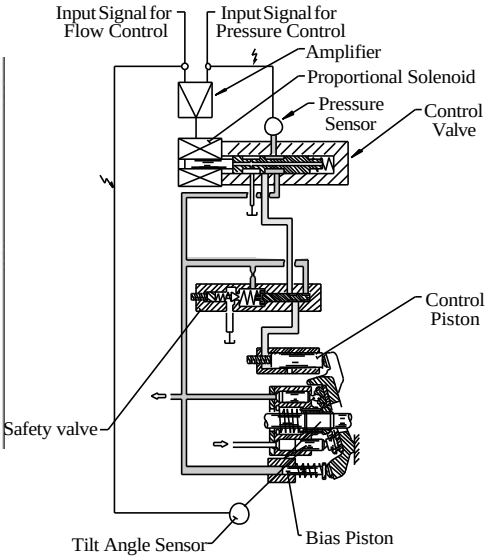
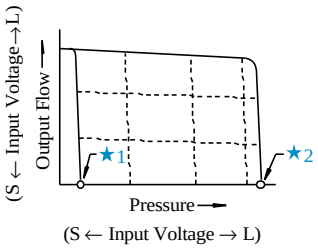
# "A" Series Piston Pumps
# Variable Displacement-Single Pumps
## Electro-Hydraulic Proportional Pressure & Flow Control
## A16 / A22 / A37 / A56 / A70 / A90 / A145 Type

PISTON PUMPS

## Model Number Designation



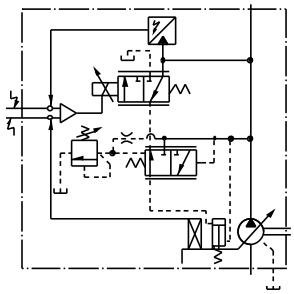

### Performance Characteristics



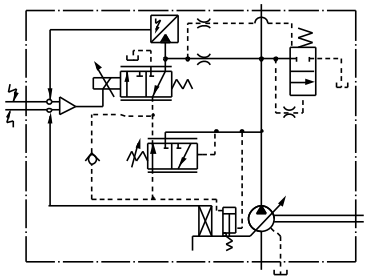

★1. Unloading pressure when input signal is 0 V.

★2. Safety valve setting pressure

### Graphic Symbols



A16/A22/A37/A56



A70/A90/A145

### Model Number Designation

| A70 | -F | R | 04E | 16 | M | A | -60 | -60 | * |
|---|---|---|---|---|---|---|---|---|---|
| Series Number | Mounting | Direction of Rotation | Control Type | Control Pressure at Input Signal is 5 V | Unit of Control Pressure | Type of ★2 Outboard Pump | Compensation ★3 Number | Design Number | Design Std. |
| A16 (15.8 cm³/rev) | F: Flange Mtg. | (Viewed from Shaft End) | 04E: Proportional Pressure & Flow Control Type | Use the same measure of the control pressure as shown on the right, 6.9 MPa (70 kgf/cm², 1000 PSI) specify within the range of maximum operating pressure | None: kgf/cm² M: MPa P: PSI | — | 06 | 42 | Refer to ★4 |
| A22 (22.2 cm³/rev) | | | | | | | 11 | 42 | |
| A37 (36.9 cm³/rev) | | | | | | | 01 | 42 | |
| A56 (56.2 cm³/rev) | | | | | | | 02 | 42 | |
| A70 (70.0 cm³/rev) | L: Foot Mtg. | R: Clockwise (Normal) ★1 | | | | Outboard pump models A: A16,A22 PV2R1 B: A37 PV2R2 | 60 | 60 | |
| A90 (91.0 cm³/rev) | | | | | | | 60 | 60 | |
| A145 (145.0 cm³/rev) | | | | | | | 60 | 60 | |

★1. Available to supply pump with anti-clockwise rotation. Consult Yuken for details.

★2. Models A70/A90/A145 can be used as double pumps. Chose either A or B suitable for the outboard pump. For the mounting of outboard pumps, make inquires separately. If you use these models as single pumps, generally specify "A".

★3. Amplifier Compensation Number may differ according to the main machine conditions. Consult Yuken for detail

★4. Design Standards: None..... Japanese Standard "JIS"
80..... European Design Standard
90..... N. American Design Standard

## Specifications

| Descriptions \ Model Numbers | | | A16 | A22 | A37 | A56 | A70 | A90 | A145 |
|---|---|---|---|---|---|---|---|---|---|
| Geometric Displacement | | $cm^3$/rev (cu. in./rev) | 15.8 (.964) | 22.2 (1.355) | 36.9 (2.25) | 56.2 (3.43) | 70.0 (4.27) | 91.0 (5.55) | 145.0 (8.85) |
| Operating Pres. MPa (PSI) | | Rated ★2 | 16 (2320) | 16 (2320) | 16 (2320) | 16 (2320) | 25 (3630) | 25 (3630) | 25 (3630) |
| | | Intermittent ★1 | 21 (3050) | 16 (2320) | 21 (3050) | 21 (3050) | 28 (4060) | 28 (4060) | 28 (4060) |
| Shaft Speed Range | | r/min | 600 - 1800 | | | | | | |
| Flow Control | Max. Flow ★3 | L/min (U.S. GPM) | 28.4 (7.5) | 40.0 (10.6) | 66.4 (17.5) | 101.0 (26.7) | 126.0 (33.3) | 163.0 (43.1) | 261.0 (69.0) |
| | Min. Pres. Required for Flow Adj. | MPa (PSI) | 2.0 (290) ★4 | | | | | | |
| | Hysteresis | | Less than 1 % | | | | | | |
| | Repeatability | | Less than 1 % | | | | | | |
| | Input Signal | | Max. Flow / 5 V DC | | | | | | |
| Pressure Control | Min. Adjustment Pressure | MPa (PSI) | 0.7 (100) | | | | | | |
| | Hysteresis | | Less than 1 % | | | | | | |
| | Repeatability | | Less than 1 % | | | | | | |
| | Input Signal | | Specified Control Pressure / 5 V DC | | | | | | |
| Coil Resistance | | Ω [@ 20℃ (68℉)] | 10 | | | | | | |
| Input Impedance | | | Flow Control : 10kΩ Pres. Control : 10kΩ | | | | | | |
| Supply Electric Power | | | 24 V DC (21 - 28 V Included Ripple) | | | | | | |
| Power Input (Max.) | | W | 30 | | | | | | |
| Output Signal | | Flow | 5 V DC/Max. Flow | | | | | | |
| | | Pressure | 5 V DC/Specified Control Pressure | | | | | | |
| Alarm Signal Output (Open Collector) | | | Voltage : Max. 30 V DC Current : Max. 40 mA | | | | | | |
| Ambient Temperature | | ℃ (℉) | 0 - 50 (32 - 122) (With Circulated Air) | | | | | | |
| Approx. Mass kg (lbs.) | Flange Mtg. | | 20.5 (45.2) | 20.5 (45.2) | 32.0 (70.6) | 39.0 (86.0) | 64.0 (141) | 76.5 (169) | 96.4 (213) |
| | Foot Mtg. | | 22.7 (50.1) | 22.7 (50.1) | 36.3 (80.0) | 43.3 (95.5) | 76.0 (168) | 97.0 (214) | 121.4 (268) |

★1. Whenever setting pressure, make sure the full cut-off pressure never exceeds the maximum intermittent pressure.
★2. When operating the pump exceeding the rated pressure, operating conditions are restricted.
Refer to page 6 for the details.
★3. Maximum flow differs to shaft speed.
The value listed above indicates shaft speed of 1800 r/min.
For other shaft speed calculate by the ratio of shaft speed.
★4. To secure the required minimum pressure, special sequence valves are available, to be directly installed at the discharge port of the pump.
Consult Yuken for details.

## Pipe Flange Kits

For Pipe flange, refer to form of pressure compensator type on page 7.

## Instructions

- **Input Signal**

The pump is on unload condition when the pump is operated without input signal voltage.

- **Electric Source**

Always turn off electric source whenever the connector for swash plate tilt angle sensor is removed.

- **Compensation of Pump Maximum Regulated Flow at Frequency**

If the same maximum flow is required at 50 Hz or 60 Hz, connect short plug in the amplifier to 60 Hz at the place where supplied frequency is 60 Hz. At this condition, maximum flow comes to the same value at 50 Hz.
If short plug is used at 60 Hz without making the change, maximum flow increased in proportion to frequency.

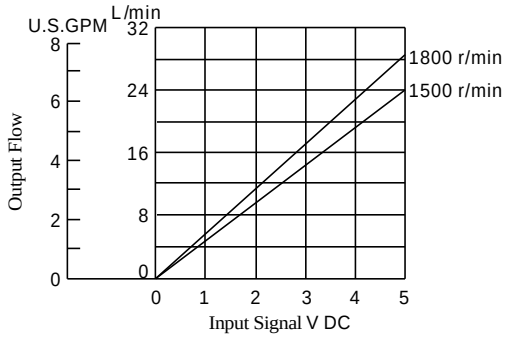
- **Painting on Amp. Box and Solenoid**

To maintain suitable radiation effect, the amp. Box and the solenoid of the control valve should not be painted.

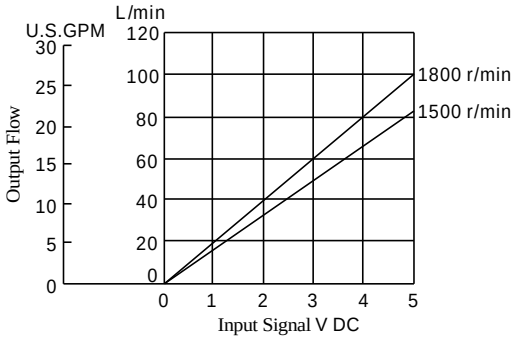
## Typical Pump Characteristics

### Output Flow vs. Input Signal

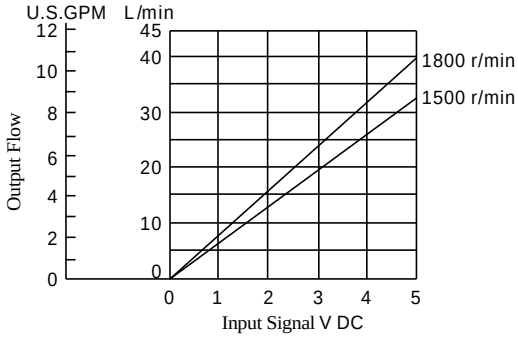
#### A16



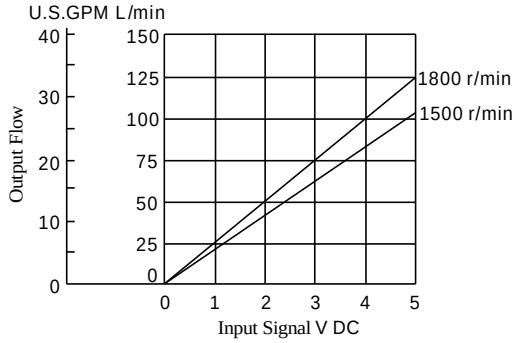

#### A56



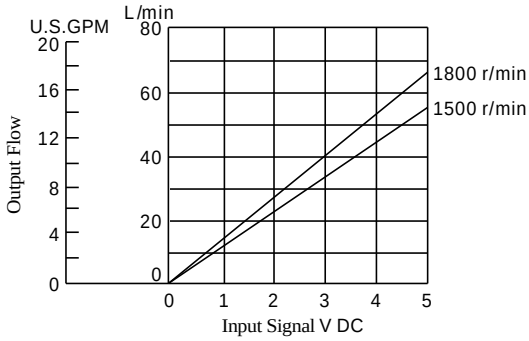

#### A22



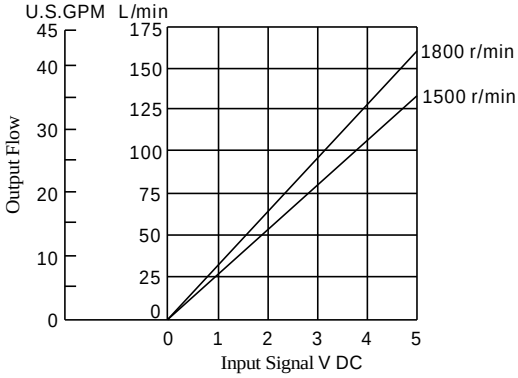

#### A70




#### A37

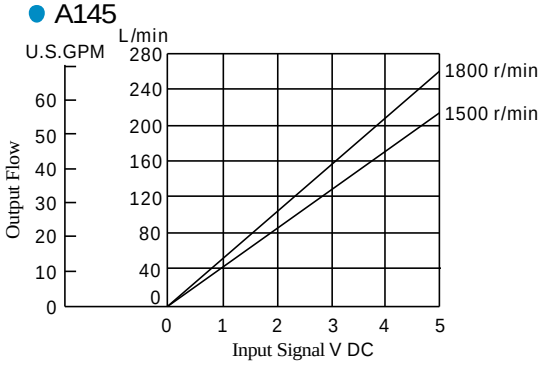



#### A90

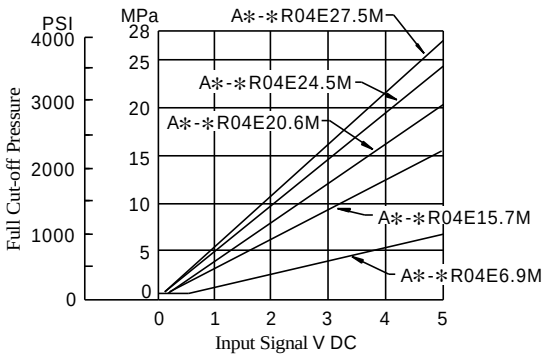



Note: Pump characteristics at 1800 r/min is the same as those at 1500 r/min where frequency is compensated.
(Refer to page 48.)

#### A145

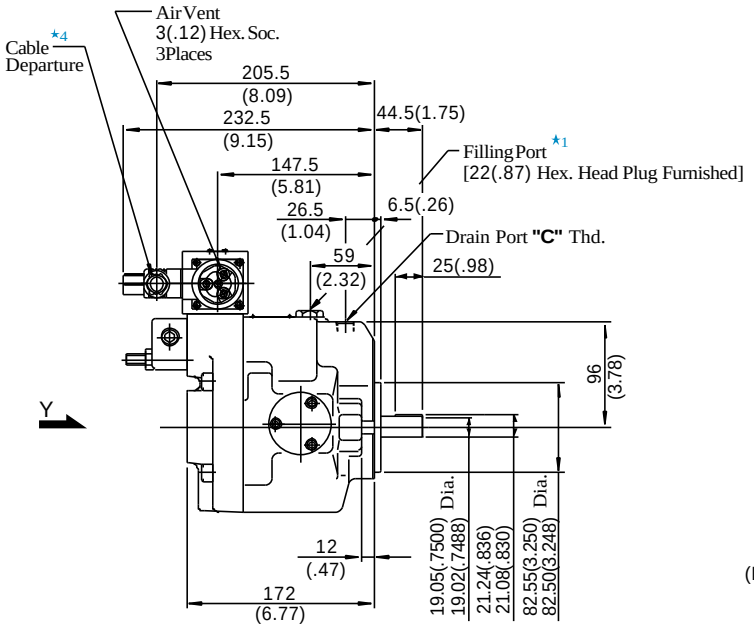


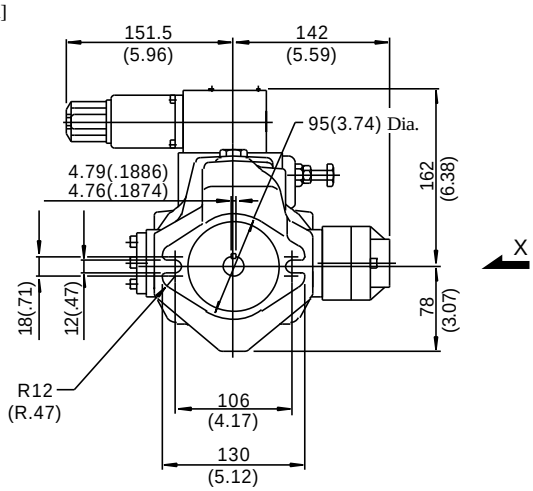

### Full Cut-off Pres. vs. Input Signal

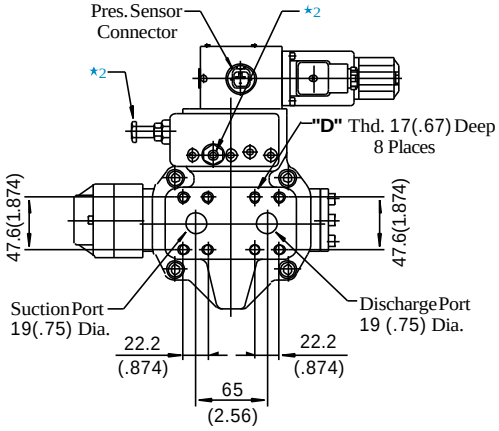



Refer to page 10 to 16 for performance characteristics of pressure compensator type excluding characteristics appeared on this catalogue.

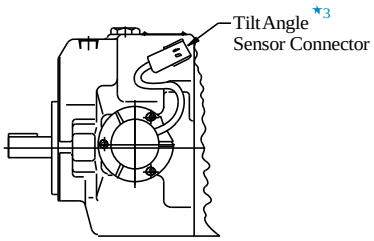
## Flange Mtg. : A16-FR04E*-06-42/4280/4290
## A22-FR04E*-11-42/4280/4290




View Arrow Y




View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.
★2. Do not touch the screw because it is adjusted at the time of shipment.
★3. For cable connection with amplifiers, see page 56.
★4. Cable Applicable:
Outside Dia. ····· 8-10mm(.31-.39 IN.)
Conductor Area ·····Not Exceeding 1.5mm$^2$(.002 Sq. IN.)

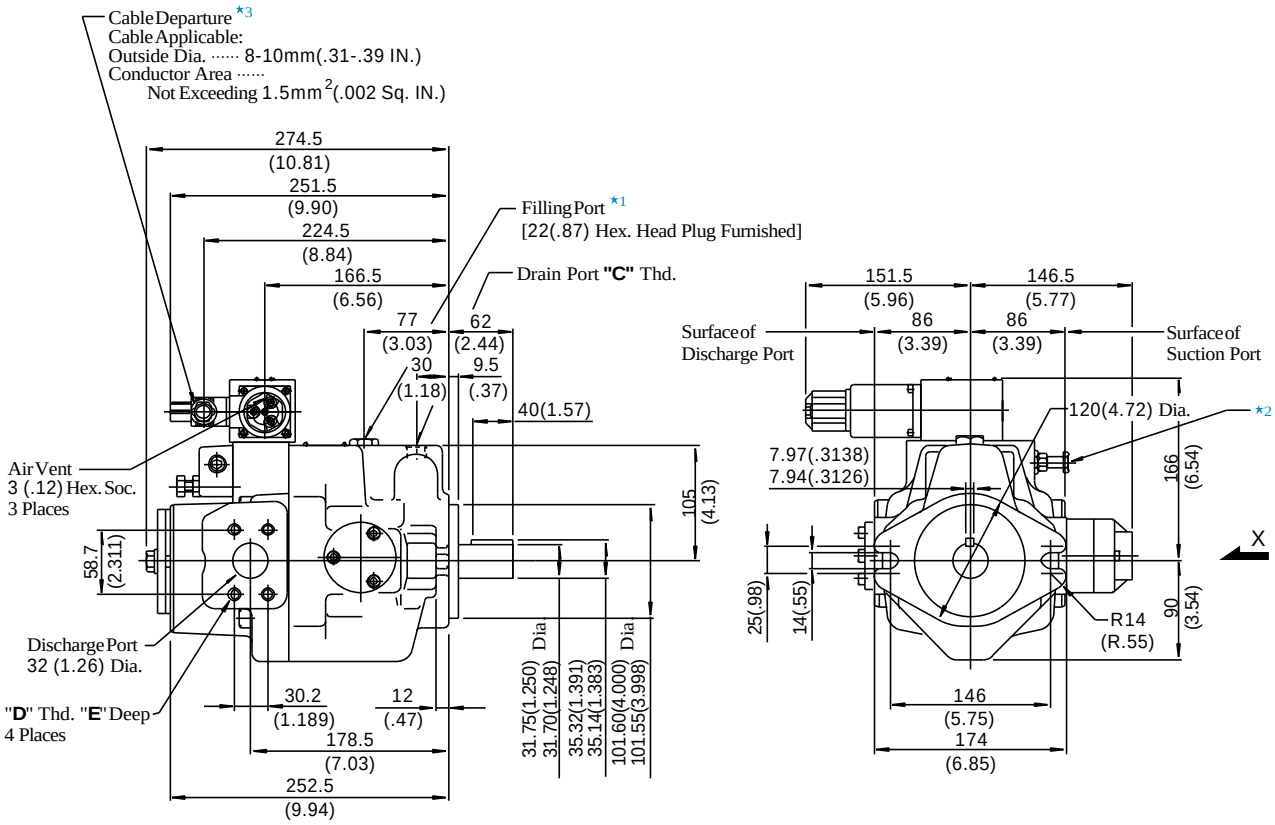
| Model Numbers | "C" Thd. | "D" Thd. |
|---|---|---|
| A16/A22-FR04E*-*-42 | Rc3/8 | M10 |
| A16/A22-FR04E*-*-4280 | 3/8 BSP.F | |
| A16/A22-FR04E*-*-4290 | 3/8 NPT | 3/8-16 UNC |

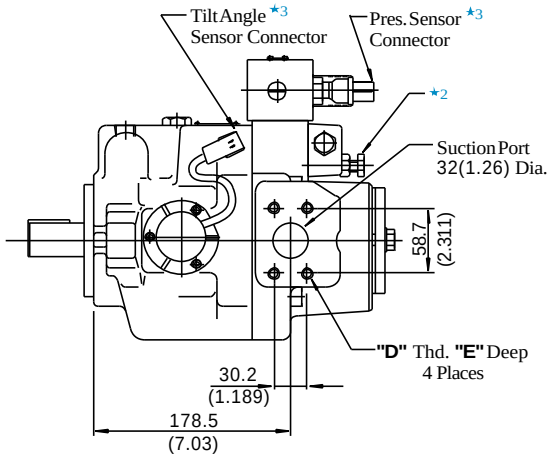
DIMENSIONS IN MILLIMETRES (INCHES)

### ● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model. Refer to page 18 for the dimensions of mounting bracket.

## Flange Mtg. : A37-FR04E*-01-42/4280/4290




View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.
★2. Do not touch the screw because it is adjusted at the time of shipment.
★3. For cable connection with amplifiers, see page 56.

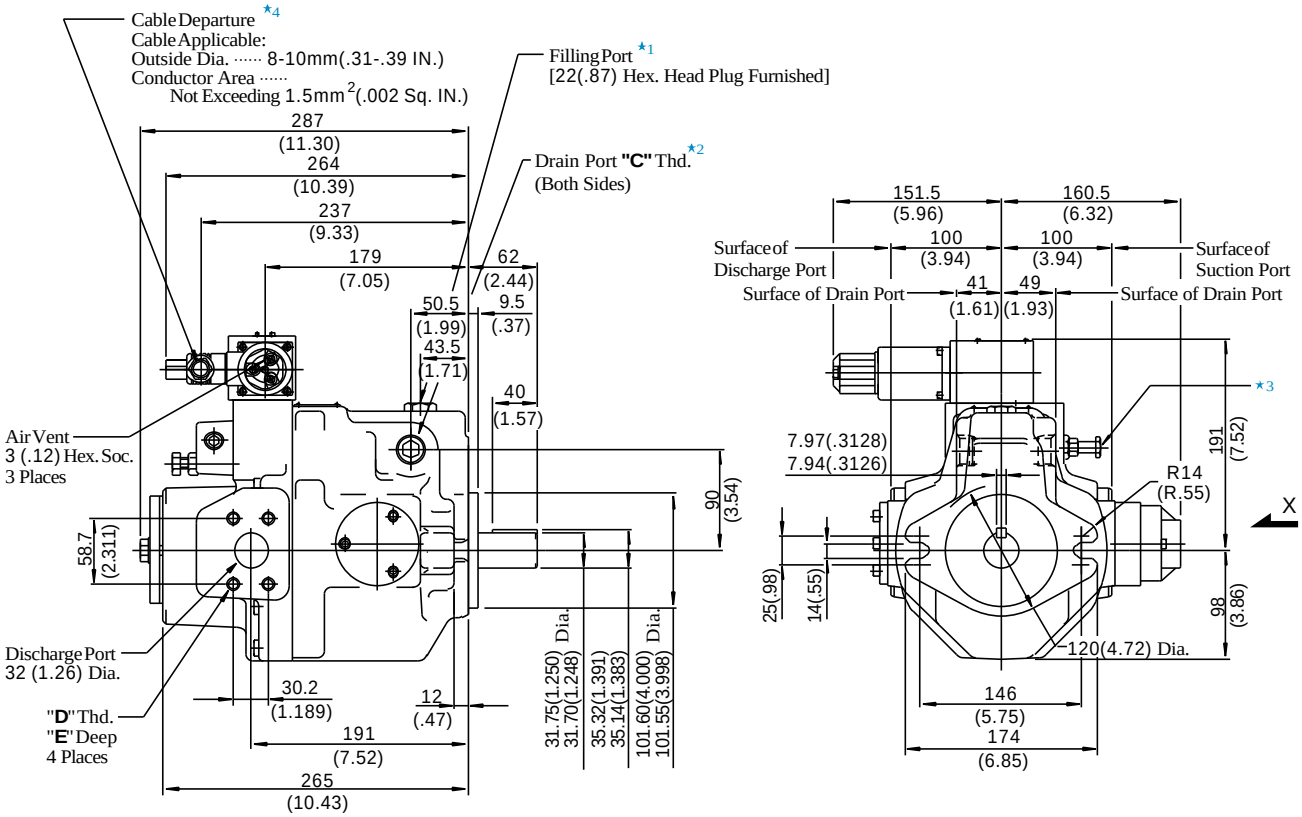
| Model Numbers | "C" Thd. | "D" Thd. | E mm (IN.) |
|---|---|---|---|
| A37-FR04E*-01-42 | Rc1/2 | M10 | 19 (.75) |
| A37-FR04E*-01-4280 | 1/2BSP.F | | |
| A37-FR04E*-01-4290 | 1/2 NPT | 7/16-14 UNC | 20 (.79) |

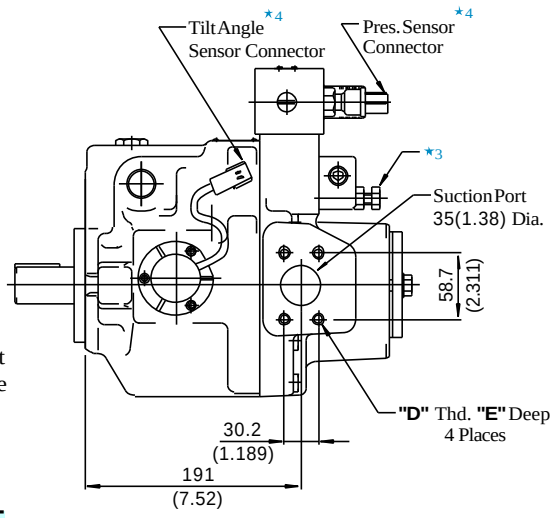
DIMENSIONS IN MILLIMETRES (INCHES)

### ● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model. Refer to page 19 for the dimensions of mounting bracket.

## Flange Mtg. : A56-FR04E*-02-42/4280/4290




View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.
★2. Use either port of two drain ports at your option. Keep the remaining port plugged. Note that on the European design standard (4280 Design), only the left side, as viewed from the shaft end, of the drain port is machined.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 56.

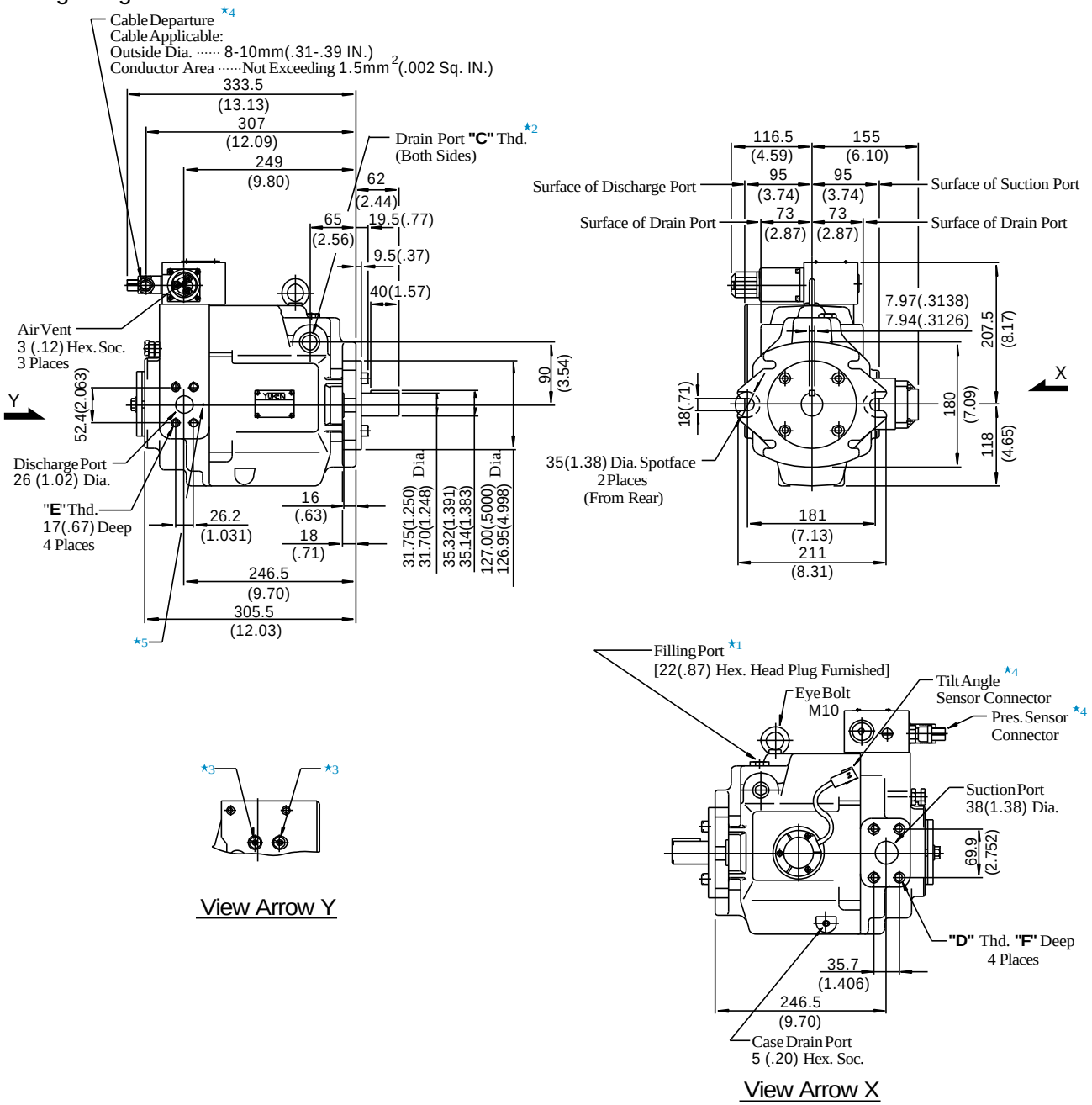
| Model Numbers | "C" Thd. | "D" Thd. | E mm (IN.) |
|---|---|---|---|
| A56-FR04E*-02-42 | Rc3/4 | M10 | 19 (.75) |
| A56-FR04E*-02-4280 | 3/4BSP.F | | |
| A56-FR04E*-02-4290 | 3/4 NPT | 7/16-14 UNC | 20 (.79) |

DIMENSIONS IN MILLIMETRES (INCHES)

### ● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model. Refer to page 20 for the dimensions of mounting bracket.

## Flange Mtg. : A70-FR04E**-60-60/6080/6090




★1. Install the pump so that the "Filling Port" is at the top.
★2. Use either port of two drain ports at your option. Keep the remaining port plugged. Note that on the European design standard (6080 Design), only the left side, as viewed from the shaft end, of the drain port is machined.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 56.
★5. If you do not use the special sequence valve, plug the port (FP-SC-1/32)

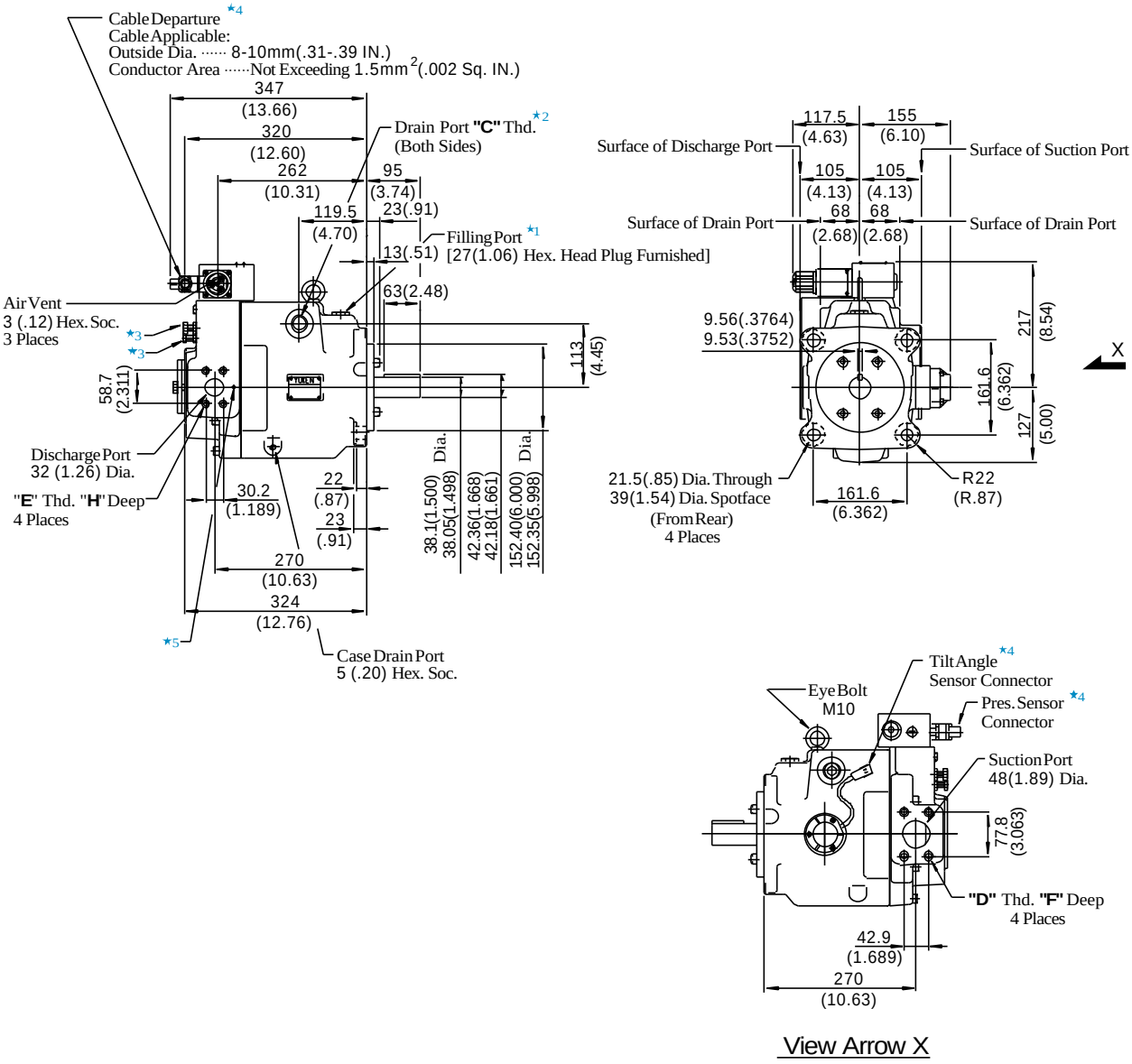
| Model Numbers | "C" Thd. | "D" Thd. | "E" Thd. | Dimensions mm (IN.) F |
|---|---|---|---|---|
| A70-FR04E**-60-60 | Rc3/4 | M12 | M10 | 19 (.75) |
| A70-FR04E**-60- | 3/4 BSP.F | | | |
| 6080 | 3/4 NPT | 1/2-13 UNC | 3/8-16 UNC | 21 (.83) |

DIMENSIONS IN MILLIMETRES (INCHES)

### ● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model. Refer to page 21 for the dimensions of mounting bracket.

## Flange Mtg. : A90-FR04E**-60-60/6080/6090




View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.
★2. Use either port of two drain ports at your option. Keep the remaining ports plugged. Note that on the European design standard (6080 Design), only the left side, as viewed from the shaft end, of the drain port is machined.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 56.
★5. If you do not use the special sequence valve, plug the port (FP-SC-1/32)

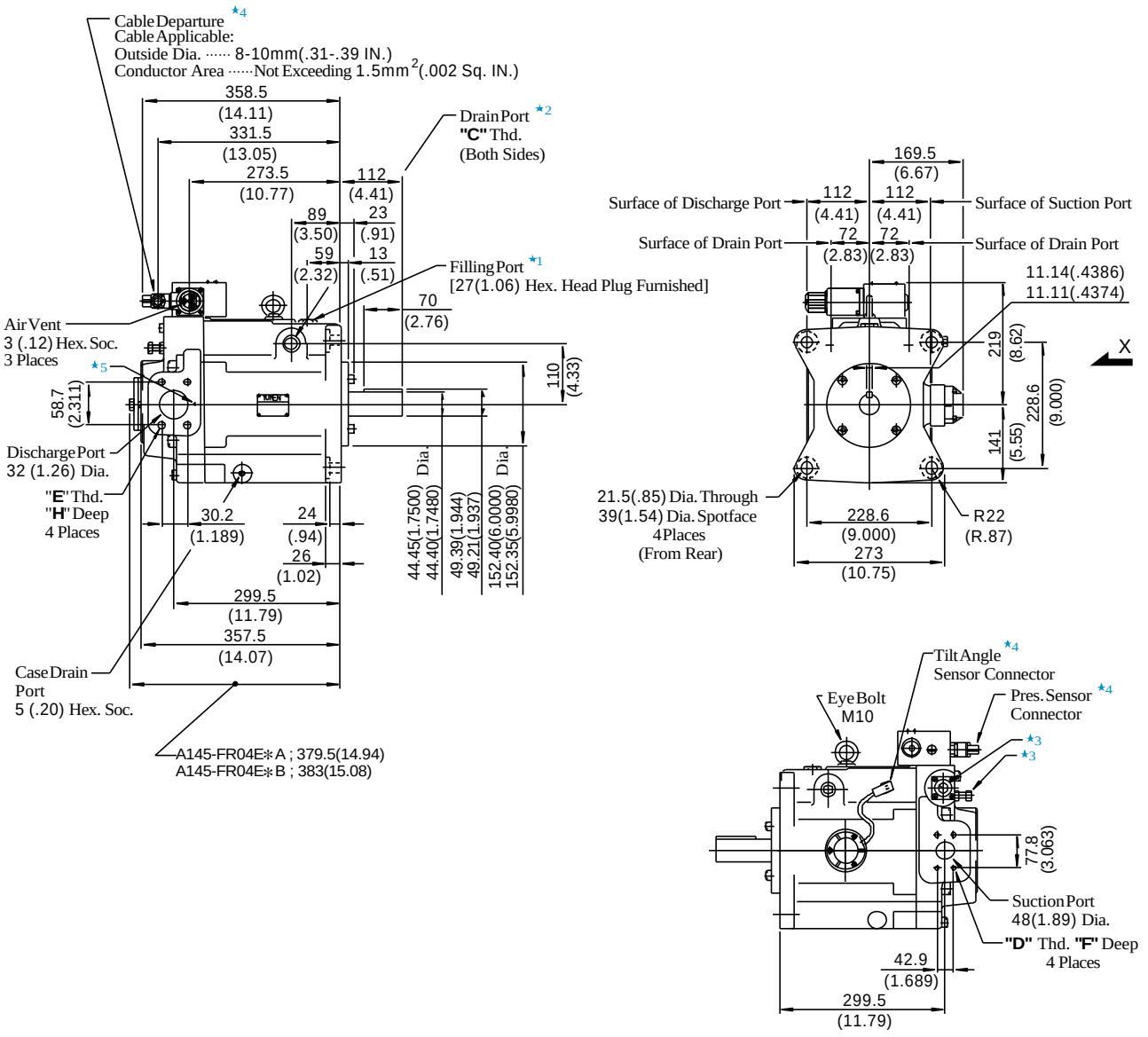
| Model Numbers | "C" Thd. | "D" Thd. | "E" Thd. | Dimensions mm (IN.) | |
|---|---|---|---|---|---|
| | | | | F | H |
| A90-FR04E**-60-60 | Rc3/4 | M12 | M10 | 19 (.75) | 19 (.75) |
| A90-FR04E**-60-6080 | 3/4BSP.F | | | | |
| A90-FR04E**-60-6090 | 3/4 NPT | 1/2-13 UNC | 7/16-14 UNC | 21 (.83) | 20 (.79) |

DIMENSIONS IN MILLIMETRES (INCHES)

### ● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model. Refer to page 22 for the dimensions of mounting bracket.

## Flange Mtg. : A145-FR04E**-60-60/6080/6090




View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.
★2. Use either port of two drain ports at your option. Keep the remaining port plugged. Note that on the European design standard (6080 Design), only the left side, as viewed from the shaft end, of the drain port is machined.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 56.
★5. If you do not use the special sequence valve, plug the port (FP-SC-1/32)

| Model Numbers | "C" Thd. | "D" Thd. | "E" Thd. | Dimensions mm (IN.) | |
|---|---|---|---|---|---|
| | | | | F | H |
| A145-FR04E**-60-60 | Rc3/4 | M12 | M10 | 19 (.75) | 19 (.75) |
| A145-FR04E**-60-6080 | 3/4BSP.F | | | | |
| A145-FR04E**-60-6090 | 3/4 NPT | 1/2-13 UNC | 7/16-14 UNC | 21 (.83) | 20 (.79) |

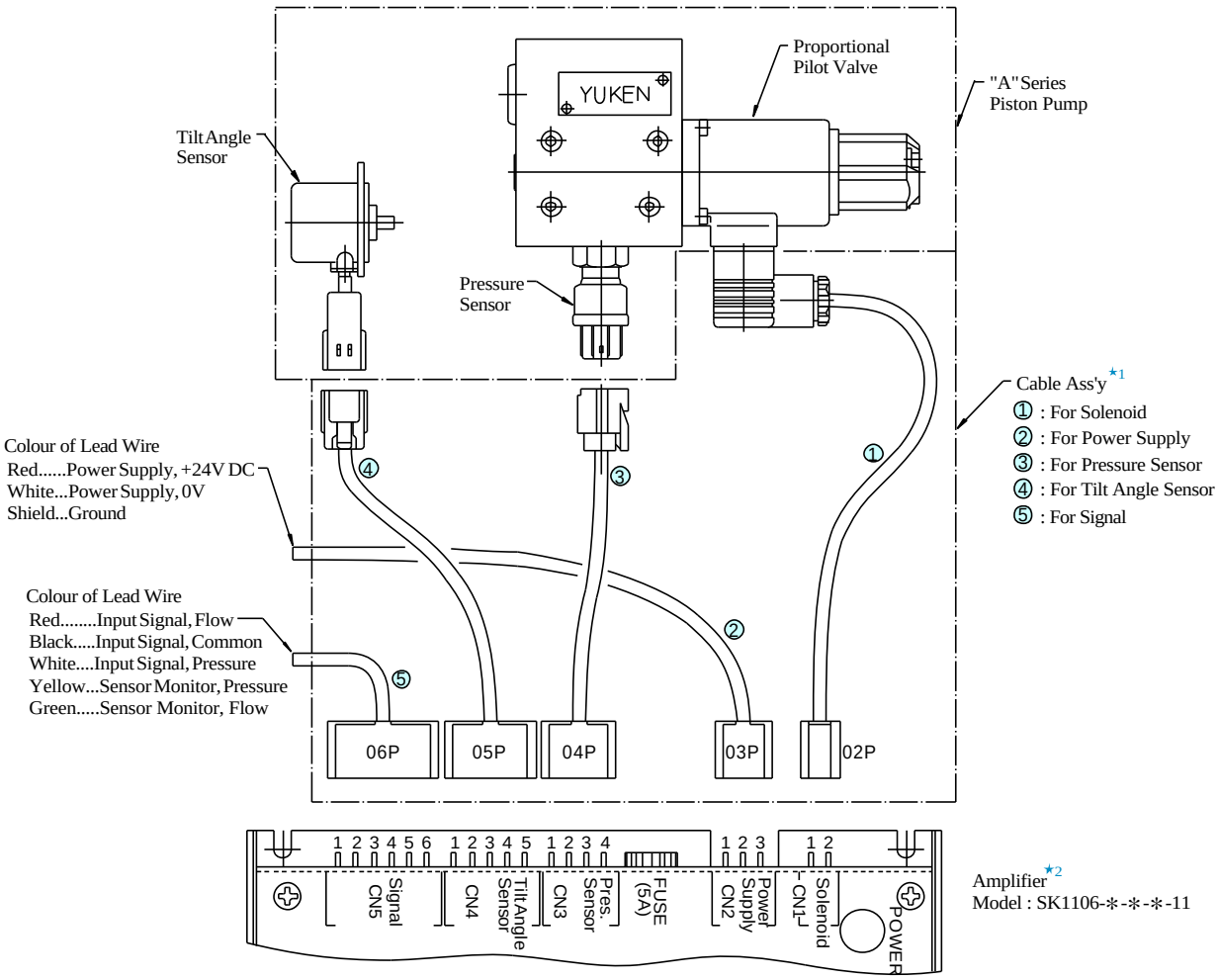
DIMENSIONS IN MILLIMETRES (INCHES)

### ● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model. Refer to page 23 for the dimensions of mounting bracket.

## Cable connection between pump and amplifier

The cable connections between the proportional pilot valve and the sensor of the pump and the attached amplifier (SK1106) are shown below.




★1. Cable assemblies are available. When ordering, specify the cable ass'y model numbers from the table below.

| Name of Cable Ass'y | Cable Ass'y Model Numbers | | |
|---|---|---|---|
| | Approx. Length of Cable mm(ft.) | | |
| | 2000 (6.6) | 5000 (16.4) | 10000 (32.8) |
| ① For Solenoid | SK1112-S-2-10 | SK1112-S-5-10 | SK1112-S-10-10 |
| ② For Power Supply | SK1112-V-2-10 | SK1112-V-5-10 | SK1112-V-10-10 |
| ③ For Pressure Sensor | SK1112-P-2-10 | SK1112-P-5-10 | SK1112-P-10-10 |
| ④ For Tilt Angle Sensor | SK1112-Q-2-10 | SK1112-Q-5-10 | SK1112-Q-10-10 |
| ⑤ For Signal | SK1112-C-2-10 | SK1112-C-5-10 | SK1112-C-10-10 |

★2. For the details of amplifier, see the follwing page.

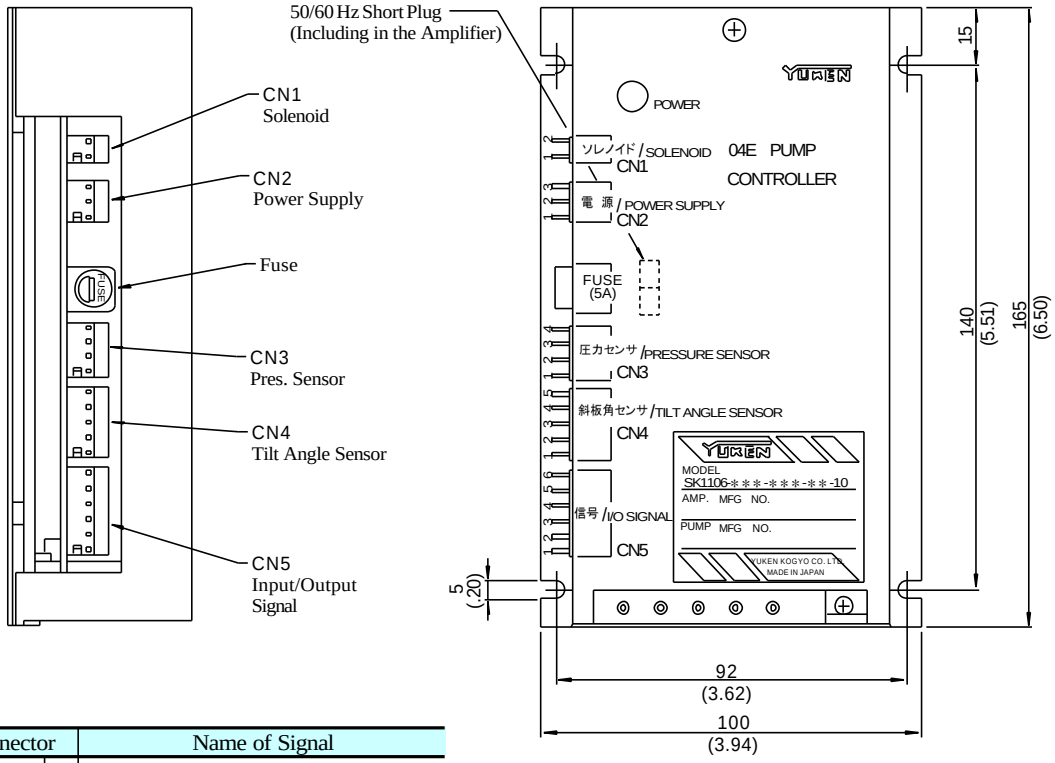
## Specifications

| Description \ Model No. | SK1106-∗-∗-∗-10 |
|---|---|
| Applicable Coil Resistance | 10 Ω |
| Input Impedance | 10 kΩ |
| Power Supply | 24 V DC (21 - 28 V Included Ripple) |
| Power Input (Max.) | 30W |
| Input Signal | Max. Flow/5V, Specified Pres./5V |
| Output Signal for Sensor Monitor | 5V/Max. Flow, 5V/Specifed Pres. |
| Ambient Temperature | 0 - 50 ℃ (32 - 122 ℉) |
| Approx. Mass | 450 g (1.0 lbs.) |

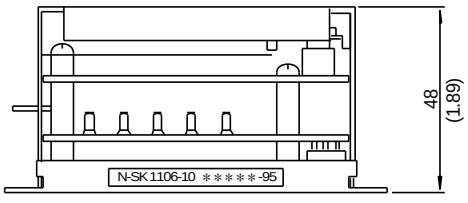
### List of Amplifier Model No.

| Pump Model Numbers | Amplifier Model Numbers |
|---|---|
| A16-∗R04E★-06-42∗ | SK1106-★-16-06-10 |
| A22-∗R04E★-11-42∗ | SK1106-★-22-11-10 |
| A37-∗R04E★-01-42∗ | SK1106-★-37-01-10 |
| A56-∗R04E★-02-42∗ | SK1106-★-56-02-10 |
| A70-∗R04E★∗-60-60∗ | SK1106-★-70-60-10 |
| A90-∗R04E★∗-60-60∗ | SK1106-★-91-60-10 |
| A145-∗R04E★∗-60-60∗ | SK1106-★-145-60-10 |

Note: Fill control pressure (at input signal is 5 V) in section marked★ .




| Connector | | Name of Signal | |
|---|---|---|---|
| CN1 Solenoid | 1 | Output to pilot valve solenoid | |
| | 2 | | |
| CN2 Power Supply | 1 | 0 [V] | (0V ) |
| | 2 | +24 [V] | (24V) |
| | 3 | 0 [V] | |
| CN3 Pres. Sensor | 1 | +5 [V] | Power Supply for Sensor |
| | 2 | 0 [V] | |
| | 3 | Input Signal - Sensor | |
| | 4 | 0 [V] | |
| CN4 Tilt Angle Sensor | 1 | +8 [V] | Power Supply for Sensor |
| | 2 | 0 [V] | |
| | 3 | Input Signal - Sensor | |
| | 4 | 0 [V] | |
| | 5 | — | |
| CN5 Input/ Output Signal | 1 | Input Signal - Flow | (Qin) |
| | 2 | Input Signal - Common | (COM) |
| | 3 | Input Signal - Pres. | (Pin) |
| | 4 | Output Signal - Sensor Monitor P | (SMP) |
| | 5 | Output Signal - Sensor Monitor Q | (SMQ) |
| | 6 | 0 [V] | |




DIMENSIONS IN MILLIMETRES (INCHES)