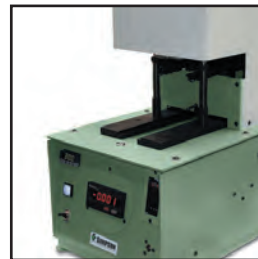
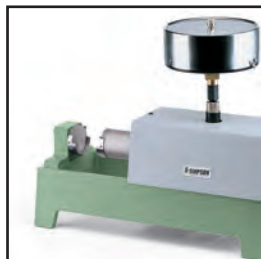


TEST INSTRUMENTS
FOR MOLDING AND CORE SANDS



SAND TESTING – The Cornerstone of Quality Orientated Casting Production

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 to 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**

Resin/Waterglass Bonded Molding Sands

Miscellaneous

Page	Test Instrument	Sampling	Samples – cold setting	Samples – thermosetting	Samples – gas cured	Transverse strength – cold setting	Transverse strength – gas cured	Transverse strength – thermos.	Permeability	Hardening condition time	Core hardness, abrasion resistant	Flowability	Amount of gas/pressure	Elasticity	Clay bonded sand (lab mixture)	Other (lab mixture)	Control, calibration equipment	Thermal degradation	Control of sand preparation
6	PSN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	PLK	.	■	.	.	.	.	.	.	.	.	.	.	.	■	■	.	.	.
6	42111	.	■	.	.	.	.	.	.	.	.	.	.	.	.	■	.	.	.
7	PWB	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	PKA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	PSA-D	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	POF	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	PRK	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	PMK	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	PNZ-D	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Physical Properties of Clay Bonded Molding Sands																			
10	PRA	.	■	.	■	.	.	.	.	.	.	.	■	.	.	.	.	.	.
10	PAB-P	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11	PDU-D	.	.	.	.	.	.	.	■	.	.	.	.	.	.	.	.	.	.
11	PED-D	.	.	.	.	.	.	.	■	.	.	.	.	.	.	.	.	.	.
11/12	PFG	.	.	.	.	■	■	.	.	.	.	.	.	.	.	.	.	■	.
12	PVG-P	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	42159	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	PFZ	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	PFP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
14	PVF-C	.	.	.	.	■	■	.	.	.	.	.	.	■	.	.	.	.	.
14	PKS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	■	.	.
Hot, Cold and Gas Cured Sand																			
15	PEP	.	.	.	.	.	.	.	.	■	.	.	.	.	.	.	.	.	.
15	PKH	.	.	.	.	.	.	.	.	.	■	.	.	.	.	.	.	.	.
15	PCR	.	.	■	.	.	.	■	.	.	.	.	.	.	.	.	.	.	.
16	PCA	.	.	■	.	.	.	.	.	.	.	■	.	.	.	.	.	.	.
16	PBH/3	.	.	■	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
17	PLS	.	.	■	■	.	.	.	.	.	.	■	.	.	.	.	.	.	.
17	PGG	.	.	.	■	.	.	.	.	.	.	.	.	.	.	.	.	.	.
18	PGD-E	.	.	.	.	.	.	.	.	.	.	.	■	.	.	.	.	.	.
18	PWG	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Miscellaneous																			
19	PLM	.	.	.	.	.	.	.	.	.	.	.	.	.	.	■	.	.	.
19	PEW	.	■	■	■	.	.	.	.	.	.	.	.	.	■	■	.	.	.
20	PAO	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
20	PUT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	■	.
21	Simpson + Hartley®	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	■

PROPERTIES OF THE BASE MATERIALS

Sample Preparation

Sampling

PSN Sand Sampler

Serves to select representative samples of molding and auxiliary materials.

Capacity 0,75 l



Sand mixtures

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



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



Washing

Washing the sand sample

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*



Automatic 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.



PROPERTIES OF THE BASE MATERIALS

Sand Characteristics

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

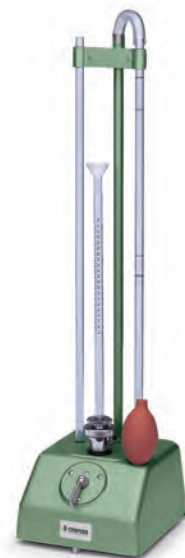
The Wet Sieve Device allows fast removal of fines smaller than 0.02 mm from foundry sand.

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



Active clay content

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



Wet tensile strength

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/cm^2 is read from the maximum indicator pointer (up to $0.6 N/cm^2$) 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

Preparation of cylindrical standard test specimen



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.



Transverse strength samples for gas cured molding sand

Transverse strength samples for no-bake, resin bonded molding sand

Flowability

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



Testing the Properties

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 σ_D up to approx. 30 N/cm².

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

PBV Transverse Strength Measuring Attachment

Transverse strength of resin-bonded sand is the strength most frequently measured.

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 x 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.



Compactability

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.

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

Compressed air supply min. 5 bar



Plasticity, moldability

42159 Shatter Index Tester

To determine the plasticity of clay bonded molding sands.

Drop height 61" (1828,8 mm)

Mesh size 1/2" (13,2 mm)

Compressed air supply min. 5 bar



Green 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.



Mold strength testing on the finished mold

PPF 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.



PHYSICAL PROPERTIES OF CLAY BONDED MOLDING SANDS

Control of functional efficiency

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



Preparation of test specimen

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 $\varnothing 50 \times 50$ mm or $\varnothing 50,2$ mm x 2 inches and core sand test bars $22,4 \times 22,4 \times 170$ mm (option)
- Determination of compactability [%]
- Green compressive strength [N/cm^2]
- Splitting strength [N/cm^2]
- Twin transverse shear strength [N/cm^2]
- Transverse strength [N/cm^2]
- Elasticity [mm]
- Tensile strength [N/cm^2]

Accessories:

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

Optional Accessory:

- Filling device PES

Measurement values in N/cm^2 , kN/cm^2 and mm; indication in PSI and inches inclusive corresponding tools on request

Power supply 230 V, 50 Hz

Compressed air supply min. 5 bar



HOT, COLD AND GAS-CURED SAND

Curing time

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.



Scratch hardness

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

Tensile strength of 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



Accessory for hot-box molding sand

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.



HOT, COLD AND GAS-CURED SAND

Peel-back behavior and curing speed of shell mold materials

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

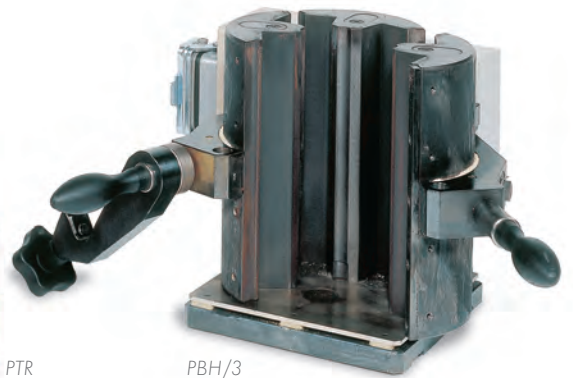
PBH/3 Electrically Heated Transverse Bars Core Box

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.



PTR



PBH/3

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 hot-box 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 Gassing with PGG

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

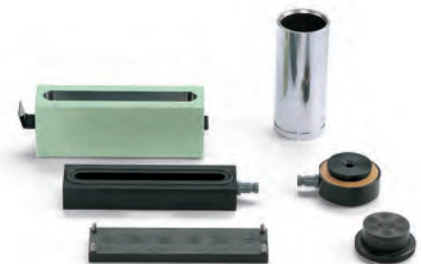
For gassing the test samples in the core box PBG/3.

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.



HOT, COLD AND GAS-CURED SAND

Moisture and Gas Formation

Gas pressure and gas volume

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.*



Moisture

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. >1g: +/- 0.2
 appr. >5g: +/- 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 adaption)
- 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



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.



Type	Accuracy / weighing range	Plate	Stabilizing time	Reproduceability
PEW / A	0,1 g / 4100 g	□ 174 x 143 mm	3 sec.	0,1 g
PEW / B	0,1 g / 6100 g	□ 174 x 143 mm	3 sec.	0,1 g
PEW / C	0,001 g / 150 g	⊘ 100 mm	3 sec.	0,001 g
PEW / D	0,01 g / 1500 g	□ 174 x 143 mm	3 sec.	0,01 g
PEW / E	0,01 g / 610 g	⊘ 116 mm	3 sec.	0,01 g
PEW / F	0,01 g / 410 g	⊘ 116 mm	3 sec.	0,01 g
PEW / G	0,01 g / 210 g	⊘ 116 mm	3 sec.	0,01 g
PEW / H	0,1 g / 2100 g	□ 174 x 143 mm	3 sec.	0,01 g
PEW / I	0,1 g / 610 g	□ 174 x 143 mm	3 sec.	0,01 g

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.*



Type	Max. temp. °C	Max. cont. temp. °C	Cap. l	Dimension in mm						Heatup time min.	Power max. kW	Weight kg
				B	inside T	H	B	outside T	H			
CWF 11/5	1100	1050	4,8	140	250	135	375	405	585	50	2,2	30
ELF 11/6	1100	1000	6,0	180	200	165	410	410	580	15	2,0	30

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.*



Type	Max. temp. °C	Cap. l	Dimensions in mm						Power max. kW	Weight kg	Grid tray	
			B	inside T	H	B	outside T	H			N° of pcs.	max. poss. pcs.
PF 30	300	30	330	310	300	654	450	454	1,0	33	2	3
PF 120	300	120	530	510	500	854	650	654	2,0	75	2	9

On-Line Control and Automation System

A complete green sand mixer group control and automation system

Simpson + Hartley®

Automation and control of mix preparation and machine function for any make and model of green sand mixer. The Simpson + Hartley features:

- Rugged design that is easy to operate and maintain
- Complete automation of all mixer group functions
- Control of compactability to +/-3 points in 90%+ of tests
- Data acquisition and reporting



SIMPSON + HARTLEY TECHNICAL DATA

		2502		2552	
MODELS		17Mk2	18Mk2	17Mk2	18Mk2
APPLICATION	Batch		•		•
	Continuous	•		•	
MEASUREMENTS	Return Sand Conductivity	•	•	•	•
	Return Sand Temperature	•	•	•	•
	Batch Weight		•		•
	Compactability	•	•	•	•
	Green Strength			•	•
	Prepared Sand Moisture	•	•	•	•
CAPABILITIES	Mixer Group Automation	•	•	•	•
	Determine Available Bond			•	•
	Calculate Bond Addition			•	•
	Self-Correcting Logic	•	•	•	•
FEATURES	Conductivity Sensors	2 probes/1 zone*	2 probes/3 zones	2 probes/1 zone*	2 probes/3 zones
	Temperature Sensors	2 points	9 points	2 points	9 points
	Operator Interface	26 cm Color	26 cm Color	26 cm Color	26 cm Color
	Printer	•	•	•	•
	Ethernet Compatible	•	•	•	•
	Modem	•	•	•	•
	Remote Input/Output	•	•	•	•
	Water Addition Group	•	•	•	•
	CONTROL	Deep (mm)	250	250	250	250
CABINET	Width (mm)	915	915	915	915
	Height (mm)	1,525	1,525	1,525	1,525
	Weight (kg)	180	180	180	180
	HARTLEY	Length (mm)	1,100	1,100	1,100	1,100
TESTER	Width (mm)	1,400	1,400	1,400	1,400
	Height (mm)	730	730	730	730
	Weight (kg)	230	230	230	230

* 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.



www.simpsongroup.com

email us at: sales@simpsongroup.com



In North America

Simpson Technologies Corporation
751 Shoreline Drive, Aurora, IL 60504-6194
USA

Tel: +1 (630) 978 0044

Fax: +1 (630) 978 0068



Simpson Technologies de Mexico S de RL de CV
Autopista Saltillo-Monterrey No. 7290 — Suite C
Saltillo, Coahuila 25200
MEXICO

Tel: +52 (844) 432 2595

Fax: +52 (844) 432 2545



In Europe

Simpson Technologies GmbH
Sennweidstrasse 43
CH-6312 Steinhausen
SWITZERLAND

Tel: +41 (41) 711 15 55

Fax: +41 (41) 711 13 87



In India

Wesman Simpson Technologies Pvt. Ltd.
Wesman Center, 8 Mayfair Road
Kolkata 700019
INDIA

Tel: +91 (33) 4002 0300

Fax: +91 (33) 2290 8050



In Asia

Simpson Technologies (Changzhou) Ltd.
Room 505, C Building, Xingbei Development Building
391 Tongjiang Road
Changzhou, Jiangsu Province, 213033
CHINA

Tel: + 86 519 85105601

Fax: + 86 519 85105701

Selected Simpson products are also produced under license by:



In Asia

Sintokogio Ltd.
Dai-Nagoya Building, 7F
28-12, 3-Chrome, Mei-Eki
Nakamura-Ku
Nagoya, 450-0002
JAPAN

Tel: +81 (52) 582 9211

Fax: +81 (52) 586 2279



In South America

Küttner do Brasil Equipamentos Siderúrgicos Ltda
Rua Santiago Ballesteros, 610
Contagem – MG 32010-050
BRAZIL

Tel: +55 (031) 3399 7200

Fax: +55 (031) 3399 7300

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