

# Duramin-600

## Instruction Manual

Original instructions.



*Duramin-600*  
*Instruction Manual*

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## **Intended use**

Automatic Macro hardness tester for Automatic Macro hardness testing of solid materials.

The machine is designed to be used with indenters specially designed for this purpose and fixed in the turret of the test head. Samples are secured on a fixed anvil or an optional manual XY-stage.

For load ranges 1 - 250 kgf, 3 - 750 kgf, or 5 – 3,000 kgf (depending on model).

The hardness tester meets the applicable DIN, ISO-EN, ASTM and JIS standards.

The machine is for use in a professional working environment (e.g. a materialography laboratory).

### **Models:**

Duramin-600 M1 / Duramin-6000 M2 / Duramin-600 M3  
Duramin-600 Z1 / Duramin-600 Z2 / Duramin-600 Z3



**NOTE:**

READ the instruction manual carefully before use.  
Keep a copy of the manual in an easy-to-access place for future reference.

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Always state *Serial No* and *Voltage/frequency* if you have technical questions or when ordering spare parts. You will find the *Serial No.* and *Voltage* on the type plate of the machine itself. We may also need the *Date* and *Article No* of the manual. This information is found on the front cover.

The following restrictions should be observed, as violation of the restrictions may cause cancellation of Struers legal obligations:  
**Instruction Manuals:** Struers Instruction Manual may only be used in connection with Struers equipment covered by the Instruction Manual.

Struers assumes no responsibility for errors in the manual text/illustrations. The information in this manual is subject to changes without notice. The manual may mention accessories or parts not included in the present version of the equipment.

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## Duramin-600

### Safety Precautions<sup>1</sup>

#### Read carefully before use

1. Ignoring this information and mishandling of the equipment can lead to severe bodily injuries and material damage.
2. The operator(s) must read the Safety and User's Guide sections of this manual and the relevant sections of the manuals for any connected equipment and accessories.
3. The machine must be installed in compliance with local safety regulations.
4. The machine must be placed on a safe and stable support. Failure to do so can affect the proper working and cause the equipment to fall down and/or cause accidents and injuries. All safety functions and guards of the machine must be in working order.
5. Service and repairs can only be carried out by Struers or trained technicians, authorised by Struers.
6. Do not modify this equipment. Doing so can cause fire and/or electric shock.
7. Do not twist or damage the power cords. Damaged power cords can cause fire and/or electric shock.
8. Do not disassemble this equipment. Doing so can cause electric shock.
9. Do not operate the equipment at a voltage other than the power voltage that is indicated. Doing so can cause fires.
10. Do not allow the machine to become wet. Fires can occur if water gets inside the equipment.  
If water or other liquid does get inside the equipment, turn off the power to the equipment's main unit, disconnect the power supply, and call technical service.
11. In case of fire, alert bystanders, the fire brigade and cut power. Use a powder fire extinguisher. Do not use water.
12. Do not block the ventilation. Blocking the ventilation can cause heat to accumulate inside the machine, which in turn, can generate fire.

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<sup>1</sup> From Safety Precaution sheet, Revision A

- 13.** In case of fire, cut power and alert bystanders/fire brigade. Use a powder fire extinguisher. Do not use water.
- 14.** If malfunctions, smoke or unusual noises are observed - turn off the power, disconnect the power supply and call technical service.
- 15.** Do not connect / disconnect power with wet hands. Doing so can result in electric shock.
- 16.** Disconnect the power supply prior to any cleaning, maintenance or service.  
Failure to do so can result in electric shock.
- 17.** Do not open any panel on the machine.  
High voltages exist inside the machine and may cause electrical shocks to personnel.
- 18.** If two persons work together, make sure to communicate clearly to avoid injuries.

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The equipment should only be used for its intended use and as detailed in the Instruction Manual.

The equipment is designed for use with accessories supplied by Struers. If subjected to misuse, improper installation, alteration, neglect, accident or improper repair, Struers will accept no responsibility for damage(s) to the user or the equipment.

Dismantling of any part of the equipment, during, service or repair, should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.)

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## Icons and typography

Struers uses the following icons and typographical conventions. A list of the Safety Messages used in this manual can be found in the chapter on [Cautionary Statements](#).

Always consult the Instruction Manual for information on the potential hazards marked by the icons fixed to the machine.

### Icons and Safety Messages



#### **ELECTRICAL HAZARD**

indicates an electrical hazard which, if not avoided, will result in death or serious injury.



#### **DANGER**

indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



#### **WARNING**

indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



#### **CAUTION**

indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



#### **CRUSHING HAZARD**

indicates a crushing hazard which, if not avoided, could result in minor, moderate or serious injury.



#### **EMERGENCY STOP**



## General Messages

**NOTE:**

indicates a risk of damage to property, or the need to proceed with special care.

**HINT:**

indicates additional information and tips.

## Colour Inside Logo



The 'colour inside' logo on the cover page of this Instruction Manual indicates that it contains colours which are considered to be useful for the correct understanding of its contents.

Users should therefore print this document using a colour printer.

## Typographic conventions

<b>Bold type</b>	indicates button labels or menu options in software programs
<i>Italic type</i>	indicates product names, items in software programs or figure titles
<a href="#">Blue text</a>	indicates a link to another section or webpage
■ Bullets	indicates a necessary work step

# User's Guide

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## 1. Getting Started

### Device Description

Duramin-600 is an automatic hardness tester that offers the most common-used hardness testing methods for all types of stable and non-explosive metals.

The test operator starts the procedure by positioning – and eventually – securing the sample to the anvil or stage. A wide range of clamping tools and vices are available to fit your needs.

Via the included software, the operator selects the test type and presses start on the touch screen monitor. The software calculates the values instantly and stores them on the internal hard drive. Afterwards, the data can be moved to a memory stick or to a network drive.

In the unlikely situation of an accident or unforeseen incident, the operator can hit the emergency stop to bring the machine to a standstill.

### Unpacking Duramin

Refer to the **DURAMIN-600: HOW TO UNPACK** instructions delivered with Duramin.



**NOTE:**

**Take care** whilst unpacking and handling Duramin.

Do not expose to external impact.

Do not tilt over 30 degrees.

Do not touch the turret.

- Carefully open and remove the top of the packing crate.
- Remove the support beam.
- Remove the sides of the packing crate.
- Remove the accessories case(s).
- Carefully lift the foam pieces to access Duramin.



**NOTE:**

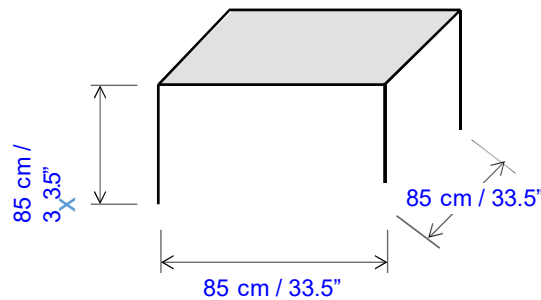
Store the packing crate and fittings for use whenever Duramin is transported or re-located.

Failure to use the original packaging and fittings could cause severe damage to the tester and will void the warranty.

## Location

- Place the machine close to the power supply.
- Place the machine on a rigid, stable workbench with a horizontal surface.

### Recommended workbench dimensions



- To facilitate easy access for service technicians, allow sufficient space around the machine.

### Vibration-free Location

- Install the machine in a vibration-free location.

**NOTE:**

Vibrations can lead to inaccurate measurements and must be avoided.

Sources of vibration can include:

- Passers-by (persons walking past), a road with heavy traffic, cranes, equipment generating vibrations, equipment generating sound (acoustic vibration), exposure to wind or air conditioning fans.

If possible, install the hardness tester on the ground floor of a building and away from exits or doorways

## Lifting Duramin

A crane, a lifting bar and lifting straps<sup>2</sup> are required to lift the machine from the packing crate.



**NOTE:**

**Take care** whilst handling Duramin.

Do not expose to external impact.

Do not tilt over 30 degrees.

Do not touch the turret.

- Check that the crane has a free pathway from the lifting point to the final location.
- Remove the four transportation bolts from underneath the pallet.
- Remove the two plates that cover the lifting bar hole.
- Insert the lifting bar and place the straps.
- Carefully, lift the Duramin from the pallet.
- While lifted, mount the four vibration dampers (feet), and adjust the height of the dampers until they are of equal height.
- Lift Duramin to its final location.
- Remove the lifting bar.
- Re-mount the hole covers.



**NOTE:**

Keep the lifting bar, bolts and nuts, and all packaging for future use.

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<sup>2</sup> Lifting Straps must be approved to at least twice the weight of the machine.

## Placing Duramin Levelling

Level the Tester once it is in its final location.

- Check that the anvil / stage is level.
- Use a wrench to turn the vibration damper in the rear right hand corner to level the tester.



## Packing Crate

In the packing crate, find the following:

- 1 Duramin-600
- 1 Accessories case

## Accessories Case

### Standard Accessories

- Indenters
  - 1 Anvil
  - 2 Fuse 3A, slow
  - 1 USB stick
  - 1 WiFi Adapter
  - 2 Power cables
  - 4 Vibration dampers (feet)
  - 1 Certificate of Calibration
  - 1 Set of manuals



## Optional Accessories

Please consult your order confirmation to check that all the accessories ordered are included in the delivery.



### **HINT:**

Some components or parts may be packaged separately and may not be included in the accessories case, or they may have been installed on the tester

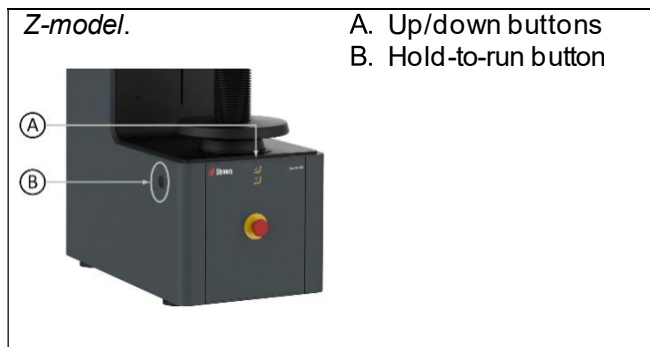
### **HINT:**

The actual packaging and accessories may appear different to those shown.

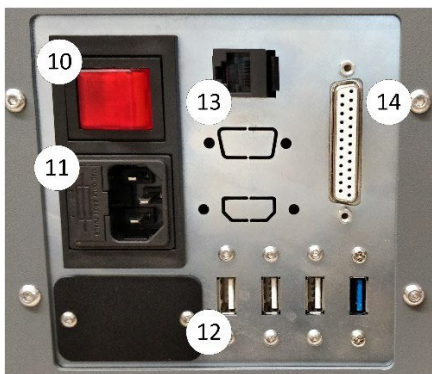
**Getting Acquainted with Duramin**



- ① Touch screen monitor
- ② Turret
- ③ Anvil
- ④ Spindle
- ⑤ Spindle hand wheel
- ⑥ Emergency stop
- ⑦ Adjustable foot
- ⑧ Lifting hole cover
- ⑨ QR code



**Power connections**



- ⑩ Main power
- ⑪ Main power connection
- ⑫ USB connections
- ⑬ HDMI connection for monitor
- ⑭ Network (RJ-45 LAN connection)

*USB Drive and WiFi Adapter*



The USB drive contains direct and indirect calibration documents.

The USB WiFi adapter allows for cable-free communication with the machine.

A wireless keyboard and mouse is available as an option.

**Noise Level**

See Technical Data in the rear of the Instruction Manual for information on the sound pressure level value.



## Supplying Power Connecting the Tester



### ELECTRICAL HAZARD

Switch the power off when installing electrical equipment.  
The machine must be earthed (grounded).  
Check that the mains voltage corresponds to the voltage stated on the type plate on the side of the machine.  
Incorrect voltage may result in damage to the electrical circuit.

### Power Socket

The mains power socket must be easily accessible and located between 0.6 m - 1.9 m (2½" – 6') above floor level. (An upper limit of 1.7 m (5' 6") is recommended).

Duramin is shipped with 2 types of Mains cables:

### Single-phase Supply



The 2-pin (European Schuko) plug is for use on single-phase connections.

If the plug supplied on this cable is not approved in your country, then the plug must be replaced with an approved plug. The leads must be connected as follows:

Yellow/green: earth (ground)  
Brown: line (live)  
Blue: neutral

### 3-phase Supply



The 3-pin (North American NEMA) plug is for use on 3-phase power connections.

If the plug supplied on this cable is not approved in your country, then the plug must be replaced with an approved plug. The leads must be connected as follows:

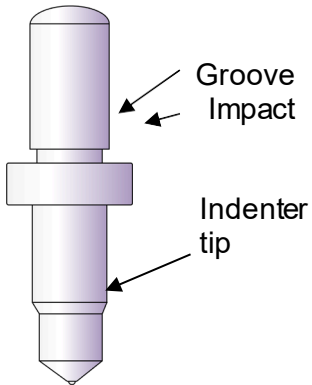
Green: earth (ground)  
Black: line (live)  
White: line (live)

### Connection to the Machine



- Connect the power cable to the Machine. (IEC 320 connector).
- Connect to the mains power supply.

## Installing an Indenter



The machine is delivered with indenter(s) as ordered.

To replace an indenter, follow these steps:

- Remove the nose cone.
- Loosen the fixation screw (use a 1.5 mm Allen key) and let the indenter slide out.
- Clean the old indenter with a soft cloth and store it in its plastic container.
- Insert the new indenter.
- Make sure that the impact rests firmly against the indenter pod. Fasten the fixation screw.
- Perform a few hardness tests on a test block to securely seat the indenter.

**NOTE:**

Only use Struers accessories.

## Installing Anvil or Stage

### Installing an Anvil

Use the appropriate anvil for the application.



*Flat anvil for even samples.  
Two sizes are available: 80 mm  
and 200 mm.*



*V-shape anvil for cylindrical  
samples (option).*

- Check that there is enough room between the indenter and the spindle to install the anvil.
- Use a soft cloth to wipe any dirt from the surfaces of the spindle and the anvil.
- Carefully insert the anvil into the spindle.
- Perform a few hardness tests on a test block to securely seat the anvil.



To (re)place the anvil, move the spindle sufficiently down and carefully insert/lift the anvil from the spindle.

### Installing an XY-stage

Duramin-600 needs an adaptor to mount a manual XY-stage. The stage is secured with a fixation screw.



**NOTE:**

Some of the accessories may be heavy. Two persons may be required to handle the accessories safely and to avoid damage to the machine.

**NOTE:**

The XY-stage is usually delivered already mounted on the machine.

**NOTE:**

Switch Duramin OFF at the mains when installing or /removing an XY-stage. Failure to comply may result in damage to the tester.

- Check that there is enough room between the nose cone and the spindle to install the XY-stage.
- Use a soft cloth to wipe any dirt from the surfaces of the spindle and the XY-stage.
- Carefully, slide the XY-stage into the dovetail connection.
- Tighten the fixation screw to secure the XY-stage.
- Perform a few hardness test on a dummy sample to securely seat the XY-stage.



**NOTE:**

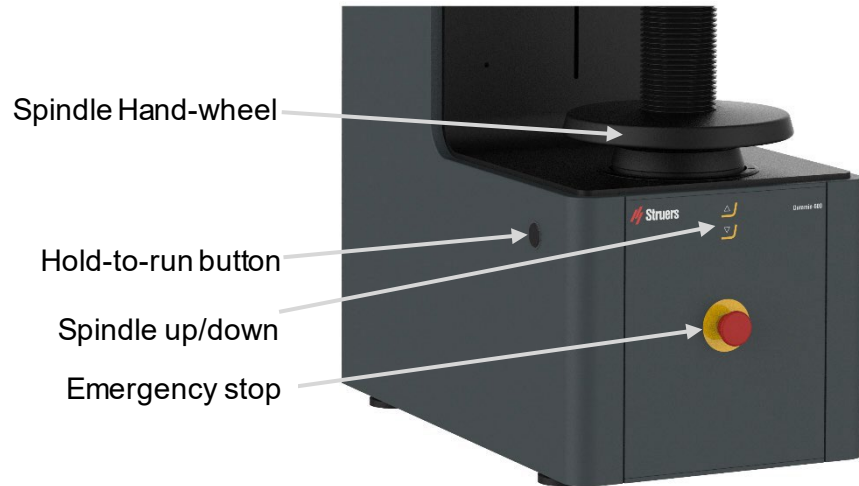
The range of force that can be applied is limited when using an XY-stage.

Check that XY-stage is set to **On** in the Duramin software.

Failure to do so may result in overload and possible damage to the stage. Excessive overload may result in irreparable damage!

## 2. Operation

### Front Panel Controls



*This is the Z-model.  
The M-model is purely manual.*

#### MAIN SWITCH

The main switch is located on the rear of the machine.  
The main switch will be illuminated when power is turned on.



The **EMERGENCY STOP** is located on the front of the machine.  
Emergency Stop  
- Push the red button to Activate.  
- Turn the red button clockwise to Release.



#### **NOTE:**

Do not use the Emergency stop for operational stop of the machine during normal operation.  
BEFORE releasing (disengaging) the Emergency stop, investigate the reason for activating the Emergency stop and take any necessary corrective action.

#### *Hold-to-run button*

When moving the spindle using the Up/Down keys, the Hold-to-run button must be pressed continuously (for Duramin-600 Z-series).

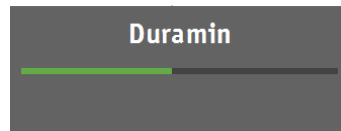
## Software

Duramin-600 is operated through the Duramin software. A short description of the software is included in this manual. Please refer to the Duramin software manual for a detailed description of the software functions.

## Start-up

- Switch the machine on.

The Duramin software initializes and the following progress bar will appear on the display:



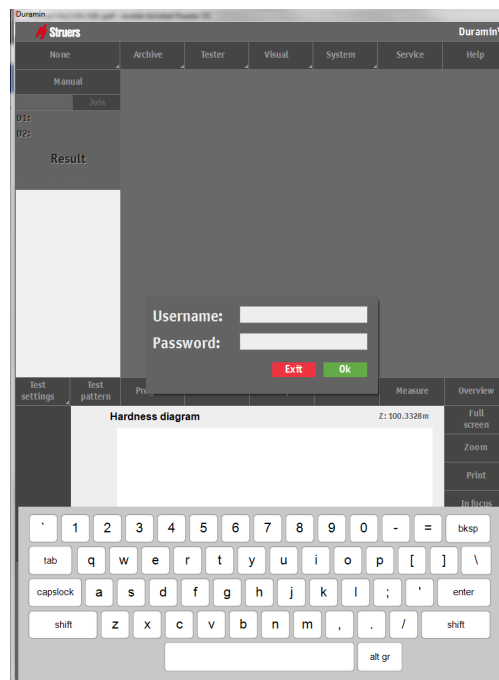
The machine beeps during initialization.



### HINT:

Make sure, that the emergency stop is not activated during start.

After initialization, the following screen appears:



To prevent scratching the screen, avoid using sharp objects.

The actual screen may look different depending on the configuration and the model of the machine.

- Enter the Username and Password.  
The default logon is:
  - Username: admin
  - Password: <empty>
- Press **OK**.



**HINT:**

The username is not case sensitive.  
The password is case sensitive.

**HINT:**

For instructions on how to add new users, please refer to the Software manual.

Start-up After Emergency Stop

Follow this procedure to prevent data-loss and secure machine stability:

- Release the emergency stop.  
Press **System**, then **Exit**.



← Exit

- Switch Duramin Off using the Main switch, then switch on again to start initialization.



**NOTE:**

If the emergency stop is activated during start-up, a failure message will appear.

**Overview Screen**

Main Menu

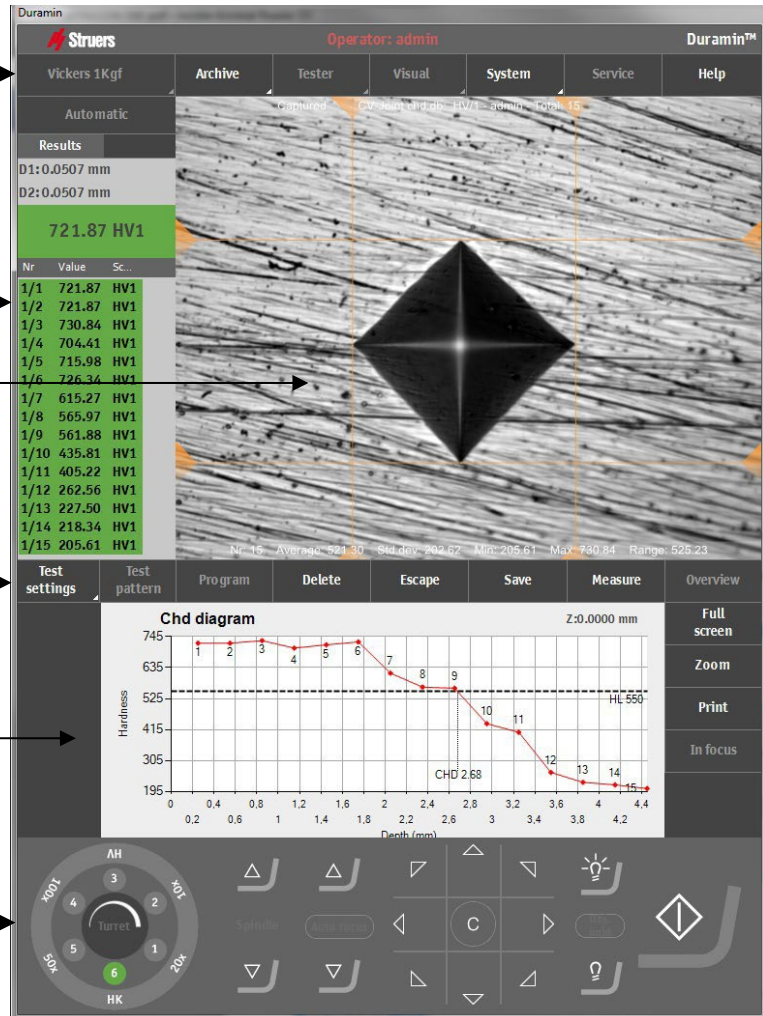
Test result

Camera view

Test settings

Graph

Dashboard Controls



*Main Menu*

Use the *Main Menu* to select the test method and scale required as well as adjusting settings and other functions.

*Test Result Window*

The *Test Result Window* shows an image of the indent (or the indent pattern) and a list of the indents performed.

*Test Settings*

Use the *Test Settings* menus to select test patterns and to perform additional functions.

*Graph*

The *Graph* shows the measurements.



### Dashboard Controls

Use the *Dashboard Controls* buttons to move the spindle and select which objective to use, fine positioning of the spindle light controls, and to start the indentation process.



**NOTE:**



For Duramin-600 Z-series (with motorized spindle), press the *hold-to-run* button on the left-hand side of the machine and the spindle up/down button or on the touch-screen monitor.

### Performing a test

Consider the following as your basic test.  
Follow these steps:

- Check that the specimen surface is smooth and even.
- Check that the specimen surface is free from oxide scale, foreign matter and completely free from lubricants.
- Setup the tester with the required type of test, scale (load) and required indenter.
- Place the specimen on the anvil / XY-stage.
- Move the specimen up until it touches the nose cone.

### Starting the test

-  Press Start to start the test.  
The testing procedure will proceed automatically.
-  The start button will turn into a red stop button.  
Press Stop to interrupt the test.  
(Do not use the Emergency Stop unless necessary).



**CRUSHING HAZARD**

Do not place your hand between the sample and the indenter.

The hardness value measured is displayed in the *Test Result* and in the *Graph*.

Move the spindle down and move the specimen to the next position.

### 3. Maintenance

#### General Cleaning

Keep Duramin-600 as clean as possible.  
To ensure a longer lifetime for your equipment, Struers strongly recommends regular cleaning.

#### Daily Maintenance Machine

- Clean all accessible surfaces with a soft, damp cloth.



**HINT:**

Do not use a dry cloth as the surfaces are not scratch resistant. Do not use aggressive or abrasive products. Grease and oil can be removed with ethanol or isopropanol.



**NOTE:**

Never use acetone, benzol or similar solvents.

#### Weekly Maintenance Cleaning Surfaces

- Clean painted surfaces and the control panel with a soft damp cloth and common household detergents.

#### Weekly Inspection

- Inspect the following parts before every hardness test or at least weekly – or if results are inconsistent.

Part	Attention	Action	Precaution
Indenter	Tip dirty	Wipe indenter	Do not bend the indenter shaft
Anvil	Rust	Remove rust	Do not bring the stage into contact with the turret.
Objective or lens	Lens surface polluted	Wipe lens	Do not scratch the objective or lens
Test block	Rusted	Replace test block	Do not use rusted test blocks. <b>NOTE:</b> Store test blocks in original packaging and under dry conditions
Telescopic cover	Dislocated	Fasten	Without telescopic cover there is free access to the spindle.

## Yearly Maintenance

Clean the spindle and oil lightly with e.g. a universal household oil (do NOT lubricate the spindle with motor oil).

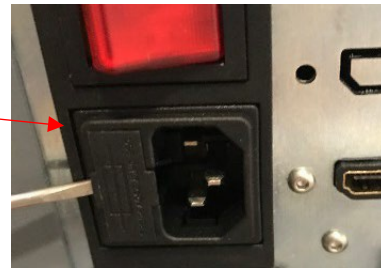
- Power off the machine.
- Carefully lift the spindle cover.
- Wipe the spindle **THOROUGHLY** after lubrication so that as little as possible oil is left on the spindle.
- Wipe the spindle again after a few days to ensure no oil residue is left on the spindle surface.

## Replacing the Fuse

The fuse holder is located directly under the power connection on the rear of Duramin-600.

- Turn Duramin-600 off.
- Disconnect the power cable.
- Pull out the fuse holder using a flat-head screwdriver.

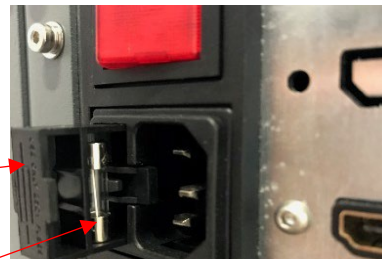
Fuse holder



- Take out the blown fuse and replace with the reserve fuse.

External cover

Fuse



- Re-install the fuse holder.
- Re-connect the electric power cable.



### **HINT:**

Remember to order a new fuse.  
Initially, a spare fuse is delivered with the machine.

**Calibration**

The highly sensitive and accurate load cell and objectives of the Duramin-600 are calibrated prior to shipping. Please contact Struers Service should the load cell or objectives require recalibration.

**Service and Repair**

Service and repairs can only be carried out by Struers or trained technicians, authorised by Struers.

## 4. Cautionary Statements

### List of Safety Messages in the Manual



#### **ELECTRICAL HAZARD**

Switch the power off when installing electrical equipment.

The machine must be earthed (grounded).

Check that the mains voltage corresponds to the voltage stated on the type plate on the side of the machine.

Incorrect voltage may result in damage to the electrical circuit.



#### **CRUSHING HAZARD**

Do not place your hand between the sample and the indenter.

## 5. Transport and Storage



**NOTE:**

Package the machine securely before transportation. Insufficient packaging could cause damage to the machine and will void the warranty. Contact Struers Service for advice. Struers recommends that all original packaging and fittings are kept for future use.

Follow these steps:

- Familiarize yourself with points in the **DURAMIN-600: HOW TO UNPACK** document
- Disconnect Duramin from power.
- If an XY-stage is mounted, remove the stage before moving the tester.
- Position a foam block between the anvil/ stage and the turret.
- Remove the lifting bar hole covers and insert the lifting bar.
- Place the lifting straps<sup>3</sup> securely on the lifting bar.
- Move the machine to its new position.

If the machine is bound for long-time **storage** or **shipping**, follow these steps:

- While lifted, remove the vibration dampers (feet).
- Line up the holes on the transport pallet with the bolts on the machine. Fasten the machine to the pallet.
- To keep the machine dry, pack the machine in an air tight plastic bag and place a desiccant (silica gel) in the bag, too.
- Mount the sides of the crate.
- Place the accessories box, and other loose items in the crate.
- Mount the lid of the crate.

At the new location:

- Check the Pre-Installation Checklist.



**NOTE:**

Always use the lifting bar when moving the machine. Failure to use the lifting bar could cause severe damage to the machine and will void the warranty.

**NOTE:**


Always transport the hardness testing machine in an upright position.

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<sup>3</sup> Lifting Straps must be approved to at least twice the weight of the machine.

## 6. Disposal



Equipment marked with a WEEE symbol  contain electrical and electronic components and must not be disposed of as general waste.

Please contact your local authorities for information on the correct method of disposal in accordance with national legislation.

# Reference Guide

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## 1. Struers Knowledge

The need for fast, robust and well proven test methods for materials verification is inevitable. Vickers, Knoop, Rockwell and Brinell methods, with a countless number of loads and indenter geometries, gives an almost countless number of procedures, suitable for simple characterization of a large fraction of existing materials.



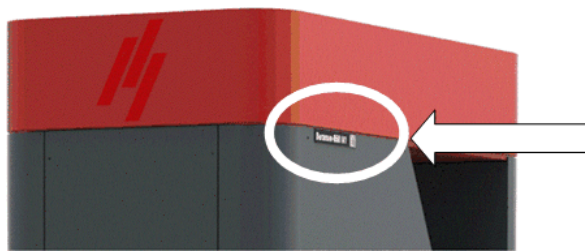
**HINT:**

Visit the Struers Hardness testing website for a comprehensive introduction to the principles of hardness testing, useful troubleshooting tips and the latest application knowledge in the field.

Click on the link: [Struers - Ensuring Certainty / Knowledge / Hardness testing](#)

OR

Scan the QR code on the Duramin tag on your machine to go to the web-site.



## 2. Trouble Shooting

Some of the minor malfunctions can be resolved by restarting the tester:

- Press **System**, then **Exit**.
- Click on the exit icon on the taskbar to shut down the embedded PC.



- Switch Duramin **Off**, then switch on again to start initialization.

Error	Explanation	Action
Indenter not present!	No Indenter selected.	- Select the Indenter installed using the turret configuration menu.
Object detected	Software safety system has registered an unexpected object.	- Remove the object and continue operation.
Start-up failure	The emergency stop is activated	- Release the emergency stop. - Restart the tester.
LCA Start-up	Failure of Software communication.	- Restart the software.
Max down reached!	The maximum down position of the force actuator has been reached.	Press OK and use the UP key to move the actuator.
Max up reached!	The maximum up position of the force actuator has been reached.	Press OK and use the DOWN key to move the actuator.
Motor failure!	Failure of force application motor.	- Restart the tester. If the error remains, contact Struers Service.
System not initialized!	Failure of Software communication.	- Restart the tester. If the error remains, contact Struers Service.
Failed to open connection to AUX on EURP AUX Virtual Com Port (COM3)	Failure of Software communication.	- Restart the tester. - Press <b>System</b> , then <b>Exit</b> . - Switch Duramin Off, then switch on again to start initialization. If the error remains, contact Struers Service.

*Duramin-600  
Instruction Manual*

<b>Error</b>	<b>Explanation</b>	<b>Action</b>
Load motor is not in home position		<ul style="list-style-type: none"> <li>- Press <b>Escape</b>.</li> <li>- Then press <b>Start</b>.</li> </ul> If this does not help, <ul style="list-style-type: none"> <li>- Restart the tester.</li> </ul> If the error remains, contact Struers Service.
Either motor or Heidenhain does not work!	Failure of motor or Heidenhain length measuring device.	<ul style="list-style-type: none"> <li>- Restart the tester.</li> </ul> If the error remains, contact Struers Service.
Timeout Heidenhain readout	Communication failure between Heidenhain length measurement device and hardware.	<ul style="list-style-type: none"> <li>- Restart the tester.</li> <li>- If the error remains, contact Struers Service.</li> </ul>
Trinamic Timeout!	Communication failure between the turret and the testers' hardware.	<ul style="list-style-type: none"> <li>- Restart the tester.</li> <li>- If the error remains, contact Struers Service.</li> </ul>

### **3. Service**

Struers recommends that a regular service check be carried out after every 1500 hours of use.

Servicing must be carried out by Struers Field Engineers, or skilled personnel specifically trained by Struers.

Struers offers a range of comprehensive maintenance plans to suit the requirements of our customers. This range of services is called **ServiceGuard**.

The maintenance plans include equipment inspection, replacement of wear parts, adjustments/calibration for optimal operation, and a final functional test.

## **4. Legal and Regulatory**

### **FCC Notice**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instruction Manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this product not expressly approved by Struers ApS could cause harmful radio interference and void the user's authority to operate the equipment.

## 5. Technical Data



**HINT:**  
Please refer to the [Duramin Product Overview brochure](#) for further details.

		Duramin-600
<b>Hardness methods</b>	Vickers	ISO 6507 ASTM E384, E92 JIS B 7725
	Knopp	ISO 4545 ASTM E92 JIS Z 2251
	Brinell	ISO 6506 ASTM E10 JIS Z 2243
	Rockwell	ISO 6508 ASTM E18 JIS Z 2245
<b>Force range</b>	M1 & Z1	9.8-2451 N (1-250 kgf)
	M2 & Z2	29.4-7355 N (3-750 kgf)
	M3 & Z3	49-29420 N (5-3000 kgf)
<b>Test force</b>	Force application	Multi-load cell, closed loop
	Test force tolerance	< 0.25% for test force higher than 1 kgf < 0.5 % for test forces lower than 1 kgf
	Dwell time settings	Default 10 s, adjustable up to 250 s
<b>Turret</b>	Motorized turret	6 position turret, 2 indenter positions, 4 objective positions
<b>Electrical data</b>	Power supply	100 V AC - 240 V AC, 50/60Hz, single phase
	Power consumption load	71 W
	Power consumption idle	65 W
	Power consumption max. load Power consumption Max. load	196 W
	Power inlet	1-phase (N+L1+PE) or 2-phase (L1+L2+PE) The electrical installation must comply with Installation Category II
<b>Residual Current Circuit Breaker (RCCB)</b>		Type A, 30 mA is required depending on local regulations.
<b>Dimensions</b>	Width	380 mm (15")
	Depth	685 mm (27")
	Height	1423 mm (56")
<b>Weight</b>	Duramin-600 M	430 kg (947 lbs)
	Duramin-600 Z	430 kg (947 lbs)

		Duramin-600
<b>Read method</b>		Automated
<b>Overview camera resolution</b>		N.A.
<b>Overview camera field of view</b>		N.A.
<b>Measurement camera resolution</b>		10.8 MPix
<b>Positions in nosepiece</b>		6 position turret, 2 indenter positions, 4 objective positions
<b>Position in nosepiece for overview camera</b>		-
<b>Max no. of Indenters</b>	<b>Max no. of indenters</b>	2
<b>Max No. of Objectives</b>	<b>Max No. of objectives</b>	4
<b>Indenter Shaft</b>	Diameter	6.35 mm
<b>Standard objectives included</b>		0.7x, 2.5x, 5x, 10x, 20x, 40x, 60x, 100x
<b>Z-Axis</b>		Manual (Motorized Optional)
<b>Anti-colission protection</b>		Yes
<b>XY Stage / Anvil</b>		Anvil or manual
<b>Stage Size</b>		Ø80 mm (3.1")
<b>Stage Stroke (travel range)</b>		N.A.
<b>Auto Illumination</b>		Yes
<b>Stage Illumination</b>		No
<b>Laser/LED Guide</b>		No
<b>Software</b>	Operating software	High performance embedded controller, i7, mSSD 120 GB MS Windows 10 operated
	Integrated PC	Yes
	Monitor	15" capacitive touch screen
	Dual view	No (Optional)
	Possibility to connect Printer	No
	Ethernet Connection	Yes
	Data Export	USB, Ethernet LAN, Wi-Fi, RS232, Bluetooth, HDMI
<b>System</b>	Data output	XML, CSV, Q-DAS certified (optional)
<b>Software modules</b>		Total test, max., min., average, range, standard deviation






		Duramin-600
<b>Sample height</b>		170 mm (6.7")
<b>Throat depth</b>		260 mm (10.2")
<b>Safety standards</b>		CE labelled according to EU directives
<b>REACH</b>		For information about REACH, contact your local Struers office
<b>Operating environment</b>	Surrounding temperature	10-35°C (50-95°F)
	Humidity	10%-90% RH non-condensing
<b>Safety Circuit Categories/Performance Level</b>	Emergency stop	EN ISO 13849-1 PL c, Category 1 Stop category 0
<b>Noise level</b>	A-weighted sound emission pressure level at workstations	< 70 dB(A)
<b>Vibration level</b>	During operation	Total vibration exposure to upper parts of the body does not exceed 2.5 m/s <sup>2</sup>

## Duramin-600, Pre-Installation Checklist

Read the Installation instructions in the Instruction Manual *before* installing the machine.

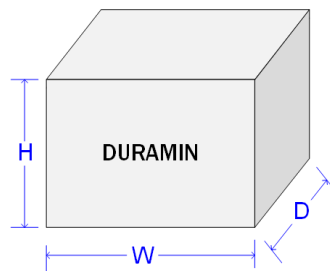
### Installation Requirements

- Crane and lifting strap
- Hexagonal wrench  size 19
- Allen keys (2.5 mm and 3 mm)
- Residual Current Circuit Breaker Type A, 30 mA

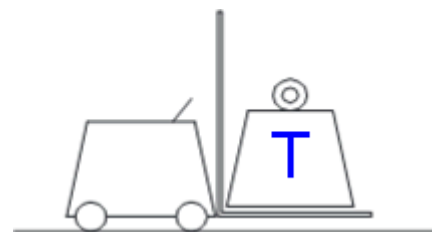
Required Accessories and Consumables (ordered separately)  
(Please refer to the [Duramin website](#) for details of the range available).

- Test blocks
- Indenters

### Crating Specifications



H	168 cm / 71"
W	92.5 cm / 34"
D	85 cm / 28"
T	460 kg / 1,014 lbs*



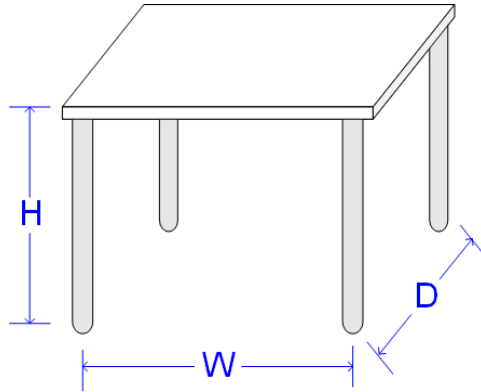
**\*Weight:**

The actual weight is clearly displayed on the outside of the delivery crate.  
The weight depends on the machine configuration selected.

## Location

The machine is designed to be placed on a rigid, stable workbench with a horizontal surface.

Recommended workbench dimensions:



*Height of table (H) follows local preferences.*

**H** Preferred height

**W** 85 cm / 33.5"

**D** 85 cm / 33.5"

## Vibration



### NOTE:

Vibrations can lead to inaccurate measurements and must be avoided.

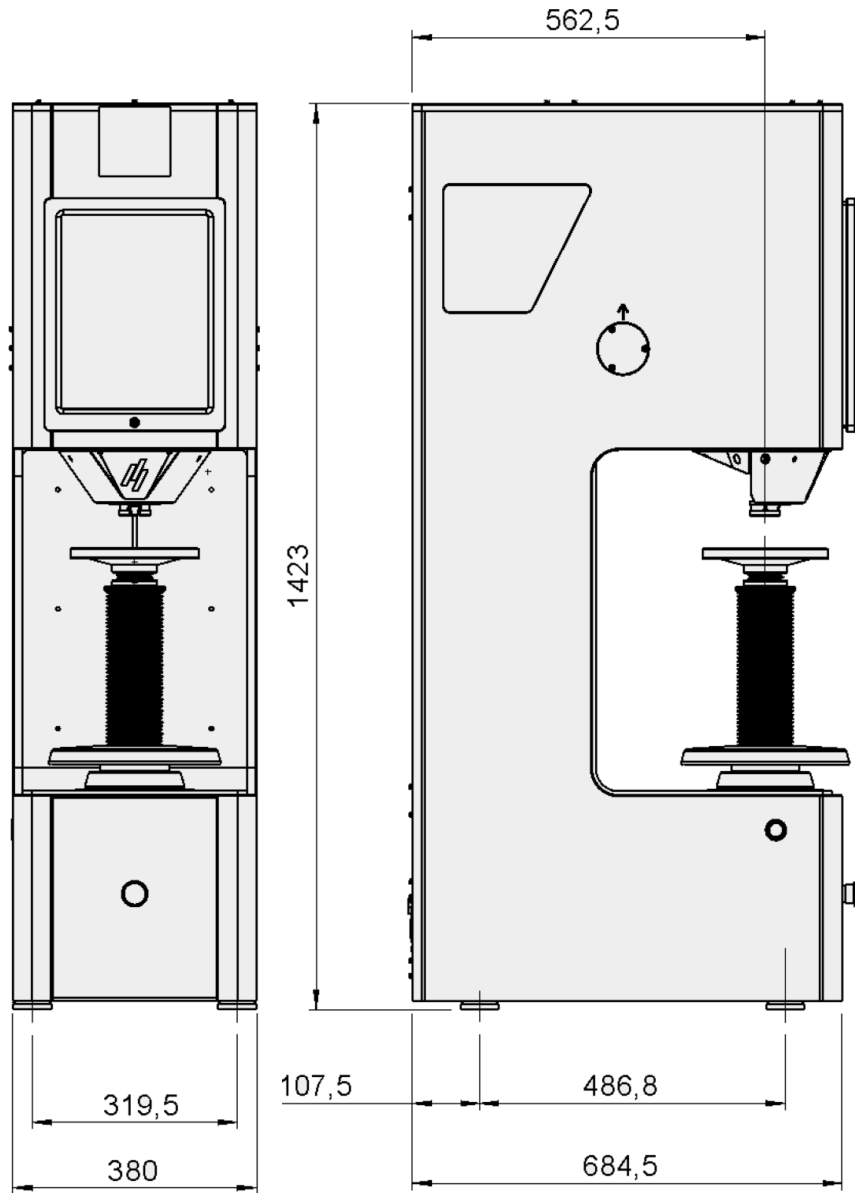
- Install Duramin in a vibration-free location.
- Install Duramin on a rigid floor which is securely fixed.

Sources of vibration can include:

- Passers-by (persons walking past), a road with heavy traffic, cranes, equipment generating vibrations, equipment generating sound (acoustic vibration), exposure to wind or air conditioning fans.
- If possible, install the hardness tester on the ground floor of a building and away from exits or doorways.

## Dimensions

Measurements in mm



## Recommended Space

**Front:** Recommended space at the front: 100 cm / 40".

**Sides:** No requirements

**Rear:** The machine may be placed against a wall.

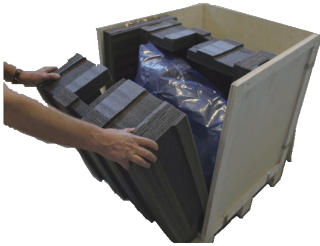
- Check there is enough room to access the main switch, and power connections.
- Check that there is enough access room for Service operations.

## Unpacking



**HINT:**

Refer to **Duramin-600: How to Unpack** instructions delivered with Duramin.  
**Take care** while handling Duramin.  
 Do not expose to external impact.  
 Do not tilt over 30 degrees.  
 Do not touch the indenter.



- Carefully open and remove the top of the packing crate.
- Remove one side of the packing crate.
- Remove the monitor, box of accessories and other loose items.
- Carefully lift the foam pieces to access Duramin.
- Store the packing box and foam packaging for future use.
- Remove the plastic covering.



**NOTE:**

Some components or parts may be packaged separately and may not be included in the accessory box or may have been installed on the hardness tester.  
 The packaging may differ to the illustrations shown.

## Lifting



**HINT:**

Refer to the **Duramin-600: How to Unpack** instructions delivered with Duramin.  
**Take care** while handling Duramin.  
 Do not expose to external impact.  
 Do not tilt over 30 degrees.  
 Do not touch the nose cone.

<b>Weight:</b>	
Duramin-600 M / 600 Z	430 Kg/ 948 lbs

**With a crane**

A crane and lifting straps<sup>1\*</sup> are required to lift the machine from the packing box.

- Check that the crane has a free pathway from the lifting point to the final location.
- Place the lifting straps securely around the steel lifting bar.
- Carefully lift Duramin out of the packing box and into its final location.
- Remove the straps and the steel lifting bar

<sup>1</sup> Lifting straps must be approved to at least twice the weight of the machine.

## Power Supply



**NOTE!**

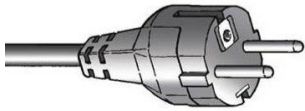
Remove the transportation security BEFORE connecting the tester to the mains power.

See the *Instruction Manual* for details.

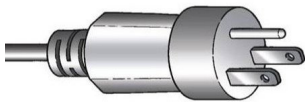
The machine is shipped with 2 types of Mains cables (length 2.5 m/ 8 ft).

If the plug supplied on this cable is not approved in your country, then the plug must be replaced with an approved plug.

The 2-pin (European Schuko) plug is for use on single-phase connections.



The 3-pin (North American NEMA 5-15P) plug is for use on single-phase connections.



**Electrical data**

Power supply	100 V AC – 240 V AC, 50/60Hz, single phase
Power consumption	71 W

**Residual Current Circuit Breaker (RCCB)**



Type A, 30 mA (or better) is recommended.

**NOTE:**

Local standards may overrule the recommendations for the main supply cable. If necessary, please contact a qualified electrician to verify which option is suitable for the local installation setup.

## Safety specifications

Safety Circuit Categories

	<b>Designed to comply with a minimum of</b>
Emergency stop	EN ISO 13849-1:2015 Cat 1 Pl c

## Water Supply

Required

Option

Not required.

## Water Drain Outlet

Required

Option

Not required.

## Compressed air

Required

Option

Not required.

## Exhaust

Required

Option

Not required.

## Ambient Conditions



10 - 35 °C / 50 – 95 °F

**Recommended:** 21 ±3°C / 70 ±5°F



**10%-90% RH** (Non-condensing)

**NOTE:** No condensation may form on the test unit.

## Accessories

Please refer to the [Hardness Testing Accessories](#) website for details of the range available.

*Use only Struers accessories.*

*The warranty may not cover damaged machine parts, where the damage can be directly related to the use of non-Struers accessories.*

Authorized to compile technical file/

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# Declaration of Conformity

Manufacturer	Struers ApS • Pederstrupvej 84 • DK-2750 Ballerup • Denmark
Name	Duramin-600
Model	M1, M2, M3, Z1, Z2 or Z3
Function	Hardness tester
Type	666
Cat. no.	06666101, 06666102, 06666103, 06666111, 06666112, 06666113, 06666213
Serial no.	



Module H, according to global approach

**EU**

We declare that the product mentioned is in conformity with the following legislation, directives and standards:

<b>2006/42/EC</b>	EN ISO 12100:2010, EN ISO 13850:2015, EN ISO 13849-1:2015, EN ISO 13849-2:2012, EN 60204-1:2018
<b>2011/65/EU</b>	EN 63000:2018
<b>2014/30/EU</b>	EN 61000-3-2:2014, EN 61000-3-3:2013, EN 55011:2016/A1:2017/A11:2020, EN 61326-1:2021

Authorized to compile technical file/  
Authorized signatory

Date: [Release date]



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