



TCH SERIES

TWO-AXIS MILLING HEADS




DIRECT-DRIVE MOTION TECHNOLOGY

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- 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

TCH 25-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

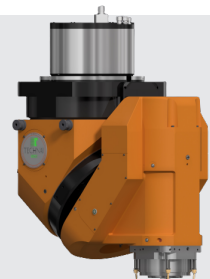
TCH 30 head is designed to equip heavy 5-axis machines for high-productivity processes and represents the best balance between power and dynamic. TCH 30 is characterized by a very stiff fork structure and its Direct Drive motors are specially designed for heavy milling "live axis" machining.



New

TCH 40-50

TCH 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.



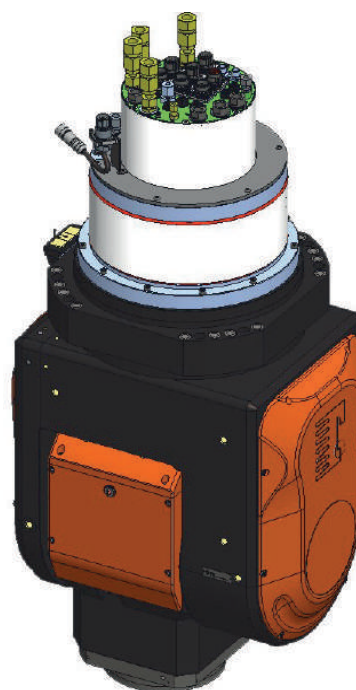
TCH 13 H is the most compact two-axis head with a fork structure offered by Technai. Optimal price-performance-precision ratio, accepts electric spindles with a body of up to D 180mm with a torque range of 35 - 60 Nm.

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

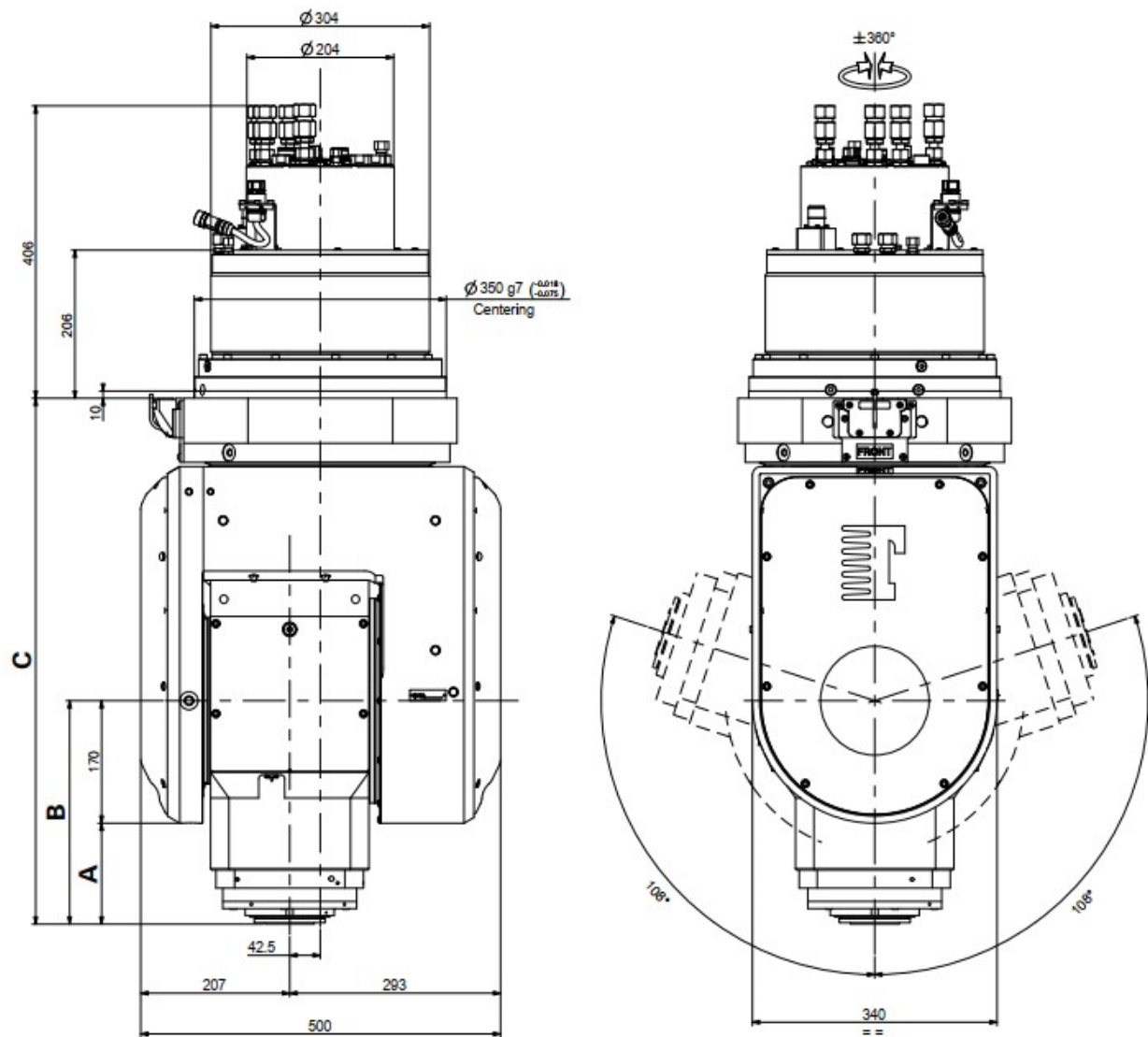
It is best used when equipped with high quality electric spindles. It has Direct Drive motors on both axes that allow for optimal fluidity and excellent precision in executing the finishing trajectories with controlled axes (full 5-axis mode).

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; DriveClik, 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	
Maximum spindle speed	rpm	24000	
Power S1-100% (S6-40%)	kW	42 (57)	
Torque S1-100% (S6-40%)	Nm	68 (90)	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	420	



ELECTROSPINDLE TYPE

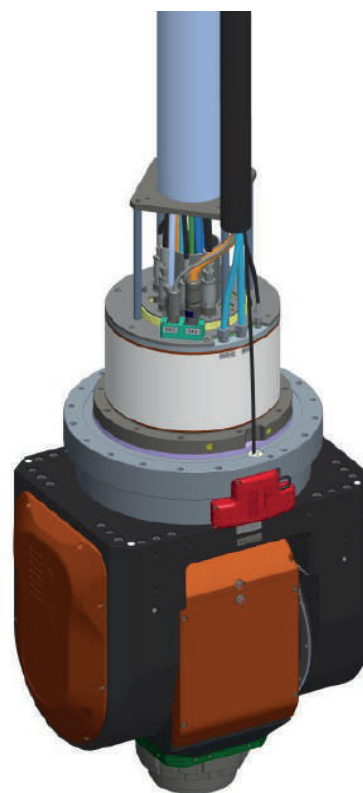
DIMENSION	HSK-A63
A	140 mm
B	310 mm
C	730 mm

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.

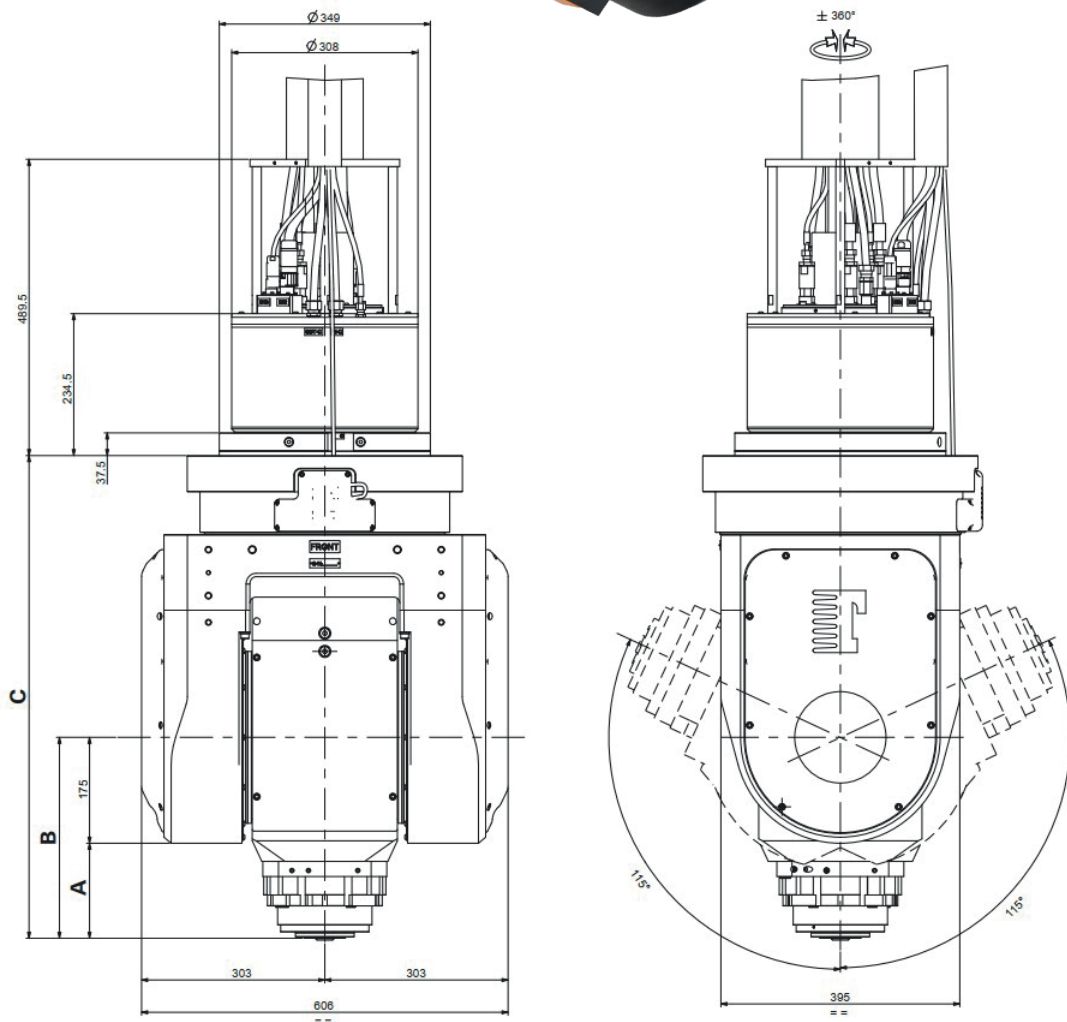
The structure is fork-shaped with a double motor on the A axis – perfectly symmetrical – and it adapts with a few variations to be configured when processing moulds or aluminium and composite components of aeronautical structures:

- 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 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)
Coolant through shaft with rotary joint		Yes	Yes
Overall mass	kg	490	



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 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 it is characterized by a compact structure which integrates the C-axis Direct Drive motor in the fork structure.

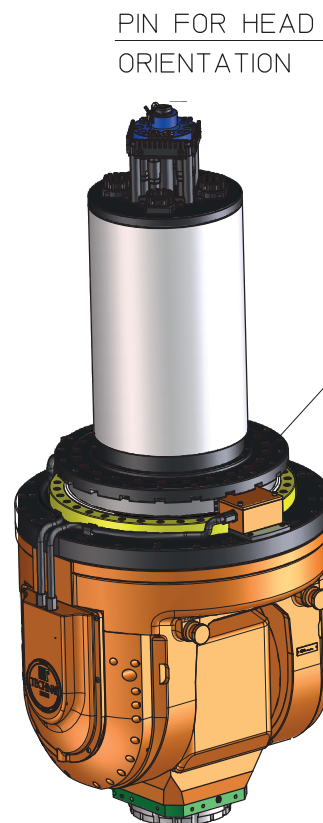
The short distance between the spindle nose and the A-axis makes the TCH 20 suitable for a wide range of machining application:

- 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.

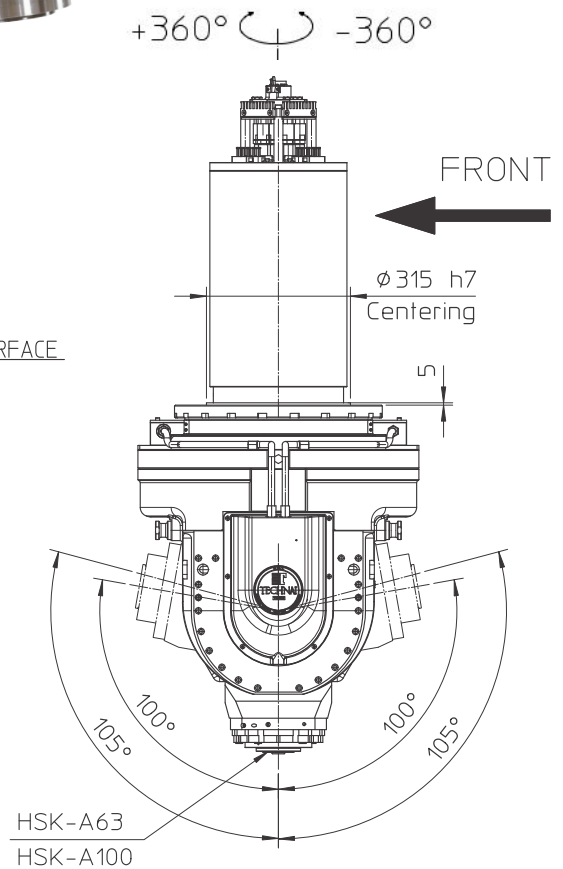
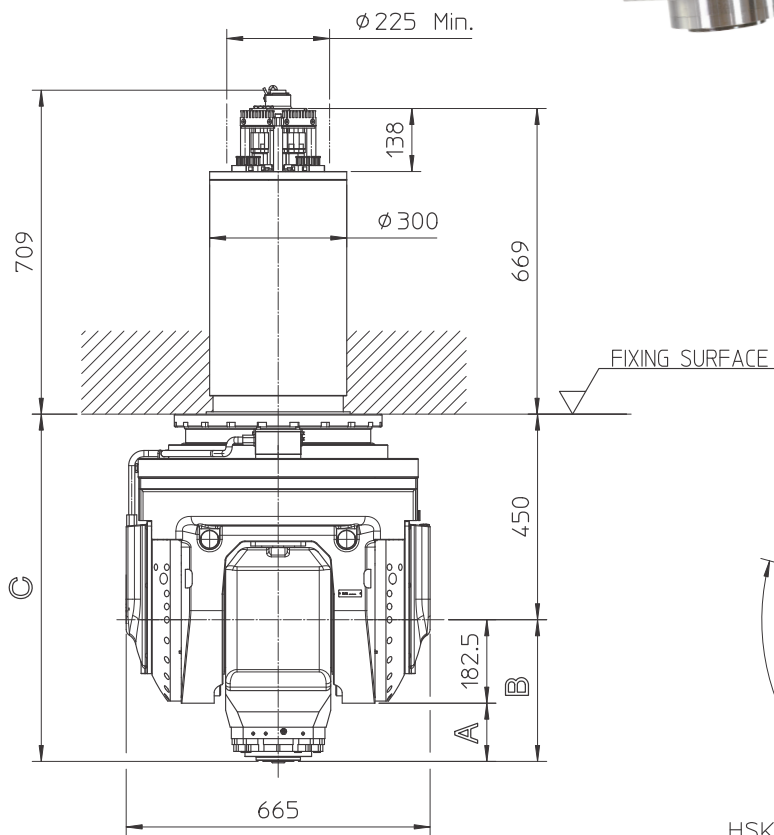
The key points are:

- 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°	±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)
Coolant through shaft with rotary joint		Yes	Yes
Overall mass	kg	600	



100° PROGRAMMABLE ANGLE
105° MECHANICAL STROKE

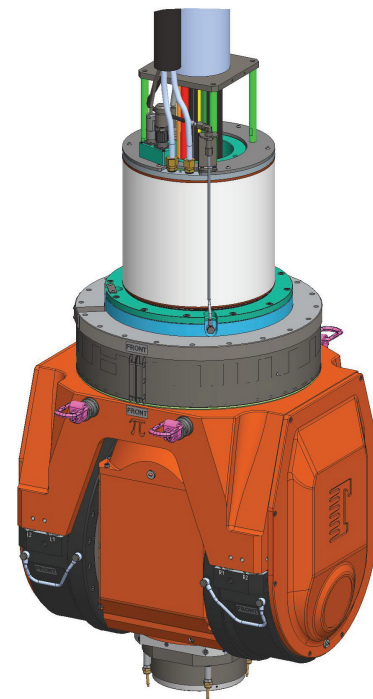
ELECTROSPINDLE TYPE		
DIMENSION	HSK-A63	HSK-A100
A	127.5 mm	162.5 mm
B	310 mm	345 mm
C	760 mm	795 mm

EXCELLENT PERFORMANCE AT 4th GENERATION

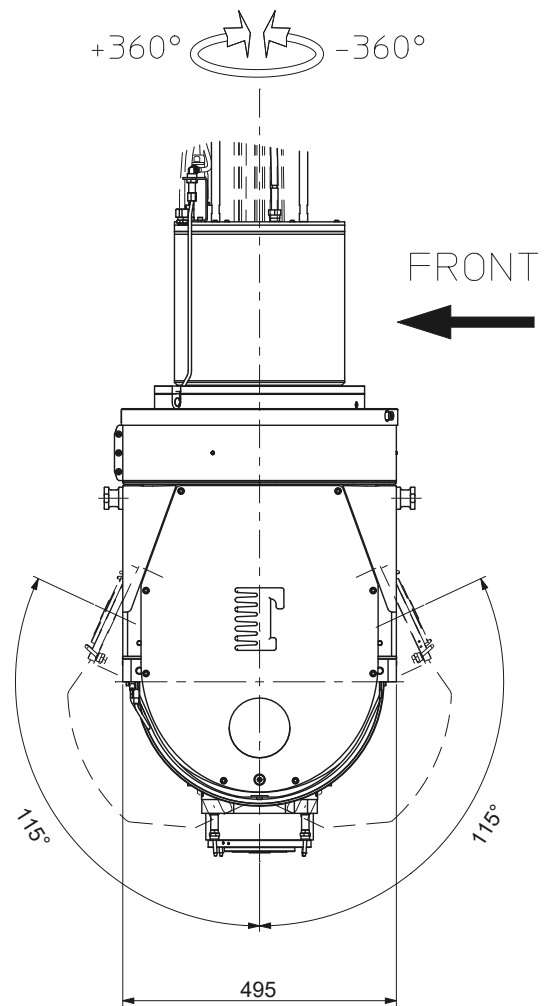
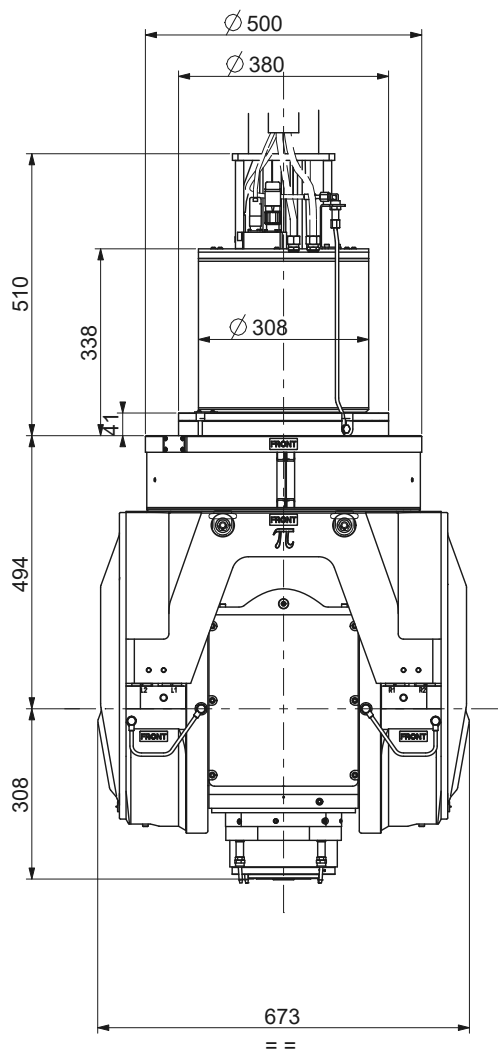
With the PI-Greco series, Technai Team reaches the fourth evolution-generation of milling heads with orthogonal rotary axes, integrating Torque motors and our 25 years expertise on application activity.

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)	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	725	



The new TCH 30 is the "Large" size of the Technai range, it allows the integration of an electrospindle with body diameter up to 315mm and torque in the range between 250 and 300 Nm.

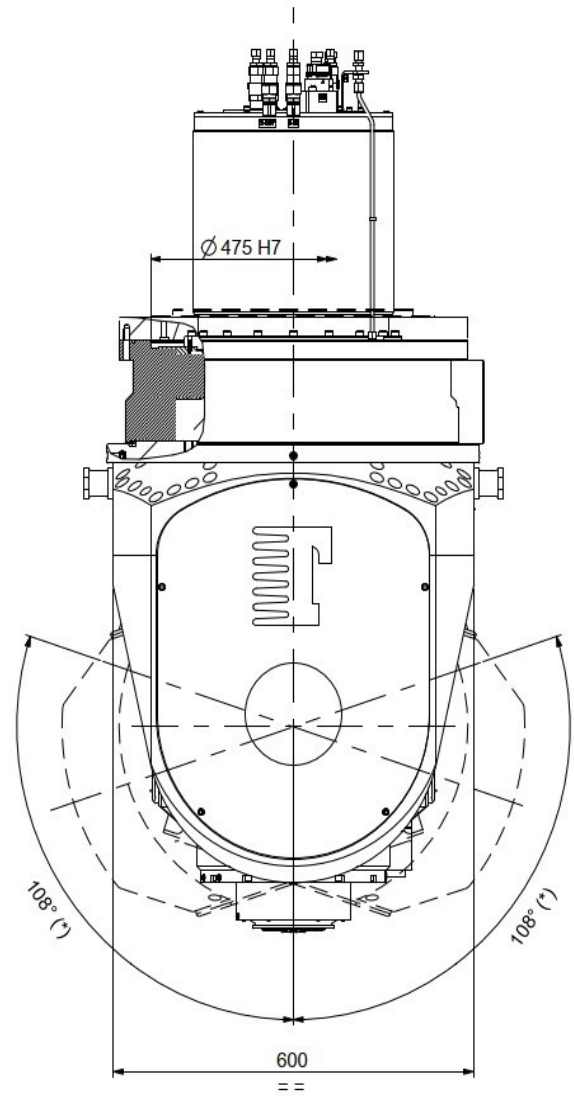
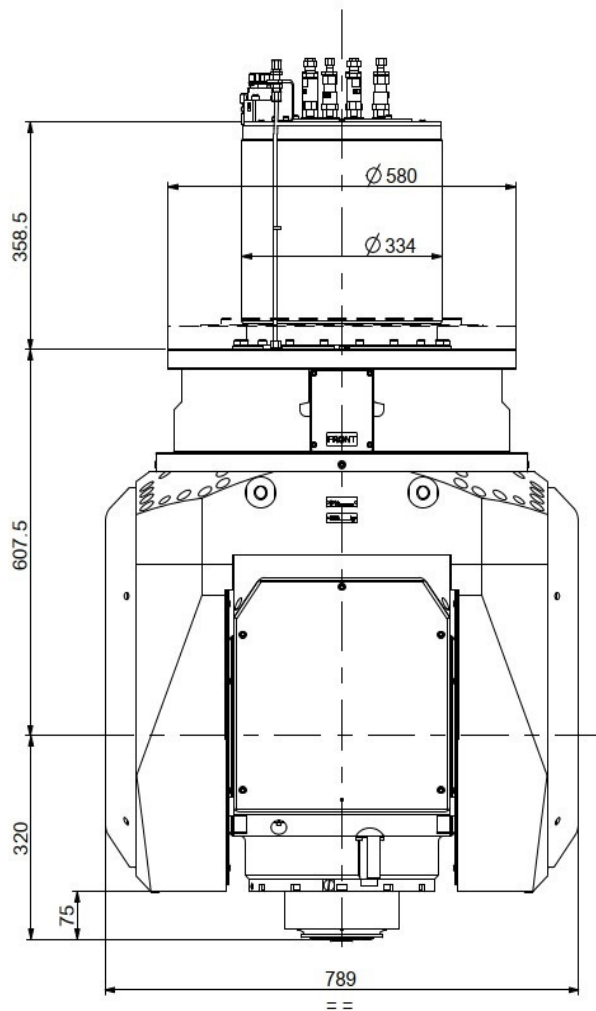
The new TCH-30 renews the former TCH 30, and integrates the latest features homogeneous to the entire line of Technai heads, in particular:

- Integration of a wider choice of electrospindles.
- Improved geometric accuracy and qualitative positioning accuracy.
- Simple and intuitive adjustment of the geometry of the two rotary axes.
- New absolute encoders on both axes.
- Powerful hydraulic locking devices of the axes, free from distortions.
- Ease of maintenance and operational reliability.

The new TCH 30 covers a wide range of both roughing and finishing operations; it is suitable for general mechanics, molds, turbines and aerospace parts.



TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	1370	1390
Maximum torque	Nm	2000	2580
Clamping torque	Nm	8500	8400
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		Heidenhain RCn 2381 abs. EnDat	Amo WMKA 2010 abs. EnDat
Accuracy	arcsec	±4"	±3"
Rotation angle	deg	±108°	±360°
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)	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	1150	



(*) mechanical stroke: 110°

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:

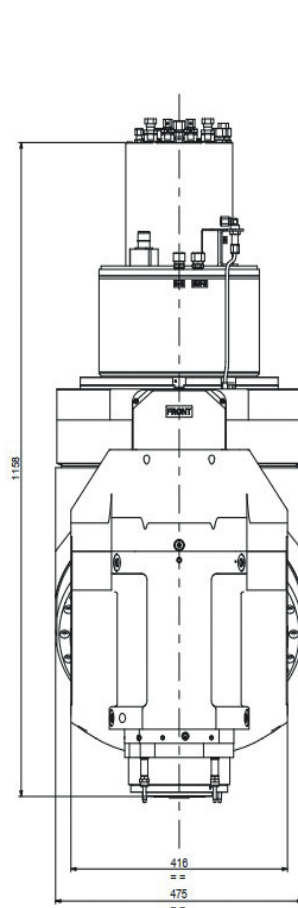
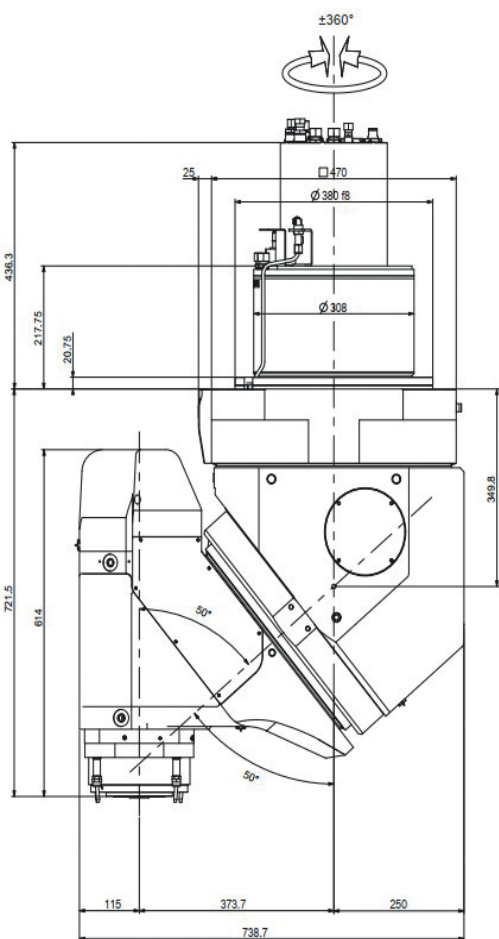
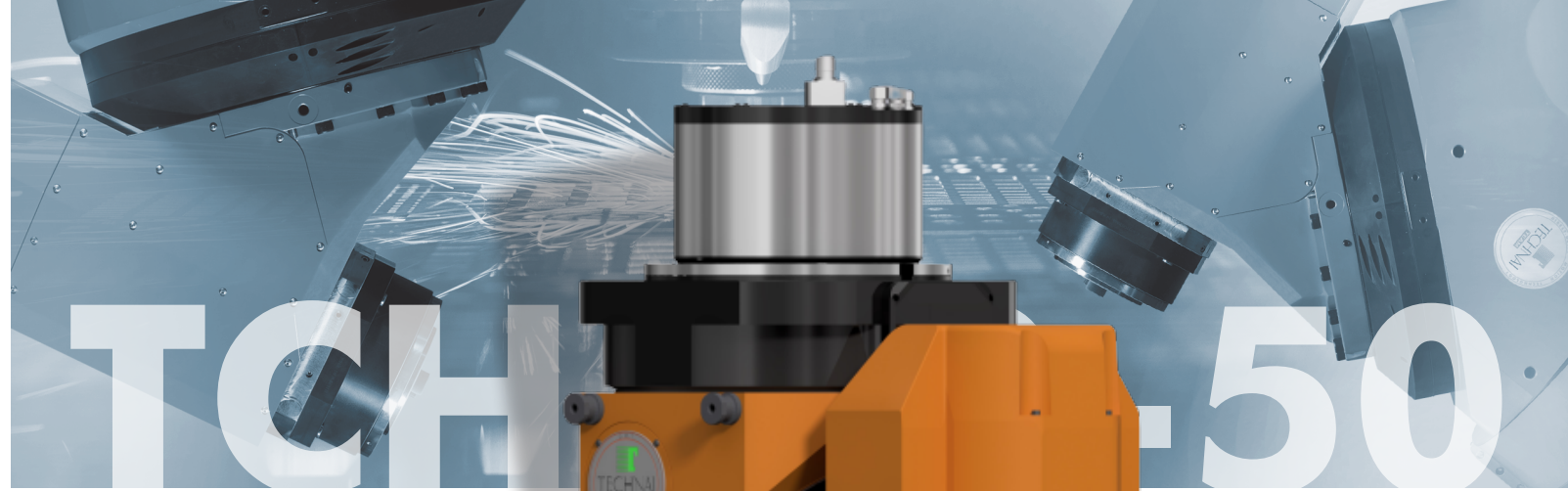
- 3+2 mode machining with seamless axis orientation and clamping;
- Superior dynamics and positioning accuracy;
- Full 5-axes continuous machining capability.

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.

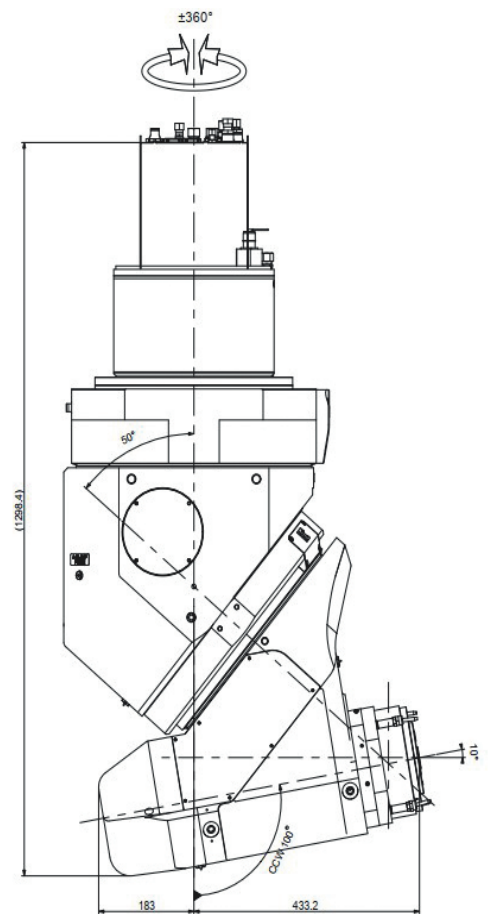


TECHNICAL DATA		A-AXIS	C-AXIS
Maximum speed	rpm	50	50
Continuous torque	Nm	415	480
Maximum torque	Nm	720	870
Clamping torque	Nm	5400	5400
Hydraulic clamp rated pressure (Max)	bar	80 (100)	80 (100)
Feedback encoder		AMO absolute encoder EnDat2.2	AMO absolute encoder EnDat2.2
Accuracy	arcsec	± 4"	
Rotation 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)	
Coolant through shaft with rotary joint		Yes	
Overall mass	kg	700	

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



FRONT VIEW

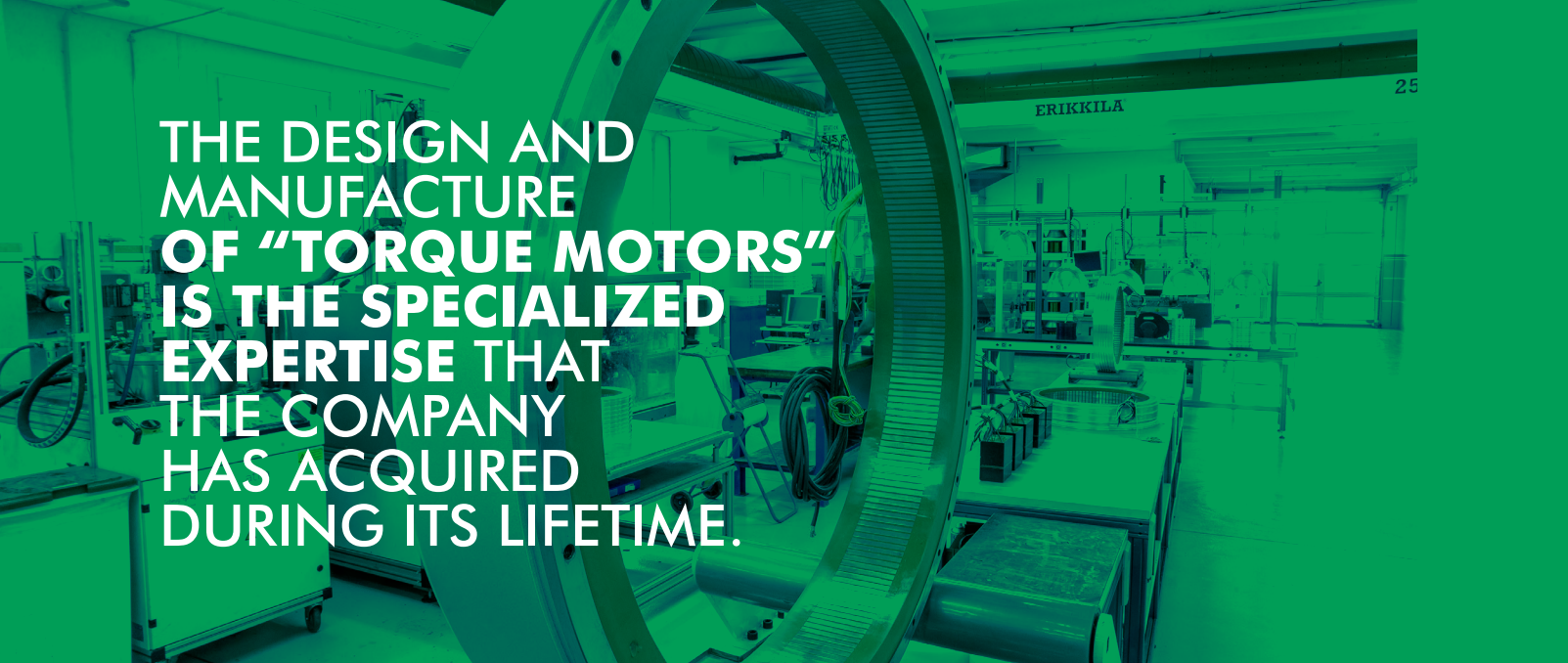


The Direct Drive principle is simple:

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

BENEFIT OF THE DIRECT-DRIVE TECHNOLOGY COMPARATED TO CONVENTIONAL SOLUTIONS

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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TECHNAI TEAM S.P.A.

Via Gelada, 15
21015 Lonate Pozzolo (VA) Italy
Tel. +39 0331 661624
Fax +39 0331 301732

www.technai.it
technai@technai.it

