



Soil-Lab

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Testing Equipment for  Construction Materials

HUMBOLDT

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H-4215

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

Compact all-metal soil processor allows customer to produce five-point moisture density relationship test results in about 5 hours. Processor also handles samples for rapid compaction of a family of curves test. Processes up to 30 lbs. of lean-to-fat and tough clays at field moisture in fewer than 15 minutes. Automatically separates and retains up to 3/4" rocks from soil to prolong screen life. Processes soil to pass a No. 4 screen. Offset rotating drum is motor driven; pre-set adjustments aren't necessary. Automatic operation frees up technician's time. Order easy-to-install replacement screen separately. Replacement parts are available. Overall dimensions: 32 x 36 x 53" (813 x 915 x 1346mm). Shipping wt. 408 lbs. (184kg)

Replacement Screens	
Replacement Screen, 11-7/8" (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

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

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. Shipping wt. 32 lbs. (15kg)

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



H-4199



H-3843A



H-4261.4



H-4261.10



H-4258



H-4257



H-3841

Soil Mortar— H-4257

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 2-1/4" (57mm) H. Complies with ASTM D421; AASHTO T87. Shipping wt. 15 lbs. (7kg)

Soil Pestle— H-4258

Rubber-tipped 8" (203mm) long pestle, made for gently grinding soils without breaking individual particles. Shipping wt. 15 lbs. (7kg)

Mortar & Pestle Set, Porcelain 400mL— H-4261.4

Heavy porcelain 6" (15cm) mortar with 6" (15cm) pestle.

Mortar & Pestle Set, Porcelain 1000mL— H-4261.10

Heavy porcelain 7.5" (19cm) mortar with 7" (18cm) pestle.

Sample Mixers—

Used to mix soil samples for compaction and other tests. Mixers are supplied in 5Qt. (4.73L), 12 Qt. (11.35L) and 20 Qt. (18.92L) capacities, see them all on page 160-161 in the Asphalt Section of this catalog.

- Laboratory Bench Mixer, 5-Qt. (4.73L), 120V 60Hz— H-3841**
 - Laboratory Bench Mixer, 5-Qt. (4.73L), 230V 60Hz— H-3841.2F**
 - Laboratory Bench Mixer, 5-Qt. (4.73L), 230V 50Hz— H-3841.5F**
- Shipping wt. 55 lbs. (25kg)

- Laboratory Bench Mixer, 12-Qt. (11L), 120V 60Hz— H-3842A**
 - Laboratory Bench Mixer, 12-Qt. (11L), 230V 50/60Hz— H-3842A.4F**
- Shipping wt. 185 lbs. (185kg)

- Laboratory Bench Mixer, 20-Qt. (19L), 120V 60Hz— H-3843A**
 - Laboratory Bench Mixer, 20-Qt. (19L), 230V 50/60Hz— H-3843A.4F**
- Shipping wt. 265 lbs. (120kg)

See our complete offering of mixers, paddles, bowls and mixer accessories, please see page 160-161.



H-4142



H-4141



H-4225



H-4151



H-4159



H-4163



H-4162



H-4161A



H-4149

Compaction Split Mold, 2.8" — H-4142
2.8" ID x 4" H with 2" detachable collar

Mold volume of .0214 cu. ft., cold-rolled steel tubing, plated for rust resistance. Mold has vertical split in body with 2 quick-acting clamps for easy removal of specimen. Used for permeability testing of remolded samples. Not compatible with H-4169 Compactor. Shipping wt. 10 lbs. (4.5kg).

Standard Proctor Density/Moisture, 4" — H-4141
4" ID x 4.584" H with 2-1/2" detachable collar

Mold volume of 1/30 cu. ft., cold-rolled steel tubing, plated for rust resistance. Includes detachable base plate, studs and wing nuts. Complies with ASTM D558, D698, D1557; AASHTO T99, T134, T180. Compatible with H-4169 Compactor. Shipping wt. 16 lbs. (7.3kg).

Standard Proctor Density/Moisture Split Mold, 4" — H-4225
4" ID x 4.584" H with 2-1/2" detachable collar

Mold volume of 1/30 cu. ft., 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. Complies with ASTM D558, D698, D1557; AASHTO T99, T134, T180. Not compatible with H-4169 Compactor. Shipping wt. 17 lbs. (7.7kg).

CBR w/Perf. Base, 6" — H-4151
6" ID x 7" H with 2" detachable collar

Mold volume of .1145 cu. ft., cold-rolled steel tubing, plated for rust resistance. Collar extension and perforated base plate can be clamped on either end of cylinder. Compatible with H-4169 Compactor. Complies with ASTM D1883, ASSHTO T193, Shipping wt. 24 lbs. (11kg).

Solid Base, 6" — H-4149
6" ID x 7" H with 2" detachable collar

Solid base version of the H-4151. Mold volume of .1145 cu. ft., cold-rolled steel tubing, plated for rust resistance. Collar extension and perforated base plate can be clamped on either end of cylinder.

Compatible with H-4169 Compactor. Complies with ASTM D1883, ASSHTO T193. Shipping wt. 22 lbs. (10kg).

Compaction 6" — H-4159
6" ID x 6.1" H with 2" detachable collar

Mold volume of 1/10 cu. ft., cold-rolled steel tubing, plated for rust resistance. Compatible with H-4169 Compactor. Steel base plate is 8" x 8" x 1/2" thick. Shipping wt. 22 lbs. (10kg).

LBR, 6" — H-4163
6" ID x 6" H with 2-1/2" detachable collar

Mold volume of 1/13.33 cu. ft., cold-rolled steel tubing, plated for rust resistance. Collar extension and perforated base plate can be clamped on either end of cylinder. Compatible with H-4169 Compactor. **LBR requires H-4147 spacer, sold separately.** Shipping wt. 22 lbs. (10kg).

LBR Spacer Disc, 6" — H-4147
5.9375" x 1.416"

For use with H-4163 LBR Mold. Compatible with H-4169 Compactor. Shipping wt. 3 lbs. (1kg).

Modified Proctor, 6" — H-4162
6" ID x 4.584" H with detachable collar

6" ID x 4.584" H with detachable collar Mold volume of 1/13.33 cu. ft., cold-rolled steel tubing, plated for rust resistance. Steel base plate is 8" x 8" x 1/2" thick. Complies with ASTM D698, D1557, ASSHTO T99, T180. Compatible with H-4169 Compactor. Shipping wt. 15 lbs. (6.8kg).

Modified Proctor Split Mold, 6" — H-4161A
6" ID x 4.584" H with 2-3/8" detachable collar

Mold volume of 1/13.33 cu. ft., cold-rolled steel tubing, plated for rust resistance. Mold has vertical split in body with 2 quick-acting clamps for easy removal of specimen. Steel base plate is 8" x 8" x 1/2" thick. Complies with ASTM D698, D1557, ASSHTO T99, T180. Not compatible with H-4169 Compactor. Shipping wt. 19 lbs. (9kg).



H-4169

H-4169.2415



H-4169.2416

**Replacement Hammers** (do not include weights)

4" Round Hammer (New Style)	H-4169.2415
6" Pie-Shape Hammer (New Style)	H-4169.2416
4" Round Hammer (Old Style)	H-4169.415
6" Pie-Shape Hammer (Old Style)	H-4169.416

(**New Style Hammers** are only threaded in the middle of the shaft)

(**Old Style Hammers** are threaded almost to the end of the shaft)



H-4170A

H-4160A

H-4173

Automatic Mechanical Compactor, 120V 60Hz— H-4169 Compactor, 230V, 50/60 Hz— H-4169.4F

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.

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 16-1/2"W x 30"D (1422 x 419 x 762mm). Max. height in operation: 66" (1677mm). Complies with ASTM D558, D559, D560, D698, D1557; AASHTO T99, T134, T135, T180.

Shipping wt. 384 lbs. (174.0kg)

California Modified Automatic Compactor, 120V 60Hz— H-4169.CA

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. Shipping wt. 384 lbs. (174.0kg)

Calibration Kit— H-4169CK

For use with H-4169 Automatic Mechanical Compactor. Calibration kit includes lead deformation apparatus, micrometer and 50 lead calibration cylinders. Complies with ASTM D2168.

Manual Compaction Hammer— H-4160A

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. Complies with ASTM D558, D698, AASHTO T99. Shipping wt. 12 lbs. (5.4kg)

Manual Compaction Hammer— H-4170A

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. Complies with AASHTO T180. Shipping wt. 18 lbs. (8.3kg)

Army Corps of Engineers Hammer— H-4173

Manual, Moisture/Density Hammer meets EM1110-1-1804 Spec. It 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. Shipping wt. 15 lbs. (6.8kg)

Army COE 10 lb. Hammer— H-4171

Manual, Moisture/Density Hammer, which incorporates a 10 lb (4.5kg) weight and a drop of 12" (305mm) with a 2" (51) face. Shipping wt. 18 lbs. (8.3kg)

Manual Compaction Hammers		
Weight	Drop	Model
5.5 lb (2.54kg)	12" (305mm)	H-4160A
10 lb (4.5kg)	18" (457mm)	H-4170A
5.5 lb (2.54kg)	12" (305mm)	H-4173
10 lb (5.08kg)	12" (305mm)	H-4171



Relative Density of Cohesionless Soils Apparatus—
230V 60Hz, 12 amps 1ph AC— H-3750.2F
230V 50Hz, 12 amps 1ph AC— H-3750.5F
 Apparatus determines the relative density of cohesionless, 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. Complies with ASTM D4253, D4254. Shipping wt. 925 lbs. (420kg)

Individual Components	
Vibrating Table, 230V 60Hz 12 amps 1ph	H-3756.2F
Vibrating Table, 230V 50Hz 12 amps 1ph	H-3756.5F
0.1 cu. ft., Relative Density Mold Set	H-3757
0.5 cu. ft., Relative Density Mold Set	H-3758
Relative Density Gauge Set	H-3759

Vibrating Table w/ Controller, 230V 60Hz,— H-3756.2F
Vibrating Table w/ Controller, 230V 50Hz— H-3756.5F
 Vibrating Tables for use with the relative density mold sets or other processes requiring vibratory compaction. Tables are 30 x 30" (762 x 762mm), which are vibrated using an electromagnetic vibrator rated above 100lbs (45.5kg) Capacity for tables is 750 lbs (341kg) and height is 21" (533mm). Shipping wt. 605 lbs. (275kg)

Relative Density Mold Set, 0.1 cu. ft.,— H-3757
 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) IH. Shipping wt. 106 lbs. (48kg)

Relative Density Mold Set, 0.5 cu. ft.,— H-3758
 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) IH. Shipping wt. 250 lbs. (113kg)

Pouring Funnel Set— H-3750F
 Used for filling loose 3/8" (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 1/2" (12.7mm). Shipping wt. 30 lbs. (14kg)

Relative Density Gauge Set— H-3759
 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 1/8" (76 x 305 x 3.2mm), calibration bar is also included. Shipping wt. 8 lbs. (4kg)

Vibration Indicator, Tachometer Type— H-3753
 Precision tachometer is pen size to allow accurate readings even on hard-to-reach equipment. Scale gives readings from 2,000 to 21,000.

Vibration Compaction Hammer Set— H-4115
 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.

Frame for Vibration Compaction Hammer— H-4115.2
 Frame Only (does not include hammer or mold)

Vibration Compaction Hammer with Tamper, 120V 60Hz— H-4115.3
 Includes Hammer, 5.75" (146mm) Tamper and 12" (305mm) long Mounting Shank. Hammer provides 170-340 No-load RPM and 1,700 to 3,300 No-load BPM. Impact energy is 6.2 ft. lbs (86 kg cm) Normal and 7.4 ft. lbs (102 kg cm) Turbo. Complies with ASTM D7382.

11-Inch, Split Compaction Mold— H-4115.4
 For use with Vibration Compaction Mold Set

6-Inch, Split Compaction Mold— H-4161A
 For use with Vibration Compaction Mold Set, Shipping wt. 19 lbs. (9kg)

Replacement Tamper (Foot and Shank)— H-4115.5
 For use with Vibration Compaction Mold Set





Horizontal Sample Ejector, 120V 60Hz— H-4185

Horizontal Sample Ejector, 220 60Hz— H-4185.2F

Horizontal Sample Ejector, 220 50Hz— H-4185.5F

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. 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. 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. Shipping wt. 340 lbs (154kg)

Hand-operated Sample Ejector— H-4155A

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 9.25" (235mm). Overall dimensions 13"W x 6"D x 27"H (330 x 152 x 686mm). Shipping wt. 65 lbs. (29.5kg)

Motorized Sample Ejector, 120V 60Hz— H-4150

Motorized Sample Ejector, 220V 50/60Hz— H-4150.4F

Similar in design and construction to the H-4155A series sample ejector, this model 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 7.25" (184mm). Overall dimensions, excluding pump, 13"W x 6"D x 29"H (330 x 152 x 737mm). Shipping wt. 80 lbs. (36kg)

Individual Components

Sample Trough, Round Bottom	H-4185.RT
Conversion Kit for 2" Sample Tube	H-4185.2
Conversion Kit for 2-1/2" Sample Tube	H-4185.3



Horizontal Sample Ejector Stand— H-4185.100

Sturdy, mobile stand accommodates H-4185 Horizontal Sample Ejector. Complete with shelf for pneumatic pump and reservoir. Large wheels provide easy maneuverability. Wooden top allows Sample Ejector to be bolted to it for added stability. Requires longer hoses (included) to reach pump and reservoir.



Harvard Miniature Compaction Apparatus— H-4165

Used for moisture density tests using small samples, its compaction action duplicates the kneading action of a sheep's foot roller. Mold is 1-5/16" (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 cu. ft. (129m³) 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 cu. ft. m³ and the net weight of a compacted specimen in grams are figuratively equal. Shipping wt. 28 lbs. (12.6kg).

H-4165 Individual Components	
Mold assembly	H-4165.15
Tamper assembly	H-4165.16
20 lb. spring	H-4165.20
37.5 lb. spring	H-4165.375
40 lb. spring	H-4165.40

Soil Strength Classifier, 125lbf / 55kgf Capacity— H-4180.125

Soil Strength Classifier, 250lbf / 110kgf Capacity— H-4180.250

Soil Strength Classifier, 350lbf / 160kgf Capacity— H-4180.350

Hand-lever operated, soil strength classifier provides fast manual approximations of unconfined compressive strength on many soil types in the field or lab. Platen accepts up to 2" (51mm) sample diameters and up to 4-1/2" (114mm) lengths. Reads loads on 4-1/4" (108mm) dial face with ±1% of dial capacity as held with second maximum-reading pointer. Dial has 1 lbf divisions on outer scale, 1 kgf divisions on inner. Unit has cast aluminum housing. Base dimensions are: 5-3/4" x 10-1/4" (146 x 260mm), drilled for optional bench mounting. Calibration spring confirms proper operation; order separately. Shipping wt. 18 lbs. (8.2kg)

Soil Strength Classifier, 125lbf / 55kgf Capacity— H-4186.125

Soil Strength Classifier, 250lbf / 110kgf Capacity— H-4186.250

Soil Strength Classifier, 350lbf / 160kgf Capacity— H-4186.350

The H-4186 Series Soil Classifiers are identical to the H-4180 Series except they feature a geared hand-wheel loading system. This unique system provides a more uniform rate of load and easier loading and recording of peak values by a single operator.

Calibration Spring, 350lbf / 160 kgf Capacity— H-4180S

Plastic Limit Set— H-4253

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 3/8" 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.

Complies with ASTM D4318; AASHTO T90. Shipping wt. 11 lbs. (5kg).

Plastic Limit Plate— H-4253.1

12 x 12 x 3/8"-thick (305 x 305 x 9.5mm) glass plate with ground finish on one side and seamed edges. Complies with ASTM D4318; AASHTO T90. Shipping wt. 2 lbs. (1kg)

Plastic Limit Roller— H-4262

Easily repeatable mechanical technique produces consistent test results and saves time. Includes integral top plate/handle, one 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 4-1/2 x 1-1/4" (203 x 114 x 32mm).

Complies with ASTM D4318; AASHTO T90, TX DOT 105-E.

Shipping wt. 4 lbs. (2kg)

Adhesive Paper— H-4262P

Pad of 50 sheets of special adhesive backed paper for Plastic Limit. Shipping wt. 1 lbs. (.5kg)

Shrinkage Limit Set— H-4254

Apparatus recommended to perform shrinkage limit test in accordance with specifications. Complies with ASTM D427; AASHTO T92.

Set includes:

- (1) H-4256 Monel Shrinkage Dish;
- (1) H-4930.250 Mixing Dish;
- (1) H-4254C Crystallizing Dish;
- (1) H-4255 Shrinkage Prong Plate, and
- (1) H-4915.025 Graduated Cylinder

All components are also available individually. Shipping wt. 4 lbs. (2kg)



H-4234



H-4230

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— H-4234

Recommended for performing liquid limit test in accordance with ASTM specifications. Includes 1 ea. of: H-4230 ASTM Liquid Limit Machine, Mixing Dish, Spatula, Graduated Cylinder and set of 48 sample cans. Complies with ASTM D4318; AASHTO T89, T90. Shipping wt. 13 lbs. (6kg)

ASTM Liquid Limit Test Set— H-4235

Same set as above except it has machine with counter. Includes 1 ea. of: H-4228 ASTM Liquid Limit Machine, Mixing Dish, Spatula, Graduated Cylinder and set of 48 sample cans. Complies with ASTM D4318; AASHTO T89, T90. Shipping wt. 15 lbs. (7kg)

ASTM Liquid Limit Machine— H-4230

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. Complies with ASTM D4318; AASHTO T89, T90. Shipping wt. 8 lbs. (3.6kg)

Liquid Limit Machine with Counter— H-4228

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-handed operation. Complies with ASTM D4318; AASHTO T89, T90. Shipping wt. 9 lbs. (4.1kg)

Motorized Liquid Limit Machine, 120V 60Hz— H-4226

Motorized Liquid Limit Machine, 220V 60Hz— H-4226.2F

Motorized Liquid Limit Machine, 220V 50Hz— H-4226.5F

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. Complies with ASTM D4318; AASHTO T89, T90.

Shipping wt. 14 lbs. (6.4kg)



H-4226



H-4228

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

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



Resiliency Tester— H-4233

Use 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. Device consists of clear acrylic tube and cap, a 5/16" dia steel ball, and a small bar magnet. Test procedure is simple and quick to perform. As natural aging occurs, base loses resiliency, eventually going out of spec. and necessitating replacement. Shipping wt. 1 lbs. (.5kg)

Durometer (D Scale)— H-4222D

As required by ASTM D4318, a durometer is used to test the hardness of the base of a Liquid Limit Machine. Precision construction delivers lifetime accuracy. Sealed springs maintain load deflection rate to a tolerance of .0004". Other models are also available, see page 263. Complies with ASTM D4318, D2240.

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. BS 1337-2, NF P94-052,1

Manual Operation Cone Penetrometer, 120V 60Hz— H-4236A

Manual Cone Penetrometer, 220-240V 50Hz— H-4236A.5F

The H-4236A consists of the penetrometer device mounted to a sturdy, micro-adjusting vertical post mounted to a solid aluminum base with adjustable feet and visual leveling device. Penetrometer includes a HM-4469.10 Digital Indicator with a 1.0-inch range and a resolution of .0001. The Indicator will run on battery, but also comes with an AC adapter for a constant power source. Also included are a 35mm long, 30°-angle stainless steel cone, (1) 55mm stainless steel Sample Cup and (1) 75mm stainless steel Sample Cup. Shipping wt. 20 lbs. (9kg)

Semi-Automatic, Cone Penetrometer, 120V 60Hz— H-4237A

Semi-Auto, Cone Penetrometer, 220-240V 50Hz— H-4237A.5F

The H-4237A incorporates the H-4236A penetrometer with a digital, 99-second timer, which can be set to the standard 5-second free-fall time or to some other setting for customized tests. When engaged the timer will allow the needle to free fall into the sample for the specific time interval and then lock the needle from advancing while providing a direct reading of the test results. Penetrometer includes a HM-4469.10 Digital Indicator with a 1.0-inch range and a resolution of .0001. The Indicator will run on battery, but also comes with an AC adapter for a constant power source. Also included are a 35mm long, 30°-angle stainless steel cone, (1) 55mm stainless steel Sample Cup and (1) 75mm stainless steel Sample Cup. Shipping wt. 32 lbs. (15kg)



H-4236A & H-4237A Accessories / Replacement Parts	
Test Cone, 35mm long, 30° angle	H-4236.1
Sample Cup, 55mm Stainless Steel	H-4236A.3
Sample Cup, 75mm Stainless Steel	H-4236A.4
Test Gauge, Checks cone tip condition	H-4236G



H-4340



H-4378



H-4374



H-4342



H-4342.2



HM-4501



HM-3930

Sand Equivalent

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.

Sand Equivalent Test Set with Case— H-4340

Sand Equivalent Test Set without Case— H-4341

Set meets ASTM D2419; AASHTO T176. Shipping wt. 43 lbs (20kg)
Set includes the following items:

- (4) Graduated, Plastic, Measuring Cylinders—H-4340.1
- (2) Solid Rubber Stopper—H-4340.5
- (1) Irrigator Tube—H-4340.2.6
- (1) Weighted Foot Assembly—H-4340.3
- (1) Standard Stock Solution, 8oz. Plastic Bottle—H-4342
- (1) Siphon Assembly—H-4340.2 (tube and hose, bow tube and hose, stopper)
- (1) Clamp—H-8630
- (1) Wide-Mouth Funnel—H-4340A
- (1) Measuring Can, 3 oz.—H-1350.3SP

Individual items above can be ordered separately.

Manually Operated Sand Equivalent Shaker— H-4378

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 6-1/2 x 26-3/8" (53 x 17 x 67cm). Complies with ASTM D2419; AASHTO T176. Shipping wt. 29 lbs. (13kg)

Sand Equivalent Shaker, 120V 60Hz— H-4374

Sand Equivalent Shaker, 230V 50Hz— H-4374.5F

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).

Complies with ASTM D2419;

AASHTO T176. Shipping wt. 80 lbs. (36.3kg)

Sand Equivalent Stock Solution— H-4342

8 oz. (.24L) Plastic Bottle of Standard Stock Solution, made from anhydrous calcium chloride, glycerine and formaldehyde. Use diluted with distilled water in ratio of 85ml solution per/gal. distilled water.

Sand Equivalent Stock Solution— H-4342.2

Same as above except 1 gallon (3.8L) Plastic Jug.

Pin Hole Dispersion Apparatus— HM-3930

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, pipet 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. Complies with ASTM D4647.

Calcium Carbonate Content Chamber— HM-4501

This test method covers the quantitative determination of the calcium carbonate (CaCO₃) content of soils. This test complies with ASTM D4373. 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. Complies with ASTM D4373. Shipping wt. 8 lbs. (4kg)



Hydrometer Jar Bath, 120V 60Hz—H-4239A

Hydrometer Jar Bath, 220V 50/60Hz—H-4239A.4F

The Humboldt Hydrometer Water 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. Temperature range can be set between 50°F (10°C) and 120°F (49°C).

The H-4239A water bath is fully-insulated and includes a circulating pump, which ensures a constant water temperature throughout bath. While the Humboldt Hydrometer Jar Water Bath can be used for many uses within labs, it was designed specifically for use in providing a consistent temperature bath for storing hydrometer jars in accordance with ASTM D422, AASHTO T88 and UNE 103.102 to determine the particle size distribution of very fine materials, such as silt and clay. 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)
 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)
 Complies with ASTM D422; AASHTO T88.

Hydrometer Analysis Set, 120V 60Hz—H-4263A
Hydrometer Analysis Set, 220V 50/60Hz—H-4263A.4F

Determines the distribution of soil particles smaller than No. 200 (0.075mm). Complies with ASTM D422; AASHTO T88.
 Shipping wt. 180 lbs. (79.4kg)

- Set includes: (1) H-4247 Sodium Hexametaphosphate, 1 lb. (0.5kg)
 (1) H-4239A Hydrometer Jar Bath (6) H-4244 Hydrometer Jars
 (1) H-4241 Soil Hydrometer A (1) H-4242 Soil Hydrometer B
 (1) H-4260 Soil Dispersion Mixer

Soil Hydrometer A—H-4241

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). Complies with ASTM D422; AASHTO T88.

Soil Hydrometer B—H-4242

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). Complies with ASTM D422; AASHTO T88.

Hydrometer Jar—H-4244

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 pourout. Dimensions: 18" (457mm) x 2-1/2" OD (64mm). Base is 4-1/3" (107mm). Shipping wt. 2 lbs. (1kg)

Soil Dispersion Mixer, 120V 60Hz—H-4260A

Soil Dispersion Mixer, 230V 50/60Hz—H-4260A.4F

For dispersing soil suspensions used in hydrometer method of testing subgrade 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 6-1/2 x 7" (508 x 165 x 178mm). Complies with ASTM D422; AASHTO T88. Shipping wt. 15 lbs. (6.8kg)

Dispersion Cup—H-4265

Chrome-plated Dispersion Cup for use with H-4260 Mixer. Shipping wt. 3 lbs. (1kg)

Stirring Paddle—H-4266

Stirring Paddle with 3 blade surfaces, 3/4" (19mm) dia. for H-4260 Mixer. Shaft threads onto mixer.

Sodium Hexametaphosphate—H-4247

Dispersing agent used in combination with gradation analysis of soils. 1 lb. (0.5kg) container. Complies with ASTM D422, AASHTO T88. Shipping wt. 2 lbs. (1kg)

Sodium Hexametaphosphate—H-4247.10

Same as above except 10 lb. (4.5kg) container.



Humboldt CBR/LBR Solutions

The California Bearing Ratio (CBR) Test was developed by The California State Highway Department and is widely used to determine the resistance strength of subgrade and subbase 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. Meets ASTM D1883; AASHTO T193; BS 1377 Part 4.

LBR or Limerock Bearing Ratio is a variation of the CBR test. Developed primarily in Florida, it is used with materials with high lime content. Humboldt offers several CBR/LBR testing solutions based on your overall testing needs and budget, from the advanced HM-3000.3F Load Frame with computer interface using our HMTS software to a simple, hand-operated H-4156 Load Frame suitable for lab or field use.

CBR Setup using the HM-3000.3F Load Frame

Pictured is the HM-3000.3F Load frame with a typical CBR setup. See the chart below for items to order for the setup shown. See page 14 for more information on the HM-3000.3F Load Frame.

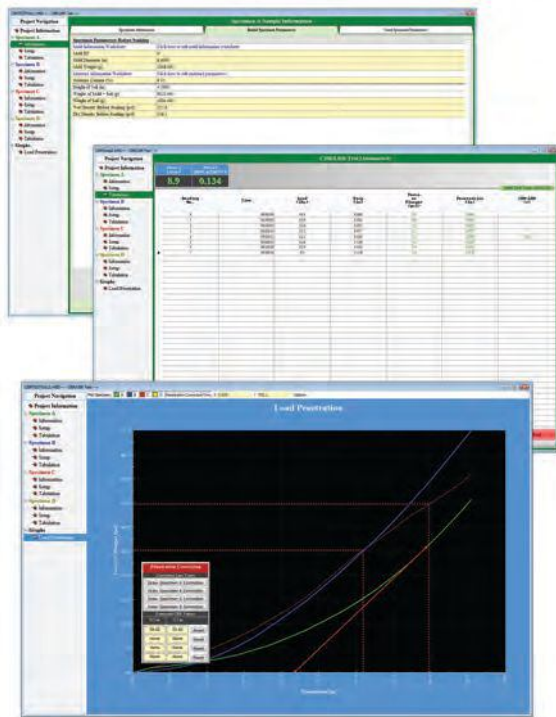
Typical CBR Setup using HM-3000.3F

Part #	Qty	Description
HM-3000.3F	1	Digital MasterLoader, 110/220V 50/60Hz
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-3001SW	1	CBR/LBR Reporting Software

Typical LBR Setup

For LBR setups, substitute H-4178F.4 for the H-4178 penetration piston and HM-2300.100P for the HM-2300.100 S-type load cell.

HM-3000.3F



HMTS Reporting Software, CBR/LBR Module— HM-3001SW

Humboldt Material Testing Software (HMTS) provides a complete solution for the acquisition, recording and presentation of test data, as well as controlling testing operations when used in conjunction with compatible Humboldt testing equipment. HMTS works in conjunction with Microsoft Excel to present test data in easy-to-read Excel workbook format files, which can be evaluated directly or sent to any computer using Microsoft Excel.

The CBR/LBR Module provides a simple, test-specific interface to control CBR/LBR test operations and automatically record data while also displaying it in real-time tables and graphs. Technicians can be freed-up for other duties with the assurance that all test data is being collected and saved.

- Test Information is stored, and all calculations are performed automatically
- Live tests and live graphing capabilities (real-time)
- Complete test report including all calculations and graphs required for testing
- Review and export tests using Microsoft Excel

See page 84 and 85 for more information on Humboldt's HMTS software.



HM-4156



H-4156M



HM-2800

CBR/LBR Specific Load Frame, 120V 60Hz— HM-4156

CBR/LBR Specific Load Frame, 220 50/60Hz— HM-4156.4F

The HM-4156 is a fully automatic, single-speed Load Frame, (0.05 inches/minute), (1.27mm/minute), designed for those who want a high-quality, application-specific Load Frame that provides simple operation with built-in data acquisition capabilities. The HM-4156 provides two channels with integral data acquisition to accommodate a load cell and transducer for CBR/LBR testing. (Includes load cell, displacement transducer, transducer bracket and penetration piston) The machine's digital display provides the ability to monitor test data in real-time, as well as the ability to see a test's peak value at a glance. Features include:

- 8" platen provides roomy, stable base for test equipment
- Provides two channels with real-time data acquisition
- Backlit LCD display for viewing test data and break values.
- Battery-backed, real-time clock
- RS232 interface for computer control and/or downloading data. (optional USB Cable is available, order HM-000379)
- Provides Chart recorder output port.
- Nonvolatile test data storage and instrument calibration
- Auto conversion of instrument calibration between English and Imperial units and SI or metric units
- User-selectable between CBR/LBR or Soil Cement tests
- User-selectable time intervals for recording test data
- Unit Auto-reverses to home position at the end of test
- Automatic triggering of test logging data
- Includes Humboldt's HMTS CBR/LBR Software Module HM-3005SW

Shipping wt. 265 lbs. (120kg)

NOTE for 220 50/60Hz operation

When HM-4156.4F is operated at 60Hz, the machine complies with ASTM D1883, .05" (1.27mm) per minute. When it is operated at 50Hz this machine complies with BS 1377: Part 4, .04" (1.00mm) per minute.

CBR-Specific Load Frame, 120V 60Hz— H-4156M

The H-4156M 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 3-1/2" (88mm). H-4156M is sold as a set with items in above chart included with load frame. Overall dimensions are: 18 x 18 x 38-1/2"H (457 x 457 x 978mm). Shipping wt. 265 lbs. (120kg)

CBR-Specific Load Frame, 220 50/60Hz— H-4156M.4F

Same specifications as the H-4156M, except 220 50/60Hz. When operated at 60Hz the machine complies with ASTM D1883, .05" (1.27mm) per minute. When it is operated at 50Hz this machine complies with BS 1377: Part 4, .04" (1.00mm) per minute. Shipping wt. 266 lbs. (121kg)

CBR Setup included with HM-4156M

Part #	Qty	Description
HM-4156M	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

Multi-Speed Load Frame, 120V 60Hz— HM-2800

Multi-Speed Load Frame, 220 50/60Hz— HM-2800.4F

The HM-2800 provides a simpler, less advanced solution for doing CBR testing than the HM-3000, while retaining the ability to assign a speed of operation between 0.008 and 2.000 inches/minute for doing the multitude of tests required by today's labs, beyond CBR. The HM-2800 pictured above shows a typical CBR setup. The HM-2800 is sold as a load frame only, order setup items separately. See page 72 for more information on the HM-2800 Load Frame. Shipping wt. 300 lbs. (136kg)

Typical CBR setup using HM-2800

Part #	Qty	Description
HM-2800	1	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



H-4156



CBR Mechanical, Loading Press— H-4156

The CBR 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. The Press, includes a H-4454.100, 11,000lbf (48.8kN) calibrated load ring, a H-4178, 1.95" (49.5mm) dia. (3 in² 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). Complies with ASTM D1883, AASHTO T193.

Two-speed Mechanical Replacement Jack— H-4156J

CBR Testing Set with H-4156 Loading Press— H-4152

H-4152 CBR Testing Set, includes:

Part #	Qty	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-4158.1	1	Dial Indicator
H-4175	4	Surcharge Weights
H-4176	4	Slotted Surcharge Weights
H-4170A	1	Density Hammer
H-4144	1	Straight Edge
H-4174	1	Cutting Edge



CBR Field Test Set— H-4152F

The CBR field test set is designed for making CBR determinations in the field and is built around a modified H-4156 Load Frame. CBR field testing can quickly yield a relative strength determination without having to rely on lab tests. Field tests involve forcing a piston into the soil and comparing the depth of penetration in relation to the load placed on the piston. Typically, the reaction load used for field testing is a heavy piece of equipment, such as a loaded dump truck. Gear Box is 2-speed model with a 10,000lbf (45kN) capacity and 3.5 inches of lift. The use of the extension and connector set provides sufficient flexibility for almost any type of height requirement. Complies with ASTM D4429.

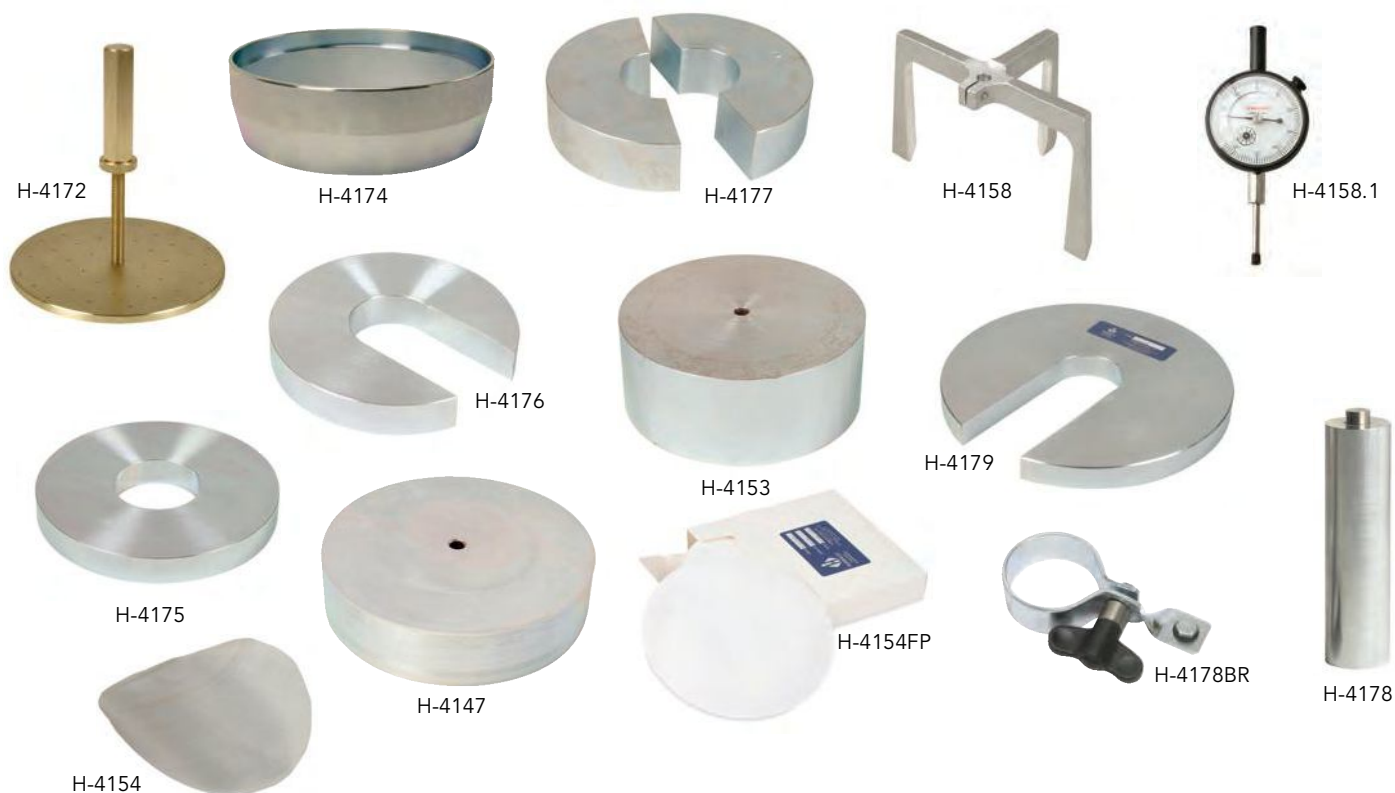
CBR Field Test Set— H-4152FM

Metric version of the H-4152F with metric-reading dial indicators.

Below is a list of the components of the Field CBR Test Kit, which can also be purchased individually.

H-4152F CBR Field Test Set, includes:

Part #	Qty	Description
H-4156J	1	2-sp. Gear Box, Handle and Platen
H-4156SB	1	Swivel Base
H-4454.020	1	2200 lbf Load Ring
H-4454.050	1	5500 lbf Load Ring
H-4152F.1	1	CBR Extension Set
H-4152F.2	1	CBR Connector Set
H-4158.1	1	Dial Indicator, 1.000" x 0.001"
H-4466.10	1	Extension Point Set of 2, 1" Length
H-4152F.8	1	Steel Bridge Support
H-4197F.10	1	Surcharge Weight, 10lb, 10" dia.
H-4179	2	Slotted Surcharge Weight, 10lb
H-4179F.20	2	Surcharge Weight, 20lb, 8.5" dia.
H-4470	1	Magnetic Indicator Mount
H-4178F.4	1	Penetration Piston, 4"



Swell Plate— H-4172

Perforated 5-7/8" (149mm) dia. base with adjustable stem. Contact end of the stem is easily locked in place with a knurled nut. Shipping wt. 5 lbs. (2.3kg)

Cutting Edge— H-4174

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. Cutting edge has 6" (152mm) ID and is 2" (51mm) high. Recess in upper section allows edge to be mounted at either end of the H-4149 or H-4151 mold to facilitate sample removal in the field. Shipping wt. 4 lbs. (2kg)

10 lb. Surcharge Weight— H-4177

10 lb. (4.5kg) Field surcharge weight, made in two parts; 5-7/8" (149mm) OD; 2-1/8" (54mm) ID Shipping wt. 11 lbs. (5.0kg)

Swell Tripod Attachment— H-4158

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. Shipping wt. 4 lbs. (2kg)

Dial Indicator— H-4158.1

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. Shipping wt. 1 lb. (.5kg)

5 lb. Surcharge Weight— H-4175

Used in the application of surcharged loads on the soil's surface during soaking and penetration. Rust-resistant, plated annular disc weighs 5 lbs. (2.3kg), 5-7/8" (149mm) OD with a 2-1/8" (54mm) ID hole in center. Shipping wt. 6 lbs. (3kg)

5 lb. Slotted Surcharge Weight— H-4176

Same as H-4175 above, except with a 2-1/8" (54mm) slot. Shipping wt. 6 lbs. (3kg)

Spacer Disc— H-4153

Disc is used as a false bottom in a soil mold during the compaction process. Plated rust-resistant steel disc is 2.416" (61mm) high, 5-15/16" (150.8mm) dia. Shipping wt. 18 lbs. (8kg)

10 lb. Slotted Surcharge Weight— H-4179

10 lb. (4.5kg) Slotted, Field surcharge weight, 8-1/2" (216mm) dia. Shipping wt. 11 lbs. (5kg)

Spacer Disc. LBR— H-4147

Disc is used as a false bottom in a soil mold during the compaction process. Plated rust-resistant steel disc is 1.416" (36mm) high, 5-15/16" (152mm) dia. Shipping wt. 3 lbs. (1kg)

Filter Paper— H-4154FP

100 pack of coarse grade paper filter, 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 Screen— H-4154

100 mesh brass screen is 5-15/16" (152mm) dia. Shipping wt. 8 lbs. (4kg)

Dial Indicator Bracket— H-4178BR

Bracket used to attach a dial indicator to the penetration piston. Shipping wt. 2 lbs. (1kg)

Penetration Piston— H-4178

CBR Penetration Piston has 3 sq. in. (19.35cm²) base area and is about 7-1/2" (191mm) long. Designed for use in conjunction with weights H-4175 and H-4176 to apply penetration surcharge loads. Shipping wt. 8 lbs. (4kg)



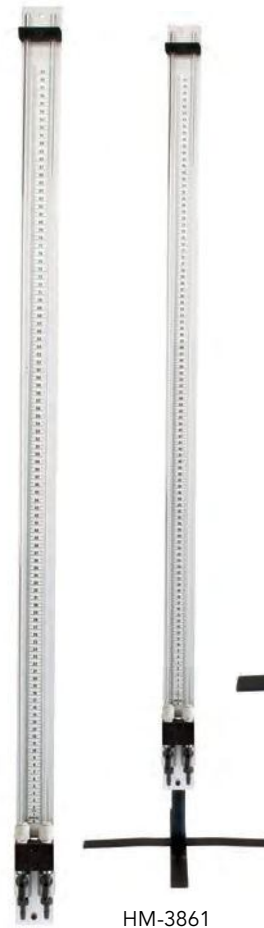
HM-3804



HM-3880



HM-3701



HM-3861



HM-3861 Detail

Constant Head Permeameter Cells

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 top stone or screen to prevent soil density changes. End caps & clamping ring of anodized aluminum. Each chamber complete with: valves; porous stones or perforated screens, depending on the diameter of sample; tubing for connection to water source and manometer tubes. Permeameters without manometer outlets available. Complies with ASTM D2434; BS 1377 Part 5. Shipping wt. 7 to 12 lbs. (3.2 to 5.4kg)

Permeameter Cells	Model
2.5" (63mm) Permeameter Cell	HM-3801
3.0" (76mm) Permeameter Cell	HM-3802
4.5" (114mm) Permeameter Cell	HM-3803
6" (152mm) Permeameter Cell	HM-3804
9" (229mm) Permeameter Cell	HM-3805

Manometer Tube Stand, Wall Mount— HM-3860

Manometer Tube Stand, Free Standing— HM-3861

Economical manometer tube setup for use with many permeameters. 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. Complies with ASTM D2434. Shipping wt. 8 lbs. (3.7kg)

Constant Head Tank, 1000cc— HM-3880

Constant Head Tank, 4000cc— HM-3881

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; rails for wall mounting with easy height adjustment and tubing for hook-up to test chamber. Shipping wt. 8 lbs. (3.7kg)

Compacting Hammer— HM-3701

Rod with sliding weights on a 2" (51mm) dia foot. Stop allows adjusting height of drop up to 8" (203mm). Includes one 1/4 lb. (100g) and one 2-1/4 lb. (1kg) weight. Shipping wt. 6 lbs. (2.72kg)



Constant/Falling Head Permeameters

For use with granular soils in determining the coefficient of permeability via the constant or falling-head method for laminar flow of water. Compact and portable unit includes manometer tube, scale and permeameter base attached to a platform. Funnel provides adjustable constant head reservoir. Spring incorporated into top cap to apply 5-10 lbs. force against top stone or screen to prevent soil density changes. End caps and clamping ring of anodized aluminum. Each set complete with: permeameter; manometer tube; two funnels; either porous stones or perforated screens depending on diameter, and tubing for connection to water source. Shipping wt. 13 lbs. (5.9kg)

Permeameter Sets	Model
2.5" (63mm) Permeameter Set	HM-3891
3.0" (76mm) Permeameter Set	HM-3892
4.5" (114mm) Permeameter Set	HM-3893
6" (152mm) Permeameter Set	HM-3894
9" (229mm) Permeameter Set	HM-3895

Compaction Permeameter, 4" — H-4145

Compaction Permeameter, 6" — H-4146

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. Complies with ASTM D5856. Shipping wt. 18 lbs. (8.16kg)

Compaction Permeameter Parts	Model
Filter Stone for H-4146	H-4148X
Porous Stone for H-4146	H-4148.6
Spring for H-4146 and H-4145	H-4145.8
Filter Stone for H-4145	H-4148
Porous Stone for H-4145	H-4184.100

Shelby Tube Permeameter, 2" — HM-3913

Shelby Tube Permeameter, 2.5" — HM-3914

Shelby Tube Permeameter, 3" — HM-3915

Allows you to perform permeability tests within a Shelby tube without removing the sample. Ideal for cohesionless 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. Shipping wt. 6 lbs. (2.72kg)

Permeability/Hydraulic Conductivity

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 triaxial 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 5 cell setups.

Fast and Easy Setup and Operation

Humboldt FlexPanels make setup fast and easy with clearly labeled ports and quick-connect hookups. 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 permeater 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.

Humboldt FlexPanels Features:

Humboldt FlexPanels provide 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 cell, top cap and base pedestal pressures. This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow for the control of 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-4150



HM-4140



HM-4150A



HM-4160



HM-4160A

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 & 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 & gauge, inlet pressure regulators & gauge, de-aired water tank controls, tap & de-aired water supply outlets, and pressure & vacuum outlets
- Comply with ASTM D5084; BS 1377 Part 6 1990.

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 five (5) burettes sets can be used with each control panel.



Rear of panel showing quick-connect hookups and plumbing.

Humboldt FlexPanels

	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)	NA	
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	50cc x 0.1 cc (ml)							
Top	10cc x 0.02 cc (ml)							
Base	10cc x 0.02 cc (ml)							
Outer Burette								
Cell	400cc (ml)							
Top	460cc (ml)							
Base	460cc (ml)							
Voltage	110/220VAC 50/60Hz						NA	
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)



Toxic Interface Unit— HM-4190

Safe and convenient means of performing permeability tests of corrosive or toxic permeants. Flexible Viton 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, Teflon, and the Viton bladder. Unit measure 8" H x 5" dia. Two units are required for each cell. Shipping wt. 6 lbs. (2.72kg)



HM-4190



HM-4188B

Permeability Cells

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 then hard-coated and Teflon-impregnated 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.



Triaxial Cells— HM-4199

For those who plan to do triaxial tests in addition to permeability testing, consider using HM-4199B and HM-4199SS Triaxial Cells for the added convenience of using one cell for both tests.

The removable base pedestal accommodates various sample diameters from 35mm to 4 inch, see charts below 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 below.

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: 13-3/4" H x 8-3/4" dia. (349.2 x 222.3mm). Overall dia. is: 11" (279.4mm). Complies with ASTM D5084.



HM-4188.28

To order individual Top Caps or Pedestal Bases, use the part number for the set of the desired size indicated at left and add a "T" suffix for a Top and a "B" suffix for a base, i.e. HM-4188.20B would be the part number for a 2" Base Pedestal.

Permeability Cells and Top Cap/Base Pedestal Sets				
Size	Standard Cell	Stainless Cell*	Anodized Aluminum**	Stainless Steel*
35mm	HM-4188B	HM-4188SS	HM-4188.35	HM-4188.35SS
1.4"			HM-4188.14	HM-4188.14SS
1.5"			HM-4188.15	HM-4188.15SS
50mm			HM-4188.50	HM-4188.50SS
2.0"			HM-4188.20	HM-4188.20SS
70mm			HM-4188.70	HM-4188.70SS
2.8"			HM-4188.28	HM-4188.28SS
100mm			HM-4188.100	HM-4188.100SS
4.0"			HM-4188.40	HM-4188.40SS



Expansion Index Consolidometer— HM-2405

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 & collar, stainless steel specimen ring and weight, 12.6 lb. (5.7kg) loading weight, and 3.99" dia. x 1/2" (101.4 x 12.5mm) porous stones. **Order dial indicator below.** 6" dia x 11" H (152 x 279 mm). Complies with ASTM D4829, California Test Method UBC 29-2.

Shipping wt. 20 lbs. (9 kg)

Dial Indicator, for HM-2405 Consolidometer— H-4471

0.5 x 0.0001" dial indicator.

Replacement Porous Stones— HM-4184.399T

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

Accessories	Model
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
Compaction Hammer	HM-3701

Soil Volume Change Meter (PVC)— HM-2415

Use 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. 7-1/4" (184 mm) dia. base x 15-1/2" (394 mm) height. Shipping wt. 30 lbs. (13.6 kg)

Compaction Base and Collar, 2.440"— HM-1975-D

Compaction Base and Collar, 2.500"— HM-1975-E

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. Shipping wt. 7 lbs. (3kg)

Basic Swell/Expansion Consolidometers—

2.440"— HM-1972-1D

2.500"— HM-1972-1E

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. Dial indicator necessary for test, choose from those listed below. Alternative loading weights are available, please enquire. Shipping wt. 8 lbs. (4kg)

Components	HM-1972-1D
Stainless steel Cutting Ring	HM-1220.24.8
Stainless steel Compaction Ring	HM-1972-3D
60 PSF Stainless steel Loading Weight	HM-1972-6D
Stainless steel Compaction Ring	HM-1972-3D
Top Porous Stone	HM-4184.240
Base Porous Stone, 3.31" dia. x 1/4" thick	HM-4184.331

Components	HM-1972-1E
Stainless steel Cutting Ring	HM-1220.25.8
Stainless steel Compaction Ring	HM-1972-3E
60 PSF Stainless steel Loading Weight	HM-1972-6E
Stainless steel Compaction Ring	HM-1972-3E
Top Porous Stone	HM-4184.2485
Base Porous Stone, 3.31" dia. x 1/4" thick	HM-4184.331

The Humboldt Geotechnical Lab

The unique concept behind the design of Humboldt's geotechnical lab equipment is accentuated by our dedication to modular design and data acquisition. All of Humboldt's primary geotechnical machines feature an integral 4-channel data logger, which allows our equipment to function as stand-alone work stations, part of a lab-wide computerized system, or anything in-between. Coupled with this is our dedication to the development of our own test-specific software, which allows you to control, collect data and run reports for all the machines in your lab.

Stand-Alone Solution

As a stand-alone solution, our geotechnical testing machines provide a simple, efficient method of obtaining test results, regardless of the size of your testing operation. No more tracking dial or digital gauge readings and making notes, our machines independently record, store and print test data. What this means for you is, if you simply want to record your test data and print it out to a printer or chart recorder, you can do that without the need for a computer. This also provides you with a great deal of versatility in setting up a lab, as well as dealing with setting up satellite labs, on-site, field locations and experimental processes; allowing you to quickly set up an independent station without having to deal with computers, loggers and networks. This stand-alone feature can also be very advantageous in a lab where you are utilizing computer-controlled machines and your computer crashes. In this scenario, because your data is being recorded and stored independently of the computer, your data is not lost and you can continue to run your tests and record your data without any downtime.

Computerized Control and Data Acquisition

In a computerized system with data acquisition, Humboldt's unique design concept for geotechnical testing equipment really reveals its strengths. In this type of setup, the same machines, which we used in the stand-alone solution can be connected to a computer running our HMTS software, which now allows you to control the actual test operations, monitor test data in real-time, capture and store test data, as well as view actual test data curves in real-time with our test-specific software modules.

Stand-Alone

The HM-3000 Load Frame used in a stand-alone mode provides you with excellent control and data-logging capabilities, while it provides you with a load frame capable of almost any type of testing you may encounter.



Computerized Control

Humboldt's design concept let's you daisy-chain our geotechnical testing equipment together, allowing you to control and collect data from all the testing machines in your lab from an individual computer station, simultaneously, in real-time.



HM-2470A.3F

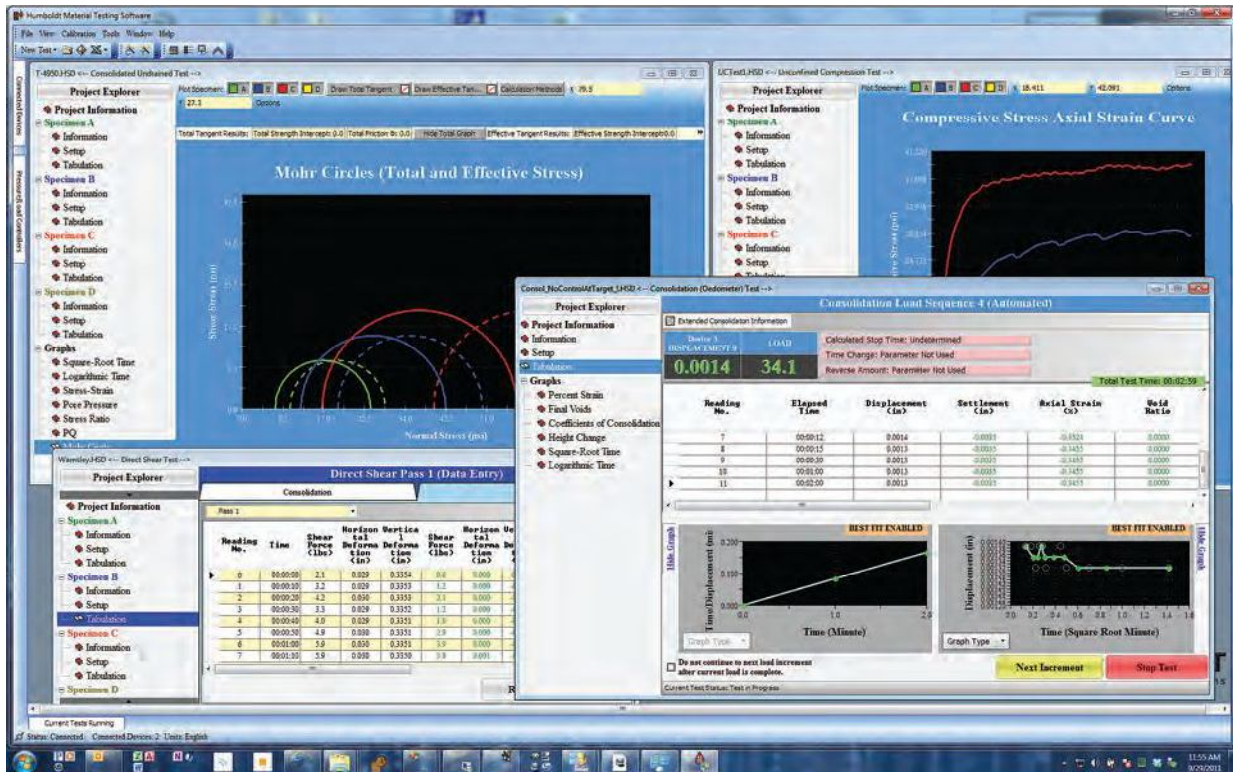
HM-2750A.3F



HM-2560A.3F



HM-4155



In a computer-controlled lab you can run myriad tests at the same time all from one computer or a number of computers, if you choose. Our highly flexible system allows you to run a bank of consolidation test machines or several triaxial tests, several direct shear tests and some consolidation tests at the same time, from the same computer, all in real-time; so you can monitor the data collection of all your tests as they run simultaneously.

Flexibility

Because our test equipment include integral data loggers, adding to a system is plug and play. You can quickly add machines to your computerized system or leave them as stand-alone stations, while still being able to export test data to computers. Our internal data loggers also make it extremely easy to move testing equipment from lab to lab quickly and easily. If you have a special project and want to move a machine to a field location, just pack it up and ship it. When it gets there you'll have the same data logging and control functions you enjoyed in your primary lab.

And, with the use of our MiniLoggers, you can also utilize existing equipment, even from other manufacturers as part of your system with full data logging capabilities. Also, our integral data loggers

HMTS software provides you the ability to control all your tests from a single computer simultaneously. You can monitor all your tests in real-time, watching the data as it is recorded and graphed.

HMTS Software

HMTS Software

From a single operation to controlling a complete geotechnical lab, Humboldt Material Testing Software (HMTS), in conjunction with compatible Humboldt testing equipment, provides a complete solution for the acquisition, recording and presentation of testing data. HMTS works in conjunction with Microsoft Excel to present test data in easy-to-read Excel workbook format files, which can be evaluated directly or sent to any computer using Microsoft Excel.



HM-2900.3F



HM-2450A.3F



HM-2325A.3F

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HM-2470A.3F
with HM-1220.25

ConMatic IPC includes:

Description	Qty	Part #
S-type Load Cell 2,000 lbs (10kN) with 3/4" adapter	1	HM-2300.020
Linear Strain Transducer, 1.0" (25mm)	1	HM-2310.10
Linear Strain Transducer Bracket	1	HM-2310BR
HMTS Consolidation Software Module	1	HM-1100SW
Ball 5/8" 440 Stainless Steel	1	HM-001076

Order Consolidation cells: page 56

**ConMatic IPC,
Automated Consolidation System,
120/220V 50/60Hz— HM-2470A.3F**

The ConMatic IPC is a fully-automated, incremental pressure controller for performing incremental consolidation and one-dimensional swell tests. The ConMatic IPC allows consolidation and constant load and volume swell tests to be run automatically, freeing up technicians for other tasks and reducing the duration of the testing procedures by more than half—effectively saving time and manpower and increasing lab profitability. One ConMatic automated system can replace the production of several manual machines—running incremental consolidation tests according to ASTM D2435 Method B, where successive load increments are applied after 100% primary consolidation.

Once a sample has been placed onto the test platform and the test conditions set, the ConMatic IPC, used in conjunction with a computer and Humboldt's HMTS software, performs all consolidation tests, including moving to the next stress level, without operator assistance. The system automatically moves through the different test parameters specified by the user with incremental consolidation tests typically being completed in 24 to 48 hours. The HMTS software records readings from the force and displacement transducers to control the unit's exceptionally accurate stepper motor. Test results are recorded and rendered in real-time on the computer screen while test data is stored and calculations are performed automatically. The HMTS software provides:

- Live tests and live graphing capabilities (real-time)
- Complete test reporting including all calculations and graphs required for testing
- Review and exporting of tests using Microsoft Excel
- Smart Test Function: automatically picks up where it left off if the test was not finished due to unexpected events within your computer

The unique design of the ConMatic IPC system enables the user to choose from multiple tests and run them independently and simultaneously.

Applicable Test Standards

ASTM: D2435, D4546, AASHTO: T216, BS: 1377:5

The ConMatic IPC system requires a supply of clean, dry compressed air and a computer, please contact Humboldt for system requirements.

Specifications	
Sample Size	up to 4" (100mm)
Maximum Load	2200lbf (10kN)
Vertical Clearance	8.25" (210mm)
Horizontal Clearance	7.75" (197mm)
Maximum Piston Travel	0.5" (12.7mm)
Dimension (L x W x H)	12 x 12 x 30 inches (305 x 305 x 762mm)
Weight	42 lbs. (19Kg)

Replacement Ball, 5/8" 440 Stainless Steel— HM-001076

**ConMatic Consolidation Machine,
120/220V 50/60Hz— HM-2432A.3F**

Compact and easy-to-use, the HM-2432A.3F pneumatic consolidation load frame is used to estimate the rate and amount of settlement anticipated for a proposed structure. The unit applies loads instantly without impact for stress-controlled consolidation testing; and, maintains the load regardless of sample compression. Its small footprint saves valuable lab counter space while maintaining its versatility by supporting fixed ring, floating ring, or permeability cells. Available with standard mechanical dial gauge, digital indicators or with strain transducers (LSCT) coupled to one of our data loggers. Complies with ASTM D2435, D4546; AASHTO T216; BS 1377 part 5. Shipping wt. 49 lbs. (22kg)

TSF Model

Con-Matic 32 TSF, 110/220V 50/60Hz— HM-2432A.3F

kg/cm² Model

Con-Matic 32 kg/cm², 110/220V 50/60Hz— HM-2432AM.3F

Consolidation (Pneumatic) Typical Setups:

Part #	Qty	Description
Pneumatic Consolidation		
HM-2432A.3F	1	ConMatic 32 TSF, 110/220 50-60Hz
HM-1220.XX	1	Fixed Ring Consolidation Cell
H-4471CC	1	Dial Gauge, 0.5" X .0001" CC
Pneumatic Consolidation w/ Analog Transducer Data Acquisition		
HM-2432A.3F	1	ConMatic 32 TSF, 110/220 50-60Hz
HM-1220.XX	1	Fixed Ring Consolidation Cell
HM-2310.04	1	Strain Transducer 0.4" (10mm)
HM-2310BR	1	Strain Transducer Bracket
HM-2325A.3F	1	MiniLogger 4 CH Analog Data Acquisition
HM-1100SW	1	HMTS Consolidation Reporting Software
Pneumatic Consolidation w/ Digital Indicator Data Acquisition		
HM-2432A.3F	1	ConMatic 32 TSF, 110/220 50-60Hz
HM-1220.XX	1	Fixed Ring Consolidation Cell
HM-4469.10	1	Digital Indicator 1" x .0001" (25 x 0.002 mm)
HM-4469C	1	Data Cable for Indicator
HM-2330D.3F	1	MiniLogger 4 CH Digital Data Acquisition
HM-1100SW	1	HMTS Consolidation Reporting Software

Part Numbers ending in .XX require a size code to be entered referring to the sample size to be tested.

For Consolidation samples, sizes are: .20 = 2.0"; .242 = 2.42"; .25 = 2.5"; .30 = 3.0"; .40 = 4.0"; .50 = 50mm; .70 = 70mm; .75 = 75mm, and .100 = 100mm.

HM-1100SW HMTS Reporting Software and the ConMatic

The ConMatic includes the Advanced, Module level of the Humboldt Material Testing Software (HMTS), which provides a complete solution for the acquisition, recording and presentation of test data, as well as controlling testing operations when used in conjunction with compatible Humboldt testing equipment. Using the HM-1100SW Advanced Module of the HMTS software in conjunction with the ConMatic provides a complete automatic solution for consolidation testing. The HMTS controls the test functions and automatically records data while also displaying it in real-time tables and graphs. Technicians can be freed-up for other duties with the assurance that all test data is being collected and saved.



HM-2432A.3F

Features include:

- Highly sensitive and accurate in lower load ranges
- Integral digital readout simplifies checking applied load and setup of predetermined load
- Adjustable upper cross beam
- Instantaneous loading without impact
- Flexible load choice
- Not sensitive to shock
- Choice of English or Metric models



HM-2432A.3F with HM-1220.25, HM-2310.10, HM-2310BR and HM-2325A.3F



HM-2432A.3F with HM-1220.25, HM-4469C, HM-4469.10 and HM-2330D.3F

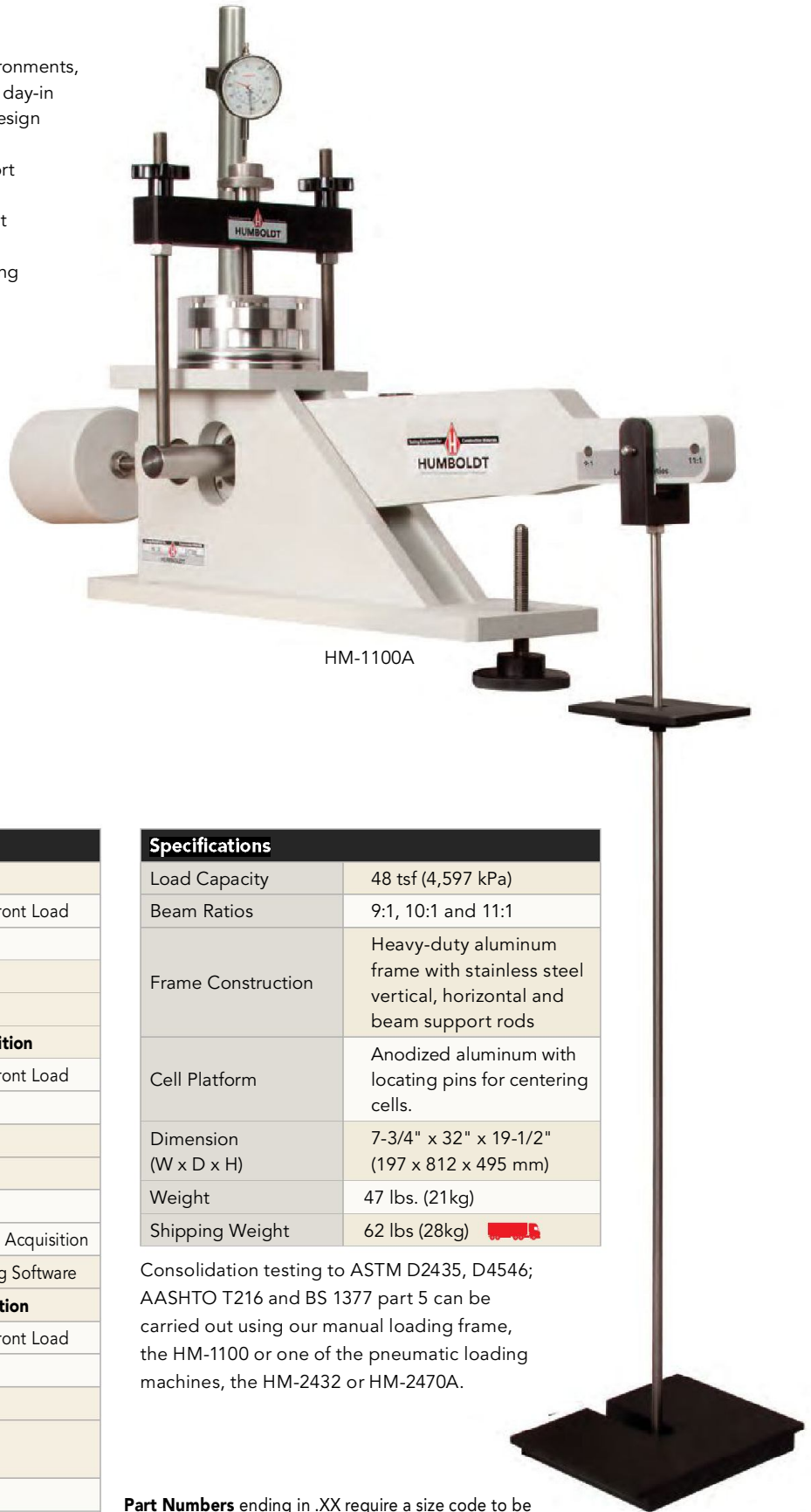


Dead-Weight Consolidation Frame— HM-1100A

Able to survive in even the harshest laboratory environments, the HM-1100A will provide you with reliable service day-in and day-out. The design features a rugged frame design manufactured from aluminum with stainless steel vertical rods, horizontal cross arms and beam support rods. The load arm incorporates 9:1, 10:1, and 11:1 beam ratios for greater flexibility and loading weight requirements. Using the 10:1 ratio on 2.5" (63 mm) diameter samples, the system is capable of producing load up to 48 tsf (4,597 kPa).

Features include:

- Triple beam ratios minimize loading weight requirements
- 48 tsf (5,148 kPa) maximum load capacity
- Aluminum and stainless steel construction for corrosion resistance and long life
- Wide range of consolidation cells available in fixed ring, floating ring, permeability and backpressure designs
- Loading weights available in both, tsf and kg versions
- Available with standard mechanical dial gauges, digital indicators or with strain transducers (LSCT) coupled to one of our data loggers




HM-1100A

Consolidation (Dead Weight) Typical Setups:

Part #	Qty	Description
Dead Weight Consolidation		
HM-1100A	1	Dead Weight Consol Frame-Front Load
HM-1120*	1	Weight Set, 16 TSF
HM-1220.XX	1	Fixed Ring Consolidation Cell
H-4471CC	1	Dial Gauge, 0.5" X .0001" CC
Dead Weight Consolidation w/ Analog Data Acquisition		
HM-1100A	1	Dead Weight Consol Frame-Front Load
HM-1120*	1	Weight Set, 16 TSF
HM-1220.XX	1	Fixed Ring Consolidation Cell
HM-2310.04	1	Strain Transducer 0.4" (10mm)
HM-2310BR	1	Strain Transducer Bracket
HM-2325A.3F	1	MiniLogger 4 CH Analog Data Acquisition
HM-1100SW	1	HMTS Consolidation Reporting Software
Dead Weight Consolidation w/ Digital Data Acquisition		
HM-1100A	1	Dead Weight Consol Frame-Front Load
HM-1120*	1	Weight Set, 16 TSF
HM-1220.XX	1	Fixed Ring Consolidation Cell
HM-4469.10	1	Digital Indicator 1" x .0001" (25 x 0.002 mm)
HM-4469C	1	Data Cable for Indicator
HM-2330D.3F	1	MiniLogger 4 CH Digital Data Acquisition
HM-1100SW	1	HMTS Consolidation Reporting Software

Specifications

Load Capacity	48 tsf (4,597 kPa)
Beam Ratios	9:1, 10:1 and 11:1
Frame Construction	Heavy-duty aluminum frame with stainless steel vertical, horizontal and beam support rods
Cell Platform	Anodized aluminum with locating pins for centering cells.
Dimension (W x D x H)	7-3/4" x 32" x 19-1/2" (197 x 812 x 495 mm)
Weight	47 lbs. (21kg)
Shipping Weight	62 lbs (28kg) 

Consolidation testing to ASTM D2435, D4546; AASHTO T216 and BS 1377 part 5 can be carried out using our manual loading frame, the HM-1100 or one of the pneumatic loading machines, the HM-2432 or HM-2470A.

Part Numbers ending in .XX require a size code to be entered referring to the sample size to be tested.

For Consolidation samples, sizes are: .20 = 2.0"; .242 = 2.42"; .25 = 2.5"; .30 = 3.0"; .40 = 4.0"; .50 = 50mm; .70 = 70mm; .75 = 75mm, and .100 = 100mm.

*For Metric applications, use HM-1122, Weight Set, 32kg.

Typical Consolidation Data Acquisition Setups Using Humboldt MiniLoggers



HM-1100A
with HM-1220.25,
HM-2310.10,
HM-2310BR,
and HM-2325A.3F



HM-1100A
with HM-1220.25,
HM-4469C, HM-4469.10
and HM-2330D.3F

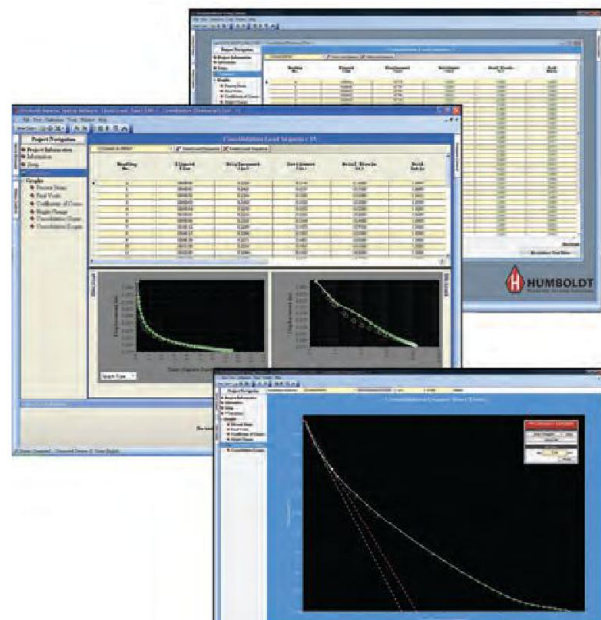
HMTS Reporting Software, Consolidation Module— HM-1100SW

Humboldt Material Testing Software (HMTS) provides a complete solution for the acquisition, recording and presentation of test data, as well as controlling testing operations when used in conjunction with compatible Humboldt testing equipment. HMTS works in conjunction with Microsoft Excel to present test data in easy-to-read Excel workbook format files, which can be evaluated directly or sent to any computer using Microsoft Excel.

The Consolidation Module provides a simple, test-specific interface to control Consolidation test operations and automatically record data while also displaying it in real-time tables and graphs. Technicians can be freed-up for other duties with the assurance that all test data is being collected and saved.

- Test Information is stored, and all calculations are performed automatically
- Live tests and live graphing capabilities (real-time)
- Complete test report including all calculations and graphs required for testing
- Review and export tests using Microsoft Excel

See page 84 and 85 for more information on HMTS software.



Single-Station Frame Stand— HM-1100.1
Triple-Station Frame Stand— HM-1100.3

Butcher Block Table-top with heavy-duty, steel frame designed to provide stable mounting platform for HM-1100A Consolidation frames. Consolidation frames can be bolted to table too and table can be bolted to floor for increased stability.

Single: Shipping wt. 50 lbs. (23kg)

Triple: Shipping wt. 75 lbs. (34kg)



Fixed Ring Consolidation Cell—

Complete cell assembly features stainless steel construction and self-trimming cutter ring. Cutter ring rests inside clamping ring on lower porous stone, which is larger than the sample. The top porous stone and loading pad rest on the sample. The assembly is fixed on the cell base and enclosed within an acrylic cylinder open to the atmosphere, which permits saturation of the sample. The cell comes complete with all the parts illustrated in the drawing below.



Fixed Ring Consolidation Cell	
2.0"	HM-1220.20
2.42"	HM-1220.242
2.5"	HM-1220.25
3.0"	HM-1220.30
4.0"	HM-1220.40
50mm	HM-1220.50
70mm	HM-1220.70
75mm	HM-1220.75
100mm	HM-1220.100

Floating Ring Consolidation Cell—

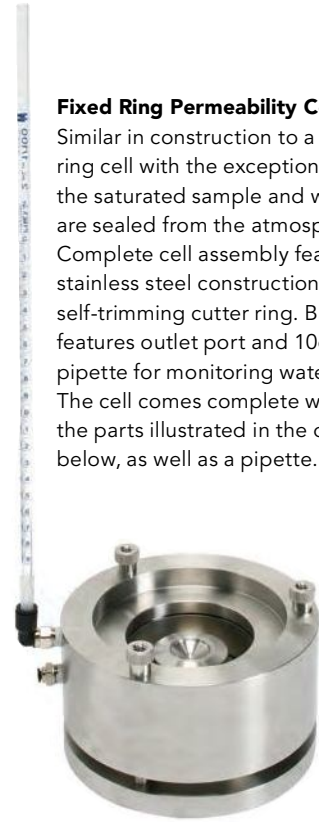
Complete cell assembly features stainless steel construction with self-trimming cutter ring. Similar in construction to a fixed ring cell with the exception that the lower porous stone fits inside the cutter ring and can move vertically within it. The sample ring is also free to move vertically. The cell comes complete with all the parts illustrated in the drawing below.



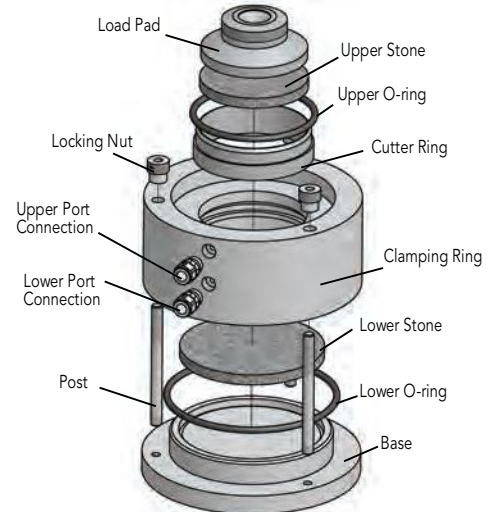
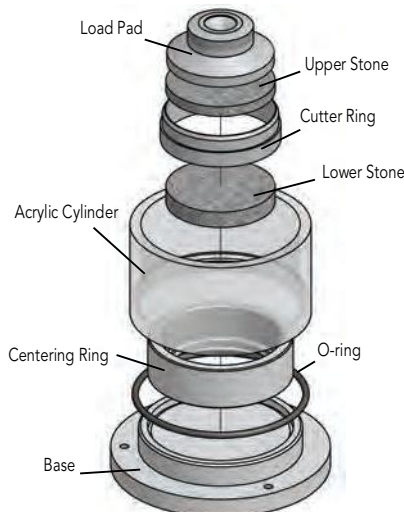
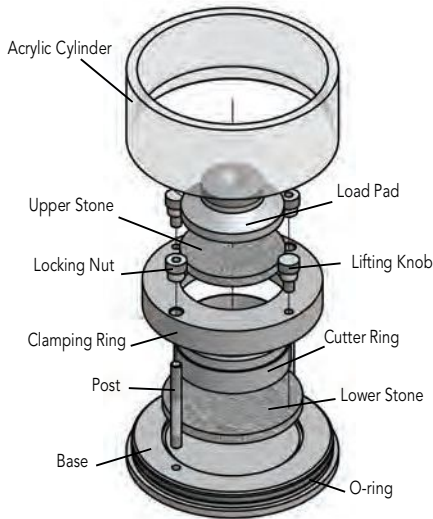
Floating Ring Consolidation Cell	
2.0"	HM-1210.20
2.42"	HM-1210.242
2.5"	HM-1210.25
3.0"	HM-1210.30
4.0"	HM-1210.40
50mm	HM-1210.50
70mm	HM-1210.70
75mm	HM-1210.75
100mm	HM-1210.100

Fixed Ring Permeability Cell—

Similar in construction to a fixed ring cell with the exception that the saturated sample and water are sealed from the atmosphere. Complete cell assembly features stainless steel construction and self-trimming cutter ring. Base features outlet port and 10cc pipette for monitoring water level. The cell comes complete with all the parts illustrated in the drawing below, as well as a pipette.



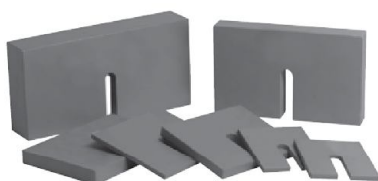
Fixed Ring Permeability Cell	
2.0"	HM-1230.20
2.42"	HM-1230.242
2.5"	HM-1230.25
3.0"	HM-1230.30
4.0"	HM-1230.40
50mm	HM-1230.50
70mm	HM-1230.70
75mm	HM-1230.75
100mm	HM-1230.100



Consolidation Cell Components									
	2.0"	2.42"	2.5"	3.0"	4.0"	50mm	70mm	75mm	100mm
Load Pad (All)	HM-1220.20.10	HM-1220.24.10	HM-1220.25.10	HM-1220.30.10	HM-1220.40.10	HM-1220.50.10	HM-1220.70.10	HM-1220.75.10	HM-1220.100.10
Upper Stone (All)	HM-4184.1985	HM-4184.240	HM-1220.25.11* HM-4184.2485	HM-4184.2985	HM-4184.3985	HM-4184.1955	HM-4184.274	HM-4184.2940	HM-4184.3925
Lower Stone (Floating)	HM-4184.1985	HM-4184.240	HM-4184.2485	HM-4184.2985	HM-4184.3985	HM-4184.1955	HM-4184.274	HM-4184.2940	HM-4184.3925
Lower Stone (Fixed & Permability)	HM-4184.331	HM-4184.331	HM-4184.331	HM-4184.331	HM-4184.4375T	HM-4184.331	HM-4184.331	HM-4184.331	HM-4184.4375T
Acrylic Cylinder (Fixed)	HM-1220.25.2	HM-1220.25.2	HM-1220.25.2	HM-1220.25.2	HM-1220.40.2	HM-1220.25.2	HM-1220.25.2	HM-1220.25.2	HM-1220.40.2
Acrylic Cylinder (Floating)	HM-1210.25.2	HM-1210.25.2	HM-1210.25.2	HM-1210.25.2	HM-1210.40.2	HM-1210.25.2	HM-1210.25.2	HM-1210.25.2	HM-1210.40.2
Centering Ring (Floating)	HM-1210.20.12	HM-1210.24.12	HM-1210.25.12	HM-1210.30.12	HM-1210.40.12	HM-1210.50.12	HM-1210.70.12	HM-1210.75.12	HM-1210.100.12
Clamping Ring (Permability)	HM-1230.20.9	HM-1230.24.9	HM-1230.25.9	HM-1230.30.9	HM-1230.40.9	HM-1230.50.9	HM-1230.70.9	HM-1230.75.9	HM-1230.100.9
Clamping Ring (Fixed)	HM-1220.20.9	HM-1220.24.9	HM-1220.25.9	HM-1220.30.9	HM-1220.40.9	HM-1220.50.9	HM-1220.70.9	HM-1220.75.9	HM-1220.100.9
Base (Floating & Permability)	HM-1230.25.1	HM-1230.25.1	HM-1230.25.1	HM-1230.25.1	HM-1230.40.1	HM-1230.25.1	HM-1230.25.1	HM-1230.25.1	HM-1230.40.1
Base (Fixed)	HM-1220.25.1	HM-1220.25.1	HM-1220.25.1	HM-1220.25.1	HM-1220.40.1	HM-1220.25.16	HM-1220.25.1	HM-1220.25.1	HM-1220.40.1
Cutter Ring (All)	HM-1220.20.8	HM-1220.24.8	HM-1220.25.8	HM-1220.30.8	HM-1220.40.8	HM-1220.50.8	HM-1220.70.8	HM-1220.75.8	HM-1220.100.8
Lower O-ring (Floating & Permability)	HM-003053	HM-003053	HM-003053	HM-003053	HM-003056	HM-003053	HM-003053	HM-003053	HM-003056
Lower O-ring (Fixed)	HM-003052	HM-003052	HM-003052	HM-003052	HM-003024	HM-003052	HM-003052	HM-003052	HM-003024
Upper O-ring (Permability)	HM-003057	HM-003058	HM-003054	HM-003059	HM-003060	HM-003057	HM-003061	HM-003062	HM-003063
Post (All)	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3	HM-1220.25.3
Locking Nut (All)	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5	HM-1220.25.5
Lifting Knob (All)	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6	HM-1220.25.6
Port Connection Upper (Permability)	HM-003027	HM-003027	HM-003027	HM-003027	HM-003027	HM-003027	HM-003027	HM-003027	HM-003027
Port Connection Lower (Permability)	HM-003055	HM-003055	HM-003055	HM-003055	HM-003055	HM-003055	HM-003055	HM-003055	HM-003055
Filter Paper	HM-4189.20	HM-4189.25	HM-4189.25	HM-4189.30	HM-4189.40	HM-4189.20	HM-4189.28	HM-4189.30	HM-4189.40
Calibration Disk	HM-1220.20.4	HM-1220.24.4	HM-1220.25.4	HM-1220.30.4	HM-1220.40.4	HM-1220.50.4	HM-1220.70.4	HM-1220.75.4	HM-1220.100.4

*this stone has a threaded stud; order HM-4184.2485 if no stud is desired.

Individual Weights and Sets—							
TSF Weight	0.125 (1/8)	0.25 (1/4)	0.50 (1/2)	1.0	2.0	4.0	
Model No.	HM-1120.125	HM-1120.250	HM-1120.500	HM-1120.1	HM-1120.2	HM-1120.4	
KGF Weight	0.5 kg	1.0 kg	2.0 kg	4.0 kg	5.0 kg	8.0 kg	10.0 kg
Model No.	HM-1122.05	HM-1122.1	HM-1122.2	HM-1122.4	HM-1122.5	HM-1122.8	HM-1122.10



Weight Set	Set Includes	Model No.	Shpg. Wt.
16 TSF Set	includes: (2) .125 TSF, (1) .25 TSF, (1) .50 TSF, (1) 1.0 TSF, (1) 2.0 TSF, (3) 4.0 TSF weights	HM-1120	Shipping wt. 140 lbs. (64kg)
32 TSF Set	includes: (2) .125 TSF, (1) .25 TSF, (1) .50 TSF, (1) 1.0 TSF, (1) 2.0 TSF, (7) 4.0 TSF weights	HM-1121	Shipping wt. 275 lbs. (125kg)
32 kgf Set	includes: (4) 1 kg, (3) 4 kg, (2) 8 kg weights	HM-1122	Shipping wt. 130 lbs. (59kg)
50 kgf Set	includes: (3) 1 kg, (1) 2 kg, (1) 5 kg, (4) 10 kg weights	HM-1125	Shipping wt. 110 lbs. (50kg)
64 kgf Set	includes: (4) 1 kg, (5) 4 kg, (5) 8 kg weights	HM-1123	Shipping wt. 110 lbs. (50kg)
88 kgf Set	includes: (4) 1 kg, (5) 4 kg, (8) 8 kg weights	HM-1124	Shipping wt. 130 lbs. (59kg)

Testing Equipment for  Construction Materials

HUMBOLDT

NEW!

Counter-balance device for ASTM D3080 compliance. Not available anywhere else. Also available as a retrofit kit. HM-2560A.1



HM-2560A.3F

Features include:

- Four channels with real-time data acquisition
- Backlit LCD display
- RS232 interface for computer or printer.
- Nonvolatile test data storage and instrument calibration
- Can be programmed to complete up to 99 shearing cycles automatically using HM-2700SW Software.
- Battery-backed real-time clock
- Auto conversion of instrument calibration between English or Imperial units and SI or metric units
- Test setup and selection via keypad
- Automatic triggering of test logging data
- View logged test data via the LCD display
- Logging rate as fast as 0.1 second/reading
- Humboldt HMTS, Basic, User-Defined Level software included for data acquisition

**Pneumatic Direct/Residual Shear Apparatus,
110/220 VAC 50/60Hz— HM-2560A.3F**

The Humboldt 25Sixty Shear, Direct/Residual Shear Apparatus, utilizes the pneumatic loading concept for applying the vertical load to the sample. In doing so, this self-contained model eliminates the need for cumbersome loading weights used in dead weight-type systems.


The microprocessor-based system features a stepper motor drive system, large display, touch-sensitive keypad and forward/reverse travel limit switches. Through the use of a built-in 4-channel data acquisition system, the operator can preset the logging condition for the test.

Built to last in the harshest laboratory environments, the vertical/horizontal loading mechanism and shear box assembly are mounted on a 1.25" (30mm) thick solid aluminum base and heavy-gage enamel painted steel cabinet. The strain rods are manufactured from stainless steel and the shearbox carriage (water chamber) is constructed of anodized cast aluminum for corrosion resistance and long service life. The shearbox is constructed of anodized aluminum for light weight.

The HM-2560A is supplied complete with a 2,000 lbf (10kN) capacity load cell, 1" (25.4mm) horizontal strain transducer, 0.4" (10.2mm) vertical strain transducer and a built-in 4-channel analog data acquisition system. Shearbox assemblies and related accessories are not included and must be ordered separately. Complies with ASTM D3080, AASHTO T236 and BS1377:7 standards.

Replacement Ball, 5/8" 440 Stainless Steel— HM-001076

Specifications

Horiz. Movement	2" (50mm) maximum
Horiz. Shear Force	2,000 lbf (10kN)
Vertical Load	2,000 lbf (10kN)
Speed Range	0.00001 to 0.49999 in/min. (0.00001 to 12.99999 mm/min.)
Voltage	110/220 VAC 50/60HZ
Current	6.5 Amps
Analog to Digital	16 bit
Data Storage	4000 Readings
Data Collection Rate	100 ms
Computer Port	RS232
Dimension (W x D x H)	30 x 15.5 x 22" (L x D x H) (760 x 394 x 558mm)
Weight	140 lb (64 kg)
Shipping Weight	168 lb (76 kg) 

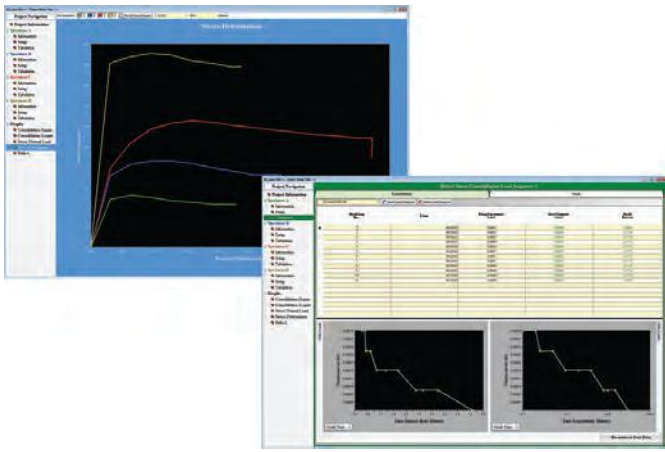
Pneumatic Direct/Residual Shear Typical Setup:

Part #	Qty	Description
Pneumatic, Computer Control w/ Analog Instrumentation		
HM-2560A.3F	1	25Sixty Shear w/ Analog Inputs
HM-2701.XX(S/D)	1	Shearbox Assembly
HM-2702.XX(S/D)	1	Shearbox Cutter
HM-2703.XX(S/D)	1	Dolly/Tamper
HM-2700SW	1	HMTS Direct Shear Reporting Software

Part Numbers ending in .XX require a size code to be entered referring to the sample size to be tested.

For Direct/Residual Shear samples, sizes are: .20 = 2.0"; .242 = 2.42"; .25 = 2.5"; .40 = 4.0"; .50 = 50mm; .60 = 60mm, and .100 = 100mm.

NOTE: For Direct/Residual Shear, also, use "S" for square and "D" for round samples.



HM-2703.60S



HM-2702.60S

HM-2704.60S

Accessory	Model
Cutter	HM-2702.XXS/D
Dolly Tamper	HM-2703.XXS/D
Porous Plate	HM-2704.XXS/D
Calibration Disk, Square	HM-2705.XXS
Calibration Disk, Round	HM-1220.XX.4

Part Numbers ending in .XX require a size code to be entered referring to the sample size to be tested.

For Direct/Residual Shear samples, sizes are:
 .20 = 2.0"; .24 = 2.42"; .25 = 2.5"; .40 = 4.0";
 .50 = 50mm; .60 = 60mm, and .100 = 100mm.

NOTE: For Direct/Residual Shear, also, use "S" for square and "D" for round samples.

HMTS Reporting Software, Direct/Residual Shear Module— HM-2700SW

Humboldt Material Testing Software (HMTS) provides a complete solution for the acquisition, recording and presentation of test data, as well as controlling testing operations when used in conjunction with compatible Humboldt testing equipment. HMTS works in conjunction with Microsoft Excel to present test data in easy-to-read Excel workbook format files, which can be evaluated directly or sent to any computer using Microsoft Excel. The Direct/Residual Shear Module provides a simple, test-specific interface to control Shear test operations and automatically record data while also displaying it in real-time tables and graphs. Technicians can be freed-up for other duties with the assurance that all test data is being collected and saved.

- Test Information is stored, and all calculations are performed automatically
- Live tests and live graphing capabilities (real-time)
- Complete test report including all calculations and graphs required for testing
- Review and export tests using Microsoft Excel

See page 84 and 85 for more information on HMTS software.



HM-2701.25D

HM-2701.60S

HM-2751.60S

HM-2751.25D

Shearbox Assemblies for use with HM-2560A.3F and HM-2750.3F Direct Shear Machines

Round Shearbox Assemblies		
Use with:	HM-2560A.3F	HM-2750.3F
Size	Model	Model
2.0"	HM-2701.20D	HM-2751.20D
2.42"	HM-2701.24D	HM-2751.24D
2.5"	HM-2701.25D	HM-2751.25D
4.0"	HM-2701.40D	HM-2751.40D
50mm	HM-2701.50D	HM-2751.50D
60mm	HM-2701.60D	HM-2751.60D
100mm	HM-2701.100D	HM-2751.100D

Square Shearbox Assemblies		
Use with:	HM-2560A.3F	HM-2750.3F
Size	Model	Model
2.0"	HM-2701.20S	HM-2751.20S
2.42"	HM-2701.24S	HM-2751.24S
2.5"	HM-2701.25S	HM-2751.25S
4.0"	HM-2701.40S	HM-2751.40S
50mm	HM-2701.50S	HM-2751.50S
60mm	HM-2701.60S	HM-2751.60S
100mm	HM-2701.100S	HM-2751.100S

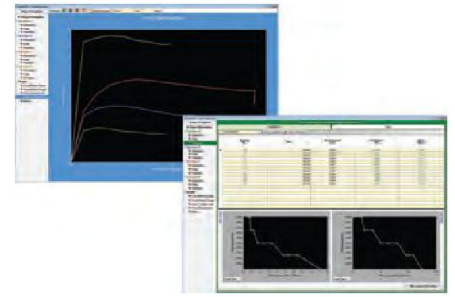
Shearbox Assemblies include: Sample Box, (2) Porous Plates, (1) Loading Pad, and (1) Grid Plate. All Shearboxes feature mounting screws for use with the HM-2750 ASTM D3080-compliant counter-balance device.



HM-2750A.3F

NEW!

Counter-balance device for ASTM D3080 compliance. Not available anywhere else. Also available as a retrofit kit. HM-2560A.1


HMTS Reporting Software, Direct/Residual Shear Module— HM-2700SW

The Direct/Residual Shear Module provides a simple, test-specific interface to control Shear test operations and automatically record data while also displaying it in real-time tables and graphs. See page 84 and 85 for more information.

Models A and D Feature:

- Backlit LCD display
- Nonvolatile test data storage and instrument calibration
- Battery-backed real-time clock
- Auto conversation of instrument calibration between English or Imperial units and SI or metric units
- Test setup and selection via keypad
- Automatic triggering of test logging data
- View logged test data via the LCD display
- Logging rate as fast as 0.1 second/reading
- Four channels with real-time data acquisition
- RS-232 interface for computer or printer.
- Humboldt HMTS, Basic, User-Defined Level software included for data acquisition

Direct/Residual Shear, Standard Controller, 120/220V 50/60Hz— HM-2750.3F**Metric, Direct/Residual Shear, Standard Controller, 120/220V 50/60Hz— HM-2750M.3F****Direct/Residual Shear, Analog Controller, 120/220V 50/60Hz— HM-2750A.3F****Direct/Residual Shear, Digital Controller, 120/220V 50/60Hz— HM-2750D.3F**

The Humboldt HM-2750 Series Direct/Residual Shear Machines are an economical choice for performing direct/residual shear tests utilizing the deadweight method. The HM-2750s come in three different configurations: a standard controller model with load rings and dial gauges; a controller with four analog instrumentation channel inputs, an RS-232 Port and RS-485 Input and Output, including the necessary analog transducers; and, a controller with four Digital instrumentation channel inputs, an RS-232 Port and RS-485 Input and Output, including the necessary digital indicators.

All models include the carriage, stand, vertical load hanger and a balanced lever loading arm with a 10:1 ratio that reduces the weight required to perform tests. The microprocessor-based system features a stepper motor drive system, large display, touch-sensitive keypad and forward/reverse travel limit switches.

All models allow for rapid and easy manual adjustment of shearing force speed rates. The maximum shear force is 2000 lbf (10kN), and, the maximum consolidation force is 2000 lbf (10kN). The carriage accepts shear box squares up to 4.0" (100mm) internal dimension. Forward and reverse measurements permit residual shear testing as standard. A built-in safety feature prevents the overloading of the load measuring system. Complies with ASTM D3080, AASHTO T236 and BS1377:7 standards.

Specifications	
Horiz. Movement	2" (50.0mm) maximum
Horiz. Shear Force	2,000 lbf (10kN)
Vertical Load	2,000 lbf (10kN)
Speed Range	0.00001 to 0.49999 in/min. (0.00001 to 12.99999 mm/min.)
Voltage	110/220 VAC 50/60HZ
Current	6.5 Amps
Analog to Digital	16 bit
Data Storage	4000 Readings
Data Collection Rate	100 ms
Computer Port	RS232
Dimension (W x D x H)	40 x 10 x 45" (L x D x H) (1016 x 254 x 1143mm)
Weight	230 lbs.
Shipping Weight	288lb (131kg)

Model Configurations

Dead Weight with Manual Control			
Description	Qty	Part #	
Direct Residual Shear Apparatus 10:1	1	HM-2750.3F	
Shearbox Assembly	1	HM-2751.XX (S/D)	
Shearbox Cutter	1	HM-2702.XX (S/D)	
Dolly/Tamper	1	HM-2703.XX (S/D)	
Weight Set, 16 TSF	1	HM-1120*	

Typical setup for HM-2750.3F for Metric version
HM-2750M.3F the dial indicators are in mm



HM-2750.3F
HM-2750M.3F

Dead Weight w/ Analog Transducer Data Acquisition			
Description	Qty	Part #	
Direct Shear w/ Analog Inputs	1	HM-2750A.3F	
Shearbox Assembly	1	HM-2751.XX(S/D)	
Shearbox Cutter	1	HM-2702.XX(S/D)	
Dolly/Tamper	1	HM-2703.XX(S/D)	
Weight Set, 16 TSF	1	HM-1120*	
HMTS Direct Shear Reporting Software	1	HM-2700SW	



HM-2750A.3F

Dead Weight, w/ Digital Gauge Data Acquisition			
Description	Qty	Part #	
Direct Shear w/ Digital Inputs	1	HM-2750D.3F	
Shearbox Assembly	1	HM-2751.XX (S/D)	
Shearbox Cutter	1	HM-2702.XX (S/D)	
Dolly/Tamper	1	HM-2703.XX (S/D)	
Weight Set, 16 TSF	1	HM-1120*	
HMTS Direct Shear Reporting Software	1	HM-2700SW	



HM-2750D.3F

Replacement Ball, 5/8" 440 Stainless Steel— HM-001076

Part Numbers ending in .XX require a size code to be entered referring to the sample size to be tested.

For Direct/Residual Shear samples, sizes are: .20 = 2.0"; .242 = 2.42"; .25 = 2.5"; .40 = 4.0"; .50 = 50mm; .60 = 60mm, and .100 = 100mm.

NOTE: For Direct/Residual Shear, also, use "S" for square and "D" for round samples.

*For Metric applications, use HM-1122, Weight Set, 32kg.

Individual Weights and Sets—

TSF Weight	0.125 (1/8)	0.25 (1/4)	0.50 (1/2)	1.0	2.0	4.0	
Model No.	HM-1120.125	HM-1120.250	HM-1120.500	HM-1120.1	HM-1120.2	HM-1120.4	
KGF Weight	0.5 kg	1.0 kg	2.0 kg	4.0 kg	5.0 kg	8.0 kg	10.0 kg
Model No.	HM-1122.05	HM-1122.1	HM-1122.2	HM-1122.4	HM-1122.5	HM-1122.8	HM-1122.10

Weight Set	Set Includes	Model No.
16 TSF Set	includes: (2) .125 TSF, (1) .25 TSF, (1) .50 TSF, (1) 1.0 TSF, (1) 2.0 TSF, (3) 4.0 TSF weights	HM-1120
32 TSF Set	includes: (2) .125 TSF, (1) .25 TSF, (1) .50 TSF, (1) 1.0 TSF, (1) 2.0 TSF, (7) 4.0 TSF weights	HM-1121
32 kgf Set	includes: (4) 1 kg, (3) 4 kg, (2) 8 kg weights	HM-1122
50 kgf Set	includes: (3) 1 kg, (1) 2 kg, (1) 5 kg, (4) 10 kg weights	HM-1125
64 kgf Set	includes: (4) 1 kg, (5) 4 kg, (5) 8 kg weights	HM-1123
88 kgf Set	includes: (4) 1 kg, (5) 4 kg, (8) 8 kg weights	HM-1124



Humboldt Triaxial Testing Systems—

Humboldt provides an extensive line of triaxial testing equipment solutions for today's soil labs. At the heart of our triaxial testing equipment is the Humboldt Concept of providing a modular system of interchangeable, stand-alone components that when combined create highly-versatile systems. This modular concept allows you to easily create a custom solution for your needs, as well as having the ability of taking advantage of upgrades and new technology, while not being locked into an obsolete proprietary system.

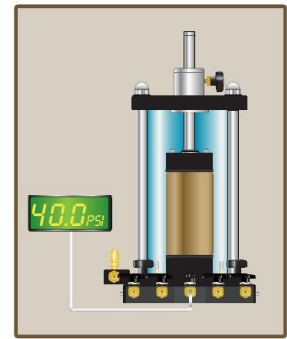
Presented below and on the following pages are three triaxial systems based around our HM-3000 and HM-2900 load frames, our HMTS software with triaxial-specific software modules and three different pressure control solutions.

Automated Pressure Control Triaxial System— Designed for those who want the ultimate in control of their triaxial testing, Humboldt's Automated Pressure Control Triaxial System is a computer-controlled system specifically designed for soil testing laboratories conducting UU, CU and CD Triaxial tests, as well as Unconfined Compression.

It is perfect for large, high-volume labs, as well as those who want to utilize technology to increase staff efficiencies and testing accuracy. This system provides complete control of the testing process including data acquisition.

Available in one or three-cell configurations, our automated control panels can handle your testing needs in stride. And, if you want to increase the number of simultaneous tests you can run, Humboldt's HMTS software can easily handle a multitude of tests. All you need to do is add cells and the other appropriate equipment to handle your needs. With the HMTS you will be able to monitor up to 64 sensor signals from a single computer.

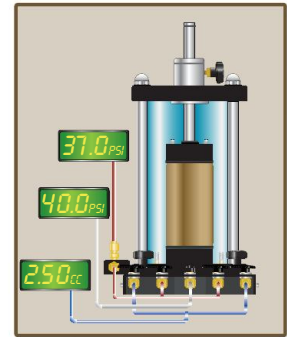
Humboldt's Automated Pressure Control Triaxial System is built around the HM-2450A Stand-alone Pressure Controller, our HMTS test-specific software, which monitors, controls and reports the test data, and, the highly-regarded HM-3000 Load Frame, with its built-in, 4-channel data acquisition for stress, strain, pore water pressure and volume change measurement. The system can



UU-Triaxial Test Typical Cell Setup



CU-Triaxial Test Typical Cell Setup



CD-Triaxial Test Typical Cell Setup



also be configured for use with our Triaxial-specific Load Frame, the HM-2900. While Humboldt's Automated Pressure Control Triaxial System has been designed to work as a complete system, its make-up provides for the ultimate in versatility and expanded possibilities.

See pages 64-65 for a complete component list for the Automated Pressure Control Triaxial System

Manual Pressure Control Triaxial System—

Humboldt's Manual Pressure Control Triaxial System provides a manually-controlled alternative to our automated system. The manual system eliminates the HM-2450A.3F pressure controller from the system and replaces its function with a control panel that allows for manual control of the confining and back pressures.

Like the automated system, our manually-controlled system can run UU, CU and CD Triaxial tests, as well as Unconfined Compression. Manual control panels are available in one or three-cell configurations and can be used in multiple configurations. All you need to do is add cells and the other appropriate equipment to handle your needs. With the HMTS you will be able to accommodate up to 64 incoming signals from your computer.

Humboldt's Manual Pressure Control Triaxial System is built around our HMTS test-specific software, which monitors, controls and reports the test data, and, the highly-regarded HM-3000 Load Frame. with its built-in, 4-channel data acquisition for stress, strain, pore water pressure and volume change measurement. The system can also be configured for use with our Triaxial-specific

Load Frame, the HM-2900. While Humboldt's Manual Pressure Control Triaxial System has been designed to work as a complete system, its make-up provides for the ultimate in versatility and expanded possibilities.

See pages 66-67 for a complete component list for the Manual Pressure Control Triaxial System

FlexPanel Pressure Control Triaxial System—

Humboldt's FlexPanel pressure control option eliminates the use of the air/water bladder interface concept of pressure control in lieu of its highly-accurate burette system. FlexPanels have a set of three burettes for each triaxial cell. The three burettes connect to the cell, top cap and base pedestal. This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow the control of the cell pressure and the back pressure for a single 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.

The three-burette design can manually measure volume change or permeability in a triaxial test sample without the use of a volume change apparatus. This is a benefit of this pressure distribution panel over the air/water bladder system.

See pages 68-69 for a complete component list for the FlexPanel Pressure Control Triaxial System



Automatic Pressure Control

Component List for 1 and 3-Cell Triaxial System with Automatic Pressure Control

Automatic Pressure Control System, 1-Cell Setup

COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW	1
CU Triaxial Software Module	HM-3003SW	1
CD Triaxial Software Module	HM-3006SW	1
Pressure		
Pressure Distribution Panel	HM-4154	1
Air/Water Bladder	HM-4151A	2
Pressure Controller	HM-2450A.3F	1
DeAiring System	HM-4187A.3F	1
Vacuum Pump	H-1763A.4F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Volume Change		
Volume Change Apparatus (Required for CU & CD Triaxial)	HM-2315	1
Strain Transducer, 1" (25mm)	HM-2310.10	1
LSCT/LVDT Mounting Bracket	HM-2310BR	1
Triaxial Cell (choose 1 below)		
3" / 75mm dia. capacity	HM-4199B	1
4" / 100mm dia. capacity	HM-4199B-4	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

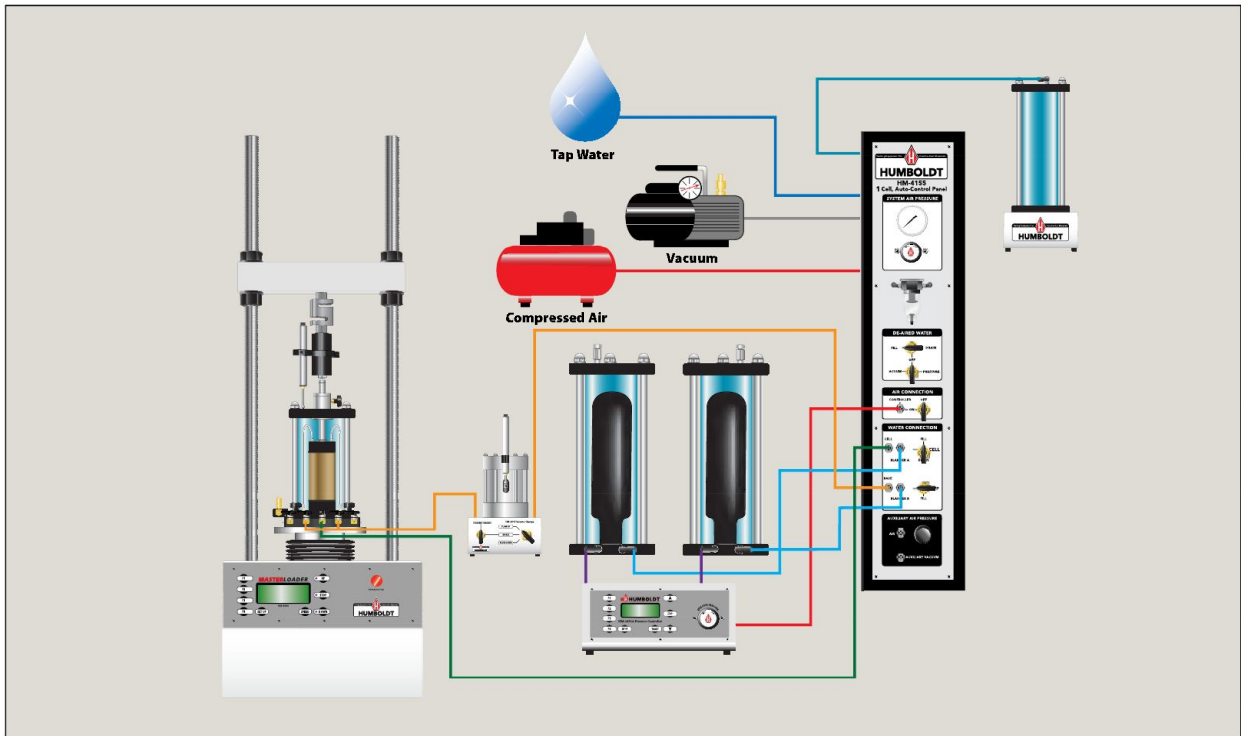
Automatic Pressure Control System, 3-Cell Setup

COMPONENTS		
Load Frame (choose 1 below)		
50kN(11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	3
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW	1
CU Triaxial Software Module	HM-3003SW	1
CD Triaxial Software Module	HM-3006SW	1
Pressure		
Pressure Distribution Panel	HM-4155	1
Air/Water Bladder	HM-4151A	6
Pressure Controller	HM-2450A.3F	3
DeAiring System	HM-4187A.3F	1
Vacuum Pump	H-1763A.4F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Volume Change		
Volume Change Apparatus (Required for CU & CD Triaxial)	HM-2315	3
Strain Transducer, 1" (25mm)	HM-2310.10	3
LSCT/LVDT Mounting Bracket	HM-2310BR	3
Triaxial Cell (choose 1 below)		
3" / 75mm dia. capacity	HM-4199B	3
4" / 100mm dia. capacity	HM-4199B-4	3
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

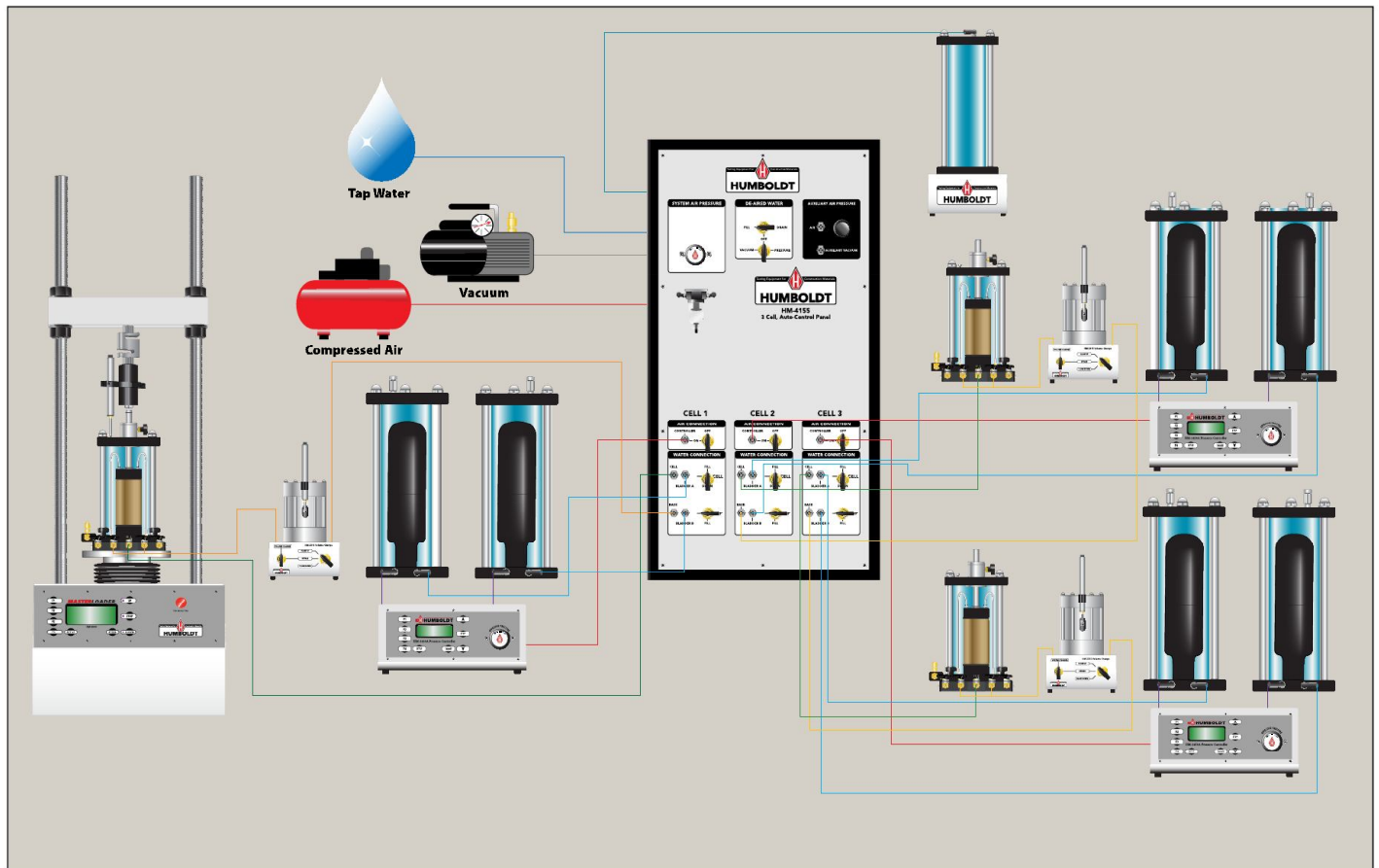
Standard Triaxial Sample Prep Accessories:

(See page 79 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Base Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3817.XX	1
Membranes	HM-4180.XX	1	Base Plate Pedestal	HM-3817.XXBP	1
Membrane Stretcher	HM-4181.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Split Miter Box	HM-3847.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
Porous Stone	HM-4184.XX	2 or 6	Filter Strips	HM-4189FS	1
Membrane Tester	HM-4185.XX	1	High Vacuum Grease	HM-4198	1



Automatic Pressure Control System, 1-Cell Setup



Automatic Pressure Control System, 3-Cell Setup

Manual Pressure Control

Component List for 1 and 3-Cell Triaxial System with Manual Pressure Control

Manual Pressure Control System, 1-Cell Setup

COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW	1
CU Triaxial Software Module	HM-3003SW	1
CD Triaxial Software Module	HM-3006SW	1
Pressure		
Pressure Distribution Panel	HM-4164.3F	1
Air/Water Bladder	HM-4151A	2
DeAiring System	HM-4187A.3F	1
Pore Pressure Transducer	HM-4170	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CU & CD Triaxial)	HM-2315	1
Strain Transducer, 1" (25mm)	HM-2310.10	1
LSCT/LVDT Mounting Bracket	HM-2310BR	1
Triaxial Cell (choose 1 below)		
3" / 75mm dia. capacity	HM-4199B	1
4" / 100mm dia. capacity	HM-4199B-4	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

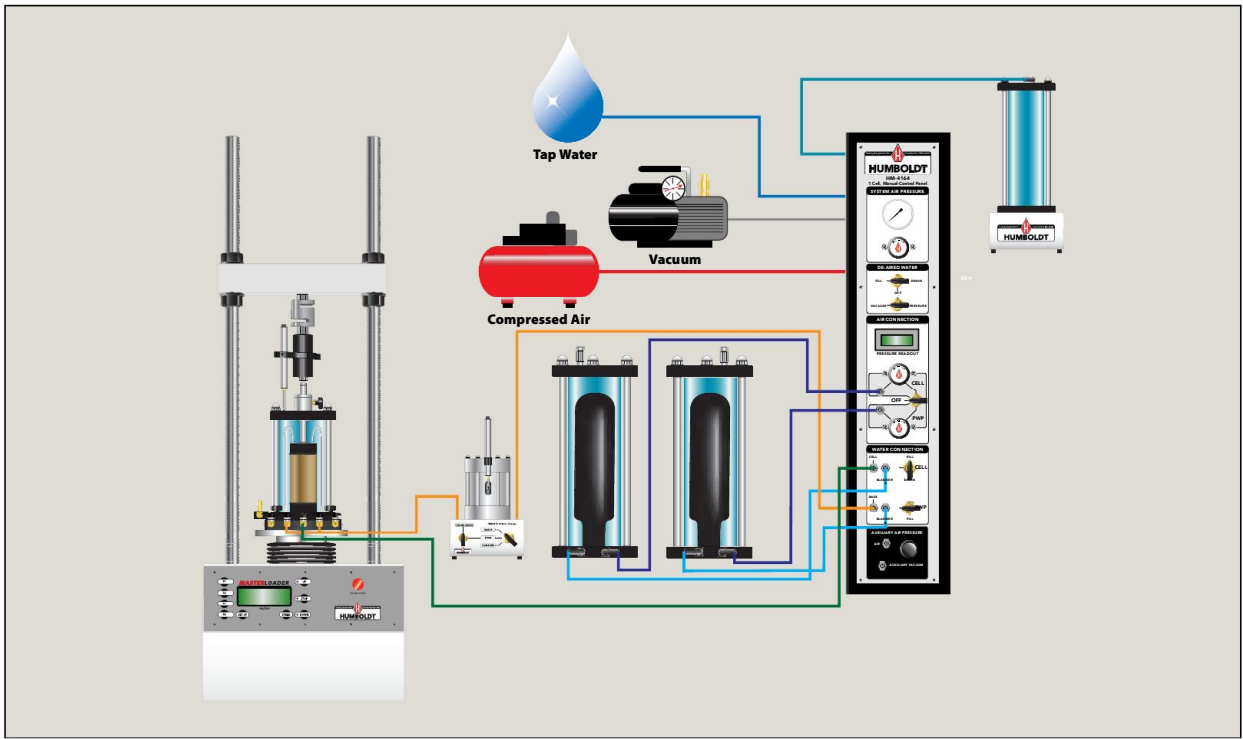
Manual Pressure Control System, 3-Cell Setup

COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW	1
CU Triaxial Software Module	HM-3003SW	1
CD Triaxial Software Module	HM-3006SW	1
MiniLogger	HM-2325A.3F	1
Pressure		
Pressure Distribution Panel	HM-4165.3F	1
Air/Water Bladder	HM-4151A	6
DeAiring System	HM-4187A.3F	1
Pore Pressure Transducer	HM-4170	3
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CU & CD Triaxial)	HM-2315	3
Strain Transducer, 1" (25mm)	HM-2310.10	3
LSCT/LVDT Mounting Bracket	HM-2310BR	3
Triaxial Cell (choose 1 below)		
3" / 75mm dia. capacity	HM-4199B	3
4" / 100mm dia. capacity	HM-4199B-4	3
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

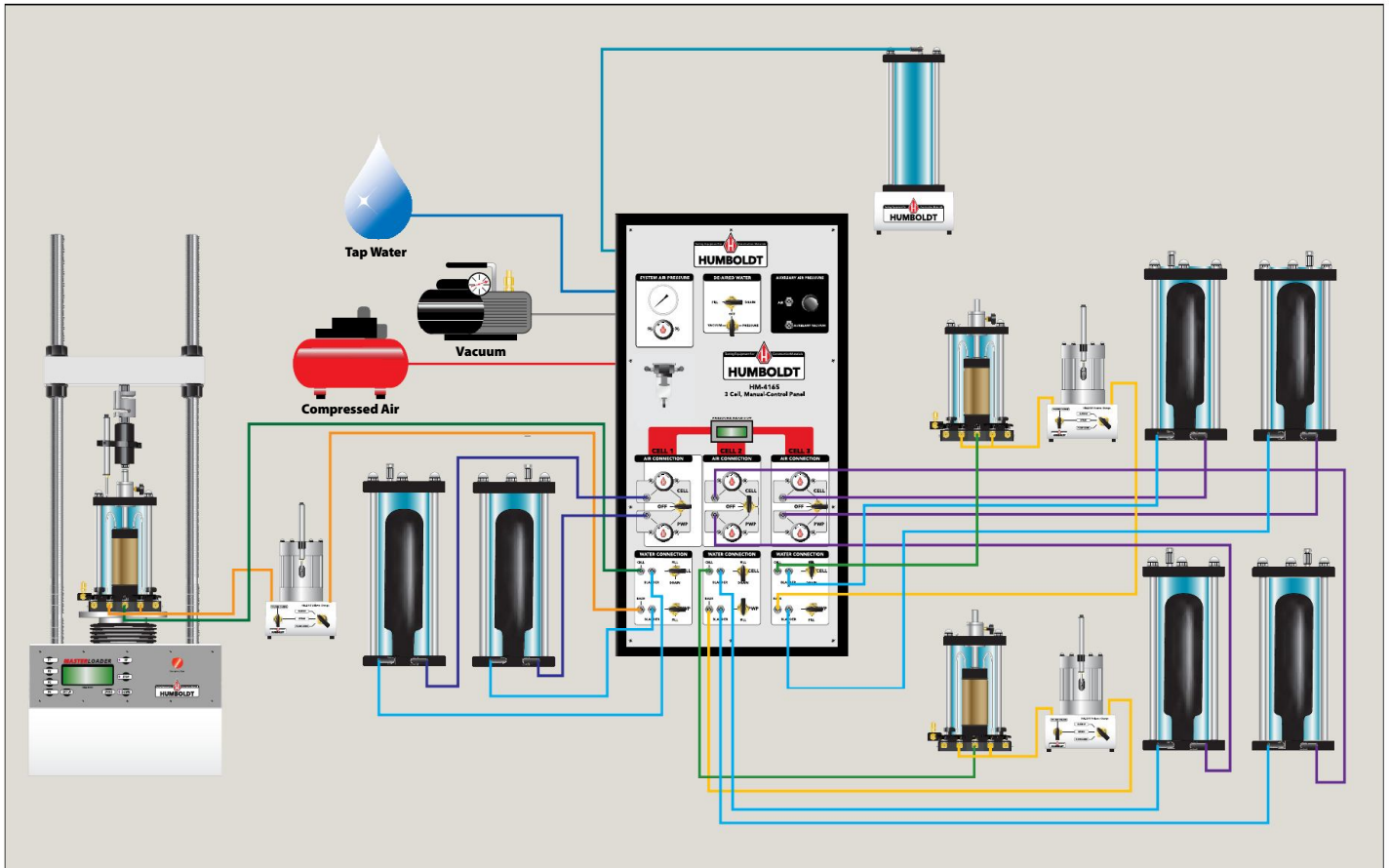
Standard Triaxial Sample Prep Accessories:

(See page 79 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Base Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3817.XX	1
Membranes	HM-4180.XX	1	Base Plate Pedestal	HM-3817.XXBP	1
Membrane Stretcher	HM-4181.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Split Miter Box	HM-3847.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
Porous Stone	HM-4184.XX	2 or 6	Filter Strips	HM-4189FS	1
Membrane Tester	HM-4185.XX	1	High Vacuum Grease	HM-4198	1



Manual Pressure Control System, 1-Cell Setup



Manual Pressure Control System, 3-Cell Setup

FlexPanels Pressure Control

Component List for 1 and 3-Cell Triaxial System with FlexPanel Pressure Control

FlexPanel Pressure Control System, 1-Cell Setup

COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW	1
CU Triaxial Software Module	HM-3003SW	1
CD Triaxial Software Module	HM-3006SW	1
Pressure		
Pressure Distribution Panel	HM-4150.3F	1
DeAiring System	HM-4187A.3F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CD Triaxial)	HM-2315	1
Strain Transducer, 1" (25mm)	HM-2310.10	1
LSCT/LVDT Mounting Bracket	HM-2310BR	1
Triaxial Cell (choose 1 below)		
3" / 75mm dia. capacity	HM-4199B	1
4" / 100mm dia. capacity	HM-4199B-4	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

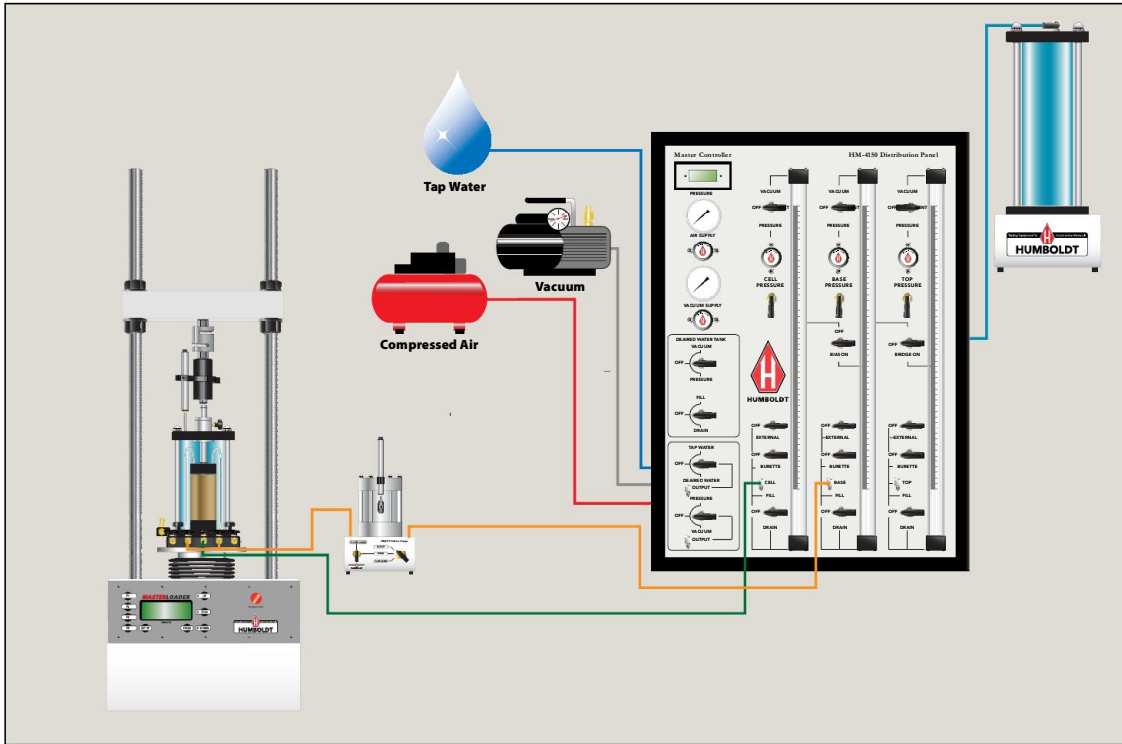
FlexPanel Pressure Control System, 3-Cell Setup

COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	3
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW	1
CU Triaxial Software Module	HM-3003SW	1
CD Triaxial Software Module	HM-3006SW	1
MiniLogger	HM-2325A.3F	1
Pressure		
Pressure Distribution Panel	HM-4150.3F	1
Pressure Distribution Panel	HM-4160A	1
DeAiring System	HM-4187A.3F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CD Triaxial)	HM-2315	3
Strain Transducer, 1" (25mm)	HM-2310.10	3
LSCT/LVDT Mounting Bracket	HM-2310BR	3
Triaxial Cell (choose 1 below)		
3" / 75mm dia. capacity	HM-4199B	3
4" / 100mm dia. capacity	HM-4199B-4	3
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

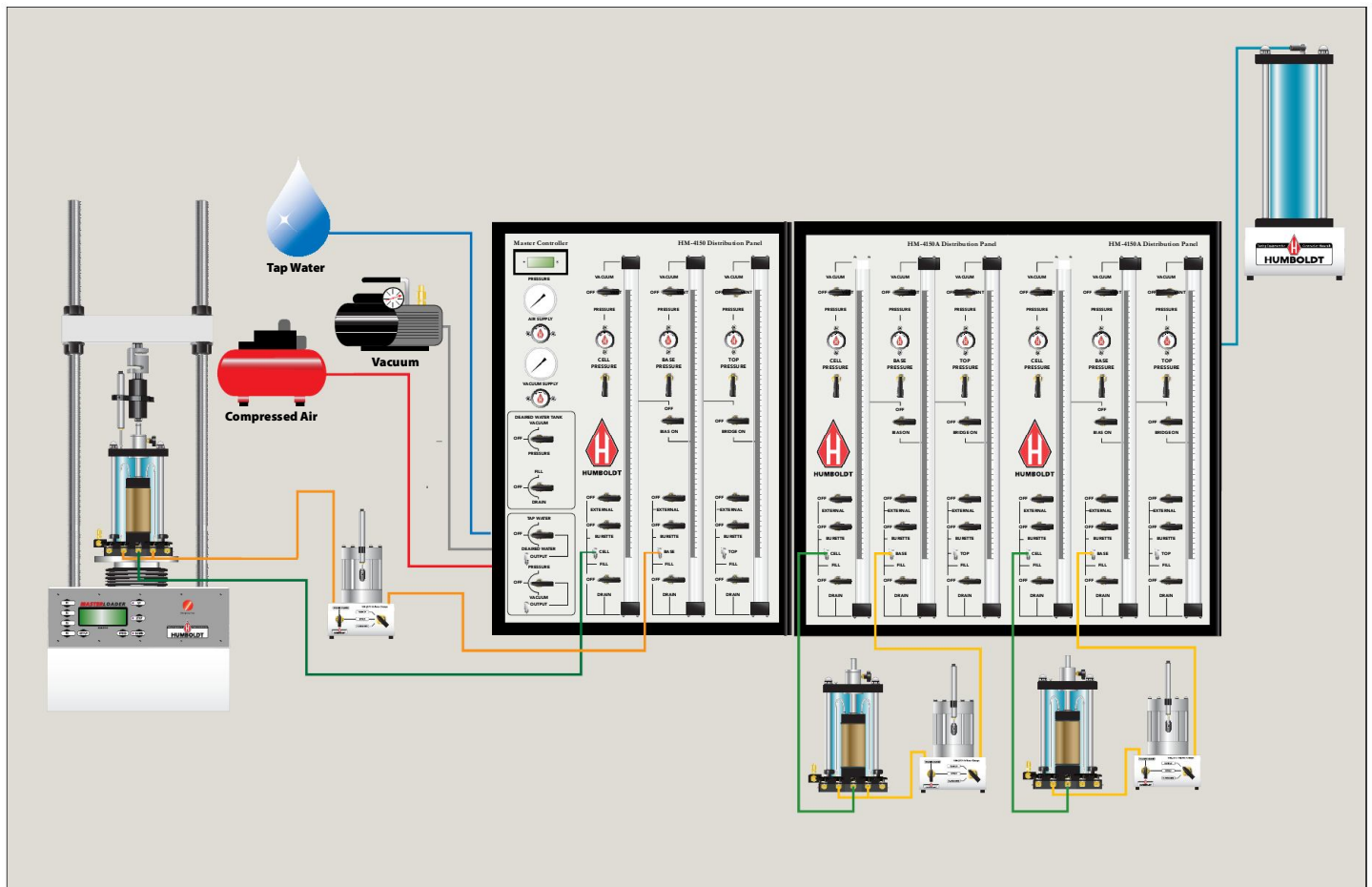
Standard Triaxial Sample Prep Accessories:

(See page 79 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Base Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3817.XX	1
Membranes	HM-4180.XX	1	Base Plate Pedestal	HM-3817.XXBP	1
Membrane Stretcher	HM-4181.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Split Miter Box	HM-3847.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
Porous Stone	HM-4184.XX	2 or 6	Filter Strips	HM-4189FS	1
Membrane Tester	HM-4185.XX	1	High Vacuum Grease	HM-4198	1



FlexPanel Pressure Control System, 1-Cell Setup



FlexPanel Pressure Control System, 3-Cell Setup

HM-3000.3F

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-3000 MasterLoader is ideal for just about any application from road construction to high-volume commercial and educational laboratories.

While the HM-3000 has been specifically designed for soil testing labs conducting multiple testing operations including: UU, CU and CD triaxials, UC, CBR and LBR, it is also perfect for running Marshall and Hveem asphalt tests as well. With its built-in four-channel data logger, the HM-3000 can acquire data from load, strain, pore pressure and volume transducers. The data acquisition can be automated by setting trigger conditions to start and stop logging. Tests can be initiated or terminated automatically increasing lab productivity.

The MasterLoader is the most versatile load frame available today. As the flagship product in the Humboldt Concept, the HM-3000 provides an internal 4-channel data logger, which allows it to be used as a standalone device capable of full test control and datalogging. It also can be quickly integrated into a complete, computer-controlled lab system incorporating its internal data logger as a component of the complete system. Its heavy-duty design and precise stepper-motor control provides a stable platform for years of reliable service allowing it to perform any tests required up to its load capacity of 11000 lbf (50 kN).

Whether as standalone unit or as part of a computer-controlled system, the MasterLoader provides the user with fully-automatic test performance allowing unattended operation while controlling motor start/stop, speed selection and test data acquisition. Its modular design and its technical specifications allow the machine to be custom configured to handle almost any test your lab may require. In addition to its ability to link to a computer, the HM-3000 also provides the ability to daisy-chain multiple machines together as part of the system. Any Humboldt Concept test equipment, from other Load Frames to Consolidation and Shear Apparatus can use this linking feature to access the computer system and related software. Unused data ports on the MasterLoader's data logger can also be used to utilize other load cells or transducers to gain access to data logging capabilities. In addition, the HM-3000 also provides an analog output port, which can be used for output to an XYt chart recorder or similar items.



Features include:

- Four channels for real-time data acquisition
- Backlit LCD display
- RS232 interface for computer or printer.
- Nonvolatile test data and instrument calibration storage
- Battery-backed real-time clock
- Auto conversation of instrument calibration between English or Imperial units and SI or metric units
- Test setup and selection via keypad
- Automatic triggering of test logging data
- View logged test data via the LCD display
- Logging rate as fast as 0.1 second/reading
- Humboldt HMTS, Basic, User-Defined Level software included for data acquisition
- Capable of Stress and Strain Control

Covers: CBR, UU, CU, CD, UC, Marshall and Hveem Tests
 ASTM: D1883, D2850, D2166, D4767, and D1559
 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

Specifications

Specifications			
Dimensions (l x w x h)	17 x 19 x 59 inch (430 x 480 x 1500mm)	Horizontal Clearance	15 inch (380mm)
Platen Size	10 inches (254mm)	Voltage	110/220 VAC 50/60Hz
Platen Travel	4 inches (100mm) Max.	Current	8.5 Amps
Net Weight	240 lbs. (110Kg)	Analog to Digital Converter	16 Bit
Shipping Weight	285 lbs. (130Kg)	Data Storage	4000 Readings
Speed Range	0 - 3.0000 inch/min (0 - 75.0000 mm/min)	Data Collection Rate	100 ms
Load Capacity	11000 lbf (50 kN)	Computer Port	RS232
Vertical Clearance	40 inch (1000mm) Max.		



HM-2900.3F

Designed specifically for triaxial applications, the HM-2900 ProLoader takes the proven concept of the HM-3000 MasterLoader, downsizes it, and provides a triaxial-specific load frame on a smaller footprint without giving up any of the MasterLoader's versatility, accuracy or its internal four-channel data logger.

The HM-2900 ProLoader has been specifically designed to handle triaxial testing applications, including: UU, CU and CD triaxials and UC. From educational institutions and consulting firms to high-volume commercial labs and construction projects, the ProLoader can handle any application with ease. With its 3,000 lb. load capacity, the HM-2900 can handle all basic triaxial tests with ease.

With its built-in 4-channel data logger, the HM-2900 can acquire data from load, strain, pore pressure and volume transducers. The data acquisition can be automated by setting trigger conditions to start and stop logging. Tests can be initiated or terminated automatically increasing lab productivity.


The ProLoader is a very versatile load frame providing an internal 4-channel data logger, which allows it to be used as a standalone device capable of full test control and data logging. It also can be quickly integrated into a complete, computer-controlled lab system incorporating its internal data logger as a component of the complete system. Its heavy-duty design and precise stepper-motor control provides a stable platform for years of reliable service allowing it to perform any tests required up to its load capacity of 3000 lbf (15 kN). Whether as standalone unit or as part of a computer-controlled system, the ProLoader provides the user with fully-automatic test performance allowing unattended operation while controlling motor start/stop, speed selection and test data acquisition. Its modular design and its technical specifications allow the machine to be handle any triaxial test with ease.

In addition to its ability to link to a computer, the HM-2900 also provides the ability to daisy-chain multiple machines together as part of the system. Any Humboldt Concept test equipment, from other Load Frames to Consolidation and Shear Apparatus can use this linking feature to access the computer system and related software. Unused data ports on the ProLoader's data logger can also be used to utilize other load cells or transducers to gain access to data logging capabilities. In addition, the HM-2900 also provides an analog output port, which can be used for output to an XYt chart recorder or similar items.

Features include:

- Four channels for real-time data acquisition
- Backlit LCD display
- RS232 interface for computer or printer.
- Nonvolatile test data and instrument calibration storage
- Battery-backed real-time clock
- Auto conversation of instrument calibration between English or Imperial units and SI or metric units
- Test setup and selection via keypad
- Automatic triggering of test logging data
- View logged test data via the LCD display
- Logging rate as fast as 0.1 second/reading
- Humboldt HMTS, Basic, User-Defined Level software included for data acquisition
- Capable of Stress and Strain Control

Specifications

Dimensions (l x w x h)	12 x 13.5 x 43.5 inch (305 x 343 x 1105mm)	Horizontal Clearance	11.25 inch (286mm)
Platen Size	10 inches (254mm)	Voltage	110/220 VAC 50/60Hz
Platen Travel	3 inches (76mm) Max.	Current	8.5 Amps
Net Weight	77 lbs. (35Kg)	Analog to Digital Converter	16 Bit
Shipping Weight	120 lbs. (54Kg) 	Data Storage	4000 Readings
Speed Range	0 - 3.0000 inch/min (0 - 75.0000 mm/min)	Data Collection Rate	100 ms
Load Capacity	3000 lbf (15 kN)	Computer Port	RS232
Vertical Clearance	27 inch (686mm) Max.		

Covers: UU, CU, CD, and UC
 ASTM: D2850, D2166,
 D4767, and D1559
 AASHTO: T193, T296, T297, T208
 BS 1377: Part 4: 1990, BS 1377:
 Part 7: 1990,
 BS 1377: Part 8: 1990





HM-2800

The HM-2800 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-2800 is ideal for applications where the operator either is not concerned with data acquisition; or, already has an existing data acquisition system or plans on constructing one. With its digital display, the HM-2800 also provides the operator with the ability to select any speed with three decimal accuracy within the load frame's speed range.

The HM-2800 features a quiet, direct-drive DC motor that provides a loading speed range from .008 to 1.999 in/min., controlled through the use of edit keys and a digital display. It also incorporates a separate, dedicated control to accommodate 2.00 in/min. for use in Marshall and TSR Testing for asphalt. The controls also accommodate a rapid travel speed of 2.25 in/min for moving the platen into position quickly.


Features include:

- 10" platen provides roomy, stable base for test equipment
- Backlit LCD display
- Test speeds adjustable from .008 to 1.999 in/min. via keypad
- User selectable unit change between U.S. Standard and Metric from keypad
- Preset Marshall/TSR Test Option

Multi-Speed Load Frame, 120V 60Hz— HM-2800

Multi-Speed Load Frame, 220 50/60Hz— HM-2800.4F
 HM-2000.56— Step-down transformer for electric conversion

Covers: CBR, UU, CU, CD, UC, Marshall and Hveem Tests
 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

Specifications			
Dimensions (l x w x h)	17 x 22 x 51 inch (432 x 559 x 1295mm)	Horizontal Clearance	11 inch (279mm)
Platen Travel	3 inches (76mm) Max.	Speed Range	0 - 1.99 inch/min (0 - 50.5 mm/min)
Net Weight	206 lbs. (94kg)	Voltage	120 VAC 50/60HZ 220 VAC 50/60HZ
Vertical Clearance	32 inch (812mm) Max.	Current	9 Amps @ 125V 4.5 Amps @250V
Load Capacity	11000 lbf (50 kN)	Shipping Weight	300 lbs. (660kg) 

Typical CU/UU Triaxial Setup

COMPONENTS	Item #	CU Triaxial	UU Triaxial
Load			
Load Frame (choose 1 below)			
50kN (11240 lbf) capacity	HM-2800	1	1
	HM-2800.4F	1	1
Strain			
Load Ring 2,200 lbf (10 kN)	H-4454.020	1	1
Dial Gauge 2.0" travel, 0.001" divisions	H-4463	1	1
Pore Pressure Transducer	HM-4170	1	
Ball Seat Adapter	HM-200387	1	1
Single Channel Readout	HM-2350	1	
HMTS Software Basic, User Defined	included	1	1
Pressure			
Pressure Distribution Panel	HM-4150.3F	1	
	HM-4150M.3F		
Pressure Distribution Panel	HM-4140.3F		1
	HM-4140M.3F		
DeAiring System	HM-4187A.3F	1	1
Vacuum Pump	H-1763A.4F	1	1
Triaxial Cell (choose 1 below)			
3" / 75mm dia. capacity	HM-4199B	1	1
4" / 100mm dia. capacity	HM-4199B-4	1	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1	1

Typical Unconfined Compression Setup

COMPONENTS		
Load		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-2800	1
	HM-2800.4F	1
Upper Unconfined Platen	HM-2002	1
Displacement Indicator Platform	HM-3000.10.2	1
Displacement Indicator Rod	HM-3000.10.1	1
Load Ring 500 lbf (2.5 kN)	H-4454.050	1
Dial Gauge 1.0" travel 0.0001" Divisions	H-4158.1	1

Typical Soil Cement Setup

COMPONENTS		
Load		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-2800	1
	HM-2800.4F	1
Upper Swivel Platen	HM-2003E	1
Strain		
Load Ring 5,000 lbf (25 kN)	H-4454.050	1

Standard Triaxial Sample Prep Accessories:

(See page 79 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Base Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3817.XX	1
Membranes	HM-4180.XX	1	Base Plate Pedestal	HM-3817.XXBP	1
Membrane Stretcher	HM-4181.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Split Miter Box	HM-3847.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
Porous Stone	HM-4184.XX	2 or 6	Filter Strips	HM-4189FS	1
Membrane Tester	HM-4185.XX	1			



Automated, 3-Cell Control Panel— HM-4155
Automated, 1-Cell Control Panel— HM-4154

Used in conjunction with the HM-2450A.3F Pressure Controller, Humboldt Automated Control Panels provide an accurate and easy-to-operate solution for providing the controls necessary for distributing compressed air, water, de-aired water and vacuum within an air/water bladder-type triaxial testing system. The use of these Control Panels and the HM-2450A.3F Pressure Controller allows changes in cell and back pressures required for sample saturation to be done automatically without the need for an operator. This feature reduces the need for continual monitoring of the sample saturation process during a triaxial test.

Humboldt Auto Control Panels feature an analog input pressure gauge and controller, an air/water filter for the input pressure and de-aired water tank input, as well as quick-disconnects for quickly connecting bladders, the pressure controller and triaxial cells.

The HM-4154 provides connections for one triaxial cell, while the HM-4155 provides connections for up to three triaxial cells. For each triaxial cell, one bladder is required for generating the cell pressure and a second bladder is required for back pressure.

Specifications			
Pressure Gauge	psi	BAR	Mpa
Max. Input Pressure	200	14	1.4
Max. Output Pressure	150	10	1
Pressure Resolution	0.1	0.01	0.001
HM-4154 Dimensions (L x W x H)	8 x 8 x 37.5" (203 x 203 x 952mm) Shipping wt. 80 lbs. (36kg)		
HM-4155 Dimensions (L x W x H)	8 x 19.5 x 37.5" (203 x 495 x 952) Shipping wt. 45 lbs. (20kg)		

Manual, 3-Cell Control Panel, 120/220V 50/60Hz— HM-4165.3F
Manual, 3-Cell Panel (kPa), 120/220V 50/60Hz— HM-4165M.3F
Manual, 1-Cell Control Panel, 120/220V 50/60Hz— HM-4164.3F
Manual, 1-Cell Panel (kPa), 120/220V 50/60Hz— HM-4164M.3F

For those operations, which do not require automated control, Humboldt's HM-4164 and HM-4165 Manual Control Panels provide an accurate and easy-to-operate solution for controlling compressed air, water, de-aired water and vacuum within an air/water bladder-type triaxial testing system.

The use of these Control Panels provides the necessary control for making changes in cell and back pressures required for sample saturation to be done from a central location on the panel. The operator has complete control of system pressure during the triaxial test with three independently-controlled pressure regulators. These control panels have a bias pressure regulator feature, which allows simultaneous control of confining and back pressures, while maintaining a constant differential pressure

Humboldt Manual Control Panels feature an analog input pressure gauge and controller, an air/water filter for the input pressure and de-aired water tank input, a digital pressure readout for each set of cell functions, as well as quick-disconnects for quickly connecting bladders, the pressure controller and triaxial cells.

The HM-4164 provides connections for one triaxial cell, while the HM-4165 provides connections for up to three triaxial cells. For each triaxial cell, one bladder is required for generating the cell pressure and a second bladder is required for back pressure.

Specifications			
Pressure Gauge	psi	BAR	Mpa
Max. Input Pressure	200	14	1.4
Max. Output Pressure	150	10	1
Pressure Resolution	0.1	0.01	0.001
Display	LCD		
HM-4164 Dimensions (L x W x H)	8 x 8 x 37.5" (203 x 203 x 952mm)		
HM-4165 Dimensions (L x W x H)	8 x 19.5 x 37.5" (203 x 495 x 952)		



HM-4140 HM-4150 HM-4150A HM-4160 HM-4160A

Humboldt FlexPanels (see page 47 for specifications):

Humboldt 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 triaxial testing. FlexPanels utilize a set of three burettes to control cell, top cap and base pedestal pressures.

This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow for the control of 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. 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 & 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 & gauge, inlet pressure regulators & gauge, de-aired water tank controls, tap & de-aired water supply outlets, and pressure & vacuum outlets
- Complies with ASTM D5084; BS 1377 Part 6 1990.

Distribution Panel Accessories



Quiet Compressor, 115V 50/60Hz— HM-4220

Quiet Compressor, 220V 50/60Hz— HM-4220.4F

When operating under full load this exceptionally quiet compressor offers a tremendously low noise level of 42 db/A. Each compressor is built with quality in mind, and comes equipped with powder-coated air tank, pressure switch, 1-micron air filter, regulator, and pressure gauges for completely automatic and trouble free operation.

Output in CFM and L/Min:	4.2 CFM/120 L/Min
Horse Power:	1.0Hp
Tank Size Gal / Lt.:	13 Gal/50 Lt.
Noise Level:	42 db/A
Dimensions:	41 x 13 x 27.43 x 18 x 33 (Packed)
Weight:	121 lbs. (147 lbs. Packed)
Max Pressure PSI / Bar:	120 PSI (8 Bar)
Operating Pressure PSI / Bar:	90-120 PSI/6-8 Bar

Pressure Regulator, 2-150PSI w/Fittings— HM-4150.22AS

Positive Bias Regulator w/Fittings— HM-4150.23AS

High Vacuum Pump, 120V 60Hz— H-1763A

High Vacuum Pump, 230V 50/60Hz— H-1763A.4F

Direct-drive two-stage rotary sliding vane high vacuum pump features gas ballast and trap to reduce risk of oil being sucked into the system. Produces free air displacement 85L per minute (3 cu. ft. per minute) and maximum vacuum 29-30". Operating temperature is 30 to 170°F (-1.11 to 76.6°C). Has 1/4" OD intake ports for 1/4" ID tubing. Dimensions: 11-1/4" x 15-1/2" x 6-1/2" (28.6 x 39.4 x 16.5cm). Shipping wt. 26 lbs (13kg)

Quick-Connect, 1/4" Male— HM-4150.72

O-Ring Replacement for HM-4150.72— HM-4196.CXO

O-Ring For Triaxial Top Cap, 1/8" Tubing—HM-4193.006

Tube Reducing Coupler, 1/4" to 1/8"— HM-003174

Brass Ferrules, 1/8" (set of 10)— HM-4197.12

Brass Ferrules, 1/4" (set of 10)— HM-4197.25

Tubing, 1/8" by the foot— HM-4196.12

Tubing, 1/4" by the foot— HM-4196.25





Air/Water Bladder Cylinder— HM-4151A

The Humboldt Air/Water Bladder Cylinder is used to deliver pressurized de-aired water to the triaxial cell. The bladder acts as a reservoir and interface between the compressed air, used as the pressure source, and the de-aired water, which is used as the pressurizing medium for the sample. The use of the bladder eliminates the reintroduction of air into the de-aired water, while providing a high-degree of accuracy. The cylinder will operate continuously to a maximum pressure of 150 psi (1000 kPa). It is constructed of anodized aluminum top and bottom plates, acrylic cylinder and a viton bladder. Shipping wt. 8 lbs. (3.7kg)

Spare Replacement Bladder— HM-4151.1

Viton replacement bladder for HM-4151A, quantity (1).

Automatic Volume Change Apparatus— HM-2315

The apparatus is used for measuring the volume change of a soil sample by monitoring the flow of water through the chamber of the unit. The lower assembly contains changeover valves, which when used in conjunction with the upper assembly provides limitless capacity. The unit can be used with a linear strain transducer, a digital indicator, or as part of an automated system. It is accurate to better than ±0.05 ml and is easily de-aired in seconds. Includes connectors, valves, and tubing. Order strain transducer or digital indicator separately. Shipping wt. 21 lbs. (9.5kg)

Strain Transducer— HM-2310.10

Strain transducer, 1" (25mm) for use with HM-2315 Automatic Volume Change Apparatus

Transducer Bracket— HM-2310BR

Bracket to attach strain transducer to HM-2315 Automatic Volume Change Apparatus

Pore Pressure Transducer— HM-4170

Highly accurate, 200 psi (1400 kPa) Pore Pressure Transducer. Designed for geotechnical lab applications with outstanding overload protection and protected from corrosive water. Requires input of 10 V DC, with an output of 100 mV. Supplied with 2 meter cable and 5-pin DIN plug.

Pressure Controller, 120/220V 50/60Hz— HM-2450A.3F

Stand alone control unit for accurate control of air pressures in the triaxial laboratory testing. It provides automatic, incremental back pressure saturation with B-value calculation and check. When used with HMTS (Humboldt Material Testing Software) and Humboldt Triaxial testing equipment, the on-board, digital and bias-pressure regulators, plus two air/water bladder systems (HM-4151A) and the distribution panel (HM-4155 or HM-4154) allow simultaneous control of the confining and back pressure while maintaining a constant differential pressure.

Specifications	
Pressure Readout	psi/kPa
Maximum Input Pressure	200/1400
Maximum Output Pressure	150/1000
Pressure Resolution	0.1/1
Input Voltage	110/220 VAC 50/60 Hz
Display	LCD
Dimension (L x W x H)	12 x 12 x 7 inches (300 x 300 x 175 mm)

De-Airing Water Tank— HM-4187H

For use with Triaxial/Permeability Distribution Panels. Requires a Vacuum Pump, (see page 75). Shipping wt. 13 lbs. (6kg)

De-Airing Water System, 120/220V 50/60Hz— HM-4187A.3F

The HM-4187A.3F produces 8-liter batches of de-aired water without the use of heat. Combined mechanical agitation and vacuum evacuation removes gasses at much higher rate than conventional heat-boiling methods. Will de-air water to less than 0.5 pph dissolved oxygen in 4 minutes. Requires a Vacuum Pump, (see page 75) 1/55hp motor 110V, 60Hz. 7.5 x 7.5 x 20" (190 x 190 x 508mm). Shipping wt. 19 lb (8.6kg)



Triaxial Cells

HM-4199B Triaxial Cells are available for use with sample sizes from 1.4" (35mm) to 6" (150mm). The clear acrylic chamber has a working pressure of 150 psi (1,000 kPa) and is tested to 250 psi (1,700 kPa). The design features a solid base, which provides an extremely stable test platform making it faster and easier to center the cell on the load frame platen— reducing setup times. HM-4199B cells provide easy access to the test chamber by utilizing a one-piece, chamber unit that is quickly removed through the removal of three easy-turn knobs. These cells also have an integral de-airing block for the pore pressure transducer built into the side. The cells have five no-volume-change valves aligned on one side for maximum convenience. Two valves handle top drainage, two valves handle bottom drainage, and one valve handles filling and drainage, as well as providing confining

pressure to the cell. The removable base pedestal accommodates various sample diameters. Top caps and base pedestals are available in a choice of black-anodized aluminum or stainless steel in various sizes (see chart below). Other sizes are available. The cell top and base are precision machined from 6061 T6 aluminum, hard-coated and Teflon impregnated. A 5/8" hardened stainless steel piston runs inside a linear bearing to reduce friction. Choice of brass or stainless steel valve fittings is available (stainless steel for use with hazardous materials). When ordering, specify top cap and base pedestal for desired sample size. Order porous stones separately, see page 21. Cell dimensions are: 13-3/4" H x 8-3/4" dia. (349.2 x 222.3mm); overall diameter is: 11" (279.4mm).

Triaxial Cells and Top Cap/Base Pedestal Sets				
Size	Standard Cell	Stainless Cell*	Anodized Aluminum**	Stainless Steel*
35mm	HM-4199B	HM-4199SS	HM-4199.35	HM-4199.35SS
1.4"			HM-4199.14	HM-4199.14SS
38mm			HM-4199.38	HM-4199.38SS
1.5"			HM-4199.15	HM-4199.15SS
50mm			HM-4199.50	HM-4199.50SS
2.0"			HM-4199.20	HM-4199.20SS
70mm			HM-4199.70	HM-4199.70SS
2.8"			HM-4199.28	HM-4199.28SS
100mm	HM-4199B-4	HM-4199SS-4	HM-4199.100	HM-4199.100SS
4.0"			HM-4199.40	HM-4199.40SS
150mm	HM-4199B-6	HM-4199SS-6	HM-4199.150	HM-4199.150SS
6"			HM-4199.60	HM-4199.60SS



To order individual Top Caps or Pedestal Bases, use the part number for the set of the desired size indicated at left and add a "T" suffix for a Top and a "B" suffix for a base, i.e. HM-4199.20T would be the part number for a 2" Top Cap.

Cell	Height	Overall Diameter	Weight
HM-4199B	13.75	11	15 lb (7kg)
HM-4199B-4	15	11.75	28 lb (13kg)
HM-4199B-6	25.5	12.75	120 lb (54kg)

*Stainless steel valve fittings for use with hazardous materials.
**Set contains Top Cap and Base Pedestal



Two-Part Compaction Molds

Two-part Aluminum molds with easy-close band clamp closure. Base plate/Pedestal combination provides a stable platform for mold during production. Ratio of sample height to diameter is 2:1

Two-Part Compaction Molds

Sample	Mold	Base Plate
1.4"	HM-3817.14	HM-3817.14BP
1.5"	HM-3817.15	HM-3817.15BP
1.875"	HM-3817.18	HM-3817.18BP
2.0"	HM-3817.20	HM-3817.20BP
2.36"	HM-3817.23	HM-3817.23BP
2.5"	HM-3817.25	HM-3817.25BP
2.8"	HM-3817.28	HM-3817.28BP
4.0"	HM-3817.40	HM-3817.40BP
6.0"	HM-3817.60	HM-3817.60BP
35mm	HM-3817.35	HM-3817.35BP
38mm	HM-3817.38	HM-3817.38BP
50mm	HM-3817.50	HM-3817.50BP
70mm	HM-3817.70	HM-3817.70BP
100mm	HM-3817.100	HM-3817.100BP
150mm	HM-3817.150	HM-3817.150BP

Length Comparator— HM-4173

Length comparator designed to quickly and accurately measure the height of soil samples to within $\pm 0.1\%$ of the total height. Includes a digital indicator accurate to within 0.0001 inches (0.002mm) with 0 to 1" (0 to 25mm) total range. The comparator is comprised of an upright support 14" (356mm) tall attached to a 6 x 6 x 2" (150 x 150 x 50mm) granite base and includes a 6" (152mm) reference bar. Other reference bars such as 4.0", 3.0" and 2.0" for other sample sizes are available. Complies with ASTM D2166, D2850, D4767, BS 1377:8. Reference bar includes Calibration Report traceable to the National Institute of Standards and Technology. Shipping wt. 16 lb (7.2kg)

Soil Sample Trimmer, 1.0 to 3.0"— HM-3130

Soil Sample Trimmer, 1.0 to 4.0"— HM-3140

Sample trimmer for cutting samples to precise diameters. The HM-3130 handles samples up to 3" and HM-3140 handles up to 4" samples by employing easily interchangeable top platens. Stainless steel pins in pedestal & top platen hold sample in position. Top platen bearing assembly is lowered & locked and sample trimmed with wire saw, order top platens and saw separately. Shipping wt. 6 lbs. (2.72kg)

Sample Trimmer Top Platens

Top Platen	Model	Top Platen	Model
1.0"	HM-3130.10	35mm	HM-3130.35
1.4"	HM-3130.14	38mm	HM-3130.38
1.875"	HM-3130.18	50mm	HM-3130.50
2.0"	HM-3130.20	70mm	HM-3130.70
2.5"	HM-3130.25	100mm	HM-3130.100
2.8"	HM-3130.28		
3.0"	HM-3130.30		
4.0"	HM-3130.40		

Wire Saw— HM-3175

Sample trimming saw with replaceable wire blade.

Replacement Wire— HM-3175.1

Replacement wire for HM-3175 saw.

High Vacuum Grease— HM-4198

Effective means of sealing latex membranes to sides of the top cap.

Filter Paper Strips— HM4189FS

Wrapped around sample to accelerate saturation in triaxial testing, 5 x 150mm, Grade 55, 100/pkg.

Precision Diameter Tape, 0.75 to 7"— HM-4174

Precision Diameter Tape, 28 to 200mm— HM-4174M

Diameter tapes provide a fast, reliable method for measuring the diameter of concrete, soil and asphalt cores and cylinders. One reading provides round and out-of-round diameters within an accuracy of .001" (.03mm) by means of special graduations and vernier scale. All tapes are made from a stainless alloy and are precision engraved to ensure accuracy. Tape has diameter range of 2 to 12" (50 to 300mm on metric model). Includes certificate of calibration. Tapes are calibrated and include a NIST-traceable certification. Complies with ASTM D2166, D2850, D4767, BS 1377:8.



Latex Membranes	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4180.14	HM-4180.15	HM-4180.20	HM-4180.28	HM-4180.40	HM-4180.60	HM-4180.14	HM-4180.15	HM-4180.20	HM-4180.28	HM-4180.40

Made from non-porous latex rubber. Length varies according to sample diameter. All have sufficient length to enclose full length of sample, both top & base of pedestal, and disc—plus enough surplus to allow doubling over the O-rings. 12/pkg. Membranes are 0.012" in thickness. For 0.025" thickness, add T suffix after part number, i.e. HM-4180.28T

Membrane Stretcher	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4181.14	HM-4181.15	HM-4181.20	HM-4181.28	HM-4181.40	HM-4181.60	HM-4181.14	HM-4181.15	HM-4181.20	HM-4181.28	HM-4181.40

Simple & effective method of sheathing (encasing) sample with latex membrane without creasing or damaging the sleeve.

O-Rings	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4182.14	HM-4182.15	HM-4182.20	HM-4182.28	HM-4182.40	HM-4182.60	HM-4182.14	HM-4182.15	HM-4182.20	HM-4182.28	HM-4182.40

For sealing membranes from confining fluid and sample. Neoprene. 12/pkg.

O-Ring Placing Tool	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4183.14	HM-4183.15	HM-4183.20	HM-4183.28	HM-4183.40	HM-4183.60	HM-4183.14	HM-4183.15	HM-4183.20	HM-4183.28	HM-4183.40

Positions rings to seal membrane with minimum disturbance to specimen.

Porous Stones	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4184.35	HM-4184.38	HM-4184.50	HM-4184.70	HM-4184.100	HM-4184.150	HM-4184.14	HM-4184.15	HM-4184.20	HM-4184.28	HM-4184.40

Used for permeability and triaxial testing to allow even distribution of water through sample. Two stones required per cell, each 1/4" thick (6mm).

Membrane Tester	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4185.14	HM-4185.15	HM-4185.20	HM-4185.28	HM-4185.40	HM-4185.60	HM-4185.14	HM-4185.15	HM-4185.20	HM-4185.28	HM-4185.40

Tester is easy to use for quick visual detection of possible flaws in membranes.

2-Part Split Miter Box	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-3847.35	HM-3847.38	HM-3847.50	HM-3847.70	HM-3847.100	HM-3847.150	HM-3847.14	HM-3847.15	HM-3847.20	HM-3847.28	HM-3847.40

For use with undisturbed samples and for sample trimming of cohesive soils. Made from non-ferrous metal.

2-Part Vacuum Split Former	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-3827.35	HM-3827.38	HM-3827.50	HM-3827.70	HM-3827.100	HM-3827.150	HM-3827.14	HM-3827.15	HM-3827.20	HM-3827.28	HM-3827.40

For use with non-cohesive soils and disturbed samples. Made from non-ferrous metal. Larger sizes require use of supporting jacks.

Sample Trimmer with Knife	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4186.14	HM-4186.15	HM-4186.20	HM-4186.28	HM-4186.40	HM-4186.60	HM-4186.14	HM-4186.15	HM-4186.20	HM-4186.28	HM-4186.40

Used to trim sample ends or cut sample to a specific length.

Filter Paper	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4189.15	HM-4189.15	HM-4189.20	HM-4189.28	HM-4189.40	HM-4189.60	HM-4189.15	HM-4189.15	HM-4189.20	HM-4189.28	HM-4189.40

Used to prevent soil from penetrating into porous stones or into panel. 100/pkg.

Base Disk	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
		HM-4179.35	HM-4179.38	HM-4179.50	HM-4179.70	HM-4179.100	HM-4179.150	HM-4179.14	HM-4179.15	HM-4179.20	HM-4179.28	HM-4179.40

Acrylic disk used in UU triaxial tests.



MiniLogger, 120/220V 50/60Hz— HM-2325A.3F

- Four individual, 16-bit analog to digital converters
- Instrumentation excitation supply of 10 VDC
- Analog outputs for XYt chart recorder
- Ideal with instruments, such as Pressure Transducers, Load Cells, and Strain Transducers.



MiniLogger, 120/220V 50/60Hz— HM-2330D.3F

- For use with Digital Indicators
- Four individual, Digital Indicator inputs.
- Instrumentation excitation supply of 5 VDC.

Data Storage	1000 readings/channel
Voltage	110/220 VAC 50/60Hz
Weight	6 lbs. (2.7Kg)
Dimension (L x W x H)	8.3 x 9.5 x 4.7 inch (210 x 240 x 120mm)

Data Storage	1000 readings/channel
Voltage	110/220 VAC 50/60Hz
Weight	6 lbs. (2.7Kg)
Dimension (L x W x H)	8.3 x 9.5 x 4.7 inch (210 x 240 x 120mm)

Humboldt MiniLoggers— Cost-effective Data Acquisition

Automating data acquisition for your geotechnical lab is easy with Humboldt's MiniLoggers— our simple-to-use, four-channel data loggers specifically designed for use within construction materials testing labs. You can use Humboldt MiniLoggers to cost-effectively update your older, non-computerized load frames, direct shear and consolidation machines with computerized data acquisition; increasing lab output, freeing-up technicians and providing more accurate test results.

Humboldt MiniLoggers can automatically accumulate test data using a wide variety of transducers, load cells and digital indicators; and, come with Humboldt's, highly-regarded, Materials Testing software. MiniLoggers can be used to automate data acquisition for many of your labs tests such as:

Soil: triaxial, direct shear, consolidation, permeability, CBR/LBR, unconfined compression and soil cement

Asphalt: Marshall flow/stability, TSR Hveem

Cost-effective, Modular Design

Humboldt's modular-design, data acquisition concept is designed to give you the most flexible and cost-effective method of data logging your lab. Rather than having to buy into a large data logging system and then growing into it, Humboldt mini-loggers give you the flexibility and low cost outlay of being able to buy loggers on an "as you grow" basis, increasing your data logging capability as your expansion demands. Being 4-channel loggers, you get enough channels to run the test you are trying to automate and have the luxury of having the controls for that test right at the machine rather than at the computer on the other side of the lab.

In this way, single MiniLoggers can be used as stand-alone units for test operations requiring up to 4 channels and connect them directly to a PC for data acquisition, or up to 16 MiniLoggers can be "daisy-chained" together providing 64 channels of data logging to a single PC.

Features:

- Four channels with real-time data acquisition
- Backlit LCD display
- RS232 interface for computer or printer
- USB output with use of HM-000379 Cable
- Nonvolatile test data storage and instrument calibration
- Battery-backed real-time clock
- Auto conversation of instrument calibration between English or Imperial units and SI or metric units
- Test setup and selection via keypad
- Automatic triggering of test logging data
- View logged test data via the LCD display
- Logging rate as fast as 0.1 second/reading
- Windows-based software included for viewing and exporting test data into an Excel format files with plug and play features.
- Up to sixteen units can be connected to a computer.



HM-2300.020P shown mounted on crossbar with LSCT and ram

HM-2003E

HM-2300.100

HM-2300.020

Submersible Load Cells—

For those concerned with reducing the effects of hysteresis on testing results, we offer a submersible load cell, which is designed to work within the triaxial cell. Positioning the load cell within the triaxial cell eliminates the possible drag effect introduced by using a plunger between the sample and an externally-mounted load

Performance Specifications:

- Overload Capacity:** 200%
- Excitation Voltage:** 10 VDC, Maximum
- Non-linearity:** ±0.05% Full Scale Output
- Hysteresis:** 0.05% Full Scale Output
- Diameter:** 75mm
- Cable Length:** 2m
- Height Excluding Ram:** 50mm

Submersible Load Cells

Capacity	Model
Load Cell 1000 lbf (5 kN)	HM-2300.010S
Load Cell 2000 lbf (10 kN)	HM-2300.020S
Load Cell 5000 lbf (25 kN)	HM-2300.050S

Pancake Load Cells—

Pancake-design load cells are available for those who want to use a load cell design that theoretically provides the least amount of deflection in applications.

Capacity	Model
Load Cell 2000 lbf (10 kN)	HM-2300.020P
Load Cell 5000 lbf (25 kN)	HM-2300.050P
Load Cell 10000 lbf (50 kN)	HM-2300.100P
Load Cell 15000 lbf (75 kN)	HM-2300.150P
Load Cell 25000 lbf (125 kN)	HM-2300.250P
Load Cell 50000 lbf (250 kN)	HM-2300.500P

Performance Specifications:

- Overload Capacity:** 150%
- Excitation Voltage:** 20 VDC, Maximum
- Non-linearity:** ±0.05% Full Scale Output
- Hysteresis:** 0.05% Full Scale Output
- Diameter:** 4.13" (104.8mm)
- Cable Length:** 2m
- Height Excluding Ram:** 2.5" (63.5mm)

Swivel, Top Platen— HM-2003E

4.25" (108mm) diameter top swivel platen.

S-Type Load Cells—

Load cells are bi-directional for both tension and compression loads. Constructed from stainless steel. Load cells can be used with various instrumentation to measure loads. Includes: 6 ft. cable with 5-pin DIN plug and calibration certificate.

Performance Specifications:

- Excitation Voltage:** 10 VDC, Maximum 15 VDC
- Rated output:** 3.0 mv/V Minimum
- Non-linearity:** 0.03% Full Scale Output
- Hysteresis:** 0.02% FSO
- Non-repeatability:** 0.01% FSO
- Creep (30 minutes):** 0.03% FSO
- Zero Balance:** ±1.0% FSO

Bridge resistance

- Input: 350 ohms, nominal
- Output: 350 ohms, ±3.5 ohms

Overload

- Safe Static: 150% of Rated Capacity
- Ultimate: 175% of Rated Capacity

Temperature

- Compensated range: 0-150°F
- Effect on output: 0.0006% FSO/°F
- Effect on zero: 0.0008% FSO/°F

Finish:

Nickel-plated or Stainless Steel

Seal:

Waterproof

S-type Load Cells

Capacity	Model
Load Cell 500 lbf (2.5 kN)	HM-2300.005
Load Cell 1000 lbf (5 kN)	HM-2300.010
Load Cell 2000 lbf (10 kN)	HM-2300.020
Load Cell 5000 lbf (25 kN)	HM-2300.050
Load Cell 10000 lbf (50 kN)	HM-2300.100

**Linear Strain Conversion Transducers (LSCT)**

Extremely accurate and reliable strain gauge instruments. Compact size does not require a module. High resolution and performance superior to LVDT.

- Less than 250g spring force on spindle
- Non-linearity better than $\pm 0.1\%$ of full scale deflection
- Hysteresis-compensated with linearity better than $\pm 0.1\%$ of full scale in both directions
- Negligible temperature effect

Stainless steel casing for environmental protection. Operating temperature range 0 to 70°C. Requires input of 10V dc; output up to 6.5 mV per volt.

LSCT

Size	Model
Linear strain transducer, .4" (10mm)	HM-2310.04
Linear strain transducer, 1.0" (25mm)	HM-2310.10
Linear strain transducer, 2.0" (50mm)	HM-2310.20

LSCT Mounting Bracket— HM-4178BRT

Bracket used for CBR and 3" bracket.

LSCT Mounting Bracket— HM-2310BR

Bracket used in mounting LSCT to equipment in replacement of dial gauge.

LSCT Mounting Bracket— HM-4193BR

Bracket used in mounting LSCT or dial gauge to the upper part of a triaxial cell with a 5/8" (15.5mm) dia. ram for strain measurement. (HM-2310BR also required for use with LSCT.)

Transducer (load cell, LSCT, Pressure)**Data Cable Extension— HM-2310C**

Sold by the foot, specify length desired.

De-Airing Block— HM-4170B

For use with Pore Pressure Transducer

Pore Pressure Transducer— HM-4170

Highly accurate, 200 psi (1400 kPa) Pore Pressure Transducer. Designed for geotechnical lab applications with outstanding overload protection and protected from corrosive water. Requires input of 10 V DC, with an output of 100 mV. Supplied with 2 meter cable and 5-pin DIN plug.

Digital Pressure Transducer— HM-4172

Solid state transducer/readout unit incorporates the latest semiconductor technology into a high-quality, yet inexpensive strain gauge. Three-digit readout display has $\pm .25\%$ of full scale accuracy—comparable to others at twice the cost. Battery operated with very long battery life—typically up to 5 years. On/off button at top of readout has factory set "on" time built into the memory. Readout shuts off automatically after 20 minutes.

Digital Pore Pressure Set, 120V 60Hz— HM-4175**Digital Pore Pressure Set, 220V 50/60Hz— HM-4175.4F**

For accurately measuring and monitoring pore water pressures and back pressure. For determining level of saturation ("B" parameter) during saturation stages of triaxial/permeability tests. Includes readout, pore pressure transducer, and de-airing block assembly. Shipping wt. 8 lb. (3.63kg)

Digital Indicators—

Switchable inch/metric digital indicator is accurate to $\pm .0001"$ (.002mm). Instant zero feature. Locks in maximum reading on LCD display with characters 0.240" high and 0.115" wide. Runs either clockwise or counter clockwise. Operates with replaceable batteries or AC power with automatic shutoff. Will replace any mechanical dial gauge.

Digital Indicators

Range	Resolution	Model
.250" / 6.35mm	.0001" / .002mm	HM-4469.02
.600" / 15.0mm	.0001" / .002mm	HM-4469.05
1.0" / 25.4mm	.0001" / .002mm	HM-4469.10
2.0" / 50.0mm	.0001" / .002mm	HM-4469.20
4.0" / 101.6mm	.0001" / .002mm	HM-4469.40

CABLES**AC Adapter for Digital Indicator, 120V 60Hz— HM-4469AC**

Allows Indicator to run off AC power.

Data Cable for Digital Indicator— HM-4469C

Used with HM-2330D.3F MiniLogger

Serial Data Cable for Digital Indicator— HM-4469RS**USB Data Cable for Digital Indicator— HM-4469USB**

Data cables to transfer data from indicator to computer.

Multi-Device Cable— HM-000379

Allows one computer to control multiple, daisy-chained machines.



H-4454.050D

H-4454.050

Load Rings—

Sometimes called "Proving Rings," Load Rings are used with various asphalt, concrete, or soil instrumentation to measure loads, and are ideal for use with our MasterLoader compression machines, Direct Shear machines and other testing equipment. Our high quality tensile steel rings have spherical seatings suitable for all shear boxes and load frames. Each load ring is shipped with a fitted dial gauge and calibration certificate, and supplied with tables listing all measurement units. 8-1/4" (210mm) high, 3/4-16 UNF thread female mounting. Available with digital indicators compatible with data acquisition systems. Eight models range in size from 110 to 22,000 lbf (0.5 to 100.0 kN). Meet ASTM E74.

Load Ring with Digital Indicator

lbf	kN	kgf	Model
110	0.5	50	H-4454.001D
220	1.0	100	H-4454.002D
550	2.5	250	H-4454.005D
1100	5.0	500	H-4454.010D
2200	10.0	1000	H-4454.020D
5500	25.0	2500	H-4454.050D
11000	50.0	5000	H-4454.100D
22000	100.0	10000	H-4454.200D

Load Ring with Dial Gauge

lbf	kN	kgf	Model
110	0.5	50	H-4454.001
220	1.0	100	H-4454.002
550	2.5	250	H-4454.005
1100	5.0	500	H-4454.010
2200	10.0	1000	H-4454.020
5500	25.0	2500	H-4454.050
11000	50.0	5000	H-4454.100
22000	100.0	10000	H-4454.200

Magnetic Indicator Mount— H-4470

Convenient, portable mount for mounting indicators and gauges. Mount has magnetic base, which mounts on flat or curved metallic surfaces. Non-magnetic stainless steel holding rod is 6 x 1/4" (154 x 6.4mm) and set in hardened ball socket so indicator or gauge may be mounted in almost any position.

Gauge Contact Point Extensions—

Used in applications where gauges require longer contact points to ensure correct gauge placement. Contact Points feature hardened steel points with polished tip to prevent scratching. Points fit all standard indicators and gauges. Not compatible with H-4471, H-4471CC, H-4465.12, and H-4465.12CC gauges.



H-4158.1



H-4665.25CC



H-4470



H-4466.30
H-4466.15
H-4466.10

Dial Gauges

Indicators are built to American Gauge Design Specifications for accuracy and are used in field and laboratory testing applications. Dials are high-quality, low-friction type, designed for long life and accurate repeatable readings. All dial indicators have continuous graduations and revolution counters that show revolutions of the indicator hand. They are furnished with a lug back (with a 90° mounting hole to be used vertically or horizontally), a regular contact point .25" long, and a dust cap. Dials listed are clockwise rotation; counter-clockwise rotation see note below.

Dial Gauges, Inches

Range	Division	Dia.	Brake	Model	CC*
.200"	.0001"	2.25"	No	H-4460	H-4460CC
.200"	.0001"	2.25"	Yes	H-4461A	NA
.300"	.0001"	2.25"	No	H-4462	H-4462CC
.500"	.0001"	2.25"	No	H-4471	H-4471CC
1.000"	.001"	2.25"	No	H-4158.1	H-4158.1CC
2.000"	.001"	2.75"	No	H-4463	H-4463CC
3.000"	.001"	2.75"	No	H-4464	H-4464CC
4.000"	.001"	2.75"	No	H-4465	H-4465CC
5.000"	.001"	2.75"	No	H-4466	NA

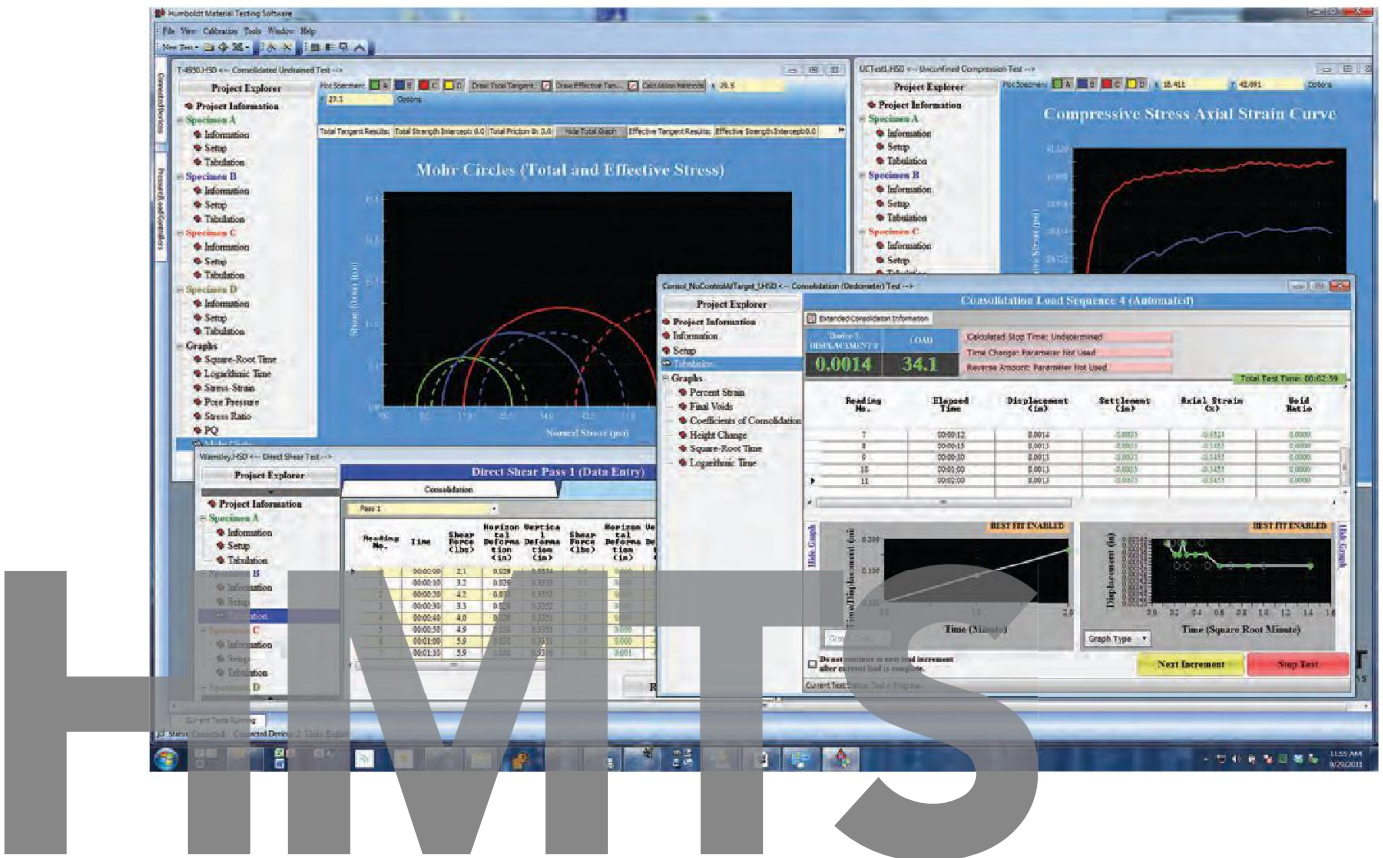
*counter-clockwise reading dial indicators

Dial Gauges, Metric

Range	Division	Dia.	Brake	Model	CC*
8mm	.002mm	57mm	No	H-4465.08	NA
12mm	.002mm	57mm	No	H-4465.12	H-4465.12CC
25mm	.010mm	57mm	No	H-4465.25	H-4465.25CC
50mm	.020mm	70mm	No	H-4465.50	H-4465.50CC

*counter-clockwise reading dial indicators

Contact Point Extensions	Model
.25" (6.4mm) Extension	H-4466.2
1" (25mm) Extension	H-4466.10
1.5" (38mm) Extension	H-4466.15
2" (50mm) Extension	H-4466.20
3" (76mm) Extension	H-4466.30
5" (127mm) Extension	H-4466.5



From a single operation to controlling a complete geotechnical lab, Humboldt Material Testing Software (HMTS), in conjunction with compatible Humboldt testing equipment, provides a complete solution for the acquisition, recording and presentation of testing data. HMTS works in conjunction with Microsoft Excel to present test data in easy-to-read Excel workbook format files, which can be evaluated directly or sent to any computer using Microsoft Excel. The HMTS is configured in two levels of functionality.

Basic, User-Defined Level

Our basic solution, or user-defined level software, is provided free with our HM-3000 MasterLoader, HM-2900 Pro Loader, HM-2325A and HM-2330D MiniLoggers, HM-2560A Shear and the HM-2750A and HM-2750D Shear Testers. This free software allows you to:

- set up and run user-configured tests;
- save test configurations as templates for rapid setup of future tests;
- collect and view data in real time with basic graphing functions;
- generate graphs in real time through the use of custom-designed Excel templates for report generation and printing, and
- simultaneously run multiple tests on one computer—based on the number of Humboldt logger-capable machines listed above that you have connected.

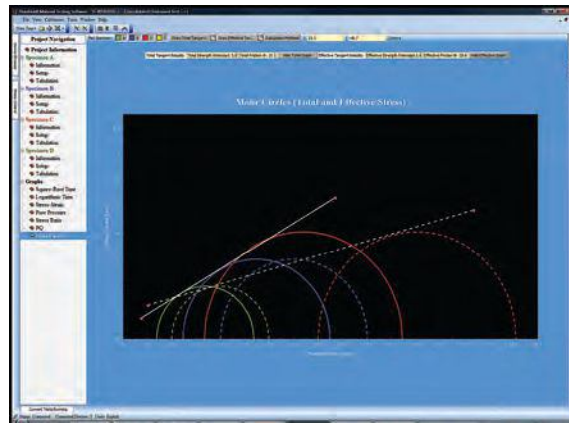
Advanced, Module Level

The advanced version of the HMTS involves upgrading the capabilities of the basic HMTS by purchasing and registering test-specific modules that are unlocked, with a registration code, from the free version of the software. Purchasing test-specific modules allows you to go beyond the functionality of the basic software by providing you with the following capabilities:

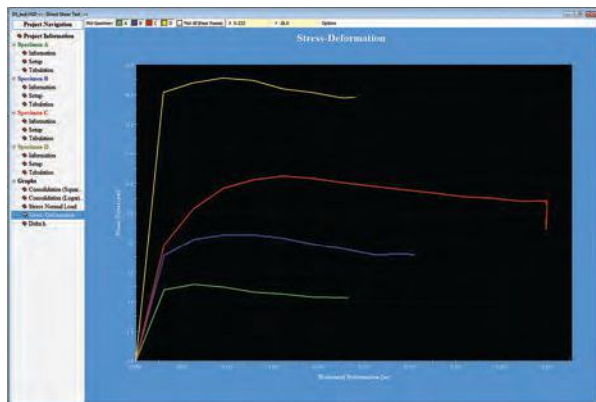
- test-specific setup that guides you through the process, which includes selecting data collection parameters that best fit the specific test;
- input specific project information for each test, such as project name, client information, etc;
- all test-specific initial, intermediate, and final parameters required by ASTM and BS standards is 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 the projects. Reports are generated in Microsoft Excel workbooks allowing you to modify any report template to fit your company's needs
- simultaneously run multiple tests on one computer, involving any of the available HMTS modules and any compatible Humboldt equipment up to 255 device connections, which is up to 1020 inputs;
- create and store test-specific test setup templates for rapid setup of future tests;
- produce test-specific graphs, which allow you to draw construction lines to calculate angles and other test-specific parameters;
- automatically recover from a PC shutdown without loss of data;
- single click between imperial and metric units;
- easily change between different test standards, and
- access free, downloadable software upgrades for purchased modules.

Test No.	Date	Operator	Project Name	Soil Type	Test Type	Vertical Stress (kPa)	Horizontal Stress (kPa)	Shear Stress (kPa)	Displacement (mm)	Time (min)	Notes
1001	10/10/08	J. Smith	Highway 101	CLAY	CU	100	30	40	1.5	10	
1002	10/10/08	J. Smith	Highway 101	CLAY	CU	200	60	80	3.0	20	
1003	10/10/08	J. Smith	Highway 101	CLAY	CU	300	90	120	4.5	30	
1004	10/10/08	J. Smith	Highway 101	CLAY	CU	400	120	160	6.0	40	
1005	10/10/08	J. Smith	Highway 101	CLAY	CU	500	150	200	7.5	50	
1006	10/10/08	J. Smith	Highway 101	CLAY	CU	600	180	240	9.0	60	
1007	10/10/08	J. Smith	Highway 101	CLAY	CU	700	210	280	10.5	70	
1008	10/10/08	J. Smith	Highway 101	CLAY	CU	800	240	320	12.0	80	
1009	10/10/08	J. Smith	Highway 101	CLAY	CU	900	270	360	13.5	90	
1010	10/10/08	J. Smith	Highway 101	CLAY	CU	1000	300	400	15.0	100	

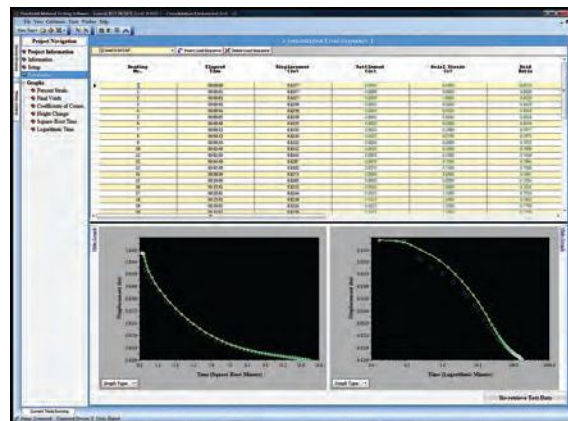
Data Entry Tabulation from CU Shear and Direct Shear tests.



Mohr Circles plot from CU test.



Stress Deformation graph from Direct Shear test.



Consolidation tabulation with plots.

Available advanced modules include:**Consolidation— HM-1100SW**

ASTM: D2435, D4546, AASHTO: T216, BS: 1377:5

Direct Shear— HM-2700SW

ASTM D3080, AASHTO T236 and BS1377:7

CBR/LBR— HM-3001SW

ASTM D1883; AASHTO T193; BS 1377 Part 4

Unconfined Compression— HM-3004SW

ASTM D2166, BS 1377-7

UU Triaxial— HM-3002SW

ASTM D2850, BS 1377-7

CU Triaxial— HM-3003SW

ASTM D4767, BS 1377-8

CD Triaxial— HM-3006SW

ASTM D4767, BS 1377-8

Marshall Design— HM-3005SW

ASTM D6927, D4123-82; AASHTO T245, T283, BS 598-107

Operating System Requirements

Windows 2000 (with at least Service Pack 4), Windows XP Professional, Windows XP Home, Windows Vista and Windows 7. Other Windows versions, such as Windows 3.1, Windows 95, 98, and NT are not supported.

Software Requirements

Microsoft® Excel is required for creating reports.

Hardware Requirements

- Pentium® 4 (32-bit) equivalent or faster
- Minimum 512 MB RAM (1024 MB or more recommended)
- 300 MB swap space (or more)
- CD-ROM or DVD Drive
- 1024 x 768 display resolution

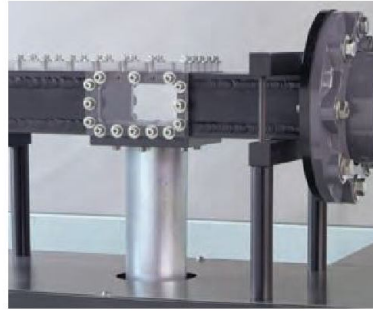
Internet Connection

As recommended above, it is highly recommended that you have an internet connection. With an internet connection you can:

- Check for updates.
- Automatic updates are performed.
- Tests can be sent to Humboldt or to anyone you choose.
- Humboldt can be notified of issues.
- Registration can be sent directly to Humboldt for quicker processing.
- In the event of issues with the software we can connect to your computer remotely and help you.

How to Use the Software

The HMTS disk contains the complete HMTS offering including all test-specific modules. After installation on your computer, you will be able to use the Basic Level software capabilities for any applicable application, for as long as you like for free. You will also be able to use all the Advanced Level Modules, with full capabilities 20 times for each test module as a free trial. The software will keep track of the number of uses and display the remaining number of tests available on the screen.



Test observation window

Specifications

Flow Rate	0 to 8 meters per second
Specimen Size	Accepts 3.0" OD x 2.875" ID (76.2 x 73mm) Shelby Tubes
Dimensions	96" x 40" x 96" 2,438 x 1,016 x 2,438mm) excluding wheels and PC Shipping wt. 1500 lbs. (680kg)

Supplied complete with PC, SRICOS Analysis Software and Flow/ Temperature Sensors.

Erosion Function Apparatus— HM-4000

The HM-4000 Erosion Function Apparatus (EFA) was designed and built to prevent bridge failures by measuring the erodibility of soil. Used in conjunction with the SRICOS scour prediction method, the HM-4000 can provide more accurate erodibility measurements and scour predictions than previously obtainable. Applications for its use include: scour at bridges, piping of dams, beach erosion and surface erosion problems. In the case of scour at bridges, the EFA leads to improved accuracy on scour depth predictions, offering several advantages over previous test methods. These advantages include: minimum sample disturbance; measurement of erosion rate vs. shear stress; measurement of critical shear stress, and incorporation of the test results from the SRICOS scour prediction method.

The HM-4000 Erosion Function Apparatus uses standard 3.0" OD x 2.875: ID (76.2 x 73 mm) Shelby tubes; and is supplied with a PC, SRICOS software and flow/temperature sensors. The SRICOS Method improves the accuracy of Pier Scour Predictions.

The HM-4000 EFA is designed to be used in conjunction with the SRICOS Method of scour prediction. The SRICOS scour prediction method and the HM-4000 Erosion Function Apparatus were developed through research carried out by Jean-Louis Briaud, PHD, PE. and the Scour Research Team at the Texas Transportation Institute of the Texas A&M University System.

In comparison with the HEC-18 equation (a standard for calculating scour predictions), SRICOS generally leads to smaller calculated scour depths and compares more favorably to actual measured scour depths.

The EFA uses either of two variants of the SRICOS method:

The Extended SRICOS Method

- 1) Calculate the maximum depth of scour
- 2) Collect soil samples at the site
- 3) Test samples in the EFA to obtain the erosion rate vs. the hydraulic shear stress applied
- 4) Prepare the velocity hydrograph for the bridge
- 5) Use the SRICOS program with 3 & 4 above as input and generate the depth of scour vs. time over the period covered by the chosen hydrograph.

The Simple SRICOS Method

- 1) Calculate the maximum depth of scour
- 2) Collect soil samples at the site
- 3) Test samples in the EFA to obtain the erosion rate vs. hydraulic shear stress applied
- 4) Calculate the equivalent time for a given design life of the bridge and for the design velocity
- 5) Using known equations, calculate the scour depth at the end of the design life

