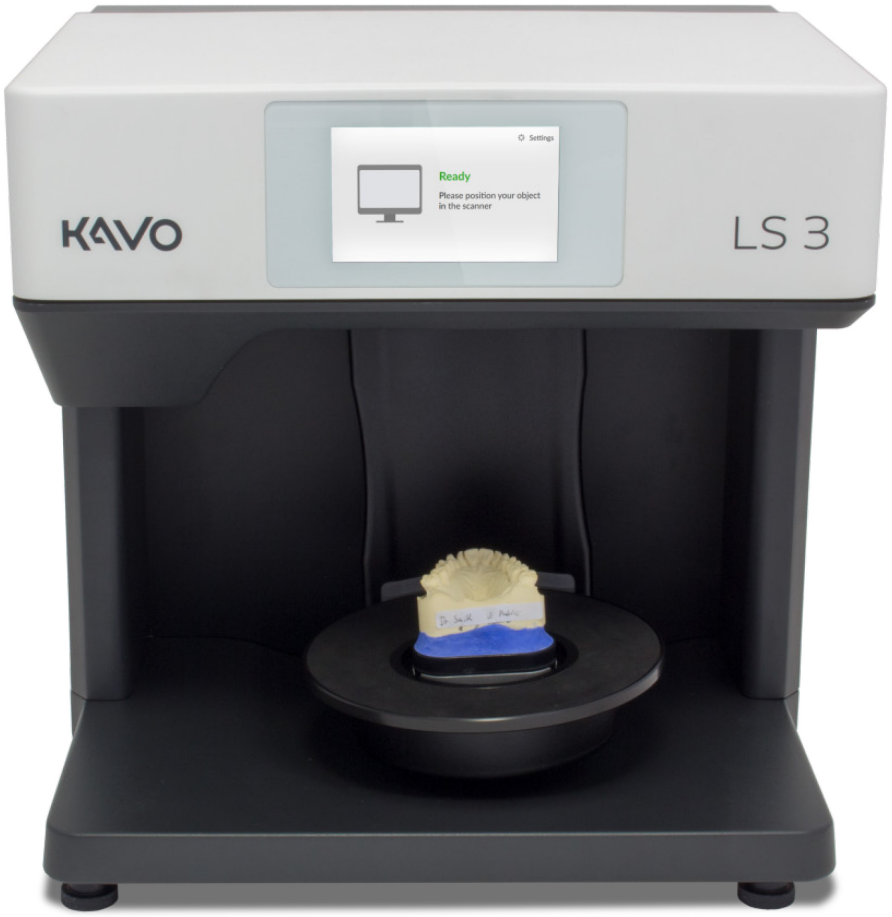
KaVo LS 3
Operating Manual



KAVO
Dental Excellence

About this manual

Please read through this operating manual carefully. Keep the operating manual in a safe place. If you pass on the device to somebody else, please make sure that you hand them this operating manual as well. Liabilites for damages due to failure to comply with the operating manual are not accepted.

Changes

Informations and illustrations correspond to the state at the time of editorial deadline. Deviations from the delivery status cannot be excluded. The manufacturer reserves the right to implement product changes as part of continuous improvement and technical progress and to make changes to this documentation.

Brands and trademarks

Brands and trademarks mentioned in this manual are signed as recommended by their owners.

Symbols and highlighting

Graphic symbols and text highlights are used to present the information more clearly.

- ■ A square on the left indicates a step involving an action.
- ➲ An arrow on the left tells you what the outcome should be if you have followed one or more steps correctly.

1. An element in a sorted list is numbered.
- An element in an unsorted list is marked with a bullet.

Important statements or keywords are highlighted in **bold type**.
➜ **Cross-references** within the manual are highlighted in bold type and an arrow.

Tip
The word “Tip” and the green color are used to highlight tips on operation and information that require your special attention.

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Safety and maintenance

Intended use of KaVo LS 3

The correct use of the KaVo LS 3 scanner consists in the optical, three-dimensional measurement of human jaw models.

The scanner can be used in orthodontics and prosthetics for all types of reconstructions as well as for archiving. Jaw models in occlusal relation can be scanned in terms of skull position, the same as dental registers (bite registers) and dental models (wax-up) as well as reference bodies (scanbodies) screw-retained in the model.

Material characteristics

The KaVo LS 3 scans materials with a dry, opaque surface in the colors white, saffron, gold, blue, beige, yellow and pink. Reflecting or dark surfaces can be scanned by treating with 3D-Scan-Spray.

Improper use

The KaVo LS 3 is not designed for scanning other models or objects, models made of transparent material or living organisms. The KaVo LS 3 is not suited for operation in an environment which is strongly contaminated with emissions (e.g. dust or varnishes).

The manufacturer strongly discourages any use other than the intended use. The manufacturer shall not accept liability for damages which occur because the user has not used the scanner as intended and/or not observed the safety notes.

Medical device

The KaVo LS 3 is no medical device according to German law MPG § 3, European guideline 93/42/EWG. In US optical impression systems for CAD/CAM are medical devices according to the FDA product classification, class 2 (product code NOF). By delivery the scanner complies with EU standards and directives:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU
- Directive 2011/65/EU on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment
- DIN EN ISO 12100:2010
- DIN EN 61326-1:2013
- DIN EN 61010-1:2010.

Qualification of the user

By declaration as a medical device the use of the scanner is restricted to healthcare practitioners, especially dental technicians. Users setting up, operating or commissioning the KaVo LS 3 require specific knowledge for the safe operation of the scanner. You can obtain this knowledge via the following measures:

1. Read and follow this operating manual, in particular the notes on setting up, commissioning and cleaning the scanner.
2. Participate in an instruction or training.
3. Observe the local laws, ordinances, regulations on occupational safety and accident prevention relating to your scanner workplace.
4. Ensure that devices and cables pass the prescribed regular safety tests for electrical equipment. Replace damaged equipment and cables immediately.

Constructive protection measures

The scanner has been developed and manufactured in accordance with the applicable safety standards and with the greatest possible care to ensure safe operation and to protect the user against injuries. A fuse is integrated in the scanner to protect the device against overvoltage.

General safety instructions

Types of warnings

Warnings provide information on how damage to objects and injury to persons can occur and give instructions on how to avoid risks. Warnings are categorized into four levels depending on the severity of the possible consequences.

Note

This combination of signal word and symbol warns you about possible material damage that might occur if the instructions are not followed correctly.

Caution

This combination of signal word and symbol warns you about possible minor injuries that might occur if the instructions are not followed correctly.

Warning

This combination of signal word and symbol warns you about severe to lethal injuries that might occur if the instructions are not followed correctly.

Danger

This combination of signal word and symbol warns you of dangerous situations which could lead directly to death or severe injuries.

Protection against injuries

Despite protective design measures, some residual risks which can lead to injuries cannot be excluded. In this section you can find out with which measures you can protect yourself and others.

Warning

Risk of injury due to electrical shock
Risk of fire due to short circuit
A technical fault of the cables or of an individual component could cause an electric shock or short circuit. This can result in a fire.

- Ensure that electrical equipment does not come into contact with water/moisture. However, should this happen, immediately disconnect the power plug. Dry the parts affected with a soft microfiber cloth.
- Under no circumstances work with faulty equipment or cables.
- Only operate electrical equipment at the recommended operating temperatures.
- Use the supplied cables or original spare parts exclusively.
- If electrical equipment is not used for a longer period, e.g. overnight, switch these off and disconnect the plug of the power socket.

Warning

Health hazards due to magnetic fields

The scanner and the accessories contain magnetic components. Magnetic fields can be hazardous to health.

- Persons with implants, in particular cardiac pacemakers, may only operate the scanner and the accessories with the express permission of a physician.

Caution

Risk of injury due to incorrect carrying

Due to the dimensions and weight, we recommend strong people to unpack and set up the scanner. Smaller persons in particular, can injure themselves by lifting or carrying the scanner on one's own.

- Lift the scanner from the packaging from behind.
- Carry the scanner with two persons.
- For transport, hold the scanner at the bottom corners.

Warning

Health hazards due to stripe light and/or RGB flash light

The scanner operates with stripe light and RGB flash light. Permanent visual contact with stripe light and/or RGB flash light can trigger epileptic seizures, migraine or similar.

- Persons with the appropriate health disposition should cover the scanner during operation.

Caution

Risk of injury by the mechanics of the scanner

The mechanics of the scanner can crush your hands.

- Only reach into the scanner when all the axes are at a standstill. Should the axes not stop at the end of a scanning run, switch off the scanner and disconnect the power plug.

Caution

Fall hazard due to packaging materials

The scanner is packaged extensively as protection against damage during transport. Packaging can present an obstacle during setting up and lead to a fall.

- Do not leave packaging materials lying on the floor.
- Remove obstacles before a transport.

Caution

Injuries due to clothes, jewelry or hair getting caught

Loose clothing, jewelry or long hair can get caught in the mechanics of the scanner. Objects or hair can be entangled through movement in the scanner. This can lead to injuries.

- Do not wear loose clothing such as scarves or ties, or jewelry such as long necklaces at the scanner workstation.
- Tie your long hair in a bun for example.
- However, should an item of clothing, hair, etc. get caught in the moving parts, switch off the scanner immediately. Disconnect the power plug before extracting clothing, jewelry or long hair.

Protection against material damage

Despite protective design measures, some residual risks which can lead to material damages (loss of data or damage to equipment) cannot be excluded. In this section you can find out with which measures you can prevent material damage.

Note

Material damage due to moisture
Continuous contact with moisture can damage sensitive materials.

- Only operate your scanner at a dry workstation.
- Avoid contact with water/moisture. However, should this happen, immediately disconnect the power plug. Immediately wipe the water/moisture with a soft microfiber cloth.

Note

Damage to optics and electronics through touching, moisture, dirt and cleaning
The optics and electronic components in the interior of the scanner are highly sensitive. Every contact as well as dirt, moisture and cleaning agents can damage these.

- Do not touch the optics and the electronic components.
- Protect the optics and electronic components against soiling by covering the scanner.
- Never use the 3D scan spray in the interior of the scanner.
- If the optics or electronic components require cleaning, do not clean them yourself. Please contact the technical support.

Note

Measuring error due to unsuitable climatic conditions
The scanner is intended exclusively for use in dry, closed rooms. The scanner will only achieve accurate measuring results under suitable climatic conditions. Excessive heat causes measuring errors as well as overheating of the scanner. Overheating can cause permanent damage to the scanner.

- Only operate the scanner at temperatures between 18°C - 30°C.
- Only operate the scanner at low humidity.
- Avoid direct sunlight at the workstation.
- Reduce cold, heat and high humidity, for example, by using air-conditioning or sun protection.

Note

Damage to the surfaces due to unsuitable cleaning agents
Paper towels, coarse cotton cloths, cleaning agents, polishing pastes and the like leave scratches on the sensitive surfaces.

- Only use the recommended materials for cleaning.

Note

Measurement errors due to reflections on the measured object
Bright ambient light results in unwanted reflections on the measured object. This affects the precision of the measurements.

- Choose a workstation that faces away from windows or excessively bright artificial lighting.
- If no other workstation is available, cover the opening during scanning, for example with light-proof foil.

Note

Measurement errors due to vibrations

The table or the workbench on which the scanner stands must not vibrate. Vibrations cause inaccurate measurements.

- Place the scanner on a stable, firm base, which can support at least twice the weight of the scanner, in other words 2 x 20 kg.
- Stabilize the base with a braced frame or by fixing to a stable wall.

Note

Inaccurate measurements due to neglected calibration or calibration with damaged calibration model

The measuring precision of the scanner is only assured if the scanner is calibrated. For this process you require a calibration model and the corresponding predefined values.

The calibration model can be damaged mechanically. This can only be tolerated in the border areas.

- Perform calibration after commissioning and then during operation every time the software asks you to do so.
- Only start calibration if the values entered in the software correspond with the values of the calibration model.
- Check whether the calibration is damaged at any central position.
- Only use the calibration model in perfect condition.

Note

Damage to scanner or models through missing or incorrect mounting

Due to the movement of the axes in the scanner, unsecured or incorrectly secured models will fall down during scanning.

- Do not place any objects on the scanner or its interior.
- Never place models in the scanner unsecured.
- Only use a supplied object holder or approved accessories for mounting the models.
- If you fixate occlusion models with rubber bands, only use robust, new rubber bands. Thin or porous rubber bands can snap.
- Always fixate the models on the flexible object holder and the multiDie adapter with adhesive putty pads.
- Only insert tooth stump models into the multiDie adapter which have been prepared with metal pins.
- Should a model still fall down, switch the scanner off immediately. Then remove the model and all broken pieces from the interior.

Note

Damage to models through unsuitable adhesive materials

Mounting models with sticky tape, instant adhesives or the like, contaminates or may even damage the models, the object holders and the scanner.

- Mount models exclusively with adhesive putty pads, which does not stick, stain or harden.

Note

Damage to scanner and models due to incorrectly positioned articulators

Articulators are not fixated in the scanner. This is possible as articulators are scanned with reduced axis movement.

- Only place an articulator in the scanner when the software asks you to do so.
- Always place an articulator in the scanner with the front facing forwards when starting an articulator scan. Then follow the software instructions.
- Always place an articulator on the system plate with all legs.
- Remove the articulator immediately when the software asks you to do so.
- Should an articulator still fall down, switch the scanner off immediately. Then remove the articulator and all broken pieces from the interior.

Note

Data loss due to the USB cable being too long

Data transfer between the scanner and the PC is affected by the length of the USB cable.

- Use the supplied USB cable or an original spare part with the appropriate length (maximum 2 meters).

Note

Loss of data due to magnetic fields

The scanner and the accessories contain magnetic components. Metal-containing technical devices and data carriers, for example, credit cards, can be disrupted in their function or even damaged permanently through contact with magnets.

- Make sure to keep a sufficient distance between metal-containing technical devices and data carriers to the magnets.

Response in case of a defect

You must not work with a defective system. Damage to the scanner, its accessories or a faulty function have occurred with high probability if:

- parts have been visibly damaged
- one or more of the moving axes continue to rotate or rotate uncontrolled
- calibration fails
- measuring errors occur despite performing all work steps
- the software displays an error message.

- Follow the instruction in an error message.
- End the software, switch off the scanner and the PC and restart the system.
- Check the connections. If applicable, replace the PC slots.
- Check whether the software is installed correctly.
- Check whether the calibration is done.
- Follow the instructions for device maintenance.
- Update your system. Check whether all important Windows updates have been installed.
- Ensure that your computer is free of viruses and malware.

If none of these measures solve the problem, repeat with another computer to exclude a computer fault. If the problem also occurs with the other computer, refer to the technical support to clarify the cause of the fault.

Device maintenance

The scanner is a delicate and sensitive optical device. To ensure trouble-free operation of the scanner, it is necessary to regularly follow the correct care measures. Further maintenance measures by the user are not required.

Calibration of the scanner

The scanner is calibrated with the aid of the software. This measure is necessary to ensure accurate measurements.
The calibration data needed are saved on the internal memory of the scanner. Each set of data fits to one scanner only.

- Always perform calibration when the software asks you to do so. To this purpose, follow the software user manual.
- Enter the values printed on the rear of the calibration model correctly.

- Check whether the calibration model is damaged. If it is, do not calibrate and order a new one.
- Position the calibration model like an individual jaw model. Use the object holder with knurled screw.
- If you contact the technical support always transmit the sensor number of your scanner. This number is needed to check the calibration data.

Cleaning the scanner

The scanner should be cleaned regularly during operation.
However, never clean the optics or other electronic components. If the optics are soiled, please contact the technical support.

- Switch off the scanner for safety reasons.
- Remove the cable connections.
- Remove the object holder.
- To remove major soiling, moisten a soft microfiber cloth with window cleaner.
- Only clean surfaces with a soft microfiber cloth.
- Clean the touch screen without applying force.
- Never clean sensitive surfaces with scouring agents or coarse cloths.
- Remove dust, foreign matter etc. from the interior with a vacuum cleaner. Attach the crevice nozzle and set the vacuum cleaner to its lowest level.
- Alternatively, use a universal compressed air cleaner. Spray briefly and set the spray strength to low.

Commission the scanner

Choose workstation

Before unpacking and installing the scanner, carefully choose the workstation.

As a device of EMC Class A, the KaVo LS 3 is suitable for use in a commercial environment.

- Choose an environment which is nearly free of emissions like dust or lacquers as well as direct sunlight or artificial light.

➲ This is important for precise scanning results. If a suitable environment is not available, you can protect the scanner with a cover, e. g. a dark foil.

- Choose a stable work desk that is big enough to allow the scanner to be connected to a PC. The scanner has a weight of 20 kg and installation dimensions of 431 mm width, 432 mm height and 398 mm depth.
- Ensure easy access to the rear as this is where the ON/OFF switch is located.
- Ensure that there are enough and sufficiently fused power sockets for all the devices. You can use an approved extension cable, a multiple power socket and a socket adapter (additional electrical devices not included in the scope of delivery). It is not necessary to use an adapter to adjust the voltage as an adapter is integrated in the scanner.
- In the following only use the supplied cables or comparable. USB and Ethernet cables can be ordered as replacement items for KaVo LS 3.

Connecting the scanner

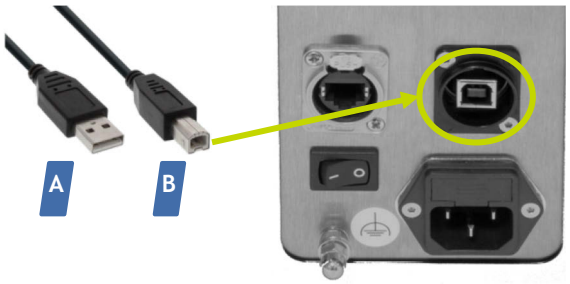
The scanner requires a power connection and a PC with fast internet. Use your respective software for scanning. The PC has to fulfil the system requirements of the software version to be installed.

Power connection

- The connections are located on the rear of the scanner. Connect the device plug of the power cable **2** to the corresponding power socket on the scanner.
- Connect the power plug of the power cable **1** to an electrical socket.

USB connection

- Connect the **type B** plug of the USB cable to the USB port of the scanner.
- Connect the **type A** plug of the USB cable to a free USB port of the PC.



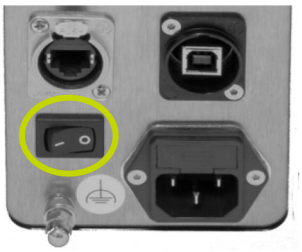
Ethernet connection

- Connect any plug of the Ethernet cable to the Ethernet port of the scanner.
- Connect the Ethernet cable with the Ethernet-to-USB-adapter.
- Connect the USB plug of the adapter to a free USB port of the PC.

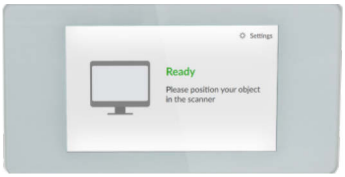
Recommended

➲ The scanner is operational.

- Switch the scanner on at the power switch.



➲ The power switch is on position I.
➲ The touch screen will start up.



Now install your respective scanning software. For computer guidelines and software installation, please refer to the software documentation

Repairs, transport and disposal

Faults and repairs

If a fault occurs, first follow the ➔ **safety notes** on response to a defect. If the fault persists, contact the technical support to clarify the cause of the fault.

Only have repairs carried out by authorized parties. Improper repairs can cause the scanner to stop working perfectly.

The manufacturer accepts no liability for damages caused by improper repairs. Please note that in this case your warranty claim will also become void.

Serial numbers

If you have questions or complaints relating to your device, please have both serial numbers of your scanner (SN and REF) as well as the serial number of the 3D sensor ready. You will find these numbers on the rear of the device.

Transport

The manufacturer recommends transporting the device in its original packaging for optimum protection.
The manufacturer accepts no liability for damages caused by improper packaging.

Parts of original packing

The original packaging consists of these parts (from bottom to top):

1. Wooden pallet

2. Bottom foam cushioning

3. Plastic bag

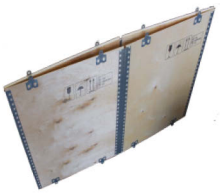
4. Foam plate with cutout

5. Foam plate (without cutout)

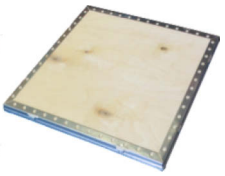
6. Box for accessories

7. Top cardboard with foam cushioning

8. Folding wooden box



9. Wooden cover



- Before you start, make a note of the device's serial numbers.
- Place the pallet **1** on the ground.
- Put the bottom foam cushioning **2** on the pallet.
- Place all cables into the hollow of the cushioning.

➲ The cables are stored properly if they lay plane with the cushioning.

- Cover the scanner with the plastic bag 3, the open side downwards.
- Grasp the scanner from behind and lift it into the corners off the foam cushioning 2.

Note

Damage to optics and electronics through touching

- If possible, grasp the underside of the scanner.
- Do not grasp deep inside the top part where the optics is ("KaVo" side).

- Place the connection panel of the scanner into the foam corner with the small cutout.

➲ The feet fit into the four hollows and the rear is close to the foam.

- Clamp the foam plate with the cutout 4 upright in front between device and foam cushioning.

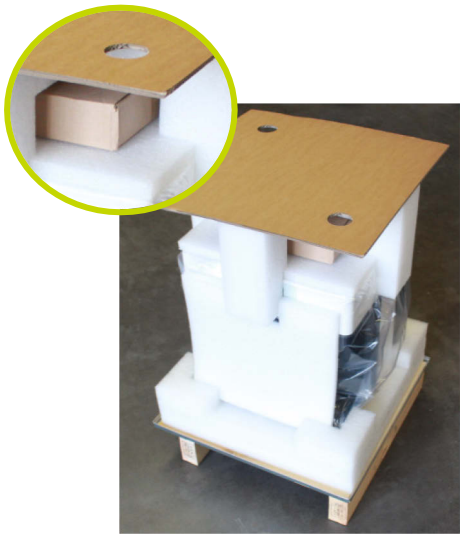
➲ The foam plate should not tilt. The display remains free.

- Place the foam plate 5 on top.
- Put the accessories inside the box 6.
- Place the accessories box on top of the foam plate.

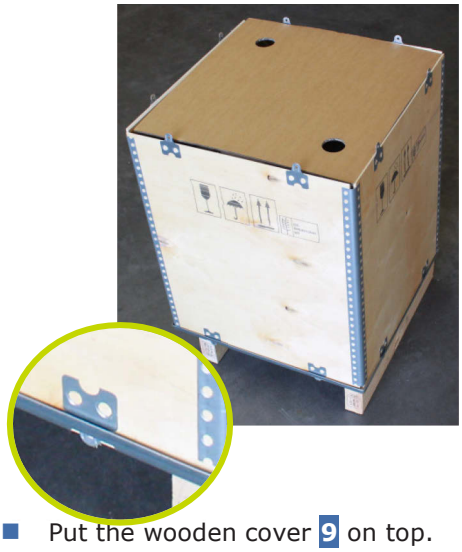
- Cover all with the top cardboard 7, with the accessories box in its middle. There is only one correct alignment of the foam brackets because they are adapted to the shape of the scanner.

- Press the front foam carefully in front of the display of the scanner.

➲ All foam parts of the top cardboard are close to the device. Between top and accessories box may remain a small space.



- Unfold the wooden box 8.
- Put the box over the package carefully.
- Insert the eight tabs of the box through the slots in the border of the bottom plate. This is important for complete and save closing.



- Put the wooden cover 9 on top.
- Insert all tabs through the slots as well.

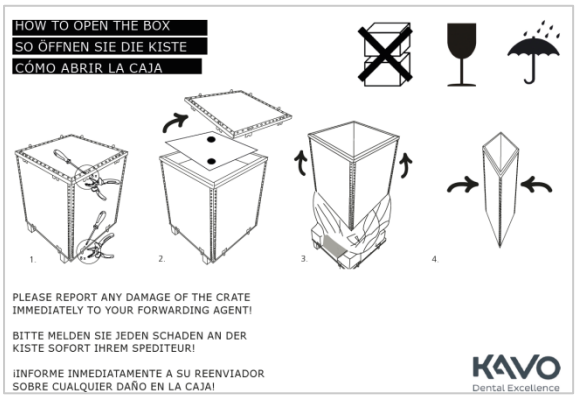
- Bend all tabs on top and bottom 90 degrees using pliers and hammer. Make sure that the tabs are as plane as possible.

➲ The scanner is packed.

- Check if the wooden box is equipped with an impact and tilt indicator (outside).

- Put the hint labels onto the upper edge.

- Check if the KaVo carton labels are put on:



➲ On these stickers important information is declared (explanation on unpacking, advice for storing and transport).

- The empty frame should be filled with the type plate of the scanner inside the box. Make sure that the serial numbers here are the same than the one's noted first.

➲ The package is ready for transport.

Environmentally friendly disposal

The information in this section refers to EU directives and German law. In non-European countries you must follow the corresponding national legislation for the disposal of packaging and electronic scrap.

You can prevent negative consequences for people and avoid harming the environment by the proper disposal of the device.

Disposal of packaging

In accordance with the German packaging ordinance (VerpackV), you can return the packaging to your dealer for disposal in Germany. However, the manufacturer recommends that you keep the packaging in case you need it to transport the scanner or to send it back in the event of warranty claims.

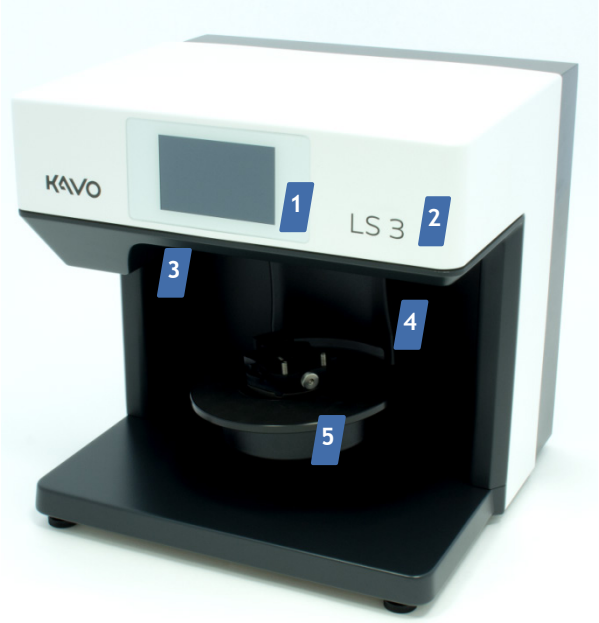
Disposal of the device

The devices marked with this symbol are subject to European Directive 2002/96/EC for WEEE (Waste Electrical and Electronic Equipment). WEEE registration number of smart optics:
DE47893210
Electrical equipment does not belong in domestic waste.

Please note that the scanner is a device that only serves for commercial or industrial use. Disposal via public waste management authorities is therefore not possible. By delivery the scanner complies with Directive 2011/65/EU on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment.

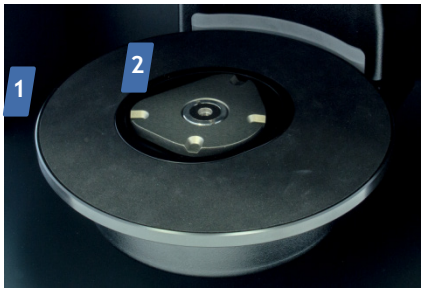
The device must be returned to the manufacturer for disposal. If you are resident within the area in which the EU directive applies you can also return the device to your dealer.

Components of the device
Front view



1. Touch screen
2. Device designation
3. Optics (camera and 3D sensor)
4. Swivel axis (electromotive lateral movement 0 45°),
   Z-axis (electromotive up and downwards movement 0 – 30 mm)
5. Rotating axis (electromotive rotation up to 315°)
6. System plate with KaVo base plate

Detailed view of system plate

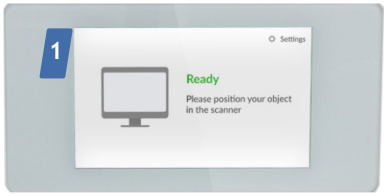


1. Turntable with non-slip rubber mat for the placement of articulators
2. KaVo base plate for mounting object holders, adapter plates and Multisplit mounting plates

Detailed view of camera and sensor

1. Optics (camera and sensor)

Detailed view touch screen



1. Stand-by mode/operating mode

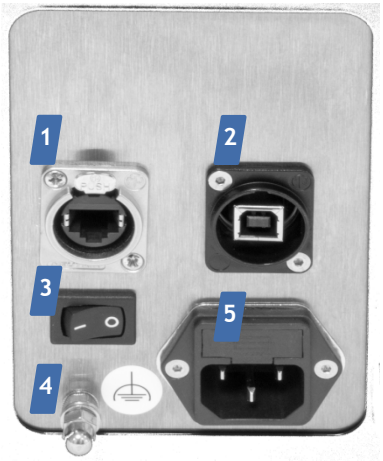
Rear view

1. Type plate
2. Connection panel

Type plate

1. The type plate located on the rear contains important information about the device
   ➔ **explanation of symbols**.
2. Serial number of the 3D sensor

Connections



1. Ethernet connection
2. USB connection for device control and camera
3. ON/OFF switch
4. Functional grounding
5. Power connection with fuse

Accessories

The cardboard box contains:

1. Object holder with knurled screw
2. Calibration model in plastic box
3. Flexible object holder
4. USB cable
5. Adhesive pads
6. multiDie adapter

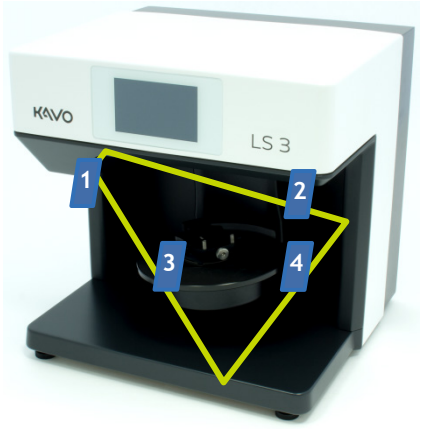
The bottom foam cushioning contains the cables:

1. Power cables with plugs for wall sockets type E+F, N, B, G, I, L
2. Ethernet cable
3. Ethernet to USB adapter

You can both purchase spare parts and additional accessories from KaVo Dental GmbH ➔ **Scope of delivery**.

Operating principle of the scanner

The most important components of the scanner are the 3D sensor, a positioning mechanism and RGB LEDs for color measurement.



The positioning mechanics in the interior of the scanner consist of an electromotively driven rotating and swivel axis 4 as well as an automatic z-axis 2. The freely rotating base plate 3 positions the object to be measured with regard to the 3D sensor 1, which is located above the swivel axis.

The swivel axis moves the rotating axis with the object holder to the side so that the 3D sensor can capture the object to be measured from the side. During a measurement, the 3D sensor projects a striped pattern onto the object being scanned. At the same time the striped pattern is recorded by a camera. With the aid of several camera images taken from different angles, the software calculates a 3-dimensional image of the object.
For color scans the measurement is supplemented with RGB flash light.

Operation per touch screen

The scanner is equipped with a touch screen which allows you to control scanning processes.
Information on all scanning procedures, the setting options and the use of optional modules can be found in the software user manual.

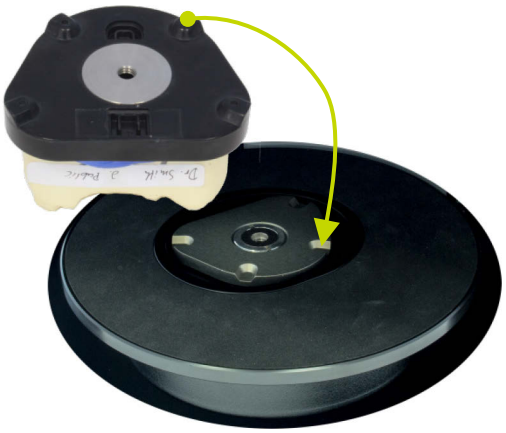
Placing single jaw models

Models on a KaVo mounting plate

You do not require additional fixing for jaw models plastered on a KaVo mounting plate. You can place the KaVo mounting plate directly on the KaVo base plate of the scanner. This option exists for the articulator system KaVo Protar®.

- Plaster the jaw model onto the KaVo mounting plate according to the manufacturer's instructions. Make sure to insert a magnetic adhesive disk into the KaVo mounting plate.

- Place the KaVo mounting plate on the KaVo base plate of the scanner. Ensure that the protrusions ("Corners") on the underside of the Multisplit mounting plate fit into the recesses of the KaVo base plate.



- ➲ The KaVo mounting plate will adhere to the magnet of the KaVo base plate.
- ➲ The KaVo mounting plate fits correctly when the plates are exactly congruent. Additional securing of the plastered jaw model is not necessary.

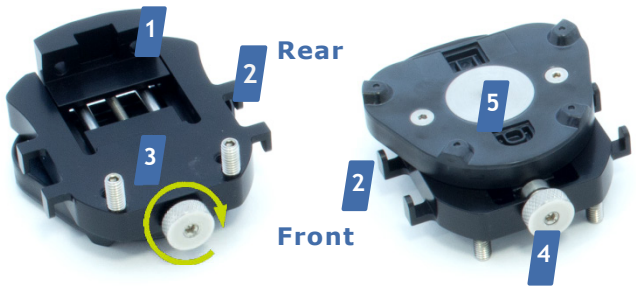
Tip
You need an adapter plate to place an individual model if it is plastered on a mounting plate for a different articulator than KaVo Protar® ➜ **Additional items.**

Fixing models on an object holder

The object holders for KaVo LS 3 serve to fix a jaw model mechanically. This method is to be applied to jaw models which are not plastered.

Tip
Use the object holder with knurled screw for positioning the calibration model, too:

Object holder with knurled screw



1. Floating stop
2. Hooks
3. Threaded pins
4. Knurled screw with clockwise thread
5. KaVo Protar plastic plate with adhesive disk

Different sizes of jaw models can be fixed securely on the object holder with the knurled screw.

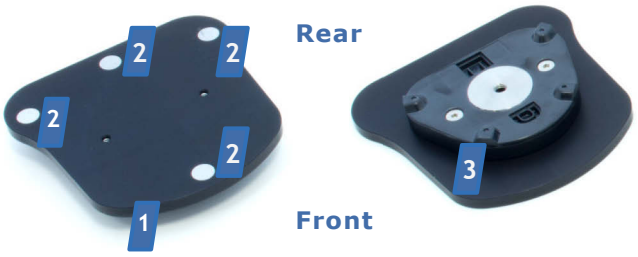
- Place the jaw model (upper or lower jaw) with the bottom side on the object holder.
- If required, loosen the knurled screw to increase the space.

➲ The anterior teeth point in direction of the knurled screw.

- Press the jaw model gently against the threaded pins.
- Tighten the knurled screw.

➲ The jaw model is fitted correctly if it is flush with the floating stop and the threaded pins.

Flexible object holder



1. Top
2. Magnet points
3. KaVo Protar plastic plate with adhesive disk

Both partial models as well as complete jaw models can be fixed securely on the flexible object holder with the large plate. For fixing, you require adhesive putty pads. Two packs of adhesive pads are included in the scope of delivery. You can purchase replacements from office suppliers if required.

- Cover the topside of the plate with putty. You should use at least three pads for complete jaw models.
- Place the jaw model (upper or lower jaw) with the bottom side on the adhesive pads.

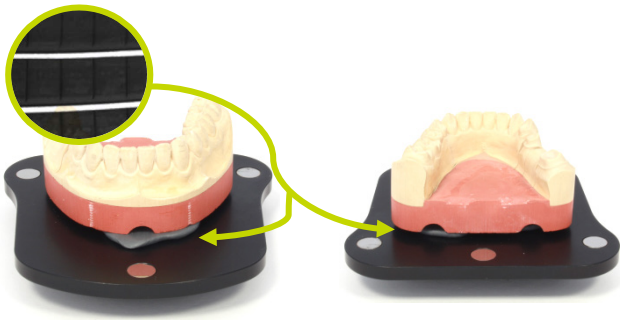
➲ The anterior teeth point in direction of the individual magnet points.

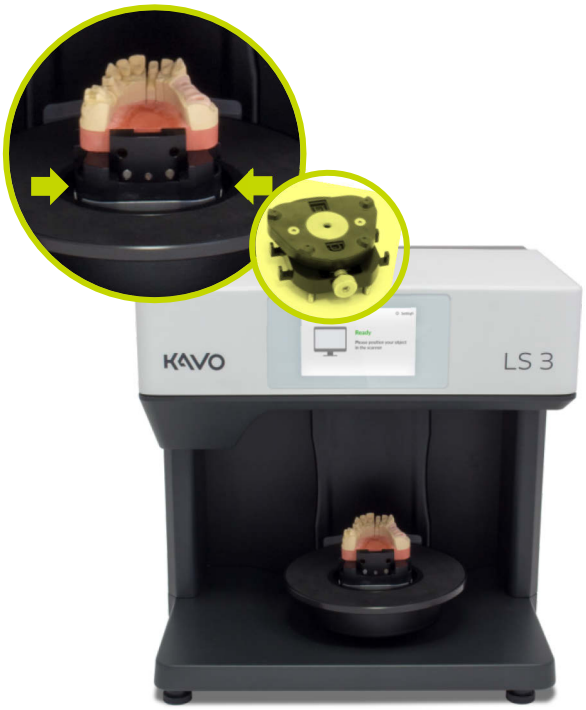
- Press the jaw model firmly.
- The jaw model fits correctly when it does not extend beyond the magnet points.

- Tilt the object holder carefully to the right and left.

➲ The jaw model fits correctly when it does not slip.

- Should the jaw model slip, use additional adhesive pads.





- Check whether the object holder can be shifted easily. If this is the case, correct the fit until the object holder fits securely.

Inserting object holders

The described procedure is the same for both object holders.

- Hold the object holder from the side.
- Place the object holder with the front side or the knurled screw facing forwards into the scanner.

➲ The protrusions ("Ovals") on the underside of the object holder engage with the recesses of the KaVo base plate.
➲ The object holder adheres to the magnet of the KaVo base plate.

Removing the object holder

The described procedure is the same for both object holders. To fix a jaw model on the object holder, you should always remove the object holder from the scanner.

- Hold the object holder on both sides, if necessary, use both hands.
- Carefully pull the object holder upwards. A certain amount of force is required due to the magnetic attraction.

➲ The object holder is released from the KaVo base plate.

If the rotating axis is inadvertently moved during model/articulator removal, switch off the scanner and software and restart the scan process again in order to return the axes to the home position.

Positioning occlusional models

Non-articulated occlusion models

A non-articulated occlusion model can be mounted on the object holder with knurled screw using a rubber band. You can position the mounted occlusion model like an individual jaw model then.

Tip
The flexible object holder is not suitable for this purpose.
For articulated occlusion you require an articulator
→ **Articulated occlusion models**.

Mounting occlusion models with a rubber band

For securing the upper and lower jaw in occlusion, you require a conventional rubber band of approx. 0.4 cm width and approx. 8.5 cm diameter.

Alternatively, you can use a crossed band. The length and strength of the rubber band varies depending on the jaw model. For this reason, always keep several different rubber bands available. Rubber bands are not included in the optional scanner accessories. For safety reasons, use only new, robust rubber bands and replace these regularly.

- Place the upper jaw model on the lower jaw model in occlusion.
- Place the rubber band cross-wise over the top part of the upper jaw model so that an equally long loop hangs from each side.
- Guide the end of each rubber loop around the hooks on the side of the object holder.

➲ Attachment is adequate if the upper jaw model cannot be tipped or shifted with slight pressure.

- If necessary, shorten the rubber bands by coiling over the hooks several times.

Alternatively, you can use two shorter rubber bands or a crossed band. Depending on the length and strength of the rubber bands used, alternative attachment methods are possible, e.g.:

- Place two shorter rubber bands at an angle over the jaw model.
- Guide one end each at the front and back around one of the hooks on the side of the object holder.

If you are using a crossed band, you can only secure the jaw models to the object holder in occlusion.

- Place the crossed band around the jaw models in occlusion such, that one crossed part is on the top and one on the bottom and that the two partial bands are stretched on the side.

- Secure the connected jaw models on the object holder.
- Guide the laterally stretched rubber bands around the hooks on the object holder.

Articulated occlusion models

The articulated occlusion of the upper and lower jaw model is prepared with aid of an articulator. For vestibular scans, you can insert any articulator into the scanner without using further aids.

Condyle-related measurements are possible with the following articulators:

- KaVo PROTAR® (standard)
- AMANN GIRRBACH Artex®
- Baumann Dental Artist/arTO®
- GAMMA® Reference
- SAM® AXIOSPLIT®

Articulators are available from the specialist trade, but cannot be purchased as accessories for the scanner.

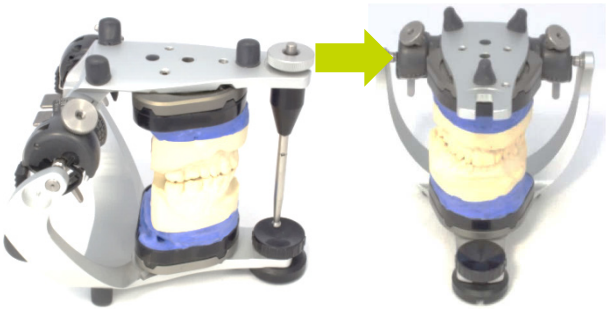
Overview

1. Support pin front
2. Feet

Inserting articulator

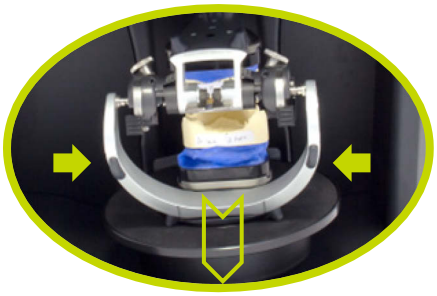
Regardless of type and manufacturer, all articulators are to be treated in the same manner.

- Ensure that the occlusion model has been articulated correctly.
- Remove all support pins from the articulator.



- It is essential to wait until the software asks you to insert the articulator. Only then it is assured that the movements of the axes are minimal for the following scanning process.
- ➲ The system plate of the scanner is moved to the horizontal service position. Should this not be the case, there is a function in the software to travel to this position.

- Hold the articulator at the rear braces with both hands.



- Place the articulator in the scanner with the front facing forwards.
- ➲ The front side of the articulator must face to the rear of the scanner, then follow the software scan procedure.

- ➲ The articulator stands free and does not touch the scanner.

- Place the articulator onto the system plate such, that all feet stand on the rubber mat. Position the articulator centrally.
- ➲ The articulator is positioned centrally on the system plate. Any other position is not permissible.
- ➲ The rubber mat is non-slip. No further fixation is required.

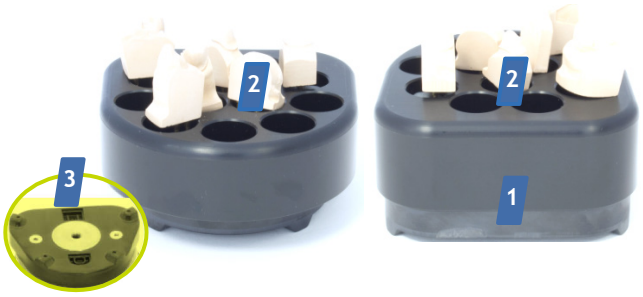
Removing the articulator

- Wait until the software announces the end of the scanning process.
- Remove the articulator as soon as the software asks you to do so (not before).
- Hold the articulator at the rear braces as before.
- Lift the articulator straight from the scanner. Do not lift it up.
- Now continue with the workflow in the software.

Positioning the multiDie adapter

You can position up to twelve tooth stump models individually with the multiDie adapter and use it for scanning single separate teeth models and for a presentation of single teeth models within a global scan.

Overview



1. Flat side (rear)
2. Slots
3. Plastic plate with adhesive disk

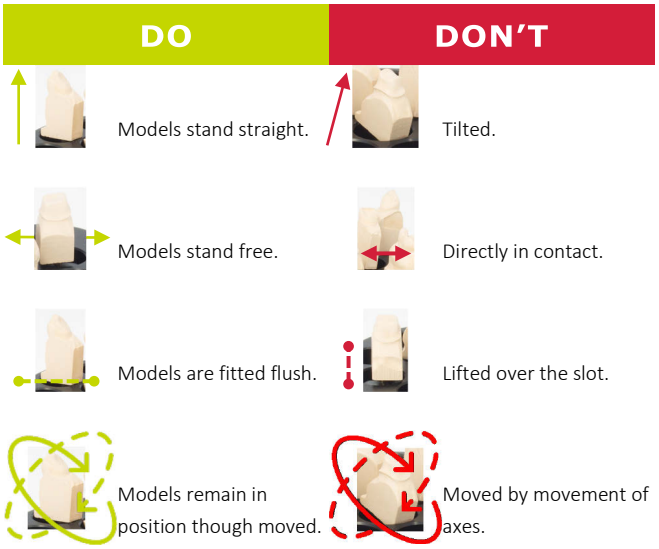
Mounting of tooth stump models

To ensure that the tooth stump models sit firmly on the multiDie adapter, you require the adhesive pads as mounting material.
Two packs of adhesive pads are included in the scope of delivery. As replacement you can use commercially available adhesive putty pads. These should be ultra-strong, but not stick, stain or harden.

- Fill all slots with putty material.
- ➲ The putty material should reach the end of the slots, but not protrude. The putty material can remain in the slots permanently.

- Insert the metal pins of the tooth stump models into the slots. It is of advantage, to insert the tooth stump models such that the buccal side faces outwards.

The prepared tooth stump models are mounted correctly like this:



Inserting the multiDie adapter

- Hold the multiDie adapter from the side.

- Place the multiDie adapter into the scanner such, that the flat side faces to the front of the scanner.

➲ The protrusions ("Ovals") on the underside engage with the recesses of the KaVo base plate.

➲ The multiDie adapter adheres to the magnet of the KaVo base plate.

➲ Check whether the multiDie adapter can be shifted easily. If this is the case, correct the fit until the multiDie adapter fits securely.

Removing the multiDie adapter

- Hold the multiDie adapter from the side, if necessary with both hands.
- Pull the multiDie adapter carefully upwards. A certain amount of force is required due to the magnetic attraction.

➲ The multiDie adapter is released from the KaVo base plate.

If the rotating axis is inadvertently moved during removal, switch off the scanner and software and restart the scan process again in order to return the axes to the home position.

Scope of delivery

Item	
Standard delivery unit	1
Description	Dental scanner with KaVo PROTAR® system plate
Ordering no.	0.870.0000

Standard items and replacement

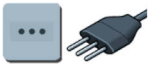
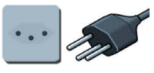
Item			
Standard delivery unit	1	1	1
Description	Standard object holder with knurled screw	multiDie adapter, fixing with adhesive pads	1 flexible object holder, large plate, fixing with adhesive pads
Ordering no.	0.870.0400	0.870.0402	0.870.0403

Item			
Standard delivery unit	1	2	1
Description	calibration model	Adhesive putty pads for fixing	Ethernet to USB Adapter
Ordering no.	0.870.0401	— (available in the office supplies)	0.870.0411

Item			
Standard delivery unit	6	1	1
Description	Power cables, plug types E+F, N, B, G, I, L*	USB-cable	Ethernet-Cable
Ordering no.	0.870.0406	0.870.0405	0.870.0404

Types of power cables

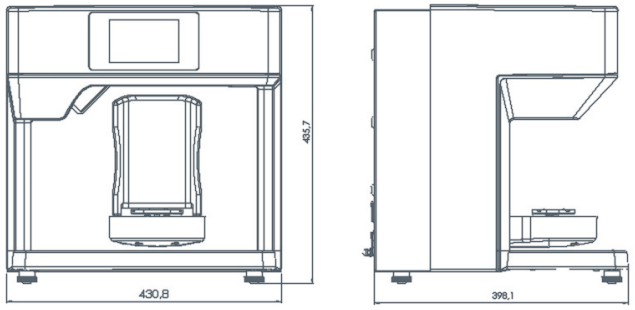
*Device plug type 3-pin plug for cold device (C 13), plug types for sockets to use in following countries (others possible):

Type E+F, CEE 7/7 (Hybrid) 	Germany, India, France, South Africa, Czech Republic, Poland, Turkey, Netherland, Norway, Denmark
Type B, NEMA 5-15, 3-pin 	USA, Canada, Japan
Type G, BS 1363 (Commonwealth) 	UK, Singapore
Type I, AS 3112 	Australia, China
Type L, CEI 23-50 (Italian) 	Italy
Type N, IEC 60906-1 	Switzerland

Technical data

Housing

Dimensions	431 mm width 432 mm height 398 mm depth



Weight	20 kg
Axes system	1 rotating axis 1 swiveling axis 1 z-axis, incl. status LED
Baseplate	KaVo Protar®
Colors	black-white
Protection Rating	IP 22

Temperature

Operating temperature	18°C - 30°C
Storage temperature	-5°C - 50°C

E-technology

Supply voltage	100 - 240 V AC, 50/60 Hz
Fuse	2 x T 1.6 A L 250 V
Power consumption	60 W max.
Connections	1 x Ethernet, 1 x USB, 1 x power
LAN	Ethernet S/FTP (PiMf), Cat 6 250 Mhz, RJ45 socket
USB	3.0
Touch display	Embedded PC with touch

E-technology

	display
Sensor technology	White stripe light triangulation
Color scanning	RGB lighting

Measurement

Resolution	2.8 Mpx	
Field	80 mm width 60 mm height 85 mm depth	
Accuracy according to ISO 12836	up to 4 µm	
Measuring speed complete jaw	Scan time	33 seconds
Measuring speed single tooth	Scan time	36 seconds
Measuring speed 3-unit bridge	Scan time	36 seconds

System requirements

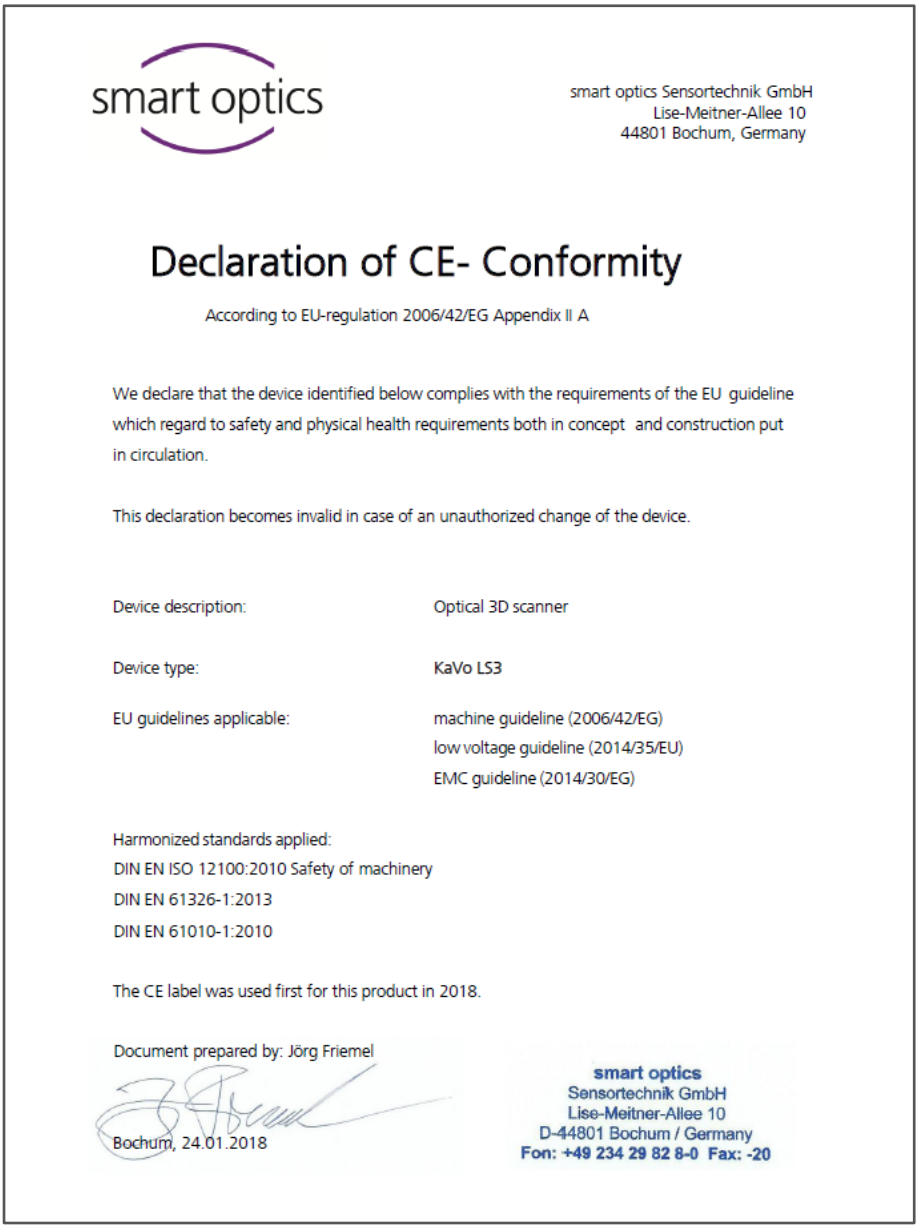
Recommended Scanner software	DTX Studio™ design

PC system requirements

Minimum	Windows 7 64-bit Quadcore CPU i3, 2.8 GHz 8 GB RAM USB 2.0 Port NVIDIA or AMD graphics card with 2 GB Video RAM 5 GB free hard disk space, more based on number of cases (dataset about 50 MB per case)
Recommended	Windows 10 64-bit Quadcore CPU i7, 3.2 GHz 16 GB RAM USB 2.0/3.0 Port NVIDIA graphics card with 2 GB Video RAM 5 GB free hard disk space, more based on number of cases (dataset about 50 MB per case)
Screen resolution	
Minimum	1920 x 1080 px
Recommended	1920 x 1200 px
Interfaces	USB 2.0 or 3.0 Ethernet (LAN)
Internet	Broadband connection with minimum 512 kbps upload speed

For further information please refer to the hardware requirements of the software.

Declaration of CE Conformity



smart optics

smart optics Sensortechnik GmbH
Lise-Meitner-Allee 10
44801 Bochum, Germany

Declaration of CE- Conformity

According to EU-regulation 2006/42/EG Appendix II A

We declare that the device identified below complies with the requirements of the EU guideline which regard to safety and physical health requirements both in concept and construction put in circulation.

This declaration becomes invalid in case of an unauthorized change of the device.

Device description:	Optical 3D scanner
Device type:	KaVo LS3
EU guidelines applicable:	machine guideline (2006/42/EG) low voltage guideline (2014/35/EU) EMC guideline (2014/30/EG)

Harmonized standards applied:
DIN EN ISO 12100:2010 Safety of machinery
DIN EN 61326-1:2013
DIN EN 61010-1:2010

The CE label was used first for this product in 2018.

Document prepared by: Jörg Friemel

Bochum, 24.01.2018

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Explanation of symbols

Symbols inside the device

Warning: Crushing of hands

To warn of a closing motion of mechanical part of equipment. Refers to the mechanical axes movements of the scanner.

Do not touch

To prohibit touching objects/parts of an object. Refers to the optical system of the scanner.

Symbols on the rear of the device

Warning: Electricity

To warn of electricity. Refers to electrical voltage inside the device.

Protective earth; protective ground

To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.

USB

USB connection.

Symbols on the type plate

SN **Serial number**

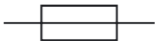
To identify the manufacturer's serial number, for example on a medical device or its packaging. The serial number shall be placed adjacent to the symbol.

Barcode

Coded consecutive serial number by the hardware manufacturer.

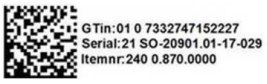
REF **Catalogue number**

Product reference and item number for ordering by the distributor.



Fuse

To identify fuse boxes or their location.



QR code

Code with severel informations.
GTin is a standardized global item number which identifies the item distinctively. SN and REF are included as well.

CE **CE mark**

Serves as a declaration to the authorities that the product complies with all valid European regulations and has undergone the specified conformity-assessment procedures.

RoHS **RoHS EU directive**

By CE declaration of conformity the device fulfils the EU directive for **R**estriction **o**f the use of certain **h**azardous **s**ubstances in electrical and electronic equipment.

EN 55011 Class A **EM labelling**
Electromagnetic compatibility according to industrial, scientific and medical high frequency equipment. The device is declared as "Class A".

Rx only **For prescription use only**
To show that the use of the device is restricted to healthcare practitioners.

Manufacturer
To identify the manufacturer of a product.

WEEE sign (Waste Electrical and Electronic Equipment)
To symbolize the compliance with the European Directive for the disposal of electrical equipment.

Operator's manual; operating instructions
To identify the location where the operator's manual is stored or to identify information that relates to the operating instructions. To indicate that the operating instructions should be considered when operating the device or control close to where the symbol is placed.

Caution
To indicate that caution is necessary when operating the device or control close to where the symbol is placed, or to indicate that the current situation needs operator awareness or operator action in order to avoid undesirable consequences.

Temperature limit
To indicate the maximum and minimum temperature limits at which the item shall be stored, transported or used.

Symbols on the carton label

This way up
To indicate correct upright position of the transport package.

Do not stack
To indicate that the items shall not be vertically stacked, either because of the nature of the transport packaging or because of the nature of the items themselves.

Fragile; handle with care
To indicate that the contents of the transport package are fragile and the package shall be handled with care.

Keep away from rain
To indicate that the transport package shall be kept away from rain and in dry conditions.

USA | Canada
Canada license exemption

Please note that not all products may have been licensed in accordance with Canadian law.

For Prescription Use Only. Caution: Federal (United States) law restricts this device to sale by or on the order of a clinician, medical professional or physician.

KV_0.870.0000_IFU_EN Rev 1-05.2018

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