



TCH SERIES

TWO-AXIS
MILLING
HEADS



DIRECT-DRIVE MOTION TECHNOLOGY

TWO-AXIS MILLING HEADS TCH SERIES

TECHNAI Two-Axis Milling Heads with Electro-spindle

Recommended for new generation milling machines with horizontal or vertical axis, intended to take advantages by 5 axis machining strategies: full 5 axis and/or 3+2 axis machining process techniques are made possible by the integration of the TCH milling heads.

The TCH series is expressly designed for following machining fields:
Mould & Die, Injection mold, Aerospace parts and general Mechanics.

TCH MODULAR CONCEPT DESIGN

HEAD STRUCTURE

All the TCH Head are designed with an innovative concept of "open frame fork structure" that is completed with the assembly of function modules to realize the rotary axes:

THE "A" AXIS

is actuated by two drive modules on both side of the Electro-spindle. This full symmetric design and the integrated water cooling system installed on each torque motor, allow an outstanding geometrical and thermal stability that improve the machining accuracy.

THE "C" AXIS drive module, is positioned at the top of the Fork head's structure with the fixing interface to the machine. On board of this unit is also located the cable & piping supplies system to be connected at the machine supplies.

The following components are included on each drive's module:

- A dedicated Technai Direct-Drive torque motor.
- High rigidity Bearing
- Integrated feedback encoder
- Hydraulically operated clamping system
- Integrated water cooling system

TCH- 13H

TCH 13 H is compact like the heads with single arm but with the advantage of the greater rigidity of the fork structure which allows to support the spindle on both sides. Excellent price-performance-precision ratio, it is suitable for receiving Electro-spindles with body up to D180mm.



TCH- 15

The TCH 15 is the small-medium size head with a perfectly symmetrical fork structure, it is suitable for receiving Electro-spindles with body up to D190mm. TCH 15 expresses a new up-grade of excellence of Technai's Direct Drive technology and is intended for applications that require maximum precision and dynamic performance.



TCH- 19

TCH 19 head is designed to equip mold and die machine tools, particularly suitable for plastic-injection mold and die in which the slim and penetrating electro spindle body structure suits the application at best. The superior axis dynamic and the high quality of machined surfaces finishing are just two of TCH-19 many strengths.



TCH- 20

TCH 20 head is characterized by a compact structure which integrates the C-axis Direct Drive motor in the fork structure. Making this product suitable for a wide range of machining application. TCH 20 head combines the high quality of Technai torque motors with a high precision mechanical execution and assembly.



TCH- 25

TCH25-PI-Greco "π series" is Technai's medium-sized head and is characterized as an eclectic platform suitable for configuring a wide range of specialized solutions: from general mechanics to aerospace machining or in the manufacturing process of molds and dies.



TCH- 30

TCH 30 head is designed to equip heavy 5-axis machines for high-productivity processes and represents the best balance between power and dynamic. TCH 30 is characterized by a very stiff fork structure and its Direct Drive motors are specially designed for heavy milling "live axis" machining.



TCH- 40-50

TCH-U 40-50 is a general purpose head, designed for the mechanical industry and optimized for undercut milling operations. Its Direct Drive technology allows 3+2 seamless axis orientation and clamping, as well as superb full 5-axis continuous machining capability.



TWO-AXIS MILLING HEADS TCH SERIES | TCH-13H

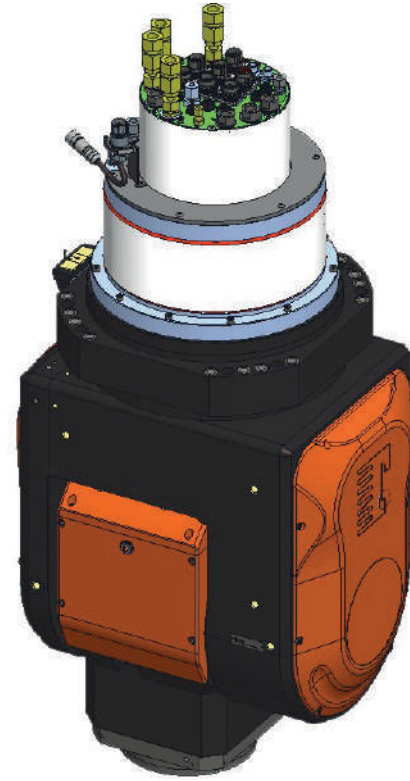
TCH 13 H is the most compact two-axis head with a fork structure offered by Technai Optimal price-performance-precision ratio, accepts electric spindles with a body of up to D 180mm with a torque range of 35 - 60 Nm.

Designed to excel in mould finishing, it is distinguished by optimal thermal stability.

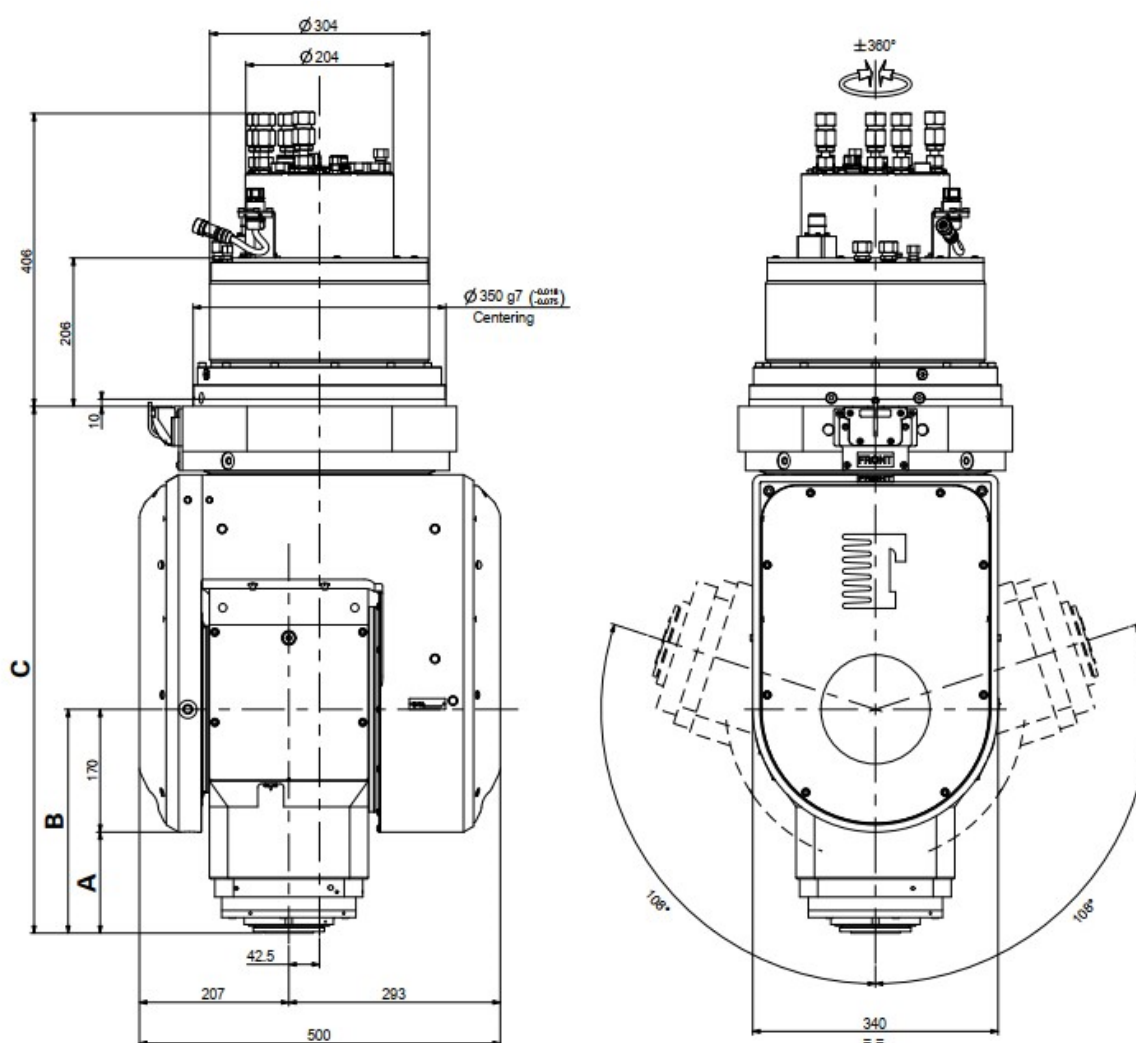
It is best used when equipped with high quality electric spindles. It has Direct Drive motors on both axes that allow for optimal fluidity and excellent precision in executing the finishing trajectories with controlled axes (full 5-axis mode).

It has powerful and rigid axis clamping devices to allow robust and stable processing with oriented and clamped axes (5-axis 3+2 mode).

It is equipped with absolute encoders on both axes (EnDat protocol; DriveCliqu, Fanuc).



TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	282	321
Maximum torque	Nm	576	580
Clamping torque	Nm	2000	3000
Hydraulic clamp rated pressure (Max)	bar	80(100)	60(100)
Feedback encoder		Abs. encoder Heidenhain - EnDat. 2.2	Absolute encoder AMO - EnDat. 2.2
Accuracy	arcsec	±2,3"	±3"
Rotation angle	deg	±108°	±360°
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A63	HSK-A100
Maximum spindle speed	rpm	16000	12000
Power S1-100% (S6-40%)	kW	20 (25)	40 (50)
Torque S1-100% (S6-40%)	Nm	12 (15)	32 (40)
Bearing lubrication type		Oil/Air	Oil/Air
Spindle manufacturer/model		PERON SPEED PS-TCV-180	PERON SPEED PS-TCV-180
Coolant through shaft with rotary joint		Yes	Yes
Overall mass	kg	410	



ELECTROSPINDLE TYPE		
DIMENSION	HSK-A63	HSK-A100
A	140 mm	197,5 mm
B	310 mm	367,5 mm
C	730 mm	787,5 mm

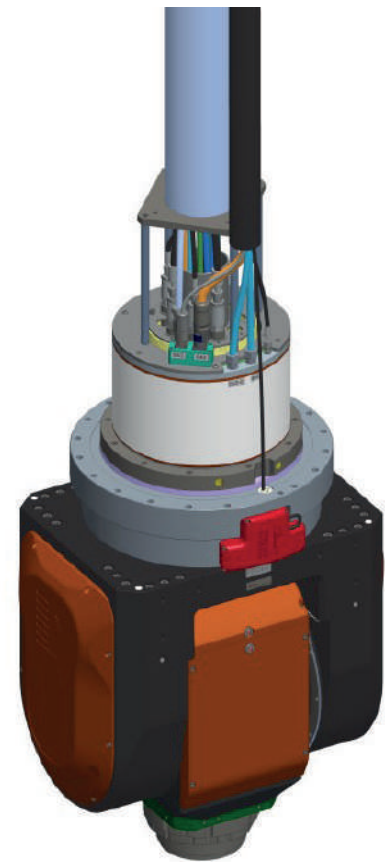
TWO-AXIS MILLING HEADS TCH SERIES | TCH-15

TCH 15 is the medium-small sized two-axis head with technical contents that reflect the state of the art and the experience of Technai in the design of Direct Drive heads.

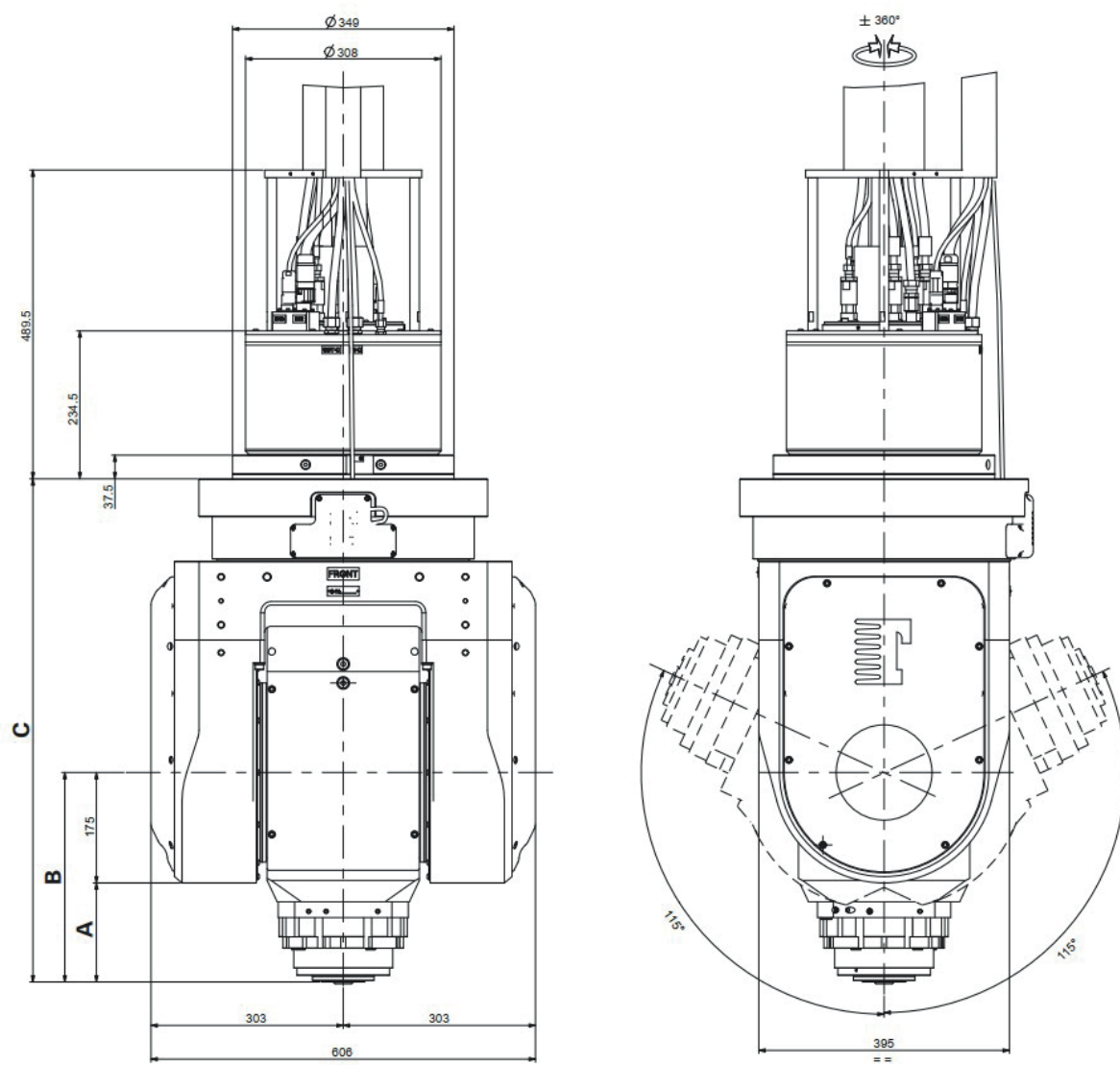
The structure is fork-shaped with a double motor on the A axis – perfectly symmetrical – and it adapts with a few variations to be configured when processing moulds or aluminium and composite components of aeronautical structures:

- To process moulds with an extended spindle body and an electric spindle of selected quality
- For “aerospace” processing in the most compact configuration and with a high power electric spindle
- An intake device and telescopic sleeve are available for composite processes
- The TCH 15 head reflects the experience acquired by Technai with the TCH 19 and TCH 20 models

The TCH 15 head accepts electric spindles with a body of up to D 190mm with a torque range of up to 100 Nm and an HSK A 63 or HSK A100 tool connection. It has Direct Drive motors on both axes that allow for optimal performance and fluidity with controlled axes (full 5-axis mode)



TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	564	480
Maximum torque	Nm	1152	873
Clamping torque	Nm	4000	4000
Hydraulic clamp rated pressure (Max)	bar	80(100)	80(100)
Feedback encoder		Abs. encoder Heidenhain - EnDat. 2.2	Absolute encoder AMO - EnDat. 2.2
Accuracy	arcsec	±3"	±3"
Rotation angle	deg	±115°	±360°
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A63	HSK-A100
Maximum spindle speed	rpm	24000	15000
Power S1-100% (S6-40%)	kW	42 (55)	50 (65)
Torque S1-100% (S6-40%)	Nm	67 (87,5)	95,5 (124)
Bearing lubrication type		Oil/Air	Oil/Air
Spindle manufacturer/model		HSD ES 510	HSD ES 510
Coolant through shaft with rotary joint		Yes	Yes
Overall mass	kg	510	



ELECTROSPINDLE TYPE		
DIMENSION	HSK-A63	HSK-A100
A	157 mm	192 mm
B	332 mm	367 mm
C	797,5 mm	832,5 mm

TWO-AXIS MILLING HEADS TCH SERIES | TCH-19

Two axis head with fork structure, optimized for mold and die machining on 5-axis machine tools; integrates modules with Technai Direct Drive motors on both axis, and is available with electrospindles up to 24.000 rpm and 50 kW, HSK-A63 or HSK-A100 tool holder. TCH 19 head is designed to equip big machines for mold and die machining, particularly suitable for plastic-injection mold and die in which the slim and penetrating electro spindle body structure suits the application at best.

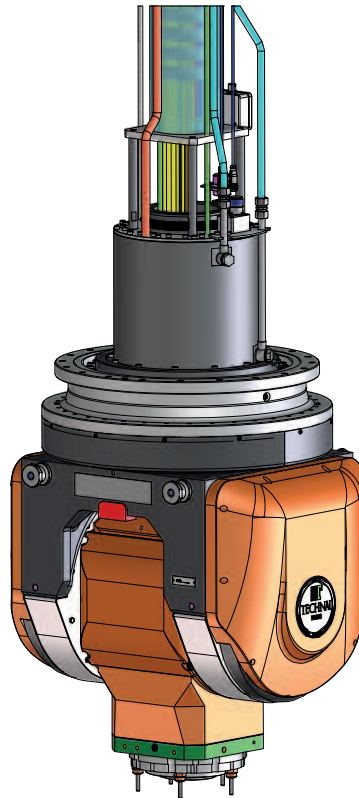
The requested features of mold and die machining manufacturers are the positioning precision of axis orientation and the firm axis clamping system, without geometrical distortions caused by clamping itself.

These the are main strenghts:

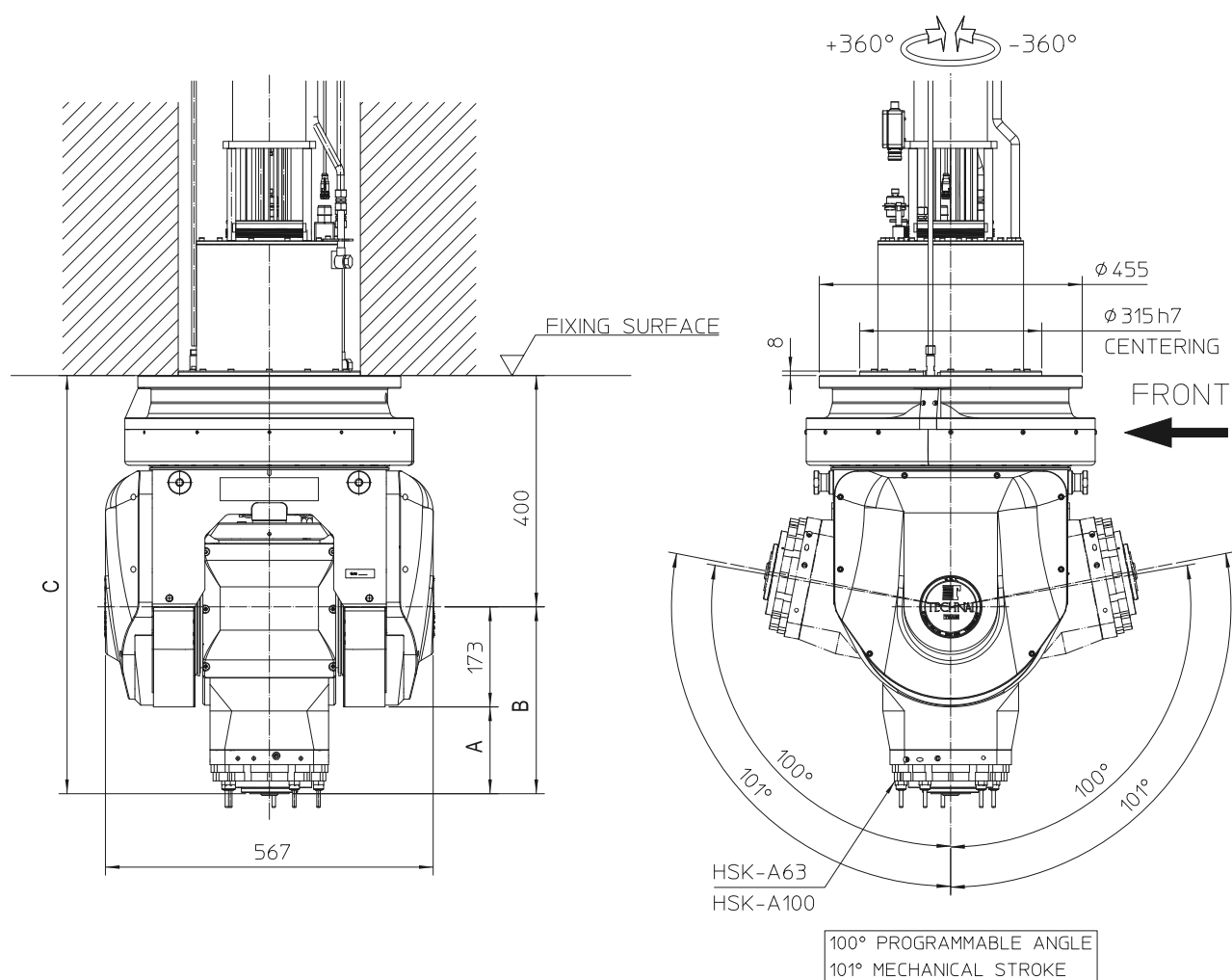
- Excellent axis dynamic high quality of machined finished surfaces.
- Thermal drift stability to obtain optimal and constant volumetric precision of machined surfaces.

TCH 19 head fulfills all these requirements thanks to a modular structure that combines the high quality of Technai torque motors with high precision mechanical execution and assembly.

Technai is proud to present the TCH heads series as the best synthesis of its long-term experience in machine tool industry.



TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	565	440
Maximum torque	Nm	1150	780
Clamping torque	Nm	3000	4700
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		Heidenhain RCn 2380 abs. EnDat	Incremental encoder AMO MHS
Accuracy	arcsec	±3"	±3"
Rotation angle	deg	±100°	±360°
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A63	HSK-A100
Maximum spindle speed	rpm	24000	15000
Power S1-100% (S6-40%)	kW	42 (55)	50 (67)
Torque S1-100% (S6-40%)	Nm	67 (87)	95 (124)
Bearing lubrication type		Oil/Air	Oil/Air
Spindle manufacturer/model		HSD ES510	HSD ES510
Coolant through shaft with rotary joint		Yes	Yes
Overall mass	kg	430	



ELECTROSPINDLE TYPE			
DIMENSION	HSK-A63 SHORT NOSE	HSK-A63 LONG NOSE	HSK-A100
A	150 mm	200 mm	185 mm
B	323 mm	373 mm	358 mm
C	723 mm	773 mm	758 mm

TWO-AXIS MILLING HEADS TCH SERIES | TCH-20

Two axis head with fork structure, optimized for 5-axis machines, integrates modules with Technai Direct Drive motors on both axis, and is available with electrospindles up to 24.000 rpm and 50 kW, HSK-A63 or HSK-A100 tool holder. TCH 20 head is designed to equip big 5-axis machines and shares the same electrospindles options of the TCH 19 head, but is characterized by a compact structure which integrates the C-axis Direct Drive motor in the fork structure.

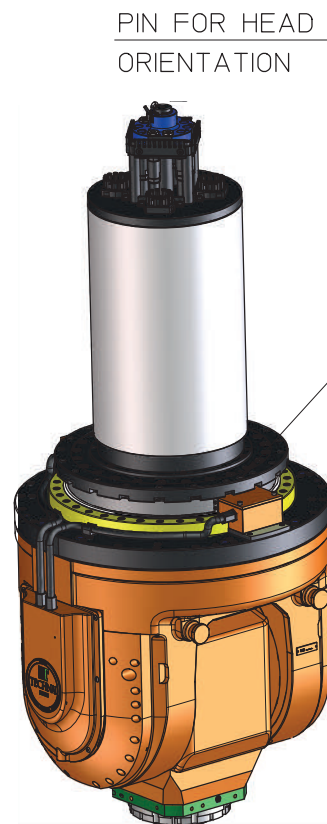
The short distance between the spindle nose and the A-axis makes the TCH 20 suitable for a wide range of machining application:

- aluminum structural parts for aerospace industry
- big mold and die machining for sheet-metal forming in automotive industry
- gears and turbines machining

With reference to mold & die sector, the key factors are the positioning precision of axis orientation and the firm axis clamping system, without geometrical distortions caused by clamping itself.

The key points are:

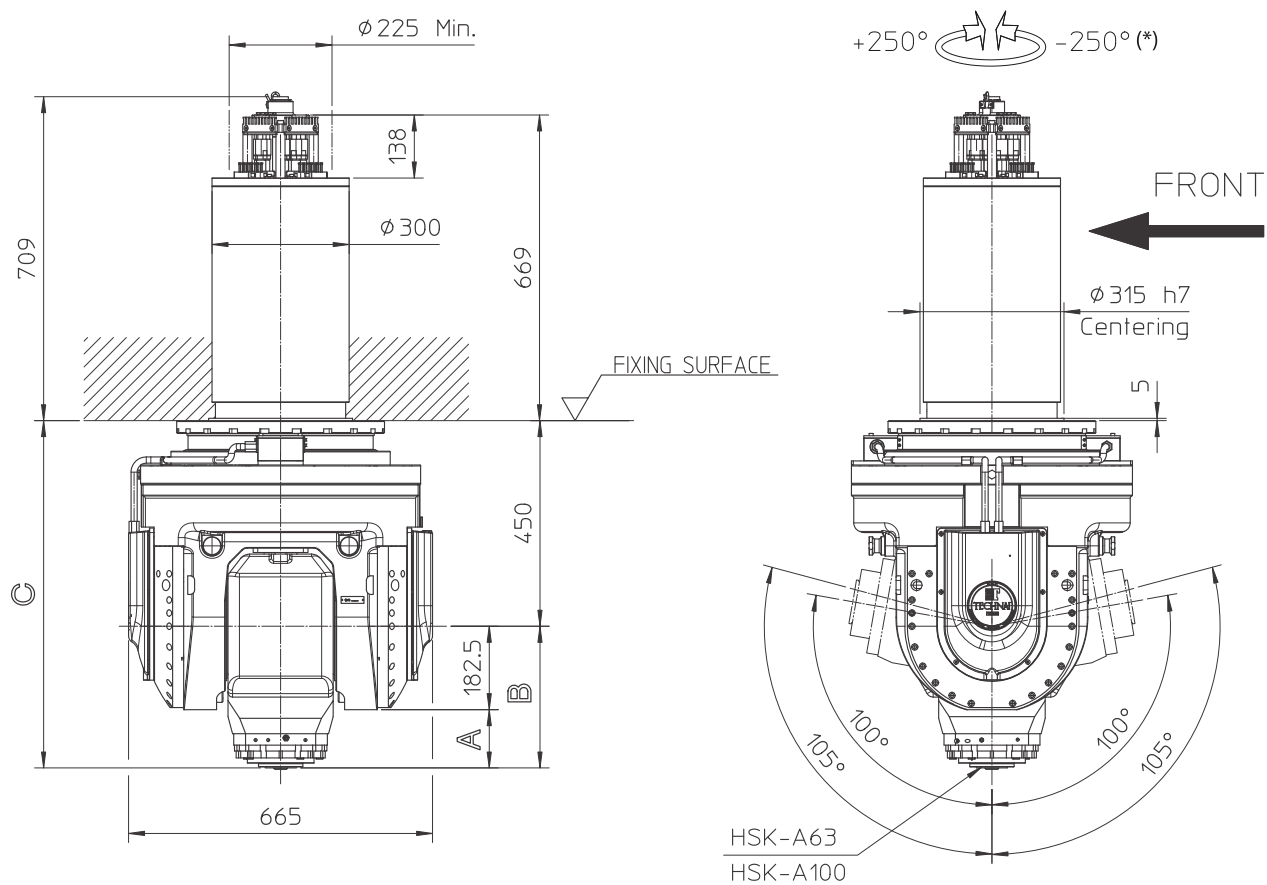
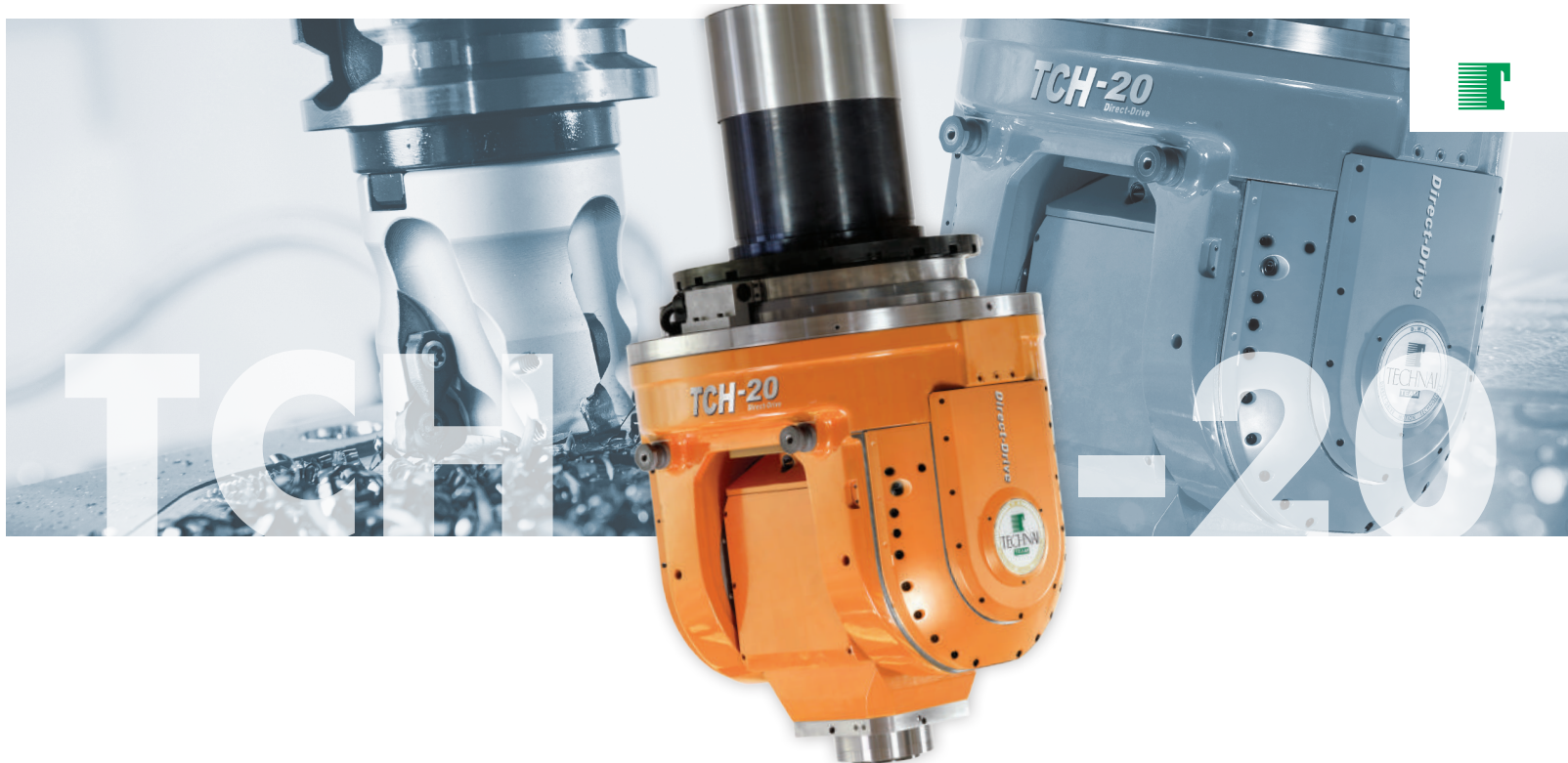
- Excellent axis dynamic and high quality in milled surfaces, both in roughing and finishing trajectories execution.
- Thermal drift stability in order to obtain optimal and constant volumetric precision of the milled surfaces.
- TCH 20 head fulfills all these requirements thanks to a modular structure that combines the high quality of Technai torque motors with a high precision mechanical execution and assembly.



Technai is proud to present the TCH heads series as the best synthesis of its long-term experience in machine tool industry.

TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	645	800
Maximum torque	Nm	1290	1520
Clamping torque	Nm	4000	6000
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		Heidenhain RCn 2380 abs. EnDat	Incremental encoder AMO MHS
Accuracy	arcsec	±3"	±3"
Rotation angle	deg	±100°	±250° (*)
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A63	HSK-A100
Maximum spindle speed	rpm	24000	15000
Power S1-100% (S6-40%)	kW	42 (55)	50 (67)
Torque S1-100% (S6-40%)	Nm	67 (87)	95 (124)
Bearing lubrication type		Oil/Air	Oil/Air
Spindle manufacturer/model		HSD ES510	HSD ES510
Coolant through shaft with rotary joint		Yes	Yes
Overall mass	kg	600	

* +/- 360° C-Axis rotation available with different configuration



100° PROGRAMMABLE ANGLE
105° MECHANICAL STROKE

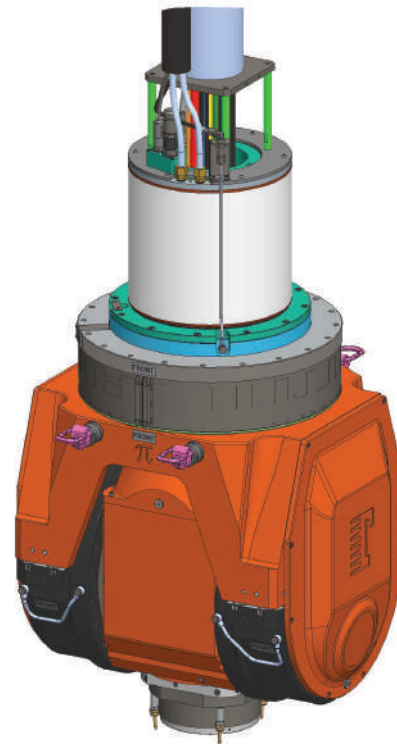
ELECTROSPINDLE TYPE		
DIMENSION	HSK-A63	HSK-A100
A	127.5 mm	162.5 mm
B	310 mm	345 mm
C	760 mm	795 mm

EXCELLENT PERFORMANCE AT 4th GENERATION

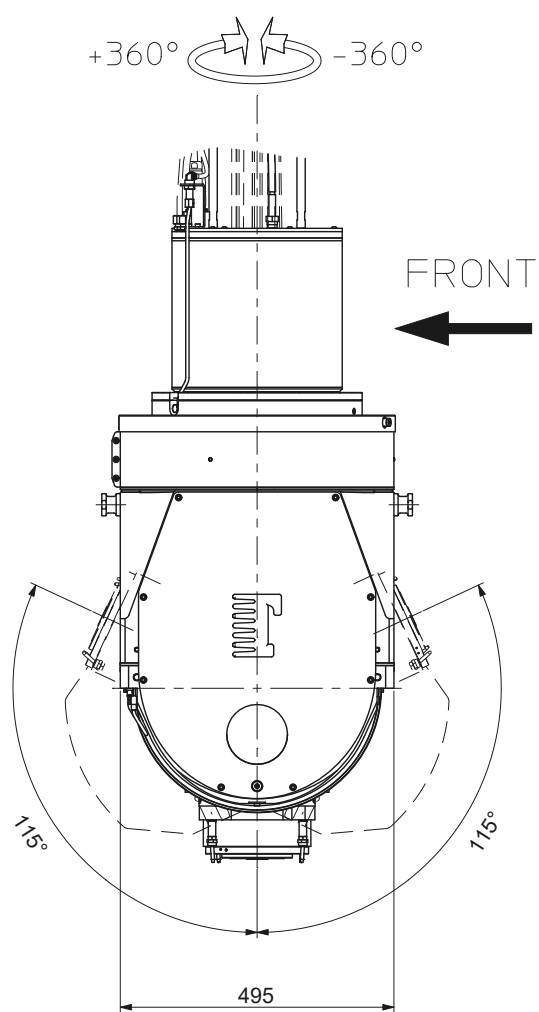
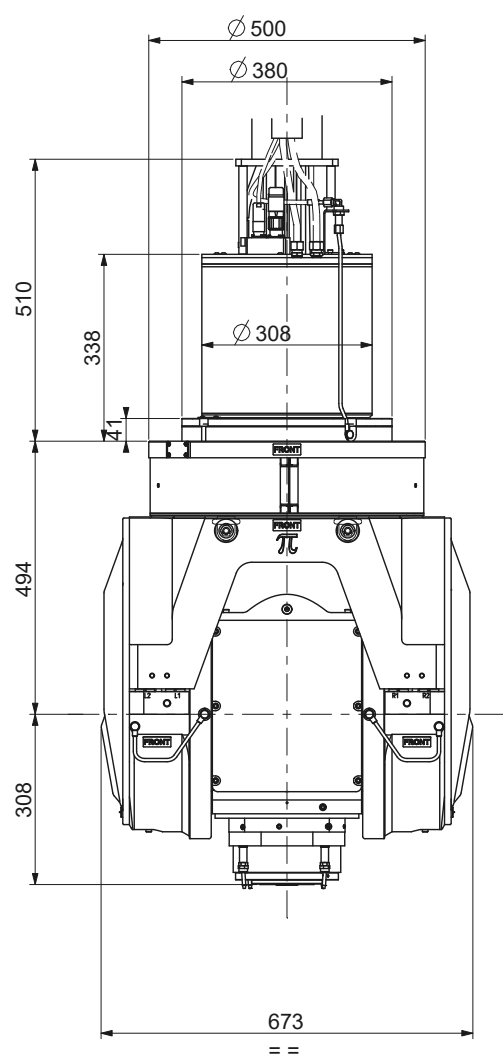
With the PI-Greco series, Technai Team reaches the fourth evolution-generation of milling heads with orthogonal rotary axes, integrating Torque motors and our 25 years expertise on application activity.

The relevant design qualities of this new Heads series are:

- **Original and exclusive thermo-symmetric modular construction**
The structural nesting of functional modules allows an optimal stiffness and thermal control of the head.
- **Design available to integrate different Electro-spindle brands selected by the customer**
Technai will develop the customisation of the head without additional costs.
- **Very compact structure and Direct Drive axes configurability**
The engineered project has led to a very reliable product and superior performance.
New TCH-25 Pi Greco is suitable for a wide range of machining applications in Aerospace and Mold and die sectors.



TECHNICAL DATA		A-AXIS MODULE	C-AXIS MODULE
Maximum speed	rpm	50	50
Continuous torque	Nm	830	800
Maximum torque	Nm	1450	1400
Clamping torque	Nm	10500	5400
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		Heidenhain RCn 2380 abs. EnDat	AMO absolute encoder EnDat2.2
Accuracy	arcsec	±3"	
Rotation angle	deg	±115°	±360°
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A100 / ISO50	
Maximum spindle speed	rpm	13000	
Power S1-100% (S6-40%)	kW	47 (63)	
Torque S1-100% (S6-40%)	Nm	150 (202)	
Bearing lubrication type		Oil/Air	
Spindle manufacturer/model		HSD ES511	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	725	



TWO-AXIS MILLING HEADS TCH SERIES | TCH-30

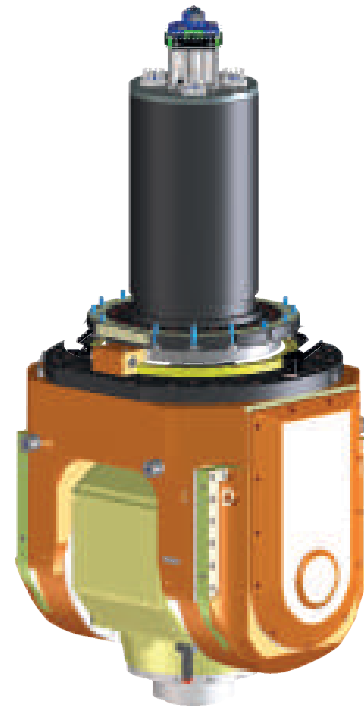
Two axis head with fork structure optimized for heavy 5-axes machines, integrates modules with Technai Direct Drive motors on both axes, and is available with electrospindles up to 12.000 rpm and 40 kW, HSK-A100 tool holder.

TCH 30 head is designed to equip 5-axes machines for high-productivity processes. The electrospindle generates 248 Nm torque and allows maximum speed of 12.000 rpm.

TCH 30 head expresses the best balance between productivity and dynamic, therefore it represents the best choice for 5-axis machining in which both roughing and finishing operations are required.

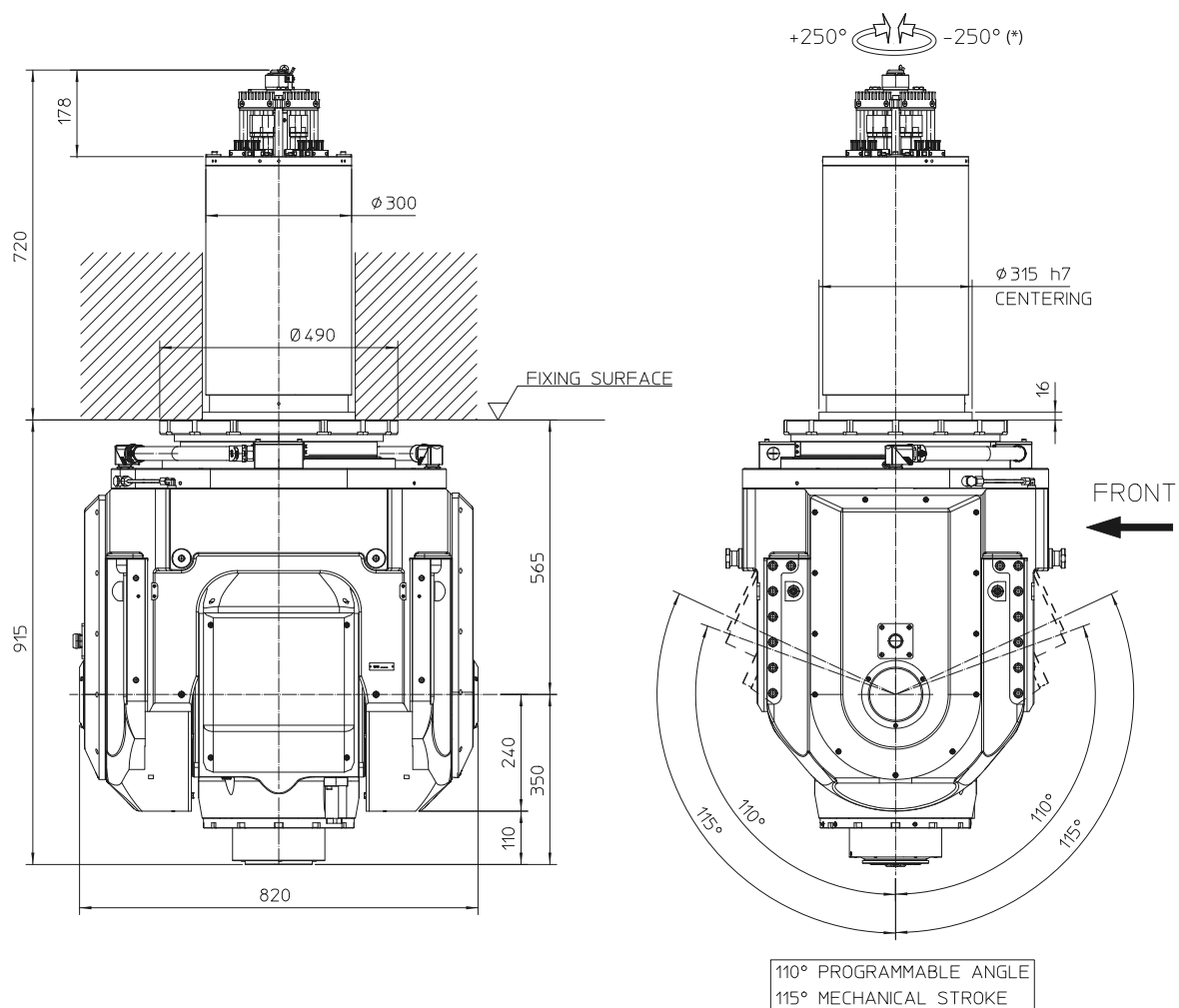
Big gears and turbine machining in the power industry or mold and die “roughing-to-finishing” machining are typical examples of TCH 30 application.

TCH 30 head is characterized by a very stiff fork structure. The C-axis and A-axis modules are equipped with hydraulic clamping devices properly designed to absorb the high milling forces generated by the electrospindle. Same way the Direct Drive motors are specially designed for heavy milling “live axis” machining, where high torques are required.



TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	1370	1460
Maximum torque	Nm	2000	2665
Clamping torque	Nm	8000	8000
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		Heidenhain RCn 2380 abs. EnDat	Incremental encoder AMO MHS
Accuracy	arcsec	±3"	±3"
Rotation angle	deg	±110°	±250° (*)
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A100	
Maximum spindle speed	rpm	12000	
Power S1-100% (S6-40%)	kW	40 (50)	
Torque S1-100% (S6-40%)	Nm	248 (314)	
Bearing lubrication type		Oil/Air	
Spindle manufacturer/model		WEISS 177024	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	1090	

* +/- 360° C-Axis rotation available with different configuration



TWO-AXIS MILLING HEADS TCH SERIES | TCH-U 40-50

TCH-U 40-50 head declines the concept of universal head for undercut milling operation in the full direct drive version. The goal is achieved by integrating the torque motors of the C and B rotary axes with a powerful electrospindle for the tool actuation. The product is mainly intended for the general mechanical industry and is optimized for milling machines or machining centers with vertical ram (bridge type or gantry machines).

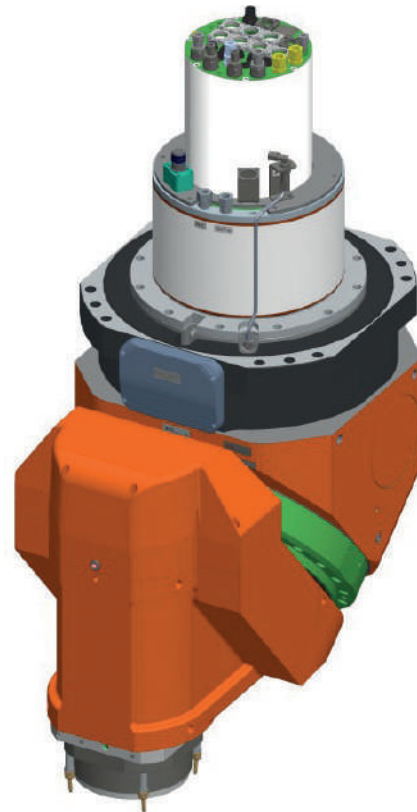
TCH-U 40-50 is equipped with 47 kW, 150 Nm and 13.000 rpm electrospindle, that is a well-balanced set of performance for achieving optimum production efficiency as required in general mechanical machining. Thanks to its particular geometric configuration, the TCH-U4050 head is able to tilt the spindle up to 100 ° in order to perform undercut milling operations.

Compared to the classic universal type, the TCH-U 40-50 benefits from the embedded Direct Drive technology.

This means:

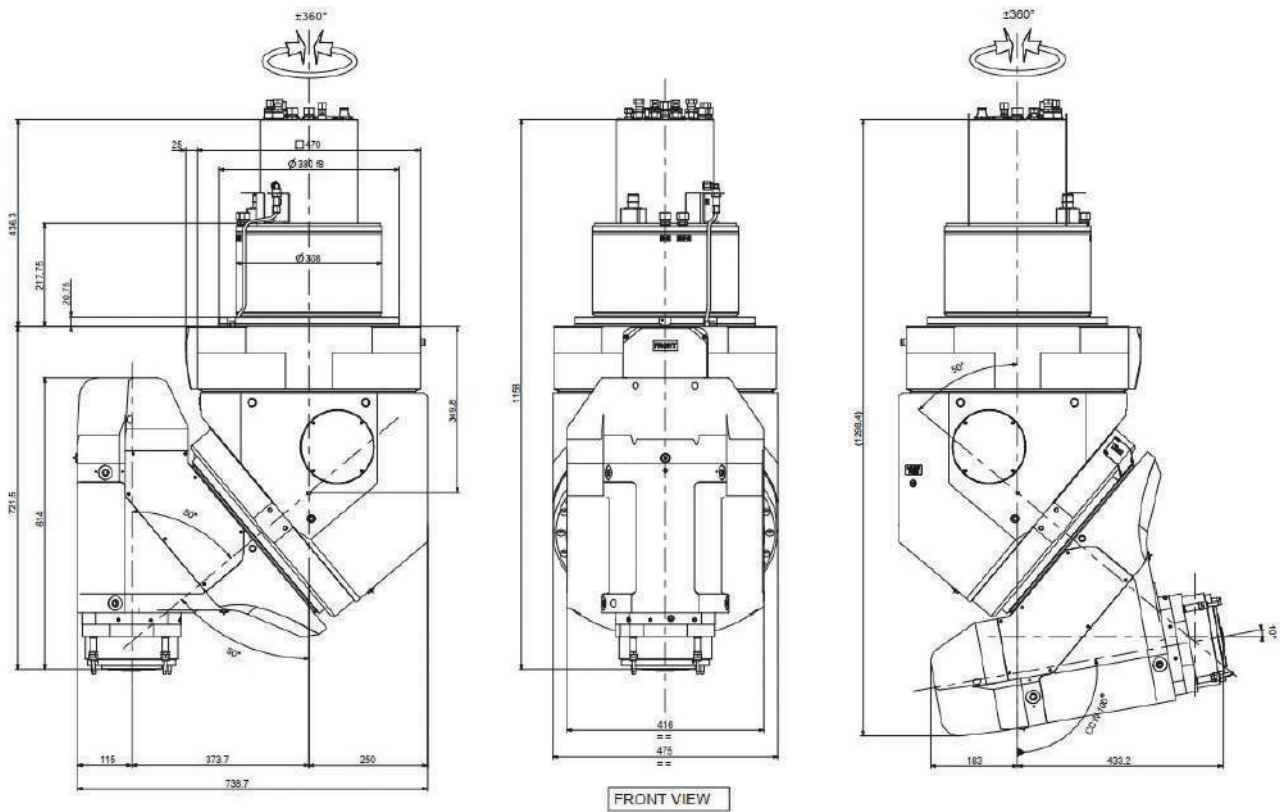
- 3+2 mode machining with seamless axis orientation and clamping;
- Superior dynamics and positioning accuracy;
- Full 5-axes continuous machining capability.

TCH-U4050 is a good example of modular configuration, where Functional Axes Modules are assembled into a frame that characterizes the morphology of the head.



TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	415	480
Maximum torque	Nm	720	870
Clamping torque	Nm	5400	5400
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		AMO absolute encoder EnDat2.2	AMO absolute encoder EnDat2.2
Accuracy	arcsec	±6"	
Rotation angle	deg	0/+100° (*)	±360°
TECHNICAL DATA		SPINDLE	
Tool type		HSK-A100 / ISO50	
Maximum spindle speed	rpm	13000	
Power S1-100% (S6-40%)	kW	47 (63)	
Torque S1-100% (S6-40%)	Nm	150 (202)	
Bearing lubrication type		Oil-Air	
Spindle manufacturer/model		HSD ES511	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	700	

(*) Spindle angle range: 0° to 100° (CCW) and 0° to 95° (CW)



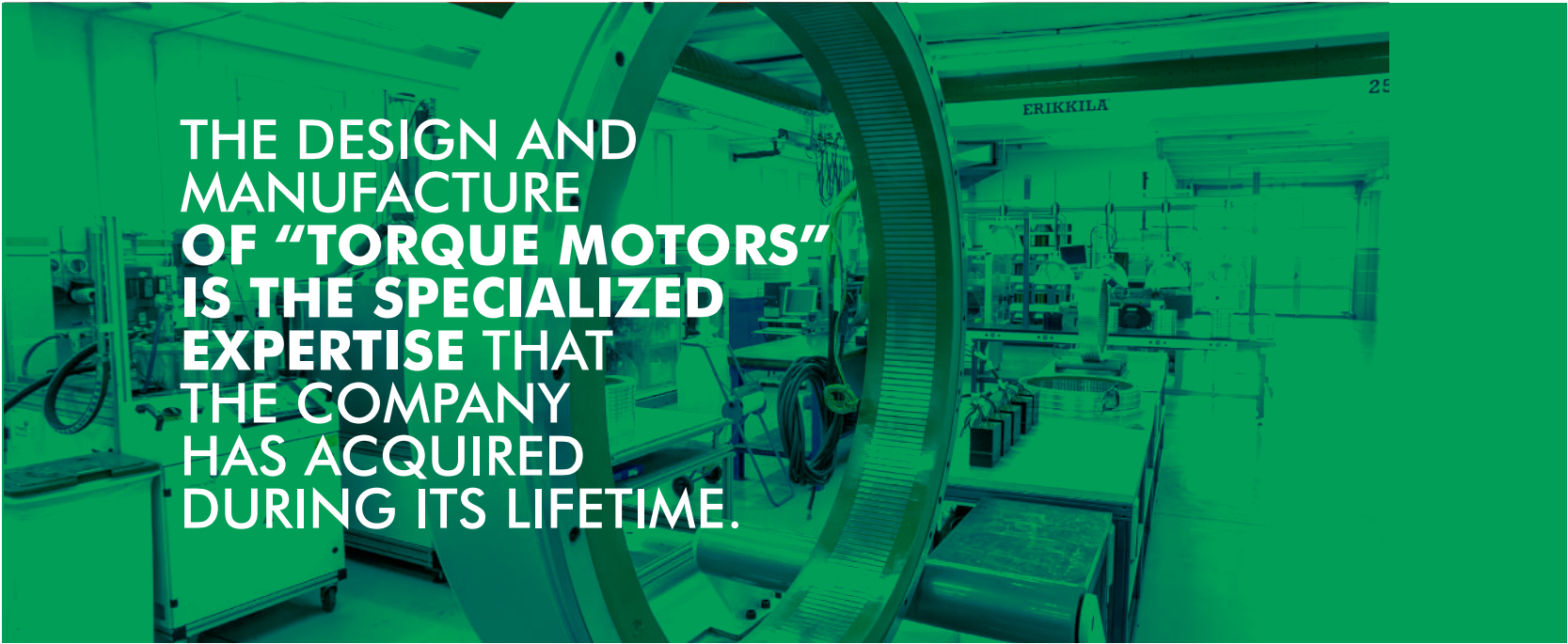
DIRECT DRIVE TECHNOLOGY

The Direct Drive principle is simple:

The electric servomotor generates mechanical power needed to move the final load, driven by the electronic-digital servo-control.

At the beginning machines were servo-controlled by drives CNCs and PLCs to which was assigned the limited function of automatically generate the sequence of movements previously performed "by hand" by the operator; precision and quality remained a characteristic of the mechanical quality of the machine.

The second generation of electronics control introduced assistance and compensation functions to overcome certain limitations or defects typical both of mechanical transmission and geometric; for example offset line axis compensation and reverse backlash compensation.



**THE DESIGN AND
MANUFACTURE
OF "TORQUE MOTORS"
IS THE SPECIALIZED
EXPERTISE THAT
THE COMPANY
HAS ACQUIRED
DURING ITS LIFETIME.**

With the advent of digital electronics the "performance overrun" occurs; servo controls learn the limits of mechanical transmission and try to overcome these defects through "feed forward" functions. This attempt to overcome the physical limits of a transmission system generates a new milestone:

Servo-control electronics is limited in its performance by the presence of mechanical transmission organs!

The "linear motors" and, for the rotary axes, the Torque motors, radically solve this problem eliminating the mechanical transmission, therefore they define a new category of servo controlled actuators the DIRECT TRANSMISSION or DIRECT DRIVE.

A Direct Drive system with Torque motor releases the potential of electronic regulation achieving immediate benefit.

The absence of gearbox means that most of problems associated with friction, wear and other cyclical drive defects, are overcome. Performance can be configured according to the technical specifications, up to the limits of individual components that from the Direct Drive system. Also, the number of components and assembly costs are reduced.

The simplified, symmetrical structure facilitates the construction of adjacent parts.

The combined result of such aspects leads to a substantial increase in performance (estimated in one order of magnitude) in terms of:

- Precision of positioning and/or execution of movements
- Superior dynamic performance in the work cycles



Technical and economic aspects associated to the Direct Drive system deserve a thorough insight. It is in fact appropriate to perform a careful comparative assessment.

The key aspects are Torque – Volume – Cost and they are directly and rigidly proportional to each other. Equally important is the relation between Cost – Precision – Dynamic that is linked to the previous one and emphasizes the necessity to verify the real need for a superior performance.

In such context, the economic rationale for the solution adopted is:

The greater is the demand for precision and dynamic performance, the higher is the added value of the Direct Drive approach, the more justified are the associated costs.



DIRECT-DRIVE MOTION TECHNOLOGY



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