Machine Manual 1

Technical Fundamentals

All about technical data, transport, installation, operation and maintenance.

DMC 75 V *linear*

iTNC 530

DECKEL MAHO
Geretsried GmbH

Dear Customer:

Your DMC 75 V *linear* may deviate in a few details from the illustrations shown in this manual. This is of no importance for the operation of the machine.

Please specify the Stock No. shown at the top, right, of the label on the back of your documentation folder, adding **MHB – 1:** GB/01.2004, series 00, if you have any inquiries concerning this Operator's Manual or if you wish to obtain additional copies.

A few remarks on the subject of safety:

This manual is indispensable for safely operating your machine. Make sure it is **always at hand** for the operating personal.

No person is allowed to operate the machine – even for only a short time – without **adequate training**, either at your factory, at a qualified training institution or at **one of our Training Centres**.

Make yourself familiar with all applicable **industrial and local safety standards, laws and regulations**. If they are not put up on a notice board, ask your safety engineer.

Observe the notes on the **prescribed end use of the machine** on the following pages.

Each Operator's Manual is accompanied by a brochure containing important **instructions on operational safety** and the **prevention of accidents**. Study these instructions carefully **before** you start working with your machine.

Close the splashguard enclosure before beginning with a machining operation. All machines used for automated production must be equipped with a splashguard enclosure.

We wish you smooth and trouble-free operations with your DECKEL MAHO machine.

Sincerely,
DECKEL MAHO Geretsried GmbH

Basis:

Prescribed end use of DECKEL MAHO DMC-line machining centres.

Your DECKEL MAHO machining centre was built using state-of-the-art technology and complies with all generally recognized safety regulations, standards and specifications.

Design:

DECKEL MAHO machining centres are suitable for manual and automatic operation.

Production technology:

Machining (as per DIN 8590, Part 0) by means of rotating tools with at least one geometrically defined cutting edge.

Fields of application:

Milling
(as per DIN 8589, Part 3):
- Surface milling
- Circular milling
- Helical milling
- Hobbing
- Profile milling
- Form milling

Drilling and boring
(as per DIN 8589, Part 2):
- Spot facing
- Drilling and boring
- Tapping and threading
- Profile drilling
- Drilling of non-cylindrical holes

Materials:

Metal, wood and plastics
The machining of easily flammable and/or explosive materials (e.g. magnesium, silicon) is not permissible except if suitable precautions are taken.

Attachments and accessories:

DECKEL MAHO provides a number of special attachments, accessories, add-on and optional equipment for extending the functional range of DECKEL MAHO machining centres to fulfil special applications.

Personnel:

Only **specially trained, authorized and reliable personnel** may operate the machine. Persons without the necessary training are not allowed to work on the machine, not even for short periods of time.

There must be **clear rules** to define the **responsibilities** of the persons entrusted with the tasks of transporting, installing, tooling, setting up, operating, servicing and maintaining the machine, and compliance with these rules must be ensured by regular **spot checks**.

Customer's obligations:

Before the machine is put into operation, the customer must make sure that all persons responsible for the machine have read and understood the operating manual, and that particular attention has been given to the **safety instructions**. The customer is also **obliged to keep a check** on the general condition of the machine (externally visible defects or damage as well as changes in operating characteristics).

Servicing:

Repairs may only be made by **specially trained and qualified personnel**, and must be made in conformity with the relevant maintenance and servicing instructions. All the applicable safety regulations must be observed.

Important:

The following work methods are **outside the scope of the prescribed end use of the machine**. The **manufacturer cannot be held liable** if these instructions are ignored:

- **Any** use of the machine which deviates from, or exceeds, the applications described above.
- Operating the machine **when it is not in perfect working order** and/or operating the machine without due regard to safety and possible hazards, observing all the instructions given in this operating manual.
- Failure to repair, **before** the machine is put into operation, any faults that may put the safety of the machine operator at risk.
- **Altering, bypassing or deactivating** any equipment fitted to the machine to safeguard perfect functioning and unrestricted use of the machine and ensure active and passive safety.

The operation of a machine may always involve **unforeseeable risks**, including

- danger to life and limb of personnel,
- damage to the machine and other assets of the company or user.

Environment, water conservation:

The machine described in this manual is an installation for the manufacture, processing and use of potentially water-polluting substances within the meaning of the German Water Resources Act (Wasserhaushaltsgesetz).

This means that the requirements of the **Water Resources Act or similar legislation in the user's country** must be observed whenever the machine, or any parts thereof, are operated, shut down or dismantled. Detailed information will be found in the applicable national or local regulations governing the use of potentially water-polluting substances.

Be sure to observe all warnings, labels and notes. Pass all warnings and safety instructions on to all persons doing any work on the machine.

Note

Special instructions on handling the machine, machine reactions and the economic use of the machine.

Warning

Special instructions on safety aspects and the prevention of damage.

Danger

Special instructions for the prevention of accidents or severe damage.
Take particular care to avoid the risk of an accident.

Caution – high voltage

Warning of dangerously high electric voltage which may cause danger to life and limb.
Take particular care to avoid any risk of accidents caused by electric current.

Press key

Key or key sequence, identified by symbol(s), to be pressed for the operating step concerned.

Danger caused by high-intensity magnetic fields

Your machine is equipped with linear synchronous motors. This requires the strict observance of the following general safety rules:

The secondary parts of linear synchronous motors produce a high-intensity static magnetic field. Persons with pacemakers, metal implants as well as pregnant women must not stay in the immediate vicinity (less than 0.5 m) of such secondary parts. Moreover, secondary parts must not be moved into the vicinity of objects which might be impaired, damaged or destroyed by magnetic fields (e.g. watches, data carriers, credit cards etc.).

Due to the marked effect of such secondary parts on ferromagnetic objects (including the primary parts and other secondary parts) whose movements may cause injuries or damage, the following safety measures shall be observed:

Always wear protective gloves when moving or installing secondary parts. Do not move, handle or install secondary parts unless they are fitted with the protective transport and assembly barrier guard. Do not remove such transport and assembly barrier guard before preassembly of the parts, i.e. before the parts have been safely fitted to the machine. Without the safety barrier guard, such secondary parts may – unless firmly attached – be subject to uncontrolled movements or inadvertently attract ferromagnetic materials, such as iron, nickel, cobalt or the like.

Do not move the secondary parts using a crane, since this may cause uncontrolled movements of the parts and thus lead to damage thereof. Linear motors may only be transported, installed and operated by specially trained, qualified personnel. All persons working with or on the equipment must be specially instructed at regular intervals, at least once a year.

Safety recommendations Accident prevention

This booklet contains important information on how you can prevent added risks of personal injury or damage to the machine by using our product solely within the scope of its prescribed end use.

Technical Fundamentals Machine Manual 1

1. Machine specification
2. Technical data
3. Operation
4. Operation Tool magazine
5. Operation Pallet changer
6. Maintenance
7. Transport
8. Installation
9. Connection, assembly

Attachments & Accessories Machine Manual 2

1. Spiral-type swarf conveyor
2. Scraper-type swarf conveyor (standard)
3. PF 210/980 Lubricoolant cleaning unit
4. Lubricoolant supply through the tool
5. Flush cleaning
6. Flush gun
7. Cooling air
8. Inspection window
9. Oil mist separator
10. BLUM-MICRO Tool scanner
11. MP 10 Measuring probe
12. TS 632 Measuring probe
13. Remote control
14. Minimal quantity lubrication unit

Contents

Contents

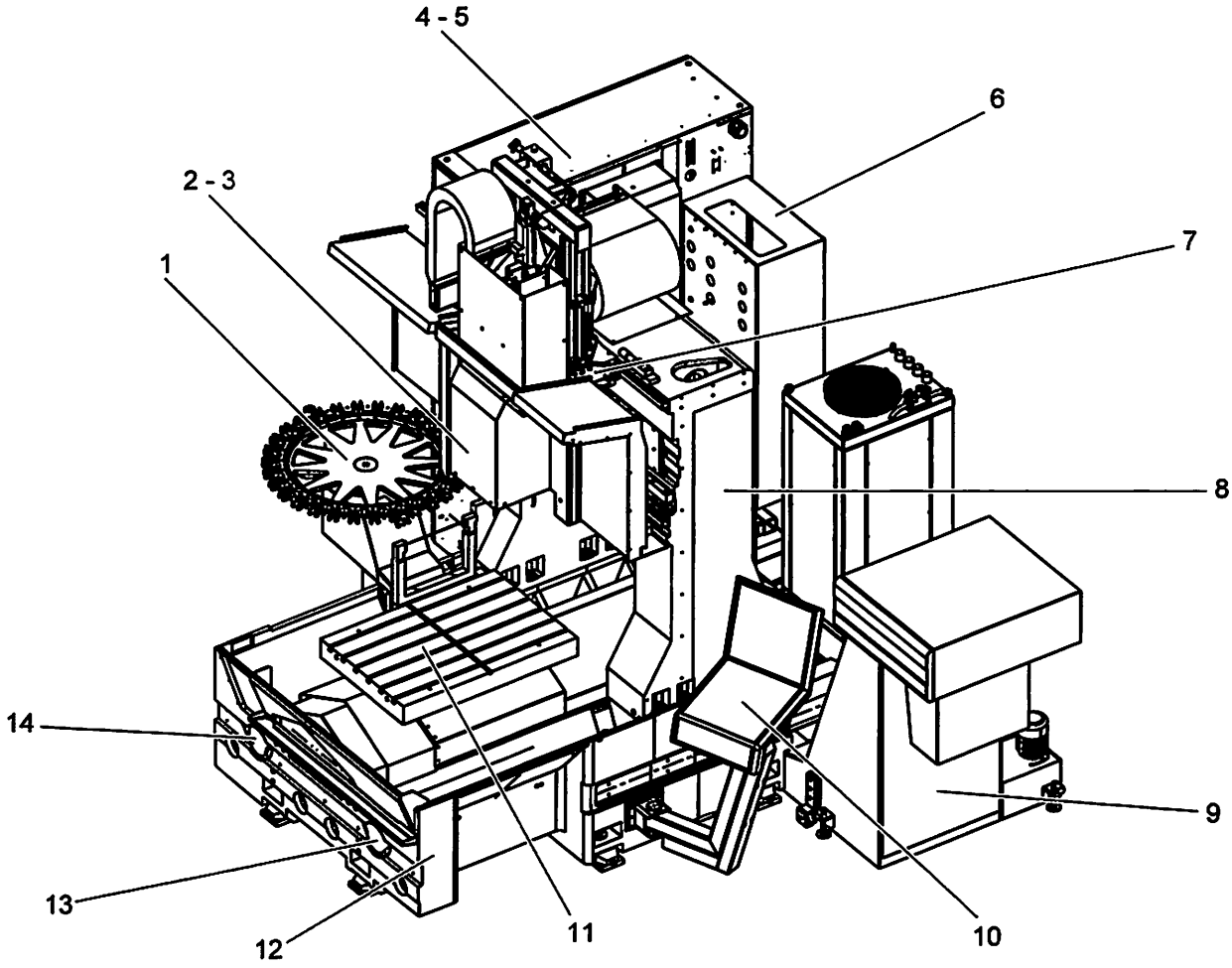
1

Machine specification

2913
DMC 75 V linear
iTNC 530
MHB – 1: EN/01.2004
en

Main assemblies • Machine with table

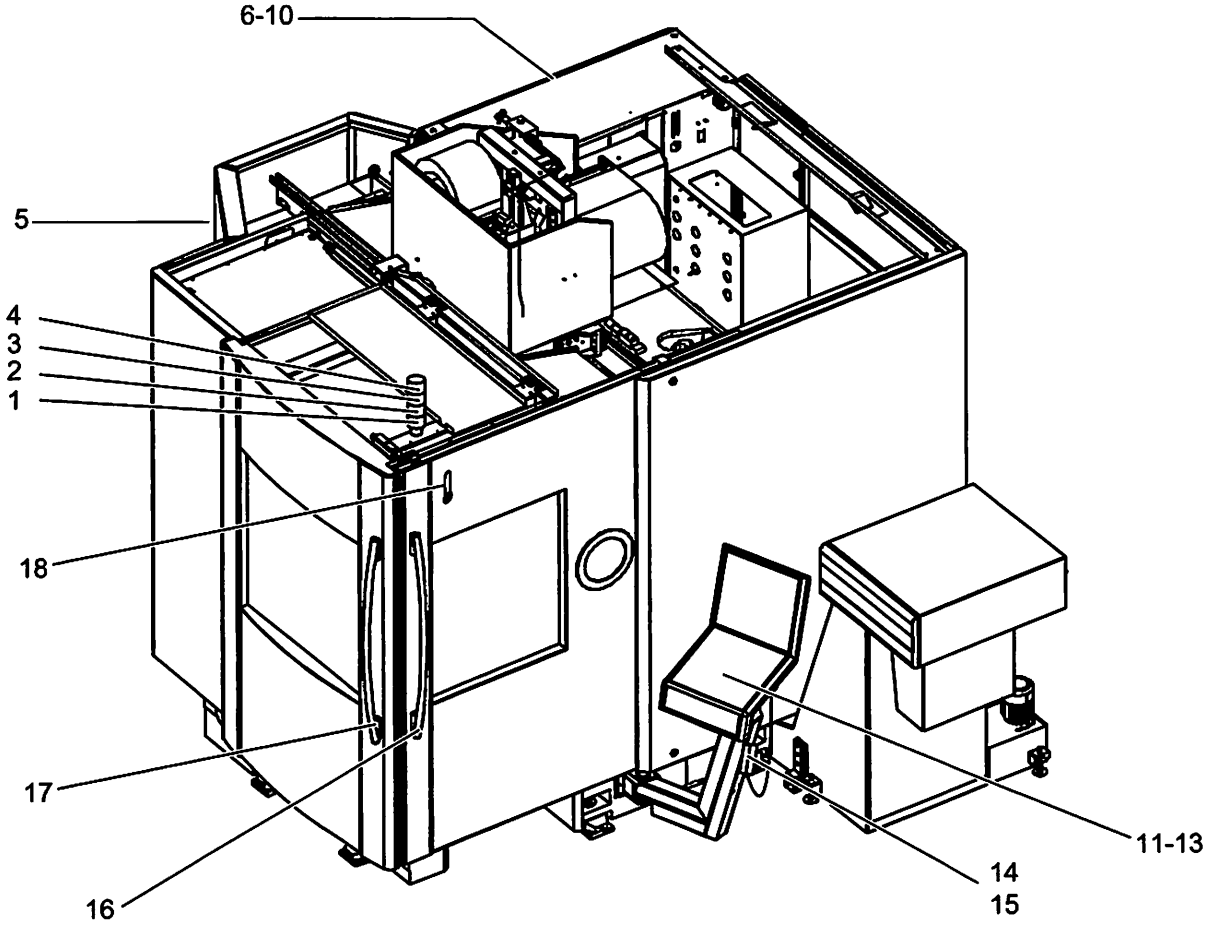
View from front, right



1 Tool magazine
2 Vertical slide (Z axis)
3 Motor spindle
4 Control cabinet
5 Modem for DECKEL MAHO Net Service (in control cabinet)
6 Auxiliary units
7 Cross-slide (Y axis)
8 Portal
9 Scraper-type swarf conveyor
10 Control console
11 Table (X axis)
12 Machine bed
13 Spiral-type swarf conveyor, front
14 Spiral-type swarf conveyor, rear

Controls • Machine with table

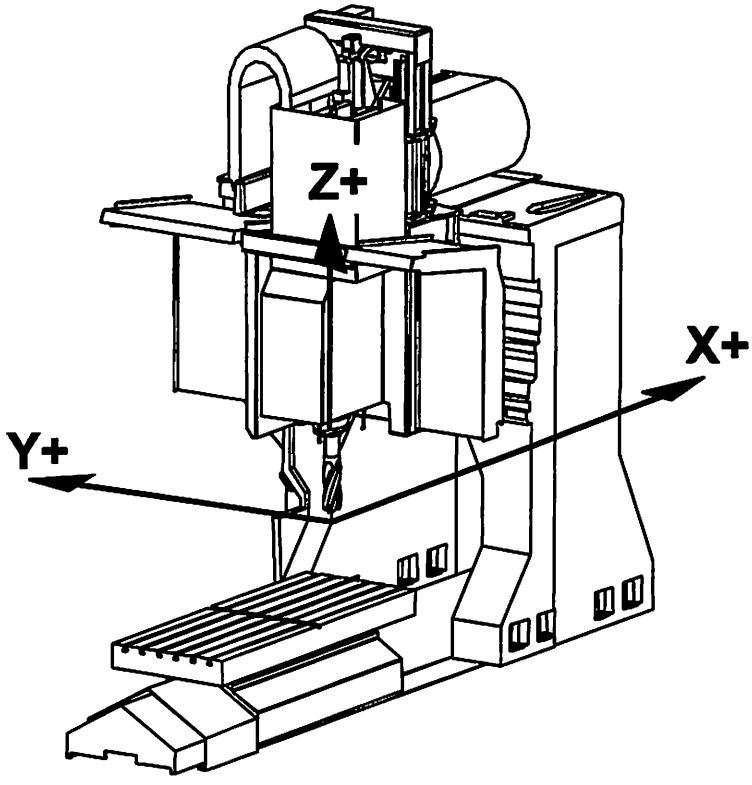
View from front, right



1 Signal lamp (option)
2 Steady green light: Program run in progress
3 Steady yellow light: Operator call
4 Steady red light: Malfunction (machine stopped)
5 Sliding window, tool magazine
6 Master switch (Q1)
7 Interfaces
8 Receptacle
9 Upper hours-of-operation counter: Spindle running time
10 Lower hours-of-operation counter: Time drives are on
11 Control console
12 Control unit
13 EMERGENCY STOP button
14 Portable control/Remote control (option)
15 EMERGENCY STOP button (option)
16 Front door to working area
17 Left-hand door to working area
18 Emergency release, auxiliary release for door to working area

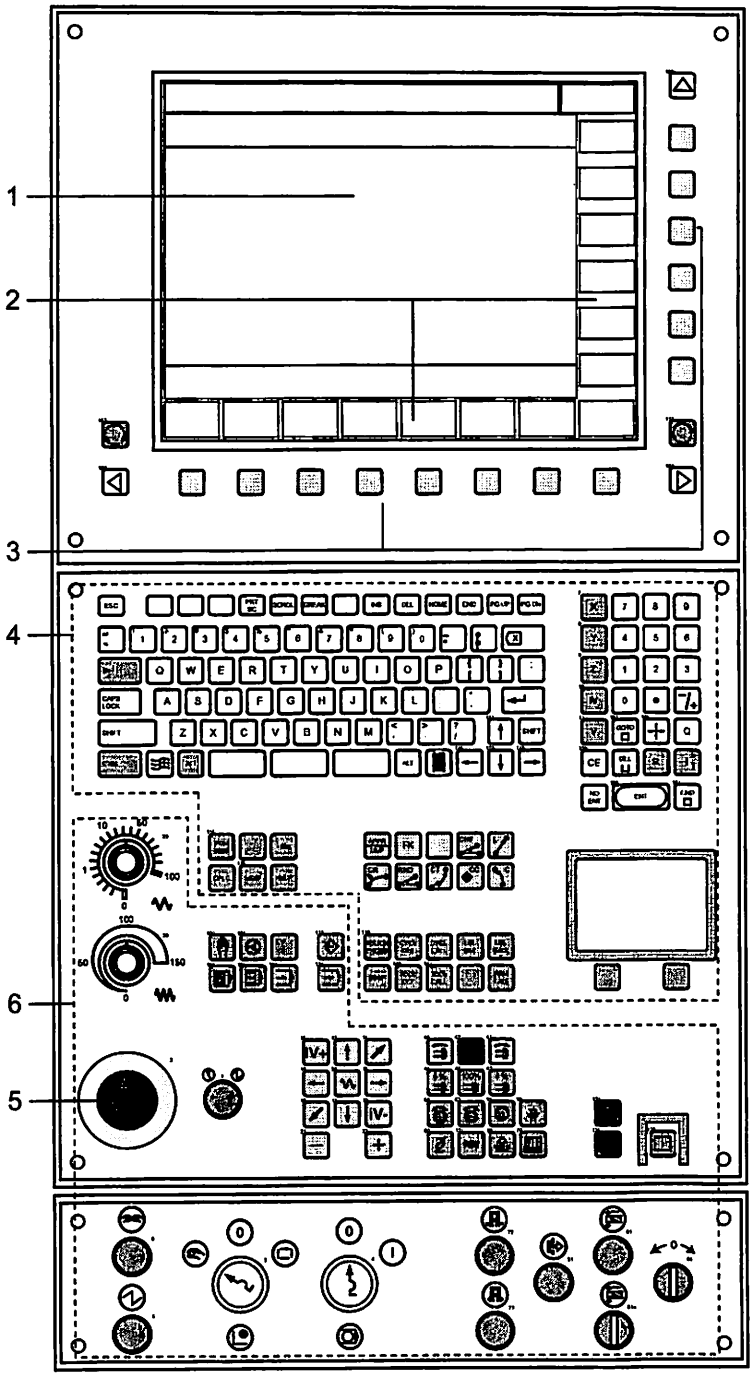
Machine axes

View from front, right



Identification of machine axes and directions of traverse of machine slides

Control console



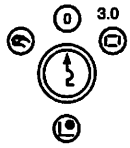
1 Monitor
2 Display, function keys
3 Function keys (softkeys)
4 NC keypad
5 EMERGENCY STOP
6 Machine control panel

Machine controls

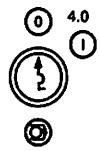
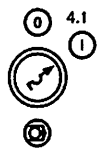
Machine ON  1

EMERGENCY STOP  2  2

Keylock switch for standard operating modes

- Machining mode 
- Set-up mode 
- Manual intervention 

Keylock switch for optional operating modes

- Extended manual intervention OFF 
- Extended manual intervention ON 

Enable key  5

for operating modes

- Set-up mode
- Manual intervention

Approval button for index head  6

Manual control

Move axes 

- Move axes within their ranges of traverse

Move

- in "–" direction  21
- in "+" direction  22

Rapid traverse  28

Feedrate override  29

Rapid traverse override  30

Spindle start

- CCW rotation  40
- CW rotation  41

Spindle stop  42

Spindle speed

- Reduce spindle speed  43
- Increase spindle speed  44
- Reset spindle speed to 100 %  45

Unlock door to working area  50

Unlock door to tool magazine (shelf magazine)  51

Preselect manual tool change  60

Release tool in spindle  61

Release tool in spindle 

- Left-hand spindle
- Right-hand spindle

Index head 

- CCW rotation
- CW rotation

Tool magazine

- CCW rotation 
- CW rotation 

Enable workpiece 

- for pallet change
- for rotary table side reversal

Workpiece

- Unclamp 
- Clamp 

Lubricoolant ON/OFF 

Lubricoolant supply through tool ON/OFF 

Operating modes and ranges

Manual control 

- Move machine slides by manual control, set up machine, set workpiece zero

Automatic mode: Automatic program run 

- Execute programs

Positioning with manual data input  102

- Enter and execute program blocks

Automatic mode: Program run block by block  104

- Execute programs block by block

Remote control  105

- Activate remote control

Programs: Store/edit programs  113

- Generate/edit programs

Programs: Program test  114

- Test programs

Programs/data files  115

- Select/delete programs or files,upload/download data

MOD  116

- Select MOD functions

Change screen display  117

- Switch over between machining and programming modes

Scanning/probe system functions  118

- Enter scanning/probe functions in a program

Machine functions

Program start  120

Feed and spindle stop  121

Auxiliary functions  125

- Switching on/off functions for attachments/ accessories

Feed stop  126

- Spindle will continue rotating

Messages CE [130]

- Cancel fault/error messages
- Reset numerical values

Other functions

Enter and call tool length and radius TOOL DEF [140]

Tool call TOOL CALL [141]

- Call a tool in a program

Page

Switch over softkey strip [160] [161] [162]

- Assign further softkeys within current menu

Screen assignment [163]

- Subdivide display screen into several windows

Edit

Cursor keys [176] [177] [178] [179]

Enter data ENT [180]

- Conclude data input, continue dialog

Conclude block END [181]

Call blocks, cycles and parameter functions directly GOTO [182]

Function keys

Horizontal and vertical function keys (softkeys) having different functions, depending on the currently active menu. The currently active function is displayed at the bottom or lateral margin of the display screen.

For information on further keys assignments see HEIDENHAIN Control Unit Manual.

Safety features and equipment

Essential features

- Splashguard enclosure with monitored and interlocked door for access to working area
- Keylock for switch operating modes
- Monitored doors and ports
- Inspection windows to view working area

Guard doors

The control system monitors the doors and ports. Only if they are closed will all machine functions be available.

- Control cabinet doors:
  Lockable, electrically monitored.
- Door to working area:
  Electrically monitored sliding door, mechanically interlocked.
- Tool magazine door:
  Electrically monitored sliding window, mechanically interlocked.
  Automatic tool change inhibited when door is opened.
- Maintenance ports:
  Lockable.

Important functions

The door to the working area is normally locked. It can only be opened upon pressing the "Unlock door to working area" key.
While the door to the working area is unlocked,

- the spindle rotation and machine slide movements are only obtainable when the "Enable" key is held down;
- the rapid traverse rate, feedrates and spindle speeds are limited (see "Technical data").

Indicating plates and labels

Caution - keep off area underneath vertical slide

Never lean over underneath the vertical slide (Z axis) while cleaning, servicing or operating the machine.

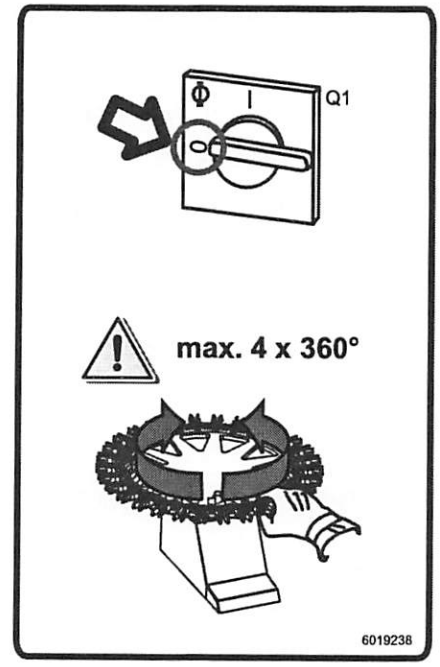
1 prohibitive label in working area of machine, on operator's side of spindle housing, bottom.

Caution - danger of collision

When the master switch is OFF, only a maximum of 4 full turns by hand of the magazine wheel are permissible.

Danger of collision, damage to machine, malfunctions when machine is switched on after more than 4 full turns by hand.

1 warning label on inside of tool magazine maintenance port.



Caution - accumulator

This unit comprises a hydraulic pressure accumulator.
Be sure to relieve the pressure before starting any maintenance work.
1 warning label at the rear of the machine, right, middle, on the left maintenance port.

Anlage enthält Hydrospeicher.
Vor dem Beginn von Instandhaltungsarbeiten muß die Anlage druckentlastet werden.

This unit comprises an accumulator.
Be sure to relieve the pressure before starting any maintenance work.

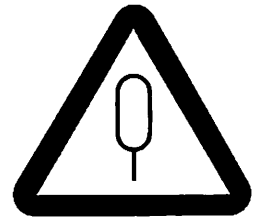
L'installation est équipée d'un réservoir hydraulique.
Couper la pression dans l'installation avant d'effectuer une réparation quelconque.

La instalación contiene acumulador hidráulico.
Antes de iniciar los trabajos de mantenimiento es necesario disminuir la presión de la instalación.

L'impianto contiene accumulatore idraulico
Prima di eseguire interventi di manutenzione deve essere tolta la pressione dall'impianto.

Caution - pressure vessel

Caution - pressure accumulator
Relieve pressure before starting disassembly.
Max. gas preload pressure p° 80 bar.
To be filled with nitrogen only.
1 warning label on inside of cross-slide panelling (Y axis), immediately adjacent to pressure accumulator.



Vorsicht - Druckbehälter
Druckentlastung vor Beginn der Demontage
Gas - Vorfülldruck p_0 max. 80 bar
Füllen nur mit Stickstoff

CAUTION - PRESSURE VESSEL
Relieve pressure before starting disassembly.
Max. gas preload pressure p_0 80 bar (1,136 psig)
To be filled with nitrogen only

Attention - Réservoir sous pression
Couper la pression avant de commencer le démontage
Gaz Pression de préremplissage p_0 max. 80 bar
Remplir d'azote

Cuidado - Depósito a presión
Disminución de la presión antes de comenzar el desmontaje
Gas - presión de prellenado p_0 máx. 80 bar
Llenar solo con nitrógeno

Attenzione - Recipiente a pressione
Smaltimento della pressione prima di iniziare il montaggio
Pressione di precarico gas p_0 max. 80 bar
Riempire solo con azoto

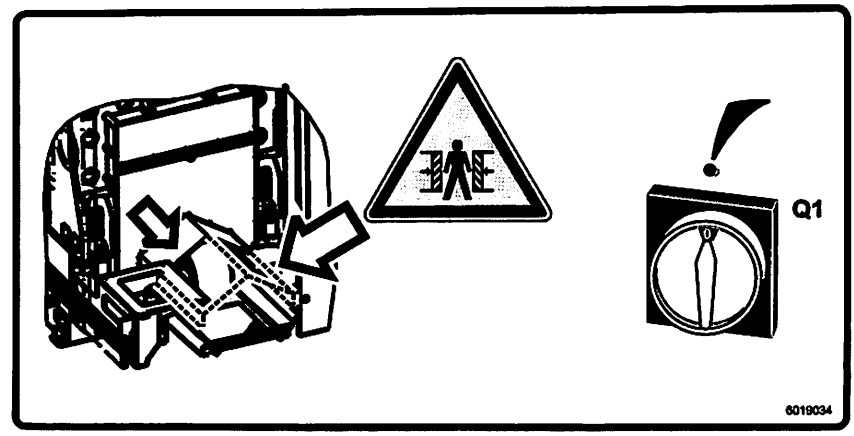
6018729

Caution - danger of injury

Risk of severe injury by shearing motion between fixed machine parts and the steel hood on the table (X axis) when the machine is running.

Turn the master switch to OFF before opening the left rear maintenance port.

1 warning label at rear of machine, middle of left outer wall of auxiliary units box.



Wear eye protection

Caution - avoid the risk of an accident that may be caused by cutting chips and lubricoolant.

1 mandatory label on operator's side of machine, right of door to the working area.

No high-pressure cleaning

Never clean the machine with compressed air, a high-power fan or similar air blasting equipment, but use an industrial vacuum cleaner to vacuum off chips, swarf and other residues.

1 prohibitive label on operator's side of machine, right of door to working area.

Class 2 laser - never look into laser beam (option)

Caution - avoid the risk of injury that may be caused by laser radiation.

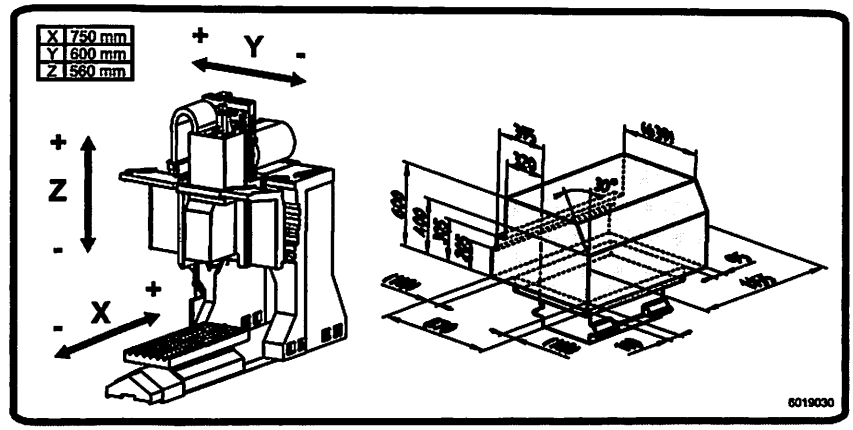
- Be sure to avoid direct contact with your eyes or skin.
- Do not look or direct optical equipment into the laser beam.
- Instruct all personnel working with the machine on the hazards of direct laser radiation into the eye or prolonged laser radiation on the skin.

1 warning label at machine front, at lower left underneath inspection window on door to working area.

Axis directions and ranges of traverse

Identification of machine axes, directions of traverse and maximum traversing ranges showing the relative movements of the cutting tool and the maximum workpiece dimensions.

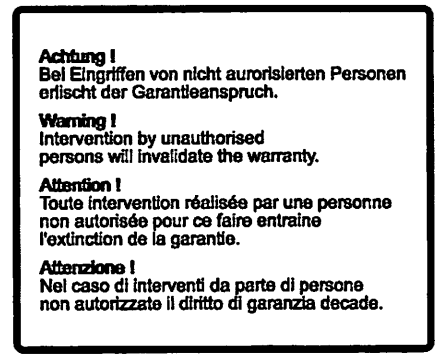
1 indicating label in working area of machine, on operator's side of spindle housing, bottom.



Warranty claims

DECKEL MAHO will not assume any liability for damage caused by failure to observe instructions.

1 indicating label on left side of machine, at top, right, of control cabinet door.



Danger caused by electric current

Caution - avoid the risk of an accident that may be caused by high voltage:

Do not touch exposed parts in the control cabinet, they may carry voltage.

Additionally isolate the machine from mains power supply by removing the fuse before starting any work on the electric system and put up a notice to this effect.

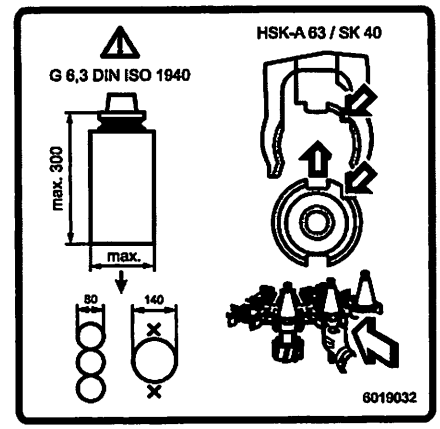
2 indicating labels on left side of machine, at top, middle, of control cabinet doors.

Permissible tools, balancing quality

It is essential to observe the specifications relating to the permissible cutting tools (see "Technical data").

When using ST 40 DIN 69871 Form A, AD, B or HST 63 Form A tool shanks, make sure that the locators engage the groove and the notch in the driver flange (see illustration).

1 indicating label on left side of machine, on tool magazine control panel.



Warning of magnetic field

The secondary parts of linear synchronous motors produce a high-intensity static magnetic field.

Persons with pacemakers, metal implants as well as pregnant women must not stay in the immediate vicinity (less than 0.5 m) of such secondary parts. Moreover, secondary parts must not be moved into the vicinity of objects which might be impaired, damaged or destroyed by magnetic fields (e.g. watches, data carriers, credit cards etc.).

5 warning labels underneath machine slide covers.

- 1 warning label each at front and rear underneath telescopic steel cover/steel hood of table (X axis).
- 1 warning label each at right and left behind bellows on cross-slide (Y axis).
- 1 warning label at top underneath steel hood of vertical slide (Z axis).

Keep off delicate parts

When cleaning, servicing or operating the machine:

- Do not step on any bellows.
- Do not step on telescopic steel covers.

The bellows or telescopic covers may be damaged or start leaking.

1 prohibitive label on telescopic steel cover of table (X axis).

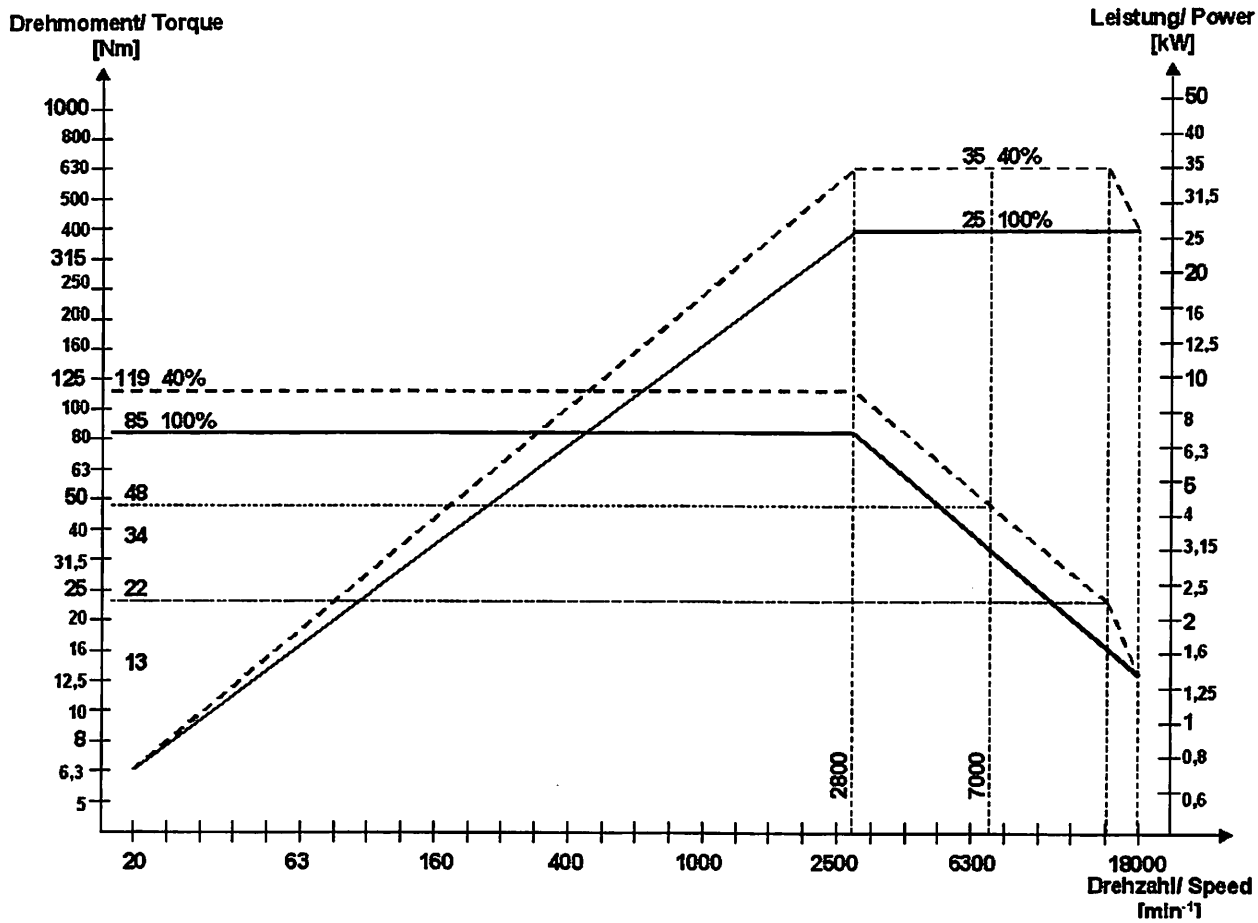
2

Technical data

2913
DMC 75 V linear
iTNC 530
MHB – 1: EN/01.2004
en

Main drive 18,000 rpm

Power/speed diagram



M [Nm] Torque
P [kW] Power
n [rpm] Spindle speed

Data sheet

Direct drive by speed-controlled liquid-cooled induction motor

Torque

Motor power S1 – 100 % duty rating	max.	Nm	86
S6 – 40 % duty rating	max.	Nm	119

Motor power

Motor power S1 – 100 % duty rating	max.	kW	25
S6 – 40 % duty rating	max.	kW	35

Spindle speed

Steplessly programmable	max.	rpm	18 000
Set-up mode	max.	rpm	800
Program check with manual intervention	max.	rpm	5 000

Spindle bearings

Diameter, front	mm	80
Diameter, rear	mm	60

Tool mounts 18,000 rpm

External lubricoolant supply

Standard Tool mounts HST 63 DIN 69893 Form A

Lubricoolant supply through the tool

Standard Tool mounts HST 63 DIN 69893 Form A

Tool draw-in force

HST 63 N 25 000

Permissible tools

Only tools which meet the following requirement may be used on the machine:

- They must be firmly mounted and be in perfect condition.
- They must fit the spindle taper and match the clamping system.
- They must be adequately dimensioned for the intended speed of rotation and cutting force (as specified by the manufacturer) and properly balanced.
- The tool diameter and the spindle speed must be such that the retaining capacity of the inspection windows on the door to the working area is not exceeded (see Chapter " Maintenance, lubrication" under the heading "Inspection windows").

Caution - the use of tools of larger diameter or at higher speeds is dangerous and may lead to accidents.

Observe and follow the instructions of the tool manufacturer.

Warning - damage to machine or operational failures may be caused by using unbalanced tools.

For spindle speeds higher than 8,000 rpm the use of rotationally symmetrical and balanced cutting tools is mandatory.

Balancing quality G as per DIN ISO 1940 G 6.3

Data sheet

Working range

Ranges of traverse	X axis	mm	750
	Y axis	mm	600
	Z axis	mm	560

Feedrates

Feed force (40 % duty rating)

Feed force in axis	X, Y	N	11 000
	Z	N	9 500

Feedrate

X/Y/Z axes	max.	m/min	90

Rapid traverse

Rate of traverse in axis	X/Y/Z max.	m/min	90

Rapid traverse

Acceleration in axis	X (at 100 kg max. workpiece weight)	m/sec^2	15
	Y	m/sec^2	12
	Z	m/sec^2	18

Linear measuring system

Positioning tolerance (max. permissible values) as per VDI/DGQ 3441, absolute, direct measuring system

P_{max} in axis	X/Y/Z	mm	0.008

System resolution	mm	0.0001
Input resolution	mm	0.0001

Tool magazine

Number of magazine pockets 30

Position coding Fixed position coding

Magazine load max. kg 150

Cut-to-cut time sec 6

Permissible tools/Tool magazine

Dimensions for tool mounts HST-A63 (standard), ST 40 (option)

Diameter Standard tools	max.	mm	80
Diameter Special tools when neighbouring positions are vacant	max.	mm	140
Diameter Trepanning tools when neighbouring positions are vacant	max.	mm	200
Length	max.	mm	300

Weights for tool mounts HST-A63 (standard), ST 40 (option)

max. kg 10

Tool changer

Arrangement Vertical

System Pick-up (by cutter spindle)

Table

Clamping surface L mm 950

W mm 650

T slots DIN 650-14

Loading height (upper edge of table) mm 900

Load max. kg 1 000

Scraper-type swarf conveyor with lubricoolant tank (standard)

Tank capacity l 500

Tank capacity on machines with optional lubricoolant cleaning unit (without lubricoolant tank) l 100

Pump delivery

External lubricoolant supply	l/min	40
	bar	2.3
Flush cleaning	l/min	100
	bar	2.3
Flush gun (option)	l/min	40
	bar	2.3

Swarf disposal

Discharge height, scraper-type swarf conveyor	mm	850
Discharge height, end piece removed	mm	1 250

When the end piece of the swarf discharge is removed, a collecting vessel with guard has to be used.

PF 210/980 Lubricoolant cleaning unit with lubricoolant supply through tool (option)

Tank capacity l 1 000
including sraper-type swarf conveyor

Pump delivery

External lubricoolant supply	l/min	40
	bar	2.4
Lubricoolant supply through the tool	l/min	23
	bar	40
Flush cleaning	l/min	50
	bar	2.4
Flush gun (option)	l/min	40
	bar	2.4

For detailed information on lubricoolant units see Machine Manual 2.

Shipment data

Transport weight, machine without packing approx. kg 10 200
with hoisting gear
including enclosure, control cabinet

Transport weight, machine on transport pallet approx. kg 10 800
with hoisting gear
including enclosure, control cabinet

Transport weight, machine in transport crate approx. kg 13 750
with hoisting gear
including enclosure, control cabinet

Transport dimensions, machine on transport pallet (approx.) L m 4.6
W m 2.5
H m 3.0

Height, transport pallet H m 0.3

Dimensions, transport crate L m 3.7
W m 3.0
H m 3.6

Clear width required (doors, passages, etc.) W min. m 2.6
H min. m 3.1

Installation data

Electrical connection

Rated power	kVA	73
Rated current	A	105
Back-up fuse (3 x, slow)	A	125
Operating voltage	V	400
Frequency	Hz	50

Compressed-air supply

Inside diameter, fitting	min.	DN	16
Operating pressure		bar	6
Required system capacity at Customer's plant (peak value, only attained momentarily)		Nm^3/h	25
Compressed-air requirements as per DIN/ISO 8573/1			
Particle fineness		Class	3
Oil content		Class	2
Dew point		Class	4

Room temperature as per EN 60204-1

Temperature	min.	°C	+ 10
	max.	°C	+ 35

Mean temperature within 24 hours

Temperature	min.	°C	+ 18
	max.	°C	+ 30

Relative humidity	min.	%	30
	max.	%	95

Noise emission as per DIN 45635-16-Class 2 (mean measuring-suface sound-pressure level LpA)	dB	≤ 75

Overall height of machine		m	3.15
Overall space required	L	m	4.9
	W	m	4.3
	H	m	3.2

In addition, provision has to be made for adequate escape routes and safety areas in compliance with applicable legislation, standards, rules and regulations.

Weights

Weight of machine including enclosure, control cabinet and swarf conveyor	approx.	kg	11 000
Installation weight Weight of machine plus max. weight of workpiece, tools, oil and lubricoolant		kg	12 700

Load at machine base

Static load per support element No.	1	kN	44
	2	kN	33
	3	kN	6
	4	kN	5
	5	kN	10
	6	kN	10
Dynamic load per support element No.	1	kN	65
	2	kN	54
	3	kN	12
	4	kN	10.5
	5	kN	17
	6	kN	13

For location of support elements see "Installation diagram, support elements".

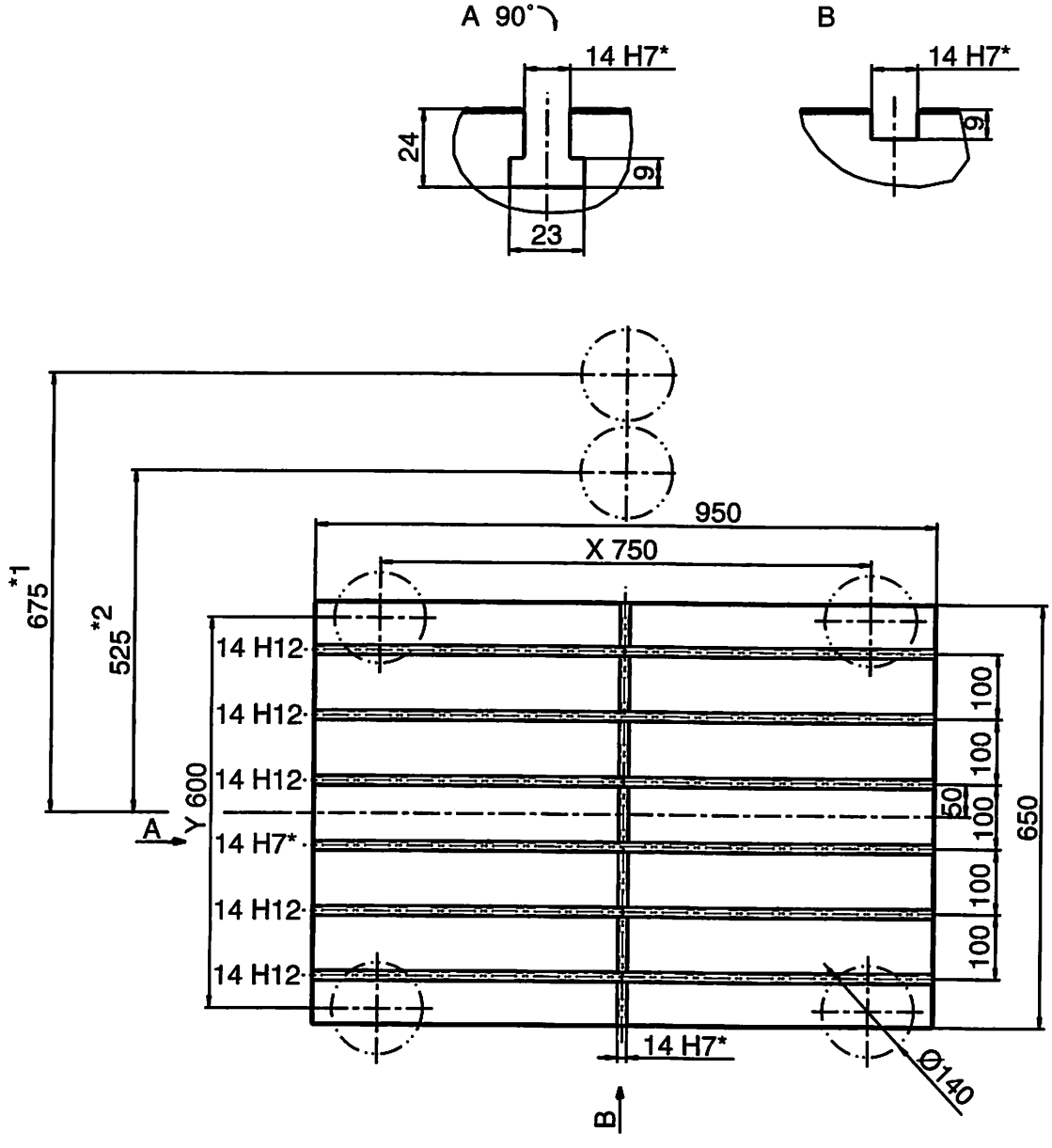
Support elements (wedge-type levelling shoes)

Number	6
Model	GS41-TW31/36
Size	M16 x 160
Manufacturer	Nivell AG

Working range

Plan view

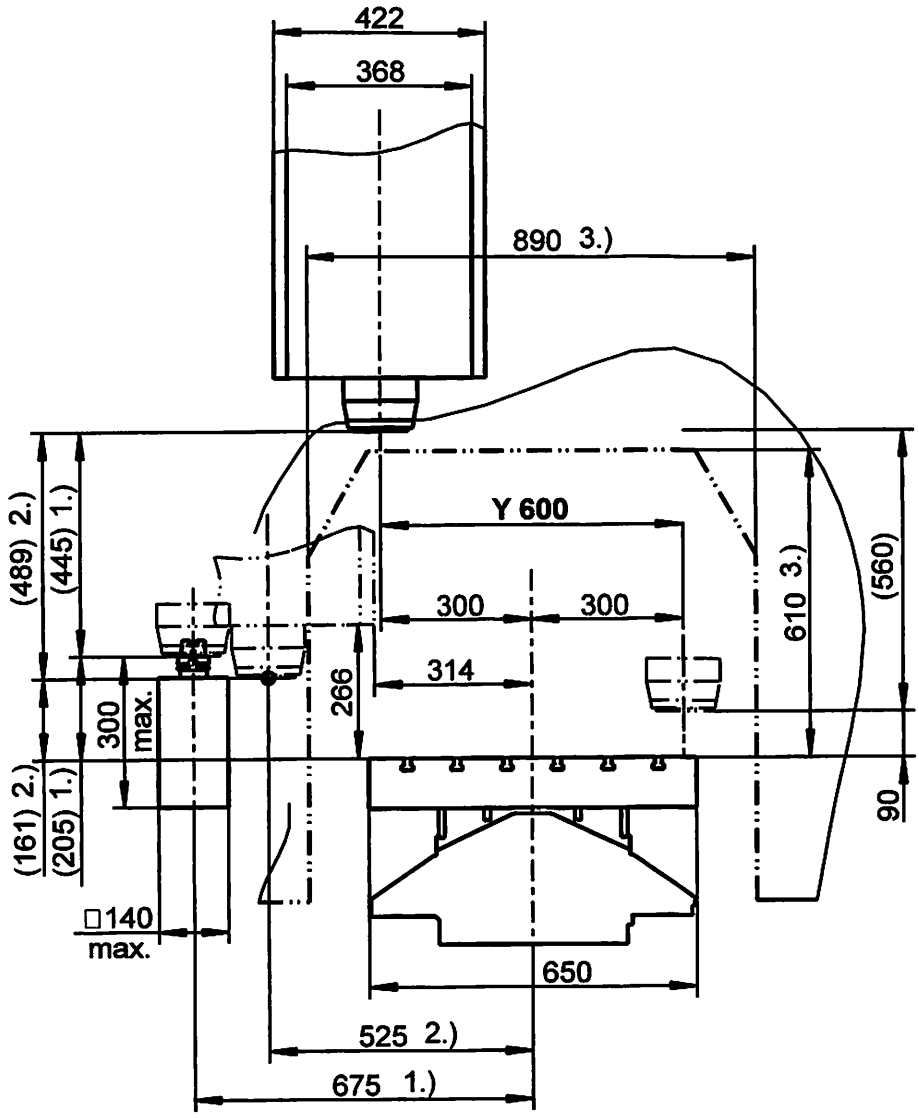
Dimensions in mm



* Guide slot
*1 Tool change position
*2 Tool scan position (option)

Front view

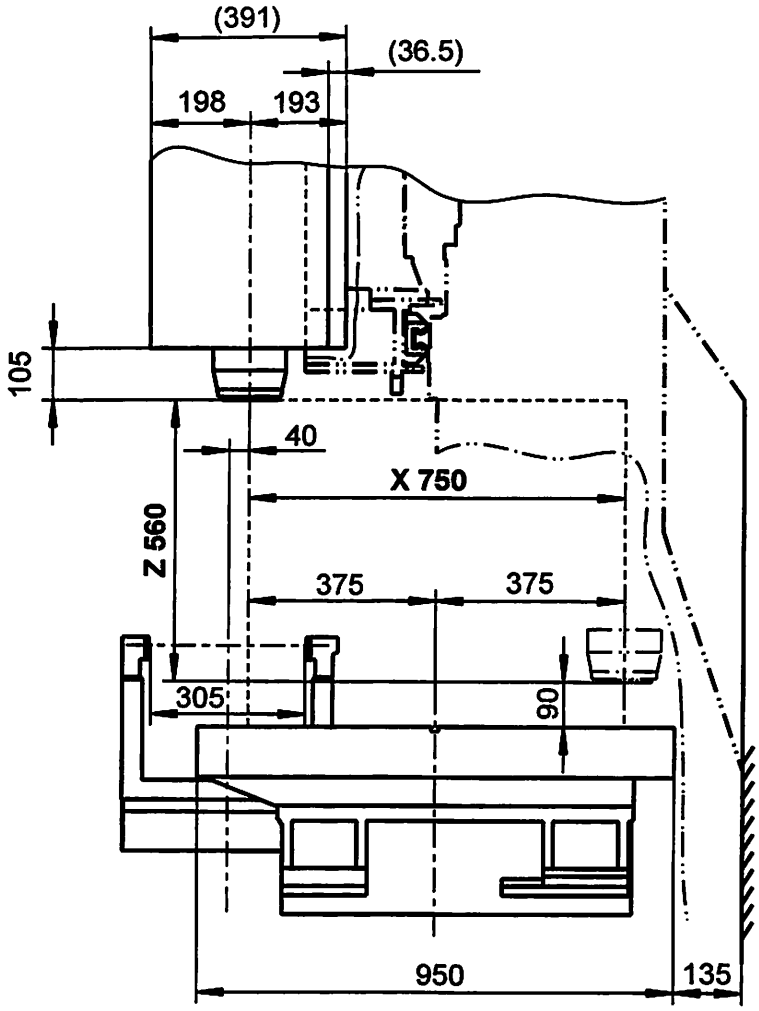
Dimensions in mm



1.) Tool change position (pick-up)
2.) Tool scan position (option), shown in drawing: tool length = 0, tool scan only possible while tool changer door is open.
3.) Portal clearance

Right-hand side view

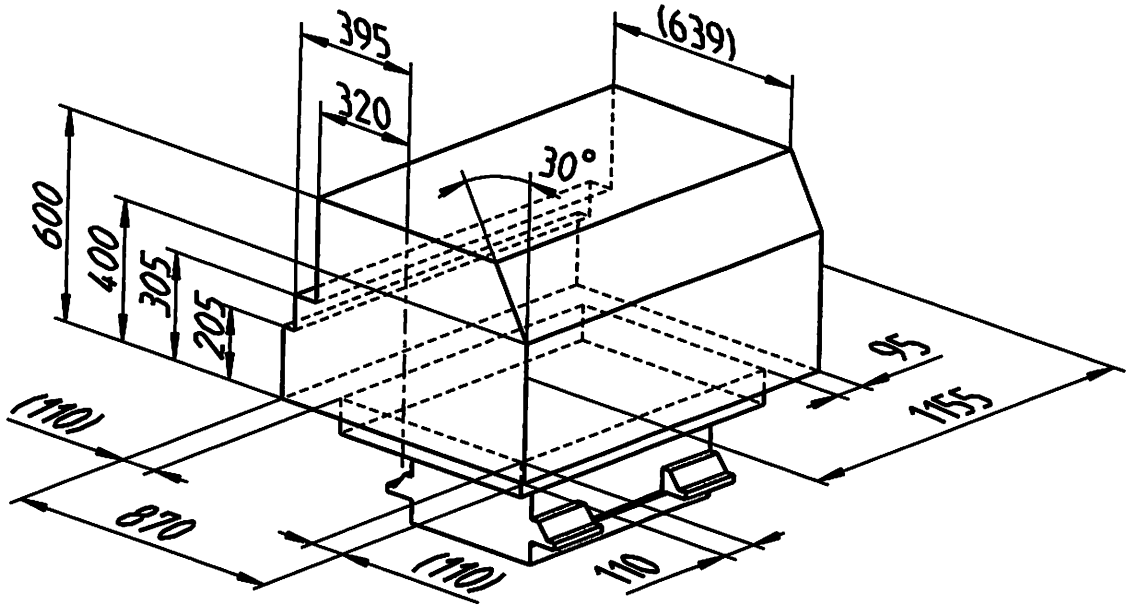
Dimensions in mm



Maximum workpiece • Machine with table

3D view

Dimensions in mm

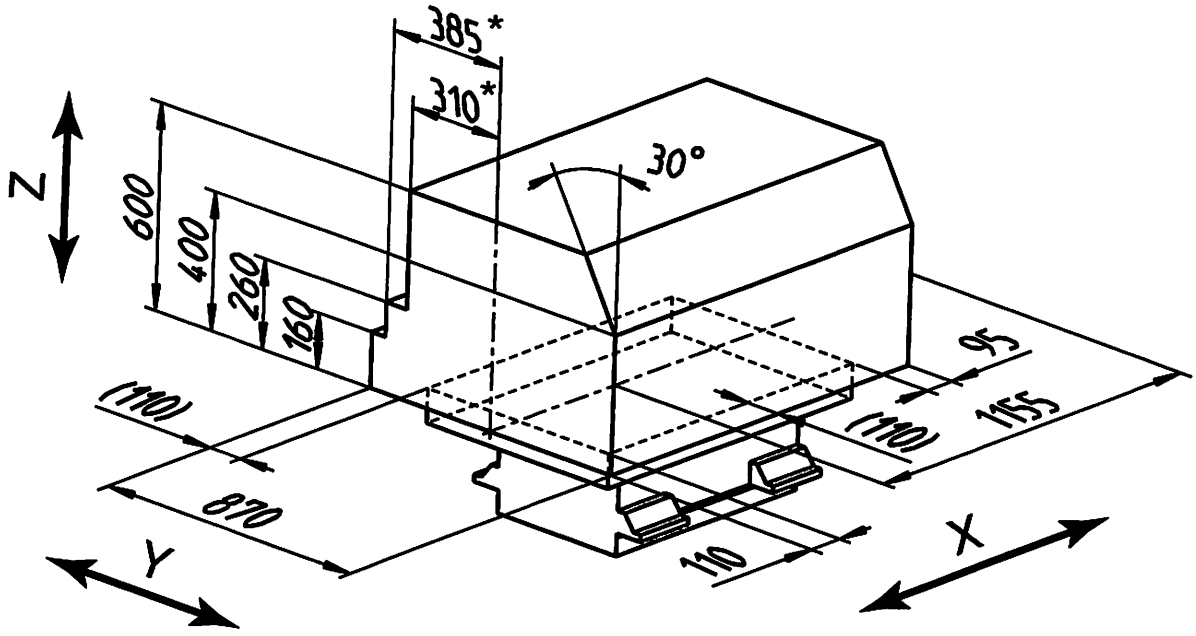


The dimensions in Y and Z direction refer to maximum workpiece size with tool length and tool diameter = 0.

Maximum workpiece • Machine with table and tool scanner (option)

3D view

Dimensions in mm

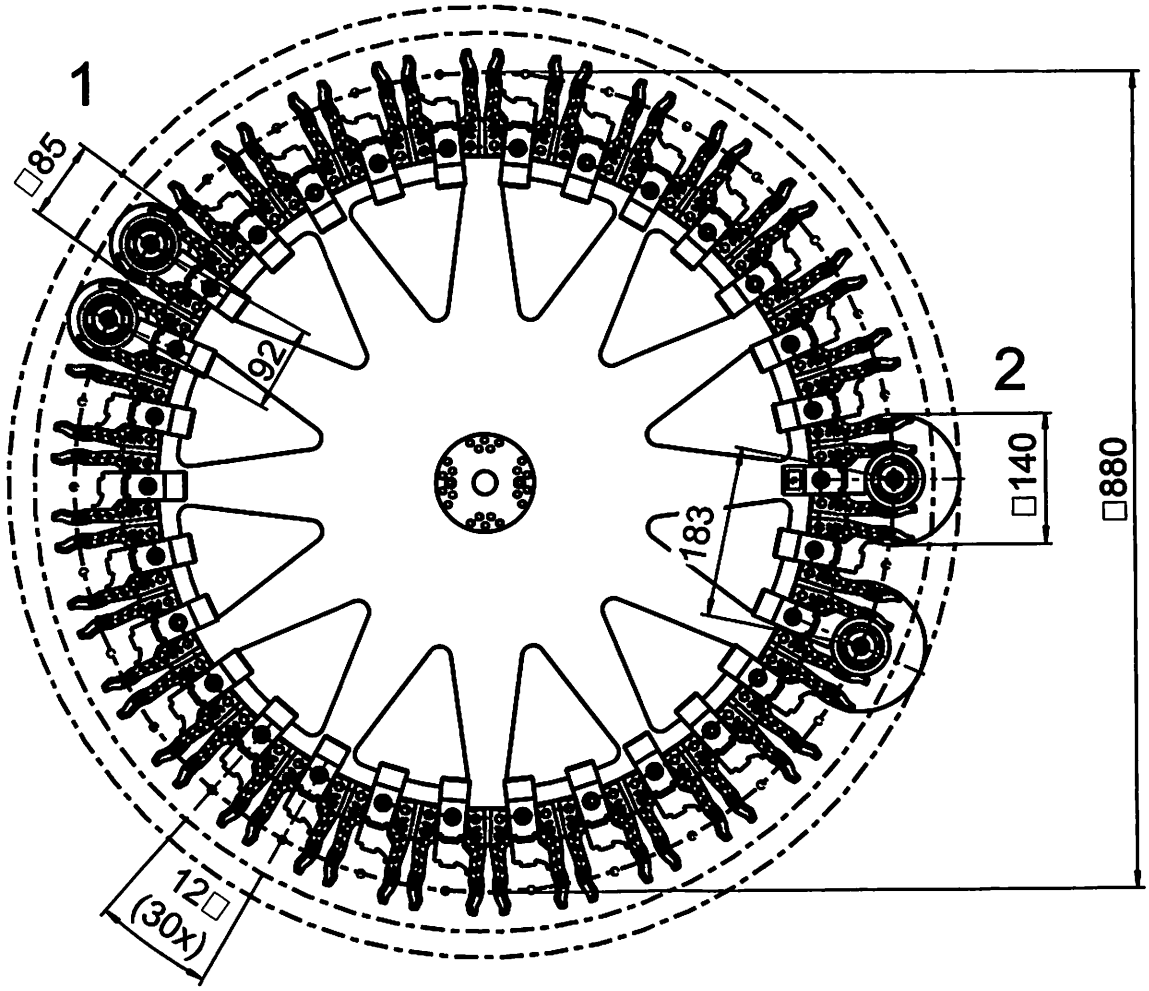


The dimensions in Y and Z direction refer to maximum workpiece size with tool length and tool diameter = 0. Tools are scanned (on machine with optional scanner) from the middle of the table in the direction of the laser beam (tool magazine). For the dimensions marked * in Y direction, 1/2 tool diameter and a min. safety clearance of 2 mm have to be taken into account.

Collision range, tool magazine

Plan view

Dimensions in mm

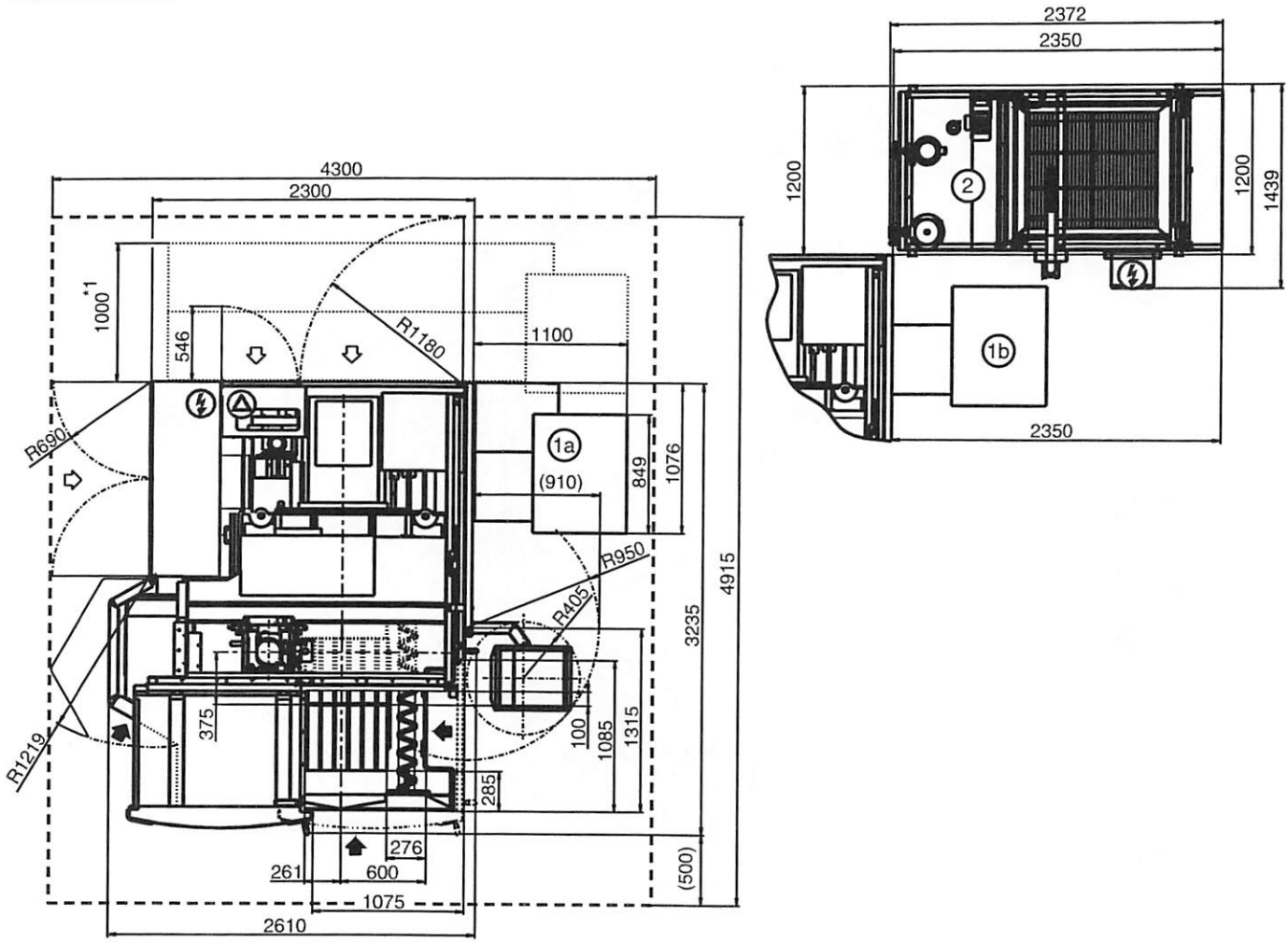


1 Max. tool size, standard tools
2 Max. tool size, neighbouring positions vacant

Installation diagram

Plan view

Dimensions in mm

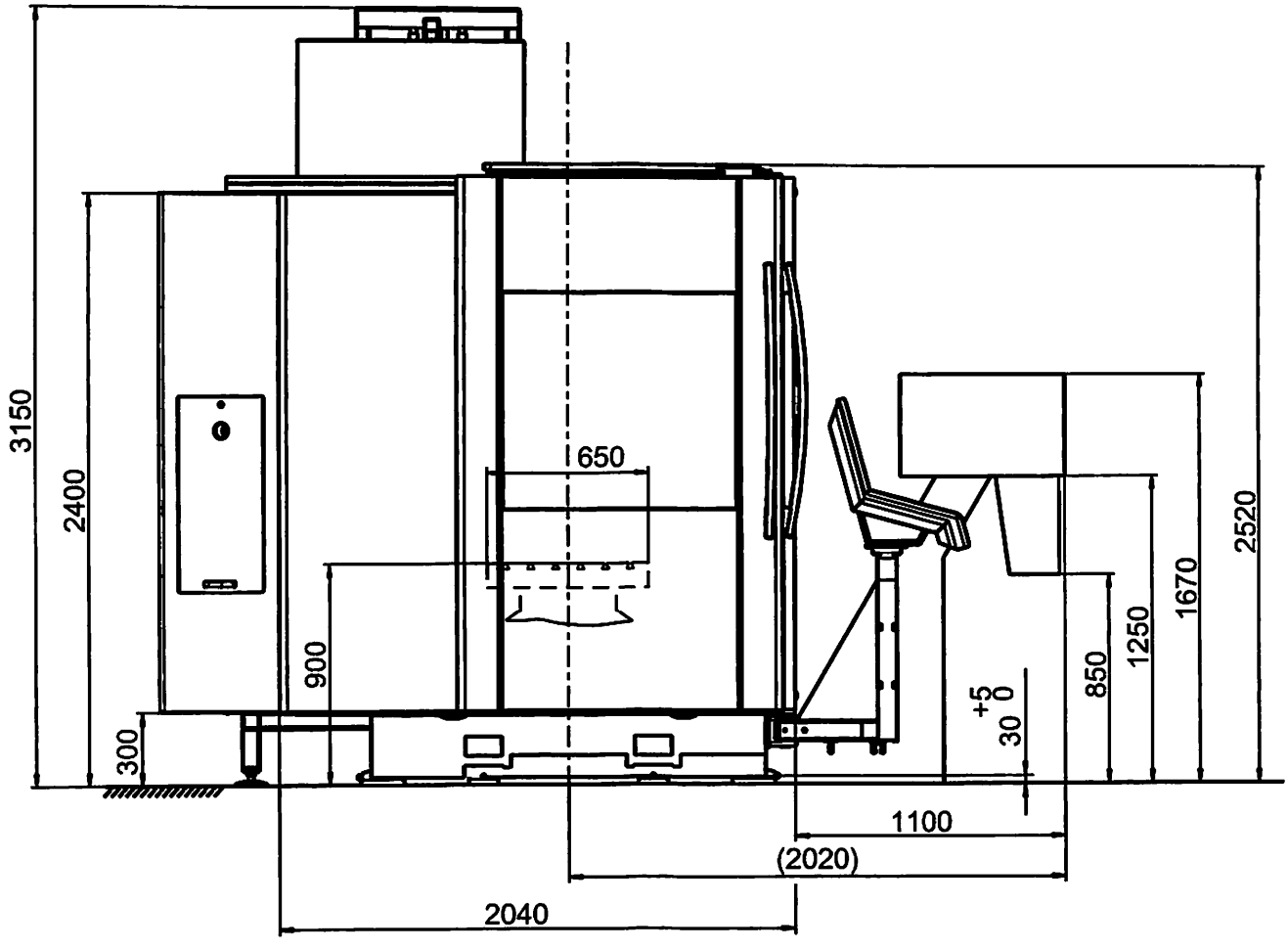


- Operation
- Maintenance
- Electric power connection
- Compressed-air supply
- (1a) Scraper-type swarf conveyor with additional lubricoolant tank (standard)
- (1b) Scraper-type swarf conveyor on machines with optional lubricoolant cleaning unit
- (2) Lubricoolant cleaning unit (option) for lubricoolant supply through tool (option)
- *1 Room required for maintenance of swarf conveyor
- Floor space (recommendation)

In addition, provision has to be made for adequate escape routes and safety areas in compliance with applicable legislation, standards, rules and regulations.

Left-hand side view

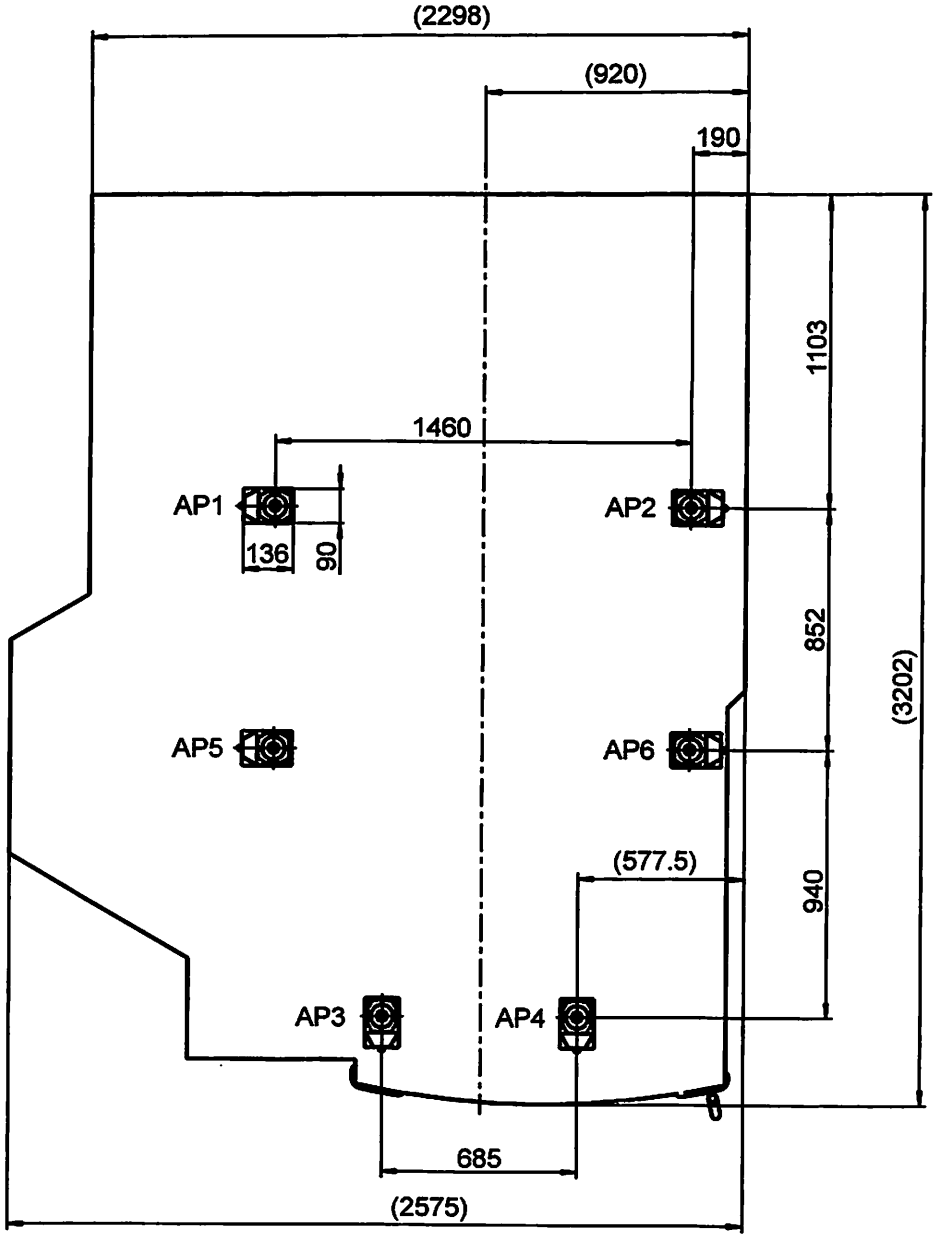
Dimensions in mm



Layout diagram, support elements

Plan view

Dimensions in mm

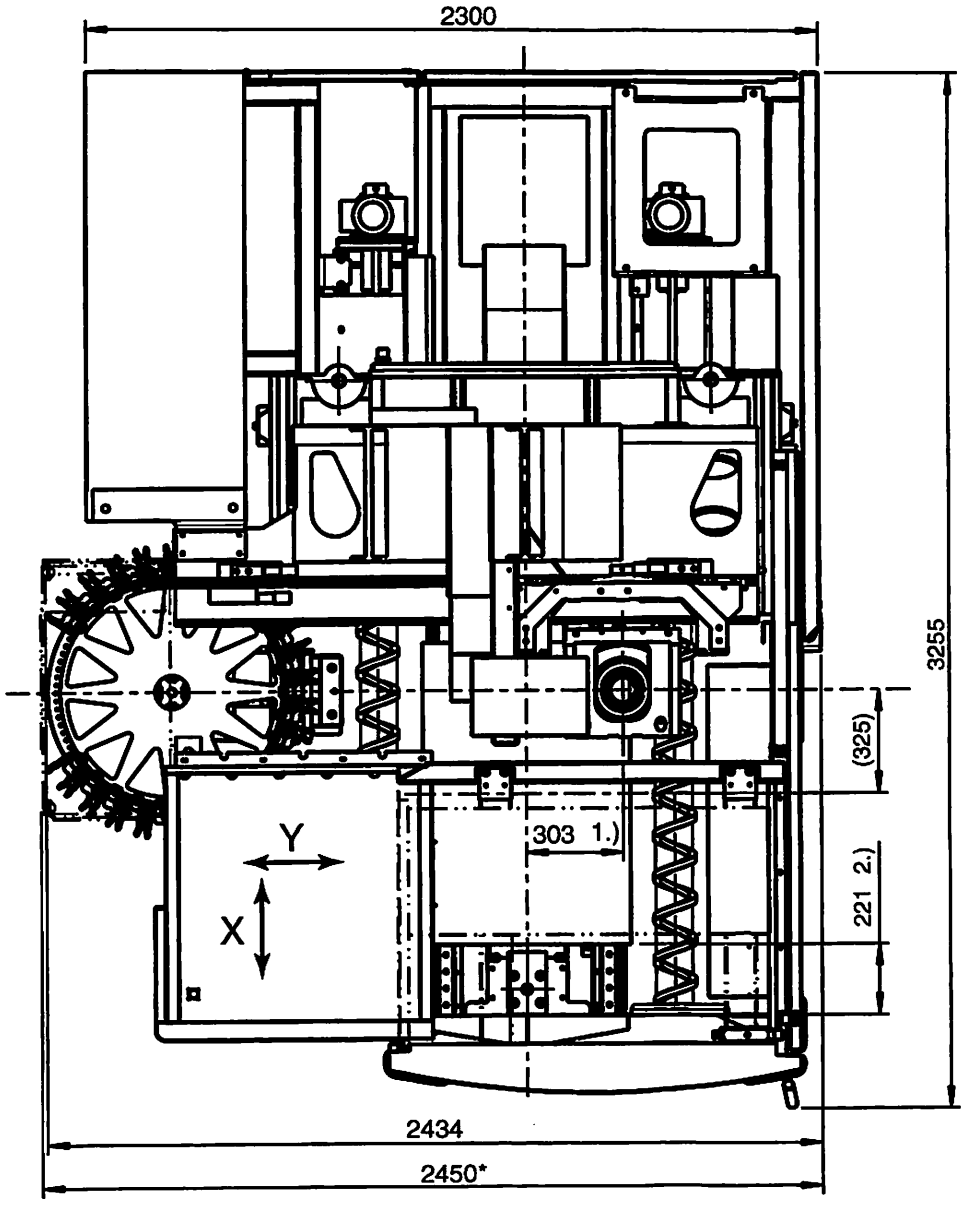


AP Support point

Transport dimensions

Plan view

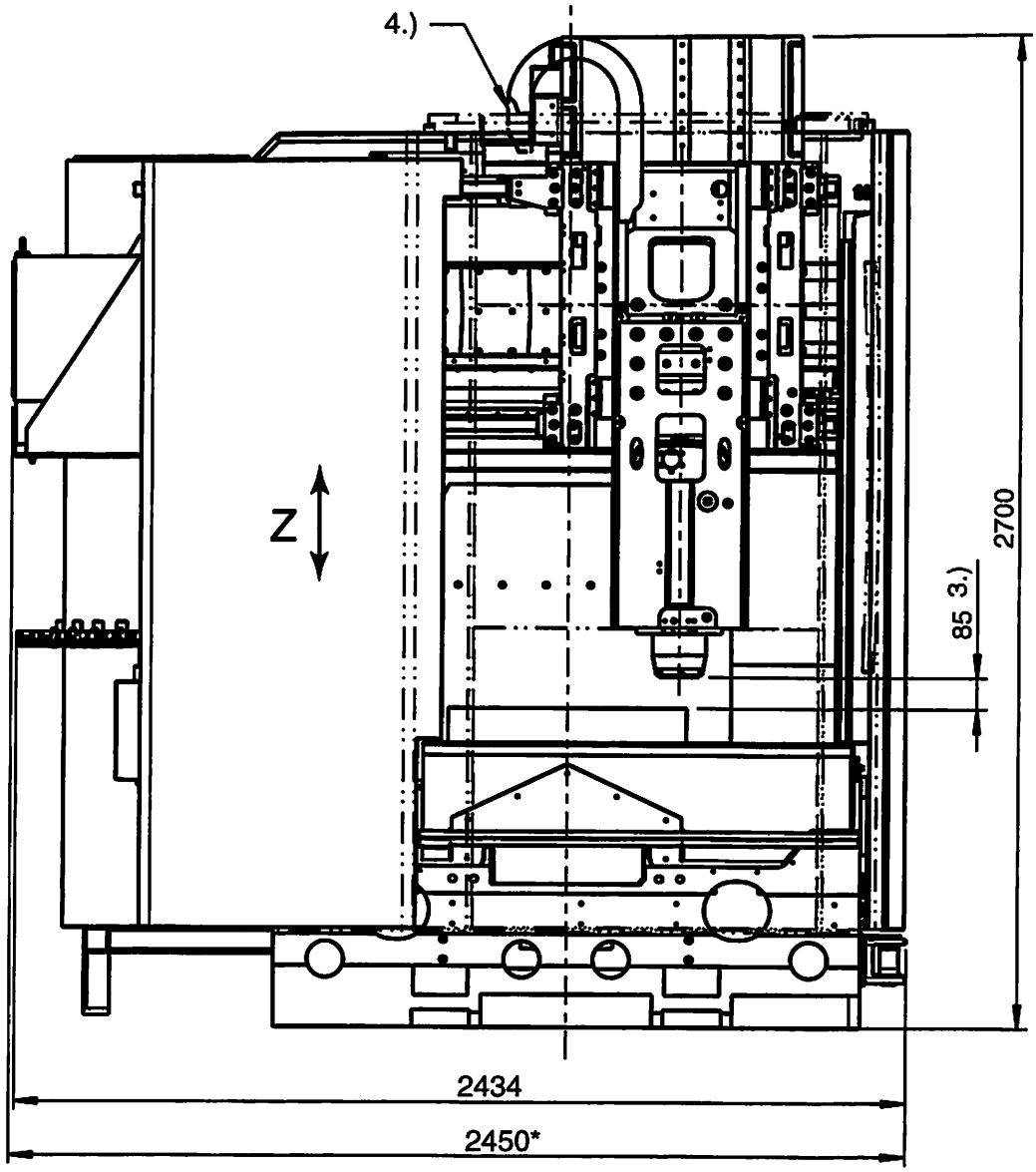
Dimensions in mm



1.) Move cross-slide (Y axis) to right-hand mechanical end position, fit shipping fixture.
2.) Move fixed table to position shown, fit shipping fixture.
* Machine with optional oil must separator

Front view

Dimensions in mm

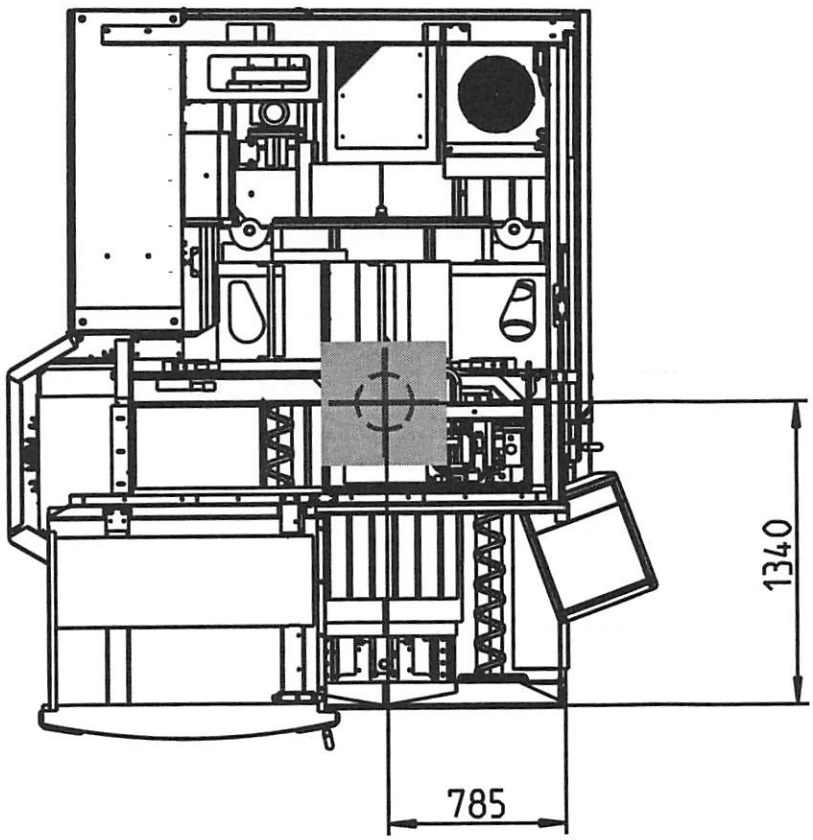


3.) Move Z axis to lower mechanical end position, no shipping fixture required.
4.) Move supply line guide for Z axis to transport position.
* Machine with optional oil must separator

Centre of gravity

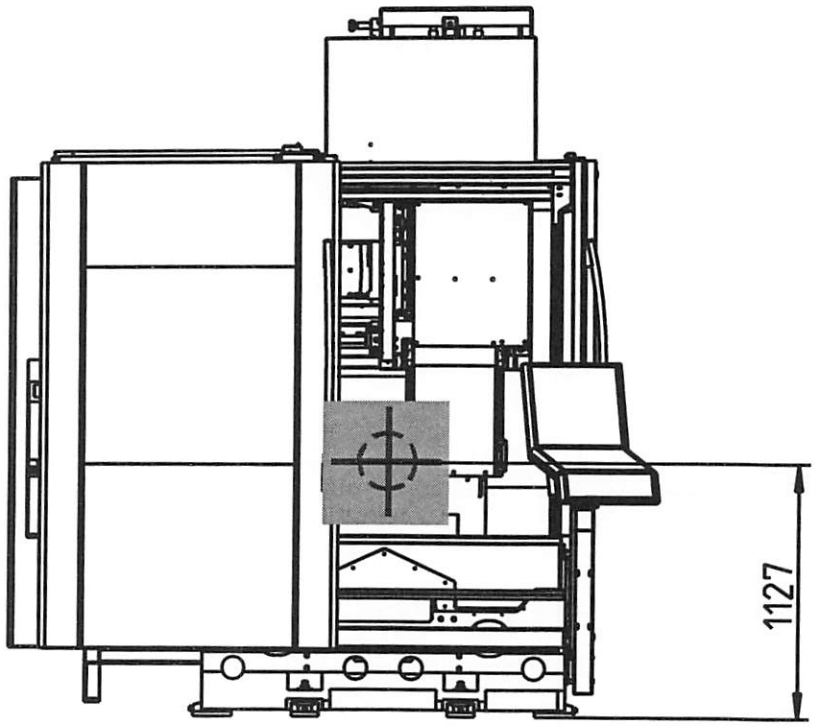
Plan view

Dimensions in mm



Front view

Dimensions in mm



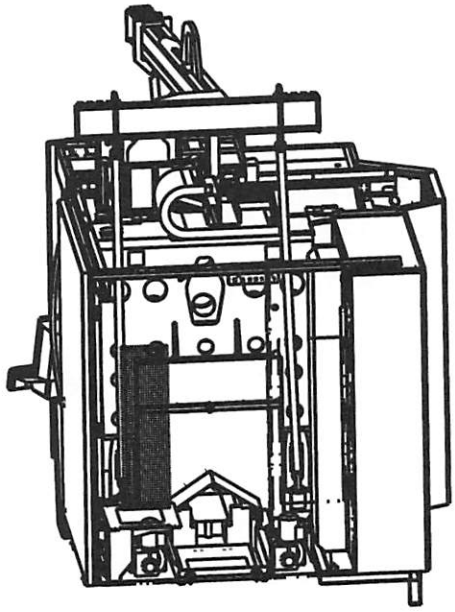
Lifting points for transport on crane hook

Right-hand side view

Dimensions in mm

Rear view

Dimensions in mm



3

Operation

2913
DMC 75 V linear
iTNC 530
MHB – 1: EN/01.2004
en

Switching on

Caution – avoid the risk of injuries that may be caused by high-intensity magnetic fields.
Keep away from the secondary parts of the linear drives.
Observe the safety rules and warning notes in the introductory section.

To switch machine on

1. Turn the master switch on the control cabinet to "I". Q1

   Wait until the system has run up.

2. Cancel fault/error message:
   Press "CE". CE 130

   The PLC program is compiled.
   The X/Y/Z reference points are set automatically, since the machine slides are equipped with linear motors using an absolute linear measuring system.

3. Close the door to the working area.

   The door to the working area must be closed before starting the machine, otherwise starting is inhibited.

4. Press "Machine ON". 1

   The drives are started, the "Machine ON" key is steadily illuminated.
   The door to the working area is now locked.

Switching off

To switch machine off

1. Press "EMERGENCY STOP" and reset the button. 

   The drives are switched off, the light in the "Machine ON" key goes out.

2. Switch over to "Manual mode". 

3. Page on to the softkey "OFF" and confirm by "Yes". 

4. Turn the master switch to "0". 

The programs remain stored.

Caution - avoid damage to the drive system caused by inappropriate switching off.

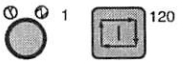
- It is essential to observe the above sequence of operations when switching the machine off.
- Wait at least five seconds after turning off the master switch before switching the machine on again.

Caution - avoid the risk of injury: high-intensity magnetic fields are also present after the machine has been switched off.

- Persons with pacemakers, metal implants as well as pregnant women must not stay in the immediate vicinity of the linear motors.
- Keep watches, electronic data carriers, cheque cards away from the linear motors.

"PowerSave" shutdown function (option)

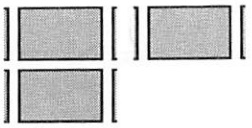
The "PowerSave" shutdown function acts to switch off all drives when a period of 20 minutes has elapsed after the end of a program (M30).

To restart the machine, press "Machine ON" or start a new program: 

Switching "PowerSave" shutdown function on/off

1. Press "Custom". 

2. To switch the "PowerSave" shutdown function on/off:
   Press the function keys "PLC", "Machine", "PowerSave on/off".



EMERGENCY STOP

Releasing an EMERGENCY STOP

1. Press the "EMERGENCY STOP" button.  2.1

   The button snaps into locked position, all drives are switched off immediately, the door to the working area remains locked.

Caution - avoid the risk of damage caused by an EMERGENCY STOP while machining is in progress.
This may lead to machining faults, fouling of the contour and/or tool breakage, since all drives will stop dead immediately.
Use the EMERGENCY STOP only in the event of danger to man or machine.

Disconnecting the portable/remote control from the machine will cause an EMERGENCY STOP.
Insert the dummy plug if you wish to disconnect the portable control, otherwise the EMERGENCY STOP circuit is interrupted and the machine cannot be started.

Restarting after "EMERGENCY STOP"

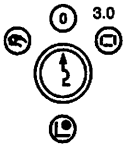
1. Eliminate the cause for the EMERGENCY STOP.
2. Reset the "EMERGENCY STOP" button.  2.2
3. Press "Machine ON".  1

   The button lights up and remains illuminated.
4. Cancel NC fault/error messages. CE 130
5. To resume the interrupted work cycle:
   See Control Unit Manual.

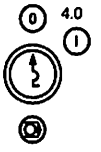
Operating modes

Keylock for switch operating modes

- Machining mode
- Set-up mode
- Manual intervention (mode 3)



- Extended manual intervention (mode 4, option)



Application

The operating modes "Manual intervention" (mode 3, option) and "Extended manual intervention" (mode 4, option) should be selected when the direct observation of the machining process or a direct intervention to an operation is required.
The decision as to using any of these two modes shall be taken by the person responsible for the use of machines at the Customer's plant.
The workpieces can be machined in part by manual control and to a limited extent also automatically.

Intended use of machine

Machining operations

The use of the operating modes "Manual intervention" and "Extended manual intervention" is only permissible for the following machining operations:

- Program check with manual intervention
- Recognition and avoidance of collision hazards not discernible when the door to the working area is closed
- Adjustment of lubricoolant nozzles (not if lubricoolant supply through the tool is used)
- Manual machining of bores (manual control of spindle quill)
- Machining of critical sections on a one-off workpiece (not permissible in batch or large-scale production)
- Manual scanning of a workpiece (critical contours)
- Surface finish check on a one-off component
- Measuring operations on workpiece contours not open to inspection when the door is closed, and which cannot be performed in the "'Set-up" mode

Qualified skilled personnel

- The "Set-up", "Manual intervention" and "Extended manual intervention" modes may only be used by specially trained, authorized skilled personnel (cf. EU Directive 89/655/EEC, Articles 5 and 7, and applicable legislation in the country of the user).
- The term "skilled personnel" is understood to mean persons who, on account of their specialist training, knowledge and experience, are capable of assessing the work entrusted to them and being aware of possible dangers.

Access

- Unskilled and semi-skilled workers shall not have access to the "Set-up", "Manual intervention" and "Extended manual intervention" operating modes.
- The keys for activating the "Set-up", "Manual intervention" and "Extended manual intervention" operating modes shall only be made available to duly authorized skilled personnel.
- The keys shall be withdrawn and held in safe custody by the person responsible for the use of machines, so that no unauthorized person may have access to the "Set-up", "Manual intervention" and "Extended manual intervention" operating modes.

Door to working area, "Machining" operation

- Before beginning, and especially during, the machining of a complex workpiece or a finishing operation in the "Set-up", "Manual intervention" and "Extended manual intervention" modes it shall be checked whether such machining operation, or the machining step next following, may not be performed in the "Machining mode" with the door to the working area closed.
  The door to the working area shall be kept closed and the "Machining mode" shall be used whenever possible.
- Upon the conclusion of any operation in the "Set-up", "Manual intervention" and "Extended manual intervention" modes, the "Machining mode" shall be reactivated using the appropriate keylock switch(es).

Spindle speed, feedrate

- The factory-set spindle speed and feedrate limitations are an important safety factor with a view to reducing hazards and risks in the "Set-up", "Manual intervention" and "Extended manual intervention" operating modes. It is essential to carefully consider the use of maximum speeds and feeds when the door to the working area is open.

- The spindle speeds and feedrates were reduced by DECKEL MAHO with due regard to the state of the art, the possible risks involved and the applicable safety criteria. In spite of these limitations there will be an increased risk for the machine operator when using the "Set-up", "Manual intervention" and "Extended manual intervention" operating modes.
  The DECKEL MAHO Technical Service may adapt the limitations of the spindle speeds and feedrates in the "Manual intervention" and "Extended manual intervention" modes to the Customer's specific requirements.
  Any such modification should, however, be carefully considered by the person responsible for the use of the machine.

Guards, protective measures and equipment

- In all operations with spindle rotation and machine slide movements in the "Extended manual intervention" mode, the operator shall always have one hand on the "EMERGENCY STOP" button, in order to be able to stop the machine immediately in the event of any danger.
- If necessary, conditioned by technological factors, such as the material of the workpiece, the tool used, the spindle speed, the feedrate, etc., the person responsible for the use of the machine shall take supplementary precautionary measures to reduce any risk of an accident. Any such measure(s) shall be carefully considered by the person responsible for the use of the machine and decided on the merits of each particular case.
- The owner of the machine shall comply with the minimum requirements laid down in EU Directive 89/391/EEC relating to safety and the protection of health, as applicable, when personal protective equipment is used by his or her employees.
- The personal protective equipment to be used, such as eye protection, safety boots, safety gloves for set-up operations, hard hat if necessary, shall be determined by the machine owner's safety officer or engineer.
- Care shall be taken in procuring personal protective equipment to ensure that such equipment is in compliance with EU Directive 89/686/EEC.
- Special care shall be taken when machining easily flammable, self-igniting or explosive materials, such as magnesium or silicon, or when oil emulsive lubricoolants (oil content >15 %) are employed: Only use machines provided with adequate safety equipment and make sure that only specially trained, authorized personnel is allowed to handle such jobs.

Residual risk

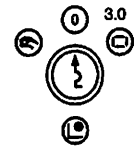
- To assess and evaluate the residual risk, refer to applicable standards, such as (in Germany) the "Instructions for Risk Evaluation at the Working Place" (ISBN 92-827-4276-8) or comparable publications in the Customer's country.

Supervision, responsibility

- The "Set-up", "Manual intervention" and "Extended manual intervention" operating modes may only be used by direction of the person responsible for the use of the machines.

- In addition, the owner of the machine shall take adequate organizational measures to ensure that the "Program check with manual intervention" and "Semi-automatic operation" modes are only used when there is a special need for such use.
- In the "Set-up", "Manual intervention" and "Extended manual intervention" modes, the machine shall never be operated without supervision.
- The ultimate responsibility for the implementation of all and any measures to reduce possible risks (injury of persons or damage to equipment) as listed in the above safety instructions shall rest with the owner of the machine. To reduce any risks that may still exist, and to decide on any supplementary precautionary measures that may be necessary, it is advisable to consult the local Technical Supervisory Board, if any, of the employers liability insurance association, trade association or similar institutions, as the case may be, or contact DECKEL MAHO.
- The DECKEL MAHO Technical Service will take pleasure in assisting customers with regard to any questions that may arise in this respect.

Function • Machining mode (mode 1)

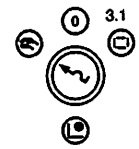
Keylock switch for standard operating modes in "Machining mode" position 

When the door to the working area is locked, the machine can be operated without any restrictions.

Available machine operating modes:

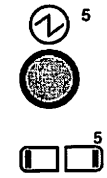
- Manual operation  100
- Electronic handwheel  105
- Positioning with manual data input  102
- Program run block by block  104
- Automatic program run  101

Function • Set-up mode (mode 2)

Keylock switch for standard operating modes in "Set-up mode" position 

With the door to the working area unlocked, machine operation is restricted.

With the door unlocked, the "Enable" key has to be held down together with the key controlling the following machine movements:



- Moving to reference points
- Manually controlled axis travel
- Spindle rotation
- Operations using the portable/remote control (option)

Available machine operating modes:

- Manual operation 
- Electronic handwheel 

Limitation of spindle speed:

Spindle speed max. rpm 800

When a spindle speed higher than 800 rpm is entered, the machine stops and an error message is displayed.

To re-enter: Close the door to the working area.

Limitation of feedrate:

Feedrate max. mm/min 2.000

Manually controlled axis travel:

The feedrate of 2.000 mm/min can additionally be controlled within the limits between 0 and 2.000 mm/min as a percentage value of the maximum feedrate if the machine, using the feedrate override knob.

Example: Machine with Fmax. 20.000 mm/min at override setting of 4 % —> F 800 mm/min.

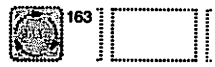
Further limitations:

The rapid traverse key is not operative. 

Lubricoolant supply is available with the door to the working area unlocked.  **M08**

Lubricoolant supply through the tool  M07

and the operation

of the swarf conveyor 

are not available with the door unlocked (change over to "Machining operation").

Automated machine functions (tool change, pallet change) are not available whith the door unlocked (change over to "Machining operation").

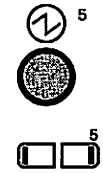
M06

M60

Function • Manual intervention (mode 3)

Keylock switch for standard operating modes in "Manual intervention" position 

With the door to the working area unlocked, machine operation is restricted.

With the door unlocked, the "Enable" key has to be held down together with the key controlling the following machine movements: 

- Moving to reference points
- Manually controlled axis travel
- Spindle rotation
- Operations using the portable/remote control (option)

Available machine operating modes:

- Manual operation 

- Electronic handwheel 

- Positioning with manual data input 

- Program run block by block 

Limitation of spindle speed:

Spindle speed max. rpm 5,000

When a spindle speed higher than 5,000 rpm is entered, the machine stops and an error message is displayed.

To re-enter: Close the door to the working area.

Limitation of feedrate:

Feedrate max. mm/min 5,000

Manually controlled axis travel:

The feedrate of 5,000 mm/min can additionally be controlled within the limits between 0 and 5,000 mm/min as a percentage value of the maximum feedrate if the machine, using the feedrate override knob.

Example: Machine with Fmax. 20,000 mm/min at override setting of 20 % —> F 4,000 mm/min.

Machining of part programs:

Programmed feedrates exceeding 5,000 mm/min are reduced to a value of 5,000 mm/min. The feedrate of 5,000 mm/min can additionally be controlled within the limits between 0 and 5,000 mm/min as a percentage value of the maximum feedrate if the machine, using the feedrate override knob.

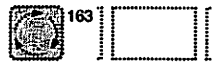
Example: Programmed Fmax. 10,000 mm/min at override setting of 40 % —> F 4,000 mm/min.

Limitation of rapid traverse rate in "Automatic" machine operating mode:
Rapid traverse rate max. mm/min 3,000
Further limitations:

The rapid traverse key is not operative. 

Lubricoolant supply is available with the door to the working area unlocked.  **M08**

Lubricoolant supply through the tool  M07

and the operation
of the swarf conveyor 

are not available with the door unlocked (change over to "Machining operation").

Automated machine functions (tool change, pallet change) are not available whith the door unlocked (change over to "Machining operation"). M06

M60

Function • Extended manual operation (mode 4)

Keylock switch for optional operating modes in "Manual intervention" position 

With the door to the working area unlocked, machine operation is restricted.
With the door unlocked, the following operations are available without pressing the "Enable" key:

- Moving to reference points
- Manually controlled axis travel
- Spindle rotation
- Operations using the portable/remote control (option)

Available machine operating modes:

- Manual operation 
- Electronic handwheel 
- Positioning with manual data input 
- Program run block by block 
- Automatic program run 

Limitation of spindle speed:

Spindle speed max. rpm 5,000

When a spindle speed higher than 5,000 rpm is entered, the machine stops and an error message is displayed.

To re-enter: Close the door to the working area.

Limitation of feedrate:

Feedrate max. mm/min 5,000

Manually controlled axis travel:

The feedrate of 5,000 mm/min can additionally be controlled within the limits between 0 and 5,000 mm/min as a percentage value of the maximum feedrate if the machine, using the feedrate override knob.

Example: Machine with Fmax. 20,000 mm/min at override setting of 20% —> F 4,000 mm/min.

Machining of part programs:

Programmed feedrates exceeding 5,000 mm/min are reduced to a value of 5,000 mm/min. The feedrate of 5,000 mm/min can additionally be controlled within the limits between 0 and 5,000 mm/min as a percentage value of the programmed feedrate, using the feedrate override knob.

Example: Programmed Fmax. 10,000 mm/min at override setting of 40 % —> F 4,000 mm/min.

Limitation of rapid traverse rate in "Automatic" machine operating mode:

Rapid traverse rate max. mm/min 3,000

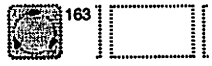
Further limitations:

The rapid traverse key is not operative. 

Lubricoolant supply is available with the door to the working area unlocked.  **M08**

Lubricoolant supply through the tool  M07

and the operation

of the swarf conveyor 

are not available with the door unlocked (change over to "Machining operation").

Automated machine functions (tool change, pallet change) are not available whith the door unlocked (change over to "Machining operation"). M06 M60

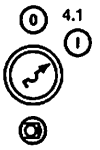
Switching to "Machining mode"

1. Turn the keylock switch to "Machining mode". 

Changing over from "Manual operation" or "Electronic handwheel" operating mode to "Set-up"/"Manual intervention"/"Extended manual intervention" (option) mode

The machine is in the "Manual operation" or "Electronic handwheel" mode:  100  105

1. Switch the machine drives off:
   Press "Spindle stop" or "Feed and spindle stop".  42  121

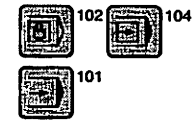
2. Turn the keylock switch to position
   "Set-up" mode 
   or
   "Manual intervention" 
   or
   "Extended manual operation". 

When the "Extended manual operation" mode is used, the keylock switch for "Machining", "Set-up" and "Manual intervention" modes is inoperative.

- Always withdraw the key after switching over.
- Only specialized skilled personnel authorized to operate the machine in these operating modes shall be responsible for, and have access to, the keys.

Changing over from "Positioning with manual data input", "Program run block by block" or "Automatic program run" mode to "Set-up", "Manual intervention"/"Extended manual intervention" (option) mode

The machine is in the "Positioning with manual data input", "Program run block by block" or "Automatic program run" mode:



1. Either wait until the workpiece has been completed or, if necessary, interrupt tne machining operation.

   To do so, change over to "Program run block by block" (see Control Unit Documentation).

2. When the last block has been completed, press "Feed and spindle stop". 

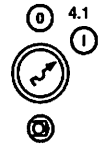
3. Turn the keylock switch to position

   "Set-up" mode 

   or

   "Manual intervention" 

   or

   "Extended manual operation". 

When the "Extended manual operation" mode is used, the keylock switch for "Machining", "Set-up" and "Manual intervention" modes is inoperative.

- Always withdraw the key after switching over.
- Only specialized skilled personnel authorized to operate the machine in these operating modes shall be responsible for, and have access to, the keys.

Door to working area

Keep at a safe distance, at least 60 mm, from the inspection window (polycarbonate window, standard).

The door to the working area is monitored by the control unit.

- When the machine or control unit is OFF, or in the case of an "EMERGENCY STOP" or a power failure, the door can be opened using the emergency door release or auxiliary door release function.
- When the control unit is ON, the door is mechanically locked and opening must be specially enabled.

Opening door in "Auto" operation

The program command for a manual tool change unlocks the door.

Opening door in manual operation

1. Stop the spindle:
   Press "Spindle stop".  121

Caution - avoid the risk of damage that may be caused by unlocking the door while a machining operation is in progress.
This may lead to machining faults, fouling of the contour and/or tool breakage, since all drives will stop dead immediately.
Never press "Unlock door to working area" while machining is in progress.

2. To unlock the door to the working area:
   Press "Unlock door to working area".  50

   The door to the working area is unlocked and can be opened.

3. Open the door to the working area.

Caution - avoid the risk of an accident that may be caused by flying chips, splashing lubricoolant or movements of the tool and machine slides.
Wear eye protection. 

Locking door

1. Close the door to the working area.
   The door is locked automatically when it is firmly closed.

Emergency door release

Application

The emergency door release serves to unlock the door mechanically from inside the working area.

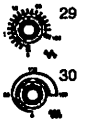
Auxiliary door release

Application

While the machine is separated from mains power supply, the door can be unlocked using the auxiliary door release (see Chapter "Machine specification" under the heading "Controls").

To avoid the risk of an accident, it is prohibited to use the auxiliary door release while the machine is switched on and the spindle is running.

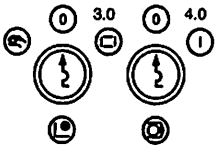
Manually controlled axis travel

- While movements are in progress, the feedrate/rapid traverse can be varied using the "Feedrate/Rapid traverse override" control knobs. 

- Rapid traverse movements are not possible while the feedrate override control is at "0".

Calling manual operation

1. Call the "Manual" operating mode:
   Press "Manual operation". 

2. Turn the keylock switch to the desired position. 

Jog control

3. Press the "Move axis" key for the desired axis and direction of movement. 

   The machine slide keeps moving at the preset rate as long as the key is held down.

Depending on the operating mode, the "Enable key" may have to be pressed and held down in addition. + 

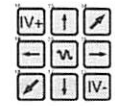
Rapid traverse

4. To move at rapid traverse rate:
   Press "Rapid traverse" in addition. + 

   The selected machine slide keeps moving in the selected direction at rapid traverse rate as long as the keys are held down.

Incremental feed

1. Call the "Electronic handwheel" mode.  105

2. Press the "Move axis" key for the desired axis and direction of movement. 

   The machine slide moves by one selected increment each time the axis key is pressed.

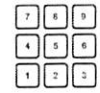
Depending on the operating mode, the "Enable key" may have to be pressed and held down in addition.  5

Setting feed increments

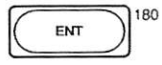
1. Change over screen assignment:
   Press "Screen assignment".  163

2. Call PLC range:
   Press the function key "POSITION+PLC" or "PLC". 

3. Select incremental feed:
   Press the function key "AXIS JOG". 

4. Enter the desired feed increment, using the numeric keypad. 

   Permissible values: 0.0000 ... 50.0000 mm

5. Enter the value:
   Press "Input".  180

Mechanical limit stops

Function

The range of traverse of each machine slide is limited by mechanical limit stops.
When a slide trips the limit stop, all feed drives are switched off.

Caution - avoid damage to the machine that may be caused by defective X/Y/Z-axis limit stops.
When a machine slide has hit against a mechanical limit stop, it is essential to replace the limit stops in that axis.

Backing away from limit stop

1. Switch the machine off:
   Turn the master switch to "0". Q1
2. Switch the machine on again:
   Turn the master switch to "I". Q1
3. Cancel the fault/error messages. CE 130
4. Close the door to the working area.
5. Press "Machine ON". 1
6. Set the keylock switch to "Machining operation". 3.0
7. Call the "Manual" operating mode:
   Press "Manual control". 100
8. Move the machine slide approx. 50 mm towards the middle of its range of traverse:
   Press the respective "Move axis" key.
9. Move to the reference point:
   See under the heading "Moving to reference points".

Changing tools manually

Caution – avoid the risk of accidents caused by rotating tools and sharp cutting edges.

- Make sure the tool has cleared the workpiece for tool changing.
- Never grip the tool without wearing safety gloves.
- Never grip the tool as long as it is still rotating.

Danger of collision if a tool has not been entered in the Tool Manager.
A manually changed tool must be removed from the spindle before an automatic tool change.

Permissible tools

- It is essential to observe the instructions on permissible tool mounts and draw-in pins. See Chapter "Technical data".
- Only use suitable tool shanks and draw-in pins.
- Only use tools in perfect condition, firmly mounted and properly balanced.
- Check the spindle speed, never exceed the maximum spindle speed permissible for a tool to be used.

Calling a tool change

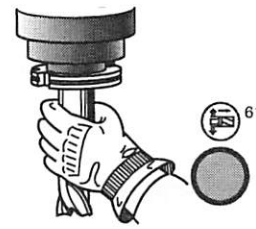
1. Call the "Manual" operating mode.  100
2. Stop the spindle:
   Press "Spindle stop".  121
3. Unlock the door to the working area:
   Press "Unlock door to working area".  50
4. Open the door.

Remove tool

5. Call tool change:

   Press "Tool change". 

6. Grip the tool, press "Release tool in spindle" and hold the key down.

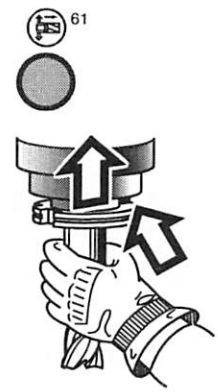


Caution – avoid the risk of accidents caused by the tool falling off.
Be sure to hold the tool firmly.

7. Remove the tool.

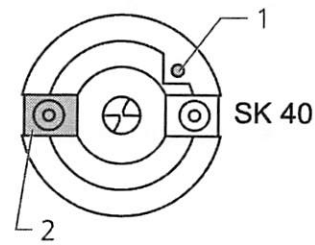
Clamp tool

8. Press "Release tool in spindle" and, holding the key down, insert the new tool.



Caution - avoid the risk of accidents caused by the tool being thrown off when the spindle is started. If wrongly inserted, the tool will not be properly clamped.

- On machines using ST 40 (DIN) shank tools, insert the tool in such a way that the locator (1) engages the associated recess in the driving flange of the tool shank and the slot engages the driver (2).



Caution – your fingers might be trapped.
Do not grip the tool too close to the driver flange.

9. Let the "Release tool in spindle" key go and assist the clamping process by pushing the tool slightly upwards.

10. Acknowledge the tool change:
    Press "Tool change". 

    The lamp in the "Tool change" key goes out.

11. Close the door to the working area.
    The door is locked.

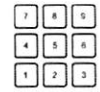
Re-entry after tool breakage

Observe and follow the instructions in the documentation of the control unit manufacturer.

Spindle

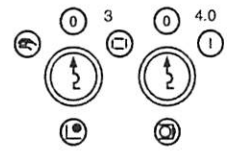
Switching on spindle, alternative 1

Enter spindle speed

1. Call the "Manual" operating mode:
   Press "Manual operation".  100
2. Press the function key "S". 
3. Tap in the spindle speed on the numeric keypad. 
4. Enter the spindle speed:
   Press "Program start".  120

   The selected spindle speed is displayed under the address "S" on the display screen.

Select operating mode

5. Turn the keylock switch to the desired position. 

Switching on

Caution – avoid the risk of accidents caused by using too high spindle speeds.
Before starting the spindle:

- Check the max. permissible spindle speed for the tool to be used.
- Recheck the spindle speed selected. Enter a new spindle speed if necessary.

6. Start the spindle in the desired direction of rotation.
   - Press "Spindle start, CW rotation"  41

     or
   - "Spindle start, CCW rotation".  40

Depending on the operating mode used, the "Enable" key may have to be held down in addition.  5

Switching on spindle, alternative 2

1.
   - Enter spindle speed,
   - select operating mode:

   See above under "Switching on spindle, alternative 1".

Switching on

2. Press the function key "M". 
3. Enter the function:
   - M 8 for spindle CW rotation 3
   - M 4 for spindle CCW rotation 4
4. Start the spindle:
   Press "Program start".  120

Varying spindle speed

1. To vary the spindle speed while the spindle is running:
   Press "Reduce spindle speed" or "Increase spindle speed".  43  45

   In the "Set-up", "Manual intervention" and "Extended manual intervention" modes you cannot increase the spindle speed to values above 100 %. If you do, the higher values selected will be shown on the screen, but for safety reasons the spindle itself will not rotate faster than 100 %.

2. To cancel a previously selected spindle speed variation:
   Press "Reset spindle speed to 100 %".  44

Switching off

1. Press "Spindle stop".  121

   The spindle stops immediately.

Jog control

1. To call jog control:
   See Supplement to Control Unit Manual.
2. Jog control, CW rotation:
   Press and hold down the function key "Spindle – A". 

   Jog control, CCW rotation:
   Press and hold down the function key "Spindle + A". 

 The spindle will rotate as long as the key is held down.

Rotating spindle manually

When the spindle and the machine drives are off, the spindle can be rotated by hand when the door to the working area is open.

 **Caution – avoid the risk of accidents caused by machine slide and spindle movements.**
Always switch off the machine drives and the spindle before touching any parts.

 Avoid damage to the tool clamping system of the spindle. Never start and run the spindle unless a tool is mounted and safely clamped.

Inhibiting spindle

Certain tools (e.g. measuring tools) may only be used while the spindle is standing still.

1. Call the tool list (see Control Unit Manual).
2. Enter the appropriate code in column "PLC":
   % 00000100 Bit 2 "1" The spindle is inhibited.

   % 00000000 Bit 2 "0" The spindle is enabled again.

Spindle running time

The running time of the spindle is recorded by an hours-of-operation counter.

1. Select the MOD function:
   Press "MOD". 

   116
2. Press the function key "Machine time". 

   The display "Hours-of-operation counter" will appear.

Data displayed in hours-of-operation counter

- Control ON
- Machine ON
- Program running time
- Spindle running time

3. To leave the hours-of-operation counter:
   Press the function key "END". 

Lubricoolant unit

Caution – lubricoolants may constitute a risk for your health.

- Avoid contact with your skin.
- Change contaminated clothing immediately.
- Do not allow lubricoolant to contaminate the sewage system, the soil or underground water; dispose of lubricoolants in compliance with applicable pollution control regulations.

Switching lubricoolant on/off manually, alternative 1

1. Close the door to the working area.
2. To switch lubricoolant supply on/off:
   Press "Lubricoolant" to switch the lubricoolant supply on or off. 
3. Check the direction of lubricoolant flow.
4. Switch off the lubricoolant and readjust the nozzles if necessary.

Switching lubricoolant on/off manually, alternative 2

1. Close the door to the working area.
2. Press the function key "M". 
3. Enter the function:
   - M 8 for switching lubricoolant ON 
   - M 9 for switching lubricoolant OFF 
4. To enter your selection:
   Press "Program start". 
5. Check the direction of lubricoolant flow.
6. Switch off the lubricoolant and readjust the nozzles if necessary.

Resuming work after an interruption

Interruption for tool change

If the command "TOOL CALL" is written in a program block, the machining operation will be interrupted upon completion of that block and the spindle will be switched off automatically.

1. Unlock the door to the working area:
   Press "Unlock door to working area". 
2. Change tools:
   See "Changing tool manually".
3. Close the door to the working area.
4. To continue the program:
   Press "Program start". 

4

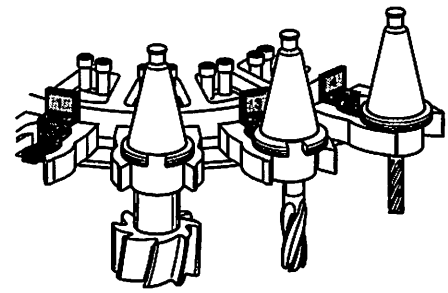
Operation Tool magazine

2913
DMC 75 V linear
iTNC 530
MHB – 1: EN/01.2004
en

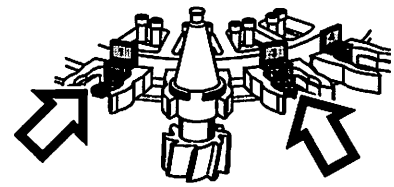
Loading/unloading of tool magazine

Caution - avoid the risk of damage to the machine or operational failures that may be caused by incorrect loading of the magazine or an incorrect entry in the Tool Manager.
This may result in machining faults or a collision after an automatic tool change.

- Always check the current magazine status before inserting or removing tools.
- It is important to update the Tool Manager each time you load or unload a tool pocket.



- For special tools of large diameter and trepanning tools (see Chapter "Technical data"), both adjacent tool pockets must remain vacant, otherwise a collision might occur. In addition, the large-diameter tool(s) must be entered in the Tool Manager.



Permissible tool shanks and draw-in pins

- It is essential to observe the instructions on permissible tool mounts and draw-in pins. See Chapter "Technical data".
- Only use suitable tool shanks and draw-in pins.
- Only use tools in perfect condition, firmly mounted and properly balanced.
- Check the spindle speed, never exceed the maximum spindle speed permissible for a tool to be used.

Tool Manager

The Tool Manager shows the current tool assignment, i.e. which tool is in the spindle and which tools are in the individual pockets of the tool magazine.
In the Tool Manager you may reserve or inhibit certain pockets, e.g. for accommodating very large tools (see Control Unit Manual).

Observe and follow the instructions in the documentation of the control unit manufacturer.

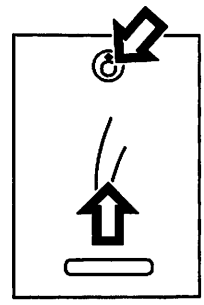
Position coding

The carousel magazine features fixed position coding for all tools in the magazine.

Unloading

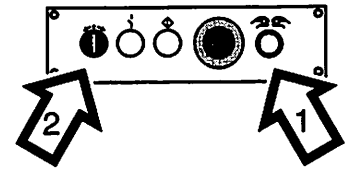
To prepare unloading

1. Unlock the sliding window on the tool magazine:
   Press "Unlock sliding window".
   The light in the key goes out.
2. Open the sliding window:
   Push the sliding window upwards.

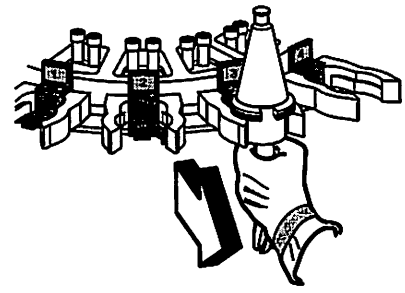


To remove tool

3. Move the desired magazine pocket to the unloading position:
   Press the "Enable" key (1) on the supplementary tool magazine control panel and simultaneously turn the "Tool magazine CW/CCW rotation" switch (2) until the magazine is in the desired position.



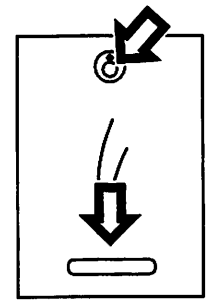
4. Grip the tool in the magazine and remove it by pulling it forward.



Hold the tool straight to avoid jamming.

To conclude unloading

5. Close the sliding window on the tool magazine.
   The "Unlock sliding window" key lights up and remains illuminated. Automatic tool changing is inhibited.

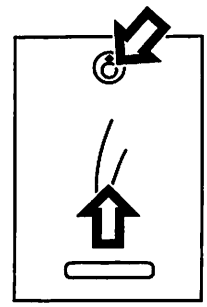


Remember: The tool will remain stored in the tool position list or tool list after removal.

Loading

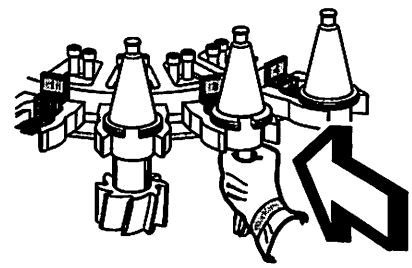
To prepare loading

1. Unlock the sliding window on the tool magazine:
   Press "Unlock sliding window".
   The light in the key goes out.
2. Open the sliding window:
   Push the sliding window upwards.



To insert tool

3. Insert the tool into the magazine pocket from the front and slightly turn it both ways until the locators click into engagement.



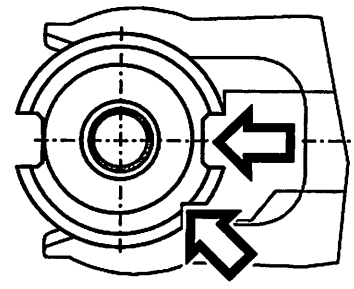
A mechanical lock holds the tool in the pocket.

⚠ **Caution – your fingers might be trapped when mounting the tool. Be careful to avoid the risk of an accident.**
Do not grip the tool too close to the driver flange.

4. Make sure that the locators on the tool holder engage the recesses in the driver flange of the tool shank.

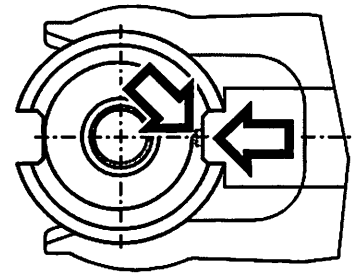
ST 40 locators

When using ST 40 DIN 69871 Form A, A-D, B or HST 63 Form A tool shanks, make sure that the locators engage the groove and the notch in the driver flange (see illustration).



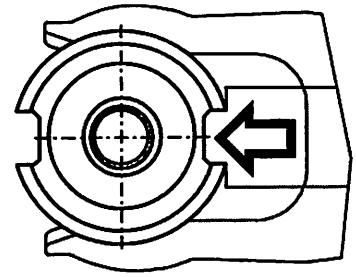
ASME locators

On ASME B 5.50-1994 tool shanks, the bore on the driver flange of the tool must point in the direction of the magazine carousel (see illustration).



BT 40 locators

On BT 40 JIS B 6339 tool shanks, the locator must engage one of the two grooves in the driver flange (see illustration).



Make sure that tools with a defined position of the cutting edge, e.g. boring bars with a single-edged tool bit, are not by mistake inserted in the wrong (= 180° inverted) position.

Caution - avoid the risk of collision that may be caused by incorrectly mounted tools.
It is essential that each tool is inserted in the correct pocket and that the locators are in proper engagement.

Enter tool number

5. Enter the T number of the tool under its appropriate pocket number in the tool magazine list of the Tool Manager

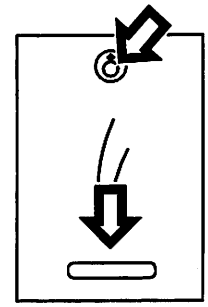
   See control unit documentation, "Supplement".

Caution - avoid the risk of faulty machining or collisions after the tool change, caused by incorrect loading or an incorrect entry.
Make sure the tools are loaded and entered correctly.

To conclude tool loading

6. Close the sliding window on the tool magazine.

   The "Unlock sliding window" key lights up and remains illuminated. Automatic tool changing is inhibited.



To reset tool magazine

If a program run was interrupted by pressing the "EMERGENCY STOP" button during an automatic tool changing cycle, the tool magazine can be reset  2.1

- either automatically
  or
- by manual control.

To prepare resetting

1. Eliminate the cause for the EMERGENCY STOP.
2. Reset the "EMERGENCY STOP" button.  2.2
3. Press "Machine ON".  1

To reset tool changer automatically

To enter resetting command

1. Abort the program run:
   Press the function key "INTERNAL STOP". 
2. Call the "Manual" operating mode:
   Press "Manual mode".  100
3. Press the function key "M". 
4. Enter the resetting command:
   - Enter the command M 77 for resetting the tool changer. 7 7

To execute resetting movements

5. Start the reset operation:
   Press "Program start" and hold the key down until the movement has been completed. 
   The control unit automatically selects the path to the nearest defined end position of the tool change operation.

To conclude resetting

6. Return to the starting menu upon completion of the resetting operation:
   Press "Conclude block". 

To reset tool changer manually via HELP function

Application

The tool changer can be moved to a defined position by manual control using the "HELP" function.

Intended use of machine

Qualified skilled personnel

- The "HELP" function may only used by adequately qualified and properly trained personnel upon specific instruction in each particular case.

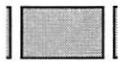
Management responsibility

- Responsibility for such use always lies with the management of the user's company.
- The DECKEL MAHO Technical Service will take pleasure in assisting customers with regard to any questions that may arise in this respect.

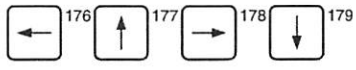
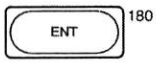
Caution - avoid the risk of collision: In most cases, collision monitoring by the control unit is not provided.
The use of the "HELP" function requires a thorough knowledge of the sequence of mechanical operations.

Call the "HELP" function

1. Call "ENTER/EDIT PROGRAMS" mode:
   Press "Enter/edit programs".  113

   The File Manager must not be active.
2. Call the modal range:
   Press "MOD".  116
3. Enter the code number for protected functions:
   Enter "789" and press "Input".  180
4. Call the "MANUAL" mode:
   Press "Manual mode".  100
5. Call the modal range:
   Press "MOD".  116
6. Call the "HELP" function:
   Press the function key "HELP". 

Call the "HELP" file

7. Press "Programs/Data files".  115
8. Use the cursor to select the desired "HELP" file.  176 177 178 179
   - File name of the "HELP" file for the tool changer: "WZW_RETT"
   - The text in the "HELP" file is only available in German and English.
9. Enter the "HELP" file:
   Press "Input".  180

Available resetting alternatives

10. Call the resetting movement:
    Press the function key "SELECT". 

    A list of the available movements is displayed.

USE CURSOR KEYS AND NC START TO
MOVE TOOL CHANGER TO BASIC POSITION

#0001 ORIENT SPINDLE TO POS_1
#0003 OPEN / CLOSE TOOL COLLET
#0004 OPEN MAGAZINE FLAP
#0005 CLOSE MAGAZINE FLAP

MOVE MACHINE SLIDES TO CHANGE POSITION

#0008 MOVE X AXIS TO CHANGE POSITION
#0009 MOVE Y AXIS TO WAITING POSITION
#0010 MOVE Y AXIS TO INTERIM POSITION
#0011 MOVE Y AXIS TO CHANGE POSITION
#0012 MOVE Z AXIS TO ENTRY POSITION 1
#0013 MOVE Z AXIS TO ENTRY POSITION 2
#0014 MOVE Z AXIS TO EXIT POSITION
#0015 MOVE Z AXIS TO WAITING POSITION

INITIALIZE TOOL CHANGER PLC

#0019 TOOL CHANGER SOFTWARE INIT
#0020 T0 IN SPINDLE PLC SOFTWARE
IMPORTANT - CHECK TOOL MEMORY NC

ENABLE AXIS MOVEMENTS BY MANUAL KEYS

#0021 RESET MACHINE AXES

The movements are NOT listed in the order of the sequence of machine movements.

Caution – risk of collision
The situation at the point of interruption must be exactly analyzed.
Select an appropriate movement on the basis of such analysis.

DECKEL MAHO recommends resetting the tool magazine to the following end positions:

- Magazine flap closed
- Axes (machine slides) reset

To execute resetting movements

11. Select the desired movement:
    Call the desired movement using the cursor keys, for example: ← 176 ↑ 177 → 178 ↓ 179

    Beispiel:
    "#0012 Z AXIS TO ENTRY POSITION 1"

12. Execute the movement:
    Press "Program start" and hold the key down until the movement has been completed. 120

To conclude resetting

13. Call the PLC software
    "#0019 TOOL CHANGER SOFTWARE INIT"
    using the cursor keys. ← 176 ↑ 177 → 178 ↓ 179

14. Enter the PLC software:
    Press "Program start". 120

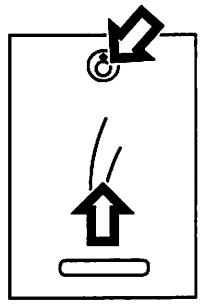
15. Leave the "HELP" function:
    Press "Conclude block". END □ 181

- Upon resetting the tool changer, it is essential to check the data in the tool position list and compare them with the actual position of the tools in the spindle and the pockets of the tool magazine.
- Edit the tool position list as required, if necessary: See "HEIDENHAIN" control unit documentation.

Turning tool magazine by hand

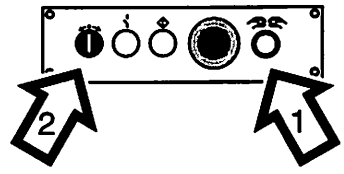
To prepare manual turning

1. Unlock the sliding window on the tool magazine:
   Press "Unlock sliding window".
   The light in the key goes out.
2. Open the sliding window:
   Push the sliding window upwards.



To turn magazine

3. Move the desired magazine pocket to the unloading position:
   Press the "Enable" key (1) on the supplementary tool magazine control panel and simultaneously turn the "Tool magazine CW/CCW rotation" switch (2) until the magazine is in the desired position.



To conclude manual turning

4. Close the sliding window on the tool magazine.
   The "Unlock sliding window" key lights up and remains illuminated. Automatic tool changing is inhibited.