

**HUMBOLDT**

Authorized Distributor Clarkson Laboratory Phone 619-425-1932 www.clarksonlab.com



Moisture/Density Gauge with Accessories



**Radiation Safety Training Courses Available On-Site, or in Scheduled Cities. Call Humboldt: 1-800-537-4183**

**Note:** Prior to shipment of radioactive equipment, a copy of your Radioactive or By-product Material License must be forwarded to Humboldt.

Humboldt is happy to assist you in obtaining or amending a license. For assistance with your application, call: 1-800-537-4183

## Moisture/Density Gauges

### Ideal for Compaction

Uses advanced microprocessor based technology to provide highly accurate measurements of moisture content and density of construction materials such as soil, aggregate and asphaltic concrete.

Automatically computes a variety of parameters, including direct readouts of wet density, dry density, moisture content, percent of moisture, percent of compaction (Proctor or Marshall), void ratio, and air voids. Reads in either English or S.I. units.

### Principle of Operation

**Density Measurement**— Is based on the attenuation of gamma radiation due to Compton scattering and photoelectric absorption directly related to the electron density of materials. This indicates the mass density of materials with a chemical composition similar to the crust of the earth.

**Moisture Content Measurement**—is based on the thermalization (or slowing down) of fast neutron radiation, a function of the hydrogen content of the materials. This calibration can be altered by the user to correct for other materials containing hydrogen.

## HS-5001 Series Moisture/Density Gauges

State-of-the-art design for precision accuracy and great reliability in day-to-day field conditions.

- Choice of three model series
- Choice of two measuring depth/increments

Models offer choice of either 8-inch (200mm) or 12-inch (300mm) rod lengths for measuring depth; choice of either 1-inch (25mm) or 2-inch (50mm) increments.

Unique indexing mechanism provides positive and accurate positioning of the source, yet eliminates the wear and potential damage common with most trigger-type mechanisms. Induction hardened stainless steel source rods minimize wear and deflection.

Modular design is easily serviced in the field (except the sealed radioactive source) without special tools or equipment. Designed for use in direct transmission and backscatter modes. Power supplied by 6 AA-size alkaline batteries having a life up to 2,000 hours.

Includes: transit case that meets USDOT specifications, reference standard, instruction and radiation safety manual, source and case certification, zippered accessory case, rod guide/scrapper plate, drill rod, 4-lb. hammer for driving drill rod, and rod extraction tool. Meets ASTM D2922, D3017, D2950; BS 1377, 1924, AASHTO T-310-02.

Note: See page 91 for specific models and accessories.

## Radiation Safety Training Courses Available On-Site, or in Selected Cities

"Radiation Safety & Proper Gauge Operation Procedures for Users of Portable Moisture/Density Gauges" is the subject of a one-day course taught by Humboldt technical experts. The class satisfies the USNRC and Agreement-State requirements for gauges. A training certificate will be issued to students who successfully complete this course. For Schedule/Enrollment Information, Call: 1-800-537-4183

### Radioactive Material Data for License Application

Radioactive Material	Chemical/Physical Form	Maximum Amount
Cesium-137	Sealed Source Humboldt 2200064	Not to exceed 11 millicuries per source
Americium-241:Be	Sealed Source Humboldt 2200067	Not to exceed 44 millicuries per source



H-5001C

## Moisture/Density Gauges, HS-5001B, "B" Series

"B" Series, has the ability to do thin-layer asphalt measurements, plus automatic indexing

- Direct readings in engineering units
- Inexpensive, easy-to-replace 2,000-hour batteries
- Totally contained automatic indexing
- Built-in test routines
- Special SHIFT/TRNCH key
- Thin layer asphalt measurements

Description	Model
Moisture/density gauge, measures to 8" (200mm) depth, 1" (25mm) increments.	HS-5001B081
Moisture/density gauge, measures to 8" (200mm) depth, 2" (50mm) increments.	HS-5001B082
Moisture/density gauge, measures to 12" (300mm) depth, 1" (25mm) increments.	HS-5001B121
Moisture/density gauge, measures to 12" (300mm) depth, 2" (50mm) increments.	HS-5001B122

## Moisture/Density Gauge, HS-5001C, "C" Series

"C" Series has all the features of the "B" Series, plus infrared RS232 port for computer or printer connection

- Direct readings in engineering units
- Inexpensive, easy-to-replace 2,000-hour batteries
- Totally contained automatic indexing
- Built-in test routines
- Special SHIFT/TRNCH key
- Thin layer asphalt measurements
- Storage capability of up to 320 measurements
- Computer or printer interface via infrared RS232 port

Description	Model
Moisture/density gauge, measures to 8" (200mm) depth, 1" (25mm) increments.	HS-5001C081
Moisture/density gauge, measures to 8" (200mm) depth, 2" (50mm) increments.	HS-5001C082
Moisture/density gauge, measures to 12" (300mm) depth, 1" (25mm) increments.	HS-5001C121
Moisture/density gauge, measures to 12" (300mm) depth, 2" (50mm) increments.	HS-5001C122

## Moisture/Density Gauges, HS-5001EZ, "EZ" Series

"EZ" Series, our top-of-the-line, has all the features of "B", and "C" Series, plus easy-to-use, built-in test routines and auto features

- Menu driven
- Built-in test routines
- 4 lines x 20 alphanumeric character backlit liquid crystal display
- Real time clock and self-calibration
- Direct readings in engineering units
- Inexpensive, easy-to-replace 1,600-hour batteries
- Totally contained automatic indexing
- Thin layer asphalt measurements & trench correction
- Computer or printer interface via infrared RS232 port

Description	Model
Moisture/density gauge, measures to 8" (200mm) depth, 1" (25mm) increments.	HS-5001EZ081
Moisture/density gauge, measures to 8" (200mm) depth, 2" (50mm) increments.	HS-5001EZ082
Moisture/density gauge, measures to 12" (300mm) depth, 1" (25mm) increments.	HS-5001EZ121
Moisture/density gauge, measures to 12" (300mm) depth, 2" (50mm) increments.	HS-5001EZ122

Dimensions and Shipping Weights				
Description	inches	(mm)	lbs.	(kg)
Gauge (excluding handle).	15.75x8.66x5.5	(400x220x140)	30	(13.6)
Height (including handle), 8" (200mm) models.	18	(450)	—	—
Height (including handle), 12" (300mm) models	21.6	(550)	—	—
Reference Standard	14x7.5x3	(350x200x75)	10	(4.5)
Transit Case	31x14.5x19	(790x370x490)	28	(12.7)
Accessory Bag (weight includes contents)	19.7x9.8x4.9	(500x250x125)	18	(8.2)
Total shipping wt.			89	(40.5)

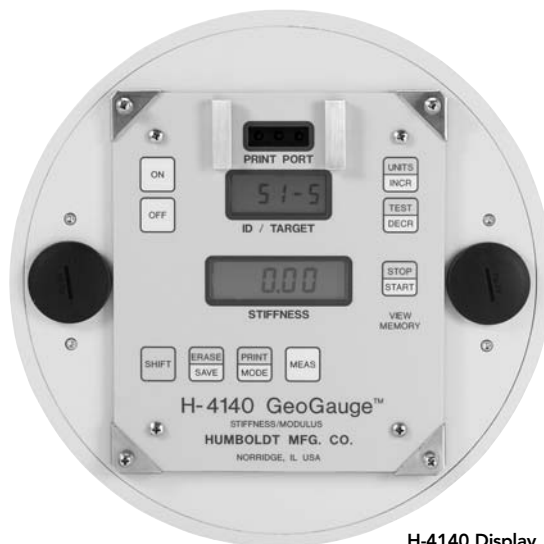
Description, Replacement Parts & Accessories	Model
Computer or printer connection via infrared RS232 port for use with HS-5001EZ and HS-5001C series.	HS-200313
Leak test kit, pkg/10.	HS-200177
Scraper Plate/Rod Guide.	HS-200127
Hammer 4 lb.; Double Faced.	HS-000176
Drill Rod.	HS-200130
Extractor Tool.	HS-200145
Tool Set (Complete).	HS-200112
Caution Radioactive Material Sign.	HS-001057
Moisture/density gauge verification of calibration device. Verifies calibration at single or multiple density points. Gauge reading may be checked by PC software for the entire construction range from 90 to 170 lb/ft <sup>3</sup> (1,4009 to 2,723 kg/m <sup>3</sup> )	HS-200700
Calibrator™ PC software upgrades HS-200700 for recalibration of Moisture/Density Gauges to the required accuracy range.	HS-200702
Survey Meter for Gamma Radiation Monitoring with traceable to NIST certificate of calibration.	HS-130512C

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H-4140



H-4140 Display

## GeoGauge™ In-Place Soil Stiffness & Modulus Gauge For Compaction Evaluation

- Ensures optimum compaction quality
- In-place QC/QA of compaction & construction materials
- In-place monitoring of stabilized material's strength
- Enables Performance Specifications via in-place mechanical & material properties
- Measures in-place the layer's stiffness and material's Young's modulus
- Ensures higher quality construction for longer pavement service life
- Improves uniformity to enhance stress distribution & reduce maintenance cost
- Speeds & facilitates the compaction process: up to 20 measurements per hour
- Unaffected by construction vibration, wind or slope
- Reliable, robust, repeatable & easy to learn & use
- No special operator training required
- Alternative to CBR and other strength, deflection & index measurements
- Winner of Construction Innovation Forum's prestigious Nova Award
- Meets ASTM Standard D6758

The Humboldt GeoGauge™ is a hand portable compaction QC/QA tool. The GeoGauge™ evaluates the quality of each compacted layer without delaying or interfering with construction. Evaluates compaction non-destructively, safely and quickly even near vibrating equipment for immediate results. Enables quick correction of problem areas while equipment is still on-site. GeoGauge™ allows contractors to control the compaction process to minimize over-compaction and damage of materials. Data can be downloaded to a PC for documenting, archiving and additional analysis. GeoGauge™ is ideal for avoiding premature failures and to develop specifications directly relevant to performance.

GeoGauge™ evaluates the level of compaction via key and relevant in-place mechanical and material properties. Its dynamic operation principle simulates cyclic traffic loadings; accurately measures the material's reaction under conditions representative of actual loadings. Measuring the deflection, GeoGauge™ displays the layer's structural stiffness and the material's Young's/elastic modulus from the surface to a depth of 9 to 12" (230 to 310 mm). Stiffness (a structure's resistance to deflection) and Young's modulus (a material's resistance to deformation) are basic properties indicating how the engineered structure and material will perform. Measuring in-place directly links compaction with Performance Specifications. Patent Pending.

**Note:** For additional information and to download reports, go to the GeoGauge web page link on Humboldt's website at: [www.humboldtmfg.com](http://www.humboldtmfg.com)

Along with in-process QC/QA for subgrade and base compaction, key applications include:

- Monitor and quantify the strength of lime, cement, fly-ash and polymer stabilized materials as the material cures to facilitate construction.
- Control and improve uniformity within each layer for lower maintenance cost and longer life.
- Duplicate stiffness properties of trench and utility backfills with surrounding undisturbed materials to improve durability.
- Assess and confirm the quality and uniformity of bases to reduce asphalt surface failures.
- Monitor for peak stiffness of the asphalt layer to reduce damage and wasteful effort.

### Specifications:

Display Panel:	LCD display with membrane function keypad and infrared communication port.
Stiffness Range:	17 to 400 klbf/in (3 to 70 MN/m).
Young's Modulus Range:	4 to 90 kpsi (26 to 610 MPa).
Measurement Depth Range:	9 to 12" (230 to 310 mm) from surface.
Operating Temperature:	0°C to 58°C (ambient).
Power Source:	(6) Alkaline "D" cell 1.5-volt batteries. Sufficient for 1000 to 1,500 measurements.
Gauge Dimensions:	11" (280 mm) diameter by 10.5" (270 mm) height (less handle).
Gauge Weight:	22 lbs. (10 kg).
Shipping Weight (domestic):	Gauge with Case; 39 lbs. (17.7kg).

Description	Model
GeoGauge™, Stiffness/Modulus Gauge. With carrying case, batteries and manual.	H-4140

Description, Accessories	Model
Infrared (IR) serial interface adapter cable with spreadsheet software template, 3.5" disk (Microsoft Windows HyperTerminal required)	H-4140.12
Verifier Mass, 10kg	H-4140.20



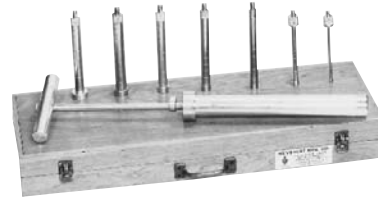
H-4200



H-4200F



H-4205



H-4139



H-4212M

## Soil Penetrometer, Pocket Type

Superior to others:

- Easy-to-read as a tire gauge
- No little parts to come off & get lost
- Won't plug-up with soil & moisture to invalidate reading or rust spring

For use by field personnel to check visual classification of soils. Verifies whether excavation side walls require shoring, based on OSHA cohesive soils classifications (see chart). Indicates consistency, shear strength, and approximate unconfined shear strength. Direct-reading scale—in tons/sq ft, or kg/sq cm—corresponds to equivalent unconfined compressive strength. Range: 0 to 4.5 tons. High quality construction. Includes belt-loop style carrying case and operating instructions. Optional adapter foot. Should not replace laboratory testing or field analysis, or be used to produce foundation design data.

Description	Model
Pocket penetrometer.	H-4200

## Penetrometer Adapter Foot

Adapter foot is recommended when testing extremely low strength cohesive soils. Foot is 1" (25mm) dia., compared to the 1/4" (6.35mm) penetrometer piston so the effective area of the piston is increased 16 times with the adapter foot. Divide by 16 to obtain correct unconfined compressive strength of material being tested when the reading in tons per square foot or kilograms per square centimeter is on the low-load side.

Description	Model
Penetrometer adapter foot.	H-4200F

## Dial Pocket Penetrometer

A sophisticated pocket penetrometer offering greater capacity and sensitivity than others. Maximum value is retained on the dial until released via pushbutton. Inner dial scale 0 to 6.0, with 0.1 divisions in tsf and kg/cm<sup>2</sup>. Outer scale gives load strength over 0 to 11.0 with 0.1 divisions in tsf and kg/cm<sup>2</sup>. This reading is used with charts (included) to estimate safe bearing pressures, depending on plunger used and soil type. Values indicated relate to the standard 1/4" dia plunger. In addition, readings with four other included plungers (10, 15, 20, 25mm) indicate safe bearing pressures for foundations in consolidated soils over a range of sandy to clayey soil types. The 2.5" (63mm) dia dial can be easily recalibrated using register plates (included) and any readable scale of 10-15 lbs. capacity. Includes data tables, register plates, instructions, and carrying case.

Description	Model
Dial pocket penetrometer kit.	H-4205

## Proctor Penetrometer Set

Establishes the moisture-penetration resistance relations of fine-grained soils. Includes these interchangeable needles (area in sq. in. or sq. cm): 1 (6.45), 3/4 (4.84), 1/2 (3.22), 1/3 (2.15), 1/5 (1.29), 1/10 (.65), 1/20 (0.32) 1/30 (0.22cm<sup>2</sup>) and 1/40 (0.16cm<sup>2</sup>). Replacement needles available. Meets ASTM D1558.

Description	Model
Proctor Penetrometer Set.	H-4139

Shipping wt. 17 lbs. (7.7kg).

## Penetration Resistance Needles

Replacement interchangeable needles for H-4139 Proctor Penetrometer. Available as set or separately. Meet ASTM D1558.

Description, Replacement Parts & Accessories	Model
Replacement resistance needle set.	H-4143N
1 sq. in. (6.45 cm <sup>2</sup> ) needle.	H-4143.1
3/4 sq. in. (4.84cm <sup>2</sup> ) needle.	H-4143.75
1/2 sq. in. (3.22cm <sup>2</sup> ) needle.	H-4143.50
1/3 sq. in. (1.29cm <sup>2</sup> ) needle.	H-4143.33
1/5 sq. in (2.15cm <sup>2</sup> ) needle.	H-4143.20
1/10 sq. in. (0.65cm <sup>2</sup> ) needle.	H-4143.10
1/20 sq. in. (0.32cm <sup>2</sup> ) needle.	H-4143.05
1/30 sq. in. (0.22cm <sup>2</sup> ) needle.	H-4143.033
1/40 sq. in. (0.16cm <sup>2</sup> ) needle.	H-4143.025

## Torvane Shear Tester Set, Metal

Torvane rapidly measures approximate shear strength of cohesive soils in the field or laboratory. May be used for place testing of test pits or trenches, ends of thin-walled tube samples or with undisturbed samples with a flat 2" (51mm) dia. surface available. Dial range of 0-1.0x0.05kg/cm<sup>2</sup> is read directly when using standard vane. Multiply readings by 0.2 and 2.5 ratiis when using large (sensitive) and small (high-capacity) vanes. Set includes driver, three vanes (standard, large and small) of different shear strength ranges and lightweight carrying case.

Description	Model
Torvane shear tester set.	H-4212M

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Sales or Technical Assistance — 1-800-544-7220



H-4221



H-4204



H-4210



H-4211



H-4120

## Geovane Soil Shear Strength Tester

The Geovane Soil Shear Strength Tester has been developed after extensive research, field-testing and trials. The Geovane is a hand-held instrument used for determination of solid shear strength and gives a result to the user in kPa, through a calibration chart.

The device is simple to use. A 19mm vane blade is screwed into the base of the Geovane and the vane is pushed into the soil. Simply rotate the Geovane at a rate of 1 revolution per minute and take a reading off the face when the soil fails. A pointer stays in place when failure occurs so all you have to do is look up the reading from the face on the supplied calibration chart to get your reading in kPa from zero to 200. Through the use of the optional 33mm vane, readings can be measured between the range of zero to 40kPa. Extension rods are available to increase the depth measurement capabilities of the unit.

The Geovane is supplied complete with a 19mm vane blade, wrenches and a carrying case.

Description	Model
Geovane Soil Shear Strength Tester.	H-4221

Description, Accessories	Model
Vane, 33mm.	H-4221.1
Extension Rod, 12" (300mm) with adapter.	H-4221.2
Extension Rod, 19.7" (500mm) with adapter.	H-4221.3

## Proving Ring Penetrometer

Used to determine the bearing capacity of subgrades, or to measure soil compaction. Light and easy to handle in the field. A rapid means of determining the penetration resistance of soil in shallow exploration surveys. Includes: 30° 1 sq. in. (6.45 sq cms) cone; 250 lb. (1.1kN) capacity proving ring; brake type dial indicator, holds final reading until manually released; 3/4" (19mm) dia shaft, graduated at 6", (152mm) intervals; 3/4" (19mm) dia extension rod, graduated at 6" (152mm) intervals; cast aluminum T-handle.

Description	Model
Proving ring penetrometer.	H-4204

Shipping wt. 15 lbs, (6.8kg)

## Static Cone Penetrometer

Used in fine-grained, soft soils at shallow foundation and pavement subgrades to depths of 30 feet (9.14m) to evaluate for:

- consistency
- level of compaction,
- bearing capacity

Unmatched for accuracy, reliability & ease of use. Pressure gauge with 0-70kg/cm is scaled for direct reading of cone stress, eliminating proving ring conversions. Dual rod design eliminates soil friction factor. High strength aluminum and steel construction. Standard models include a 60° cone with area of 1.5 cm. max., a starter rod assembly rated at 250 lbf axial force max., and a pressure gauge.

Description	Model
Static cone penetrometer, with 2.5 ft. (.76m) starter rod.	H-4210
Static cone penetrometer, with 4 ft. (1.22m) starter rod.	H-4211

Shipping wt. 8 lb. (3.63kg)

Description, Replacement Parts & Accessories	Model
60° Cone with 3 cm <sup>2</sup> max area.	H-4210.3
Extension rod, 4 ft. (1.22m).	H-4210E.4
Extension rod, 2.5 ft. (.76m).	H-4210E.2
60° Cone with 1.5 cm <sup>2</sup> max area.	H-4210.1
Starter rod, 4 ft. (1.22m).	H-4210.4
Starter rod, 2.5 ft. (.76m).	H-4210.2
Replacement "O" Ring.	H-4210.9

## Corps of Engineers Cone Penetrometer

- The principal instrument for evaluating soil trafficability
  - Factory calibrated dial indicator reads directly in psi
  - Manufactured to Corps of Engineers specifications
- 30 degree cone with 1/2 sq. in. base area, 150 lb capacity proving ring, dial indicator calibrated direct 0-300psi in 5psi increments, extension rod 5/8", (15.8mm) dia x 19" (483mm), plus handle.

Description	Model
Corps of Engineers cone penetrometer.	H-4120

Shipping wt. 15 lbs. (6.8kg)



H-4218A



H-4219

## Dual-Mass Dynamic Cone Penetrometer

The Dual-Mass, Dynamic Cone Penetrometer (DCP) provides fast, economical, accurate, in-place soil shear strength in mm/blow and an indication of different strength layers. Patented by the U.S. Army Corps of Engineers, this instrument can penetrate soils to depths of 37.5" (953mm) or up to 6ft. (1.8,) with an extension. Correlations of the rate of penetration to CBR (California Bearing Ratio) are in the User's Manual. Software included in the kit will graph depth vs. CBR and bearing values in lbs/sq. ft. The system consists of an 8 kg stainless steel two-part hammer assembly, stainless steel upper rod, stainless anvil, new segmented lower rod with flats (wrenches replace channel locks and loctite), stainless steel lower rod, reusable hardened point, disposable cone adapter, 25 disposable cones, vertical scale, hand tools, users manual with spreadsheet software template and a heavy-duty carrying case with wheels. A sliding attachment facilitates one-person operation. Meets ASTM D6951.

Description	Model
Dual-Mass dynamic cone penetrometer set.	H-4218A

Shipping wt. 57.5 lbs. (26.1kg)

Description, Replacement Parts	Model
Stainless steel top rod and handle.	H-4218.1
Stainless steel two-part hammer.	H-4218.2
Stainless steel lower rod, 34.75".	H-4218.13-34
Vertical scale, 44". Graduated in inches and centimeters.	H-4218.5
Hardened point with wrench flats.	H-4218.7
Cone adapter with wrench flats.	H-4218.8
Disposable cones. Pkg. of 25.	H-4218.9
Owners manual/diskette.	H-4218.11
Aluminum carrying case.	H-4218.12
Stainless steel lower rod and anvil, 37.5".	H-4218.13

## NEW Semi-Automatic, Portable Penetrometer Electronic Recorder (SAPPER)

The SAPPER is a fast, rugged and accurate device that automates DCP with an 8 kg hammer at a rate of about one blow every two seconds. It records the in-place soil shear strength and displays penetration, blows, mm/blow and correlations to CBR and lbs/sq ft. Data is stored so that it can be uploaded to a PC at the end of the day. The DCP fits into a carriage mounted to a collapsible two-wheeled chaise made of aluminum and stainless steel. An onboard battery powers two 12-volt motors that advance and extract the DCP, as well as the controls and data recorder. Meets ASTM D6951.

Description	Model
SAPPER.	H-4217

## Heavy-Duty Dual-Mass Dynamic Cone Penetrometer

The new Humboldt Heavy-Duty, Dual-Mass Dynamic Cone Penetrometer has been engineered to improve assembly, performance and extend the service life. Designed in full compliance with the U.S. Army Corps of Engineers specifications, key design improvements include:

- Welded top shaft to anvil construction avoids thread stripping or breakage as in standard versions.
- Wrench flats machined into extension shafts, anvil and cone tips for easy assembly
- Modified hammer set screw hole design eliminates screw loosening during use or thread damage
- Engineered using a superior grade of stainless steel than original design specifications call for.
- All parts 100% inspected with hammer weights verified using a certified weighing system.
- Heavy-duty plastic carrying case with wheels and die-cut foam inserts.

The complete set consists of the dual-mass slide hammer assembly, extension shaft with hardened tip, extension shaft with disposable cone tip adapter, 100 disposable tips, vertical scale, go-no go gauge, all necessary wrenches, user manual with spreadsheet software template and carrying case.

Description	Model
Heavy-Duty, Dual-Mass Dynamic Cone Penetrometer Set.	H-4219

Description, Replacement Parts	Model
Top rod with welded anvil and handle assembly.	H-4219.1
Vertical Scale.	H-4219.2
Go-no go gauge.	H-4219.3
Hardened cone tip with wrench flats.	H-4219.4
Disposable cone tip adapter with wrench flats.	H-4219.5
Disposable cone tip, pack of 25.	H-4219.25
Disposable cone tip, pack of 50.	H-4219.50
Disposable cone tip, pack of 100.	H-4219.100

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Sales or Technical Assistance — 1-800-544-7220



H-4202

### Dynamic Cone Penetrometer Test Set

For use in nearly all types of soils. The H-4202 set for 10 ft. includes; one sliding drive hammer assembly (H-4202.1), one heat treated 60 cone penetrometer point with 1 ft. adapter rod (H-4202.3), four 2.5 ft. E drill rod extensions (H-4202.225), one auger head (H-4202.6), one auger T-handle (H-4202.4), four 36" auger extensions (H-4202.5), and one ASTM special technical publication #399 (H-4202.10).

Description	Model
Dynamic cone penetrometer test set.	H-4202

Shipping wt. 76 lbs. (36kg)

Description, Component/Replacement Parts for H-4202	Model
Sliding drive hammer assembly.	H-4202.1
E drill rod extension. 1 ft.	H-4202.21
E drill rod extension. 2 ft.	H-4202.22
E drill rod extension. 2.5 ft.	H-4202.225
E drill rod extension. 5 ft.	H-4202.25
Drive point w/1 ft. adapter.	H-4202.3
Drive point only.	H-4202.3DP
Auger assembly. Includes auger head, two connector pins, tee handle and one extension.	H-4202.6A
Auger Tee handle.	H4202.4
Auger Tee handle, stainless steel	H-4202.4SS
Auger extension. 36".	H-4202.5
Auger extension, stainless steel. 36".	H-4202.5SS
Auger head, standard (heat treated carbon steel). 3-1/4"	H-4202.6
Auger head, stainless steel. 3-1/4".	H-4202.6SS
Windowed auger head, standard (heat treated carbon steel). 3-1/4"	H-4202.6W
Windowed auger head, standard (stainless steel). 3-1/4".	H4202.6WSS
Drive tube assembly, zinc plated steel. 3x10".	H-4202.7
Drive tube assembly, stainless steel. 3x10".	H-4202.7SS
Replacement connector pin.	H-4202.8
Replacement connector pin, stainless steel.	H-4202.8SS
ASTM special technical publication.	H-4202.9



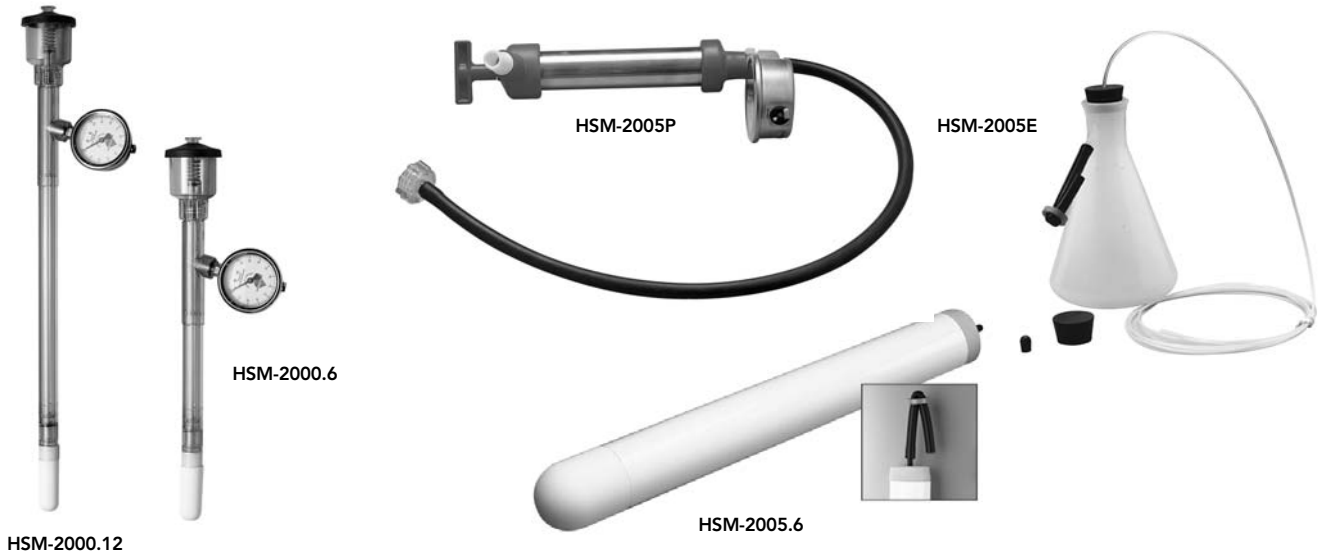
H-4223

### Heavy-Duty Dynamic Cone Penetrometer

The new H-4223 series Heavy-Duty Dynamic Cone Penetrometer was developed for users requiring a more rugged and longer lasting design, yet portable for easy transport to the field. This new version consist of a 10-pound slide hammer assembly with a 24" drop, two 36" extension shafts with 6" increment markings, wrenches and a hardened-steel 60-degree cone tip. All components packed in a heavy-duty carrying case with wheels for easy transport to the job site. Through the use of higher-grade materials and manufacturing techniques, failures of shaft couplings, threads or other techniques, commonly associated with lower cost versions are virtually eliminated.

Description	Model
Heavy-duty dynamic cone penetrometer set.	H-4223

Description, Accessories and Replacement Parts	Model
Sliding hammer assembly.	H-4223.1
Extension shaft, 36" long.	H-4223.2
Hardened steel 60 degree cone tip.	H-4223.3
Auger assembly. Includes auger head, two connector pins, tee handle and one extension (Optional).	H-4202.6A



## Jet Fill Tensiometers

The Jet Fill Tensiometer measures the force with which water is held in the soil by the soil particles. This force, referred to as soil suction, tension, or potential, indicates how tightly the water is bound in the soil, and how much energy must be exerted by plant roots to remove and use the water.

The Jet Fill Tensiometer features the patented Jet Fill reservoir for pushbutton convenience and minimization of soil disturbance when servicing is required. Unique modular construction allows for easy replacement of the porous ceramic cup and dial gauge and adaptation of extensions for flexibility and variety in use. The Model HSM-2000SK Service Kit, available separately, is used to refill and maintain the Tensiometer. The optional Insertion Tools are used make a 7/8" (2.2 cm) diameter hole, which ensures good hydraulic contact between the Tensiometer and the soil.

Description	Model
Jet Fill Tensiometer, 6" (15cm) length.	HSM-2000.6
Jet Fill Tensiometer, 12" (30cm) length.	HSM-2000.12
Jet Fill Tensiometer, 18" (46cm) length.	HSM-2000.18
Jet Fill Tensiometer, 24" (61cm) length.	HSM-2000.24
Jet Fill Tensiometer, 36" (91cm) length.	HSM-2000.36
Jet Fill Tensiometer, 48" (122cm) length.	HSM-2000.48
Jet Fill Tensiometer, 60" (152cm) length.	HSM-2000.60

Description, Accessories	Model
Service Kit, available separately, is used to refill and maintain the tensiometer. Includes a vacuum hand pump without gauge; blue fluid concentrate, for improved viewing of fluid level and algae buildup; tensiometer service cap; neoprene tubing, and a special filler bottle.	HSM-2000SK
Insertion Tool, 30" (76cm) length.	HSM-2002.30
Insertion Tool, 54" (30cm) length.	HSM-2002.54
Insertion Tool, 78" (61cm) length.	HSM-2002.78

## Soil Water Samplers (Lysimeters)

The Soil Water Sampler is a large-volume sampler designed for near-surface installation at depths ranging from 6 inches (15 cm) to 6 feet (1.8 m). The unit consists of a 1.9" (4.8 cm) outside diameter PVC tube, a porous ceramic cup with a 2 bar (200 kPa) air-entry value, and a stopper. Neoprene tubing is used as an access port for sample extraction and evacuation. Clamping rings slip over the folded Neoprene tubing to seal the sampler after evacuation. An extraction kit is required for sample retrieval and a vacuum pump is required to evacuate the sampler. A Model HSM-2005P Vacuum Hand Pump and Model HSM-2005E, 1000 ml Extraction Kit is recommended for routine operation.

Description	Model
Soil Water Sampler, 6" (15cm) length.	HSM-2005.6
Soil Water Sampler, 12" (30cm) length.	HSM-2005.12
Soil Water Sampler, 24" (61cm) length.	HSM-2005.24
Soil Water Sampler, 36" (91cm) length.	HSM-2005.36
Soil Water Sampler, 48" (122cm) length.	HSM-2005.48
JSoil Water Sampler, 60" (152cm) length.	HSM-2005.60
Soil Water Sampler, 72" (183cm) length.	HSM-2005.72

Description, Accessories	Model
Vacuum Test Hand Pump with Gauge.	HSM-2005P
Extraction Kit, 1000ml.	HSM-2005E



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HSM-2010



HSM-2015, HSM-2016



HSM-2050

## 5-Bar Pressure Plate Extractor

The HSM-2010 series Pressure Plate Extractor allows analysis of the water-holding characteristics of soil samples in the 0 to 5 bar pressure range. The pressure vessel is 9" (22 cm) deep and has an inside diameter of 12" (30 cm). Up to 4 ceramic plates can be accommodated at one time, allowing for approximately 48 each 2-1/4" (5.7 cm) diameter samples to be analyzed simultaneously. The unit consists of a pressure vessel and lid, clamping bolts, O-ring seals, and outflow tube assemblies. (Note: when used with the low-pressure manifold, range only goes up to 4 bars).

Description	Model
5-bar pressure plate extractor less cells.	HSM-2010

Description, Accessories	Model
1-bar pressure plate cell.	HSM-2010.1
3-bar pressure plate cell.	HSM-2010.3
5-bar pressure plate cell.	HSM-2010.5
Soil sample retaining rings, pack of 12.	HSM-2020
Manifold, low pressure.	HSM-2025
Manifold, low to high pressure.	HSM-2030
Connecting hose, extractor to manifold.	HSM-2035
PM air compressor, 110V, 50/60HZ.	HSM-2050
PM air compressor, 230V, 50/60HZ.	HSM-2050.4F
Connecting hose, compressor to manifold.	HSM-2055

## PM Air Compressor

The PM Air Compressor is used as a pressure supply for the Pressure Plate Extractor. The compressor is designed for sustained, continuous operation, and provides 295 psi operating pressure. The compressor is fully assembled and tested at the factory. The oil is then removed prior to shipment. Approximately 300 ml of SAE 75-90 gear oil (ISO 220 weight) is required (not supplied) prior to operation.

Description	Model
PM air compressor, 110V, 5060Hz.	HSM-2050
PM air compressor, 110V, 5060Hz.	HSM-2050.4F

Special Note: Pressure Plate Cells, Manifolds, PM Air Compressor and Connecting Hoses are required for system operation; not included, must be order separately.

## 15-Bar Pressure Plate Extractor

The HSM-2015 series 15-Bar Pressure Plate Extractor is used to analyze the water-holding characteristics of soil samples throughout the pressure range of interest in most agricultural as well as other research applications. The pressure vessel is 4" (10 cm) deep and has an inside diameter of 12" (30 cm). Up to 3 ceramic plates can be accommodated at one time, allowing approximately 36 2-1/4" samples to be analyzed simultaneously. The unit consists of a pressure vessel and lid, clamping bolts, O-ring seals, and outflow tube assemblies.

Description	Model
15-bar pressure plate extractor less cells.	HSM-2015

Description, Accessories	Model
PM hinge with adapter plate	HSM-2016
1-bar pressure plate cell.	HSM-2010.1
3-bar pressure plate cell.	HSM-2010.3
5-bar pressure plate cell.	HSM-2010.5
Soil sample retaining rings, pack of 12.	HSM-2020
Manifold, low to high pressure.	HSM-2030
Connecting hose, extractor to manifold.	HSM-2035
PM air compressor, 110V, 50/60HZ.	HSM-2050
PM air compressor, 230V, 50/60HZ.	HSM-2050.4F
Connecting hose, compressor to manifold.	HSM-2055

## Pressure Control Manifolds

The HSM-2025 series Low-Pressure Control Manifold designed for use with the Model HSM-2010 5-Bar Pressure Plate Extractor. Output pressure can be regulated from 3 to 60 psi (0.2 to 4 bars). Double regulation is provided. Readout pressure test gauge is graduated from 0 to 60 psi (0 to 4 bars) in 0.2 psi and 0.02 bar intervals. The HSM-2030 series Manifold allows operation of the 15-Bar Pressure Plate Extractor and the 5-Bar Pressure Plate Extractor. Output pressure can be regulated from 10 to 250 psi (0.7 to 16 bars) and from 3 to 60 psi range (0.2 to 4 bars). Double regulation is provided. The 300 psi readout test gauge is graduated from 0 to 300 psi (0 to 20 bars), in 2 psi and 0.1 bar intervals. The 60-psi readout test gauge is graduated from 0.2 psi and .02 bar intervals.

Description	Model
Manifold, low pressure.	HSM-2025
Manifold, low to high pressure.	HSM-2030



HSM-2060

## MiniTrace Portable TDR Kit

The MiniTrace has proven reliability around the world in harsh environments, such as tropical and arid climates under constant use. "Plug and play" STD BUS architecture, plus a wide selection of waveguides and standard or customizable lookup tables. Aluminum waterproof case, indicator lights, "quick change" batteries and optional multiplexing; this CE device is ready for work!

The MiniTrace features significantly reduced weight, size and cost. MiniTrace provides the largest signal pulse of any standard commercial TDR instrumentation used in soils or dielectric measurements. This means you get a return reflection from waveguide end points buried deep in wet, salty conditions. MiniTrace uses the proven step pulse methodology that is the expected standard for TDR measurements, a fact that is appreciated and acknowledged by discerning scientists worldwide.

With 1,200 point sampling resolution, 5,000 reading capacity and user-friendly operations, there is simply no better piece of equipment on the market than the MiniTrace. With the largest selection of inexpensive waveguides available, the user can measure large areas at multiple sites and multiple depths at the lowest possible cost per site or area covered.

The MiniTrace Kit consists of the MiniTrace, a standard waveguide connector, Palm IIIc terminal, backpack for easy portability, Makita battery plus all the necessary cables, chargers, and software to use and download data to your PC. Optional accessory items are expanded memory card, multiplexing card and multiplexing accessories, plus a variety of different waveguides.

### Specifications

Measuring Range:	0-100% volumetric moisture content
Measuring Accuracy:	±2% full scale or better with the standard waveguide connector
Operating Temp:	0 to +45°C
Power Supply:	One each NiCad battery, supplied. Total capacity: 1.2-amp hr. Auxiliary power input 18 volt, 2.2 Amp AC Power Adapter for independent operation. Recharge time, 30-45 minutes. External battery input, 12 volts, for independent operation.

Connecting Ports:	BNC port —For waveguide connection RS-232 serial port— For data transfer Power Port— 8-pin DIN
MiniTrace Memory:	* Standard 256 Kb memory with storage capacity greater than 180 graphs/ 5,610 readings. * Optional 4 Mb memory board increases storage to greater than 3,900 graphs 122,880 readings. * Automatic data tagging with time and date plus user definable Tag field.
MiniTrace Electronic Particulars:	Measuring pulse amplitude 1.5 volt peak Sampling resolution, 10 picoseconds Hardware – 5-slot card cage, 3 system boards, 2 optional slots (for optional expanded memory and multiplexing)

Description	Model
MiniTrace portable TDR kit.	HSM-2060

Description, Replacement, Accessories	Model
Standard Waveguide Connector, supplied in the MiniTrace Kit, attaches to 1/4-inch diameter stainless steel waveguides that can be left in place in the soil or used as a portable probe system. Use of waveguides of different lengths from 15 to 70 cm gives an estimate of how soil water content changes with depth. If bulk soil electrical conductivity exceeds 3 dS/m, coated waveguides can be used to determine water content from the surface to 70 cm.	HSM-2062
Coated waveguides, 15cm (set of 2)	HSM-2062C.15
Coated waveguides, 30cm (set of 2)	HSM-2062C.30
Coated waveguides, 45cm (set of 2)	HSM-2062C.45
Coated waveguides, 60cm (set of 2)	HSM-2062C.60
Coated waveguides, 75cm (set of 2)	HSM-2062C.75
Waveguides, 15cm (set of 2)	HSM-2062C.15
Waveguides, 30cm (set of 2)	HSM-2062C.30
Waveguides, 45cm (set of 2)	HSM-2062C.45
Waveguides, 60cm (set of 2)	HSM-2062C.60
Waveguides, 75cm (set of 2)	HSM-2062C.75



HSM-2075.3, HSM-2070



H-4040 Series

## Digital Soil Moisture Meter

Used to measure the resistance of the soil moisture block in ohms. The obtained reading is converted to a corresponding reading between 0 and 100 on an empirical scale and displayed on the meter. This empirical range covers the soil suction range of 0.2 to 10 bars. The moisture content for different types of soils corresponding to the meter reading can be determined using the calibration graphs provided.

The meter is operated by means of a standard 9v battery (not included) and has Set, Read buttons, and a thumb wheel adjustment knob on the instrument panel. The optional moisture block is connected to the meter by means of simple spring type terminals. Soil moisture blocks are not included and must be ordered separately. See below for details.

Description	Model
Digital soil moisture meter (less blocks).	HSM-2070

## Soil Moisture G-Blocks

The Soil Moisture G-Blocks are an evolution in design. They provide quick response and true sensitivity to conditions where moisture remains relatively high. All Soil Moisture G-Blocks are wetted and checked for speed of response and ability to maintain overall consistency from block to block prior to shipping. The new design of electrode spacing ensures a sensitive response to changing moisture conditions below 2 bars of matric suction with overall operation range to 10 bars of matric suction. The Soil Moisture G-Blocks should provide significant improvements over any competitive blocks.

Description	Model
Soil moisture G-block, 3 ft. (0.9m) lead.	HSM-2075.3
Soil moisture G-block, 6 ft. (1.8m) lead.	HSM-2075.6
Soil moisture G-block, 15 ft. (4.6m) lead.	HSM-2075.15
Soil moisture G-block, 50 ft. (15.2m) lead.	HSM-2075.50

## Water Level Indicators

- Easily accesses small openings, holes & shafts that are not always straight

Instruments for determining water levels in drainage operations, dams, reservoirs, embankments, wells, bore holes, underground cavities, or any hydrological/geological work.

Compact, self-contained units feature a jointed design for easy access to difficult openings. Weighted probe is lowered into the opening via high-strength, flexible cable; buzzer & light indicate when water level has been reached; readings taken from marked cable to very tip of probe so less than 1 ml of water is displaced. Probe resists false readings caused by cascading water. Standard models have cables marked in feet, metric models marked in centimeters. Available in three lengths.

Water Level Indicators				
Description	Dimensions inches (mm)	Weight lbs. (kg)	Standard Model (feet)	Metric Model (centimeters)
150' (50 meters)	5Wx7.5Hx5D (127x191x127)	3 (1.36)	H-4040.150	H-4040.50M
300' (100 meters)	6.25Wx9.25Hx6D (159x235x152)	5 (2.27)	H-4040.300	H-4040.100M
500' (150 meters)	6.25Wx9.25Hx6D (159x235x152)	6 (2.72)	H-4040.500	H-4040.150M



H-4963, H-4966



H-4967

## Speedy® Moisture Tester

Gives fast, accurate measurements of moisture content in powders, mixes, pastes—of soil, sand, clay or any granular material. Portable for field use. Pressure gauge is calibrated for direct reading of percentage of moisture in specimen. Includes pressure gauge, tared balance, measuring scoop, cleaning cloth, brushes and oak carrying case. Meets ASTM D4944; AASHTO T217. Separate calibration kit assures continued accuracy every time.

Speedy® Moisture Testure			
Capacity	% Range	Shipping Weight	Model
6g	0-20	14 lbs (6.4 kg)	H-4964
20g	0-20	18 lb (7.3 kg)	H-4963

## Calibration Kit

Includes calibration unit, instructions, wooden carrying case.

Description	Model
Calibration kit.	H-4965

## Moisture Tester Reagent

Calcium carbide reagent for Speedy® Moisture Testers. Carton of 24-1 lb. (0.5kg) cans. Shipped via motor freight only.

Description	Model
Moisture tester reagent.	H-4966

Shipping wt. 26 lbs. (11.7kg)

## Speedy® 2000 Moisture Tester

The Speedy® 2000 is a new moisture testing kit that combines the original Speedy tester with an electronic balance and a new, heavy-duty plastic carrying case. The new case offers the highest level of protection in the most demanding on-site conditions. The case incorporates tailor made foam insets that secure the contents and protect them from shock damage. The case itself is very durable. The electronic balance is used to weigh the sample before placing it into the Speedy tester. It is very simple to use, accurate and repeatable. The tester is supplied complete with electronic balance, beaker, cleaning cloth, cap, washer, scoop, steel pulverizing balls and cleaning brushes. Meets ASTM D4944 and AASHTO T217.

### Specifications:

Capacity.	H-4967: 20g, H-4968: 6g
Gauge.	Calibrated from 0-20% moisture based on wet weight
Accuracy.	Within 0.5% on most materials
Test Speed.	45 sec. to 3 min., depending on material being tested
Carrying Case.	Heavy-duty plastic
Balance.	Electronic; 0-7 oz (0-200g) range; battery operated
Shipping Wt.	13 lbs. (5.9kg)

Description	Model
Speedy® 2000 moisture tester, 20g capacity	H-4967
Speedy® 2000 moisture tester, 6g capacity	H-4968

### HAZARDOUS WARNING:

Danger of explosion/fire may result if allowed to contact with moisture. Calcium carbide forms flammable acetylene gas when wet so must be kept sealed and dry. Provide adequate ventilation and use away from sparks and flame. U.S. shipping regulations require shipment by approved carriers. Contact Humboldt for international shipping regulations.

## HM-4000 Erosion Function Apparatus

The HM-4000 Erosion Function Apparatus (EFA) was designed and built to measure the erodibility of soils and soft rocks. Applications include 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. This effective new apparatus offers several advantages over previous tests methods:

- Minimum sample disturbance;
- Measurement of erosion rate vs. shear stress;
- Measurement of critical shear stress, and incorporation of the test results in a scour prediction method SRICOS.

The HM-4000 Erosion Function Apparatus helps prevent bridge failures by measuring soil erodibility. Used in conjunction with the new SRICOS scour prediction method, the HM-4000 can provide more accurate erodibility measurements and scour predictions.

### The New SRICOS Method improves the accuracy of Pier Scour Predictions.

The HM-4000 EFA is designed for use in conjunction with the new SRICOS Method of scour prediction. In comparison with the HEC-18 equation (a standard for calculating scour predictions), SRICOS generally led to smaller calculated scour depths and compared more favorably to measured scour depths than HEC-18.

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



### Specifications

Flow Rate:	0-6 meters per second
Specimen Size:	Accepts 3.0" OD x 2.875" ID (76.2 x 73 mm) Shelby tubes
Dimensions (w x d x h):	96" x 40" x 96" (2,438 x 1,016 x 2,438 mm) (excluding wheels and PC)
Supplied complete with PC, SRICOS Analysis Software and Flow/Temperature Sensors.	

Description	Model
HM-4000 Erosion Function Apparatus, supplied complete with PC, SRICOS analysis software and flow/temperature sensors.	HM-4000



## Motorized Hydraulic Sample Ejector

Provides a very efficient and easy means for rapid ejection of samples from standard 3" (76.2mm) thin wall sample tubes. When operated in the standard vertical position, the ejector requires only a maximum height of 76" (1,930mm) when extruding samples from a 36" (914mm) long tube.

In operation, two electrically driven cylinders, working in tandem, are used to pull the tube down in 20" (508mm) increments. The tube gripper assembly was specifically designed to securely hold the thin wall tube in place and quickly release when the ejection process has completed without damaging the tube.

Through the use of optional accessories, the sample ejector can be used to extrude samples from 2" (50.8mm) or 2.5" (63.5mm) O.D. tubes. For laboratories that desire to eject samples horizontally, an optional V-shaped trough is available.

Description	Model
Motorized hydraulic sample ejector for 3" (76.2 mm) O.D. sample tubes. 115V, 60 Hz.	H-4157B
Motorized hydraulic sample ejector for 3" (76.2mm) O.D. sample tubes. 230V, 60 Hz.	H-4157B.2F
Motorized hydraulic sample ejector for 3" (76.2mm) O.D. sample tubes. 230V, 50 Hz.	H-4157B.5F

Shipping wt. 177 lbs (80kg)

Description, Replacement Parts & Accessories	Model
Trough for horizontal ejector use.	H-4157B.1
2" (50.8 mm) O.D. sample tube conversion accessories	H-4157B.2
2.5" (63.5 mm) O.D. sample tube conversion accessories	H-4157B.3

## Shelby Tubes

Description, Shelby Tubes	Model
Galvanized Shelby tubes, 3" diam x 10" long	H-4210.10
Galvanized Shelby tubes, 3" diam x 18" long	H-4210.18
Galvanized Shelby tubes, 3" diam x 30" long	H-4210.30
Galvanized Shelby tubes, 3" diam x 36" long	H-4210.36

## Density Drive Sampler

For determining in-place density of soil by driving a thin-walled tube into the soil mass to obtain a relatively undisturbed sample. Typically used to verify compacted fill placement, or to obtain samples from the bottom of shallow excavations. Drive head and sliding weight hammer used with separately ordered drive tubes. Drive head has shock reducing spring to guard against fatigue failure. Drive tubes have machined outside cutting edge. Essential components are zinc-plated steel. Meets ASTM D2937.

Description	Model
Density drive sampler, 3" (76.2mm) drive head. Shipping wt. 22 lbs. (10.0kg)	H-4203.3
Density drive sampler, 4" (101.6mm) drive head. Shipping wt. 23 lbs. (10.5kg)	H-4203.4

Description, Replacement Parts & Accessories	Model
Drive tube for use with H-4203 series, 3" (76.2mm) diam x 0.01 ft <sup>3</sup> .	H-4203DT.3
Drive tube for use with H-4203 series, 4" (101.6mm) diam x 1/30 ft <sup>3</sup> .	H-4203DT.4
Sample ejector for use with H-4203 series. Shipping wt. 65 lbs (29.2kg).	H-4155A

## Probe Rods

Convenient hand-held tool for locating soft zones in and under compacted areas in sub-grades, footing excavations, etc. Zinc-plated shaft 36" (914mm) long x 1/2" (12.7mm) diameter.

Description	Model
Probe rod, steel	H-4188
Probe rod, fiberglass	H-4188F

Shipping wt. 5 lbs. (2.2 kg)

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H-4199

## Soil Grinder

Prepares soil samples to proper particle size for accurate, repeatable test results. Grinds one-pint sample in 15 seconds. Stainless steel construction. Includes a No. 10 perforated stainless plate.

Description	Model
Soil grinder. 110V, 60Hz, 1 ph AC.	H-4199
Soil grinder. 230V, 50Hz, 1ph AC.	H-4199.5F

Shipping wt. 25 lbs. (11.25kg)

Description, Replacement Parts & Accessories	Model
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

Exploded view of replacement parts is available. Call 1-800-544-7220.

## Auger, Spiral Type

For use in sampling soils, auger has 1-1/2" dia. x 4" long (38mm x 152mm) spiral-type auger bit. Features graduation marks every 6" (152mm). Overall length 36" (915mm), including handle. Removable handle permits attachment of H-4251 extension for sampling beyond 36" depths. Meets ASTM D420, D1452; AASHTO T86, T202.

Description	Model
Soil Auger.	H-4250

Shipping wt. 6 lbs. (2.7kg).



H-4250

H-4251

H-4252 Series

## Extension for Auger, Spiral Type

For use with H-4250 auger, 36" long (914mm) extension allows sampling at greater depths.

Description	Model
Soil Auger extension.	H-4251

## Augers, Iwan-Type

T-handle augers are also known as post-hole, Iwan-type or non-adjustable augers. Feature 36" (914mm) long steel shaft and hardwood cross handle. Available 2" (51mm) to 6" (152mm) diameter. Overall length 48" (1219mm). Meets ASTM D420, D1452; AASHTO

Description	Model
2" dia. (51mm) T-handle auger.	H-4252.2
3" dia. (76mm) T-handle auger.	H-4252.3
4" dia. (102mm) T-handle auger.	H-4252.4

T86, T202.

Shipping wt. 7 lbs. (3.2kg).

Description	Model
6" dia. (152mm) T-handle auger.	H-4252.6

Shipping wt. 9 lbs. (4.1kg).

## Extension for 2" Auger, Iwan-Type

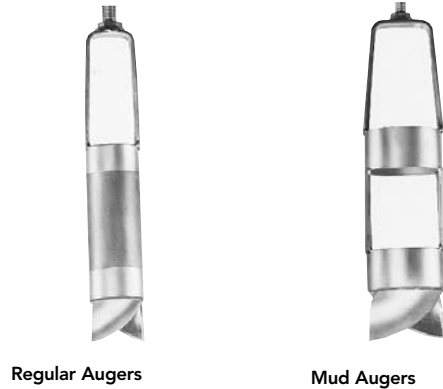
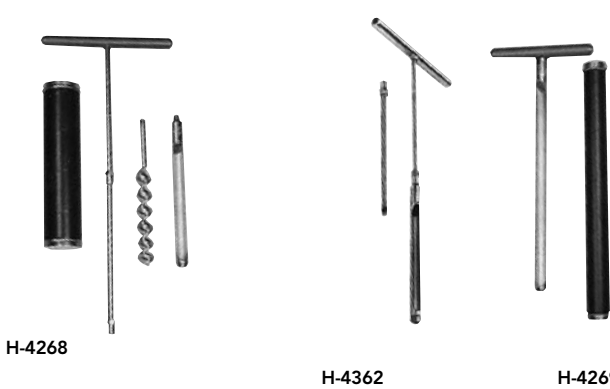
For use with H-4252.2 T-handle auger only, extension is 36" (914.4mm) long and includes end coupling.

Description	Model
T-handle auger extension for 2" T-handle.	H-4252.2E

## Extension for 3", 4" and 6" Auger, Iwan-Type

For use with H-4252.3, H-4252.4 and H-4252.6 T-handle augers, extension is 36" (914mm) long and includes end coupling.

Description	Model
Auger extension for 3", 4" and 6" T-handle.	H-4252E



### Soil Sampling Auger Tube Set

Soil sampling auger tube sets are helpful and functional for agricultural and other soil-testing procedures. Components are steel and plated to resist abrasive action of soil. Parts have graduation marks every 6" (152mm) to indicate sampling depth. Includes 1-1/4" (25mm) dia. by 12-1/2" (318mm) long auger, 1" (approx. 25mm) O.D. by 12-1/2" (318mm) long sampling tube, two 12" (305mm) extension rods, handle and a 13" (330mm) long carrying case.

Description	Model
Auger tube set.	H-4268

Shipping wt. 7 lbs. (3.2kg).

### Soil Sampling Tube

For use in collecting soft soil samples in 3/4" core sample size. Depth capacity is about 39". Includes sampler tube, one tip, two extension rods, handle and fiberboard case.

Description	Model
Soil sampling tube.	H-4362

### Soil Sampling Tube Set

Tube sets are helpful and functional for agricultural and other soil-testing procedures. Sampling tube will produce 15" (381mm) core of soil. Includes 18" (457mm) long, 7/8" (22mm) I.D. sampling tube, handle and carrying case.

Description	Model
Auger tube set.	H-4269

### Auger Extensions, Quick-Connect

Description	Model
2' (609.6mm) extension. Molybdenum seamless tubing.	H-4442QC
3' (914.4mm) extension. Molybdenum seamless tubing.	H-4443QC
4' (1219mm) extension. Molybdenum seamless tubing.	H-4444QC
5' (1524mm) extension. Molybdenum seamless tubing.	H-4445QC

### Augers, Quick Connect, Bucket-Type

Bucket augers offer outstanding durability, allow deeper depths. Regular auger bit is designed for ordinary soil sampling. Sand auger bit is used for dry, sandy soils. Mud auger bits are designed for sampling heavy, wet soil or clay samples; opening facilitates removal of wet samples.

Heat treated, high carbon steel bits with tungsten carbide hard-surfaced edges. Bits are welded to stainless steel cylinder, topped with carbon steel ball.

Augers, Quick-Connect Bucket-Type					
Type	2"	2-1/4"	2-3/4"	3-1/4"	4"
Regular	H-4410QC	H-4411QC	H-4412QC	H-4413QC	H-4414QC
Mud	H-4420QC	H-4421QC	H-4422QC	H-4423QC	H-4424QC
Sand	H-4430QC	H-4431QC	H-4432QC	H-4433QC	H-4434QC

### Auger Cross Handle, Padded

Description	Model
Padded chrome cross handle.	H-4447QC

### Auger Cross Handle

Description	Model
Cross handle. Molybdenum seamless tubing.	H-4448QC





H-4050, H-4051

## Power Soil Augers/Samplers

For soil sampling, construction and more, earth augers are gasoline powered and portable. Using one operator, they allow fast and easy drilling. They feature snap-on or screw-on augers and extensions.

Engine mounted on wheel-base carrier keeps motor noise and fumes away from the operator. Torque tube eliminates counter torque. Features such as the carrier and torque tube offer greater mobility, beneficial in areas inaccessible to large equipment, on slopes and horizontal drilling, various standard sampling methods to obtain material samples. Recoil starter and spring-loaded throttle-in-handle assembly provide fingertip control.

Centrifugal clutch, heavy-duty flexible shaft connects to the motor and provides for a smooth operation. Blades and points are tool steel, hard-surfaced and heat treated. Blades are reversible for longer life. Most augers are snap-on design; smaller diameter augers are screw-on.

Auger has either 5HP or 8HP, 4-cycle engine with 10:1 gear ratio, complete with wheel kit and torque tube. Order augers and extensions separately. For augers 1-1/2" to 6" dia., maximum depth is 18' (38 to 152mm, 5.5m deep).

Description	Model
5HP Power soil auger/sampler. Shipping wt. 99 lbs. (45.0kg).	H-4050
8HP Power soil auger/sampler. Shipping wt. 113 lbs. (51.3kg).	H-4051



H-4052.4



H-4053.4



H-4052.2



H-4053.2

### Power Soil Sampler Augers and Extensions

Full-flighted 42" (106.7mm) long augers are marked at 6" (152mm) intervals to indicate sampling depth. Snap-on extensions provide fast, secure connection. Initial auger flights are continuous, with cutting head assembled at one end. H-4054 adapter required to adapt screw-on extensions to earth drill. See chart for details on models.

### Replacement Point

For H-4052.4 and H-4052.6 augers. Specify diameter.

Description	Model
Replacement point.	H-4055

### Replacement Blade

For H-4052.4 and H-4052.6 augers. Specify diameter.

Description	Model
Replacement blade.	H-4056

42" Length Augers					
Diameter		Type Auger	Ship. Wt.		Model
in.	mm.		lbs.	kg.	
1-1/2	38	Screw on; requires H-4054 adapter for earth drill extension	6-1/2	3.0	H-4052.1
2	51	Screw on; requires H-4054 adapter for earth drill extension	8-1/2	3.9	H-4052.2
3	76	Screw on; requires H-4054 adapter	13	5.9	H-4052.3
4	102	Snap on	18	8.2	H-4052.4
6	152	Snap on	22	10	H-4052.6

36" Length Extensions					
Diameter		Type Extension	Ship. Wt.		Model
in.	mm.		lbs.	kg.	
1-1/2	38	Screw on	6	2.3	H-4053.1
2	51	Screw on	8	3.6	H-4053.2
3	76	Screw on	12	5.4	H-4053.3
4	102	Snap on	16	7.2	H-4053.4
6	152	Snap on	21	9.1	H-4053.6

Adapter required to connect screw-on augers and/or screw-on extensions to power auger. Order separately. H-4054



H-4382

### Microprocessor-Based Portable pH Meter

The easy-to-use H-4382 series portable pH meter offers much of the same features found in many costly top-of-the-line bench-type meters. With high speed and accuracy, the meter measures pH, ORP, ISE and temperature. pH is measured from 0.00 to 14.00 with an accuracy of  $\pm 0.01$  pH units. With the temperature probe attached, all readings are automatically compensated for temperature variations and displayed from 0.0 to 100.0°C with an accuracy of  $\pm 0.4^\circ\text{C}$ . The meter also features automatic two-point calibration to three memorized buffers (pH 4.01, 7.01 and 10.1) The pH meter is supplied complete with a double junction pH electrode, temperature probe and a 9v battery. For users requiring a more rugged instrument for on-site applications, the H-4384 series meter offers all of the same features as the H-4382, plus the addition of a more rugged, waterproof casing. The meter is supplied complete with a double-junction pH electrode, temperature probe, four 1.5 "AA" batteries, and a rugged carrying case.

Description	Model
Microprocessor-based portable pH meter with carrying case.	H-4382
Microprocessor-based portable pH meter with waterproof casing and rugged carrying case.	H-4384

Description, Replacement Parts & Accessories	Model
Double-junction pH electrode.	H-4382.1
Temperature probe for H-4382.	H-4382.2
Temperature probe for H-4384.	H-4384.2
Soil preparation solution. Used to moisten soil to facilitate a chemical reaction for accurate pH measurements. 460ml.	H-4360A.1
pH 4.01 buffer solution. 460ml.	H-4360A.4
pH 7.01 buffer solution. 460ml.	H-4360A.7
pH 10.01 buffer solution. 460ml.	H-4360A.10



H-4380A



H-4381

### Pocket pH/Temperature Tester

This pocket pH tester not only displays both pH and temperature simultaneously on one multi-level display, but also features automatic calibration, stability indicator and battery level at start up. The tester is completely waterproof and will actually float if dropped into the sample that is being tested. The meter has an easily replaceable pH sensor that incorporates an extractable cloth junction for longer service life. All readings are automatically compensated for temperature variations and have an accuracy of  $\pm 0.1$  for pH and  $\pm 1.0^\circ\text{F}$  ( $\pm 0.5^\circ\text{C}$ ) for temperature.

Description	Model
Pocket pH/temperature tester.	H-4380A

Description, Replacement Parts	Model
Replacement electrode.	H-4380A.1

### Checker pH Tester

At the cost of a few rolls of pH litmus paper, the Checker series pH Tester offers users with fast and accurate readings on a large LCD display. The meter will measure pH from 0.00 to 14.00 with an accuracy of  $\pm 0.2$  pH units. The tester features manual two-point calibration through trimmers and has an easily replaceable electrode. The meter uses two 1.4V watch-type batteries and will last for approximately 3000 hours of continuous use.

Description	Model
Checker pH tester.	H-4381

Description, Replacement Parts & Accessories	Model
Replacement electrode with screw connector.	H-4381.1
pH 4.01 buffer solution. 460ml.	H-4360A.4
pH 7.01 buffer solution. 460ml.	H-4360A.7
pH 10.01 buffer solution. 460ml.	H-4360A.10



### Plastic Limit Set

Includes all apparatus recommended to perform plastic limit test in accordance with specifications. Set includes one each (except as noted) of items in chart below. All components are also available as replacement parts. Meets ASTM D4318; AASHTO T90.

Description	Model
Plastic limit set.	H-4253

Shipping wt. 11 lbs. (5kg).

Description, Replacement Parts & Accessories	Model
Plastic plate, 12x12x3/8" thick.	H-4253.1
Mixing dish.	H-4930.250
Spatula.	H-4906
Graduated cylinder (25ml).	H-4915.025
Sample cans, (48 in set).	H-1350.3A

### Plastic Limit Plate

12x12x3/8"-thick (305x305x9.5mm) glass plate with ground finish on one side and seamed edges. Meets ASTM D4318; AASHTO T90.

Description	Model
Plastic limit plate.	H-4253.1

### Plastic Limit Roller

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). Meets ASTM D4318; AASHTO T90, TX DOT 105-E.

Description	Model
Plastic limit roller.	H-4262
Extra adhesive paper for contact surfaces, pad of 50 sheets.	H-4262P

### Liquid Limit Test Set

Apparatus recommended to perform liquid limit test in accordance with specifications. Set includes one each (except as noted) of items in chart below. All components are also available as replacement parts. Meets ASTM D4318; AASHTO T89.

Description	Model
Liquid limit test set.	H-4234

Shipping wt. 13 lbs. (28.6kg)

Description, Replacement Parts & Accessories	Model
ASTM Liquid limit machine.	H-4230
Mixing dish.	H-4930.250
Spatula.	H-4906
Graduated cylinder (25ml).	H-4915.025
Sample cans, 2.5oz., 48 in set.	H-1350.3A

### Shrinkage Limit Set

Apparatus recommended to perform shrinkage limit test in accordance with specifications. Set includes one each of items in chart below. All components are also available as replacement parts. Meets ASTM D427; AASHTO T92.

Description	Model
Shrinkage limit set.	H-4254

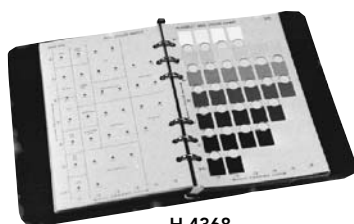
Description, Replacement Parts & Accessories	Model
Mixing dish.	H-4930.250
Monel shrinkage dish.	H-4256
Crystallizing dish.	H-4254C
Shrinkage prong plate.	H-4255
Graduated cylinder (25ml).	H-4915.025

### Optional Equipment for Shrinkage Limit Test

Description, Optional Accessories	Model
Instrument grade mercury, 1 lb. (0.5kg) bottle.	H-3632
Ground steel straightedge with beveled edge.	H-4144
Triple beam balance, 2610g total capacity.	H-4603
Spatula.	H-4904

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H-4368



H-4180 Series



H-4186 Series



H-4228

## Soil Color Charts

Soil color is measured by comparing with color chart. Set includes nine hue charts displaying 322 colors on a neutral gray chart stock. Apertures are cut between the adjacent color chips so sample may be evaluated directly against the standard colors. Charts, diagrams and interleaves fit into a six-ring looseleaf binder. Charts are 7-1/4x4-1/4" (184x108mm), small enough for field use.

Description	Model
Standard Soil color charts with binder.	H-4368

## Special Use Soil Color Charts

Tropical Soil Charts. For use with H-4368. Special charts for reddish tropical soils. Recommended for regions such as South and Central America, Africa, India, Malaysia, and similar tropical areas. Includes two charts that fit into H-4368 binder.

Sand Grading Chart. Unique chart useful to engineers, geologists, contractors, and soil scientists for uniform classification of sands.

Description	Model
Tropical soil color charts for use with H-4368.	H-4368T
Sand grading chart.	H-4369

## 125 lbf, 250 lbf and 350 lbf Soil Strength Classifiers

Hand-lever operated soil strength classifiers for field or lab use provide fast manual approximations of unconfined compressive strength on many soil types. 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  $\pm 1\%$  of dial capacity as held with second maximum-reading pointer.

Dial has 1 lbf divisions on outer scale, 1 kgf divisions on inner scale. Unit has cast aluminum housing. Base dimensions: 5-3/4x10-1/4" (146x260mm), drilled for optional bench mounting. Available in 125, 250 or 350 lbf capacity. Calibration spring confirms proper operation; order separately.

Description	Model
Soil strength classifier, 125 lbf/55 kgf capacity.	H-4180.125
Soil strength classifier, 250 lbf/110 kgf capacity.	H-4180.250
Soil strength classifier, 350 lbf/160 kgf capacity.	H-4180.350
Calibration spring 350 lbf/160 kgf capacity. (Shipping wt. < 5lbs.)	H-4180S

Shipping wt. 18 lbs. (8.2kg)

## 125 lbf, 250 lbf and 350 lbf Soil Strength Classifiers with Hand-Wheel Loading

The new H4186 Series Classifiers are identical in specification to the H-4180 Series, except for the loading mechanism. This new unit features a geared hand-wheel loading system. This unique system provides a more uniform rate of loading capabilities and easier loading and recording of the peak value by a single operator.

Description	Model
Soil strength classifier with hand-wheel, 125 lbf/55 kgf capacity.	H-4186.125
Soil strength classifier with hand-wheel, 250 lbf/110 kgf capacity.	H-4186.250
Soil strength classifier with hand-wheel, 350 lbf/160 kgf capacity.	H-4186.350
Calibration spring 350 lbf/160 kgf capacity. (Shipping wt. < 5lbs.)	H-4180S

## ASTM Liquid Limit Machine

For determining liquid limit of soil. 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. Meets ASTM D4318; AASHTO T89.

Description, Replacement Parts & Accessories	Model
ASTM Liquid limit machine.	H-4230

Shipping wt. 8 lbs. (3.6kg)

## Liquid Limit Machine with Counter

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. Meets ASTM D4318; AASHTO T89.

Description	Model
Liquid limit machine with counter.	H-4228

Shipping wt. 9 lbs. (4.1kg)



H-4226



H-4232, H-4229



H-4233



H-4236



H-4237

## Motorized Liquid Limit Machine

Motorized liquid limit machine gives uniform testing with greater degree of accuracy. Unit includes H-4230 liquid limit machine, 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. Meets ASTM D4318; AASHTO T89.

Description	Model
Motorized liquid limit machine. 110V, 60Hz, 0.65amps, 1ph AC.	H-4226
Motorized liquid limit machine with H-1042 transformer. 220V, 50Hz.	H-4226.5F

Shipping wt. 14 lbs. (6.4kg)

## Liquid Limit Grooving Tools

Description	Model
Grooving tool (metal).	H-4232
ASTM Grooving tool (metal) and gauge block.	H-4229
ASTM Plastic Grooving tools. Pkg. of 10.	H-4229P

## Replacement Liquid Limit Cups

Brass cup with screws, as furnished with H-4226, H-4228 and H-4230.

Description	Model
Brass cup.	H-4231
Brass cup mounted on cam follower.	H-4231.1
Stainless steel liquid limit cup.	H-4231.2

## Resiliency Tester

Use to test resiliency of hard rubber base of liquid limit machines, which should be done at 90-day intervals to insure base is in compliance with ASTM standard. Device consists of a clear acrylic plastic 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. Meets ASTM D4318.

Description	Model
Resiliency tester for hard rubber base of liquid limit machines.	H-4233
Replacement base for all Humboldt liquid limit machines, hard rubber. Meets ASTM D4318	H-4230.1

## Cone Penetrometer/Method for Measuring Liquid Limit

The Cone Penetrometer test method for Liquid Limit is based on the relationship between the moisture content and the penetration of the cone into the soil sample. The apparatus consists of a cast aluminum base, 150mm diameter dial with 0.1mm subdivisions, calibrated cursor, automatic zeroing device, release button, micrometric displacement device, penetration test cone and two sample brass cups. The optional semi-automatic version incorporates a built-in 5 second timer for greater uniformity in test results.

Description	Model
Cone penetrometer.	H-4236
Semi-automatic cone penetrometer, 110V, 60Hz.	H-4237
Semi-automatic cone penetrometer, 220-240V, 50Hz.	H-4237.5F

Description, Replacement Parts & Accessories	Model
Penetration test cone, 35mm long, 30° angle.	H-4236.1
Brass sample cup.	H-4236.2
Test gauge. Checks condition of tip.	H-4236G
Mirror. Aids in height adjustment of cone.	H-4236M

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H-4257, H-4258



H-4260

H-4265,  
(Items not shown to scale)

H-4266



H-4239

## Soil Mortar

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 5" (127mm) dia. x 2-1/2" H (64mm). Meets ASTM D421; AASHTO T87.

Description	Model
Soil mortar.	H-4257

## Soil Pestle

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

Description	Model
Soil pestle.	H-4258

## Soil Dispersion Mixer

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: 20x6-1/2x7" (508x165x178mm). Meets ASTM D422; AASHTO T88.

Description	Model
Soil dispersion mixer. 120V. 60Hz. 1ph. AC. 125W.	H-4260
Soil dispersion mixer. 230V. 50/60Hz. 1ph. AC.	H-4260.4F

Shipping wt. 15 lbs. (6.8kg)

Description, Replacement Parts & Accessories	Model
Chrome-plated dispersion cup for H-4260 mixer.	H-4265
Stirring paddle for H-4260 mixer. Shaft threads into mixer. 3 blades, 3/4" (19mm) dia.	H-4266

## Hydrometer Analysis Set

Set includes all apparatus recommended to perform hydrometer analysis test in accordance with specifications. Set consists of one each (except as noted) of items in component chart below. Meets ASTM D422; AASHTO T88.

Description	Model
Hydrometer analysis set. 115V. 60Hz. 1ph. AC.	H-4263
Hydrometer analysis set. 230V. 50/60Hz. 1ph. AC.	H-4263.4F

Shipping wt. 175 lbs. (79.4kg)

Description, Set Component Parts	Model
Soil dispersion mixer.	H-4260
Hydrometer jar bath.	H-4239
Hydrometer A, -5 to 60g.	H-4241
Hydrometer B, 0.995 to 1.038 specific gravity.	H-4242
Sodium hexametaphosphate.	H-4247
Hydrometer jars (six in set).	H-4244

## Hydrometer Jar Bath

Designed to maintain a constant temperature of 20°C ±0.2°C (68°F) for particle size distribution test in accordance with ASTM and AASHTO specifications. Up to eight hydrometer jars can be stored in the bath at the same time. The bath features a stainless steel interior and shelf for corrosion resistance and long service life. The automatic high temperature safety cut-off circuit incorporated into the design prevents damage to the heater and pump system. Inside dimensions are 37-3/4"x7-3/4"x16-1/2" deep (959x197x419mm). The overall outside dimensions are 40"x10"x23" high (1,016x254x584mm). Meets ASTM D422; AASHTO T88.

Description	Model
Hydrometer jar bath. 110V. 50/60 Hz, 1ph.	H-4239
Hydrometer jar bath. 220V. 50/60 Hz, 1ph.	H-4239.4F

Shipping wt. 155 lbs. (70kg)



H-4241, H-4242, H-4244



H-3386, H-3387, H-3385

## Soil Hydrometer A

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. Calibrated for use at 68°F (20°C). Graduated in grams of soil per liter from -5 to 60g in 1° divisions. Has ASTM/AASHTO scale 152 H. Total length: 11" (280mm). Meets ASTM D422; AASHTO T88.

Description	Model
Hydrometer A.	H-4241

## Soil Hydrometer B

Same as H-4241 with graduations 0.995 to 1.038 specific gravity by 0.001° divisions. Has ASTM/AASHTO scale 151 H.

Description	Model
Hydrometer B.	H-4242

## Hydrometer Jar

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" O.D. (64mm). Base is 4-1/3" (107mm).

Description	Model
Hydrometer jar.	H-4244

Description, Accessories	Model
Rubber stopper.	H-4244RS

## Specific Gravity Bottles (Pycnometer)

Adjusted bottle for commercial routine testing, fitted with ground-in perforated stopper. Capillary vent stopper design allows stopper to be inserted to fixed depth in the bottle's neck. Small hole in center of stopper allows emission of air and surplus water. Volume of the bottle has been adjusted at 20°C. Meets ASTM D854; AASHTO T100.

Description	Model
25ml Specific gravity bottles (pycnometer).	H-3385
50ml Specific gravity bottles (pycnometer).	H-3386
100ml Specific gravity bottles (pycnometer).	H-3387

## Sodium Hexametaphosphate

Dispersing agent used in combination with gradation analysis of soils. Meets ASTM D422; AASHTO T88.

Description	Model
Sodium hexametaphosphate, 1 lb. (0.5kg) package.	H-4247
Sodium hexametaphosphate, 10 lb. (4.5kg) package.	H-4247.10

## Thermometers

Description	Model
Thermometer for use with H-4239 bath jar, -30 to 120°F, 1° div.	H-2611
Thermometer for use with H-4239 bath jar, -20 to 110°C, 1° div.	H-2614



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H-4374



H-4378



H-4340

## 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 Shaker with Dual Electronic Timer

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 operations delivers an 8" (203mm) stroke at a speed of  $175 \pm 2$  strokes per minute. Dimensions: 12x24x24" H (31x61x61cm). Meets ASTM D2419; AASHTO T176.

Description	Model
Sand equivalent shaker with dual electronic timer. 115V, 60Hz, 6.8amps, 1ph AC.	H-4374
Sand equivalent shaker with dual electronic timer. 230V, 50Hz, 3.6amps, 1ph AC.	H-4374.5F

Shipping wt. 80 lbs. (36.3kg)

### Manually Operated Sand Equivalent Shaker

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: 21x6-1/2x26-3/8" (53x17x67cm). Meets ASTM D2419; AASHTO T176.

Description	Model
Manually operated sand equivalent shaker.	H-4378

Shipping wt. 49 lbs. (22.3kg)

## Sand Equivalent Test Set

Individual components may be ordered as replacement parts. Set includes one each (except as noted) of parts in list below and carrying case. Set meets ASTM D2419; AASHTO T176.

Description	Model
Sand equivalent test set, with case.	H-4340
Sand equivalent test set, without case.	H-4341

Shipping wt. 21 lbs (9.5kg)

Description, Replacement Parts & Accessories	Model
Graduated plastic measuring cylinder.	H-4340.1
Solid rubber stopper.	H-4340.5
Irrigator tube.	H-4340.2.6
Weighted foot assembly.	H-4340.3
Standard stock solution in 8 oz.(240ml) plastic bottle.	H-4342
Siphon assembly (siphon tube and hose, blow tube and hose, stopper).	H-4340.2
Clamp.	H-8630
Wide-mouth funnel.	H-3810.4
Measuring can, 2.5 oz.	H-1350.3A

## Sand Equivalent Stock Solution

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.

Description	Model
8 oz. (.24L) plastic bottle of sand equivalent stock solution.	H-4342
1 gal. (3.8L) plastic jug of sand equivalent stock solution.	H-4342.2



H-4215



H-4165

## Rapid Soil Processor

Compact all-metal soil processor produces five-point moisture density relationship test results in about 5 hours. Processor also handles samples for rapid compaction or 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: 32x36x53" (813x915x1346mm).

Description	Model
Rapid soil processor. 115V. 60Hz.	H-4215
Rapid soil processor. 220V. 50/60Hz.	H-4215.4F

Shipping wt. 408 lbs. (184kg)

Description, Replacement Parts & Accessories	Model
Replacement screen for H-4215 sold before March, 1995. 13"h (330mm).	H-4215.26
Replacement screen for H-4215 sold after March, 1995. 11-7/8"h (302mm).	H-4215.32

Shipping wt. 20 lbs. (9.07kg)

## Harvard Miniature Compaction Apparatus

Used for moisture density tests using small samples, its compaction type duplicates the kneading action of a sheepsfoot roller. Mold is 1-5/16" (33mm) I.D. 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.

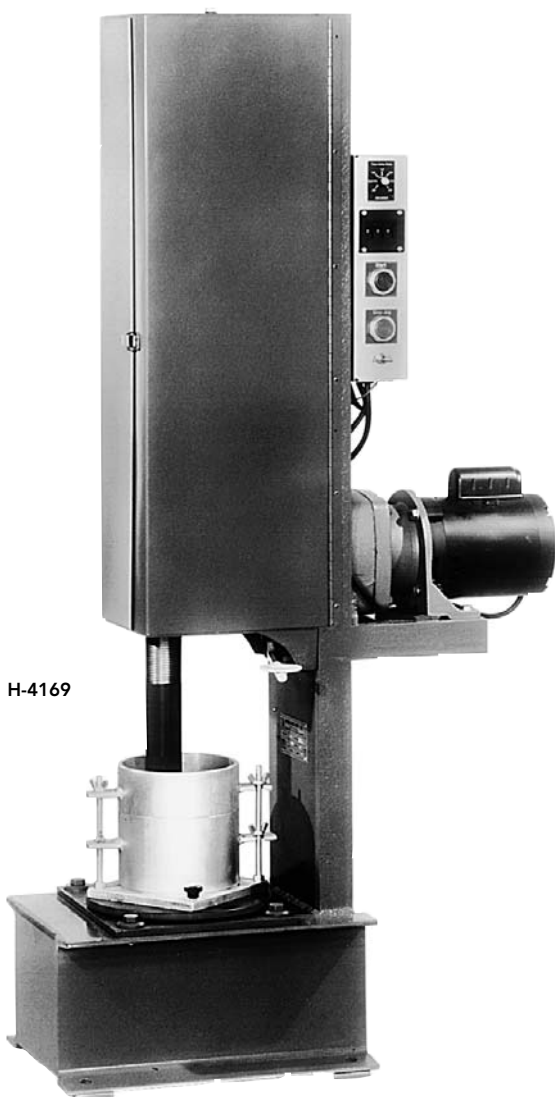
Description	Model
Harvard miniature compaction apparatus.	H-4165

Shipping wt. 28 lbs. (12.6kg).

Description, Replacement Parts & Accessories	Model
Mold assembly for H-4165.	H-4165.15
Tamper assembly for H-4165.	H-4165.16
20 lb. spring for H-4165.	H-4165.20
37.5 lb. spring for H-4165.	H-4165.375
40 lb. spring for H-4165.	H-4165.40

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H-4169

## Automatic Mechanical Compactor

Unit is designed to automatically compact soil samples rapidly and to produce the accuracy of hand compaction. For standard or modified compaction tests with 5.5 lb. hammer with 12" (305mm) height of drop or 10 lb. hammer with 18" (457mm) drop.

Compactor accommodates 4" (102mm) or 6" (152mm) I.D. molds. 4" (102mm) round hammer, or 6" (152mm) pie-shaped hammer compensate for sample drop during compaction. The weight is concentrated at the foot, allowing free fall of the rammer. Hammer changes are made from in front of the compactor.

Automatic counter registers number of blows per compaction and can be preset to stop the machine. A start-stop switch controls the operation independently from the counter control. Compaction mold is mounted on the round base; the circular base indexes automatically with each blow to ensure uniform sample compaction. A pie-shaped compactor foot is used with 6" (152mm) dia. molds to completely cover the soil surface.

Includes 5.5 lb (2.5kg), 10 lb. (4.5kg) circular-faced and pie-shaped hammers and 4" (102mm) and 6" (152mm) molds. Overall dimensions: 56"Hx16-1/2"Wx30"D (1422x419x762mm). Max. height in operation: 66" (1677mm). Meets ASTM D558, D559, D560, D698, D1557; AASHTO T99, T134, T135, T180.

Description	Model
Automatic mechanical compactor. 115V, 60Hz, 1ph AC.	H-4169
Automatic mechanical compactor. 230V, 50/60Hz, 1ph AC.	H-4169.4F
California type modified automatic mechanical compactor 115V, 60Hz, 1ph. Contact Humboldt for details.	H-4169.CA

Shipping wt. 432 lbs. (196.0kg)

## Calibration Kit

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

Description	Model
Calibration kit.	H-4169CK
Replacement lead calibration cylinders, pkg. 100	H-4169LC

## Mechanical Compaction Hammers, Kits and Replacement Parts

Type	Hammer Weight lbs. (kg)	Hammer Fall in. (mm)	Description	Meets Specifications	Shp. Wt. lbs. (kg)	Model
Mechanical Compaction Hammer Set	5.5 (2.5kg) and 10 (4.5kg)	12" (305mm) or 18" (457mm)	Set includes one 2" round 5.5-lb. hammer, one 10-lb. pie-section hammer, hammer safety device, 4" mold, 6" mold and surcharge weight to make hammers 10 lbs. 120V. 60Hz.	ASTM D558, D559, D560, D698, D1557, AASHTO T99, T134, T135, T136, T180	432 (196kg)	H-4169
			Same as H-4169 with 220V, 50/60Hz.			H-4169.4F
Mold 4" diam	N/A	N/A	4" replacement mold for H-4169 and H-4169.4F.		16 (7.25)	H-4169.4
Mold 6" diam			6" replacement mold for H-4169 and H-4169.4F.		22 (9.97)	H-4169.6
Round Hammer 4"	5.5 (2.5kg)	12"	Round replacement hammer for H-4169 and H-4169.4F.		7 (3.17)	H-4169.2415
Pie-Section Hammer 6"	10 (4.5kg)	12"	Pie-shaped replacement hammer for H-4169 and H-4169.4F.			H-4169.2416

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SOIL

H-4160,  
H-4170

H-4173

H-4190,  
H-4192,  
H-4194,  
H-4196

Hand Compaction Hammers						
Type	Hammer Weight lbs. (kg)	Hammer Fall in. (mm)	Description	Meets Specifications	Shp. Wt. lbs. (kg)	Model
Moisture Density Hammer	5.5 (2.5kg)	12" (305mm)	Manually operated, 2" dia. circular 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.	ASTM D558, D698; AASHTO T99	12 (5.4kg)	H-4160
	10 (4.5kg)	18" (457mm)		AASHTO T180	18 (8.3kg)	H-4170
U.S. Army Corps of Engineers Compaction Hammer	5.5 (2.5kg)	12" (305mm)	With 2" dia. tamping face, hammer is guided on shaft instead of a sleeve. Length of drop is slightly adjustable. Foot assembly has recoil mechanism to reduce impact fatigue on parts. Tamping face is removable and replaceable.	EM1110-2-1907	15 (6.8kg)	H-4173
Moisture Density Hammer	4.0 (1.78kg)	12" (305mm)	Manually operated. Use with 2.8" mold H-4142 for remolded samples in permeability tests. 1.4" diam face. Guide sleeve has four vent holes in each end to release built up air pressure. Machined steel, plated for rust resistance. Resilient rubber ball bearings.	—	10 (4.5kg)	H-4181

## Clegg Impact Soil Testers

An in-situ impact soil testing device used to measure "stiffness" of natural or constructed soil conditions. Easily carried and operated by one person, it offers low cost, efficiency in field or laboratory. Direct readout is given of the strength parameter.

The strength of a layer of soil up to 6" (150mm) thick (and by inference) the compaction condition of this layer is measured. A known mass, the Clegg hammer, is dropped from a fixed distance and its deceleration is measured on impacting the soil surface. Four successive trials are used to obtain the IV (impact value) which correlates directly with ASTM California Bearing Ratio, Texas Class Number, and Elastic Modulus.

Can be used to test the full range of soils and soft rocks typically encountered on flexible pavement and earthworks construction sites. Ideal for measuring peak strength, because no weighing and drying is required. Easy and quick to use, each test can be completed in less than 30 seconds by site personnel with minimal training. Offers the convenience of rapidly scanning the strength variation over a large area with as many as 250 to 500 test points in a single day.

Description	Model
Clegg impact soil tester, "Standard", 4.5kg hammer. Tests full range of soils encountered in road base surfaces, soil compaction, flexible pavements, and earthworks. Ideal for quick checking and determining variations during construction, especially when quality assurance procedures are used.	H-4190

Shipping wt. 21 lbs. (9.5kg)

Description	Model
Clegg impact soil tester, "Light", 0.5kg hammer. Tests same medium as the "Standard" H-4190, except greater sensitivity in softer conditions, or fragile materials. Meets ASTM D5874.	H-4192

Shipping wt. 12 lbs. (5.4kg)

Description	Model
Clegg impact soil tester, "Heavy", 20kg hammer. Tests lightly sealed and unsealed gravel surfaces, or pavements. Includes built-in, two-wheel cart.	H-4194

Shipping wt. 55 lbs. (24.9kg)

Description	Model
Clegg impact soil tester, "Sports Turf", 2.25kg hammer. Tests the shock attenuation characteristics, or cushioning properties of natural and man-made sports turf and recreational playing surfaces. Can also be used where soil conditions fall between "Standard" and "Light", Meets ASTM F1702.	H-4196

Shipping wt. 16 lbs. (7.3kg)

Hand Compaction Hammers, Clegg

**HUMBOLDT**

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H-4141



H-4161



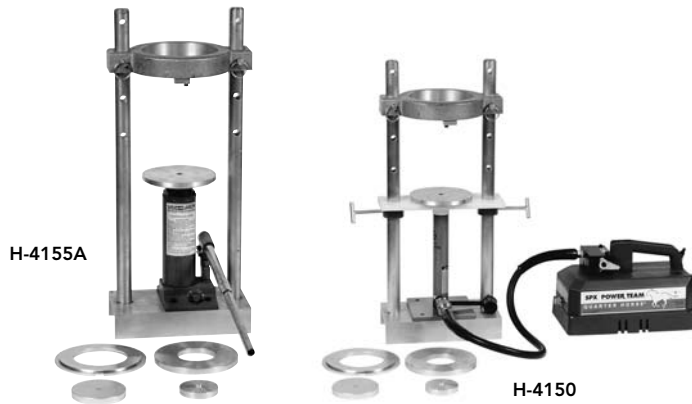
H-4225



H-4145, H-4146

## Soil Molds

Compaction Molds and Permeameters	Layers Soil/Blows Per Layer	Dimensions (in.)	Mold Volume cu. ft.	Description	Meets Specs	Shpg. Wt. lbs. (kg)	Model No.
Standard 4" Proctor/CBR Mold	3/25	4" I.D. x 4.584"H with 2-1/2" detachable collar	1/30	Cold-rolled steel tubing, plated for rust resistance. Includes detachable base plate, studs and wing nuts.	ASTM D558; AASHTO T99	16 (7.3kg)	H-4141
CBR Solid Base Mold	3/56	6" I.D. x 7"H with 2" detachable collar	.1145	Cold-rolled steel tubing, plated for rust resistance. Collar extension and solid base plate can be clamped on either end of cylinder	—	22 (10kg)	H-4149
CBR Test Mold	5/56	6" I.D. x 7"H with 2" collar	.1145	Same as H-4149 with perforated base plate.	ASTM D1883; AASHTO T193	22 (10kg)	H-4151
Compaction Mold	5/56	6" I.D. x 6.1"H plus 2"H collar	1/10	Cold-rolled steel tubing, plated for rust resistance. Steel base plate is 8x8x1/2" thick.	—	22 (10kg)	H-4159
LBR Test Mold	5/56	6" I.D. x 6"H plus 2-1/2" detachable collar	1/13.33	Cold-rolled steel tubing, plated for rust resistance. Collar extension and perforated base plate can be clamped on either end of cylinder. LBR requires spacer, sold separately. See H-4147.	—	22 (10kg)	H-4163
Modified 6" Proctor Mold	3/56	6" I.D. x 4.584"H plus 2-3/8" H collar	1/13.33	Mold has longitudinal split and 2 quick-acting clamps. Base is 8x8x1/2". Cold-rolled steel tubing plated for rust resistance.	ASTM D698, D1557; AASHTO T99, T180	16 (7.3kg)	H-4161
Standard 6" Proctor/CBR Mold	5/56	6" I.D. x 4.584"H plus 2-3/8" H collar	1/13.33	Like H-4161 without split and clamps	—	15 (6.8kg)	H-4162
Split Moisture Density Mold	3/25	4" I.D. x 4.584"H plus 2-1/2"H detachable collar assembly	1/30	Like H-4141 with longitudinal split and clamps. Cold-rolled steel tubing plated for rust resistance.	ASTM D558; AASHTO T99	17 (7.7kg)	H-4225
2.8" Split Compaction Mold	N/A	2.8" I.D. x 4.0"H plus 2"H detachable collar	.0214	For 2.8" remolded samples for permeability testing with 2" detachable collar, with longitudinal split and clamp.	—	10 (5.5kg)	H-4142
Soil Permeameter	N/A	4" I.D. x 4.584" H	1/30	Includes 2-1/2" H collar.	—	18 (8.2kg)	H-4145
	N/A	6" I.D. x 4.584" H	1/13.33	Includes 2-3/8" H collar.	—	24 (10.9kg)	H-4146



H-4454 Series

## Hand-Operated Sample Ejector

Designed for lab and field use to extract soil samples from either 4" or 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. Overall dimensions 13"Wx6"Dx27"H. (330x152x686mm).

Description	Model
Hand-operated sample ejector.	H-4155A

Shipping wt. 65 lbs. (29.5kg).

## Motorized Sample Ejector

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 both standard 4" or 6" compaction molds, as well as 2" and 2.8" sample tubes. Overall dimensions excluding pump 13"Wx6"Dx29"H. (330x152x737mm).

Description	Model
Motorized sample ejector. 110-115V, 50/60 Hz.	H-4150
Motorized sample ejector. 220-230V, 50/60 Hz.	H-4150.4F

Shipping wt. 80 lbs. (36kg).

## Straightedge

For striking-off samples in containers, measures or molds. Ground steel with beveled edge. Meets ASTM C185, D558, D559, D560, D698; AASHTO T137.

Description	Model
Straightedge, 8". 1/8x1-1/4x8" (3x32x203mm)	H-4144.8
Straightedge, 12". 1/8x1-1/4x12" (3x32x305mm)	H-4144
Straightedge, 16". 1/8x1-1/4x16" (3x32x406mm)	H-4144.16
Straightedge, 24". 1/8x1-1/4x24" (3x32x610mm)	H-4144.24

## 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 Master Loader Multi-Use Compression Tester, and/or a wide variety of other instrumentation as well—such as using load rings together with digital indicators, or using with load cells for data acquisition.

Our high quality tensile steel rings have spherical seatings suitable for all shear boxes and load frames. Each load ring shipped with a fitted dial gauge and calibration certificate, and supplied with tables listing all measurement units. 8-1/4" (210mm) high, 3/4-16UNF thread female mounting. When using linear strain devices in automated systems, linearity is a factor, but does not apply when used with tables or equations.

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). Meets ASTM E74.

Load Rings					
Description	Range and Measurement Units			Meets Spec.	Model (Analog Gauge) (Digital Gauge)
	lbf	kN	kgf		
Tensile steel load rings, 0.75% FS linearity, 0.15 % FS error, 8.20" high, 3/4-16 female mounting.	110	0.5	50	ASTM E74	H-4454.001 H-4454.001D
	220	1.0	100		H-4454.002 H-4454.002D
	550	2.5	250		H-4454.005 H-4454.005D
	1,100	5.0	500		H-4454.010 H-4454.010D
	2,200	10.0	1,000		H-4454.020 H-4454.020D
	5,500	25.0	2,500		H-4454.050 H-4454.050D
	11,000	50.0	5,000		H-4454.100 H-4454.100D
	22,000	100.0	10,000		H-4454.200 H-4454.200D



HM-2000A

## Master-Loader

Handles a variety of tests with one load frame (Marshall, CBR, Unconfined, Unconsolidated undrained triaxial). Bench-mounted unit features pre-set speed selections and accessories. Variable speed setting allows stepless adjustment from 0.002" to 2.000" per minute. Order load ring separately. Meets ASTM D1633, D1883, D2166, D1559; AASHTO T193, T208, T245; BS 1377.

Description	Model
Master Loader, 120V, 60 Hz, 1 ph AC.	HM-2000A
Master Loader, 240V, 50/60 Hz, 1 ph AC.	HM-2000A.4F

Shipping wt. 300 lbs. (660kg)

### Master Loader Pre-Set Speeds

Test	Speed inches/minute	Speed mm/minute
CBR/LBR, Hveem and Soil-Cement	0.050	1.27
UC and UU for material having plasticity, on 1.4" (35.56mm) diam sample	0.028	0.71
UC and UU for material having plasticity, on 2.8" (71.12mm) diam sample	0.056	1.42
CBR (B.S.)	0.039	1.00
UU quick triaxial on 1.4" (35.56mm) diam sample for brittle material, only.	0.0085	0.22
UU quick triaxial on 2.8" (71.12mm) diam sample for brittle material, only.	0.017	0.43
Marshall stability and flow test / TSR	2.000	50.8
Variable Speed	Stepless Adjustment Range	
Other Tests	0.008–2.000"	0.20 mm–50.8 mm

## Master-Loader Accessories



H-4454.100, H-1344, H-1342

H-4454.100, HM-4178,  
H-4158.1, HM-2001HM-4199B, H-4454.100,  
H-4158.1H-4454.100, HM-2002,  
H-4158.1, HM-2001

H-4454.100, HM-2003

Marshall Test Accessories			
Description	Meets ASTM Specifications	Shipping Wt. lbs.	Model
Breaking head stability mold.	D1559	22	H-1342
Flowmeter dial gauge, 1" travel, 0.0001" divisions.	D1559	—	H-1344
Load ring, 10,000lbf (50kN)	D698	5	H-4454.100
CBR/LBR, Hveem Test Accessories			
Load ring, 10,000lbf (50kN)	D698	5	H-4454.100
Dial gauge, 1" travel, 0.001" divisions.	D1559	—	H-4158.1
Base Platen and strain rod for CBR and unconfined compression tests.	—	10	HM-2001
Piston for CBR test, 3" square.	D1883	8	H-4178
UU Quick Triaxial Test Accessories			
Triaxial cell.	D4767	—	HM-4199B
Load rings, see page 109 for complete description.	D2850	6	H-4454 Series
Dial gauge, 1" travel, 0.0001" divisions.	D1559	—	H-4158.1
Unconfined Compression Test Accessories			
Unconfined upper platen.	D2850	—	HM-2002
Base platen and strain rod for unconfined compression and CBR tests.	D2850	10	HM-2001
Dial gauge, 1" travel, 0.001" divisions.	—	—	H-4158.1
Load rings, see page 109 for complete description.	D698	6	H-4454 Series
Soil Cement Test Accessories			
Upper swivel platen and lower platen	—	5	HM-2003
Load ring, 10,000lbf (50kN).	D698	5	H-4454.100
Instrumentation Test Accessories			
Single-channel display.	—	5	HM-2350
Four-channel display.	—	10	HM-2320
Twin-channel display.	—	9	HM-2340
S-type load cell, 500 lbf.	E74	—	HM-2300.005
S-type load cell, 10,000 lbf.	E74	—	HM-2300.100
Strain transducer, 0.4" (10mm).	—	—	HM-2310.04
Strain transducer, 1.0" (25mm).	—	—	HM-2310.10
Other instrumentation and sizes are available. Call 1-800-537-4183 for details.			



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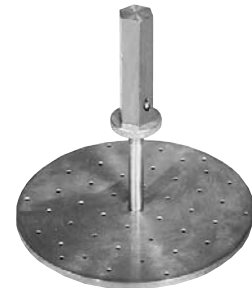
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H-4156



H-4156SB



H-4172

## CBR Apparatus

California Bearing Ratio (CBR) apparatus, developed from specifications of the California State Highway Department, the laboratory apparatus used in this method determines the bearing ratio of soil when it is compacted and tested in the laboratory by comparing the penetration load of the soil to that of a standard material. The method covers the evaluation of the relative quality of subgrade soils but is applicable to subbase and some base course materials. Meets ASTM D1883; AASHTO T193.

## Mechanical Loading Press

A two-speed mechanical jack is used, applying a steady rate of penetration load. Press has 10,000 lbf (44.4kN). Complete apparatus includes penetration piston mounted on a calibrated proving ring with dial holder and penetration dial attached to front upright. Overall dimensions: 18x12x34" (45.8x30.5x86.4cm). Meets ASTM D1883; AASHTO T193.

Description	Model
Mechanical loading press. Shipping wt. 120 lbs. (54.4kg)	H-4156

Description, Replacement Parts & Accessories	Model
Two-speed mechanical replacement jack. Shipping wt. 40 lbs. (18kg)	H-4156J
Swivel base for mechanical jack. Shipping wt. 6 lbs. (2.7kg)	H-4156SB

## Penetration Piston

CBR penetration piston has 3 sq. in. (19.35cm<sup>2</sup>) base area and is about 7-1/2" (191mm) long. Designed for use in conjunction with weights H-4175 and H-4176, which are used to apply penetration surcharge loads.

Description	Model
Penetration piston.	H-4178

Shipping wt. 8 lbs. (3.6kg)

## CBR Set

Set includes all component parts in chart below. Components may be ordered as replacement parts. Meets ASTM D1883; AASHTO T193.

Description	Model
California bearing ratio set.	H-4152

Shipping wt. 247 lbs. (112kg)

Description, Replacement Parts	Qty. in Set	Model
Mechanical loading press.	one	H-4156
Mold.	four	H-4151
Spacer disc.	one	H-4153
Filter screens.	four	H-4154
Swell plates.	two	H-4172
Tripod attachment.	one	H-4158
Dial indicator.	one	H-4158.1
Surcharge weights.	four	H-4175
Slotted surcharge weights.	four	H-4176
Density hammer.	one	H-4170
Straight edge.	one	H-4144
Cutting edge.	one	H-4174

## Swell Plates

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

Description	Model
Swell plates.	H-4172

Shipping wt. 5 lbs. (2.3kg)

## Field CBR Test Set

Used for determining CBR values in the field. Set consists of a two-speed mechanical jack, swivel base, penetration piston, extension and connector sets, bridge support with dial holder, penetration dial indicator, 2,000 lb and 5,000 lb capacity proving rings and surcharge weights. Meets ASTM D4429 specifications.

Description	Model
Field CBR test set.	H-4152F



H-4158



H-4174



H-4175



H-4176

## Tripod Attachment

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

Description	Model
Tripod attachment.	H-4158

## Dial Indicator

Dial indicator has 1.000" operating range, graduated in 0.001" divisions, clockwise movement and revolution counter. Recommended for use with H-4158 tripod attachment.

Description	Model
Dial indicator.	H-4158.1

## Cutting Edge

Machined from seamless tubing with a sharpened edge to enable undisturbed samples to be taken in the field, cutting edge is plated for rust resistance. Cutting edge has 6" (152mm) I.D. 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.

Description	Model
Cutting edge.	H-4174

## Filter Screen

100 mesh brass screen is 5-15/16" (1521mm) dia.

Description	Model
Filter screens.	H-4154

## Filter Paper

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.

Description	Model
Filter Paper.	H-4154FP

## Surcharge Weights

Used in the application of surcharged loads on the soils surface during soaking and penetration. Rust-resistant plated annular disc weighs 5 lbs. (2.3kg), 5-7/8" (149mm) O.D. with a 2-1/8" (54mm) I.D. hole in center.

Description	Model
Surcharge weight.	H-4175
Same except with 2-1/8" (54mm) slot.	H-4176

Shipping wt. 6 lbs. (2.7kg)

## 10 Lb. Field Surcharge Weight

Field surcharge weight is 10 lbs. (4.5kg). Model H-4177 is made in two parts; 5-7/8" (149mm) O.D.; 2-1/8" (54mm) I.D. and model H-4179 is a single piece, slotted design.

Description	Model
10 Lb. field surcharge weight.	H-4177
Same except slotted and 8-1/2" (216mm) dia.	H-4179

Shipping wt. 11 lbs. (5.0kg)

## Spacer Disc

Disc is used as a false bottom in a cylinder mold during compaction process. Plated rust-resistant steel disc is 5-15/16" (150.8mm) dia.

Description	Model
Spacer disc, 2.416"H (61.4mm)	H-4153

Shipping wt. 18 lbs. (8.2kg)

Description	Model
Spacer disc, LBR, 1.416"H (35.96mm).	H-4147

Shipping wt. 11 lbs. (5.0kg)

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H-4245



H-4246



H-4248



H-4166, H-4167

## Density Apparatus

Sand density apparatus determines the in-place density of soils. Set includes 1-gal. (3.79L) threaded jar, detachable double cone consisting of a brass cylindrical valve with a 1/2" (12.7mm) dia. orifice. Valve has stops that prevent rotating past completely open or completely closed positions. Bottom cone 6-1/2" (165mm) dia. flanged opening fits the opening of the H-4246 field density plate (order separately). Meets ASTM D1556; AASHTO T191.

Description	Model
Density apparatus.	H-4245

Shipping wt. 10 lbs. (4.5kg)

## 2-Quart Density Apparatus

Similar to H-4245, but features 2 qt (1.89L) threaded jar and bottom cone flanged to 4-1/2" (114mm) dia. to fit opening of H-4249A field density plate (order separately).

Description	Model
2-Qt. density apparatus.	H-4249

Shipping wt. 8 lbs. (3.6kg)

## Field Density Plate

Used with H-4245 density apparatus to simplify removal of soil from test mold and to act as template to control hole diameter. Cast aluminum alloy. Size 12x12" (305x305mm). Meets ASTM D1556; AASHTO T191.

Description	Model
Field density plate for H-4245 density apparatus.	H-4246
Field density plate for H-4249 density apparatus.	H-4249A

## Replacement Jars

1-gal (4L) capacity threaded plastic replacement jar is same as furnished with H-4245. 2-qt. (2.0L) capacity threaded glass replacement jar is same as furnished with H-4249

Description	Model
1-gal. plastic replacement jar.	H-4238
2-qt. glass replacement jar.	H-4249B

## Sand Density Cone

For the sand method of determining in-place density of gravel and coarse soils. Features two identical cones (top cone is clear plastic) with large valve in middle and circular density plate. Flange that fits the lower cone allows apparatus to be used on holes up to 12" (305mm) dia. Meets U.S. Army Corps of Engineers specifications.

Description	Model
Sand density cone.	H-4248

Shipping wt. 50 lbs. (22.7kg)

## Density Sand

Clean, dry, free-flowing uncemented sand has few, if any, particles passing the No. 200 (75mm) or retained on the No. 10 (2.00mm) sieves. The sand's variation in bulk density does not vary greater than 1 percent. Packaged in a heavy reinforced bag. Meets ASTM D1556; AASHTO T191.

Description	Model
Density sand.	H-3821

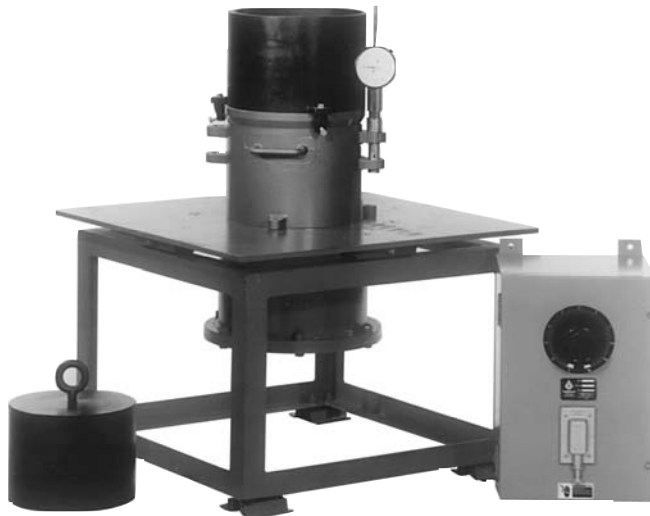
Shipping wt. 50 lbs. (22.7kg)

## Voluessel

Voluessel provides definite method of determining density of in-place compacted or firmly bonded soils using rubber balloon apparatus. It is not suitable for very soft soil that will deform under slight pressure or in which the volume of the hole cannot be maintained at a constant value. A simple operated device measuring in-place density with rapid determinations through graduated direct-reading clear plastic cylinder. The cylinder is high-strength plastic, threaded and open on both ends. Each cylinder is double graduated in cubic feet and cubic meters, minimum graduation is .00025 cu. ft. (7cm<sup>3</sup>). Features a pressure-vacuum pump assembly, pressure gauge, quick coupler valve, double-graduated cylinder, 10 balloons and a density plate. Meets ASTM D2167; AASHTO T205.

Description	Model
Voluessel. 1/20 cu. ft. (1600ml) capacity. Shipping wt. 13 lbs. (95.9kg)	H-4166
Voluessel. 1/13 cu. ft. (2230ml) capacity. Shipping wt. 14 lbs. (6.4kg)	H-4167
Pump assembly, double-acting type.	H-4166.10
Replacement balloons; 10 pack.	H-4168
Saddle weight, 5.5 lbs.	H-4166S

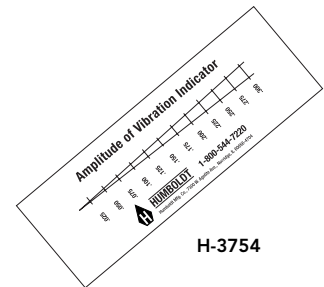
Exploded view of H-4166 with replacement parts is available.



H-3750 Set



H-3753



H-3754

## Relative Density of Cohesionless Soils

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 (75 $\mu$ m) sieve, depending on the distribution of particle sizes, which causes them to have free-draining characteristics. Relative density of cohesionless 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. Meets ASTM D4253, D4254.

Description	Model
Relative density of cohesionless soils apparatus, complete set. 230V, 60Hz, 12.0 amps, 1ph, AC	H-3750.2F
Relative density of cohesionless soils apparatus, complete set. 230V, 50Hz, 12.0 amps, 1ph, AC	H-3750.5F

Shipping wt. 925 lbs. (420kg)

## Pouring Funnel Set

Used for placement of loose 3/8" (9.5mm) or finer soils in relative density mold. Includes two 6" (152mm) dia. x 12" (305mm) long metal cylinders, each with a funnel.

Description	Model
Pouring funnel set.	H-3750FS

### Relative Density Apparatus Components

Description	Shipping Wt	Model
Vibrating table, 230V, 60Hz, 12.0 amps, 1ph, AC	465 lbs. (211kg)	H-3756.2F
Vibrating table, 230V, 50Hz, 12.0 amps, 1ph, AC.		H-3756.5F
0.1 cu.ft.-Relative density mold set.	96 lbs. (43.6kg)	H-3757
0.5 cu.ft.-Capacity relative density mold set.	350 lbs. (159kg)	H-3758
Relative density gauge set.	—	H-3759

## Vibration Indicator, Tachometer Type

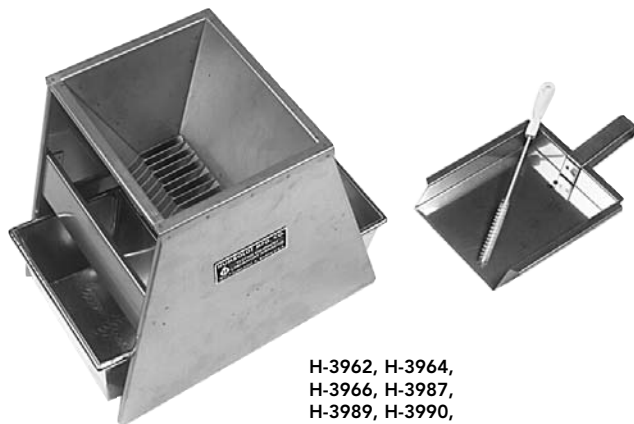
Precision tachometer is pen size to allow accurate readings even on hard-to-reach equipment. Scale gives readings from 2,000 to 21,000

Description	Model
Vibration indicator, tachometer type	H-3753

## Vibration Indicator, Visual Type

Visual indicator gives accurate reading of amplitude of vibration so vibrating table may be adjusted to ASTM specification.

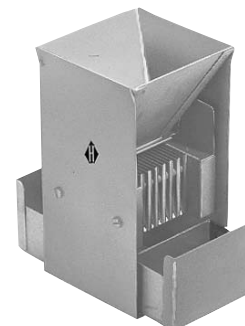
Description	Model
Vibration indicator, visual type	H-3754



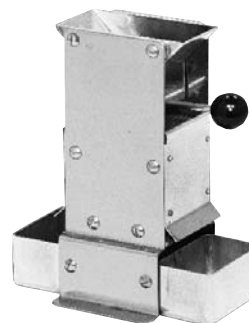
H-3962, H-3964,  
H-3966, H-3987,  
H-3989, H-3990,  
H-3992



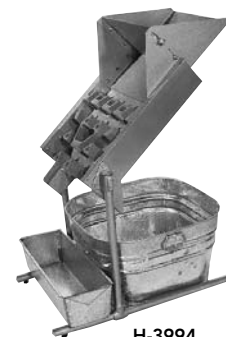
H-3970, H-3975



H-3971C



H-3973, H-3974



H-3994

**Sample Splitters**

Riffle-type sample splitters divide or halve dry materials such as cement, gravel, powdered ores, coal, coke, sand, soils, etc. Material poured into hopper is divided into two equal portions by two series of chutes that discharge alternately in opposite directions into separate pans.

Splitters are stainless steel construction. Include pans of stainless steel or cold-rolled steel, see chart for type and quantity of pans included. Also includes scoop and cleaning brush. See chart for other product details on specific models. Meets ASTM B215, C136, C702, C778, D421, D424, D457, D806, AASHTO T27, T144, T248.

**One-Piece Construction Sample Splitters**

For rapid, single-step reduction of large sample volumes. Ideal for general labor field applications. See models: H-3962, H-3964, H-3966, H-3987, H-3989, H-3990, H-3992.

**Sample Splitters with Removable Hopper**

Include removable stainless steel hopper for easy cleaning. See models: H-3980 and H-3985.

**Enclosed Sample Splitters**

Ideal for dusty samples, including coal, coke and chaff. Meets ASTM C702, D410, D2013, D3176, D3180; AASHTO T248. See models: H-3970 and H-3975.

**Microsplitters & Pans**

For fine easily segregated materials, particularly low-grade and radioactive ores. Stainless steel and aluminum alloy splitter is made entirely of nonmagnetic metals. Hopper is designed with cut-off gate to stop flow of materials from the hopper, preventing possible errors normally caused by overflowing material at corner of pan into riffles. See corresponding table for complete details on all models.

**16-to-1 Sample Reducer**

Produces 10-lb.-or-greater representative samples with maximum particle size 1/2" (13mm). Reducer cuts out 1/16th of the material fed through in one pass. (a one-pound sample can be obtained from a 256-pound original by passing it through twice).

Description	Model
16-to-1 Sample reducer. Shipping wt. 65 lbs. (29.5kg).	H-3994

Description, Replacement Parts & Accessories	Model
Materials pan.	H-3996
Wash tub.	H-3997

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**HUMBOLDT****SOIL****Sample Splitters, Microsplitters**

Sample Splitters							
No. of Chutes	Width of Chutes		Hopper Size	Pans Furn.	Ship Wt.		Model
	in.	mm. (approx.)			lbs.	kg.	
14	3/8	10	6-3/4x8" (172x203mm)	4	14	8.2	H-3962
14	1/2	13	6-3/4x11" (172x279mm)	4	17	7.7	H-3964
14	3/4	19	6-3/4x14-3/4" (172x375mm)	4	21	9.5	H-3966
14	3/8	10	6-1/2x8" (165x203mm)	2	22	10.0	H-3970 Enclosed
24	3/8	10	4-1/2x11" (114x279mm)	2	25	11.4	H-3975 Enclosed
12	1/2	13	8-1/2x11" (216x279mm)	4	15	6.8	H-3980 with Removable Hopper
12	3/4	19	8-1/2x14" (216x356mm)	4	21	9.5	H-3985 with Removable Hopper
16	1	25	9x20" (229x508mm)	4	31	14.1	H-3987
8	2	50	9-1/2x19-1/2" (241x495mm)	4	27	12.3	H-3989
10	1-1/2	38	9x20-1/2" (229x520mm)	4	50	22.7	H-3990
8	2-1/2	65	9x24" (229x610mm)	4	50	22.7	H-3992

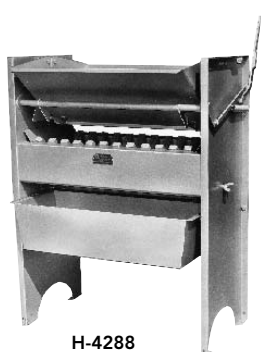
Sample Splitter Replacement Pans			
Dimensions	Ship. Wt.		Model
	lbs.	kg.	
8x5-1/4x4-1/2"D (203x133x114mm)	3	1.4	H-3981* and H-3981S
10-1/2x5-1/2x4-1/2"D (267x40x114mm)	4	1.8	H-3986* and H-3986S
13-1/2x6-3/4x5"D (343x71x127mm)	5	2.3	H-3967S
7x3-3/4x6"D (178x95x152mm)	5	2.3	H-3977S Drawer
11-3/4x6x5"D (298x152x127mm)	5	2.3	H-3976S Stainless Drawer
8x5-1/4x4-1/2"D (203x133x114mm)	3	1.4	H-3981* and H-3981S
10-1/2x5-1/2x4-1/2"D (267x140x114mm)	4	1.8	H-3986* and H-3986S
19x6-1/2x5-1/4"D (483x165x133mm)	6	2.7	H-3988* and H-3988S
19x6-1/2x5-1/4"D (483x165x133mm)	6	2.7	H-3988* and H-3988S
19x6-1/2x5-1/4"D (483x165x133mm)	6	2.7	H-3988* and H-3988S
22x6-1/2x5-1/4"D (559x165x133mm)	6	2.7	H-3993S

Splitters are stainless steel construction. All mm. dimensions are approximate.

\* Pans shipped with sample splitters are cold-rolled steel except where "S" follows the pan model number. "S" after model number indicates stainless steel construction.

Microsplitters							
No. of Chutes	Width of Chutes (in/mm)		Hopper Size	Pans Furn.	Ship.Wt. (lbs/kg)		Model
16	1/8	3	4-1/4x4-1/4x3-1/2"D 108x108x89mm	2	7	3.2	H-3971C
32	1/4	6	7x8 1/4x3-1/2"D 178x210x89mm	2	23	10.4	H-3973
16	1/2	13	7x8x3-1/2"D 178x203x89mm	2	23	10.4	H-3974

Microsplitter Pans			
Dimensions	Ship. Wt. (lbs/kg)		Model
2x3-1/2x1-3/4"D 51x89x45mm	2	.9	H-3972
5-3/4x9-3/4x4"D 146x248x102mm	3	1.3	H-3973.1
5-1/2x9-1/2x4"D 140x241x102mm	3	1.3	H-3973.1



H-4288



H-4289, H-4290



H-4291



H-4287

**Gilson Sample Splitters**

Reduces test samples too large to handle conveniently. Divides samples so each half is representative of original total sample. Handles any material from sand sizes up to 4".

Heavy welded steel construction loading hopper, lever-actuated clamshell hopper, and two material pans that slide under each half of

splitter chute. One pan can be replaced by a bag loading chute to return one half of the charge to a sample bag.

The single-splitter chute has aluminum or plated steel bars with a locating rod passed through their lower ends to provide wide flexibility in sizes of chute openings. Two materials pans are included.

**Gilson Sample Splitters**

Description	Materials Handled (max size)	Hopper Capacity	Width of Chutes	Dimensions (LxWxH)	Ship. Wt.	Model
Gilson no. SP-1 Sample Splitter large capacity, floor model	4"	1 cu. ft. (0.3m <sup>3</sup> )	24" adjustable by 1/2" increments	29x19x39" (737x483x991mm)	136 lbs (61.7kg)	H-4288
Gilson no. SP-2 Porta-Splitter medium capacity, bench model	2"	.5 cu. ft. (0.15m <sup>3</sup> )	Adjustable to 1/2, 1, 1-1/2, or 3"	22x14.5x20.5" (559x368x521mm)	64 lbs (29kg)	H-4289
Gilson no. SP-2.5 Versa-Splitter medium capacity, bench model	3/4"	.28 cu. ft. (0.084m <sup>3</sup> )	Adjustable to 1/4, 1/2, 3/4, 1, 1-1/2, or 2"	15.5x12.5x17.5" (394x318x445mm)	40 lbs (18.2kg)	H-4290
Gilson no. SP-3 Mini-Splitter bench model	1/4"	125 in. <sup>3</sup> (2.0L)	Adjustable to 1/8, 1/4, 3/8, 1/2, 3/4, 1, or 1-1/2"	9.5x8.5x13.5" (241x216x343mm)	15 lbs (6.8kg)	H-4291

**Parts and Accessories**

Description	Gilson no.	Model
Wheels (ball bearings/rubber tires)	SPA114	H-4288.1
Materials pan	SPA100	H-4288.2
Bag loading chute	SPA102	H-4288.3
Materials pan	SPA101	H-4289.1
Wheels (ball bearings/rubber tires)	SPA114	H-4288.1
Materials pan	SPA108	H-4290.1
Materials pan	SPA301	H-4291.1

**Quartering Canvas**

heavy-duty quartering canvas for use in selecting and quartering soils and aggregates. All edges are seamed and stitched. H-4135 does not meet ASTM and AASHTO specs. H-4136 meets ASTM C109, C702; AASTO T248.

Description	Model
Quartering canvas 5x5' (1.5x1.5m). Shipping wt. 6 lbs. (2.7kg).	H-4135
Quartering canvas 6x8' (2m x 2.5m). Shipping wt. 7 lbs. (3.2kg).	H-4136

**California Sample Splitter**

Designed by and constructed for the California Department of Transportation, this splitter meets CalTrans C 201 requirements. Large capacity, 1.9 Cu. Ft. (53.8L) gate release hopper. Ten 2-1/4" (57.2mm) fixed chutes process particle sizes up to 1-1/8" (28.6mm). Sturdy, heavy-gauge steel frame with painted and baked finish is built for extended service life under heavy use. Four swivel casters permit mobility and easy storage in busy, crowded labs. Two 1.2 Cu. Ft. (34L) capacity, welded steel sample pans are included. Reinforced pans have sturdy handles at each end for safe and convenient handling of heavy samples. Overall dimensions: 29x28x46" (71x74x 117cm).

Description	Model
California sample splitter.	H-4287

Description, Replacement Parts	Model
Material pan.	H-4287.1



Sieve Series

## U.S.A. Standard Sieve Series

Sieve frames are seamless spun brass or stainless steel with rigid rolled edges, extended bottoms (skirts) to fit all frames, pans or separator bottoms of the same diameter. This allows a set of sieves to be stacked. Brass sieves are cost efficient; stainless steel sieves are longer lasting, with sag-resistant mesh.

Sieve number, microns, nominal opening in millimeters and inches are listed on a permanently attached metal plate on each sieve. U.S.A. Standard Sieves are stocked in full and half heights, 8" (203mm) in diameter; 12" (305mm) dia. sieves are available in full, intermediate and half heights. 3" (76mm), 4" (101mm), 5" (127mm), 6" (152mm) and 10" (254mm) are available. All sieves meet ASTM E11; AASHTO M92.

Information on sieves, covers and pans is featured on the following pages.

**NOTE:** All U.S.A. Standard Sieves are individually serialized on the sieve frame.

### U.S.A. Standard Sieve Sizes and Equivalents

Alternative No.	Nominal Opening (in.)	Standard (mm)
4"	4.000	100mm
3-1/2"	3.500	90mm
3"	3.000	75mm
2-1/2"	2.500	63mm
2.12"	2.120	53mm
2"	2.000	50mm
1-3/4"	1.750	45mm
1-1/2"	1.500	37.5mm
1-1/4"	1.250	31.5mm
1.06"	1.060	26.5mm
1"	1.000	25.0mm
7/8"	0.875	22.4mm
3/4"	0.750	19.0mm
5/8"	0.625	16.0mm
0.530"	0.530	13.2mm
1/2"	0.500	12.5mm
7/16"	0.434	11.2mm
3/8"	0.375	9.5mm
5/16"	0.312	8.0mm
0.265"	0.265	6.7mm
1/4"	0.250	6.3mm
1/8"	0.125	3.17mm
No. 3-1/2	0.223	5.6mm
No. 4	0.187	4.75mm
No. 5	0.157	4.00mm
No. 6	0.131	3.35mm
No. 7	0.110	2.80mm
No. 8	0.094	2.36mm
No. 10	0.078	2.00mm
No. 12	0.066	1.70mm
No. 14	0.055	1.40mm
No. 16	0.046	1.18mm
No. 18	0.039	1.00mm
No. 20	0.033	850μ
No. 25	0.027	710μ
No. 30	0.023	600μ
No. 35	0.019	500μ
No. 40	0.016	425μ
No. 45	0.013	355μ
No. 50	0.011	300μ
No. 60	0.009	250μ
No. 70	0.008	212μ
No. 80	0.007	180μ
No. 100	0.005	150μ
No. 120	0.0049	125μ
No. 140	0.0041	106μ
No. 170	0.0035	90μ
No. 200	0.0029	75μ
No. 230	0.0024	62μ
No. 270	0.0020	53μ
No. 325	0.0017	45μ
No. 400	0.0014	38μ
No. 450	0.0012	32μ
No. 500	0.0009	25μ
No. 635	0.0007	20μ





## 8" Dia. USA Standard Sieves

Sieve Designation		Brass Frame and Mesh		Brass Frame, Stainless Mesh		Stainless Frame and Mesh	
Alt. No.	Std. (mm)	Full Height 2" (50mm)	Half Height 1" (25mm)	Full Height 2" (50mm)	Half Height 1" (25mm)	Full Height 2" (50mm)	Half Height 1" (25mm)
<b>Coarse Series</b>							
4"	100	—	—	H-3920CS4.000	H-3910CS4.000	H-3920CSS4.000	H-3910CSS4.000
3-1/2"	90	—	—	H-3920CS3.500	H-3910CS3.500	H-3920CSS3.500	H-3910CSS3.500
3"	75	H-3920C3.000	H-3910C3.000	H-3920CS3.000	H-3910CS3.000	H-3920CSS3.000	H-3910CSS3.000
2-1/2"	63	H-3920C2.500	H-3910C2.500	H-3920CS2.500	H-3910CS2.500	H-3920CSS2.500	H-3910CSS2.500
2.12"	53	—	—	H-3920CS2.120	H-3910CS2.120	H-3920CSS2.120	H-3910CSS2.120
2"	50	H-3920C2.000	H-3910C2.000	H-3920CS2.000	H-3910CS2.000	H-3920CSS2.000	H-3910CSS2.000
1-3/4"	45	—	—	H-3920CS1.750	H-3910CS1.750	H-3920CSS1.750	H-3910CSS1.750
1-1/2"	37.5	H-3920C1.500	H-3910C1.500	H-3920CS1.500	H-3910CS1.500	H-3920CSS1.500	H-3910CSS1.500
1-1/4"	31.5	—	—	H-3920CS1.250	H-3910CS1.250	H-3920CSS1.250	H-3910CSS1.250
1.06"	26.5	—	—	H-3920CS1.060	H-3910CS1.060	H-3920CSS1.060	H-3910CSS1.060
1"	25.0	H-3920C1.000	H-3910C1.000	H-3920CS1.000	H-3910CS1.000	H-3920CSS1.000	H-3910CSS1.000
7/8"	22.4	—	—	H-3920CS.875	H-3910CS.875	H-3920CSS.875	H-3910CSS.875
3/4"	19.0	H-3920C.750	H-3910C.750	H-3920CS.750	H-3910CS.750	H-3920CSS.750	H-3910CSS.750
5/8"	16.0	—	—	H-3920CS.625	H-3910CS.625	H-3920CSS.625	H-3910CSS.625
0.530"	13.2	—	—	H-3920CS.530	H-3910CS.530	H-3920CSS.530	H-3910CSS.530
1/2"	12.5	H-3920C.500	H-3910C.500	H-3920CS.500	H-3910CS.500	H-3920CSS.500	H-3910CSS.500
7/16"	11.2	—	—	H-3920CS.438	H-3910CS.438	H-3920CSS.438	H-3910CSS.438
3/8"	9.5	H-3920C.375	H-3910C.375	H-3920CS.375	H-3910CS.375	H-3920CSS.375	H-3910CSS.375
5/16"	8.0	—	—	H-3920CS.312	H-3910CS.312	H-3920CSS.312	H-3910CSS.312
0.265"	6.7	—	—	H-3920CS.265	H-3910CS.265	H-3920CSS.265	H-3910CSS.265
1/4"	6.3	H-3920C.250	H-3910C.250	H-3920CS.250	H-3910CS.250	H-3920CSS.250	H-3910CSS.250
1/8"	3.17	—	—	H-3920CS.125	H-3910CS.125	H-3920CSS.125	H-3910CSS.125
<b>Fine Series</b>							
No. 3-1/2	5.6	—	—	H-3920FS3-1/2	H-3910FS3-1/2	H-3920FSS3-1/2	H-3910FSS3-1/2
No. 4	4.75	H-3920F4	H-3910F4	H-3920FS4	H-3910FS4	H-3920FSS4	H-3910FSS4
No. 5	4.00	—	—	H-3920FS5	H-3910FS5	H-3920FSS5	H-3910FSS5
No. 6	3.35	—	—	H-3920FS6	H-3910FS6	H-3920FSS6	H-3910FSS6
No. 7	2.80	—	—	H-3920FS7	H-3910FS7	H-3920FSS7	H-3910FSS7
No. 8	2.36	H-3920F8	H-3910F8	H-3920FS8	H-3910FS8	H-3920FSS8	H-3910FSS8
No. 10	2.00	H-3920F10	H-3910F10	H-3920FS10	H-3910FS10	H-3920FSS10	H-3910FSS10
No. 12	1.70	H-3920F12	H-3910F12	H-3920FS12	H-3910FS12	H-3920FSS12	H-3910FSS12
No. 14	1.40	H-3920F14	H-3910F14	H-3920FS14	H-3910FS14	H-3920FSS14	H-3910FSS14
No. 16	1.18	H-3920F16	H-3910F16	H-3920FS16	H-3910FS16	H-3920FSS16	H-3910FSS16
No. 18	1.00	H-3920F18	H-3910F18	H-3920FS18	H-3910FS18	H-3920FSS18	H-3910FSS18
No. 20	850	H-3920F20	H-3910F20	H-3920FS20	H-3910FS20	H-3920FSS20	H-3910FSS20
No. 25	710	H-3920F25	H-3910F25	H-3920FS25	H-3910FS25	H-3920FSS25	H-3910FSS25
No. 30	600	H-3920F30	H-3910F30	H-3920FS30	H-3910FS30	H-3920FSS30	H-3910FSS30
No. 35	500	H-3920F35	H-3910F35	H-3920FS35	H-3910FS35	H-3920FSS35	H-3910FSS35
No. 40	425	H-3920F40	H-3910F40	H-3920FS40	H-3910FS40	H-3920FSS40	H-3910FSS40
No. 45	355	H-3920F45	H-3910F45	H-3920FS45	H-3910FS45	H-3920FSS45	H-3910FSS45
No. 50	300	H-3920F50	H-3910F50	H-3920FS50	H-3910FS50	H-3920FSS50	H-3910FSS50
No. 60	250	H-3920F60	H-3910F60	H-3920FS60	H-3910FS60	H-3920FSS60	H-3910FSS60
No. 70	212	H-3920F70	H-3910F70	H-3920FS70	H-3910FS70	H-3920FSS70	H-3910FSS70
No. 80	180	H-3920F80	H-3910F80	H-3920FS80	H-3910FS80	H-3920FSS80	H-3910FSS80
No. 100	150	H-3920F100	H-3910F100	H-3920FS100	H-3910FS100	H-3920FSS100	H-3910FSS100
No. 120	125	H-3920F120	H-3910F120	H-3920FS120	H-3910FS120	H-3920FSS120	H-3910FSS120
No. 140	106	H-3920F140	H-3910F140	H-3920FS140	H-3910FS140	H-3920FSS140	H-3910FSS140
No. 170	90	—	—	H-3920FS170	H-3910FS170	H-3920FSS170	H-3910FSS170
No. 200	75	H-3920F200	H-3910F200	H-3920FS200	H-3910FS200	H-3920FSS200	H-3910FSS200
No. 230	63	H-3920F230	H-3910F230	H-3920FS230	H-3910FS230	H-3920FSS230	H-3910FSS230
No. 270	53	H-3920F270	H-3910F270	H-3920FS270	H-3910FS270	H-3920FSS270	H-3910FSS270
No. 325	45	H-3920F325	H-3910F325	H-3920FS325	H-3910FS325	H-3920FSS325	H-3910FSS325
No. 400	38	—	—	H-3920FS400	H-3910FS400	H-3920FSS400	H-3910FSS400
No. 450	32	—	—	H-3920FS450	H-3910FS450	H-3920FSS450	H-3910FSS450
No. 500	25	—	—	H-3920FS500	H-3910FS500	H-3920FSS500	H-3910FSS500
No. 635	20	—	—	H-3920FS635	H-3910FS635	H-3920FSS635	H-3910FSS635

Sales or Technical Assistance — 1-800-544-7220

**HUMBOLDT****SOIL**  
**Sieves—U.S.A. Standard 12"****12" Dia. USA Standard Sieves**

Sieve Designation		Brass Frame and Mesh			Brass Frame, Stainless Mesh			Stainless Frame and Mesh	
Alt. No.	Std. (mm)	Full Height 3"(75mm)	Inter-Height 2" (50mm)	Half Height 1-5/8" (41mm)	Full Height 3" (75mm)	Inter-Height 2" (50mm)	Half Height 1-5/8" (41mm)	Full Height 3"(75mm)	Half Height 1-5/8" (41mm)
<b>Coarse Series</b>									
4"	100	—	—	—	H-3912CS4.000	H-3922CS4.000	H-3932CS4.000	H-3912CSS4.000	H-3932CSS4.000
3-1/2"	90	—	—	—	H-3912CS3.500	H-3922CS3.500	H-3932CS3.500	H-3912CSS3.500	H-3932CSS3.500
3"	75	H-3912C3.000	H-3922C3.000	H-3932C3.000	H-3912CS3.000	H-3922CS3.000	H-3932CS3.000	H-3912CSS3.000	H-3932CSS3.000
2-1/2"	63	H-3912C2.500	H-3922C2.500	H-3932C2.500	H-3912CS2.500	H-3922CS2.500	H-3932CS2.500	H-3912CSS2.500	H-3932CSS2.500
2.12"	53	—	—	H-3932C2.120	H-3912CS2.120	H-3922CS2.120	H-3932CS2.120	H-3912CSS2.120	H-3932CSS2.120
2"	50	H-3912C2.000	H-3922C2.000	H-3932C2.000	H-3912CS2.000	H-3922CS2.000	H-3932CS2.000	H-3912CSS2.000	H-3932CSS2.000
1-3/4"	45.0	—	—	H-3932C1.750	H-3912CS1.750	H-3922CS1.750	H-3932CS1.750	H-3912CSS1.750	H-3932CSS1.750
1-1/2"	37.5	H-3912C1.500	H-3922C1.500	H-3932C1.500	H-3912CS1.500	H-3922CS1.500	H-3932CS1.500	H-3912CSS1.500	H-3932CSS1.500
1-1/4"	31.5	—	—	—	H-3912CS1.250	H-3922CS1.250	H-3932CS1.250	H-3912CSS1.250	H-3932CSS1.250
1.06"	26.5	—	—	—	H-3912CS1.060	H-3922CS1.060	H-3932CS1.060	H-3912CSS1.060	H-3932CSS1.060
1"	25.0	H-3912C1.000	H-3922C1.000	H-3932C1.000	H-3912CS1.000	H-3922CS1.000	H-3932CS1.000	H-3912CSS1.000	H-3932CSS1.000
7/8"	22.4	—	—	H-3932C.875	H-3912CS.875	H-3922CS.875	H-3932CS.875	H-3912CSS.875	H-3932CSS.875
3/4"	19.0	H-3912C.750	H-3922C.750	H-3932C.750	H-3912CS.750	H-3922CS.750	H-3932CS.750	H-3912CSS.750	H-3932CSS.750
5/8"	16.0	—	—	H-3932C.625	H-3912CS.625	H-3922CS.625	H-3932CS.625	H-3912CSS.625	H-3932CSS.625
0.530"	13.2	—	—	—	H-3912CS.530	H-3922CS.530	H-3932CS.530	H-3912CSS.530	H-3932CSS.530
1/2"	12.5	H-3912C.500	H-3922C.500	H-3932C.500	H-3912CS.500	H-3922CS.500	H-3932CS.500	H-3912CSS.500	H-3932CSS.500
7/16"	11.2	—	—	—	H-3912CS.438	H-3922CS.438	H-3932CS.438	H-3912CSS.438	H-3932CSS.438
3/8"	9.5	H-3912C.375	H-3922C.375	H-3932C.375	H-3912CS.375	H-3922CS.375	H-3932CS.375	H-3912CSS.375	H-3932CSS.375
5/16"	8.0	—	—	—	H-3912CS.312	H-3922CS.312	H-3932CS.312	H-3912CSS.312	H-3932CSS.312
0.265"	6.7	—	—	—	H-3912CS.265	H-3922CS.265	H-3932CS.265	H-3912CSS.265	H-3932CSS.265
1/4"	6.3	H-3912C.250	H-3922C.250	H-3932C.250	H-3912CS.250	H-3922CS.250	H-3932CS.250	H-3912CSS.250	H-3932CSS.250
1/8"	3.17	—	—	H-3932C.125	H-3912CS.125	H-3922CS.125	H-3932CS.125	—	H-3932CSS.125
<b>Fine Series</b>									
No. 3-1/2	5.6	—	—	—	H-3912FS3-1/2	H-3922FS3-1/2	H-3932FS3-1/2	H-3912FSS3-1/2	H-3932FSS3-1/2
No. 4	4.75	H-3912F4	H-3922F4	H-3932F4	H-3912FS4	H-3922FS4	H-3932FS4	H-3912FSS4	H-3932FSS4
No. 5	4.00	—	—	—	H-3912FS5	H-3922FS5	H-3932FS5	H-3912FSS5	H-3932FSS5
No. 6	3.35	—	—	—	H-3912FS6	H-3922FS6	H-3932FS6	H-3912FSS6	H-3932FSS6
No. 7	2.80	—	—	—	H-3912FS7	H-3922FS7	H-3932FS7	H-3912FSS7	H-3932FSS7
No. 8	2.36	H-3912F8	H-3922F8	H-3932F8	H-3912FS8	H-3922FS8	H-3932FS8	H-3912FSS8	H-3932FSS8
No. 10	2.00	H-3912F10	H-3922F10	H-3932F10	H-3912FS10	H-3922FS10	H-3932FS10	H-3912FSS10	H-3932FSS10
No. 12	1.70	H-3912F12	H-3922F12	H-3932F12	H-3912FS12	H-3922FS12	H-3932FS12	H-3912FSS12	H-3932FSS12
No. 14	1.40	H-3912F14	H-3922F14	H-3932F14	H-3912FS14	H-3922FS14	H-3932FS14	H-3912FSS14	H-3932FSS14
No. 16	1.18	H-3912F16	H-3922F16	H-3932F16	H-3912FS16	H-3922FS16	H-3932FS16	H-3912FSS16	H-3932FSS16
No. 18	1.00	H-3912F18	H-3922F18	H-3932F18	H-3912FS18	H-3922FS18	H-3932FS18	H-3912FSS18	H-3932FSS18
No. 20	850	H-3912F20	H-3922F20	H-3932F20	H-3912FS20	H-3922FS20	H-3932FS20	H-3912FSS20	H-3932FSS20
No. 25	710	H-3912F25	H-3922F25	H-3932F25	H-3912FS25	H-3922FS25	H-3932FS25	H-3912FSS25	H-3932FSS25
No. 30	600	H-3912F30	H-3922F30	H-3932F30	H-3912FS30	H-3922FS30	H-3932FS30	H-3912FSS30	H-3932FSS30
No. 35	500	H-3912F35	H-3922F35	H-3932F35	H-3912FS35	H-3922FS35	H-3932FS35	H-3912FSS35	H-3932FSS35
No. 40	425	H-3912F40	H-3922F40	H-3932F40	H-3912FS40	H-3922FS40	H-3932FS40	H-3912FSS40	H-3932FSS40
No. 45	355	H-3912F45	H-3922F45	H-3932F45	H-3912FS45	H-3922FS45	H-3932FS45	H-3912FSS45	H-3932FSS45
No. 50	300	H-3912F50	H-3922F50	H-3932F50	H-3912FS50	H-3922FS50	H-3932FS50	H-3912FSS50	H-3932FSS50
No. 60	250	H-3912F60	H-3922F60	H-3932F60	H-3912FS60	H-3922FS60	H-3932FS60	H-3912FSS60	H-3932FSS60
No. 70	212	H-3912F70	H-3922F70	H-3932F70	H-3912FS70	H-3922FS70	H-3932FS70	H-3912FSS70	H-3932FSS70
No. 80	180	H-3912F80	H-3922F80	H-3932F80	H-3912FS80	H-3922FS80	H-3932FS80	H-3912FSS80	H-3932FSS80
No. 100	150	H-3912F100	H-3922F100	H-3932F100	H-3912FS100	H-3922FS100	H-3932FS100	H-3912FSS100	H-3932FSS100
No. 120	125	H-3912F120	H-3922F120	H-3932F120	H-3912FS120	H-3922FS120	H-3932FS120	H-3912FSS120	H-3932FSS120
No. 140	106	H-3912F140	H-3922F140	H-3932F140	H-3912FS140	H-3922FS140	H-3932FS140	H-3912FSS140	H-3932FSS140
No. 170	90	—	—	—	H-3912FS170	H-3922FS170	H-3932FS170	H-3912FSS170	H-3932FSS170
No. 200	75	H-3912F200	H-3922F200	H-3932F200	H-3912FS200	H-3922FS200	H-3932FS200	H-3912FSS200	H-3932FSS200
No. 230	63	H-3912F230	H-3922F230	H-3932F230	H-3912FS230	H-3922FS230	H-3932FS230	H-3912FSS230	H-3932FSS230
No. 270	53	H-3912F270	H-3922F270	H-3932F270	H-3912FS270	H-3922FS270	H-3932FS270	H-3912FSS270	H-3932FSS270
No. 325	45	H-3912F325	H-3922F325	H-3932F325	H-3912FS325	H-3922FS325	H-3932FS325	H-3912FSS325	H-3932FSS325
No. 400	38	—	—	—	H-3912FS400	H-3922FS400	H-3932FS400	H-3912FSS400	H-3932FSS400
No. 450	32	—	—	—	H-3912FS450	H-3922FS450	H-3932FS450	H-3912FSS450	H-3932FSS450
No. 500	25	—	—	—	H-3912FS500	H-3922FS500	H-3932FS500	H-3912FSS500	H-3932FSS500
No. 635	20	—	—	—	H-3912FS635	H-3922FS635	H-3932FS635	H-3912FSS635	H-3932FSS635



**4" and 12" Dia. Deep Frame USA Standard Sieves**

Sieve Designation		4" Diameter				12" Diameter Deep Frame			
Alt. No.	Std. (mm)	1-1/2" Deep Brass Frame and Mesh	1-1/2" Deep Brass Frame, Stainless Mesh	4" Deep Brass Frame and Mesh	4" Deep Brass Frame, Stainless Mesh	4" Deep Brass Frame and Mesh	4" Deep Brass Frame, Stainless Mesh	8" Deep Brass Frame and Mesh	8" Deep Brass Frame, Stainless Mesh
<b>Coarse Series</b>									
4"	100	—	—	—	—	—	H-3928CS4.000	—	H-3938CS4.000
3-1/2"	90	—	—	—	—	—	H-3928CS3.500	—	H-3938CS3.500
3"	75	—	—	—	—	H-3928C3.000	H-3928CS3.000	H-3938C3.000	H-3938CS3.000
2-1/2"	63	—	—	—	—	H-3928C2.500	H-3928CS2.500	H-3938C2.500	H-3938CS2.500
2.12"	53	—	—	—	—	H-3928C2.120	H-3928CS2.120	H-3938C2.120	H-3938CS2.120
2"	50	—	—	—	—	H-3928C2.000	H-3928CS2.000	H-3938C2.000	H-3938CS2.000
1-3/4"	45.0	—	—	—	—	H-3928C1.750	H-3928CS1.750	H-3938C1.750	H-3938CS1.750
1-1/2"	37.5	—	—	—	—	H-3928C1.500	H-3928CS1.500	H-3938C1.500	H-3938CS1.500
1-1/4"	31.5	—	—	—	—	—	H-3928CS1.250	—	H-3938CS1.250
1/06"	26.5	—	—	—	—	—	H-3928CS1.060	—	H-3938CS1.060
1"	25.0	H-3914C1.000	H-3914CS1.000	H-3924C1.000	H-3924CS1.000	H-3928C1.000	H-3928CS1.000	H-3938C1.000	H-3938CS1.000
7/8"	22.4	—	H-3914CS.875	—	H-3924CS.875	—	H-3928CS.875	—	H-3938CS.875
3/4"	19.0	H-3914C.750	H-3914CS.750	H-3924C.750	H-3924CS.750	H-3928C.750	H-3928CS.750	H-3938C.750	H-3938CS.750
5/8"	16.0	—	H-3914CS.625	—	H-3924CS.625	—	H-3928CS.625	—	H-3938CS.625
0.530"	13.2	—	H-3914CS.530	—	H-3924CS.530	—	H-3928CS.530	—	H-3938CS.530
1/2"	12.5	H-3914C.500	H-3914CS.500	H-3924C.500	H-3924CS.500	H-3928C.500	H-3928CS.500	H-3938C.500	H-3938CS.500
7/16"	11.2	—	H-3914CS.438	—	H-3924CS.438	—	H-3928CS.438	—	H-3938CS.438
3/8"	9.5	H-3914C.375	H-3914CS.375	H-3924C.375	H-3924CS.375	H-3928C.375	H-3928CS.375	H-3938C.375	H-3938CS.375
5/16"	8.0	—	H-3914CS.312	—	H-3924CS.312	—	H-3928CS.312	—	H-3938CS.312
0.265"	6.7	—	H-3914CS.265	—	H-3924CS.265	—	H-3928CS.265	—	H-3938CS.265
1/4"	6.3	H-3914C.250	H-3914CS.250	H-3924C.250	H-3924CS.250	H-3928C.250	H-3928CS.250	H-3938C.250	H-3938CS.250
1/8"	3.17	—	H-3914CS.125	—	H-3924CS.125	—	H-3928CS.125	—	H-3938CS.125
<b>Fine Series</b>									
No. 3-1/2	5.6	—	H-3914FS3-1/2	—	H-3924FS3-1/2	—	H-3928FS3-1/2	—	H-3938FS3-1/2
No. 4	4.75	H-3914F4	H-3914FS4	H-3924F4	H-3924FS4	H-3928F4	H-3928FS4	H-3938F4	H-3938FS4
No. 5	4.00	—	H-3914FS5	—	H-3924FS5	—	H-3928FS5	—	H-3938FS5
No. 6	3.35	—	H-3914FS6	—	H-3924FS6	—	H-3928FS6	—	H-3938FS6
No. 7	2.80	—	H-3914FS7	—	H-3924FS7	—	H-3928FS7	—	H-3938FS7
No. 8	2.36	H-3914F8	H-3914FS8	H-3924F8	H-3924FS8	H-3928F8	H-3928FS8	H-3938F8	H-3938FS8
No. 10	2.00	H-3914F10	H-3914FS10	H-3924F10	H-3924FS10	H-3928F10	H-3928FS10	H-3938F10	H-3938FS10
No. 12	1.70	H-3914F12	H-3914FS12	H-3924F12	H-3924FS12	H-3928F12	H-3928FS12	H-3938F12	H-3938FS12
No. 14	1.40	H-3914F14	H-3914FS14	H-3924F14	H-3924FS14	H-3928F14	H-3928FS14	H-3938F14	H-3938FS14
No. 16	1.18	H-3914F16	H-3914FS16	H-3924F16	H-3924FS16	H-3928F16	H-3928FS16	H-3938F16	H-3938FS16
No. 18	1.00	H-3914F18	H-3914FS18	H-3924F18	H-3924FS18	H-3928F18	H-3928FS18	H-3938F18	H-3938FS18
No. 20	850	H-3914F20	H-3914FS20	H-3924F20	H-3924FS20	H-3928F20	H-3928FS20	H-3938F20	H-3938FS20
No. 25	710	H-3914F25	H-3914FS25	H-3924F25	H-3924FS25	H-3928F25	H-3928FS25	H-3938F25	H-3938FS25
No. 30	600	H-3914F30	H-3914FS30	H-3924F30	H-3924FS30	H-3928F30	H-3928FS30	H-3938F30	H-3938FS30
No. 35	500	H-3914F35	H-3914FS35	H-3924F35	H-3924FS35	H-3928F35	H-3928FS35	H-3938F35	H-3938FS35
No. 40	425	H-3914F40	H-3914FS40	H-3924F40	H-3924FS40	H-3928F40	H-3928FS40	H-3938F40	H-3938FS40
No. 45	355	H-3914F45	H-3914FS45	H-3924F45	H-3924FS45	H-3928F45	H-3928FS45	H-3938F45	H-3938FS45
No. 50	300	H-3914F50	H-3914FS50	H-3924F50	H-3924FS50	H-3928F50	H-3928FS50	H-3938F50	H-3938FS50
No. 60	250	H-3914F60	H-3914FS60	H-3924F60	H-3924FS60	H-3928F60	H-3928FS60	H-3938F60	H-3938FS60
No. 70	212	H-3914F70	H-3914FS70	H-3924F70	H-3924FS70	H-3928F70	H-3928FS70	H-3938F70	H-3938FS70
No. 80	180	H-3914F80	H-3914FS80	H-3924F80	H-3924FS80	H-3928F80	H-3928FS80	H-3938F80	H-3938FS80
No. 100	150	H-3914F100	H-3914FS100	H-3924F100	H-3924FS100	H-3928F100	H-3928FS100	H-3938F100	H-3938FS100
No. 120	125	H-3914F120	H-3914FS120	H-3924F120	H-3924FS120	H-3928F120	H-3928FS120	H-3938F120	H-3938FS120
No. 140	106	H-3914F140	H-3914FS140	H-3924F140	H-3924FS140	H-3928F140	H-3928FS140	H-3938F140	H-3938FS140
No. 170	90	—	H-3914FS170	—	H-3924FS170	—	H-3928FS170	—	H-3938FS170
No. 200	75	H-3914F200	H-3914FS200	H-3924F200	H-3924FS200	H-3928F200	H-3928FS200	H-3938F200	H-3938FS200
No. 230	63	H-3914F230	H-3914FS230	H-3924F230	H-3924FS230	H-3928F230	H-3928FS230	H-3938F230	H-3938FS230
No. 270	53	H-3914F270	H-3914FS270	H-3924F270	H-3924FS270	H-3928F270	H-3928FS270	H-3938F270	H-3938FS270
No. 325	45	H-3914F325	H-3914FS325	H-3924F325	H-3924FS325	H-3928F325	H-3928FS325	H-3938F325	H-3938FS325
No. 400	38	—	H-3914FS400	—	H-3924FS400	—	H-3928FS400	—	H-3938FS400
No. 450	32	—	H-3914FS450	—	H-3924FS450	—	H-3928FS450	—	H-3938FS450
No. 500	25	—	H-3914FS500	—	H-3924FS500	—	H-3928FS500	—	H-3938FS500
No. 635	20	—	H-3914FS635	—	H-3924FS635	—	H-3928FS635	—	H-3938FS635

Sales or Technical Assistance — 1-800-544-7220



CONCRETE

Sieves—U.S.A. Standard

3", 5", 6" and 10" Dia. USA Standard Sieves									
Sieve Designation		3" Diameter		5" Diameter		6" Diameter		10" Diameter	
No.	(mm)	1" Deep Brass Frame and Mesh	1" Deep Brass Frame, Stainless Mesh	1-1/2" Deep Brass Frame and Mesh	1-1/2" Deep Brass Frame, Stainless Mesh	1-1/2" Deep Brass Frame and Mesh	1-1/2" Deep Brass Frame, Stainless Mesh	3" Deep Brass Frame and Mesh	3" Deep Brass Frame, Stainless Mesh
<b>Coarse Series</b>									
4"	100mm	—	—	—	—	—	—	—	H-3919CS4.000
3-1/2"	90mm	—	—	—	—	—	—	—	H-3919CS3.500
3"	75mm	—	—	—	—	—	—	H-3919C3.000	H-3919CS3.000
2-1/2"	63mm	—	—	—	—	—	—	H-3919C2.500	H-3919CS2.500
2.12"	53mm	—	—	—	—	—	—	—	H-3919CS2.120
2"	50mm	—	—	—	—	—	—	H-3919C2.000	H-3919CS2.000
1-3/4"	45.0mm	—	—	—	—	—	—	—	H-3919CS1.750
1-1/2"	37.5mm	—	—	—	—	—	—	H-3919C1.500	H-3919CS1.500
1-1/4"	31.5mm	—	—	—	—	—	—	—	H-3919CS1.250
1/06"	26.5mm	—	—	—	—	—	—	—	H-3919CS1.060
1"	25.0mm	H-3913C1.000	H-3913CS1.000	H-3915C1.000	H-3915CS1.000	H-3916C1.000	H-3916CS1.000	H-3919C1.000	H-3919CS1.000
7/8"	22.4mm	—	H-3913CS.875	—	H-3915CS.875	—	H-3916CS.875	—	H-3919CS.875
3/4"	19.0mm	H-3913C.750	H-3913CS.750	H-3915C.750	H-3915CS.750	H-3916C.750	H-3916CS.750	H-3919C.750	H-3919CS.750
5/8"	16.0mm	—	H-3913CS.625	—	H-3915CS.625	—	H-3916CS.625	—	H-3919CS.625
0.530"	13.2mm	—	H-3913CS.530	—	H-3915CS.530	—	H-3916CS.530	—	H-3919CS.530
1/2"	12.5mm	H-3913C.500	H-3913CS.500	H-3915C.500	H-3915CS.500	H-3916C.500	H-3916CS.500	H-3919C.500	H-3919CS.500
7/16"	11.2mm	—	H-3913CS.438	—	H-3915CS.438	—	H-3916CS.438	—	H-3919CS.438
3/8"	9.5mm	H-3913C.375	H-3913CS.375	H-3915C.375	H-3915CS.375	H-3916C.375	H-3916CS.375	H-3919C.375	H-3919CS.375
5/16"	8.0mm	—	H-3913CS.312	—	H-3915CS.312	—	H-3916CS.312	—	H-3919CS.312
0.265"	6.7mm	—	H-3913CS.265	—	H-3915CS.265	—	H-3916CS.265	—	H-3919CS.265
1/4"	6.3mm	H-3913C.250	H-3913CS.250	H-3915C.250	H-3915CS.250	H-3916C.250	H-3916CS.250	H-3919C.250	H-3919CS.250
1/8"	3.17mm	—	H-3913CS.125	—	H-3915CS.125	—	H-3916CS.125	—	H-3919CS.125
<b>Fine Series</b>									
No. 3-1/2	5.6mm	—	H-3913FS3-1/2	—	H-3915FS3-1/2	—	H-3916FS3-1/2	—	H-3919FS3-1/2
No. 4	4.75mm	H-3913F4	H-3913FS4	H-3915F4	H-3915FS4	H-3916F4	H-3916FS4	H-3919F4	H-3919FS4
No. 5	4.00mm	—	H-3913FS5	—	H-3915FS5	—	H-3916FS5	—	H-3919FS5
No. 6	3.35mm	—	H-3913FS6	—	H-3915FS6	—	H-3916FS6	—	H-3919FS6
No. 7	2.80mm	—	H-3913FS7	—	H-3915FS7	—	H-3916FS7	—	H-3919FS7
No. 8	2.36mm	H-3913F8	H-3913FS8	H-3915F8	H-3915FS8	H-3916F8	H-3916FS8	H-3919F8	H-3919FS8
No. 10	2.00mm	H-3913F10	H-3913FS10	H-3915F10	H-3915FS10	H-3916F10	H-3916FS10	H-3919F10	H-3919FS10
No. 12	1.70mm	H-3913F12	H-3913FS12	H-3915F12	H-3915FS12	H-3916F12	H-3916FS12	H-3919F12	H-3919FS12
No. 14	1.40mm	H-3913F14	H-3913FS14	H-3915F14	H-3915FS14	H-3916F14	H-3916FS14	H-3919F14	H-3919FS14
No. 16	1.18mm	H-3913F16	H-3913FS16	H-3915F16	H-3915FS16	H-3916F16	H-3916FS16	H-3919F16	H-3919FS16
No. 18	1.00mm	H-3913F18	H-3913FS18	H-3915F18	H-3915FS18	H-3916F18	H-3916FS18	H-3919F18	H-3919FS18
No. 20	850	H-3913F20	H-3913FS20	H-3915F20	H-3915FS20	H-3916F20	H-3916FS20	H-3919F20	H-3919FS20
No. 25	710	H-3913F25	H-3913FS25	H-3915F25	H-3915FS25	H-3916F25	H-3916FS25	H-3919F25	H-3919FS25
No. 30	600	H-3913F30	H-3913FS30	H-3915F30	H-3915FS30	H-3916F30	H-3916FS30	H-3919F30	H-3919FS30
No. 35	500	H-3913F35	H-3913FS35	H-3915F35	H-3915FS35	H-3916F35	H-3916FS35	H-3919F35	H-3919FS35
No. 40	425	H-3913F40	H-3913FS40	H-3915F40	H-3915FS40	H-3916F40	H-3916FS40	H-3919F40	H-3919FS40
No. 45	355	H-3913F45	H-3913FS45	H-3915F45	H-3915FS45	H-3916F45	H-3916FS45	H-3919F45	H-3919FS45
No. 50	300	H-3913F50	H-3913FS50	H-3915F50	H-3915FS50	H-3916F50	H-3916FS50	H-3919F50	H-3919FS50
No. 60	250	H-3913F60	H-3913FS60	H-3915F60	H-3915FS60	H-3916F60	H-3916FS60	H-3919F60	H-3919FS60
No. 70	212	H-3913F70	H-3913FS70	H-3915F70	H-3915FS70	H-3916F70	H-3916FS70	H-3919F70	H-3919FS70
No. 80	180	H-3913F80	H-3913FS80	H-3915F80	H-3915FS80	H-3916F80	H-3916FS80	H-3919F80	H-3919FS80
No. 100	150	H-3913F100	H-3913FS100	H-3915F100	H-3915FS100	H-3916F100	H-3916FS100	H-3919F100	H-3919FS100
No. 120	125	H-3913F120	H-3913FS120	H-3915F120	H-3915FS120	H-3916F120	H-3916FS120	H-3919F120	H-3919FS120
No. 140	106	H-3913F140	H-3913FS140	H-3915F140	H-3915FS140	H-3916F140	H-3916FS140	H-3919F140	H-3919FS140
No. 170	90	—	H-3913FS170	—	H-3915FS170	—	H-3916FS170	—	H-3919FS170
No. 200	75	H-3913F200	H-3913FS200	H-3915F200	H-3915FS200	H-3916F200	H-3916FS200	H-3919F200	H-3919FS200
No. 230	63	H-3913F230	H-3913FS230	H-3915F230	H-3915FS230	H-3916F230	H-3916FS230	H-3919F230	H-3919FS230
No. 270	53	H-3913F270	H-3913FS270	H-3915F270	H-3915FS270	H-3916F270	H-3916FS270	H-3919F270	H-3919FS270
No. 325	45	H-3913F325	H-3913FS325	H-3915F325	H-3915FS325	H-3916F325	H-3916FS325	H-3919F325	H-3919FS325
No. 400	38	—	H-3913FS400	—	H-3915FS400	—	H-3916FS400	—	H-3919FS400
No. 450	32	—	H-3913FS450	—	H-3915FS450	—	H-3916FS450	—	H-3919FS450
No. 500	25	—	H-3913FS500	—	H-3915FS500	—	H-3916FS500	—	H-3919FS500
No. 635	20	—	H-3913FS635	—	H-3915FS635	—	H-3916FS635	—	H-3919FS635



Sieve Pans and Covers

**200mm Dia Test Sieves**

Brass frame with stainless steel cloth mesh. Full ht. 2-5/8" (66mm); Half ht. = 1-5/8" (40.6mm). Depth to cloth: Full ht. = 2" (50.8mm); Half ht. = 1" (25.4mm).

**200mm Diameter Test Sieves**

Micron	Std. (mm)	Full Ht. Model	Half Ht. Model
40000	40	H-3906.40000	H-3908.40000
28000	28	H-3906.28000	H-3908.28000
20000	20	H-3906.20000	H-3908.20000
14000	14	H-3906.14000	H-3908.14000
10000	10	H-3906.10000	H-3908.10000
5000	5	H-3906.05000	H-3908.05000
2500	2.5	H-3906.02500	H-3908.02500
1250	1.5	H-3906.01250	H-3908.01250
630	630	H-3906.00630	H-3908.00630
315	315	H-3906.00315	H-3908.00315
160	160	H-3906.00160	H-3908.00160
80	80	H-3906.00080	H-3908.00080

**Description, Accessories**

**Model**

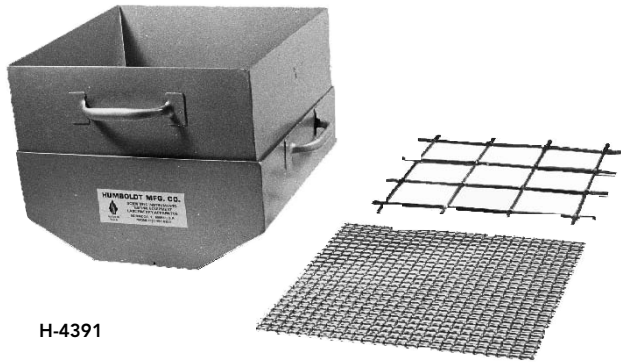
Brass cover for 200mm diam test sieves.	H-3908BC
Full height brass pan for 200mm diam test sieves.	H-3906BP
Half height brass pan for 200mm diam test sieves.	H-3908BP

**Sieve Covers With Ring**

Description	Brass	Stainless
3" Dia. Sieve Cover	H-3913BC	H-3913SC
4" Dia. Deep Frame Sieve Cover	H-3914BC	—
5" Dia. Sieve Cover	H-3915BC	—
6" Dia. Sieve Cover	H-3916BC	—
8" Dia. Sieve Cover	H-3930BC	H-3930SC
10" Dia. Sieve Cover	H-3919BC	—
12" Dia. Sieve Cover	H-3912BC	H-3912SC

**Sieve Pans**

Description	Brass	Stainless
3" Dia. Bottom Pan, 1" (25mm) deep	H-3913P	H-3913SS
3" Dia. Separator Pan	H-3913SP	—
4" Dia. Separator Pan, 1-1/2" (38.1mm) deep 4" Dia. Separator Pan, 4" (102mm) deep	H-3914SP H-3924SP	—
5" Dia. Bottom Pan, 1" (25mm)	H-3915P	—
5" Dia. Separator Pan	H-3915SP	—
6" Dia. Bottom Pan, 1" (25mm) deep	H-3916P	—
6" Dia. Separator Pan	H-3916SP	—
8" Dia. Bottom Pan 1" (25mm) deep 8" Dia. Bottom Pan 2" (51mm) deep	H-3960P H-3950P	H-3960SS H-3950SS
8" Dia. Separator Pan, 1" (25mm) deep 8" Dia. Separator Pan, 2" (51mm) deep	H-3955SP H-3956SP	H-3955SS H-3956SS
10" Dia. Bottom Pan, 2" (51mm) deep	H-3919P	—
10" Dia. Separator Pan	H-3919SP	—
12" Dia. Bottom Pan, 1" (25mm) deep 12" Dia. Bottom Pan, 2" (51mm) deep 12" Dia. Bottom Pan, 3" (75mm) deep	H-3932P H-3922P H-3912P	H-3932PSS — H-3912PSS
12" Dia. Separator Pan, 1" (25mm) deep 12" Dia. Separator Pan, 2" (51mm) deep 12" Dia. Separator Pan, 3" (75mm) deep 12" Dia. Separator Pan, 4" (100mm) deep 12" Dia. Separator Pan, 8" (200mm) deep	H-3932SP H-3922SP H-3912SP H-3928SP H-3938SP	H-3932PSS — H-3912PSS — —



H-4391



H-4100 Series

## Rocker-Type Field-Testing Sieves

For sieve analysis of coarse aggregates and other materials. Consists of a 12" (305mm) square frame with handles mounted on a collector box with rockers. Includes 3" (76.1mm), 2" (50.8mm), 1-1/2" (38.1mm), 1" (25.4mm), 3/4" (19.0mm), 1/2" (12.7mm), 3/8" (9.51mm) and No. 4 ASTM wire screen plates with square openings.

Screen plates of any standard openings are available; separations finer than No. 20 mesh are not recommended for this unit. Screens are held in place with two locking devices on opposite sides. All screens can be clamped into frame for carrying or storage. O.D. 15-1/4x12-1/4x10" (387x311x354mm). Replacement screens available, call 1-800-544-7220.

Description	Model
Rocker-type field testing sieves.	H-4391

Shipping wt. 42 lbs. (19kg)

## Soil Analysis Sieves

Used by agricultural engineers because of their accuracy and ease of handling. Frames are seamless brass with rolled edges and extended skirts for nesting.

## 5"-Dia. Perforated Plate Soil Analysis Sieve Set

Set includes pan, cover and five metric perforated plate sieves. Screening surfaces are perforated brass plate with 0.5mm, 1mm, 2mm, 3mm and 5mm size openings. Frames are 5" (127mm) dia. by 1-1/2" (38mm) deep.

Description	Model
5"-Dia. Perforated plate mechanical soil analysis sieve set.	H-3902

Shipping wt. 10 lbs. (4.5kg)

## Sieve Brushes (see page 218)

## 18"-Dia. Brass Frame Riddles (Sieves)

Brass frame riddles (sieves) are made with stainless steel wire cloth and are used to wash, sift, strain for draining-off liquids and separate aggregates and dry materials in the sieve analysis of concrete and other materials. Meet ASTM specifications.

18" Brass Frame Riddles		
Screen No. or Size Mesh		Model
4"	100mm	H-4109.4
3-1/2"	90mm	H-4109A
3"	75mm	H-4109
2-1/2"	63mm	H-4108
2"	50mm	H-4107
1-1/2"	37.5mm	H-4106
1-1/4"	31.5mm	H-4105A
1"	25.0mm	H-4105
7/8"	22.4mm	H-4104A
3/4"	19.0mm	H-4104
5/8"	16.0mm	H-4103A
1/2"	12.5mm	H-4103
3/8"	9.5mm	H-4102
1/4"	6.3mm	H-4101
No. 3-1/2	5.60mm	H-4100.3
No. 4	4.75mm	H-4100.4
No. 5	4.00mm	H-4100.5
No. 6	3.35mm	H-4100.6
No. 7	2.80mm	H-4100.7
No. 8	2.36mm	H-4100.8
No. 10	2.00mm	H-4100.10
No. 12	1.70mm	H-4100.12
No. 14	1.40mm	H-4100.14
No. 16	1.18mm	H-4100.16
No. 18	1.00mm	H-4100.18
No. 20	850µ	H-4100.20

## 18" Diameter Brass Cover and Bottom Pan for Riddles

Description	Model
18" diam brass cover.	H-4100C
18" diam brass bottom pan.	H-4100P



H-3949



H-3880

## Aggregate Washer

Removes clay, aggregate particles and water-soluble materials by the decanted wash water. Specimen is agitated sufficiently to completely separate all particles. Revolving drum is 10-3/4" dia.x13"D (27x33cm) and locks in four angle positions. Includes valve and 3/8" goose-neck water tube. O.D. 30x20x32"H (76x51x81cm). Order USA Standard Sieve, 200 mesh separately. Meets ASTM C117.

Description	Model
Aggregate washer. 115/230V, 60Hz. 1ph, 3 amps AC.	H-3949
Aggregate washer. 230V, 50Hz. 1ph, AC.	H-3949.5F
U.S.A. Standard Sieve, No. 200 mesh, 8" diam.	H-3920FS200
U.S.A. Standard Sieve, No. 200 mesh, 12" diam.	H-3912FS200

Shipping wt. 115 lbs. (52.2kg)

## Table-Top Aggregate Washer

This lightweight, table-top model is designed to be located near the sink drain on a laboratory countertop. The easily removable drum that measures 9" diameter by 10-3/4" deep (229x273mm) is manufactured from stainless steel for rust and corrosion resistance. With the drum mounted in its fixed tilted position, the complete unit weighs only 25 lbs. (11.3kg). In operation, the washer applies a gentle agitation to the sample in the revolving drum until all particles are washed, separated and the overflow water runs clear. The unit is supplied complete with a permanent water connect with regulator valve, tubing, saddle valve, stainless steel goose-neck water tube with swivel connection and a 6-ft. power cord with GFCI plug for operator safety. Meets ASTM C117.

Description	Model
Table-top aggregate washer. 115V, 59/60 Hz.	H-3880
Table-top aggregate washer. 230V, 50/60 Hz.	H-3880.4F

Shipping wt. 40 lbs. (18.1kg)

Sales or Technical Assistance — 1-800-544-7220

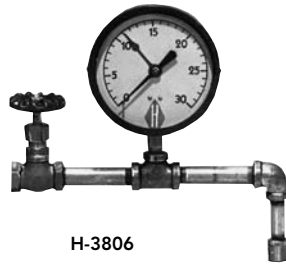


SOIL

Wet Washing Sieves



H-3942, H-3943



H-3806



H-3807



H-3945

### Deep Frame Wet Washing Sieves with Replaceable Mesh Discs

Description	Size (diam x deep)	Shpg. Wt. lbs. (kg)	Model
Deep frame wet washing sieve with replacement mesh disc	8 x 4" (203x101mm)	7 (3.2)	H-3942
Deep frame wet washing sieve with replacement mesh disc and backup mesh	8 x 6" (203x152mm)		H-3943
Replaceable 200 mesh disc for H-3942 and H-3943	8" diam (203mm)		H-3942.200

### Deep Frame Wet Washing Sieves

Extra-deep frame sieves for wet testing of various materials make it possible to wash the fines through the sieve without losing any of the sample. Sieves are constructed of brass frames and permanently installed stainless steel cloth.

#### Deep Frame Wet Washing Sieves

Description	Size (dia x deep)	Shpg. Wt. lbs. (kg)	Model
Wet washing sieve with No. 200 stainless steel cloth	8 x 4" (203x102mm)		H-3945
Same as H-3945 with supporting back-up cloth			H-3945RC
Wet washing sieve with No. 200 stainless steel cloth	8 x 6" (203x152mm)	7 (3.2)	H-3946
Same as H-3946 with supporting back-up cloth			H-3946RC
Wet washing sieve with No. 200 stainless steel cloth	8 x 8" (203x203mm)		H-3947
Same as H-3947 with supporting back-up cloth			H-3947RC
Wet washing sieve with No. 200 stainless steel cloth	12 x 4" (305x102mm)	11 (5.0)	H-3928FS200
Same as H-3928FS200 with supporting back-up cloth			H-3928FS200RC
Wet washing sieve with No. 200 stainless steel cloth	12 x 8" (305x203mm)	14 (6.3)	H-3938FS200
Same as H-3938FS200 with supporting back-up cloth			H-3938FS200RC

NOTE: Available from 50–400 mesh. Call 1-800-544-7220 to order mesh not listed.

### Wet Washing Sieve Apparatus

Controls spray and water pressure. Includes valve, pressure gauge, piping, and H-3808 spray nozzle. Meets ASTM C430, D1514; AASHTO T-192; Test Std. No. 158 (Method 211).

Description	Model
Wet washing sieve apparatus.	H-3806

Description, Replacement Parts & Accessories	Model
Replacement spray nozzle for H-3806.	H-3808

### Cement Wet Washing Sieves

Nickel-plated brass frame with stainless steel mesh and legs for support when drying on hot plate.

Description	Model
Cement wet washing sieve, USA standard No. 325 mesh, 2" diam x 3" deep (52x76mm).	H-3807
Cement wet washing sieve, USA standard No. 200 mesh, 3" diam x 3-1/2" deep (76x89mm).	H-3804
Cement wet washing sieve, USA standard No. 325 mesh, 4" diam x 4-1/2" deep (102x114mm).	H-3809

Description, Replacement Parts & Accessories	Model
Replacement legs for cement wet washing sieves.	H-3807.4
Replacement screws for cement wet washing sieves.	H-3807.5
Replacement mesh disc, 2" diam, USA standard No. 325 mesh.	H-3807.325
Replacement mesh disc, 3" diam, USA standard No. 200 mesh.	H-3804.200
Replacement mesh disc, 4" diam, USA standard No. 200 mesh.	H-3809.200

Other mesh discs are available in most sizes, call 1-800-544-7220



**HUMBOLDT**

Sales or Technical Assistance — 1-800-544-7220



H-4325, H-4310, H-4330



H-4315A



H-4326



H-4328



H-4320, H-4322

## Sieve Shakers

Complete line of heavy-duty sieve shakers to meet virtually every application—and every budget.

Sieve Shakers													
Description	Handles Sieve Diam. in. (mm)	Maximum Capacity (No. of sieves)			Meets ASTM	Timer Minutes	Mounting Required	Motor HP	Dimensions W x D x H	Ship. Wt.	Model (115V. 60Hz)	Model (220V. 60Hz)	Model (220V. 50Hz)
		Full Ht.	Intmed. Ht.	Half Ht.									
Hand Operated Sieve Shaker	3" (76mm) 5" (127mm) 8" (203mm)	16 12 10	—	18	C136	—	Yes	—	15x15x45" (380x380x1,143mm)	49 lbs* (22.2kg)	(non electrical) H-4310	—	—
Motorized Sieve Shaker	3" (76mm)	6	—	—	—	—	—	1/20	8x8x16" (203x203x406mm)	6 lbs* (2.7kg)	H-4326	—	—
Motorized Sieve Shaker	3" (76mm) 5" (127mm) 8" (203mm)	16 12 10	—	18	C136	30	Yes	1/4	15x15x45" (380x380x1,143mm)	65 lbs* (29.5kg)	H-4325	—	H-4325.5F
Larger Capacity Motorized Sieve Shaker	8" (203mm) 10" (254mm) 12" (305mm)	11 7 7	11	13	C136	30	Yes	1/4	21x18x47" (533x457x1,194mm)	85 lbs (38.5kg)	H-4330	—	H-4330.5F
Wet/Dry Sieve Shaker	8" (203mm)	2	—	3	—	—	No	1/20	14x14x10" (355x355x254mm)	12 lbs* (5.4kg)	H-4328	—	—
Ro-Tap Motorized Sieve Shaker	8" (203mm)	6	—	13	C136	99 (Digital)	No	1/4	28x21x25" (635x711x533mm)	225 lbs (102.1kg)	H-4320	H-4320.2F	H-4320.5F
Ro-Tap Motorized Sieve Shaker	12" (305mm)	4	6	10	C136	99 (Digital)	No	1/4	28x21x25" (635x711x537mm)	225 lbs (102.1kg)	H-4322	H-4322.2F	H-4322.5F
Sound enclosure for all Ro-Tap Models		—	—	—	—	—	—	—	34x24x31" (860x610x780mm)	120 lbs (55kg)	H-4324	—	—
Mary Ann Motorized Laboratory Sifter	8" (203mm) 12" (305mm)	10 6	—	—	—	99 (Digital)	No	1/3	13x35x45" (330x889x1,143mm)	140lbs (63.5kg)	H-4315A	—	—

Order Sieves Separately. Replacement parts and exploded views available, call 1-800-544-7220 \*Ships via UPS



H-4334



H-3948



H-2813

## Micron Air-Jet Sieve Shaker

Effective single sieve for dry powders, fragile samples or material that can't be wet sieved, Micron air-jet sieve shaker uses 200mm dia. sieve drums, with 2mm to 20 $\mu$  particle size range. Unit adapts to 75mm diameter electroformed sieves in 90mm drums for 45 $\mu$  to 5 $\mu$ . Timer and vacuum controls allow results' reproducibility. Filter attachment, micromesh sieve or cyclone collector accessories may be used to recover fines.

Includes 200mm cast aluminum sieve drum housing unit, Plexiglas lid, 15W slotted brass air nozzle, 0-15-minute rotary timer switch, 1HP vacuum power system, gage and 9.5 gal. recoverable capacity steel filter canister. Sieves are not included. Accessories and air-jet sieve drums are available; call Humboldt for details and pricing.

Description	Model
Micron air-jet sieve shaker. 115V. 60Hz.	H-4334
Micron air-jet sieve shaker. 230V. 50/60Hz.	H-4334.4F

Shipping wt. 110 lbs. (50kg)

## Micron Air-Jet Sieves

For use with Air-Jet sieving systems. Stainless steel frame and cloth mesh. 7-7/8" dia (200mm) frame with rubber seal. Overall height = 1-3/4" (44.5mm). Depth to cloth = 1-1/8" (28.6mm). Each sieve supplied with serial number and matching "Test Sieve Certificate" for traceability. Meets ASTM E-11.

Micron Air-Jet Sieves			Micron Air-Jet Sieves		
U.S. Std (Mesh)	Micron	Model	U.S. Std (Mesh)	Micron	Model
No. 8	2360	H-4335F8	No. 80	180	H-4335F80
No. 10	2000	H-4335F10	No. 100	150	H-4335F100
No. 12	1700	H-4335F12	No. 120	125	H-4335F120
No. 14	1400	H-4335F14	No. 140	106	H-4335F140
No. 16	1180	H-4335F16	No. 170	90	H-4335F170
No. 20	850	H-4335F20	No. 200	75	H-4335F200
No. 25	710	H-4335F25	No. 230	63	H-4335F230
No. 30	600	H-4335F30	No. 270	53	H-4335F270
No. 35	500	H-4335F35	No. 325	45	H-4335F325
No. 40	425	H-4335F40	No. 400	38	H-4335F400
No. 45	355	H-4335F45	No. 450	32	H-4335F450
No. 50	300	H-4335F50	No. 500	25	H-4335F500
No. 60	250	H-4335F60	No. 635	20	H-4335F635
No. 70	212	H-4335F70			

## Corps of Engineers Wash Screen Assembly

Unit is used to wash out fines from samples of base coarse materials. Assembly has 10 to 12 lb. (4.5 to 5.4kg) capacity. Includes 12" (305mm) dia. brass frame with No. 200 mesh detachable screen with a coarser mesh backing at the bottom. Sieve is 10" deep (254mm) with an overload screen at midpoint. Sieves easily disassembles to clean and replace mesh.

Description	Model
Corps of Engineers wash screen assembly.	H-3948
No. 10 overload screen for H-3948.	H-3948M10
Replacement No. 200 mesh for H-3948.	H-3948M200

Shipping wt. 112 lbs. (5.4kg)

## Magnifying Comparator

The magnifying Comparator is ideal for use in examining sieve mesh for size verification, as well as general inspection for damage. The instrument is supplied complete with three interchangeable scales. A 15mm by 0.1mm scale; a parallel line decimal inch scale spaced 0.01" apart and marked at each 0.1" with a total of 51 lines covering 0.5" in width; and a parallel line fractional scale with lines spaced every 1/64" and marked every 1/8" with a total of 33 lines covering 1/2" in width.

Description	Model
Magnifying comparator.	H-2813



H-4283

For Technical Assistance or Professional Sales Service, Call Humboldt: 1-800-544-7220



H-4273



H-4295

**Gilson Testing Screens**

Ideal for sizing test samples of crushed stone, sand gravel, slag, coal, coke, wood chips, ores, pellets, and similar materials. Hydraulic clamping model recommended for heavy-use situations.

**Note:** Coarse screen trays and dustpan are included. See chart below.

Gilson Testing Screens															
Description	Gilson No.		Maximum Batch Capacity		Material Size Max. to Min.	Tray Capacity	Overall Tray Size (LxW)	Features (see key)	Includes Trays*		Motor	Dimensions	Ship Wt.	Humboldt Model (110V. 60Hz)	Humboldt Model (220V. 50Hz)
	110V. 60Hz	220V. 50Hz	Vol.	Wt.					Coarse	Dustpan					
Gilson Testing Screen with hydraulic clamping	TS1	TS1F	1 cu.ft. (0.3m <sup>3</sup> )	80 lbs (36kg)	4" (104mm) to No. 200 mesh (14.75mm)	6	18x26" (457x660mm)	1 2 3	5	1	1/3-HP† capacitor	23x31x33" (584x787x 838mm)	470 lbs* (214kg)	H-4283	H-4283.5F
Gilson Testing Screen with hand clamping	TS2	TS2F	1 cu.ft. (0.3m <sup>3</sup> )	80 lbs (36kg)	4" (104mm) to No. 200 mesh (14.75mm)	6	18x26" (457x660mm)	1 2	5	1	1/2-HP‡ 1/3-HP‡	23x31x33" (584x787x 838mm)	470 lbs (214kg)	H-4276	H-4276.5F
Gilson Porta-Screen for field control of aggregates— quality control of blacktop/ready-mix plants	PS4	PS4F	.75 cu.ft. (0.023m <sup>3</sup> )	60 lbs (27.3kg)	2" (50.8mm) to No. 16 mesh (1.18mm) or finer meshes to No. 200 (75)	7	16x16-1/2" (406x419mm)	1 4 5 6	7	1	1/4-HP	19x16.5x48.3" (483x419x 1,222mm)	225 lbs (116kg)	H-4295	H-4295.5F
	PS3	PS3F				5		5				5		19x16.5x42" (483x419x 1,067mm)	H-4297
Gilson Test-Master®	TM3	TM3F	1 cu.ft. (0.3m <sup>3</sup> )	80 lbs (36kg)	4" (104mm) to No. 4 mesh (4.75mm) or finer meshes to No. 200 (75)	6	18x26" (457x660mm)	5 6 7	5	1	1/3-HP	27x33x45" (686x838x 1,143mm)	650 lbs (295kg)	H-4273	H-4273.5F
7-Tray Capacity Gilson Test-Master®	TM4	TM4F	1 cu.ft. (0.3m <sup>3</sup> )	80 lbs (36kg)	4" (104mm) to No. 4 mesh (4.75mm) or finer meshes to No. 200 (75)	7	18x26" (457x660mm)	5 6 7	5	1	1/3-HP	27x33x45" (686x838x 1,143mm)	650 lbs (295kg)	H-4274	H-4274.5F

\* Specify desired tray mesh.

† TEFC or Explosion-Proof motors quoted on request

‡ 1/2-HP Motor for H-4276, 1/3-HP Motor for H-4276.5F

**Features Key:**

1. Trays independently removable
2. In-progress viewing
3. Special speed and/or amplitude available
4. Portable-mounting not required
5. Counter-balanced
6. Digital timer
7. Totally enclosed.



### Accessories for Gilson Testing Screens, Porta-Screen, Test-Master®

Description	Gilson No.	For Use With	Ship Wt.	Humboldt Model
Dustpan Tray	TSA-113	H-4273 H-4274	15 lbs (6.8 kg)	H-4273P
Dustpan Tray	TSA-112	H-4276 H-4283	15 lbs (6.8 kg)	H-4283P
Stationary Dustpan Tray with Adapter	TSA-116	H-4273 H-4274	23 lbs (10.4 kg)	H-4273DP
Porta Wheels	PSA-114	H-4288 H-4297		H-4288.1
Dustpan Tray	PSA-310	H-4295 H-4297	10 lbs (4.5 kg)	H-4302
Porta-Screen® Cover	PSA-312	H-4295 H-4297		H-4305
Gilson Porta-Pan	PSA-367	H-4295 H-4297	14 lbs (6.3 kg)	H-4306
Gilson Sand Attachment	TSA-158T	H-4283 H-4276	14 lbs (6.3 kg)	H-4281T
Gilson Sand Attachment	TSA-158M	H-4273 H-4274	14 lbs (6.3 kg)	H-4281M
Gilson Tray Rack	TSA-156	H-4273 H-4274 H-4276 H-4283	43 lbs (19.5 kg)	H-4285
Gilson Door Enclosure	TSA-157	H-4276 H-4283	12 lbs (5.4 kg)	H-4286
Gilson Clean-n-Weigh Accessory	TSA-167	H-4273 H-4274 H-4276 H-4283	63 lbs (28.6 kg)	H-4307

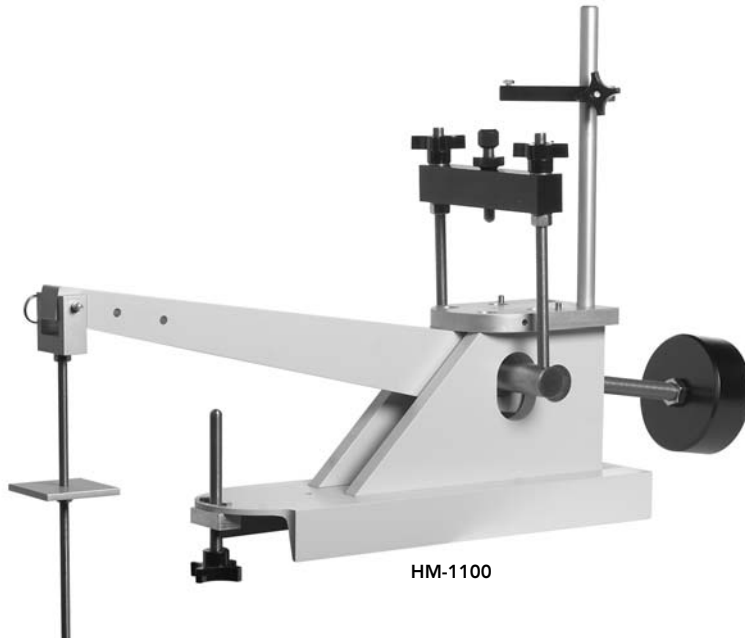
**Note: For included screen trays see coarse series.**

### U.S.A. Standard Screen Trays

Alt. No.	Nominal Opening (in.)	Standard (mm)	18x26" Model (457x660mm) for H-4273, H-4274, H-4276 and H-4283 Screens (Gilson Nos. TM-3, TM-4, TS-2 and TS-1)	16x16-1/2" Model (406x419mm) Porta-Screen Trays for H-4295 and H-4297 (Gilson Nos. PS-4 and PS-3)
<b>Coarse Series</b>				
4"	4.000	100	H-4278C4.000	—
3-1/2"	3.500	90	H-4278C3.500	—
3"	3.000	75	H-4278C3.000	—
2-1/2"	2.500	63	H-4278C2.500	—
2"	2.000	50	H-4278C2.000	H-4398C2.000
1-3/4"	1.750	45	H-4278C1.750	H-4398C1.750
1-1/2"	1.500	38.1	H-4278C1.500	H-4398C1.500
1-1/4"	1.250	31.5	H-4278C1.250	H-4398C1.250
1"	1.000	25.0	H-4278C1.000	H-4398C1.000
7/8"	.875	22.4	H-4278C.875	H-4398C.875
3/4"	.750	19.0	H-4278C.750	H-4398C.750
5/8"	.625	16.0	H-4278C.625	H-4398C.625
1/2"	.500	12.5	H-4278C.500	H-4398C.500
7/16"	.438	11.2	H-4278C.438	H-4398C.438
3/8"	.375	9.5	H-4278C.375	H-4398C.375
5/16"	.312	8.0	H-4278C.312	H-4398C.312
1/4"	.250	6.3	H-4278C.250	H-4398C.250
No. 3-1/2"	.223	5.6	H-4278F3-1/2"	H-4398F3-1/2"
No. 4	.187	4.75	H-4278F4	H-4398F4
<b>Intermediate Series</b>				
No. 5	.157	4.00	H-4278F5	H-4398F5
No. 6	.132	3.35	H-4278F6	H-4398F6
No. 7	.111	2.80	H-4278F7	H-4398F7
No. 8	.0937	2.36	H-4278F8	H-4398F8
No. 10	.0787	2.00	H-4278F10	H-4398F10
No. 12	.0661	1.70	H-4278F12	H-4398F12
No. 14	.0555	1.40	H-4278F14	H-4398F14
<b>Fine Series</b>				
No. 16	.0469	1.18	H-4278F16	H-4398F16
No. 18	.0394	1.00	H-4278F18	H-4398F18
No. 20	.0331	850 $\mu$	H-4278F20	H-4398F20
No. 25	.0278	710 $\mu$	H-4278F25	H-4398F25
No. 30	.0234	600 $\mu$	H-4278F30	H-4398F30
No. 35	.0197	500 $\mu$	H-4278F35	H-4398F35
No. 40	.0165	425 $\mu$	H-4278F40	H-4398F40
No. 45	.0139	335 $\mu$	H-4278F45	H-4398F45
No. 50	.0117	300 $\mu$	H-4278F50	H-4398F50
No. 60	.0098	250 $\mu$	H-4278F60	H-4398F60
No. 70	.0083	212 $\mu$	H-4278F70	H-4398F70
No. 80	.0070	180 $\mu$	H-4278F80	H-4398F80
No. 100	.0059	150 $\mu$	H-4278F100	H-4398F100
No. 200	.0029	75 $\mu$	H-4278F200	H-4398F200

**HUMBOLDT**

Sales or Technical Assistance — 1-800-544-7220



HM-1100

### Dead-Weight Consolidation Frame

- Triple beam ratios minimizes 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 indicators, digital indicators or with strain transducers (LSCT) coupled to one of our data acquisition system and Windows®-based software packages

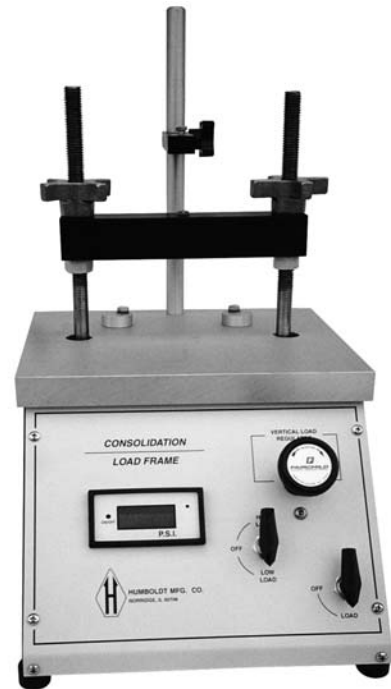
The HM-1100 series Dead-Weight Consolidation Frame is designed for the harshest laboratory environments. The design features a rugged frame design manufactured from aluminum with stainless steel vertical rods, horizontal cross arms and beam support rods. The load arm incorporates 9:1, 10:1, and 11:1 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 (5,148 kPa).

#### Specifications:

Load Capacity:	48 tsf (5,148 kPa)
Beam Ratios:	9:1, 10:1 and 11:1
Frame Construction:	Heavy-duty anodized aluminum frame with stainless steel vertical, horizontal and beam support rods
Cell Platform:	Anodized aluminum with locating pins for centering cell
Dimensions (w x d x h)	7-3/4" x 32" x 19-1/2" (197 x 812 x 495 mm) excluding loading weight hanger
Net Weight	47 lbs. (104 kg)
Shipping Weight	62 lbs. (137 kg)

Description	Model
Dead-weight consolidation frame.	HM-1100

**Note:** Consolidation cell, displacement measurement indicator and loading weights required for operation, not included. See following page for a complete listing of available accessories.



HM-2432

### ConMatic Soil Consolidation Machine

Compact & easy-to-use for pneumatic, one-dimensional consolidation. Estimate the rate and amount of settlement anticipated for a proposed structure with ease & accuracy.

- 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

Predetermined load may be set before applying load to sample. Supports either fixed ring, floating ring, or permeability cells on 2-1/2" (63.5mm) dia platen. 12"Wx14.5"Dx20.5"H (305X368X521mm). Meets ASTM D2435, D4546; AASHTO T-216; BS 1377 part 5.

Description, English Models	Model
ConMatic 16 TSF, 110 V, 50/60Hz.	HM-2416
ConMatic 16 TSF, 220V, 50/60Hz.	HM-2416.4F
ConMatic 32 TSF, 110 V, 50/60Hz.	HM-2432
ConMatic 32 TSF, 220V, 50/60Hz.	HM-2432.4F

Description, Metric Models	Model
ConMatic 16 kg, 110 V, 50/60Hz.	HM-2416M
ConMatic 16 kg, 220V, 50/60Hz.	HM-2416M.4F
ConMatic 32 kg, 110 V, 50/60Hz.	HM-2432M
ConMatic 32 kg, 220V, 50/60Hz.	HM-2432M.4F

Shipping wt. 48 lbs. (21.8kg)

**Note:** Consolidation cell and displacement measurement indicator required for operation, not included. See following page for a complete listing of available accessories.



Cells and Accessories



Indicators



Weights

**Fixed Ring Consolidation Cells**

Sample Size	Cell Part No.	Upper Stone	Lower Stone	Cutter Ring	Filter Paper	Calibration Disc	Perspex
50mm	HM-1222	HM-4184.1955	HM-4184.331	HM-1222.3	HM-4189.20	HM-1222.4	HM-1222.2
70mm	HM-1224	HM-4184.2743	HM-4184.331	HM-1224.3	HM-4189.28	HM-1224.4	HM-1224.2
75mm	HM-1225	HM-4184.2940	HM-4184.331	HM-1225.3	HM-4189.30	HM-1225.4	HM-1225.2
100mm	HM-1227	HM-4184.3925	HM-4184.40	HM-1227.3	HM-4189.40	HM-1227.4	HM-1227.2
2.0"	HM-1221	HM-4184.1985	HM-4184.331	HM-1221.3	HM-4189.20	HM-1221.4	HM-1221.2
2.42"	HM-1229	HM-4184.2405	HM-4184.331	HM-1229.3	HM-4189.25	HM-1229.4	HM-1229.2
2.5"	HM-1220	HM-4184.2485	HM-4184.331	HM-1220.3	HM-4189.25	HM-1220.4	HM-1220.2
3.0"	HM-1226	HM-4184.2985	HM-4184.331	HM-1226.3	HM-4189.30	HM-1226.4	HM-1226.2
4.0"	HM-1228	HM-4184.3985	HM-4184.40	HM-1228.3	HM-4189.40	HM-1228.4	HM-1228.2

Permeability Cells	
Sample Size	Cell Part No.
50mm	HM-1222P
70mm	HM-1224P
75mm	HM-1225P
100mm	HM-1227P
2.0"	HM-1221P
2.42"	HM-1229P
2.5"	HM-1220P
3.0"	HM-1226P
4.0"	HM-1228P

Loading Weights			
TSF Weight	Model	KGf Weight	Model
0.125 (1/8) TSF	HM-1220.125	0.5 kg	HM-1122.05
0.25 (1/4) TSF	HM-1220.250	1.0 kg	HM-1122.1
0.50 (1/2) TSF	HM-1220.500	2.0 kg	HM-1122.2
1.0 TSF	HM-1220.1	4.0 kg	HM-1122.4
2.0 TSF	HM-1220.2	8.0 kg	HM-1122.8
4.0 TSF	HM-1220.4	—	—

Displacement Indicators	
Description	Model
Dial gauge (clockwise), 12x0.002mm.	H-4465.12
Dial gauge (clockwise), 0.5x0.0001".	H-4471
Dial gauge (counter-clockwise), 12x 0.002mm.	H-4465.12CC
Dial gauge (counter-clockwise), 0.5x0.0001".	H-4471CC
Digital indicator (both clockwise & counter-clockwise), 0.5x 0.0001" (12x0.0002mm).	HM-4469.05
Digital indicator (both clockwise & counter-clockwise), 1.0x 0.0001" (25x0.0002mm).	HM-4469.10
AC Adapter for digital indicator.	HM-4469AC
Transducer, 0.4x0.0001" (10x0.0002mm).	HM-2310.04
Transducer, 1.0x 0.0001" (25x0.0002mm).	HM-2310.10
Single channel transducer readout.	HM-2350

Note: See following page for complete test sets.



Dead-Weight Consolidation Sets for HM-1100, HM-1220 and H-4471CC



Pneumatic Loading Consolidation Sets for HM-2432, HM-1220 and H-4471CC

**Dead-Weight Consolidation Basic Sets**

**Pneumatic Loading Consolidation Basic Sets**

Description, English Models	Qty. in Set	Model
Dead-weight consolidation set (English).		HM-1100E25-16
<b>Set Includes:</b>		
Dead-weight consolidation frame.	1	HM-1100
Fixed ring cell, 2.5".	1	HM-1220
Dial gauge, 0.5x0.0001" (counter clockwise).	1	H-4471CC
0.125 (1/8) TSF slotted weight.	2	HM-1120.125
0.25 (1/4) TSF slotted weight.	1	HM-1120.250
0.50 (1/2) TSF slotted weight.	1	HM-1120.500
1.0 TSF slotted weight.	1	HM-1120.1
2.0 TSF slotted weight.	1	HM-1120.2
4.0 TSF slotted weight.	3	HM-1120.4
Description, Metric Models	Qty. in Set	Model
Dead-weight consolidation set (Metric).		HM-1100M75-16
<b>Set Includes:</b>		
Dead-weight consolidation frame.	1	HM-1100
Fixed ring cell, 75 mm.	1	HM-1225
Dial gauge, 12mm x 0.002mm (counter clockwise).	1	H-4465.12CC
1kg slotted weight.	2	HM-1122.1
2kg slotted weight.	1	HM-1122.2
4kg slotted weight.	1	HM-1122.4
8kg slotted weight.	7	HM-1122.8

Description, English Models	Qty. in Set	Model
Pneumatic consolidation set (English)		HM-2432E25-32
<b>Set Includes:</b>		
ConMatic with digital readout, 32 TSF, 110v, 50/60Hz	1	HM-2432
Fixed ring cell, 2.5".	1	HM-1220
Dial gauge, 0.5x0.0001" (counter clockwise).	1	H-4471CC

Description, Metric Models	Qty. in Set	Model
Pneumatic consolidation set (Metric).		HM-2432M75-32
<b>Set Includes:</b>		
ConMatic with digital readout, 32 TSF, 220v, 50/60Hz	1	HM-2432.4F
Fixed ring cell, 75mm	1	HM-1225
Dial gauge, 12mm X 0.002mm (counter clockwise).	1	H-4465.12CC



## Fully-Automated Incremental Consolidation Test Set

Humboldt's Fully-Automated Incremental Consolidation Test Set has transformed consolidation testing by reducing the duration of the testing procedure by half. Saving time invariably allows for greater profitability. The unique design of the system enables the user to choose from multiple tests to be run simultaneously and independently. The complete set consists of the ConMatic loading unit, Incremental Pressure Controller (APC), Master Logger 300, Four-Channel Digital Input Module, 2.5 Fixed Ring Cell, Windows 98 compatible computer with WinODE Consolidation Reporting Software and Digital Indicator. Up to sixteen Units can be linked for optimum productivity.

Through innovative engineering, the ConMatic Load Frame features state-of-the-art electronics with a stepper motor driven system for exceptionally accurate stress applications.

Test Parameters of the system include:

- Incremental Loading Tests (controlled by loading time, by settlement or manually).

The ConMatic System allows for real-time display of load-compression, as well as time-compression curves for each loading step on Incremental Loading Tests.

Upon completion of the tests, the WinODE Consolidation Reporting Software allows the user reporting options, such as relative compression, modulus of compressibility, coefficient of consolidation and deformation rate as the function of the effective load on the sample. Reports may be generated in linear, logarithmic and/or square root scale. Incremental Loading Tests can be reported through displacement vs. time and displacement vs. square root of time generations.

Key Features

- No need for weights that can be easily knocked, ruining days of testing.
- Fully-automatic loading and unloading sequences based on user-selected conditions.

### Specifications:

Sample Size	2.5 or (75mm)
Maximum Load	32 TSF (32Kg/cm <sup>2</sup> )
Vertical Clearance	8.25" (210mm)
Horizontal Clearance	7.75" (197mm)
Maximum Piston Travel	0.5" (12.7mm)
Dimensions:	
ConMatic:	12" W x 14.5" W x 20.5" D (305 x 368 x 521mm)
APC:	8" W x 6" H x 14"D (210 x 165 x 375mm)
MasterLogger:	5.9" H x 17.7" W x 14.6" D (150 x 450 x 370mm)

**Note:** \*Requires a supply of good clean air to use this system.  
\*PC minimum recommended Pentium IV.

Description	Model
Fully-Automated Incremental Consolidation Test Set	HM-2430E25-32
Set includes:	
ConMatic w/ blank front panel, 32 TSF, 110V, 50/60Hz. Qty. 1.	HM-2430
Incremental Automatic Pressure Controller, 110/220V, 50/60Hz. Qty. 1.	HM-2450.3F
Fixed Ring Cell, 2.5 or (75mm HM-1225). Qty. 1.	HM-1220
Master Logger 300, 110/220V. Qty. 1.	HM-2250.3F
Four-channel Digital Input Module. Qty. 1.	HM-2253
WinODE Consolidation Reporting Software. Qty. 1.	HM-2157
Digital Indicator 1.0 x 0.0001. Qty. 1.	HM-4469.10
Cable for Digital Indicator. Qty. 1.	HM-4469C



**HUMBOLDT**

Sales or Technical Assistance — 1-800-544-7220



HM-2405

HM-2415

H-4042

## Expansion Index Consolidometer

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.

- Simple, compact
- Quick test results
- Corrosion resistant, durable anodized aluminum and stainless steel construction.

Includes anodized aluminum base & collar, stainless steel specimen ring, 12.6 lb. (5.7kg) loading weight, and 3.99" dia. x 1/2" (101.4x12.5mm) porous stones. Shown with dial indicator; not included, order separately. 6" dia x 11"H (152x279 mm). Meets ASTM D4829, California Test Method UBC 29-2.

Description	Model
Expansion index consolidometer.	HM-2405
Dial indicator, 0.5" x 0.0001".	H-4471
Porous stones, 3.99" x 1/2".	HM-4184.399T

Shipping wt. 20 lbs. (9 kg)

## Soil Volume Change Meter (PVC)

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.

- Measures both shrinkage & swelling of soils
- Ideal for gauging swelling of clay soils
- Fast & simple operation

Includes 1,000 lb. (4.5 kN) capacity proving ring and compaction hammer, mold assembly, loading cap, porous stones, loading pistons, 2-3/4" (70 mm) dia. specimen ring, and conversion charts. 7-1/4" (184 mm) dia base x 15-1/2"H (394 mm).

Description	Model
Soil volume change meter (PVC).	HM-2415

Shipping wt. 30 lbs. (16.3 kg)

Description, Replacement Parts & Accessories	Model
Proving ring, 1,000 lb.	H-4454.010

## Discrete Stormwater Sampler

The Discrete Stormwater Sampler can be installed near any storm water channel to take samples throughout a storm event. The unit takes a discrete sample ( about 2.5L) based on rainfall accumulation and storm water runoff. The rain sensors can also be used independently. The sampler's rechargeable battery will last without requiring recharging throughout several storm events. The unit is waterproof and requires minimum maintenance.

Description, Replacement Parts & Accessories	Model
Discrete Stormwater Sampler.	H-4042



HM-4502



HSM-2100

## Double Ring Infiltrometer

Ideal for field testing as well as lab use. Two stainless steel rings measure 12 and 24 dia x 20"H (304.8 and 609.6 dia x 508mm). Rings have double thick welded top edge for increased stability when driving into the soil. A Mariotte tube provides a constant head of water for flow tests. Graduations on the side of the tube used to determine flow rate. Sealed adjusting tube raises or lowers the head inside the infiltrometer ring. Main flow valve in base platform, bleed valve next to adjusting tube seal.

Includes: 1/2" thick (12.7mm) aluminum driving cap with centering pins; two 6" square (152.4mm) neoprene splash guards; and two Mariotte tubes with 3,000 ml and 10,000 ml capacities. Meets ASTM D3385.

Description	Model
Double ring infiltrometer.	HM-4502

Shipping wt. 160 lbs. (72.5kg)

Description, Replacement Parts & Accessories	Model
Mariotte tube, 3,000 cc capacity.	HM-4503
Mariotte tube, 10,000 cc capacity.	HM-4510
Mariotte tube, 100,000 cc capacity.	HM-4512

## Guelph Permeameter Kit

The Guelph Permeameter is an easy to use instrument for quickly and accurately measuring in-situ hydraulic conductivity. Accurate evaluation of soil hydraulic conductivity, soil sorptivity, and matrix flux potential can be made in all types of soils. The equipment can be transported, assembled, and operated easily by one person. Measurements can be made in 1/2 to 2 hours, depending on soil type, and require only about 2.5 liters of water. Measurements can be made in the range of 15 to 75 cm below the soil surface.

The Guelph Permeameter is a complete kit consisting of the permeameter, field tripod, well auger, well preparation and cleanup tools, collapsible water container, and vacuum test hand pump, all packaged in a durable carrying case. Meets ASTM D5126.

Description	Model
Guelph Permeameter Kit.	HSM-2100

Shipping wt. 33 lbs. (14.9 kg)

Description, Accessories	Model
Extension Kit. Extends the depth of operation by 80cm.	HSM-2102
10cm Ring Infiltrometer Attachment. Enables the Guelph to measure permeability and flow conditions using a 10cm ring, for retained pressure heads.	HSM-2104
20cm Ring Infiltrometer Attachment. Provides greater sensitivity. Same as above except includes a 20cm ring for greater sensitivity in low permeability conditions.	HSM-2106
Tensin Infiltrometer Adapter. Allows the Guelph to measure permeability and flow under adsorptive, tensional, and very low head conditions. Supplied with 20cm porous foot, Mariott bubbler, and reservoir connection tube.	HSM-2108

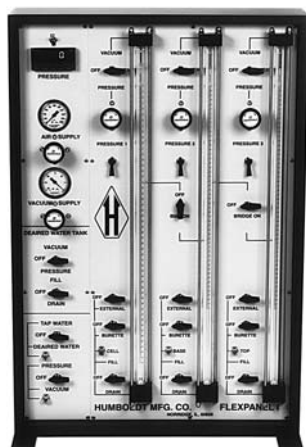
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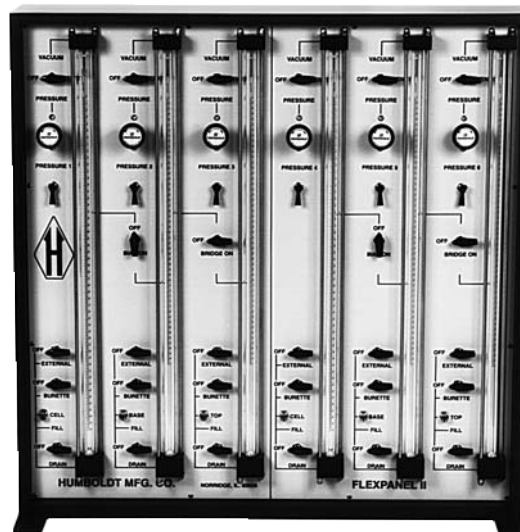
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HM-4140



HM-4150



HM-4160A

## Hydraulic Conductivity/Permeability

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 a 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.

## FlexPanel Series

FlexPanel pressure distribution panels are used for triaxial and permeability testing of standard or contaminated soil samples, including soils containing hazardous or toxic waste.

- 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
- Cost efficient, expandable system
- Uses no-volume-change Whitey valves
- Bridge feature delivers simultaneous control of base and top pressures by adjusting one pressure regulator
- 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
- Quick-connect inlets and outlets

Meets ASTM D5084; BS 1377 Part 6 1990.

### FlexPanel Master Controller Panels

Description	Shipping Weight	Model
FlexPanel master controller panel, 110V, 60Hz.	18 lbs. (8.2kg)	HM-4140
FlexPanel master controller panel, 220V, 50/60Hz.	18 lbs. (8.2kg)	HM-4140.4F
FlexPanel I 3-burette testing panel with master controller 110V, 60Hz.	95 lbs. (43kg)	HM-4150
FlexPanel I 3-burette testing panel with master controller 220V, 50/60Hz.	95 lbs. (43kg)	HM-4150.4F
FlexPanel II 6-burette testing panel with master controller 110V, 60Hz.	125 lbs. (56.7kg)	HM-4160
FlexPanel II 6-burette testing panel with master controller 220V, 50/60Hz.	125 lbs. (56.7kg)	HM-4160.4F

### FlexPanel Add-On Panels

Description	Shipping Weight	Model
FlexPanel I 3-burette testing panel without master controller.	77 lbs. (34.9kg)	HM-4150A
FlexPanel II 6-burette testing panel without master controller.	157 lbs. (71.2kg)	HM-4160A



HM-4188B



HM-4190

## Flexible Wall Permeameter Cell

Accurate, reliable, flexible—with five Whitey valves aligned on one side of cell for maximum convenience. Two valves handle top drainage; two valves handle bottom drainage; a fifth valve handles filling, emptying, and providing confining pressure to cell.

- Quick-connect in center of cell top
- Top machined so air moves to center to be bled out of fitting
- Cell has 3 strain rods with knobs for easy set-up

Cast acrylic chamber withstands up to 250psi. Top caps and bases available in several sizes (see chart below). Other sizes available on request. Choice of brass or stainless steel valve fittings (order stainless steel for use with hazardous permeants). Order top cap, base pedestal, and porous stones separately. Cell is 12H x 8" dia; 11" overall dia. Meets ASTM D5084.

## Toxic Interface Unit

Safe & convenient means of performing permeability tests of corrosive or toxic permeants. Flexible 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 flexible bladder. 8" H x 5" dia.

Description	Model
Toxic interface unit.	HM-4190

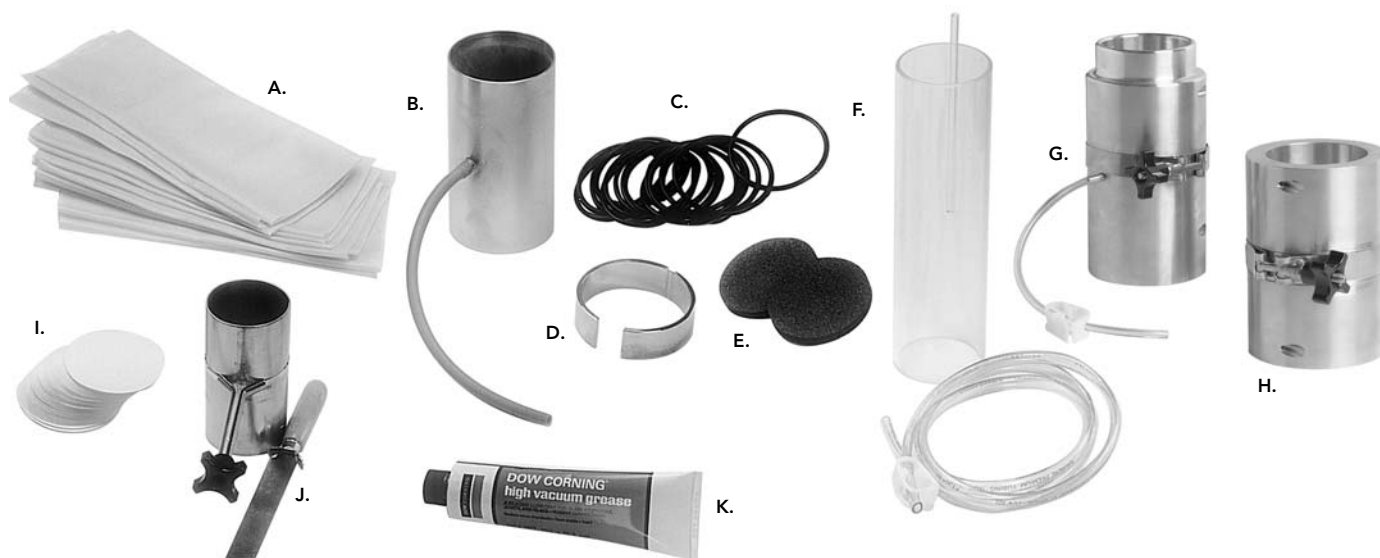
Shipping wt. 6 lbs. (2.72kg)

### Permeability Cells/Caps/Bases

Sample Size	Brass			Stainless Steel		
	Permeability Cell (Brass)	Top Cap (Polycarbonate)	Base Pedestal (Polycarbonate)	Permeability Cell (Stainless Steel)	Top Cap (Stainless Steel)	Base Pedestal (Stainless Steel)
35 mm	HM-4188B	HM-4193.35T	HM-4193.35B	HM-4188SS	HM-4193.35TSS	HM-4193.35BSS
1.4 in	HM-4188B	HM-4193.14T	HM-4193.14B	HM-4188SS	HM-4193.14TSS	HM-4193.14BSS
50 mm	HM-4188B	HM-4193.50T	HM-4193.50B	HM-4188SS	HM-4193.50TSS	HM-4193.50BSS
2.0 in	HM-4188B	HM-4193.20T	HM-4193.20B	HM-4188SS	HM-4193.20TSS	HM-4193.20BSS
70 mm	HM-4188B	HM-4193.70T	HM-4193.70B	HM-4188SS	HM-4193.70TSS	HM-4193.70BSS
2.8 in	HM-4188B	HM-4193.28T	HM-4193.28B	HM-4188SS	HM-4193.28TSS	HM-4193.28BSS
100 mm	HM-4188B	HM-4193.100T	HM-4193.100B	HM-4188SS	HM-4193.100TSS	HM-4193.100BSS
4.0 in	HM-4188B	HM-4193.40T	HM-4193.40B	HM-4188SS	HM-4193.40TSS	HM-4193.40BSS

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## Permeability Accessories

### A. Latex Membranes

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.

### B. Membrane Stretcher

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

### C. O-Rings

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

### D. O-Ring Placing Tool

Position rings to seal membrane with minimum disturbance to specimen.

### E. Porous Stones

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

### F. Membrane Tester

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

### G. Two-Part Vacuum Split Former

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

### H. Two-Part Split Miter Box

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

### I. Filter Paper

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

### J. Sample Trimmer with Knife

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

### K. High Vacuum Grease

Effective means of sealing latex membranes to sides of the top cap and base pedestal. Especially useful during sample preparation.

## Permeability Accessories

	A*	B	C*	D	E*	F	G	H	I	J	K
Sample Size	Latex Membranes (0.012" thick) (12/pkg)	Membrane Stretcher	O-Rings (12/pkg)	O-Ring Placing Tool	Porous Stones (1/4" thick)	Membrane Tester	Two-Part Vacuum Split Former	Two-Part Split Miter Box	Filter Paper (100/pkg)	Sample Trimmer w/Knife	Vacuum Grease
35 mm	HM-4180.14	HM-4181.14	HM-4182.14	HM-4183.14	HM-4184.35	HM-4185.14	HM-3821M	HM-3841M	HM-4189.14	HM-4186.14	
1.4 in	HM-4180.14	HM-4181.14	HM-4182.14	HM-4183.14	HM-4184.14	HM-4185.14	HM-3821	HM-3841	HM-4189.14	HM-4186.14	
50 mm	HM-4180.20	HM-4181.20	HM-4182.20	HM-4183.20	HM-4184.50	HM-4185.20	HM-3824M	HM-3844M	HM-4189.20	HM-4186.20	
2.0 in	HM-4180.20	HM-4181.20	HM-4182.20	HM-4183.20	HM-4184.20	HM-4185.20	HM-3824	HM-3844	HM-4189.20	HM-4186.20	HM-4198
70 mm	HM-4180.28	HM-4181.28	HM-4182.28	HM-4183.28	HM-4184.70	HM-4185.28	HM-3827M	HM-3847M	HM-4189.28	HM-4186.28	
2.8 in	HM-4180.28	HM-4181.28	HM-4182.28	HM-4183.28	HM-4184.28	HM-4185.28	HM-3827	HM-3847	HM-4189.28	HM-4186.28	
100 mm	HM-4180.40	HM-4181.40	HM-4182.40	HM-4183.40	HM-4184.100	HM-4185.40	HM-3828M	HM-3848M	HM-4189.40	HM-4186.40	
4.0 in	HM-4180.40	HM-4181.40	HM-4182.40	HM-4183.40	HM-4184.40	HM-4185.40	HM-3828	HM-3848	HM-4189.40	HM-4186.40	

\* Other sizes and thicknesses are available on request.

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SOIL



HM-4130.28

## Permeability Test Sets

### Basic Permeability Test Sets

Sample Size	One Cell Permeability Test Set	Two Cell Permeability Test Set	Three Cell Permeability Test Set	Four Cell Permeability Test Set	Five Cell Permeability Test Set
35 mm	HM-4110.35	HM-4120.35	HM-4130.35	HM-4140.35	HM-4150.35
1.4 in	HM-4110.14	HM-4120.14	HM-4130.14	HM-4140.14	HM-4150.14
50 mm	HM-4110.50	HM-4120.50	HM-4130.50	HM-4140.50	HM-4150.50
2.0 in	HM-4110.20	HM-4120.20	HM-4130.20	HM-4140.20	HM-4150.20
70 mm	HM-4110.70	HM-4120.70	HM-4130.70	HM-4140.70	HM-4150.70
2.8 in	HM-4110.28	HM-4120.28	HM-4130.28	HM-4140.28	HM-4150.28
100 mm	HM-4110.100	HM-4120.100	HM-4130.100	HM-4140.100	HM-4150.100
4.0 in	HM-4110.40	HM-4120.40	HM-4130.40	HM-4140.40	HM-4150.40

### Components

Description	Model Series
Flexpanel(s);	HM-4150's or HM-4160's
Flexwall permeability cell(s);	HM-4188's
Top cap and base pedestal (one per cell);	HM-4193's
Membranes, one pkg. (12/pkg);	HM-4180's
Porous stones (two per cell);	HM-4184's
O-rings, one pkg. (12/pkg);	HM-4182's
De-Airing tank (one per set);	HM-4187E
Membrane stretcher (one per set);	HM-4181's
Membrane tester (one per set);	HM-4185's
Vacuum grease, one tube;	HM-4198

### Permeability Test Set Optional Accessories

Description	Model Series
<b>FOR MONITORING PORE PRESSURE:</b>	
Pore pressure transducer.	HM-4170
De-airing block.	HM-4170B
Single-channel or four-channel readout.	HM-2350 or HM-2370
<b>FOR TOXIC PERMEANTS:</b>	
Stainless steel permeability cell.	HM-4188SS
Stainless steel top cap.	HM-4193 SS Series
Stainless steel base pedestal.	HM-4193 SS Series
Toxic interface units (two per cell).	HM-4190
<b>FOR SPEEDING UP VERY LONG TESTS:</b>	
Constant volume device.	HM-4192

Hydraulic Conductivity/Permeability

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HM-4187E



HM-4187



HM-4175

### De-Airing Water Tank

For use with FlexPanel I & II Triaxial/Permeability Panels. Cast acrylic chamber, 6 dia. x 16"H (152x406mm). Head plate mounted with three fittings. Two are modified to allow 1/4" tubing to pass through to tank bottom, one for filling with tap water and the other for extracting the water once de-aired. The third fitting is used to connect vacuum/pressure to tank.

Description	Model
De-airing water tank, 6L.	HM-4187E

Shipping wt. 13 lb. (5.8kg)

### Nold De-Aerator Water System

Completely self-contained unit produces 6-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. 1/55hp motor 110V, 60Hz. 7.5x7.5x20" (190x190x508mm).

Description	Model
Nold de-aerator, 6L.	HM-4187

Shipping wt. 19 lb. (8.6kg)

### Digital Pore Pressure Set

For accurately measuring & 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.

Description, Complete Set	Model
Digital pore pressure set. 115V, 50/60 Hz.	HM-4175
Digital pore pressure set. 220V, 50/60 Hz.	HM-4175.4F

Shipping wt. 8 lb. (3.63kg)

Description, Component Parts	Model
Pore pressure transducer (200 psi).	HM-4170
De-airing block.	HM-4170B
Single-channel readout, 4-digit. 115V, 50/60 Hz.	HM-2350
Single-channel readout, 4-digit. 220V, 50/60 Hz.	HM-2350.4F



## Two-Part Compaction Molds

Two-Part Compaction Molds		
Sample Size	Two-Part Compaction Mold	Base Plate Pedestal
35mm	HM-3811M	HM-3811MBP
1.4"	HM-3811	HM-3811BP
38mm	HM-3812M	HM-3812MBP
1.5"	HM-3812	HM-3812BP
1.875"	HM-3813	HM-3813BP
50mm	HM-3814M	HM-3814MBP
2.0"	HM-3814	HM-3814BP
2.36"	HM-3815	HM-3815BP
2.5"	HM-3816	HM-3816BP
70mm	HM-3817M	HM-3817MBP
2.8"	HM-3817	HM-3817BP
100mm	HM-3818M	HM-3818MBP
4.0"	HM-3818	HM-3818BP
6.0"	HM-3819	HM-3819BP
Wire Saw		HM-3175

## Open-Type Miter Box

For trimming and squaring soil specimens, miter box consists of base and sides. Opening is 3.2"W X 3-1/2"H (81x89mm) Plated for corrosion resistance.

Description	Model
Open-type miter box.	H-4187

Shipping wt. 10 lbs. (4.5kg)



HM-3130,  
HM-3130.14,  
HM-3130.28,  
HM-3175

## Soil Sample Trimmers

For cutting samples to precise diameters. Adjustable between 1–4" (see exact diameters in chart below) 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 platens and saw separately.

Description	Model
Soil sample trimmer, 1.0 to 3.0". Order platens separately.	HM-3130
Soil sample trimmer, 1.0 to 4.0". Order platens separately.	HM-3140

Shipping wt. 6 lbs. (2.72kg)

## Accessories for Soil Sample Trimmers

For use with HM-3130 & HM-3140.

Description, Replacement Parts & Accessories	Model
Top platen, 1.0".	HM-3130.10
Top platen, 1.4".	HM-3130.14
Top platen, 1.875".	HM-3130.18
Top platen, 2.0".	HM-3130.20
Top platen, 2.5".	HM-3130.25
Top platen, 2.8".	HM-3130.28
Top platen, 3.0".	HM-3130.30
Top platen, 4.0".	HM-3130.40
Wire saw (w/replaceable wire).	HM-3175



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HM-3860, HM-3880, HM-3802



## Economy Manometer Tube Stand

Economical manometer tube stand for use with many permeameters. Two acrylic tubes with valving mounted on aluminum rail, with scale for monitoring flow volumes. Scale is 100 cm long with cm and mm graduations. Each tube has own valve to allow running two tests. Wall mounted or free standing manometer available. Meets ASTM D2434.

Description	Model
Wall mounted manometer tube stand.	HM-3860
Free standing manometer tube stand.	HM-3861

Shipping wt. 8 lbs. (3.7kg)

## Constant Head Tank

Acrylic tank with regulating valve for flow control of water and a porous media on bottom to filter out air bubbles. Maintains constant water head via 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.

Description	Model
Constant head tank, 1000cc.	HM-3880
Constant head tank, 4000cc.	HM-3881

Shipping wt. 8 lbs. (3.7kg)



Detail of HM-3802

## 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 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.

Meets ASTM D2434; BS 1377 Part 1990.

Description	Model
Permeameter cell, 2.5". (63.4mm).	HM-3801
Permeameter cell, 3.0". (76mm).	HM-3802
Permeameter cell, 4.5" (114mm).	HM-3803
Permeameter cell, 6.0" (152mm).	HM-3804
Permeameter cell, 9.0" (229mm).	HM-3805

Shipping wt. 7 to 12 lbs. (3.2 to 5.4kg)

## Compacting Hammer

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.

Description	Model
Compacting hammer.	HM-3701

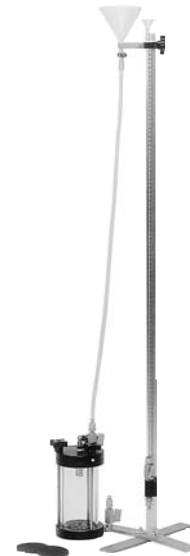
Shipping wt. 6 lbs. (2.72kg)



HM-3915



H-4145, H-4146



HM-3892

## Shelby Tube Permeameter

Saves time & money by performing permeability test right in the actual Shelby tube liner. Ideal for cohesionless materials and sands. It is suggested that specimen be ejected at test conclusion and examined for voids or large pieces 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.

Description	Model
Shelby tube permeameter, 2".	HM-3913
Shelby tube permeameter, 2.5".	HM-3914
Shelby tube permeameter, 3".	HM-3915

Shipping wt. 6 lbs. (2.72kg)

## Compaction Permeameters

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.

Description	Model
Soil permeameter, 4".	H-4145
Soil permeameter, 6".	H-4146

Shipping wt. 18 lbs. (8.16kg)

**Note:** Manometers available in various sizes for permeameters.

## Constant/Falling Head Permeameters

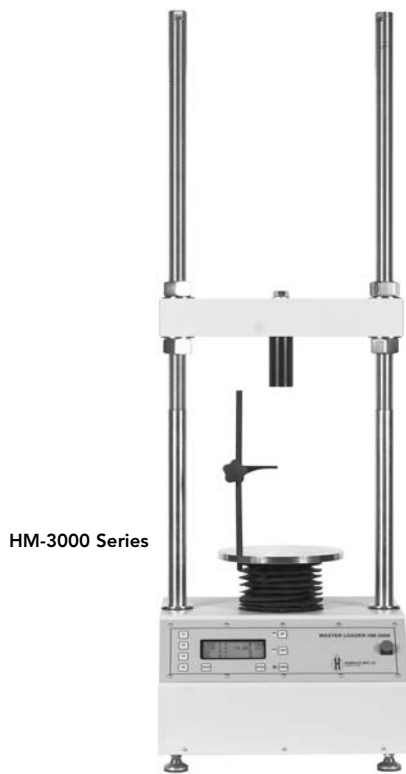
For use with granular soils for determining the coefficient of permeability via the constant or falling head method for laminar flow of water. Acrylic chamber allows viewing. Compact & portable unit has manometer tube, scale, and permeameter base attached to a platform. Funnel provides adjustable constant 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 & clamping ring of anodized aluminum. Each set complete with: chamber with valves; manometer tube; two funnels; either porous stones or perforated screens, depending on the diameter; and tubing for connection to water source.

Description	Model
Constant/falling head permeameter set, 2.5" (63.4mm).	HM-3891
Constant/falling head permeameter set, 3.0" (76mm).	HM-3892
Constant/falling head permeameter set, 4.5" (114mm).	HM-3893
Constant/falling head permeameter set, 6.0" (152mm).	HM-3894
Constant/falling head permeameter set, 9.0" (229mm).	HM-3895

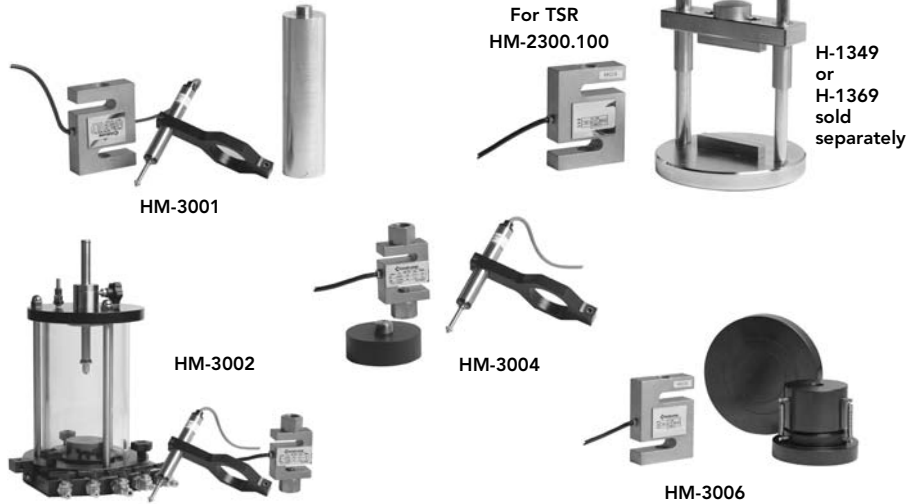
Shipping wt. 13 lbs. (5.9kg)

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HM-3000 Series



## Digital MasterLoader

Designed for applications requiring multi-purpose loading systems, the HM-3000 series MasterLoader is ideal for road construction projects, educational institutions and start-up labs. Its modular design minimizes initial costs and allows easy upgrades as desired. 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. Key features include:

- Microprocessor-based stepper motor speed control
- Four channel analogue-to-digital converter with real-time data acquisition
- Large, backlit LCD display 5 x 2-3/4" (127 x 70 mm)
- Touch-sensitive keypad
- Emergency stop button
- Speeds range 0-3.0000 in/min (0-75.0000 mm/min) fully-adjustable by the user
- RS-232 interface for computer control of load frame functions and data transfer
- Analogue output port for use with Xyt chart recorder
- Nonvolatile storage of test data and instrumental calibration
- Battery-backed, real-time clock
- Auto conversion of instrument calibration and speed from English units to SI units and vice versa
- Test setup and selection via keypad
- Fully-automatic test performing (starting/stopping the motor, speed selection and acquisition of test data)
- Download test data for data analysis via Windows®-based software (included)

## Specifications:

Mechanical:	
Dimensions (l x w x h)	17 x 19 x 59" (430 x 480 x 1500mm)
Platen Travel	4" (100mm) Max.
Net Weight	240 lbs. (110Kg)
Shipping Weight	85 lbs. (130Kg)
Speed Range	0 -3.0000 in/min (0 - 75.0000 mm/min)
Load Capacity	11,000 lbs. (50 KN)
Vertical Clearance	40" (1000mm) Max.
Horizontal Clearance	15" (380mm)
Electrical /Electronics:	
Current	8.5 Amps
A/D Digital Converter	16 Bit
Data Storage	4000 Reading
Data Collection Rate	100 ms
Computer Port	RS232

Description	Model
Digital MasterLoader, 110/220 VAC 50/60Hz.	HM-3000.3F

Description, Accessories	Model
CBR Accessory Set. Consists of a 10,000 lb.(50 KN) load cell, 1.0" (25mm) displacement transducer with mounting bracket and CBR Plunger.	HM-3001
Unconsolidated Undrained (UU) Triaxial Accessory Set. Consists of a 2,000 lb. (10 KN) load cell, ball seat adapter, and a 2.0" (50mm) displacement transducer with mounting bracket.	HM-3002
Consolidated Undrained (CU) Triaxial Accessory Set. Consists of a 2,000 lb. (10 KN) load cell, ball seat adapter, 2.0" (50mm) displacement transducer with mounting bracket, and a 200 PSI (1400 kPa) pore water pressure transducer with deairing block.	HM-3003
Unconfined Compression (UC) Accessory Set. Consists of a 500 lb. (2.5 KN) load Cell, 2.0" (50mm) displacement transducer with mounting bracket, and an unconfined upper platen.	HM-3004
Marshall Stability Accessory Set. Consists of a 10,000 lb. (50 KN) load cell, and a 1.0" (25mm) displacement transducer with mounting bracket.	HM-3005
Soil Cement Accessory Set. Consists of a 10,000 lb. (50 KN) load cell, and soil cement platen set.	HM-3006

For TSR use HM.2300.100 and H-1349 or H-1369.



HM-4140



HM-4150



HM-4160A

### FlexPanel Series Constant Pressure System

FlexPanel pressure distribution panels are used for triaxial and permeability testing of standard or contaminated soil samples, including soils containing hazardous or toxic waste.

- 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
- Cost efficient, expandable system

- Uses no-volume-change Whitey valves
- Bridge feature delivers simultaneous control of base and top pressures by adjusting one pressure regulator
- 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
- Quick-connect inlets and outlets

#### FlexPanel Master Controller Panels

Description	Shipping Weight	Model
FlexPanel master controller panel, 110V, 60Hz.	18 lbs. (8.2kg)	HM-4140
FlexPanel master controller panel, 220V, 50/60Hz.	18 lbs. (8.2kg)	HM-4140.4F
FlexPanel I 3-burette testing panel with master controller 110V, 60Hz.	95 lbs. (43kg)	HM-4150
FlexPanel I 3-burette testing panel with master controller 220V, 50/60Hz.	95 lbs. (43kg)	HM-4150.4F
FlexPanel II 6-burette testing panel with master controller 110V, 60Hz.	125 lbs. (56.7kg)	HM-4160
FlexPanel II 6-burette testing panel with master controller 220V, 50/60Hz.	125 lbs. (56.7kg)	HM-4160.4F

#### FlexPanel Add-On Panels

Description	Shipping Weight	Model
FlexPanel I 3-burette testing panel without master controller.	77 lbs. (34.9kg)	HM-4150A
FlexPanel II 6-burette testing panel without master controller.	157 lbs. (71.2kg)	HM-4160A



HM-4199 Series

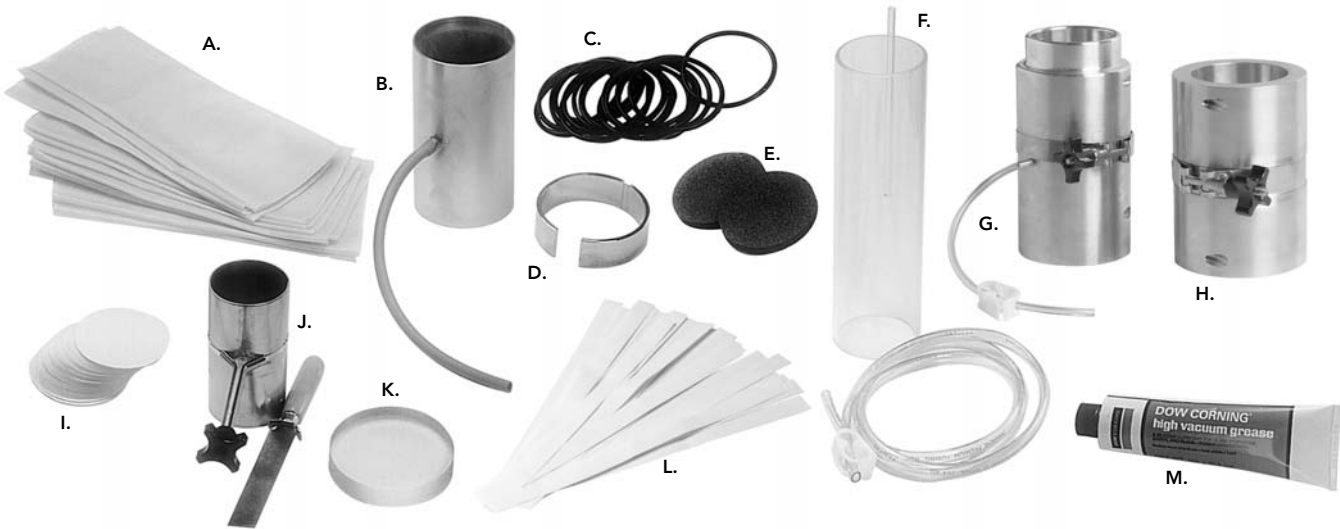
## Triaxial Cells

HM-4199B is ideal for sample sizes from 1.4" (35mm) to 3" (75mm). The clear acrylic chamber has a working pressure of 150 psi (1,000 Kpa) and is tested to 250 psi (1,700 Kpa). The new state-of-art design features a solid base making it easier to center on the platen and more timely test set-up; top of the cell and chamber are all one piece that easily detaches by removing three knobs for extremely easy access to the sample; de-airing block for the pore pressure transducer is also built into the side of the cell. Cell has 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/emptying and providing confining pressure to the cell. Removable base pedestal accommodates various sample diameters. Top cap and base pedestal are available in choice of black anodized aluminum or stainless steel in various sizes (see chart below). Other sizes available.

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 (stainless steel for use with hazardous materials). Order top cap, base pedestal and porous stones separately. Cell 13-3/4"H x 8-3/4" dia. (349.2 x 222.3mm); 11" (279.4mm) overall dia.

### Triaxial Cells/Caps/Bases

Sample Size	Brass			Stainless Steel		
	Triaxial Cell (Brass)	Top Cap (Aluminum)	Base Pedestal (Aluminum)	Triaxial Cell (Stainless Steel)	Top Cap (Stainless Steel)	Base Pedestal (Stainless Steel)
35 mm	HM-4199B	HM-4199.35T	HM-4199.35B	HM-4199SS	HM-4199.35TSS	HM-4199.35BSS
1.4 in	HM-4199B	HM-4199.14T	HM-4199.14B	HM-4199SS	HM-4199.14TSS	HM-4199.14BSS
38mm	HM-4199B	HM-4199.38T	HM-4199.38B	HM-4199SS	HM-4199.38TSS	HM-4199.38BSS
50 mm	HM-4199B	HM-4199.50T	HM-4199.50B	HM-4199SS	HM-4199.50TSS	HM-4199.50BSS
2.0 in	HM-4199B	HM-4199.20T	HM-4199.20B	HM-4199SS	HM-4199.20TSS	HM-4199.20BSS
70 mm	HM-4199B	HM-4199.70T	HM-4199.70B	HM-4199SS	HM-4199.70TSS	HM-4199.70BSS
2.8 in	HM-4199B	HM-4199.28T	HM-4199.28B	HM-4199SS	HM-4199.28TSS	HM-4199.28BSS
100 mm	HM-4199B-4	HM-4199.100T	HM-4199.100B	HM-4199SS-4	HM-4199.100TSS	HM-4199.100BSS
4.0 in	HM-4199B-4	HM-4199.40T	HM-4199.40B	HM-4199SS-4	HM-4199.40TSS	HM-4199.40BSS



**Triaxial Accessories**

**A. Latex Membranes**

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.

**B. Membrane Stretcher**

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

**C. O-Rings**

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

**D. O-Ring Placing Tool**

Position rings to seal membrane with minimum disturbance to specimen.

**E. Porous Stones**

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

**F. Membrane Tester**

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

**G. Two-Part Vacuum Split Former**

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

**H. Two-Part Split Miter Box**

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

**I. Filter Paper**

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

**J. Sample Trimmer with Knife**

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

**K. Base Disk**

Acrylic disk used in UU triaxial test.

**L. Filter Paper Strips**

Wrapped around sample to accelerate saturation in triaxial testing. 50pkg.

**M. High Vacuum Grease**

Effective means of sealing latex membranes to sides of the top cap and base pedestal. Especially useful during sample preparation.

Triaxial Accessories													
Sample Size	A	B	C	D	E	F	G	H	I	J	K	L	M
	Latex Membranes (0.012" thick) (12/pkg)	Membrane Stretcher	O-Rings (12/pkg)	O-Ring Placing Tool	Porous Stones (1/4" thick)	Membrane Tester	Two-Part Vacuum Split Mold	Two-Part Split Miter Box	Filter Paper (100/pkg)	Sample Trimmer w/Knife	Base Disk	Filter Paper Strips	Vacuum Grease
35mm	HM-4180.14	HM-4181.14	HM-4182.14	HM-4183.14	HM-4184.35	HM-4185.14	HM-3821M	HM-3841M	HM-4189.14	HM-4186.14	HM-4179.35	HM-4189FS 5 x 150mm Grade 55 (pkg/100)	HM-4198
38mm	HM-4180.38	HM-4181.38	HM-4182.38	HM-4183.38	HM-4184.38	HM-4185.38	HM-3822M	HM-3842M	HM-4189.38	HM-4186.38	HM-4179.38		
50mm	HM-4180.20	HM-4181.20	HM-4182.20	HM-4183.20	HM-4184.50	HM-4185.20	HM-3824M	HM-3844M	HM-4189.20	HM-4186.20	HM-4179.50		
70mm	HM-4180.28	HM-4181.28	HM-4182.28	HM-4183.28	HM-4184.70	HM-4185.28	HM-3827M	HM-3847M	HM-4189.28	HM-4186.28	HM-4179.70		
100mm	HM-4180.40	HM-4181.40	HM-4182.40	HM-4183.40	HM-4184.100	HM-4185.40	HM-3828M	HM-3848M	HM-4189.40	HM-4186.40	HM-4179.100		
150mm	HM-4180.60	HM-4181.60	HM-4182.60	HM-4183.60	HM-4184.150	HM-4185.60	HM-3829M	HM-3849M	HM-4189.60	HM-4186.60	HM-4179.150		
1.4 in	HM-4180.14	HM-4181.14	HM-4182.14	HM-4183.14	HM-4184.14	HM-4185.14	HM-3821	HM-3841	HM-4189.14	HM-4186.14	HM-4179.14		
2.0 in	HM-4180.20	HM-4181.20	HM-4182.20	HM-4183.20	HM-4184.20	HM-4185.20	HM-3824	HM-3844	HM-4189.20	HM-4186.20	HM-4179.20		
2.8 in	HM-4180.28	HM-4181.28	HM-4182.28	HM-4183.28	HM-4184.28	HM-4185.28	HM-3827	HM-3847	HM-4189.28	HM-4186.28	HM-4179.28		
4.0 in	HM-4180.40	HM-4181.40	HM-4182.40	HM-4183.40	HM-4184.40	HM-4185.40	HM-3828	HM-3848	HM-4189.40	HM-4186.40	HM-4179.40		
6.0 in	HM-4180.60	HM-4181.60	HM-4182.60	HM-4183.60	HM-4184.60	HM-4185.60	HM-3829	HM-3849	HM-4189.60	HM-4186.60	HM-4179.60		



## Automated Triaxial Testing System

The Humboldt Automated Triaxial Testing System is a state-of-the-art system specifically designed for soil testing laboratories conducting UU, CU, and CD triaxial, unconfined compression and other tests, such as CBR, LBR and Marshall tests. This is the most advanced Triaxial testing system available to soil testing laboratories on the market today. The system consists of a microprocessor-based Tri-Scan 50 frame, incorporating a large graphical display and a touch-sensitive keypad for data entry, Master Logger 300 allowing data acquisition from load, strain, pore pressure and volume transducers for up to 64 channels. The System includes the Flex Panel, Triaxial Cell, Automatic Pressure Controller (APC), computer and accessories.

In addition, the WinTriax reporting software allows the user to transform from collected data effective and total triaxial testing reports at the click of a mouse. The system allows for real-time display of current test curves for easy monitoring of test progress. Data acquisition is automated from the computer by setting trigger conditions to start and stop logging. Tests are automatically initiated and terminated, as well as from the computer, by the preset channel condition offering the freedom of unsupervised triaxial testing in a timely manner.

Key Features include:

- 11,000 lb. (50kN) capacity load frame
- Microprocessor-based load frame
- Fully-automated computer-controlled system
- Flex Panel readability to 0.02cc for the 10cc burette and 0.1cc burette and 0.1cc for the 50cc burette.
- Flex Panel is economically expandable for multiple test chambers
- Triaxial Cell, up to 3 (built-in de-airing block)
- Capable of monitoring and logging up to 64 channels

Description	Model
Tri-Scan 50, Standard Version 110/220V, 50/60Hz	HM-2605.3F
Ball Seat Adapter, Qty. 1.	HM-200387
Automatic Pressure Controller, Dual Channel 110/220V, 50/60Hz, Qty. 1.	HM-2451.3F
FlexPanel I, (3-burette/master control) 110/60Hz, Qty. 1.	HM-4150
S-Type Load Cell 2,000 lbs. (10kN), Qty. 1.	HM-2300.020
Strain Transducer 2.0 (50mm), Qty. 1.	HM-2310.20
Displacement Transducer Bracket, Qty. 1.	HM-4178BRT
Triaxial Cell, (up to 3 Qty.) brass fittings, built-in de-airing block, Qty. 1.	HM-4199B
Top Cap and Base Pedestal (choose sample size), Qty. 1.	HM-4199.xx
Pore Pressure Transducer, 200psi., Qty. 1.	HM-4170
Automatic Volume Change Device (add ddi or transducer), Qty. 1.	HM-2315
Strain Transducer 1 (25mm), Qty. 1.	HM-2310.10
Bracket for Strain Transducer, Qty. 1.	HM-2310BR
De-Airing Tank, Qty. 1.	HM-4187E
Master Logger 300, 110/220V, Qty. 1.	HM-2250.3F
Eight-channel Analogue Input Module, Qty. 1.	HM-2251
WinTRIAX Reporting Software, Qty. 1.	HM-2155
See Page 159 for Sample Preparation Accessories	



## Unconsolidated Undrained (UU) Triaxial Test Sets

Meets ASTM D2850; BS1377 Part 7 1990.

Mechanical UU Triaxial Setup	
Each Set Includes:	Model
Flexpanel or Flexpanels.	HM-4150's
(1) Triaxial Load Frame.	HM-2000A
(1) 1,000 lb. (5kN) Proving Ring.	H-4454.010
(1) 1" Strain Indicator or 25mm Strain Indicator	H-4158.1 H-4465.25
Triaxial Cell or Cells.	HM-4199's
Top Cap & Base Pedestal, (1) for each cell.	HM-4199's
(1) Pkg. of Membranes (12/pkg.)	HM-4180's
Base Disk (2 each cell).	HM-4179's
(1) Pkg. of O-rings (12/pkg.)	HM-4182's
(1) Membrane Stretcher.	HM-4181's
(1) Membrane Tester.	HM-4185's
(1) Tube of Vacuum Grease.	HM-4198

Digital UU Triaxial Setup	
Each Set Includes:	Model
Flexpanel or Flexpanels.	HM-4150's
(1) Triaxial Load Frame.	HM-3000.3F
(1) 2,000 lb. (10kN) Load Cell.	HM-2300.020
(1) 2" (50mm) Strain Indicator	HM-2310.20
(1) Strain Indicator Bracket.	HM-4178BRT
Triaxial Cell or Cells.	HM-4199's
Top Cap & Base Pedestal, (1) for each cell.	HM-4199's
(1) Pkg. of Membranes (12/pkg.)	HM-4180's
Base Disk (2 each cell).	HM-4179's
(1) Pkg. of O-rings (12/pkg.)	HM-4182's
(1) Membrane Stretcher.	HM-4181's
(1) Membrane Tester.	HM-4185's
(1) Tube of Vacuum Grease.	HM-4198

## Unconfined Compression Test Sets

Meets ASTM D2166; AASHTO T208; BS 1377 Part 7 1990.

Mechanical Unconfined Compression Setup	
Each Set Includes:	Model
(1) Triaxial Load Frame.	HM-2000A
(1) 1,000 lb (5kN) Proving Ring.	H-4454.010
(1) 1" Strain Indicator or 25mm Strain Indicator	H-4158.1 H-4465.25
(1) Lower Platen.	HM-2001
(1) Upper Platen	HM-2002

Digital Unconfined Compression Setup	
Each Set Includes:	Model
(1) Triaxial Load Frame.	HM-3000.3F
(1) 500 lb (2.5kN) Load Cell.	HM-2300.005
(1) 2" (50mm) Strain Indicator	HM-2310.20
(1) Upper Platen	HM-2002



**HUMBOLDT**

Sales or Technical Assistance — 1-800-544-7220



HM-4187E

### De-Airing Water Tank

For use with FlexPanel I & II Triaxial/Permeability Panels. Cast acrylic chamber, 6 dia. x 16"H (152x406mm). Head plate mounted with three fittings. Two are modified to allow 1/4" tubing to pass through to tank bottom, one for filling with tap water and the other for extracting the water once de-aired. The third fitting is used to connect vacuum/pressure to tank.

Description	Model
De-airing water tank, 6L.	HM-4187E

Shipping wt. 13 lb. (5.8kg)

### Nold De-Aerator Water System

Completely self-contained unit produces 6-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. 1/55hp motor 110V, 60Hz. 7.5x7.5x20" (190x190x508mm).

Description	Model
Nold de-aerator, 6L.	HM-4187

Shipping wt. 19 lb. (8.6kg)



HM-4187



HM-3130, HM-3130.14, HM-3130.28, HM-3175

### Soil Sample Trimmers

For cutting samples to precise diameters. Adjustable between 1–4" (see exact diameters in chart below) 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 platens and saw separately.

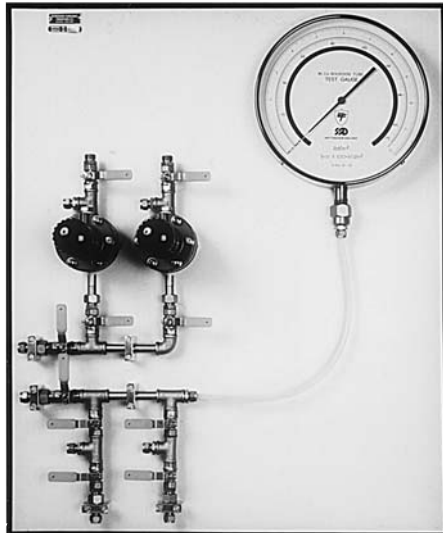
Description	Model
Soil sample trimmer, 1.0 to 3.0". Order platens separately.	HM-3130
Soil sample trimmer, 1.0 to 4.0". Order platens separately.	HM-3140

Shipping wt. 6 lbs. (2.72kg)

### Accessories for Soil Sample Trimmers

For use with HM-3130 & HM-3140.

Description, Replacement Parts & Accessories	Model
Top platen, 1.0".	HM-3130.10
Top platen, 1.4".	HM-3130.14
Top platen, 1.875".	HM-3130.18
Top platen, 2.0".	HM-3130.20
Top platen, 2.5".	HM-3130.25
Top platen, 2.8".	HM-3130.28
Top platen, 3.0".	HM-3130.30
Top platen, 4.0".	HM-3130.40
Wire saw (w/replaceable wire).	HM-3175



HM-4152



HM-4151

## Bladder Air-Water Cylinder Constant Pressure System

For distribution and control of de-aired water within triaxial testing systems.

Description	Shipping wt.	Model
2-Unit, Compressed Air/Water Control Panel.	35 lbs (16kg)	HM-4152
4-Unit, Compressed Air/Water Control Panel.	75 lbs (34kg)	HM-4154
6-Unit, Compressed Air/Water Control Panel.	97 lbs (44kg)	HM-4156

## Bladder Air-Water Cylinders

For use with constant pressure systems to permit the use of de-aired water. Cost effective for multi output systems. Up to 1,000 kPa maximum pressure capacity. Panel-mounted precision pressure regulators. Standard gauge calibrated up to 1,200 kPa.

- Accurate within  $\pm 0.1\%$  of full scale reading
- Can be used with any suitable compressor

Includes: one impervious rubber bladder; connections for 8mm o.d. tubing, air inlet, water outlet to triaxial cell, and pressure line. Pressure source required.

Description	Model
Bladder air-water cylinder.	HM-4151

Shipping wt. 19 lbs. (9kg)

Description, Replacement Parts & Accessories	Model
Spare bladder for HM-4151.	HM-4151.1



## Resistivity Meter

The resistivity meter can be easily used to measure resistivity of soil in-situ using the 2, 3, or 4 electrode method or with the soil box to measure resistivity of soil or water in the range of distilled to sea water. It has a wide range (0.01 ohm to 1.1 megohm) in 8 ranges with 10% overlap. It is fully temperature stabilized over temperature ranges encountered in all field conditions; is insensitive to A.C. or D.C. ground currents; can be used safely in wet ground and comes with (1) 12-volt lantern battery and shoulder carrying strap.

Description	Model
Resistivity Meter.	H-4385

Shipping wt. 11 lbs (5kg)

## Soil Box

The soil box is used with H-4385 resistivity meter for a quick and accurate measurement of resistivity of a soil or water sample in the field or laboratory. Construction is clear plastic with stainless steel current plates and brass potential pins. The dimensions are such that the measured resistivity with the H-4385, when the box is filled level, can be expressed in ohm-centimeter, making calculations unnecessary. The box can also be used with other meters.

Description	Model
Soil box	H-4386
Soil box leads, set of 4.	H-4387

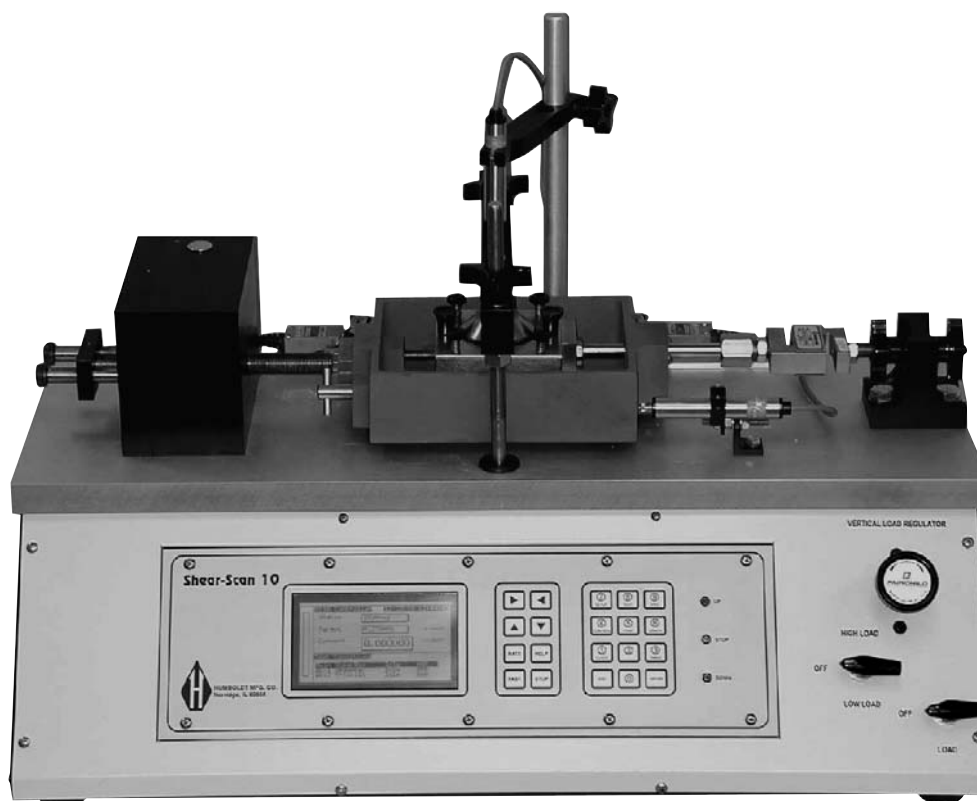
## Resistivity Test Reel with Soil Pins

Four pin, test reel set for attaining 1-20 ft. depth measurements. Can be used with any 4-terminal meter. Uses 4-electrode Wenner method. Includes 4 separate, color-coded wires of varying lengths from 5 to 65 ft. Jumper leads (2-foot) are supplied for connection to meter.

Description	Model
Resistivity test reel with soil pins.	H-4388



HM-2560.3F



## ShearScan 10 Pneumatic Direct/Residual Shear Apparatus

- Windows menu-driven system
- Microprocessor control with stepper motor drive
- Real-time display via large graphical display (3x5") system
- Touch sensitive data entry keypad
- Variable speed settings from 0 to 0.40000 in/min (0 to 10,00000 mm/min)
- Up to 1000 readings per channel with time stamp
- Linear, Incremental and Custom logging modes
- Viewable test data in tabular and graphical form
- Password protected test/channel configuration and calibration
- Nonvolatile storage of test data and calibration
- Battery-baked real time clock
- RS232 serial port interface for computer/printer
- Auxiliary port for optional data acquisition channel expansion
- Optional WinShear PC program for control/data analysis

The Humboldt ShearScan 10 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 loading weights used in dead weight-type systems.

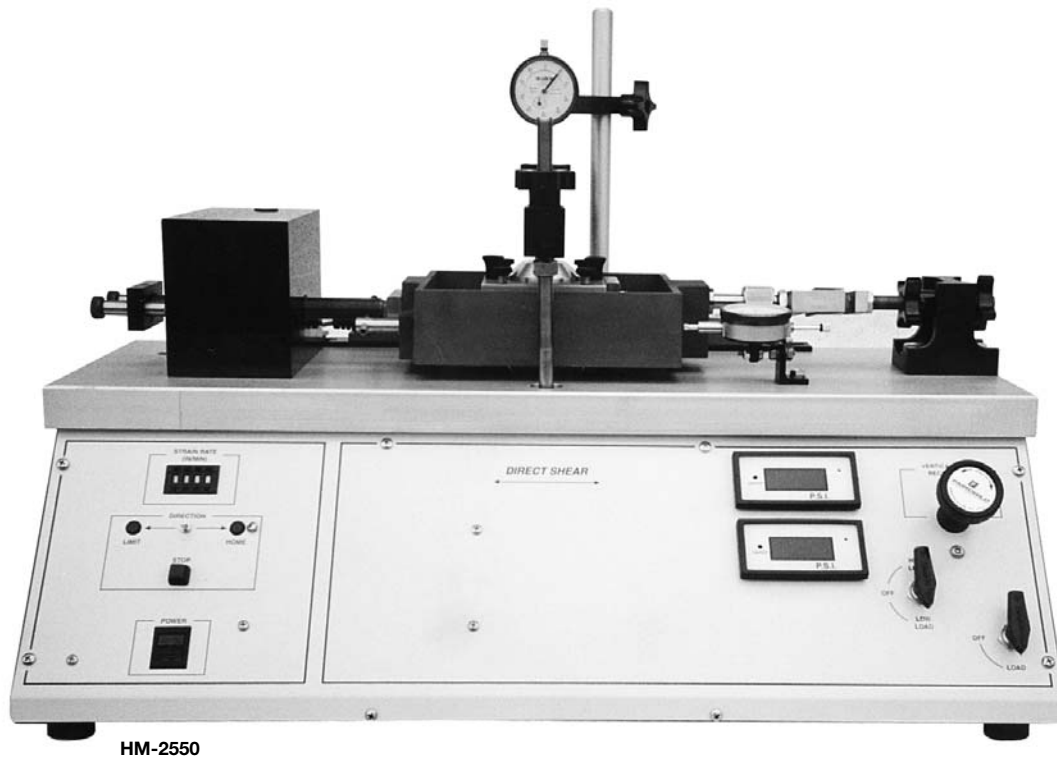
The microprocessor-based ShearScan 10 system features a stepper motor drive system, large graphical display, touch-sensitive keypad and forward/reverse travel limit switches. Through the use of a built-in 4-channel data acquisition system, the operator can preset the starting and stopping conditions 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 and shear boxes 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 ShearScan 10 is supplied complete with a 2,000 lb. (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. Meets ASTM D3080, AASHTO T236 and BS1377 standards.

### Specifications:

Horizontal Movement.	2" (50.4mm) maximum
Vertical Load.	2,000 lbs. (10kN)
Horizontal Shear Force.	2,000 lbs. (10kN)
Speed Range.	0.00001 to 0.40000 in./min.; (0.00001 to 10,00000 mm/min)
Dimensions.	30" Lx15.5" Dx22" H (760x368x558mm)
Weight.	Net 140 lbs. (64kg); shipping 168 lbs. (76kg)



HM-2550

## Pneumatic Direct/Residual Shear Apparatus (Basic Model)

- Basic, economical version for laboratories not requiring data acquisition and storage
- Pneumatic system eliminates cumbersome manual loading of weights
- 1,500 lb. (6.7kN) vertical load and horizontal shear force capacity
- Built-in digital readouts for vertical load pressure and horizontal shear force loads
- Shearbox assemblies available in a wide range of sizes

Similar in design to the ShearScan 10, this model offers the user a more basic version of the apparatus. The unit has built-in digital readouts for pressure and load. These are used for setting the vertical load and for measurement of shear forces. Horizontal and vertical shear displacement values are measured by means of two mechanical dial indicators. Shearbox assemblies and related accessories are not include and must be ordered separately. Meets ASTM D3080, AASHTO T236 and BS1377 standards.

### Specifications:

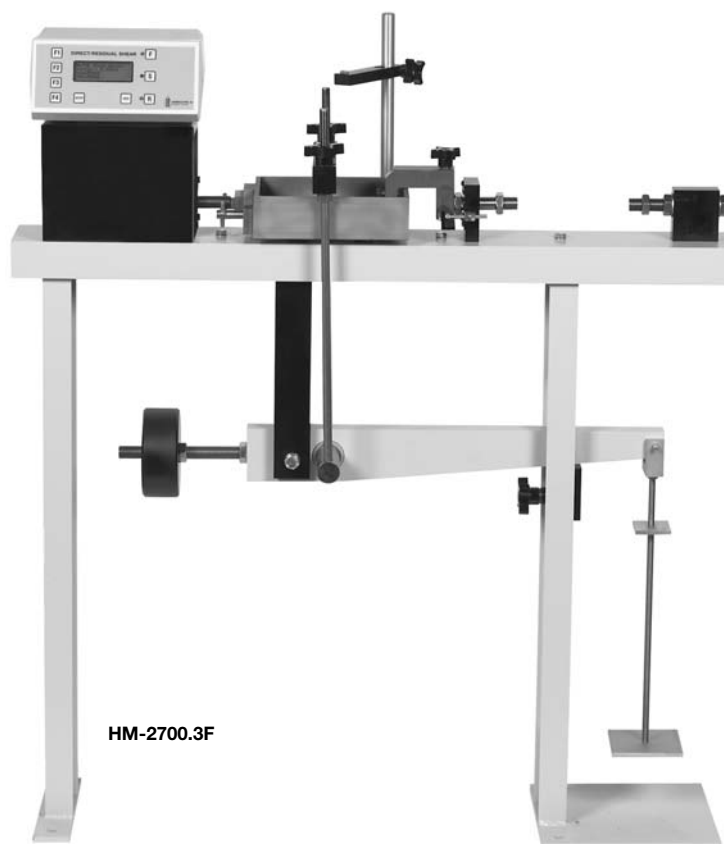
Horizontal Movement.	.08" (20.3mm) maximum
Vertical Load.	1,500 lbs. (6.7kN)
Horizontal Shear Force.	1,500 lbs. (6.7kN)
Speed Range.	0.0001 to 0.3 in/min.; (0.0025 to 7.6200 mm/min)
Dimensions.	30"Lx14.5"Dx22"H (760x368x558mm)
Weight.	Net 140 lbs. (64kg); shipping 190 lbs. (86.2kg)

Description	Model
ShearScan 10 direct/residual apparatus. 110-220V, 50/60 Hz, 1 ph.	HM-2560.3F

Description	Model
Pneumatic direct/residual apparatus. 110-120V, 50/60 Hz, 1 ph.	HM-2550
Pneumatic direct/residual apparatus. 220-240V, 50/60 Hz, 1 ph.	HM-2550.4F

Description, Accessories	Model
Auxilliary input, 4-digital channels.	HM-2625
Auxilliary input, 4-analog channels.	HM-2630
WinShear reporting software for control and data analysis	HM-2156

Shearbox and Accessories				
Sample Size	Shearbox (includes Porous Plates)	Cutter	Tamper	Porous Plate (Stones)
2.0" Dia.	HM-2551.20D	HM-2552.20D	HM-2553.20D	HM-2554.20D
2.42" Dia.	HM-2551.24D	HM-2552.24D	HM-2553.24D	HM-2554.24D
2.5" Dia.	HM-2551.25D	HM-2552.25D	HM-2553.25D	HM-2554.25D
60mm Sq.	HM-2551.60S	HM-2552.60S	HM-2553.60S	HM-2554.60S
60mm Dia.	HM-2551.60D	HM-2552.60D	HM-2553.60D	HM-2554.60D
100mm Sq.	HM-2551.100S	HM-2552.100S	HM-2553.100S	HM-2554.100S
100mm Dia.	HM-2551.100D	HM-2552.100D	HM-2553.100D	HM-2554.100D
4.0" Sq.	HM-2551.40S	HM-2552.40S	HM-2553.40S	HM-2554.40S
4.0" Dia.	HM-2551.40D	HM-2552.40D	HM-2553.40D	HM-2554.40D



## Direct/Residual Shear

A shear test in which soil or rock under applied normal load is stressed to failure by moving one section of the sample or sample container (shear box) relative to the other section. This test shears the sample along a predefined plane.

## Direct/Residual Shear Apparatus

With stepless speed range from 0.00001 to 0.49999 in./min. (0.00001mm to 12.99999mm/min.) per minute with stepper motor control. Permits testing specimen of 60mm, 100mm, 2.5" and 4.0" dimension both square and circular. The speed rate for application of the shearing force can be rapidly adjusted manually. Maximum shear force 2,000 lb. (10 kN). Maximum consolidation force 2,000 lb. (10 kN). Carriage accepts shear box squares up to 100mm internal dimension. Forward and reverse measurements permit residual shear testing as standard. Safety feature prevents overload of load measuring system. Meets ASTM D3080, BS 1377.

- No gear changing required
- Stand mounted

Includes: carriage, stand, vertical load hanger, and balanced lever loading arm of 10:1 ratio that reduces weights required.

Description, Complete Set	Model
Direct Residual Shear Apparatus, 110/220V, 50/60Hz, 1ph.	HM-2700.3F
10:1 Lever Loading Device for fitting beneath stand for large stress application.	HM-2710
Direct Residual Shear Apparatus with analog inputs.	HM-2700A.3F
Direct Residual Shear Apparatus with digital inputs.	HM-2700D.3F

Shipping wt. 178 lbs. (52kg)

Description, English Set	Qty. in Set	Shipping wt.	Model
Direct/Residual shear set (English).		265 lbs	HM-2700.2.5
<b>Set Includes:</b>			
Direct/Residual Shear Apparatus.	1	178 lbs	HM-2700.3F
10:1 Lever Loading Device	1		HM-2710
Shearbox Assembly, 2.5" diameter	1	7 lbs	HM-2701.25D
Proving ring, 1,100 lbf (5.0 kN).	1	5 lbs.	H-4454.010
Mechanical Dial Gauge, 0.5x 0.0001". (Vert.)	1	1 lb.	H-4471
Mechanical Dial Gauge, 1.0x 0.001". (Horz.)	1	1 lb.	H-4158.1
Weight Set, 32 Kg. (4=1kg, 3=4kg, 2=8kg)	1	71 lbs.	HM-1122
Cutter, 2.5 in diameter.	1	1 lb.	HM-2702.25D
Dolly/Tamper, 2.5 in diameter.	1	1 lb.	HM-2703.25D
Description, Metric Set	Qty. in Set	Shipping wt.	Model
Direct/Residual shear set (Metric).		120 kg	HM-2700M.60
<b>Set Includes:</b>			
Direct/Residual Shear Apparatus.	1	81 kg	HM-2700.3F
10:1 Lever Loading Device	1		HM-2710
Shearbox Assembly, 60mm Square	1	3.2 kg	HM-2701.60S
Proving ring, 5.0kN (1,000lbf).	1	2.3kg	H-4454.010
Mechanical Dial Gauge, 12mm x 0.002mm. (Vert.)	1	1 kg	H-4465.12
Mechanical Dial Gauge, 25mm x 0.01mm. (Horz.)	1	1 kg	H-4465.25
Weight Set, 32 Kg. (4=1kg, 3=4kg, 2=8kg)	1	32 kg	HM-1122
Cutter, 60mm diameter.	1	.5 kg	HM-2702.60S
Dolly/Tamper, 2.5 in diameter.	1	.5 kg	HM-2703.60S



Shearbox & Accessories

Weights

### Shearbox and Accessories

Shearbox and Accessories									
SQUARE					ROUND				
Sample Size	Shearbox	Cutter	Dolly/Tamper	Porous Plate	Sample Size	Shearbox	Cutter	Dolly/Tamper	Porous Plate
50mm square	HM-2701.50S	HM-2702.50S	HM-2703.50S	HM-2704.50S	50mm dia.	HM-2701.50D	HM-2702.50D	HM-2703.50D	HM-2704.50D
60mm square	HM-2701.60S	HM-2702.60S	HM-2703.60S	HM-2704.60S	60mm dia.	HM-2701.60D	HM-2702.60D	HM-2703.60D	HM-2704.60D
2.5" square	HM-2701.25S	HM-2702.25S	HM-2703.25S	HM-2704.25S	2.0" dia.	HM-2701.20D	HM-2702.20D	HM-2703.20D	HM-2704.20D
4.0" square	HM-2701.40S	HM-2702.40S	HM-2703.40S	HM-2704.40S	2.42" dia.	HM-2701.24D	HM-2702.24D	HM-2703.24D	HM-2704.24D
					2.5" dia.	HM-2701.25D	HM-2702.25D	HM-2703.25D	HM-2704.25D
					2.875" dia.	HM-2701.2875D	HM-2702.2875D	HM-2703.2875D	HM-2704.2875D
					4.0" dia.	HM-2701.40D	HM-2702.40D	HM-2703.40D	HM-2704.40D

### Load Measuring Devices

Load Measuring Devices	Model
Proving ring w/ mechanical dial gauge, 220 lbf (1.0 kN).	H-4454.002
Proving ring with digital indicator, 220 lbf (1.0 kN).	H-4454.002D
Proving ring w/ mechanical dial gauge, 550 lbf (2.5 kN).	H-4454.005
Proving ring w/ digital indicator, 550 lbf (2.5 kN).	H-4454.005D
Load cell, 500 lbf (2.2 kN).	HM-2300.005
Proving ring w/ mechanical dial gauge, 1,100 lbf (5.0 kN).	H-4454.010
Proving ring w/ digital indicator, 1,100 lbf (5.0 kN).	H-4454.0010D
Load cell, 1,000 lbf (5.0 kN).	HM-2300.010
Data cable for digital indicator.	HM-4469C

### Displacement Measuring Devices

Vertical Measuring Devices	Model
Mechanical dial gauge, 0.5x0.0001".	H-4471
Mechanical dial gauge, 12x0.002mm.	H-4465.12
Digital indicator, 0.5x0.0001".	HM-4469.05
Data cable for digital indicator.	HM-4469C
LVDT, 0.4" (10mm)	HM-2310.04
Horizontal Measuring Devices	
	Model
Mechanical dial gauge, 1.0x0.001".	H-4158.1
Mechanical dial gauge, 25x0.01mm.	H-4465.25
Digital indicator, 1.0x0.0001".	HM-4469.10
Data cable for digital indicator.	HM-4469C
LVDT, 1.0" (25mm) .	HM-2310.10

### Weights

Weight Set	Weight Sets							Set Model Number
	1kg Weight	2kg Weight	4kg Weight	5kg Weight	8kg Weight	10kg Weight		
	HM-1122.1	HM-1122.2	HM-1122.4	HM-1122.5	HM-1122.8	HM-1122.10		
32kg Weight Set. Includes:	4	—	3	—	2	—	HM-1122	
50kg Weight Set. Includes:	3	1	—	1	—	4	HM-1125	

**HUMBOLDT**

Sales or Technical Assistance — 1-800-544-7220



HM-2250.3F

## Data Logging/Electronic Instrumentation

Now, data acquisition systems are available which offer unprecedented technology to dramatically increase laboratory productivity and cost effectiveness. More importantly, your increased use of these state-of-the-art devices and systems will increase the accuracy, reliability, and repeatability of every type of test you perform—saving recorded data for meaningful comparative analysis as well as for your permanent records. Automating your monitoring and other data logging systems can free your personnel for other tasks. And, most devices and systems are modular—giving you maximum choice, for example, the option to start with low cost digital indicators and later upgrade as you deem appropriate.

### MasterLogger 300

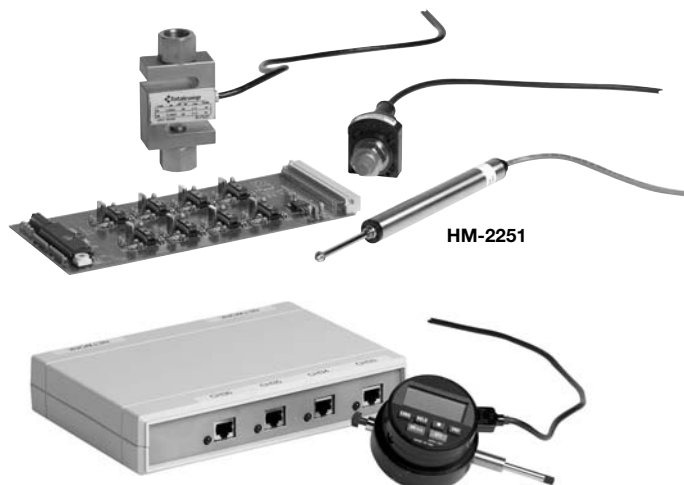
Make your every test routine easier and faster with this versatile and expandable microprocessor based system. Up to 64 channels, 16-bit A/D converter.

- Dial indicator & transducer excitation 10V
- Real time clock (HH:MM:SS, MM:DD:YY) and storage of logged data are battery backed
- Non-volatile storage of calibration
- Logged reading per channel of 512 max
- Logging rate configured in linear, logarithmic, square root, or incremental
- Automatic START/STOP logging modes in delay, greater than, and less than
- Windows™ WinHOST based PC program for a control/monitoring channel, or multiple channels
- Includes standard RS232 port for external interface
- Free-standing 19" rack EMC enclosure

Capable of channel configuration, calibration, and control via either standard RS232 port, or integral 20-key membrane touch pad. Graphics display of 240x64 pixels for viewing logged data.

Description	Model
MasterLogger-300, 110/220 VAC, 50/60Hz.	HM-2250.3F

Shipping wt. 20 lbs. ( 9kg)



HM-2251

HM-2253

MasterLogger Options	Model
<b>Input Modules</b>	
4-Channel digital input module.	HM-2253
8-Channel analogue input module.	HM-2251
<b>Monitoring Software</b>	
Host Management Software (WinHOST) data acquisition monitoring software (Windows version).	HM-2150
<b>Reporting Software</b>	
Win TRIAX, Triaxial Software.	HM-2155
Win SHEAR, Shear Software.	HM-2156
Win ODE, Consolidation Software.	HM-2157

## GeoSpec2 Materials Testing Reporting Software

GeoSpec2 software is specifically designed for the construction materials testing industry. All modules are completely mouse driven and employ the Microsoft Windows® interface. The software can run on virtually any PC today and uses very little disk space and memory. Modules are currently included for Atterberg Limits, Proctor Density, Sieve Analysis, Concrete Compression, Asphalt Mix Analysis and Field Density reporting.

Description	Model
GeoSpec2 materials testing software.	HM-2165



HM-2325, HM2330



HM-2340

## miniScanner Series

miniScanner modules are microprocessor based with 4-line by 20 character LCD display and membrane touch pad designed for a broad spectrum of geotechnical laboratory applications.

## miniScanner Twin-Channel Marshall/CBR/LBR Acquisition

Designed specifically for Marshall, CBR, LBR, UC, and UU testing. Includes standard RS232 port for external interface to printer or computer, plus two analog output channels for X/Yt chart recorder. Up to 999 reading per channel. In the Marshall mode, the two analog channels accept stability and flow measurements at a rate of four readings per second, with peak hold and auto tare. In the CBR, LBR, unconfined and UU mode, the two analog channels accept load and strain measurements at a rate of one reading per second with no peak hold.

Description	Model
miniScanner twin-channel Marshall/CBR display. 110V, 60Hz.	HM-2340
miniScanner twin-channel Marshall/CBR display. 220V, 50Hz.	HM-2340.5F

Shipping wt. 10 lbs. ( 4.5kg)

## miniScanner Four-Channel Data Acquisition for Analog Instrumentation

For fully automated test data collection. Easy to use, stand-alone system specifically designed for soil testing laboratories. Ideal for Triaxial, UU, CU, CD, one dimensional consolidation, direct shear, and other tests.

- Windows™ based program for data acquisition monitoring
- Input for up to four analog transducers (0-100mV)
- Up to 250 storage of reading per channel
- Logging mode in linear, logarithmic, and square root times.

Includes: standard RS232 port for external interface, Real time clock, 16-bit A/D converter, and 10V transducer excitation supply.

Description	Model
miniScanner four-channel analog data acquisition unit. 110V, 60Hz.	HM-2325
mini Scanner four-channel analog data acquisition unit. 220V, 50Hz.	HM-2325.5F

Shipping wt. 10 lbs. ( 4.5kg)

## miniScanner Four-Channel Data Acquisition for Digital Dial Indicators

For fully automated test data collection. Easy to use, stand-alone system specifically designed for soil testing laboratories. Ideal for Triaxial, UU, unconfined, one dimensional consolidation, direct shear, and other tests.

- Windows™ based program for data acquisition monitoring
- Auto start logging (greater than, less than, delay)
- Input for up to four digital indicators
- Up to 250 storage of reading per channel
- Logging mode in linear, logarithmic, and square root times.

Includes: standard RS232 port for external interface, and real time clock.

Description	Model
miniScanner four-channel analog to digital data acquisition unit. 110V, 60Hz.	HM-2330
miniScanner four-channel analog to digital data acquisition unit. 220V, 50Hz.	HM-2330.5F

Shipping wt. 10 lbs. ( 4.5kg)



**HUMBOLDT**

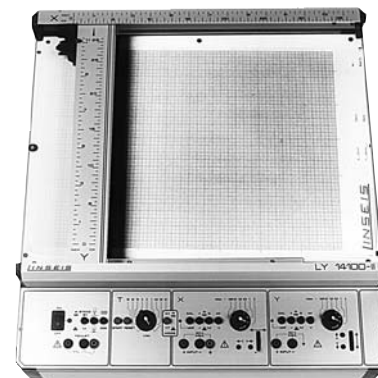
Sales or Technical Assistance — 1-800-544-7220



HM-2320



HM-2350



H-1326

## Digital Transducer Readouts

Microprocessor based state-of-the-art instruments specifically designed for direct monitoring of load, displacement, pore water pressure, and volume change during laboratory soil testing. Readouts in engineering units. Provides excitation voltage to all Humboldt transducers for load cell, strain, pressure, and volume change.

## Four-Channel Transducer Readout

Accepts four analog signals such as pressure, strain, load cell and volume change transducers. Conversion from analog to digital via 16-bit A/D converter. Channel readings in engineering units together with unit name and unit. Four line x 20 character LCD display. Membrane touch pad. Built-in stabilized voltage for transducer (10Vdc, -5Vdc). Input voltage (0-100mV). Includes standard RS232 port for external interface, plus four rear mounted 5-pin DIN plugs.

Description	Model
miniScanner, four-channel display. 110V, 60Hz.	HM-2320
miniScanner, four-channel display. 220V, 50Hz.	HM-2320.5F

Shipping wt. 10 lbs. ( 4.5kg)

## Single Channel, 4-Digit Transducer Readout

Large, easy-to-read LED display. Two-point calibration with or without known (load, displacement, pressure). Built-in stabilized voltage for transducer (10Vdc, + 24Vdc). Input voltage (0-100mV,  $\pm 50$ mV, 0-10V,  $\pm 5$ V, 0-20mA, 4-20mA). Tare and peak hold features. Includes one rear mounted 5-pin DIN plug and carrying case. Optional analog output available.

Description	Model
Single channel, 4-digit transducer readout. 110V, 60Hz.	HM-2350
Single channel, 4-digit transducer readout. 220V, 50Hz.	HM-2350.5F

Shipping wt. 6 lbs. ( 2.72kg)

## Single Channel, 6-Digit Transducer Readout

Large, easy-to-read LED display. Two-point calibration with or without known (load, displacement, pressure). Built-in stabilized voltage for transducer (10Vdc, + 24Vdc). Input voltage (0-100mV,  $\pm 50$ mV, 0-10V,  $\pm 5$ V, 0-20mA, 4-20mA). Tare and peak hold features. Includes one rear mounted 5-pin DIN plug and carrying case. Optional analog output and RS232 port for external interface available.

Description	Model
Single channel, 6-digit transducer readout. 110V, 60Hz.	HM-2360
Single channel, 6-digit transducer readout. 220V, 50Hz.	HM-2360.5F

Shipping wt. 6 lbs. ( 2.72 kg)

## X-Y/t Chart Recorder

Single pen flatbed plotter. Over range indication. X-Y input range selectable (0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1,000, 2,000, mV/cm). Time base on X-axis selectable (50, 20, 10, 5, 2, 1, 0.5, 0.2, 0.1, sec/cm). Includes two black pens and 100 sheets of DIN A4 paper.

Description	Model
X/Yt Chart Recorder, 110V, 60Hz.	H-1326
X/Yt Chart Recorder, 220V, 60Hz.	H-1326.2F
X/Yt Chart Recorder, 220V, 50Hz.	H-1326.5F

Shipping wt. 20 lbs. ( 9kg)

Description	Model
Replacement black pens, 5/pkg.	H-1326BP
Replacement DIN A4 graph paper, 100 sheets.	H-1326GP



HM-4175

## Digital Pore Pressure Transducer Set

For reading back pressure and determining "B" value during the saturation stages of both triaxial and permeability tests. Includes: pore pressure transducer, de-airing block, and 4-digit single-channel readout.

Description, Complete Set	Model
Digital pore pressure set. 115V, 50/60 Hz.	HM-4175
Digital pore pressure set. 220V, 50/60 Hz.	HM-4175.4F

Shipping wt. 6 lbs. (2.72kg)

Description, Component Parts	Model
Pore pressure transducer (200 psi).	HM-4170
De-airing block.	HM-4170B
Single-channel readout, 4-digit. 115V, 50/60 Hz.	HM-2350
Single-channel readout, 4-digit. 220V, 50/60 Hz.	HM-2350.4F

## Digital Pressure Transducer

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 half 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.

Description	Model
Digital pressure transducer.	HM-4172



HM-4172

Strain Indicators

## Strain Indicators

Used for accurate vertical deformation of sample during triaxial tests.

### Strain Indicator, Mechanical Dial Gauge

Description	Model
Dial gauge, 1,000x0.001" clockwise, 2-1/4" diam.	H-4158.1
Dial gauge, 2,000x0.001" clockwise, 2-3/4" diam.	H-4463
Dial gauge, 25x0.010mm clockwise, 57mm diam.	H-4465.25
Dial gauge, 50x0.02mm clockwise, 70mm diam.	H-4465.50

### Strain Indicator, Digital Indicator

Description	Model
Digital dial gauge, 1.0" (25.0mm) x0.0001".	HM-4469.10
Digital dial gauge, 2.0" (50.0mm) x0.0001".	HM-4469.20
AC adapter for HM-4469.10, HM-4969.20.	HM-4469AC

### Linear Strain Transducers

Description	Model
Linear strain transducer, 1.0" (25mm).	HM-2310.10
Linear strain transducer, 2.0" (50mm).	HM-2310.20
Mounting bracket for fitting LSCT to equipment instead of dial gauge.	HM-2310BR



H-4454.100



H-4454.100D



HM-2300 Series

**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 Master Loader Multi-Use Compression Tester, and/or a wide variety of other instrumentation as well—such as using load rings together with digital indicators, or using with load cells for data acquisition.

Our high quality tensile steel rings have spherical seatings suitable for all shear boxes and load frames. Each load ring shipped with a fitted dial gauge and calibration certificate, and supplied with tables listing all measurement units. 8-1/4" (210mm) high, 3/4-16UNF thread female mounting. When using linear strain devices in automated systems, linearity is a factor, but does not apply when used with tables or equations. 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). Meets ASTM E74.

**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 asphalt, concrete or soil instrumentation to measure loads. Includes: 20 ft. cable with 5-pin DIN plug and calibration certificate. Order readout separately.

**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
<b>Bridge resistance</b>	
Input:	350 ohms, nominal
Output:	350 ohms, ±3.5 ohms
<b>Overload</b>	
Safe Static:	150% of Rated Capacity
Ultimate:	300% of Rated Capacity
<b>Temperature</b>	
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

Load Rings					
Description	Range and Measurement Units			Meets Spec.	Model (Analog Gauge) (Digital Gauge)
	lbf	kN	kgf		
Tensile steel load rings, 0.75% FS linearity, 0.15 % FS error, 8.20" high, 3/4-16 female mounting.	110	0.5	50	ASTM E74	H-4454.001 H-4454.001D
	220	1.0	100		H-4454.002 H-4454.002D
	550	2.5	250		H-4454.005 H-4454.005D
	1,100	5.0	500		H-4454.010 H-4454.010D
	2,200	10.0	1,000		H-4454.020 H-4454.020D
	5,500	25.0	2,500		H-4454.050 H-4454.050D
	11,000	50.0	5,000		H-4454.100 H-4454.100D
	22,000	100.0	10,000		H-4454.200 H-4454.200D

Description	Model
Load cell, 500 lbf (2.5 kN).	HM-2300.005
Load cell, 1000 lbf (5.0 kN).	HM-2300.010
Load cell, 2000 lbf (10.0 kN).	HM-2300.020
Load cell, 5000 lbf (25.0 kN).	HM-2300.050
Load cell, 10,000 lbf (50.0 kN).	HM-2300.100
Single channel readout.	HM-2350

Other capacities and styles (pancake, submersible) available, call: 1-800-537-4183 for details

Sales or Technical Assistance — 1-800-544-7220



SOIL

Data Logging/Electronic Instrumentation



H-4158.1



HM-4469.05



HM-2310 series

## Mechanical Dial Gauges

For use in field and laboratory. High quality, low friction design for accurate, repeatable readings and long life. Continuous graduations and revolution counters.

Dial Indicators, Inches					
Range	Division	Diameter	Brake	Counter-clockwise Model	Model
0.200"	0.0001"	2-1/4"	No	H-4460CC	* H-4460
0.200"	0.0001"	2-1/4"	Yes	H-4461CC	* H-4461
0.300"	0.0001"	2-1/4"	No	H-4462CC	H-4462
0.500"	0.0001"	2-1/4"	No	H-4471CC	H-4471
1.000"	0.0010"	2-1/4"	No	H-4158.1CC	* H-4158.1
2.000"	0.0010"	2-3/4"	No	H-4463CC	* H-4463
3.000"	0.0010"	2-3/4"	No	H-4464CC	H-4464

\* Models include two revolution counters

Dial Indicators, Metric					
Range	Division	Diameter	Brake	Counter-clockwise Model	Clockwise Model
8mm	0.002mm	57mm	No	H-4465.08CC	H-4465.08
12mm	0.002mm	57mm	No	H-4465.12CC	H-4465.12
25mm	0.010mm	57mm	No	H-4465.25CC	H-4465.25
50mm	0.020mm	70mm	No	H-4465.50CC	H-4465.50

## Digital Indicators

Switchable inch/metric digital indicator is accurate to  $\pm 0.0001"$  (0.002mm). 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. Will replace any mechanical dial gauges.

Digital Indicators		
Range	Dial Face Diameter	Model
0.25x0.0001" (6.25x0.002mm)	2-1/4"	HM-4469.02
0.5x0.0001" (12.5x0.002mm)	2-1/4"	HM-4469.05
1.0x0.0001" (25.0x0.002mm)	2-1/4"	HM-4469.10
2.0x0.0001" (50.0x0.002mm)	2-1/4"	HM-4469.20
AC Adapter for digital indicators.		HM-4469AC
Data cable for digital indicators.		HM-4469C
6' extension cable.		HM-4170EC
25' extension cable.		HM-2310C

## 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.

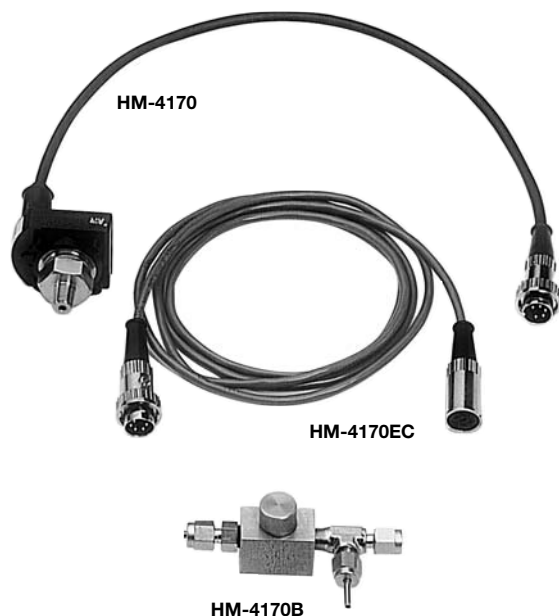
- Less than 250g spring force on spindle
- Non-linearity better than  $\pm 0.1\%$  of full scale deflection
- Hysteresis-compensated with linearity better than  $\pm 0.1\%$  of full scale in both directions
- Negligible temperature effect

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.

Description	Model
Linear strain transducer, 0.4"(10mm).	HM-2310.04
Linear strain transducer, 1.0" (25mm).	HM-2310.10
Linear strain transducer, 2.0" (50mm).	HM-2310.20

Mounting Brackets	Model
Mounting Bracket for fitting LSCT to equipment instead of dial gauge.	HM-2310BR
Mounting bracket for fitting LSCT to the upper part of a triaxial cell with a 15.5mm diam ram for strain measurement. (HM-2310BR also required.)	HM-4193BR

Other brackets available, call: 1-800-537-4183 for details

**HUMBOLDT**

## Pressure Measurement (Pore Pressure)

Highly accurate and reliable instruments designed especially for geotechnical testing laboratories.

- Outstanding overload protection
- Protected against corrosive pore water

Operating temperature range 0 to 70°C. Requires input of 10V DC; output up to 100 mV. Supplied with 2 meters of cable, plus a 5-pin DIN plug.

Description	Model
Pressure transducer, 200 psi (1,400 kPa).	HM-4170
De-airing block for use with HM-4170.	HM-4170B
6-foot extension cable.	HM-4170EC



## Automatic Volume Change Measuring Apparatus

For measuring large volumes. Two-part assembly consists of:

- Upper assembly—a stand-alone unit for measuring automatic volume change, having standard capacity of 100 ml
- Lower assembly—containing changeover valves

Using the upper assembly together in conjunction with the lower assembly gives limitless capacity.

Complete model includes both upper and lower assemblies. Use with linear strain transducer, digital indicator, or as part of an automated system. Accurate to better than  $\pm 0.05$  ml. Easily de-aired in seconds. Includes connectors, valves, and tubing. Order indicator separately.

Description	Model
Automatic volume change measuring apparatus (two-part assembly).	HM-2315

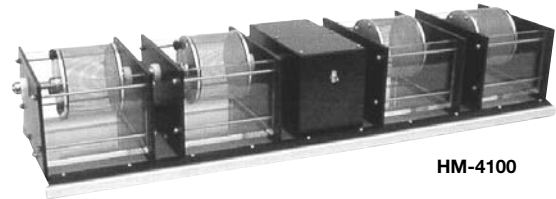
Shipping wt. 21 lbs. ( 9.5kg)

Description, Replacement Parts & Accessories	Model
Automatic volume change measuring apparatus stand-alone 100ml upper assembly.	HM-2315.1
Transducer for analog measurement, 25mm travel.	HM-2310.10
Bracket to fit HW-17015 to HW-17043.	HM-2310BR
Digital indicator, 25mm travel (no bracket required).	HM-4469.10
AC adapter for digital indicator.	HM-4469AC



HM-4501

HM-3930



HM-4100

## Calcium Carbonate Content Chamber

This test method covers the quantitative determination of the calcium carbonate (CaCO<sub>3</sub>) content of soils. This test complies with ASTM-D-4373. 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" I.D. 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.

Description	Model
Calcium Carbonate Content Chamber.	HM-4501

## Pin Hole Dispersion Apparatus

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.

Description	Model
Pin Hole Dispersion Apparatus.	HM-3930

## Slake Durability Apparatus

The Slake Durability Apparatus is used to determine the durability of rocks and the probable amount of deterioration of weak rocks, over a period of time, after simulated exposure to nature's continual wetting and drying cycles. The apparatus consists of a base-mounted motor drive unit with two mesh drums and two water tanks with quick-release drive assemblies. The drums rotate at a speed of 20 revolutions per minute. Options include two extra drums and tanks for running up to four tests simultaneously. Conforms to ASTM D-4644 standard.

Significant features include:

- Corrosion resistant mesh drums
- Ability to test two or four drums simultaneously
- Test speed accuracy of 20 revolutions per minute
- Quick and easy release of water tank assemblies

Description & Accessories	Model
Slake durability apparatus, 110vAC, 60Hz.	HM-4100
Wire mesh drums – set of two (2).	HM-4100.1
Wire mesh drums/water tanks assembly – set of two (2).	HM-4100.2