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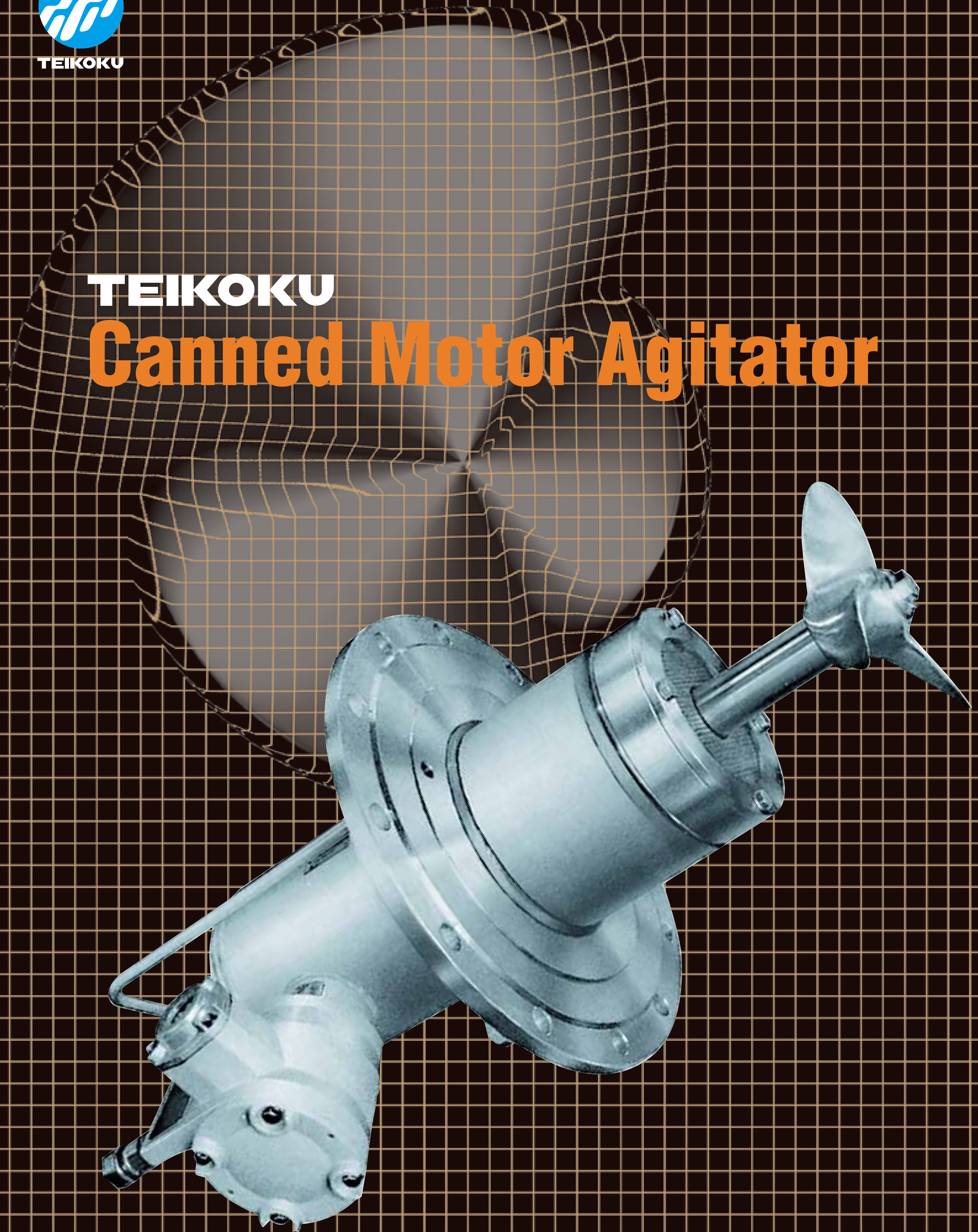
ISO 9001
ISO 14001
BUREAU VERITAS
Certification

PTB
ATEX

Catalog No. CAT-0060 09-12

TEIKOKU

TEIKOKU Canned Motor Agitator



TEIKOKU ELECTRIC MFG. CO., LTD.

CANNED MOTOR AGITATOR

Another Epoch-Making Application of Canned Motor

Here Comes "Dream Agitators" Combined with Proven Canned Motor Technology!

Quiet and hygienic

because it's canned motor driven!

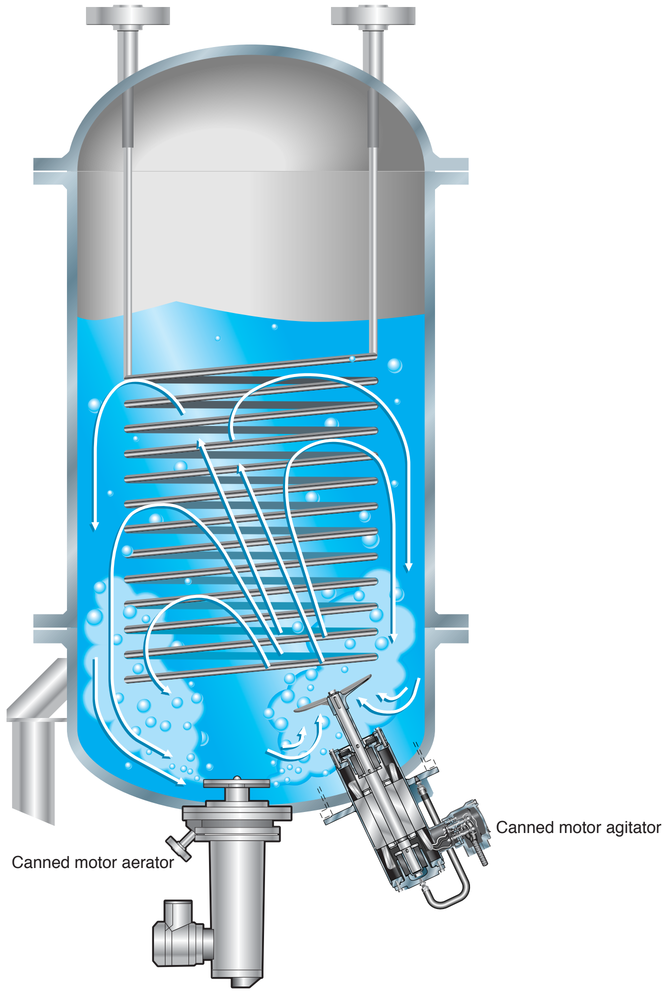
- Quiet because there is no fan to cool the motor.
- No contamination of the process, because no external lubricant is required.
- Perfectly suited to sanitary environments.

Completely leak-free

because it's canned motor driven!

- Completely leak free because there are no shaft seals.
- Well suited to high-temperature, high-pressure, and high-vacuum applications.
- Well suited to variable combinations of gas-liquid, solid-liquid, liquid-liquid, and gas-solid-liquid reactions.
- SUS 304/316 is used as the standard material. Special materials such as alloy C-276 and titanium are available as options when agitating special liquids such as strong acids and alkalis.

Sample configuration



No tank-top mess

because it's side/bottom entry type!

- A simple layout is yours because no maintenance space is required at the top of the tank.
- Cost saving because there are no heavy parts at the top of the tank so the tank wall thickness can be reduced.
- Higher safety is yours because less work is required at high places.

Can be oriented in any direction through 360 degrees

because it's side/bottom entry type!

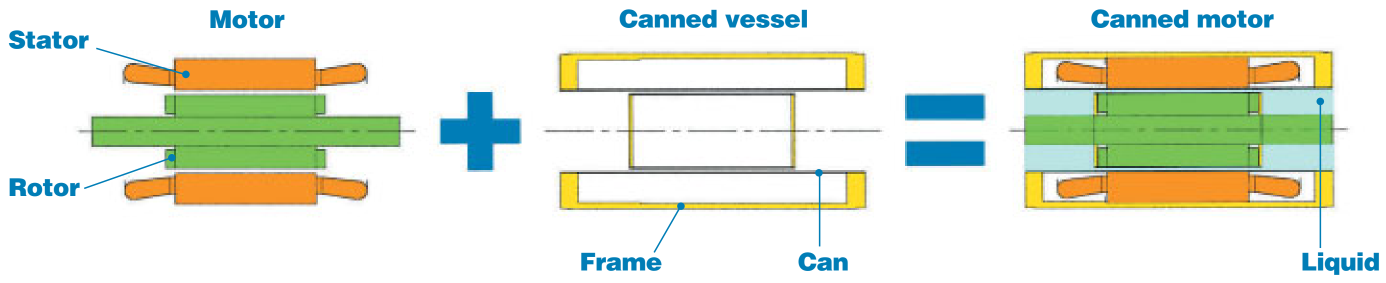
- Wider choice of agitating angle, from side to bottom, is yours.
- Pinpoint target for agitation is yours.
- Higher speed blade rotation can be achieved thanks to the shorter shaft with higher torque resistance.
- Retrofit is available for any existing design.

Structure of canned motors

Two types of canned motors, the core of TEIKOKU's agitators, are available: the R-type, which uses a radial air-gap motor similar to a general-purpose motor, and the A-type, which uses our proprietary axial air-gap motor. The different characteristics of these two motor types will allow us to meet the variety of agitation demands.

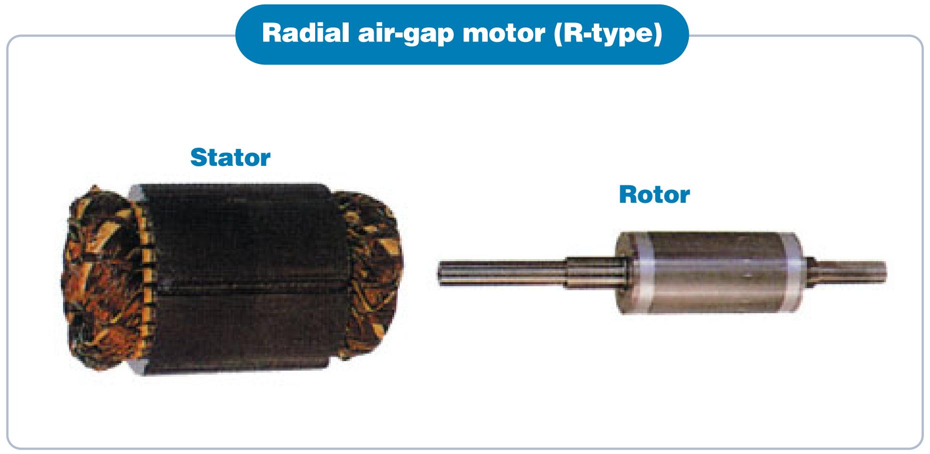
What is a canned motor?

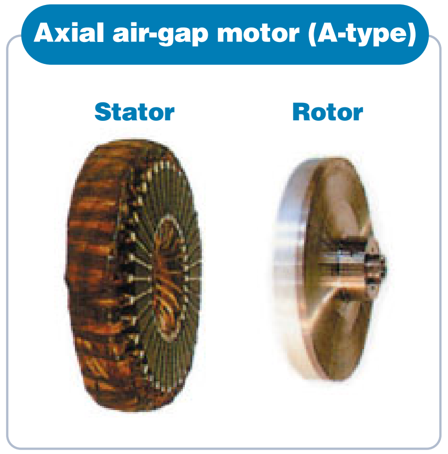
Canned motors are leak-free motors with no shaft seals, in which the stator and the rotor are canned with thin plates (cans) and the rotor is floated in the flooded space when it turns.

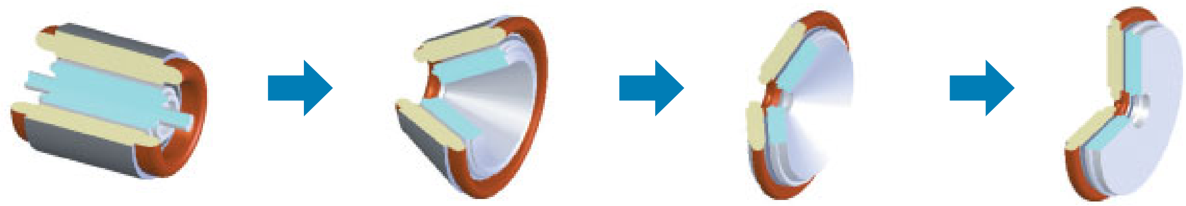


What is an axial air-gap motor?

Axial air-gap motors are disc-shaped while conventional motors are cylindrical in shape. The cylindrical stator and rotor are transformed into a disc-shaped stator and rotor if they are stretched out like an umbrella.



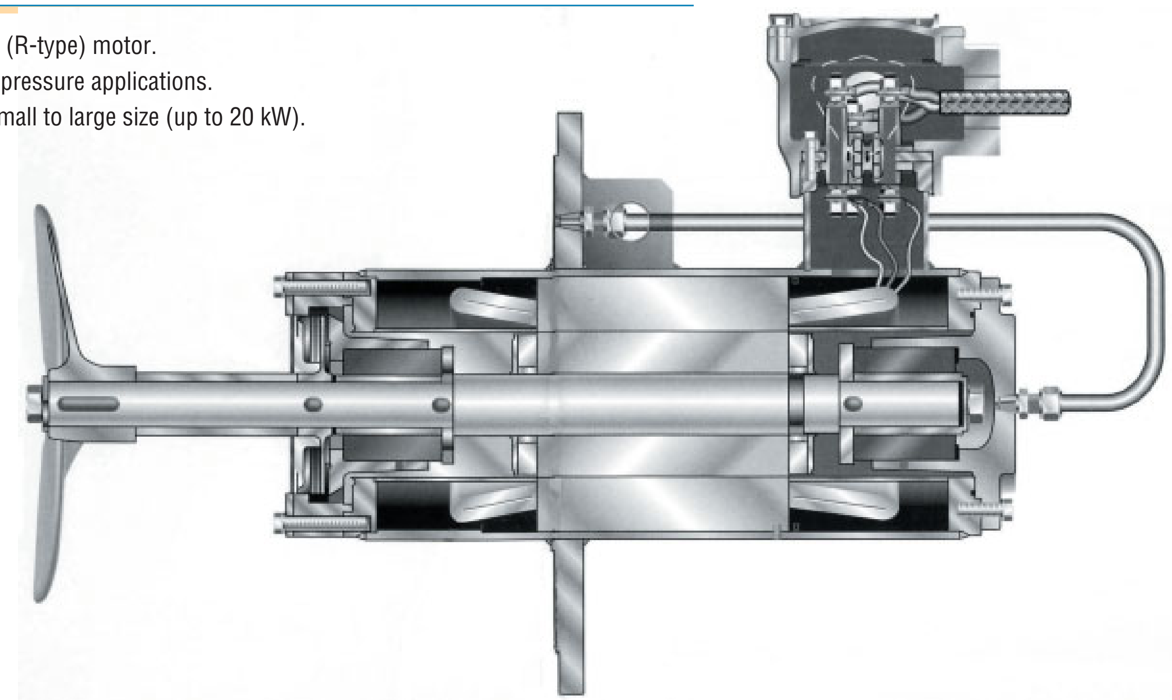




Standard configuration of the canned-motor agitator

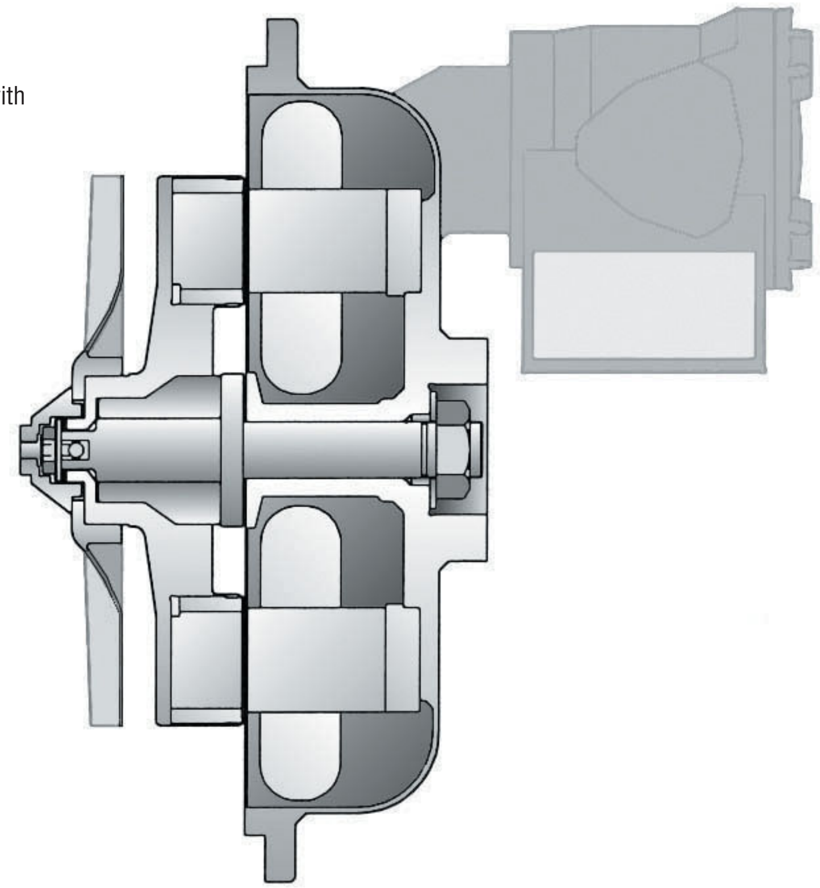
R-type agitator

- Uses a radial air-gap (R-type) motor.
- Can be used in high-pressure applications.
- Standardized from small to large size (up to 20 kW).



A-type agitator

- An axial air-gap (A-type) motor is applied.
- Compact and very space-saving.
- Very adaptable to sanitary requirements with reduced possibility of liquid trapping.



Unique flow patterns generated by the side and bottom installation

The agitator comes standard with two types of agitator blades: propeller blades and turbine blades. Special blades for sanitary agitators, crushers and aerators are also prepared to meet the special requirements.

Propeller blades

Propeller blades have a shape that gives excellent discharge capabilities in the axial direction. They are suitable for liquid-liquid mixture, thermal unification and prevention of sedimentation of slurry in solid-liquid process when they are close in specific gravity.

●**Side installation (Fig. 1)**

Installation position: Installed at a height of 1 to 1.5 times the outer diameter of the agitator blade from the bottom of the tank.

Flow pattern: After hitting the side wall, the discharge flow is divided into a downflow and an upflow; the upflow returns from the liquid surface back to the agitator and the downflow returns from the tank bottom up to the agitator. If there are thermal transfer coils along the tank wall, arrange the space for the agitation blade so that a good flow pattern can be expected.

●**Bottom installation (Fig. 2)**

Installation position: Installed as standard at a distance of one-quarter of the tank diameter from the center of the tank.

Flow pattern: A circulating flow pattern generated along the tank wall by the suction of the agitator and another flow discharged by the agitator to the liquid surface will make large hydraulic circulations in the tank.

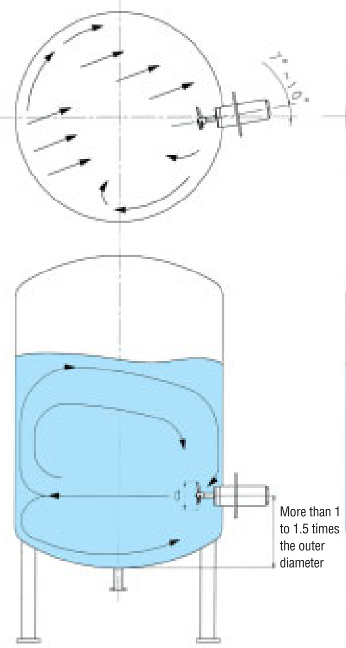


Fig. 1 Side installation

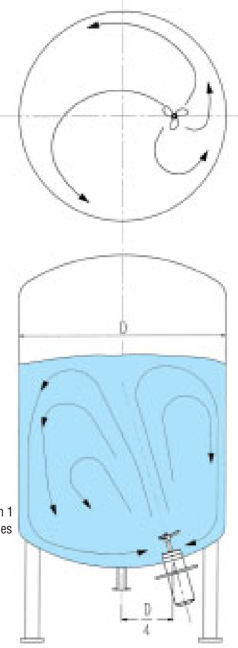


Fig. 2 Bottom installation

Turbine blades

Turbine blades have a shape that can produce a strong shear force and excellent radial discharge. They are suitable for emulsification in liquid-liquid systems, suspension polymerization reactions, dissolution of solids, crushing of solids, and dispersion of gases.

●**Side installation (Fig. 3)**

Installation position: The ideal installation height for the best agitation efficiency is at one-third of the tank height from the bottom. It could be changed depending on operating conditions.

Flow pattern: The fluid discharged in the radial direction along the tank wall is separated into a flow toward the liquid surface and a flow toward the bottom of the tank, and then returns to the blades from the center.

●**Bottom installation (Fig. 4)**

Installation position: Installed as standard at a distance of one-quarter of the tank diameter from the center of the tank. This installation position is suitable for preventing sedimentation, and for dissolution, and crushing. It is also well suited to the tanks with a thermal transfer coil along the inner side of the wall.

Flow pattern: The radial flow discharged along the bottom of the tank rises along the side wall, merges, and returns all the way to the blades diagonally from the top corner.

●**Gas-liquid agitation (Figs. 5 and 6)**

Installation position: For gas-liquid agitation, both bubble dispersion and agitation can be done efficiently by blade installation at the center of the bottom of the tank and blowing the gas toward the blades. Figures 5 and 6 show the configuration of a turbine blade unit and an aerator.

Flow pattern: The flow discharged in the radial direction along the bottom of the tank ascends to the surface along the side-wall, merges at the surface center, then descends in the center vertically to return to the blades.

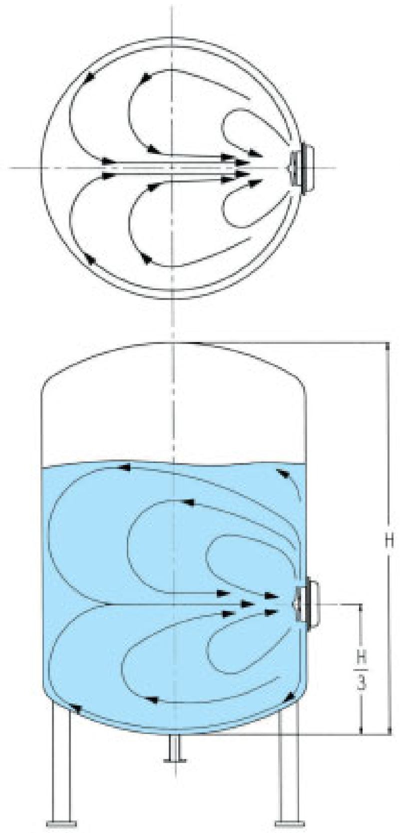


Fig. 3 Side installation

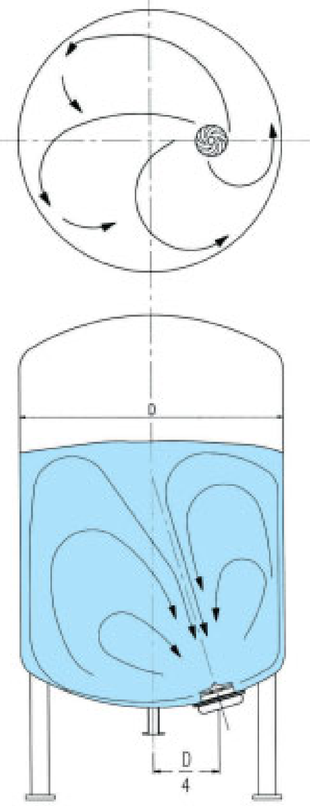


Fig. 4 Bottom installation

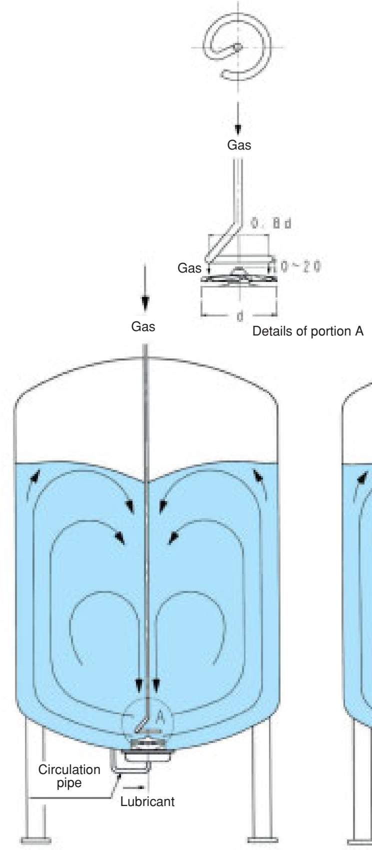


Fig. 5 Center installation

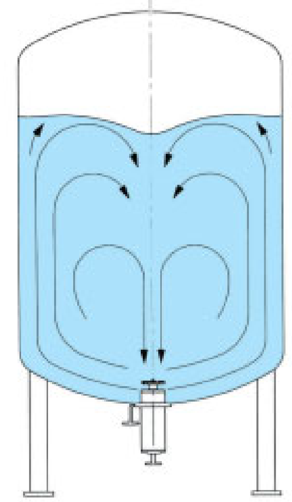


Fig. 6 Center installation

Installation of multiple units

For tall tanks, installation of two or more units increases the agitation efficiency.

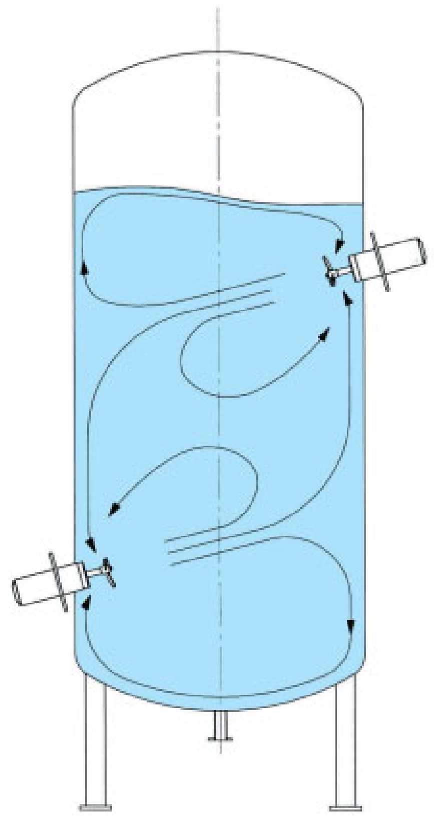


Fig. 7 Two propeller blade units

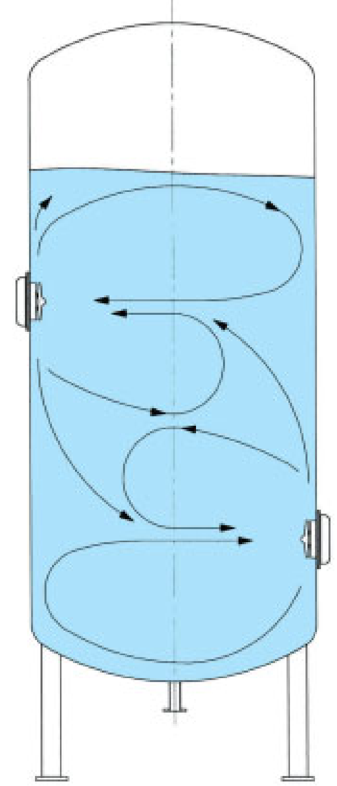


Fig. 8 Two turbine blade units

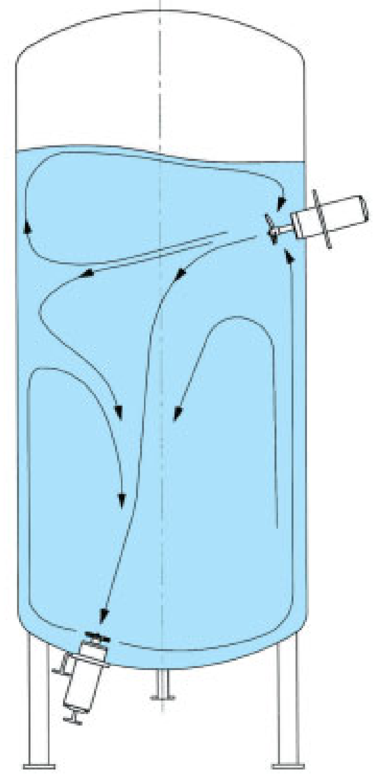


Fig. 9 One aerator and one propeller blade agitator

Test facilities

TEIKOKU can assist in examination tests designed by the customers with the variety of test facilities.
If such tests and examinations are in demand, please contact our nearest sales office.

Test building

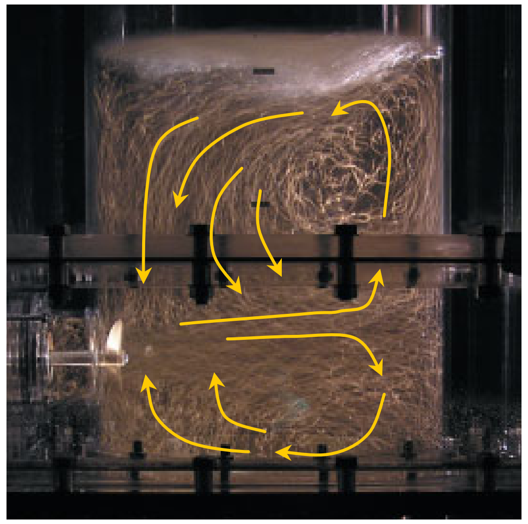
List of test tanks

No.	Tank name	Shape	Capacity	Material
(1)	Observation tank 1	ø1200 x H2000, Round bottom	2.3 m^3	Vinyl chloride, bottom plate: SUS 304
(2)	Observation tank 2	ø580 x H1160, Round bottom, w/ observation angular sub-tank	0.3 m^3	Acryl, bottom plate: SUS 304
(3)	Flat-bottomed observation tank	ø580 x H1000, Flat bottom, w/ observation angular sub-tank	0.26 m^3	Acryl, bottom plate: SUS 304
(4)	Sanitary test tank	ø780 x H1000, Flat bottom	0.47 m^3	Acryl, bottom plate: SUS 304
(5)	SUS tank	ø1500 x H2300, Round bottom	3.9 m^3	SUS304
(6)	Small SUS tank 1	ø600 x H820, Round bottom	0.2 m^3	SUS304
(7)	Small SUS tank 2	ø600 x H820, Round bottom	0.2 m^3	SUS304

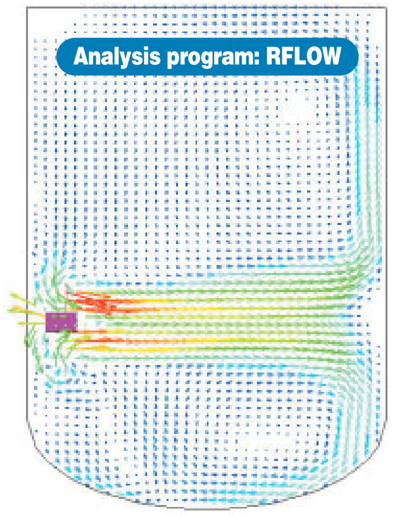
Test data

An example of in-house test data is given below.

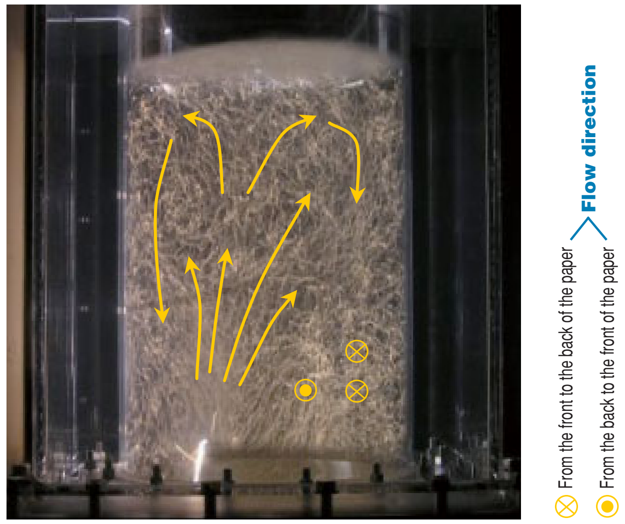
Flow visualization for propeller blades (side installation)



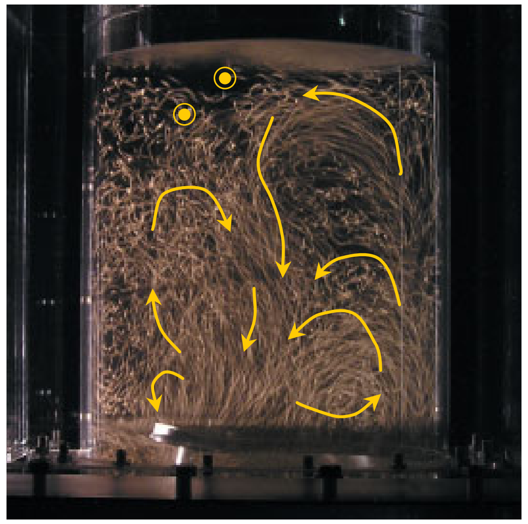
Flow pattern analysis for propeller blades (side installation)



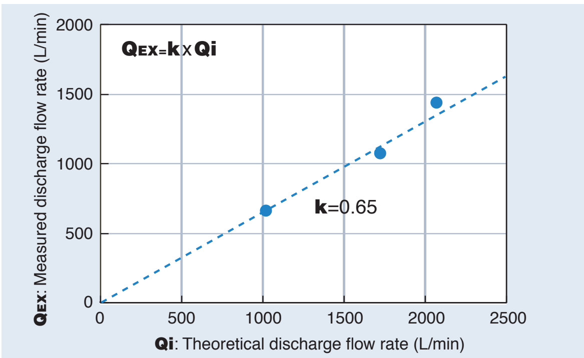
Flow visualization for propeller blades (bottom installation)



Flow visualization for turbine blades (bottom installation)



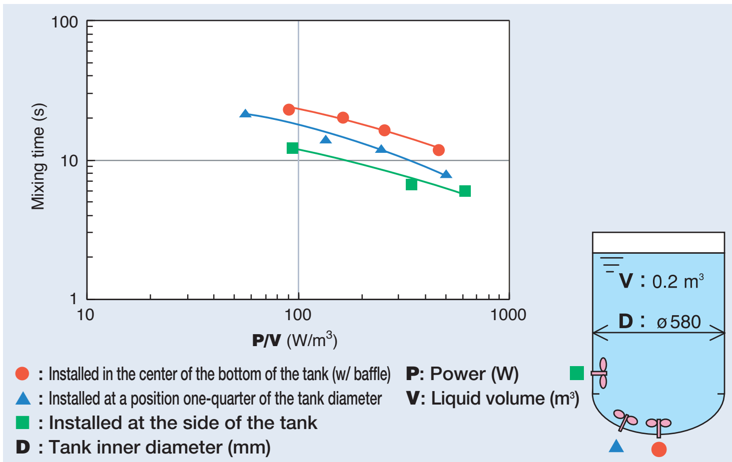
Propeller blade discharge flow rate



●: Measured discharge flow rate
$Q_i = \pi/4 \times d^2 \times P \times n$
$Q_{EX} = k \times Q_i$
$k = 0.65$

d: Blade diameter (mm)
P: Blade pitch (mm)
n: Revolution (rpm)

Mixing time for propeller blades



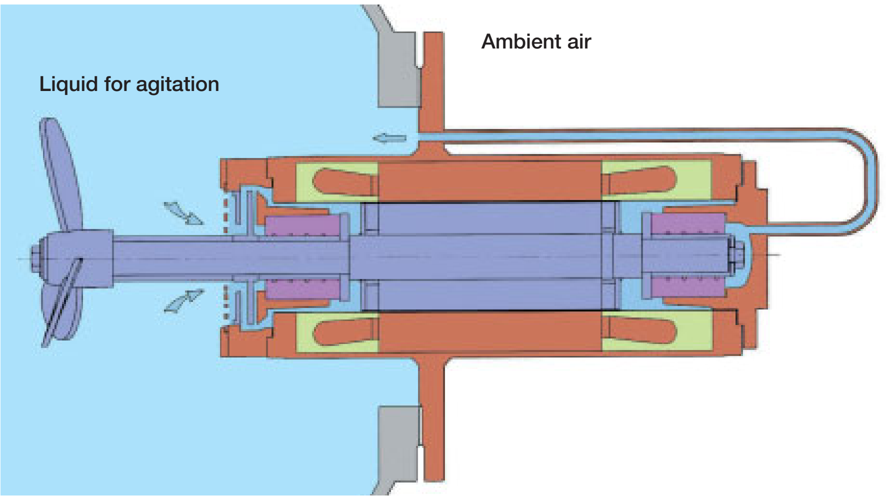
● : Installed in the center of the bottom of the tank (w/ baffle)
▲ : Installed at a position one-quarter of the tank diameter
■ : Installed at the side of the tank
D : Tank inner diameter (mm)

P: Power (W)
V: Liquid volume (m^3)

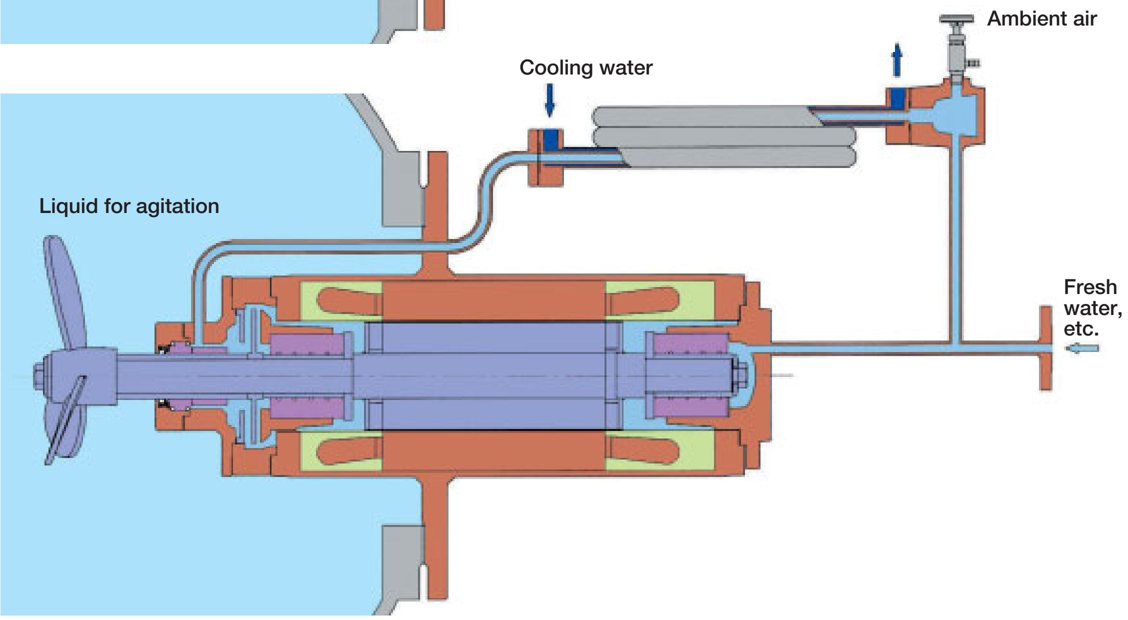
Lineup

R-type agitator

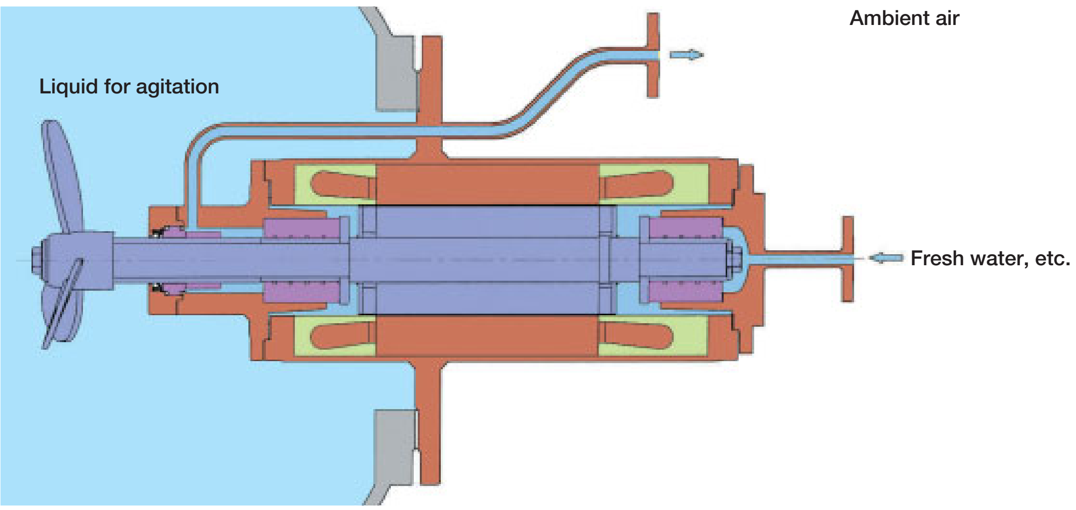
Basic type (AF type)
TEIKOKU's most popular, basic type agitator.



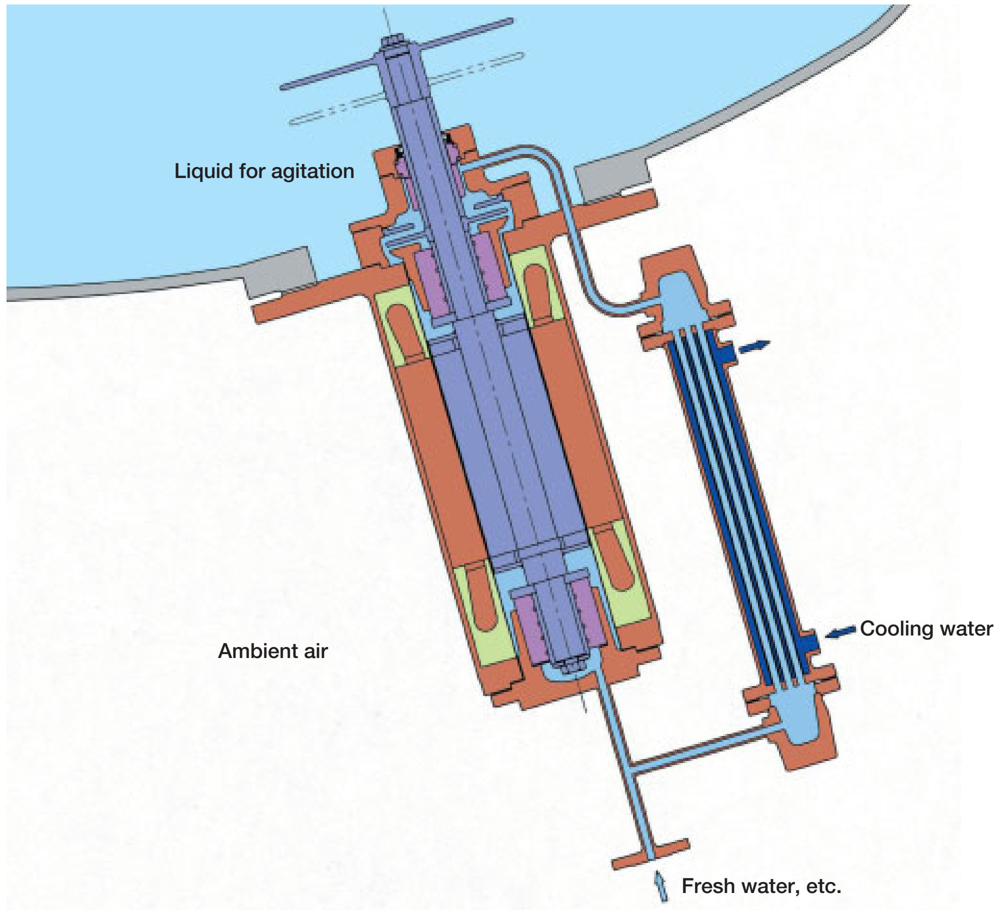
Liquid-sealed slurry type (AD type)
Suitable for agitating liquid containing a large amount of slurry.



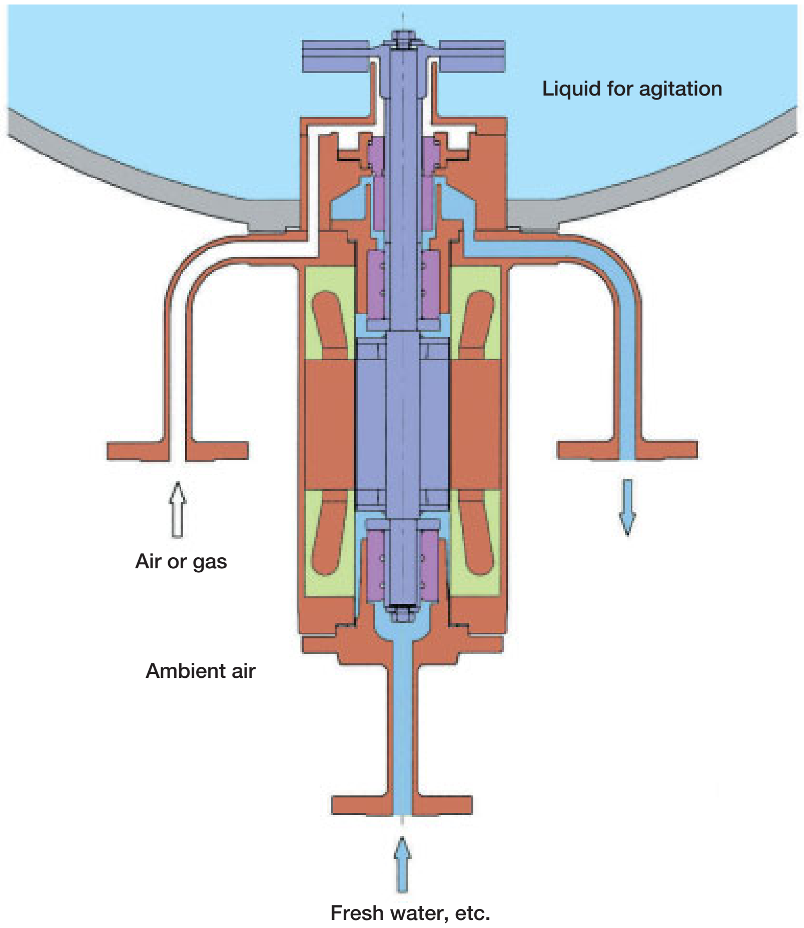
Liquid-injection slurry seal type (AS type)
Suitable for agitating liquid containing a large amount of slurry.



Canned motor crusher
Crushes solids deposited on the surface of pipes and tanks.
(See page 13)



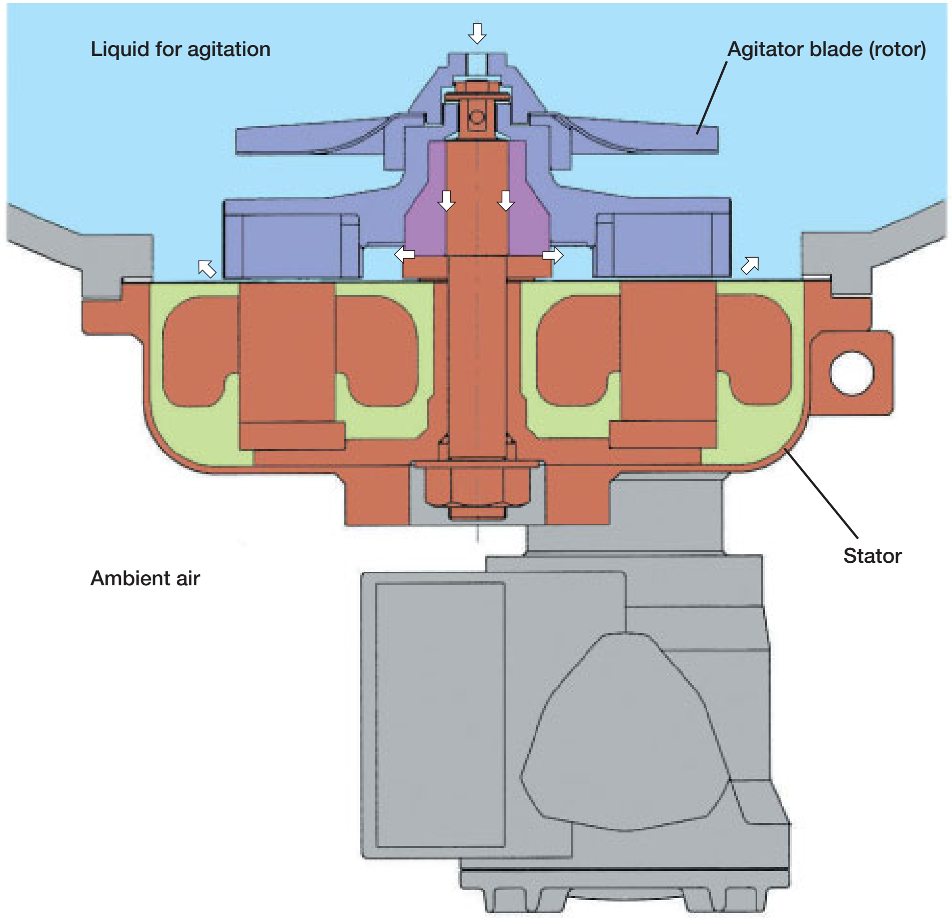
Aerator
Excellent for distributing gases.
(See page 14)



A-type agitator

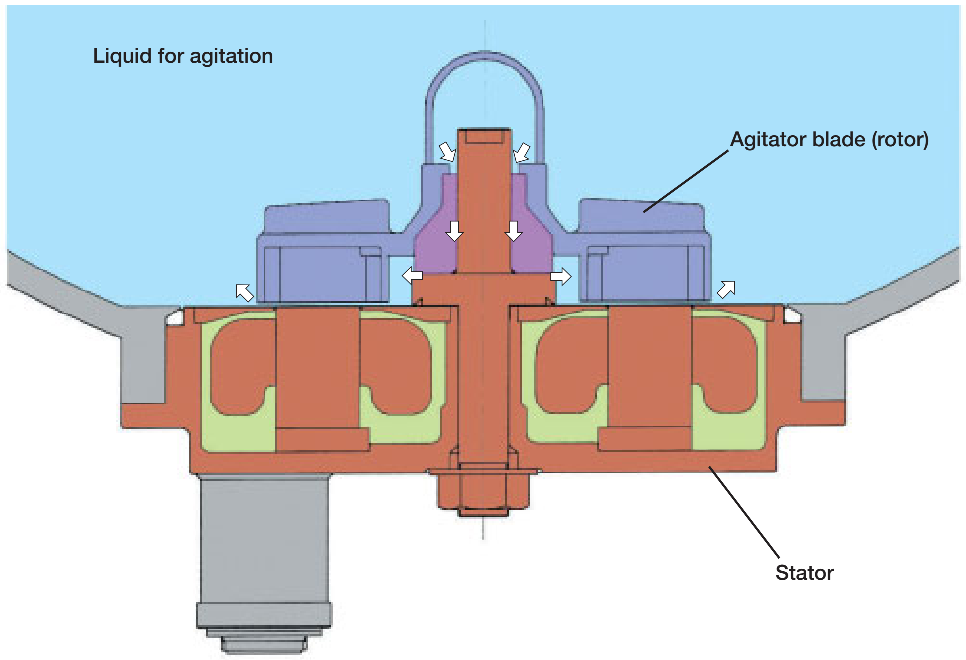
Basic type
TEIKOKU's most popular, basic type agitator.

⇦ : Circulation flow path



Sanitary agitator
Suitable for pharmaceutical, food and beverage, and other sanitary process needs.
(See page 12)

⇦ : Circulation flow path

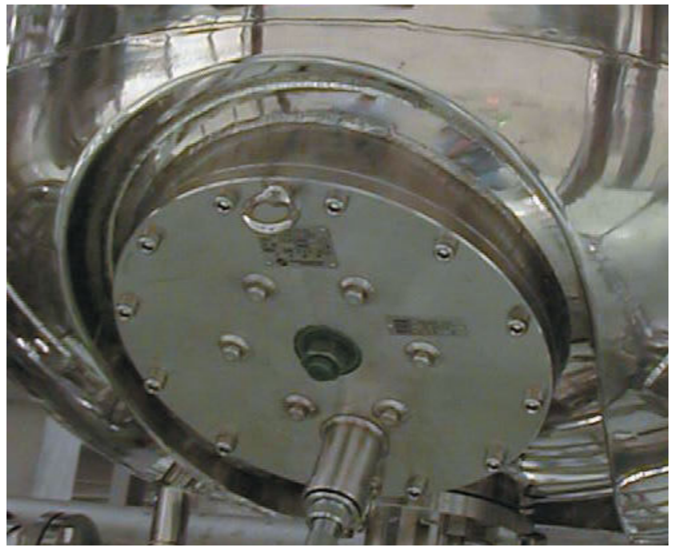


Special agitators

Sanitary agitators

Characteristics

- Suitable for pharmaceutical, food and cosmetic applications requiring sanitary operation.
- No contamination from external sources because no shaft seals are used.
- Its simple structure makes assembling/disassembling/cleaning very easy.
- Fewer components.
- Its A-type motor gives the facility a simple appearance.



A photo taken from the bottom of the tank.

The agitator can be installed in the narrow space at the bottom of the tank.

One-touch disassembly.

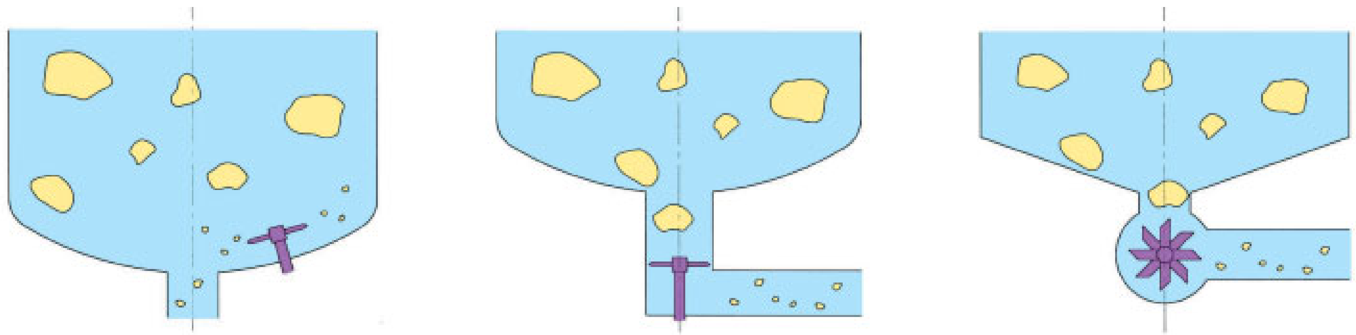
Since the agitator can be removed simply by lifting the blades, it can be easily cleaned and provides reliable sanitary operation.

Canned motor crusher

Characteristics

- A solution for troublesome solid-removal from the bottom of the tank and the drain pipe, which used to be possible only when the process is off work.
- Takes remarkable advantages of the R-type agitator characteristics.
- Crushes the solids by rotating the cutter blades directly mounted to the motor shaft at a high speed of 1,000 to 3,600 rpm; the robust cutter blades strike the deposits to break them into pieces.
- Allows selection of the cutter blade angle, the number of blades and stages depending on the initial particle size, properties, and targeted crushed particle size.

Installation: The following illustration shows the standard installation of the crusher to crush solids efficiently.



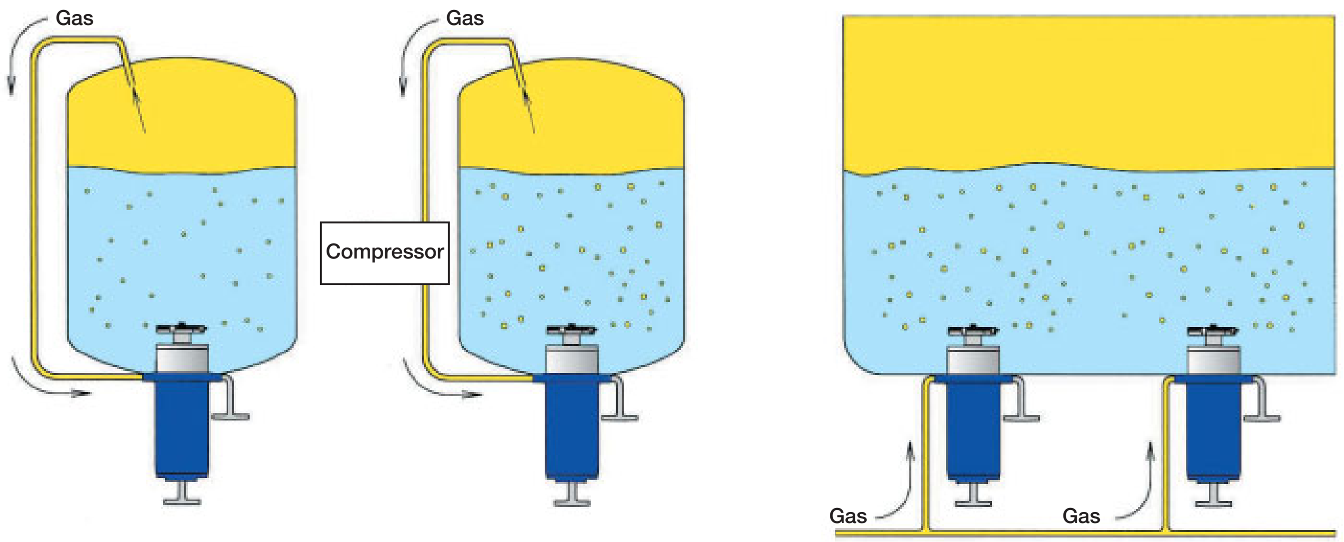
Tank-bottom installation **In-line installation** **Pit-in installation**

Aerator

Characteristics

- Suitable to boost gas-liquid contact by gas dispersion, purification of wastewater (aeration), and other hydrogenation reactions.
- Fine-crushes bubbles by the strong shear force of the blades.
- Self-primes air by the suction of the blades.
- No sparger is necessary.

Installation: The following illustration shows three examples of installation: self-prime, booster feed, and multiple installation.



Self-prime
The gas phase is dispersed into the liquid by simply installing a suction pipe.

Booster suction feed
This type is used for high gas feed rates and large liquid depths.

Multiple installation
This is recommended for use in dispersing gas over a wide area.

TRG that can externally monitor the overall operating conditions of a canned motor

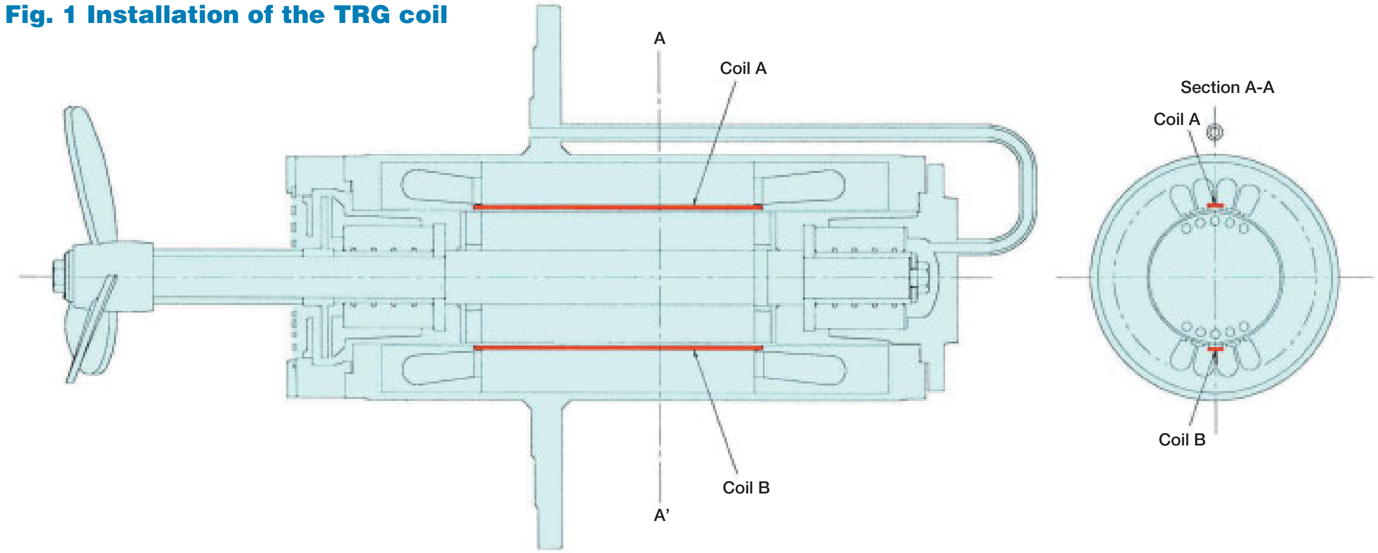
(TEIKOKU Rotary Guardian)

Patented in Japan, the US, the U.K., Germany, Russia, France, and Italy.

This monitoring equipment has dramatically increased the reliability of TEIKOKU's agitators and can be installed only on R-type motors.

Structure

Fig. 1 Installation of the TRG coil



Working principle

Fig. 2

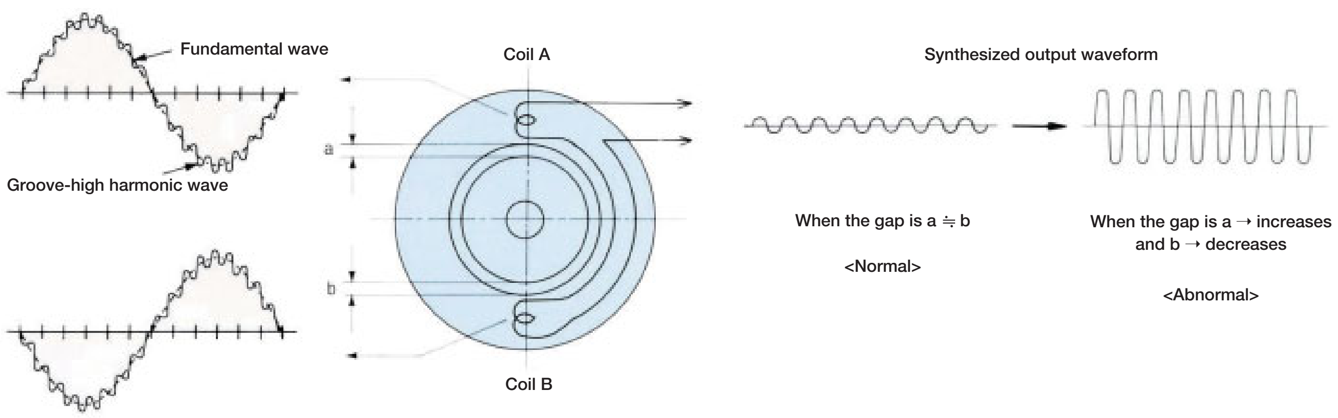
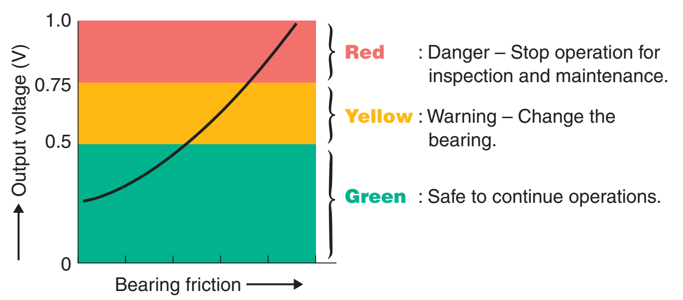


Fig. 3

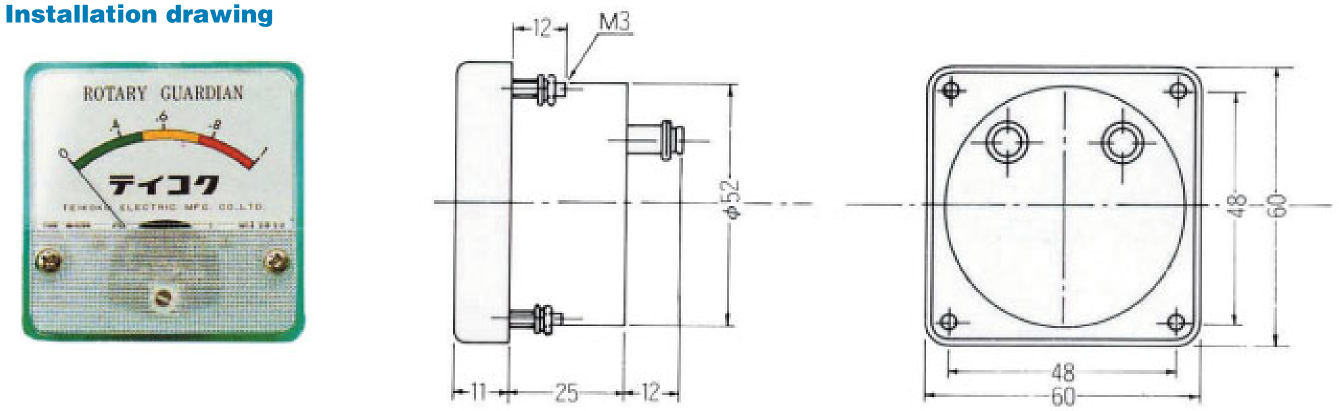


As shown in **Fig. 1**, a pair of TRG coils wound around the stator core teeth induce a voltage of the waveform superimposed with groove high harmonic waves as shown in **Fig. 2**. When the phase of each coil is shifted by 180 degrees, the amplitude of the fundamental waves becomes zero and only the difference in the high harmonic component between coils A and B appears at the TRG coil output terminal. If the bearing wears, gap "a" increases and gap "b" decreases, the high harmonic waves of coil B significantly increase, resulting in an output voltage proportional to the amount of bearing wear as shown in **Fig. 3**. The voltage is measured and displayed to show the operating condition.

TRG with a terminal box for local monitoring

TRG with a panel for remote monitoring

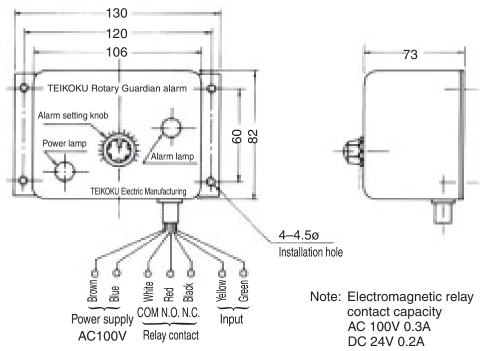
Installation drawing



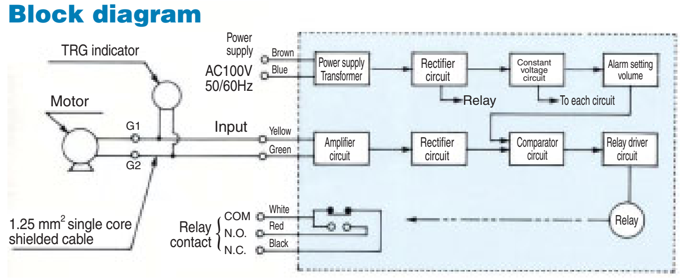
Alarms (optional)

The alarm shown in the picture on the right is available. An alarm circuit can be easily arranged to receive the output voltage of the TRG and thus the motor can be interlocked.
A TRG converter is also available to convert the signal from the TRG to 4–20 mA DC or 1–5 V DC.
Please contact us for details.

Installation drawing



Block diagram



* Using the TRG with an inverter

When a canned motor with a TRG is driven by an inverter or when an inverter is used near the motor, the TRG indication may increase in error due to the electric noise from the inverter. Please consult us before using an inverter.

Selection and installation

When you use our agitator for the first time:

Please make a selection as follows:

(1) Obtain the agitation factor from the table on the right.

(2) Obtain the tentative flow rate, determine the size of the driver motor from the flow rate and dynamic viscosity in reference to the agitator motor selection chart, and determine the motor type according to the operating conditions.

Tentative flow rate = volume of the liquid for agitation x specific gravity of the liquid x agitation factor ... (a)

Agitation factor

Agitation type	Factor	Agitation type	Factor
Strong agitation	3.42	Gas cleaning	1.78
Emulsification (stable)	3.36	Cleaning (liquid)	1.64
Solid suspension (difficult)	3.29	Heat conduction (normal)	1.57
Gas absorption (low solubility)	3.08	Crystal size adjustment	1.37
Solid dissolution	2.80	Cleaning (solid)	1.26
Heat conduction	2.60	Extraction (liquid-liquid)	1.19
Contact	2.46	Solid suspension (easy)	1.10
Emulsification (unstable)	2.40	Stirring (circulation only)	1.07
Medium agitation	2.26	Gas absorption (high solubility)	1.04
Gas absorption	2.05	Mixing (easy-to-mix liquids)	1.00
Solid suspension	1.92	Weak agitation	0.90

Notes:
1. Applicable to round tanks with a liquid level-to-tank diameter ratio of 1.3 to 0.8 and side installation. Please consult us for other cases.
2. Please consult us if there is a draft tube or a coil jacket in the tank.
3. SG x $\nu^{0.2}$ (specific gravity x dynamic viscosity to the power of 0.2) should not exceed 3.

An example of selection

Purpose of agitation = to obtain a homogeneous liquid phase
Tank shape = 2000 D x 2400 H
Volume of liquid for agitation= 6.5 m^3
Tank inner pressure = 0.2 MPaG
Properties of liquid for agitation
Specific gravity = 1.4
Viscosity = 2 mPa-s
Temperature = 60°C
Explosion-proof structure of motor = ed2G3
Power = 3-phase x 60 Hz x 220 VAC

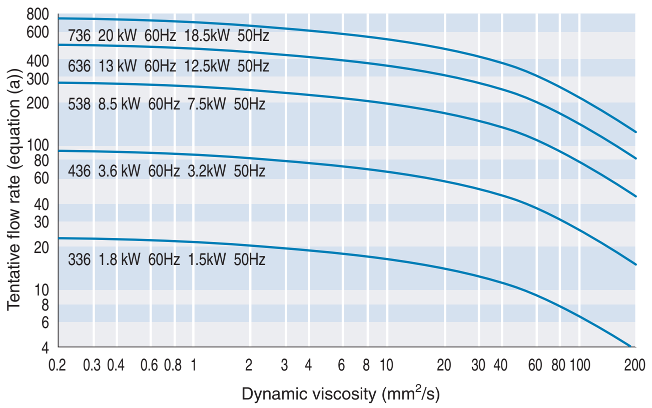
Determine the size of the agitator motor

Obtain the tentative flow rate from equation (a).
Tentative flow rate = 6.5 x 1.4 x 1.00 = 9.1 m^3
Dynamic viscosity: $\nu = 2 \times 10^{-3}/1.4 \times 10^3 = 1.43 \times 10^{-6}$ m^2/s = 1.43 mm^3/s
Choose R-type or A-type, depending on the use.
The size is determined to be 150-6 from the selection chart.

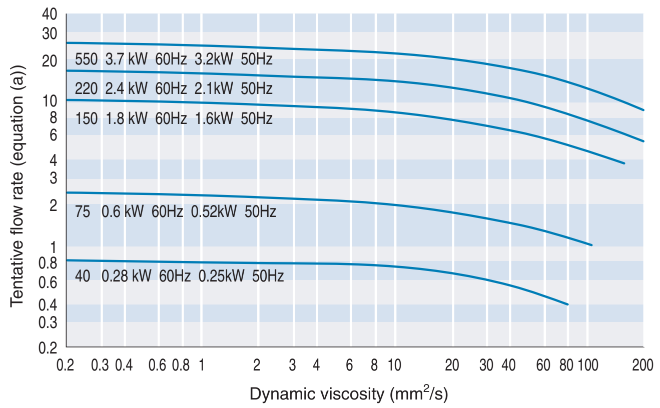
Determine the type of agitator

The type is determined as ACE150-6V according to the classification on pages 21 and 22.

Agitator motor selection chart: R-type agitators



Agitator motor selection chart: A-type agitators



When you have experience with our agitators and wish to scale up the existing agitator

TEIKOKU's agitators are scaled up as follows:

(1) Soluble liquid-liquid agitation

The following formula applies to the relationship between the power ratio and the liquid ratio:

$$P_2/P_1 = (V_2/V_1)^{0.64} \ldots \text{(b)}$$

V_1: volume of the liquid for agitation (m^3) for the model plant — P_1: Power of the model plant (kW)
V_2: volume of the liquid for agitation (m^3) for the scaled-up agitator — P_2: Power for the scaled-up agitator (kW)

The power is obtained from the equation (b) to determine the agitator power and the required number of agitators.
If the required number exceeds that for the model plant, the installation position of the agitators must be considered. Please consult us.

An example of selection

In order to scale up the tank with a agitation liquid volume of 30 m^3 to that of the same shape with an agitation liquid volume of 70 m^3. Originally one ACE550-6V unit is used.

From equation (b), $P_2 = (70/30)^{0.64} \times 3.7 = 1.72 \times 3.7$ kW
Consequently, two ACE550-6V units should be installed.

(2) Solid suspension and emulsification agitation
The following equation holds true: $P_2/P_1 = V_2/V_1$..... (c)
Follow the steps in (1).

(3) Please consult us for solid dissolution and other scale-ups.

Calculation of agitation time

Let T be the required number of turnovers for the model plant until the completion of agitation.

t = T = V/Q (min)..... **(d)**
t: agitation time (min)
T: required number of turnovers
Q: circulation flow rate of the agitator (m^3/min)
V: volume of liquid (m^3)

Propeller blade

Q = k x π/4 x Di^2 x P x N (m^3/min)..... **(e)**
k: coefficient
Di: blade outer diameter (m)
P: propeller blade pitch (m)
N: Revolution of the agitator (r/min)

Turbine blade

Q = Nq x N x Di^3 (m^3/min)..... **(f)**
Nq: coefficient

An example of calculation

Conditions to calculate the agitation time
Volume of the liquid for agitation: 30 m^3
Agitator type: AF41-436C2BM-11-B

From Table 20 on page 19,
Di = 0.265 m, P = 0.25 m
If T and k take a value of 3 and 0.6, respectively, based on measurements:
From equation (e), Q = 0.6 x π/4 x 0.265^2 x 0.25 x 900 = 7.4 mm^3/min
From equation (d), t = 3 x 30/7.4 = 12.16 min

Instructions for selecting the type

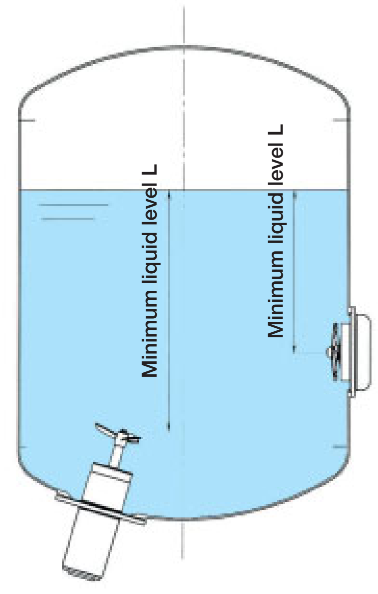
(1) The following are special cases. Please consult us.
- The value of SG x $\nu^{0.2}$ (specific gravity x dynamic viscosity to the power of 0.2) exceeds 3.
- The temperature of the agitator exceeds the allowable liquid temperature.
- Agitators having a round tank and a liquid height-to-tank diameter ratio is beyond the range of 1.3 to 0.8.

(2) The following are special cases for agitation of slurry (solid suspension), and slurry seal agitators are recommended.
- Abrasive slurry
- Adhesive slurry
- 0.5 mm or larger slurry
- Slurry density is 30 wt% or above
- Back-flush liquid injection is extremely limited.

Installation of the agitator

Minimum liquid level

When vigorous liquid level fluctuation occurs, be sure to install a liquid-level controller to prevent such operation with the liquid level below the minimum liquid level.
Note: The minimum liquid level, L, is the distance from the liquid surface to the center of the blade.



R-type agitators

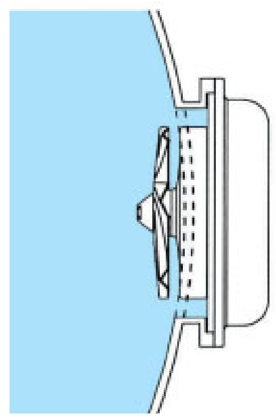
Type	Minimum agitation level L (mm)		
	AF (basic type)	AS (liquid injection type)	AD (liquid-sealed type)
336	450	350	350
436	500	400	400
538	550	400	400
636	600	450	450
736	600	450	450

A-type agitators

Type	Minimum agitation level L (mm)
40–6	500
75–6	600
150–6	700
220–6	800
550–6	900

Nozzle-end flange for installation

As shown in the figure on the right, design the flange so that the agitator blades project out of the extension of the tank wall.

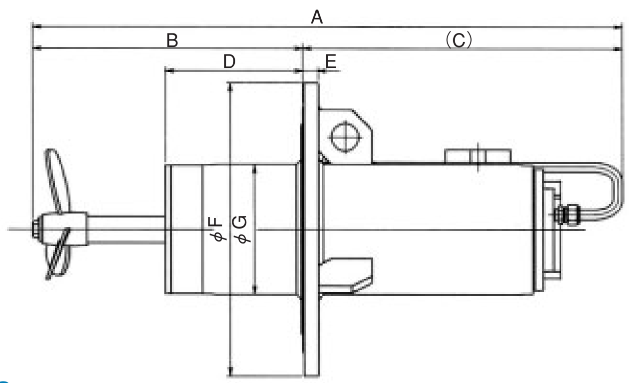


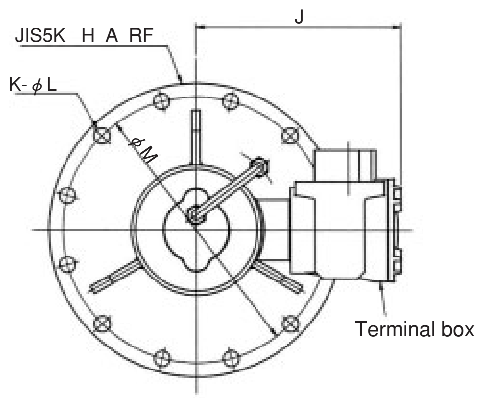
Specifications and dimensions

R-type agitators/explosion-proof structure d2G3

Specifications

Motor Frame No.	Frequency (Hz)	Rated Power (kW)	Rated Voltage (V)	Rated Current (A)	Starting Current (A)	Max. Liquid Temp (°C) Test Pass No. (Type C Insulation)	Std. Outer Dia. (mm)	Std. Blade Pitch (mm)	Circulation Flow Rate (m³/min)	Weight (kg) AF	AS	AD
336	60	1.5	200	18	38	100 T46419	ø200	190	4.30	130	135	160
			220	17	42							
		1.8	220	18	42							
	50	1.5	200	18	44		ø220	210	4.79			
436	60	3.2	200	26	62	110 T40926	ø250	200	7.07	142	148	185
			220	24	68							
		3.6	220	26	68							
	50	3.2	200	26	70		ø265	250	8.27			
538	60	5.5	200	42	114	90 T39818	ø265	250	9.93	225	231	270
			220	42	124							
		7.5	200	50	114		ø285	270	12.4			
			220	46	124							
		8.5	220	50	124		ø300	285	14.5			
	50	5.5	200	42	132		ø300	285	12.1			
		7.5	200	50	132		ø315	300	14.0			
636	60	11	200	66	158	110 T49572	ø315	300	16.8	380	385	450
			220	64	174							
		12.5	200	78	158							
			220	70	174							
		13.5	220	78	174							
	50	11	200	66	186		ø350	330	19.0			
		12.5	200	78	186							
736	60	15	200	88	220	105 T40540	ø335	320	20.3	470	528	590
			220	88	242							
		18.5	200	104	220		ø350	330	22.9			
			220	96	242							
		20	220	104	242							
	50	15	200	96	262		ø380	350	23.8			
		18.5	200	104	262							





Dimensions

Motor Frame No.	A	B	C	D	E	F	G	H	J	K	L	M
336	863	395	468	202	22	430	190.7	300	300	12	23	390
436	911	420	491	216	24	480	216.3	350	316	12	25	435
538	1139	545	594	246	24	540	244.5	400	347	16	25	495
636	1270	561	709	262	24	605	280	450	367	16	25	555
736	1454	711	743	351	27	605	318.5	450	438	16	25	555

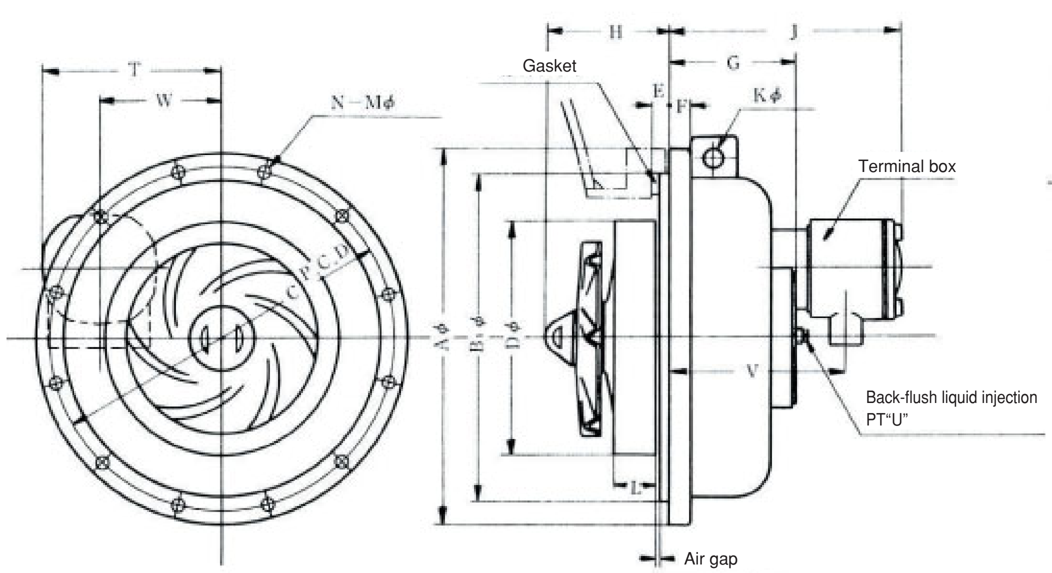
A-type agitators/explosion-proof structure ed2G3: w/o jacket ed2G2: w/ jacket

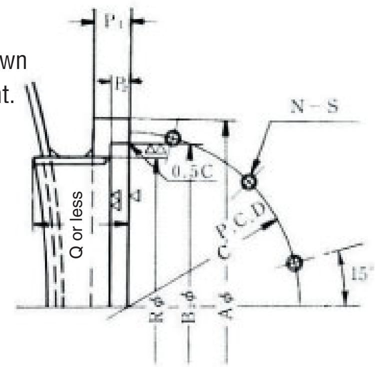
Specifications

Motor Frame No.	Frequency (Hz)	Rated Power (kW)	Rated Voltage (V)	Rated Current (A)	Starting Current (A)	Locked Current (A)	Max. Liquid Temp (°C) Test Pass No. (Type C Insulation) w/o jacket	w/ jacket	Std. Outer Dia. (mm)	Circulation Flow Rate (m³/min)	Max. viscosity (mPa-s)	Weight (kg)
40–6	60	0.28	220	3.0	4.6	4.0	115	125	130	1.2	70	25
	50	0.25	200	3.0	5.0		T47868	T48181	140	1.1		
75–6	60	0.6	220	5.7	9.0	7.2	85	95	160	2.7	140	30
	50	0.52	200	5.7	9.6		T47869	T48182	180	2.9		
150–6	60	1.8	220	12	24	17	100	110	210	5.9	220	45
	50	1.6	200	12	26		T47870	T48183	220	5.5		
220–6	60	2.4	220	15	32	28	105	115	235	8.6	220	60
	50	2.1	200	15	34		T47871	T48184	250	8.4		
550–6	60	3.7	220	24	48	42	85	105	270	10.5	220	80
	50	3.2	200	24	50		T47872	T48185	296	11.1		

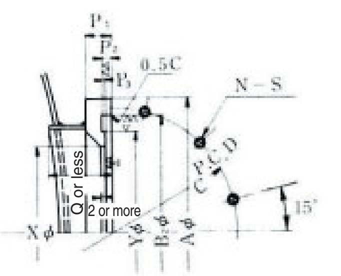
Notes:
1. The current for 400 V/440 V should be half the value in the table.
2. The standard blade diameter and the circulation flow rate are for fresh water.
3. The allowable locked-rotor operation time is 15 sec.

Tank nozzle-end flange should be made as shown in the figure on the right.





Increased-safety non-explosion proof



In the case of a vacuum tank

Dimensions

Motor Frame No.	A	B_1	C	D	E	F	G	H	J	L	N	M	T	W	U	B_2	R	P_2	S	Q	P_1	P_3	X	Y
40−6	272	243	254	176	8.5	11.5	77.5	81.5	263	29	12	9	171	96	1/8	$243^{+0.8}_{+0.5}$	220	7.5	M8	33	18	1.8±0.1	186	208
75−6	308	276	288	202	10	12.5	87.5	93	268	32	12	9	179	104	1/4	$276^{+0.8}_{+0.5}$	252	9	M8	37	18	1.8±0.1	212	236
150−6	360	324	337	232	10	15	102	111.5	278	36	12	11	191	116	1/4	$324^{+1.1}_{+0.8}$	296	9	M10	43	20	1.8±0.±1	240	280
220−6	400	362	376	258	12	15	107	120	287	38.5	12	11	196	121	3/8	$362^{+1.1}_{+0.8}$	328	11	M10	45	22	3.0±0.1	280	312
550−6	464	414	434	296	14	16	119	132.5	293	46.5	12	14	215	140	3/8	$414^{+1.1}_{+0.8}$	382	13	M12	55	24	3.0±0.1	320	364

Classification/materials

R-type agitators

Classification

Product classification	Motor	Agitator	Accessory structure
A■■●● (1)(2)(3)(4)	●●●■●■■ (1) (2)(3)(4)(5)	●●■ (1)(2)(3)	■■ (1)(2)

A■■●● — ●●●■●■■ — ●●■ — ■■

● : Alphabetics
■ : Arabic numerals

Product classification

(1) Type
- **F**: Basic type
- **D**: Liquid-sealed slurry seal type
- **S**: Liquid-injection slurry seal type
- **Z**: Special

(2) Horizontal, vertical
- **Blank**: horizontal
- **P**: vertical

(3) Main material classification
- **1**: FC
- **2**: SC
- **4**: SUS304
- **5**: SUS304L
- **6**: SUS316
- **7**: SUS316L
- **9**: Special

(4) Nominal pressure-resistance class
- **1**: 1 MPa or less
- **2**: 2 MPa
- **3**: 3 MPa
- **4**: 4 MPa
- **5**: 5 MPa
- **6**: 6 MPa
- **7**: 7 MPa
- **8**: 8 MPa
- **9**: 9 MPa or more

Motor

(1) Motor frame No.

● ● ● 330–730
- ● Stator outer diameter class
- ● Number of poles
- ● 9: special

(2) Heat-resistance class
- **C**: 220 (Type C 220°C)
- **J**: 220 (Type C 220°C, jacket: water)
- **S**: 220 (Type C 220°C, jacket: steam, hot water, etc.)
- **X**: 400 (Special Type C 400°C)
- **Y**: 400 (Special Type C 400°C, jacket: steam, hot water, etc.)

(3) Nominal voltage class
- **2**: 200 V
- **4**: 400 V
- **9**: Special

(4) Other*1

No. of terminal boxes	Starting method	Thermostat	W/o inverter	W/ inverter
1	D. O. L.	No	Blank	P
		b-contact	B	F
		a-contact, etc.	X	S
Special			Z	

(5) TRG (TEIKOKU Rotary Guardian)
- **Blank**: None
- **L**: Terminal box with meter
- **M**: Terminal box with meter + rotational direction detector
- **G**: Probe only
- **R**: Probe + rotational direction detector
- **N**: Other

Agitator

(1) Impeller type
- **1**: Propeller
- **2**: Welded propeller
- **3**: Turbine type
- **4**: Paddle type
- **9**: Special

(2) Single- or multi-stage
- **1**: Single stage
- **2**: Two stages
- **3**: Three stages

(3) Gasket
- **Blank**: Standard
- **V**: Spiral G
- **Z**: Special

Accessory structure

(1) Frequency
- **A**: 60Hz
- **B**: 50Hz

(2) Accessories

	Circulation pipe*2	Stand
Blank	Standard	No
D	Standard	Yes
C	W/ cooler (water)	No
E	W/ cooler (water)	Yes
J	W/ jacket (water)	No
K	W/ jacket (water)	Yes
S	W/ jacket (steam, hot water, etc.)	No
T	W/ jacket (steam, hot water, etc.)	Yes
Z	Special	

*1. For the a-contact specification, other symbols are used for the starting methods. P, F and S are used only for explosion-proof inverter-driven motors.
*2. For liquid-sealed slurry seal and liquid-injection slurry seal types, the circulation method is automatically determined. Therefore, duplicate indication should be avoided, and "blank" (without the stand) or D (with the stand) shall be used.

Material

		Standard		Special material
		SUS304	SUS316	Alloy C-276
Impeller		SCS13	SCS14	Alloy C-276
FB housing RB housing		SCS13 SUS304	SCS14	Alloy C-276
Motor flange		SUS304L	SUS316L	Alloy C-276
Stator can	530 or below	SUS304L	SUS316L	Alloy C-276
	630 or over	Alloy C-276		
Rotor can		SUS304L	SUS316L	Alloy C-276
Bearing		Carbon graphite		Carbon graphite
Sleeve		SUS316 + hard chromium		Alloy C-276
Other area in contact with liquid		SUS304 SUS316	SUS316	Alloy C-276
Areas not in contact with liquid		SS, FC, etc.		SS, FC, etc.

Note: These special materials are just examples.

A-type agitators

Classification

Product classification	Motor	Agitator
■■■ (1)(2)(3)	●●● (4)	●■ (5)(6)

■■■●●● — ●■

● : Alphabetics
■ : Arabic numerals

Product classification

(1) Nominal design pressure class
- **A**: 0.2 MPa or less

Motor

(2) Thermal-resistance class
- **C**: 220 (Type C 220°C)*1
- **J**: 220 (Type C 220°C, jacket: water)*2

(3) Explosion-proof grade
- **E**: ed2G3 or ed2G2
- **No**: Non-explosion proof

(4) Frame number
- 40–550

(5) Pole No.
- 6: 6 poles

Agitator

(6) Blade type
- **V**: Turbine blade
- **P**: Propeller blade*3

*1: The explosion-proof structure represented by the symbol "C" is ed2G3.
*2: The symbol "J" represents Type C insulation with the jacket attached to the motor and the explosion-proof structure is ed2G2.
*3: Propeller blades can be used only for frame numbers 220 and 550.

Material

	Standard	Special material
	SUS316	Alloy C-276
Impeller	SUS316	Alloy C-276
Rotor and rotor can	SCS16 SUS316L	Alloy C-276
Stator can	SUS316L	Alloy C-276
Shaft	SUS316	Alloy C-276
Shaft surface hard-facing	Stellite	—
Bearing	Carbon graphite	Carbon graphite
Gasket	Teflon	Teflon
Other welding parts	SUS316	Alloy C-276
Non wetted parts	SS, FC, etc.	SS, FC, etc.

Note: These special materials are just examples. In addition to them, titanium and other corrosion-resistant materials can be used. Please consult us for details.