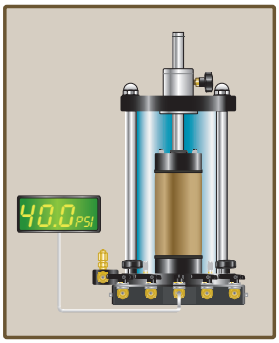
Humboldt Triaxial Testing Systems—
Humboldt provides an extensive line of triaxial testing equipment solutions for today's soil labs. At the heart of our triaxial testing equipment is the Humboldt Concept of providing a modular system of interchangeable, stand-alone components that when combined create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

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

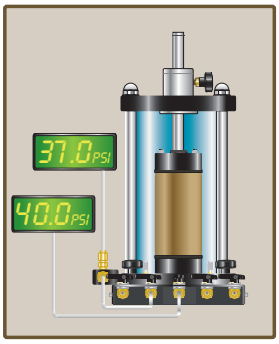
Automated Pressure Control Triaxial System—
Designed for those who want the ultimate in control of their triaxial testing, Humboldt's Automated Pressure Control Triaxial System is a computer-controlled system specifically designed for soil testing laboratories conducting UU, CU and CD Triaxial tests,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

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

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



UU-Triaxial Test
Typical Cell Setup



CU-Triaxial Test
Typical Cell Setup

CD-Triaxial Test
Typical Cell Setup

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

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

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

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

Humboldt's Manual Pressure Control Triaxial System is built around our HMTS test-specific software, which monitors, controls and reports the test data, and, the highly-regarded HM-3000 Load Frame. with its built-in, 4-channel data acquisition for stress, strain, pore water pressure and volume change measurement. The system can also be configured for use with our Triaxial-specific Load Frame, the HM-2900. While Humboldt's Manual Pressure Control Triaxial System has been designed to work as a complete system, its make-up provides for the ultimate in versatility and expanded possibilities.

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

FlexPanel Pressure Control Triaxial System—
Humboldt's FlexPanel pressure control option eliminates the use of the air/water bladder interface concept of pressure control in lieu of its highly-accurate burette system. FlexPanels have a set of three burettes for each triaxial cell. The three burettes connect to the cell, top cap and base pedestal. This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow the control of the cell pressure and the back pressure for a single cell. They can monitor volume change in the sample and can be used to measure the flow of water through the sample for permeability testing.

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

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

Automatic Pressure Control

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

Automatic Pressure Control System,1-Cell Setup

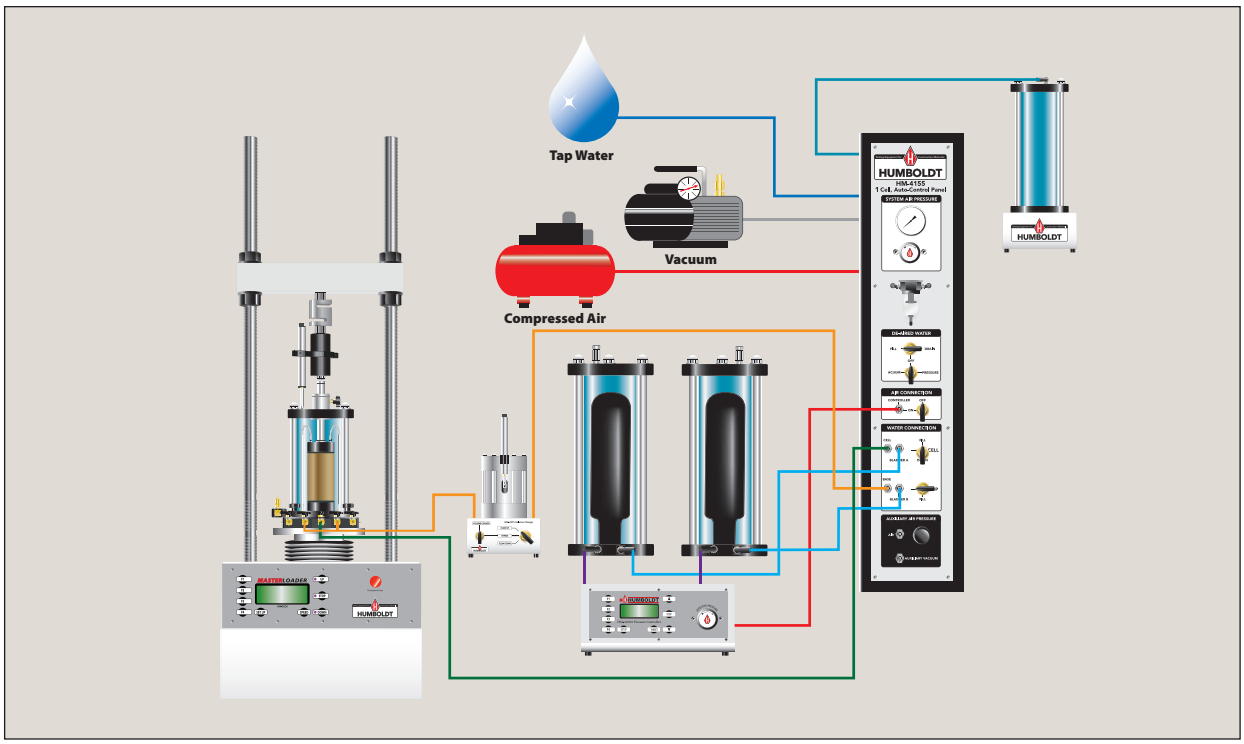
COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU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

Automatic Pressure Control System, 3-Cell Setup

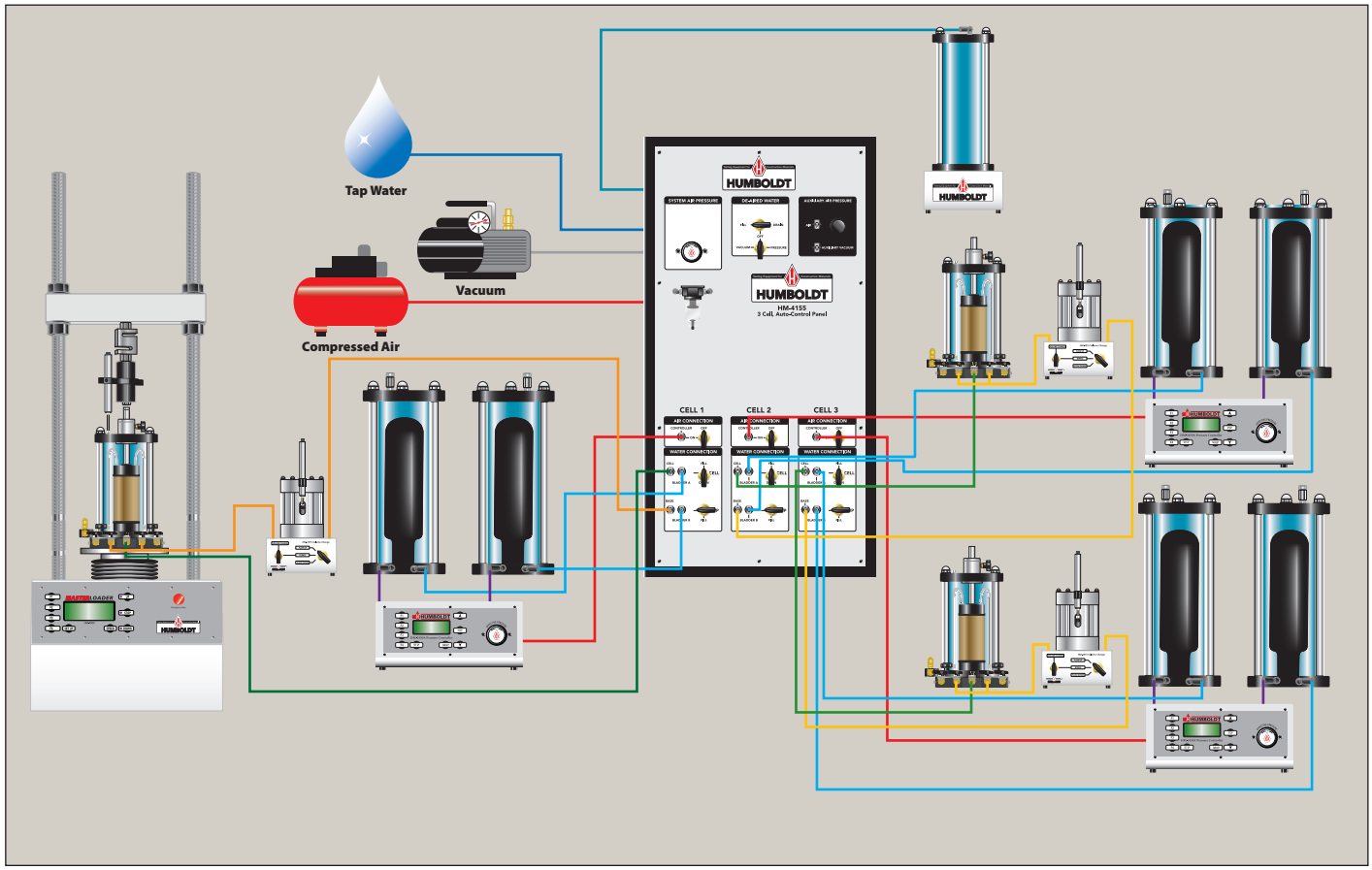
COMPONENTS		
Load Frame (choose 1 below)		
50kN(11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Pore Pressure Transducer	HM-4170	3
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU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

Standard Triaxial Sample Prep Accessories:
(See page 79 for a complete list and description. Items with .XX require a sample size)

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



Automatic Pressure Control System,1-Cell Setup



Automatic Pressure Control System, 3-Cell Setup

Manual Pressure Control

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

Manual Pressure Control System,1-Cell Setup

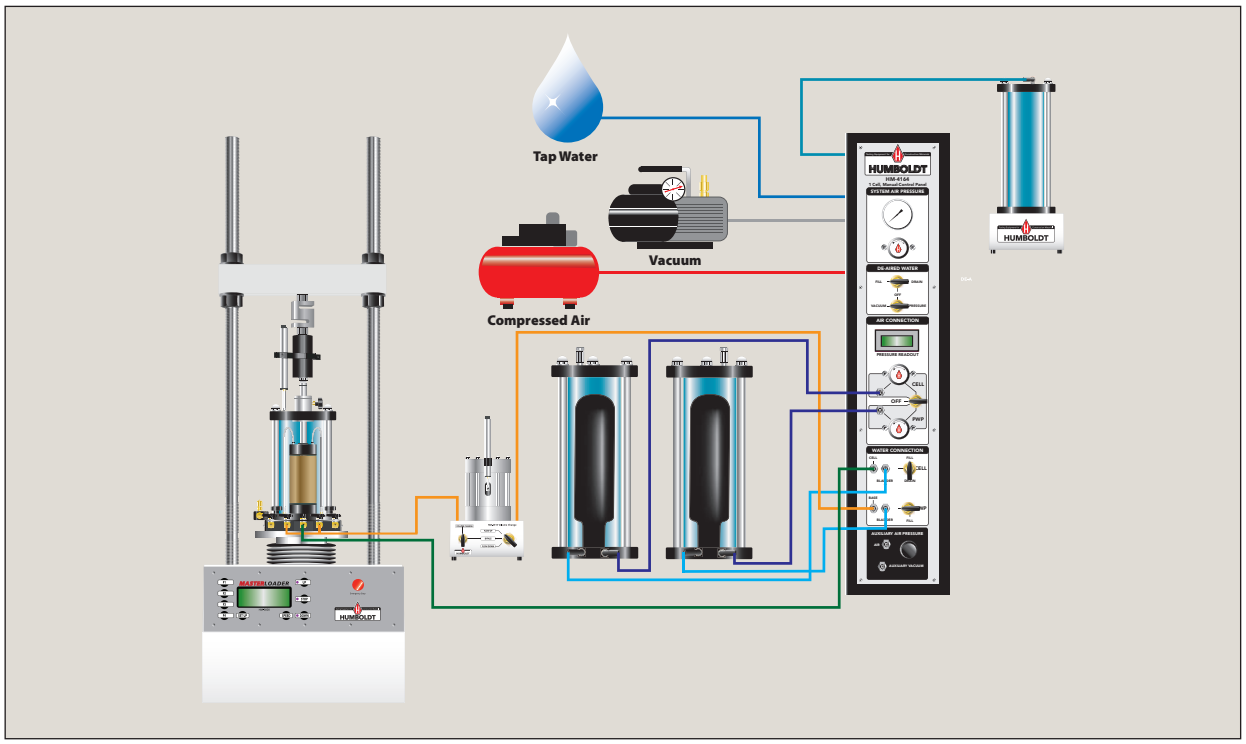
COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW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

Manual Pressure Control System, 3-Cell Setup

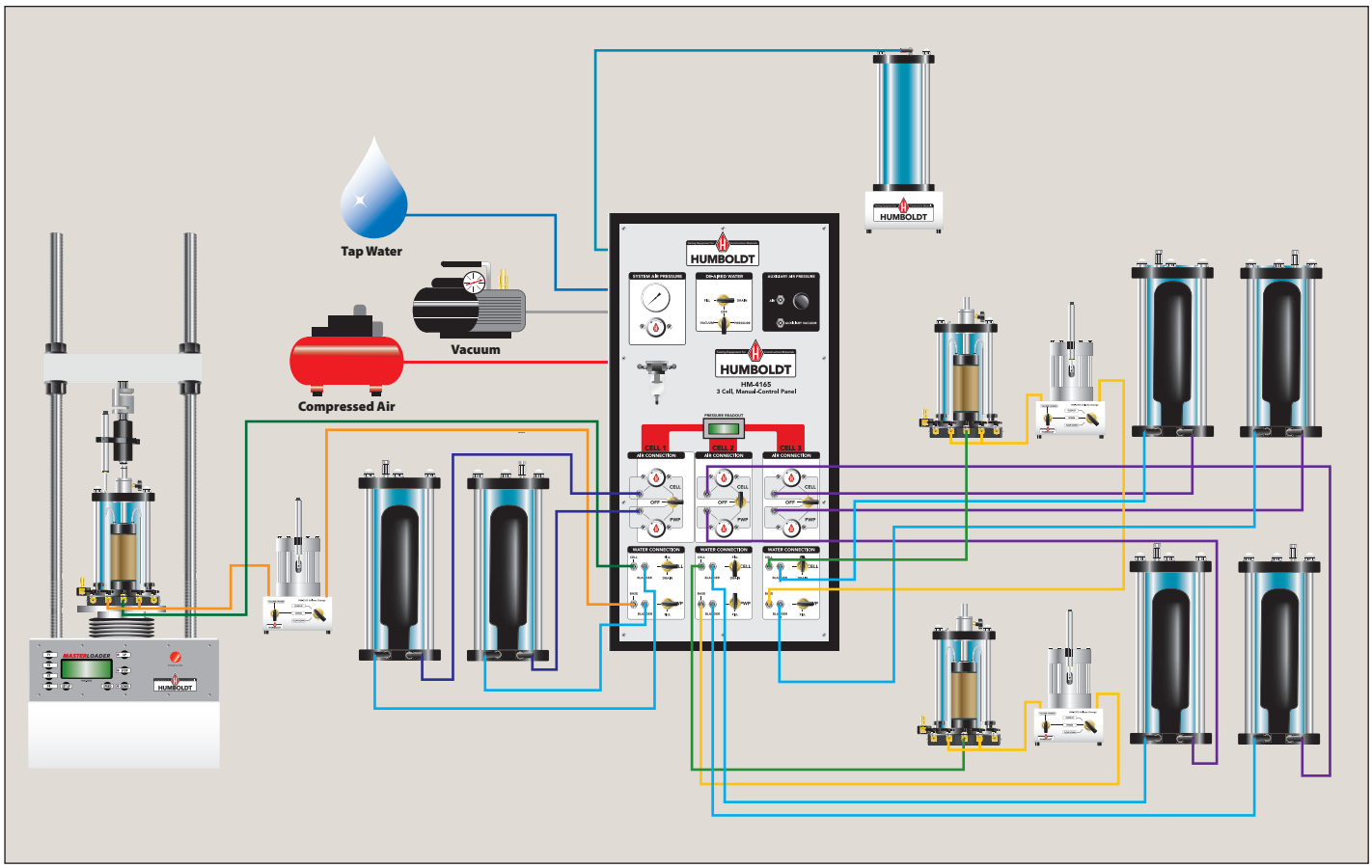
COMPONENTS		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-3000.3F	1
15kN (3372 lbf) capacity	HM-2900.3F	1
Load/Strain		
Load Cell	HM-2300.020	1
Strain Transducer (LSCT)	HM-2310.20	1
Ball Seat Adapter	HM-200387	1
Strain Transducer Bracket	HM-4178BRT	1
UU Triaxial Software Module	HM-3002SW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

Standard Triaxial Sample Prep Accessories:
(See page 79 for a complete list and description. Items with .XX require a sample size)

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



Manual Pressure Control System,1-Cell Setup



Manual Pressure Control System, 3-Cell Setup

FlexPanels Pressure Control

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

FlexPanel Pressure Control System,1-Cell Setup

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

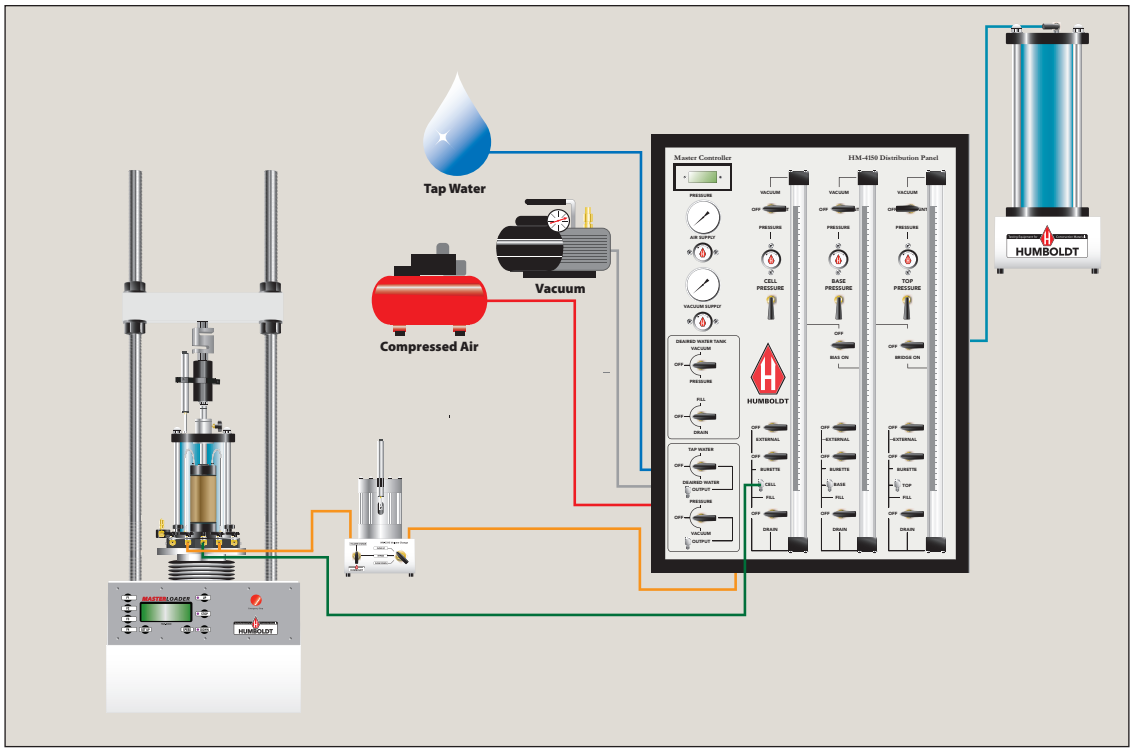
FlexPanel Pressure Control System, 3-Cell Setup

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

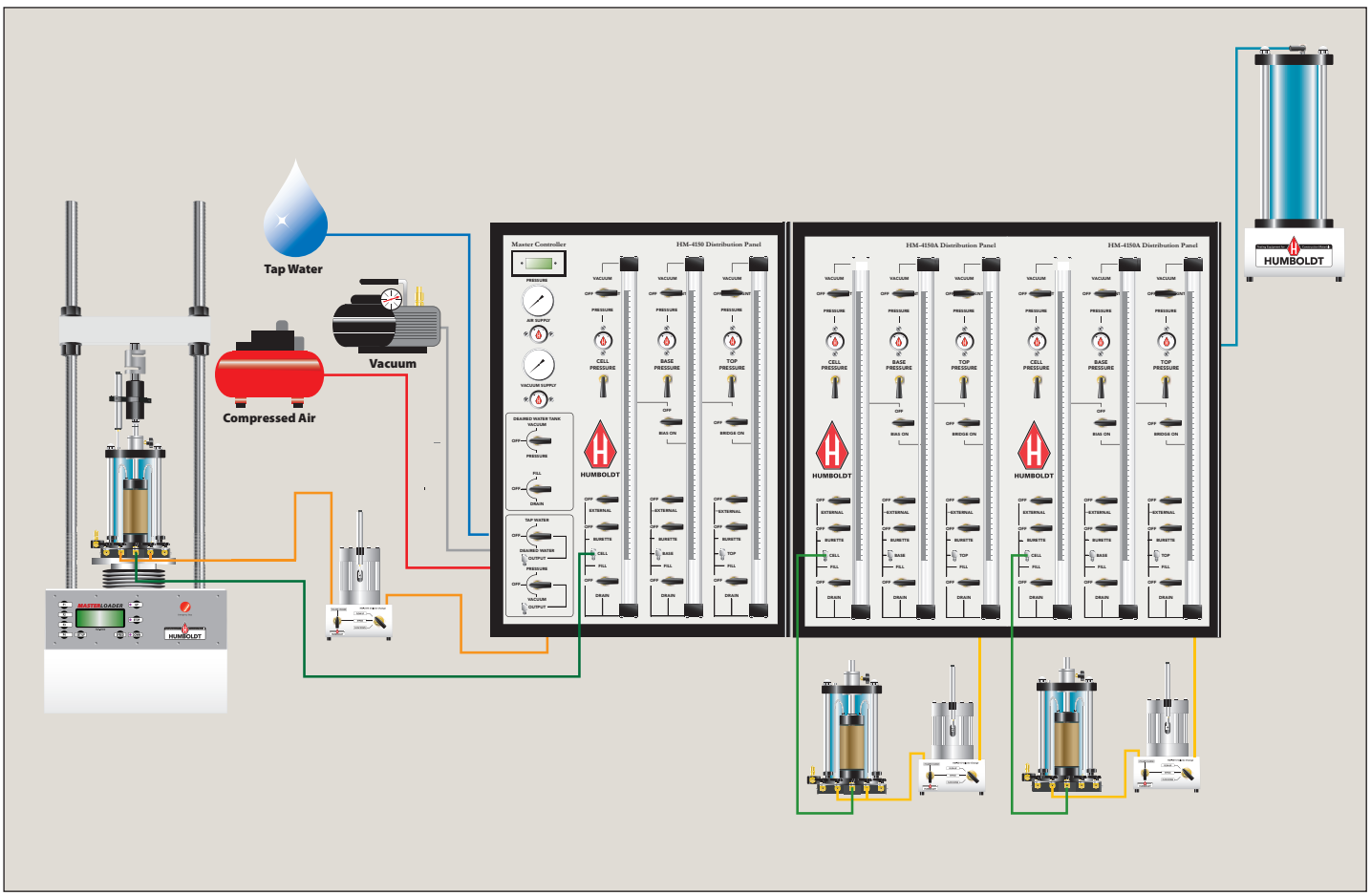
Standard Triaxial Sample Prep Accessories:

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

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



FlexPanel Pressure Control System,1-Cell Setup



FlexPanel Pressure Control System, 3-Cell Setup

HM-3000.3F

Designed for applications requiring multi-purpose loading systems, such as road construction projects in either mobile or fixed labs, educational institutions and consulting firms, the HM-3000 MasterLoader is ideal for just about any application from road construction to high-volume commercial and educational laboratories.

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

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

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

Features include:

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

Covers: CBR, UU, CU, CD, UC, Marshall and Hveem Tests
ASTM: D1883, D2850, D2166, D4767, and D1559
AASHTO: T193, T296, T297, T208, T245, and T246
BS 1377: Part 4: 1990, BS 1377: Part 7: 1990,
BS 1377: Part 8: 1990, BS 598: Part 107

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

HM-2900.3F

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

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

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

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

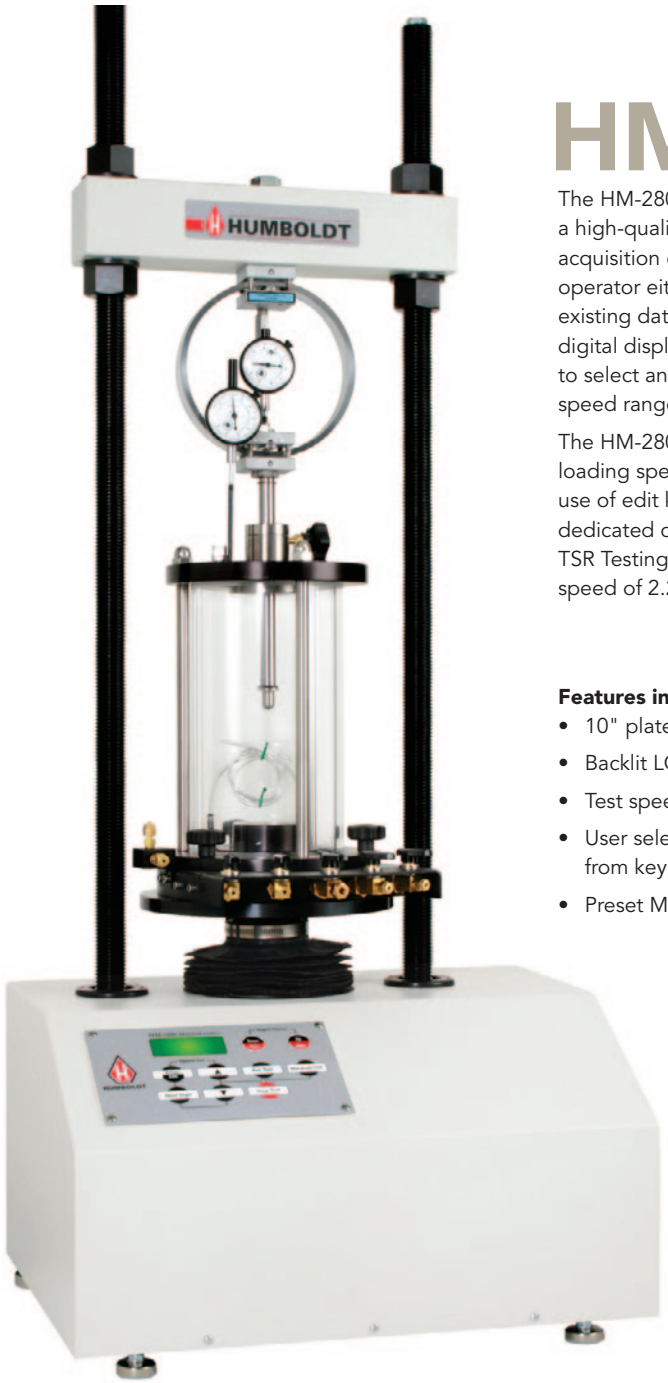
In addition to its ability to link to a computer, the HM-2900 also provides the ability to daisy-chain multiple machines together as part of the system. Any Humboldt Concept test equipment, from other Load Frames to Consolidation and Shear Apparatus can use this linking feature to access the computer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

Features include:

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

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

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



HM-2800

The HM-2800 Multi-speed Load Frame is designed for those who want a high-quality but simple, multi-purpose load frame without built-in data acquisition capabilities. The HM-2800 is ideal for applications where the operator either is not concerned with data acquisition; or, already has an existing data acquisition system or plans on constructing one. With its digital display, the HM-2800 also provides the operator with the ability to select any speed with three decimal accuracy within the load frame's speed range.

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

Features include:

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

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

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

Covers: CBR, UU, CU, CD, UC, Marshall and Hveem Tests
ASTM: D1883, D2850, D2166, D4767, D5581 and D6927
AASHTO: T193, T296, T297, T208, T245, and T246
BS 1377: Part 4: 1990, BS 1377: Part 7: 1990,
BS 1377: Part 8: 1990, BS 598: Part 107

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

Typical CU/UU Triaxial Setup

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

Typical Unconfined Compression Setup

COMPONENTS		
Load		
Load Frame (choose 1 below)		
50kN (11240 lbf) capacity	HM-2800	1
	HM-2800.4F	1
Upper Unconfined Platen	HM-2002	1
Displacement Indicator Platform	HM-3000.10.2	1
Displacement Indicator Rod	HM-3000.10.3	
Load Ring 500 lbf (2.5 kN)	H-4454.050	1
Dial Gauge 1.0" travel 0.0001" Divisions	H-4158.1	1

Typical Soil Cement Setup

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

Standard Triaxial Sample Prep Accessories:
(See page 79 for a complete list and description. Items with .XX require a sample size)

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

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

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

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

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

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

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

For those operations, which do not require automated control, Humboldt's HM-4164 and HM-4165 Manual Control Panels provide an accurate and easy-to-operate solution for controlling compressed air, water, deaired 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 regualtors. These control panels have a bias pressure regulator feature, which allows simultaneous control of confining and back pressures, while maintaining a constant differential pressure

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

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

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

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

Humboldt FlexPanels (see page 47 for specifications):

Humboldt FlexPanels provide an accurate and easy-to-operate solution for controlling compressed air, water, deaired water and vacuum without the need for air/water bladder interfaces to produce the pressures necessary for triaxial testing. FlexPanels utilize a set of three burettes to control cell, top cap and base pedestal pressures.

This extremely versatile pressure system controls the pressure, water, de-airing tank and vacuum from a single panel. The three burettes allow for the control of the cell pressure and the back pressure for each cell. They can monitor volume change in the sample and can be used to measure the flow of water through the sample for permeability testing. FlexPanels can manually measure volume change or permeability in a triaxial test sample without the use of a volume change apparatus, a distinct benefit when compared to air/water bladder systems.

- Bias pressure regulator allows simultaneous control of confining & back pressures, while maintaining a constant differential
- Longer Burette and 0.02ml graduation give more accurate results, better productivity, and faster turnaround
- Uses no-volume-change Swagelock valves
- Bridge feature delivers simultaneous control of base and top pressures by adjusting one pressure regulator simplifying testing
- Quick-connect hookups for fast and reliable set up.
- Master control panel houses digital pressure readout for the controlling pressure, inlet vacuum regulator & gauge, inlet pressure regulators & gauge, de-aired water tank controls, tap & de-aired water supply outlets, and pressure & vacuum outlets
- Complies with ASTM D5084; BS 1377 Part 6 1990.

Distribution Panel Accessories

HM-4220

HM-4150.22AS

H-1763A

HM-4196.25
HM-4196.12
HM-003174

HM-4150.72

HM-4197.12

Quiet Compressor, 115V 50/60Hz— HM-4220
Quiet Compressor, 220V 50/60Hz— HM-4220.4F

When operating under full load this exceptionally quiet compressor offers a tremendously low noise level of 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.

Output in CFM and L/Min:	4.2 CFM120 L.Min
Horse Power:	1.0Hp
Tank Size Gal / Lt.:	13 Gal50 Lt.
Noise Level:	42 db/A
Dimensions:	41 x 13 x 2743 x 18 x 33 (Packed)
Weight:	121 lbs. (147 lbs. Packed)
Max Pressure PSI / Bar:	120 PSI (8 Bar)
Operating Pressure PSI / Bar:	90-120 PSI6-8 Bar

Pressure Regulator, 2-150PSI w/Fittings— HM-4150.22AS
Positive Bias Regulator w/Fittings— HM-4150.23AS

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

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

Quick-Connect, 1/4" Male— HM-4150.72

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

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

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

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

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

Tubing, 1/8" by the foot— HM-4196.12

Tubing, 1/4" by the foot— HM-4196.25


HM-4151A


HM-2450A.3F


HM-2315


HM-2310.10


HM-4170


HM-4187H


HM-4187A.3F

Air/Water Bladder Cylinder— HM-4151A
The Humboldt Air/Water Bladder Cylinder is used to deliver pressurized de-aired water to the triaxial cell. The bladder acts as an reservoir and interface between the compressed air, used as the pressure source, and the deaired water, which is used as the pressurizing medium for the sample. The use of the bladder eliminates the reintroduction of air into the de-aired water, while providing a high-degree of accuracy. The cylinder will operate continuously to a maximum pressure of 150 psi (1000 kPa). It is constructed of anodized aluminum top and bottom plates, acrylic cylinder and a viton bladder. Shipping wt. 8 lbs. (3.7kg)

Spare Replacement Bladder— HM-4151.1
Viton replacement bladder for HM-4151A, quantity (1).

Automatic Volume Change Apparatus— HM-2315
The apparatus is used for measuring the volume change of a soil sample by monitoring the flow of water through the chamber of the unit. The lower assembly contains changeover valves, which when used in conjunction with the upper assembly provides limitless capacity. The unit can be used with a linear strain transducer, a digital indicator, or as part of an automated system. It is accurate to better than ±0.05 ml and is easily de-aired in seconds. Includes connectors, valves, and tubing. Order strain transducer or digital indicator separately. Shipping wt. 21 lbs. (9.5kg)

Strain Transducer— HM-2310.10
Strain transducer, 1" (25mm) for use with HM-2315 Automatic Volume Change Apparatus

Transducer Bracket— HM-2310BR
Bracket to attach strain transducer to HM-2315 Automatic Volume Change Apparatus

Pore Pressure Transducer— HM-4170
Highly accurate, 200 psi (1400 kPa) Pore Pressure Transducer. Designed for geotechnical lab applications with outstanding overload protection and protected from corrosive water. Requires input of 10 V DC, with an output of 100 mV. Supplied with 2 meter cable and 5-pin DIN plug.

Pressure Controller, 120/220V 50/60Hz— HM-2450A.3F
Stand alone control unit for accurate control of air pressures in the triaxial laboratory testing. It provides automatic, incremental back pressure saturation with B-value calculation and check. When used with HMTS (Humboldt Material Testing Software) and Humboldt Triaxial testing equipment, the on-board, digital and bias-pressure regulators, plus two air/water bladder systems (HM-4151A) and the distribution panel (HM-4155 or HM-4154) allow simultaneous control of the confining and back pressure while maintaining a constant differential pressure.

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

De-Airing Water Tank— HM-4187H
For use with Triaxial/Permeability Distribution Panels. Requires a Vacuum Pump, (see page 75). Shipping wt. 13 lbs. (6kg)

De-Airing Water System, 120/220V 50/60Hz— HM-4187A.3F
The HM-4187A.3F produces 8-liter batches of de-aired water without the use of heat. Combined mechanical agitation and vacuum evacuation removes gasses at much higher rate than conventional heat-boiling methods. Will de-air water to less than 0.5 pph dissolved oxygen in 4 minutes. Requires a Vacuum Pump, (see page 75) 1/55hp motor 110V, 60Hz. 7.5 x 7.5 x 20" (190 x 190 x 508mm). Shipping wt. 19 lb (8.6kg)


HM-4199B


HM-4199B-6

HM-4199B-4

HM-4199B

Triaxial Cells

HM-4199B Triaxial Cells are available for use with sample sizes from 1.4" (35mm) to 6" (150mm). The clear acrylic chamber has a working pressure of 150 psi (1,000 kPa) and is tested to 250 psi (1,700 kPa). The design features a solid base, which provides an extremely stable test platform making it faster and easier to center the cell on the load frame platen— reducing setup times. HM-4199B cells provide easy access to the test chamber by utilizing a one-piece, chamber unit that is quickly removed through the removal of three easy-turn knobs. These cells also have an integral de-airing block for the pore pressure transducer built into the side. The cells have five no-volume-change valves aligned on one side for maximum convenience. Two valves handle top drainage, two valves handle bottom drainage, and one valve handles filling and drainage, as well as providing confining pressure to the cell. The removable base pedestal accommodates various sample diameters. Top caps and base pedestals are available in a choice of black-anodized aluminum or stainless steel in various sizes (see chart below). Other sizes are available. The cell top and base are precision machined from 6061 T6 aluminum, hard-coated and Teflon impregnated. A 5/8" hardened stainless steel piston runs inside a linear bearing to reduce friction.

Choice of brass or stainless steel valve fittings is available (stainless steel for use with hazardous materials). When ordering, specify top cap and base pedestal for desired sample size. Order porous stones separately, see page 21. Cell dimensions are: 13-3/4" H x 8-3/4" dia. (349.2 x 222.3mm); overall diameter is: 11" (279.4mm).

Triaxial Cells and Top Cap/Base Pedestal Sets

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

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


HM-4199.28

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

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

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

Two-Part Compaction Molds

Sample	Mold	Base Plate
1.4"	HM-3817.14	HM-3817.14BP
1.5"	HM-3817.15	HM-3817.15BP
1.875"	HM-3817.18	HM-3817.18BP
2.0"	HM-3817.20	HM-3817.20BP
2. 36"	HM-3817.23	HM-3817.23BP
2.5"	HM-3817.25	HM-3817.25BP
2.8"	HM-3817.28	HM-3817.28BP
4.0"	HM-3817.40	HM-3817.40BP
6.0"	HM-3817.60	HM-3817.60BP
35mm	HM-3817.35	HM-3817.35BP
38mm	HM-3817.38	HM-3817.38BP
50mm	HM-3817.50	HM-3817.50BP
70mm	HM-3817.70	HM-3817.70BP
100mm	HM-3817.100	HM-3817.100BP
150mm	HM-3817.150	HM-3817.150BP

Length Comparator— HM-4173
Length comparator designed to quickly and accurately measure the height of soil samples to within ±0.1% of the total height. Includes a digital indicator accurate to within 0.0001 inches (0.002mm) with 0 to 1" (0 to 25mm) total range. The comparator is comprised of an upright support 14" (356mm) tall attached to a 6 x 6 x 2" (150 x 150 x 50mm) granite base and includes a 6" (152mm) reference bar. Other reference bars such as 4.0", 3.0" and 2.0" for other sample sizes are available. Complies with ASTM D2166, D2850, D4767, BS 1377:8. Reference bar includes Calibration Report traceable to the National Institute of Standards and Technology.
Shipping wt. 16 lb (7.2kg)

Soil Sample Trimmer, 1.0 to 3.0"— HM-3130
Soil Sample Trimmer, 1.0 to 4.0"— HM-3140
Sample trimmer for cutting samples to precise diameters. The HM-3130 handles samples up to 3" and HM-3140 handles up to 4" samples by employing easily interchangeable top platens. Stainless steel pins in pedestal & top platen hold sample in position. Top platen bearing assembly is lowered & locked and sample trimmed with wire saw, order top platens and saw separately.
Shipping wt. 6 lbs. (2.72kg)

Sample Trimmer Top Platens

Top Platen	Model
1.0"	HM-3130.10
1.4"	HM-3130.14
1.875"	HM-3130.18
2.0"	HM-3130.20
2.5"	HM-3130.25
2.8"	HM-3130.28
3.0"	HM-3130.30
4.0"	HM-3130.40

Top Platen	Model
35mm	HM-3130.35
38mm	HM-3130.38
50mm	HM-3130.50
70mm	HM-3130.70
100mm	HM-3130.100

Wire Saw— HM-3175
Sample trimming saw with replaceable wire blade.

Replacement Wire— HM-3175.1
Replacement wire for HM-3175 saw.

High Vacuum Grease— HM-4198
Effective means of sealing latex membranes to sides of the top cap.

Filter Paper Strips— HM4189FS
Wrapped around sample to accelerate saturation in triaxial testing, 5 x 150mm, Grade 55, 100/pkg.

Precision Diameter Tape, 0.75 to 7"— HM-4174
Precision Diameter Tape, 28 to 200mm— HM-4174M
Diameter tapes provide a fast, reliable method for measuring the diameter of concrete, soil and asphalt cores and cylinders. One reading provides round and out-of-round diameters within an accuracy of .001" (.03mm) by means of special graduations and vernier scale. All tapes are made from a stainless alloy and are precision engraved to ensure accuracy. Tape has diameter range of 2 to 12" (50 to 300mm on metric model). Includes certificate of calibration. Tapes are calibrated and include a NIST-traceable certification. Complies with ASTM D2166, D2850, D4767, BS 1377:8.

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

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

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

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

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

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

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

Positions rings to seal membrane with minimum disturbance to specimen.

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

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

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

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

2-Part Split Miter Box	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
	HM-3847.35	HM-3847.38	HM-3847.50	HM-3847.70	HM-3847.100	HM-3847.150	HM-3847.14	HM-3847.15	HM-3847.20	HM-3847.28	HM-3847.40	HM-3847.60

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

2-Part Vacuum Split Former	35mm	38mm	50mm	70mm	100mm	150mm	1.4"	1.5"	2.0"	2.8"	4.0"	6.0"
	HM-3827.35	HM-3827.38	HM-3827.50	HM-3827.70	HM-3827.100	HM-3827.150	HM-3827.14	HM-3827.15	HM-3827.20	HM-3827.28	HM-3827.40	HM-3827.60

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

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

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

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

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

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

Acrylic disk used in UU triaxial tests.