

# Maintenance Instructions

**TNL20**

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## Preface

## General notes

The maintenance activities described in this document essentially pertain only to the machine. Maintenance activities of auxiliary units (e.g., bar loading magazines, extraction systems) are described in the documentation of the specific manufacturer.

The maintenance and servicing activities must absolutely be observed. Failure to conduct maintenance and servicing in accordance with these instructions (especially not at the respective intervals) rules out any claims for damages. This does not apply if it is proved that the non-compliance with the maintenance and servicing activities is unrelated to the defect. Normal wear and tear, especially of components such as bearings and seals, is not a defect. These components are therefore excluded from the warranty. It is recommended to keep a written log of all maintenance activities carried out.

**Maintenance intervals**

The maintenance intervals are given based on the operating hours counter / "Hydraulic system On" operating condition.

**Maintenance intervals displayed on the controller (XPanel)**

Depending on the respective machine type and the different controller types, a corresponding message is issued on the controller when a maintenance interval is reached. The maintenance instructions stored on the respective controller provide information (maintenance log) explaining the service and maintenance activities to be performed.

**Cleaning of the machine****Do not clean the machine with compressed air**

- Raised dirt particles may cause breathing difficulty or injury (especially of the sensory organs). Furthermore, raised dirt particles or chips may reach spots where they cause technical problems.

**Do not use cotton waste for cleaning**

- When cleaning with cotton waste, fibers or thread can get loose causing safety problems.

**Solvents**

- Do not use highly volatile solvents such as petroleum spirit, trichloroethylene or similar cleaning agents. These cleaners may damage the seals, which can lead to safety problems.

**Pressure washers**

- Do not clean the machine with a pressure washer. Cleaning with a pressure washer results in strong corrosion. Furthermore, bearings may be degreased and seals may become leaking, which can lead to safety problems.



### Cleaning of tool mountings

A suitable cleaning tool must be used to clean the hole in the tool mounting.



### Ordering spare parts

Always specify the machine type and machine number when ordering spare parts. This and other information about the machine are located on the nameplate under the main switch of the control cabinet.



### Operating material

For all work in connection with operating media, observe the information in the data sheets from the respective manufacturers and the information in the document Notes on Operating Materials.



### Pressure accumulators $\leq 1$ L

Pressure accumulators with a volume of  $\leq 1$  L are **not** subject to testing and labeling according to the current issue of the pressure equipment directive. The guidelines and regulations applicable in the country of use must be followed.

## Safety Instructions



### Safety Instructions and Technical Details

The user documentation and, in particular, the document “**Safety Instructions and Technical Details**” must be observed.





## **Carrying out maintenance work**

### **Authorized and trained personnel**

- Maintenance is to be performed only by authorized and trained personnel. This applies particularly to work on motors (spindle motors) or other electrical assemblies. The instructions in the respective manufacturer documentation must be followed for such work.

### **Allow the machine to cool down**

- Prior to working on the machine, it must be allowed to cool down, as hot parts may be located under the covers.

### **Maintenance work on machine being switched off**

- In general, maintenance is to be carried out with the machine switched off. The main switch must be locked out. Even when the main switch is switched off, parts of the machine (e.g., the control cabinet light) may still carry electricity. These parts are labeled. In a few cases, maintenance work needs to be performed with the machine turned on (e.g., replacement of backup batteries). These maintenance activities must be carried out with special care.

### **Required tools**

- For removing machine parts, suitable lifting gears and a variety of tools must be used. Removed machine parts must be placed in a safe position and secured against falling over.
- All maintenance work on the machine must be carried out with utmost care. Fasteners must be loosened carefully and parts must be secured against falling down. When elastic items (springs) are removed/replaced, appropriate devices must be used. Any (non-horizontal) axes that pose a risk of falling down must be moved to their end positions or secured against falling down. Pedal switches must be put aside to avoid inadvertent actuation.

### **Performing maintenance, repair or service work**

- The currently valid safety regulations, as well as the specific manufacturer's information for the intended use must be observed for these activities.

### **Use of climbing aids (ladders or steps)**

- In addition, appropriate climbing aids may be required to carry out these activities. When working on climbing aids at great heights, e.g. on the control cabinet, these must always be secured or fastened (depending on the machine, eyelets are also provided for this purpose).



### Procurement/use of spare parts

We recommend the use of original spare parts and accessories. For damages caused by the use of parts from third-party providers, liability and warranty are excluded. The use of such products may change the structural characteristics of the machine and negatively affect the active or passive safety.



### Cellular and cordless phones

When the control cabinet is open or the machine covers are open or removed, no cellular or cordless phones may be used within a 2 m radius.



### Handling hydraulic and hose lines

Damaged hydraulic hose lines must be replaced immediately. Typical types of damage include chafing, kinks, cracks, deformations, or visible leaks.

Flexible, pressurized hydraulic hose lines of **INDEX** equipment are generally designed as thermoplastics or metallic hydraulic hose lines.

The machine operator/owner is responsible for compliance with the laws and regulations of the country of use with regard to the use of hydraulic hoses.

We recommend inspection and documentation of the hydraulic hose lines installed inside the machine and not directly visible every 12 months. For hydraulic hose lines visible in the work area or mounted outside the machine and connecting components to the machine, we recommend inspection and documentation every 6 months.

For the flexible, pressurized hydraulic hose lines used by **INDEX**, empirical values are available for very different periods of use, some of which exceed 10 years.



### Maintenance work on fluid systems (hydraulic, lubrication, and pneumatic systems)

When carrying out maintenance work on fluid systems (hydraulic, lubrication, and pneumatic systems), make sure **before** starting the work that the respective system **has been depressurized** (accumulator drain valve / manual slide valve).



### Test run or functional test

After all maintenance work and work on electrical assemblies, a test run or functional test must be performed.

## **Service Interval - Care activities**

## Maintenance Summary - Care activities



It is recommended to document the maintenance activities carried out by using the appropriate maintenance log. The maintenance log has the document number DTE035EN - 26.10.2022.



The maintenance interval is highly dependent on the production and environmental conditions of the machine. The determination of the appropriate interval must be made by the operator.

**The maintenance interval should be between once per shift and once a week!**

- AL010** - Check the work area door and window pane
- AL011** - Clean the guide rail/gutter at the work area door
- AL046** - Check pneumatic unit (visual inspection)
- AL050** - Check the filter mat of the main and counter spindle cooling, clean if necessary
- AL095** - Visual inspection of all fluid lines and electrical cables
- AL120** - Check cooling lubricant (visual inspection)
- AL147** - Check work area light (visual inspection)
- AL165** - Clean and check all telescopic covers and telescopes of the tool carriers
- AL166** - Check central lubrication system
- AL167** - Clean and lubricate clamping device
- AL168** - Pneumatic clamping device, clamping without collet
- AL171** - Clean covers and wipers
- AL180** - Clean the work area
- AL190** - Transition from work area to coolant/oil mist extraction system
- AL240** - Clean the chip pan
- AL266** - Clean the chip conveyor
- AL310** - Lubricate all linear axes by moving the axes.

## AL010 - Check the work area door and window pane

### Orientation

Inspection and maintenance of the work area door includes several steps:

- Inspection of the window pane for damage.
- Check the safety label on the window pane (replacement interval 8 years).
- Check/adjust or replace, if necessary, the wipers.
- Check the work area door for smooth opening/closing.
- Automatic work area door (optional). Hydraulic valves and motor, control panel, rack and spur gear. (for hydraulic door drive)
- Automatic work area door (optional - electric door drive - **follow the manufacturer's documentation** ).

The window pane consists of three panes. The inner pane (inside the work area) of tempered glass, the central pane of polycarbonate, and the outer pane (cover pane) also made of polycarbonate. The inner window pane is relatively resistant. It can be cleaned with any commercially available cleaning agents. Only the center pane is essential for the impact resistance of the window pane.

The polycarbonate panes are subject to **natural** aging and therefore must be subjected to regular visual inspection. Through contact with cooling lubricant, the aging process is accelerated even further



If the window pane is damaged, it must be replaced. This is necessary regardless of the extent of damage. Even with minimal damage, the impact resistance of the pane can no longer be guaranteed.

Heavily soiled or damaged wipers may cause damage to the inner pane. Moreover, it may be possible that the work area door can be moved only with considerable effort due to heavy soiling or chip deposits in the wipers.

Check the guide rails of the work area door. The guide bars must be checked and cleaned regularly so that the work area door can be moved without much effort.

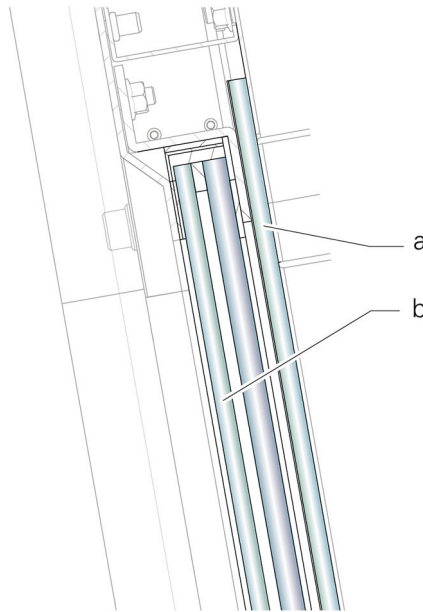
### Procedure

1. Check window pane for damage.

2.



The inside of the window pane is scratch-resistant. Any commercial cleaning agent can be used here.



**Window pane TNL20**

- a Design glass on operator side
- b Window pane on work area side

Clean window pane on work area side.

3.



Clean the cover pane (outer glass pane) with a soft cloth or sponge and glass cleaner or soap and water. Do not use abrasive or alkaline cleaners (e.g., benzene, acetone or carbon tetrachloride) and no sharp tools or sharp objects (such as razor blades or screwdrivers).

Clean cover pane.

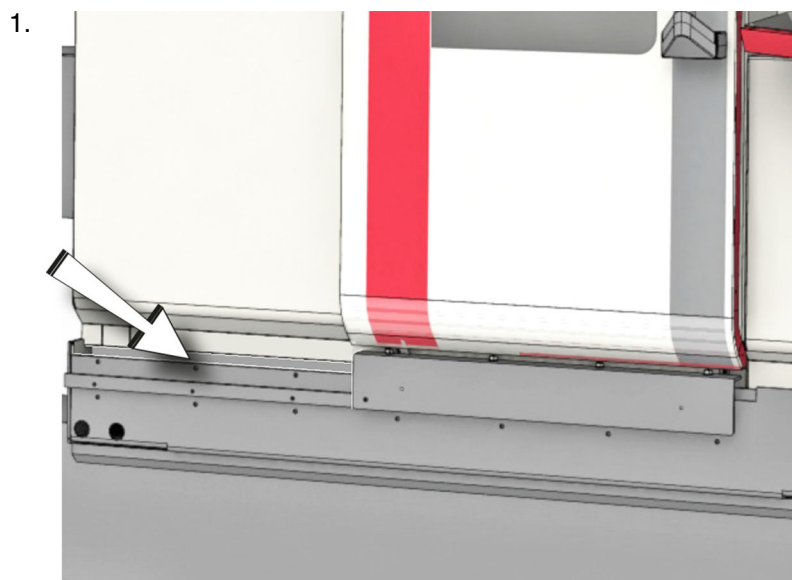
4. Check wipers. Remove and clean the wipers. If the wipers are severely deformed or damaged, they must be replaced. To clean the door panels evenly, be sure to reinstall the wipers after their removal aligned in parallel and ensure that they snugly contact the work area door.
5. Check the work area door for ease of movement. To do so, open and close the work area door. If the work area door can be moved only with effort, determine the cause. Possible causes include – depending on the work area door – defective or improperly adjusted wipers. Chips on the guide bar or between the door and wiper, or in the guide rollers of work area door.

**AL011** - Clean the guide rail/gutter at the work area door

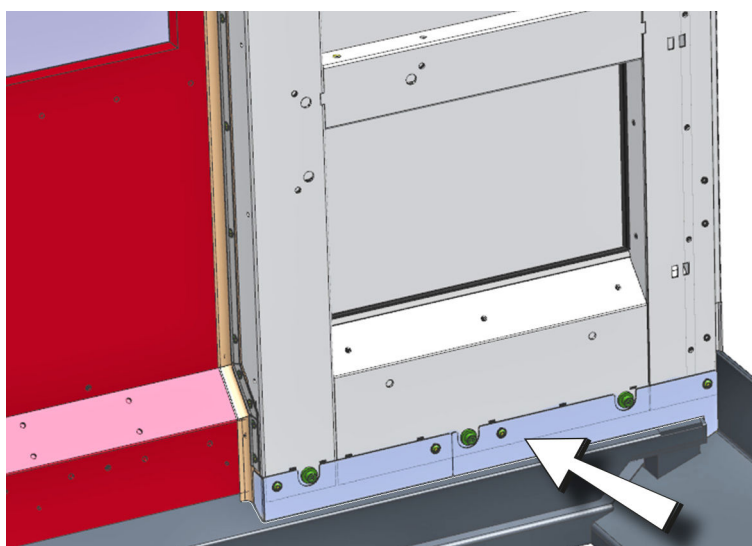
## Orientation

The guide rail/gutter located at the underside must be cleaned regularly around the work area door.

## Procedure



Exterior view of guide rail/gutter TNL20



Inside cover sheets, guide rail/gutter TNL20

Clean guide rail/gutter at the work area door.

In case of heavy soiling, 2 cover sheets can be removed at the inside for better cleaning, and the dirt can be pushed into the chip conveyor.

## AL046 - Check pneumatic unit (visual inspection)

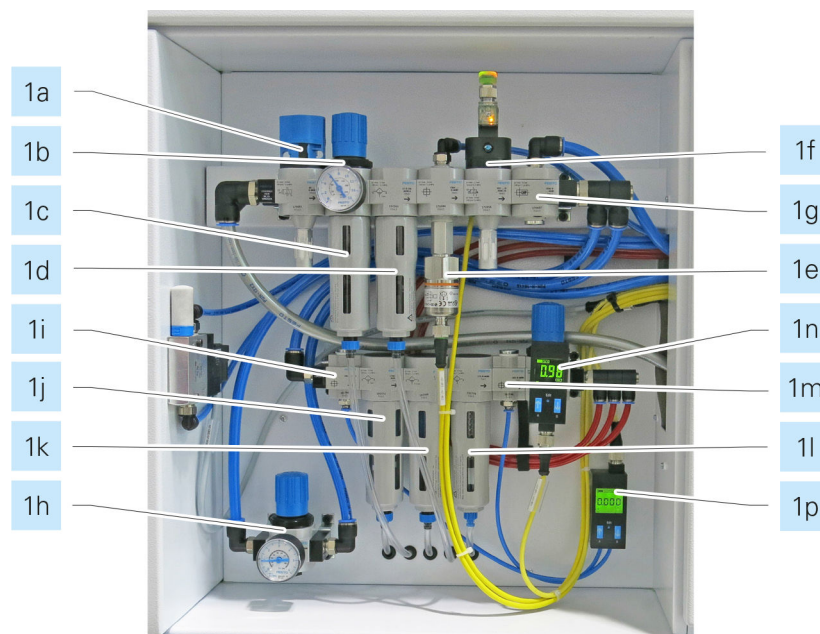
### Orientation

The pneumatic unit consists of two components. The system part (1a-1 h) and the optional linear measuring system (1i-1p). To ensure trouble-free operation, periodic checks (visual inspection) of the pneumatic unit are necessary.

- Check oil level at oiler (optional).
- Check system pressure and sealing air settings.
- Check fluid lines.
- Drain condensate (not applicable to auto-drain).



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



#### Example: Pneumatic unit 3 TNL20 4

- 1a** Manual switch-on valve
- 1b** Filter regulating valve / system pressure gauge 6 bar
- 1c** Filter insert 40 µm
- 1d** Filter insert 5 µm
- 1e** Branch module with system pressure sensor
- 1f** Electrical turn-off valve
- 1g** Branch module for functions
- 1h** Pressure regulating valve for sealing air
- 1i** Distribution block
- 1j** Filter insert 1 µm
- 1k** Filter insert 0.01 µm
- 1l** Activated carbon
- 1m** Distribution block
- 1n** Pressure regulating valve / pressure sensor
- 1p** Differential pressure sensor for glass scales

### Procedure

1. Check oil level at oiler (optional).



2. Check the pressure setting on system pressure gauge and adjust if necessary. An operating pressure of 6 bar has been set at the factory.
3. Check fluid lines (damage and leakage). Fluid lines must be checked for damage. Pre-damage such as kinks or abrasions should be logged and replacement should be initiated.
4. Drain condensate (not applicable to auto-drain).
5. Check the pressure setting on the “linear measuring system” pressure sensor and adjust if necessary. An operating pressure of 1 bar has been set at the factory.

## AL050 - Check the filter mat of the main and counter spindle cooling, clean if necessary

### Orientation

The filter must be cleaned regularly depending on the environmental conditions.

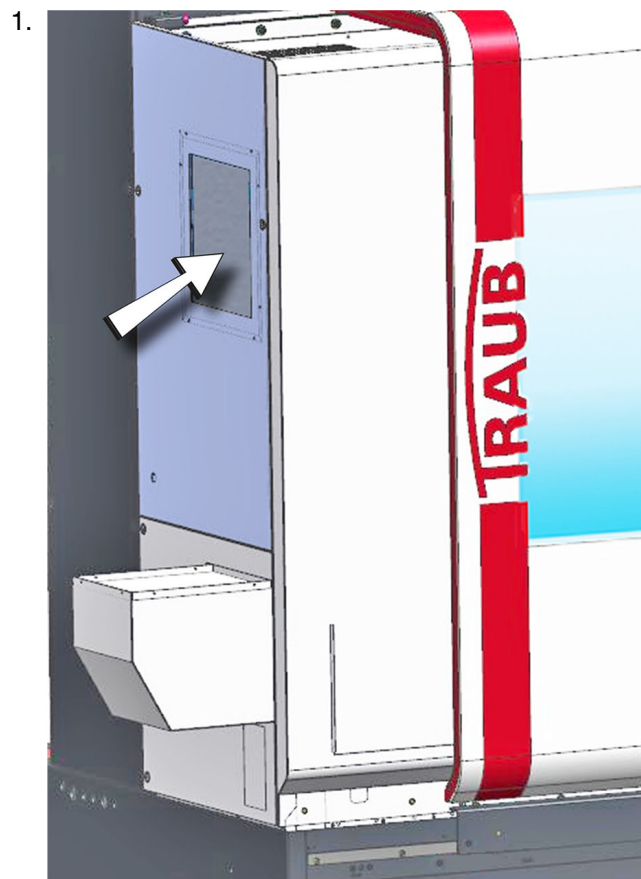


Use only the original filters according to the spare or wear parts list! Otherwise the machine is at risk of sustaining serious damage due to overheating.



Follow the corresponding manufacturer's documentation.

### Procedure



Filter mat of spindle cooling, left side of the machine

Remove left side panels.

2. If necessary, clean the filter mat according to the manufacturer's instructions.
3. Attach the left side panels again.

**AL095** - Visual inspection of all fluid lines and electrical cables

## Orientation

Depending on the duration of use, usage profile of the machine and different ambient conditions, it is absolutely necessary to subject all fluid lines and electrical cables to regular visual inspections. This allows that any faults or problems can be detected and eliminated early on.



Damaged fluid lines may cause leakage of fluids under high pressure. Be sure to use personal protective equipment during visual inspection.

## Requirement

Should defective points be found on fluid lines or electrical cables during the visual inspection, the machine must be switched off and the damaged lines or cables must be promptly replaced.



Replaced fluid lines must be tightened to the torque specified by the manufacturer.

## Procedure

1. Visual inspection of all fluid lines.
2. Visual inspection of all electrical cables.

## AL120 - Check cooling lubricant (visual inspection)

### Orientation



Follow the user documentation **Notes on Operating Materials** and the documentation of the cooling lubricant manufacturer.



For all work in connection with operating materials, the information in the data sheets of the respective manufacturers and the information in the document **Notes on Operating Materials** must be observed.

The cooling lubricant is subject to wear depending on the material and the generated temperature. Regular inspection is therefore essential.

In case of strong formation of odor, fungus or mold, the cooling lubricant emulsion must be changed at once. The principle of open lubrication may cause a slight commixture between cooling lubricant and hydraulic fluid. If the surface of the cooling lubricant tank is covered with a layer of oil, the cooling lubricant must be replaced. Furthermore, determine the cause of the oil ingress.



Synthetic cooling lubricants or cooling lubricant based on esters are not admissible.

If the type of cooling lubricant or the manufacturer is changed, make sure that the cooling lubricant meets the required specifications.

See the manufacturer's documentation for the fill quantities.



Regularly checking the cooling lubricant is necessary in particular if cooling lubricant emulsions containing mineral oil are used, so that the required properties are ensured.

### Requirement

A refractometer is required to determine the concentration.

### Procedure

1.



Caution

**Biological and chemical changes in the cooling lubricant.  
Skin irritation or respiratory and circulatory problems.**

Wear personal protective equipment (e.g., safety gloves and safety goggles).

Remove a cover (e.g. at the filter basket) on the chip pan or the chip conveyor.

2. Visual and olfactory inspection of the cooling lubricant.

3. Check cooling lubricant emulsion. See document **Notes on Operating Materials**

4. Check fluid lines. Fluid lines must be checked for damage. Pre-damage such as kinks or abrasions should be logged and replacement should be initiated.

## AL147 - Check work area light (visual inspection)

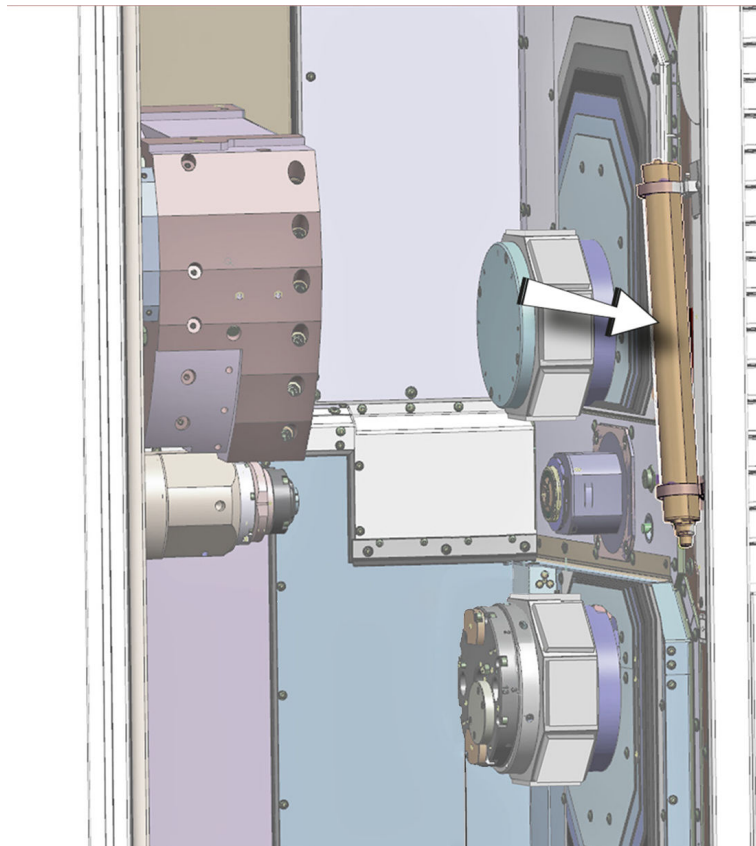
### Orientation

To ensure even illumination of the working areas in the machine, work area lights are installed in the work area.

They enable safe working and should therefore be checked regularly. **Damaged lighting fixtures must be replaced immediately.**

### Procedure

1. Check all lamps (visual inspection).
- 2.



Example: Work area light TNL20

Check lamp protective glass for damage. If cooling lubricant has already penetrated into the lamp protective glass of the work area light, the lamp must be repaired.

## AL165 - Clean and check all telescopic covers and telescopes of the tool carriers

### Orientation

Depending on the material used and the machining process, the telescopic cover must be cleaned and checked regularly. In particular, before any prolonged shutdown of the machine (e.g., during weekends).



After cleaning, the telescopic covers and wipers must be coated with low-viscosity oil.

The oil must not resinify and sediments must not form when exposed to other fluids or machining residues (e.g., metallic dust). Otherwise, the service life of the wipers would be considerably impaired.

### Requirement

When cleaning the telescopic cover and telescope of TC top and TC bottom, the tool carriers must be moved to a suitable position.

### Procedure

1. Clean telescopic cover.
2. Flush plates with cooling lubricant.
3. Check the plates for visible damages (e.g., dents or flaws). Have damaged plates repaired or replaced immediately by the machine manufacturer's service personnel.
4. Apply thin oil to telescopic plates by spraying or rubbing.
5. Carefully move tool carriers back and forth; if necessary, spray or rub once more with oil.

## AL166 - Check central lubrication system

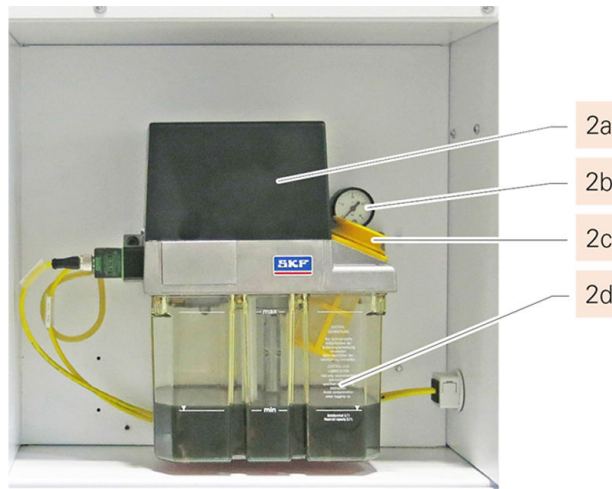
### Orientation



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



Only oil of viscosity class ISO VG 220 must be used to lubricate the TNL20.



**Central lubrication system TNL20 1**

- 2a Central lubricating unit
- 2b System pressure gauge
- 2c Lubricating oil filler neck
- 2d Lubricating oil level indicator

### Procedure

1. Check fill level of the central lubrication unit, refill if necessary.



## AL167 - Clean and lubricate clamping device

### Orientation

To ensure reliability and accuracy of the machine, clamping devices must be subjected to periodic maintenance.

The interval of this maintenance is strongly influenced by the type of material and daily production time. Especially for short chipping materials (e.g., brass or cast iron), these maintenance activities must be performed much more frequently.

Compression collets and guide bushings must be removed for cleaning.

Note when removing the compression collet from the main spindle:

- Fixed headstock operation → remove in work area
- Sliding headstock operation → remove in drive area



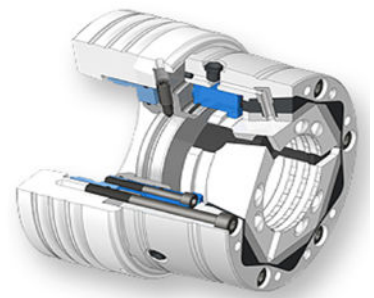
Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



Depending on the materials to be machined (e.g.: brass, cast iron) and the number of shifts per day, more frequent cleaning of the clamping device is necessary.

For this, the clamping device must be removed and completely cleaned.

### Requirement



Example: Collet and chuck.



**Do not use cotton waste for cleaning.**

When cleaning with cotton waste, fibers or thread can get loose causing safety problems.

## Procedure

1.



Caution

### Sharp contours on the clamping device

#### Cuts

Use personal protective equipment (e.g., protective gloves)



The **removal/installation of the compression collet and guide bushing** is described in the document "Operating the machine TNL20".

Clean clamping devices

2. Lubricate clamping devices according to manufacturer's instructions.

## AL168 - Pneumatic clamping device, clamping without collet

### Orientation

To ensure lubrication of the pneumatic clamping device across the entire clamping area, some clamping operations should be made over the entire stroke without a collet when changing the collet.



Follow the corresponding manufacturer's documentation.

### Procedure

1. Perform no-load clamping according to the manufacturer's instructions.

## AL171 - Clean covers and wipers

### Orientation

Depending on the material used and the machining process, the covers and wipers must be cleaned and checked regularly. In particular, for dry machining and before any prolonged shutdown of the machine (e.g., during weekends).

Dirty covers and wipers affect the accuracy of the machine and its service life.

Contamination of the covers and wipers results in increased friction (stiffness) of the plates. This may damage the covers and wipers so that contaminants can get into the area behind the cover. This in turn may cause damage to other machine parts, requiring expensive repair. In the event of damage, determine the cause of the damage and immediately notify the machine manufacturer or its representative company.



After cleaning, the cover must be coated with low-viscosity oil.

The oil must not resinify and sediments must not form when exposed to other fluids or machining residues (e.g., metallic dust). Otherwise, the service life of the wipers would be considerably impaired.

### Requirement

Before starting the cleaning, move the tool slides to positions that are more convenient for the cleaning process.



Power off the machine and secure it against power on.

### Procedure

1. Clean cover panels. Remove chips with a suitable chip hook or hand-held broom. Afterwards rub with a cloth.
2. Check covers and wipers for damage. Look for deep scoring or abrasion.
3. Oil covers.
4. Switch the machine on and move the tool slides until an even film of oil is visible over the whole traversing range of the covers. If relubrication is required, first stop the travel movement and set feed rate override to “zero” position.

## AL180 - Clean the work area

### Orientation

To ensure consistent quality, high availability and value retention, the machine must be regularly cleaned, depending on the operating conditions.

Of course, this is influenced by various factors. The use of emulsion as a cooling lubricant requires a more frequent and intensive cleaning.

Compared to machining producing long chips, machining producing short chips requires a considerably higher maintenance effort. Short chips, such as in the machining of brass or cast iron, form chip accumulations or become deposited in small cracks and corners. These positions must be cleaned regularly to avoid damage to the respective components.

Areas such as telescopic covers, rubber seals, sealing lips or wipers are particularly affected points. Frequent cleaning of these areas is particularly important.

### Requirement



Only the agents described in the documentation may be used for the cleaning and after-treatment of the machine.

Always use the proper tool to remove chips.

The following tools are required for cleaning:

- chip hooks,
- chip brushes,
- spray bottles of cleaners or cooling lubricant,
- a sufficient quantity of rags,
- the used medium, cooling lubricant to apply to the telescopic plates and all other bare parts by spraying or by brushes.

### Procedure

1.



**Chips and projecting tools in the work area.**

**Cuts.**

Use of personal protective equipment such as safety goggles and gloves, and appropriate tools.

Remove chips from the work area.

2. Chip accumulation particularly in the area of the tool carriers and the work area door.
3. Flush work area with cooling lubricant.
4. Wipe clean with rags.
5. Apply an oil film to bare metal plates and telescopic covers.
6. Examine any visible damage, and repair or replace, if necessary.

## AL190 - Transition from work area to coolant/oil mist extraction system

### Orientation

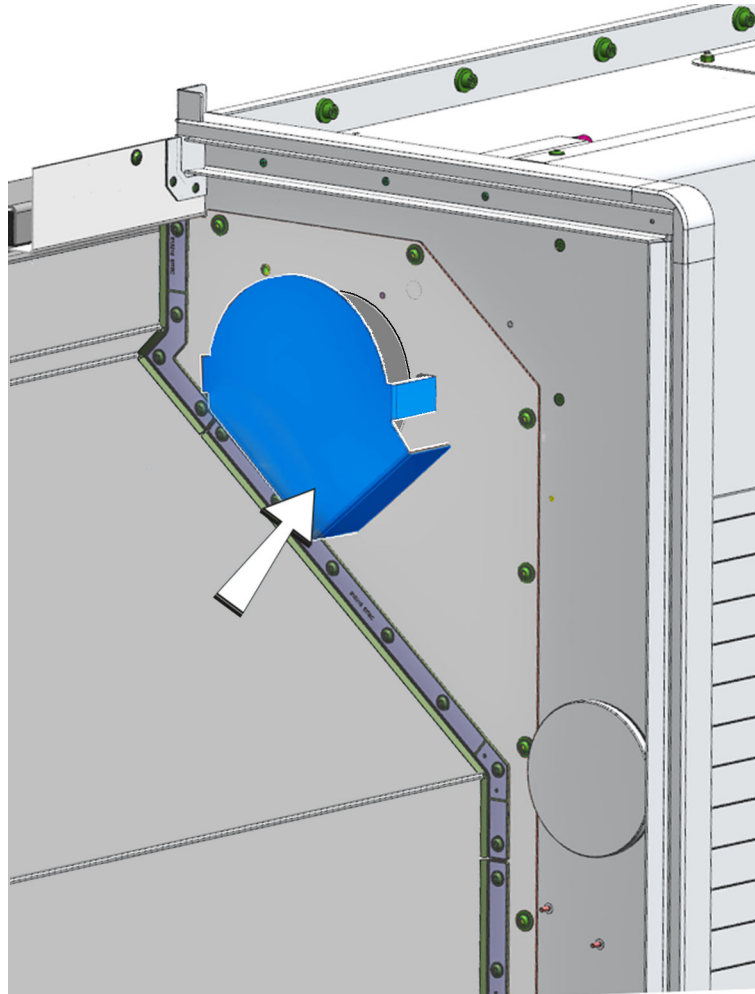


Illustration as an example, TNL20 extraction - work area

The transition from the work area to the coolant/oil mist extraction system is provided with a cover that is open at the top to protect against chips. Accumulated cooling lubricant in the bottom section of the cover is removed to the chip conveyor/ chip pan by means of a hose outside the drive area. The cover must be checked for contamination and cleaned if necessary at regular intervals.

### Procedure

1. Check the cover for contamination and clean if necessary.

## AL240 - Clean the chip pan

## Orientation



Avoid skin contact with cooling lubricant! Use appropriate skin protection agents!...



For all work in connection with operating materials, the information in the data sheets of the respective manufacturers and the information in the document **Notes on Operating Materials** must be observed.

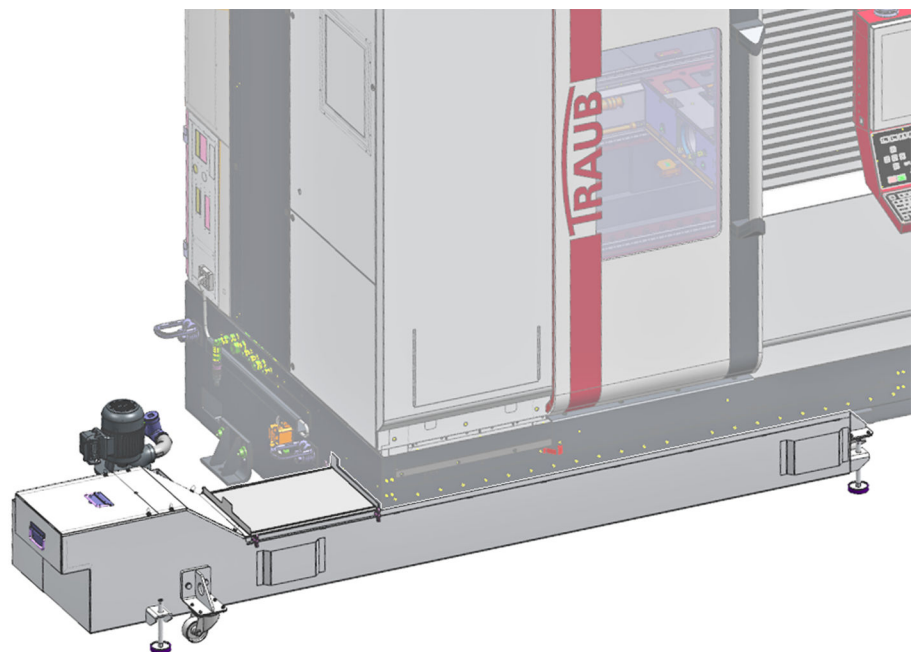


Follow the corresponding manufacturer's documentation.



Removing the chips is allowed only when the machine is switched off or in setup mode.

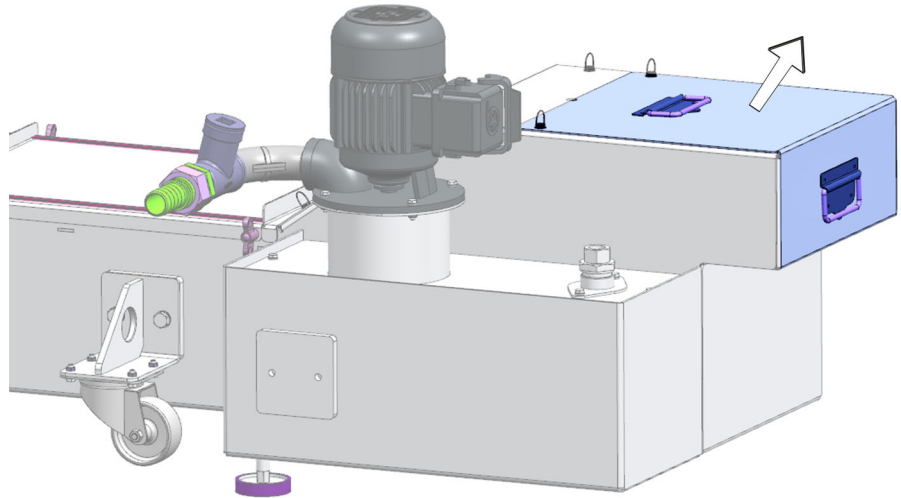
To ensure a smooth production process, the chip pan should be cleaned and serviced regularly. The cleaning interval depends on the utilization of the machine. The chip pan is used for collection of chips from the work area and is also a reservoir for the cooling lubricant. In particular, make sure that the area around the cooling lubricant pump(s) is always free of chips or dirt.



TNL20 chip pan

## Procedure

1.

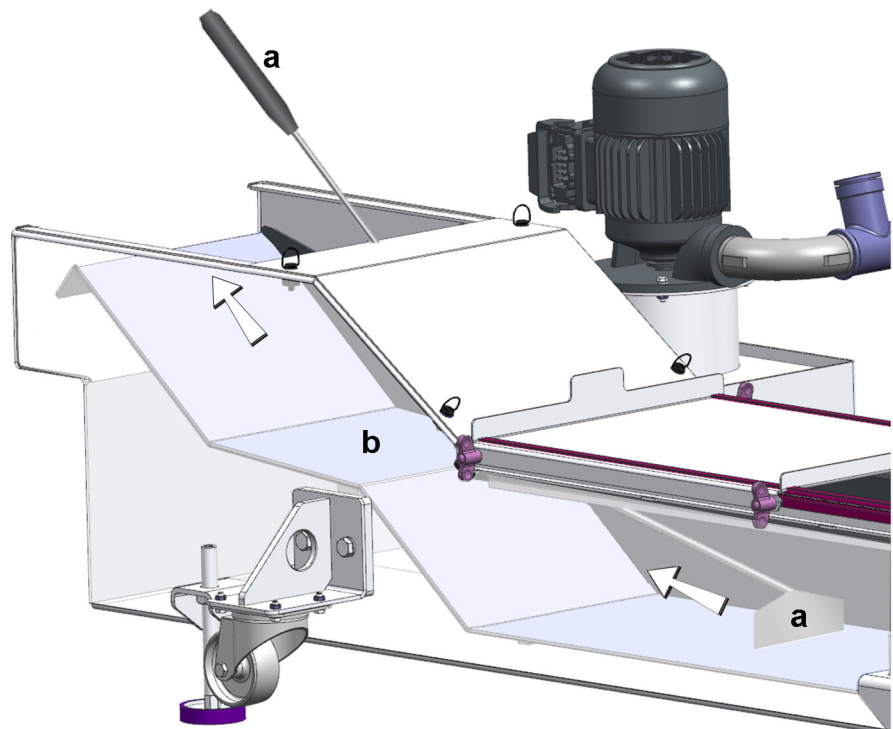


**TNL20 chip pan cover**

Open the 2 quick releases on the cover. Lift the cover at the upper handle and take it off using the second handle.

2. If necessary, push the chips from the machine area to the chip pusher (a).

3.



**Example shown**

Use the chip pusher (a) to push the chips to the storage/drip position (b) and allow the cooling lubricant to drain.

4. Then deliver the chips into a suitable container using the chip pusher.



5. Replace the cover and fasten it with the 2 quick releases.

## AL266 - Clean the chip conveyor

### Orientation



Service and maintenance are to be carried out according to the manufacturer's specifications.



For all work in connection with operating materials, the information in the data sheets of the respective manufacturers and the information in the document **Notes on Operating Materials** must be observed.

### Requirement

To ensure a smooth production process, the chip conveyor should be cleaned and serviced regularly. With regular cleaning, any defects can be detected and corrected early. The chip conveyor is used for removing the produced chips from the work area. The cooling lubricant is filtered in the chip conveyor. For this purpose, various filters and filter plates are built into the chip conveyor. These filters must be cleaned regularly.



Be sure to interrupt the motion of the conveyor belt by switching off the chip conveyor before commencing cleaning work around the discharge chute!

### Procedure

1. Perform service and maintenance activities on the chip conveyor according to the manufacturer's instructions

**AL310** - Lubricate all linear axes by moving the axes.

## Orientation

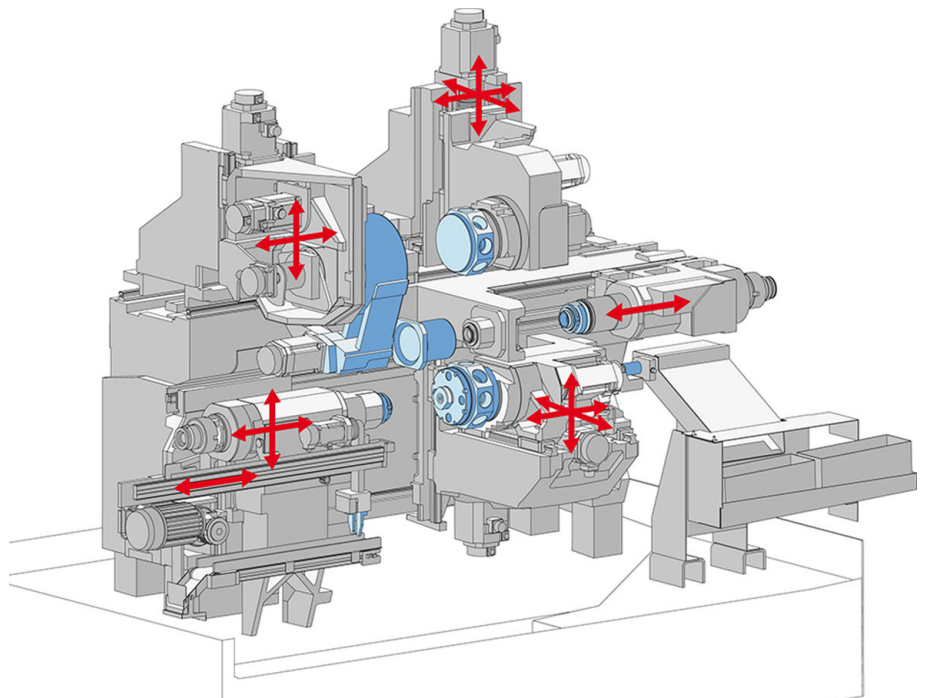
Move all linear axes through the maximum travel stroke to ensure uniform lubrication of the linear guides.

## Procedure

1.



When moving the axes, be sure to pay attention to the collision zones with other spindles, tool carriers and tools.



Example: TNL20-11

Lubricate all linear axes by moving the axes.



**Service Interval - 2.000 Operating hours**

## Maintenance Summary - 2.000 Operating hours



It is recommended to document the maintenance activities carried out by using the appropriate maintenance log. The maintenance log has the document number DTE035EN - 26.10.2022.

- CL010** - Check maintenance logs of servicing activities
- CL020** - Clean and check wipers and guide rails of the work area door
- CL035** - Check work area door (optionally with electr. drive) and window pane
- CL076** - Checking outer wipers of roller guides on the “workpiece removal unit to the left”
- CL500** - Perform data backup
- CL520** - Check control cabinet

## CL010 - Check maintenance logs of servicing activities

### Orientation

The maintenance logs on the performed maintenance activities allow you to review the maintenance activities carried out between two maintenance intervals. The logs may contain important indications as to work that may be necessary beyond the maintenance activities. Similarly, the logs can be used for determining the cause of malfunctions due to incorrect or inadequate maintenance activities carried out.

### Procedure

1. Check maintenance or inspection logs.

## CL020 - Clean and check wipers and guide rails of the work area door

### Orientation



Regular inspection of the wipers prevents damage to the wipers themselves and to the work area door.

If the work area door can be opened and/or closed only with increased effort, it can be expected that the wipers are already destroyed by accumulation of chips and swarf compaction.

### Requirement



Example: Chip hook and chip brush

Use appropriate tools to remove coarse chips, chip nests and other debris.

### Procedure



Example: 1 Removing chip nest using appropriate tools (e.g., chip hooks)



Remove large chips on the inside of the work area door from top to bottom. Use a chip hook for this purpose.



Example: 2 Sweep small chips and other debris from top to bottom using chip brooms or brushes.

Remove small chips and chip accumulations on the inside of the work area door from top to bottom. Use a chip brush for this purpose.




Example: 3 upper wipers, G300

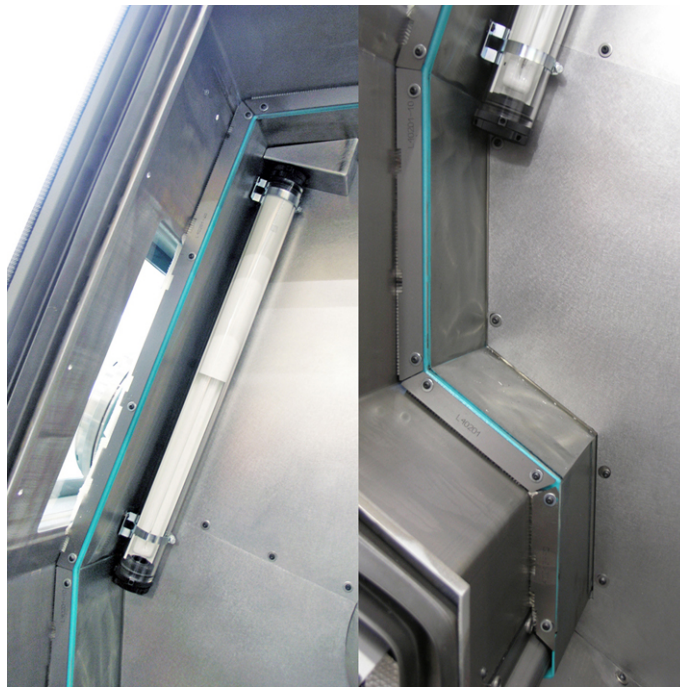
Clean wipers.

**Alternatively, the following procedure can be used!**

In case of heavy soiling or adhesion of chips to the wipers, the wipers and associated cover panels should at any rate be completely removed and cleaned. **In this case, also clean the area behind the wipers.**

- 4.
- 

Make sure that the wipers evenly contact the work area door before tightening the screws.



Example: 4 wipers on the sides and bottom, G300

Check the wipers for proper seating. After the work area door has been cleaned, it should open and close again without much effort as usual

5.



If cleaning or replacement of the wipers has not resulted in tangible improvement, the soiled rollers and the guide rail of the work area door must also be cleaned.

Clean rollers and guide rail of the work area door.

**CL035** - Check work area door (optionally with electr. drive) and window pane

## Orientation

Inspection and maintenance of the work area door includes several steps:

- Inspection of the window pane for damage.
- Check the safety label on the window pane (replacement interval 8 years).
- Check/adjust or replace, if necessary, the wipers.
- Check the work area door for smooth opening/closing.
- Check functions of the automatic work area door (optional - electric door drive - **Follow manufacturer's documentation from Langer & Laumann** ).

The window pane consists of three panes. The inner pane made of tempered glass, the central pane made of polycarbonate, and the outer pane also made of polycarbonate. The inner pane is relatively resistant. It can be cleaned with any commercially available cleaning agents. Only the center pane is essential for the impact resistance of the window pane.

The polycarbonate panes are subject to **natural** aging and therefore must be subjected to regular visual inspection. Through contact with cooling lubricant, the aging process is accelerated even further.



If the window pane is damaged, it must be replaced. This is necessary regardless of the extent of damage. Even with minimal damage, the impact resistance of the pane can no longer be guaranteed.

Heavily soiled or damaged wipers may cause damage to the inner pane. Moreover, it may be possible that the work area door can be moved only with considerable effort due to heavy soiling or chip deposits in the wipers.

Regularly check and clean the guide rails of the work area door.

Check function of the automatic work area door with electric drive (option like open/close) with different speeds with or without obstacle detection check.

## Requirement



The automatic work area door can be tested only when the machine is switched on and fully functional.

Be sure that the wipers have been checked before testing the automatic work area door. Be sure to remove any chip nests and make sure that the wipers have been cleaned and attached to the plates.

## Procedure

1. Check window pane for damage.

2.

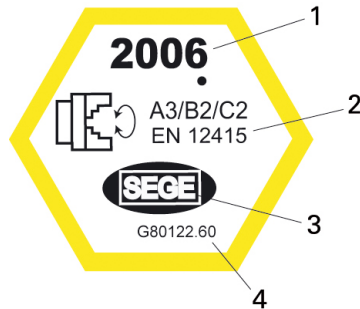


Clean the outer pane with a soft cloth or sponge and glass cleaner or soap and water. Do not use abrasive or alkaline cleaners (e.g., benzene, acetone or carbon tetrachloride) and no sharp tools or sharp objects (such as razor blades or screwdrivers).

Clean outer pane.

3. Clean inner pane.

4.



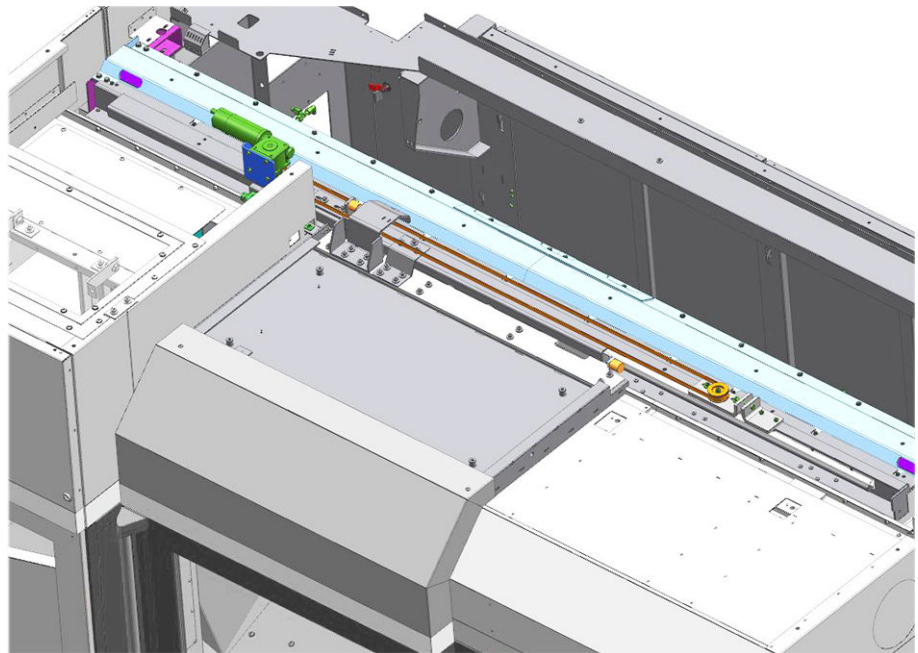
Example: Safety label – window pane 2006

- 1 Year of manufacture
- 2 Protection class and EN standard
- 3 Manufacturer
- 4 INDEX part number

Check safety label (replacement interval every 8 years).


5. Check wipers. Remove and clean the wipers. If the wipers are severely deformed or damaged, they must be replaced. To clean the door panels evenly, be sure to reinstall the wipers after their removal aligned in parallel and ensure that they snugly contact the work area door.

6.



Example: Automatic work area door with drive

Check the work area door for ease of movement. To do this, press the emergency stop button and manually open and close the work area door. If the work area door can be moved only with effort, determine the cause. Possible causes are defective or improperly adjusted wipers, or chips on the guide bar or in the guide rollers of the work area door.

7.  **Pinching of limbs due to faulty obstacle detection on the work area door**

Danger

Check obstacle detection.



INDEX recommends an annual check of the obstacle detection function of the automatic work area door.

The check should only be carried out using a suitable aid, e.g., a rectangular strip or a softwood squared timber.

INDEX recommends documenting the results of the inspection and keeping them at the workplace.

The machine must be switched on and fully functional for this test.



Example: Checking the obstacle detection

Check obstacle detection of the automatic work area door. During the obstacle detection test, a rectangular strip or softwood squared lumber, for example, is held in the travel path of the work area door during the closing process. If the rectangular strip or squared timber comes into contact with the work area door in the closing area, the obstacle detection is triggered and the closing movement must be reversed.

If the obstacle detection does not immediately lead to reversal of the moving direction, the complete work area door must be checked immediately. **The machine must not be operated any further.**

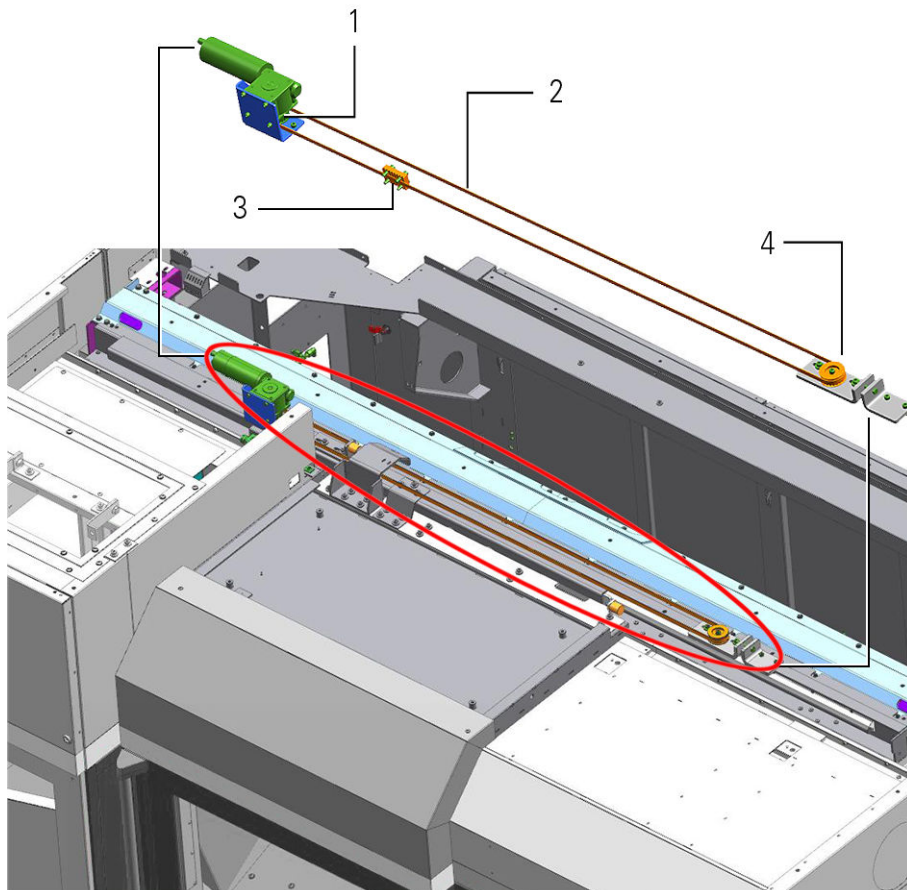


8.



Be sure to contact the **INDEX** service department or an **INDEX** representative.

9.



**Example: Automatic work area door drive**

- 1 Drive/deflection pulley
- 2 Belt
- 3 Driver
- 4 Deflection pulley

Visual inspection of the drive of the automatic work area door. This is in particular an assessment of the toothed belt (2) - condition, tension. Also the condition of the two deflection pulleys (1+4) and the actuator (3).

## CL076 - Checking outer wipers of roller guides on the “workpiece removal unit to the left”



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation

Regularly checking the wipers of the roller guides on the “workpiece removal unit to the left” prevents accelerated wear of the guides. This test is a visual inspection. But if the wiper is destroyed and no longer snugly contacts the contour of the guide, it must be replaced. **It is essential to ensure absolute cleanliness when removing and installing the wiper.**

### Requirement

Move the “workpiece removal unit to the left” to a suitable position. For checking the outer wipers, parts of the machine enclosure may have to be removed from the machine. In most cases, access to the wipers is best in the end positions of the respective axes. To move to the positions in which the wipers can be checked, it may be necessary to switch the machine on/off several times.

### Procedure

1. Move the “workpiece removal unit to the left” to the position required for checking.

2.



Caution

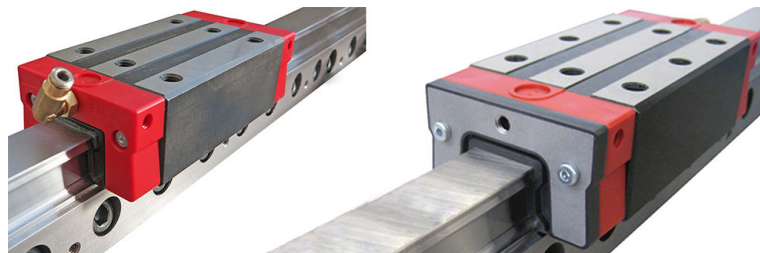
#### Moving axes.

#### Crushing hazard.

Switch off the machine via the main switch or shut down with the emergency stop.

Remove relevant machine enclosure.

3.



Example: Wiper on the trolley of the roller guide (view from the preassembly).

Check wipers.

4. Replace wipers. Loosen and remove the mounting screws of the wiper on the trolley. Push the wiper from the guide bar. Clean the guide bar and push a new wiper onto the guide bar. Finally lightly oil the guideway.

## CL500 - Perform data backup

### Orientation

Using a current data backup, the machine can be restored to the original state before the failure after a defect of the internal storage device/NC control.

The file name of the data backup includes the machine type, machine number, and date/time of the backup.

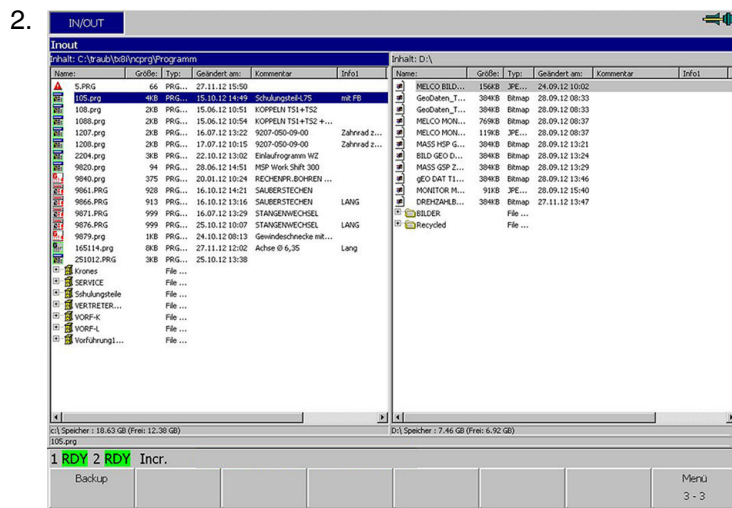


Network settings and the customer's NC programs are not included in the backup.

Backup additionally to an external data carrier in case of a defect of the internal storage medium.

### Procedure

1. Connect USB device to USB port



Example shown

**IN/OUT** screen and use **TAB** to activate the right part of the screen

3. **Softkey** Press **Select** (F3) (select appropriate target, e.g., USB)
4. **Softkey** Press **Menu** (F8) twice. **Softkey** text "Menu 3-3" appears

5. Note that the backup includes no customer NC programs! Include them in a separate backup, if necessary

**Softkey** **Backup** (F1) and press **Softkey** **OK** (F1) to acknowledge the informational message

All relevant parameters and data for the backup are compiled

6. Press **Softkey** **OK** (F1) to confirm the transfer of the data to the desired storage location




## CL520 - Check control cabinet

### Orientation


To avoid problems and prevent any resulting system failures, simplified control cabinet checks must be carried out at regular intervals on the cabinet and associated components. Additional built-in air conditioning units (option) ensure a constant temperature in the control cabinet. These air conditioners cannot work efficiently if filters are dirty or doors are not tight.

### Procedure

1.  **Electric shock**  
Power off the machine and wait approx. 30 minutes. Check with a meter if there is still voltage applied to the intermediate circuit.

Check settings of the fuses. For this purpose, review the information in the wiring diagram.

2. Check the screws of drives, terminals, control modules, connectors, bus, device bus and intermediate circuit bus for tightness.

3.  Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!

If necessary, check settings on the air conditioning unit(s).

4. Clean suction port(s).
5. Check condensate drain.
6. Check door seals.



**Service Interval - 4.000 Operating hours**

## Maintenance Summary - 4.000 Operating hours



It is recommended to document the maintenance activities carried out by using the appropriate maintenance log. The maintenance log has the document number DTE035EN - 26.10.2022.

- DL010** - Cleaning of the machine
- DL015** - Check shutters for function and auto stop
- DL030** - Check coolant
- DL050** - Check central lubrication unit
- DL055** - Check pneumatic unit
- DL070** - Check power clamping device for dog clamping
- DL071** - Check pneumatic clamping device with wedge gear
- DL075** - Check the cycloidal gear on the turret and the front working attachment
- DL080** - Check the seals on the rotary distributor of the turret and the front working attachment, replace if necessary
- DL160** - Determine axis ballscrew backlash
- DL170** - Axes
- DL180** - Check fire protection system (visual inspection)
- DL225** - Replace toothed belts and check belt tension
- DL480** - Check wipers on the trolleys of the workpiece removal unit and replace them, if necessary
- DL490** - Replace the wiper and telescopic plates
- DL491** - Clean drain holes at the Z cover of the upper tool carrier
- DL492** - Replace the wiper for fixed headstock operation on the main spindle
- DL510** - Perform data backup
- DL520** - Check control cabinet and cable assemblies (visual inspection)
- DL525** - Check the fan and fan cover in the control cabinet, clean if necessary
- DL590** - Check inspection/replacement date of the backup batteries in the control cabinet (NC)
- DL636** - Check the replacement interval of the servo backup batteries at the axis servos.

## DL010 - Cleaning of the machine

### Orientation

To ensure consistent quality, high availability and value retention, the machine must be regularly cleaned, depending on the operating conditions.

Of course, this is influenced by various factors. The use of emulsion as a cooling lubricant requires a more frequent and intensive cleaning.

Compared to machining producing long chips, machining producing short chips requires a considerably higher maintenance effort. Short chips, such as in the machining of brass or cast iron, form chip accumulations or become deposited in small cracks and corners. These positions must be cleaned regularly to avoid damage to the respective components.

Areas such as telescopic covers, rubber seals, sealing lips or wipers are particularly affected points. Frequent cleaning of these areas is particularly important.

### Requirement



Only the agents described in the documentation may be used for the cleaning and after-treatment of the machine.

Always use the proper tool to remove chips.

The following tools are required for cleaning:

- chip hooks,
- chip brushes,
- spray bottles of cleaners or cooling lubricant,
- a sufficient quantity of rags,
- oil to apply to the telescopic plates and all other bare parts by spraying or by brushes.

### Procedure

1.



**Chips and projecting tools in the work area.**

**Cuts.**

Use of personal protective equipment such as safety goggles and gloves, and appropriate tools.

Remove chips from the work area.

2. Chip accumulation particularly in the area of the tool carriers and the work area door.
3. Flush work area with cooling lubricant.
4. Wipe clean with rags.
5. Apply an oil film to bare metal plates and telescopic covers.
6. Check plates for damage, repair or replace if necessary.

7.



When cleaning the drive area, make sure that the dirt does not penetrate directly into the path measuring systems and the ballscrews. The cleaning process must not aggravate the contamination of the components.

Clean drive area. Spray cooling lubricant onto the drive area around the supports of the guide bars and then sweep off the rough dirt down into the drag of the machine with a hand brush. Afterwards rub with rags.

8.



When cleaning the spindle carriers, make sure that the dirt does not penetrate directly into the spindle encoders. The cleaning process must not aggravate the contamination of the components. Follow the manufacturer's documentation.

Cleaning of the spindle carriers of the main and counter spindles. Remove machine covers in the area of the spindles. Then remove and clean the spindle covers.

9. Clean the machine base. Remove accumulations of chips, especially in the area of the counter spindle. For this purpose, move the counter spindle towards the main spindle and flush the area with cooling lubricant in the direction of the chip conveyor. Sweep the dirt arising from the cleaning of the drive area also in the direction of the chip conveyor and then flush with cooling lubricant. Afterwards rub with rags.

10. Clean and reinstall machine covers.

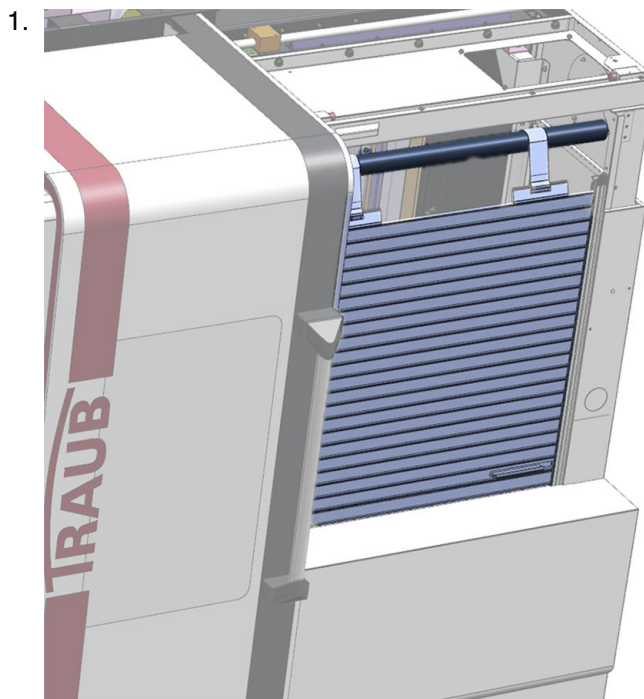
11. Clean the collecting tray under the workpiece handling unit.

**DL015** - Check shutters for function and auto stop

## Orientation

The shutter on the machine serves as access to the drive area. Check the opening and closing function of the shutter. The auto stop of the shutter must be ensured in all positions.

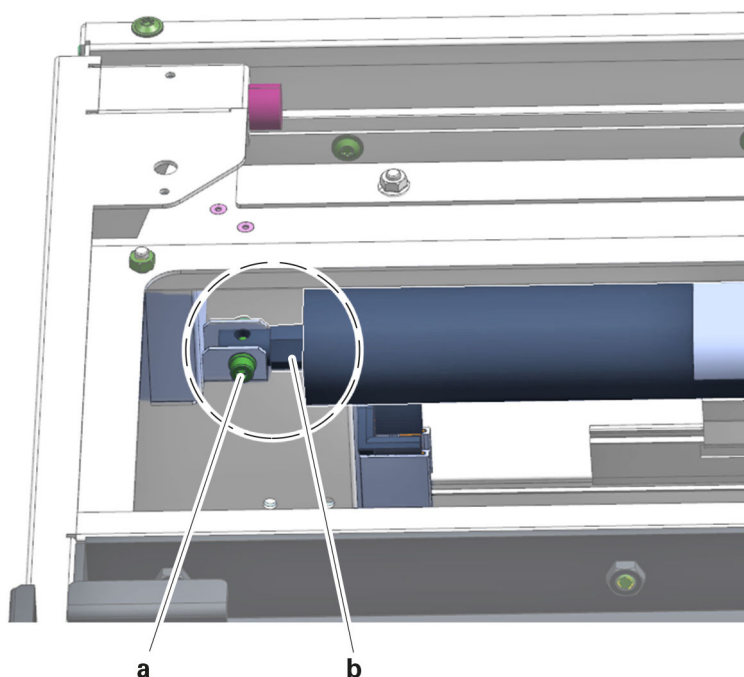
## Procedure



Shutter TNL20

Check the shutter function. It must be possible to fully open and close the shutter. The upper cover sheets can be removed for replacement/repair.

2.



**Rear view of the machine. Shutter holding spring \_TNL20**

- a** Fixing screw for shutter holding spring
- b** Shutter holding spring with hexagon head

Check the shutter for auto stop.

Readjust the tension of the holding spring if necessary until the shutter auto stop is ensured. To adjust the holding spring, fix the hexagon head (b) with a wrench, remove the fixing screw (a), turn the holding spring by 90° with the wrench, and secure the holding spring again by turning in the fixing screw. Check the shutter once more. Repeat the procedure, if necessary.



## DL030 - Check coolant

## Orientation

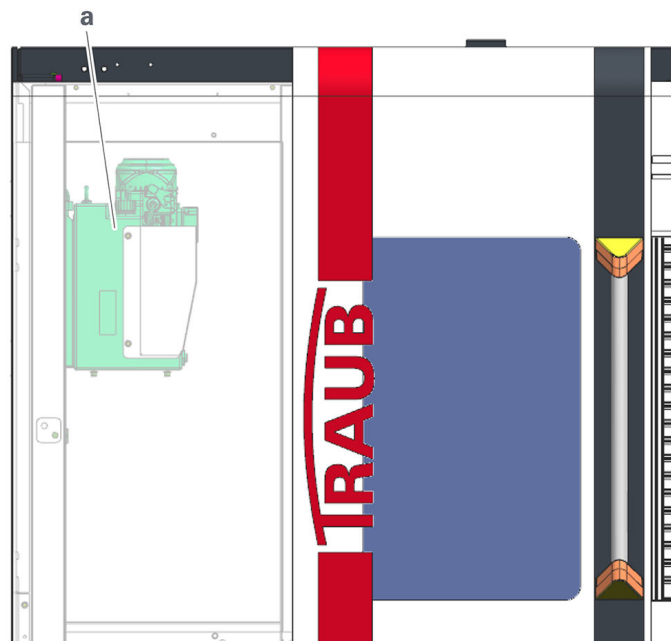
For add-on equipment that cannot be cooled conventionally with cooling lubricants or hydraulic fluid due to high temperature development, separate cooling is provided in an independent cooling circuit. The coolant used here should be checked continuously for its condition.



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



For all work in connection with operating materials, the information in the data sheets of the respective manufacturers and the information in the document **Notes on Operating Materials** must be observed.



Spindle cooling of main and counter spindle TNL20

a Cooling unit for main and counter spindle cooling

## Requirement



Replenish only with coolant of the same manufacturer having the same specification. Mixing different coolants may lead to corrosion of the cooling system and degradation of the coolant.



When switching the coolant to another product or changing the manufacturer, the cooling system must be completely flushed and cleaned with this coolant. Only then the machine may be put back into operation.

## Procedure

1. Check coolant. Test criteria for this visual inspection are the clarity and purity of the coolant.

If necessary, replace the coolant according to the manufacturer's requirements

2. Check fill level

## DL050 - Check central lubrication unit

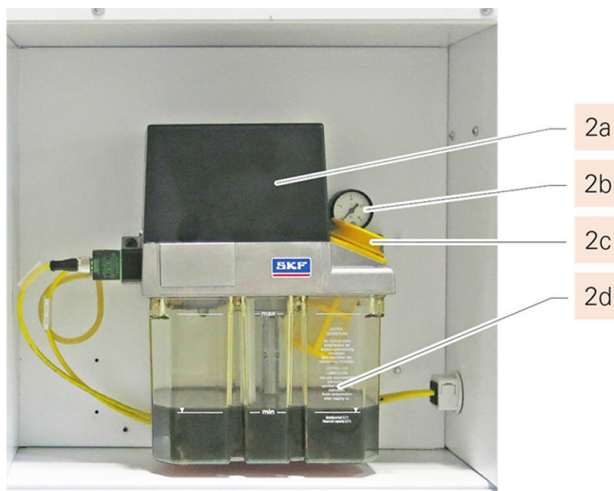
## Orientation



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



Only oil of viscosity class ISO VG 220 must be used to lubricate the TNL20.



Central lubrication system TNL20 1

- 2a Central lubricating unit
- 2b System pressure gauge
- 2c Lubricating oil filler neck
- 2d Lubricating oil level indicator

#### Lubrication points of central lubrication unit

- X/Y/Z axis lower/upper turret → trolley, screw drive
- Tool drive in lower/upper turret → drip lubrication, gear
- Z axis main spindle → trolley, screw drive
- X/Z axis counter spindle → guide, ballscrew drive
- Workpiece removal unit to the left (option) → guide
- X/Z axis front working attachment → guide, ballscrew drive (TNL20-11)
- Tool drive front working attachment → oil/air lubrication (TNL20-11)

#### Requirement

The maintenance of the central lubrication unit system requires the following auxiliary or working equipment:

- Use an ample supply of cleaning rags.
- A sufficient amount of lubricating oil for refilling/changing.
- Replacement filters for lubricating oil tank if necessary.

## Procedure

1. Check fill level of the central lubrication unit, refill if necessary.
2. Approx. 10 x apply lubrication pulse in the control.
3. Monitor the area around the lubricating oil distributor for leakage

## DL055 - Check pneumatic unit

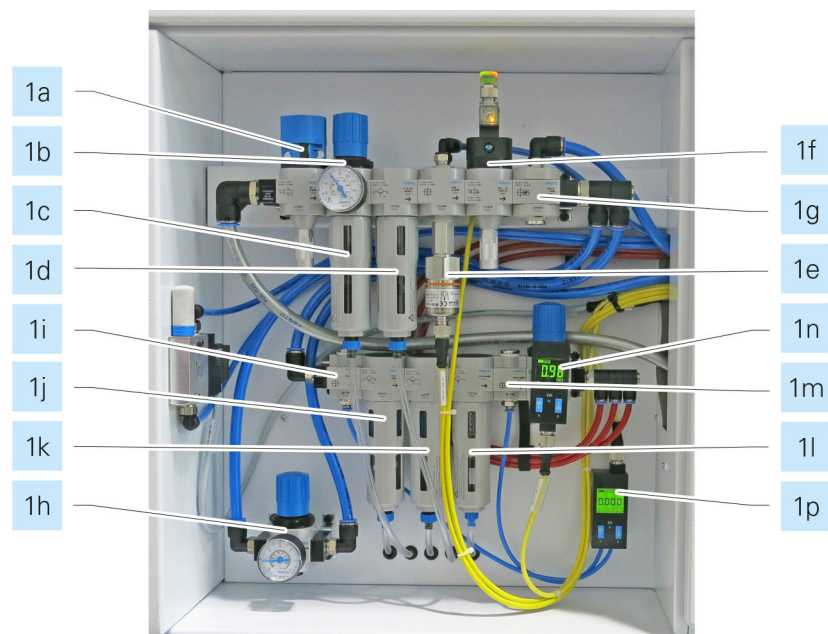
## Orientation

The pneumatic unit consists of two components. The system part (1a-1 h) and the optional linear measuring system (1i-1p). To ensure trouble-free operation, periodic checks of the pneumatic unit are necessary.

- Check oil level at oiler (optional).
- Check system pressure and sealing air settings.
- Check fluid lines.
- Drain condensate (not applicable to auto-drain).




Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



**Example: Pneumatic unit 3 TNL20 4**


- 1a** Manual switch-on valve
- 1b** Filter regulating valve / system pressure gauge 6 bar
- 1c** Filter insert 40  $\mu\text{m}$
- 1d** Filter insert 5  $\mu\text{m}$
- 1e** Branch module with system pressure sensor
- 1f** Electrical turn-off valve
- 1g** Branch module for functions
- 1h** Pressure regulating valve for sealing air
- 1i** Distribution block
- 1j** Filter insert 1  $\mu\text{m}$
- 1k** Filter insert 0.01  $\mu\text{m}$
- 1l** Activated carbon
- 1m** Distribution block
- 1n** Pressure regulating valve / pressure sensor
- 1p** Differential pressure sensor for glass scales

## Procedure


1.  Power off the machine to depressurize the pneumatic unit and secure against accidental switching on.

Check oil level at oiler (optional).

2. Check fluid lines (damage and leakage). Fluid lines must be checked for damage. Pre-damage such as kinks or abrasions should be logged and replacement should be initiated.


3.  Dirty filter cartridges must never be cleaned but always replaced. Filter cartridges are hazardous waste and must be disposed of according to local regulations.  
  
Only filters with a filter fineness described in the fluid plans must be used.

Replace filter.

4.  Condensate is extremely harmful to the environment due to its high pollution impact. Condensate must be collected in a container specifically marked for this purpose and properly disposed of.

Drain condensate (not applicable to auto-drain).

5. Switch on the machine.
6. Check the pressure setting on the system pressure gauge and adjust if necessary. A pressure of 6 bar has been set at the factory.

7.  Dirty measuring systems or lack of sealing air can cause damage to the machine.

Check sealing air supply. To protect measuring systems or other components from the ingress of liquids or dirt, they are pressurized (1.0 bar). In this case, a low hiss is noticeable. To ensure trouble-free operation, periodic checks of the sealing air supply are necessary.

8. Check all fluid lines of the sealing air supply for damage.
9. Check the pressure setting on the sealing air pressure gauge and adjust if necessary. A pressure of 1 bar has been set at the factory.
10. Check sealing air supply on the components. A reliable method is the use of a suitable pressure gauge. The pressure gauge is attached to the line that is screwed off to monitor the existing pressure. The pressure should be in the range of the preset pressure of the sealing air supply. If this is not the case, the cause must be determined and the fault must be fixed.

**Alternatively, the following procedure can be used!**

Disconnect the fluid line in the area of the components and cover the opening of the fluid line with your finger. A slight counter pressure should be felt. Then connect the fluid line again.

11. Check the pressure settings on the differential pressure sensor for glass scales and adjust if necessary. An operating pressure of 1.0 bar has been set at the factory.

## DL070 - Check power clamping device for dog clamping



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

### Orientation

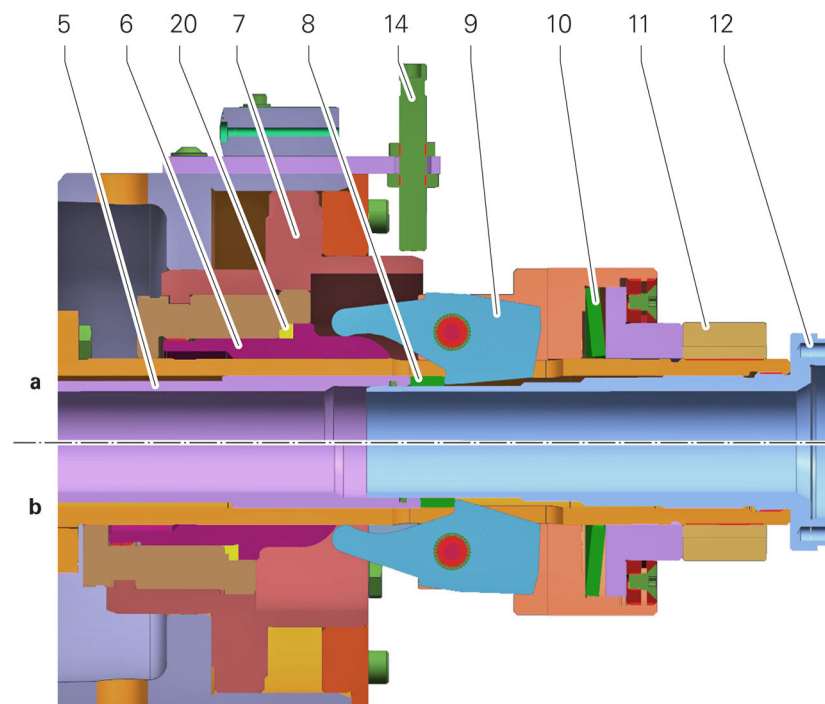


Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!

The clamping dogs (9), the hardened ring (8) and the clamping sleeve (6) on the power clamping device must be checked periodically and replaced if necessary.

If damage to the clamping dogs (9) or the hardened ring (8) is visible, the relevant parts must be replaced.

The axial clamping stroke of the power clamping device must be checked by measuring.



**Dog clamping fixture opened/clamped TNL20**

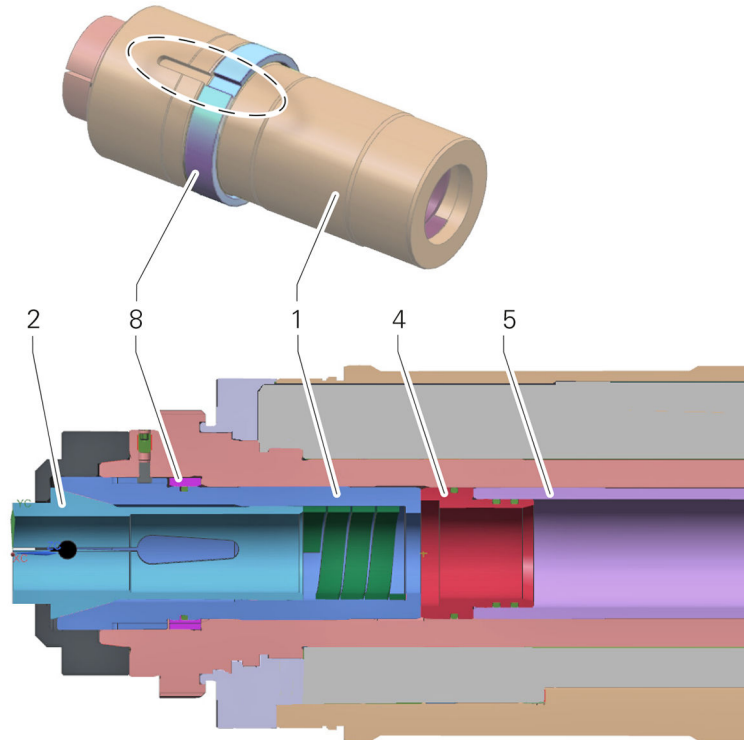
- a** clamped
- b** open
- 5** Clamping tube
- 6** Clamping sleeve
- 7** Piston
- 8** Hardened ring
- 9** Clamping dog
- 10** Disk spring
- 11** Adjusting nut
- 12** Protective tube
- 14** Inductive sensor
- 20** Adjusting ring (for clamping sleeve)



## Procedure

1. Visual inspection of the clamping dog (9), the hardened ring (8) and the clamping sleeve (6) on the power clamping device.

2.



### Work fixture TNL20

- |   |   |
|---|---|
| 1 | Collet clamping bush (without positive opening operation) |
| 2 | Collet  |
| 4 | Hardened length adjusting ring (preset)                   |
| 5 | Clamping tube   |
| 8 | Hardened ring   |

Check the power clamping device by no-load clamping. The collet (2) and the collet clamp bushing (1) must be removed for this. The axial no-load clamping is measured with a depth gauge to the preset length adjusting ring (4). The axial stroke of the no-load clamping should be min. 2 mm.

If the axial stroke of the no-load clamping is less than 2 mm, the dog clamping device must be checked for wear and parts (clamping dog, clamping sleeve, hardened ring) may need to be replaced.

## DL071 - Check pneumatic clamping device with wedge gear

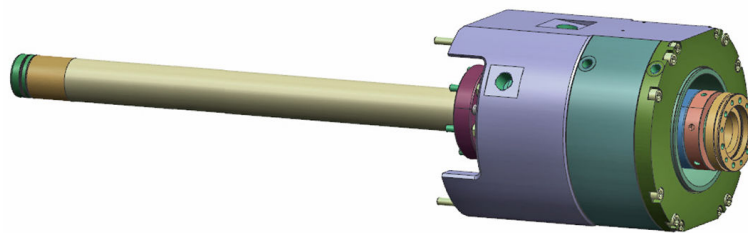


Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

### Orientation



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



Pneumatic clamping device TNL20

### Procedure

1. Check pneumatic clamping device with wedge gear according to the manufacturer's specifications

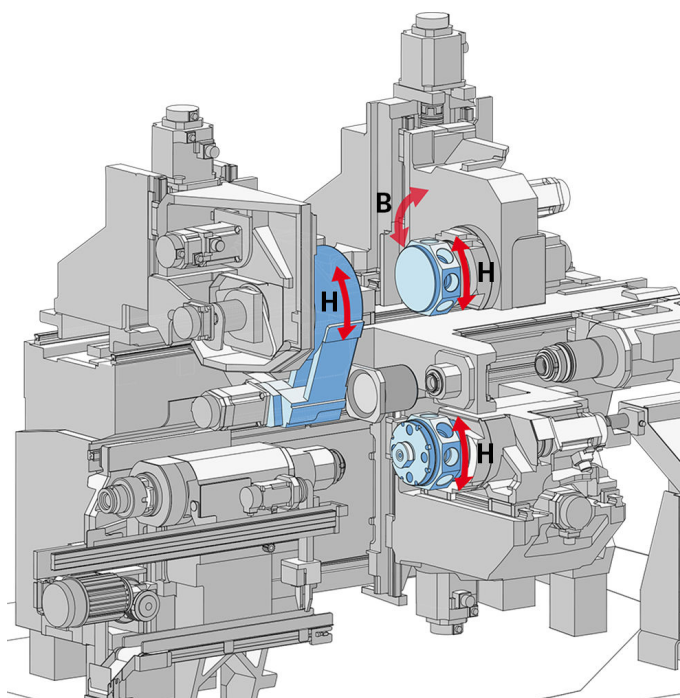
**DL075** - Check the cycloidal gear on the turret and the front working attachment

Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

**Orientation**

The cycloidal gear must be checked on the turret and the front working attachment by measuring the axial runout and the repeatability of the H axes and, where appropriate, of the B axis.

- H axis of front working attachment stations 1 to 6 → approx. 105 degrees
- H axis turret → 360 degrees
- B axis upper turret → approx. 100 degrees



**B axis and H axes TNL20**

**Procedure**

1. Check the cycloidal gear on the turrets by measuring the axial runout and the repeatability of the H axes, and of the B axis if necessary.
2. Check the cycloidal gear on the front working attachment by measuring the axial runout and the repeatability of the H axis

**DL080** - Check the seals on the rotary distributor of the turret and the front working attachment, replace if necessary



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

## Orientation

The Glydring seals of the rotary distributor on the turrets and on the front working attachment must be checked for leakage. Also check the O-ring gaskets on the cooling lubricant transfer kidney/pin on the turrets for leakage.

## Procedure

1. Check the Glydring seals of the rotary distributor on the turrets and on the front working attachment, replace if necessary.
2. Check the O-ring gaskets on the cooling lubricant transfer kidney/pin on the turrets for leakage, replace if necessary.

## DL160 - Determine axis ballscrew backlash



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

## Orientation



The Z axis should be adjusted around the machining position, as the backlash is not constant across the entire Z axis!

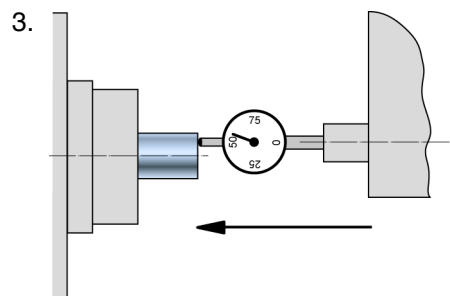
## Requirement

For backlash checking, the machine must have run warm for at least 3 h (traverse all axes).

For measuring the backlash, the machine must only be traversed by a CNC program, not with the handwheel.

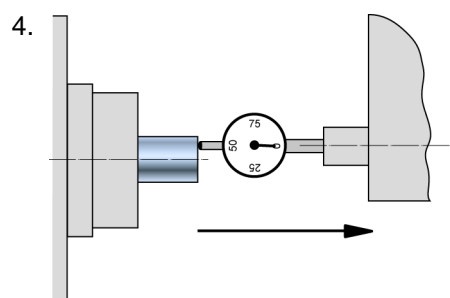
## Procedure

1. Clamp a face-cut round part in the collet.
2. Attach dial gauge (accuracy 1/1000) to the tool carrier.



Move dial gauge into position

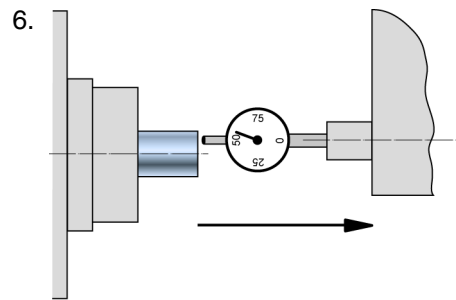
Move to the clamped turned part until the dial gauge probe is short of the hard stop (feed rate  $f = 200$  mm/min).



Back off the dial gauge by 1/2 measuring range

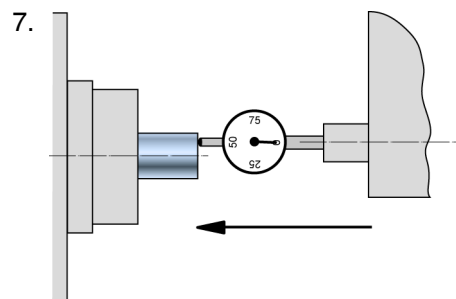
Back off the slide until the pointer of the dial gauge is within the indicating range (f = 150 mm/min).

5. Set the dial gauge pointer to "0".



Back off the dial gauge by 3 mm

Back off the slide by 3 mm (dial gauge is free) (f = 150 mm/min).



Advance the dial gauge by 3 mm

Advance the slide by 3 mm to the zero point (f = 150 mm/min).

8. Repeat the measurement five times and calculate the average.

Double this value and enter the result as backlash compensation into the control.

9. Remeasure for confirmation.

Should the backlash values for the X, Y and Z axes exceed 0.01 mm, they must be corrected by the machine manufacturer's service personnel.

## DL170 - Axes



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

### Orientation

Check the grid point spacing and the reference points of all axes, and correct if necessary.

### Requirement

### Procedure

1. Have the grid point spacing of all axes checked by the machine manufacturer's service personnel.
2. Have the reference points of all axes checked by the machine manufacturer's service personnel.

## DL180 - Check fire protection system (visual inspection)

### Orientation

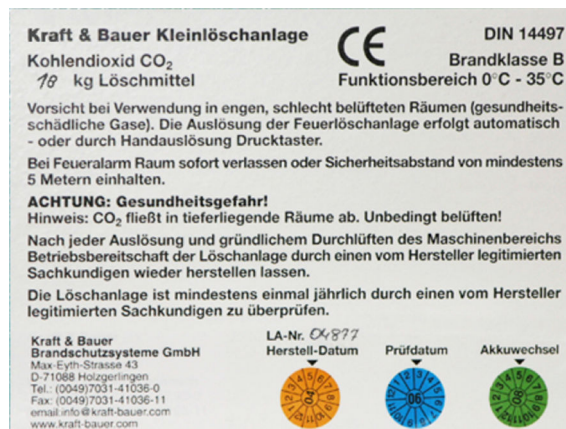


An examination of a fire protection system may only be conducted directly by the manufacturer or a person with written authorization by the manufacturer.

Be sure to read the operating instructions of the manufacturer!

### Procedure

1.



Example: Kraft and Bauer stickers

- Check sticker for manufacturing date.
2. Check sticker for inspection date.
3. Check sticker for battery replacement.



## DL225 - Replace toothed belts and check belt tension



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

### Orientation



Use only the original belts according to the spare or wear parts list.

Intact belts and correct belt tensions are necessary preconditions for trouble-free operation. Damaged belts must be replaced immediately.

**Frequency measurement of belt tension** Check the belt tensions with a frequency meter (e.g., from CLAVIS or Reiff). Place the frequency meter in the middle of the belt and lightly flick the belt (e.g., with the handle of a screwdriver) to set it in vibration. (If there are more than 2 pulleys, be sure to measure at the longest section of the belt).

### Requirement



After replacing a drive belt, be sure to observe the values (Hz) specified in the table below for the belt tension of the respective axis. **A frequency meter is required for testing.**

Also the reference point may need to be checked or adjusted.

### Procedure

1.



Caution

**Uncontrolled movements of axes or machine components.  
Severe cut and crush injuries.**

Secure all axes or components against uncontrolled movements during maintenance or repair work.

Move the tool slides to a suitable position.

2. Replace S5 belt.
3. Measure belt tension (frequency meter) and adjust belt.
4. Replace H1 belt.
5. Measure belt tension (frequency meter) and adjust belt.
6. Replace H2 belt.
7. Measure belt tension (frequency meter) and adjust belt.
8. Replace H3 belt.

9. Measure belt tension (frequency meter) and adjust belt.

## DL480 - Check wipers on the trolleys of the workpiece removal unit and replace them, if necessary



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation

The wipers on the guide carriages of the workpiece discharge unit prevent the ingress of dirt into the ball screw. The outer wipers of the trolleys are easily accessible and thus can be replaced quickly. The entire trolley under the workpiece removal unit can also be pushed out to replace the two wipers.

### Procedure

1. Move the workpiece removal unit to an appropriate position.
2. Replace outer wipers. Loosen screws of wipers accessible from the outside and remove the wipers. Replace wipers.

#### **Alternatively, the following procedure can be used!**

Replace external and internal wipers. Loosen and remove screws of the accessible trolley. Always remove one trolley and replace one wiper after the other.

3.



Do not push trolley from the guide bar. Balls of the linear ball bearing may be lost.

Carefully push out the trolley from under the workpiece removal unit.

4.



New wipers must rest against the contour of the guide bar.

Replace inner and outer wipers.

5. Push the trolley back under the workpiece removal unit and tighten the screws.

## DL490 - Replace the wiper and telescopic plates

### Orientation



Regular inspection of the wipers prevents damage to the wipers themselves and to the work area door.

If the work area door can be opened and/or closed only with increased effort, it can be expected that the wipers are already destroyed by accumulation of chips and swarf compaction.

### Requirement



Example: Chip hook and chip brush

Use appropriate tools to remove coarse chips, chip nests and other debris.

### Procedure



Example: 1 Removing chip nest using appropriate tools (e.g., chip hooks)

Remove large chips on the inside of the work area door from top to bottom. Use a chip hook for this purpose.

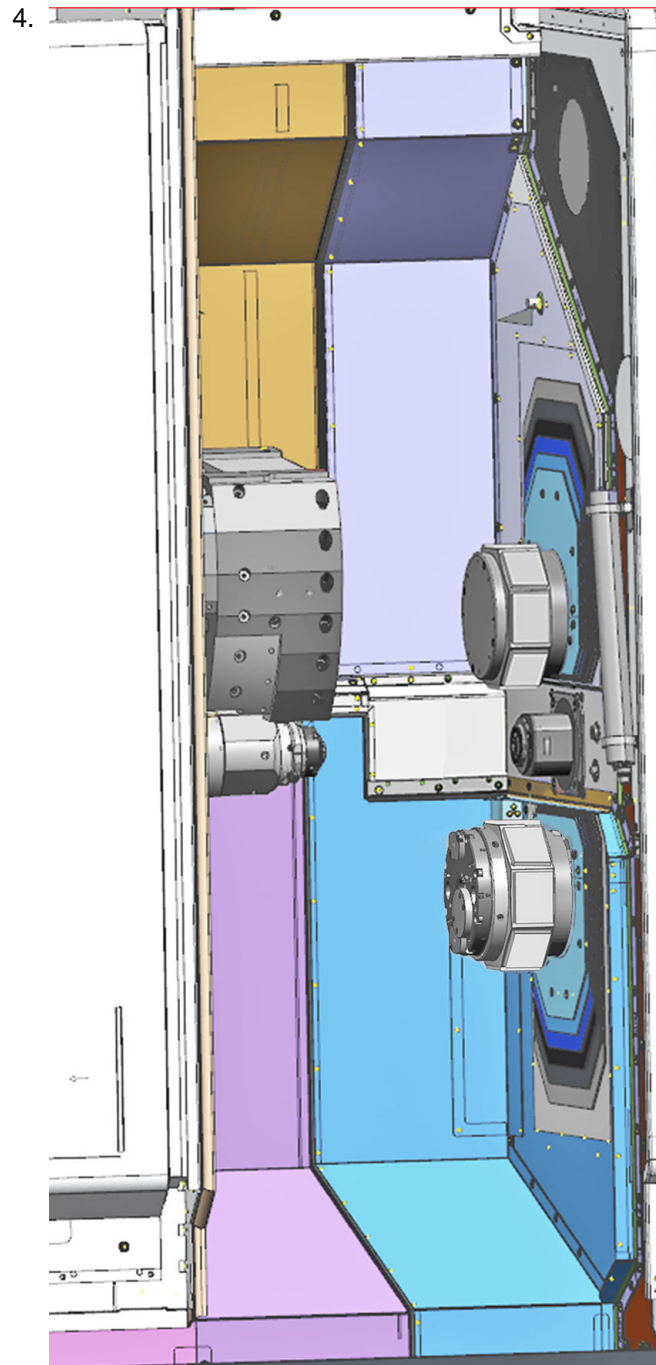
2.



Example: 2 Sweep small chips and other debris from top to bottom using chip brooms or brushes.

Remove small chips and chip accumulations on the inside of the work area door from top to bottom. Use a chip brush for this purpose.

3. Clean the area behind the wipers.



Example: Wipers work area TNL20


Replace wipers.

5.

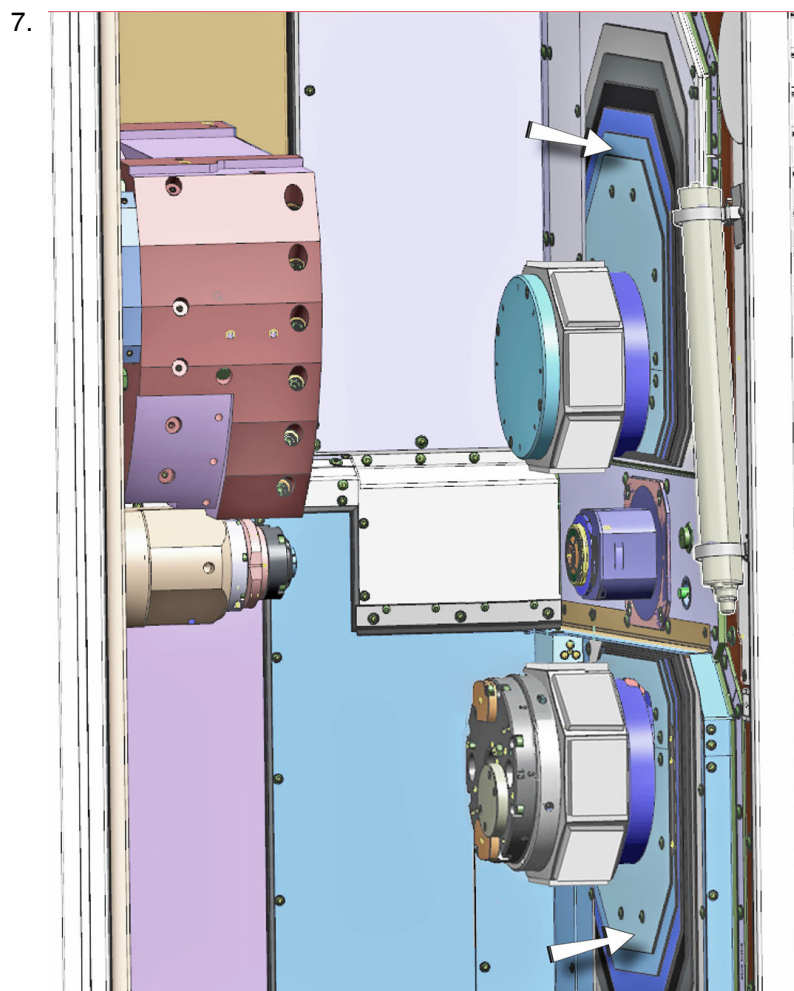


Make sure that the wipers evenly contact the work area door before tightening the screws.

Check the wipers for proper seating. After the wipers have been replaced, the work area door should open and close again without much effort as usual

6.  If replacement of the wipers has not resulted in tangible improvement, the soiled rollers and the guide rail of the work area door must also be cleaned.

Clean rollers and guide rail of the work area door.



Example: Detailed view of work area TNL20

Replace telescopic plates in the work area

## DL491 - Clean drain holes at the Z cover of the upper tool carrier

### Orientation

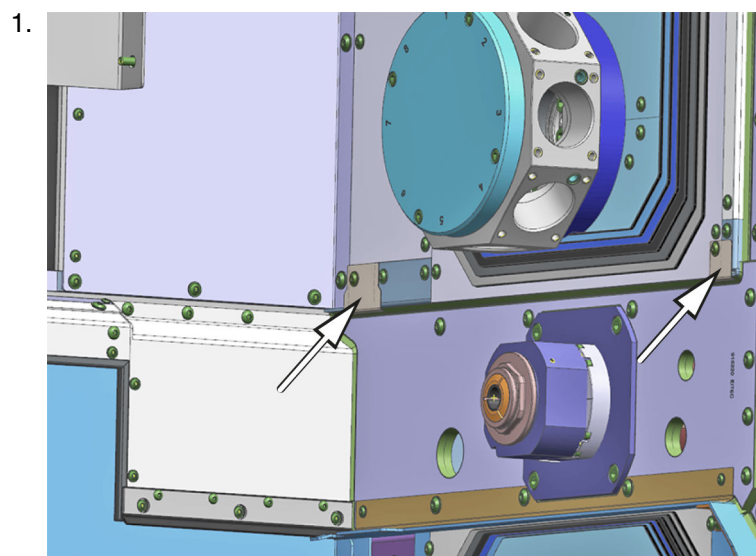


The drain holes at the Z cover of the upper tool carrier should be cleaned at regular intervals, so that any cooling lubricant behind can drain into the work area.

### Requirement

Use appropriate tools to remove coarse chips, chip nests and other debris.

### Procedure



Example: Drain hole of work area TNL20

Remove cover sheets over the drain holes and clean the drain holes with a brush, for example.

2. Reattach the cover sheets over the drain holes.



**DL492** - Replace the wiper for fixed headstock operation on the main spindle

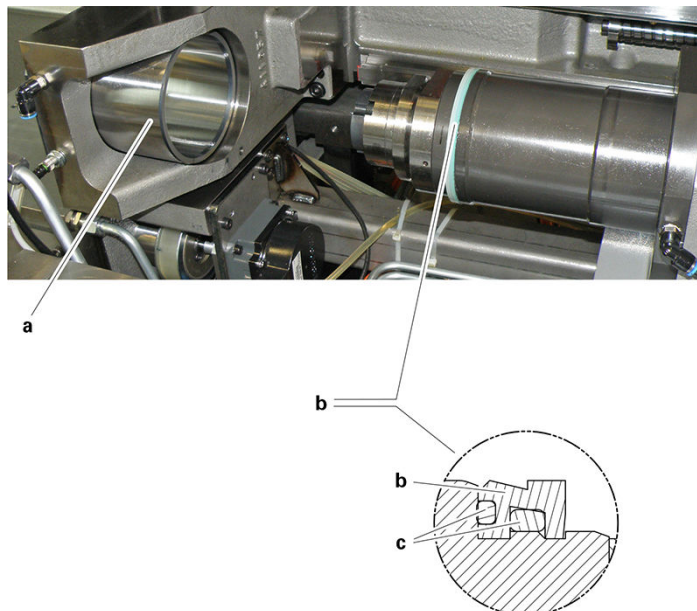
Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

## Orientation



The part numbers can be found in the spare parts catalog.

For fixed headstock operation with guide bushing, a wiper with O-rings is located on the main spindle. This seals the spindle area (main spindle/guide bushing) between the work area and the drive area during fixed headstock operation.



**Example: Figure of TNL18-9 fixed headstock operation**

- a Guide bush
- b Wiper
- c O-ring

## Requirement

Move the main spindle by means of the Z axis to the rear end position. This exposes the wiper of the guide bush. A mounting device kit must be used when installing the new wiper.

## Procedure

1. Replace wipers with O-rings

## DL510 - Perform data backup

### Orientation

Using a current data backup, the machine can be restored to the original state before the failure after a defect of the internal storage device/NC control.

The file name of the data backup includes the machine type, machine number, and date/time of the backup.

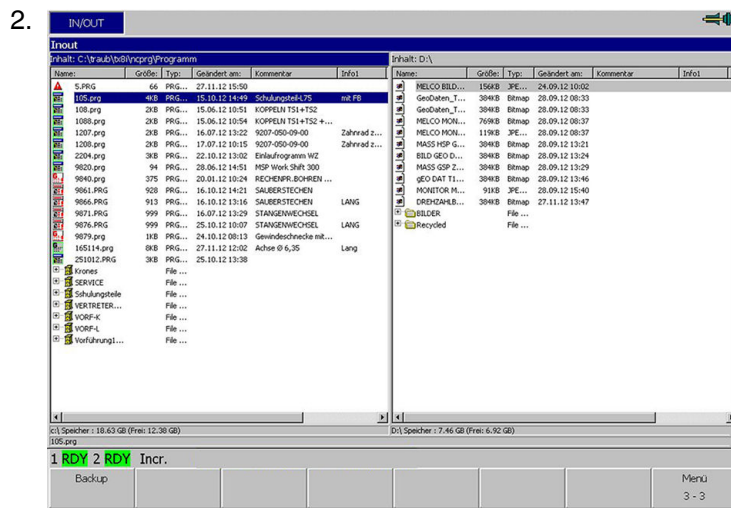


Network settings and the customer's NC programs are not included in the backup.

Backup additionally to an external data carrier in case of a defect of the internal storage medium.

### Procedure

1. Connect USB device to USB port



Example shown

**IN/OUT** screen and use **TAB** to activate the right part of the screen

3. **Softkey** Press **Select** (F3) (select appropriate target, e.g., USB)
4. **Softkey** Press **Menu** (F8) twice. **Softkey** text "Menu 3-3" appears

5. Note that the backup includes no customer NC programs! Include them in a separate backup, if necessary

**Softkey** **Backup** (F1) and press **Softkey** **OK** (F1) to acknowledge the informational message

All relevant parameters and data for the backup are compiled

6. Press **Softkey** **OK** (F1) to confirm the transfer of the data to the desired storage location

## DL520 - Check control cabinet and cable assemblies (visual inspection)



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation

To avoid problems and prevent any resulting system failures, simplified control cabinet checks must be carried out at regular intervals on the cabinet and associated components. This include a visual inspection of the wire harnesses of the individual modules and the grounding cable. Additional built-in air conditioning units (option) ensure a constant temperature in the control cabinet. These air conditioners cannot work efficiently if filters are dirty or doors are not tight.



Use only the original filters according to the spare or wear parts list!

Filters are hazardous waste and must be disposed of in accordance with environmental guidelines and regulations of the country of operation.

When working in or on the control cabinet, switch off the machine and secure it against power on.

### Requirement



Even with the machine powered off, some devices or components in the control cabinet are still energized.



Observe the specific electrical diagrams for this machine.

### Procedure

1. Switch off the machine.
2. Have the electrical diagrams for the corresponding machine ready.
3. Replace all filters on the control cabinet and cabinet components.
4. Check that the cabinet doors can be properly closed. If the cabinet doors can not be closed properly, determine the cause and eliminate it. Possible causes could be faulty seals, hinges, or even a damaged cabinet door.
5. Check all cabinet seals. They should be free of oil and condensation.
6. Clean the control cabinet. Use a suitable vacuum cleaner for this purpose.
7. Check the cabinet lighting (optional).

8. Check grounding cable. Grounding cables are located, e.g., between the control cabinet and cabinet doors and between the base and the machine bed.
9. Check all connections in the control cabinet, tighten loose connections

10.



### **Danger from electricity**

The charge lamp should be off (must not illuminate).  
Measure the voltage at the power rails to ensure they are de-energized.

Remove the covers from the power rails of the amplifiers and retighten all connections. Then reinstall the covers.

11. Check cable assemblies for damage, replace if necessary.

**DL525** - Check the fan and fan cover in the control cabinet, clean if necessary

Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

## Procedure

1.



Caution

**Electrical equipment or parts thereof are under dangerous voltage.**

**Electric shock.**

Switch off the machine and lock it out.



Control cabinet TNL20 Fan 1

Check the fan and fan cover in the control cabinet for dirt, clean if necessary.

## DL590 - Check inspection/replacement date of the backup batteries in the control cabinet (NC)



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation

To ensure that no important machine data is lost in the event of a power failure, backup batteries or rechargeable batteries are installed at various points of the machine, which must be regularly tested and/or replaced. The backup batteries described here have a lifespan of 4 years after which they must be replaced promptly.



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!

### Requirement

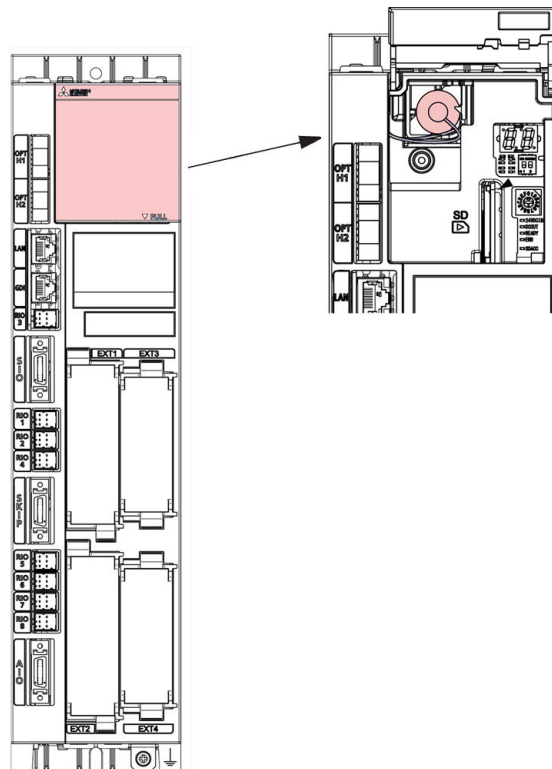
Prior to this maintenance activity, make sure that you have a sufficient number of batteries or rechargeable batteries available.

The required number of backup batteries varies depending on the extensions of the machine. The number of required backup batteries can be found in the electrical diagrams of the machine or obtained from the customer service of the machine manufacturer.

### Procedure

1. Switch off drives.
2. Press the emergency stop button.

3.



**NC backup battery in the control cabinet**

Open the battery compartment cover.

4. Remove the battery including connectors.
5. Insert a new battery and plug in the connectors.

6.



Example of the data to be logged in a maintenance schedule.

- approved/replaced on:
- Name:
- Signature:

Record testing or replacement date in a maintenance schedule.

7. Record testing or replacement date of NC backup battery in the control cabinet.
8. Close covers.

## DL636 - Check the replacement interval of the servo backup batteries at the axis servos.



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation

To ensure that no important machine data is lost in the event of a power failure, backup batteries or rechargeable batteries are installed at various points of the machine, which must be regularly tested and/or replaced. The axis servo backup batteries described here have a lifespan of 4 years after which they must be replaced promptly.



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!

### Requirement

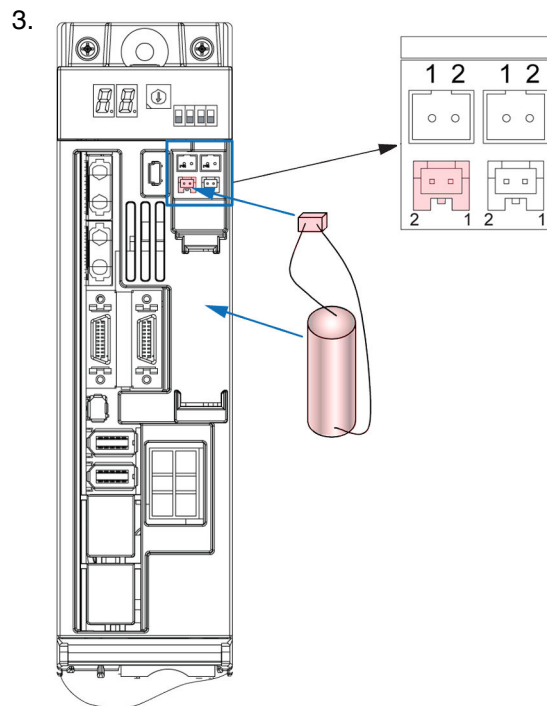
Prior to this maintenance activity, make sure that you have a sufficient number of batteries or rechargeable batteries available.

The number of axis servos and thus the required number of backup batteries vary depending on the extensions of the machine. The number of required backup batteries can be found in the electrical diagrams of the machine or obtained from the customer service of the machine manufacturer.

### Procedure

1. Switch on the NC.
2. Press the emergency stop button.





Servo backup battery in the control cabinet

Disconnect and remove the servo backup battery.

4. Connect a new servo backup battery and insert it into the axis servo.

- 5.
- i** Example of the data to be logged in a maintenance schedule.

  - Axis servo:
  - approved/replaced on:
  - Name:
  - Signature:

Record testing or replacement date in a maintenance schedule.



**Service Interval - 8.000 Operating hours**

## Maintenance Summary - 8.000 Operating hours



It is recommended to document the maintenance activities carried out by using the appropriate maintenance log. The maintenance log has the document number DTE035EN - 26.10.2022.

- EL010** - Check the dog clamping fixture, replace if necessary
- EL020** - Check pneumatic clamping device with wedge gear, replace if necessary
- EL030** - Check automatic work area door with Xcenter (option)

**EL010** - Check the dog clamping fixture, replace if necessary

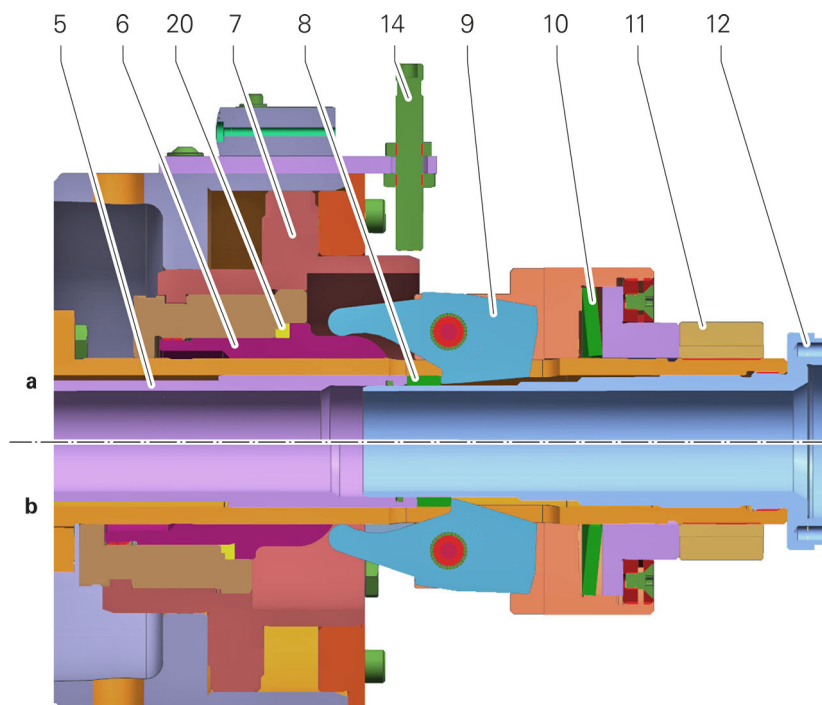
Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

**Orientation**

The clamping dogs on the dog clamping fixture should be replaced at regular intervals.

Also check the clamping sleeve for damage to the contact surfaces and renew if necessary the contact surfaces by turning the clamping sleeve (can be done several times). Turning the clamping sleeve is done by grinding down the adjusting ring (see figure).

Finally check the clamping force of the disk springs of the dog clamping device using a clamping force meter.



**Dog clamping fixture opened/clamped TNL20**

- 5 Clamping tube
- 6 Clamping sleeve
- 7 Piston
- 8 Hardened ring
- 9 Clamping dog
- 10 Disk spring
- 11 Adjusting nut
- 12 Protective tube
- 14 Inductive sensor

**Procedure**

1. Replace the clamping dogs on the power clamping device. The clamping dogs must be greased when installing.

2. Check the clamping sleeve for damage to the contact surfaces.

If the contact surfaces of the clamping sleeve are damaged, the contact surface must be renewed by turning the clamping sleeve. Turning the clamping sleeve is done by grinding down the adjusting ring.

3. If necessary, turn the clamping sleeve by grinding down the adjusting ring.

4. Check the clamping force of the disk springs of the dog clamping device using a clamping force meter

If the measured clamping force does not match the required value, replace the disk spring(s)

5. Replace disk spring(s) if necessary

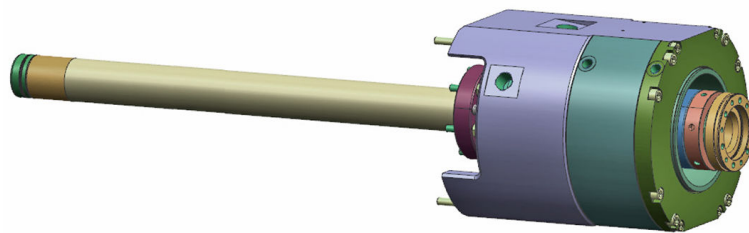
**EL020** - Check pneumatic clamping device with wedge gear, replace if necessary

Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

## Orientation



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



Pneumatic clamping device TNL20

## Procedure

1. Check pneumatic clamping device with wedge gear according to the manufacturer's specifications, replace if necessary.

## EL030 - Check automatic work area door with Xcenter (option)

### Orientation

When using the optional automatic work area door in conjunction with Xcenter, the two trolleys of the linear guideway must be lubricated in accordance with the manufacturer's specifications. Also, the casters must be checked, and replaced if necessary.




TNL20 Aut. work area door Xcenter 3

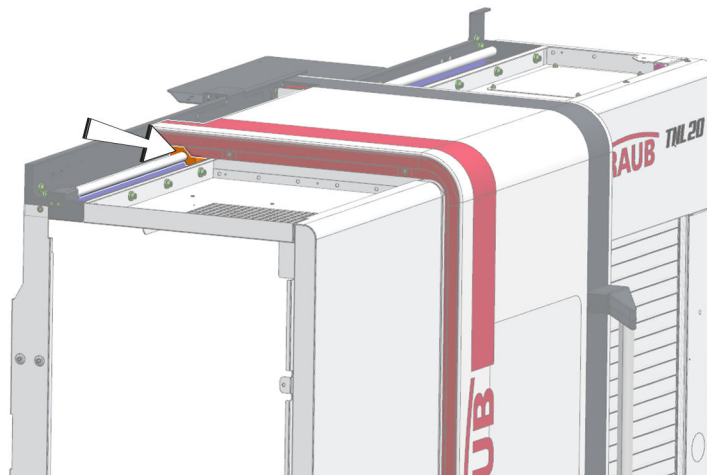


TNL20 Aut. work area door casters 2

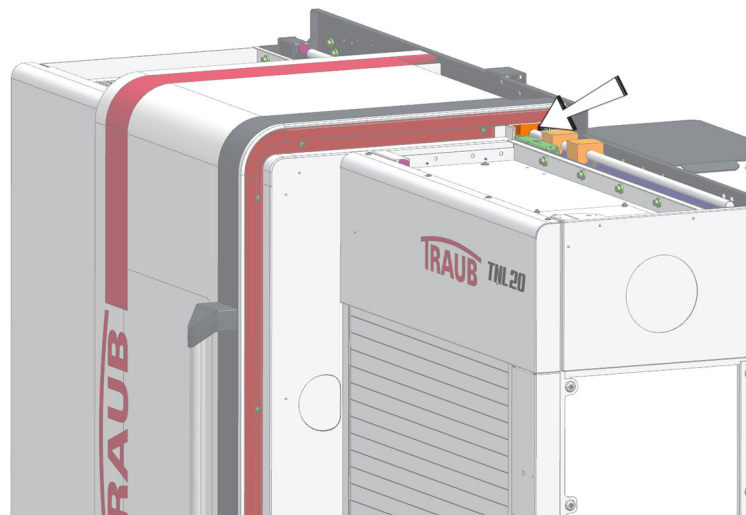
### Procedure

1.  Follow the corresponding manufacturer's documentation.



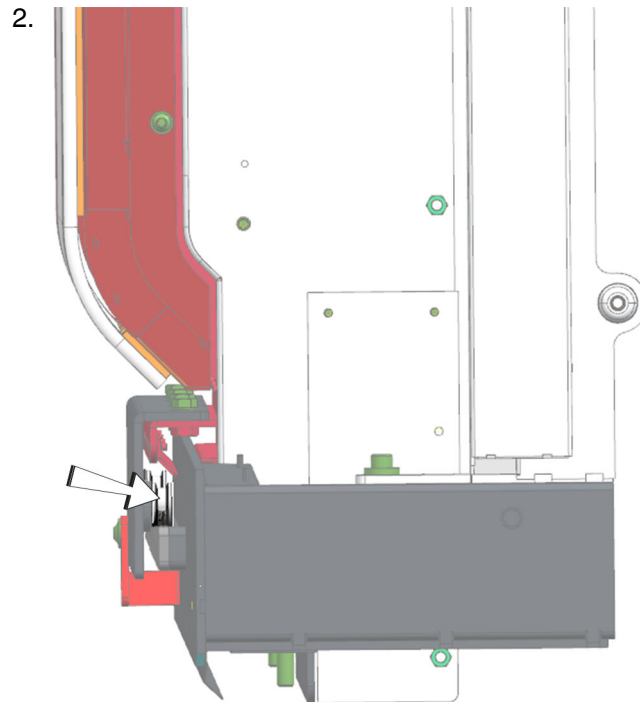


**TNL20 Aut. work area door Xcenter 1**



**TNL20 Aut. work area door Xcenter 2**

On automatic work area door in conjunction with Xcenter, lubricate the two trolleys of the linear guideway in accordance with the manufacturer's specifications.



**TNL20 Aut. work area door casters**

On automatic work area door in conjunction with Xcenter, check the rollers, and replace with new rollers if necessary.

## **Service Interval - 5 Years**

## Maintenance Summary - 5 Years



It is recommended to document the maintenance activities carried out by using the appropriate maintenance log. The maintenance log has the document number DTE035EN - 26.10.2022.

- IL010** - Replacing the pneumatically pilot- controlled cooling lubricant valves
- IL060** - Check the pretension on the spindle bearings on the main and counter spindles

## IL010 - Replacing the pneumatically pilot- controlled cooling lubricant valves

### Orientation

In the course of the machine's operating time, internal wear of the pneumatically pilot-controlled cooling lubricant valves may occur, with the result that cooling lubricant may penetrate the pneumatic control lines. To avoid consequential damage, **INDEX** recommends replacing these valves after 5 years.

### Requirement



Due to different requirements and/or specifications of the respective manufacturers, be sure to review the respective manufacturer's documentation!



Power off the machine to depressurize the pneumatic system and secure against accidental switching on.

### Procedure

1. Renew valves.

## IL060 - Check the pretension on the spindle bearings on the main and counter spindles



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must be carried out only by authorized personnel of the manufacturer!

### Procedure

1. Check the pretension on the spindle bearing of the main spindle.
2. Check the pretension on the spindle bearing of the counter spindle.

## **Service Interval - 8 Years**

## Maintenance Summary - 8 Years



It is recommended to document the maintenance activities carried out by using the appropriate maintenance log. The maintenance log has the document number DTE035EN - 26.10.2022.

**JL005** - Note on replacing the window pane or removing the design pane

**JL010** - Replace the window pane



## JL005 - Note on replacing the window pane or removing the design pane



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation



The instructions described in this point only serve as information for the subsequent maintenance activity “**replace window pane**” of the respective machines.

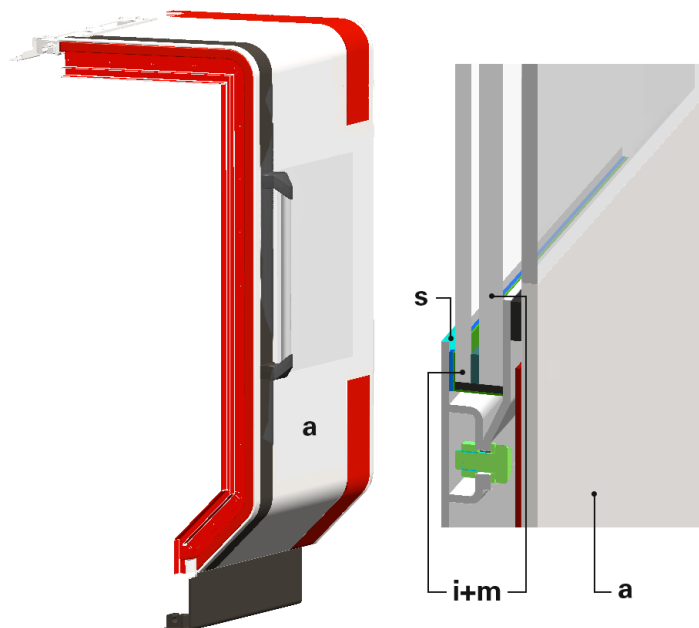


If the window pane is damaged, it must be replaced. This is necessary regardless of the extent of damage. Even with minimal damage, the impact resistance of the pane can no longer be guaranteed.



For safety reasons, it is recommended to obtain the window pane directly from the machine manufacturer or its country representative.

The window pane consists of three panes. the inner pane of tempered glass, the central pane of polycarbonate, and the outer pane also made of polycarbonate. The inner pane is relatively resistant. It can be cleaned with any commercially available cleaning agents. Only the center pane is essential for the impact resistance of the window pane. The polycarbonate panes are subject to natural aging and must be replaced at regular intervals.



Example: TNA400.2 Work area door


- a Outer pane (design pane made of PMMA – polymethyl methacrylate)
- m Center pane (polycarbonate)
- i Inner pane (glass)
- s Silicone gasket

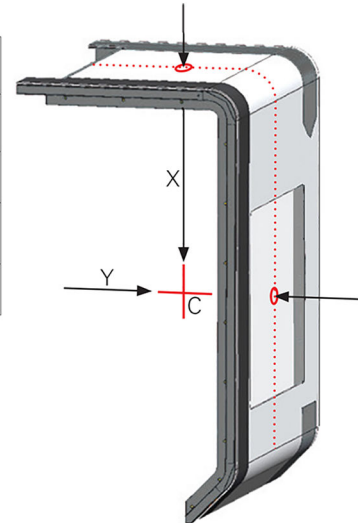
Depending on the machine type, it may be necessary to remove a handle attached here before dismantling the design disks.

## Requirement



General information. **The values indicated in the table must be strictly observed.**

A		B	C	
			X	Y
TNL20	-	46	617	110,5
TNA400.2 TNA500.2	+	67	603	48
TNX220.3	+	91,5	707	166



### Example: Design pane specifications for the respective machines

- A** Machine designation
- B** Weight (kg)
- C** Values for centers of gravity
- Y** Y-value (mm)
- X** X-value (mm)



From a weight of approx. 80kg, the use of lifting equipment (cranes, forklifts or similar) is recommended. The machines marked with + in the table ( **example: design pane specifications...** ) have threaded bushings at the top of the design pane and are therefore crane-compatible.

If the design pane is not removed using a crane or other lifting equipment but by hand using suction lifters, it is imperative that the current **Load Handling Ordinance (LasthandhabV)** be taken into account. When using suction lifters (see example), be sure to select the appropriate size or type according to the table ( **example: design pane specifications...** ).



The locally valid guide lines and regulations must be taken into consideration.



60kg



100kg

Example: Bohle suction lifter 60 kg-100 kg

## Procedure

1. If you have questions, be sure to contact the **INDEX** service department or an **INDEX** representative.

## JL010 - Replace the window pane



Carrying out the maintenance activities described below requires special knowledge. For this reason, these maintenance activities must only be carried out by staff that has received adequate training by the machine manufacturer!

### Orientation



If the window pane is damaged, it must be replaced. This is necessary regardless of the extent of damage. Even with minimal damage, the impact resistance of the pane can no longer be guaranteed.



For safety reasons, it is recommended to obtain the window pane directly from the machine manufacturer or its country representative.



Design element TNL20

The design element consists of the work area door with a permanently attached design pane. The design element covers the window pane on the operator's side. The window pane consists of three panes: the inner pane of tempered glass, the central pane of polycarbonate, and the outer pane also made of polycarbonate. The inner pane is relatively resistant. It can be cleaned with any commercially available cleaning agents. Only the center pane is essential for the impact resistance of the window pane. The polycarbonate panes are subject to natural aging and must be replaced at regular intervals.

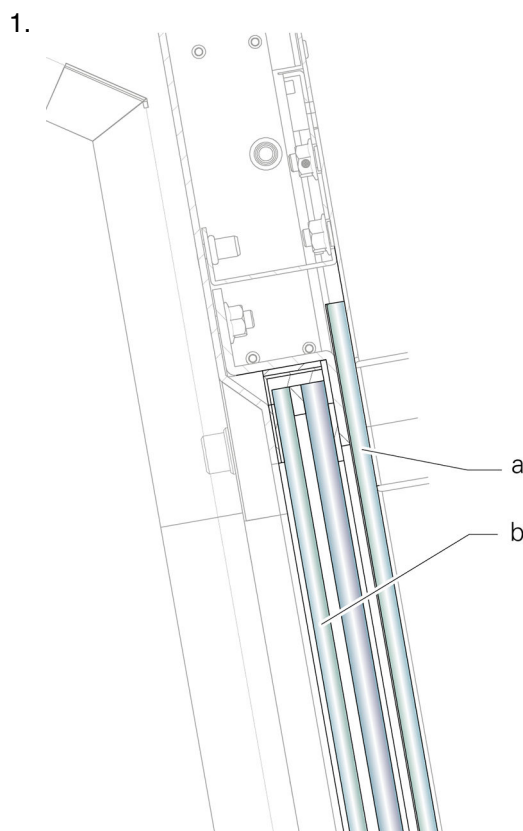
There is a safety label on the window pane indicating the part no., year of manufacture, and manufacturer. The first replacement of the window pane is due 8 years after production of the machine (see nameplate).

Make sure of the correct mounting position (safety glass facing the work area) when replacing the polycarbonate safety glass. The safety label should be readable from the outside.



**Cleaning the window pane.** The inside of the window pane is scratch-resistant. Any commercial cleaning agent can be used here.  
**Cleaning the cover pane.** The cover pane is sensitive to scratches on the operator side! Clean the cover pane with a soft cloth or sponge and glass cleaner or soap and water. Use no abrasive or alkaline cleaning agents and no sharp-edged items.

## Procedure



### Window pane TNL20

- a Design glass on operator side
- b Window pane on work area side

Replace the window pane.

# INDEX

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