ONO SOKKI

DG-4120

Digital Gauge Counter

Instruction Manual

ONO SOKKI CO., LTD.

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FOREWORD

Thank you for your selection of the DG-4120 Digital Gauge Counter.
To ensure that you get the most out of your new instrument, we recommend that you read this manual thoroughly and follow its instructions carefully.

Warranty

This product is covered by a warranty for a period of one year from the date of purchase. Defects judged to be the responsibility of the manufacturer will be repaired free of charge during this period. This product has been manufactured according to a complete program of quality control and subjected to a strict series of inspections. Should any failure occur, please inform our sales representative or sales office. Failures due to misuse or mis-operation will be handled on a fee basis, even during the warranty period.

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PRECAUTIONS (READ BEFORE USING)

● **Installation Environment**

The operating temperature range of this equipment is 0 to 40˚C. Do not expose the equipment to any sudden temperature change even if it is within this range.

When mounting the equipment in a rack, pay attention to provide good ventilation. Do not install the equipment near a heat generating device.

When using the equipment in an area subjected to metallic dust, be sure to protect it against entrance of such dust.

● **Noise prevention**

In order to prevent noise interference, keep the input and output cables such as gauge sensor signal lines and BCD output lines separated from the power line as far as possible while limiting the cable length to a minimum.

Use shielded cables for this purpose.

● **Power Input Terminal Strip**

The rear panel terminal strip for the grounding terminal and power supply terminals is provided with a protection cover. To ensure the safety in operation, do not remove this protection cover when using this equipment.

● **Grounding**

In order to ensure safety and eliminate noise interference in operation, be sure to ground the grounding terminal provided on the rear panel.

1.1 General Description

The DG-4120 Digital Gauge Counter displays the measurement result in digital value when used in combination with a gauge sensor. This equipment is capable of providing BCD output, hence it can be used widely for recording measurement results, performing automatic comparison, measuring peak values, etc.

The BCD output is an open-collector output signal which features less susceptibility to noise interference and disturbance. The polarity of output logic can be switched between positive and negative by means of bit switches. This makes it easier to ensure better matching with a sequencer or the like.

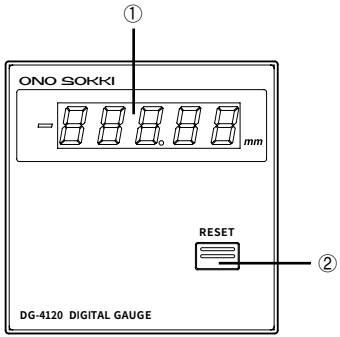
This equipment can be mounted to a variety of panels because the external dimensions conform to the DIN72 standard.

1.2 Applicable Gauge Sensors

This equipment can be used in combination with any of the following gauge sensors.

Model	Measuring range	Resolution	Model	Measuring range	Resolution
BS102	10 mm	10 μm	GS-1530A	30 mm	10 μm
BS-102W	10 mm	10 μm	GS-1613A	13 mm	1 μm
BS-112	10 mm	1 μm	GS-1630A	30 mm	1 μm
BS-112W	10 mm	1 μm	GS-4513	13 mm	10 μm
GS-1000	100 mm	10 μm	GS-4530	30 mm	10 μm
GS-102	10 mm	10 μm	GS-4613	13 mm	1 μm
GS-251	25 mm	10 μm	GS-4630	30 mm	1 μm
GS-251W	25 mm	10 μm	GS-6513	15 mm	10 μm
GS-503	50 mm	10 μm	GS-6530	30 mm	10 μm
GS-5011	50 mm	1 μm	GS-6613	13 mm	1 μm
GS-1513A	13 mm	10 μm	GS6630	30 mm	1 μm

2.1 Front Panel



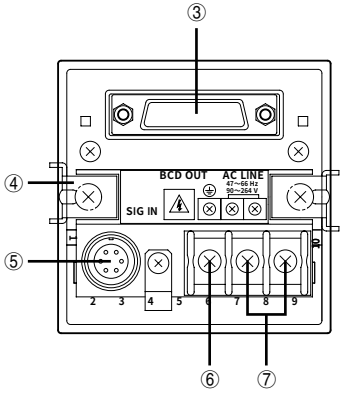
① Display section

The display section displays the measured value in five digits. The unit is mm. When the measured value is a minus value, the minus sign "-" lights at the left end side.

② RESET switch

Pressing this switch will reset the displayed value, BCD output data, error indication and error output.

2.2 Rear Panel



③ BCD OUT connector

This connector is used to connect BCD output, polarity output, decimal point output, error output, hold input, reset input, BUSY input, and print command output signals to this equipment.

Receptacle : DX10A-36S (Manufactured by HIROSE)
Applicable plug : DX40-36P (Manufactured by HIROSE)
Plug cover : DX36-CV1 (Manufactured by HIROSE)

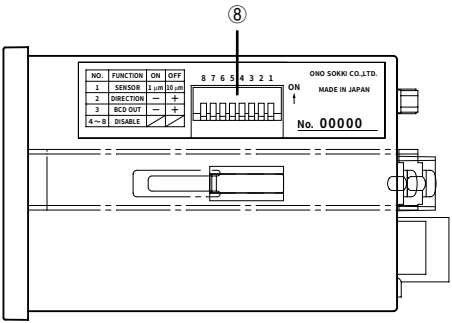
④ **Panel fixtures**
Used to mount this equipment to a panel.

⑤ **SIG IN connector**
The gauge sensor signal enters from this connector. Connect the gauge sensor signal connector to this connector.

⑥ **Grounding terminal (Terminal screw M3.5)**
This terminal must be grounded for noise elimination and safety in operation.

⑦ **Power supply terminals (Terminal screw M3.5)**
The allowable range of power supply voltage to be connected here is 90 to 264 V AC.

2.3 Side Panel



⑧ Bit switches

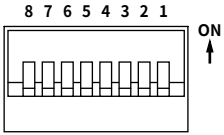
In the initialized state, all the bit switches are in the OFF position. The following functions can be set by switching bit switches 1 to 3 between ON and OFF positions. The bit switches are covered by a sealing vinyl cover. Seal the bit switches by attaching this vinyl cover except when changing the setting of the switches.

No.	Function		ON	OFF
1	SENSOR	Minimum unit of measurement	1 μm	10 μm
2	DIRECTION	Polarity of count value indicated when spindle is pushed in	Negative (–)	Positive (+)
3	BCD OUT	Polarity of logic of BCD output	Negative logic	Positive logic
4-8	DISABLE	Unused		

3.1 Setting Bit Switches

The bit switches are protected by a sealing vinyl cover. To turn up the vinyl cover, press the center portion of the cover. The bit switches must be covered with this vinyl cover except when changing the switch setting.

<Bit Switch Initial Setting>



Bit switch 1 (SENSOR)

Set this switch according to the gauge sensor to be connected.

Switch position	Gauge sensor
ON	Gauge sensors with minimum measuring unit of 1 μm: BS-112, BS-112W, GS-5011, GS-1613A, GS-1630A, GS4613, GS-4630, GS-6613, GS-6630
OFF	Gauge sensors with minimum measuring unit of 10 μm: BS-102, BS-102W, GS-1000, GS-102, GS-251, GS-251W, GS-503, GS-1513A, GS-1530A, GS-4513, GS4530, GS-6513, GS-6530

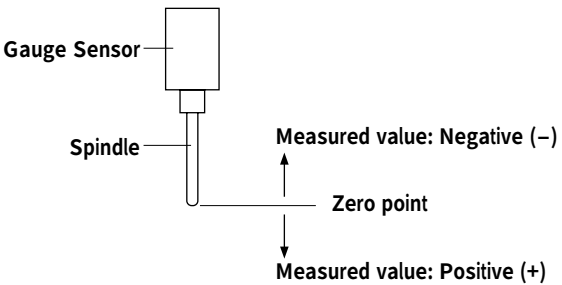
Bit switch 2 (DIRECTION)

This switch selects the polarity (negative or positive) of a value indicated when pushing in the sensor spindle.

Switch position	Counter indication
ON	When spindle is pushed in, a negative value is indicated.
OFF	When spindle is pushed in, a positive value is indicated

<Relation between polarity of displayed value and bit switch 2>

● When bit switch 2 is set to ON:



Bit switch 3 (BCD OUT)

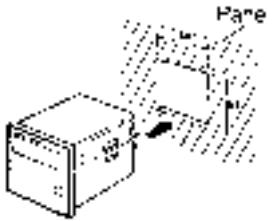
This switch is used to choose between positive logic and negative logic for the output from the rear panel BCD OUT connector. The polarity of error output from pin 30 and the print command output from pin 35 is not changed even when this switch is set to ON position.

Switch operation	Positive/negative logic
ON	Negative logic
OFF	Positive logic

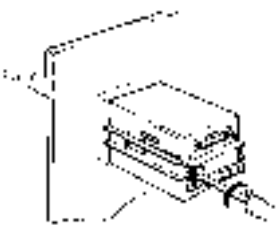
3.2 Mounting to Panel

This equipment can be mounted to a panel having an opening of
$68^{+0.7}_{0}$ ¥ $68^{+0.7}_{0}$ mm.

① Remove the panel fixtures by loosening the screws on the rear panel.
② Insert this equipment from the front into the mounting position of the panel.



③ Install the panel fixtures from rear side of this equipment. Make sure that the projected portion of the panel fixture will fit in the hole provided in the side panel.
④ Tighten the screw of the panel fixture to secure this equipment to the panel.



3.3 Connecting Cable

① Remove the protective cover, and connect the power supply input terminal on the rear panel to a power source (90 to 264 V AC). (Terminal screw M3.5)
② Connect the grounding terminal of the rear panel to ground, and install the protective cover to the original position. (Terminal screw M3.5)
③ Connect the gauge sensor signal connector to the SIG IN connector on the rear panel.
④ Connect the BCD output cable to the BCD OUT connector on the rear panel.

3.4 Measurement

① Move the gauge sensor spindle to make sure the displayed value varies correspondingly. Press the RESET switch on the front panel, or apply one pulse of Lo level voltage signal with a pulse width of minimum 20 μs (microsecond) to pin 32 of the BCD OUT connector. After resetting, start measurement.
② If a counting error occurs in the counter circuit, the display section begins to flash, and occurrence of an error is indicated. In such a case, start measurement by pressing RESET switch on the front panel, or applying one pulse of Lo level voltage signal with a pulse width of 20 μs to pin 32 of the BCD OUT connector.
③ To hold the displayed value and BCD output data, enter also the Lo level voltage signal to pin 31.

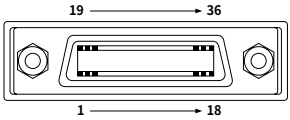
4.1 Explanation of BCD OUT connector

The BCD OUT connector on the rear panel is used to connect the BCD output, polarity output, decimal point output, error output, hold input, reset input, BUSY input and print command output signals to the equipment.
The pin arrangement of each signal is as shown below:

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	1 ¥ 10^0	13	1 ¥ 10^3	25	Polarity output (+)
2	2 ¥ 10^0	14	2 ¥ 10^3	26	Polarity output (–)
3	4 ¥ 10^0	15	4 ¥ 10^3	27	D.P 3 decimal point output
4	8 ¥ 10^0	16	8 ¥ 10^3	28	D.P 4 decimal point output
5	1 ¥ 10^1	17	1 ¥ 10^4	29	N.C
6	2 ¥ 10^1	18	2 ¥ 10^4	30	Error output
7	4 ¥ 10^1	19	4 ¥ 10^4	31	Hold input
8	8 ¥ 10^1	20	8 ¥ 10^4	32	Reset input
9	1 ¥ 10^2	21	N.C	33	BUSY input
10	2 ¥ 10^2	22	N.C	34	N.C.
11	4 ¥ 10^2	23	N.C	35	Print command output
12	8 ¥ 10^2	24	N.C	36	Common

BCD output

Pin arrangement



Receptacle : DX10A-36S
Applicable plug : DX40-36P
Die-cast cover : DX36-CV1
Applicable cable :
Conductor size ; AWG#30
Conductor composition ; 7/0.1
Insulator O.D. ; ø0.5
Cable UL style ; UL20276/UL2789

4.2 Explanation of Signals

① **BCD output**
Pins 1 to 20
Positive/negative logic switching, 5-digit parallel output
Open collector output

② **Polarity output**
Pin 25 (+ output) and pin 26 (– output)
Open collector output

- When negative logic is selected with bit switch 3 set to ON:
  If measured value is positive (+);
  pin 25 (+ output): ON, pin 26 (– output): OFF
  If measured value is negative (–);
  pin 25 (+ output): OFF, pin 26 (– output): ON
  If reset;
  pin 25 (+ output): ON, pin 26 (– output): OFF
  ❊ If positive logic is selected by setting bit switch 3 to OFF, the ON and OFF status of output are all reversed.

③ Decimal point output

Pin 27 (when D.P 3 and minimum measuring unit of 10 μm are selected),
Pin 28 (when D.P 4 and minimum measuring unit of 1 μm are selected)
Open collector output

- When negative logic is selected by setting bit switch 3 to ON:
  If 1 μm is selected by setting bit switch 1 to ON:
  Pin 27 (D.P 3): OFF, pin 28 (D.P 4): ON
  If 10 μm is selected by setting bit switch 1 to OFF:
  Pin 27 (D.P 3): ON, pin 28 (D.P 4): OFF
  ❊ If positive logic is selected by setting bit switch 3 to OFF, the ON and OFF status of output are all reversed.

④ Error output

Pin 30
Open collector output
If error counting occurs in the counter circuit of this equipment, ON signal will be issued. This ON signal will continue until it is reset.

⑤ Print command output

Pin 35
Open collector output
If hold signal or BUSY signal is entered and the displayed value and BCD output turn into hold state, the print command signal will be issued as a negative pulse.

⑥ Hold input

Pin 31

If Lo level voltage signal is entered, the displayed value and BCD output data are set in the hold status, and the print command signal is issued. This signal maintains the hold status during the period of Lo level. However, the counter circuit is carrying out the counting operation in response to the input signal sent from the gauge sensor. Accordingly, if the hold status is canceled, the displayed value and BCD output data will be changed to the values obtained at that moment of cancellation.

⑦ Reset input

Pin 32

If Lo level voltage signal is entered, the displayed value and BCD output data, and error indication and error output are reset. The reset status will continue as long as this signal remains at Lo level.

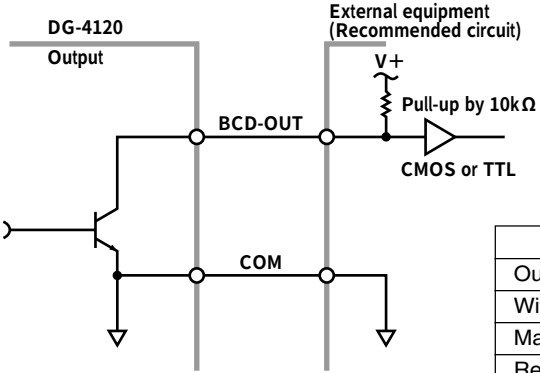
⑧ BUSY input

Pin 33

The same status as that of hold input

4.3 Recommended Interface

① **BCD output, polarity output, decimal point output, error output, print command output**
The recommended interface circuit is shown below:

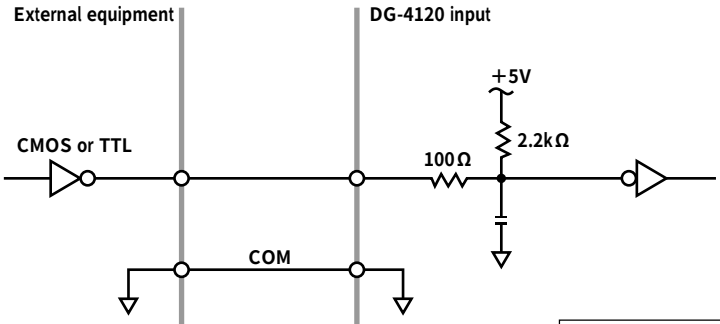


Output format	Open collector output
Output IC	74LS07
Withstand voltage	30 V max*
Maximum sink current	40 mA max
Residual voltage	0.5 V max

* To improve the reliability, use of a power supply system with +24 V or lower voltage is recommended.

② **Hold input, reset input, and BUSY input**

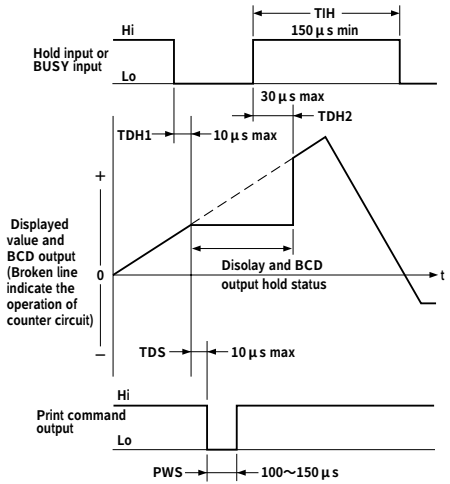
The recommended interface circuit is shown below:



Lo level input voltage	0 to 1.4 V
Hi level input voltage	3 to 5.25 V
Input impedance	1 kW min

4.4 Timing Chart

① Timing chart for hold input, BUSY input and print command output



TDH1 Time interval between input of hold signal and actual holding of display value and BCD output data. The maximum length is 10 μs.

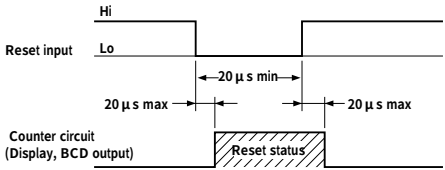
TDH2 Time interval between cancellation of hold signal and actual cancellation of hold status. The maximum length is 30 μs.

TDS Time interval between holding of the display value and BCD output data and output of print command signal. The maximum length is 10 μs.

PWS Pulse width of print command signal. It is 100 to 150 μs.

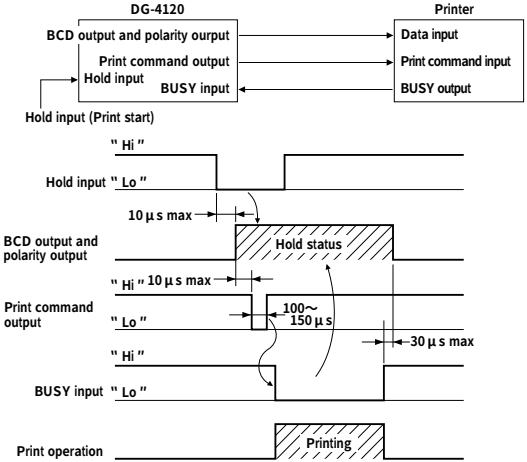
TIH Time interval between cancellation of hold signal and re-inputting of the hold signal. The minimum length is 150 μs. If hold signal is entered in shorter interval, print command signal may not be issued.

② Reset input timing chart



The reset input signal must have a pulse width of minimum 20 μs. The time interval between input of reset signal and actual creation of reset status, or the interval between cancellation of reset signal and actual cancellation of reset status must be maximum 20 μs.

③ Printer command output timing chart



In the diagram shown above, the printer is started at the leading edge of the print command pulse signal. The hold input must be maintained at Lo level until the BUSY input turns Lo.

Applicable Gauge Sensors

Model	Measuring range	Resolution	Model	Measuring range	Resolution
BS102	10 mm	10 μm	GS-1530A	30 mm	10 μm
BS-102W	10 mm	10 μm	GS-1613A	13 mm	1 μm
BS-112	10 mm	1 μm	GS-1630A	30 mm	1 μm
BS-112W	10 mm	1 μm	GS-4513	13 mm	10 μm
GS-1000	100 mm	10 μm	GS-4530	30 mm	10 μm
GS-102	10 mm	10 μm	GS-4613	13 mm	1 μm
GS-251	25 mm	10 μm	GS-4630	30 mm	1 μm
GS-251W	25 mm	10 μm	GS-6513	15 mm	10 μm
GS-503	50 mm	10 μm	GS-6530	30 mm	10 μm
GS-5011	50 mm	1 μm	GS-6613	13 mm	1 μm
GS-1513A	13 mm	10 μm	GS6630	30 mm	1 μm

Counter Signal Input Section

Type of Amplification : 2-channel waveform shaping
Signal waveform : Square wave and 90˚ phase difference signal
Input impedance : 47 kW, min
Input level : Lo; 0 to 1.4 V
Hi; 3 to 5.25 V
Frequency range : DC to 75 KHz
Input plug receptacle : R03-R6F (Manufactured by Tajimi-Radio)

Pin number and signal assignment are shown below.

Pin No.	A	B	C	D	E	F
Signal	SIG1	SIG2	+5V	---	COM	---

Count Display Section

Counting system	: Reversible counting
No. of counter digits	: Decimal 5 digits
No. of display digits	: One digit for polarity and five digits for numerals
Display range	: 0.000 to ±99.999 0.00 to ±999.99
Minimum measuring unit	: 1 μm/10 μm
Zero suppression	: Digits at left of 1 mm digit are zero-suppressed.
Display section	: 7-segment red LED
Character height	: 10.16 mm

BCD output section

Input plug receptacle : DX10-36S (Manufactured by Hirose)
① BCD output : Positive or negative logic, parallel, open collector output in five digits
② Polarity output : Positive or negative logic, open collector output
③ Decimal point output : Positive or negative logic, open collector output
④ Error output : If counting error occurs in the counter circuit of this equipment, ON signal is issued as an open collector output.
⑤ Print command output : When the display value and BCD output data are set in the hold status by the input of hold signal or BUSY signal, a negative pulse, print command signal is issued as open collector output.

Common to ① to ⑤

Output form	Open collector output
Output IC	74LS07
Withstanding voltage	30 V max*
Excessive sink current	40 mA max
Residual voltage	0.5 V max

⑥ Hold input : When Lo level voltage signal is fed, the display value and BCD output data are set in the hold status. The hold status continues as long as this signal remains at Lo level.
⑦ Reset input : When Lo level voltage signal is fed, the display value and BCD output data and error indication and error output are reset. The reset status continues as long as this signal remains at Lo level.
⑧ BUSY input : When Lo level voltage signal is fed, the display value and BCD output data are set in the hold status. The hold status continues as long as this signal remains at Lo level.

Common to ⑥ to ⑧

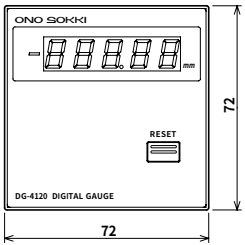
Lo level input voltage	0 to 1.4 V
Hi level input voltage	3 to 5.25 V
Input impedance	1 kW min

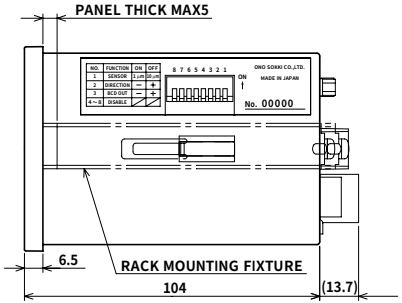
Power supply section

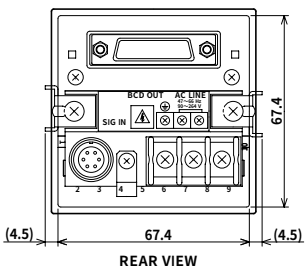
Source voltage : 90 to 264 VAC, 50/60 Hz
Power consumption : Approx. 7 VA (at 100 V AC)
Withstanding voltage : 1500 V AC/one minute
Insulation resistance : 10 MW or higher when measured with 500 V DC megger

Others

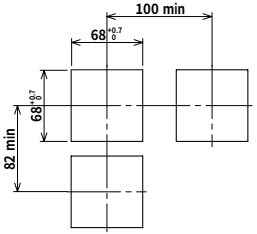
Operating temperature range	:	0 to 40˚C
Storage temperature range	:	–10 to 55˚C
External dimensions	:	72 (W) ¥ 114 (L) ¥ 72 (H) mm
Weight	:	370 g
Accessories	:	Instruction manual
		Panel fixtures
Option	:	BCD output cable
		AA-8005: for RQ-381 printer (3 m)
		AA-8006: for DA-108 D/A converter (3 m)
		AA-8007: One-end open type (5 m)







Panel cutout
The standard panel cutout (in accordance with DIN43700) is as shown below:



Panel cutout dimensions
Horizontal: 68
(tolerance: 0 to +0.7)
Vertical: 68
(tolerance: 0 to +0.7)

Unit: mm

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*Outer appearance and specifications are subject to change without prior notice.

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