ROCK

Rock mechanics is an important field of geotechnical engineering as it is the theoretical and applied science concerning the physical behavior of rocks and rock masses. It also deals with the application of the principles of engineering mechanics to the design of the rock structures generated by mining, drilling, civil construction activity and other structures built in or made of rock.

Like aggregates, rocks need special cares too: a rock stratum undergoes several alterations in case of excavations and handlings. As a result, specific studies on the properties of intact rocks are required.

CONTENTS

DIGITAL POINT LOAD TESTER (ROCK STRENGTH INDEX)

STANDARD: ASTM D5731

Used to determine the strength values of a rock specimen both in the field and in the laboratory.

It consist of a load frame for applying loads up to 50 kN or 100 kN, on which a manual hydraulic jack is mounted.

The instrument accepts core specimens up to 4" (101.6 mm) diameter which are loaded by two cone shaped points. A graduated scale indicates the distance between the conical points.

Complete with Manuel Hydraulic Jack, Digital Indicator, Safety Mask and Wooden Carrying Case.

Spare Parts & Accessories:

Product Code	Product Name
HR-R0125/1	Manuel Hydraulic Jack
HR-R0125/2	Digital Indicator
HR-R0125/3	Safety Mask
HR-R0125/4	Wooden Carrying Case

HR-R0125

Technical Specifications:

Product Code	Product Name	Dimensions (cm)	Weight (kg)
HR-R0125	Digital Point Load Tester (Rock Strength Index), 50 kN	40X53X72	25
HR-R0125	Digital Point Load Tester (Rock Strength Index), 100 kN	40X53X72	40

ROCK CLASSIFICATION HAMMER (LOW IMPACT ENERGY MODEL)

STANDARDS: ASTM D5873

This lightweight and portable impact hammer is used for rock classification tests.

Includes rubbing stone for surface preparation.

The hammer is similar to a device used for many years for strength classification tests of mass concrete.

Cylindrical cores, usually NW size, are held in a horizontal position and the hammer mechanism impacted against the core to obtain rebound readings. A series of readings is taken along the length of the core to get the average rebound number.

The core rock specimen normally NX Ø54,7 mm is held on a special cradle in horizontal position and the hammer tests the same in all its length to obtain average of the readings.

The Rock Cradle is used to hold cores (EX Ø21,46 mm and NX Ø54,74 mm) in place during rock classification test procedures. The cradle incorporates a guide for positioning the hammer to allow for a series of readings along the length of the core.

HR-R0120 with HR-R0110

Rock cradle and Calibration Anvil should be ordered separately.

Technical Specifications:

Product Code	Product Name	Impact energy (Nm)	Dimensions (cm)	Weight (kg)
HR-R0120	Rock Classification Hammer (Low Impact Energy Model)	0.74	10X10X36	2

Spare Parts & Accessories:

Product Code	Product Name	Dimensions (cm)	Weight (kg)
HR-R0110	Rock Cradle	15x11x31	20
HR-R0115	Calibration Anvil	Ø 15x23	16

CALIBRATION ANVIL

STANDARDS: EN 12504-2, ASTM D5873, C805

Used for the verification of the calibration of the hammers.

The EN 12504:2 Specification requires obligatory the use of the anvil for the hammer tests.

The Standard specifies; before a sequence of tests on a concrete surface, take and record readings using the steel reference anvil and check to ensure that they are within the range recommended by the manufacturer. If they are not, clean and/or adjust the hammer.

After tests, take readings using the steel anvil, record them and compare them with those taken prior to the test. If the results differ, clean and/or adjust the hammer and repeat the test.

Made of hardened steel according to the standards.

HR-R0115

Product Code	Product Name	Dimensions (cm)	Weight (kg)
HR-R0115	Calibration Anvil	Ø 15x23	25

SLAKE DURABILITY APPARATUS

STANDARDS: ASTM D4644

This equipment has been developed to assess the durability of rock to weakening and disintegration when subjected to the simulated effects of climatic slaking.

The rock samples are dried and then submitted to wear stress inside a drum which is rotated into water.

The test is performed different times and the wear is given by the loss in weight of the sample.

The system incorporates a motor drive unit mounted on a baseplate which revolves two stainless steel drums manufactured from 2 mm mesh, 140 mm dia. x 100 mm long.

The tanks are filled with water to a level 20 mm below the drum axis.

A digital timer automatically stops the motor after the preset time. The machine can turn to two or four drums with 20 rpm.

The equipment is supplied complete with two Drums with tanks, base and accessories.

Technical Specifications:

Product Code	Product Name	Dimensions (cm)	Weight (kg)	Power Supply
HR-R0135	Slake Durability Apparatus	35x74x30	30	220 V, 50 Hz, 1 ph
HR-R0135/60Hz	Slake Durability Apparatus	35x74x30	30	220 V, 60 Hz, 1 ph

Spare Parts & Accessories:

Product Code	Product Name	Dimensions (mm)
HR-R0135/1	Drum (2 pieces)	Ø 140 x 100

HR-R0135

AUTOMATIC CORE-ROCK COMPRESSION TESTING MACHINE

STANDARDS: EN 12390-3, 12390-4; BS 1881, ASTM C39

The HİRA Automatic 600 kN Capacity Compression Testing Machine has been designed for reliable and consistent testing of core and rock samples. Machine confirms all EN, ASTM and BS standards written above. These also meet the requirements of CE norms for the safety and health of the operator.

A compression test determines behavior of materials under crushing loads. The specimen is compressed and deformation at various loads is recorded.

Testing machines are supplied with EN compression platens as standard. Machines also comply with the ASTM C39 standard when used together with suitable platens.

Tests can be performed by either Digital Readout Unit or on a computer with using free Software.

The Automatic Core-Rock Compression Testing Machine allow inexperienced operators to perform the tests. Once the machine has been switched on and the specimen is positioned and centered by the help of centering apparatus. The only required operations are;

- Setting test parameters, including pace rate (only required when the specimen type is changed).
- Pressing the START button on the control unit
- The machine automatically starts the rapid approach, when the specimen touches the upper platen the rapid approach is ended and starts loading at the pace rate that selected by user and stops once the specimen fails.

The Automatic Core-Rock Compression Testing Machines consist of;

- Load Frame,
- Automatic Hydraulic Power Pack,
- Digital data acquisition & control system,
- Distance Pieces, Ø165x30 mm, Ø165x50 mm and Ø165x80 mm,
- Upper Platen (with ball seating assembly) Ø165 mm,
- Lower Platen Ø165 mm,
- Loading Cylinder Assembly & Limit Switch for safety,
- Front and Rear Protective Doors for safety.

Core-Rock Compression Load Frame **HR-R6000**

Load Frame is 600 kN Capacity.

The dimensions of the 600 kN Load Frame allow the testing of concrete and rock samples up to its capacity.

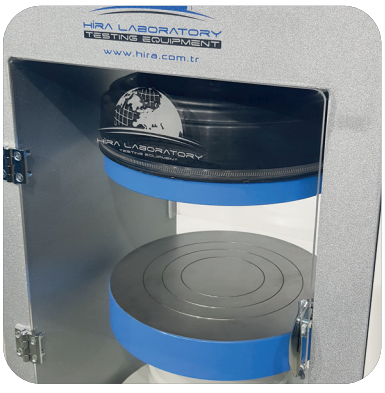
The load frame provides the stability needed for accurate and repeatable test results over the years of operation. The machine's hydraulic power pack, control and read out units are positioned on the right hand side of the load frame for easier accessibility, increased productivity and for safer operations.

Upper Platens/Lower Platens

Upper Platen (with ball seating assembly) Ø 165 mm and Lower Platen Ø 165 mm.

The platens enable the testing of a wide variety of cylinder or similar samples.

- Manufactured from high quality steel, which is then hardened, smoothed and finished.
- The roughness value for the surface texture of the auxiliary platens is ≤ 3.2 µm.
- Ø 165 mm Upper Platen (with ball seating assembly) and Lower Platen have centering rings on the lower platens for proper centering of 100 mm and 150 mm cylinder samples.



Distance Pieces

Distance pieces are used to reduce the amount of vertical clearance between the upper platen and the lower platen. Supplied with Ø165x30 mm, Ø165x50 mm and Ø165x80 mm distance pieces.

HR-C8166 & HR-C8167 & HR-C8168

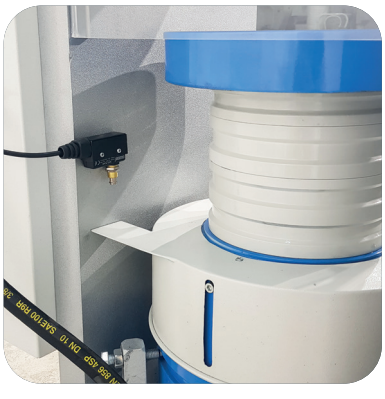
Loading Cylinder Assembly & Limit Switch

The Load Frame has a single acting up stroking ram. The diameter of piston changes with regard to the capacity.

The maximum ram stroke is 50 mm, a limit switch is fitted to prevent over travel of the ram which cuts the power to the pump for safety.

At the end of the test process to start a new test the piston returns to default position.

There is a low friction coaxial PTFE seal between the cylinder and the piston fitted to the cylinder.



HYDRAULIC POWER PACK AND DIGITAL DATA ACQUISITION & CONTROL SYSTEM

Hydraulic Power Pack

Automatic Hydraulic Power Pack, dual stage, controlled by digital readout unit is designed to supply the required oil to the load frames for loading.

Controller unit has a simple and compact configuration.

Very silent power pack can load the specimen between 1 kN/sec. to 20 kN/sec, with an accuracy of ±5%. A Rapid approach pump is supplied as standard. Safety valve (maximum pressure valve) is used to avoid machine overloading.

Maximum working pressure of the system is 400 bar.

HR-C8000

HİRA TESTING EQUIPMENT

Dual Stage Pump

The dual stage pump is formed by two groups;

1. Low pressure gear pump
2. High pressure radial piston pump

On the dual stage pump, a high delivery, low pressure gear pump is used for rapid approach, while a low delivery, high pressure radial piston pump is used for test execution. The rapid approach facility shortens the time interval from piston start until the upper platen touches to the specimen. This excellent feature helps to save a lot of time when a large number of specimens are going to be tested.

Motor

The motor which drives the dual pumps in an AC motor and it is controlled by motor inverter. The variation in the oil flow is executed with the variation of the rotation speed of the motor.

Distribution Block

A distribution block is used to control the oil flow direction supplied by the dual stage pump, the following parts are fitted to the distribution block; Solenoid valve, Safety valve (max. pressure valve), High Precision Pressure Transducer, Low pressure gear pump and High pressure radial piston pump.

High Precision Pressure Transducer

The HİRA range of Automatic Machines can be upgraded with option High Precision Pressure Transducer special calibration Class 1 starting from 1% of the full range.

This unique performance enables the machines to be used for a considerable number of applications including:

- Early age (2 or 3 days) compression strength tests
- Flexural and splitting tests by using proper accessories
- Mortar (Cement) compression tests by using proper accessories
- Core Testing

Load Cell

600 kN Load Cell can be used for load measurements instead of High Precision Pressure Transducer.

These property allows high accuracy at very low sample failures. (Class 1 at 6 kN to 600 kN)

The user can choose Load Cell or Transducer in the order stage.

Oil Tank

The tank includes enough oil to fill the mechanism which pushes the ram during the test. The level and oil temperature can be seen on the indicator fitted to the tank. It has 25 L capacity. Hydraulic motor oil, number 46, must be used.

Digital Data Acquisition & Control System

HR-C8002

The unit is designed to control the machine and processing of data from load-cells and pressure transducers which are fitted to the machine.

All the operations of the unit is controlled from the front panel consisting of a LCD display and function keys.

The unit has easy to use menu options.

Digital graphic display unit loading rate of the time of Testing and load values can be monitored.

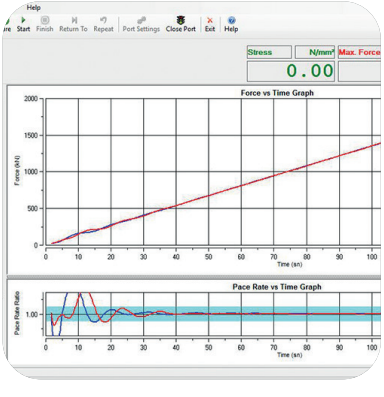
Digital graphic display is able to draw real-time “Load vs. Time”.

Software

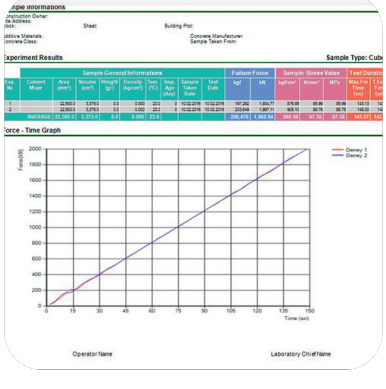
Sample, company, laboratory and test values can be entered in the programme.

Load-time graphic, test reports and sample reports can be taken.

Software provides test data, results, and the load-time graphs can be seen at LCD screen.



The Automatic Core-Rock Compression machine can be controlled (Start, Stop commands) by a computer with the software free of charge. This software provides data acquisition and management for compression, tensile and splitting tensile test throughout the test execution. The advanced functions for data base management provide an easy navigation of all saved data. The test results certificate includes all descriptive information. Therefore, test parameters can be set and details about the test carried out such as client details, test type, specimen type, user info and other information required can be entered and printed out as well as test report and graph.



Software can be performed in Turkish and English.

Test results, graphics and properties of 24 different specimens can be saved in one folder. Old test folders can be reviewed.

User can highlight all 12 different specimen curves in different colors on the graphics.

Frequently used information like name and location of the laboratory, type and dimensions of mostly used specimens are held in memory and can be written automatically by right clicking on information boxes and selecting frequently used text in menu.

User can access any data of previously completed tests and use in his/ her new report since most of the tests have same structure and properties.

HİRA TESTING EQUIPMENT

Main Features

- Pace rate control from 1 kN/sec to 20 kN/sec depending on piston size.
- Can control 2 frames (optional)
- Can make test with load control.
- Real time display of test graph.
- Analog channels for different frame load cells
- RS-232 serial port connecting for computer interface
- LCD display
- 2 different unit system selection; kN and kgf
- Multi-language support (English and Turkish)
- 2 different unit system selection; SI and Metric
- Real-time clock and date
- Free of charge PC software for the test control and printout the test report.

Safety Features

- Maximum pressure valves to avoid machine overloading
- Piston travel limit switch
- Emergency stop button
- Software controlled maximum load value
- Front and rear transparent durable Plexiglas guards

Technical Specifications:

Product Code	HR-R6000
Capacity (kN)	600
Roughness (µm)	≤ 3.2
Ø Lower Platen (mm)	165
Ø Upper Platen (mm)	165
Max. Vertical clearance (mm)	330
Piston diameter (mm)	150
Piston Stroke (mm)	50
Horizontal clearance (mm)	230
Oil Capacity (lt)	25
Max. Working Pressure (bar)	400
Power (W)	750

Technical Specifications:

Product Code	Product Name	Dimensions (cm)	Weight (kg)	Power Supply
HR-R6000	600 kN Automatic Core-Rock Compression Testing Machine	71x38x91	450	220 V, 50-60 Hz, 1 ph

Spare Parts & Accessories:

Product Code	Product Name	Dimensions (cm)	Weight (kg)	Power Supply
HR-R6000/1	600 kN Load Frame	35x30x91	350	---
HR-C8000	Hydraulic Power Pack and Digital Data Acquisition & Control System	36x38x91	100	220 V, 50-60 Hz, 1 ph
HR-C8001	Hydraulic Power Pack	36x38x91	98	220 V, 50-60 Hz, 1 ph
HR-C8002	Digital Data Acquisition & Control System	---	---	220 V, 50-60 Hz, 1 ph
HR-C8003	High Precision Pressure Transducer	---	---	---
HR-C8004	Software	---	---	---
HR-C8165	Distance Pieces	Ø 16,5 x 2,5	---	---
HR-C8166	Distance Pieces	Ø 16,5 x 3	---	---
HR-C8167	Distance Pieces	Ø 16,5 x 5	---	---
HR-C8168	Distance Pieces	Ø 16,5 x 8	---	---
HR-G0975	Computer & Printer	---	---	220 V, 50-60 Hz, 1 ph
HR-G0975/1	Usb to com port Converter	---	---	---
HR-G0979	Thermal Printer	---	---	---

COMPRESSION JIG ASSEMBLY FOR ROCK CORE SPECIMENS

STANDARDS: ASTM D2938

The jig assembly is used for uniaxial compressive strength tests of rock core specimens with Ø 50 to 55 mm and 100 to 110 mm height and consists of a two-column frame fit with an upper platen with spherical seat that moves vertically sustained by a spring. The lower platen is fit to the base. The assembly is also used for compressive strength test of natural stone core specimens. Minimum Hardness of Platens is 58 HRC.

Compression Jig Assembly is used for uniaxial compressive strength for rock core specimens.

Technical Specifications:

Product Code	Product Name	Dimensions (cm)	Weight (kg)
HR-R0105	Compression Jig Assembly for Rock Core Specimens	12x12x25	10

HR-R0105

TRIAXIAL TESTS ON ROCK SPECIMENS

STANDARDS: EN 1926, 14580; ASTM D2664, D2938, D3148, D5407

The manual pressure system is used for maintaining the constant lateral pressure in the Hoek triaxial cells and consists of a hydraulic hand pump with oil reservoir, a precision digital readout unit, a pressure transducer and a 3 m long flexible hose with quick release coupling.

The manual pressure system is used with any Hoek triaxial cell and 2000 kN Automatic Compression Testing Machine for the triaxial tests. Other type of HİRA compression testing machine can be used instead of HR-C2000.

BX type (Ø 42,04 mm), NX type (Ø 54,74 mm) and HQ, Ø 63,5 mm Hoek Cells have been designed for triaxial testing of rock specimens.

Hoek Cells comprise a steel body complete with two quick release self-sealing couplings, two steel end caps which are screwed to the cell body, 2 pieces of upper and 2 pieces of lower loading caps with spherical coupling and a rubber sealing sleeve to separate the specimen from the cell fluid.

Triaxial Test Set complete with Hand operated pressure system for lateral pressure in Hoek Cell with 700 bar capacity.

Hoek Cells and Spare Sealing Sleeves for Hoek Cells should be ordered separately according the test.

HR-R0150 with HR-C2000

Technical Specifications:

Product Code	Product Name	Max. Working Pressure	Dimensions (cm)	Weight (kg)
HR-R0150	Triaxial Test Set on Rock Specimens	700 bar	---	---
HR-C2000	2000 kN Automatic Compression Testing Machine	400 bar	81x50x100	900

Spare Parts & Accessories:

Product Code	Product Name	Max. Working Pressure	Dimensions (cm)	Weight (kg)
HR-R0151	Hand Operated Pressure System for Lateral Pressure in Hoek Cell	700 bar	105x50x30	20
HR-G9000	Hydraulic Hand Pump	700 bar	---	---
HR-R0153	Pressure Transducer and Digital Readout Unit	---	---	---
HR-R0154	Hoek Cell, BX, Ø 42,04 mm	---	35x15x20	15
HR-R0154/1	Spare Sealing Sleeves for HR-R0154	---	---	---
HR-R0155	Hoek Cell, NX, Ø 54,74 mm	---	35x15x20	15
HR-R0155/1	Spare Sealing Sleeves for HR-R0155	---	---	---
HR-R0156	Hoek Cell, HQ, Ø 63,5 mm	---	35x15x20	15
HR-R0156/1	Spare Sealing Sleeves for HR-R0156	---	---	---

SPECIMEN EXTRUDER FOR HOEK TRIAXIAL CELLS

Specimen Extruder for Hoek Triaxial Cells is used to eject the rock sample from the rubber jacket, avoiding to empty the confining fluid out of the Hoek Cell.

The Specimen Extruder consists of a steel frame with a rack and pinion mechanism.

Supplied without Adaptors and should be ordered separately according the sample.

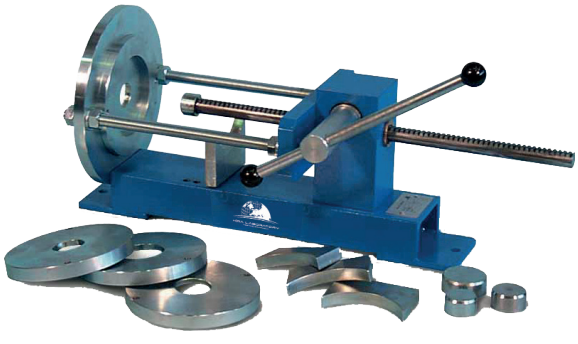
Adaptor Alternatives are BX Type (Ø 42,04 mm), NX Type (Ø 54,74 mm), HQ Type (Ø 63,5 mm) Adaptors.

Technical Specifications:

Product Code	Product Name	Dimensions (cm)	Weight (kg)
HR-R0100	Specimen Extruder for Hoek Triaxial	50x25x20	15

Spare Parts & Accessories:

Product Code	Product Name
HR-R0100/1	BX (Ø 42,04 mm) Type Adaptor
HR-R0100/2	NX (Ø 54,74 mm) Type Adaptor
HR-R0100/3	HQ (Ø 63,5 mm) Type Adaptor



HR-R0100

BRAZILIAN TEST APPARATUS

Brazilian Test Apparatus is designed to test specimens from 50 mm dia to 100 mm dia having thickness equal to half of the diameter for determination of Indirect Tensile Strength of rocks.

The specimen is held in circular jaws, this is primarily similar to a compression Machine and consists of a small load frame having sturdy base with two vertical threaded rods and an adjustable cross head. The hydraulic jack is fitted at the centre of the base of the load frame. The jack of the load frame is self-retracting and two plain platens are supplied.

A pressure gauge capacity is 0-100 x 1 kN is fixed at the base of jack.

A maximum pointer is also provided on the gauge, a pair of semicircular platens for Ø 50mm samples also provided.

The other Pair of jaws should be ordered separately.

Technical Specifications:

Product Code	Product Name
HR-R0250	Brazilian Test Apparatus

Spare Parts & Accessories:

Product Code	Product Name
HR-R0250/1	Pair of jaws for Ø 50 mm samples
HR-R0250/2	Pair of jaws for Ø 60 mm samples
HR-R0250/3	Pair of jaws for Ø 70 mm samples
HR-R0250/4	Pair of jaws for Ø 80 mm samples
HR-R0250/5	Pair of jaws for Ø 90 mm samples
HR-R0250/6	Pair of jaws for Ø 100 mm samples

HR-R0250