Press-fit processes are frequently used joining techniques. However, subsequent nondestructive testing of these connections can be very problematic, virtually making in-process testing a must. CoMo Net is ideal for this purpose, recording the interdependent measurands, e.g. joining force and displacement distance, and evaluating their functional relationship. The evaluation results can then be used to separate non-conforming parts for reprocessing or to divide production into different tolerance classes. Designed as a web server, CoMo Net can be easily integrated into existing Ethernet networks. A web browser running either on an existing visualization unit or on a PC is used for programming and visualizing the current process. The intuitive operating method guides the operator quickly and reliably through the setup procedure for the measuring process.

- Flexible monitoring of joining processes and product testing.
- Connection for piezoelectric and strain gauge sensors as well as sensors with voltage output.
- Measuring mode \( y(x) \) or \( y(t) \)
- 12 evaluation functions, which can be freely combined, for monitoring threading, curve shape, slope, hysteresis, blocking force and final position.
- Real-time thresholds for overload protection or for speed control.
- Monitors up to 20 cycles per second.
- Fast actuation via digital I/O of SPC
- Memory for storing the last 10 measured curves for error analysis, reference curve as well as for 16 measuring programs.
- Extensive process data compilation with statistical cp and cpk value analyses.
- Integral web server.
- Intuitive setup via Ethernet and standard web browser.
- Top-hat rail mounting.
- Options: Profibus DP

**Description**

The CoMo Net is a two-channel control monitor for DIN rail mounting for monitoring and classifying industrial processes and operates on a 24V industrial supply.

6 SPC-compatible digital inputs and outputs allow the system to be integrated into a machine control system. The CoMo Net can be networked via TCP/IP and Ethernet. The RS 232C interface is used solely for testing and servicing purposes.

The system is operated exclusively by means of a standard web browser via Ethernet on a PC or web terminal (parameter setting, visualization). The web server integrated in the CoMo Net controls the HTML pages for operation, with the data server controlling the exchange of process data with the outside world. Access to the various menu levels is controlled for operators, supervisors or service personnel, with authorization being required by password.

**Measuring Amplifier \( y \)-channel (e.g. force)**

Charge amplifier for piezoelectric sensors or voltage amplifiers for piezoresistive sensors, strain gauge bridges or sensors with voltage output.
Measuring Amplifier x-channel (e.g. displacement)
Voltage amplifier for potentiometric displacement sensor; power supply through control monitor.

Depending on the application selected, the measurands saved are evaluated after the cycle.

Profibus DP (extension module)
System integration is possible via the Profibus (with a transmission rate up to 12Mbaud), which can be provided as an optional extra. The following functions can be controlled:
- Measuring cycle, Start/Stop
- Trigger, Start/Stop
- Taring x, y
- Parameter set switching
- Statistics/Trend deleting
- Query: Measuring readiness/status
- Read, process evaluation
- Read, real-time thresholds x,y

Calibration
The transmission factors of all amplifiers (charge, displacement and strain gauge) are checked within the scope of a function check against the capacitance and voltage references present in the CoMo Net. If these are outside the tolerances specified, the CoMo Net must be calibrated with an external charge or voltage source. All calibration values and other information such as the MAC address are stored in the EEPROM on the LVU card.

The CoMo Net has CE conformity and complies with EMC standards EN 61000-6-3 (interference emission, residential areas) and EN 61000-6-2 (interference immunity, industrial areas). Its interference immunity was tested with the grounding screw fitted. Inputs and outputs are protected with varistors against electrostatic charges. Its degree of protection is IP 20.

Fig. 1: Block schematic diagram of CoMo Net Type 5863A…
Process Arrangement

![Diagram showing the process arrangement involving PC Browser, IPC Browser, Web Terminal Browser, Hub, Factory-LAN, Ethernet TCP/IP, Data Server, Data Processing Service, Data Protection, Other Services, CoMo Net Web-Server, SPS, and Kistler System Component.]

Operation

Measurement Setup

Fig. 2: Measurement

Fig. 3: Measurement setting
**Evaluation Functions**

Up to 12 evaluation functions of varying types such as boxes, thresholds, limit positions, gradients dy or dx and hysteresis can be activated and freely combined for the purpose of process monitoring.

Various information for each evaluation element, namely a trend, the distribution of the point of intersection of the curve with the element, or statistics such as the average, standard deviation cp or cpk value. The corresponding process values can be displayed and stored in numerical form. A control signal (conforming/nonconforming) is actuated and then fed to the interfaces (digital outputs, Profibus DP or Ethernet) for process evaluation.

**Limit Value Monitoring in Real Time:**

Real-time thresholds can be used to actuate trigger signals or, for example, to monitor safety criteria (e.g. overload protection).

<table>
<thead>
<tr>
<th>Type of limit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**Post-Cycle Evaluation Functions and Process Values**

<table>
<thead>
<tr>
<th>Evaluation function</th>
<th>Numeric process values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry/exit point</td>
<td></td>
</tr>
<tr>
<td>Minimum/maximum values</td>
<td></td>
</tr>
<tr>
<td>Point of intersection</td>
<td></td>
</tr>
<tr>
<td>y, x maximum</td>
<td></td>
</tr>
<tr>
<td>y, x/t stop position</td>
<td></td>
</tr>
<tr>
<td>Gradient dy/dx</td>
<td></td>
</tr>
<tr>
<td>dy, dx hysteresis</td>
<td></td>
</tr>
</tbody>
</table>

Further thresholds are used to monitor various partial ranges of the signal characteristic. Evaluation takes place after the measuring cycle.

**Boxes**

The box function is used to monitor whether the signal characteristic enters and exits the prescribed sides of the box. The other sides must not be touched.

![Fig. 4: Real-time threshold monitoring](image)

![Fig. 5: Thresholds for monitoring partial ranges](image)

![Fig. 6: Monitoring with box functions](image)
Control Monitor CoMo Net®, Type 5863A…

Fig. 7: Differential monitoring

Fig. 8: Hysteresis $\Delta y$

Fig. 9: Hysteresis $\Delta x$

Fig. 10: Monitoring the stop position during press work

Fig. 11: Monitoring the limit position

Hysteresis
Monitoring function, e.g. for testing springs
Setting Evaluation / Process Analysis

Fig. 12: Setting evaluation

Fig. 13: Trend

Fig. 14: Statistics

Fig. 15: Numeric
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This information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes. Liability for consequential damage resulting from the use of Kistler products is excluded.

### Technical Data

#### Analog inputs (general data)
- **2**
  - Sampling frequency per channel kHz: **10**
  - Number of measuring points per cycle: 250, 500 or 1000
  - Resolution of analog/digital converter (21 Vpp): **Bit 12**

#### Charge amplifier for piezoresistive sensor (BNC)
- Measuring range: **pC ±100 … 1’000’000** (divided into 4 decade partial ranges)
- Error with calibration: % <1
- Error without calibration: % <3
- Repeat error: % FS <0,1
- Zero point error and zero transition (Reset/Operate): SW correction

**Switching times**
- Reset/Operate: ms <5
- Operate/Reset (residual charge <0,5 % FS): ms <15
- Drift:
  - at 25 °C: pC/s <0,1
  - at 50 °C: pC/s <0,5

#### "Force" voltage amplifier for sensors with voltage output
(instead of charge amplifier)
- Sensor types: Piezoresistive (current fed), Strain gauge bridge (voltage-fed, 4 or 6 conductor)
- Sensor with voltage or current output

**Measuring range**
- **V ±0,005 … ±10**

**Range subdivision**
- Range 1: V ±0,005 … ±0,05
- Range 2: V ±0,05 … ±0,5
- Range 3: V ±0,1 … ±1,0
- Range 4: V ±1,0 … ±10

**Common mode**
- of the differential input stage: V ±18

**Input filter, passive**
- kHz: 5

**Error**
- Range ±0,005 … ±0,05 V: % <1,5
- Range ±0,05 … ±10 V: % <1
- max. input voltage (continuous): V ±20

**Taring function (voltage feed after differential stage)**
- Voltage source (2 ranges), Resolution: V ±1, ±0,1 (0,05 %)
- Zero offset in relation to ±10 V Output: ±1 … ±10
- Scaling amplifier 1 … 10: V ±1 … ±10
- Scaling amplifier >10 … 100: V ±1 … ±10

### Power source for piezoresistive sensor
- **Supply voltage between +Ex (10 V) and –Ref**
- **Output current mA**: –4
- **Error %**: <0,5
- **Load resistance kΩ**: <4,7

### Power source for strain gauge bridge
- **Output voltage V**: 5 or 10
- **Error %**: <0,5
- **Output current mA**: <40

**Remarks**
- The effective bridge voltage is measured and the result taken into account by the software (this is important for 6-conductor connections).
- Shunt calibration with selectable external resistance.
- The sum of the currents for the strain gauge bridge supply and the potentiometric displacement sensor must not exceed 60 mA because of the equipment power dissipation.

#### Voltage amplifier for potentiometric displacement sensor
- **Measuring range**
  - **V ±0,5 … ±10**
- **Error %**: <1
- **Zero offset of the input signal, resolution V ±10 (±0,02)**

#### Power sources for displacement sensor supply
- **2**
- **Output voltage V**: –10/+10
- **Error %**: <0,2
- **Output current mA**: <20

### Analog monitor outputs
(2 mm sockets, general data)
- **2**
- **Output current mA**: <3
- **Error (without error, measuring amplifier) %**: <0,5

**Monitor output y (Force)**
- **Output voltage for FS input signal V ±10**
- **Zero offset mV**: <±10
- **Zero transition (Reset / Operate) pC**: <±0,5

**Monitor output X (displacement corrected)**
- **Output voltage for FS input signal V 0 … +10**
- **Zero offset mV**: <±20

### Digital inputs (optocoupler, electrically isolated)
- **6**
  - Functions: 1 cycle, 4 parameter sets, 1 reserve
  - Bounce-masking by software
  - Logical input level, High: V >14
  - Logical input level, Low: V <8
  - Input current at 24 V mA: 5

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Control Monitor CoMo Net®, Type 5863A…

Connections

Charge input
for piezoelectric sensor Type BNC neg.
- "Force" voltage amplifier Type Phoenix 3,5 mm
for sensors with voltage output
(piezoresistive sensor, strain gauge bridge or other)

Monitor output Type Phoenix 3,5 mm
- Monitor outputs x = displacement corrected Type 2 mm test socket
  y = force (charge amplifier or strain gauge)

Digital outputs, qty. 6 Type Phoenix 3,5 mm

Digital inputs, qty. 6 Type Phoenix 3,5 mm

Equipment supply Type Phoenix 3,5 mm

Interface Ethernet 10Base-T Type RJ45

Remarks
- The recommendations in the operating instructions concerning
  EMC must be observed.
- For applications subject to EMC, the electrically isolated measuring
  circuit can be snugly connected to the case (protective ground)
  using the cheese-head screw M2,5 x 5 under the input BNC.

Digital outputs

Functions: 1 Ready, 5 evaluation elements

- Current loading, continuous mA <100
- Current loading, pulse <0,1 s mA <300
- Resistance when switched on Ω <50 (typ. 30)
- Voltage V <40

Connections

Charge input
for piezoelectric sensor Type BNC neg.
- "Force" voltage amplifier Type Phoenix 3,5 mm
for sensors with voltage output
(piezoresistive sensor, strain gauge bridge or other)

Monitor output Type Phoenix 3,5 mm
- Monitor outputs x = displacement corrected Type 2 mm test socket
  y = force (charge amplifier or strain gauge)

Digital outputs, qty. 6 Type Phoenix 3,5 mm

Digital inputs, qty. 6 Type Phoenix 3,5 mm

Equipment supply Type Phoenix 3,5 mm

Interface Ethernet 10Base-T Type RJ45

Remarks
- The recommendations in the operating instructions concerning
  EMC must be observed.
- For applications subject to EMC, the electrically isolated measuring
  circuit can be snugly connected to the case (protective ground)
  using the cheese-head screw M2,5 x 5 under the input BNC.

Digital outputs

(Photo MOS relay, electrically isolated, common feedback)

Functions: 1 Ready, 5 evaluation elements

- Current loading, continuous mA <100
- Current loading, pulse <0,1 s mA <300
- Resistance when switched on Ω <50 (typ. 30)
- Voltage V <40

Connections

Charge input
for piezoelectric sensor Type BNC neg.
- "Force" voltage amplifier Type Phoenix 3,5 mm
for sensors with voltage output
(piezoresistive sensor, strain gauge bridge or other)

Monitor output Type Phoenix 3,5 mm
- Monitor outputs x = displacement corrected Type 2 mm test socket
  y = force (charge amplifier or strain gauge)

Digital outputs, qty. 6 Type Phoenix 3,5 mm

Digital inputs, qty. 6 Type Phoenix 3,5 mm

Equipment supply Type Phoenix 3,5 mm

Interface Ethernet 10Base-T Type RJ45

Remarks
- The recommendations in the operating instructions concerning
  EMC must be observed.
- For applications subject to EMC, the electrically isolated measuring
  circuit can be snugly connected to the case (protective ground)
  using the cheese-head screw M2,5 x 5 under the input BNC.
Control Monitor CoMo Net®, Type 5863A…

Accessories Included
only for Type 5863A10 and 5863A11
- Test cable for monitor outputs, 2 mm sockets, red
- Test cable for monitor outputs, 2 mm sockets, black
- Ethernet cable, crossed, category 5 STP, 2xRJ45, 3 m

<table>
<thead>
<tr>
<th>Type</th>
<th>Accessory Description</th>
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<tbody>
<tr>
<td>5.590.097</td>
<td>Test cable for monitor outputs, 2 mm sockets, red</td>
</tr>
<tr>
<td>5.590.096</td>
<td>Test cable for monitor outputs, 2 mm sockets, black</td>
</tr>
<tr>
<td>5.590.235</td>
<td>Ethernet cable, crossed, category 5 STP, 2xRJ45, 3 m</td>
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</table>

Optional Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Accessory Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200A27</td>
<td>RS-232C cable, null modem, DSUB-9P/DSUB-9S, 5 m</td>
</tr>
<tr>
<td>Z15822</td>
<td>Simulator for feeding in force/displacement signals</td>
</tr>
<tr>
<td>Z17862-1</td>
<td>Cable to simulator Z15822</td>
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<tr>
<td>Z17862-2</td>
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Ordering Key for the CoMo Net Control Monitor

<table>
<thead>
<tr>
<th>Type 5863A</th>
<th>CoMo Net, network link via Ethernet 10 Mbit/s interface, RJ45 connection, 2-channel amplifier, y measuring channel for charge, voltage and strain gauges, x measuring channel for voltage and potentiometric unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>EM-1 expansion module Profibus DP interface</td>
</tr>
<tr>
<td>01</td>
<td>CoMo Net, network link via Ethernet 10 Mbit/s interface, RJ45 connection, 2-channel amplifier, y measuring channel for charge, voltage and strain gauges, x measuring channel for voltage and potentiometric unit with mounted EM-1 expansion module Profibus DP interface</td>
</tr>
<tr>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 16: Typ 5863A11
Fig. 17: Typ 5863A01
Fig. 18: 5863A10
Fig. 19: Typ 5863A…