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HDT-L410

**PROTABLE LEEB HARDNESS TESTER
(HIHG ACCURACY)
OPERATION MANUAL**

PLEASE SCAN QR CODE TO
WATCH THE OPERATION
VIDEO OF PRODUCTS.

VIDEO

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Technical Specifications

- ◆ Accuracy: ±2HLD/±0.3%(when HLD=800)
- ◆ Display resolution: 1HLD, 1HV, 1HB, 0.1HRC, 0.1HRB, 0.1HRA, 0.1HS, 1SGM
- ◆ Display: 320*320 high contrast color TFT
- ◆ Impact direction: Universal angle, no need to setup impact direction
- ◆ Hardness scale: HL, HRC, HRB, HB, HV, HS, HRA, SGM
- ◆ Measuring range: HL100-960, HRC1-78.7, HRB1-140, HB1-1878, HV1-1698, HS1.0-131, HRA7-88.5, SGM (rm) 118-3315N/mm²
- ◆ Memory: 31 files, 100 data for each file
- ◆ Application workpiece:
  minimum weight: 5kg

       2kg(on solid support)

       0.05kg(couple on plate)

  minimum thickness: 5mm
  minimum radius of curved surface: 30mm
  maximum roughness(Ra): 2µm
- ◆ Statistics: mean, max., min., extreme deviation, standard deviation, column chart, dynamic doughnut chart
- ◆ Power supply: 3.7V Li-ion rechargeable battery
- ◆ Interface: USB/Bluetooth to PC for transferring data or printing, USB for charging
- ◆ Operating environment: temperature: -20~+70°C
- ◆ Dimensions: 145 x 45 x 20 mm
- ◆ Weight: 115 g
- ◆ Standards: Conforming to ASTM A956, DIN 50156, GB/T 17394-1998

Applications

- ◆ Hardness tests on installed machines or steel structures: e.g. on heavy and large work-piece or on permanently installed system parts.
- ◆ Rapid testing of multiple measuring areas for examination of hardness variations over larger regions.
- ◆ Measuring hardness for produced parts at production line.
- ◆ Identifying metallic material stored in a warehouse.
- ◆ Ineffectiveness analysis of permanent parts, pressure -vessel, turbo generator.

Operating Instructions

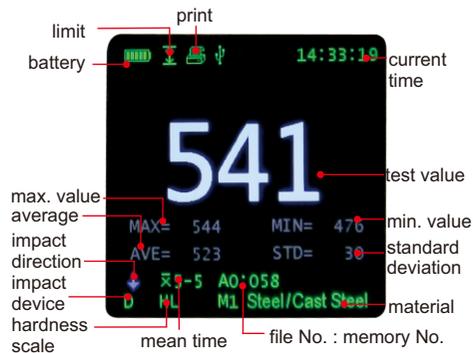① Layout of instrument and button description

Button	Function
▼	Menu key, press it to enter main menu Downward key, press it to move cursor downward
▲	Press it shortly to enter config menu Press and hold it to enter language menu Upward key, press it to move cursor upward
● Power On/Off	Press it to switch on the tester Press and hold it about 2 seconds to switch display direction Press and hold it till the tester is switched off Confirm the selection Press it on measuring mode to save/print/delete current reading
Rolling the tester	Navigate within the main menu items by rolling the tester either away from you or towards you

2 Measurement Screen

The Measurement screen consists of Data display area and top/bottom status bar. There are four types of Data display areas: large font display, statistical parameter display, histogram display and dynamic ring display.
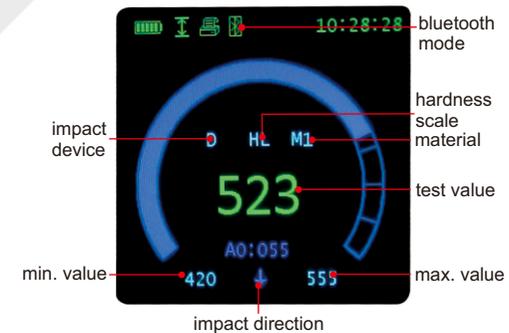
a Measurement Screen - Large Font Display

limit
print
battery
current time

541

max. value
average
impact direction
impact device
hardness scale
test value
MAX= 544
MIN= 476
min. value
AVE= 523
STD= 30
standard deviation
x̄5-5 AO:058
D HL M1 Steel/Cast Steel
material
mean time
file No. : memory No.

b Measurement Screen - Statistical Parameter Display

14:34:31

	HL	HB
	522	240
	517	235
	518	236
	517	235
	505	223
	509	227
	495	214
	534	252

test value 252
hardness scale
max. value MAX= 252
min. value MIN= 214
average AVE= 230
standard deviation STD= 14
x̄5-5 AO:060
D HB M1 Steel/Cast Steel

c Measurement Screen - Histogram Display

14:34:58

upper limit 274
lower limit 153
cartogram
MAX= 252 max. value
MIN= 214 min. value
AVE= 230 average
STD= 14 standard deviation
test value 252
x̄5-5 AO:060
D HB M1 Steel/Cast Steel

d Measurement Screen - Dynamic Ring Display

10:28:28 bluetooth mode

impact device
D HL M1
hardness scale
material

523
test value

AO:055

min. value 420
max. value 555
impact direction

3 Language Menu

Press and hold ▲ in Measurement screen to enter Language Menu screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to exit without changing the text.
There are ten languages including Simplified Chinese and Traditional Chinese, such as English, Russian, German and French etc. The users can choose their language as required.

④ Configuration Menu

Press ▲ in Measurement screen to enter Configuration Menu screen.
Press ▲ or ▼ to move the option.
Press ● to enter the option.
Press and hold ● to exit and return to Measurement screen.
Press ◄ to exit.
There are nine Configuration Menu items, mainly used for settings of the instrument. For example, you can set Display Style, Date and Time, Calibration Mode, etc.

ⓐ Display Style

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select display style and press ● to enter display style screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to exit and return to Measurement screen.
1-4 mean four display styles. Select any one, the Measurement screen immediately changes.
Choose a display style according to preferences and the brightness of the ambient light. Display Style 1 is set for large font display with super-large test result display and maximum/minimum data processing display. Display Style 2 is set for statistical parameter display to show the current value and statistics processing and list the first 8 data. Display Style 3 is set for histogram display of 8 data by compare. Any value exceeding Upper/Lower limit is indicated by red arrow. Display Style 4 is set for dynamic ring display, generally for enable Upper/Lower Limit/Deviation. The ring range is lower limit - upper limit. When the Upper/Lower Limit is enabled and the value is displayed, the ring dynamically displays the test results from left to right.

The Upper/Lower Limit proportions for the data are displayed. When the evaluation value is enabled, the ring is divided into two parts. The middle data is the determining value. The left/right value is the determining value plus/minus the offset, respectively.
When the testing value is lower than the evaluation value, the ring display moves clockwise. When the testing value is higher than the evaluation value, the ring display moves anti-clockwise. When the upper or lower limit is exceeded, the test result changes to red.

ⓑ Date and Time

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select date and time and press ● to enter date and time screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press Time to set system time.
Press Date to set the system date.
Press Format to select format of date.
Press ◄ to exit.

ⓒ Calibration Mode

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select calibration mode and press ● to enter calibration mode screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit, or enter the upper/lower level window.
Press and hold ● to confirm and return to measurement screen, or enter the upper/lower level window.
Independent Mode and Coincident Mode are calibration method.

When Independent Mode is selected, the hardness value of the selected scale can be calibrated, and the hardness values of other scales do not change. The coincident Mode is the traditional calibration method, which is used to calibrate the Leeb hardness data. The data of other scales will change following the calibrated Leeb hardness data.

d Evaluation Mode

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select evaluation mode and press ● to enter evaluation mode screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to measurement screen.
Select Upper/lower Limits to enable judgment by Upper/lower Limit.
Select Deviation to enable judgment by Deviation.
Select Evaluation Mode to judge whether the measurement range overruns.
When Upper/lower Limit is selected, the test result is normal when it is between the upper limit and the lower limit;
otherwise, it exceeds the range. The user needs to set the Upper/Lower limit in the Upper/Lower Limits/Deviation in Menu screen, e.g., set the upper limit to 780 and the lower limit to 770. The measurement range is 770-780. If the value exceeds the range, the alarm is given.
When Evaluation Mode is selected, the test result will be based on a judgment value, such as 775, plus or minus an offset (5), the range is 770-780. In Display Style 1-3, the difference is minor. The user can select the configuration. This setting is particularly useful in Display Style 4 with a noticeable difference in the screen.

When Display Style 4 is selected, select Upper/Lower Limit, the range is dynamically displayed from left to right; select Evaluation Mode, the range is dynamically displayed from middle to left/right.

e Bluetooth

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select bluetooth and press ● to enter bluetooth screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to measurement screen.
Select On to enable bluetooth port.
Select Off to disable bluetooth port.

f Sound

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select sound and press ● to enter sound screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to measurement screen.
Select On to enable sound port.
Select Off to disable sound port.
Sound is set for reminder. The buzzer emits "dripping" sound during measurement or during parameter setting. If the user does not need Sound , you can Off it.
When the Sound is Off, after enabling, Sound is enabled automatically.

g Screen Light

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select screen light and press ● to enter screen light screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to measurement screen.
1-7 is the level of the screen light. The screen light changes immediately after selecting.
The brighter the light, the more power the instrument consumes and the shorter the battery life.

h No. of Measurement

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select No. of measurement and press ● to enter No. of measurement screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to measurement screen.
Press Erase to clear the number of measurements. A window will appear for confirmation. Press (and hold) ● to delete, displaying √ after deleting successfully and return to Measurement screen; Press other key to cancel the operation.
Press ◀ to exit or return to the Measurement screen.
This function can be used to count the number of measurements, so that the users can maintain the Impact based on it.

I Information

Press ▲ in Measurement screen to enter configuration menu screen.
Press ▲ or ▼ to select Information and press ● to enter screen Information screen.
Press ● to confirm and exit.
Press and hold ● to confirm and return to measurement screen.

5 Text Menu

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to move the option.
Press ● to enter the option.
Press and hold ● to return to Measurement screen.
Press ◀ to exit.
There are 9 options, which are mainly used to for setting of test. For example, you can set the Impact Device, Select Material, Hardness Scale and so on.

a Impact Device

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Impact Device.
Press ● to enter Impact Device screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to Measurement screen.
D and DL are the Impact Device.
This option is to set the impact device. Select the proper impact device to ensure the correct reading.

ⓑ Materials

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to choose Materials.
Press ● to enter Materials screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to Measurement screen.
M1- M12 are the type of materials under test.
Select the proper material under test to ensure the correct reading.

ⓒ Hardness Scale

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Hardness Scale.
Press ● to enter Hardness Scale screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to Measurement screen.
HL, HRC and others are scales for the hardness.
For some specific materials, not all hardness scales can be converted to each other. For scales of hardness which cannot be converted, there will be a "*" symbol.

ⓓ Mean Time

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Mean Time.
Press ● to enter Mean Time screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to Measurement screen.
Select 3, 4, 5, 6 or 7 as the mean time.

The option Close means no average calculation is required. After setting the mean time, each time the cumulative number of measurements reaches the setting, the average number will automatically display in Display Style 1-3.

ⓔ Limit/Deviation

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Limit/Deviation.
Press ● to enter Limit/Deviation screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit, or enter Upper/Lower Limit adjustment.
Press and hold ● to confirm and return to Measurement screen, or enter Upper/Lower Limits adjustment.
Close: Close Limit/Deviation alarm.
Open: Open Limit/Deviation alarm.
When Upper/Lower Limit is selected in the Configuration Menu, displaying.
Upper Limit: enter Upper Limit adjustment.
Lower Limit: enter Lower Limit adjustment.
When Deviation is selected in the Configuration Menu, displaying.
Evaluation Value: enter evaluation value adjustment.
Deviation: enter the deviation adjustment.
Select Enable Upper/Lower Limit, the sound is automatically on. The icon ↨ displays in status bar in the Measurement screen. During measuring, if the limit is overrun, "drip" will sound for three times. If the measurement is greater than the upper limit, ▲ or ↑ displays next to the measurement; If the measurement is less than the lower limit, ▼ or ↓ displays next to the measurement. Under Display Style 4, if the value exceeds the Limit/Deviation, the display is in red. When Evaluation Mode→Upper/Lower Limit is selected in the Configuration Menu, select Limit/Deviation in the Menu to adjust the upper limit or lower limit.

When Evaluation Mode →Deviation is selected in the Configuration Menu, select Limit/Deviation in the Menu to adjust the evaluation value or the deviation.
Select Open to open the Limit/Deviation prompt.
Select close to close the Limit/Deviation prompt.
After disabling the Limit/Deviation alarm, turn off the sound in Configuration Menu.
During data statistics, the data over the range is processed as non-compliance data.

Upper/Lower Limit

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Limit/Deviation.
Press ● to enter Limit/Deviation screen.
Press ▲ or ▼ in Limit/Deviation screen to select Upper Limit or Lower Limit.
Press ● to enter Upper Limit or Lower Limit screen.
Press ▲ or ▼ to change the upper/lower finely (step 1 for Leeb's value).
Press and hold ▲ or ▼ to change the upper/lower coarsely (step 10 for Leeb's value).
Press(and hold) ● to confirm and exit.

Evaluation Value/Deviation

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Limit/Deviation.
Press ● to enter Limit/Deviation screen.
Press ▲ or ▼ in Limit/Deviation screen to select Evaluation Value or Deviation.
Press ● to enter Evaluation Value or Deviation screen.
Press ▲ or ▼ to change the upper/lower finely (step 1 for Leeb's value).
Press and hold ▲ or ▼ to change the upper/lower coarsely (step 10 for Leeb's value).
Press(and hold) ● to confirm and exit.

f Automatically Print

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Automatically Print.
Press ● to enter Automatically Print screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to Measurement screen.
Select Printing Each Measurement to enable printing of each test result.
Select Printing Average to enable printing of the average.
Select Close to close Automatically Print.
Automatically Print is valid only for special Bluetooth printers.
When Automatically Print is enabled, the icon 🖨 will be displayed in the status bar. The Bluetooth port is set in the Configuration Menu.
Select Printing Each Measurement to print each measurement in real time. The average is printed only after Mean time is selected and the average appears.

6 File / Save

a Save

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select File / Save.
Press ● to enter File / Save screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.
Press and hold ● to confirm and return to Measurement screen.
Save Each Measurement, Save average, Save manually are three kinds of storage; As Save manually is selected, press ● to save the current value after the value is displayed.
Select Close to close the storage function.
Select File to change the current stored file.
Select Erase to delete the data in the current file.

Select Initialize to delete data in all files.
The model provide three kinds of storage methods. Select Save each Measurement, each measurement is saved. As Save average is chosen, only as Mean time is enabled, the final average is saved after the average number is complete. As Manual Save is chosen, the operator needs to choose whether to save.

b Re-read

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select File / Save.
Press ● to enter File / Save screen.
Press ▲ or ▼ in File / Save screen to select Re-read.
Press ● to enter Re-read screen.
Press ▲ or ▼ for Page Up/Page Down.
Press and hold ● to move the cursor to the file name, then press ▲ or ▼ to change the folder. At last press and hold ● to confirm the folder.
Press ● to exit.
You can view the data in the folder as well as the identification information related to the data.

c Erase/Initialize

Select Erase to delete the data in the current file. Select Initialize to delete data in all files. The deleted data cannot be restored.

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select File / Save.
Press ● to enter File / Save screen.
Press ▲ or ▼ to select Erase or Initialize.
Confirm again before executing Erase or Initialize.
Delete the data in the specified file to save new data. If you want to delete the data in all files, select Initialize.

7 Calibration

This menu is used to Open/Close calibration and to enter calibration adjustments.

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Calibration.
Press ● to enter Calibration screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit, or enter the calibration Adjust screen.
Press and hold ● to confirm and return to Measurement screen, or enter the calibration Adjust screen.
Press Close to enable calibration.
Press Open to disable calibration.
Press Adjust to enter the Adjustment screen.

Press ▲ or ▼ to change the adjustment finely (step 1 for HL).
Press and hold ▲ or ▼ to change the adjustment coarsely (step 10 for HL).
Press(and hold) ● to confirm and exit.
When the adjustment is 0, the Calibration function is not enabled.
Adjustment = Nominal value of standard test block - measurement of standard test block.
The Impact may be worn after use multiple times and the measurement may be inaccurate and usually higher. Calibration is required for regular maintenance and calibration of the instrument.

8 Setup

Press ▼ in Measurement screen to enter Menu screen.
Press ▲ or ▼ to select Setup.
Press ● to enter Setup screen.
Press ▲ or ▼ to move the option.
Press ● to confirm.
Press and hold ● to return to Measurement screen.

Select Default to use the default parameters.
Select Load User Setup to use the user-saved parameters.
Select Save as User Setup to save the current settings as the user's settings.
Press ◄ to exit.
For convenient setting of the instrument. Select Save as User Setup to save the current job number, serial number etc. for the user. Select Load User Setup to load the user-saved parameters to the instrument.

9 Shortcuts

Press ● in Measurement screen to enter Menu screen.
Press ▲ or ▼ to move the option.
Press ● to confirm and exit.

Preparation before Measuring

The surface temperature of sample should be less than 120°C
The samples must feature a metallic smooth, ground surface, in order to eliminate erroneous measurements brought about by coarse grinding or lathe scoring. The roughness of the finished surface should not exceed 2μm.
For samples weighing over 5 kg and of compact shape, no support is needed.
Samples weighing between 2-5 kg, and also for heavier samples with protruding parts or thin walls, should be placed on a solid support in such a manner that they do not bend or move by the impact force.
Samples weighing less than 2 kg should be firmly coupled with a stable support weighing over 5 kg.
Surface -hardened steels and especially case-hardened steels produce L-values which are too low when case-hardening depth is small because of their soft core. When measuring with impact device D/DL the depth of the hardened layer should be no less than 0.8 mm.
Surface of the test sample should not be magnetic.

Operation of Probe

◆ The probe is sophisticated. Be careful during operation.
◆ The probe is easy to wear. All parts will be worn to some degree with increased number of measurements. Using worn probes to measure hardness may reduce the accuracy of the measurement.
◆ The wire of wired probes may bend. The wire connector is a vulnerable part. Avoid sharp bending or strong pulling, etc., which may reduce the lifetime of the wire and the connector.
◆ Prevent oil, water, dust and others entering the probe.

a Load

hold the body by left hand, hold the probe loading lever by right hand and push toward the body, until the spring is compressed to the end. Slowly release the right hand, so that the loading lever returns to its original position to complete the loading.

b Release (measurement)

Hold the body by left hand and keep it perpendicular to the measured surface of the workpiece under test. Press the button on the top by right hand to release the impact. The hardness value will be displayed on the screen.
To release the impact, be sure to keep the probe perpendicular to the workpiece surface. Slight tilt and jitter will affect the measurement accuracy.
In continuous operation, the interval between two measurements should not be less than 1 second.

Print Measurements

Automatically Print and Manual Print are set for the measurements, and Print Each Measurement and Print Average are set for Auto Print.

Printing Each Measurement and Printing Average are set for Automatically Print. After Printing Each Measurement is chosen, each measurement is printed automatically after each measuring. After Printing Average is chosen, the average is printed automatically after reaching the average number.

The current measurement can also be printed after selecting Print Current Measurement without Automatically Print enabled. The steps are as follows:

Press ● in the Measurement screen to enter Shortcut Menu

Select Print Current Measurement and press ● to confirm. At the moment the printer will print the current measurement. You can repeat to for multiple printing.

Upload Measurement to Computer

Computer will prompt "Found new hardware" while the hardness tester is connected to the computer first time, please install the driver.

Double click "setup.exe" to install the PC software. Please follow the installation wizard to finish it.

After the data communication software is installed, a shortcut will be created on the desktop automatically. Double click the shortcut to run the program.

The main interface of the software is a standard windows form, containing the title bar, menu bar and toolbar.

After running the software, click the "Connect" from the toolbar to create connection between PC and tester.

Maintenance of Probe

Do not open or remove the instrument and its fixed parts freely. Avoid collision, liquid immersion, heavy dust, moisture, oil or strong magnetic field.

After using up to 500-2000 times, clean the guide tube and the impact body with the accompanying brush in the following procedure.

Unscrew the support ring and remove the impact body.

Turn the brush counterclockwise into the bottom of the guide tube and pull it out again. Repeat 5-6 times to clean the guide tube.

Replace the impact body and the support ring.

After each test, release the impact spring.

Do not use any kind of lubricant.

When calibrating the hardness tester with a standard test block, reading above 1 HRC indicates that the impact ball is worn and needs to be replaced.

Probe is wearing part. With the number of use increases, all parts of the probe will be worn to different degree, and the measurement accuracy will decline. In case the measurement accuracy cannot reach the standard, replace it with a new one. To ensure the accuracy, calibrate the instrument after the replacement.

Measuring And Conversion Range

IMPACT DEVICE D	HL: 170 -960						
MATERIALS	HRC	HRB	HB	HV	HS	HRA	σb (N/mm$^{2)}$)
STEEL/CAST STEEL	0.1-74.7	1.2-140	28-1027	45-1230	4.0-112	7-88.5	118-3315
ALLOY TOOL STEEL	0.9-78.7		15-1878	32-1698	5.5-128		79-6599
STAINLESS STEEL	3.7-62.4	8.3-101.7	85-655	36-802	6-131		108-1725
LAMELLAR IRON	21-59	24-100	35-570	90-698	6-83		
NODULAR IRON	21-60	24-100	62-857	96-724	8-90		
CAST ALUMINUM	1-48	24-85	19-445	22-193	3-64		129-2618
COPPERZINC BRASS	1-53	1.5-99.6	32-477	29-495	5-65	32-76	258-4146
BRONZE	1-56	14-100	15-505	11-535	2-68	29-76	190-1860
WROUGHT COPPER	1-54	14-100	35-569	38-590	6-73		
FORGING STEEL	1-72		50-1060	48-1110	7-103		200-3750
MILL ROLLER	1-72		82-1380	83-1440	14-117.8		310-4860