

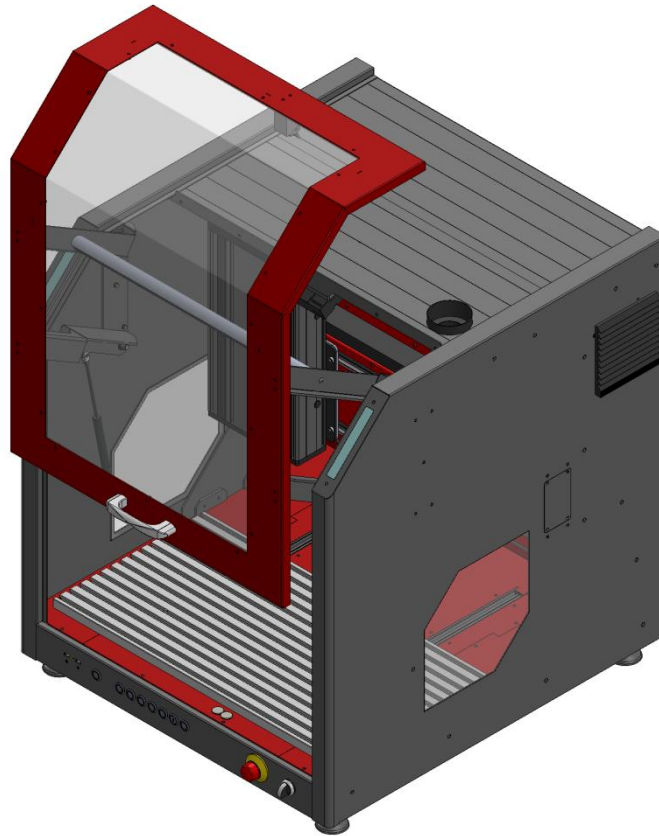


Figure 1: ICV 4030 EC

Assembly manual for CNC base machines
(partly completed machines)

Operating manual for CNC machines
(complete machines)

Type: ICV 4030 EC

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Information about this operating manual

Abbreviations

MD Machinery Directive 2006/42/EC

Symbols used in this manual

Various symbols are used in this manual to draw your attention to important information / circumstances, and dangers:



Warning!

Warning of dangers which can result in harmful effects on the health, physical injury, or death.



Warning! Life-threatening voltage

Warning of danger from electrical current. Non-observance can result in severe injury or death.



Attention!

This symbol identifies information which must be observed in order to avoid damage or malfunctions.



Information:

This symbol identifies important information and instructions.

Safety information



Before you commission the CNC machine ICV 4030 EC, or work with or add supplements and/or make modifications to the electrical installations of the machine / in the switch cabinet /5/ of the machine, you must carefully read:

- the safety instructions in this operating manual (Section 3) and
- the safety instructions for electrical drives and control units in the operating manual for the positioning module with CANopen interface /1.1/ and/or /1.2/

This operating manual must be kept in the immediate vicinity of the machine and must remain accessible to personnel (operators, fitters, maintenance personnel) at all times.

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Print errors and mistakes cannot be entirely ruled out despite all care on our part.
We appreciate your assistance with any recommendations for improvement or notification of errors.

CE mark for (complete) CNC machines:

isel CNC machines are CE compliant and marked accordingly.

The CE Declaration of Conformity applies for these machines.

No CE mark for incomplete machines:

Partly completed machines (definition in accordance with the Machinery Directive 2006/42/EC) do not have a CE mark.

The CE Declaration of Conformity applies for these machines.

Commissioning is not permitted for any other machine parts and components to which the CE safety guidelines must be applied until all corresponding requirements have been fulfilled.

The company **isel Germany AG** assumes no warranty or liability if you make modifications on the machine which influence the CE compliance of the machine.

The EMC test only applies for the original configuration of the partly completed machine / machine (including switch cabinet), and the CNC control panel as delivered from factory.

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1 Introduction

All **isel** CNC base machines (as defined in Machinery Directive 2006/42/EC **partly completed machines or partial machines**) and/or **isel** CNC machines (as defined in Machinery Directive 2006/42/EC **machines, i.e. complete machines**) of the type ICV 4030 (as well as machines of the type ICP 4030) are tested CNC machines which offer you the full scope of possibilities for two or three dimensional machining of workpieces.

The machines are built and equipped in various sizes and versions. They are based on precisely tailored and variably mounted standard profiles and drive units which are assembled depending on the requirements of the machine type (the so-called machine kinematics). The outer appearance of the machines of the same type is always the same. The applications of the concrete CNC machine corresponding to the mounted tool (on the Z-axis) can be very diverse.

The control and safety concept and the basic layout of the mechanical components are the same for all CNC base machines / CNC machines of the type **ICV 4030**. Prior to delivery, each individual machine is configured, thoroughly tested for several hours, measured and started up at the factory.

A measurement and test report is archived by the manufacturer isel Germany AG under the customer order number for each delivered base machine / machine and can be requested by you as the purchaser. All basic machines / machines are tested with QC20 ball-bar testers from **Renishaw®** in all three interpolation levels and/or laser interferometers.

As a fundamental requirement for your work, you must have basic skills in CNC technology and PC application, and, if possible, basic understanding of the terminology of the currently applicable Machinery Directive (MD):

- **MD 2006/42/EC** **legally binding since** **29/12/2009**

Please observe this **operating manual** in order to

- properly install / commission the CNC base / CNC machine,
- work safely, quickly and efficiently,
- keep dangers away from people and the equipment,
- and to fully utilise the performance capability of the CNC machine.

The versions in this operating manual are based on a standard scope of supply in which the machine is ready for operation. Versions (e.g. accessories and software) which do not pertain to your machine can be skipped over when studying this **operating manual** for the first time.

The versions in this operating manual apply for the following equipment / technical status of the CNC machine:

- all motor end phases are equipped with **standstill monitor** (effective 01/07/2008)
- used as operating software: **ProNC /6/ / Remote /7/ with software version V1.46.2.1 or higher**

Please also observe the additional manuals and instructions for installation and commissioning of software or the accessories.

They are indicated in the list of references.

Example **CNC base machine** ICV 4030 EC:

- **partly completed machine**
- **not equipped with tool**, no final definition of the purpose of use
- this CNC machine is delivered **without CE mark**
- the **Declaration of Incorporation** applies for this CNC machine

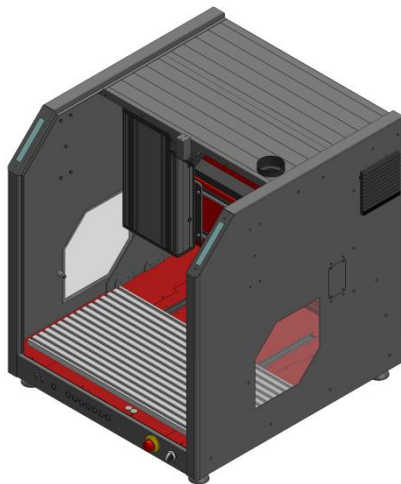


Figure 2: ICV 4030 EC CNC base machine

Example **CNC machine** ICV 4030 EC:

- **complete machine**
- **equipped with milling spindle tool**, thus suitable for drilling / milling
- this CNC machine is delivered **with CE mark**
- the **Declaration of Conformity** applies for this CNC machine

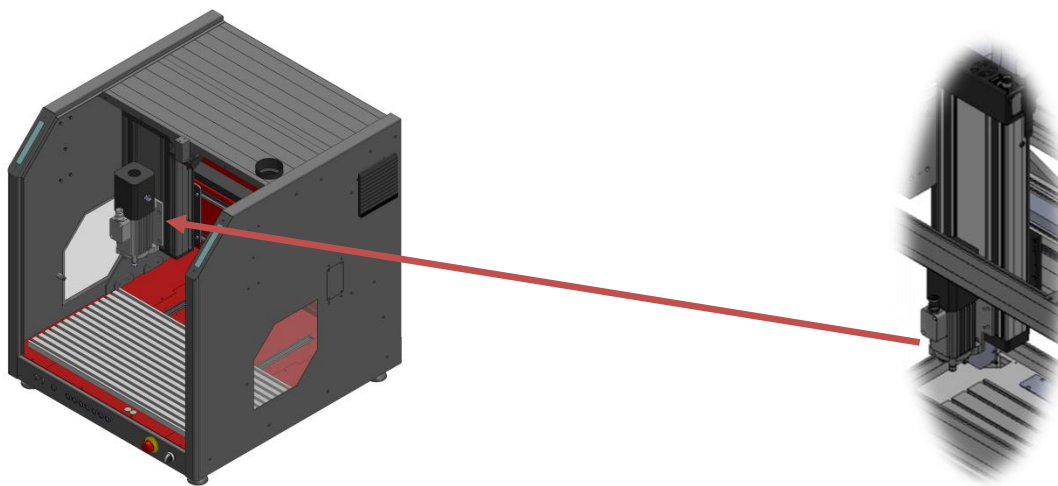


Figure 3: ICV 4030 EC CNC machine

2 Intended use, foreseeable misuse

isel/ CNC machines / isel/ CNC base machines are CNC-controlled machines with multiple linear axes and/or an optional rotary axis. The motor end phases are controlled by a PC-based CAN-CNC control unit (according to CANopen standard). The complete control and power electronics for all axes are arranged in the rear wall of the machine.



Difference between a CNC machine and a CNC base machine:

isel/ CNC machine:

In the legally binding Machinery Directive 2006/42/EC effective as of 29/12/2009, the term '**machine**' is defined as follows (excerpt from MD, Article 2, a):

'Machine'

- *an assembly of linked parts or components, at least one of which moves through some type of actuator, with associated power and control circuits, joined together **for a specific purpose** in the processing, treatment;*

Every isel/ CNC machine supplied **with a tool** (e.g.milling or engraving spindle, dosing device, sensor element, such as a CCD camera or triangulation laser, water jet nozzle, plasma torch, etc.) is a machine in the sense of the Machinery Directive 2006/42/EC, because it is designed for a specific **purpose and is therefore manufactured and used *for an intended purpose***.

The use is determined by the type of tool (mounted on a moving axis), such as:

Tool = machining spindle	-> used for milling, drilling
Tool = engraving spindle	-> used for engraving
Tool = dosing unit	-> used for adhering, dosing
Tool = water jet nozzle	-> used for water jet cutting
etc.	

As the manufacturer, isel Germany AG can perform the legally required risk assessment for CNC machines. CNC machines are delivered with an enclosure (all four sides, but open on top).

isel/ CNC base machine:

In the legally binding Machinery Directive 2006/42/EC effective as of 29/12/2009, the term '**partly completed machine**' is defined as follows (excerpt from MD, Article 2, G):

'partly completed machine'

- *an assembly which is almost machinery but which cannot **in itself perform a specific application**. A drive system is partly completed machinery. Partly completed machinery is only intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment, thereby forming machinery to which this Directive applies;*

Every isel/ CNC base machine that is supplied **without a tool** and is therefore not provided *for a specific application* is a **partly completed machine** as defined in the Machinery Directive 2006/42/EC.

- The **CNC machine / CNC base machine** is designed for use in dry rooms (workshops, laboratories and/or similar rooms) and industrial operations (maximum environmental temperature: 40°C).
- **CNC machine:**
 - The **CNC machine (complete machine)** must be used according to the purpose of the type of tool mounted on the machine. This means that the concrete tool of the CNC machine defines the intended use of the machine in the sense of the Machinery Directive (Annex I, section 1.1.2). According to this logic, the CNC machine is suitable for milling, drilling, cutting, engraving, dosing, measuring, or water-jet cutting. The CNC machine is not suitable for processing graphite.
 - Suitable materials to be processed include light metals, plastics, wood, glass, circuit board materials, etc.
 - Materials which produce gases harmful to the health when processed are not permitted.
 - The CNC machine is prepared for an extraction device. This extraction is primarily suited for dry dusts (wood dust, GRP / glass fibre circuit board dust, etc.).
- The **CNC base machine (partly completed machine)** can be supplemented by you as the purchaser of the base machine with the various suitable machining tools for the CNC machine (complete machine) in compliance with the requirements of the Machinery Directive. You are responsible for the CE certification if you use the machine yourself and/or sell it (put on the market). The CE certification also includes the statutorily required marking of the machine with the CE mark.

- CNC machinery for milling:
 - The CNC milling machinery is intended for the milling / drilling of the following materials: **aluminium, copper, brass, plastics (e.g. GRP/fibreglass), wood**
 - The machining of magnesium is **prohibited due to the risk of fire.**
 - Only engraving work or machining with low cutting forces is possible for the machining of steel / stainless steel.
 - Mills and drills having a shaft diameter greater than 7 mm may not be used.
 - The form cutter and countersinker tools for wood applications may not have a cutting diameter greater than 45mm or a shaft diameter greater than 7mm.
- The rapid motion speeds should not exceed 150mm/sec to 200mm/sec depending on the system size.
- The advance speed of the tools in the material must be determined technologically and should always be lower than the rapid motion speed.
- The user is responsible for ensuring the safe clamping of the tools in the tool holding fixture.

The (reasonably) foreseeable misuses include operation of the CNC machine by two people. One person pressing the acknowledge button (ACK button) on the control panel (see section 7.1 operating modes) in test mode and the other person reaching into the work area of the machine with the sliding door open during an axis movement or carrying out similar tasks therein is prohibited.

The locking device on the protective cover (on the rear side) may not be manipulated in any way.

3 Safety instructions



Carefully read this section of the operating manual before connecting and commissioning the machine! As with all technical systems, fault-free function and operational safety are only guaranteed with this system if the *general* safety precautions and *special* safety instructions are observed for the operation of this machine.

3.1 General safety instructions

1. The setup and commissioning of the machine may only be carried out by authorised personnel with appropriate qualification.
2. The machine may only be used as specified in this manual. The manufacturer accepts no liability for damages which arise with use of the machine for other applications.
3. The CNC machine may only be operated for the machining of suitable materials using tested accessory parts. With the use of unapproved materials and accessory parts (e.g. mills), damage to the machine or workpieces can occur. In this case, the manufacturer excludes all liability.
4. Prior to the commissioning of the machine, ensure that the mains voltage specified on the type plate of the individual components matches the available mains voltage. An incorrect mains voltage can destroy the machine and its components.
5. To avoid an electric shock, do not introduce any objects into the machine; this does not apply for the intended exchange of parts as specified in this operating manual.
6. Always disconnect the machine from the mains before performing maintenance tasks.
7. Never operate the machine in locations in which there is a danger of water or other liquids penetrating into the control unit behind the rear wall cover or the operating elements on the front side.
8. The supporting surface on which the machine is installed must be sufficiently stable; observe the permissible floor load bearing capacity.
9. Only authorised service technicians are permitted to open the machine housing and perform repairs on the machine.
10. Please observe that there may be a risk of injury with a mill clamped in the milling spindle.
11. The milling machine may only be operated with original accessories or appropriate accessories approved by the manufacturer. Only original parts may be used for the replacement of parts as specified in this operating manual. The manufacturer assumes no liability for damages resulting from the use of accessories or third-party parts which have not been approved.
12. The milling machine may not be installed in explosion-prone areas.
13. When routing the mains cable, avoid creating trip hazards and causing damage to the cables.
14. If a modification of the CNC Machine or its components is made without the written consent of the manufacturer, the EC Declaration of Conformity will lose its validity.
15. Avoid inhaling the dusts created when cleaning the machine.

16. Only clean the machine with suitable cleansers (standard household, non-abrasive cleansers).
17. Mobile telephones should not be used near the machine. Disruptive influences on the CNC control unit cannot be ruled out.

3.2 Special safety instructions

- The CNC machine surrounded by an enclosure and/or protective cover around the work area.
The clear viewing panes installed in the machine frame and/or the protective cover are provided for the safety of the operating personnel. The panes may not be removed. The material of these panes is:
 - PETG = polyethylene terephthalate with glycol or
 - polycarbonate, e.g. trade name Makrolon ®The clear viewing panes guarantee protection from moving machine parts during operating of the machine (during the setup and/or workpiece machining) and from any tool or machine parts ejected from the work area due to a material break. The CNC machine is open on top, so complete protection from ejected parts is not provided (residual risk).
The enclosure reduces the noise level and retains chips arising during machining. The protective cover **is locked during machining (bolt)** and cannot be opened. This safety device (**door lock**, the **so-called Schmersal switch**) may not be removed or altered.
Without a complete, intact housing, including undamaged PETG or polycarbonate panes, a CNC machine supplied with CE mark cannot be commissioned.
- The **drilling and/or milling tools used with machining spindle on the CNC machine may not have a shaft diameter greater than 7 mm (standard) with the SK11 tool holding fixture**. In case of uncertainty or questions about tool selection, please contact the Application Technology department at isel Germany AG.
- The CNC base machine without enclosure and/or protective cover is a partly completed machine in the sense of the Machinery Directive 2006/42/EC and is delivered without CE mark. The Declaration of Incorporation and assembly instructions apply.
As owner of the CNC base machine, you are responsible for taking suitable protective measures based on your risk assessment in order to fulfil the safety requirements on the machine in accordance with Machinery Directive 2006/42/EC.
- Always ensure the firm seating of the workpieces. The use of the workpiece clamping device for the concrete machining is the responsibility of the owner of the CNC machine. Unsuitable, non-secure clamping devices can lead to serious accidents with deadly consequences or physical injury and/or severe damage of the workpiece, the tool, the clamping device, or other machine parts as a result of the loosening of the workpiece from the workpiece clamping device.
- There is an Emergency Stop switch on the front side for emergency situations. This switch disconnects the voltage supply of the power electronics (motor end phases) and the frequency converter for the main spindle drive. The shutdown takes place in accordance with Stop Category 1 (controlled shutdown and subsequent disconnection of the energy supply to the drives).

- Only trained, skilled personnel may use the key switch on the controls, because there is an increased risk of injury in test mode.
Please keep the spare key under lock and key.
- Ensure that there is adequate ventilation when there is dust or gas development caused by the machining of the materials.
- If the sound pressure level at the machine exceeds the value of 70dB(A), suitable hearing protection must be worn by the operating personnel.
- Work on and with the machine may only be carried out by authorised, trained, and instructed personnel. These personnel must have received special instruction in the dangers (special residual risk) which can occur.
- The machine must be shut down by pressing the Emergency Stop switch before a tool change takes place.
- No flowing water may be used for the cooling; only a cooling device (see accessories) with which a water vapour or air may provide the cooling effect. No drips may form and flow under the clamping plate.



- **ATTENTION! High leakage current (earth leakage current, protective conductor current)!**

An additional protective conductor must be connected (cross-section, routing, and terminal in the switch cabinet are described in section 5.5 *Connection to the AC mains power supply*) before connection to the AC mains power supply.



- **ATTENTION! High leakage current (earth leakage current, protective conductor current)** An additional protective conductor must be connected before connection to the AC mains power supply. An **additional protective conductor** (cross-section: 2.5 mm² or 4 mm², see below) must be connected before connection of the CNC controller to the AC mains power supply! Before electrical commissioning of the machine, an additional protective conductor of 2.5 mm² (protected installation) or a protective conductor of 4 mm² (unprotected installation) must be permanently connected from the terminal  identified on the rear housing wall to the point where the protective conductor has a cross-section of at least 10 mm² copper or 16 mm² aluminium (e.g. building current distribution board). Please contract a qualified electrician to perform this work. If you use an earth leakage circuit breaker (FI) to safeguard the conductor / limit leakage current: An FI switch with AC characteristics should not be used. With the use of frequency inverters and chopper end phases in the conductor units, overlapping leakage currents with pulsing direct current and direct current can arise in addition to AC leakage currents. Please consult with your qualified electrician.
- **The term *leakage term* should be understood as earth leakage current in this case. This is defined in the standard EN 60204-1:2007 in section 8.2.8, Comment 1.**
- **If the CNC machine (ideally) is isolated from the earth reference potential, the earth leakage current is the same as the protective conductor current.**



4 Scope of supply / condition as supplies (QS)

4.1 Standard scope of supply

The following are included in the standard scope of supply of the CNC machine / CHC base machine:

- Machine housing with three linear axes including
- Complete control electronics
- Drilling and milling machine with 3 mm collet
- Key for collet, AF 22
- Clamping set (hand lever, stop rails, 5 mm Allen key)
- Triangle key for unlocking the cover switch
- Mains supply cable, PC - machine connection cable
- 4-way power strip with illuminated main switch
- ProNC or RemoteWin as software (optional)
- CAD/CAM software isy-CAM (optional)
- Machine documentation with documentation parts:
 - CNC base machine / CNC machine operating manual
 - Operating manuals for System module SKM-E, iSM10, or iSM5, motor end phase iMD10/20/40, iPC series control computer
 - Circuit diagrams / parts lists



The control software ProNC /6/ or Remote /7/ including CAN CNC Motion Control software is completely installed on the control PC (integrated in the CNC control panel or in the switch cabinet). The CNC machine is tested with this software. The Declaration of Conformity for CNC machines is only valid if the CNC machine is used with this control software (ProNC version 1.45.6.1 or higher or Remote version 1.45.6.1 or higher). The control software ProNC / Remote is archived on CD-ROM and USB memory stick for the purpose of re-installation (setup) as a backup. The user is responsible for archiving user programs on the supplied USB memory stick.



Please refer to the delivery note for the exact scope of supply of your CNC machine.

4.2 Condition as supplied ex works (quality assurance)

The Renishaw® QC20 ballbar system is used for verification / testing of the machine precision of the CNC machines.

The precision of the axes of all produced CNC machines / CNC base machines can be determined with this system prior to delivery. This verification / testing is a basic component of the proof of machine capability in accordance with DIN ISO 230:

- DIN ISO 230-2: Determination of the positioning uncertainty and the repeat accuracy of the positioning of numerically controlled axes. This testing takes place on request and for testing purposes with laser interferometer XL80.
- DIN ISO 230-4: Circularity testing for numerically controlled machine tools. This testing takes place on every machine with a QC20 ballbar system.

QC20 ballbar system

The QC20 can be mounted on any machine tool and requires only a few minutes. The circular measurement is controlled by means of a simple, standardised CNC program. The data is recorded and evaluated in the diagnostic software and the errors are shown with their respective sizes and influence on the overall precision in graphic/tabular form.

The shapes of the recorded circles (on all three interpolation levels XY/XZ/YZ) provide information about possible machine errors:

- Contouring error / position tolerance
- Straightness error / perpendicularity
- Error in dimension / backlash
- Quadrant transition / circular error

The measurements take place with a radius of 50mm, 100mm, 150mm, and 300mm, depending on the size of the axes to be measured. In the process, the shortest axis should always be considered.

Delivery of each CNC machine only takes place when all parameters are within the required range. The results of the measurements are saved and archived on a machine and/or order basis.



Figure 4: Circularity measurement with the Renishaw QC10 circularity measuring system

The laser interferometer Renishaw XL-80 is used for measurement / testing of positioning accuracy. This laser measuring system enables both the complete testing of complex machine tools and/or automation systems / special machines and simple positioning units / axes of movement.

There are comprehensive options available for static and dynamic testing with the available lenses, such as determination of the real speed profile $v=v(t)$ of a linear axis and thus verification of the permanence of this expressive signal progression:

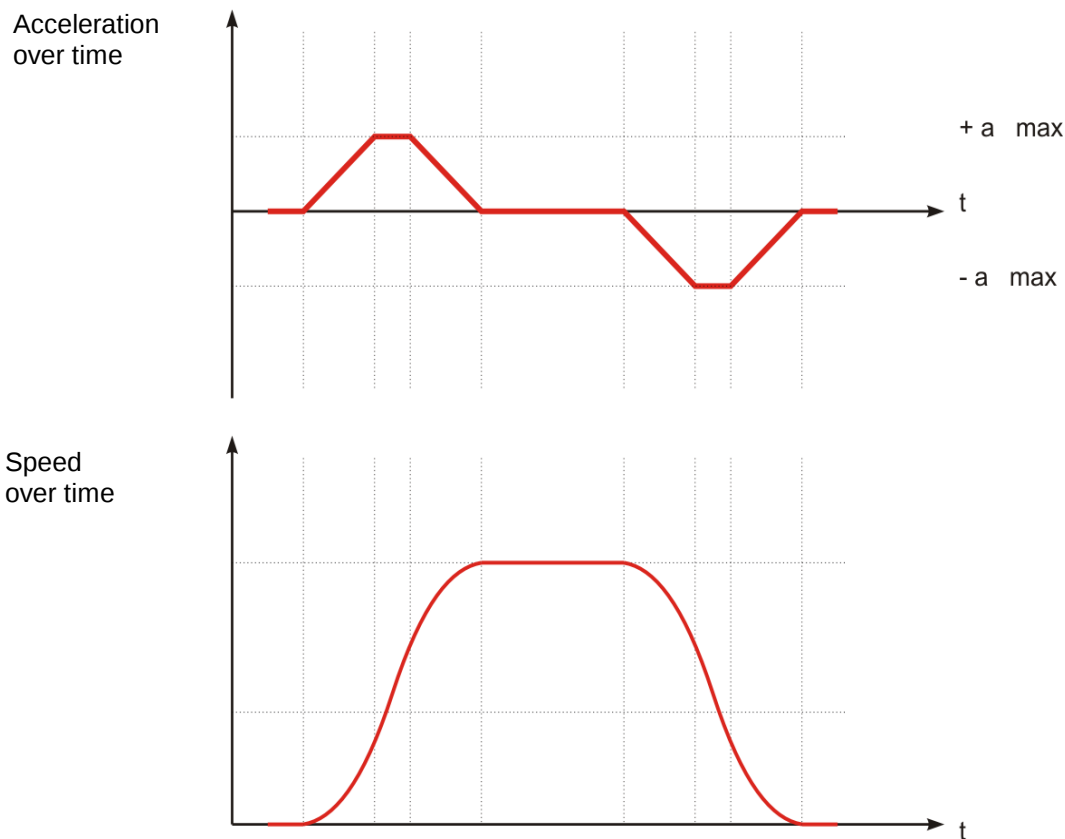


Figure 5: Speed profile of a linear axis with torque limitation

The position measurement is the measurement that is most frequently performed on the machine. The laser measuring system measures the positioning accuracy and the repeat accuracy with a comparison of the position indicated by the machine with the actual position measured by the laser measuring system.

5 Set-up and connection of the CNC machine

5.1 Dimensions and spatial requirements

The spatial requirements of the machine are limited to the outer dimensions and adequate space around the machine in order to be able to operate and equip it. A clearance of approximately 10 cm is required behind the machine for the plug. Ensure a sufficient clearance of 30 cm on the sides in order to ensure proper function of the fans. The cover of the housing opens upwards such that the overall height is approximately 1.35 metres.

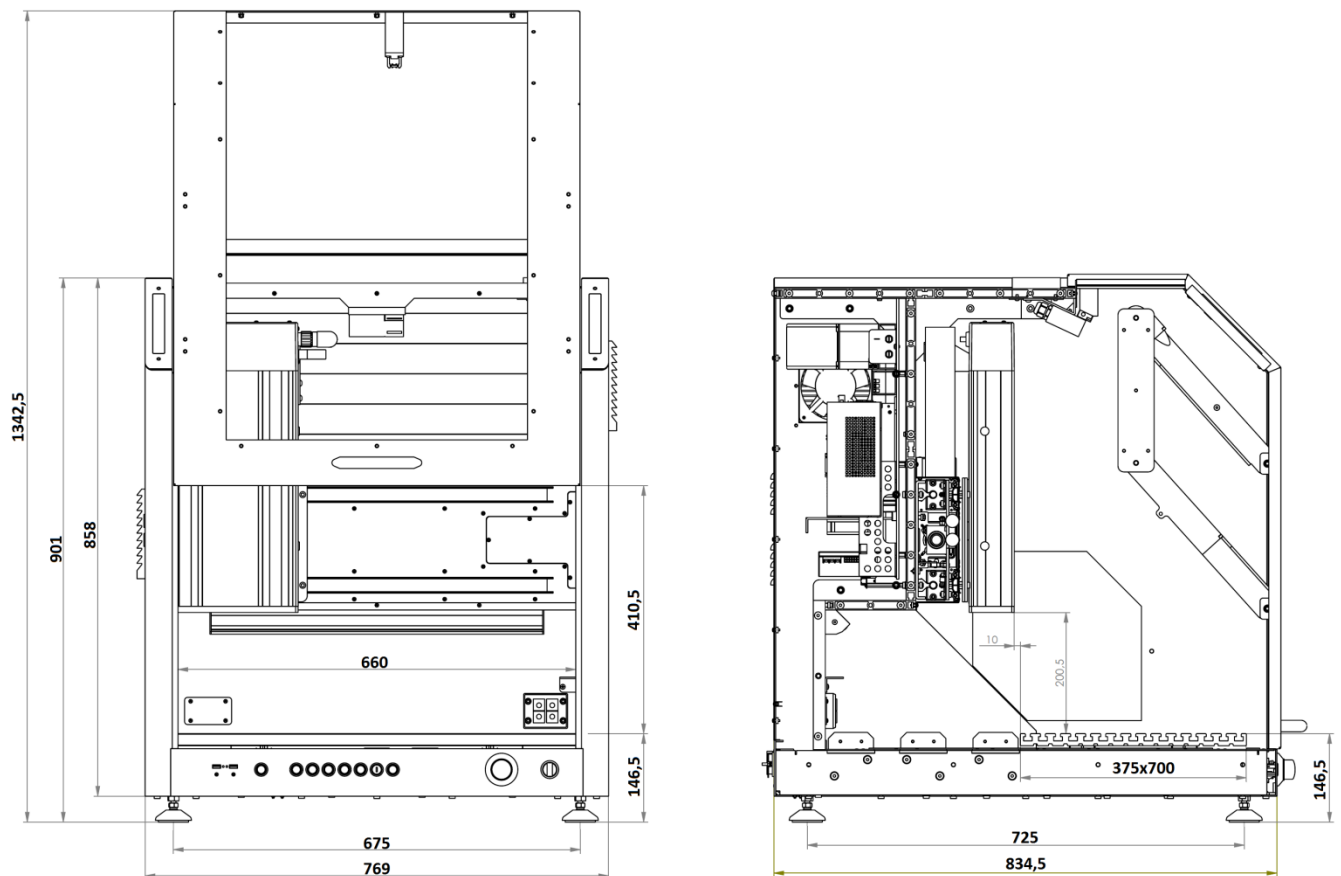


Figure 6: Dimensions and spatial requirements



Always keep the triangle key separate from the machine - particularly during transport.



When setting up your machine, only use suitable, safe clamping tools (refer to 'Accessories').

Always ensure the firm seating of the workpieces.



When planning the installation area for the CNC machine, access on all sides for trained personnel during maintenance and service tasks must be ensured!

5.2 Transport of the CNC machine

Remove the transport locks. Only use suitable lifting equipment (forklift, lift truck). Only lift the machine from below.

If transporting the machine at a later time, please ensure that the mains and connection cables are not damaged.

Always pull out the mains plug before transport.



Ensure that the machine is not subjected to heavy jolting or vibration during transport. Always keep the triangle key for manually unlocking the door separate from the machine.

5.3 Setup of the CNC machine

The mounting surface / machining surface on the CNC machine and all axes are precisely aligned perpendicularly at the factory.

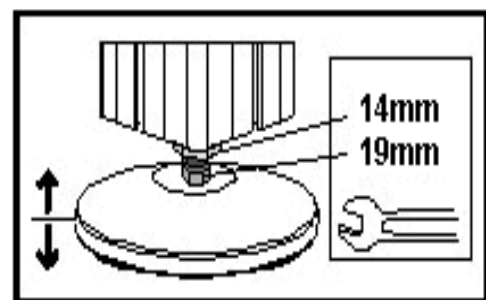


Never disconnect the fasteners of axes or the mounting bracket on which the transverse axis (X-axis) is mounted. Otherwise, the machine must be measured again by a technician from the manufacturer, isel Germany AG.

Position the machine on a level and stable surface. The height-adjustable feet can be used to compensate for unevenness in the floor / on the table.

A spirit level with a precision of at least 0.1 mm/m is required for the precise alignment of the machine.

Secure the height of the machine feet with the lock nuts.



We offer the following on-site service for secure setup of your new CNC machine:

CNC base machine / CNC machine measurement / adjustment with laser interferometer on the customer's / end user's premises

(Article number: 991300 0001).

5.4 Protective cover with safety bolt

	<i>For compact CNC machines of the type ICP, the enclosure is uniform, which means it cannot be removed.</i>
---	---

	The clear viewing panes (material: polycarbonate) installed in the machine frame and/or the cover guarantee protection from moving machine parts during operating of the machine (during the setup and/or workpiece machining) and from any tool or machine parts ejected from the work area due to a tool or workpiece break.
	<i>Without a complete, intact housing, including undamaged polycarbonate panes, a CNC machine supplied with CE mark cannot be commissioned.</i>

5.5 Connection to the AC mains power supply, wiring

In order to reach the connections of the servo motor control unit, please proceed as follows:



Switch off the machine and pull out the mains plug!

Remove the protective cover of the machine by unscrewing the hexagon screws and disconnecting the earthing cable from the protective cover.

Now you can connect additional components to the connections of the servo motor control unit (e.g. frequency converter, solenoid valves, sensors, actuators, etc.).

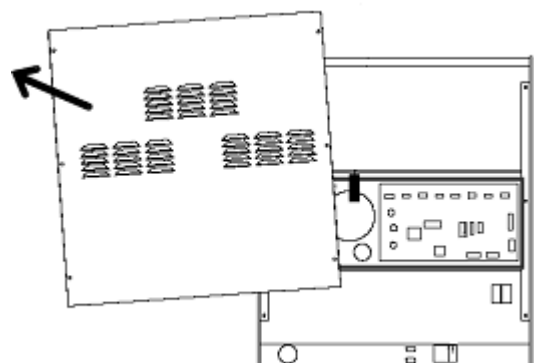


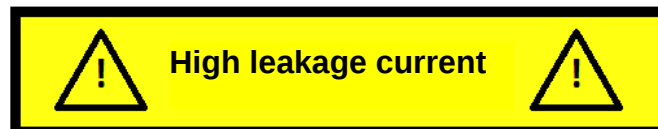
Figure 7: Opening the housing of the servo motor control unit

5.5.1 Connection to the AC mains power supply

The CNC machine is controlled by a control PC /3/ and power electronics for the motors (motor end phases /1.1/ /1.2/). The complete power control unit - integrated behind the rear machine wall /5/ - is completely wired and connected to the machine.

An extensive overview of the wiring of the electrical / electronic components is provided in the machine documentation /5/.

Do not connect the AC mains cable of the machine control unit until the machine is ready for commissioning. The following specifications must be observed:



ATTENTION: High leakage current!

Connect an additional protective conductor (cross-section: 2.5 mm² or 4 mm², see below) before connection of the CNC machine to the AC mains power supply!

Before electrical commissioning of the machine, an additional protective conductor of 2.5 mm² (protected installation) or a protective conductor of 4 mm² (unprotected installation) must be permanently connected from the terminal  identified on the rear side of the machine to the point where the protective conductor has a cross-section of at least 10 mm² copper or 16 mm² aluminium (e.g. building current distribution board). Please contract a qualified electrician to perform this work.

Connection to the AC mains power supply: TN-S mains, i.e.

- Single-phase connection: PHASE (P), NEUTRA CONDUCTOR, PROTECTIVE CONDUCTOR
- Conductor safeguarding: P (L1) 16A - C or gGgL



If you use an earth leakage circuit breaker (FI) to safeguard the conductor / limit leakage current: An FI switch with AC characteristics should not be used. With the use of frequency inverters and chopper end phases in the power units (switch cabinet) of our CNC machines, overlapping leakage currents with pulsing direct current and direct current can arise in addition to AC leakage currents. Please consult with your qualified electrician.

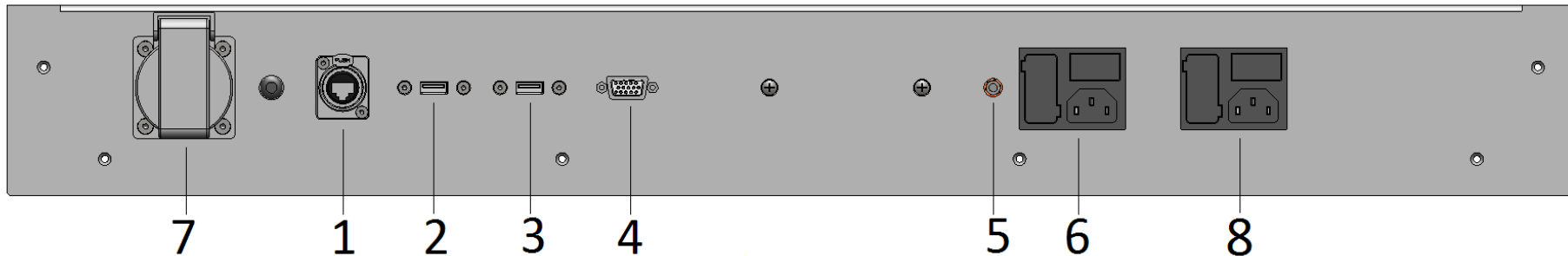


The term *leakage term* should be understood as earth leakage current in this case.

This is defined in the standard EN 60204-1:2007 in section 8.2.8, Comment 1.

If the CNC machine (ideally) is isolated from the earth reference potential, the earth leakage current is the same as the protective conductor current.

5.5.2 Connections on the rear side



Number	Identification	Description
1	LAN	RJ45 connection jack for LAN connection to the iPC 25
2	USB 3.0	USB 3.0 jack for external periphery (mouse or keyboard)
3	Recovery	USB 2.0 jack for recovery of the iPC 25 and external periphery (mouse or keyboard)
4	VGA connection	15-pin connection jack for VGA monitor
5	Earthing pin	M4 connection pin for additional potential equalisation
6	Mains connection socket with main switch and fuses	230V AC mains adapter connection with main switch and mains fuse 2 x 10A; IEC 127 HBC  Only replace defective fuses with original spare parts!
7	Schuko plug socket	L/N/PE mains connection socket wired in accordance with IEC CEE7/3 (optional auxiliary equipment)
8	Additional mains connection socket with main switch and fuses I	230V AC mains adapter connection with main switch and mains fuse 2 x 10A slow; IEC 127 HBC for optional auxiliary equipment. Attention! No shut-off in case of Emergency Stop  Only replace defective fuses with original spare parts!

6 Commissioning - CNC technology terminology

6.1 Controls

The following image provides an overview of the **controls on the CNC control panel**. All controls and their functions are described in detail in section 7.3.

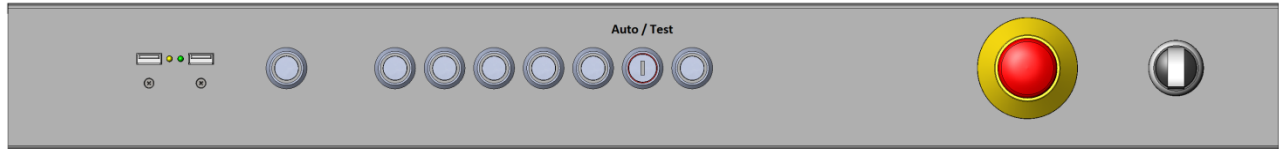


Figure 8: Controls

6.2 Coordinate system and workpiece zero point

The **coordinate system** of the CNC machine is a right-handed coordinate system, as shown in the figure.

The **workpiece zero point** P0 can be defined with the CNC software (e.g. via teach-in) or is freely programmable in the user program.

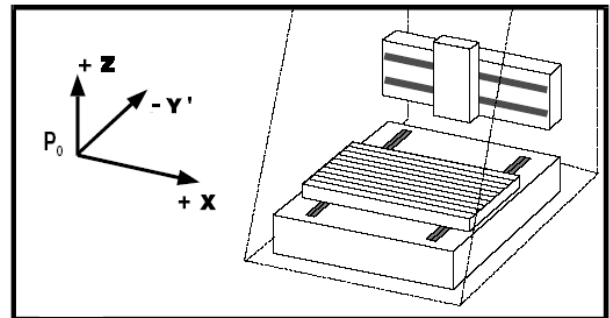


Figure 9: Coordinate system of linear axes

Yellow stickers on the axes of the CNC machine identify both the axes (X, Y, or Z are normally axis address letters for linear axes; A, B, or C are normally axis address letters for rotational axes) and the positive / negative axis direction for linear axes and/or the positive / negative rotational direction for rotary axes.



If you have to change the arrangement of the coordinates, please read the motor end phase manual /1.1/ /1.2/. If you have any questions, please contact our technical support.

6.3 Assignment of axes of movement

The assignment of the positive direction of movement of the linear axes of movement in relation to the operating positions is as follows:

X-axis	= transverse axis	-> +X to the right; -X to the left
Y-axis	= longitudinal axis	-> +Y away from the operator; -Y towards the operator
Z-axis	= vertical axis Z	-> +Z upwards; -Z downwards

The logical address letters are as follows:

X-axis	= transverse axis	= X	= End phase node address 1
Y-axis	= longitudinal axis	= Y	= End phase node address 2
Z-axis	= vertical axis Z	= Z	= End phase node address 3
A-axis	= rotary axis	= A	= End phase node address 4

6.4 Reference point, machine zero point, and home position

The **reference point** of the machine (**machine zero point**) is defined in the factory in the axis position

- rear (Y-axis)
- left (X-axis)
- top (Z-axis)

The **reference point** is defined by a hardware limit switch (factory setting).

The **home position** was signalled to the control unit by means of an electromagnetic switch contact in older isel Germany AG machines (in systems without standstill monitoring in the motor end phases).

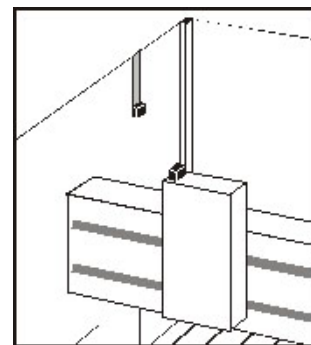


Figure 10:
Home position sensor



The home position sensor is no longer necessary for isel machines due to the equipment of the motor end phases with standstill monitoring.

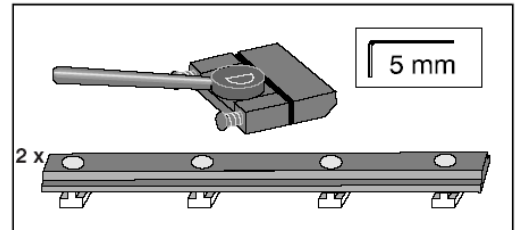
6.5 Workpiece fastening



***When setting up your CNC machine, only use suitable, safe clamping tools (refer to 'Accessories').
Always ensure the firm seating of the workpieces.
For this purpose, use the optional clamping set from isel Germany AG.***

The **clamping set** comprises a hand lever clamping device and two stop rails with fastening material for the T-slot plate.

Always ensure the firm seating of the workpieces.



7 Operation

7.1 Operating modes

- **Operation mode AUTO = AUTOMATIC operation = machining mode**

In the AUTO operating mode, you can run a selected (i.e. open) user program (ISO / PAL / NCP or CNC file) on your CNC machine to machine your workpieces. The door is locked during the machining process (no axis standstill).

In this operating mode, you can only open the door after all axes of the CNC machine are no longer in movement (standstill monitor) **and** the machining spindle (e.g. milling spindle motor in CNC milling machines) is no longer rotating (speed = 0 rpm), and is therefore also switched off.

Press the COVER button to open the door.

After closing the door, the **safety bolt** is automatically locked again.

- **Operating mode TEST = SETUP mode = test mode**

For testing and control purposes, you can run the (selected) user program (ISO / PAL / NCP or CNC file) on the CNC machine **with an open door** if you turn the key in the **key switch** to the **TEST** position to the right (**SETUP mode = test mode**). The program now continues for as long as the ACK button (acknowledgement button) is held.

Test mode has no influence on the advance and/or rapid speed of the axes. The current speed is not changed.

Releasing the ACK button (with door still open) will switch off the power end phases. The activation of the machining spindle (e.g. milling spindle motor) by the safety circuit module (SC module) is suppressed in test mode.



Attention: Risk of injury!

The key switch = operating mode selector switch may only be used by qualified and authorised personnel, because there is no protection from moving machine axes after the door has been opened in test mode.

7.2 Door locking / door release / standstill monitor



The **locking** of the (single) door is a basic safety-related function.

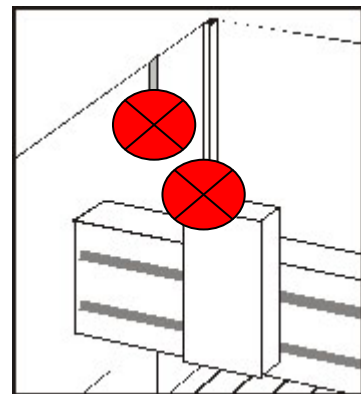
A special **home position** is not monitored by the control unit and thus has **no influence on the door locking / door release**.

Instead, the **standstill monitor** integrated in all motor end phases is relevant.

This **standstill monitor** has a redundant design in compliance with DIN EN 62061 (VDE 0113-50) (cross-circuiting detection). All motor end phases integrated in the machine control unit /5/ of the CNC machine (e.g. IMD10 /1.1/ or IMD20 /1.2) are connected in series for safety purposes and forward the cycle signals if the servo motor controlled by the corresponding end phase does **not** move outside of a (positional) rule window). The cycle signals generated by the safety module (e.g. 'sent') are also received and evaluated by this module. With a standstill of all servo motors / axes, the door is **released** in **AUTOMATIC mode**.



A home position sensor not provided because there is standstill monitoring of all axes!



Basically, the linear axes X, Y, and Z of the CNC machine and all optional rotary axes A, B, or C must be at a 'standstill' in order to be able to open the door when the **key switch** is set to **AUTO (AUTOMATIC operating mode)**.



Key switch = operating mode selector switch

In the **SETUP operating mode** (**key switch = operating mode selector switch** set to **TEST** position), the door can always be opened **regardless of the current position / standstill** of the linear axes X, Y, and Z, as well as all optional rotary axes A, B, or C of the CNC machine.

The door control (as a component of the **safety circuit module (SCM)**), controls the sensor / actuator (**safety bolt**) for the door locking:

- Sensor function of the safety bolt:
 1. Door closed
 2. Door locked
- Actuator function of the safety bolt:
 - Door locking



Manual door unlocking:

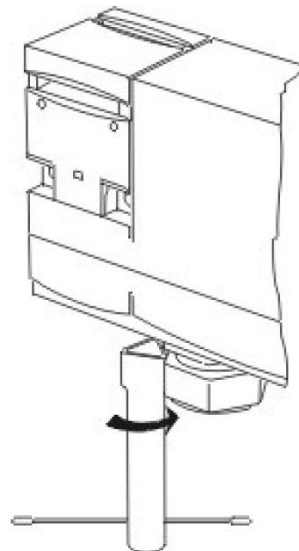
For special situations (e.g. safety bolt defect or mains voltage failure or machine / system is not connected to the mains power supply), you can manually unlock the door locking mechanism with the triangular key (in the accessories kit accompanying the CNC machine).

1. Switch off the machine.
2. Turn the triangular key - without applying excessive force - a half rotation to the left and open the door.

You may not operate the machine in this state.

Current does not flow to the motors of the CNC machine in this state.

3. Turn the triangular key back to the right.

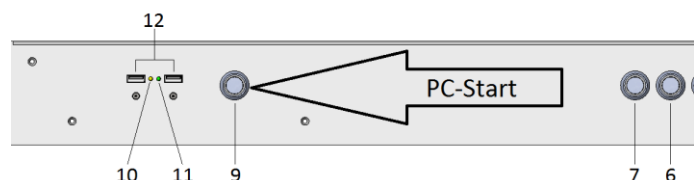


You may not operate the machine if the safety bolt is manually unlocked.

7.3 Control PC / controls

7.3.1 Control PC: Button for PC on / off

After you have switched on the main switch on the rear side of the machine, you can start the control PC, i.e. boot the Windows operating system. To do so, press the button located on the front side of the machine.



7.3.2 CNC controls - front side

Operation of the CNC machine takes place with the controls on the front side of the machine.

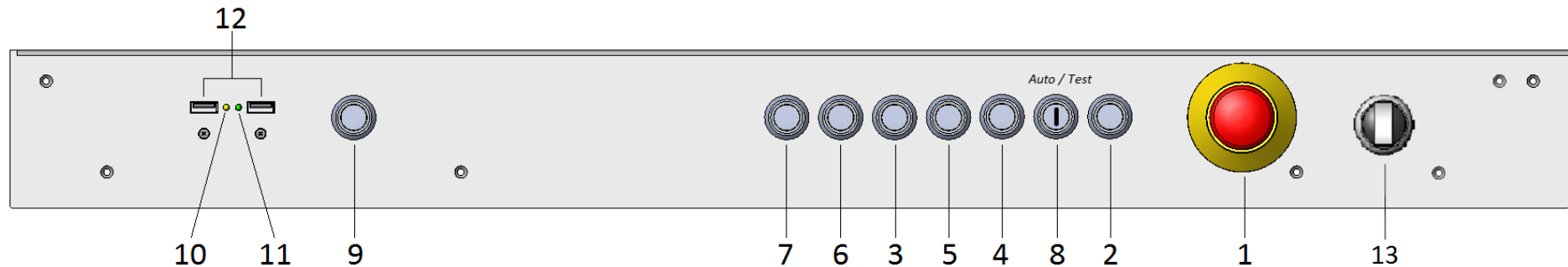


Figure 11: Detail: Standard machine controls

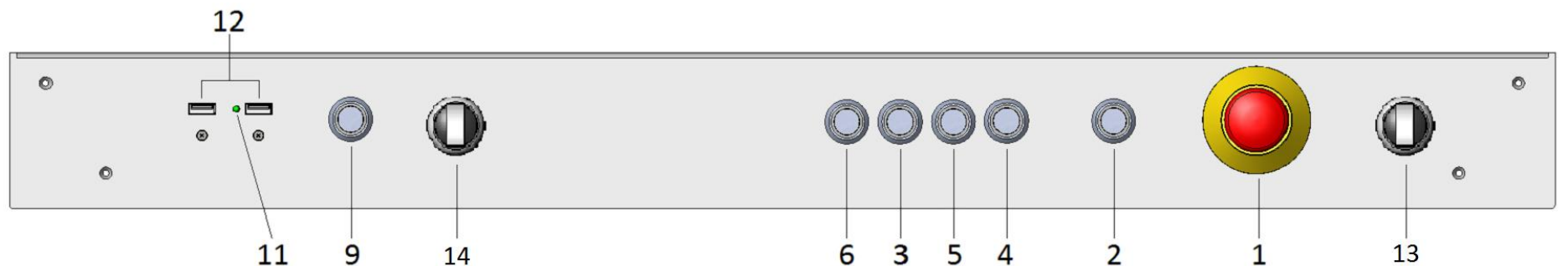


Figure 12: Detail: Special application machine controls

Number	Identification	Description
13	Main switch of the machine	Main switch for switching the voltage supply ON and OFF
14	Switch for accessories	Switch for activating the mains connection socket on the rear side

Controls for the machine control unit

Number	Identification	Description
1	Emergency OFF button	Shut-off of the voltage supply of the motor end phases and the working spindle.
2	Power ON button	The voltage supply of the end phases is connected.
3	Fault indicator	The fault indicator signals an error in the safety circuit.
4	Start button	Starts the processing of the current NC program or resumes an interrupted process.
5	Stop button	Interrupts the processing of the current NC program. Pressing the Stop button again ends the processing (does not apply for all control unit configurations).
6	Cover button	This button is used to open the cover (if present). The cover can only be opened if the Cover button is illuminated. This is the case if the axes are in the HOME position or the operating mode selector switch is in the Test mode position.
7	ACK (Acknowledge) button	This button must be pressed in order to be able to move the axes in test mode with the cover open.
8	Operating mode selector switch	This key switch is used to switch between automatic and setup modes. The cover and/or door can only be opened in automatic mode if the axes are in the home position. In setup mode, the cover can be opened and the axes can be moved when the ACK button is pressed.

Controls for the control computer

Number	Identification	Description
9	Power button	Switching on the integrated control computer
10	Power LED	Operating indicator of the control computer
11	HDD LED	Indicator for hard disk access
12	USB slots	USB 2.0 slots for USB devices (USB stick, WIBU, etc.)

1 Emergency STOP button

switches off the operating voltage of the motor end phases / drive control unit and the frequency converter of the working spindle when pressed (**controlled shutdown, STOP Category 1 in accordance with EN 60204-1**). Press the Emergency STOP button in the event of danger to your health or the machine safety. The safety module (safety module) in the switch cabinet is designed for Category 3 in accordance with DIN EN ISO 13849-1. The Emergency STOP button is unlocked by turning it to the right.



The mains input voltage in the control cabinet is still present after an Emergency STOP button is pressed. Only the operating voltage (DC or AC) for the motor end phases and/or spindle motor inverter is interrupted.

2 Fault indicator

signals an error in the safety circuit module (SC module). The motor end phases and the inverter for the working spindle are not released.

3 Power ON button

switches on the operating voltage of the motor end phases / power electronics. The operating voltage of the motor end phases can only be switched on if the Emergency STOP button is unlocked.



The operating manual for the safety circuit module /2/, you will find information about possible causes if the operating voltage cannot be switched on in the chapter Status dialogue.

4 Start button

starts the user program or resumes a suspended movement and/or a suspended user program. The machine movement moves to the exact place where it was when interrupted by the Stop button if the machining was not ended, i.e. cancelled, by the software.

5 Stop button

stops the running user program and thus immediately stops any axis movement of the machine axes. The current program line in the user program remains marked /6/ /7/. The machine remains switched on, the door can be unlocked when all machine axes are at a standstill (by pressing the COVER button), and thus opening is released. Pressing the Stop button again cancels the processing of the user program.

6 Cover button

deactivates the safety locking mechanism and thereby enables the opening of the door when pressed, insofar as all necessary conditions of the SC module are fulfilled. The button is only functional when the light is illuminated.

7 ACK button, ACKnowledge button

must be pressed and held in setup mode (TEST operating mode) to move the axes while the door is open. If you release the button while the door is open, the safety circuit module (SC module) switches off the drive control unit (power unit).

8 Key switch = operating mode selector switch

You can change between

- AUTO (AUTOMATIC operation = machining mode)
- or
- TEST (SETUP mode = test mode)

operating modes with the key switch.



In which operating mode can the machining spindle (milling spindle) be switched on?

Operation mode AUTO = AUTOMATIC operation = machining mode:

The machining spindle can only be switched on and operated at the setpoint speed if the door is closed. You can only open the door in **automatic mode** if all machine axes are at a standstill (standstill monitoring), regardless of the programmed speed of travel (advance).

Operating mode TEST = SETUP mode = test mode:

Basically, the machining spindle cannot be switched on in **setup mode**. You can always open the door in **setup mode**, regardless of the current speed of travel (advance) of the machine axes. In order to prevent an Emergency STOP as a result of the opening of the door in this operating mode, press the acknowledge button (**ACK button**) on the control panel.



AUTO —► TEST operating mode selection:
When changing the operating mode from **AUTO —► TEST** during workpiece machining, the machining spindle runs down (with spindle inverter with a release input) and/or is switched off.



TEST —► AUTO operating mode selection:
With the resetting from **TEST —► AUTO**, the machining spindle is run up again (to the previous setpoint speed) and/or is switched on.



Changing operating modes is only permitted when the movement axes of the CNC machine are in the STOP state!

If the operating mode change does not take place when the movement axes are in the stop state, the machining spindle or the workpiece can be damaged.

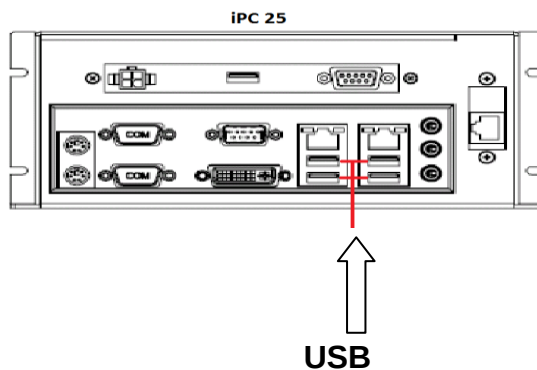


Attention: Risk of injury !

The key switch = operating mode selector switch may only be used by qualified and authorised personnel, because there is no protection from moving machine axes after the door has been opened in test mode.

7.3.3 Control PC: USB jack(s)

The USB jacks are provided for connection of USB devices (USB memory stick, WIBU USB dongle for ProNC or external CD-ROM drive). The NC data exchange between user and control PC /3/ takes place via this interface. You can transfer NC programs or drawings created on an external computer to the control PC with a USB memory stick and then perform the workpiece machining with these NC programs.



The control PC is already wired at the factory and integrated into the machine control unit /5/. As a user, you do not normally need to make any changes to the wiring. The connections for **USB**, **LAN** and the **monitor** are already guided 'outwards' to the front or rear panel.



If you would like to execute an ISO or PAL user program with the ProNC /6/ programming software, you must use the WIBU USB dongle. Plug the dongle into the USB port.

No WIBU USB dongle is required to execute ISO or NCP programs with Remote /7/.

7.4 Installing and starting CNC software

You can choose between the CNC user interfaces / CNC operating software

- Operating and programming software **ProNC**
- Operating and output software (interpreter) **Remote.**

The CNC software included in the scope of supply of your CNC machine

- **ProNC** including Remote Article number: **Z11-333500** or
- **Remote** Article number: **Z12-334500**

includes the appropriate manuals

- **ProNC:** **Operating manual and programming rules**
- **Remote:** **Operating manual**

saved in PDF format on the correspondingly identified installation CD and the supplied USB memory stick.



Also use the USB memory stick for the archiving of your user programs.

In the condition of the CNC machine as supplied, the CNC operating software **ProNC** or **Remote** (depending on the order / scope of supply) is already completely installed.

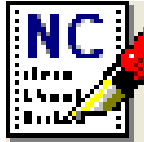
In case of uncertainty regarding the installation (e.g. a software update) of **ProNC** or the configuration of the software modules, please read the ProNC operating manual chapter 3.4.4 'Configuration dialogue' /6/.

In case of uncertainty regarding the installation (e.g. a software update) of **Remote** or the configuration of the software modules, please read the REMOTE operating manual chapter 2.8.3.1 'Configuration dialogue' /7/.

For further information about the CNC operating software, please refer to the respective manuals and/or ReadMe files on the installation CD.

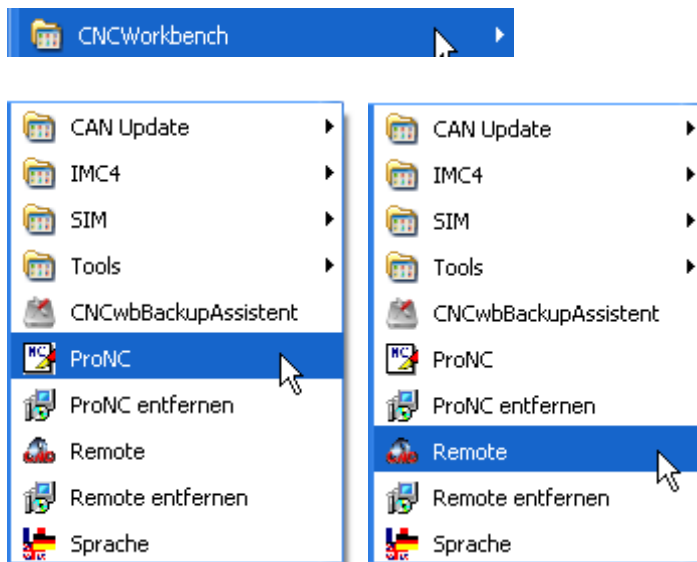


***Alternatively, you can also start the installation assistant.
This assistant will guide you through the installation.***



Start the **ProNC** or **Remote** CNC operating software

- by clicking on the icon on the desktop or in the task bar
- or
- by clicking in the start menu folder **CNCWorkbench**



7.5 AUTOMatic mode - production on the CNC machine

The production of parts on a CNC machine is performed according to the following sequence:

- 1: Establishment of a state of readiness for operation (production preparation)
- 2: Production: Machining / production of one or multiple workpieces
- 3: Ending of the state of readiness for operation (cleaning or maintenance)

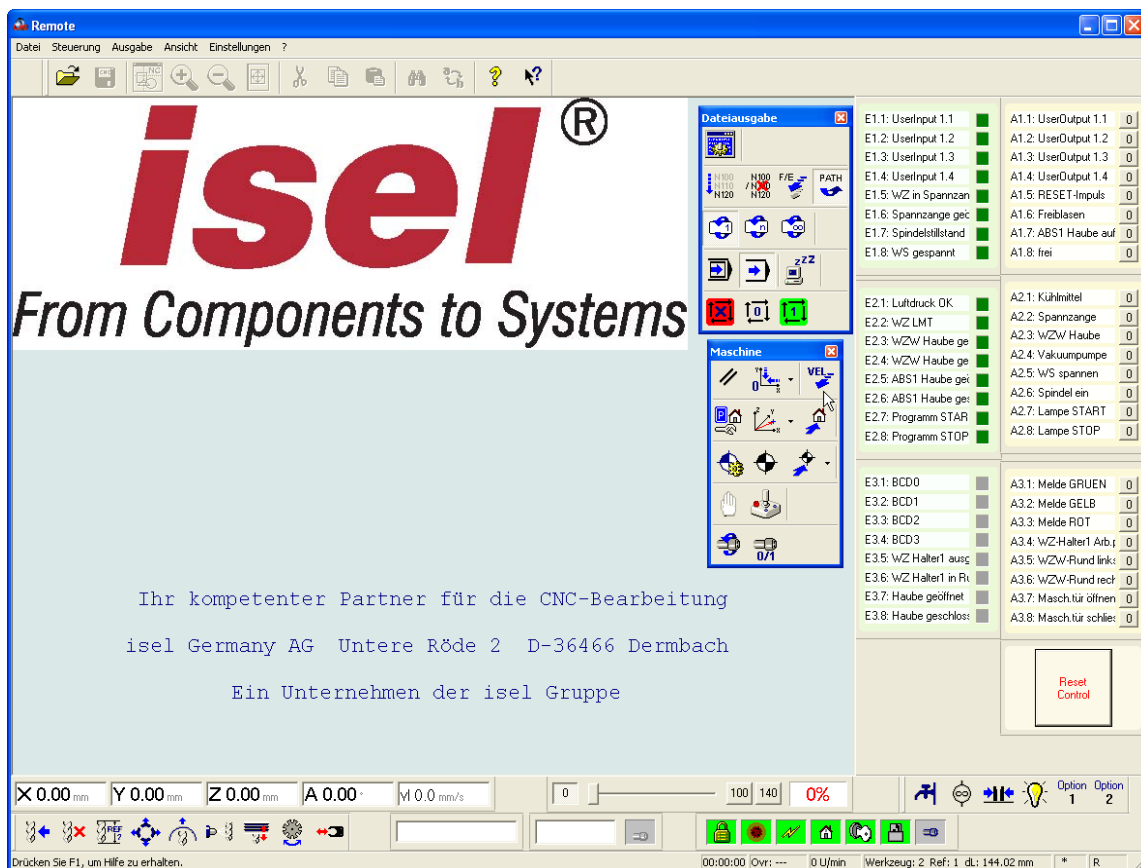
The following description is simplified (i.e. without manual or automatic tool change) and only applies for the production of **one** milled part with the **Remote** CNC operating software.

7.5.1 Establishment of a state of readiness for operation

Steps:

- 1: Start the **Remote** CNC operating software, close the cover of the CNC machine
- 2: Move the operating mode selector switch to AUTO
- 3: Press the Power ON button on the CNC control panel

Result (the background image with isel logo and text is monochromatic by default):



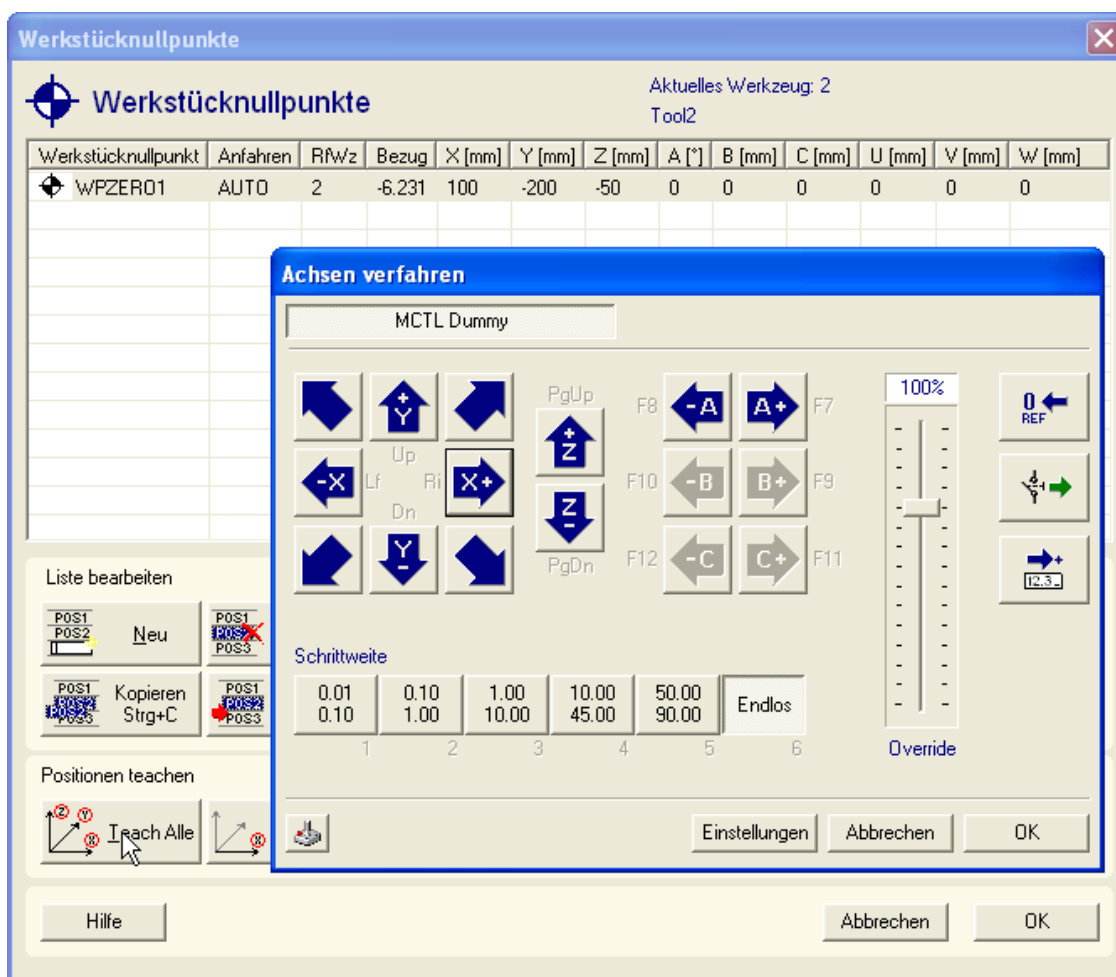
- 4: Reset of the movement control -> all drive units are initialised and their readiness for operation is established



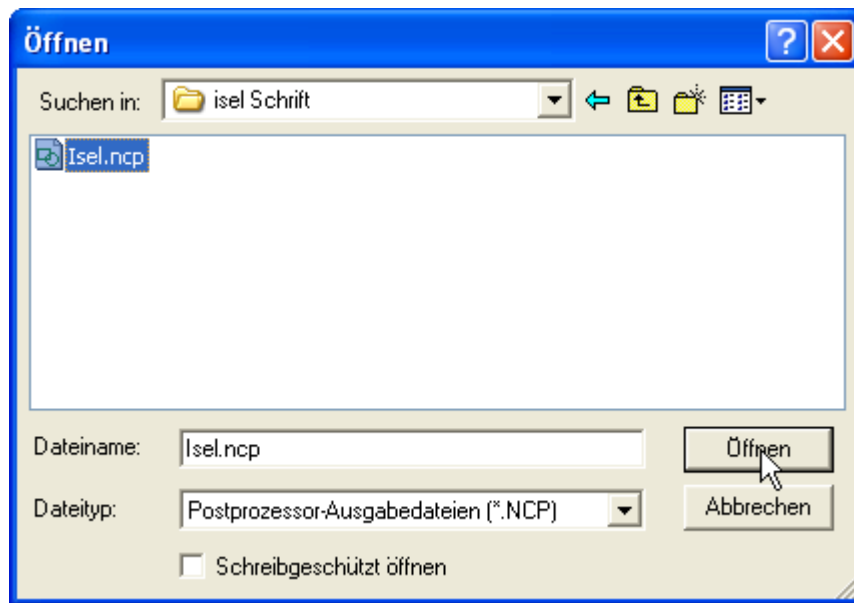
- 5: Execute a reference run of all axes (standard setting: the Z-axis is referenced first)
-> after this step, the numerical axes can be moved manually



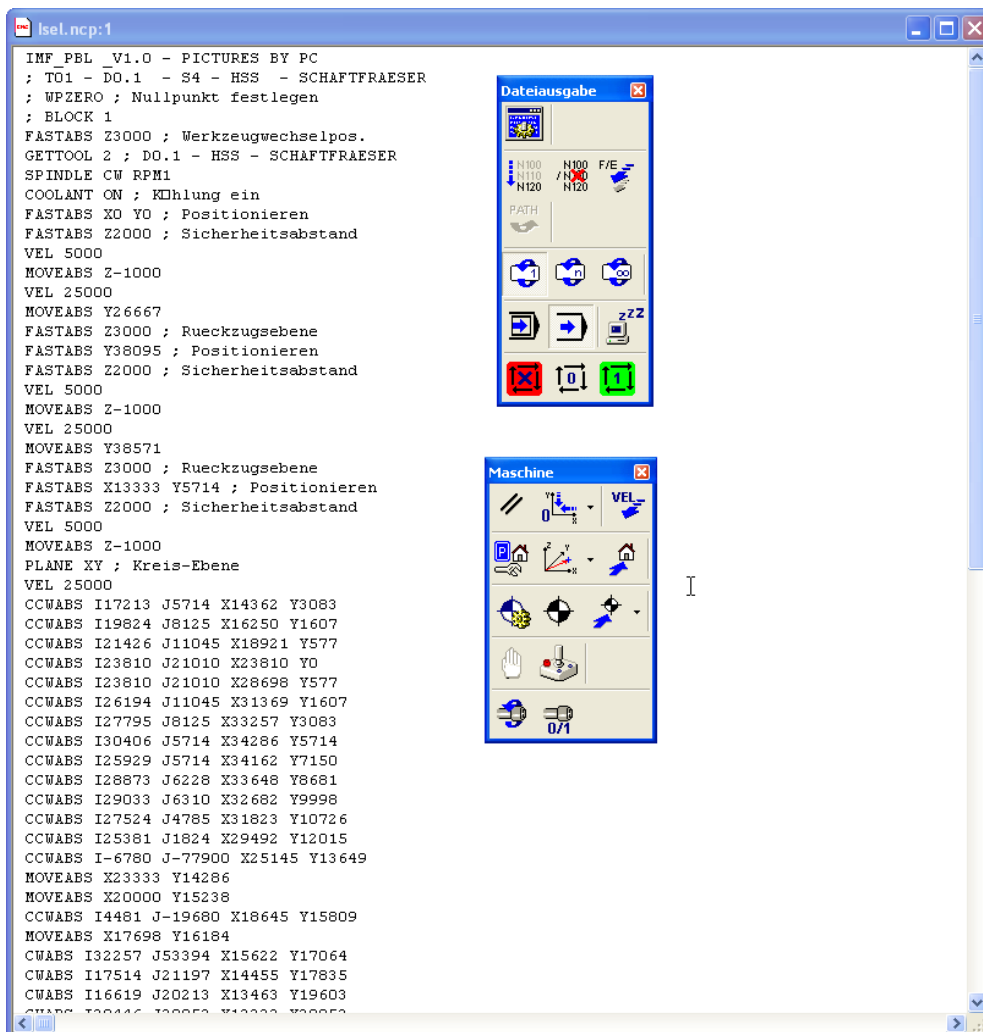
- 6: Manually move the axes to a position in which the tool can be clamped in the clamping fixture of the machining spindle; open the cover; clamp the tool; clamp the workpiece blank on the machining surface; close the cover; determine the workpiece zero point, e.g. via teach-in:



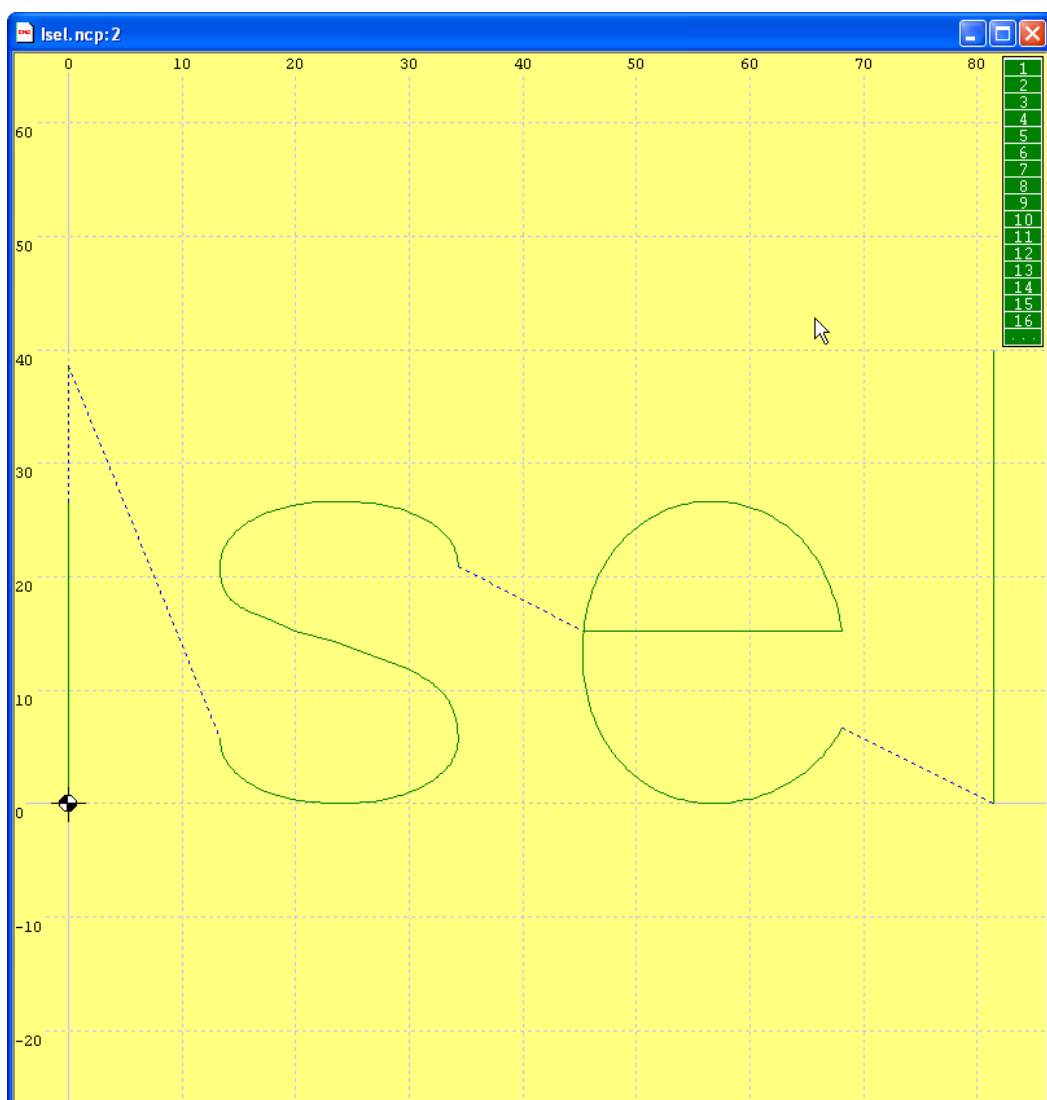
- 7: Open the machining program (here: the NCP file *isel.ncp*):



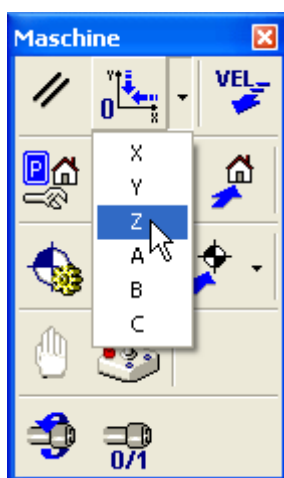
Result (text view):



Result (graphic view):



8: Reference the Z-axis for safety purposes:



7.5.2 Production: Machining / production of a workpiece

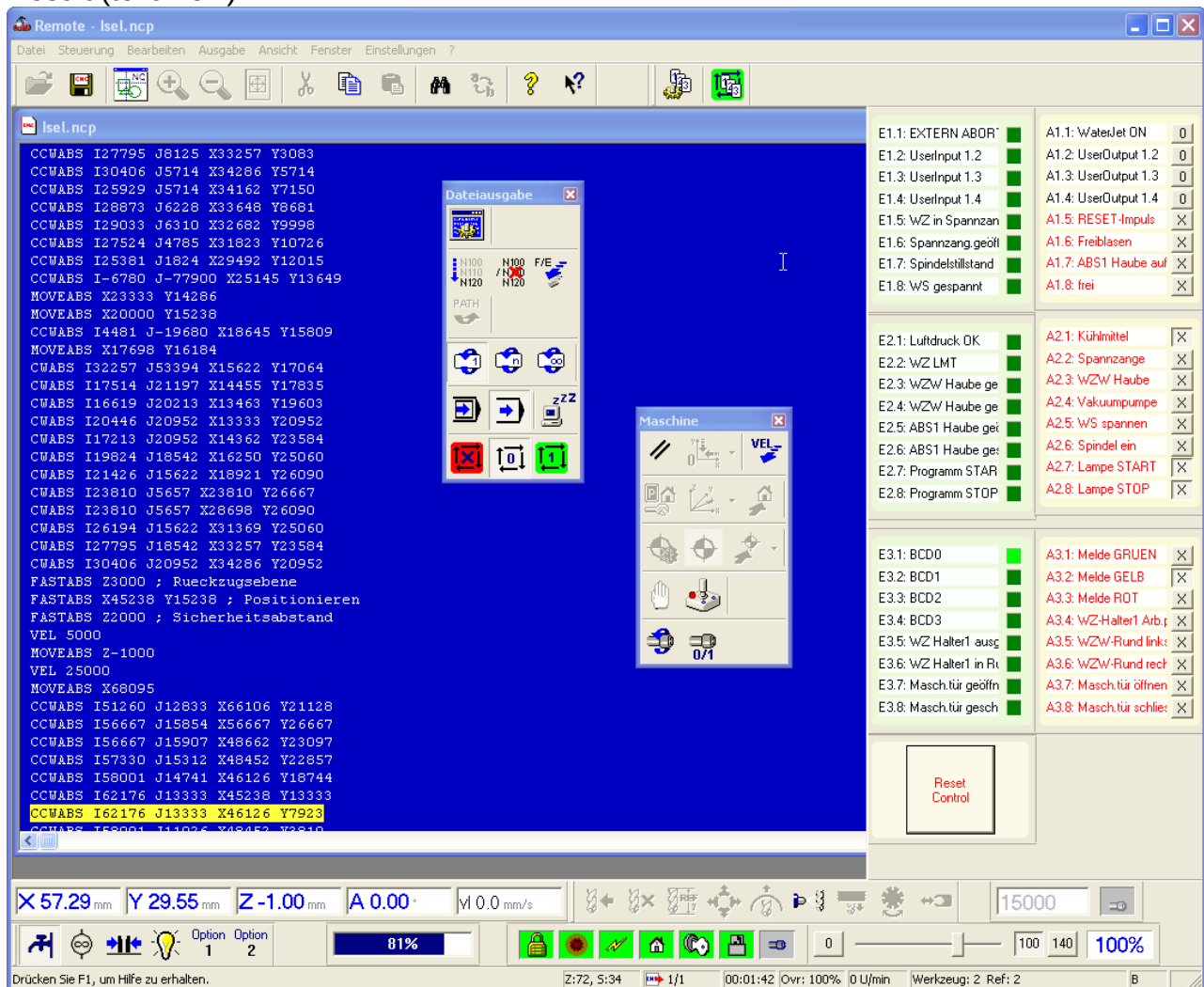
Steps:

1: Adjust the processing mode to automatic:

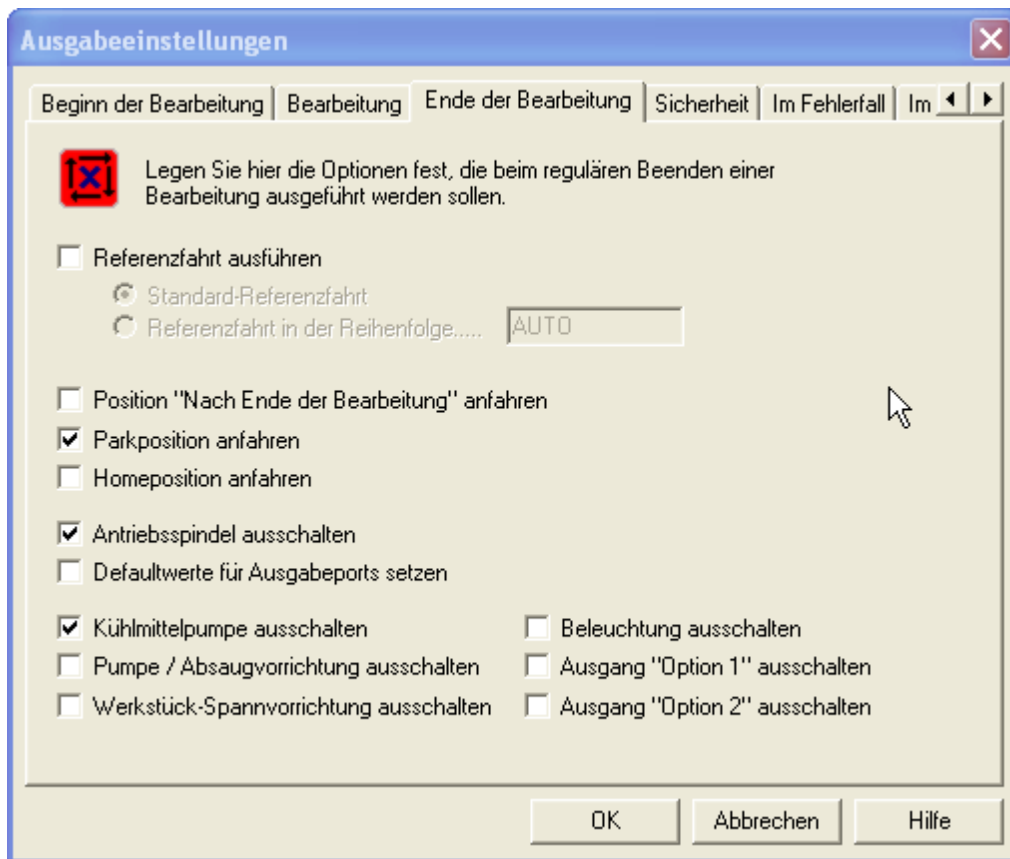


2: Press the START button on the CNC control panel -> Machining starts

Result (text view):



- 3: Wait until the machining has ended; when the workpiece has been completely machined, the axes of the CNC machine (Z-axis first, then the X and Y axes) automatically move to park position when the following output settings (*Settings -> Output of the CNC file*):



- 4: Open the cover, then unclamp and inspect the machined workpiece

7.5.3 Ending the readiness for operation

Steps:

- 1: Press the EMERGENCY STOP button for safety purposes -> All drives are de-energised.
- 2: If necessary, carry out cleaning tasks (see section 9).
- 3: Close the **Remote** CNC operating software (*File -> Exit*).
- 4: On the CNC control panel, click on *Shut down*



or press the PC ON/OFF button on the right side of the CNC control panel.

- 5: Switch the main switch on the control cabinet to the 'OFF' position.

8 Accessories

The following accessories matching the ICP 3020 / 4030 can be ordered:

- Clamp set (clamping lever SH1, SH2, 2 stop rails, Allen key)
- Additional fastening material for the T - slot plate
- Vice 1, 2
- Additional collets for the respective milling spindles
- Mill, drill, graver tool set
- Linear tool changer with high-frequency spindle, option: length measuring sensor
- Rotary axis (4th axis)
- Main spindle drives iSA 500, 750, 900
- Machining spindle UFM 500, UFM 1050
- Vacuum clamping system **isel Vakufit**
- Cooling air system **isel CoolMin**: cooling device with cold air nozzle (down to -20°C)
- Extraction device
- Spray/cooling device, coolant HL4
- Working chamber lighting
- ProNC, PalPC control software
- CAD/CAM software isyCAD/CAM 2.5



Note for compressed air connection of accessories:

In order to be able to use the optional vacuum clamping system, the cold air nozzle, or the tool changer and the collet of the machining spindle, a compressed air connection must be available in the installation location of the machine.

Accessories	Air pressure	Air consumption
Pneumatic vacuum pump	4 - 6 bar	100-150 l/min (1 nozzle)
Cold air nozzle	3 - 10 bar	100-150 l/min
Tool changer cover	3 - 6 bar	Pulse
Milling spindle with automatic tool change	> 7.5 bar	Pulse
Pivoting unit mounted on the milling spindle for extraction (especially for wood processing)	2 bar	Pulse



The software necessary for the tool change, including the tool length measurement is a component of the Remote / ProNC operating and programming software.



Ensure that all accessories are correctly mounted and observe the applicable standards and safety regulations.

9 Technical advice and sales

For further information and/or orders, please contact

Technical advice and sales

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You can also visit our permanent display at our headquarters in our factory in Eichenzell, Germany on all work days and see all of our products on display at all the important trade fairs.

We provide a sampling of our product range in our showroom and offer you practical demonstrations when possible.



10 Cleaning, lubrication, and maintenance



Switch the main switch off before any cleaning or maintenance tasks and pull out the mains plug in order to prevent inadvertently switching on the machine.

10.1 Cleaning

- Regularly remove all chips from the machine with a hand brush or vacuum (no compressed air). This protects the mechanical components from premature wear.
- The sealing lips contain a Teflon component and do not require any special maintenance.
- Clean the plastic discs with a non-abrasive plastic cleanser.

10.2 Lubrication

- The guide bars and drive shafts are provided with long-life central lubrication at the factory. The guides and drive shafts should be re-lubricated every 500-1000 operating hours depending on the work load. For this purpose, use the grease press and corresponding special grease available as accessory items for central lubrication.
- Do not lubricate too much at once; the shafts and steel rails do not have to be swimming in grease.
- If you want to lubricate the machine, first perform a reference run, then open the cover, then switch on the machine.

10.2.1 Basic lubrication

The drive components are pre-lubricated at the factory with isel special grease. They are ready for operation.

The EC Safety Data Sheet in accordance with Directive 93/112/EEC and 11014-1 can be requested from the factory.

10.2.2 Re-lubrication

Only use isel special grease for re-lubrication of linear bearings with shafts.

Use the following article numbers to order the necessary grease:

- 299032 0002 Grease cartridge
- 299032 0003 Grease press

Depending on the usage situation, re-lubrication must take place every 500 to 1000 operating hours.

For lubrication of the X-axis, slide the carriage to the left*, remove the plastic plug on the left side of the machine, and lubricate through the now visible lubricating nipple. You can access the guide rails again through the sealing lips.

Grease properties:

The isel special grease is distinguished by the following properties:

- extreme wear reduction

- significantly lower consumption
- miscible with lithium and calcium greases
- water-repellent
- highly resistance to cold, heat, salt water, and solvents
- temperature range: -25°C to 200°C
- emergency running >300°C
- service life extension of up to 6 times
- extremely good adhesion to metal surfaces

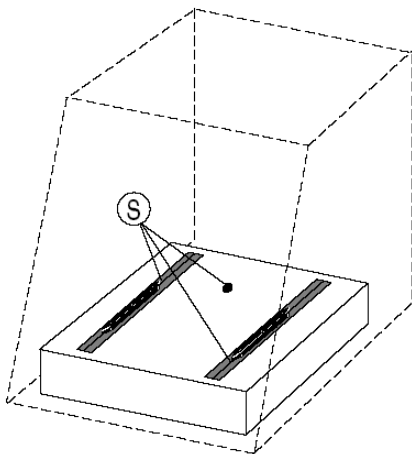
Classification and identification according to EU Directives 67/548/EEC and 88/369/EEC - Water hazard class 1.

10.2.3 Lubrication points of linear axes X, Y, and Z

In order to **lubricate the Y-axis**, you must first slide the T - slot plate all the way forward* and then unscrew it from the Y-axis (six screws).

Remove the plastic plug underneath it and lubricate through the now visible lubricating nipple. You can access the guide rails through the sealing lips.

In order to remove the cover plate of the Y-axis, unscrew the fastening screws.



Identifies access points to all lubrication points in all drawings.

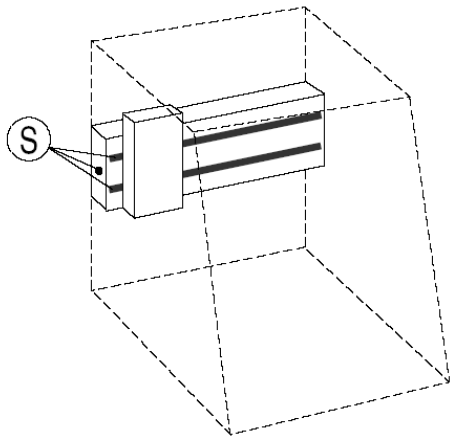


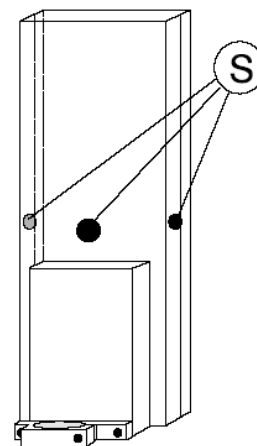
Figure 13: Lubrication points of X, Y, and Z axes

For **lubrication of the X-axis**, slide the carriage to the left*, remove the plastic plug on the left side of the machine, and lubricate through the now visible lubricating nipple. You can access the guide rails again through the sealing lips.

On the **Z-axis** you must first remove the processing machine from its mount, remove the three plugs, and push the carriage all the way down. *

You can add some oil to the guide rails through the two lateral holes.

The lubricating nipple for the drive is now positioned behind the opening.



**If the machine is switched off, you can slide the carriage by hand.*

10.3 Maintenance intervals according to operating hours counter

The software operating hours counter integrated in the isel control software ProNC /6/ or Remote /7/ notifies the operating personnel about the lapse of the current maintenance interval:

  Bearbeitung 82:11 Mechanik 44:15 Spindel 27:01    00:05:48	  Bearbeitung 82:12 Mechanik 44:15 Spindel 27:40    00:57:46
Green bar: Minimum maintenance interval elapsed	Red bar: Maintenance interval elapsed; maintenance work is due

Clicking on the  icon provides further information:

Übersicht Service und Wartung

 5.12.2013 - 10:19:23

	insgesamt	seit der letzten Wartung	nächste Wartung in
Bearbeitungszeiten in Remote	15:04	00:00	
Bearbeitungszeiten in ProNC	82:12	00:00	
....insgesamt	97:16	00:00	600:00
Achslaufzeiten (mindestens 1 Achse)	44:15	00:00	200:00
Laufzeit der Frässpindel 1	27:40	00:00	500:00



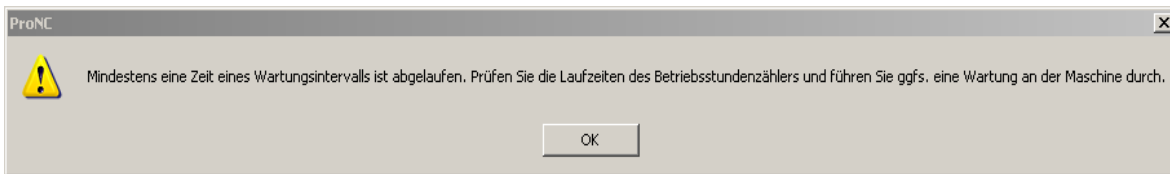
isel Germany AG
Ein Unternehmen der isel-Gruppe

isel Germany AG
 Bürgermeister-Ebert-Straße 40
 D-36124 Eichenzell
 Tel: +49 (0) 66 59 / 981 - 0
 E-Mail: automation@isel.com

OK

The maintenance interval is pre-set at the factory to a value of 300 **machining hours**.

If, when starting up the isel control software ProNC or Remote, the notice



that maintenance is required is displayed, the following maintenance tasks must be carried out.

10.4 Maintenance tasks

The following tasks must be performed after the laps of a maintenance interval:

- Visual inspection lubrication film on the **ball screw spindle and steel shaft guide** through the sealing lips of linear axes X, Y, and Z
- Re-lubrication, if necessary (see section 'Lubrication points')
- Visual inspection **chips and dirt within the linear axes** through the sealing lips, vacuum and clean as necessary
- Visual inspection **chips and dirt within the tool changing unit** through the loading opening, vacuum and clean as necessary

Further maintenance tasks include:

- as necessary: Cleaning dirt out of the interior
 Acoustic check for development of unusual noises
- 2 months: Visual inspection of linear units - wear
 Visual inspection of toothed belt deflections in the Z-axis for tension and wear
- 1 year: Replacement of toothed belts in the Z-axis
 Check for freedom from play of the linear guides and ball-type linear drives (circularity test on all levels with Renishaw measurement)



Toothed belts in the Z-axis:
 refer to the parts list of the linear units in chapter *17.1 Axis layout*

11 Faults

<i>Error</i>	<i>Cause</i>	<i>Solution</i>
The system does not start up	Mains connection not provided	Check the power circuit Mains plug, power strip
	Main switch not switched on	Switch on the main switch
	Defective fuse	Pull out the mains plug Replace the fuse
The POWER button does not work	At least one motor end phase signals an error	Diagnose and eliminate the cause of the error
	Emergency STOP not unlocked	Unlock the Emergency STOP
	Defective fuse	Pull out the mains plug Replace the fuse
Software does not work correctly	System not switched on	Switch on the system (main switch)
	End phase not switched on	Switch on the end phase (POWER button)
	CAN connection not correct	Check cable connections, CAN node addresses, and terminating resistance
Drive motor of an axis does not react	No voltage supply of the end phase, fuse defect	Check the fuses in the switch cabinet /5/ and/or the power end phase /1.1/ or /1.2/
	Temperature protection of the end phase is active	- Check fan in the switch cabinet - Check / clean filter in the fan
	End phase defect	Replace end phase (send in to manufacturer)
	Connection plug has disconnected	Check plug - at the control output and at the motor
	Cable break	Replace cable

<i>Error</i>	<i>Cause</i>	<i>Solution</i>
Machine (spindle) does not work, i.e. it cannot be switched on	Not released by the SC module	Check spindle release signal
	Mains switch on the Kress machining spindle switched off	Switch on the mains switch on the Kress machining spindle
	Incorrect signalling parameter (spindle start) setting	Check and correct the signalling parameter
	Operating mode selector switch set to TEST	Move the operating mode selector switch to AUTO
	Door locking open	Set the door switch to automatic unlocking
Red LED on the frequency converter blinking	Error on the speed-controlled frequency converter	Check frequency converter parameter settings
	Overcurrent / overvoltage	Check the frequency converter parameter settings against the motor data of the working spindle

12 Return of waste electrical and electronic devices for disposal

Collection

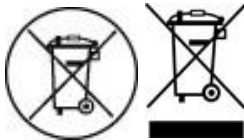
Users of electrical and electronic devices are obligated, in accordance with the country-specific regulations, to separate disposal of the waste equipment. Waste electrical and electronic equipment may not be disposed of with household waste. The separate collection required for recycling and re-use, whereby natural resources can be conserved.

Return and collection systems

Disposal of your Gantry OverHead M CNC machine, particularly the electronic components, may not take place with household waste. Local waste disposal companies have made the necessary disposal facilities available for this purpose.

Meaning of symbols

All electrical and electronic equipment identified with this symbol must not be disposed of with household waste in accordance with EU Directives.



13 Customer information

No one is authorised to disclose information differing from the specifications in this manual.

Guarantee

The manufacturer, isel Germany AG, guarantees that this product is free from material and manufacturing defects. isel Germany AG DOES NOT ASSUME ANY FURTHER LIABILITY OR ANY IMPLICIT GUARANTEE WITH RESPECT TO SALABILITY OR SUITABILITY FOR A SPECIFIC PURPOSE. The user is responsible for the use and intended use of the product. If damage to the product occurs during the warranty period, you only claim and the only obligation of isel Germany AG is the repair or the replacement of the product.

Limitation of liability

Insofar as a limitation of liability is legally permissible, there is no liability whatsoever for the manufacturer, isel Germany AG, for losses or damage caused by this product. This applies regardless of whether this involves direct, indirect, special, ancillary or consequential damages, regardless of the legal basis, including guarantee, contract, negligence, or intent.

The General Terms and Conditions (**GTC**) of isel Germany AG apply.

14 Remote diagnosis

Please contact our service department about remote diagnosis via the world wide web (internet):

Frank Hecht	+49 (0) 6659 / 981-763	frank.hecht@isel.com
Frank Jansen	+49 (0) 6659 / 981-765	frank.jansen@isel.com

The latest version of TeamViewer ® is used as a communication tool for the remote diagnosis.



Connection of the control PC /3/ in the CNC control panel of your CNC machine / CNC base machine to the internet is required for online remote diagnosis. Every control PC is equipped with an Ethernet connection for this purpose.

The connection is established via the internet in three steps:

1. **Step:** Contact our support by telephone or email and request advice. The operator at the CNC machine becomes a **participant**, the **isel** service technician acts as **advisor**.
2. The participants starts the Windows program '**TeamViewerQS_de.exe**' on the control PC.

This program can be found under the following directory:

C:\CNCWorkbench\Tools\TeamViewer

The reports the following:



3. Provide the **advisor** with the **ID and password**.
After connection has been successfully established, the remote diagnosis can begin.

15 Technical data of the CNC machine / CNC base machine

15.1 Clamping surface and travel range

Model	Width in mm	Depth in mm	Height in mm	Clamping surface (W x D) in mm	Paths of travel X / Y / Z in mm	Z clear height in mm
ICV 4030 EC	769	834.5	1342.5	700 x 375	400/ 300 /140	200

15.2 Technical data

Technical data			ICV 4030 CAN
T - slot grid		[mm]	25
Weight approx.		[kg]	150
Sound pressure level		[dB(A)]	<75
Mains connection			230V, 50/60Hz, external fuse max. 16A
Drive motor			156 watts each
Main drive spindle			Type-dependent
Fuse			Mains input 2 x 10A slow HBC
Earthing			Corresponding to Protection class 1
Air humidity			max. 80%
Environmental temperature	Operation	[°C]	5 to 40
	Storage	[°C]	-10 to 50
Installation location			Up to 2000 m above sea level

16 Declaration of Conformity or Declaration of Incorporation?

In the new legally binding Machinery Directive 2006/42/EC effective as of 29/12/2009, the term **'machine'** is defined as follows (excerpt from Machinery Directive 2006/42/EC Article 2 a):

'Machine'

- *an assembly of linked parts or components, at least one of which moves through some type of actuator, with associated power and control circuits, joined together for a specific purpose in the processing, treatment;*

For all isel CNC machines which are delivered with a tool (e.g. milling or engraving spindle, dosing device, sensor element, such as a CCD camera or triangulation laser, water jet nozzle, plasma torch, etc.), the Declaration of Conformity in this operating manual applies.

These CNC machines are to be used *for the purpose of the intended application* based on the type of tool (mounted on the moving axis):

Tool = machining spindle	-> used for milling, drilling
Tool = engraving spindle	-> used for engraving
Tool = dosing unit	-> used for adhering, dosing

etc.

In the Machinery Directive 98/37/EC valid as of 28/12/2009, the term **'partial machine / partly completed machine'** and/or the term **'partly completed machine'** in the new Machinery Directive 2006/42/EC, which is legally binding as of 29/12/2009, is defined as follows (excerpt from Machinery Directive 2006/42/EC, Article 2, g):

'partly completed machine'

- *an assembly which is almost machinery but which cannot in itself perform a specific application. A drive system is partly completed machinery. Partly completed machinery is only intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment, thereby forming machinery to which this Directive applies;*

The Declaration of Incorporation in this operating manual applies for all isel **CNC base machines** which are delivered **without a tool** (e.g. milling or engraving spindle, dosing device, sensor element, such as a CCD camera or triangulation laser, water jet nozzle, plasma torch, etc.), and therefore not *for an intended use*.

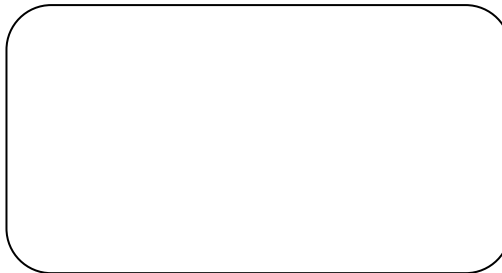
16.1 Declaration of Conformity for (complete) machine

Declaration of Conformity in accordance with EC Machinery Directive 2006/42/EC, Annex II A

The manufacturer **isel Germany AG**
Bürgermeister-Ebert-Strasse 40
36124 Eichenzell, Germany

hereby declares that the following product

Product name: **isel CNC machine ICV 4030**
Types: **ICV 4030 EC** **Art. no.: 280260 XXXX**
Type plate:



conforms to the requirements of the Directive identified above, including the applicable amendments at the time of the declaration.

The following harmonised standards have been applied:

EN ISO 12100:2010	Safety of Machinery - Safety of machinery -- General principles for design -- Risk assessment and risk reduction
EN ISO 13857:2008	Safety of machinery -- Safety distances to prevent hazard zones being reached by upper and lower limbs
EN 349:1993+A1:2008	Safety of machinery. Minimum gaps to avoid crushing of parts of the human body
EN ISO 14120:2015	Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards
EN ISO 13850:2015	Safety of machinery -- Emergency stop -- Principles for design
EN 14121-1:2007	Safety of machinery. Risk assessment. Part 1: Principles
EN 60204-1/A1:2009	Safety of machinery. Electrical equipment of machines - Part 1: General requirements

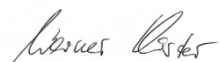
The following additional EU Directives which are relevant for this product were applied:

EMC Directive	2014/30/EC
Low Voltage Directive	2014/35/EC

The **technical documentation** for this machine has been compiled in accordance with Annex VII, Part A. The manufacturer is obligated to electronic submission of this technical documentation to the national competent authorities upon request.

Person authorised to compile the technical documentation: **Helmut Danz**

Place, date: Dermbach, 06 June 2017



Werner Kister, Chair

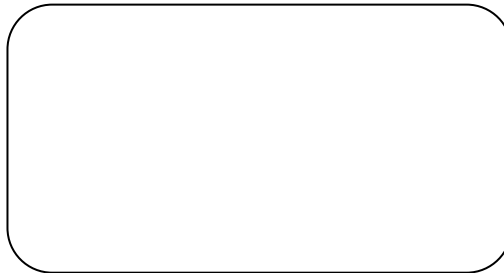
16.2 Declaration of Incorporation for (partly completed) base machines

Declaration of Incorporation in accordance with EC Machinery Directive 2006/42/EC, Annex II B

The manufacturer **isel Germany AG**
Bürgermeister-Ebert-Strasse 40
36124 Eichenzell, Germany

hereby declares that the product

Product name: **isel/ base machine ICV 4030**
Types: **ICV 4030 EC** **Art. no.: 280260 XXXX**
Type plate:



conforms to the basic safety and health requirements of **EC Machinery Directive 2006/42/EC Annex I**.
The following additional EU Directives which are relevant for this product were applied:

EMC Directive	2014/30/EC
Low Voltage Directive	2014/35/EC

The following harmonised standards have been applied:

EN ISO 12100:2010	Safety of Machinery - Safety of machinery -- General principles for design -- Risk assessment and risk reduction
EN ISO 13857:2008	Safety of machinery -- Safety distances to prevent hazard zones being reached by upper and lower limbs
EN 349:1993+A1:2008	Safety of machinery. Minimum gaps to avoid crushing of parts of the human body
EN ISO 14120:2015	Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards
EN ISO 13850:2015	Safety of machinery -- Emergency stop -- Principles for design
EN 14121-1:2007	Safety of machinery. Risk assessment. Part 1: Principles
EN 60204-1/A1:2009	Safety of machinery. Electrical equipment of machines - Part 1: General requirements

The **technical documentation** for this machine has been compiled in accordance with Annex VII, Part B.
The manufacturer is obligated to electronic submission of this technical documentation to the national competent authorities upon request.

Person authorised to compile the technical documentation: **Helmut Danz**

The product (partially completed machine) is intended for incorporation into a machine or combination with other partially completed machinery to form a machine in the sense of **Machinery Directive 2006/42/EC**, Article 1, Section (1), Letter a.

The commissioning of the complete machine (product) is prohibited until the machine into which this product has been incorporated or of which it is a component complies with the provisions of all relevant directives (particularly Machinery Directive 2006/42/EC) and this (complete) machine has been provided with a CE mark.

Place, date: Dermbach, 06 October 2016

Werner Kister, Chair

17 Exploded view, spare parts lists

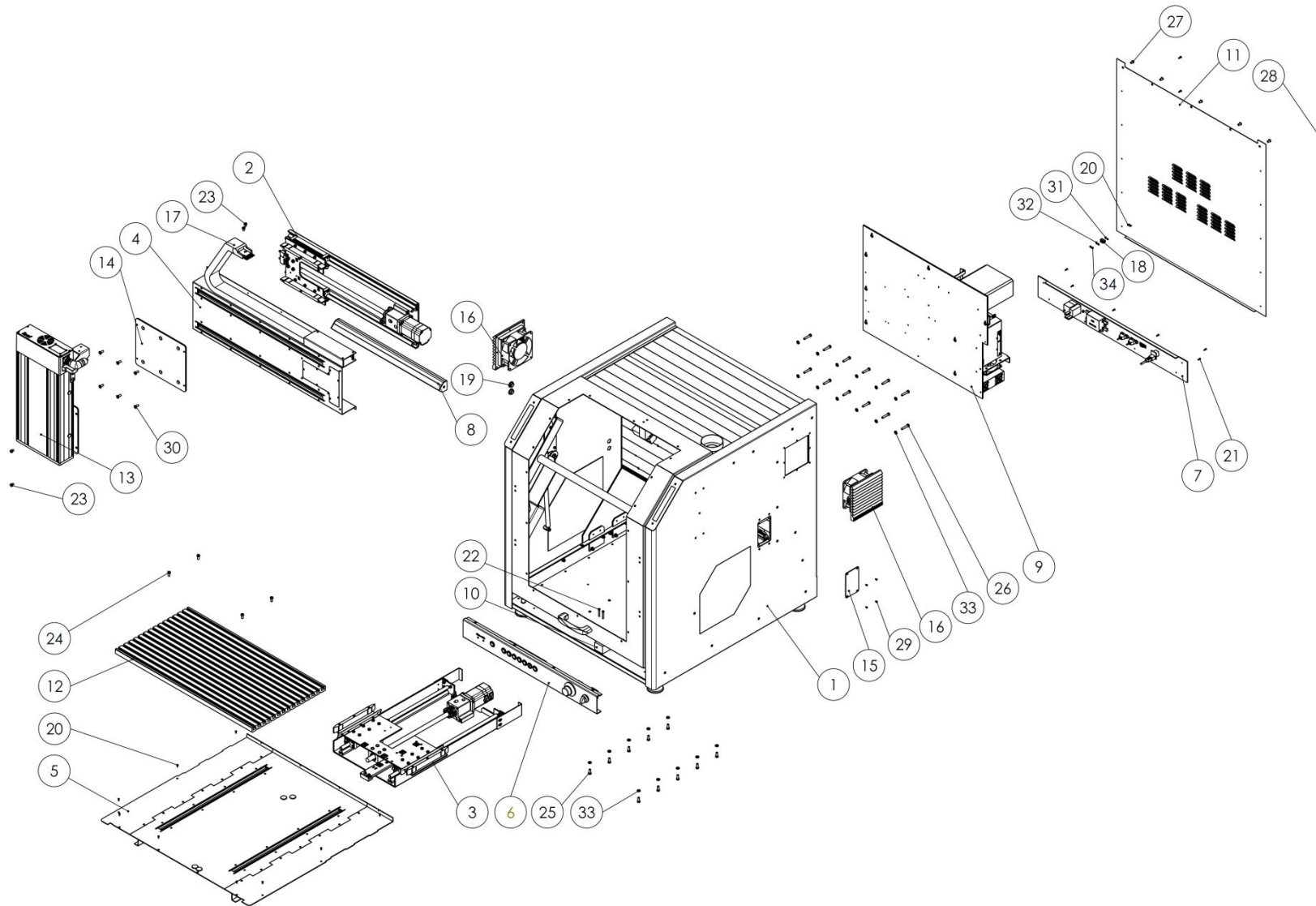


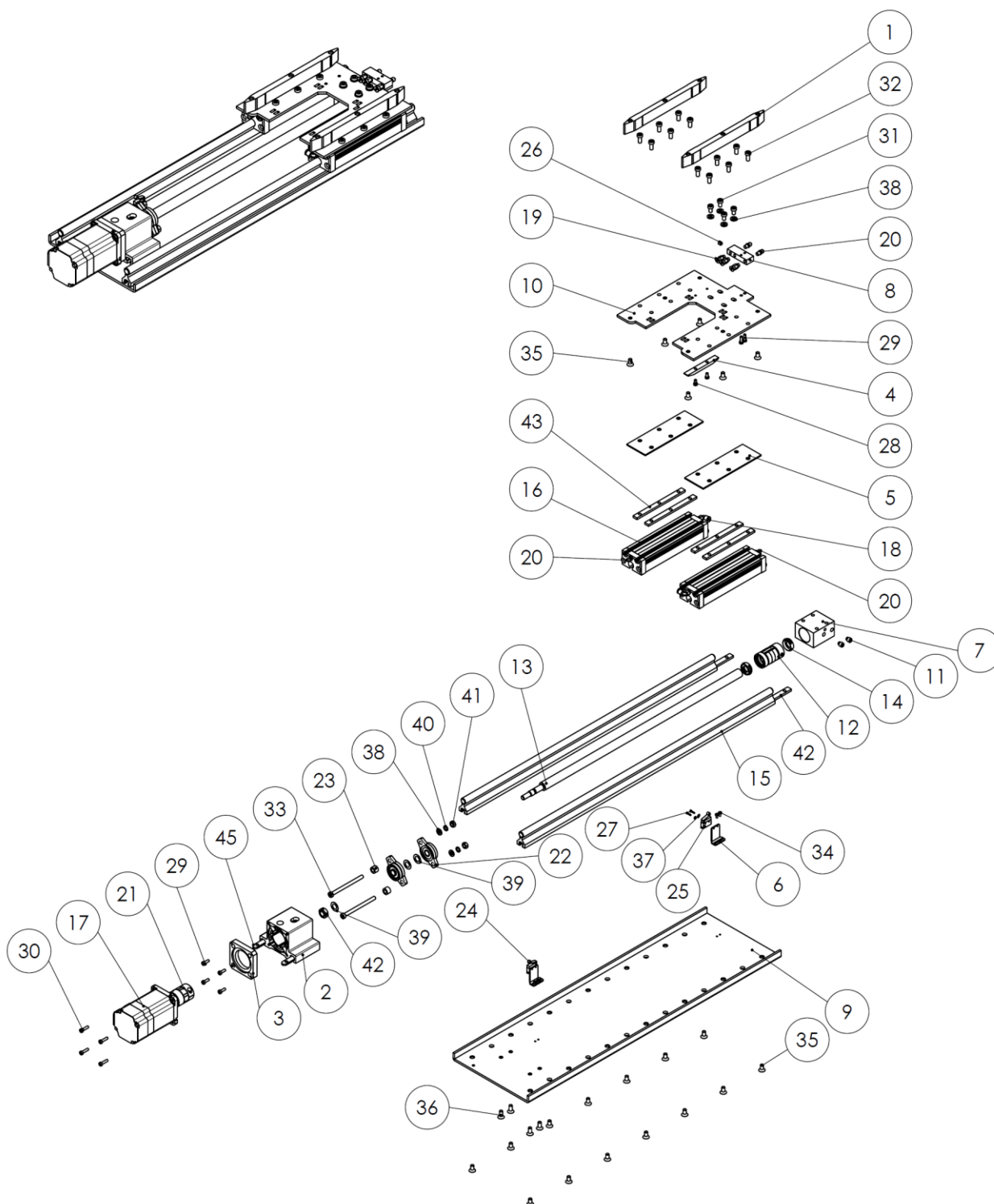
Figure 14: Exploded view ICV 4030, DZ8000

Parts list

Pos. no.	Item number	Quantity	Name	Drawing no.
1	680670 8001	1	Chassis ICV-EC	DZ8001
2	680620 1001	1	ICV 4030 - EC sheet metal machine X-axis	DZ8036
3	680630 1001	1	ICV 4030 - EC sheet metal machine Y-axis	DZ8035
4	680670 8025	1	ICV 4030 - EC sheet metal machine X-axis cover	DZ8025
5	680670 8034	1	ICV 4030 - EC sheet metal machine Y-axis cover	DZ8034
6	680670 80241	1	ICV 4030 - EC front panel with controls	DZ8024
7	680670 8051	1	ICV 4030 - EC connection panel	DZ8051
8	675012 6559	1	LED - machine lighting - PW45 for ICV	DZ6559
9	680650 8065	1	Control unit IMD20 - installation - ICV 4030 - EC	DZ8065
10	680670 8044	1	Central lubrication counter presser	DZ8044
11	680670 8053	1	ICV 4030 - EC rear wall cover	DZ8053
12	680670 8054	1	Table plate PT 25 ICV 4030 - EC	DZ8054
13	680640 1001	1	ICV 4030 - EC sheet metal machine Z-axis	DZ8060
14	680670 8063	1	ICV 4030 - EC X-axis connecting plate	DZ8063
15	680670 8289	1	ICV 4030 - EC Y-axis service panel	DZ8289
16	639112 29775	1	Double flange ø80-ø50-2	DZ2977
17	564028 1000	2	Aubomatcon - filter fan ZL 803 - 120x120 - with fan	
18	219200 1000/219201	1	Energy chain 1	
19	559071	1	4-way plug strip (6.3 mm)	
20	610019 0002	2	Blind plug ø16	
21	569056 2000	1	Cable duct 650 mm lg	
22	610019	3	Blind plug ø9.5	
23	891201 0081	12	Raised countersunk screw DIN 966 4.8 VZ M 3 x 8	
24	891201 0101	6	Raised countersunk screw DIN 966 4.8 VZ M 3 x 10	
25	891122 0301	2	Cylinder screw DIN 6912 8.8 M 4 x 30	
26	891124 0081	9	Cylinder screw DIN 6912 8.8 M 6 x 8	
27	891124 0141	4	Cylinder screw DIN 6912 8.8 M 6 x 14	
28	891124 0161	10	Cylinder screw DIN 6912 8.8 M 6 x 16	
29	891124 0301	12	Cylinder screw DIN 6912 8.8 M 6 x 30	
30	891594 0102	5	Raised countersunk screw DIN 7380 M 6 x 10	
31	891181 0101	19	Raised countersunk screw DIN 7985 4.8 VZ M 3 x 10	
32	891592 0082	4	Raised countersunk screw DIN 7380 M 4 x 8	
33	891131 0061	4	Countersunk screw DIN 7991 M 3 x 6	
34	891134 0161	6	Countersunk screw DIN 7991 M 6 x 16	
35	893160 0001	2	Serrated washer DIN 6797 Ø3.2	
36	893050 0001	2	Washer DIN 125 ST 3,2	
37	893054 0001	22	Washer DIN 125 ST 6,4	
38	892022 0001	2	Hexagon screw DIN 934 8 M 3	

17.1 Axis system layout

X-axis

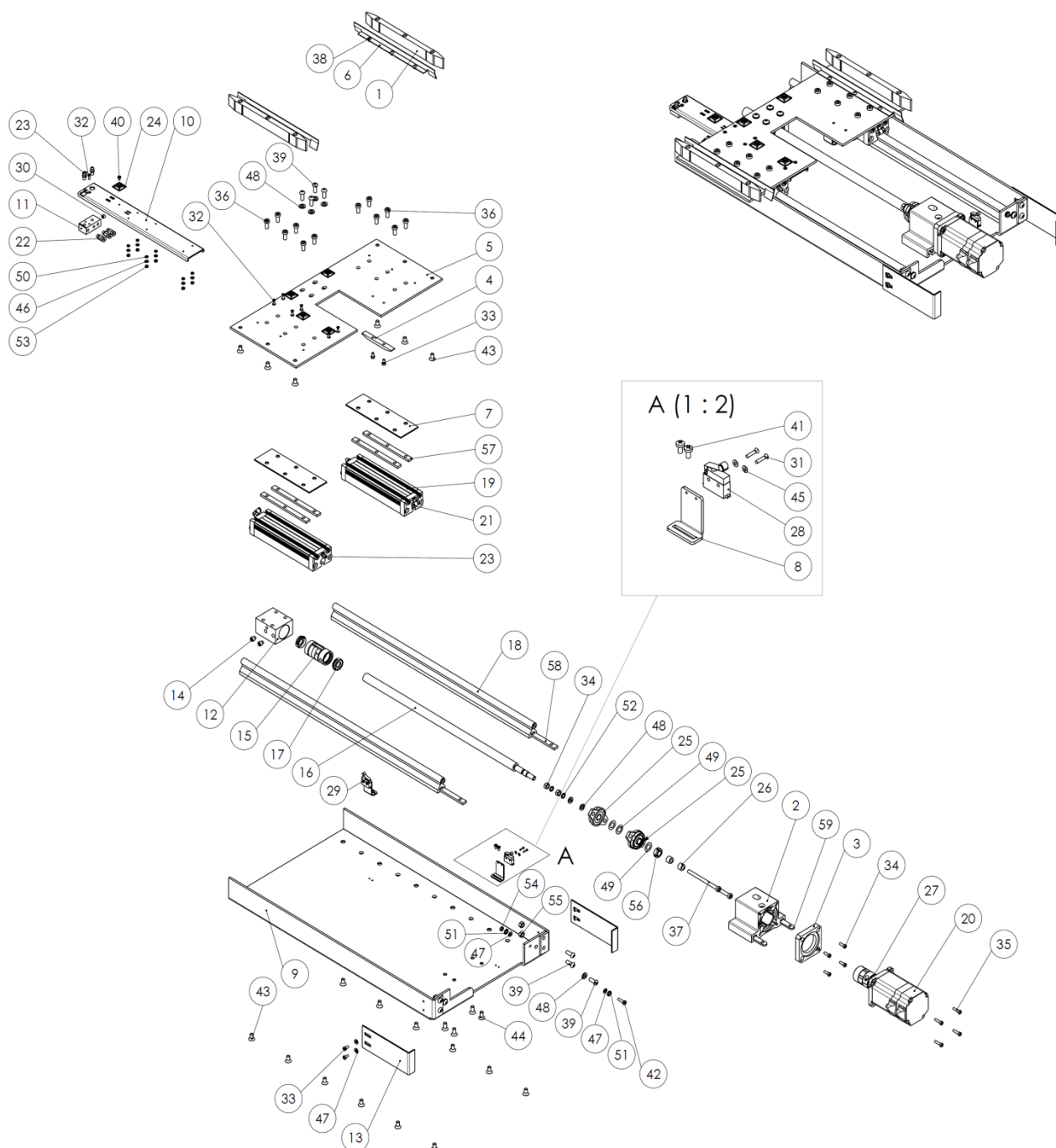


Parts list

Pos. no.	Item number	Quantity	Name	Drawing no.
1	680524 1250	2	Shuttle H22.5 ICP 20-15,30-20,40-30	DZ1250
2	680524 1328	1	ICP X-axis bearing	DZ1328
3	675012 3730	1	Motor plate EC-60 LES21	DZ3730
4	675012 7255	1	Shuttle for limit switch GOH - Z-axis	DZ7255
5	680670 8039	2	ICV 4030 - EC X-Y-axis - slide support	DZ8039
6	680670 8040	2	ICV 4030 - EC X-Y-axis - limit switch mounting bracket	DZ8040
7	680670 8046	1	ICV 4030 - EC X-Y-axis - clamping block round nut	DZ8046
8	680670 8048	1	ICV 4030 - EC X-axis lubricant distributor	DZ8048
9	680670 8049	1	ICV 4030 - EC X-axis mounting plate	DZ8049
10	680670 8050	1	ICV 4030 - EC X-axis slide plate	DZ8050
11	622002 0001	2	Pin M8x0.75x10mm with taper (replaces TP0150-4)	TE1409
12	613110 0001	1	Ball screw nut - 16x10	TE2456
13	211135 10562	1	Ball screw spindle - 16x10 - L=562	TE2859
14	613502	2	Ball screw nut wiper	TP0104
15	680000 0647	2	ELF 1 with face end hole - L=648	
16	623071 0151	2	Shaft carriage WS6 - L=150	
17	398723 0007	1	EC60 - 48V servo module - ICV-EC - X-Y-axis	
18	840003 0028	3	Threaded union - 90 degrees -M6-4	
19	840003 0027	3	Threaded union - straight QSM-M6-4	
20	623080 0001	4	Lubricating nipple for carriage	
21	218002 8012	1	Shaft coupling WK 30-40 D 8 - 12	
22	420010	2	Flange bearing for ball screw spindle	
23	642523	2	Flange bearing combination spacer bush D12d6.75	
24	397011 1012	1	Limit position switch with roller lever - 2pin - L=550	
25	397015 1012	1	Limit position switch with roller lever - 2pin - L=950	
26	891374 0061	1	Threaded pin DIN 913 M 6 x 6	
27	891168 0101	4	Countersunk screw DIN 963 4.8 VG M 2 x 10	
28	891122 0081	2	Cylinder screw DIN 6912 8.8 M 4 x 8	
29	891122 0121	6	Cylinder screw DIN 6912 8.8 M 4 x 12	
30	891122 0161	4	Cylinder screw DIN 6912 8.8 M 4 x 16	
31	891124 0101	4	Cylinder screw DIN 6912 8.8 M 6 x 10	
32	891124 0141	12	Cylinder screw DIN 6912 8.8 M 6 x 14	
33	891124 0801	2	Cylinder screw DIN 6912 8.8 M 6 x 80	
34	891181 0061	4	Raised countersunk screw DIN 7985 4.8 VZ M 3 x 6	
35	891134 0121	20	Countersunk screw DIN 7991 M 6 x 12	
36	891134 0141	4	Countersunk screw DIN 7991 M 6 x 14	
37	893050 1000	4	Washer DIN 125 ST 2,2	
38	893054 0001	6	Washer DIN 125 ST 6,4	
39	893089 4000	3	Washer DIN 137 ST 10,5	
40	893164 0001	2	Serrated washer DIN 6797 Ø6.4	
41	892025 0001	2	Hexagon screw DIN 934 8 M 6	

Pos. no.	Item number	Quantity	Name	Drawing no.
42	890257 0011	1	Nut DIN 981 M10x0.75	
43	609011 0125	4	Threaded inserts M6 10x4 125 long	
44	609011 0625	2	Threaded inserts M6 1cx4 625 long	
45	890315 0002	2	Sliding nut 2xM6 - L45xW10xH3.5mm	TE0162

Y-axis

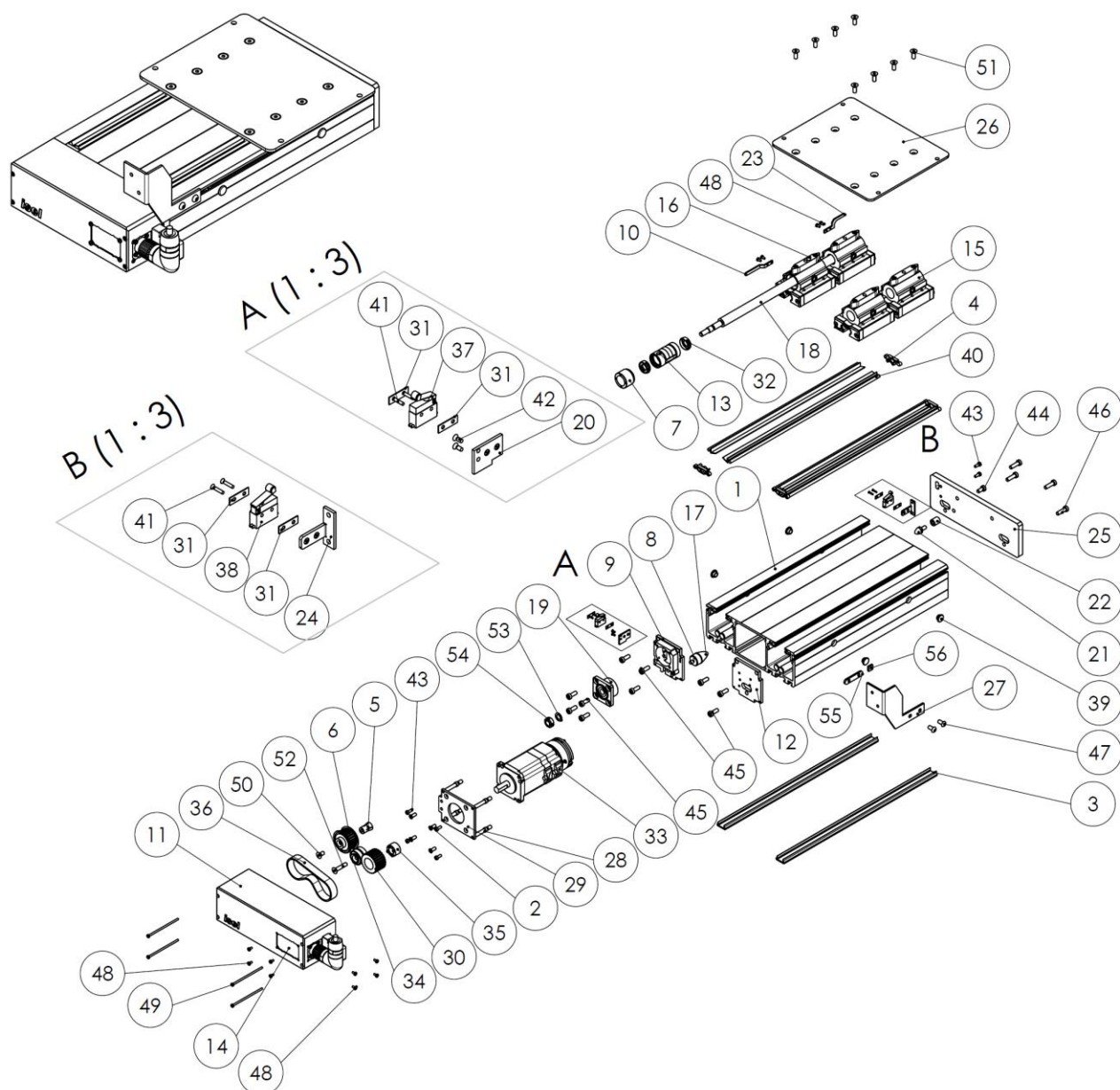


Parts list

Pos. no.	Item number	Quantity	Name	Drawing no.
1	680534 1244	2	Shuttle H22.5 ICP 30-20	DZ1244
2	680524 1328	1	ICP X-axis bearing	DZ1328
3	675012 3730	1	Motor plate EC-60 LES21	DZ3730
4	675012 7255	1	Shuttle for limit switch GOH - Z-axis	DZ7255
5	680670 8037	1	ICV 4030 - EC Y-axis slide plate	DZ8037
6	680670 8038	2	ICV 4030 - EC Y-axis chip plate	DZ8038
7	680670 8039	2	ICV 4030 - EC X-Y-axis - slide support	DZ8039
8	680670 8040	2	ICV 4030 - EC X-Y-axis - limit switch mounting bracket	DZ8040
9	680670 8041	1	ICV 4030 - EC Y-axis mounting plate	DZ8041
10	680670 8042	1	ICV 4030 - EC Y-axis lubricant distributor plate	DZ8042
11	680670 8043	1	ICV 4030 - EC Y-axis lubricant distributor	DZ8043
12	680670 8046	1	ICV 4030 - EC X-Y-axis - clamping block round nut	DZ8046
13	680670 8047	2	ICV 4030 - EC Y-axis chip guard	DZ8047
14	622002 0001	2	Pin M8x0.75x10mm with taper (replaces TP0150-4)	TE1409
15	613110 0001	1	Ball screw nut - 16x10	TE2456
16	211135 10462	1	Ball screw spindle - 16x10 - L=462	TE2859
17	613502	2	Ball screw nut wiper	TP0104
18	680060 0826	2	Guide LFS-12-11 L=542	
19	623071 0151	2	Shaft carriage WS6 - L=150	
20	398723 0007	1	EC60 - 48V servo module - ICV-EC - X-Y-axis	
21	840003 0028	2	Threaded union - 90 degrees -M6-4	
22	840003 0027	3	Threaded union - straight QSM-M6-4	
23	623080 0001	4	Lubricating nipple for carriage	
24	582009	5	Holder for cable tie	
25	420010	2	Flange bearing for ball screw spindle	
26	642523	2	Flange bearing combination spacer bush D12d6.75	
27	218002 8012	1	Shaft coupling WK 30-40 D 8 - 12	
28	397011 1012	1	Limit position switch with roller lever - 2pin - L=550	
29	397015 1012	1	Limit position switch with roller lever - 2pin - L=950	
30	891374 0061	1	Threaded pin DIN 913 M 6 x 6	
31	891168 0101	4	Countersunk screw DIN 963 4.8 VG M 2 x 10	
32	891191 0101	8	Countersunk screw DIN 965 4.8 VZ M 3 x 10	
33	891122 0081	6	Cylinder screw DIN 6912 8.8 M 4 x 8	
34	891122 0121	4	Cylinder screw DIN 6912 8.8 M 4 x 12	
35	891122 0161	4	Cylinder screw DIN 6912 8.8 M 4 x 16	
36	891124 0141	12	Cylinder screw DIN 6912 8.8 M 6 x 14	
37	891124 0801	2	Cylinder screw DIN 6912 8.8 M 6 x 80	
38	891592 0052	6	Raised countersunk screw DIN 7380 M 4 x 5	
39	891594 0162	10	Raised countersunk screw DIN 7380 M 6 x 16	
40	891181 0051	5	Raised countersunk screw DIN 7985 4.8 VZ M 3 x 5	
41	891181 0061	4	Raised countersunk screw DIN 7985 4.8 VZ M 3 x 6	
42	891182 0161	1	Raised countersunk screw DIN 7985 4.8 VZ M 4 x 16	

Pos. no.	Item number	Quantity	Name	Drawing no.
43	891134 0121	18	Countersunk screw DIN 7991 M 6 x 12	
44	891134 0141	4	Countersunk screw DIN 7991 M 6 x 14	
45	893050 1000	4	Washer DIN 125 ST 2,2	
46	893050 0001	6	Washer DIN 125 ST 3,2	
47	893051 0001	6	Washer DIN 125 ST 4,3	
48	893054 0001	8	Washer DIN 125 ST 6,4	
49	893089 4000	3	Washer DIN 137 ST 10,5	
50	893160 0001	6	Serrated washer DIN 6797 Ø3.2	
51	893163 0001	2	Serrated washer DIN 6797 Ø5.3	
52	893164 0001	2	Serrated washer DIN 6797 Ø6.4	
53	892022 0001	6	Hexagon screw DIN 934 8 M 3	
54	892023 0002	1	Hexagon screw DIN 934 8 M 4	
55	892025 0001	6	Hexagon screw DIN 934 8 M 6	
56	890257 0011	1	Nut DIN 981 M10x0.75	
57	609011 0125	4	Threaded inserts M6 10x4 125 long	
58	609011 0525	2	Threaded inserts M6 10x4 525 long	
59	890315 0002	2	Sliding nut 2xM6 - L45xW10xH3.5mm	TE0162

Z-axis



Parts list

Pos. no.	Item number	Quantity	Name	Drawing no.
1	635500 0039	1	Linear guide LFS-12-5 L=390	DZ2521
2	890133 0121	4	TE0174 - Countersunk screw with Torx 20 M5x12	TE0174
3	632505	2	TE0275 - Cover profile SK593 P10_4	TE0275
4	693001	4	TE0398 - End edge for sealing lip	TE0398
5	635001	1	TE0561 - Collet 8mm	TE0561
6	616002	1	TE0562 - Toothed belt pulley Z25 AT5 for collet D=8mm	TE0562
7	623065 0001	1	TE1972 - Lock nut for ball spindle nut ø16	TE1972
8	674500 017312	1	TE2056 - Parabolic spring extension - L 12	TE2056
9	623051 2000	1	TE2342 - Direct drive and life counter bearings side end plate	TE2342

CNC base machine / CNC machine: Type ICV 4030

Pos. no.	Item number	Quantity	Name	Drawing no.
10	635014	1	TE2328 - Limit switch run-over plate	TE2328
11	623058 1000	1	TE2337 - Protective cover 225x75x80	TE2337
12	623052 1000	1	TE2435 - Protective cover 72x72x5 for LF 4-6	TE2435
13	613105 0001	1	TE2457 - Ball screw nut - 16x5mm	TE2457
14	610110 2471	1	TE2471 - Dummy plate for protective cover 225x75x80	TE2471
15	623072 0013	3	TE2796 - Shaft slide WS5 - L=70 without ball screw nut	TE2796
16	623072 0014	1	TE2797 - Shaft slide WS5 for ball screw nut	TE2797
17	632126 2816	1	TE2816 - Rubber bonded metal parabolic screw - Art. no.632126 2816	TE2816
18	211134 10372	1	TE2859 - Ball screw spindle 16x5 - L=372	TE2859
19	623065 0102	1	TE2935 - Flange for belt drive (LF4-6)	TE2935
20	623056 1002	1	TE5925 - IGP 2520 - LES4 belt drive - end plate - limit switch plate	TE5925
21	632126 2374	1	DZ2374 - Rubber bonded metal parabolic screw d12	DZ2374
22	674500 25130	1	DZ2513 - Parabolic screw spacer bush	DZ2513
23	635014 2518	1	DZ2518 - Limit switch plate	DZ2518
24	674501 2519	1	DZ2519 - Limit switch bracket - LES 5 - special	DZ2519
25	680670 8061	1	DZ8061 - Z-axis - cover for LES5 - ICV 4030 - EC	DZ8061
26	680670 8062	1	DZ8062 - Z-axis - connecting plate - ICV 4030 - EC	DZ8062
27	680670 8429	1	DZ8429 - E-chain holding plate Z-axis -ICV 4030 - EC	DZ8429
28	634500 9012	4	SZ0789 - Spacer	SZ0789
29	674501 07901	1	SZ0790 - Motor adapter plate	SZ0790
30	616001 0002	1	SZ2789 - Toothed belt pulley Z25 AT5 D=11mm	SZ2789
31	610110 3745	4	SZ3745 - Micro-switch mounting plate	SZ3745
32	613502	2	TP0104 - Ball screw nut wiper	TP0104
33	474156 1048	1	Servo drive module with EC60, 156W with brake	
34	616400	1	Tension pulley for toothed belt LF4-LF5	
35	898122 2131	1	Clamping bush 12-22-13 (Mädler; 615712 00)	
36	616503 0280	1	Toothed belt 16AT5-280 - EC60 1_1 - 616503 0280*)	
37	397030 1012	1	Limit switch L=400mm	
38	397015 1012	1	Limit switch L=950mm	
39	610016	4	Kapsto cover GPN 300 F-Type 300	
40	630900	4	Sealing lip L - 380	TE2951
41	891168 0101	4	Countersunk screw DIN 963 4.8 VG M 2 x 10	
42	891190 0061	2	Countersunk screw DIN 965 4.8 VZ M 2.5 x 6	
43	891122 0101	6	Cylinder screw DIN 6912 8.8 M 4 x 10	
44	891124 0121	1	Cylinder screw DIN 6912 8.8 M 6 x 12	
45	891124 0161	6	Cylinder screw DIN 6912 8.8 M 6 x 16	
46	891124 0201	4	Cylinder screw DIN 6912 8.8 M 6 x 20	
47	891594 0122	2	Raised countersunk screw DIN 7380 M 6 x 12	
48	891181 0061	16	Raised countersunk screw DIN 7985 4.8 VZ M 3 x 6	
49	891181 0751	4	Raised countersunk screw DIN 7985 4.8 VZ M 3 x 75	
50	891134 0121	1	Countersunk screw DIN 7991 M 6 x 12	
51	891134 0161	8	Countersunk screw DIN 7991 M 6 x 16	

52	891134 0301	1	Countersunk screw DIN 7991 M 6 x 30	
53	893307 0000	1	Washer DIN 988 ST 10 x 1	
54	890257 0011	1	Nut DIN 981 M10x0.75	
55	890315 0002	1	Sliding nut 2xM6 - L45xW10xH3.5mm	TE0162
56	890303 0002	1	Square nut M4 - factory standard 10x10x3	

***)** wear part, annual replacement recommended

18 List of references

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Manual for motor end phase UVE8112 / IMD10 for brush-type DC servo motors and commissioning program DCSetup.exe;
isel Germany AG, 06/2008
- /1.2/ **Positioning module IMD20 with CANopen interface operating manual:**
Manual for motor end phase IMD20 for brushless DC servo motors and commissioning program ACSetup.exe;
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- /2/ **Operating manual for isel/ system module SKM-E:**
Manual for system module ISKM-E;
isel Germany AG, 05/2008
- /3/ **Operating manual for isel/ control computer iPC-25:**
Manual for control computer (control PC) iPC-25;
isel Germany AG, 06/2014
- /4/ **CNC control panel operating manual:**
Operating manual for the CNC control panel;
isel Germany AG, 06/2014
- /5/ **Circuit diagrams for switch cabinet with isel/ CAN-CNC control unit):**
Circuit diagrams and parts lists for the switch cabinet with IMD20, IMD40, SKME, CAN I/O, CT inverter
isel Germany AG, 09/2015
- /6/ **ProNC: Operating manual and programming rules:**
Manuals (parts 1 and 2) for ProNC operating and programming interface;
isel-automation 06/2005
- /7/ **Remote: Operating and output program for ISO, NCP, and CNC files:**
Manual for Remote user interface;
isel-automation 06/2005
- /8/ **EC Machinery Directive 2006/42/EC** (legally-binding since 29/12/2009)

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