

# Duramin-650

## Instruction Manual

Original instructions.



*Duramin-650*  
*Instruction Manual*

<b>Table of Contents</b>	<b>Page</b>
Intended use .....	4
Safety Precaution Sheet.....	6
Icons and typography .....	8
Disposal.....	9
User´s Guide.....	9
Reference Guide.....	33
Contents of the Declaration of Conformity .....	41

## **Intended use**

**IMPORTANT**

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

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 motorized test head. Samples are secured on a fixed anvil or optional motorized XY-stage.

For load ranges 1 - 250 kgf, 3 - 750 kgf, or 5 - 3000 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-650 M1/Duramin-650 M2/Duramin-650 M3  
Duramin-650 AC1/Duramin-650 AC2/Duramin-650 AC3

## Duramin-650 Instruction Manual

---

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.

**Service Manuals:** Struers Service Manual may only be used by a trained technician authorised by Struers. The Service Manual may only be used in connection with Struers equipment covered by the Service Manual.

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

The contents of this manual are the property of Struers. Reproduction of any part of this manual without the written permission of Struers is not allowed.

All rights reserved. © Struers 2019.

**Struers ApS**  
Pederstrupvej 84  
DK-2750 Ballerup  
Denmark  
Telephone +45 44 600 800  
Fax +45 44 600 801

---



## Duramin-650 Safety Precaution Sheet

### To be read carefully before use

1. 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.

<b>WARNING</b>
Ignoring this information and mishandling of the equipment can lead to severe bodily injuries and material damage.

2. The machine must be installed in compliance with local safety regulations.
3. 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.
4. Do not modify this equipment. Doing so can cause fire and/or electric shock.
5. Do not twist or damage the power cords. Damaged power cords can cause fire and/or electric shock.
6. Do not disassemble this equipment. Doing so can cause electric shock.
7. Do not operate the equipment at a voltage other than the power voltage that is indicated. Doing so can cause fires.
8. 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.
9. If malfunctions, smoke or unusual noises are observed - turn off the power, disconnect the power supply and call technical service.
10. Do not connect/ disconnect power with wet hands. Doing so can result in electric shock.

*Duramin-650*  
*Instruction Manual*

- 11.** Disconnect the power supply prior to any cleaning, maintenance or service.  
Failure to do so can result in electric shock.
- 12.** Do not block the ventilation. Blocking the ventilation can cause heat to accumulate inside the machine, which in turn, can generate fire.
- 13.** Do not open any panel on the machine.  
High voltages exist inside the machine and may cause electrical shocks to personnel.

---

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 maintenance, service or repair, should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.)

---

## Icons and typography

The following icons and typographic conventions are used in this instruction manual:

### 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.

### General Messages



#### ***Important or Note***

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



#### ***Information or Tip***

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
■ Bullets	indicates a necessary work step



## 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.



# User's Guide

Table of Contents	Page
<b>1. Getting Started</b>	
Unpacking Duramin-650 .....	10
Location.....	11
Lifting Duramin.....	12
Placing Duramin-650.....	13
Checking the Contents.....	15
Getting Acquainted with Duramin-650.....	16
Noise Level.....	18
Power Supply.....	19
Assembling the Monitor.....	20
Installing an indenter.....	22
Installing an Anvil or Stage.....	22
Installing an XY Stage.....	23
<b>2. Basic Operations</b>	
Front Panel Controls.....	24
Software.....	25
Start-up.....	25
Overview Screen.....	27
<b>3. Maintenance</b>	
General Cleaning.....	30
Daily Maintenance.....	30
Weekly Maintenance.....	30
Yearly Maintenance.....	31
Calibration.....	32

## 1. Getting Started

### Unpacking Duramin-650

***Important***

Refer to the **HOW TO UNPACK** instructions delivered with Duramin.

**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 sides of the packing crate.
- Remove the accessories case(s).
- Carefully lift the foam pieces to access Duramin.



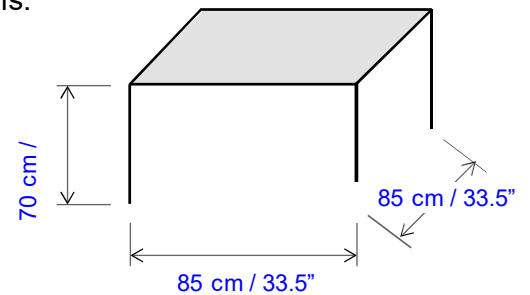
**Store the packing crate, foam packaging and fittings for use whenever Duramin is transported/re-located.**

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

## Location

- Duramin must be placed close to the power supply.
- Duramin is designed to be placed on a rigid, stable workbench with a horizontal surface.  
The workbench must be able to carry at least 350 Kg / 770 lbs.

Minimum workbench dimensions:



## Vibration-free Location

- Install Duramin in a vibration-free location.



**Important**

Vibrations can lead to inaccurate measurements and must be avoided.

A simple way of detecting vibrations is to set up a tray of water and watch for ripples on the surface.

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

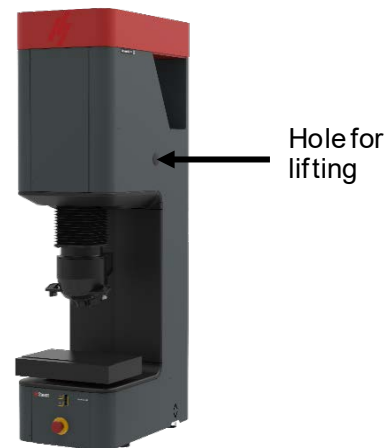
A crane, lifting bar (approx. 75cm length, 25mm diameter) and lifting straps are required to lift the machine from the packing crate.



**Important**

**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 plastic hole covers.



- Carefully insert the lifting bar through the two lifting holes.



**Important**

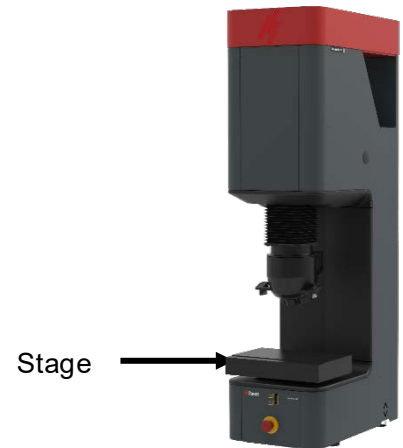
**DO NOT** place the lifting bar through the space in the tester's cover.

- Place the lifting straps securely around the lifting bar, ensure that the straps do not press on the tester.
- Remove the bolts securing Duramin to the pallet.
- Carefully lift Duramin out of the packing crate.
  
- Install the 4 adjustable vibration dampers and adjust the height of the dampers until they are of equal height.
- Lift Duramin into its final location.

## Placing Duramin-650 Levelling

To eliminate possible wear and tear of the testers mechanical structure, the tester should be levelled once it is in its final location.

- Check that the anvil / stage is level.



If not:

- Turn the vibration damper in the rear right hand corner to level the tester.



## Removing the Lifting Bar

- Remove the lifting bar.
- Re-mount the two black hole covers.



### **Important**

Keep the lifting bar for use whenever the machine is to be relocated.

*Removing the Transport Plate*  
(Motorized XY-stage option only)

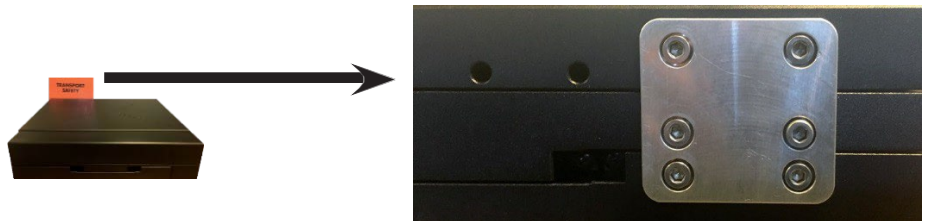
- Remove the transport safety **before** turning on the tester. The motorized XY-stage will automatically move to perform a reference search on initialization.



***Important***

Damage to the stage will result if the tester is switched on with the transport safety plate mounted.

- Unscrew the six screws securing the transport safety plate at the rear.
- Keep the plate and screws for use whenever the machine is to be relocated.





## Checking the Contents

In the packing crate you should find the following parts:

- 1 Duramin-650 (Hardness Tester)
- 1 Accessories Case
- 1 15" Monitor (2<sup>nd</sup> monitor optional)

### Accessories Case Standard Accessories



- Indenter(s)
  - 1 Anvil or Motorized stage (optional)
  - 2 Fuse 3A slow
  - 2 Power cables
- 4 Vibration dampers (feet)
- 1 Certificate of calibration
- 1 Instruction Manual set

### Optional Accessories

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



#### **Information**

Some components or parts may be packaged separately and may not be included in the accessory case or may have been installed on the hardness tester.



#### **Information**

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

**Getting Acquainted  
with Duramin-650**

Take a moment to familiarise yourself with the location and names of the Duramin-650 components.

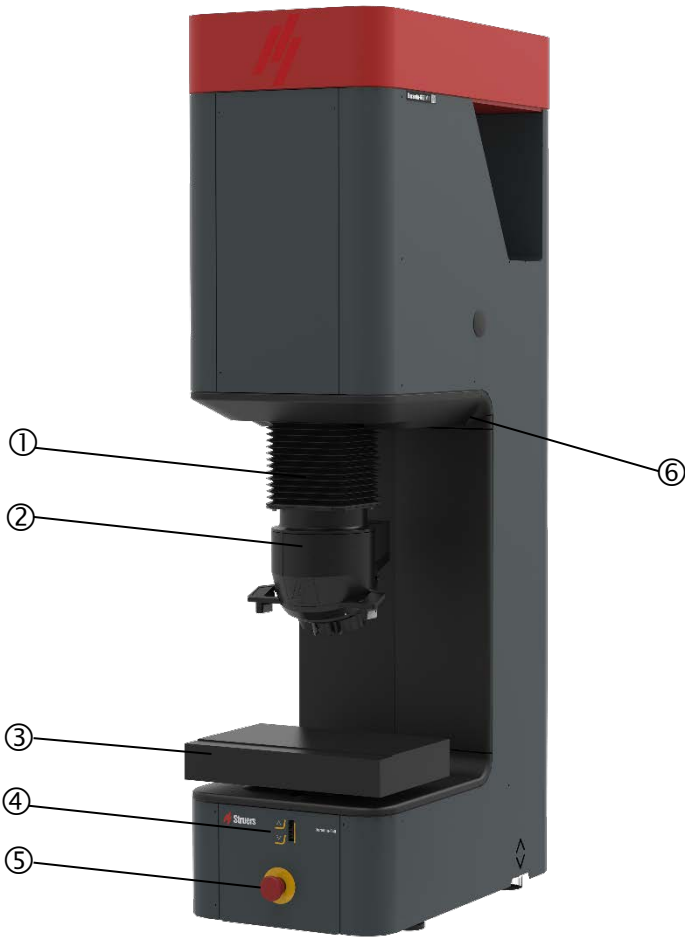


15" LCD monitor  
touchscreen



Tester

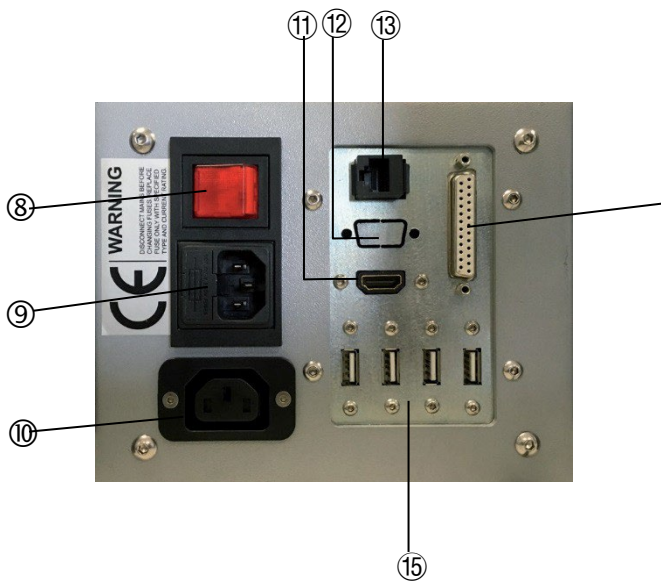
*Duramin-650  
Instruction Manual*



- ① Spindle cover
- ② Turret (with Overview camera)
- ③ Anvil / Stage
- ④ Z-axis control
- ⑤ Emergency stop
- ⑥ USB port
- ⑦ Hold-to-run button



**Power Connections**



- ⑧ Main power switch
- ⑨ Main power connection
- ⑩ Power connection for monitor
- ⑪ HDMI connection for monitor
- ⑫ Not used
- ⑬ Network (RJ-45 LAN connection)
- ⑭ Not used
- ⑮ USB connections (2 Not used)

*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 Duramin.

*Rear plate*

Information on the model number, serial number, weight, date of manufacture, and power requirements can be found on the type plate on the back of the machine.

**Noise Level**

Less than 70 <sup>1</sup> dB(A) measured at idle running, at a distance of 1.0 m/39.4" from the machine.  
Use hearing protection if exposure to noise exceeds levels set by local regulations.

---

<sup>1</sup> "The figures quoted are emission levels and are not necessarily safe working levels. Whilst there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of the workforce include the characteristics of the workroom and the other sources of noise, i.e. the number of machines and other adjacent processes and the length of time for which an operator is exposed to the noise. Also, the permissible exposure level can vary from country to country. This information, however, will enable the user of the machine to make a better evaluation of the hazard and risk."  
(ref. EN ISO 16089:2015)

## Power Supply

Connecting the  
Tester

Always remember to switch the power off when installing electrical equipment!



### ELECTRICAL HAZARD

- The machine must be earthed.
- 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.

Duramin-650 is shipped with 2 types of Mains cables:

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



The 3-pin (North American NEMA 5-15P) 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:

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.

## **Assembling the Monitor**

Contents of the monitor box:

- 1 monitor with base
- 1 power cord adapter
- 1 USB cable, and European power cords.

Note: The dual monitor option will be delivered with 2 monitor boxes.

- Remove the monitor's rear panel.
- Slide the panel off to expose the connection ports.



- Remove the two black plastic pieces around the monitor stand joint.
- Adjust the stand angle.  
If necessary loosen the two nuts around the joint using a 13 mm hexagonal wrench.



- Lay the monitor face down on a flat surface.
- Unscrew the four screws on the rear of the monitor.

- Position the stand on the back of the monitor and line up the four holes with the four screw holes.  
Check that the label **TOP** will be at the top of the monitor when it is upright.
- Tighten the four screws to attach the monitor to the stand.

### Connecting the Monitor

- Plug the USB cable into the USB port, HDMI cable to the DVI port, and the power cord adapter to the power port on the rear of the tester.
- Check that all plugs are connected correctly and replace the rear panel of the monitor.



**Important**

Only monitors supplied by Struers may be connected to Duramin.  
Failure to adhere to this may result in material damage.

### Dual Monitor Option

The monitors will be labeled *Screen L* and *Screen R*.  
The ports at the rear of the Duramin will also be labelled *Screen L* and *Screen R*.



- Connect the correct USB and HDMI cables to the corresponding *Screen L* and *Screen R* ports.
- The power cable for the 2<sup>nd</sup> monitor must be plugged into a mains 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).



**Tip**

Place the monitor in a location where there are no reflections on the screen.

## Installing an indenter



Indenter Shaft



Duramin-650 is delivered with pre-installed indenter(s) as ordered.

### **Important**

Do not use other than Struers accessories

To install additional indenters:

- Use a soft cloth to wipe any dirt or debris from the indenter, indenter holder or shoulder.
- Insert the shaft into the indenter holder and push firmly into place.
- Install an anvil and run a test on a test block to securely seat the indenter.

## Installing an Anvil or Stage

(depending on model and options purchased)



### **Important**

Do not use other than Struers accessories.

### **Important**

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

Dovetail connection



Fixation screw

Use the appropriate anvil for the application.

Duramin-650 has a dovetail connection for fixation of an anvil or stage.

The anvil/stage is secured in place with a fixation screw.

To install an anvil:

- Move the spindle to its top position.
- Use a soft cloth to wipe any dirt or debris from the mat surfaces of the anvil and dovetail connection.
- Carefully slide the anvil into the dovetail connection.
- Tighten the fixation screw to secure the anvil in place.
- Perform a few hardness tests on a test block to securely seat the anvil.



## Installing an XY Stage



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



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

- Move the spindle to its top position.
- Use a soft cloth to wipe any dirt or debris from the mat surfaces of the dovetail connection.
- Carefully slide the stage into the dovetail connection.
- Tighten the fixation screw to secure the stage in place.
- Connect the cable to the motorized XY-stage and to the connection on the machine.

Connection for  
motorized XY-stage



- Perform a few hardness tests on a test block to securely seat the stage.

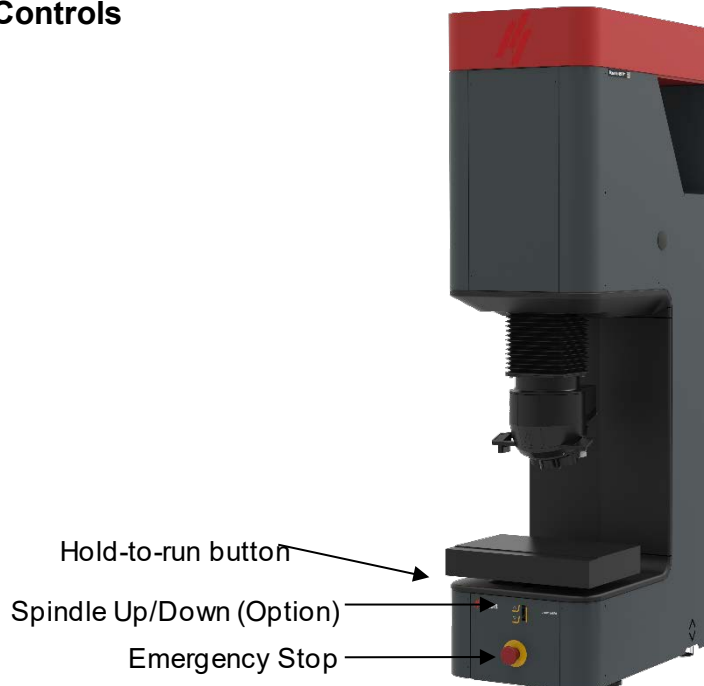
The Duramin software must be configured correctly when a motorized XY-stage is mounted or removed.



**Important**  
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. Basic Operations

### Front Panel Controls



#### 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.



**Important**  
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*

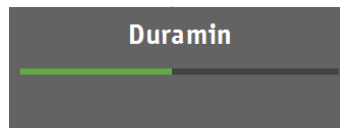
When moving the spindle using the Up/Down keys, the Hold-to-run button must be pressed continuously.

## Software

Duramin-650 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 Duramin-650 on using the main switch at the rear. The Duramin software will initialize and the following progress bar will appear on the display:



**Note:** Duramin-650 will beep during initialization.



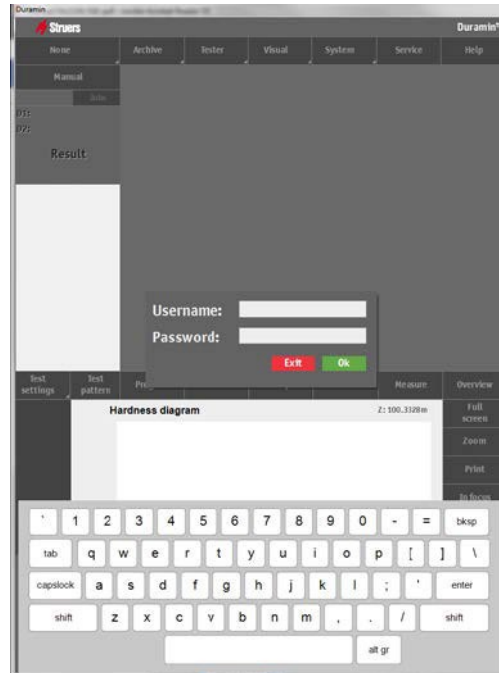
**Tip**

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

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

- Release the emergency stop.
- Touch the screen to acknowledge the pop-up message.
- Re-start the Duramin software by double clicking on the Duramin icon on the display.

The following screen will appear on the monitor.



**Information**

The actual screen may appear different depending on the configuration and model of the Duramin-650.

- Push gently in the middle of the designated buttons for tester operation. Do not use force. Do not use sharp objects.
- Enter the *Username* and *Password*.  
When Duramin is used for the first time, the default will be:  
**Username:** Admin  
**Password:** none
- Press **Ok**.



**Tip**

The default username is not case sensitive.

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

**Overview  
Screen**

The overview screen is primarily divided into 5 main areas.

- Main menu
- Test result
- Objective view
- Test settings with Additional results
- Dashboard Controls

The screenshot shows the Duramin software interface. On the left side, five arrows point to specific areas of the screen:

- Main Menu:** Points to the top navigation bar containing 'Vickers 1Kgf', 'Archive', 'Tester', 'Visual', 'System', 'Service', and 'Help'.
- Test result:** Points to the 'Results' section on the left, which displays '721.87 HV1' and a table of test results.
- Objective view:** Points to the central image showing a diamond-shaped indentation on a metal surface.
- Test settings:** Points to the 'Test settings' button located above the 'Chd diagram'.
- Additional results:** Points to the 'Chd diagram' graph, which plots Hardness against Depth (mm).

The 'Test result' table contains the following data:

Nr	Value	Sc...
1/1	721.87	HV1
1/2	721.87	HV1
1/3	730.84	HV1
1/4	704.41	HV1
1/5	715.98	HV1
1/6	726.34	HV1
1/7	615.27	HV1
1/8	565.97	HV1
1/9	561.88	HV1
1/10	435.81	HV1
1/11	405.22	HV1
1/12	262.56	HV1
1/13	227.50	HV1
1/14	218.34	HV1
1/15	205.61	HV1

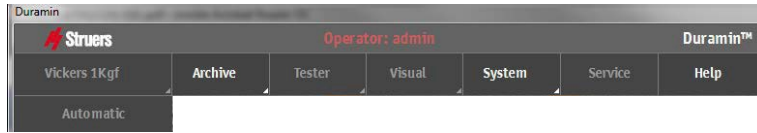
The 'Chd diagram' graph shows Hardness (Y-axis, 195 to 745) versus Depth (mm) (X-axis, 0 to 4.4). A horizontal dashed line is drawn at HL 550. A vertical dashed line is drawn at CHD 2.68. The graph shows a series of data points connected by a line, with points 1 through 15 marked.

The 'Dashboard Controls' at the bottom of the screen include a circular control with 'AH', '3', '200', '500', '20x', and 'HK' labels, and a grid of directional and function buttons.

# Duramin-650 Instruction Manual

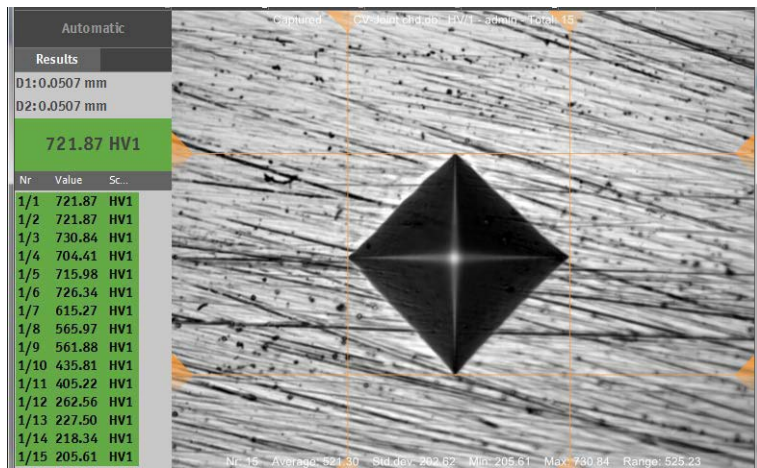
## Main Menu

The *Main Menu* is used 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.



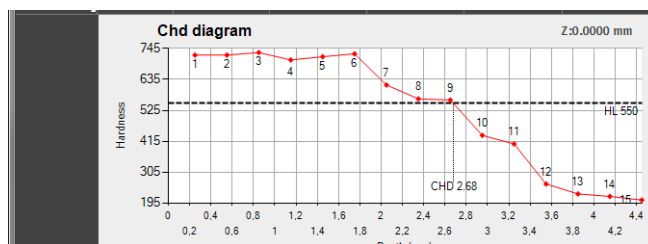
## Test Settings

The *Test Settings* menus are used to select test patterns and to perform additional functions.



The *Additional Results Window* shows an illustration of the results obtained.

## Additional Results Window



*Dashboard  
Controls*

The *Dashboard Controls* are used to move the turret and select the objective to be used, fine positioning of the spindle light controls and to start the indentation process.



Please refer to the [Duramin Software manual](#) for a detailed description of the software and its functions.

### 3. Maintenance

#### General Cleaning

- Keep Duramin-650 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.



**Tip:**  
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.



**Important**  
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.

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



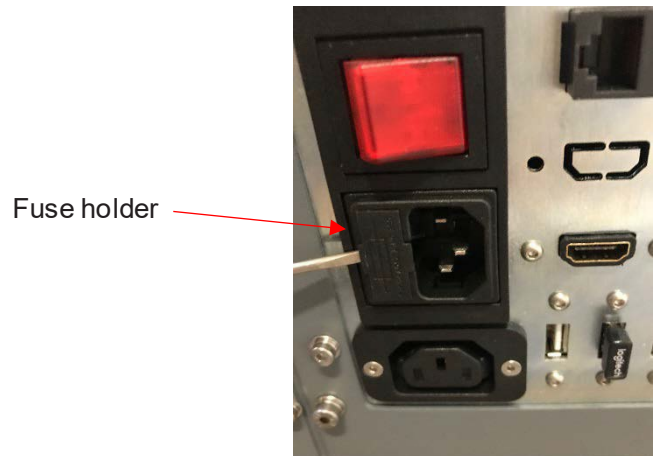
**Yearly  
Maintenance**

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

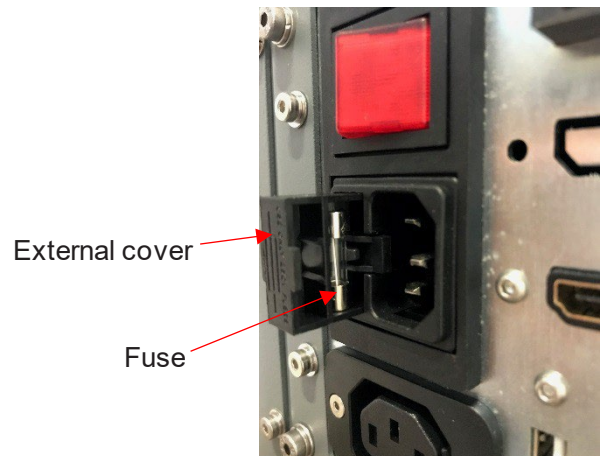
### Replacing the Fuse

The fuse holder is located directly under the power connection on the rear of Duramin-650.

- Turn Duramin-650 off.
- Disconnect the power cable.
- Pull out the fuse holder using a flat-head screwdriver.



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



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



**Tip**

Remember to order a new reserve.

### Calibration

Duramin-650's highly sensitive and accurate load cell and objectives are calibrated prior to shipping.

Please contact Struers Service should the load cell or objectives require recalibration.

# Reference Guide

Table of Contents	Page
1. Struers Knowledge.....	34
2. Trouble Shooting.....	35
3. Transport.....	36
4. Technical Data .....	37

## 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.



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



## 2. Trouble Shooting

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

- Press **System**, then **Exit**.
- Click on the stop 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.
Load motor is not in home position		- Press <b>Escape</b> . - Then press <b>Start</b> .  If this does not help, - Restart the tester. If the error remains, contact Struers Service.
Either motor or Heidenhain does not work!	Failure of motor or Heidenhain length measuring device.	- Restart the tester. If the error remains, contact Struers Service.
Timeout Heidenhain readout	Communication failure between Heidenhain length measurement device and hardware.	- Restart the tester. - If the error remains, contact Struers Service.
Trinamic Timeout!	Communication failure between the turret and the testers' hardware.	- Restart the tester. - If the error remains, contact Struers Service.

### 3. Transport

The hardness testing machine must always be transported standing upright!

DO NOT ship or transport the tester without the correct packing materials.



**Store the packing crate, foam packaging and fittings for use whenever Duramin is transported/re-located.**

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

XY-Stage - Secure the transportation safety before moving the tester.

Turret – Position the foam block between the anvil/ stage and the turret.

DO NOT lift the tester without mounting a lifting bar  
This could cause severe damage to the testers load application system.

## **4. Technical Data**

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

		Duramin-650
<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&AC1	9.8-2451 N (1-250 kgf)
	M2&AC2	29.4-7355 N (3-750 kgf)
	M3&AC3	49-29420 N (5-3000 kgf)
<b>Test force</b>	Force application	Multi-load cell, closed loop, force feedback system
	Test force tolerance	< 0.25%
	Dwell time settings	Default 10 s, adjustable up to 250 s
<b>Turret</b>	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	75 W
	Power consumption max. load - Duramin-650 M	103 W
	Power consumption max. load - Duramin-650 AC	201 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	365 mm (14.4")
	Depth	6813 mm (24.1")
	Height	1434 mm (56.5")
<b>Weight</b>	Duramin-650 M	255 kg (562 lbs)
	Duramin-600 Z	260 kg (573 lbs)



		Duramin-650
<b>Read method</b>		Automated
<b>Overview camera resolution</b>	Duramin-650 AC	5 Mpix
<b>Overview camera field of view</b>		variable 40x30 mm - 210x160 mm (1.6"x1.2" - 8.3"x6.3")
<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>	Max no. of indenters	3
<b>Max No. of Objectives</b>	Max no. of objectives	3
<b>Indenter Shaft</b>	Diameter	6.35 mm
<b>Standard objectives included</b>		0.7x, 2.5x, 5x, 10x, 20x
<b>Z-Axis</b>		Motorized
<b>Anti-colission protection</b>		Yes
<b>XY Stage / Anvil</b>	Duramin-650 M	Anvil
	Duramin-650 AC	Motorized
<b>Stage Size</b>	Duramin-650 M	Ø80 mm (Ø3.1")
	Duramin-650 AC	337x238 mm / 410x280 mm (13.3"x9.4" / 16.1"x11")
<b>Stage Stroke (travel range)</b>	Duramin-650 AC	250x150 mm (9.8"x5.9")
<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" portrait mode capacitive touch screen
	Dual view	Optional
	Possibility to connect Printer	No
	Ethernet Connection	Yes
	Data Export	4x USB, Ethernet LAN, Wi-Fi, RS232, Bluetooth, Dual HDMI



<b>Duramin-650</b>		
<b>System</b>	Data output	XML, CSV, Q-DAS certified (optional)
<b>Software modules</b>		Total test, max., min., average, range, standard deviation, all in real time after each test
<b>Sample height</b>		300 mm (11.8")
<b>Throat depth</b>		220 mm (8.7")
<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>

# Declaration of Conformity

Manufacturer	Struers ApS • Pederstrupvej 84 • DK-2750 Ballerup • Denmark
Name	Duramin-650
Model	M1, M2, M3, AC1, AC2 or AC3
Function	Hardness tester
Type	663
Cat. no.	06636101, 06636102, 06636103, 06636111, 06636112, 06636113, 06636203, 06636213
Serial no.	



Module H, according to global approach



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]



Pederstrupvej 84  
DK-2750 Ballerup  
Denmark