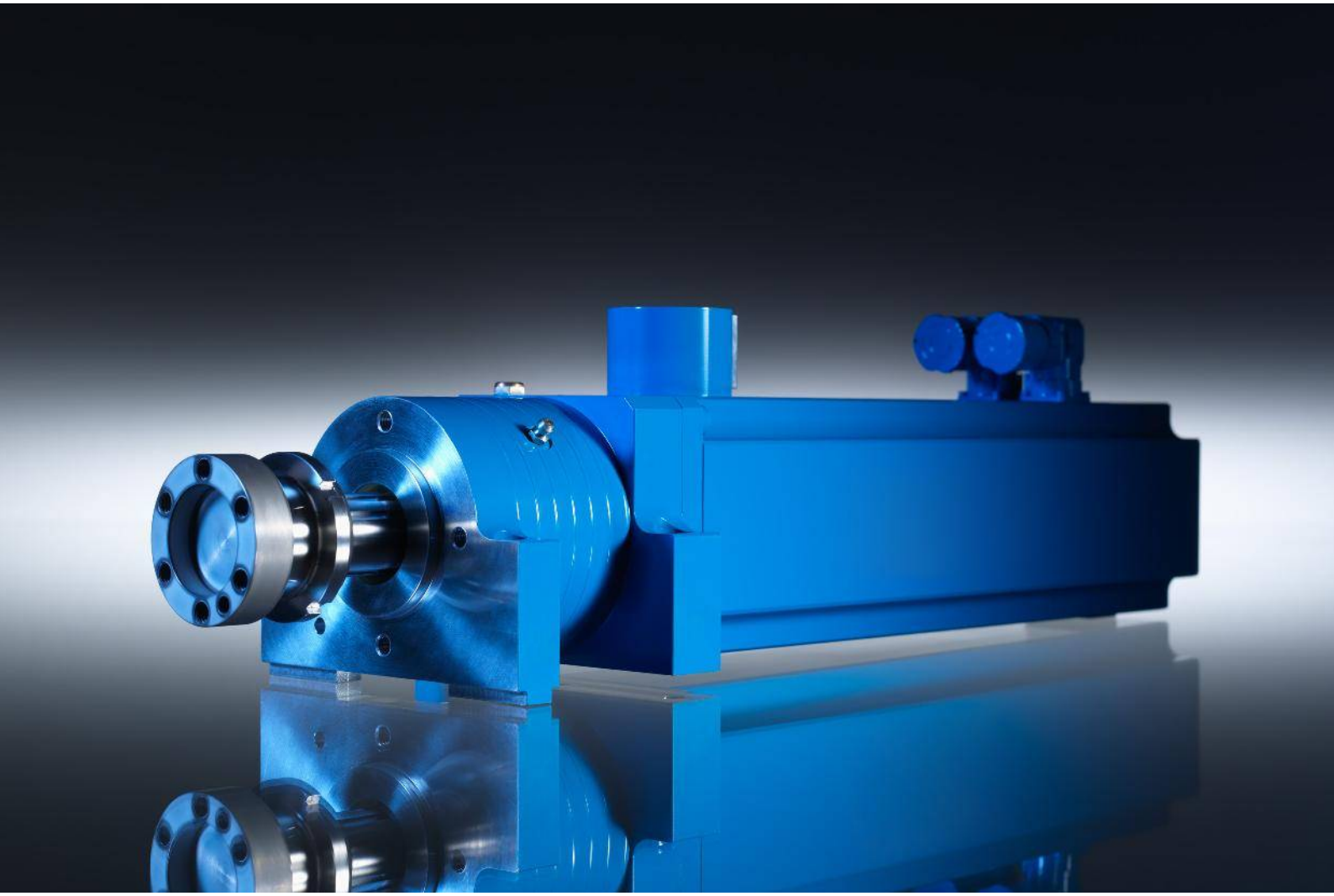
KISTLER

measure. analyze. innovate.



NC Joining Systems

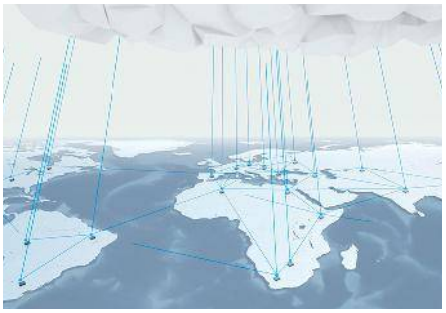
Solutions for Energy-Efficient and Highly Flexible Press-Fit and Joining Processes

Absolute attention for tomorrow's world

Kistler develops measurement solutions consisting of sensors, electronics, systems and services. In the physical border area between emissions reduction, quality control, mobility and vehicle safety, we deliver excellence for a future- oriented world and create ideal conditions for Industry 4.0. We thereby facilitate innovation and growth for – and with – our customers.

Kistler stands for progress in motor monitoring, vehicle safety and vehicle dynamics and provides valuable data for the development of the efficient vehicles of tomorrow.

Kistler measurement technology ensures top performance in sport diagnostics, traffic data acquisition, cutting force analysis and other applications where absolute measurement accuracy is required.



Kistler systems support all steps of networked, digitalized production and ensure maximum process efficiency and profitability in the smart factories of the next generation.

Contents

Transparent production processes ensure quality and reduce costs

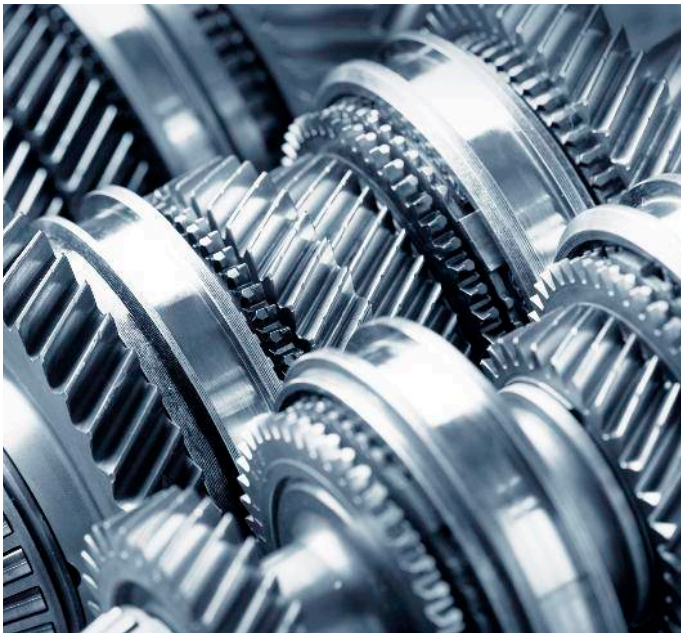
Resource optimization thanks to integrated process monitoring

The integration of process monitoring has become a factor of increasing importance in industrial production. It is especially the field of press-fit and joining applications where the electromechanical NC joining systems made by Kistler tower head and shoulder above conventional systems: They play a significant role in the cutting of energy costs, the increase of system utilization and the overall boost in production efficiency.

For industries dependent on automated production the pro-duction, reducing energy costs is paramount to their ability to compete in the global marketplace. It is for this reason that a widening number of companies operating in the automotive and automotive supplier industry opt for the NC joining systems made by Kistler to lower the cost of their series production. A few of the key advantages that Kistler electromechanical systems offer over pneumatic or hydraulic processes include a dramatically higher level of efficiency, press-fit forces that can be set with perfect accuracy, and an exceptionally high level of repeatability.

Advantages

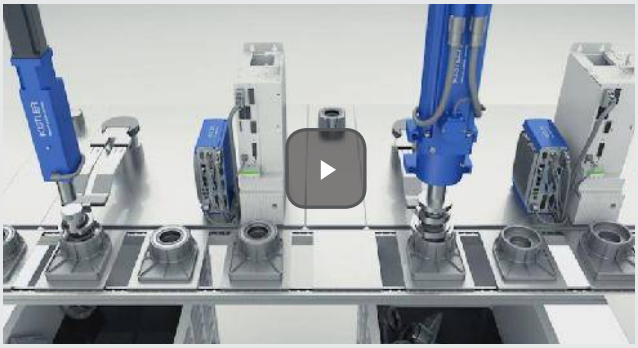
- Enhanced quality thanks to integrated process control
- Traceable process results
- Higher energy efficiency, translating to savings of up to 80 %
- Lower operating costs
- Global presence



Improved economic efficiency thanks to optimized system utilization

Offering a comprehensive range of cutting-edge joining systems for the force range of up to 300 kN – from compact standardized single modules to custom designs tailored to the customer's specific requirements – Kistler is setting new standards on the global market.

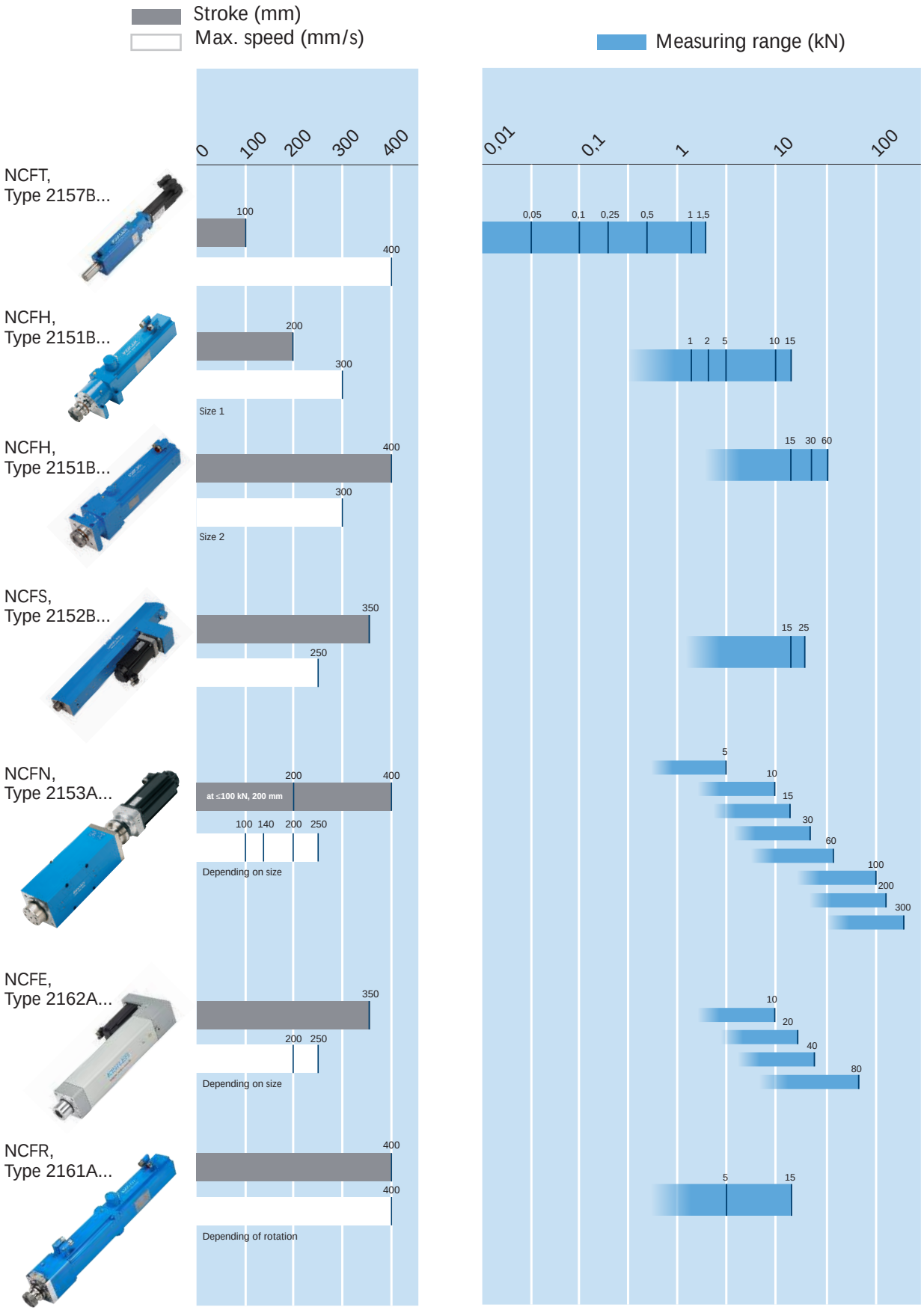
Regardless of whether they are used for transmission and engine assembly or for the assembly of wheel carrier, wheel set and chassis: The NC joining systems made by Kistler allow for high-precision control of all traversing movements performed during assembly and product inspection. Better still, the options to switch between the different measuring ranges of the NC joining systems and to easily switch between measuring programs make it possible to use the same machine for manufacturing a wide variety of different components. The systems thereby provide for a sustained increase in system utilization and economical operation over the long-term.



Joining control Kistler – experience it online now

Watch our animation for an up-close and personal look of our first-rate Kistler solutions – the safest way to achieve a quality rating of 100 % in your production:
www.kistler.com/nc-joining

Overview NC Joining Modules



Note: Each NC joining module utilizes an integral absolute encoder for positioning. See the corresponding data sheet for additional technical data.

NC Joining Modules

NC Joining Module NCFT, for joining processes with low force

Technical data	Type	2157B...			
Measuring range 1	kN	0,25	0,25	0,50	0,50
Measuring range 2	kN	0,05	0,10	0,10	0,25
Measuring range 1	kN	1	1	1,50	1,50
Measuring range 2	kN	0,25	0,50	0,10	0,50
Direction of measurement		Compression/tension			
Max. movement speed	mm/s	400			
Practical repeatability	mm	<0,002			
Length of stroke	mm	100			
Features		Maximum measuring accuracy thanks to the piezoelectric force sensor integrated in the ram, transmission via telemetry, excellent overload protection with low process forces in a small measuring range, excellent dynamics, integrated switching between measuring ranges			
Accessories (optional)		Measuring and Evaluation Module maXYmos NC (MEM) Type 5847..., Display Module (DIM) Type 5877AZ000, Servo Amplifier Type 2180A..., DIM Cable Extender Type 1200A163			
Data sheet www.kistler.com		2157B (000-948)			

NC Joining Module NCFH, for joining processes with low force

Technical data	Type	2151B...			
Measuring range 1	kN	2	5	5	10
Measuring range 2	kN	1	1	2	1
Measuring range 1	kN	10	10	15	15
Measuring range 2	kN	2	5	2	5
Measuring range 1	kN	30	60	60	
Measuring range 2	kN	15	30	15	
Direction of measurement		Compression/tension			
Max. movement speed	mm/s	300			
Practical repeatability	mm	0,01			
Length of stroke	mm	200 (size 1), 400 (size 2)			
Features		Hollow shaft drive: compact design without belts, direct drive ensures outstanding dynamics, integrated piezosensor offers two measuring ranges and increased overload protection, standardization reduces spare parts inventories, two sizes cover a measuring range of 1 ... 60 kN			
Accessories (optional)		Measuring and Evaluation Module maXYmos NC (MEM) Type 5847..., Display Module (DIM) Type 5877AZ000, Servo Amplifier Type 2180A..., DIM Cable Extender Type 1200A163			
Data sheet www.kistler.com		2151B (000-690)			

NC Joining Modules

NC Joining Module NCFS, for joining processes with a narrow axle distance

Type 2152B...

Technical data	Type	2152B...
Measuring range 1	kN	25
Measuring range 2	kN	15
Direction of measurement		Compression/tension
Max. movement speed	mm/s	250
Practical repeatability	mm	0,01
Length of stroke	mm	350
Features		Slimline trapezoid design saves space when installing in very confined areas (spacing: up to 70 mm), compact arrangement allows savings on coordination, guidance accuracy is improved by the integrated linear guide, integrated piezosensor offers two measuring ranges and increased overload protection
Accessories (optional)		Measuring and Evaluation Module maXYmos NC (MEM) Type 5847..., Display Module (DIM) Type 5877AZ000, Servo Amplifier Type 2180A..., DIM Cable Extender Type 1200A163
Data sheet www.kistler.com		2152B (000-763)

NC Joining Module NCFN, standard design for medium to high force

Type 2153A...

Technical data	Type	2153A...			
Nominal force	kN	5	10	15	30
Nominal force	kN	60	100	200	300
Direction of measurement		Compression/tension			
Max. movement speed	mm/s	100 (NCFN 300 kN)		140 (NCFN 200 kN)	
	mm/s	200 (NCFN 100 kN)		250 (NCFN 5/10/15/30/60 kN)	
Practical repeatability	mm	0,01			
Length of stroke	mm	200 (only at nominal force ≤100 kN)			
	mm	400 (nominal force 5 ... 300 kN)			
Features		Extremely wide measuring range, from 5 … 300 kN, modular construction kit allows for special solutions, e.g. longer strokes, optional safety brake			
Accessories (optional)		Measuring and Evaluation Module maXYmos NC (MEM) Type 5847..., Display Module (DIM) Type 5877AZ000, Servo Amplifier Type 2180A..., DIM Cable Extender Type 1200A163			
Data sheet www.kistler.com		2153A (000-669)			

NC Joining Modules

NC Joining Module NCFE, with cost optimized standard design

Type 2162A...

Technical data	Type	2162A...			
Measuring range 1	kN	10	20	40	80
Direction of measurement		Compression			
Max. movement speed	mm/s	250 (NCFE 10, 20, 40 kN), 200 (NCFE 80 kN)			
Practical repeatability	mm	0,01			
Length of stroke	mm	350			
Features		Price-optimized joining module for simple joining processes, three sizes cover a measuring range of 10 ... 80 kN			
Accessories (optional)		Measuring and Evaluation Module maXYmos NC (MEM) Type 5847..., Display Module (DIM) Type 5877AZ000, Servo Amplifier Type 2180A..., DIM Cable Extender Type 1200A163			
Data sheet www.kistler.com		2162A (003-261)			

NC Joining Module NCFR, for joining processes and rotational movement

Type 2161A...

Technical data	Type	2161A...
Measuring range 1	kN	15
Measuring range 2	kN	5
Direction of measurement		Compression/tension
Max. movement speed	mm/s	400 (the movement speed can be reduced during simultaneous operation depending on the speed of rotation)
Practical repeatability	mm	0,01
Length of stroke	mm	400
Features		Compact design thanks to hollow shaft motors, 2 hollow shaft motors for independent rotational movement, torque of up to 50 N·m and 1 000 min^{-1}, maximum dynamics and low weight, absolute encoder for displacement and crank angle, optional torque sensor including amplifier
Accessories (optional)		Measuring and Evaluation Module maXYmos NC (MEM) Type 5847B1, Display Module (DIM) Type 5877AZ000, Servo Amplifier Type 2180A..., DIM Cable Extender Type 1200A163
Data sheet www.kistler.com		2161A (003-230)

Kistler provides the optimally configured system technology for each quality assurance strategy

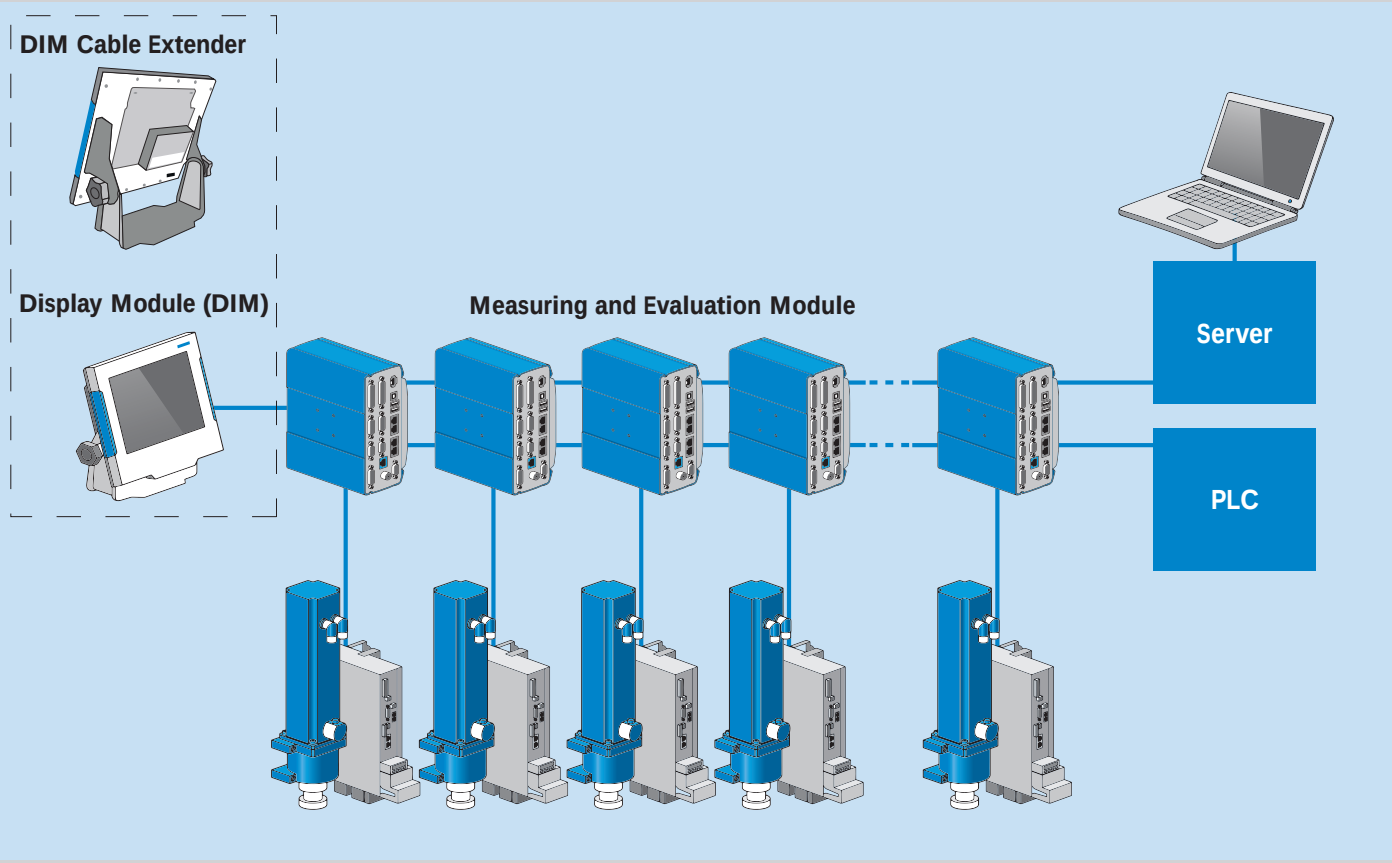
Monitoring and control of NC Joining Modules

As the core element of the joining system, the maXYmos NC monitors and controls the entire joining process. Sporting an intuitive touch screen display and an integrated sequence control, the system offers exceptional usability and an outstanding degree of flexibility making it suitable for joining process ranging from simple to highly complex.

maXYmos NC controls, monitors, evaluates and documents XY curves for joining and press-fit processes, together with NC joining modules and the IndraDrive servo amplifier that is included in the system. The shape of the measurement curves allows the quality of individual manufacturing steps, assembly groups or even an entire product to be monitored and controlled via SERCOS III in real-time. This means that optimum cycle times can be implemented with maximum repeat accuracy. Since unplanned downtimes are minimized, machine availability and the productivity of the manufacturing process are increased.

Advantages

- 128 independent programs with up to 10 evaluation elements
- Storage for 500 curves, 8 000 measuring points per curve
- Flexible system concept: desktop/ wall-mounted
- Measuring modules can be cascaded
- Uniform operating philosophy



Can be cascaded to up to eight XY channels. The MEMs can be installed in the control cabinet. The DIM is used as the central visualization system and can be connected directly via a cable across distances of up to 5 m. Greater distances can be covered with the DIM Cable Extender

Increased flexibility for the user
With the integrated sequence control (Sequencer Mode), processes can be reproduced without having to rely on complex, external PLC programming. The programs can be set up rapidly and easily via the intuitive operating interface of the touch display.

A total of up to 128 programs can be stored, and for each program it is possible to define an independent sequence series with up to 255 elements. Even highly complex processes can be easily mapped with this method.

Für jedes der bis zu 128 Programme besteht die Möglichkeit, einen unabhängigen Ablauf zu definieren.

Monitoring, evaluation and documentation

maXYmos NC, XY Monitor for monitoring and montrolling NC Joining Modules

Technical data	Type	5847B...
Number of measurement channels		1 X-Channel, 1 Y-Channel
Sampling X/Y max.	kHz	10
Sensors	Channel X	Potentiometer, Process signal ±10 V, Incremental TTL, Inductive LVDT, half-, full-bridge, SSI
Sensors	Channel Y	Piezo, Strain gage, Process signal ±10 V
Monitor outputs	Anzahl	1 X-Channel, 1 Y-Channel
Nominal value	V	±10
Linearity error	%FS	0,05
Datentransfer über	Interface	PROFIBUS DP, PROFINET, EtherCat, EtherNet/IP, 2 Port Ethernet Switch
Visualization		via VNC, or DIM
Features		Integrated sequence control (sequencing) for maximum flexibility, real-time process control with SERCOS III, so cycle times are shorter, high-performance control and evaluation functions (EOs with Live Window), uniform operating philosophy, everything is on board (e.g. PROFIBUS, PROFINET, EtherCAT, EtherNet/IP), low spare parts inventory (one type only)
Data sheet www.kistler.com		5847B (003-272)

DIM Cable Extender, as an active cable extension between maXYmos MEM and display DIM up to 100 m operating distance

Technical data	Type	1200A163
Power supply	VDC	18 ... 30
Power consumption: Only DIM Cable Extender Total (inserted in maXYmos DIM)	 W W	 ≤4 ≤24
Dimensions including mounting plate	mm	197x163x26,5
Features		Transfer of screen content, touch and USB data via Ethernet cable for distances of >5 m, option to select several measurement modules on the display, supports mixed operation between maXYmos TL and NC
Accessories (included)		Operating voltage connector with junction box Type 55145411
Data sheet www.kistler.com		1200A163 (003-221)

Amplifier IndraDrive C

Technical data	Type	2180A...
Interface		SERCOS III
Control voltage	VDC /W	(19,2 ... 28,8) /24
Power connection	V Hz Phases	400 (400 ... 500) ±10 % 50 ... 60 ±2 % 3
Features		Technology can ensure safety up to performance level "e", complete coordinated package with all components, control unit CSB02 NC joining module specifically parameterized, included as standard in the scope of delivery with safely reduced speed, SERCOS III connection to maXYmos NC, Safe Motion on board (SMES, SMST2[1], SMM1[1]), diagnosis via Ethernet
Data sheet www.kistler.com		2180A (003-125)

[1]not for NCFR

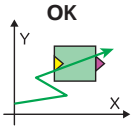
Evaluation objects EOs

Excerpt of the evaluation elements EOs (Evaluation Objects) for maXYmos NC

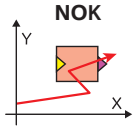
Entry and exit as specified. No crossing of "closed" sides allowed. Each side can be defined as entry or exit.

Type UNI-BOX

OK



NOK



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

Type LINE-X

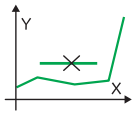
OK

NOK

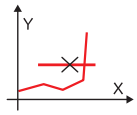
The line may not be crossed. Otherwise, NOK and "NO-PASS" real-time signal.

Type NO-PASS

OK



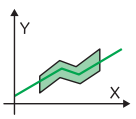
NOK



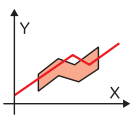
The measurement curve must not cross the upper or lower line of the envelope. This evaluation object is easy to master.

Type ENVELOPE CURVE

OK



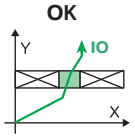
NOK



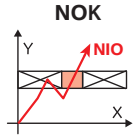
Entry and exit as specified. Crossing of the "closed" sides generates a real-time signal.

Type TUNNELBOX-X

OK



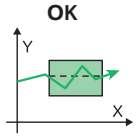
NOK



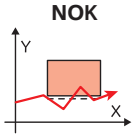
Evaluates the average of all Y-values in the box region.

Type AVERAGE

OK

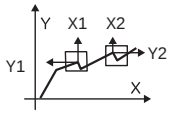


NOK



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.

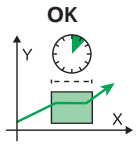
Type GET-REF



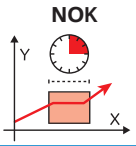
Evaluation criterion is the time between the entry and exit points in a special box.

Type TIME

OK



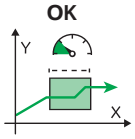
NOK



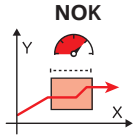
Evaluation criterion is the speed between the entry and exit points in a special box.

Type SPEED

OK



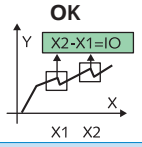
NOK



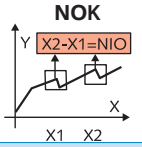
Object references two selectable process values and performs calculations, e.g. the X-difference between two ripples, and evaluates them.

Type CALC

OK



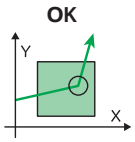
NOK



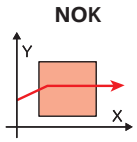
A defined gradient change is expected within the expectancy range (box) and can be used as a further switching condition in the sequence.

Type INFLEXION

OK



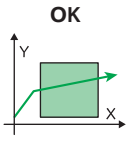
NOK



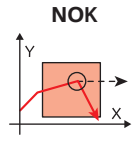
Provides NOK and online signal in case of sudden gradient change within an expectancy range (box), e.g. in case of tool breakage.

Type BREAK

OK



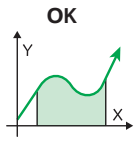
NOK



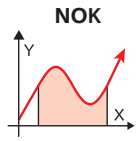
The area beneath the curve is determined and evaluated.

Type INTEGRAL

OK



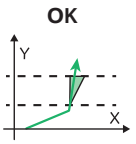
NOK



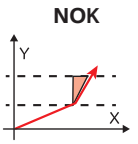
Evaluates the gradient dX/dY between two horizontal lines.

Type GRADIENT-X

OK



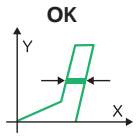
NOK



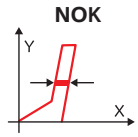
Evaluates the X-hysteresis between forward and reverse curves on a horizontal line.

Type HYSTERESIS-X

OK



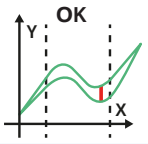
NOK



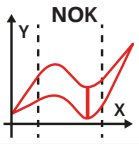
If the curve throughput is within the defined range, the maximum curve displacement is determined and verified between the advancing and the returning curve.

Type DELTA-Y

OK



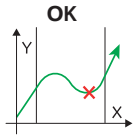
NOK



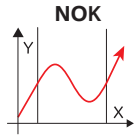
If the curve throughput is within the defined range, the system checks for the presence of a digital signal.

Type DIG-IN

OK



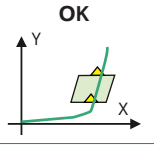
NOK



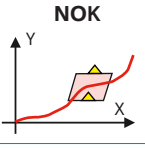
Entry and exit as specified. No crossing of "closed" sides allowed. Each side can be defined as entry or exit.

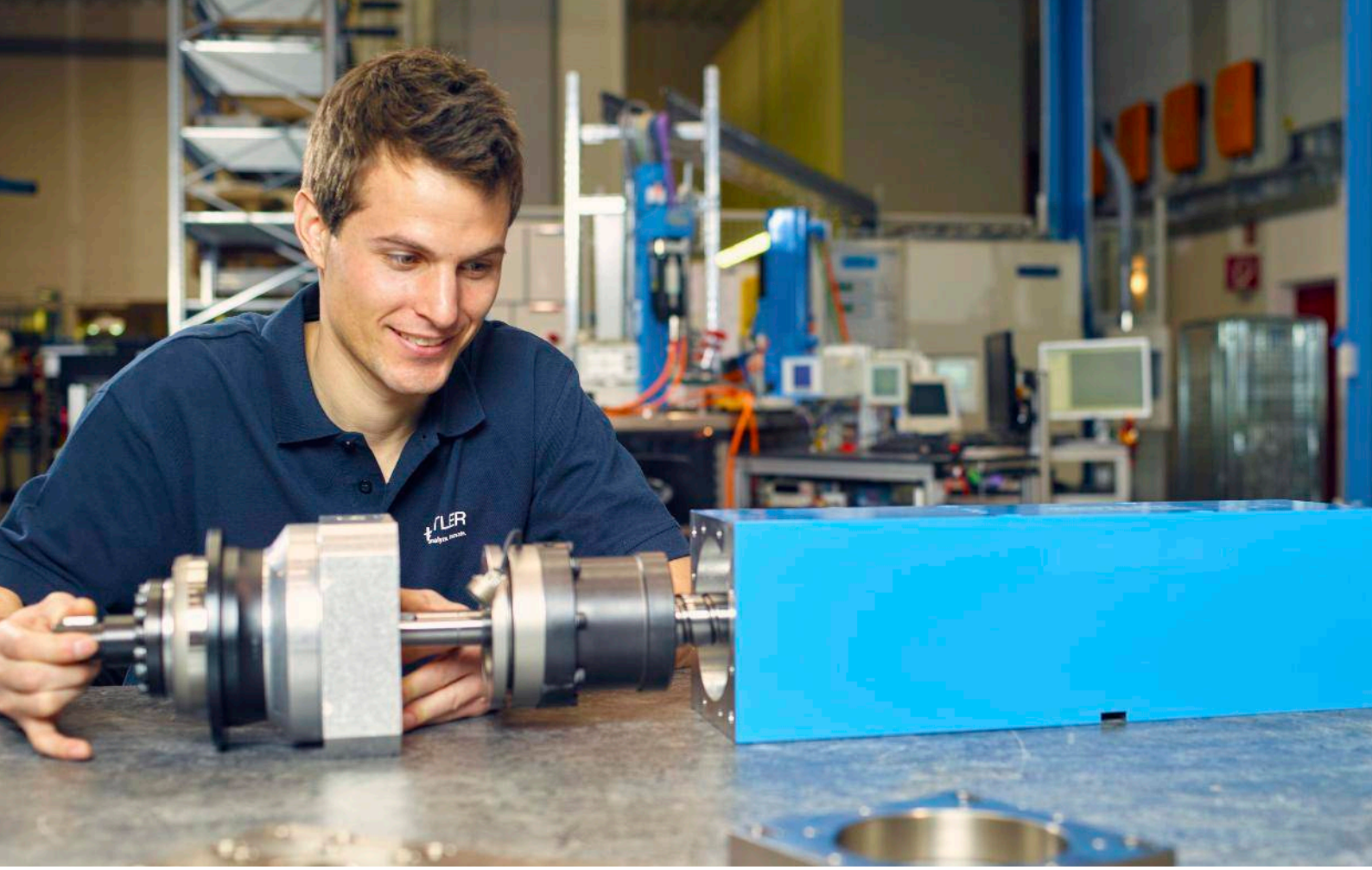
Type TRAPEZOID-X

OK



NOK





From the competent consultation through the installation to the fast supply of spare parts: Kistler is present worldwide with comprehensive service and training offerings

Kistler service: customized solutions from A–Z

Kistler offers sales and service wherever automated production processes are applied.

In addition to sensors and systems, Kistler offers a variety of services – from the competent consultation to the installation to the fast, worldwide supply of spare parts. An overview of our service offering can be found under www.kistler.com. Please contact our local distribution partners for detailed information about our training offerings (see p. 15).

Kistler service at a glance

- Consultation
- Support during the commissioning of systems
- Process optimization
- Periodic onsite calibration of sensors
- Education and training events
- Development services