2018/05/10

# DPA Series Pressure Sensor
# Instruction Sheet

Thank you very much for choosing Delta DPA series pressure sensor. Please read this instruction sheet carefully before using your DPA. Keep this instruction sheet handy for quick reference.

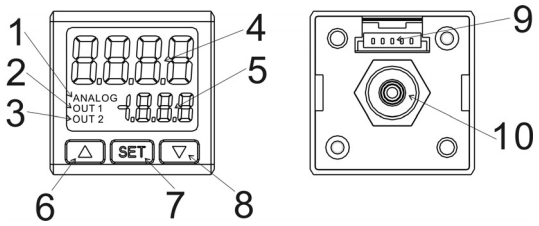
## ■ Warning

⚠ **DANGER! CAUTION! ELECTRIC SHOCK!**

⚠ **DPA is a pressure measurement device. DO NOT use it out of its specification. Improper pressure or incorrect wiring may cause series injuries on staff or damages on other devices.**

1. Keep away from high-voltage and high-frequency environment during the installation in case of interference. Prevent using the device in premises which contain:
   (a) dust or corrosive gas; (b) high humidity and high radiation; (c) shock and vibration.
2. DPA can only be used for air pressure measurement and should avoid corrosive, inflammable or toxic gas measurement.
3. Make sure the power supply is switched off when installing or dismounting DPA and the pressure source stops its action in case harms occur on human body and properties.
4. DO use parts compatible to the specification of the pressure pore for connection to avoid mistaken measurement or safety problems.
5. Before switching on the power supply, check the signal connection, e.g. the input voltage and polarity. Voltage that is too high may cause damages on DPA.
6. DO use dry cloth and DO NOT use acid or alkaline liquid to clean the device.

## ■ Product Profile & Outline




| | |
|---|---|
| 1. Analog output indicator | 6. UP key |
| 2. Digital output 1 indicator | 7. SET key |
| 3. Digital output 2 indicator | 8. DOWN key |
| 4. Pressure/parameter display | 9. Power supply and output terminals |
| 5. SV/setup item display | 10. Pressure input pore |

- Contents in the pack: Pressure sensor, signal wire, unit sticker, instruction sheet
- Optional accessories: Panel mounting parts, metal mounting parts

## ■ Ordering Information

DPA 1 2 3 - 4

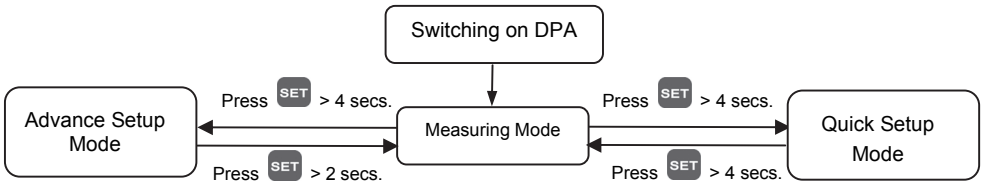
| | |
|---|---|
| Series name | DPA: Delta DPA series pressure sensor |
| 1 2<br>Measurable pressure range | 01: -100kPa ~ 100kPa<br>10: -100kPa ~ 1,000kPa |
| 3 Output types | N: NPN output + 4 ~ 20mA; P: PNP output + 4 ~ 20mA<br>M: NPN output + 1 ~ 5V; Q: PNP output + 1 ~ 5V |
| 4 Pressure pore types | P: Outer pore PT 1/8, inner pore M5<br>N: Outer pore NPT 1/8, inner pore M5<br>G: Outer pore G 1/8, inner pore M5 |

## ■ Electrical Specifications

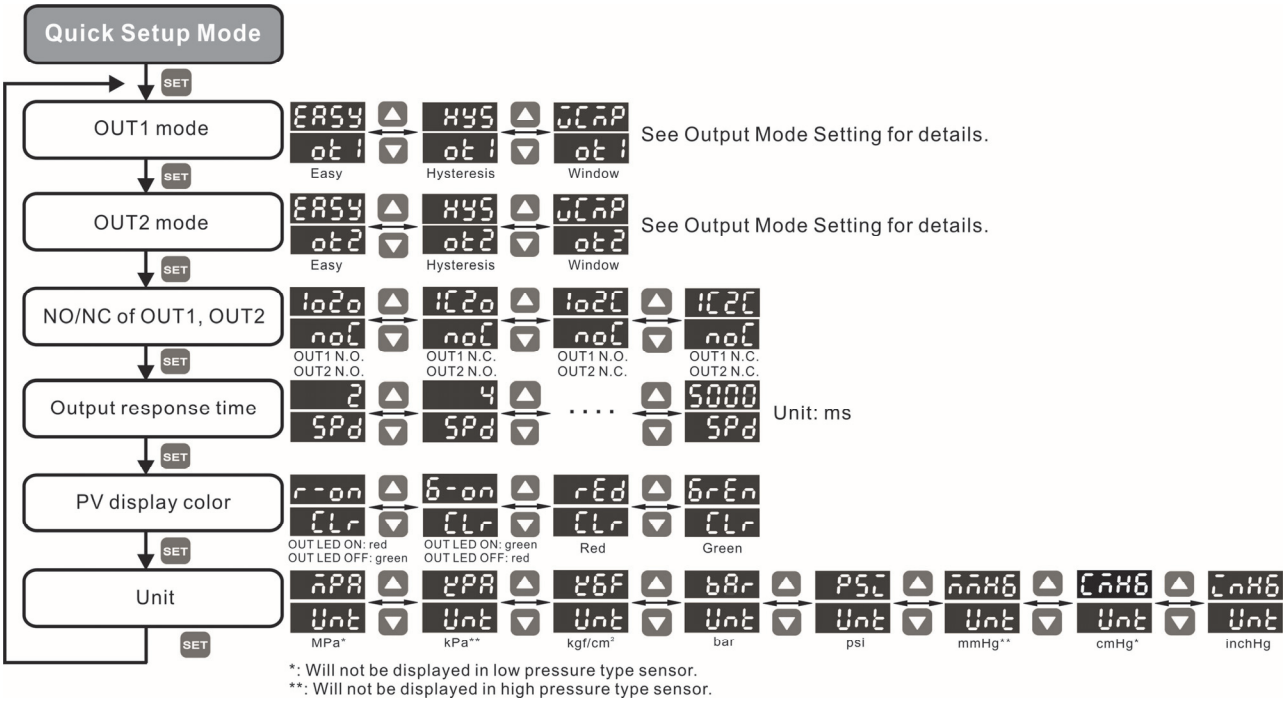
| | | |
|---|---|---|
| Power supply | Voltage range | 12 ~ 24V DC +/- 10% no isolation |
| | Power consumption | 40mA Max.; current output type 60mA Max. |
| Pressure measurement | Pressure type | Non-corrosive gas, gauge type |
| | Measurable range | DPA01: -100kPa ~ 100kPa |
| | | DPA10: -100kPa ~ 1,000kPa |
| | Max. durable pressure | DPA01: 200kPa |
| | | DPA10: 1,500kPa |
| | Accuracy | +/- 3% entire process |
| | Temperature inaccuracy | +/- 2% entire process |
| Display | Setup display | 2-line LCD display, 4 digits for measured value and 3.5 digits for setup display |
| | Status display | LCD output status display |
| | Display mode | 3 colors for different modes |
| | Cycle | 100ms, 250ms, 500ms, 1,000ms |
| Output | Number of outputs | Built-in 2 NPN or PNP transistor digital outputs and 1 analog output |
| | Transistor output | NPN: Max. durable pressure 30V/100mA, residual voltage 1.5V |
| | | PNP: Max. durable pressure 30V/100mA, residual voltage 1.5V |
| | Analog output | 1 ~ 5V: Min. output load resistance 1,000Ω |
| | | 4 ~ 20mA: Max. output load resistance 400Ω; linear inaccuracy < 2% entire process |
| | Response time | 2ms, 4ms, 10ms, 30ms, 50ms, 100ms, 250ms, 500ms, 1,000ms, 5,000ms |
| | Output inaccuracy | Linear inaccuracy: < +/- 2% entire process |
| Pore size | P | Outer pore PT 1/8, inner pore M5 |
| | N | Outer pore NPT 1/8, inner pore M5 |
| | G | Outer pore G 1/8, inner pore M5 |
| Shock immunity | | 10 ~ 500Hz, 10mm 3 axes for 2 hours |
| Vibration immunity | | Max. 100m/ $s^2$ 3 axes 6 directions, 3 times each |
| Ambient temperature | | 0°C ~ +50°C |
| Storage temperature | | -20°C ~ +65°C |
| Altitude | | < 2,000m |
| Ambient humidity | | 35% ~ 80% RH (non-condensing) |

## ■ How to Set up Parameters

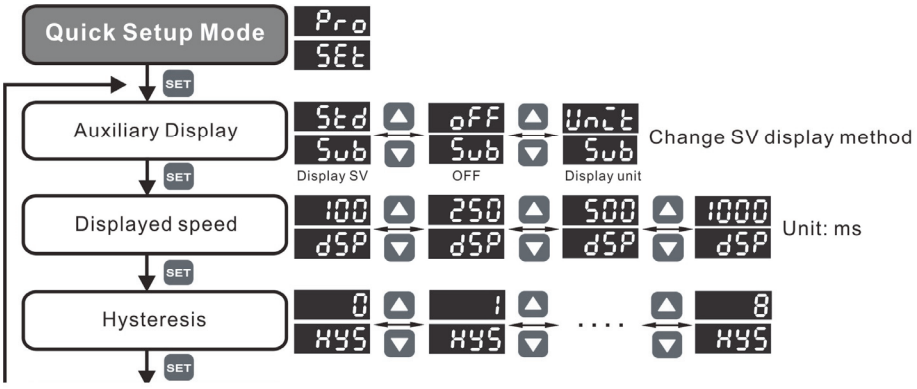
- **Switching modes:** DPA will be in the “Measuring Mode” when it is switched on, displaying PV and SV. Press SET for more than 2 seconds in this mode to switch to the “Quick Setup Mode”. Press SET for more than 4 seconds in the “measuring mode” to switch to “Advanced Setup Mode”. Press SET in the “Quick Setup Mode” or “Advanced Setup Mode” to return to the “Measuring Mode”.
- **Setting up parameters:** In the three modes, press SET once to select the parameter to set up. When you find the parameter to be set up or modify, use ▲ ▼ to modify the setting.

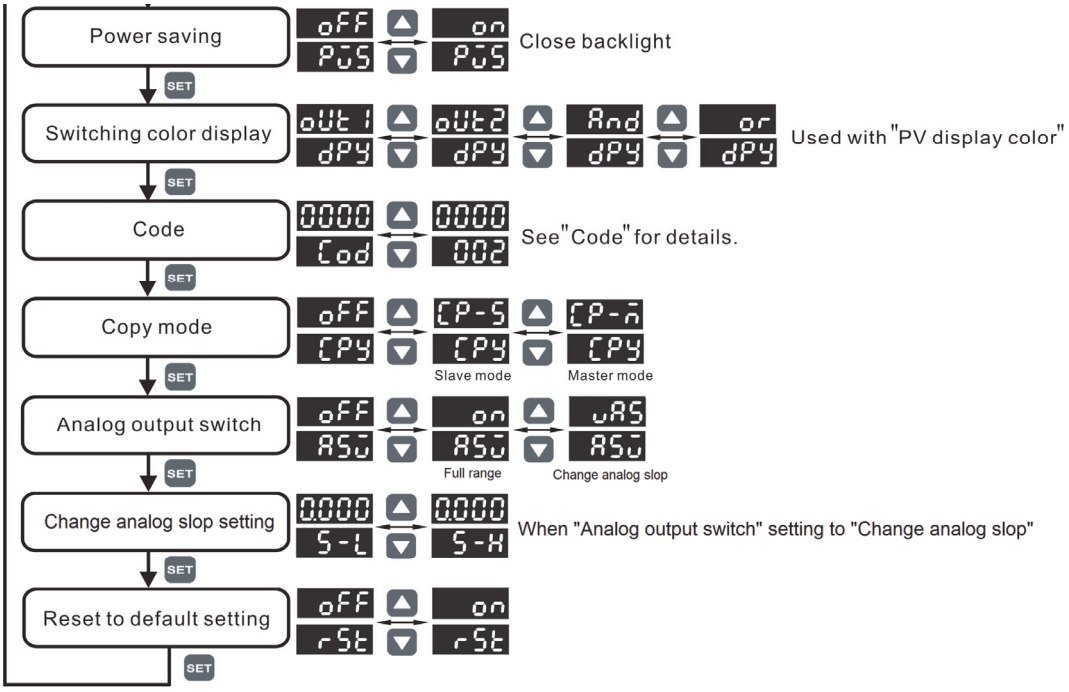



- **Quick Setup Mode:**

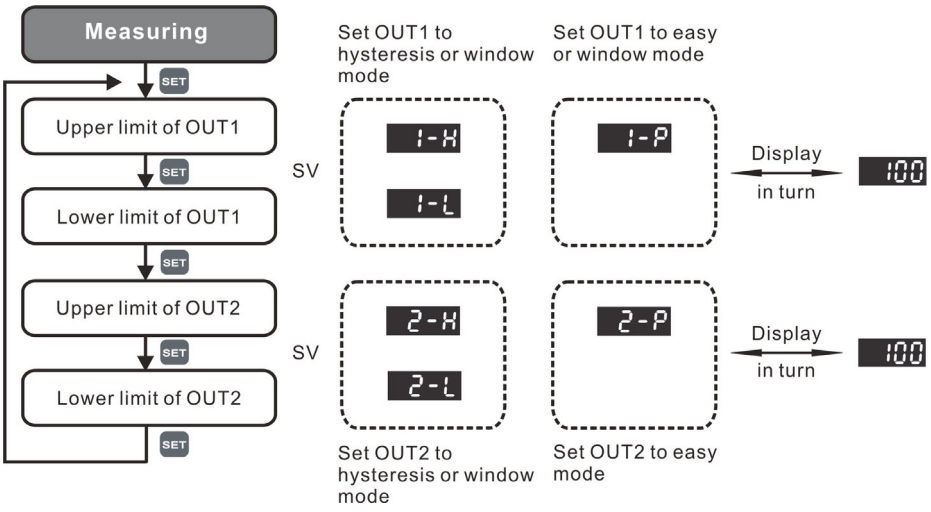



- **Advanced Setup Mode:**






- **Measuring Mode:**




| Quick Setup Mode | Advanced Setup Mode | Measuring Mode |
|---|---|---|
| ot1 Set up OUT1 mode<br>Press SET ▽ | Sub Set up auxiliary display<br>(Change SV display method)<br>Press SET ▽ | 1-H Set up upper limit of OUT1<br>(Set OUT1 to hysteresis mode / window mode)<br>Press SET ▽ |
| ot2 Set up OUT2 mode<br>Press SET ▽ | dSP Set up displayed speed<br>Press SET ▽ | 1-L Set up lower limit of OUT1<br>(Set OUT1 to hysteresis mode / window mode)<br>Press SET ▽ |

| Quick Setup Mode | Advanced Setup Mode | Measuring Mode |
|---|---|---|
| noC Set up N.O./N.C. of OUT1 and OUT2<br>Press SET ▽ | HYS Set up hysteresis<br>Press SET ▽ | 1-P SV of OUT1<br>(Set OUT1 to easy mode)<br>Press SET ▽ |
| SPd Set up output response time<br>Press SET ▽ | PoS Set up power saving mode<br>Press SET ▽ | 2-H Set up upper limit of OUT2<br>(Set OUT2 to hysteresis mode / window mode)<br>Press SET ▽ |
| CLr Set up PV display color<br>Press SET ▽ | dPY Set up switching color referencing output items<br>Press SET ▽ | 2-L Set up lower limit of OUT2<br>(Set OUT2 to hysteresis mode / window mode)<br>Press SET ▽ |
| Unt Set up unit<br>Press SET ▷ Return to “set up OUT1 mode” | Cod Set up code<br>Press SET ▽ | 2-P SV of OUT2<br>(Set OUT2 to easy mode)<br>Press SET ▷ Returning to output setting |
| | CPY Set up copy function<br>Press SET ▽ | |
| | ASo Set up analog output switch<br>Press SET ▽ | |
| | rSt Return to default settings<br>Press SET ▷ Return to “set up auxiliary display” | |

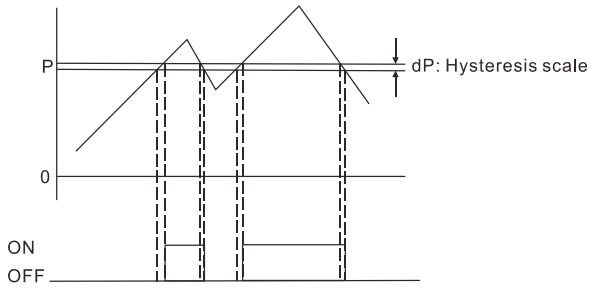
# ■ Initial Setting

1. Units: DPA provides many units for users, including kPa, kgf/cm$^2$, bar, psi, mmHg and inchHg. In the easy mode, you can press SET and find Unt to set the unit to the desired one.
2. Output status: You can set up 2 output status in DPA, N.O. (normally open) and N.C. (normally closed). In the easy mode, you can press SET and fine noC to set up the output status for OUT1 and OUT2.
3. Response time: Referring to the time required for the pressure to reach output status. For example, “50” refers to once the pressure has reached the output status, it has to last for 50ms before the output starts to operate. In the easy mode, press SET and find SPd. Use ▲ ▼ to set up the response time.

# ■ Output Mode Setting

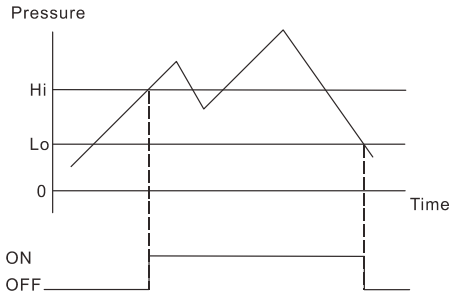
There are 3 output modes in DPA: Easy, Hysteresis and Window

1. Easy Mode: Set up pressure P. When the pressure measured is bigger than (P + dP), the output will be ON. When the pressure measured is smaller than P, the output will be OFF. (See Figure 1: Output in Easy Mode)
   - In the “Measuring Mode”, press SET and find 1-P (OUT1) and 2-P (OUT2). Use ▲ ▼ to set up P value.
   - In the “Advanced Setup Mode”, press SET and find HYS. Use ▲ ▼ to set up “dP” value.



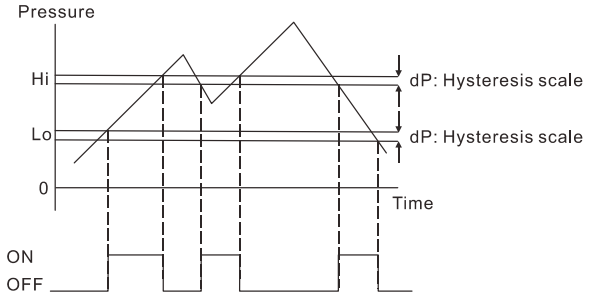

[Figure 1: Output in Easy Mode]

2. Hysteresis Mode: Set up pressure Hi/Lo. When the pressure measured is bigger than the Hi value, the output will be ON. When the pressure measured is smaller than the Lo value, the output will be OFF. (See Figure 2: Output in Hysteresis Mode)
   - In the “Measuring Mode”, press SET and find 1-H (OUT1 Hi), 1-L (OUT1 Lo), 2-H (OUT2 Hi) and 2-L (OUT2 Lo). Use ▲ ▼ to set up Hi/Lo values.




[Figure 2: Output in Hysteresis Mode]

3. Window Mode: Set up pressure Hi/Lo. When the pressure measured is bigger than Hi or smaller than Lo, the output will be OFF. When the pressure measured is bigger than Lo and smaller than Hi, the output will be ON. (See Figure 3: Output in Window Mode)
   - In the “Measuring Mode”, press SET and find 1-H (OUT1 Hi), 1-L (OUT1 Lo), 2-H (OUT2 Hi) and 2-L (OUT2 Lo). Use ▲ ▼ to set up Hi/Lo values.
   - In the “Advanced Setup Mode”, press SET and find HYS. Use ▲ ▼ to set up “dP” value.




[Figure 3: Output in Window Mode]

***Note:*** *Supposed the output is ON and the output status is set to N.O. (normally open), the output will then be off. If the output status is set to N.C (normally closed), the output will then be on. Supposed the output is OFF and the output status is set to N.O., the output will then be on. If the output status is set to N.C., the output will then be off.*

## ■ Zero Returning

In the "Measuring Mode”, press ▲ ▼ together, and you will see 0000 / ADJ. The zero returning will start. Release the keys to end the zero returning.

## ■ Analog Output

1. Full range mode:

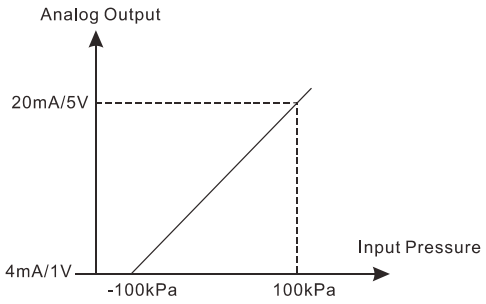
When the input pressure starts to change, the analog output will change with the input. For example, supposed the range for input is -100kPa ~ 100kPa, and DPA reads -100kPa, the output will be 4mA or 1V. When DPA reads 100kPa, the output will be 20mA or 5V.

(See Figure 4: Full range analog Output)

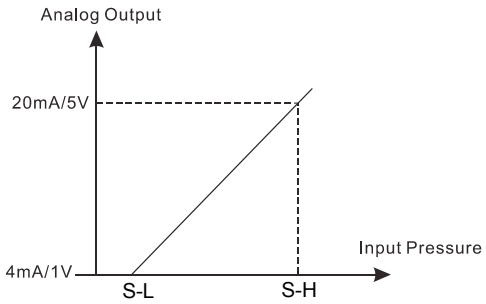
2. Change analog slop mode:

When the DPA reads S-L , the output will be 4mA or 1V. When DPA reads S-H , the output will be 20mA or 5V.

(See Figure 5: Change analog slop output)




[Figure 4: Full range analog Output]




[Figure 5: Change analog slop Output]

## ■ Key Locking Function

- Lock On: Press SET and ▲ together for 2 seconds until LoCY on is displayed. You will then see the display of pressure value (PV) and set value (SV).
- Lock Off: Press SET and ▼ together for 2 seconds until LoCY oFF is displayed. You will then see the display of pressure value (PV) and set value (SV).
- Lock Display: Press any key in the key locking mode, and you will see the display of pressure value (PV) and LCY (SV). Release the key, and the PV and SV will return to original values.

## ■ Switching Colors

In DPA, different output statuses can have different display colors. The output statuses for DPA are “OUT1”, “OUT2”, ”OUT1 and OUT2”, “OUT1 or OUT2”. See below explanations for how to set:

1. Setting up output status: In the “Measuring Mode”, press SET for more than 4 seconds and release the key after you see Pro SEt. You are now in the “Advanced Setup Mode”. Press SET for 5 times and find the switching color referencing items (see Advanced Setup Mode chart). Use ▲ ▼ to select the referencing item you'd like.
2. Switching colors: In the “Measuring Mode”, press SET for more than 2 seconds to enter the “Quick Setup Mode”. Press SET for 4 times and find the parameter for setting up colors (see Quick Setup Mode chart). Use ▲ ▼ to select the color you’d like.

*Note: “OUT1 and OUT2” will be ON only when both OUT1 and OUT2 are ON; otherwise, it will be OFF. “OUT1 or OUT2” will be OFF only when both OUT1 and OUT2 are OFF; otherwise, it will be ON.*

## ■ Copy Function

DPA is able to copy the parameters in the master device to another slave device.

1. Hardware: Connect Pin 2 on master to Pin 3 on slave; Pin 3 on master to Pin 2 on slave; Pin 5 on master and slave to GND on power supply; Pin 1 on master and slave to +24V on power supply.
2. Software:

   a) Slave device: In the “Measuring Mode”, press SET for more than 4 seconds and release the key after you see Pro SEt. You are now in the “Advanced Setup Mode”. Press SET for 7 times and find the parameter for setting up the copy function (see Advanced Setup Mode chart). Use ▲ ▼ to select CP-S CPy (CP-S refers to Copy-Slave).

   b) Master device: In the “Measuring Mode”, press SET for more than 2 seconds and release the key after you see Pro SEt. You are now in the “Advanced Setup Mode”. Press SET for 7 times and find the parameter for setting up the copy function (see Advanced Setup Mode chart). Use ▲ ▼ to select CP-n CPy (CP-n refers to Copy-Master). Next, press SET for more than 2 seconds and return to the “Measuring Mode”. Now, you will see CP-n Cnt on the screen and CP-S Cnt on the slave device, indicating that the two devices have been connected. On Cnt, you will see numbering counting up, referring to the number of parameters transmitted successfully between the two devices. Once the copy of parameter succeeds, you will see CP-n oK on the master device and CP-S oK

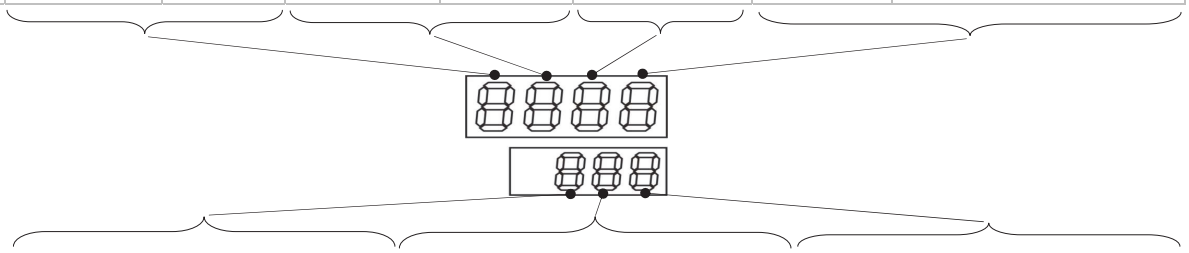
on the slave device. That the number at oE stays intact refers to the copy fails.
After the copy is completed, switch off the two devices and connect them again to the power supply.

## ■ Code

DPA offers codes for the user to set up. In the “Measuring Mode”, press SET for more than 4 seconds and release the key after you see Pro SEt. You are now in the “Advanced Setup Mode”. Press SET for 6 times to find the parameter to set up codes (see Advanced Setup Mode chart). 0000 Cod ⟷ 0000 002 displays in turn.

See the meanings of codes in the table below:

| Code | 1st digit | | 2nd digit | | 3rd digit | 4th digit | |
|---|---|---|---|---|---|---|---|
| | OUT1 mode | N.O./N.C. | OUT2 mode | N.O./N.C. | Response time | Color | Referencing item for color |
| 0 | Easy | N.O. | Easy | N.O. | 2ms | Red when ON | OUT1 |
| 1 | | N.C. | | N.C. | 4ms | | OUT2 |
| 2 | Hysteresis | N.O. | Hysteresis | N.O. | 10ms | | OUT1 and OUT2 |
| 3 | | N.C. | | N.C. | 30ms | | OUT1 or OUT2 |
| 4 | Window | N.O. | Window | N.O. | 50ms | Green when ON | OUT1 |
| 5 | | N.C. | | N.C. | 100ms | | OUT2 |
| 6 | - | - | - | - | 250ms | | OUT1 and OUT2 |
| 7 | - | - | - | - | 500ms | | OUT1 or OUT2 |
| 8 | - | - | - | - | 1,000ms | Red | OUT1 |
| 9 | - | - | - | - | - | | OUT2 |
| A | - | - | - | - | - | | OUT1 and OUT2 |
| b | - | - | - | - | - | Red | OUT1 or OUT2 |
| C | - | - | - | - | - | Green | OUT1 |
| d | - | - | - | - | - | | OUT2 |
| E | - | - | - | - | - | | OUT1 and OUT2 |
| F | - | - | - | - | - | | OUT1 or OUT2 |

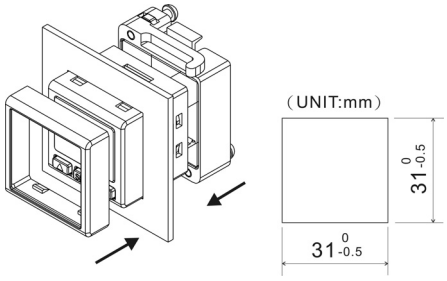


| Code | 6th digit | 7th digit | | 8th digit |
|---|---|---|---|---|
| | Pressure unit | Speed | Auxiliary display | Hysteresis setting |
| 0 | kPa | 250ms | Standard | 1 |
| 1 | kgf/cm$^2$ | | Off | 2 |
| 2 | bar | | Unit. | 3 |
| 3 | psi | 500ms | Standard. | 4 |
| 4 | mmHg | | Off | 5 |
| 5 | inchHg | | Unit | 6 |
| 6 | -- | 1,000ms | Standard | 7 |

| Code | 6th digit | 7th digit | | 8th digit |
|---|---|---|---|---|
| | Pressure unit | Speed | Auxiliary display | Hysteresis setting |
| 7 | - | | Off | 8 |
| 8 | - | | Unit | - |

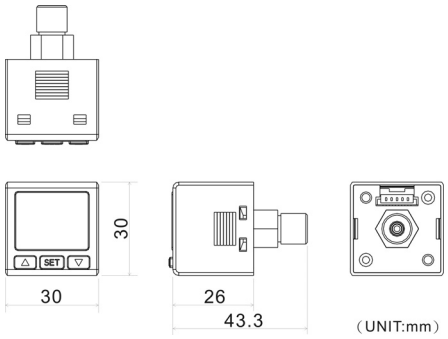
## ■ How to Install

- Panel: Use optional accessory DPA-PFKit.

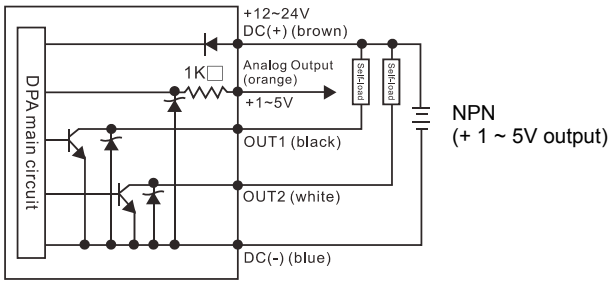



- To install the fixing frame, you have to purchase the optional accessory: DPA-FMKit.

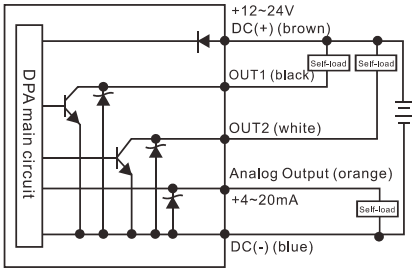
## ■ Dimension



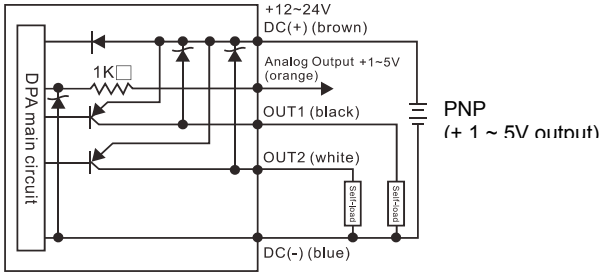

## ■ Internal Circuit



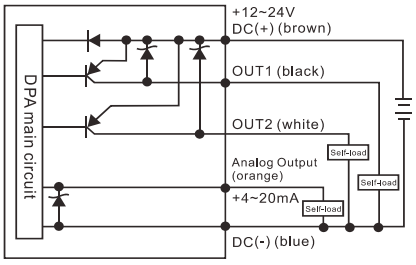

NPN
(+ 1 ~ 5V output)




NPN
(+ 4 ~ 20mA output)

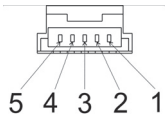



PNP
(+ 1 ~ 5V output)




PNP
(+ 4 ~ 20mA output)

## ■ Terminals




1. Positive power supply input (brown)
2. Digital output 1 signal (black)
3. Digital output 2 signal (white)
4. Analog output signal (orange)
5. Negative power supply input (blue)

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