isel® From Components to Systems

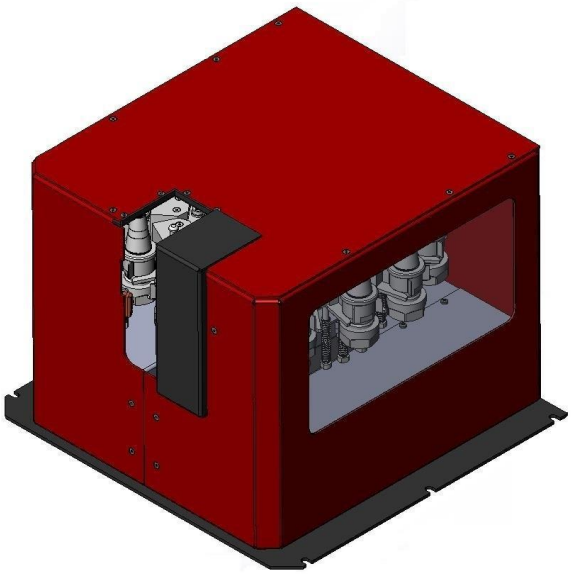

Figure 1: Turned tool changing station SK20

Turned tool changing station SK11 and SK20

Assembly manual

About this assembly manual

Abbreviations used in this manual

MD	*Machinery Directive 2006/42/EC*
EMCD	*EMC Directive 2004/108/EC*
LVD	*Low Voltage Directive 2006/95/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.

Observance of safety instructions

Before you commission the SK 11 and SK20 turned tool changing stations, work with them, or carry out expansions and/or modifications to the electrical installation of the turned tool changing station / in the housing of the turned tool changing station, you must carefully read the safety instructions in this assembly manual.

The information, technical data, and dimensional specifications contained in this document correspond to the state of the art at the time of publication. However, any print errors and mistakes cannot be entirely ruled out. We appreciate your assistance with any recommendations for improvement or notification of errors.

It should be stressed that the software and hardware names used in our documents are subject to the trademark, copyright, and legal patent protection of the respective companies.

isel Germany AG machines and controllers and their original accessories are CE compliant and marked accordingly. 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.

isel Germany AG assumes no warranty if you carry out any modifications of the turned tool changing station.

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Revisions	Date of change	Reason for change	Changed by
c	08/04/2019	Layout adaption, Declaration of Incorporation for (partly completed) base machines	KJ
b	10/04/2015	Technical data	
a	16/01/2015	Schematic representation	RL
	28/11/2014	First print	RL

Table of contents

1 General information

1.1 Intended use

The SK11 and SK20 turned tool changing stations are space-saving tool storage units with tool slots arranged in a circle. The SK11 turned tool changing station is designed to hold and temporarily store up to 12 milling and/or machining tools with SK11 tool holding fixtures. The SK20 changing station can accommodate up to 14 milling and/or machining tools. After actuation by the operator, the automatic tool release takes place from a freely selected storage slot. Please refer to the technical data for more precise features of the tools. The control of the changing station takes place by means of the TCHUni.dll file offered by ISEL. The changing station has internal power electronics and offers the possibility of connecting external components to an I/O interface.

General information:

Carefully read the entire assembly manual and follow the instructions. Non-observance of this assembly manual can result in property damage, severe bodily injury, or death.
All important information about the assembly, programming, and operation of your SK11 or SK20 turned tool changing station can be found in this manual. It also provides you with important information and notices for your safety.

1.2 Safety instructions

- The SK11 and SK20 turned tool changing stations are designed according to the state of the art and generally recognised good engineering principles.
- The equipment may only be operated in technically fault-free condition. Faults must be rectified immediately. Children and untrained persons may not commission the equipment.
- The equipment may only be used for the intended purpose: Changing station for milling tools with SK11 holding fixture for SK11 turned tool changing station and SK20 holding fixture for SK20 turned tool changing station. Control takes place by means of the TCHUni.dll file offered by ISEL.
- Do not reach into the turned tool changing station as long as the machine is switched on and the compressed air is connected.
- Prevent fires which can occur due to excessively hot tools in the turned tool changing station.

- Work may only be carried out by authorised, qualified personnel in consideration of the regulations of the electrical and electronics industry, as well as accident prevention regulations. The mains plug must be pulled out before opening the housing and performing any work on the electrical installation.

- Ensure that the turned tool changing station is sufficiently cleaned on a regular basis.

- Assembly and use of the equipment must take place in accordance with the standards of the assembly / conformity declaration. The regulations and thresholds observed by the manufacturer do not safeguard against unintended use of the equipment.

- The equipment may not be exposed to high air humidity and heavy vibrations.

- Store this assembly manual in a safe location and require all users to comply with its contents!

2 Product description

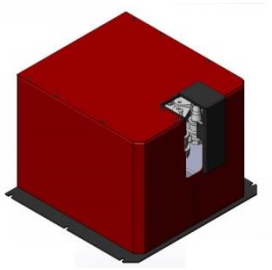
2.1 Types

Type	Description	Item no.
SK11 turned tool changer	11 storage slots for SK11	239100 4900
SK20 turned tool changer	14 storage slots for SK20	239100 6630

2.1.1 Turned tool changing station SK11

- Powder-coated RAL3011 aluminium housing
- 12 **type SK11** tool slots arranged in a circle
- Monitoring of tool slot and changer opening
- Integrated power electronics
- Linear movement of toolholder and changer opening
- Control by means of ISEL TCHUni.dll via RS232 interface
- Compatible with isel CNC machines

2.1.2 Turned tool changing station SK20

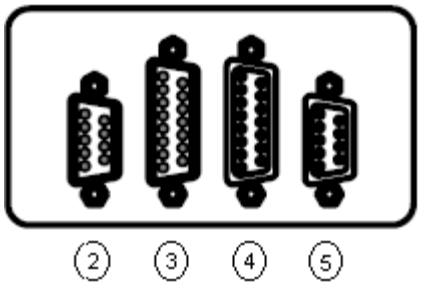


- Powder-coated RAL3011 aluminium housing
- 14 **type SK20** tool slots arranged in a circle
- Monitoring of tool slot and changer opening
- Integrated power electronics
- Linear movement of toolholder and changer opening
- Control by means of ISEL TCHUni.dll via RS232 interface
- Compatible with isel CNC machines

3 Connections

All turned tool changing stations are optimised for operation with isel control units. Connection cables may not be extended; otherwise the optimal operation of the SK11 or SK20 turned tool changer can no longer be guaranteed.

3.1 Electrical connection

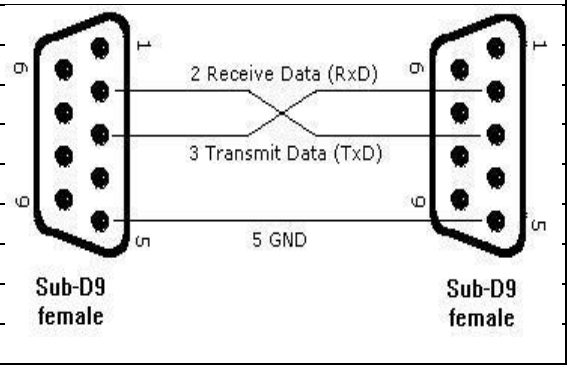


*We reserve the right to technical modifications

No.	Element	Description
2	COM	RS232 serial interface to the machine control unit
3	System IN	Voltage supply and interface to the safety circuit
4	System OUT	Connection jack for 2nd changing system
5	External I/O	Inputs and outputs for length measurement transducers, light barriers, etc.

2nd RS232 serial interface plug connection

Pin	Signal	Identification
1	n.c.	not assigned
2	RXD	RXD RS 232
3	TXD	TXD RS 232
4	n.c.	not assigned
5	Digital GND	Digital ground
6	n.c.	not assigned
7	n.c.	not assigned
8	n.c.	not assigned
9	n.c.	not assigned



If you should not have an additional RS232 serial interface on your control computer, we recommend using a USB-RS232 adapter, Item no.: 561050.

3. System IN plug connection

Pin	Signal	Identification
1	Stop1 IN	CH1 standstill monitor
2	Enable	Tool changer release
3	n.c.	not assigned
4	+24V	Logic +24V voltage supply
5	GND 24V	Logic GND voltage supply
6	+ Power	Motor +24V voltage supply
7	GND Power	Motor GND voltage supply
8	GND Power	Motor GND voltage supply
9	Stop2 IN	CH2 standstill monitor
10	Ready OUT	No errors of motors / power units
11	+24V	Logic +24V voltage supply
12	GND 24V	Logic GND voltage supply
13	+ Power	Motor +24V voltage supply
14	+ Power	Motor +24V voltage supply
15	GND Power	Motor GND voltage supply

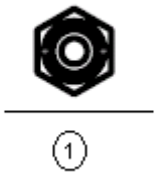
4. System OUT plug connection

Pin	Signal	Identification
1	Stop1 OUT	CH1 standstill monitor, HIGH signal on standstill
2	Enable	Tool changer release
3	n.c.	not assigned
4	+24V	Logic +24V voltage supply
5	GND 24V	Logic GND voltage supply
6	+ Power	Motor +24V voltage supply
7	GND Power	Motor GND voltage supply
8	GND Power	Motor GND voltage supply
9	Stop2 OUT	CH2 standstill monitor, HIGH signal on standstill
10	Ready IN	No errors of motors / power units
11	+24V	Logic +24V voltage supply
12	GND 24V	Logic GND voltage supply
13	+ Power	Motor +24V voltage supply
14	+ Power	Motor +24V voltage supply
15	GND Power	Motor GND voltage supply

5. External I/O pin configuration

Pin	Signal	Identification
1	+24V	+24V voltage supply
2	User IN1	Input 1, freely programmable in the user software
3	User IN9	Input 9, freely programmable in the user software
4	User OUT1	Output 1, freely programmable in the user software
5	GND 24V	GND voltage supply
6	LMT IN	Length measurement transducer input, optional
7	User IN2	Input 2, freely programmable in the user software
8	User IN10	Input 10, freely programmable in the user software
9	User OUT2	Output 2, freely programmable in the user software

3.2 Pneumatic connection



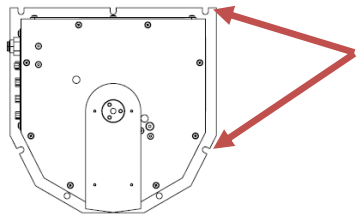
No.	Description
1	**Connection to compressed air supply** The turned tool changer requires an operating pressure of 8 bar and must be connected to a maintenance unit. Required hose diameter 6mm.

4 Assembly and commissioning

4.1 Assembly of turned tool changing station SK11, SK20

Ensure that you have a stable and secure foundation for the turned tool changing station prior to commissioning. Avoid collision with other components of the machine.

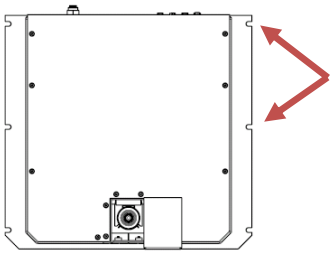
4.1.1 SK11 assembly



Fasten all five fastening points on the turned changer to the mounting area of your machine with machine screws (not included in the scope of supply) and ensure that it is flat and level.
Attention: The turned changer must be positioned in the travel range of your CNC machine.

Figure 2: SK11 fastening

4.1.2 SK 20 assembly



Fasten all six fastening points on the turned changer to the mounting area of your machine with machine screws (not included in the scope of supply) and ensure that it is flat and level.
Attention: The turned changer must be positioned in the travel range of your CNC machine.

Figure 3: SK20 fastening

4.2 Establishing connections

Attention! Switch off the mains voltage and pull out the mains plug before connecting the tool changer! Shut off the compressed air and ensure the absence of pressure!

Only authorised, qualified experts may carry out work on the electrical equipment of the machine. After completion of the integration of the turned tool changing station and prior to the initial commissioning, the machine must undergo inspection in accordance with EN 60204-1:2006, section 18.7. Route the cable without crossing other high-voltage cables. Avoid sharp bends and corners when routing the cable and ensure that the cable is not pinched and cannot be damaged as a result of movements of the machine. Only use suitable cable guidance systems.

System IN interface

1) Connect the 15 pin Sub D of the orange cable to the ***System IN*** slot on the turned changer. Route the cable into the switch cabinet.

2)

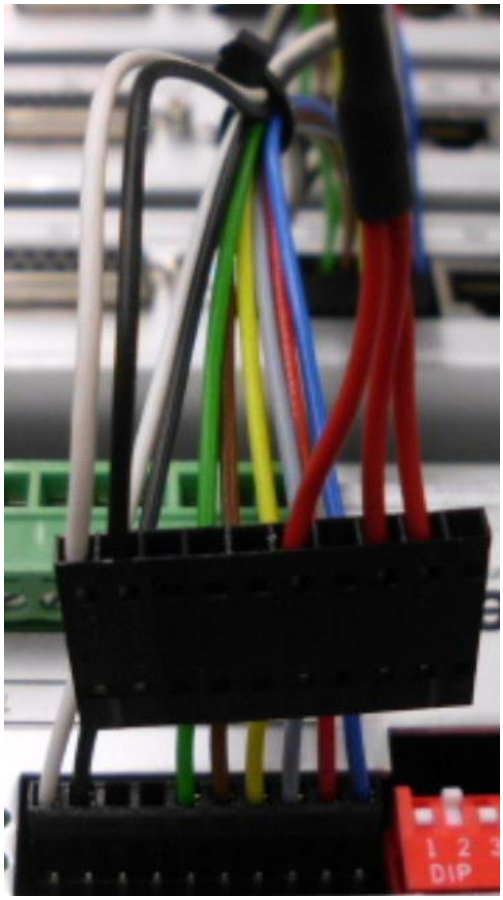
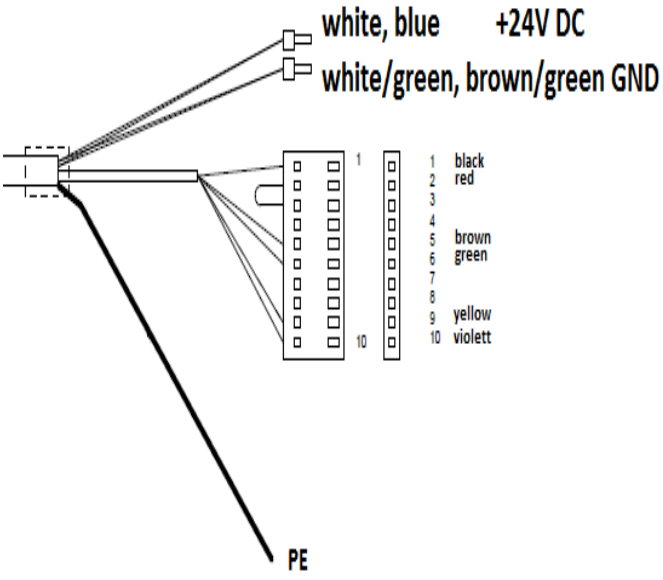


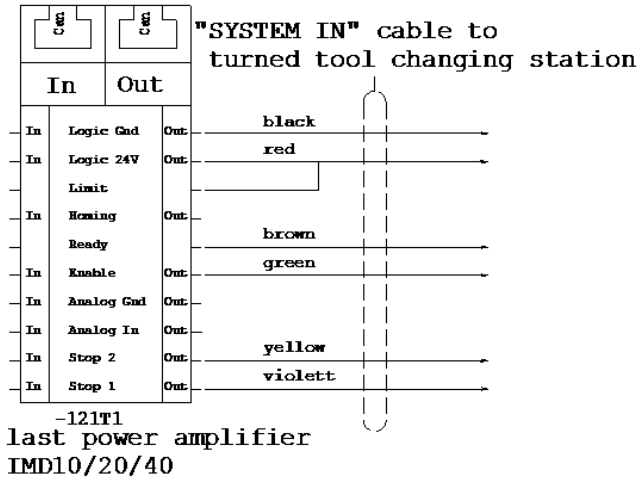
Figure 4: X3 terminal strip on the last output stage

Disconnect the black AMP plug strip, STOP1 OUT, STOP2 OUT, … to Logic GND at terminal X3 of the last output stage IMD 10/20/40.

3)



Plug in the black AMP plug of the turned changer at this position. **Ensure that the colours match (brown and green must be the same).**



4)

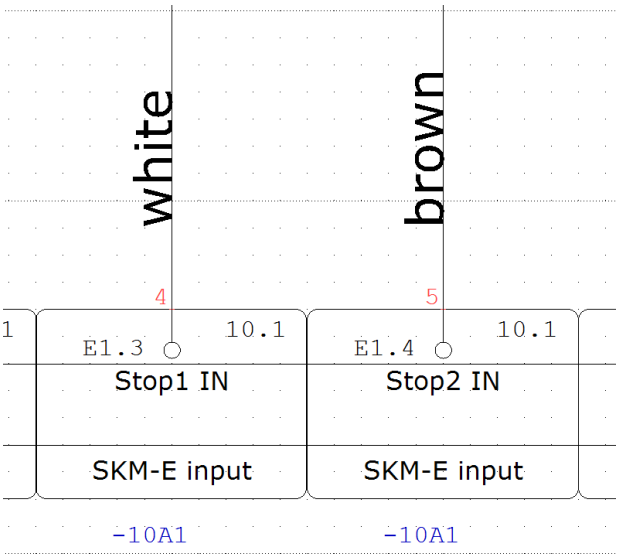


Figure 5: Connection to the safety circuit module

Connect the System OUT cable to the appropriate jack on the turned changer and route the cable to the SKM-S1.2-E safety circuit module in the switch cabinet. White and black wires are already connected at terminals X5:E1.3 and X5:E1.4 (standstill monitor of motor modules without turned changer). Disconnect these and make the following connections.
white -> X5:E1.3, Stop1 IN
brown -> X5:E1.4, Stop2 IN

5)

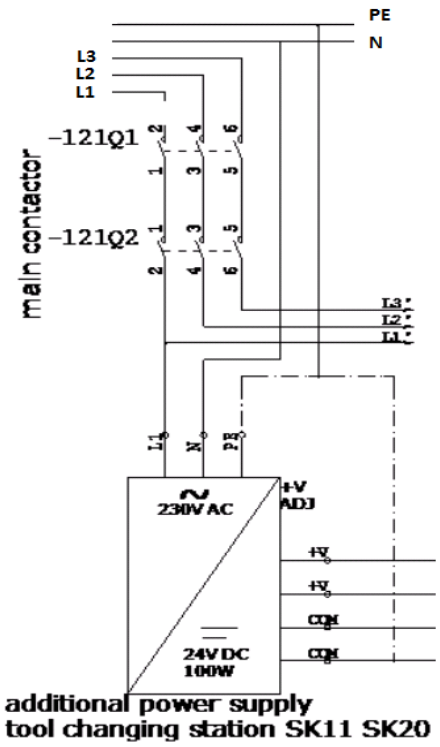


Figure 6: Voltage supply diagram

Establishing voltage supply:
The turned tool changing station also requires a 24V DC voltage supply.
We recommend using a 24V power supply unit with at least 100 watts. **The voltage connection must be made after the main contactors (disconnection on Emergency STOP).**

Establish the connections as follows:
white/blue -
white/green and brown/green

The green/yellow conductor must be connected to the machine's protective earth conductor.

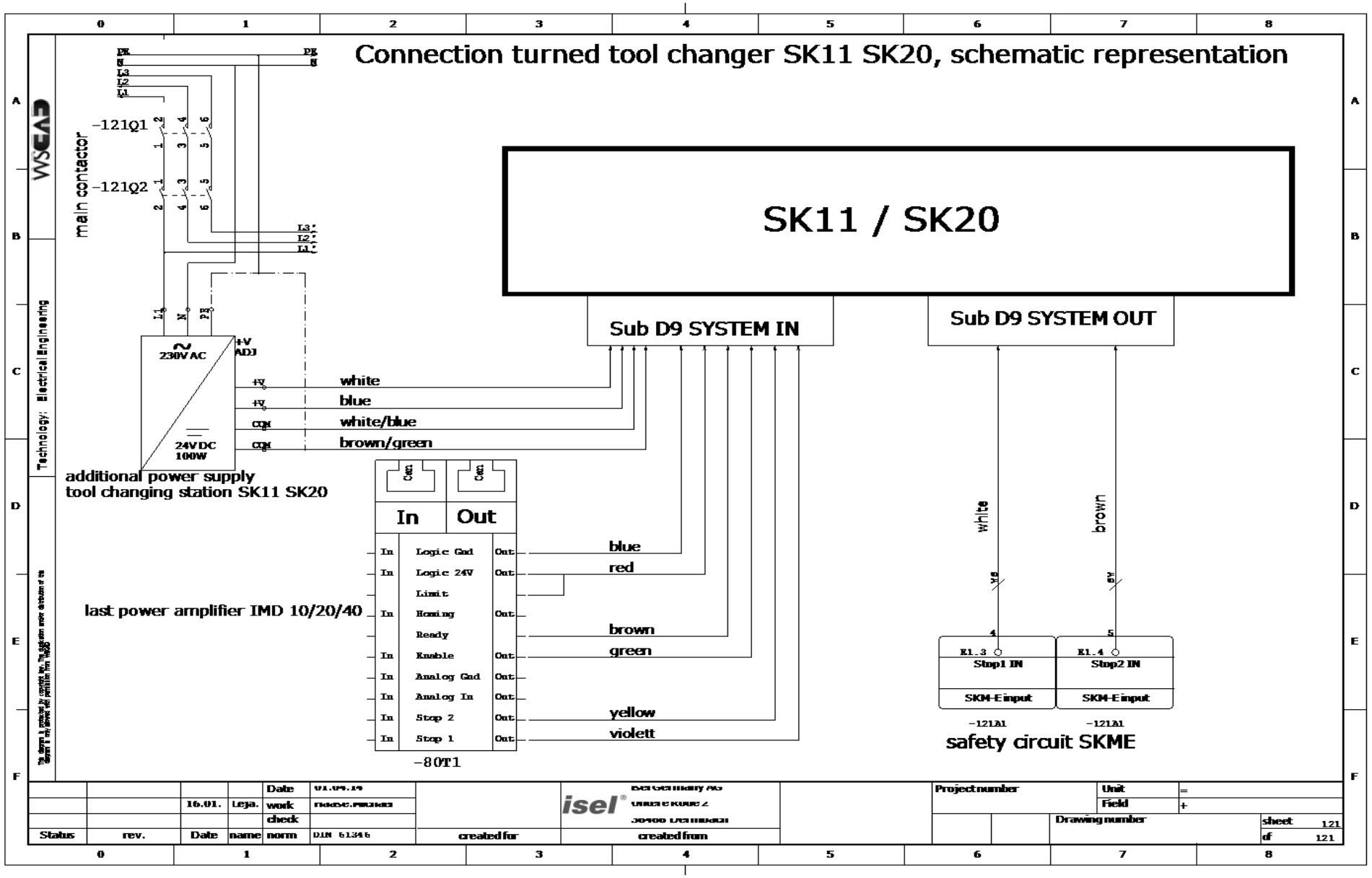
5) Insulate the open ends of conductors which are not needed, or completely disconnect and remove them.

6) Connect the COM interface to the control computer (iPC15 / iPC25).

7) Ensure that there is an appropriate compressed air connection.

8) Connect any accessories via the external I/O interface.

Ensure that there is a sufficient protective circuitry of the outputs with the use of inductors, e.g. self-induction recuperation diodes.


Connection turned tool changer SK11 SK20, schematic representation
SK11 / SK20
Sub D9 SYSTEM IN
Sub D9 SYSTEM OUT
main contactor
-121Q1
-121Q2
230V AC
24V DC
100W
+V ADJ
additional power supply
tool changing station SK11 SK20
white
blue
white/blue
brown/green
last power amplifier IMD 10/20/40
In
Out
Logic Gnd
Logic 24V
Limit
Homing
Ready
Enable
Analog Gnd
Analog In
Stop 2
Stop 1
blue
red
brown
green
yellow
violett
-80T1
white
brown
E1.3
E1.4
Stop1 IN
Stop2 IN
SKM-Einput
-121A1
safety circuit SKME
Technology: Electrical Engineering
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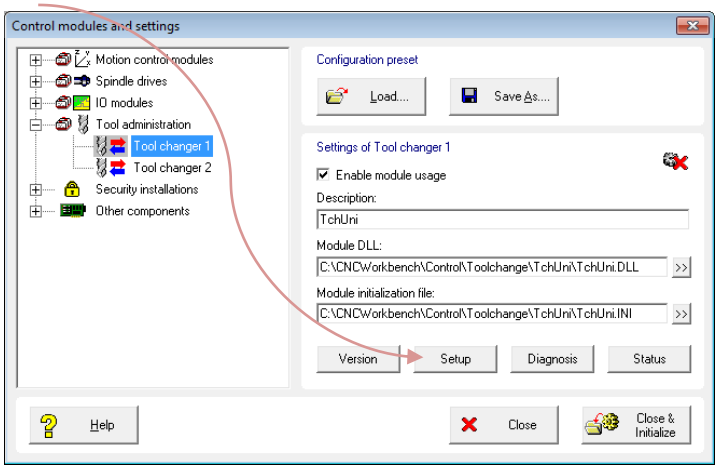
norm
DIN 61346
created for
created from
Project number
Unit
Field
Drawing number
sheet 121
of 121

4.3 Commissioning

Commissioning takes place with the isel ProNC software.
You should check all settings and adapt them to your tool changer.

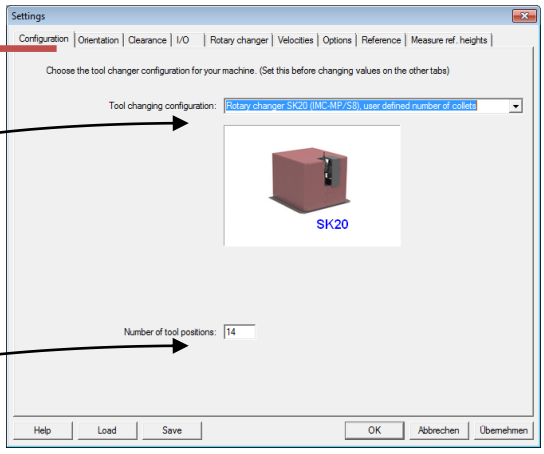
Start ProNC,
under the menu *Settings -> Control unit -> Tool management -> Changing station 1*
you will find *Setup*



Follow the window step-by-step (tab by tab) and adjust the necessary settings.

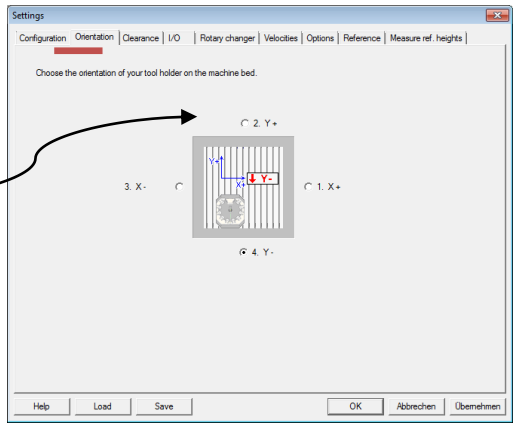
Here you enter your tool changing station type.

Select the number of tool slots.

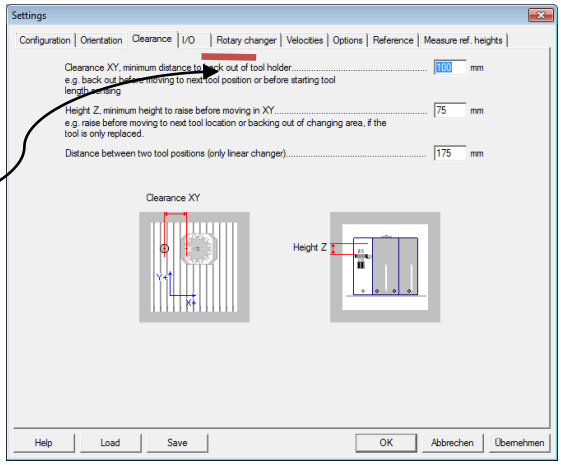


SK11

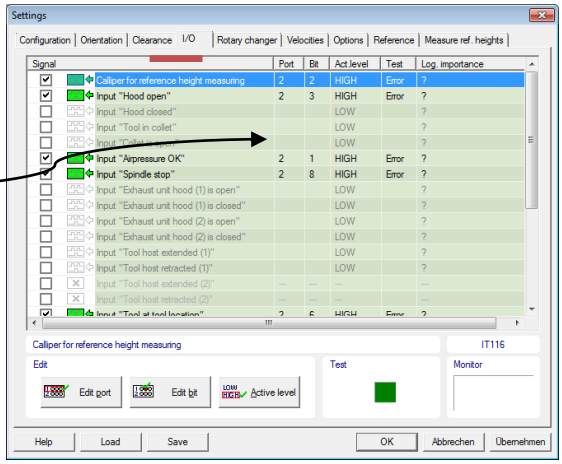
Determine the direction from which the tool changer should run.



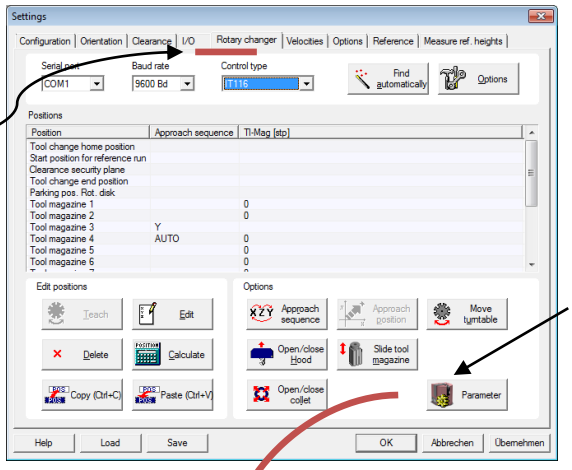
Specify the minimum clearances before critical movements here.



Adjust the I/Os. For this purpose, pay attention to the Help in ProNC.

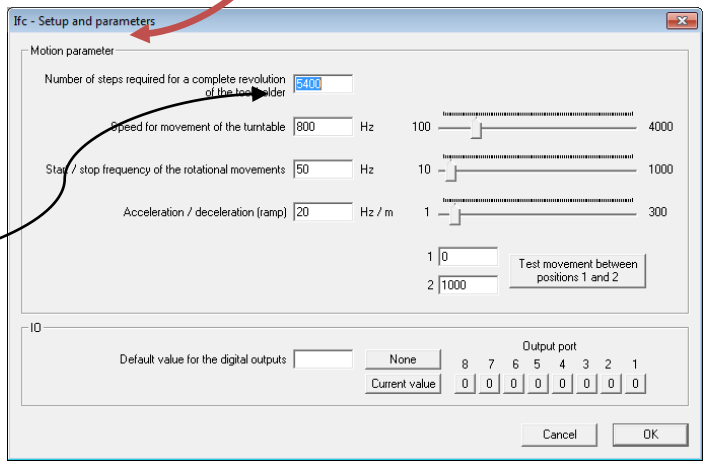


You configure your tool changer here. Enter the start and/or end position of the tool changer, specify the interface, and specify the individual tool slots. Also use the detailed Help in ProNC.

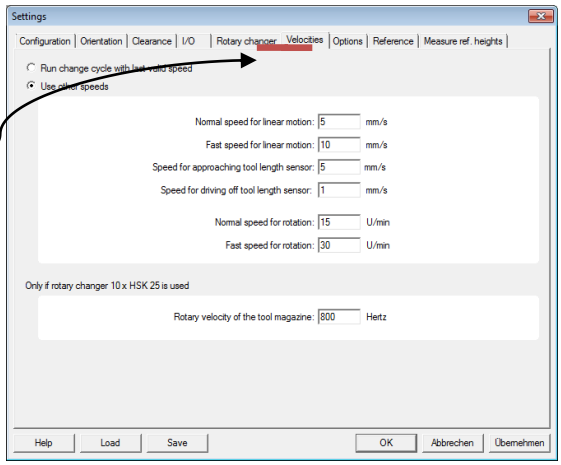


By clicking on *Parameters* you can change the speed setting for the changing station.

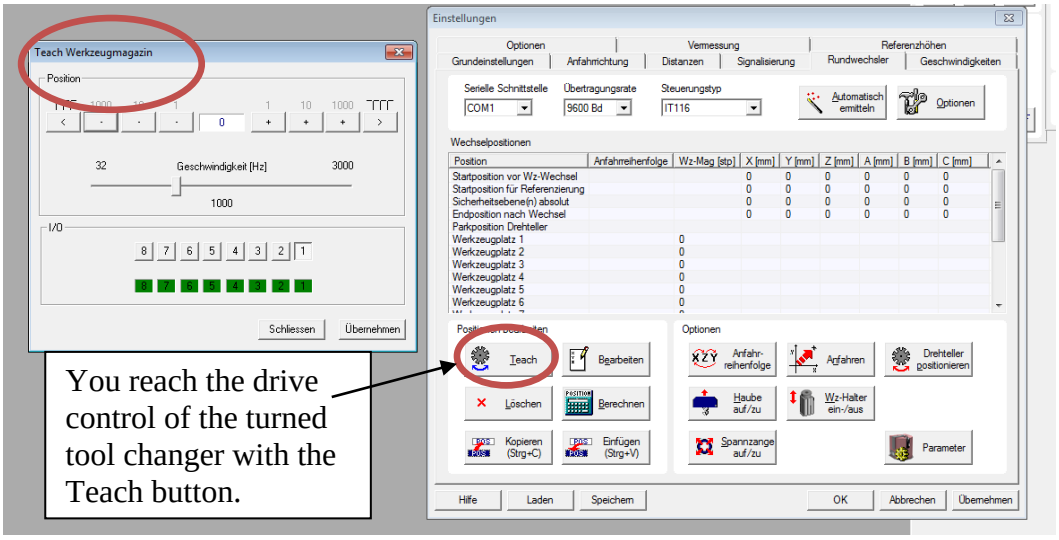
Specify the number of steps required for a complete rotation of the tool changer as follows:
Gear reduction x motor step resolution
For SK20:
5400 steps per rotation
For SK11:
800 steps per rotation
This provides the advantage of moving the tool changer over the shortest path to reach the tool.



Specify the speeds for the tool change.

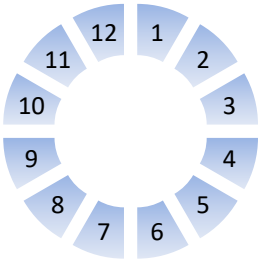


4.3.1 Teaching in the tool slots



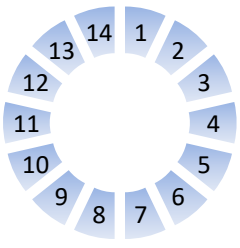
You must define each individual tool slot in the turned tool changer. For this purpose, we recommend arranging tool slots increasing in ascending order, beginning with 1. However, the storage slots may also be freely assigned.

tool positions



Recommended arrangement of the tool storage slots in the SK11 turned tool changer with 12 storage slots.

tool positions

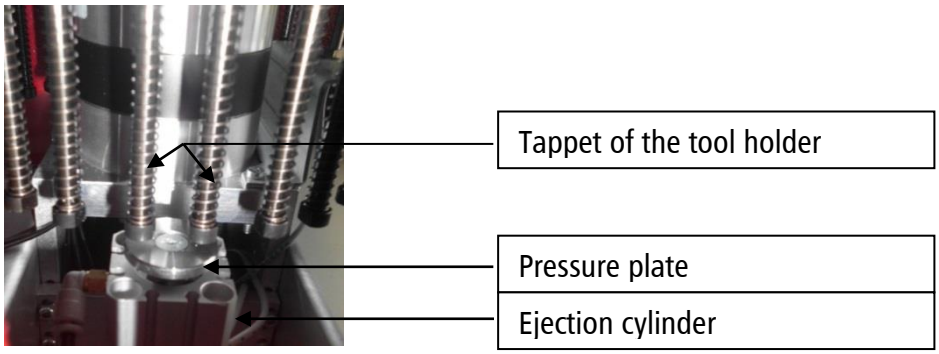


Recommended arrangement of the tool storage slots in the SK20 turned tool changer with 14 storage slots.

Move the turned tool changer until storage slot 1 is centred in the tool change opening.

Attention: Do not reach into the moving changing station. Danger of severe injury.

For better control: Both tappets of the tool holder must be above the pressure plate of the ejection cylinder.

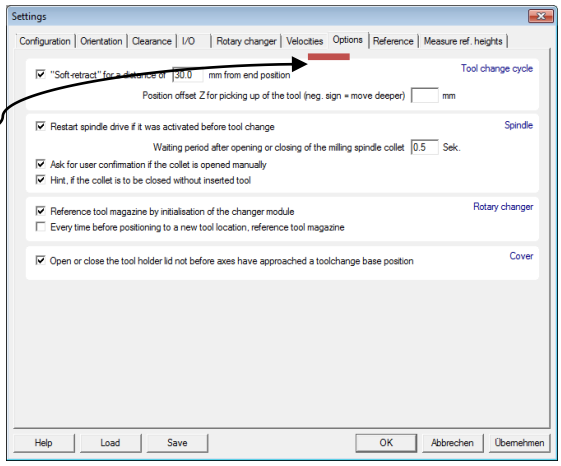


Check the positioning of the storage slot. If everything is correct and the tool can be driven out without danger or damage, adopt the position.

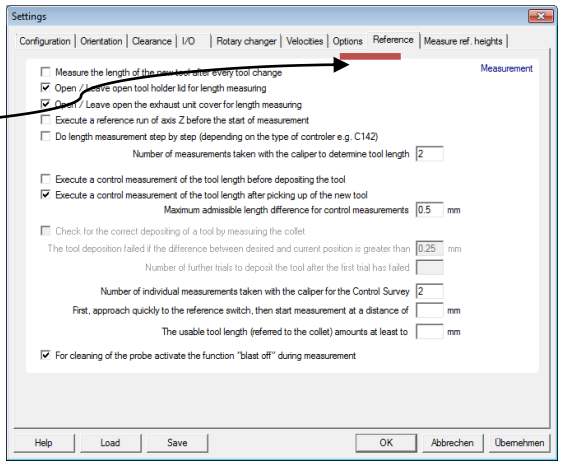
Approach the 2nd storage slot. It must also be centred in the tool change opening. Perform the same check of the tappet as with the first storage slot.
Adopt the position and proceed with the other positions in the same manner as with storage slots 1 and 2.

When all storage slots have been taught in, please check again whether the individual positions of the tools have actually been "ADOPTED".
For this purpose, have the turned changing station repeatedly approach the various storage slots and check the position of the toolholder in the tool change opening.

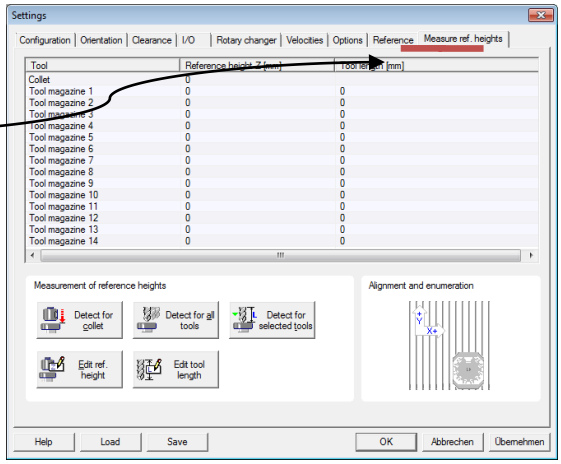
Make fine adjustments for the changing process under the Options menu item.



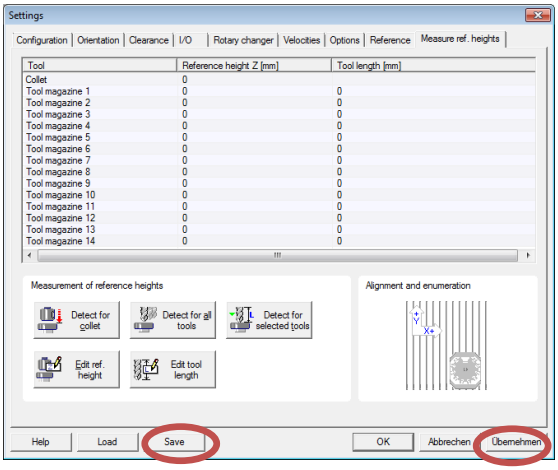
Set up the automatic tool measurement.



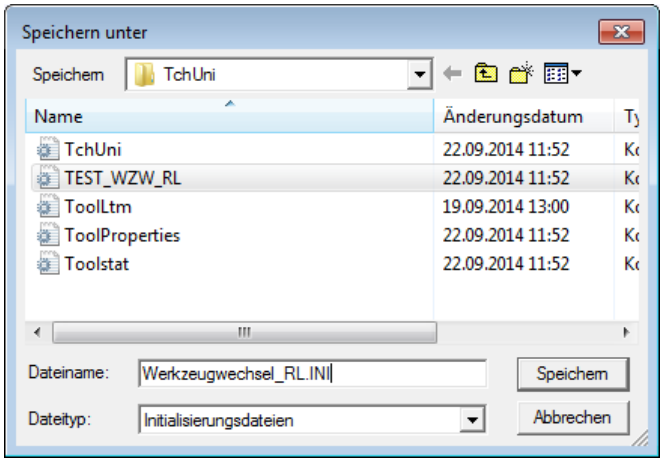
Specify the reference heights of the individual tools.

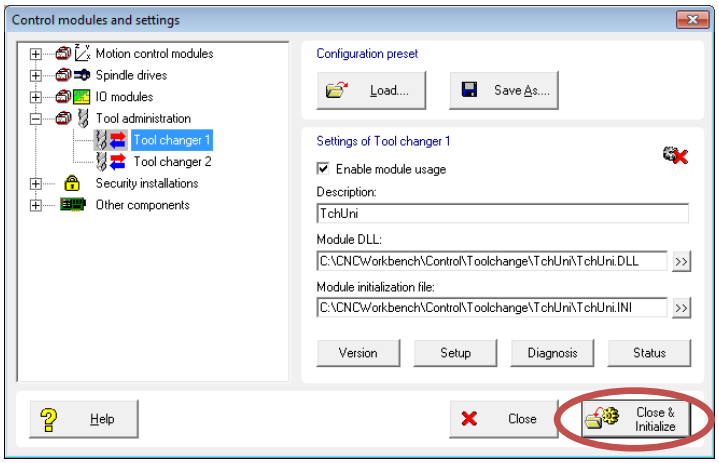


4.3.2 Saving and initialising the configuration



After you have confirmed the configuration with Adopt, it should be saved under *CNCWorkbench|Control|Toolchange|TchUni*. The folder *CNCWorkbench|* is already on your computer.





The settings are transmitted to the control unit with Close and Initialise, and the tool changer is now ready for operation.

5 Technical data

Dimensional drawings:

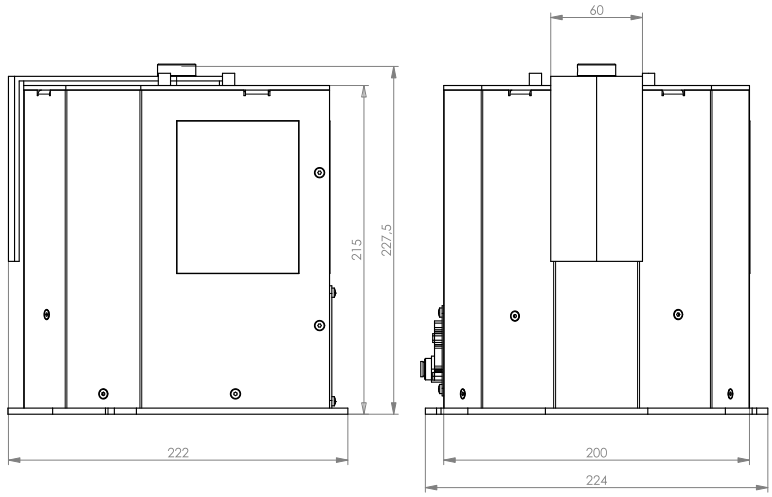


Figure 7: SK11 dimensional drawing

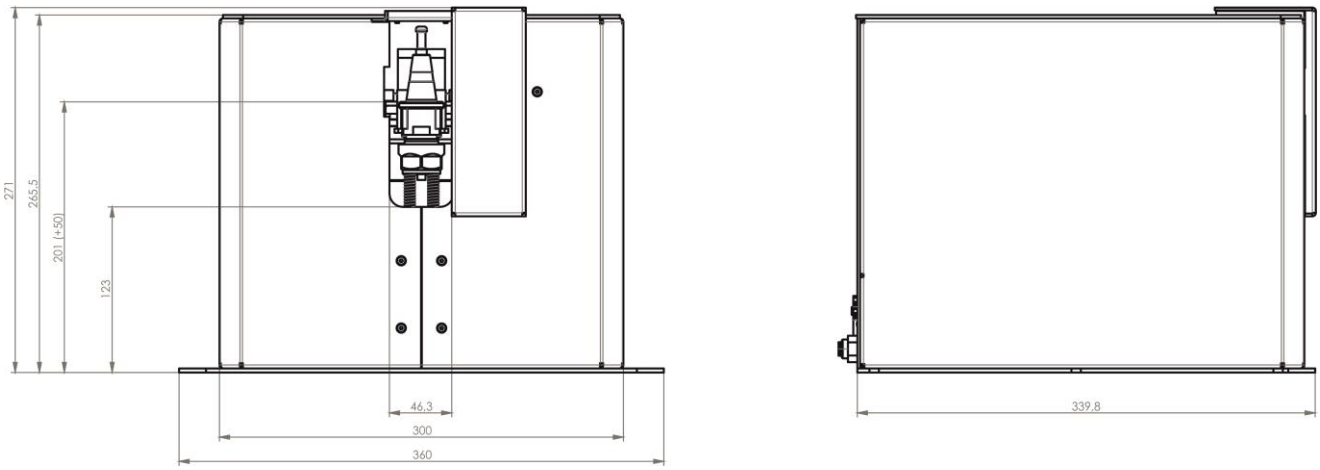


Figure 8: SK20 dimensional drawing

Component	Description	
	SK11	**SK20**
Dimensions: LxWxH	224mm x 222mm x 228mm	360mm x 339.8mm x 271mm
Minimum clear height:	250mm	300mm
Maximum tool length: tool diameter:	 60mm 22mm	 75mm 36mm
Tool holding device: Shank diameter:	Shank taper, type SK11 1.0mm to 10.0mm	Shank taper, type SK20 2.0mm to 13.0mm
Tool slots:	12 positions for SK11	14 positions for SK11
Weight:	approx. 8 kg unequipped	approx. 15 kg unequipped
Operating pressure:	8 bar	
Air consumption:	Pulse	
Voltage supply	24V DC, separate 100W voltage supply required	
Interface	RS 232	
Protection rating:	IP20	
Motor:	2-phase stepping motor, 1.8°, 3.0A max. peak current, 3V DC	2-phase stepping motor, 1.8°, 2.4A max. peak current, 2.4V DC
	800 steps / rotation	5400 steps / rotation
Environmental temperature:	+5°C to +40°C	
Storage temperature:	-20°C to +65°C	
Rel. air humidity:	Max. 90% non-condensing	

6 Maintenance and service

Maintenance

The SK11 and SK20 turned changing stations are maintenance-free.
However, isel Germany AG recommends regular cleaning.

Cleaning

Switch off the machine and shut down the compressed air. Open the upper cover. Only clean the turned changer using suitable aids (vacuum cleaner and brush). Do not use any cleansers. When cleaning, make sure that none of the mechanical components are blocked. After the cleaning is finished, there should be no dust or machining residue on the turned changing station.

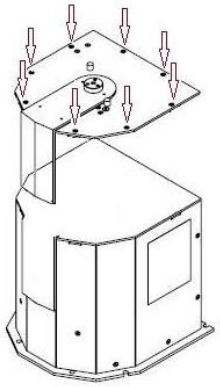


Figure 9: SK11 cleaning

Unscrew the M3 x 8mm screws and remove the cover. **Attention: The connecting lines of the tool changer door are still connected to the cover. Avoid kinking the lines.**

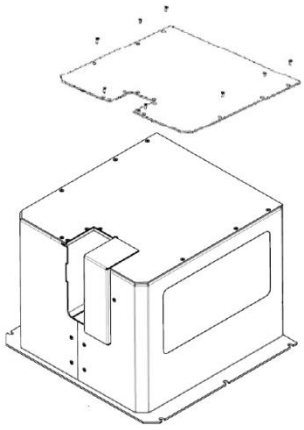


Figure 10: SK20 cleaning

7 Faults

Fault	Measures
Tool flap does not move	1 – Check pneumatic connection 2 – Check voltage supply 3 – Check communication
Tool does not move to OUT or IN	1 – Check pneumatic connection 2 – Check voltage supply 3 – Check communication
Motor does not turn	1 – Check voltage supply 2 – Confirm with "ACK button" with system in test mode 3 – Unlock 'Emergency STOP' 4 – Eliminate error in safety circuit 5 – Check communication
The magazine remains in an incorrect position	1 – Re-teach tool slots 2 – Check step resolution
No communication	1 – Check COM port

8 Disposal

Return of waste electrical and electronic devices for disposal

Collection

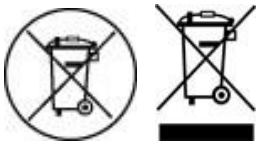
Users of electrical and electronic devices are obligated, in accordance with the country-specific regulations, to separate disposal of the waste equipment. Waste electrical and electronic equipment may not be disposed of with household waste. The separate collection required for recycling and re-use,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

Return and collection systems

Disposal of your SK11 and SK20 turned tool changing station, 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.



9 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
D-36124 Eichenzell

hereby declares that the following product: **Turned tool changing station SK11 and SK20**
Product designation: **Item-No.: 239100 4900 (SK11), 239100 6630 (SK20)**

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 13850:2015	Safety of machinery -- Emergency stop -- Principles for design
EN 60204-1:2006	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 **special 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: **Christian Bley (CE coordinator, isel Germany AG)**

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 compete 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: Eichenzell, 21 June 2016

Werner Kister, chair