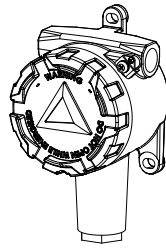



Installation, Operation & Maintenance Instructions



Sentry Series
Models P01, P02, P03 (Pressure Switches)

SAFETY INSTRUCTIONS






-  **Information** ..points out useful tips, recommendations and information for efficient and trouble-free operation.
-  **CAUTION!** ..indicates a potentially dangerous situation that can result in light injuries or damage to equipment or the environment, if not avoided.
-  **WARNING!** ..indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.
-  **WARNING!** ..identifies hazards caused by electric power. Should the safety instructions not be observed, there is a risk of serious or fatal injury.
-  **WARNING!** ..indicates a potentially dangerous situation that can result in burns, caused by hot surfaces or liquids, if not avoided.
-  **WARNING!** ..indicates a potentially dangerous situation in the hazardous area that can result in serious injury or death, if not avoided.
-  **Ex applications** ..special instructions for Ex applications.

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Foreword

The unit is manufactured, checked and supplied in accordance with our published specification, and when installed and used in normal or prescribed applications, with the lid in place and within the parameters set for mechanical and electrical performance, will not cause danger or hazard to life or limb.

-  **Warning:** Units must be selected and installed by suitably trained and qualified personnel in accordance with appropriate codes of practice so that the possibility of failure resulting in injury or damage caused by misuse or misapplication is avoided.
-  **EX**
-  **Warning:** before installation **check** that the instrument **characteristics** comply with process and plant requirements
-  **Warning:** The users attention is drawn to the fact that, when the unit is 'live' with respect to electrical or pressure supplies, a hazard may exist if the unit is opened or dismantled
-  **EX**
- Warning:** where any special condition of the product has been required as identified by the last 4 digits of the part number, follow the necessary safety instruction for a correct installation.

If the equipment is likely to come into contact with aggressive substances, suitable precautions should be taken that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals or solvents that may affect non-metallic materials. Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

Allowed over range

Pressure exceeding the adjustable range can be allowed up to the max pressure stated on nameplate. The voltage and current limits for the microswitch must not be exceeded. (see fig. 2&3).

Transitory electrical over ranges can have a destructive effect on the microswitch

Ambient Temperature

The surface temperature of the instrument is influenced by the process temperature, electrical working conditions, installation and environmental. Special attention must be taken to avoid exceeding the limits specified on table below (i.e. remote mounting, valves, siphons, diaphragm seals. See Mounting).

Process temperature

For the instrument model P0* the following table is applicable

| Temperature Class | Ambient temperature range | Max process temperature at the process connection | Max electrical loads (resistive loads) |
|-------------------|----------------------------------|---|--|
| T6 or T85 | -30°C to +65°C or -60°C to +65°C | 65°C | 15A, 250 V a.c. & 5A, 30V d.c. |
| T5 or T100 | -30°C to +80°C or -60°C to +80°C | 80°C | |



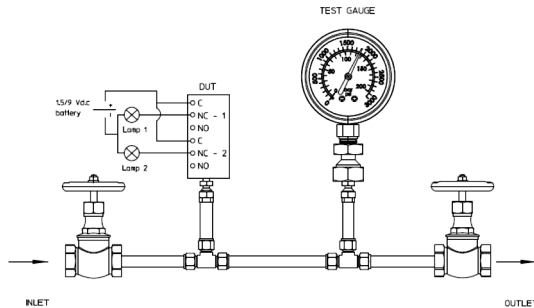
Tools to be use for checking and calibrating set point.

- ◆ Hex Socket Key 1.5 mm
- ◆ Open ended spanner A/F 13mm
- ◆ Screwdriver Pozidriv size 1

The following calibration circuit is to be used to proceed with the calibration of the set point or periodical functional verification.

The test gauge should have a range similar to the instrument under verification with an accuracy consistent with the accuracy required to calibrate the set point.

Fig. 1 - Calibration Circuit



Operating principles

Pressure Switch models P0* are diaphragm operated switches.

This diaphragm generates a force proportional to the applied pressure and is balanced by a user adjustable control spring.

When the force exceeds that created by the control spring, the diaphragm moves causing a push rod to actuate a snap-acting micro-switch.

Marking

Flameproof models carry the following label markings:

Fig. 2 - Flameproof nemeplate



Intrinsic Safety Model carry the following label markings:

Fig. 3 - Intrinsic Safety nemeplate



Input limitations for intrinsic safety:
 $U_i = 30V$, $I_i = 100mA$, $P_i = 0.6W$

List of standard to which the product is conform

This product complies with the following standards:

| IECEX | ATEX | UKEx |
|--------------------|---------------------|------------------------|
| IEC 60079-0: Ed.7 | EN IEC 60079-0:2018 | BS EN IEC 60079-0:2018 |
| IEC 60079-1: Ed 7 | EN 60079-1:2014 | BS EN 60079-1:2014 |
| IEC 60079-31: Ed.2 | IEC 60079-31:2014 | BS EN 60079-31:2014 |
| IEC 60079-11: Ed 6 | EN 60079-11:2012 | BS EN 60079-11:2012 |

Special conditions of use

Warning: The Sentry Pressure Switch must not be installed in a location where moving dust flow can generate an electrostatic charge on the equipment.

Warning: Instruments with aluminium enclosure. The instrument must be protected against accidental damage and impacts to the housing.

Warning: if the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

Warning: The flamepaths are not to be repaired.

Installation Mounting

The instruments are designed to be mounted vertically with the process connection underneath. However, mounting up to 45° from the vertical in any plane is acceptable, although a small calibration shift may occur.

They can be mounted either direct to process, or to a wall or panel using the mounting holes provided. Select the mounting point so as to avoid excessive shock, vibration or temperature fluctuation.

If sudden changes of pressure (pulsations) are likely then we recommend that snubber are fitted between the process line and instrument.

Instruments should be mounted to avoid excessive heat transfer from the process lines or adjacent plant. With application on process fluid that could crystallize/solidify, it is suggested the use of adequate chemical seals and capillary.

Use a spanner to support the process connection when fitting the instrument.

The following figures show the minimal installation tips.

Fig. 4 - Remote installation

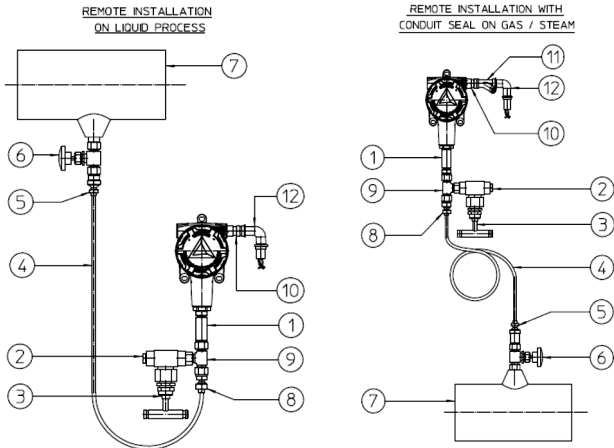
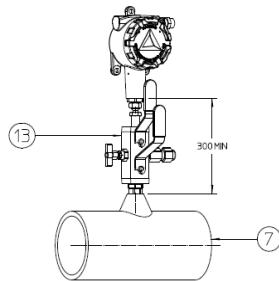


Fig. 5 - Direct Installation

DIRECT INSTALLATION WITH
THREADED DOUBLE BLOCK & BLEED VALVE



LEGEND

| | | |
|-------------------|--|--------------------------------|
| 1. SWIVEL ADAPTOR | 6. ROOT VALVE WITH DRAIN | 11. CONDUIT SEALING FITTING |
| 2. DRAIN PLUG | 7. PROCESS PIPING | 12. ELBOW |
| 3. SERVICE VALVE | 8. SWIVEL ADAPTOR | 13. DOUBLE BLOCK & BLEED VALVE |
| 4. PIPING | 9. T ¹ FITTING | 14. PRESSURE SWITCH |
| 5. SWIVEL ADAPTOR | 10. SWIVEL ADAPTOR/CERTIFIED CABLE GLAND | |

Caution: Check the connection thread size and specification on the unit to avoid mismatching with the process connection adaptor. See digit 11 of product code.

Electrical Connections

One or two electrical entries are provided, into which cable glands can be assembled. The thread type and size is marked on the enclosure, just below the connection.

Warning: fittings/adaptor/plugs used for the electrical connection of the flameproof instruments shall be certified according to IEC or EN standards and shall guarantee instrument degree of protection (IP66)

Warning: cable entries not used must be plugged and sealed with plugs so as to prevent rainwater or other from entering the instrument enclosure. **In case of flameproof instruments these plugs, if not correctly installed and sealed to prevent their removal, do NOT guarantee the mode of protection Ex d.**

Furthermore, in order to guarantee the degree of protection IP66 and the non-loosening of plugs, it is recommended to seal the threads of connection with the same anaerobic sealant used for the glands. For instance, a sealant like Loctite ® 542 can be applied on the thread of plugs, before screwing them into the unused enclosure entry.

Wiring

Disconnect all supply circuits before wiring. Wire in accordance with local and national codes. Use cables no larger than 2.5 mm² (14 AWG)

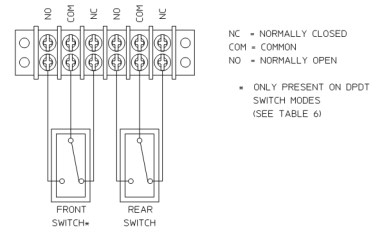
Warning: Do not exceed electrical ratings stated in literature and on nameplates.

Warning: If the ambient temperature exceeds 60 °C it is recommended to use cables suitable for operating temperatures not less than 105 °C.

The three switch terminals are clearly marked "NORMALLY CLOSED", "NORMALLY OPEN" and "COMMON" as per fig.6.

The following diagram can be used as a

Fig. 6 - Electrical Connections



Insert bare wires fully into the terminal block and tighten securely. Keep wiring tails to a minimum and check that wires do not interfere with the operating mechanism. The instrument may be equipped with a micro switch single or double pole, double throw or two independent switches.

Warning: in case of Intrinsically Safe Instruments: All the electrical connections must form part of the same intrinsically safe circuit. The relevant entry parameters are written on the nameplate and are:
 $U_i = 30 \text{ V d.c.}$; $I_i = 100 \text{ mA}$; $P_i = 0.60 \text{ W}$;
 $C_i = 0 \text{ } \mu\text{F}$; $L_i = 0 \text{ mH}$

Before closing the lid:

- Ensure wire is clear of all moving parts.
- Ensure that wires do not touch the lid as it is closed.

Close the lid, being careful not to trap any wires in doing so. Securely tighten the M3 lid locking screw set provided using a 1.5mm hex key.

Earthing connections

Warning: The instrument is supplied with two protective grounding connections, one inside and one outside the enclosure. The two connections provide effective connection of a conductor with a cross-sectional area of at least 4 mm².

Warning: In order to protect the instrument against extreme environmental conditions, a coating thicker than 0,2 mm should be applied. The grounding connection has to be adequately realized to prevent an electrostatic surcharge on the instrument surface. **CLEAN ONLY with a damp cloth**

Operation Adjustments

Pressure Switches are supplied and adjusted at midscale falling unless otherwise specified. If the instrument has been ordered with a specific calibration values the adhesive label shows the set point values.

It is a good practice to check the calibration values marked on the relevant adhesive label, prior to installation.

Calibration

Please follow the suggested steps below to calibrate the set point of the instrument: Connect the instrument to the pneumatic tools in the normal installation position (see Fig.1). Slacken the lid lock screw and unscrew the lid. Connect the warning lamp according the desired function to the terminals.



Caution: Do not attempt to set the switch outside the scale limits.

Though the unit may be set anywhere within its range, for optimum performance, it is good practice to have a set point value between 25% and 75% of span.

Connection C-NO terminal

- The circuit is open at the normal operating pressure, the switch close the circuit as the pressure increase when the desired value is reached.
- The circuit is closed at the normal operating pressure, the switch open the circuit as the pressure decrease when the desired value is reached

Connection C-NC terminal

- The circuit is closed at the normal operating pressure, the switch open the circuit as the pressure increase when the desired value is reached.
- The circuit is open at the normal operating pressure, the switch close the circuit as the pressure decrease when the desired value is reached

Pressurize the circuit and increase slowly the pressure up to the set point.

Slacken the set point lock screw.

Using a suitable spanner (Ch 13), rotate the range adjuster clockwise to increase the set point and counter-clockwise to decrease the set point up to the relative lamp turn ON (or OFF).

Go to the normal operating pressure and increase (or decrease) the pressure up the relative lamp turn ON (or OFF). Read the pressure on the test gauge. Eventually adjust the range adjuster and recheck again using the lamp until the set point is achieved with the required accuracy.

Tighten the set point lock screw.

Close the instrument lid and tighten lid lock screw.



Write the set point on the adhesive label
Caution: The striker screw and lock nut are factory set and should not be adjusted. Should these parts be accidentally loosened, please contact Delta for assistance.

Periodical calibration check.

Connect the instrument to the pneumatic tools in the normal installation position (see Fig.1). Slacken the lid lock screw and unscrew the lid. Connect the warning lamp according the desired function.

Set point calibrated with increasing pressure

From atmospheric pressure pressurize the circuit and increase slowly the pressure up to the set point (the warning lamp became ON). Record the pressure read on the test gauge. Return to atmospheric pressure. Repeat the above operation twice.

Set point calibrated with decreasing pressure

From atmospheric pressure pressurize the circuit up to upper range value. Decrease slowly the pressure up to the set point (the warning lamp became ON). Record the pressure read on the test gauge. Return to upper range pressure value. Repeat the above operation twice.

Evaluation of set point value and repeatability

With all the above values detected, calculate:

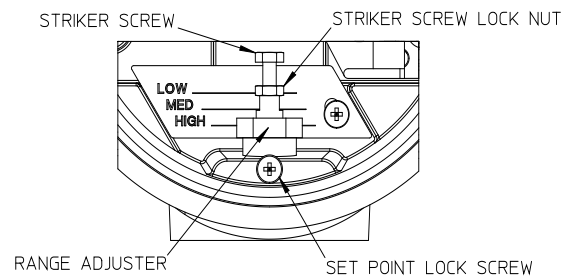
- Average set point value
- Repeatability as the max difference of the detected set point values

If the average set point is different from the expected, instrument must be recalibrated. If the repeatability is higher than the value in the Technical Data Sheet of the product replace the instrument with a new one and contact the factory.

End of verification

Remove the instrument from the pneumatic tool and disconnect the warning lamp. Close the instrument lid and tighten lid lock screw

Fig. 7 - Set point adjusting



Safety Integrity Level (SIL) instrument and installation requirements

Refer to Functional Safety Manual Sentry series.

Commissioning



Warning: Ensure the enclosure is sealed and the cover locking set screw is screwed in fully before the switch is energized.

The instrument starts operating as soon as is energized and the root valve is opened (see fig. 4&5).

Inspections and maintenance

The instrument is maintenance-free but is a good practice to conduct periodic inspections (visual and functional).

Inspections should be carried out at least once a year depending upon operating, environmental conditions and customer plan.



Caution: It is recommended that instruments used to provide an alarm or a shutdown safety related are operated periodically to ensure they are functioning correctly. If further maintenance is required seek advice from Delta Mobrey before attempting repair or replacement of parts.

Periodical visual inspection

Isolate the unit from process and power.



Warning: The flame proof or intrinsic safety instruments installed in explosive atmospheres of combustible dust, must be periodically cleaned externally in order to remove any accumulation of dust.



Verify the integrity of the electrical unit using IEC 60079-17 as guide.

Verify if the device for natural ventilation is in place and is free from obstructions such as fungi, molds and insects.

Verify the leakage of the process externally.

Slacken the lid lock screw and unscrew the lid



Warning: flameproof instrument. Before removing the lid or the cable gland check that no explosive atmosphere is present and that the instrument is de-energized.

- Check all terminals for tightness.
- Check that cable tails are not fouled or chafed.
- Check for internal condensation.
- Check that the gasket is seated properly in the lid recess and is not worn.
- Check that the vent area does not become blocked or obstructed and vent plug has not degraded.

Periodical functional verification

The verification consists in check the set point. This verification is done, usually, removing the instrument from the plant and perform the verification on a test room (see periodical calibration check paragraph).



Warning: Flameproof instrument. Before remove the lid or the cable gland check that the electrical supply is not energized and that no explosive atmosphere is present.

If the verification is done on site the preferred procedure is the verification of the entire loop without remove the lid or the cable gland.



Warning: The flameproof instruments may be checked on site only if apparatus suitable for explosive atmospheres are used.



Warning: Verify that loop is in a safe configuration before acting on the valves and instrument. Do not dispose the process fluid on environment if this cause pollution or personal injury.

Replacement parts

Only the microswitch and terminals can be replaced. Use factory authorised parts only.



IMPORTANT NOTE: operations involving replacement of essential components must be carried out at our workshop, especially for instruments with flameproof certificate; this is to guarantee the user the total and correct restoration of the product original characteristics.



Warning: The flame paths (cable entry & cover threads, range adjuster) are not to be repaired.

Warranty

See Standard Conditions of Sale.

Decommissioning



Warning: Verify that the loop is in a safe configuration before acting on the valves and instrument. Power off the instrument.



Warning: verify, in case of flameproof instrument, the absence of explosive atmosphere before removing the lid or the cable glands.

Do not dispose the process fluid on environment if this cause pollution or personal injury.



Warning: In case of flame proof instruments, it is recommended to follow at least the standard IEC 60079-17 and for the withdrawal from service of electrical apparatus.

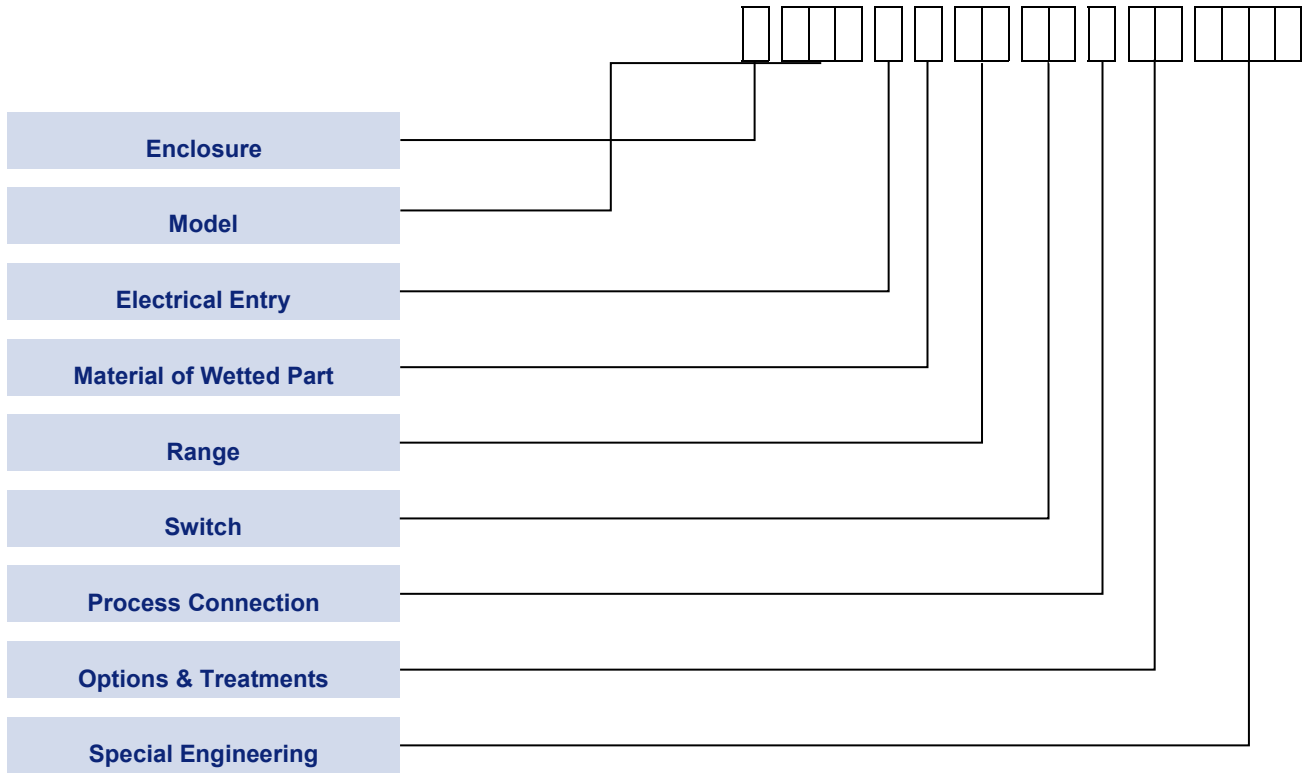
- Isolate the instrument from the process and depressurize acting on the valves.
- Slacken the lid lock screw and unscrew the lid.
- Disconnect all the live terminals and insulate the cables.
- Disconnect the grounding.
- Remove the cable gland.
- Dismount the instrument from the process connection. **Warning:** the process fluid can be hot or corrosive.
- Plug the process pipe.
- Reassembly the lid.
- Remove the mounting screws to the wall/panel.



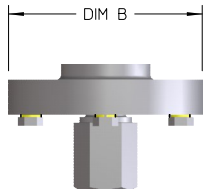
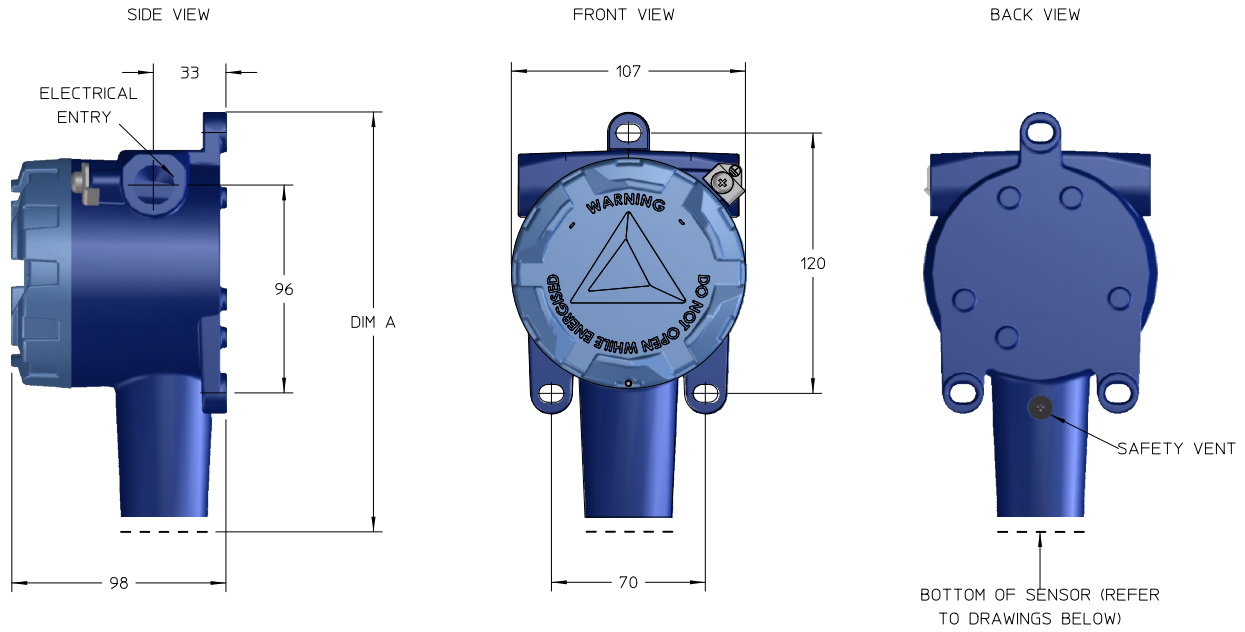
Disposal

The instrument is mainly made of aluminium and stainless steel. Remove the microswitch and clean the wetted parts before scrap the instrument.

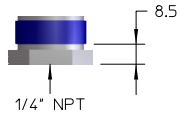
Model code



DIMENSIONS



P01 SENSOR



P02 & P03 SENSOR

| Model | Range | DIM A | DIM B | DIM C |
|-----------|------------|-------|-------|-------|
| P01 | CC, CD, CE | 215 | 88 | - |
| | A0, G3 | 215 | 63 | - |
| P02 & P03 | ALL | 195 | - | - |

| Model (weights may vary according to the range & material) | Weight (Kg) | Weight (lb) |
|--|-------------|-------------|
| WP01* / HP01* / 5P01 | 2.6 | 5.0 |
| WP02* / HP02* / 5P02 | 1.7 | 3.7 |
| WP03* / HP03* / 5P03* | 1.7 | 3.7 |
| AP01* / RP01* / 4P01* | 4.5 | 9.9 |
| AP02* / RP02* / 4P02 | 3.8 | 8.4 |
| AP03* / RP03* / 4P03 | 3.8 | 8.4 |