory Information Management System (LIMS)

Linking lab with production
QDA SOLUTIONS’s Laboratory Information Systems Solution reduces paperwork, errors and uncertainty and optimizes laboratory workflow, from data collection to the certificate of analysis. It integrates manufacturing operations with other business areas and generates cost savings through automation and better utilization of resources.

Key Benefits
• Optimize your laboratory workflow
• Significant cost saving through automation
• Integration with your plant floor and business systems

Gage and Tool Management

Calibration, Integration and Traceability Made Easy
QDA SOLUTIONS’s Gage and Tool Management Solution improves cost control and ensures measurement, tool and process traceability through automated calibration and workflows. It integrates with other QDA SOLUTIONS quality software and solutions to meet the regulatory requirements.

Key Benefits
• Automated calibration workflow
• Includes calibration standard templates
• Improves cost control

Non-Conformance Management

Manage Complaints Confidently and Decisively
QDA SOLUTIONS’s Non-Conformance Management Solution keeps non-conformance issues under control with automated workflows and integrated data from other relevant areas. It pulls in ISO standards and FDA mandates, ties in CIP and CAPAs and rolls the consolidated and analyzed findings into intuitive focused reports that enable decisive actions.

Key Benefits
• Identify areas to improve
• Flexible non-conformance workflow integration
• Enhanced communication and escalation

Supply Chain Management

Strategic Advantage through Quality Collaboration
QDA SOLUTIONS’s Supply Chain Management Solution extends your quality standards to your suppliers, integrates incoming inspection, auditing, corrective action and complaint management. It ensures compliance with ISO/TS, VDA and other standards and allows for proactive supplier grading.

Key Benefits
• Link supply chain operations
• Supplier integration through web portal
• Automated 8D and PPM
QDA SOLUTIONS GMBH

Traceability

QDA SOLUTIONS’s Traceability Solution drives focused management decision making by integrating quality data and analyses from all angles. Traceability backed up with solid data improves first time quality, reduces defects, rework and warranty claims.

Key Benefits
- Real-time product status visibility
- Sound intelligence driving focused improvement
- Traceability linked with quality data

QDA-Upload/Download for testXpert of ZwickRoell

Essential characteristics of the interface
Using the interface between testXpert and the QDA software from QDA SOLUTIONS, it is possible to automatically transfer the values measured at the machine to the QDA-LIMS system. Here, the QDA-LIMS also undertakes the statistical assessment of the measured values compared to the specifications stored in the system. This allows the early exposure of statistical trends and deviations from the reference values. Using the interface to ERP systems, the specifications can also be read directly from there and be directly transferred to the testing machine. In every case, this method leads to a significant reduction of separate testing procedures. Using the existing interface, additional product-dependent machinery parameters such as speed, clamping length and similar data can be transferred too, which are then used dynamically in the testing procedure.

Key Benefits
- Simple connection to ZwickRoell machinery
- Reduction of inspection requirement
- Using statistical methods like MSA
- Simple transfer of inspection results
- Clear design of measurement results
MicroProf® 100

- Multi-Sensor Metrology
- Double-sided Sample Inspection (TTV-Option)
- Roughness, Topography, Film Thickness …

Multi-sensor technology creates maximum flexibility

You want to measure roughness, topography or film thickness of your sample? And this without contact. The versatile MicroProf® 100 is universally applicable thanks to optical multi-sensor technology.

A variety of point, field of view and film thickness sensors can be integrated. This makes it possible to measure a wide range of surfaces from smooth to rough, from matt to reflective to transparent. Depending on the dimensions, up to three sensors and one camera can be installed.

The MicroProf® 100 can also be upgraded for double-sided sample inspection. This allows users to measure the top and bottom of their sample simultaneously and also determine the sample thickness in the same measuring process. If a new measuring task arises at a later date, our surface measuring tool can be flexibly retrofitted at any time. The inhouse software is also of modular design and can perform either manual or fully automated measurements of the sample.

The travel range of the xy table is 150 mm x 100 mm. The MicroProf® 100 is ideally suited for the measurement of small samples. Several samples in workpiece carriers, which are very popular in production, can also be measured optimally. The MicroProf® 100 is also popular in R&D, as it can be integrated almost anywhere as a tabletop tool.
More information: www.zwickroell.com/composites

The key themes for our static testing machines in the field of fiber composites are Reliable Test Results, Extension Measurement and Modularity. With our LTM electrodynamic testing machines, we will show you options for characterizing fatigue properties over a wide temperature range.
Hall plan Composites A7
**161 Tensile Test ISO 527-4, -5 and ASTM D3039**

**Testing solution:**
- AllroundLine Z250 SE, Fmax 250 kN
- Body over wedge grips, temperature chamber version, Fmax 150 kN
- Temperature chamber for materials testing machines
- videoXtens 2-120 HP

**Advantages and benefits:**
- Investment security: Because of their modularity, every testing system can be easily expanded according to increasing test requirements.
- The modularity allows for testing to more than 120 test standards in a force range up to 250 kN and at temperatures from -70°C to 360°C.
- Non-contact, biaxial strain measurement with the videoXtens 2-120 HP means low-maintenance operation and perfect temperature distribution in the temperature chamber.

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**162 IPS Testing to ISO 14129, Static**

**Testing solution:**
- AllroundLine Z010 TN, Fmax 10 kN
- Body over wedge grips, pneumatic, Fmax 10 kN
- videoXtens 2-150 HP+

**Advantages and benefits:**
- The non-contact extensometer operates according to standards without the need for specimen markings. This saves time in preparing the test and eliminates possible error sources from markings.
- In addition, this extensometer has two separate cameras for longitudinal and transverse strain measurement. This way optimal resolution of the measurement signal is achieved in every direction.

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**163 Testing of Fiber Strands to ASTM D4018**

**Testing solution:**
- AllroundLine Z010 TH, Fmax 10 kN
- Pneumatic grips, Fmax 10 kN
- makroXtens II 100, CFRP/GFRP

**Advantages and benefits:**
- Reliable, proven and robust measurement of specimen strain to break with help from the makroXtens extensometer.
3-Point and 4-Point Flexure to ISO 14125 or ASTM D7264

Testing solution:
- zwickiLine Z1.0 TS, Fmax 1 kN
- 3-point and 4-point flexure test kit, Fmax 10 kN
- Displacement transducer for compression tests and 3 or 4-point flexure tests

Advantages and benefits:
- With the zwickiLine, routine tests such as 3-point and 4-point flexure tests are performed conveniently and according to standards.
- It is easy to switch between individual tests using the testXpert III test environment, since all relevant machine and safety settings are saved.

Iosipescu Shear Test to ASTM D5379 with Biaxial Strain Measurement via HBM Universal Measurement Amplifier QuantumX

Testing solution:
- zwickiLine Z5.0 TS, Fmax 5 kN
- Iosipescu fixture
- QuantumX measurement amplifier

Advantages and benefits:
- The QuantumX is easily connected through the testControl II standard interface, allowing for an extension of the number of measuring points. The measured values are also recorded in synchronization with the measurement signals of the testing machine.
- The test tool consists of one fixed clamping mechanism and one clamping mechanism guided in the axial direction. It is used by the testing machine to introduce deformation.
- The testXpert III testing software determines the correct shear stress and strain stress values.

G1c Test with DCB Specimen with Video Monitoring of the Crack Growth and Automatic Camera Tracking to AITM

Testing solution:
- zwickiLine Z2.5 TN, Fmax 2.5 kN
- Fixture for G1c test on long-fiber-reinforced composites
- Video recording option to visually record crack growth for video display in testXpert III

Advantages and benefits:
- zwickiLine materials testing machines are space-saving, and used for efficient standard-based tests in a force range up to 5 kN.
- To achieve better measurement traceability, digital magnifying glasses are used, which are guided along the specimen as the crack progresses and record a video of the measurement.
- With time synchronous video recording, the user also has the option of visually retracing the specimen behavior at the end of the test.
167 Pre-Damaging Test Plates to ASTM D7136, AITM 1.0010, EN 6038

**Testing solution:**
- Drop weight tester HIT600F
- CAI modular weight set
- Anti-rebound device
- CAI testing equipment is required for pre-damaging fiber composite plates

**Advantages and benefits:**
- With the use of modular drop weights, the drop speed, impact energy and impulses are accurately set for the compression after impact test.
- With easily accessible specimen mounts, pre-damaging is performed quickly and efficiently.
- The pre-damaging result is displayed in the form of an unfiltered graph in textXpert III, and allows for conclusions to be drawn on the damage in the laminate.

168 Alignment measurement as per Nadcap

As leading provider of calibration services for materials testing systems, ZwickRoell also carries out checks on test axis alignment. These alignment verifications to ASTM E1012 satisfy Nadcap criteria AC 7101 and AC 7122.

**Key features:**
- experienced, specially trained service technicians
- use of standardized strain-gaged alignment transducers allows ZwickRoell to guarantee a high degree of comparability with customer-specific specimen dimensions (adaptation)

**Advantages and benefits:**
- Complete, detailed recording of verification results as required by the standards and beyond (incorporation of images possible)
- Rapid alignment verification using standardized ZwickRoell strain-gaged alignment transducers
- Correction of alignment errors by adjustment using the optionally available alignment unit
- Individual geometry data can also be translated to a strain-gaged alignment transducer
- Everything from a single source, from advice to implementation
- Alignment verification also possible on other makes of testing machine

169 Fatigue tests on composite specimens

**Testing solution:**
- LTM 10, Fmax 10 kN
- Pneumatic grips 10 kN
- Test frame for 10 kN LTM with integrated T-slotted platform
- Testing software: testXpert R

**Advantages and benefits:**
- The optional alignment fixture allows for precise alignment of the load string, which is ideal for the strict requirements on fatigue testing of composite specimens.
- Maintenance free system due to wear-free components
- No additional supply feeds required, i.e. coolant or oil
- Safe set-up mode to EN 60204-1 via speed reduction to 10 mm/s
ZwickRoell GmbH & Co. KG

Tensile Tests ISO 527-4, Multidirectional, Compression Test to ASTM D6641, AITM 1.0008, ISO 14126

Testing solution:
- AllroundLine Z250 SNS, Fmax 250 kN
- Alignment unit, Fmax 250 kN
- Wedge screw grips, Fmax 250 kN
- makroXtens II 100, CFRP/GFRP
- Hydraulic compression fixture for composites

Advantages and benefits:
- Both test areas in the testing machine provide optimal operating height. This provides the highest level of operator convenience and reduces any conversion efforts.
- Quick changes between different test methods reduces cycle times.
- The machine can also be equipped with a third test area, e.g. for components testing.
More information: www.zwickroell.com/medical

Occupying center stage for the medical and pharmaceutical industries are testing solutions for injection systems (automated testing of autoinjectors and tests on pre-filled syringes to ISO 11040-4). Other key areas include testing systems for orthopedic implants, packaging and software solutions for extended traceability in accordance with CFR 21 Part 11 and the ZwickRoell Qualification Service.
Hall plan Medical A8
Automated Function Testing of Autoinjectors

Testing solution:
- Robotic testing system roboTest N (testing assistant) with lightweight robot
- Magazine for 2 x 15 devices/autoinjectors
- autoEdition3 automation software
- Reliable operation due to CE-compliant safety device

Advantages and benefits:
- Simple operation through a standardized user interface and full integration with autoEdition 3 and testXpert III software
- Easy adaptation to various specimen shapes through an intuitive teaching interface (no programming knowledge required)
- With compact design and space saving safety measures, automation can be easily retrofitted to existing machines.
- Modular design of the robotic testing system allows for manual testing whenever required.

2.5 kN Materials Testing Machine with 20 Nm Torsion Drive for Pharmaceutical Injectors

Testing solution:
- 2.5 kN zwickiLine Z2.5 TN materials testing machine with Fmax. 2.5 kN and 20 Nm torsion drive
- Two test axes for independent or combined axial/torsion tests
- Flange connection system and alignment unit for improved concentricity
- Universal holder for pens with optical dosing range identification
- testControl II digital measurement and control electronics
- Proven testXpert® III testing software

Advantages and benefits
- Full integration
- Flexible software for straightforward programming of expanded test programs
- Easy access to test results and simple data analysis
- Optional software extension in accordance with FDA 21 CFR Part 11
- Extensive IQ/OQ experience with a wide range of customers

Pharmaceutical products must complete their life cycle with consistent high accuracy. Therefore, production as well as quality control must always be traceably documented. To meet the individual test requirements of customers in the pharmaceutical field, ZwickRoell offers optical recognition of characters and numbers. The evaluation program is integrated with testXpert and offers the highest level of processing reliability through two independent evaluation processes. Ideal for the recognition of characters and numbers in the area of dosing for pharmaceutical pens.
Testing of Syringes / Autoinjectors (Pens) with Dynamic Simulation of the Spring Characteristics via Reference Points in testXpert III

**Testing solution:**
- zwickiLine Z2.5 TN+, Fmax 2.5 kN
- Test fixture for syringes and carpules
- testXpert III Graphical Sequence Editor spring simulation

**Advantages and benefits:**
- With the simulation of spring forces, the costly use of real springs during development of devices can be eliminated, and development efforts can be reduced.
- The functional capability of spring loaded devices, even with changes in viscosity during storage, can already be tested in the development phase. This ensures product safety and helps avoid possible recalls due to incomplete injections.
- In addition to the high crosshead speed, the high resolution of the crosshead movement and superb speed accuracy, even at very slow test speeds and short test travel, deliver reliable test results.

Syringe Glide Force Testing to ISO 7886-1

**Testing solution:**
- zwickiLine Z0.5 TN, Fmax 500 N
- Test fixture for plunger glide force

**Advantages and benefits:**
- The flexible test fixture allows for testing (injections) of syringes with varying geometries.
- A precise test sequence is performed with the testXpert III testing software. With the traceability option it fulfills the requirements according to the ZwickRoell FDA 21 CFR Part 11 whitepaper.
ZwickRoell GmbH & Co. KG

175 Syringe Testing to ISO 11040-4

Testing solution:
- zwickiLine Z0.5 TN, Fmax 500 N
- Test devices to ISO 11040-4

Advantages and benefits:
- The modular tools concept allows for all tests to ISO 11040 to be performed with a reduced number of test fixtures.
- Reliable gripping of sensitive specimens with adjustable clamping pressure guarantees high reproducibility of the test results.
- Extremely high accuracy of the travel measurement and positioning are guaranteed by online correction of the machine compliance.

176 Pushability Test on Catheters and Guide Wires

Testing solution:
- AllroundLine Z005 TE, horizontal version, Fmax 1 kN
- Pneumatic grips, submersible, Fmax 500 N
- Basin for water bath
- Threaded plate, 475 x 560 mm

Advantages and benefits:
- The large test area allows for the installation of large catheters, as well as several catheters to be tested at the same time.
- Testing in the horizontal position with temperature-controllable medium simulates the patient during a medical procedure.
- Automated processes greatly reduce operator influences and therefore achieve reproducible processes and reliable test results.

177 Cyclic Glide Force Tests on Catheters

Testing solution:
- zwickiLine Z1.0 TN, Fmax 1 kN
- Medium container
- Specimen grips for pull-out tests on catheters, cyclic test

Advantages and benefits:
- The medium container made of glass and stainless steel provides a high level of resistance to salt solutions and cleaning agents.
- The interchangeable jaws can be provided with different types of friction lining, which maintain an even friction coefficient.
- The clamping force for the catheter is reproducibly set using dead weights.
ZwickRoell GmbH & Co. KG

Bone-Screw Test to ASTM F543 and ISO 6475

Testing solution:
- zwickiLine Z5.0TN testing machine with Fmax 5 kN and 20 Nm torsion drive
- Flange connection system and alignment unit for improved concentricity
- Two test axes for independent or combined axial/torsion tests
- testXpert III test program for screw-in tests on bone screws to ASTM F543, A1.3

Advantages and benefits:
- The high resolution of the angle of rotation measurement and travel measurement delivers precise results even for the smallest bone screws.
- Available in various force (up to 5 kN) and torque (up to 20 Nm) ranges
- Extensive IQ/OQ experience with a wide range of customers
- Optional software extension in accordance with FDA 21 CFR Part 11

Fatigue tests on bone plates and fixation devices to ASTM F382 and ISO 9585

Testing solution:
- Electrodynamic testing machine LTM 3 (HR)
- 3-point flexure device with corresponding bath to simulate body temperature
- Large selection of test devices for testing solutions in the medical field
- Digital measurement and control electronics testControl II with 10kHz control frequency allows for quick reaction to spontaneous events
- Testing software: testXpert R

Advantages and benefits:
- With the integrated T-slotted platform for various mounting options for test devices and components, different size engine mounts for example can be easily adapted.
- The travel measuring system is coaxial and mounted near the specimen in the piston rod. This results in high positioning repeatability and precise piston travel measurement.
- Intelligent testing software featuring intuitive operation - testXpert R for dynamic tests and testXpert III for static tests.

With the introduction of the LTM1 and LTM2, the ZwickRoell LTM series was expanded to include smaller load forces. The LTM3 now completes the ZwickRoell product portfolio between 1 and 10 kN. In the HR version with enhanced performance.
Dynamic testing on spinal implants (ASTM F1717-09)

Testing solution:
- Electrodynamic testing machine LTM2 in HR version with enhanced performance
- Digital measurement and control electronics testControl II with 10kHz control frequency allows for quick reaction to spontaneous events.
- Standard-compliant test fixtures for spinal column implants to ASTM F1717-09
- Testing software testXpert R

Advantages and benefits:
- Standard-compliant and clean performance of fatigue tests without the need for additional supply feeds such as pneumatics, coolant or oil
- Motor-driven crosshead adjustment and ideal working height for convenient operation
- Operator-friendly testXpert R testing software with preadjusted controller settings and availability of free controller definition for individual testing requirements

DQ/ IQ/ OQ qualification of ZwickRoell materials testing systems

For the Design Qualification (DQ), Installation Qualification (IQ) and Operational Qualification (OQ) stages in the qualification of materials testing systems, ZwickRoell assists customers by providing comprehensive qualification documentation (individually tailored if required) and through on-site performance of qualification by an experienced ZwickRoell service technician.

Customers can choose between full qualification consisting of DQ, IQ and OQ, part qualification consisting of IQ and OQ or a solution tailored to their individual requirements.

Key features:
- experience gained from over 750 successful qualifications worldwide
- professionally generated qualification documentation
- expert knowledge and advice plus long-term technical experience from a single source

Advantages and benefits:
- no tying up of capacity in the preparation and execution of qualification
- standardized document layout enables rapid project implementation
- customized expansion of basic ZwickRoell documentation as and when required
- qualification with ZwickRoell: complete one-stop solutions for enhanced cost-effectiveness
### Notes

- A8 - Medical
We welcome you to our ZwickRoell premises!

This info will ensure you a pleasant stay at our factory premises. This is to inform you about possible dangers, our safety regulations and safety devices. Please read them carefully and adhere strictly to them. This information is valid for all our visitors and customers. We would like to wish you a pleasant and safe stay with us.

General Safety and Security Information:

- **No smoking** in buildings
- **No photography** on the factory premises
- **Video control** on the factory premises
- **No unauthorized copying.** We herewith refer to the copyright of all drawings and circuit diagrams.

When you are visiting our production facilities (mechanical manufacturing and assembly halls):

- Do not leave the indicated routes. Do not go near the machines.
- When entering the halls please make yourself familiar with the escape routes in case of emergency.
- In case of an accident please follow the instructions on the information boards.
- Please do not forget that trucks and forklifts are driving on the premises. Therefore before crossing the road please pay special attention to the moving traffic.
- Do not walk under raised loads.
We thank you very much for your visit and would be pleased to welcome you again at the testXpo 29th International Forum for Materials Testing, 12th-15th October 2020.