MKS - TKS

The MKS and TKS models represent the natural evolution of the TFS series to which, besides, they assure the complete compability.
New functions as "loop break alarm" and an instrument design aligned to the new ERO production are added to the flexibility, reliability and easy of use that conferred the commercial success of the previous version.

Main features

- SMART function (Auto-tuning algorithm).
- ECP software package further simplifies the instrument configuration.
- SDDE driver, it is a simple object oriented interface between ERO instruments and Windows® applications on PC.
- Complete interchangeability with the instruments of the previous version.

Windows® is a registred trademark of Microsoft Corporation

MKS/TKS with relay or SSR output selectable

- Output failure detection alarm with load current measurement (OFD function).
- Loop break alarm function for the detection of the control loop malfunctions (LBA function).
- 2 programmable set points (main and auxiliary).
- Logic input for set point selection.

MKS/TKS-mA with linear output

- One linear output (mA) programmable as control output or analog retransmission of the measured value or operative set point.
- 4 local set points selectable by logic inputs.
- 24 V DC auxiliary power supply.

For MKS/TKS-Servo with servomotor control output

- Control output programmable as servomotor or time proportional output.
- Programmable open or closed loop servomotor control.
- 3 logic inputs used for the selection of: the operative set point, the AUTO/MANUAL mode and the DIRECT/REVERSE control mode.
- 4 local set points selectable by logic inputs.
- AUTO/MANUAL transfer with programmable valve positioning.

Special alarm functions

Two functions are included into these instruments for the detection of malfunctions and/or fault conditions on the control loop.

The LBA function allows to detect malfunctions on the control loop which get the process uncontrollable. This evaluation is carried out on the basis of the process rate of rise, therefore:
- no additional measurement is required,
- it is appliable on process with any controlled element.

The instruments equipped with the OFD function allow to:
- timely signal the partial or total load break down;
- immediately signal the actuator break down or short circuit;
- display the current running through the load (in Amps) during the ON and OFF periods of the output.

CONFIGURATION

ECP configuration software (Easy Configuration Software)

This is a special software facility developed to simplify the instrument configuration and the run time parameters setting.
The capability to memorize a complete configuration set, offers a quick and sure repetitive configuration system and deletes maintenance time loss, while the possibility to print a configuration report increases work traceability (as required by the Quality Systems) and simplifies plant analysis.

HOW TO ORDER *the configurator:* 6ER.CNF.000.XXX

SDDE
DDE communication driver for ERO devices

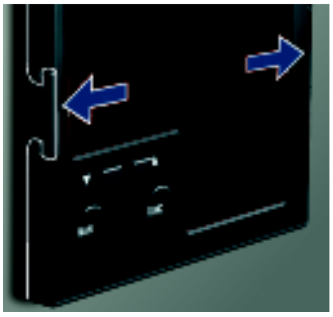
How can you simply create a dinamic link between ERO instruments and a PC running Windows®?
Now it is quick and inexpensive by using SDDE driver developed by ERO Electronic to make available, as Windows objects, the process data handled by the instruments as well as there run-time and configuration parameters.
The integration of ERO instruments in the Windows work enviroment allows to link them to any Windows based package like Excel, Word, etc., or to build up your own application by using any other tool like In-Touch, Visual Basic and similar.

Windows® is a registred trademark of Microsoft Corporation

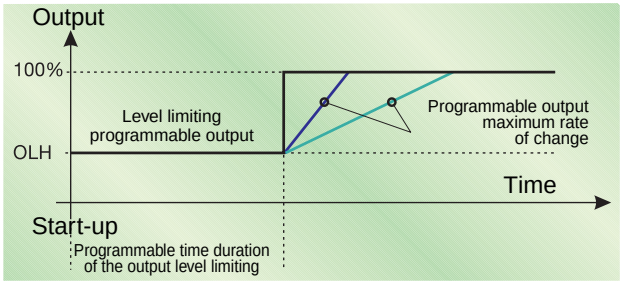
HOW TO ORDER *the communication driver:* 6ER.SDD.E00.XXX

FRONT EXTRACTION

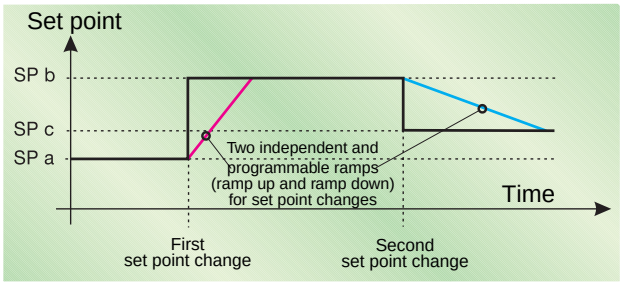
The adoption of some innovative mechanical solutions allows we to make the instrument extraction particularly easy.
In fact, it does not require any tools and the extraction force is very little whereas the front lock assure a safe and vibration resistant fixing.



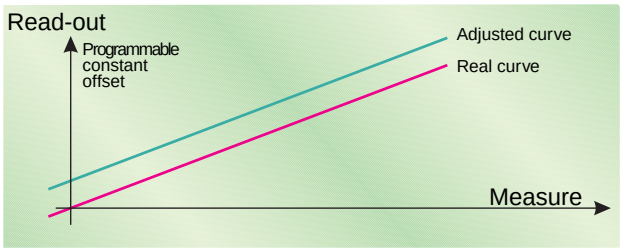
MKS - TKS GENERAL SPECIFICATIONS



Soft Start function
This function allows to gradually preheat the controlled process in order to increase the heater life.
In order to use this function, it is necessary to program the level of the power output to be used during preheating and its time duration.
The alarm masking function assures that no false indication will occur during pre-heat.
With these instruments is also possible to program the output power maximum rate of change in order to avoid thermal shock during normal operation.



Two independent ramps (ramp up and ramp down) for set point changes
This product family allows to program a ramp for increasing a set point and a ramp for decreasing a set point.
This solution is essential where it is necessary to produce a gradual set point variation.
Moreover, a process may need an heating speed different from cooling.



OFFSET on the measured value
These instruments offer the possibility to program a constant offset applied to the measured value in order to re-align the measured value with the real value of the process.
In many cases it is quite difficult to place your sensor in an ideal position. The incorrected positioning of the sensor may produce a measured value that is not a true representation of the process value.

Case:	Polycarbonate.
Self extinguishing degree:	According to UL 746 C.
Front protection:	designed and tested for IP 65 (*) and NEMA 4X (*) for indoor locations (when panel gasket is installed). (*) In accordance with IEC 529, CEI 70-1 and NEMA 250-1991 STD.
Weight:	360 g max. for TKS model - 490 g max. for MKS model
Power supply (switching mode):	from 100 to 240 V AC. 50/60 Hz (+10 % to -15 % of the nominal value) or 24 V DC/AC (±10 % of the nominal value).
Power consumption:	6 W max.
Common mode rejection ratio:	> 120 dB @ 50/60 Hz.
Normal mode rejection ratio:	> 60 dB @ 50/60 Hz.
Electromagnetic compatibility and safety requirements:	This instrument is marked CE. Therefore, it is conforming to council directives 89/336/EEC (reference harmonized standard EN 50081-2 and EN 50082-2) and to council directives 73/23/EEC and 93/68/EEC (reference harmonized standard EN 61010-1).
Installation category:	II
Sampling time:	250 ms for linear inputs - 500 ms for TC or RTD inputs
Accuracy:	± 0.2% f.s.v. @ 25 °C (77 °F) and nominal power supply voltage.
Operative temperature:	from 0 to +50 °C.
Storage temperature:	from -20 to +70 °C.
Humidity:	from 20% to 85 % RH not condensing.

MEASURING INPUT

Thermocouples

Burn out:	Detection of the open input circuit (wires or sensor) with underrange or overrange selectable indication.
Cold junction:	automatic compensation for an ambient temperature between 0 and 50 °C .
Cold junction compensation error:	0.1 °C/°C.
Calibration:	according to IEC 584-1.

STANDARD RANGES TABLE

TC type	Range	
L	0 / 900 °C	0 / 1650 °F
L	0.0 / 400.0 °C	
J	-100 / 1000 °C	-150 / 1830 °F
J	-100.0 / 400.0 °C	
K	-100 / 1370 °C	-150 / 2500 °F
K	-100.0 / 400.0 °C	
N	-100 / 1400 °C	-150 / 2550 °F
R	-50 / 1760 °C	0 / 3200 °F
S	-50 / 1760 °C	0 / 3200 °F
T	-199.9 / 400.0 °C	-330 / 750 °F
For TKS/MKS Servo only		
L	0 / 1820 °C	0 / 3310 °F

RTD input

Type: Pt 100 3 wire connection.
Calibration: according to DIN 43760.
Line resistance: Max 20 Ω/wire with no measurable error.
Burn out: detection of the sensor open circuit and of one or more wires open circuit. The instrument shows the short circuit indication when the resistance of the sensor is lower than 12 Ω.

STANDARD RANGES TABLE

RTD type	Range	
PT100	-200 / 800 °C	-330 / 1470 °F
PT100	-199.0 / 400.0 °C	-199.9 / 400.0 °F

Linear input

Read-out: keyboard programmable from -1999 to 4000.
Decimal point: programmable in any position.

STANDARD RANGES TABLE

Input	Ingresso con zero soppresso	Impedance
0 - 20 mA	4 - 20 mA	< 5 Ω
0 - 60 mV	12 - 60 mV	> 1 M Ω
0 - 5 V	1 - 5 V	> 200 k Ω
0 - 10 V	2 - 10 V	> 400 k Ω

CONTROL ACTION

Algorithm: PID + SMART.
Types: one control output (heating)
two control outputs (heating and cooling).
Proportional band: for MKS/TKS relay the proportional band is programmable from 1.0% to 100.0% of the input span.
For MKS/TKS mA and Servo the proportional band is programmable from 1.0% to 200.0% of the input span. For all the models, setting a PB equal to 0 the control action becomes ON/OFF.
Hysteresis (for ON/OFF control action): from 0,1% to 10,0% of the input span.
Integral time: from 1 second to 20 minutes or excluded.
Derivative time: from 1 second to 10 minutes or excluded.
Integral preload: for one control output, from 0 to 100% of the output range
for two control outputs, from -100% to +100% of the heating/cooling output range.
ARW function: from 10% to 200% of the input span.
Relative cooling gain: from 0,20 a 1,00 referred to the proportional band.
Overlap / dead band: from -20% (dead band) to +50% (overlap) of the proportional band.
Output limiters: for main and/or secondary control outputs it is possible to set:
- output high limits
- output low limits
- output max. rate of rise.

ALARMS

Alarm action: direct or reverse function programmable.
Alarm functions: each alarm can be configured as process alarm, band alarm, deviation alarm or process alarm on the output value.
Alarm reset: automatic or manual reset programmable for each alarm.
Alarm masking: each alarm can be configured as masked alarm or standard alarm. This function allows to delete not desired alarm indications at instrument start up and after a set point changement.
Hysteresis: programmable in engineering units from 1 to 200 digits.

Process alarm

Operative mode: minimum or maximum programmable.
Threshold: programmable in engineering units within input range.

Band alarm

Operative mode: inside or outside programmable.
Threshold: two thresholds are programmable
low - from 0 to -1000 units
high - from 0 to +1000 units.

Deviation alarm

Operative mode: high or low programmable.
Threshold: programmable from -1000 to +1000 units.

SERIAL INTERFACE
(optional)

Type: Isolated RS 485.
Protocol type: MODBUS, JBUS.
Baud rate: programmable from 600 to 19200 BAUD.
Byte format: 8 bit programmable.
Stop bit: one.
Address: from 1 to 255.

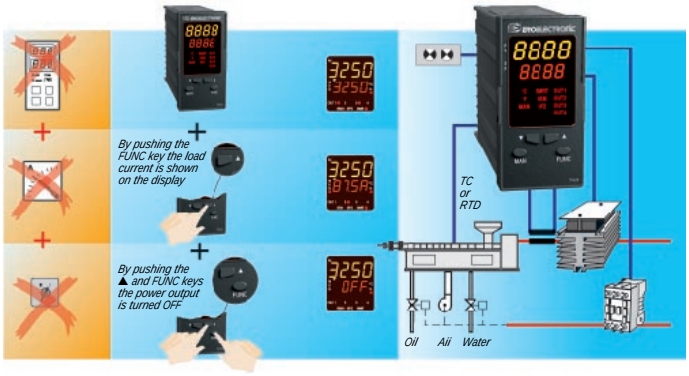
OUTPUT "TURN OFF" FUNCTION

This function allows to disable the control output. Therefore, it removes the power from the controlled load and makes the instrument to work as indicator.Therefore, this function allows to maintain the monitoring of the process variable even when the load is OFF. When the control mode is resumed, the instrument will become operative as follows: the integral component of the output signal will be set to zero and the soft start and the alarm masking functions will be enabled.

LOOP BREAK ALARM (LBA function)

The functioning principle of this alarm is based on the concept that, with a steady load and steady power output, the process rate of rise (deviation/time) is steady as well. Thus, analyzing the process rate of rise of the two limit conditions (power output = 0 and power output = 100%), it is possible to estimate the two limits which define the correct process behaviour. The LBA function is automatically activated when the control algorithm requires the maximum or the minimum power and, if the process response is slower than the estimated limits, the instrument generates an alarm indication in order to show that one or more element of the control loop is in fault condition.
Deviation: from 0 to 500 units.
Timer: from 1 sec. to 40 min.
Hysteresis: from 1% to 50 % of the input span.

MKS - TKS relay



OUTPUTS

These instruments are equipped with 3 independent outputs programmable as:

	Output 1	Output 2	Output3
mode 1	Heating	AL1	AL2 + LBA
mode 2	Heating	Cooling	AL2 + LBA
mode 3	Heating	AL1	AL2 + OFD + LBA
mode 4	Heating	Cooling	AL2 + OFD + LBA

Type: time proportioning.
Action: direct/reverse keyboard programmable.
Main output cycle time: programmable from 1 s to 200 s.
Secondary output cycle time: programmable from 1 s to 200 s.

Output 1 relay

Note: for this output only, the relay output and SSR output are both fitted, the used output is selectable by jumper.
Function: control output (heating).
Relay type: SPST. The selection of the NO or NC contact is made by jumper.
Contact rating: 3 A @ 250 VAC on resistive load.

Output 1 SSR

Logic level 1: 14V DC ± 20% @ 20 mA max.
24V DC.± 20% @ 1 mA max.
Logic level 0: < 0.5 V DC.

Output 2 and 3

Type: relay with SPST contact.
Contact rating: 2 A @ 250 V AC on resistive load.

Output 4 (optional)

Type: relay with SPST contact.
Contact rating: 2 A @ 250 V AC on resistive load.
Function: alarm 3 output.

SET POINTS

Two set point are available: main set point (SP);
auxiliary set point (SP2).
Set point transfer: transfer from SP to SP2 and viceversa may be driven by logic input (contact closure).
Note: the transfer may be done by a step transfer or by a ramp with two different programmable rates of rise (ramp up and ramp down).
Set point limiters: set point low limit and set point high limit are programmable.

LOGIC INPUT

These instruments are equipped with a logic input to be used to select between main set point and auxiliary set point (SP or SP2).

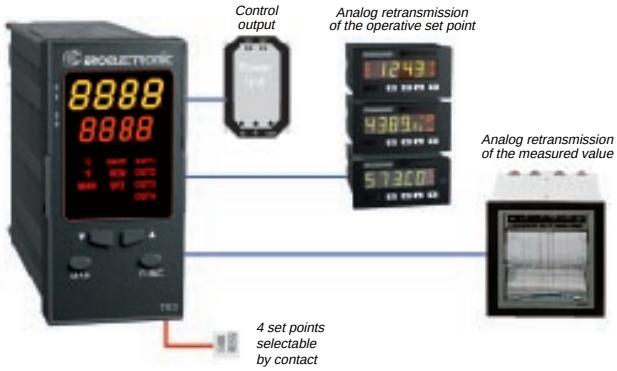
OUTPUT FAILURE DETECTION (OFD FUNCTION) (optional)

The instrument equipped with this feature is capable to measuring, by means of a CT, the running current in the load driven by the output 1.
- During the ON period of the output, the instrument measures the current through the load and it generates an alarm condition when this current is lower than a pre-programmed threshold value (a low current shows a partial or total break down of the load or of the actuator).
- During the OFF period of the output, the instrument measures the leakage current through the load and it generates an alarm condition when this current is higher than a pre-programmed threshold value (a high leakage current shows a short circuit of the actuator).

Input range: 50 mA AC.
Scaling: from 10 A to 100 A (with 1 A step).
Resolution: for full scale up to 20A: 0.1A
for full scale from 21 A to 100 A: 1A
Active period: for relay output: NO or NC
for SSR output: logic level 1 or 0
Minimum active period to perform the measurement: 400 ms.

MKS - TKS mA

4 - 20 mA PROGRAMMABLE LINEAR OUTPUT



24 V DC AUXILIARY POWER SUPPLY FOR TRANSMITTERS

OUTPUTS

These instruments are equipped with 3 independent outputs programmable as:

	Output 1	Output 2	Output 3
mode 1	Heating	AL1	AL2
mode 2	Heating	Cooling	AL2
mode 3	Heating	AL1	Cooling
mode 4	Cooling	Heating	AL2
mode 5	Cooling	AL1	Heating
mode 6	Retrans.	Heating	AL2
mode 7	Retrans.	AL1	Heating
mode 8	Retrans.	Heating	Cooling
mode 9	Retrans.	Cooling	Heating
mode 10	Retrans.	AL1	AL2

Action: direct/reverse keyboard programmable.
Main output cycle time: programmable from 1 s to 200 s.
Secondary output cycle time: programmable from 1 s to 200 s.

Output 1

Type: optoisolated 0-20 mA or 4-20 mA.
Function: Programmable as:
control output (heating or cooling)
retransm. of the measured value
retransm. of the operative set point.
Scaling: programmable from -1999 to 4000.
Maximum load: 500 Ω.
Resolution: 0.1% when used as control output.
0.05% when used as analog retransmission.
Digital filter: it is possible to enable a digital filter, on the output retransmission, with the same time constant chosen for the readout.
Output level indication: (as control output only) from 00.0 to 100.0%.
Output status indication: the OUT 1 indicator flashes with a duty cycle proportional to the output level.

Output 2 relay

Note: for this output only, the relay output and SSR output are both fitted, the used output is selectable by jumper.
Function: control output (heating)
Relay type: SPST. Contact NO or NC selectable by jumper.
Contact rating: 3 A @ 250 V AC on resistive load.

Output 2 SSR

Logic level 1: 14V DC ± 20% @ 20 mA max.
24 V DC ± 20% @ 1 mA max.
Logic level 0: < 0.5 V DC.

Output 3

Type: relay with SPST contact.
Contact rating: 2 A @ 250 V AC on resistive load.

Output 4 (optional)

Type: relay with SPST contact.
Contact rating: 2 A @ 250 V AC on resistive load.
Function: alarm 3 output.

SET POINTS

4 set point are available: SP, SP2, SP3 and SP4.
Set point transfer: transfer may be driven by logic input (contact closure).
Note: the transfer may be done by a step transfer or by a ramp with two different programmable rates of rise (ramp up and ramp down).
Set point limiters: set point low limit and set point high limit are programmable.

LOGIC INPUTS

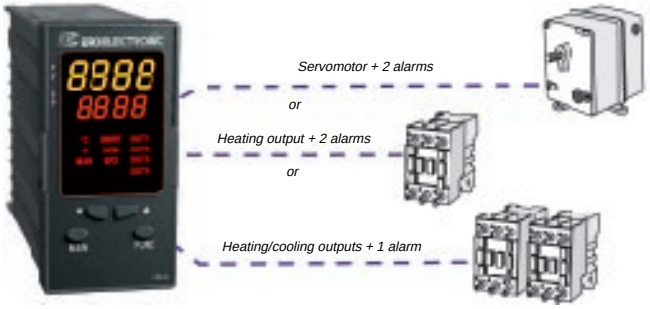
These instruments are equipped with 2 logic inputs (contact) used for the operative set point selection SP, SP2, SP3 and SP4 (binary code).

AUXILIARY POWER SUPPLY

Type: not isolated 24 V DC.
Maximum current: 25 mA with short circuit protection.
Output variation: ± 10% of the nominal value.

MKS - TKS servo

PROGRAMMABLE RELAY OUTPUTS



OUTPUTS

These instruments are equipped with 3 independent outputs programmable as:

	Output 1	Output 2	Output 3
mode 1	Output servomotor		AL1
mode 2	Heating	//	AL1
mode 3	Heating	//	Cooling
mode 4	Cooling	//	Heating

Action: direct/reverse keyboard programmable.
Main output cycle time: programmable from 1 s to 200 s.
Secondary output cycle time: programmable from 1 s to 200 s.

Output 1 and 2 servomotor

Type: 2 relays interlocked (Open/Closed).
Relay: SPST contact (NO).
Contact rating: 3 A @ 250 V AC on resistive load.

Output 1 relay

Function: control output.
Relay type: SPST. Contact NO or NC selectable by jumper.
Contact rating: 3 A @ 250 V AC on resistive load.

Output 3

Type: relay with SPST contact.
Contact rating: 2 A @ 250 V AC on resistive load.

Output 4 (optional)

Type: relay with SPST contact.
Contact rating: 2 A @ 250 V AC on resistive load.
Function: output of the alarm 3.

CONTROL OUTPUT

A) Closed loop servomotor output

Feedback potentiometer range: from 100 Ω to 10KΩ.
Servomotor dead band: from 1% to 50% of the selected servomotor stroke time.
Control action: direct or reverse programmable.
Valve position limiter: low and high limiters programmable.

B) Open loop servomotor output with valve position indication

Indication potentiometer range: from 100 Ω to 10KΩ.
Servomotor dead band: from 1% to 50% of the selected servomotor stroke time.
Servomotor stroke time: programmable from 6 seconds to 3 minutes.
Control action: direct or reverse programmable.

C) Open loop servomotor output without valve position indication

Servomotor dead band: from 1% to 50% of the selected servomotor stroke time.
Servomotor stroke time: programmable from 6 seconds to 3 minutes.
Control action: direct or reverse programmable.

D) One time proportioning output

Output used: output 1.
Control action: direct or reverse programmable.
Output cycle time: from 1 second to 200 seconds.
Output power limiting: high limit programmable.

E) Two time proportioning outputs

Output used: output 1 and 3.
Output cycle time: from 1 second to 200 seconds.
Output power limiting: high limit programmable.

SET POINTS

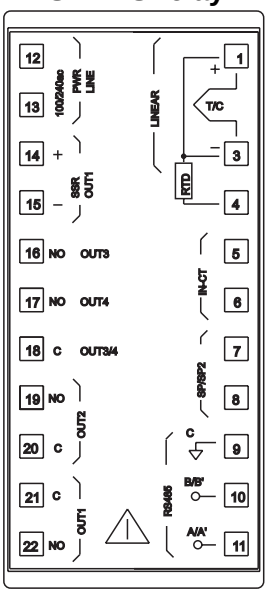
4 set points are available: SP, SP2, SP3 and SP4
Set point transfer: transfer may be driven by logic input (contact closure).
Note: the transfer may be done by a step transfer or by a ramp with two different programmable rates of rise (ramp up and ramp down).
Set point limiters: set point low limit and set point high limit are programmable.

LOGIC INPUTS

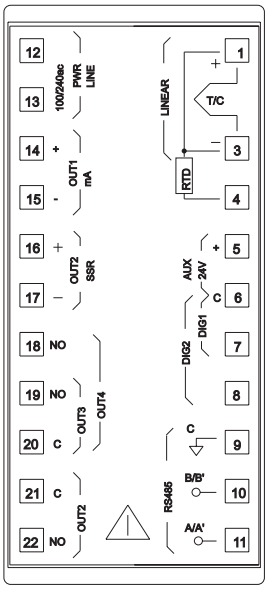
These instruments are equipped with 3 logic inputs (contact closure). Two of them used for the operative set point selection SP, SP2, SP3 and SP4 (binary code).

REAR TERMINAL BLOCK

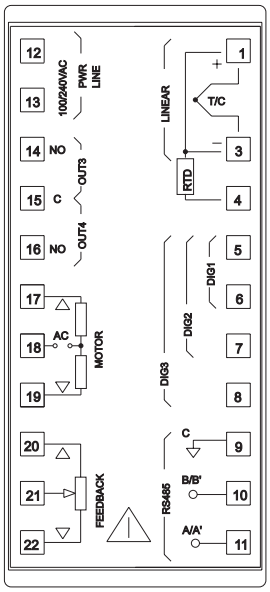
MKS - TKS relay



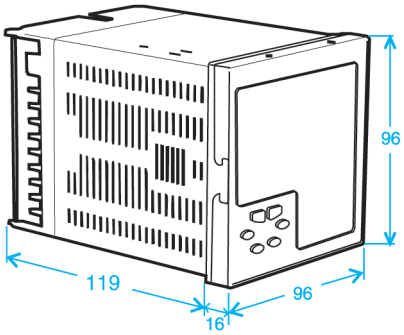
MKS - TKS mA

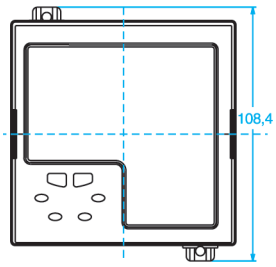


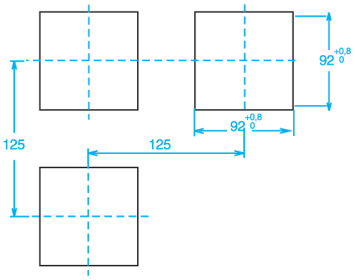
MKS - TKS servo

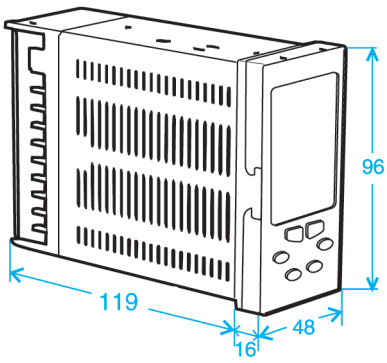


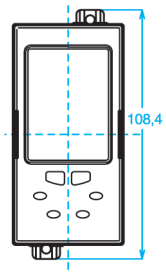
DIMENSIONS AND PANEL CUT-OUT

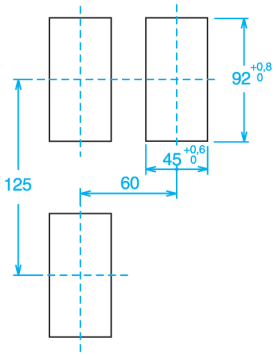












REAR COVER

A particular attention has been dedicated to the safety rear cover design. The used system assures an easy access to the terminals and it reports a clear description of the connection diagrams without to permit the protection removing.