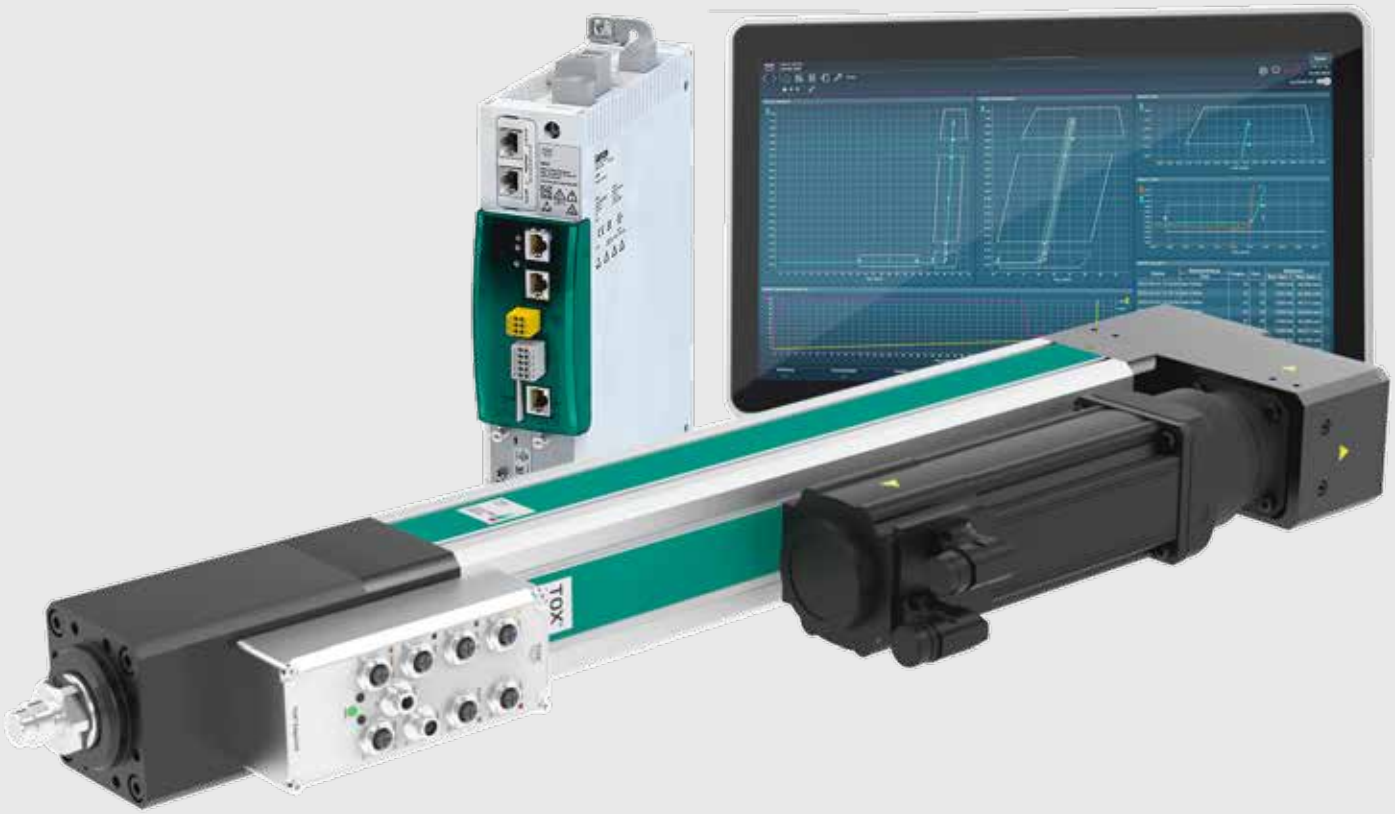
TOX® ElectricDrive

Electromechanical drive technology
for force and precision



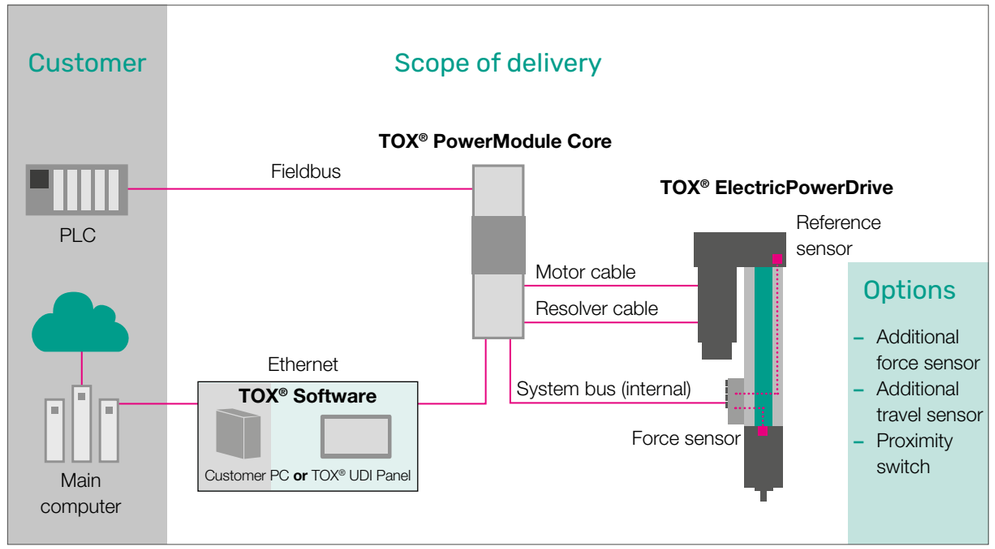
The TOX® ElectricDrive Core system
Precise press forces from 0.02 - 1000 kN

The new TOX® ElectricDrive Core System with its electrical drives can be used in a wide range of applications. The highly flexible integration into existing control environments saves time and costs – drive control, process monitoring and quality assurance are combined in one system. The intuitive HMI meets all your requirements. You decide whether the TOX® Software is run on the TOX® UDI panel or on your own PC.

Advantages

- Fast commissioning due to the intuitive operation of the software: Plug-and-Play
- Cost saving due to slim control architecture
- Industry 4.0-capable thanks to state-of-the-art process monitoring
- Predictive maintenance ready
- Energy-efficient and maintenance-free
- Flexible integration in existing system
- Quality data and evaluation in one system

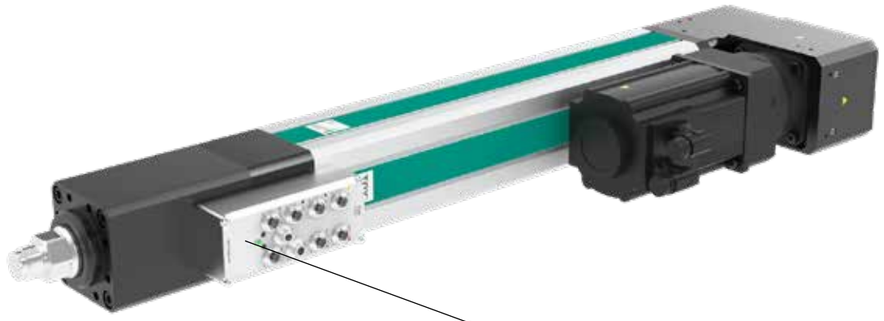
Overview TOX® ElectricDrive Core



Components of the system

TOX® ElectricPowerDrive
The electromechanical servo drive

- Press forces from 0.02 kN to 1.000 kN
- Interfaces and sensorics offer highest flexibility



TOX® EdgeUnit
The decentralized intelligence for every drive

TOX® PowerModule Core
Servo inverter and central interface

- Servo inverter with application for force-travel control included
- Main interface and connection to the fieldbus system
- All functions of your application are pre-parameterized

TOX® Software
HMI, visualization and process monitoring

- Visualization and HMI
- Storage of the quality data and forwarding to server
- Operating system independent (Windows/Linux)
- On customer PC / line PC or TOX® UDI Panel

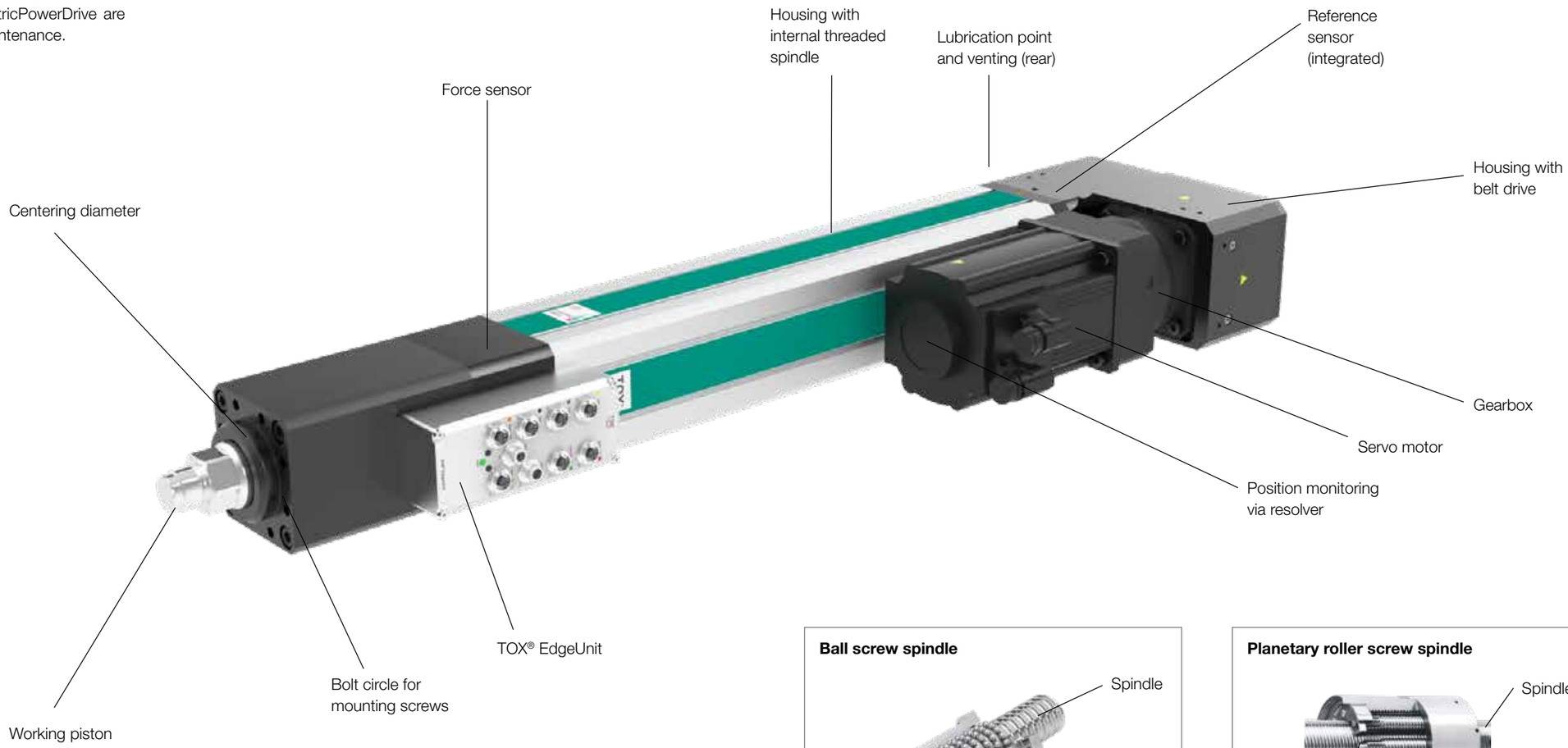
The electromechanical servo drive

With the TOX® ElectricDrive you get an energy-efficient drive solution for various applications with a usable press force range up to 1000 kN. The drives are equipped with either ball screws or planetary roller screws and can be used in many applications.

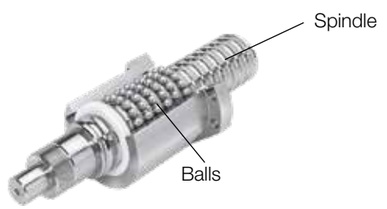
Due to their maintenance-free servo motors and belt drives, as well as long lubrication intervals, the electromechanical servo drives TOX® ElectricPowerDrive are designed to require only minimal maintenance.

Advantages

- Robust and durable
- High energy efficiency
- Low operating costs
- High mechanical precision
- Precise repeatability
- Anti rotation feature

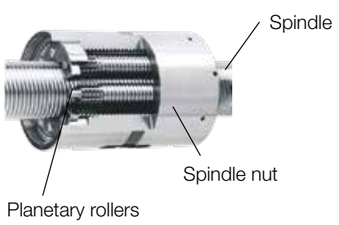


Ball screw spindle



Circulating balls transfer the force between the spindle and nut. The even load distribution across many contact points enables high load capacity and efficiency.

Planetary roller screw spindle



Here, planetary rollers installed in the spindle nut rotate around the spindle. The high number of force-transmitting contact surfaces can take high loads, with compact dimensions.

The complete electromechanical drive family

EQe

Advantages

- Cost effective
- Ball screw spindle
- Polynom calibration
- 4-point force measurement

TOX® ElectricPowerDrive EQe-K

- Press force range 0.02 kN – 100 kN
- Available in types
  2 kN / 5 kN / 10 kN / 30 kN / 60 kN / 100 kN
- Total stroke 150 / 300 / 450 mm
- Speed up to 300 mm / s
- Acceleration / Deceleration
  up to 2500 mm/s²

The cost efficient drive system

Applications:
Pressing, joining, single drive with medium space requirement

EXe

Advantages

- Smaller space requirement
- 4-point force measurement
- High power density with low weight
- Planetary roller screw spindle
- Polynom calibration

TOX® ElectricPowerDrive EXe-K

- Press force range 0.1 – 200 kN
- Available in types
  10 kN / 30 kN / 60 kN / 100 kN / 200 kN
- Total stroke 150 / 300 / 450 mm
- Speed up to 300 mm / s
- Acceleration / Deceleration
  up to 3000 mm/s²

The high performance drive system

Applications:
Insertion of functional elements, clinching, riveting, space limited pressing applications, punching

TOX® ElectricPowerDrive EXe-F

- Press force range 0.05 – 100 kN
- Available in types
  5 kN / 10 kN / 30 kN / 60 kN / 100 kN
- Total stroke 150 / 300 mm
- Speed up to 800 mm / s
- Increased service life
- Acceleration / Deceleration
  up to 8000 mm/s²

The extremely fast drive system with with up to 800 mm / s

Applications:
Press applications requiring short cycle times

TOX® ElectricPowerDrive EXe-L

- Press force range 3 kN – 1000 kN
- Available in types
  300 kN / 400 kN / 500 kN / 700 kN / 1000 kN
- Total stroke 300 mm
- Speed up to 90 mm / s

The powerful drive system with up to 1000 kN

Applications:
Multi-point clinching and riveting, high force press applications

Special versions

Design:
- Variable mounting version
- Variable lubrication position
- Frontal mounting of tools
- Modified stroke length
- Narrow design

Certifications:
- Protection type IP65
- Cleanroom air-cleanliness class 5

Cycle optimized:
- Long force holding time
- Reduced cooling time
- Force pulling or punching
- Increased speed

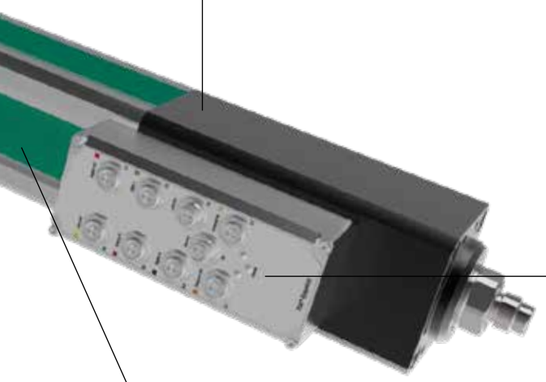
TOX® EdgeUnit with sensorics and interfaces

The TOX® EdgeUnit is the decentralized intelligence of the TOX® ElectricPowerDrive. The integrated force sensor is directly located next to the measuring amplifier of the TOX® EdgeUnit. No complex cabling – no susceptibility to electromagnetic interference.

In addition, a second DMS measuring amplifier is available for closed-loop monitoring – a full-featured second measuring channel.

Force sensor

- 4 x DMS with < 0,5% measurement accuracy
- Spatial position independant itself compensating
- Internal connection with the TOX®-EdgeUnit
- Measurement amplifier and 16 Bit ADC



TOX® EdgeUnit

- Onboard memory for:
  - digital type plate
  - service and stroke counter
  - drive data and calibration factor
- 2 digital inputs and outputs
- Encoder input (TTL)
- 2 analog inputs
- Additional measuring amplifier (16-Bit)

Reference sensor

- Internal connection with the TOX® EdgeUnit
- Redundance for the reference (additional to currency increase or fixed stop)

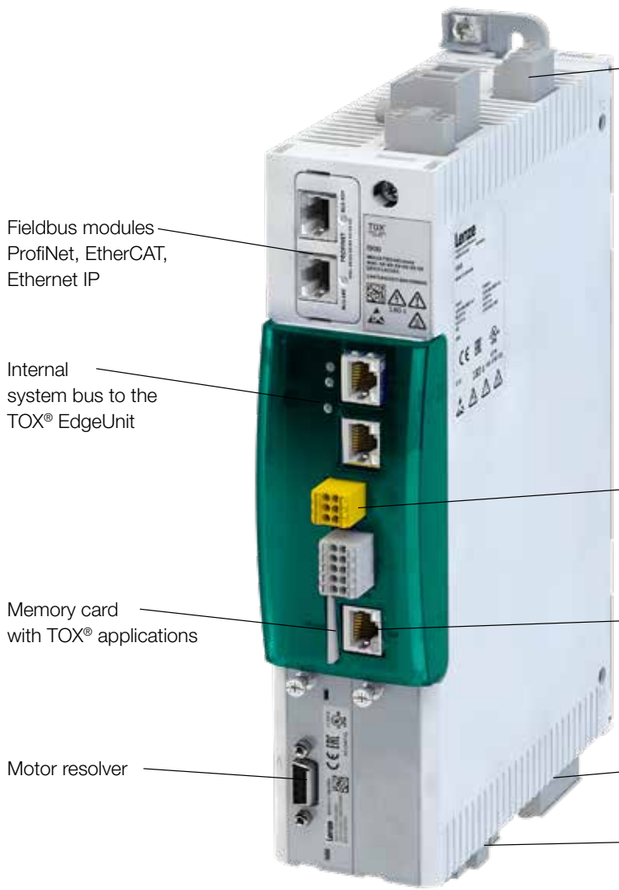
TOX® PowerModule Core the central intelligence

The TOX® PowerModule Core serves as servo inverter for power provision in the system as well as central intelligence of the drive control. Furthermore, the fieldbus interface to the higher PLC / to the higher robot is integrated.

The TOX® PowerModule Core is parameterized with the TOX® Software. The connection of the TOX® UDI Panel or customer PC with the PowerModule Core takes place via Ethernet (TCP/IP).

Advantages

- Force or function control
- Individual acceleration and deceleration
- Pressing in on PLC preset values
- Driving on position or on force or both combined
- Multiple operation (access to a process and task at once)
- Taring the force sensor



Visualization and intuitive HMI for highest quality in production

The TOX® Software is the comprehensive solution for the operation of your plants. In addition to pure operation, detailed visualizations and data evaluations can be viewed and processes can be configured.

The software impresses with its modern, intuitive UI design with dashboard and widget functions. These allow easy customization of the user interface, resulting in screens that are perfectly adapted to each operator. Simply install the software on your Windows PC or use our TOX® UDI Panel. The communication takes place in real time and guarantees high repeatability and highest performance of the process control.

Advantages

- Modern user interface „look and feel“
- Widget based for customizable dashboards
- Intuitive handling
- Easy installation and parametrization
- Integrated window technique for many applications

Technical information

- 5 windows per process freely defineable
- 1000 software programs
- 2 channels e.g. force 1 / position 1 and force 2 / position 2
- Flexible fieldbus with 32 words
- 10 tracks in one diagram e.g. force, speed, currency, torque...
- 5000 diagram points per track

TOX® UDI Panel

The TOX® UDI Panel is a touch panel with an integrated PC and the TOX® Software on a Linux operating system. It is ready for the digital connection of your processes for Industry 4.0. It combines the operation of your system with the storage and processing of data.

The panel, specially developed for TOX® systems, provides you with the relevant information that you need to ensure the safety of your processes at all times. The data is made available and stored for other applications via various network protocols (e.g. MQTT, OPC-UA). The process configuration and the visualization of the work results can be controlled with the intuitive TOX® Software directly on the UDI-Panel.

10" 15" 21"

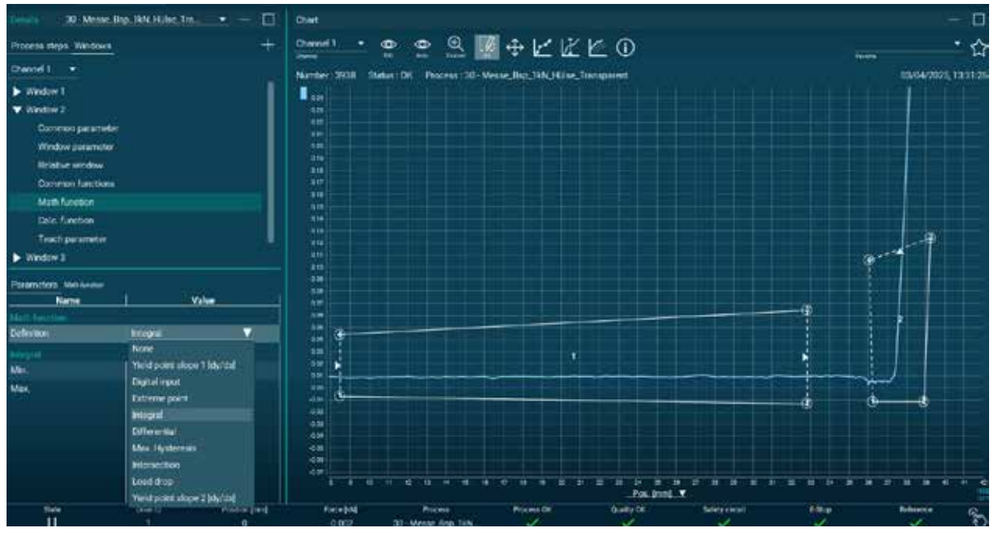
Process monitoring with window technique

During operation, the system continuously supplies force-displacement curves, which are used for monitoring application processes. The TOX® Software takes over the evaluation of the curves and their documentation. On the basis of these measurement curves, the quality of an individual production step, an assembly or the entire product can be monitored and controlled in real time.

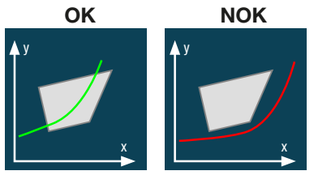
With the help of various windows, even complex XY curves can be monitored and controlled in detail according to requirements.

Advantages

- Complete process monitoring integrated (e.g. enter and exit points, touch and crosspoints)
- Window and Envelope Technique
- Calculation functions



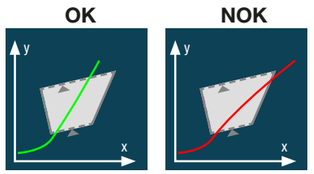
Must cross



The curve must cross the defined windown.

Application: Monitoring of the force-travel progress during pressing in of elements

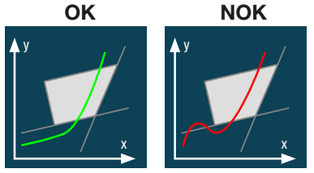
Enter and Exit



The entry and exit sides can be freely defined and will be monitored.

Application: Monitoring of the force-travel progress during pressing in of elements

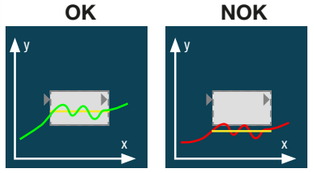
Extended Lines



The extended lines define a region. The force-travel-curve must enter the window without touching and crossing these lines.

Application: Monitoring of the force-travel progress during pressing in of elements

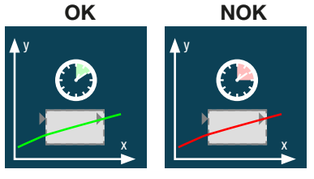
Average



An average value is calculated and monitored within the window.

Application: Control of the average force applied to a piece part when clamping, forming or molding.

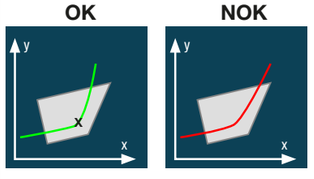
Time Monitoring



Detection of the time between entry and exit.

Application: Monitoring of time functions
e.g. flowrate of material during deformation

Slope detection



The slope has to reach a defined value. This value will be recorded and is relevant for other actions.

Application: Part recognition during press-fitting and compensation of tolerance variations

Networked production and quality data

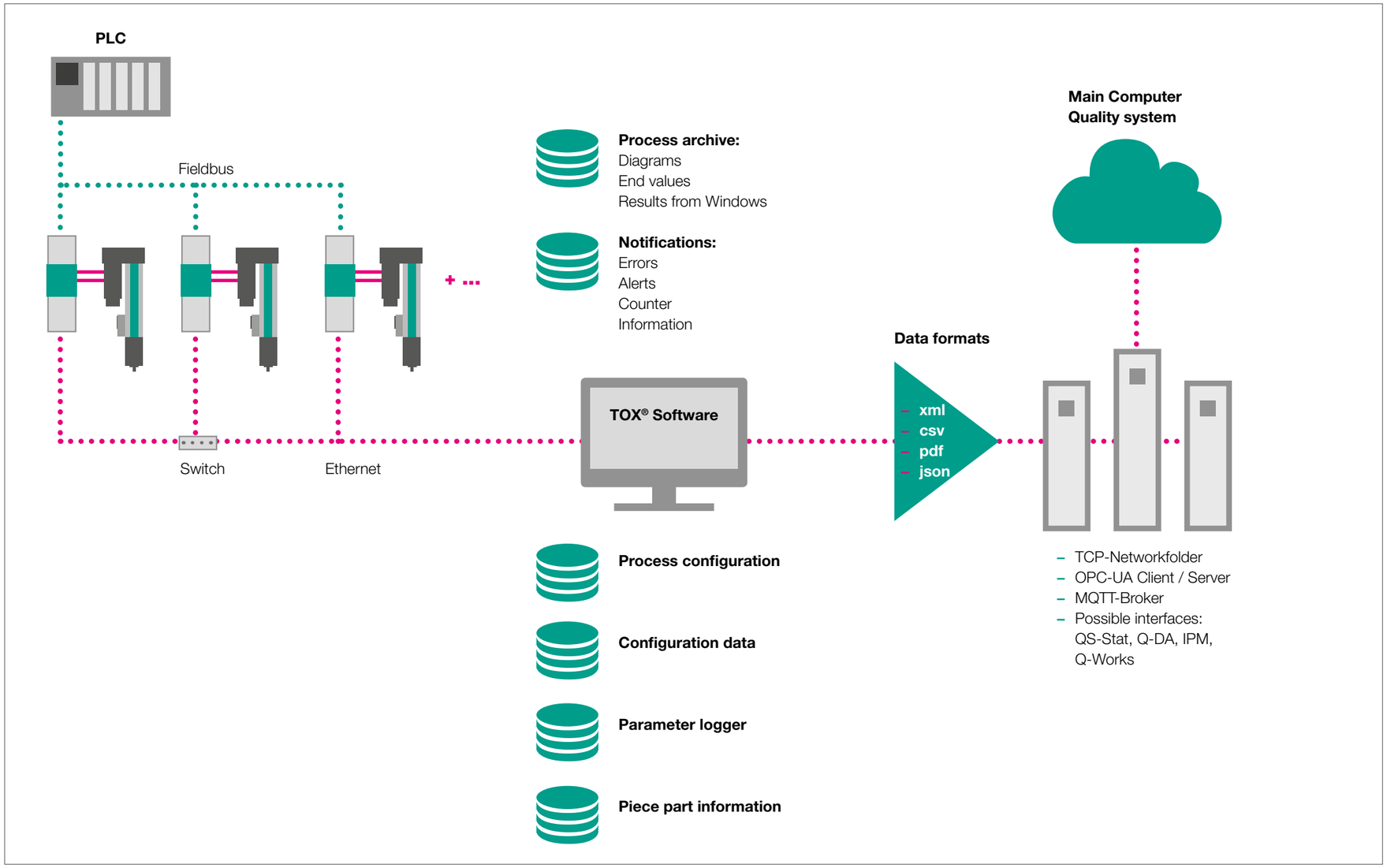
Digitization is making its way into industrial production. Modern information and communication technology enables self-organized production, so that people, machines, plants, logistics and products communicate and cooperate directly with each other. Intelligent and digitally networked systems are necessary for this.

Data connection and network
Thanks to numerous interfaces, the TOX® ElectricDrive Core System can be excellently integrated into a network - be it a machine, a production line or an entire company network. The system components communicate with each other via fieldbus.

Quality data for further processing
The data generated in the network makes it possible to monitor and improve the processes on an ongoing basis. Feedback from the production process can be used to optimize technology parameters. Links of component serial numbers to the respective process quality data are possible and can be stored permanently. Unnecessary maintenance work and downtimes can be avoided thanks to predictive maintenance.

Advantages

- Interfaces for connecting peripheral devices via Industrial Ethernet
- Plug & Play installation
- Fast application changeover
- Modular design
- Import of process parameters from the production network
- Dynamic adaptation of process settings
- Data exchange via communication protocols such as OPC-UA and MQTT



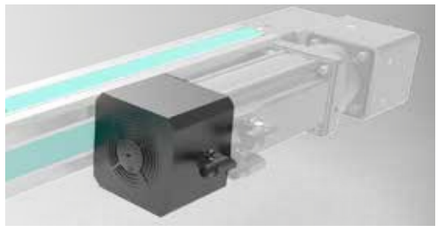
Options and accessoires

With various accessories and expansion options, the system can be equipped to meet individual requirements.

Certified for cleanromm ISO-class 5
The TOX® ElectricDrive EXe-K electromechanical drive meets the highest standards of cleanliness and process reliability - tested and certified by the Fraunhofer Institute for Manufacturing Engineering and Automation IPA.

With their cleanroom suitability in accordance with ISO 14644-1, class 5, our drives set new standards in cleanroom-compatible joining technology.

Fan
The drives can be equipped with a fan. This cools down the motor and enables higher power density and thus higher cycle rates. It also enables sustained high press-in forces.



Automatic lubrication device
All drives can be equipped with an automatic lubrication device. This ensures optimum lubrication of the drive.

Force sensor
Additional force sensors at important positions measure the relevant forces.

Piezo-electric sensor
Upon request, a piezo sensor can be integrated.

Proximity switch
For detecting positions of workpieces and tools.

Travel sensor
The drive system can be equipped with sensors for precise measurement of travel, distance and position independent of deflection.

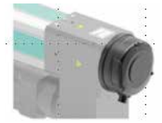
External linear position sensor
To measure distances between objects and a reference point independent of deflection, external travel measuring systems (glass scales) are used.

Safety for man and machine

Servo presses are highly precise and powerful, but their high power and speed require special safety precautions to prevent accidents and injuries. Therefore, safety technology for servo presses includes a variety of measures and technologies aimed at ensuring the safe operation of these machines

Overall, safety technology for servo presses is a combination of mechanical, electrical and software-based safety solutions. The right combination of these technologies helps to make the operation of servo presses safe and efficient.

Holding brake in the motor
The motor holding brake prevents the weight-loaded working piston from dropping when the system is de-energised.



Safety brake (mounted on drive)
In the event of a malfunction, the safety brake stops the drive and protects against injury. The brake is checked for functionality before each cycle.

Speed detector
For operator safety an external encoder can be mounted on the safety brake.

The TOX® PowerModule Core controller is required for the operation of the servo drive and is offered in 2 versions:

TOX® PowerModule Core Basic Safety
The TOX® PowerModule Core - Basic Safety fulfills the most important requirements for safety technology and reliably protects man and machine with Performance Level e.

TOX® PowerModule Core Extended Safety
The TOX® PowerModule Core - Extended Safety combines excellent performance with extended safety functions and offers maximum safety and flexibility:
- FSoE, Profisafe
- SLS (Safely Limited Speed)
- more on request

Versatile applications

The TOX® ElectricDrive Core System is perfectly suited for precise and powerful use in joining machines, assembly machines, presses, robot tongs and special machines. The system ensures maximum productivity in a wide range of applications.

Joining and Assembling


Clinching

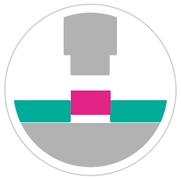

Clipping


Pressing, Compressing


Crimping


Insertion of functional elements


Punching, Piercing

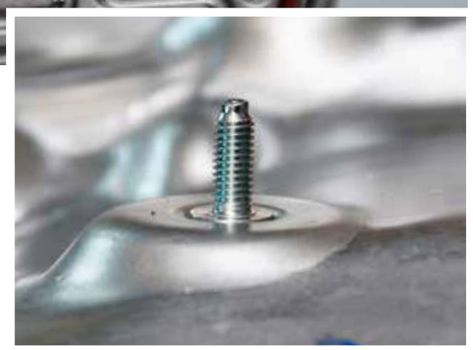

Press Fitting, Installing


Riveting


Tightening, Clamping

Advantages

- Common applications are pre-parameterized
- Easy adjustment of the process parameters
- Fast changing of applications
- All combined in one system



Forming


Bending

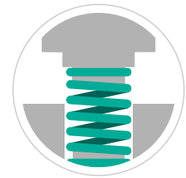

Molding


Stamping, Marking


Deep drawing

Checking and Testing

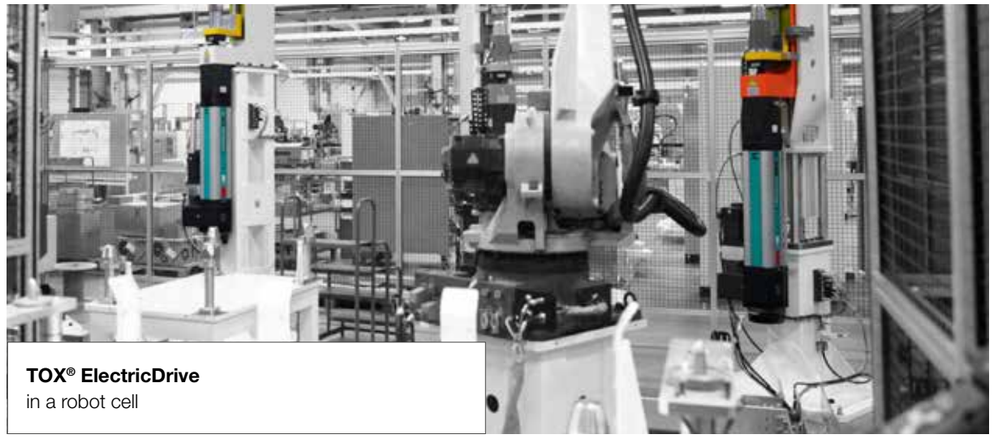

Checking, Measuring


Testing

TOX® Laboratory tests for you!

We test your application with your piecepart in our in-house test laboratory. Thus we guarantee an optimal combination of drive and application.

Applications in action individual and flexible.



TOX® ElectricDrive
in a robot cell

TOX® ElectricDrive joining modules
in a robot cell

TOX® ElectricDrive joining modules
in industrial setting

TOX® ElectricPowerDrives
installed in a rotary indexing table

TOX® PowerModule Core
several in a row operating several drives

TOX® ElectricDrive joining modules
in industrial setting

TOX® ElectricPowerDrive
in special color

Your Partner for future-proof solutions. Globally networked. Regionally based.

Joining is tradition

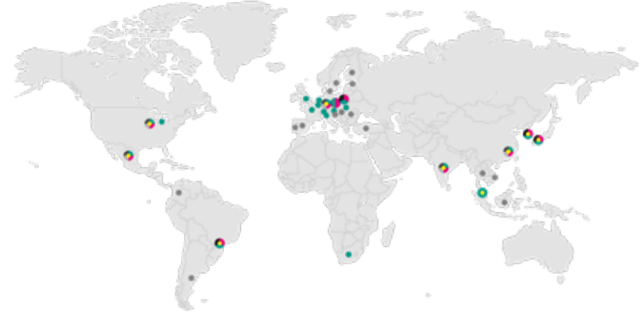
For over 45 years, TOX® has been a leader in providing innovative solutions for sheet metal joining and drive technology. As an international family-owned business with its headquarters in Weingarten (Baden-Württemberg) we develop intelligent systems for joining, press-fitting, and clinching — from individual components to complex production systems.

TOX® stands for the highest quality, durability and depth of integration.

Technologies are our DNA

TOX® determines the ideal technology for the respective application in advance in its in-house test laboratory. Preliminary tests are carried out and analyzed using samples and test parts.

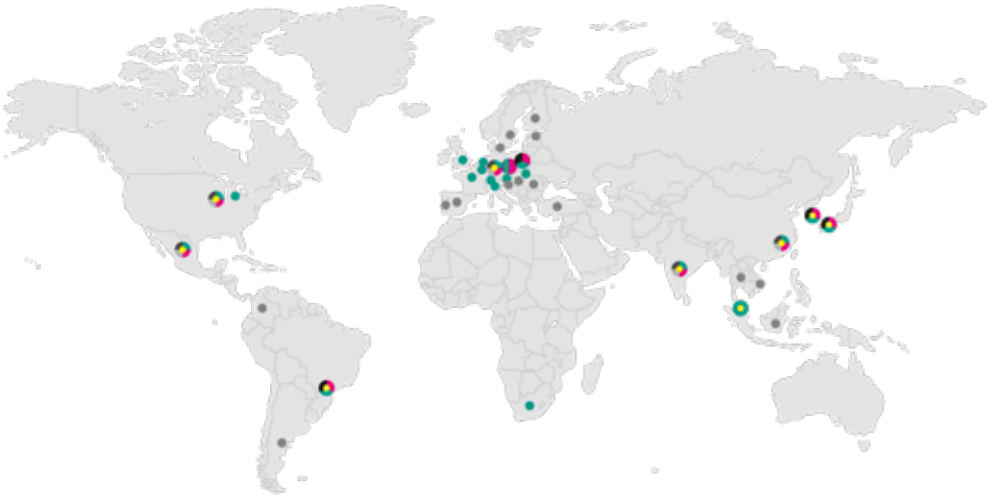
The results provide important parameters, such as the required pressing force or tool geometry, which are incorporated into the system configuration and processing technology. Final test reports verifiably ensure the quality of the joint.



German Engineering meets global Innovation

Our headquarters and technology center are located in Weingarten (Baden-Württemberg). With 17 branches worldwide and a broad network of sales partners, we offer global proximity and comprehensive service.

Five production sites – in Germany, the USA, China, India and Mexico – ensure highest quality wherever our customers are.



TOX® PRESSOTECHNIK SE & Co. KG
Riedstrasse 4
88250 Weingarten / Germany

Find your local contact at:
www.tox.com

309968 / 40.202604.en