
INTACT® 1200

INTACT® 1600

Service Instructions

Original Service Instructions

INTACT® V6.1R

Carl Zeiss Optotechnik GmbH

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1. Introduction

1.1. General

Thank you for your confidence in our products!

Our INTACT and the tire testing machine form the most recent generation of a modern, user-friendly system which represents the most advanced technology available.

INTACT is a system which facilitates all applications as far as possible. The simple and self-explaining user interface, the context-sensitive help system and the object-oriented software design are the main advantages you can make use of. The software can easily be customized for the customer's specific requirements, for example, with additional functions.

INTACT is due to its stable runtime behavior especially suitable for industrial applications. As a result of the consistent use of drivers, INTACT is software-independent. The image processing has been designed as single monitor system. Through selection of the corresponding hardware, the performance can be scaled freely. Thus, the software remains fully transparent for the operator.

The tire testing machine is only suitable for the testing of tires. The measurement technique is called shearography.

If the machine is used for other purposes than those it was designed for, the right to claim under guarantee expires and the manufacturer is not liable for damage.

1.2. About the Manual

In this manual service and maintenance of the individual devices of the system are explained.

Additional details, such as the description of software tools, are given in chapter 5. **Software for Maintenance**. The use of these software tools requires a password and special training, however.

When you click the **Help** button in INTACT software error messages, the User Manual opens automatically

2. Safety

2.1. Basic Safety Instructions



Electric voltage

Warning

Risk to life and limb due to electrical voltage.

Burns, cardiac arrest, death.

- Do not open the machine housing until it is tension-free.
- Do not disconnect cables until the machine is tension-free.
- Do not operate or perform maintenance with untrained personnel.



Laser radiation

Caution

Health hazard due to laser radiation.

Looking directly into the laser beam or through an optical device can damage the eyes.

- Do not look into the laser beam. Distance 15 cm.
- Do not look into the laser beam through an optical device.



Movable parts

Caution

Health hazard due to movable parts.

Burns, cardiac arrest, death.

- Do not stand under the loader / unloader during operation.
- Do not touch parts of the loader / unloader during operation.
- Do not touch parts of the tire flip during operation.
- Secure the lids at the loader / unloader side with transport bolts during maintenance and repair measures.

2.2. General Safety Measures

- Wear safety shoes and gloves during machine operation.
- Do not enter pressure chamber or optional tire flipper via loader and unloader or tilting table. Do not climb on the tilting table. It is forbidden for persons to stay around while the tilting table is in motion and operating. Before operating the tilting table, the operator must ensure that no persons are present in the danger zone. (Severe injuries!)
- Unauthorized persons must not have access to danger zones.
- The tire testing machine must not be subjected to shocks. Otherwise, it can be damaged.
- The tire testing machine must not be subjected to significant temperature fluctuations.
- The tire testing machine must not be operated:
Temperatur: over +40 °C or below +10 °C.
Air pressure (sea level): <1000 m.
Relative humidity: 10%-85 %.
- Danger of mortal electrical shock. Do not remove protective measures as isolation and shields.
- All work on the electrical equipment of the machine / system may only be performed by a qualified electrician according to electrical engineering regulations and with the main switch switched off and secured against being switched on again.
- All protective and safety-related devices, such as removable protective devices and EMERGENCY STOP devices, must be installed in correct position and enabled and fully functional.
- The company using this machine has to assure that safety measures as safety switches and safety light barriers of the machine are checked on regular base (function and mechanical stability).
- The company using this machine has to assure that personell in laser areas must be conversant with the procedures to be observed with respect to the laser accident prevention regulations.
- To prevent unauthorized persons from operating the machine PC login requires password. Keep it secret!
- The housing of the tire testing machine must not be opened during operation.

2.3. Additional Safety Measures during installation

The additional instructions below must be followed during transport / installation of the INTACT tire testing machine:

- Please use only adequately rated means of transport!
- The presence of persons under suspended loads/machine parts or between suspended parts and fixed objects is prohibited.
- Wear personal safety equipment (safety gloves, safety shoes and safety helmet) during transport!
- Pay attention to centre of gravity of the machine parts!

- In combination with customer owned conveyor: close gaps <120 mm between single conveyor belts! Remaining gap between conveyor belt and fixed object <= 5 mm. Compliance with these specifications must be ensured by the integrator or customer if customer owned conveyor technology (loader and unloader) is used.
- For operation with tilting table: Indicate below tilting table as danger zone!
- Refer to instructions for transport of the machine in operator and service manuals.
- Use suitable aids for support.
- Secure components against falling over, e.g. by a second person.
- Secure the components immediately after installation.
- Seal off danger zone.

2.4. Additional Safety Measures during operation

The additional instructions below must be followed during operation of the INTACT tire testing machine:

- The housing of the tire testing machine must not be opened during operation.
- During automatic operation there is danger of being crushed at pneumatic lids of the pressure chamber.
- Inspecting very large tire dimensions there is danger of being crushed during tire loading. Do not put your fingers through the safety fence!
- Tires must not exceed min / max dimensions!
- There is danger of being crushed during tire unloading at gravity roller conveyors.
- The presence of persons in the danger zone of the tilting table is prohibited while it is moving. Make sure that no one is in the danger zone before operating the tilting table.
- For machines with tilting table mounted at the pressure chamber: Do not reach at the danger zone of the pneumatic cylinder below the tilting table during tire loading! There is residual risk of being crushed at hand and arms.
- Do not climb the tilting table! May cause severe personal injury.
- Do not enter the pressure chamber!
- When the tilting table is raised, it is forbidden to reach into the danger zone of the lifting cylinder under the tilting table. Crushing hazard!

Eliminating blockades/ disturbances in the work process

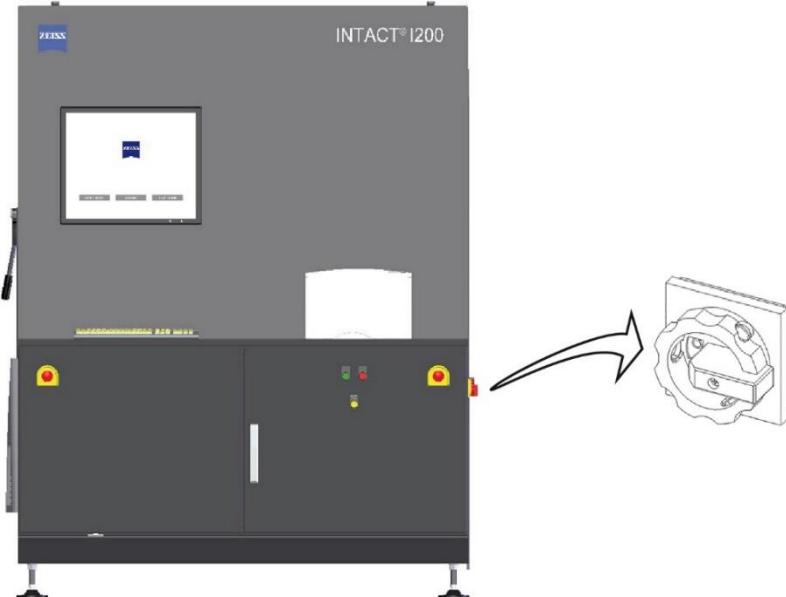
Siehe Operator manual, Chapter Trouble Shooting.

2.5. Additional Safety Measures for maintenance

The additional instructions below must be followed during maintenance of the INTACT tire testing machine:

- Maintenance services and alignment work must be performed only by trained personell using personal protection equipment and observing the regulations regarding work safety.
- Wear personal safety equipment (safety gloves, safety shoes) during maintenance!
- During maintenance services combinations of riks and multiple consequences may occur.
- Before starting any maintenance and service work, disconnect the instrument from the electrical supply and secure it against unauthorised restart (LOTO: Lock Out - Tag Out). When the power supply is switched off, the pneumatic supply is automatically switched off as well. The operating company must ensure that there is a main shut-off device in the compressed air supply line and that there is a lock so that it can be secured against being switched on again.
- During maintenance work, the machine must be depressurised and secured against being switched on again using a lock on this main shut-off device.
- Caution!
Dangerous movements caused by inherent energy (compressed air) possible.
- Perform any work inside the pressure chamber only when machine is switched off and secured against unauthorised restart!
- Do not enter the pressure chamber!
- Alignment work may require supplementary lighting. Use hand lamp!
- Only use original spare parts as only original spare parts meet the specified technical requirements.

Disconnecting the machine from voltage/pressure



1. Switch off the main switch (1) on the INTACT and secure it with a padlock against being switched on again.
2. Put up a sign reading "Attention, working on the machine. Do not start the machine".

2.6. Requirements to operating company and personnel

The system may only be used, repaired and maintained by trained operating staff.

The company using this machine has to assure that personnel is trained on regular base. Applicable safety and accident prevention regulations must be observed at any time.

Operating company

The operating company must ensure that:

- all requirements regarding the installation site are met.
- the components and the complete machine are used as intended.
- all safety elements function as intended and comply with the provisions of the Ordinance on Industrial Safety and Health.
- all safety devices are properly installed and functional before each start-up of individual components and the complete machine.
- a person responsible for safety is appointed.
- only trained and qualified personnel work on the components and the complete machine.
- trained and qualified personnel working on the components and the complete machine have the appropriate training and experience.
- personal protective equipment is available to the trained and qualified personnel.
- the operating instructions / manual for the components and the complete machine are available at all times at the place of use.
- the industrial safety regulations are observed. This includes, for instance that:
- the operating company must comply with their monitoring and supervision duties.
- the operating company must carry out trainings to train instruct personnel on the individual components and the complete machine at fixed intervals.

Trained and qualified personnel

Only trained and qualified personnel is allowed to work on the components and the complete machine (machine / product).

Persons under the age of 18 may only work on the machine under the supervision of a trained and qualified specialist.

A trained and qualified specialist is a person who, due to his training and experience, can safely carry out the required work and is able to recognise and avoid possible risks and dangers.

The following conditions apply to trained and qualified personnel:

- trained and qualified personnel must have been appointed to perform the required work by a person responsible for safety.

- trained and qualified personnel must have the appropriate training and experience required for performing the work to be done.
- trained and qualified personnel must have received instruction on the components and the complete machine.
- trained and qualified personnel must have knowledge of the relevant standards, regulations, accident prevention rules and the respective operating conditions.

Qualified personnel (for assembly)

(Assembler, manufacturer's designing engineers, forwarding agents, transport personnel)

In the position to carry out the assigned tasks and to recognize dangers independently due to appropriate technical training, knowledge and experience Measures for hazard avoidance are known.

Machine Operator

Machine operator instructed by the operating company. Tasks and operating steps that go beyond operation in normal mode (measuring tires) may only be carried out by the machine operator after the operating company has expressly instructed him to do so.

Service personnel / qualified personnel

Includes (maintenance staff) and qualified and trained electricians

Supervisor appointed by the operating company

In the position to carry out the assigned tasks and to recognize dangers independently due to appropriate technical training, knowledge and experience Measures for hazard avoidance are known.

The supervisor (employee of the operating company) is trained and instructed by the manufacturer and able to carry out extended tasks on the machine. These tasks are specified in the operating instructions.

2.7. Product Safety Labels

The following warning signs are attached to the INTACT tire testing machine and its components:

 <p>Warning hazardous voltage</p>  <p>Warning hazardous voltage (Attention! Only open after interrupting the main switch.)</p>	<p>These symbols indicate danger due to high voltage (380 V – 500 V) especially inside electrical cabinets. Work may only be carried out by skilled personnel.</p>
 <p>Warning laser radiation hazard</p>  <p>Note class 1 laser product</p>  <p>Note class 3B laser product</p>	<p>These symbols indicate the special danger implied in working with lasers. Work on the measuring head may be done by trained personnel only!</p>
 <p>Warning of hand injuries</p>	<p>This symbol indicates danger due to moveable parts. Work may only be carried out by skilled personnel.</p>
 <p>No Access</p>	<p>This symbol indicates access is prohibited because of severe risks in pressure chamber or flipper.</p>
 <p>No stepping on surface</p>	<p>This symbol indicates stepping on conveyor surface is prohibited because of severe risks on surface and in pressure chamber or flipper.</p>
 <p>No fork lift trucks beyond this point</p>	<p>This symbol indicates risk of damage for machine parts when supported by fork lift in this areas.</p>
 <p>Danger zone</p>	<p>These hatched areas mark the danger zone around the tilting table.</p>
 <p>Do not reach into this area</p>	<p>This symbol indicates areas that must not be reached into.</p>

2.1. Additional Symbols and Warning Signs

2.1.1.



Caution

Warning of direct danger for the operator. The operator must read text marked with this sign in the manual very carefully and observe the instructions given there.

2.1.2.



Diode Laser or Retro-Reflective Sensor (Laser)

This symbol will be found at the measuring head, and it indicates the special danger implied in working with lasers. Work on the measuring head may be done by trained personnel only!

As the lasers are class 1 laser products in accordance with DIN EN 60825-1:2001-11, no further marking is required.



The symbol to the left is found on the retro-reflective sensors (laser) at the lead-in and lead-out lids and at the lift axis. The symbol shown below is provided on the holders of the retro-reflective sensors (laser). This warning sign indicates the special danger implied by the retro-reflective sensors (laser). They present a similar danger as the diode lasers. The retro-reflective sensors are class 2 laser products. As they are not switched off, you need to be particularly careful. Please observe the instructions and warnings given in the user manual for the retro-reflective sensors (laser).

2.1.3.



Caution! Voltage!

Danger

These symbols are found on the control cabinet and the terminal box of the tire testing machine. They indicate danger due to high voltage (380 V – 500 V). Work may only be carried out by skilled personnel!



Caution! Voltage!

Cord is live even if main switch is switched off!



Achtung!

Nur nach Ausschalten des
Hauptschalters öffnen!

Only open after interrupting
the main switch.

Ouvrir seulement après
interruption du
commutateur principal.

2.2. Procedure in the event of dangerous incidents and accidents

Rescue of injured persons

1. Press the emergency stop button immediately.
2. Clamping cylinders and tilting table can be moved slightly by hand to free persons.

Fire

1. Switch off the machine at the main switch.
2. If necessary, switch off the turning station at the main switch.

3. Notes on Service and Trouble Shooting

3.1. General Notes and Instructions

3.1.1. Service and Trouble Shooting

Service and repair of tire testing machine and loader/unloader may be done by trained personnel only. This work has to be done especially carefully. The warnings must be observed! Otherwise, electricity and diode lasers may cause severe injuries (see text below).

3.1.2. Fault Detection and Support

The staff of Carl Zeiss Optotechnik GmbH will be glad to answer your questions regarding fault detection and trouble shooting. Help is available via fax, phone or e-mail, however, no guarantee can be given for this support. In case a service engineer of Carl Zeiss Optotechnik GmbH is required at your premises, a separate quotation will be submitted.

3.1.3. Software Tools for Service and Support

The tire testing machines supplied with software versions 2.7.1 or higher feature new software tools, which greatly facilitate error finding and correction. The software tools can also be implemented in older versions of the tire testing machine. Carl Zeiss Optotechnik will be happy to assist you in the implementation.

You will find a description of the software tools in chapter Fehler! erweisquelle konnte nicht gefunden werden. **Software for Servicing** in this manual. The correct and safe use of the software tools requires special training.

3.2. Special Attention Required!

3.2.1.

Diode Laser



Diode laser light implies certain dangers because of its characteristic features which are quite different compared to common light sources.

For the safe application of diode lasers, it is necessary that all operators and all persons who work in the surroundings of the laser are aware of this danger.

Viewing the diode laser using an optical instrument without exercising due care especially endangers the eyes. Direct contact of the diode laser beam with the eyes may cause severe damage and lead to loss of sight!!!!

Works at diode laser or measuring head may, thus, be carried out by trained personnel only!

Before repairing or adjusting work is done at the measuring head, make sure that the diode lasers are switched off. This also applies if the measuring head is to be removed.

3.2.2.

Control Cabinet / Switch Box

They may only be opened by skilled personnel. This also applies if the main switch is switched off. Some components still are live for some time after they have been switched off.

3.2.3.

Vacuum

No one may be inside the machine. If this is required for service, the service door must not be closed and no vacuum must be created. This could lead to severe injuries.

3.2.4.

Lids / Axes

While axes or lids are moving, the drives must not be touched since fingers or clothing may get caught.

For transport as well as during maintenance and repair measures, the lids at the loader and the unloader side of the INTACT tire testing machine must be secured with transport bolts (2x ISO-4762-M8x50-A2-70, with DIN 934 A4 M8) in order to prevent an unexpected fall down.



A	Lid (loader side)
B	Transport bolt reception

3.2.5.

Loader / Unloader / Tire Flip Device (Flipper)

The loader, as well as the complete machine may only be used for the handling respectively the testing of tires. No one must stay under the loader / unloader while it is in vertical position. No one must stay on the loader / unloader while it is in horizontal position. Moving parts of loader and unloader must not be touched during operation! This also applies, without limitation, to the tire flip device. In addition, it is essential to always keep in mind that the tire flip device rotates and that the roller conveyors move together.

3.2.6.

Operator

We shall not be liable for faults and defects which are caused by faulty use or human error. This also applies to injuries which operator or other persons may suffer due to improper use of the machine.

The instructions given in all other manuals and in this one must be followed strictly!

4. Service / Maintenance

4.1. Summary for Service and Maintenance

Objects	Work to do	Consumption material	Cycle	Page
Safety installation	- check	-	- daily; after each maintenance or repair work	18
Measuring Head and Diode Laser Segments	- remove	-	if required	22
Diode Lasers	- visual check			29
	- exchange		if required	30
Measuring head holder	- exchange	-	-monatlich, bei Bedarf	31
Measuring head	- adjust	-	- if required	32
Shearing Module and the CCD Camera	- Replace	-	- if required	34
Tilt Axis	- adjust	-	- if required	38
Toothed belts	- replace	-	- if required	39
	- tension	-	- if required	46
Pneumatics without Electricity	- control	-	- if required	53
Vacuum pump	- clean the ball bearings - clean and grease - clean the entire pump	Unirex N3 (Esso)	20,000 hours or 2 years	54
Conveyour System	- clean the ball bearings - clean and grease	Unirex N3 (Esso)		54
Optical Setup	- clean	-	- if required	54
Maintenance unit	- clean	-	automatically	
Lids	- align	-	- if required	84
Cylinder of Lids	- exchange	-	- if required	85

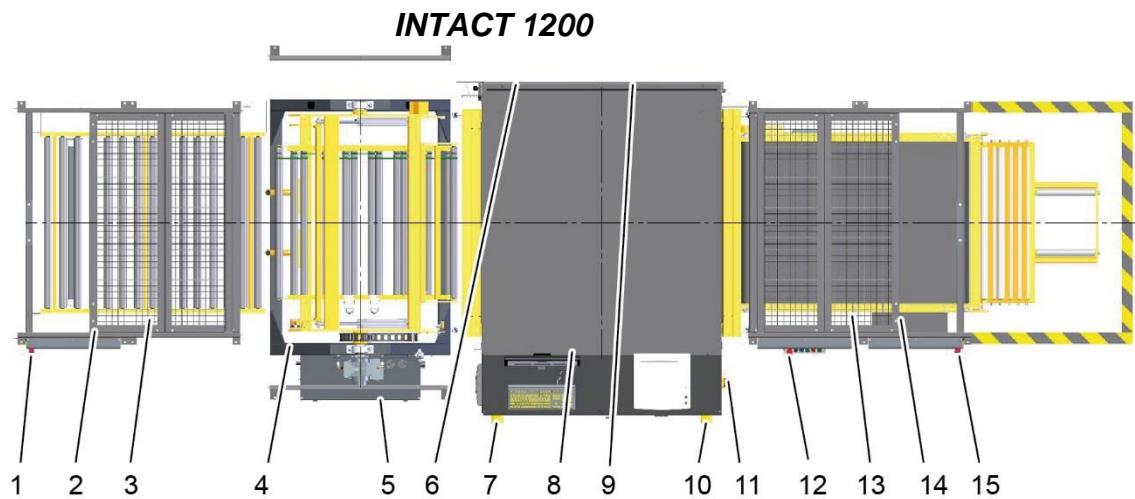
Objects	Work to do	Consumption material	Cycle	Page
Fire wire cable	- change	-	- if required	88
Brake roller at unloader	- check	-	- weekly	8988
Guides and bearings	- clean - grease at appropriate places (see lubrication chart)	see lubrication chart	see lubrication chart	55 ff
Screw connections	check the: - synchronized pulley - measuring heads	-	every 6 months once a year see section 4.19.6	
Optical system	- clean the objective lens - clean the diode lasers	- blow off with clean air - isopropyl alcohol - lens cleaning paper (Eastmann Kodak Company, Rochester, NY 14650)	as required as required	
Entire machine	- clean	-	as required	
Air conditioner	- clean the cooling ribs	- with compressed air	every 6 months	
Photoelectric beam	- clean the sensors - clean the reflectors	- lens cleaning paper (Eastman Kodak) - lens cleaning paper or Q-Tips	once a month, or as required	
Verify Body ⁸	- check the image quality - check the vacuum system - check the axes	- with the Verify function	daily	27
ASTM Body ⁸	- check the image quality - check the vacuum system - check the axes	- with the "ASTM Verify" function	every 2 months	

⁸ Not all machines are provided with a Verify Body or ASTM Body as they are optional.

4.2. Safety installation

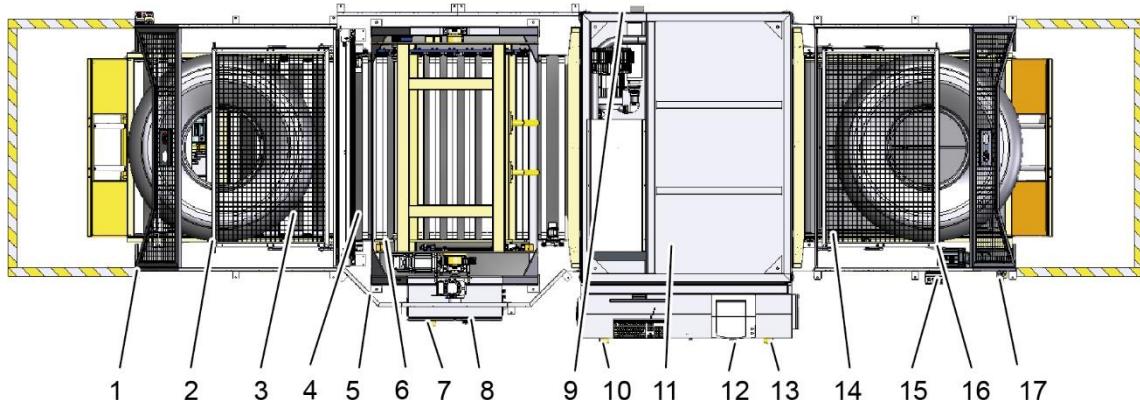
4.2.1. Safety layout

Depending on the machine configuration, the following safety devices may be installed.



Item	Designation
1	Emergency stop button
2	Safety light barrier
3	Guard (both sides and on top)
4	Guard (both sides and on top)
5	Main switch for turning device (only for INTACT 1600 with tire flipper)
6	On-off valve (on pneumatic maintenance unit)
7	Emergency stop button (for INTACT 1200 / for INTACT 1600 with tire flipper)
8	Guard (safety enclosure, with control based safety functions and emergency stop button on the inside)
9	Safety switch on the electrically locked service door
10	Emergency stop button
11	Main switch of the machine
12	Emergency stop button
13	Guard (both sides and on top)
14	Safety light barrier
15	Emergency stop button

INTACT 1600



Item	Designation
1	Emergency stop button
2	Safety light barrier
3	Guard (both sides and on top)
4	Rolling shutter
5	Guard (both sides and on top)
6	Safety switch
7	Emergency stop button
8	Main switch for turning device
9	On-off valve (on pneumatic maintenance unit) (rear side of INTACT)
10	Emergency stop button
11	Guard (safety enclosure, with control based safety functions and emergency stop button on the inside)
12	Main switch of the machine
13	Emergency stop button
14	Guard (both sides and on top)
15	Emergency stop button und pushbuttons for control of tilt table (if existing)
16	Safety light barrier
17	Emergency stop button

Checks

Check all safety devices daily, weekly and each time maintenance or repair work has been done.

If you notice any damage, fault, malfunction or change in operating behavior, immediately notify the person in charge and immediately stop all work on the machine.

If the machine can be started although the safety device has been activated: Disconnect the instrument from the electrical supply and secure it against unauthorised restart (LOTO: Lock Out - Tag Out).

Checking the INTACT main switch

1. Switch off the main switch.
2. The display must be blank.

Checking the emergency stop button

1. Press the emergency stop button.
2. Check if the correct message is displayed on the operating panel.
3. Press luminous pushbutton “Start”.
4. The machine must not start up.
5. Release emergency stop button
6. Press luminous pushbutton „Start“
7. Machine should be resest again and ready for operation
8. Check each emergency stop button individually.

Checking the service door (only INTACT 1200)

1. Open service door while machine is ready for operation.
2. Check if the correct message is displayed on the operating panel.
3. Press luminous pushbutton “Start”.
4. The machine must not start up.
5. Close Service door.
6. Press luminous pushbutton „Start“
7. Machine should be resest again and ready for operation.

Checking the safety light barrier (only INTACT 1200)

1. Hold an object into the area monitored by the safety light barrier (520 mm above conveying level).
2. Check if the correct message is displayed on the operating panel.
3. Press luminous pushbutton "Start".
4. The machine must not start up.
5. Remove object from safety light barrier.
6. Press luminous pushbutton „Start“
7. Machine should be reset again and ready for operation.

Guard

1. Check and make sure that the guards are mounted properly.
 - Safety fence elements on the loader, turning unit and unloader.
 - Sheet metal cladding around the pressure chamber.
 - Sheet metal cladding around the drives and the moving mechanical assemblies.
 - Sheet metal cladding around live parts.
 - Filling pieces on the conveyor belts.

Rolling shutter (only INTACT 1600)

1. Open roller shutter with service tool. (meanwhile check if pneumatic drives still work)
2. Try to rotate (flip) and clamp the flipper with the service tool.
3. Rotation and clamping should not be possible due to open roller shutter
4. Close roller shutter with service tool. (meanwhile check if pneumatic drives still work)
5. Try again to rotate (flip) and clamp the flipper with the service tool.
6. Rotation and clamping should only work while roller-shutter is closed

4.3. Removing Measuring Head and Diode Laser Segments

The measuring head of the tire testing machine consists of single segments. Their number depends on the type of tire testing machine or, more specifically, on the number of measuring heads. Each measuring head is provided with one segment with diode lasers.

The tire testing machines allow for a 90° or 180° travel range of the measuring head, depending on customer specifications.

4.3.1. Measuring head with 90° Travel Range

7. **Shut down** the system and switch off the machine with the main switch. You can now open the service door.
8. Remove the cables from the CCD camera.
9. Remove the power cables (red and black) of the diode lasers. You will find them on the back of the measuring head holder.
10. Loosen the four screws that secure the step motor. The screws do not have to be removed completely.
11. Screw the clamping screw underneath the motor downwards as far as possible. You can now loosen the toothed belt.
12. Loosen the 2 hexagon socket screws at the back of the measuring head holder. You can then remove the measuring head.
13. Slip the toothed belt off the pinion.

Thus, the removal of the measuring head is completed. The installation is done the other way round.

1. Slip the toothed belt over the pinion and deflection roller.
2. Fix the measuring head to the measuring head holder with 2 hexagon socket screws.
3. Plug in the power cables for the diode lasers (red and black) at the corresponding jacks, which are provided on the back of the measuring head holder.
4. Connect the camera cables.
Make sure that the cables are laid properly and are not pinched or trapped in any way. To verify proper routing of the cables, tilt the measuring head up and down all the way to the limit stops.
5. Retighten the toothed belt. Instructions on tightening the toothed belt are given in sections **4.10.2. Tilt Axis** and **4.11. Tensioning of the Toothed Belts**.
6. Tighten the step motor again with the four hex head screws.
7. Check the distance between the inductive switch and the control cam with a gauge. The distance must be 0.1 mm. You can set the distance by adjusting the grub screw at the

switching lug. Then secure the grub screw again with **Loctite (red)**.

8. After completion of the measuring head installation, the machine can be switched on again. A **self-diagnosis** is executed. After a successful test, the machine can operate without limitations again.

4.3.2.

Measuring Head with 180° Travel Range

1. **Shut down** the system and switch off the machine with the main switch. You can now open the service door.
2. Remove the camera cables.
3. Remove the power cables (red and black) of the diode lasers.
 - 3.1. Unscrew the cover and take it off the top of the diode laser segment.
 - 3.2. Open the cable clips and remove the cables.
 - 3.3. Remove the cable ties at the bottom of the diode laser segment.
4. Remove the energy management chain that is mounted on the diode laser segment.
5. Loosen the four screws that secure the step motor. The screws do not have to be removed completely.
6. Screw the clamping screw underneath the motor downwards as far as possible. You can now loosen the toothed belt.
7. Remove the 2 hexagon socket screws inside the recess in the back of the measuring head holder. You can then remove the measuring head.
8. Slip the toothed belt off the pinion.

Thus, the removal of the measuring head is completed.

The installation is done the other way around.

1. Slip the toothed belt over the pinion and deflection roller.
2. Fix the measuring head to the measuring head holder with 2 hexagon socket screws.
3. Plug in the power cables (red and black) for the diode lasers.
 - 3.1. Unscrew the cover and take it off the top of the diode laser segment.
 - 3.2. Secure the cables with the cable clips.
 - 3.3. Fasten the cables at the bottom of the diode laser segment and screw the cover back on. Make sure that no cables are pinched.
4. Screw the energy management chain back onto the diode laser segment.
5. Connect the camera cables.
Make sure that the cables are laid properly and are not pinched or trapped in any way. To verify proper routing of the cables, tilt the measuring head up and down all the way to the limit stops.
6. Retighten the toothed belt. Instructions on tightening the toothed belt are given in sections **4.10.2. Tilt Axis** and **4.11. Tensioning of the Toothed Belts**.
7. Tighten the step motor again with the four hex head screws.
8. Check the distance between the inductive switch and the control cam with a gauge. The distance must be 0.1 mm. You can set the distance by adjusting the grub screw at the switching lug. Then secure the grub screw again with **Loctite (red)**.
9. After completion of the measuring head installation, the machine can be switched on again. A **self-diagnosis** is executed. After a successful test, the machine can operate without limitations again.

4.3.3.

Diode Laser Segment for 90° Travel Range

1. Move the measuring heads to zero position. If a tire is inserted in the machine, use the Convey function to remove it. You can now open the service door.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Remove the power cables for the diode lasers (red and black) from the jacks. They are found at the rear side of the measuring head holder.
3. The diode laser segment is fastened with 4 hexagon socket screws. First, remove the 2 hexagon socket screws which are at the bottom of the diode laser segment. Then remove the 2 rear hexagon socket screws at the top of the diode laser segment.
4. Carefully pull the segment forward. The diode laser segment must slide forward without force or effort. If this is not the case, slightly loosen the cover of the diode laser segment. It is fastened with four hexagon socket screws.
Make sure that the segment is not tilted since the objective lens might be damaged.

Then, the removal is completed. The installation of the segments is done the other way round. You do not have to place the diode laser segments into the same measuring head. The segments cannot be installed in a wrong way.



When installing the segments make sure that the segment is not tilted since the objective lens might be damaged. Please also be careful to correctly connect the power cables. The black cable is plugged into the black jack and the red cable into the red jack.

To check the correct functioning, measure some tires.

4.3.4.

Diode Laser Segment for 180° Travel Range

1. Move the measuring heads to zero position. If a tire is inserted in the machine, use the Convey function to remove it. You can now open the service door.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Remove the power cables (red and black) of the diode lasers.
 - 2.1. Unscrew the cover and take it off the top of the diode laser segment.
 - 2.2. Open the cable clips and remove the cables.
 - 2.3. Remove the cable ties at the bottom of the diode laser segment.
3. Remove the energy management chain that is screwed to the diode laser segment.
4. The diode laser segment is fastened with 4 hexagon socket screws. First, remove the 2 hexagon socket screws which are at the bottom of the diode laser segment. Then remove the 2 rear hexagon socket screws at the top of the diode laser segment.
5. Carefully pull the segment forward. The diode laser segment must slide forward without force or effort. If this is not the case, slightly loosen the cover of the diode laser segment. It is fastened with four hexagon socket screws.
Make sure that the segment is not tilted since the objective lens might be damaged.

Then, the removal is completed. The installation of the segments is done the other way round. You do not have to place the diode laser segments into the same measuring head. The segments cannot be installed in a wrong way.



When installing the segments make sure that the segment is not tilted since the objective lens might be damaged. Please also be careful to correctly connect the power cables. The black cable is plugged into the black jack and the red cable into the red jack.

To check the correct functioning, measure some tires.

4.3.5.

Verify Body

1. Move the measuring heads to home position. If a tire has been loaded into the machine, unload it. You can now open the service door.

Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.



2. The Verify Body is mounted on a beam. Remove the 2 hexagon socket screws on the back of the beam.

Removing the Verify Body is now complete. To install the Verify Body, you simply fasten it in place with the two hexagon socket screws.

After installing the Verify Body, you need to run the **Verify Body** function in the **Test** menu. With this function, you can check whether the Verify Body has been properly installed. In the **Operator Manual's appendix, Verify Body** section, you will find original phase image for reference.

Mechanically adjusting the position of the Verify Body

The mechanical adjustment procedure described below should only be carried out to correct minor deviations, as there is very little play in the holes.

Please use the software to make greater adjustments. The procedure is described further below.

1. Loosen the 4 hexagon socket screws that fasten the beam to the oblique support of the lift axis.
Attention: Do not unscrew the screws all the way.
2. Move the beam to the desired position.
3. Tighten the 4 screws again.
4. Run the **Verify Body** function to check the position. The function is described in the **operator manual**. There, you will also find original phase and video images for reference.
5. If the position is still not correct, repeat the steps 1 to 4.

Adjusting the position of the Verify Body in the software

The parameters are given in the file
D:\INTACT_V32NG\Testprogs\TestParam.xml

1. Open the Windows Explorer and go to the subdirectory given above.
2. Edit the file with the Notepad or Textpad.
3. In the bottom section of the file, you will find the **Reference** section. Here you can adjust the positions of the measuring heads. The measuring head positions depend on the machine type and the number of Verify Bodies.

*Measuring head
position for use
of a Verify Body.*

```
<Reference>
    <VerifyLiftPos>0</VerifyLiftPos>
    <VerifyHeadDiam>20</VerifyHeadDiam>
    <VerifyHeadTilt>0</VerifyHeadTilt>
    <VerifyRotPos>293</VerifyRotPos>
    <VerifyPressure>60</VerifyPressure>
</Reference>
```

4. Save the file after making the changes. Restarting the software is not necessary.
5. Run the **Verify Body** function to check the position. The function is described in the operator manual. There, you will also find an original phase image for reference.

4.4. Visual Check of Diode Lasers

As described in the operator manual, **Diode Lasers Defective**, single diode lasers may break down at some time. To check the diode lasers, you should use the **Verify Body** function of the **Test** menu. There, you will also find original phase and video images as reference examples. If you cannot exactly locate the defective diode laser with the video or phase image, you can check the diode lasers directly.

The following steps for the check of the diode lasers may only be carried out by trained persons, and special care and attention is required to avoid injuries.



We especially wish to draw your attention to the chapter: **Special Attention Required! / Diode Laser**, and to the danger described therein.

1. Switch on the machine and carry out the self-diagnosis.
2. Start the **Close Lid** function in the **Machine** menu if the Lids are opened.
3. Start the **Grab** function in the **Image Processing** menu.
4. The diode lasers are switched on.
5. Open the service door.
6. You can now evaluate the diode lasers. If the diode laser is working properly, you see a red dot that is expanded by a lens.



Caution: Keep a safety distance of at least 10 cm to the diode lasers.

Remove the segment containing the defective diode laser and return it to Carl Zeiss Optotechnik GmbH for repair.

How to replace the diode laser segment is described in section **4.3.3. Diode Laser Segment for 90° Travel Range** and section **4.3.4. Diode Laser Segment for 180° Travel Range**.

4.5. Exchange of Defective Diode Lasers

As already mentioned, it may occur that diode lasers fail completely, or that their performance weakens. Exchanging the diode lasers is not easy and may only be performed by specially trained personnel. Aligning the diode lasers requires a special test setup.

For this reason, it is a good idea to replace the entire diode laser segment and return it to Carl Zeiss Optotechnik GmbH for repair.

For instructions on how to replace the diode laser segment see section **4.3.3. Diode Laser Segment for 90° Travel Range** and section **4.3.4. Diode Laser Segment for 180° Travel Range**.



Please comply with the special safety rules that apply to the handling of diode lasers. Otherwise your eyes could be injured severely.
Static discharge may damage the diode lasers.

4.6. Exchange of Measuring Head Holder

1. Remove the measuring head and the toothed belt as described in section **4.3.3. Measuring Head with 90° Travel Range** and **4.3.4. Measuring Head with 180° Travel Range**.
2. Unscrew the inductive switch that is at the lower end of the holder.
3. Unscrew the holder for the motor cable and unplug the plug from the socket.
4. Unscrew the toothed wheel. It is fixed with a grub screw. Carefully take the toothed wheel off the motor shaft.
Caution: The toothed wheel is glued to the shaft.
5. Unscrew the cable canal from the measuring head holder by opening some parts of the cable canal.
6. Push the measuring heads fully apart (up to limit stops).
7. Loosen the clamps for the toothed belt and carefully remove the toothed belt.
8. Unscrew the motor from the measuring head holder.
9. Remove the cable guide for the video cable. It is located in the oblong hole above the measuring head. Not all machines have a cable guide, however.
10. Draw the power cables for diode lasers, the inductive switch, and the video cable carefully through the measuring head holder.
11. Now you can remove the measuring head holder which is fixed with 8 hexagon socket screws.
12. Unscrew the deflection roller for the toothed wheel of the tilt axis from the holder.

Thus, the removal of the measuring head holder is completed. The installation of the new holder is done the other way round. Instructions on tightening the toothed belt are given in sections **4.10.2. Tilt Axis** and **4.11. Tensioning of the Toothed Belts**.

Please make sure that all cables are laid correctly so that they do not rub or break.

Fix the toothed wheel with the screw retention (blue) on the shaft.

4.7. Adjustment at the Measuring Head

Only trained personnel may repair or adjust the measuring head observing all safety instructions.

Once per month (in case of much dirt even more often), the objective lens has to be cleaned. Dirt influences the image quality. The objective lens does not necessarily need to be removed to do so. It is often sufficient to blow away dust and dirt.

4.7.1.

Removing and Cleaning of the Objective Lens

1. Move the measuring heads to zero position. If a tire is still inserted in the machine, use the Convey function to remove it. You can now open the service door.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Remove the diode laser segment as described in section **4.3.3. Diode Laser Segment for 90° Travel Range** and section **4.3.4. Diode Laser Segment for 180° Travel Range**.
3. Carefully unscrew the objective counterclockwise.
Please make sure that the settings of the objective are not changed and that the diode lasers do not get dirty or damaged.
4. For cleaning the objective use isopropyl alcohol and lens cleaning paper (Kodak). You should blow away the worst of the dirt beforehand.
5. After cleaning, you can screw the objective back into the holder.
Please make sure that the settings of the objective are not changed and that the diode lasers do not get dirty or damaged.

When you have finished installing the objective, you must test the functioning of the machine. For this purpose, simply measure some tires.

4.7.2.

Alignment of the CCD Camera

To simplify aligning the CCD camera, we recommend extending the monitor's video and power cables. This way, you can place the monitor in the vacuum chamber and follow the alignment process directly on-screen. If the cables cannot be extended, you will need a second person to observe the alignment process on-screen for you.

1. Rotate the measuring heads to the 45° position by using the **Rotate measure head** function. If there is a tire in the machine, use the Convey function to remove it. You can now open the service door.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Activate the **Grab** function in the **Image processing** menu. The video image of measuring head **no. 1** is displayed on the left and the image of measuring head **no. 2** on the right. The measuring heads point in the same direction. In this way you can determine which CCD camera needs to be aligned.
3. The CCD camera is fastened to the measuring head with a tube. Slightly loosen the two hexagon socket screws that fix the tube in place. You can now turn the CCD camera. **Be careful not to move the tube when turning the camera, as this will alter the focus.**
4. Turn the CCD camera until the video image on the monitor is correctly aligned in the horizontal direction.
5. Tighten the hexagon socket screws again.

4.8. Replacing the Shearing Module and the CCD Camera (only machines with temporal phase shift)

The shearing module is located in the measuring head and contains all optical and mechanical components for the shearing process as well as the CCD camera.

4.8.1. Shearing Module

Removing the Shearing Module



1. **Shut down** the system and switch off the machine with the main switch. You can now open the service door.
2. Remove the video cable, the ring piezo cable and the cable for the exposure fusion from the CCD camera. Not all machines provide exposure fusion.
3. Carefully unscrew the objective lens (counterclockwise).
4. Remove the two hexagon socket screws on the base plate and set the measuring head down with the CCD camera pointing upward. You find further details in section Fehler! erweisquelle konnte nicht gefunden werden.. **Measuring head**.
5. Remove the hexagon socket screws on the base plate of the measuring head. You can now remove the base plate.
6. Now unscrew the two slotted screws as far as possible without removing them. You find further details in section Fehler! erweisquelle konnte nicht gefunden werden.. **Setting the Shearing Width and Direction**.
7. Remove the four hexagon socket screws which fasten the shearing module to the cover plate. Carefully remove the shearing module.
8. You can now screw the CCD camera off the shearing module (turn counterclockwise).
Do not touch the CCD chip. You should cover the CCD chip with a plastic cap.
9. Finally, solder off the two cables of the ring piezo (red and black) at the installation jack located in the measuring head base plate.

Removing the shearing module is now complete.

Installing the Shearing Module

To reinstall the shearing module, proceed in the reverse order.

1. When soldering the piezo cable, please take care to solder the red wire to the middle contact (plus) and the black wire to the side contact (GND) of the installation jack.
2. Screw the CCD camera back onto the shearing module (clockwise). To set the CCD camera, loosen the four grub screws in the camera holder and turn the camera in such a way that the ID plate is opposite the short arm of the shearing module. Then tighten the screws again. You find further details in section **4.8.2. CCD Camera**.
3. With the four hexagon socket screws, screw the shearing module onto the cover plate.
4. Screw the two slotted screws into the cover plate.
5. Fasten the base plate to the measuring head with the hexagon socket screws.
6. Carefully screw the objective lens into the shearing module (clockwise).
7. Fix the measuring head on the base plate of the measuring head holder with 2 hexagon socket screws. Plug in the video cable, the ring piezo cable and the cable for the exposure fusion. Not all machines provide exposure fusion. You find further details in section Fehler! Verweisquelle konnte nicht gefunden werden.. **measuring head**.
Make sure that the cables are laid properly and are not pinched or trapped in any way. To verify proper routing of the cables, tilt the measuring head up and down all the way to the limit stops.

When you have completed installing the shearing module, you can switch the power supply for the CCD camera, computer and laser back on.

You can check the functioning of the shearing module in the following way:

1. Execute the **Verify Body** function in the menu **Test**. You find further details in section Fehler! Verweisquelle konnte nicht gefunden werden..
2. Create a video image by using the **Grab** function of the **Image processing** menu.
3. Check the lighting on the video image and change the settings, as required.
4. Setting the shear width and direction with the two slotted screws. You find further details in section Fehler! erweisquelle konnte nicht gefunden werden.. **Setting the Shearing Width and Direction**.
5. Calibrate the ring piezo.

If the result is not satisfactory, you need to readjust the shearing module settings and the lighting.

4.8.2.

CCD Camera

Removing the CCD camera

Before you remove the CCD camera, you need to shut down the computer and switch off the power of the machine.

The following steps may only be carried out by trained persons, and special care and attention is required to avoid injuries.



We especially wish to draw your attention to the chapter: Special Attention Required! / Diode Laser, and to the danger described therein.

Then do the following:

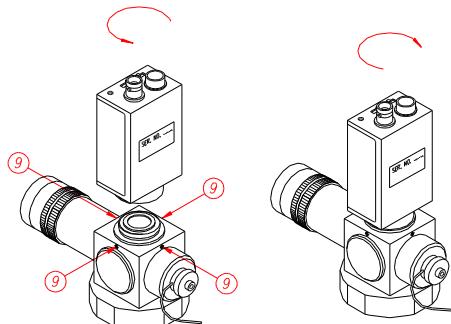
1. Remove the shearing module from the measuring head. How you can remove the measuring head and the shearing module is described in section Fehler! Verweisquelle konnte nicht gefunden werden.. **Measuring head** and **4.8.1. Searing Module**.
2. Turn the CCD camera counterclockwise to remove it from the shearing module.
Do not touch the CCD chip. You should cover the CCD chip with a plastic cap.

Installing the CCD camera

Do the following:

1. Screw the CCD camera onto the shearing module (clockwise). To set the CCD camera, loosen the four grub screws ⑨ and turn the camera in such a way that the ID plate is to the short arm of the shearing module and the plugs are to the long arm. When you have completed the settings, tighten the screws again.
2. Fasten the shearing module to the cover plate and screw the base plate back on. Screw the two slotted screws into the cover plate.
3. Screw the objective lens onto the shearing module (clockwise).
4. Fix the measuring head on the base plate of the measuring head holder with 2 hexagon socket screws. Plug in the video cable, the ring piezo cable and the cable for the exposure fusion. Not all machines provide exposure fusion. You find further details in section Fehler! Verweisquelle konnte nicht gefunden werden.. **Measuring head**.

Make sure that the cables are laid properly and are not pinched or trapped in any way. To verify proper routing of the cables, tilt the measuring head up and down all the way to the limit stops.



You then need to check the functioning of the measuring head:



The following steps may only be carried out by trained persons, and special care and attention is required to avoid injuries.

We especially wish to draw your attention to the chapter: Special Attention Required! / Diode Laser, and to the danger described therein.

1. Execute the **Verify Body** function in the menu **Test**. You find further details in section Fehler! Verweisquelle konnte nicht gefunden werden..
2. Create a video image by using the **Grab** function of the **Image processing** menu.
3. Check the lighting on the video image and change the settings, as required.
4. Setting the shear width and direction with the two slotted screws. You find further details in section Fehler! erweisquelle konnte nicht gefunden werden.. **Setting the Shearing Width and Direction.**
5. Calibrate the ring piezo.

If the result is not satisfactory, you need to readjust the shearing module settings and the lighting.

4.9. Adjustment of the Tilt Axis

The tilt axis usually only needs to be adjusted if the inductive switch or its position was changed.

The tilt axis might also have to be adjusted if the index ring at the measuring head was changed.

1. Make sure there is no tire inside the machine.
2. Open the service door.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

3. Install the measuring heads as described above, unless they are already installed in the tire testing machine.
4. Attach a strip of metal to the diode segments with screw clamps.
Be careful not to damage the diode lasers.
The measuring heads should be as far apart from each other as possible. After attaching the metal strip, the two measuring heads must be horizontal.
5. Loosen the two hexagon socket screws at the index rings of the measuring heads. Each measuring head has an index ring.
6. Set the index ring in such a way that the inductive switch is actuated when the index ring is turned upward. The inductive switch must not be covered up completely.
The distance between the index ring and the inductive switch should be only 0.1 mm. The best way to measure the distance is to use a gauge.
7. Fix the index rings again with the two hexagon socket screws.
8. Remove the screw clamps and the metal strip.
Be careful not to damage the diode lasers.

Adjusting the tilt axis is now complete.

You can check whether the measuring heads are horizontal by restarting the software and carrying out the self-diagnosis.

If the measuring heads are not horizontal after the successful completion of the self-diagnosis, the adjustment process needs to be repeated. This also applies if the self-diagnosis fails during the referencing of the tilt axis.

You can also use the Service Tool for the setup of the tilt axis. You find further details in section **5.2. Service Tools**.

4.10. Replacement of the Toothed Belts

All axes of the tire testing machine are driven by toothed belts.

In the shift axis, a toothed belt drives both measuring heads in such a way that they move simultaneously, but in opposite directions. The lift axis is driven by two toothed belts to prevent tilting.

4.10.1.

Rotation Axis

1. If there is a tire in the machine, you need to remove it. You can then open the service door.
Press an emergency stop button.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Loosen the two tension rollers which are found next to the motor of the rotation axis.

The removal of the toothed belt has now been completed. The installation is done the other way round. **Make sure that the toothed belt runs smoothly and evenly and that the two tension rollers are equally tensioned, if possible.**

A tension meter for measuring the tension of the toothed belts is available from Carl Zeiss on request. You will find a description of how to use the tension meter in chapter 4.11. Tensioning of the Toothed Belts.

To check the correct functioning, start the software, execute the self-diagnosis and measure a tire.

4.10.2.

Tilt Axis

1. If there is a tire in the machine, you need to remove it. You can then open the service door.

Press an emergency stop button.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Slightly loosen the four screws that secure the motor. The screws are located inside the measuring head holder.
3. Loosen the set screw that is provided underneath the motor so that the motor can slide downwards.
4. Screw the set screw down as far as necessary. The toothed belt slackens.
5. Remove the power cables (red and black) from the diode lasers.
6. Carefully slip the toothed belt over the diode segment.

Please be especially careful not to damage a diode laser.

Thus, the removal of the toothed belt is completed. The installation is done the other way round.

When installing the toothed belt, make sure that it runs properly around the tension roller. The toothed belt must tension in such a way that the measuring head can only be tilted using force. The toothed belts of the two tilt axes both must have the same tension.

A tension meter for measuring the tension of the toothed belts is available from Carl Zeiss on request. You will find a description of how to use the tension meter in chapter 4.11. Tensioning of the Toothed Belts.

The power cables for the diode lasers must not be mixed up. The red cable has to be plugged into the red jack and the black cable into the black jack.

To check the correct functioning, start the software, execute the self-diagnosis and measure a tire.

4.10.3.

Shift Axis

1. If there is a tire in the machine, you need to remove it. You can then open the service door.
Press an emergency stop button.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

2. Push the measuring heads fully apart.
3. Loosen the tension rollers provided at the end of the axis.
4. Inside each measuring head holder, there is a clamping piece that connects the measuring head with the toothed belt. Loosen the screws on both clamping pieces.
5. You can now carefully remove the toothed belt.

The removal of the toothed belt has now been completed.

The new toothed belt is installed in the following way:

1. Push the measuring heads fully apart.
Attention: The two measuring heads have to be at an equal distance from the home position. Otherwise, the path of traverse will be limited and the machine will not function properly.
2. Slip the toothed belt around the drive roller and around the belt tightener.
3. Tension the toothed belt with the belt tightener.
4. Replace the clamps and screw them down.

The installation of the toothed belt has now been completed. **Make sure that the toothed belt is evenly tensioned.**

A tension meter for measuring the tension of the toothed belts is available from Carl Zeiss on request. You will find a description of how to use the tension meter in chapter 4.11. Tensioning of the Toothed Belts.

To check the correct functioning, start the software, execute the self-diagnosis and measure a tire.

4.10.4.

Lift Axis

1. If there is a tire in the machine, you need to remove it.
2. Start the software and execute the self-diagnosis. Press an emergency stop button as soon as the lift axis has reached the bottom position.

You have to support the axis since it will otherwise fall down when you remove the toothed belts.



Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.

3. Remove the lift axis cover. It is fastened with hexagon socket screws.
 4. Remove the energy management chain with the cables.
 5. Screw the clamping screw (M8) back as far as possible.
 6. Loosen the screws of the clamping plates.
 7. You can now remove the toothed belt.
- Make sure that the toothed clamps do not fall out of the guide block.**

The removal of the toothed belt has now been completed.

The new toothed belt is installed in the following way:

1. Slip the new toothed belt over the toothed wheel.
2. Insert one end of the toothed belt into the toothed clamp and lightly screw on the clamping plate.
Please take care to align the edge of the toothed belt flush with the edge of the clamp.
3. Insert the other end of the toothed belt in the toothed clamp and lightly screw on the clamping plate.
Please take care to align the edge of the toothed belt flush with the edge of the clamp.
4. Tighten the toothed belt with the clamping screw (M8). **Be careful not to tilt the belt tightener.**
5. You can now screw down the clamping plates tightly.
6. Fix the cover and the energy management chain to the lift axis.

The installation of the toothed belt has now been completed. **Make sure that the toothed belt is evenly tensioned.**

A tension meter for measuring the tension of the toothed belts is available from Carl Zeiss on request. You will find a description of how to use the tension meter in chapter 4.11. Tensioning of the Toothed Belts.

To check the correct functioning, start the software, execute the self-diagnosis and measure a tire.

4.10.5.

Conveyor Belt

Internal conveyor belt

1. If there is a tire in the machine, you need to remove it. You can then open the service door.

Press an emergency stop button.

Before opening the service door, it is essential that you press the emergency stop button to ensure that the diode lasers are switched off. Nevertheless, you should be especially careful when working with the diode lasers since otherwise your eyes could be injured severely.



2. The motor is mounted on a base plate with 4 oblong holes. Slightly loosen the 4 screws.
3. You can now move the base plate with the 2 set screws provided on the front of the base plate. Screw the two screws back as far as possible.
4. Move the motor, together with the base plate, towards the lid far enough for you to slip the toothed belt over both synchronous pulleys.

The removal of the toothed belt has now been completed.

The installation of the toothed belt is done the other way round:

1. Slip the toothed belt over both synchronous pulleys.
2. Move the motor, which is mounted on a base plate with oblong holes, back as far as possible.
3. Screw the 2 set screws out of the base plate until they touch the base plate of the lift axis.
4. Screw the 2 set screws further out of the base plate until the toothed belt is optimally tensioned. Both screws must be screwed out equally far. For a detailed description, see chapter **4.11. Tensioning of the Toothed Belts**.
5. Screw the base plate tight again. **Make sure that the base plate does not tilt in the oblong holes.**

The installation of the toothed belt has now been completed.

A tension meter for measuring the tension of the toothed belts is available from Carl Zeiss on request. You will find a description of how to use the tension meter in chapter 4.11. Tensioning of the Toothed Belts.

To check the correct functioning, start the software, execute the self-diagnosis and measure a tire.

4.10.6.

Lids

1. Unscrew the 8 screws of the cover and remove it.
2. Secure the upper lid so that it cannot fall down.
3. Loosen the 4 screws of the belt clamp at the lid. The screws are located at the inside of the lid.
Attention: To not screw out the screws completely since the clamping device will otherwise fall down.
4. You can now align the lid with the grub screw located at the front of the clamping device.
5. Tighten the screws again.
6. Fasten the cover again.

If it should be necessary to align all four belt clamps, please proceed as described above for each alignment.

4.12. Tensioning of the Toothed Belts

The tire testing machine of the INTACT type uses toothed belts for transmitting the motor power to the axes. To make this power transmission possible, the toothed belts need to be tensioned. Tensioning can be done by feel and thus depends on the service engineer. This involves certain risks and dangers.

1. If the tension of the toothed belts is too high, the motor and transmission shafts may be damaged. This danger applies particularly to the external loaders and unloaders.
2. If the tension of the toothed belts is too low, the axes might not function properly. This danger applies particularly to the tilt axes.

To avoid the disadvantages described above, a measuring instrument is used to determine the tension of the toothed belts. This instrument measures the vibration frequency of the toothed belt. The tension of the toothed belt can then be calculated.

The frequency at which the toothed belt vibrates at a given tension, is calculated as follows:

$$f = 1/2 * L * \sqrt{F_v/m}$$

f = frequency of belt vibration [Hz]

L = vibratory belt length [m]

m = weight per meter of the toothed belt [kg/m]

F_v = tension force of the toothed belt [N]

Prior to using the tension meter, please read the “WF - Tension Meter” operating instructions thoroughly from beginning to end. The operating instructions are included with the instrument. Besides detailed information on calculating the belt tension, they provide safety notices as well as details on how to deal with problems that may occur during measurement.

4.12.1.

Tilt Axes

Tighten the toothed belts of the tilt axes as described in section **4.10.2. Tilt Axis**. After tightening the toothed belts, you need to check the tension force with the tension meter. This is done in the following way.

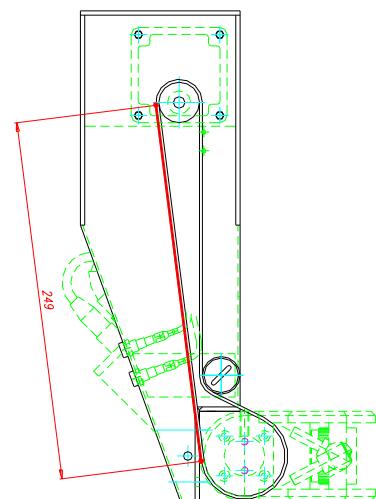
► **How to check the tension force:**

1. Manually tilt the measuring heads up and down a few times. This neutralizes possible tension differences between the belt sides.
2. Switch on the tension meter as described in the operating instructions.
3. Hold the tension meter over the back of the toothed belt. The distance should be about 10mm and the instrument should be held at the center of the free belt side length. The free belt side length is marked in color in the drawing below.
4. With your hand or a tool, such as a wrench, make the toothed belt vibrate like a guitar string. The measurement result is displayed. Repeat the measurement several times.
5. If the measured value deviates from the nominal value, you need to increase or reduce the tension of the toothed belt, depending on the measured frequency.

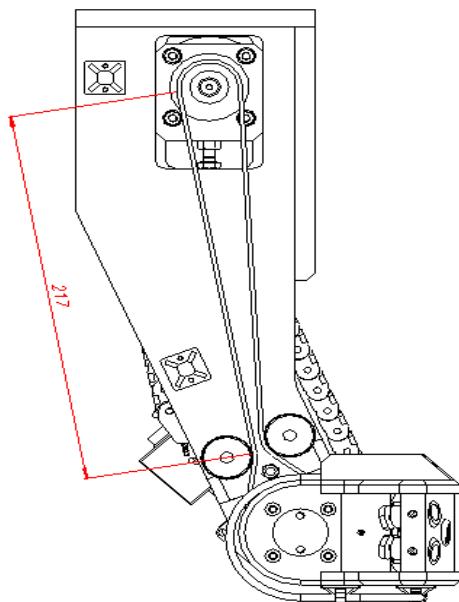
► **Toothed belt values for determining the tension:**

Axis	Frequency of belt vibration	Tension force	Vibratory length	Weight per meter
Tilt axis (90°)	120 HZ ± 10 Hz	121 N	0.249 m	0.034 kg/m
Tilt axis (180°)	138 HZ ± 10 Hz	121 N	0,217 m	0,034 kg/m

The belt length marked red is the vibratory length at which you measure the frequency (tilt axis 90°).



*The belt length marked red
is the vibratory length at
which you measure the
frequency (tilt axis 180°).*



4.12.2.

Shift Axis

Tighten the toothed belts of the shift axes as described in section 4.10.3.

Shift Axis. After tightening the toothed belts, you need to check the tension force with the tension meter. This is done in the following way.

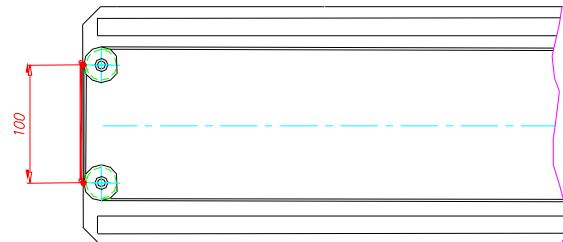
► **How to check the tension force:**

1. Push the measuring heads fully apart from home position to limit stop and back together again. Repeat this procedure a few times to neutralize the tension differences between the belt sides.
2. Switch on the tension meter as described in the operating instructions.
3. Hold the tension meter over the back of the toothed belt. The distance should be about 10 mm and the instrument should be held at the center of the free belt side length. The free belt side length is marked in color in the drawing below.
4. With your hand or a tool, such as a wrench, make the toothed belt vibrate like a guitar string. The measurement result is displayed. Repeat the measurement several times.
5. If the measured value deviates from the nominal value, you need to increase or reduce the tension of the toothed belt, depending on the measured frequency.

► **Toothed belt values for determining the tension:**

Axis	Frequency of belt vibration	Tension force	Vibratory length	Weight per meter
Shift axis	300 Hz \pm 5 Hz	122 N	0.100 m	0.034 kg/m

The belt length marked red is the vibratory length at which you measure the frequency.



4.12.3.

Lift Axis

Tighten the toothed belts of the lift axes as described in section **4.10.4. Lift Axis**. After tightening the toothed belts, you need to check the tension force with the tension meter.

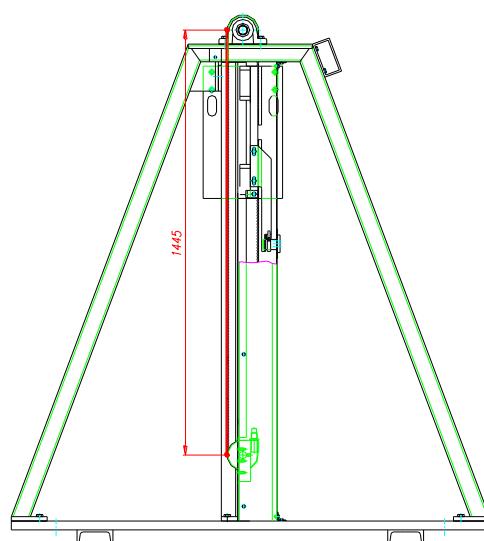
► How to check the tension force:

1. Traverse the lift axis up and down a few times. You can do this by using the service tool. The use of the service tool is described in chapter **5.2. Service Tools**. Traversing the axis neutralizes the tension differences between the belt sides.
2. Switch on the tension meter as described in the operating instructions.
3. Hold the tension meter over the back of the toothed belt. The distance should be about 10mm and the instrument should be held at the center of the free belt side length. The free belt side length is marked in color in the drawing below.
4. With your hand or a tool, such as a wrench, make the toothed belt vibrate like a guitar string. The measurement result is displayed. Repeat the measurement several times.
5. If the measured value deviates from the nominal value, you need to increase or reduce the tension of the toothed belt, depending on the measured frequency.

► Toothed belt values for determining the tension:

Axis	Frequency of belt vibration	Tension force	Vibratory length	Weight per meter
Lift axis	20 Hz \pm 5 Hz	970 N	1.445 m	0.29 kg/m

The belt length marked red is the vibratory length at which you measure the frequency.



4.12.4.

Internal and External Conveyor Belts

Tighten the toothed belts of the conveyor belts as described in section 4.10.5.

Conveyor Belt. After tightening the toothed belts, you need to check the tension force with the tension meter. This is done in the following way.

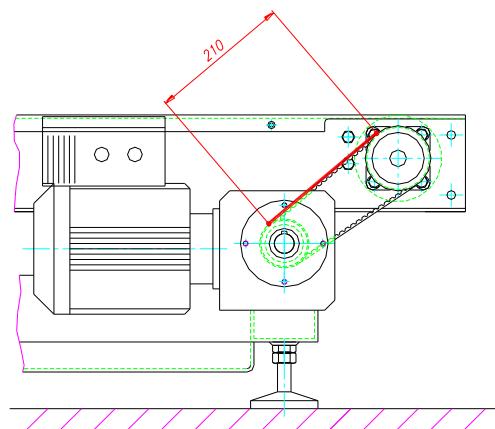
► **How to check the tension force:**

1. Remove the cover of the toothed belt, if necessary.
2. Switch on the tension meter as described in the operating instructions.
3. Hold the tension meter over the back of the toothed belt. The distance should be about 10 mm and the instrument should be held at the center of the free belt side length. The free belt side length is marked in color in the drawing below.
4. With your hand or a tool, such as a wrench, make the toothed belt vibrate like a guitar string. The measurement result is displayed. Repeat the measurement several times.
5. If the measured value deviates from the nominal value, you need to increase or reduce the tension of the toothed belt, depending on the measured frequency.

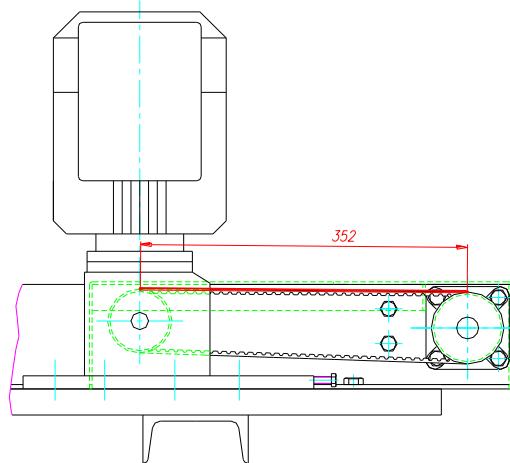
► **Toothed belt values for determining the tension:**

Conveyor belt	Frequency of belt vibration	Tension force	Vibratory length	Weight per meter
external	$+0\text{Hz}$ 78 Hz -5Hz	200 N	0.210 m	0.186 kg/m
internal	$47\text{ Hz} \pm 3\text{ Hz}$	200 N	0.352 m	0.186 kg/m

The belt length marked red is the vibratory length of the external toothed belt, at which you measure the frequency.



The belt length marked red is the vibratory length of the internal toothed belt, at which you measure the frequency.



4.12.5.

Rotation Axis

The tension force of the toothed belt cannot be determined with the tension meter. The vibratory length of the toothed belt is not long enough.

Tensioning this toothed belt has to be done by feel.

After you have tensioned the toothed belt, you need to check whether the axis functions properly. You can use the service tool for this purpose.

➤ **How to check the functioning of the axis:**

1. Start the service tool as described in chapter **5.2. Service Tool**.
2. Click on the **Rot** tab.
3. Execute the **Referencing** function.
4. If referencing the rotation axis fails, you may need to readjust the belt tension. For a description of how this is done, see section **4.10.1. Rotation Axis**.

4.13. Control of Pneumatics without Electricity

The pneumatic cylinders that move the lids are controlled by two pneumatic valve blocks provided above the maintenance unit. The pneumatic valve blocks can also be operated manually with the help of two hand drives. The labeling is next to the valve blocks.

4.13.1.

Lids

1. Insert one hand drive in the on-off valve at the maintenance unit.
2. Rotate the hand drive by 90° clockwise. The system is now under pressure.
3. Insert the second hand drive in the corresponding opening of the corresponding valve.
6. Rotate the hand drive by 90° clockwise.
Thus, the valve is bolted and the cylinder moves to the limit stop (permanent compressed air).

- or -

Press the hand drive into the opening without turning it.
The cylinder is then only used as long as you press it. In this way, you can move the cylinder step by step.

4.14. Vacuum Pump

After 12,000 hours or 2 years the grease in the roller bearings and the adjacent areas should be replaced by fresh grease. Approximately 50% of the free space in the roller bearings and 65% of the surrounding grease-areas should be filled with Unirex N3 (Esso).

For further instruction see the Siemens ELMO Gas Ring Vakuumpumpe manual.

4.15. Conveyor System

The required maintenance work is described in the following sections. It mostly consists of cleaning and greasing the bearings.

4.16. Optical Setup

Clean the optical parts whenever it is necessary.

This especially applies to the reflectors with which the tire is measured. They are located at the lid and are best cleaned using Q-Tips.

4.17. Pneumatics

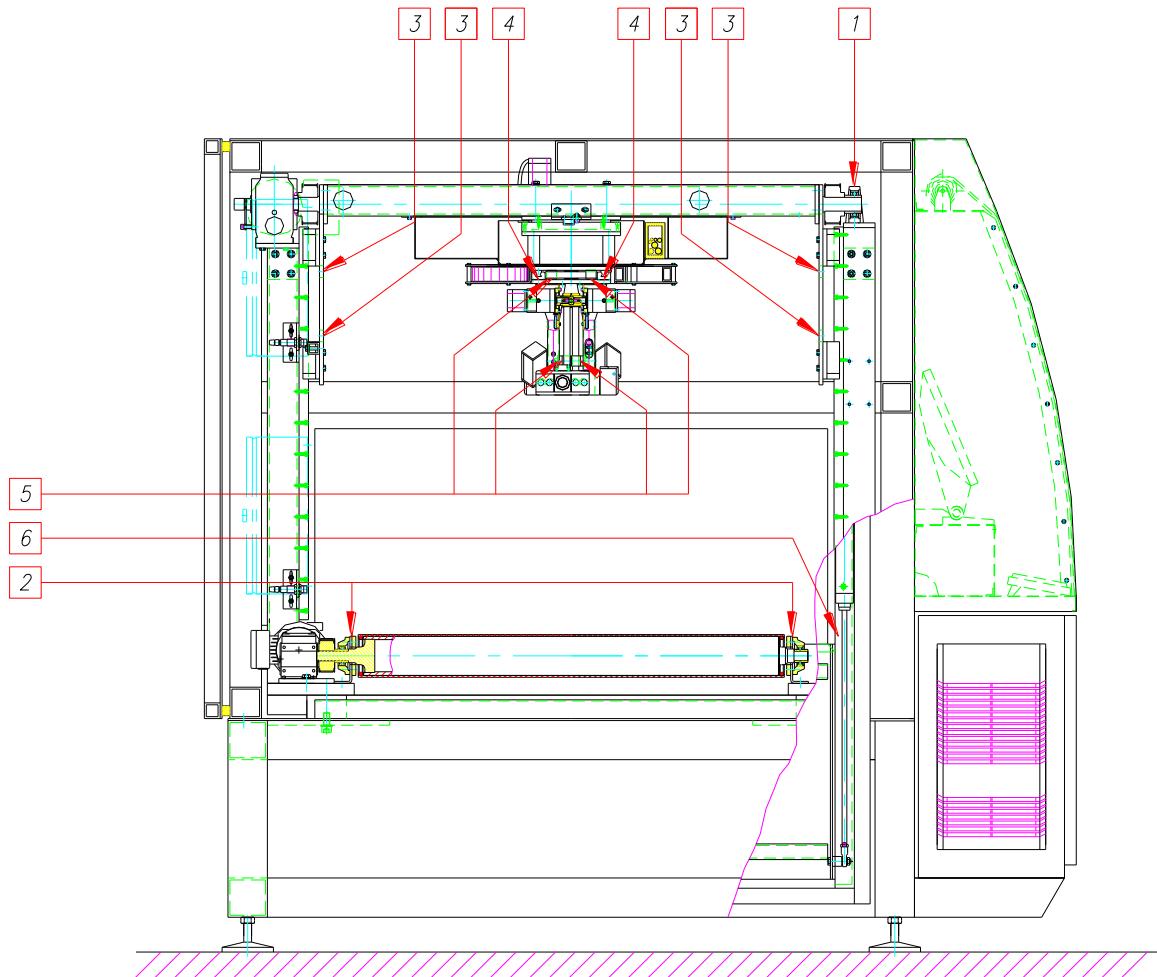
The maintenance unit, the pneumatic cylinders and the pneumatic valves are maintenance-free.

The maintenance unit cleans itself automatically.

For further instructions see the manuals for the pneumatic components.

4.18. Lubrication Chart: Machine (INTACT 1200)

INTACT 1200-1 / 1200-2:



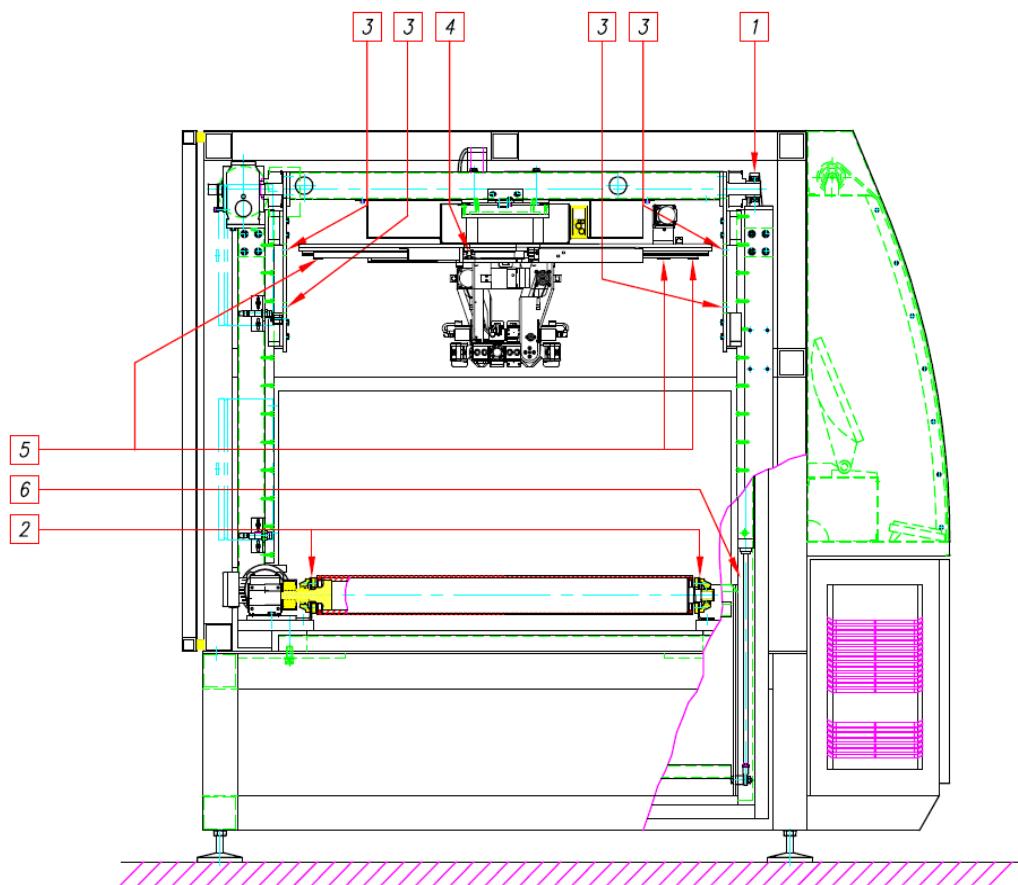
	Designation	Qty	Action	Lubricant ⁹	Interval	Manual
1	Pedestal bearings: Lift axis	1	Grease with grease gun	Grease	Annually	0
2	Flanged bearings: loader (int.)	4	Grease with grease gun	Grease	Annually	Fehler! erweisquelle konnte nicht gefunden werden.

⁹ Lithium complex soap grease (e.g. DIVINOL Lithogrease G421,...)

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2	Flanged bearings: loader (ext.)	4	Grease with grease gun	Grease	Annually	Fehler! erweisquelle konnte nicht gefunden werden.
3	Slides: Lift Achse	4	Grease with grease gun	Grease	2000 hrs.	4.18.4
4	Slides: Shift Achse	6	Grease with piston-type grease gun	Grease	2000 hrs.	4.18.7
5	Deflection rollers	8	Grease by hand	Grease	Annually	Fehler! erweisquelle konnte nicht gefunden werden.
6	Pedestal bearings: Flaps	4	Grease by hand	Grease	annually	4.18.9

INTACT 1200-4 / INTACT 30:



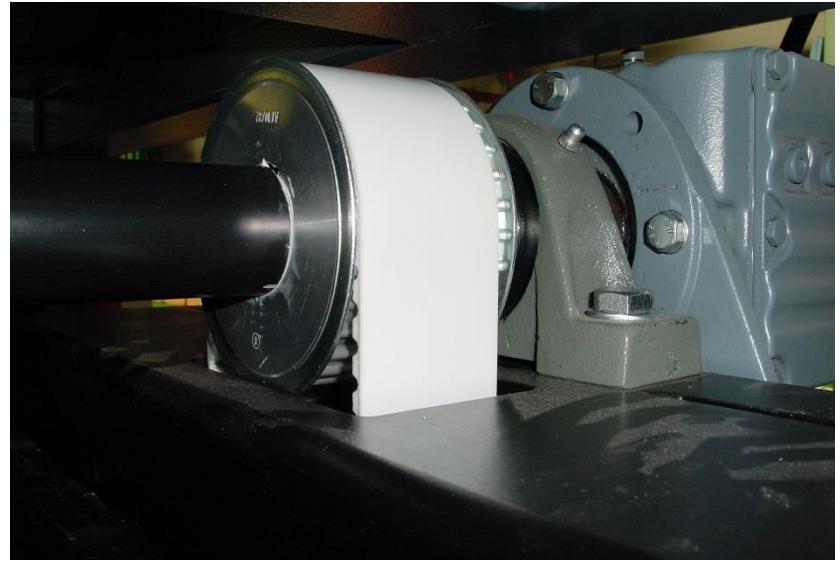
	<i>Designation</i>	<i>Qty</i>	<i>Action</i>	<i>Lubricant⁹</i>	<i>Interval</i>	<i>Manual</i>
1	Pedestal bearings: Lift axis	1	Grease with grease gun	Grease	Annually	0
2	Flanged bearings: loader (int.)	4	Grease with grease gun	Grease	Annually	Fehler! erweisquelle konnte nicht gefunden werden.
2	Flanged bearings: loader (ext.)	4	Grease with grease gun	Grease	Annually	Fehler! erweisquelle konnte nicht gefunden werden.
3	Slides: Lift Achse	4	Grease with grease gun	Grease	2000 hrs.	4.18.4
4	Slides: Shift Achse	6	Grease with piston-type grease gun	Grease	2000 hrs.	4.18.7
5	Deflection rollers	8	Grease by hand	Grease	Annually	Fehler! erweisquelle konnte nicht gefunden werden.
6	Pedestal bearings: Flaps	4	Grease by hand	Grease	annually	4.18.9

4.18.1.

Pedestal bearings: Lift axis

⁹ Lithium complex soap grease (e.g. DIVINOL Lithogrease G421,...)

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Front pedestal bearing



Rear pedestal bearing

The pedestal bearings of the lift axis must be greased once a year using DIVINOL Lithogrease G421 grease.

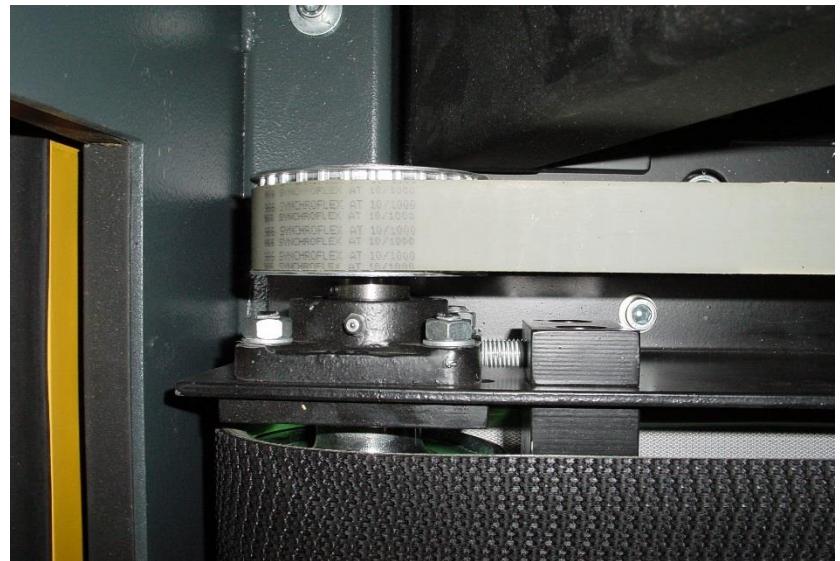
For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

Wipe off any oozed grease.

4.18.2.

Flanged bearing: Loader (internal)



Flanged bearing at the driving roller of the internal loader

The flanged bearings of the internal loader must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

Wipe off any oozed grease.

4.18.3.

Flanged bearing: Loader (external)



The flanged bearings of the external loader must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

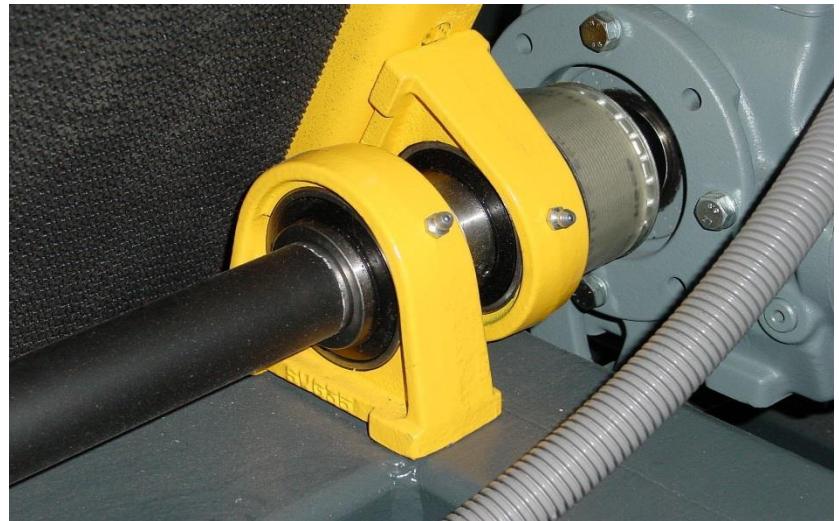
Wipe off any oozed grease.



Flanged bearing, left side (without tooth belt)

4.18.4.

Pedestal bearings: Loader/Unloader



Right pedestal bearing (while engine is running) with elevated tilting table



Left pedestal bearing with elevated tilting table



CAUTION!!!

To grease the bearings, you need to move the tilting table to top position. It is then essential that you press the EMERGENCY STOP button on the tilting table to ensure that the tilting table cannot move down by accident!

The pedestal bearings of the external loader must be greased 1x annually with DIVINOL Lithogrease G421 grease

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Grease the bearings (amount of grease: 3 – 4 strokes per bearing).

Wipe off any oozed grease.

4.18.5.

Radial Tilting table Bearings



CAUTION!!!

To grease the bearings, you need to move the tilting table to top position. It is then essential that you press the EMERGENCY STOP button on the tilting table to ensure that the tilting table cannot move down by accident!

The radial tilting table bearings of the tilting table must be greased after approx. every 200 operating hours by using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Grease the bearings (amount of grease: 3 – 4 strokes per bearing).

Wipe off any oozed grease.

4.18.6.

Slides: Lift Axis



Slide (top position)



Slide (bottom position)

The slides of the lift axis must be greased after approx. every 2000 operating hours by using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per slide.

Wipe off any oozed grease.

4.18.7.

Slide: Shift Axis



The slides of the shift axis must be greased after approx. every 2000 operating hours by using DIVINOL Lithogrease G421 grease.

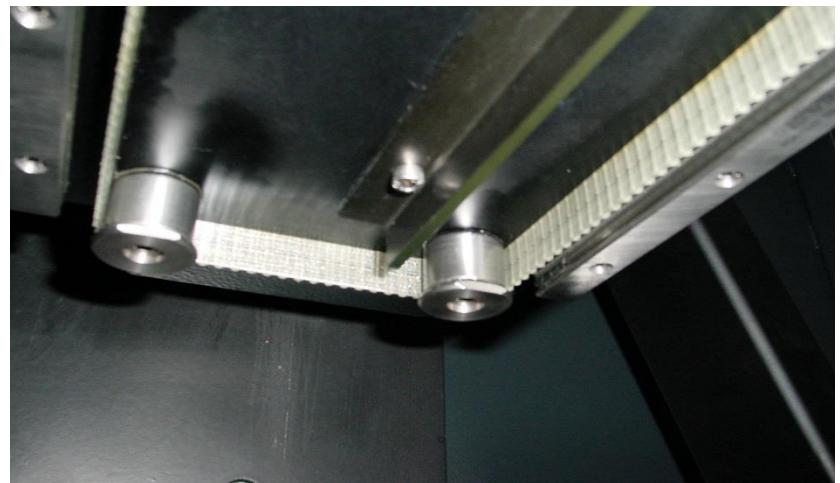
For this purpose, you need a piston-type grease gun with a fitting for K1 lubricating nipples.

Amount of grease: 3 – 4 strokes per slide.

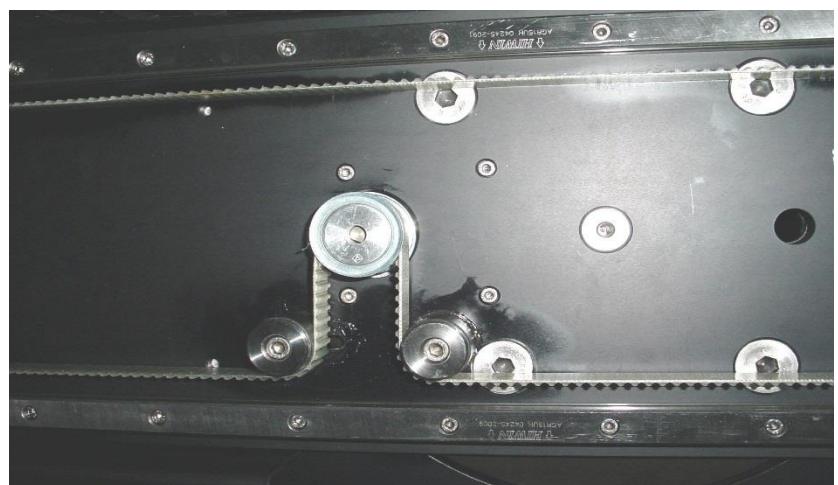
Wipe off any oozed grease.

4.18.8.

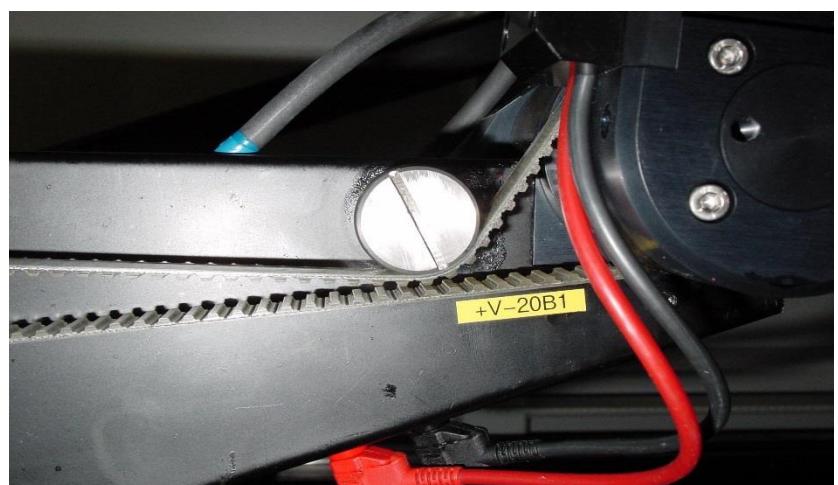
Deflection Rollers



Deflection rollers at the end points



Deflection rollers at the tightening roller (shift axis)



Deflection rollers at the tilt axis

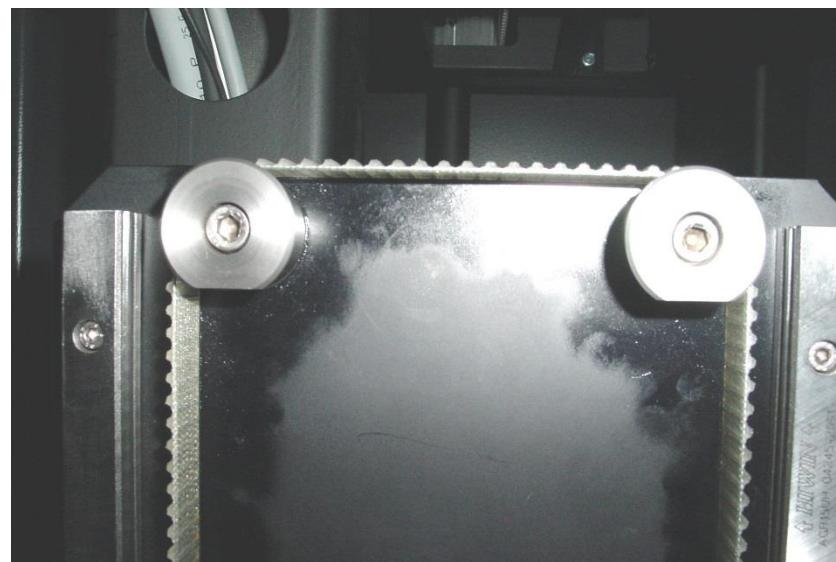
The deflection rollers must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need to screw out the bearing bolts and slip off the needle bearings.

The needle bearings need to be washed out and filled with fresh grease.

Then insert the cleaned bearing bolts into the needle bearings and screw them back in place.

The deflection rollers at the end points must be aligned as shown in the figure below.



Umlenkrollen der Shift Achse

The synchronized pulley of the shift axis, tilt axis and rotation axis are fixed with a grub screw. This grub screws should be checked every six months. To check these screws you have to dismount the toothed belt. For more information see section **4.10. Replacement of the Toothed Belts** and section **4.11. Tensioning of the Toothed Belts**.

4.18.9.

Pedestal bearings (Flaps)

INTACT 1200-1 / 1200-2:



The pedestal bearings oft he flaps must be greased once a year using DIVINOL Lithogrease G421 grease

To grease the upper part oft he pedestal bearings you have to move down the flaps

INTACT 1200-4 / INTACT 30:



The pedestal bearings oft he flaps must be greased once a year using DIVINOL Lithogrease G421 grease

To grease the upper part oft he pedestal bearings you have to move down the flaps



CAUTION!!!

Before the pedestal bearings can be grased it is necessary to press the EMERGENCY STOP button to ensure that the flaps cannot move by accident!

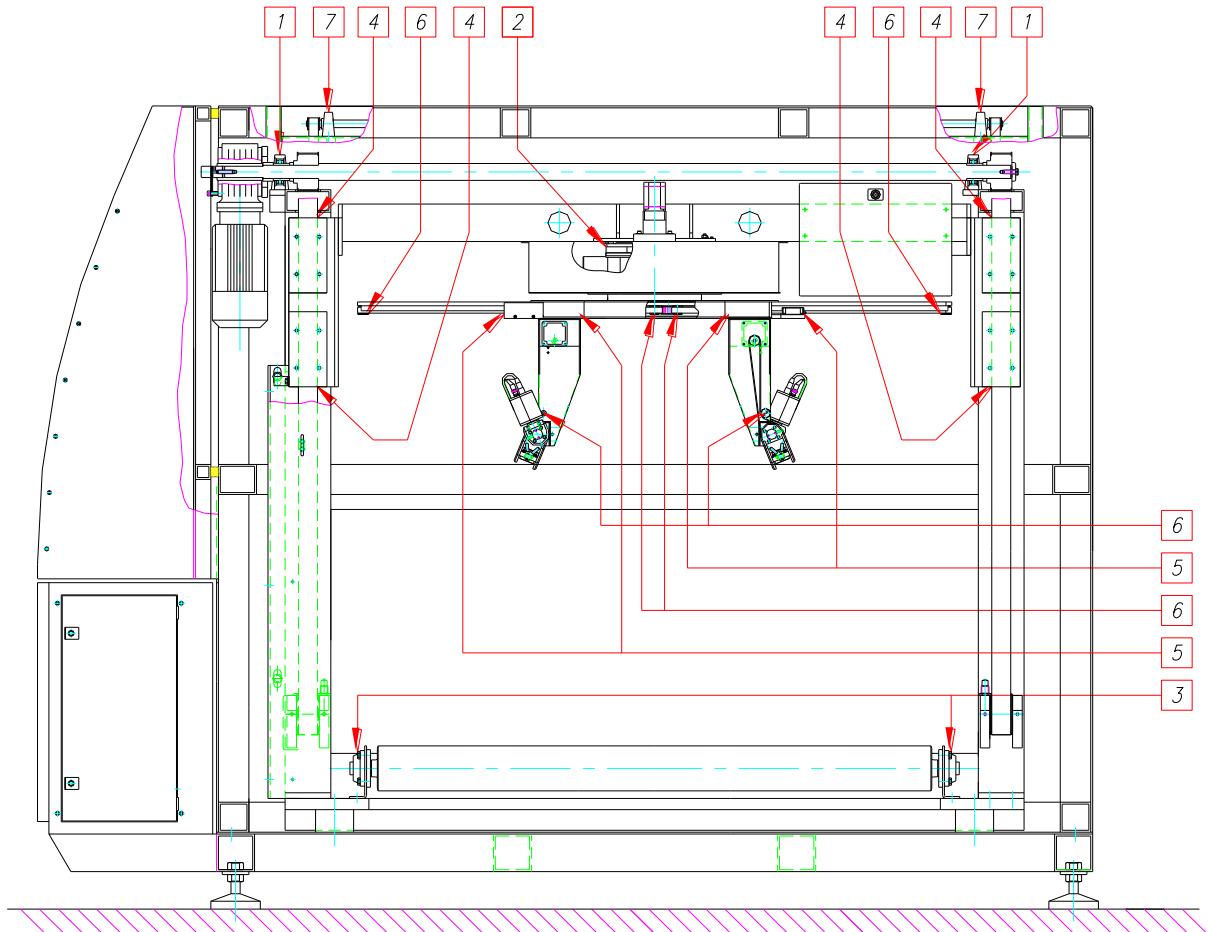
Clean the tread area of the guide rails with a cloth or cleaning paper.

Now apply a thin greasy film with a pencil at the tread area of the guide rails.

Pull out the EMERGENCY STOP button and press the START button.

To grease the lower part of the guide rail, the flaps must be moved up

4.19. Lubrication Chart: Machine (INTACT 1600)



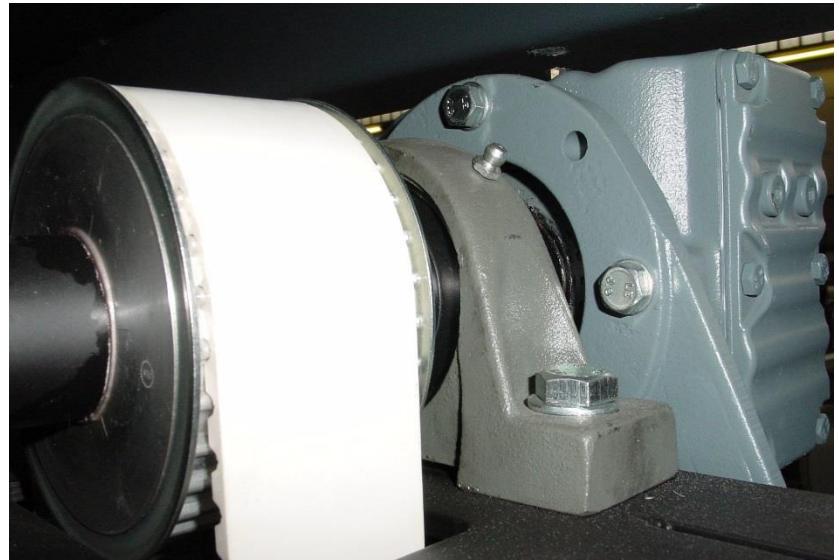
	Designation	Qty.	Action	Lubricant ⁹	Interval	Manual
1	Pedestal bearings: Lift axis	2	Grease with grease gun	Grease	Annually	4.19.1
2	Bearing: Rotary axis	1	Not necessary	-	-	4.19.2
3	Flanged bearings: Loader	4	Grease with grease gun	Grease	Annually	4.19.3
4	Slides: Lift axis	4	Grease with grease gun	Grease	2000 hrs.	4.19.4
5	Slides: Shift axis	6	Grease with piston-type grease gun	Grease	2000 hrs.	4.19.5
6	Deflection rollers	8	Grease by hand	Grease	Annually	4.19.6
7	Pedestal bearings: Flaps	4	Grease with grease gun	Grease	Annually	4.19.7

⁹ Lithium complex soap grease (e.g. DIVINOL Lithogrease G421,...)

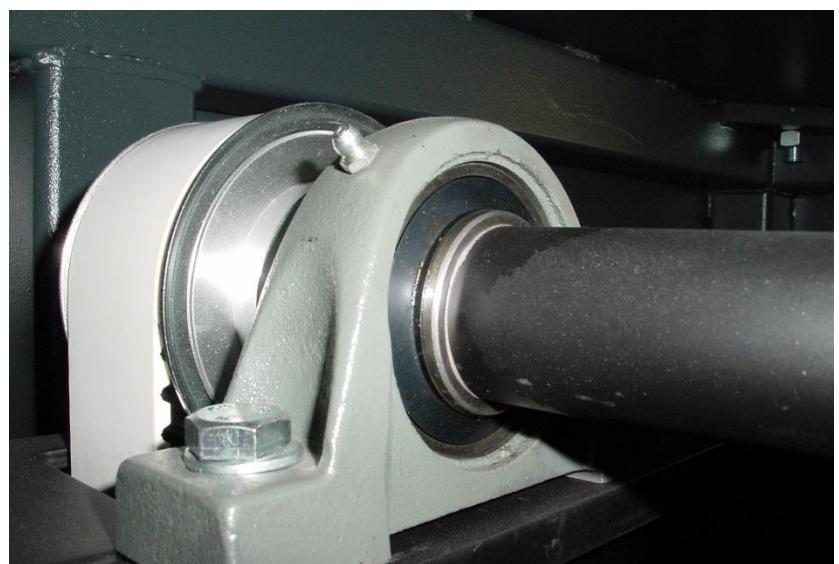
13.07.2011

4.19.1.

Pedestal Bearings: Lift Axis



Front pedestal bearing



Rear pedestal bearing

The pedestal bearings of the lift axis must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

Wipe off any oozed grease.

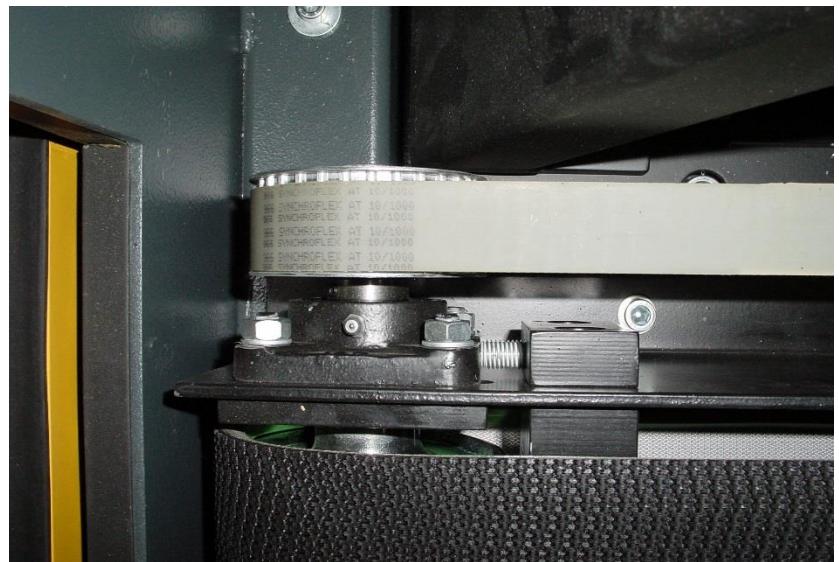
4.19.2.

Bearing: Rotary Axis

The bearing of the rotary axis must not be greased. This bearing is maintenance-free.

4.19.3.

Flanged Bearings: Loader (Internal)



Flanged bearing at the driving roller of the internal loader

The flanged bearings of the internal loader must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

Wipe off any oozed grease.

4.19.4.

Slides: Lift Axis



Slide (top position)



Slide (bottom position)

The slides of the lift axis must be greased after approx. every 2000 operating hours by using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per slide.

Wipe off any oozed grease.

4.19.5.

Slides: Shift Axis



The slides of the shift axis must be greased after approx. every 2000 operating hours by using DIVINOL Lithogrease G421 grease.

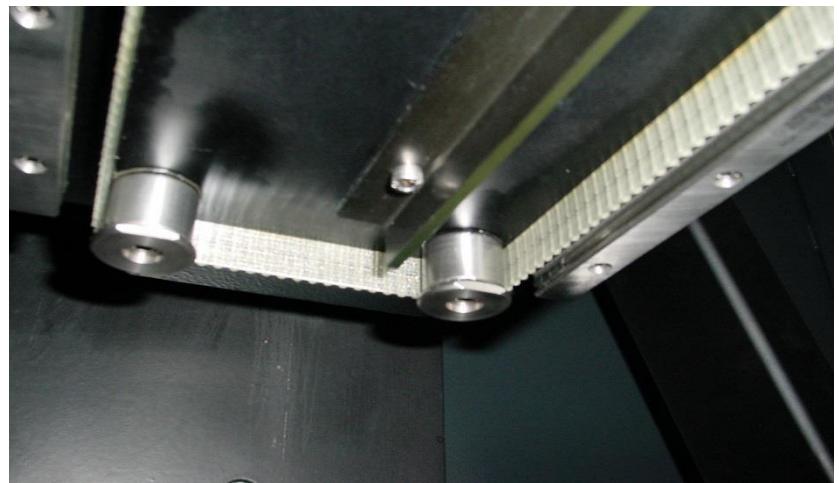
For this purpose, you need a piston-type grease gun with a fitting for K1 lubricating nipples.

Amount of grease: 3 – 4 strokes per slide.

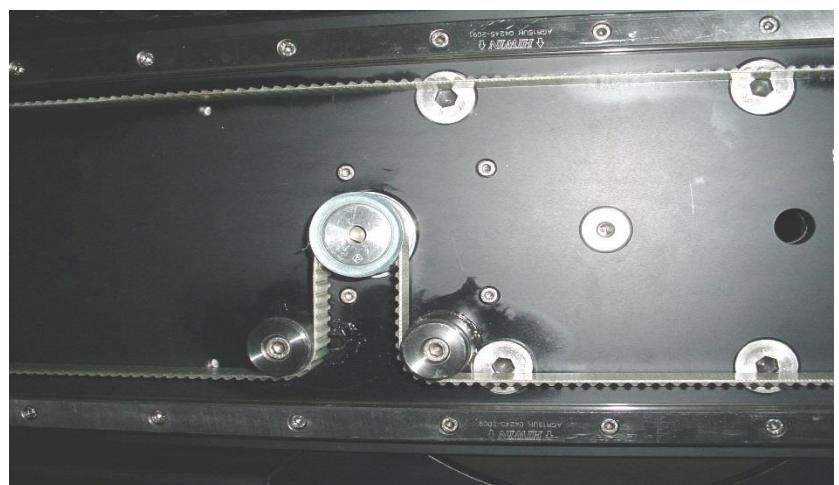
Wipe off any oozed grease.

4.19.6.

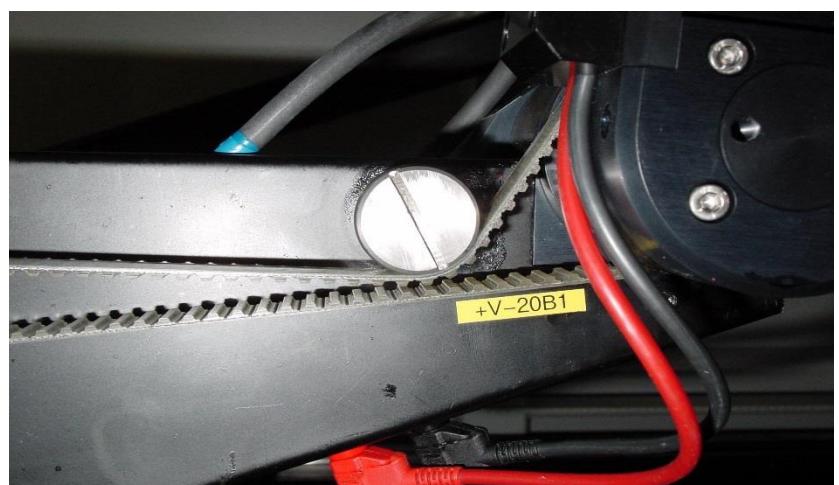
Deflection Rollers



Deflection rollers at the end points



Deflection rollers at the tightening roller (shift axis)



Deflection rollers at the tilt axis

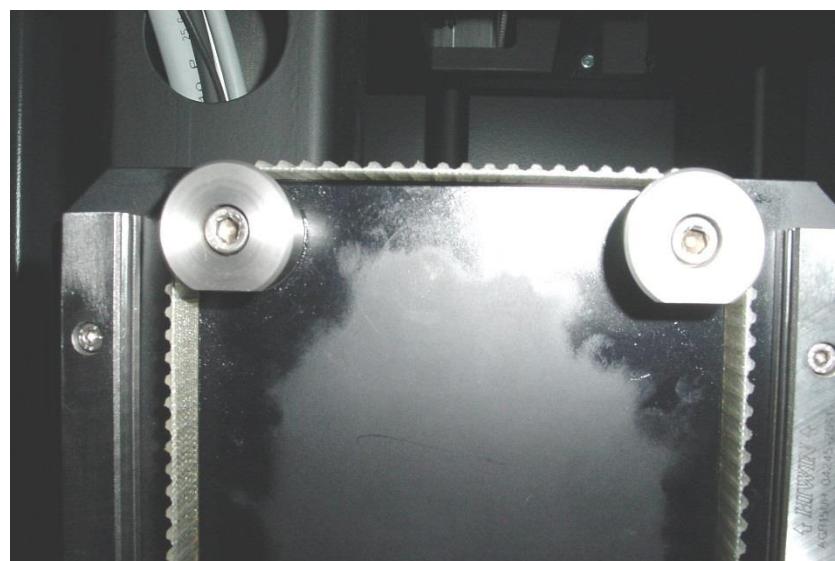
The deflection rollers must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need to screw out the bearing bolts and slip off the needle bearings.

The needle bearings need to be washed out and filled with fresh grease.

Then insert the cleaned bearing bolts into the needle bearings and screw them back in place.

The deflection rollers at the end points must be aligned as shown in the figure below.



The synchronized pulley of the shift axis, tilt axis and rotation axis are fixed with a grub screw. This grub screws should be checked every six months. To check these screws you have to dismount the toothed belt. For more information see section **4.10. Replacement of the Toothed Belts** and section **4.11. Tensioning of the Toothed Belts**.

4.19.7.

Pedestal Bearings: Flaps



Flap frame (without cover) with pedestal bearing

The pedestal bearings of the flaps must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

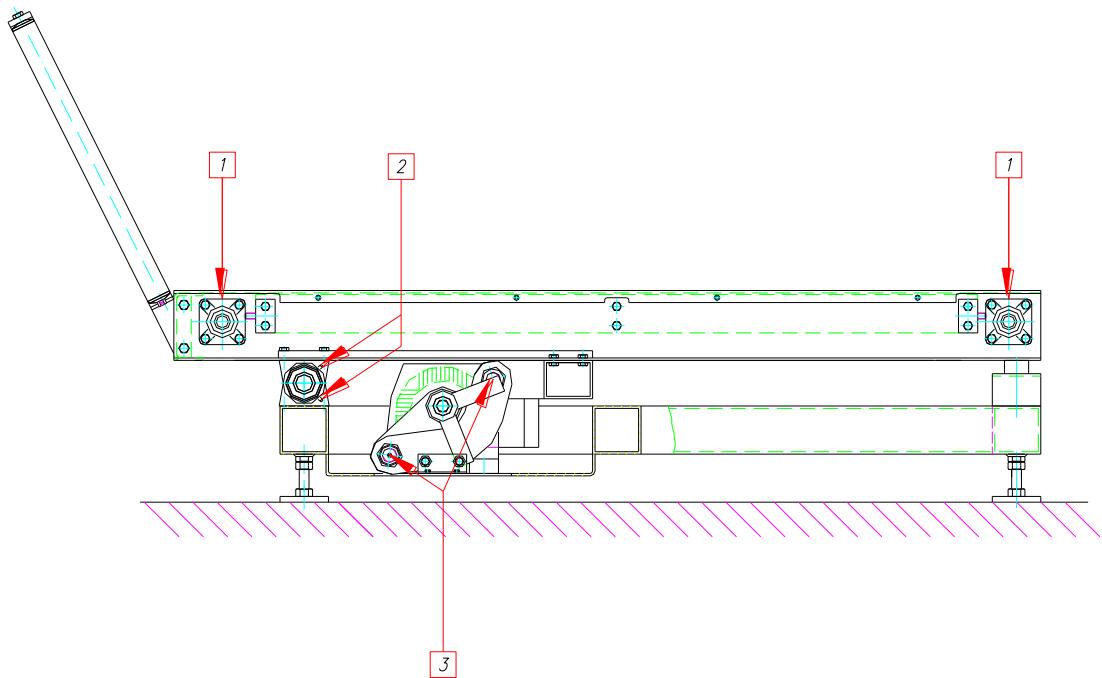
Unscrew the 8 screws on the left and right of the flap and lift off the cover.

Grease the bearings (amount of grease: 3 – 4 strokes per bearing).

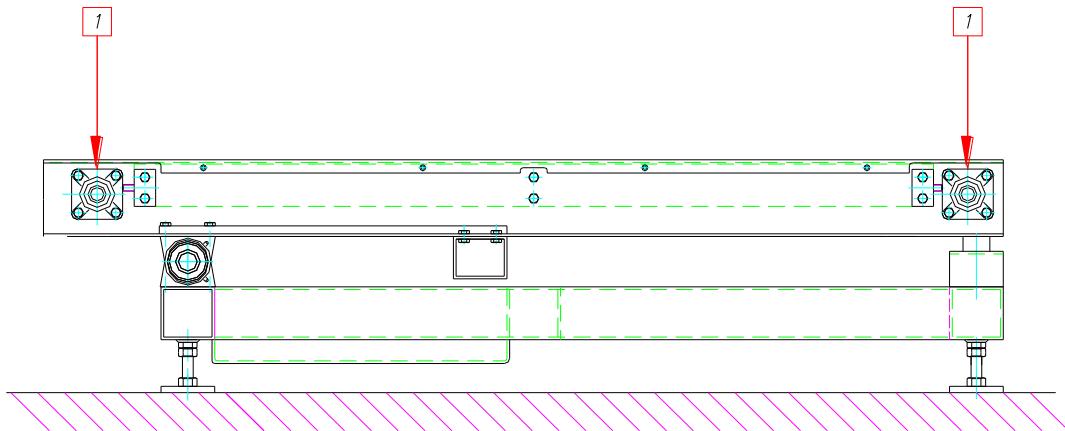
Wipe off any oozed grease.

Then replace the cover.

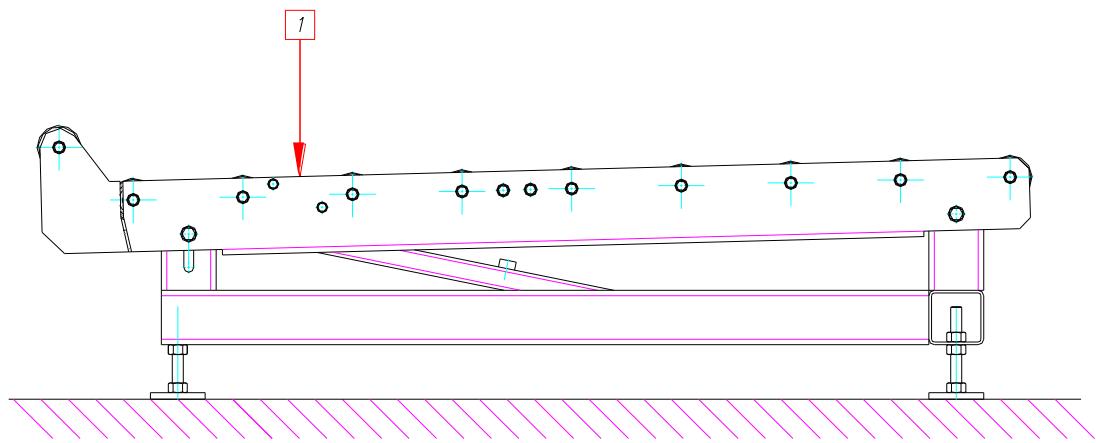
4.20. Lubrication Chart: Loader and Unloader



Without Tilting table



Passive Unloader



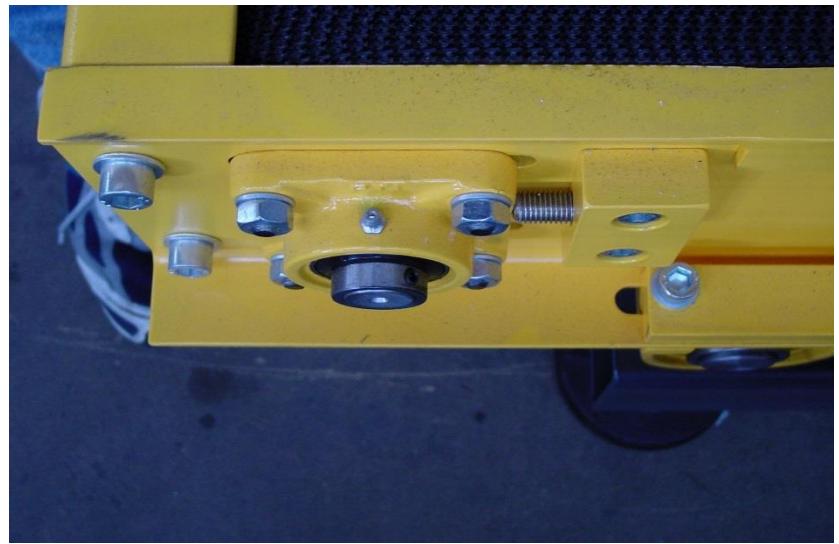
	<i>Designation</i>	<i>Qty.</i>	<i>Action</i>	<i>Lubricant⁹</i>	<i>Interval</i>	<i>Manual</i>
1	Flanged bearings: Loader/Unloader	4	Grease with grease gun	Grease	Annually	4.20.1
2	Pedestal bearings: Loader/Unloader	4	Grease with grease gun	Grease	Annually	4.20.2
3	Radial tilting table bearings	2	Grease with grease gun	Grease	200 hrs.	4.20.3

⁹ Lithium complex soap grease (e.g. DIVINOL Lithogrease G421,...)

13.07.2011

4.20.1.

Flanged Bearings: Loader/Unloader



Flanged bearing, right side



Flanged bearing, left side (without cover of toothed belt)

The flanged bearings of the external loader must be greased once a year using DIVINOL Lithogrease G421 grease.

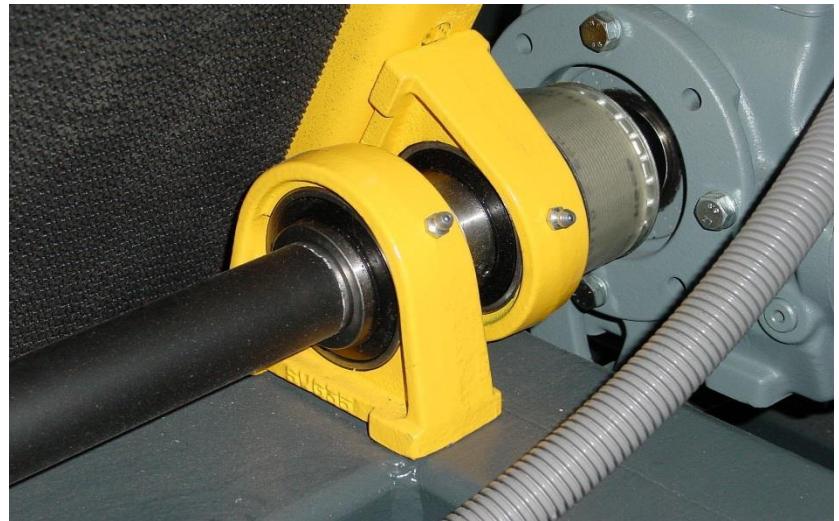
For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

Wipe off any oozed grease.

4.20.2.

Pedestal Bearings: Loader/Unloader



Right pedestal bearings with driving motor with tilting table swung upwards



Left pedestal bearings with tilting table swung upwards



CAUTION!!!

To grease the bearings, you need to move the tilting table to top position. It is then essential that you press the EMERGENCY STOP button on the tilting table to ensure that the tilting table cannot move down by accident!

The pedestal bearings of the external loader must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Grease the bearings (amount of grease: 3 – 4 strokes per bearing).

Wipe off any oozed grease.

4.20.3.

Radial Tilting table Bearings



CAUTION!!!

To grease the bearings, you need to move the tilting table to top position. It is then essential that you press the EMERGENCY STOP button on the tilting table to ensure that the tilting table cannot move down by accident!

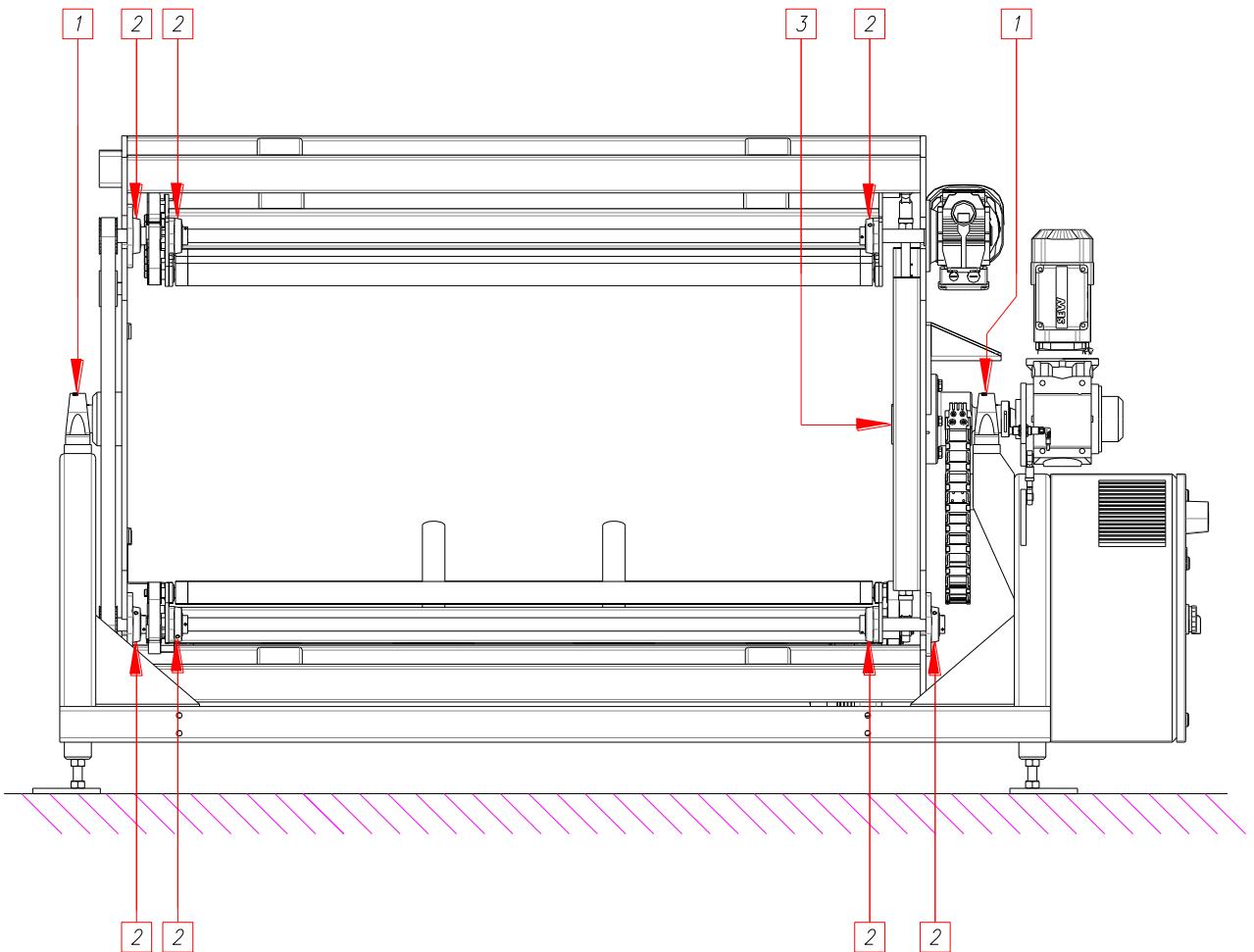
The radial tilting table bearings of the tilting table must be greased after approx. every 200 operating hours by using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Grease the bearings (amount of grease: 3 – 4 strokes per bearing).

Wipe off any oozed grease.

4.21. Lubrication Chart: Tire Flip Device (Flipper)



	<i>Designation</i>	<i>Qty.</i>	<i>Action</i>	<i>Lubricant⁹</i>	<i>Interval</i>	<i>Manual</i>
1	Pedestal bearings	2	Grease with grease gun	Grease	Annually	8.17.1.
2	Flanged bearings	7	Grease with grease gun	Grease	Annually	8.17.2.
3	Guide block	2	Grease with grease gun	Grease	Annually	8.17.3.

⁹ Lithium complex soap grease (e.g. DIVINOL Lithogrease G421,...)

13.07.2011

4.21.1.

Pedestal Bearings: Rotation Axis

The pedestal bearings of the tire flip device must be greased once a year using DIVINOL Lithogrease G421 grease.

Grease the bearings (amount of grease: 3 – 4 strokes per bearing).

Wipe off any oozed grease.

4.21.2.

Flanged Bearings: Roller Conveyor

The flanged bearings of the tire flip device must be greased once a year using DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for H1 lubricating nipples.

Amount of grease: 3 – 4 strokes per bearing.

Wipe off any oozed grease.

4.21.3.

Guide Block: Roller Conveyor Together

The guide blocks of the tire flip device must be greased once a year using DIVINOL Lithogrease G421 grease.

For the roller you should use DIVINOL Lithogrease G421 grease.

For this purpose, you need a grease gun with a fitting for K1 lubricating nipples.

Amount of grease: 3 – 4 strokes per slide.

Wipe off any oozed grease.

4.22. Alignment of the Lids

After replacing the toothed belts, it may be necessary to realign the lids.

4.22.1.

Aligning the Lids

7. Unscrew the 8 screws of the cover and remove it.
8. Secure the upper lid so that it cannot fall down.
9. Loosen the 4 screws of the belt clamp at the lid. The screws are located at the inside of the lid.
Attention: To not screw out the screws completely since the clamping device will otherwise fall down.
10. You can now align the lid with the grub screw located at the front of the clamping device.
11. Tighten the screws again.
12. Fasten the cover again.

If it should be necessary to align all four belt clamps, please proceed as described above for each alignment.

4.22.2.

Adjusting the Cylinder Rods

1. Unscrew the 8 screws of the cover and remove it.
2. Secure the upper lid so that it cannot fall down.
3. Loosen the nut at the cylinder rod.
4. Screw the cylinder rod further into the cylinder. The lids will then not be pressed together so tightly when they are closed.

Screw the cylinder rod further out of the cylinder. The lids will then be pressed together more tightly when they are closed.

5. Fasten the cover again.



After adjusting the cylinder rod, you need to test the machine to check whether the lids close properly and whether they open far enough.

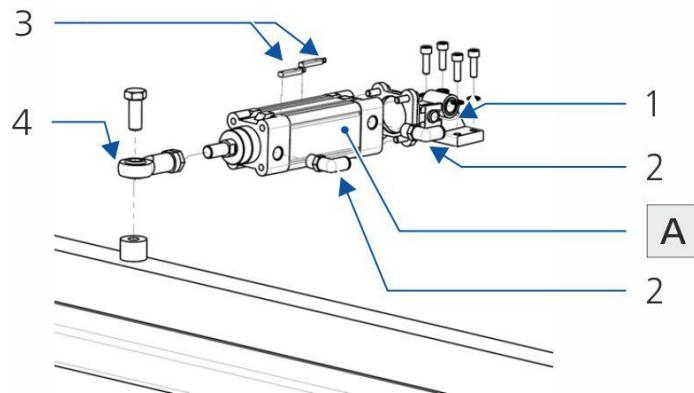
4.23. Exchanging the Cylinders of the Lids

4.23.1.

Exchange Lower Cylinder for Opening and Closing the Lid

There is one cylinder of this kind on each side (loader/unloader Side) of the INTACT tire testing machine. Exchange the cylinders as described below:

1. Close the lid
2. Press emergency stop and switch off the machine with the main switch.
3. Check at service unit if the machine is depressurized.
4. Secure lid with transport lock against falling down (see chapter 3.2.4. Lid / Axes).
5. Mark the position of the sensors on the cylinder.
6. Disassemble the sensors.
7. Disconnect compressed air hoses.
8. Unscrew the lock.
9. Unscrew the cylinder mounting.
10. Remove cylinder and install new one.
11. Screw on the cylinder mounting.
12. Screw on the lock.
13. Assemble the sensors
14. Connect compressed air to hoses.
15. Fit and adjust sensors as with old cylinder.
16. Remove transport lock.
17. Switch on the machine.



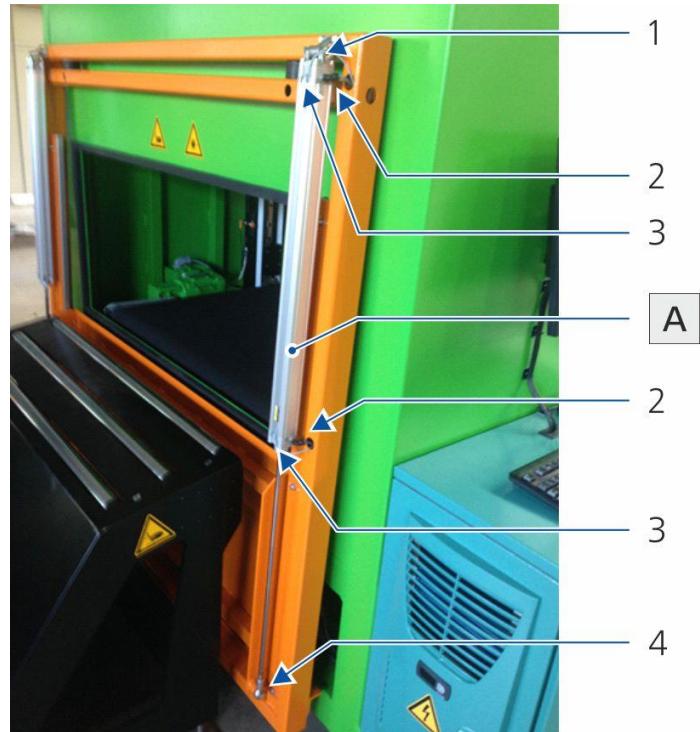
A	Cylinder
1	Cylinder mounting
2	Hose connection
3	Sensor

4.23.2.

Exchange Top Cylinder for Up and Down the Lid

There are two cylinders of this kind on each side (loader/unloader Side) of the INTACT tire testing machine. Exchange the cylinders as described below:

1. Close the lid
2. Press emergency stop and switch off the machine with the main switch.
3. Check at service unit if the machine is depressurized.
4. Secure lid with transport lock against falling down (see chapter 3.2.4. Lid / Axes).
5. Remove safety fence.
6. Mark the position of the sensors on the cylinder.
7. Disassemble the sensors.
8. Unscrew the lock.
9. Unscrew the cylinder mounting.
10. Disconnect compressed air hoses.
11. Screw on the cylinder mounting.
12. Screw the lock.
13. Remove cylinder and install new one.
14. Connect compressed air hoses.
15. Assemble the sensors.
16. Mount and adjust sensors as with old cylinder.
17. Fit safety fence.
18. Remove transport lock.
19. Switch on the machine.



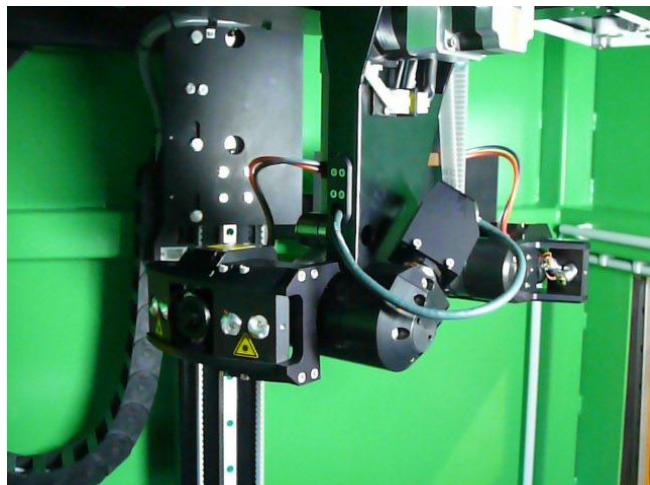
A	Cylinder
1	Cylinder mounting
2	Hose connection
3	Sensor
4	Lock

4.22. Changing the firewire cable (not all machines)

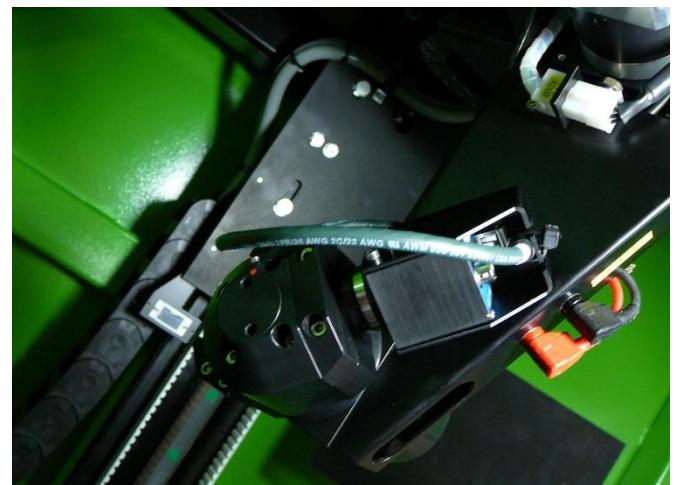
The cameras which are applied in the tire test machines are partially connected by firewire cables.

It is especially important how to lay the firewire cables from the measuring head holder towards the camera.

1. Insert the cable with the angle plugs first from above into the measuring head holder.
2. The cable length from the measuring head holder to the plug end is **285 mm**.
3. Fix the cable with a cable tie inside the measuring head holder in order to prevent that it slips out further. The length from the cable tie to the plug end is **290 mm**.
4. The cable has to be twisted in a way that it stays as close as possible at the measuring head.
5. Fix the plug with cable tie at the cable holder at the camera.
6. Avoid scrubbing or jamming of the cables when fixing it in the cable trays. Fix the cable on other cables and the end of the cable tray.



Front view.



Side view.

4.23. Brake roller at the unloader (option) (only for INTACT 1200)



The third-to-last roller is designed as brake roller. It slows down the tire so that it can be removed.

1. Check and make sure that the brake roller is functioning properly on a daily basis. The tire must be slowed down safely during operation and must come to a halt on the roller conveyor.



CAUTION!!!

Do not change the function of the brake roller. Risk of injury due to tires falling from the conveyor.

5. Software for Maintenance

5.1. INTACTService

This is a software tool that is installed on machines with software version 2.7.1. and higher. The tool summarizes all the information that is necessary to allow quick error analysis and makes it available in a file. The tool is very easy to use since an icon is created in the task bar during installation.

➤ **How to create the file for error analysis:**

1. If a problem has occurred, **do not** close the error message.
2. Move the mouse pointer down until the task bar appears.
3. Click on the icon with the red cross. You will find it on the left side of the task bar.
4. A ZIP file is created. A dialog box displays the e-mail address to which you can send the file.
5. Click on **OK** to save the file to the **D:\INTACTService\INTACTService..Date** directory.
6. If you cannot send any e-mails from the tire testing machine, copy the file to a computer from which you can send e-mails.

5.2. DOS PLC (FEC 34)

5.2.1.

Tasks of the Controllers (PLC)

The tire testing machine features multiple controllers each of which has different tasks. The number of controllers depends on machine size, complexity and on on-site configuration. The functionality of particular controllers may therefore vary from the information given below.

The following table describes some of the possibilities.

PLC	Function	IP address ¹¹	Port
Main PLC	- Height adjustment (lift axis) - Diameter adjustment (shift axis) - Conveyor belt, internal	192.168.202.18	27365
B2B PLC	- Rotation axis - Tilt axis	192.168.202.19	27367
Feeder PLC	- Conveyor belt, external - Tilting table	192.168.202.20	27369
Conveyor belt PLC	- Conveyor belt, external	192.168.202.21	27371
Unloader belt PLC	- Conveyor belt, external	192.168.202.22	27373
Flip device	- Conveyor belt for flipper	192.168.202.23	27375

Coordination and monitoring of all controllers is performed by the computer. In addition, it provides the interface to the user.

Not all inputs, outputs and signals run via the controllers. The computer therefore also controls the RS232 interface to the module block with the analogue and digital interfaces. This is performed via the serial interface (COM1) of the computer.

5.2.2.

DOS PLC Software Installation

The PLC used in the tire testing machine has 12 inputs and 8 outputs. In a complex machine, multiple controllers can be employed. Communication is performed via a TCP/IP cable.

There are two ways to transfer the software into the PLC. For machines with the **INTACT Software Version 2.7.1.** or higher, a service tool has been developed, which facilitates transferring software. The following section provides further information.

You have to log in as Administrator if you want to upload or change the software. Further details are given in Section **Fehler! erweisquelle konnte nicht gefunden werden.. User levels.**

¹¹ The IP addresses may vary from customer to customer. They depend on your company network.

Over the COM Interface

This method needs to be used when a new PLC is installed or if the program of the PLC has been damaged.

The PLC can no longer be started if the program is damaged. This is evident from the LED continuously flashing.

For further information on the PLC, refer to the relevant user manual.

1. Connect the serial cable to a non-assigned COM interface of your computer.
2. Connect the RJ45 connector of the cable to the COM port of the PLC (see figure at lower right)

The serial cable for transferring the software.

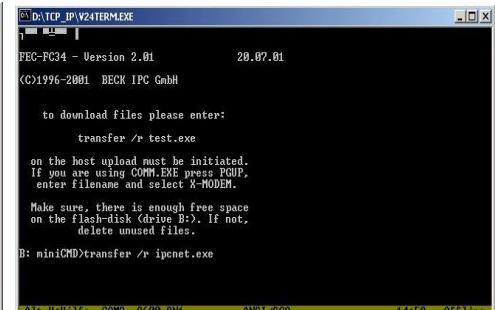


The serial cable is connected to the COM port of the PLC.



3. Copy the file to be transferred to the **D:\TCP\IP** directory and rename it **ipcnet.exe** or **ipcnet.ini**.
A backup of the PLC software is in the directory **D:\BUDate\PLC**.
4. Run the file **V24Term.exe**.
5. Press the **Alt + P** keys. A window opens for changing the parameters.
6. Go to the interface where you have connected the cable to the computer. This will usually be the **COM2** interface.

The box for setting the parameters.



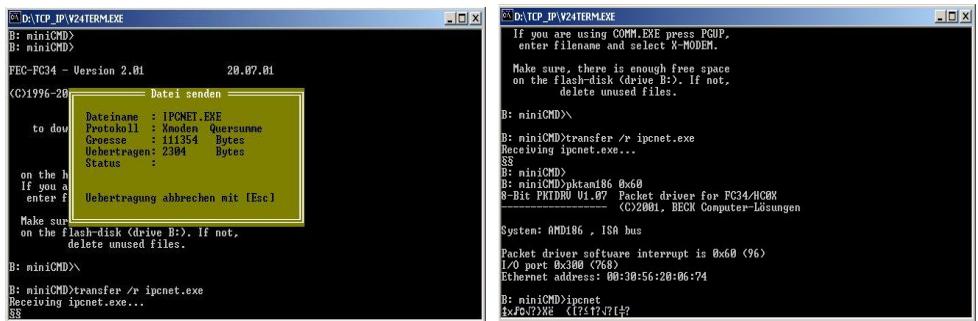
The boot screen after switch-on of the PLC and the command for transferring the software.

7. Set the Run/Stop switch of the PLC to **Stop** (see figure at upper right).

8. Switch off the 24V power supply (Fuse F1), wait a few seconds and switch on again. The PLC is now rebooted. The boot screen of the PLC is displayed.
9. Enter **transfer /r ipcnet.exe** into the input line if you want to transfer the EXE file, or enter **transfer /r ipcnet.ini** if you want to transfer the INI file.
10. Press Return to confirm your entry, then press the **Alt + U** keys.
11. A dialog box opens. Enter the file name once again.
12. The file is now transferred. You can watch its progress on the transfer counter. The dialog box closes automatically when the transfer is completed.

The file is being transferred.

The boot screen after restarting the PLC. The last line contains the undefined characters.



13. Set the Run/Stop switch of the PLC to **Run** and enter the **Reboot** command.
14. The boot screen of the PLC is displayed but now differs from the first boot screen. In place of the input line, you now see undefined characters.
15. Exit the program and remove the cable.

Over the TCP/IP Interface

Transferring the software using a TCP/IP cable is only possible if the PLC has already been commissioned and if the software is not damaged.

With the TCP/IP cable and a software tool, you can also back up the PLC software.

The following section describes both the transmitting and the receiving processes. In both processes, you have to enter the IP address and port of the PLC as well as the source and target file names.



Caution: You are working directly with the PLC's file system. Operator errors may have fatal effects on PLC functioning.

Transmitting the Software

1. The PLC must be enabled for this purpose as it is protected from unauthorized access.
 - 1.1. Change to the **D:\Service** directory and run the **EPCLogin**.



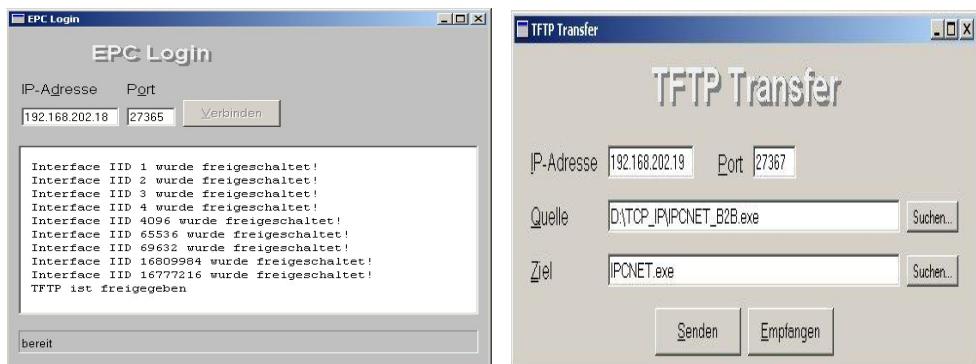
Caution: Unauthorized access to the EPCLogin file must be prevented under any circumstances.

- 1.2. Enter the PLC's IP address and port into the relevant boxes.
- 1.3. Click on the **Verbinden** button.
- 1.4. This starts PLC enabling. This process is completed when the dialog box shown in the figure below appears on the screen.

- 1.5. Close the dialog box.

The dialog box shows that the PLC has been successfully enabled.

Dialog box for transmitting the software.



2. Change to the **D:\TCPIP** directory and run the **TFTPTransfer** file.

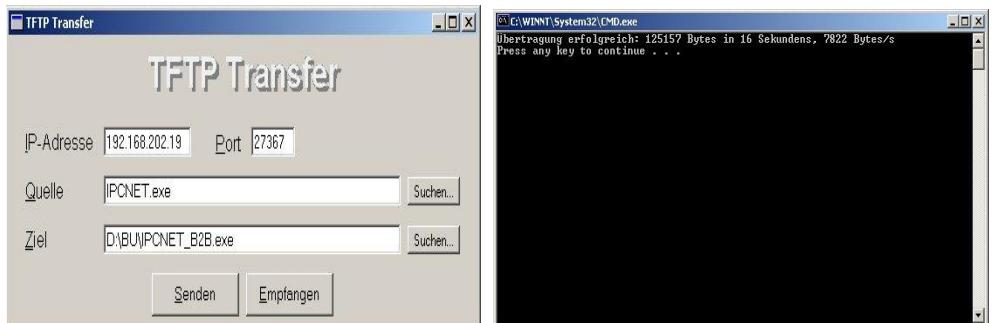
3. Enter the PLC's IP address and port into the dialog box. A list of the most common TCP/IP addresses and ports is provided in Section **5.5.1. Tasks of the Controllers (PLC)**.
For the source, enter the path of the file you want to transmit.
For the target, enter the file name in the PLC, e.g. **ipcnet.exe**.
4. Click on **Senden** to start the transfer.
5. A dialog box opens which shows you whether sending the file was successful or not. Press any key to close the dialog box.
6. Any software changes which may have been made will only become effective after a PLC restart. Therefore, should you suspect that the file you have just transmitted might be corrupted, you should immediately perform an error-free transmission. Otherwise, the PLC might then no longer work after a restart.

Receiving the Software

1. The PLC must be enabled for this purpose because it is protected from unauthorized access (see above).

Dialog box for receiving the software from the PLC.

Transmitting / receiving was successfully completed.



2. Change to the **D:\TCPIP** directory and run the **TFTPTTransfer** file.
3. Enter the PLC's IP address and port into the dialog box. A list of the most common TCP/IP addresses and ports is provided in Section **5.5.1. Tasks of the Controllers (PLC)**.
For the source, enter the file name in the PLC, e.g. **ipcnet.exe**.
For the target, enter the path to which you want to save the file on the computer hard disk.
4. Click on **Empfangen** to start the operation.
5. A dialog box opens which shows you whether the file was successfully received. Press any key to close the dialog box.

5.3. Service Tools

As described previously, the tire testing machine uses multiple controls which have different tasks. The number of controls depends on the machine size and complexity and on the configuration on site. The controls execute and monitor axis movement. The required parameters are saved in the controls.

The software of the tire testing machine includes a self-diagnosis of the most important functions. The self-diagnosis helps you find errors and check the machine functions. In some cases, such as for service and maintenance, the scope of the self-diagnosis is not sufficient, however. For this purpose, a service tool has been developed.

The use of the service tool requires special training. The service tool enables you not only to check the functioning of the machine and document the test results, but also to change the PLC parameters or the control software.

The following sections describe the most important functions. You have to log in as the **Administrator** to use the service tool software. How to log in using the **Administrator** account is described in the operator manual, **Within Windows 2000 Pro and Windows XP**.

5.3.1.

Enabling and Registering the PLCs

When you start the service tool, a connection to all PLCs is opened automatically. For this reason, the INTACT software must not be active. The file with which you start the service tool is located in the **D:\ServiceTool** directory and is named **ServiceTools (in English).cmd**.

1. Exit the INTACT software if it is still active.
2. Open the Explorer and go to the directory indicated above.
3. Double-click on the **cmd** file or use the desktop icon.
4. A window opens which lists the notes that need to be observed when using the service tool. Verify that all items of this checklist are complied with.

Notice:

All DOS-PLCs have to be activated, that means :

- Mode switch has to be at 'Run'
- LED close to label 'Run' has to blink green
- LED close to label 'Power' has to be green continuously
- Network cable has to be plugged
- Green 'TP' LED has to be on

No other tasks may run accessing DOS-PLCs too (check Task list if in doubt).

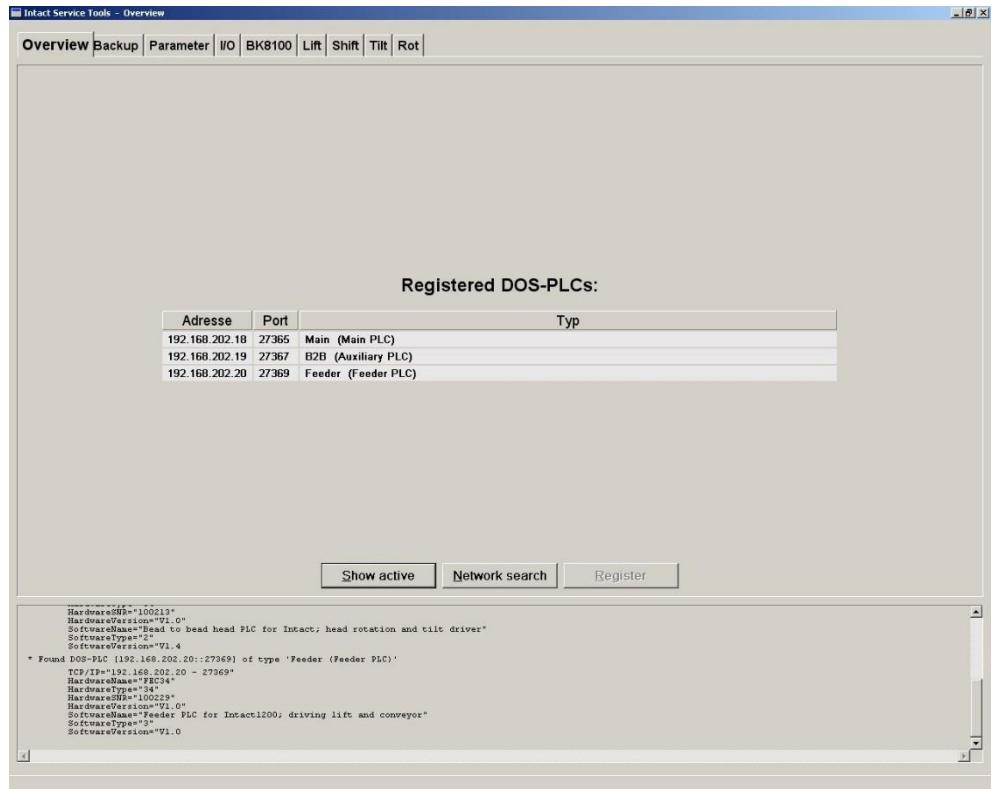
Caution: During service **nobody** is allowed to stay in chamber or at other hazardous places such as feeder or unloader!

No person is allowed in the machine during use of the service tool.

This safety notice must be strictly complied with.

5. After having verified compliance with all items of the checklist, click on the **Continue** button.
6. Click on the **Show active** button.
7. All PLCs provided in the machine are displayed. The **Register** button is enabled if you have started the software for the first time or if the PLCs have not been registered yet. Click on **Register** to register the files in the operating system.

The software displays all PLCs of the machine. Registering is no longer required.



8. Before registering starts, a dialog box opens which prompts you for your password. Enter the password and click on **OK** to enable the software for all accesses and changes.

- or -



- Click on **Cancel** to cancel the process. In this case, however, you cannot work with those functions of the service tool which access the PLCs.
9. When you have entered the correct password, you can start checking the axes or editing the parameters.
 10. To change the password, enter the current password and click on the **Change** button. A dialog box opens in which you can enter a new password. Confirm the new password and then click on **OK** to apply it.

- or -

Click on **Cancel** to exit the dialog box. The previous password remains in effect.

5.3.2.

Setting the Outputs and Querying the Inputs of the PLCs

The service tool also offers you the possibility set and query the PLC's inputs and outputs. This includes, for example, the vacuum pump and the lids of the vacuum chamber.



Please strictly comply with the safety notices given in this manual since the commands are not verified when you manually control the machine. Therefore, there is a danger of damage to the machine.

➤ **How to set the outputs:**

1. Start the software as described above.
2. Connect the PLCs. This process is described in section **5.3.1. Enabling and Registering the PLCs**.
3. Click on the **I/O** tab. A window with safety information opens. **The instructions given must be strictly followed.**

Window with safety information.

Caution:

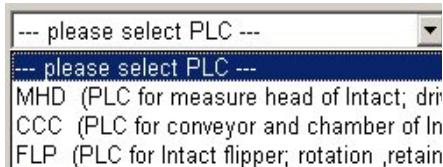
Manipulating outputs of PLC directly exposes very high risk of damaging machine!

To reduce risk **all** drives should be **switched off**!

Please follow all safety precautions by all means!

Outputs may not be set permanently if any safety device is active.

Continue



4. Click on the **Continue** button.
5. A list box opens. **<0>Klicken Sie auf den Pfeil, der sich neben der Box befindet. <1>Click on the arrow next to the box and select the PLC for which you want to display or set the inputs and outputs.**
6. A list of the inputs and outputs appears. By setting the outputs, you can execute specific functions. The inputs show the status of the machine. They change when a function has been successfully executed.

List of the inputs and outputs.

Intact Service Tools - I/O

Overview | FTP | Backup | Parameter | I/O | Lift | Shift | Tilt | Rot | Convey | Flip | MovMot | MovTrac |

Accessing inputs / outputs of MHD (PLC for measure head of Intact,

E0		E2		E1		E3		A0		A1	
.0		.0		.0	IShiftZeroSensor	.0	LiftUpCmdFeedback	.0	DriverSupply	.0	LaserGroup0
.1		.1		.1	IRotZeroSensor	.0	LiftDownCmdFeedback	.0	.1	.1	LaserGroup1
.2		.2		.2	ITilt1ZeroSensor	1	ILiftTireDetectionSensor	0	.2	.2	LaserGroup2
.3		.3	ServiceMode	0	.3		.3	SlowAndDirection	1	.3	
.4		.4		.4	.4		.4	ShiftStepper	0	.4	
.5		.5	LiftEncoderError	0	.5		.5	RotStepper	0	.5	
.6		.6	ILiftMovMotError	0	.6		.6	Tilt1Stepper	0	.6	
.7		.7	IEmergency	1	.7		.7	Tilt2Stepper	0	.7	DisableStepper

At segment 0x388C: MathTools (build: May 06 2009 - 17:14:53)
At segment 0x3900: MathTools (build: May 06 2009 - 17:14:53)
At segment 0x3D1C: EPC-Manager (build: May 06 2009 - 17:14:57)
At segment 0x379E: Notification (build: May 06 2009 - 17:14:57)
At segment 0x3900: Notification (build: May 06 2009 - 17:14:57)
At segment 0x4094: UDP-Manager (build: May 06 2009 - 17:14:58)

Parameter (13/08/2009 16:34:24)

Getting parameter of PLC 'MHD (PLC for measure head of Intact; drives lift, shift, rotational and tilt axes - 192.168.202.18)'
Access to I/O of PLC 'MHD (PLC for measure head of Intact; drives lift, shift, rotational and tilt axes - 192.168.202.18)' provided
Cycles: 22 / 1

I/O (13/08/2009 16:37:16)

5.3.3.

Checking the Functioning of an Axis

This service tool can be used to check each axis that is controlled by a PLC. This applies to the lift, shift, tilt and rotation axes. A tab is provided for each axis.

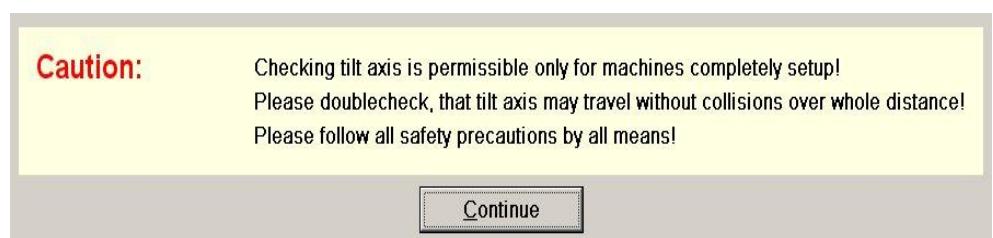
You can move the axis to zero position or reference it. You can also have the referencing process repeated automatically for each axis and display information. The information help you find and correct errors.

The procedure is illustrated using the tilt axis as an example.

► How to check the functioning of the axis:

1. Click on the **Tilt** tab.
2. A window opens which gives safety notices for preventing damage to the machine. **Read these notices thoroughly from beginning to end and strictly comply with them.**

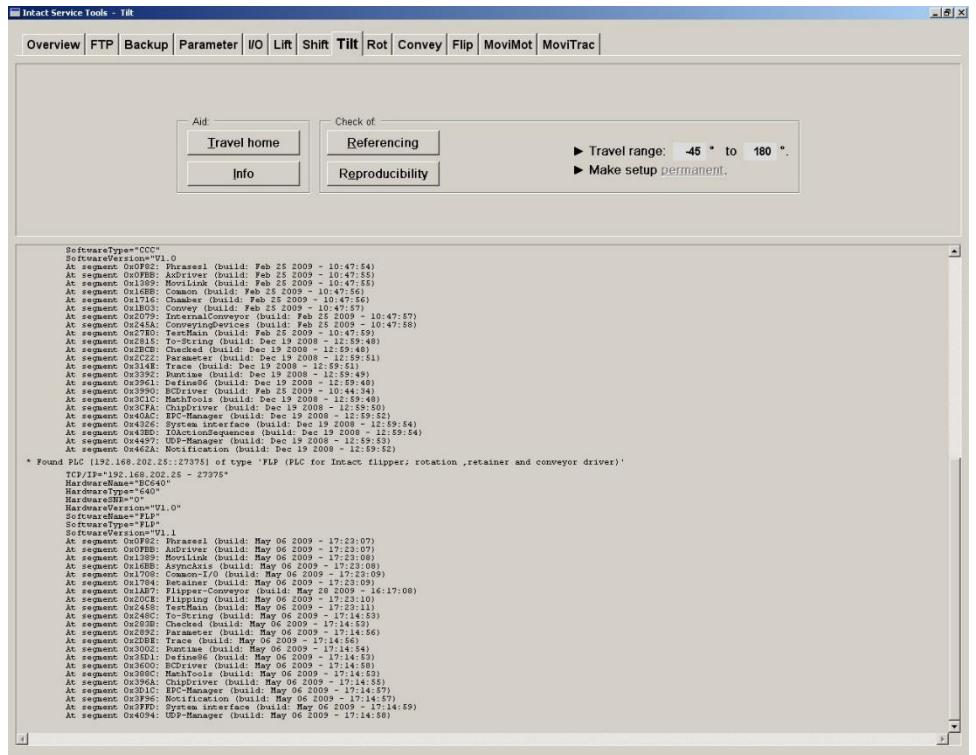
Window with safety information.



3. After reading the notices, click on the **Continue** button.
4. A window opens which contains the buttons for referencing and traversing the axis. It also displays status messages. The current parameters for the travel/traversing range of the axis are given on the right.
5. Click on the button for the function you want to run.
 - 5.1. **Travel home**
The axis is moved to its home position, unless it is already there.
 - 5.2. **Info**
Displays a quick guide.
 - 5.3. **Referencing**
The axis is referenced once, as during the self-diagnosis. To stop the process before completion, click on the **Abort** button. In that case, the axis will not be referenced, however.
 - 5.4. **Reproducibility**
The axis is continuously referenced until an error occurs or until you cancel referencing by clicking on **Abort**.



Window for checking the tilt axis after confirmation of the safety notices.



6. The axis starts to move and a progress bar is displayed on the screen. Click on **Abort** to stop the process.

7. On completion of the function, the result is shown in the bottom section of the window. There are three different states.

7.1. Referencing was successful.

The length of the axis and the limits for the parameters are displayed.

7.2. The axis length is too short.

An error message is displayed. The value in the first parentheses indicates the minimum length for the axis. Enter this value for the parameter and reference the axis again. How you edit the parameter is described in section **5.3.4. Changing Parameters in the Control Software**.

7.3. The axis length is too long or not optimally set.

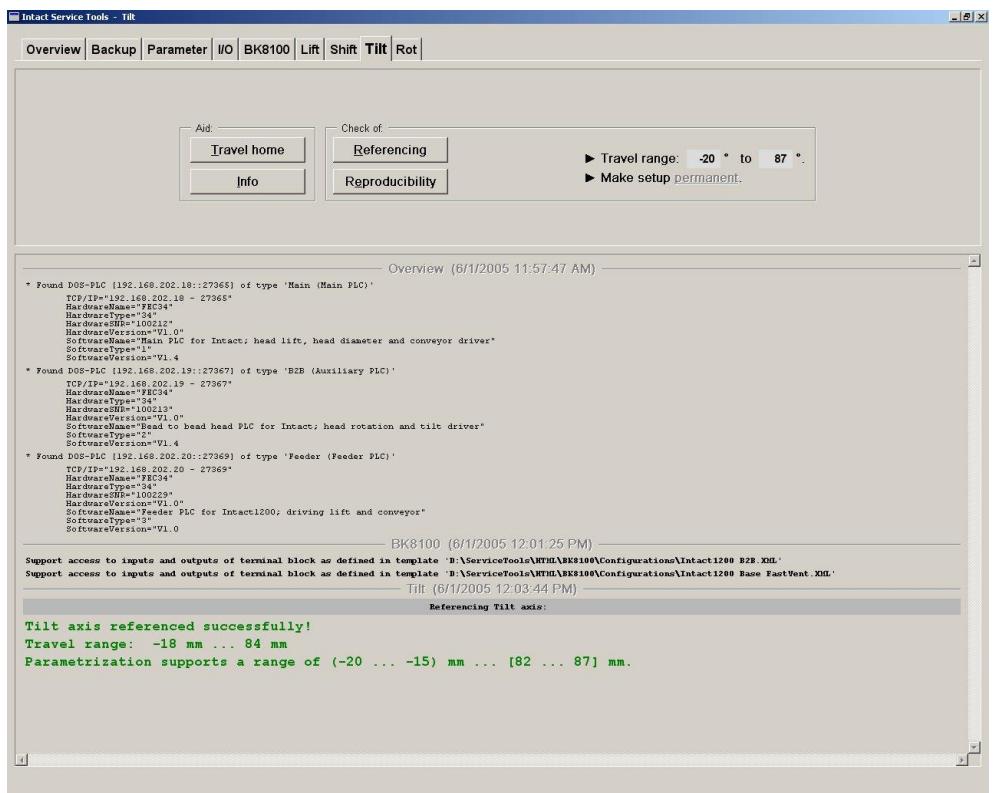
You are informed that the axis has been referenced, but that the parameters are not optimally set. A dialog box opens in which you can confirm the suggested value.

7.4. Click on **Yes** to confirm the value.

- or -

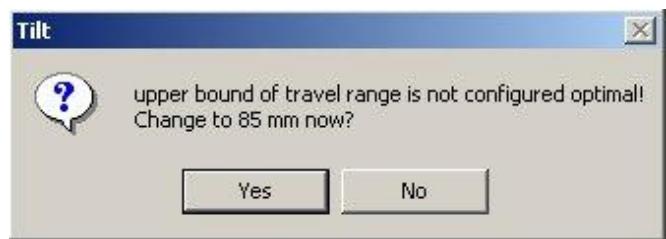
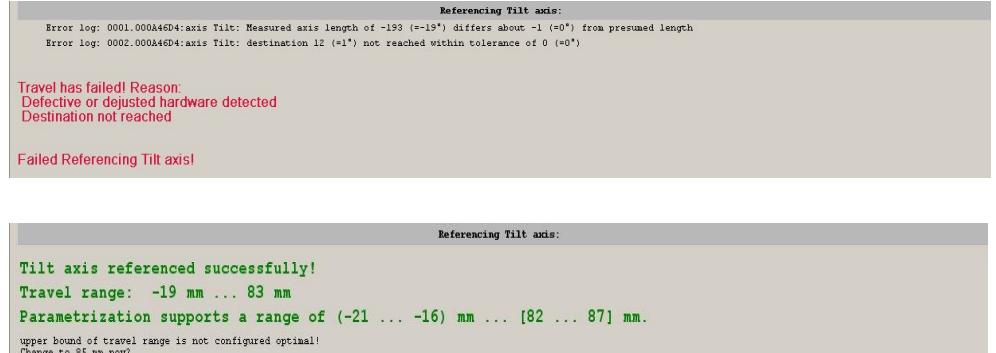
Click on **No** if you do not want to confirm the value. You can then change the parameter yourself as described in section **5.3.4 Changing Parameters in the Control Software**.

Referencing the axis was successful.



Referencing the axis failed.

The parameter is not optimally set. The service tool suggests a better value.



The above procedure is the same for all axes. If problems occur which cannot be solved by editing the parameters, you can display information on possible solutions by clicking on the **Info** button. You can also refer to those sections of this manual which deal with axis problems.

5.3.4.

Changing Parameters in the Control Software

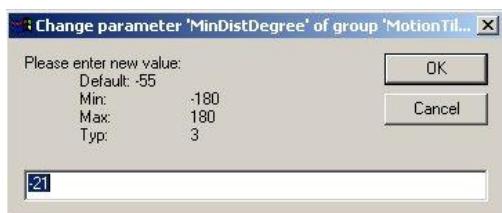
The service tool provides a separate area for changing the parameters for the axes. In this area, you can change all the parameters. The axis length parameters can also be changed directly on the tab of the corresponding axis and saved permanently.

This section describes both procedures.

► How to change the parameters on the Parameter tab:

1. Click on the **Parameter** tab to display it.
2. In the top line of the tab, you find a list box. Here, you can select the PLC for the axis whose parameters you want to edit. Click on the arrow to display the list of all PLCs. Section **5.5.1. Tasks of the Controls (PLCs)** describes which PLC controls which axis.
3. A table opens which lists all groups in which you can edit parameters.
4. Open the group with the desired parameters by clicking the small box in front of the group name.
5. The highlighted parameters can be edited. The info field shows you a brief description of the parameters.
6. After clicking on the parameter you want to change, a dialog box opens. Here, you can change the parameter value. Click on **OK** to confirm the new parameter value.

- or -



7. Click on **Cancel** to close the dialog box without changing the value.
8. To save the change permanently, click on the **Persist** button.
8. You can undo the change by clicking on **Undo**.

Parameters of the
tilt axis.

Parameter of MHD (PLC for measure head of Intact)						
Name	Value	Default	Min	Max	Type	Kind
Persistence						
Trace						
system						
BCIO_E0						
BCIO_E1						
BCIO_E2						
BCIO_E3						
BCIO_A0						
BCIO_A1						
IOPParameter						
Lift						
Shift						
Rotation						
Tilt						
ConfigurationFlags	0x203	0x203	0x0	0xFFFF	USHORT	R/W
						Flags: 0x0001 reversed direction, 0x0002 half step mode, 0x0004 Use break, 0x0008 Neglige homing direction, 0x0200 Use to move shift axis for referencing
Trials	2	2	1	10	UCHAR	R/W
UnitToRawFactor	10000	10000	1	66536	USHORT	R/W
UnitToRawDivisor	2250	2000	1	65535	USHORT	R/W
MinPosition	-45	-45	-180	0	SHORT	R/W
MaxPosition	180	180	0	190	USHORT	R/W
IndexingDiffMax	2	2	0	10	USHORT	R/W
PrecisionFrequency	80	80	10	200	USHORT	R/W
ConstFrequency	300	300	100	1000	USHORT	R/W
MinFrequency	100	100	100	1000	USHORT	R/W
MaxFrequency	1000	1000	100	2000	USHORT	R/W
AxesMaster						

► How to change the axis length in a different way:

1. Open the tab for the relevant axis.
2. Read and comply with the displayed safety notices and click on the **Continue** button
3. The parameter which determines the length of the axis is given on the upper right.
4. Click on the parameter you want to change (-45° or 180°). A dialog box opens as described above.
5. Enter the new parameter value and click on **OK** to confirm. The **Permanent** function is now enabled.

- or -

- Travel range: **-45 °** to **180 °**.
- Make setup permanent.

Click on **Cancel** to close the dialog box without changing the value.

6. It is essential to reference the axis at this point. This is necessary to ensure that the axis functions correctly and the parameter has been optimally set. For information, see also section **5.3.3. Checking the Functioning of an Axis**.
7. After verifying that the axis functions without problems, you can apply the new parameter. This is done by clicking on **Permanent**.

5.3.5.

Backing Up and Restoring the Control Software

The service tool enables you to save all the files of the PLC in a directory. The files should be backed up after any change of the parameters and after every software update. You also need to back up the software before installing an update. You can password protect the backup file.

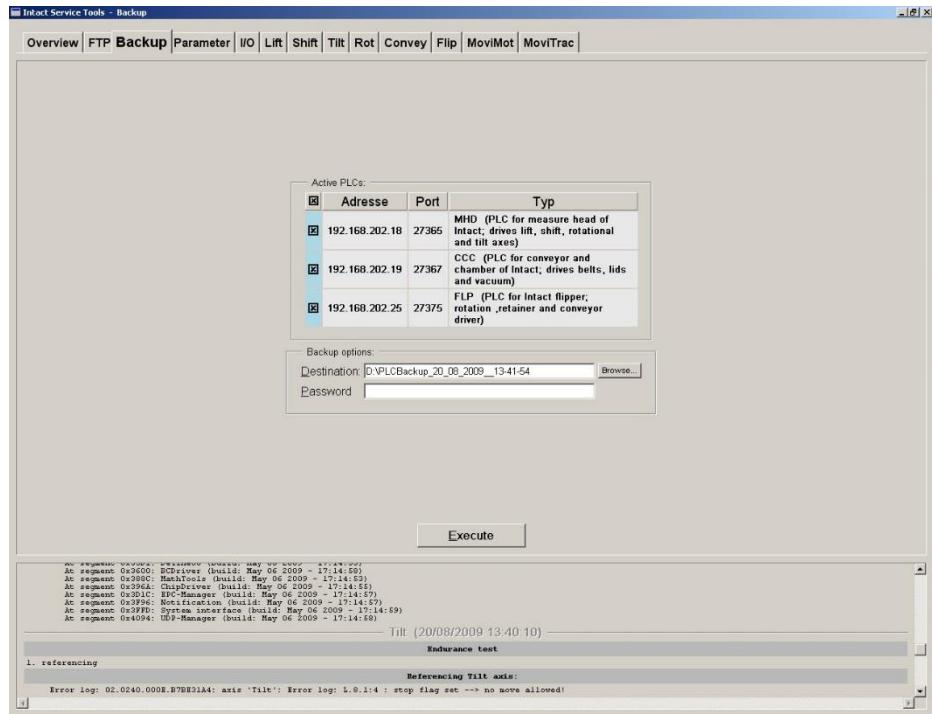
Backing up the software

A backup of the files is created automatically after you have selected for which PLCs you want to create the backup file and in which directory you want to save it.

► How to create the backup:

1. Change to the **Backup** tab.
2. A list of all available PLCs is displayed together with a dialog box in which you can change the directory for the backup file.
3. A small box with an **X** is given next to each available PLC. If you click on the **X**, it is removed and the software of this PLC will not be included in the backup.
4. In the **Password** box, you can enter a password for the backup. This password will then be needed for restoring the backup.
5. Click on **Execute** to start the backup process.

Backup of the PLC software in a directory.



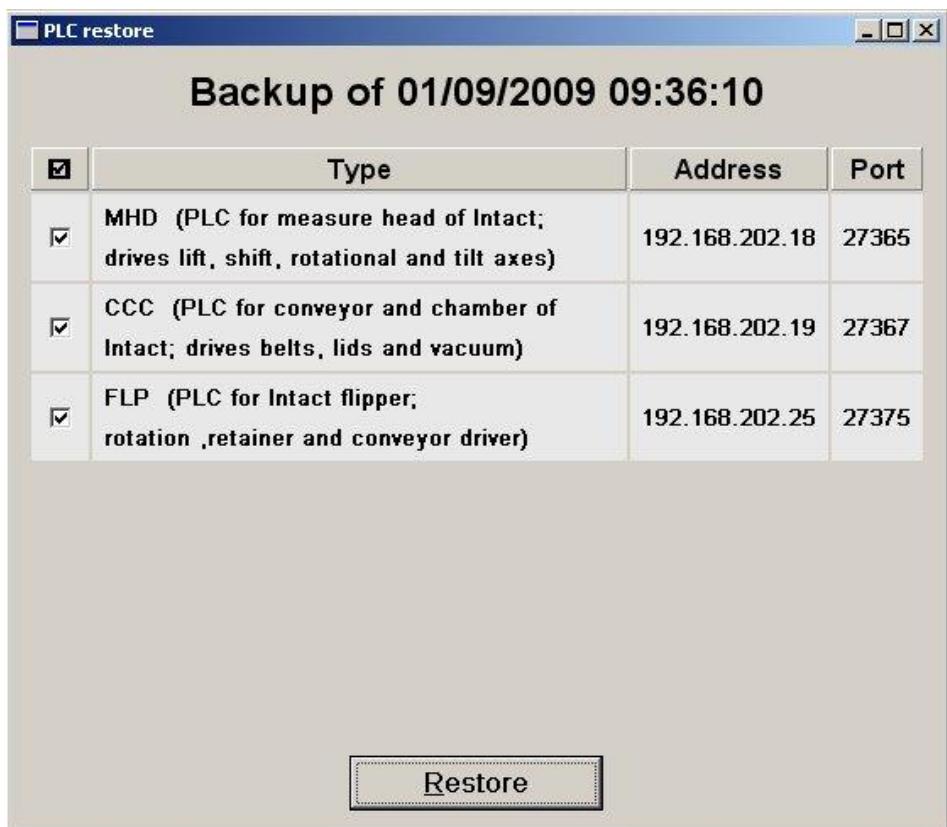
Restoring the software

Restoring the software is started from the directory to which the backup has been saved. If the INTACT® software or the service tool software is running, exit these applications before starting the restore.

► How to restore the software:

1. Open the directory that contains the backup files you want to restore. The files may be located in the default directory (**D:\PLCBackup\ Date**) or in a directory you selected during backup.
2. Double-click on the **Restore.HTA** file.
3. A window opens which lists all the PLCs for which a backup was created. If you remove the checkmark for a PLC, the software for this PLC will not be restored.
4. If you have entered a password during backup, an input box is displayed in which you have to enter the password to be able to restore the software.
5. Click on the **Restore** button to start the process.

Restoring the software without password.



6. A progress window is displayed during the transfer of the software to the PLC.

7. When the transfer is complete, click on the **x** button in the top right corner to close the window.
8. Restart the PLC to which you have transferred the software.

Progress window for transfer of the software to the PLC.



5.3.6.

Installing a New Software Version

As the software for controlling INTACT is continuously further developed, software updates may be released from time to time. To make this process as easy as possible, the individual files required for the PLCs are combined and stored in a directory.

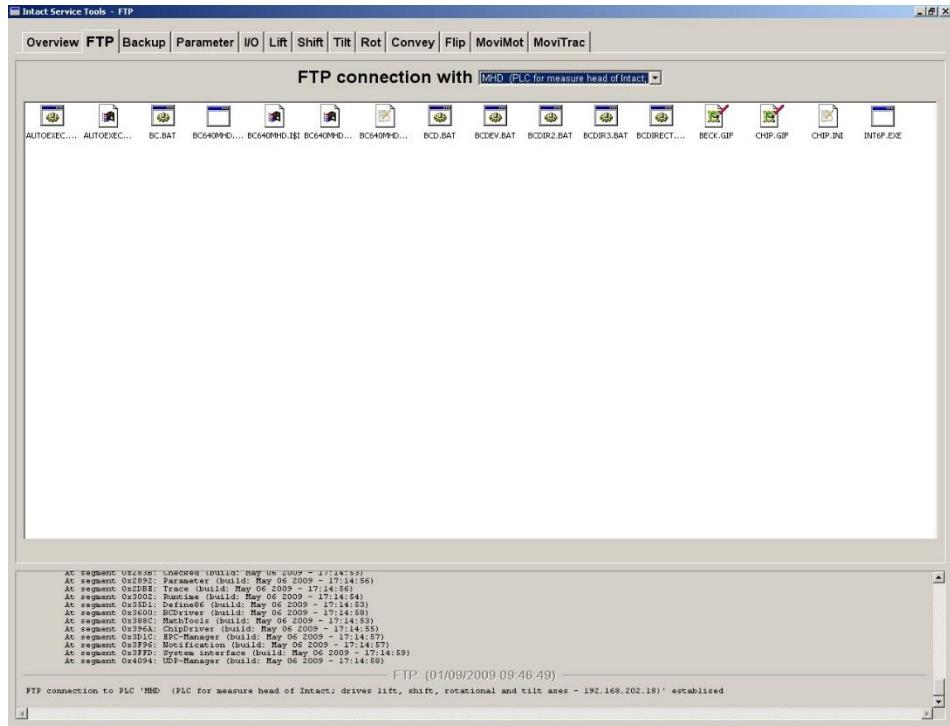
You can copy the files to the PLC by using the **FTP** function provided by the service tool software.

The **FTP** function also allows transferring files from or to a PLC without having to switch the PLC to a different mode. This is particularly important for remote maintenance of the machine.

► How to install the new software:

1. Create a backup of the current software. Section **5.3.5. Backing Up and Restoring the Control Software** describes how this is done.
2. Copy the directory containing the new software version to your computer hard disk and open it.
3. Select all files and click the right mouse button.
4. Select **Copy** on the shortcut menu.
5. Click on the **FTP** tab in the service tool software.
6. In the list box, select the PLC on which you want to install the new software.
7. The window then displays all the files that are available in the selected PLC.

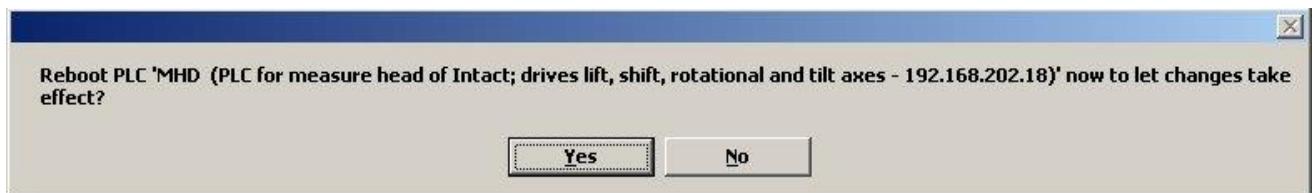
Files available in the MHD PLC.



8. Right-click into the window Sie erhalten eine Dialogbox. to open the shortcut menu.
9. Choose **Paste**.
10. The files selected previously are copied to the PLC.
11. After the successful completion of the copy operation, you can either exit the service tool software or select another PLC you want to update.
12. A pop-up window appears asking you if you want to reboot the updated PLC. Rebooting is required to activate the update.
13. Click on **Yes** to activate the update.

- or -

Click on **No** to close the pop-up window without activating the update. The new software version will then be activated the next time you switch on the machine.



5.3.7.

Exiting the Service Tool

The user interface of the software is grouped into two areas. In the upper area, you enter the commands and edit the parameters. In the bottom area, all actions are recorded and logged. Before you exit the service tool, you should save the log file.

► How to save the log file:



1. Press the right mouse button.
2. The dialog box shown on the left opens.
3. Click on **Save**.
4. A dialog box opens in which you can enter the directory and the file name. Please enter **HTML** as the file name extension.

After having saved the log file, you can exit the software.

► How to exit the service tool:

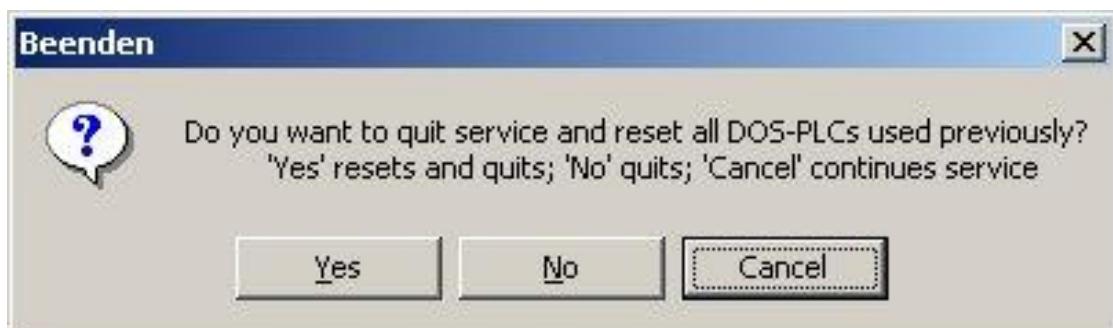
1. Click on the **X** in the top right corner of the screen.
2. A pop-up window is displayed. Click on the **Yes** button to exit the service tool and reset the PLCs. The PLCs are rebooted and you can immediately start the INTACT® software to check whether your changes have been correctly applied.

- or -

Click on **No**. The software is terminated without resetting the PLCs. This means that your changes will only become effective after a restart.

- or -

Click on **Cancel** to continue working with the service tool.



5.4. Installing a New PLC Software Version

As the software for controlling INTACT is continuously developed, software updates may be released from time to time. To make this operation as easy as possible, the individual files required for the PLCs are combined into a single file.

This file is configured in such a way that it first enables the PLCs and then automatically installs the update files.

► **How to install the new software:**

14. Create a backup of the current software. Section **5.3.5. Backing Up and Restoring the Control Software** describes how this is done.
15. Copy the file onto your computer hard disk.
16. Double-click on the file.
17. A dialog box containing information on the update is displayed.
18. Click on **Install** to copy the update to the PLC.

- or -

Click on **Cancel** to close the box without installing the update.

19. After successful completion of the update, you have to shut down the system and switch off the machine.
20. Wait approx. 20 seconds and then switch on the machine again. The update is now active.



5.5. DOS PLC

5.5.1.

Tasks of the Controls (PLCs)

The tire testing machine features a PLC with 32 inputs and 16 outputs. Communication is via a TCP/IP cable.

The tire testing machine features multiple controls which each have different tasks. The number of controls depends on the size and complexity of the machine as well as the configuration on site. The functionality of particular controls may therefore vary from the information given below.

The following table describes some of the possibilities.

PLC	Function	IP address ¹¹	Port
Measuring head (MHD)	<ul style="list-style-type: none">- Height adjustment (lift axis)- Diameter adjustment (shift axis)- Tilting of measuring heads (tilt axis)- Rotating of measuring heads (rotation axis)	192.168.202.18	27365
Test chamber and conveyor (CCC)	<ul style="list-style-type: none">- Conveyor belts, internal- Conveyor belts, external- Tilting tables for loading and unloading	192.168.202.19	27367
Flip device	<ul style="list-style-type: none">- Flip device	192.168.202.23	27375

The coordination and monitoring of all controls is performed by the computer. In addition, it provides the interface to the user.

¹¹ The IP addresses may vary from customer to customer. They depend on your company network.

5.5.2.

DOS PLC Software Installation

There are two ways to load the software into the PLC. For machines with the **INTACT software version 2.7.1.** or higher, a service tool has been developed, which facilitates the software upload. The following section provides further information.

You have to log in as the **Administrator** if you want to upload or change the software. Further details are given in operator manual, section. **User Levels**.

Uploading the software with the service tool is only possible if the PLC has already been commissioned and if the software has not been damaged.

The following description illustrates how you can upload the software with the external **ChipTool** software application.

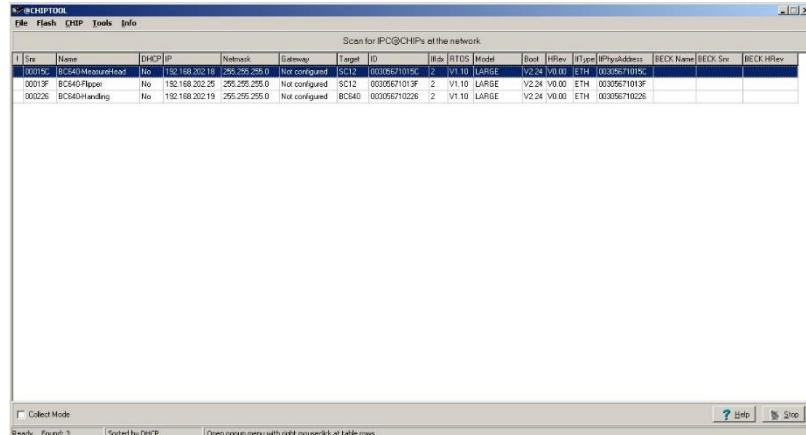


**Attention: You are working directly with the PLC's file system.
Operator errors can have fatal effects on the functioning of the PLC.**

Uploading the software

1. Log in as the Administrator.
2. Turn the mode switch of the PLC from **Run (1)** to **Stop**.
3. Start the software by double-clicking on the **ChipTool** icon on the desktop.
4. A dialog box appears, listing all available PLCs. Click on **Stop** to stop scanning for further PLCs.

The dialog box displays the available PLCs.

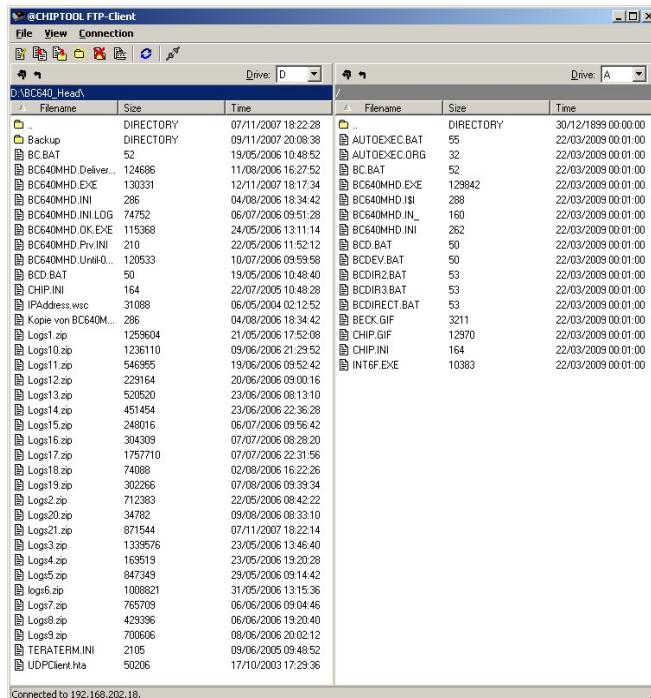


5. Right-click on the PLC with the software you want to transfer. A shortcut menu appears.
6. Choose **FTP**.



The dialog box displays a directory on the hard disk and one on the PLC.

7. A dialog box appears where you can enter the IP address, user name and password. These parameters have already been preset during installation of the software. Therefore, all you need to do here is click on **Connect**.
 8. The ChipTool **FTP-Client** displays the files residing on the PLC in the right-hand window, and a drive on your computer in the left-hand window. Please browse to the directory containing the software you want to transfer to the PLC, e.g. **D:\PLCBackup_Date_Time\192_168_202_18 (MHD)**
 9. Select the files in the window on the left and drag/drop them into the window on the right.
 10. Exit the ChipTool software and set the mode switch back to **Run (1)**. Restart the PLC to allow upload of the new software. To do this, you can either briefly switch off the fuse **4F1** or restart the entire machine.



You can also use the ChipTool software to back up the software of a PLC.

1. Please follow steps 1 to 7 as described above.
 2. In the left-hand window of the **FTP-Client**, select the directory to which you want to save the PLC's software.
 3. Select the files in the window on the right and drag/drop them into the window on the left.
 4. Exit the ChipTool software and set the mode switch back to **Run (1)**. Then either briefly switch off the fuse **4F1** or restart the entire machine.

5.6. Beckhoff PLC

5.6.1.

Tasks of the controllers (PLC)

In this tire testing machine is inserted a central control. It owns two EtherCat strands that work with different cycle times.

The main strand PLC_Main works with a cycle time of 10ms. The network adapter is configured as follows:

- IP-adress: 192.168.210.1
- Subnet-Mask: 255.255.255.0

The fast strand PLC_Fast has a cycle time of 50µs. It is concerned for capturing time critical signals. The following configuration is dedicated for the assigned network adapter:

- IP-adress: 192.168.211.1
- Subnet-Mask: 255.255.255.0

5.7. Service Tools for Beckhoff PLC

In newer INTACT 1200 tire testing machines is inserted a central control that assumes different tasks. The control consists of several modules that are depending on the size and complexity of the machine, plus the difference of the configuration from customer to customer. The control implements the axis movement and observes it. The necessary parameters are saved in the controls.

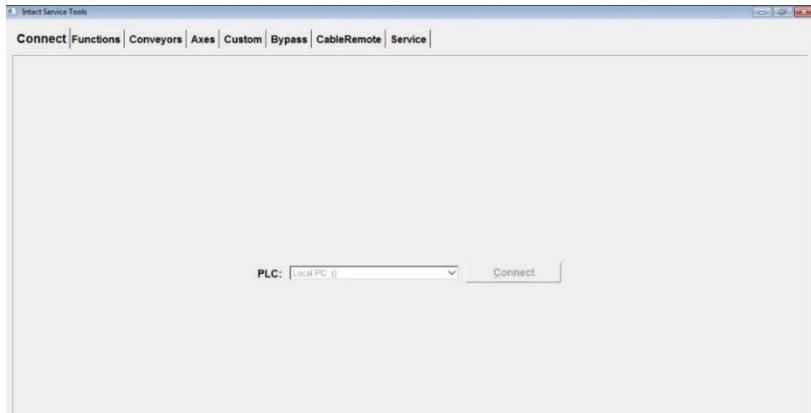
The tire testing machine has an integrated selftest for testing the most important functions. The selftest helps to find errors and to check the functions of the machine. In some cases (e.g. maintenance or service) the selftest is not enough. Therefore was developed a Service Tool.

An additional training is necessary to operate the Service Tool. The Service Tool affords the possibility to test the function of the machine.

In the following are mentioned the most important functions. You have to be logged in as **Administrator**.

5.7.1.

Connecting



When starting the Service Tool you can select the PLC to be connected with. Choosing „localhost“ will connect the Service Tool to the PLC of the same computer.

The Service Tool can be started parallelly to the Intact software. For safety reasons it is exclusively possible to watch the status of the function in this case.

If you want to use the whole range of functions of the Service Tool, make sure that the Intact Software is not active.

The file to start the Service Tool is located in the folder **D:\Service\ServiceTool** and is named **ServiceTools (in English).cmd**.

1. Close the Intact Software, if it is still active.
2. Open the explorer and switch to the above mentioned folder.
3. Double-click the desired file (German or English).
4. After choosing the target system you can click on the button **Connect**.
5. In the lower status area is displayed information on connection and, if it was successful, the version number of the connected PLC.

Access restriction

1. Use the tab change to switch to the function group that you want to operate.
2. A dialog box appears that requests you to enter the password. Enter the password and click **OK** to activate the software for all accesses and changes.
- or- Click **Cancel** to stop the process. Thereby you can not work with that part of the Service Tool that accesses to the PLCs.
3. After entering the correct password you can start checking the axis or changing the parameters.
4. To change the password, enter the current password and click **Change**. Then appears a dialog box to enter the new password. After confirming the new password click **OK** to apply it. - or – Click **Cancel** to leave the dialog box. The old password keeps valid.

5.7.2.

General structure of a functional unit

Setting a checkmark on “release all dependencies” must not be made. Whenever it is necessary be aware that nothing will prevent you from damaging the machine!!!

The execution of procedures of a functional unit is treated as operations in management. An operation can have three states:

- *None: no operation in execution*
- *Running: operation is currently in execution*
- *Stopped: operation was stopped*

An operation can be started and stopped via buttons.

An operation consists of following parts:

- *Action: means the order that should be executed in the operation*
- *Parameter: values that help to parameterize the order*

Functional unit

- *Operation: see above*
- *State: current state of the functional unit (e.g. sensor state, errors)*
- *Errors: classification of occurred errors*
- *Error Code: error number of mistakes occurred*
- *Logging: saves all movements for documentation*

Cycle	<input type="button" value="▶"/> <input type="button" value=" "/> 0x0002
Action	<input type="button" value="Stop"/> <input type="button" value="▼"/>
State	0x0000
Errors	0x0000
Error Code	0
Logging	<input type="button" value="disable"/> <input type="button" value="▼"/> <input type="button" value="▶"/>

5.7.3.

Functions of the test chamber

The Service Tool gives you the possibility to directly operate and control the procedures of the chamber. These include e.g. the vacuum pump or the lids of the vacuum chamber.

It is absolutely necessary to pay attention to the safety instructions of this manual because during manually control of the machine exists no verification of the order. This can cause damages at the machine!

1. Start the software as mentioned before
2. Connect the PLC. This operation is described in **4.3.1. Connect**
3. Switch to the tab **Functions**

Setting a checkmark on “release all dependencies” must not be made. Whenever it is necessary be aware that nothing will prevent you from damaging the machine!!!

Laser

The laser diodes that are installed at the measuring heads are controllable through the function unit **Laser**.

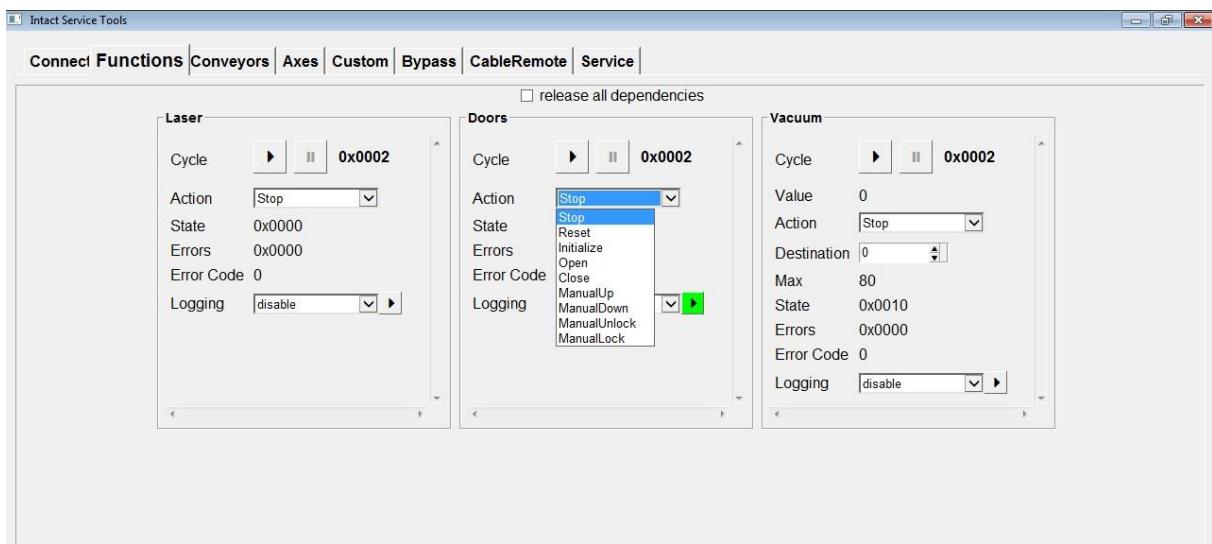
How to turn on the laser:

1. Please note that the laser can only be turned on when the chamber is closed and the emergency stop is deactivated. How to close the chamber is described in chapter **Doors** below.
2. Choose the action **Activate**.
3. Click the execution button to start the operation.
4. As long as the operation is in the state of **Running** the lasers are switched on. The state **Active** is active.

How to turn off the laser:

1. Choose the action **Stop**.
2. Start the operation by clicking the execution button.
- or -
Stop the operation by clicking the stop button.

Doors



The function unit Doors enables the access to the functions of the doors of the test chamber.

This function unit must be initialized to execute further operations.

How you initialize the doors:

1. Please note that the doors can only be initialized while the emergency stop is deactivated.
2. Choose the action **Initialize**
3. Start the operation through clicking the execution button.
4. After successfull initializing the doors are open and the state **Initialized** is active.

How you open the doors:

1. Please note that the doors only can be initialized while the emergency stop is deactivated.
2. Choose the action **Open**.
3. Start the operation by clicking the execution button.

Following actions are possible:

Stop – stopps all running actions of this function unit

Reset – rolls the function unit back into the starting condition

Initialize – initializes the function unit

Open – opens the doors

Close – closes the doors

ManualUp – lift the doors as long as the button is triggered

ManualDown – move the doors downwards as long as the button is triggered

ManualUnlock – move the doors away from the machine as long as the button is triggered

ManualLock – move the doors towards the machine as long as the button is triggered

Following states are possible:

Initialized – Function unit is initialized

Busy – Execution of operation is ongoing

Blocked – Execution of operation is blocked

Open – Doors are completely opened

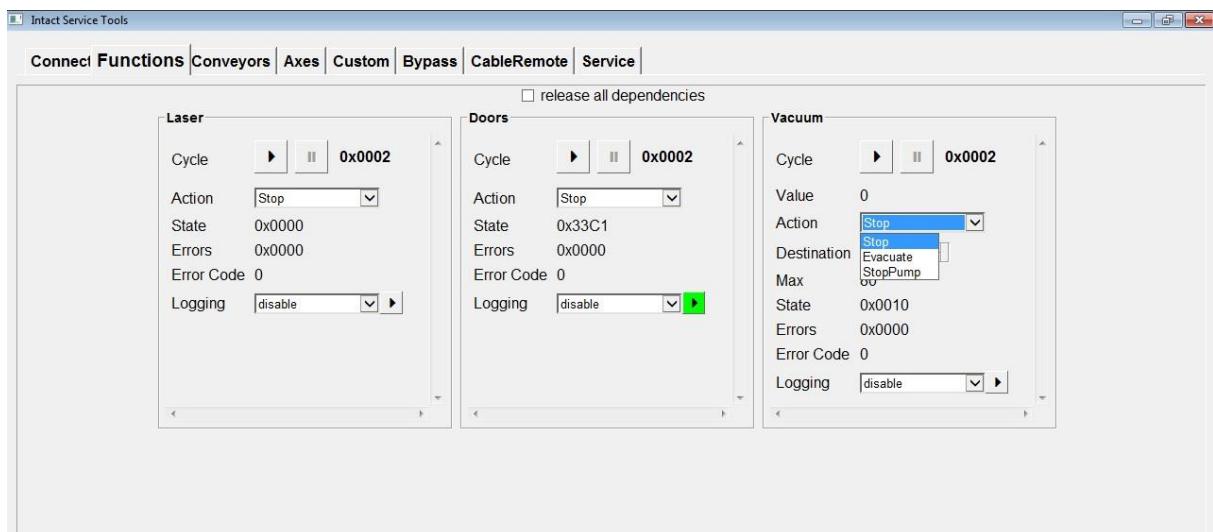
Closed – Doors are completely closed

light-tight – chamber is closed opaque

air-tight – chamber is closed vacuum-tight

Error – while execution of the operation an error has occurred

Vacuum



The function unit Vacuum enables the access to the functions of the vacuum pump system.

This function unit has to be initialized before further operations can be executed.

After the evacuating process the vacuum pump remains ca. 10 min at idle speed before it shuts down.

How to build up a vacuum of 50 mbar:

1. Please close the doors and deactivate the emergency stop.
2. Choose the action **Evacuate**.
3. Enter the desired target pressure – here **50** – into the field **Destination**.
4. Start the operation by clicking the execution button.
5. You can track the current pressure in the field **Value**.
6. After achieving the target pressure the ventilation process gets initiated by itself.

Following actions are possible:

Stop – stops all running actions of this function unit

Evacuate – builds up the indicated vacuum

StopPump – stops the vacuum pump of the idle speed

Following states are possible:

Ready – vacuum pump is ready to evacuate

Busy – execution of an operation is constantly

Evacuation – vacuum gets builded up at the moment

Ventilated – doors are completely closed

P.-Reached – target pressure was reached

PumpActive – vacuum pump is active

Error – while executing the operation has occured an error

5.7.4.

Functions of the tire conveyors

The tire transport is performed by neighbouring transport units. The availability depends on type and amount of the machine.

Setting a checkmark on “release all dependencies” must not be made. Whenever it is necessary be aware that nothing will prevent you from damaging the machine!!!

Modes of a transport unit

There are four possible operation modes of a transport unit:

Normal Mode

In Normal Mode the interfaces to the machines before and after are deactivated. The transport unit has to be considered as a single unit.

Manual functions only can be executed in Normal Mode.

The FlipperConveyor only in this mode is able to permit operations of the flipper.

Slave Mode

All transport units, except for the IntactConveyor, are able to switch into SlaveMode.

A transport unit in SlaveMode follows the IntactConveyor in all transport operations. No tire delivery or takeover of external equipment (before and after) takes place.

Inline Mode

In InlineMode the transport unit executes actions by itself.

In case of unknown state, the search function gets activated that initiates a slow transport until the tire was found or it was made sure, that no tire is present.

If it is permitted, a tire delivery or takeover of external equipment (before and after) takes place.

Remote Mode

The Remote Mode only is supported for DUAL INTACT machine configurations and only for the transport unit FlipperConveyor.

The Remote Mode is equivalent in behavior to the InlineMode. Additionally connected transport units are allowed to claim the transport unit in this mode.

It is absolutely necessary to pay attention to the safety instructions of this manual because during manually control of the machine exists no verification of the order. This can cause damages at the machine!

Loader/Unloader Conveyor

The standard conveyor belt before the machine is the Loader.

The standard conveyor belt behind the machine is the Unloader.

The standard transport direction is determined by a foreward transport.

Related to the standard transport direction a light barrier exists on each side (entry and exit).

ManFeeder Conveyor

A conveyor belt for manually input of car tires is called ManFeeder (manual feeder).

The function of the conveyor belt is equivalent to the function of a loader.

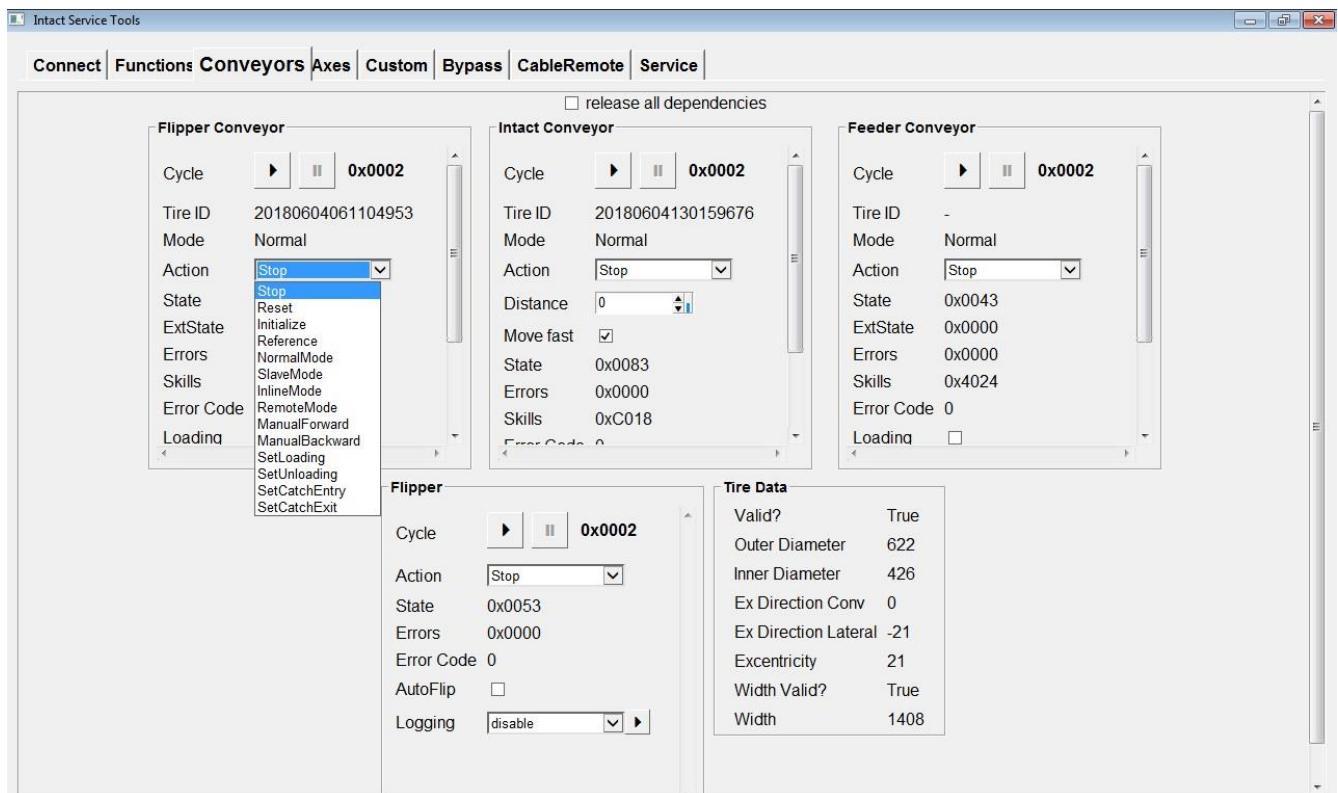
Dual Conveyor

This transport unit is only existing at dual machines.

It is a virtual transport unit that provides the functions of the transferring transport unit of the pre-machine.

This function possesses a limited extend and is equivalent to the functions of the loader.

Flipper Conveyor



The flipper has two transport units: a lower and an upper conveyor. The assignment refers to the cage rotated into home position.

The functions are only active, if the rotation of the cage is located in one of its end positions and they are referring to each of the conveyors that are responsible for the transport.

The functions are equivalent to the functions of the loader. Optionally the number of light barriers differs.

Note: a transport is only possible, if no mechanical parts are blocking the transport route. It is not possible to transport e.g. via the forks of the cage.

Following actions are possible:

Stop – stops all running actions of this function unit

Reset – rolls the function unit back into initial state

Initialize – initializes the function unit

Reference – references the function unit

ManualForward – Moves the transport unit manually forwards / in the direction of loading

ManualBackward – Moves the transport unit manually backwards / against the direction of loading

SetLoading – needs to be in InlineMode and needs a checkmark on Loading; Loads a tire when possible

SetUnloading – needs to be in InlineMode and needs a checkmark on Unloading; Unloads a tire when possible

SetCatchEntry - catches tire backwards at the light barrier at entry at a transport

SetCatchExit – catches tire backwards at the light barrier at exit at a transport

Following States are possible:

NormalMode

InlineMode

SlaveMode

RemoteMode

(see above for the description)

Following indications of state are possible:

Initialized – transport unit is initialized, state is calculated

Referenced – transport unit is referenced, dynamic is determined

Blocked – execution of an operation is blocked

Busy – execution of an operation is constant

ModeLocked – mode can not be switched

Moving – transport unit is moving

BeltClear – there is surely no tire on the transport unit

HasTire – there is surely a tire on the transport unit

SensorEntry – state of light barrier at entry

SensorExit – state of light barrier at exit

LoadingEnabled – tire takeover of external preequipment permitted

UnloadingEnabled – tire takeover to external afterequipment permitted

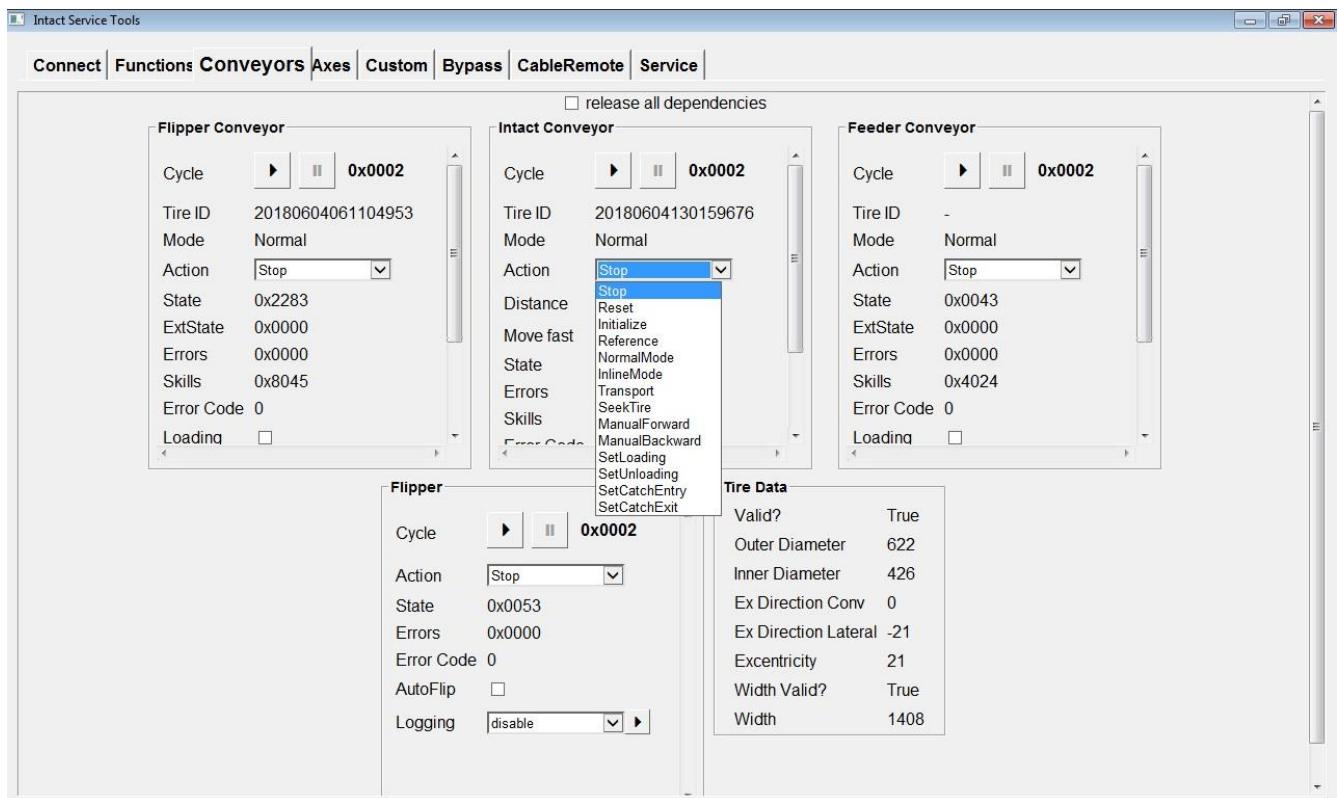
CatchEntry – tire gets catched backwards at the light barrier at entry at a transport

CatchExit – tire gets catched backwards at the light barrier at exit at a transport

RemoteInitialized – connected transport unit is initialized (dual)

Error – while executing the operation has occurred an error

Intact Conveyor



The IntactConveyor is responsible for the tire transport into and out of the Intact.

In addition to Flipper Conveyor as described above following actions are possible:

Transport – transports a tire (positive value in charging direction, negative value against charging direction)

SeekTire – Intact is searching for a tire

Following States are possible:

NormalMode

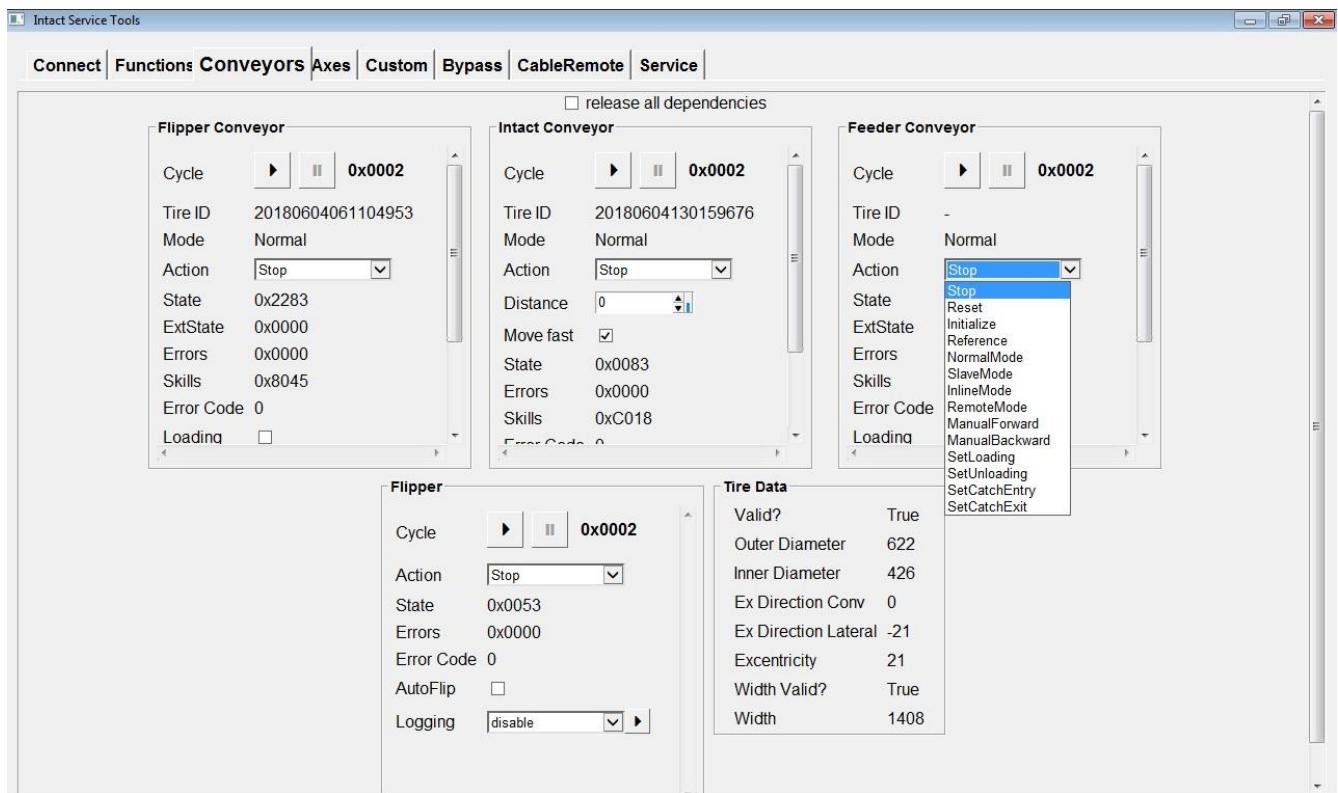
InlineMode

No RemoteMode or SlaveMode because the Intact is the master.

(see above for the description)

Possible state indications as described above for Flipper Conveyor

Feeder Conveyor



A conveyor belt with attached tilting table is called feeder.

The function of this conveyor belt conforms to the functions of the loader.
The tilting table possesses its own control panel.

Possible actions as described above for Flipper Conveyor

Following States are possible:

NormalMode

InlineMode

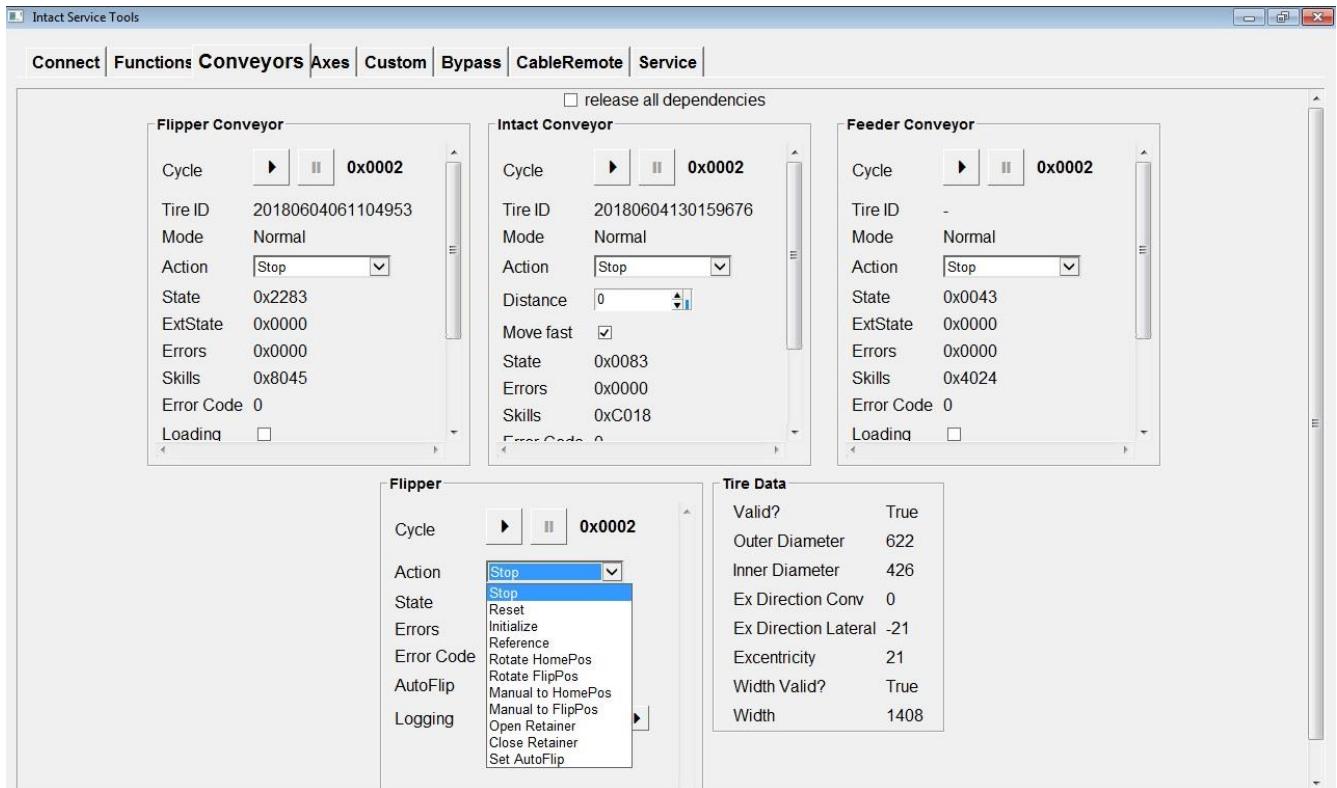
SlaveMode

RemoteMode

(see above for the description)

Possible state indications as described above for Flipper Conveyor

Flipper



The FlipperConveyor is responsible for the tire transport into and out of the flipper.

The actual flip is controlled by the flipper. The functions of the flipper only are accessible, if the FlipperConveyor is in NormalMode.

One retainer can be tilted, in order to prevent that the tire falls out of the cage while flipping.

Following actions are possible:

Stop – stops all running actions of this function unit

Reset – rolls the function unit back into initial state

Initialize – initializes the function unit

Reference – references the function unit

Rotate HomePos – rotates the cage to position HOME. The retainer gets automatically activated if the cage is not available

Rotate FlipPos – rotates the cage to position FLIP, this is only possible if the cage is available

ManualToHomePos – rotates the cage manually to position HOME, the operator is responsible for safety

ManualToFlipPos – rotates the cage manually to position FLIP, the operator is responsible for safety

Open Retainer – opens the tiltable roller conveyor

Close Retainer – closes the tiltable roller conveyor

SetAutoFlip – flipper will flip the tire automatically when he catches a tire

There are following indications of state:

Initialized – swifel unit is initialized, state is calculated

Referenced - flipper is ready to run

Blocked – execution of operation is blocked

Busy – execution of an operation is constant

HomePos - Rotation is in position HOME, a by transport is possible

FlipPos - Rotation is in position FLIP, the forks block the way

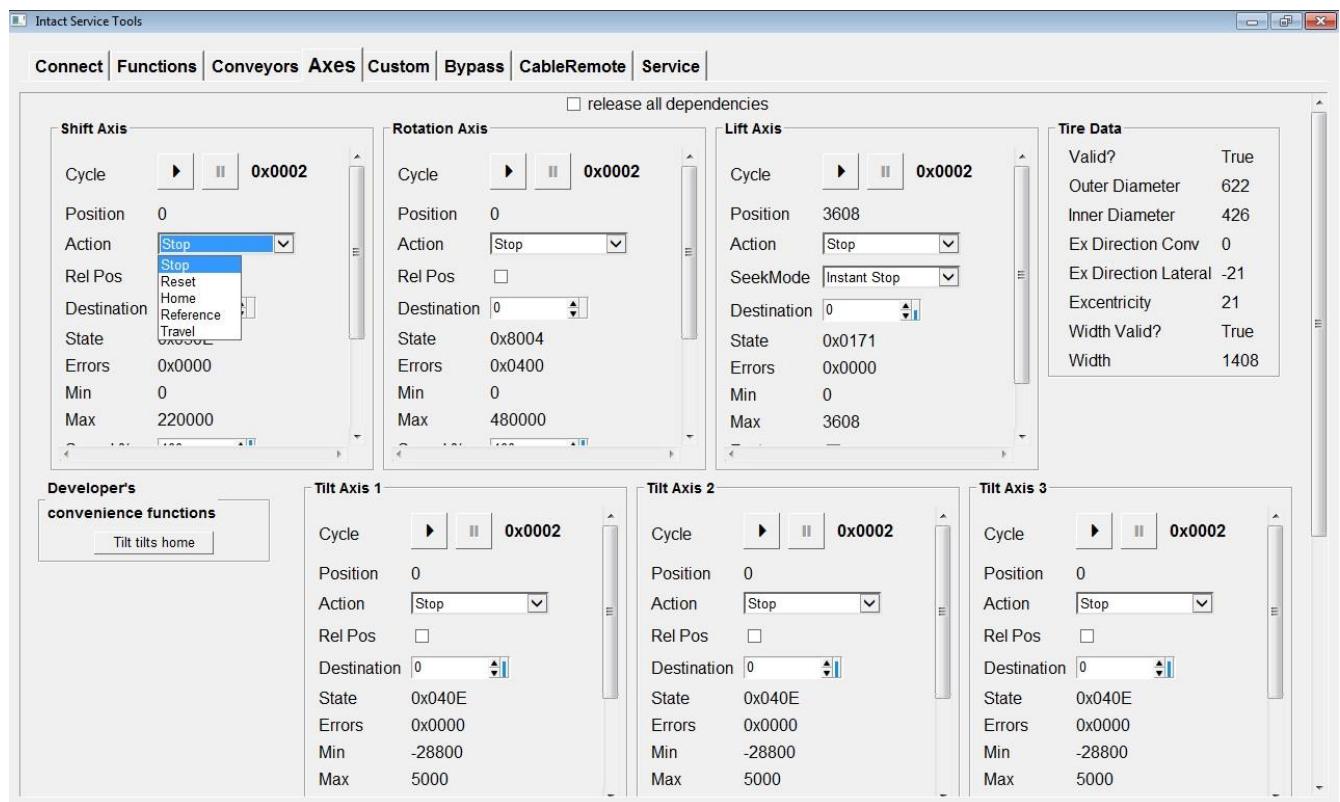
Retainer Open – tilttable roller conveyor is completely open

Retainer Closed – tilttable roller conveyor is complete or closed to the tire

Error – while executing of the operation has occurred an error

5.7.5.

Functions of the Axes



Every axis (Lift, Shift, Tilt, Rotation Axis), controlled by a PLC, can be checked with this Service Tool. There is a functional unit for every axis.

Machines of type „F“ have no Tilt Axis. There are instead additional axis ShiftIn and LiftIn (inner).

It is absolutely necessary to pay attention to the safety instructions of this manual because during manually control of the machine exists no verification of the order. This can cause damages at the machine!

Setting a checkmark on “release all dependencies” must not be made. Whenever it is necessary be aware that nothing will prevent you from damaging the machine!!!

The procedure is described at the example of the Shift axis. How to check the function of the Shift axis:

1. Click the register **Axes**
2. A window with safety instructions appears which should prevent damages at the machine. **Read and follow the instructions.**
3. After reading the instructions you can click **Further**.
4. Another window appears that provides access to actions on every axis and information of states.
5. Execute the desired function in the group **Shift axis**.

Click the button of the function that you want to execute.

Following actions are possible:

Stop – stopps all running actions of this axis

Reset – rolls the axis back to the initial condition

Reference – references the function unit

Home – travels the axis to the position HOME

Travel – travels the axis to the indicated position

Following options to the actions are possible:

Destination – target position of action „Travel“

Speed – max. speed of axis in percent of maximum acceleration

Accel – max. acceleration of axis in percent of maximum acceleration

Is Relative – target position is relative to the current position

Lazy – easier (faster) way of the action „Home“

There are following state parameters:

Position – Position of axis

Min – min. possible position of axis

Max – max. possible position of axis

HomeDiff – Difference between expected and real position of the axis after action HOME

There are following indications of state:

Moving – Axis is moving

Referenced – Axis is referenced

Position known - Position of axis is known

Home – Standard position of axis

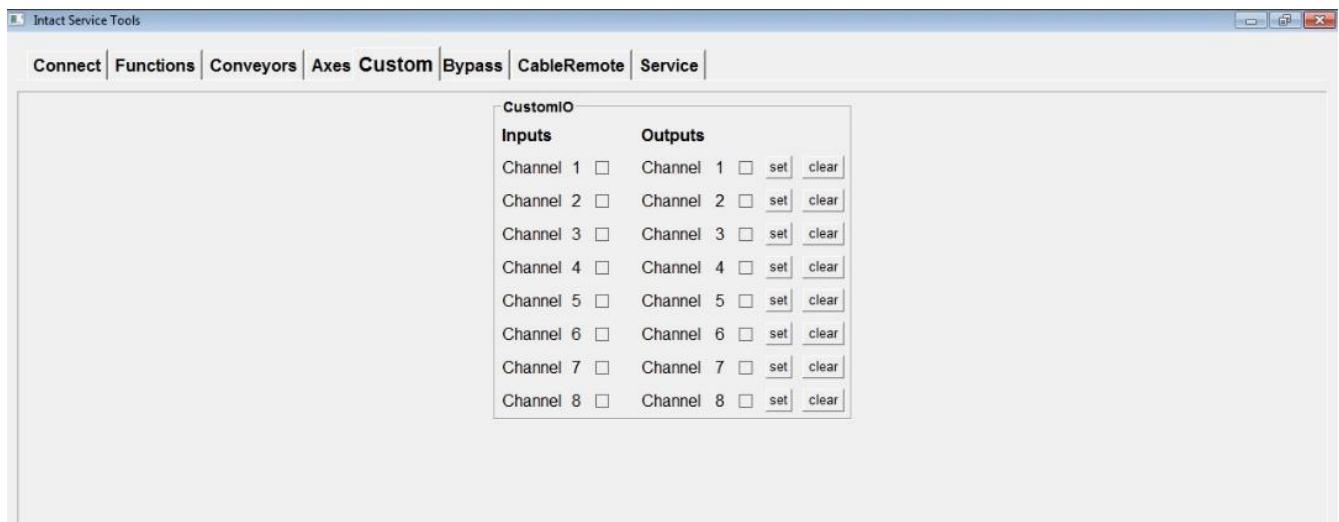
SensorMin - Status of sensor at position Min

SensorMax - Status of sensor at position Max

SensorRef – Status of sensor at position Refere

5.7.6.

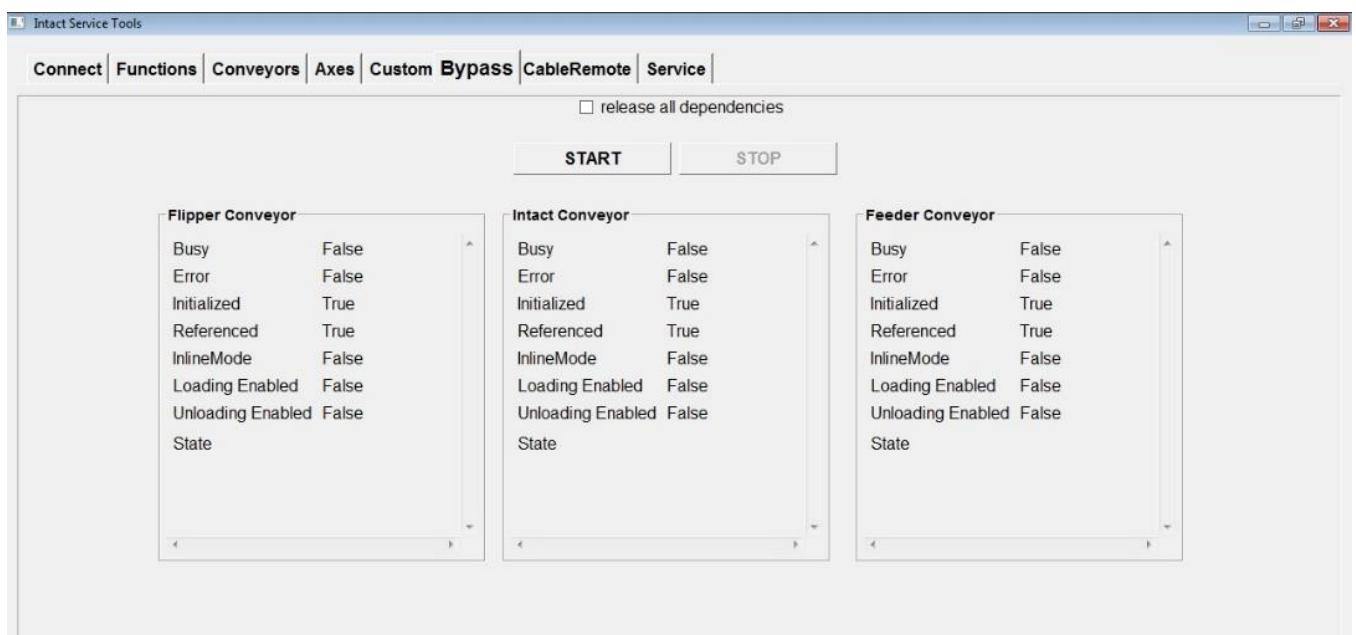
Custom



The Custom-Tool is an input and output card. You can read the input signals due to a binary code. The outputs can be set and cleared manually.

5.7.7.

Bypass



Setting a checkmark on “release all dependencies” must not be made. Whenever it is necessary be aware that nothing will prevent you from damaging the machine!!!

The Bypass-Tool enables the tire transport when parts of machinery and plant broke or do not operate correctly.

By pressing the start button, the Intact will transport tires through the machine automatically until you press the stop button.

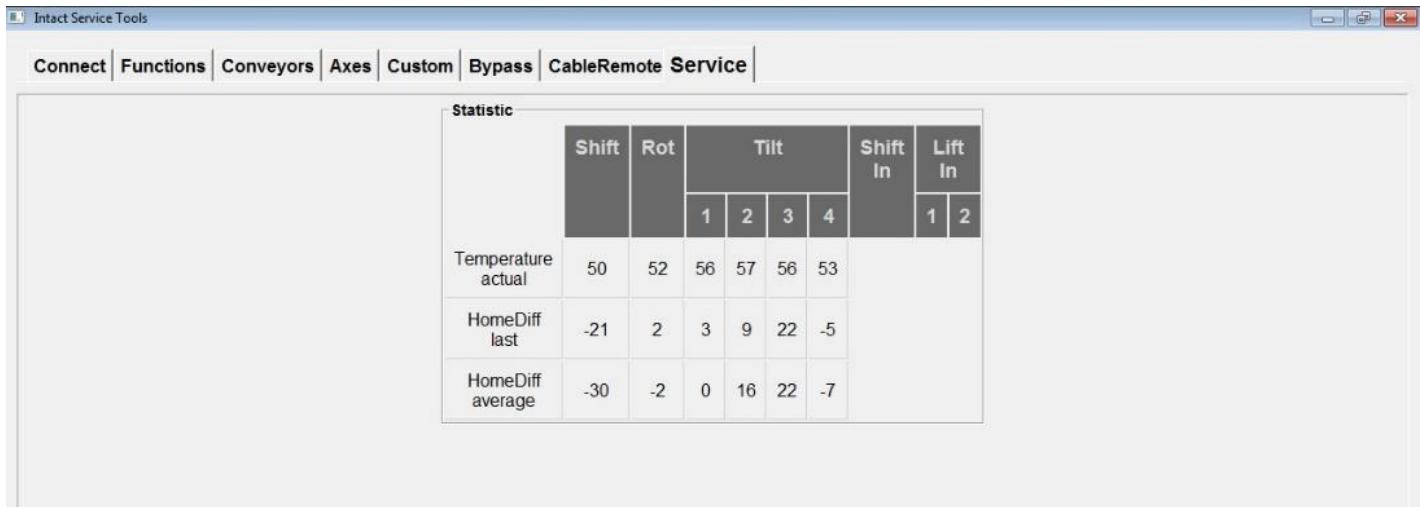
5.7.8.

CableRemote

It is only important in the manufacturing process of the machine so here irrelevant.

5.7.9.

Service



The screenshot shows a software interface titled 'Intact Service Tools'. The 'CableRemote Service' tab is active, indicated by a blue border. Below the tabs, there is a table titled 'Statistic' with the following data:

	Shift	Rot	Tilt				Shift In	Lift In
			1	2	3	4		
Temperature actual	50	52	56	57	56	53		
HomeDiff last	-21	2	3	9	22	-5		
HomeDiff average	-30	-2	0	16	22	-7		

Statistic of the steppermotor module about:

- Current temperature
- Last difference between expected and real position of the axis after action HOME
- Average difference between expected and real position of the axis after action HOME

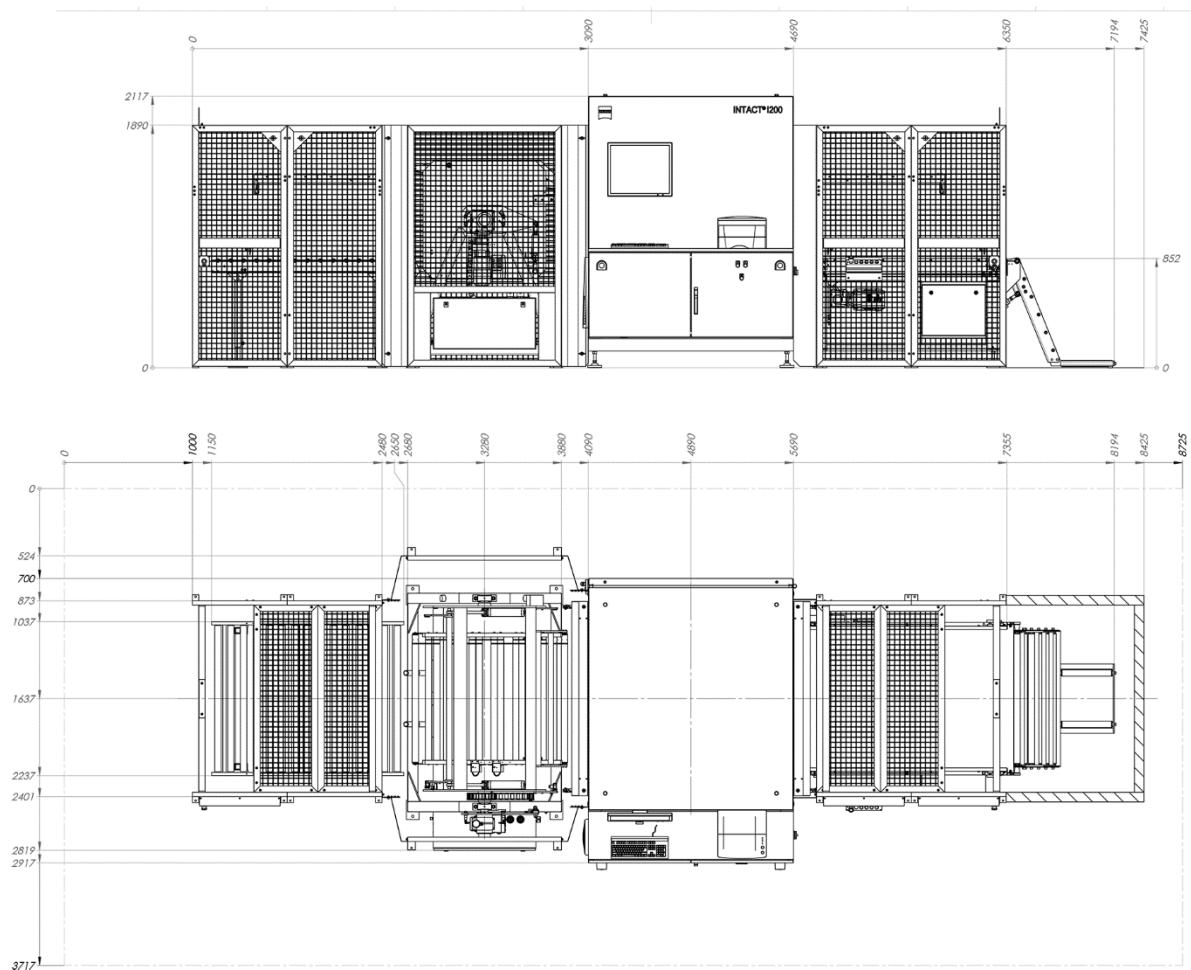
Unfilled boxes imply that the present Intact System has none of these axes.

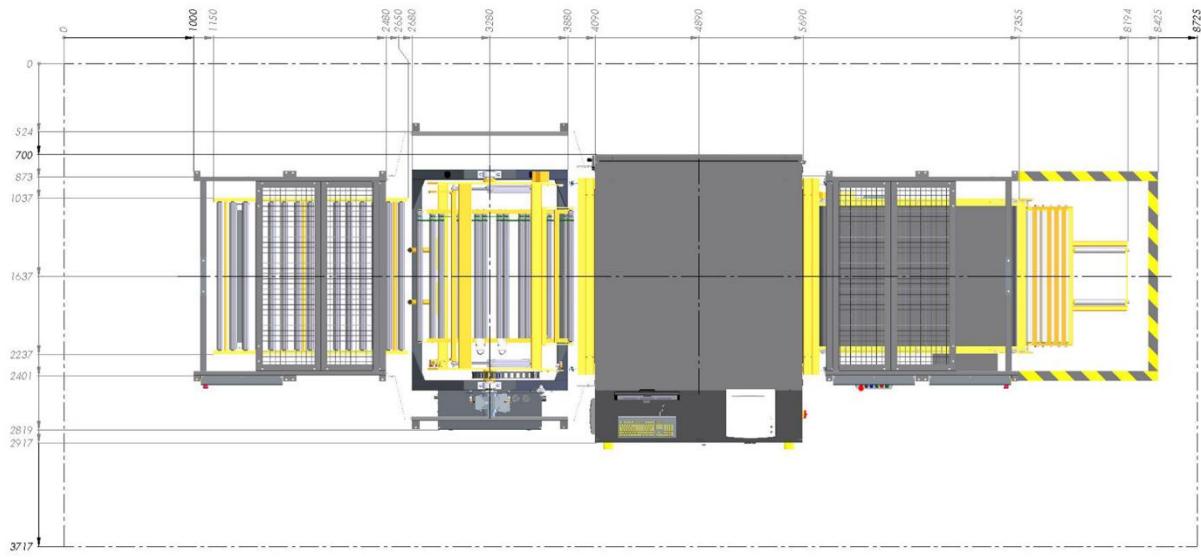
5. Appendix

5.8. Technical Data (drawings do not show latest generation)

5.8.1. Intact 1200 Bead to Bead Inline

Max. Configuration





All data in mm.

Installation surface area : 4900 x 3055 mm
 Total weight : 3900 kg

Tire Sizes:

Outside Ø (max.)	:	1230 mm
Outside Ø (min.)	:	500 mm
Inside Ø (max.)	:	---
Inside Ø (min.)	:	13" / 330 mm, opt. 12" / 294 mm
Width (max.)	:	500 mm
Width (min.)	:	120 mm
Weight (max.)	:	80 kg, opt. 120 kg

Paths of Traverse for measuring head axes:

Tilt Achse : 17° upward; (89°) downward

Transmissions for measuring head axes:

Lift axis	:	47,32 :1 320 mm	(Worm gear box) (Path of traverse per crown gear revolution) (z=32 /t=10)
Rotary axes	:	5 : 1 10,7 : 1	(Step motor gear box) (z1=20/ swivel Ø=618 mm)
Shift axis	:	5 : 1 100 mm	(Schrittmotor-Getriebe) (Path of traverse per crown gear revolution) (z=20 /t=5)
Tilt axis	:	5 : 1 1,8 : 1	(Step motor gear box) (z1=20 / z2=36)

Belt Drive: (external /internal)

Rotational speeds	:	2900 min -1 (Motor) 232 min -1 (Gear box output) 204 min -1 (Driving roller)
-------------------	---	--

Transmissions	:	12,48 : 1 (Worm gear box) 1,14 : 1 (z1=22 / z2=25) 314mm (Belt movement per roller revolution) (Ø=100mm of driving roller)
Conveying speed of the tire	(max.)	: 1134 mm/s
Conveying speed of the tire	(min.)	: 77 mm/s
Acceleration of the tire	(max.)	: approx. 2 m/s ²

Vacuum Chamber:

Volume	:	4,1 m ³
Volume Δ (at 50 mbar)	:	0.20m ³

Vacuum Pump:

Volume flow (at 50 mbar)	:	4.5m ³ / min
Δ p (max.)	:	-200 mbar
Electrical power	:	1,5 kW

Pneumatic Data:

Compressed-air supply	:	6 bar
Compressed-air consumption	:	approx. 30 L / min

Electrical Data:

Operating voltage	:	360 - 480 V 50 /60 Hz
Control voltage	:	115 V / 230 V AC, 24 V DC
Connected load	:	ca. 6,5 kW
Rated current	:	3 Phasen + Nullleiter + Erdung, 25 A

Sound emission:

< 70 dB (A)

The operating company is responsible for the operation of the machine at the operating company's site. The operating company is also responsible for the actual noise exposure of the machine operator. The operating company must measure the noise emission, evaluate the results and take appropriate measures if required.

Installation area

Requirements for installation area:

Ground height (concrete)	:	min. 220 mm
Evenness of the floor	:	max. 5 mm/m
Concrete strength	:	min. C20/25, max. C50/60 uncracked
Free floor space	:	min. 8.7 x 3.7 m] for Intact1200InlineFlipWippe
Free height:	:	min. 2, m

Anchor bolt:

Fischer FBN II 12 / 20		
Drill hole-Ø	:	12 mm
Borehole depth:	:	>105 mm
Tightening torque:	:	50 Nm

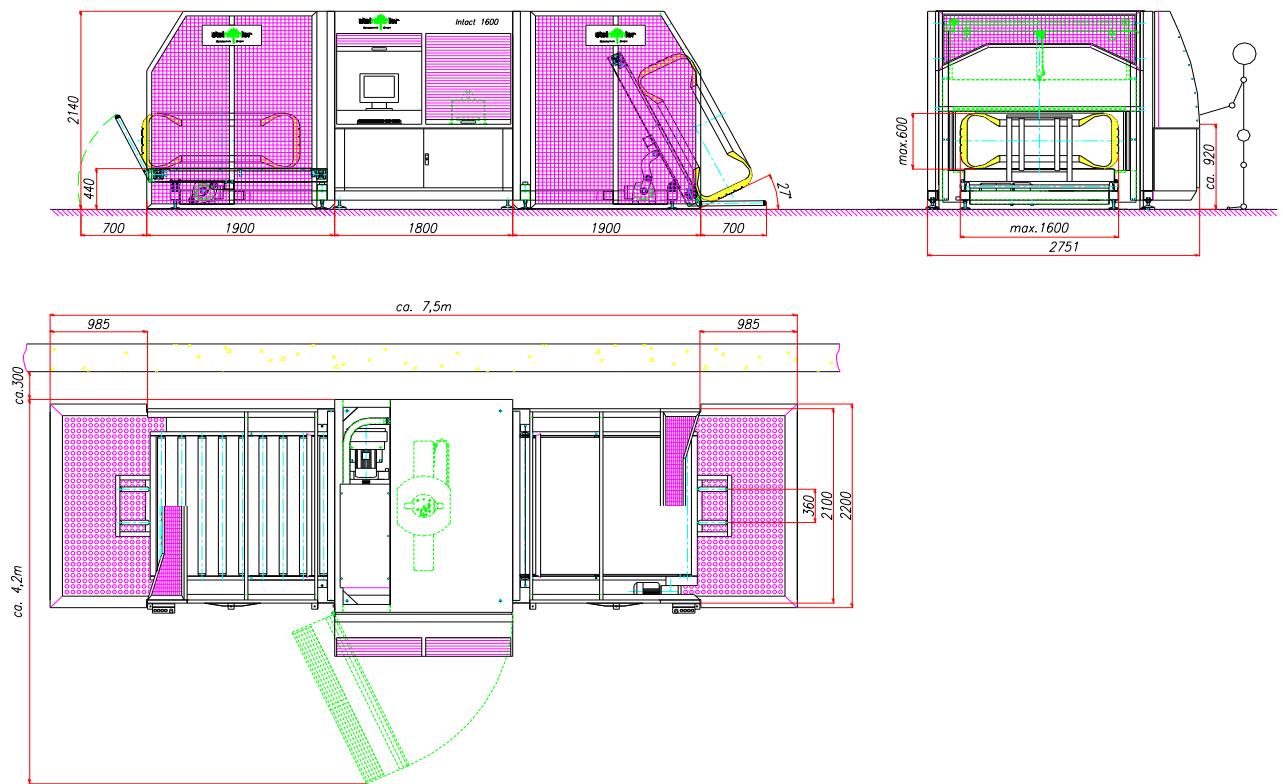
Use these bolt anchors to anchor the machine and the safety fence to the ground after setting up.
Repeat the electrical test before making the electrical connection.

Before making the electrical connection, check the setting on the installed transformer and adjust it according to the available mains voltage (if necessary). Please find further details in the electrical circuit diagram (the data sheet of the transformer is part of applicable documents)

5.8.2.

Intact® 1600 Bead to Bead Inline

Max. Configuration



All data in mm.

Installation surface area : 7500 x 3000 mm
 Total weight : 5200 kg

Tire Sizes:

Outside Ø (max.)	:	1600 mm
Outside Ø (min.)	:	500 mm
Inside Ø (max.)	:	---
Inside Ø (min.)	:	13" / 330 mm; (12" / 294 mm)
Width (max.)	:	600 mm
Width (min.)	:	120 mm
Weight (max.)	:	160 kg

Paths of Traverse for measuring head axes:

Lift axis	:	780 mm
Rotary axis	:	352°
Shift axis	:	551 mm
Tilt axis	:	45° upward / 89° downward; (180°) downward

Transmissions for measuring head axes:

Lift axis	:	47.32 : 1 (Worm gear box) 320 mm (Path of traverse per crown gear revolution) (z=32 /t=10)
Rotary axis	:	5 : 1 (Step motor gear box) 10.7 : 1 (z1=20 / z2=214)
Shift axis	:	5 : 1 (Step motor gear box) 100 mm (Path of traverse per crown gear revolution) (z=20 /t=5)
Tilt axis	:	5 : 1 (Step motor gear box) 1.8 : 1 (z1=20 / z2=36)

Belt Drive: (external / internal)

Rotational speeds	:	2900 rpm (Motor) 204 rpm (Gear box output) 150 rpm (Driving roller)
Transmissions	:	14.14 : 1 (Worm gear box) 1.36 : 1 (z1=22 / z2=30) 377mm (Belt movement per roller revolution) (Ø 120mm of driving roller)
Conveying speed of the tire	(max.)	: 950 mm/s
Conveying speed of the tire	(min.)	: 67 mm/s
Acceleration of the tire	(max.)	: approx. 2 m/s ²

Vacuum Chamber:

Volume	:	6.8m ³
Volume Δ (at 50 mbar)	:	0.35m ³

Vacuum Pump:

Volume flow (at 50 mbar)	:	7.5m ³ / min
Δ p (max.)	:	-200 mbar
Electrical power	:	4 kW

Pneumatic Data:

Compressed-air supply	:	6 bar
Compressed-air consumption	:	approx. 20 L / min

Electrical Data:

Operating voltage	:	360 - 480 V 50 /60 Hz
Control voltage	:	230 V AC, 24 V DC
Connected load	:	approx. 8 kW
Rated current	:	25 A

Sound emission:

< 70 dB (A)

The operating company is responsible for the operation of the machine at the operating company's site. The operating company is also responsible for the actual noise exposure of the machine operator. The operating company must measure the noise emission, evaluate the results and take appropriate measures if required.

Installation area

Requirements for installation area:

Ground height (concrete)	:	min. 220 mm
Evenness of the floor		max. 5 mm/m
Concrete strength	:	min. C20/25, max. C50/60 uncracked
Free floor space		min. 8.7 x 3.7 m for Intact1200InlineFlipWippe
Free height:		min. 2.2 m

Anchor bolt:

Fischer FBN II 12 / 20

Drill hole-Ø	:	12 mm
Borehole depth:	:	>105 mm
Tightening torque:	:	50 Nm

Use these bolt anchors to anchor the machine and the safety fence to the ground after setting up.

Repeat the electrical test before making the electrical connection.

Before making the electrical connection, check the setting on the installed transformer and adjust it according to the available mains voltage (if necessary). Please find further details in the electrical circuit diagram (the data sheet of the transformer is part of applicable documents)