

Digital Direct Shear Machine, Dead-Weight

HM-380D/380DF

INTRODUCTION

The Gilson HM-380D AND HM-380DF Dead-Weight Direct Shear Machines are motorized units for direct and direct/residual shear testing of soil samples and use a 10:1 dead-weight beam loading system to apply vertical confining pressures. These compact, self-contained units are built for harsh laboratory environments and require little floor space.

This Direct Shear Unit has a strain rate of 0.0001–0.3in/min (0.0025–7.62mm/min) with a maximum shear displacement of 0.8in (20.3mm) and the travel speed is set with the thumbwheels on the left side of the unit. The residual shear force is determined by a load cell while real time load settings and peak load are displayed on the digital readout. Vertical load capacity is 1,411lb (640kg) and the maximum horizontal shear force is 1,500lbf (6.67kN). Consolidation and shear displacement are measured with Displacement Transducers and displayed on a Data Readout.

Shear boxes and weight sets are required and sold separately.

FEATURES

- Total shear capacity of 1,500lbf (6.67kN)
- Stepper motor controls strain rates to $\pm 1\%$ from 0.0001 to 0.3in/min (0.0025 to 7.62mm/min)
- Teflon-coated anodized aluminum water chamber with drainage port included.
- Meets requirements for ASTM D3080 and AASHTO T 236

REQUIRED ACCESSORIES (purchased separately)

Direct shear boxes are sold separately and are available in a wide range of inch and metric sizes with round or square shapes. See all options at www.globalgilson.com and in the chart to the right.



Dead-Weight Direct Shear Machine with Linear Variable Displacement Transducers, Four-channel Data Readout and Shear Box shown (Shear Box sold separately)

Direct Shear Boxes & Accessories				
Size, in (mm)	Shear Box	Cutters	Extruders	Porous Stones
Round Direct Shear Boxes				
1.97 (50) Diameter	HMA-733M	HMA-743M	HMA-763M	GSA-208
2.0 (50.8) Diameter	HMA-733	HMA-743	HMA-763	GSA-210
2.36 (60) Diameter	HMA-734M	HMA-744M	HMA-764M	GSA-213
2.42 (61.4) Diameter	HMA-734	HMA-744	HMA-764	GSA-217
2.5 (63.5) Diameter	HMA-735	HMA-745	HMA-765	GSA-219
3.94 (100) Diameter	HMA-737	HMA-747	HMA-767	GSA-231
4 (101.6) Diameter	HMA-736	HMA-746	HMA-766	GSA-232
Square Direct Shear Boxes				
1.97 (50) Square	HMA-733MS	HMA-743MS	HMA-763MS	GSA-208S
2.0 (50.8) Square	HMA-733S	HMA-743S	HMA-763S	GSA-210S
2.36 (60) Square	HMA-734MS	HMA-744MS	HMA-764MS	GSA-213S
2.42 (61.4) Square	HMA-734SA	HMA-744SA	HMA-764SA	GSA-217S
2.5 (63.5) Square	HMA-735S	HMA-745S	HMA-765S	GSA-219S
3.94 (100) Square	HMA-737S	HMA-747S	HMA-767S	GSA-231S
4 (101.6) Square	HMA-736S	HMA-746S	HMA-766S	GSA-232S

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Weight Sets are required to apply the consolidation load and are available in both Pound and Kilogram sets.

Pound Weight Sets								
Model	Total Mass	Total Load at 10:1 Beam Ratio ¹	Included Weight Sets					
			0.852lb (1/8tsf)	1.704lb (1/4tsf)	3.409lb (1/2tsf)	6.818lb (1tsf)	13.635lb (2tsf)	27.270lb (4tsf)
HMA-727	54.5lb	545lbf (8tsf)	2	1	1	1	1	1
HMA-732	109.1lb	1,091lbf (16tsf)	2	1	1	1	1	3
HMA-729	218.2lb	2,182lbf (32tsf)	2	1	1	1	1	7

¹tsf values indicate force applied to a 2.50in diameter specimen using a 10:1 beam ratio.

Kilogram Weight Sets					
Model	Total Mass	Total Load at 10:1 Beam Ratio	Included Weight Sets		
			1kg	4kg	8kg
HMA-730	32kg	320kg	4	3	2
HMA-725	64kg	640kg	4	5	5
HMA-731	88kg	880kg	4	5	8

UNPACKING & SETUP

- Inspect your Direct Shear Machine for damage, remove from the pallet.
- Review connections section and install necessary components.
- Assemble the dead-weight lever arm. Remove all packing material from arm and adjusting screw support bracket. Reposition the arm above the support bracket holes and reinstall the support bracket. Next install the 3.5in diameter counterbalance weight and the weight platform.

CONNECTIONS

Vertical Displacement Transducer Rod – Screws into the top platform to the right of the rear pull-down rod.

Vertical Displacement Transducer Clamping Arm – Attach to the above rod.

Vertical Displacement Transducer – Consolidation – Attach to the clamping arm with the screw provided. Connection is made at the rear of the Data Readout.

Horizontal Displacement Transducer – Shear – Attach to the threaded rod on the angle bracket-top platform, right front. Connection is made at the rear of the Data Readout.

Load Cell – Connect the load cell to the support casting at the right end of the direct shear using the two knobs. Adjust the knobs so that the load cell is as far to the right as possible. This will allow room for assembling the water chamber and the shear rings with minimum interference. Connection is made at the rear of the Data Readout.

Mini USB 2.0 Port – Connection is made at the rear of

the readout box to a computer.

Water Chamber – Special care should be taken to see that the four roller bearings between the water chamber and the base slide tracks are properly cleaned and contain a slight amount of oil during and after use. We advise using a cover over the direct shear after use to eliminate dust from entering the precision slide assembly. The main drive shaft should be at its home position. This will place the sample load pad in the center of the crossarm for consolidation.

Shear Boxes (sold separately) – The shear rings are held together with two stainless steel screws boxes. There are also four screws for adjusting the gap between the rings once consolidation has been reached. The gap is adjusted by turning the screws clockwise from the finger tight position. One full turn will create a 0.031in gap. There is a line scribed on the adjusting knob for determining how much gap each screw has provided. The screws should be turned evenly to maintain a proper gap. At the bottom of each screw is a nylon glide which keeps the top shear ring from dropping during the test.

FRONT PANEL CONTROLS

The strain rate is controlled from the front panel thumbwheels. Machine must be plugged in to a properly wired grounded receptacle with appropriate electrical current.

PANEL CONTROLS — POWER & SHEAR RATE

Power Switch – An indicator light is present when power is turned on.

Strain Rate Selector – The strain rate is set with thumbwheel selectors. The switches are direct reading in inches/minute with an implied leading decimal point. Once the rate is set and the test is started, the switch setting is ignored until the stop switch is pressed or a limit switch is tripped.

Limit Switches – These switches are located on the platform behind the water chamber.

Adjustment of these switches is made by loosening the Phillips-head screws and moving the limit switch as-

sembly in the direction desired. The home position has been set so that the load crossarm is in the middle of the shear rings.

Note: The limit of travel of the drive shaft is dependent on the limit switch settings. Do not operate the drive motor with the water chamber disconnected because this will make the limit switches inoperable.

Stop Switch – Momentary push button to stop the motor.

Direction Switch – Momentary (spring-loaded) switch. After setting the desired shear rate, moving the switch in the desired direction will initiate movement. This switch will then become inactive until the stop button is pressed, or a limit switch is activated. The left position will move the water chamber to the left. It will continue until the water chamber activates the limit switch. At this time, the limit indicator light will be lit. The right switch position will move the shear box to the right until the home limit switch is made. See above note.

Residual Counter – Two-digit thumbwheel is used for setting the number of residual shear passes required. One shear pass will allow the shear box to travel from the home position to the limit switch setting. Two passes will travel from the home position out to the limit switch and then return to the home position. Each pass completed will register on the digital readout to the right of the thumbwheels. Choose between 0–99 passes.

Home & Limit Indicators – Used to indicate the limit of travel of the shear box.

Fuse – 4 amp SLO BLO fuse located in the cabinet rear.

OPERATING INSTRUCTIONS

Read all operating instructions before performing a test and refer to ASTM D3080 or AASHTO T 236 for complete test procedures and calculations.

Set Up

1. Place the shear box into the water chamber and secure the load cell shaft to the top of the shear box.
2. Tighten the two shear ring clamping knobs located on the left side of the water chamber.
3. Install the counterbalance, HMA-735, if necessary.
4. Tare the load cell by pressing the “Tare” button on the digital readout.
5. Adjust the top cross arm and LVDT so there is 1/8in gap between the cross arm and loading ball. Align

the cross arm pin so it is above the loading ball. Make sure the cross arm is level.

6. Adjust the LVDT by raising or lowering the indicator rod and holder so the tip of the LVDT is resting on the cross arm pin.

Consolidation

The weight of the consolidation load arm with two upright rods lower cross arm and lower weight platform is 11.9lb. The lever arm on the right side of the device has been preset to a 10:1 ratio, select a consolidation load and apply the required weights to the weight hanger. The consolidation result is read on the Data Readout.

Refer to ASTM D3080 for consolidation calculations.

Direct Shear

1. After consolidation phase is complete, add a small seating shear load by adjusting the two knurled nuts on the load cell support.
2. Tare the shear load cell which is displayed on channel 1 of the Data Readout.
3. Remove the two holding screws on the shear box to separate the top and bottom sections. Adjust the four adjusting screws on the shear box to set the gap between the top and bottom of the shear box. One full turn of these adjusting screws will create a 0.031in (0.78mm) gap.
4. Set the shear/strain rate with the thumbwheels on the left side of the machine. Each number is set by pushing the thumbwheel button, the rate is in inches per minute (0001 = 0.0001in/min).
5. Tare the horizontal displacement LVDT on channel 2 of the Data Readout. To begin shear, switch the DIRECTION toggle switch to the left towards the LIMIT light.
6. The water chamber with shear box will continue to move at the set rate until the limit switch is activated or the STOP button is pressed.
7. Load and Shear Displacement will be displayed on channels 1 and 2 of the Data Readout and transferred to an Excel file or the Direct/Residual Shear Data Acquisition Software on the user’s connected computer.
8. At the test completion, switch the DIRECTION toggle to the right towards the HOME light. Press the stop button when Zero load is reached on the load cell, channel 1 of the Data Readout.
- 8A. If Residual Shear values are needed, these can be

determined during this time.

9. Reduce the vertical load to Zero by adjusting the Fairchild Pressure Regulator until Zero psi is reached on the Data Readout.
10. The Shear Box can now be removed from the water chamber and the sample can be inspected.

MAINTENANCE

Special care should be taken to see that the four roller bearings between the water chamber and the base slide track are properly cleaned and contain a slight amount of oil during and after use. It is recommended to cover the Direct Shear machine when not in use to prevent dust buildup.

Empty the water chamber after each test to prevent soil and sand buildup inside the chamber. The water can be drained from the port, or the chamber can be removed from the Direct Shear Machine for thorough cleaning.

Digital Direct Shear Machines, Dead-Weight

Digital Direct Shear Machine, Dead-Weight, 115V, 50/60Hz	HM-380D
Digital Direct Shear Machine, Dead-Weight, 230V, 50/60Hz	HM-380DF
Accessories	
Shear Box Counterbalance	HMA-739
Direct/Residual Shear Data Acquisition Software	HMA-610