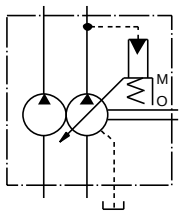
Graphic Symbol



Model Number Designation

A16R1	-F	R	Inboard Pump (Driven End)		Outboard Pump			K	-32	*
			01	B	-23	A	A			
Series Number	Mounting	Direction of Rotation	Control Type	Pres. Adj. Range MPa(PSI)	Nominal Displacement cm^3/rev	Discharge Port Position	Suction Port Position	Shaft Extension	Design Number	Design Std.
A16R1	F: Flange Mtg. L: Foot Mtg.	(Viewed from Shaft End) R: ★1 Clockwise (Normal)	01: Pressure Compensator Type	B: 1.2 - 7 (170 - 1020) C: 1020) H: 1.2 - 16 (170 -	6, 8 10, 12 14, 17 19, 23 25, 31	(Viewed from Shaft End) A: Up	A: Up	K: Keyed Shaft	32	Refer to ★2
A22R1				B: 1.2 - 7 (170 - 1020) C: 1.2 - 16 (170 -					32	
A37R1				1.2 - 7 (170 - 1020) B: 1.2 - 16 (170 - C: 2320) H: 1.2 - 21 (170 - 3050)					32	
A56R1									32	
A70R1				1.2 - 7 (170 - 1020) B: 1.5 - 16 (220 - C: 2320) H: 1.8 - 21 (260 - K: 3050) 2.0 - 28 (290 - 4060)				None: Keyed Shaft	60	
A90R1									60	
A145R1									60	
A70R2				1.2 - 7 (170 - 1020) B: 1.5 - 16 (220 - C: 2320) H: 1.8 - 21 (260 - K: 3050) 2.0 - 28 (290 - 4060)	41, 47 53, 59 65				60	
A90R2									60	
A145R2									60	

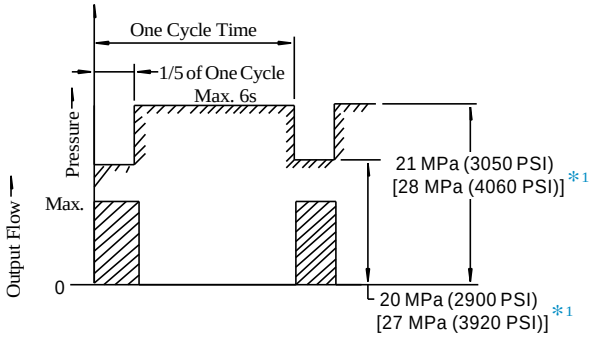
★1. Available to supply pump with anti-clockwise rotation. Consult Yuken for details.
★2. Design Standards: None..... Japanese Standard "JIS"
80..... European Design Standard
90..... N. American Design Standard

Specifications

Model Numbers		Geometric Displacement cm^3/rev (cu.in./rev)	Operating Pressure MPa (PSI)		Shaft Speed Range r/min		Approx. Mass kg (lbs.)	
			Rated ★2	Intermittent ★1	Max.	Min.	Flange Mtg.	Foot Mtg.
A16R1-＊R01＊-＊AAK-32＊	Outboard Pump	Refer to the following page			1800	750	28.8 (63.5)	31.0 (68.4)
	Inboard Pump	15.8 (.964)	16 (2320)	21 (3050)				
A22R1-＊R01＊-＊AAK-32＊	Outboard Pump	Refer to the following page			1800	750	28.8 (63.5)	31.0 (68.4)
	Inboard Pump	22.2 (1.355)	16 (2320)	16 (2320)				
A37R1-＊R01＊-＊AAK-32＊	Outboard Pump	Refer to the following page			1800	750	39 (86.0)	43.3 (95.5)
	Inboard Pump	36.9 (2.25)	16 (2320)	21 (3050)				
A56R1-＊R01＊-＊AAK-32＊	Outboard Pump	Refer to the following page			1800	750	47 (104)	51.3 (113)
	Inboard Pump	56.2 (3.43)	16 (2320)	21 (3050)				
A70R1-＊R01＊-＊AA-60＊ ★3	Outboard Pump	Refer to the following page			1800	750	66 (146)	78 (172)
	Inboard Pump	70.0 (4.27)	25 (3630)	28 (4060)				
A90R1-＊R01＊-＊AA-60＊ ★3	Outboard Pump	Refer to the following page			1800	750	82 (181)	105 (232)
	Inboard Pump	91.0 (5.55)	25 (3630)	28 (4060)				
A145R1-＊R01＊-＊AA-60＊ ★3	Outboard Pump	Refer to the following page			1800	750	102 (225)	129 (284)
	Inboard Pump	145 (8.85)	25 (3630)	28 (4060)				
A70R2-＊R01＊-＊AA-60＊ ★3	Outboard Pump	Refer to the following page			1800	600	72.5 (160)	84.5 (186)
	Inboard Pump	70.0 (4.27)	25 (3630)	28 (4060)				
A90R2-＊R01＊-＊AA-60＊ ★3	Outboard Pump	Refer to the following page			1800	600	91.5 (202)	112 (247)
	Inboard Pump	91.0 (5.55)	25 (3630)	28 (4060)				
A145R2-＊R01＊-＊AA-60＊ ★3	Outboard Pump	Refer to the following page			1800	600	112 (247)	137 (302)
	Inboard Pump	145 (8.85)	25 (3630)	28 (4060)				

★1. Whenever setting pressure, make sure the full cut-off pressure never exceeds the maximum intermittent pressure.

★2. Care should be taken in cases of use at a higher pressure than the rated pressure, because operating terms may be restricted. For example, if used as per maximum illustrated operating conditions, intermittent time at maximum flow is restricted to under 1/5 of one cycle time and under 6 seconds simultaneously. Conditions may vary according to the actual working pressure and delivery (inclination angle of the swash plate). Consult factory or Yuken sales representative for further information.



＊1. Applicable only for A70R1/R2, A90R1/R2, A145R1/R2.

★3. The maximum input power of except "A56R1" pump must be restricted, because of the shaft strength. Refer to the following page.

Allowable Input Power

With the pumps listed in the table below, there is a limit to the sum of the input power of the inboard and outboard pumps because of shaft strength.
If both pumps are used for boosting at once, referring to the calculation formulas below, check that the displacements and discharge pressures of both pumps are within the allowable ranges.

$Q1 \cdot P1 + Q2 \cdot P2 \leqq L_M$

- Q1 : Displacement (cm^3/rev), P1 : Discharge Pressure (MPa) } Outboard Pump
- Q2 : Displacement (cm^3/rev), P2 : Discharge Pressure (MPa) } Inboard Pump
- L_M : See the table below

$Q1 \cdot P1 + Q2 \cdot P2 \leqq L_P$

- Q1 : Displacement (cu.in/rev), P1 : Discharge Pressure (PSI) } Outboard Pump
- Q2 : Displacement (cu.in/rev), P2 : Discharge Pressure (PSI) } Inboard Pump
- L_P : See the table below

Model Numbers	L_M	L_P
A16R1/A22R1	523	4627
A37R1	900	7963
A70R1/A70R2	2408	21305
A90R1/A90R2	4348	38470
A145R1/A145R2	4739	41930

Geometric Displacement and Max. Pressure of Outboard Pump

Model Numbers	Geometric Displacement cm^3/rev (cu.in./rev)	Max Pres. MPa (PSI)	
		Anti-Wear Type	R&O Type
A∗R1-∗R01∗-	5.8(.354)	21 ★1 (3050)	16 (2320)
A∗R1-∗R01∗-	8.0(.488)		
A∗R1-∗R01∗-	9.4(.574)	21 (3050)	
A∗R1-∗R01∗-	12.2(.744)		
A∗R1-∗R01∗-	13.7(.836)		
A∗R1-∗R01∗-	16.6(1.013)		
A∗R1-∗R01∗-	18.6(1.135)		
A∗R1-∗R01∗-	22.7(1.385)	17.5 (2540)	
A∗R1-∗R01∗-	25.3(1.544)	15 (2180)	15 (2180)
A∗R1-∗R01∗-	31.0(1.892)	12 (1740)	12 (1740)
A∗R2-∗R01∗-	26.6(1.623)	21 (3050)	14 (2030)
A∗R2-∗R01∗-	33.3(2.03)		
A∗R2-∗R01∗-	41.3(2.52)		
A∗R2-∗R01∗-	47.2(2.88)	20 (2900)	
A∗R2-∗R01∗-	52.5(3.20)	18 (2610)	
A∗R2-∗R01∗-	58.2(3.55)	16 (2320)	
A∗R2-∗R01∗-	64.7(3.95)	14 (2030)	

★ 1. Whn pump is operated pressure more than 16 MPa (2320 PSI), shaft speed should be more than 1450 r/min.

Instructions

Suction Pressure of Outboard Pump

Permissible suction pressure at inlet port of the outboard pump (PV2R) is the range between -20 kPa and +30 kPa (5.9 in. Hg vacuum and +4.3 PSIG).

Suction Piping of Outboard Pump

When the operating speed is less than 1200 r/min, the suction port of the outboard pump (PV2R) should be facing upwards to facilitate oil suction when starting.

When Starting the pump at low speed

maximum viscosity is restricted. Refer to the table below.

Model	Start-up Speed r/min	Max. Viscosity mm^2/s (SSU)
A∗R1	750	100(465)
	950	200(930)
A∗R2	600	100(465)
	950	200 (930)

Performance Characteristics

Performance characteristics of inboard pump refer to relevant page for performance characteristics of "A" series single pumps excluding noise level characteristics.
Performance characteristics of outboard pump refer to "PV2R" series vane pump catalogue (catalogue No. Pub. EC-0118).

Model	Performance Characteristics	
	Inboard Pump	Outboard Pump
A16R1	Same as Single Pump "A16", Refer to Page 10	Same as Vane Type Single Pump "PV2R1". Refer to the Catalogue No. Pub.EC-0118.
A22R1	Same as Single Pump "A22", Refer to Page 11	
A37R1	Same as Single Pump "A37", Refer to Page 12	
A56R1	Same as Single Pump "A56", Refer to Page 13	
A70R1	Same as Single Pump "A70", Refer to Page 14	
A90R1	Same as Single Pump "A90", Refer to Page 15	
A145R1	Same as Single Pump "A145", Refer to Page 16	
A70R2	Same as Single Pump "A70", Refer to Page 14	Same as Vane Type Single Pump "PV2R2". Refer to the Catalogue No. Pub.EC-0118.
A90R2	Same as Single Pump "A90", Refer to Page 15	
A145R2	Same as Single Pump "A145", Refer to Page 16	

Pipe Flange Kits

Pipe flange kits are available. When ordering, specify the kit number from the table below.

For Inboard Pump ("A" Pump)

Pump Model Numbers	Name of Port	Pipe Flange Kit Numbers						
		Threaded Connection			Socket Welding★		Butt Welding	
		Japanese Std. "JIS"	European Design Std.	N. Ameraican Design Std.	Japanese Std. "JIS" & European Design Std.	N. Ameraican Design Std.	Japanese Std. "JIS" & European Design Std.	N. Ameraican Design Std.
A16R1 A22R1	Suction	F5-06-A-10	F5-06-A-1080	F5-06-A-1090	F5-06-B-10	F5-06-B-1090	F5-06-C-10	F5-06-C-1090
	Discharge	F5-06-A-10	F5-06-A-1080	F5-06-A-1090	F5-06-B-10	F5-06-B-1090	F5-06-C-10	F5-06-C-1090
A37R1 A56R1	Suction	F5-10-A-10	F5-10-A-1080	F5-10-A-1090	F5-10-B-10	F5-10-B-1090	F5-10-C-10	F5-10-C-1090
	Discharge	F5-10-A-10	F5-10-A-1080	F5-10-A-1090	F5-10-B-10	F5-10-B-1090	F5-10-C-10	F5-10-C-1090
A70R1	Suction	F5-12-A-10	F5-12-A-1080	F5-12-A-1090	F5-12-B-10	F5-12-B-1090	F5-12-C-10	F5-12-C-1090
	Discharge	F5-08-A-10	F5-08-A-1080	F5-08-A-1090	F5-08-B-10	F5-08-B-1090	F5-08-C-10	F5-08-C-1090
A90R1 A145R1	Suction	F5-16-A-10	F5-16-A-1080	F5-16-A-1090	F5-16-B-10	F5-16-B-1090	F5-16-C-10	F5-16-C-1090
	Discharge	F5-10-A-10	F5-10-A-1080	F5-10-A-1090	F5-10-B-10	F5-10-B-1090	F5-10-C-10	F5-10-C-1090

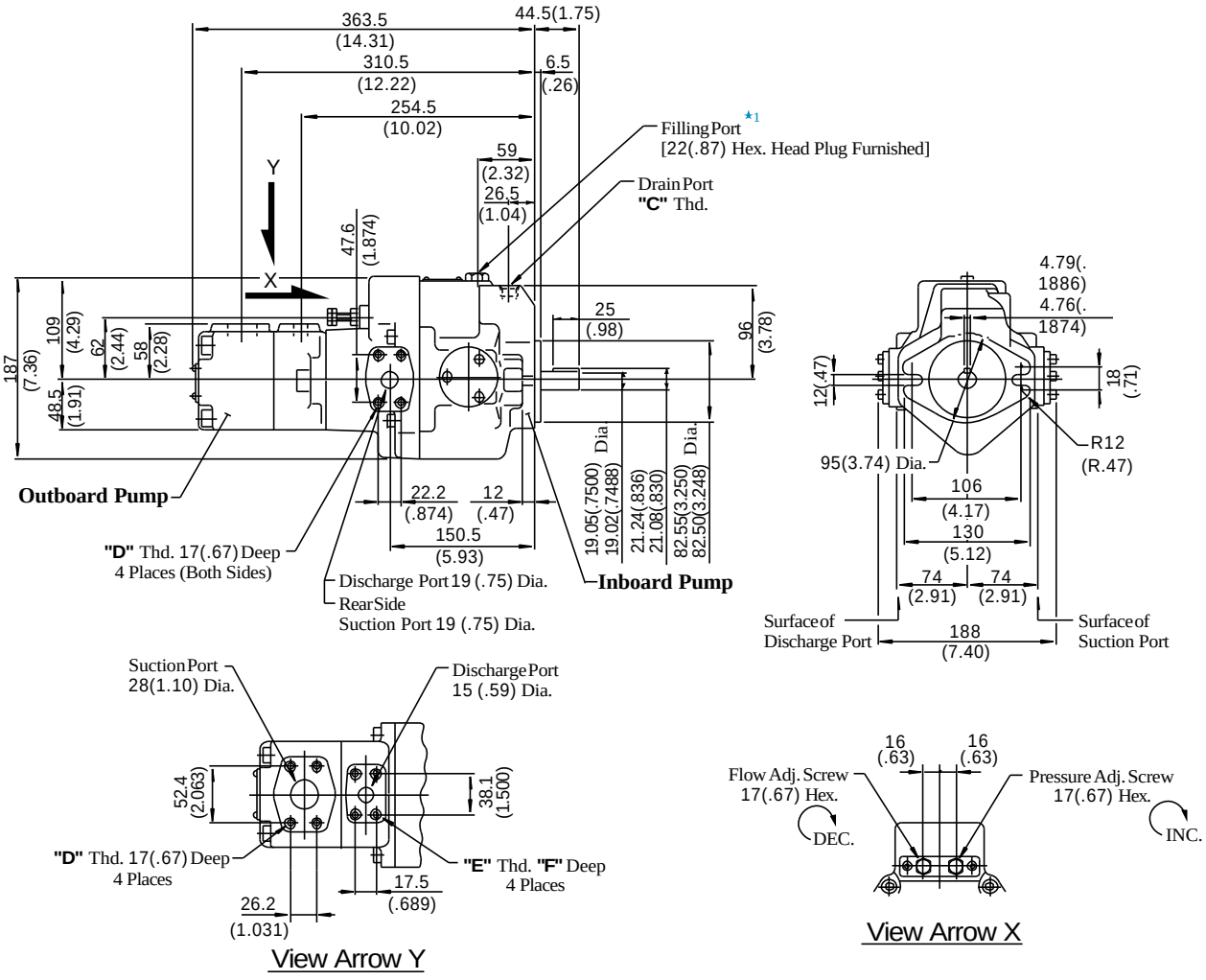
For Outboard Pump (PV2R Pump)

Pump Model Numbers	Name of Port	Pipe Flange Kit Numbers						
		Threaded Connection			Socket Welding★		Butt Welding	
		Japanese Std. "JIS"	European Design Std.	N. Ameraican Design Std.	Japanese Std. "JIS" & European Design Std.	N. Ameraican Design Std.	Japanese Std. "JIS" & European Design Std.	N. Ameraican Design Std.
A16R1 A22R1 A37R1 A56R1 A70R1 A90R1 A145R1	Suction	F5-08-A-10	F5-08-A-1080	F5-08-A-1090	F5-08-B-10	F5-08-B-1090	F5-08-C-10	F5-08-C-1090
	Discharge	F5-04-A-10	F5-04-A-1080	F5-04-A-1090	F5-04-B-10	F5-04-B-1090	F5-04-C-10	F5-04-C-1090
A70R2 A90R2 A145R2	Suction	F5-10-A-10	F5-10-A-1080	F5-10-A-1090	F5-10-B-10	F5-10-B-1090	F5-10-C-10	F5-10-C-1090
	Discharge	F5-06-A-10	F5-06-A-1080	F5-06-A-1090	F5-06-B-10	F5-06-B-1090	F5-06-C-10	F5-06-C-1090

★ In case of using socket welding flanges, there is a case where the operating pressure should be set lower than the normal because of strength of the flanges. Therefore, please pay cautious attention to the operating pressure when the socket welding flanges are used.

• Details of the pipe flange kits are given in the Catalogue No. Pub. EC-3001.

Flange Mtg. : A16R1-FR01*-*AAK-32/3280/3290
A22R1-FR01*-*AAK-32/3280/3290



View Arrow Y

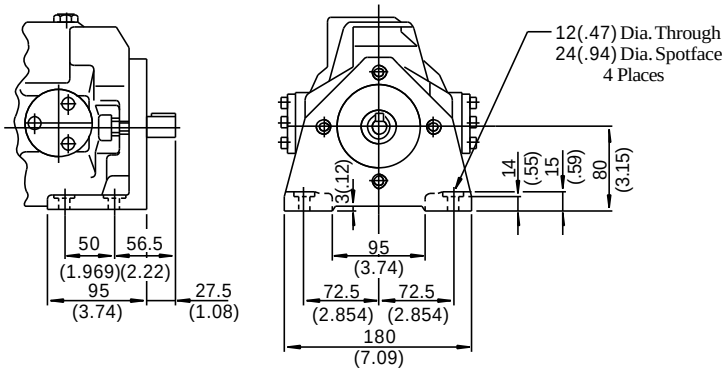
View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.

Model Numbers	"C" Thd.	"D" Thd.	"E" Thd.	F mm (IN.)
A16R1/A22R1-FR01*-*AAK-32	Rc3/8	M10	M8	14 (.55)
A16R1/A22R1-FR01*-*AAK-3280	3/8BSP.F			
	3/8 NPT	3/8-16 UNC	5/16-18 UNC	16 (.63)

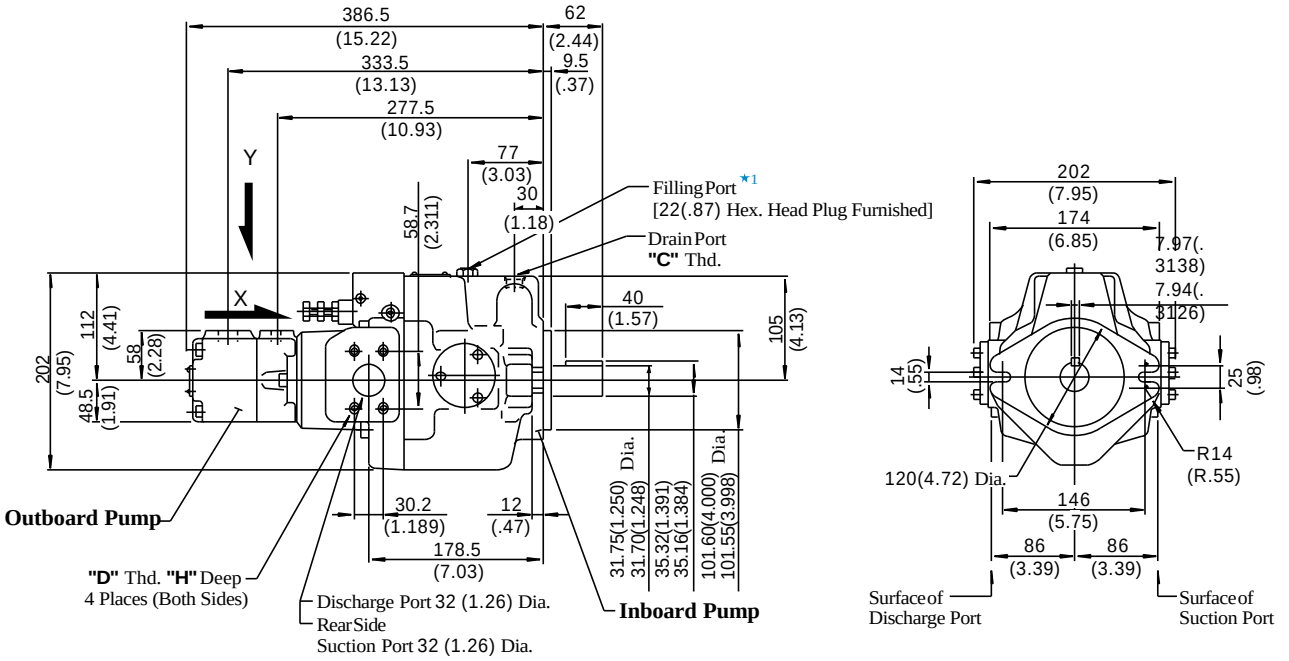
DIMENSIONS IN MILLIMETRES (INCHES)

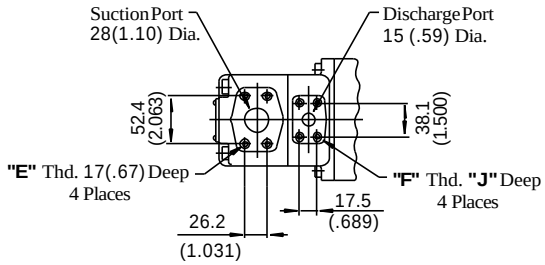
Foot Mtg. : A16R1-LR01*-*AAK-32/3280/3290
A22R1-LR01*-*AAK-32/3280/3290



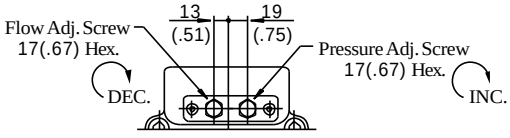
● For other dimensions, refer to "Flange Mtg.".

Flange Mtg. : A37R1-FR01*-*AAK-32/3280/3290





View Arrow Y



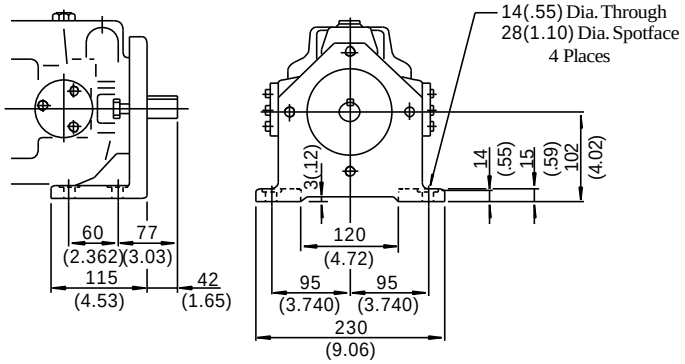
View Arrow X

★1. Install the pump so that the "Filling Port" is at the top.

Model Numbers	"C" Thd.	"D" Thd.	"E" Thd.	"F" Thd.	mm (IN.)	
					H	J
A37R1-FR01*-*AAK-32	Rc1/2	M10	M10	M8	19 (.75)	14 (.55)
A37R1-FR01*-*AAK-	1/2BSP.F					
3280	1/2 NPT	7/16-14 UNC	3/8-16 UNC	5/16-18 UNC	20 (.79)	16 (.63)

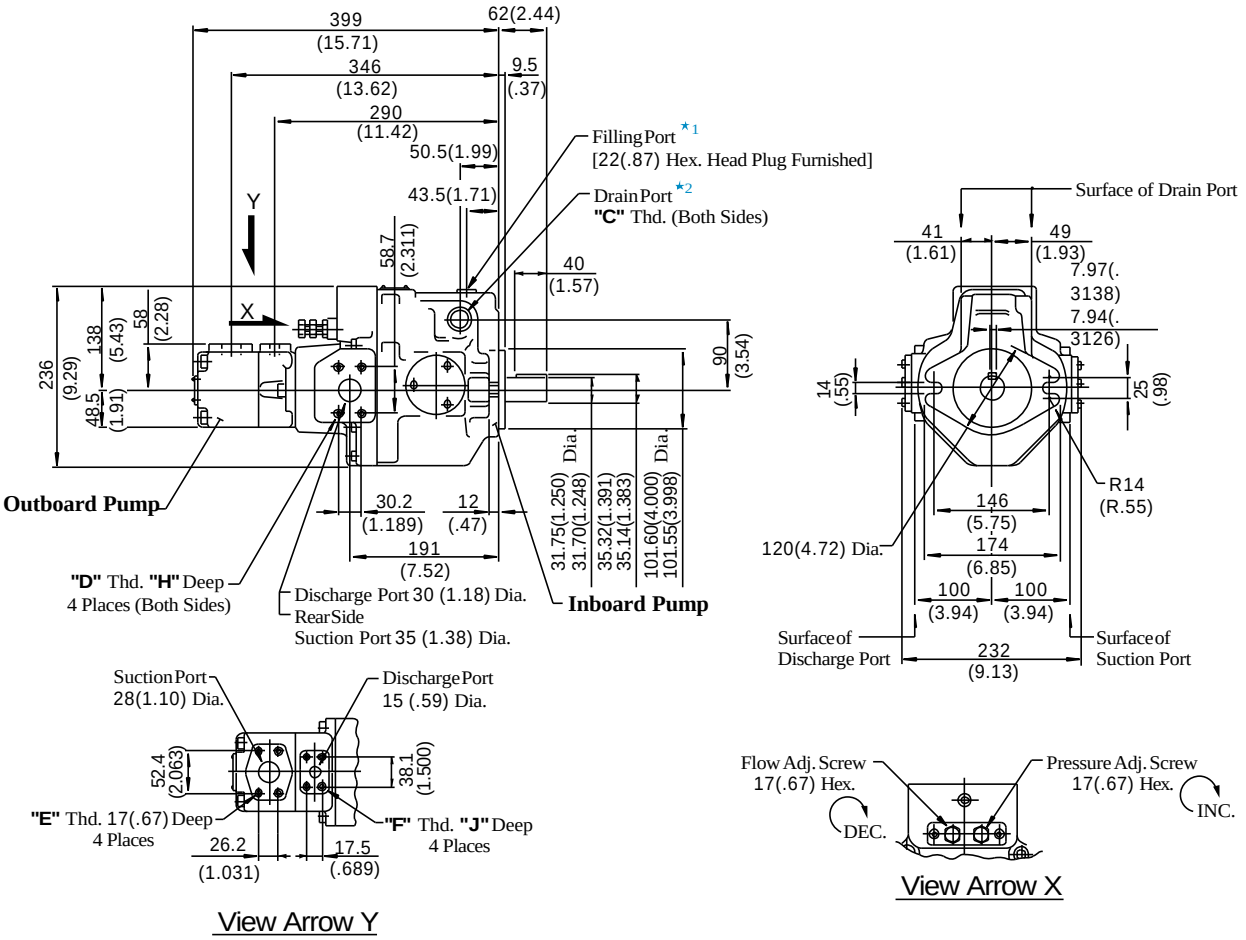
DIMENSIONS IN MILLIMETRES (INCHES)

Foot Mtg. : A37R1-LR01*-*AAK-32/3280/3290



• For other dimensions, refer to "Flange Mtg.".

Flange Mtg. : A56R1-FR01*-**AAK-32/3280/3290



View Arrow Y

View Arrow X

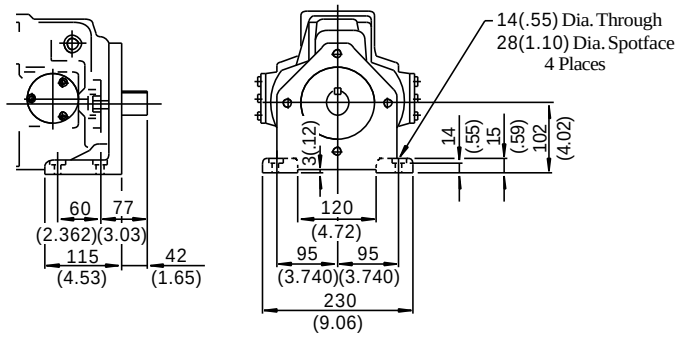
★ 1. Install the pump so that the "Filling Port" is at the top.

★ 2. Use either port of two drain ports of inboard pump at your option. Keep the remaining port plugged. Note that on the European design standard (3280 Design), only the left side, as viewed from the shaft end, of the drain port is machined.

Model Numbers	"C" Thd.	"D" Thd.	"E" Thd.	"F" Thd.	mm (IN.)	
					H	J
A56R1-FR01*-*AAK-32	Rc3/4	M10	M10	M8	19 (.75)	14 (.55)
A56R1-FR01*-*AAK-	3/4BSP.F					
3280	3/4 NPT	7/16-14 UNC	3/8-16 UNC	5/16-18 UNC	20 (.79)	16 (.63)

DIMENSIONS IN MILLIMETRES (INCHES)

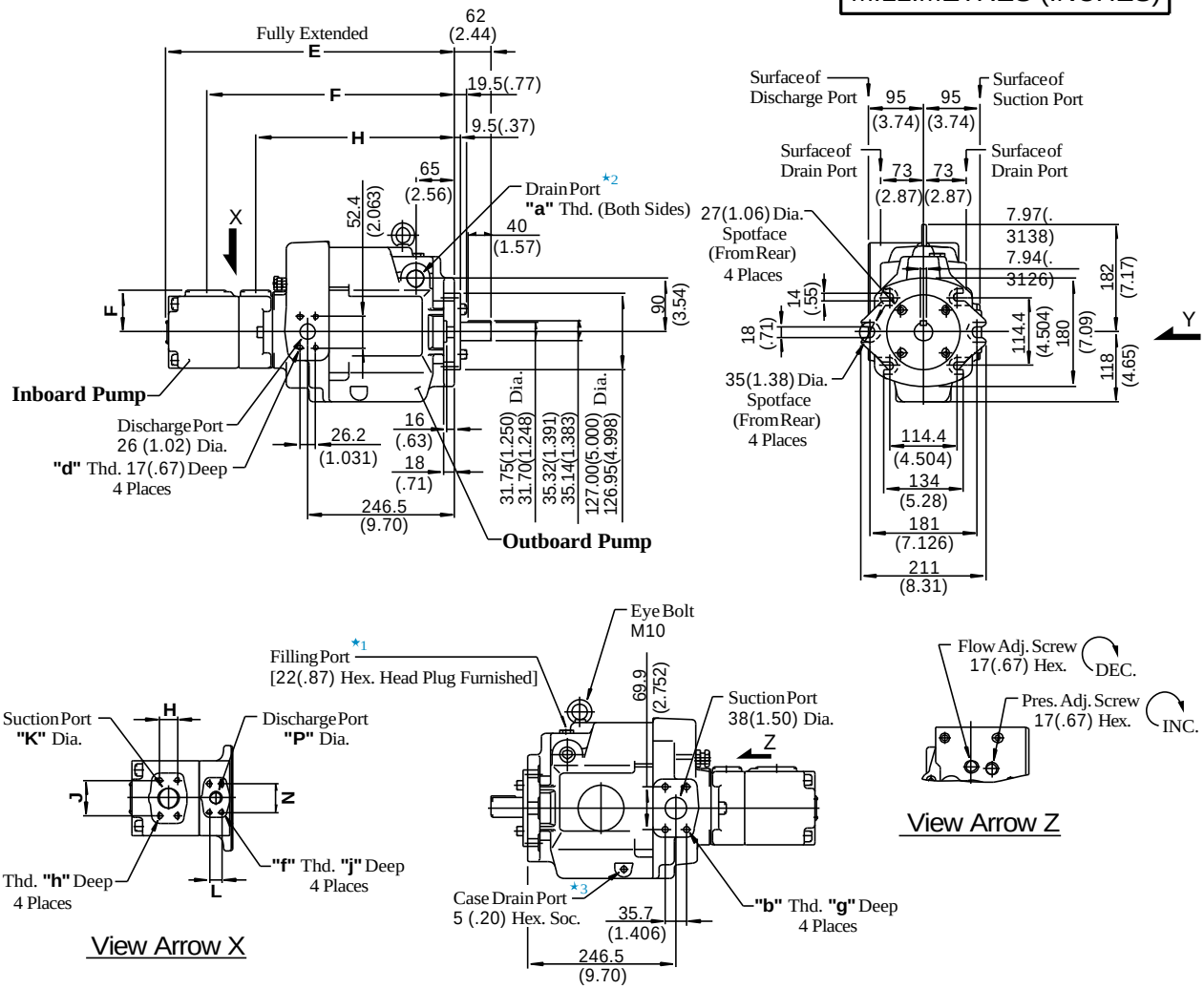
Foot Mtg. : A56R1-LR01*-**AAK-32/3280/3290



• For other dimensions, refer to "Flange Mtg.".

Flange Mtg. : A70R1-FR01*-*AA-60/6080/6090
A70R2-FR01*-*AA-60/6080/6090

DIMENSIONS IN MILLIMETRES (INCHES)



★1. Install the pump so that the "Filling Port" is at the top.

★2. Use either port of two drain ports of inboard pump 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 ports is machined.

★3. Case drain ports are available for use when draining hydraulic fluid from pump casing.

Model Numbers	Dimensions mm (Inches)									
	C	D	E	F	H	J	K	L	N	P
A70R1-FR01*-*AA-60*	439.5 (17.30)	386.5 (15.22)	330.5 (13.01)	58 (2.28)	26.2 (1.031)	52.4 (2.063)	28 (1.10)	17.5 (.689)	38.1 (1.500)	15 (.59)
A70R2-FR01*-*AA-60*	468.5 (18.44)	413.5 (16.28)	333.5 (13.13)	70 (2.76)	30.2 (1.189)	58.7 (2.311)	34 (1.34)	22.2 (.874)	47.6 (1.874)	21 (.83)

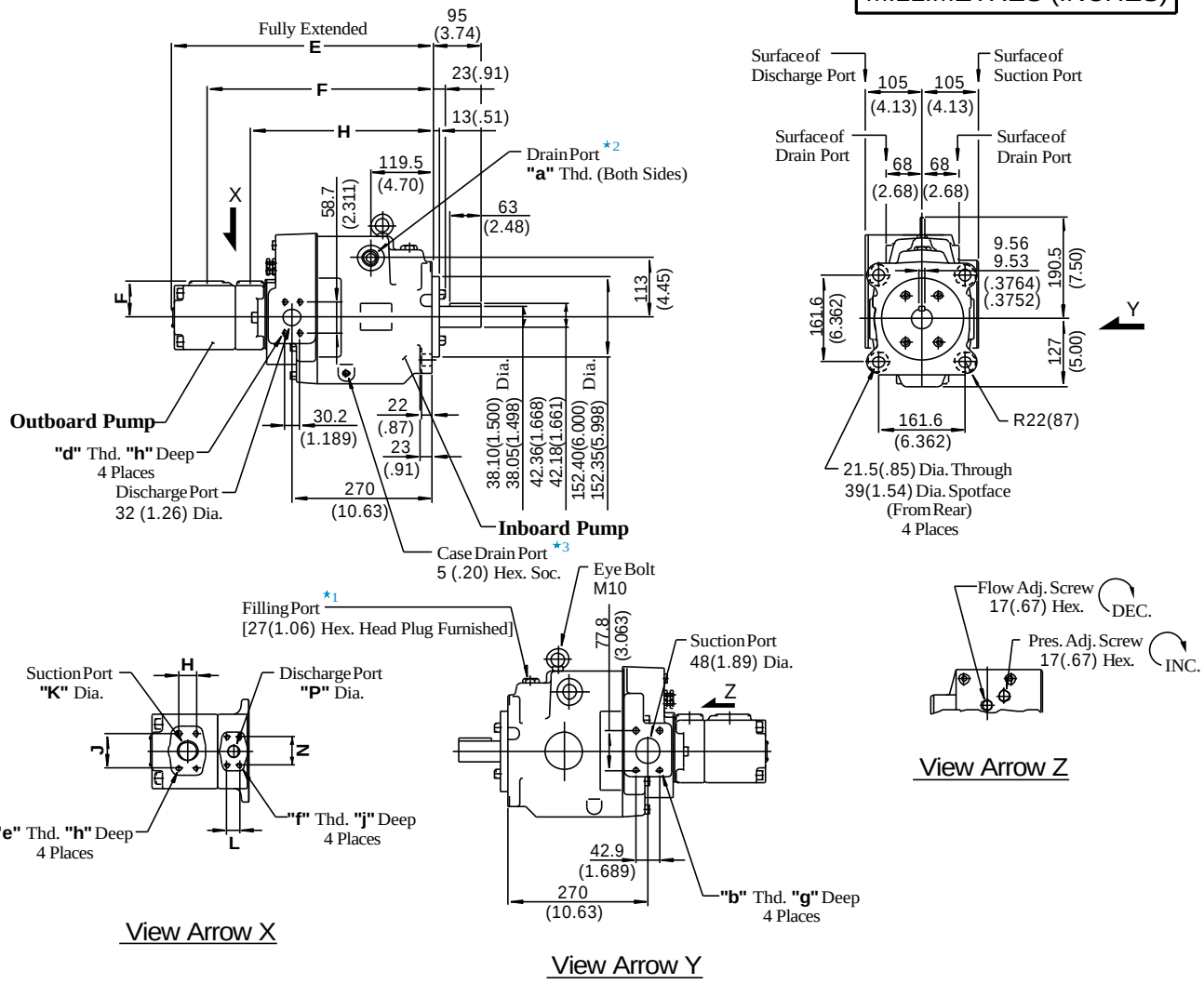
Model Numbers	Thread Size					mm (Inches)		
	a	b	d	e	f	g	h	j
A70R1-FR01*-*AA-60	Rc3/4	M12	M10	M10	M8	19 (.75)	17 (.67)	14 (.55)
A70R1-FR01*-*AA-6080	3/4BSP.F							
A70R1-FR01*-*AA-6090	3/4NPT	1/2-13 UNC	3/8-16 UNC	3/8-16 UNC	5/16-18 UNC	21 (.83)		16 (.63)
A70R2-FR01*-*AA-60	Rc3/4	M12	M10	M10	M10	19 (.75)	19 (.75)	17 (.67)
A70R2-FR01*-*AA-6080	3/4BSP.F							
A70R2-FR01*-*AA-6090	3/4 NPT	1/2-13 UNC	3/8-16 UNC	7/16-14 UNC	3/8-16 UNC	21 (.83)	20 (.79)	

● Foot Mounting Type

The mounting bracket is common to that of single pumps A70. Refer to page 21 for the dimensions of mounting bracket.

Flange Mtg. : A90R1-FR01*-*AA-60/6080/6090
A90R2-FR01*-*AA-60/6080/6090

DIMENSIONS IN MILLIMETRES (INCHES)



★1. Install the pump so that the "Filling Port" is at the top.

★2. Use either port of two drain ports of inboard pump 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 ports is machined.

★3. Case drain ports are available for use when draining hydraulic fluid from pump casing.

Model Numbers	Dimensions mm (Inches)									
	C	D	E	F	H	J	K	L	N	P
A90R1-FR01*-*AA-60*	458 (18.03)	405 (15.94)	349 (13.74)	58 (2.28)	26.2 (1.031)	52.4 (2.063)	28 (1.10)	17.5 (.689)	38.1 (1.500)	15 (.59)
A90R2-FR01*-*AA-60*	497 (19.57)	432 (17.01)	352 (13.86)	70 (2.76)	30.2 (1.189)	58.7 (2.311)	34 (1.34)	22.2 (.874)	47.6 (1.874)	21 (.83)

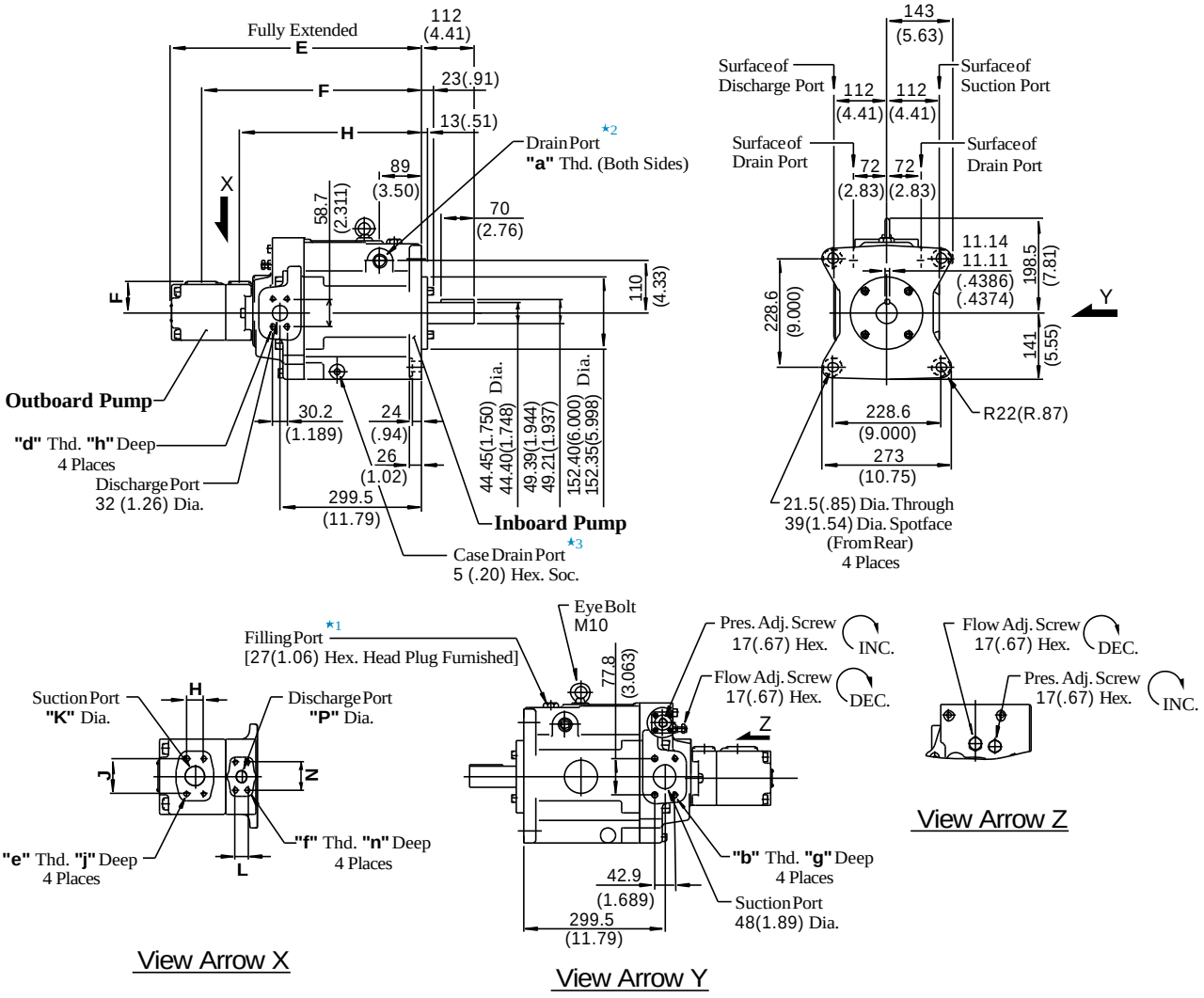
Model Numbers	Thread Size					mm (Inches)		
	a	b	d	e	f	g	h	j
A90R1-FR01*-*AA-60	Rc3/4	M12	M10	M10	M8	19 (.75)	17 (.67)	14 (.55)
A90R1-FR01*-*AA-6080	3/4BSP.F							
A90R1-FR01*-*AA-6090	3/4NPT	1/2-13 UNC	7/16-14 UNC	3/8-16 UNC	5/16-18 UNC	21 (.83)		16 (.63)
A90R2-FR01*-*AA-60	Rc3/4	M12	M10	M10	M10	19 (.75)	19 (.75)	17 (.67)
A90R2-FR01*-*AA-6080	3/4BSP.F							
A90R2-FR01*-*AA-6090	3/4 NPT	1/2-13 UNC	7/16-14 UNC	7/16-14 UNC	3/8-16 UNC	21 (.83)	20 (.79)	

● Foot Mounting Type

The mounting bracket is common to that of single pumps A90. Refer to page 22 for the dimensions of mounting bracket.

Flange Mtg. : A145R1-FR01∗-∗AA-60/6080/6090
A145R2-FR01∗-∗AA-60/6080/6090

DIMENSIONS IN MILLIMETRES (INCHES)



★1. Install the pump so that the "Filling Port" is at the top.

★2. Use either port of two drain ports of inboard pump 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 ports is machined.

★3. Case drain ports are available for use when draining hydraulic fluid from pump casing.

Model Numbers	Dimensions mm (Inches)									
	C	D	E	F	H	J	K	L	N	P
A145R1-FR01∗-∗AA-60∗	491.5 (19.35)	438.5 (17.26)	382.5 (15.06)	58 (2.28)	26.2 (1.031)	52.4 (2.063)	28 (1.10)	17.5 (.689)	38.1 (1.500)	15 (.59)
A145R2-FR01∗-∗AA-60∗	530.5 (20.89)	465.5 (18.33)	385.5 (15.18)	70 (2.76)	30.2 (1.189)	58.7 (2.311)	34 (1.34)	22.2 (.874)	47.6 (1.874)	21 (.83)

Model Numbers	Thread Size					mm (Inches)			
	a	b	d	e	f	g	h	j	n
A145R1-FR01∗-∗AA-60	Rc3/4	M12	M10	M10	M8	19 (.75)	19 (.75)	17 (.67)	14 (.55)
A145R1-FR01∗-∗AA-6080	3/4BSP.F								
A145R1-FR01∗-∗AA-6090	3/4NPT	1/2-13 UNC	7/16-14 UNC	3/8-16 UNC	5/16-18 UNC	21 (.83)	20 (.79)		16 (.63)
A145R2-FR01∗-∗AA-60	Rc3/4	M12	M10	M10	M10	19 (.75)	19 (.75)	19 (.75)	17 (.67)
A145R2-FR01∗-∗AA-6080	3/4BSP.F								
A145R2-FR01∗-∗AA-6090	3/4 NPT	1/2-13 UNC	7/16-14 UNC	7/16-14 UNC	3/8-16 UNC	21 (.83)	20 (.79)	20 (.79)	

● Foot Mounting Type

The mounting bracket is common to that of single pumps A145. Refer to page 23 for the dimensions of mounting bracket.