HM-2315

Volume Change Apparatus

Introduction:
The Humboldt Mfg. Co. Volume Change Apparatus consists of a two chamber, reversible piston assembly mounted onto an enclosure which contains the flow control valves and internal fluid lines. The apparatus uses two different methods for measuring the volume change. The standard 100 cc Volume Change Apparatus is designed to utilize either a standard LSCT or a Humboldt Digital Gauge for measuring the volume change.

The Volume Change Apparatus comprises a change over valve system, which provides an unlimited capacity by reversing the flow. Once again an LSCT and bracket or Digital Gauge must be used for measurement.

Installation:
Using 1/8 inch O/D tubing, attach a fluid line from the pressure system into the left hand side (when viewed from the front) of the Volume Change Apparatus (Figure 1). Note: The tubing is to connect into the same side as the Volume Change/Bypass control valve. Using the same sized tubing, run a line from the right hand side of the Volume Change Unit (i.e. from the Flow Up/Flow Down valve side) to the backpressure valve situated on the Triaxial Cell base pedestal.

To measure the volume change, you need to fit an LSCT with bracket or Digital Gauge to the top of the Volume Change Unit.

With the left hand valve set to VOLUME CHANGE position and the right hand valve set to FLOW UP position, slowly fill the top chamber with de-aired water with the top bleed valve open to release any entrapped air. Once the chamber is full and all the air has been bled, tighten the air release valve at the top of the chamber. To fill the bottom chamber repeat the above procedure with the two chamber assembly rotated 180 Deg. (i.e. upside down) and the Right Hand Valve to FLOW DOWN.

It is advisable to leave this apparatus for at least 8 hours with an internal pressure of 700 kPa (102 psi) so that any remaining trapped air can be absorbed into the water. It is then necessary to flush out the Volume Change unit with fresh de-aired water. It may be necessary to carry out this procedure more than once if there are any signs of air pockets in the system.

The Humboldt 100 ml Volume Change Apparatus can be used with a 25 mm LSCT and bracket, or can be purchased complete with a Digital Gauge. These units are usually supplied to connect to an existing laboratory set up where there are sufficient change over valves and panels within the pressure system to enable the reverse flow. Sometimes these units are used directly in the pressure line by connecting the upper chamber to the base of the Triaxial Cell and the lower chamber receives the de-aired water. In such case, it is necessary to apply a pressure to the top of the chamber after each test to reverse the flow. This pressure could be taken from the cell pressure line. Calibration and de-airing etc. is carried out as mentioned earlier.

Volume Change Measurement & Bypass
In order to measure the volume change, the left hand valve of the Volume Change Apparatus must be set to VOLUME CHANGE position and the right hand valve must be set to FLOW UP position or FLOW DOWN position.

During a test, water fills one of the chambers, while the other chamber is opened and water drains out. As one chamber is filling and the other draining, the piston will move inside the cylinder and the lever arm will move up or down depending on which chamber is filling. The lever arm acts on the LSCT or Digital Gauge which indicates the distance the piston has moved. This information is then converted by the computer to volume change. During the test, if the capacity of the sample exceeds the volume in one of the chambers, it may be necessary to increase the volume change capacity. This is done by reversing the flow direction. The flow direction is changed by switching the FLOW UP/FLOW DOWN valve to the opposite direction. Note: When using the reverse flow for greater capacity during a test, certain precautions should be carried out when calibrating the apparatus (see calibration instructions).

By setting both valves to the BYPASS position, de-aired water can flow through the change over valves system direct to the Triaxial cell. Volume is not measured when the valves are in the Bypass position.

Calibration:
Switch on the power supply to the logger or monitoring readout unit with the LSCT or Digital Gauge connected to it for at least one hour before attempting calibration. Note: Some older monitors or loggers require a longer warm up period. Please refer to your logger or read out unit guide.

With the probe of the transducer or Digital Gauge set to its maximum downward position, set the monitor or logger to zero (if using a Digital Gauge, set it to zero also). Note: The probe must still be in contact with the lever arm.

Adjust the right hand valve to the FLOW UP position until the maximum upward movement has been achieved. Accurately measure the amount of water flowing out with a measuring cylinder.

Alternatively you could work out the volume change by weighing the volume of water displaced from the draining chamber. Weigh a beaker or other suitable container with which to collect the water. Collect the water displaced when one chamber is filled and the other drained. Weigh the beaker again with the water displaced after the maximum upward movement has been achieved. Subtract the empty container weight from the weight of the container and displaced water. If the weight is measured in grams, this number will be the same as the volume in millilitres or cubic centimetres.

Once the volume has been determined, the Digital Gauge should be set to show the volume displaced and the logger or monitor should be adjusted to the same volume.

This procedure should be carried out at least three times or until an acceptable agreement between the measured volumes and the digital displays are achieved.

Note: You should only attempt to calibrate in one direction.

Where more than 100cc of volume change occurs, you will need to reverse the flow. You must therefore check the reverse displacement against the calibrated readings. If necessary you may need to use a correction factor to overcome any small hysteresis.

Warranty

Humboldt Mfg. Co. warrants its products to be free from defects in material or workmanship. The exclusive remedy for this warranty is Humboldt Mfg. Co., factory replacement of any part or parts of such product, for the warranty of this product please refer to Humboldt Mfg. Co. catalog on Terms and Conditions of Sale. The purchaser is responsible for the transportation charges. Humboldt Mfg. Co. shall not be responsible under this warranty if the goods have been improperly maintained, installed, operated or the goods have been altered or modified so as to adversely affect the operation, use performance or durability or so as to change their intended use. The Humboldt Mfg. Co. liability under the warranty contained in this clause is limited to the repair or replacement of defective goods and making good, defective workmanship.

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Triaxial Testing Equipment

Testing Equipment For Construction Materials

HUMBOLDT

Testing Equipment For Construction Materials

HUMBOLDT

www.humboldtmfg.com
1.800.544.7220

Humboldt Triaxial Testing Systems

Humboldt provides an extensive line of triaxial testing equipment solutions for use in today's soil labs. These solutions begin with the choice of a pressure control system. Humboldt provides primarily four different pressure controllers.

Auto Hydraulic Pressure Control Triaxial System

This system features a hydraulic-powered system, which provides the option for high-pressure of up to 500psi (3500kPa), as well as the standard pressure of 150psi (1034kPA). These controllers consist of hydraulic pistons, driven by low-friction stepper motors, managed through a closed-loop feedback system with built-in data acquisition and a 7" touch-screen color control panel.

Auto Pneumatic Pressure Control Triaxial System

This system features a pneumatic-powered system, which provides the standard pressure of 150psi (1034kPA). It is a fully-automated pneumatic pressure controller, which is highly accurate up to 150psi (1000kpa) in pressure and 100cc (100ml) in volume.

Manual Pneumatic Pressure Control Triaxial System

This system features a pneumatic-powered system, which provides the standard pressure of 150psi (1034kPA). It is a manual-controlled pneumatic pressure controller, which is highly accurate up to 150psi (1000kpa) in pressure and 100cc (100ml) in volume.

FlexPanel Pressure Control Triaxial System

Humboldt's FlexPanel pressure control option eliminates the use of the air/water bladder interface concept of pressure control in lieu of its highly-accurate burette system. Humboldt FlexPanels provide an accurate and easy-to-operate solution for controlling compressed air, water, de-aired water and vacuum.

Auto Hydraulic Pressure Control Triaxial System

Humboldt's stand-alone, hydraulic-pressure controllers are designed to provide control of the triaxial testing function from a compact, small-footprint device. These hydraulic-pressure controllers eliminate the need for pneumatic/water bladder systems, and remove many of the problems inherent with these systems. The controllers consist of hydraulic pistons, driven by low-friction stepper motors, managed through a closed-loop feedback system with built-in data acquisition and a 7" touch-screen color control panel. The user-friendly, touch-screen panel provides pressure control with real-time pressure and volume change readings.

These hydraulic-pressure controllers are available in both high-pressure 500psi (3500kPa) and standard pressure 150psi (1034kpa) models. They provide a volume of 220mL/channel, and can maintain a desired pressure within 0.35 kPa (0.05 psi) while monitoring volume changes within 0.001 cc.

The HM-5820 and HM-5810 controllers provide a single, control unit to handle the saturation, consolidation and permeation of triaxial tests. In addition, The HM-5820 also provides an integral triaxial shear function for complete triaxial testing.

The HM-5250 provides the saturation and consolidation functions for triaxial tests, and pairs well with either the HM-5810 or HM-5820 for added cell setups, or it may be augmented with a simple control panel for permeability and an Elite-series load frame for the shear function.

Auto Pneumatic Pressure Control Triaxial System

Designed for those who want the ultimate in control of their triaxial testing, Humboldt's automated pressure control triaxial system is a computer-controlled system specifically designed for soil testing laboratories conducting UU, CU and CD Triaxial tests, as well as unconfined compression. It is perfect for large, high-volume labs, as well as those who want to utilize technology to increase staff efficiencies and testing accuracy. This system provides complete control of the testing process including data acquisition.

Available in one or three-cell configurations, our automated control panels can handle your testing needs in stride. And, if you want to increase the number of simultaneous tests you can run, Humboldt's NEXT software can easily handle a multitude of tests. All you need to do is add cells and the other appropriate equipment to handle your needs.

Humboldt's automated pneumatic pressure control triaxial system is built around the HM-5240.3F Stand-alone pressure controller. The HM-5240.3F is a fully-automated pneumatic pressure controller, which is highly accurate up to 150psi (1000kpa) in pressure and 100cc (100ml) in volume. It is designed specifically for geotechnical laboratory triaxial testing (UU, CU and CD) and provides control and monitoring of cell pressure, back pressure, pore water measurement and volume change when used with our Elite Series load frames.

The HM-5240 provides four (4) integral and independent data acquisition channels, which can be utilized in stand-alone configuration or accessed through a LAN-networked computer using Humboldt's NEXT software.

Hydraulic, Auto High-Pressure Control Triaxial System Components

Pneumatic, Auto Pressure Control Triaxial System Components

The unit is built with durable high-quality components and features the use of two electronic regulators to ensure smooth and reliable operation of pressures, as well as precise results.

In stand-alone mode, this pressure controller provides a 7" (178mm) touch-screen controller. This new waterproof, touch screen provides colorful, at-a-glance monitoring of testing functions without the use of a computer. Operator can see all the data in several formats at the controller while the test is running. This data can be viewed simultaneously or downloaded later to a computer in the lab, in the next room or at a different location, while also providing report generation capabilities from within Humboldt's NEXT software or our enhanced test-specific modules. The system can also be configured for use with our triaxial-specific load frame, the HM-5020.3F. While Humboldt's automated pressure control triaxial system has been designed to work as a complete system, its make-up provides for the ultimate in versatility and expanded possibilities.

Manual Pneumatic Pressure Control Triaxial System

Humboldt's manual pressure control triaxial system provides a manually-controlled alternative to our automated system. The manual system eliminates the HM-5240.3F pressure controller from the system and replaces its function with a control panel that allows for manual control of the confining and back pressures. The HM-2315 Volume Change Apparatus, which measures the volume change of a soil sample by monitoring the flow of water through the chamber of the unit. The lower assembly contains changeover valves, which when used in conjunction with the upper assembly provides limitless capacity. It is accurate to better than ±0.05 ml and is easily de-aired in seconds.

Like the automated system, our manually-controlled system can run UU, CU and CD triaxial tests, as well as unconfined compression. Manual control panels are available in one or three-cell configurations and can be used in multiple configurations. All you need to do is add cells and the other appropriate equipment to handle your needs.

Humboldt's manual pressure control triaxial system is built around our NEXT software and our enhanced test-specific modules, which monitors, controls and reports test data, and, the highly-regarded HM-5030 load frame with its built-in, 4-channel data acquisition controller for stress, strain, pore water pressure and volume change measurement. The system can also be configured for use with our triaxial-specific load frame, the HM-5020. While Humboldt's manual pressure control triaxial system has been designed to work as a complete system, its make-up provides for the ultimate in versatility and expanded possibilities.

FlexPanel Pressure Control Triaxial System

Humboldt's FlexPanel pressure control option eliminates the use of the air/water bladder interface concept of pressure control in lieu of its highly-accurate burette system. Humboldt FlexPanels provide an accurate and easy-to-operate solution for controlling compressed air, water, de-aired water and vacuum without the need for air/water bladder interfaces to produce the pressures necessary for triaxial testing.

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

This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow for the control of the cell pressure and the back pressure for each cell. They can monitor volume change in the sample and can be used to measure the flow of water through the sample for permeability testing. This is a benefit to using FlexPanels over the air/water bladder system.

Like our other control systems you can run UU, CU and CD triaxial tests with FlexPanels. They are available in one or three-cell configurations and can be used in multiple configurations. All you need to do is add cells and the other appropriate equipment to handle your needs. Humboldt's FlexPanel pressure control system also uses our NEXT software and our enhanced test-specific modules, which monitors, controls and reports test data, and, the highly-regarded HM-5030 load frame with its built-in, 4-channel data acquisition controller for stress, strain, pore water pressure and volume change measurement. The system can also be configured for use with our triaxial-specific load frame, the HM-5020

Pneumatic, Manual Pressure Control Triaxial System Components

FlexPanel, Pressure Control Triaxial System Components

TRIAXIAL SYSTEMS

Hydraulic Pressure Controllers

HM-5820-500.3F

HM-5810-500.3F

Humboldt's stand-alone, hydraulic-pressure controllers are designed to provide control of the triaxial testing function from a compact, small-footprint device. These hydraulic-pressure controllers eliminate the need for pneumatic/water bladder systems, removing many of the problems inherent with these systems. The controllers consist of hydraulic pistons, driven by low-friction stepper motors, managed through a closed-loop feedback system with built-in data acquisition and a 7" touch-screen color control panel. The user-friendly, touch-screen panel provides pressure control with real-time pressure readings and the volume change. These hydraulic-pressure controllers can be used for high-pressure applications up to 500psi (3500kPa) and a volume of 220mL/channel. They can maintain a desired pressure within 0.35 kPa (0.05 psi) while monitoring volume changes within 0.001 cc.

The HM-5820 and HM-5810 controllers provide a single, control unit to handle the saturation, consolidation and permeation of triaxial tests. In addition, The HM-5820 also provides an integral triaxial shear function for complete triaxial testing. The HM-5250 provides the saturation and consolidation functions for triaxial tests, and works well with either the HM-5810 or HM-5820 for added flexibility. It may also be augmented with a simple control panel for permeability and an Elite-series load frame for the shear function.

Automated, Triax-Control Pressure Controller

ASTM D2850, D2166, D4767, D5084; AASHTO T296, T297, T208

The Auto Triax-Control Pressure Controller (HM-5820) is an automated, hydraulic pressure/volume controller designed to handle saturation, consolidation of a triaxial test sample, as well as permeability tests. It can also perform the triaxial shear function with the use of its integral HM-5020 load frame eliminating the need for a stand-alone load frame. It is available in two configurations; one for high-pressure applications: 0-500psi (3500kpa), and a standard pressure model for 0-150psi (1034kpa) applications.

The HM-5820 provides an accurate and compact configuration for performing triaxial and permeability tests without the need for separate distribution panels, while simplifying the tubing and control cable setup. And, with its integral load frame, the HM-5820 provides an extremely compact and organized setup.

The HM-5820 provides four (4) analog input channels (24-bit) for measuring pressures and load, one (1) analog input channel (12-bit) for measuring displacement and three (3) digital encoder inputs for measuring volumes.

The HM-5820 is built around Humboldt's integral, data logger with its touch-screen control, allowing the HM-5820 to be used as a stand-alone device, capable of full test control and data logging. It can also be controlled by a networked computer at any location with access to the network.

HM-5820 Specifications	
Max. hydraulic pressure	0-500psi (3500kpa) 0-150psi (1034kpa)
Volumetric capacity	250mL/channel
Load capacity	3000 lbf (15kN)
Voltage/Current	110/220V 50/60Hz 16.0 amps
Dimensions (L x D x H)	38" x 15" x 45.5" (970 x 385 x 1160 mm)

Triax Pressure Controller, 500psi HM-5820-500.3F
Triax Pressure Controller, 150psi HM-5820-150.3F

Shipping wt. 275 lb (124.7kg)

Automated, Hydro-Control Pressure Controller

ASTM D2850, D2166, D4767, D7181, D5084; AASHTO T296, T297, T208

The HM-5810.3F is an automated, hydraulic pressure/volume controller designed to handle saturation, consolidation of a triaxial test sample, as well as permeability tests. The HM-5810 provides an accurate and compact configuration for performing triaxial and permeability tests without the need for separate distribution panels, while simplifying the tubing and control cable setup.

It is available in two configurations; one for high-pressure applications: 0-500psi (3500kpa), and a standard pressure model for 0-150psi (1034kpa) applications. By using the integral staging platform for triaxial and permeability cells, the HM-5810 provides an extremely compact and organized setup for testing.

Tests Covered*:
UU – D2850 UC – D2166
CU – D4767 CD – D7181
Permeability – D5084**

*Shear function with HM-5810 and HM-5250 require an Elite-series load frame like the HM-5020.
** HM-5250 does not do permeability.

HM-5250-500.3F

Specifications	HM-5820	HM-5810	HM-5250
Max. hydraulic Pressure	HM-5820-500.3F: 0-500psi (3500kpa) HM-5820-150.3F: 0-150psi (1034kpa)	HM-5810-500.3F: 0-500psi (3500kpa) HM-5810-150.3F: 0-150psi (1034kpa)	HM-5250-500.3F: 0-500psi (3500kpa) HM-5250-150.3F: 0-150psi (1034kpa)
Volumetric capacity	250mL / channel	250mL / channel	250mL / channel
Voltage/Current	110/220V 50/60Hz 16.0 amps	110/220V 50/60Hz 16.0 amps	110/220V 50/60Hz 16.0 amps
Dimensions	38" x 15" x 45.5" (970 x 385 x 1160 mm)	38" x 15" x 20.5" (970 x 385 x 520 mm)	13" x 11.5" x 22" (330 x 292 x 559 mm)
Load capacity	3000 lbf (15kN)	—	—
Display (Resistive Touch)	7" (178mm) VGA (480 x 800)	7" (178mm) VGA (480 x 800)	7" (178mm) VGA (480 x 800)
Real-time test data	Graphic and tabulation	Graphic and tabulation	Graphic and tabulation
Processor	Dual 32-bit ARM	Dual 32-bit ARM	Dual 32-bit ARM
RAM	64MB	64MB	64MB
Memory, non-volatile	4GB	4GB	4GB
Analog to digital converter	24 bit	24 bit	24 bit
Logging speed	up to 50 readings per second	up to 50 readings per second	up to 50 readings per second
Multi-test storage	1000	1000	1000
Points per test	3000	3000	3000
USB port (front)	export data, import/export calibration data	export data, import/export calibration data	export data, import/export calibration data
USB port (back)	provides external power for wireless access point	provides external power for wireless access point	provides external power for wireless access point
Ethernet connection	for network connectivity	for network connectivity	for network connectivity
24-bit differential analog-to-digital converter	4 1 (12-bit)	3	2
Data Acquisition Channels	8	6	4
Ambient temp. sensor	1	1	1
Firmware Update	flash drive	flash drive	flash drive

To perform the shear phase of a triaxial test, you will need to add an elite-series load frame.
The HM-5810 provides three (3) analog input channels (24-bit) for measuring pressures and three (3) encoder inputs for measuring volumes.

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

HM-5810 Specifications	
Max. hydraulic pressure	0-500psi (3500kpa) 0-150psi (1034kpa)
Volumetric capacity	250mL/channel
Voltage/Current	110/220V 50/60Hz 16.0 amps
Dimensions (L x D x H)	38" x 15" x 20.5" (970 x 385 x 520 mm)

Hydro Pressure Controller, 500psi HM-5810-500.3F
Hydro Pressure Controller, 150psi HM-5810-150.3F
Shipping wt. 168 lb (76kg)

Hydraulic Pressure Controller
ASTM D2850, D2166, D4767, D7181; AASHTO T296, T297, T208

The HM-5250.3F is a fully-automated hydraulic pressure controller, which is highly accurate up to 500psi (3500kpa) in pressure and 250ml in volume. It is designed specifically for geotechnical laboratory triaxial testing (UU, UC, CU and CD) and provides control and monitoring of cell pressure, back pressure, pore water measurement and volume change when used with our Elite-series load frames.

It is available in two configurations; one for high-pressure applications: 0-500psi (3500kpa), and a standard pressure model for 0-150psi (1034kpa) applications.

The HM-5250 provides two (2) analog input channels (24-bit) for measuring pressures and two (2) encoder inputs for measuring volumes.

In stand-alone mode, this pressure controller provides a 7" (178mm) touch-screen controller. This waterproof, touch screen provides colorful, at-a-glance monitoring of testing functions without the use of a computer. Operator can see all the data in several formats at the controller while the test is running. The test data can be viewed simultaneously or downloaded later to a computer in the lab, in the next room or at a different location, while also providing report generation capabilities from within Humboldt's NEXT software or our enhanced test-specific modules.

HM-5250 Specifications	
Max. hydraulic pressure	0-500psi (3500kpa) 0-150psi (1034kpa)
Volumetric capacity	250mL/channel
Voltage/Current	110/220V 50/60Hz 16.0 amps
Dimensions (L x D x H)	13" x 11.5" x 22" (330 x 292 x 559 mm)

Pressure Controller, 500psi HM-5250-500.3F
Pressure Controller, 150psi HM-5250-150.3F
Shipping wt. 75 lb (34kg)

Hydraulic Auto Pressure Control

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

Hydraulic Auto Pressure Control System, 1-Cell, Setup

Components		
Pressure/Volume Change		
(choose 1) Triax-Pressure Controller (500psi) Triax-Pressure Controller (150psi)	HM-5820-500.3F HM-5820-150.3F	1
De-airing System	HM-4187A.3F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Load Frame		
15kN (3372 lbf) capacity	integral	1
Load/Strain		
Load Cell, Pancake (included)	HM-2300.020CP	1
Linear Potentiometer Transducer, 2.0" (50mm)	HM-2305.20	1
Ball Seat Adapter (included)	HM-200387	1
LP Transducer Bracket (included)	HM-2305BR	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Triaxial Cell		
(choose 1) High-Pressure 500psi (3500kPa) 3"/ 75mm dia. capacity 4"/ 100mm dia. capacity Std.-Pressure 150psi (1034kPa) 3"/ 75mm dia. capacity	HM-4699B HM-4699B-4 HM-4199B	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

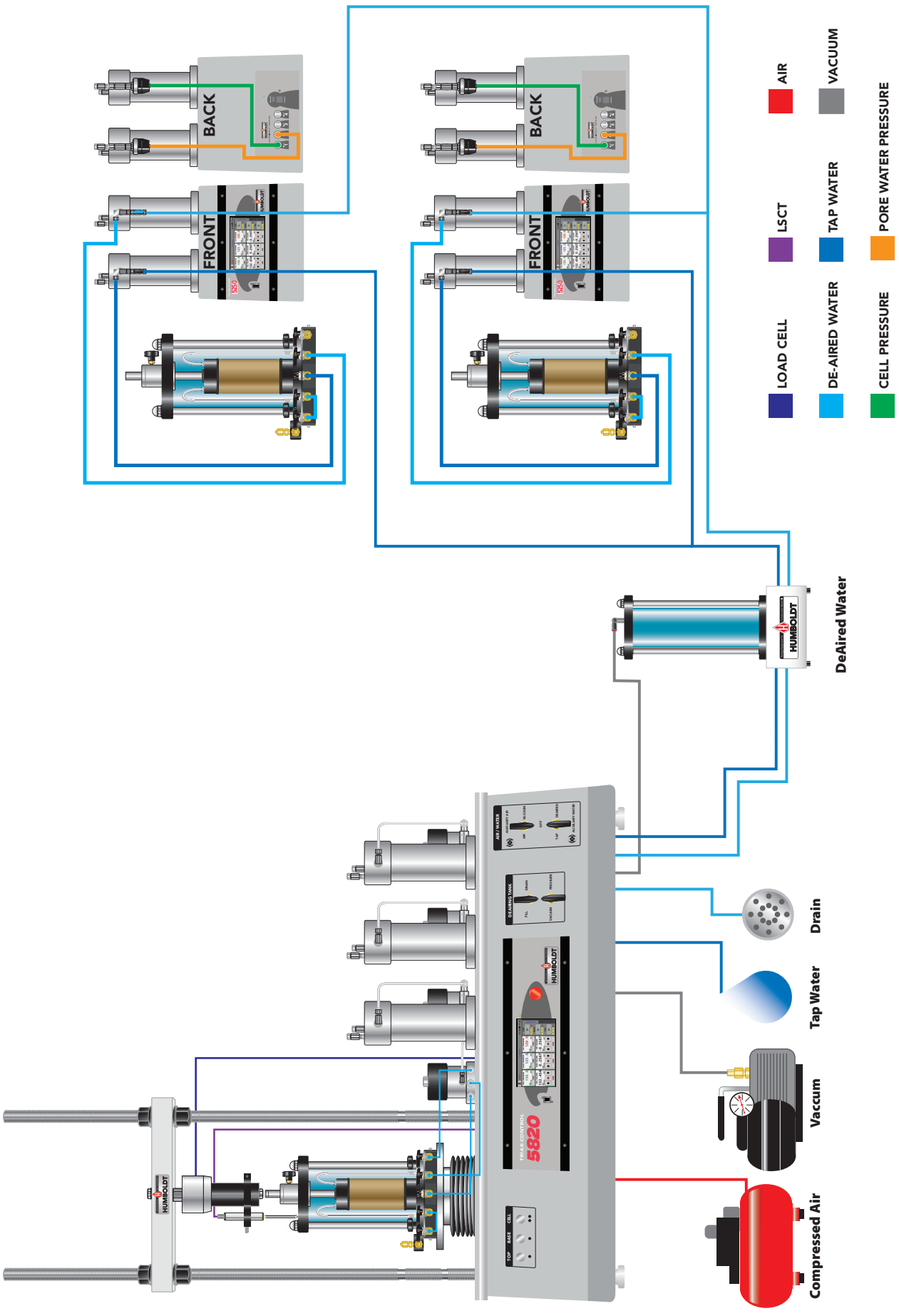
Hydraulic Auto Pressure Control System, 3-Cell, Setup

Components		
Pressure/Volume Change		
(choose 1) Triax-Pressure Controller (500psi) Triax-Pressure Controller (150psi)	HM-5820-500.3F HM-5820-150.3F	1
(choose 1) Hydraulic Pressure Controller (500psi) Hydraulic Pressure Controller (150psi)	HM-5250-500.3F HM-5250-150.3F	2
De-airing System	HM-4187A.3F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Load Frame		
15kN (3372 lbf) capacity	integral	1
Load/Strain		
Load Cell, Pancake (included)	HM-2300.020CP	1
Linear Potentiometer Transducer, 2.0" (50mm)	HM-2305.20	1
Ball Seat Adapter (included)	HM-200387	1
LP Transducer Bracket (included)	HM-2305BR	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Triaxial Cell		
(Choose 3 of either style below) High-Pressure 500psi (3500kPa) 3"/ 75mm dia. capacity 4"/ 100mm dia. capacity Std.-Pressure 150psi (1034kPa) 3"/ 75mm dia. capacity	HM-4699B HM-4699B-4 HM-4199B	3
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

Triaxial Installation Kit— HM-4167
Kit designed to provide fittings, connectors, tubing and tools to complete a triaxial set up installation. See page 158 for kit contents and other individual set up items.

Standard Triaxial Sample Prep Accessories:
(See page 161-163 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3818.XX	1
Membranes	HM-4180.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
Membrane Stretcher	HM-4181.XX	1	Split Miter Box	HM-3847.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Strips	HM-4189FS	1
Porous Stone	HM-4184.XX	2 or 6	High Vacuum Grease	HM-4198	1
Membrane Tester	HM-4185.XX	1	Compaction Mold	HM-3820.XX	1



Hydraulic Auto Pressure Control System, 3-Cell Setup

TRIAXIAL SYSTEMS

Pneumatic Pressure Controllers

HM-4154

HM-4155

HM-5240.3F

HM-4151A

Humboldt's pneumatic pressure controller triaxial testing systems are designed to provide control of the triaxial testing function utilizing either automatic or manual-controlled distribution panels and pneumatic/water bladders. These pneumatic-powered systems provide an accurate and easy-to-operate solution for providing the controls necessary for distributing compressed air, water, de-aired water and vacuum within an air/water bladder-type triaxial testing system.

Humboldt's automated pressure control triaxial system is built around the HM-5240.3F Stand-alone pressure controller. This controller is highly accurate up to 150psi (1000kpa) in pressure and 100cc (100ml) in volume.

The manually-controlled system allows for manual control of the confining and back pressures. The HM-2315 Volume Change Apparatus, which measures the volume change of a soil sample by monitoring the flow of water through the chamber of the unit.

Both automatic and manual systems can handle the saturation, consolidation and permeation functions of triaxial tests. If shear function is also required, we recommend the HM-5020 Elite Series load frame.

Automated Control Panel

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

Used in conjunction with the HM-5240.3F pressure controller, Humboldt automated control panels provide an accurate and easy-to-operate solution for providing the controls necessary for distributing compressed air, water, de-aired water and vacuum within an air/water bladder-type triaxial testing system. The use of these control panels and the HM-5240.3F pressure controller allows changes in cell and back pressures required for sample saturation to be done automatically without the need for an operator. This feature reduces the need for continual monitoring of the sample saturation process during a triaxial test.

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

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

Specifications			
Pressure gauge	psi	BAR	Mpa
Max. input pressure	200	14	1.4
HM-4154 dimensions (L x W x H)	8" x 8" x 37.5" (203 x 203 x 952mm)		
HM-4155 dimensions (L x W x H)	8" x 19.5" x 37.5" (203 x 495 x 952)		

Automated Panel, 1 Cell **HM-4154**

Shipping wt. 45lb (20.4kg)

Automated Panel, 3 Cell **HM-4155**

Shipping wt. 60lb (27.2kg)

Pneumatic Pressure Controller, 150psi (1000kpa)

The HM-5240.3F is a fully-automated pneumatic pressure controller, which is highly accurate up to 150psi (1000kpa) in pressure and 100cc (100ml) volume in any one direction. It is designed specifically for geotechnical laboratory triaxial testing (UU, CU and CD) and provides control and monitoring of cell pressure, back pressure, pore water measurement and volume change when used with our Elite Series load frames.

The HM-5240 provides four (4) integral and independent data acquisition channels, which can be utilized in stand-alone configuration or accessed through a LAN-networked computer using Humboldt's NEXT software. The unit is built with durable high-quality components and features the use of two electronic regulators to ensure smooth and

HM-4164.3F

HM-4165.3F

HM-2315 Shown with
HM-2310.10 Transcducer
and HM-2310BR Bracket

HM-4151A

reliable operation of pressures, as well as precise results.

In stand-alone mode, this pressure controller provides a 7" (178mm) touch-screen controller. This new waterproof, touch screen provides colorful, at-a-glance monitoring of testing functions without the use of a computer. Operator could see all the data in several formats at the controller while the test is running. Then can be viewed simultaneously or downloaded later to a computer in the lab, in the next room or at a different location, while also providing report generation capabilities from within Humboldt's NEXT software or our enhanced test- specific modules.

Specifications	
Maximum Pressure	150psi (1000kpa)
Volume Capacity	100cc (100ml) in any one direction
Voltage	110-220V 50/60Hz - 5.0 amps
Dimension (L x W x H)	13" x 11.5" x 22" (330 x 292 x 559mm)

Pressure Controller **HM-5240.3F**

Shipping wt. 40 lb (18.1kg)

Tests Covered:
UU – D2850 CU – D4767
CD – D7181

For typical parts lists and setup drawings of both 1 and 3 cell setups see next page:

Manual Control Panel

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

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

The use of these control panels provides the necessary control for making changes in cell and back pressures required for sample saturation to be done from a central location on the panel. The operator has complete control of system pressure during the triaxial test with three independently-controlled pressure regulators. These control panels have a bias pressure regulator feature, which allows simultaneous control of confining and back pressures, while maintaining a constant differential pressure. Humboldt manual control panels feature an analog input pressure gauge and controller, an air/water filter for the input pressure and de-aired water tank input, a digital pressure readout for each set of cell functions, as well as quick-disconnects for quickly connecting bladders, the pressure controller and triaxial cells.

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

Specifications			
Pressure gauge	psi	BAR	Mpa
Max. input pressure	200	14	1.4
Max. output pressure	150	10	1
Pressure resolution	0.1	0.01	0.001
HM-4164 dimensions (L x W x H)	8" x 8" x 37.5" (203 x 203 x 952mm)		
HM-4165 dimensions (L x W x H)	8" x 19.5" x 37.5" (203 x 495 x 952)		

Manual Panel, psi, 1 Cell, 120/220V 50/60Hz **HM-4164.3F**

Shipping wt. 45lb (20.4kg)

Manual Panel, kPa, 1 Cell, 120/220V 50/60Hz **HM-4164M.3F**

Shipping wt. 45lb (20.4kg)

Manual Panel, psi, 3 Cell, 120/220V 50/60Hz **HM-4165.3F**

Shipping wt. 60lb (27.2kg)

Manual Panel kPa, 3 Cell, 120/220V 50/60Hz **HM-4165M.3F**

Shipping wt. 60lb (27.2kg)

Volume Change Apparatus, Automatic

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

Volume Change Apparatus **HM-2315**

Shipping wt. 22 lb (9.9kg)

Pneumatic Auto Pressure Control

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

Automatic Pressure Control System,1-Cell Setup

Components		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-5030.3F	1
15kN (3372 lbf) capacity	HM-5020.3F	1
100kN (22480 lbf) capacity	HM-5040.3F	1
Load/Strain		
Load Cell	HM-2300.020CP	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Pressure/Volume Change		
Pressure Distribution Panel	HM-4154	1
Air/Water Bladder	HM-4151A	2
Pressure/Volume Controller	HM-5240.3F	1
De-airing System	HM-4187A.3F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Triaxial Cell		
3"/ 75mm dia. capacity	HM-4199B	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

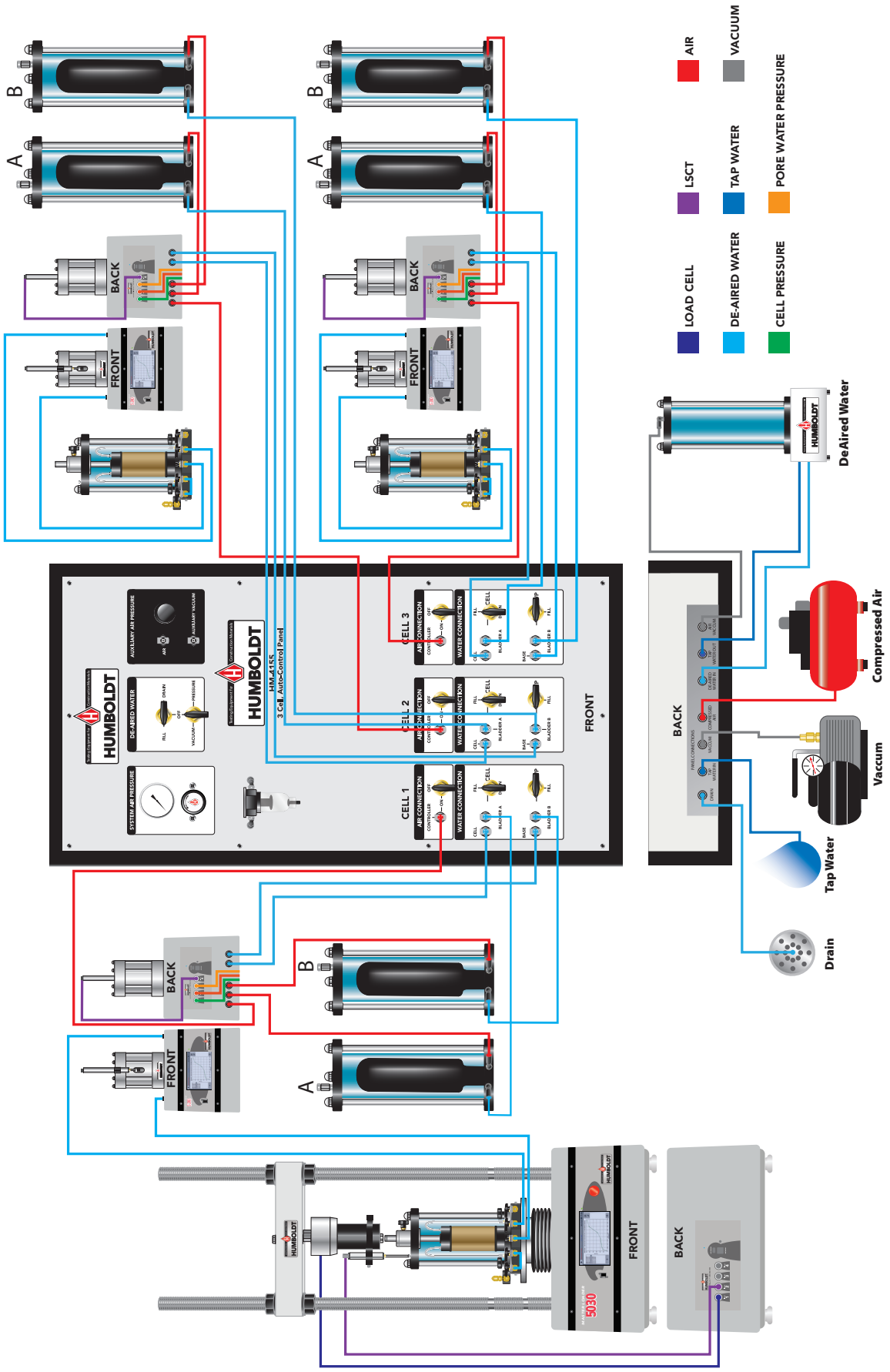
Automatic Pressure Control System, 3-Cell Setup

Components		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-5030.3F	1
15kN (3372 lbf) capacity	HM-5020.3F	1
100kN (22480 lbf) capacity	HM-5040.3F	1
Load/Strain		
Load Cell	HM-2300.020CP	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Pressure/Volume Change		
Pressure Distribution Panel	HM-4155	1
Air/Water Bladder	HM-4151A	6
Pressure/Volume Controller	HM-5240.3F	3
De-airing System	HM-4187A.3F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Triaxial Cell		
3"/ 75mm dia. capacity	HM-4199B	3
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

Triaxial Installation Kit— HM-4167
Kit designed to provide fittings, connectors, tubing and tools to complete a triaxial set up installation. See page 158 for kit contents and other individual set up items.

Standard Triaxial Sample Prep Accessories:
(See page 161-163 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3818.XX	1
Membranes	HM-4180.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
Membrane Stretcher	HM-4181.XX	1	Split Miter Box	HM-3847.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Strips	HM-4189FS	1
Porous Stone	HM-4184.XX	2 or 6	High Vacuum Grease	HM-4198	1
Membrane Tester	HM-4185.XX	1	Compaction Mold	HM-3820.XX	1



Pneumatic Auto Pressure Control System, 3-Cell Setup

Pneumatic Manual Pressure Control

Component List for 1 and 3-Cell Triaxial System with Manual air/water bladder Pressure Control

Manual Pressure Control System,1-Cell Setup

Components		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-5030.3F	1
15kN (3372 lbf) capacity	HM-5020.3F	1
100kN (22480 lbf) capacity	HM-5040.3F	1
Load/Strain/Pore Pressure		
Load Cell	HM-2300.020CP	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Pressure		
Pressure Distribution Panel	HM-4164.3F	1
Air/Water Bladder	HM-4151A	2
De-airing System	HM-4187A.3F	1
Pore Pressure Transducer	HM-4170	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CU & CD Triaxial)	HM-2315	1
Strain Transducer, 1" (25mm)	HM-2310.10	1
LSCT/LVDT Mounting Bracket	HM-2310BR	1
Triaxial Cell		
3"/ 75mm dia. capacity	HM-4199B	1
Top Cap/ Base Pedestal Set (Specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

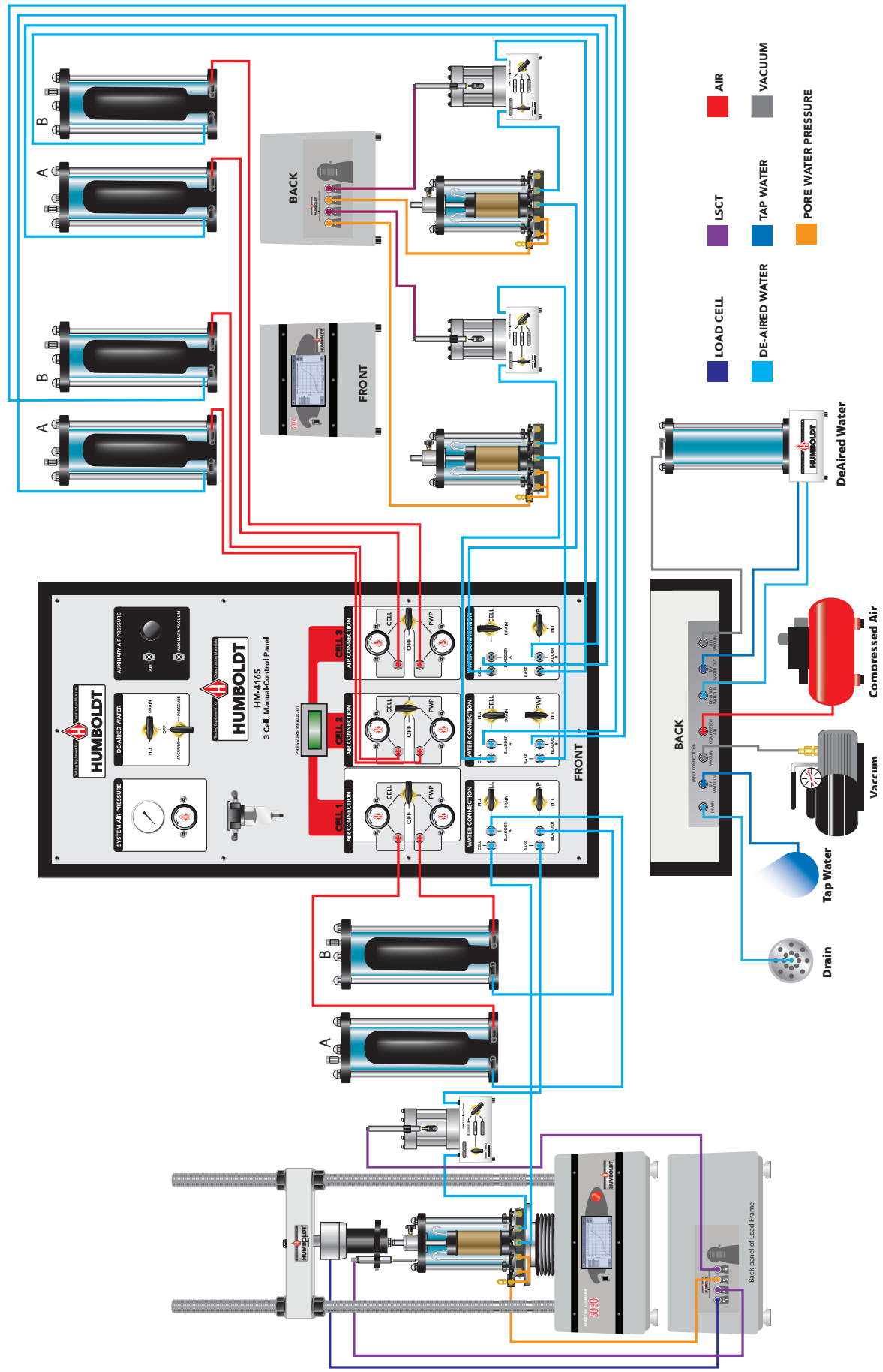
Manual Pressure Control System, 3-Cell Setup

Components		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-5030.3F	1
15kN (3372 lbf) capacity	HM-5020.3F	1
100kN (22480 lbf) capacity	HM-5040.3F	1
Load/Strain/Pore Pressure		
Load Cell	HM-2300.020CP	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Humboldt Logger	HM-5320.3F	1
Pressure		
Pressure Distribution Panel	HM-4165.3F	1
Air/Water Bladder	HM-4151A	6
De-airing System	HM-4187A.3F	1
Pore Pressure Transducer	HM-4170	3
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CU & CD Triaxial)	HM-2315	3
Strain Transducer, 1" (25mm)	HM-2310.10	3
LSCT/LVDT Mounting Bracket	HM-2310BR	3
Triaxial Cell		
3"/ 75mm dia. capacity	HM-4199B	3
Top Cap/ Base Pedestal Set (Specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

Triaxial Installation Kit— HM-4167
Kit designed to provide fittings, connectors, tubing and tools to complete a triaxial set up installation. See page 158 for kit contents and other individual set up items.

Standard Triaxial Sample Prep Accessories:
(See page 161-163 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3818.XX	1
Membranes	HM-4180.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
Membrane Stretcher	HM-4181.XX	1	Split Miter Box	HM-3847.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Strips	HM-4189FS	1
Porous Stone	HM-4184.XX	2 or 6	High Vacuum Grease	HM-4198	1
Membrane Tester	HM-4185.XX	1	Compaction Mold	HM-3820.XX	1



Pneumatic Manual Pressure Control System, 3-Cell Setup

TRIAXIAL SYSTEMS

FlexPanel Pressure Controllers

HM-4140.3F

HM-4150.3F

HM-4160.3F

Humboldt FlexPanels

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

Humboldt FlexPanels

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

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

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

Fast and Easy Setup and Operation

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

All inlets and outlets utilize quick-connects to ensure fast, accurate setup to permeameter cells, as well as air, water and drain hook ups. Fittings, tubing and connectors are supplied with each unit. All FlexPanels are designed to handle air pressures up to 150 psi.

Humboldt FlexPanels Features:

Humboldt FlexPanels are constructed of lightweight aluminum for long, rust-free life. FlexPanels provide an accurate and easy-to-operate solution for controlling compressed air, water, de-aired water and vacuum without the need for air/water bladder interfaces to produce the pressures necessary for triaxial testing. FlexPanels utilize a set of three burettes to control cell, top cap and base pedestal pressures. This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow for the control of the cell pressure and the back pressure for each cell. They can monitor volume change in the sample and can be used to measure the flow of water through the sample.

FlexPanels can manually measure volume change in a triaxial test sample without the use of a volume change apparatus, a distinct benefit when compared to air/water bladder systems. However if you need to do data acquisition a volume change apparatus would then be required.

- Bias pressure regulator allows simultaneous control of confining and back pressures, while maintaining a constant differential.
- Longer burette and 0.02ml graduation give more accurate results, better productivity, and faster turnaround.
- Uses no-volume-change valves
- Bridge feature delivers simultaneous control of base and top pressures by adjusting one pressure regulator simplifying testing.

HM-4150A

HM-4160A

Rear of panel showing quick-connect hookups and plumbing.

HM-2315 Volume Change Apparatus Shown with HM-2310.10 Transducer and HM-2310BR Bracket. This is only required if you are doing data acquisition. See page 139 for info.

- Quick-connect hookups for fast and reliable set up.
- Master control panel houses digital pressure readout for the controlling pressure, inlet pressure regulators and gauge, de-aired water tank controls, tap and de-aired water supply outlets, and pressure and vacuum outlets.

Control Panels

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

Control Panel (psi), 120/220V 50/60Hz HM-4140.3F
Shipping wt. 35 lb (16kg)

Control Panel (kPa), 120/220V 50/60Hz HM-4140M.3F
Shipping wt. 50 lb (22.6kg)

Control, 1-Cell (psi), 120/220V 50/60Hz HM-4150.3F
Shipping wt. 98 lb (44.5kg)

Control, 1-Cell (kPa), 120/220V 50/60Hz HM-4150M.3F
Shipping wt. 98 lb (44.5kg)

Control, 2-Cell (psi), 120/220V 50/60Hz HM-4160.3F
Shipping wt. 175 lb (79.3kg)

Control, 2-Cell (kPa), 120/220V 50/60Hz HM-4160M.3F
Shipping wt. 125 lb (56kg)

Auxiliary Panels

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

Auxiliary Panel, 1-Cell HM-4150A
Shipping wt. 77 lb (34.9kg)

Auxiliary Panel, 2-Cell HM-4160A
Shipping wt. 275 lb (124.7kg)

! For typical parts lists and setup drawings of both 1 and 3 cell setups see next page.

	HM-4140.3F	HM-4140M.3F	HM-4150.3F	HM-4150M.3F	HM-4160.3F	HM-4160M.3F	HM-4150A	HM-4160A
Pressure/ Resolution	2-150 psi (0.1 psi)	14-1000 kPa (1 kPa)	2-150 psi (0.1 psi)	14-1000 kPa (1 kPa)	2-150 psi (0.1 psi)	14-1000 kPa (1 kPa)	Not Applicable	
Vacuum	0-14.7 psi or 30 Hg	(0-100kPa) or 30 Hg	0-14.7 psi or 30 Hg	(0-100kPa) or 30 Hg	0-14.7 psi or 30 Hg	(0-100kPa) or 30 Hg		
Inner Burette								
Cell	Not Applicable		50cc x 0.1cc (ml)					
Top	Not Applicable		10cc x 0.02cc (ml)					
Base	Not Applicable		10cc x 0.02cc (ml)					
Outer Burette								
Cell	Not Applicable		400 cc (ml)					
Top	Not Applicable		460 cc (ml)					
Base	Not Applicable		460 cc (ml)					
Voltage	110/220VAC 50/60Hz						Not Applicable	
Power	6 watts							
Operating Temperature	14 to 158°F (-10 to 70°C)							
Dimensions	8 x 8 x 37.5" (203 x 203 x 952mm)		8 x 25.5 x 37.5" (203 x 648 x 952mm)		8 x 43.5 x 37.5" (203 x 1105 x 952mm)		8 x 19.5 x 37.5" (203 x 495 x 952)	8 x 37.5 x 37.5" (203 x 952 x 952)
Shipping Weight	35lb (16kg)		95lb (43kg)		145lb (66kg)		77lb (35kg)	133lb (60kg)

FlexPanel Pressure Control

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

FlexPanel Pressure Control System,1-Cell Setup

Components		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-5030.3F	1
15kN (3372 lbf) capacity	HM-5020.3F	1
100kN (22480 lbf) capacity	HM-5040.3F	1
Load/Strain/Pore Pressure		
Load Cell	HM-2300.020CP	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Pressure		
Pressure Distribution Panel	HM-4150.3F	1
De-airing System	HM-4187A.3F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CD Triaxial)	HM-2315	1
Strain Transducer, 1" (25mm)	HM-2310.10	1
LSCT/LVDT Mounting Bracket	HM-2310BR	1
Triaxial Cell		
3"/ 75mm dia. capacity	HM-4199B	1
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	1
Installation Kit	HM-4167	1

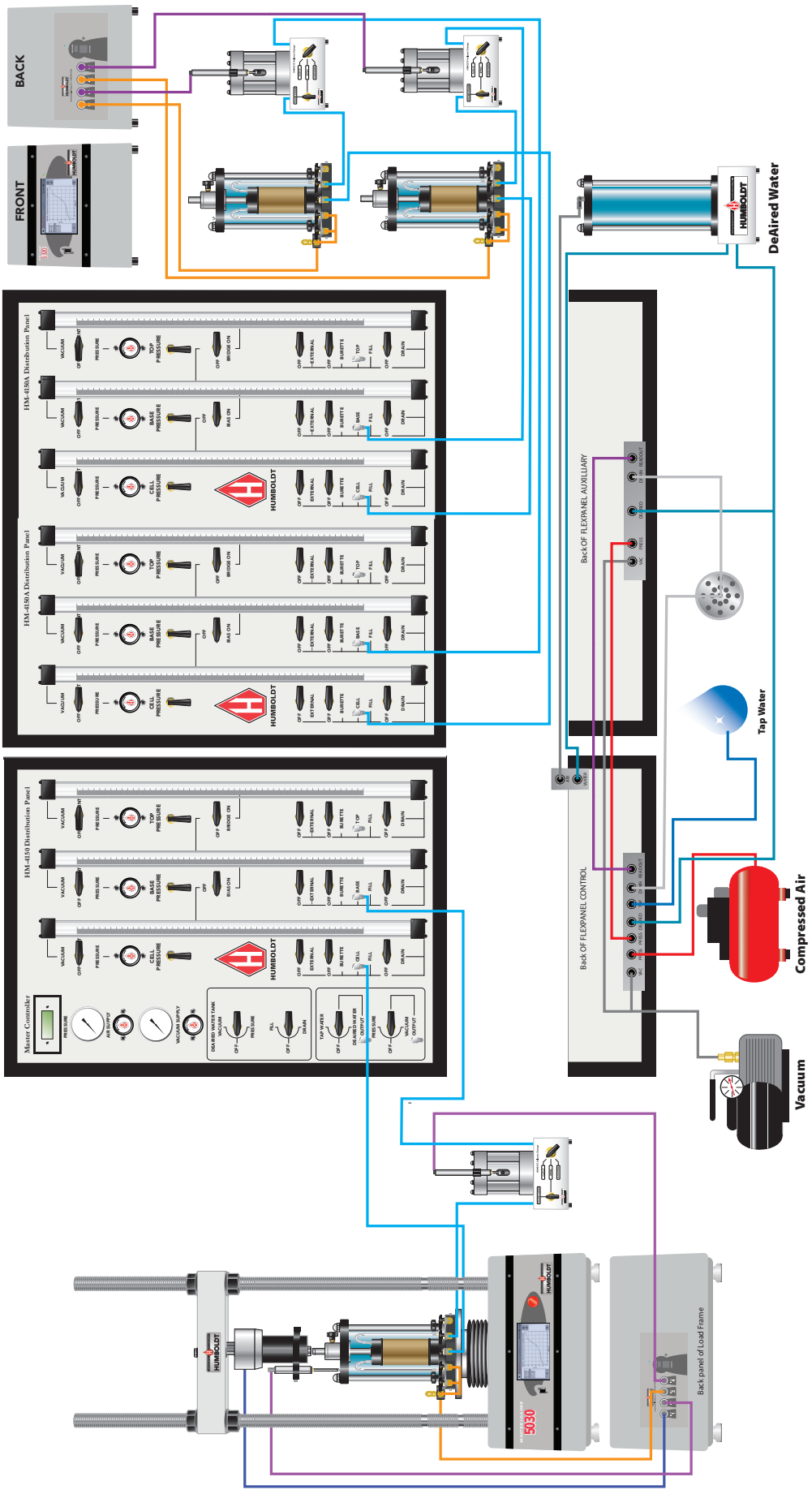
FlexPanel Pressure Control System, 3-Cell Setup

Components		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-5030.3F	1
15kN (3372 lbf) capacity	HM-5020.3F	1
100kN (22480 lbf) capacity	HM-5040.3F	1
Load/Strain/Pore Pressure		
Load Cell	HM-2300.020CP	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	3
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-5002SW	1
CU Triaxial Software Module	HM-5003SW	1
CD Triaxial Software Module	HM-5006SW	1
Humboldt Logger	HM-5320.3F	1
Pressure		
Pressure Distribution Panel	HM-4150.3F	1
Pressure Distribution Panel	HM-4160A	1
De-airing System	HM-4187A.3F	1
Silent Air Compressor	HM-4220 or HM.4220.4F	1
Vacuum Pump	H-1763A or H-1763A.4F	1
Volume Change		
Volume Change Apparatus (Required for CD Triaxial)	HM-2315	3
Strain Transducer, 1" (25mm)	HM-2310.10	3
LSCT/LVDT Mounting Bracket	HM-2310BR	3
Triaxial Cell		
3"/ 75mm dia. capacity	HM-4199B	3
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX	3
Installation Kit	HM-4167	1

Triaxial Installation Kit— HM-4167
Kit designed to provide fittings, connectors, tubing and tools to complete a triaxial set up installation. See page 158 for kit contents and other individual set up items.

Standard Triaxial Sample Prep Accessories:
(See page 161-163 for a complete list and description. Items with .XX require a sample size)

Accessory	Item #	Required	Accessory	Item #	Required
Acrylic Base Disk	HM-4179.XX	2 or 6	2-Part Compaction Mold	HM-3818.XX	1
Membranes	HM-4180.XX	1	2-Part Vacuum Split Mold	HM-3827.XX	1
Membrane Stretcher	HM-4181.XX	1	Split Miter Box	HM-3847.XX	1
O-Rings (12-pack)	HM-4182.XX	1	Filter Paper (100-pack)	HM-4189.XX	1
O-Ring Placing Tool	HM-4183.XX	1	Filter Strips	HM-4189FS	1
Porous Stone	HM-4184.XX	2 or 6	High Vacuum Grease	HM-4198	1
Membrane Tester	HM-4185.XX	1	Compaction Mold	HM-3820.XX	1



FlexPanel Pressure Control System, 3-Cell Setup

ELITE SERIES
Load Frames

Elite Series Load Frames

ASTM D1883, D2850, D2166, D4767 and D1559; AASHTO T193, T296, T297, T208, T245 and T246; BS 1377: Part 4, BS 1377 Part 7, BS 1377 Part 8, BS 598 Part 107

Humboldt's Elite Series Load Frames provide the materials testing lab with a choice of three, highly-versatile and precision-built loading systems covering a range of testing applications. The HM-5030 is the workhorse of the group, capable of handling any testing need up to 50kN or 11,000 lbf. The HM-5020 is a machine designed specifically for triaxial testing and other testing requirements up to 15kN or 3,000 lbf. and, the HM-5040, is a heavy-duty machine capable of handling testing requirements up to 100kN or 22,000 lbf.

These machines provide four (4) integral and independent data acquisition channels, which can be utilized in stand-alone configurations or accessed through a LAN-networked computer using Humboldt's Next Software.

Elite Series load frames are built with durable, high-quality components and feature the use of a stepper motor, precision gears and gear box to ensure smooth and reliable operation, as well as precise results.

In stand-alone mode, these load frames provide a 7" (178mm) touch-screen controller. These new waterproof, touch screens provide colorful, at-a-glance monitoring of testing functions without the use of a computer. Operators can see all the data in several formats at the machine while the test is running. Data can then be downloaded later to a computer in the lab, in the next room or at a different location, while also providing report generation capabilities from within Humboldt's NEXT software or our enhanced test-specific modules.

NOTES

Elite Series load frames are sold as load frames only though shown here with typical triaxial setups.

HM-5020 TRIAXIAL LOADER

Load capacity	3000 lbf (15kN)
Speed Range Testing: Fast Approach:	0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min) 2.25 in/min (57.1 mm/min)
Data channels	4
Platen Size / Travel	10" (254mm) / 4" (101mm)
Data storage	1000 tests and up to 3000 readings per test
Clearance, vertical	27" (686mm)
Clearance, horiz.	11" (286mm)
Voltage	110/220V 50/60Hz. 5.0 amps

A small-footprint, triaxial-specific load frame that provides the versatility, precision and durability found throughout Humboldt's Elite Series load frames.

The HM-5020 Triaxial Loader has been specifically designed to handle triaxial testing applications, including: UU, CU and CD triaxial and UC. From educational institutions and consulting firms to high-volume commercial labs and construction projects, the Triaxial Loader can handle any application with ease. Its heavy-duty design and precise stepper-motor control provide a stable platform for years of reliable service allowing the HM-5020 to perform any tests required up to its load capacity of 3000 lbf (15kN).

Like all Elite Series load frames, the HM-5020 is built around Humboldt's integral, 4-channel data logger with touch-screen control, which allows the load frame to be used as a standalone device capable of full test control and data logging. It can also be controlled by a networked computer at any location with access to the network.

Triaxial Loader, 110/220V 50/60 Hz HM-5020.3F

Shipping wt. 120 lb (54kg)

HM-5030 MASTER LOADER

Load capacity	11000 lbf (50kN)
Speed Range Testing: Fast Approach:	0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min) 2.25 in/min (57.1 mm/min)
Data channels	4
Platen Size / Travel	10" (254mm) / 4" (101mm)
Data storage	1016 tests and up to 3000 readings per test
Clearance, vertical	40" (1000mm)
Clearance, horiz.	15" (381mm)
Voltage	110/220V 50/60Hz. 5.0 amps

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

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

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

Master Loader, 110/220V 50/60 Hz HM-5030.3F

Shipping wt. 300 lb (136kg)

HM-5040 GRAND LOADER

Load capacity	22000 lbf (100kN)
Speed Range Testing: Fast Approach:	0.00001 – 0.49999 in/min (0.00001 – 12.674 mm/min) 0.5 in/min (12.7 mm/min)
Data channels	4
Platen Size / Travel	10" (254mm) / 4" (101mm)
Data storage	1000 tests and up to 3000 readings per test
Clearance, vertical	44" (1118mm)
Clearance, horiz.	21" (533mm)
Voltage	110/220V 50/60Hz. 5.0 amps

The HM-5040 Grand Loader is ideal for just about any application from road construction to high-volume commercial and educational laboratories, which require higher pressure loading capacities up to 22000 lbf (100kN), such as those involving larger sized samples and samples comprised of rock and rock/soil mixtures. It's wider stance and large vertical and horizontal clearances allows it to accommodate much larger sample-size cells. Its heavy-duty design and precise stepper-motor control provide a stable platform for years of reliable service allowing the HM-5040 to perform any tests required up to its load capacity of 22000 lbf (100kN). Like all Elite Series load frames, the HM-5040 is built around Humboldt's integral, 4-channel data logger with touch-screen control, which allows the load frame to be used as a standalone device capable of full test control and data logging. It can also be controlled by a networked computer HM-5040 includes a storage base with casters.

Grand Loader, 110/220V 50/60 Hz HM-5040.3F

Shipping wt. 725 lb (329kg)

ELITE SERIES
Load Frames

Choose:
Stand-Alone or Computer Controlled

Stand-Alone Control

Humboldt's touch-screen controller provides you with full, graphical monitoring of all testing functions in a stand-alone application, while maintaining full computer control when desired.

Now you can have full, finger-tip control and monitoring of all testing functions with Humboldt's touch-screen controller, found on Humboldt's Elite Series Load Frames. This seven-inch, waterproof screen provides at-a-glance monitoring of testing functions, in a real-time graphical display, without the use of a computer, building upon Humboldt's dedication to modular, stand-alone data acquisition.

Now, in a stand-alone application, you will be able to run tests and display results while viewing tabulation, basic x-y graphs and instrument readings in real-time during the test, using user-defined, basic data acquisition. Test data is stored in the device and can be downloaded to a USB drive via the machine's FRONT USB port or the data can be transferred to a computer via the LAN port.

A second USB port located on the back of the machine can also be used to power a wireless access point, which can provide a wireless hook-up with a computer, if no LAN is available.

Touch-Screen Controller Provides:

- 4-channel data acquisition
- Hi-res, 7", waterproof, touch-screen provides total control and real-time graphical display of tests
- Machine/Test control and data acquisition via touch-screen
- Control all channels at the same time
- Calibration of channels to load cell and transducer
- Real-time graphical chart and numerical display of tests via touch-screen display
- Effective sampling rate of 50 readings per second
- Stores up to 1000 tests with 3000 points per test
- 2 USB ports. One in front for data transfer and the rear port is for powering a wireless access point.

Computer Control

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

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

So, whether you are controlling a single load frame, controlling multiple machines or even a complete geotechnical lab, Humboldt's NEXT software, in conjunction with Humboldt's Elite Series Load Frames provide a complete solution for acquisition, recording and presentation of testing data in data tabulation and graphic chart formats.

- Machine control, and data acquisition via networked computer
- Provides the ability to use Next Software's, advanced test-specific modules
- Real-time graphical chart and numerical display of tests via computer display
- Effective sampling rate of 50 readings per second
- Stores 1000 tests with up to 3000 points per test.
- Up to 255 individual tests can be run simultaneously from a single PC
- Provides advanced graphing capabilities
- Provides full-unit customization
- Reports can also be exported to Excel or a CSV file, if desired, and, we can provide custom integration/export solutions for LIMS, EQuIS, gINT, etc.

Controller Specifications

Specifications for the touch-screen controller, instrumentation and data acquisition used with Humboldt Elite series load frames.

Controller Specifications:	
Display (Resistive Touch)	7" (178mm) VGA (480 x 800)
Real-time test data	Graphic and tabulation
Processor	Dual 32-bit ARM
RAM	64MB
Memory, non-vol-atile	4GB
Analog to digital converter	24 bit
Data acquisition	4 Channels
Logging Rate	effective rate of 320 readings per second
Multi-test storage	1000
Points per test	3000
USB port (front)	export data, import/ export calibration data
USB port (back)	provides external power for wireless access point
Ethernet connection	for network connectivity
Emergency stop	Large button
24-bit differential analog to digital converter	4
Ambient temperature sensor	1
Limit switches	2
Firmware Update	flash drive

Typical Triaxial Test Setups with the HM-5030

Consolidated Drained and Undrained

Unconsolidated Undrained

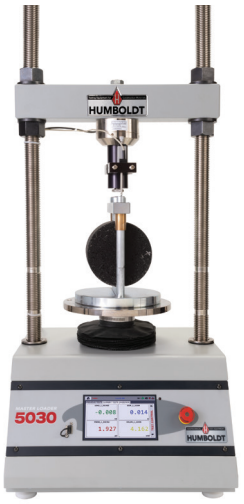
Unconfined Compression

Other Typical Test Setups with the HM-5030

CBR/LBR

Marshall

Semi-Circular Bending



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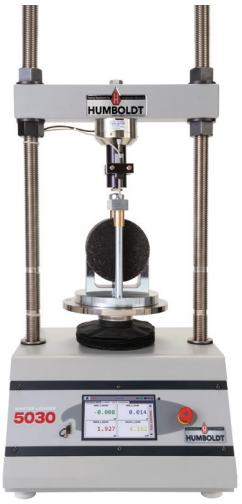

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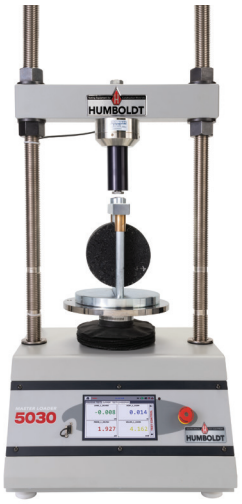


TSR

HM-2850.3F

Specifications	
Load capacity	11000 lbf (50kN)
Speed range	.00001 - 2.00000 in/min. .00001 - 50.80000 mm/min.
Platen Size / Travel	8" (203mm) / 4" (101mm)
Clearance, vertical	40" (1016mm)
Clearance, horiz.	11" (279mm)
Dimensions (l x w x h)	17 x 22 x 51 inch (432 x 559 x 1295mm)
Voltage	110/220V 50/60Hz. 5.0 amps

Features Include:

- 8" platen provides roomy, stable base for test equipment
- User selectable unit change from touchscreen between U.S. Standard and Metric units.

Multi-Speed Load Frame— HM-2850.3F Includes:

- SHH04—3/4"-16 Bolt x 3.5" long
- WF04—Washer for SHH04 Bolt

HM-2850 load frame shown with optional components for conducting CU Triaxial tests.

CU/UU Triaxial Setup with HM-2850

Components	Item
Load	
50kN (11240 lbf) capacity	HM-2850.3F
Strain	
Load ring 2,200 lbf (10 kN)	H-4454.020
Dial gauge 2.0" travel, 0.001" divisions)	H-4463
Pore pressure transducer	HM-4170
Ball seat adapter	HM-200387
Single channel readout (choose)	HM-2350.3F
	HM-2350.3F
Pressure	
Pressure distribution panel for CU triaxial (choose)	HM-4150.3F HM-4150M.3F
Pressure distribution panel for UU triaxial (choose)	HM-4140.3F HM-4140M.3F
De-airing system	HM-4187A.3F
Vacuum pump (choose)	H-1763A
	H-1763A.4F
Triaxial Cell (choose 1 below)	
3"/ 75mm dia. capacity	HM-4199B
4"/ 100mm dia. capacity	HM-4199B-4
Top Cap/ Base Pedestal Set (specify specimen size)	HM-4199.XX

Unconfined Compression Setup with HM-2850

Components	
Load	
50kN (11240 lbf) capacity	HM-2850.3F
Upper unconfined platen	HM-2002
Displacement Contact Assembly	HM-3000.10.5
Load ring 500 lbf (2.5 kN)	H-4454.005
Dial gauge 2.0" travel 0.001" divisions	H-4463

Typical Soil Cement Setup

Components	
Load	
50kN (11240 lbf) capacity	HM-2850.3F
Upper swivel platen	HM-2003E
Strain	
Load ring 5,000 lbf (25 kN)	H-4454.050

Multi-Speed Load Frame

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

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

The HM-2850 features a quiet, direct drive stepper motor that provides a range of loading speeds from 0.00001 to 2.00000 in/min. This speed range is more than adequate for the majority of standard soil tests. The HM-2850 also incorporates a separate, dedicated control to accommodate 2.00 in/min. for use in Marshall and TSR Testing, as well as a rapid travel speed of 2.25 in/min for moving the platen into position quickly. Speeds are controlled through the use of edit keys and the digital display.

Multi-Speed Load Frame, 110/220V 50/60 Hz HM-2850.3F

Shipping wt. 300 lb (136kg)

NEXT SOFTWARE

CONTROL, DATA ACQUISITION AND REPORTING

Humboldt's, NEXT Basic Software Provides:

- Machine control, and data acquisition via networked computer
- Provides the ability to use NEXT software's, advanced test-specific modules
- Real-time graphical chart and numerical display of tests via computer display
- Effective recording rate of 320 readings per second
- Stores 1000 tests with up to 3000 points per test.
- Up to 255 individual tests can be run simultaneously from a single PC
- Advanced, test-specific modules are available, which provide all the calculations and graphs required per testing standards
- Provides advanced graphing capabilities
- Provides full-unit customization
- Reports can also be exported to Excel or a CSV file, if desired, and, we can provide custom integration/export solutions for LIMS, EQuIS, gINT, etc.

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

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

With Humboldt's NEXT Basic software, operators have the ability to view and control testing operations from a PC in the lab, in the next room or at a different location, as well as the ability to control and monitor multiple tests at the same time.

So, whether you are controlling a single testing operation or controlling a complete geotechnical lab, Humboldt's NEXT Basic software, in conjunction with Humboldt's testing machines, provides a complete solution for the calibration, acquisition, recording and presentation of testing data in data tabulation and graphic chart formats.

MADE IN USA

NEXT Test-Specific Software Modules

Humboldt NEXT Basic software can be enhanced with the purchase of test-specific modules. These modules provide you with the following capabilities beyond the standard software included with your ELITE Series load frames.

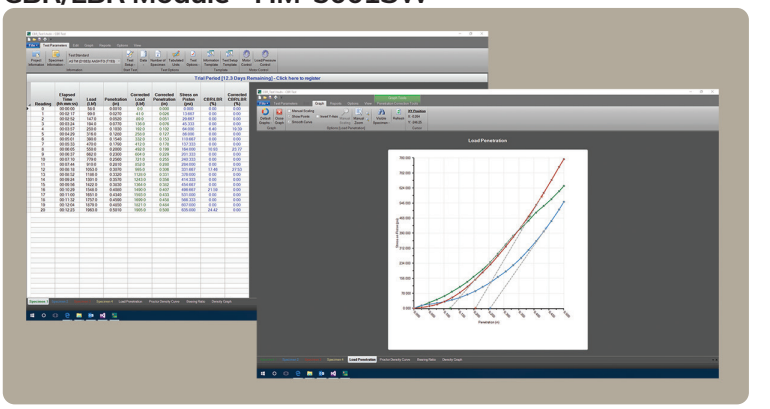
- Test-specific setup, which guides you through the process and includes selecting data collection parameters that best fit the specific test
- Input specific project information for each test, such as project name, client information, etc.
- All test-specific initial, intermediate, and final parameters required by ASTM and BS standards are dynamically calculated for you, based on your input of specimen information, such as size, weight, etc.
- Tabulated test data, graphs and all test-specific calculations are provided in real time, allowing you to monitor tests in process
- Generate test-specific reports that include all graphs and data presented in a project
- Simultaneously run multiple tests on one computer, involving any of the available NEXT modules and any compatible Humboldt equipment up to 255 device connections, which is up to 1020 inputs
- Create and store test-specific test setup templates for rapid setup of future tests
- Produce test-specific graphs, which allow you to draw construction lines to calculate angles and other test-specific parameters
- Automatically recover from a PC shutdown without loss of data
- All unit parameters can be adjusted individually
- Easily change between different test standards
- Access free, down loadable software upgrades for purchased modules
- Additional modules are available, please inquire

Consolidation Module	HM-5100SW
Direct Shear Module	HM-5700SW
CBR/LBR Module	HM-5001SW
Unconsolidated Undrained (UU) Module	HM-5002SW
Consolidated Undrained (CU) Module	HM-5003SW
Unconfined Compression (UC) Module	HM-5004SW
Consolidated Drained (CD) Module	HM-5006SW
Marshall Module	HM-5005SW
Permeability Module	HM-5007SW

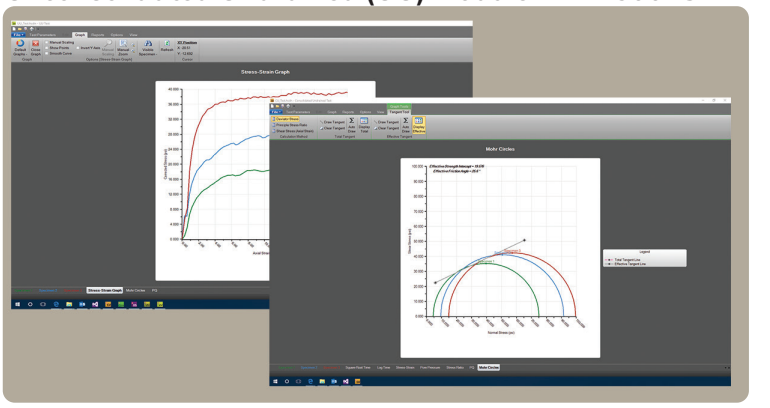
YOU CAN PURCHASE AND REGISTER YOUR SOFTWARE MODULES ONLINE!

www.humboldtmfg.com/elitenextsoftware

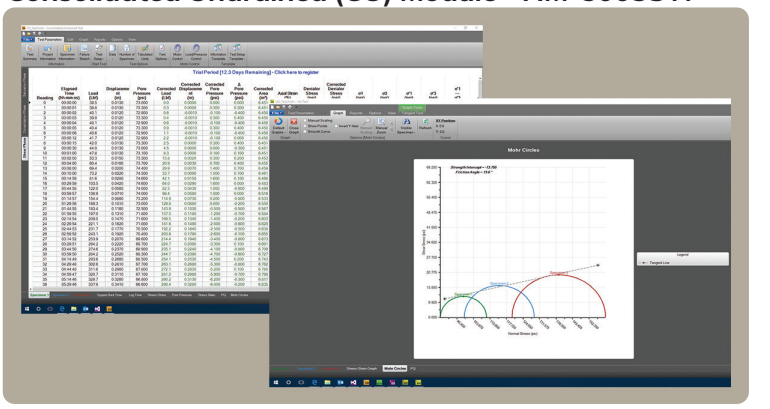
CBR/LBR Module - HM-5001SW



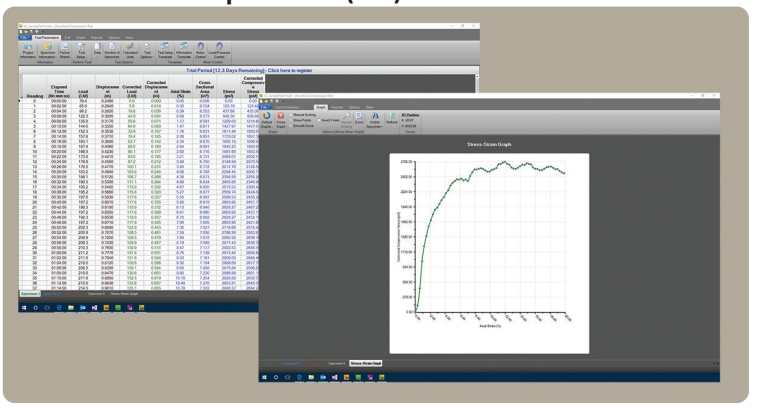
Unconsolidated Undrained (UU) Module - HM-5002SW



Consolidated Undrained (CU) Module - HM-5003SW



Unconfined Compression (UC) Module - HM-5004SW




HM-4199B


HM-4699B-3


HM-4699B-4

HM-4199B-6

Standard Triaxial Cell

The Standard Triaxial Cell is available for use with sample sizes from 1.4" (35mm) to 2.8" (71mm). The clear acrylic chamber has a working pressure of 150 psi (1,000 kPa) and is tested to 250 psi (1,700 kPa). The design features a solid base, which provides an extremely stable test platform making it faster and easier to center the cell on the load frame platen— reducing setup times. HM-4199B cells provide easy access to the test chamber by utilizing a one-piece, chamber unit that is quickly removed through the removal of three easy-turn knobs. These cells also have an integral de-airing block for the pore pressure transducer built into the side. The cells have five no-volume-change valves aligned on one side for maximum convenience. Two valves handle top drainage, two valves handle bottom drainage, and one valve handles filling and drainage, as well as providing confining pressure to the cell. The removable base pedestal accommodates various sample diameters. Top caps and base pedestals are available in black-anodized aluminum or stainless steel in various sizes (see chart below). Other sizes are available. The cell top and base are precision machined from 6061 T6 aluminum, black anodized for a durable finish. A .625" hardened stainless steel piston runs inside a linear bearing to reduce friction. Choice of brass or stainless steel valve fittings is also available (stainless steel for use with hazardous materials).

Standard Triaxial Cell, up to 3.0" (75mm) HM-4199B

15 lb (7kg)

NOTES

HM-4199B Triaxial Cells include a HM-4199B.20 piston extension for smaller samples sizes.

High-Pressure Triaxial Cells

High-Pressure Triaxial Cells are available for use with sample sizes from 1.4" (35mm) to 2.8" (71mm). The clear acrylic chamber has a working pressure of 500 psi (3,500 kPa) and is tested to 550 psi (3,800 kPa). This high-pressure cell includes the addition of 4 metal bands to maintain integrity of the test chamber during testing. The design features a solid base, which provides an extremely stable test platform making it faster and easier to center the cell on the load frame platen— reducing setup times. This cell provides easy access to the test chamber by utilizing a one-piece, chamber unit that is quickly removed through the removal of three easy-turn knobs. These cells also have an integral de-airing block for the pore pressure transducer built into the side. The cells have five no-volume-change valves aligned on one side for maximum convenience. Two valves handle top drainage, two valves handle bottom drainage, and one valve handles filling and drainage, as well as providing confining pressure to the cell. The removable base pedestal accommodates various sample diameters. Top caps and base pedestals are available in black-anodized aluminum or stainless steel in various sizes (see chart below). Other sizes are available. The cell top and base are precision machined from 6061 T6 aluminum, black anodized for a durable finish. A .625" hardened stainless steel piston runs inside a linear bearing to reduce friction. Choice of brass or stainless steel valve fittings is also available (stainless steel for use with hazardous materials).

High-Pressure Triaxial Cell, 3" (75mm) HM-4699B-3

35 lb (16kg)

High-Pressure Triaxial Cell, up to 4" (100mm)

The 4" version of our High-Pressure Triaxial Cell is identical in construction to our 3" model. It is designed for use in testing samples up to 4" (100mm) samples in high-pressure applications up to 500psi or (3,500 kPa). This cell also feature s the addition of 4 metal bands to maintain integrity of the test chamber during testing.

High-Pressure Triaxial Cell, 4" (100mm) HM-4699B-4

Stainless Version Cell, 4" (100mm) HM-4699SS-4

35 lb (16kg)

Standard Triaxial Cell 6" (150mm)

This Standard Triaxial Cell is designed for use in testing 6" (150mm) samples. Construction is similar to our Standard Triaxial cells, but accommodates 6" (150mm) samples.

Standard Triaxial Cell, 6" (150mm) HM-4199B-6

Stainless Version Cell, 6" (150mm) HM-4699BSS-6

130 lb (59kg)

Cell	Sample Diameter Compatibility					
	1.4" (35mm)	1.5" (39mm)	2.0" (50mm)	2.8" (71mm)	4" (100mm)	6" (150mm)
HM-4199B	X	X	X	X		
HM-4699B-3	X	X	X	X		
HM-4699B-4	X	X	X	X	X	
HM-4199B-6						X

NOTES

When ordering cells, specify Top Cap and Base Pedestal Set for desired sample size. Order porous stones separately, see page: 163.

HM-4199.28

HM-4199.28SS

HM-2300.020CP

NOTES

Load Cells are wired for use with Humboldt Equipment. Please contact support for instructions when using other manufacturers' equipment.

HM-2300.020S

H-4178.2

HM-2300.75AD50

Triaxial Cell Top Caps, Pedestals and Sets

See charts at bottom of page for part numbers of Individual Top Caps, Pedestals and Top Cap/ Pedestal sets. They are available in aluminum and stainless steel.

See Charts Below

Size	Top Caps	
	Aluminum	Stainless Steel
35mm	HM-4199.35T	HM-4199.35SST
1.4"	HM-4199.14T	HM-4199.14SST
38mm	HM-4199.38T	HM-4199.38SST
1.5"	HM-4199.15T	HM-4199.15SST
50mm	HM-4199.50T	HM-4199.50SST
2.0"	HM-4199.20T	HM-4199.20SST
70mm	HM-4199.70T	HM-4199.70SST
2.8"	HM-4199.28T	HM-4199.28SST
100mm	HM-4199.100T	HM-4199.100SST
4.0"	HM-4199.40T	HM-4199.40SST
150mm	HM-4199.150T	HM-4199.150SST
6"	HM-4199.60T	HM-4199.60SST

Size	Pedestals	
	Aluminum	Stainless Steel
35mm	HM-4199.35B	HM-4199.35SSB
1.4"	HM-4199.14B	HM-4199.14SSB
38mm	HM-4199.38B	HM-4199.38SSB
1.5"	HM-4199.15B	HM-4199.15SSB
50mm	HM-4199.50B	HM-4199.50SSB
2.0"	HM-4199.20B	HM-4199.20SSB
70mm	HM-4199.70B	HM-4199.70SSB
2.8"	HM-4199.28B	HM-4199.28SSB
100mm	HM-4199.100B	HM-4199.100SSB
4.0"	HM-4199.40B	HM-4199.40SSB
150mm	HM-4199.150B	HM-4199.150SSB
6"	HM-4199.60B	HM-4199.60SSB

Size	Top Cap/ Pedestal Sets	
	Aluminum	Stainless Steel
35mm	HM-4199.35	HM-4199.35SS
1.4"	HM-4199.14	HM-4199.14SS
38mm	HM-4199.38	HM-4199.38SS
1.5"	H M-4199.15	HM-4199.15SS
50mm	HM-4199.50	HM-4199.50SS
2.0"	HM-4199.20	HM-4199.20SS
70mm	HM-4199.70	HM-4199.70SS
2.8"	HM-4199.28	HM-4199.28SS
100mm	HM-4199.100	HM-4199.100SS
4.0"	HM-4199.40	HM-4199.40SS
150mm	HM-4199.150	HM-4199.150SS
6"	HM-4199.60	HM-4199.60SS

Pancake Load Cells

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

Performance Specifications	
Overload Capacity:	150%
Excitation Voltage:	10 VDC, Maximum
Rated Output:	3.0 mv/V
Cable Length:	79" (2m)
Material:	Alloy Steel

Cell	Diameter	Height
500 lbf (2.5kN)	3" (75mm)	1.8" (46mm)
2000 lbf (10kN)	3" (75mm)	1.8" (46mm)
4000 lbf (20kN)	3" (75mm)	1.8" (46mm)
10000 lbf (50kN)	4.13" (105mm)	2.5" (63.5 mm)
15000 lbf (75kN)	5" (125mm)	3.46" (88mm)
20000 lbf (100kN)	5" (125mm)	3.46" (88mm)

Load Cell, 500 lbf (2.5 kN) **HM-2300.005CP**
Load Cell, 2000 lbf (10 kN) **HM-2300.020CP**
Load Cell, 4000 lbf (20 kN) **HM-2300.040CP**
Load Cell, 10000 lbf (50 kN) **HM-2300.100CP**
Load Cell, 15000 lbf (75 kN) **HM-2300.150CP**
Load Cell, 20000 lbf (100 kN) **HM-2300.200CP**

Shipping wt. 5 lb (2.3kg)

Submersible Load Cells

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

Performance Specifications	
Overload Capacity:	200%
Excitation Voltage:	10 VDC, Maximum
Non-linearity:	0 ± 0.05% Full Scale Output
Hysteresis:	0.05% Full Scale Output
Diameter:	3" (75mm)
Cable Length:	79" (2m)
Height: (Cell only)	2" (50mm)

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

Shipping wt. 1 lb (0.45kg)

Stud, Threaded

Threaded stud for attaching load cells to load frame cross beams.

Stud, Threaded **H-4178.2**

Shipping wt. 0.2 lb (0.09kg)

Stud Adapter

Adapter for connecting 3/4-16F threads to 1/2-20.

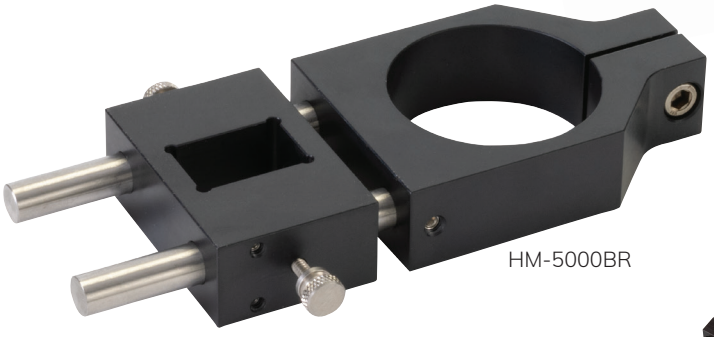
Stud Adapter **HM-2300.75AD50**

Shipping wt. 0.2 lb (0.09kg)


HM-2310.10


HM-2305.10


HM-2006E


HM-5000BR


HM-2310BR


HM-2003E


HM-4193BR


HM-4178BRT


H-1327B

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. 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.

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

LSCT, 0.4" (10mm) **HM-2310.04**
LSCT, 1.0" (25mm) **HM-2310.10**
LSCT, 2.0" (50mm) **HM-2310.20**
Shipping wt. 0.8 lb (0.36kg)

Linear Potentiometer Transducers (LPT)
Accurate and reliable strain gauge instruments for use with Humboldt's HM-5150, HM-5170 and HM-5120 Load Frames. Also, included with HM-5820.

Linear Potentiometer Transducer 1.0" (25mm) **HM-2305.10**
Linear Potentiometer Transducer 2.0" (50mm) **HM-2305.20**
Shipping wt. 0.8 lb (0.36kg)

Linear Potentiometer Universal Bracket
Bracket used to mount HM-2305.XX linear potentiometers to all Humboldt load frames. Adjustable LPT positioning is ideal for many test configurations.

Linear Potentiometer Univ. Bracket **HM-5000BR**
Shipping wt. 0.7 lb (0.32kg)

Platen, Swivel Top
4.25" (108mm) diameter top swivel platen. Platen used for soil cement and/or large unconfined compression tests.

Platen, Swivel Top **HM-2003E**
Shipping wt. 5.2 lb (2.35kg)

Platen, Swivel Top
6.25" (158.75mm) diameter top swivel platen. Platen used for soil cement and/or large unconfined compression tests.

Platen, Swivel Top **HM-2006E**
Shipping wt. 6.5 lb (2.95kg)

LSCT Displacement Transducer Bracket
Bracket is used with the HM-5020.3F, HM-5030.3F and HM-5040.3F load frames with the HM-2310.xx LSCTs for use with many tests. Can also be used with CBR piston (H-4178) in conjunction with HM-2310.xx LSCTs.

LSCT Displacement Transducer Bracket **HM-4178BRT**
Shipping wt. 0.7 lb (0.32kg)

LSCT/LVDT Contact/Mounting Bracket
Bracket used in mounting LSCT to equipment in replacement of dial gauge.

LSCT/LVDT Mounting Bracket **HM-2310BR**
Shipping wt. 0.1 lb (0.04kg)

LSCT Triaxial Mounting Bracket
Bracket used in mounting LSCT or dial gauge to the upper part of a triaxial cell with a 0.625" (15.5mm) dia. ram for strain measurement. (HM-2310BR also required for use with LSCT.)

LSCT Triaxial Mounting Bracket **HM-4193BR**
Shipping wt. 2 lbs (0.9kg)

Linear Potentiometer Universal Bracket
Bracket used to mount HM-2305.XX linear potentiometers to all Humboldt load frames. Adjustable LPT positioning is ideal for many test configurations.

Linear Potentiometer Univ. Bracket **HM-5000BR**
Shipping wt. 0.7 lb (0.32kg)

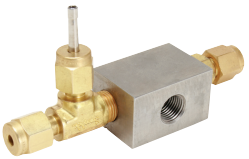
LVDT Bracket
Bracket used to mount LVDTs in load frame setups.

LVDT Bracket **H-1327B**
Shipping wt. 0.7 lb (0.32kg)

HM-2350.3F

Set
HM-4175.3F

HM-4170



HM-4170B

HM-4172

HM-4470C

HM-4470U

HM-2310C

HM-4469AC

HM-000379

HM-4469USB

HM-4469C

Single-Channel Display
Single-channel display used with pore pressure transducers to monitor pore water pressures and back pressure directly from the de-airing block on a triaxial cell. The HM-2350.3F provides 4-digit accuracy. This display is typically used when no data acquisition is being used either by the load frame or a data logger.

Single-Channel Display, 120V 50/60Hz HM-2350.3F
Shipping wt. 6 lb (2.7kg)

Digital Pore Pressure Set
For accurately measuring and monitoring pore water pressures and back pressure. For determining level of saturation ("B" parameter) during saturation stages of triaxial/permeability tests. Includes readout, pore pressure transducer, and de-airing block assembly.

Digital Pressure Set, 120V 50/60Hz HM-4175.3F
Shipping wt. 7 lb (3.1kg)

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

Pore Pressure Transducer HM-4170
Shipping wt. 0.8 lb (0.36kg)

De-Airing Block
For use with pore pressure transducer.

De-Airing Block HM-4170B
Shipping wt. 1 lb (0.45kg)

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 ±.25% of full scale accuracy—comparable to others at twice the cost. Battery operated with very long battery life—typically up to 5 years. On/off button at top of readout has factory set "on" time built into the memory. Readout shuts off automatically after 20 minutes.

Digital Pressure Transducer HM-4172
Shipping wt. 2 lbs (0.9kg)

Transducer Data Extension Cable
Data extension cable for use with load cells, LSCT or pressure devices. **Cable is 25ft. (7.6m) length.**

Transducer Data Extension Cable HM-2310C
Shipping wt. 1 lb (0.45kg)

AC Adapter, 120V 60Hz
AC adapter for digital indicator, allows indicator to run off AC power.

AC Adapter, 120V 60Hz HM-4469AC
Shipping wt. 0.6 lb (0.27kg)

Data Cable
For use with HM-4469, HM-4470 and HM-4471 Series Digital Gauges when used with Elite Series Machines and Digital Data Logger. Includes 6ft. cable.

Data Cable HM-4470C
Shipping wt. 0.5 lb (0.23kg)

Data Cable
Upgrade for HM-4169C Data Cable for use with Elite Series Machines and Digital Data Logger. Includes 6ft cable.

Data Cable HM-4470U
Shipping wt. 0.5 lb (0.23kg)

Data Cable
Data cable for digital indicator, used with HM-2330D.3F Humboldt Logger.

Data Cable HM-4469C
Shipping wt. 0.5 lb (0.23kg)

Multi-Device Cable
Allows one computer to control multiple daisy-chained machines. For Non-elite machines.

Multi-Device Cable HM-000379
Shipping wt. 1 lb (0.45kg)

USB Data Cable
For use with HM-4469 Series Digital Indicators Only. Will not work with HM-4470 Indicators.

USB Data Cable HM-4469USB
Shipping wt. 1 lb (0.45kg)

HM-4151A

HM-4151.1

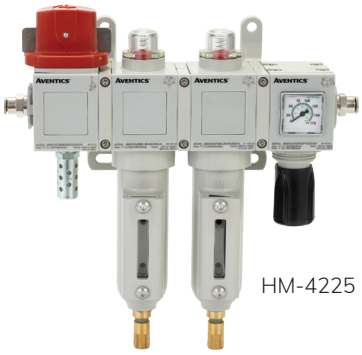
HM-4220

H-1763A

HM-4187A.3F

HM-4187H

HM-4222



HM-4225

Air/Water Bladder Cylinder

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

Bladder Cylinder **HM-4151A**

Shipping wt. 11 lb (4.9kg)

Bladder

Replacement bladder for HM-4151A Air/Water Bladder Cylinder.

Bladder **HM-4151.1**

Shipping wt. 0.5 lbs (0.22kg)

Compressor

When operating under full load this exceptionally quiet compressor offers a tremendously low noise level of 40 db/A. Each compressor is built with quality in mind, and comes equipped with powder-coated air tank, pressure switch, 1-micron air filter, regulator, and pressure gauges for completely automatic and trouble free operation.

Specifications	
Output	4.2 CFM120 L.Min
Horse Power	1.0Hp
Tank Size	13 Gal50 Lt.
Noise Level	42 db/A
Max Pressure	120 PSI (8 Bar)
Operating Pressure	90-120 PSI6-8 Bar

Compressor, 120V 50/60Hz **HM-4220**
Compressor, 220V 50/60Hz **HM-4220.4F**

Shipping wt. 147 lbs (66kg)

High-Vacuum Pump

Direct-drive two-stage rotary sliding vane high vacuum pump features gas ballast and trap to reduce risk of oil being sucked into the system. Produces free air displacement 85L per minute (3 cu. ft. per minute) and maximum vacuum 29-30". Operating temperature is 30 to 170°F (-1.11 to 76.6°C). Has 0.25" OD intake ports for 0.25" ID tubing. Dimensions: 11.25" x 15.5" x 6.5" (28.6 x 39.4 x 16.5cm).

High-Vacuum Pump, 120V 60Hz **H-1763A**
High-Vacuum Pump 230V 50/60Hz **H-1763A.4F**

Shipping wt. 31 lbs (14kg)

De-Airing Water System

The HM-4187A.3F produces 8-liter batches of de-aired water without the use of heat. Combined mechanical agitation and vacuum evacuation removes gasses at much higher rate than conventional heat-boiling methods. Will de-air water to less than 0.5 pph dissolved oxygen in 4 minutes. Requires a vacuum pump, (see page 140) 1/55hp motor 110V, 60Hz. 7.5 x 7.5 x 20" (190 x 190 x 508mm).

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

Shipping wt. 24.5 lb (11.3kg)

De-Airing Water Tank

For use with Triaxial/Permeability Distribution Panels. Requires a Vacuum Pump, (see H-1763).

De-Airing Water Tank **HM-4187H**

Shipping wt. 17 lb (7.7kg)

Air Prep Assembly

Air Prep Assembly includes a shutoff with lockout and muffler; particulate and coalescing filters to remove particulates (3-5 micron) and liquid aerosols and droplets (0.3 micron/ ISO 8573-1:2010. Air purity class at max 3.5scfm/100L/m at 91.4psig) with metal bowls, indicators, and auto drains; a regulator with gauge (7-125 psig); two (2) wall-mounting brackets; and 1/4" tube inlets and outlet ports. Max flow = 17scfm/ 480l/m ANR.

Air Prep Assembly **HM-4225**

Shipping wt. 5 lb (2.3kg)

Replacement Filters for HM-4225	
Particulate Filter 5 micron (white)	HM-4225.5
Coalescing Filter 0.3 micron (yellow) w/ 3 micron pre-filter (green)	HM-4225.6

Desiccant Dryer

Ideal for drying small volumes of air at the point of use. Convenient in-line mounting saves space. ISO Class 2 dryer. Max. operating pressure is 150 psig. and max operating temperature is 125°F. Total capacity is 4400 ft^3, Female NPT inlet/ outlet size is 0.25 NPTF, bowl size is 1.75 lbs, Height: 11", Width: 4.625". Includes one charge of desiccant.

Desiccant Dryer **HM-4222**

Shipping wt. 5 lb (2.3kg)

HM-4167

HM-4168

HM-4197.25

HM-4197.12

HM-4150.78

HM-003176

HM-4196.25

HM-4196.12

HM-4150.22AS

HM-4150.44

HM-4150.72

HM-003175

HM-4150.45

Triaxial Installation Kit

Kit designed to provide fittings, connectors, tubing and tools to complete a triaxial set up installation. Kit includes items in the table below. All items can be purchased individually as well.

Triaxial Kit Components	
.125" Brass Ferrules (10)	HM-4197.12
.25" Brass Ferrules (10)	HM-4197.25
.125" OD Tubing, 10ft.	HM-4196.12
.25" OD Tubing, 100ft.	HM-4196.25
.375" to .25" Reducer Bushing (3)	HM-4150.77
Cutter, Flexible Tubing (1)	HM-000058
Thread Tape, PTFE (1)	HM-000059
Hex wrench, 3/16" (1)	HM-000060
Hex wrench, 7/64" (1)	HM-000061
Hex wrench, 2.5mm (1)	HM-000062
Wrench, 7/16 & 9/16" (1)	HM-000063
Wrench, Adjustable, 6" (1)	HM-000064
Union T Fitting, .25" (5)	HM-4150.45
Quick Valve Coupling, .25" (2)	HM-4150.72
Regulator Elbow, .25" (3)	HM-4150.44
.25" to .125" Reducer Coupling (3)	HM-4150.78
Tube Fitting T, 6mm OD (5)	HM-003175
Push-to-Connect Tube Fitting Coupler, .25" OD (4)	HM-003176
Plug, .25" Nylon (5)	HM-003193
O-ring (Upper Cap), .125" (10)	HM-4150.006
O-ring for Quick-Connect (10)	HM-4196.CXO

Triaxial Installation Kit **HM-4167**

Shipping wt. 4.5 lbs (2.04kg)

Shear & Consolidation Installation Kit

Kit designed to provide fittings, connectors, tubing and tools to complete a triaxial set up installation. Kit includes items in the table below. All items can be purchased individually as well.

Shear & Consolidation Kit Components	
.25" OD Tubing, 100ft.	HM-4196.25
.375" to .25" Reducer Bushing (3)	HM-4150.77
Cutter, Flexible Tubing (1)	HM-000058
Thread Tape, PTFE (1)	HM-000059
Wrench, Adjustable, 6" (1)	HM-000064
Union T Fitting, .25" (5)	HM-4150.45
Quick Valve Coupling, .25" (2)	HM-4150.72
Regulator Elbow, .25" (3)	HM-4150.44
Tube Fitting T, 6mm OD (5)	HM-003175
Push-to-Connect Tube Fitting Coupler, .25" OD (4)	HM-003176

Shear & Consolidation Installation Kit **HM-4168**

Shipping wt. 4.5 lbs (2.04kg)

Replacement Pressure Regulators	
Pressure regulator 2-150 psi w/ fittings	HM-4150.22AS
Positive bias regulator w/ fittings	HM-4150.23AS

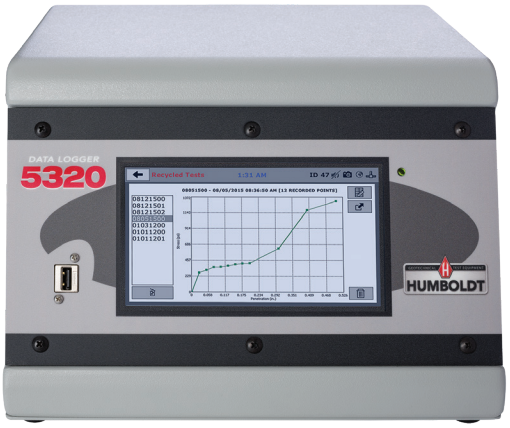
HM-4190

Toxic Interface Unit

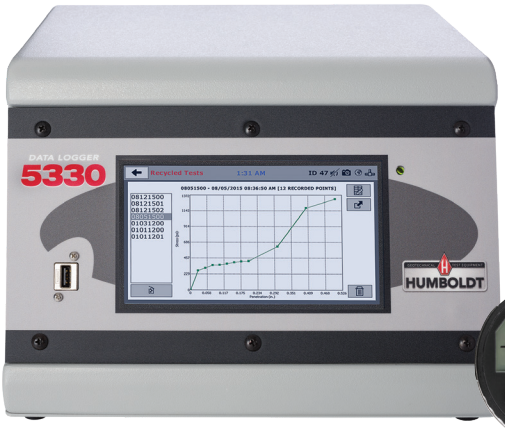
Safe and convenient means of performing permeability tests of corrosive or toxic permeants. Flexible fluoro-elastomer bladder accumulator interfaces between control panel and sample drains on permeameter. Serves as a fluid separator to prevent permeant from entering control panel. Also prevents contact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

Toxic Interface Unit **HM-4190**

Shipping wt. 7 lbs (3.1kg)



HM-5320.3F



HM-5330.3F

Humboldt Elite Series Data Loggers

Humboldt's Elite Series Data Loggers are specifically designed for use within construction materials testing labs. You can use Humboldt Data Loggers to cost-effectively update your older, non-computerized load frames, direct shear and consolidation machines with computerized data acquisition— increasing lab output, freeing-up technicians and providing more accurate test results.

Humboldt's modular-design, data acquisition concept is designed to give you the most flexible and cost-effective method of data logging for your lab. Rather than having to buy into a large data logging system and then growing into it, Humboldt Data Loggers give you the flexibility and low cost outlay of being able to buy loggers on an "as you grow" basis, increasing your data logging capability as your expansion demands.

Humboldt Data Loggers can be used with a wide variety of transducers, load cells and digital indicators; and both come with Humboldt's, highly-regarded, NEXT software. This software provides robust data acquisition and report generation for those wanting to use a computer to monitor tests and collect test data.

In stand-alone mode, these data loggers provide a 7" (178mm) touch-screen controller, which provides real-time, visual views of your data in both tabular and graphic formats. These new waterproof, touch screens provide colorful, at-a-glance monitoring of testing functions without the use of a computer. Operators can see all the data in several formats at the machine while the test is running. Data can then be viewed simultaneously or downloaded later to a computer in the lab, in the next room or at a different location, while also providing report generation capabilities from within Humboldt's NEXT software or our enhanced test-specific modules.

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

Humboldt Elite Series Data Logger, Analog

Provides four individual, 24-bit analog to digital converters with an instrumentation excitation supply of 10 VDC. The analog Logger is ideal for use with instruments, such as pressure transducers, load cells, and strain transducers. It provides data storage for 1000 readings per channel. Voltage: 120/220V 50/60Hz.

Elite Series Data Logger, Analog **HM-5320.3F**

Shipping wt. 5lb (2.2kg)

Humboldt Elite Series Data Logger, Digital

Provides four individual, Digital Indicator inputs with an instrumentation excitation supply of 5 VDC. The digital Logger is ideal for use with digital indicators. It provides data storage for 1000 readings per channel. Voltage: 120/220V 50/60Hz.

Elite Series Data Logger, Digital **HM-5330.3F**

Shipping wt. 6 lb (2.7kg)

Digital Indicator Cable, 6ft.

For use with HM-4469 & HM-4470 Series digital gauges when used with Elite Series Machines and Digital Data Logger.

Digital Indicator Cable, 6 ft. **HM-4470C**

Shipping wt. 6 lb (2.7kg)

Specifications	
Display	7" (178mm) VGA (480 x 800) Resistive-touch screen
Real-time test data	Graphic and tabulation
Processor	Dual 32-bit ARM
RAM	64MB
Memory, non-volatile	4GB
Analog to digital converter	24 bit (HM-5320.3F only)
Data acquisition	4 Channels
Logging Rate	effective rate of 320 readings per second
Multi-test storage	1000
Points per test	3000
USB port (front)	use to export data and import/export calibration data
USB port (back)	provides external power for wireless access point
Ethernet connection	for network connectivity
24-bit differential analog to digital converter (21 bits @1000 samples/sec.	4 (HM-5320.3F only)
Ambient temperature sensor:	1
Limit switches	4
Firmware Update	flash drive


HM-4471.10


H-4466.30
H-4466.15
H-4466.10


H-4470


HS-4156.14


H-4158.1


H-4665.25CC


H-4454. 050D

H-4454. 050

Digital Indicators

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

Range	Resolution	Model
.250" / 6.35mm	.0001" .002mm	HM-4471.02
.600" / 15.0mm		HM-4471.05
1.0" / 25.4mm		HM-4471.10
2.0" / 50.0mm		HM-4471.20
4.0" / 101.6mm		HM-4471.40

Digital Indicators **See Table**

Shipping wt. 1 lb (0.45kg)

Gauge Contact Point Extensions

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

Contact Point Extensions	Model
0.25" (6.4mm) Extension	H-4466.2
0.5" (13mm) Extension	H-4466.5
1" (25mm) Extension	H-4466.10
1.5" (38mm) Extension	H-4466.15
2" (50mm) Extension	H-4466.20
3" (76mm) Extension	H-4466.30
6" (152mm) Extension	H-4466.6

Gauge Contact Point Extensions **See Table**

Shipping wt. 0.1 lb (0.04kg)

Magnetic Indicator Mount

Convenient, portable mount for mounting indicators and gauges. Mount has magnetic base, which mounts on metallic surfaces. Features non-magnetic stainless steel holding rod, 6 x 0.25" (154 x 6.4mm), set in hardened ball socket. Can be mounted in almost any position.

Magnetic Indicator Mount **H-4470**

Shipping wt. 1.3 lb (0.58kg)

Magnetic Gauge Mount

Convenient, portable mount for mounting indicators and gauges. Mount has magnetic base, which mounts on metallic surfaces.

Magnetic Gauge Mount **HS-4156.14**

Shipping wt. 1.3 lb (0.58kg)

Dial Gauges

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

All dial gauges above feature clockwise rotation. **Counter-clockwise models are available for all except: H-4465 and H-4462. To order counter-clockwise models, add CC to the end of the model number.**

Range	Division	Dia.	Brake	Model
.200"	.0001"	2.25"	No	H-4460
.200"	.0001"	2.25"	Yes	H-4461A
.300"	.0001"	2.25"	No	H-4462
.500"	.0001"	2.25"	No	H-4471
1.000"	.001"	2.25"	No	H-4158.1
2.000"	.001"	2.75"	No	H-4463
3.000"	.001"	2.75"	No	H-4464
4.000"	.001"	2.75"	No	H-4465
5.000"	.001"	2.75"	No	H-4466
12mm	.002mm	57mm	No	H-4465.12
25mm	.010mm	57mm	No	H-4465.25
50mm	.020mm	70mm	No	H-4465.50

Dial Gauges **See Table**

Shipping wt. 1.3 lb (0.58kg)

Load Rings

ASTM E74

Sometimes referred to as "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 compression machines, direct shear machines and other testing equipment. Our high-quality, tensile steel rings have spherical seatings suitable for all shear boxes and load frames. Each load ring is shipped with a fitted gauge or indicator and calibration certificate, and supplied with tables listing all measurement units. 8.25" (210mm) high, 3/4-16 UNF thread female mounting. Available with digital indicators compatible with data acquisition systems. Eight models range in size from 110 to 22,000 lbf (0.5 to 100.0 kN).

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

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

Load Rings **See Tables**

Shipping wt. 8 lb (3.7kg)

HM-3820.28

HM-3818.28

HM-3701

HM-3330

Compaction Mold, Three-Part with Hammer

Three-part aluminum molds with easy-close band clamp closure. Molds include base plate and pedestal, which provides a stable platform for mold during production. Ratio of sample height to diameter is 2:1.

Sample Size	Mold with Base Plate
1.4"	HM-3820.14
1.5"	HM-3820.15
1.875"	HM-3820.18
2.0"	HM-3820.20
2.36"	HM-3820.23
2.5"	HM-3820.25
2.8"	HM-3820.28
4.0"	HM-3820.40
6.0"	HM-3820.60
35mm	HM-3820.35
38mm	HM-3820.38
50mm	HM-3820.50
70mm	HM-3820.70
100mm	HM-3820.100
150mm	HM-3820.150

Compaction Mold, Three-Part **See Table**

Shipping wt. 18 lbs (8.2kg)

Compaction Mold, Two-Part

Two-part aluminum molds with easy-close band clamp closure. Molds include base plate and pedestal, which provides a stable platform for mold during production. Ratio of sample height to diameter is 2:1.

Sample Size	Mold with Base Plate
1.4"	HM-3818.14
1.5"	HM-3818.15
1.875"	HM-3818.18
2.0"	HM-3818.20
2.36"	HM-3818.23
2.5"	HM-3818.25
2.8"	HM-3818.28
4.0"	HM-3818.40
6.0"	HM-3818.60
35mm	HM-3818.35
38mm	HM-3818.38
50mm	HM-3818.50
70mm	HM-3818.70
100mm	HM-3818.100
150mm	HM-3818.150

Compaction Mold, Two-Part **See Table**

Shipping wt. 15 lbs (6.8kg)

Compaction Hammer

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

Compaction Hammer **HM-3701**

Shipping wt. 6 lbs (2 .7kg)

Soil Sample Trimmer

Sample trimmer with alignment bar for cutting samples to precise diameters. The HM-3330 handles samples up to 4" samples by employing easily interchangeable top platens. Stainless steel pins in pedestal & top platen hold sample in position. Top platen bearing assembly is lowered & locked and sample trimmed with wire saw. **Order top platens (below) and saw (next page) separately.**

Soil Sample Trimmer, 1" to 4" **HM-3330**

Shipping wt. 7 lb (3.1kg)

Top Platens for Soil Trimmer

Individual, sized, top platens for the soil sample trimmer. Platens are interchangeable.

Size	Model	Size	Model
1.0"	HM-3330.10	4.0"	HM-3330.40
1.4"	HM-3330.14	35mm	HM-3330.35
1.875"	HM-3330.18	38mm	HM-3330.38
2.0"	HM-3330.20	50mm	HM-3330.50
2.5"	HM-3330.25	70mm	HM-3330.70
2.8"	HM-3330.28	100mm	HM-3330.100
3.0"	HM-3330.30		

Top Platens for Soil Trimmer **See Chart**

Shipping wt. 1 lb (0.45kg)


HM-3175


H-4973

HM-4174
HM-4174M


HM-4173


HM-4189FS

HM-4198


HM-4180.28

Wire Saw
Sample trimming saw with replaceable wire blade.
Wire Saw **HM-3175**
Shipping wt. 1 lbs (0.45kg)

Wire Saw Blade
Replacement wire for HM-3175 saw.
Wire Saw Blade **HM-3175.1**
Shipping wt. 0.1 lb (0.04kg)

Preparation Knife
Used for sample preparation and general lab work, knife has 6"-long thin, sharp blade and wood handle.)
Preparation Knife **H-4973**
Ship wt. 0.5lbs. (0.2kg

Length Comparator
ASTM D2166, D2850, D4767, BS 1377:8

Length comparator designed to quickly and accurately measure the height of soil samples to within ±0.1% of the total height. Includes a digital indicator accurate to within 0.0001 inches (0.002mm) with 0 to 1" (0 to 25mm) total range. The comparator is comprised of an upright support 14" (356mm) tall attached to a 6" x 6" x 2" (150 x 150 x 50mm) granite base and includes a 6" (152mm) reference bar. Other reference bars such as 4.0", 3.0" and 2.0" for other sample sizes are available. Reference bar includes Calibration Report traceable to the National Institute of Standards and Technology.
Length Comparator **HM-4173**
Shipping wt. 20 lb (9.07kg)

Precision Diameter Tape
ASTM D2166, D2850, D4767, BS 1377:8

Diameter tapes provide a fast, reliable method for measuring the diameter of concrete, soil and asphalt cores and cylinders. One reading provides round and out-of-round diameters within an accuracy of .001" (.03mm) by means of special graduations and vernier scale. All tapes are made from a stainless alloy and are precision engraved to ensure accuracy. Inch-scale tape has a diameter range of 0.75 to 7" and the metric-scale tape has a diameter of 28 to 200mm. Includes certificate of calibration. Tapes are calibrated and include a NIST-traceable certification.
Precision Diameter Tape, 0.75 to 7" **HM-4174**
Precision Diameter Tape, 28 to 200mm **HM-4174M**
Shipping wt. 0.8 lb (0.36kg)

High-Vacuum Grease
Effective means of sealing latex membranes to sides of the top cap.
High-Vacuum Grease **HM-4198**
Shipping wt. 0.8 lb (0.36kg)

Filter Paper Strips
Wrapped around sample to accelerate saturation in triaxial testing, 5 x 150mm, Grade 55, 100/pkg.
Filter Paper Strips **HM-4189FS**
Shipping wt. 0.5 lb (0.22kg)

Latex Membranes
Made from non-porous latex rubber [max. temp. 220°F (104°C)]. Length varies according to sample diameter. All have sufficient length to enclose full length of sample, both top & base of pedestal,and disc—plus enough surplus to allow doubling over the O-rings. 12/pkg. Membranes are 0.012" or 0.025"in thickness.
Latex Membranes **See Tables Below**
Shipping wt. 0.8 lb (0.36kg)

Latex Membranes, 0.012"	
35mm	HM-4180.14
38mm	HM-4180.15
50mm	HM-4180.20
70mm	HM-4180.28
100mm	HM-4180.40
150mm	HM-4180.60
1.4"	HM-4180.14
1.5"	HM-4180.15
2.0"	HM-4180.20
2.8"	HM-4180.28
4.0"	HM-4180.40
6.0"	HM-4180.60

Latex Membranes, 0.025"	
35mm	HM-4180.14T
38mm	HM-4180.15T
50mm	HM-4180.20T
70mm	HM-4180.28T
100mm	HM-4180.40T
150mm	HM-4180.60T
1.4"	HM-4180.14T
1.5"	HM-4180.15T
2.0"	HM-4180.20T
2.8"	HM-4180.28T
4.0"	HM-4180.40T
6.0"	HM-4180.60T

HM-4179.28

HM-4189.28

HM-4184.28

HM-4182.28

HM-4183.28

Acrylic Disk	
35mm	HM-4179.35
38mm	HM-4179.38
50mm	HM-4179.50
70mm	HM-4179.70
100mm	HM-4179.100
150mm	HM-4179.150
1.4"	HM-4179.14
1.5"	HM-4179.15
2.0"	HM-4179.20
2.8"	HM-4179.28
4.0"	HM-4179.40
6.0"	HM-4179.60

Acrylic disk used in UU triaxial tests. Disks are 0.25" thick (6mm).

Filter Paper	
35mm	HM-4189.35
38mm	HM-4189.38
50mm	HM-4189.50
70mm	HM-4189.70
100mm	HM-4189.100
150mm	HM-4189.150
1.4"	HM-4189.14
1.5"	HM-4189.15
2.0"	HM-4189.20
2.8"	HM-4189.28
4.0"	HM-4189.40
6.0"	HM-4189.60

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

Porous Stones	
35mm	HM-4184.35
38mm	HM-4184.38
50mm	HM-4184.50
70mm	HM-4184.70
100mm	HM-4184.100
150mm	HM-4184.150
1.4"	HM-4184.14
1.5"	HM-4184.15
2.0"	HM-4184.20
2.8"	HM-4184.28
4.0"	HM-4184.40
6.0"	HM-4184.60

Used for permeability and triaxial testing to allow even distribution of water through sample. Two stones required per cell, each 0.25" thick (6mm).

O-Rings	
35mm	HM-4182.35
38mm	HM-4182.38
50mm	HM-4182.50
70mm	HM-4182.70
100mm	HM-4182.100
150mm	HM-4182.150
1.4"	HM-4182.14
1.5"	HM-4182.15
2.0"	HM-4182.20
2.8"	HM-4182.28
4.0"	HM-4182.40
6.0"	HM-4182.60

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

O-Rings	
35mm	HM-4183.35
38mm	HM-4183.38
50mm	HM-4183.50
70mm	HM-4183.70
100mm	HM-4183.100
150mm	HM-4183.150
1.4"	HM-4183.14
1.5"	HM-4183.15
2.0"	HM-4183.20
2.8"	HM-4183.28
4.0"	HM-4183.40
6.0"	HM-4183.60

Positions rings to seal membrane with minimum disturbance to specimen.

HM-4181.28

HM-4185.28

HM-3847.28

HM-3827.28

HM-4186.28

Membrane Stretcher	
35mm	HM-4181.35
38mm	HM-4181.38
50mm	HM-4181.50
70mm	HM-4181.70
100mm	HM-4181.100
150mm	HM-4181.150
1.4"	HM-4181.14
1.5"	HM-4181.15
2.0"	HM-4181.20
2.8"	HM-4181.28
4.0"	HM-4181.40
6.0"	HM-4181.60

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

Membrane Tester	
35mm	HM-4185.35
38mm	HM-4185.38
50mm	HM-4185.50
70mm	HM-4185.70
100mm	HM-4185.100
150mm	HM-4185.150
1.4"	HM-4185.14
1.5"	HM-4185.15
2.0"	HM-4185.20
2.8"	HM-4185.28
4.0"	HM-4185.40
6.0"	HM-4185.60

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

2-Part Split Miter Box	
35mm	HM-3847.35
38mm	HM-3847.38
50mm	HM-3847.50
70mm	HM-3847.70
100mm	HM-3847.100
150mm	HM-3847150
1.4"	HM-3847.14
1.5"	HM-3847.15
2.0"	HM-3847.20
2.8"	HM-3847.28
4.0"	HM-3847.40
6.0"	HM-3847.60

For use with undisturbed samples and for sample trimming of cohesive soils. Made from aluminum.

2-Part Vacuum Split Form	
35mm	HM-3827.35
38mm	HM-3827.38
50mm	HM-3827.50
70mm	HM-3827.70
100mm	HM-3827.100
150mm	-
1.4"	HM-3827.14
1.5"	HM-3827.15
2.0"	HM-3827.20
2.8"	HM-3827.28
4.0"	HM-3827.40
6.0"	HM-3827.60

For use with non-cohesive soils and disturbed samples. Made from aluminum.

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

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

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Testing Equipment For Construction Materials

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