TEIKOKU

CANNED MOTOR PUMPS

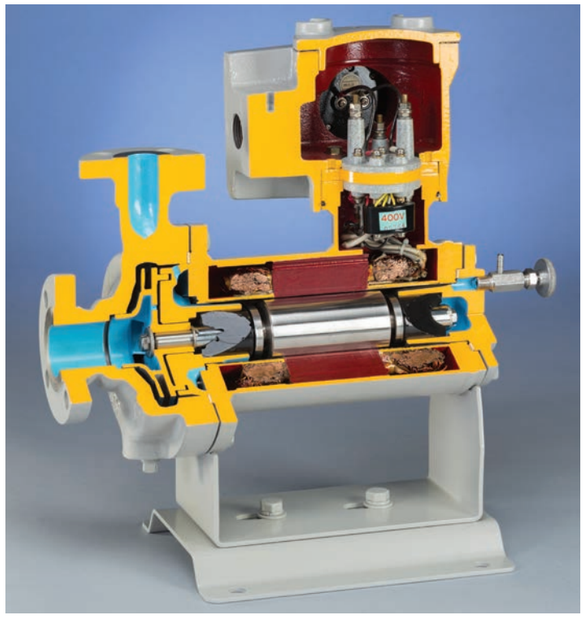
World's Largest Manufacturer of Canned Motor Pumps

ISO 9001 CERTIFIED

TEIKOKU ELECTRIC MFG. CO., LTD.

STATE OF THE ART PROCESS PUMPS

To Meet Today's Standards



Safety Meets Economy

Increase safety, while minimizing risk to the environment, plant personnel and neighbors, by specifying TEIKOKU Canned Motor Pumps. TEIKOKU's unique pumping solutions operate emission-free and are 100% leakproof by design, with secondary containment offered as standard to enhance corporate goals for safety and long term sustainability.

TEIKOKU Canned Motor Pumps offer unique solutions to the demands of Process Industries to utilize equipment that, while operating leak-free, performs with a high degree of reliability and efficiency. TEIKOKU's Canned Motor Pumps more than meet this challenge.

Besides providing for safe, redundant control for total fluid containment, TEIKOKU pumps offer some remarkable performance advantages. Designed for long periods of time between maintenance (MTBM) intervals, pre-planned maintenance during scheduled downtime is achievable. TEIKOKU Canned Motor Pumps feature a minimal number of components that need to be monitored and serviced. Costly, time consuming alignment procedures and external lubrication are completely eliminated. And, because TEIKOKU Canned Motor Pumps are sealless, complicated seal support systems and seal maintenance are eliminated.

TEIKOKU Canned Motor Pumps: true secondary containment safety, highly reliable operation, cost-economy…and ZERO environmental impact.

Teikoku Canned Motor Pumps

NO LEAKAGE OR EMISSIONS
Handles toxic, explosive, expensive, hazardous, carcinogenic and corrosive fluids without leaking during operation, shutdown or process upset conditions.

AIRTIGHT
Ideal for vacuum services or for fluids with high reactivity to atmosphere.

NO SHAFT SEAL
No dynamic mechanical seal. No gland packing.

NO EXTERNAL LUBRICATION
Pumped fluid provides cooling and thin film lubrication of motor and bearings. No lubrication levels to check or maintain.

VACUUM TO HIGH SYSTEM PRESSURE
Designs can be rated like pressure vessels to handle conditions from full vacuum to 5,000 psi / 35 MPa.

COMPACT DESIGN
Motor and pump are a combined, single unit. No alignment is necessary. Grouting and/or elaborate foundation design is eliminated.

QUIET OPERATION
Low noise levels are achieved since the motor is cooled without a fan. All rotating parts operate within the thick motor shell.

EXPLOSION PROOF
Certified by several underwriting agencies around the globe for use in electrical hazardous area locations.

API 610 / 685 NOZZLE LOADS

FIELD REPAIRABLE
Minimal number and simplicity of wear parts makes field service quick and safe.

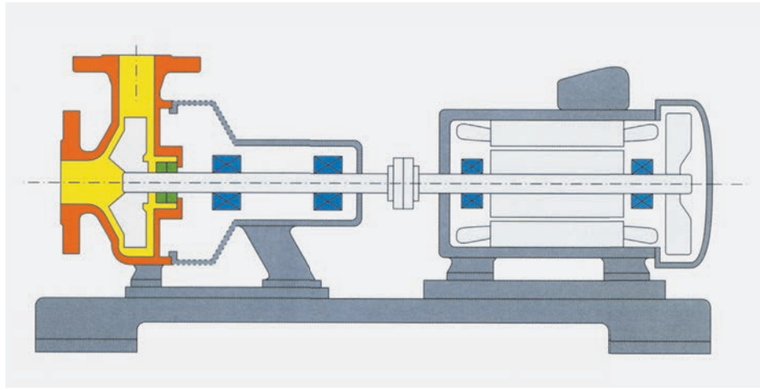
ELECTRONIC BEARING MONITORS
All TEIKOKU Canned Motor Pumps are supplied with bearing wear monitors.

ANSI B73.3 & ISO2858 SIZES AVAILABLE

ALL PUMPS PERFORMANCE TESTED
Every component of a TEIKOKU Canned Motor Pump, including the motor and hydraulics parts, are manufactured by TEIKOKU to the strict statistical quality control tolerances important to canned motor pump performance, where hermetic motor and hydraulic performance are linked by design. Every pump manufactured by TEIKOKU is tested and documented for performance and Net Positive Suction Head Required ($NPSH_R$) before shipment.

COMPARE TEIKOKU TO:

CENTRIFUGAL PUMPS with double mechanical seals



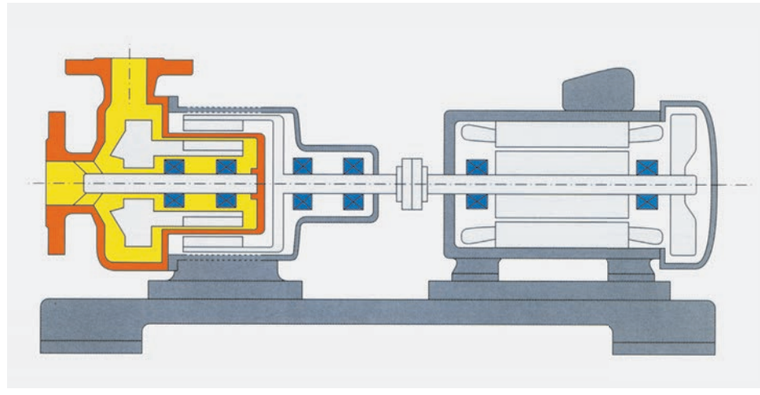
MECHANICAL SEALS
Seal failure usually results in total shutdown and pumps offer no secondary containment.

SEPARATE MOTOR AND PUMP
Requires scheduled and proper alignment to maximize unit reliability and the life of bearings and couplings. Motors are exposed and require fan cooling. Foundation pads must be poured and are necessary to support the increased weight and reduce the danger of misalignment. More than 60% longer than similar sized canned motor pumps.

COMPLEX MAINTENANCE
Motor and bearing lubrication and vibration levels must be continually monitored to extend operating life.

ELEVATED NOISE LEVEL
Separate motor cooling fan and other rotating parts greatly increase operating noise levels.

MAGNETIC DRIVE PUMPS



THIN CONTAINMENT SHELL
Required for efficiency and subject to damage by driven magnet sets and subsequent leakage to atmosphere. No secondary containment.

MULTIPLE BEARING TECHNOLOGY EMPLOYED
Combination of oil and grease lubricated ball bearings and fluid lubricated sleeve bearings requires frequent monitoring for proper lubrication. Rotating sleeve bearings cannot be externally monitored.

DECOUPLING DUE TO PROCESS UPSET
Decoupling may lead to sudden catastrophic failure and rapid heat rise.

SEPARATE MOTOR AND PUMP
Requires scheduled and proper alignment to maximize unit reliability and the life of bearings and couplings. Motors are exposed and require fan cooling. Foundation pads must be poured and are necessary to support the increased weight and reduce the danger of misalignment. More than 60% longer than similar sized canned motor pumps.

NOISY FAN
Separate motor cooling fan and other rotating parts greatly increase operating noise levels.

TEIKOKU CANNED MOTOR PUMPS

Designed For Zero-Leakage Services In The CPI & HPI

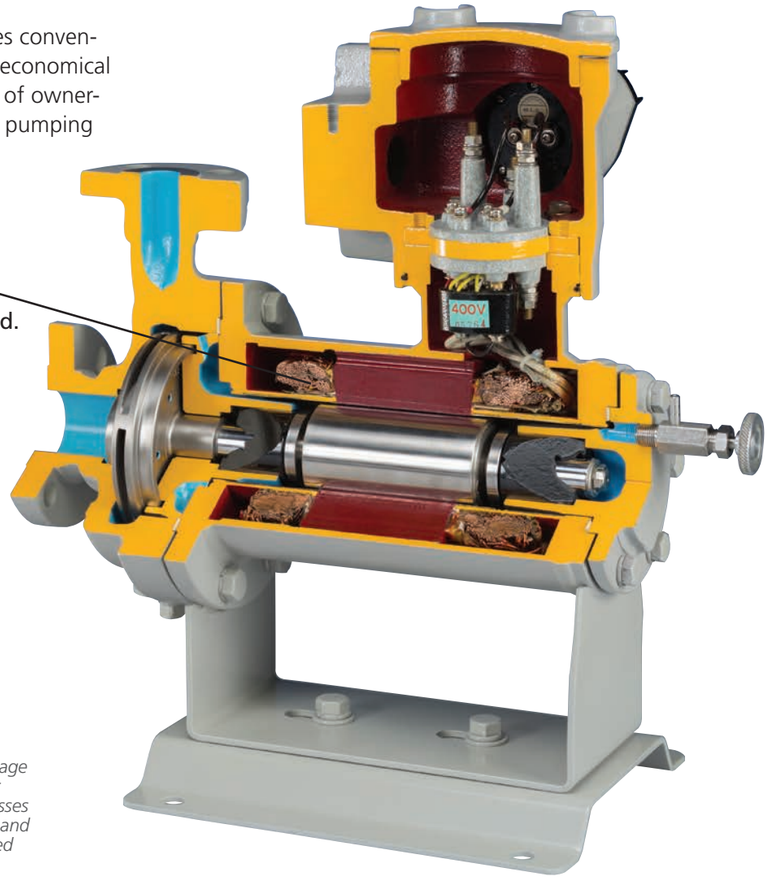
TEIKOKU, the world's largest supplier of canned motor pumps, offers a state-of-the-art, sealless pump.

No newcomer to the field, TEIKOKU has provided customers with proven Canned Motor Pump solutions for more than 50 years. Over 500,000 units have been installed worldwide, covering every possible application.

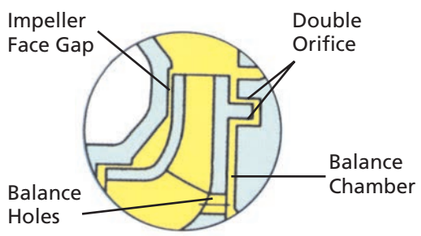
TEIKOKU is unique in that it designs and manufactures both pumps and motors, thus, ensuring users total quality control and matched hydraulic/driver performance.

The TEIKOKU Canned Motor Pump replaces conventional sealed pumps providing safer, more economical operation through reduced long term cost of ownership. This is especially advantageous when pumping hazardous, volatile, toxic and hard to handle fluids.

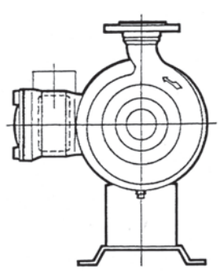
TEIKOKU provides expertise in selecting the pump best suited to a user's specific needs. TEIKOKU's experience encompasses horizontal standard pumps, vertical designs with either pump up or motor up configurations, pumps and motors jacketed for cooling or heating, self-priming volutes, submerged units, slurry design, non-cooled, high heat resistant motor pumps and more.



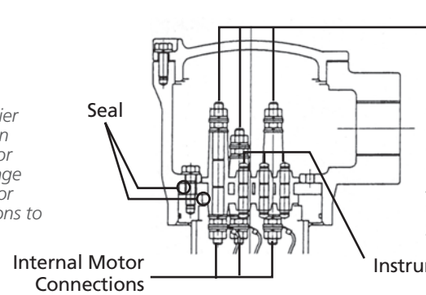
TEIKOKU THRUST BALANCE SYSTEM



Non-contacting double orifice permits minimum leakage and improves volumetric efficiency. Enclosed impeller with optimized face gap tolerance keeps hydraulic losses to a minimum for increased hydraulic efficiency. Size and number of balance holes set balance pressure for fixed axial operating position.

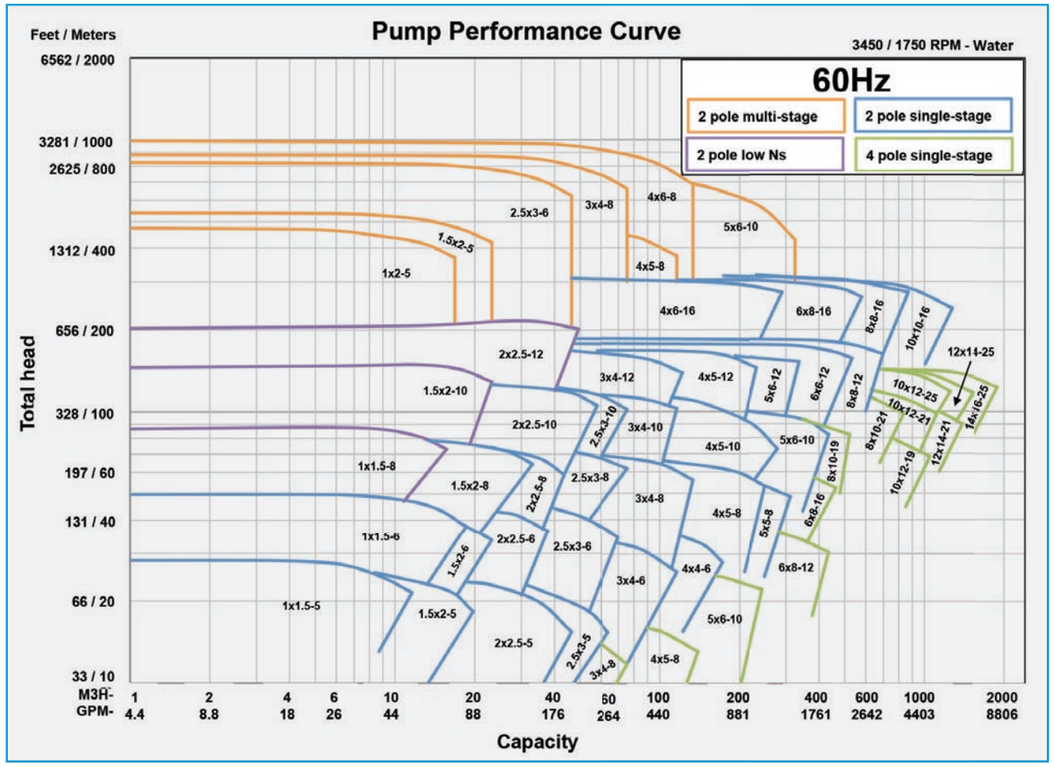


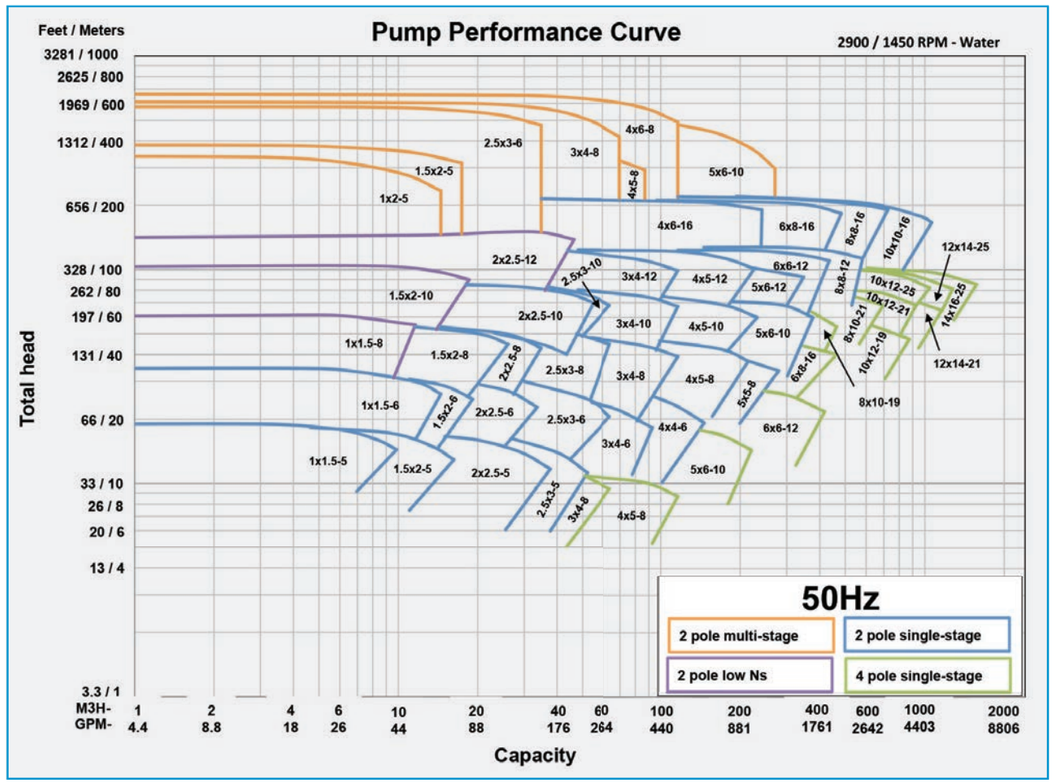
Centered End Suction and Centerline Discharge for easier piping design and installation consistent with either ANSI or ISO standards. Standard flange connections are raised face or available in a variety of options to meet user piping standards.



Terminal plates and lead seals isolate higher pressures from inside containment, and a waterproof, wash down duty terminal box ensures safe outdoor operation. All canned motor pumps are manufactured with an explosion proof terminal box.

PUMP PERFORMANCE CURVES





MOTOR RATINGS for standard canned motors

Standard 2-POLE MOTORS

Motor Frame #	Rate Output (KW)	Rate Output (HP)	Nominal Voltage	60Hz Rated Amp	60Hz Start Amp	50Hz Rated Amp	50Hz Start Amp
119	0.75	1	400	2.2	10	2.4	11
			440	2.2	10.5	2.2	13
	1.1	1.5	400	3	10	3	11
			440	2.7	10.5	2.8	13
	1.3	1.7	440	3	10.5	---	---
215	1.1	1.5	400	3.3	15	3.3	17
			440	3	16	3	19
	1.5	2	400	3.8	15	3.8	17
			440	3.6	16	3.4	19
	1.7	2.3	440	3.8	16	---	---
216	2.2	3.0	400	5.5	22	5.5	25
			440	5.1	24	5	28
	2.5	3.4	440	5.5	24	---	---
217	2.2	3	400	5.7	25	6.2	28
			440	5.5	27	5.4	31
	2.5	3.4	400	6.3	25	6.8	28
			440	6	27	5.9	31
	3	4	400	7.5	25	7.5	28
			440	6.7	27	6.8	31
	3.4	4.6	440	7.5	27	---	---
	3.5	4.7	400	8	25	8.5	28
			440	8	27	8.00	31
	3.9	5.2	440	8.5	27	---	---
316	3.7	5	400	9	51	10	58
			440	9	55	9.5	64
	5.5	7.4	400	13	51	13	58
			440	11.5	55	12	64
	6.2	8.3	440	13	55	---	---
317	6.6	8.9	400	16	53	16	61
			440	15	58	14.5	68
	7.4	9.9	440	16	58	---	---
	8.4	11.3	400	19	53	20	61
			440	19	58	19	68
	9.2	12.3	440	20	58	---	---
416	7.5	10.1	400	16	92	17	106
			440	16	101	17	117
	11	14.8	400	23	92	23	106
			440	21	101	23	117
	12	16.1	440	23	101	---	---
417	15	20.1	400	33	119	33	136
			440	30	130	33	150
	17	22.8	440	33	130	---	---
	17.5	23.5	400	36	119	37	136
			440	36	130	35.5	150
	19.5	26.1	440	37	130	---	---
516	15	20.1	400	31	137	33	158
			440	31	150	33	174
	18.5	24.8	400	39	137	39	158
			440	36	150	39	174
	20	26.8	440	39	150	---	---
518	22	29.5	400	48	182	48	210
			440	44	200	48	231
	26	34.9	400	55	182	55	210
			440	51	200	55	231
	29	38.9	440	55	200	---	---

Motor Frame #	Rate Output (KW)	Rate Output (HP)	Nominal Voltage	60Hz Rated Amp	60Hz Start Amp	50Hz Rated Amp	50Hz Start Amp
616	30	40.2	400	57	229	61	264
			440	57	251	61	291
	37	49.6	400	74	229	74	264
			440	69	251	74	291
	40	53.6	440	74	251	---	---
617	45	60.3	400	90	286	90	331
			440	84	314	90	365
	50	67.1	440	90	314	---	---
716	55	73.8	400	102	588	110	690
			440	102	646	110	759
	65	87.2	400	126	588	126	690
			440	118	646	126	759
	75	101	400	145	588	145	690
			440	134	646	145	759
	85	114	440	145	646	---	---
717	90	121	400	175	774	175	918
			440	162	850	175	1010
	105	141	440	185	850	---	---
	110	148	400	210	774	210	918
			440	194	850	210	1010
	120	161	440	210	850	---	---
2814	110	148	400	237	1050	236	1250
			440	226	1150	226	1370
	120	161	400	255	1050	252	1250
			440	241	1150	240	1370
	132	177	400	286	1050	283	1250
			440	270	1150	268	1370
	150	201	400	---	---	315	1250
			440	299	1150	296	1370
	160	215	440	315	1150	---	---
2816	150	201	400	338	1590	352	1880
			440	324	1750	344	2060
	160	215	400	356	1590	368	1880
			440	340	1750	356	2060
	180	241	400	390	1590	400	1880
			440	370	1750	386	2060
	200	268	440	400	1750	---	---
3917	200	268	400	425	2420	412	2460
			440	387	2270	393	2710
	230	308	400	475	2420	---	---
	245	329	400	---	---	488	2460
			440	455	2270	459	2710
	265	355	440	488	2270	---	---
	260	348	400	526	2420	---	---
	275	369	400	---	---	540	2460
			440	501	2270	505	2710
	300	402	440	540	2270	---	---

NOTES:

1. Volts & Amps offered are nominal and not for actual sizing purposes
2. Motors are Class 220 insulated and available with or without cooling jackets

Standard 4-POLE MOTORS

Motor Frame #	Rate Output (KW)	Rate Output (HP)	Nominal Voltage	60Hz Rated Amp	60Hz Start Amp	50Hz Rated Amp	50Hz Start Amp
326	1.5	2	400	8	38	8	43
			440	7	41	8	48
	2.2	3	400	8	38	8.5	43
			440	8	41	8.5	48
	3.7	5	400	10.5	38	10.5	43
			440	10	41	10.5	48
	4.2	5.6	440	10.5	41	---	---
426	5.5	7.4	400	15	69	16	78
			440	15	75	16	86
	7.5	10.1	400	18	69	19	78
			440	18	75	19	86
	8.5	11.4	440	19	75	---	---
526	11	14.8	400	26	113	28	130
			440	26	124	28	143
	15	20.1	400	35	113	35	130
			440	32	124	35	143
	17	22.8	440	35	124	---	---
626	18.5	24.8	400	43	173	43	200
			440	40	190	43	220
	22	29.5	400	49	173	49	200
			440	45	190	49	220
	25	33.5	440	49	190	---	---
726	30	40.2	400	71	271	71	312
			440	65	297	71	344
	37	49.6	400	83	271	83	312
			440	77	297	83	344
	40	53.6	440	83	297	---	---
728	45	60.3	400	105	450	105	515
			440	95	490	105	567
	55	73.8	400	124	450	124	515
			440	115	490	124	567
	62	83.1	440	124	490	---	---

Motor Frame #	Rate Output (KW)	Rate Output (HP)	Nominal Voltage	60Hz Rated Amp	60Hz Start Amp	50Hz Rated Amp	50Hz Start Amp
825	65	87.2	400	140	500	140	500
			440	130	500	140	550
	75	101	400	165	500	165	500
			440	150	500	165	550
	85	114	440	165	500	---	---
829	90	121	400	220	1054	230	1250
			440	220	1160	230	1375
	100	134	400	240	1054	250	1250
			440	230	1160	240	1375
	110	148	400	255	1054	270	1250
			440	250	1160	250	1375
	132	177	400	310	1054	310	1250
			440	285	1160	285	1375
	145	194	400	320	1054	335	1250
			440	310	1160	310	1375
	160	215	440	335	1160	---	---
3922	160	215	400	334	1242	347	1398
			440	315	1366	333	1538
	185	248	400	379	1242	391	1398
			440	353	1366	369	1538
	200	268	400	408	1242	418	1398
			440	377	1366	392	1538
	210	282	400	428	1242	436	1398
			440	394	1366	407	1538
	220	295	440	410	1366	---	---
	235	315	440	436	1366	---	---

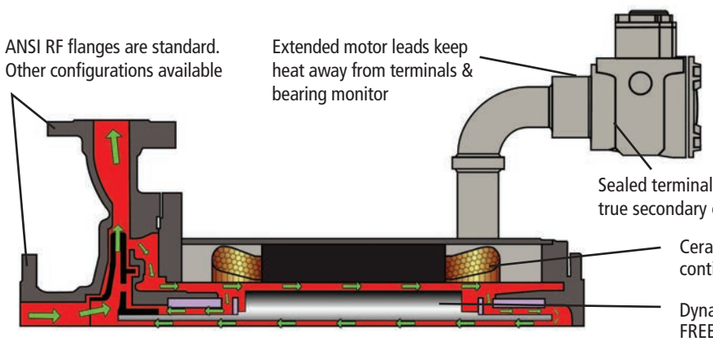
LARGE FRAME SIZE MEDIUM VOLTAGE MOTORS

Motor Frame #	Rate Output (KW)	Rate Output (HP)	Nominal Voltage	60Hz Rated Amp	60Hz Start Amp	50Hz Rated Amp	50Hz Start Amp
1123	132	177	690	---	---	188	740
			3300	42	170	44	200
			6600	21	85	22	100
	145	194	690	---	---	200	740
			3300	46	170	46	200
			6600	23	85	23	100
	160	215	690	---	---	218	740
			3300	48	170	50	200
			6600	24	85	25	100
	185	248	690	---	---	248	740
			3300	54	170	56	200
			6600	27	85	28	100
	200	268	3300	58	170	---	---
			6600	29	85	---	---
1125	185	248	690	---	---	268	1240
			3300	62	290	66	340
			6600	31	145	33	170
	200	268	690	---	---	282	1240
			3300	66	290	70	340
			6600	33	145	35	170
	220	295	690	---	---	300	1240
			3300	70	290	74	340
			6600	35	145	37	170
	250	335	690	---	---	334	1240
			3300	76	290	80	340
			6600	38	145	40	170
	280	375	690	---	---	368	1240
			3300	82	290	86	340
			6600	41	145	43	170
	315	422	3300	90	290	---	---
			6600	45	145	---	---

Motor Frame #	Rate Output (KW)	Rate Output (HP)	Nominal Voltage	60Hz Rated Amp	60Hz Start Amp	50Hz Rated Amp	50Hz Start Amp
1225	250	335	3300	80	320	86	410
			6600	40	175	43	205
	280	376	3300	86	350	92	410
			6600	43	175	46	205
	315	422	3300	94	350	98	410
			6600	47	175	49	205
	355	476	3300	102	350	108	410
			6600	51	175	54	205
	400	536	3300	112	350	---	---
			6600	56	175	---	---
1227	355	476	3300	112	550	118	650
			6600	56	275	59	325
	400	536	3300	122	550	126	650
			6600	61	275	63	325
	450	603	3300	128	550	136	650
			6600	64	275	68	325
	500	671	3300	142	550	146	650
			6600	71	275	73	325
	550	738	3300	154	550	156	650
			6600	77	275	78	325
	600	805	3300	164	550	---	---
			6600	82	275	---	---

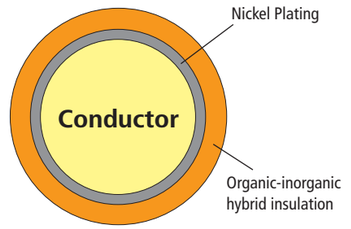
TYPE F WITH U OR X MOTOR (High Temperature Insulation)

Motor Insulation System	Motor Speed (RPM)	Minimum Pump Size	Minimum Motor KW	Minimum Motor HP	Maximum Pump Size	Maximum Motor KW	Maximum Motor HP
Thermal Class 300 U Motors	3600	1.5 x 1 - 5	0.75	1	10 x 10 -16	315	422
	1800		1.5	2	8 x 10 -19	120	161
Thermal Class 400 X Motors	3600	1.5 x 1 - 5	1.5	2	5 x 6 - 10	60	80.5
	1800	3 x 4 - 8	3.7	5	6 x 8 - 12	18.5	24.8



API 685 PLAN 1-S HIGH TEMPERATURE WITHOUT COOLING

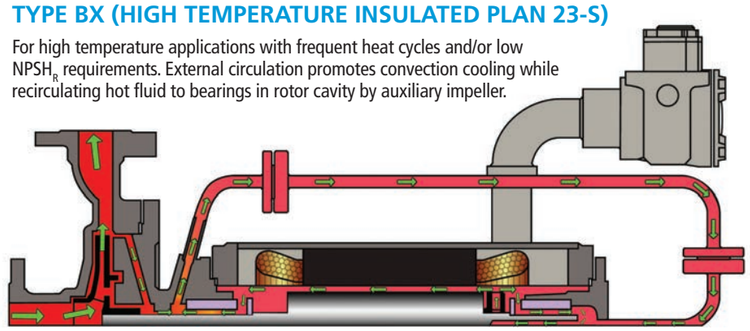
TEIKOKU U-Motor
Fluid Temperatures to 500° F / 260° C



Thermal Class 300
2-Layer magnet wire

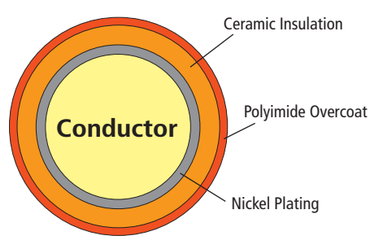
TYPE BX (HIGH TEMPERATURE INSULATED PLAN 23-S)

For high temperature applications with frequent heat cycles and/or low $NPSH_R$ requirements. External circulation promotes convection cooling while recirculating hot fluid to bearings in rotor cavity by auxiliary impeller.



API 685 PLAN 23-S HIGH TEMPERATURE WITH CONVENCTION COOLING

TEIKOKU X-Motor
Fluid Temperatures to 750° F / 400° C



Thermal Class 400
3-Layer ceramic insulated magnet wire

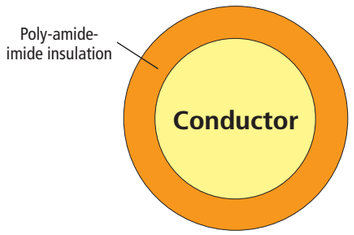
TYPE BA WITH ON-BOARD COOLER AND MOTOR COOLING JACKET PER API 685 ANNEX D PLAN 23-S

- Highest tolerance sealless pump design available for temperature changes and thermal upsets
- Broadest range of sealless solutions on the market
- No mechanical seal, no ball bearings, no coupling and NO LEAKAGE
- Water & Air Cooled versions are available
- Wide variety of heat exchangers to meet plant requirements

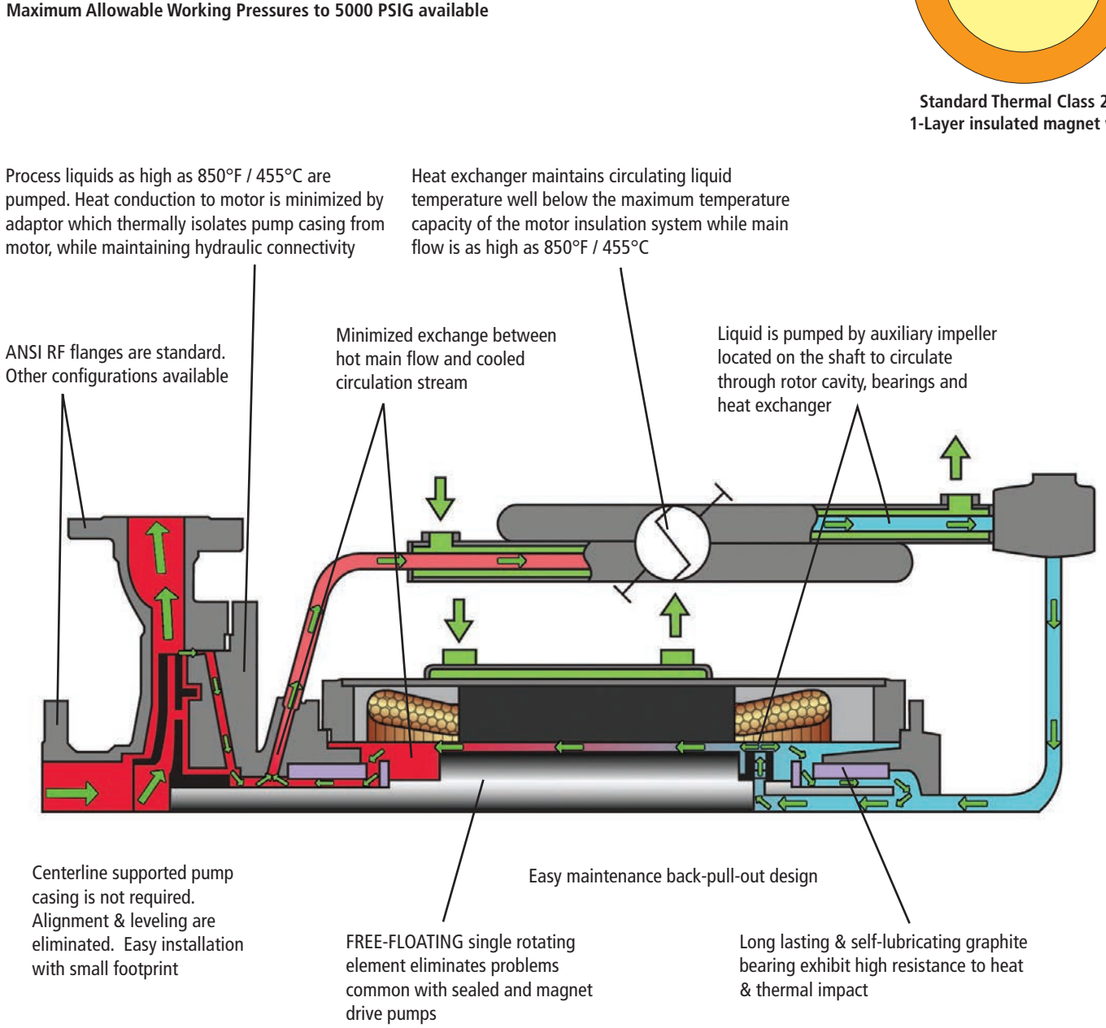
Thermal Class 220 Standard Externally Cooled Motors	Motor Speed (RPM)	Minimum			Maximum		
		Pump Size	Motor		Pump Size	Motor	
			KW	HP		KW	HP
	3600	1.5 x 1 - 5	1.1	1.5	10 x 10 -16	300	402
	1800		2.2	3	14 x 16 - 25	600	805

Maximum Liquid Temperature: 850°F / 455°C
Maximum Allowable Working Pressures to 5000 PSIG available

TEIKOKU Standard Class C Insulated Motor

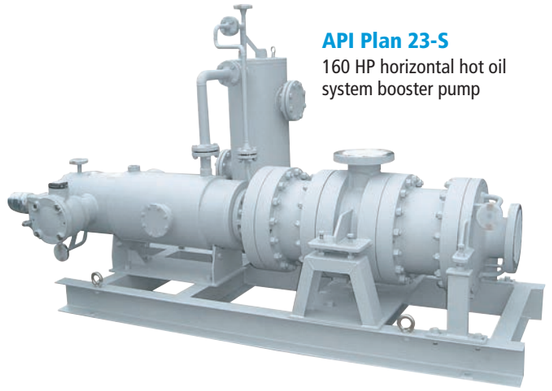


Standard Thermal Class 220 1-Layer insulated magnet wire



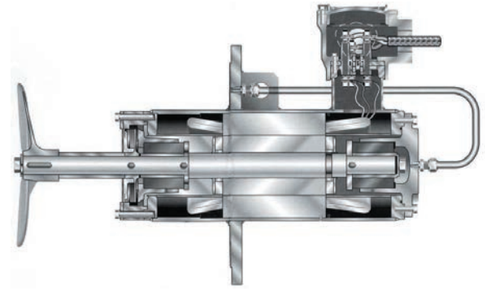
CUSTOM MADE TEIKOKU CANNED MOTOR PUMPS

For Diversified Customer Needs



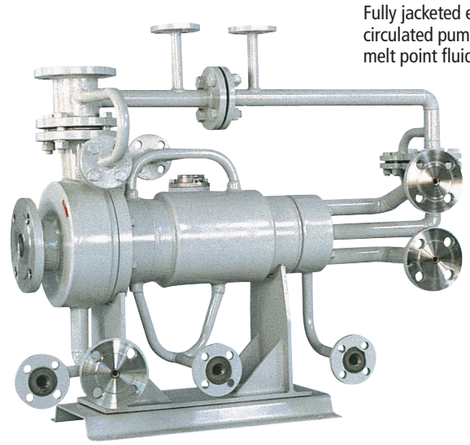
API Plan 23-S
160 HP horizontal hot oil system booster pump

API Plan 11-S
Canned Motor Sealless Agitator provides leak-free, zero maintenance operation under full vacuum or high internal tank pressures.

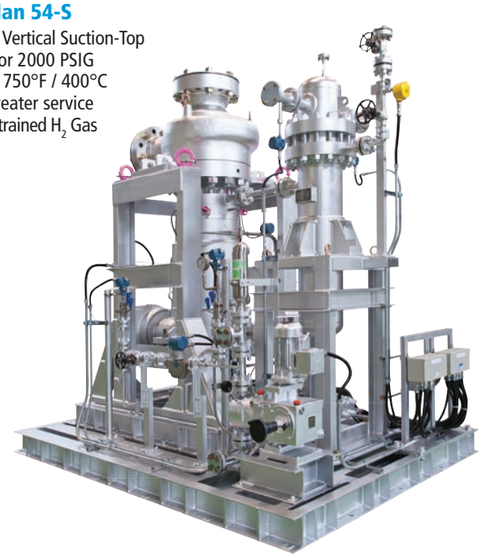


API Plan 1-S
5000 PSIG MAWP
Vertical In-Line Loop
Circulation Pump

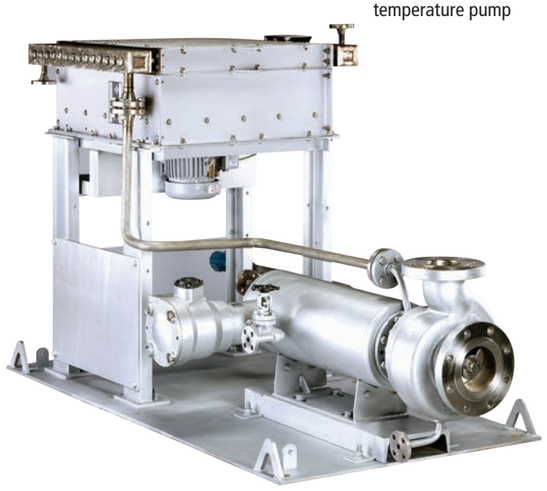
API Plan 11-S
Fully jacketed externally circulated pump for high melt point fluid service



API Plan 54-S
475 HP, Vertical Suction-Top pump for 2000 PSIG MAWP, 750°F / 400°C Hydrotreater service with entrained H_2 Gas

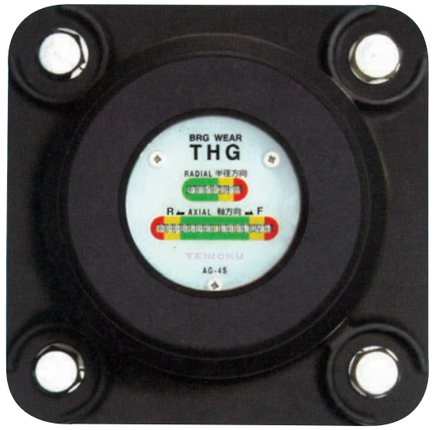


API Plan 23-S
Air cooled high temperature pump



TEIKOKU HYBRID GUARDIAN – THG

Dual Function Rotor Position Monitor for TEIKOKU Canned Motor Pumps

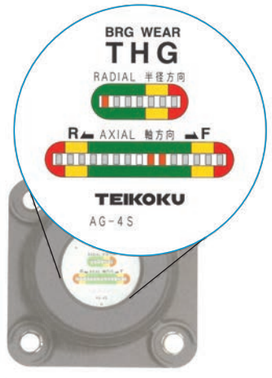


Principle of Operation

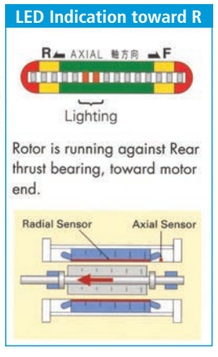
Sensors embedded in the stator cavity of a leakproof TEIKOKU Canned Motor Pump produce signals that enable the on-board THG monitor to both display and provide instrument outputs indicating the real-time axial and radial positions of the entire pump rotating assembly. Position signals are converted into low voltage outputs that power the THG monitor display band featuring LED indication of actual rotor position. Rotor position changes over time are indicative of bearing wear in both axial and radial directions and the process conditions causing the changes.

LED Display

THG Hybrid monitor provides accurate, real-time monitoring of both the direction and range of hydraulic axial thrust. This display information indicates both the direction and amount of axial bearing wear, while simultaneously displaying the amount of radial bearing wear.

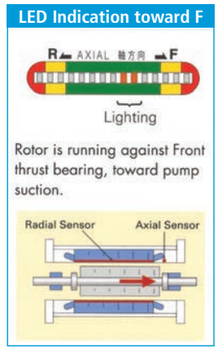


LED Indication toward R



Rotor is running against Rear thrust bearing, toward motor end.

LED Indication toward F



Rotor is running against Front thrust bearing, toward pump suction.

Features:

- Real-time indication of the rotor position in both axial and radial directions during operation.
- Detection accuracy is as high as 0.2mm (0.0078 inches) in the axial direction.
- Axial display indicates the direction of pump hydraulic thrust: either forward or toward the rear of the pump.
- After normal replacement of worn parts, the THG is easily recalibrated to the null position in the field utilizing Teikoku's Industry First Zero Aid remote hand held instrument.
- THG features two 4-20mA analog instrument output signal capabilities: one each for axial and radial position indication. Connections are provided on the THG to wire signals directly from the monitor.
- If full functionality is required with a Variable Frequency Drive, ask TEIKOKU about the THG II.

patented in Japan, pending in USA

ZERO-AID Initial Calibration & Field Re-Calibration Device for THG

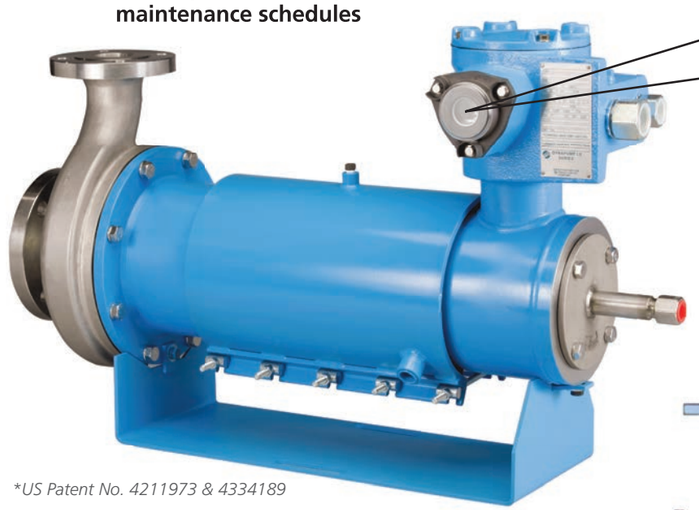
- Battery powered portable instrument that enables field zero (null point) adjustment of TEIKOKU's THG after field or pump shop preventative maintenance.
- The industry's first-ever recalbration device suitable for operator use.
- SAFE! All field re-calibrations are made before plant power is applied to the pump.

Light	Condition	User Reponse
Green	Good	Continued Operation - regularly check wear rate
Yellow	Caution	Plan Routine Maintenance - more frequent wear rate checks
Red	Alert	Shutdown & Replace Worn Parts

TEIKOKU ROTARY GUARDIAN – TRG

The industry standard for sealless pump monitoring and reliability for over 40 years

- **Monitor current conditions**
- **Develop data-based preventative maintenance schedules**



**US Patent No. 4211973 & 4334189*

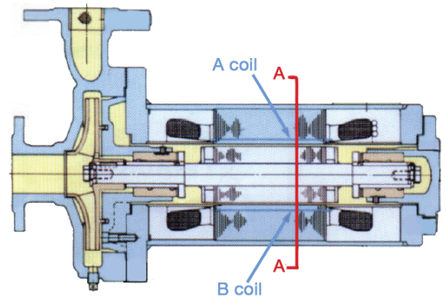
On-Board Terminal Box Mount

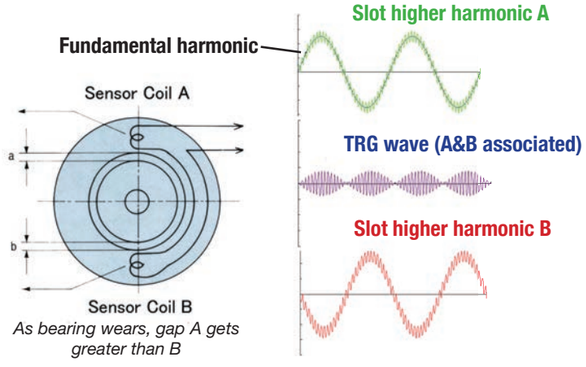
Remote Panel Meter

- **Monitors and indicates rate of radial bearing wear**
- **Detects lost phase**
- **Shows reverse rotation**
- **The only bearing wear monitor on the market that operates with Variable Frequency Drives**

Principle of Operation

1. The TRG meter operates on the principle of induced voltage. A magnetic field is created in the TRG coils by the current flowing through the stator winding. In addition, a magnetic field is created by induced currents in the rotor.
2. When the rotor is perfectly centered in the stator, the two magnetic fields are essentially concentric or balanced.
3. When bearing wear occurs and the gap "B" between the rotor and stator decreases, a magnetic flux created by the imbalance in the magnetic fields causes an induced voltage in the TRG coils.
4. This voltage is indicated on the TRG voltmeter. The meter is mounted on the pump terminal box as standard but is available as remote panel-mount.





As bearing wears, gap A gets greater than B

TRG with Phase Sequence Sensor in Operation

TRG initial indication varies from pump to pump. Users can record the initial value to establish a baseline. This determines a point from which to monitor the wear rate of the bearings and establishes preventative maintenance schedules.

TRG Indication Zone	Diagnosis	User Action
Green	Good	No Action
Yellow > 0.3v over baseline	Bearings Worn Caution Level	Plan Routine Maintenance
Red > 0.5v over baseline	Maintenance Required	Immediate Shutdown Replace Worn Parts

Optional TRG Converter

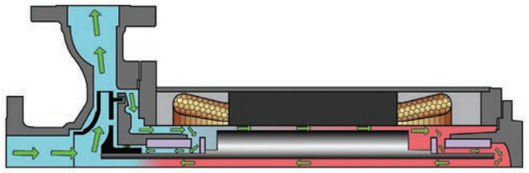
Converts signal into either analog 4-20mA or 1-5 VDC for various I&E control

BASIC CANNED MOTOR PUMP APPLICATION SOLUTIONS

with API 685 Annex D Circulation Plan References

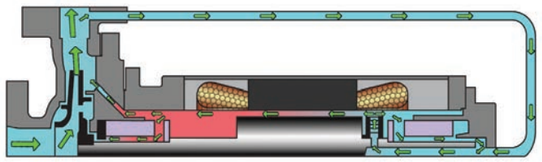
F-V Type – Plan 1-S (Internal Circulation)

Most basic and commonly used design of TEIKOKU Canned Motor Pumps with a hollow shaft for a wide variety of applications.



F-R Type – Plan 1-SD (Pressurized Circulation)

Suitability for handling volatile fluids with a high degree of safety for expensive and/or toxic volatiles and low boilers with a minimum of accessory system components and control.

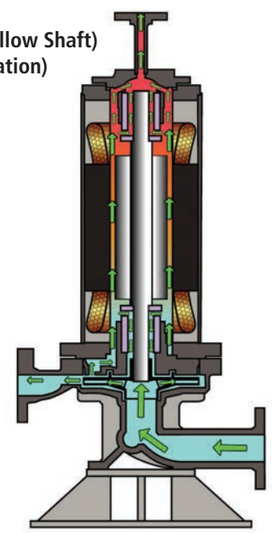


RW or RV – Plan 13-SE (Reverse Circulation)

- Improved venting
- Lower bearing loads
- Recommended for fluids with low viscosity and/or steep vapor pressure vs. temperature profiles
- Minimizes floor space

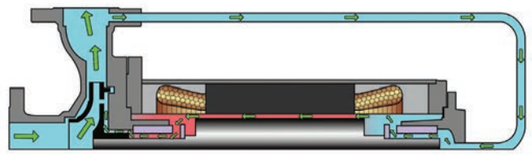
FW or FV – Plan 1-S (Internal Circulation with Hollow Shaft) or Plan 11-S (External Circulation)

- Minimizes floor space



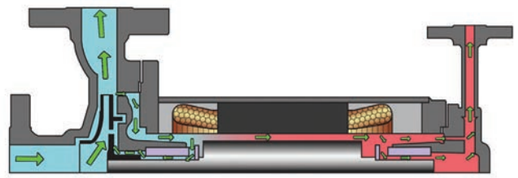
F Type – Plan 11-S (External Circulation)

Basic design of TEIKOKU Canned Motor Pumps with a solid shaft for a wide variety of applications and the ability to condition circulated fluid.



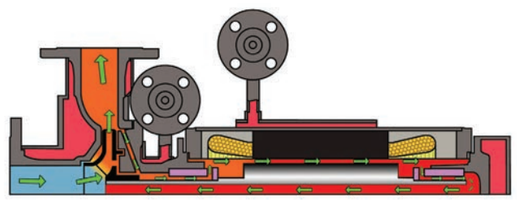
R Type – Plan 13-SE (Reverse Circulation)

Suitability for economically handling volatile fluids, such as refrigerants, liquefied gasses and other low boilers, and low NPSH margins.



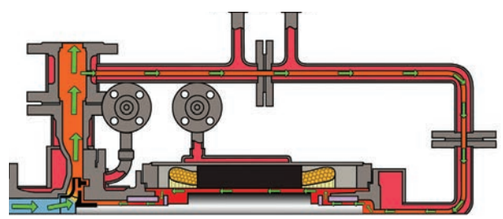
K Type – Plan 1-S (Internal Circulation) with Fully Jacketed Components

Suitability for handling fluids with high melting points.



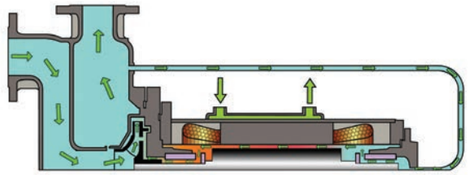
K-S Type – Plan 11-S (External Circulation) with Fully Jacketed Components

Suitability for handling fluids with high melting points.



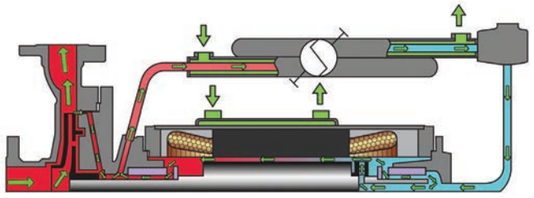
G Type – Plan 11-S (Self Priming)

Adaptation of basic design with self-priming pump casing suitable for external circulation. Application suitability for pumping fluids from underground tank or rail/tank car unloading.



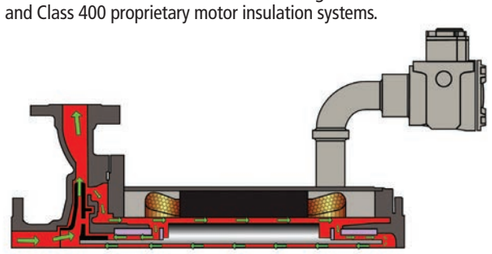
B Type – Plan 23-S (Externally Cooled Motor)

Suitability for economically handling high temperature fluids, such as heat transfer oils with air or liquid heat exchangers.



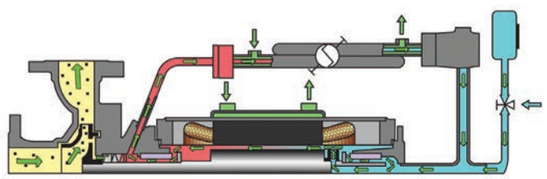
X and U Type – Plan 1-S (High Temperature Insulated Motor)

Suitability for handling high temperature fluids such as heat transfer oils with no need for external coolers through the use of Class 300 and Class 400 proprietary motor insulation systems.



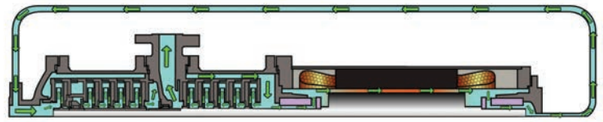
D Type – Plan 53-S and 54-S (Sealed Slurry Type)

Suitability for handling fluids containing small amounts of fine solids or fluids with entrained gas. Motor isolation is provided by a mechanical seal or throttle bushing and requires flush provided by a seal pot (Plan 53-S) or external flush (Plan 54-S).

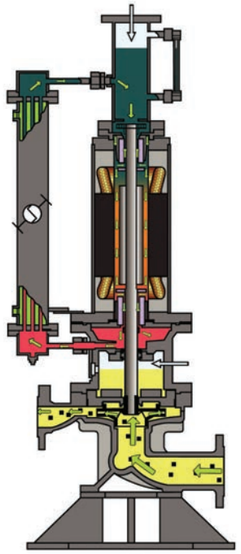


F-M or R-M or B-M Types – Plan 11-S (Multi-Stage)

High head, high hydraulic efficiency pumps with reverse circulation to pump suction or suction vessel. Externally cooled, high temperature designs are also available.



XG and SG Type – 53-S Variant (Gas Sealed Slurry Handling)



Suitability for handling fluids with various slurry concentrations by isolating the motor from the pump to allow for a barrier fluid that is cooled for the motor. Balanced N_2 charge eliminates migration of slurry into motor section. Available in both XG design with onboard, gas charged reservoir and heat exchanger and SG design for external motor flush with cool liquid.

Other API 685 Annex D Circulation Plan variants available for custom, leak-free solutions.

PRODUCT RANGE and third party compliance

	Standard Range		Extended Range	
CAPACITY (max)	4,403 GPM	1000 m^3/hr	10,500 GPM	2385 m^3/hr
TDH (max)	2,000 ft.	609 m	3,281 ft.	1,000 m
TEMPERATURE*	-112 to 716°F	-80 to 380°C	-328 to 842°F	-200 to 450°C
VISCOSITY (max)	100 cst		350 cst	
DESIGN PRESSURE (max)	430 psi	3 MPa	7,900 psi	55 MPa
MOTOR HORSEPOWER (max)	267 HP	200 KW	805 HP	600 KW
MAJOR MATERIALS OF WETTED PART	304SS, 316SS		304L & 316L SS, Alloy 20, Alloy B & C, Titanium	

**temperature of pumped liquid*

Quality Assurance

All motors and pumps are designed and manufactured by TEIKOKU under its full quality control program. Every canned unit is inspected and tested before shipment. The QC program consists of the following tests and inspections.

◉ **Applied to all pumps, data furnished to customer if required.**

○ **Applied to all pumps, no data available to customer.**

◬ **Applied to all pumps, data submitted by customer.**

△ **Test done only upon customer request, data submitted to customer.**

I. MOTOR

1-1 Measurement of resistance between terminals (main power coils) ..... ◉
1-2 No load test ..... ◉
1-3 Locked rotor test ..... ◉
1-4 Surge test ..... ○
1-5 Insulation test ..... ◬
1-6 Dielectric strength test ..... ◬
1-7 Temperature rise test ..... △
1-8 Measurement of resistance between terminals (TRG coils) ..... ○

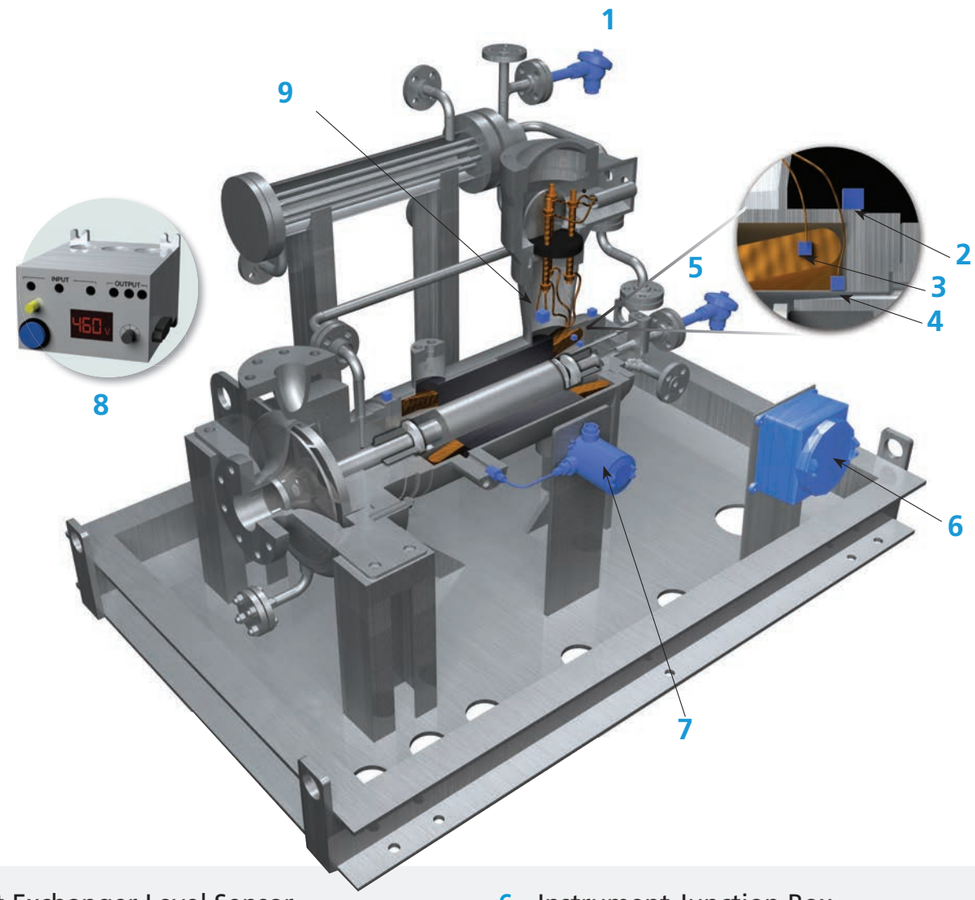
II. PUMP PERFORMANCE

2-1 Capacity vs. head, current, input ..... ◬
2-2 NPSH test ..... ◬
2-3 Capacity vs. TRG output measurement ..... ○
2-4 Thrust force and circulation flow measurement ..... ○
2-5 TRG output check for reverse rotation ..... ○

III. OTHERS

3-1 Vibration test ..... △
3-2 Noise test ..... △
3-3 Dimensional check ..... △
3-4 Hydrostatic test ..... ◬
3-5 Pneumatic test ..... ◬
3-6 Vacuum test ..... ○
3-7 Halogen leak test ..... △
3-8 Mechanical seal leak test (slurry design) ..... ○
3-9 Priming test (for type G only) ..... ◉
3-10 Mill certificate on metallic materials ..... △
3-11 ND tests on metals and welding ..... △

INSTRUMENTATION & SAFETY OPTIONS

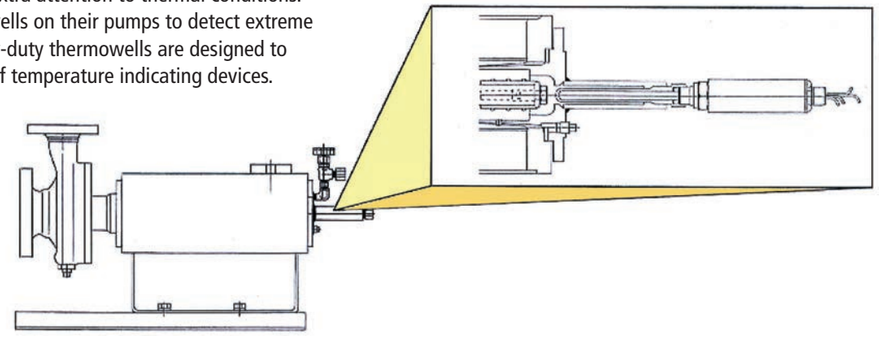


1 Heat Exchanger Level Sensor
2 Vibration Pads
3 Stator Winding RTD
4 Stator Liner Temperature Sensor
5 Rotor Cavity Temperature Probe
6 Instrument Junction Box
7 Secondary Containment Pressure Transmitter
8 Power Monitor
9 Secondary Containment Pressure Sensor (TPS)

THERMOWELL

Certain applications demand extra attention to thermal conditions. TEIKOKU can provide thermowells on their pumps to detect extreme temperature operations. Heavy-duty thermowells are designed to accommodate a wide variety of temperature indicating devices.

Contact TEIKOKU for other available options.



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ISO 14001
BUREAU VERITAS
Certification

PTB Physikalisch Technische Bundesanstalt

TEIKOKU

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