



ORIGINAL INSTRUCTIONS

Instruction Manual
Multi Counter
CEU5-* series**



The intended use of this product is to count pulse signals from a stroke reading cylinder and send an output signal to a PC or PLC.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)⁽¹⁾, and other safety regulations.

- ⁽¹⁾ ISO 4414: Pneumatic fluid power - General rules relating to systems.
- ISO 4413: Hydraulic fluid power - General rules relating to systems.
- IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
- ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
- Do not service machinery / equipment or attempt to remove components until safety is confirmed.
- Do not use the product outside of the specifications.
- Refer to the operation manual or catalogue on the SMC website (URL: <https://www.smcworld.com>) for further Safety Instructions.
- Special products (-X) might have specifications different from those shown in the specifications section. Contact SMC for specific drawings.

2 Specifications

- The CEU5 counter counts pulses output from an encoder (A/B quadrature pulse or UP/DOWN individual pulse) and sends a signal to a PC or PLC if the count matches with preset data. A BCD output option is available.
- RS-232C communication allows the counter to send counts to a PC or PLC and also to set the counter by communication.

2.1 Specifications

Product	CEU5 Multi-counter
Mounting	Surface mount (DIN rail or screws)
Operation	Addition and subtraction
Mode	Operation mode, Preset data setting mode, Function setting mode
Reset	External reset terminal
Display	LCD (with back light)
Number of Digits	6 digits
Memory Backup (storage)	Set values (always held), Count values (hold / non-hold selection) E ² ROM (alarm after approx. 800,000 cycles)
Input signal	Count input, Control signal input (reset, hold, bank selection)
Count Input	No-voltage pulse input
Pulse signal input	A/B quadrature input, UP/ DOWN individual pulse input *1
Counting speed	100 kHz *2
Control signal input	For connecting COM terminal to 12 or 24 VDC, conduction between each input and GND. For connecting COM terminal to GND terminal, conduction between each input and 12 or 24 VDC.
Power supply for counter	CEU5: 90 to 264 VAC CEU5**-D: 21.6 to 26.4 VDC
Power consumption	CEU5: 20 VA max. CEU5**-D: 10 W max.
Power supply for sensor	12 VDC ±10%, 60 mA
Preset output form	Compare, hold, one-shot (fixed at 100 ms)
Output method	Individual 5 points output, binary code output
Output signal	CEU5: Preset output, cylinder stop output CEU5*B: Preset output, cylinder stop output, BCD output
Output type	CEU5: NPN open collector (positive common) / sink (30 VDC, 50 mA max.) CEU5P: PNP open collector (negative common) / source (30 VDC, 50 mA max.)
Output time lag	5 ms or less (normal output) 60ms or less (binary output)
Communication	RS-232C
Proof voltage	1500 VAC, 1 minute between case and AC line. 500 VAC, 1 minute between case and earth.
Insulation resistance	50 MΩ 500 VDC or more (between case and AC line).
Ambient temperature	0 to +50°C (no freezing)
Ambient humidity	35 to 85% RH (no dew condensation)
Noise resistance	Square wave noise by noise simulator (pulse width: 1μs) Between power terminals: ±2000V, input line: ±600V
Vibration proof	10 Hz to 55 Hz, amplitude of 0.75 mm in X, Y and Z directions for 2 hours each.
Impact resistance	10 G in X, Y and Z directions for 3 times each.
Weight	350 g approx.

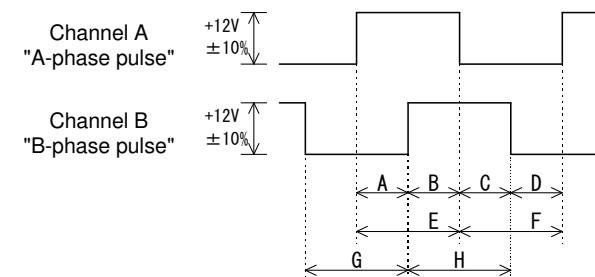
*1: Pulse signals can be counted by CEU5 should meet "Input waveform requirements".
*2: Counting speed of 100 kHz is provided when "Input waveform requirements" are met. When signals are damped due to long wires, taking countermeasures such as reducing the speed is required.

2 Specifications (continued)

2.2 Input Waveform Requirements

[A/B Quadrature Input]

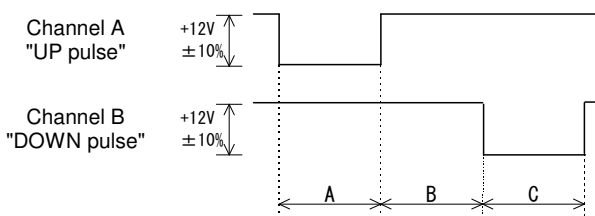
- Two count channel input (A and B) in quadrature (90° nominal phase relationship). The maximum input waveform shall be 100 kHz, and the waveforms of A and B phases at this time are as below.



A,B,C and D: requires 2.5 μsec. minimum.
E,F,G and H: requires 5 μsec. minimum.

[UP/DOWN Individual Pulse Input]

- An "UP pulse" is an input to add the count, and "DOWN pulse" is an input to subtract the count. The maximum input waveform shall be 100 kHz, and the waveforms of UP and DOWN pulses are as below.

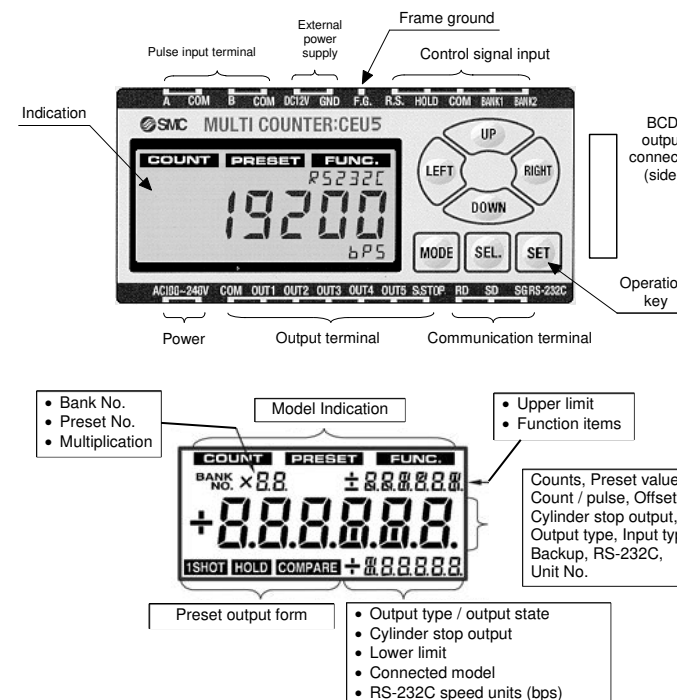


A, B and C: requires 5 μsec. each minimum

[When using encoders from other manufacturers]

- When using encoders from other manufacturers, check that the encoders are within the specification range of CEU5 before use.
- A performance test is carried out on the SMC scale reading cylinder with CEU5 using a 23 meter long extension cable. Wiring length depends on the specifications of the encoder and cable for each manufacturer and should be checked before use.
- The CEU5 includes a power supply for the encoder (12 VDC, 60 mA). If an encoder requires a power supply other than 12 VDC or a larger current consumption, use a separate power supply.

3 Name and Function of Parts



4 Installation

4.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.

4.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Do not use in a place where condensation occurs due to sudden temperature change.
- Do not use in an atmosphere containing conductive powder such as dust and iron chips, oil mist, salt, or organic solvent, or splashed by cutting chips, dust and cutting oil (water, liquid).
- Do not use in a place where strong electromagnetic noise is generated, strong magnetic field or surge is generated.
- Do not use in a place where static electricity is discharged or in a condition where the product are exposed to electrostatic discharge.
- Do not use in a condition where the product is deformed by force or weight applied.

4.3 Operation

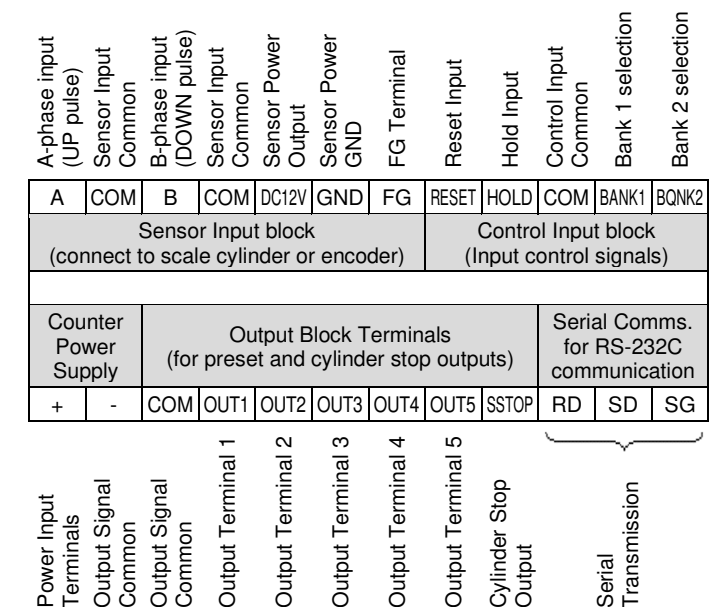
- Terminal block protective cover. Operation of the keys should be carried out with a terminal block protective cover mounted. If the terminal block accidentally is touched an electric shock may result.
- Prohibition of operation with wet hands. Do not perform key operation with wet hands, which may cause an electric shock and / or failure of the product and other devices.

5 Wiring

5.1 Preparation for wiring

- Turn OFF the power before wiring (including the insertion and removal of connectors).
- Mount a protective cover over the terminal block after wiring.
- Make sure the power supply has sufficient capacity and voltages are within the specified range before wiring.
- Check the wiring. Incorrect wiring may cause damage or malfunction.

5.2 Terminal block layout



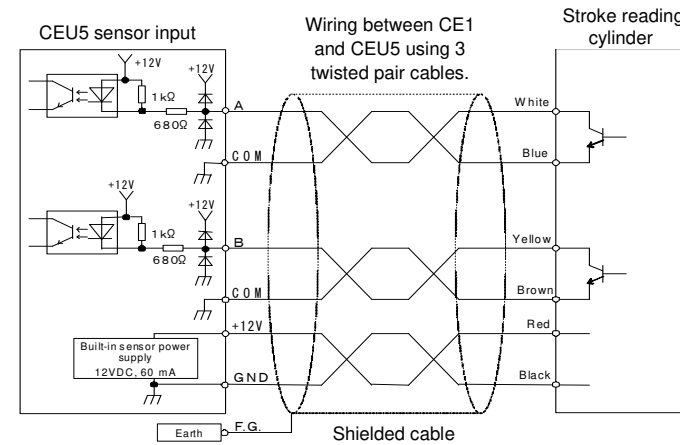
5 Wiring (continued)

Caution

- The COM terminal in each block is insulated from COM terminals of the other blocks. (However, the COM terminal and GND terminal in the Sensor Input block are connected together inside).

5.3 Wiring of Sensor Input

- Use SMC extension cable (Part No. CE1-R**) for wiring between the stroke reading cylinder and the CEU5.
- Reverse the wiring combination of white-A / blue-COM and yellow-B / brown-COM to white-B / blue-COM and yellow-A / brown-COM in pairs to reverse the count direction.

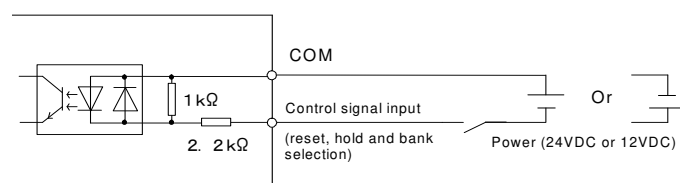


- The wire colours shown are for the SMC stroke reading cables.
- If the length of cable between the stroke reading cylinder and CEU5 is 20 m or longer, use the specified relay box (SMC Part No. CE1-H0374).

5.4 Control Signal Input wiring (Reset, Hold and Bank selection)

- Each control signal shall be input in a circuit using a transistor that allows current flow of 15 mA or more, or a circuit of contact output.

- The input time for reset signal shall be 10 ms or longer.
- Bank selection and hold are active only during signal input.
- COM is common for each signal input for NPN and PNP input types. Use a power supply of 12 or 24 VDC and connect to DC- for PNP input and DC+ for NPN input.

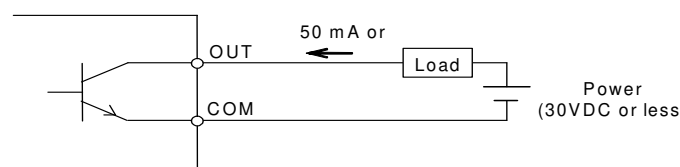


5.5 Output wiring (Preset and Cylinder Stop)

- The following shows the wiring for preset output (OUT 1 to 5) and cylinder stop output (S.STOP) with two output types: NPN and PNP.

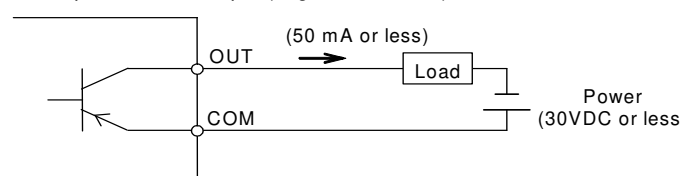
CEU5, CEU5B, CEU5-D, CEU5B-D

NPN open collector output (positive common) / sink



CEU5P, CEU5PB, CEU5P-D, CEU5PB-D

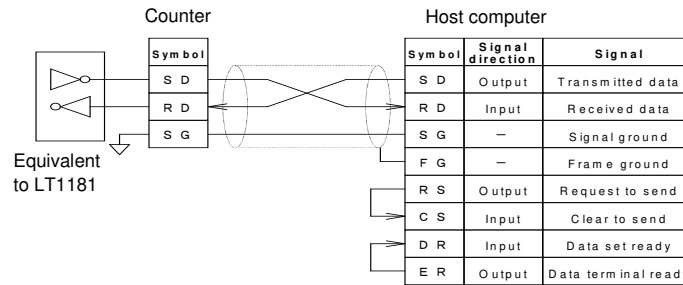
PNP open collector output (negative common) / source



5 Wiring (continued)

5.6 RS-232C Wiring

Details of wiring in accordance with EIA RS-232C.



5.7 Noise Countermeasures

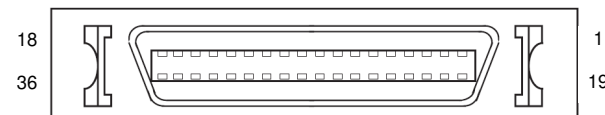
Caution

Follow the instructions below to prevent malfunction due to noise:

- Use SMC extension cable CE1-R** for CEU5 with a scale cylinder.
- Use a shielded cable of 5 meters max. for wiring of control input signals, output signals and serial communications.
- Mount a ferrite core to signal cables to avoid radiated noise effects.
- Use a stable power source for the CEU5 power supply, separate to the motor and solenoid valves for AC type.
- Mount a noise filter for possible noise effects of power source.
- Separation of signal wires from power wires
Avoid common or parallel wiring of signal and power wires to prevent malfunction due to noise.
- Keep relays at least 10 cm away from the CEU5 if installed.
- Wiring arrangement and fixing. Avoid bending cables sharply near the connector or electrical entry in the wiring arrangement.
Inproper arrangement may cause disconnection which in turn may cause malfunction. Fix cables close enough not to avoid excessive force to the connector.

5.8 BCD Output wiring (option)

BDC Output connector: 36 pin half pitch D-sub connector (Hirose Part No. DX10M-36S). The mating connector is Hirose Part No. DX10M-36S.



Pin No.	Signal	Pin No.	Signal
1	D0	19	D12
2	D1	20	D13
3	D2	21	D14
4	D3	22	D15
5	D4	23	D16
6	D5	24	D17
7	D6	25	D18
8	D7	26	D19
9	D8	27	D20
10	D9	28	D21
11	D10	29	D22
12	D11	30	D23
13	(+/-)	31	N.C.
14	Data Valid	32	N.C.
15	N.C.	33	N.C.
16	COM	34	COM
17	N.C.	35	N.C.
18	COM	36	COM

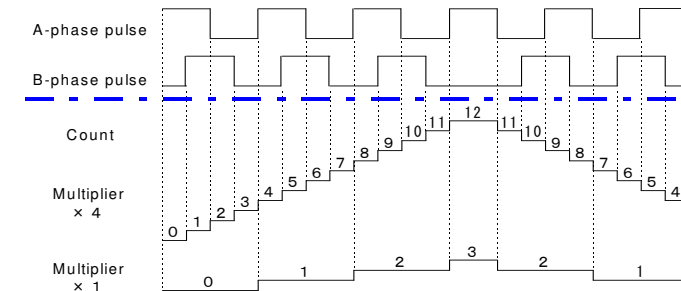
5.9 Ground Connection

- Connect the product to ground using the Ground terminal block F.G.
- Individual grounding should be provided close to the product.
Resistance to ground should be 100 ohms or less.

6 Functions

(1) Multiplication function.

All the pulses are multiplied by a 4 times multiplier in hardware at input of A/B quadrature and is multiplied by 2 times multiplier or no multiplier in software. This will provide greater resolution of measurement and improve the accuracy of the origin. The following figure shows the relation between count by 4 times multiplier and no multiplier.



(2) Switching of A/B quadrature input and UP/ DOWN individual pulse input. For encoders with A/B quadrature output and UP/ DOWN individual pulse output.

(3) Pre-scale function for the user to set the number indicated for one count.

(4) Setting of tolerances for preset values. Upper and lower limits can individually set to preset values. Each set value can be either positive or negative.

(5) Bank functions (4 channels). A preset output can be sent from 5 points simultaneously. Preset values of 5 points are grouped into one frame (bank) and there are 4 banks (1 to 4). A maximum of 20 types of operation can be classified by switching these banks.

(6) Binary output (31 points). A preset output can be sent from 31 points without bank switching by sending signals from five output terminals in binary output method (if output signals are overlapped, a signal of the smaller preset number is sent. Output form is to compare output only).

(7) Cylinder stop output is a signal sent out from the S.STOP terminal when pulse signals from the encoder do not change for a certain period of time. This output signal provides better timing for reading preset output and outputs sent to a PLC or PC.

(8) Hold function (for RS-232C communication or BCD output). The display on the counter is held during a hold signal. With RS-232C communication or BCD output, the data indicated is sent out. Even if the reading process of the PLC is delayed, the count when the hold signal was input can be taken in (the display is held, however counting is continued inside. At this time, preset output is sent out according to the count inside with or without the hold signal).

(9) Backing up of counts (changeable between hold and non-hold) after power interruptions. This function can be selected either ON or OFF.

(10) RS-232C communication function. Count output and setting of each function can be carried out by PLC or PC in serial transmission (with RS-232C functions).

(11) BCD output function (equipped only with CEU5*B-* type) sends out counts by BCD coding. This function also allows taking in counts by PLC or PC and connecting to external large indicator.

7 Settings

- The CEU5 Multi-Counter does not have DIP switches for setting. The setting of each item is done by software. There are three basic modes (Count, Preset and Function) and 8 items can be set in function mode.

(1) Count mode

Count pulses input from outside and display a value in the counter. At the same time, send out a signal to a PLC or PC if the count matches with the preset data. The output process is only carried out in this mode.

(2) Preset mode

Set preset data (preset value, upper limit and lower limit for the basis of sending an output signal). Note that preset data are 1 to 31, but 21 to 31 are only used for binary output.

8 Settings

(3) Function mode

It is possible to set 8 functions: Pre-scale, Offset, Cylinder Stop output, Output type, Input type, Backup, RS-232C and Unit number.

Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for further details of the setting procedure.

9 How to Order

Refer to the catalogue or operation manual on the SMC website (URL: <https://www.smcworld.com>) for the "How to Order" information.

10 Outline Dimensions

Refer to the catalogue or operation manual on the SMC website (URL: <https://www.smcworld.com>) for Outline dimensions.

11 Maintenance

11.1 General maintenance

Caution

Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.

- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.

- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

- Performing regular maintenance check**
Check regularly that the product does not operate with failures unsolved. Checks should be carried out by trained and experienced operators.

- Prohibition of disassembly and modification**
To prevent accidents such as failures and electric shocks, do not remove the cover to perform disassembly or modification. If the cover must be removed, turn OFF the power before removal.

12 Limitations of Use

12.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

13 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

14 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor / importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
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