



8011 Speedy 300 Service Manual





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CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.





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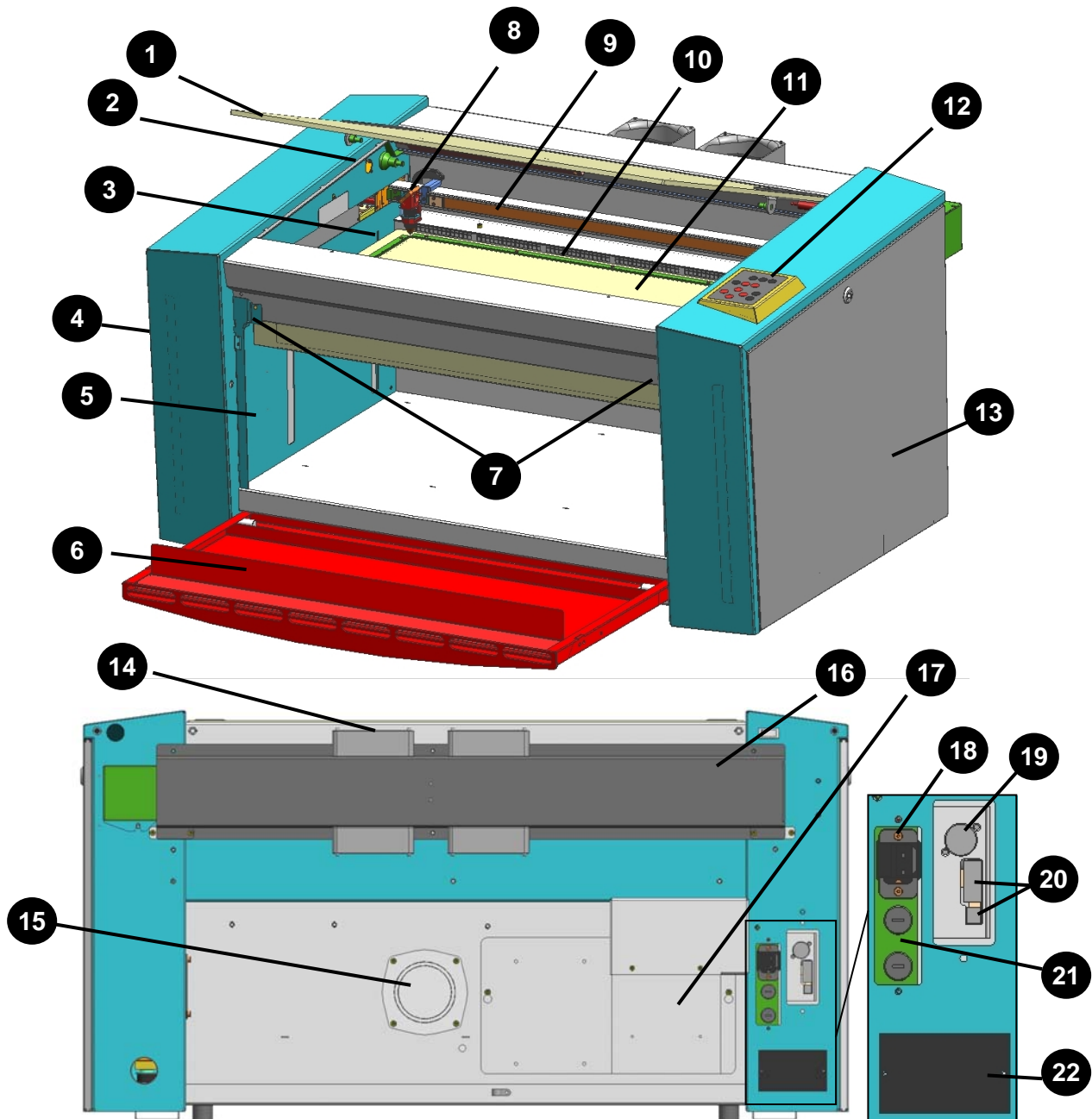




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1 Machine view and connections



- 1 Top lid
- 2 Service socket
- 3 Autofocus sensor
- 4 Service access panel
- 5 Connection Socket for Rotary
- 6 Front lid
- 7 Interlocks front lid
- 8 Focusing head
- 9 X-axis
- 10 Ruler
- 11 Working table

- 12 Keypad
- 13 Maintenance panel
- 14 Cooling fan
- 15 Exhaust hose connector
- 16 Laser tube cover
- 17 Power supply
- 18 Power socket
- 19 Exhaust connection cable
- 20 PC connection cable (USB/Serial)
- 21 Fuse(s)
- 22 Manufacturers label





2 Safety information

Please read this chapter before operating or servicing the laser system!

2.1 General

The Speedy 300 is an industrial apparatus with a high level of security. To guarantee a safe operation it is necessary to know potential dangers and avoid risks. The dangers can be classified in three categories:

- Dangers caused by the laser beam
- Dangers caused by electricity
- Mechanical dangers

When working with the laser machine please take note of the following safety instructions:

1. Operation and service of the machine may only be performed by trained personnel.
2. Direct exposure of skin or eyes to laser radiation may cause severe injuries. The correct operation and service according to the manual can prevent hazards. Operators may perform procedures required inside the housing only through the interlocked door. They must never attempt to defeat the door interlocks nor remove non interlocked portions of the housing.
3. The laser beam can ignite flammable materials. Therefore a fire extinguisher should always be nearby. Do not store flammable materials near or inside the laser machine.
Working with the laser or setting the system to service mode without supervision is not permitted.
4. Many materials, especially non-anodized aluminium, copper, silver and gold, cannot be engraved with the laser machine due to the very low absorption of laser radiation. This means that most of the energy of the laser beam is reflected. Therefore those materials must not be present in the laser beam path as otherwise a reflected laser beam could destroy the cover of the laser unit.
5. Beam adjustment may only be done by trained personnel. Otherwise there could be uncontrolled emission of laser radiation. There are only limited possibilities to adjust the mirrors due to a mechanic restriction. These restrictions may only be altered by authorized personnel.
6. Before starting to work check whether the processing of the material can cause harmful fumes and whether the filters of your exhaust system are suitable for these fumes. It is emphasized that it is the user's responsibility to obey the national and regional threshold values for dusts, fumes and gases. (The maximum concentration of harmful substances must not be exceeded). Never use the laser machine without an exhaust unit with appropriate filters for the processed material, as cutting or processing certain materials can produce vapours. Materials causing toxic or carcinogenic smokes or fumes must not be processed without an exhaust unit with appropriate filters. Furthermore it is the user's responsibility to ensure the safe removal and disposal of the smokes and particles from the laser machine according to the national and regional threshold values.
In the US reference should be made to Section 7.3 in the ANSI Z136.1-1993 Standard for the safe use of lasers, to the exposure criteria in CFR 1910 Subpart Z from the US





government, and to the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH).

7. Please refer to the manual of your exhaust system regarding the change intervals of the filters. We recommend making a note of the last change of filters on an adhesive label.
8. **PVC (Polyvinylchloride) and medical instruments (parts) must not be processed with the laser machine.**

If you have any questions, please contact your supplier or Trotec.

2.2 Laser Safety

The safety of a laser apparatus is defined by one of five safety classes: I (1), II (2), IIIa (3a), IIIb (3b) and IV (4). The SPEEDY 300 without laser pointer is in the EU safety class 1 (with an installed laser pointer laser class 2) and therefore presents no hazard to personnel when properly used during normal operation or routine maintenance. In the US all machines are classified as class II laser products. This status is guaranteed by the safety housing and safety devices that are installed in the product.

Please be aware that improper operation of the laser apparatus nullifies this safety class and allows under certain circumstances the emission of radiation which can be potentially dangerous.

This laser system contains a carbon dioxide (CO₂)-laser class IV (4) product, which emits an **intensive** and **invisible** radiation. Without safety devices the direct radiation and also diffuse reflected radiation is dangerous.

Please be aware:

The Laser Radiation of a CO₂ Laser is invisible!

2.2.1 US laser classes

As posted by the Center for Devices and Radiological Health (CDRH) regulation 21 CFR 1040.10 and 21 CFR 1040.11, the standard classification for lasers are as follows:

CLASS I LASERS: Class I lasers are low-powered and **do not emit** hazardous radiation under normal operating conditions because they are completely enclosed. Class I lasers are exempt from any control measures. Equipment, such as laser printers and laser disc players, are examples of this class.

CLASS II LASERS: Class II lasers emit accessible visible laser light with power levels **less than 1 mW** radiant power and are capable of creating eye damage through chronic exposure. The human eye blink reflex, which occurs within 0.25 seconds of exposure to the Class II laser beam, provides adequate protection. It is possible to overcome the blink response and stare into the Class II laser long enough to damage the eye. Class II lasers are exempt from any control measures. Equipment, such as some visible continuous wave Helium-Neon lasers and some laser pointers, are examples of Class II lasers.

CLASS IIa LASERS: Class IIa lasers are special purpose lasers that emit accessible visible laser light with power levels **less than 1 mW** radiant power and are not intended for viewing. This class of lasers causes injury when viewed directly for more than 1,000 seconds. Class IIa lasers are exempt from any control measures. Equipments, such as some bar code readers, are examples of Class IIa lasers.

CLASS IIIa LASERS: Class IIIa lasers are systems with power levels of **1 to 5 mW** that normally would not produce a hazard if viewed for only momentary periods with the unaided eye. They pose severe eye hazards when viewed through optical instruments (e.g., microscopes, binoculars, or other collecting optics). Class IIIa





lasers must be labelled. A warning label shall be placed on or near the laser in a conspicuous location and caution users to avoid staring into the beam or directing the beam toward the eye of individuals. Equipment, such as some visible continuous wave Helium-Neon lasers and some solid state laser pointers, are examples of Class IIIa lasers.

CLASS IIIb LASERS: Class IIIb lasers are systems with power levels of **5 mW to 500 mW for continuous wave lasers or less than 10 J/cm² for a 0.25 s pulsed laser**. These lasers will produce an eye hazard if viewed directly. This includes intrabeam viewing or specular reflections. Higher power lasers in this class will also produce hazardous diffuse reflections. Specific control measures covered in Class IIIb lasers shall be used in areas where entry by unauthorized personnel can be controlled. Entry into the area by personnel untrained in laser safety may be permitted by the laser operator if instructed in applicable safety requirements prior to entry and provided with required protective eye wear.

CLASS IV LASERS: Class IV lasers are systems with power levels **greater than 500 mW for continuous wave lasers or greater than 10 J/cm² for a 0.25 s pulsed laser**. These lasers will produce eye, skin and fire hazards. This includes intrabeam viewing, specular reflections or diffuse reflections

EMBEDDED LASERS: Embedded lasers are found in laser products with lower class ratings. Laser printers, CD players, and laser welders may have Class III or Class IV lasers in their protective and interlocked housings. When such a laser system is used as intended, the lower laser class applies. When such a system is opened (e.g., for service or alignment) and the embedded laser beam is accessible, the requirements for the higher class of the embedded laser must be implemented.

2.2.2 IEC laser classes

Class 1 lasers are products where the irradiance (measured in watts per metre square) of the accessible laser beam (the accessible emission) does not exceed the Maximum Permissible Exposure (MPE) value. Therefore, for Class 1 laser products the output power is below the level at which it is believed eye damage will occur. Exposure to the beam of a Class 1 laser will not result in eye injury and may therefore be considered safe. However, some Class 1 laser products may contain laser systems of a higher Class but there are adequate engineering control measures to ensure that access to the beam is not reasonably likely. Examples of such products include laser printers and compact disc players. Anyone who dismantles a Class 1 laser product that contains a higher Class laser system is potentially at risk of exposure to a hazardous laser beam.

Class 1M lasers are products which produce either a highly divergent beam or a large diameter beam. Therefore, only a small part of the whole laser beam can enter the eye. However, these laser products can be harmful to the eye if the beam is viewed using magnifying optical instruments. Some of the lasers used for fibre-optic communication systems are Class 1M laser products.

Class 2 lasers are limited to a maximum output power of 1 milliwatt (abbreviated to mW) or one thousandth of a watt and the beam must have a wavelength between 400 and 700 nm. A person receiving an eye exposure from a Class 2 laser beam, either accidentally or as a result of someone else's deliberate action (misuse) will be protected from injury by their own natural aversion response. This is a natural involuntary response that causes the individual to blink and avert their head thereby terminating the eye exposure. Repeated, deliberate exposure to the laser beam may not be safe. Some laser pointers and barcode scanners are Class 2 laser products.

Class 2M lasers are products which produce either a highly divergent beam or a large diameter beam. Therefore, only a small part of the whole laser beam can enter the eye and this is limited to 1 mW, similar to a Class 2 laser product. However, these products can be harmful to the eye if the beam is viewed using magnifying optical instruments or for long periods of time. Some lasers used for civil engineering applications, such as level and orientation instruments are Class 2M laser products.





Class 3R lasers are higher powered devices than Class 1 and Class 2 and may have a maximum output power of 5 mW or 5 times the Accessible Emission Limit (AEL) for a Class 1 product. The laser beams from these products exceed the maximum permissible exposure for accidental viewing and can potentially cause eye injuries, but the actual risk of injury following a short, accidental exposure, is still small.

Class 3B lasers may have an output power of up to 500 mW (half a watt). Class 3B lasers may have sufficient power to cause an eye injury, both from the direct beam and from reflections. The higher the output power of the device the greater the risk of injury. Class 3B lasers are therefore considered hazardous to the eye. However, the extent and severity of any eye injury arising from an exposure to the laser beam of a Class 3B laser will depend upon several factors including the radiant power entering the eye and the duration of the exposure. Examples of Class 3B products include lasers used for physiotherapy treatments and many research lasers.

Class 4 lasers have an output power greater than 500 mW (half a watt). There is no upper restriction on output power. Class 4 lasers are capable of causing injury to both the eye and skin and will also present a fire hazard if sufficiently high output powers are used. Lasers used for many laser displays, laser surgery and cutting metals may be Class 4 products.

2.2.3 Risks of Laser Radiation:

If the built in safety measures are defeated or the laser is operated with the housing open, there is a risk of setting clothing or other flammable materials on fire. Laser energy at a power of up to 150W (Model C100) at a wavelength of 10,6 μm could be present inside the housing.

Therefore operators can perform procedures required inside the housing only when the interlocked door has been opened. (A normal user must never defeat the door interlocks or remove portions of the protective housing, except the machine is not powered).

Therefore you must under no circumstances neither alter the laser tube unit nor dismantle it nor set a system to work which has been altered or dismantled!



2.2.4 Safety Interlock System

The machine is equipped with an integrated safety interlock system which cuts off the power of the laser tube immediately as soon as one of the doors is opened.



CAUTION

Do not attempt to alter the interlock system as that could result in hazardous radiation exposure.



CAUTION

Technicians, who are performing service procedures, must be trained in laser safety, and if they are defeating interlocks, they must wear laser protective eyewear designed for the 10,6 μm CO₂ laser energy.

The top lid, front lid and the maintenance access panel are interlocked. If the interlocks are defeated access to laser class IV radiation is possible through any of these doors. All other covers are not interlocked.



CAUTION

When a non interlocked cover is opened (and the machine is powered) access to class IV laser radiation is possible.

These covers are labeled with „DANGER: INVISIBLE LASER RADIATION WHEN OPEN. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION“

2.3 Dangers of Electricity

When you open the covers of the system there is the danger to get in contact with parts under high voltage. Therefore it is absolutely necessary that service and repair work is only done while the power supply is unplugged. In any case all safety laws and standards in connection with electricity must be obeyed.

IMPORTANT REMARK:

Usually you do not need to get in touch with the electrical and electronic components. In case you do that when servicing or repairing the laser machine, please be sure that you first plug off the power supply.

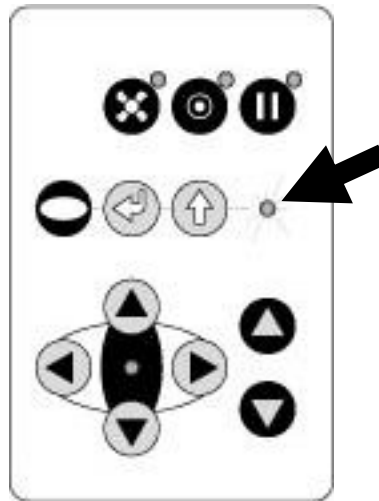


2.4 Emission indication and safety labelling

2.4.1 Light Emitting Diodes



On the keypad of the laser machine there is on the right side a red LED (light emitting diode) which is illuminated when laser radiation is emitted.

If the service plug is used to defeat the door interlocks, the red LED close to the service button is flashing (which indicates that the machine now is in service mode). In this case the machine represents a laser class IV (4) product and special safety provisions are necessary.



2.4.2 Audible Warning

When starting up the laser machine without closing the cover there is an intermittent beep. This indicates that the interlock system has not been checked yet. (You can run the machine only if all interlock switches are closed). Close the cover of the laser machine to initialize the machine.

On emitting a laser beam (which is called test pulse) by pressing the „Repeat“ and „Shift“   button simultaneously there is a beep (as long as you keep the buttons pressed) to remind you of the possible risks. This test pulse will last 10 seconds at maximum.

2.4.3 Safety Labels

The laser safety standards require that any removable panels that could permit access to laser energy include laser safety labels. These labels are visible before and after opening a cover.

Labels with the name of the manufacturer, date of production, description of the product, model number, serial number and safety labels are placed on the outer side of the apparatus. All these labels are mounted when producing the laser machine. These labels must not be removed.

If the labels are lost or damaged please contact Trotec. Replacements will be sent to you free of charge. All labels and their exact places are mentioned in the user manual:

The labelling meets the standards

☛ **21 CFR 1040 – Laser safety**

and

☛ **EN 60825-1(2001)**



3 Laser beam alignment

3.1 What you need

Laser protection glasses (for CO2 lasers) Part # 69300

The toolbox enclosed to the laser machine

Adhesive tape / BATs (beam alignment tools)



Part #	Description
10345	BAT-TELESCOPE RETAINER (3 pieces)
10292	Deflection unit for mirrors (incl. 3 inserts)
10294	BAT-INSERT FOR 10292 (5 pieces)



CAUTION To make sure that there is no laser emission out of a controlled area, establish a limited access area by using non flammable beam blocking curtains, temporary walls or other enclosures.



CAUTION The laser beam alignment may only be performed by service technicians that have been trained by Trotec and are familiar with the hazards from lasers



CAUTION

Never expose any part of your body to the beam as this could result in serious injuries.



CAUTION

To do the alignment it is absolutely necessary to wear laser protection glasses.

3.2 What you have to know

The number of the mirrors is counted from the outlet of the laser tube to the focusing head from one to three.

The whole alignment is done while the machine is running. To make sure the system works at a suitable power level switch the machine off and on again.

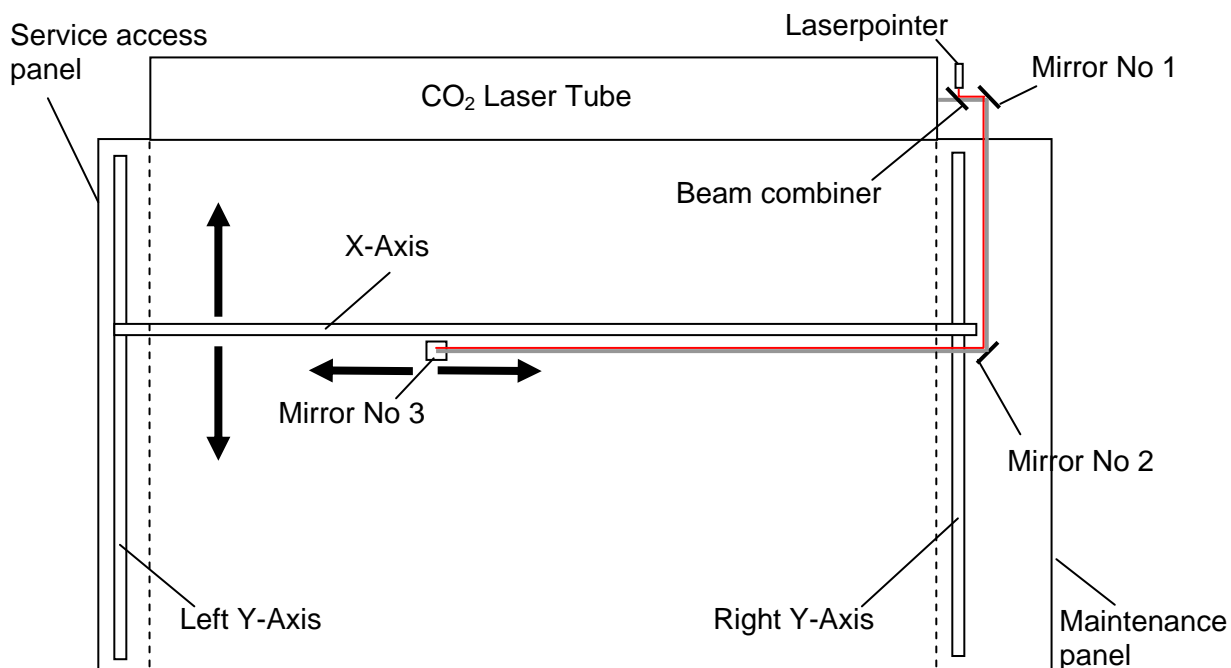
The laser beam is invisible. To make it visible, use adhesive tape or a BAT tool. It is burned at the spot, where it is hit by the laser beam and shows so a mark.

The tolerable displacement (distance from burned dot to the centre) is one sixth of the diameter of the mirror or hole where you check the position.

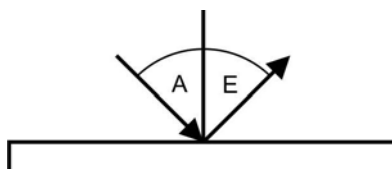
A “**Testpulse**” is a laser beam signal for test purposes. The power of the Testpulse has to be set in the Service-Options within JobControl. Setting for adjustment is appr. 10%, depending on Laserpower. To generate a test pulse, you have to press the keys **Start** and **Shift** together. Maximum duration of a test pulse is 10 seconds. Use a service key or magnets to bridge the interlock circuit to perform a test pulse (**Caution**: Class 4 laser emission).



3.3 Beam path

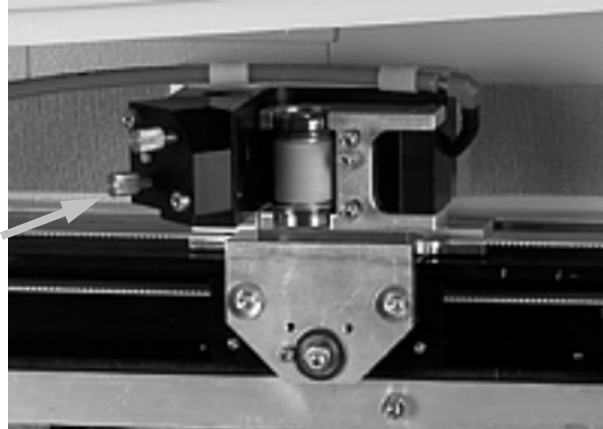


On mirrors, the laser beam arrives at an angle (A) and exits at the same angle (E).
This rule is important to understand the behaviour of the laser beam when adjusting the mirrors.

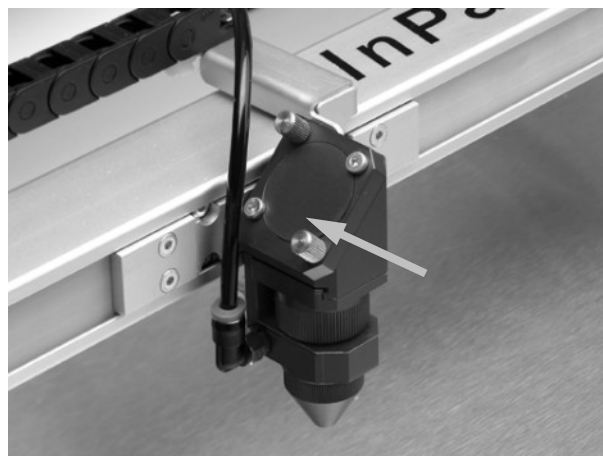


3.4 What you have to do

1. Remove the maintenance panel on the right side of the machine (10mm Allen key).
2. Take the laser protection glasses and remove the grey cover of the first mirror at the rear of the laser (right side) wearing the sign „DANGER. INVISIBLE LASER RADIATION WHEN OPEN. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION.“
3. Remove mirrors #2 and #3.



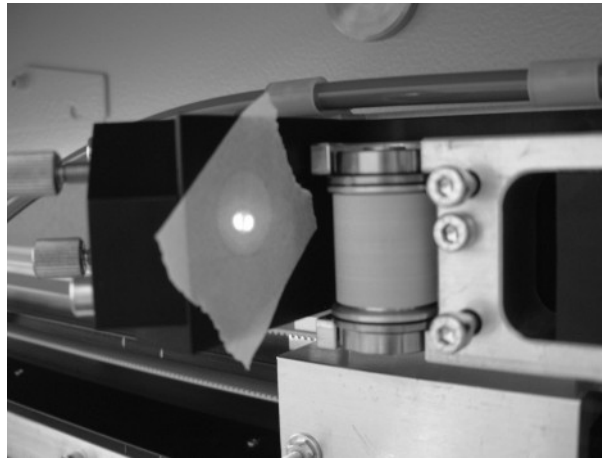
mirror #2



mirror #3



4. Put a piece of adhesive tape or the BAT (Beam Alignment Tool) on the hole of mirror unit #2 (black anodized aluminium part).



alignment of mirror no.1

5. Move the x-axis to the top position.
6. Do a testpulse until you see a little mark on the adhesive tape or BAT. The mark should be in the center of the hole. (If you don't see a mark adjust the two brass screws at mirror #1 until you can see one.



adjustments at mirror #1

7. Move the x-axis to the bottom position.
8. Repeat step 6, but this time try to hit the spot that you've created first.
9. Repeat steps 5 to 8 until the two spots are exactly at the same place.
10. If the spot is not centered bring it to the center by moving the slider of mirror#1 and/or by raising or lowering the laser source
11. Replace mirror #2.

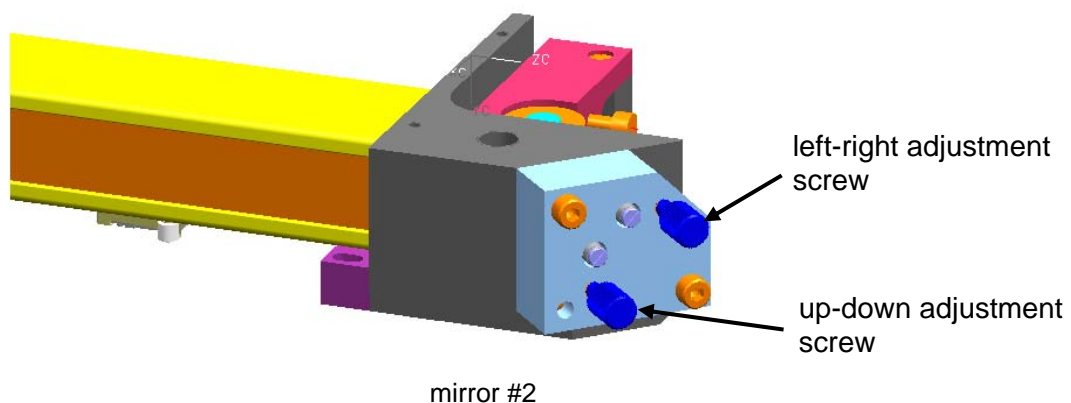


12. Put a piece of adhesive tape or the BAT on the beam entrance hole of mirror unit #3.



checking the beam position at mirror #3

13. Move the focusing head to the top right corner.
14. Do a test pulse until you see a little mark on the adhesive tape.
15. Move the focusing head to the top left corner and adjust the two brass screws at mirror #2 until you hit the spot created in step 14.

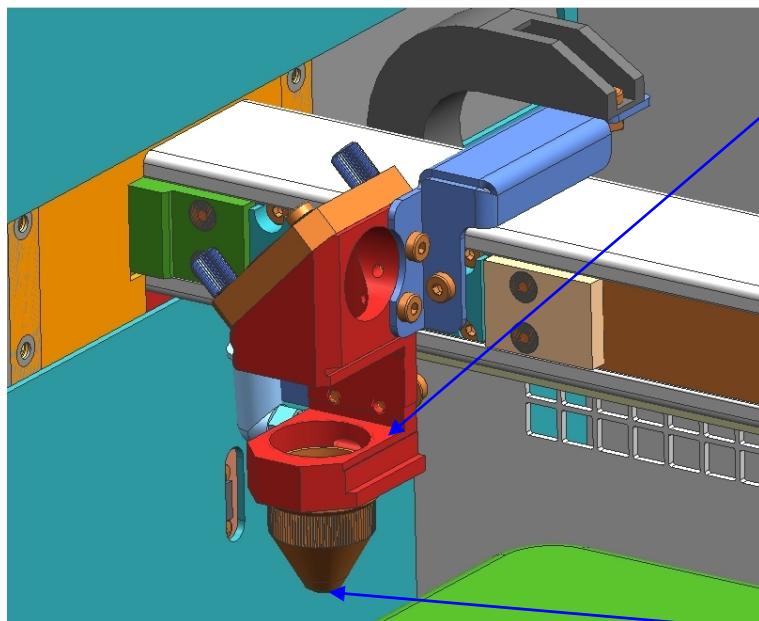


mirror #2

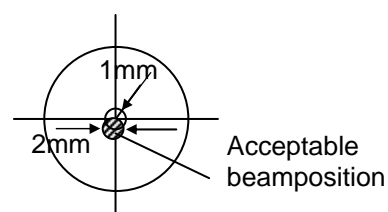
16. Repeat steps 13 to 15 to check the position. If necessary readjust mirror #2.
17. Move the x-axis to the bottom position and check the alignment on the bottom left position. If necessary do small corrections at mirror #1.
18. Check the alignment on all four corners.
19. Assemble all parts again.
20. Now the machine is aligned properly.



3.5 Problems with non right angled cutting lines in thicker materials



1. Remove the lensholder with the lens
2. Put some adhesive tape on the upper side
3. Do a test pulse on each corner (test and repeat button) until you see a small mark on the tape
4. If you have more difference than 1mm from the middle point, you have to adjust the beam with the slider at mirror #1 or the laser tube



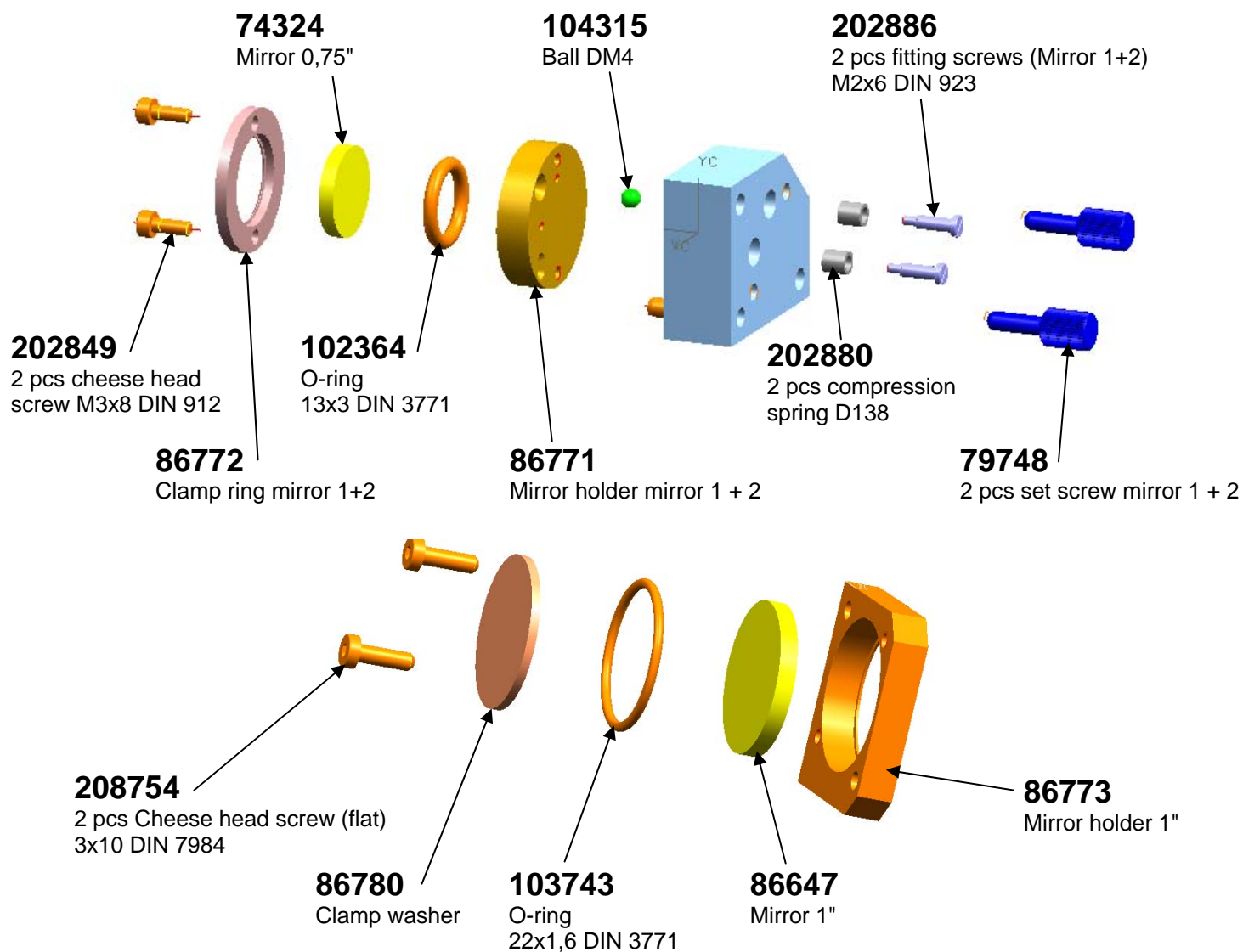
5. Repeat the steps above, but put the adhesive tape on the bottom of the nozzle.

Note:

If the laserbeam is out of the middle of the lens, you will never reach a right angled cutting line on all four sides of a working piece.



3.6 Design of the Mirror Units



4 Laser pointer adjustment



CAUTION

To do the alignment it is absolutely necessary to wear laser protection glasses.

4.1 What you need

Laser protection glasses (for CO2 lasers) Part # 69300
The toolbox enclosed to the laser machine
A 2.5mm Allen key
Adhesive tape



4.2 What you have to know

The alignment is done while the machine is running. To make sure the system works at a suitable power level switch the machine off and on again.

The laser beam is invisible. To make it visible, you use adhesive tape. It is burned at the spot, where it is hit by the laser beam and shows so a mark.

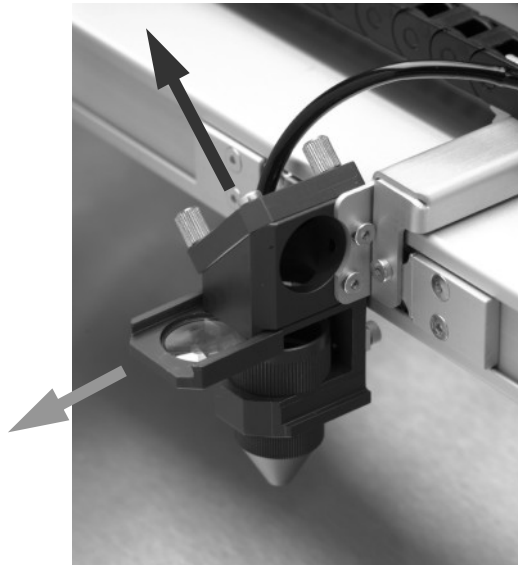
The tolerable displacement (distance from burned dot to the centre) is one sixth of the diameter of the mirror or hole where you do the adjustment.

A "**Testpulse**" is a laser beam signal for test purposes. The power of the Testpulse has to be set in the Service-Options within JobControl. Setting for adjustment is appr. 10%, depending on Laserpower. To generate a test pulse, you have to press the keys **Start** and **Shift** together. Maximum duration of a test pulse is 10 seconds. Use a service key or magnets to bridge the interlock circuit to perform a test pulse (**Caution**: Class 4 laser emission).



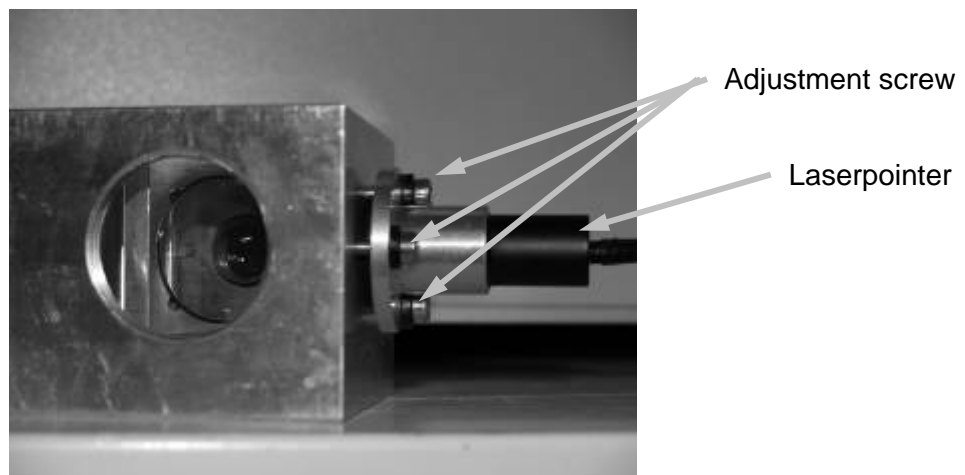
4.3 What you have to do

- 1.) After you've installed the laser pointer glue some adhesive tape on the beam entrance hole of the focusing head (first remove the last mirror and the lens).



Move the focusing head to the bottom left corner of the working table.

- 2.) Do a test pulse, until you can see a small spot on the paper tape.
- 3.) Adjust the three small screws (see picture below) close to the laser pointer until the red dot hits exactly the burned spot on the paper tape.



- 4.) Check the beam position on all four corners of the working table. You can get the highest sensitivity to changes of the pointer position in the lower left corner of the working table.



5 Replacing the laser tube

The laser tube is one of the main components of any laser machine.

To make the tube fire it must be

- *Connected to the power supply*

10W - 30W air cooled	32V
40/45W Synrad	32V
45W Coherent	48V
60W water cooled	32V
60W - 75W air cooled	30V
85W - 95W air cooled	36V
105W - 120W air cooled	30V
105W - 120W water cooled	48V / 96V (up to S3-1395)

[On Synrad tubes this will be indicated with a green LED]

- *Provided with a control signal* (BNC connector, two for the 50W)
The control signal is a 5V TTL signal that comes from the main board.
[If there is a signal Synrad tubes will indicate this with an illuminated red LED]
- Tube has to be turned on (Interlocks closed)

All tubes have an integrated over temperature protection. If the tube exceeds a certain limit it is switched off to prevent an immediate and permanent damage of the gas/electronics. Depending on the type of the lasertube this shutoff temperature level can be relatively high. Lifetime of the lasertube is significantly lowered if the laser is operated above the maximum ambient temperature even if temperature of the laser tube is still (slightly) below shutoff temperature level. Operating the laser tube outside the specified temperature range leads to loss of warranty!

The following reasons might make it necessary to replace the tube:

- A too low laser power at the laser source outcoupling window
- Fluctuations of laser power
(typically jumps from 100% to 50% engraving depth)
The frequency of these power fluctuations is low (e.g. every 5 minutes)
- Uncontrollable timing behavior (high frequency effect).
This effect shows shifted start/end points of the pulses so that the image looks frayed although the mechanics (of the motion system) and software adjustment are OK.



5.1 Measuring the laser power

To measure the laser power you need:

1. Laser protective goggles Part # 69300
2. Laser power meter Part # 70342
3. Interlock defeat tool (service plug or magnets)



Tools for measuring the laser power



CAUTION To make sure that there is no laser emission out of a controlled area, establish a limited access area by using non flammable beam blocking curtains, temporary walls or other enclosures.



CAUTION The laser power measurement may only be performed by service technicians that have been trained by Trotec and are familiar with the hazards from lasers



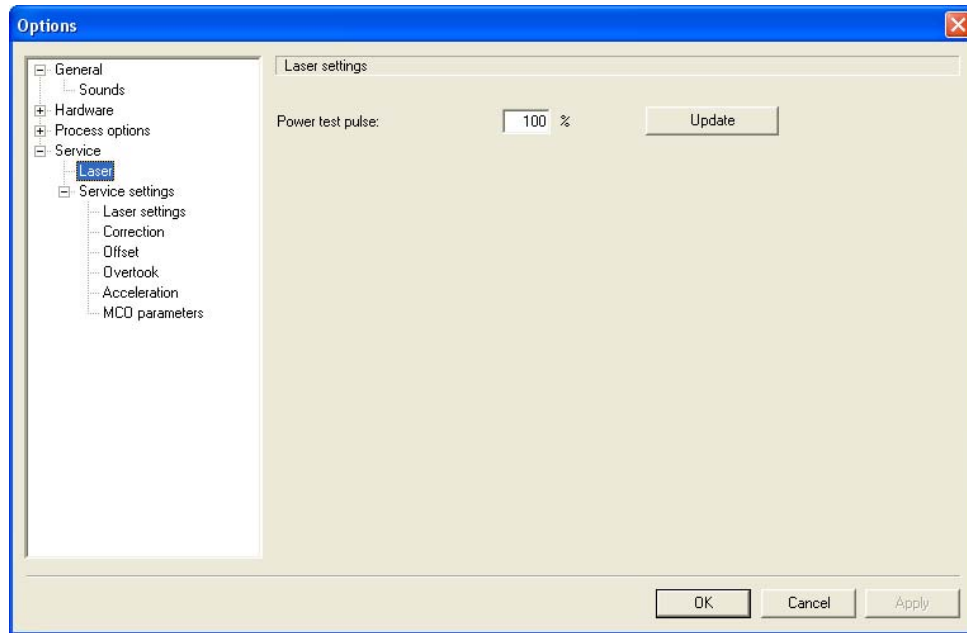
CAUTION Never expose any part of your body to the beam as this could result in serious injuries.



CAUTION To do the laser power measurement it is absolutely necessary to wear laser protection glasses.

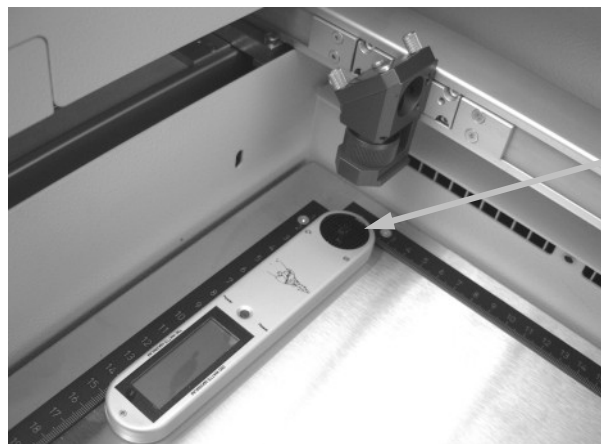
- Open the Trotec JobControl and connect to the laser machine
- Enter the Advanced Options menu (Settings>Options>Service>Laser,) and switch Power Testpulse to 100%. Press update.





Increasing the test pulse to full power

- Defeat the interlock by plugging in the service tool.
- Remove the lens
- Put the power meter with the black absorbing area in one of the corners of the working table
- Move the table to a height level so that the distance between processing head and target area is approximately four centimeters.



setup for measuring the laser power

- Press the reset button on the power meter and do a test pulse.
- After some seconds you will hear a beep sound, which indicates that the measurement has been finished.
- Repeat the procedure in the other corners

The wattage difference between the four corners should be smaller than 10% of the average laser power. Otherwise something is wrong with the beam alignment/telescope adjustment.

Additionally measure the power directly at the beam aperture of the lasertube. Only this value will be significant for complaints.



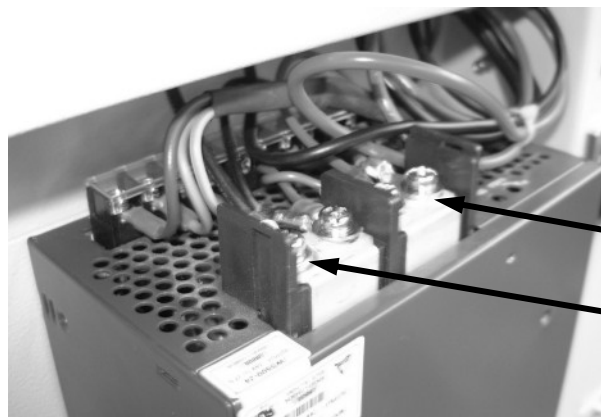
5.2 Laser tube replacement (12W, 25W and 30W)



CAUTION

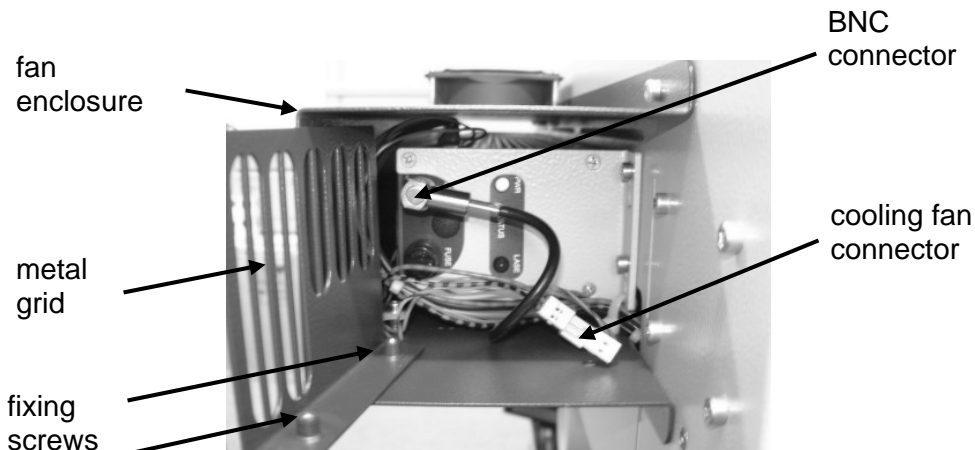
Disconnect electrical supply before working on this equipment!!!

1. Switch off the machine and open the service access panel using a 10 mm allen key. Remove also the cover of the power supply.
2. Disconnect the power wires (black-red) for the lasertube on the power supply.



connectors on the power board

3. Take out the metal grid and disconnect the cooling fans.



4. Remove the fan enclosure
5. Pull out the power cable (black-red) and unplug the signal cable on the lasertube.
6. **CAUTION:** Before you perform that step please ask a second person to assist you. The risk is to drop the tube. Loosen the two 4mm screws on the right side of the tube and remove the four philips screws on the left side (before you can do that remove the cover of mirror unit 1).
7. Remove the tube
8. Assemble the new tube in the reverse way.
9. After the replacement you've to do the beam alignment.
10. Pack the tube and ship it back to Trotec.





5.3 Laser tube replacement (50W and 100W)



CAUTION

Disconnect electrical supply before working on this equipment!!!

1. Switch off the machine and open the service access panel using a 10 mm allen key. Remove also the cover of the electronic compartment.
2. Unplug the power connector (black-red) for the lasertube on the main board.
3. Remove the tube enclosure.
4. Disconnect the six push fit fittings that are connected to the tube and disassemble the two that fix the plastic water distributor.
5. Remove also all fittings on the left side of the tube.
6. Pull out the power cable (black-red) and unplug the two signal cables on the lasertube.
7. **CAUTION:** Before you perform that step please ask a second person to assist you. The risk here is to drop the tube. Loosen the two 4mm screws on the right side of the tube and remove the six philips screws on the left side (before you can do that remove the cover of mirror unit 1).
8. Remove the tube
9. Assemble the new tube in the reverse way.
10. After the replacement you've to do the beam alignment.
11. Pack the tube and ship it back to Trotec.

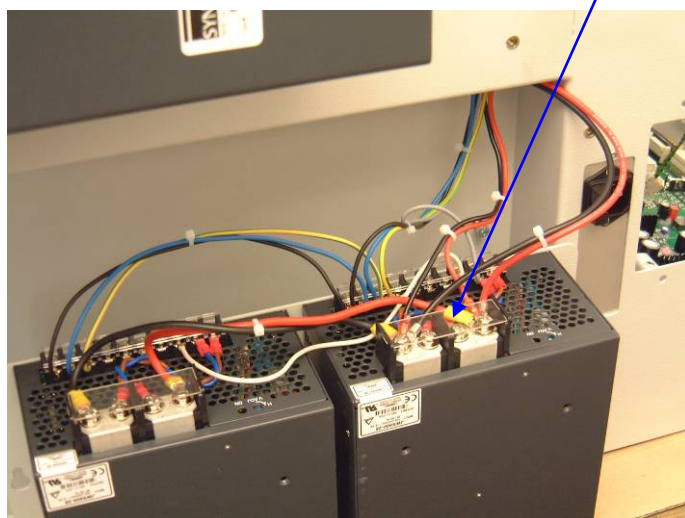
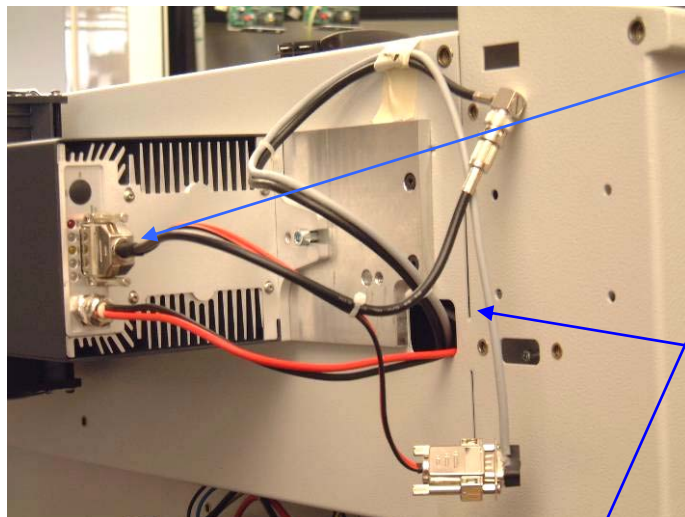


5.4 Laser tube replacement (40W) Synrad



CAUTION

Disconnect electrical supply before working on this equipment!!!



1. Unplug the user interface connector (Laserenable, TTL)
2. Disconnect the power wires (black / red) for the laser tube on the power supply. Before you can do that remove the cover of the two power supplies
3. Pull out the power wires
4. Remove the cover of the mirror #1 and disconnect the laserpointer
5. Loose the two screws on the left and the one screw on the right side at the tube, and remove it carefully.
6. Remove the telescope and the mirror #1 from the old tube(open the four black screws at the tube side) and fit it to the new Lasertube
7. Assemble the new tube in the reverse way
8. Align the laserbeam
9. Send the old tube back to Trotec



5.5 Laser tube replacement (45W) Coherent

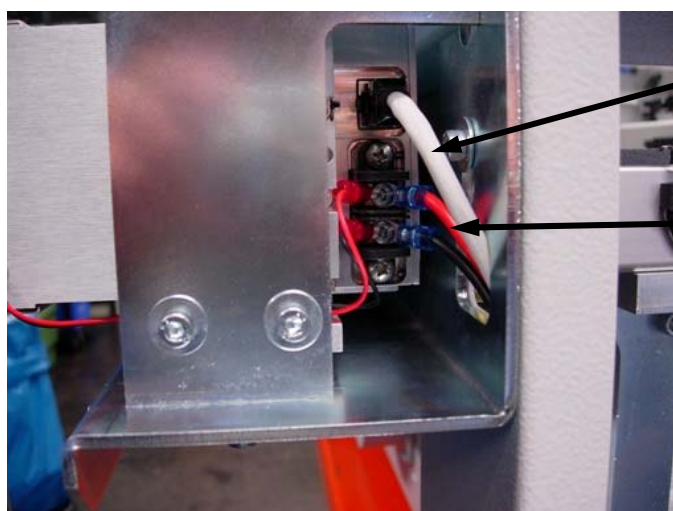
CAUTION

Disconnect electrical supply before working on this equipment!!!

1. Switch off the machine and open the service access panel using a 10 mm allen key.
2. Remove also the cover of the laser tube (picture of SP100 – procedure is quite the same).



3. Disconnect the power cables (black-red) and unplug the signal cable (grey) on the lasertube.

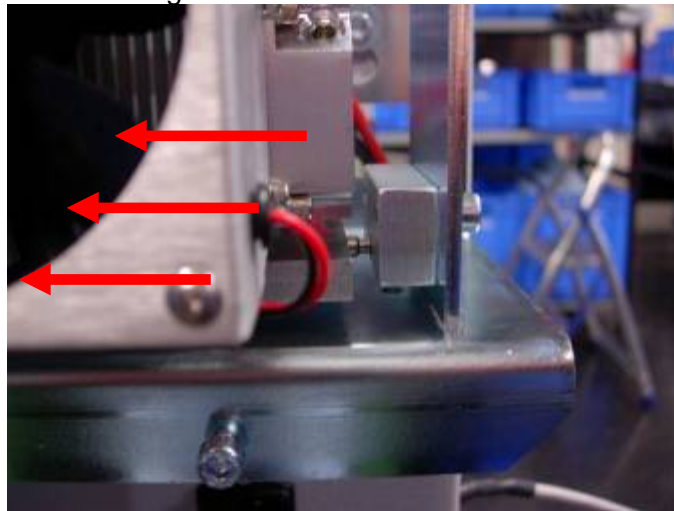


4. Open the screw which is fixing the laser tube to the housing.



Fixing screw

5. Slide the laser tube to the left to get it out from the bracket.



6. Pull the laser tube away from the housing.
7. If not already installed, remove the base plates from the old lasertube and install them on the new one.



Base plates on
the laser tube

8. Assemble the new tube in the reverse way.
9. After the replacement you've to do the beam alignment.
10. Pack the old tube and ship it back to Trotec.



5.6 Laser tube replacement (60W)



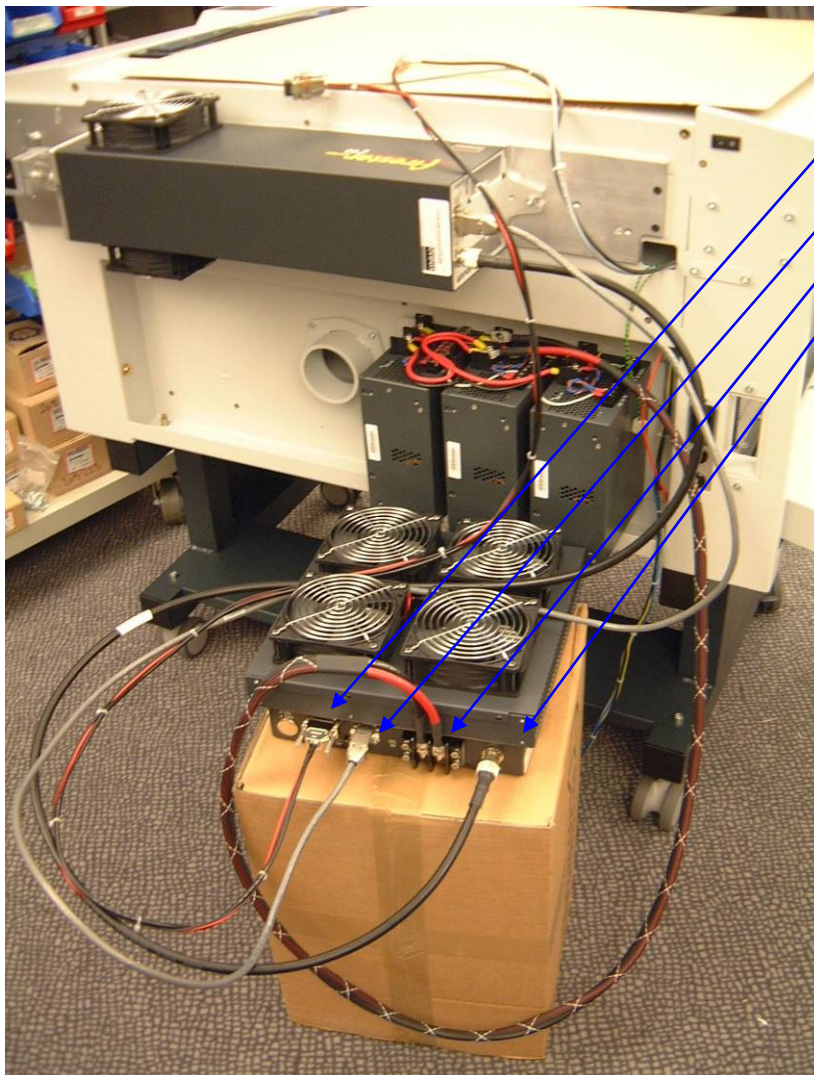
CAUTION

Disconnect electrical supply before working on this equipment!!!

The big different between the 40 and the 60 Watt machine is the RF Power supply between the 30V DC powersupplies and the Lasertube.

In case of a lasertube problem you have to change both parts (Lasertube and RF-Powersupply)

The RF Supply is placed under the machine on the base frame and fixed with four screws. It is fed by two of the DC powersupplies on the back of the machine



1. Open the four screws at the RF Supply and remove it
2. Unplug the cable from the electronics,
3. the signalcable for the tube,
4. the power wires,
5. and the RF-cable for the tube
6. Unplug the RF-cable and the signalcable at the lasertube itself.
7. Remove the cover of the mirror#1 and disconnect the laserpointer
8. Loose the two screws on the left, and the one on the right side at the tube and remove it carefully
9. Remove the telescope and the mirror #1 from the old tube(open the four black screws at the tube side) and fit it to the new Lasertube
10. Assmble the new tube and the RF-Supply in the reverse way , Do the laserbeamalignment and send the old tube back to Trotec

6 Adjusting the Software

Most of the Software Settings are changed in the “Options” dialog. You can open this dialog in JobControl “Settings – Options” or via the short-cut “Strg + Alt + S”. If you use the first option, you have to enter the password “name” to be able to change the service settings. With the shortcut, you immediately are in the service mode.

DO NOT provide this information to end users of the machine or untrained personnel, as changes in these settings have huge impact on the machine and may lead to severe damage if not done properly.

6.1 Adjusting the tickle power

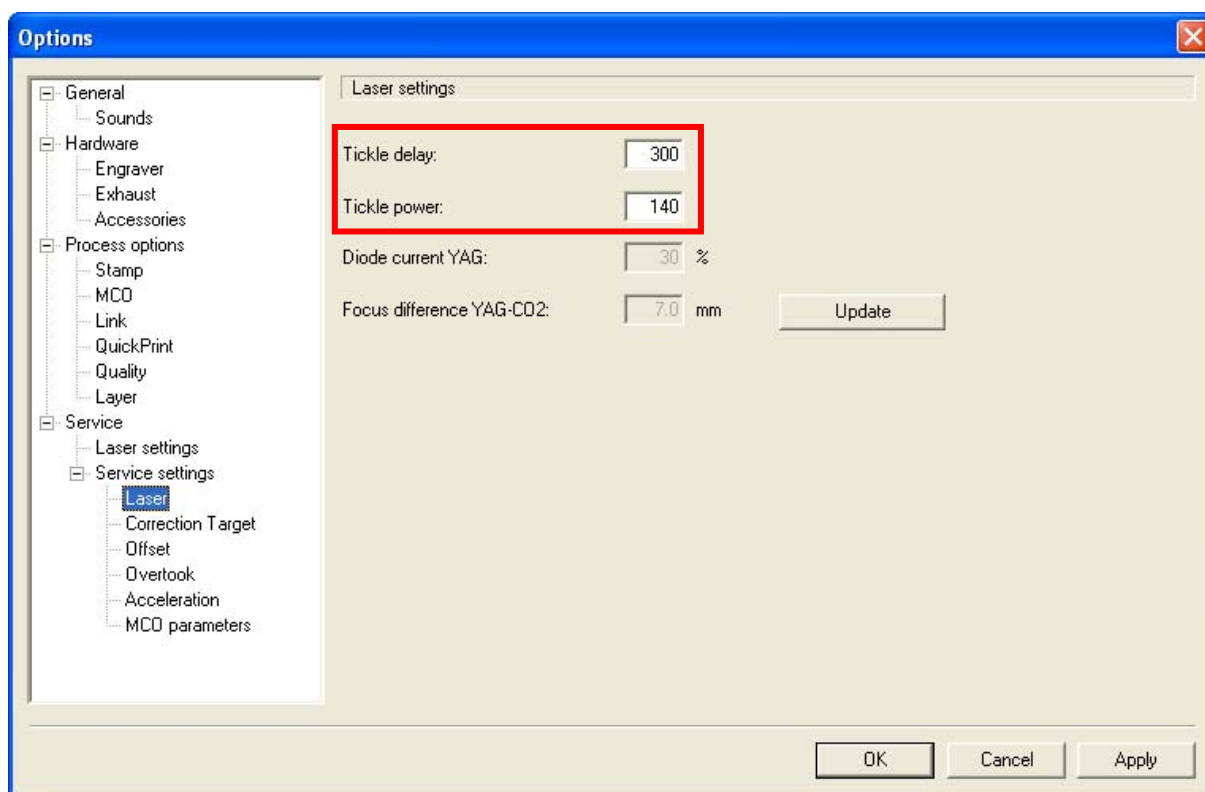
The tickle pulses are used to keep the plasma inside the tube ionized continuously. This guarantees a quick response whenever laser power is needed to mark or cut materials.

If the tickle power is too low, then typical effects are bad contrast for fine details, missing elements (e.g. a not closed circle) or frayed edges.

If the tickle power is too high you will see shadows on the edges.

There are two settings in the Trotec JobControl, which are responsible for a correct excitement of the gas filling. These are:

1. Tickle delay
2. Tickle power



Tickle delay defines a time from the end of laser output (to mark the surface) to the start of the tickle pulses within which no tickles are sent. This delay makes sure that no following pulses are caused by the tickles immediately after firing.

Tickle power is a parameter that defines the intensity of the tickle pulses.

Reduce it when you see shadows on the edges.

Increase it, when e.g. fine images on anodized aluminum are less engraved than big ones.



To find the correct settings of tickle power do the following steps:

1. Warm up the tube by engraving some samples at full power.
2. Take a very laser sensitive material e.g. laser plastics or soft wood.
3. Engrave an image into the wood and have a look on the edges (please use a low speed).
4. If you see shadows reduce tickle power, if no shadows appear increase tickle power. To make sure that the changes take effect always click on apply in the dialog window.



Shadows besides the engraving, caused by too high tickle power

5. Repeat steps 4 to 6 until you've found the setting that is necessary to prevent shadows, but keeps the tube just below firing.
6. Now you've adjusted tickle power.

Note: Before you adjust the edit settings of a tube you should always make sure that tickle power has been set correctly.

For optimum engraving quality a new adjustment of Edit settings and tickle power is necessary after a certain lifetime of the tube (Recommended after 1000 hours of operation).

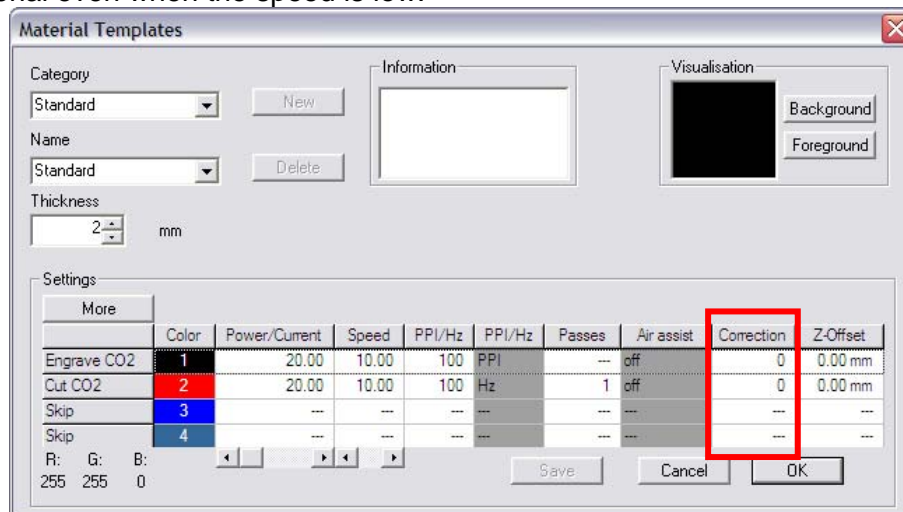
Here a list of minimum tickle power values of CO2 laser sources used in Trotec machines.

Type of laser source	Minimum Ticklepower
481	50
482	50
485	50
T60	140
T80	140
T100	140
EVO100	50
EVO200	50
EVO240	50
V30	50
V40	50
f-series	0
G-Series	0
GEM 40	0



6.2 Adjusting the Power Correction factor CL

The factor Correction (Material Templates > column Correction) is a minimum power level that will affect the material even when the speed is low.



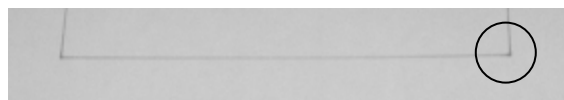
The reason for the correction factor is in the material behavior itself:

Many materials show a nonlinear response. That means when you process the material with a continuously increased power level the change of color will not have a linear connection with the change of power. For many materials you need a certain minimum power level (e.g. anodized aluminum: because of the high heat conductivity, that causes a quick heat transfer you need a relatively high factor $CL \approx 30$) for marking the workpiece. This minimum power can be adjusted by setting the power correction factor CL – adjustment step should be 10.

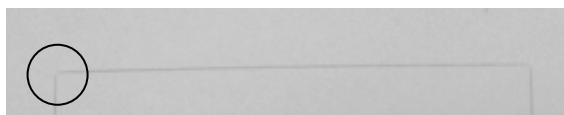
Note: The power correction factor must be adjusted for each material and color individually and can be changed only in the Trotec JobControl. For most materials a low value of $CL \approx 10$ is OK)

Steps for adjusting the power correction:

1. Create a rectangular cut job ($\approx 5 \times 5\text{cm}$)
2. Cut into the material. Set the parameters so that you only mark the surface and do not cut deep into the material.
3. If the cut line is closed on the corners but is thicker where the lines meet reduce CL.



4. If the cut line is not closed on the corners increase CL.



5. As soon as you have a closed curve with constant line thickness you've found the correct factor of CL.

Note: This adjustment is especially important when you want to mark the surface of a material or process foils. It is hardly needed for Laser cutting all the way through thicker material. A change of the tickle power setting will also affect the correct setting of CL.



6.3 Adjusting the Offset parameters

The machine uses so called offset parameters (X and Y) to make sure that the zero position of the software is exactly in the cross point of the rulers (0/0 position). This is important for precise positioning of jobs.

Additionally we use the Z offset to fine-tune the automatic focus. (Only for focusing using the software)

An offset is a certain distance from the home position that is given by the limit switches to the edge of the rulers (for X and Y) or the focus level of the lens (Z).

Whenever you see that the position of the job on the table is not the same as in the desktop publishing program you have to adjust the offsets.

Steps for checking and adjusting the X, Y and Z offsets:

1. Make sure that the ruler angle has been adjusted correctly.
2. Focus the beam on the surface of the rulers and glue some adhesive tape in the cross point.
3. Move the focusing head to 0/0 (Engraver>move laser)
4. Do a test pulse until you can see a small spot in the paper tape.

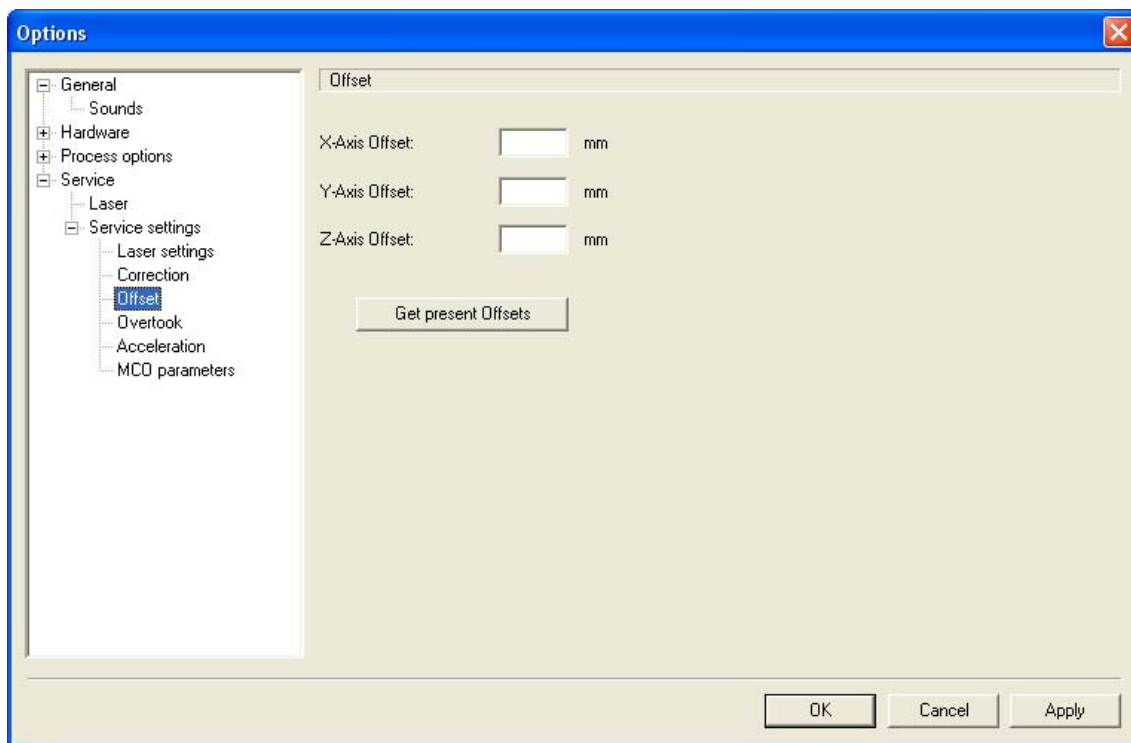


Checking the zero position

5. The distance between this spot and the rulers should be smaller than 0.5mm.



6. If the distance is bigger: focus on the table using the focus tool (we recommend to use the coordinate position $x=100$, $y=100$), then move the focusing head to the cross point of the rulers.
7. Click on „get present offsets“ in the offset settings (Settings>Options>Service>Service settings>Offset)



Note: If you can not reach the requested position you have to move the rulers. Please refer to the section „ruler adjustment“ in this manual.

Steps for adjusting the Z offset manually:

A manual adjustment of the Z offset is done in the following way:

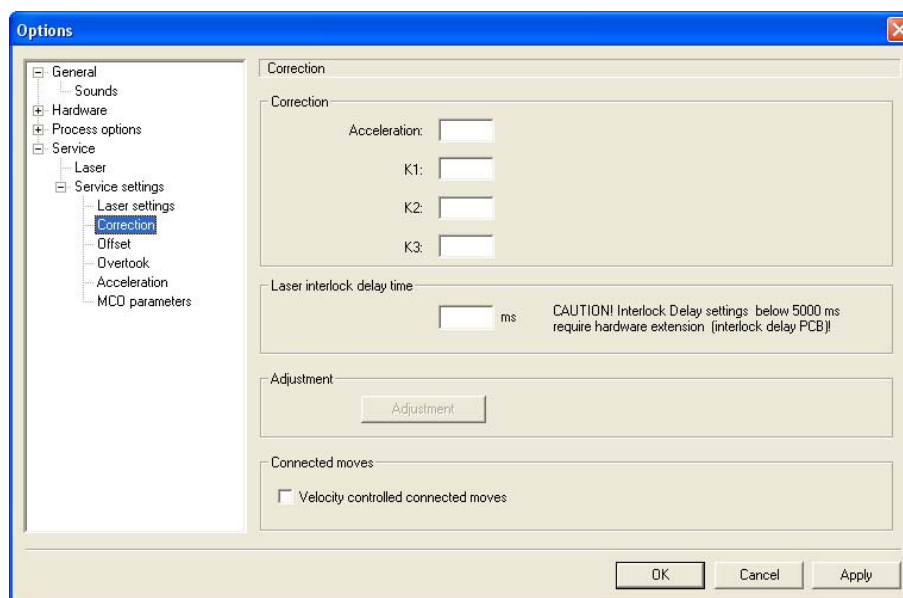
1. Check if the table has been adjusted correctly.
2. Make sure that the selected plate material has been defined as 0mm thick.
3. Move the focusing head to 100/100 mm (Engraver>Move laser)
4. Hang the focus tool on the focusing head.
5. Click on “focus laser” or select Engraver>Focus laser (top door must be closed).
6. The focus tool should gently touch the table.
7. If it drops increase the Z offset, if there is space between the tip and the processing table decrease the offset.

Note: If it is not possible to reach a satisfying result (because there is not enough range of adjustment) you have to move the limit switches (especially the lower one, as this is used for homing)

6.4 Adjusting the “correction” settings

The default parameters are:

Acceleration: 5
K1: 7
K2: 0
K3: 10



These parameters are responsible for achieving good engraving quality at various speeds. Trotec uses a patented algorithm for compensating imperfections of the laser tube behavior. Especially the laser delay time needs to be considered.

The factor K1 provides a shift of the laser control signal linear with speed.

A typical indication for the necessity to adjust the factor K1 is the impression of perfect engraving quality at the edges of our Times New Roman test pattern, but imperfect in the centre (doubled letters are visible at the small fonts) or reverse.

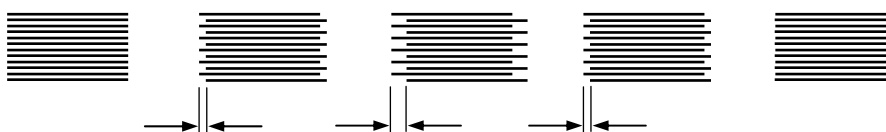
It's important to make sure that the belts are tensioned correctly before performing this test.

Otherwise mechanical problems could be interpreted as laser tube timing effects.

Also after each tube replacement the validity of the factor K1 needs to be verified.

To adjust it, perform the following steps:

1. Engrave the 125dpi test pattern at full speed. PPI setting should be 1000. Check the positions of start and end points, especially whether the shifts between neighboring lines are varying along the length of the test sample.
2. If there are fluctuations adjust the factor K1 until there is a constant shift.



Imperfect adjustment of K1

3. Adjust the edit factors (overtake adjustment).



6.5 Overtok adjustment – Edit factors

The Trotec JobControl shows a special feature that is used to fine tune the engraving quality of the machine. For a variety of speeds you can set individual parameters (so called edits) to compensate the dynamic behavior of the tube not covered by K1 compensation. Using these factors can compensate a tube behavior that is different from the average.

Typical symptoms of an incorrect Edit factor adjustment are:

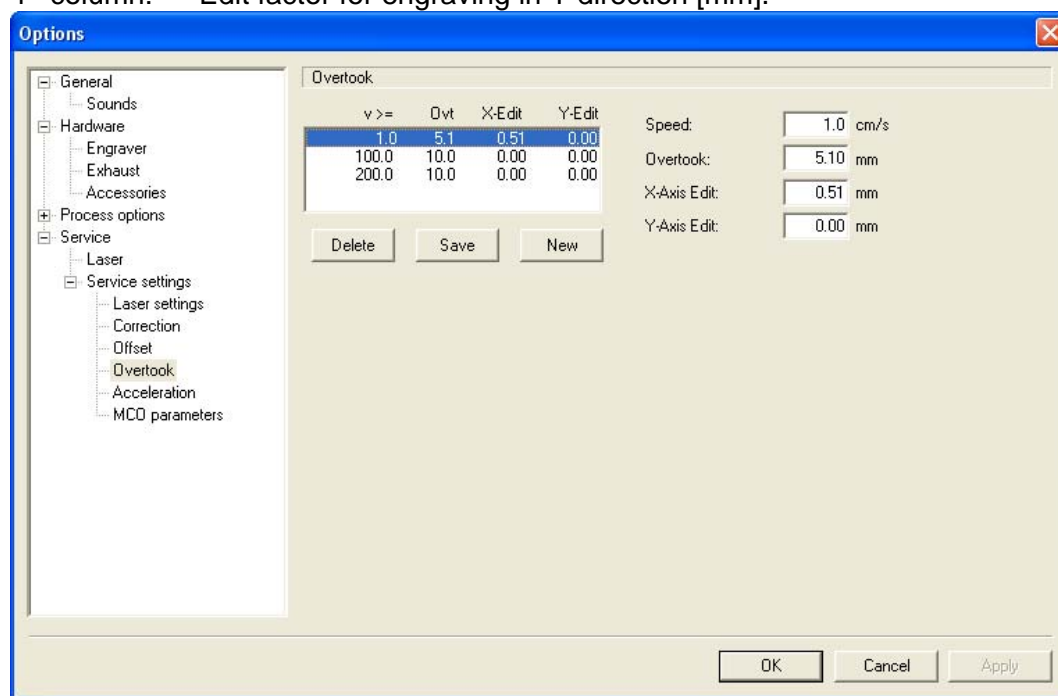
- Double letters for small fonts
- Inconstant line thickness for horizontal and vertical lines
- Frayed edges

If you see one of these effects you have to adjust the edit settings in the Section “Overtok” in JobControl.

Understanding the Overtok table:

The table gives you the following information:

- 1st column: gives you the speed from which on the selected line is valid [cm/s]
 2nd column: gives the overtok (distance of travel from the line end to the position where the focusing head turns its direction) [mm]
 3rd column: Edit factor for engraving in X direction [mm]
 4th column: Edit factor for engraving in Y direction [mm].



When engraving in X direction at 50% speed (which means e.g. 177,5 cm/s if engraving velocity [settings>options>hardware>engraver] is 355 cm/s) the second line of the table is responsible for the engraving result.

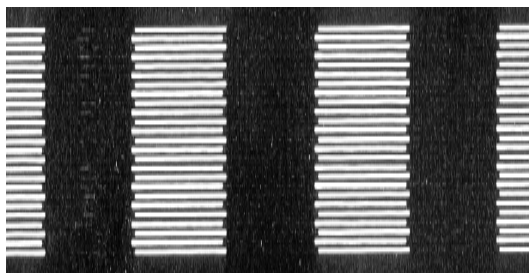
Steps for adjusting the Edit settings:

1. Create a job at 125dpi that looks like the following and covers at least half of the table width.



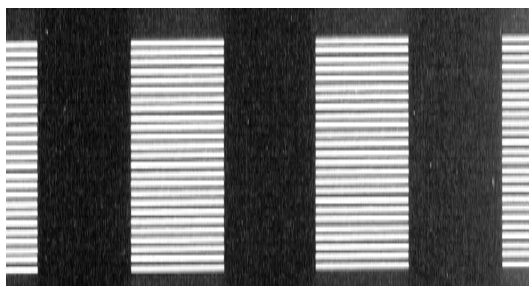
You can use the job for adjusting the X edit when you engrave it in X direction, when you rotate it by 90° and engrave it in Y direction (which can be done directly in JobControl) you can adjust the Y edits.

2. In a job like this you can see (when you engrave it) the individual lines (as they are not overlapping at 125 dpi)
3. Engrave this job at a certain speed and check the shift between the start points of neighboring lines using a magnifier.



Bad adjustment of the edit factor

4. A perfectly adjusted machine doesn't show a shift between the individual start points.
5. If there is a shift increase or decrease the edit factor and repeat step 3 until it disappears.



The adjustment is OK now

6. Keep on adjusting until you have a perfect result at any speed.

Note: Before adjusting the Edit factors make sure tickle power is adjusted correctly.

To rotate a job and engraving direction by 90° go to the plate setup and select the opposite parameters for engraving direction and job orientation.

6.6 Section "Acceleration" in the service setup

The default parameters are:

X:	9
Y:	4
Vector:	1
Circle:	1

Altering the default parameters can be useful if there is a problem on one of the axis (tracking errors) and you want to keep the machine in operation. In this case reduce the acceleration (and eventually the top speed).





7 Adjusting the Hardware

7.1 Ruler adjustment and rectangularity adjustment

The machine provides a highly developed system of software adjustments. This makes it also possible to fine tune the zero position of the rulers precisely without touching any mechanical component. (Please refer to the chapter software adjustment)

If a software adjustment is not possible (e.g. because the range of adjustment in the software is too small or the rulers are not parallel to the motion system) you have to adjust the rulers and/or the motion system.

7.1.1 How to check the ruler position

For both rulers we have a tolerance of 0.5 mm. That means that when you move the head to 0/0 (and you fire the test pulse) the burned spot must not hit the ruler and have a distance of max. 0.5 mm to the ruler. If the distance is bigger and not constant you have to adjust rulers and/or X-axis.

Y ruler check

1. Glue some adhesive tape in the cross point and at the endpoints of the rulers.
2. Focus on the rulers
3. Move the focusing head to 0/10 (Engraver>Move laser, X=0, Y=10)
4. Fire the test pulse into the paper until you see a small spot (press test, keep it pressed then press repeat)
5. Move the focusing head to the lower end. (e.g. by pressing test+down)
6. Fire the test pulse again.

X ruler check

1. Glue some adhesive tape in the cross point and at the endpoints of the rulers.
2. Focus on the rulers
3. Move the focusing head to 10/0 (Engraver>Move laser, X=10, Y=0)
4. Fire the test pulse into the paper until you see a small spot (press test, keep it pressed then press service)
5. Move the focusing head to the right end. (e.g. by pressing test+right)
6. Fire the test pulse again.

7.1.2 Ruler adjustment

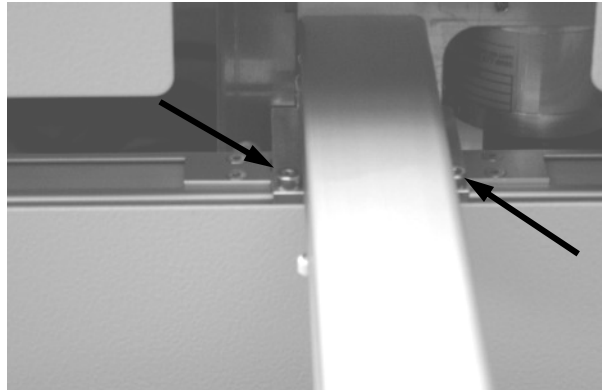
When you've found that the ruler is not parallel to the Y-axis (inconstant distance between the upper and lower spot and the Y ruler) you've to open the three screws that fix the Y ruler and shift the ruler until the above mentioned axis check shows a result that is within tolerance.

After you've done that make sure that the X ruler is oriented in an angle of exactly 90° to the Y ruler. If it is not, open the five screws that fix it and rotate the ruler until you reach the correct angle. In the next step you've to make sure that the X axis is parallel to the X ruler. If the X ruler check fails adjust the angle position of the axis.



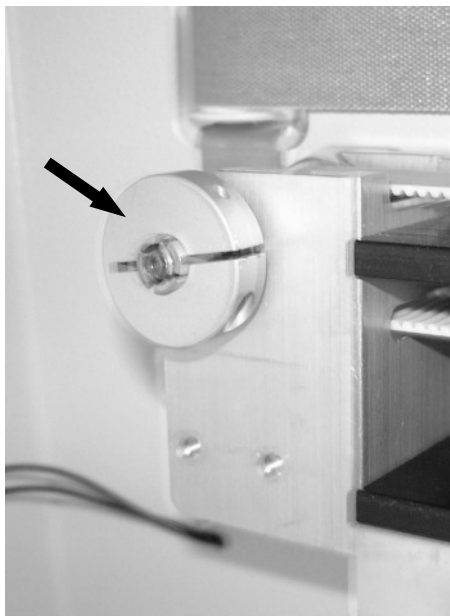
7.1.3 Rectangularity adjustment of the motion system

1. Check the angle between X-axis and Y-axis. It has to be 90°. If the axis are misaligned, proceed as follows.
2. Open the two screws on the right and the two on the left side of the X axis, that connect it to the Y axis. On systems equipped with dust protection belts first remove the strengthening plate by releasing the belts and removing the two fixing screws on each side.



fixing screws on the right and on the left side of the X-axis

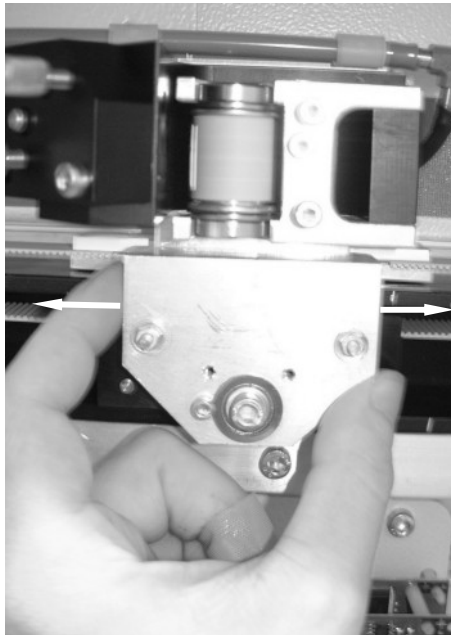
3. Open the Y axis drive shaft connector (in the maintenance compartment). On machines with air assist it is necessary to remove the hose.



Y axis drive shaft connector



4. Turn the (right side of the) X axis if necessary, until the axis position is within tolerance.



adjusting the angle position

5. Fix the screws on the left side of the X-axis to fix it in a exact 90° angle on the left Y-axis.
6. Fix the screws on the right side of the X-axis.
7. Fix drive shaft connector again. Do the same with the dust protection belts if they are installed.

Caution: When you adjust the X-axis it can easily happen that the laser beam is no longer centered at the focusing head. To make sure that this effect does not affect the adjustment result check also the beam position at the focusing head regularly.



7.2 Table adjustment

The correct adjustment of the table is important to make sure that a constant engraving depth is reached all over the table (another reason for an inconstant engraving depth is a bad beam alignment).

7.2.1 How to check the table adjustment

1. Focus on the table.
2. Move the focusing head to the position X/Y=10/60.
3. Measure the distance between focusing head and table.



distance measurement

4. Move to 10/350, repeat step 3.
5. Move to 725/220, repeat step 3.

The accepted tolerance is 0.5 mm.

If the difference is bigger the table needs to be adjusted.



7.2.2 Adjusting the table

1. Focus on the table
2. Switch off the machine and disconnect it from the electric supply network.
3. Open the Maintenance access panel and the Service access panel
4. Open the screw that holds the electronic compartment



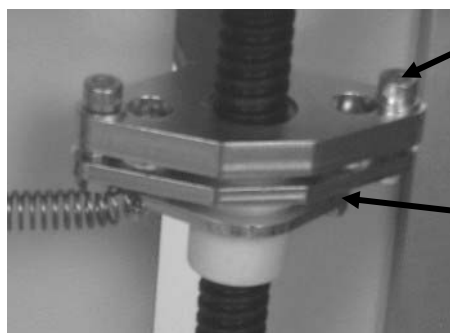
fixing screw of the electronic compartment

and move it carefully to the side to have free access to the lead screws and plastic nuts.



removed electronic compartment

5. Move the focusing head manually to 725/220 and focus on the table.
6. Measure the distance to the table.
7. Open the lead screw nut fixing rings.

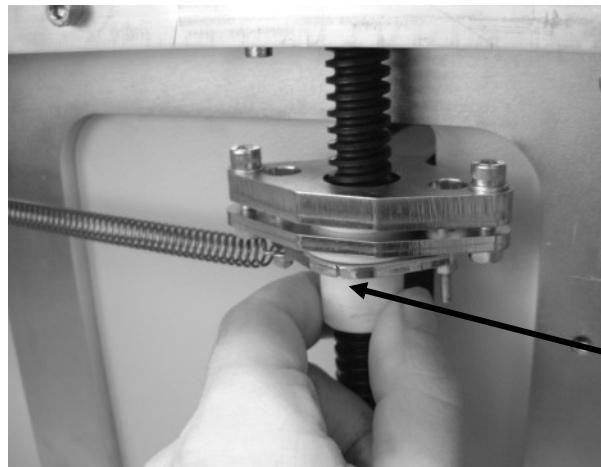


fixing screw

lead screw nut
fixing ring



8. Now move the focusing head to 10/60 and rotate the lead screw nut close to the focusing head until you reach the correct height level of the table.



lead screw
nut

table leveling

9. Do the same at 10/350.
10. For fine tuning repeat the steps 7 to 10.
11. Now tighten the lead screw nut fixing rings again.
12. Assemble all components again.

IMPORTANT:

If you experience problems with the Z axis, such as tracking errors, mechanical resistance please ensure that:

- > the latest firmware version is installed
- > the workpiece does not exceed the max. load for the table (usually aprox. 12kg)
- > the table is leveled
- > the lead screws are free of dust, grease and dirt

It's absolutely necessary to check/clean the lead screws after 3 month. To clean the lead screws use either silicon aerosol or industrial oil (acid free) MoS2 spray. Apply some oil to the lead screws and clean them with a clean soft tissue. Ensure that the thread is clean. After cleaning the lead screws, apply a small amount of oil to the lead screws and move the table up and down a few times. If there is still dust/dirt on the thread, repeat cleaning the lead screws until they appear clean. NOTE: don't apply to much oil to the lead screws as dust can stick to it.



7.3 Servicing the X axis

The axes are the most strained mechanical components in a laser machine. As we have to make sure that the precision is high enough to get a perfect engraving result it is important that possible positioning errors between incremental resolver and focusing head are minimized (engraving accuracy at $1000\text{dpi}=25.4\mu\text{m}$, at cutting $1\text{ increment}=10\mu\text{m}$).

To assure this, we have to service the axes periodically. The most important one is the X-axis, as it moves approximately 500 times farther than the Y axis (this is true for square jobs and a resolution of 500 dpi)

Each of the axes contains some wear and tear parts. These are:

- Belts (motor belt and main belt)
- X-motor including drive gear
- Ball bearings
- THK guide
- X-gearing assembly

which have to be replaced regularly.

The following instructions contain all mechanical elements that might have to be replaced. On every machine the technician has to decide which of the components are outworn. (Please refer to „12.2 Recommended service intervals“ for further information)

Steps for servicing the X-axis:

- Open the maintenance and the service access panel
- Disconnect the X axis motor cable

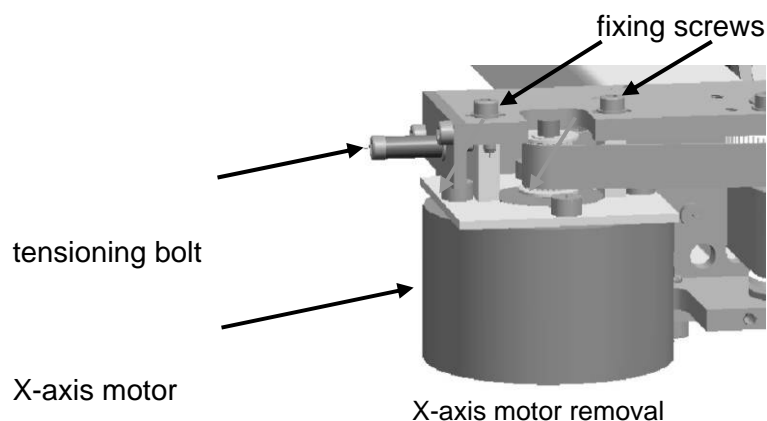


X connector

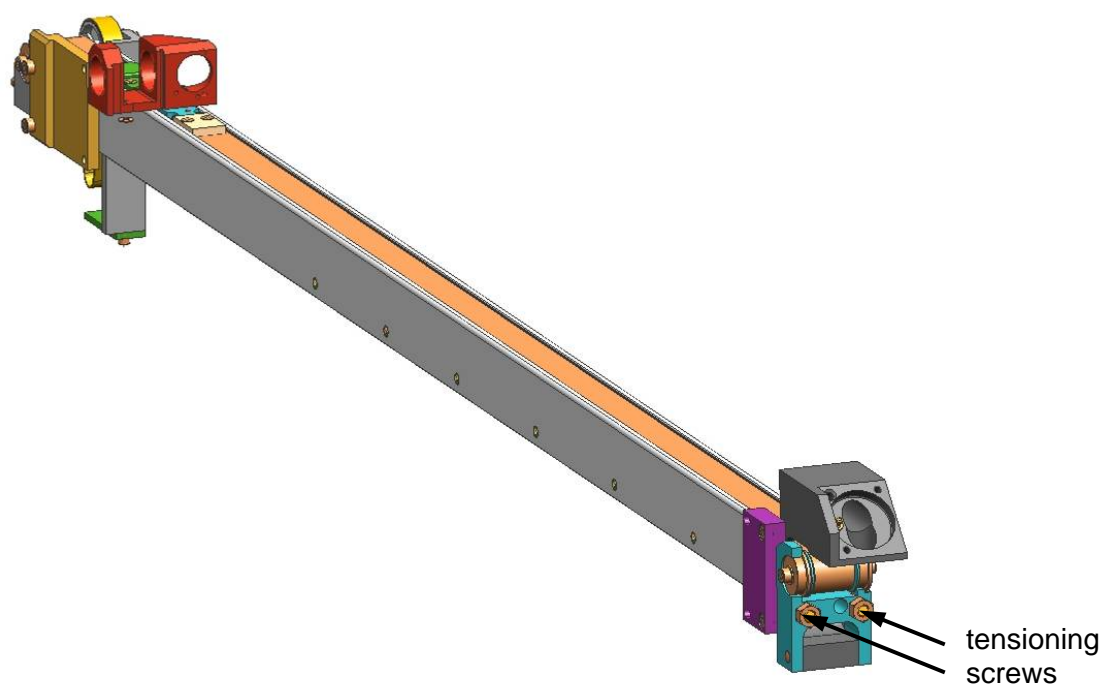


Adjusting the Hardware

1. Dismantle the X-motor
 - Disconnect DC power and resolver plug
 - Loosen the two motor fixing screws
 - Take out the tensioning bolt
 - Take out the motor

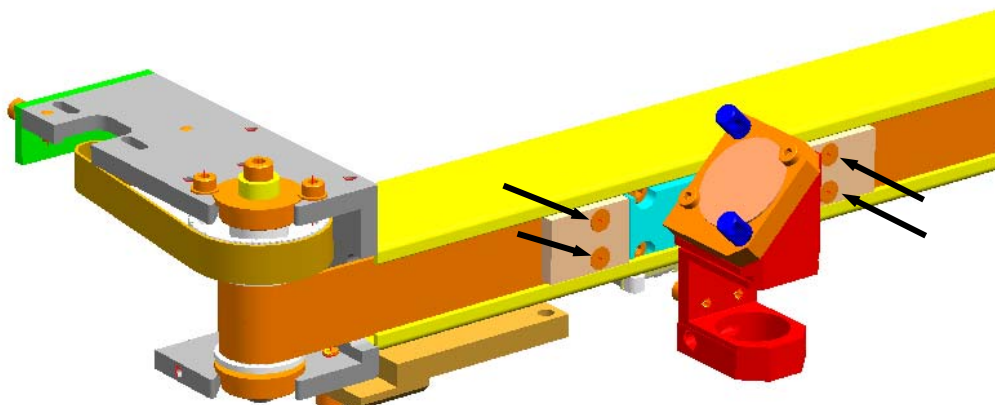


2. Check the main belt tension BEFORE releasing the belt and remember how it feels.
3. Release the main belt
 - Remove the X belt tensioning screws



Adjusting the Hardware

- Remove the four screws and the belt grips on the left and on the right side of the lens holder carriage.

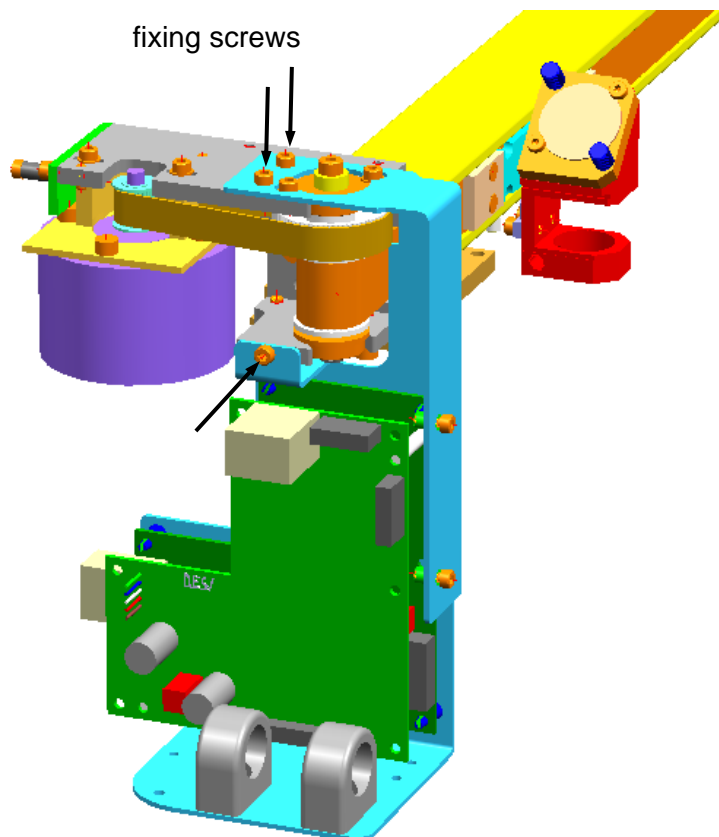


replacing the belt

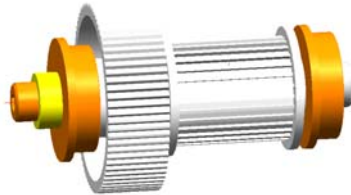
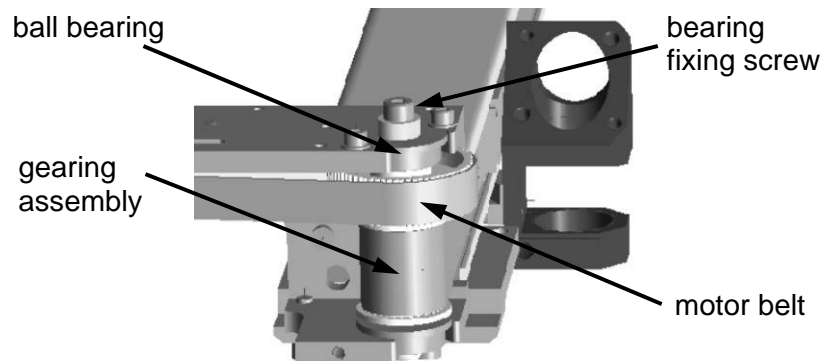
4. Replace the main belt
 - Connect the new belt to the old one. Pull out the old belt (and at the same time pull in the new belt)
5. Replace the ball bearings, the X-gearing assembly and the motor belt

There are ball bearings on the left side and on the right side of the X axis. One each on the upper and lower end of the X-gearing assembly and two on the main belt idler pulley.

 - Remove the electronics carriage. There are two fixing screws on top and one at the side.

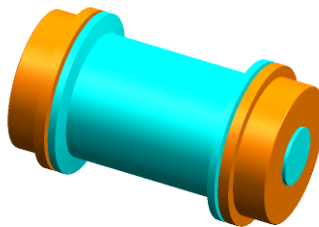


- Take out the gearing assembly (including ball bearings) and the motor belt and replace them. To be able to remove the ball bearings it's necessary to remove the bearing fixing screws.



gearing assembly

- Take out the idler pulley, remove the old ball bearings and replace them for new ones.



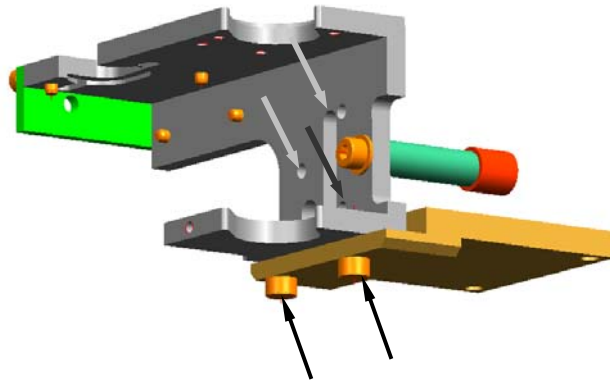
idler pulleyX-axis

6. Assemble all components in the reverse order.



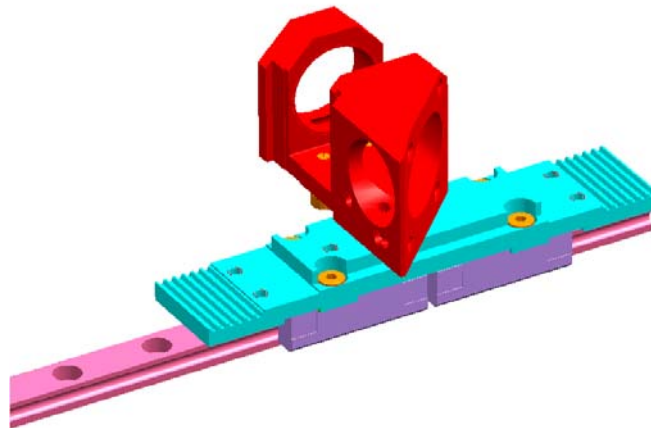
After a very long time of use also the THK guides must be replaced:

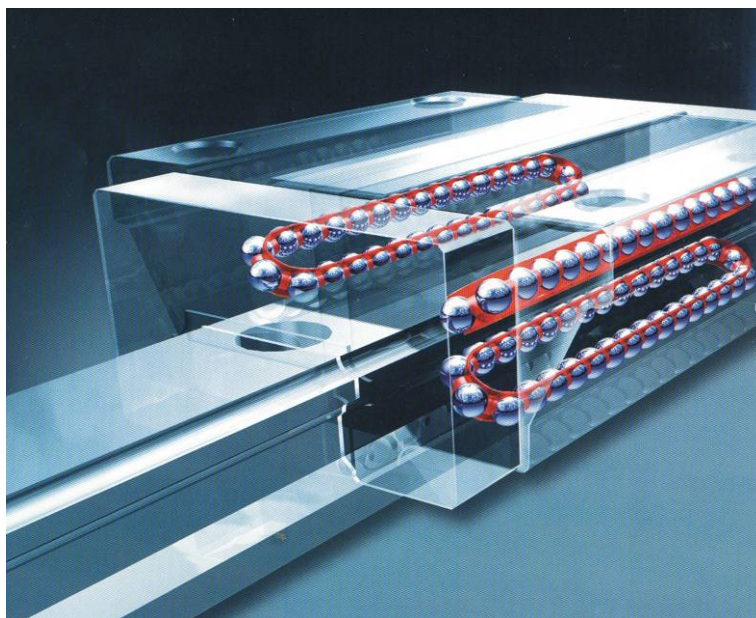
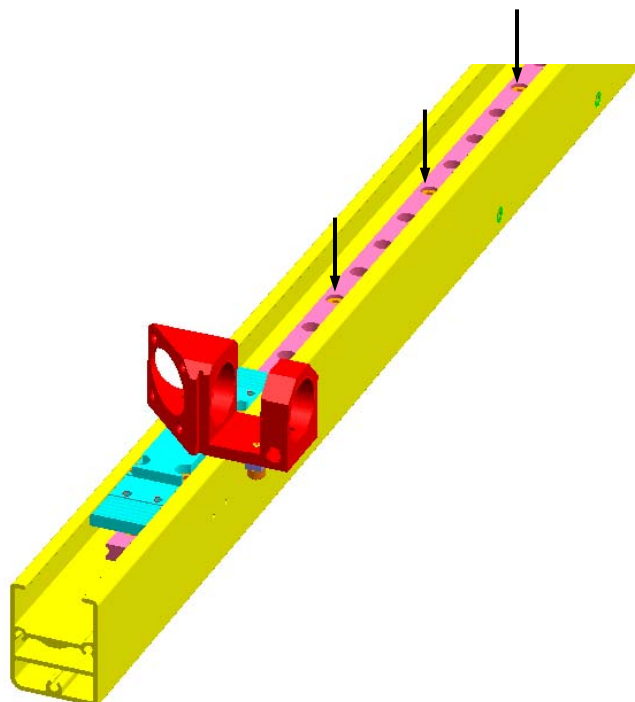
-Remove the motor carriage



X motor carriage fixing screws

- Remove all screws that fix the THK and slide it to the left
- Replace it and assemble the components in the reverse order





THK functionality

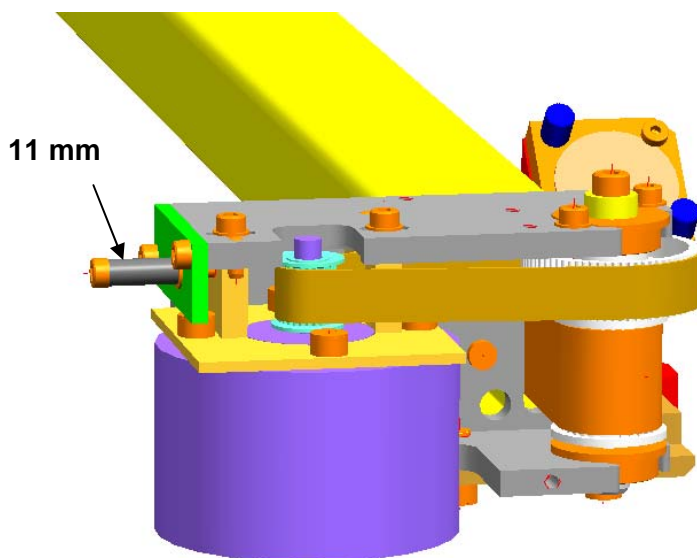


7.4 Special instructions for X-belt tensioning

Correct belt tensioning is very important for

- obtaining good engraving results (Are the belts too loose quality of engravings can be poor)
- life expectancy of mechanical parts (Is belt tensioning too high, mechanics like ball bearings, belts, gears, will wear out quickly)

1. Disconnect the laser from mains.
2. Open the maintenance access panel and the service access panel.
3. Check tensioning of x-gearing belt (small golden belt on the left side of x-axis) by measuring the spring length of the TENSIONING BOLT
Spring length should be **11 mm**.
In case the spring length is incorrect proceed with the following steps:
 - Loosen the MOTOR FIXING SCREWS (2 pcs.).
 - Bring the spring to it's correct length (the belt to the correct tension), by screwing the TENSIONING BOLT in or out.
 - Tighten the MOTOR FIXING SCREWS.
 - Check spring length again. If necessary repeat the tensioning process.

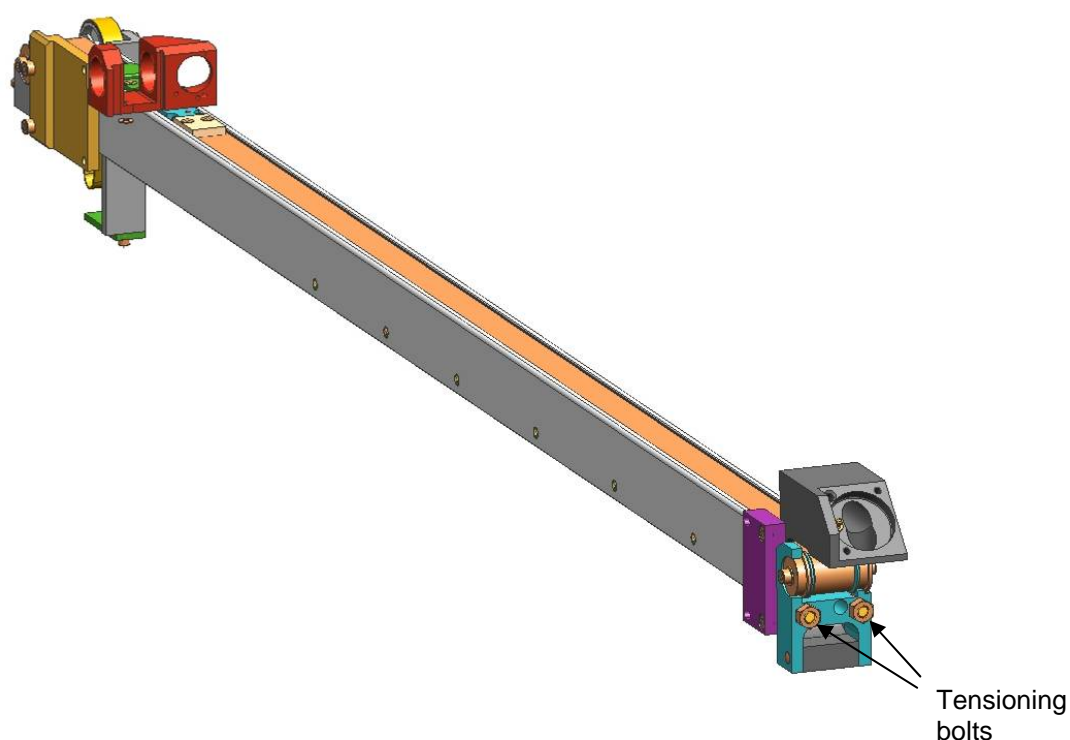


Adjusting the Hardware

4. Check tension of x-main belt (grey belt that drives the focusing head) – you should know how it has to feel or you need a dial indicator gauge.

In case the tension is incorrect proceed with the following steps:

- Screw the TENSIONING BOLTS in or out to achieve the right tension
- Check the tension again. If necessary repeat the tensioning process.

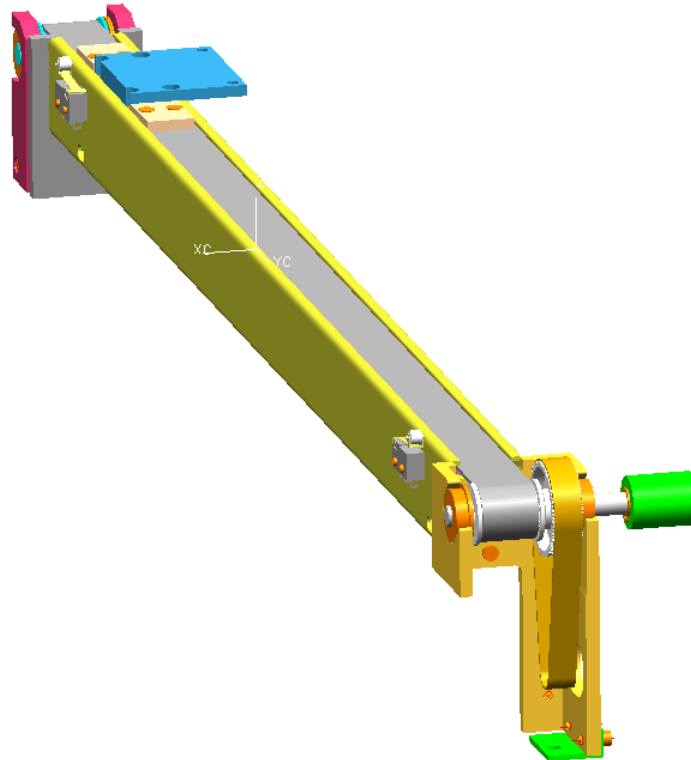


Tensioning of x-belts is finished. Replace all removed covers to the housing.



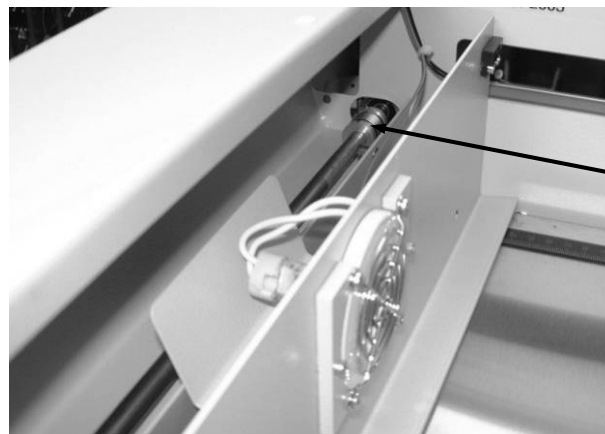
7.5 Servicing the Y axis left part

The left part of the Y axis is similar to the X axis. It contains also a THK guide, main belt, motor belt and motor.



Steps for servicing the Y-axis:

1. Open the flexible coupling (which is located behind the illumination panel)
 - Move the table to it's top position
 - Remove the illumination panel (three screws). Be careful not to damage the wiring of the interlock system and lights.

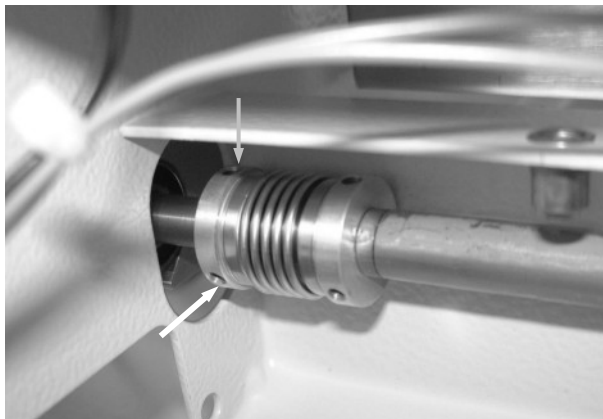


illumination panel



Adjusting the Hardware

- Open the two screws that are positioned 90° turned to each other, but only on the side closer to the Y axis motor.



fixing screws

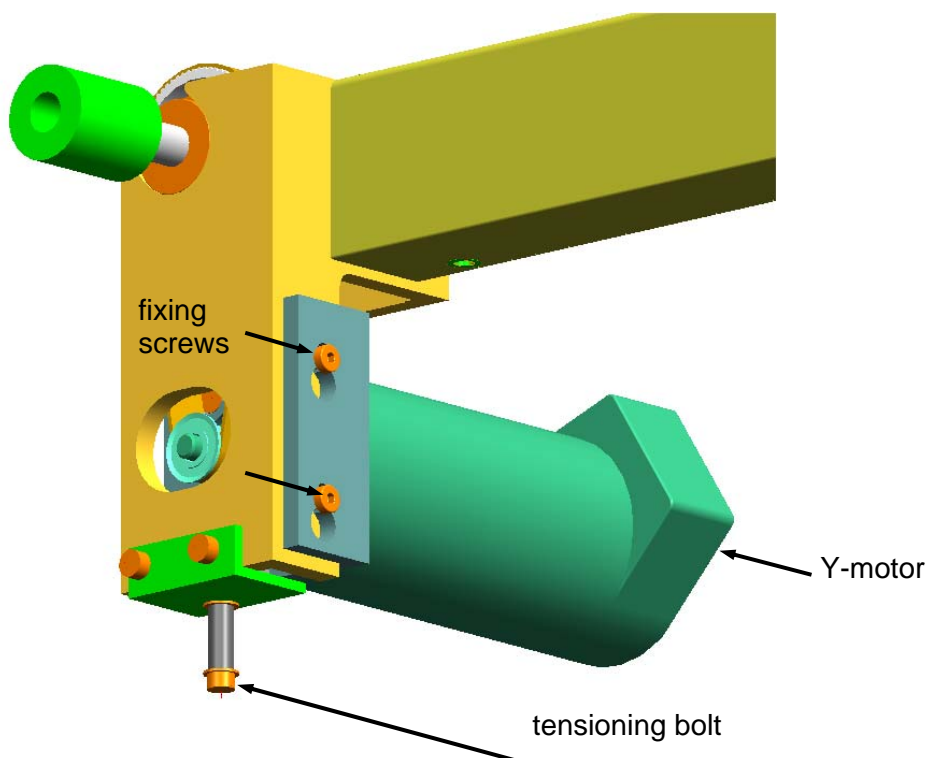
2. Take the left Y-axis out of the machine



fixing screws

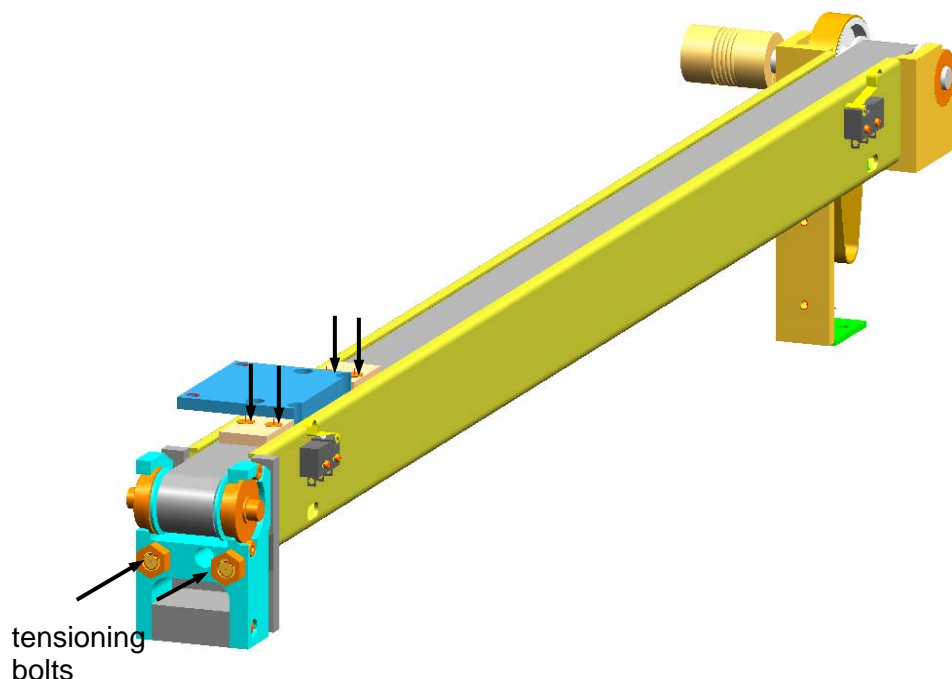
3. Dismantle the Y-motor

- Loosen the two motor fixing screws
- Take out the tensioning bolt
- Take out the motor



Adjusting the Hardware

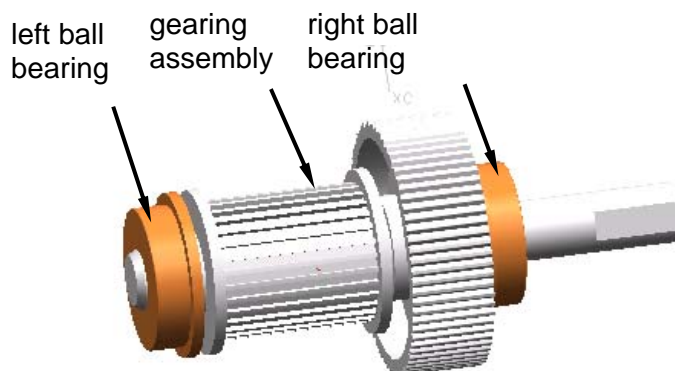
4. Check the main belt tension BEFORE releasing the belt and remember how it feels.
5. Release the main belt
 - Remove the tensioning bolts
 - Remove the four screws and the belt grips on the front and the back of the X axis carriage (This step is identical to the X-axis).



6. Replace the main belt
 - Connect the new belt to the old one. Pull out the old belt (and at the same time pull in the new belt)
7. Replace the ball bearings, the Y-gearing assembly and the motor belt

There are ball bearings on the front and on the back of the Y axis.
One each on the upper and lower end of the Y-gearing assembly and two on the main belt idler pulley.

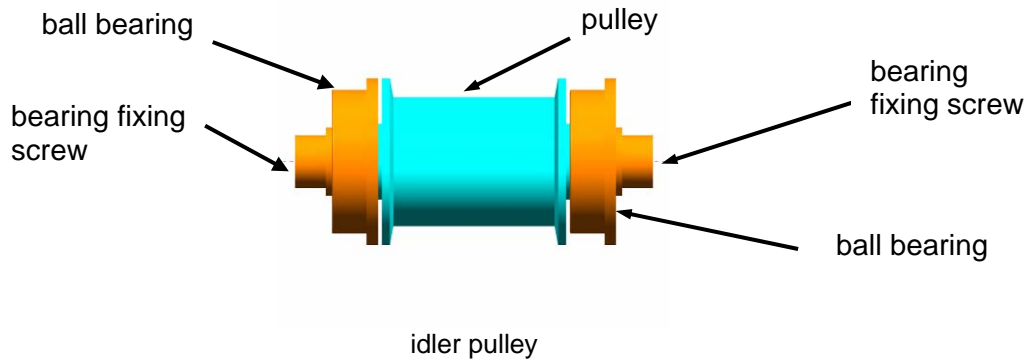
 - Take out the gearing assembly (including ball bearings) and the motor belt and replace it.



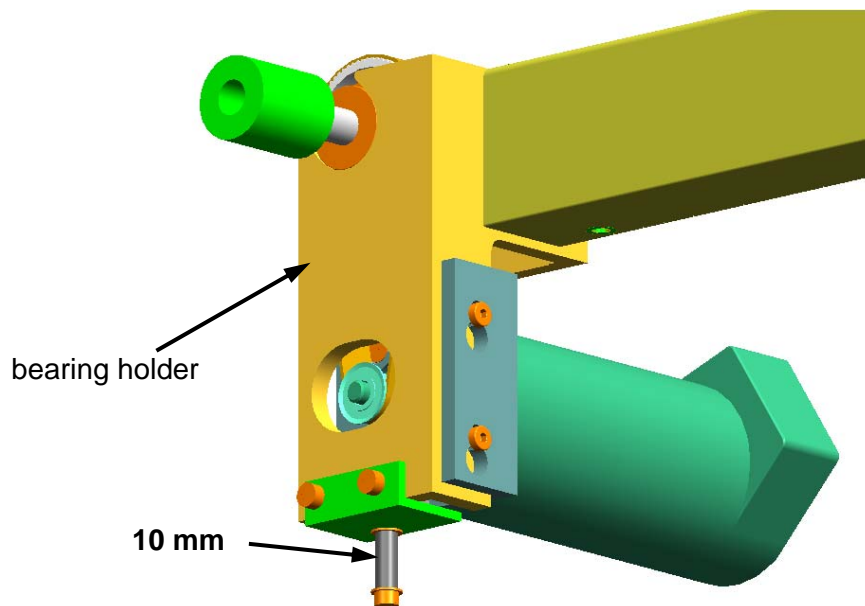
replace gearing assembly



- Take out the idler pulley, remove the old ball bearings and replace them for new ones.



8. Assemble all components in the reverse order. Tension the belts so that you have a distance of 10 mm spring length at the motor belt. The main belt has to have the same tension as before releasing it.



After a very long time of use also the THK guides must be replaced. This is done between step 5 and 6 and is similar to the X axis:

- Remove the bearing holder and carriage stopper.
- Remove all screws that fix the THK and slide it to the front
- Replace it and assemble the components in the reverse order

Please refer also to „servicing the X axis“ for analogies.

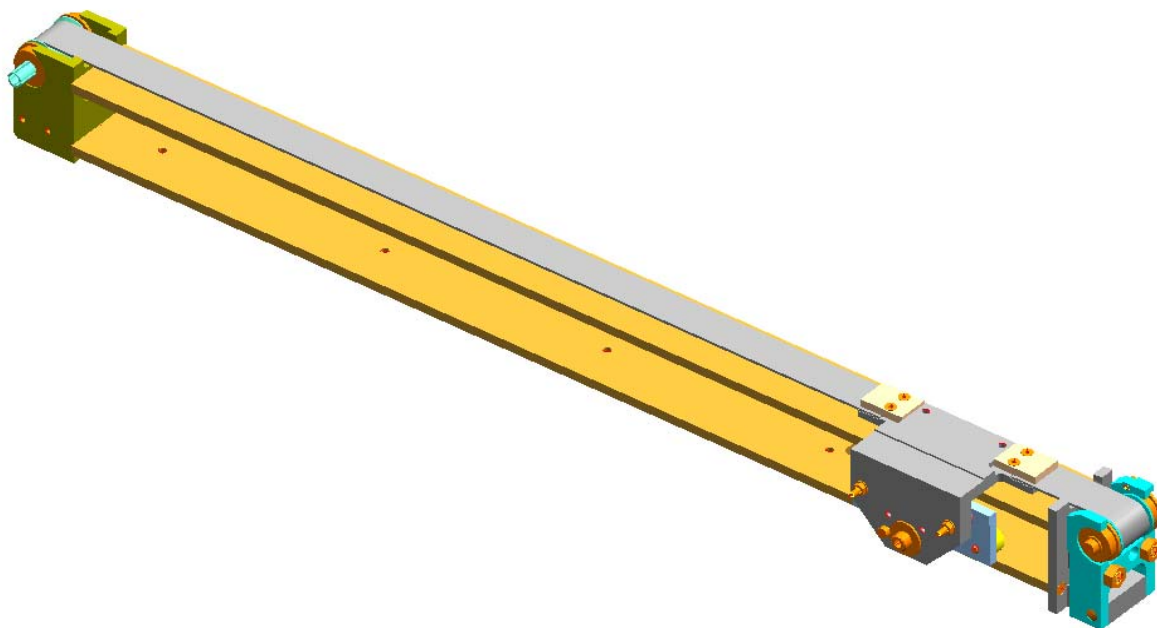


7.6 Servicing the Y axis right part

The right part of the Y axis is a construction that you will find only in Trotec machines. It does not use a THK guide, but a system of wheels to make sure that even heat expansion of the X axis does not cause mechanical stress.

The construction makes also sure that all three bearings are in contact with the guide rail at any time.

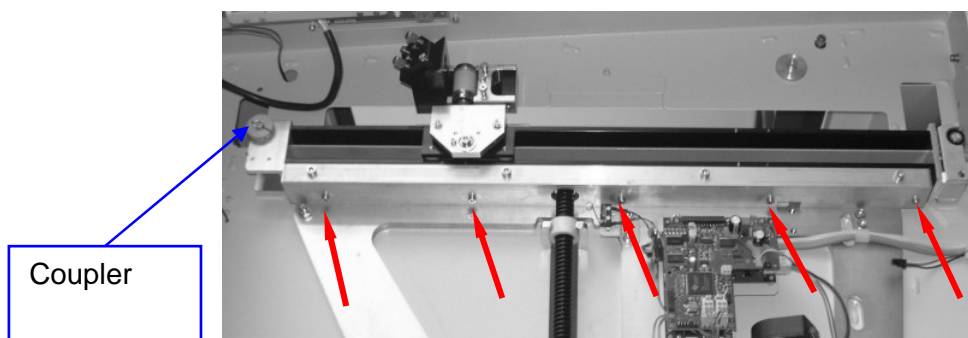
To reach that a spring loaded bearing which presses against the rail is used.



right Y axis

Steps for servicing the Y-axis:

1. Take the X-axis out of the machine (please refer to the chapter: Servicing the X axis)
2. Open the drive shaft connector
3. Take the right Y-axis out of the machine
 - There are five screws that fix it from the lower side to the aluminium profile

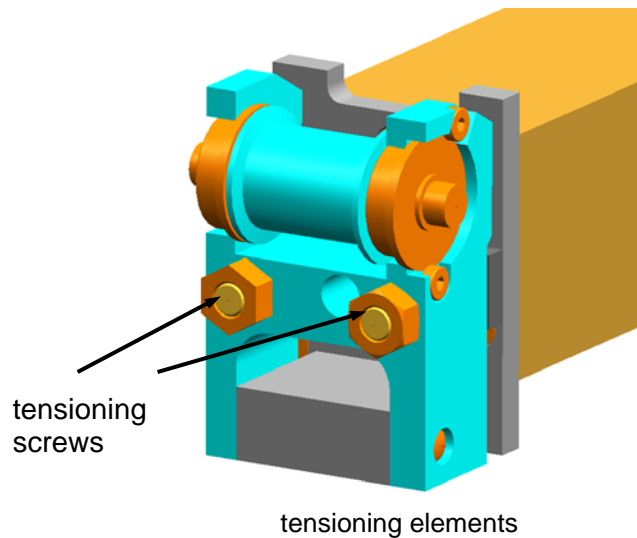


Coupler

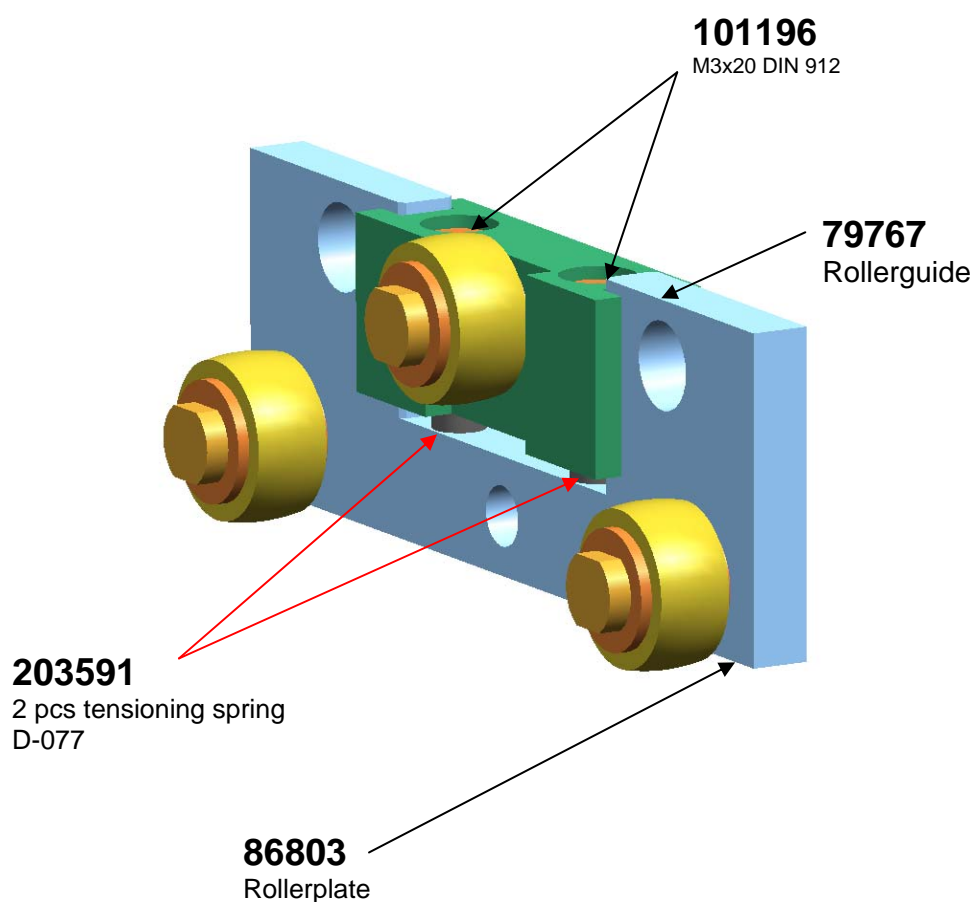
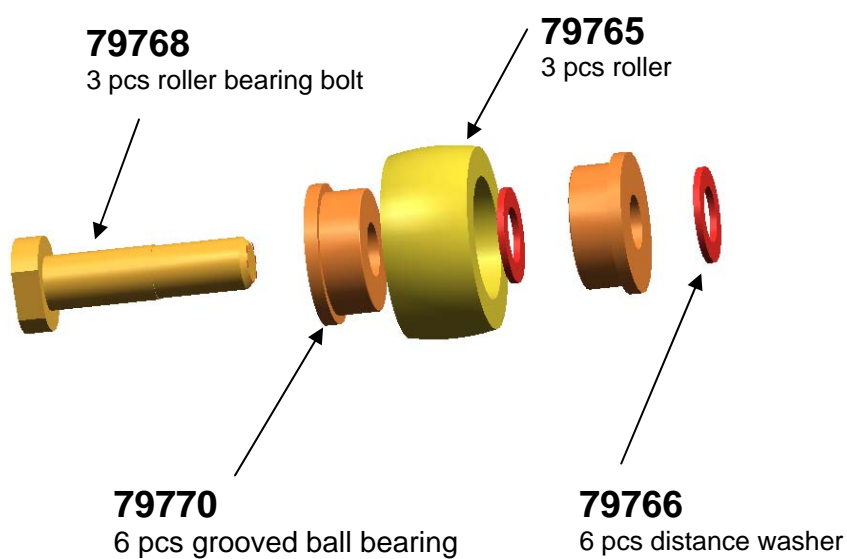
fixing screws of the Y-axis

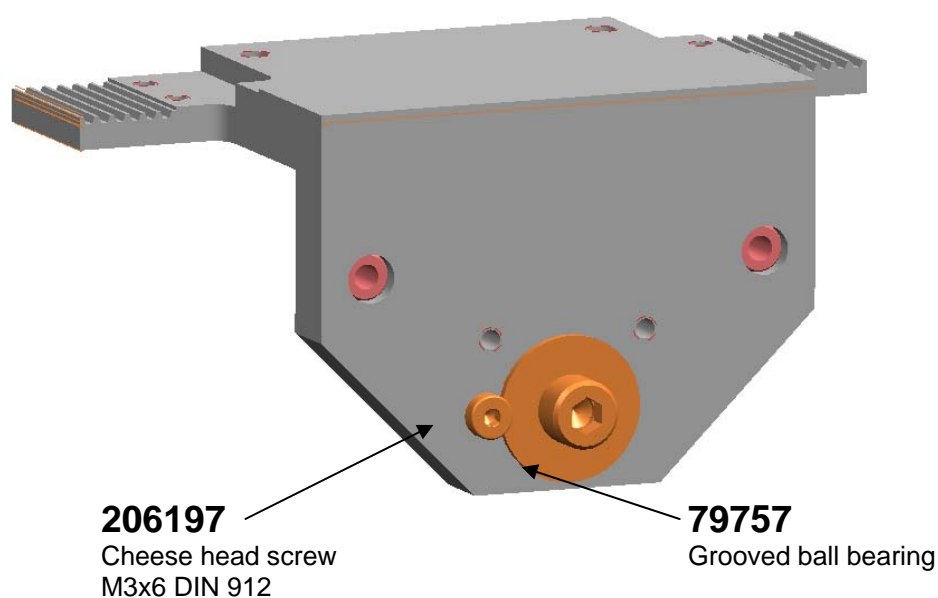
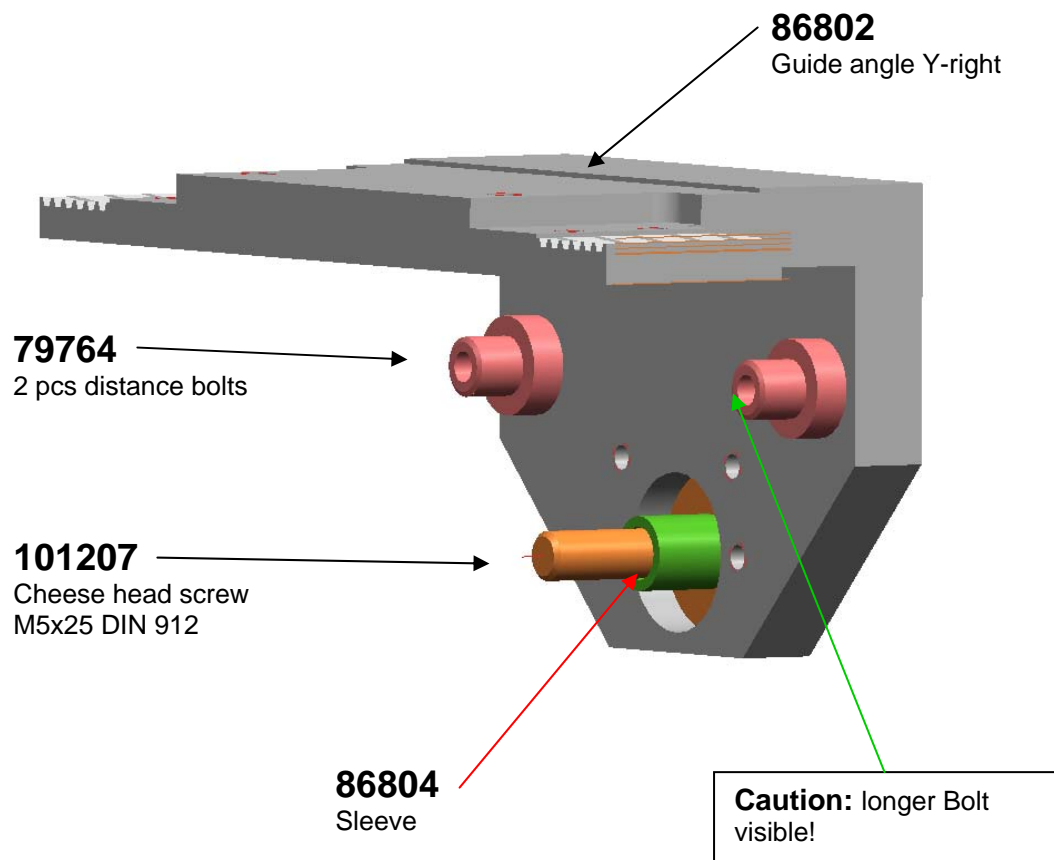


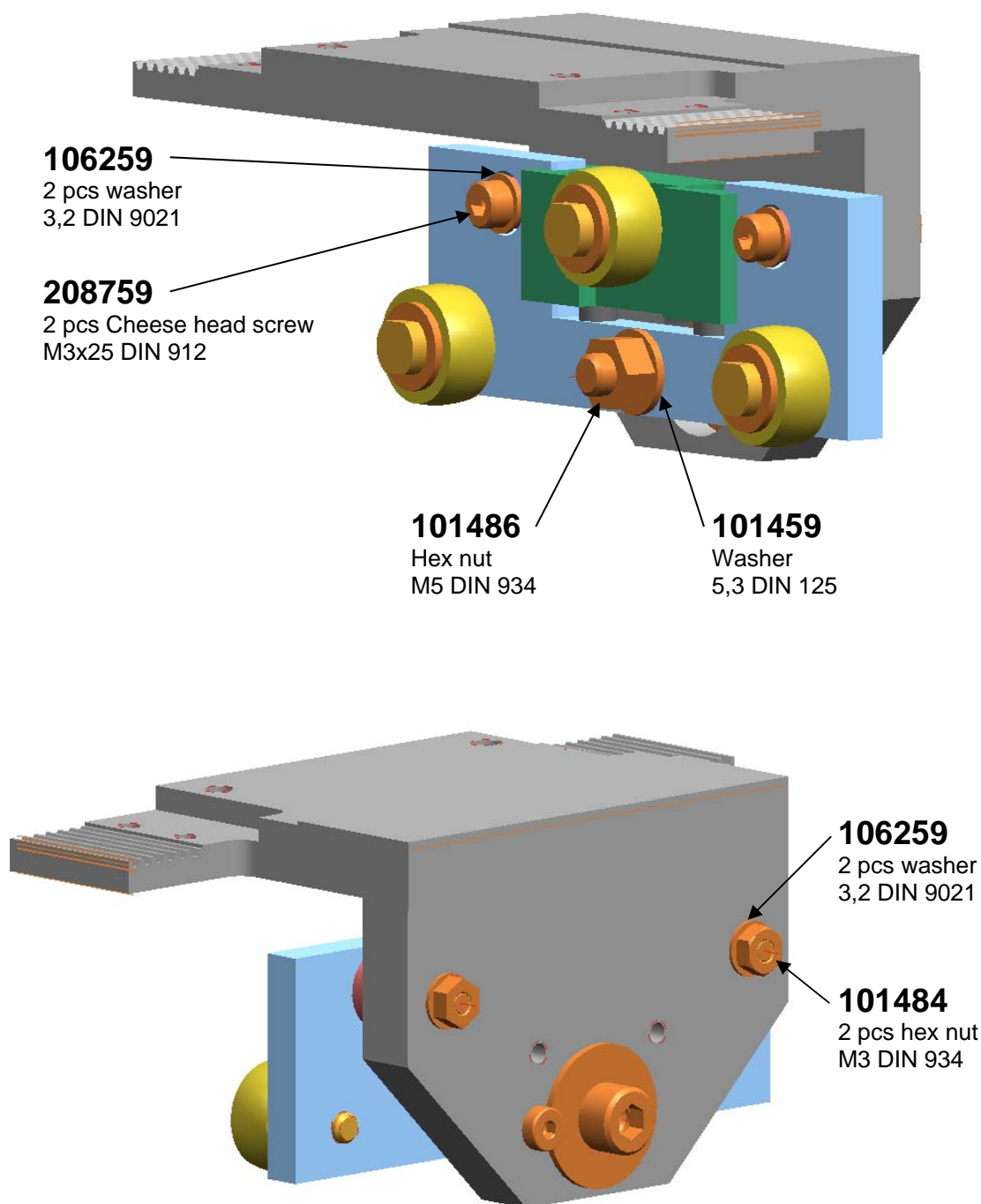
4. Check the main belt tension BEFORE releasing the belt and remember how it feels.
5. Release the main belt
 - Remove the tensioning screws



- Remove the four screws and the belt grips on the front and the back of the X axis carriage. Replace the Y-axis bearing assembly. (similar to Y axis left part)







6. Replace the main belt

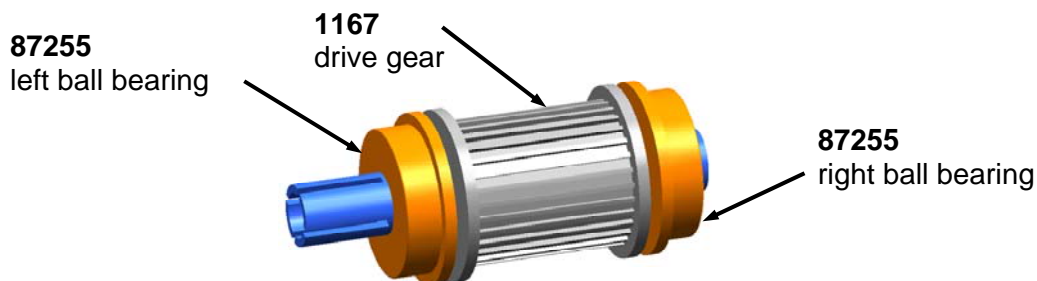
- Connect the new belt to the old one. Pull out the old belt (and at the same time pull in the new belt)



Adjusting the Hardware

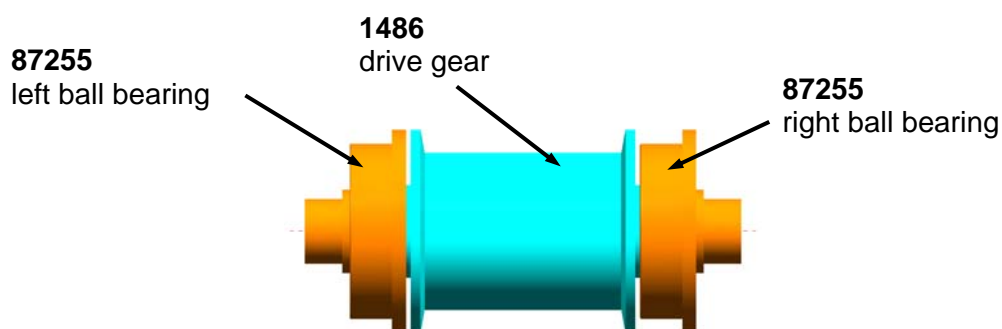
7. Replace the ball bearings, the Y axis drive gear and the motor belt.
There are ball bearings on the front and on the back of the Y axis.
Two on the drive gear and two on the main belt idler pulley.

- Take out the drive gear. Put in a new one and replace also the ball bearings



drive gear assembly

- Take out the idler pulley, remove the old ball bearings and replace them for new ones.



idler pulley assembly

8. Assemble all components in the reverse order. Tension the belts as they were before releasing them.





8 Electric system

The MACHINE is an advanced servo motor system, which contains the following electrical components:

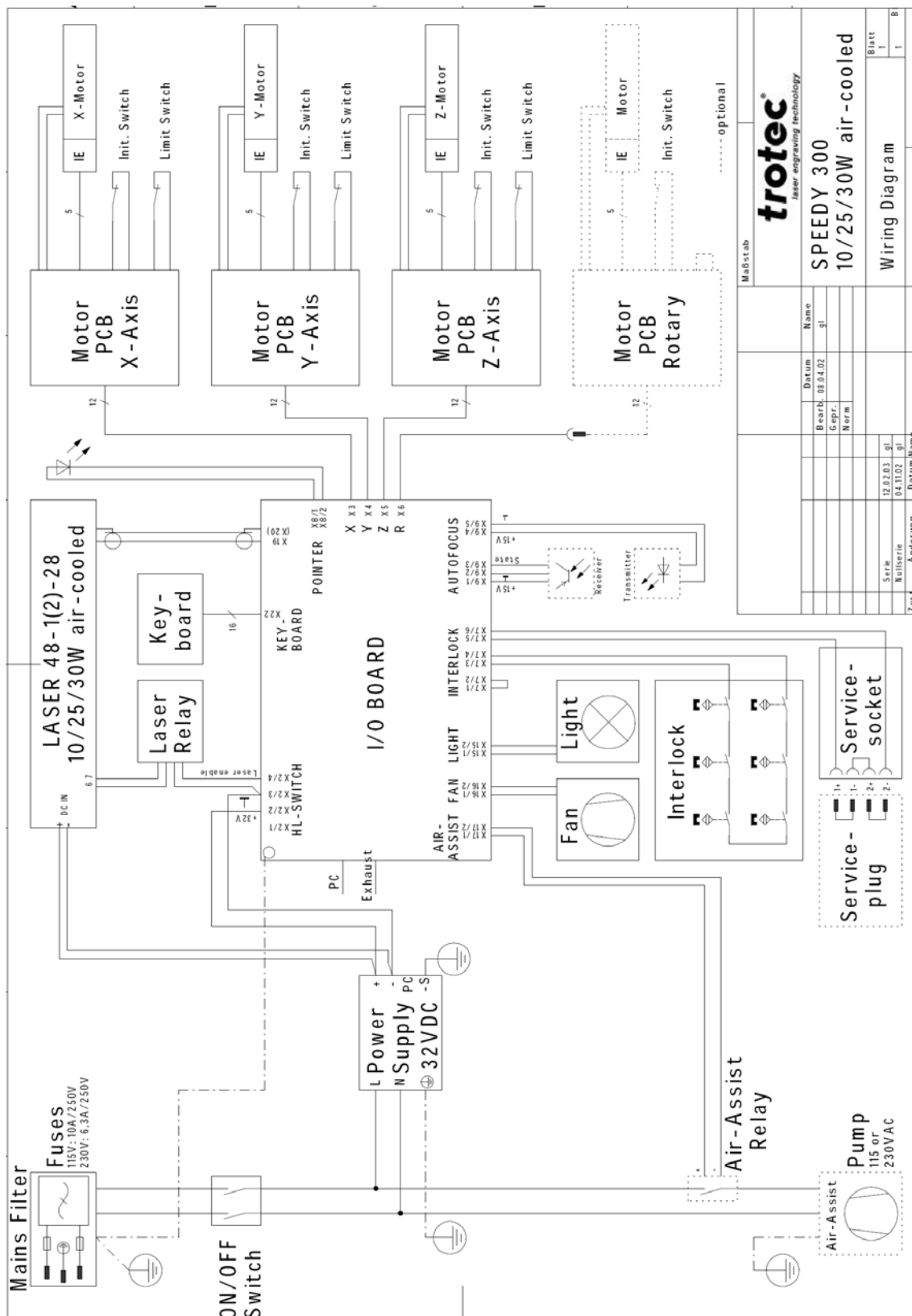
1. IO board
2. Print CPU
3. Print Motor
4. Power supply
5. Laser tube
6. Halogen lights
7. X axis motor
8. Y axis motor
9. Z axis motor
10. Keypad
11. Cooling fans
12. Air compressor (optional)
13. Laser pointer
14. Cables

For checking the system we recommend to use an electronic multimeter (Voltage check, Ohmmeter)

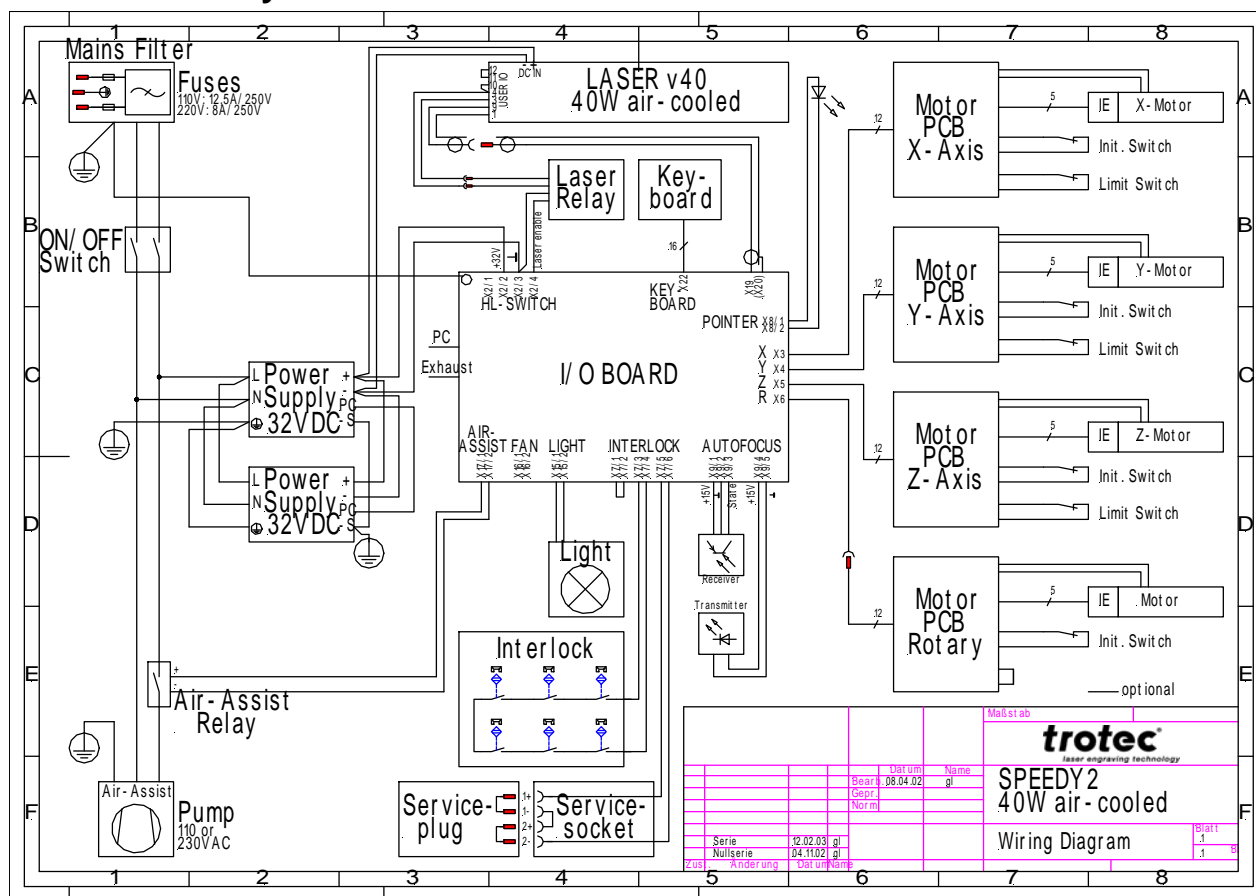


8.1 Block wiring diagrams

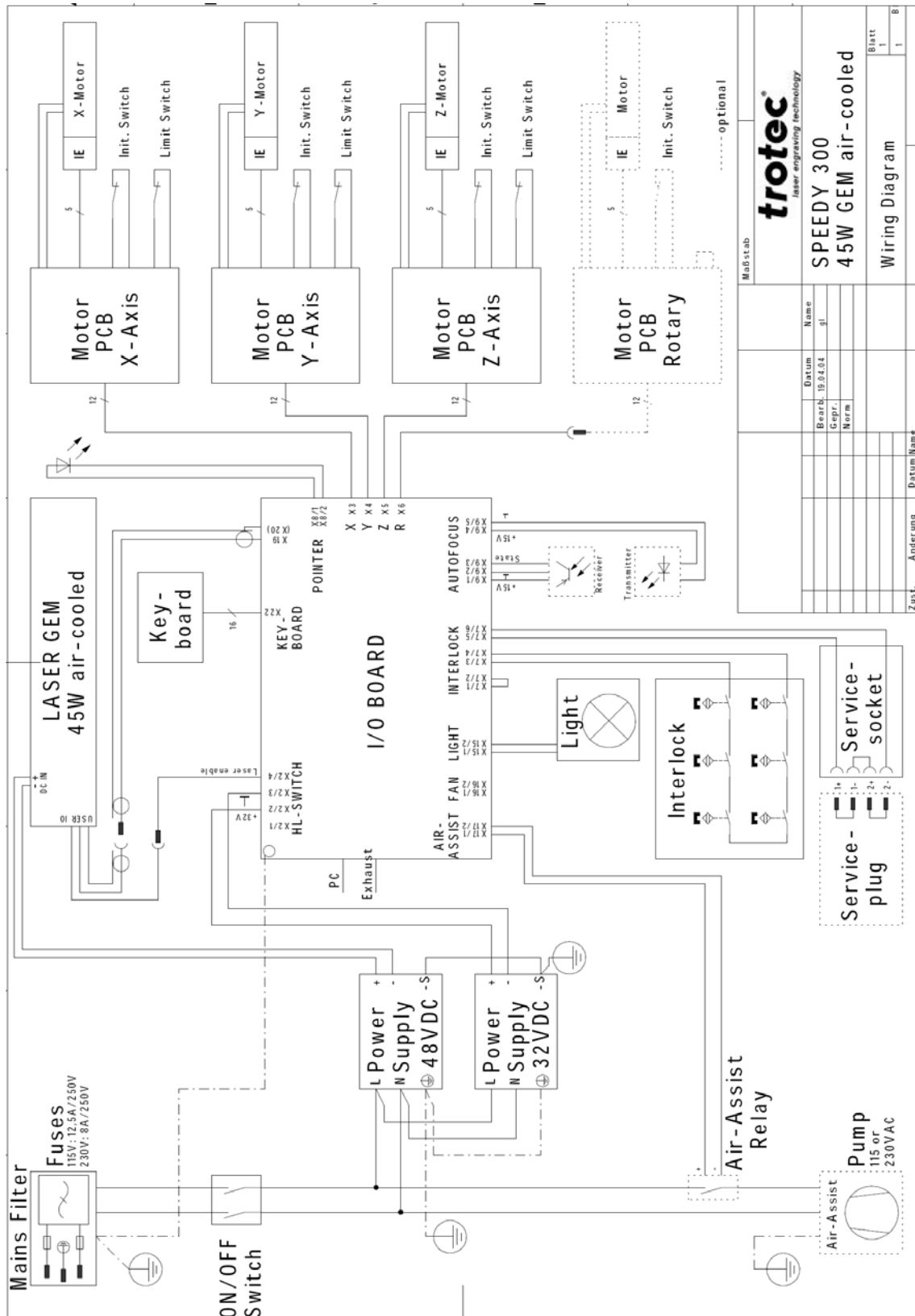
8.1.1 10W - 30W



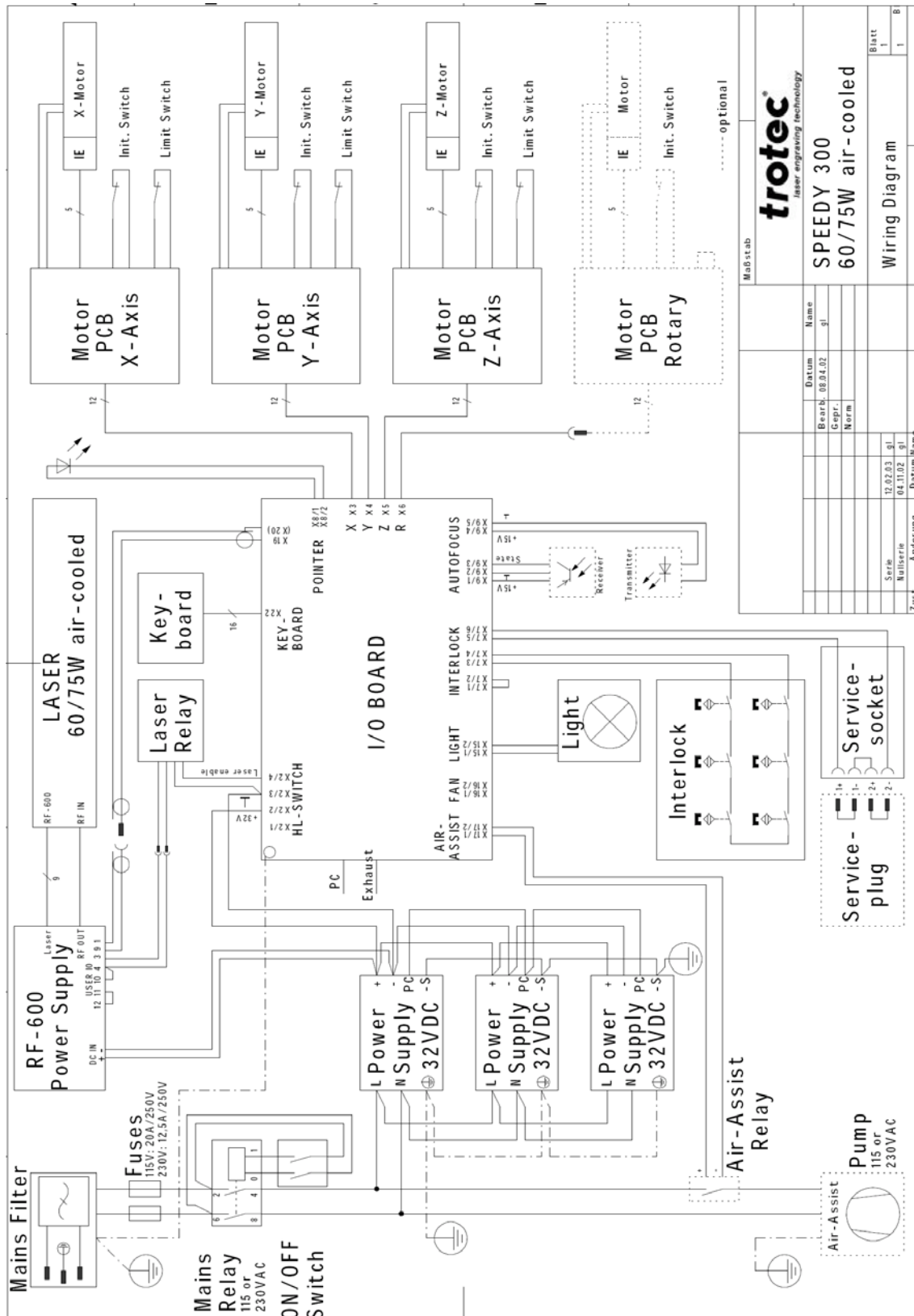
8.1.2 40/45W Synrad



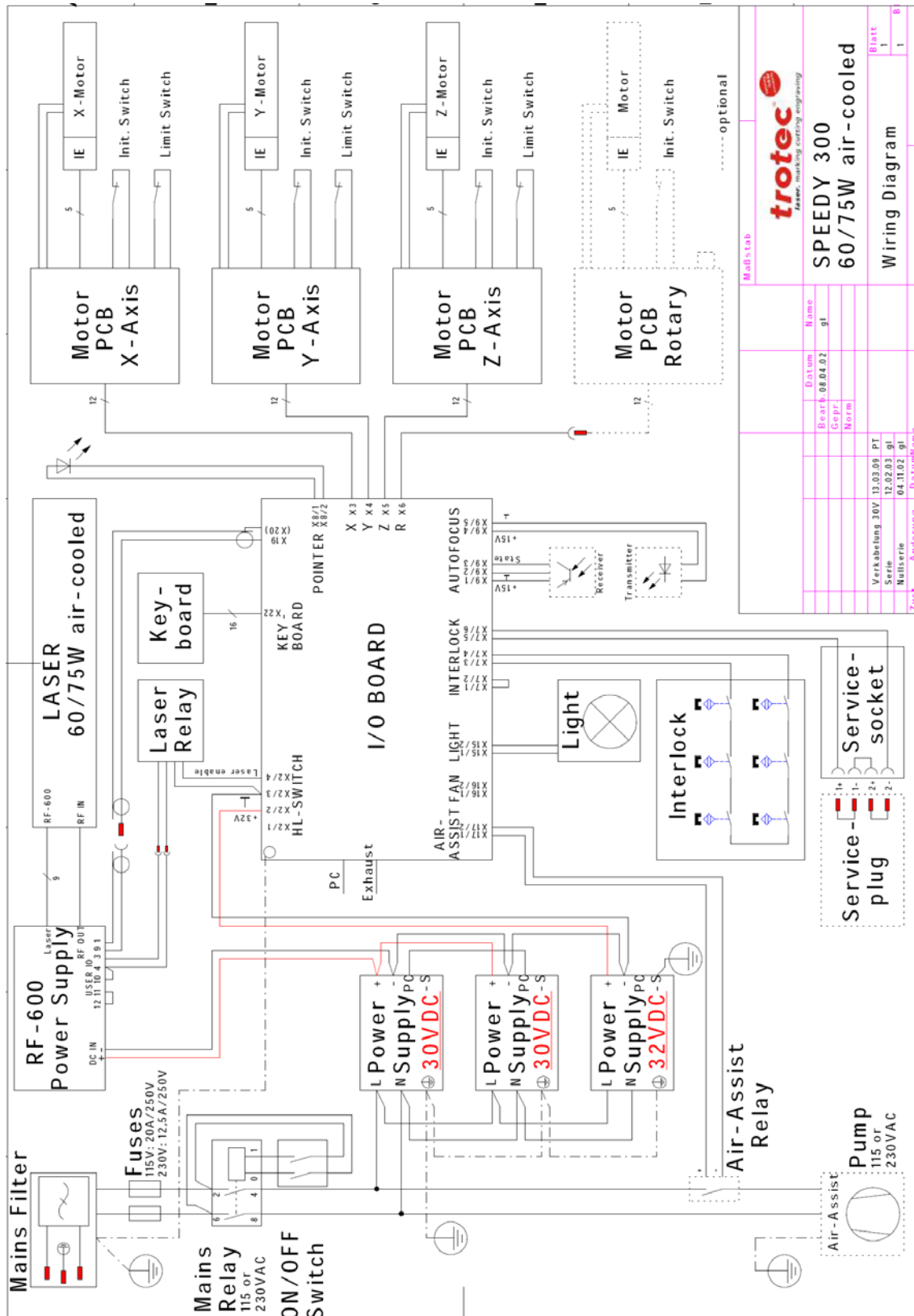
8.1.3 40/45W Coherent



8.1.4 60W – 75W air cooled up to S3-1537

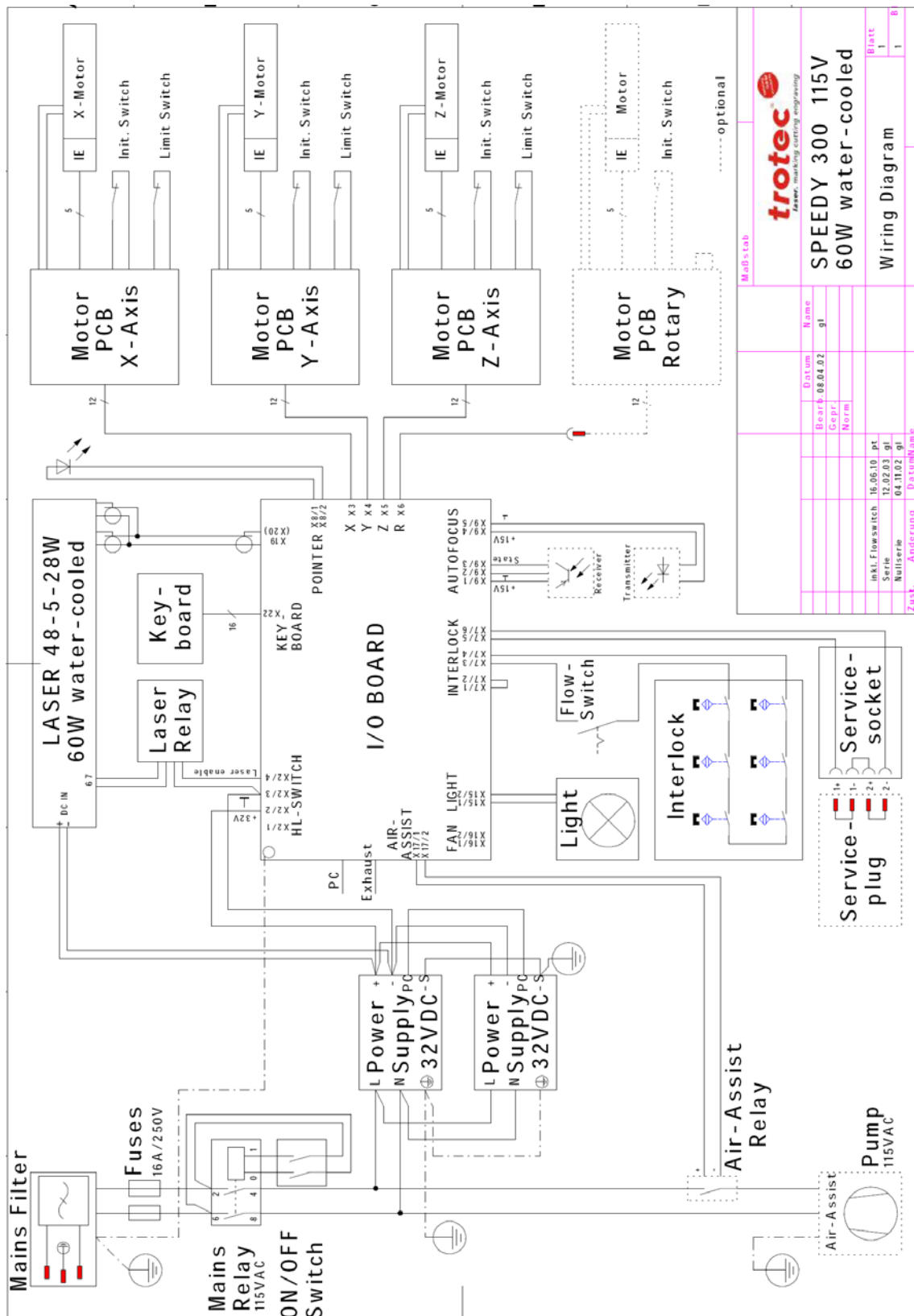


8.1.5 60W – 75W air cooled S3-1538 ongoing



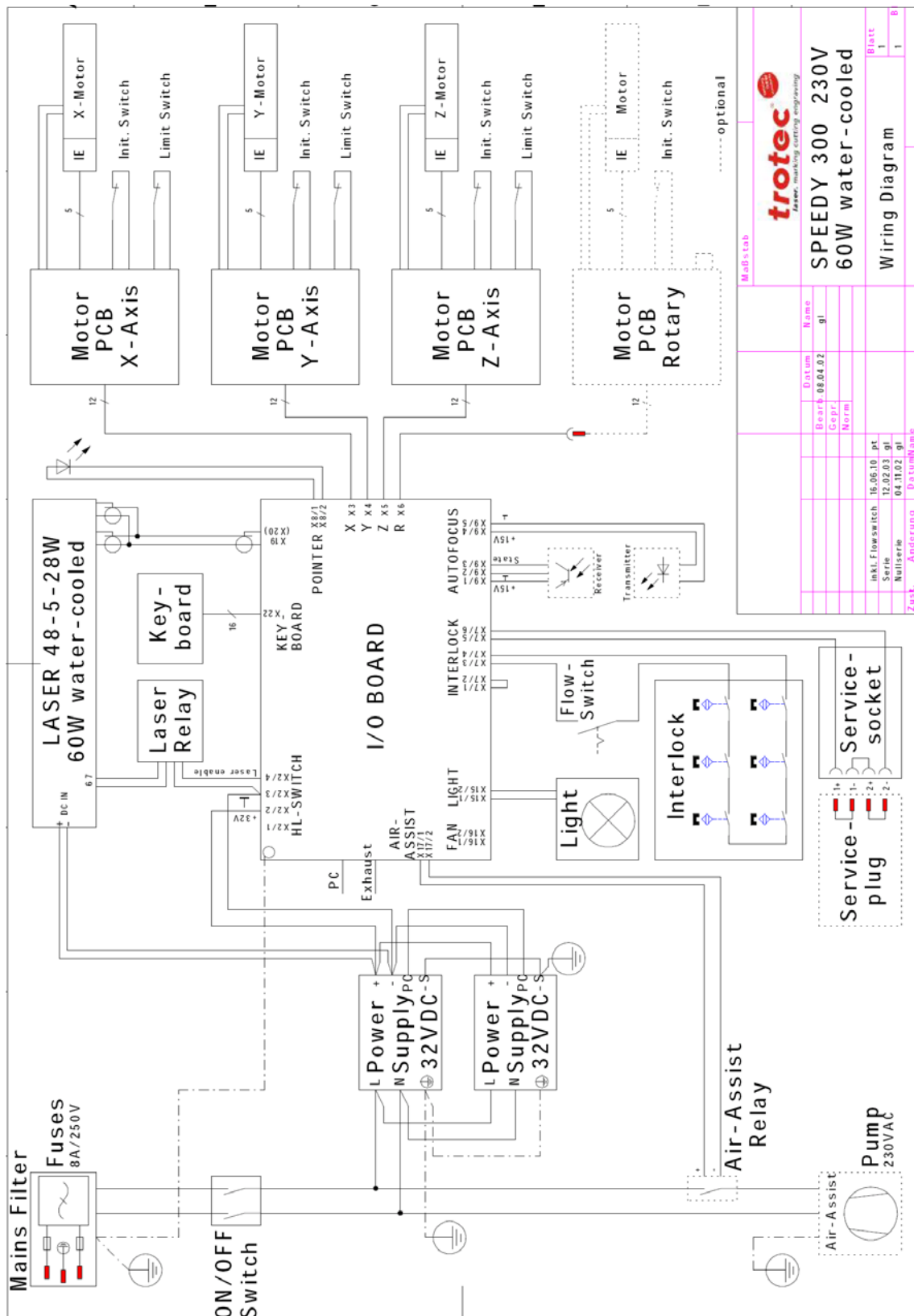
8.1.6 60W water cooled 110V

Machines before S3-1822 are delivered without flowswitch.

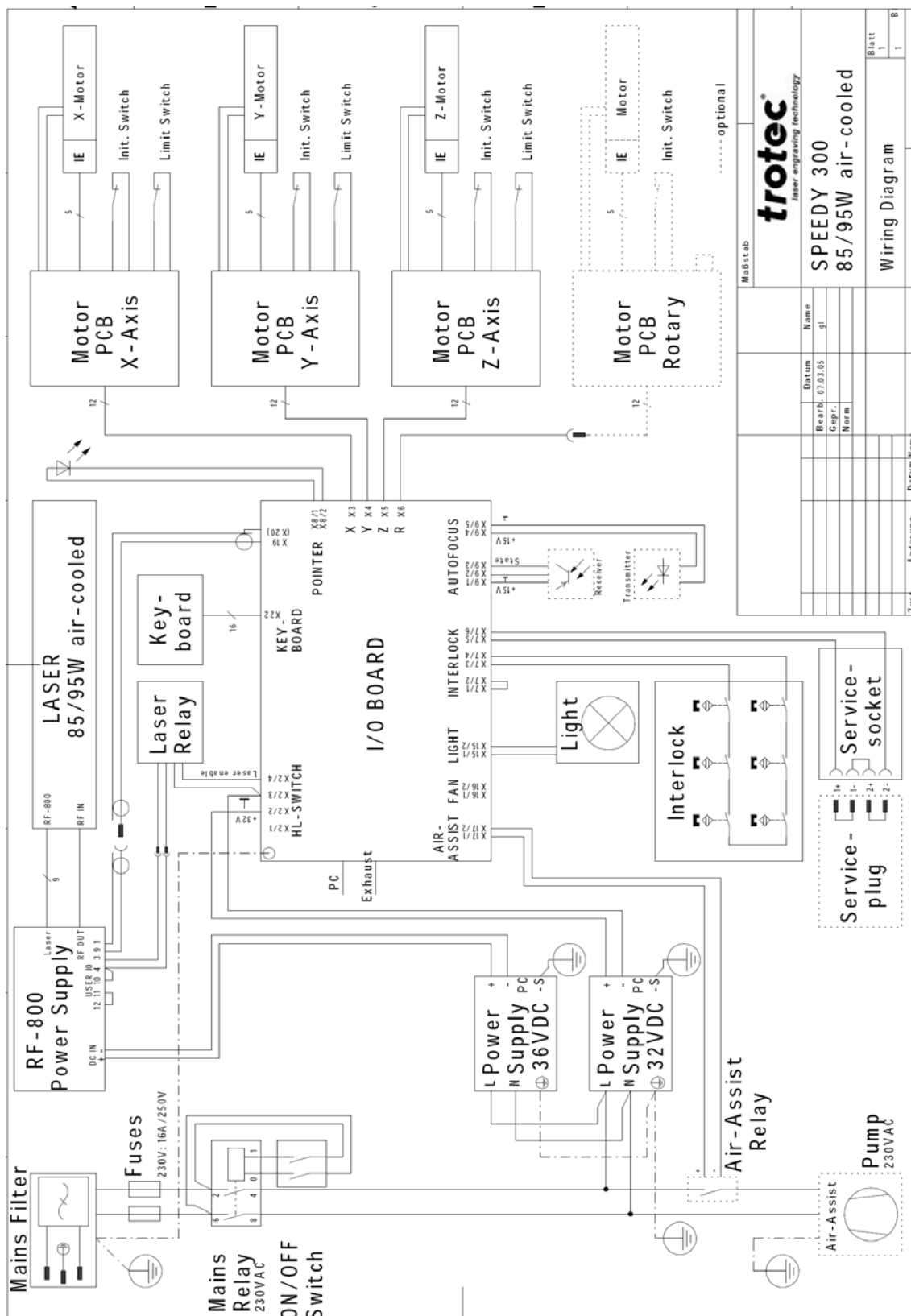


8.1.7 60W water cooled 230V

Machines before S3-1822 are delivered without flowswitch.

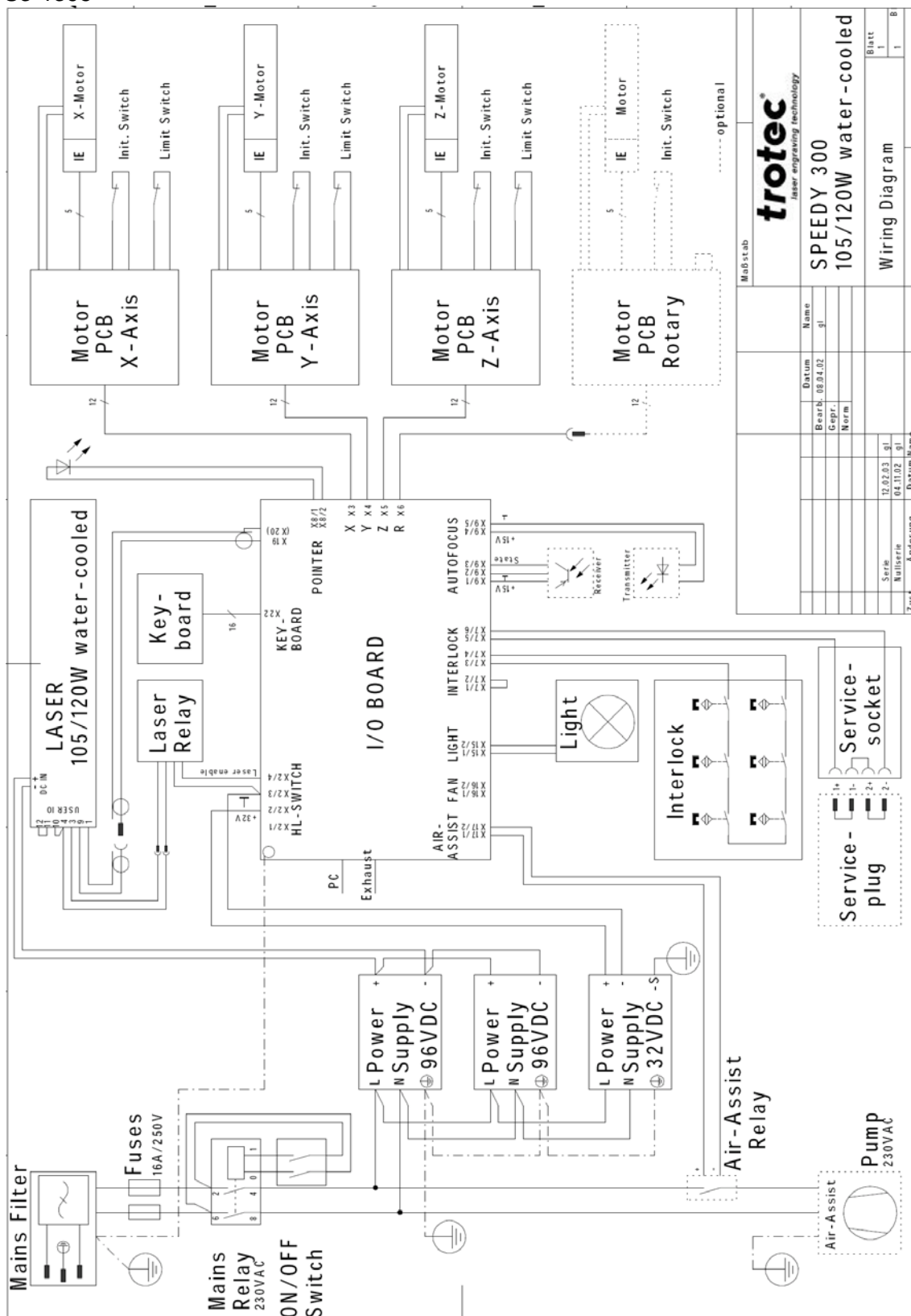


8.1.8 85W – 95W air cooled



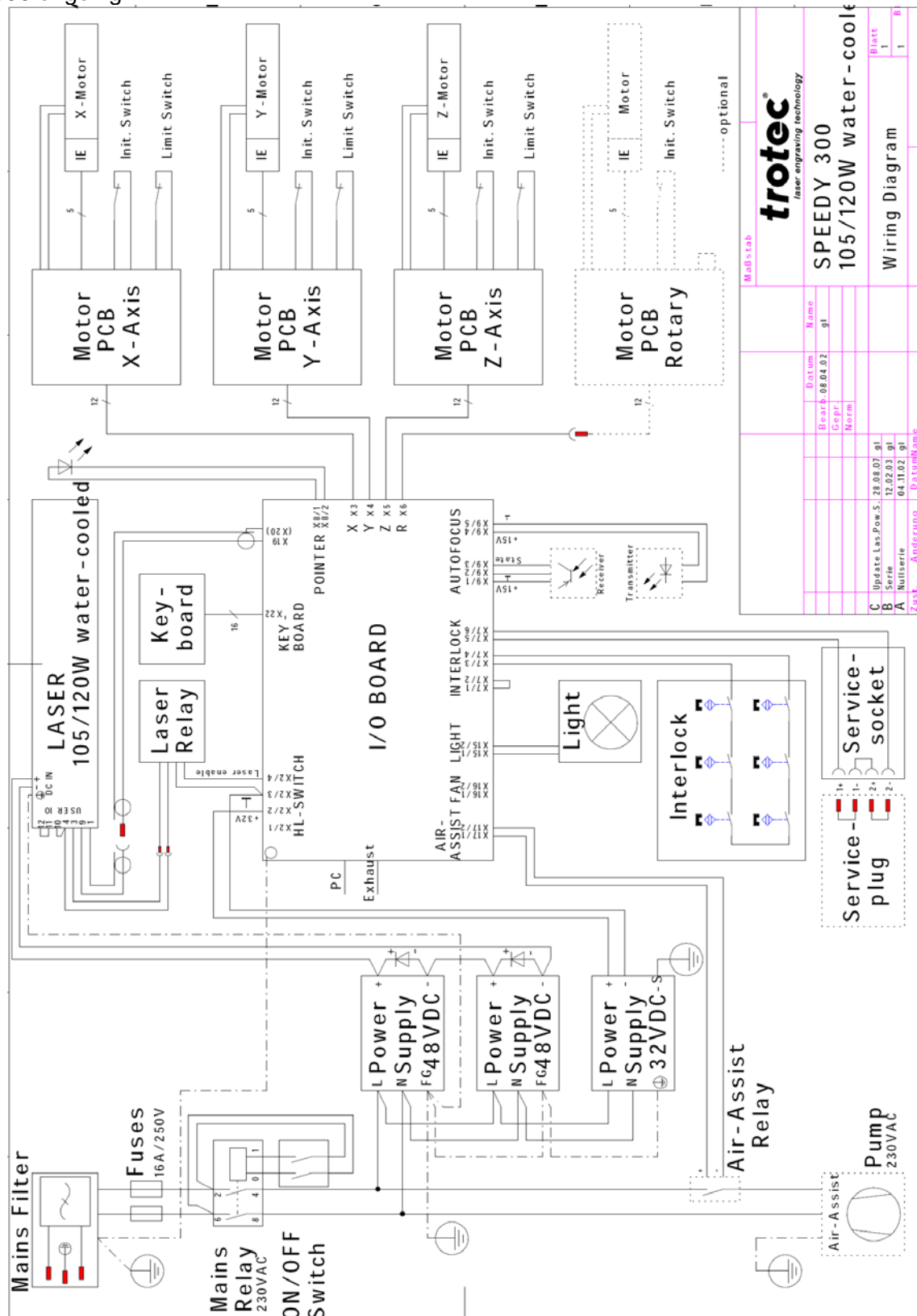
8.1.9 105W – 120W water cooled 96VDC

Up to S3-1395

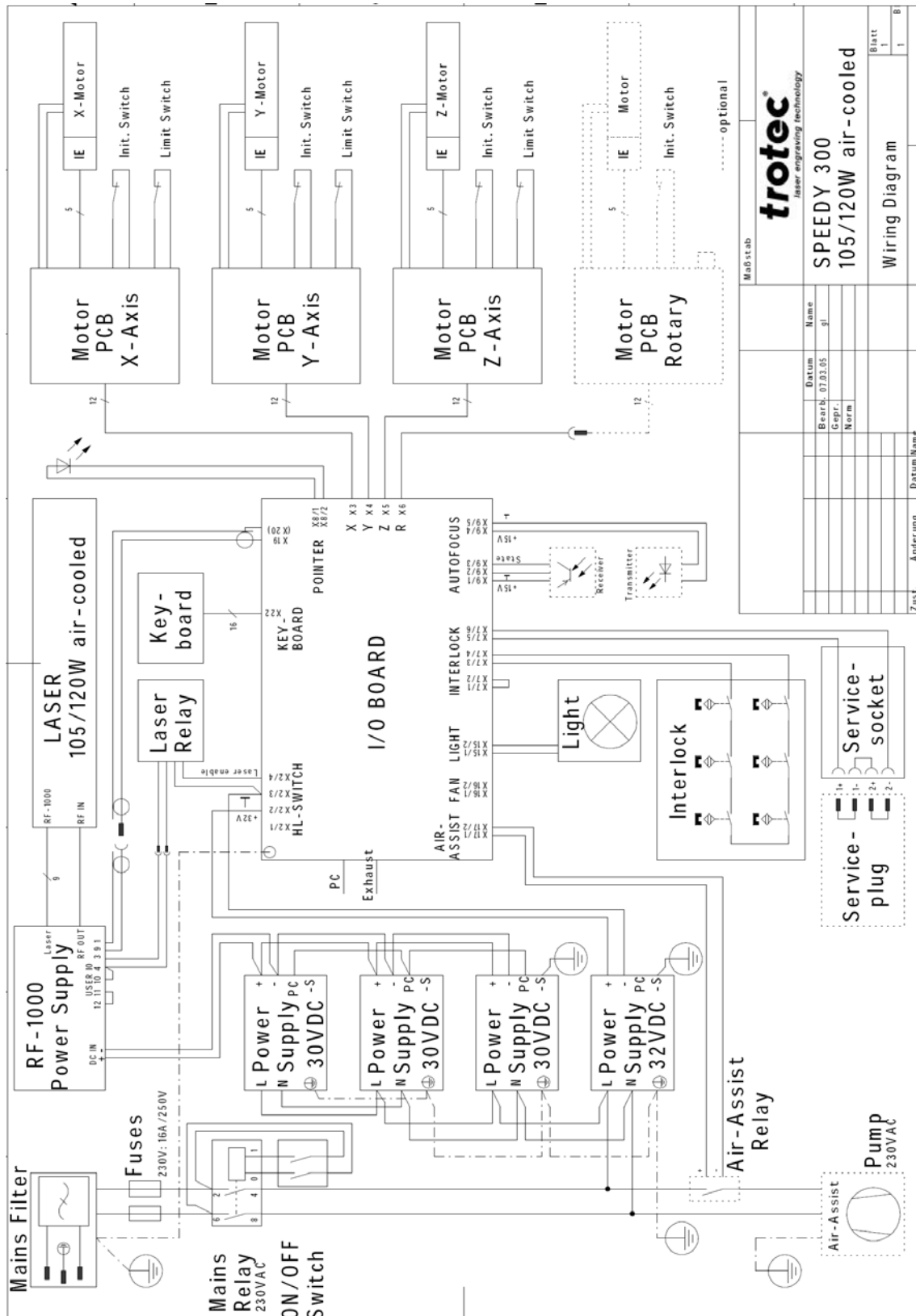


8.1.10 105W – 120W water cooled 48VDC

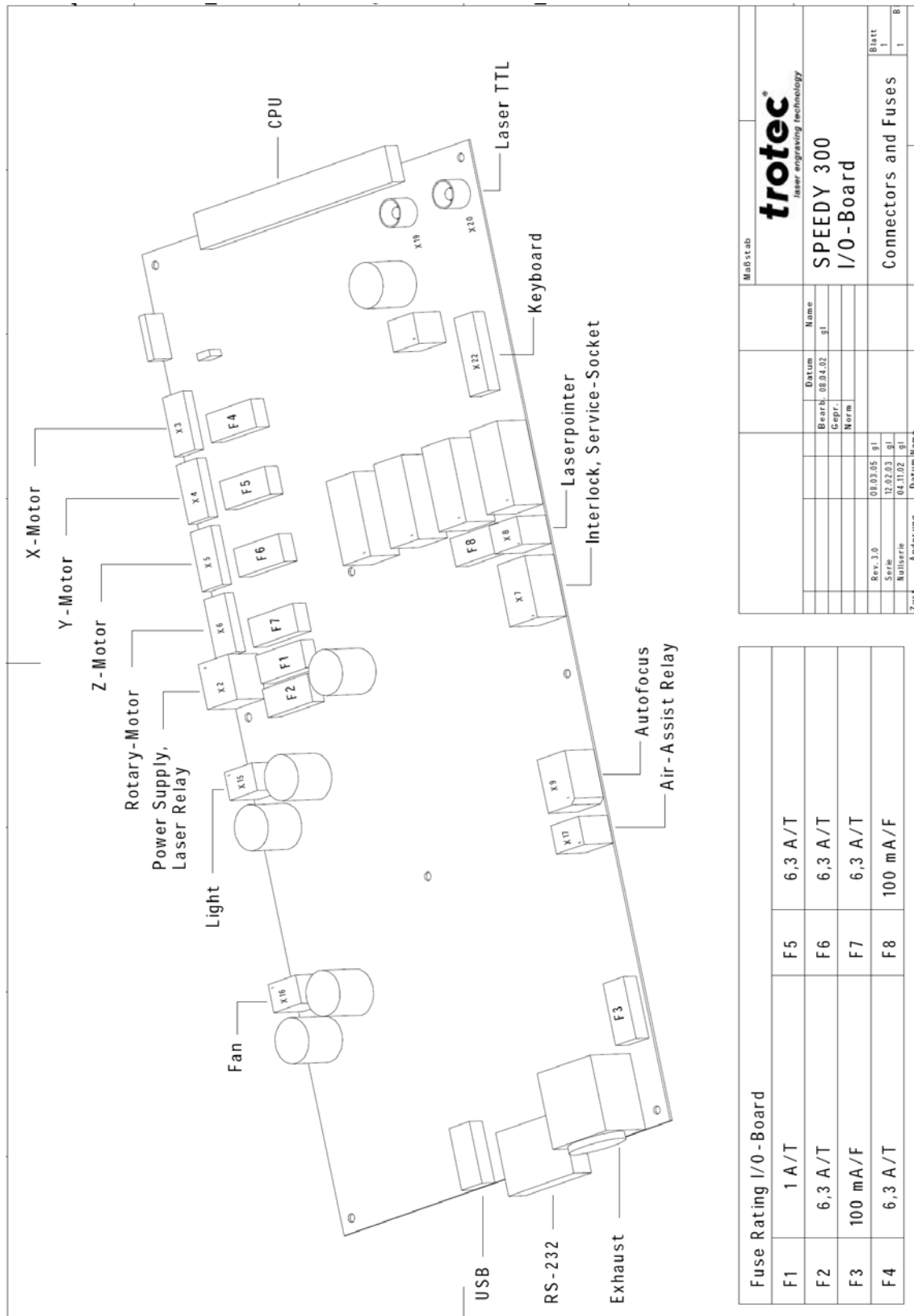
S3-1396 ongoing



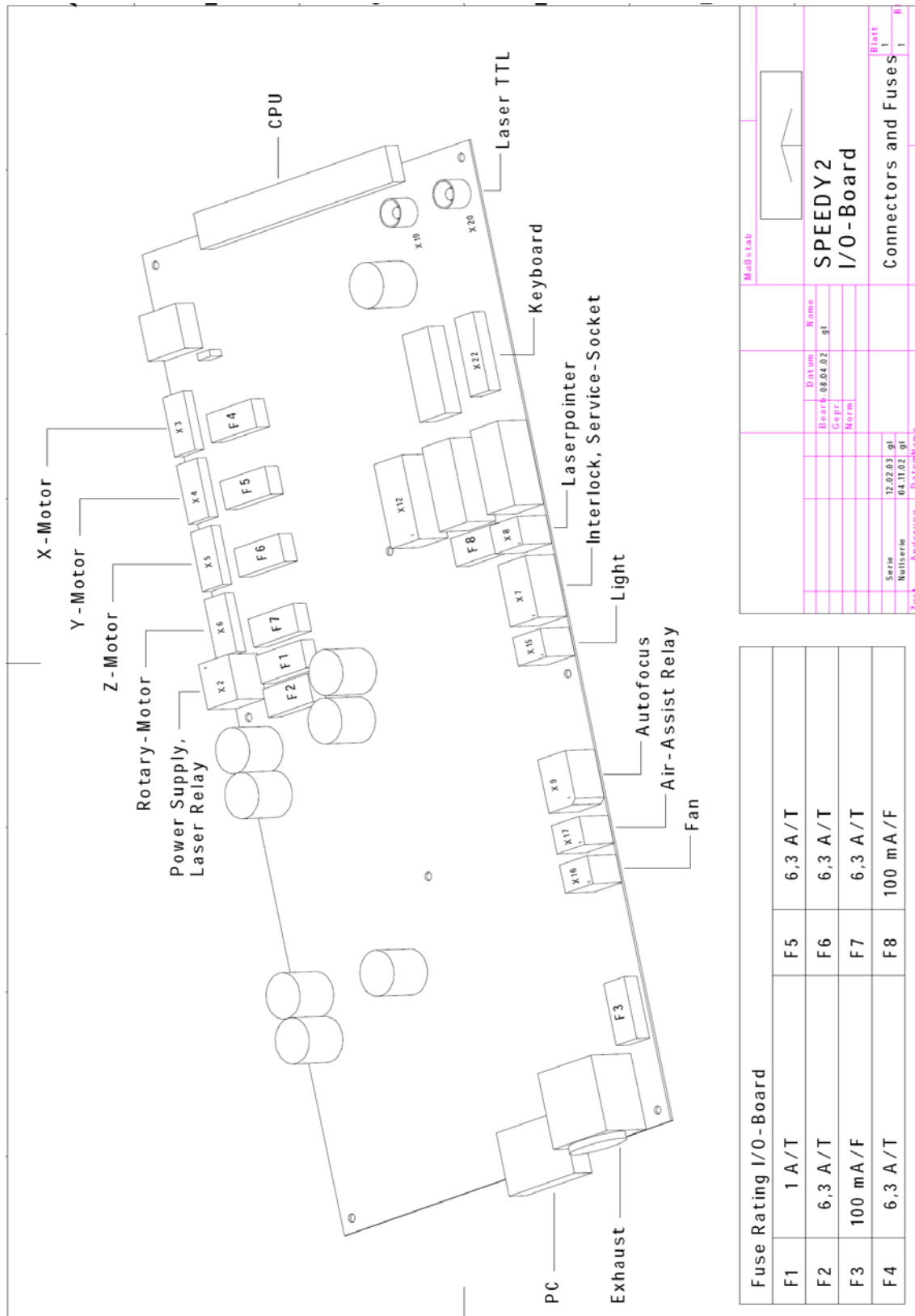
8.1.11 105W – 120W air cooled



8.1.12 I/O Print new

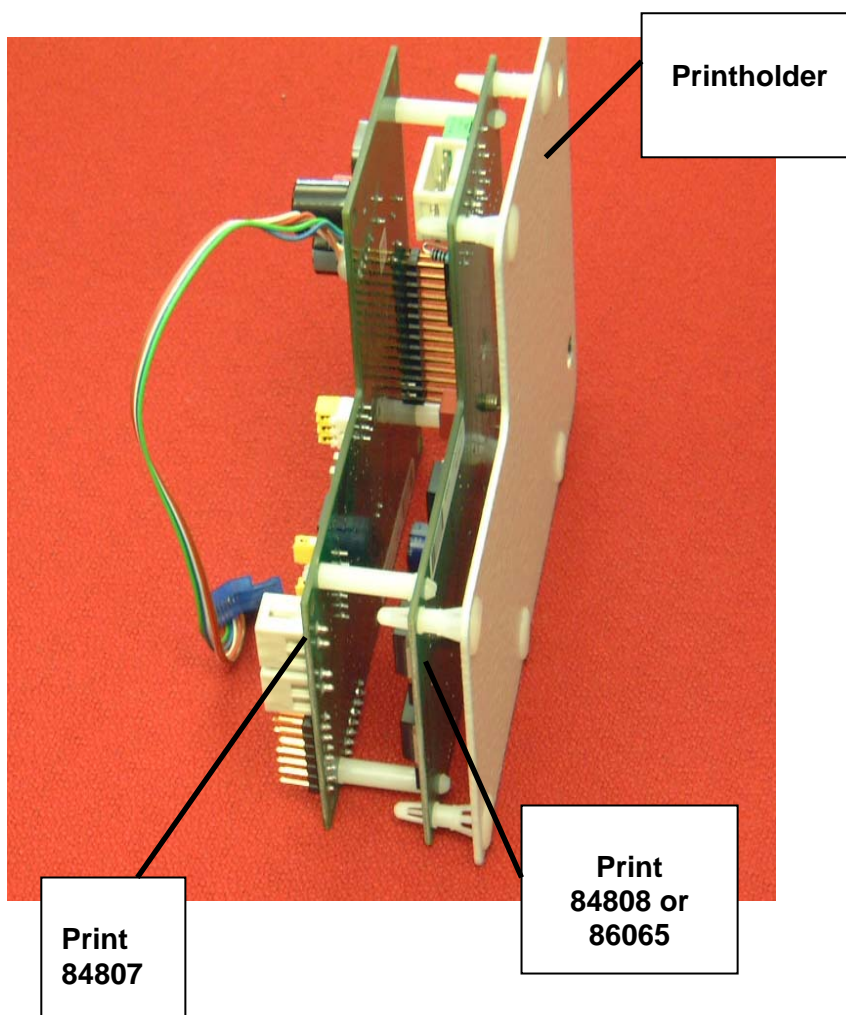


8.1.13 I/O Print old



8.2 Motor prints for X, Y and Z

	Motor-CPU	Motor-print	Printhead
X-Axis	84807	84808	86763
Y-Axis	84807	86065	86738
Z-Axis	84807	86065	86738

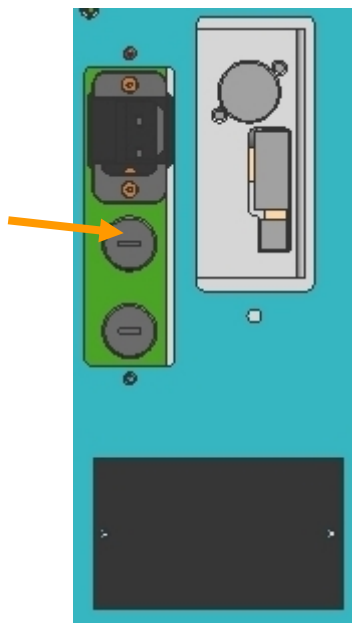


8.3 Checking the different components

Some components can be checked easily by performing only a few steps. These tests are described here. Additionally a lot of electronic problems can be recognized in the engraving result. Please do also check our FAQs.

8.3.1 Main fuses

The main fuse is located on the back of the machine close to the main connector. It contains one or two fuses. Whenever the machine does not respond on start up, check these fuses first. The dimension is 5x20mm - ratings are mentioned in the operation manual.



8.3.2 Net Filter

Directly after the main fuse you can find the net filter. It prevents electromagnetic emissions. Overcurrents can damage this filter.

For checking if it works just measure whether there is voltage between the black and the blue wire like shown in the picture. Put the multimeter in position ACV.

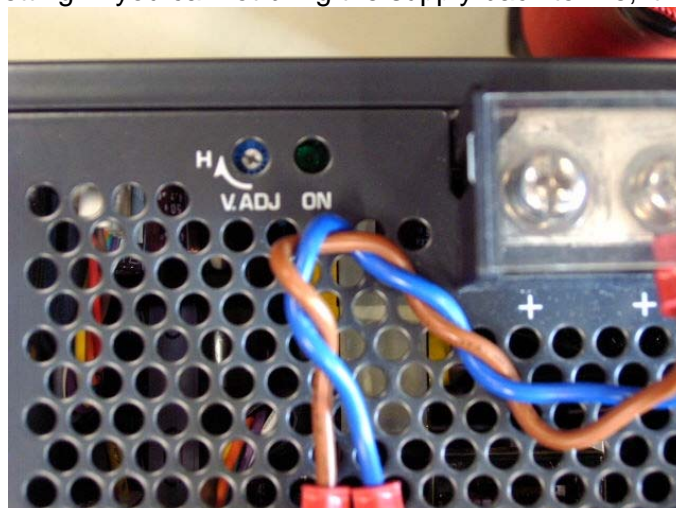


8.3.3 How to check the power supply

Open the the cover of the power supply (which is located on the back side of the machine). Switch the machine on. Make sure that there is net voltage (AC) between the pins N and L on the power supply. Measure the output voltage (DC) between + and – on the power supply. It must be close to the value mentioned in the wiring diagram (or list below).

If it is 0 or very high (near to double nominal value) the power supply is defective or the internal safety-off is activated. If it is around the aimed value take a small screwdriver and adjust the potentiometer V.ADJ until you have the precise value.

If it is 0, turn the machine off and wait for 10 min. Turn V-ADJ to “low” and switch the machine on. Then raise the V-ADJ setting. If you cannot bring the supply back to live, it has to be exchanged.



Power supplies for different machine types:

Machine type	Voltage	Part#	Qty.	Consumer	Comments
10W - 30W air cooled	32V	87878	1	Complete	
40/45W Synrad	32V	87878	2	Complete	Connected parallel
45W Coherent	32V	87878	1	Electronics	
	48V	84810	1	Laser source	
60W water cooled	32V	87878	2	Complete	Connected parallel
60W - 75W air cooled	32V	87878	1	Electronics	
	30V	87878	2	Laser source	Connected parallel
85W - 95W air cooled	32V	87878	1	Electronics	
up to S3-1839	36V	expired	1	Laser source	Order 12879 + 40039
S3-1840 ongoing	36V	12879	1	Laser source	
105W - 120W water cooled	32V	87878	1	Electronics	
up to S3-1395	96V	expired	2	Laser source	Contact technical support
S3-1396 ongoing	48V	12911	2	Laser source	Connected serial
105W - 120W air cooled	32V	87878	1	Electronics	
	30V	5835	1	Laser source	

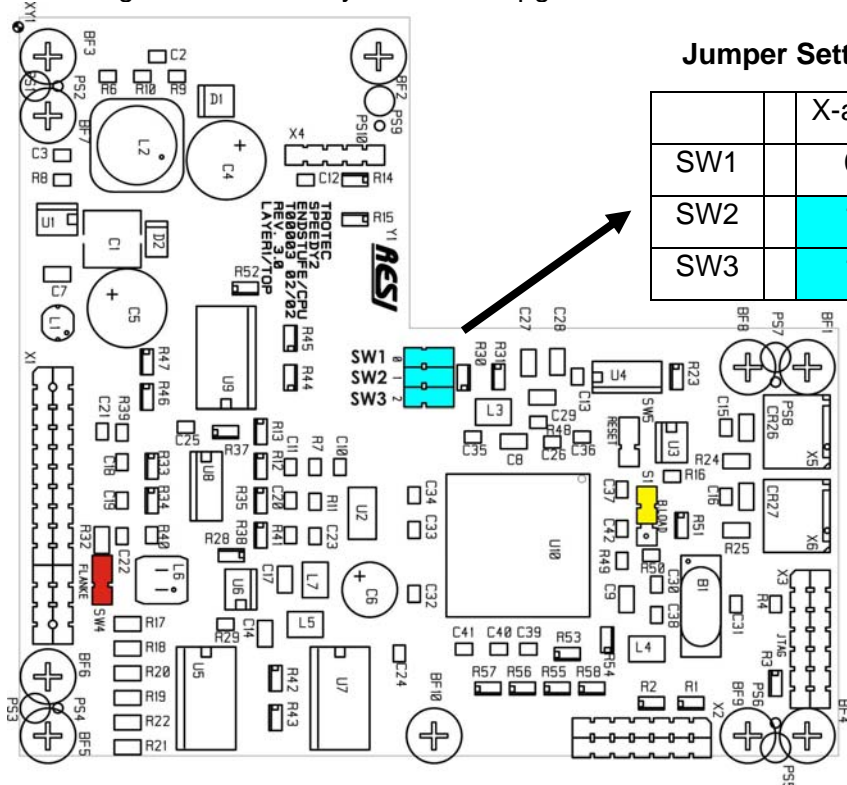


8.3.4 How to check the Motor prints (motor PCBs)

Whenever you think there is a problem with one of the motor prints (e.g. because one of the axes doesn't reference) then replace two of the boards for the different axes (Y and Z are identical). If then suddenly the axis that has previously shown a problem works fine, you know that only the motor print shows a problem and must be replaced.

If the X-print seems defective you have to unplug the X-motor when you test a Y- or Z-print.

CAUTION: To make a motor print CPU work in a machine, you have to adjust the JUMPER settings according to the axis and you have to upgrade the firmware according to the machine.

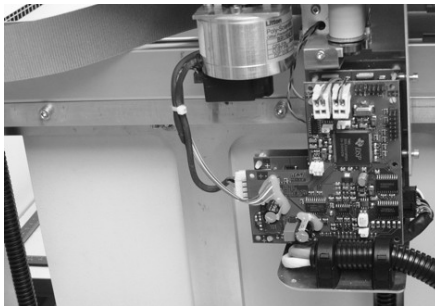


Jumper Settings

	X-axis	Y-axis	Z-axis	rotary
SW1	0	1	0	0
SW2	1	0	0	1
SW3	1	1	1	0

1 = closed 0 = open

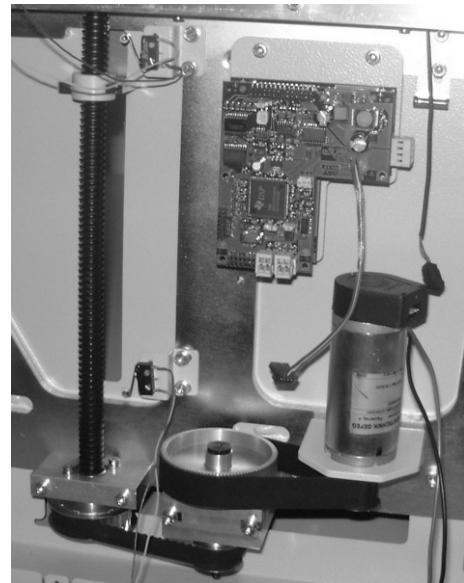
X axis motor print



Y axis motor print



Z axis motor print



8.3.5 How to check the IO board

The IO print is located behind the service access panel, (left side) inside the electronic compartment. To reach it just open the locking screw, turn the compartment by 90° and open the cover by removing the 6 fixing screws.

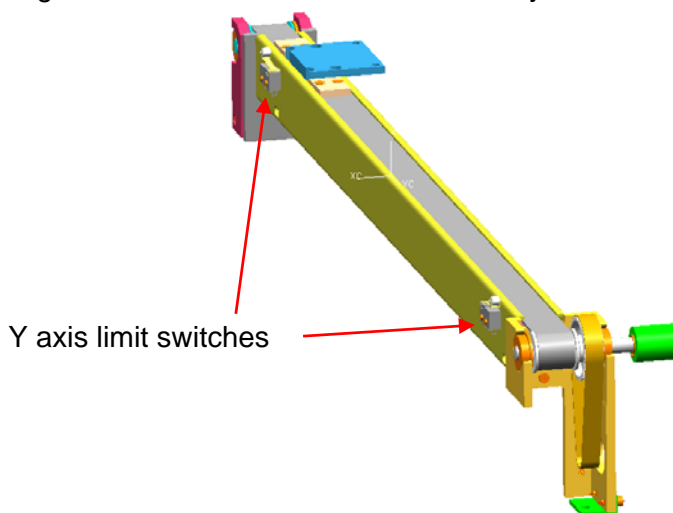


IO print + print CPU

8.3.6 Reference switches

The reference switches are used for two different reasons:

- To define the mechanical home position of the three axes.
- To recognize errors which cause the motion system to leave the specified working area.



The following limit switches are responsible for defining the home position:

- left X axis reference switch
- back reference switch on the left Y axis
- lower reference switch of the Z axis

The position of the limit switch does not define the 0 position shown in JobControl. This is necessary as the focusing head overshoots a certain distance measured from the end of graphical objects in the job. (For details refer to the chapter „Adjusting the edit factors“)





9 Error Feedback

The following error codes can be generated by the Trotec JobControl, whenever it recognizes a machine or computer problem. In many cases these codes are helpful information which makes it easier to sort out problems.

Nevertheless sometimes the indication of an error code can be confusing, because machine errors (that are indicated by beeping and blinking of the machine) might cause a software error as well although the true cause is the machine.

9.1 Software Error Definitions

Number Text

- 0 // no error occurred
- 3 // Laser turned off
- 100 // -2 (TP_ERR_INTERNAL) received from COMM module - mostly USB problems
- 200 // Initialisation of com port failed
- 201 // Echo packet not correctly received
- 202 // Other transmission is in progress
- 203 // Echo packet contains wrong data
- 204 // Timeout occurred
- 205 // No data pending
- 206 // Some "TP" function failed to succeed
- 207 // No abort valid in this state
- 208 // No abort valid in this state
- 209 // Failed to allocate memory
- 210 // Failed to allocate memory
- 211 // Wrong WS spool size
- 212 // Wrong WS spool size
- 213 // Wrong WS spool size
- 214 // Wrong JOB spool size
- 215 // No jobs found to transmit
- 216 // Jobs on platte have different params
- 217 // canceled update of settings
- 218 // Switch of com speed failed
- 250 // transmission should idle here
- 251 // communication not ready
- 252 // could not write data to comm
- 300 // firmware download aborted
- 301 // could not open data file
- 302 // no answer for datagram
- 303 // RAM error
- 304 // FLASH error
- 305 // Could not clear RAM
- 800 // Could not open job file
- 801 // Could read file header
- 802 // wrong file format
- 803 // compressed data currently not supported
- 804 // Could read info header
- 805 // Could read cut info
- 806 // Could send query command
- 807 // Got no info from graver (timeout)
- 808 // SetMark of loader failed
- 809 // loader is out of sync





Number Text

- 810 // Wrong color depth encountered
- 811 // Could not create bitmap
- 812 // No trotec info found
- 812 // Error retrieving color table
- 900 // could not initialize rubber
- 901 // could not initialize bmp line
- 902 // could not retrieve line from CRubber
- 903 // invalid (NULL) job specified
- 904 // move of file failed
- 905 // copy of file failed
- 906 // error in ICDDIK db Kernel
- 907 // job history reports negative time value
- 997 // This is an info for the user
- 998 // Assertion failure in release version
- 999 // should never occur
- 1000 // Obsolete
- 1010 // Attempt to select nozzle for unavailable color
- 1011 // Attempt to move nozzle without connection to device
- 1020 // Obsolete
- 1021 // Obsolete
- 1030 // Obsolete
- 1100 // FW-Update - general information
- 1101 // FW-Update successfully finished
- 1102 // FW-Update finished with error
- 1111 // FW-Update Version number of DSPX.HEX
- 1112 // FW-Update Version number of DSPY.HEX
- 1113 // FW-Update Version number of DSPZ.HEX
- 1114 // FW-Update Version number of DSP_RGV.HEX
- 1115 // FW-Update Version number of DSP_LASER.HEX
- 1116 // FW-Update Fram version
- 1117 // FW-Update Preload version
- 1118 // FW-Update Download version
- 1119 // FW-Update c167version
- 1120 // FW-Update Date of Firmware-file
- 1121 // FW-Update Time of Firmware-file
- 1122 // FW-Update Model-Number in Firmware-file





9.2 Hardware Error Definitions

Error Code 123	A device on the CAN bus is not working properly
Error Code 124	Switching Point density is too high
Error Code 125	Bitmapline not finished (with engraving mode only)
Error Code 126	Wrong combination of firmware / JobControl
Error Code 128	Firmware Update Error
Error Code 129	Fault of Laser DSP
Error Code 130	x-axis Lost positions
Error Code 131	Tracking error on x-Axes
Error Code 132	Overcurrent drive motor on x-Axes
Error Code 133	Overtemperature x-motor
Error Code 134	Wrong Connection of x-axis encoder
Error Code 135	Wrong x-axis Encoder
Error Code 136	Wrong connection of x-axis motor
Error Code 137	x-axis limit switch triggered
Error Code 138	Illegal reference switch operation X axis
Error Code 139	x-Axis is blocking
Error Code 144	Firmware Timing Problem
Error Code 146	y-axis lost positions
Error Code 147	Tracking error on y-Axis
Error Code 148	Overcurrent drive motor on y-Axis
Error Code 149	Overtemperature y-motor
Error Code 150	Wrong Connection of y-axis encoder
Error Code 151	Wrong y-axis Encoder
Error Code 152	Wrong connection of y-axis motor
Error Code 153	y-axis limit switch triggered
Error Code 154	y-axis reference switch triggered
Error Code 155	y-Axis is blocking
Error Code 162	z-axis lost positions
Error Code 163	Tracking error on z-Axis
Error Code 164	Overcurrent drive motor on z-Axis
Error Code 165	Overtemperature z-motor
Error Code 166	Wrong Connection of z-axis encoder
Error Code 167	Wrong z-axis Encoder
Error Code 168	Wrong connection of z-axis motor
Error Code 169	z-axis limit switch triggered
Error Code 170	z-axis reference switch triggered
Error Code 171	z-Axis is blocking
Error Code 194	rotary lost positions
Error Code 195	Tracking error on rotary
Error Code 196	Overcurrent drive motor on rotary
Error Code 197	Overtemperature rotary-motor
Error Code 198	Wrong Connection of rotary encoder
Error Code 199	Wrong rotary Encoder
Error Code 200	Wrong connection of rotary motor
Error Code 201	rotary limit switch triggered
Error Code 202	rotary reference switch triggered
Error Code 203	rotary is blocking

This list is just a hint on where to look at. For detailed information on reasons and possible solutions of the error code, please consult the Error Code list available on Merlin.





10 Firmware Update

For detailed instruction on Firmware Update – especially for versions older than 9.3.4 - please have a look at the according file on Merlin or contact your Trotec dealer.

Here the important steps as overview for JobControl version 9.3.4 and ongoing:

1. Start JobControl
2. Turn off the laser machine
3. Open the top cover of the laser machine
4. Turn on the laser machine
5. Connect to JobControl.
6. Choose **Settings → Update Firmware** and browse to the directory where the firmware is saved. For JobControl 9.3.3 ongoing use the .tuz file, for older versions you need to select the update2.ttu file of the extracted zip file (.tuz renamed to .zip).
7. Wait until the firmware update has been finished and then press the OK button.
Do not press the CANCEL button!
8. After the update and pressing the button OK wait 5 seconds and turn the laser machine off.
9. Close the top cover of the laser machine.
10. Turn on the laser machine.
11. The axes have to do the reference move. IF NOT, REPEAT the firmware update after turning the machine off and opening the top cover.
12. Connect to JobControl
13. Choose **Settings → Information**
If the firmware version is the new one, the update has been finished.

Do NEVER manipulate the machine or the PC during a Firmware update!





11 Recommended tools

service key (interlock defeat tool)

Allen key set inch

Allen key set metric

laser power meter

lens cleaner

lens tissue

spring balance 300g

laser protective goggles

electronic multimeter

tool box

magnifier 8x

engraving materials

set of screw drivers

set of screw drivers Phillips

brushes in different sizes

paper tape

nomodem cable

PC data cable

side cutting pliers

combination pliers

adjustable wrench

small file, triangular

cutter knife

set of hexagon wrenches

adjustment plate for mirrors with
magnetic holder

Beam alignment tools (BAT)





12 Recommended spare parts

12.1 Starter Kit

Part number	Part description
84809	CPU board
84806	IO board
84807	Motor Print CPU
84808	Motor print driver x
86065	Motor print driver y/z
86647	Mirror #3 (without holder)
87504	Lens 1.5" + carriage (red)
87505	Lens 2.0" + carriage (black)
87506	Lens 2.5" + carriage (silver)
86962	Cable harness
79830	Axis gearing belt for x and y
87501	x-axis assembly
87225	ball bearings
90000	x-axis motor + drive gear
90001	y-axis motor + drive gear
90002	z-axis motor + drive gear

12.2 Recommended service intervals

For any service technician it's important to have information about the life expectancy of the different components.

The idea behind is to be able to decide whether a preventive replacement makes sense or not. Please study the following information in detail.

Trotec recommends the below mentioned replacement intervals. The life time will in many cases be much longer. But as we want to prevent a loss of engraving precision wear-and-tear parts should be replaced regularly.

All mentioned hour ratings are laser hours.

X-axis

Amount	Part no.	Part name	Replacement interval
1	79830	Motor belt X-axis	2years / 2500h
1	90003	Main belt X-axis	3 years / 3000h
1	90000	X-axis motor	as required
4	87225	Ball bearings X,Y-axis	1 year / 1500h
1	86706	Gearing assembly X-axis	3 years / 3000h
1	1486	Idler Pulley X,Y-axis	3 years / 3000h
1	86057	THK guide X-axis	3 years / 3000h





Y-axis left side

Amount	Part no.	Part name	Replacement interval
1	79830	Motor belt Y-axis	2years / 2500h
1	90004	Main belt Y-axis	3 years / 3000h
1	90001	Y-axis motor	as required
4	87225	Ball bearings X,Y-axis	1 year / 1500h
1	1486	Idler Pulley X,Y-axis	3 years / 3000h
1	86707	Gearing assembly Y-axis (left)	as required
1	86058	THK guide Y-axis	as required

Y-axis right side

Amount	Part no.	Part name	Replacement interval
1	90004	Main belt Y-axis	3 years / 3000h
1	1167	Drive gear Y-axis	3 years / 3000h
4	87225	Ball bearings X,Y-axis	1 year / 1500h
1	1486	Idler Pulley X,Y-axis	3 years / 3000h
3	79765	Bearing yellow Y-Axis right	3 years / 3000h
6	79766	Spacer	3 years / 3000h
6	79770	Ballbearings Y-Axis right (for yellow Bearings)	3 years / 3000h
3	79768	Bearing pin	3 years / 3000h

Z-Axis

Amount	Part no.	Part name	Replacement interval
1	90002	Z-axis motor	as required
1	78330	Main belt Z-axis	3 years / 3000h

Miscellaneous

Amount	Part no.	Part name	Replacement interval
		laser tube	as required.
1	74324	Mirror 1	as required
1	74324	Mirror 2	as required
1	86647	Mirror 3	as required
1		Lens	as required
1	37426	Upgrade kit reference switch x-axis	optional



13 FAQ's

13.1 Problems you can see in the engraving or cutting result

13.1.1 Trotec test routine

Trotec has developed special test files for quality checks. Start the following tests if you recognize troubles in the engraving result on the laser system:

- Provide the first test file on anodized aluminum and laser plastics
On aluminum you can see if the tickle adjustment is good and if the edit factors have been adjusted correctly.

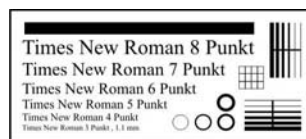
On plastics you can realize very good if the tickle power setting is too high.

The tests are done at 30% power (depends on the laserpower) and at 100% speed.
Use a magnifier (8x) to judge the engraving result.



Tailing is shown on maximum speed

- circles not closed, thin vertical lines missing: too low tickle power
- doubled images: edit factors/K1 not adjusted correctly
- frayed edges: tickle delay too small
- „snow“ in the background: tickle power too high
- Do the following test on laser rubber (2.3mm) from Trotec.
Here you can see if the laser power is big enough, if the shoulder setting is good and if the edit factors for rubber speed have been adjusted correctly.




























- shadows beside test pattern: tickle power too high
- doubled images: edit factors/K1 not adjusted correctly



13.1.2 Customer experience

Problem description:	Possible reason:	Solution:
too low engraving depth	imprecise focusing dirty optics table misaligned too low laser power dirty beam output window on tube	check focus clean optics check table adjustment replace tube clean output window
blurred edges	imprecise focusing table misaligned incorrect Edit settings (Overtook)	check focus check table adjustment adjust Edits
bad shoulder angle	table misaligned defect electronic board bad shoulder settings	check table adjustment replace board improve shoulder settings
missing cut lines	0 passes in driver or JobControl selected line thickness in Corel Draw too big color is skipped	increase the amount of passes reduce line thickness to smallest possible value Set to cutting
shadows on the edges	tickle power too high	adjust tickle power
Shadows between letters	Tickle delay too low	Adjust tickle delay
Inconstant / alternating engraving depths	table misaligned Lasertube is defect / empty Laserbeam misaligned Material is not plane (foil)	adjust table replace tube adjust Laserbeam use multimate
waviness of the lines	bad THK guide bad belt tension too high acceleration settings Lens is loosen	replace guide check belt tensions reduce acceleration check if lens sticks to lensholder
no visible marking result	too low laser power too high velocity not focused wrong focus tool damaged lasertube	increase power setting reduce velocity check focus change focus tool replace tube
fine details on stamps are engraved too thin	incorrect Edit settings too steep shoulders	adjust edits reduce T, increase W
not vertical cut edge	beam isn't in the middle of the lens	Problems with non right angled cutting lines



 job has not been finished correctly	 connection to machine broken	 check the cable connection, the electronics and the com port on the computer
 Engraved or cut job size doesn't match with size in Corel Draw	 -Raster correction ON  Wrong size settings in the printer driver  Wrong image position is selected in the layout tab (printing)  Wrong machine is selected in the JobControl	 Switch off raster correction in JobControl (settings/advanced options/laser tab)  Use the same size as in Corel draw  Switch in the layout settings to : as in document  Switch to the proper machine
 Engraving quality in the center of jobs is different to the edges	 Incorrect factor K1  Loose belt  Defect X-Axis	 Adjust K1  Tension belts  Make a X-Axis service
 Curves looks a little bit angular in acrylic	 You have the wrong program for this application	 Use a CAD / CAM software like TROCAM to get really smooth curves
 Corners and angles not cut or marked through	 The power correction is to low	 Increase the powercorrection. Settings / Material Templates Setup.—correction—



13.2 Machine malfunctions

13.2.1 No error code is created

Problem description:	Possible reason:	Solution:
<ul style="list-style-type: none"> no referencing after start up 	<ul style="list-style-type: none"> top, front or side door not closed defect in the interlock system mechanical problem on axis bad limit switch defect power supply 	<ul style="list-style-type: none"> close doors check interlocks make sure that the mechanical resistance is small replace the limit switch measure voltage, if necessary replace it
<ul style="list-style-type: none"> no response at switching on of the system 	<ul style="list-style-type: none"> main fuses blown power supply defect FRAM defective 	<ul style="list-style-type: none"> replace fuses replace power supply refresh FRAM / exchange CPU
<ul style="list-style-type: none"> no communication to machine 	<ul style="list-style-type: none"> invalid COM port selection serial cable defect COM port is in use by an other program 	<ul style="list-style-type: none"> change selection replace cable close this program, or change the COM port
<ul style="list-style-type: none"> connection to machine breaks frequently 	<ul style="list-style-type: none"> electromagnetic imissions 	<ul style="list-style-type: none"> make sure that machine and computer are connected to the same electric circuit the original cable lengths should not be exceeded
<ul style="list-style-type: none"> offsets between engraving jobs and cut lines 	<ul style="list-style-type: none"> dusty encoder top speed too high acceleration too high 	<ul style="list-style-type: none"> clean encoder reduce speed reduce acceleration
<ul style="list-style-type: none"> The machine makes unusual things 	<ul style="list-style-type: none"> Destroyed FRAM parameters Damaged firmware 	<ul style="list-style-type: none"> Refresh FRAM parameters Update the firmware
<ul style="list-style-type: none"> The Axis make the wrong movements (X-Axis make the movement for the Y-Axis and inverse) 	<ul style="list-style-type: none"> The jumpers on the motor boards are interchanged (The engraving result looks like mirrored) 	<ul style="list-style-type: none"> Use the right codification on each Axis
<ul style="list-style-type: none"> Laser head doesn't move back to the exact home position 0 / 0 	<ul style="list-style-type: none"> Wrong offset is adjusted Rulers are misaligned 	<ul style="list-style-type: none"> Adjust the offset new in the service setup Adjust the rulers fixing
<ul style="list-style-type: none"> Big shift in the engraving result 	<ul style="list-style-type: none"> Damaged resolver or motor Bad gearing assembly 	<ul style="list-style-type: none"> Change resolver or motor Change gearing assembly / X-Axis service
























13.2.2 Error code is created

Also see Error Codes above 9 Error Feedback.

- Hardware ERROR codes
































Error message:	Possible reason:	Solution:
 Tracking error X axis	 Faulty X-motor cable  Damaged encoder  Damaged motor driver  Bad wear parts	 Replace cable  Replace motor / encoder  Replace driver board  Replace bearings, THK guide or Belts
 Illegal limit switch operation	 Damaged limit switch	 Replace switch
 Overcurrent Z axis	 High mechanical resistance of table  Too heavy material loaded	 Clean and oil lead screws  Adjust table  Align lead screws  Move the table without loading























13.3 Problems with the Software

Problem description:	Possible reason:	Solution:
After installation it is not possible to send jobs to Job control	spool settings don't match Wrong settings in the properties of the printer driver	link the spool directory in Job control to the spool folder in the explorer select local port: [Directory of Trotec Printerdriver], and print directly to the printer (XP, Vista, Windows7)
the installation is terminated	incorrect serial number specified	please check the serial number in the directory INIfiles on the CD only here mentioned numbers will be accepted
missing material parameters	on installation „Custom“ and/or wattage was not selected	repeat the installation, install type custom make sure that the box that represents the correct wattage is checked
multiple positioning of jobs is not possible	selected job is already on the plate	select the job in the job queue click on
when clicking on start error messages occur	damaged trlog.vol file crowded Spool directory	delete trlog.vol empty spool directory
missing objects	RGB parameters don't match object line thickness invalid Required color is skipped	disable color calibration load Trotec color palette from installation CD change line thickness to 0.001mm change color to cut or engrave
Firmware update doesn't work	no cable connection main CPU lost FRAM Parameters damaged CPU board "Version" for any motor CPU is "0" in Settings-Information	use cable like specified refresh FRAM change CPU board change motor CPU
Unable to position job in the center of a marker	marker too close to page border	reposition the marker, resize the job
Not possible to open JobControl or print to JobControl	Bad material file (e.g. TR_CO2_Material.dat)	Update material file or reinstall JobControl



 No engraving or cutting	 Skipped cut lines or skipped engraving	 Set the right functions in the parameter window (double click on the plate)
 Problems with printing jobs to the JobControl	 Printer settings	 Go to the TROTEC printer properties (start/settings/fax and printers).  Choose the "Port" tab and select the right directory and "local port".  Choose the "Advanced" tab and select "print directly to the printer"  Click OK
 Problems with cutting lines in Corel Draw	 Color management	 Disable the color management in Corel Draw.  Please use the Corel help to find the color management in the Corel version
 Printing fails There was an error found when printing the document "xyz.cdr" to TROTEC: Do you want to retry or cancel the job?	 Incorrect spool path	 Set valid spool path within JobControl/Settings/Options/General/Spoolpath.
 Jumbled bitmaps when printing.	 "Print directly to the printer" not activated.	 Go to the printer properties (start/settings/fax and printers).  Choose the "Advanced" tab and select "print directly to the printer"  Click OK
 No colors are displayed in material dialog.	 Material file (e.g. TR_CO2_Material.dat) is write protected (copy from CD-ROM)	 Override write protection.
 Error message when attempting to print. "Unable to access printer driver. Try removing and reinstalling this printer driver."	 Previous job-size too small.  Reinstallation of the driver does not resolve the problem!	 Go to the TROTEC printer properties (start/settings/fax and printers).  Choose the "Print" tab and set Width and Height to something like 100mm (4 in)  Click OK 















 Job size orientation does not match the chosen settings.	 CorelDraw message "Printer paper orientation does not match one or more document pages. Adjust printer automatically?" was accepted with "Yes".	 Always prevent from automatic adjusted page sizes by selecting "No".
 A new JobControl opens for each job printed.	 File jc.ini is write protected.	 Remove write protection.
 Unwished printer driver default settings	 Default settings are bad	 Go to Trotec printer properties (Advanced / Printing defaults) and change it
 Unable to change material settings	 You are logged in as an user	 Log in as administrator
 Bad raster quality	 Default settings of raster options are bad  Raster correction in the JobControl is not activated	 Go to printer properties (Print/ Halftone Settings) and select 8x8  JobControl / Settings / Options / Process Options / Quality. Check raster correction
 Automatic cutting line in not modifiable in JobControl	 You are not in the preview mode	 Make a double-click on the job

13.4 Laser Quick Check

The laser quick check is thought for situations where you don't see an obvious problem, but want to do check the temporary condition of the machine.

- check the optical components (lens, mirror#1, mirror#2, mirror#3, beam combiner)
- check the grade of soiling (engraving area)
- verify home position
- listen carefully to eventual noise generation

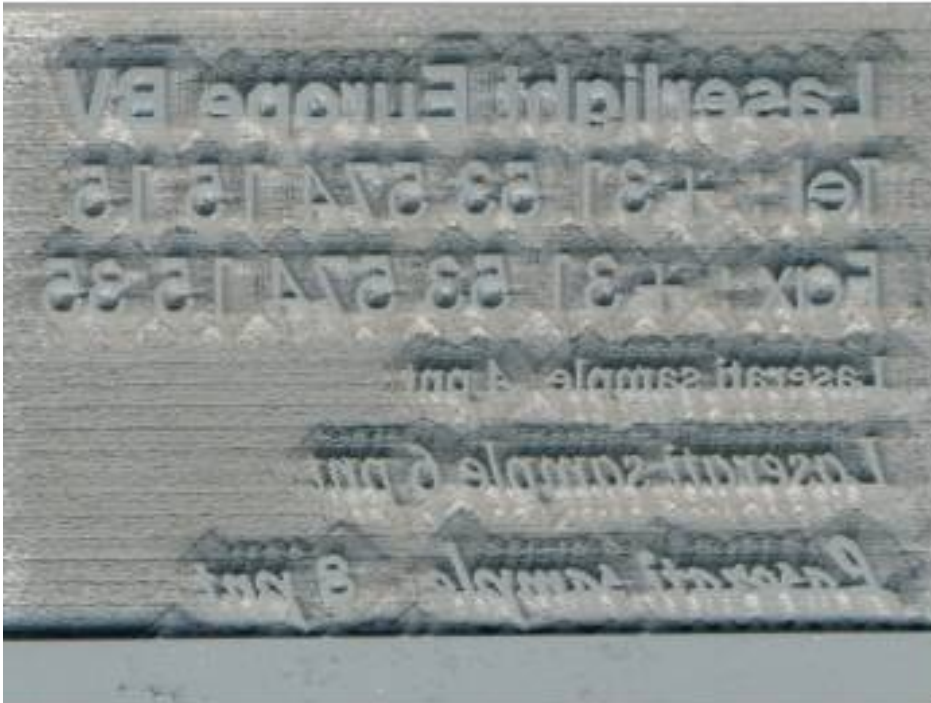
Problem description:	Possible reason:	Solution:
 noisy cooling fans	 damaged ball bearings  incorrect supply voltage  old fan version	 replace fan  wrong fan installed – change it
 noisy or vibrating table	 old version of the lead screws	 Oil and adjust the lead screws new. If you have no success change to the redesigned one.
 Lower laserpower (less engraving depth in rubber, reduced engraving speed)	 Scratches on the optical components	 Change the scratched optics

- classify the engraving quality of the results
- check the laser beam alignment (CO2 laser and red dot)



13.5 Samples

Good shoulder settings



Bad shoulder settings



Shadow on the edges



Blurred edges

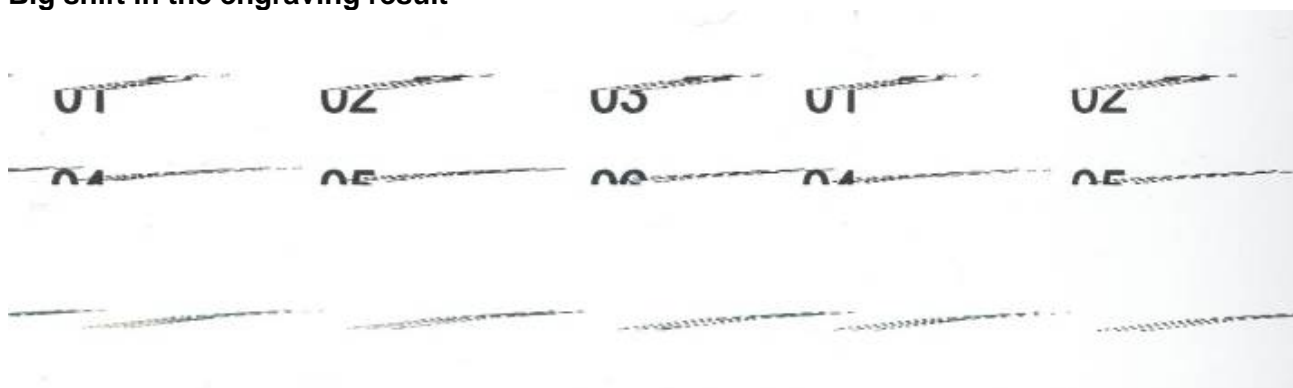


Waviness of lines





Big shift in the engraving result



Engraving quality in the center is different to the edges



Bad power correction

