

JIS

JAPANESE INDUSTRIAL STANDARD

Submersible Pumps for
Construction

JIS A 8604—1985

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Submersible Pumps for Construction

A 8604-1985

1. Scope

This Japanese Industrial Standard specifies a temporary and portable submersible pump, hereinafter referred to as the "pump", used for civil-engineering works, architectural works and other construction works, which is of single suction, single stage, centrifugal type and has nominal diameter ⁽¹⁾ of pump of 32 to 250 mm and is coupled directly with a submersible 3-phases induction motor with 2 poles, 4 poles or 6 poles, or a submersible single phase induction motor with 2 poles or 4 poles and rated frequency of 50 Hz or 60 Hz.

Note ⁽¹⁾ The nominal diameter of pump shall be indicated by a nominal diameter of hose coupling to be fixed to the pump.

Remark: The units and numerical values given in { } in this standard are in accordance with the International System of Units (SI), and are appended for reference.

2. Classification Types

2.1 Classification The pumps shall be classified as shown in Table 1 by nominal diameter of pump, rated output of motor, discharge type and rated frequency of electric motor.

Applicable Standards: See page 36.

Table 1. Classification

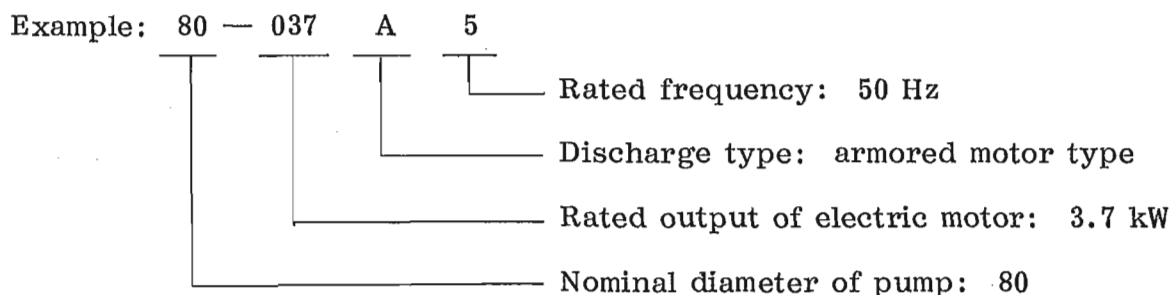
Rated output of electric motor kW Nominal diameter of pump	0.15	0.25	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	Dis- charge type	Symbol	Rated fre- quency Hz	Symbol
	001	002	004	007	015	022	037	055	075	110	150	185	220	300	370				
32	○																		
40		○																	
50			○	○	○	○	○										A		
80					○	○	○	○	○	○								50	5
100							○	○	○	○	○	○	○	○			B		
150								○	○	○	○	○	○	○	○			60	6
200										○	○	○	○	○	○		C		
250													○	○	○				

Notes (2) The exterior motor type is a pump discharging the liquid to be lifted from the casing part directly without passing the electric motor part. (See Attached Fig. 1).

(3) The armored motor type is a pump discharging the liquid to be lifted through the outer casing, in which the whole electric motor is surrounded, from the upper part of pump. (See Attached Fig. 2).

(4) The semiarmored motor type is a pump discharging the liquid to be lifted through the outer casing, in which a part of the electric motor is surrounded. (See Attached Fig. 3).

2.2 Type The type of pump shall be indicated, as shown in the following example, by the combination of symbols of classification.



3. Name of Each Part of Pump

The name of each part of pump shall be as shown in Attached Figs. 1 to 3.

4. Range of Lifted Liquid by Using Pump

The lifted liquid shall be muddy water generated from job sites of civil-engineering works, architectural works and other construction works. The muddy water shall be not higher than 40°C in water temperature, 6.5 to 8.0 in pH, not more than 2 % in volumetric ratio of mixed earth and sand and not more than 5 cP { 5 mPa · s } in viscosity and the size of particles shall be in such range that particles can pass through the network of strainer.

5. Performance

5.1 Pressure Resistance The pressure resistance of pump shall be tested in accordance with 9.2 and the pressure resistant part of the body of pump shall be free from leakage.

5.2 Leakage The leakage of pump shall be tested in accordance with 9.1 and the clearance of each part of pump shall be free from leakage.

5.3 Operating Performance The operating performance of pump shall be tested in accordance with 9.3 and comply with the requirement of each of the following clauses.

- (1) Discharge Quantity of Pump The discharge quantity of pump shall be as shown in Table 2.

Table 2. Range of Discharge Quantity

Nominal diameter of pump	32	40	50	80	100	150	200	250
Range of discharge quantity of pump m^3/min	Up to 0.03	0.04 to 0.125	0.12 to 0.32	0.32 to 0.8	0.63 to 1.6	1.25 to 3.15	2.0 to 5.0	3.15 to 8.0

- (2) Total Head The total head of pump to its discharge quantity shall be as shown in Attached Fig. 4.
- (3) Pump Efficiency The highest efficiency of pump shall be not lower than efficiency A of Attached Fig. 5 at the maximum discharge quantity of each pump.

Further, the pump efficiency at the quantity in the range of discharge quantity of Table 2 shall be not lower than efficiency B of Attached Fig. 5.

Furthermore, the discharge quantity at the highest efficiency shall be in the range shown in Table 2, as a rule.

- (4) Shaft Power of Pump The shaft power of pump shall not exceed the rated output of electric motor up to the maximum discharge quantity ⁽⁵⁾ of that pump

Note ⁽⁵⁾ The maximum discharge quantity means the discharge quantity when the total head is zero on the performance curve for pump.

- (5) Operating Condition Even when the part of electric motor has been exposed in the atmosphere at the time of starting or during operation of pump, the pump shall be operated without hindrance. Provided that the temperature rise of electric motor shall be as specified in Appendix 1 and Appendix 2.
- (6) Operating State The pump shall use fresh water and shall be free from remarkable vibration, noise and temperature rise of electric motor in any case of discharge quantity when inspected from the outside of pump.

6. Structure, Shape and Size

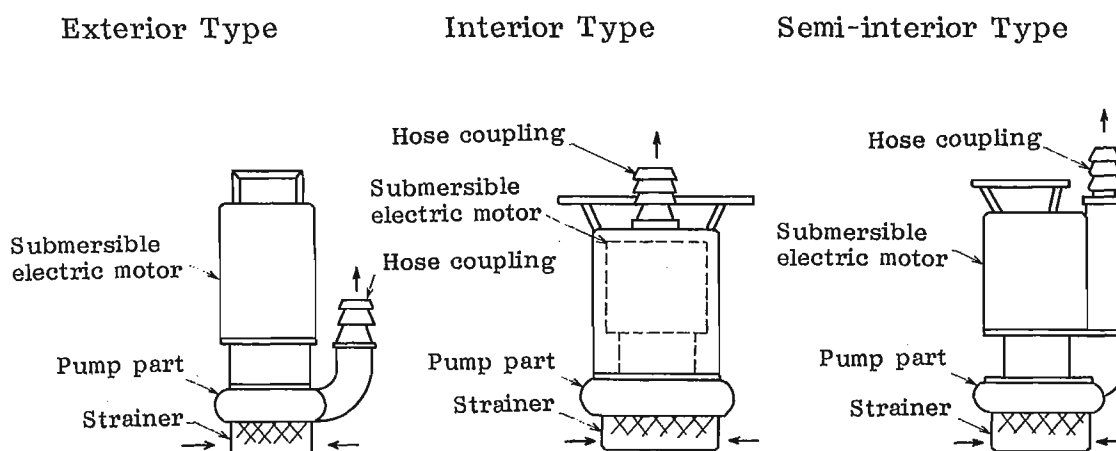
6.1 Direction of Revolution of Pump The direction of revolution of pump shall be clockwise when looking it from above.

6.2 Pump Body

6.2.1 The structure of pump body shall be of a vertical shaft type with a submersible electric motor placed at the upper part and with the shaft seal device and pump part equipped at the lower part of common shaft. The lower part of electric motor shall be so constructed that it consists of oil casing, casing, casing cover, etc. and the electric motor and pump have been connected by spigot joint and united in a body by bolt clamping so as to be suitable for transportation.

Further, the discharge system shall be of exterior type, interior type and semi-interior type as shown in Fig. 1.

Fig. 1. Discharge System of Pump

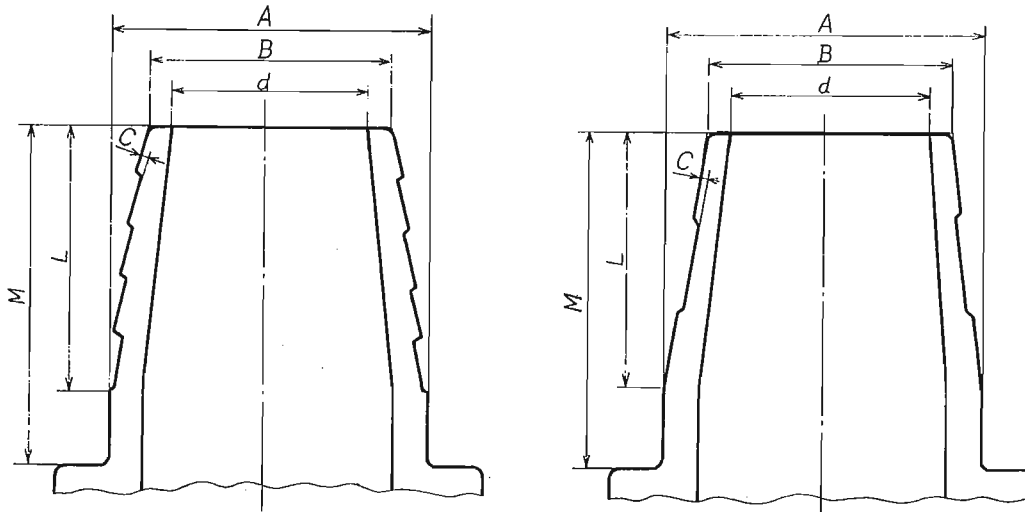


6.2.2 The shaft seal part shall be equipped with a shaft seal device, for which oil seal specified in JIS B 2402 or mechanical seal specified in JIS B 2405 has been used, so that the liquid to be lifted will not leak into the inside of the shaft penetration part of electric motor. The surface roughness of ground face of shaft or sleeve shall be 3.2 S or superior specified in JIS B 0601. The circumference of shaft seal device shall be equipped with chamber in which lubricating oil is sealed as a rule.

6.2.3 The suction opening shall be opened downward the bottom of pump body as a rule and its circumference shall be equipped with strainer. The holes of strainer shall be made large as far as possible so that solid matters will not be blocked at the impellar and the total area of holes shall be of a size that will not reduce the performance of pump.

6.2.4 The discharge opening of pump shall be fitted with a hose coupling. Its size shall be as shown in Fig. 2. The shape of fitting part is not specified particularly.

Fig. 2. Dimensions of Hose Coupling



Unit: mm

Dimensions Nominal diameter of hose coupling	A	B	C	d	L	M
32	—	—	—	—	—	—
40	$38^{+1.5}_0$	$36^{+1.5}_0$	1.5	30 ± 1	38	46 min.
50	$50^{+1.5}_0$	$47^{+1.5}_0$	1.5	39 ± 1	50	60 min.
80	$75^{+1.5}_0$	$71^{+1.5}_0$	2	61 ± 1.5	75	90 min.
100	$100^{+1.5}_0$	$95^{+1.5}_0$	2	83 ± 2	100	120 min.
150	150^{+2}_0	144^{+2}_0	2	130 ± 2	150	180 min.
200	200^{+3}_0	192^{+3}_0	3	176 ± 3	180	210 min.
250	250^{+4}_0	242^{+3}_0	4	226 ± 3	200	250 min.

6.2.5 The wall thicknesses of pressure resistant part and abrasion part of the pump body shall be as shown in Table 3.

Remark: The pressure resistant part means the oil casing, casing, casing cover, outer casing, head cover, etc. The abrasion part means the impeller, casing, and casing cover.

6.3 Impeller

6.3.1 The construction of impeller shall be such that it is of open type, excellent in abrasion resistance and exchangeable easily. Provided that the space between the impeller and the casing cover shall be of an adjustable structure.

6.3.2 The impeller shall be excellent in equilibrium.

Table 3. Wall Thicknesses of Pressure Resistant Part and Abrasion Part

Unit: mm

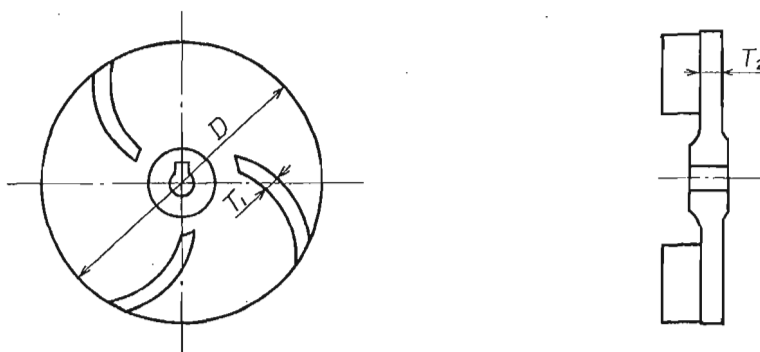
Material	Wall thickness
SS 41 of JIS G 3101	1.6 min.
FCD 40 of JIS G 5502	4 min.
FC 20 of JIS G 5501	4 min.
AC 2 A of JIS H 5202	4 min.

Remark: The thickness of blade shall be as specified in 6.3.4.

6.3.3 The surface of outer circumference, sliding part and end face of impeller shall be smooth.

6.3.4 The thickness of blade and side plate of impeller shall be as shown in Fig. 3. However, the thickness of tips of inlet and outlet of blade is not specified.

Fig. 3. Minimum Plate Thickness of Impeller



Unit: mm

Outside diameter of impeller D	Thickness of blade T_1	Thickness of side plate T_2
Under 150	4 min.	4 min.
150 to 250 excl.	5 min.	5 min.
250 and over	8 min.	6 min.

6.4 Electric Motor of Pump The electric motor of pump shall be as specified in Appendix 1 and Appendix 2.

6.5 Main Shaft

6.5.1 The diameter (⁶) of main shaft shall be not less than the value calculated from the following formula:

$$d = K \sqrt[3]{\frac{P}{N}}$$

where d : diameter of main shaft (mm)
 P : shaft power of pump (kW)
 N : number of revolution (rpm)
 K : coefficient

Provided that the value of K shall be as follows:

Where the material of main shaft is SUS 403 specified in JIS G 4303 and its quench hardening and tempering have been carried out 116

Where the material of main shaft is S 35 C specified in JIS G 4051 125

Note (⁶) The diameter of main shaft means a diameter of part relating to power transmission.

6.5.2 Counter measures shall be taken by washers or other methods so that the impeller nut and impeller bolt will not loosen even when the shaft revolves in any direction.

6.6 Bearing The bearing shall be as specified in Appendix 1 and 5.4 of Appendix 2.

6.7 Fit The fit of each part of pump shall be as specified in Table 4 as a rule.

Table 4. Fit

Each part of pump	Symbol of fit
Impeller and main shaft	H 7/g 6
Sleeve and main shaft	H 7/g 6
Spigot part of pump body	H 8/h 7
Pump body and spigot part of motor part	H 7/h 7

- Remarks 1. The fit shall be as specified in JIS B 0401.
2. The fit shall be of hole basis as a rule but may be of shaft basis.
3. The spigot part of casing and casing cover may be not as specified in Table 4.

6.8 Others

6.8.1 The size of key of impeller shall be a sunk key as specified in JIS B 1301 or equivalent thereto.

6.8.2 The pump shall be equipped with a handle for traveling or with a metal fittings for suspension.

6.8.3 The pump shall be free from remarkable changes in performance and life even when it is operated in any position at not more than 90° from the verticality.

7. Painting and Corrosion-proof Treatment

A sufficient rust preventive painting or corrosion-proof treatment shall be carried out on the outer surface of pump body.

Further, a similar corrosion-proof treatment shall be carried out also on a required place of the inside.

8. Material of Pump Body

The materials to be used for the main part of pump body shall be as specified in Table 5, or equal or superior to them.

Table 5. Materials

Name of part	Material
Main shaft, sleeve, key	SUS 403 of JIS G 4303 S 35 C of JIS G 4051
Hose coupling	FC 15 of JIS G 5501 AC 2 A of JIS H 5202
Head cover, frame, bracket, outer casing, oil casing, casing, casing cover	FC 20 of JIS G 5501 FCD 40 of JIS G 5502 SS 41 of JIS G 3101 AC 2 A of JIS H 5202
Impeller	FC 20 of JIS G 5501 FCD 40 of JIS G 5502 SS 41 of JIS G 3101 SCS 2 of JIS G 5121
Impeller nuts, bolts, nuts	SUS 403 of JIS G 4303 SS 41 of JIS G 3101
Strainer	SUS 403 of JIS G 4305 SS 41 of JIS G 3101 A 5052 P, A 3003 P, A 3203 P, A 6061 P, A 5083 P, A 5005 P, A 5154 P, A 5N01 P of JIS H 4000