KISTLER

measure. analyze. innovate.

maXYmos BL
maXYmos TL
maXYmos NC

XY Monitors for Process Monitoring with 100 % Quality in Manufacturing, Assembly and Product Testing

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XY Monitors maXYmos for 100 % Quality in Assembly and Product Testing

The maXYmos XY monitors make it possible to check and evaluate the quality of a product or production step on the basis of a curve. The user can apply evaluation objects in order to adapt the curve evaluation to the individual monitoring task. Based on this specification, the maXYmos can check each workpiece and decide whether the part is good or bad.

Chain to Process
By performing earlier checks within the manufacturing and assembly process, more rejects can be avoided. Faulty parts are sorted out early in the process, thereby supplying system components with only good parts rather than defective ones. This type of systematic, in-process quality assurance guarantees reliable results, maximizing production while reducing costs.

The maXYmos XY monitors make it possible to check and evaluate the quality of a product or production step on the basis of a curve. The monitors record the interrelation of all of the measurands that can be measured, for example, with force or torque sensors on the Y-channel and with displacement or rotation angle sensors on the X-channel. Quality-relevant sections of the measurement curves recorded by means of measurement functions, such as Y = f(X), Y = f(t), Y = f(X,t) and X = f(t) are analyzed with the aid of evaluation objects. This involves the maXYmos checking whether the curves pass through the evaluation objects as predefined. If they do, it generates an "OK", otherwise a "not OK" (NOK) result.

The maXYmos monitors from Kistler check and evaluate XY curves of two measurands that stand in relation to each other.

Such curves arise in applications such as:
- Press-fitting ball bearings
- Pivoting and adjusting rake of backrests
- Riveting and caulking casing parts
- Tactile manipulation of rotary switches, etc.
- Testing springs
- Measuring of haptic behavior as can occur during switch tests

XY Monitoring at a Glance

- In-process monitoring of joining and assembly processes
- Early detection of quality variations in the production process
- Transparency in production process enables fast feedback
- Traceable process results
- Economization of test routines

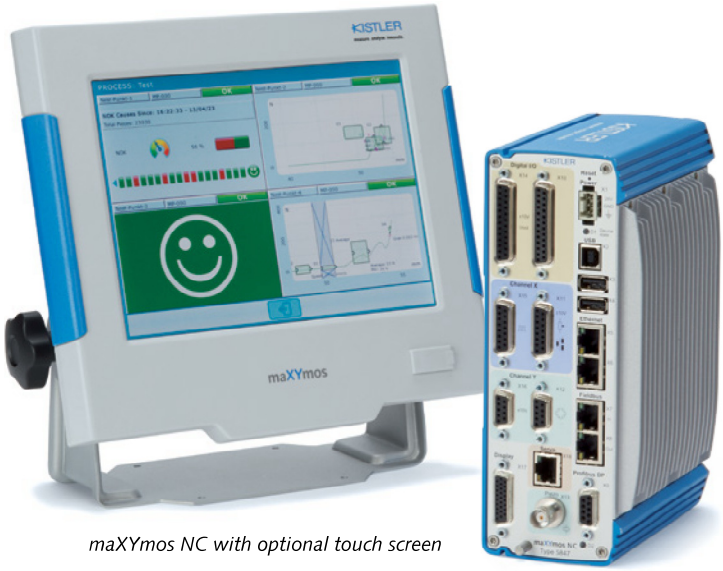
Contents

XY Monitor maXYmos NC for Monitoring and Controlling NC Joining Modules

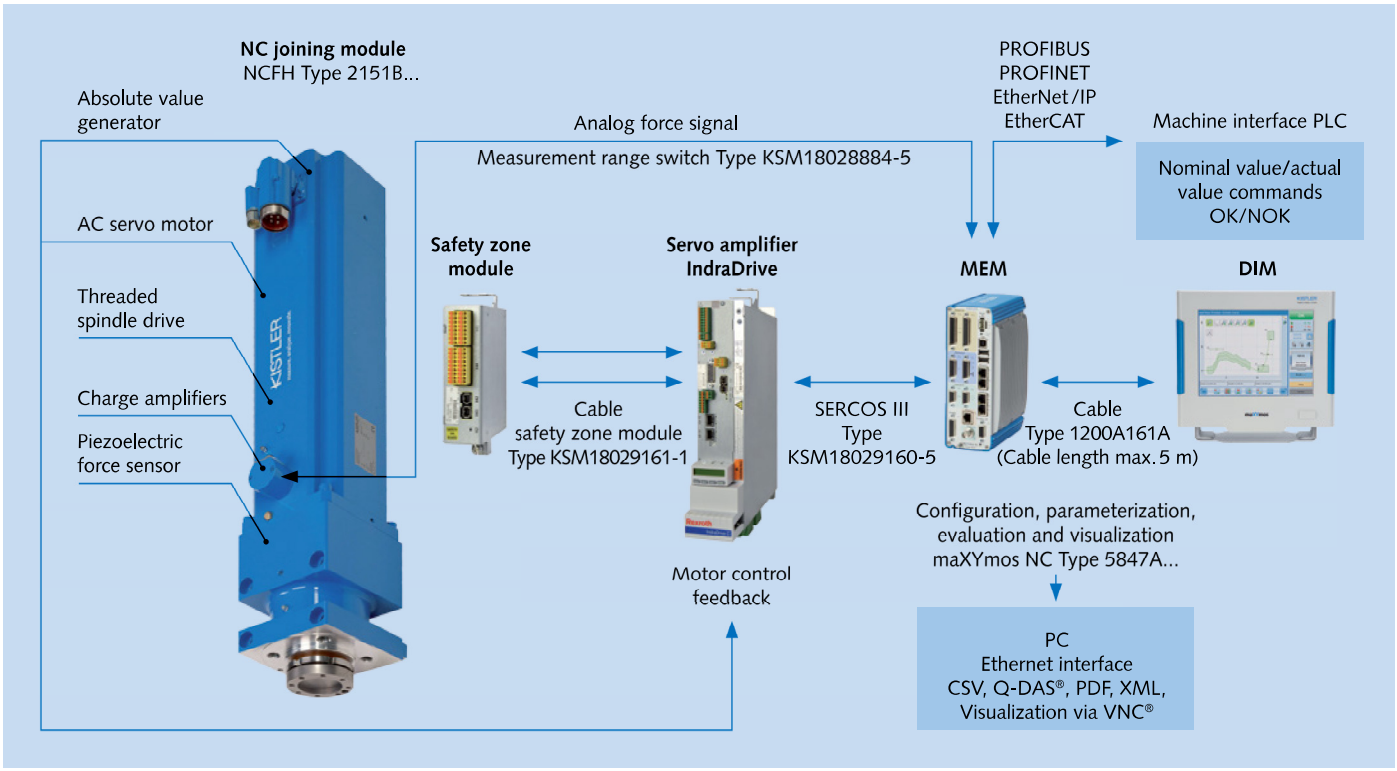
The maXYmos NC controls, monitors, evaluates and documents XY progressions for joining and press-fitting processes in combination with NC joining modules and the associated servo amplifier IndraDrive. The shape of the measurement curves allow the quality of individual manufacturing steps, assembly groups or even an entire product to be monitored and controlled in real-time.

The maXYmos NC not only handles the evaluation of curve progressions and their documentation, it is also responsible for activation of the servo amplifier IndraDrive that controls the NC joining module. Communication takes place in real-time through SERCOS III, guaranteeing high repeatability and maximum performance in process control.

Commissioning is easy via PC or using the optional touch screen. Various fieldbus interfaces are available to connect to the control system. The integrated sequence control ('Sequencer Mode') enables easy, fast and versatile mapping of even complex processes.



maXYmos NC with optional touch screen

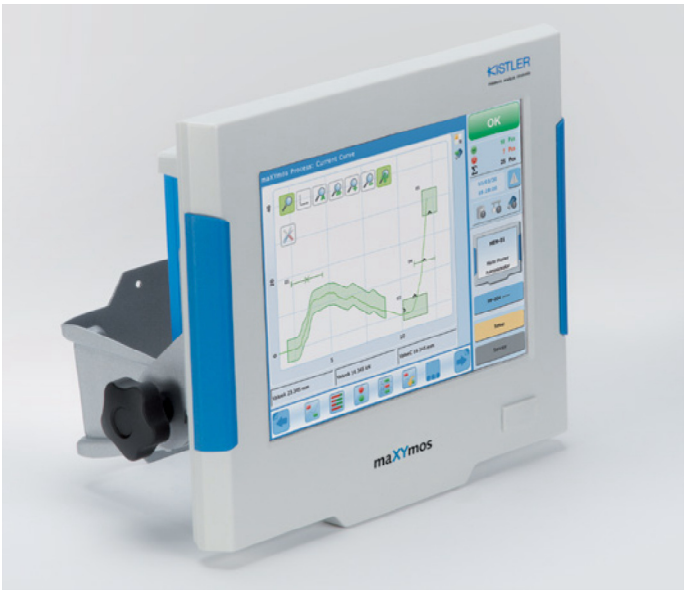


Functional principle of an NC joining system using the NC joining module NCFH Type 2151B... and maXYmos NC Type 5847A...

XY Monitors maXYmos BL and TL

maXYmos BL

maXYmos TL

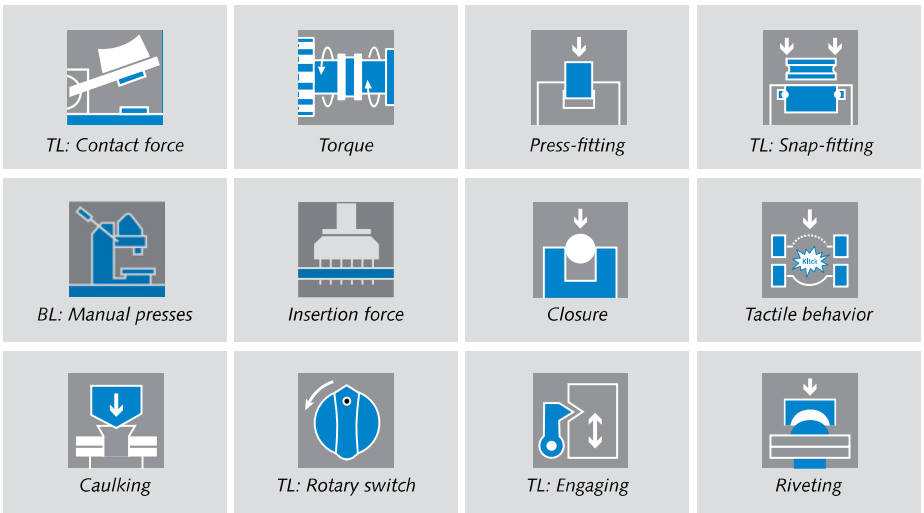


maXYmos BL (Basic Level)
The maXYmos BL is an XY monitor for standard applications in assembly and product testing. This can range from simple spring tests through monitoring of press-fitting and testing of damper characteristics. The monitor is equipped with one pair of measuring channels (XY) to evaluate part-specific curves using universal evaluation objects, such as UNI-BOX, LINE-X, LINE-Y, NO-Pass and ENVELOPE. Despite the very modest price, the user still has access to helpful features such as the curve history memory for NOK diagnostics, table of process values, fieldbus interface for exchange of signals, and Ethernet interface for fast data export and remote maintenance. The maXYmos BL can be optionally equipped with the fieldbus Profibus DP or EtherNet/IP.

maXYmos TL (Top Level)
This XY monitor can be used for simple force-displacement monitoring to challenging multichannel applications in assembly and product testing. Its functionality and operating concept build upon that of the maXYmos BL.

Key features of the maXYmos TL include more powerful evaluation techniques, a larger selection of sensors, unrestricted choice of fieldbus types, expandability up to 8 pairs of channels and a 10.4" color touch screen display. The monitor is truly ideal in terms of its ease of use and display capabilities.

Applications



Advantages of the maXYmos family

- Assembly monitoring
- Product testing
- Final inspection
- Wear tests
- Production lines
- Manual workstations
- Rotary indexing tables
- Inspection of incoming goods

Technical Specifications

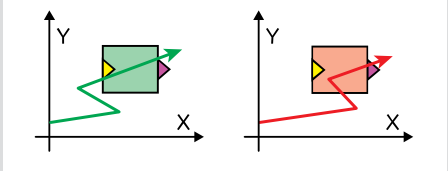
XY monitors				
Type		5867B...	5877A...	5847A...
Name		maXYmos BL	maXYmos TL	maXYmos NC
Number of measurement channels per basic unit		1 x XY	1 x XY	1 x XY
Expandable up to measurement channels			8 x XY	8 x XY
Functions of measurement curve detection		y = f(x), y = f(t), y = f(x, t), x = f(t)	y = f(x), y = f(t), y = f(x, t), x = f(t)	y = f(x), y = f(t), y = f(x, t), x = f(t)
Storage depth per measured curve		8 000 * XY	8 000 * XY	8 000 * XY
Sampler rate (XY value pairs/second)		5 000	20 000	10 000
Number of parameter sets per XY channel		16	128	128
Diagnosis storage for measured curves		20 curves	500 curves	500 curves
Sensor channel X	Potentiometer	■	■	■
	Power ±10 V	■	■	■ Monitor output
	Incremental Sin-Cos (A, B, Z)		■	■
	Incremental right angle (A, B, Z)		■	■
	SSI		■	■
	LVTD		■	■
	Inductive half bridge		■	■
Sensor channel Y	Piezo	■★	■	■
	DMS	■★	■	■
	Power ±10 V	■★	■	■ Monitor output
Motion elements for evaluating curve progression	UNI BOX (window)	■	■	■
	ENVELOPE (envelope curves)	■	■	■
	LINE (X+ Y)	■	■	■
	NO-PASS (line with online signal)	■	■	■
	BREAK		■	■
	HYSTERESIS (X+ Y)		■	■
	SPEED		■	■
	AVERAGE (average value BOX)		■	■
	GRADIENT (X+ Y)		■	■
	TIME		■	■
	GET-REF (finds reference point)		■	■
	CALC (calculates and evaluates)		■	■
	INTEGRAL		■	■
	TUNNEL BOX (X+ Y)		■	■
	BEND		■	■
	OBLIQUE BOX		■	
Interf.	Ethernet (TCP/IP)	■	■	■
	USB	■ (device)	■ (host + device)	■ (host + device)
Fieldbus	Fieldbus master			■ SERCOS III for controlling servo amplifier IndraDrive
	PROFIBUS DP	■★	■	■
	PROFINET		■	■
	EtherNet/IP	■★	■	■
	EtherCAT		■	■
DI / DOs		11 / 8	22 / 23	16 / 16
Display		3.5" color touch screen	10.4" color touch screen	10.4" color touch screen
Remote control via		Ethernet per VNC	Ethernet per VNC	Ethernet per VNC
Protection class according to IEC/EN 60529		IP40, IP65 (for front panel mounting)	IP40, IP65 (for front panel mounting)	IP40, IP65 (for front panel mounting)
Power		24 (18 ... 30) VDC	24 (18 ... 30) VDC	24 (18 ... 30) VDC

■ = *Standard* ★ = *Optional*

XY Monitors maXYmos: Models and Selection Criteria

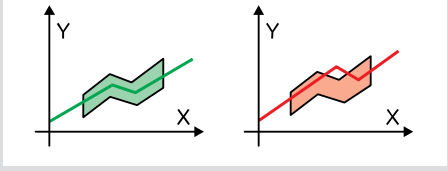
maXYmos BL

Type UNI BOX



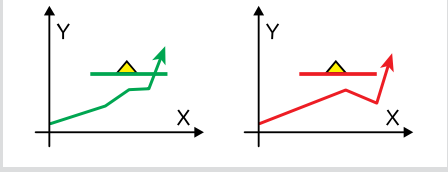
Entry and exit as specified. No crossing of "closed" sides allowed. Each side can be defined as entry or exit.

Type ENVELOPE CURVE



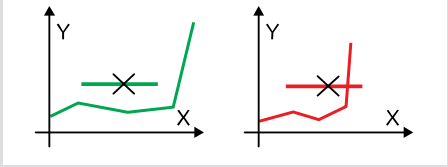
The measurement curve must not cross the upper or lower line of the envelope. This evaluation object is easy to master.

Type LINE-X



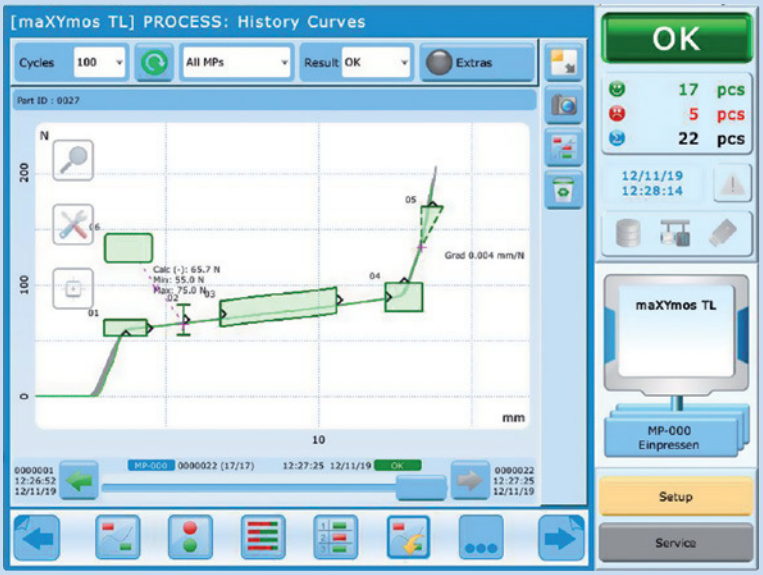
The line must be crossed once. An X-value at the point of intersection is monitored.

Type NO-PASS



The line may not be crossed. Otherwise, "NOK" and "NO-PASS" real-time signal appears.

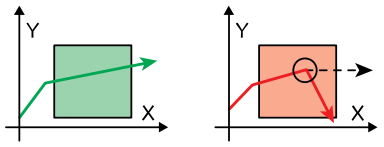
maXYmos TL / NC



Screen TL/NC: Curve history memory

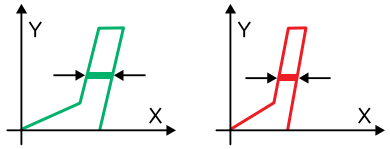
maXYmos TL / NC *(incl. maXYmos BL selection criteria)*

Type BREAK



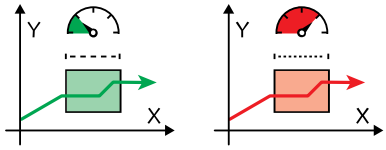
Provides "NOK" and online signal in case of sudden gradient change within an expectancy range (box), e.g. tool breakage.

Type HYSTERESIS-X



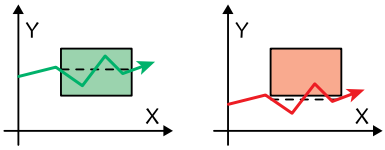
Evaluates the X-hysteresis between forward and reverse curves on a horizontal line.

Type SPEED



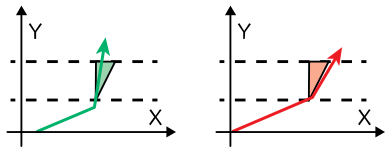
Evaluation criterion is the speed between the entry and exit points in a special box.

Type AVERAGE



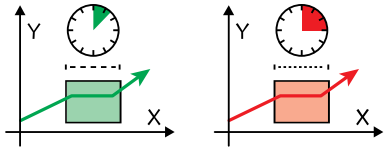
Evaluates the average of all Y-values in the box region.

Type GRADIENT-X



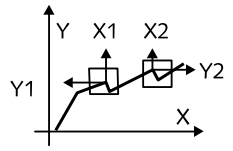
Evaluates the gradient dX/dY between two horizontal lines.

Type TIME



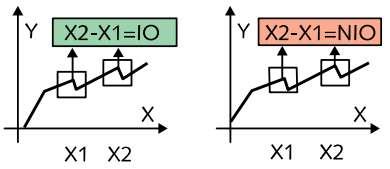
Evaluation criterion is the time between the entry and exit points in a special box.

Type GET-REF



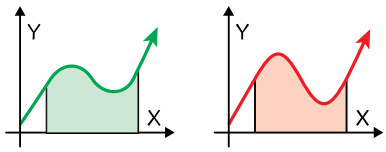
Box detects significant curve features and their XY coordinates in the expectancy range. This information can be used as reference points for other EOs or as an input for the CALC object.

Type CALC



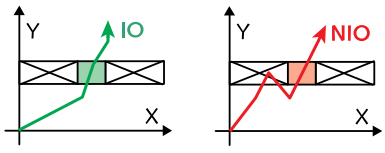
Object references two selectable process values and performs calculations, e.g. the X-difference between two ripples, and evaluates them.

Type INTEGRAL



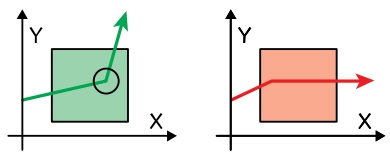
The area beneath the curve is determined and evaluated.

Type TUNNEL BOX-X



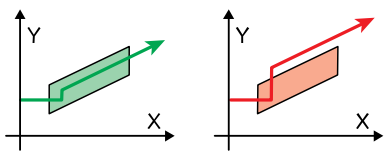
Entry and exit as specified. Crossing of the "closed" sides generates a real-time signal.

Type BEND



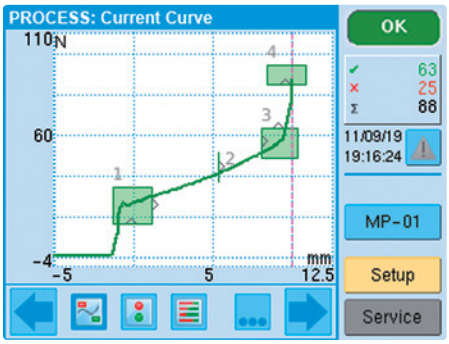
A defined gradient change is expected within the expectancy range (box) and can be used as a further switching condition in the sequence.

Type OBLIQUE BOX



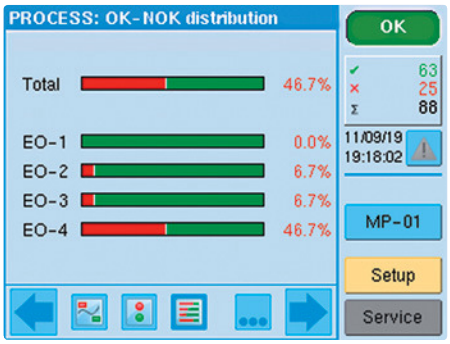
Entry and exit are pre-defined. No violation of "closed" sides permitted. Each side can be defined as an entry or exit.

maXYmos BL:
Process Pages and Features

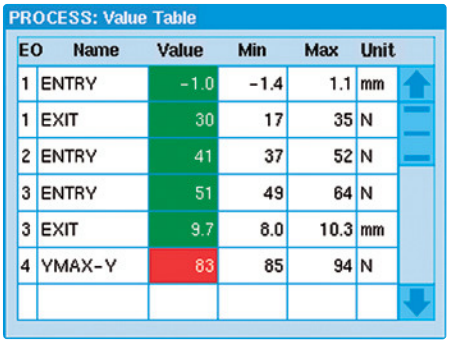


Current measurement curve

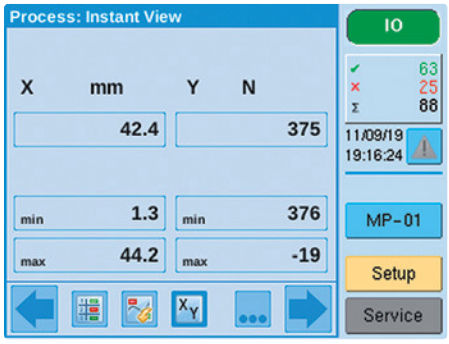
Traffic lights



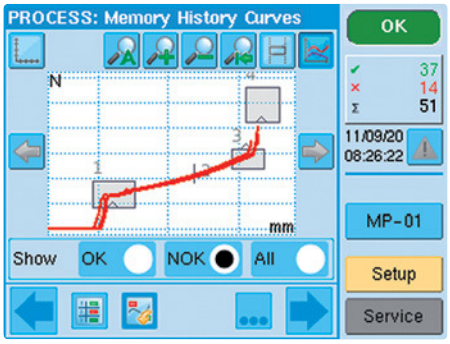
OK/NOK distribution:
Which evaluation object is primarily responsible?



Results and process values



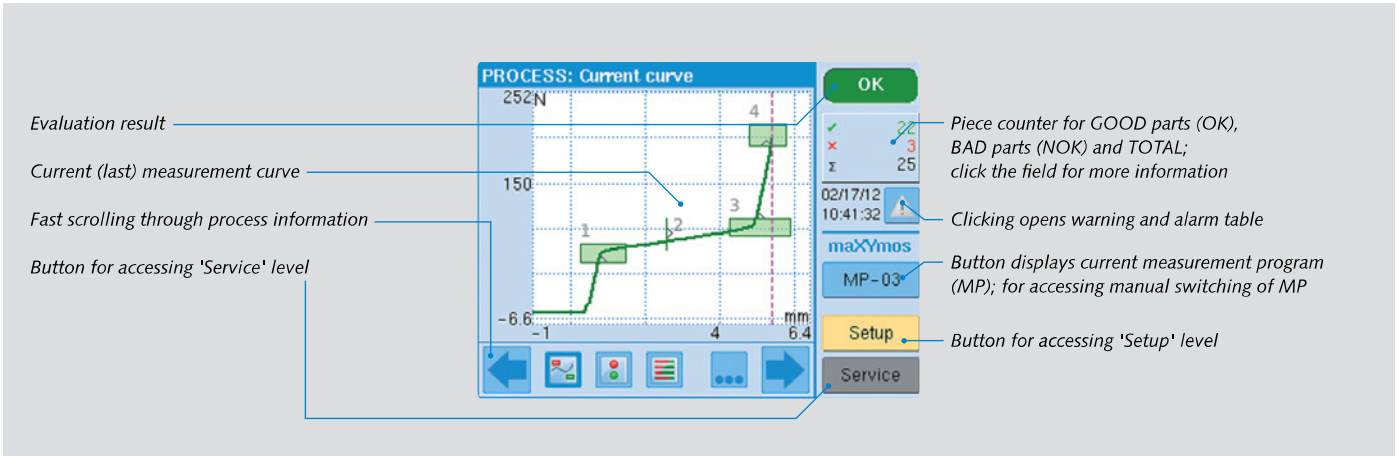
Instant view



NOK diagnostics: "Last measurement curves" memory

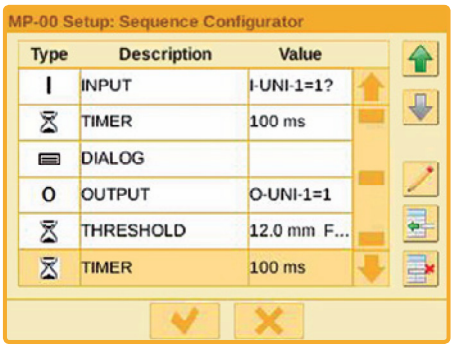
Important maXYmos BL features at a glance:

- Curve evaluation using envelope curves, boxes and thresholds
- 4 evaluation objects per curve and measurement program
- Monitoring of up to 10 parts per second
- 16 measurement programs for 16 different types of part
- Up to 8 000 pairs of X/Y-values per curve
- 3 real-time outputs for X- and Y-thresholds
- Dig-IO (24 V), PROFIBUS DP, Ethernet (TCP/IP) and USB
- Memory for historical measurement curves for NOK diagnosis
- Warning and alarm messages allowing early countermeasures
- Serial numbers from PLC or internal S/N generator
- Access protection for various user groups
- Channel X: potentiometer and ±10 V, channel Y: piezoelectric or strain gage / ±10 V
- Bright, high-contrast 3.5" color touch screen display
- Clearly structured user interface
- General-purpose case for panel, wall and desktop mounting
- PC software "maXYmos PC" as support tool
- Extremely good value for money



Main menu for 'Process' level: Starting point for process information and other menu levels

maXYmos BL 2.2: Sequencer Mode



The 'Sequencer Mode' in the maXYmos BL allows programming of sequence controls, which are used to control the processes. An independent program can be created for every measurement program, using the freely programmable digital input and outputs to poll or output special, process-relevant conditions, for example. The following elements are available:

Measurement Start/Stop Element – this element starts and stops the measuring. When the measurement stops, evaluation is performed based on parameters configured for the evaluation elements.

Timer Element – this element delays execution of the subsequent element by the configured time. Use as a setting time under force, for example.

Dialog Element – this element enables interaction with the user; for example, to forward useful information.

Input Element – when this element is activated, the system waits for the configured digital input signal and then continues the sequence.

Output Element – when this element is activated, the correspondingly configured output is set on the device.

Switching Threshold Element – this element serves to record the learned positions on the X and Y axes. These positions act as a progressive switching or query condition in the sequence.

If/Else Element – this element permits a conditional branch, i.e. a branch in the sequential program according to the query condition or result.

Restart Element – branching option to the start of the sequence.

Important features of the maXYmos BL 'Sequencer Mode':

- 11 freely programmable digital inputs
- 8 freely programmable digital outputs
- up to 128 elements for measurement program
- "cam function" for the X and Y axis

The solution package for retrofitting hand presses Type 9819A, for instance, comprises:

maXYmos BL, Type 5867B0010

- XY monitor for good / bad evaluation
- Flexible evaluation options
- 16 measurement programs
- Color touch screen
- Clearly structured, intuitive user interface

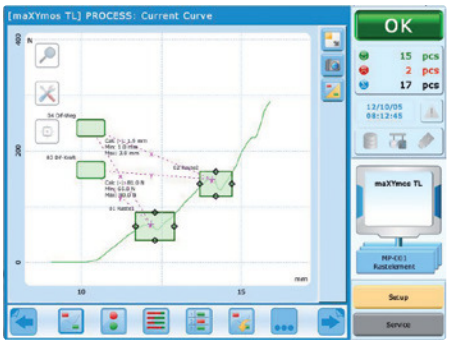
maXYmos BL 'Sequencer Mode', Type 2832A1

Press Force Sensor, Type 9340A

- Measurement range –10 ... 60 kN
- Calibrated for 1 %, 10 %, 100 %
- Ready for measuring, no on-site calibration
- Fits tool adapter ø10 mm or ø12 mm

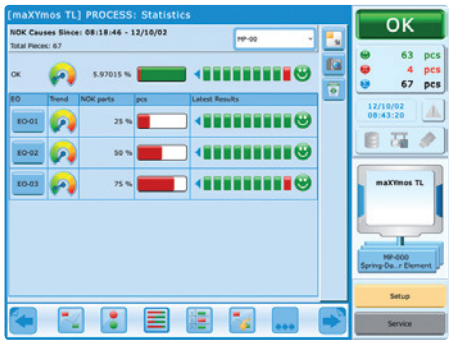
Additionally included in packet: Mounting pin for the force sensor, path sensor, cable and attachment material.

maXYmos TL/NC:
Process Pages and Features

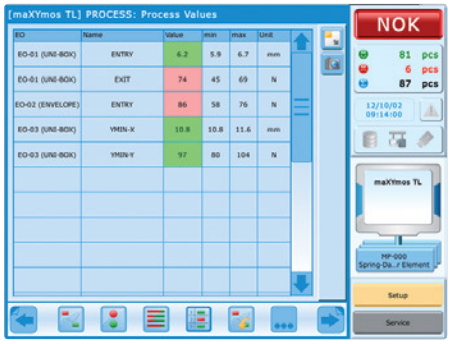


Application in product testing: Distance check between two breakover points of a fixing element. GET-REF boxes provide the coordinates of the points to the CALCULATE objects. They in turn compute and evaluate the relevant distances in the force and displacement direction (current measurement curve).

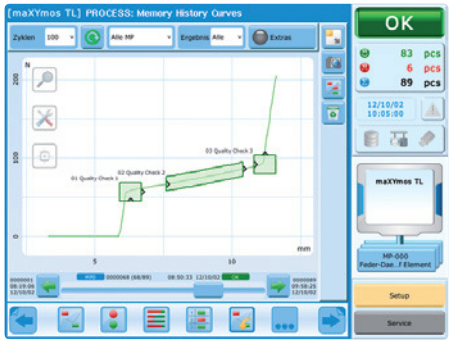
Traffic lights



OK/NOK distribution:
Which evaluation object is primarily responsible?



Results and process values

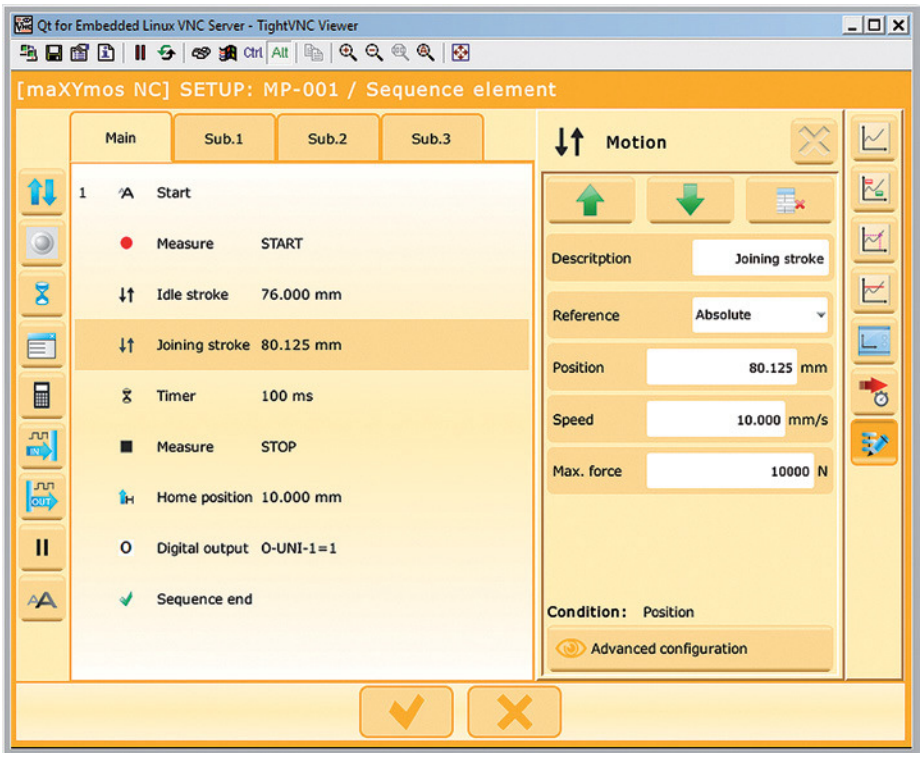


Curve history memory

Important maXYmos TL / NC features at a glance:

- 128 independent programs, each with up to 10 evaluation elements using a variety of types
- Up to 8 000 pairs of XY-values per measurement curve
- Real-time outputs for rapid response
- Powerful tools for diagnosing the causes of NOKs
- Diagnostic memory for up to 500 measurement curves with bundle function
- Warning and alarm messages allowing early countermeasures
- Cascadable to up to 8 pairs of XY-channels
- Serial numbers from PLC or internal S/N generator
- Access protection for different user groups
- Monitoring of up to 20 parts per second
- Statistics and protocoling of the measurement results (Q-DAS ®, CSV, PDF, XML)
- Self-monitoring and diagnosis, as well as visualization and remote control (VNC)
- Channel X: potentiometer, ±10 V, incremental encoder, LVDT or SSI, inductive half bridge
- Channel Y: piezoelectric, strain gage or ±10 V
- On-board fieldbus interfaces for system control (PROFIBUS, PROFINET, EtherCAT, EtherNet/IP)
- Bright, high-contrast 10.4" color touch screen display
- Clearly structured user interface
- PC software "maXYmos PC" as support tool

maXYmos NC: Sequencer Mode



The maXYmos NC controls the NC joining module via the servo amplifier through the integrated sequence control (Sequence). SERCOS III handles communication to the servo amplifier and thus guarantees real time behavior. An independent sequence can be defined for each program. The sequence can be configured freely on the basis of the following elements. Measurement and evaluation take place in the main routine. The 3 sub-routines can be used to define other sequences and execute these independently of the main routine. A total of 255 elements can be placed per program.

Motion Element – this element causes the NC joining module to actuate to the specified position (absolute or relative) or force level. In addition, force regulation, deflection compensation or stopping on an external signal, or the response to a bend point event can be configured.

Wait Element – when the sequence reaches this element, it is stopped and acknowledgment must be obtained from the PLC before the sequence continues.

Mark Element – this element provides interaction with the PLC. In the process, the label number is transferred to the PLC when the 'Element Label' is activated.

Measurement Start/Stop Element – this element starts and stops the measurement. When measurement stops, evaluation is performed according to the parameterized evaluation elements.

Timer Element – this element delays execution of the subsequent element by the configured time. Use as a setting time under force, for example.

Dialog Element – this element enables interaction with the user; for example, to forward useful information. The dialog must be confirmed by the user at the visualization.

Calculation Element – this element can be used to calculate subsequent parameters for further use from existing parameters, such as actual values from evaluation elements.

Input Element – when this element is activated, the system waits for the configured digital input signal and then continues the sequence.

Output Element – when this element is activated, the correspondingly configured output is set on the device.

Basic Settings Element – this element is contained once in the sequence and defines the basic settings. It is approached with the pre-defined speed when the element is activated or via the fieldbus.

Sequence End Element – this element indicates that the sequence has been ended. Subsequent elements are no longer executed.

maXYmos BL / TL / NC: Equipment and System Concept

The flexible case concept of the maXYmos XY monitors allows easy integration into existing or newly planned systems. Retrofitting of presses (automatic or manually operated) is also very simple.

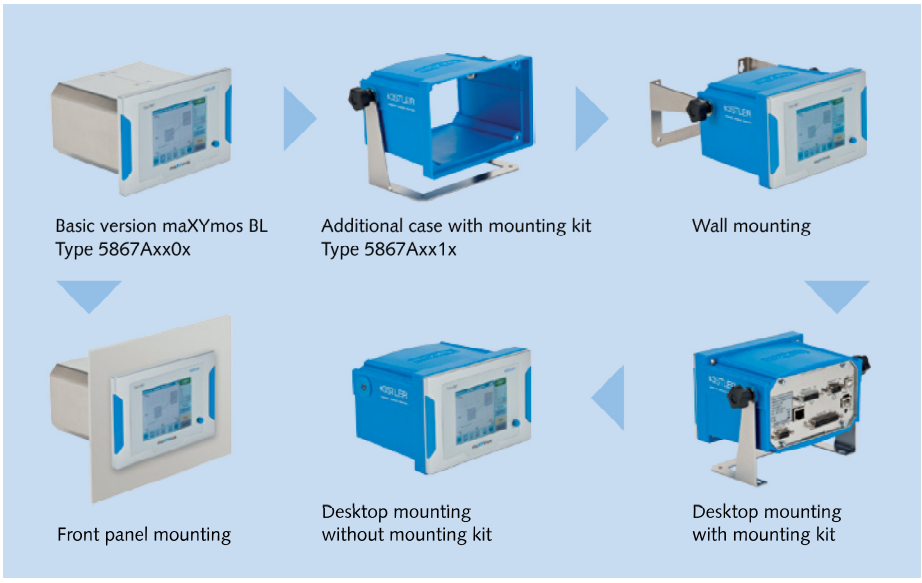
Both monitor types employ a universal case concept. A minimum of manipulation is required to convert between the desktop, wall-mounting and panel installation versions.

maXYmos BL
As the basic version, the maXYmos BL is optimized for mounting in a front panel. An optional additional case allows mounting on a vertical panel of a machine or on a flat surface, as well as continuous adjustment of the angle of inclination. The operator can use the adjusting screws on both sides to set the desired view angle.

maXYmos TL / NC
The maXYmos TL/NC consists primarily of two components: the measuring and evaluation module (MEM) and the display module (DIM). The two components can either be installed separately at different locations so they are only connected via the monitor cable, or they can function as a single compact mechanical and electrical unit. The latter configuration is achieved by inserting the MEM into the rear slot of the DIM. This combination already provides one pair of measuring channels (XY) and all of the interfaces required for control, data export and remote maintenance. If continual visualization is not required, the MEM can also function as a black box module and the user interface can be displayed on a PC (provided by the customer) or operator panel by using a VNC client.

Desktop and Wall Version
The mounting bracket attached to the DIM module can be used to convert the device from the desktop version to the wall version with minimal manipulation.

It is also possible to separate the measuring and evaluation module (MEM) from the display module (DIM) and arrange it at a remote position, e.g. in the control cabinet. Advantages: Only a monitor cable is connected to the display. At the same time, the degree of protection in the area of the monitor is increased to IP65.



maXYmos BL

maXYmos TL / NC *Front panel mounting (panel version) attachment using removable frame*

Wall mounting

Desktop mounting

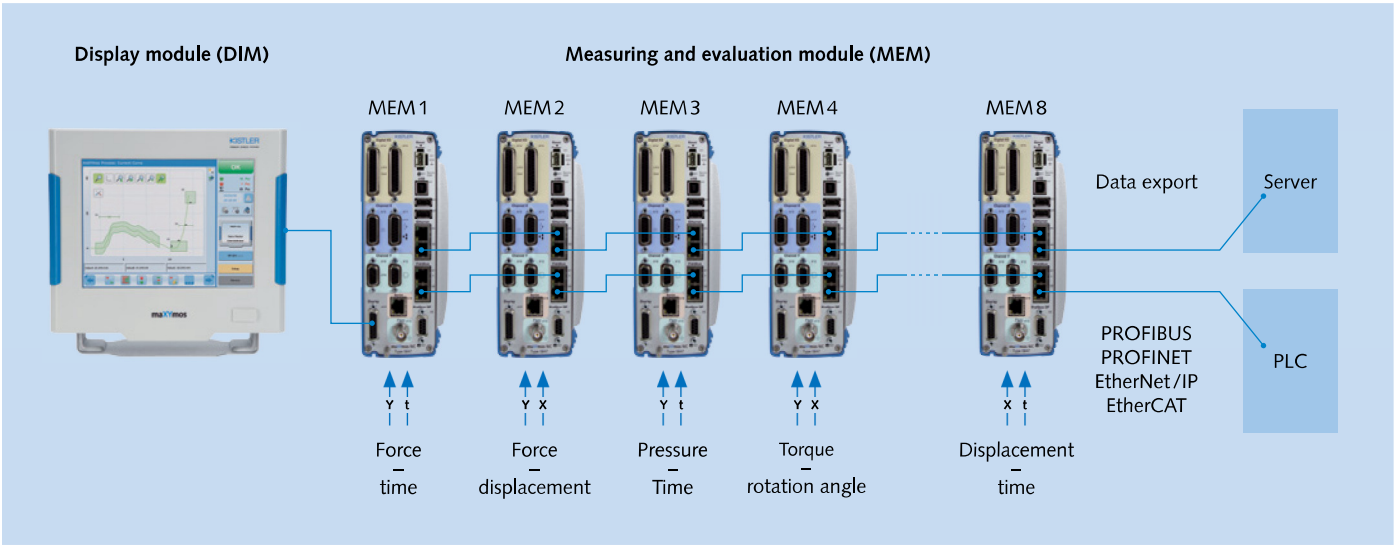
Panel Version for Front Panel Mounting
After removing the mounting bracket and rear frame from the display module, the display is inserted through the front-panel opening and the frame is screwed back into place. If necessary, the measuring module (MEM) can also be inserted into the display module's slot.

MEM as Pure Black Box Module
Setup and process visualization are then handled using VNC access via the Ethernet interface or in conjunction with the "maXYmos PC" software, available as an accessory via the USB interface. A maXYmos TL/NC system can be easily expanded to handle up to 8 pairs of channels (XY). The MEMs are connected to the Ethernet interface using patch cables. No external switches are required since the Ethernet connection is looped through the MEMs using in/out connectors.

Using an optional top hat rail clip, the MEM can be housed in a protected manner in a control cabinet. It is then possible to visualize the individual measurement channels via a display module outside of the switch cabinet.

Display module (DIM, left), measuring and evaluation module (MEM, right)

Compact electrical and mechanical unit (top), separate installation of both components with a connection via the monitor cable (bottom)



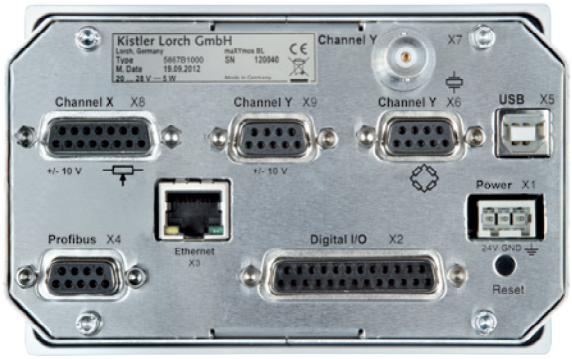
Cascadability: Up to eight pairs of XY channels. In the example above, all of the MEMs are accommodated in the control cabinet and are therefore protected. MEM1 could also be inserted into the slot of the display module.

Interfaces

The maXYmos XY monitors are characterized by a consistent operating concept, as well as consistent interfaces. The available interfaces are compatible on the pin and signal levels. This applies to the available sensor systems in addition to the digital control signals.

For the Y-channel there is an input for piezoelectric sensors, as well as an interface for strain gage sensors and sensors with a ±10 V output. For the X-channel, inputs are installed for analog sensors (potentiometer, ±10 V, LVDT, inductive) and digital sensors (incremental, SSI). This allows for flexible selection of the connected sensor system, depending on the particular measuring task at hand, with no definitive choice required in advance. USB and Ethernet TCP/IP interfaces are provided for communications and for exporting data. Various fieldbus versions (Profibus DP, EtherNet/IP, ProfiNet, EtherCat) can be used to communicate with the machine or system. These versions are installed on the MEM module and can be selected via the device's software.

maXYmos BL
The maXYmos BL is available in four versions. The Y-channel is available in a piezoelectric version and a strain gage ±10 V version. Potentiometric displacement and angle sensors, as well as sensors with a ±10 V output for the X-channel are supported by both types. Besides choosing between the piezoelectric and strain gage versions, the user must also select one of the bus versions (PROFIBUS or EtherNet/IP).

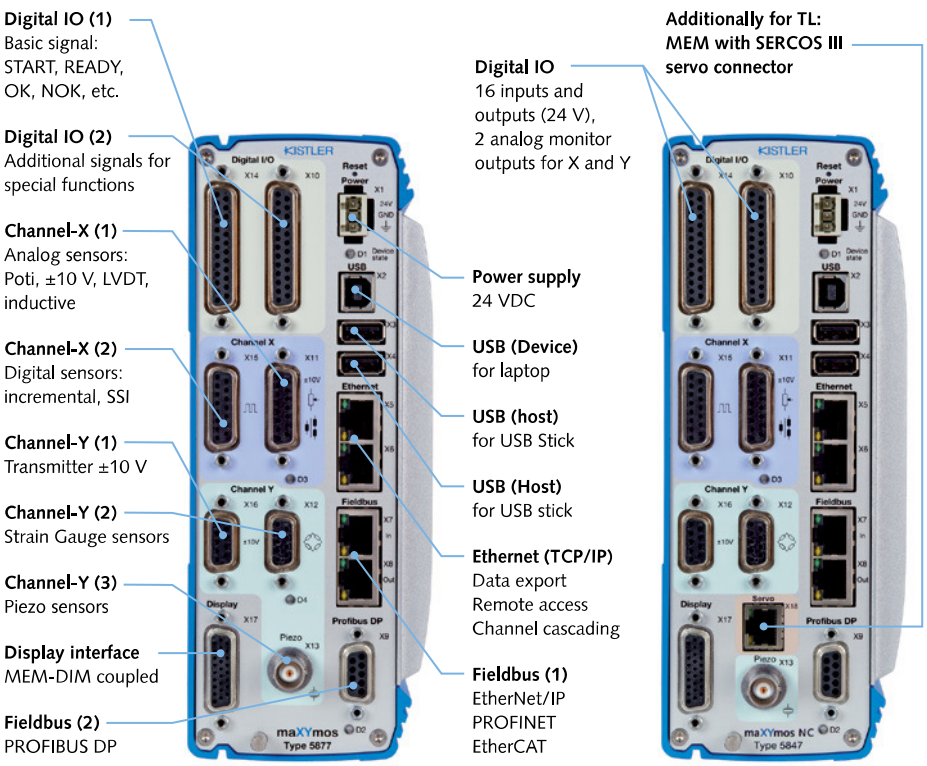


maXYmos BL:
Back panel piezoelectric version (with PROFIBUS), optionally as piezo or DMS version

maXYmos TL / NC
In terms of the variety of possible interfaces, the measuring and evaluation module (MEM) also meets practically every need. The most common interfaces are always available for quick selection in the menu. This allows the user to respond quickly to changing requirements in the area of sensor and fieldbus types. The cost of maintaining an inventory of spare parts is also reduced: Thanks to the "one for all" principle, only one type needs to be maintained on hand.

maXYmos TL:
Measuring and evaluation module (MEM)

maXYmos NC:



"maXYmos PC": Compatible Sensors Software

Sensors

For operation with the maXYmos monitors, Kistler offers a wide selection of force and torque sensors based on the piezoelectric or strain gage measuring principle, as well as potentiometric displacement and angle sensors:

Piezoelectric Sensors
Tension/compression force:
0 ... ±0,5 N to 0 ... ±300 kN
Compression force:
0 ... 0,1 N to 0 ... 800 kN
Strain (indirect measurement):
up to 800 με
Torque (static):
0 ... ±0,25 N·m to 0 ... ±200 N·m

Potentiometric Sensors
Displacement: 0 ... 10 mm to 0 ... 750 mm
Rotation angle: 0 ... 360°

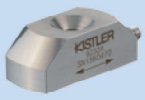
Strain Gage Sensors
Tension/compression force:
0 ... ±20 N to 0 ... ±500 kN
Compression force: 0 ... 20 N to 0 ... 200 kN
Torque (rotating):
0 ... ±2 N·m to 0 ... ±1,000 N·m

Software: "maXYmos PC"

Windows® Software "maXYmos PC" (Basic)* Type 2830A1
- Organize firmware updates
- Save device settings as file (backup)
- Reload device settings from file (restore)

Windows® Software "maXYmos PC" (Plus) Type 2830B2
Like basic version but also includes the following:
- Open, view and edit backup files
- Manage complete device settings on PC (setup editor)
- Explorer opens and interprets exported test records
- Cursor measurement, curve bundle display, etc.
- Display completed Y(X) curves also as Y(t) or X(t)
- Generation of Excel® statistics file with selected process values
- PDF print function for test records

The maXYmos family is comprised of XY monitors that are suitable for every application along with appropriate sensors – all from a single source.


Type 9232A...


Type 9217A


Type 90X1A...


Type 9237B


Type 9323A


Type 9313AA...


Type 9340A...


Type 4501A...


Type 4503A...

* *Included with product*

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