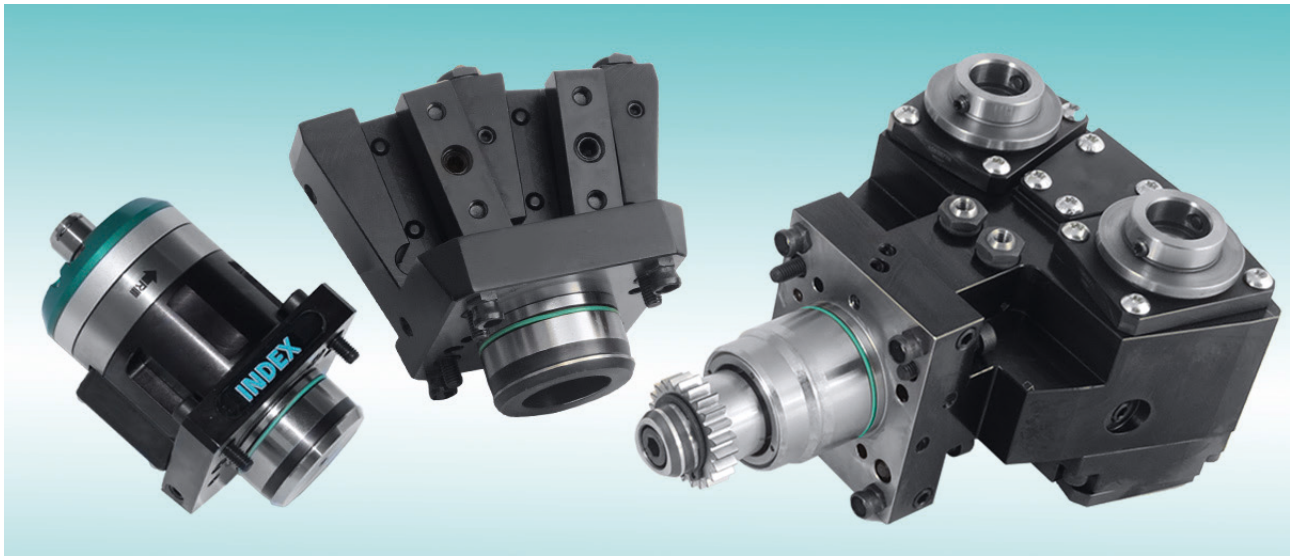
INDEX



TRAUB TNL20-9, TRAUB TNL20-9B

Tool holder Technical Information

*better.parts.**faster.***

Note on applicability

Illustrations in this publication may deviate from the product supplied. Errors and omissions due to technical progress expected.

A word on copyright

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INDEX

Tool holder selection

For more information, please visit our iXshop at ixshop.ixworld.com

We will be happy to send you an individual offer.
Just call us at +49 711 3191-9854 or
send us an email to werkzeughalter@index-werke.de.

Warranty

When using tool holders that are not adjusted, tested and marked as such by INDEX, the warranty for the tool drive is void.

Information on wear parts

Tool holders are wear parts requiring correct handling.
In order to ensure a long service life, compressed air or coolant must not enter the gap seals of the holders.

Inspection of live tool holders

Tool holders must be inspected at regular intervals (at least twice a year) for smooth running and play.

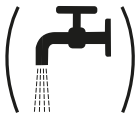
The drive pinion and drive clutch of the live tool holders must be subjected to a visual inspection for damage or wear.

If one of the above-mentioned defects is detected during the inspection of the tool holders, they must be returned immediately for preventive maintenance or repair to the following address:

INDEX-Werke GmbH & Co. KG
Plochinger Straße 92
D-73730 Esslingen
Fon +49 711 3191-554
werkzeughalter@index-werke.de

Tool holders with cooling lubricant supply

Tool holders marked with this symbol must be operated with cooling lubricant (no dry running permitted).

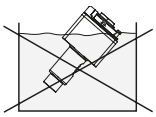


Tool holders marked with this symbol can be converted from external cooling lubricant supply to internal cooling lubricant supply.
Observe dry running capability of IC attachment!

Cooling lubricant filtering

When using live tool holders with internal cooling lubricant supply, it is necessary to use a cooling lubricant filter system with a retained particle size ≤ 50 µm.

Cleaning live tool holders



Live tool holders must never be immersed in cleaning fluid since mixing the cleaning fluid with the bearing grease will reduce the service life of the tool holders.

Speed ratio specifications on tool holders

The value to be programmed is specified in the documentation and on the live tool holders (= the input in the NC program).

$n_{prog} = n_{Tool} \times i$

n_{Tool} = speed at the cutting tool edge

n_{PROG} = speed to be programmed

i = speed ratio in the tool holder

This means the speed increase or speed reduction is not specified as a fraction but as **a number**.

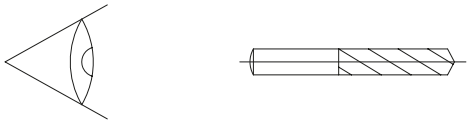
This gives speed **increase** ratios as numbers **less than 1**.
Example: i = 0.333 (corresponds to i = 1:3)
i = 0.676 (corresponds to i = 1:1.48)

Speed reduction ratios are numbers greater than 1.
Example: i = 2 (corresponds to i = 2:1)
i = 1.333 (corresponds to i = 4:3)

The tool holder speed ratio is engraved on TRAUB TNL tool holders.

Direction of rotation specification

Definition of the viewing direction.
Viewing direction for determining the direction of rotation is always from behind (that is, from the drive direction) toward the shaft.



On the machine side, the direction of rotation has been set by parameters such that M03 always denotes clockwise rotation and M04 counter-clockwise rotation at the interface of the drive pinion of the tool holder.

The direction of rotation given on the holder therefore refers to a "change in direction within the holder". M03 and M04 are machine functions to be programmed.
The ↷ and ↶ arrows indicate the direction of rotation of the cutting edges.

This means:

↷ M03 ↶ M04

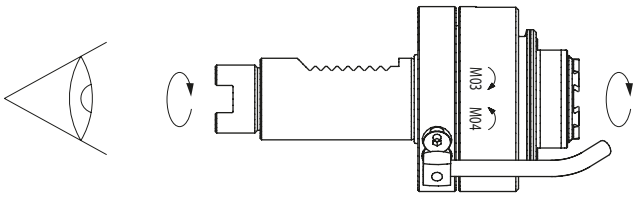
No reversal of direction of rotation
When the holder drive shaft has the **same** direction of rotation as the tool cutting edge, the clockwise direction of run must be specified by M03 (clockwise rotation). Accordingly, counter-clockwise rotation must be specified by M04.

↷ M04 ↶ M03

Reversal of direction of rotation
When the holder drive shaft has the **opposite** direction of rotation as the tool cutting edge, the clockwise direction of rotation must be specified by M04.
Accordingly, counter-clockwise rotation must be specified by M03.

Example

No reversal of direction of rotation



Replacement seals for tool shank

The gaskets on the tool shank and the cooling lubricant bushing must be regularly checked for damages.

O-ring	Material number	Installation location
D 40 x 1.6	10800263	Compact shank
D 11.21 x 1.78	10451119	Cooling lubricant transfer

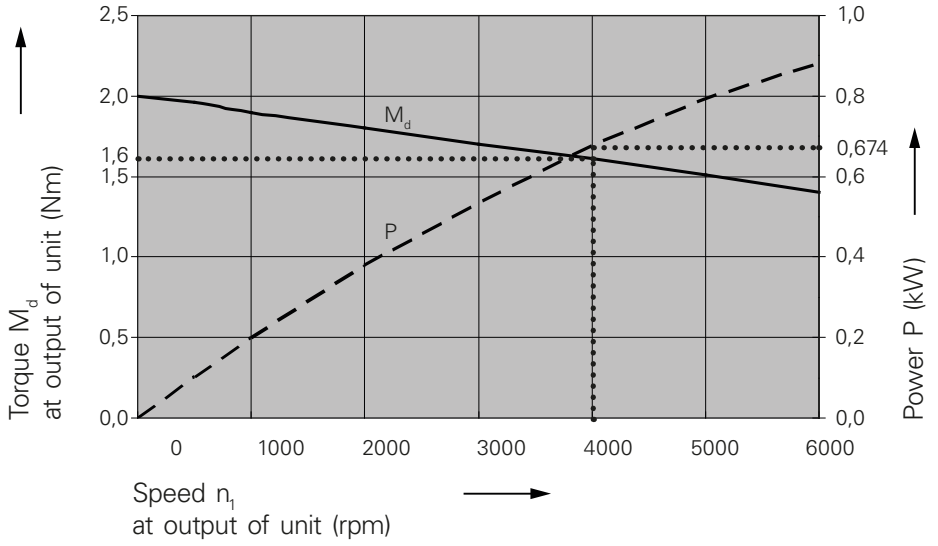
Notes on how to use the diagram when using tool holders

The diagram relates to the output speed **n** of the tool unit. The tool speed can be read directly from the diagram only if the internal speed ratio **i** in the tool holder is 1:1.

For tool holders with an internal speed ratio i ≠ 1, the output speed **n** of the tool unit to be programmed must be calculated from the required tool speed and the speed ratio i. Afterwards, the actual powers or torques can be read off or determined.

Example (at 100% duty cycle):

live tool unit, tool speed n_{Tool} = 1000 rpm	
Internal speed ratio i of the tool holder	i = 4
Programmed speed n_{prog} for the drive of the unit	$n_{prog} = n_{Tool} * i = 1000 \text{ rpm} * 4 = 4000 \text{ rpm}$
Torque M_{Tool} at the output of the tool holder	Read-out M_d at speed n_{prog} = 4000 rpm = 1.6 Nm $M_d = M_{Tool}: i$ Formula changed: $M_{Tool} = M_d * i = 1.6 \text{ Nm} * 4 = 6.4 \text{ Nm}$
Power P at the output of the tool holder ≈ Power P at the output of the setup	Read-out at 4000 rpm –> P = 0.67 kW calculated: $P = 2 * \pi * n_{prog} * M_d$ $P = \frac{2 * \pi \times 4000 * 1.6 \text{ Nm}}{60 * 1000} = 0.67 \text{ kW}$



The transmission ratio and the technical data of each tool holder are available in our iXshop at ixshop.ixworld.com

Tool turret

The TNL20-9 is equipped with 2 tool turrets: one upper turret, as well as one lower turret with front mounted back working attachment (option). The tool turrets consist of the swivel drive, turret head, tool drive, and axis drives.

Swivel drive as rotary axis

The tool turrets are equipped with a rotary axis. It consists of a cycloidal gearbox (eccentric gearbox) in which the torque is transmitted via curved disks.
This allows high impact loads on the drive (up to 500%), low-wear operation, and low friction losses.
The gearbox is not self-locking. Therefore, the turret head is connected directly with a measuring system that reports the exact position and compensates the cutting forces. This allows top precision turning and milling operations.

Turret head

Each turret head has 8 tool stations for stationary and live tool holders.
All stations are equipped with a cooling lubricant transfer unit. The tool stations 1 and 7 on the upper and lower turrets are equipped with an additional fluid transfer station. They can be used either as a sealing air port or as a high-pressure port for cooling lubricant. In either case, the appropriate tool holders and valves must be available.
The turret heads have fixing inclines for the fixing pins of the tool holders on both sides along their circumference.

Live tool holder, turret head

When using live tool holders in the turret head, only tool holders with a spur gear with 18 teeth may be used.

When using live tool holders with a different number of teeth, such as TRAUB TNL32 with 23 teeth, the tool drive will be destroyed.

Tool holders with combination pinion can be used on tool carriers with single or overall drive.
The combination pinion is an absolute requirement for tool turrets with single drive.

Existing compact shank tool holders can be converted to combination pinions by INDEX.

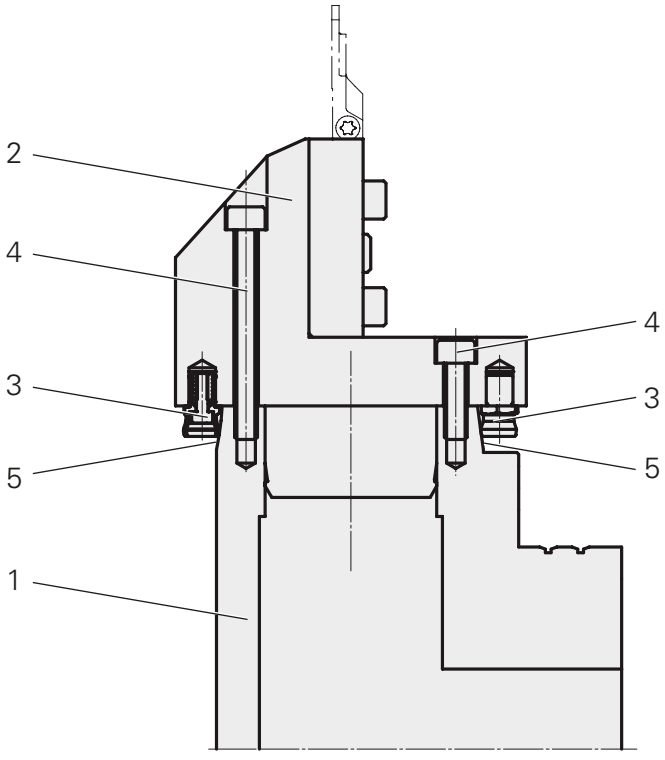
Tool holder system on tool turret

The tool holder system is a compact shank.

The turret head has a locally hardened fixing incline on both sides along its circumference. When the tool holder is inserted into the turret head, the tool holder aligns itself automatically with the fixing inclines by means of the fixing pins. The tool holders are fastened to the face of the stations using cylinder head screws.
Most of the tool holders have elastic fixing pins. The width tolerance of the turret head is offset by the elasticity of the fixing pins, also the turret will not be damaged in a collision.
The fixing bolts are eccentrically arranged and are adjusted to the exact position for INDEX and sealed.

The customer may not manipulate the adjusted and sealed fixing pins of the tool holders.

The fixing pins can be replaced and readjusted by INDEX, e.g., after a collision.



1 Turret head
2 Tool holder
3 Fixing pin
4 Cylinder head screws
5 Fixing incline

Attaching/detaching the live tool holders to/from the tool turret

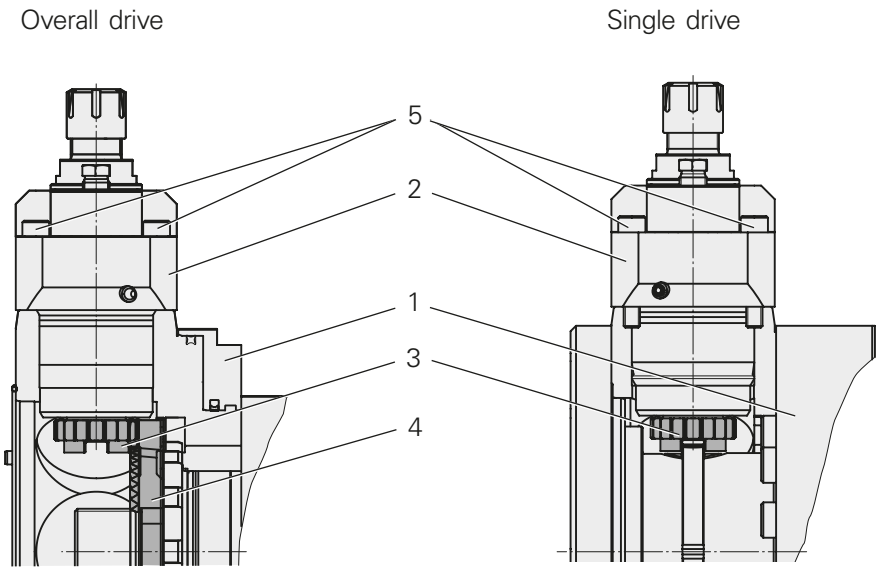
Swivel the turret head (1) into the required position.
Carefully remove chips and dirt from the tool holder (2) (or the blanking plug) to be replaced and its surrounding area using a cleaning gun.

Chips and dirt must not enter into the inside of the turret head when tool holders are being replaced.

Clean the removed tool holder (2) and the tool mountings.
Check that the proper mounting screws (5) have been installed on the replacement tool holder (2). The mounting screws (5) should not protrude more than 12mm from the tool holder (2).
Insert the cleaned tool holder (2).

For live tool holders (2) and an **overall drive**, the spindle must be slightly moved so that the drive pinion (3) can be pushed into the crown wheel (4).
Tighten the mounting screws (5). Tightening torque Ma=14 Nm.

For live tool holders (2) and **single drives**, the spindle's drive claw must be aligned with the single drive's drive claw when mounting the tool holder (2).
Tighten the mounting screws (5). Tightening torque Ma=14 Nm.



1 Turret head
2 Tool holder
3 Drive pinion (combined pinion for single and overall drives)
4 Crown wheel
5 Mounting screws

Tool drive on the tool turret

All 8 tool stations on the upper turret and all 8 tool stations on the lower turret can be live.
The tool drive can optionally be selected as an single or overall drive.
The tool drive as overall drive is equipped as single drive on the B-turret.
The AC motor of the tool drive is designed for heavy cutting performance in the lower rpm range with high torque.
For higher speeds at which lower torques are required, the transmission occurs within the tool holders.
The tool turret can be swiveled with the H axis while the tool drive is running (applies only to an overall drive).
With a single drive, the tool holder must be in the correct position so the H axis can be swiveled.
The advantage of a single drive is that only the tool of the active turret stations is rotating.
The overall drive makes engaging and disengaging the drive shaft with/from the tool holders as well as acceleration and deceleration superfluous.
As a result, the turret head can be swiveled with the H axis while the drive is running. Depending on the direction of swivel or rotation, the speed is shortly increased or decreased when swiveling the turret.
When swiveling from station to station, the tool drive should not be run at top speed to relieve the tool holders.
The speed of the tool holder drive pinion can be programmed with the AC-controlled three-phase motor in the range 0 to 12,000 rpm with an overall drive and 0 to 8,000 rpm with an single drive.

Dry run with live tool holders

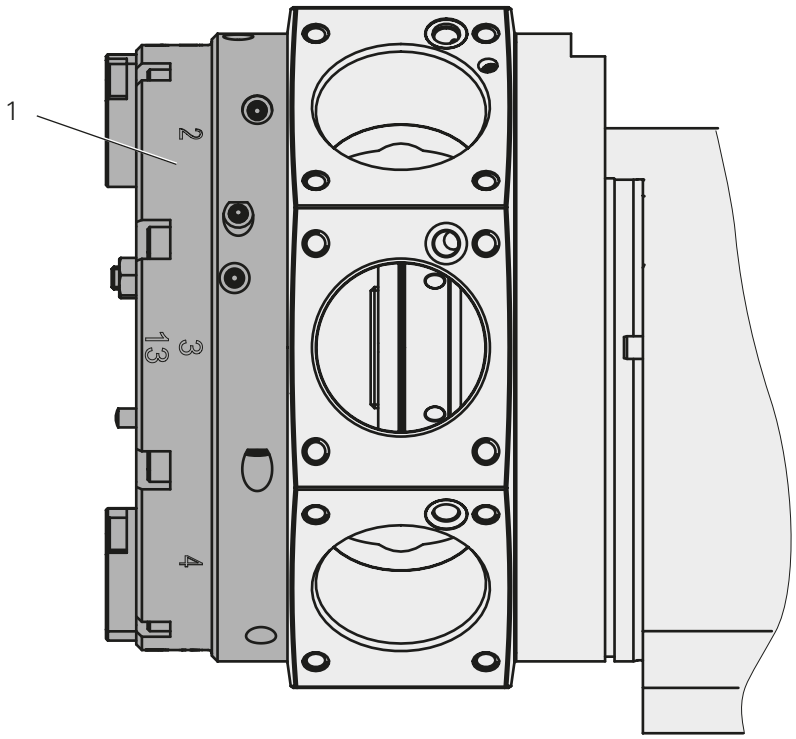
In setup and automatic mode, make sure that the seal on the tool holder is always wet with cooling lubricant at the cooling lubricant transfer.

The tool holder may be operated in setup mode without cooling lubricant only for a short time. During this time, the leakage of the adding valves and the reserves in the supply line are used for lubrication.

Cleaning the tool drive

on lower tool turret

When cleaning the tool drive inside the turret head, the back working attachment (1) must not be removed, because otherwise the back working attachment (1) needs to be readjusted.

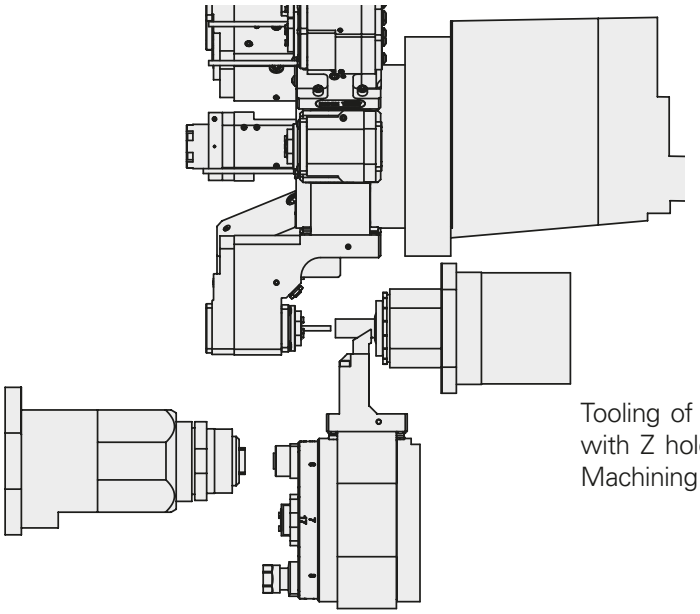


Tooling TRAUB TNL20-9B

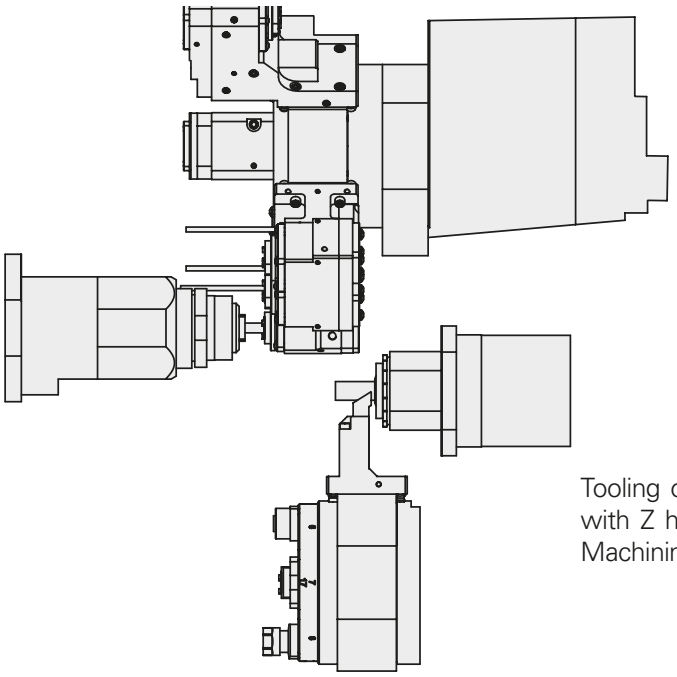
To ensure that there are no collisions with the counter-spindle, special care must be taken to ensure that the B turret is equipped with suitable tools.

Tooling with Z holder

is recommended if inclined axial machining on the counter spindle or deep-hole drilling with internal cooling is required. With this tooling, the B turret never swivels in completely, because all axial machining on the main and counter spindles is carried out with Z holders. X holders can be used, but should only be used for radial machining with this tooling. This also ensures that the B turret does not collide with the counter spindle despite the protruding Z holders.



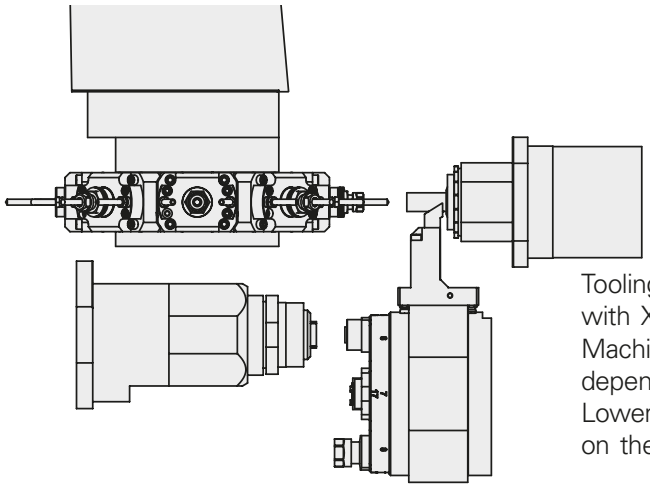
Tooling of B turret
with Z holder
Machining on main spindle



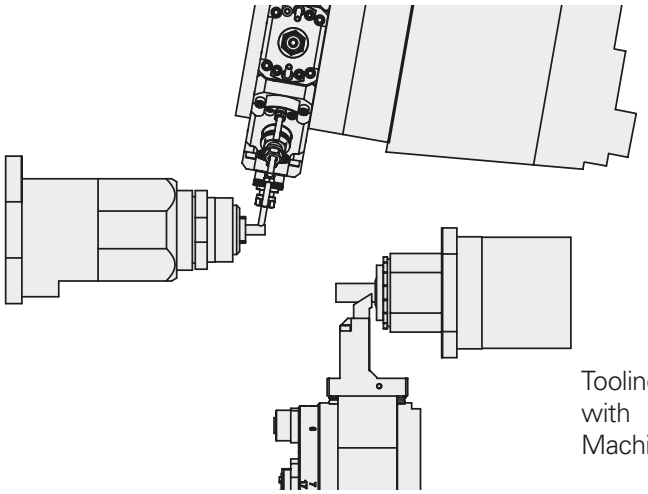
Tooling of B turret
with Z holder
Machining on counter spindle

Tooling without Z holder

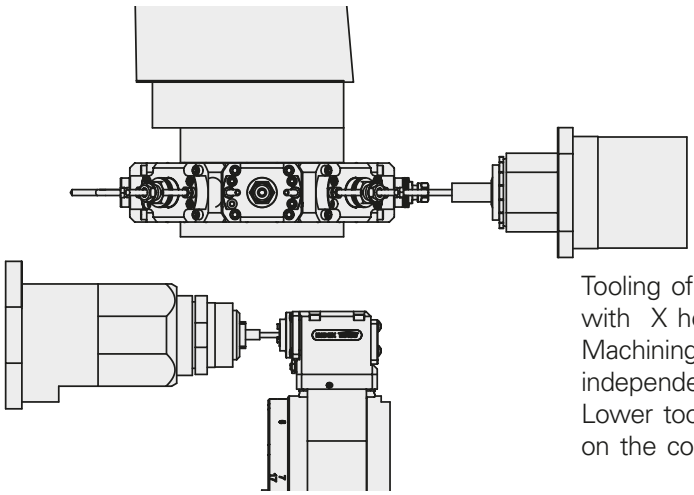
is recommended if no inclined axial machining on the counter-spindle and no internal cooling is required for axial deep hole drilling. This ensures that the B turret will not collide with the counter spindle even when the V turret is swiveled in by 90°. Machining axially to the counter spindle is not possible with this tooling.



Tooling of B turret
with X holder
Machining axially on main spindle
dependent machining
Lower tool turret
on the counter spindle



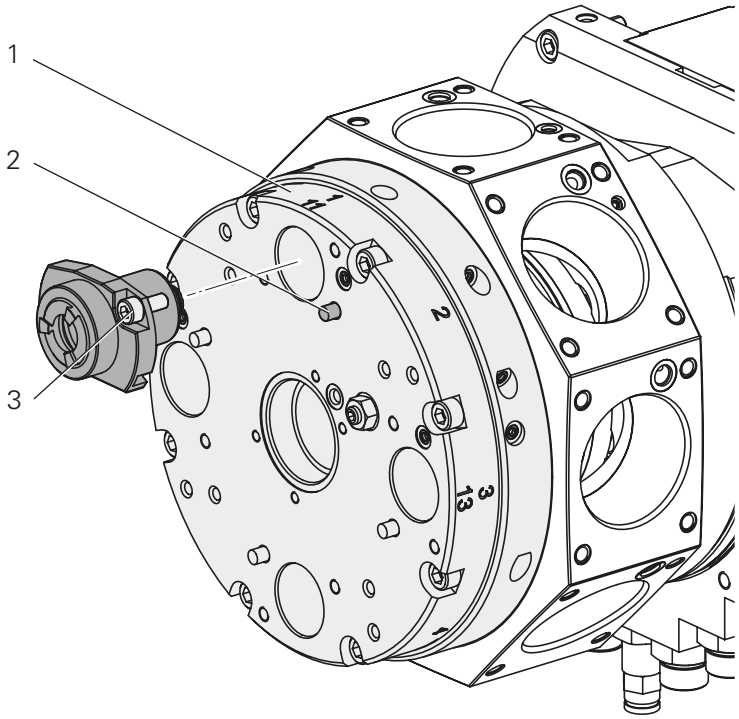
Tooling of B turret
with X holder
Machining axially on counter spindle



Tooling of B turret
with X holder
Machining axially on main spindle
independent machining
Lower tool turret
on the counter spindle

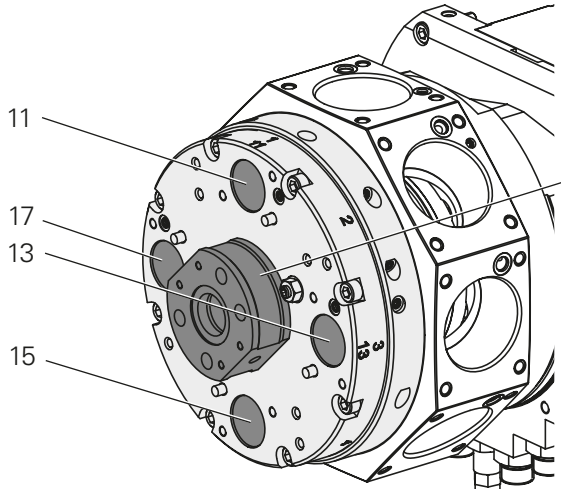
Back working attachment (option)

Optionally the machine can be equipped at all levels with a back working attachment for machining on the counter spindle (tool mounting D25).
The back working attachment is set up on the lower tool turret and has common X/Y/Z axes with the lower tool carrier. On the fully equipped machine, up to 4 tools can be in use simultaneously, whereby the counter spindle must follow the turret movement.



1 Back working attachment with tool mounting D25
2 Pin for position fixing of the tool
3 Mounting screw (2x)

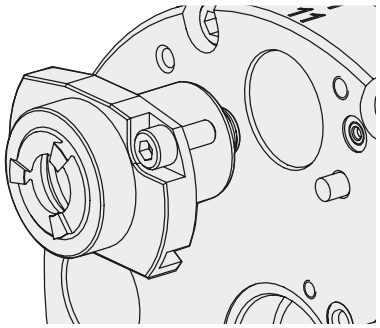
Designation of the mounting stations



Information on attaching/detaching the tool holders

Clean the mounting shank on the back working attachment and tool holder when installing and removing the tool holders.

The sealing rings on the tool shank must be inspected regularly for damage. Replace any damaged sealing ring.



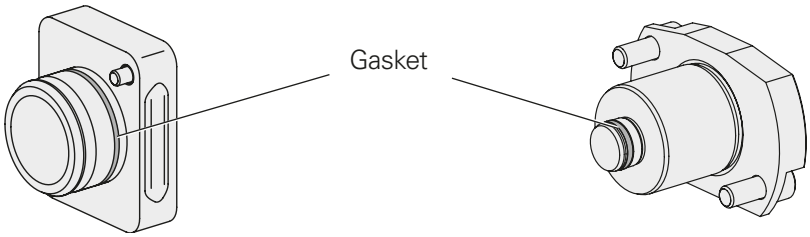
Blanking plug

The machine may be operated only when all unused tool stations are closed with blanking plugs.

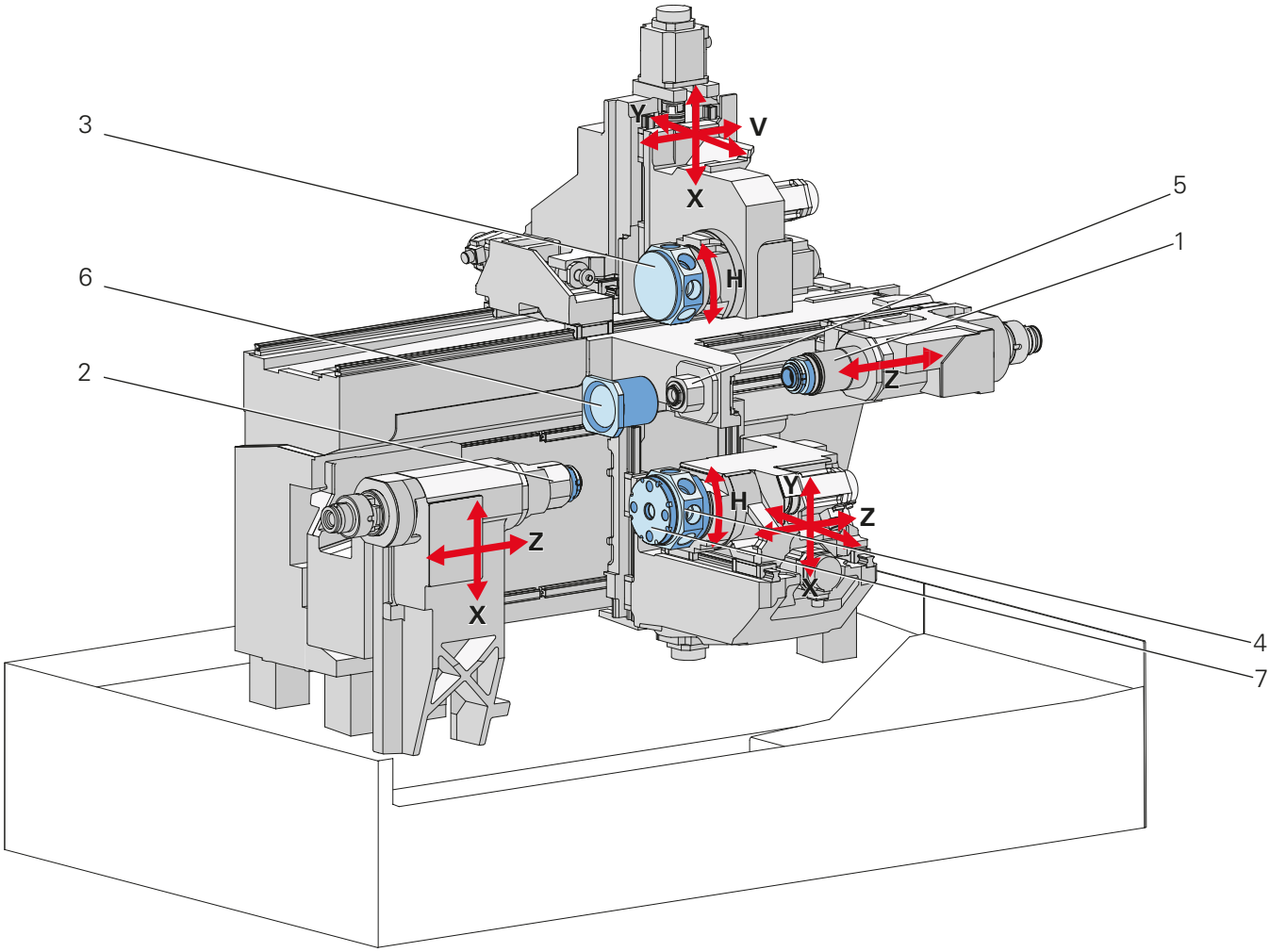
A limited number of blanking plugs is included.
Additional plugs must be ordered separately.

The sealing rings on the blanking plugs must be inspected regularly for damage. Replace any damaged sealing ring.

Tool turret **Back working attachment**



Modular system of the TRAUB TNL20-9



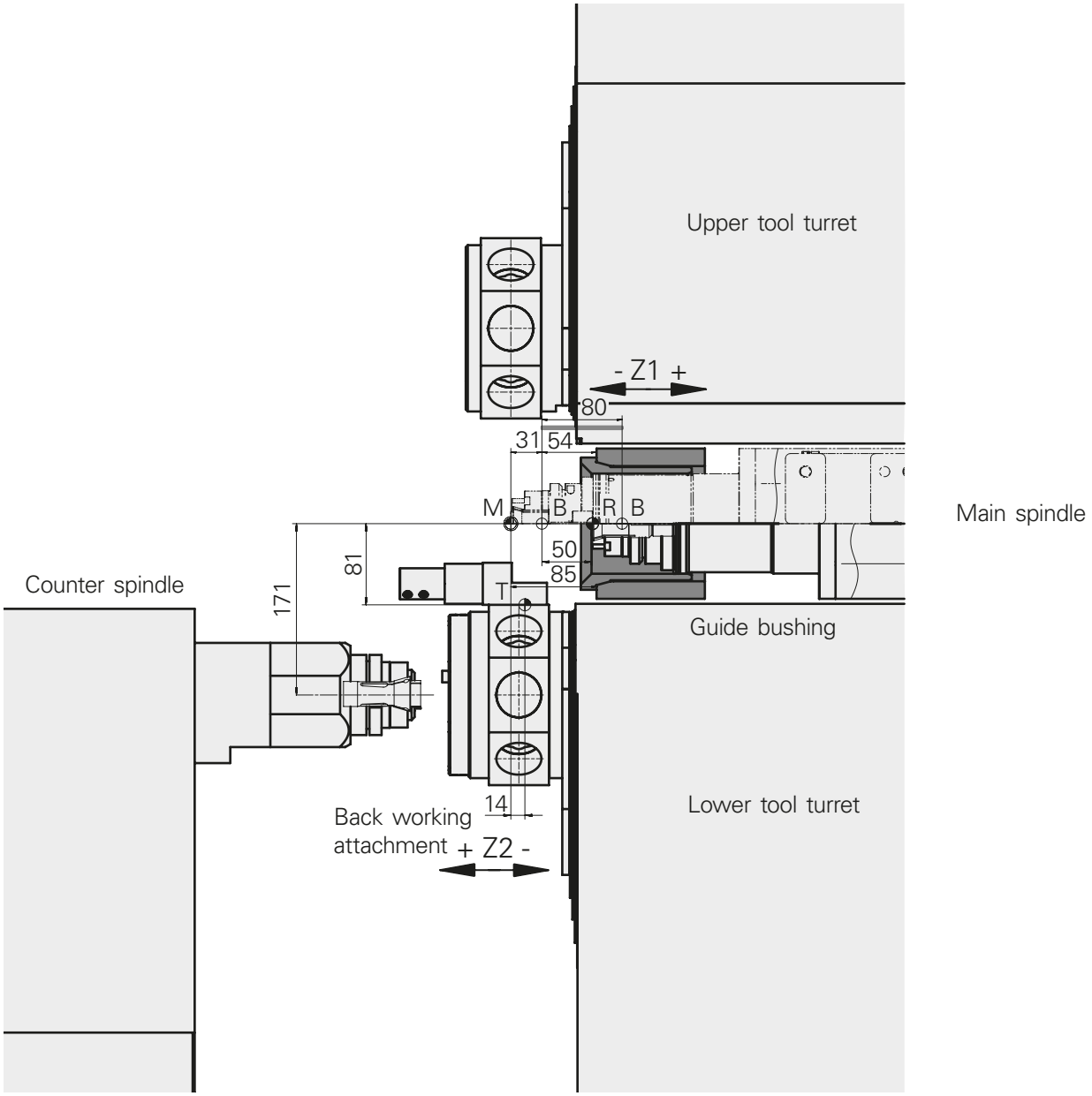
1 Main spindle - Z
2 Counter spindle - XZ
3 Upper tool turret - XYZH
4 Lower tool turret - XYZH
5 Guide bushing
6 Guide sleeve
7 Back working attachment, 4x

Working area TRAUB TNL20-9

Fixed headstock turning, workpiece flushing

Tool turret 2 on station 2

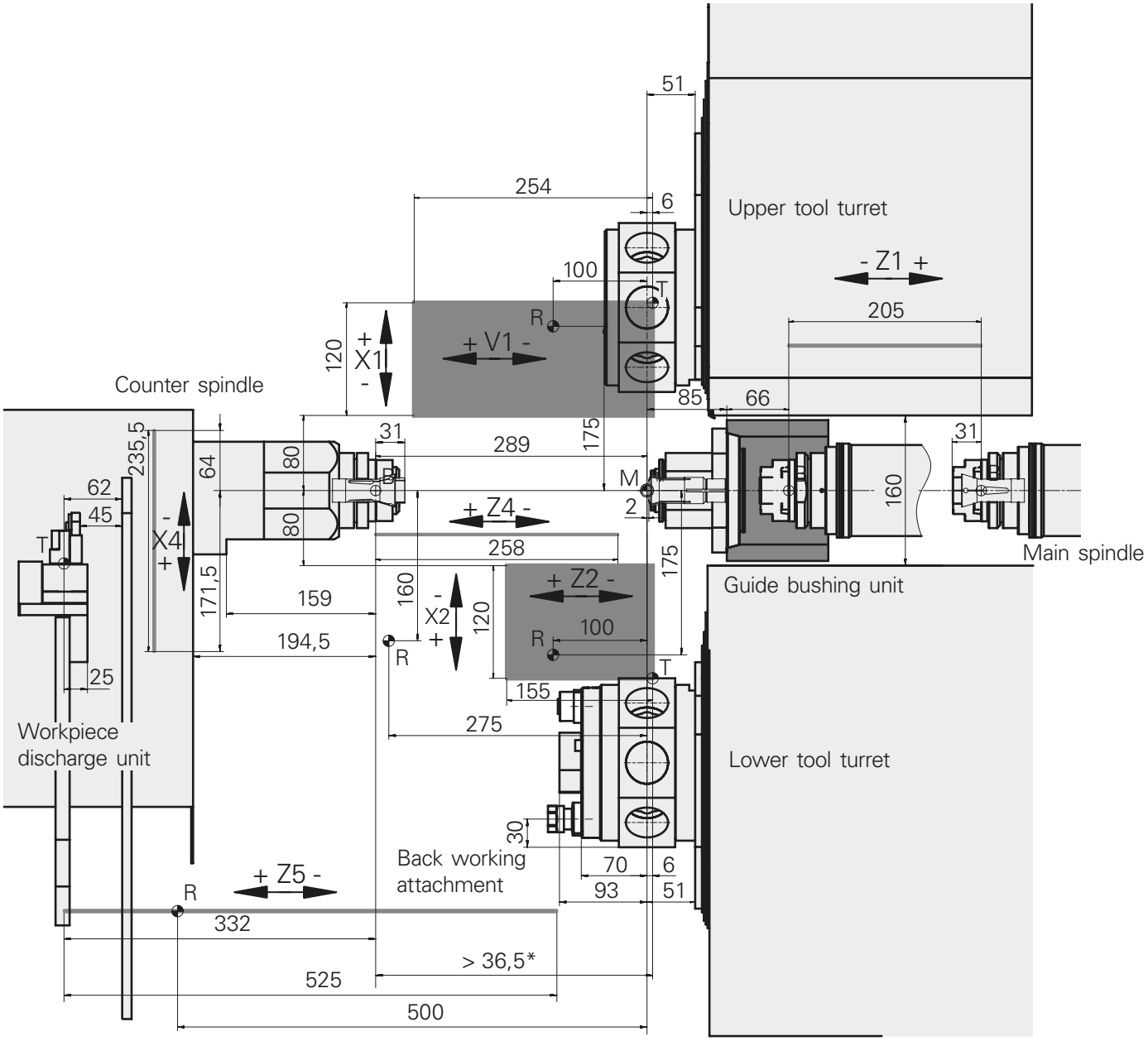
- T = Workpiece carrier zero point
- B = Reference point
- R = Reference point
- M = Machine zero point



Working area TRAUB TNL20-9

Sliding headstock turning

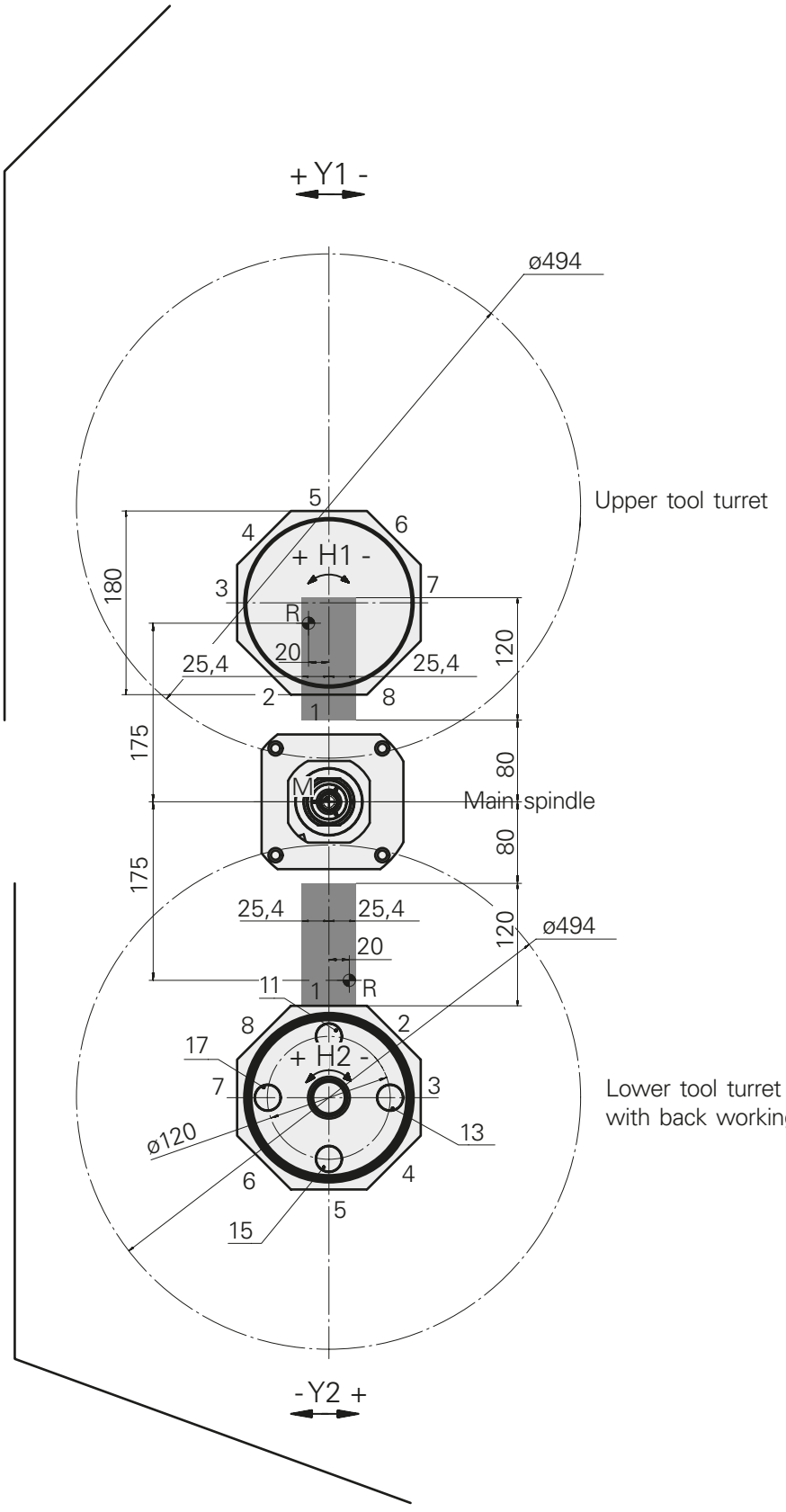
- T = Workpiece carrier zero point
- B = Reference point
- R = Reference point
- M = Machine zero point



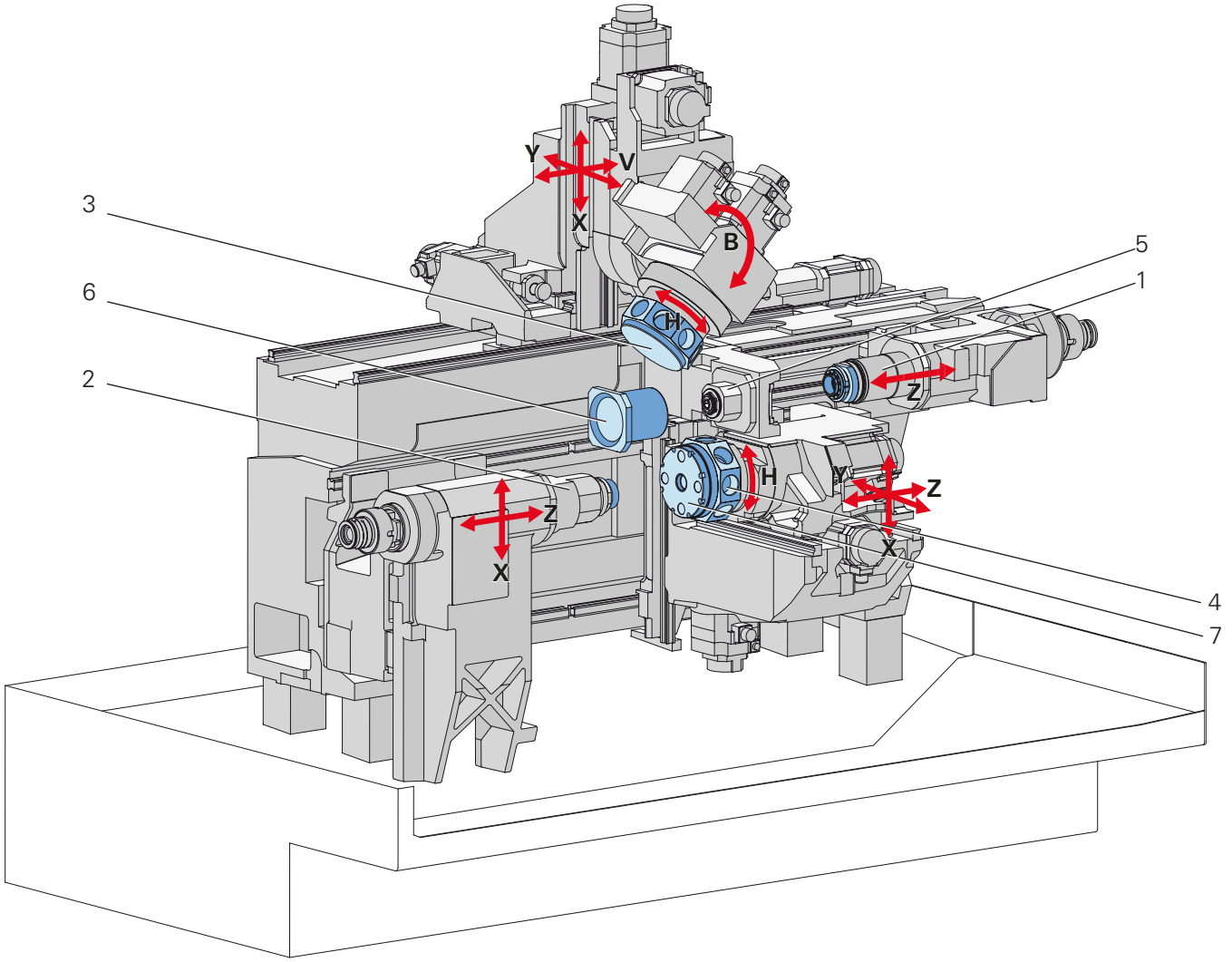
* The total travel distances shown are partially restricted by collision monitoring of the subsystems among each other.

Working area TRAUB TNL20-9

Side view



Modular system of the TRAUB TNL20-9B



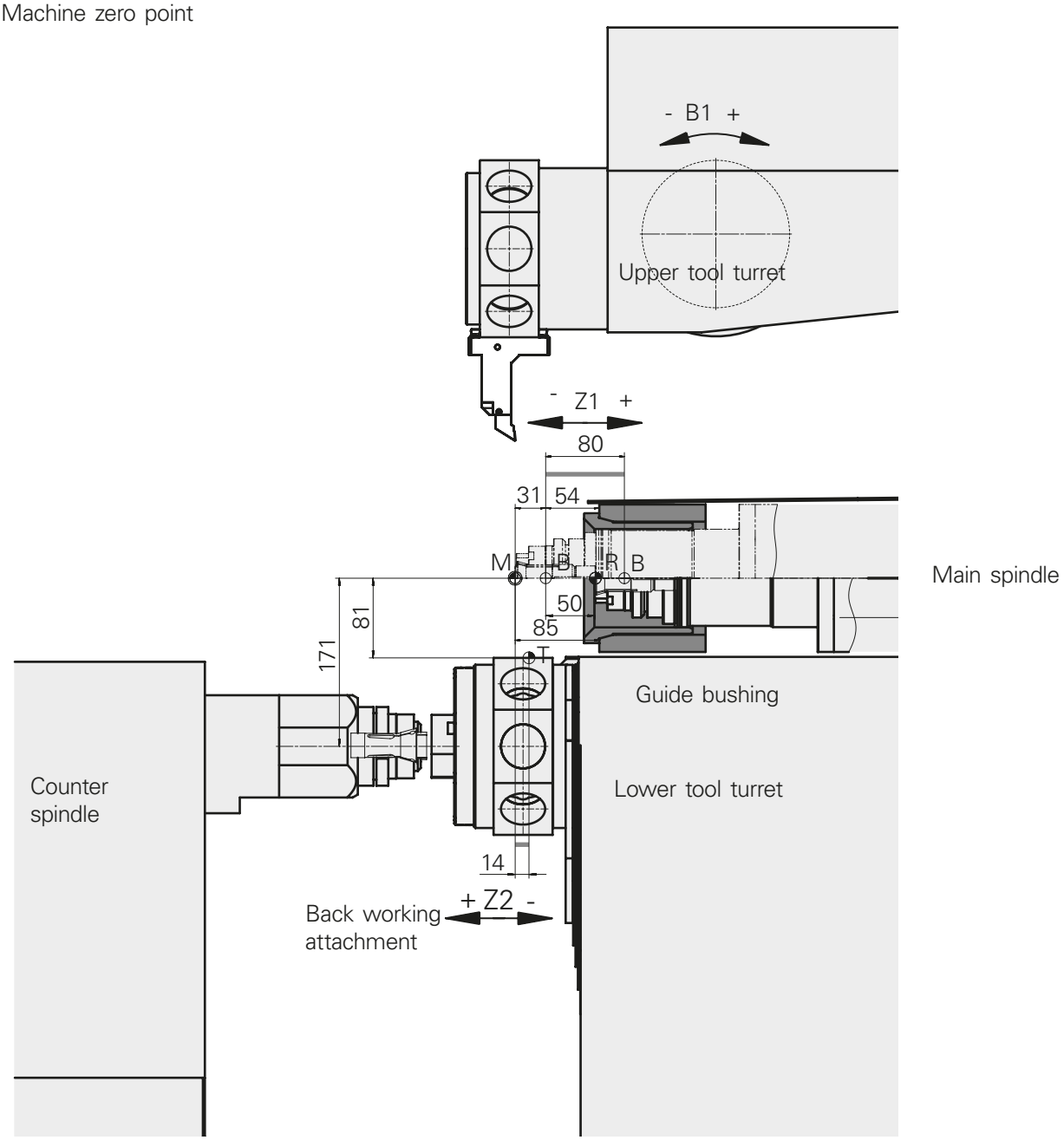
1 Main spindle - Z
2 Counter spindle - XZ
3 Upper tool turret - XYZHB
4 Lower tool turret - XYZH
5 Guide bushing
6 Guide sleeve
7 Back working attachment, 4x

Working area TRAUB TNL20-9B

Fixed headstock turning, workpiece flushing

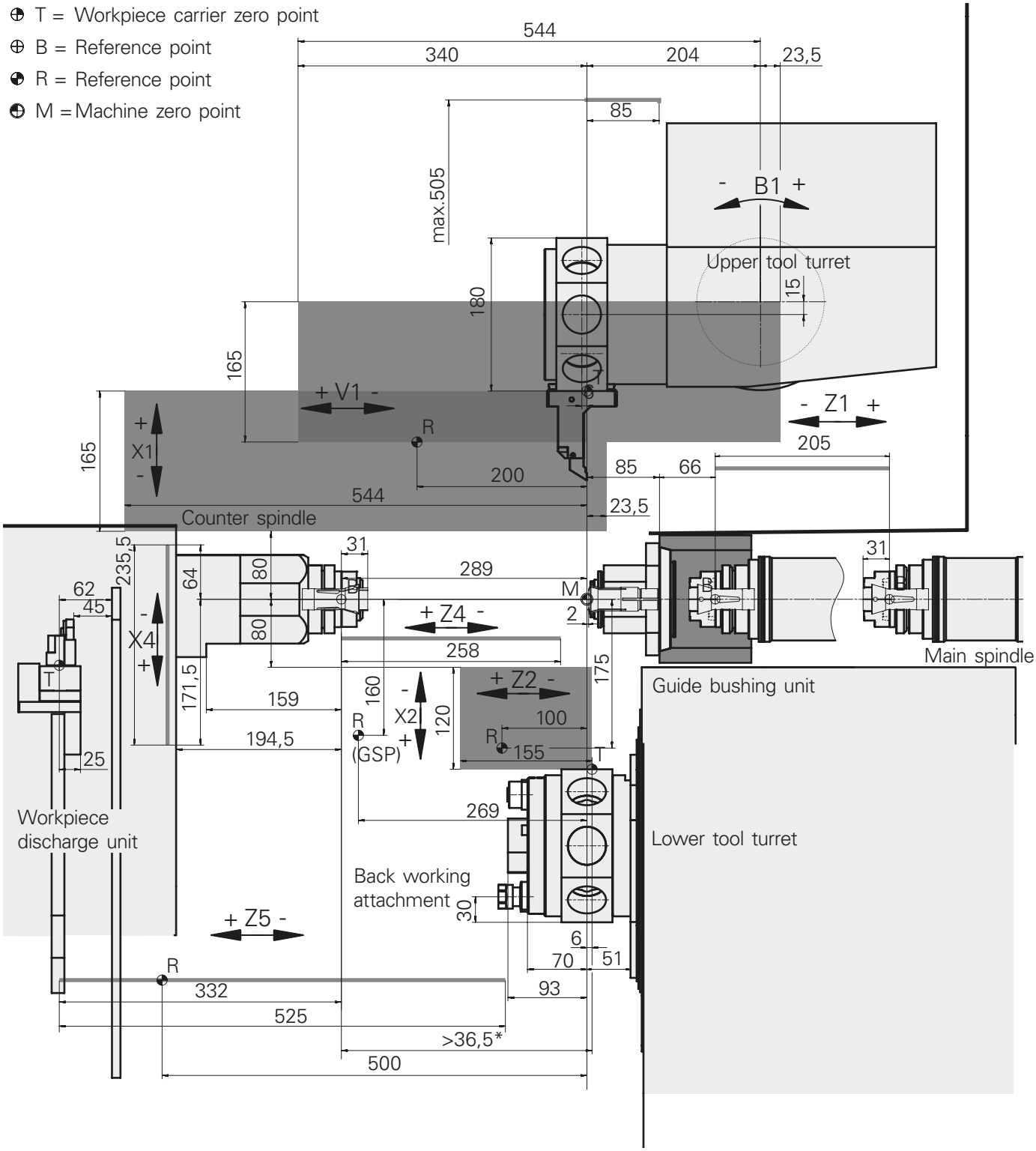
Tool turret 2 on station 2

- T = Workpiece carrier zero point
- B = Reference point
- R = Reference point
- M = Machine zero point



Working area TRAUB TNL20-9B

Sliding headstock turning

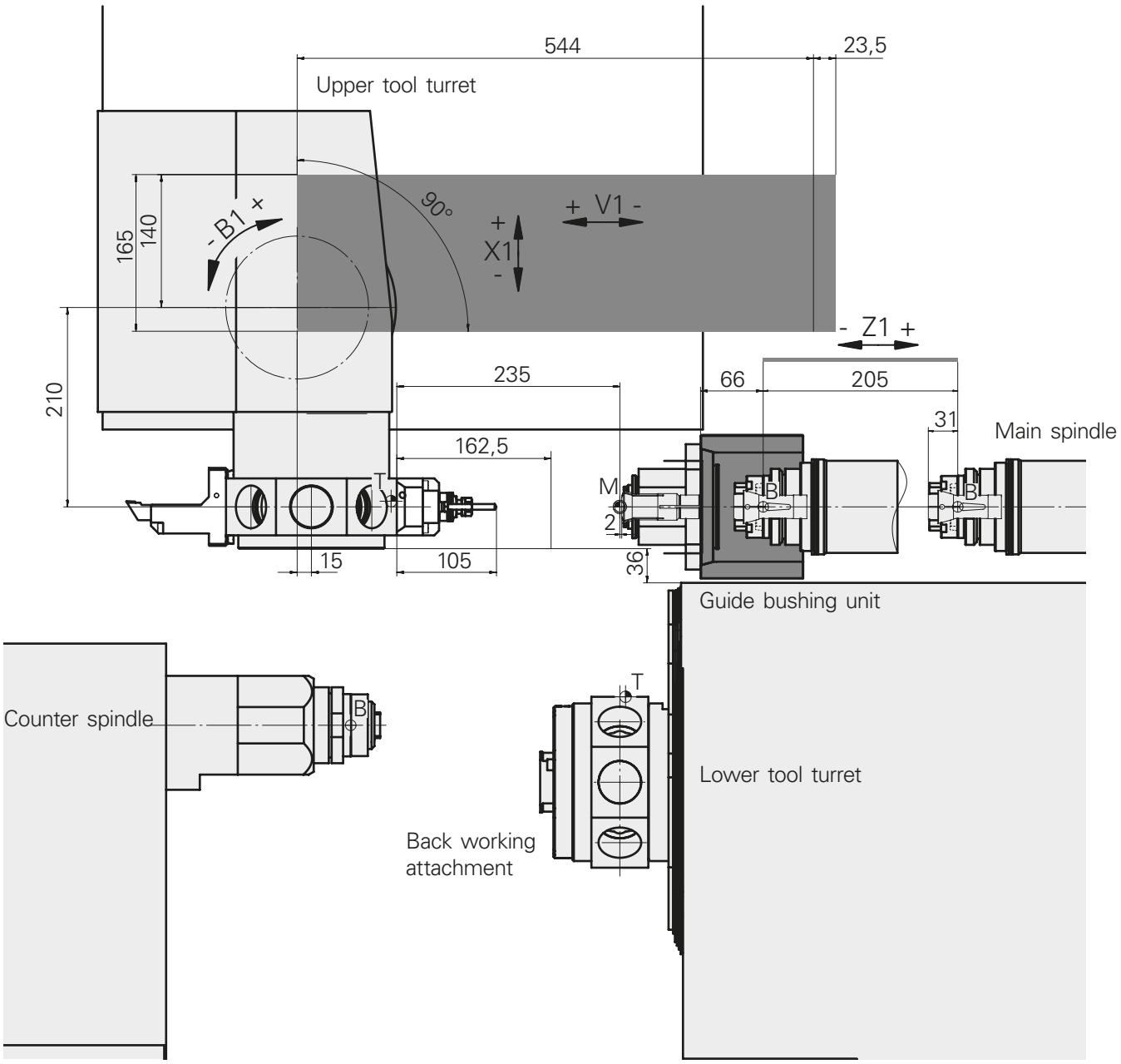


* The total travel distances shown are partially restricted by collision monitoring of the subsystems among each other.

Working area TRAUB TNL20-9B

B-axis -90°, machining to main spindle, sliding headstock turning

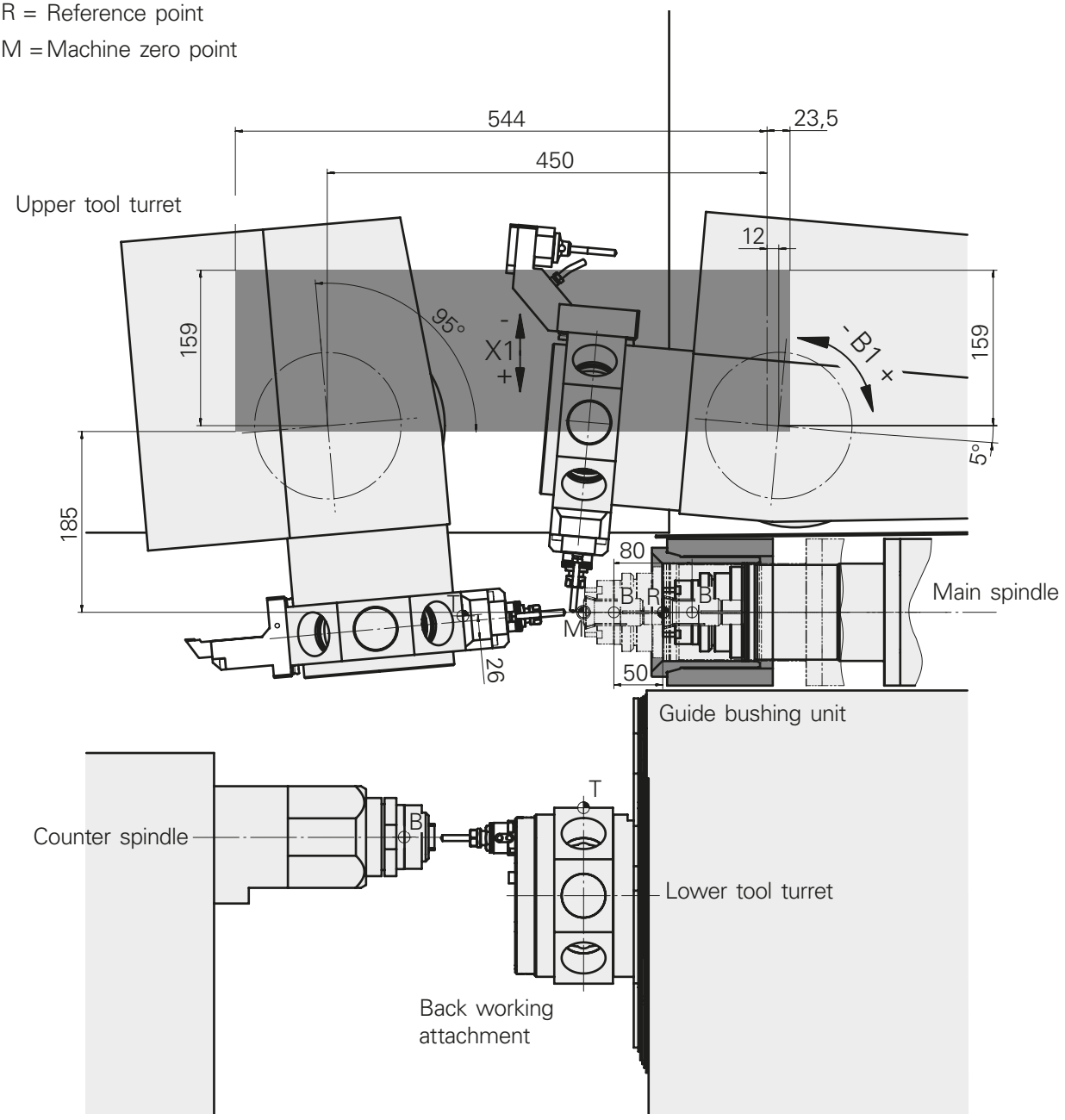
- T = Workpiece carrier zero point
- B = Reference point
- R = Reference point
- M = Machine zero point



Working area TRAUB TNL20-9B

B-axis 5°/-95°, machining to main spindle, sliding headstock turning

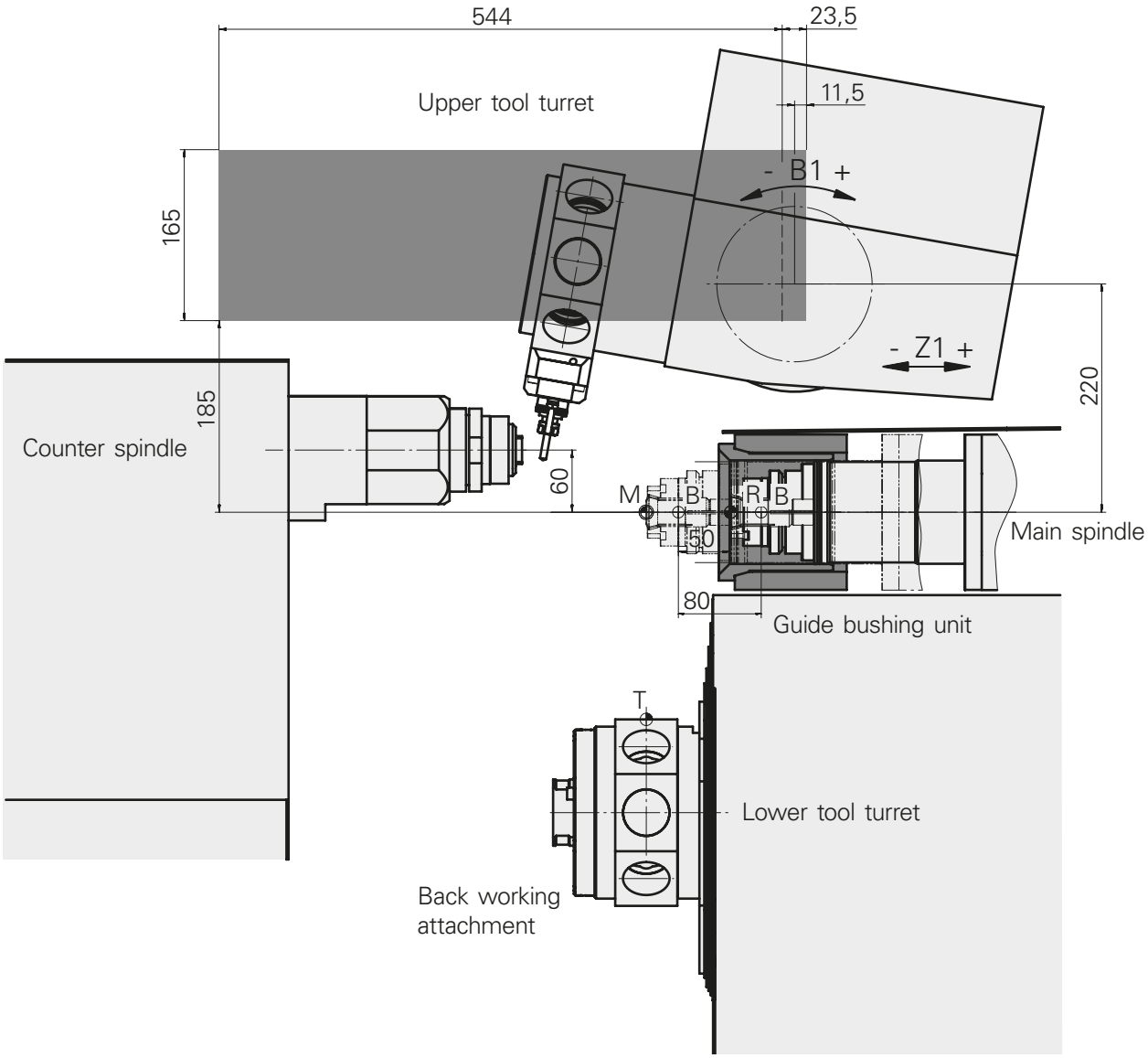
- T = Workpiece carrier zero point
- B = Reference point
- R = Reference point
- M = Machine zero point



Working area TRAUB TNL20-9B

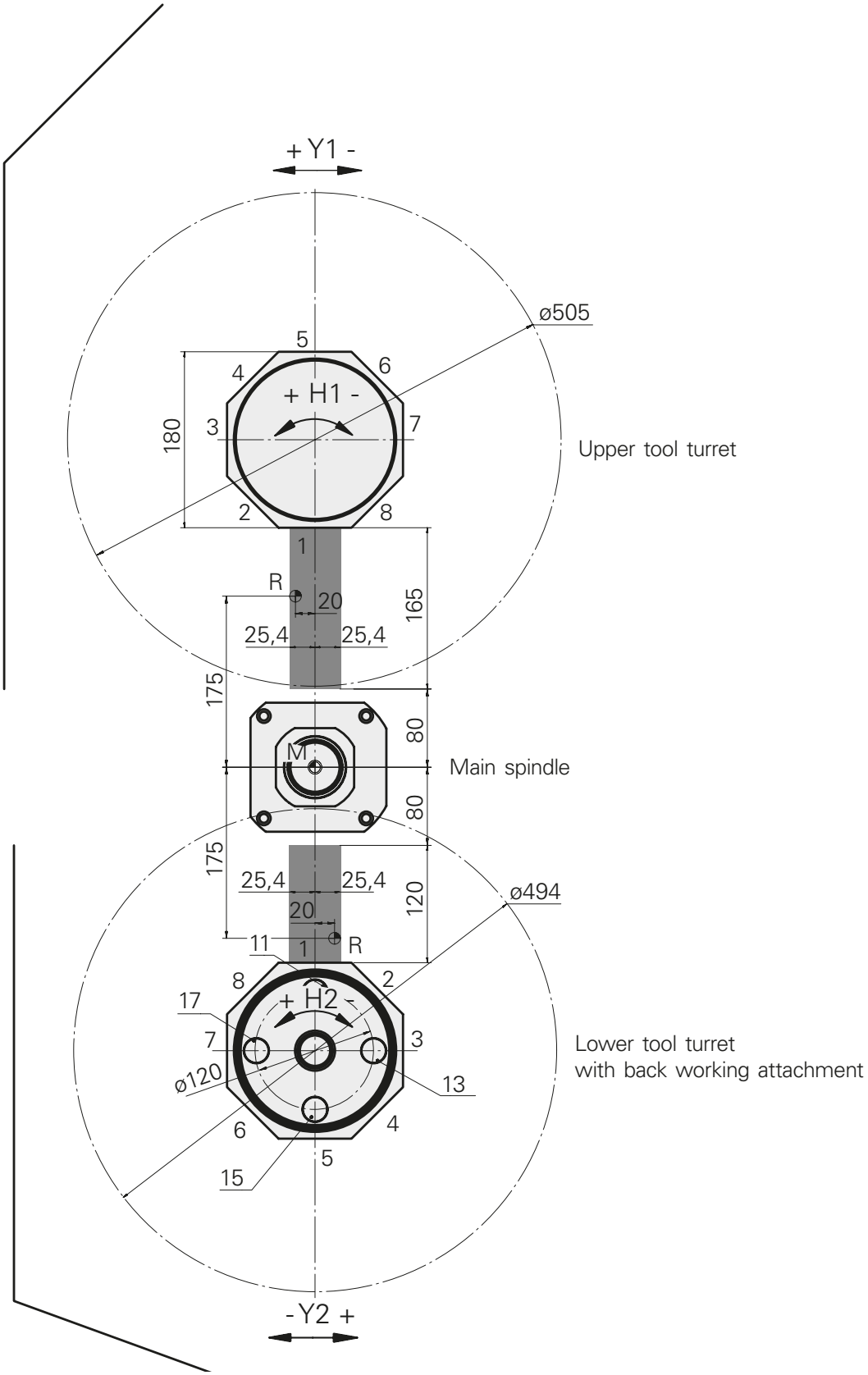
B-axis 10°/-95°, machining to main spindle, sliding headstock turning

- T = Workpiece carrier zero point
- B = Reference point
- R = Reference point
- M = Machine zero point



Working area TRAUB TNL20-9B

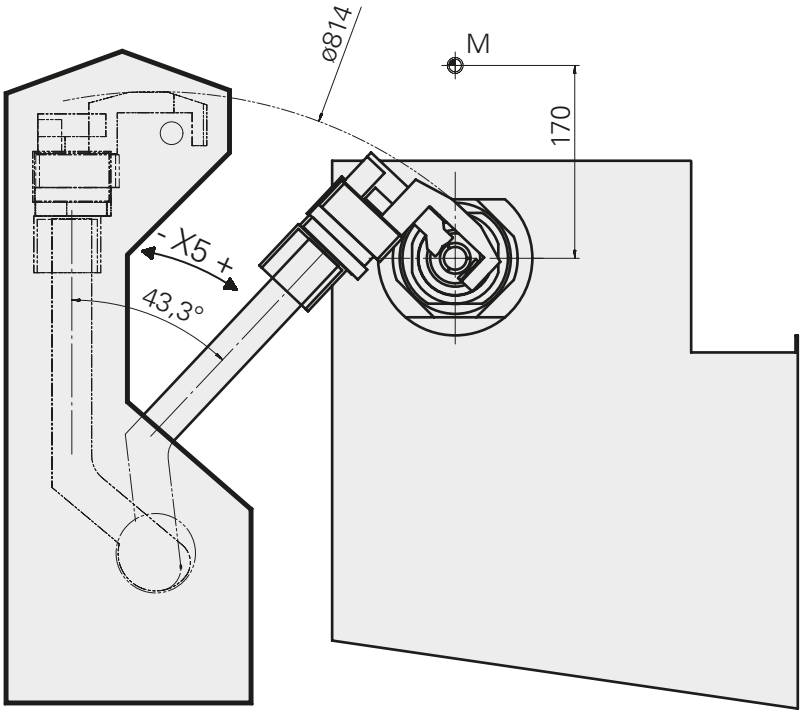
Side view



Workpiece removal unit

Gripping position

Counter spindle X +170

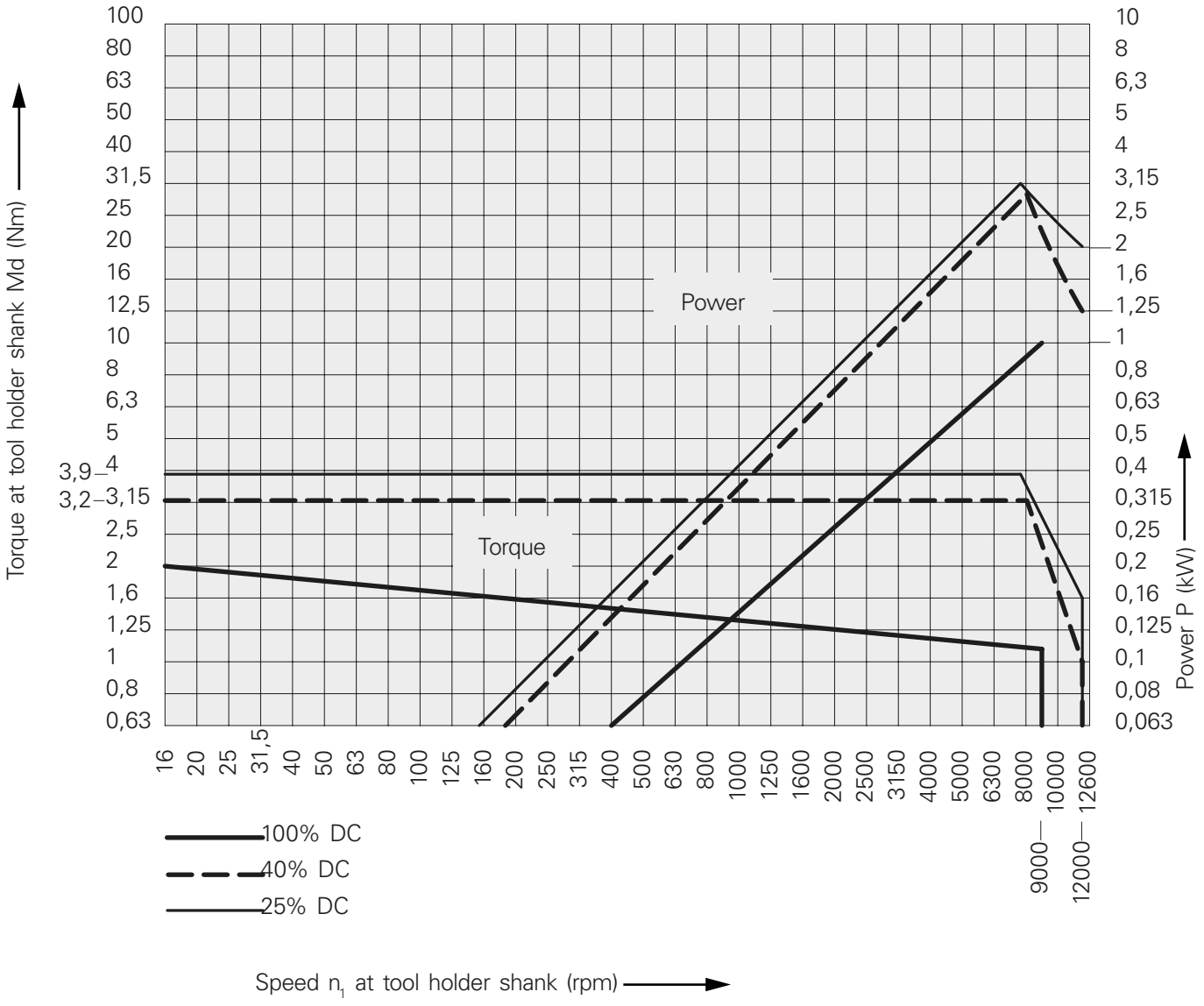


Performance diagram

Live tools, upper/lower tool turrets, single drive

Speed range 0-8000 rpm

For information on how to use the diagram, see Chapter "Technical Information".

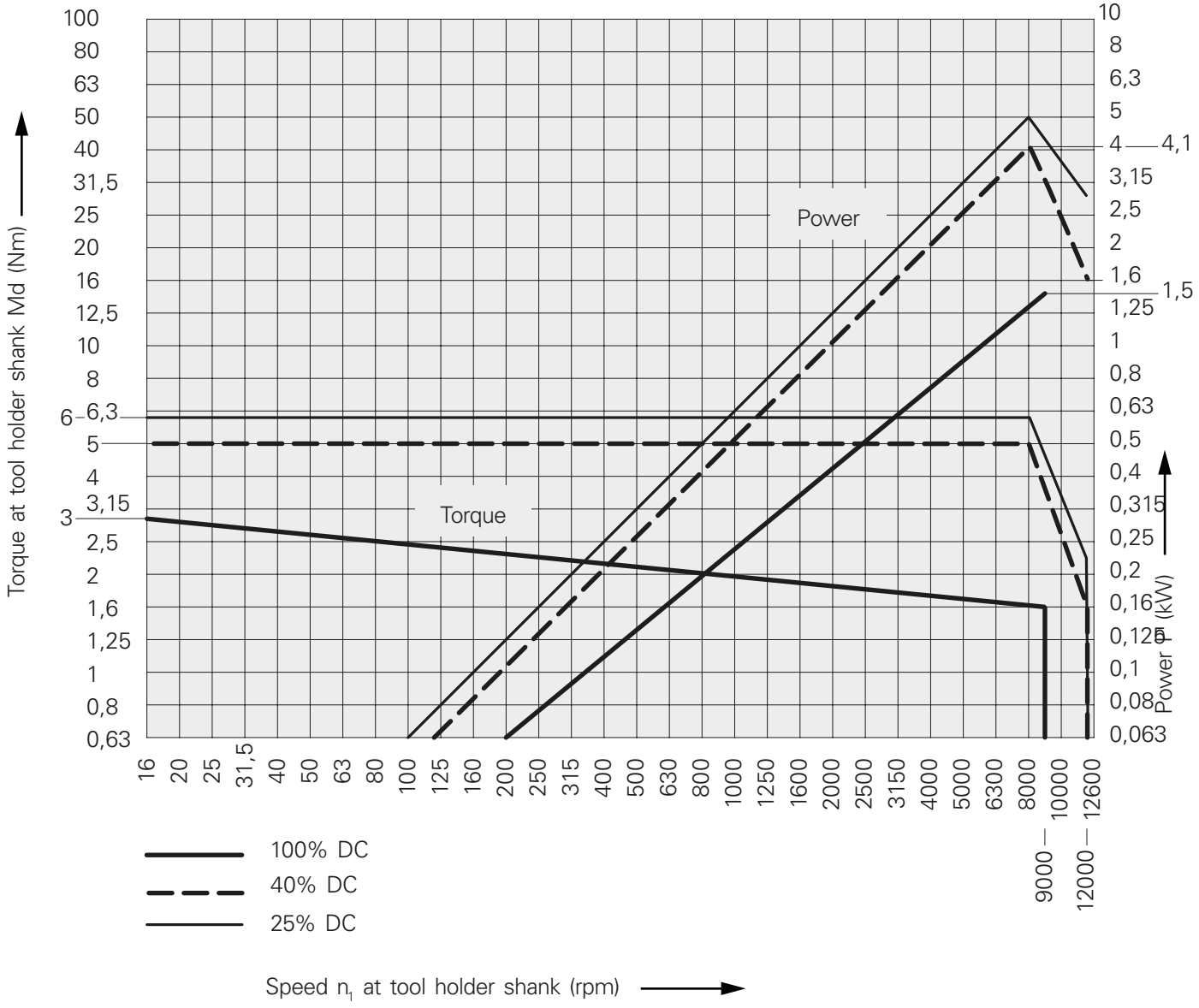


Performance diagram

Live tools, upper/lower tool turrets, overall drive

Speed range 0-12000 rpm

For information on how to use the diagram, see Chapter "Technical Information".

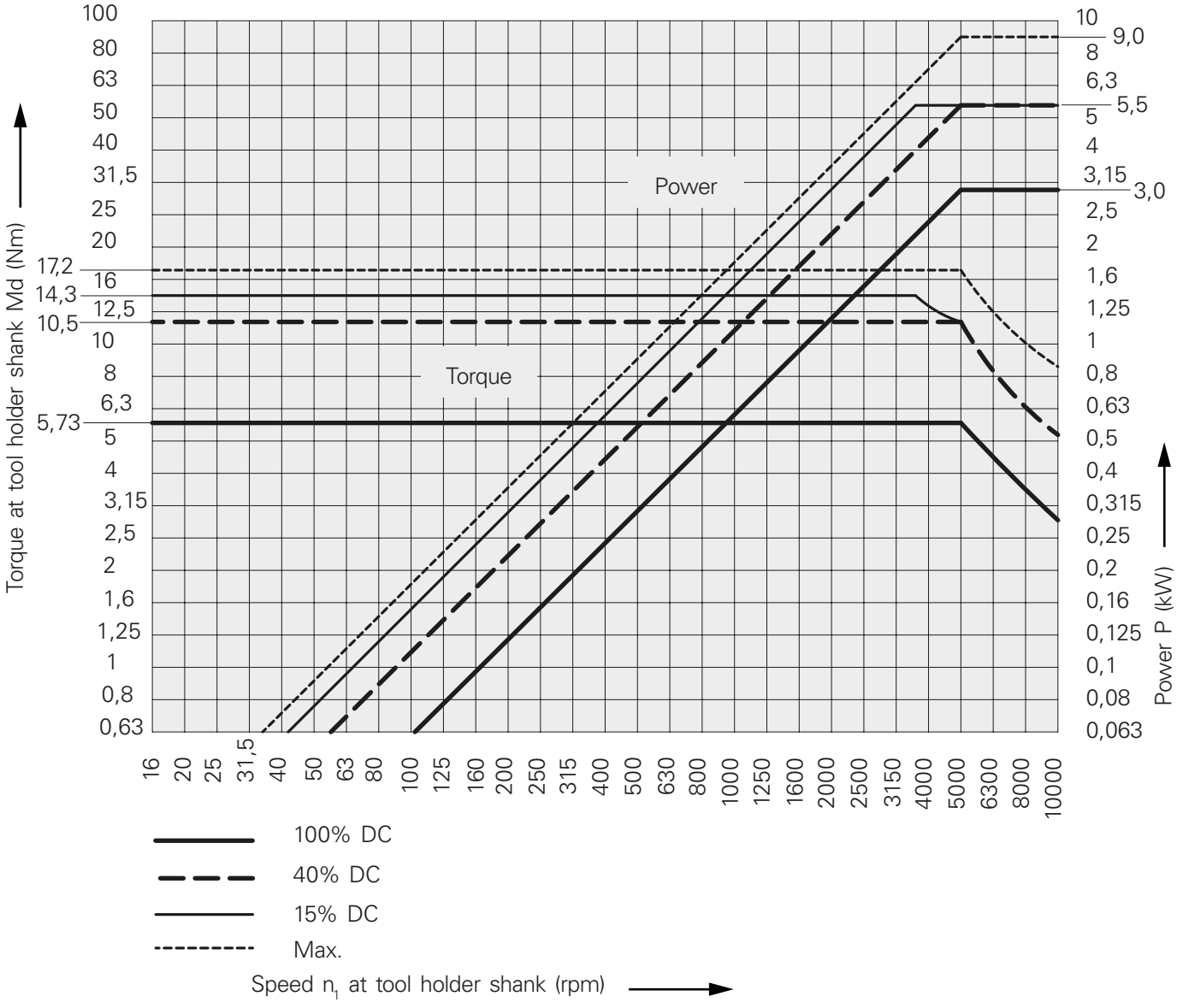


Performance diagram

Main spindle and counter spindle

Speed range 0-10000 rpm

For information on how to use the diagram, see Chapter "Technical Information".



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