



TEIKOKU BOILER CIRCULATION PUMP

CANNED MOTOR



TEIKOKU ELECTRIC MFG.CO.,LTD. (JAPAN)

Plant & Business Headquarters

Post Code : 679-4395

60 Hirano, Shingu-Cho, Tatsuno-Shi, Hyogo-Ken, Japan

Phone : +81-791-75-0411 Fax : +81-791-75-4317

International Business Division

Post Code : 103-0022

12F Sakura-Muromachi Bldg. 5-1, 4-Chome, Nihombashimuromachi,
Chuo-ku, Tokyo, Japan

Phone : +81-3-3275-3641 Fax : +81-3-3275-9776

E-mail : ibd-tokyo@teikokudenki.co.jp

North and South America

TEIKOKU USA INC
(North & South America)

959 Mearns Road

Warminster, PA 18974 USA

Phone : +1-215-343-6000

Fax : +1-267-486-1037

Web : www.TeikokuPumps.com

TEIKOKU USA INC

(US Gulf Coast Sales and Service Center)

5880 Bingle Road, Houston, TX 77092 USA

Phone : +1-713-983-9901

Fax : +1-713-983-9919

Web : www.TeikokuPumps.com

China

DALIAN TEIKOKU CANNED
MOTOR PUMP CO.,LTD.

中国大连三涧堡工业科技园区

Sanjianpu Science & Technology Industry
Area, Dalian, China

Phone : +86-411-8626-9662

Fax : +86-411-8626-9499

Web : www.teikoku-china.com

Europe

TEIKOKU Electric GmbH

Nuernberger Strasse 24, D-40599

Duesseldorf Germany

Phone : +49-211-700-6778

Fax : +49-211-749-0011

E-mail : info@teikoku-electric.de

Web : www.teikokupump.de

Taiwan

TAIWAN TEIKOKU PUMP CO., LTD.

9F-1, No.5, Jinzhou st., Zhongshan District,

Taipei City 104, Taiwan, R.O.C.

Phone : +886-2-2567-9800

Fax : +886-2-2568-2670

E-mail : info@teikoku.tw

Web : (see US website)

INDIA

HYDRODYNE (INDIA) PVT.LTD.

Survey No.18, Hissa No.3,4 & 5 of Village

Ghodbundar, Mira Bhayander Road,

Near R.T.O. Office, Mira Road (East),

Thane 401107, India

Phone : +91-22-4064-7600

Fax : +91-22-4064-7634

South East Asia

TEIKOKU SOUTH ASIA PTE LTD.

No.15, Joo Koon Crescent, Singapore 629015

Phone : +65-6861-4121

Fax : +65-6861-4521

E-mail : info@teikoku-sa.com.sg

Web : (see US website)

Korea

TEIKOKU KOREA CO., LTD.

5F HB Tower, 25 Nonhyun-ro 87 Gil,

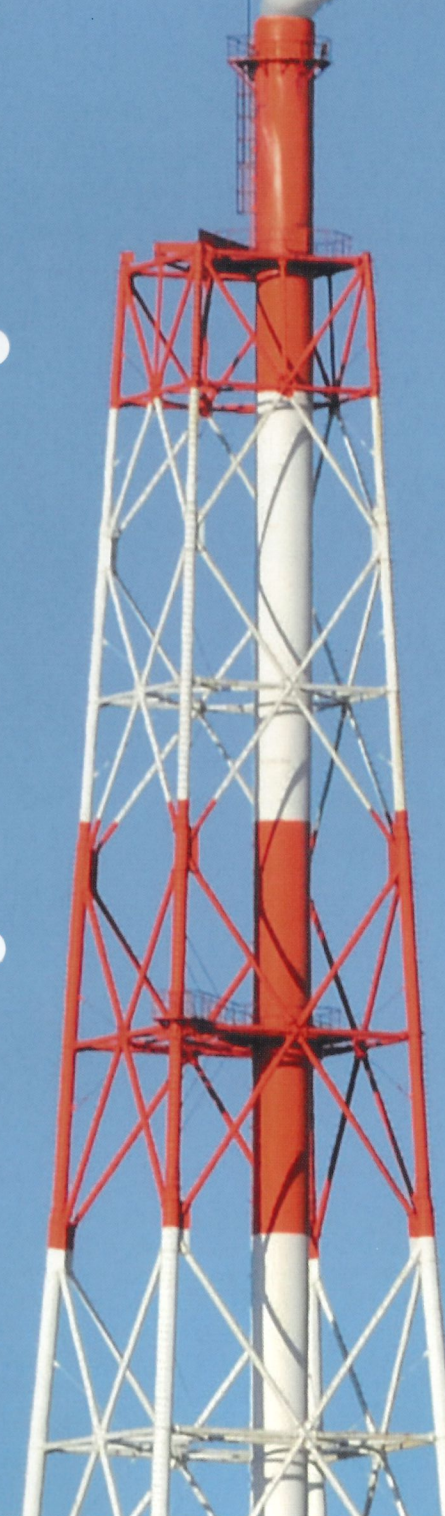
Gangnam-gu, Seoul, 06236, Korea

Phone : +82-2-790-7012

Fax : +82-2-790-7014

E-mail : webmaster@teikokukorea.co.kr

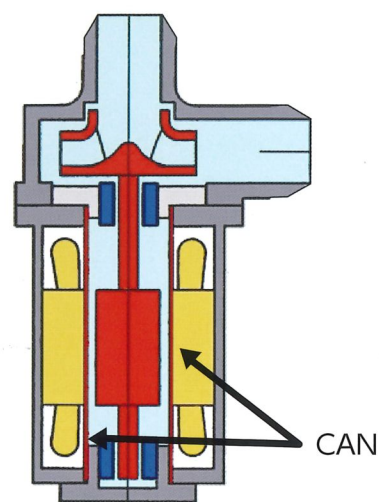
Web : www.teikokukorea.co.kr



TEIKOKU ELECTRIC MFG. CO., LTD.

Teikoku Boiler Circulation Pumps incorporate all of the features of Teikoku's market leading canned motor technology.

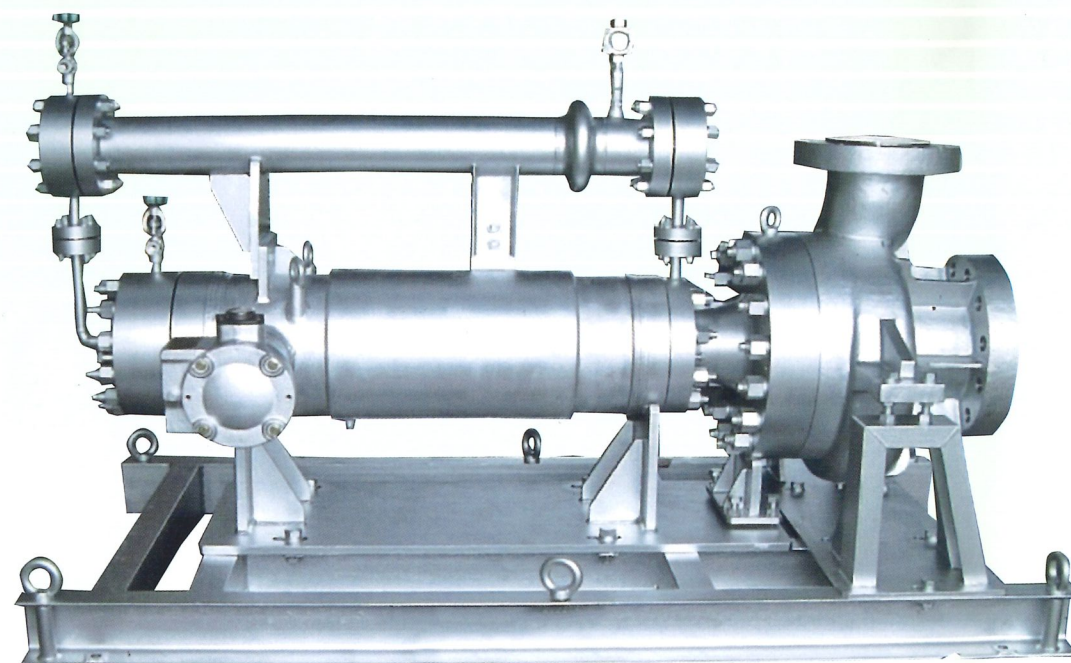
Boiler circulation pumps with canned motors provide a 100% leak-free design with the enhanced safety feature of a motor winding that cannot come in contact with the fluid being pumped. This feature provides high motor winding reliability, significantly simplifies routine maintenance and optimizes operating safety for operators of thermal power generation plants and CDQ generation for steel manufacturers, each requiring high design temperature and pressure boiler circulation pumps.



01

Highly reliable motor winding!

Since the motor is hermetically sealed or "canned" the motor winding is completely isolated assuring no contact with the pumped liquid or other foreign material(s). An optional enhancement can be supplied to monitor the motor winding temperature utilizing a temperature sensing element installed directly into the motor for real-time temperature readings of the windings.



02

Optimal safety!

All canned motor pumps are sealless designs that provide leak-free operation even under high temperature and pressure conditions. Furthermore, Teikoku canned motors are certified by Japanese and International explosion proof underwriters for use in listed hazardous area locations.

03

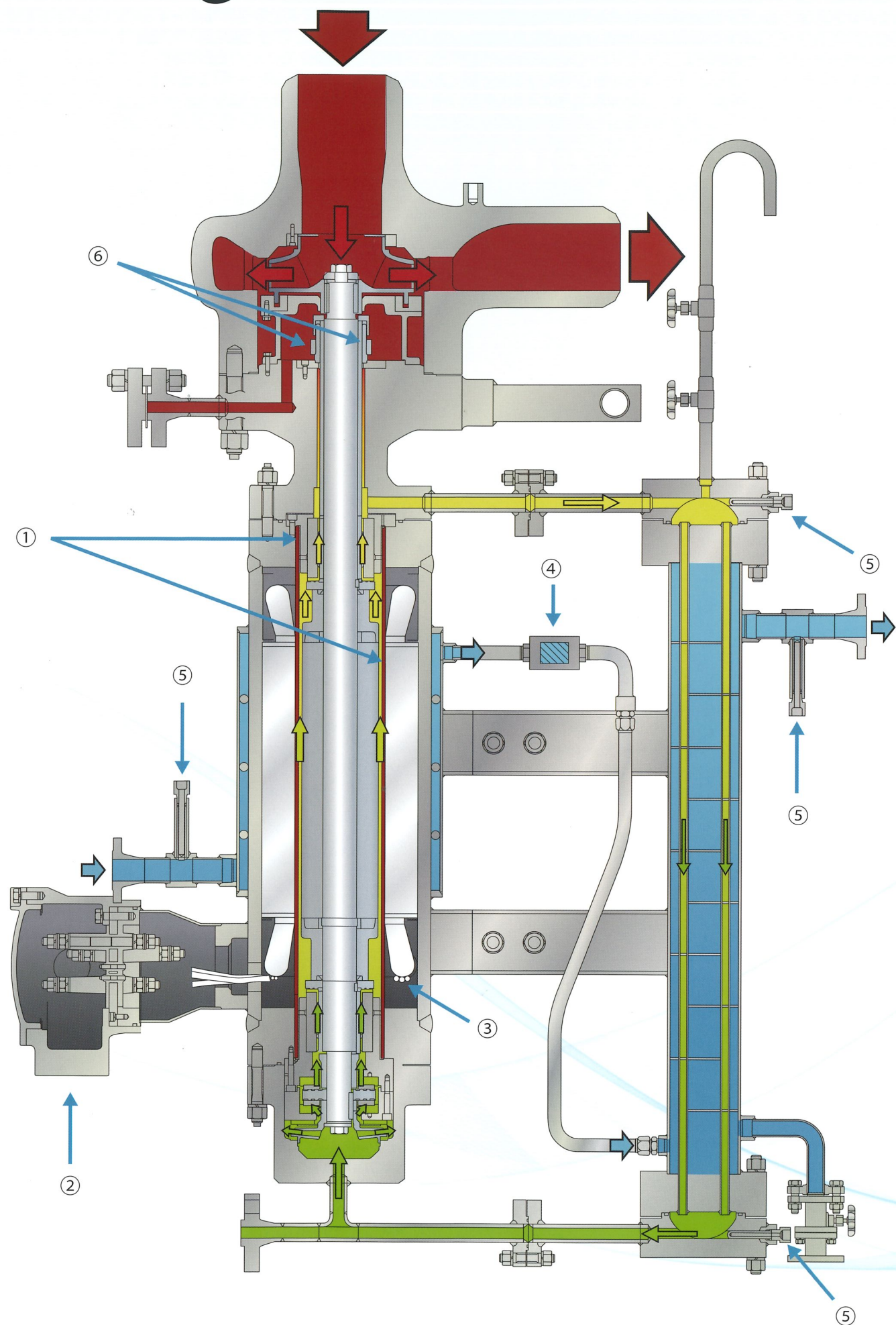
Easy maintenance!

Canned motor pumps provide for long Mean Time Between Maintenance (MTBM) intervals that, when combined with minimal wearing parts and simple maintenance steps, offer the industry's lowest total installed costs. Since the motor and pump are combined and bearings are pumped fluid lubricated, requirements for external lubrication and hot/cold alignment procedures are completely eliminated. All Teikoku canned motor pumps are equipped with bearing wear monitors as standard that present real-time bearing conditions and can provide outputs to support operations with data to establish and enhance preventative maintenance scheduling.

Design basis of canned motor pumps

The basic design of a canned motor pump hermetically seals the motor windings and rotor core, isolating each from the external environment as if they were in "cans" as the name indicates. These canned or lined components are then integrated with the pump in, not only a completely leak-free package with excellent durability in high temperature and pressure conditions, but also with superior suitability for use with explosive, flammable toxic and/or volatile liquids, including strong acid and alkali solutions.

Design Features



Isolated motor winding

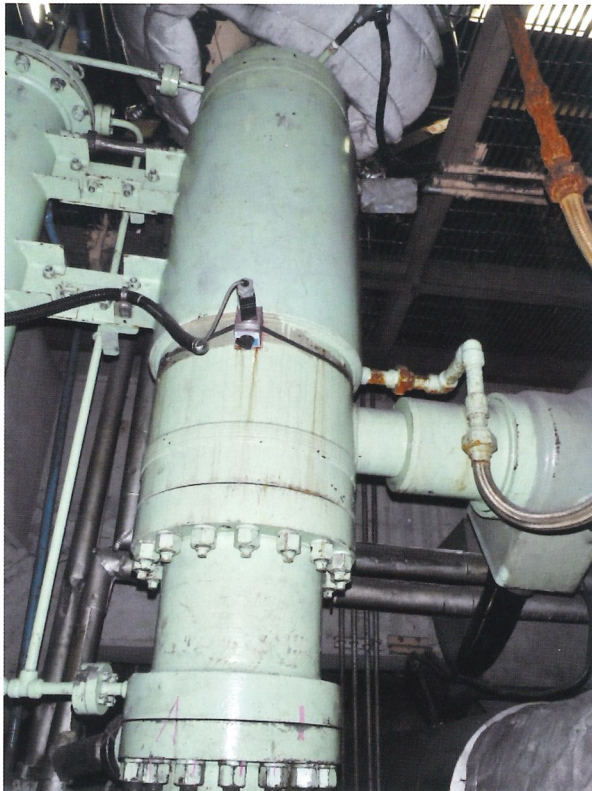
Teikoku Boiler Circulation Pumps are supplied in an API 685 Plan 23-5 circulation design that features an adapter between the pump casing and the motor to isolate the motor from the hot liquid pumped and provide heat dissipation to minimize the hot process temperatures migrating toward the motor. This enables the much lower flow inside the motor rotor cavity to be temperature controlled by an onboard heat exchanger.

Features and Instrumentation for protecting and monitoring canned motor pumps

| No. | Protection Element | Design and Operating Effect |
|-----|---|---|
| 1 | Stator & Rotor Liners | Provides hermetic seal to both isolate motor windings and rotor core from the pumped liquid and achieve high reliability of the windings. |
| 2 | * TRG Meter (Standard) * THG Meter (Option) | Provides real-time monitoring of radial bearing wear. Optional THG Meter also shows axial wear. |
| 3 | * Winding Temperature Sensor (thermostat, thermocouple, etc.) | Monitors winding temperature during operation. |
| 4 | * Flow meter | Monitors cooling water flow rate for motor jacket and heat exchanger. |
| 5 | * Thermowells (With Temperature Sensors) | Monitors pumped liquid temperature in motor cooling circuit with installation on inlet & outlet of heat exchanger and motor jacket to verify performance. |
| 6 | Magnetic Filter | Installed on rotor shaft behind impeller to capture entrained ferrous particles, including rust that may be present in the pumped liquid. |
| ※ | | Data transmitted to operator control systems can be used to remotely monitor operation continuously and establish preventative maintenance schedules. |

Application Range

Design pressure : Max. 55 (MPaG) Liquid Temperature : Max. 450 (°C)
 Capacity : Max. 1,500 (m³/hr) Head : Max. 1,600 (m)
 Power Supply : 50 or 60 HZ base frequencies
 Low voltage 200/220, 400/440 & 500/600 designs
 Medium voltage 3000/3300 and 6000/6600 designs
 Base Speed : 2 pole – 3450/2900 RPM, 4 pole – 1750/1425 RPM
 Variable Speed : All Teikoku motors are suitable for use with variable frequency drives (VFD)
 Maximum Power : 660 KW / 885 HP



To prevent hot pumped liquid from mixing with liquid in the rotor cavity and minimize thermal conduction between the hot process flow and cooled circulation flow in the rotor cavity, Teikoku offers unit vertical mounting configuration as standard. Vertical orientation of any canned motor pump also assures a completely self-venting design. Horizontal mounting configurations can also be offered upon request. Both vertical and horizontal configurations feature Teikoku Plan 23-S designs where the liquid in the rotor cavity temperature controlled by the heat exchanger which assures motor insulation protection. Since the motor winding is hermetically sealed by the stator liner or "can", there is no contact with the pumped liquid assuring high reliability in an industry leading and trusted sealless pump design.



Sample of Teikoku Boiler Circulation Pump Experience

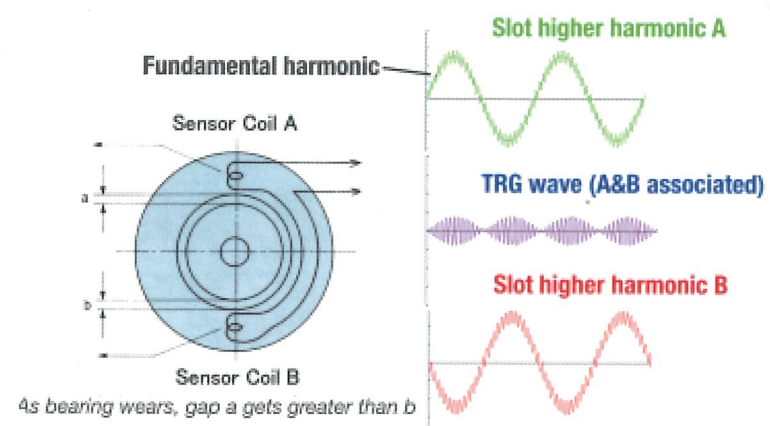
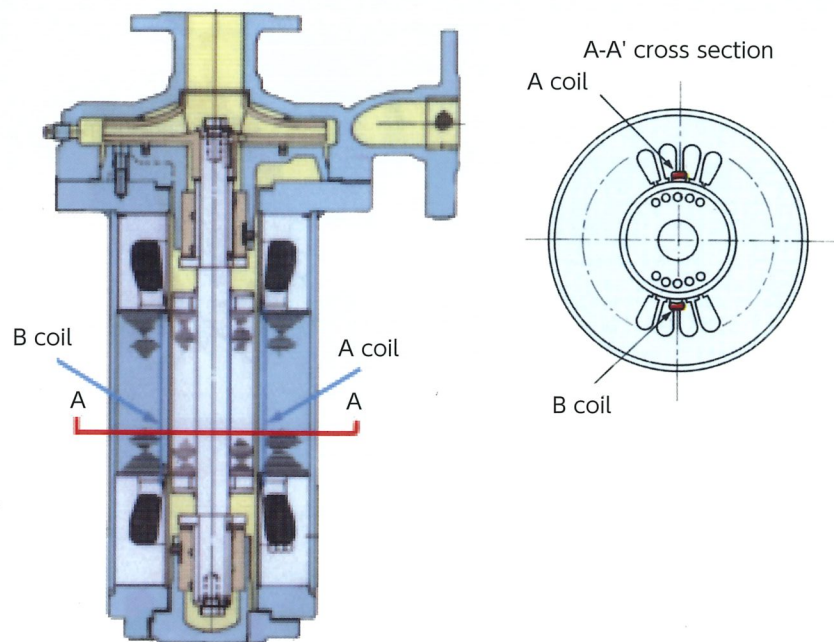
| Plan 23-S Pump Type | Orientation | Conditions of Service | | | | |
|--------------------------|-------------|-----------------------|---------------------------------|------------|---------------------|----------------|
| | | KW/HP | Capacity M ³ /HR/GPM | TDH M / FT | Temperature °C / °F | MAWP KG/M2/PSI |
| BA49-715J4BM-1012V1V-B | Horizontal | 55 / 74 | 126 / 555 | 100 / 328 | 222 / 432 | 91 / 1,294 |
| BP29-829J4BM-2025W1V-A | Vertical | 145 / 194 | 819 / 3606 | 47 / 154 | 344 / 651 | 165 / 2,346 |
| BP49-719J4YN-1012TM4V-E | Vertical | 130 / 174 | 100 / 440 | 200 / 656 | 355 / 671 | 195 / 2,773 |
| BP49-719J4YN-1012TM4V-E | Vertical | 130 / 174 | 90 / 396 | 210 / 689 | 355 / 671 | 195 / 2,773 |
| BA29-716J4XM-1212U4Z1V-A | Horizontal | 65 / 87 | 148 / 652 | 82 / 269 | 110 / 230 | 195 / 2,773 |
| BA29-716J4XM-1212U4Z1V-A | Horizontal | 65 / 87 | 148 / 652 | 75 / 246 | 113 / 235 | 195 / 2,773 |
| BA29-716J4XM-1212U4Z1V-A | Horizontal | 75 / 101 | 158 / 696 | 75 / 246 | 135 / 275 | 195 / 2,773 |
| BP42-829J4EM-2025X1V-A | Vertical | 150 / 201 | 425 / 1871 | 70 / 230 | 175 / 347 | 20 / 284 |
| BP29-617J4XM-3030T1V-A | Vertical | 50 / 67 | 240 / 1057 | 47 / 154 | 330 / 626 | 130 / 1,849 |
| BP29-4260J7ZN-2530X1V-AT | Vertical | 260 / 347 | 1090 / 4799 | 62 / 203 | 320 / 608 | 120 / 1,706 |
| BP29-829J4M-3535W1V-HT | Vertical | 132 / 177 | 1400 / 6164 | 21 / 69 | 345 / 653 | 168 / 2,389 |
| BP29-829J4M-3535W1V-HT | Vertical | 132 / 177 | 1400 / 6164 | 21 / 69 | 345 / 653 | 168 / 2,389 |
| BA49-728J4BL-1520W1V-GT | Horizontal | 55 / 74 | 282 / 1242 | 44 / 144 | 307 / 585 | 104 / 1,479 |
| BP29-829J4M-3535W1V-HT | Vertical | 132 / 177 | 1400 / 6164 | 21 / 69 | 345 / 653 | 168 / 2,389 |
| BP29-829J4BM-2025W1V-A | Vertical | 145 / 194 | 819 / 3606 | 47 / 154 | 344 / 651 | 168 / 2,389 |
| BP29-829J4BM-2025W1V-A | Vertical | 145 / 194 | 819 / 3606 | 47 / 154 | 344 / 651 | 168 / 2,389 |
| BA29-716J4XM-1212U4Z1V-A | Horizontal | 75 / 101 | 152 / 669 | 75 / 246 | 300 / 572 | 196 / 2,787 |
| BP29-717J4XL-1520V1V-BT | Vertical | 90 / 121 | 90 / 396 | 59 / 194 | 330 / 626 | 132 / 1,877 |
| BP29-717J4XL-1520V1V-BT | Vertical | 90 / 121 | 90 / 396 | 50 / 164 | 335 / 635 | 138 / 1,962 |

The Boiler Circulating Pumps referenced above represent sealless, canned motor pumps solutions provided for power generating plants ranging in size from 15,000 KW to 1,100,000 KW output. A range of lower horsepower, comparably designed, canned motor pumps has also been supplied for alternative power generation technologies and for boiler based heat and steam generation.

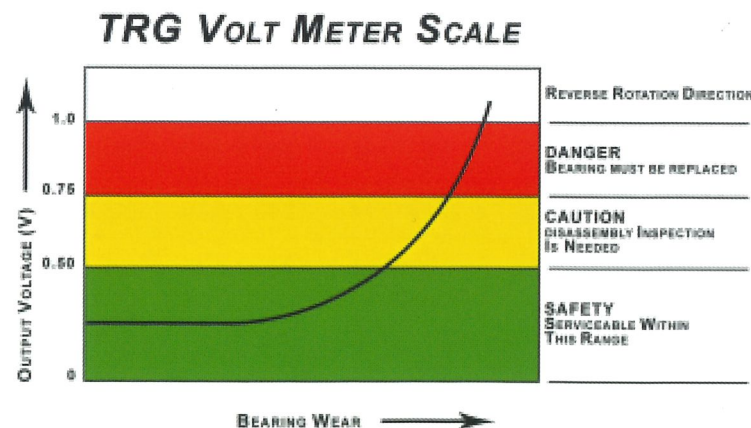
Various Monitoring Devices

TRG Meter

The Teikoku Rotary Guardian (TRG) takes the "mystery" out of canned motor pump operation by utilizing real time output of critical running clearances to both monitor current conditions and develop data based preventative maintenance schedule.



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. When the rotor is perfectly centered in the stator, the two magnetic fields are essentially concentric or balanced. 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. This voltage is indicated on the TRG voltmeter.



TRG Panel Meter

Remote monitor type is available to supplement the standard local, on-board TRG monitor



TRG Converter

I/E signal converter provides sensor millivolt output conversion to either DC 4-20mA or DC 1-5V outputs for use in various electrical and instrumentation control schemes.

- Specifications

| | |
|--|----------------------------------|
| Input Signal : TRG Meter millivolt signal | Output Signal : DC4-20mA, DC1-5V |
| Power Supply : AC100V, AC200V | Power consumption : Approx. 5VA |
| Outline Dimensions : 100 L x 110 W x 85 H (mm) / 4 L x 4-5/16 W x 3-3/8 H (inches) | Enclosure : Open |
| Weight : Approx. 900g / 2 pounds | |
| Mounting : Suitable for DIN rack mount installation or in other applicable electrical instrument enclosures. | |



TRG Set Point Relay

With this simple device, users can set a TRG signal alarm contact through a normally open contact closure to which an alarm device and/or motor control circuit could be wired. When the TRG reading reaches the set point value the contact will close and energize the connected device(s) for alarm or motor shutdown prior to any pump failure due to excessive bearing wear.

- Specifications

| | |
|---|---|
| Input Signal : TRG Coil Output | Alarm Contact : Normally Open Contact Closure |
| Output Alarm Contact Rating : AC - 100V / 0.3A, DC - 24V/0.2A | |
| Input Power Voltage : AC - 100V / AC200V | Input Power Supply : 5 Watts maximum |
| Envelope Dimensions : 82 L x 130 W x 60 H (mm) / 3-1/4 L x 5-1/8 W x 2-1/3 H (inches) | |
| Weight : Approx. 500 grams / 1 pound | |



Dry Run Protection Relay

Dry running of any canned motor pump causes abnormal and accelerated wear quickly leading to excessive heat build and destruction of wearing parts (bearings, shaft sleeves and thrust collars) that require pumped liquid flow. Teikoku's dry run protection relay indicates low amperage motor draw associated with the zero or low motor load that occurs during dry-run or cavitation events. That indication provides a user set-point relay contact signal for use by an alarm device and/or motor control circuit for shutdown prior to any major damage due to dry run or cavitation.

- Specifications

| | |
|--|---------------------------------------|
| Set-Point Current Range : 0.5-60A (100-300A with external current transformer) | Input Power Amps : Less than 2VA |
| Input Power Volts : AC - 100V / AC200V | |
| Amperage Detection Method : 2 Phase Current Transformer | Alarm Contact Rating : AC - 250V / 3A |
| Alarm Contact : Normally Open Contact Closure | |
| Outline Dimensions : 72 L x 54 W x 64.5 H (mm) / 2-13/16 L x 2-1/8 W x 2-9/16 H (inches) | |
| Weight : Approx. 200 grams / 7 ounces | |



TRC (Teikoku Rotary Checker)

As a canned motor pump's direction of rotation is not visible based on the inherent full containment design, Teikoku's TRC offers an easy-to-use device to check the rotating direction of any Teikoku Canned Motor Pump. This small, light-weight and portable instrument can also be used to check the direction of rotation of any AC induction motor.

- Specifications

| | |
|--|-----------------------------------|
| Principle of Operation : Detects phase difference of magnetic fields. | Input Power : On-board 9V battery |
| Envelope Dimensions : 92 L x 66.5 W x 28H (mm) / 3-5/8 L x 2-5/8 W x 1-1/16 (inches) | |
| Weight : Approx. 130 grams / 4.6 ounces | |



Teikoku Remote Meter

The Teikoku Remote Meter is a panel-mount extension of the Teikoku TRG on-board pump meter that provides for remote indication of the TRG output. This remote meter can be mounted approximately 3,300 feet from the pump with reliable output. Remote meters are equipped with a user adjustable alarm contact through a normally open contact closure to which an alarm device and/or motor control circuit could be wired. This device also possesses functionality to indicate bearing wear by generating 4-20mA and 1-5V DC signals with capability to store and output bearing wear data for use in trending bearing wear rates with actual process operation to provide data based preventative maintenance scheduling.

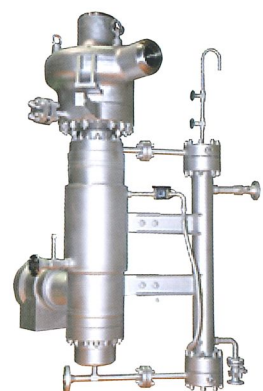
- Specifications

| | |
|--|---|
| Mounting distance : 1km / 3,330 feet maximum | Alarm Contact : Normally Open Contact Closure |
| Alarm Contact Rating : AC - 250V / 3A, DC - 30V / 3A | Output Signal : 4-20mA, 1-5V DC |
| Input Power Volts : DC - 24V / AC - 85-265V | |
| Outline Dimensions : 48 L x 96 W x 125 H (mm) / 1-15/16 L x 3-3/4 W x 4-15/16 H (inches) | |
| Weight : Approx. 350 grams / 12.5 ounces | |



Applications for Teikoku Pumps in Power Generation

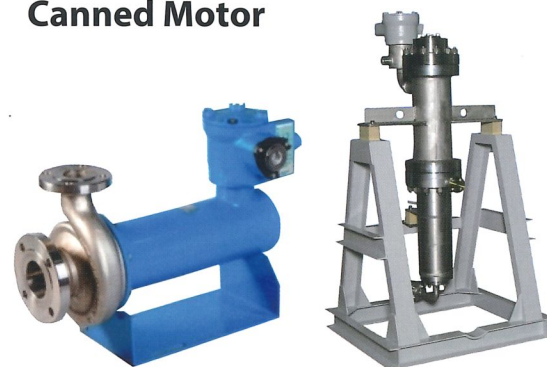
Boiler Circulation Pump Canned Motor BCP



Circulation Boiler Water under pressure

Fuel Supply Pump

LNG Pump
Canned Motor



Transfer of fuels such as LNG and heavy and light diesel with explosion proof and high pressure gas certifications available.

Transformers

Transformer Oil
Circulation Pump



Circulates transformer insulating oil through coolers

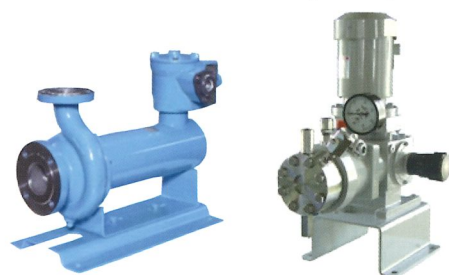
SF6 Blower



Cools insulation system gas

Boiler Water Chemical Treatment

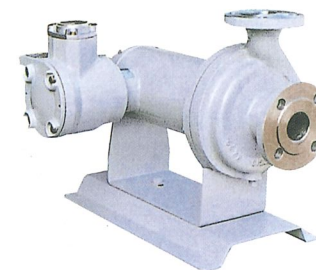
Metering pump, Magnetic drive pump, Canned motor pump



Chemical injection for boiler water conditioning an pH control (Sulfuric & hydrochloric acid, caustic, hydrazine, ammonia, etc.)

Related Products

Type FV Standard Design



Chemical service pumps for a wide range of non-slurry liquid. Available in 304 SS, 316 SS and other high alloys. Available with optional heating or cooling jackets for both motor and pump. Available with Explosion Proof motors. Standard performance range:

| | | |
|-----------------------|-----------------|-----------------------|
| Specifications | Qmax : 3,430gpm | 13m ³ /min |
| | TDH max : 530ft | 160m |
| | kW max : 295HP | 220kW |

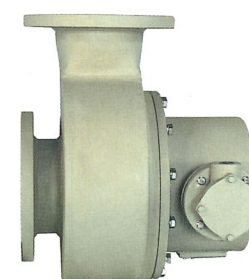
Simplex Diaphragm Pump



This is available with options of PTFE or metal diaphragms. It boasts of state-of-art hydraulic system, mechanical and sealing durability in compliance with API 675 with several exquisite protective outfits to produce one of the most accurate metered pumping in your best interest.

| | |
|----------------------|---------------------------|
| Product Range | Qmax : 4,000 l/h per head |
| | Pd max. : 50MPa |

Type QK / QKD for Insulation Oils



Sealless motor pump with high reliability for circulating insulation oil in large transformers and rectifiers. Design has produced a proven product for reliability, stability and total quality. Available in many sizes and orientations.

| | | |
|-----------------------|-----------------|--------------------|
| Specifications | Qmax : 2,113gpm | 8m ³ /m |
| | TDH max : 65ft | 20m |
| | kW max : 30HP | 22KW |

Plastic Lined Mag Drive Pump



Magnetically driven inert plastic lined sealless pump for corrosive applications. All wetted parts are manufactured in either ETFE, PVDF, Rulon and/or Ceramics for superior corrosion resistance against chemicals that attack exotic alloys. Applications include Sulfuric acid (H2SO4), Hydrochloric acid (HCL), Chromic acid (CrO3), Phosphoric acid (H3PO4) and Hydrogen peroxide (H2O2)

| | | |
|-----------------------|--------------------------------------|-------------|
| Specifications | Capacity : Max. 1.2m ³ /m | Max. 317GPM |
| | Head : Max. 42m | Max. 140ft |
| | Motor : Max. 15kW | Max. 20HP |

Multiplex High Flow and Pressure Diaphragm Pump with manually adjustable stroke control.



Available with up to 6 pump heads. Multiple pump heads can be stroke programmed to minimize pulsations at equal stroke lengths or each pump head can be flow/stroke controlled manually meter different chemical reagents in applicable proportions.

| | |
|-----------------------|--|
| Applications | Chemicals, gas forming |
| Specifications | Flow rate max 11 m ³ /hr (48 gpm) . 22 m ³ /hr (96 gpm) with 6 pump-heads. Max. 35 MPa (5,076 psi) discharge head with teflon diaphragm. |

Type TQ sealless gas blower for SF6 gas



Centrifugal gas blower and electric motor are coupled without shaft seal. Manufacturing and design specs upon request.