■■■ MKC.PKC

ADVANCED - CONTROLLERS

CE c(UL)us

- SMART TUNE- PID CONTROL
- UNIVERSAL, 3 WIRE- TC, RTD AND LINEAR INPUT
- AUX- REMOTE SET POINT/ TRIM INPUT
- 2x ISOLATED CONTROL AND RETRANSMISSION (mA) OUTPUTS
- 4x EVENT OR ALARM OUTPUTS (+10 OPTIONAL MKC)
- 3x LOGIC INPUTS (+8 OPTIONAL MKC)
- 24V DC TRANSMITTER POWER SUPPLY
- RS 485 MODBUS SERIAL COMMS OPTION
- OPC BASED GRAPHICAL CONFIGURATION SOFTWARE

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OVERVIEW

A wide range of hardware combinations and special software functions make these instruments highly flexible and suitable for a wide range of advanced control applications. Designed to offer outstanding control performance and provide comprehensive solutions for a wide variety of applications such as food processing, steam control, flow control, research-heating equipment requiring precision heat/cool control and process protection alarms. The custom display provides a complete view of the process. Universal thermocouple, RTD or process linear input coupled with a responsive, SMART auto-tuning PID control algorithm that is equipped with special functions including soft start and non linear cooling. A complete set of process protection alarm functions, high and low limit, band and deviation are included.

Optional features include: CT input- HBD, OFD Servo valve positioner, (mA) linear control or retransmission outputs, ModBus communication interface option.

CONFIGURATION PROGRAM

The configuration software simplifies the instrument configuration, parameter adjustment and program editing. A complete instrument configuration may be saved from, and downloaded to the instrument providing a quick and reliable method to maintain instrument settings.

SPLIT RANGE OF THE OUTPUT

Allows two different physical outputs, (two different actuators) to be driven from the same control output. Bias and gain settings for each output may be independently set to achieve optimal control precision.

This feature may be used to improve flow control and reduce energy consumption when using two control valves or variable speed pumps of different size, as illustrated in the diagram.
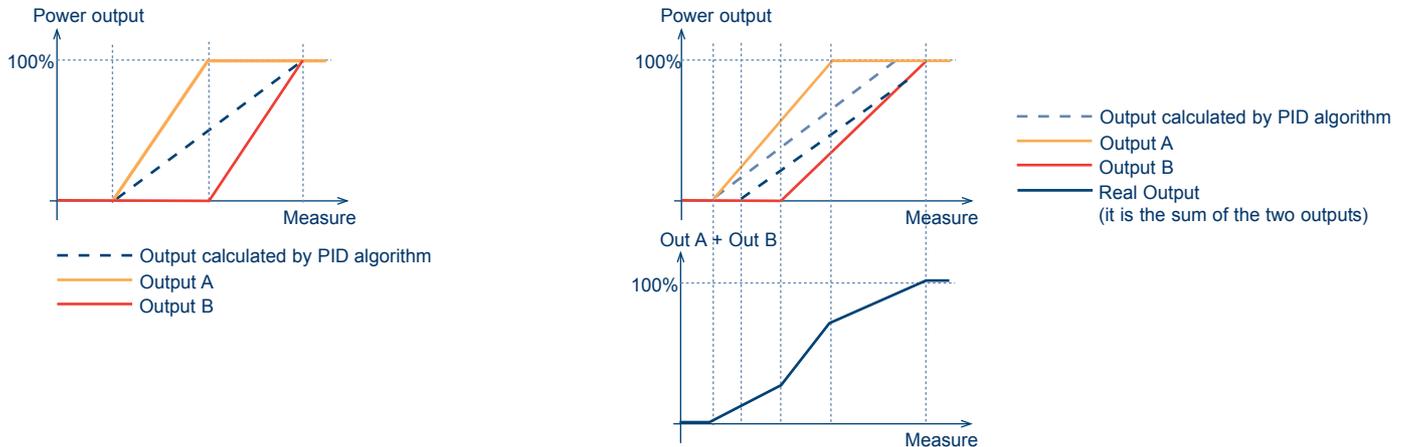
SQUARE ROOT EXTRACTION ON THE MEASURED VALUE

A square root extraction function is available to calculate flow with a standard DP transmitter without additional signal conditioning hardware.

PREPROGRAMMED OUTPUT CHARACTERISTICS

Quick opening and equal percentage valve flow characteristic are automatically compensated by the output linearisation facility. This function linearises the ratio between flow rate and valve travel in order to obtain a better control of the process.
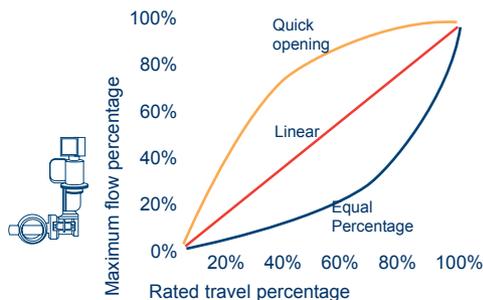
ALARM ON THE OUTPUT VALUES

The control output percentage is monitored by a configurable process alarm. Using this method it is possible to simplify the control of the process. In the example shown, the instrument is controlling a process by driving an airflow valve. The airflow generator uses 3 fans; the first one is always ON while the second and third are turned ON when the power output reaches the programmed value [33 % (AL 1) and 66% (AL 2)]. This solution reduces power consumption and improves process control.

PROCESS PROTECTION ALARMS

Process (high or low limit), Band and Deviation alarm outputs are available with the additional flexibility of latching and masking functions until the process variable reaches the alarm threshold plus or minus hysteresis. Band and deviation alarms are also masked after a set point change until process variable reaches the alarm threshold. The alarm latching function holds the alarm on until it is acknowledged.

OFD FUNCTION - OUTPUT FAILURE DETECTION (optional)

Using the CT input the, output failure detection function monitors the current in the load driven by the output 1. Load and actuator protection is provided in the following way:

1. During the ON period of the output, the instrument measures the current through the load and it generates an alarm condition if this current is lower than a pre-programmed threshold. A low current shows a partial or total break down of the load or actuator SSR.
2. 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.

PRODUCT SPECIFICATIONS

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). test perfomed in accordance with IEC 529, CEI 70-1 and NEMA 250-1991 STD.
Rear terminal board:	32 screw terminals.
Dimensions (according to DIN 43700):	48 x 96mm for PKC 96 x 96mm for MKC.
Depth:	128mm.
Weight:	500g for PKC. 600g for MKC.
Power supply *(switching type):*	from 100 to 240V AC 50/60 Hz (from -15% to +10%of the nominal value) or 24V DC/AC (+10% of the nominal value).
Power consumption:	15VA max. for PKC 16VA max. for MKC.
Insulation:	a double or reinforced insulation is guaranteed between the power supply and all the instrument inputs and outputs.
Common mode rejection ratio:	> 120dB @ 50/60Hz.
Normal mode rejection ratio:	> 60dB @ 50/60Hz.
EMC/Safety:	this instrument is marked CE.It conforms to council directives 89/336/EEC (reference harmonized standard EN 50081-2 and EN 50082-2), 73/23/EEC and 93/68/EEC (reference harmonized standard EN 61010-1).
Sampling time:	125mSec for linear inputs 250mSec for TC or RTD.
Accuracy:	± 0.2% f.s.v., @ 25°C and nominal power supply.
Operating temperature:	from 0 to +50°C.
Storage temperature:	from -20 to +70°C.
Humidity:	from 20% to 85% RH not condensing.

MEASURING INPUTS

All inputs are factory calibrated and selectable by the front keyboard. It is possible to apply a first order digital filter on the displayed value. The time constant of the filter may be programmed within 0 and 8 seconds.

Thermocouples

Line resistance compensation error:	max. ± 0.1% of input span with input impedance <100Ω.
Burn out:	detection of the open input circuit (wire 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.
Input impedance:	> 1MΩ.
Calibration:	according to IEC 584-1.

Standard range table

TC type	°C	°F
B	0/1820	32/3300
C	0/2300	0/4170
D	0/2300	0/4170
E	-100/800	-150/1470
G	0/2300	0/4170
L	-100/900	-150/1650
J	-100/1000	-150/1830
K	-100/1370	-150/2500
N	-100/1400	-150/2550
Nic -18% Mo	0/1200	0/2190
R	-50/1760	-60/3200
S	-50/1760	-60/3200
T	-200/400	-330/750
U	-200/600	-330/1110

RTD input

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

Standard range table

RTD type	°C	°F
Pt 100	-200/850	-330/1560
Pt 100	-199.9/850.0	-199.9/999.9

Linear inputs (mA and V)

Input linearization:	programmable square root extraction.
Readout:	keyboard programmable from -1999 to 9999.
Decimal figure:	programmable in any position.

Standard range table

Input	Impedance
0-20 mA	>5 Ω
4-20 mA	>5 Ω
0-60 mV	>1MΩ
12-60 mV	>1MΩ
0-5 V	>200 kΩ
1-5 V	>200 kΩ
0-10 V	>400 kΩ
2-10 V	>400 kΩ

Auxiliary input (optional)

Function:	this input can be used as trim function, or as remote set point input
Type:	not isolated.
Scaling:	programmable from -1999 to 9999, the decimal figure is automatically positioned as for main input.
Sampling time:	500 ms.
	± 0.2% f.s.v.
Accuracy:	± 1digit @ 25°C and nominal power supply voltage.
Temperature drift:	300ppm/°C.

Standard range table

Input	Impedance
0-20 mA	>5 Ω
4-20 mA	>5 Ω
0-5 V	>200 kΩ
1-5 V	>200 kΩ
0-10 V	>400 kΩ
2-10 V	>400 kΩ

OUTPUTS

These products may be supplied with up to 4 digital outputs (relay, SSR, TRIAC or servomotor drive) and up to 2 linear outputs (mA).

Digital outputs (Out 1 and 2)

Function:	singularly programmed as:
Type:	- control output
	- alarm output
	- event output.
	relay, SSR or TRIAC.

Out 1 and 2 - Relay

Relay type:	SPDT
Contact rating:	3A @ 250V AC on resistive load.

Out 1 and 2 - SSR

Type:	not isolated voltage outputs.
	- Logic level 1: 14V @ 20 mA max. 24V @ 1 mA.
	- Logic level 0: < 0.5V

Out 1 and 2 - TRIAC

Switching mode:	isolated zero crossing type.
Triac rating:	from 50mA to 1A
	from 24V rms to 250V rms.

Out 3 and 4

Function:	singularly programmed as: - control output - alarm output - event output. - Servomotor drive (OUT 3 open, OUT 4 close).
Type:	relay SPST.
Contact rating:	3A @ 250V AC on resistive load. The OUT 3 and 4 commons are connected together with the same rear terminal.

Servomotor output

Type:	two relays interlocked (OUT 3 and 4).
Servomotor output type:	- close loop - open loop with valve position indication only. - open loop without valve position indication.
Feedback potentiometer input:	from 100Ω to 10kΩ.
Servomotor travel time:	from 12 seconds to 3 minutes.
Servomotor dead band:	from 1% to 50% of the feedback span or of the valve travel time.

Analog outputs (Out 5 and 6)

Function:	programmable as - control output - analog retransmission of the measured value - analog retransmission of the operative set point.
Output type:	isolated output programmable as: 0-20mA 4-20mA.
Scaling:	programmable from -1999 to 9999.
Maximum load:	600Ω .
Accuracy:	0.1% when it is used as control output. 0.05% when it is used as analog retransmission
Filter:	it is possible to apply a first order digital filter on the retransmitted value. The time constant of the filter may be programmed within 0 and 8 seconds.

ADDITIONAL LOGIC I/O

L'MKC can be equipped with up to two additional card.
Each card is equipped with four digital input and five relay output. The I/O status can be managed by serial link only.

CONTROL ACTION

Algorithm:	PID +SMART.
Types:	- one control output (digital or analog output)
	- one control output split on two outputs (split range).
	- two control outputs.
	the outputs can be freely selected among analog, digital or servo.
Digital output types:	relay, SSR or TRIAC.
Digital output control action:	proportional time
Analog output types:	linear (20mA).
Servomotor output:	two relays interlocked.
Proportional band:	programmable from 0.5% to 999.0% of the input span.
	Setting a PB equal to 0 the control action becomes ON/OFF.
Hysteresis	
(for ON/OFF control action):	programmable from 0.1% to 10.0% of the input span.
Integral time:	programmable from 1 second to 20 minutes or excluded.
Derivative time:	programmable from 1 second to 10 minutes or excluded.
Integral preload:	programmable.
	- 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.
Main output cycle time:	from 1 second to 200 seconds.
Secondary output cycle time:	from 1 second to 200 seconds.
Relative secondary output gain:	programmable from 0.20 to 2.00 referred to proportional band.
Overlap/dead band:	programmable 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.
AUTO/MANUAL mode:	selectable by front pushbutton or logic input.

SET POINT

These instruments are supplied with 4 local set points (selectable by external contact) and an input for the remote set point (RSP).
The transfer from one set point to another 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 programmable.
Rate of change for set point variations:	from 1 to 200 digits per minute or excluded.
Digital filter:	it is possible to apply a first order digital filter on the measured value by the remote set point input (RSP). The time constant of this filter may be programmed within 0 and 8 seconds.

ALARMS

Alarm action:	direct or reverse action programable
Alarm function:	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.

Process alarm

Operative mode:	minimum or maximum programmable.
Threshold:	programmable in engineering units within input range.
Hysteresis:	programmable in engineering units from 1 to 200 digits

Band alarm

Operative mode:	inside or outside programmable.
Threshold:	two thresholds are programmable: low - from 0 to -1000 digits. / high - from 0 to +1000 digits.
Hysteresis:	programmable in engineering units from 1 to 200 digits

Deviation alarm

Operative mode:	high or low programmable.
Thieshuld:	programmable from -1000 to +1000 digits.
Hysteresis:	programmable in engineering units from 1 to 200 digits.

Alarm on the main output values

it is possible to obtain an alarm condition when the main control output is lower or higher than a programmed value.

Operative mode:	minimum or maximum programmable.
Threshold:	programmable from 0.1 to 100.0% of the output.
Hysteresis:	programmable in engineering units from 0.1 to 20.0%

Alarm on the secondary output values

it is possible to obtain an alarm condition when the secondary control output is lower or higher than a programmed value.

Operative mode:	minimum or maximum programmable.
Threshold:	programmable from 0.1 to 100.0% of the output.
Hysteresis:	programmable in engineering units from 0.1 to 20.0% of the output.

EVENTS

All digital outputs can be programmed as events.
It is possible to set an event choosing among the following types:
- error condition on the main input (overrange, underrange, open or short circuit)
- error condition on the remote set point input (RSP)
- error condition on both measuring inputs
- auto/manual mode annunciator
- local/remote set point annunciator

LOGIC INPUT (optional)

Function: these instruments may be supplied with 3 logic inputs, each one can be programmed as:
- set point selection (SP-SP2).
- set point selection (SP3-SP4).
- local/remote set point selection.
- auto/manual mode selection.
- output limiter activation.
- data Hold of the measured value.
- manual reset of alarms (acknowledgement)
- direct/reverse control action.

Input type: contact closure (voltage free).

Active contact status: close or open programmable.

SERIAL INTERFACE (optional)

Type: RS 485 isolated.

Protocol type: MODBUS, JBUS.

Baud rate: programmable from 600 to 19200 BAUD.

Byte format: 8 bit.

Parity: even, odd or non - programmable.

Stop bit: one.

Address: from 1 to 255.

Output voltage levels: according to EIA standard.

AUXILIARY POWER SUPPLY (optional)

An un-isolated auxiliary power supply option enables direct connection of a 2, 3 or 4-wire transmitters and eliminates the need for an additional, separate power supply unit.

Type: 24V DC ± 20% not isolated.

Max. current: 25mA.

HOLD FUNCTION

By an external contact it is possible to stop the input sampling keeping the last measured value frozen.

SOFT START

The Soft-start feature provides time based output power limit protection. Limiting the heater power during startup reduces potential thermal stress on the heating elements. Both the Soft-start time and temperature threshold are configurable.

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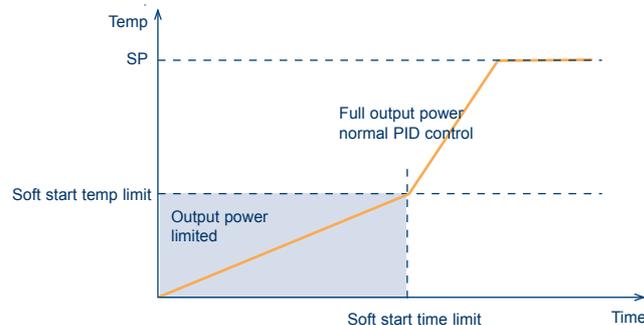
DIMENSIONS AND PANEL CUT - OUT MKC
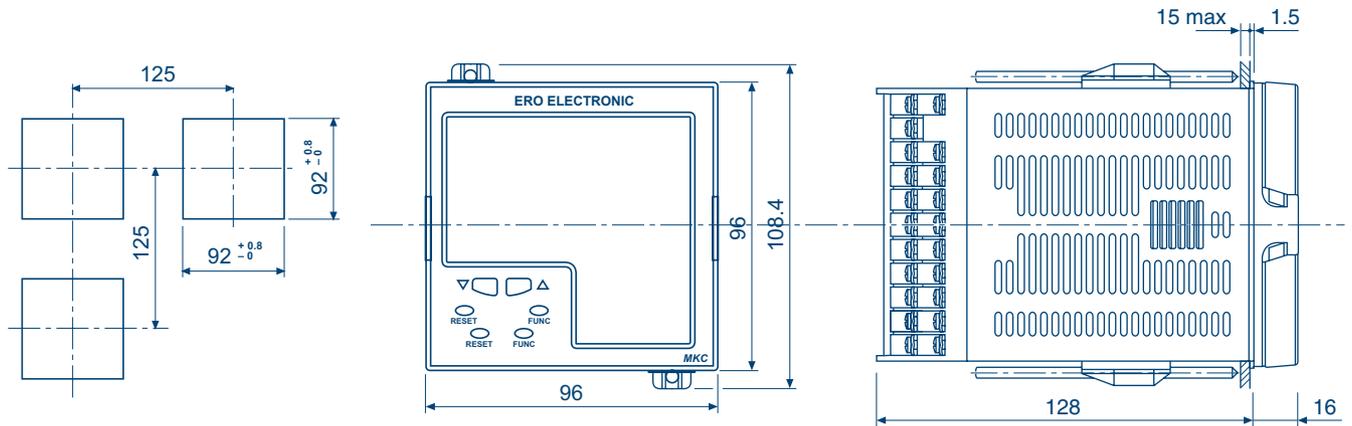
DIMENSIONS AND PANEL CUT - OUT PKC

REAR TERMINAL BLOCK MKC

REAR TERMINAL BLOCK PKC
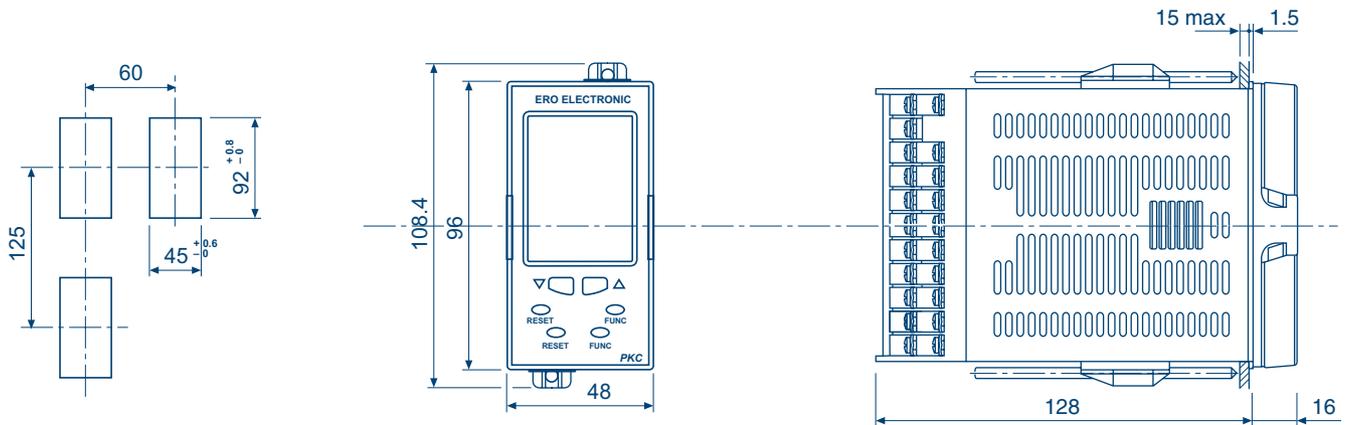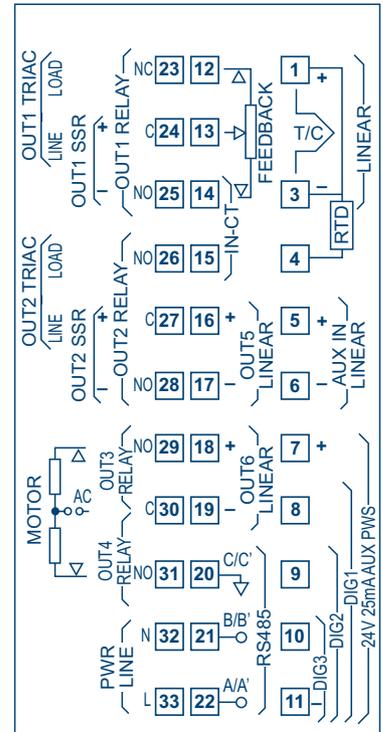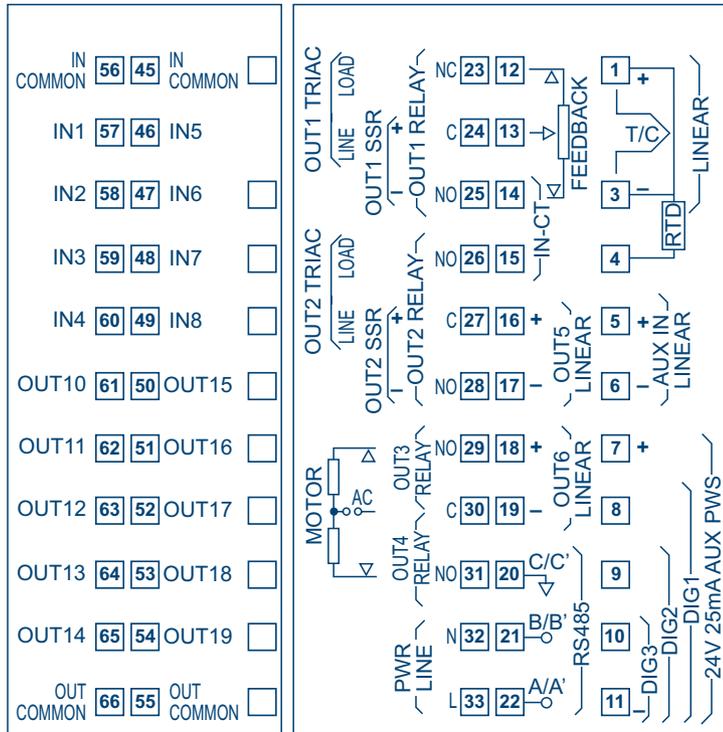
MKC block:

IN COMMON	56	45	IN COMMON
IN1	57	46	IN5
IN2	58	47	IN6
IN3	59	48	IN7
IN4	60	49	IN8
OUT10	61	50	OUT15
OUT11	62	51	OUT16
OUT12	63	52	OUT17
OUT13	64	53	OUT18
OUT14	65	54	OUT19
OUT COMMON	66	55	OUT COMMON

OUT1 TRIAC — LINE / LOAD
OUT1 SSR
OUT1 RELAY — NC 23 / C 24 / NO 25

12 / 13 / 14 — FEEDBACK / IN-CT

1 + / T/C LINEAR / 3 − / RTD
4

OUT2 TRIAC — LINE / LOAD
OUT2 SSR
OUT2 RELAY — NO 26 / C 27 / NO 28

15 / 16 + / 17 − — OUT5 LINEAR

5 + / AUX IN LINEAR / 6 −

MOTOR — AC
OUT3 RELAY — NO 29 / C 30 / NO 31
OUT4 RELAY

18 + / 19 − / 20 — OUT6 LINEAR

7 + / 8 / 9

PWR LINE — N 32 / L 33

C/C' 20 / B/B' 21 / A/A' 22 — RS485

10 / 11 — DIG3 / DIG2 / DIG1 / 24V 25mA AUX PWS

PKC block:

OUT1 TRIAC — LINE / LOAD
OUT1 SSR
OUT1 RELAY — NC 23 / C 24 / NO 25

12 / 13 / 14 — FEEDBACK / IN-CT

1 + / T/C LINEAR / 3 − / RTD
4

OUT2 TRIAC — LINE / LOAD
OUT2 SSR
OUT2 RELAY — NO 26 / C 27 / NO 28

15 / 16 + / 17 − — OUT5 LINEAR

5 + / AUX IN LINEAR / 6 −

MOTOR — AC
OUT3 RELAY — NO 29 / C 30 / NO 31
OUT4 RELAY

18 + / 19 − / 20 — OUT6 LINEAR

7 + / 8 / 9

PWR LINE — N 32 / L 33

C/C' 20 / B/B' 21 / A/A' 22 — RS485

10 / 11 — DIG3 / DIG2 / DIG1 / 24V 25mA AUX PWS

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HOW TO ORDER

MODEL	INPUT	OUT 1 and OUT 2	OUT 3 and OUT 4	OUT 5 and OUT 6	OPTIONS	POWER SUPPLY
MKC 1/4 DIN	1 main + Aux-in. + Logic inputs	11 two relay outputs	0 not provided	0 not provided	0 not provided	3 100/240V AC
PKC 1/8 DIN	5 main + OFD (or Feedback)	44 two TRIAC outputs	1 two relay outputs	5 two mA outputs	1 aux.PWS	5 24V AC/DC
	6 main + Aux-in. + Logic inputs + OFD (or Feedback)	61 one SSR + one relay output	2 two relay outputs interlockable by jumper	7 One mA output (Out 5)	2 RS485 + Aux. PWS	
	9 main	66 two SSR outputs			3 RS485	
					6* RS485 + 4 logic inputs + 5 Digital outputs	
					7* RS485 + 8 logic inputs + 10 Digital outputs	

(*) MKC only

HOW TO ORDER
Current transformer (for instrument with OFD option only)

MODEL	PRIMARY CURRENT
CTR current transformer	1 10A
	2 25A
	3 50A
	4 100A
CTR	

DIMENSIONS CTR

5.5   27   5.5   2

48   19 9   20   ⌀13
8   8
38   20

4   30   4
10   10
Hole   ⌀2.9
Depth mm.9

A170.CAT.MKC.ODE