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maXYmos TL / TL ML / TL L

Type 5877B...

XY Monitor for complex evaluation of curves

The maXYmos TL (Top Level) captures, analyzes and evaluates XY curves of two measurands that have to stand in a precisely defined relationship to each other. Such curves arise in applications such as

- Press fitting of bearings or valve seat rings
- Riveting and flanging of casing parts
- Turning and swiveling of joints
- Turning of key switches
- Movement of drawer slides
- Compression and extension of shock absorbers
- Pressing of snap-in elements

The measurement curves can be used to assess the quality of an individual stage of production, an assembly or the product as a whole.

Description

The functions of this XY monitor range from simple, single-channel force-displacement monitoring to complex multi-channel applications for use in assembly and product testing. The monitor, which can have up to eight cascadable channel pairs, is designed to satisfy the most demanding users who require maximum user-friendliness, user comfort and flexibility. With a wide range of powerful evaluation objects, even very complex XY curves can be evaluated. For example, the GET-REF object is able to determine the coordinates of significant points on a curve, e.g., the position of a snap-in point, and pass them to a CALC object. This then calculates, e.g., the distance between two such snap-in points and evaluates it.

The main features of each MEM:

- Curve capture according to Y=f(X), Y=f(X,t), Y=f(t), X=f(t)
- Curve evaluation with NO-PASS, LINE-X, LINE-Y, UNI-BOX, ENVELOPE, GET-REF, CALC, GRADIENT-Y, GRADIENT-X, HYSTERESIS-Y, HYSTERESIS-X, TUNNELBOX-X, TUNNELBOX-Y, SPEED, AVERAGE, BREAK, INFLEXION, INTEGRAL, DIG-IN, DELTA-Y, TRAPEZOID-X, TRAPE-ZOID-Y, TIME, DISPLACEMENT RANGE, FORCE RANGE, PASS-THROUGH BOX
- Up to 10 evaluation objects (EOs) per curve
- Dynamic referencing of evaluation objects in X and Y directions
- 108 measurement programs and 20 master programs
- Measurement curve with up to 8,000 XY value pairs
- Access via web-browser using encryption
- EtherNet TCP/IP for measurement data, remote maintenance and channel cascading
- Choice of bus types available via menu: PROFIBUS DP, EtherNet/IP, PROFINET, EtherCAT
- Dig-IO (24 V) for control and results
- 2 switching signals on X or Y threshold
- 2+1 USB for USB stick and notebook
- Channel X: Pot, ±10 V, LVDT, incremental, SSI
- Channel Y: Strain gauge, ±10 V, ±10 V (2 measurement ranges), or piezoelectric sensors
- Multiple data export formats, e.g. Q-DAS, QDA9, IPM 5.0, XML, CSV, PDF
- Desktop, wall or front panel mounting; can be repositioned in a few easy steps
- Informative NOK cause diagnosis, process value trend patterns, etc. incl. warnings and alarms
- Process value table with free choice of contents
- Selected process values for the curve graph
- Acces protection with various levels of access
- Display module (DIM) with 10.4" color touch screen and front-mounted USB slot
- Sequencer mode (logical sequence control)

maXYmos TL ML

- FDA and MDR conform process monitoring

Licensed functions

- Connections and security (incl. LDAPS / AD)
- Multipoint calibration
- IIoT connectivity via OPC-UA
- Audit trail
- Extended evaluation

For more information visit www.kistler.com/maxymos

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Technical data

Measuring and evaluation module (MEM)

Degree of protection	IP	40
Operating temperature	°C	0 ... 45
Housing color 5877B0, B3		blue
Housing color 5877B2 (medico)		white

Measuring channels

Number	1 X-channel, 1 Y-channel	
Sampling rate X/Y max.	kHz	20
Resolution per (analog) channel	bit	24
Accuracy class	%	0.2
Low-pass filter per channel (in stages)	Hz	0.1 ... 2,000

Sensors channel X

Sensor Type 1		Potentiometer
Linearity error	%FS	±0.05
Track resistance	kΩ	1 ... 5
Supply voltage	V	4 (4.16)
Connection system	3-wire	
Wiper current	µA	<1.0
Sensor Type 2		Process signal ±10 V
Signal output	V	±10
Linearity error	%FS	±0.05
Transmitter supply	VDC	24 ±5%
max. mA X+Y Channel	mA	500
Sensor Type 3		Incremental TTL
Signal output		Sinus/Cos, RS-422 (A+B)
Reference marker		yes
Counting depth	bit	32
Counting frequency	MHz	10 (RS-422)
	MHz	1 (sine/cos)
Impedance	Ω	120
Sensor Type 4		Inductive
Principle		LVDT, half-, full-bridge
Sensor supply	Veff	1.8 ±5%
	kHz	5.2 ±0.5%
Linearity error	%FS	±0.05
Frequency range (–3 dB)	kHz	0 ... 1
Sensor Type 5		SSI
Signal output		RS-422
Clock frequency max.	MHz	1

Sensors channel Y

Sensor Type 1		Piezo (Type B0)
Measuring range 1	pC	±100 ... ±1,000
Measuring range 2	pC	±1,000 ... ±10,000
Measuring range 3	pC	±10,000 ... ±100,000
Measuring range 4	pC	±100,000 ... ±1,000,000
Sensor Type 1		Piezo (Type B2, B3)
Measuring range 1	pC	±0 ... ±40
Measuring range 2	pC	±40 ... ±400
Measuring range 3	pC	±400 ... ±1,000
Measuring range 4	pC	±1,000 ... ±10,000
Drift	pC/s	0.05
TKE	ppm/K	<±100
Frequency range (–3 dB)	kHz	0 ... 5
Low-pass filter (in stages)	Hz	in stages 0.1 ... 2,000
Linearity error (<40 pC)	%FS	±0.2
Linearity error (<40 ... ≤10,000 pC)	%FS	±0.1
Linearity error (>10,000 pC)	%FS	±0.05
Sensor Type 2		DMS
Measuring range	mV/V	0 ... ±5
Supply voltage	VDC	5 ±5%
Connection system		4-wire, 6-wire
Bridge resistance	Ω	≥300
Linearity error	%FS	±0.05
Frequency range (–3 dB)	kHz	0 ... 5
Sensor Type 3		Process signal ±10 V
Signal output	V	±10 ±10 (2 measurement ranges)
Linearity error	%FS	±0.05
Transmitter supply	VDC	24 ±5%
max. mA X+Y Channel	mA	500

Cycle control

Start – Stopp	Dig-Input/Fieldbus/Threshold X/ Threshold Y/ Time/Manual

Measuring functions

Measurement curve according to	Y=f(X), Y=f(t), Y=f(X,t), X=f(t)

Curve memory

Current curve	XY-pairs	max. 8,000
Historic curves (for NOK diagnosis)		the last 500

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Evaluation Objects (EOs)

Offline EO types	NO-PASS, LINE-X, LINE-Y, UNI-BOX, ENVELOPE, GET-REF, CALC, GRADIENT-Y, GRADIENT-X, HYSTERESIS-Y, HYSTERESIS-X, TUNNELBOX-X, TUNNELBOX-Y SPEED, AVERAGE, INTEGRAL, DELTA-Y, TIME, TRAPEZOID-Y, TRAPEZOID-X, DISPLACEMENT RANGE, FORCE RANGE, PASS-THROUGH BOX
Online EO types	TUNNELBOX-X, TUNNELBOX-Y, LINE-X, LINE-Y, BREAK, INFLEXION, DIG-IN
Real-time EO-Types	NO-PASS, SWITCH LEVEL
Reference points	Absolute X, Dynamic: Block point X, Dynamic: X on trigger Y, Referencing in X and Y directions possible
Editing	Remote VNC, via touchpanel, Browser based (Web), OPC-UA Data Access [1]

Data export

Protocol	Q-DAS®, QDA9, IPM 5.0, OPC-UA Event [1]
Format	XML, CSV, PDF
Destination	USB, Server
Medium	USB, Ethernet

Visualization

Type	across VNC, or Display Modul (DIM), Browser basiert (Web)

Serielle interfaces

Ethernet	TCP/IP 100 Base TX with 2 Port Switch
USB	3 x USB (Device + Host)
BUS	PROFIBUS DP, PROFINET, EtherCAT, EtherNet/IP, 2 Port Switch

Dig-In/Out

Norm		DIN EN61131
Level state "0"	V	0 ... 5
Level state "1"	V	15 ... 30
Number of inputs		22
Input current max.	mA	8 (at 24 V)
Number of outputs		23
Output current max. (per channel)	mA	500 (at 24 V)
Output current max. (in total)	mA	1,500 (at 24 V)

Measurement programs

Number measuring programs		108
Number master programs		20
Switchover via		Menu/Dig.-In/BUS
Switchover time	ms	<50

Switching signals

Number	2
Channel assignment	X or Y (selectable)
Switching point	Threshold X exceed/underrun, Threshold Y exceed/underrun
Output	Dig.-Out or Fieldbus
Mode	Free-running or latch
Influence on evaluation	No

Real-time reactions

Switching signals	ms	<1
EO type "NO-PASS"	ms	<1
EO type "online"	ms	<2

Power supply

Voltage	VDC	24 (18 ... 30)
Power consumption (typical)	VA	45
Power consumption (max.)	VA	80
Lossy line (MEM)	W	18
Screw-type/plug-in connector,	1 supplied with device Wago, order no. 734-103/037-000 Housing: order no. 734-603	

Environment

Working temperature	°C	0 ... 45
Storage temperature	°C	0 ... 50
IP degree of protection (EN 60529)		
– Connector and cable running downwards	IP	53
– Standard rail version	IP	20

Display module (DIM)

Size	Inches	10.4
Color		yes
Touchscreen		yes
Resolution	Pixels	800x600 (SVGA)
Technology		TFT-LCD
Backlighting		LED
Supply voltage (of MEM)	VDC	24
Power consuption	VA	6
IP degree of protection (EN 60529)		
– Front	IP	65
– Rear	IP	53
Operating temperature range	°C	0 ... 45

[1] function requiring license

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The system concept

Basic components

The maXYmos TL consists of two basic components: the measuring and evaluation module (MEM), which works entirely autonomously and supports one XY channel pair each, and the display module (DIM).

DIM Type 5877AZ000 Type 5877B0 Type 5877B2 Type 5877B3

MEM with display module

The MEM and DIM can either be installed separately from each other, in which case they are connected only via the optional connecting cable type 1200A161A2.5/5.

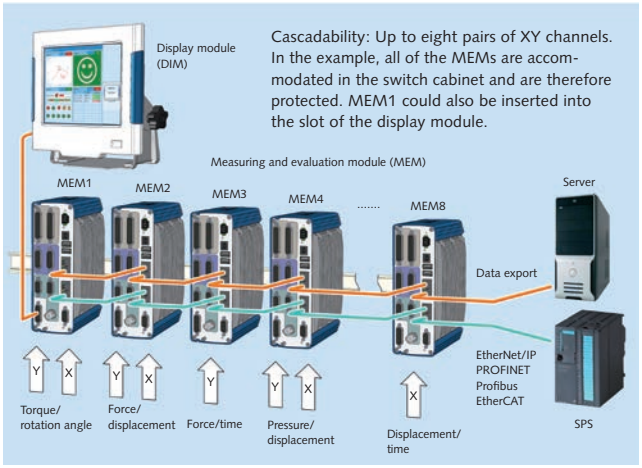
…. or they can be used as a compact unit. In this case the MEM is inserted into the rear slot of the DIM, forming a secure mechanical and electrical connection:

MEM as black box module

Since the measuring and evaluation module (MEM) works entirely autonomously, it can also be operated without the DIM. In this case, setup and process visualization are carried out via the graphical user interface (GUI), which can be transferred onto a PC. Access is by VNC, or a web browser, via the Ethernet interface or USB.

Expandable for up to eight XY channel pairs

For this purpose, the MEMs are connected to the Ethernet interface via patch cables. External switches are not required. The Ethernet is simply looped through the MEMs via the In-Out sockets.



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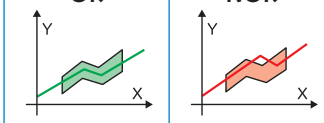
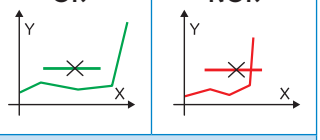
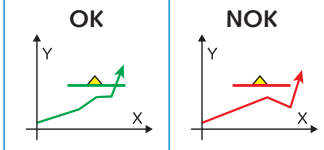
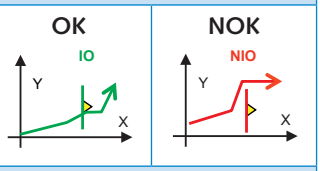
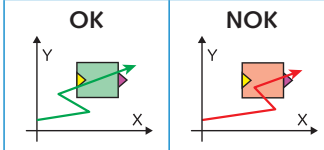
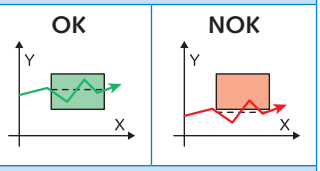
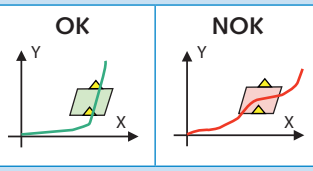
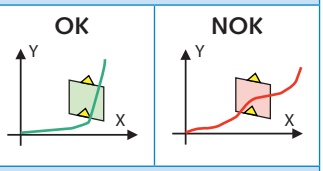
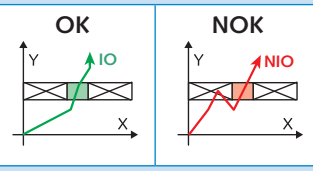
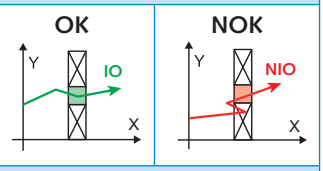
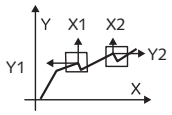
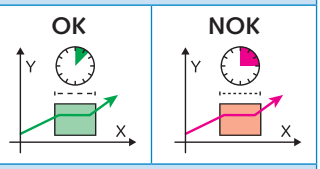
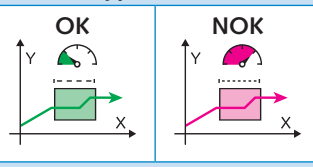
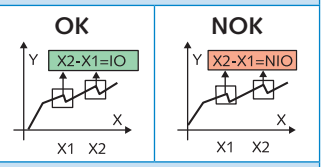
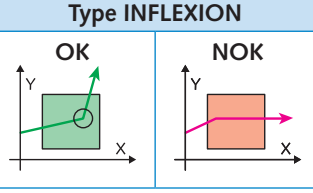
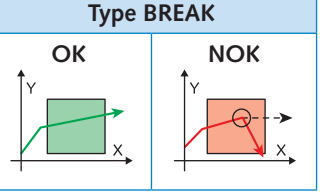
Evaluation objects (EOs) for maXYmos

The measurement curve must not cross the upper or lower line of the envelope. This evaluation object is easy to master.	**Type ENVELOPE** OK / NOK 	The line may not be crossed. Otherwise, NOK and "NO-PASS" real-time signal.	**Type NO-PASS** 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 be crossed once. An Y-value at the point of intersection is monitored.	**Type LINE-Y** OK / NOK 
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 	Evaluates the average of all Y-values in the box region.	**Type AVERAGE** 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 	Entry and exit as specified. No crossing of "closed" sides allowed. Each side can be defined as entry or exit.	**Type TRAPEZOID-Y** OK / NOK 
Entry and exit as specified. Crossing of the "closed" sides generates a real-time signal.	**Type TUNNELBOX-X** OK / NOK 	Entry and exit as specified. Crossing of the "closed" sides generates a real-time signal.	**Type TUNNELBOX-Y** 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 

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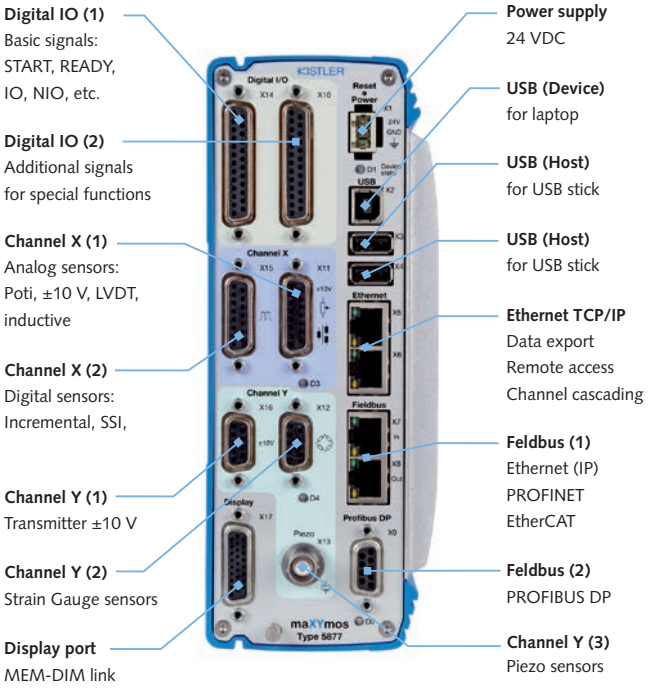
Measuring and evaluation module (MEM)

Interfaces

The module, which features an XY channel pair and all data and control interfaces, forms the heart of the XY monitor.

maXYmos TL:
Measuring and evaluation module (MEM)



Evaluates the displacement end position and detects the max. value The curve must reach the X range. The upper limit must not be reached.	**Type DISPLACEMENT RANGE** OK / NOK
Evaluates the force end position and detects the max. value. The curve must reach the Y range. The upper limit must not be reached.	**Type FORCE RANGE** OK / NOK
Evaluates passing through. The curve must pass the whole box in the preset direction. Evaluation is done over the whole range.	**Type PASS-THROUGH BOX** OK / NOK
Evaluates the X-Hysteresis between forward and reverse curves on a horizontal line.	**Type HYSTERESIS-X** OK / NOK
Evaluates the Y-Hysteresis between forward and reverse curves on a vertical line.	**Type HYSTERESIS-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
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
Evaluates the gradient dX/dY between two horizontal lines.	**Type GRADIENT-X** OK / NOK
Evaluates the gradient dX/dY between two vertical lines.	**Type GRADIENT-Y** OK / NOK
The area beneath the curve is determined and evaluated.	**Type INTEGRAL** OK / NOK

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Sequencer mode

The Sequencer Mode in the maXYmos TL 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:

Important features of maXYmos TL sequenzer mode:

- 7 freely programmable digital inputs
- 7 freely programmable digital outputs
- Up to 256 elements for each measurement program
- "Cam function" for the X and Y axis
- MP toggle function
- 20 master measurement programs
- 108 regular measurement programs
- 100 variables

MP Switching element SWITCH BACK, by using this element you can change to and return from one of the 20 master measurement programs in one of the 107 sub-measurement programs.

CALCULATOR element, by using this element you are able to calculate with determined values.

MEASURE 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 dwell time under force, for example.

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 SEQUENCE RESET, branching option to the start of the sequence.

PIEZO OPERATE element, this element is used to perform a variable measure/reset of the integr. charge amplifier included in the sequence.

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.

OUTPUT element: when this element is activated, the corresponding configured output is set on the device.

INPUT element: when this element is activated, the system waits for the configured digital input signal and then continues the sequence.

DIALOG element, this element enables interaction with the user. It can be used, for example, to forward useful information to the user. The dialog must be confirmed by the user at the visualization or will be hidden automatically after a configured period of TIME.

ZERP TARA element, this ZERO TARA element can be used to set the sensor to zero on the X or Y channel in the sequence.

BARCODE-reader element, this element can be used to read a barcode.

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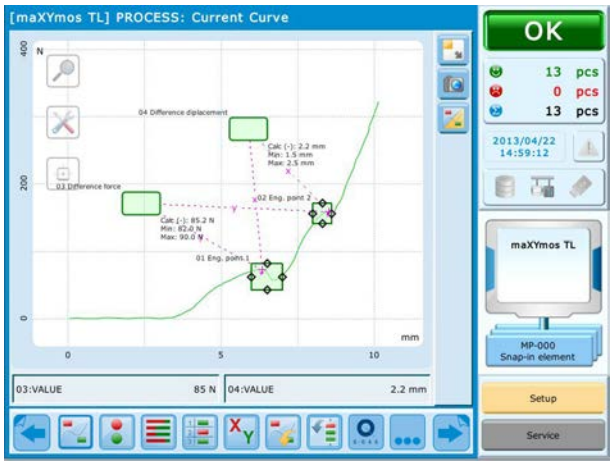
Product testing example: Distance check between two snap-in points of a latch. The two GETREF boxes supply the coordinates of the snap-in points to the CALC objects. These calculate and evaluate the distances in the X and Y directions.



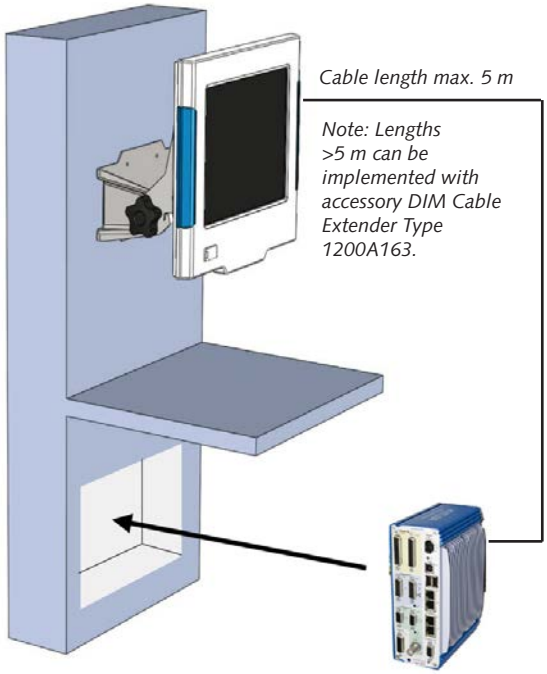
Housing concept and installation variants
With the universal housing concept, different mounting configurations can be realized in a few easy steps. This allows the machine designer to change to a different mounting configuration at any time.

Desktop and wall mounting
A desktop unit can be changed into a wall-mounted version in a few easy steps.

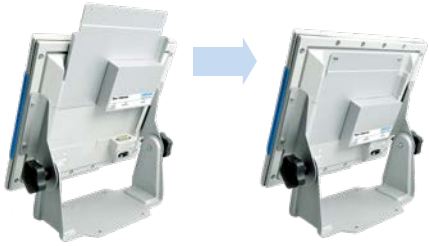
Front panel mounting
After removing the fixing bracket and rear frame, push the display through the front panel opening. Then screw the frame back on. The measuring module (MEM) can now be pushed into the slot of the display module if required.

DIN Rail mounting
The measuring module (MEM) can be mounted on a DIN rail with a optional fastening clip. This makes it possible to house the sensitive connection area of the MEM inside the control cabinet, where it is well protected, while placing the better protected display module (DIM) in the visible area.

Advantages: There is only a monitor cable leading to the display. At the same time, the degree of protection in the monitor area is increased to IP65.



Functional principle with DIM Cable Extender
DIM Cable Extender as an active cable extension between maXYmos MEM and Display DIM with a range of up to 100 m. The DIM Cable Extender Type 1200A163 is inserted into the rear panel of the maXYmos DIM Type 5877AZ000 display and fixed in place with two screws.



The DIM Cable Extender is inserted at the rear portion of the display. The DIM Cable Extender is supplied with 24 V of power (the display is then supplied by the DIM Cable Extender). The DIM Cable Extender is connected to one or several maXYmos units via an Ethernet cable.

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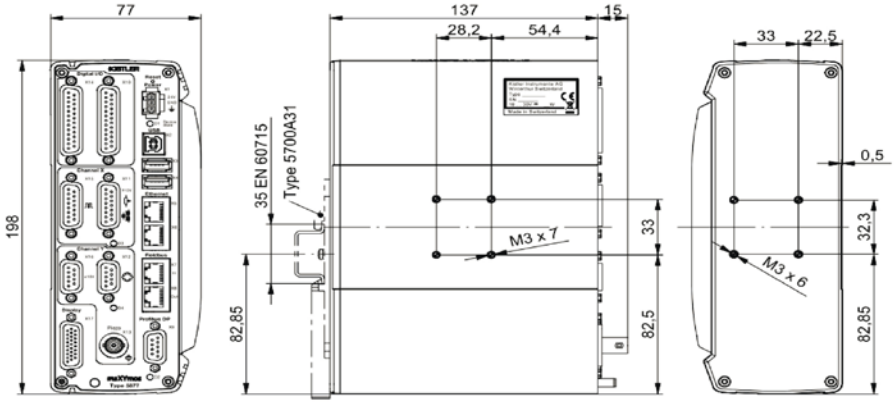
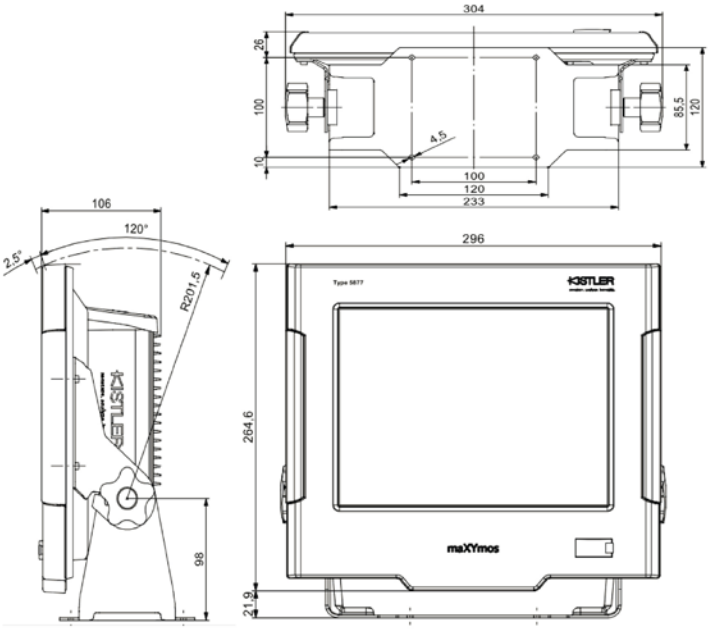
Dimensions

Measuring and evaluation module (MEM)

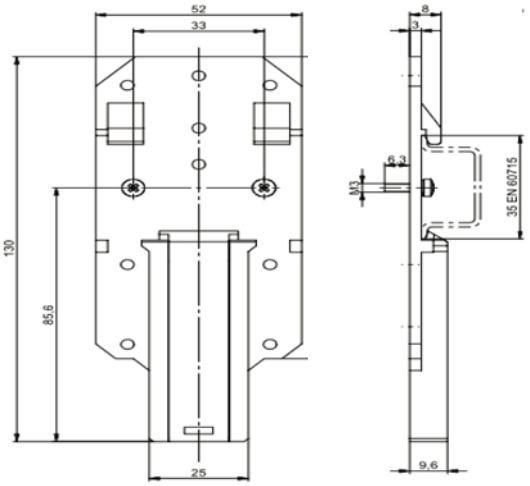


Note: Observe minimum spacing of >10 mm between the MEM's!

Display module (DIM)



DIN rail clip dimensions



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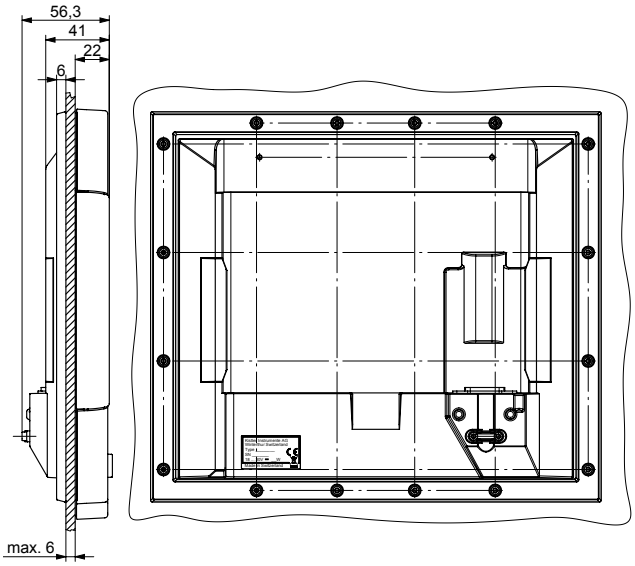
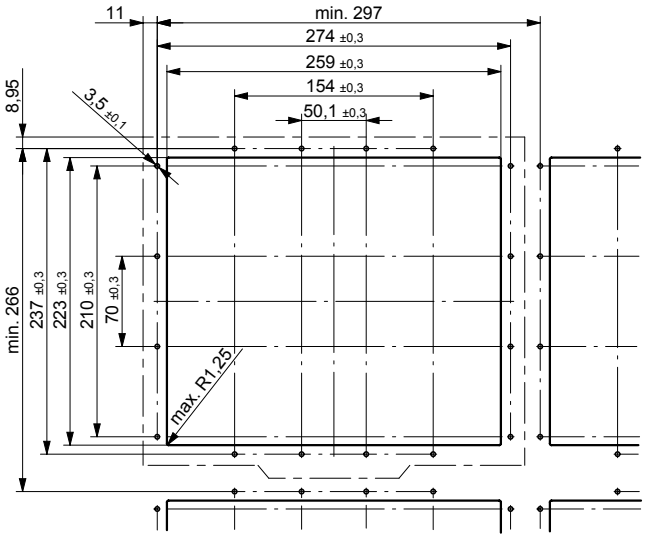
Display Module (DIM) switch panel mounting



Display Module (DIM) – panel cut-out for switch panel mounting. With lateral distance to adjacent displays.



Functions subject to licensing software

From firmware version 1.8.6 licenses are available to extend product capabilities.
From firmware version 1.9.2 license Extended Evaluation is available.

Licence	Content	Notes	NC	TL	TL L	TL ML
Connections and security	LDAP user management	Centralized user access management with LDAP/LDAPS/AD	○	○	○	●
	User and password options	Password reuse prevention, Password expiration, Lock user, Export Login Name				
	Network printer	Enables printing of results on network printers using CUPS				
Multipoint calibration	Multipoint calibration	Linearization of Y-axis sensor signals using support points	○	○	○	○
IIoT connectivity	OPC UA server	OPC-UA Data Access for Setup Parameters and OPC-UA Events for cyclic reports	○	○	○	○
Audit trail	Audit trail	Logging of configuration changes via local input, PLC system or network connections	○	○	○	●
Extended evaluation	20 EO	Extends to max. 20 EO per MP	○	○	○	○
	EO calc complex formula	Advanced option "Fraction"				
	Envelope dynamic scaling	Advanced option dynamic scaling				

○ included ● optional

Kistler reserves the right to extend the scope of functions of the licenses in subsequent firmware versions and to offer new functions in further licenses.

Note: Use of extended funcionality may have impact on system performance (eg. extended post-processing time, reponse delay from logging).

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Accessories	Type
• Display module (DIM)	5877AZ000
• Set of connectors maXYmos TL for sensors, digital I/0 and supply	5877AZ010
• Connecting cable between MEM and DIM, length 2.5 m	1200A161A2.5
• Connecting cable between MEM and DIM, length 5 m	1200A161A5
• Ethernet connecting cable between MEM's, length 0.5 m	1200A49A3
• Ethernet connecting cable between MEM's, length 5 m	1200A49
• Power supply 90 - 264 VAC/24 VDC ready for connection max. 90 W (3.75 A), configurable country cable	5781B5
• DIN rail clip for MEM control cabinet mounting	5700A31
• DIM Cable Extender	1200A163

Windows-Software maXYmos PC (Basic) **2830A1**

- Organize firmware updates
- Save device settings in a backup file
- Restore settings to the device

(included in the scope of delivery of the measuring and evaluation module type 5877B)

Included accessories for Type 5877B0	Type/Mat. No.
• Set of connectors maXYmos TL for sensors, digital I/0 and supply	5877AZ010

Ordering key

Type 5877B ☐ ■ ☐ ☐ ☐ ☐ ☐

MEM maXYmos TL Standard Standard	**0**
MEM maXYmos TL ML Medical Low measuring range	**2**
MEM maXYmos TL L Low measuring range	**3**

Only hardware	**–**
Initial buy of hardware and licenses	**H**
Additional buy of licenses	**S**

Connections and security	No	**0**
	Yes	**1**
Multipoint calibration	No	**0**
	Yes	**1**
IIOT connectivity	No	**0**
	Yes	**1**
Audit trail	No	**0**
	Yes	**1**
Extended evaluation	No	**0**
	Yes	**1**

Note: maXYmos licenses are applicable to hardware R7 from firmware version 1.8.6. Hardware R6 does not support multipoint calibration. Older hardware may additionally experience performance degradation.

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