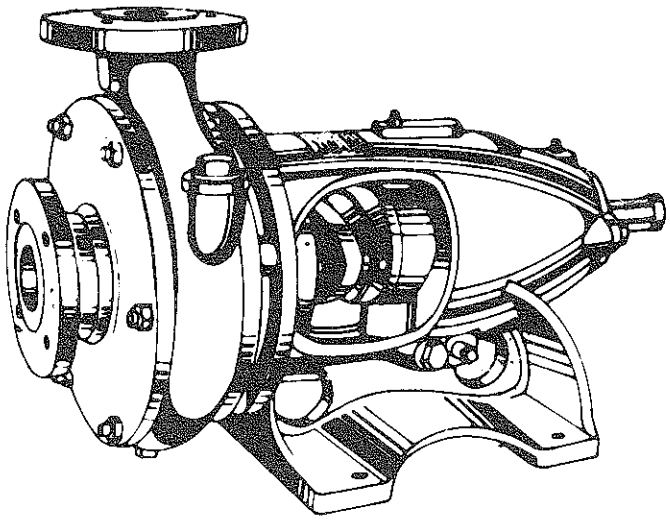
TECHNICAL MANUAL FOR KIRLOSKAR PUMPS TYPE PCE/PCH



KIRLOSKAR BROTHERS LIMITED
UDYOG BHAVAN, TILAK ROAD, PUNE - 411 002

TECHNICAL MANUAL
FOR
KIRLOSKAR
PROCESS PUMPS
TYPE PCE/PCH

KIRLOSKAR BROTHERS LIMITED
UDYOG BHAVAN, TILAK ROAD, PUNE 411 002.

CONTENTS

1.0 MODELS

PCE/PCH Pumps are manufactured to following models :

PCE	PCH	PCE	PCH
1 PCE 63A	—	2 PCE 59	2 PCH 59
1 PCE 63	1 PCH 63	50 PCE 250	50 PCH 250
15 PCE 55	15 PCH 55	50 PCE 280	50 PCH 280
15 PCE 75	15 PCH 75	65 PCE 180	65 PCH 180
15 PCE 9	15 PCH 9	80 PCE 180	80 PCH 180

2.0 APPLICATIONS

PCE/PCHpumps are suitable for handling liquids of both corrosive and non-corrosive nature and at temperatures as high as 140°C. These pumps can handle liquids containing small percentage of solids. Mainly used in Oil Industries, Process Industries, for condensate extraction, for hot clean liquids in industries etc.

3.0 GENERAL DESCRIPTION

3.1 CONSTRUCTIONAL FEATURES

PCE/PCH type pumps are single stage, horizontal shaft, volute type pumps. They are fitted with extra deep stuffing boxes with external sealing arrangement. PCH type pumps have semi-open impellers while PCE type pumps have closed impellers.

3.2 LIQUID CONDITIONS

PCE/PCH pumps are normally recommended for clear liquids or liquids containing small percentage of solids. Liquids up to 90°C can be handled without providing stuffing box cooling. Liquids upto 140°C can be handled by providing stuffing box cooling.

4.0 OPERATING DATA

4.1 ROTATIONAL SPEEDS

MODELS PCE	MODELS PCH	Speed rpm
1 PCE 63 A	—	
1 PCE 63	1 PCH 63	
15 PCE 75	15 PCH 75	
2 PCE 59	2 PCH 59	
65 PCE 180	65 PCH 180	
15 PCE 55	15 PCH 55	2900
15 PCE 9	15 PCH 9	
50 PCE 250	50 PCH 250	
80 PCE 180	80 PCH 180	
50 PCE 280	50 PCH 280	1450

Speed Limitation

a) For pumps with impeller dia up to 220 mm .. 3500 rpm
b) For pumps with impeller dia above 225 mm .. 2200 rpm

4.2 TEST PRESSURES

MODELS PCE	MODELS PCH	Test Pressure (Kg/cm²)
1 PCE 63 A	—	6
1 PCE 63	1 PCH 63	6
15 PCE 55	15 PCH 55	6
15 PCE 75	15 PCH 75	9
15 PCE 9	15 PCH 9	14
2 PCE 59	2 PCH 59	6
50 PCE 250	50 PCH 250	14
50 PCE 280	50 PCH 280	14
65 PCE 180	65 PCH 180	7
80 PCE 180	80 PCH 180	7

4.3 NET POSITIVE SUCTION HEAD (NPSH)

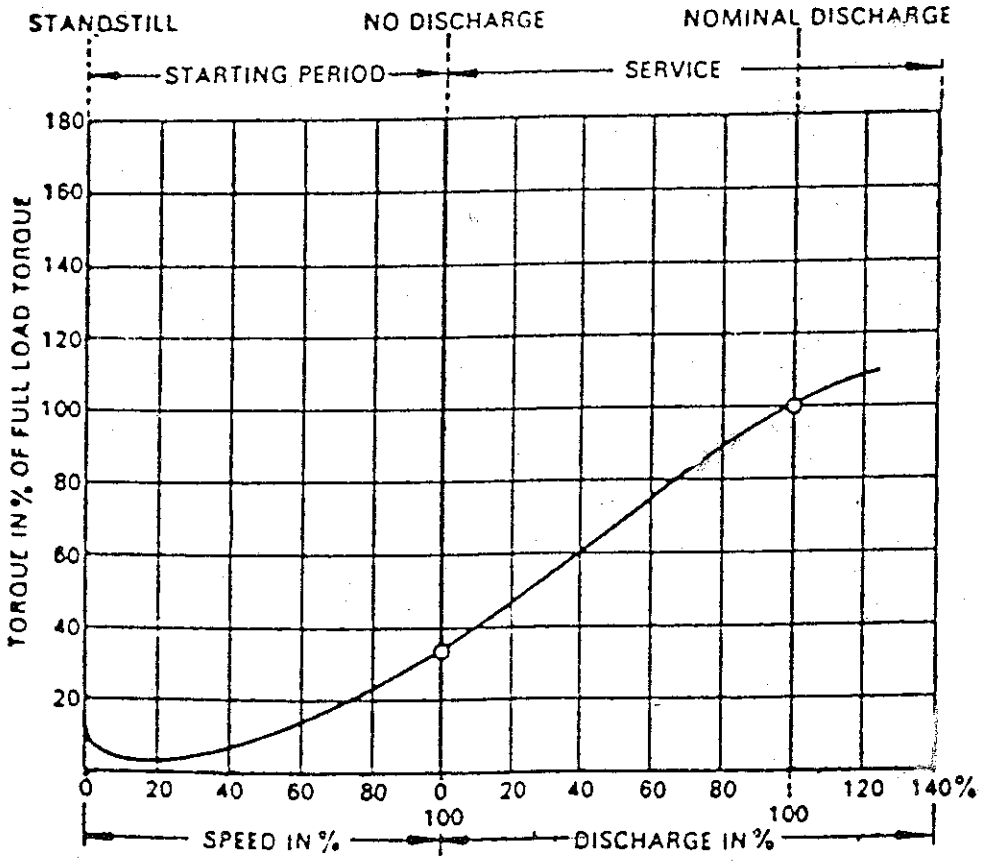
The values obtained on our test bed are plotted on the graph. A minimum safety margin of 0.5 meters should be added to this for site conditions.

4.4 MAX. PERMISSIBLE SUCTION PRESSURES

Models PCE	Models PCH	Pressure
1 PCE 63A	—	Up to 1 kg/cm²
1 PCE 63	1 PCH 63	
15 PCE 55	15 PCH 55	
—	15 PCH 75	
65 PCE 180	65 PCH 180	
80 PCE 180	80 PCH 180	
15 PCE 75	—	Up to 2 kg/cm²
2 PCE 59	2 PCH 59	
15 PCE 9	—	Up to 3 kg/cm²
—	15 PCH 9	Up to 4 kg/cm²
50 PCE 250	50 PCH 250	
50 PCE 280	50 PCH 280	

4.5 STARTING TORQUE

Please refer to the graph below. In the left half of the diagram, percentage starting torques are indicated in relation to the rise in speed, whereas in the right half, the torques at full speed are shown as a function of discharge.



4.6 MINIMUM SAFE FLOW

Models PCE	Min. safe flow in Lit/Sec.	Models PCH	Min. safe flow in Lit/Sec.
1 PCE 63 A	0.42	—	—
1 PCE 63	0.42	1 PCH 63	0.63
15 PCE 55	0.5	15 PCH 55	0.6
15 PCE 75	0.75	15 PCH 75	0.9
15 PCE 9	1.3	15 PCH 9	1.1
2 PCE 59	1.0	2 PCH 59	1.0
50 PCE 250	1.4	50 PCH 250	1.7
50 PCE 280	1.6	50 PCH 280	1.4
65 PCE 180	1.6	65 PCH 180	1.6
80 PCE 180	2.2	80 PCH 180	1.8

5.0 CONSTRUCTION

5.1 CASING

The delivery casing is of volute type with ample cross section throughout to produce smooth flow with gradual change in velocity. The casing is clamped to the bearing pedestal. The flanged suction cover is clamped to the casing.

5.1.1 Casing Details

Models	Direction of rotation viewed from DE	Casing thickness mm	Max. working pressure kg/cm²
1 PCE 63	CW	6.3	4.0
1 PCE 63A	CCW	6.3	4.0
15 PCE 55	CW	6.3	4.0
15 PCE 75	CW	8.0	6.0
15 PCE 9	CW	8.0	9.3
2 PCE 59	CCW	7.0	4.0
50 PCE 250	CCW	8.0	9.3
50 PCE 280	CCW	8.0	9.3
65 PCE 180	CW	8.0	4.7
80 PCE 180	CW	8.0	4.7
1 PCH 63	CW	6.3	4.5
15 PCH 55	CCW	6.3	4.0
15 PCH 75	CW	8.0	6.0
15 PCH 9	CW	8.0	9.3
2 PCH 59	CCW	7.0	4.0
50 PCH 250	CCW	8.0	9.3
50 PCH 280	CCW	8.0	9.3
65 PCH 180	CW	8.0	4.7
80 PCH 180	CW	8.0	4.7

5.1.2 Casing Ring Details

Models	I.D.		O.D.		Clearance between impeller & casing ring
	mm	Inch	mm	Inch	
1 PCE 63	54	$2\frac{1}{8}$	63	$2\frac{1}{2}$	0.25 mm for ferrous and non-ferrous metals and 0.5 mm for all special metals.
1 PCE 63A	54	$2\frac{1}{8}$	63	$2\frac{1}{2}$	
15 PCE 55	54	$2\frac{1}{8}$	63	$2\frac{1}{2}$	
15 PCE 75	65	$2\frac{9}{16}$	73	$2\frac{7}{8}$	
15 PCE 9	65	$2\frac{9}{16}$	73	$2\frac{7}{8}$	
2 PCE 59	65	$2\frac{9}{16}$	73	$2\frac{7}{8}$	
50 PCE 250	82	$3\frac{1}{4}$	94	$3\frac{11}{16}$	
50 PCE 280	95	$4\frac{3}{16}$	106	$4\frac{3}{16}$	
65 PCE 180	95	$4\frac{3}{16}$	105		
80 PCE 180	120	4	130		

Casing rings are not provided for PCH type pumps.

5.1.3 Flanges

All companion flanges are normally drilled according to BS 10, Table D.

Models PCE	Models PCH	Suc. bore dia mm	Del. bore dia mm
1 PCE 63	1 PCH 63	32	25
1 PCE 63A	—	32	25
15 PCE 55	15 PCH 55	40	40
15 PCE 75	15 PCH 75	40	40
15 PCE 9	15 PCH 9	50	40
2 PCE 59	2 PCH 59	50	50
50 PCE 250	50 PCH 250	65	50
50 PCE 280	50 PCH 280	65	50
65 PCE 180	65 PCH 180	80	65
80 PCE 180	80 PCH 180	100	80

Flanges can be drilled to other standards like ASA/DIN against specific requirements at extra cost.

5.1.4 Nozzle orientation

PCE/PCH type of pumps have horizontal end suction nozzles and standard delivery nozzles available as listed below for different models :

PCE Models	PCH Models	Delivery
1 PCE 63A	—	Vertical side
1 PCE 63	1 PCH 63	
15 PCE 55	15 PCH 55	
2 PCE 59	2 PCH 59	
15 PCE 9	15 PCH 9	
15 PCE 75	15 PCH 75	Central side
50 PCE 250	50 PCH 250	
50 PCE 280	50 PCH 280	
65 PCE 180	65 PCH 180	
80 PCE 180	80 PCH 180	

5.1.5 Casing Tappings

Casing tappings are provided for following parts

TPO 1 Suction gauge or vacuum equalising connection

TPO 2 Delivery gauge

TOP 3 Delivery casing drain

TPO 5 Stuffing box sealing connection

TPO 6 Priming funnel

TPO 10 Mechanical seal flushing

Casing tapping details in inch B.S.P. are as follows :

Models	TPO 1	TPO 2	TPO 3	TPO 5	TPO 6	TPO 10
1 PCE 63A —	3/8	3/8	1/4	1/4	1/4	1/4
1 PCE 63 / 1 PCH 63	3/8	3/8	1/4	1/4	1/4	1/4
15 PCE 55 / 15 PCH 55	3/8	3/8	1/4	1/4	1/2	1/4
15 PCE 75 / 15 PCH 75	3/8	3/8	1/4	1/4	1/2	1/4
15 PCE 9 / 15 PCH 9	3/8	3/8	1/4	1/4	1/2	1/4
2 PCE 59 / 2 PCH 59	3/8	3/8	1/4	1/4	1/2	1/4
50 PCE 250 / 50 PCH 250	3/8	3/8	1/4	1/4	1/2	1/4
50 PCE 280 / 50 PCH 280	3/8	3/8	1/4	1/4	1/2	1/4
65 PCE 180 / 65 PCH 180	3/8	3/8	3/8	1/4	3/8	1/4
80 PCE 180 / 80 PCH 180	3/8	3/8	3/8	1/4	3/8	1/4

5.2 IMPELLERS

The impellers for PCE/PCH pumps are generally made of close grained C.I. or Phosphor Bronze. The impeller is semi-open type for PCH and enclosed type for PCE. The liquid passages are hand finished and the impeller is accurately balanced. Both impellers are provided with back vanes and balancing holes to minimise the pressure on the stuffing box. Impellers in other materials such as Stainless Steel, Ni-Cast Iron, Cast Steel etc. are also available on request, depending on the nature of liquid to be handled.

5.2.1 Balancing

The impellers of PCE/PCH pumps are provided with back vanes as well as balancing holes for balancing the axial thrust. They are also dynamically balanced to counter the vibrations.

5.3 BEARINGS

5.3.1 Bearing details

PCE/PCH pumps are fitted with two ball bearings one each on the driving end and non-driving end. The standard design is with grease lubricated bearing. In order to protect bearing from corrosive and aggressive atmosphere, the bearing covers are provided with oil seals.

Models	Driving end Bearing No.	Non-Driving end Bearing No.	Bearing life in hours	
			Driving end	Non-Driving end
1 PCE 63A —	6305	6205	1,00,000	2,00,000
1 PCE 63 / 1 PCH 63	6305	6205	1,00,000	2,00,000
15 PCE 55 / 15 PCH 55	6305	6205	1,00,000	2,00,000
15 PCE 75 / 15 PCH 75	6306	6206	40,000	2,00,000
15 PCE 9 / 15 PCH 9	6306	6206	40,000	2,00,000
2 PCE 59 / 2 PCH 59	6306	6206	28,000	2,00,000
50 PCE 250 / 50 PCH 250	6306	6206	7,000	2,00,000
50 PCE 280 / 50 PCH 280	6306	6206	5,000	2,00,000
65 PCE 180 / 65 PCH 180	6306	6206	25,000	2,00,000
80 PCE 180 / 80 PCH 180	6306	6206	25,000	2,00,000

Note : The above numbers denote the bearing Nos. as per SKF Catalogue.

5.4 LUBRICATION

For PCE/PCH pumps the standard lubrication is with grease.

Recommended grease :

Servogem 3 or equivalent for 2900 rpm pumps.

Servogem 2 or equivalent for 1450 rpm pumps.

Grease to be changed after every 1000 running hours.

Quantity of lubricant 150 gms.

Lubrication with oil can be given against specific requirement.

Recommended oil :

Servo system 317 or equivalent for 2900 rpm pumps.

Servo system 321 or equivalent for 1450 rpm pumps.

Quantity of (lubricant) 0.2 litres to be changed after every 1000 hours.

5.5 SHAFTS

The shafts for PCE/PCH pumps are made out of carbon steel 40C8, AISI 410/316/304 Stainless Steel and ground throughout. It is of ample size to transmit the maximum power continuously without undue strain.

5.5.1 Shaft details

Models	Dia. at coupling in mm A	Dia. under shaft sleeve in mm/Inch C	Length under stuffing box in mm/Inch
1 PCE 63A —	23.8	24 / $^{15}/_{16}$	62 / $2^{7}/_{16}$
1 PCE 63 / 1 PCH 63	23.8	24 / $^{15}/_{16}$	62 / $2^{7}/_{16}$
15 PCE 55 / 15 PCH 55	23.8	24 / $^{15}/_{16}$	62 / $2^{7}/_{16}$
15 PCE 75 / 15 PCH 75	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$
15 PCE 9 / 15 PCH 9	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$
2 PCE 59 / 2 PCH 59	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$
50 PCE 250 / 50 PCH 250	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$
50 PCE 280 / 50 PCH 280	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$
65 PCE 180 / 65 PCH 180	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$
80 PCE 180 / 80 PCH 180	28.57	28.5 / $1^{1}/_{8}$	67 / $2^{5}/_{8}$

5.5.2 Stuffing box arrangement

a) The stuffing box is extra deep to reduce leakage and minimise the maintenance. Sealing by external supply is standard. Fresh and clear water is recommended for most of the services. Internal sealing and grease sealing will be provided on request.

b) i) Cooling to stuffing box cover — Above 90°C pumping temperature.
ii) Tapping size — 1/4" B. S. P. for inlet and outlet.
iii) Recommended pipe dia for cooling connection — 1/4" (not included in the scope of supply).
iv) Cooling water (Quantity litres/min.)

at liquid temperature °C				
100	110	120	130	140
1.5	1.98	2.25	2.48	3.0

Cooling water max. temp. 50°C.

c) Mechanical seal arrangement

i) Possible —

Crane make Mechanical Seal	type 2	Single	(MA)
— do —	type 1A	— do —	(MA1)
— do —	type 109	— do —	(MP)
— do —	type 109B	— do —	(MV)
— do —	type 2	Double	(MG)

or equivalent from Sealol or Durametallic.

ii)	Mechanical seal cover	Non-split type and having clamping at four points
iii)	Tapping for flushing connection	1/4" B.S.P.
iv)	Flushing pipe dia recommended	1/4" (Not included in scope of supply)
v)	Flushing quantity	3 to 5 Litres/minute approx.

d) Standard Gland Packing Specification

— Graphited solid plait cotton

— J. N. Marshall P-1000 or

— Champion style 3116 or

— J. D. Jones PKW 151

Gland packing of proper grade is provided depending on the nature of liquid to be handled.

5.5.3 Stuffing box details

Model	Depth in mm (Inch) D	Bore size in mm (Inch) B	Size of packing in mm^2 ($Inch^2$)	Length of packing in mm (Inch)
1 PCE 63A	63 ($2^{7}/_{16}$)	38 ($1^{1}/_{2}$)	6($^{1}/_{4}$)	600 ($23^{3}/_{4}$)
1 PCE 63 / 1 PCH 63	— do —	— do —	— do —	— do —
15 PCE 55 / 15 PCH 55	— do —	— do —	— do —	— do —
15 PCE 75 / 15 PCH 75	66 ($2^{5}/_{8}$)	45 ($1^{5}/_{32}$)	8($^{5}/_{16}$)	685 (27)
15 PCE 9 / 15 PCH 9	— do —	— do —	— do —	— do —
2 PCE 59 / 2 PCH 59	— do —	— do —	— do —	— do —
50 PCE 250 / 50 PCH 250	— do —	— do —	— do —	— do —
50 PCE 280 / 50 PCH 280	— do —	— do —	— do —	— do —
65 PCE 180 / 65 PCH 180	— do —	— do —	— do —	— do —
80 PCE 180 / 80 PCH 180	— do —	— do —	— do —	— do —

5.5.4 Shaft sealing arrangement

Gland packing arrangement is standard (3 + L + 3). Sealing with mechanical seal can also be provided on request where the application warrants a leakless operation.

5.5.5 Stuffing box sealing arrangements

External sealing is standard arrangement. Internal and grease sealing can be provided at extra cost.

5.6 DRIVE

5.6.1 Direct drive

PCE/PCH pumps are directly driven by electric motor through love joy type flexible coupling as a standard arrangement. Other types could also be offered on request.

5.6.2 Indirect drive

Indirect drive arrangement such as belt, gear etc. can be offered against specific request. V-belt with direct mounted V-pulley is possible.

5.6.3 Direction of rotation

The pumps are having direction of rotation looking from coupling end as below ;

Models	Direction of Rotation
1 PCE 63A, 15 PCH 55 2 PCE 59/2 PCH 59 50 PCE 250/50 PCH 250 50 PCE 280/50 PCH 280	Anti-clockwise
Other pumps	Clockwise

5.7 COUPLING

Love-joy coupling is standard supply.

5.7.1 Coupling types

Models	Std. Love-joy type coupling
1 PCE 63A	KL-100
1 PCE 63 / 1 PCH 63	— do —
15 PCE 55 / 15 PCH 55	— do —
15 PCE 75 / 15 PCH 75	L-110
15 PCE 9 / 15 PCH 9	— do —
2 PCE 59 / 2 PCH 59	— do —
50 PCE 250 / 50 PCH 250	— do —
50 PCE 280 / 50 PCH 280	— do —
65 PCE 180 / 65 PCH 180	— do —
80 PCE 180 / 80 PCH 180	— do —

6. MATERIALS

PCE/PCH pumps are available in following combinations of material construction.

a) Standard fitted construction with C.I. IS:210 GR FG200 Impeller.

b) Bronze fitted.

c) All bronze.

d) All cast iron.

e) Special metal fitted.

f) All special metal construction.

Please refer to our Head Office, for these combinations.

6.1 MATERIAL CODE CHART FOR PCE/PCH PUMPS

Material Code	Material Description
000	STEEL
011	CI IS 210-FG 200
021	MALLEABLE CI IS 2107-WM 410 (GF)
031	CI IS 210 - FG 200 Ni 1.5 (MIN)
042	MS IS 1079 - ST 34
043	MS IS 2062-Fe 410 W A
052	CS IS 1570 - 20C* HOT RLD
053	CS IS 1570 - 40C8 HOT RLD
110	LT BR IS 318-LTB2
112	PH BR IS 28-1
119	RLD-BRASS IS 319 GR 1
153	COPPER TUBES (IS 2501) IS 191 PART V
202	CS ASTMA 216/216 M WCB
211	AI AFG Ni20 Cr3
232	ST ST ASTMA 351/351 M - CF8M
234	ST ST GR CF12M
253	ST ST ASTMA-276-410 ANLD
257	ST ST TUBE/PIPE ASTMA-269-316
268	ST ST ASTMA-167 TYPE 304 ETCHED
270	IS 1367 PART 3 CL-4.6
274	IS 1367 PART 3 CL 10.9
276	IS 1367 PART 6 CL-4
276	IS 1367 PART 6 CL-4
331	CHAMPION-1800 OR EQ
332	CHAMPION-1610 OR EQ
360	PAPER DALMIA
371	NEOPRENE RUBBER
374	PLASTIC
377	IS 2712 W/1
444	IS 1367PART 3 CL-4.6 CDP
460	STEEL ZNP
500	MS IS 1079 ST34 GALV
558	ST ST ASTMA-276-410 340 BHN
574	NTR RBR ST SPRING
999	REFER O/A

6.2 MATERIAL CONSTRUCTION CHART FOR PCE PUMPS

(MOC CODE 01 IS STANDARD, * MARK INDICATES STANDARD MATERIAL)

SR. NO.	DESCRIPTION OF PART	PART CODE	01	02	03	04	05	06
1.	PUMP CASING & CASING COVER	101, 220	011	*	*	110	112	*
2.	ENCLOSED IMPELLER	151	011	110	112	110	112	*
3.	WEAR RING	190,	110	*	112	*	112	011
4.	PUMP SHAFT, KEY FOR IMPELLER	180, 320	053	*	*	253	253	*
5.	SHAFT SLEEVE	311	011	*	112	110	112	*
6.	LIQUID DEFLECTOR	236	011	*	*	112	112	*
7.	LANTERN RING	227	011	*	*	110	112	*
8.	SPLIT GLAND	229	011	*	*	110	112	*
9.	BEARING PEDESTAL	242	011	*	*	*	*	*
10.	IMPELLER NUT	330	112	*	*	*	*	011
11.	STUFFING BOX BUSH	350	110	*	112	*	112	011
12.	SPACER FOR COUPL.	195	011	*	*	*	*	*
13.	SUCTION COVER	210	011	*	*	110	112	*
14.	COOLING CHAMBER	221	011	*	*	*	*	*
15.	CLAMPLING PLATE	224	042	*	*	*	*	*
16.	DEEP GROOVE BALL BEARING	260.1 260.2	000*	*	*	*	*	*
17.	BEARING COVER	270, 271	011	*	*	*	*	*
18.	KEY FOR COUPLING	321	053	*	*	*	*	*
19.	HEX LOCK NUT	332	276	*	*	*	*	*
20.	GLAND PACKING	430	331	*	*	332	332	332
21.	GREASE NIPPLE	441	444	*	*	*	*	*
22.	VENT. VALVE	450	052	*	*	119	119	*
23.	PROTECTION COVER	471.1 471.2	000	*	*	*	*	*
24.	COMPANION FLANGES	490.1 490.2	011	*	*	*	*	*

SR. NO.	DESCRIPTION OF PART	PART CODE	01	02	03	04	05	06
25.	OIL SEAL DE & NDE	500.1 500.2	574	*	*	*	*	*
26.	GASKET FOR SUCTION COVER	510	360	*	*	377	377	377
27.	GASKET FOR CASING COVER	511	360	*	*	377	377	377
28.	GASKET FOR COOLING CHAMBER	512	360	*	*	*	*	*
29.	GASKET FOR SHAFT SLEEVE & IMPELLER	515.1 515.2	360	*	*	*	*	*
30.	GASKET FOR CASING DRAIN PLUG	517,	377	*	*	*	*	*
31.	'O' RING FOR CASING COVER & COOLING CHAMBER	525	371	*	*	*	*	*
32.	PIPE NIPPLE FOR ST. BOX SEALING	530	500	*	*	*	*	*
33.	SOCKET FOR ST. BOX SEALING	540	021*	*	*	*	*	*
34.	SEALING NUT	558	053	*	*	253	253	253
35.	ADAPTER FOR CASING COVER	559 559.1	053	*	*	253	253	253
36.	TUBE	560	153	*	*	*	*	257
37.	HEX. NUT FOR STUD	581.1 581.2	276	*	*	253	253	*
38.	HEX. NUT FOR STUD OF CASING COVER	582	276	*	*	*	*	*
39.	HEX. NUT FOR GLAND STUD	583	276	*	*	253	253	*
40.	STUD FOR PUMP CSG. BRG. HSG & S. COVER	590.1 590.2	270	*	*	253	253	*
41.	STUD FOR CSG. COVER	591	270	*	*	*	*	*
42.	STUD FOR GLAND & COOLING CHAMBER	592	270	*	*	253	253	*
43.	COLLARED PLUG FOR CASING DRAIN	601	052	*	*	110	112	*
44.	PLUG FOR SEALING	602	052	*	*	253	253	*

SR. NO.	DESCRIPTION OF PART	PART CODE	01	02	03	04	05	06
45.	PLUG FOR SOCKET	603	374	*	*	*	*	*
46.	PLUG FOR SEALING PIPE NIPPLE	603.1	052	*	*	*	*	*
47.	LOCKING PLUG FOR COOLING CONNECTION	603.2	374	*	*	*	*	*
48.	PIPE PLUG FOR ST. BOX & OIL DRAIN	605.1 605.2	052	*	*	*	*	*
49.	PLUG FOR PRIMING	606	052	*	*	*	*	*
50.	PUNCHED WASHER FOR LOCK NUT	622	043	*	*	*	*	*
51.	HEX SCREW TO RELEASE SUC. COVER	630	270	*	*	253	253	*
52.	HEX. SCREW FOR BRG COVER PS & DS	631.1 631.2	270	*	*	*	*	*
53.	HAMMER DRIVE SCREW	640	460	*	*	*	*	*
54.	HEX. SOCKET FOR LIQUID DEFLECTOR	654	274	*	*	*	*	*
55.	DUTY NAME PLATE	670	268	*	*	*	*	*
56.	COOLING NAME PLATE INLET & OUTLET	671.1 671.2	268	*	*	*	*	*
57.	ARROW NAME PLATE	672	268	*	*	*	*	*
58.	SEALING NAME PLATE (INLET)	676	268	*	*	*	*	*

MATERIAL CONSTRUCTION CHART FOR PCE PUMPS

(MOC CODE 01 IS STANDARD, * MARK INDICATES STANDARD MATERIAL)

SR. NO.	DESCRIPTION OF PART	PART CODE	07	08	09	10	11	12
1.	PUMP CASING & CASING COVER	101, 220	*	031	*	202	*	*
2.	ENCLOSED IMPELLER	151	031	031	202	202	232	234
3.	WEAR RING	190,	031	031	053	053	251	251
4.	PUMP SHAFT, KEY FOR IMPELLER	180, 320	*	253	*	*	253	253
5.	SHAFT SLEEVE	311	031	031	558	558	251	251
6.	LIQUID DEFLECTOR	236	*	*	*	053	*	*
7.	LANTERN RING	227	*	031	*	202	*	*
8.	SPLIT GLAND	229	*	031	*	202	*	*
9.	BEARING PEDESTAL	242	*	*	*	*	*	*
10.	IMPELLER NUT	330	202	202	202	202	232	234
11.	STUFFING BOX BUSH	350	011	031	011	202	011	011
12.	SPACER FOR COUPL.	195	*	*	*	*	*	*
13.	SUCTION COVER	210	*	031	*	202	*	*
14.	COOLING CHAMBER	221	*	*	*	*	*	*
15.	CLAMPLING PLATE	224	*	*	*	*	*	*
16.	DEEP GROOVE BALL BEARING	260.1 260.2	*	*	*	*	*	*
17.	BEARING COVER	270, 271	*	*	*	*	*	*
18.	KEY FOR COUPLING	321	*	*	*	*	*	*
19.	HEX LOCK NUT	332	*	*	*	*	*	*
20.	GLAND PACKING	430	332	332	332	332	332	332
21.	GREASE NIPPLE	441	*	*	*	*	*	*
22.	VENT. VALVE	450	*	*	*	*	*	*
23.	PROTECTION COVER	471.1 471.2	*	*	*	*	*	*
24.	COMPANION FLANGES	490.1 490.2	*	*	*	*	*	*

SR. NO.	DESCRIPTION OF PART	PART CODE	07	08	09	10	11	12
25.	OIL SEAL DE & NDE	500.1 500.2	*	*	*	*	*	*
26.	GASKET FOR SUCTION COVER	510	377	377	377	377	377	377
27.	GASKET FOR CASING COVER	511	377	377	377	377	377	377
28.	GASKET FOR COOLING CHAMBER	512	*	*	*	*	*	*
29.	GASKET FOR SHAFT SLEEVE & IMPELLER	515.1 515.2	*	*	*	*	*	*
30.	GASKET FOR CASING DRAIN PLUG	517,	*	*	*	*	*	*
31.	'O' RING FOR CASING COVER & COOLING CHAMBER	525	*	*	*	*	*	*
32.	PIPE NIPPLE FOR ST. BOX SEALING	530	*	*	*	*	*	*
33.	SOCKET FOR ST. BOX SEALING	540	*	*	*	*	*	*
34.	SEALING NUT	558	253	*	253	253	253	253
35.	ADAPTER FOR CASING COVER	559 559.1	253	253	253	253	253	253
36.	TUBE	560	257	257	257	257	257	257
37.	HEX. NUT FOR STUD	581.1 581.2	*	253	*	*	*	*
38.	HEX. NUT FOR STUD OF CASING COVER	582	*	*	*	*	*	*
39.	HEX. NUT FOR GLAND STUD	583	*	253	*	*	*	*
40.	STUD FOR PUMP CSG. BRG. HSG & S. COVER	590.1 590.2	*	253	*	*	*	*
41.	STUD FOR CSG. COVER	591	*	*	*	*	*	*
42.	STUD FOR GLAND & COOLING CHAMBER	592	*	253	*	*	*	*
43.	COLLARED PLUG FOR CASING DRAIN	601	*	031	*	*	*	*
44.	PLUG FOR SEALING	602	*	253	*	*	*	*

SR. NO.	DESCRIPTION OF PART	PART CODE	07	08	09	10	11	12
45.	PLUG FOR SOCKET	603	*	*	*	*	*	*
46.	PLUG FOR SEALING PIPE NIPPLE	603.1	052	*	*	*	*	*
47.	LOCKING PLUG FOR COOLING CONNECTION	603.2	*	*	*	*	*	*
48.	PIPE PLUG FOR ST. BOX & OIL DRAIN	605.1 605.2	*	*	*	*	*	*
49.	PLUG FOR PRIMING	606	*	*	*	*	*	*
50.	PUNCHED WASHER FOR LOCK NUT	622	*	*	*	*	*	*
51.	HEX SCREW TO RELEASE SUC. COVER	630	*	253	*	*	*	*
52.	HEX. SCREW FOR BRG COVER PS & DS	631.1 631.2	*	*	*	*	*	*
53.	HAMMER DRIVE SCREW	640	*	*	*	*	*	*
54.	HEX. SOCKET FOR LIQUID DEFLECTOR	654	*	*	*	*	*	*
55.	DUTY NAME PLATE	670	*	*	*	*	*	*
56.	COOLING NAME PLATE INLET & OUTLET	671.1 671.2	*	*	*	*	*	*
57.	ARROW NAME PLATE	672	*	*	*	*	*	*
58.	SEALING NAME PLATE (INLET)	676	*	*	*	*	*	*

MATERIAL CONSTRUCTION CHART FOR PCE PUMPS

(MOC CODE 01 IS STANDARD, * MARK INDICATES STANDARD MATERIAL)

SR. NO.	DESCRIPTION OF PART	PART CODE	13	14	15	16	28
1.	PUMP CASING & CASING COVER	101, 220	232	234	*	*	211
2.	ENCLOSED IMPELLER	151	232	234	112	*	211
3.	WEAR RING	190,	251	251	*	*	211
4.	PUMP SHAFT, KEY FOR IMPELLER	180, 320	251	251	*	253	253
5.	SHAFT SLEEVE	311	251	251	*	*	211
6.	LIQUID DEFLECTOR	236	251	251	*	*	211
7.	LANTERN RING	227	232	234	*	*	211
8.	SPLIT GLAND	229	232	234	*	*	211
9.	BEARING PEDESTAL	242	*	*	*	*	*
10.	IMPELLER NUT	330	232	232	*	*	211
11.	STUFFING BOX BUSH	350	251	251	*	*	211
12.	SPACER FOR COUPL.	195	*	*	*	*	*
13.	SUCTION COVER	210	232	234	*	*	211
14.	COOLING CHAMBER	221	*	*	*	*	*
15.	CLAMPLING PLATE	224	*	*	*	*	*
16.	DEEP GROOVE BALL BEARING	260.1 260.2	*	*	*	*	*
17.	BEARING COVER	270, 271	*	*	*	*	*
18.	KEY FOR COUPLING	321	*	*	*	*	*
19.	HEX LOCK NUT	332	*	*	*	*	*
20.	GLAND PACKING	430	332	332	*	*	332
21.	GREASE NIPPLE	441	*	*	*	*	*
22.	VENT. VALVE	450	251	251	*	*	253
23.	PROTECTION COVER	471.1 471.2	*	*	*	*	*
24.	COMPANION FLANGES	490.1 490.2	*	*	*	*	*

SR. NO.	DESCRIPTION OF PART	PART CODE	13	14	15	16	28
25.	OIL SEAL DE & NDE	500.1 500.2	*	*	*	*	*
26.	GASKET FOR SUCTION COVER	510	377	377	*	*	377
27.	GASKET FOR CASING COVER	511	377	377	*	*	377
28.	GASKET FOR COOLING CHAMBER	512	*	*	*	*	*
29.	GASKET FOR SHAFT SLEEVE & IMPELLER	515.1 515.2	*	*	*	*	*
30.	GASKET FOR CASING DRAIN PLUG	517,	*	*	*	*	*
31.	'O' RING FOR CASING COVER & COOLING CHAMBER	525	*	*	*	*	*
32.	PIPE NIPPLE FOR ST. BOX SEALING	530	*	*	*	*	*
33.	SOCKET FOR ST. BOX SEALING	540	*	*	*	*	*
34.	SEALING NUT	558	251	251	*	*	253
35.	ADAPTER FOR CASING COVER	559 559.1	251	251	*	*	253
36.	TUBE	560	257	257	*	*	257
37.	HEX. NUT FOR STUD	581.1 581.2	251	251	*	*	253
38.	HEX. NUT FOR STUD OF CASING COVER	582	*	*	*	*	*
39.	HEX. NUT FOR GLAND STUD	583	251	251	*	*	253
40.	STUD FOR PUMP CSG. BRG. HSG & S. COVER	590.1 590.2	251	251	*	*	253
41.	STUD FOR CSG. COVER	591	*	*	*	*	*
42.	STUD FOR GLAND & COOLING CHAMBER	592	251	251	*	*	253
43.	COLLARED PLUG FOR CASING DRAIN	601	251	251	*	*	211
44.	PLUG FOR SEALING	602	251	251	*	*	253

SR. NO.	DESCRIPTION OF PART	PART CODE	13	14	15	16	28
45.	PLUG FOR SOCKET	603	*	*	*	*	*
46.	PLUG FOR SEALING PIPE NIPPLE	603.1	052	*	*	*	*
47.	LOCKING PLUG FOR COOLING CONNECTION	603.2	*	*	*	*	*
48.	PIPE PLUG FOR ST. BOX & OIL DRAIN	605.1 605.2	*	*	*	*	*
49.	PLUG FOR PRIMING	606	*	*	*	*	*
50.	PUNCHED WASHER FOR LOCK NUT	622	*	*	*	*	*
51.	HEX SCREW TO RELEASE SUC. COVER	630	251	251	*	*	253
52.	HEX. SCREW FOR BRG COVER PS & DS	631.1 631.2	*	*	*	*	*
53.	HAMMER DRIVE SCREW	640	*	*	*	*	*
54.	HEX. SOCKET FOR LIQUID DEFLECTOR	654	*	*	*	*	*
55.	DUTY NAME PLATE	670	*	*	*	*	*
56.	COOLING NAME PLATE INLET & OUTLET	671.1 671.2	*	*	*	*	*
57.	ARROW NAME PLATE	672	*	*	*	*	*
58.	SEALING NAME PLATE (INLET)	676	*	*	*	*	*

6.3 PAINTING

The details of paint used for PCE/PCH pumps are as below

Standard colour	D.A. Gray
Brand name	LAKAKI
Primer coat	Zinc Chromate
Final coat of	D. A. Gray
Coating thickness	1.25 to 2.5 mm (0.05 to 0.1")

7. DESIGN CRITERIA

7.1 VISCOSITY

PCE/PCH pumps are offered for liquids up to 500 SSU. This will have bearing on pump performance. For further details please refer to our Head Office.

7.2 MAX PERMISSIBLE N/N VALUES FOR THE STANDARD COMBINATION OF IMPELLER AND SHAFT MATERIAL ARE AS GIVEN BELOW :

Models	N/n value (HP/RPM)
1 PCE 63 A	0.001725
1 PCE 63/1 PCH 63	—do—
15 PCE 55/15 PCH 55	—do—
15 PCE 75/15 PCH 75	0.0069
15 PCE 9/15 PCH 9	—do—
2 PCE 59/2 PCH 59	—do—
50 PCE 250/50 PCH 250	—do—
50 PCE 280/50 PCH 280	—do—
65 PCE 180/65 PCH 180	—do—
80 PCE 180/80 PCH 180	—do—

For the N/n values of pumps with material combination of impeller and shaft other than the standard, please refer to our Head Office.

7.3 RESERVE POWER MARGIN

In order to avoid continuous overloading of the electric motor the rated power of the motor in kw should exceed power requirement of shaft by following percentages :

Power absorbed by pump in kw	Reserve power margin of driver
Upto 2	20% approx
2 to 20	15% approx
above 20	10% approx

7.4 MOMENT OF INERTIA

The moment of inertia of complete rotating unit with full size C.I. impeller is given below:

PCE MODELS	M. I. in kg-cm²	PCH MODELS	M.I. in kg-cm²
1 PCE 63 A	92	—	—
1 PCE 63	89	1 PCH 63	78
15 PCE 55	77	15 PCH 55	66
15 PCE 75	205	15 PCH 75	160
15 PCE 9	385	15 PCH 9	255
2 PCE 59	148	2 CPH 59	113
50 PCE 250	400	50 PCH 250	308
50 PCE 280	440	50 PCH 280	362
65 PCE 180	365	65 PCH 180	233
80 PCE 180	330	80 PCH 180	275

7.4.1 M. I. of Impellers with material other than Cast Iron

If impellers are made of special material other than C. I., the M. I. can be obtained by using the following formula :

$$\text{M. I. of special material impeller} = \frac{\text{Sp. Gr. of special material}}{\text{Sp. Gr. of Cast Iron}} \times \text{M. I. of Cast Iron Impeller}$$

7.4.2 Moment of inertia of cut-down Impellers

If moment of inertia for cut down impeller diameters is to be calculated, it can be done by using the following formula.

$$\text{M. I. of cut-down dia. impeller} = \left(\frac{\text{cut-down dia}}{\text{full dia.}}\right)^{2.5} \times \text{M. I. of full dia. impeller}$$

7.4.3 GD^2 Values

The GD^2 values for complete rotating unit with full size impeller are given below

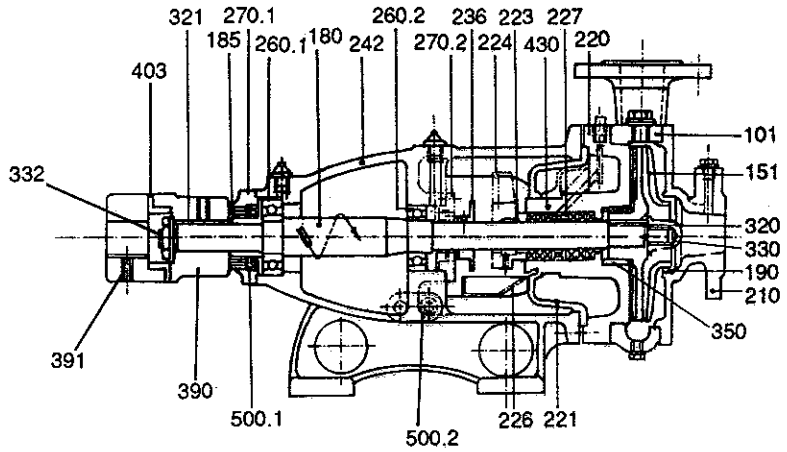
PCE Models	GD^2 value in kg-cm^2	PCH Models	GD^2 Value in kg-cm^2
1 PCE 63 A	368	—	—
1 PCE 63	356	1 PCH 63	312
15 PCE 55	308	15 PCH 55	264
15 PCE 75	820	15 PCH 75	640
15 PCE 9	1540	15 PCH 9	1020
2 PCE 59	592	2 PCH 59	452
50 PCE 250	1600	50 PCH 250	1232
50 PCE 280	1760	50 PCH 280	1448
65 PCE 180	1460	65 PCH 180	932
80 PCE 180	3120	80 PCH 180	1100

7.5 WEIGHTS

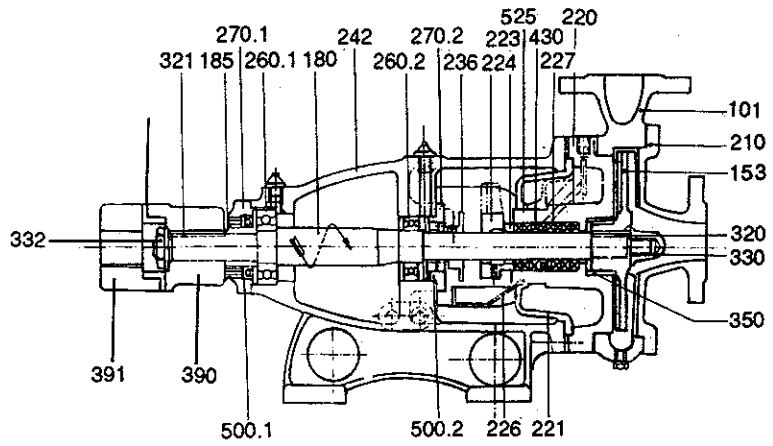
PCE Models	Approx net wt.	PCH Models	Approx net wt.
1 PCE 63 A	43.5	—	—
1 PCE 63	43	1 PCH 63	42
15 PCE 55	44	15 PCH 55	43
15 PCE 75	60.5	15 PCH 75	59
15 PCE 9	68	15 PCH 9	66
2 PCE 59	59	2 PCH 59	57.5
50 PCE 250	81.5	50 PCH 250	80
50 PCE 280	86	50 PCH 280	84
65 PCE 180	62	65 PCH 180	60
80 PCE 180	74	80 PCH 180	72

Cross Sectional View

PCE Pump



PCH Pump



8.0 LIST OF COMPONENTS FOR PCE/PCH PUMPS & CROSS SECTIONAL DRAWINGS

Part Nos. NEW	Part Description
101	Pump casing
151	Enclosed impeller (only for PCE models)
153	Semi-open impeller (only for PCH models)
180	Pump Shaft
190	Wear ring (only for PCE models)
210	Suction cover
220	Stuffing box cover
221	Cooling chamber
242	Bearing Pedestal
260.1	Ball Bearing DE
260.2	Ball Bearing NDE
270.1	Bearing cover DE with Oil Seal
270.2	Bearing Cover NDE with Oil Seal
500.1	Oil Seal for DE Cover
500.2	Oil Seal for NDE Cover
224	Gland
227	Lantern Ring
350	Bearing Bush
185	Spacer Ring for Coupling
390	Pump coupling (Love-joy type)
391	Driver Coupling (Love joy type))
403	Coupling Star
236	Liquid Deflector
320	Key for Impeller
321	Key for Coupling
330	Impeller nut
332	Coupling nut
430	Gland packing
510	Gasket for delivery casing & suction cover
511	Gasket for delivery casing & Stuffing box cover
512	Gasket for stuffing box cover & cooling chamber
525	'O' Ring for stuffing box cover & cooling chamber
622	Washer for coupling nut
441	Grease nipple
224	Clamping plate for gland
226	Drip pan for stuffing box leakage (against order)

9.0 INTERCHANGEABILITY OF PARTS

Description	PUMP TYPES																	
	1 PCE 63/ 1 PCE 63A	1 PCE 63	15 PCE 55	15 PCE 55	15 PCE 75	15 PCH 75	15 PCE 9	15 PCH 9	2 PCE 59	2 PCH 59	50 PCE 250	50 PCH 250	50 PCE 280	50 PCH 280	65 PCE 180	65 PCH 180	80 PCE 180	80 PCH 180
Delivery Casing	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
Casing Ring	1	—	1	—	2	—	2	—	2	—	3	—	4	—	5	—	6	—
Impeller	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Suction Cover	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stuffing Box Cover	1	1	1	1	2	2	2	2	2	2	3	3	4	4	2	2	2	2
Cooling Chamber	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Split Gland	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lantern Ring	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Stuffing Box Bush	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Bearing Pedestal	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Bearing Cover DE	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Bearing Cover NDE	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Coupling	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Shaft	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ball Bearing DE & NDE	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Oil Seals DE & NDE	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2

NOTE : The parts of pumps carrying same number in the horizontal line are interchangeable.

10.0 STANDARD SCOPE OF SUPPLY

1) Pump with normal stuffing box arrangement with packed gland packing
2) Pump half coupling
3) Motor half coupling (unbored)
4) Companion flanges for standard fitted, bronze fitted and all CI pumps only
5) Stuffing box sealing connection (Pipe nipple with coupling only)
6) Name Plates
   a) Duty nameplate
   b) Cooling water inlet and outlet
   c) Direction of rotation arrow nameplate
7) Priming funnel will auxiliary piping for standard fitted & bronze fitted pumps
8) Holes plugged for sealing connection
9) Grease nipple
10) Instruction Manual

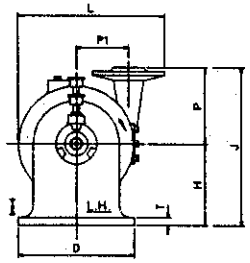
10.1 OPTIONAL ACCESSORIES (SUPPLIED AGAINST ORDER ONLY)

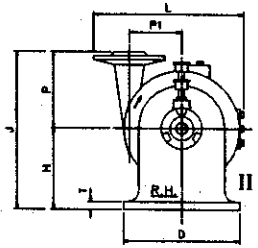
1) Base plate C.I., M.S. with/without drain rim type
2) Coupling Guard
3) Set of bolts for foundation
4) Set of special stuffing box packing
5) Bored motor coupling
6) Suction Gauge/Vacuum equalising tapping
7) Pressure Gauge tapping
8) Motor
9) Starter
10) Companion flanges for all bronze and special metal pumps
11) Internal sealing connection, grease sealing connector stuffing box
12) Drip pan
13) Bearing lubrication by Oil
14) Pressure Gauges
15) Slip on flange (Bore diameter to be given by customer)

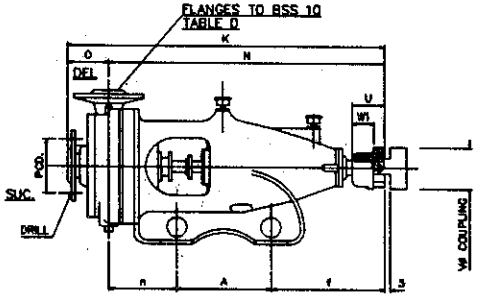
KIRLOSKAR BROTHERS LTD.
KIRLOSKARWADI – DIST. SANGALI.
(INDIA)

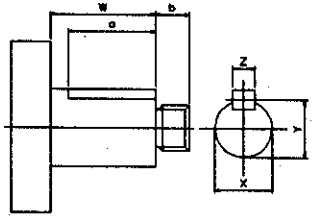
OUT–LINE DRG. OF KIRLOSKAR PCE/PCH PUMPS WITH LOVEJOY COUPLING.

DRG NO. –
TL133–97–001–0

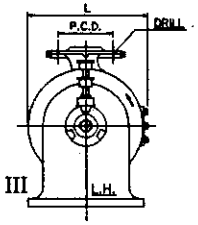


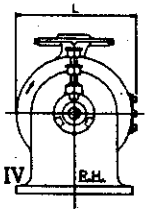


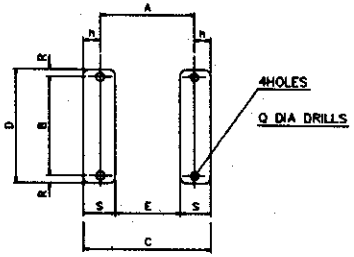




BARE SHAFT END AT COUPLING







LOVEJOY COUPLING L–110 C.I.AS PER
REF.DRG.NO.–R/L–132.FOR 6 UNIT
LOVEJOY KL–100 C.I.R/L–131 FOR 5 UNITS

ALL DIMENSIONS ARE IN mm.EXCEPT SPECIFIED.

NOTE: –
** INDICATES PCE/PCH PUMP SIZES.

FIG NO.	PUMP	SUC	DEL	DRIVING UNIT	A	a	B	b	C	D	E	f	H	h	J	K	L	N	n	o	P	P1	Q	R	S	T	U	LOVEJOY V	W	W1	X	Y	Z	SUCTION PCD	SUCTION DRILL	SUCTION HOLES	DELIVERY PCD	DELIVERY DRILL	DELIVERY HOLES
II	1PCE63/1PCE63 A 1PCH63	32	25	5	162	32	171	17	219	197	111	125	139.7	28.5	267	475	246	404	117	71	127	89	11.5	13	54	13	58	65	37	38	23.812 K6 +0.015 +0.002	26.6	1/4"S	87.5	14	4	82.3	14	4
I	15PCE/PCH55 L.H.	40	40	5	162	32	171	17	219	197	111	125	139.7	28.5	279	480	254	404	117	76	140	86	11.5	13	54	13	58		37	38		26.6	1/4"S	98.4	14	4	98.4	14	4
IV	15PCE/PCH75 R.H.	40	40	6	178	51	190	19	257	222	123	174	158.7	39.5	330	566	265	482	130	84	171	–	14	16	67	16	80	85	55	57	28.575 K6 +0.015 +0.002	31.3	1/4"S	98.4	14	4	98.4	14	4
II	15PCE/PCH9 R.H.	50	40	6	178	51	190	19	257	222	123	174	158.7	39.5	311	568	330	482	130	84	152	124	14	16	67	16	80		55	57		31.3	1/4"S	114.3	18.5	4	98.4	18.5	4
I	2PCE/PCH59 L.H.	50	50	6	178	51	190	19	257	222	123	174	158.7	39.5	311	574	282	482	130	92	152	92	14	16	67	16	80		55	57		31.3	1/4"S	114.3	18.5	4	114.3	18.5	4
III	50PCE/PCH250 L.H.	65	50	6	178	51	190	19	257	222	123	174	158.7	39.5	379	619	330	488	136	131	220	–	14	16	67	16	80		55	57		31.3	1/4"S	127	18.5	4	114.3	18.5	4
III	50PCE/PCH280 L.H.	65	50	6	178	51	190	19	257	222	123	174	158.7	39.5	388	617	359	488	136	129	229	–	14	16	67	16	80	85	55	57		31.3	1/4"S	127	18.5	4	114.3	18.5	4
IV	65PCE/PCH180 R.H.	80	65	6	178	51	190	19	257	222	123	174	158.7	39.5	349	604	255	494	142	110	190	–	14	16	67	16	80		55	57	28.575 K6 +0.015 +0.002	31.3	1/4"S	146	18.5	4	127	18.5	4
IV	80PCE/PCH180 R.H.	100	80	6	178	51	190	19	257	222	123	174	158.7	39.5	369	616	277	496	144	120	210	–	14	16	67	16	80		55	57		31.3	1/4"S	178	18.5	4	146	18.5	4