

Duramin-40

Instruction Manual

Original Instructions



CE

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Table of Contents

1	About this manual	6
2	Safety	6
2.1	Intended use	6
2.1.1	Duramin-40 safety precautions	7
2.2	Safety messages	8
2.3	Safety messages in this manual	8
3	Getting started	9
3.1	Device description	9
3.2	Overview	10
4	Transport and storage	11
4.1	Transport	11
4.2	Long-term storage or shipping	12
5	Installation	12
5.1	Unpacking	12
5.2	Checking the packing list	13
5.3	Lifting	14
5.4	Location	16
5.5	Placing the machine	17
5.5.1	Removing the transport safety plate	17
5.6	The monitor (option)	18
5.6.1	Contents of the monitor box	18
5.6.2	If you have a two-monitor setup (option)	18
5.7	Mounting an XY-stage	18
5.8	Power supply	20
5.8.1	Connection to the machine	20
5.9	Noise	21
5.10	Vibration	21
6	Operating the device	21
6.1	Main screen	22
6.2	Front panel controls	23
6.3	Starting up Duramin-40	23
6.4	Mounting an indenter	24
6.5	Performing a basic test	25

7	Maintenance and service - Duramin-40	26
7.1	General cleaning	26
7.1.1	Daily	26
7.2	Weekly	27
7.2.1	Cleaning the monitor	27
7.2.2	Weekly inspection	27
7.3	Annually	27
7.3.1	Maintenance	27
7.3.2	Testing safety devices	27
7.3.3	Emergency stop	28
7.3.4	Calibration	28
7.4	Service and repair	28
7.4.1	Spare parts	29
7.4.2	Replacing the fuse	29
7.5	Disposal	29
8	Troubleshooting - Duramin-40	30
8.1	Troubleshooting - Duramin-40	30
9	Technical data	32
9.1	Technical data - Duramin-40	32
9.2	Specifications	33
9.2.1	Test force	33
9.2.2	Turret	33
9.2.3	System	34
9.3	Safety Related Parts of the Control System (SRP/CS)	34
9.4	Noise and vibration levels	34
9.5	Diagrams	35
9.5.1	Diagrams - Duramin-40	35
9.6	Legal and regulatory information	37
10	Drilling guide	37
10.1	Duramin-40 - Drilling guide	37
11	Pre-installation checklist	39
11.0.1	Installation requirements	40
11.0.2	Packaging specifications	40
11.0.3	Location	40
11.0.4	Dimensions	42
11.0.5	Recommended space	43
11.0.6	Transport and storage	44
11.0.7	Unpacking	45
11.0.8	Lifting	46

11.0.9 Power supply	48
11.0.10 Connection to the machine	48
11.0.11 Safety specifications	49
11.0.12 Duramin-40 - Drilling guide	49
12 Manufacturer	51
Declaration of Conformity	52

1 About this manual

Instruction Manuals

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.



Note

Read the instruction manual carefully before use.



Note

If you wish to view specific information in detail, see the online version of this manual.

2 Safety

2.1 Intended use

The intended use is the hardness testing of products. The machine is to be used in an industrial or laboratory setting. The machine is intended to be used by adult qualified personnel. The machine may only be operated as described in this manual. The manufacturer is not liable for the damage caused by incompetent use (unintentional use). Only use the machine when it is technically in good working order and use it according to the intended use, paying attention to the safety and potential hazards referred to in this manual.

Manufacturer responsibilities expire when:

- Not or insufficiently complying with the information in this manual.
- Using spare parts or parts not approved by the manufacturer.
- The machine is operated incorrectly.
- Removing, manipulating or not using safety features.
- Changing functions of the machine.
- Unauthorized modifications to the machine are applied.
- Maintenance is not carried out according to instructions.
- The machine is used unintentionally.

Model

Duramin-40M1, M2, M3

Duramin-40A1, A2, A3

Duramin-40AC1, AC2, AC3

2.1.1 Duramin-40 safety precautions



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 must read the safety precautions and Instruction Manual, as well as relevant sections of the manuals for any connected equipment and accessories.
3. The machine must be installed in compliance with local safety regulations. All functions on the machine and any connected equipment must be in working order.
4. The machine must be placed on a safe and stable table with an adequate working height. Failure to do so can affect how the machine works and cause the equipment to drop from the table and/or cause accidents and injuries.
5. All safety functions must be intact and in working order. If they are not, they must be replaced or repaired before the machine can be used.
6. Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine. Failure to do so can result in the machine catching fire.
7. Do not twist or damage the power cables. Damaged power cables can cause fire and/or electric shock.
8. Never block the ventilation. The machine can overheat and it can cause fire.
9. Never try to modify this equipment, as doing so can result in fire and/or electric shock.
10. Never try to disassemble this equipment. Doing so can result in electric shock.
11. Never open any panel on the machine while it is turned on. Doing so can result in electric shock.
12. Do not allow the machine to come into contact with any liquid. The equipment can catch fire if water or any liquid gets inside it. If water or any other liquid gets inside the machine, turn off the power, disconnect the power supply and call technical service.
13. Do not connect or disconnect power with wet hands. Doing so can result in electric shock.
14. If you observe malfunctions or hear unusual noises, stop the machine and call technical service.
15. If two persons work together, make sure they communicate clearly to avoid injuries.
16. Disconnect the machine from the power supply before cleaning it. Failure to do so can result in electric shock.
17. Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.
18. If the equipment is subjected to misuse, incorrect installation, alteration, neglect, accident or incorrect repair, Struers will accept no responsibility for damage to the user or the equipment.
19. Dismantling of any part of the equipment, during service or repair, should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).

2.2 Safety messages

Signs used in safety messages

Struers uses the following signs to indicate potential hazards.



ELECTRICAL HAZARD

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



DANGER

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



WARNING

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



CAUTION

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



CRUSHING HAZARD

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

General messages



Note

This sign indicates that there is a risk of damage to property, or a need to proceed with special care.



Hint

This sign indicates that additional information and hints are available.

2.3 Safety messages in this manual



WARNING

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.



CRUSHING HAZARD

Take care of your fingers when handling the machine.
Wear safety shoes when handling heavy machinery.

**WARNING**

Switch off the machine, disconnect the electrical power cable and wait 5 minutes before you dismantle the machine or install additional components.

**ELECTRICAL HAZARD**

Switch off the electrical power supply before installing electrical equipment. The machine must be earthed (grounded). Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine. Incorrect voltage can damage the electrical circuit.

**CAUTION**

Prolonged exposure to loud noises may cause permanent damage to a person's hearing. Use hearing protection if the exposure to noise exceeds the levels set by local regulations.

**WARNING**

Do not use the machine with defective safety devices. Contact Struers Service.

**WARNING**

Before you release the emergency stop, investigate the reason for activating the emergency stop and take any necessary corrective action.

**WARNING**

Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.

3 Getting started

3.1 Device description

Duramin-40 offers a technology base for manual, semi-automatic or fully automated testing of Micro and Macro Vickers, Knoop or Brinell assignments.

The specimen is placed on the anvil/XY-stage, and the desired testing pattern is set up using the testing software.

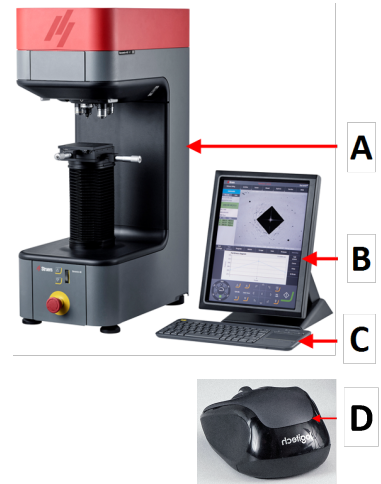
When the test is started, the indenter will move down and indent the specimen with the selected force.

Following the indentation, the result is obtained by an optical measurement of the indent.

The results can be stored or exported using several formats.

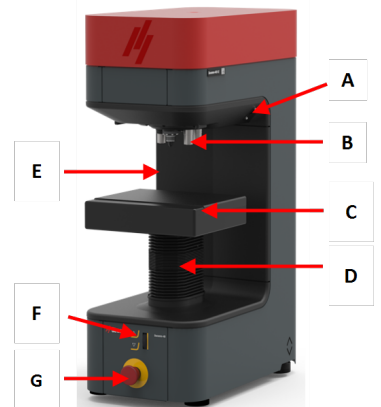
3.2 Overview

- A Hardness tester
- B Monitor
- C Wireless keyboard (option)
- D Mouse (option)



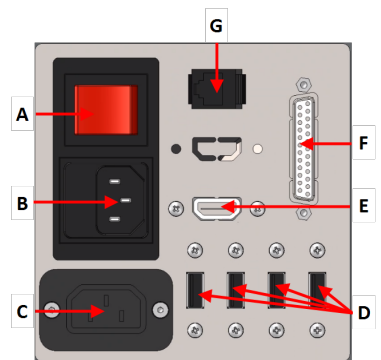
Front view

- A USB port
- B Turret
- C XY-stage
- D Spindle cover
- E Connection for motorized XY-stage
- F Z-axis and focus control
- G Emergency stop



Rear view

- A Power indicator
- B Power cable adapter
- C Power cable adapter, Monitor
- D USB ports
- E HDMI connector
- F Connector, Monitor
- G Internet connector



WiFi adapter

For wireless communication with the machine.

**USB drive**

The USB drive contains calibration documents.

**Type plate**

The type plate states information about the following:

- Model
- Serial number
- Weight
- Date of manufacture
- Power supply specifications

4 Transport and storage

If, at any time after the installation, you have to move the unit or place it in storage, there is a number of guidelines we recommend that you follow.

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

4.1 Transport

- Disconnect the unit from the electrical power supply.
- Disconnect the cable and mount the transport bracket.
- Position a foam block between the indenter and the anvil or XY-stage to prevent them from moving.
- Mount the lifting bar. See also: [Unpacking ► 45](#)
- Place the lifting straps securely around the lifting bar. The straps must be approved for at least twice the weight of the machine.
- Move the machine to the workbench.

4.2 Long-term storage or shipping



Note

Struers recommends that all original packaging and fittings are kept for future use.

- Clean the machine and all accessories thoroughly.
- Disconnect the unit from the electrical power supply.
- Place the machine on the pallet.
- Mount the sides of the crate.
- Place the accessories box, and other loose items in the crate. To keep the machine dry, place a desiccant (silica gel) in the box, too.
- Mount the lid of the transport box.

At the new location

At the new location, make sure that the facilities required are in place. See also: [Location ▶ 40](#).

5 Installation



WARNING

Struers equipment must only be used in connection with and as described in the instruction manual supplied with the equipment.

5.1 Unpacking



Note

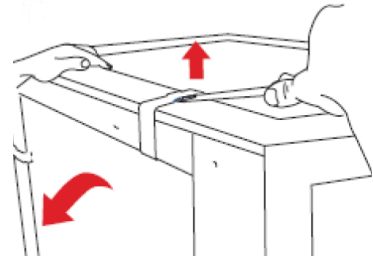
Struers recommends that all original packaging and fittings are kept for future use.



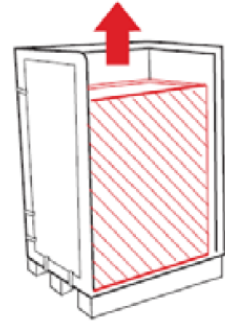
Note

- Be careful when you handle the machine.
- Do not drop or damage the machine.
- Do not tilt the packing box more than 30 degrees.
- Be careful not to damage the turret.

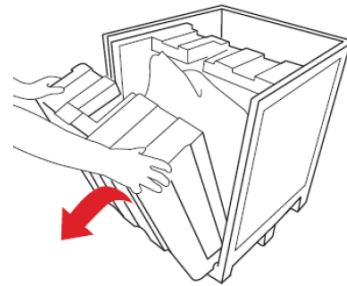
1. Remove the top of the packing box.



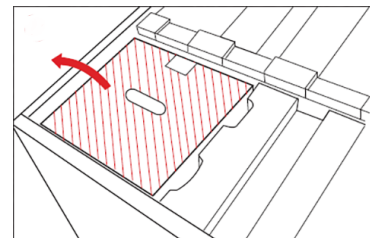
2. Remove one side of the packing box.



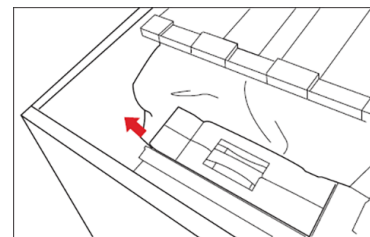
3. Remove the foam pieces that protect the machine.



4. Take out the box containing the monitor.



5. Take out the accessories box and all other small components.



5.2 Checking the packing list

Some components or parts can be packaged separately and may not be included in the accessories case or may be installed on the machine.

Optional accessories may be included in the packing box.

The packing box contains the following items:

Pcs.	Description
1	Duramin-40
1	Accessories case
1	Monitor, 15", (option)
1	Instruction Manual set

Accessories case

Pcs.	Description
	Indenters
	Objective lens
1	Allen key 0.9 mm
1	Z-spindle limiter bracket
1	Mouse, (option)
2	Power supply cables
1	Spare fuse
1	Calibration certificate (on memory stick)
1	WiFi adapter
1	Cable for motorized XY-stage (option)
1	Bluetooth dongle (option)

5.3 Lifting



CRUSHING HAZARD

Take care of your fingers when handling the machine.
Wear safety shoes when handling heavy machinery.

Weight	
Duramin-40M1/M2/M3	100 kg (223 lbs)
Duramin-40A1/A2/A3	112 kg (247 lbs)
Duramin-40AC1/AC2/AC3	112 kg (247 lbs)

With a crane



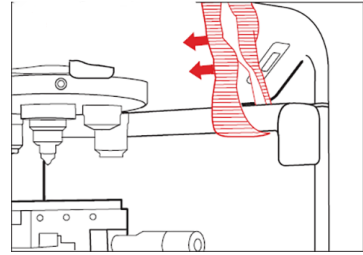
Note

The lifting straps must be approved to lift at least twice the weight of the machine.

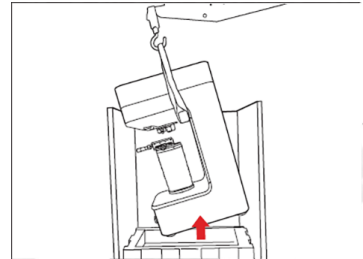
Use a crane and lifting straps to lift the machine from the packing box.

Make sure that the crane has a free pathway from the lifting point to the workbench.

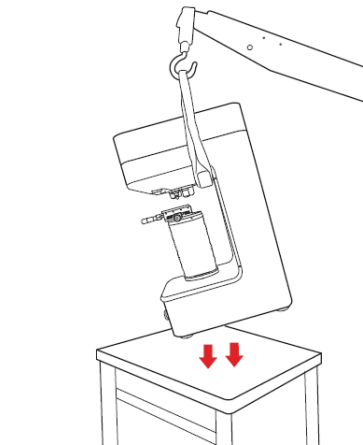
1. Place the lifting straps securely around the lifting bar.



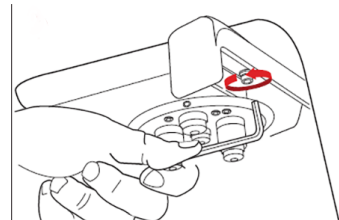
2. Lift the machine out of the packing box.



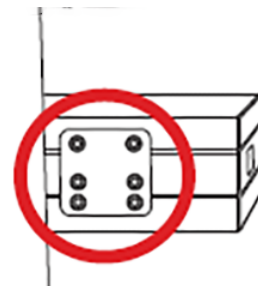
3. Lift the machine onto the table.



4. Support the lifting bar and remove the screws and washers from both sides of the bar using a 5 mm Allen key.



5. Remove the transport protection of the XY-stage.

**Note**

Struers recommends that all original packaging and fittings are kept for future use.

5.4 Location

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

Supply requirements

The machine must be placed close to the power supply.

Supply type	Required	Not required
Power supply	Required	
Water supply		Not required
Waste water outlet		Not required
Compressed air		Not required
Exhaust		Not required

Ambient conditions		
Operating environment	Surrounding temperature	10-35°C (50-95°F)
	Humidity	10-90 % RH non-condensing



Note

Make sure that no condensation forms on the test unit.

Workbench

- Place the machine on a stable and level surface, which can support the weight of the machine.
- Place the machine on a rigid, stable workbench with a horizontal surface and an adequate height.

Minimum recommended table dimensions			
Height	85 cm (33.5")		
Width	75 cm (20")		
Depth	60 cm (24")		
1: Ø for spindle hole	110 mm (4.5")		
2: Spindle protrusion	140 mm (5.5")		



Note

If you wish to use the maximum spindle capacity, you must drill a hole in the table top to accommodate the full stroke of the spindle.

See also: [Duramin-40 - Drilling guide](#) ▶ 49

Vibration

Vibrations can lead to inaccurate measurements and must therefore be avoided.

- Install the machine in a vibration-free location.

Sources of vibration can include:

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

5.5 Placing the machine

Leveling the machine

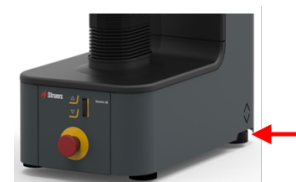
Level the machine after placing it on the workbench.

- Make sure that the XY-stage/anvil is level.



A XY-stage

- If the XY-stage is not level, turn the adjustment foot in the rear right corner to level the XY-stage.



5.5.1 Removing the transport safety plate



Note

Only for motorized XY-stage option.

Remove the transport safety plate before you switch on the machine.



CAUTION

The XY-stage will be damaged if the transport safety plate is not removed before you switch on the machine.

1. Unscrew the six screws securing the transport safety plate on the rear of the XY-stage. Use an 2.5 mm (0.1") Allen key.
2. Struers recommends that all original packaging and fittings are kept for future use.



When you switch on the machine, the XY-stage will automatically move to perform a reference search.

5.6 The monitor (option)

5.6.1 Contents of the monitor box

- | | |
|---|--------------|
| 1 | Monitor |
| 1 | HDMI cable |
| 1 | USB cable |
| 1 | Power cables |

5.6.2 If you have a two-monitor setup (option)

1. Both the monitors and the ports at the back of the machine are labeled **Screen L** and **Screen R**.
2. Connect the correct USB and HDMI cables to the corresponding **Screen L** and **Screen R** ports.
3. Connect the power supply cable of the second monitor to the electrical power supply.

5.7 Mounting an XY-stage



WARNING

If two persons work together, make sure they communicate clearly to avoid injuries.



CRUSHING HAZARD

Do not hold on to the XY-stage or the anvil while you are using the machine.

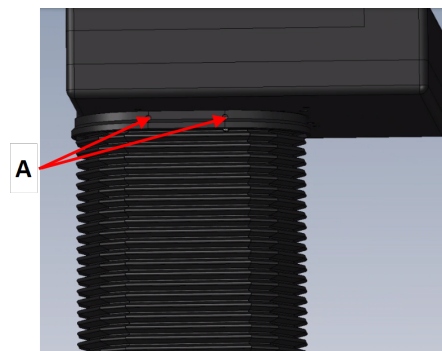


CAUTION

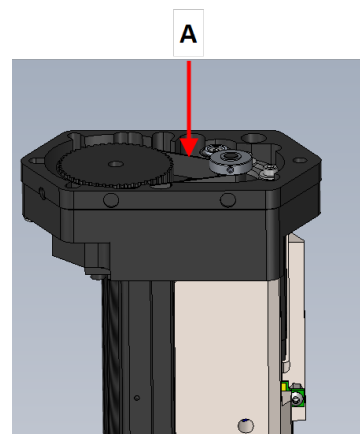
Always switch off the machine if you need to install or remove an XY-stage, otherwise the machine can be damaged.

1. Move the Z-spindle to the lowest position.
2. Switch off the machine.

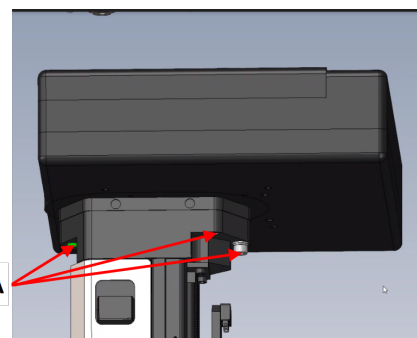
- Remove the set screws [A] keeping the protecting bellow in place.



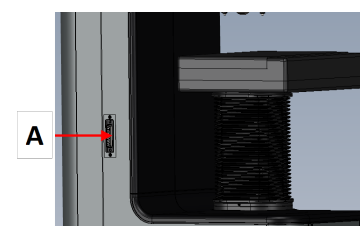
- Carefully place the stage onto the top of the spindle [A].



- Mount the stage using the four fixation screws [A] (the 4th screw is placed on the left side and not visible in this illustration).



- Connect the cable to the motorized XY-stage and to the connection on the left side of the machine.



A Connection for motorized XY-stage.

Make sure that the Duramin software is configured correctly when a motorized XY-stage is mounted or removed. In the Duramin software, select **System > Settings**, and make sure that the option **XY-stage** is checked.



Note

The range of force that can be applied is limited when using a XY-stage. Excessive overload can result in irreparable damage to the machine.

5.8 Power supply



ELECTRICAL HAZARD

Switch off the electrical power supply before installing electrical equipment.
 The machine must be earthed (grounded).
 Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine.
 Incorrect voltage can damage the electrical circuit.



Note

The equipment is shipped with 2 types of electrical power cables. If the plug supplied on these cables is not approved in your country, the plug must be replaced with an approved plug. If necessary, use a C14 IEC320 plug.

Power socket

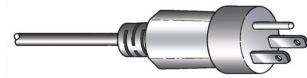
The electrical power supply socket must be easy to access.

Single-phase supply

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



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



Electrical data	
Power supply	100-240 V, 50/60 Hz
Power, nominal load	82 W
Power, idle	67 W
Current, nominal load	0.35 A
Current, maximum load	0.5 A
Residual Current Circuit Breaker (RCCB)	Type A, 30 mA (or better) is recommended

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

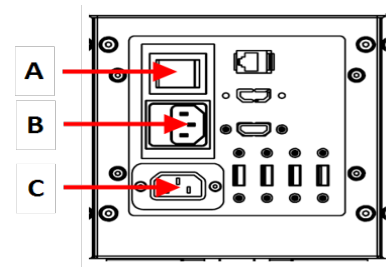
5.8.1 Connection to the machine

- Connect the electrical power cable to the machine (C14 IEC 320 connector).
- Connect the cable to the electrical power supply.



Electrical power connection

- A** Electrical power switch
- B** Electrical power socket/ Fuse compartment
- C** Electrical power connection, Monitor

**5.9 Noise**

For information on the sound pressure level value, see this section: [Technical data](#) ► 32

**CAUTION**

Prolonged exposure to loud noises may cause permanent damage to a person's hearing.

Use hearing protection if the exposure to noise exceeds the levels set by local regulations.

5.10 Vibration

For information on the total vibration exposure to hand and arm, see this section: [Technical data](#) ► 32.

6 Operating the device**WARNING**

If two persons work together, make sure they communicate clearly to avoid injuries.

**CRUSHING HAZARD**

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

**CRUSHING HAZARD**

Do not hold on to the XY-stage or the anvil while you are using the machine.

Electrical power switch

The electrical power switch is located on the rear of the machine.

Emergency stop



The emergency stop is located on the front of the machine.

- To activate the emergency stop, press the red emergency stop button.
- To release the emergency stop, turn the red emergency stop button clockwise.

Note

Do not use the emergency stop for operational stop of the machine during normal operation.

Before you release the emergency stop, investigate the reason for activating the emergency stop and take any necessary corrective action.

The machine is operated through the Duramin software. Consult the software manual for a detailed description of the software functions.

6.1 Main screen

A Main menu

B Test results

C Camera view

D Test settings

E Graphs/diagrams

F Dashboard

Main menu

Use the main menu to select the test method, load and scale required. The Main menu is also used for loading archives and adjusting system and optical settings.

Test result

The Test result window shows a list of the obtained results.

Camera view: shows live images from either objective camera or the overview camera. When you click a result, the image used for measurement will be shown.

Test settings

The Test Settings menu is used to select test settings, such as dwell time, patterns, etc.

Graphs/diagrams

The Graphs/diagrams window shows a graph of the results obtained.

6.2 Front panel controls

- A Spindle up/down keys
- B Emergency stop
- C Scroll wheel for fine focus

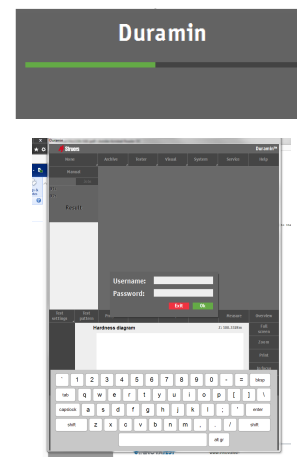


6.3 Starting up Duramin-40

1. Switch on the hardness tester using the electrical power switch at the rear. The software will initialize and you will see the progress bar on the monitor.

The following screen will appear on the monitor.

2. Enter the User name and Password. The first time you use the machine, the default will be:
User name: Admin (not case sensitive)
Password: none
3. Select **OK**.
4. A dialog stating that the machine is going to initialize will appear.
5. Select **OK** to start the initialization. The XY-stage and turret start moving.



Hint

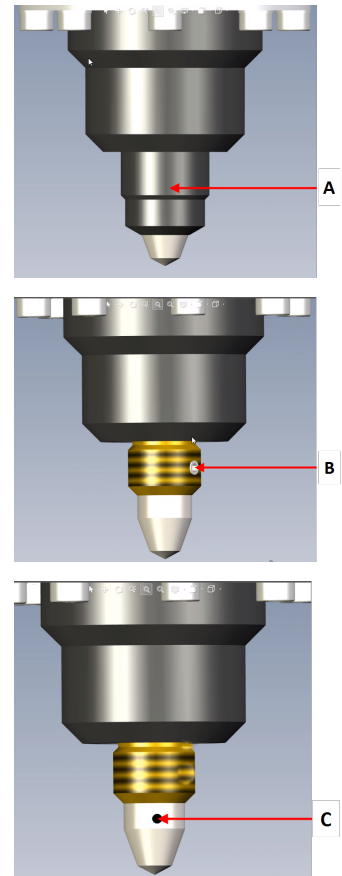
If you need to add more users, consult the Software manual.

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

- Select **OK** in the Emergency stop dialog box to exit the software.
- Restart the software. Go to the **Windows Start** menu and click the Duramin icon.

6.4 Mounting an indenter

1. Lower the XY-stage.
2. Unscrew the indenter cap [A] counter-clockwise.
3. Loosen the socket set screw [B].
4. Insert the new indenter in the indenter shaft. Make sure that you keep the black dot [C] facing towards you.
5. Tighten the socket set screw using a 0.9 mm Allen key. Make sure that you do not use excessive force



Note

Make sure that the indenter is intact before you mount it on the hardness tester. A damaged indenter can give invalid results.

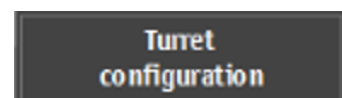


Note

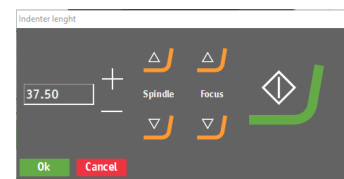
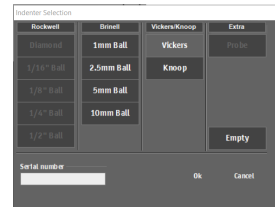
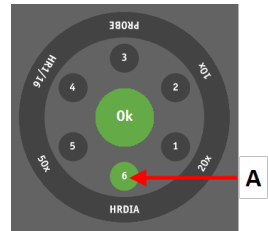
Always keep indenters in their case when you are not using them, otherwise they can be damaged.

Checking the indenter length

1. Start the Duramin software.
2. Focus on a smooth test sample using the highest magnification available.
3. Select **Tester > Turret configuration**.



4. In the **Turret animation** screen, select the desired indenter position, for instance, [A].
5. Select the new indenter type in the Indenter Selection menu.
6. Select **OK**
7. Select **Start** and wait until the procedure is finished.
8. In the Turret animation screen, select **OK**].



6.5 Performing a basic test

The following description only covers a basic test. If you need more advanced test options, consult the software manual.

1. Check that the specimen surface is smooth and even.
2. Check that the specimen surface is free from oxide scale, foreign matter and completely free from lubricants.
3. Set up the tester with the required type of test, load, scale and required indenter.
4. Place the specimen on the anvil or XY-stage.
5. Select an objective.
6. Move the spindle until the specimen surface is in focus.
7. Press the **In focus** button.

Starting the test



CRUSHING HAZARD

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

1. Press **Start** to start the test. The testing procedure will continue automatically.
2. Press **Stop** if you want to stop the test.



After the indent is made, the software automatically measures the indent and displays the result.

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

7 Maintenance and service - Duramin-40

Proper maintenance is required to achieve the maximum up-time and operating lifetime of the machine. Maintenance is important in ensuring continued safe operation of your machine.

The maintenance procedures described in this section must be carried out by skilled or trained personnel.

Safety Related Parts of the Control System (SRP/CS)

For specific safety related parts, see the section "Safety Related Parts of the Control System (SRP/CS)" in the section "Technical data" in this manual.

Technical questions and spare parts

If you have technical questions or when you order spare parts, state serial number and voltage/frequency. The serial number and the voltage are stated on the type plate of the machine.

You can also find this information in the Duramin software by selecting **Tester > Info**.

7.1 General cleaning

To ensure a longer lifetime for your machine, Struers strongly recommends regular cleaning.



Note

Do not use a dry cloth as the surfaces are not scratch resistant.



Note

Do not use acetone, benzol or similar solvents.

- Clean the XY-stage and anvil with a damp cloth after use.

If the machine is not to be used for a longer period of time

- Clean the machine and all accessories thoroughly.

7.1.1 Daily

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



Note

Grease and oil can be removed with ethanol or isopropanol.
Do not use acetone, benzol or similar solvents.

7.2 Weekly

- Clean the front panel, the anvil and the XY-stage with a soft damp cloth and common household detergents.

7.2.1 Cleaning the monitor

The touch screen

Wipe the screen using a soft, clean cloth moistened with window cleaner.

The cabinet

1. Wipe the cabinet using a soft, clean cloth moistened with a mild detergent.
2. Use a dry cloth to remove excess moisture.

7.2.2 Weekly inspection

Inspect the following parts weekly.

Part	Attention	Action	Precaution
Indenter	Tip is dirty	Wipe indenter	Handle the indenter with care
Objective or Lens	Lens surface is dirty	Wipe lens. Use special lens cleaning paper	Do not scratch the objective or lens
Anvil/XY-stage	Rust	Remove rust	
Test block	Rust	Replace test block	Do not use rusted test blocks

7.3 Annually

7.3.1 Maintenance

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

1. Carefully lift the spindle cover.
2. Wipe the spindle THOROUGHLY after lubrication so that as little as possible oil is left on the spindle.
3. Wipe the spindle again after a few days to make sure that no oil residue is left on the spindle surface.

7.3.2 Testing safety devices

The safety devices must be tested at least once a year.



WARNING

Do not use the machine with defective safety devices.
Contact Struers Service.



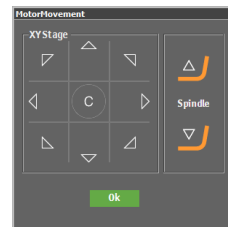
Note

Testing should always be performed by a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).

7.3.3 Emergency stop

Make sure that the emergency stop is functioning correctly:

1. Start the machine.
2. Press the emergency stop. The machine should stop and the following message should appear. If this is not the case, contact Struers Service.
3. Release the emergency stop and select OK in the **Motor movement** screen. This will shut down the software.



7.3.4 Calibration

Duramin-40 has a highly sensitive and accurate load cell and optical system which are calibrated before the machine is shipped.

Calibration of both the applicable force and the objectives of the hardness tester require specific equipment and must therefore only be performed by Struers. Contact Struers Service if you need to have the load cell or objectives recalibrated.

7.4 Service and repair

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



Note

Service must only be performed by a Struers engineer or a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).
Contact Struers Service.

Service check

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.

7.4.1 Spare parts

Technical questions and spare parts

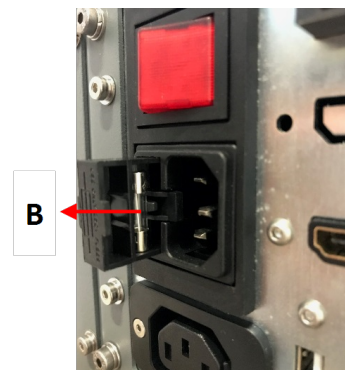
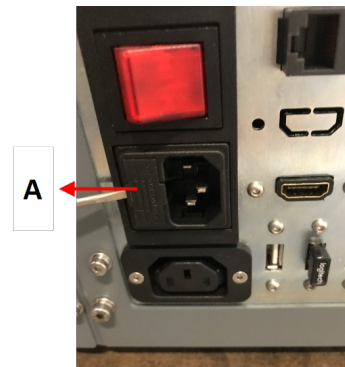
If you have technical questions or when you order spare parts, state serial number and voltage/frequency. The serial number and the voltage are stated on the type plate of the machine.

For further information, or to check the availability of spare parts, contact Struers Service. Contact information is available on Struers.com.

7.4.2 Replacing the fuse

The fuse holder is located directly under the power connection on the rear.

1. Turn off the machine.
2. Disconnect the power cable.
3. Pull out the fuse holder **[A]** using a flat-head screwdriver.
4. Take out the blown fuse **[B]** and replace it with a new one. You can find spare fuses in the accessories case.
5. Re-install the fuse holder cover.
6. Re-connect the electric power cable.



7.5 Disposal



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

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

For disposal of consumables and recirculation fluid, follow local regulations.

8 Troubleshooting - Duramin-40

8.1 Troubleshooting - Duramin-40


No.	Issue	Action
#1	Overview camera is lagging/freezing	Go to Visuals -> Contrast while the Overview camera is active. Select Default . If the settings for active image correction have been set to High , the camera cannot process the live video feed.
#2	Objective image flickers	Go to Visuals > Contrast , and deselect Automatic . If the error remains, contact Struers Service.
#3	Most/all buttons are grayed out when starting up the software	The machine settings file is most likely corrupted due to an improper shutdown. Contact Struers Service.
#4	The message Force too high is shown when I try to make an indent	Make an indenter length calibration. See also Mounting an indenter ▶ 24
#5	Object detected error when performing an indent	Make sure the sample is in focus before starting a measurement. If the error remains, calibrate the indenter length. See also Mounting an indenter ▶ 24
#6	A message COM port x does not exist is shown	A device connected to the tester has been moved to another USB port. Move the connected device back to its original port. Restart the software.
#7	A method is missing in the software. I.e. Vickers, Knoop, Brinell, KIC, HVT cannot be selected in the scale selection dialog	Make sure that the indenter for the scale you are looking for is installed on the turret. If you want to see the scale without the indenter installed, go to System -> Settings and make sure that the setting Scales only with indenter is unchecked. If this does not fix the issue the method has not been enabled for you tester. Contact Struers Service.
#8	The motorized XY-stage stalls during reference search or movements during normal operation	Make sure that there is nothing physically preventing the stage from moving (transport safety bracket, dirt, etc.)

No.	Issue	Action
#9	Timeout message shown: Trinamic timeout Timeout Depthmeter Readout LCA Timeout	Restart the software to reset the USB bus. The problem could be caused by the removal of a USB device. Use a different USB port for the USB drive or use a different USB drive.
#10	Comet tails or indenter scratches visible	<ol style="list-style-type: none"> 1. Make sure that the specimen surface is plane. 2. Clean the indenter. 3. Rotate the indenter 180 degrees to see if the tail follows the indenter orientation. If the error remains, contact Struers Service.
#11	There is oil residue on the stage/sample	Clean the sample and the stage. If the error remains, contact Struers Service.
#12	Autofocus cannot find the right focus plane	If Autofocus settings uses a combination of a high search range and a high search speed, the steps of the autofocus search might be too large to find the actual focus plane. Try to lower both the search range and the search speed. Select Visual > Autofocus .
#13	Vickers or Knoop indents are not symmetrical	Make sure your specimen surface is plane. Make an indent on a testblock to verify the asymmetrical indent. If the error remains, contact Struers Service.
#14	The measurement cursor changes from a green crosshair to a red dot	This is a built-in function. Use the mouse scrollwheel click function to toggle between the crosshairs and the red dot.
#15	The user interface is shown in Landscape, not Portrait mode	Check that the monitor is connected according to the marking on the rear of the tester. Restart the machine. If the error remains, contact Struers Service.
#16	Touch function does no longer work on my screen	Check that the USB cable between the monitor and the hardness tester is connected correctly. Press and hold the Menu and the Enter buttons on the side of the monitor to enable/disable touch function.
#17	Failed to open connection to AUX or LCA	Restart the software. If the error remains, contact Struers Service.

No.	Issue	Action
#18	I do not get a image on my objective camera	Make sure the light level is not set to 0. Try to focus on a sample.If the error remains, contact Struers Service.
#19	When in Focus on a sample and switching to the indenter, the stage moves up and the sample touches the indenter	Perform an objective focus distance calibration

9 Technical data

9.1 Technical data - Duramin-40

Subject		Specifications
Electrical data	Power supply	100 V AC – 240 V AC, 50/60Hz, single phase
	Power consumption Max. load	90 W
	Idle	67 W
Residual Current Circuit Breaker (RCCB)	Type A, 30 mA is required depending on local regulations.	
Safety standards	See the Declaration of Conformity	
Dimensions	Width	27.4 cm/10.7"
	Depth	47.4 cm/18.6"
	Height	77.5 cm/30.5"
Weight	Duramin-40 M1/M2/M3	100 Kg/220.5 lbs
	Duramin-40 A1/A2/A3	112 Kg/247 lbs
	Duramin-40 AC1/AC2/AC3	112 Kg/247 lbs
Operating environment	Surrounding temperature	10-35 °C / 40-105 °F.Recommended: 21 ± 3 °C / 73.4 ± 5 °F
	Humidity	10%-90% % RH non-condensing
		<div style="border: 1px solid blue; padding: 5px; display: inline-block;">  <p>Note Do not let condensation form on the machine.</p> </div>

9.2 Specifications

Force ranges	
Duramin-40 M1/A1/AC1	10gf - 10 kgf
Duramin-40 M2/A2/AC2	10gf - 31.21kgf
Duramin-40 M3/A3/AC3	1gf - 62.5kgf

Hardness methods	
VICKERS	ISO 6507 ASTM E384, E92 JIS B 7725
KNOOP	ISO 4545 ASTM E92 JIS Z 2251
BRINELL	ISO 6506 ASTM E10 JIS Z 3243
CONVERSIONS	Conversions to other hardness methods according to ASTM E140, ISO 18265, GB/T 1172. .

9.2.1 Test force

Test force	
Force application	Load cell, closed loop, force feedback system.
Test force tolerance	<0.25% for test force 100 gf to 62.5 kgf. 0.5 % for test forces lower than 100gf.
Dwell time settings	Default 10 seconds, user defined. From 1 to 999 seconds.

9.2.2 Turret

Turret	
Motorized turret	6 position turret, 2 indenter positions, 4 objective positions.

9.2.3 System


System	
Data output	XML, CSV, Certified for Q-DAS (Optional)


9.3 Safety Related Parts of the Control System (SRP/CS)

Safety Circuit Categories/Performance Level

Safety Circuit Categories/Performance Level	Emergency stop	EN ISO 13849-1 PL c, Category 1 Stop category 0
----------------------------------------------------	----------------	----------------------------------------------------

 **WARNING**
Safety critical components must be replaced after a maximum lifetime of 20 years. Contact Struers Service.

 **Note**
SRP/CS (safety-related parts of a control system) are parts that have an influence on safe operation of the machine.

 **Note**
Replacement of safety critical components must only be performed by a Struers engineer or a qualified technician (electromechanical, electronic, mechanical, pneumatic, etc.).
Safety critical components must only be replaced by components with at least the same safety level.
Contact Struers Service.

Safety related part	Manufacturer/Manufacturer description	Manufacturer catalogue no.	Electrical ref.	Struers catalogue no.
Emergency stop button	Schneider Electric	ZB4BS844	S1	
Emergency stop contact	Schneider Electric	ZB2BE102	S1	16610016
Emergency stop relay	Schrack	SR4D4012	A10	16600042

9.4 Noise and vibration levels

Noise level	A-weighted sound emission pressure level at workstations	$L_{pA} = 54.5 \text{ dB(A)}$ (measured value) Uncertainty $K = 4 \text{ dB}$ Measurements made in accordance with EN ISO 11202
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Vibration level	During operation	Total vibration exposure to upper parts of the body does not exceed 2.5 m/s^2 .
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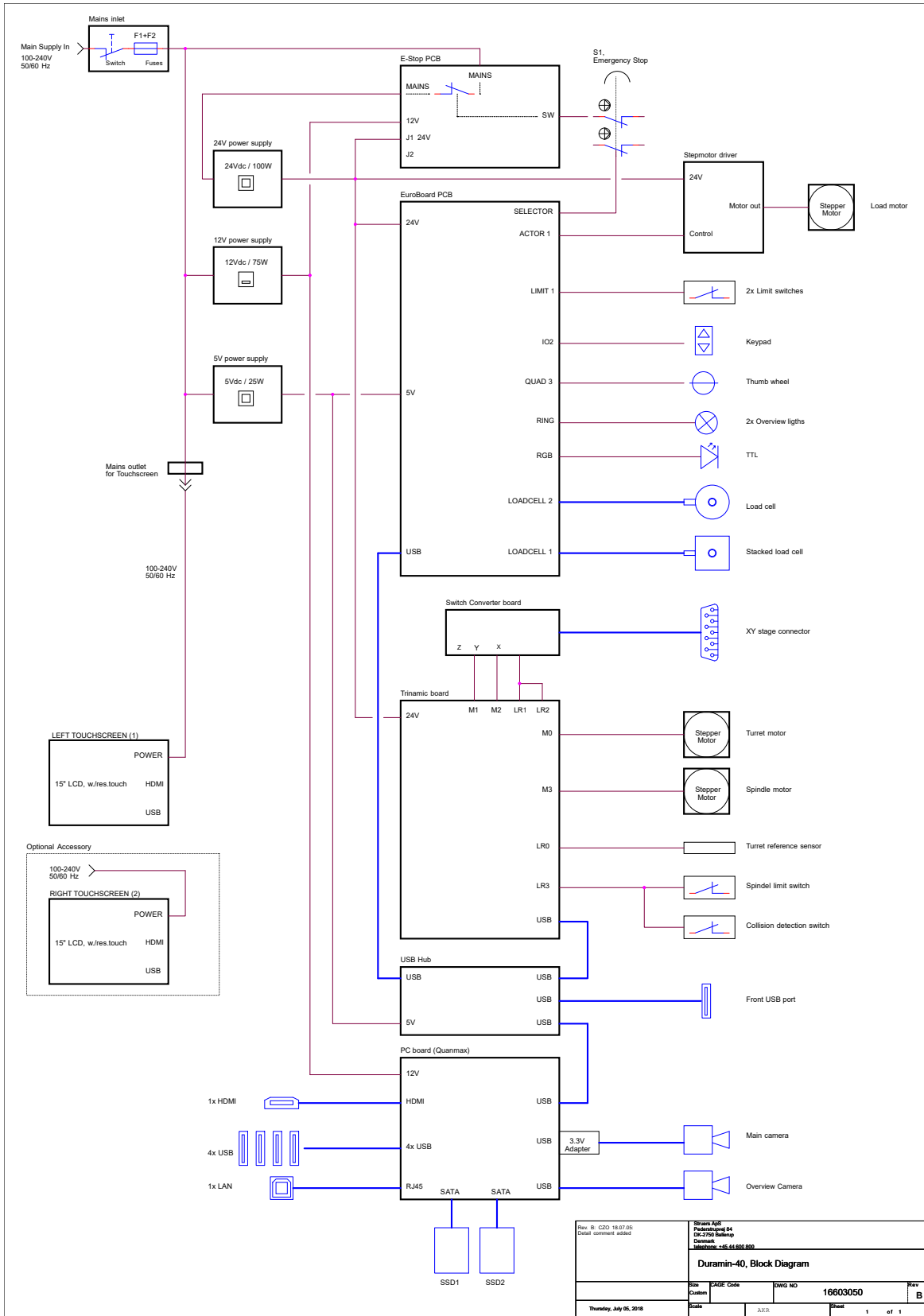
9.5 Diagrams

If you wish to view specific information in detail, see the online version of this manual.

9.5.1 Diagrams - Duramin-40

Title	No.
Duramin-40, Block diagram	16603050 B

16603050 B



9.6 Legal and regulatory information

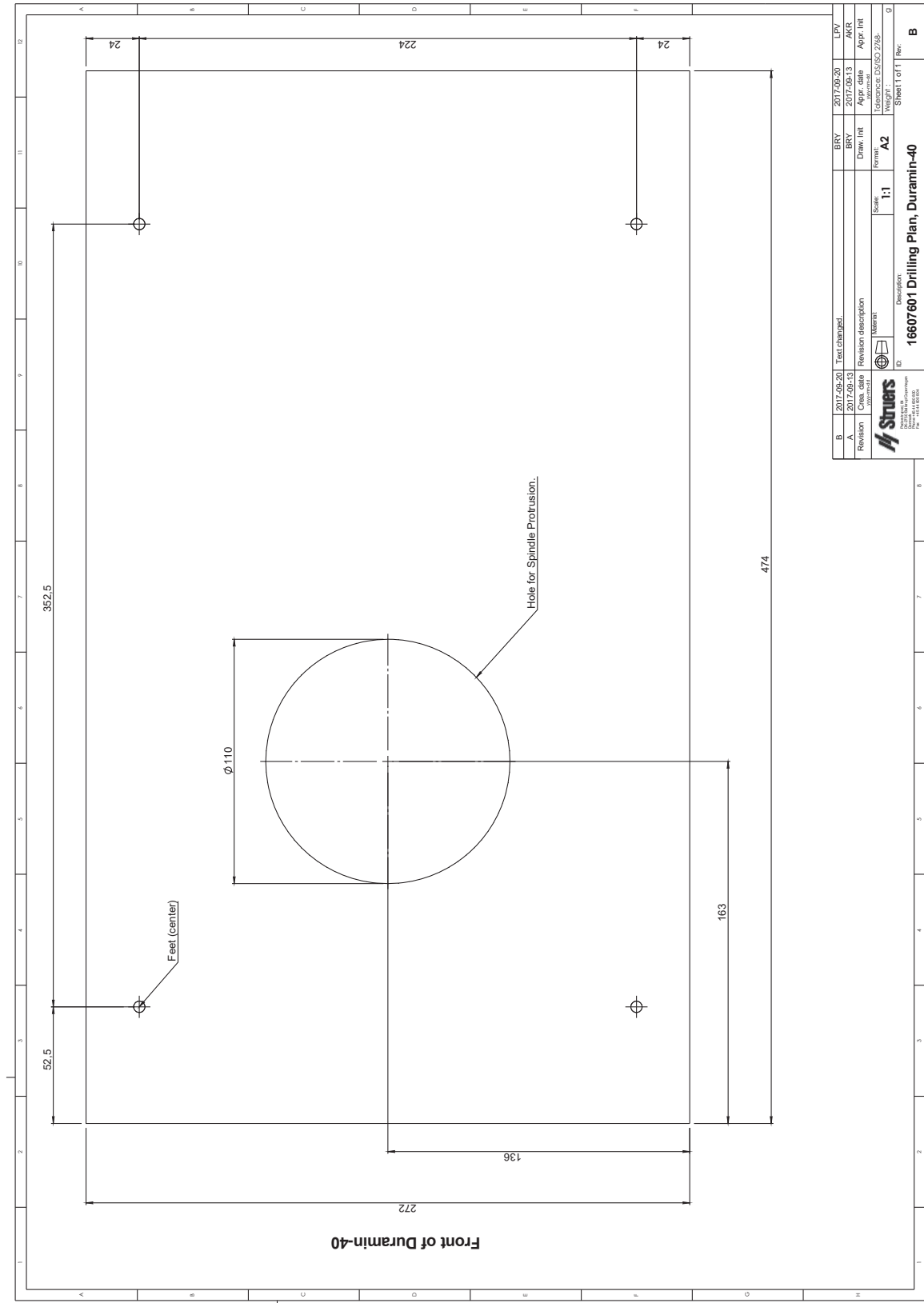
FCC notice


This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

10 Drilling guide

10.1 Duramin-40 - Drilling guide



B	2017-09-20	Text changed.	BRY	2017-09-20	LPV
A	2017-09-13	Revision description	BRY	2017-09-13	AKR
Revision	Created	Material	Drawn	Appr.	Appr. int.
			Form	Idemance	DS/60 7/96
			Scale	Weight	
			1:1	A2	Sheet 1 of 1
 16607601 Drilling Plan, Duramin-40					
16607601 Drilling Plan, Duramin-40 16607601 Drilling Plan, Duramin-40 16607601 Drilling Plan, Duramin-40					

11 Pre-installation checklist

11.0.1 Installation requirements

- Crane and lifting straps
- Allen key: 3 mm and 5 mm
- Workbench


Required accessories and consumables

(ordered separately)

- Test blocks
- Indenters

11.0.2 Packaging specifications

Dimensions and weight	
X:	85 cm/34"
Y:	80 cm/31.5"
Z:	106 cm/41.7"
Weight	182 kg/401.2 lbs



Note
The actual weight depends on the machine configuration and accessories selected.

11.0.3 Location

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

Supply requirements

The machine must be placed close to the power supply.

Supply type	Required	Not required
Power supply	Required	
Water supply		Not required
Waste water outlet		Not required
Compressed air		Not required
Exhaust		Not required

Ambient conditions		
Operating environment	Surrounding temperature	10-35°C (50-95°F)
	Humidity	10-90 % RH non-condensing

**Note**

Make sure that no condensation forms on the test unit.

Workbench

- Place the machine on a stable and level surface, which can support the weight of the machine.
- Place the machine on a rigid, stable workbench with a horizontal surface and an adequate height.

Minimum recommended table dimensions		
Height	85 cm (33.5")	
Width	75 cm (20")	
Depth	60 cm (24")	
1: Ø for spindle hole	110 mm (4.5")	
2: Spindle protrusion	140 mm (5.5")	

**Note**

If you wish to use the maximum spindle capacity, you must drill a hole in the table top to accommodate the full stroke of the spindle.

See also: [Duramin-40 - Drilling guide](#) ▶ 49

Vibration

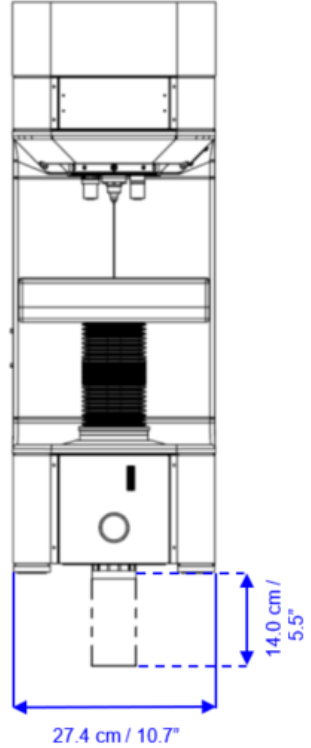
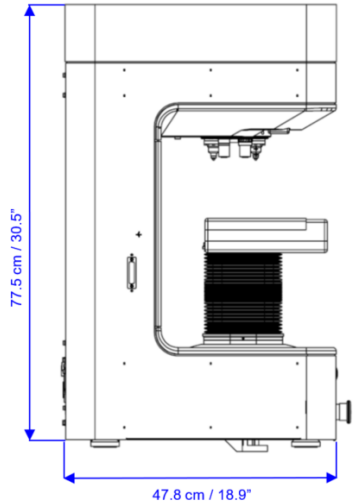
Vibrations can lead to inaccurate measurements and must therefore be avoided.

- Install the machine in a vibration-free location.

Sources of vibration can include:

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

11.0.4 Dimensions

Duramin-40	
Front view	 <p>27.4 cm / 10.7"</p> <p>14.0 cm / 5.5"</p>
Side view	 <p>77.5 cm / 30.5"</p> <p>47.8 cm / 18.9"</p>

Footprint - Duramin-40	
Seen from above	
Feet - Front view	
Feet - Side view	

11.0.5 Recommended space

Space in front of the machine

- Make sure that there is enough room in front of the machine.

100 cm/40"

Space at the rear of the machine

- The machine can be placed against a wall.
- Make sure that there is enough room to access the main switch, USB ports and power connections.
- Make sure that there is enough room at the rear for service access.
- Make sure that there is enough room behind the work bench for the cover to be opened completely.

Space at the sides of the machine

- Make sure that there is enough room for the monitor (2 monitors if you have chosen this option) and the keyboard.

Space under the machine

- To take advantage of the full spindle capacity, a hole must be drilled in the table top to accommodate the spindle. See also [Duramin-40 - Drilling guide ▶ 49](#)

11.0.6 Transport and storage

If, at any time after the installation, you have to move the unit or place it in storage, there is a number of guidelines we recommend that you follow.

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

Transport

- Disconnect the unit from the electrical power supply.
- Disconnect the cable and mount the transport bracket.
- Position a foam block between the indenter and the anvil or XY-stage to prevent them from moving.
- Mount the lifting bar. See also: [Unpacking ▶ 45](#)
- Place the lifting straps securely around the lifting bar. The straps must be approved for at least twice the weight of the machine.
- Move the machine to the workbench.

Long-term storage or shipping



Note

Struers recommends that all original packaging and fittings are kept for future use.

- Clean the machine and all accessories thoroughly.
- Disconnect the unit from the electrical power supply.
- Place the machine on the pallet.

- Mount the sides of the crate.
- Place the accessories box, and other loose items in the crate. To keep the machine dry, place a desiccant (silica gel) in the box, too.
- Mount the lid of the transport box.

At the new location

At the new location, make sure that the facilities required are in place. See also: [Location ► 40](#).

11.0.7 Unpacking



Note

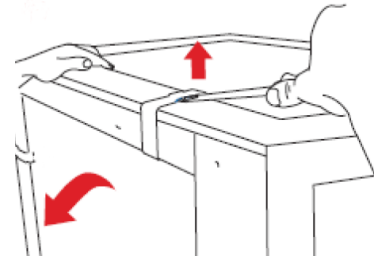
Struers recommends that all original packaging and fittings are kept for future use.



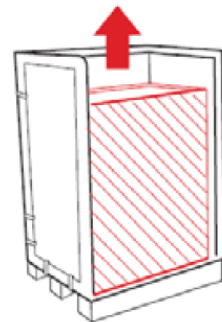
Note

- Be careful when you handle the machine.
- Do not drop or damage the machine.
- Do not tilt the packing box more than 30 degrees.
- Be careful not to damage the turret.

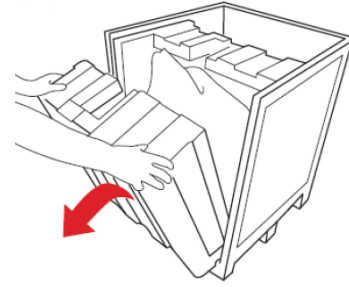
1. Remove the top of the packing box.



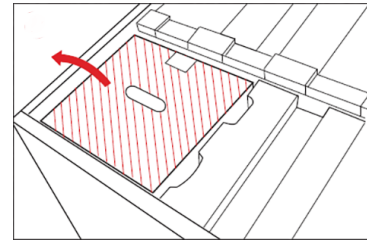
2. Remove one side of the packing box.



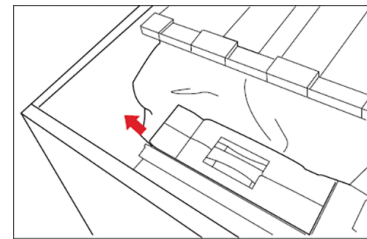
- Remove the foam pieces that protect the machine.



- Take out the box containing the monitor.



- Take out the accessories box and all other small components.



11.0.8 Lifting



CRUSHING HAZARD

Take care of your fingers when handling the machine.
Wear safety shoes when handling heavy machinery.

Weight	
Duramin-40M1/M2/M3	100 kg (223 lbs)
Duramin-40A1/A2/A3	112 kg (247 lbs)
Duramin-40AC1/AC2/AC3	112 kg (247 lbs)

With a crane



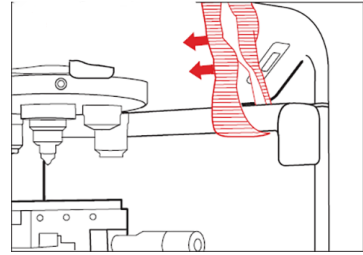
Note

The lifting straps must be approved to lift at least twice the weight of the machine.

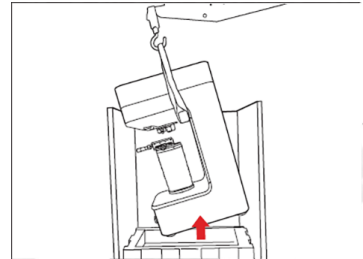
Use a crane and lifting straps to lift the machine from the packing box.

Make sure that the crane has a free pathway from the lifting point to the workbench.

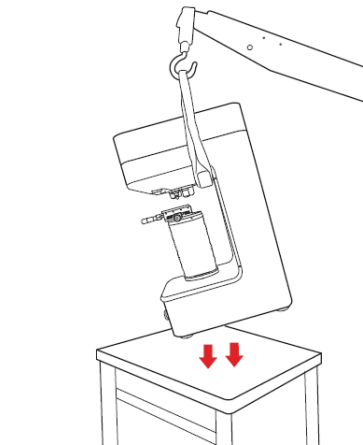
1. Place the lifting straps securely around the lifting bar.



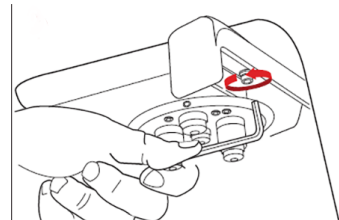
2. Lift the machine out of the packing box.



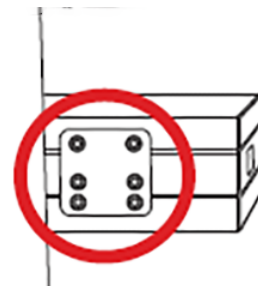
3. Lift the machine onto the table.



4. Support the lifting bar and remove the screws and washers from both sides of the bar using a 5 mm Allen key.



5. Remove the transport protection of the XY-stage.

**Note**

Struers recommends that all original packaging and fittings are kept for future use.

11.0.9 Power supply



ELECTRICAL HAZARD

Switch off the electrical power supply before installing electrical equipment. The machine must be earthed (grounded). Make sure that the actual electrical power supply voltage corresponds to the voltage stated on the type plate of the machine. Incorrect voltage can damage the electrical circuit.



Note

The equipment is shipped with 2 types of electrical power cables. If the plug supplied on these cables is not approved in your country, the plug must be replaced with an approved plug. If necessary, use a C14 IEC320 plug.

Power socket

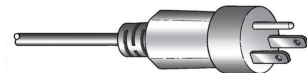
The electrical power supply socket must be easy to access.

Single-phase supply

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



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



Electrical data	
Power supply	100-240 V, 50/60 Hz
Power, nominal load	82 W
Power, idle	67 W
Current, nominal load	0.35 A
Current, maximum load	0.5 A
Residual Current Circuit Breaker (RCCB)	Type A, 30 mA (or better) is recommended

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

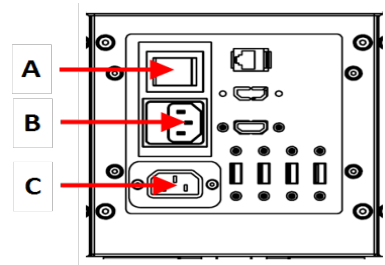
11.0.10 Connection to the machine

- Connect the electrical power cable to the machine (C14 IEC 320 connector).
- Connect the cable to the electrical power supply.



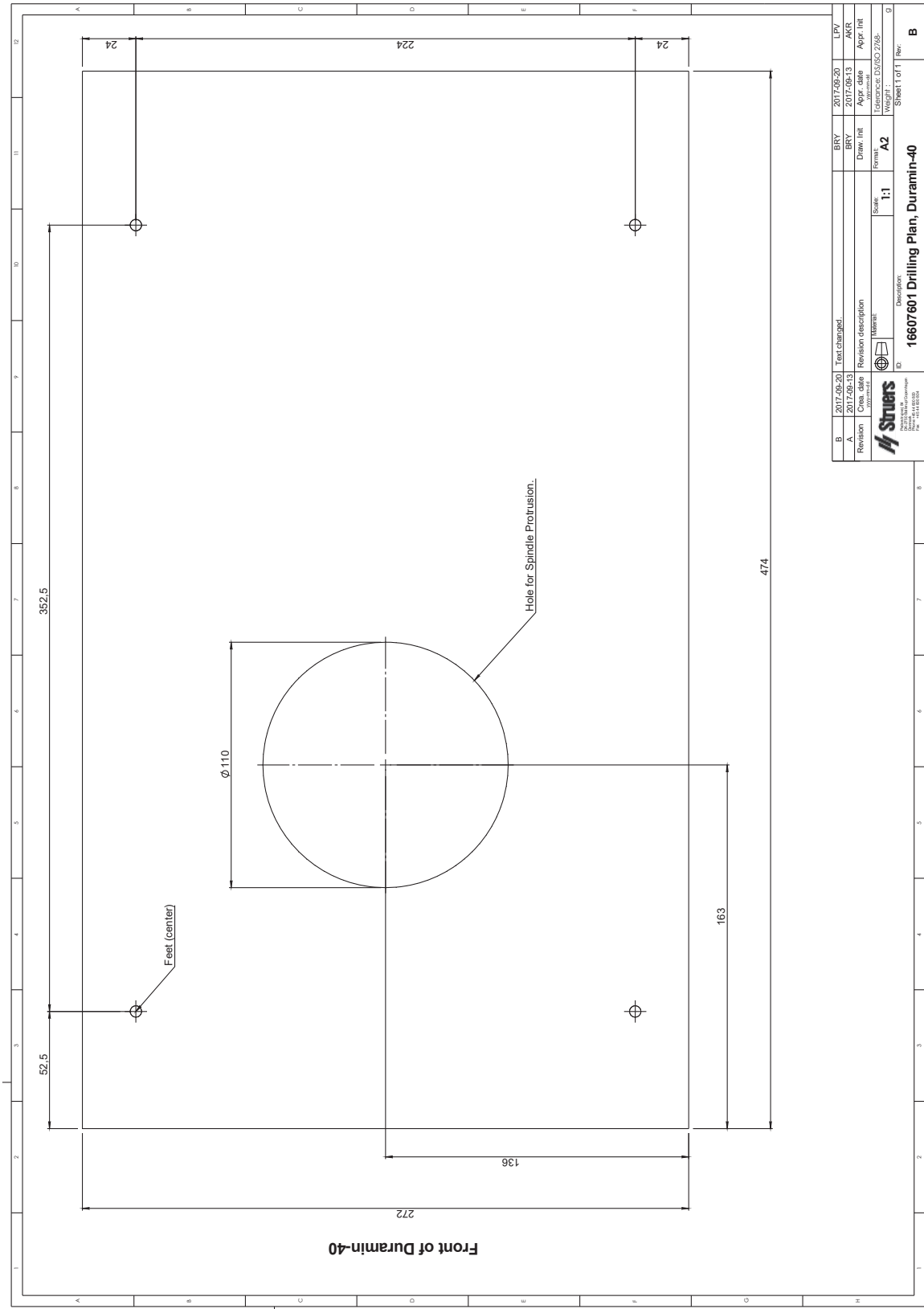
Electrical power connection

- A** Electrical power switch
- B** Electrical power socket/ Fuse compartment
- C** Electrical power connection, Monitor

**11.0.11 Safety specifications**

Safety Circuit Categories/Performance Level	Emergency stop	EN ISO 13849-1 PL c, Category 1 Stop category 0
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11.0.12 Duramin-40 - Drilling guide



B	2017-09-20	Text changed.	BRY	2017-09-20	LPV
A	2017-09-13	Revision description	BRY	2017-09-13	AKR
Revision	Created	Material	Drawn	Approved	Appr. Ink
			Forma	Idemance	DS/60 7766-
			Scale	Weight	
			1:1	A2	
16607601 Drilling Plan, Duramin-40					
					Sheet 1 of 1
					B

12 Manufacturer

Struers ApS
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DK-2750 Ballerup, Denmark
Telephone: +45 44 600 800
Fax: +45 44 600 801
www.struers.com

Responsibility of the manufacturer

The following restrictions should be observed, as violation of the restrictions may cause cancellation of Struers legal obligations.

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

The manufacturer is to be considered responsible for effects on safety, reliability, and performance of the equipment only if the equipment is used, serviced, and maintained in accordance with the instructions for use.

Struers ApS
Pederstrupvej 84
DK-2750 Ballerup, Denmark

Declaration of Conformity

EU / UE / EL / EC / EE / ES / EÜ / AB

Manufacturer / Производител / Výrobce / Producent / Hersteller / Κατασκευαστής / Fabricante / Tootja / Valmistaja / Fabricant / Proizvođač / Gyártó / Fabbicante / Gamintojas / Ražotājs / Fabrikant / Producent / Fabricante / Producătorul / Výrobca / Proizvajalec / Tillverkare / 販売元 / 製作者 / Produsent / Изготовитель / Imalatçı / 製造商

Декларация за съответствие Prohlášení o shodě Overensstemmelseserklæring Konformitátserklárung Δήλωση συμμόρφωσης Declaración de conformidad Vastavusdeklaratsioon	Vaatimustenmukaisuusvakuutus Déclaration de conformité Izjava o skladnosti Megfelelőségi nyilatkozat Dichiarazione di conformità Atitikties deklaracija Atbilstības deklarācija	Verklaring van overeenstemming Deklaracja zgodności Declaração de conformidade Declarație de conformitate Vyhlásenie o zhode Izjava o skladnosti Intyg om överensstämmelse	適合宣言書 적합성 선언서 Samsvarserklæring Заявление о соответствии Uygunluk Beyanı 符合性声明
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Name / Име / Název / Navn / Name / Ονομα / Nombre / Nimetus / Nimi / Nom / Naziv / Név / Nome / Pavadinimas / Nosaukums / Naam / Nazwa / Nome / Denumirea / Názov / Ime / Namn / 名前 / 제품명 / Наименование / Adı / 名称	Duramin-40
Model / Модел / Model / Model / Modell / Μοντέλο / Modelo / Mudel / Malli / Modèle / Model / Modell / Modello / Modelis / Modelis / Model / Model / Modelo / Modelul / Model / Model / Modell / モデル / 모델 / Modell / Модель / Model / 型号	M1/M2/M3, A1/A2/A3, AC1/AC2/AC3
Function / Функция / Functie / Funktion / Funktion / Λειτουργία / Función / Funktsioon / Toiminto / Focntion / Funkcija / Funkció / Funzione / Funkcija / Funkcija / Functie / Funkcja / Função / Funcția / Funkcia / Funkcija / Funktion / 機能 / 기능 / Funksjon / Назначение / Fonksiyon / 功能	Hardness tester.
Type / Тип / Typ / Type / Typ / Τύπος / Tipo / Tüüp / Tyyppi / Type / Tip / Tipus / Tipo / Tipas / Tips / Type / Typ / Tipo / Tipul / Typ / Tip / Typ / 種類 / 유형 / Type / Тип / Tür / 类型	066061XX
Serial no. / Серийн номер / Výrobní číslo / Seriennummer / Seriennummer / Σειριακός αριθμός / N.º de serie / Seerianumber / Sarjanro / No de série / Serijski broj / Sorozatszám / N. serie / Serijos Nr. / Sērijas Nr. / Serien. / Numer seryjny / N.º de série / Nr. serie / Výrobné č. / Serijska št. / Serienummer / シリアル番号 / 일련번호 / Serienr. / Серийный номер / Seri no. / 序列号	

CE
Module H, according to global approach

en We declare that the product mentioned is in conformity with the following directives and standards:	es Declaramos que el producto mencionado cumple con las siguientes directivas y normativas:	hu Kijelentjük, hogy jelen termék megfelel a következő irányelveknek és szabványoknak:	ro Declaram că produsul menționat este în conformitate cu următoarele directive și standarde:	ko 해당 선언서 상의 제품은 다음 지침 및 기준에 적합함을 선언합니다.
bg Декларираме, че посоченият продукт е в съответствие със следните директиви и стандарти:	et Kinnitame, et nimetatud toode vastab järgmistele direktiividele ja standarditele:	it Dichiaro che il prodotto citato è conforme ai seguenti standard e direttive:	sk Vyhlasujeme, že uvedený výrobok je v súlade s týmito smernicami a normami:	no Vi erklærer at produktene som er nevnt er i samsvar med følgende direktiver og standarder:
cs Tímto prohlašujeme, že uvedený výrobek je v souladu s následujícími směrnici a normami:	fi Vakuutamme, että mainittu tuote on seuraavien direktiivien ja standardien mukainen:	lt Pareiškiame, kad nurodytas gaminy's atitinka šias direktyvas ir standartus:	sl Potrjujemo, da je omenjeni izdelek v skladu z naslednjimi direktivami in standardi:	ru Настоящим заявляем, что указанная продукция отвечает требованиям перечисленных далее директив и стандартов:
da Vi erklærer herved, at det nævnte produkt er i overensstemmelse med følgende direktiver og standarder:	fr Nous déclarons que le produit mentionné est conforme aux directives et normes suivantes :	lv Mēs apstiprinām, ka minētais produkts atbilst šādām direktīvām un standartiem:	sv Vi intygar att den angivna produkten överensstämmer med följande direktiv och standarder:	tr Belirtilen ürünün aşağıdaki direktiflere ve standartlara uygun olduğunu beyan ederiz:
de Wir erklären, dass das genannte Produkt den folgenden Richtlinien und Normen entspricht:	hr Izjavljujemo da je spomenuti proizvod sukladan sljedećim direktivama i standardima:	pt Declaramos que o produto mencionado está em conformidade com as seguintes normas e diretivas:	ja 弊社はこの指定製品が以下の指令および基準に適合することを宣言します。	zh 我们特此声明上述产品符合以下指令和标准:
el Δηλώνουμε ότι το εν λόγω προϊόν είναι σύμφωνο με τις ακόλουθες οδηγίες και πρότυπα:				

2006/42/EC	EN ISO 12100:2011, EN ISO 13849-1, EN ISO 13850:2015, EN 60204-1, EN 60204-1-A1:2009, EN 60204-1/Corr.:2010.
2014/30/EU	EN 55011:2009, EN 55011:2009/A1:2010, EN 61326-1:2013, EN 61000-3-2:2014, EN 61000-3-3:2013.
2011/65/EU	EN IEC 63000:2018

Additional standards

Authorized to compile technical file/
Authorized signatory

Christian Skjold Heyde
VP Operations

Date: [Release date]

