



MICRO S AUTOMATIC

OPERATING MANUAL



UNITED
FELTS 
A VORTEX COMPANY

IMS
ROBOTICS

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REV. 08-01-2024



| Presented by

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1 Intended Use

The operational safety of the system supplied is guaranteed only if it is used as intended.

Intended use includes compliance with the regulations laid down in this operating manual and performance of all scheduled maintenance and service work.

The IMS milling machine MICRO S Automatic may be used only for the execution of milling work for the purpose of rehabilitating unpressurised pipes or lines. The device can be used to open inliners after renovation and remove obstacles (roots, protruding seals, small misalignments, etc.). The machine may not be used for any other purpose.

Unauthorised structural changes to the system can lead to damage to the machine and pose a danger to persons. IMS shall not be liable for any resulting damage. In the event of damage, responsibility remains with the operator and cannot be transferred to IMS.

2 Operation

2.1 General Information

The IMS milling machine MICRO S Automatic is a device for the execution of milling work for the purpose of rehabilitating unpressurised pipes or lines. The device can be used to open inliners after renovation and remove obstacles (roots, protruding seals, small misalignments, etc.).

In order to operate and deploy the IMS milling machine MICRO S Automatic, the nitrogen filling equipment and the necessary media must be provided. The milling machine consists of the following assemblies:





NUMBER	COMPONENT
01	Monitor
02	Control unit in case
03	Hose package
04	Water equipment
05	Cutter drive
06	Camera
07	Milling motor

The serial number of the device is located on the frame.



All assemblies, except the monitor and the control unit in the case, have a degree of protection of at least IP54.

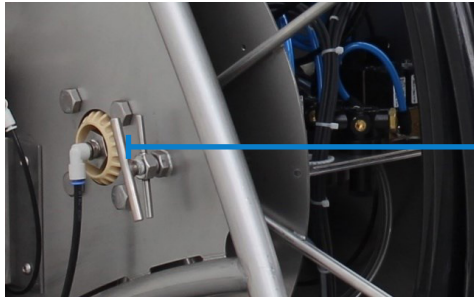
This means that the assemblies are protected against:

- Access with a wire
- Dust
- Splash water on all sides

Power supply: 100–240 VAC, 50/60 Hz, maximum 1.6 A
Supply air: Free of dirt (particles < 5 micrometres)
 Temperature range 5°C to maximum 40°C (41°F to maximum 104°F)
 Residual water separated
 Residual oil < 5 mg/m³
 Supply pressure 145 psi (10 bar)
 min. flow rate 1 m³/min (35 CFM)

2.2 Deployment

- The operator must verify that all assemblies, accessories and media are correctly in place.
- Transport of the milling drive and the frame to the desired working place.
- Release manual brake.



Manual brake

- Unroll the hose package from the drum. The hose package may not be pulled over sharp edges and must not be bent during transport.
- Remove the cover caps from the coupling of the milling drive and that of the hose package.



If necessary, attach extensions for 8 - 12 in (DN200 - 250) and screw on using clamps. The extensions are to be mounted so that the longer runners point forward at the front bladder and rearward at the rear bladder.



Plug together and connect the milling drive to the hose package by means of a bayonet joint.



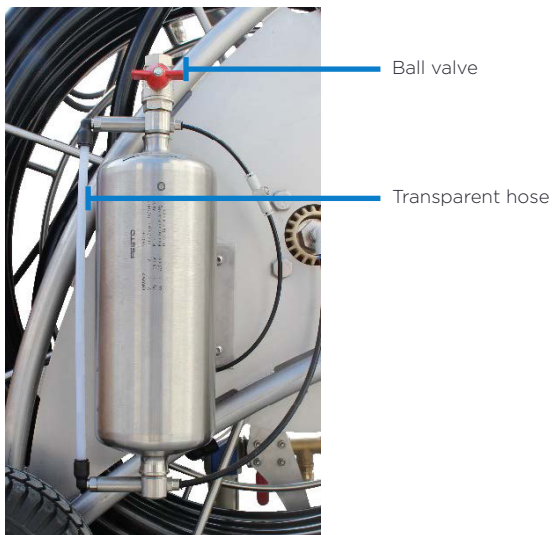
Check the required milling tool for imbalance (e.g., missing cutting edges) After successful inspection, mount the milling tool (see Section 2.8.2 *Change Milling Tool*).



CAUTION

Damaged tool extensions, wire brushes or other tools that have not been adapted to the device can cause serious damage to the device.

- If necessary, fill the water tank on the drum with distilled water (air shut-off valve on the frame must be closed). Open the ball valve on the water tank, fill the tank and close the ball valve again. The filling level is displayed in the transparent hose on the water tank.



CAUTION

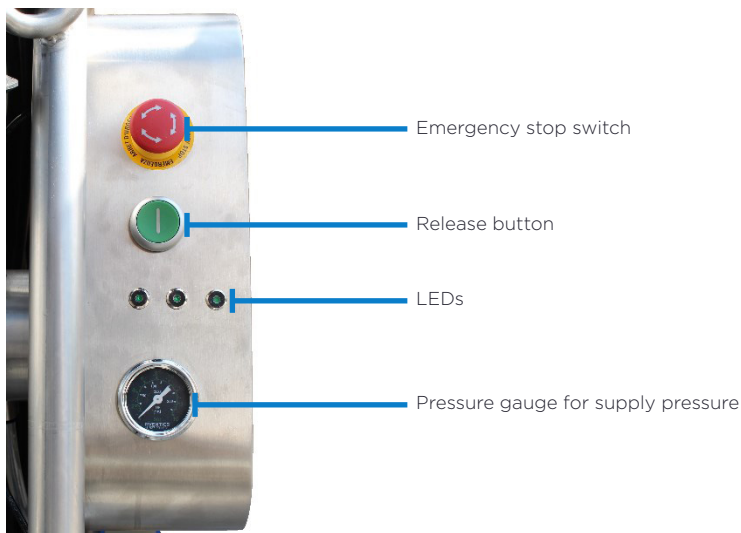
Do not bend over the filling opening when opening, since there may be pressure in the tank.

EXTERNAL MONITOR

If an external monitor is connected to the control panel, make sure that protective separation is not rendered ineffective by connecting the ground to the PE protective conductor.

Therefore, when connecting an external monitor with its own power cord, either

- the video connecting cable must be connected via a video isolating transformer or
- the monitor must be operated by plugging its power cord into a protective isolating transformer
- Connect the drum to the power supply. All 3 LEDs (green) on the drum to the left under the emergency stop switch must light up. Otherwise, one of the power supply units is defective (contact service department), the supply line is damaged or de-energized.
- Check whether the emergency stop switch on the cable drum is pressed. If yes, unlock.

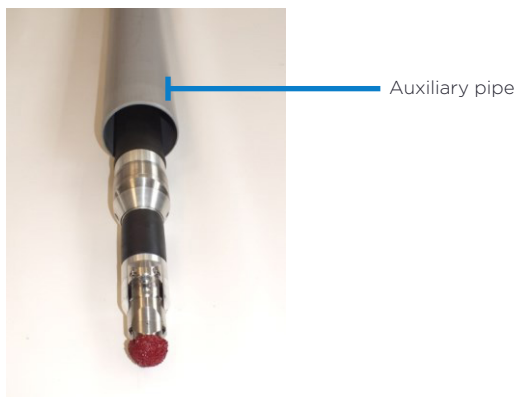


- Release the system with the release button.
- LED ring on the camera must light up.
- Connect the supply line from the compressor to the claw coupling on the frame.
- Insert the milling drive into an auxiliary pipe (4 - 6 in (DN100 - 150)) or correspondingly larger when using the extensions, approximately 1.5 m long).



CAUTION



Commissioning without an auxiliary pipe can lead to injuries and destruction of the tensioning bladders!



- Switch on compressor.

**CAUTION**

Put on or use hearing protection.

- Switch on air motor switch and check function.
- Switch off air motor (stop).
- Using the right joysticks on the control unit, check the turning function (turn to the left and right) and the articulation (move up and down).
- The rotation speed can be adjusted by means of a selector switch on the control unit (for this purpose, turn the right joystick to the left and right and set the desired rotation speed on the turn switch).
- Check the function of the front and rear tensioning bladders one after the other using the switch on the control unit. For this purpose, press the switch for the front bladder and wait until the bladder has tightened. When tensioning occurs, switch to release, wait until bladder has released and repeat procedure for rear bladder.
- Check axial feed. For this purpose, tighten the rear tensioning bladder and then actuate the left joystick or switch for axial feed ( tighten) — the milling machine must move back, then tighten the front bladder, release the rear bladder and completely extend the axial feed again with the left joystick or switch  (the hose package must also move back in the pipe).
- In order to check the compressed air tightness of the IMS milling machine MICRO S Automatic, first completely remove the nitrogen from the device. The nitrogen valve is located on the front side of the rear tensioning bladder. The nitrogen valve is covered by a moulded part mounted at this place. This moulded part must be unscrewed for inspection or filling.
- Now use a suitable tool (e.g., a small screwdriver) to press the nitrogen valve until there is no more nitrogen in the milling drive. Push the milling machine into a pipe [maximum 6 in (DN150)] up to the end of the tensioning unit. Switch on compressor and air and let the milling motor run for approximately 5-10 minutes. Switch off the milling motor and immediately press the valve with a small screwdriver. If air escapes, the milling machine is not airtight and must be taken to the service station. Otherwise, fill the milling machine with 11.6 psi (0.8 bar) nitrogen and screw on the valve cap.
- After successful testing, completely release both bladders and remove the milling drive from the pipe.

**CAUTION**

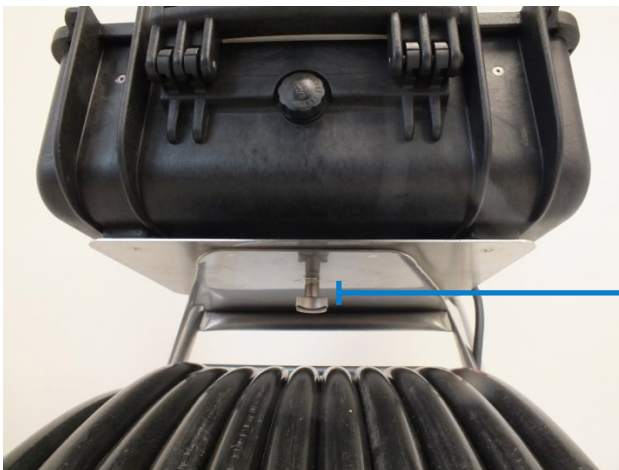
Lack of nitrogen leads to the destruction of the IMS milling machine MICRO S Automatic.

2.3 Control Case

The control unit is mounted in a sturdy transport case.



The control case can be turned and removed. In order to remove the control case, the fixing screw on the retaining plate below the case must be loosened. Then pull the control case slightly upwards and turn it (approximately 90°) until the control case can be removed.

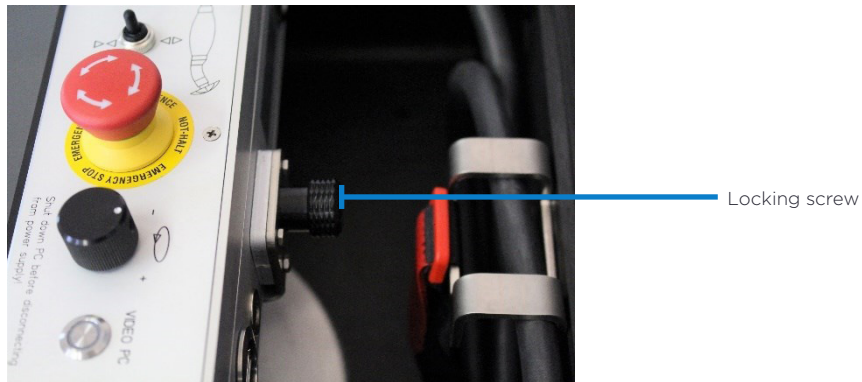


Fixing screw

The operation can be carried out either via the control case or separately. To do this, loosen the retaining screws of the cable bushing and remove the upper part of the cover.



Remove electrical connections between controller and monitor. Then remove the locking screw on the controller and pull the controller forwards. The controller is now unlocked and can be removed from the case.



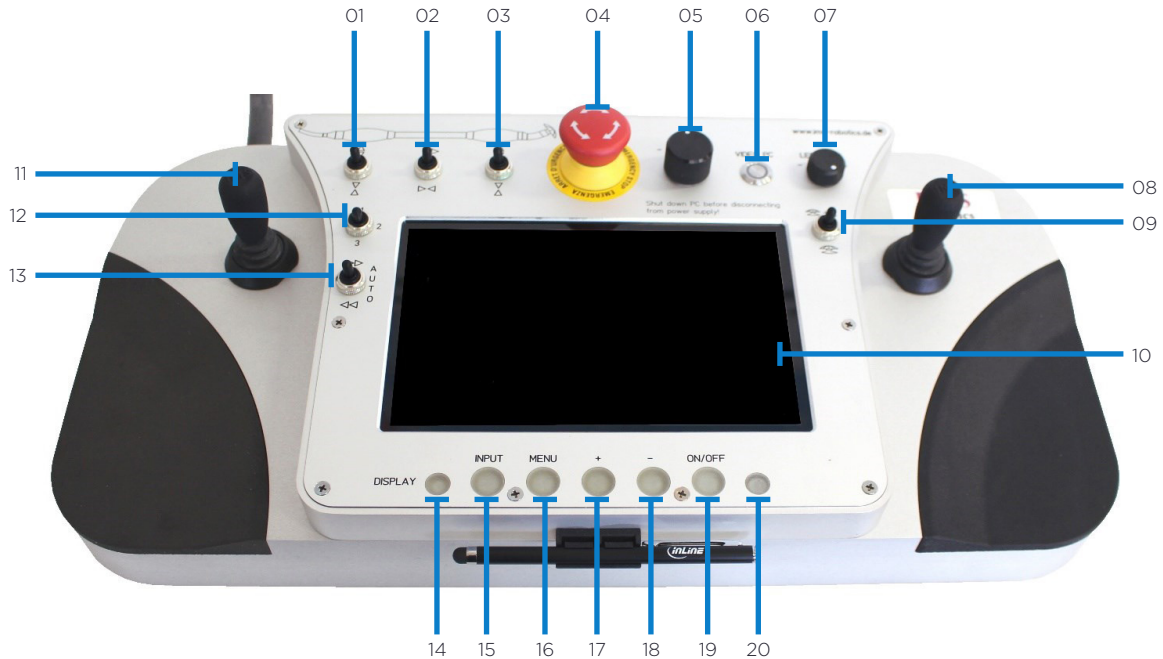
2.3.1 Overview of Connections and Operating Elements on Control Case

BACK



NUMBER	COMPONENT
01	Analogue video signal BNC
02	Power supply for monitor in case cover
03	2x USB connection for separate keyboard, computer mouse or mass storage
04	Connection cable to the cable drum

FRONT



NUMBER	COMPONENT	NUMBER	COMPONENT
01	Rear tensioning bladder switch	11	Joystick axial feed
02	Axial feed switch	12	Automatic mode switch
03	Front tensioning bladder switch	13	Switch to select nominal diameter
04	Emergency stop switch	14	Status light of monitor
05	Potentiometer rotation gear	15	Video source HDMI
06	Video PC on/off button	16	View monitor menu
07	Adjustable camera lighting	17	To move in the monitor menu
08	Turn and swivel joystick	18	To move in the monitor menu
09	Milling / stop / milling + water	19	Monitor on/off
10	Touch monitor	20	Infrared for monitor control

The middle position (stop) of the switches for the front and rear tensioning bladders fix the current pressure and thus the current position.

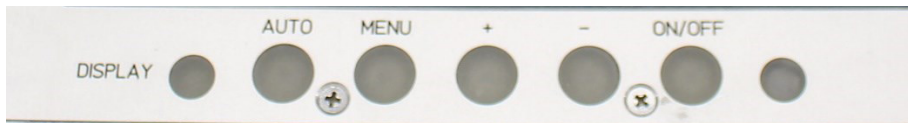


2.3.2 Operation Touch Monitor with Video Software

2.3.2.1 Monitor

The controller has a built-in touch monitor. All necessary settings are preset. If necessary, the settings can be changed with the buttons on the controller.

The monitor has a separate operating manual.



2.4 Video Software

2.4.1 Starting the Video Software

The IMS video software has a recorder and player function, a function for taking photos and recording data.

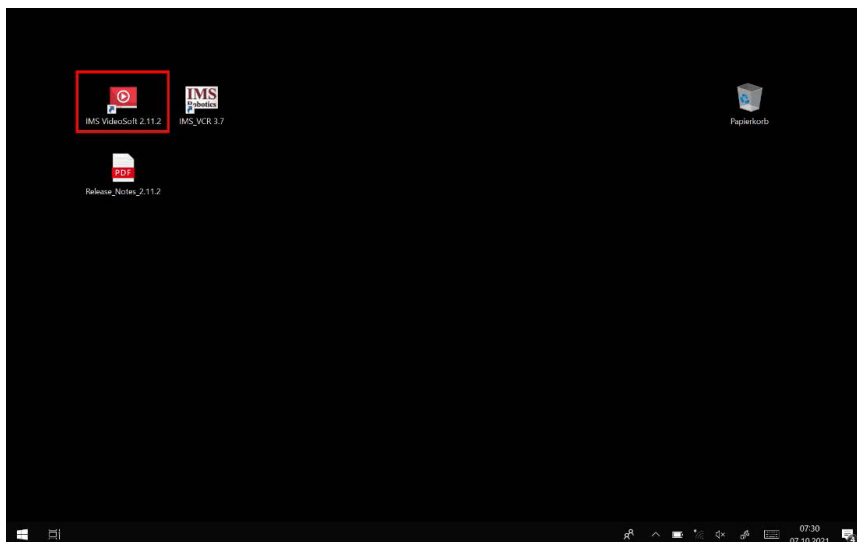
The IMS video software is supplied with the IMS MICRO S Automatic.

The video software is pre-installed on a Mini PC, which is installed in the controller.

In order to start the video PC, press the corresponding button on the controller for approximately 3 seconds. The button is then illuminated in green.



When the monitor and video PC are turned on and booted, the following desktop screen appears:

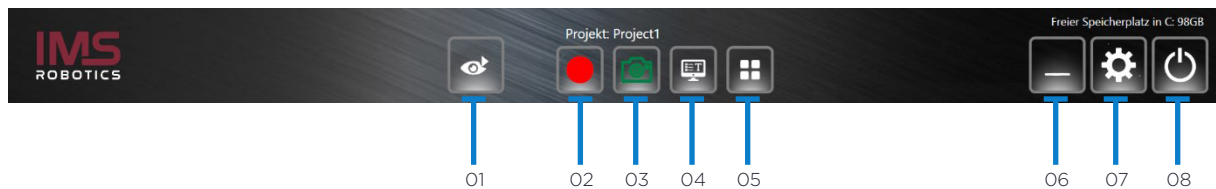










The video software is started with a double click via the button .

The following screen appears:




2.4.2 Overview of the Individual Buttons in the Footer Bar

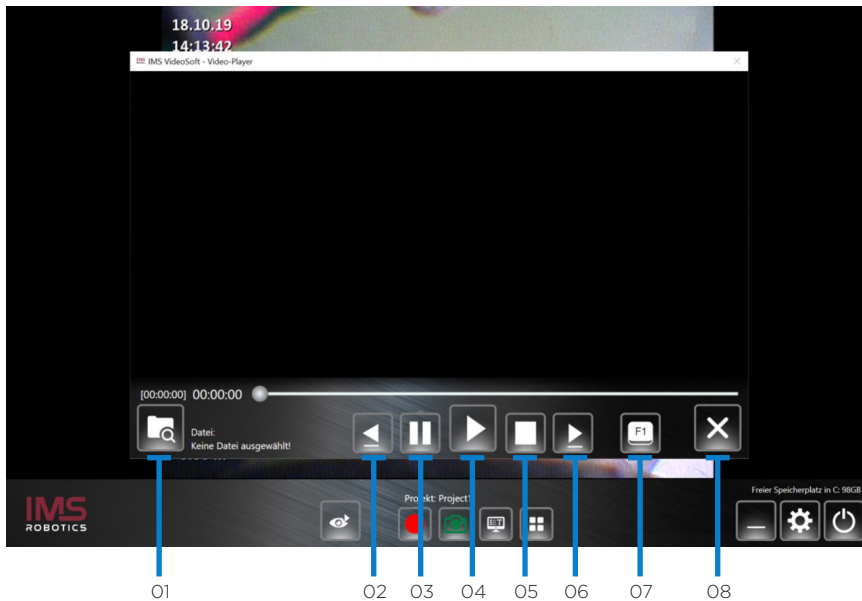


NUMBER	BUTTON	OPERATION
01		Use the “Video player” button to open the video player. (see Section 2.4.3.1 <i>Video Player Menu</i>)
02		Press the “Record” button to start video recording. The button turns blue.
03		Pressing the button creates a photo of the screen display.
04		Press the button to open a submenu at the upper left edge of the screen. This allows the date, time and a company logo to be displayed.
05		Press the button to open a submenu at the upper right edge of the screen. The meter counting of the cable drum can be set to “zero” here. This function is only active if an optional meter counter is installed.
06		Press the button to minimize the program and place it in the footer bar of the desktop.
07		Press the button to open the “Settings” submenu.
08		Press the button to terminate the program.









2.4.3 Explanation of the Individual Buttons

2.4.3.1 Video Player Menu


Use the video player button  to start the video player. It is used to play back recorded video files and also to view image files. After pressing the button, the following screen opens:

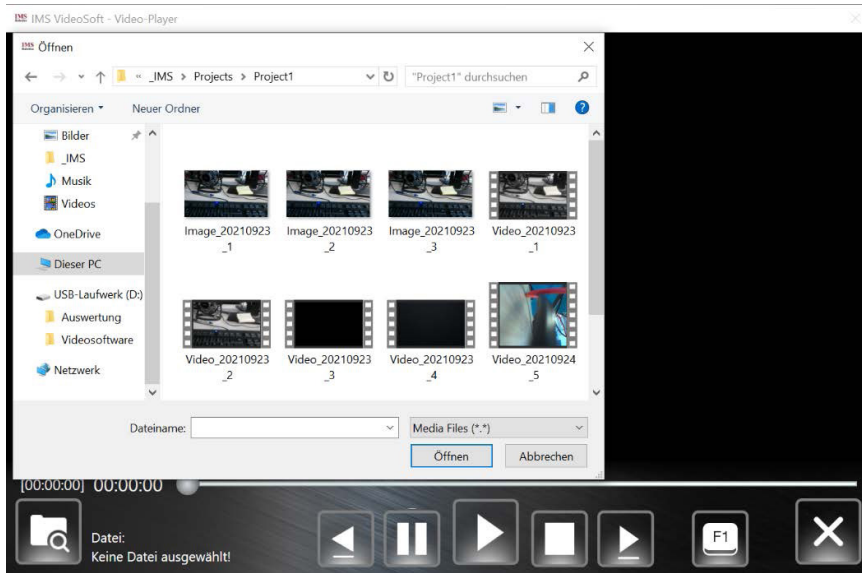


The video player has the following buttons:

NUMBER	BUTTON	OPERATION
01		The button opens the “Window Explorer” of the Mini PC. The video files and image files are stored there.
02		Pressing the button skips 5 seconds back in a current video playback.
03		Press the “Pause” button to pause the video recording. The button turns blue.
04		Press the “Play” button to start video recording. The button turns blue.
05		Press the button to stop playback.
06		Press the button to jump 5 seconds forward in a current video playback.
07		Pressing the button opens a submenu. The keyboard shortcuts for video control are explained here.
08		Press the button to terminate the program.

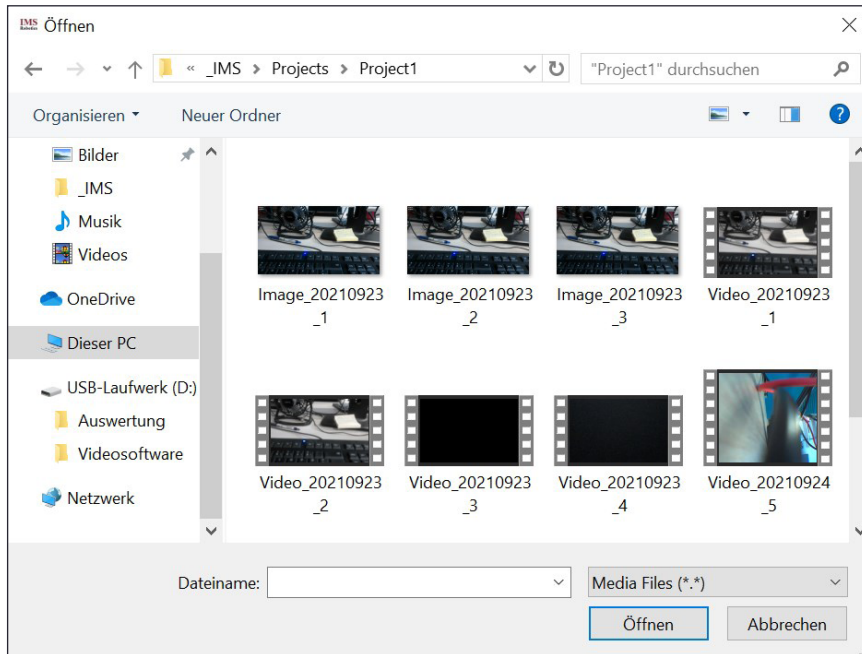
2.4.3.2 Loading and Playing a Stored Video or Image File

Press the “Open” button  to open the “Window Explorer” of the Mini PC.





The files are stored under “windows (C:) > Projects”. The “Projects” folder contains all the project folders you have created yourself (see Section 2.4.9.1 *Basic Settings*). Double-click to select a project folder.

This folder now contains all video and image files that were created for this project.



Double-click on the desired file to load it into the video player.

The loaded video file can now be started using the  button. The button is now displayed in blue. Pause playback with the pause  button. When the “Pause” button is pressed, the symbol is blue. You can move forward and backward in the video file using the grey dot in the playbar. To do this, touch the grey dot on the



Touch Monitor. The grey dot can now be moved to the right and left. If an external computer mouse is connected, it can also be used for this purpose.

The and buttons can be used to jump in the video in 5 seconds steps. If an external keyboard is also connected, further options for video playback are available.

Pressing the button opens a submenu. The keyboard shortcuts for video control are explained here.

Playback can be stopped via the “Stop” button . The button turns now blue.

2.4.4 “Record” Button

Press the “Record” button to start video recording. The button now turns blue . Press this button to stop video recording.

2.4.5 “Functions” Button

Press the “Functions” button to display another menu at the top right edge of the screen .

2.4.6 “Camera” Button

Press the “Camera” button to create an image file. The button changes color briefly. To view this file, see Section 2.4.3.2 *Loading and Playing a Stored Video or Image File*.

2.4.7 “Text Overlays” Button

Press the “Text Overlays” button at the top left edge of the screen to display a submenu.

<input checked="" type="checkbox"/> All	If a check mark is set in the “All” field, the time, date and a text (e.g., address of the construction site) defined in the “Settings” menu (see Section 2.4.10 <i>Text Overlay</i>) are displayed.
<input checked="" type="checkbox"/> Date (Screen 1)	If a check mark is set in the “DT” field, only the time and date are displayed.
<input checked="" type="checkbox"/> Time (Screen 1)	If a check mark is set in the “Add” field, a text (e.g., address of the construction site) defined in the “Settings” menu (see Section 2.4.10 <i>Text Overlay</i>) is displayed.
<input checked="" type="checkbox"/> Text (Screen 1)	A company logo can also be displayed.
<input type="checkbox"/> Logo	To do this, press the “Search Logo” button. Windows Explorer will open. Browse here for the location of the logo and load the image file.

The image file must be an ICO file.

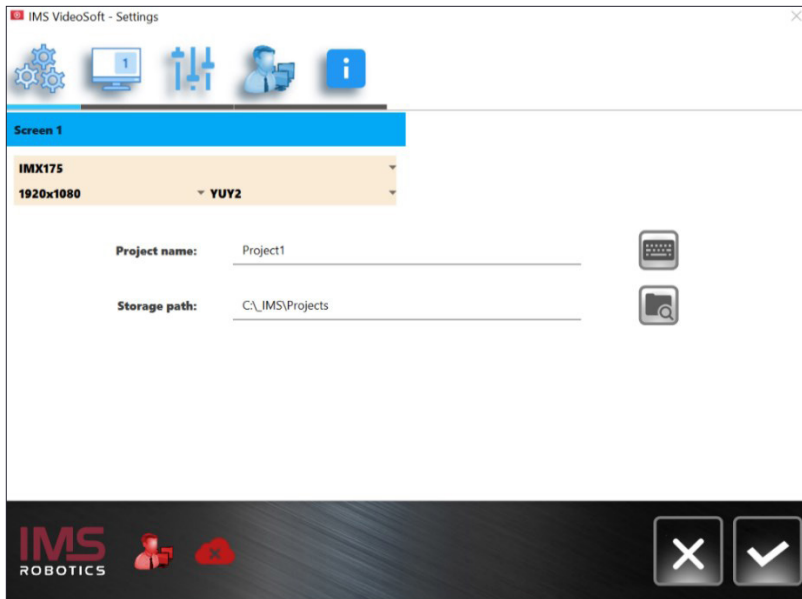
2.4.8 “Minimize” Button


Press the “Minimize” button to minimize the program and place it in the footer bar of the desktop. Click on the button there to reopen the program.

2.4.9 “Settings” Button

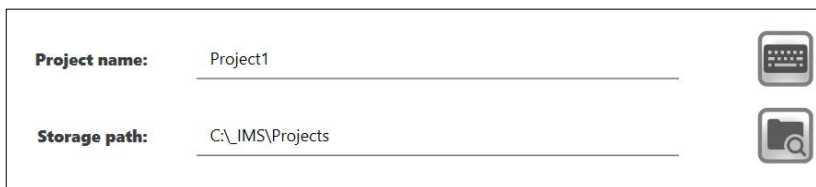
2.4.9.1 Basic Settings


Press the “Settings” button  to open the settings menu.



You will first be taken to the  page where various basic settings are made.



Most fields are predefined by the manufacturer of the system. Only the fields “Project name” and “Set the Path” are of general interest on this page.




New projects can be created in the “Project name” field. Image and video files are then stored under this name. Press the button for the virtual keyboard  to make entries. The virtual keyboard now opens. You can also make entries via an external keyboard.

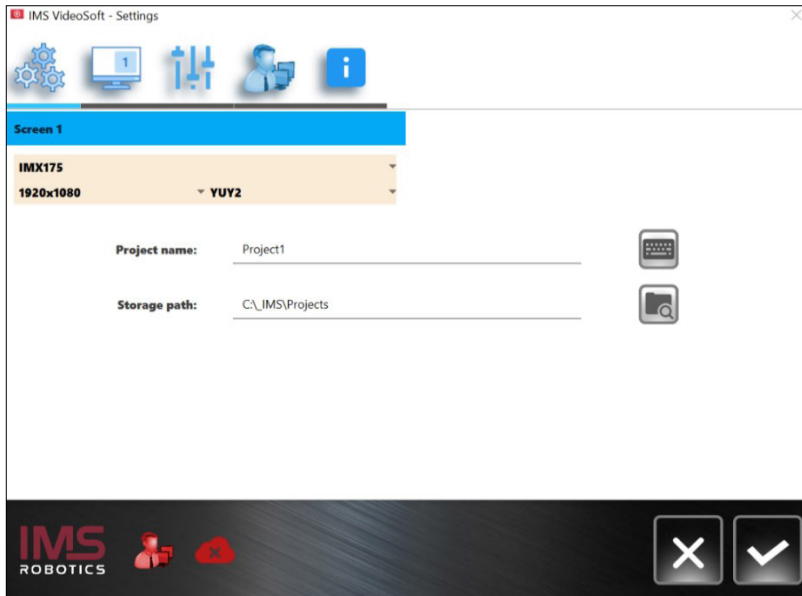
Press the “Save” button  to confirm the entry.

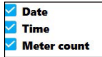
The file path under which the projects are saved is defined in the “Set the Path” field.

For this, press the “Browse” button . This will open Windows Explorer and you can define a folder for storing the projects. If no path is selected, the projects will be stored in the path C:_IMS\Projects. You can select using the touch function of the monitor or a separately connected keyboard and computer mouse. Finally, press the “Save” button  to confirm the entry.

2.4.10 Text Overlay

Press the “Text overlay” button  to open a menu in which overlays can be defined and in which text can be written.



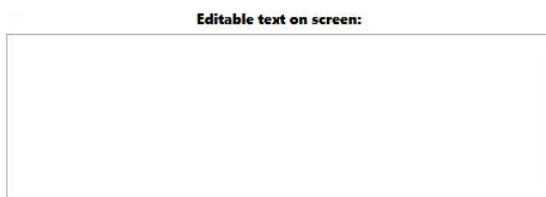
If a check mark is set in the “Date” and “Time” fields , the current date and time are displayed at the top left edge of the screen.


You can make entries using the touch function of the monitor or with an external keyboard.

Finally, press the “Save” button  to confirm the entry.

To write text, click in the field provided using the touch function.


The virtual keyboard will now open.

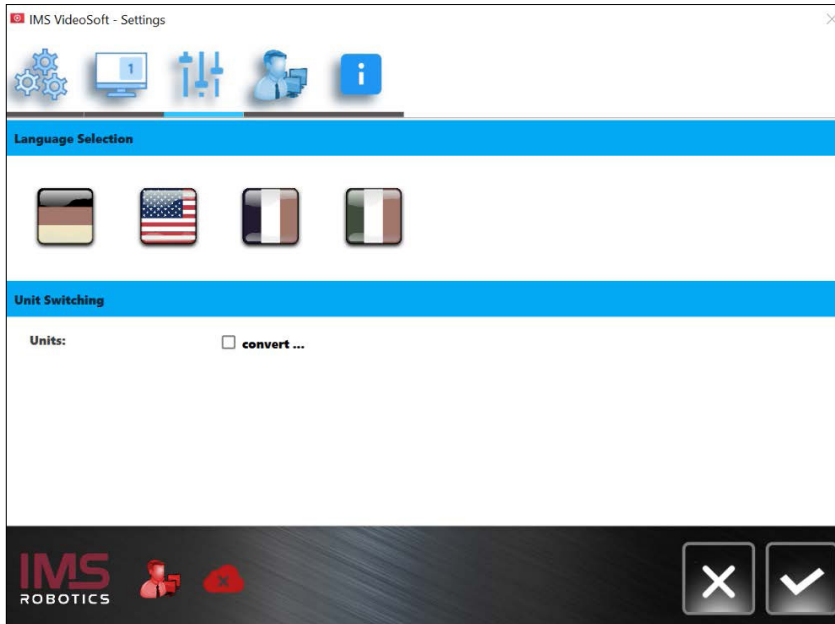


You can write the text. You can also enter text via an additionally connected keyboard. Finally, press the “Save” button  to confirm the entry.


2.4.11 Select Language and Unit

Press the “Select language”  button to open the language selection menu.


Furthermore, the units of measurement can be changed from metric to imperial here. The metric system is preset. By ticking the “convert” field, we switch to the imperial system of measurement. The entry must then be confirmed .



2.4.12 Service Menu

Click on the “Service menu” button  to open the service menu. This is a password-protected menu and can only be accessed by service technicians of IMS or authorised service centers.

2.4.13 Information Menu

Click on the “Information menu” button  to open an information page with all contact details of IMS.



2.5 Meter Counter (Optional)

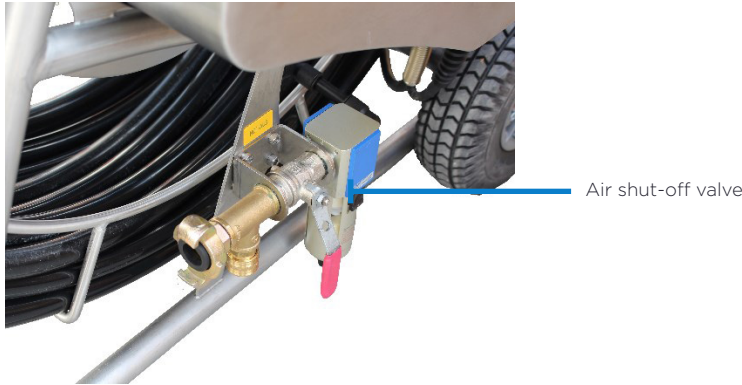
By counting the meters, the distance pushed can be displayed on the video software. Even with a precise adjustment, the meter count only serves as a rough guide and is not suitable for measuring branches for liner rehabilitation.





2.6 Operation of IMS Milling Machine MICRO S Automatic

- Carefully insert the milling drive into the pipe
- If milling articulation, tensioning bladders and axial feed are to be used, open the air shut-off valve on the frame.



- Push the milling drive with hose to the place of use. When pushing through bends, turn the milling head in the direction of curvature of the bend using the joystick and then lift the cutting head so that the bends can be pushed through without the application of force. For new pipes, rub the milling robot with water-based lubricant if necessary. Remove any folds in the linked pipes before pushing through.
- If pushing without feed support is no longer possible (e.g., in rising pipes, bends, branches), the IMS MICRO S Automatic milling machine can be used to conveniently switch to automatic mode. The automatic mode can be used only with constant camera observation (see Section 3.2 *Special Regulations*). Furthermore, the switches for the tensioning bladders must be in the stop position. First, the corresponding nominal width must be set using the selection switch (see table below). This switch controls the inflation or deflation times for the front and rear tensioning bladders. The following approximate nominal width allocation applies:

SWITCH POSITION	NOMINAL WIDTH
01	4 in (DN100), 8 in (DN200)*, 10 in (DN250)* (DN200, DN250 with extensions)
02	5 in (DN125)
03	6 in (150DN)

- The automatic mode switch, which allows three positions (forward/OFF/reverse), can now be set to forward (or reverse when moving back). After a few seconds, the milling machine starts to move forward or backward. The tensioning and releasing of the bladders and the extension and contraction of the axial feed are fully automatic and endless. In this way, longer distances can also be covered.
- If both switches for the tensioning bladders are in the release position, both bladders are released after automatic mode has been switched off. This can cause the milling machine to fall down, especially in vertical pipes. Therefore, the 2 switches for manual mode must be set to the stop position after automatic mode has been switched on.
- The control unit does not store the time when the automatic mode is switched off. In order to have a defined point, it is advisable to remain in automatic mode under camera observation until the forward or backward movement of the milling head is immediately completed, i.e., no more movement takes place. Now the rear bladder is always tightened and the front bladder is released. The axial feed has moved apart by the previous forward movement and contracted by the previous backward movement. You can now continue working manually from these defined states.
- Position at milling point without pipe contact of milling tool.

- Switch on the front tensioning bladder and wait for approximately 10 seconds until the bladder has tightened.
- Switch on switch for milling motor.
- Work away material to be removed by slow turning and swivelling.
- By means of axial feed, the milling machine can now be moved forward by a maximum of approximately 4 in (100 mm):
 - a) Forward movement: Pull axial feed together, tighten rear bladder, move axial feed apart briefly (milling machine cannot move forward because both bladders are tightened), release front bladder slightly until milling machine moves forward, move axial feed apart until desired milling position is reached.
 - b) Backward movement: tighten rear bladder, release front bladder, pull axial feed completely together, tighten front bladder, pull axial feed briefly apart (milling machine cannot move forward because both bladders are tightened), slightly release front bladder until the cutting machine moves forward, pull axial feed completely apart until the original milling position is reached again, now the axial feed can be pulled together during milling.
- The axial feed can also be used to navigate bends.
- If the camera lens is dirty, the window can be cleaned by moving the milling head to a free position and activating the “Milling with window cleaning” switch.

2.7 Finishing the Work

- Ensure cutting head is in straight position.
- If the tensioning bladders are released and the axial feed is extended, pull the milling drive with hose out of the pipe.
- Insert milling drive into auxiliary tube.
- If there is a risk of frost, drain distilled water completely. For this purpose, first close the air shut-off valve. The system is vented via an air shut-off valve. Carefully open the ball valve on the water tank (do not bend over the ball valve). Then remove the transparent water hose from the tank and let the water run out or collect it. When the tank is empty, reconnect the hose to blow out any residual water. For this purpose, close the ball valve on the tank, open the air shut-off valve on the drum (milling air), actuate the switch for window cleaning and let the milling motor run in the auxiliary pipe until only dry air emerges from the water nozzle on the milling drive. Switch off the window cleaning switch.
- Let the air motor run for approximately 20 seconds with the milling tool in order to blow out water residues from the milling motor.
- Close the air shut-off valve on the drum so that the milling machine and water tank are completely depressurised.
- Switch off air motor, dismantle and store in a dry place until next use.
- Clean milling drive with camera and hose package. (see Section 4.1 *Cleaning and Transport*)
- Separate the milling drive from the hose package by opening the bayonet joint.
- Secure hose package with cover caps against damage and store straight.



- Wind the hose package in the drum and secure it with the manual brake.



- Store frame and milling drive safely in the vehicle. Do not bend any bladders of the milling drive.
- Pack the control unit and accessories.
- The complete frame must be secured against damage during transport.

2.8 Milling Tools







In order to operate the milling machine, we recommend using the original IMS milling tools. These have been developed in conjunction with the device to ensure the longevity and reliability of the device.

The original IMS milling tools meet the requirements with regard to quality, stability, concentricity and, above all, the design properties.

Tool extensions, wire brushes or other tools not adapted to the device (or any other tools) can cause damage to the device.

2.8.1 Overview of Milling Tools

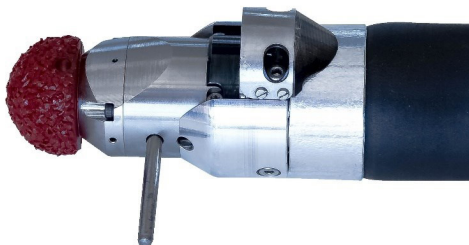
Original IMS milling tools for the IMS milling machine MICRO S Automatic:

PHOTO	ITEM NO.	NAME	USE FOR
	015 01 134	PK Diamond ball milling cutter transparent D40 4 blades	Plastics (PVC, GRP, felt liners, etc.), roots
	015 01 126	PK Diamond hemispherical milling cutter D40	Plastics (PVC, GRP, felt liners), roots
	015 01 127	Diamond hemispherical milling cutter D40	Concrete, stoneware
	015 01 144	Diamond Inlet milling cutter D40	Concrete, stoneware
	015 01 128	Carbide granulate hemispherical milling cutter D40	Lime, roots, plastics
	015 01 129 (only on request, no in-stock items)	Diamond granulate hemispherical milling cutter D40	Post-processing (removal of film residues, etc.)

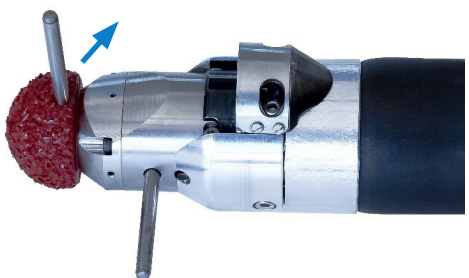
Further milling tools are also available.

2.8.2 Change Milling Tool

The supplied pins (diameter 5 mm) are used to remove the milling tool. A pin is used to fix the rotor to the housing by means of the hole provided.



The second pin is used to loosen the milling tool (according to the direction of the arrow).



The tool is assembled in reverse order.



2.9 Recovery of the Milling Machine in the Event of a Fault

Under certain conditions, it is no longer possible to pull the milling machine out of the pipe when the tensioning bladders are tightened, or to empty the axial bladder and the cutting head articulation.

These incidents occur in the following cases:

- Defective control unit
- Defect in the electrical system of the milling machine
- Defective directional valve(s) in the cable drum
- Power supply failure
- Supply air failure

In such a case, the tensioning bladders, the axial bladder and the articulator must be emptied manually. In order to empty the tensioning bladders and the axial bladder, the air hoses must be disconnected from the hose package to the pressure reducer. The valves and pressure reducers are located inside the cable drum. In order to release, press the black retaining clip on the pressure reducer or directional valve and pull out the hose.

From the hose package, trace the black air hoses and disconnect from the appropriate pressure reducer. The pressure reducers are numbered and assigned as follows:

- 1 Directional valve 1 Articulation
- 2 Pressure reducer 2 Front tensioning bladder
- 3 Pressure reducer 3 Rear tensioning bladder
- 4 Pressure reducer 4 Axial feed

3 Safety Regulations

3.1 General Regulations

1. The accident prevention regulations (UVV/BGV A-D) must be observed when operating the device.
2. The device may be operated only by persons who have been instructed in its use and who have studied this operating manual completely. Inadequate knowledge can cause damage to the device or danger to the operator.
3. When lowering the MICRO S Automatic IMS milling machine into shaft structures, it is forbidden for persons to be in the shaft or under the suspended load.
4. The accident prevention regulations for working in pipelines, earth-moving machines, winches, lifting and pulling equipment and the safety regulations for pipeline construction work must be observed.

3.2 Special Regulations

1. The milling motor may not be put into operation without a milling tool. Operation without or with other milling tools that have not been adapted may result in destruction of the milling drive.
2. Compressed air must be able to escape when milling pipes with closed ends. For example, you can carry a push rod parallel to the bladder. However, the tube eel must not collide with the milling articulation.
3. When the milling motor is switched on, the milling motor starts turning immediately. Never reach into the milling tool. It is also not permitted to stop the milling tool with the foot or with aids.
4. When inflating the tensioning bladders, do not reach between the bladders and the pipe wall.
5. The turning of milling head is realised by an electric drive. Turning the rotating drive by hand is not permitted, since this can lead to a defect in the gear unit.
6. Checking the nitrogen tightness is one of the most important tasks when operating the system and must be carried out daily. The manufacturer disclaims any warranty for moisture damage if the damage cannot be inspected at the service workshop within 3 days of occurrence at the latest.

7. The IMS milling machine MICRO S Automatic must not be operated outdoors without an auxiliary pipe. In addition, the tensioning units may not be located in front of an open branch/connector.
8. The ball valve for filling or draining distilled water may be opened only when the switch for water is switched off and the air shut-off valve is closed and must be carried out with extreme caution as the water tank is under pressure. Never bend over the ball valve.
9. Only distilled water should be used for cleaning the camera.
10. Distilled water may not be drunk.
11. If both tensioning bladders are tightened, the axial feed may not be fully actuated. Short actuation to move apart to determine free movement in the pipe is permissible.
12. The milling drive may not be used without a camera.
13. The air motor of the IMS milling machine MICRO S Automatic may be operated only with hearing protection.
14. The water and air hoses are designed for maximum 145 psi (10 bar) It is not permitted to use hoses other than those approved by IMS.
15. In order to ensure safe operation and to minimize damage to the device, an annual inspection of the system by IMS or an authorised service partner is recommended.

4 Maintenance and Repair

4.1 Cleaning and Transport

The IMS milling machine MICRO S Automatic must be cleaned externally after each use. Do not use high-pressure equipment.

The IMS milling machine MICRO S Automatic must be transported in the corresponding frame.

The milling motor must be unscrewed, dismantled (see photo), cleaned (without oil or grease, maximum with Ballistic oil) and stored in a dry place using the four hexagon socket screws at regular intervals (recommended weekly) or if it is not to be used for a longer period of time.



It is screwed together again at the latest before the start of the next milling operation. (see Section 5.2.2 *Disassembling and Reassembling the Air Motor*) Do not leave the motor screwed together for a long time, since water residues in the hose can lead to corrosion, which can seriously damage the air motor.

4.2 Care and Maintenance

Regular check of the media supply lines to the IMS milling machine MICRO S Automatic and the hose package by means of visual inspection is mandatory. Damaged and kinked hoses lead to water entering the milling machine and thereby to the destruction of electrical components and the corrosion of mechanical components.

Damaged media supply lines or hose packages must be replaced. A temporary repair of the damaged areas with insulating tape or similar endangers the operational safety and is not permitted.

Oil-free operation of the milling machine leads to wear of the ball bearings and blades of the air motor. These can be purchased as spare parts from the manufacturer and replaced independently. Wear is indicated by increased axial play of the bearings, “hooking” of the air motor when switching on, reduced milling performance or stress marks in the motor housing.

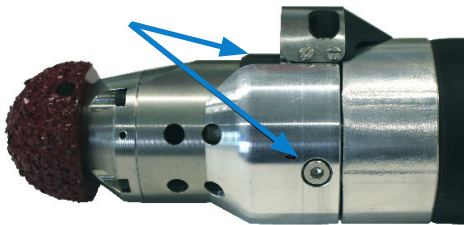
This maintenance work is required regularly and is not covered by the manufacturer’s warranty.

The air feed-through and electrical rotary feed-through in the hub of the drum are maintenance-free.

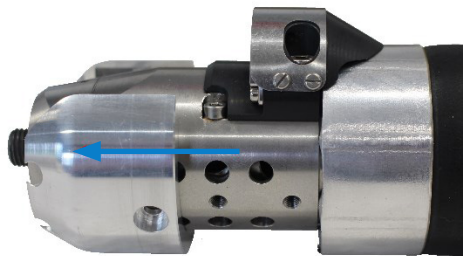
4.2.1 Cleaning the Camera Cleaning Ring

In order to prevent unnecessary soiling of the camera during work, it is advisable to dismantle and clean the camera cleaning ring every week. To do this, proceed as follows:

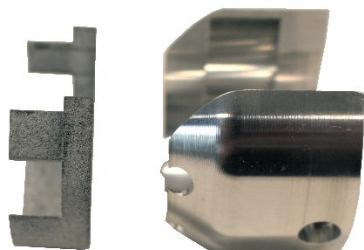
First remove the two Allen screws M4 x 6.



Then push the cleaning ring forwards in the direction of the arrow and remove it.



There is a moulded plastic part inside the groove in the cleaning ring. Remove this and clean all parts thoroughly.



The assembly is done in reverse order.



4.3 Pressure Monitoring

4.3.1 Function Check

The pressure monitoring function must be checked before each use.

Procedure:

If necessary, couple the milling drive with the hose package

Connect the controller

Connect the supplied power cord to the power supply (LEDs on cable drum must light up). The controller loads the program (approximately 20 sec.), then activate the green release button. An automatic status check is now performed. If pressure monitoring is OK, the light on the milling drive blinks twice, 10 seconds after the “Release Button” is pressed.

If the function check is unsuccessful, it shall be assumed that the monitoring is defective. Defective monitoring can cause serious damage to the robot, as leaks are not indicated. Contact the service workshop.

4.3.2 Pressure Monitoring Operation

With the robot and power supply connected, nitrogen refilled (see Section 4.3.4 Nitrogen Filling) and functional pressure monitoring, the interior of the milling machine is constantly checked for pressure changes, i.e., deviations from the target value of nitrogen overpressure. The target pressure is 11.6 psi (0.8 bar) (see Section 4.3.4 Nitrogen Filling). If the pressure is between 4.3 and 17.4 psi (0.3 – 1.2 bar), no fault notification appears. However, if the pressure decreases below or increases above these values, this is indicated by flashing of the light on the camera.

BLINKING FREQUENCY OF CAMERA	INTERNAL PRESSURE IN THE DEVICE	STATUS OF THE DEVICE
4 x blinks:	less than 4.3 psi (.3 bar)	leaking
6 x blinks:	greater than 17.4 psi (1.2 bar)	leaking

After 30 seconds the blinking process is repeated. Stop the work immediately. The milling drive must be filled with nitrogen correctly (see Section 4.3.4 Nitrogen Filling). If the blinking appears again after this, there is a leak. The milling drive assembly must be repaired in a service workshop.

Continuing to work with a leaking robot can cause serious damage and result in high repair costs.

In case of irregular blinking, contact the service workshop immediately. Any further work can also lead to damage here.



4.3.3 Inspection after Completion of the Work

After completing the milling work, the function of the pressure monitoring must be rechecked.

1. Fill the device with approximately 19-20 psi (1.3-1.4 bar) maximum nitrogen (light must blink 6 times)
2. After this, remove the nitrogen from the device (press on the nitrogen valve until the nitrogen has escaped and repeat after 1 minute). The light must blink 4 times.
3. Then check compressed air tightness (run the milling motor in the pipe for approximately 3 minutes)

4x blinking:	Device is compressed air tight
6 x blinking or no blinking:	Device is not compressed air tight

In the event of any leaks, contact the service workshop. Continuing to work on the device can cause serious damage to it.

If the device is leak-proof, refill the milling machine with nitrogen (see Section 4.3.4 Nitrogen Filling).

4.3.4 Nitrogen Filling

PRINCIPLES:

- Use only dry nitrogen.
- Never top up with nitrogen when the valve is wet (water gets into the milling cutter).
- Always unscrew the valve cap after filling
- Work only with an externally dry filling device.
- Always fill up with nitrogen in a dry environment.

The internal pressure of nitrogen should be 11.6 psi (0.8 bar). For this, either an existing nitrogen equipment with passenger car tire inflation valve with the valve extension (IMS Order Number: 021 01 059) or the IMS nitrogen equipment (IMS Order Number: 015 04 000 – nitrogen cylinder with pressure reducer and IMS filling device) must be used. The nitrogen filling must be carried out in a dry place.

The nitrogen filling valve is located between the front tensioning bladder and the axial bladder.



Nitrogen valve with cap

1. Filling with valve extension and separate nitrogen equipment:

First the pressure at the pressure reducer must be set correctly (11.6 psi (0.8 bar)) and checked by briefly placing it on the valve extension (do not screw on). After removing the valve extension, the pressure must return to 11.6 psi (0.8 bar). Then unscrew the valve cap on the milling drive and screw on the valve extension and place the filling device on the valve extension and wait for a few seconds until filling is complete. Now remove the filling device and the valve extension and screw on the valve cap.



2. Filling with IMS filling device:

First, the pressure at the pressure reducer must be set correctly (11.6 psi (0.8 bar)). For this purpose, briefly press on the ram of the filling device. Pressure drops briefly. The pressure must then be reset to 11.6 psi (0.8 bar). Then unscrew the valve cap and place the filling device on the valve and wait for a few seconds until filling is complete.



5 Repairs

5.1 Repair, Replacement and Spare Parts

The IMS milling machine MICRO S Automatic consists of several replacement assemblies. In the event of a defect, these can be repaired or completely replaced as desired in the service workshop. Spare parts can also be ordered for these assemblies.

1. Repair:

The defective assembly is sent to IMS with a repair order. The assembly is repaired and returned. The customer receives his assembly back. Then the calculation takes place. Here, the repair (if no warranty claim exists) and the transport costs incurred are calculated.

2. Replacement:

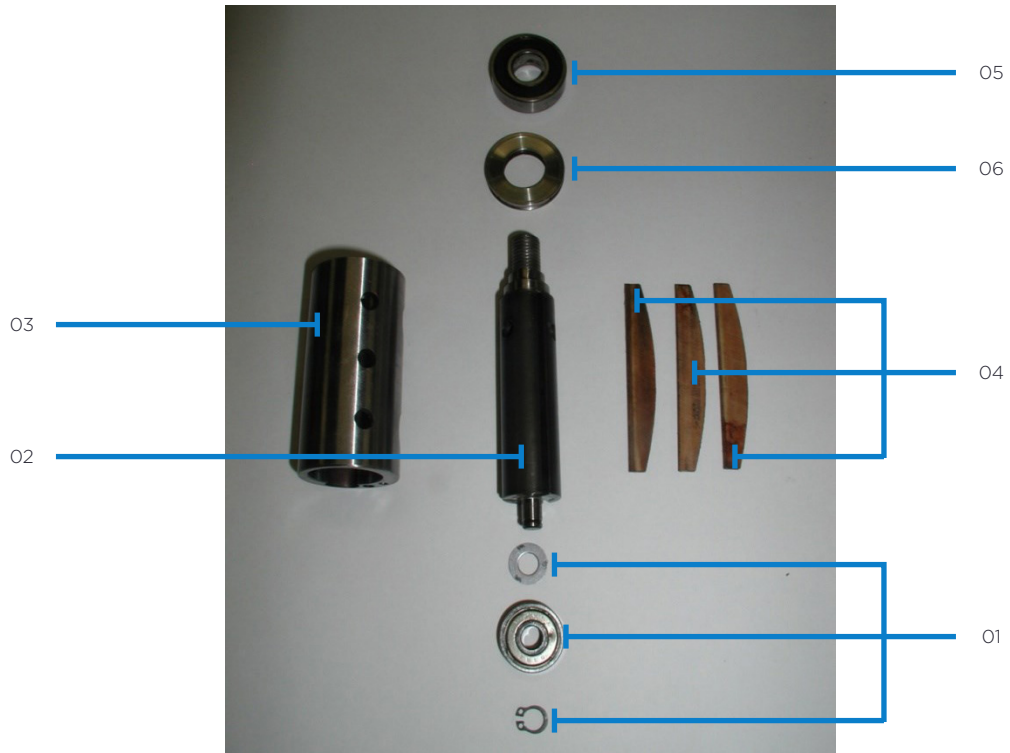
The customer reports a defect and clears the assemblies to be replaced with the service department. If the repair order is received by IMS before 3:00 pm, an identical functional assembly will be shipped on the same day (this may differ abroad). The customer guarantees the return transport of the defective assembly within 5 working days (receipt by IMS). Subsequently, the repair of the returned assembly and invoicing are carried out. Here, the repair costs (if no warranty claim exists), transport costs and possible delay fees (only if the 5 working days are exceeded) are calculated.

3. Spare parts:

Spare parts are wear parts and do not constitute separate replacement assemblies. They can be ordered in stock or after wear and replaced independently. The worn parts do not need to be returned.

5.2 Air Motor Repair

5.2.1 Overview of Air Motor Spare Parts



NUMBER	ITEM NO.	COMPONENT
01	006 30 001	Ball bearing with shim ring and retaining clip
02	021 01 027	Cylinder
03	006 30 002	Rotor with air motor ring
04	021 01 053	Set of blades
05	030 01 070	Ball bearing
06	030 01 032	Venting ring

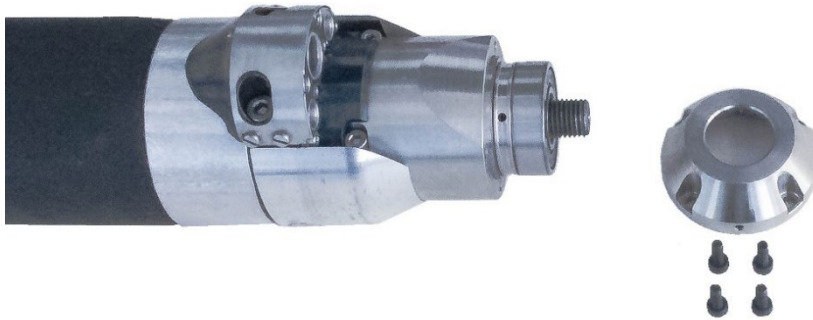
5.2.2 Disassembling and Reassembling the Air Motor

Removing the milling tool (see Section 2.8.2 *Change Milling Tool*)

Unscrew the air motor cover (4 screws M3x8).



Pull out rotor with cylinder.



Cylinder can be exchanged.



Remove the blades from the rotor. Blades can now be exchanged.

Place the rotor in a vice or similar (without tightening) and knock the rotor out of the large bearing using a plastic hammer. Ball bearings with venting ring can be replaced. Install venting ring with shoulder in the direction of the ball bearing.

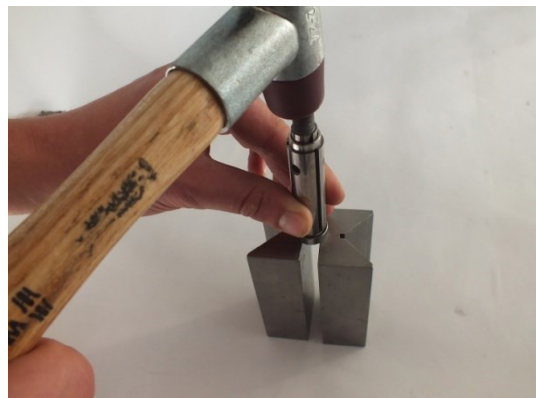


Remove retaining clip from small ball bearing.



Remove rotor with pin or mandrel. Rotor with air motor ring or bearing with shim ring and retaining clip can be replaced.

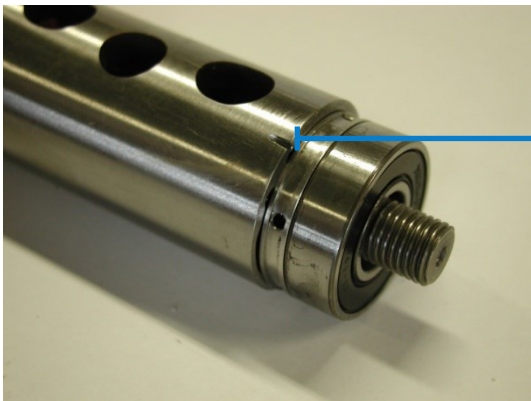
The assembly is carried out in reverse order. Place the shim ring on the rotor, fit the small ball bearing with a plastic hammer as far as it will go and fit the retaining clip.



Place the venting ring with the shoulder facing upwards. Fit the large ball bearing and knock it in as far as it will go with a plastic hammer.

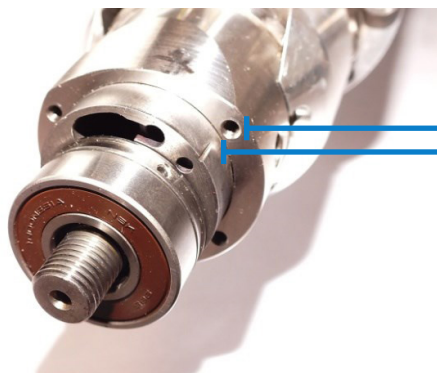


Insert the blades and attach the cylinder. Notch on cylinder must point towards the large bearing.



Notch

Insert the cylinder and rotor **simultaneously** into the air motor housing. The notch must be aligned with the threaded hole on the air motor housing (seen from the front to the right of the phase)

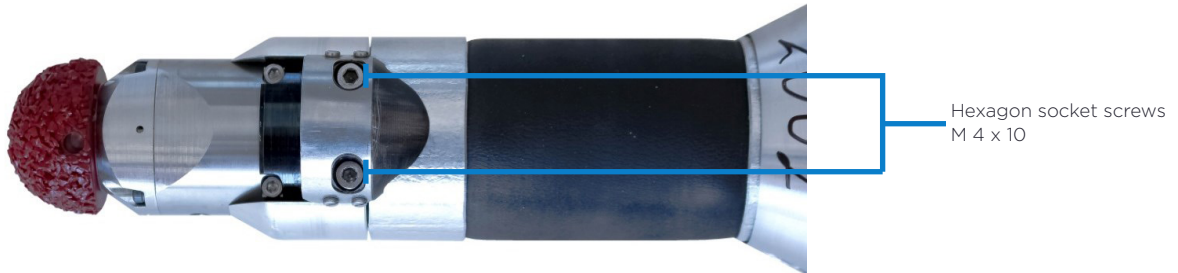


Thread hole
Notch

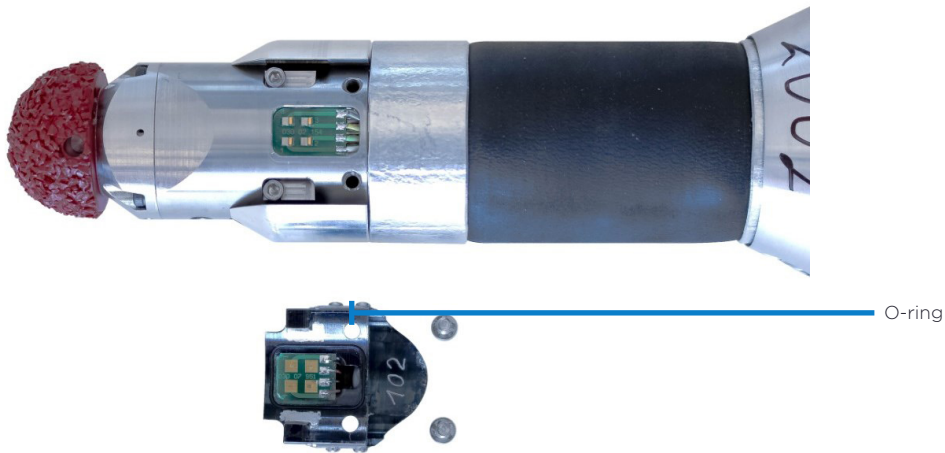
Screw on the air motor cover and mount the milling tool (see Section 2.8.2 *Change Milling Tool*).

5.3 Replace Camera

It is essential to disconnect the milling robot from the power supply. Unscrew camera (hexagon socket screws M 4 x 10) and carefully remove.



The cleaning ring for the air/water supply remains on the device and is not shipped with it.



Replace camera. Do not operate the milling drive without a camera. Screw on the camera. Make sure that the O-ring is seated correctly.



6 Technical Data

Main dimensions:	Cable drum: L35.4 x W21.6 x H472 in / L900 x W550 x H1200 mm
Weight:	Approximately 68 kg
Range of application:	Pipes of nominal diameter 3-6 in (DN75 - DN150) (optionally up to 10 in (DN250) with extensions)
Degree of protection:	IP 54 (protected against access with a wire, dust and splash water on all sides) except Tablet PC and control unit in case
Temperature range:	41°F to maximum 104°F (+5 ... +40°C)
Power supply:	100-240 VAC, 50/60 Hz, maximum 1.6 A
Supply air:	Free of dirt (particles < 5 micrometres) Temperature range 41°F to maximum 104°F (5°C to maximum 40°C) Residual water separated Residual oil < 5 mg/m ³ Supply pressure 145 psi (10 bar) Minimum flow rate 1 m ³ /min (35 CFM)
Water supply:	Distilled water

7 Warranty Conditions

All information and instructions for the operation and maintenance of the IMS milling machine MICRO S Automatic are provided to the best of our knowledge and experience, taking into account our previous experiences and knowledge. We reserve the right to make technical changes as part of the further development of the device described in this operating manual.

During the warranty period (1 year), the customer may carry out only the repairs to the system described in this manual. Otherwise, liability for the entire device is void.

All wear parts (e.g., bearings, blades, milling tools, etc.) are not covered by the manufacturer's warranty. The rubber covers of the tensioning bladder and the milling articulation are also wear parts. The manufacturer accepts no liability for damage caused by wear and tear (abrasion, sharp-edged shards, etc.).



8 EC-Declaration of Conformity



-Translation-

EC-Declaration of Conformity

According to EC Machinery Directive (2006/42/EC), Annex II 1. A.

Manufacturer: IMS Robotics GmbH
Am Bauhof 6
01458 Ottendorf-Okrilla

Name of machine: Milling robot

Function: Milling machine for sewer rehabilitation

Series / Type name: IMS-MICRO S automatic / 045 08 000

Machine- / Serial number: see bill of delivery

Year of production: 2022

The manufacturer hereby declares that the product listed above, in the state that it was brought into the market, does comply with all applicable regulations of the EC Machinery Directive (2006/42/EG). During manufacturing the requirements of the following norms and guidelines were also observed.

European Directive(s):

2014/30/EC EC directive on electromagnetic compatibility (EMC)

Applied harmonised standards:

EN ISO 12100:2010 Safety of machinery - General principles for design
- Risk assessment and risk reduction

EN ISO 4414:2010 Pneumatic fluid power - General rules and safety requirements for systems and their components (ISO 4414:2010)

EN ISO 13849-1:2015 Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)

EN ISO 13849-2:2012 Safety of machinery - Safety-related parts of control systems - Part 2: Validation (ISO 13849-2:2012)

EN ISO 13850:2015 Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)

EN ISO 14118:2018 Safety of machinery - Prevention of unexpected start-up (ISO 14118:2017)

EN 894-1:1997+A1: 2008 Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators

EN 60204-1:2018 Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2016, modified)

EN 61000-6-1:2007 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments

EN 61000-6-3:2007 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

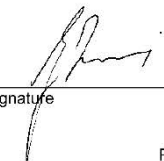
The following other technical standards and specifications were applied:

Authorized for the compilation of the technical documents:

IMS Robotics GmbH, Am Bauhof 6, 01458 Ottendorf-Okrilla

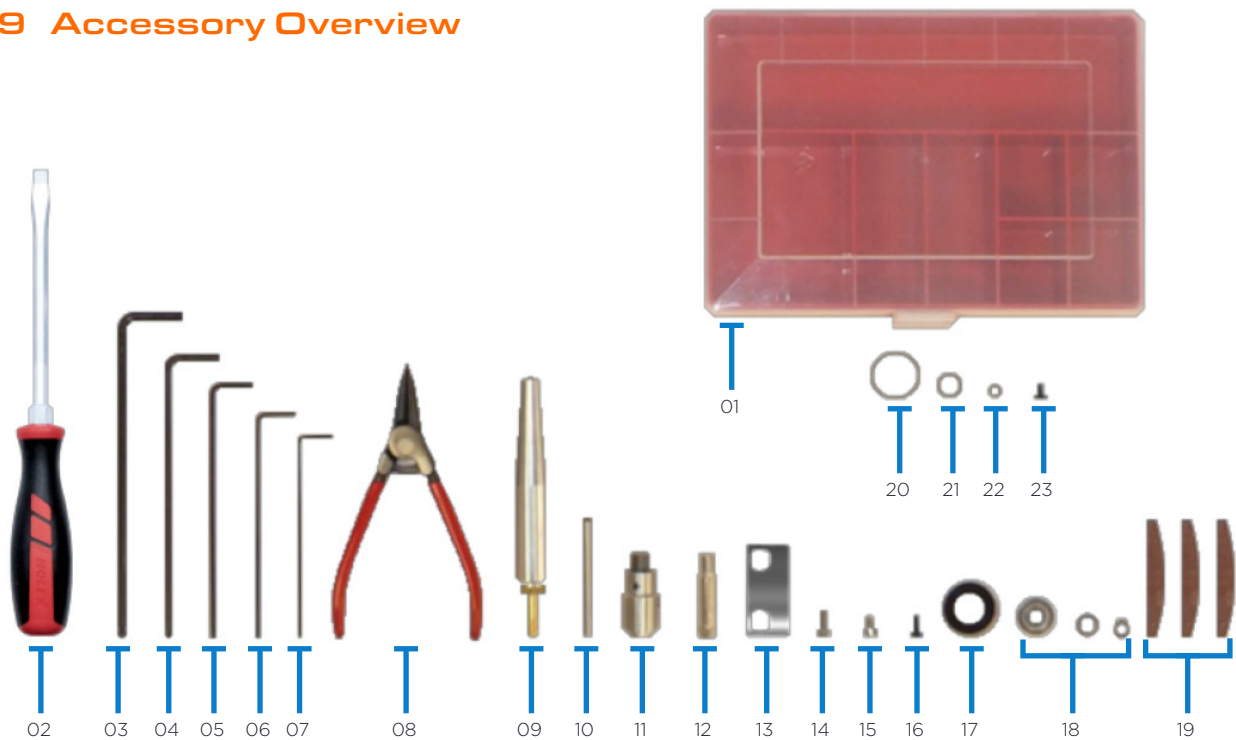
Ottendorf-Okrilla, 11-04-2022
(Place, Date)

L. Zlatkovic
Managing director


Signature

Page 1 from 1

9 Accessory Overview



ITEM	ORDER NUMBER	QUANTITY	DESCRIPTION
01	030 01 779	1 piece	Assorted box
02	030 01 759	1 piece	Screwdriver 7
03	030 01 756	1 piece	Allen key 5
04	030 01 755	1 piece	Allen key 4
05	030 01 777	1 piece	Allen key 3
06	030 01 778	1 piece	Allen key 2, 5
07	030 01 754	1 piece	Allen key 2
08	030 01 760	1 piece	Retaining clip pliers
09	015 04 006	1 piece	Nitrogen filling adapter
10	030 01 757	2 pieces	Cylinder pin, hardened
11	045 01 133	1 piece	Tool extension
12	021 01 059	1 piece	Valve extension
13	030 07 905	1 piece	Guard plate
14	030 03 651	4 pieces	Allen screw M4x10, camera
15	030 01 772	4 pieces	Allen screw M4x6, camera cleaning ring
16	030 01 770	16 pieces	Allen screw M3x8, air motor cap
17	030 01 070	1 piece	Ball bearing
18	006 30 001	1 set	Ball bearing with shim ring
19	021 01 053	1 set	Vanes
20	105 10 503	2 pieces	Seal ring, camera
21	045 01 050	2 pieces	Seal ring, milling air
22	045 01 053	8 pieces	Seal ring, milling stroke
23		4 pieces	Flat head screw M 2x4, camera fender



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