



# SOIL-LAB

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H-4215



H-4198



H-4197



H-4199

### Rapid Soil Processor

Processing soil for soil compaction tests has never been easier than when using Humboldt's Rapid Soil Processor. It automatically processes semi-moist, moist and even samples close to optimum moisture content to minus #4 screen size more than five times faster than any other method available. Samples of up to 30 pounds of fat and tough clays at field moisture levels can be processed in less than 15 minutes. For those drying back samples or taking up to 24hrs to prepare samples for five-point moisture/density relationship tests, the rapid soil processor can accomplish this preparation in about 5 hours. Other test preparations can also benefit from the rapid soil processor, reducing prep time to almost nothing. If you use field expedient methods, such as "rapid compaction" or "family of curves" testing, the rapid soil processor is a must.

In addition, while processing a sample, rocks in the sample of up to 0.75" in size are automatically separated from the soil, preventing damage to the screen.

The rapid soil processor features heavy-duty, all-metal construction, which provides years of dependable service under constant use. The off-set rotating drum is motor driven and requires no preset adjustments. Automatic operation frees up technician's time allowing them to do other tasks while processing soil samples. Easy-to-install, replacement screens are available, as are replacement parts. Overall dimensions: 32" x 36" x 53" (813 x 915 x 1346mm).

Rapid Soil Processor, 120V 60Hz H-4215  
 Rapid Soil Processor, 220V 60Hz H-4215.2F  
 Rapid Soil Processor, 220V 50Hz H-4215.5F

Shipping wt. 406 lbs (184kg)

### Replacement Screens for Rapid Soil Processor

Description	Model
Replacement Screen, 11.875" (302mm) height (for units sold after March, 1995)	H-4215.32
Replacement Screen, 13" (330mm) height (Old Style, for units sold before March, 1995)	H-4215.26

### Electric, Disk Grinding Mill

ASTM C409

The H-4198 Electric Disk Grinding Mill is used in testing labs around the world and complies with ASTM C409 for sample preparation of Hardgrove Grindability specimens. This grinding mill features a 1/3hp single-phase, geared motor, which is mounted to a rigid, cast-aluminum base with rubber feet for stability. The grinding mill head construction is made of sturdy, durable cast iron. The grinding mill head can be easily removed and disassembled for cleaning without the use of any special tools. The grinding plates are made of a hard iron alloy designed for clog resistance and long life. Plate-to-plate clearance is easily adjusted by hand in order to change the mesh size range desired. Output capacity is up to 40lbs (18kg) per hour with dry material and the material hopper provides 50in<sup>3</sup> (820ml) approximately 2lb (0.9kg) of material. Grinding mill is sold with the dry grinding feeder and disk set—a wet grinding feeder and disk set is available as an accessory (H-4198.1). The complete unit ships in two boxes.

Soil Grinder, 120V 60Hz H-4198  
 Soil Grinder, 220V 60Hz H-4198.2F  
 Soil Grinder, 220V 50Hz H-4198.5F

Shipping wt. 55 lbs (25kg)

Description	Model
Coarse Grinding Plate Set	H-4198.1

### Soil Grinder, Humboldt

This table-top unit prepares soil samples to designated particle size for accurate, repeatable test results. Grinds one-pint sample in 15 seconds. Stainless steel construction. Includes a No. 10 perforated stainless plate.

Soil Grinder, 120V 60Hz H-4199  
 Soil Grinder, 220V 50Hz H-4199.5F

Shipping wt. 28 lbs (12.7kg)

### Soil Grinder Accessories

Description	Model
No. 4 Perforated, SS Plate	H-4199.A
No. 10 Perforated, SS Plate	H-4199.B
No. 35 Perforated, SS Plate	H-4199.C
2mm Perforated, SS Plate	H-4199.D
Beater Assembly	H-4199.7

### Disk Grinding Mill, Hand-operated

Hand-operated Grinding Mill mounts to bench top up to 1.5" (38.1mm) thick with an integral c-clamp for fast grinding of samples. The mill is made of sturdy, durable, painted cast iron. Mill head can be easily disassembled for cleaning without the use of any special tools. The grinding plates are made of a hard iron alloy designed for clog resistance and long life. Unit is sold with dry grinding feeder and disk set, but wet grinding set up is available as an accessory. Output capacity is up to 40lbs (18kg) per hour with dry material and an energized cranker. The material hopper provides 50in<sup>3</sup> (820ml) approximately 2lb (0.9kg) of material.

Disk Grinding Mill, Hand-operated H-4197

Shipping wt. 12.5 lbs (5.7kg)

Description	Model
Revolving Plate	H-4197.1





H-4257

H-4258



H-3839



H-3858.3F



HC-3851



H-3842A  
H-3843A



**ACCESSORIES**

For Mixer Accessories, please see page: 280.

**Soil Mortar**

ASTM D421; AASHTO T87

Heavy porcelain mortar, glazed outside surface and unglazed inside; for use with H-4258 pestle to break up soil particle aggregates for testing. Mortar is 3.5" (90mm) ID x 2.25" (57mm) H.

**Soil Mortar**

H-4257

Shipping wt. 1.5 lbs (0.7kg)

**Soil Pestle**

ASTM D421; AASHTO T87

Rubber-tipped 8" (203mm) long pestle, made for gently grinding soils without breaking individual particles.

**Soil Pestle**

H-4258

Shipping wt. 0.7 lbs (0.32kg)

**Mixer, 5-Qt.**

Mixer for mixing material samples. The H-3839 operates on the principle of planetary action where the beater reaches every part of a batch, rotating on its axis in opposite directions as it moves around the bowl. This mixer thoroughly blends, mixes and aerates all ingredients for a consistent, predictable finished batch. Selective agitator transmission has 3 speed settings: 139, 285 and 591 RPM. Direct gear drive and a heavy-duty motor ensure constant mixing speeds under load. A locking hand-lever provides precise raising and lowering of the mixing bowl. Base dimensions: 10.375 x 15" (264 x 381mm). Height: 17" (432mm). The mixer includes a stainless steel bowl, wire whip, dough hook and an aluminum flat beater. It is suggested that a stainless steel beater or a Humboldt extreme-duty whisk be purchased for materials mixing applications for improved beater life.

Mixer, 5-Qt. (4.73L), 120V 60Hz

H-3839

Mixer, 5-Qt. (4.73L), 230V 60Hz

H-3839.2F

Mixer, 5-Qt. (4.73L), 230V 50Hz

H-3839.5F

Shipping wt. 55 lbs (25kg)

**Humboldt Laboratory Mixer, 5-Qt.**

Humboldt's NEW 5-Qt. Laboratory Mixer has been designed to provide material testing labs with a step up in quality from the typical lab mixer. This mixer has been designed specifically for the demands of cement and soil mixing and not as a kitchen-prep machine. This new mixer, with its clear safety cover provides a sealed mixing design, which allows for material, water and other additives to be easily added to the mix via a port at the top of the mixer. The clear safety cover is attached to the mixer, independent of the bowl and can be removed for cleaning. The mixer features lightweight aluminum construction and comes with a stainless steel stirrer and mixing bowl.

The HC-3858.3F promotes extremely safe operation and complies with CE standards. It provides enclosed operation, an emergency stop button and stops automatically when the bowl is lowered during the mixing process. Its design is optimized for easy handling including its easy-lowering bowl mechanism. The mixer provides two mixing speeds: 140 ± 5 U/min and 285 ± 10U/min. Dimensions are: 9.25" x 15.5" x 22.4" (235 x 396 x 568mm).

Mixer, 5-Qt. (4.73L), 120/230V 50/60Hz

H-3858.3F

Shipping wt. 66lbs (30kg)

**Soil and Mortar Mixer, 5L (5.3qt)**

This excellent, alternative to the Hobart mixer features two-speed, manual-control with a very robust design, expressly made for the efficient mixing of cement pastes and mortar. The mixer offers two speeds: 140 rpm for revolving with 62 rpm planetary action and 285 rpm revolving with 15 planetary action.

This mixer features a heavy-duty design, which provides excellent stability when placed on a counter top. Provides open mixing bowl for easy visual consistency control. Simple distance control between stirrer paddle and mixing bowl maintains standard distance between bowl and stirrer.

Hoisting mechanism can also be used to lower the mixing bowl. Quick-clamping system allows mixing bowl to be attached to the mixer easily. Provided with standard stainless steel bowl and standard beater.

Mortar Mixer, 5L (5.3qt), 120V 60Hz

HC-3851

Mortar Mixer, 5L (5.3qt), 230V 60Hz

HC-3851.2F

Shipping wt. 125lbs. (56kg)

**Laboratory Bench Mixers**

These mixers are designed with larger bowls for larger samples or busier labs. They feature a direct gear drive and a heavy-duty 1/2hp motor to ensure constant mixing speeds under load. A locking hand-lever provides precise raising and lowering of the mixing bowl. These mixers thoroughly blend, mix and aerate all ingredients for a consistent, predictable finished batch. Selective agitator transmission has 3 fixed speed settings and a stir speed, these are: 107, 198 and 365 and 59 RPM. Its 15-minute SmartTimer provides ease of use and consistency. Bowl Interlock ensures mixer bowl is properly in place for mixer to operate and bowl lift is an ergonomic hand crank operated, which self-locks in the top and bottom positions. Includes stainless-steel bowl, flat-type aluminum grid beater, whip and aluminum dough hook.

Base Dimensions of the 12 Qt. Mixer are: 14.75" x 20" x 29.6125" (375 x 508 x 750mm).

Base Dimensions of the 20 Qt. Mixer are: 21" x 21.5" x 41.25" (533 x 546 x 1048mm).

Bench Mixer, 12Qt, 120V 60Hz

H-3842A

Bench Mixer, 12Qt, 230V 50/60Hz

H-3842A.4F

Shipping wt. 185 lbs (84kg)

Bench Mixer, 20Qt, 120V 60Hz

H-3843A

Bench Mixer, 20Qt, 230V 50/60Hz

H-3843A.4F

Shipping wt. 230 lbs (104kg)

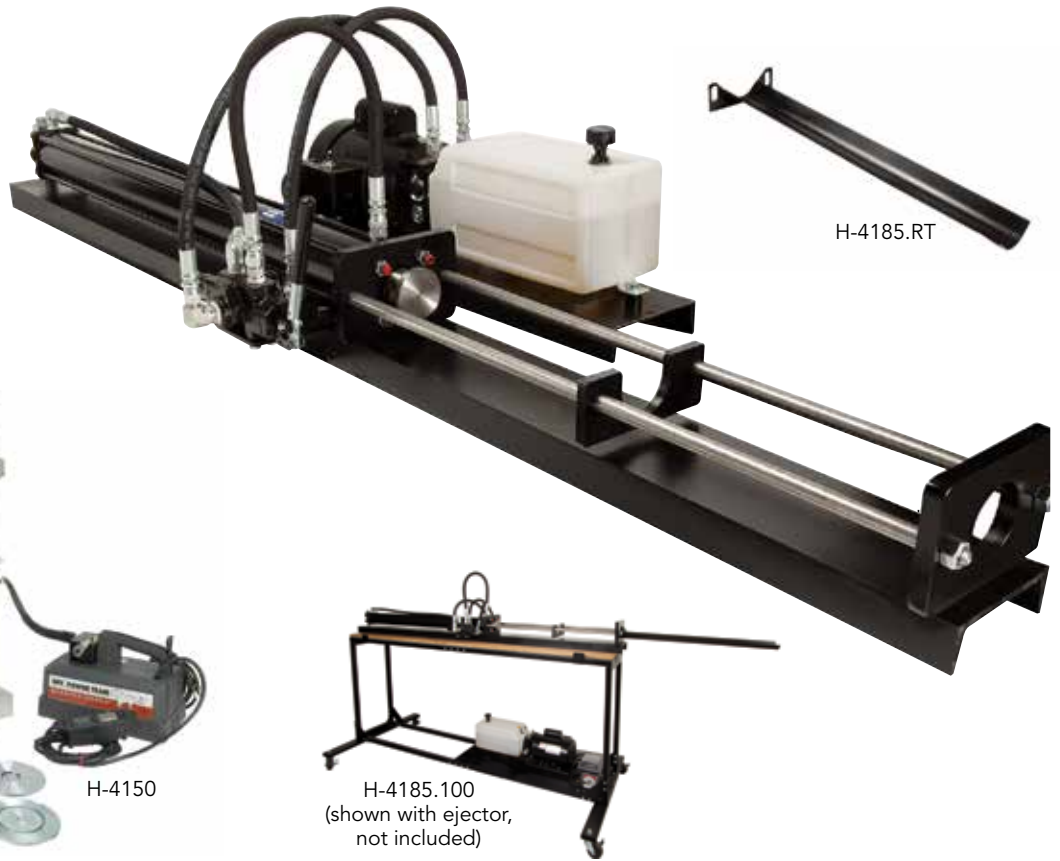




H-4155A



H-4150



H-4185.RT

H-4185.100  
(shown with ejector,  
not included)

**Sample Ejector, Hand-Operated**

Designed for lab and field use to extract soil samples from 4" and 6" compaction molds, as well as 2" and 2.8" tube samples. The ejection force is generated by means of a 3-ton (27.7kN) capacity, hand-operated hydraulic jack. The cast-aluminum ejector head assembly can be positioned at different heights through the use of quick release pins. This enables the operator to easily match the ejection travel to the height of the mold being used. Piston stroke is 8" (235mm). Overall dimensions 13"W x 6"D x 27"H (330 x 152 x 686mm).

**Sample Ejector, Hand-Operated** H-4155A  
Shipping wt. 56 lbs (25.5kg)

**Sample Ejector, Motorized**

Designed for lab and field use to extract soil samples from 4" and 6" compaction molds, as well as 2" and 2.8" tube samples. This sample ejector features the use of a 5-ton capacity, motorized hydraulic pump and ram assembly. The unit incorporates extended upright rods in order to accommodate standard 4" and 6" compaction molds, as well as 2" and 2.8" sample tubes. Piston stroke is 9.25" (184mm). Overall dimensions, excluding pump, 13"W x 6"D x 29"H (330 x 152 x 737mm).

**Sample Ejector, Motorized, 120V 60Hz** H-4150  
**Sample Ejector, Motorized, 220V 50/60Hz** H-4150.4F  
Shipping wt. 90 lbs (40kg)

**Horizontal Sample Ejector**

Hydraulically driven horizontal sample ejector designed for rapid ejection of 3" (76.2mm) x 30" (762mm) thin-wall sample tubes (Shelby tubes). The horizontal sample ejector provides a smooth and easily controlled piston stroke providing easy and rapid handling of ejected samples. The unit's hydraulic system accurately controls the horizontal piston's 5600lbf (24.9kN) force to eject samples smoothly. The ejector uses 1.7gpm hydraulic pump powered by a 1hp electric motor. Hydraulic oil reservoir provides 2.5gal (9.5L) capacity.

This ejector can also be used with 2 or 2.5" Shelby tube samples using the corresponding conversion kit, see chart below. The ejector comes with (1) sample trough to support ejected samples. Overall dimensions w/o sample trough are: 84" (2134mm) L x 23" (584mm) W x 18" (457mm) H.

**Horizontal Sample Ejector, 120V 60Hz** H-4185  
**Horizontal Sample Ejector, 220V 60Hz** H-4185.2F  
**Horizontal Sample Ejector, 220V 50Hz** H-4185.5F  
Shipping wt. 310 lbs (140kg)

**Portable Stand for Horizontal Sample Ejector**

Sturdy, mobile stand accommodates H-4185 horizontal sample ejector. Complete with shelf for pneumatic pump and reservoir. Large wheels provide easy maneuverability. Top allows sample ejector to be bolted to it for added stability. Requires longer hoses (included) to reach pump and reservoir. Some assembly required.

**Portable Stand for Sample Ejector** H-4185.100  
Shipping wt. 170 lbs (77kg)

Accessories for H-4185	
Sample Trough, Round Bottom	H-4185.RT
Conversion Kit for 2" Sample Tube	H-4185.2
Conversion Kit for 2.5" Sample Tube	H-4185.3





H-4141



H-4225



H-4162



H-4161A



H-4151



H-4149



H-4159



H-4163



H-4142

**Standard Proctor Compaction Mold, 4"**

ASTM D558, D559, D560, D698, D1557, D1558, AASHTO T99, T134, T135, T136, T180, T220

Soil mold used where a compacted sample is required, such as standard proctor density/moisture tests. Mold volume is 1/30 ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Mold dimensions are 4" ID x 4.584" H with a 2" detachable collar. Includes detachable base plate, studs and wing nuts.

**Standard Proctor Compaction Mold, 4" H-4141**  
 Shipping wt. 14 lbs (6.3kg)

**Standard Proctor Mold, Split Design, 4"**

ASTM D558, D559, D560, D698, D1557, D1558, AASHTO T99, T134, T135, T136, T180, T220

Mold volume of 1/30 ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Includes detachable base plate, studs and wing nuts. Mold has vertical split in body with 2 quick-acting clamps for easy removal of specimen. Mold dimensions are 4" ID x 4.584" H with a 2" detachable collar. Includes detachable base plate, studs and wing nuts.

**Standard Proctor Mold, Split-Design, 4" H-4225**  
 Shipping wt. 13 lbs (5.9kg)

**Modified Proctor Compaction Mold, 6"**

ASTM D558, D559, D560, D698, D1557, D1558, AASHTO T99, T134, T135, T136, T180, T220

Soil mold used for modified proctor density/Moisture tests. Mold volume of 1/13.33 ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Mold dimensions are 6" ID x 4.584" H with a 2" detachable collar. Includes detachable base plate, studs and wing nuts.

**Modified Proctor Compaction Mold, 6" H-4162**  
 Shipping wt. 19 lbs (8.6kg)

**Modified Proctor Mold, Split Design, 6"**

ASTM D558, D559, D560, D698, D1557, D1558, AASHTO T99, T134, T135, T136, T180, T220

Mold volume of 1/13.33 ft<sup>3</sup>, cold-rolled steel tubing, plated for rust resistance. Includes detachable base plate, studs and wing nuts. Mold has vertical split in body with 2 quick-acting clamps for easy removal of specimen. Mold dimensions are 6" ID x 4.584" H with a 2" detachable collar. Includes detachable base plate, studs and wing nuts.

**Modified Proctor Mold, Split Design, 6" H-4161A**  
 Shipping wt. 18.3 lbs (8.3kg)

**CBR Mold with Perforated Base, 6"**

ASTM D1883; AASHTO T193

CBR mold with a volume of .1145 ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Collar extension and perforated base plate can be clamped on either end of cylinder. Mold dimensions are 6" ID x 7" H with a 2.5" detachable collar. Includes detachable base plate, studs and wing nuts.

**CBR Mold with Perforated Base, 6" H-4151**  
 Shipping wt. 23.2 lbs (10.5kg)

**CBR Mold with Solid Base, 6"**

ASTM D1883; AASHTO T193

CBR mold with a volume of .1145 ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Collar extension and solid base plate can be clamped on either end of cylinder. Mold dimensions are 6" ID x 7" H with a 2" detachable collar. Includes detachable base plate, studs and wing nuts.

**CBR Mold with Solid Base, 6" H-4149**  
 Shipping wt. 22 lbs (10kg)

**Compaction Mold, 6"**

ASTM D1883; AASHTO T193

Compaction mold with a volume of 1/10th ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Mold dimensions are 6" ID x 6.1" H with a 2.5" detachable collar. Includes detachable base plate (8" x 8" x 0.5" thick), studs and wing nuts.

**Compaction Mold, 6" H-4159**  
 Shipping wt. 21 lbs (9.5kg)

**LBR Mold, 6"**

FM 1-T 180, FM 5-515

Compaction mold with a volume of 1/13.33 ft<sup>3</sup>, cold-rolled steel tubing, plated for rust resistance. Mold dimensions are 6" ID x 6.1" H with a 2.5" detachable collar. Collar extension and perforated base plate can be clamped on either end of cylinder. **Compatible with H-4169 Compactor.** LBR test requires H-4147 spacer disc, sold separately, see next page.

**LBR Mold, 6" H-4163**  
 Shipping wt. 22 lbs (10kg)

**Compaction Split Mold, 2.8"**

Compaction mold with a volume of .0214 ft<sup>3</sup>. Cold-rolled steel tubing, plated for rust resistance. Mold dimensions are 2.8" ID x 4" H with a 2" detachable collar. Mold has vertical-split body with 2 quick-acting clamps for easy removal of specimen. Not compatible with H-4169 compactor.

**Compaction Split Mold, 2.8" H-4142**  
 Shipping wt. 7.8 lbs (3.5kg)

**Compaction Mold, California 216**

CA Method 216B

Compaction mold 6" ID x 2.875" H with a 2.5" detachable collar. For use with H-4169.CA Compactor.

**Compaction Mold, 6" H-4169.4CA**  
 Shipping wt. 21 lbs (9.5kg)





H-4174



H-4172



H-4158

H-4158.1  
H-4465.25

H-4175



H-4177



H-4176



H-4179



H-4153



H-4147



H-4154FP



H-4154



H-4178BR



H-4178

### Cutting Edge

Machined from seamless tubing with a sharpened edge to enable undisturbed samples to be taken in the field. Cutting edge is plated for rust resistance and has a 6" (152mm) ID and 2" (51mm) high. Recess in upper section allows edge to be mounted at either end of a H-4149 or H-4151 mold to facilitate sample removal in the field.

### Cutting Edge

H-4174

Ship wt. 2 lbs. (0.9kg)

### Swell Plate

Perforated 5.875" (149mm) dia. base with adjustable stem. Contact end of the stem is easily locked in place with a knurled nut.

### Swell Plate

H-4172

Ship wt. 5 lbs. (2.3kg)

### Swell Tripod Attachment

Metal Tripod supports dial gauge for measuring the amount of swell during soaking. Attachment is used with H-4172 swell plate. Order dial indicator separately.

### Swell Tripod Attachment

H-4158

Ship wt. 0.8 lbs. (0.3kg)

### Dial Indicator

Dial indicator has 1.000" operating range, graduated in 0.001" divisions, clockwise movement and revolution counter. Recommended for use with H-4158 tripod attachment. Metric version, H-4465.25 is 25mm x 0.01mm.

### Dial Indicator

H-4158.1

### Dial Indicator, Metric

H-4465.25

Ship wt. 1.3 lbs. (0.5kg)

### Surcharge Weight, 5 lb.

Used in the application of surcharged loads on the soil's surface during soaking and penetration. Rust-resistant, plated annular disk weighs 5 lbs. (2.3kg), 5.875" (149mm) OD with a 2.125" (54mm) ID hole in center.

### 5 lb. Surcharge Weight

H-4175

Ship wt. 5.7 lbs. (2.5kg)

### Surcharge Weight, 10 lb.

10 lb. (4.5kg) Field surcharge weight, made in two parts; 5.875" (149mm) OD; 2.125" (54mm) ID.

### 10 lb. Surcharge Weight

H-4179

Ship wt. 12 lbs. (5kg)

### Slotted Surcharge Weight, 5 lb.

Used in the application of surcharged loads on the soil's surface during soaking and penetration. Rust-resistant, plated annular disk weighs 5 lbs. (2.3kg), 5.875" (149mm) OD with a 2.125" (54mm) slot.

### 5 lb. Slotted Surcharge Weight

H-4176

Ship wt. 6 lbs. (3kg)

### Slotted Surcharge Weight, 10 lb.

10 lb. (4.5kg) slotted, field surcharge weight, 8.5" (216mm) dia.

### Slotted Surcharge Weight, 10 lb.

H-4179

Ship wt. 11 lbs. (5kg)

### Spacer Disk

Disk is used as a false bottom in a soil mold during the compaction process. Plated, rust-resistant steel disk is 2.416" (36mm) high, 5-15/16" (152mm) dia.

### Spacer Disk

H-4153

Ship wt. 20 lbs. (9kg)

### Spacer Disk LBR 6"

For use with the H-4163 LBR mold. Compatible with H-4169 Compactor. Disk is used as a false bottom in a soil mold during the compaction process. Plated, rust-resistant steel disk is 1.416" (36mm) high, 5-15/16" (152mm) dia.

### Spacer Disc. LBR

H-4147

Ship wt. 12.2 lbs. (5.5kg)

### Filter Paper

100 pack of coarse grade filter paper used to separate spacer disc and soil in the CBR mold during compaction operation, or over the top surface of the soil when the compaction operation is completed.

### Filter Paper

H-4154FP

Ship wt. 0.3 lbs. (0.13kg)

### Filter Screen

100 mesh stainless screen is 5-15/16" (152mm) dia.

### Filter Screen

H-4154

UPS

Ship wt. 0.1 lbs. (0.04kg)

### Dial Indicator Bracket

Bracket used to attach a dial indicator to the penetration piston.

### Dial Indicator Bracket

H-4178BR

UPS

Ship wt. 0.8 lbs. (0.36kg)

### Penetration Piston

CBR penetration piston has 3 sq. in. (19.35cm<sup>2</sup>) base area and is about 7.5" (191mm) long. Designed for use in conjunction with weights H-4175 and H-4176 to apply penetration surcharge loads.

### Penetration Piston

H-4178

UPS

Ship wt. 7 lbs. (3kg)



H-4169

**Mechanical Compactor, Automatic**

ASTM D558, D559, D560, D698, D1557; AASHTO T99, T134, T135, T180

The mechanical compactor automatically compacts and rotates mold after each blow while keeping track of the number of hammer blows and shutting off once a preset number of blows is reached. The start/stop function of the compactor is independent of the counter. The unit can be used to perform standard or modified compaction tests using a 5.5 lb. (2.5kg) hammer with 12" (305mm) height of drop or a 10 lb. (4.5kg) hammer with 18" (457mm) drop. Hammer lift compensates the height of the drop for soil thickness in the mold during compaction. Hammer weight is concentrated at the foot, allowing free fall of the hammer. Hammer changes are made from in front of the compactor, making maintenance/adjustments easier without moving machine away from mounted location.

Included with the compactor are: (1) 5.5 lb (2.5kg) hammer; (1) 10 lb. (4.5kg) pie-shaped hammer; (1) hammer surcharge weight to convert hammers to 10lb (4.5kg); (1) hammer safety device; (1) 4" (102mm) mold; and (1) 6" (152mm) mold. Overall dimensions: 56"H x 16.5"W x 30"D (1422 x 419 x 762mm). Max. height in operation: 66" (1677mm).

Mechanical Compactor, 120V 60Hz H-4169  
 Mechanical Compactor, 230V 50/60Hz H-4169.4F  
 Shipping wt. 387 lbs (175kg)

**Mechanical Compactor Safety Cage**

Cage provides protection from moving parts during compaction. Cage is hinged to allow access to mold and hammer.

Mechanical Compactor Safety Cage H-4169.100-B  
 Shipping wt. 8 lbs (3.6kg)



H-4169.100-B



H-4169.2415

H-4169.2416



H-4170B

H-4160B

H-4173A

H-4171A

**California Mechanical Auto Compactor**

Model complies with California method 216 and is supplied with a 2" round 10 lb hammer and corresponding piston and rod. Required split mold is available upon request. Use with H-4169.4CA Mold.

California Mechanical Auto Compactor H-4169.CA  
 Shipping wt. 432 lbs (195kg)

**Calibration Kit for Mechanical Compactor**

ASTM D2168  
 For use with H-4169 automatic mechanical compactor. Calibration kit includes lead deformation apparatus, micrometer and 50 lead calibration cylinders.

Calibration Kit for Mechanical Compactor H-4169CK  
 Shipping wt. 4.9 lbs (2.2kg)

Replacement Hammers	
4" Round, New Style*	H-4169.2415
6" Pie-Shape, New Style*	H-4169.2416
4" Round, Old Style*	H-4169.415
6" Pie-Shape, Old Style*	H-4169.416

\*Hammers do not include weights. New Style Hammers are only threaded in the middle of the shaft. Old Style Hammers are threaded almost to the end of the shaft.

**NOTES**  
 Replacement parts are available. Please inquire and include Unit Serial Number.

**Compaction Hammer, Standard, Manual**

ASTM D558, D698; AASHTO T99  
 Manual, moisture/density hammer meets ASTM and AASHTO specs. It incorporates a 5.5 lb (2.54kg) weight and a drop of 12" (305mm) with a 2" (51) face. Guide sleeve has four vent holes in each end of sleeve to release built-up air pressure. Machined steel, plated for rust resistance. Features resilient rubber ball handle.

Standard Compaction Hammer, Manual H-4160B  
 Shipping wt. 9.2 lbs (4.2kg)

**Compaction Hammer, Modified, Manual, AASHTO**

AASHTO T180  
 Manual, moisture/density hammer meets AASHTO specs. It incorporates a 10 lb (4.5kg) weight and a drop of 18" (457mm) with a 2" (51) face. Guide sleeve has four vent holes in each end of sleeve to release built-up air pressure. Machined steel, plated for rust resistance. Features resilient rubber ball handle.

Compaction Hammer, Modified H-4170B  
 Shipping wt. 15 lbs (7kg)

**Compaction Hammer, Manual, Corps of Engineers**

EM 1110-1-1804  
 Hammer incorporates a 5.5 lb (2.54kg) weight and a drop of 12" (305mm) with a 2" (51) face. Hammer is guided on shaft. Length of drop is slightly adjustable. Foot assembly has recoil mechanism to reduce impact fatigue on parts. Tamping face is removable and replaceable.

Compaction Hammer, Manual, 5lb, COE H-4173A  
 Shipping wt. 11 lbs (4.9kg)

Compaction Hammer, 10lb, COE  
 Manual, moisture/density hammer, which incorporates a 10 lb (4.5kg) weight and a drop of 12" (305mm) with a 2" (51) face.

Compaction Hammer, 10lb, COE H-4171A  
 Shipping wt. 18 lbs (8.3kg)



### Relative Density Apparatus

ASTM D4253, D4254

Apparatus determines the relative density of cohesion-less, free-draining soils and provides well-defined results on soils that do not respond well to conventional moisture-density impact compaction testing. Soils for which this method is appropriate may contain up to 12 percent of soil particles passing a No. 200 (75µm) sieve, depending on the distribution of particle sizes, which causes them to have free-draining characteristics. Relative density of cohesion less soils uses vibratory compaction to obtain maximum density and pouring to obtain minimum density. Complete set includes: vibrating table H-3756.2F, relative density mold sets H-3757 and H-3758 and relative density gauge set H-3759. Both models are 12 amps 1ph AC.

Relative Density Apparatus, 230V 60Hz H-3750.2F  
Relative Density Apparatus, 230V 50Hz H-3750.5F  
Shipping wt. 925 lbs (420kg)

### Vibrating Table with Controller

Vibrating table for use with the relative density mold sets or other processes requiring vibratory compaction. Table is 30" x 30" (762 x 762mm), and vibration is provided by an electromagnetic vibrator rated above 100lbs (45.5kg). Capacity for table is 750 lbs (341kg) and height is 21" (533mm).

Vibrating Table/Controller, 230V 60Hz H-3756.2F  
Vibrating Table/Controller, 230V 50Hz H-3756.5F  
Shipping wt. 605 lbs (275kg)

### Relative Density Mold Set, 0.1 ft<sup>3</sup>

0.1 cu. ft. capacity mold set for use with relative density apparatus. Mold set comes with detachable guide sleeve and clamp assembly. Includes surcharge base plate with removable handle and surcharge weight with handle. Mold is 6" (152.4mm) ID x 6.112" (155.2mm) H.

Relative Density Mold Set, 0.1 ft<sup>3</sup> H-3757  
Shipping wt. 103 lbs (46kg)

### Relative Density Mold Set, 0.5 ft<sup>3</sup>

0.5 cu. ft. capacity mold set for use with relative density apparatus. Mold set comes with detachable guide sleeve and clamp assembly. Includes surcharge base plate with removable handle and surcharge weight with handle. Mold is 11" (279.4mm) ID x 9.092" (230.9mm) H.

Relative Density Mold Set, 0.5 ft<sup>3</sup> H-3758  
Shipping wt. 280 lbs (127kg)

### Pouring Funnel Set

Used for filling loose .375" (9.5mm) or finer soils into relative density mold. Includes two 6" (152mm) dia. x 12" (305mm) long metal cylinders, each with a integral funnel at the end. Orifices are 1" (25.4mm and 0.5" (12.7mm).

Pouring Funnel Set H-3750FS  
Shipping wt. 25 lbs (11kg)

### Gauge Set, Relative Density

Gauge set for use with relative density molds. Designed to fit guide brackets of either the H-3757 or H-3758 mold sets. Set includes a 2" (50.8mm) dia., 2.0 x 0.001" mechanical dial gauge. A metal, 3 x 12 x .125" (76 x 305 x 3.2mm), calibration bar is also included.

Gauge Set, Relative Density H-3759  
Shipping wt. 8 lbs (4kg)

### Vibration Indicator, Tachometer Type

Precision, pen-sized tachometer provides accurate readings even on hard-to-reach equipment. Scale gives readings from 2,000 to 21,000.

Vibration Indicator, Tachometer Type H-3753  
Shipping wt. 0.5 lbs (0.2kg)

### Vibration Compaction Frame and Hammer Set

ASTM D7382-08

Vibration compaction set used to compact soil samples for use in tests referencing ASTM D7382-08 methods. This method refers to the determination of the maximum dry unit weight and water content range for the effective compaction of granular soils using a vibrating hammer. The test set includes a heavy-duty frame designed specifically

for easily mounting a vibration hammer. A vibration hammer, which includes a 5.75" tamper and a 12" long mounting shank. The set also includes an 11" split, compaction mold. The vibrating hammer test method may be performed in the field or in the laboratory.

Vibration Compaction Frame/Hammer Set H-4115  
Shipping wt. 368 lbs (167kg)

### Compaction Frame Only

Mounting frame for compaction hammer set up. Does not include hammer or mold.

Compaction Frame H-4115.2  
Shipping wt. 269 lbs (122kg)

### Vibration Compaction Hammer with Tamper

ASTM D7382-08

Includes hammer, 5.75" (146mm) Tamper and 12" (305mm) long mounting shank.

Compaction Hammer with Tamper H-4115.3  
Shipping wt. 35 lbs (15.8kg)

### Compaction Molds

ASTM D7382-08

Split compaction molds for use with vibration compaction mold set.

11-Inch Compaction Mold H-4115.4  
6-Inch Compaction Mold H-4161A  
Shipping wt. 60 lbs (27kg)

### Tamper for Compaction Hammer

ASTM D7382-08

Replacement tamper and foot for compaction hammer.

Tamper and Foot H-4115.5  
Shipping wt. 14 lbs (6kg)





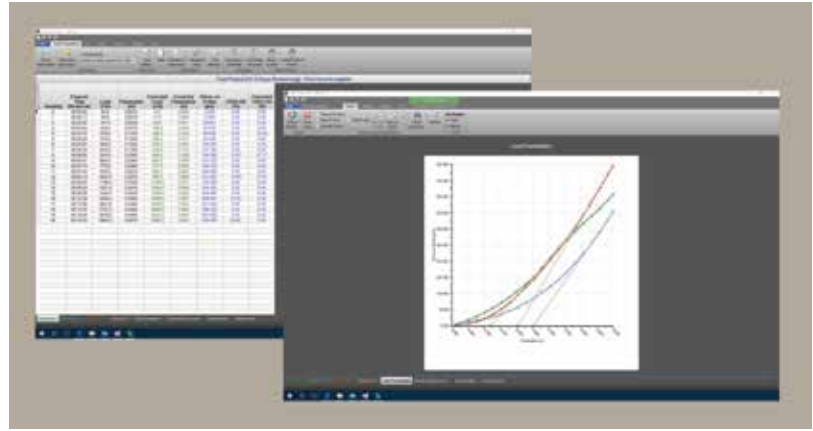
Typical CBR/LBR Setup for HM-5030.3F

Part #	Description
HM-2300.100	(1) S-type load cell, 10,000lbf (50kN)
HM-2310.10	(1) Strain Transducer, 1" (25mm)
H-4178	(1) Penetration piston with stud
HM-4178BRT	(1) Displacement transducer bracket
HM-5001SW	(1) CBR/LBR reporting software

Shown with H-4151 CBR Mold.

**NOTES**

HM-5030.3F Load Frame is sold as a load frame only. (Shown with typical CBR setup). For more information on the HM-5030 Master Loader, See pages 126-129.



The California Bearing Ratio (CBR) test was developed by The California state highway department and is widely used to determine the resistance strength of sub-grade and sub-base materials. The test is basically a simple penetration test using a load frame and a standard, compacted CBR test mold of the material to be tested. The results of the test are then compared and evaluated to known standards already established for the material being tested.

LBR or lime-rock bearing ratio is a variation of the CBR test. Developed primarily in Florida, it is used on materials with a high lime content. Humboldt offers several CBR/LBR testing solutions based on your overall testing needs and budget, from the advanced HM-5030.3F load frame with computer interface using our NEXT software to a simple, hand-operated H-4156 load frame suitable for lab or field use.

**Humboldt MasterLoader CBR/LBR Solution**

ASTM D1883; AASHTO T193; BS 1377 Part 4

Designed for applications requiring multi-purpose loading systems, such as road construction projects in either mobile or fixed labs, educational institutions and consulting firms, the HM-5030 Master Loader is ideal for just about any application from road construction to high-volume commercial and educational laboratories.

While the HM-5030 has been specifically designed for soil testing labs conducting multiple testing operations including: UU, CU and CD triaxial, UC, CBR and LBR, it is also perfect for running Marshall, Hveem, TSR and SCB asphalt tests as well. Its heavy-duty design and precise stepper-motor control provide a stable platform for years of reliable service allowing the HM-5030 to perform any tests required up to its load capacity of 11000 lbf (50kN).

Like all Elite Series load frames, the HM-5030 is built around Humboldt's integral, 4-channel data logger with touch-screen control, which allows the load frame to be used as a standalone device capable of full test control and data logging. It can also be controlled by a networked computer at any location with access to the network.

**MasterLoader, 110/220V 50/60 Hz HM-5030.3F**  
Shipping wt. 300 lbs (136kg)

**NEXT CBR/LBR Software Module**

ASTM D1883; AASHTO T193; BS 1377 Part 4

Humboldt's NEXT software is used to control the operation of Humboldt's testing machines, as well as provide data acquisition and reporting of test data. The software provides a computer-based platform with the ability to configure testing machines and the testing process; specify testing parameters and limits, operate the machine during the testing and provide detailed reports of the data collected in tabular or graphical formats.

From controlling a single operation to a complete geotechnical lab, Humboldt's NEXT data acquisition software, in conjunction with compatible Humboldt testing equipment, provides a complete solution for the acquisition, recording and presentation of test data. NEXT software is included with many of Humboldt's load frames, consolidation and direct shear machines; providing robust machine control, data acquisition and report generation for those using a computer to control load frame operations.

- Test-specific setup, which guides you through the process and includes selecting data collection parameters that best fit the specific test
- Input specific project information for each test, such as project name, client information, etc
- All test-specific initial, intermediate, and final parameters required by ASTM and BS standards are dynamically calculated for you, based on your input of specimen information, such as size, weight, etc
- Tabulated test data, graphs and all test-specific calculations are provided in real time, allowing you to monitor tests in process
- Generate test-specific reports that include all graphs and data presented in a project

**NEXT CBR/LBR Software Module HM-5001SW**

[Download](#)

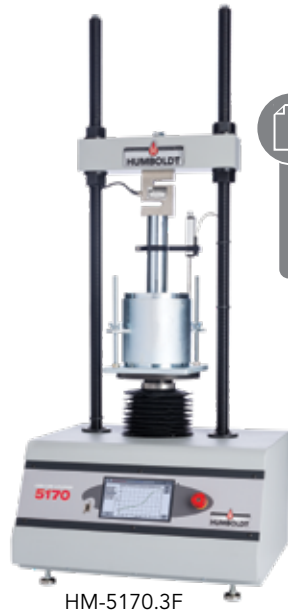
**NOTES**

For more information on Humboldt's NEXT Software. See pages 108-109.





HM-5150.3F



HM-5170.3F

#### NOTES

HM-5150.3F and HM-5170.3F Load Frames are sold as load frames only. (shown with typical CBR setup.)

#### NOTES

HM-2850.3F Load Frame is sold as a load frame only. See page 89 for a typical HM-2850/3F CBR setup.



HM-2850.3F

### CBR/LBR Specific Automatic Load Frame

ASTM D1883; AASHTO T193; BS 1377 Part 4

Humboldt provides these two Elite Series Load Frames for doing CBR and LBR applications. **The two machines are identical except that the HM-5170 can also do Marshall and TSR tests for those also doing asphalt testing.**

The HM-5150 and HM-5170 Load Frames have been specifically designed to handle CBR and LBR applications. Their heavy-duty design and precise stepper-motor control provide a stable platform for years of reliable service. From educational institutions and consulting firms to high-volume commercial labs and construction projects, the Load Frames can perform these applications with ease.

Like all Elite Series Load Frames, the HM-5150 and HM-5170 are built around Humboldt's integral, data logger with touch-screen control, which allows the load frames to be used as standalone devices capable of full test control and data logging, as well as controlled from a network computer.

#### Standalone Control

The waterproof, touch screens featured on these load frames provide a colorful, at-a-glance monitoring of testing functions without the use of a computer. Operators can see all the data in several formats at the machine during the testing procedure. Test data can then be transferred to a computer for use with Humboldt's NEXT Software for report generation.

#### Computer Control

Humboldt's Next software is included with the all Elite Series Load Frames. This software provides robust machine control, data acquisition and report generation for those using a computer to control testing operations.

In addition, operators have the ability to view and control testing operations from a PC in the lab, in the next room or at a different location, while also providing report generating capabilities using NEXT software and the test-specific software modules.

A CBR-specific software module is available for use with the NEXT software, which provides CBR-specific setup and formatting, rather than the generic formatting provided with the basic NEXT software.

#### HM-5150 and HM-5170 Specifications

Load Capacity	11000 lbf (50kN)
Speed Range	Both Machines: 0.05 in/min (1.27mm/min) and 1.00 mm/min HM-5170.3F ALSO: 2 in/min. (50.8mm/min.)
Data Channels	2
Data Storage	1000 tests and up to 3000 readings per test
Platen Size Travel	8" (203mm) / 4" (100mm)
Clearance	27" (686mm) Vertical 11" (279mm) Horizontal

CBR, LBR Load Frame, 110/220V 50/60 Hz HM-5150.3F  
Shipping wt. 300 lb (136kg)

CBR, LBR, and Asphalt tests Load Frame  
110/220V 50/60 Hz HM-5170.3F  
Shipping wt. 300 lbs (136kg)

#### CBR/LBR Setup: HM-5150.3F and HM-5170.3F

Part #	Description
HM-2300.100	(1) S-type load cell, 11,000lbf (50kN)
HM-2305.10	(1) Strain Transducer, 1" (25mm)
H-4178	(1) Penetration piston with stud
HM-2305BRT	(1) Displacement transducer bracket
HM-5001SW	(1) NEXT CBR/LBR software module

### Multi-Speed Load Frame

ASTM: D1883, D2850, D2166, D4767, D5581 and D6927 AASHTO: T193, T296, T297, T208, T245, and T246; BS 1377: Part 4: 1990, BS 1377: Part 7: 1990, BS 1377: Part 8: 1990, BS 598: Part 107

The HM-2850 Multi-speed Load Frame is designed for those who want a high-quality, but simple, multi-purpose load frame without built-in data acquisition capabilities. The HM-2850 is ideal for applications where the operator is either not concerned with data acquisition; or, already has or is planning to construct their own data acquisition system. With its large 7" color, touchscreen, the HM-2850 provides the operator with the ability to precisely select any speed with five decimal accuracy within the machine's speed range.

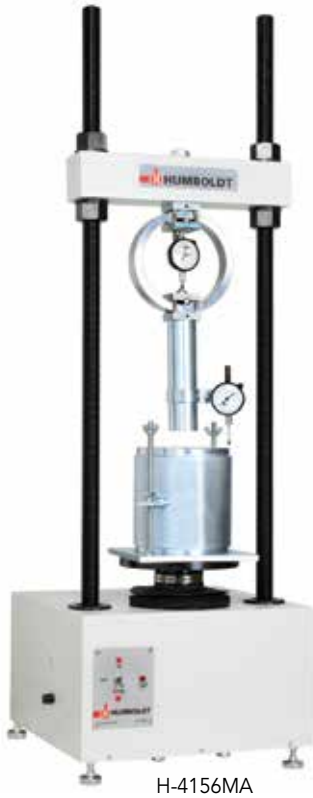
The HM-2850 features a quiet, direct drive, stepper motor that provides a range of loading speeds from 0.00001 to 2.00000 (0.00001 to 50.80000 mm/min). This speed range is more than adequate for the majority of standard soil tests. The HM-2850 can also be used for asphalt Marshall and TSR testing and features a rapid travel speed of 2/25 in/min. for moving the platen into position quickly.

#### HM-2850.3F Specifications

Load Capacity	11000 lbf (50kN)
Speed Range	0.05 to 2.00000 inch/min .00000-50.800000 mm/min
Platen Size [Travel]	8" (203mm) [4" (100mm)]
Clearance	32" (812mm) Vertical 11" (279mm) Horizontal
Current	9 Amps @ 125V (4.5 @250V)
Dimensions	17 x 22 x 51" (432 x 559 x 1295mm)

Multi-Speed Load Frame, 110/220V 50/60 Hz HM-2850.3F  
Shipping wt. 258 lbs (117kg)





H-4156MA



H-4156



H-4152

Typical CBR Setup for HM-2850.3F (page 88)

Part #	Description
H-4454.100	(1) Load ring, 11,000lbf (50kN)
H-4158.1	(1) Dial gauge 1.000" x .001"
H-4178	(1) Penetration piston with stud
H-4178BR	(1) Dial indicator bracket

CBR/LBR Specific Load Frame

ASTM D1883; AASHTO T193; BS 1377 Part 4

The H-4156MA load frame has been designed as a low-cost solution to doing CBR testing. It features one-speed operation with a preset speed specifically for CBR tests. The CBR speed is set at 0.050 inches/minute (1.27 mm/minute), ASTM D1883. Maximum piston travel is 3.5" (88mm). The H-4156MA is sold as a set with items in the chart below. Overall dimensions are: 18" x 18" x 38.5"H (457 x 457 x 978mm).

CBR Setup included with H-4156MA

Part #	Description
H-4156MA	(1) CBR-specific load frame
H-4454.100	(1) Load ring, 10,000lbf (50kN)
H-4158.1	(1) Dial gauge 1.000" x .001"
H-4178	(1) Penetration piston with stud
H-4178BR	(1) Dial indicator bracket

CBR/LBR Load Frame, 120V 60 Hz H-4156MA  
 CBR/LBR Load Frame, 220V 50/60 Hz H-4156MA.4F  
 Ship wt. 265lbs. (120kg)

CBR Mechanical Loading Press

ASTM D1883; AASHTO T193

The H-4156 loading press (load frame) uses a two-position mechanical jack to provide steady test speeds, as well as rapid travel of the platen for positioning of the sample. Overall dimensions: 18" x 12" x 34" (45.8 x 30.5 x 86.4cm). The following items in the chart below are included for testing CBR.

CBR Setup included with H-4156

Part #	Description
H-4156	(1) CBR-specific load frame
H-4454.100	(1) Load ring, 10,000lbf (50kN)
H-4158.1	(1) Dial gauge 1.000" x .001"
H-4178	(1) Penetration piston with stud
H-4178BR	(1) Dial indicator bracket

CBR Mechanical Loading Press H-4156  
 Ship wt. 132lbs. (60kg)

Mechanical, Two-Speed Loading Jack

Mechanical, two-speed loading jack used in the H-4156 and H-4156M loading presses.

Mechanical, Two-Speed Loading Jack H-4156J  
 Ship wt. 42lbs. (19kg)

CBR Mechanical Test Set

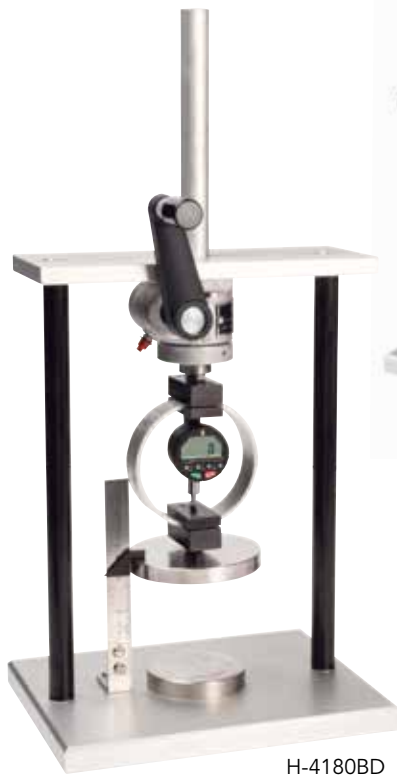
ASTM D1883; AASHTO T193

Complete mechanical test set used for CBR testing. Includes a complete complement of test equipment for performing CBR testing. The test set features the H-4156 loading press (load frame), which uses a two-position mechanical jack to provide steady test speeds, as well as rapid travel of the platen for positioning of the sample. The press, includes a H-4454.100, 11,000lbf (48.8kN) calibrated load ring, a H-4178, 1.95" (49.5mm) dia. (3 in<sup>2</sup> area) penetration piston, a H-4158.1, 1.000" x .001, dial indicator and a H-4178BR dial indicator bracket, Overall dimensions: 18" x 12" x 34" (45.8 x 30.5 x 86.4cm). The CBR test set includes:

Part #	Description
H-4156	(1) Mechanical loading press
H-4151	(4) Mold
H-4153	(1) Spacer disk
H-4154	(4) Filter screens
H-4172	(2) Swell plates
H-4158	(1) Tripod attachment
H-4175	(4) Surcharge weights
H-4176	(4) Slotted surcharge weights
H-4170B	(1) Proctor Hammer, AASHTO
H-4144.12	(1) Straight edge, 12-inch
H-4174	(1) Cutting edge

CBR Mechanical Test Set H-4152  
 Ship wt. 379lbs. (172kg)





H-4180BD



H-4180AD



H-4180DD



H-4973



HM-4144



HM-4501



H-4165

### Unconfined Soil Testers

ASTM D2166

These Unconfined soil testers with digital gauges allow for quick and accurate determination of unconfined compressive strength of cohesive soils in the field or lab. The digital H-4180BD Tester is designed to be a replacement for the now defunct "Rimac" tester. They can be used for on-site pile tonnage or foundation bearing capacity estimates. The light and compact design of these testers provide great portability for everyday field use. These digital models feature a quality digital indicator, which provides readings to 1.0lb precision. The load ring readout of the H-4180AD and H-4180BD provides fast and easy-to-read direct load values in pounds. The "vertical daylight" of the H-4180BD is 5.125", the other two models this is 6.375". Total gearbox travel for all models is 5". All of these testers are sturdily made of light and durable aluminum and feature a geared, hand-wheel loading system. All include a load ring and platen. The H-4180BD and H-4180AD feature an adjustable height scale. The H-4180DD features a dial indicator to determine vertical travel. This dial gauge is supplied with a calibration chart for precise measurement readings.

Digital Unconfined Soil Tester, 3000lb (1.33kN) H-4180BD

Unconfined Soil Tester, 5000lb (2.22kN) H-4180AD

Unconfined Soil Tester, 10000lb (4.45kN) H-4180DD

Shipping wt. 18 lbs (8.2kg)

### Unconfined Soil Sample Trimmer

Used to cut soil samples to length for use with Unconfined Soil Testers.

Unconfined Soil Sample Trimmer HM-4144

Shipping wt. 6.1 lbs (2.7kg)

### Preparation Knife

Used for sample preparation and general lab work, knife has 6" long thin blade with wood handle.

Preparation Knife H-4973

Shipping wt. 6.1 lbs (2.7kg)

### Calcium Carbonate Content Chamber

This test method covers the quantitative determination of the calcium carbonate ( $\text{CaCO}_3$ ) content of soils. It is a gasometric method that utilizes a simple portable apparatus. The test method is quickly performed for soils containing calcium carbonate. The acrylic chamber is 2.5" ID x 5.5" long and sealed with anodized end caps. The unit comes complete with 10psi test gauge, bleed valve and a 20ml cup with handle.

Calcium Carbonate Content Chamber HM-4501

Shipping wt. 6.1 lbs (2.7kg)

### Harvard Miniature Compaction Apparatus

Used for moisture density tests using small samples, its compaction action duplicates the kneading action of a sheep's foot roller. Mold is 1.2625" (33mm) ID by 2.816" (71mm) H. Unit is designed so collar remover and specimen ejector are consolidated into one piece. Set includes specimen ejector, collar remover with spacer plate, mold holder, 1/454 ft<sup>3</sup> (129m<sup>3</sup>) volume mold and collar, compaction tamper with 20 lb. (9.07kg), 37.5 lb. (17kg), and 40 lb. (18.2kg) spring and operating instructions. Mold is machined from seamless tubing. Unit weight in pounds per ft<sup>3</sup> m<sup>3</sup> and the net weight of a compacted specimen in grams are figuratively equal.

#### H-4165 Individual Components

Mold assembly	H-4165.15
Tamper assembly	H-4165.16
Spring, 20 lb.	H-4165.20
Spring, 37.5 lb.	H-4165.375
Spring, 40 lb.	H-4165.40

Harvard Miniature Compaction Apparatus H-4165

Shipping wt. 28 lbs (12.6kg)



Test Set  
H-4234



Test Set  
H-4235



H-4230



H-4228



H-4226

**Atterberg Limits (Liquid Limit Testing)**

Liquid limit testing determines the water content at which soil changes from a liquid to a plastic state. It is determined using the devices on this page. To perform, a soil sample is placed into the cup of the liquid limit machine and separated into two halves using a grooving tool. The crank on the machine is then rotated so that the cup holding the sample strikes the base of the test machine. The number of blows is recorded until the two halves flow together and close the groove.

**ASTM Liquid Limit Test Set**

ASTM D4318; AASHTO T89, T90

Recommended for performing liquid limit test in accordance with ASTM specifications. Includes 1 ea. of: H-4230 ASTM liquid limit machine, H-4930.250 mixing dish, H-4904 spatula, H-4915.025 graduated cylinder and a H-1350.3A 48 sample cans pack.

ASTM Liquid Limit Test Set H-4234  
Shipping wt. 11 lbs (5kg)

**ASTM Liquid Limit Test Set with Counter**

ASTM D4318; AASHTO T89, T90

Same set as above except it has machine with counter. Includes 1 ea. of: H-4228 ASTM liquid limit machine, H-4930.250 mixing dish, H-4904 spatula, H-4915.025 graduated cylinder and a H-1350.3A 48 sample cans pack.

ASTM Liquid Limit Test Set w/ Counter H-4235  
Shipping wt. 15 lbs (7kg)

**ASTM Liquid Limit Machine**

ASTM D4318; AASHTO T89, T90

Unit consists of brass cup, cam mechanism, carriage and crank mounted on a hard rubber base. Includes H-4229 ASTM grooving tool and gauge block. Crank can be shifted to right- or left-hand operation.

ASTM Liquid Limit Machine H-4230  
Shipping wt. 5.5 lbs (2.5kg)

**ASTM Liquid Limit Machine with Counter**

ASTM D4318; AASHTO T89, T90

Hand-operated liquid limit machine features mechanical revolution counter attached to the shaft to register the number of drops in the liquid limit cup. Includes H-4229 ASTM grooving tool and gauge block. Crank can be shifted for left or right-hand operation.

ASTM Liquid Limit Machine with Counter H-4228  
Shipping wt. 6 lbs (2.7kg)

**ASTM Liquid Limit Machine, Motorized**

ASTM D4318; AASHTO T89, T90

Motorized liquid limit machine gives uniform testing with greater degree of accuracy. Unit is comprised of H-4230 ASTM liquid limit machine with geared motor to give proper operating speed and automatic counter. Machine is attached to metal plate with rubber feet. Includes H-4229 ASTM grooving tool and gauge block.

Liquid Limit Machine, 120V 60Hz H-4226  
 Liquid Limit Machine, 220V 50Hz H-4226.5F  
Shipping wt. 14 lbs (6.4kg)



**ACCESSORIES**

For Liquid Limit Accessories and Replacement Parts, please see page 93.





H-5236



H-5237



H-4236



H-4237

#### Cone Penetrometer (Liquid Limit Testing)

The cone penetrometer test method for liquid limit is based on the relationship between the moisture content and the penetration of a cone into a soil sample. This method eliminates test results dependent upon operator skills and provides a visual measurement of penetration. Two cone penetrometer models are available. One, a manual operation model, and the other an automatic model, which releases the cone for a set amount of time and then locks the movement of the cone, registering the result.

#### Cone Penetrometer, Digital

BS 1337-2, NF P94-052,1; CEN ISO/TS 17892

The H-5236 digital cone penetrometer features an aluminum base with leveling screws and a spirit level for maintaining a level testing position. The digital readout provides readings in 0.1mm resolution in either mm or inches. The chromed support rod features micro-metric vertical displacement for accurate positioning with a brass slider that provides smooth free fall, a stop and release button and an automatic zero set. Includes a stainless steel penetration test cone: 35mm long with a 30° angle, weighing 20g. Two brass cups are included (55 x 35mm and 70 x 45mm) This cone penetrometer can also be used to measure the shear undrained strength of undisturbed and reconstituted soil samples per CEN ISO/TS 17892-06. Overall dimensions are: 8.6" x 6.7" x 16.1" (220 x 170 x 410mm).

Cone Penetrometer, Digital H-5236

 Shipping wt. 19 lbs (8.6kg)


#### Cone Penetrometer, Digital, Semi-Automatic

BS 1337-2, NF P94-052,1; CEN ISO/TS 17892

The H-5237 semi-automatic cone penetrometer is equipped with a magnetic controller device with an electronic, digital, programmable timer that automatically releases the plunger head and ensures free falling of the cone during the five second test. The digital readout provides readings in 0.1mm resolution in either mm or inches. The chromed support rod features micro-metric vertical displacement for accurate positioning with a brass slider that provides smooth free fall, a stop and release button and an automatic zero set. Includes a stainless steel penetration test cone: 35mm long with a 30° angle, weighing 20g. Two brass cups are included (55 x 35mm and 70 x 45mm) This cone penetrometer can also be used to measure the shear undrained strength of undisturbed and reconstituted soil samples per CEN ISO/TS 17892-06. Overall dimensions are: 8.6" x 6.7" x 16.1" (220 x 170 x 410mm).

#### Cone Penetrometer, Digital Semi-Auto

120V 60Hz H-5237  
230V 50Hz H-5237.5F

 Shipping wt. 33 lbs (15kg)

#### Cone Penetrometer, Dial Indicator

BS 1337-2, NF P94-052,1; CEN ISO/TS 17892

The H-4236 cone penetrometer with dial indicator features a 6" (150mm) diameter dial gauge, which is easily readable and is graduated in 0.1mm divisions. Overall dimensions are: 8.6" x 6.7" x 16.1" (220 x 170 x 410mm).

Cone Penetrometer, Dial Indicator H-4236

 Shipping wt. 21.6 lbs (9.8kg)


#### Cone Penetrometer, Semi-Automatic

BS 1337-2, NF P94-052,1; CEN ISO/TS 17892

The H-4237 semi-automatic cone penetrometer with dial indicator is equipped with the same magnetic controller device as the digital version, H-5237. Its electronic, digital, programmable timer automatically releases the plunger head and ensures a free-falling cone during the five second test. Overall Dimensions: 8.6" x 6.7" x 16.1" (220 x 170 x 410mm).

Cone Penetrometer, 120V 60Hz H-4237

Cone Penetrometer, 220V 50Hz H-4237.5F

 Shipping wt. 25 lbs (11.3kg)

#### Accessories / Replacement Parts

Test cone, 35mm long, 30° angle	H-4236.1
Test cone, 60° angle w/ 60g weight	H-4236.5
Sample cup, brass, 70 x 45mm	H-4236.2
Sample cup, brass, 55 x 35mm	H-4236.3
Weight, 20g	H-4236.4
Weight, 320g (shear strength for 400g total weight)	H-4236.6
Test gauge, 30° angle (cone point check)	H-4236.7
Test gauge, 60° angle (cone point check)	H-4236.8
Mirror (for height adjustment)	H-4236.9





**Liquid Limit Accessories**

Accessories	
ASTM metal grooving tool and gauge block	H-4229
ASTM plastic grooving tools (10 pk)	H-4229P
AASHTO liquid limit metal grooving tool	H-4232
Mixing dish	H-4930.250
Spatula	H-4904
Graduated cylinder (25ml)	H-4915.025
Sample cans, 2.5 oz. (48 pk.)	H-1350.3A

**Resiliency Tester**

ASTM D4318; AASHTO T89, T90

Used to test resiliency of hard rubber base of liquid limit machines, which should be done at 90-day intervals to ensure base is in compliance with ASTM D4318 standard.

**Resiliency Tester** H-4233  
 Shipping wt. 1.2 lbs (0.5kg)

**Durometer (D Scale)**

ASTM D4318, D2240; AASHTO T89, T90

As required by ASTM D4318, a durometer is used to test the hardness of the base of a liquid limit machine. Sealed springs maintain load deflection rate to a tolerance of .0004". Other models are also available, see page 362.

**Durometer (D Scale)** H-4222D  
 Shipping wt. 1.7 lbs (0.7kg)

**Liquid Limit Replacement Parts**

Replacement Parts	
Brass cup w/ screws for liquid limit machines	H-4231
Brass cup w/ screws and cam follower	H-4231.1
Stainless steel cup w/ screws (non ASTM)	H-4231.2
Base	H-4230.1

**Shrinkage Limit Set**

Apparatus recommended to perform shrinkage limit test in accordance with specifications. Set includes: (1) H-4256 monel shrinkage dish; (1) H-4930.250 mixing dish; (1) H-4254C crystallizing dish; (1) H-4255A shrinkage prong plate, (1) H-4256 shrinkage dish, and (1) H-4915.025 graduated cylinder All components are also available individually.

**Shrinkage Limit Set** H-4254  
 Shipping wt. 3 lbs (1.3kg)

**Plastic Limit Set**

ASTM D4318; AASHTO T90

Includes all apparatus recommended to perform plastic limit test in accordance with specifications. Set includes the following: (1) H-4253.1 plastic limit plate, 12 x 12 x .375" (305 x 305 x 9.5mm) thick; (1) H-4930.250 mixing dish; (1) H-4904 spatula; (1) H-4915.025 graduated cylinder, and (1) H-1350.3A Pkg. of 48 sample cans All components are also available individually.

**Plastic Limit Set** H-4253  
 Shipping wt. 11 lbs (5kg)

**Plastic Limit Roller**

ASTM D4318; AASHTO T90; TX DOT 105-E

Easily repeatable mechanical technique produces consistent test results and saves time. Includes integral top plate/handle, one (H-4262P) pad of 50 sheets of special adhesive backed paper to cover contact surfaces (paper will not introduce fibers into soil samples), and instructions. Rigid acrylic 8 x 4.5 x 1.25" (203 x 114 x 32mm).

**Plastic Limit Roller** H-4262  
 Shipping wt. 3 lbs (1.3kg)

**Adhesive Paper**

Pad of 50 sheets of special adhesive backed paper for plastic limit.

**Adhesive Paper** H-4262P  
 Shipping wt. 0.5 lbs (0.2kg)



HO-4930



HO-4943

HO-4940

HO-4941



HO-4960



H-4361A.4



H-4360A.7

Model	HO-4930	HO-4940	HO-4941	HO-4943	HO-4960
Range	0.00 to 14.0 pH	0.00 to 14.00 pH	0.00 to 14.00 pH	0-1999 $\mu\text{s}/\text{cm}$	-2.00 to 16.00 pH -1999 to 1999 mV
Resolution	0.01 pH 1 mV 0.1 $^{\circ}\text{C}$	0.01 pH	0.01 pH	1 $\mu\text{s}/\text{cm}$	0.01 pH 1 mV 0.1 $^{\circ}\text{C}$
Accuracy	$\pm 0.01$ pH $\pm 1$ mV $\pm 0.5$ $^{\circ}\text{C}$	$\pm 0.05$ pH	$\pm 0.1$ pH	$\pm 1.5\%$ FS	$\pm 0.01$ pH $\pm 1$ mV $\pm 0.5$ $^{\circ}\text{C}$
Calibration	3 Points 1 Predefined Buffer Group	3 Points	N/A	N/A	Up to 3 Points 3 Predefined Buffer Groups
Temp. Range	0 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$	0.0 to 99.0 $^{\circ}\text{C}$	N/A	N/A	-5 $^{\circ}\text{C}$ to 110 $^{\circ}\text{C}$

### Portable pH Meter

The HO-4930 portable pH meter marries portability with precise pH measurement. An ORP or temperature electrode can also be easily connected to provide additional functionality.

- Auto buffer recognition stores calibration data and helps to avoid errors during the calibration process
- Automatic and manual temperature compensation helps ensure accurate readings

The OHAUS Starter Series of portable water quality & electro-chemistry meters was created with versatility in mind. They can be operated in the lab with the support of the built-in stands or in the field thanks to their lightweight design. With a crisp, well-organized LCD screen and five clearly marked keys, utilizing the OHAUS Starter Series is simple for students and teachers alike. The portable OHAUS Starter Series also boasts IP54 protection which shields the meter from damage by water and dust particles and also offers an integrated labeling area which can be customized for quick identification. Each meter can store 30 sets of data memory and has the ability to quickly recall calibration data and stored information with one quick touch.

**Includes HO-4964 Plastic Gel, non-refillable electrode (0-14pH) and a pH buffer powder sachet.**

Portable pH Meter

HO-4930



Ship wt. .39lbs. (.18kg)

### pH and Temp. Analysis Pens

These pH/Temp. Analysis Pens offer a convenient way to measure pH, or the relative acidity or alkalinity of a sample at a given temperature. The pH pen can be completely operated with just one hand, freeing up your other hand to handle samples. Analysis pen meters provide what should be expected of a small pen meter: simple, fast, straightforward, no-frills yet highly accurate operation time and time again. With durable plastic housing, a protective cap that safeguards the sensor and an automatic shutdown feature to preserve battery life, Analysis Pen meters can endure consistent use in rugged environments. The electrodes are also replaceable, which extends

the meters' usable life considerably. Equipped with a wrist strap that helps to prevent unintentional dropping, Analysis Pen meters are constructed with an IP67 waterproof design that can prevent water damage when accidentally dropped into liquid.

**pH and Temp. Analysis Pen**

HO-4940

pH Analysis Pen

HO-4941



Ship wt. .39lbs. (.18kg)

### pH Bench Meter w/Electrode

The HO-4960 pH Bench Meter offers premium features at a cost-effective price point for reliable and convenient pH and ORP measurements.

- Starter 3100's intuitive software includes three point calibration, three buffer groups, automatic and manual endpoint functions, as well as a 99 item library
- Among Starter 3100's user-friendly features that support ease-of-use are an adjustable stand-alone electrode holder and large backlit LCD display
- Documenting measurement data is made simple through the RS232 which can be used to connect peripheral devices such as printers or computers to the meter

**Includes HO-4963, 3-in-1 plastic, refillable pH electrode, pH Buffer Powder Sachet and In-Use Cover.**

pH Bench Meter w/Electrode

HO-4960



Ship wt. 3.8lbs. (1.7kg)

Electrodes	Model
Electrode, pH only, refillable, BNC	HO-4962
Electrode, pH/temp., refillable, BNC	HO-4963
Electrode, pH/temp., non-refillable, BNC	HO-4964
Electrode, Temperature	HO-4965

### Conductivity Pen

This conductivity pen meter is a great choice for basic testing needs of the total ionic concentration within a solution.

**Conductivity Pen**

HO-4943



Ship wt. .39lbs. (.18kg)

### Buffer Solutions

Buffer solutions for meters with 0.01 resolution are standardized against NIST-traceable pH references within 0.01 pH at 77°F (25°C). Store buffers away from direct sunlight. Sold in single, 1 pint bottles.

Buffer Solutions

See Table



Ship wt. 2lbs. (0.9kg)

Buffer Solutions	Model
pH 10.0 $\pm$ pH Accuracy, 1-pint	H-4360A.10
pH 12.45 $\pm$ pH Accuracy, 1-pint	H-4360A.12
pH 1.68 $\pm$ pH Accuracy, 1-pint	H-4360A.2
pH 4.01 $\pm$ pH Accuracy, 1-pint	H-4360A.4
pH 7.00 $\pm$ pH Accuracy, 1-pint	H-4360A.7
Soil Prep Solution, 500ml	H-4360A.1

### Buffer Solution, Singles

These convenient pH buffer packs are sealed against light, air, and other contaminants for fast, accurate results. Each pack contains enough buffer solution for one calibration.

Buffer Solution, Singles

See Table



Ship wt. 1.5lbs. (.68kg)

Buffer Solutions, Singles	Model
pH 10.0 $\pm$ pH Accuracy, 20 pack	H-4361A.10
pH 4.01 $\pm$ pH Accuracy, 20 pack	H-4361A.4
pH 7.00 $\pm$ pH Accuracy, 20 pack	H-4361A.7
Deionized Water, 20 pack	H-4361A.00



**Hydrometer Analysis Set**

ASTM D7928; AASHTO T88

This complete hydrometer analysis setup includes the Humboldt hydrometer jar bath combined with hydrometer analysis accessories to provide a complete testing set. Set includes:

Components	
Hydrometer jar bath	H-4239A
Soil hydrometer A	H-4241
Soil hydrometer B	H-4242
Hydrometer jars, (8)	H-4244
Soil dispersion mixer	H-4260A
Stopper for Hydrometer Jar (8)	H-4244RS
Sodium Hexametaphosphate (1lb.)	H-4247

Hydrometer Analysis Set, 120V 60Hz H-4263A  
 Hydrometer Analysis Set, 220V 50/60Hz H-4263A.4F  
 Shipping wt. 225lbs (102 kg)

**Hydrometer Jar Bath**

ASTM D7928; AASHTO T88; UNE 103.102

The Humboldt hydrometer jar bath is designed to provide a 68°F (20°C) ambient temperature throughout the unit by using a microprocessor-based temperature control with integral heater and chiller. The control processor in the H-4239A provides a consistent bath temperature of 68°F (20°C) accurate to within 0.1% of input span ±1°F, which makes it an ideal bath for storing hydrometer jars in accordance with the standards listed above. The Hydrometer bath also can be used for many other processes within a lab and can be set to maintain temperatures within its temperature range of 50°F (10°C) and 120°F (49°C).

The H-4239A jar bath is fully-insulated and includes a circulating pump, which ensures a constant water temperature throughout bath. The H-4239A can accommodate (8) hydrometer jars at a time. All models include a stainless steel shelf, which supports specimens while allowing 2" of free circulating water above and below specimens.

Tank volume: 20.5 gallons (77.6 Liters).  
 Bath dimensions: ID: 37" L x 8" W x 16" D (940 x 203 x 406 mm).  
 Overall dimensions: 48" L x 11" W x 19" D (1220 x 280 x 483 mm)  
 Hydrometer Jar Bath, 120V 60Hz H-4239A  
 Hydrometer Jar Bath, 220V 50/60Hz H-4239A.4F  
 Shipping wt. 195lbs (88 kg)

**Hydrometer Jar**

ASTM D7928; AASHTO T88  
 Graduated glass cylinder used in determining amount of soil in dispersed suspensions contains 1000ml at 20°C (68°F). Open end is fire-polished without pour-out. Dimensions: 18" (457mm) x 2.5" OD (64mm). Base is 4.333" (110mm).

Hydrometer Jar H-4244  
 Shipping wt. 2lbs (1 kg)

**Soil Hydrometer A**

ASTM D7928; AASHTO T88  
 Seamless, symmetrical stem and bulb do not vary in diameter. One-piece ballast is secured to lower part of the body. Guaranteed calibration accuracy eliminates errors due to variable dilution. H-4241 uses ASTM 152 H scale, graduated to read in grams per liter (g/L) of suspension and has a range of -5 to +60g/L in 1g/L divisions at 68°F (20°C). Total length: 11" (280mm).

Soil Hydrometer A H-4241  
 Shipping wt. 2lbs (1kg)

**Soil Hydrometer B**

ASTM D7928; AASHTO T88  
 Seamless, symmetrical stem and bulb do not vary in diameter. One-piece ballast is secured to lower part of the body. Guaranteed calibration accuracy eliminates errors due to variable dilution. H-4242 uses ASTM 151 H scale, graduated to read specific gravity with a range of 0.995 to 1.038 in 0.001 divisions at 68°F (20°C). Total length: 11" (280mm).

Soil Hydrometer B H-4242  
 Shipping wt. 1.3lbs (0.59 kg)

**Soil Dispersion Mixer**

ASTM D7928; AASHTO T88  
 Modified mixer to meet specifications is used for dispersing soil suspensions used in hydrometer method of testing sub-grade soils. Heavy-duty mixer operates at a speed above 10,000 RPM (no load). Includes stirring apparatus with H-4266 stainless steel paddle and H-4265 chrome-plated dispersion cup with 4 sets of permanent interior baffles. Rounded cup bottom prevents soil accumulation. Furnished with 5' cord and 3-prong plug. Dimensions: 20" x 6.5" x 7" (508 x 165 x 178mm).  
 Soil Dispersion Mixer, 120V 60Hz H-4260A  
 Soil Dispersion Mixer, 230V 50/60Hz H-4260A.4F  
 Shipping wt. 17lbs (7.7 kg)

**Dispersion Cup**

Chrome-plated dispersion cup for use with H-4260 mixer.  
 Dispersion Cup H-4265  
 Shipping wt. 1.1lbs (0.49 kg)

**Stirring Paddle**

Stirring paddle with 3 blade surfaces, 0.75" (19mm) dia. for H-4260A mixer. Shaft threads onto mixer.  
 Stirring Paddle H-4266  
 Shipping wt. 0.1lbs (0.45 kg)

**Sodium Hexametaphosphate**

Dispersing agent used in combination with gradation analysis of soils.  
 1 lb (0.5kg) H-4247  
 10 lb (4.5kg) H-4247.10  
 Shipping wt. 1.6lbs (0.7kg) 11.6lbs (5.2 kg)

**Stopper for Hydrometer Jar**

Rubber stopper for hydrometer jars  
 Stopper (Hydrometer Jar) H-4244RS  
 Shipping wt. 0.2lbs (0.09 kg)





H-4270

H-4264

**Air Jet Dispersion Tube**

ASTM D7928; AASHTO T88

Alternative method for dispersing soil suspensions used in hydrometer method of testing sub-grade soils. Uses air bubbles to disperse soil samples. Comparative tests show the unique air jet action achieves better dispersion of clays with less degradation of soft particles like micas. Provides easier method, as samples are dispersed right in the sedimentation cylinder, eliminating the mess and sample loss from moving samples from one container to the other. Used by U.S. government agencies, State DOTs and consulting geotechnical engineers. **Shown with hydrometer jar, Not included.**

Air Jet Dispersion Tube

H-4270



Shipping wt. 6 lbs (2.72kg)

**Dispersion Hand Stirrer**

ASTM D7928; AASHTO T88

Inexpensive hand stirrer for dispersing soil suspensions used in hydrometer method of testing sub-grade soils. **Shown with hydrometer jar, Not included.**

Dispersion Hand Stirrer

H-4264



Shipping wt. 2 lbs (0.9kg)

**Sand Equivalent Testing**

Sand equivalent tests serve as rapid field-correlation tests to show relative proportions of clay-like or plastic fines and dusts in granular soils and fine aggregates. The test separates sand and clay, a comparative reading is determined between the suspended clay and the settled sand in the measuring cylinder. Tests may be done in the laboratory or the field.

H-4374

H-4374.5F

Shipping wt. 125 lbs (56.6kg)

**Cover for Motorized Sand Equivalent Shaker**

Clear acrylic cover encloses the sand equivalent shaker for safer operation. The cover swings back out of the way for loading.

Cover for Sand Equivalent Shaker

H-4374.C



Shipping wt. 8 lbs (3.7kg)

H-4379  
(shown with  
H-4374.C cover)

H-4374



H-4340



H-4378

**Sand Equivalent Shaker, Digital Timer**

ASTM D2419; AASHTO T176

Motorized sand equivalent shaker features a digital timer, which can be set from 0 to 60 minutes with automatic shutoff. It features an easy-to-use digital interface with an accuracy of 0.5% to increase accuracy and ease of operation. It is recommended for samples in the laboratory. The consistent, repeatable oscillation of the apparatus eliminates operator-caused variation. Shaking operation delivers an 8" (203mm) stroke at a speed of 175 ±2 strokes per minute. Dimensions: 12" x 24" x 24"H (31 x 61 x 61cm).

Sand Equivalent Shaker, 120V 60Hz

H-4379

Sand Equivalent Shaker, 220V 50Hz

H-4379.5F



Shipping wt. 125 lbs (56.6kg)

**Sand Equivalent Shaker, Motorized**

ASTM D2419; AASHTO T176

Motorized sand equivalent shaker features two separate electronic timers (one preset at 45 seconds and the other preset at 10 minutes) to increase accuracy and ease of operation compared to a spring-type timer. It is recommended for samples in the laboratory. The consistent, repeatable oscillation of the apparatus eliminates operator-caused variation. Shaking operation delivers an 8" (203mm) stroke at a speed of 175 ±2 strokes per minute. Dimensions: 12" x 24" x 24"H (31 x 61 x 61cm).

H-4374

H-4374.5F

Shipping wt. 125 lbs (56.6kg)

**Sand Equivalent Test Set**

ASTM D2419; AASHTO T176

The Humboldt sand equivalent test set includes all items required to perform a sand equivalent test except for a shaker. Be sure to choose a shaker from those offered on this page. These test sets include:

Components	
Measuring cylinder, plastic	H-4340.1
Latex Tubing (ft.)	H-4340.2.2
Rubber stopper	H-4340.5
Irrigator tube	H-4340.2.6
Weighted foot assembly	H-4340.3
Siphon assembly	H-4340.2
Wide-mouth funnel	H-4340.4
Measuring can (3.0 oz.)	H-1350.3SP
Standard stock solution (8 oz.)	H-4342

Sand Equivalent Test Set with Case

H-4340

Sand Equivalent Test Set without Case

H-4341



Shipping wt. 25.1 lbs (11kg)

**Sand Equivalent Shaker, Manual Operation**

ASTM D2419; AASHTO T176

Manually operated sand equivalent shaker is ideal for use on job site to give more uniform shaking action. Shaker consists of mounting bracket with cylinder holder and two spring steel straps, stroke indicator and counter mounted on one end. Uniform shaking action is accomplished by pushing the top frame by a simple stroke of the hand. Portable unit features removable wooden carrying case. Dimensions: 21" x 6.5" x 26.375" (53 x 17 x 67cm).

Sand Equivalent Shaker, Manual Operation

H-4378



Shipping wt. 26 lbs (11.7kg)



**Sand Equivalent Stock Solution**  
ASTM D2419; AASHTO T176

Standard stock solution, made from anhydrous calcium chloride, glycerin and formaldehyde. Use diluted with distilled water in ratio of 85ml solution per/gal. distilled water.

Sand Equivalent Stock Solution, 8oz (.24L) H-4342  
Sand Equivalent Stock Solution, 1G (3.8L) H-4342.2  
Shipping wt. 0.8 lbs (0.36kg)

**Pin Hole Dispersion Apparatus**  
ASTM D4647

This test is used for evaluating clay soils for erodibility by flowing water through a small hole that is drilled through the compacted specimen. The test chamber has a unique clamping ring for holding the stainless steel mold to the base while compacting the sample. Included with the chamber are screens, base stand, constant head reservoir, tubing, connections, pipette and a tool for drilling the pinhole. The end cap has a pilot hole for drilling the 1.0mm (.040") hole through the sample. All aluminum parts are anodized for corrosion resistance.

Pin Hole Dispersion Apparatus HM-3930  
Shipping wt. 6.6 lbs (3kg)

**Falling Head Permeameter Cells**  
ASTM D2434; BS 1377 Part 5

For use with granular soils in determining the coefficient of permeability via the falling-head method for laminar flow of water. Compact and portable unit includes a spring incorporated into top cap to apply 5-10 lbs. force against screen to prevent soil density changes. End caps and clamping ring are anodized aluminum. Each cell comes complete with valves and perforated screens. **9" (229mm) cells are made to order.**

**Permeameters without manometer outlets**

- Permeameter Cell, 2.5" (63mm) HM-5891A
  - Permeameter Cell, 3.0" (76mm) HM-5892
  - Permeameter Cell, 4.5" (114mm) HM-5893
  - Permeameter Cell, 6" (152mm) HM-5894
  - Permeameter Cell, 9" (229mm) HM-5895
- Shipping wt. 3-33 lbs (1.3 - 14.9kg)

**Shelby Tube Permeameter**

The Shelby tube permeameter allows you to perform permeability tests within a Shelby tube without removing the sample. Ideal for cohesion-less materials and sands. It is suggested that the specimen be ejected at test conclusion and examined for voids or large aggregate, which possibly could affect the test results. Two sets of end caps fit over a Shelby tube liner up to 6" long. End caps each contain valve to control flow of permeants through the specimen, along with a porous stone to prevent material from flowing into and clogging the valve. End caps are anodized aluminum. Includes o-rings, connecting rods, clamping knobs, and tubing. Shelby tube not included.

- Shelby Tube Permeameter, 2" HM-3913
  - Shelby Tube Permeameter, 2.5" HM-3914
  - Shelby Tube Permeameter, 3" HM-3915
- Shipping wt. 6 lbs (2.72kg)

**Constant Head Permeameter Cells**  
ASTM D2434; BS 1377 Part 5

Use to determine the coefficient of permeability by the constant head method for laminar flow of water through granular soils. Two manometer ports are grooved & screened on the inside. Distance between ports is always equal to diameter. 100 mesh screens used to prevent migration of material through valves & tubing during test. Acrylic chamber permits viewing sample. Spring incorporated into top cap to apply 5-10 lbs. force against screen to prevent soil density changes. End caps and clamping ring are anodized aluminum. Each cell comes complete with valves and perforated screens. **9" (229mm) cells are made to order.**

**Permeameters with manometer outlets**

- Permeameter Cell, 2.5" (63mm) HM-5801
  - Permeameter Cell, 3.0" (76mm) HM-5802
  - Permeameter Cell, 4.5" (114mm) HM-5803
  - Permeameter Cell, 6" (152mm) HM-5804
  - Permeameter Cell, 9" (229mm) HM-5805
- Shipping wt. 3-33 lbs (1.3 - 14.9kg)

Permeameter Replacement Parts	
HM-5801 Replacement Screen Strips 8.75" long for HM-5801 (set of 2)	HM-5801.7
HM-5801 & HM-5891A Replacement Screens 2.485" (3)	HM-5801.8
Perforated Plate 2.5"	HM-5801.9

**Tubing for use with Permeameter Cells**

Flexible, clear PVC tubing for use with Permeameter cells. 0.25" ID x 0.375" OD.  
Tubing, 0.25" ID x 0.375" OD, 25ft. HM-003349  
Shipping wt. 0.5 lbs (0.2kg)



**Dual Manometer Tube Stand**

ASTM D2434

Economical manometer tube setup for use with Constant Head Cells. Two acrylic tubes with valves mounted on aluminum rail, with scale for monitoring flow volumes. Scale is 100cm long with cm and mm graduations. Each tube has its own valve to allow running two tests. Choose wall mount or free standing. Includes tubing.

Dual, Manometer Stand, Wall Mount **HM-5860**

Dual, Manometer Stand, Free Standing **HM-5861**

Shipping wt. 8 lbs (3.7kg)

**Single Manometer Tube Stand**

ASTM D2434

Economical manometer tube setup for use with Falling Head Cells. Single acrylic tube with valves mounted on aluminum rail, with scale for monitoring flow volumes. Scale is 100cm long with cm and mm graduations. Choose wall mount or free standing. Includes funnel and tubing.

Single, Manometer Stand, Wall Mount **HM-5890**

Manometer Stand, Free Standing **HM-5896**

Shipping wt. 8 lbs (3.7kg)

**Constant Head Tank**

Acrylic tank with regulating valve for flow control of water and a porous media on bottom to filter out air bubbles. Maintains constant water head via an overflow port. Includes: saddle valve for connection to either de-aired or tap water source and tubing for hook-up to test chamber. Tank measures 5.625" diameter x 5.25" height.

Constant Head Tank, 1500cc **HM-5880**

Shipping wt. 5 lbs (2.2kg)

**Compaction Permeameters**

ASTM D5856

For determining permeability of clay, sand, and gravel soils. Uses Proctor plasticity compaction method. Two-piece cylindrical mold includes: upper plate with valve; water inlet/outlet; filter base plate; and filter stones. 6"W x 6"D x 12"H.

Compaction Permeameters, 4" **H-4145**

Compaction Permeameters, 6" **H-4146**

Shipping wt. 25.9 lbs (11.7kg)

**Permeameter Replacement Parts**

Filter stone for H-4146	H-4148X
Filter stone for H-4145	H-4148
Porous stone for H-4146	H-4148.6
Porous stone for H-4145	HM-4184.100
Spring for H-4146 and H-4145	H-4145.8

**Permeameter Accessories**

High Vacuum Pump	H-1763A or H-1763A.4F
Material Scoop, #2 Round	H-3731
Mixing Bowl, 8qt (7.6L) 12.5" x 5.5" (318 x 140mm)	H-4938
Graduated Cylinder, 250mL, Glass or Plastic	H-4915.250 H-4916P.250

**Compaction Hammer**

Rod with sliding weights on a 2" (51mm) dia foot. Stop allows adjusting height of drop up to 8" (203mm). Includes one .25 lb. (100g) and one 2.25 lb. (1kg) weight.

Compaction Hammer **HM-3701**

Shipping wt. 6 lbs (2.7kg)







Triaxial cells can also be used for permeability testing.

**ACCESSORIES**  
 For Sample Prep Accessories and consumables, please see page 145.

Permeability Cells, Top Cap/Base Pedestal Sets and Individual Top Caps and Bases								
Size	Cell Standard	Cell Stainless	Set Aluminum	Top Cap Only	Base Only	Set Stainless Steel	SS Top Cap Only	SS Base Only
35mm	HM-4188B	HM-4188SS	HM-4188.35	HM-4199.35T	HM-4188.35B	HM-4188.35SS	HM-4199.35SST	HM-4188.35SSB
1.4"			HM-4188.14	HM-4199.14T	HM-4188.14B	HM-4188.14SS	HM-4199.14SST	HM-4188.14SSB
38mm			HM-4188.38	HM-4199.38T	HM-4188.38B	HM-4188.38SS	HM-4199.38SST	HM-4188.38SSB
1.5"			HM-4188.15	HM-4199.15T	HM-4188.15B	HM-4188.15SS	HM-4199.15SST	HM-4188.15SSB
50mm			HM-4188.50	HM-4199.50T	HM-4188.50B	HM-4188.50SS	HM-4199.50SST	HM-4188.50SSB
2.0"			HM-4188.20	HM-4199.20T	HM-4188.20B	HM-4188.20SS	HM-4199.20SST	HM-4188.20SSB
70mm			HM-4188.70	HM-4199.70T	HM-4188.70B	HM-4188.70SS	HM-4199.70SST	HM-4188.70SSB
2.8"			HM-4188.28	HM-4199.28T	HM-4188.28B	HM-4188.28SS	HM-4199.28SST	HM-4188.28SSB
100mm			HM-4188.100	HM-4199.100T	HM-4188.100B	HM-4188.100SS	HM-4199.100SST	HM-4188.100SSB
4.0"			HM-4188.40	HM-4199.40T	HM-4188.40B	HM-4188.40SS	HM-4199.40SST	HM-4188.40SSB

**Permeability Cells**  
 ASTM D5084; BS 1377 Part 6 1990  
 HM-4188B permeability cells are constructed of high-quality materials throughout for long-lasting performance. The cell top and base are precision machined from 6061 T6 aluminum and black anodized for a durable finish. To facilitate sample setup, the chamber and cell top can be quickly and easily removed by loosening the three knobs that hold the upper assembly to the base. The clear acrylic chamber provides a working pressure of 150 psi (1,000 kPa) and is tested to 250 psi (1,700 kPa).

The cell has five, no-volume-change, valves aligned along the front of the cell for maximum convenience. Two valves handle top drainage, two valves handle bottom drainage, and one valve handles filling/emptying and providing confining pressure to the cell.  
 The removable base pedestal accommodates various sample diameters from 35mm to 4 inch, see chart above for model numbers corresponding to the size needed. Cells are available with black-anodized aluminum or stainless steel top caps and base pedestals, refer to chart above.

Brass valves are standard with these cells, but stainless steel valves (stainless steel is typically used with hazardous materials) are an option, please inquire. Cell dimensions are: 13.75" H x 8.75" dia. (349.2 x 222.3mm). Overall dia. is: 11" (279.4mm).  
**Triaxial Cells— HM-4199**  
 For those who plan to do triaxial tests in addition to permeability testing, consider using HM-4199B or HM-4199SS triaxial cells for the added convenience of using one cell for both tests. See page 131.

# ELITE SERIES

## Automated Pressure Controller



HM-5810.3F

### Automated, 3-Channel Pressure Controller

ASTM D5084

The HM-5810 is an automated three-channel pressure controller designed to handle saturation, consolidation and permeation of a triaxial test sample. In this application it can be used solely for permeability testing as well, eliminating the need for distribution panels, etc. The HM-5810 is all you need to successfully do permeability testing for soil.

Cell, head and tail pressure can be set in increments of 0.1 PSI while volume change is measured to 0.0001cc. The flow rate for permeation can be set from 1 cc/sec (60 cc/min) down to less than 0.000002 cc/sec (0.00012 cc/min). There are three data input channels – one for each pressure transducer, or if you are only doing permeability, you will only need one of the channels/pressure transducers.

The HM-5810 provides an accurate and simplified permeability setup, which eliminates the need for separate distribution panels, and simplifying tubing and control cable setup. By using the integral staging platform, the HM-5810 provides an extremely compact and organized setup.

The HM-5810 is built around Humboldt's integral, data logger with touch-screen control, which allows the HM-5810 to be used as a standalone device capable of full test control and data logging. It can also be controlled by a networked computer at any location with access to the network.

### Standalone Mode

In stand-alone mode, the HM-5810 Pressure Controller provides a 7" (178mm) touch-screen controller, giving you finger-tip control of your testing processes, as well as providing real-time, visual views of your data in both tabular and graphic formats. The waterproof, touch screen provides colorful, at-a-glance monitoring of testing functions without the use of a computer. Operators can see all the data in several formats at the machine while the test is running. Data can then be viewed simultaneously from a computer or downloaded later to a computer in the lab, in the next room or at a different location, while also providing report generation capabilities from within Humboldt's NEXT software or our enhanced HM-5007SW Permeability Software Module.

### Computer Control

When operated from a networked computer the NEXT software provides robust machine and test control, and report generation. It also provides the ability to control and monitor multiple machines from a single computer.

NEXT software and the enhanced Permeability module, HM-5007SW provides robust machine control, calibration, data acquisition and report generation for those who want to use a computer to control permeability testing operations.

### HM-5810.3F Specifications:

Hydraulic pressure range:	0-500 psi
Volumetric capacity	270mL/channel
Load Capacity	3000lbf (15kN)
Dimensions (L x D x H)	38" x 15" x 20.5" (970 x 385 x 520mm)
Voltage	110/220V 50/60Hz - 16.0 amps

### Controller Specifications:

Display (Resistive Touch)	7" (178mm) VGA (480 x 800)
Real-time test data	Graphic and tabulation
Processor	Dual 32-bit ARM
RAM	64MB
Memory, non-volatile	4GB
Analog to digital converter	24 bit
Logging speed	up to 50 readings per second
Multi-test storage	1000
Points per test	3000
USB port (front)	export data, import/export calibration data, WiFi
USB port (back)	provides external power for wireless access point
Ethernet connection	for network connectivity
24-bit differential analog to digital converter	4
Ambient temperature sensor	1
Firmware Update	Flash drive

### Automated, 3-Channel Pressure Controller HM-5810.3F

Shipping wt. 168 lb (76kg)



### NOTES

Permeability cells and related accessories are not included and should be ordered separately.



### NEXT SOFTWARE

For more information on Humboldt's Next Permeability Module, please see pages 108-109.



HM-4150.3F



HM-4140.3F



HM-4160.3F



HM-4150A



HM-4160A

### Humboldt FlexPanels

ASTM: D1559, D2850, D2166, D4767, and D5084; AASHTO: T193, T296, T297, T208; BS 1377: Part 4: 1990, BS 1377: Part 6, BS 1377: Part 7: 1990, BS 1377: Part 8: 1990

Permeability testing measures the rate of discharge of water under laminar flow conditions through a unit cross-sectional area of a porous medium under a unit hydraulic gradient and standard (20°C) temperature conditions. In permeability testing, soil is subjected to water under a known pressure, and the flow is measured. The coefficient of permeability (k), or simply permeability, expresses the ability of water to flow through the particular medium. The "constant head" test method is applicable to coarse granular soils such as sands and gravels. The "falling head" test method is applicable to fine grain soils. Either method may be used to test clay soils.

### Humboldt FlexPanels

Humboldt FlexPanels provide a simple and highly efficient distribution system for providing air, water and de-aired water for use in permeability and tri-axial testing applications. The FlexPanel's simple, straight-forward configuration, with its integral burettes provides a condensed/compact design that takes up less counter space than competing systems with air/water bladders.

The long, narrow burette design of Humboldt's FlexPanels provide faster test processing times when compared to larger, shorter burette systems, while providing the same volume. This is due to the reduced amount of meniscus formation in the narrower burettes, which allows the water level to drop faster, resulting in faster readings. In addition, the use of longer/narrower burettes and a scale graduation of 0.02ml, also provides an easier-to-read and more accurate scale.

FlexPanels also feature a bias regulator and bridge. The bias regulator maintains the differential pressure when confining and back pressures are increased. The bridge delivers simultaneous control of base and top pressures through the use of just one regulator. This feature minimizes operator time and reduces the margin of error in opening and adjusting regulators during a test. The Humboldt FlexPanel system is comprised of 5 separate panel configurations, which can be grouped together to accommodate from 1 to 6 cell setups.

### Fast and Easy Setup and Operation

Humboldt FlexPanels make setup fast and easy with clearly labeled ports and quick-connect hook-ups. Operation is just as easy with clearly labeled controls, large gauges and easy-to-read burette markings.

All Humboldt FlexPanels use no-volume change Swagelock valves and Fairchild constant-bleed type precision regulators for accurate control. All inlets and outlets utilize quick-connects to ensure fast, accurate setup to permeameter cells, as well as air, water and drain hook ups. Fittings, tubing and connectors are supplied with each unit. All FlexPanels are designed to handle air pressures up to 150 psi. For testing contaminated samples, Humboldt offers an optional Toxic Interface Unit, which prevents toxic fluids and vapors from entering the FlexPanel. See next page.

### Humboldt FlexPanels Features:

Humboldt FlexPanels are constructed of lightweight aluminum for long, rust-free life. FlexPanels provide an accurate and easy-to-operate solution for controlling compressed air, water, de-aired water and vacuum without the need for air/water bladder interfaces to produce the pressures necessary for permeability and triaxial testing. FlexPanels utilize a set of three burettes to control the cell pressure and the back pressure for each cell. They can monitor volume change in the sample and can be used to measure the flow of water through the sample for permeability testing.



	HM-4140.3F	HM-4140M.3F	HM-4150.3F	HM-4150M.3F	HM-4160.3F	HM-4160M.3F	HM-4150A	HM-4160A	
Pressure/Resolution	2-150 psi (0.1 psi)	14-1000 kPa (1 kPa)	2-150 psi (0.1 psi)	14-1000 kPa (1 kPa)	2-150 psi (0.1 psi)	14-1000 kPa (1 kPa)	Not Applicable		
Vacuum	0-14.7 psi or 30 Hg	(0-100kPa) or 30 Hg	0-14.7 psi or 30 Hg	(0-100kPa) or 30 Hg	0-14.7 psi or 30 Hg	(0-100kPa) or 30 Hg			
Inner Burette									
Cell	Not Applicable		50cc x 0.1cc (ml)						
Top	Not Applicable		10cc x 0.02cc (ml)						
Base	Not Applicable		10cc x 0.02cc (ml)						
Outer Burette									
Cell	Not Applicable		400 cc (ml)						
Top	Not Applicable		460 cc (ml)						
Base	Not Applicable		460 cc (ml)						
Voltage	110/220VAC 50/60Hz						Not Applicable		
Power	6 watts								
Operating Temperature	14 to 158°F (-10 to 70°C)								
Dimensions	8 x 8 x 37.5" (203 x 203 x 952mm)		8 x 25.5 x 37.5" (203 x 648 x 952mm)		8 x 43.5 x 37.5" (203 x 1105 x 952mm)		8 x 19.5 x 37.5" (203 x 495 x 952)	8 x 37.5 x 37.5" (203 x 952 x 952)	
Shipping Weight	35lb (16kg)		95lb (43kg)		145lb (66kg)		107lb (49kg)	157lb (71kg)	

FlexPanels can manually measure volume change or permeability in a triaxial test sample without the use of a volume change apparatus, a distinct benefit when compared to air/water bladder systems.

- Bias pressure regulator allows simultaneous control of confining and back pressures, while maintaining a constant differential.
- Longer burette and 0.02ml graduation give more accurate results, better productivity, and faster turnaround.
- Uses no-volume-change Swagelock valves
- Bridge feature delivers simultaneous control of base and top pressures by adjusting one pressure regulator simplifying testing.
- Quick-connect hookups for fast and reliable set up.
- Master control panel houses digital pressure readout for the controlling pressure, inlet vacuum regulator and gauge, inlet pressure regulators and gauge, de-aired water tank controls, tap and de-aired water supply outlets, and pressure and vacuum outlets.

**Control Panels**

The HM-4140 stand-alone control panel or the integral control panels on the HM-4150 and HM-4160 provide pressure controls and readouts for permeability and triaxial applications. All three controllers provide identical controls, which include: a digital, readout pressure meter, a pressure supply gauge, a master pressure regulator, a vacuum supply gauge, a master vacuum regulator, de-aired water tank controls, tap and de-aired water supply outlets and pressure and vacuum outlets.

**Auxiliary Panels**

The HM-4150A and HM-4160A auxiliary panels provide additional sets of burettes, which can be used to expand the capacity of a system. Each set of three (3) burettes provide the controls necessary for another cell to be used. The HM-4150A provides one (1) set of burettes and the HM-4160A provides two (2) sets. Humboldt recommends any combination of up to six (6) burettes sets can be used with each control panel.

**Toxic Interface Unit**

Safe and convenient means of performing permeability tests of corrosive or toxic permeants. Flexible fluoro-elastomer bladder accumulator interfaces between control panel and sample drains on permeameter. Serves as a fluid separator to prevent permeant from entering control panel. Also prevents contact of air with permeant, thus no toxic or corrosive vapors can escape into lab. Handles any fluid compatible with stainless steel, PTFE, and the fluoro-elastomer bladder. Unit measure 8" H x 5" dia. Two units are required for each cell.

**Toxic Interface Unit**

**HM-4190**

Shipping wt. 7 lbs (3.1kg)



HM-4190

Rear of panel showing quick-connect hookups and plumbing.





**Expansion Index Consolidometer**

ASTM D4829

Self-contained unit for conducting expansion tests on cured soil specimens. After compaction in stainless steel ring, specimen is placed in the consolidometer with air-dried porous stones, and loaded with a stainless steel weight. Specimen is allowed to consolidate for 10 minutes, after which it is immersed in distilled water for up to 24 hrs. During this time, height of specimen is recorded to determine maximum swell. Corrosion resistant, durable anodized aluminum and stainless steel construction. Includes anodized aluminum base and collar, stainless steel specimen ring and weight, 12.6 lb. (5.7kg) loading weight, and 3.99" dia. x 0.5" (101.4 x 12.5mm) porous stones. **Dial Indicator required, see below.** 6" dia x 11" H (152 x 279 mm).

Expansion Index Consolidometer **HM-5405**  
 Shipping wt. 20 lbs (9kg)

**Dial Indicators for Consolidometer**

The expansion index consolidometer requires one of these dial indicators.

- Dial Indicator, 0.2" range x 0.0001" **H-4460**
- Dial Indicator, 0.5" range x 0.0001" **H-4471**
- Dial Indicator, 1.0" range x 0.001" **H-4158.1**
- Dial Indicator, 12mm range x .002mm **H-4465.12**
- Dial Indicator, 25mm range x .010mm **H-4465.25**
- Dial Indicator, 50mm range x .020mm **H-4465.50**  
 Shipping wt. 1.3 lbs (0.6kg)

**Porous Stone**

Porous stone for use with HM-2405 consolidometer, 3.99" x 0.5".

Porous Stone, 3.99" x 0.5" **HM-4184.399T**  
 Shipping wt. 0.5 lbs (0.2kg)

**Soil Volume Change Meter (PVC)**

Used to evaluate potentially dangerous swelling/shrinking conditions found in clay soils in commercial/residential development sites. PVC (potential volume change) refers to maximum possible volume change a soil could undergo when submitted to changing moisture conditions. It features fast and simple operation, measuring both shrinkage and swelling of soils and is ideal for gauging swelling of clay soils. Includes: H-4454.010, 1,000 lb. (4.5 kN) capacity proving ring, mold assembly, loading cap, porous stones, loading pistons, 2-3/4" (70 mm) dia. specimen ring (HM-1220.70), and conversion charts. 7.25" (184 mm) dia. base x 15.5" (394 mm) height.

Soil Volume Change Meter (PVC) **HM-2415**  
 Shipping wt. 32 lbs (14.5kg)

**Compaction Base and Collar**

The compaction base and collar is used to produce a soil sample for use with the basic swell/expansion consolidometers. Use HM-3701 compaction hammer.

Compaction Base & Collar, 2.440" **HM-1975-D**  
 Compaction Base & Collar, 2.500" **HM-1975-E**  
 Shipping wt. 7 lbs (3kg)

**Compaction Hammer**

Rod with sliding weights on a 2" (51mm) dia foot. Stop allows adjusting height of drop up to 8" (203mm). Includes one .25 lb. (100g) and one 2.25 lb. (1kg) weight.

Compaction Hammer **HM-3701**  
 Shipping wt. 6 lbs (2.7kg)

**Basic Swell/Expansion Consolidometer**

A self-contained consolidometer used to conduct swell expansion tests on soil specimens. Set includes: stainless steel base/acrylic ring device with adjustable, dial indicator standard and bracket, a compaction specimen ring, top and bottom porous stones and a 60 psf stainless steel loading weight. Consolidometer can also be used with cutting ring, listed below, instead of supplied compaction ring for use in acquiring samples from undisturbed Shelby tube samples. A dial indicator is required, choose from either H-4471 with a range of .500" with .0001" divisions or H-4465.12 with a range of 12mm and .002mm divisions. Alternative loading weights are also available, please inquire.

Consolidometer, 2.440" **HM-1972-1D**  
 Consolidometer, 2.500" **HM-1972-1E**  
 Shipping wt. 8 lbs (4kg)

Components for HM-1972-1D	
Cutting Ring, SS	HM-1220.24.8
Compaction Ring, SS	HM-1972-3D
Loading Weight, 60 PSF (SS)	HM-1972-6D
Top Porous Stone	HM-4184.240
Base Porous Stone, 3.31" dia. x 0.25" thick	HM-4184.331

Components for HM-1972-1E	
Cutting Ring, SS	HM-1220.25.8
Compaction Ring, SS	HM-1972-3E
Loading Weight, 60 PSF (SS)	HM-1972-6E
Top Porous Stone	HM-4184.2485
Base Porous Stone, 3.31" dia. x 0.25" thick	HM-4184.331