Ultrasonic Measuring Test System IP-8

Precise Monitoring of Setting Processes in
Development | Production | Research & Teaching
### Ultrasonic Test System IP-8 suitable for a variety of Materials

<table>
<thead>
<tr>
<th><strong>Applications</strong></th>
<th><strong>Main Features</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• All materials with a setting process (e.g. cement, mortar, gypsum, concrete)</td>
<td>• High-precision measuring system (res. 0.05 µs)</td>
</tr>
<tr>
<td>• Heat insulation and render systems</td>
<td>• 8 independently controllable channels</td>
</tr>
<tr>
<td>• Construction chemicals, additives</td>
<td>• Intuitive software for control and evaluation</td>
</tr>
<tr>
<td>• Gypsum products and adhesives</td>
<td>• Simple and easy to use in everyday lab work</td>
</tr>
<tr>
<td>• Refractories, castables</td>
<td>• Suitable for industrial applications</td>
</tr>
<tr>
<td>• Food industry</td>
<td>• Optional PLC control and integration in production lines</td>
</tr>
</tbody>
</table>

© UltraTest GmbH 2015, Germany
UltraTestLab© - Control and Evaluation Software

- Intuitive operating concept with a clearly arranged user interface
- Measurement duration: 15 minutes - 31 days
- Measurement interval: 1 second - 60 minutes
- During measurement simultaneously visible:
  1. Speed in m/s or runtime in μs
  2. Curve derivation (acceleration) and curvature
  3. Temperature inside the sample (-20 ... +125 °C)
  4. Shrinkage/swelling by connection of “shrinkage grooves” (optional)
- Comparable against reference measurements
- Reproduction of characteristic points such as initial set and final set with graphic markers
- Permissible deviations definable with envelopes
- Evaluation, Excel export and printouts possible during measurement
- Automatic logging of all measurements
- Dynamic E-modulus calculation and display
- Option: external temperature measurement by thermocouples (-40 ... 1820 °C)
- Option: measurement of shrinkage/swelling by connection of “shrinkage grooves”
The complete IP-8 Ultrasonic Test System
# UltraTest Systems - References

## Refractories, castables
- Kermic
- Eikem Silicon Materials
- RATH
- Nabaltec
- REFRA TECHNIK
- RHI
- ALMATIS Insulated Materials
- Didier-Werke AG
- INTOCAST
- FGF Tegutstoffe Verwaltungs GmbH & Co. KG
- VISMAUER
- alteo
cintillas
- C.A.R.D.
- STEULER KCH
- Calder
- Lungmuß Neuzeit
- CALUCEM
- ALLIED MINERAL
- TAIKO

## Mortar, plaster thermal composite systems
- Saint-Gobain
- Sanvic
- Holcim
- Brillux
- remmers
- quick-mix
- risecco
- AVOLTEX
- FChoices
- Sto

## Facades, floor, roofing systems, drywall
- Rigips
- KNAUF
- Weber
- rimex
- Wienerberger
- JOMY
- BRASA MONEIR
- SCHÖNEX
- Kiesel
- USG
- National Gypsum
- Bril
- S&B
- HASIT
- Tata Steel

## Construction chemicals, additives, waterproofing
- Wacker
- DOA
- Ashland Specialty Coatings
- Budenheim
- BASF
- ASC CHEMICALS
- BK Giulini
- Formula
- Hexion
- AKEO NOBEL
- ELMOTEX
- Bostik
- BYK Additives & Instruments
- Shin-Etsu
- SCHOMBURG
- Evonik
- Evonik

## Cement, concrete, construction materials
- Lohner Holcim
- Scherrer & Co
- Beisser
- HeidelbergCement
- Xella
- SOWEX
- HOCHTIEF
- Holcim
- Dyckerhoff
- KEMPSEY LÄRME

## Universities, research, teaching
- Fraunhofer
- Bauhaus-Universität Weimar
- UNIKASSEL VERSITAT
- DFG Deutscher Forschungs- COOPERATION
- Forschungszentrum Jülich
- Sektion Fächeri Technik / TU Berlin
- TU Berlin
- TU Clausthal
- Hochschule Ruhr-Universität Bochum
- seiersdorf laboratories
- Fraunhofer ZKI
- Fraunhofer FKZ
- Fraunhofer IFF
- Fraunhofer IZK
- Fraunhofer IFW
- Fraunhofer ITWM
- Fraunhofer ITWM
- Fraunhofer IZM
Measuring & Analysis of Temperature, Velocity & 1st Derivative (Acceleration)

- Ultrasonic Wave Velocity
- 1st Derivative
- Temperature
Defining Permissible Deviation from Reference with Envelope Function

Admissible Deviation

channel 2: deviation at 191.0 min.
Result Table for Clear Presentation of Measured Values & Characteristics

<table>
<thead>
<tr>
<th>Brand</th>
<th>channel 1</th>
<th>channel 2</th>
<th>channel 3</th>
<th>channel 4</th>
<th>channel 5</th>
<th>channel 6</th>
<th>channel 7</th>
<th>channel 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM 1525 R</td>
<td>4040</td>
<td>4082</td>
<td>4082</td>
<td>4000</td>
<td>4020</td>
<td>4020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max. Velocity [m/s]</td>
<td>9.7</td>
<td>9.6</td>
<td>10.1</td>
<td>9.0</td>
<td>9.0</td>
<td>9.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max. Acceleration [m/s²]</td>
<td>185</td>
<td>179</td>
<td>185</td>
<td>190</td>
<td>188</td>
<td>184</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max. Temperature [°C]</td>
<td>28.1</td>
<td>28.4</td>
<td>26.7</td>
<td>26.6</td>
<td>25.1</td>
<td>25.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark20 [m/s] [min]</td>
<td>25</td>
<td>23</td>
<td>24</td>
<td>23</td>
<td>25</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark40 [m/s] [min]</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>54</td>
<td>55</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark80 [m/s] [min]</td>
<td>119</td>
<td>119</td>
<td>119</td>
<td>120</td>
<td>121</td>
<td>124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark120 [m/s] [min]</td>
<td>164</td>
<td>166</td>
<td>167</td>
<td>167</td>
<td>167</td>
<td>171</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( E_{\text{dyn}} ) [GPa]</td>
<td>28.8</td>
<td>29.2</td>
<td>29.2</td>
<td>28.0</td>
<td>28.3</td>
<td>28.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strength [GPa]</td>
<td>57.1</td>
<td>59.0</td>
<td>59.3</td>
<td>55.0</td>
<td>56.0</td>
<td>56.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration [min]</td>
<td>10045.0</td>
<td>10045.0</td>
<td>10045.0</td>
<td>10045.0</td>
<td>10045.0</td>
<td>10045.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>File [AVM]</td>
<td>PURS K1</td>
<td>PURS K2</td>
<td>PURS K3</td>
<td>PURS K1</td>
<td>PURS K5</td>
<td>PURS K6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transparent Modus
MS-Excel® Export of up to 8 Test Series with One-Click
Evaluation Tools available: Example Tangent
Setting Process of various Tile Adhesive Compositions
Setting and Hardening of Ultra Low Cement Castable (ULCC)

- Start of setting: definition with ultrasonic: after 1.7 h
definition with cup-test: after 1.7 h

- Exothermal peak after 19.4 h
Standard Mortar with Water Cement ratio of 40% 50% and 60%

Influence of the Water Content on the Ultrasonic Wave Velocity & on the Dynamic E-modulus
Influence of the Water-Cement Ratio ... 

... on the Ultrasonic Wave Velocity & Compressive Strength

Sonic Wave Velocity

Compressive Strength [N/mm²]
VICAT needle test covers only a small area of the overall setting process.

- CEM I 42,5R standard mortar
- VICAT initial set: 158 min = 760 m/s
- VICAT final set: 196 min = 1020 m/s
Repeat Accuracy Test

... with Cement Mortar on 8 Channels Standard Deviation = 0.8%

Ultrasonic Wave Velocity after 24 Hours:
- Average Value = 3719 m/s
- Standard Deviation = 30 m/s (0.8%)
Quick-Test Function

... for Runtime, Velocity, Temperature and Dynamic modulus of Elasticity
**Dynamic E-Modulus**

**Dependency of Ultrasonic Speed and Poisson Ratio $\mu$**

Formular for the calculation of the dynamic elastic modulus:

$$E_{dy} = v^2 \cdot \rho \cdot k$$

$k = (1 + \mu) \cdot (1 - 2\mu) / (1 - \mu)$

$\mu =$ POISSON’s figure (poisson ratio)

$v =$ Velocity of sound in [m/s]

$\rho =$ Density of the sample in [kg/dm³]

I most cases the estimated value of $\mu \approx 0.2$ can be assumed for cement and mortar.

The dynamic E-modulus is only defined for hard materials. Calculations for fresh mortar do not deliver valid values.
Measuring Moulds (Standard) ...

... for all kinds of Setting & Hardening Processes

**Measuring moulds:** non-adhesive, inherently stable, easy to clean, chemically resistant, temperature range -20 to + 125 °C

90% of all measurements are performed with standard form SMV 140-50 bl32!

---

1. **Measuring Mould 140-50 bl32 with Vibration Absorber:**
   95 ml mould (corn size ≤12 mm), measuring distance: 30-40 mm

2. **Measuring Mould 150-70 bl32 with Vibration Absorber:**
   190 ml mould (corn size ≤16 mm), measuring distance: 50-60 mm

3. **Measuring Mould 220-120-70 with Vibration Absorber:**
   675 ml mould for coarse grained materials ≤32 mm, measuring distance: 112 mm - **ONLY for concrete with grain size 16-32 mm**

4. **Measuring Mould 220-120-110 with Vibration Absorber:**
   1070 ml mould for coarse grained materials ≤32 mm, measuring distance: 112 mm - **ONLY for concrete with grain size 16-32 mm**

**Type 3 and 4 only for concrete with max. grain size 16-32 mm**
Measuring Moulds with Low Initial Velocity (LIV) …

... for High Resolution Measurements of the early Setting & Hardening Processes

Measuring moulds: made of soft silicone, non-adhesive, inherently stable, easy to clean, chemically resistant, temperature range -20 to +125 °C

5. Measuring Mould 140-50 LIV with vibration absorber: 95 ml mould (corn size ≤12 mm), measuring distance: 30-40 mm

6. Measuring Mould 130-20 LIV with vibration absorber: 64 ml mould for grained materials ≤6 mm, measuring distance: 20 mm

7. Measuring Mould 130-30 LIV with Vibration Absorber: 102 ml mould for grained materials ≤10 mm, measuring distance: 30 mm
Measuring Moulds with Low Intinital Velocity (LIV) …

Ultrasonic velocity - 0 ... 60 min
with cementitious self leveling compound
Flexible Installation for all Laboratories

Laboratory Trolley and Platforms

Platforms for 2, 3 or 4 Measuring Cells with Vibration-Reducing Base

Laboratory Trolley with Detachable Platforms for 4, 6 or 8 Measuring Cells Uninterruptible Power Supply UPS
Measurements under controlled Humidity & Temperature Conditions

Measurements in Climate Chambers up to 90°C

IP-8 Connector-Box:
Plug & Play Connection for Climate Chambers
Shrinkage Measurement for UltraTestLab

- For simultaneous measuring of ultrasonic speed and shrinkage/swelling
- USB interface for 1, 4 or 8 Mitutoyo Digimatic indicators
- Also for existing "shrinkage grooves"
Requirements for Set Up & Shipment

Dimensions for set up
4-Channel System with 1 platforms: 130 x 60 cm
8-Channel System with 2 platforms: 220 x 60 cm

Power supply
110 and 240 V / 50-60 Hz / 0,5 A max.
Euro plug or US plug

Notebook
Operation System: Windows 7/8/10
RAM memory: min 4 GB
HDD: min 10 GB free
Processor: Intel Pentium, i-series, AMD
Free USB 2.0 port: 1
Not older than 4-5 years

Shipping
IP-8 / 8 channels: 51 x 34 x 35 cm, 21 kg
IP-8 / 4 channels: 40 x 30 x 28 cm, 12 kg
Platform: 95 x 63 x 10 cm, 11 kg
Tariff-code: 90248019

Setup and training
Onsite or Online on request
We would be pleased to present the system at your premises. Just give us a call!

You can send us up to 3 product samples for a test measurement.

The results will be e-mailed to you as PDF or Excel files within a few days.