In today’s highly competitive market, quality and price are imperative for the success of a product. No matter how complex the manufacturing process — what really counts is whether the product is good or scrap, and how it compares with competitive products in terms of price and quality.

Quality Aspects
The more sequences a production process involves, the higher the number of factors on which the quality of the finished product depends. The properties and the homogeneity of the molding sand greatly influence the quality of the molds, the cores, and, of course, the finished castings. Hence, inspection and control of the molding sand properties within set tolerance limits are indispensable.

• In many cases, constant supervision of all production steps and the statistical documentation of the results — as part of the quality assurance system — are compulsory.

• Continual in-process sand control will not only help to minimize fluctuations in molding sand consistency, but will also help to optimize recipes and make them infinitely reproducible.

Therefore, molding sand testing is not merely an option, but an absolute necessity.

Economic Aspects
In addition to quality requirements, there is a demanding need for cost-efficient production and more economical use of resources and materials. Molding sand testing has become a must, because it facilitates the selection of more suitable, therefore, more economical molding sand components.

Molding sand testing will, among other things, enable foundries to determine the exact amount of binder and other sand additives needed to produce the mold best suited to meet the quality standards specified for the casting.

Molding sand testing can be instrumental in developing sand mixtures that are better adapted to a particular foundry operation and will help prevent sand-related rejects.

Moreover, the proper choice of a suitable sand mixture that will help foundries achieve the required mold configuration, maximum dimensional accuracy and high-quality surface finish, will in turn, lead to a reduction in shot blasting and finishing costs.

Our complete program features about 50 instruments, all conforming to applicable CE-regulations. The equipment list on the following pages is classified to these criteria:

• Incoming Control
• Control of Production Bentonite Bonded Sand
• Resin/Waterglass Bonded Molding Sands
• Production of Laboratory Mixtures
• Miscellaneous
## Properties of the Base Materials

- **PSN** Sand Sampler
- **PLK** Laboratory Mixer
- **42111** Core Sand Mixer
- **PWB** Agitator
- **PKA** Continuous Clay Washer
- **PSA-D** Laboratory Sifter and Wet Sieve Device
- **POF** Sand Surface Testing Apparatus
- **PRK** Magnetic Stirrer
- **PMK** Methylene-Blue Clay Tester
- **PNZ-D** Wet Tensile Strength Testing Apparatus

## Physical Properties of Clay Bonded Molding Sands

- **PRA** Sand Rammer, assorted attachments to PRA
- **PAB-P** Pneumatic Ejector
- **PDU-D** Permeability Meter
- **PED-D** Electric Permeability Meter
- **PFG** Universal Strength Machine, attachments to PFG
- **PVG-P** Compactability Testing Apparatus
- **PFZ** Green Tensile Strength Testing Apparatus
- **PFP** Mold Strength Tester
- **PKS** Calibration Kit for Testing Equipment

## Hot, Cold and Gas Cured Sand

- **PEP** Impact Tester
- **PKH** Core Hardness Tester
- **PCR** Shell Mold Testing Apparatus, attachments to PCR
- **PCA** Shell Mold Materials Testing Apparatus
- **PBH/3** Heated Transv. Bars Mold, attachments to PLS/ PTR
- **PLS** Labjet
- **PGG** Gassing Controller, attachments to PLS
- **PGD-E** Gas Pressure Determinator
- **PWG** Moisture Analyzer, Water Content

## Miscellaneous

- **PLM** Stereo Microscope
- **PEW** Precision Scale
- **PAO** Incinerating Furnace
- **PUT** Forced Air Drying Cabinet
- **Simpson + Hartley®**
<table>
<thead>
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<th>Resin/Waterglass Bonded Molding Sands</th>
<th>Miscellaneous</th>
</tr>
</thead>
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<td>PLK</td>
</tr>
<tr>
<td>Sample – drying setting</td>
<td>42111</td>
</tr>
<tr>
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<td>PWB</td>
</tr>
<tr>
<td>Transverse strength</td>
<td>PKA</td>
</tr>
<tr>
<td>Transverse strength – gas cured</td>
<td>PSA-D</td>
</tr>
<tr>
<td>Transverse strength – thermos.</td>
<td>POF</td>
</tr>
<tr>
<td>Thermos</td>
<td>PRK</td>
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<tr>
<td>Hardenability</td>
<td>PMK</td>
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<td>Core hardness tolerant</td>
<td>PNZ-D</td>
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<tr>
<td>Flowability</td>
<td>PRA</td>
</tr>
<tr>
<td>Amount of gas / pressure</td>
<td>PAB-P</td>
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<tr>
<td>Elasticity</td>
<td>PDU-D</td>
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<tr>
<td>Clay bonded sand (lab mixture)</td>
<td>PED-D</td>
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<tr>
<td>Control, calibration equipment</td>
<td>PFG</td>
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<tr>
<td>Thermal degradation</td>
<td>PVG-P</td>
</tr>
<tr>
<td>Control of sand preparation</td>
<td>42159</td>
</tr>
<tr>
<td>Other (lab mixture)</td>
<td>PFZ</td>
</tr>
<tr>
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<td>PFP</td>
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<tr>
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<td>PVF-C</td>
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<td>PKH</td>
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<td>PCR</td>
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<td>PCA</td>
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<tr>
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<td>PBH/3</td>
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<td>Control of sand preparation</td>
<td>PLS</td>
</tr>
<tr>
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<td>PLS</td>
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<td>Control of sand preparation</td>
<td>PFG</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>PGD-E</td>
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<td>PWG</td>
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<td>Miscellaneous</td>
<td>PAO</td>
</tr>
<tr>
<td>Control of sand preparation</td>
<td>PUT</td>
</tr>
</tbody>
</table>

*SYSTEM SIMPSON... OPTIMIZED SOLUTIONS DESIGNED FOR SPECIFIC NEEDS | 5*
Sample Preparation

**PSN Sand Sampler**
Serves to select representative samples of molding and auxiliary materials.
Capacity 0.75 l

**PLK Laboratory Muller**
Clay bonded sands need intensive mulling for excellent coating of the sand grains. The Laboratory Muller is well-suited for brief but thorough primary mixing, or for intensive secondary mixing of foundry sand, as well as for the preparation of synthetic laboratory mixtures.
Capacity 6 kg
RPM 31
Motor 0.55 kW
400 V, 50 Hz

**42111 Core Sand Mixer**
Designed to mix liquid binders with sands that are common to all chemically bonded sand mixtures. The mixer incorporates an “S” shaped mixing blade that completely mixes the complete sand mass.
Capacity 4.08 kg
Standard 230 V, 50-60 Hz
Optional 115 V, 50-60 Hz
Motor 0.38 kW
Washing

**PKA Continuous Clay Washer**
The washer serves to remove all fines of size $< 0.02$ mm from two samples at the same time. The Clay Washer works on the principle of elutriation, i.e. by holding the sample in an upstream water current of a velocity equalling the sedimentation speed of the particles size $< 0.02$ mm.

**PWB Agitator**
To determine the fines content, particles of size $< 0.02$ mm must be separated from the grains and brought into suspension. This requires intensive and thorough agitation of the prepared sample.

RPM approx. 8000
230 V, 50/60 Hz, 55 W
0-99 min. digital timer
Sieve analysis

**PSA-D Electronic Laboratory Sifter**

Electro-magnetic vibration sieve machine for the determination of the grain distribution by screening the dried, fine-free sand.

For test sieves with 203 mm diameter.

(Customer selection to include: DIN or ASTM)

all-electronic control, digital indication of all functions, max. weight of sieving material: 3 kg,

free interface RS 232 C,

230 V, 50 or 60 Hz, or 115 V, 60 Hz.

**Standard Option:**

PSS Sieves according to DIN

Mesh size in mm

1,4 · 1,0 · 0,71 · 0,5 · 0,355 · 0,25 · 0,18 · 0,125 · 0,09 · 0,063

**Alternative Option:**

PSS Sieves according to ASTM

Mesh size in mm

1,7 · 1,18 · 0,85 · 0,6 · 0,425 · 0,3 · 0,212 · 0,15 · 0,106 · 0,075 · 0,053

**Additional Accessory: PSB Wet Sieve Device**

The Wet Sieve Device allows fast removal of fines smaller than 0.02 mm from foundry sand.

Specific surface, grain shape

**POF Sand Surface Area Testing Apparatus**

For precise sand characterization, the coefficient of angularity is used.

This criteria is obtained by dividing the actual specific surface area (measured with the Sand Surface Testing Apparatus) by the theoretical surface area determined with the Electronic Laboratory Sifter PSA-D.
Bentonite Testing

**Stirring**

**PRK Magnetic Stirrer with Heating**
For fast and complete removal of the clay coating and other material from the sand surface.

- 230 V, 50 Hz, 630 W, with heater
- Heating plate ø 145 mm
- Temperature range up to 350° C

**PMK Methylene-Blue Clay Tester**
For fast, exact determination of the live clay content in the sand system; control of systems with fireclay.

- With digital 50 ml burette, digital display, solar operated

**PNZ-D Digital Wet Tensile Strength Testing Apparatus**
By heating the top face of a cylindrical standard test specimen, a temperature gradient is produced. This creates a zone of overwet sand (the so-called condensation zone) with reduced strength, a few millimeters below the surface. Exposed to a tensile force, the test specimen ruptures in this zone. The wet tensile strength in N/cm² is read from the maximum indicator pointer (up to 0.6 N/cm²) and is a direct value for the evaluation of bentonite and molding sands.

- Heating temperature 300° C
- 230 V, 50 Hz, 445 W
PHYSICAL PROPERTIES OF CLAY BONDED MOLDING SANDS

Sample Preparation

**PRA Sand Rammer**
Serves to prepare standard cylindrical test specimen. Accessories for determining the transverse strength of cold-setting resin-bonded sands and their flowability are also available.

**Optional Accessory: PRA-MA Sand Rammer**
Electric motor and preselection counter instead of hand drive. For automatic execution of a preset number of ram blows.

**PAB-P Pneumatic Ejector**
Automatic and gentle stripping of test samples, no after-compaction. Green and core sand test specimen.

**PAB Stripping Post**
To strip the test specimen and to clean the precision test specimen tube.

**PBK/R Transverse Strength Core Box**
For the preparation of transverse bars from cold setting sand.

**PBG/R Simple Transverse Strength Core Box**
For gassing of a sample bar from gas cured sand.

**PFB/R Flowability Testing Fixture**
Determination of the flowability [in %] for cold setting or bentonite bonded molding sands.

**PMU Dial Indicator**
To measure the height of sand in the specimen tube.
Graduation: 0.01 mm
Accessory: end block 50 mm
Gas permeability of clay and resin bonded molding sands

**PDU-D Digital Permeability Meter**
Permeability of molding sand, in conformity with the standard test regulation, can be determined either by the fast orifice method or calculated from the air passage time and the pressure reading. Both methods can be applied with the Permeability Meter PDU.

Measuring range:
large orifice: 0 – 500, small orifice: 0 – 50

**PED-D Digital Electric Permeability Meter**
Determination of gas permeability by the orifice method.

230 V, 50 Hz, 90 W

Strength determination (clay and resin bonded molding sands)

**PFG Universal Strength Machine**
For the determination of the compressive strength $\sigma_D$ up to approx. 30 N/cm$^2$.

230 V, 50 Hz

**Optional Accessory: PFG-MA Universal Strength Machine**
Electric motor instead of hand drive optional.
Auxiliary instruments for determination of:
Transverse-, shear-, splitting and increased strengths.
PHYSICAL PROPERTIES OF CLAY BONDED MOLDING SANDS

Transverse-, shear-, splitting and increased strengths

PVG-P Pneumatic Compactability Tester
With integrated sieve to determine the compactability of molding sand. The molding sand, which is screened into the test specimen tube, is compacted with 2000 N compaction force (approx. 100 N/cm² surface pressure). The decrease of the sand cylinder is measured.

Compactability = \( \frac{L_{\text{Test Sample Tube}} - L_{\text{Test Sample}}}{L_{\text{Test Sample Tube}}} \times 100 \)

Compressed air supply min. 5 bar

PQS Twin-Transverse Shear Strength Measuring Attachment
This accessory measures the accuracy of the twin-transverse shear strength. The measured value is divided by 2 (up to 15 N/cm²).

PSP Splitting Strength Measuring Attachment
Serves to determine the splitting strength by simplified and approximate measuring, or green tensile strength (splitting strength \( \times 0.637 \) = green tensile strength) of up to 15 N/cm².

PHM Load Gauge
For strengths up to 132.4 N/cm².

PZV Tensile Strength Attachment
For testing tensile strength.
PFZ Green Tensile Strength Testing Apparatus

To measure the tensile strength of clay bonded molding sand. The values can be determined on a cylindrical test specimen in the laboratory or on the mold in the shop.

42159 Shatter Index Tester

To determine the plasticity of clay bonded molding sands.

Drop height 61\” (1528 mm)
Mesh size 1/2\” (13.2 mm)
Compressed air supply min. 5 bar

PFP Mold Strength Tester

This electronic mold strength tester ensures a practically movement-free force measurement by means of an oscillating crystal-controlled sensor. The measured force, which corresponds to the penetration resistance, indicates the strength rate. The tester comprises a digital display unit, a multifunction push-button switch and two 1.5 V batteries. It measures and stores the maximum value in N/cm² or PSI, automatically calibrates the zero point, retains the value last measured in storage, and then turns off automatically.
PVF-C Minilab

Multi-purpose instrument to prepare test specimen and to determine the most frequently required sand values in a foundry:

- Preparation of cylindrical standard test specimen of green sand Ø 50 x 50 mm or Ø 50.2 mm x 2 inches and core sand test bars 22.4 x 22.4 x 170 mm (option)
- Determination of compactability [%]
- Green compressive strength [N/cm²]
- Splitting strength [N/cm²]
- Twin transverse shear strength [N/cm²]
- Transverse strength [N/cm²]
- Elasticity [mm]
- Tensile strength [N/cm²]

Accessories:
- Tools for preparation of specimen and to carry out all tests indicated
- Sand chute

Optional Accessory:
- Filling device PES

Measurement values in N/cm², kN/cm² and mm; indication in PSI and inches inclusive corresponding tools on request

Power supply 230 V, 50 Hz
Compressed air supply min. 5 bar

PKS Calibration Kit for Testing Equipment

Control of the functional efficiency [temperature, pressure] of PRA, PVG, PDU, PED, PFG, PCR, PIT, PNZ. Auxiliary tools:
- Precision gauge block
- Anvil for PRA
- Calibration device for PRA
**PEP Impact Penetration Tester**
For the determination of the degree of curing in the lower zones and determination of curing time, especially the strip time.

**PKH Core Hardness Tester**
The hardness of the sand is determined by turning a milling head into cores and reading the penetration depth in mm.

---

**Shell Sands**

**PCR Shell Mold Tester**
For determining the hot tensile strength (up to 400 N/cm²) of shell molding sands.

230 V, 400 W
Thermostatic temperature regulation up to 300° C

**PHB Hot-Box Testing Device**
With this accessory test specimen of hot-box sand are prepared and tested on the PCR as follows: the closed-bottom box is placed on the PCR and filled with sand. The sample is compacted by applying the hand ram and then pulling the sliding plate.
PCA Shell Mold Material Tester
The application of the dumping method for the production of shell molds and hollow cores presupposes that the resin coated sand builds up a uniform wall thickness on the heated molding tool. The curing speed and the peel-back behavior are the determining factors, and can be measured with this instrument.

230 V, 50 Hz, Heating capacity 1500 W

Preparation of transverse bars

PTR Temperature Controller
For regulation of temperature and time when preparing transverse strength bars.

230 V, 50 Hz. Pre fuse 10 A.
Connecting cable to PBH/3

PBH/3 Electrically Heated Transverse Bars Core Box
For manual or mechanical (PLS) preparation of standard bars (1 - 3 per operation)

Heating capacity 2 x 800 W
The transverse strength as limiting factor is determined with Minilab PVF-C or the Universal Strength Machine PFG.
Gas-Cured Sand

Test sample preparation

**PLS Labjet**
For the determination of the transverse strength of core sand, a standard sample specimen of reproducible quality must be made. With the Labjet and the corresponding attachments, such test specimen can be made out of gas-cured (PGG) and from hotbox sands (PTR, PBH/3).

Working pressure: 5 bar, Volume of air: 3.5 l
Weight approx. 110 kg

Gassing transverse bars

**PGG Gassing Device**
This equipment controls gassing of test samples of gas-cured molding sand.

230 V, 50 Hz, 20 W

Accessories for making transverse bars

**PZG Gassing Device for Cylindrical Test Samples**
Two-part device to gas cylindrical standard test samples in the precision test sample tube.

**PBG/R Simple Transverse Bar Box**
For producing and gassing a transverse bar.

**PGC/3 Gassing Head**
For gassing the test samples in the core box PBG/3.

**PBC/3 Transverse Bar Box**
For the production of 3 transverse strength samples of gas-cured sand to determine deformation.

**PBS/3C or PBS/3H Sand Container**
For sand with normal and easy flowability.
Moisture and Gas Formation

PGD-E Gas Pressure Measuring Device
This device serves to measure the gas pressure and, indirectly, the gas volume (the sum of all gasses). It also measures the rate of gas formation. The temperature of the PGD-E can be set electronically and reaches the maximum temperature of 1000° C within 12 minutes, which allows to carry out the test with a test sample of 0.5 – 2 g. With a special software (included) the pressure diagram can be displayed on a computer.

230 V, 50 Hz, 2000 W
Max. temperature up to 1000° C
Pressure: max. 500 mbar
*Laptop not included.

PWG Moisture Analyzer
This device serves as a dryer. It also evaluates and automatically records the water contents.
Max. weighing capacity: 35 g (or 150 g)
Weighing accuracy: 1 mg
Repeatability, average (%) for initial sample weight:
appr. >1 g: +/- 0.2
appr. >5 g: +/- 0.05
Display mode for results:
% moisture,
% dry weight (solids)
% ratio g residue, g/kg residue
Temperature range: 40 – 230° C
Data interface port: RS 232 C unidirectional
Number of program memories: 3
230 V, 50/60 Hz
**Optical Control**  
(Evaluation of grain shape and surface)

**PLM Stereo Microscope**  
Laboratory microscope with direct and trans-illumination.

- Magnification: 7x to 180x (zoom), 7x to 45x (foto/video adaptation)
- Single binocular adjustment
- WF 10x ocular pair, 20 mm;
- Fine and coarse focus control, with adjustable stop (max. 90 mm)

*Standard accessories:* rubber eyeguard, fuse, spare lamp, 75 mm black/white plate, dust cover 230 V, 50/60 Hz

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**Weighing**

**PEW Laboratory Scale**  
With high luminous digital display. Auto/zero function, short stabilizing time, overload fuse. 230 V, 50 Hz. Further versions (weighing range) available on request.

<table>
<thead>
<tr>
<th>Type</th>
<th>Accuracy / weighing range</th>
<th>Plate</th>
<th>Stabilizing time</th>
<th>Reproduceability</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEW / A</td>
<td>0.1 g / 4100 g</td>
<td>174 x 143 mm</td>
<td>3 sec.</td>
<td>0.1 g</td>
</tr>
<tr>
<td>PEW / B</td>
<td>0.1 g / 6100 g</td>
<td>174 x 143 mm</td>
<td>3 sec.</td>
<td>0.1 g</td>
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<td>PEW / C</td>
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<td>100 mm</td>
<td>3 sec.</td>
<td>0.001 g</td>
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<td>PEW / D</td>
<td>0.01 g / 1500 g</td>
<td>174 x 143 mm</td>
<td>3 sec.</td>
<td>0.01 g</td>
</tr>
<tr>
<td>PEW / E</td>
<td>0.01 g / 610 g</td>
<td>116 mm</td>
<td>3 sec.</td>
<td>0.01 g</td>
</tr>
<tr>
<td>PEW / F</td>
<td>0.01 g / 410 g</td>
<td>116 mm</td>
<td>3 sec.</td>
<td>0.01 g</td>
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<tr>
<td>PEW / G</td>
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<td>3 sec.</td>
<td>0.01 g</td>
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<td>0.1 g</td>
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<td>PEW / I</td>
<td>0.1 g / 610 g</td>
<td>174 x 143 mm</td>
<td>3 sec.</td>
<td>0.1 g</td>
</tr>
</tbody>
</table>
MISCELLANEOUS

Incineration

PAO Incinerating Furnace, Type CWF and ELF
Loss on ignition rate, ash contents and the proportion of volatile ingredients are important sand characteristics analyzed in a temperature range of > 900°C.

With electric control, analog or digital display.
Other furnaces on request.

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. temp. °C</th>
<th>Max. cont. temp. °C</th>
<th>Cap. l</th>
<th>Dimension in mm</th>
<th>Heatup time min.</th>
<th>Power max. kW</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWF 11/5</td>
<td>1100</td>
<td>1050</td>
<td>4.8</td>
<td>140 inside T 135</td>
<td>50</td>
<td>2.2</td>
<td>30</td>
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<tr>
<td>ELF 11/6</td>
<td>1100</td>
<td>1000</td>
<td>6.0</td>
<td>180 inside T 165</td>
<td>15</td>
<td>2.0</td>
<td>30</td>
</tr>
</tbody>
</table>

Drying

PUT Forced Air Circulation
Drying Cabinet
For drying sand samples or test specimen.

With electronic regulator, analog or digital display.
Items with other specifications on request.

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. temp. °C</th>
<th>Cap. l</th>
<th>Dimensions in mm</th>
<th>Power max. kW</th>
<th>Weight kg</th>
<th>Grid tray N° of pcs</th>
<th>Grid tray max pass pcs</th>
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<tbody>
<tr>
<td>PF 30</td>
<td>300</td>
<td>30</td>
<td>330 inside T 300</td>
<td>1.0</td>
<td>33</td>
<td>2</td>
<td>3</td>
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<td>PF 120</td>
<td>300</td>
<td>120</td>
<td>530 inside T 500</td>
<td>2.0</td>
<td>75</td>
<td>2</td>
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SIMPSON + HARTLEY TECHNICAL DATA

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<td>18Mk2</td>
<td>17Mk2</td>
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<td>APPLICATION</td>
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<td>MEASUREMENTS</td>
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<td>Return Sand Conductivity</td>
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<td>Return Sand Temperature</td>
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<tr>
<td>Batch Weight</td>
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<td>Compactability</td>
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<td>Prepared Sand Moisture</td>
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<td>CAPABILITIES</td>
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<td>Mixer Group Automation</td>
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<tr>
<td>Determine Available Bond</td>
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<tr>
<td>Calculate Bond Addition</td>
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<td>●</td>
</tr>
<tr>
<td>Self-Correcting Logic</td>
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<td>●</td>
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<tr>
<td>FEATURES</td>
<td>Conductivity Sensors</td>
<td>2 probes / 1 zone*</td>
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<tr>
<td>Temperature Sensors</td>
<td>2 points</td>
<td>9 points</td>
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<tr>
<td>Operator Interface</td>
<td>26 cm Color</td>
<td>26 cm Color</td>
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<tr>
<td>Printer</td>
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<td>●</td>
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<tr>
<td>Ethernet Compatible</td>
<td>●</td>
<td>●</td>
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<tr>
<td>modem</td>
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</tr>
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<td>Remote Input/Output</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Water Addition Group</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>CONTROL</td>
<td>Deep (mm)</td>
<td>250</td>
</tr>
<tr>
<td>CABINET</td>
<td>Width (mm)</td>
<td>915</td>
</tr>
<tr>
<td></td>
<td>Height (mm)</td>
<td>1,525</td>
</tr>
<tr>
<td></td>
<td>Weight (kg)</td>
<td>180</td>
</tr>
<tr>
<td>HARTLEY</td>
<td>Length (mm)</td>
<td>1,100</td>
</tr>
<tr>
<td>TESTER</td>
<td>Width (mm)</td>
<td>1,400</td>
</tr>
<tr>
<td></td>
<td>Height (mm)</td>
<td>730</td>
</tr>
<tr>
<td></td>
<td>Weight (kg)</td>
<td>230</td>
</tr>
</tbody>
</table>

* For model 2502 17Mk2 and model 2552 17Mk2, the one zone is continuously fed into the system.

All figures are approximate and are subject to change depending upon your application.
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