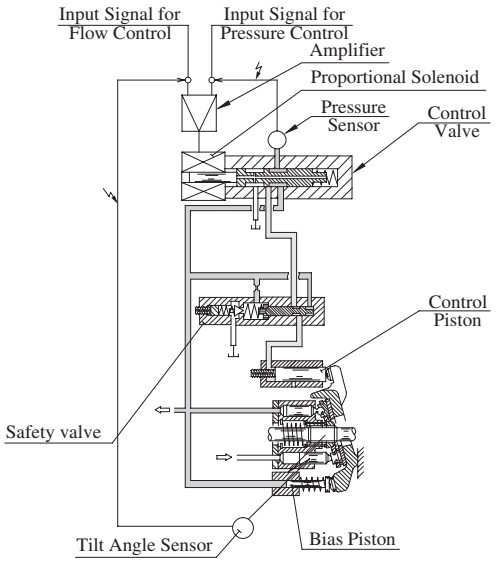
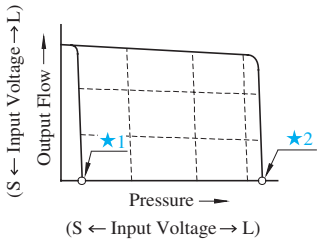
"A" Series Variable Displacement Piston Pumps – Single Pump, Electro-Hydraulic Proportional pressure & Flow Control Type



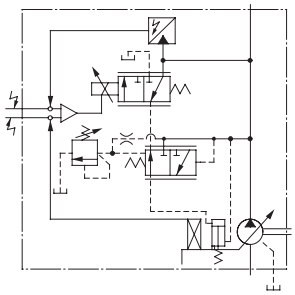
Performance Characteristics



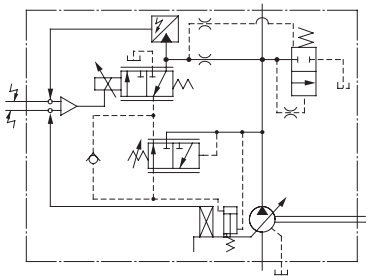
★1. Unloading pressure when input signal is 0 V.

★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 specify within the range of maximum operating pressure	**M:** MPa **P:** PSI	—	**06**	**42**	Refer to ★4
A22 (22.2 cm³/rev)							**11**	**42**	
A37 (36.9 cm³/rev)						**None** ★2	**01**	**42**	
A56 (56.2 cm³/rev)							**02**	**42**	
A70 (70.0 cm³/rev)	**L:** Foot Mtg.	**R:** Clockwise (Normal) ★1				**A:** ★2 **B:** ★2	**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. These pumps, except A16 and A22 types, can be connected to outboard pumps.
- A37/A56 type (outboard pump connection symbol: **None**): spigot diameter: 82.55 mm (3.250 in.) (A16, A22, and PV2R1).
- A70/A90/A145 type (outboard pump connection symbol: **"A"**): spigot diameter:82.55 mm (3.250 in.) (A16, A22, and PV2R1).
- A70/A90/A145 type (outboard pump connection symbol: **"B"**): spigot diameter:101.6 mm (4.000 in.)(A37 and PV2R2).

★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

• Consult Yuken when "N. American Design Standard" is required.

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 Pressure 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		1 % or less						
	Repeatability		1 % or less						
	Input Signal		Max. Flow / 5 V DC						
Pressure Control	Min. Adjustment Pressure	MPa (PSI)	0.7 (100)						
	Hysteresis		1 % or less						
	Repeatability		1 % or less						
	Input Signal		Specified Control Pressure / 5 V DC						
Coil Resistance		[@ 20°C (68 °F)]	10						
Input Impedance			Flow Control : 10 kΩ Pressure Control : 10 kΩ						
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		°C (°F)	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 33 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 34.

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.

Outboard Pumps

A37 to A145 type pumps, except A16 and A22, can be used as double pumps, by connecting an outboard pump on the cover side. See the table below for details.

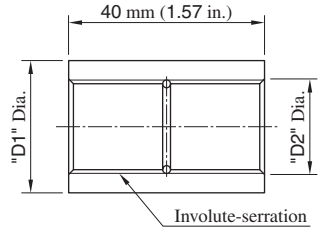
Connectable Outboard Pump

Outboard Pump Connection Symbol		Spigot Diameter for Connecting an Outboard Pump mm (in.)	Connectable Pump★
A37/A56	None	82.55 (2.500)	A16, A22, PV2R1
	"A"		
A70/A90/A145	"B"	101.6 (4.000)	A37, PV2R2

★ Connectable pumps shafts are involute-serrated design, not the standard parallel key slot design. For details, including pump dimensions and model numbers, consult Yuken.

Coupling

Please use assembly part number when ordering coupling assemblies for shaft connections to outboard pumps.



Outboard Pump Connection Symbol		Part Number of Coupling Ass'y	Dimensions mm (in.)		Serration Size (Nominal Dia.× No. of Teeth× Mojule)
			"D_1"	"D_2"	
A37/A56	None	098-PK412588-6	27 (1.06)	19.5 (.77)	18.75×24×0.75
	"A"				
A70/A90/A145	"B"	098-PK412623-1	36 (1.42)	26 (1.02)	25×24×1

Selecting an Outboard Pump Type

The maximum torque of outboard pumps is limited by shaft and coupling assembly strength. When determining the outboard pump type, the value of the displacement times the pressure for a particular pump should not exceed the value shown in the table below.

Pump Model No.	① Inboard Pump and Outboard Pump $(q_1\times P_1)+(q_2\times P_2)$	② Outboard Pump $q_2\times P_2$	
		Outboard pump connection symbol "None"/"A"	"B"
A37	900(7963) and less	519(4592) and less	—
A56	1742(15413) and less		
A70	2408(21305) and less		935(8272) and less
A90	4348(38470) and less		977(8644) and less
A145	4739(41930) and less		951(8414) and less

- q_1, q_2 : Displacement cm^3/rev (cu.in./rev)
  P_1, P_2 : Pressure MPa (PSI)
- For selection of the appropriate pump, both values, ① and ②, should be satisfied.

Attachment

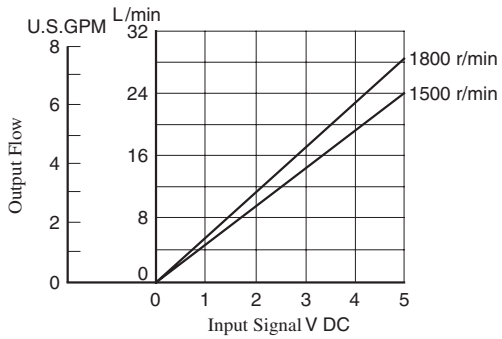
Amplifier

Pump Model Numbers	Amplifier Model Numbers	Control Pressure MPa (PSI)
A16-∗R04E★-06-42	SK1106-★-16-06-10	– 14.7 (– 2132)
	SK1106-★-16-06-1001	14.7 – 19.6 (2132 – 2842)
	SK1106-★-16-06-1002	19.6 – 21.0 (2842 – 3045)
A22-∗R04E★-11-42	SK1106-★-22-11-10	– 14.7 (– 2132)
	SK1106-★-22-11-1001	14.7 – 16.0 (2132 – 2320)
A37-∗R04E★-60-42	SK1106-★-37-60-10	– 14.7 (– 2132)
	SK1106-★-37-60-1001	14.7 – 19.6 (2132 – 2842)
	SK1106-★-37-60-1002	19.6 – 21.0 (2842 – 3045)
A56-∗R04E★-60-42	SK1106-★-56-60-10	– 14.7 (– 2132)
	SK1106-★-56-60-1001	14.7 – 19.6 (2132 – 2842)
	SK1106-★-56-60-1002	19.6 – 21.0 (2842 – 3045)
A70-∗R04E★∗-60-60	SK1106-★-70-60-10	– 14.7 (– 2132)
	SK1106-★-70-60-1001	14.7 – 19.6 (2132 – 2842)
	SK1106-★-70-60-1002	19.6 – 22.6 (2842 – 3277)
	SK1106-★-70-60-1003	22.6 – (3277 –)
A90-∗R04E★∗-60-60	SK1106-★-91-60-10	– 14.7 (– 2132)
	SK1106-★-91-60-1001	14.7 – 19.6 (2132 – 2842)
	SK1106-★-91-60-1002	19.6 – 22.6 (2842 – 3277)
	SK1106-★-91-60-1003	22.6 – (3277 –)
A145-∗R04E★∗-60-60	SK1106-★-145-60-10	– 14.7 (– 2132)
	SK1106-★-145-60-1001	14.7 – 19.6 (2132 – 2842)
	SK1106-★-145-60-1002	19.6 – 22.6 (2842 – 3277)
	SK1106-★-145-60-1003	22.6 – (3277 –)

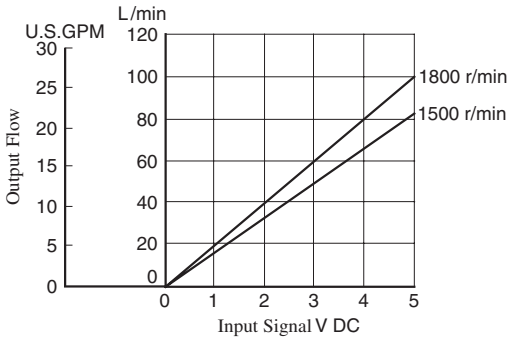
Note 1. The symbol "★", shown with pump and amplifier model numbers, is the control pressure at input signal of 5 V.
2. Cable for pump-amplifier connection is not included. See Page 85 for details on ordering cables.

Output Flow vs. Input Signal

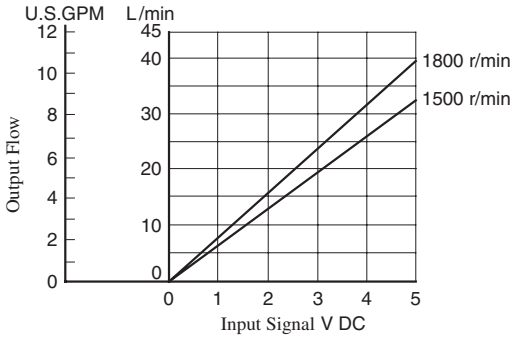
A16



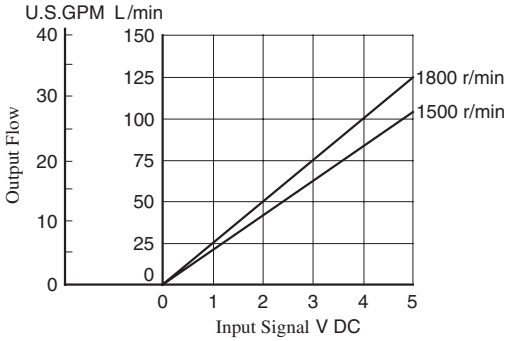
A56



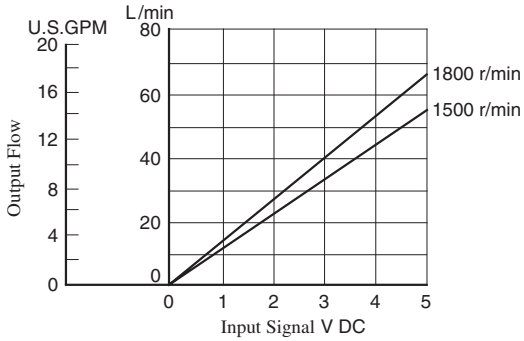
A22



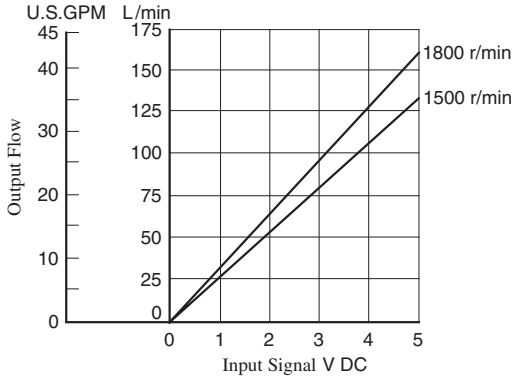
A70



A37

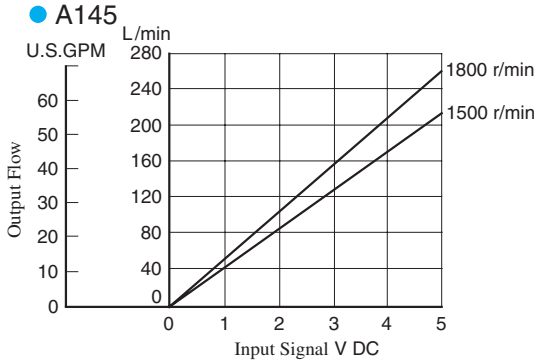


A90

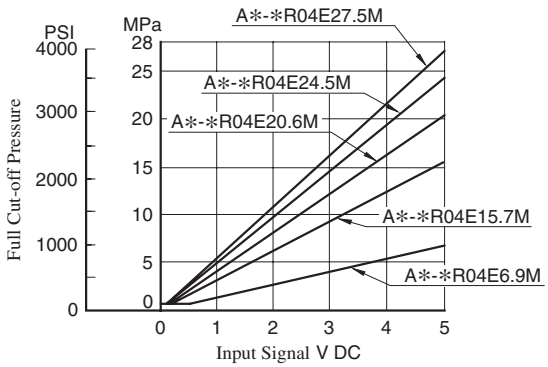


Note: Pump characteristics at 1800 r/min is the same as those at 1500 r/min where frequency is compensated.
(Refer to page 75.)

A145

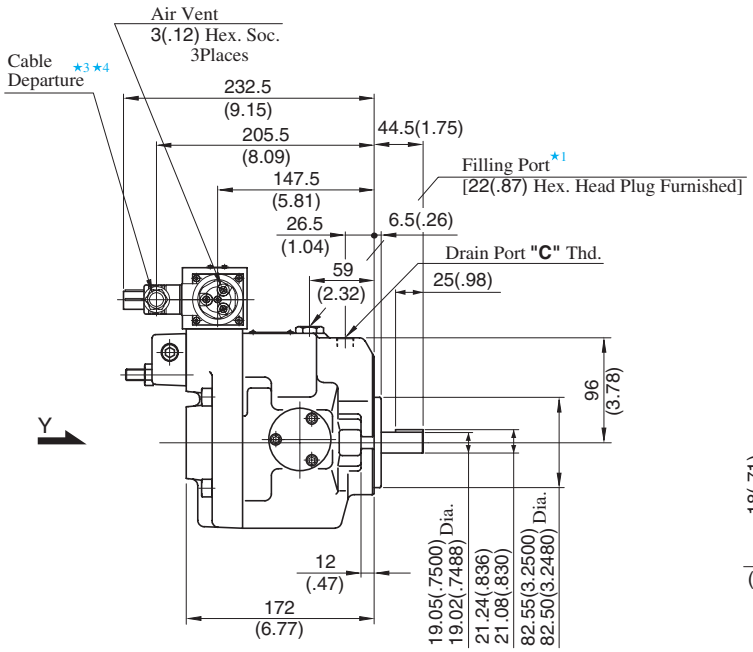


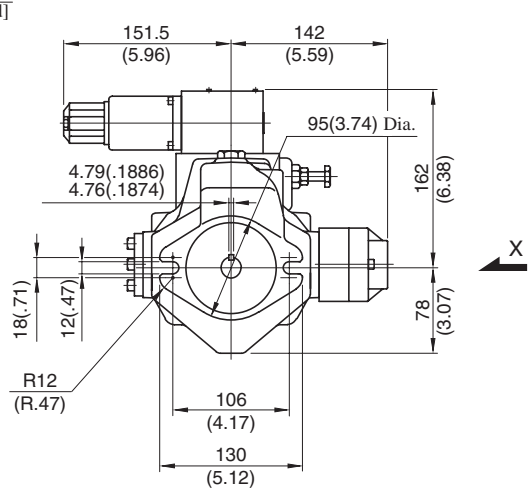
Full Cut-off Pres. vs. Input Signal

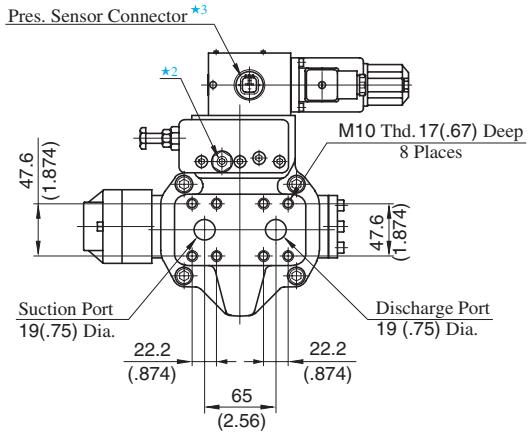


Refer to page 37 to 43 for performance characteristics of pressure compensator type excluding characteristics appeared on this catalogue.

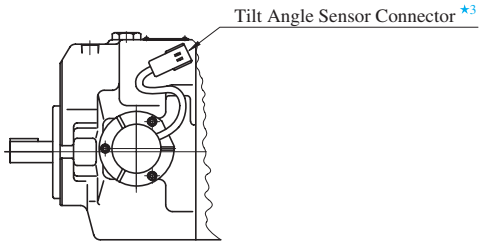
Flange Mtg. : A16-FR04E∗-06-42/4280
A22-FR04E∗-11-42/4280







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 85.
★4. Cable Applicable:
Outside Dia. ..... 8-10mm(.31-.39 IN.)
Conductor Area..... Not Exceeding 1.5mm ^{2}(.0023 Sq. IN.)

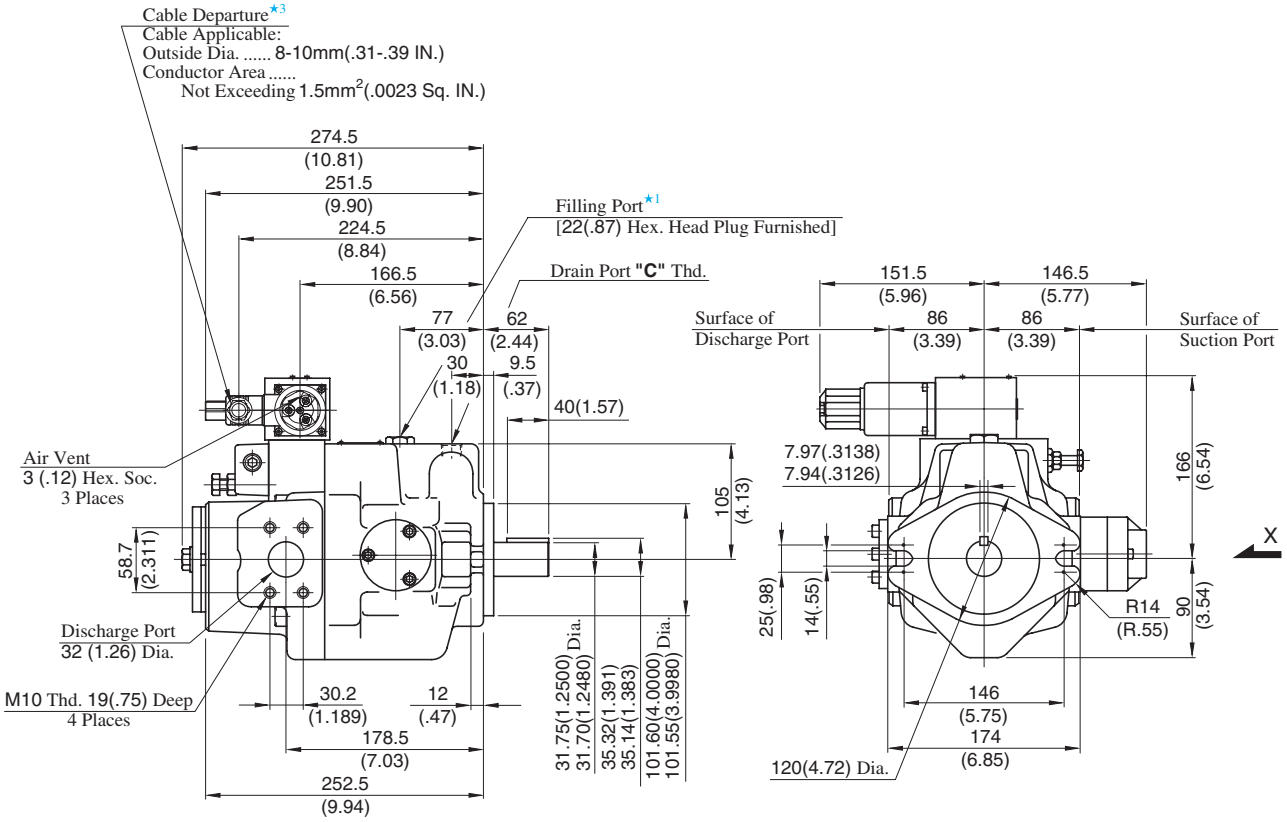
Model Numbers	"C" Thd.
A16/A22-FR04E∗-∗-42	Rc 3/8
A16/A22-FR04E∗-∗-4280	3/8 BSP.F

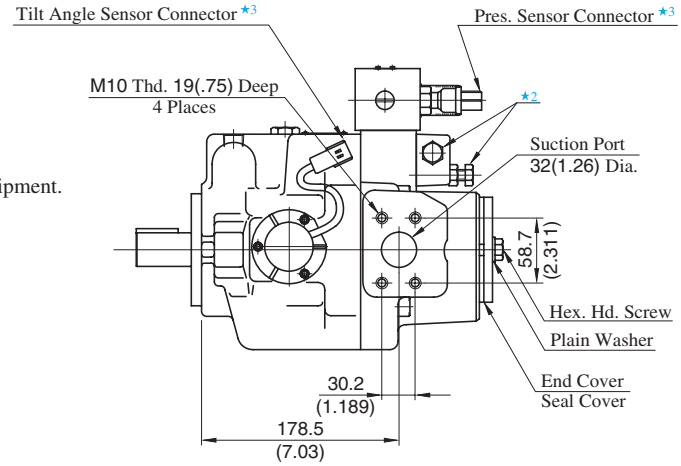
DIMENSIONS IN MILLIMETRES (INCHES)

● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model.
Refer to page 45 for the dimensions of mounting bracket.

Flange Mtg. : A37-FR04E✻-01-42/4280





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 85.

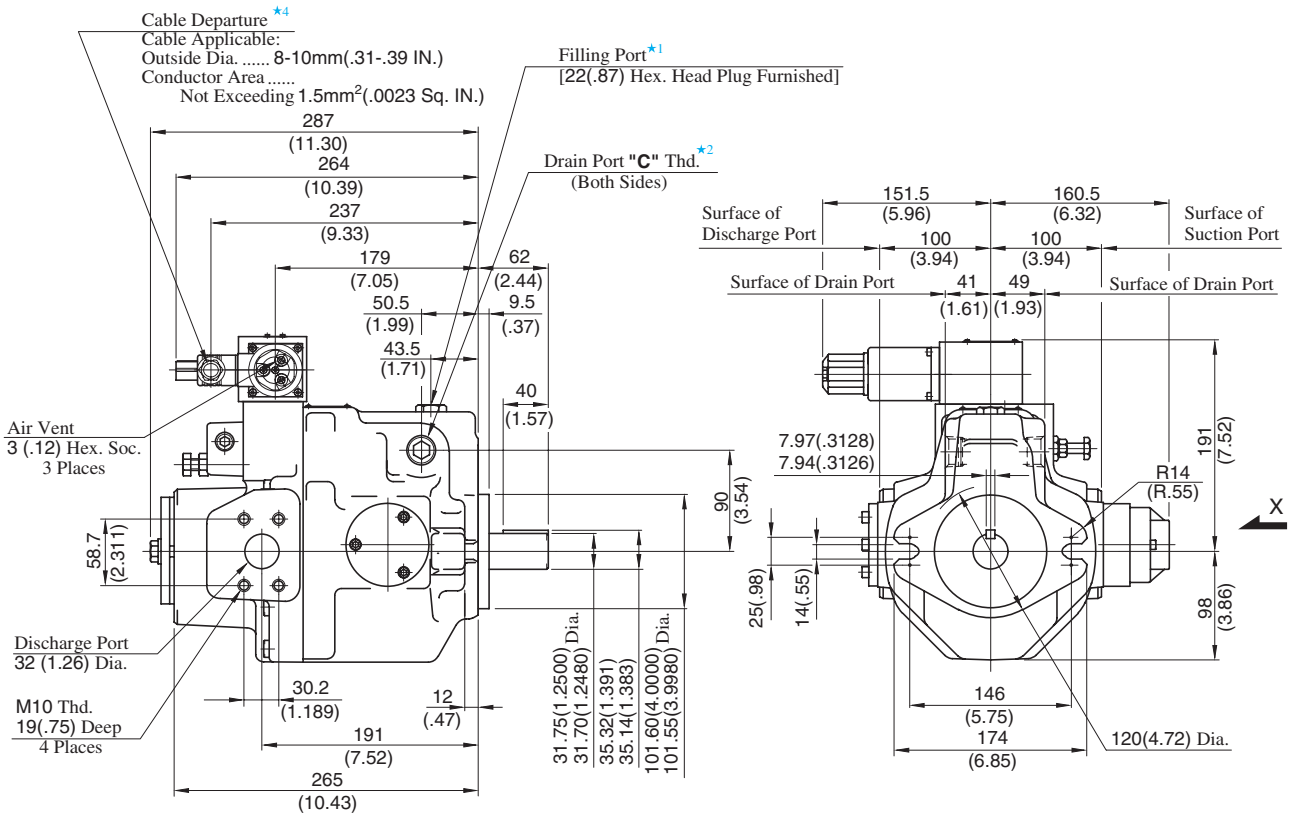
Model Numbers	"C" Thd.
A37-FR04E✻-01-42	Rc 1/2
A37-FR04E✻-01-4280	1/2 BSP.F

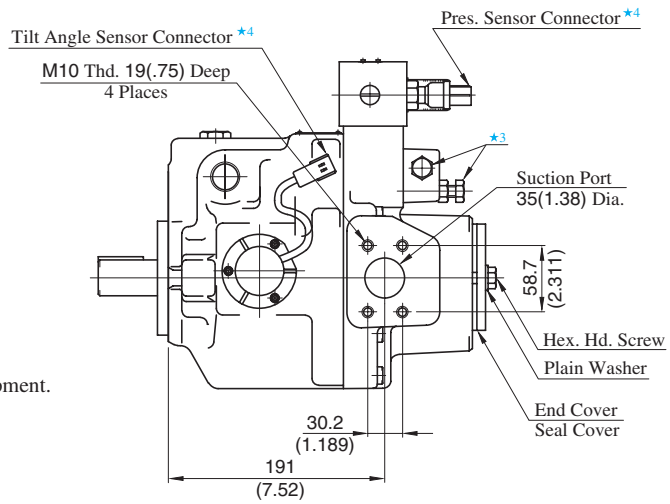
DIMENSIONS IN MILLIMETRES (INCHES)

● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model.
Refer to page 46 for the dimensions of mounting bracket.

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





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.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 85.

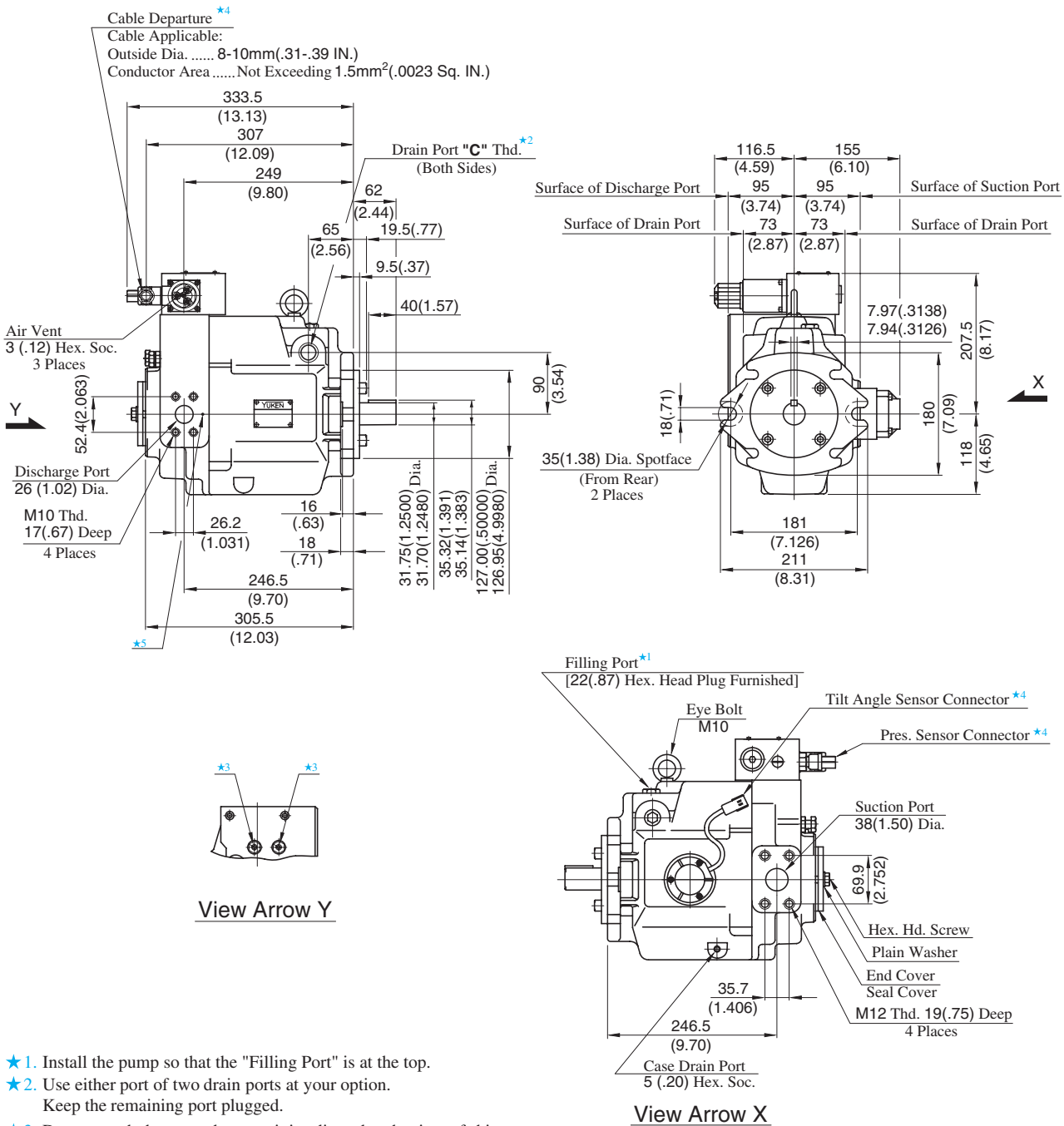
Model Numbers	"C" Thd.
A56-FR04E*-02-42	Rc 3/4
A56-FR04E*-02-4280	3/4 BSP.F

DIMENSIONS IN MILLIMETRES (INCHES)

● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model.
Refer to page 47 for the dimensions of mounting bracket.

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



★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.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 85.
★5. If you do not use the special sequence valve, plug the port (FP-SC-1/32).

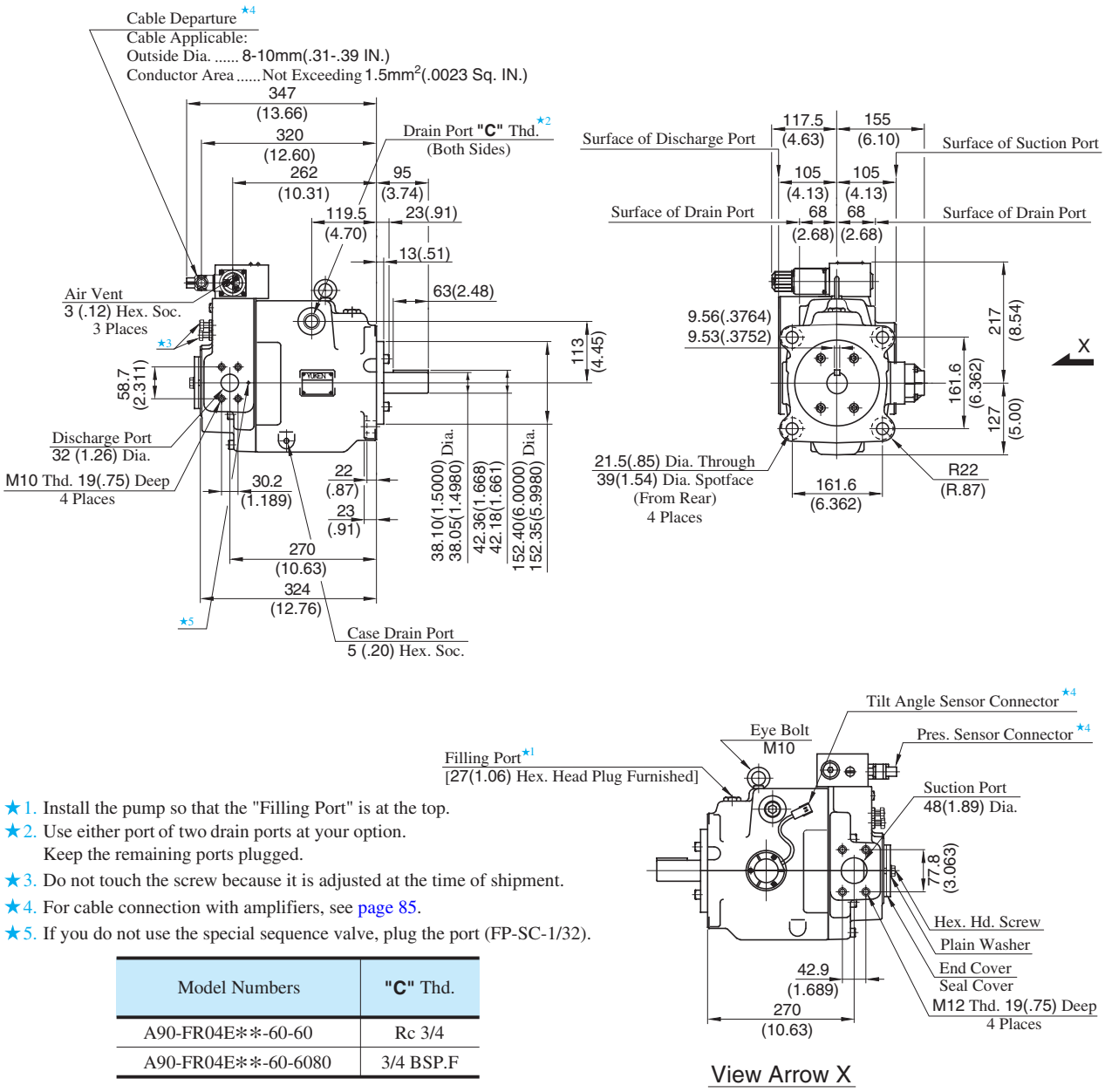
Model Numbers	"C" Thd.
A70-FR04E**-60-60	Rc 3/4
A70-FR04E**-60-6080	3/4 BSP.F

DIMENSIONS IN MILLIMETRES (INCHES)

● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model.
Refer to page 48 for the dimensions of mounting bracket.

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



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.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 85.
★5. If you do not use the special sequence valve, plug the port (FP-SC-1/32).

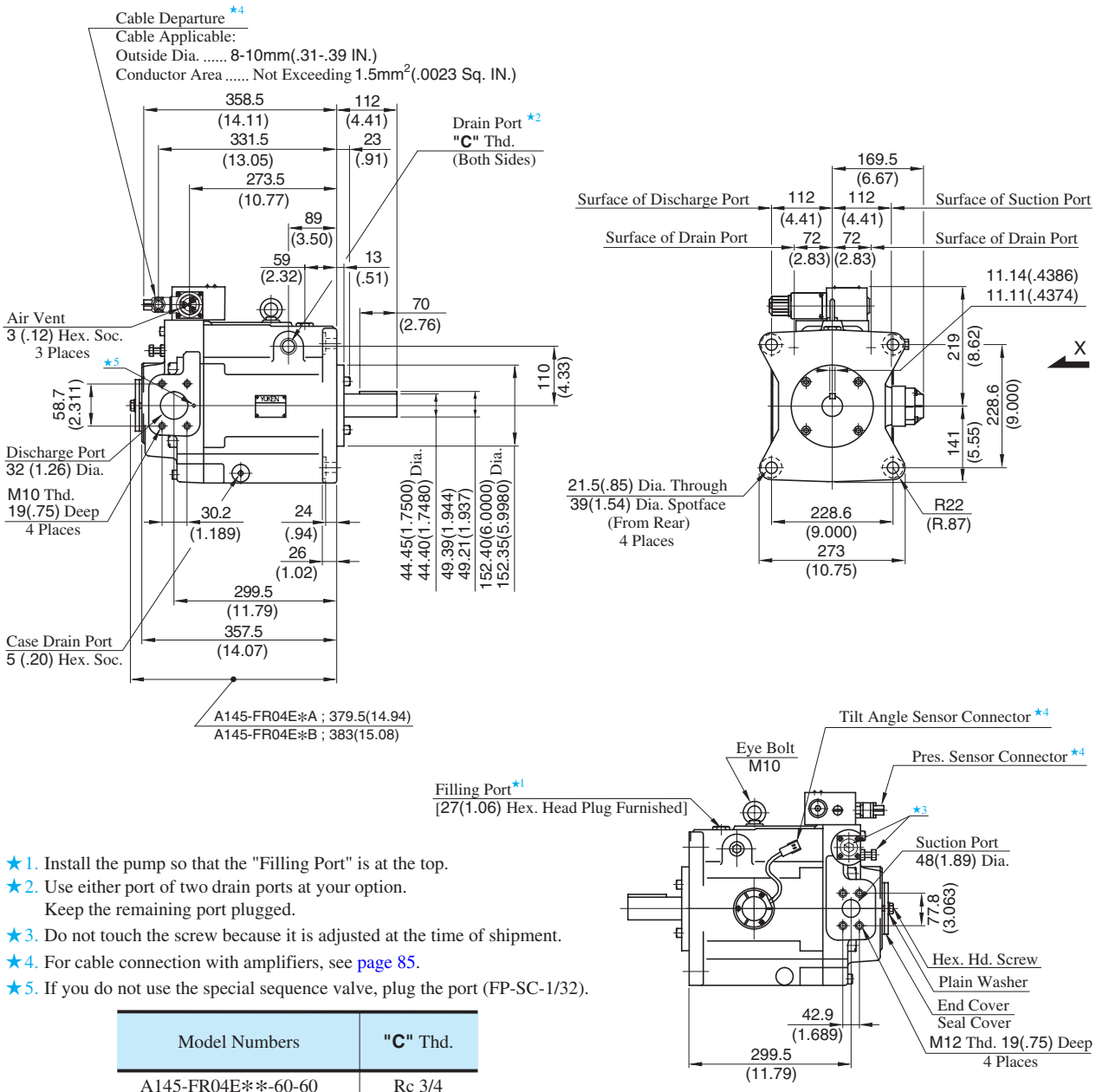
Model Numbers	"C" Thd.
A90-FR04E**-60-60	Rc 3/4
A90-FR04E**-60-6080	3/4 BSP.F

DIMENSIONS IN MILLIMETRES (INCHES)

● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model.
Refer to page 49 for the dimensions of mounting bracket.

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



★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.
★3. Do not touch the screw because it is adjusted at the time of shipment.
★4. For cable connection with amplifiers, see page 85.
★5. If you do not use the special sequence valve, plug the port (FP-SC-1/32).

Model Numbers	"C" Thd.
A145-FR04E**-60-60	Rc 3/4
A145-FR04E**-60-6080	3/4 BSP.F

DIMENSIONS IN MILLIMETRES (INCHES)

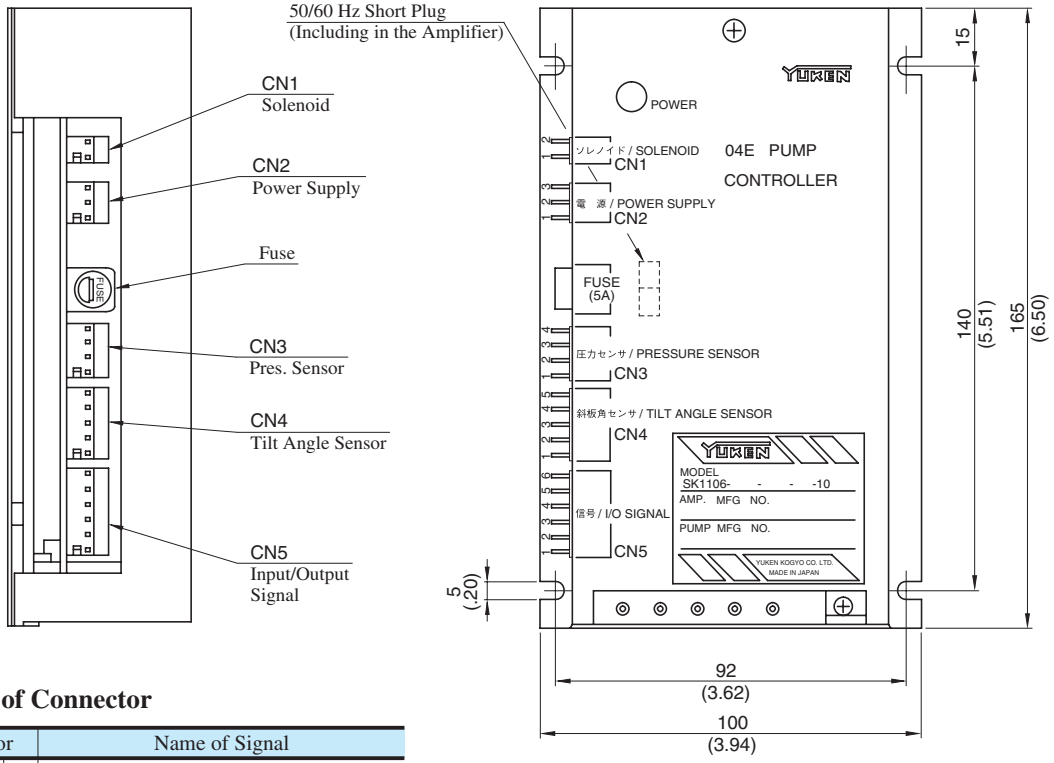
● Foot Mounting Type

Mounting bracket is common to that of pressure compensator model.
Refer to page 50 for the dimensions of mounting bracket.

Amplifiers for Electro-Hydraulic Proportional Pressure & Flow Control Type Pumps (SK1106-★-∗-∗-10∗∗)

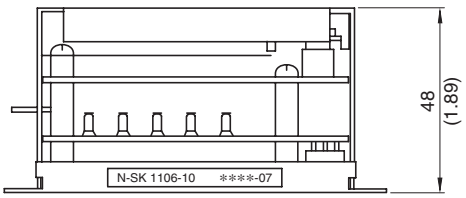
Specifications

Description \ Model No.	SK1106-★-∗-∗-10∗∗
Applicable Coil Resistance	10 Ω [at 20 °C (68 °F)]
Input Impedance	10 kΩ (PIN, QIN)
Power Supply	24 V DC (21 - 28 V Included Ripple)
Power Input (Max.)	30 W
Input Signal	Max. Flow/5V (QIN), Specified Pres./5V (PIN)
Output Signal for Sensor Monitor	5V/Max. Flow (SMQ), 5V/Specified Pres. (SMP)
Ambient Temperature	0 - 50 °C (32 - 122 °F)
Approx. Mass	450 g (1.0 lbs.)



Detail of Connector

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]	

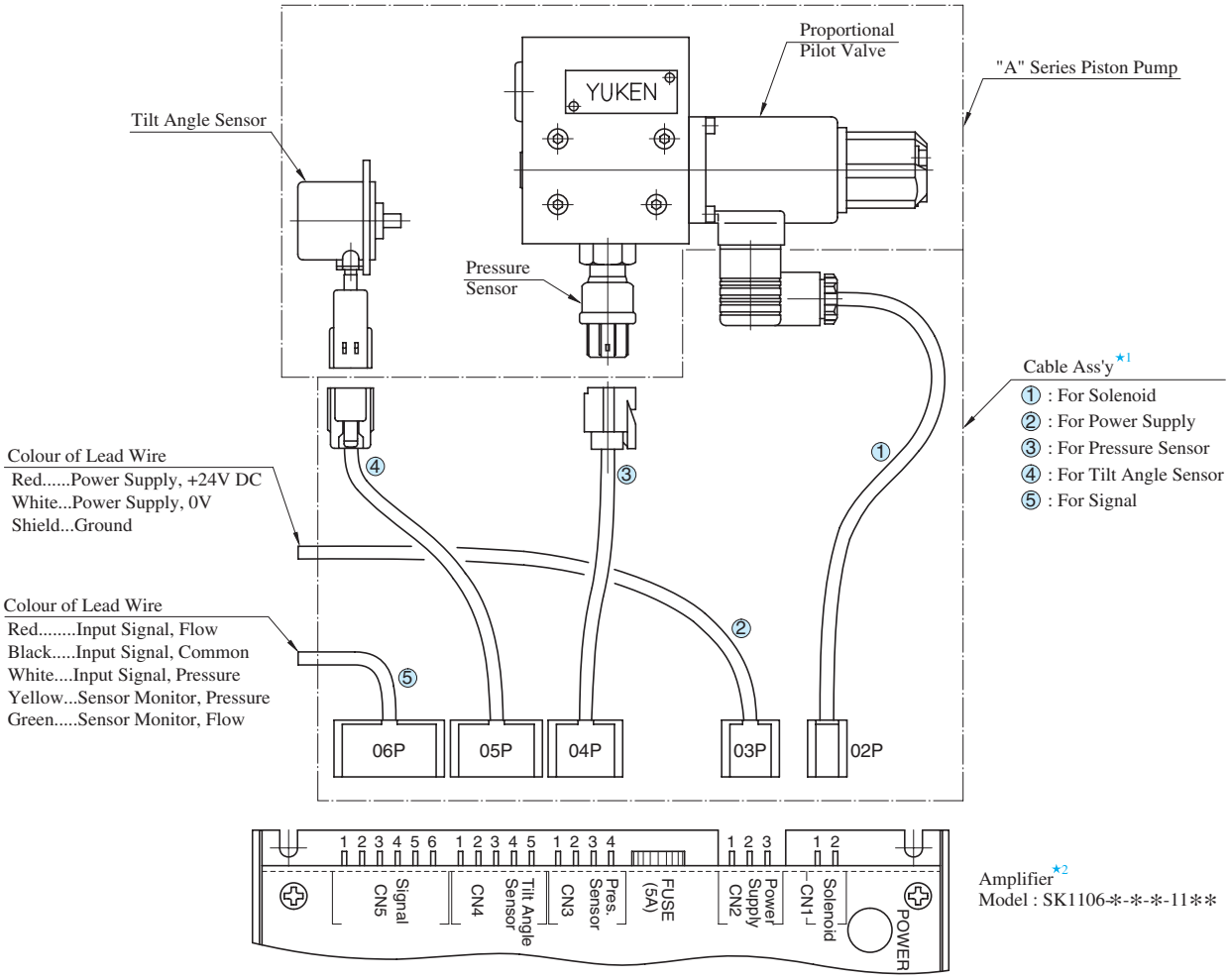


DIMENSIONS IN MILLIMETRES (INCHES)

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.

The cable assemblies are not included in the pump assembly. Purchase separately with model number described in the below table if required.



★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 previous page.