Stainless Steel Pump FSSC Introduction

Ebara Machinery (China) Co., Ltd
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Contents

Complete Pump

Model Code

50 X 40 FSS 4 H C 5 .4 H

- H — Maximum work pressure 16bar
- .4 — Output kW
- 5 — frequency 50Hz（6:60Hz）
- C — Made in China
- H — Impeller code
- 4 — No. of Pole (2,4)
- FSS — Model
- 40 — Discharge size (mm)
- 50 — Suction size (mm)

Applications


Chemical Industry


Pulp and Paper-making


Mineral and Mining


Oil Refining and Fuel Gas Processing


Food and Drink


Water and Wasted Water


Power Generation


Metallurgy


Pharmacy

Parameter

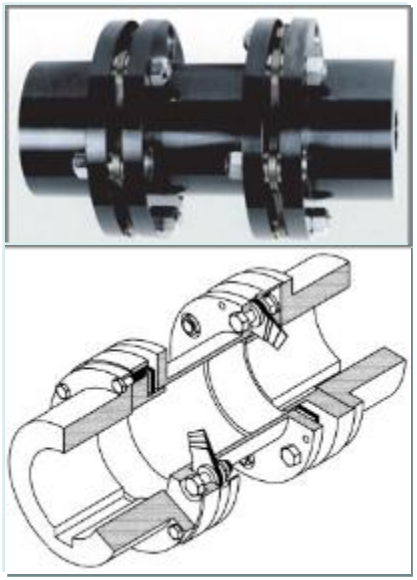
Flow Rate	3～1320m³/h
Pump Head	4～150m
Working Pressure	10bar，16bar
Size	32～250mm
No. of Pole	2，4

Type		Development stage-1			Development stage-2		
		Standard		Optional	Standard		Optional
Maximum working pressure		10bar	16bar		10bar	16bar	
Delivered liquid	Name	Clean water and moderate corrosive liquid（except license）			Clean water, oil and chemical fluid		
	Temperature	-10℃～105℃			-10℃～105℃		-40℃～-10℃； 105℃～150℃
Construction	Casing	Foot support			Foot support		
	Impeller	Enclosed			Enclosed		
	Shaft seal	Mechanical seal（balance type）		Gland packing	Mechanical seal（balance type）		Gland packing, double seal, cartridge and unbalance type
	Sealing	Water series: self flushing(-10℃～80℃);external flushing(80℃～105℃); Oil series: Self flushing(-10℃～100℃) ;external flushing(100℃～105℃)			Water series: self flushing(-10℃～80℃);external flushing(80℃～105℃); Oil series: Self flushing(-10℃～100℃) ;external flushing(100℃～105℃)		Self flushing with quenching; Self flushing + Heat exchanger
	Bearing type and lubrication	Sealed ball bearing (grease lubrication)		Open ball bearing (oil lubrication)	Sealed ball bearing (grease lubrication)		Open ball bearing (oil lubrication)
Flange		JIS 10K RF	JIS 16K RF	DIN,ANSI	JIS 10K RF	JIS 16K RF	DIN ,ANSI
Material	Casing	SCS13		SCS14	SCS13		SCS14
	Impeller	SCS13		SCS14	SCS13		SCS14
	Shaft	SUS316			SUS316		
	Seal	SiC/C/FPM		SiC/SiC/FPM Packing：PTFE/Flexible graphite	SiC/C/FPM		SiC/SiC/FPM Packing：PTFE/Flexible graphite

Motor classification

Configuration	Standard	Optional
No. of Pole	2/4	
Frequency	50Hz（60Hz）	
Synchronous speed	3000min^{-1}，1500min^{-1} （3600min^{-1}。1800min^{-1}）	
Phase	three	
Voltage	380V±10%	
Type	TEFC(Indoors）	Outdoors
Protection and Insulation Class	IP55 F	
Frequency Conversion	30～50Hz(30～60Hz)	5～50Hz(5～60Hz)
Others	New GB3 motor	explosion-proof, high-efficiency, outdoors and frequency conversion

elastic pin coupling



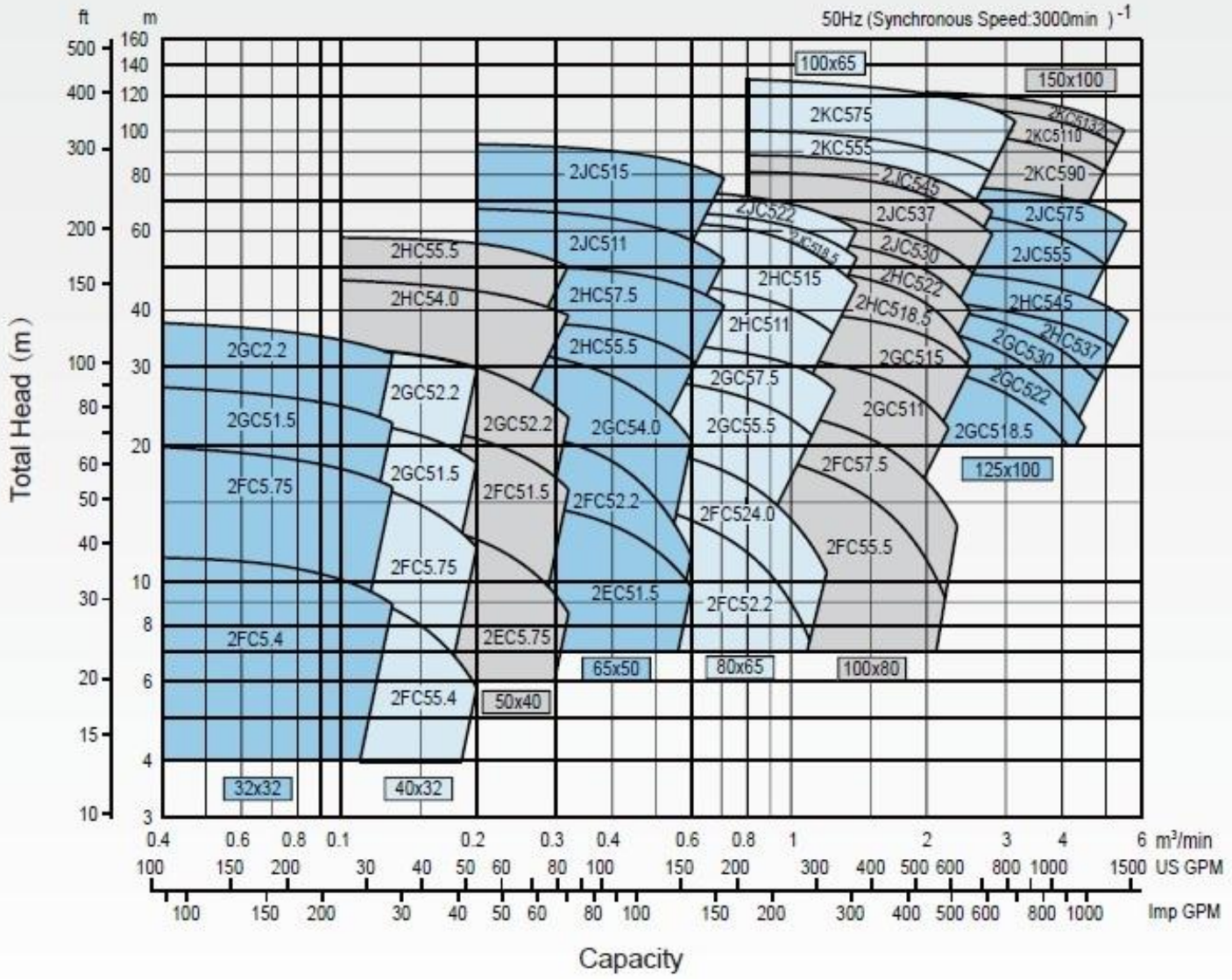
diaphragm coupling

Size in accordance with JB/T9147

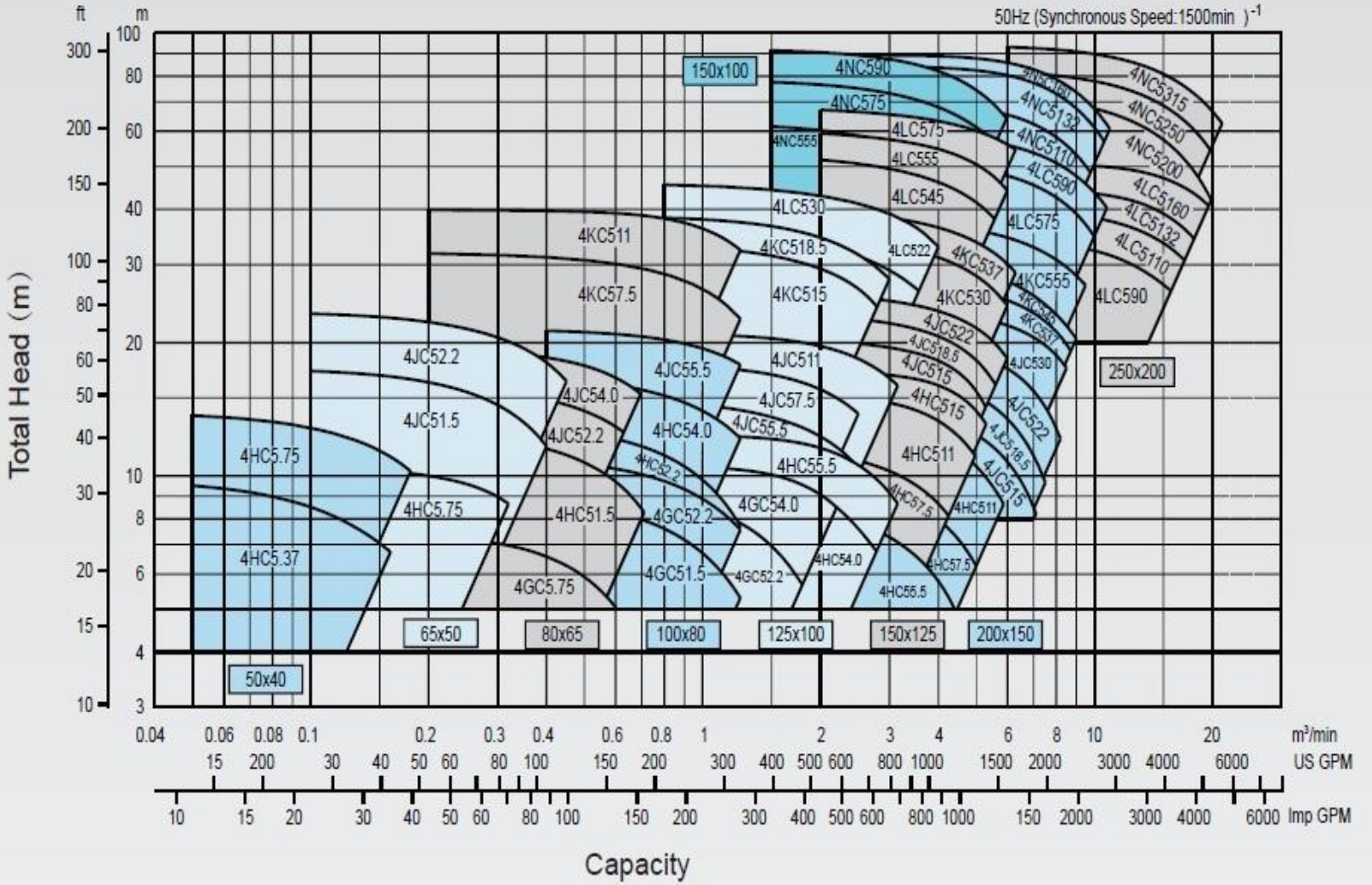
Accessories

Standard	Optional
Fabricated baseplate	
Elastic pin coupling	Diaphragm coupling
Coupling guard	Totally enclosed coupling guard
	GB anchor bolts
	Anti-vibration bench

2P-50Hz


50Hz (Synchronous Speed:3000min)-1
ft
m
Total Head (m)
100x65
150x100
2KC575
2KC555
2JC515
2JC545
2KC5132
2KC5110
2KC590
2JC537
2JC575
2JC522
2JC530
2JC555
2JC511
2HC55.5
2HC515
2HC522
2HC54.0
2HC57.5
2HC518.5
2HC545
2HC511
2HC537
2GC530
2GC2.2
2HC55.5
2GC515
2GC57.5
2GC522
2GC52.2
2GC52.2
2GC54.0
2GC55.5
2GC511
2GC51.5
2GC518.5
2FC57.5
2FC5.75
2GC51.5
2FC51.5
2FC52.2
125x100
2FC524.0
2FC55.5
2FC5.75
2EC51.5
2FC52.2
2FC5.4
2EC5.75
65x50
80x65
100x80
2FC55.4
50x40
32x32
40x32
m³/min
US GPM
Imp GPM
Capacity

4P-50Hz


50Hz (Synchronous Speed:1500min)-1
Total Head (m)
ft
m
Capacity
m³/min
US GPM
Imp GPM
150x100
250x200
65x50
80x65
100x80
125x100
150x125
200x150
50x40
4NC590
4NC575
4NC555
4LC575
4LC555
4LC545
4LC530
4KC511
4KC518.5
4KC57.5
4KC515
4LC522
4KC537
4KC530
4KC555
4LC590
4NC5315
4NC5250
4NC5200
4LC5160
4LC5132
4LC5110
4NC5132
4NC5110
4JC52.2
4JC51.5
4JC55.5
4JC54.0
4JC57.5
4JC511
4JC522
4JC518.5
4JC515
4JC530
4HC515
4HC511
4HC5.75
4HC5.37
4HC54.0
4HC52.2
4HC55.5
4HC51.5
4HC57.5
4GC52.2
4GC54.0
4GC5.75
4GC51.5

--Casing，Impeller – Reversal Design

Hydraulic model is designed by water character. And it can reduce friction loss& noise, improve efficiency .

Back Pull-out construction – Easy maintenance

All the rotors can be pulled out with no disassembly of suction & discharge connection at troubleshooting.

-Bearing

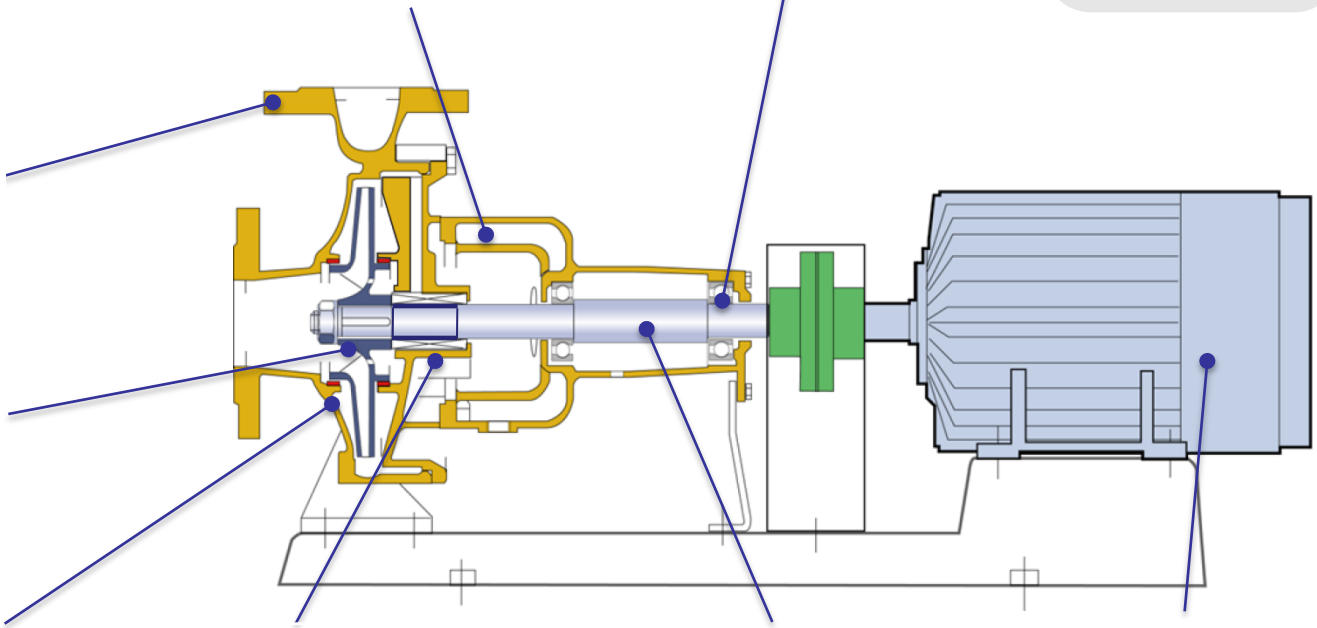
World-class brand-NSK。

-Manufacturing

Each process in pump production is strictly controlled by QC according to Qualification system ISO9001

- Top discharge- Robust Body

With top-discharge and bottom-support construction, it can prevent center deviation from installation caused by anti-force.



-SCS13 impeller

SS impeller enlarges range of application.

Option: SCS14, Bronze

Wear ring

Two wear rings are located in each side of impeller and easy to be maintained. Gap between impeller and casing is really small in comparison with other famous pump suppliers. And efficiency of pump will be increased**.**

-Mechanical seal configuration: Single, double, unbalance, balance, cartridge, packing.

Stainless steel shaft.—anti-corrosion with high rigidity

Pump shaft uses high quality material.

Motor-IEC

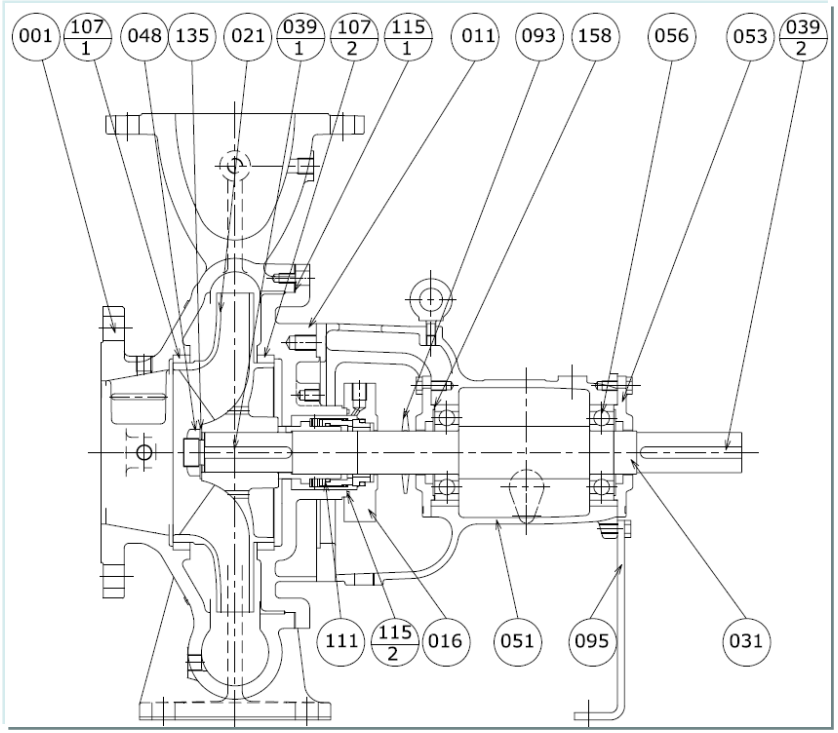
Pump can equip different supplier's motor. It is up to Customer.

- Service

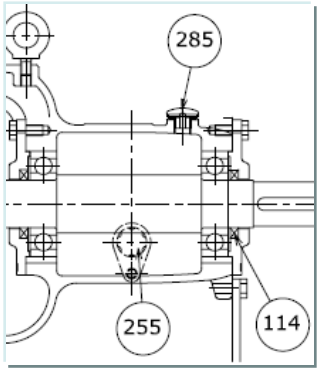
Many interchangeable parts can reduce repair cost

The impeller, bearing, bearing body, coupling, coupling cover ,base and motor of standard FSSC product is interchangeable with FSC.

Grease lubrication



Oil lubrication



1.With grease lubrication, such openings as oil filling hole, oil meter hole and oil leaking hole of bearing body are not drilled.

2. With grease lubrication , oil seal is not required on bearing cover and oil sealing part is not processed.

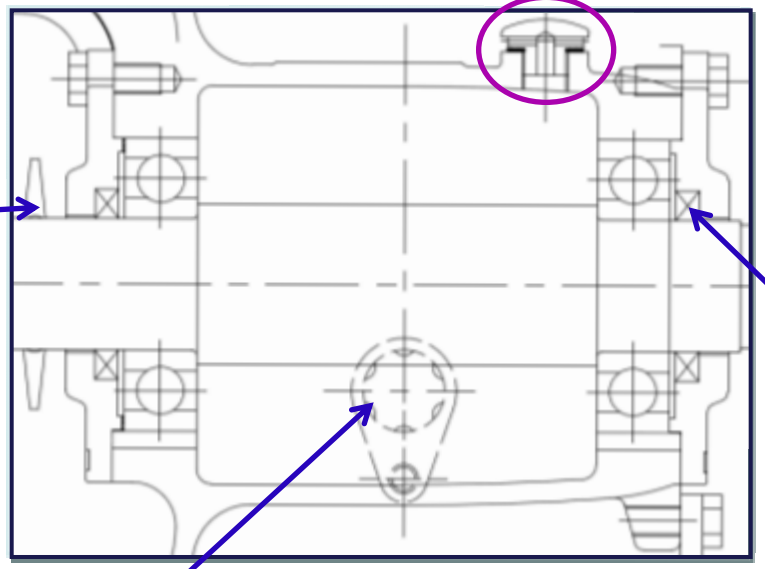
3.Sealed ball bearing is only used in case of grease lubrication.

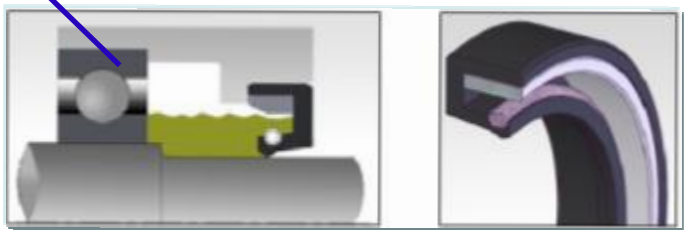
Parts No.	Parts name	Material	Number
117-1	Shaft sleeve	stainless steel	1
115-2	O-ring	FPM	1
115-1	Sealing gasket	non-asbestos gasket	1
107-2	Wear ring	stainless steel	1
107-1	Wear ring	stainless steel	1
039-2	key	steel	1
039-1	key	stainless steel	1
285	Air breather		1
255	Oil level gauge		1
158	Shim	C2801	1
135	Impeller nut washer	stainless steel	1
114	Oil seal		2
111	Mechanical seal	STD	1
095	Bearing support	steel	1
093	Deflector	CR	1
056	Ball bearing	—	2
053	Bearing cover	cast iron	2
051	Bearing Housing	cast iron	1
048	Impeller nut	stainless steel	1
031	Shaft	stainless steel	1
021	Impeller	stainless steel	1
016	Gland cover	stainless steel	1
011	Casing cover	stainless steel	1
001	Pump Casing	stainless steel	1

Pump Model	Bearing unit	Shaft
32X32FSS2FC	320	320A
32X32FSS2GC	320	320
40X32FSS2FC	320	320
40X32FSS2GC	320	320
50X40FSS2EC	320	320
50X40FSS2FC	320	320
50X40FSS2GC	320	320
65X50FSS2EC	320	320
65X50FSS2FC	225-1	225A
65X50FSS2GC	225-1	225A
50X40FSS4GC	225-1	225B
40X32FSS4HC	225-1	225S
80X65FSS2FC	225-1	225S
100X80FSS2FC	225-1	225S
80X65FSSGC	225-1	225S
100X80FSSGC	225-1	225S
50X40FSSHC	225-2	225S
65X50FSSHC	225-2	225S
65X50FSSJC	225-2	225S
80X65FSSHC	225-2	225S

Pump Model	Bearing unit	Shaft
80X65FSSJC	235-1	235
100X80FSSHC	235-1	235
100X80FSSJC	235-1	235
125X100FSSGC	235-1	235
125X100FSSHC	235-1	235
150X125FSSHC	235-1	235
150X125FSSJC	235-1	235
200X150FSSHC	235-1	235
80X65FSSKC	235-2	235
125X100FSSKC	235-2	235
100X65FSSKC	245	345
125X100FSSJC	245	345
125X100FSSLC	245	245
150X125FSSKC	245	245
150X125FSSLC	245	245
200X150FSSJC	245	245
150X100FSSKC	BG-150IFI	250
200X150FSSKC	255	255
200X150FSSLC	255	255
150X100FSSNC	255	255
200X150FSSNC	IWBG-165	165
250X200FSSLC	IWBG-165	165
250X200FSSNC	IWBG-175T	175

Sectional drawing





Sight glass

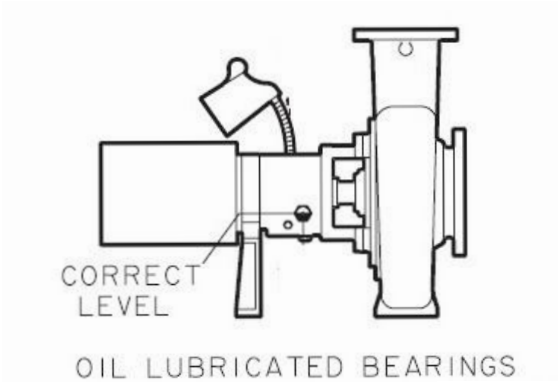
oil sealing：Dimensions and Design are in accordance with GB/T9877

1,Selection of turbine oil.

ISO VG46

2,Maintenance

Add oil until level is at the center of the sight glass.



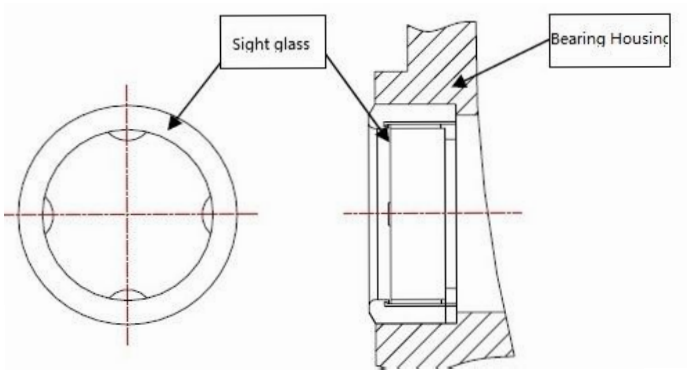
Change the oil after 300 hours for new bearings.

Bearing housing	Drive end	Non-drive end	Periond of replacement
320	6304	6304	6 months
225-1	6305	6305	6 months
225-2	6305	6305	6 months
235-1	6307	6307	6 months
235-2	6307	6307	6 months
245	6309	6309	6 months
BG-150IFI	6310	6310	6 months
255	6312	6312	6 months
IWBG-165	6313	6313	6 months
IWBG-175T	6315	6315	6 months

3,Sight glass

Dimensions comply with JB/T7941.2

Technical requirements comply with GB1163



1,Shaft Power

$S=0.1634 \times \gamma \times Q \times H / \eta$

S:Shaft power(kW) γ: Specific gravity Q:Capacity(m3/min) H:Head(m) η:Efficiency

2,Motor Power

P=KS

Motor	K
≤7.5kW	1.15
>7.5kW	1.10

a, If it is driven by turbine, Shaft power should be provided to turbine supplier for final determination.

b, If liquid viscosity is over than 20cst, It should be converted to equivalent water parameter for power calculation.(see behind for more details)

c, Required shaft power should be less than available shaft power for each model .(see behind for more details)

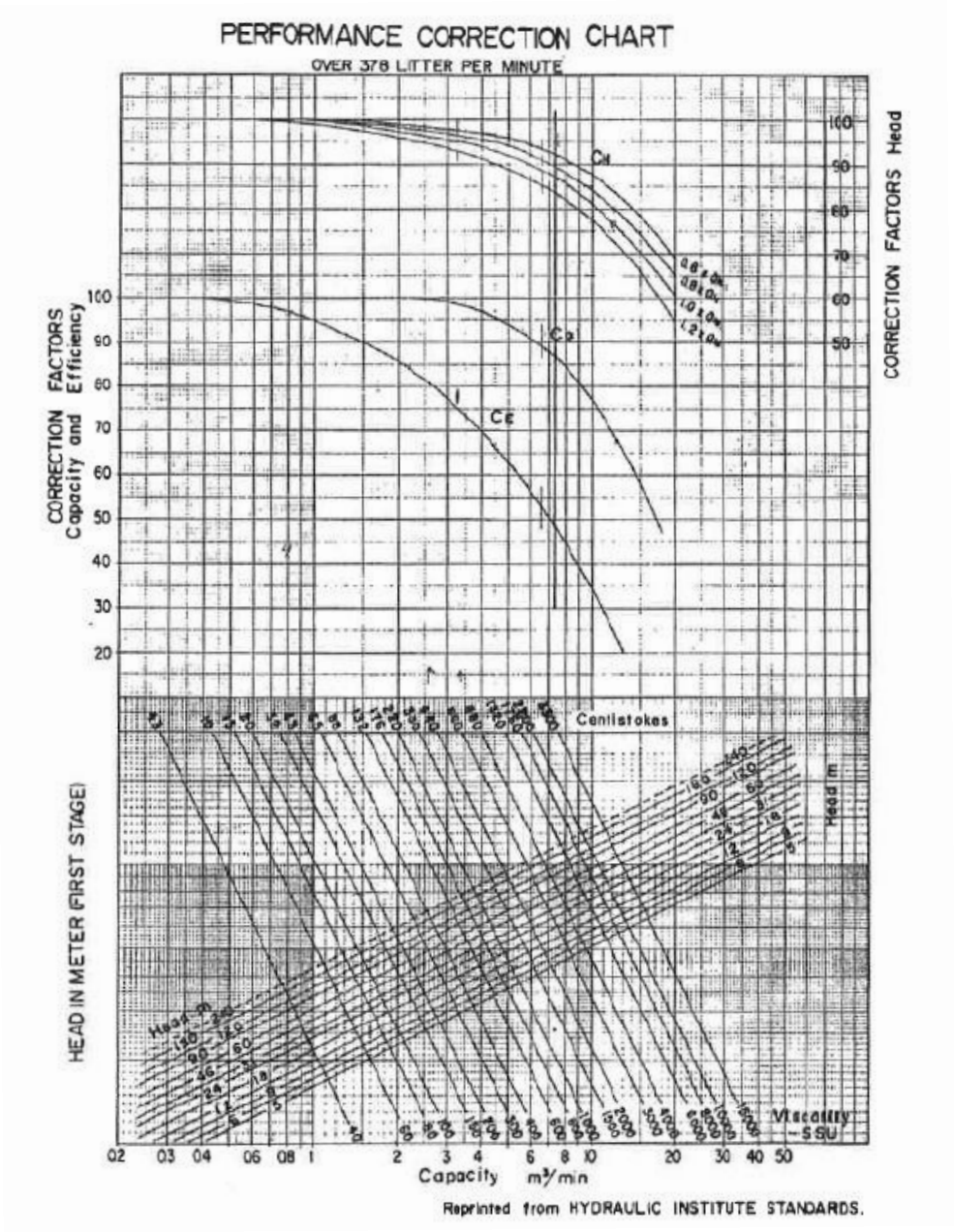
d, If specific gravity of liquid is less than 0.8, the S.G should be considered to apply 0.8 instead of it.

e, please see below frequency of starting. Please contact with EMC in case of being out of range.

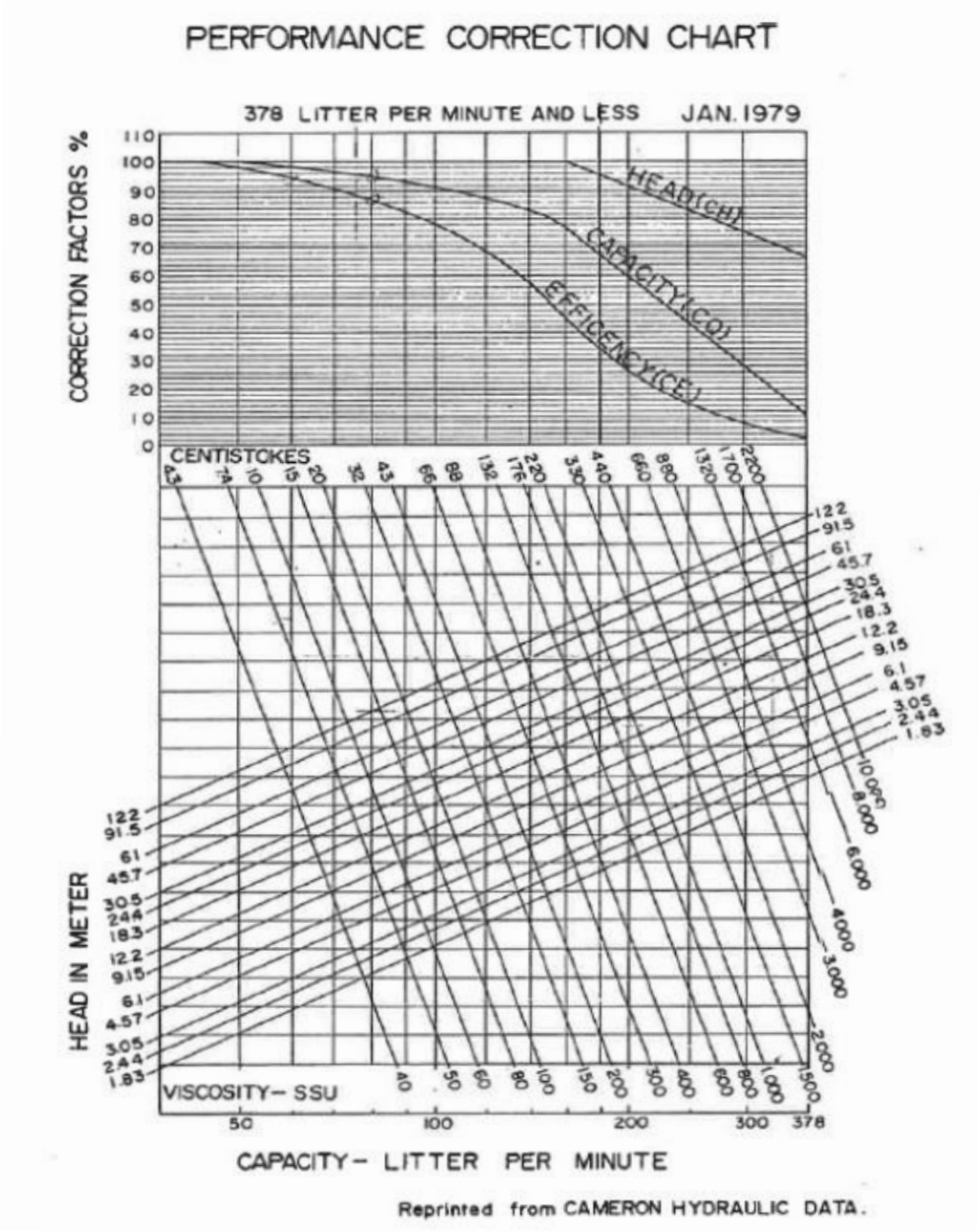
Motor	Frequency
≤7.5kW	6 times per hour
≤22kW	4 times per hour
≤30kW	3 times per hour

Available Shaft Power(kW)

Shaft \ Min^{-1}	1450	1750	2950	3550
320A	-	-	2.9	3.5
320/225A/225B	-	-	6.8	8.2
225S	8.7	17.8	-	-
235	26.9	54.8	-	-
245/250	60.9	123.8	-	-
345	41.6	84.6	-	-
260	90.8	109.6	-	-
165	177.4	214.1	-	-
175	281.7	340	-	-



Scope: Over 378 litter per minute



Scope: 378 litter per minute and less

Flushing for gland packing

Flushing	Liquid	Quench	Temperature	Remarks
Self-flushing or plug	All	No	0~100℃	
		Yes	0~110℃	
External flushing	All	-	0~120℃	Flushing fluid temperature is less than 30℃

1) If delivered liquid temperature is over than 100℃, external flushing is recommended.

2) If self-flushing with above 0.3MpaG pressure is adopted, Return pipe is necessary which connects stuffing box to suction.

3) If pressure of stuffing box is over than 0.3MpaG, the only flushing method is plugged.

4) External flushing conditions:

a) Flushing fluid:Normal water(below 30 ℃)

b) Flushing capacity

Shaft	320C	320	225A	225B	225S	235	245	345	250	260	165	175
Capacity (L/min)	3	3	3	3	3	4	5	5	5	5	5	5

c) Flushing Pressure =(Pdis-Psuc) × 0.05+ Psuc+0.05MPaG.

Pmin=0.15MPaG Pmax=0.3MPaG

Quenching for below conditions

1) Crystallization takes place when liquid touches air.

2) Liquid temperature is over 100 ℃ with self-flushing or being plugged.

3) Suction pressure is negative without flushing.

4) Saturation pressure of liquid is over 0.1MPaA..

5) With Normal water: Crystal can be dissolved by water. With hot water: Crystallization happens in low temperature.

6) Quenching parameter: Capacity:2l/min Pressure:~0.05MPaG.

Applicable working conditions:

a) Liquid: water and chemical liquids

b) Temperature:-40℃~150 ℃

c) Pressure: below 16kgf/cm2

d) Viscosity: below 400cst

e) Density: above 0.6kg/l

f) Slurry: contact with EMC

g) Crystallization: contact with EMC

Applicable seal type:

Seal type	Construction	
single mechanical seal	multi-spring	unbalanced
		balanced
	mono-spring	unbalanced
		balanced
	Bellows	balanced
double mechanical seal	multi-spring	Air side:balanced Liquid side:unbalanced

Out of above range, please contact with EMC.

Key point of seal configuration

Delivered liquid	Issues	Key point	Piping plan
Low boiling point liquid Hydrocarbon liquid	Liquid is prone to vaporize due to heat caused rub of seal rings.	Balanced mechanical seal Double mechanical seal SiC&C is preferred	-
Toxic liquid Tetrachloride(CCl_4) Hydrazine(N_2H_4) Mercury **Flammability** Petroleum	Accident is going to take place due to liquid leakage.	Leakage should be collected, diluted or controlled. Double mechanical seal	By quenching or external flusing with double mechanical seal
Corrosive liquid Calcium chloride($CaCl_2$) Acetic acid	All wetted parts inclusive of seal rings,spring and O-rings are Corrosion-resistant.	Look up material corrosion table	Corrosion-resistant material
Crystallization Sodium hydrate(NaOH) Chrome alum Zinc nitrate P-nitrophenol Phenol Phthalate Lauric acid	With changing of temperature, Solute can be deposited and cause abrasion.	High hardness seal rings Double mechanical seal Single seal with Mono-spring.	Heat preservation or cooling method. External flushing. Self-flushing with vapor quenching.
Solidity Syrup,sulphur Camphor Turpentine	With changing of temperature, seal rings are prone to be broken.	High hardness seal rings Double mechanical seal Single seal with Mono-spring.	Heat preservation or cooling method. External flushing. Self-flushing with vapor quenching.

Key point of seal configuration

Delivered liquid	Issues	Key point	Piping plan
S.G.	Especially S.G. below 0.6	High hardness material/carbon balanced type is preferred	All flushing piping are welded.
High viscosity Glycol Castor oil Nonyl phenol	Seal rings are prone to be broken. Spring is dragged and out of work.	High hardness seal rings Double mechanical seal Knife edge seal	Heat preservation
Low temperature Methanol Ethanol Calcium chloride(CaCl2) Glycol	Freeze resistance Vaporize with temperature up	Low temperature material Double mechanical seal Metal bellows seal.	Prevent from freeze Quenching by nitrogeon before and after operation
High temperature SK oil Dowtherm Petroleum	It can be oxidated with air and deposited along V-ring. And performace of spring will be impacted.	High temperature material Metal bellows mechanical seal (above 250℃)	Keep high temperature Nitrogen can keep air away or Vapor can carry leakage away. All piping need to be welded.
High Vacuum	Air will be leaked out though friction surface and dry-running is going to happen	Balanced mechanical seal Sic/Carbon is preferred Double mechanical seal.	To prevent air in, external flushing and quenching is preferred.

Flushing for mechanical seal

Construction	Flushing	Media	Quenching	Temperature	Comments
Mechanical seal	Self-flushing without exchanger	Water series	No	0~80℃	
			Yes	-40~80℃	
		Oil series	No	0~100℃	
			Yes	-40~100℃	
	Self-flushing with exchanger	Water series	-	80~150℃	
		Oil series	-	100~150℃	
	External flushing	All	-	0~150℃	Media temperature is below 30℃
Double mechanical seal	Self-flushing without exchanger	Water series	-	-40~80℃	
		Oil series	-	-40~120℃	
	Self-flushing with exchanger	Water series	-	80~150℃	
		Oil series	-	120~150℃	
	External flushing	All	-	-40~150℃	Media temperature is below 30℃

1) Self-flushing

a, Clean liquid exclusive of slurry

b, Leakage will not be crystallized and is harmless.

c, The high temperature liquid with low viscosity can be cooled by cooler.

2) External-flushing

a, Slurry or equivalent liquid

b, Leakage is harmful or customer has special requirement.

c, Liquid can separate out crystal with pump operation or start-stop.

d, Flushing capacity.

Shaft	320C	320	225A	225B	225S	235	245	345	250	260	165	175
Capacity (L/min)	3	3	3	3	3	4	5	5	5	5	5	5

e, Flushing pressure.

Pressure= Pressure of seal chamber + 0.05MPa PS: the Min Pressure will be 0.15 MPa.

Quenching for below conditions

1) Quenched by normal water

a, Toxic, irritative and water-soluble liquid. For example: Liquid ammonia.

b, Leakage can be crystallized and water-soluble. For example: Sodium hydrate solution.

c, The gauge pressure is below 0.

2) Quenched by warm water or vapor

a, Leakage can be crystallized in normal temperature.

For example: Sulphur , Animal and vegetable oils, Amine, Pitch, Phenol, Urea, Heavy crude etc.

3) Quenched by methanol.

a, Pumped liquid temperature is below 0℃. The seal needs to be quenched when start-stop.

4) Quenched by Nitrogen.

a, Heat medium, hot oil can be oxidized when being exposed to air.

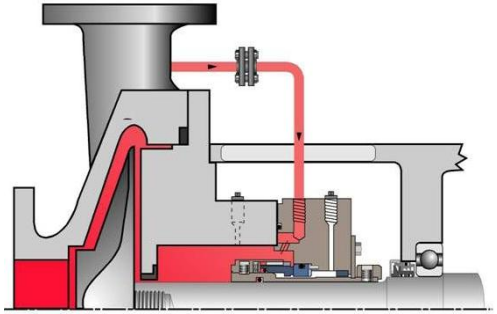
b, Pumped liquid temperature is below 0℃. It prevent seal from freezing by quenching.

Sizes of openings

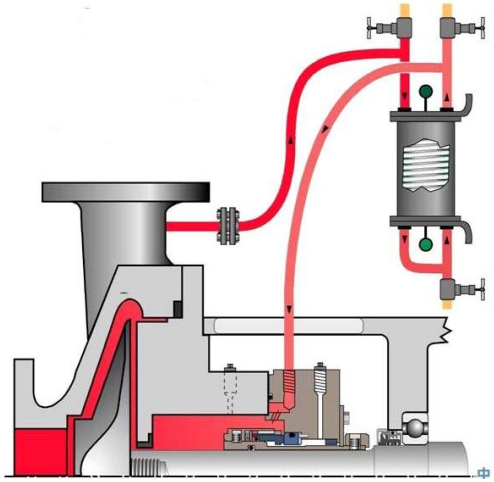
Name of openings	Size	Material
Drainage	1/2	SUS316
Flushing(M.S.)	3/8	SUS316
Flushing(Packing)	3/8	SUS316
Instruments	3/8	SUS316
Quench	3/8	SUS316

Flushing plan

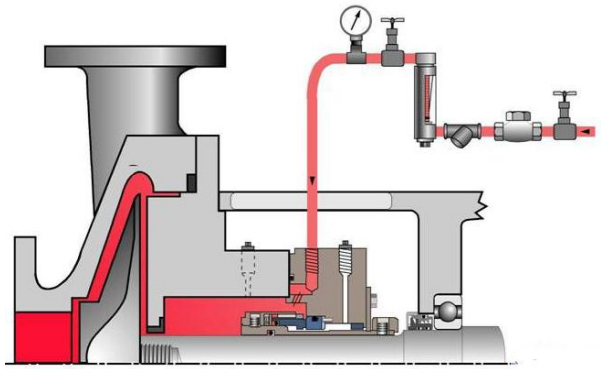
-10℃～80℃：self-flushing（Plan 11）



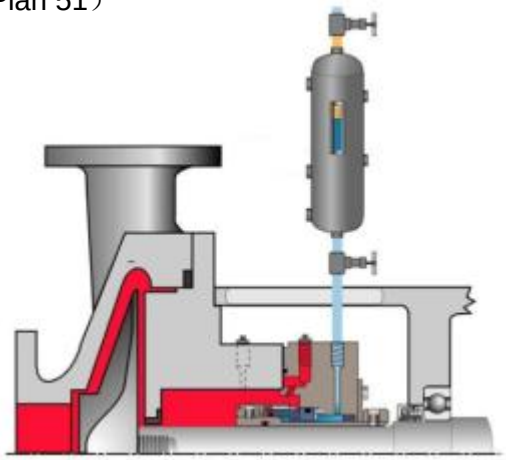
80℃～150℃：Self-flushing plus heat exchanger（Plan 21）



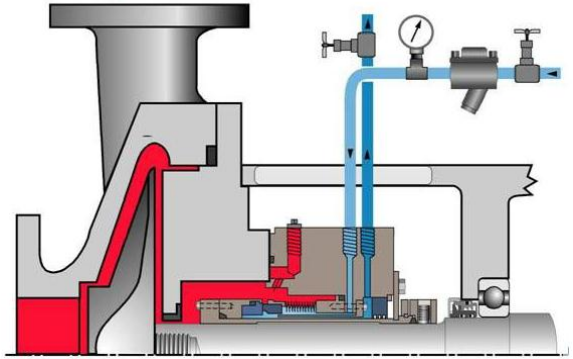
80℃～150℃：external flushing(Plan 32)

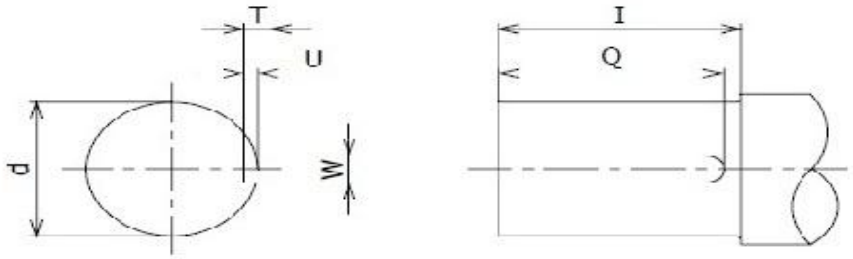


-40℃～-10℃：Quenching by external reservior（Plan 51）



-40℃～-10℃： Quenching by external source（Plan 62）





Model	Shaft					
	I	Q	d	T	U	W
32X32FSS2FC	40	31	19	6	3.5	6
32X32FSS2GC	40	31	19	6	3.5	6
40X32FSS2FC	40	31	19	6	3.5	6
40X32FSS2GC	40	31	19	6	3.5	6
40X32FSS4HC	40	31	19	6	3.5	6
50X40FSS2EC	40	31	19	6	3.5	6
50X40FSS2FC	40	31	19	6	3.5	6
50X40FSS2GC	40	31	19	6	3.5	6
50X40FSSHC	50	44	24	7	4	8
65X50FSS2EC	40	31	19	6	3.5	6
65X50FSS2FC	50	44	24	7	4	8
65X50FSS2GC	50	44	24	7	4	8
65X50FSSHC	50	44	24	7	4	8
65X50FSSJC	50	44	24	7	4	8
80X65FSS2FC	50	44	24	7	4	8
80X65FSSGC	50	44	24	7	4	8
80X65FSSHC	50	44	24	7	4	8
80X65FSSJC	80	68	32	8	5	10
80X65FSSKC	80	68	32	8	5	10
100X80FSS2FC	50	44	24	7	4	8
100X80FSSGC	50	44	24	7	4	8
100X80FSSHC	80	68	32	8	5	10
100X80FSSJC	80	68	32	8	5	10

Model	Shaft					
	I	Q	d	T	U	W
125X100FSSGC	80	68	32	8	5	10
125X100FSSHC	80	68	32	8	5	10
125X100FSSJC	80	68	38	8	5	10
125X100FSSKC	80	68	32	8	5	10
125X100FSSLC	110	106	42	8	5	12
150X125FSSHC	80	68	32	8	5	10
150X125FSSJC	80	68	32	8	5	10
150X125FSSKC	110	106	42	8	5	12
150X125FSSLC	110	106	42	8	5	12
200X150FSSHC	80	68	32	8	5	10
200X150FSSJC	110	106	42	8	5	12
200X150FSSKC	110	107	48	9	5.5	14
200X150FSSLC	110	107	48	9	5.5	14
200X150FSSNC	110	100	60	11	7	18
100X65FSSKC	80	68	38	8	5	10
150X100FSSKC	95	90	42	8	5	12
150X100FSSNC	110	107	48	9	5.5	14
250X200FSSLC	110	100	60	11	7	18
250X200FSSNC	125	110	74	12	7.5	20

Configuration

	IFW	FSSC(current configuration)	FSSC(New increased sonfiguration
Liquid	Clear water,oil and chemical liquid	Clear water and chemical liquid（parts)	Clear water,oil and chemical liquid
Temperature	-50～200℃	-10～105℃	-40～150℃
Pressure	～1.56MPa	～1.56MPa	～1.56MPa
Flow rate	～30m3/min	～22m3/min	～22m3/min
Out put	～315kW	～315kW	～315kW

Overlapping area of FSSC and IFW

Diameter

Diameter	model
300mm	IFW
250mm	
200mm	
150mm	
125mm	
100mm	
80mm	
65mm	
50mm	
40mm	
32mm	FSSC

Material of casing and impeller

Materrial	model
SCS13	
SCS14	
FC250	IFW
FCD400	IFW

FC・FCD are FSC or IFW products

Motor output

Out put	model
160～315kW	
90～160kW	
75kW	
55kW	
45kW	
37kW	
30kW	
22kW	
18.5kW	
15kW	
11kW	
7.5kW	
5.5kW	
3.7kW(FSSC4kW)	
2.2kW	
1.5kW	
0.75kW	

Shaft seal

Shaft Seal	model
Knife edge double	Contact with EMC
SIC/SIC-double	
SIC/C-double	
SIC/SIC-single	
SIC/C-single	
Gland packing	

Knife edge double mechanical seal belongs to FSSC developing project of third phase

Cooling method

Cooling method	tem.scope	model
Heat exchanger	over 130℃	
cooling pot	-30～-40℃	
cooling pot(N2 gas)	-40～-50℃	IFW
bearing(high tem.)	over 150℃	IFW

Production license should be acquired to produce high-temperature-type products of FSSC