



Product Overview

ETEL

ABOUT ETEL

Since its founding in 1974, ETEL has grown steadily to become a leading supplier of high performance motion control components and complete motion platforms. ETEL is the preferred supplier worldwide that is 100% dedicated to direct drive solutions. ETEL will maintain its leadership position with:

- Continuous technological innovation
- Leading-edge products and services
- Uncompromising quality standards
- Synergies within the HEIDENHAIN group already proven to be a winning combination
- A stable working environment where employees can develop their expertise and contribute to success

Our presence in a broad range of industries and experience with many demanding OEM manufacturers make us the perfect partner for companies looking for high precision, repeatability and long-life quality solutions.

High level competences and services

In order to serve its customers, ETEL has developed a variety of competences allowing ETEL to propose the appropriate abilities depending on machine builders' support requirements:

- Application oriented engineering
- Turnkey solutions
- Complete vertical integration
- Mechatronic experts
- Customized services
- On-site support
- Hotline and technical support
- Advanced trainings



For more information about ETEL, refer to our **Company Profile** catalog.

INDUSTRY SECTORS

ETEL is a leading supplier of components and motion systems to the following industries.



THREE CORE BUSINESSES

ETEL focuses on three core businesses, we develop, manufacture and support in the fields of:

MOTORS	<p>LINEAR MOTORS</p> <p>TORQUE MOTORS</p>
MOTION CONTROL	<p>MULTI-AXIS MOTION CONTROLLERS</p> <p>POSITION CONTROLLERS</p>
MOTION SYSTEMS	<p>STANDARD MODULES</p> <p>ADVANCED MOTION PLATFORMS</p>

TORQUE MOTORS

ETEL offers the most comprehensive standard torque motor range in the industry. With more than 100 models to choose from, almost any requirement can be successfully fulfilled. ETEL also excels in developing custom motors to meet a specific application need.

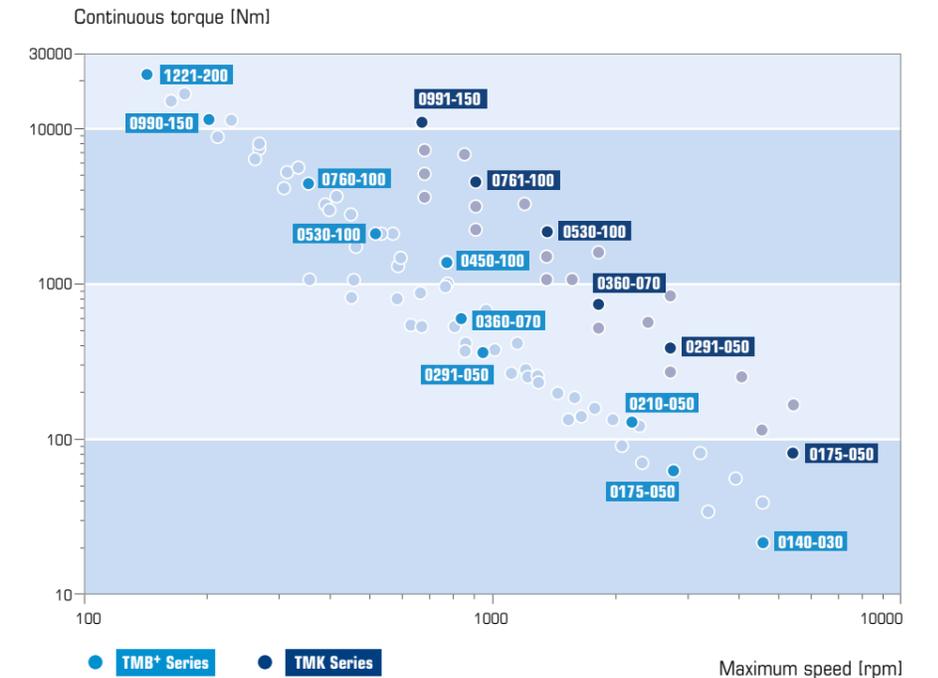
The TM series of ETEL are the industry's most popular ironcore frameless torque motors. Powerful magnets are used to maximize torque and acceleration while minimizing the size of the motor. The performance of ETEL's torque motors has been further increased by the use of "buried magnet" technology on the latest TMK family.

The TMB+ motor series is today's industry preferred torque motor solution. This renowned family is designed with a precision stator and has been optimized to achieve very high continuous torque while minimizing the dissipated heat when liquid cooling is used. For more demanding applications, the TMK family can achieve more torque and significantly faster speeds than TMB+ motors thanks to its unique rotor design. In addition, the TML family can be used to reach high performance at a lower price in less demanding applications. All families of torque motors benefit from ETEL's know-how in ironcore design that provides unmatched torque efficiency and low torque ripple.



Torque motors range

ETEL's standard torque motors are available in a wide range of torque and sizes.



	CHARACTERISTICS	TYPE	HIGHLIGHTS	APPLICATIONS
PERMANENT MAGNETS SYNCHRONOUS TORQUE MOTORS	 <ul style="list-style-type: none"> External diameter up to 1290 mm Large hollow shaft up to 1070 mm Active length up to 200 mm Peak torque up to 42900 Nm Maximum rated speed up to 4590 rpm Four different windings per diameter Open or closed cooling variants 	TMB+	<ul style="list-style-type: none"> More than 60 standard sizes available 600 VDC bus voltage Very high continuous torque Very high peak torque Flux weakening compliant Low torque ripple Designed for the most demanding applications 	<ul style="list-style-type: none"> High speed milling / turning tables High precision machining centers Grinding / finishing machines Boring / drilling / tapping machines Milling heads Transfer lines EDM Laser / ultrasonic cutting machines Stamping machines Lathes Indexing tables Electronic chip testing equipment Pick-and-place machinery High-end printing / scanning machines Packaging equipment Handling equipment Composite materials manufacturing Telescopes
	 <ul style="list-style-type: none"> External diameter up to 581 mm Large hollow shaft up to 420 mm Peak torque up to 4990 Nm Maximum rated speed up to 2600 rpm No liquid cooling option Cageless motor 	TML TMM	<ul style="list-style-type: none"> Two fixing methods (TML and TMM) 600 VDC bus voltage Very high peak torque Low torque ripple Light weight 	
 <ul style="list-style-type: none"> External diameter up to 1050 mm Large hollow shaft up to 800 mm Peak torque up to 20800 Nm Maximum rated speed up to 5450 rpm Liquid cooling channels 	TMK	<ul style="list-style-type: none"> Powerful high speed ironcore torque motor TMK stator (up to Ø530 mm) compatible with the mechanical interface of the TMB+ series 600 VDC bus voltage Continuous torque increased by up to 30% vs TMB+ Very high peak torque Up to 5 times speed increase vs TMB+ Flux weakening compliant Low torque ripple 		

TMB+ closed cooling

All TMB+ variants are available with an optional cooling jacket. It consists of a precisely mounted metal jacket that ensures water tightness and guarantee exact same motor performance than with the conventional "open cooling" mounting. There are two different cooling jacket types to fit any machine design: radial or axial water inlet / outlet.



TMB+ radial closed cooling

TMB+ axial closed cooling

This new cooling concept brings the known added value of direct drive torque motor to more applications with minimal efforts and within a more compact space allowing a shorter time to market and lower costs. The easy "wall mounting" of the TMB+ with cooling jacket will ease the replacement of conventional servo drives and thus increase the performance of your motion axes.



For more information, refer to our Torque Motors catalog.

LINEAR MOTORS

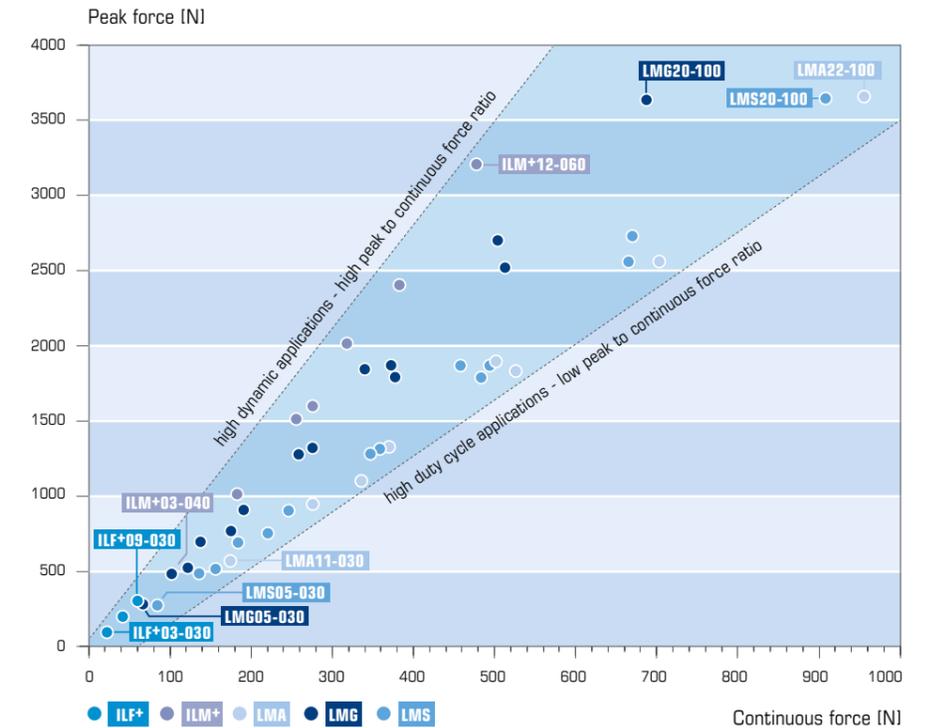
During the last two decades, many linear motor variations have emerged on the market. Nevertheless, only a few were found to be practical, perform well and economically viable. ETEL has always remained dedicated to the flat, synchronous, 3-phase linear motors with permanent magnet excitation. This family of motors represents more than 90 percent of industrial applications worldwide. They can be classified into ironcore and ironless motors.

The ironcore construction enables an exceptional peak force density, as well as unparalleled thermal efficiency, which is a significant advantage for thermal-drift-sensitive precision machines. The LMA is a mid-size motor optimized for application requiring high continuous force. The LMG is smaller, optimized for high dynamic applications and provides a high peak-to-continuous force ratio. In case an upgrade is requested for an application, the LMS is highly compatible with LMG in terms of integration and provides about 30% more continuous force. This makes the LMS perfectly suited for high duty cycle axes. The ILF+ is a small size motor perfectly suited for very high dynamic and low moving mass applications. The ILM+ is a more powerful version of the ILF+. These motor types also provide a highly linear behavior, perfectly suited for the most demanding scanning applications where zero attraction force and outstanding speed stability are required.



Linear motors range

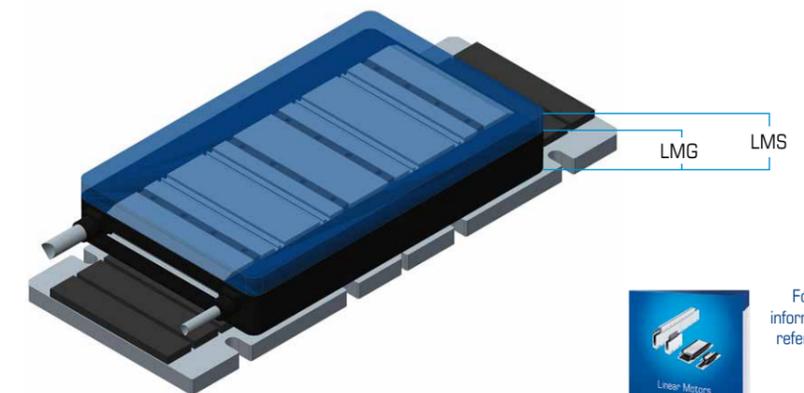
ETEL offers the most comprehensive standard linear motor range in the industry. With more than 50 models to choose from, almost any requirement can be satisfied.



	CHARACTERISTICS	TYPE	HIGHLIGHTS	APPLICATIONS
STANDARD PRODUCTS	<p>Ironcore motors</p> <ul style="list-style-type: none"> Speed up to 15 m/s Acceleration up to 20 g Peak force up to 3650 N Low force ripple All linear motors types work with same MWD magnetic way 	LMA	<ul style="list-style-type: none"> Highest continuous force Optimized for high duty cycle application 600 VDC compliant 	<ul style="list-style-type: none"> Wafer inspection systems Chip placement machines Flip-chip / die bonders Wire bonders PCB drilling PCB testing machines Flat panel display equipment Medical equipment General automation
		LMG	<ul style="list-style-type: none"> Compact design Economic High peak force 600 VDC compliant 	
		LMS	<ul style="list-style-type: none"> Compact design Economic High continuous force 600 VDC compliant 	
PERMANENT MAGNETS SYNCHRONOUS LINEAR MOTORS	<p>Ironless motors</p> <ul style="list-style-type: none"> Acceleration up to 30 g Peak force up to 3200 N Option: forced air cooling No attraction force No force ripple 	ILF+	<ul style="list-style-type: none"> Medium force Very low mass glider 600 VDC compliant 	<ul style="list-style-type: none"> Wafer inspection systems Chip placement machines Flip-chip / die bonders Wire bonders Very high dynamic axes PCB testing machines Air bearing systems CMM measuring machines Optical equipment manufacturing Medical equipment
		ILM+	<ul style="list-style-type: none"> High force Low mass glider 600 VDC compliant 	
INTEGRATED MOTORS	<p>ETEL motor design competences also serve more complex requests such as fully integrated axes. In fact, motors can be designed to perfectly fit a very specific form factor to satisfy customer applications. This process ultimately provides highly integrated motion systems with unique performance. Our linear motors and our expertise in direct drive technology are included into ETEL's motion systems and their dedicated components.</p>		<ul style="list-style-type: none"> Chip placement machines Flip-chip / die bonders Wire bonders PCB testing machines Very high dynamic axes 	

Mechanical compatibility between LMG and LMS

Dimensionally, LMS motors are about 7 mm thicker than LMG versions, while all other critical dimensions remain unchanged. Mechanical interfaces are identical between corresponding products, representing an immediate "plug & play" upgrade opportunity.

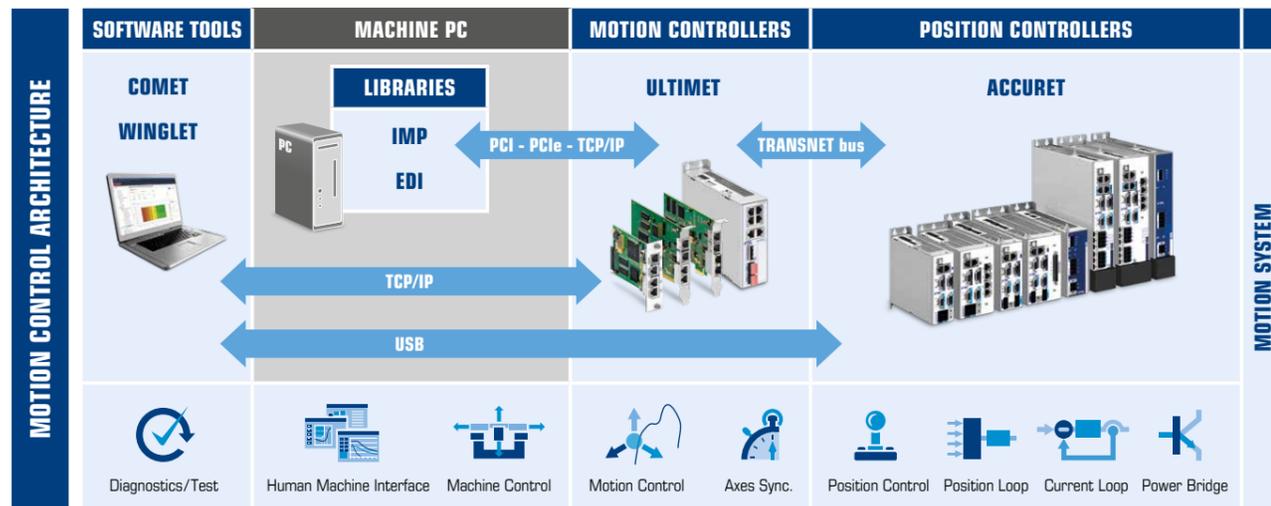


MOTION CONTROL

ETEL's leading edge products have been integrated in a variety of motion control solutions serving high-tech industries for more than 20 years.

ETEL's range of motion and position controllers allows the machine builders to control direct drive axes with the highest level of performance while maintaining a compact footprint.

The decentralized architecture ensures consistent performance and throughput regardless of the number of axes to control in the machine. Distributed architecture also makes cabling easier to manage and maintain in the field. The software environment simplifies embedded programming, machine commissioning, and maintenance.



Software environment

COMET is a user friendly interface for commissioning, tuning and maintenance with ETEL controlled equipment. Thanks to COMET, the user can fine tune the extensive set of regulation parameters ETEL controllers provide. Additional tools to observe the overall machine static and dynamic behavior are made available through COMET to help in the development phase. As a result, machine performance and proper robustness can be ensured from day-one.

WINGLET is a PC based software that brings an additional layer of capabilities in machine fine tuning and qualification of performance. It addresses a wide range of users active anywhere along the path that starts at design phase in R&D and ends at the end-user's equipment. From a pure machine performance enabler, WINGLET also brings significant benefits to automated testing procedures at OEMs' production floor, as well as it helps streamline field services interventions and troubleshooting. WINGLET can benefit each of these parties by shortening design phases and increasing machine performance level, ensuring robustness and repeatability in equipment manufacturing and providing fast and precise machine diagnostics.

ETEL Device Interface (EDI) is a library which enables the communication between ETEL's motion control system and customer's application. By providing all necessary commands directly into the user's code, the communication to ETEL devices can be fully embedded and time optimized no matter what interface is used to communicate with the devices (USB, TCP/IP, PCIe, etc.).

The Interpolated Motion Planning (IMP) is a trajectory optimization library that greatly improves throughput and precision of some specific processes such as laser processes or fast dispensing systems to name but a few. The gain in time is obtained by pre-processing the optimal trajectory while staying within user defined boundaries and automatically optimizing the transition from one pattern to the next. Using IMP for trajectory generation can lead to unprecedented increased throughput without compromise on accuracy.

ULTIMET multi-axis motion controllers

The ULTIMET motion controller is the master on the TRANSNET bus and can manage up to 63 axes. To provide the best price/performance solution to its customers, ETEL provides two versions of the motion controller: the ULTIMET LIGHT and the ULTIMET ADVANCED.



The ULTIMET LIGHT provides different ways to manage multi-axis movements, depending on the needs: synchronized or interpolated movements, or advanced control feature requiring slave to slave communication between the different position controllers. They are available in three form factors: PCI and PCI Express version integrated into a PC for high speed applications requiring real-time deterministic communication and TCP/IP version directly mounted inside an ACCURET position controller. This configuration is best for stand-alone machines, in which the need for time deterministic data transfer between motion system and machine PC is lower.

The ULTIMET ADVANCED is a powerful and versatile high-end multi-axis motion controller. It brings outstanding intrinsic performance as well as a high level of flexibility in controlling advanced motion systems with strategies that one can shape very precisely to match dedicated needs of various applications. This motion controller is fitted with a quad-processor from which one core is fully dedicated to the user and running with a real-time operating system. The computation power provided by this "user core" can be used for any type of motion control algorithm, enabling the ULTIMET to become a very open and flexible architecture possibly hosting part of the process IP. From a hardware standpoint, ULTIMET ADVANCED also provides many more interfacing capabilities such as multiple TCP/IP connections, SPI channels, GPIOs, SD card, etc. to directly bring additional data into the real-time motion control execution. The ULTIMET ADVANCED brings the most added value when a process requires more computation power, more data processing, more interfacing and free real-time operating system.

ACCURET position controllers

The ACCURET position controllers can drive two axes and a single power supply can be used for multiple ACCURETs sharing the same DC bus voltage. They perform setpoint generator, position and current loop real time control algorithms. In addition, they run up to 2 embedded programs per axis, so machine builders can manage any process specific tasks at the controller level. ACCURET covers a wide range of voltage and current levels in a compact solution, making the integration of various motors in a single machine very easy. No rack is needed, making the required volume only dependent on the number of driven axes. Simplified power and communication cabling as well as modular cooling unit make the machine installation and maintenance easy to perform. ACCURET position controllers contain integrated protection and diagnostics for machine and, more importantly, stage protection: over-temperature detection, over-current and voltage, loss of feedback, etc.



Ethernet TCP/IP allows commissioning and machine management during operations while USB can be used for commissioning and maintenance at any time. However, the best performance is obtained by using TRANSNET, a Gigabit based real-time communication bus developed to ensure perfect synchronization of all devices and extremely fast communication in between each other's.

For the most demanding applications, ETEL developed a unique Very High Performance position controller range called ACCURET VHP. This range of product is equipped with both specific hardware and software that maximizes the performance in terms of position stability and speed accuracy. They are compatible with all the other ACCURET controllers and can be dedicated to the most demanding axes of a multi-axis motion system. In addition to the benefits of ETEL controllers, ETEL's VHP range provides outstanding signal to noise ratio of 100 dB and advanced control features enabling more options and unique algorithms for complex motion systems. For instance, ACCURET VHP provides High Speed Encoder Interfaces (HSEI) to enable extremely high resolution position feedback in combination with high speed motion. Improve machine throughput and accuracy thanks to ETEL advanced control features:

- Machine vibration cancellation.
- Advanced feedforward compensating for all repeatable perturbations.
- High accuracy position based triggers.
- Stage mapping allowing reaching micrometer range accuracy at tool point.
- Advanced Force Control capabilities.



For more information, refer to our **Motion Control** catalog.

MOTION SYSTEMS

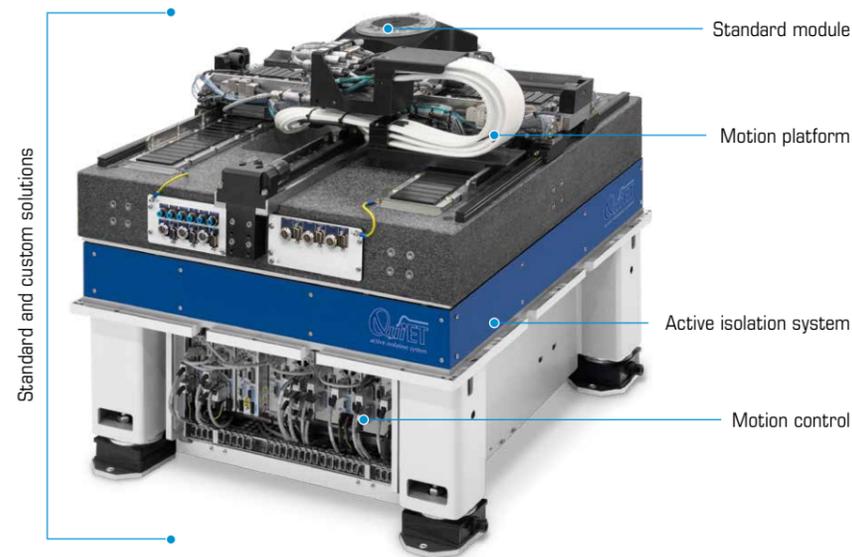
As the world leader in advanced motion systems and controls, ETEL offers a wide range of mechatronics solutions addressing the increasingly complex demands placed on precision motion components and systems in semiconductor and electronics markets.

Thanks to our dedication to the science of motion, 100% dedicated to direct drive technology, ETEL can provide its customers with the appropriate advanced motion control solution to address its specific application needs, from stand-alone actuators to high-end motion platforms. The latter includes not only the motion system, but also the base, active or passive damping system, and frame coupled to a state-of-the-art motion control architecture.

Companies looking for a motion system partner providing high quality, precision, repeatability and reliability need look no further.



For more information, refer to the corresponding flyers and leaflets.



Standard and custom solutions

CORE COMPETENCES USED IN MOTION SYSTEMS

Motion control

Wide range of position controllers featuring high position loop sampling frequency, outstanding force control, vibration cancellation as well as real-time triggering, stage mapping capabilities, to name but a few. For more information, refer to our Motion Control brochure.



Motors

ETEL patented magnetic designs are used to provide state-of-the-art linear and torque motors including ironcore, ironless, and toothless technologies. For more information, refer to our Torque and Linear Motors brochures.



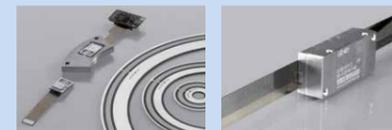
Bearings

ETEL developed a lot of expertise on the guiding elements for linear and rotary systems: mechanical bearings and air bearings are part of ETEL competences. Encoder kits combining high-quality bearings and high accuracy encoder disks allow ETEL to provide unique and unequalled high accuracy rotary solutions.



Encoders

ETEL has access to an extensive range of encoders which can be adapted to the application depending on the targeted performance, form factor, and cost requirements. Core components of those encoders can also be buried into the mechanics for an optimal embedded integration.



Cable management

With over 20 years of experience in producing highly reliable cable assemblies, ETEL's sister company provides solutions for highly dynamic, highly reliable, long lifetime applications, operating in clean environments. Flat or round high-flex cables, flexprints, and other pneumatic tubing assemblies can be specified to the application needs.



Mechatronics design

State of the art simulation tools are used on a daily basis to provide optimized mechatronics solutions: finite element analysis, thermal analysis, magnetic simulation, frequency analysis, dynamic simulations, etc.



Short stroke actuators

Solutions based on different motor, bearing and encoder technologies, featuring an optimized form factor, built-in gravity compensators, highly accurate force control, high dynamic, long lifetime and multiple degrees of freedom.



Linear and rotary axes

Wide range of linear and rotary axes, easily stackable, available in different sizes and travels, and with different options to provide you an optimized solution in an optimized form factor.



Combined modules

ETEL modules combine several degrees of freedom within one single unit. Typically vertical and rotary movements for wafer positioning or chip placement.



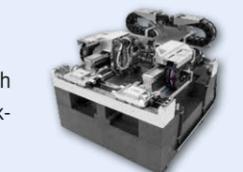
Stacked systems

Multi-axis configuration can be easily provided based on off-the-shelf axes and modules.



Gantry platforms

A wide range of gantry designs is available for high accuracy, high dynamics, high speed stability, high force in Z, typically for back-end semiconductor applications.



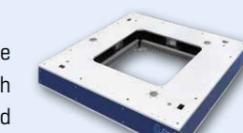
Planar platforms

Wide range of air bearing solutions, based on standard components on the market but also on in-house design to reach the ultimate performance required in terms of speed stability, bidirectional repeatability, dynamic flatness and straightness.



Active isolation system

QuiET is an active isolation system bringing the overall performance of high-end motion systems to the next level. It combines both vibration insulation from the surrounding environment and cancellation of the drive force generated by the stage movement.



Very large platforms

Through its sister company Soonhan, ETEL can provide very large motion platforms with travels up to 4 meters and longer. More information on www.soonhan.com





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