KCT2-6ST-V
KC-LED-96-1T-24VDC

Pulse counter/Position indicator

Bedienungsanleitung

$C \epsilon$

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1. Description

The display counter is a multipurpose device. Depending on the programmed basic function, the device operates like
- the pulse counter (see page 4) or
- the frequency meter (see page 6) or
- the time meter (see page 7)

1.1 Preface

Please read this instruction manual entirely and carefully before installation and start-up. Please observe all warnings and advice, both for your own safety and for general plant safety. If the device is not used in accordance with this instruction manual, then the intended protection can be impaired.

2. Safety Instructions and Warnings

Please use the device only if its technical condition is perfect. It should be used only for its intended purpose. Please bear in mind safety aspects and potential dangers and adhere to the operating instructions at all times.

Defective or damaged devices should be disconnected from the mains immediately and taken out of operation.

The device shall not be opened. Use the repair service of the manufacturer.

Only connect the device to the electricity networks provided to that purpose.

The safety of the system in which the device is integrated is the responsibility of the installer.

Disconnect all electricity networks prior to any installation or maintenance work.

Use exclusively cables approved in your country and designed for your temperature and power ranges.

Installation and service work shall be carried out exclusively by qualified personnel.

The device must compulsorily be protected with approved external fuses. The value of these fuses can be found in the technical information.

This symbol is used on the device to remind of the existence of dangers, which are referred to in this manual.

2.1 Use according to the intended purpose

The counter detects and measures pulses, times and frequencies up to max. 60 kHz and offers a wide variety of different operating modes. Use for any purpose over and beyond this will be deemed as not in accordance with its intended purpose and thus not complying with the requirements.

The application area for this device lies in industrial processes and controls, in the fields of manufacturing lines for the metal, wood, plastics, paper, glass, textile and other like industries. Over-voltages at the terminals of the device must be kept within the limits of Over-voltage Category II.

The device must only be operated when mounted in a panel in the correct way and in accordance with the section "Technical Data".

The device is not suitable for use in hazardous areas and for areas excluded in EN 61010 Part 1. If the device is used to monitor machines or processes in which, in the event of a failure of the device or an error made by the operator, there might be the risk of damaging the machine or causing an accident to the operators, it is your responsibility to take the appropriate safety measures.

The device has been designed for indoor operation. It may nevertheless be used outdoors, provided the technical data is adhered to. In this case, take care to provide suitable UV protection.

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2.2 Mounting in a control panel

⚠️ **CAUTION**

Mount the device away from heat sources and avoid direct contact with corrosive liquids, hot steam or similar.

Provide a free space of 10 mm all around the device for its ventilation.

The device should be mounted so that the terminals are out of the reach of the operator and cannot be touched by him. When mounting the device, consider the fact that only the front side is classified as accessible for the operator.

Mounting instructions
1. Remove the mounting clip from the device.
2. Insert the device from the front into the panel cut-out, ensuring the front-panel gasket is correctly seated.
3. Slide the fixing clip from the rear onto the housing, until the spring clamps are under tension and the upper and lower latching lugs have snapped into place.
Note: In case of proper installation, IP65 can be reached on the front side.

⚠️ **DANGER**

2.3 Electrical Installation
The device must be disconnected from any power supply prior to any installation or maintenance work. Make sure that no more voltages LIABLE TO CAUSE AN ELECTROCUTION are present.

AC-powered devices must only be connected to the low-voltage network via a switch or circuit breaker installed close to the device and marked as their disconnecting device.

Installation or maintenance work must only be carried out by qualified personnel and in compliance with the applicable national and international standards.

Take care to separate all extra-low voltages entering or exiting the device from hazardous electrical conductors by means of a double or reinforced insulation (SELV circuits).

⚠️ **DANGER**

The device must be protected externally for its proper operation. Information about the prescribed fuses can be found in the technical information.

It must also be made sure that, even in case of a malfunction, the values stated in the technical data are under no circumstances exceeded

• The cables and their insulation must be designed for the planned temperature and voltage ranges. Regarding the type of the cables, adhere to the applicable standards of the country and of the plant. The cross sections allowed for the screw terminals can be found in the technical data.
• Before starting the device, check the cables for proper wiring and tightening. The screws of unused screw terminals must be screwed to the stop, so that they cannot loosen and get lost.
• The device has been designed for overvoltage category II. If higher transient voltages cannot be excluded, additional protection measures must be taken in order to limit the overvoltage to the values of CAT II.

Advice on noise immunity
All connections are protected against external sources of interference. The installation location should be chosen so that inductive or capacitive interference does not affect the device or its connecting lines! Interference (e.g. from switch-mode power supplies, motors, clocked controllers or contactors) can be reduced by means of appropriate cable routing and wiring.

Measures to be taken:
• Use only shielded cable and control lines. Connect shield at both ends. The conductor cross-section of the cables should be a minimum of 0.14 mm^2.

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• The shield connection to the equipotential bonding should be as short as possible and with a contact area as large as possible (low-impedance).
• Only connect the shields to the control panel, if the latter is also earthed.
• Install the device as far away as possible from noise-containing cables.
• Avoid routing signal or control cables parallel to power lines.

2.4 Cleaning and maintenance

The front side of the unit should only be cleaned using a soft damp (water!) cloth. Cleaning of the embedded rear side is not planned and is the responsibility of the service personnel or of the installer. In normal operation, this device is maintenance-free. Should the device nevertheless not operate properly, it must be sent back to the manufacturer or to the supplier. Opening and repairing the device by the user is not allowed and can adversely affect the original protection level.

2.5 Start-up

The following points must be checked before starting up the device:
1. Does the available supply voltage match the supply voltage of the device?
2. Is the supply voltage connected to the good terminals of the device?
3. For DC-powered devices, does the supply voltage respect the polarity?
4. Is the device set and programmed correctly (function; for counters, max. counting frequency)?

2.6 Failure possibilities and causes

No display:
• No power supply.

Keys cannot be operated:
• Key lock input is activated

Counter does not count:
• Wrong or reversed wiring of the counting input

• Setting of an input signal not matching the pulse generator
• Polarity (NPN/PNP) reversed
• Gate input is active
• No ground connection between the pulse generator and the counter
• Maximum counting frequency exceeded
• Signal levels do not reach the switching threshold of the counter
• Factor too small

If, despite all, your device still does not operate, contact your local representative or call us directly for technical support.

When sending your device back, please attach a short description of the failure, of the programming and of the connection diagram, in order to allow us to reproduce a possibly existing defect and to repair your device as quickly as possible.

3. Setting of the operating parameters

a. Press both front side keys keys and switch on the supply voltage or, if the supply voltage is already on, press both keys simultaneously during 5 s.
b. The display shows

$$\boxed{Pro5}$$

c. After releasing the keys, the display shows

$$\boxed{no}$$

c1. Hold the left key pressed and press the right key to leave the programming operation.
c2. Press the right key to switch to

$$\boxed{YE5}$$

d. Hold the left key pressed and press the right key to switch to the first parameter.
e. After releasing the keys, the display alternates between the menu title and the current menu item setting. After pressing any key, only the menu item setting is displayed.
f. Pressing the right key, the menu item setting will be switched to the next value. If figures are to be input (e.g. when setting the scaling factor), select first the decade using the left key, and then set the value using the right key.

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g. Hold the left key pressed and press the right key to switch to the next menu item.

h. The last menu title "EndPro" allows, when selecting "Yes", to exit the programming menu and to take over (store) the new values. If "no" is selected, the programming routine is repeated, the latest values set remaining active. They can now be checked again or modified.

4. Programming routine

The first menu item is the selection of the basic operating mode, which determines the functions of the device.

PᴹodE

CountE
Operating mode pulse counter. Continued on page 4.

tAcho
Operating mode frequency meter. Continued on page 6.

timᴉEr
Operating mode time meter. Continued on page 7.

Pulse counter/Position indicator
(Operating mode pulse counter)

1. Description
• 6-digit display counter with SET/RESET-function
• Red LED display, character height 14 mm
• Display range from -199 999 to 999 999
• Leading zeros suppression
• Programming via two setting keys on the front side
• During programming, the display guides the user with text prompts
• Counter operating modes:
  Count input INP A + count direction input INP B (Cnt.Dir)
  Differential count INP A – INP B (up.dn)
  Totalising INP A + INP B (up.up)
  Count Up/Down INP A 90° INP B x 1 (quAd)
  Count Up/Down INP A 90° INP B x 2 (quAd2)

  Count Up/Down INP A 90° INP B x 4 (quAd4)
• With AC power supply: sensor supply voltage 24 V DC ±15 %/100 mA

2. Inputs
INP A
Dynamic count input.
INP B
Dynamic count input.
SET/RESET
Dynamic SET/RESET input. Linked in parallel to the red SET/RESET key. Resets the counter to the predefined setting value.

3. Programming routine
The programmable parameters of the device are described below, in the order in which they can be set. The device is fully programmed after one pass of the routine.

The first values stated correspond to the factory settings

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3.1 Polarity of the inputs

`InPoL`

`nPn`   npn: switching for 0 V

`PnP`   pnp: switching for +U_B

3.2 Switching on the 30 Hz filter (INP A, INP B)

`FiLtEr`

`oFF`   30 Hz filter off (f_{max})

`on`   30 Hzfilter on

3.3 Input mode

`InPut`

`Cntdir`   Count input and count direction input
INP A: Count input
INP B: Count direction input

`uP dn`   Differential input
IINP A: count input adding
INP B: count input subtracting

`uP uP`   Totalising
INP A: count input adding
INP B: count input adding

`quAd`   Quadrature input
INP A: count input 0°
INP B: count input 90°

`quAd 2`   Quadrature input with pulse doubling
INP A: count input 0°
INP B: count input 90°
Each pulse edge of INP A will be counted

`quAd 4`   Quadrature input with pulse quadrupling
INP A: count input 0°
INP B: count input 90°
Each pulse edge of INP A and INP B will be counted.

3.4 Multiplying factor

`FActor`

`00.0001`
`99.9999`   It can be set from 00.0001 up to 99.9999.
The decimal point is set to 4 decimal places. „0" is not accepted!

3.5 Dividing factor

`diviSo`

`00.0001`
`99.9999`   It can be set from 00.0001 up to 99.9999.
The decimal point is set to 4 decimal places. „0" is not accepted!

3.6 Decimal point

`dP`   The decimal point defines the way of displaying the count values. It does not affect counting.

`0`
`0.000`

0	no decimal place
0.0	one decimal place
0.00	two decimal places
0.000	three decimal places

3.7 SET/RESET Mode

`rESnrd`

`MAnEL`   manual reset via the red SET/RESET key and electrical reset via the SET/RESET input

`no rES`   no reset (red SET/RESET key and SET/RESET input locked)

`EL rES`   only electrical reset via the SET/RESET input

`MAnrE`   only manual reset via the red SET/RESET key

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3.8 SET value

5 E E P E

1 9 9 9 9 9

The device will be set to the set point by pressing the red SET/RESET key or activating the SET/RESET input.
SET value -199999... 999999 (number of decimal places depends on the decimal point option)

9 9 9 9 9 9

For programming the decimal point see 4.6

3.9 End of programming

E n d P r o

n o

The programming routine is repeated once more. The values set until now can be checked and modified.

4 E 5

The programming routine wil be left and all values set will be stored as new parameters. Afterwards the device is ready for operation.

Tachometer/Frequency meter
(Operating mode frequency meter)

1. Description
- 6 digit frequency meter
- Red LED display, character height 14 mm
- Display range from 0 to 999 999
- Leading zeros suppression.
- Programming via two setting keys on the front side
- During programming, the display guides the user with text prompts
- Value conversion and display in 1/s or 1/min
- With AC power supply: sensor supply voltage 24 V DC ±15 %/100 mA

2. Inputs
INP A
Dynamic count input.

3. Programming routine
The programmable parameters of the device are described below, in the order in which they can be set. The device is fully programmed after one pass of the routine.

The first values stated correspond to the factory settings

3.1 Polarity of the inputs

i n P o L

n P n
npn: switching for 0 V

P n P
pnp: switching for +U_B

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3.2 Switching on the 30 Hz filter

$$F_iL \, t \, E_r$$

| oFF | 30 Hz filter off (f_{max}) |

| on | 30 Hzfilter on |

3.3 Multitplying factor

$$FRctor$$

| 000001 | It can be set from 00.0001 up to 99.9999. |
| 999999 | The decimal point is set to 4 decimal places. „0" is not accepted! |

3.4 Dividing factor

$$d_iU_iSo$$

| 000001 | It can be set from 00.0001 up to 99.9999. |
| 999999 | The decimal point is set to 4 decimal places. „0" is not accepted! |

3.5 Decimal point

| dP | The decimal point defines the resolution |

0	0 no decimal place
	0.0 one decimal place
	0.00 two decimal places
0.000	0.000 three decimal places

3.6 Display mode

$$d_iSP_{no}$$

| $SEC - I$ | Value conversion and display in 1/s |

| $Pq_in - I$ | Value conversion and display in 1/min |

3.7 Max. time to wait until „0" is displayed

This parameter indicates, how long it takes, when measuring is active, until „0" is displayed.

$$LJR_itO$$

| 00.1 | Max. time to wait 00.1 s (min. value) |

| 999 | Max. time to wait 99.9 s |

3.8 End of programming

$$EndPro$$

| no | The programming routine is repeated once more. The values set until now can be checked and modified. |

| YES | The programming routine wil be left and all values set will be stored as new parameters. Afterwards the device is ready for operation. |

Time meter
(Operating mode time meter)

1. Description
- 6 digit time meter with SET/RESET function
- Red LED display, character height 14 mm
- Display range from 0 to 999 999
- Leading zeros suppression.
- Operation indicator: the decimal point of the lowest digit blinks while the count is active.
- Programming via two setting keys on the front side
- During programming, the display guides the user with text prompts
- Time meter operating modes
  – Counting while INP B is inactive (GAtE.Lo)
  – Counting while INP B is active (GatE.hi)
  – Count Start/Stop with INP B edge (Inb.Inb)
  – Count Start with INP A edge, count Stopwith INP B edge (InA.Inb)

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• Counting ranges h; min; s; h.min.s
• With AC power supply: sensor supply
  voltage 24 V DC ±15 %/100 mA

2. Inputs

INP A
Start input (depending on the input mode chosen)

INP B
Start/Stop or gate input (depending on the input mode chosen)

SET/RESET input
Dynamic SET/RESET input. Linked in parallel to the red RESET key. Resets the counter to the predefined setting value.

3. Programming routine

The programmable parameters of the device are described below, in the order in which they can be set. The device is fully programmed after one pass of the routine.

> The first values stated correspond to the factory settings

3.1 Polarity of the inputs

| `InPoL` |

| `nPn` | npn: switching for 0 V |

| `PnP` | pnp: switching for +U_B |

3.2 Switching on the 30 Hz filter (INP A, INP B)

| `FiLtEr` |

| `oFF` | 30 Hz filter off
Start/Stop inputs not damped |

| `on` | 30 Hz filter on
Start/Stop inputs damped for use with mechanical switches. |

3.3 Input mode

| `StArt` |

| `GAtELo` | Start/Stop via Inp B. counting while Inp B (Gate) not active or open |

| `GAtEhi` | Start/Stop via Inp B. counting while Inp B (Gate) active (High level with pnp; Low level with npn) |

| `Inb.Inb` | Count Start/Stop via INP B (LOW-HIGH edge with pnp; HIGH-LOW edge with npn). Every active edge changes the counter status. |

| `InA.Inb` | Count start via INP A, stop via INP B. (LOW-HIGH edge with pnp; HIGH-LOW edge with npn) |

3.4 Operating mode

| `ModE` |

| `SEC` | Time unit: seconds (accuracy depending on position of the decimal point*) |

| `MMin` | Time unit: minutes (accuracy depending on position of the decimal point*) |

| `hour` | Time unit: hours (accuracy depending on position of the decimal point*) |

| `h.MMin.S` | Time units: Hours:Minutes:Seconds (decimal point setting is ignored) |

*0, 0.1, 0.01, 0.001 means: time measurement in 0, 0.1, 0.01, 0.001 time units

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3.5 Decimal point

| dP |

The decimal point defines the resolution of the programmed time unit.

| 0 |

0   1
0.0   1/10   (0,1)
0.00   1/100   (0,01)
0.000   1/1000   (0,001)

| 0.000 |

3.6 SET/RESET mode

| rESnd |

| PRnEL | manual reset via the red SET/RESET key and electrical reset via the SET/RESET input

| no rES | no reset (red SET/RESET key and SET/RESET input locked)

| EL rES | only electrical reset via the SET/RESET input

| PRnrE | only manual reset via the red SET/RESET key

3.7 SET value

| SEtPt |

| 000000 |

| 999999 |

The device will be set to the set point by pressing the red SET/RESET key or activating the SET/RESET input. SET value 0 ...999 999 or 99.59.59 (number of decimal places depends on the decimal point option)

3.8 End of programming

| EndPro |

| no | The programming routine is re-peated once more. The values set until now can be checked and modified.

| YES | The programming routine will be left and all values set will be stored as new parameters. Afterwards the device is ready for operation.

5. Technical data

Supply voltage

| AC power supply: | 100 ... 240 VAC/max. 8 VA Tolerance ±10%, 50/60 Hz ext. fuse protection: T 0.1 A |
| DC power supply: | 10 ... 30 V DC/max. 50 mA with inverse-polarity protection SELV, CLASS II (Limited Power Source) ext. fuse protection: T 0.1 A |

Display: 6 digits, red 7 segment LED display, height 14 mm

Data retention: EEPROM

Polarity of the inputs:
Programmable, npn or pnp for all inputs

Input resistance: appr. 5 kOhm

Count frequency:

AC power supply:	100 ... 240 VAC ±10%
Input level:	Standard
typ. Low Level:	2,5 V
typ. High Level:	22,0 V
Fmax:	kHz
CntDir	60
UpDown	25
Up.Up	25
Quad1	25
Quad2	25
Quad4	15

DC power supply:	24	12 V DC
Input level:	Standard	
typ. Low Level:	2,5	2,0 V
typ. High Level:	22,0	10 V
Fmax:	kHz	kHz
CntDir	60	20
UpDown	25	15
Up.Up	25	15
Quad1	25	15
Quad2	25	15
Quad4	15	15

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Count frequency:
Frequency measurement
  Accuracy <0.1 %
  Measuring principle:

≤ 38 Hz:	period measurement
> 38 Hz:	gating time measurement
	gating time 26,3 ms

In case of frequencies < 10 Hz, the waiting time must be increased accordingly to obtain the display of a value.

AC power supply:	100 ... 240 VAC ±10%
Input level:	Standard
typ. Low Level:	2,5 V
typ. High Level:	22,0 V
Fmax:	**kHz**
Tacho	60

DC power supply:	24	12 V DC
Input level:	Standard	
typ. Low Level:	2,5	2,0 V
typ. High Level:	22,0	10 V
Fmax:	**kHz**	**kHz**
Tacho	60	20

Counting ranges:	
Seconds	0.001 s ... 999999 s
Minutes	0.001min ... 999999 min
Hours	0.001 h ... 999999 h
h.min.s	00 h 00 min 01 s
	... 99 h 59 min 59 s
Accuracy	<50 ppm

Minimum pulse length for the Reset input:
5 ms

Input sensitivity:
SELV circuits, reinforced / double insulation

Standard sensitivity:
AC power supply	Low: 0 ... 4 V DC
	High: 12 ... 30 V DC
DC power supply	Low: 0 ... 0,2 x U_B [V DC]
	High: 0,6 x U_B ... 30 V DC

Pulse shape: any,
Schmitt-Trigger inputs

Sensor supply voltage:
(Voltage output for external sensors)
SELV circuit, reinforced/double insulation
AC power supply   24 V DC ±15 %/100 mA

Ambient temperature:
–20 ...+65 °C

Storage temperature:
–25 ... +70 °C

Relative humidity: <85 % (non-condensing)

Altitude: to 2000 m

EMC:
Noise immunity: with shielded signal and
control cables

Device safety (for the AC models):
Protection Class: Protection Class 2
(front side)

⚠ Only the front side is classified as accessible for the operator.

Application area:	Pollution level 2
	over-voltage Category II
Insulation:	
Front:	double insulation
Rear side:	basic insulation
Signal inputs and	
sensor power supply:	SELV

Housing:
For front panel mounting:
96 x 48 mm
acc. to DIN 43700,
RAL7021, dark grey

Weight: appr. 150 g

Protection: IP65 (front, device only)

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6. Terminal assignment
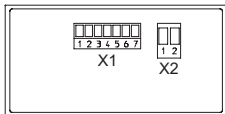
X1 Terminal assignment

Pin	AC Version	DC Version
1	n.c.	
2	n.c.	
3	SET (n.c for frequency meter)	
4	INP B (n.c for frequency meter)	
5	INP A	
6	GND	n.c.
7	+24 Vout	n.c.

X2 Terminal assignment

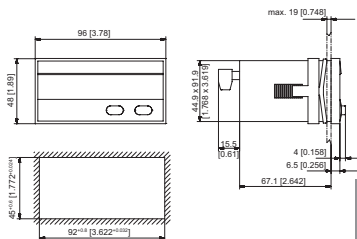| Pin	AC Version	DC Version
1	100...240 VAC ±10%	0 V DC (GND)
2	100...240 VAC ±10%	10 ... 30 V DC

7. Delivery includes:
Digital display
2 pin screw terminal RM 5.08
7 pin screw terminal RM 3.81
Panel mounting clip
Seal
Multilingual operating instructions

8. Ordering code:
100...240 VAC ±10%: KCT2-6ST-V
10-30 VDC: KC-LED-96-1T-24VDC

9. Dimensions:
Dimensions in mm [inch]

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Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

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