

# **SHINKO**

**CARGO OIL,  
TANK CLEANING &  
BALLAST PUMPS**

**KV/CVL**





# CARGO OIL PUMPS

Shinko KV centrifugal pumps have been designed and manufactured as cargo oil unloading pumps for oil tankers. And, on the basis of our many years of experience and service, consideration has been given to the following points in our design:

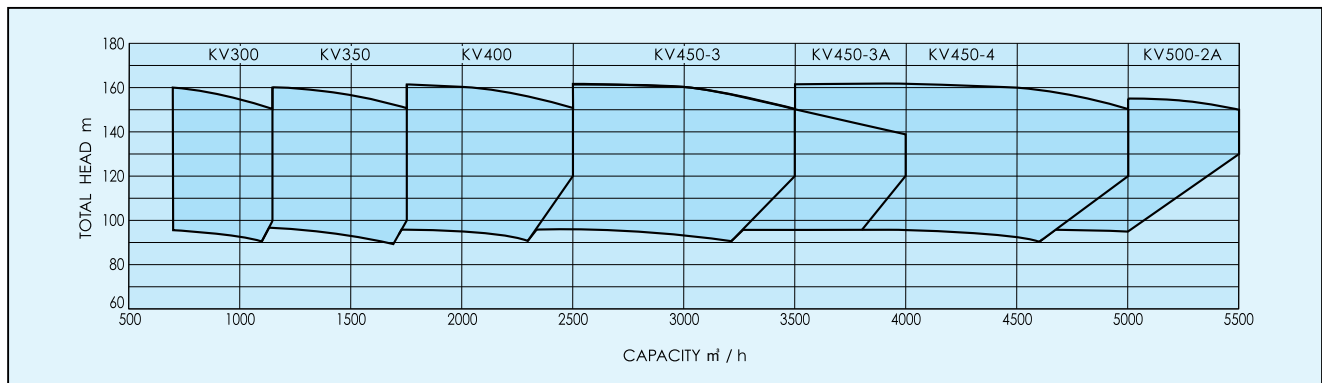
1. High efficiency
2. High performance under various suction conditions
3. Materials suitable for crude oil and product oil
4. Construction for minimizing vibration
5. Rigidity against external force

## ■ GENERAL CHARACTERISTICS

The vertical KV models are single-stage double suction cargo oil pumps. And, we have the following 7 standard models classified by capacity:

Item	Model	KV 300	KV 350	KV 400	KV 450-3	KV 450-3A	KV 450-4	KV 500-2A
Normal capacity	(m <sup>3</sup> /h)	1000	1500	2000 2500	3000 3500	3500 4000	4000 4500 5000	5500
Normal speed at total head 150m	(min <sup>-1</sup> )	1900	1910	1620 1650	1410 1450	1300 1300	1180 1190 1200	1200
Rotation		Counter-clockwise when viewed from coupling side						
Suction bore	(mm)	350	400	450	600	600	600	700
Discharge bore	(mm)	300	350	400	450	450	450	500
Lubrication of pump bearing		Grease lubrication						
Amount of grease for upper side	(g)	70	70	110	150	150	270	270
Amount of grease for lower side	(g)	50	50	70	110	110	150	150
Lubrication of inter. shaft bearing		Grease lubrication						
Amount of grease for upper side	(g)	70	70	110	150	150	270	270
Amount of grease for lower side	(g)	70	70	110	150	150	270	270
Bulkhead stuffing box seal		Grease lubrication						
Amount of grease filled	(g)	240	240	280	300	300	360	360
Brand of grease		NLGI NO.2						
Lubrication of gear coupling		Gear oil						
Amount of oil filled	(ℓ)	0.44	0.44	0.61	1.04	1.04	1.31	1.31
Brand of oil		ISO VG680						
Weight (kg)	Pump (bronze casing)	1030	1300	1400	2400	2400	3000	3650
	Inter. shaft 2m, floating shaft 2m and bearing support	590	590	700	1050	1050	1300	1300
	Water in casing	200	300	450	850	850	1100	1600

## ■ PERFORMANCE CHART

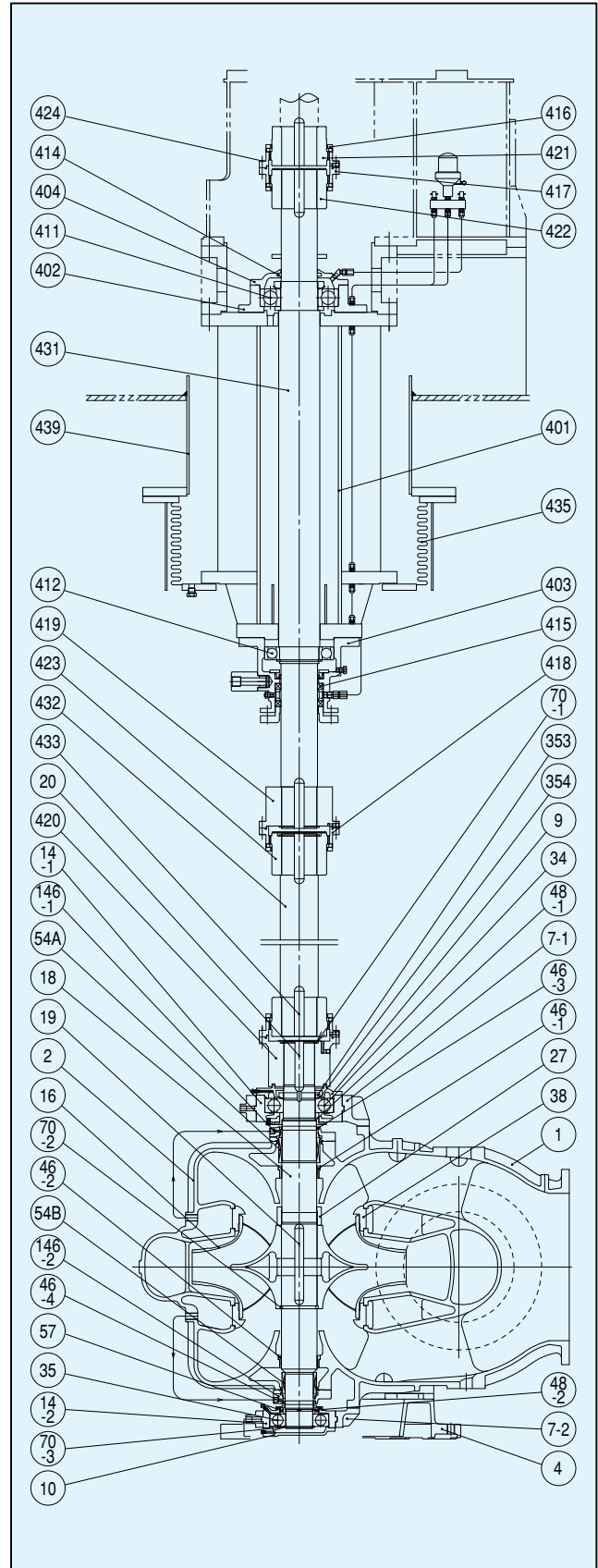


## ■ DESIGN & MATERIALS

The cargo pump consists of a pump, a bulkhead stuffing box positioned between the pump room and the engine room, an intermediate shaft, and a floating shaft.

The standard materials for parts and components are shown in the following table:

PART NO.	NAME OF PART	MATERIAL			REQ.NO. FOR 1PUMP
		NAME	JIS	ASTM EQUIVALENT	
1	VOLUTE CASING	BRONZE	CAC402	B584 C92300	1
2	VOLUTE COVER	〃	〃	〃	1
4	PUMP BED	CAST IRON	FC200	A48 NO.35	1
7-1	BEARING HOUSING	〃	〃	〃	1
7-2	BEARING HOUSING	〃	〃	〃	1
9	BEARING COVER	〃	〃	〃	1
10	BEARING COVER	〃	〃	〃	1
14-1	BEARING INNER CASE	〃	〃	〃	1
14-2	BEARING INNER CASE	〃	〃	〃	1
16	IMPELLER	PHOSPHOR BRONZE	CAC502A	B427 C90700	1
18	IMPELLER SHAFT	STAINLESS STEEL	SUS329J1	S32900	1
19	IMPELLER KEY	〃	SUS304	A276 304	1
20	COUPLING KEY	CARBON STEEL	S55C	AISI1055	1
27	IMPELLER NUT	SPECIAL AL BRONZE			1
34	BALL BEARING	SPECIAL STEEL			1
35	BALL BEARING	〃			1
38	MOUTH RING	BRONZE	CAC406	B584 C83600	2
46-1	THROTTLE BUSH	〃	CAC604	B584 C93800	1
46-2	THROTTLE BUSH	〃	〃	〃	1
46-3	OIL SEAL	RUBBER			1
46-4	OIL SEAL	〃			1
48-1	FLINGER	BRONZE	CAC403	B584 C90500	1
48-2	FLINGER	STAINLESS STEEL	SCS13	A351	1
54A	MECHANICAL SEAL				1SET
54B	MECHANICAL SEAL				1SET
57	PACKING RING	RUBBER			1
70-1	SNAP RING	CARBON TOOL STEEL	SK85	A686 WI-8	1
70-2	SPLIT RING	STAINLESS STEEL	SUS304	A276 304	1SET
70-3	SNAP RING	CARBON TOOL STEEL	SK85	A686 WI-8	1
146-1	MECHANICAL SEAL COVER	BRONZE	CAC406	B584 C83600	1
146-2	MECHANICAL SEAL COVER	〃	〃	〃	1
353	BEARING NUT	STEEL	SS400	A283D	1
354	BEARING WASHER	〃	〃	〃	1
401	BEARING SUPPORT	〃	〃	〃	1
402	BEARING CASE	CAST IRON	FC200	A48 NO.35	1
403	BEARING HOUSING	〃	〃	〃	1
404	BEARING COVER	〃	〃	〃	1
411	BALL BEARING	SPECIAL STEEL			1
412	BALL BEARING	〃			1
414	PACKING RING	FELT			1
415	GLAND PACKING	CARBONIZED FIBER			2
416	SLEEVE	CARBON STEEL	S48C		1
417	SLEEVE	〃	〃	〃	1
418	SLEEVE	〃	〃	〃	2
419	COUPLING FLANGE	〃	〃	〃	1
420	COUPLING FLANGE	〃	〃	〃	1
421	HUB	〃	〃	〃	1
422	HUB	〃	〃	〃	1
423	HUB	〃	〃	〃	2
424	COUPLING BOLT NUT & WASHER	CARBON STEEL STEEL	S45C SS400	AISI1045 A283D	3SETS
431	INTERMEDIATE SHAFT	Cr-Mo STEEL	SCM435	AISI4137	1
432	FLOATING SHAFT	〃	〃	〃	1
433	COUPLING KEY	CARBON STEEL	S55C	AISI1055	4
435	BELLOWS	STAINLESS STEEL	SUS304	A276 304	1
439	DOUBLING PLATE	STEEL	SS400	A283D	1

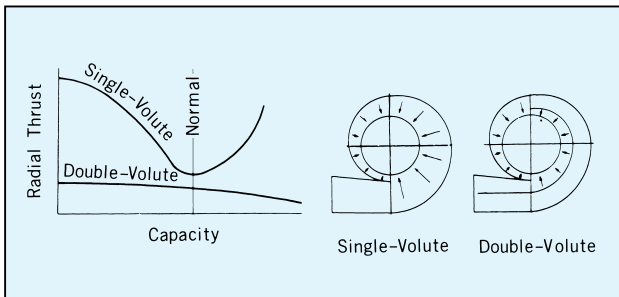


## ●Double-Volute Casing

The double-volute casing is vertically split into two halves. The suction and discharge nozzles are built into the volute casing. This allows simple removal of the volute cover and the rotating elements without disturbing the suction and discharge piping.

Radial thrust in a single volute is at its lowest around the normal capacity, and becomes increasingly greater as capacity deviates from the normal capacity.

Thus, the double-volute casing is adopted to reduce thrust and prevent shaft deflection in all service ranges.



## ●Ball Bearings & Lubrication

Heavy duty deep-groove ball bearings are fitted into the vertically-split bearing housings at both the upper and lower ends of the casing. The upper ball bearings support the weight of the rotating element. All of the bearings are grease lubricated.

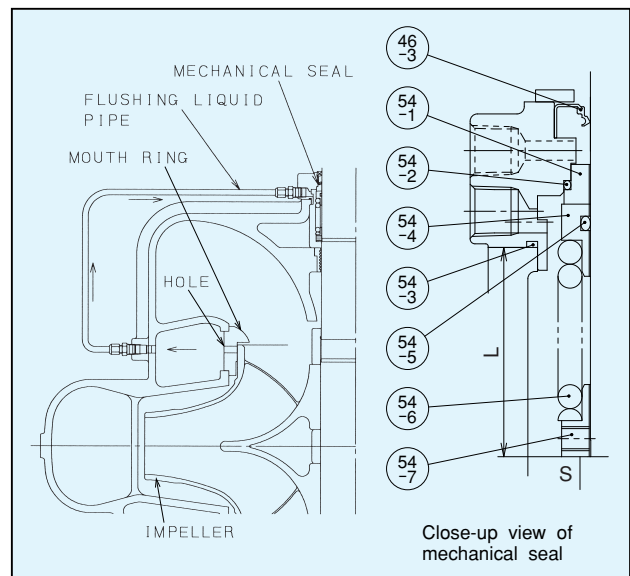
## ●Bearing Support & Stuffing Box

The bulkhead is provided with a bearing support and a stuffing box in order to support the intermediate shaft and floating shaft. At the same time, this prevents the gas produced in the pump room from leaking into the engine room.

## ●Mechanical Seal & Flushing

The standard mechanical seals are fitted in the upper and lower stuffing boxes in order to prevent leakage of liquids or air due to variation in suction conditions. The shaft is designed with shoulder S to fit a mechanical seal into exact dimensions of L. The mechanical seals made by both Japanese manufacturers and Sealol (American) can be fitted interchangeably with each other.

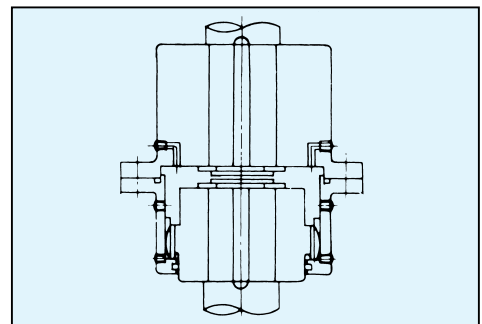
Flushing of the mechanical seals is carried out by taking the necessary amount of liquid from the discharge side. The liquid, which is cleaned and reduced in pressure when passing through the narrow radial gap between the mouth ring and the impeller, is led to the seal faces of the mechanical seals.



## ●Intermediate Shaft, Floating Shaft & Gear Coupling

The cargo pump installed in the pump room is driven through the intermediate and floating shafts by a steam turbine or electric motor installed in the engine room. The shafts are provided with gear couplings at both ends.

The teeth of the gear coupling hub are crowned to compensate for angular misalignments up to  $\pm 15$  minutes (about 4mm per meter). High viscosity oil is poured through the oil inlet to lubricate the gear.



## ■ ACCESSORIES

### ● Standard

	Item	A Standard		B Standard		Notes
		Type	Q'ty	Type	Q'ty	
Pump	Air vent valve on casing top (with pipe)		1		1	
	Flushing pipe & joint (for mechanical seal)		2sets		2sets	
	Grease nipple	pin type	2	pin type	2	
	Gauge root valve		2		2	
	Gauge board with press. gauges		1set		1set	
	Pump suc. & disch. press. (trip) remote indication (2 gauges)	air	1set	elect. (ia)	1set	
Safety device	Pump over disch. press. trip	PS (air)	1	elect. (ia)	1	
	Pump casing high temp. alarm & trip	capillary	1	∕	1	
	Pump bearing high temp. alarm & trip	∕	2	∕	2	
	Stuffing box seal high temp. alarm & trip	∕	1	∕	1	
	Emerg. trip device in pump room	elect. (ia)	1	∕	1	
	Emerg. trip device at manifold (2), pump room entrance (1)	∕	1set/ship	∕	1set/ship	

### ● Option

Press. indication	TK cleaning main line press. remote indication (1 gauge)	air	1set/ship	elect. (ia)	1set/ship	
	Main cargo line press. remote indication (3 gauges)	∕	1set/ship	∕	1set/ship	
Safety device	Remote temp. indication, alarm & trip device for pump casing (1), bearing (2) & stuffing box seal (1). Remote 4~20mA.			elect. (ia)	1set	OCIMF recommendations
	Remote temp. CCR indication			∕	1set	∕
	Pump vibration monitoring & alarm device			∕	1set	∕
	Pump mech. seal leakage alarm device			∕	1set	∕
	Intermediate shaft upper bearing high temp. alarm & trip at TBN side	capillary	1	elect.	1	
Others	Universal joint for floating shaft		1			
	Pump mech. seal steam cleaning device		1set			
	Intermediate shaft protecting cover		1			
	Counter flange		1set			

Note 1. elect. (ia) : Electric Intrinsically Safe Device (sensors, barriers, indicators, and etc. included)

2. OCIMF : Oil Companies International Marine Forum

3. PS : Press. Switch (air)

## ■ STANDARD SPARE PARTS [per ship]

Mechanical seal ..... 1/set\*  
 Coupling bolt & nut ..... 1/set\*  
 Mouth ring ..... 1/set\*  
 Ball bearing ..... 1/set\*  
 Packing ring ..... 1/set\*  
 Stuffing box seal ..... 1/set\*  
 Complete set of rotating element ..... 1/set\* (option)  
 (set\* = all units with the same model and application)

## ● Pump Over Discharge Pressure Trip

When the pump discharge pressure rises beyond normal levels, the discharge pipes, valves, and other related components become exposed to danger. In that case, discharge pressure is changed into air pressure through the transmitter that forces the turbine to stop the pump.

## ● Pump Casing High Temperature Alarm & Trip

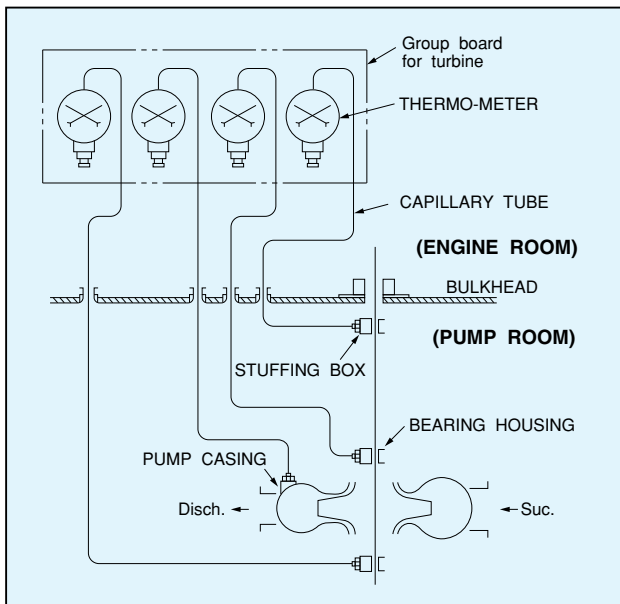
When the liquid temperature in the casing becomes too high, there is danger of explosion. So, a thermo-switch (thermometer with contact point) is installed on the discharge side of the casing. If it registers a temperature of 75°C, the system issues an alarm. The turbine forces the pump to stop via the trip at 80°C.

## ● Pump Bearing High Temperature Alarm & Trip

When the temperature of the ball bearings on the upper side and the lower side of the casing rises too high, the gas inside the pump room is in danger of catching a fire. So, the upper and lower bearings are provided with a thermo-switch. If either of them registers a temperature of 85°C, the system issues an alarm. The turbine forces the pump to stop via the trip at 90°C.

## ● Stuffing Box Seal High Temperature Alarm & Trip

When the temperature of the seal of the stuffing box rises too high, there is danger of catching a fire. So, the stuffing box is provided with a thermo-switch. If it registers a temperature of 85°C, the system issues an alarm. The turbine forces the pump to stop via the trip at 90°C.



## Alarm & Trip setting list

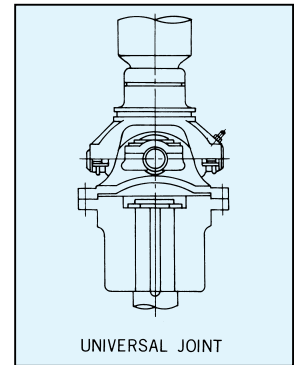
Item	Alarm	Trip	Notes
Pump over press. (MPaG)	—	110%	COP only
Pump casing high temp. (°C)	75	80	※
Pump BRG high temp. (°C)	85	90	※
Stuffing box seal high temp. (°C)	85	90	※
I.M. shaft upper BRG high temp. (°C)	85	90	
Pump vibration (μm)	150 p-p	—	OCIMF
Pump mech. seal leakage	alarm : off	—	OCIMF

※ :SHINKO standard

※ :When the OCIMF standards are applied, a temperature monitoring system with a remote-read out can be equipped to the COP as an option.

## ● Universal Joint for Floating Shaft (Option)

In the case that the floating shaft is too short or too long due to the hull height arrangement, a universal joint with a hollow shaft is used instead of the gear coupling with a solid shaft.



## ● Pressure Transmitter (Option)

In order to indicate the accurate suction and discharge pressure of the cargo pumps in the engine room and control room, pressure transmitters are installed in the pump room. The transmission signals of the pressure are converted into either air pressure or an electric signal through the transmitters. We also have pressure transmitters for eductors and other equipment available.

## ●OCIMF Recommendation (Option)

For pump room safety, OCIMF recommendations are as follows:

### Temperature Monitoring

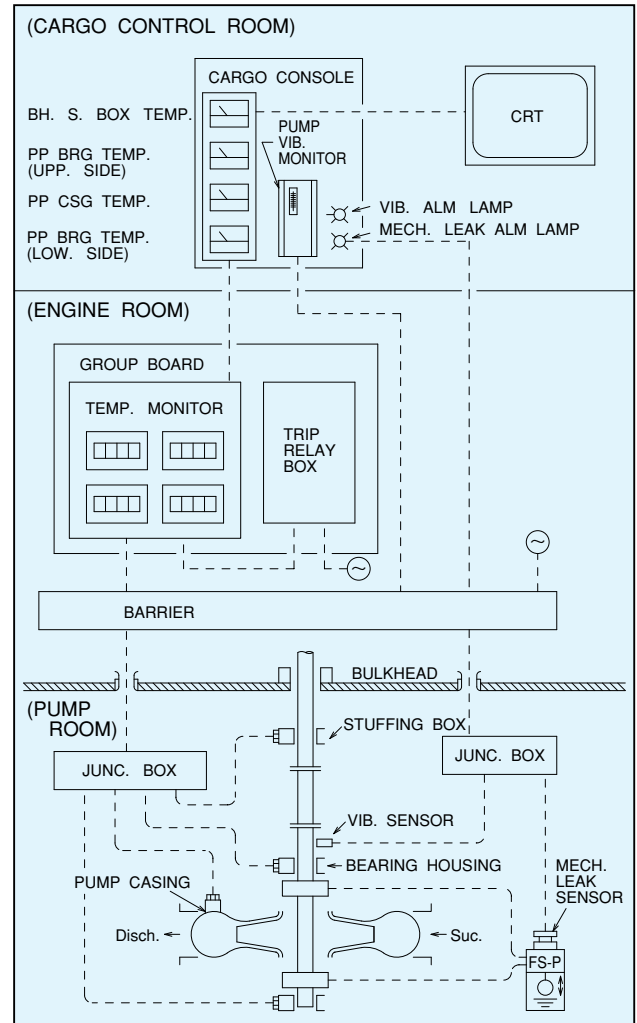
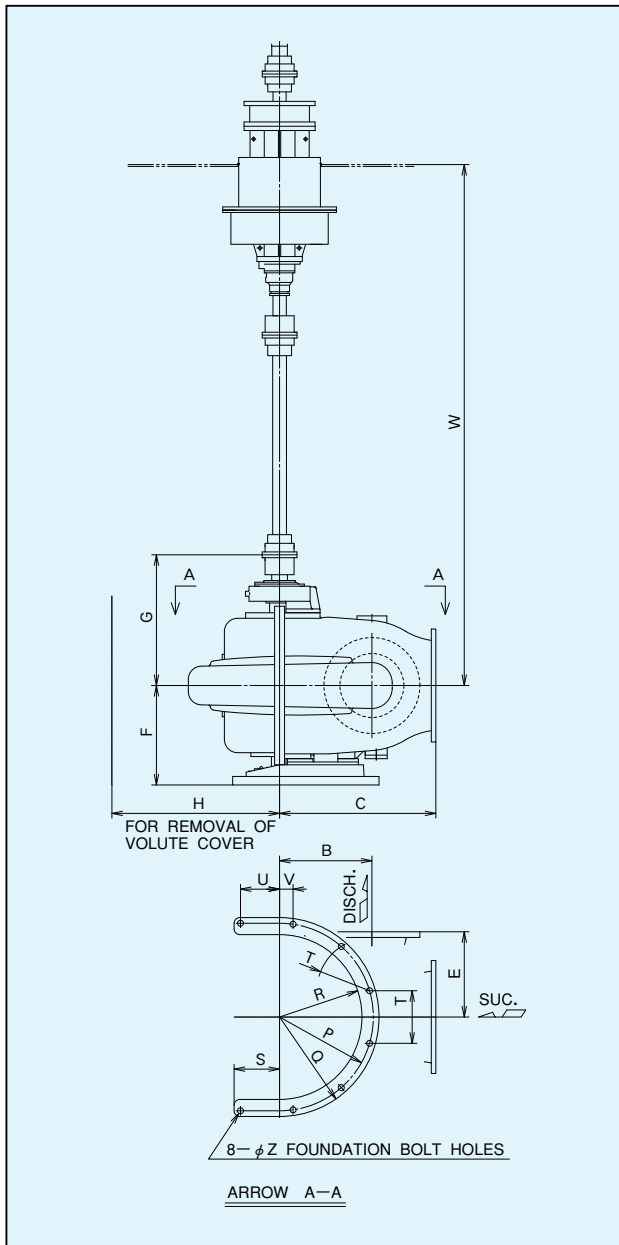
All cargo pump glands, bearings, and casings should be equipped with a temperature monitoring system with remote read-outs, alarm, and shut-down functions.

### Vibration Monitoring

Fixed vibration monitoring equipment is provided on all centrifugal cargo pumps. The equipment should include a remote alarm facility.

### Cargo Pump Leakage Detection

All centrifugal cargo pumps should be equipped with a double seal arrangement designed to contain any leakage from the shaft seal and to provide remote alarm indication of its occurrence.



Dimensions : mm

Model	KV 300	KV 350	KV 400	KV 450-3 KV 450-3A	KV 450-4	KV 500-2A
Bore	Suc.	350	400	450	600	700
	Disch.	300	350	400	450	500
B	350	400	500	600	650	650
C	700	800	850	1000	1100	1200
E	400	450	450	600	600	700
F	500	570	550	640	700	760
G	580	650	720	850	920	970
P	420	420	465	610	660	755
Q	450	450	500	650	700	800
R	360	360	390	530	580	680
S	150	150	200	300	320	400
T	230	230	255	340	370	430
U	120	120	170	250	275	335
V	80	80	80	90	95	95
Z	35	35	35	42	42	48
H min.	700	750	840	1080	1180	1310
W	min.	2550	2620	2710	3350	3570
	max.	3730	3800	4320	4950	5470

# CVL BALLAST PUMPS

Shinko CVL centrifugal pumps have been designed and manufactured as ballast pumps for oil tankers, and on the basis of our many years of experience and service, consideration has been given to the following points in our design.

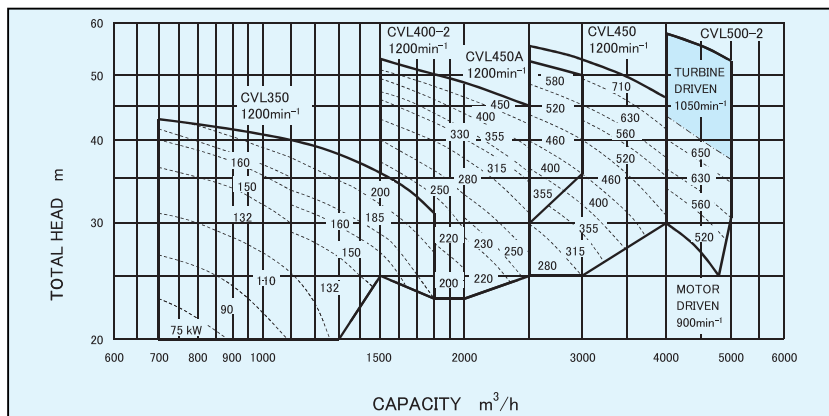
1. High efficiency
2. High performance under various suction conditions
3. Line bearings of special carbon are utilized in the lower side bearings to insure there is no leakage.

## ■ GENERAL CHARACTERISTICS

The vertical CVL models are single-stage, double suction ballast pumps with a line bearing. We have the following 5 standard models classified by capacity.

Item	Model	CVL 350	CVL 400-2	CVL 450A	CVL 450	CVL 500-2
Normal capacity	(m <sup>3</sup> /h)	1000	2000	3000	3500	4500
		1500	2500		4000	5000
Normal speed	(min <sup>-1</sup> )	1180	1180	1200	1180	880
Rotation		Counter-clockwise when viewed from coupling side				
Suction bore	(mm)	400	500	600	600	700
Discharge bore	(mm)	350	400	450	450	500
Lubrication of pump bearing		Grease lubrication				
Amount of grease for upper side	(g)	50	50	70	110	150
Lubrication of inter. shaft bearing		Grease lubrication				
Amount of grease for upper side	(g)	70	70	110	110	150
Amount of grease for lower side	(g)	70	70	110	110	150
Bulkhead stuffing box seal		Grease lubrication				
Amount of grease filled	(g)	240	240	280	280	300
Brand of oil		NLGI NO.2				
Lubrication of gear coupling		Gear oil				
Amount of oil filled	(ℓ)	0.44	0.44	0.44	0.44	0.69
Brand of oil		ISO VG680				
Weight (kg)	Pump (bronze casing)	800	1230	1600	2000	2600
	Inter. shaft 2m, floating shaft 2m and bearing support	530	590	640	640	980
	Water in casing	300	500	700	1400	2000

## ■ PERFORMANCE CHART



When a two speed motor is used, output at low speed is determined by the following formula:

$$P_L = \left\{ \left( \frac{N_L}{N_H} \right)^3 \times P_H \times 1.07 \right\} + \alpha$$

Here,

$P_L$  : Output at low speed (kW)

$N_L$  : Low speed (min<sup>-1</sup>)

$N_H$  : High speed (min<sup>-1</sup>)

$P_H$  : Output at high speed (kW)

Example:

In the case that the output at high speed is 250kW, the output at low speed will be as follows:

$$P_L = \left\{ \left( \frac{900}{1200} \right)^3 \times 250 \times 1.07 \right\} + \alpha$$

$$= 112.85 + 2.15$$

$$= 115 \text{ kW}$$

“ $\alpha$ ” value is added for rounding up to the nearest 0 or 5.

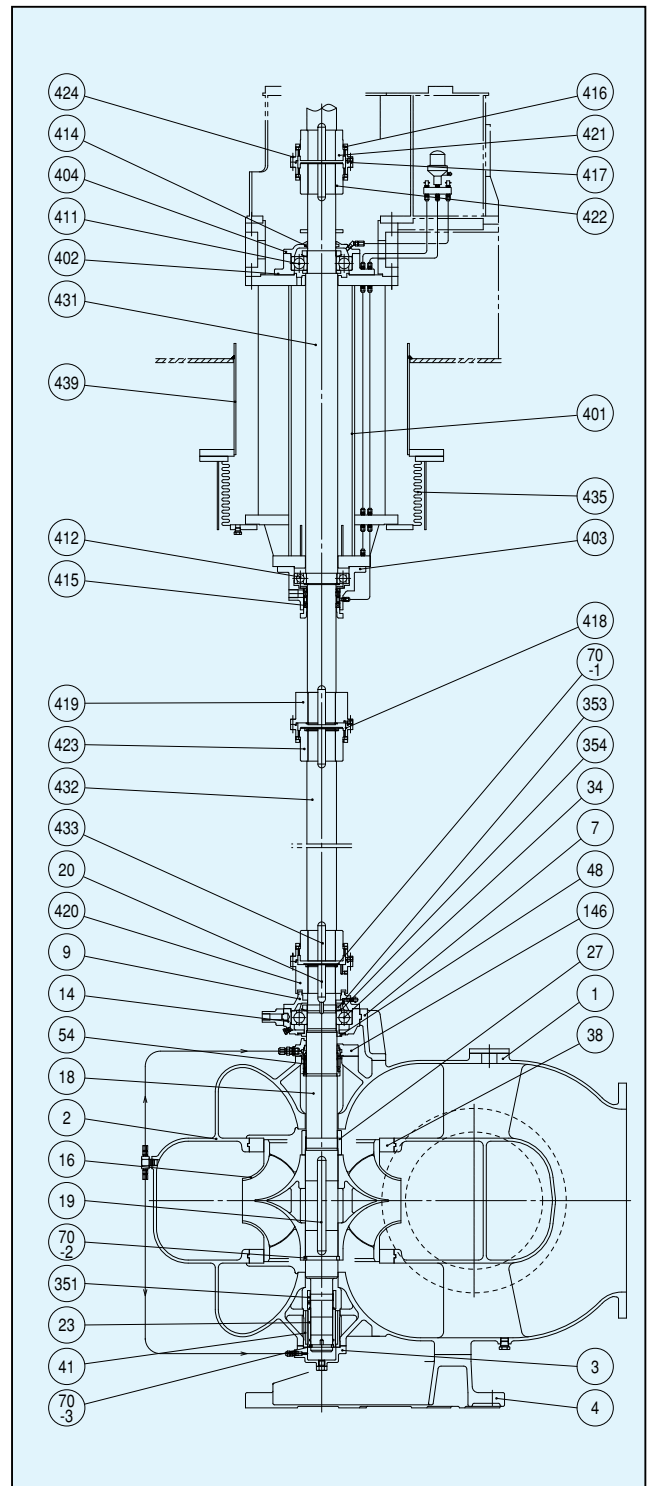


## ■ DESIGN & MATERIALS

The ballast pump consists of a pump, a stuffing box positioned between the pump room and the engine room, an intermediate shaft, and a floating shaft.

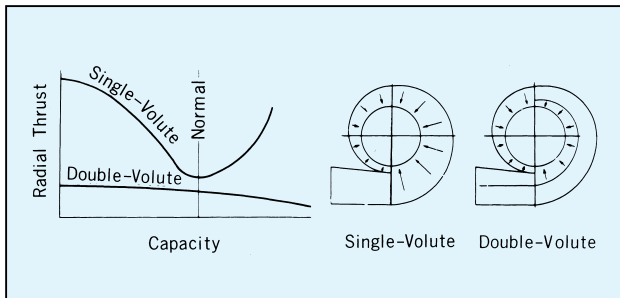
The standard materials for parts and components are shown in the following table:

PART NO.	NAME OF PART	MATERIAL			REQ.NO. FOR 1PUMP
		NAME	JIS	ASTM EQUIVALENT	
1	VOLUTE CASING	BRONZE	CAC402	B584 C92300	1
2	VOLUTE COVER	〃	〃	〃	1
3	VOLUTE END COVER	〃	〃	〃	1
4	PUMP BED	CAST IRON	FC200	A48 NO.35	1
7	BEARING HOUSING	〃	〃	〃	1
9	BEARING COVER	〃	〃	〃	1
14	BEARING INNER CASE	〃	〃	〃	1
16	IMPELLER	PHOSPHOR BRONZE	CAC502A	B427 C90700	1
18	IMPELLER SHAFT	STAINLESS STEEL	SUS329J1	S32900	1
19	IMPELLER KEY	STAINLESS STEEL	SUS304	A276 304	1
20	COUPLING KEY	CARBON STEEL	S55C	AISI1055	1
23	SLEEVE	STAINLESS STEEL	SUS316	A276 316	1
27	IMPELLER NUT	SPECIAL A2 BRONZE			1
34	BALL BEARING	SPECIAL STEEL			1
38	MOUTH RING	BRONZE	CAC403	B584 C90500	2
41	LINE BEARING	CARBON			1
48	FLINGER	BRONZE	CAC403	B584 C90500	1
54	MECHANICAL SEAL				1SET
70-1	SNAP RING	CARBON TOOL STEEL	SK85	A686 WI-8	1
70-2	SPLIT RING	STAINLESS STEEL	SUS304	A276 304	1
70-3	SPLIT RING	〃	〃	〃	1
146	MECHANICAL SEAL COVER	BRONZE	CAC406	A584 C83600	1
351	SLEEVE NUT	STAINLESS STEEL	SUS316	A276 316	1
353	BEARING NUT	STEEL	SS400	A283D	1
354	BEARING WASHER	〃	〃	〃	1
401	BEARING SUPPORT	〃	〃	〃	1
402	BEARING CASE	CAST IRON	FC200	A48 NO.35	1
403	BEARING HOUSING	〃	〃	〃	1
404	BEARING COVER	〃	〃	〃	1
411	BALL BEARING	SPECIAL STEEL			1
412	BALL BEARING	〃			1
414	PACKING RING	FELT			1
415	GLAND PACKING	CARBONIZED FIBER			2
416	SLEEVE	CARBON STEEL	S48C		1
417	SLEEVE	〃	〃	〃	1
418	SLEEVE	〃	〃	〃	2
419	COUPLING FLANGE	〃	〃	〃	1
420	COUPLING FLANGE	〃	〃	〃	1
421	HUB	〃	〃	〃	1
422	HUB	〃	〃	〃	1
423	HUB	〃	〃	〃	2
424	COUPLING BOLT NUT & WASHER	CARBON STEEL STEEL	S45C SS400	AISI1045 A283D	3SETS
431	INTERMEDIATE SHAFT	Cr-Mo STEEL	SCM435	AISI4137	1
432	FLOATING SHAFT	〃	〃	〃	1
433	COUPLING KEY	CARBON STEEL	S55C	AISI1055	4
435	BELLOWS	STAINLESS STEEL	SUS304	A276 304	1
439	DOUBLING PLATE	STEEL	SS400	A283D	1



## ●Volute Casing

For the small capacity pump model CVL350, a single volute casing is employed. And, for the pumps with a capacity greater than model CVL400-2, a double-volute casing is employed. Owing to this, shaft deflection is prevented in all service ranges.



## ●Ball Bearings & Lubrication

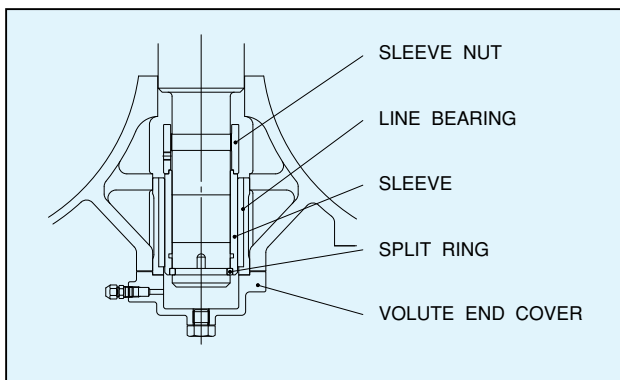
One set of heavy duty deep-groove ball bearings is fitted into the vertically-split bearing housing at the upper end of the casing.

The ball bearings support the weight of the rotating element. The bearings are grease lubricated.

## ●Lower Line Bearing

A line bearing is employed for lower side bearing to ensure that liquid does not leak.

Special carbon is used as material of the line bearing, the effectiveness of which has been proven over time.



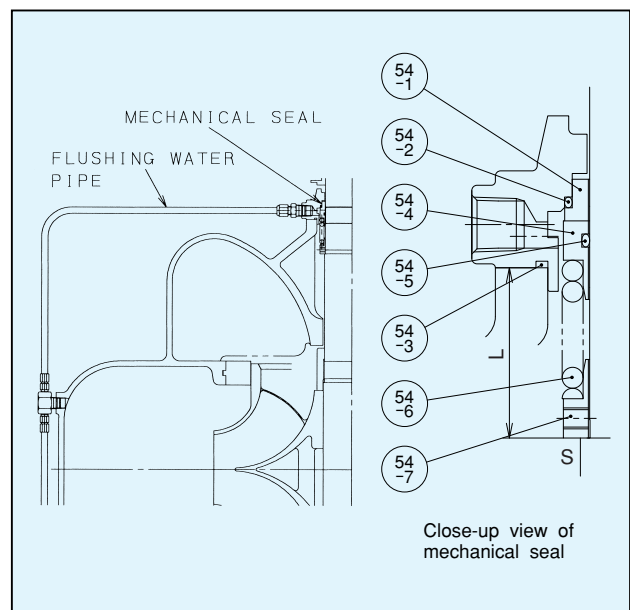
## ●Bearing Support & Stuffing Box

The bulkhead is provided with a bearing support and a stuffing box in order to support the intermediate shaft and floating shaft. At the same time, this prevents the gas produced in the pump room from leaking into the engine room.

## ●Mechanical Seal & Flushing

The standard mechanical seal is fitted in the stuffing box in order to prevent leakage of liquids or air due to variation in suction conditions. The shaft is designed with shoulder S to fit a mechanical seal into exact dimensions of L. The mechanical seals made by both Japanese manufacturers and Sealol (American) can be fitted interchangeably with each other.

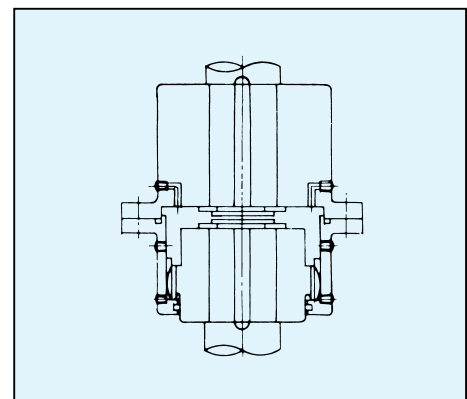
Flushing of the mechanical seal is carried out by taking the necessary amount of liquid from the discharge side.



## ●Intermediate Shaft, Floating Shaft & Gear Coupling

The ballast pump installed in the pump room is driven through the intermediate and floating shafts by a steam turbine or electric motor installed in the engine room. The shafts are provided with gear couplings at both ends.

The teeth of the gear coupling hub are crowned to compensate for angular misalignments up to  $\pm 15$  minutes (about 4mm per meter). High viscosity oil is poured through the oil inlet to lubricate the gear.



## ■ ACCESSORIES

### ● Standard

	Item	A Standard		B Standard		Notes
		Type	Q'ty	Type	Q'ty	
Pump	Air vent valve on casing top (with pipe)		1		1	
	Flushing pipe & joint (for mechanical seal)		1set		1set	
	Lubricating pipe & joint (for line bearing)		1set		1set	
	Grease nipple	pin type	1	pin type	1	
	Gauge root valve		2		2	
	Gauge board with press. gauges		1set		1set	
	Pump suc. & disch. press. remote indication (2 gauges)	air	1set	elect. (ia)	1set	
Safety device	Pump casing high temp. alarm & trip	capillary	1	elect. (ia)	1	
	Pump bearing high temp. alarm & trip	∕	2	∕	2	
	Stuffing box seal high temp. alarm & trip	∕	1	∕	1	
	Relay box at driver (TBN or Motor) side	elect.	1set	elect.	1set	

### ● Option

Press. indication	Ballast strip. eductor press. remote indication (2 gauges)	air	1set/ship	elect. (ia)	1set/ship	
	Ballast strip. eductor press. remote indication (3 gauges)	∕	1set/ship	∕	1set/ship	
	Ballast strip. eductor press. remote indication (2 gauges)	∕	2sets/ship	∕	2sets/ship	
	Ballast strip. eductor press. remote indication (3 gauges)	∕	2sets/ship	∕	2sets/ship	
Safety device	Remote temp. indication, alarm & trip device for pump casing (1), bearing (2) & stuffing box seal (1). Remote 4~20mA.			elect. (ia)	1set	
	Remote temp. CCR indication			∕	1set	
	Pump vibration monitoring & alarm device			∕	1set	
	Emerg. trip device in pump room	elect. (ia)	1	∕	1	
	Intermediate shaft upper bearing high temp. alarm & trip at TBN side	capillary	1	elect.	1	
Others	Universal joint for floating shaft				1	
	Intermediate shaft protecting cover				1	
	Counter flange				1set	

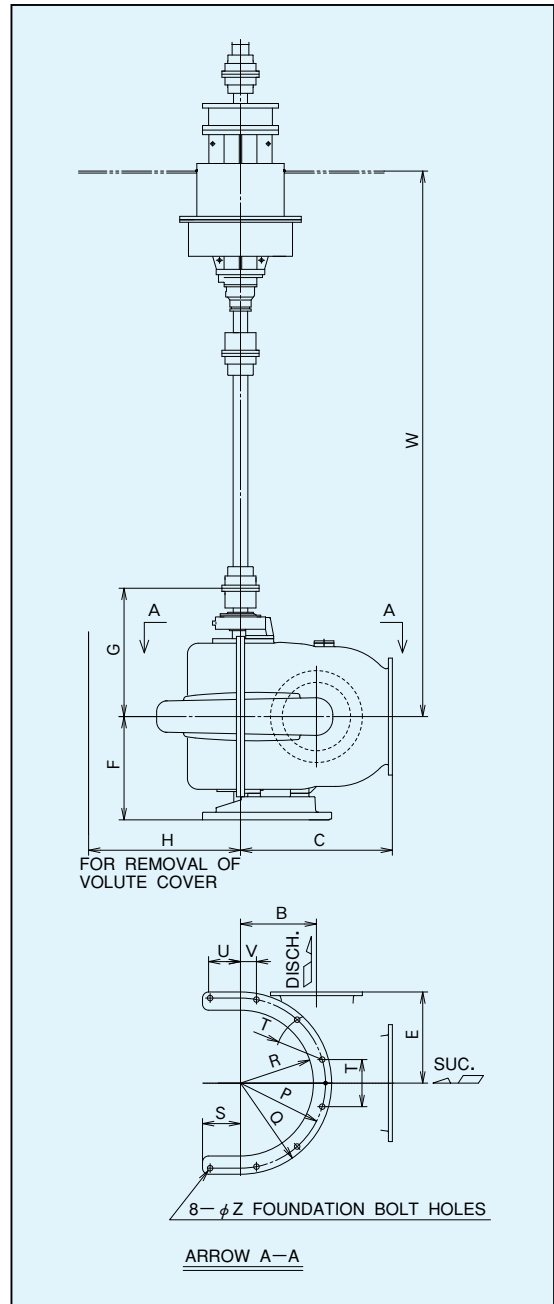
Note elect. (ia) : Electric Intrinsically Safe Device (sensors, barriers, indicators, and etc. included)

## ■ STANDARD SPARE PARTS [per ship]

Mechanical seal ..... 1/set\*  
 Coupling bolt & nut ..... 1/set\*  
 Mouth ring ..... 1/set\*  
 Ball bearing ..... 1/set\*  
 Line bearing ..... 1/set\*  
 Packing ring ..... 1/set\*  
 Stuffing box seal ..... 1/set\*  
 Complete set of rotating element ..... 1/set\* (option)  
 (set\* = all units of the same model and application)

Dimensions : mm

Model		CVL 350	CVL 400-2	CVL 450A	CVL 450	CVL 500-2
Bore	Suc.	400	500	600	600	700
	Disch.	350	400	450	450	500
B		350	420	480	500	550
C		700	860	920	1000	1150
E		460	500	550	600	800
F		645	660	610	680	750
G		650	700	720	775	960
P		420	465	560	560	660
Q		450	500	600	600	700
R		360	390	480	480	580
S		150	200	250	250	320
T		230	255	310	310	370
U		120	170	200	200	275
V		80	80	105	105	95
Z		35	35	36	36	42
H min.		650	800	900	1000	1100
W	min.	2620	2670	3240	3265	3460
	max.	4300	4350	4700	4725	5260



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