Process Monitoring Systems

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

Kistler – Your Partner for Process Efficiency and Cost Effectiveness

The Kistler Group is one of the world's leading manufacturers of sensors and systems to measure pressure, force, torque and acceleration. Thanks to systems from Kistler, measurement signals can be captured and analyzed – so companies benefit from increased process efficiency and enhanced business success over the long term.

Content

The maXYmos process monitoring system offers maximum control of production, assembly and product testing.

Focusing on Product Quality and Process Reliability

Quality is increasingly ranked as the critical cost factor in the industrial production sector, where processes have to run without errors. Kistler's process monitoring systems use the profile to monitor and evaluate the quality of a product or manufacturing step. As well as meeting the highest standards for quality, safety and reliability, these systems provide the essential basis for business success.

The global market environment for industrial production is extremely challenging – and this applies to every sector, from automobile manufacture and medical technology to electrical engineering. Requirements for product quality and process reliability are already high, but they will become even more demanding as time goes on. Now, the maXYmos family gives users a simple system that can quickly and accurately accomplish a variety of product testing tasks. maXYmos can be used in production plants, and it is the ideal solution for end-to-end process monitoring, quality assurance and documentation in joining, assembly, forming and testing processes.

Benefits at a Glance:
- In-process monitoring of joining and assembly processes
- Early detection of quality deviations in the production process
- Minimized outlay on quality assurance
- Faster feedback thanks to transparency in the production process
- Traceable process results
- No additional testing routines

Process Monitoring Systems for Every Application

maXYmos BL (Basic Level) is suitable for standard assembly and product testing applications. maXYmos TL (Top Level) offers a variety of interfaces, making it the ideal platform for capturing and evaluating a diverse range of measurands. maXYmos NC controls, monitors, evaluates and documents the XY profiles for joining and press-fit processes in conjunction with NC Joining Modules and the IndraDrive servo amplifier that is included in the system.

Higher Quality – Lower Costs

Convincing benefits across the board: with Kistler's XY monitors and process monitoring systems, optimal cycle times and maximum repeat accuracy can also be achieved for multi-stage processes. Downtime is minimized and machine availability is increased – resulting in a boost in productivity for the entire manufacturing process. In short: Kistler provides the basis for maximum control of the entire production chain – paving the way for increased quality and reduced costs in production.

**Increased Process Efficiency
with Kistler – Now Online!**
View our animation to experience convincing, first-class Kistler solutions – the sure way to optimize process efficiency:
www.kistler.com/maXYmos

Kistler's XY monitors track and evaluate XY profiles where two measurands must be in a specified relation to one another.

Transparent Production Processes Guarantee Quality

The maXYmos process monitoring system can use a profile to monitor and assess the quality of a product or a production step. To achieve this, the system interrelates all the measurands: those captured via the Y channel with force, torque or pressure sensors, for instance, and those acquired via the X channel with displacement or rotation angle sensors.

maXYmos uses defined evaluation objects (EOs) to analyze quality-relevant sections of the measured curves that are captured by the measuring functions. To do this, the maXYmos monitoring system verifies whether the curves pass through the evaluation objects in the predefined manner. If so, maXYmos generates an "OK" result; otherwise, the result is "Not OK" (NOK).

Profiles of this sort can be generated for many applications: examples include press-fitting of ball bearings, rotation and swiveling of seat backrests, riveting and caulking of housing components, or tactile processes on rotary switches – and also for testing springs and measuring haptic behavior, e.g. in switch tests.

Benefits at a Glance:
- Simple integration into existing plants and processes
- Uniform intuitive operating concept
- High-performance evaluation objects
- Extensive diagnostic possibilities, so causes of NOK are tracked down quickly
- Standard interfaces
- Identical signal and data formats

www.kistler.com
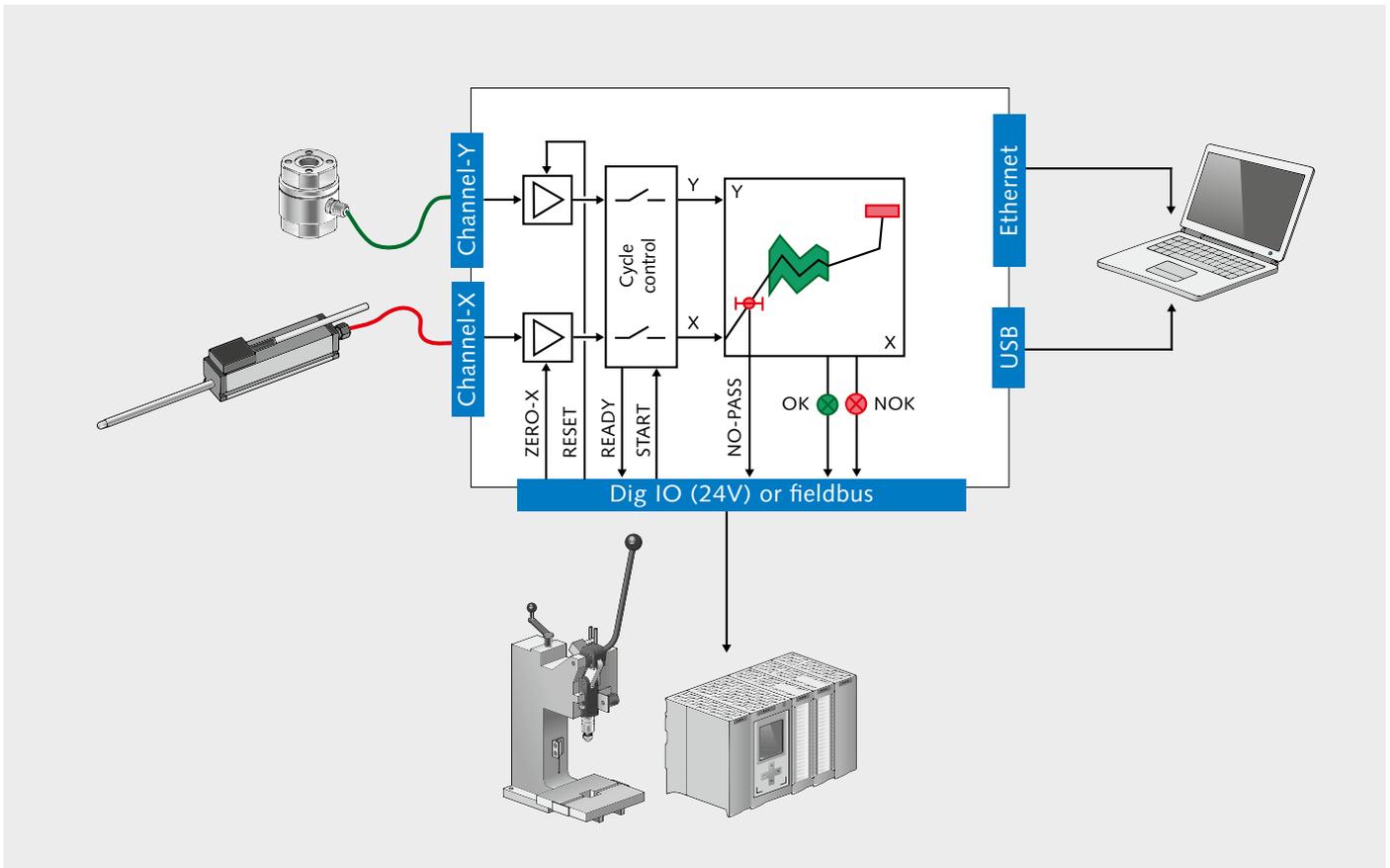
Integration into the plant infrastructure is simple because numerous interfaces are available. The maXYmos family supports a variety of data protocols, not only to control the measuring cycle but also to transmit the measurement data obtained and for maintenance purposes.

Interfaces

For the Y channel, a connection for strain gage sensors and sensors with a ±10 V output is provided, as well as the input for piezo sensors. For the X channel, inputs are installed for analog sensors (potentiometric, ±10 V, LVDT, inductive) and digital sensors (incremental, SSI). This means that the connected sensors can be defined flexibly depending on the requirements set by the measuring assignment.

Integration of maXYmos devices into a fieldbus environment enables communication with the machine control. This makes it possible to optimize coordination of the measurement to the production cycle. Also, individually definable measurements can be transmitted via the fieldbus – it is even possible to parameterize the maXYmos monitoring system via the fieldbus.
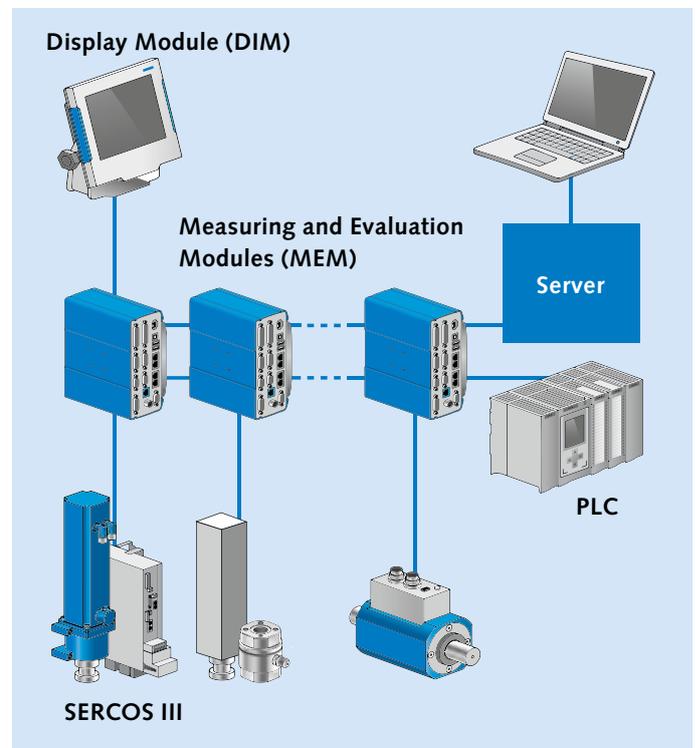
Cascadability: up to eight pairs of XY channels. The MEMs can be accommodated in the control cabinet. The DIM provides central visualization and can be connected directly via a cable (cable extender > distance of 5m).

Extract: Evaluation Objects (EOs) for maXYmos

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

Type UNI-BOX

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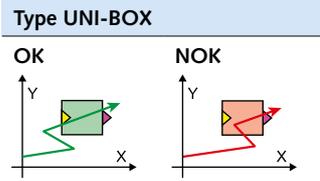
The line must be crossed once. An X-value at the point of intersection is monitored.

Type LINE-X

OK   NOK
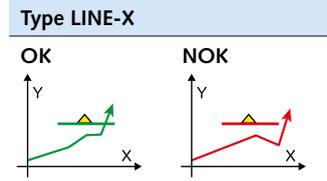
The line must not be crossed. Otherwise: "NOK" and "NO-PASS" real-time signal appears.

Type NO-PASS

OK   NOK
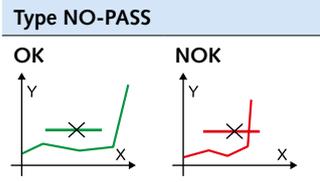
The measured curve must not violate the upper and lower line of the envelope curve band. Evaluation object can be "learned" quickly with trend tracking.

Type ENVELOPE CURVE

OK   NOK
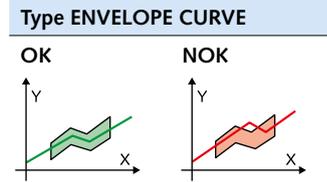
Entry and exit as specified. Violation of the closed sides supplies a real-time signal and stops the sequence.

Type TUNNEL BOX-X

OK   NOK
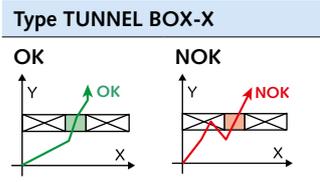
Evaluates the average of all Y values in the box range.

Type AVERAGE

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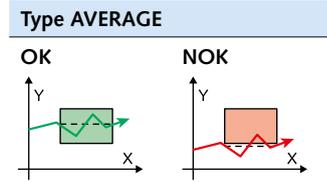
Box detects significant curve features and their XY coordinates in the expectancy range. These can be used as reference points for other EOs or as input for the CALC object.

Type GET-REF
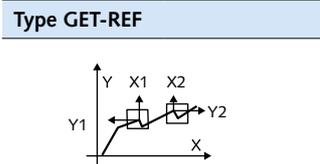
The evaluation criterion is the time between the entry and exit points in a special box.

Type TIME

OK   NOK
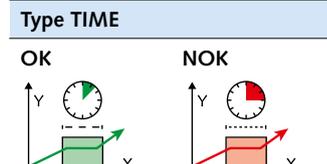
The evaluation criterion is the speed between the entry and exit points in a special box.

Type SPEED

OK   NOK
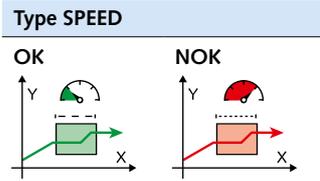
Object references two selectable process values and performs calculations and evaluations with them, e.g. to calculate the X-difference between two ripples.

Type CALC

OK   NOK

X2-X1=OK   X2-X1=NOK
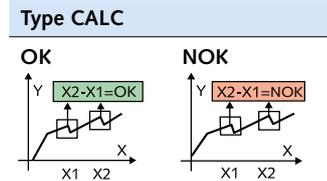
A defined gradient change is expected within the expectancy range (box) and can be used as a further switching condition in the sequence.

Type BEND

OK   NOK
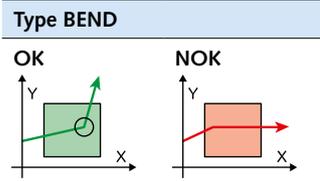
Supplies "NOK" and online signal in case of sudden gradient change within an expectancy range (box), e.g. tool breakage – and stops the sequence.

Type BREAK

OK   NOK
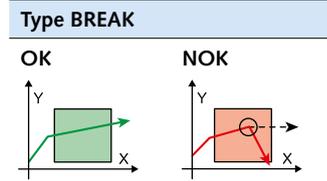
The area under the curve is determined and evaluated.

Type INTEGRAL

OK   NOK
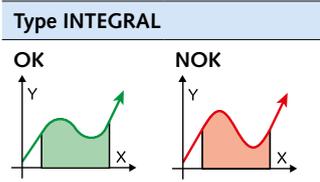
Evaluates gradient dX/dY between two horizontal lines.

Type GRADIENT-X

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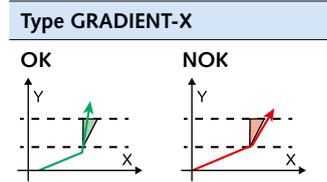
Evaluates the X-hysteresis between forward and reverse curves on a horizontal line.

Type HYSTERESIS-X

OK   NOK
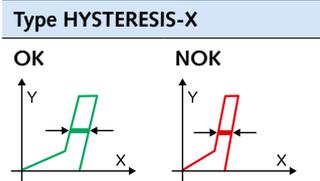
If the curve path is within the defined range, the maximum force offset between forward and reverse curves is determined and verified.

Type DELTA-Y

OK   NOK
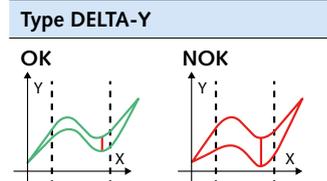
If the curve path is within the defined range, testing determines whether a digital signal is present (switch test).

Type DIG-IN

OK   NOK
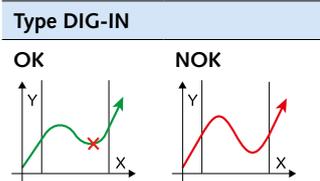
Product Overview: maXYmos BL/TL/NC

Type	5867B...	5877A...	5847A...
XY Monitors			
Name	maXYmos BL	maXYmos TL	maXYmos NC
Application	Process monitoring	Process monitoring	Joining with electromechanical systems
Number of measurement channels per basic unit	1 × XY	1 × XY	1 × XY
Expandable up to (maximum measurement channels)		8 × XY	8 × XY
Measurement curve detection functions	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	8000* XY	8000* XY	8000* XY
Sampler rate (XY value pairs/second)	5000	20000	10000
Number of parameter sets per XY channel	16	128	128
Diagnosis storage for measured curves	360 curves	500 curves	500 curves

Sensor Channel X

	5867B...	5877A...	5847A...
Potentiometer	■	■	■
Power ±10 V	■	■	■ Monitor output
Incremental Sin-Cos (A, B, Z)		■	■
Incremental right angle (A, B, Z)		■	■
SSI		■	■
LVDT		■	■
Inductive half bridge		■	■

Sensor Channel Y

	5867B...	5877A...	5847A...
Piezo	■ ■	■	■
Strain gage	■ ■	■	■
Power ±10 V	■ ■	■	■ Monitor output

Motion elements for evaluating curve progression

	5867B...	5877A...	5847A...
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		■	■
DIG IN		■	■

■ Standard
■ According to choice

Monitoring Devices

maXYmos BL

Type 5867B...

Technical Data	Type	5867B...
Number of measuring channels		1 × X/Y
Resolution per channel	Bit	24
Sampler rate X / Y max.	kHz	5
Accuracy class	%	0,3
Sensors that can be connected	Channel-X Channel-Y	Potentiometer, transmitter ±10 V Piezo, strain gage, transmitter ±10 V
Measuring functions		Y(X), Y(t), Y(X,t), X(t)
Curve evaluation using Evaluation Objects (EOs)	Type	UNI-BOX, ENVELOPE, LINE (X + Y), NO-PASS
Evaluation results via	DIG outputs Fieldbus Optical	OK, NOK OK, NOK, process values Curve, process values, traffic light
Data transfer via	Interface	Ethernet TCP/IP, USB, fieldbus: Profibus DP, ProfiNet, EtherCAT, EtherNet IP, CC-LINK
Visualization		Via VNC or integrated display
Data export via	Ethernet (TCP/IP)	CSV
Housing		Front panel or desktop/wall mounting
Data sheet: see www.kistler.com		**5867B (000-863)**

Accessories		
Connector Set for Strain Gage Version (1 set included in scope of delivery)	Type	5867AZ010
Connector Set for Piezo Version (1 set included in scope of delivery)	Type	5867AZ011
Windows® Software Basic Version	Type	2830A1
Power supply, 240VAC / 24VDC	Type	5779A3
maXYmos BL Sequencer Mode License	Type	2832A1

maXYmos TL

DIM

MEM
Type 5877A...

Technical Data	Type	5877A...
Number of measuring channels		1×X/Y ... 8×X/Y
Resolution per channel	Bit	24
Sampler rate X/Y max.	kHz	20
Accuracy class	%	0,3
Sensors that can be connected	Channel-X	Via menu choice: potentiometer, transmitter ±10 V, incremental, SSI, LVDT, inductive
	Channel-Y	Via menu choice: piezo, strain gage, transmitter ±10 V
Measuring functions		Y(X), Y(t), Y(X,t), X(t)
Curve evaluation using Evaluation Objects (EOs)	Type	UNI-BOX, ENVELOPE, LINE (X+Y), NO-PASS, BREAK HYSTERESIS, SPEED, AVERAGE, GRADIENT, TIME, GET-REF, CALC, INTEGRAL, TUNNEL BOX (X+Y), BEND, DIG IN
Evaluation results via	DIG outputs	OK, NOK
	Fieldbus	OK, NOK, process values
	Optical	Curve, process values, trend display, traffic light
Data transfer via	Interface	Ethernet TCP/IP, USB, fieldbus: Profibus DP, EtherNet/IP, ProfiNet, EtherCat, CC-LINK
Visualization		via VNC or DIM
Data export via	USB Ethernet (TCP/IP)	CSV, XML, PDF, Q-Das, Q-DA9, IPM
Housing		Front panel or desktop/wall mounting (Combination of MEM/DIM) accommodated in MEM switch cabinet
Data sheet: see www.kistler.com		5877A (000-973)

Accessories		
Display Module (DIM) Completes an existing Measuring and Evaluation Module (MEM) by adding a touchscreen	Type	5877AZ000
Measuring Module (MEM) Extends an existing maXYmos TL system with an additional XY channel pair	Type	5877AK00
Basic Connector Set (1 set included in scope of delivery)	Type	5877AZ010
Standard Rail Clip to mount the measuring module (MEM) on a DIN rail	Type	5877AZ...
Windows® Software Basic Version	Type	2830A1
Power supply, 240 VAC/24 VDC	Type	5779A3
DIM Cable Extender	Type	1200A163

maXYmos NC to Monitor and Control NC Joining Modules

DIM

MEM
Type 5847A...

Technical Data	Type	5847A...
Number of measuring channels		1 × X/Y
Resolution per channel	Bit	24
Sampler rate X / Y max.	kHz	10
Accuracy class	%	0,3
Sensors that can be connected	Channel-X	Servo, SSI, incremental, potentiometer, process signal, ± 10 V, inductive
	Channel-Y	Piezo, strain gage, transmitter ±10 V
Measuring functions		Y(X), Y(t), Y(X,t), X(t)
Curve evaluation using Evaluation Objects (EOs)	Type	UNI-BOX, ENVELOPE, LINE (X+Y), NO-PASS, BREAK, HYSTERESIS, SPEED, AVERAGE, GRADIENT, TIME, GET-REF, CALC, INTEGRAL, TUNNEL BOX (X+Y), BEND, DIG IN
Evaluation results via	DIG outputs Fieldbus Optical	OK, NOK OK, NOK, process values Curve, process values, trend display, traffic light
Visualisation		via VNC or DIM
Data export via	USB Ethernet (TCP/IP)	CSV, XML, PDF
Data transfer via	Interface	PROFIBUS DP, PROFINET, EtherCat, EtherNet/IP, 2-port Ethernet switch
Special features		Integrated sequence control to maximize flexibility; real-time process control with SERCOS III so cycle times are shorter; high-performance control and evaluation functions (EOs with partially live evaluation); uniform operating philosophy. Everything is on board (e.g. PROFIBUS, PROFINET, EtherCAT, EtherNet/IP); minimal spare parts inventory (one type only)
Data sheet: see www.kistler.com		**5847A (003-126)**

DIM Cable Extender, actively extends cables between maXYmos MEM and display DIM, range: up to 100 m

Technical Data	Type	1200A163
Power supply	VDC	18 ... 30
Power consumption: DIM Cable Extender only	W	≤4
Total (plugged into maXYmos DIM)	W	≤24
Dimensions with mounting plate	mm	197 × 163 × 26,5
Special features		Screen content data transmission; touch and USB via one Ethernet cable for distances >5 m; multiple measuring modules can be selected on one display; mixed operating mode (maXYmos TL / NC) is possible
Accessories (included in delivery scope)		Supply voltage connector with terminal housing Type 55145411
Data sheet: see www.kistler.com		**1200A163 (003-221)**

Simple Control
of Complex Processes

Sequencer mode makes it possible to program sequence controls for targeted control of the production process. An independent program can be created for each sequence of measurements – for instance, special process-relevant conditions can be interrogated and/or outputted via the freely programmable digital inputs and outputs.

Sequencer mode was developed so that multiple testing sequences can be programmed and evaluated in one device. In other words, multiple testing tasks can be accomplished with a single device. This not only allows separation of the end results into good and bad; it also allows a precise specification of whether the desired quality was achieved in each step of the sequence chain.

Thanks to integrated sequence control, complex test processes can also be mapped with no need to rely on costly external PLC programming. The programs can be set up quickly and easily via the intuitive user interface on the touch display – and no programming know-how is required.

Now, maXYmos users can also measure multi-stage production processes (i.e. those with consecutive staggered steps) in

every application: this has been made possible by equipping the maXYmos TL (Top-Level System) and the maXYmos BL (Basic-Level System) with a sequencer mode, in the same way as the maXYmos NC (Numeric Control).
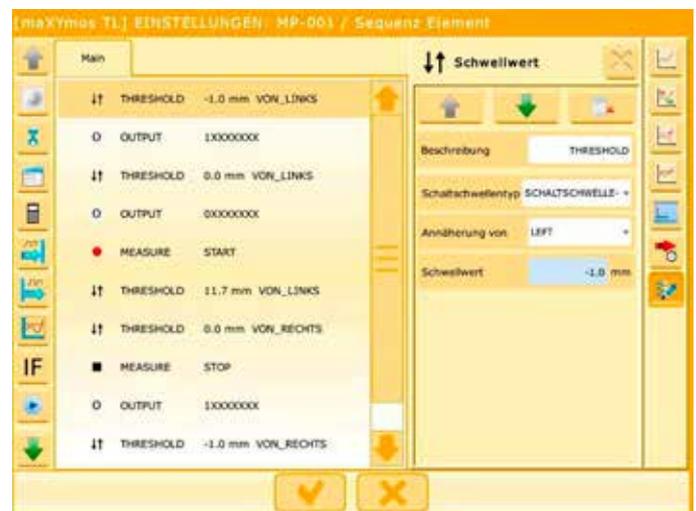
An independent sequence can be defined for each of the programs (up to 128 in number).

Measuring Chains

In order to integrate sensor technology into a given application, it is beneficial to clarify the following points in advance. This will provide the basis for selecting the relevant components to generate the measuring chain:
• Type of signal: charge for piezoelectric sensors, voltage, frequency, PLC integration (fieldbus, TCP/IP)
• Pin allocation for sensor and evaluation unit (see data sheet)

When installing the cables, make sure that the maximum permitted cable length is not exceeded. It is advisable to use original Kistler cables only.

High-insulation cable (typical insulation value: >1E12 Ohm) is a particularly important element of piezoelectric measuring technology, and it should be selected according to the ambient conditions.

Measure	Connect	Amplify	Monitor & Control
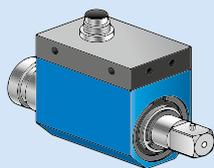
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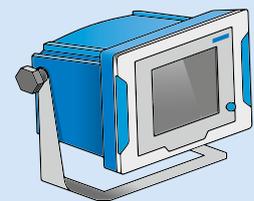
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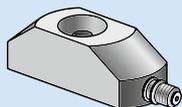
Type 9232A
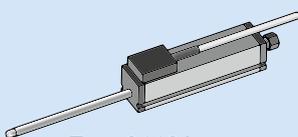
Type 2118A
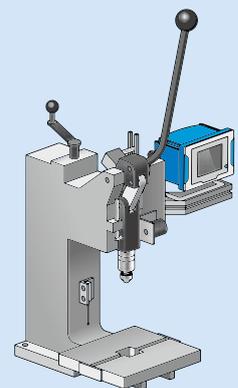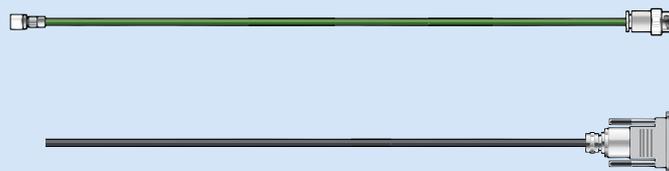
Type 9333A

$y = f(t)$
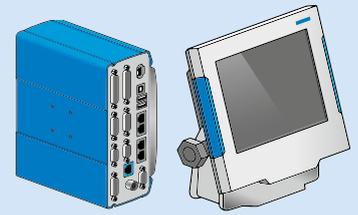
Type 5877A
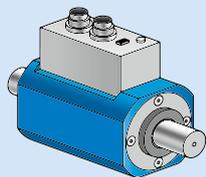
Type 4503B
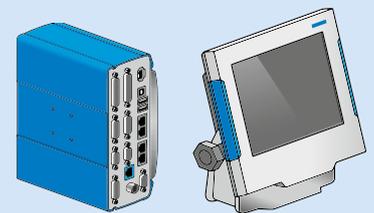
Type 5877A
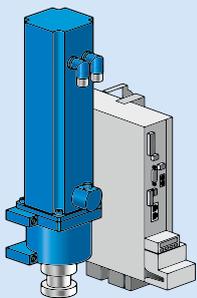
Typ 2151B
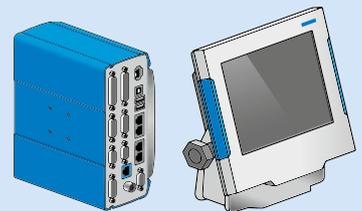
Type 5847A
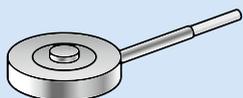
Type 4577A
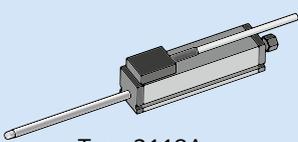
Type 2118A
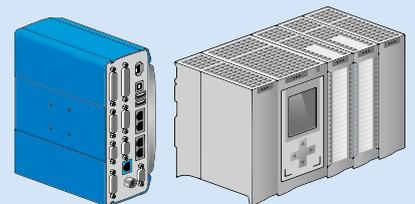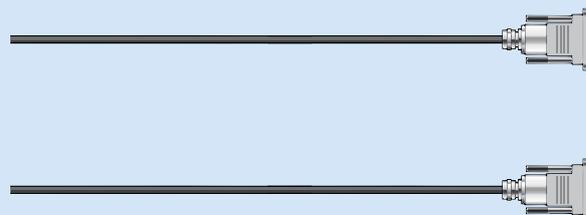
Type 5877A   PLC

Solution Packages for Manually Operated Presses

Thanks to solution packages from Kistler, quality control using force-displacement monitoring can now be integrated for manually or pneumatically operated presses.

Compression connectors are often manufactured on manually operated presses. The only option for post-production control of the joint in this particular case is destructive testing. In this situation, it pays off to integrate quality control directly into the process. This solution allows immediate detection and separation of rejects so that zero-defect manufacture of the end products is guaranteed.

The force-displacement monitoring system can be used or retrofitted wherever manual knuckle-joint presses or pneumatically powered presses are in operation. For this purpose, the piezoelectric sensor is clamped directly between the press ram and the die. Evaluation of the resultant force-displacement curve then provides the basis for good/bad assessment, making it is a key factor in achieving zero-defect production.

The ready-packaged solution – also available as a retrofit for existing manual presses, Type 9819A...
This package includes the new Press Force Sensor and the maXYmos BL XY monitor for process recording and monitoring. Also included: mounting pin for the force sensor, displacement sensor, cable and attachment fittings.

Press Force Sensor, Type 9340A...
- Measuring range –10 ... 60 kN
- Calibrated for 1 %, 10 %, 100 %
- Ready to measure – no on-site calibration
- Fits tool adapter ø 10 or 12 mm

Accessories

Displacement Sensors

Type 2112A...
Potentiometric displacement sensor

Technical Data	Model	TRS25	TRS50	TRS75	TRS100
Measuring range	mm	25	50	75	100
Repeat accuracy	mm	0,002	0,002	0,002	0,002
Maximum permitted supply voltage	V	42	42	42	42
Actuation force (horizontal)	≤N	5	5	5	5

General Technical Data		
Temperature range	°C	–30 ... 100
Oscillations	Hz	5 ... 2 000
Shock	g/ms	50/11
Degree of protection (EN 60529)	IP	40
Electrical connection		5-pole round connector, IEC 130-9
Data sheet: see www.kistler.com		**2112A (000-868)**

Type 2118A...
Potentiometric displacement sensor

Technical Data	Model	TR10	TR25	TR50	TR75	TR100
Measuring range	mm	10	25	50	75	100
Repeat accuracy	mm	0,002	0,002	0,002	0,002	0,002
Maximum permitted supply voltage	V	24	42	42	42	42
Actuation force (horizontal)	≤N	5	5	5	5	5

General Technical Data		
Oscillations	Hz	5 ... 2 000
Shock	g/ms	50/11
Degree of protection (EN 60529)	IP	40
Electrical connection		3-wire, shielded cable with tension relief, length: 2 m
Data sheet: see www.kistler.com		**2118A (000-875)**

Type 2122B...
Incremental displacement sensor

Technical Data	Model	DK10	DK25	DK50	DK100
Repeat accuracy	mm	10	25	50	100
Repeat accuracy (for 20°)	µm	2	2	2	2
Shock	N	< 4,9	< 4,9	< 6,2	< 9,3

General Technical Data		
Vibration resistance (10 ... 2 000 Hz)	m/s²	150
Temperature range	°C	0 ... 50
Power supply	VDC	+5 (± 5 %)
Degree of protection (sensor body)	IP	64
Lifetime		Minimum of 5 million strokes without shock
Data sheet: see www.kistler.com		**2122B (003-235)**
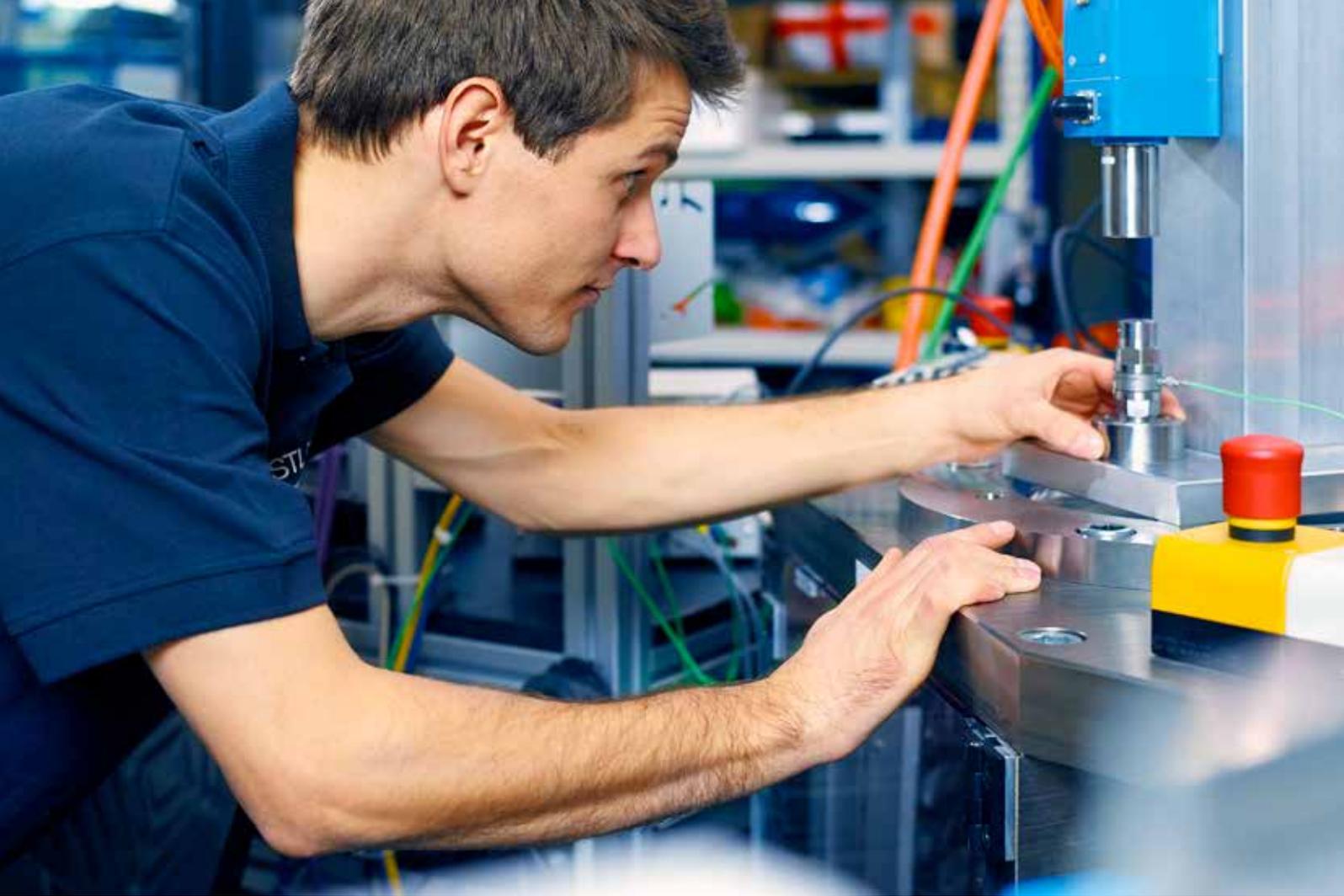
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Kistler offers sales and service wherever automated manufacturing processes take place.

In addition to sensors and systems, Kistler offers a host of services – ranging from professional advice on installation to speedy deliveries of spare parts worldwide. For an overview of the services we offer, visit **www.kistler.com**. For detailed information on our training courses, please contact our local distribution partners (see page 19).

Kistler Services at a Glance
- Advice
- Support with system commissioning
- Process optimization
- Periodic sensor calibration
- Education and training events
- Development services
- On-site calibration of maXYmos equipment

Kistler – At Our Customers' Service Across the Globe

With over 1 400 employees, the Kistler Group leads the global market for dynamic measuring technology. 31 group companies and over 30 distributors ensure close contact with customers, individual application support and short delivery times.
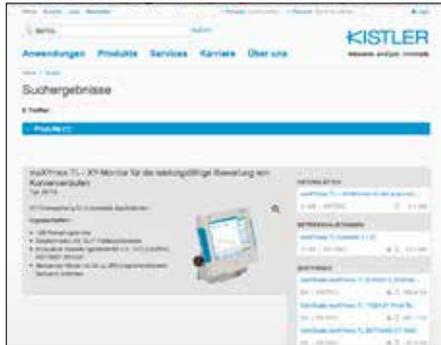
Data Sheets and Documents
Use our search engine to download data sheets, brochures or CAD data.

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