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

INDUSTRY SECTORS

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

- Water and die level packaging
- Process control
- Lithography
- Test and control equipment
- Placement machines
- Machining
- Finishing / grinding
- Tables / milling heads
- Stamping / laser cutting
- Flat panel display (FPD)
- Photovoltaic
- Medical
- Packaging
- Optics
- Printing / scanning
- Telescopes
- Process control
- Lithography
- Test and control equipment
- Placement machines
- Machining
- Finishing / grinding
- Tables / milling heads
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- Flat panel display (FPD)
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THREE CORE BUSINESSES

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

- LINEAR MOTORS
- TORQUE MOTORS
- MULTI-AXIS MOTION CONTROLLERS
- POSITION CONTROLLERS
- STANDARD MODULES
- ADVANCED MOTION PLATFORMS
Innovative Motion Control

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.

ETEL’s TM series 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 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.

### Characteristics

**TMB**
- 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
- More than 60 standard sizes available
- 600 VDC bus voltage
- Low torque ripple
- Very high peak torque
- Flux weakening compliant
- Designed for the most demanding applications

**TMK**
- External diameter up to 1035 mm
- Large hollow shaft up to 860 mm
- Peak torque up to 20800 Nm
- Maximum rated speed up to 5400 rpm
- Liquid cooling channels
- 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

**TMM**
- External diameter up to 591 mm
- Large hollow shaft up to 420 mm
- Peak torque up to 4990 Nm
- Maximum rated speed up to 2690 rpm
- No liquid cooling option
- Cageless motor
- Two fixing methods (TML and TMM)
- 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

**TML**
- External diameter up to 591 mm
- Large hollow shaft up to 420 mm
- Peak torque up to 4990 Nm
- Maximum rated speed up to 2690 rpm
- No liquid cooling option
- Cageless motor
- Two fixing methods (TML and TMM)
- 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
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- Electronic chip testing equipment
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**TMB+ closed cooling**

All TMB+ variants are available with an optional cooling jacket. It consist 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 seal water inlet / outlet.

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.

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**Permanent magnets synchronous torque motors**

**Conventional ironcore motors**

**Big shaft ironcore motors**

For more information, refer to our Torque Motors catalog.
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.

**Ironcore motors**
- 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

**Ironless motors**
- Acceleration up to 30 g
- Peak force up to 3200 N
- Option: forced air cooling
- No attraction force
- No force ripple

### Integrated motors
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.

### Permanent magnets synchronous linear motors

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**Characteristics**
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<table>
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<tr>
<th>CHARACTERISTICS</th>
<th>TYPE</th>
<th>HIGHLIGHTS</th>
<th>APPLICATIONS</th>
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| **Ironcore motors** | LMA  | • Highest continuous force  
|  |  | • Optimized for high duty cycle application  
|  |  | • 600 VDC compliant |
| **Ironless motors** | LMG  | • Compact design  
|  |  | • Economic  
|  |  | • High peak force  
|  |  | • 600 VDC compliant |
| **Ironless motors** | LMS  | • Compact design  
|  |  | • Economic  
|  |  | • High continuous force  
|  |  | • 600 VDC compliant |
| **Ironless motors** | ILF+ | • Medium force  
|  |  | • Very low mass glider  
|  |  | • 600 VDC compliant |
| **Ironless motors** | ILM+ | • High force  
|  |  | • Low mass glider  
|  |  | • 600 VDC compliant |

**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.
ETEL motion control solutions have been integrated in leading edge machines for a variety of high-tech industries for more than fifteen years.

ETEL’s range of motion and position controllers allows the machine builders to drive servo motors (brushless, DC motors, steppers) with the highest performance regulation in a minimum footprint.

The decentralized architecture ensures consistent performance and speed regardless of the number of axes to drive in the machine. Distributed architecture also makes cabling easier manage and maintain in the field. The software environment simplifies software development, machine installation, and maintenance.

Software environment

ComET is a user friendly interface for commissioning and maintenance with ETEL’s controllers. Thanks to ComET, the user can optimize the machine design during the development phase as well as the controller parameters. As a result, machine stability and robustness are improved at runtime.

ETEL Device Interface (EDI) is a library which enables the communication between ETEL’s motion control system and customer’s application. ETEL’s software environment allows machine builders to improve machine serviceability in the field. Full motion control configuration can now be checked, maintained and even upgraded thanks to ETEL’s system configuration management tools.

The Interpolated Motion Planning (IMP) allows for geometry fitting by pre-processing the optimal trajectory within customer defined boundaries and it automatically optimizes 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

UltimET Light motion controllers can reliably manage axis synchronization or interpolation of up to 63 axes on the TransnET bus. More significantly, the level of performance will be the same no matter the number of axes, allowing for high-end machine design. Machine builders seeking smaller tracking error, better speed stability, higher bandwidth or “zero” settling time will benefit from the ETEL motion control architecture.

AccurET dual axis controllers

AccurET dual axis controllers are key in ETEL’s distributed motion control architecture. They perform setpoint generator, position and current loop real time control algorithms. AccurET also computes all encoder and local I/O related programming. In addition, they run up to 2 embedded programs per axis, so machine builders can manage any process specific tasks at the controller level.

Improve machine throughput and accuracy thanks to ETEL advanced control features:

- Machine vibration cancellation
- Advanced feedforward compensating for all repeatable perturbations
- High accuracy triggers (few tens nanosecond resolution)
- Stage mapping allowing reaching micrometer range accuracy at tool point
- Advanced Force Control capabilities
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.

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