CIG®
CRESCENT
INTERNAL GEAR

CIG SINGLE & DOUBLE HYDRAULIC PUMPS

Bulletin CIG-96

Imo™ Pump

CIG®
CRESCENT
INTERNAL GEAR

A New Family

of Rugged, Reliable, High-Pressure Hydraulic Single and Double Pumps with Silent, Efficient, Ripple-Free Performance.

CIG is based on the patented Truninger system QT™ design from Switzerland with all units manufactured under license in the United States by the IMO Pump Division of Imo Industries Inc. Performance is field proven with thousands of units delivered in both Europe and the United States.

Single pumps are available in 54 different models and double pumps are available in over 1300 different combinations. Single units range in flows from 1 to 125 gpm with continuous pressure ratings up to 5000 psig.

A PUMP WITH THE FEATURES YOU'VE BEEN LOOKING FOR.

CIG offers the best features of other types of hydraulic pumps in one single, efficient unit: simple design like conventional gear pumps, high pressure ratings up to 5000 psig like piston-type pumps, and low noise levels like screw-type pumps. In addition, CIG offers the following advantages:

- ☐ Low noise
- ☐ Low pressure ripple
- ☐ Low stress on pump components
- ☐ Low systems cost
- ☐ High efficiency
- ☐ High speed capability
- ☐ Few moving parts
- ☐ Multiple pump configurations on a common shaft
- ☐ Long life
- ☐ Compatible with water glycols, phosphate esters, inverts, 95/5, and other special fluids

WHAT LOW NOISE LEVELS CAN MEAN TO YOU

Perhaps the most important benefit provided by CIG pumps is reduced noise levels—ON THE AVERAGE OF 20 to 30 db(A) LESS THAN CONVENTIONAL HIGH-PRESSURE PUMPS AT FULL PRESSURE AND HIGH OPERATING SPEED. CIG IS QUIETER THAN THE ELECTRIC MOTOR DRIVING THE PUMP. Reduced noise levels result in system cost savings.

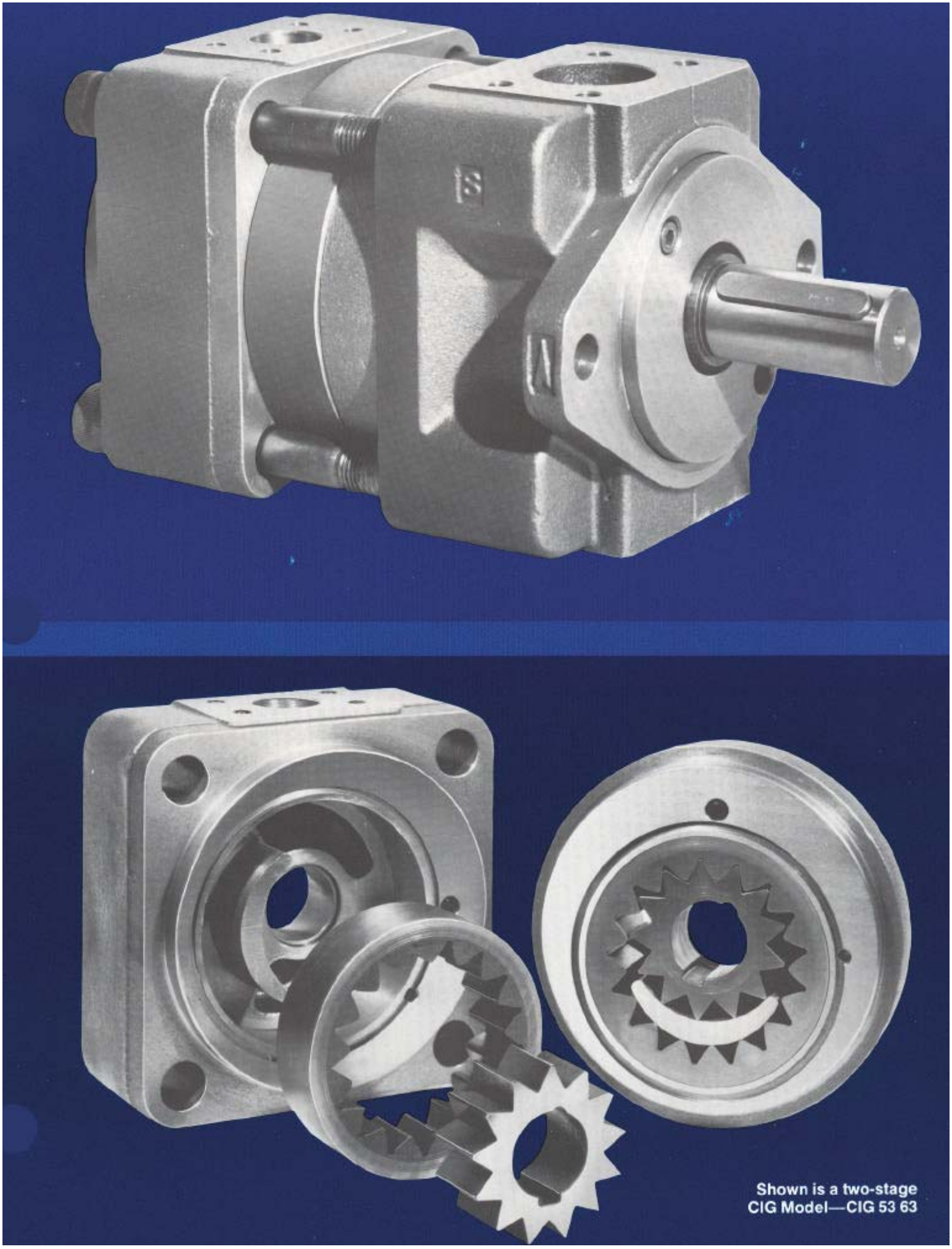
A few of these savings are:

- ☐ No acoustic enclosures
- ☐ No "hiding" of the pump
- ☐ No lengthy remote piping
- ☐ No special room to contain hydraulic pump noise.

Other design characteristics of CIG allow additional system cost savings:

- ☐ No booster pump required, even at 3600 rpm
- ☐ Smaller accumulators
- ☐ Longer pump life
- ☐ Reduced cost for electric motors
- ☐ No compromise in sizing or selecting . . . 54 single models and over 1300 double-pump combinations.

CIG offers the opportunity of using hydraulics in applications previously not suited because of high noise levels or various cost-limiting factors. Accordingly, CIG not only meets, but far exceeds, the noise level requirements of OSHA relating to industrial in-plant environmental conditions.



Shown is a two-stage
CIG Model—CIG 53 63

Unique Design

Principles of CIG

PATENTED INTERNAL GEAR DESIGN

The positive-displacement internal gear design of the pump consists of a single shaft that runs through the center of the pump housing driving a pair of star-shaped gears for each stage or element of the pump. The design is extremely simple and modular, since there are only two moving parts per stage. A tie rod design allows the "stacking" of these modular stages for increased pressure ratings. Modular design of the pump makes it possible to offer 54 single models and over 1300 double pump combinations—one of the largest, if not the largest, selections in the industry.

CIG features extra large suction and discharge areas; fluid velocities are kept low and pressure rise-times are long, which helps reduce noise levels.

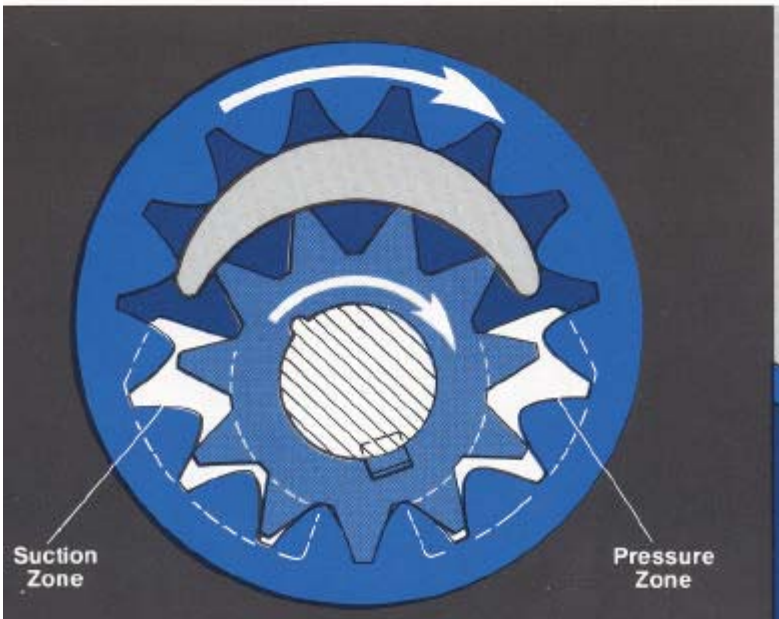
CIG's suction capabilities are excellent, and along with its self-priming characteristics, needs no booster pump, even at the high rotational speeds. The design of the suction area of the pump is such that the flow of the oil into the unit is in an axial direction, which enables the pump to fill smoothly and reduce the possibility of cavitation.

The unique characteristic of CIG's internal gear design is the patented gear tooth profile. Tooth flanks on the pinion are essentially straight, a factor which—for all practical purposes, eliminates any "trapped oil" volume. Thus, pressure pulsations are eliminated, resulting in ripple-free and low-noise operation.

CIG IS WELL SUITED TO MANY APPLICATIONS

Because of its many desirable features, CIG is a "natural" for a wide variety of high-pressure hydraulic applications, particularly for in-plant industrial environments.

- ☐ Metalworking and machine tools.
- ☐ Die-casting machines.
- ☐ Injection-molding equipment.
- ☐ Hydraulic presses.
- ☐ Automated processing equipment.
- ☐ Material handling equipment.
- ☐ Testing machines.
- ☐ Packaging machinery.
- ☐ Mining equipment.
- ☐ Mobile equipment.
- ☐ Medical apparatus.
- ☐ Computer equipment.
- ☐ Marine hydraulics.
- ☐ Extrusion presses.
- ☐ Foundry equipment.
- ☐ Stage machinery.
- ☐ ... Your own.



EXTRA LARGE SUCTION AND PRESSURE ZONES keep fluid velocities at a minimum, thereby reducing noise levels and improving suction capabilities.

PATENTED GEAR TOOTH PROFILE has teeth flanks that are essentially straight, virtually eliminating any "trapped oil" volume and producing ripple-free flow and low-noise operation.

Design Simplicity

Means Longer Life

THE FEATURES OF MULTI-STAGING AND MULTIPLE PUMP CONFIGURATIONS.

Since a common shaft runs through the center of the pump body, it easily lends itself to multi-staging and multi-section configurations, or "piggybacking."

The multi-stage stacking of the modular CIG elements determines pressure levels. CIG 1000-psi and 2500-psi units are each of a single-stage design. The 4000-psi units are of a multi-stage design, in which two pump stages, each rated at 2000-psi are stacked in series. An additional stage may be added to obtain 5000 psig continuous pressure. Fluid flows from the outlet of one stage to the inlet of the next stage, and each stage participates equally in pumping against the discharge pressure. The fact that each stage shares half the pressure load, reduces stresses on pump components—thus increasing pump life.

Double-pump configurations are two hydraulically independent pumps, arranged on a common drive shaft, with each pump having a separate discharge and sharing a common suction. Thus there are over 1300 different combinations available for double-pump configurations. Such configurations are particularly desirable for applications such as presses, molding equipment, and processing systems in which pressures and flow rates must be tailored independently for an optimum work cycle performance.

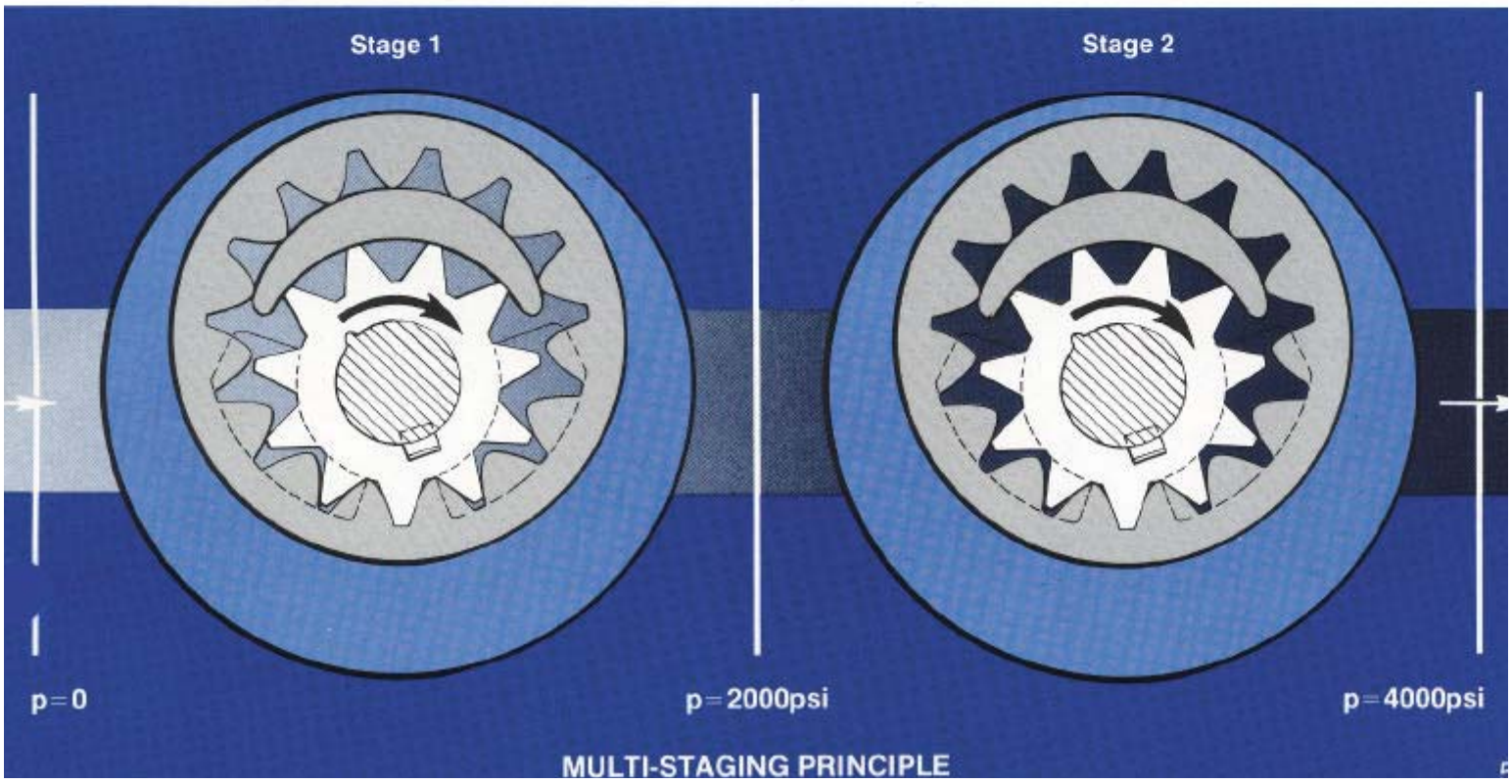
Pages 14 and 15 of this brochure describe in more detail double-pump configurations and contain a chart for selection of double-pump combinations.

Because the design of the CIG is so simple, it offers you many advantages—among them, longer life and silent operation.

Smooth and efficient operation is inherent in the hydrodynamic internal gear design of CIG. All internal parts float on a film of fluid. There's minimal wear and tear and in operation, with no metal-to-metal contact between the stationary and moving elements of the pump.

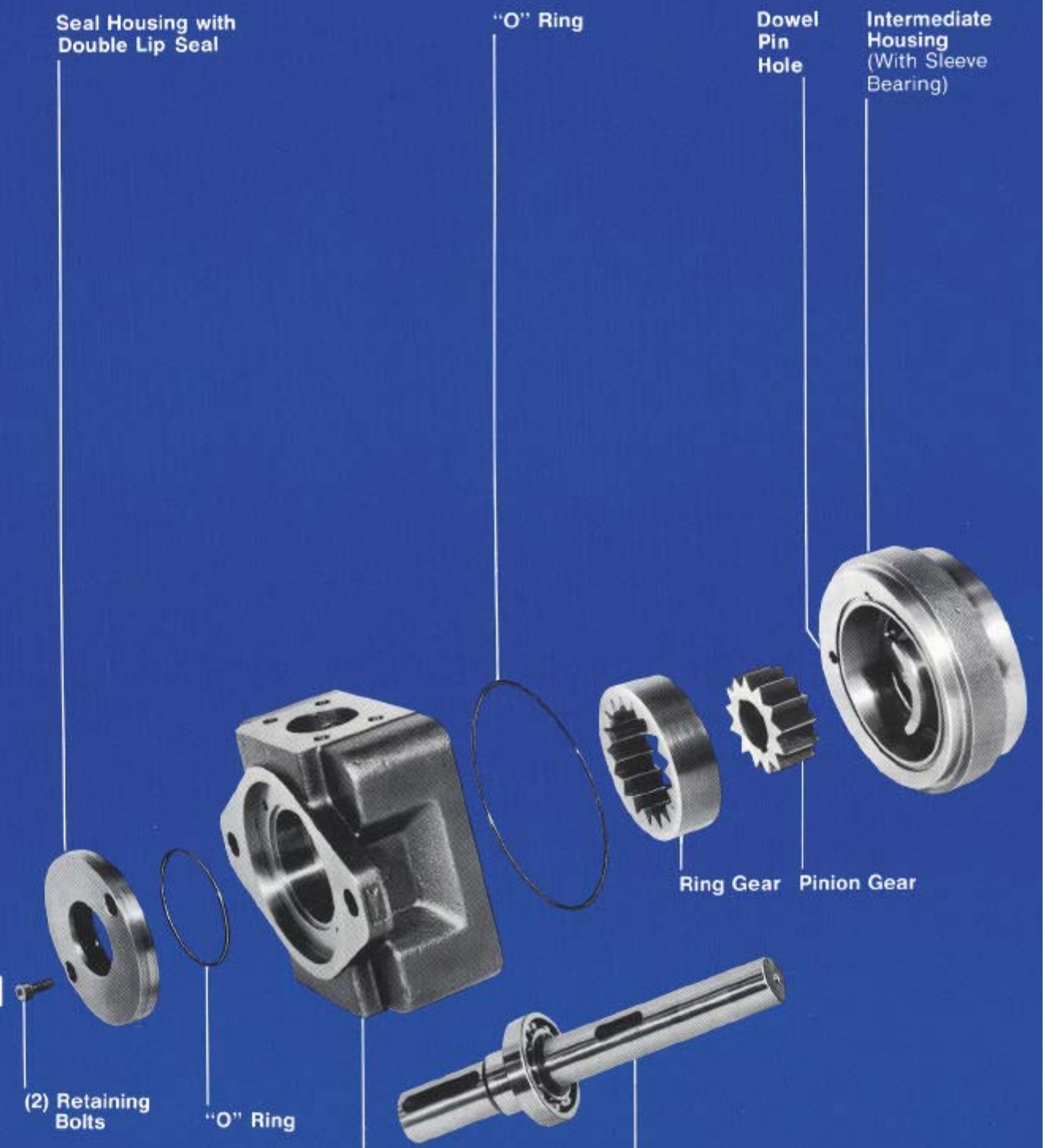
Just compare the number of moving parts in CIG with that of any conventional high-pressure pump. CIG has only two moving parts per stage. In a 4000-psi unit, that means only four moving parts (five counting the shaft). Simply put, there are fewer moving parts to worry about.

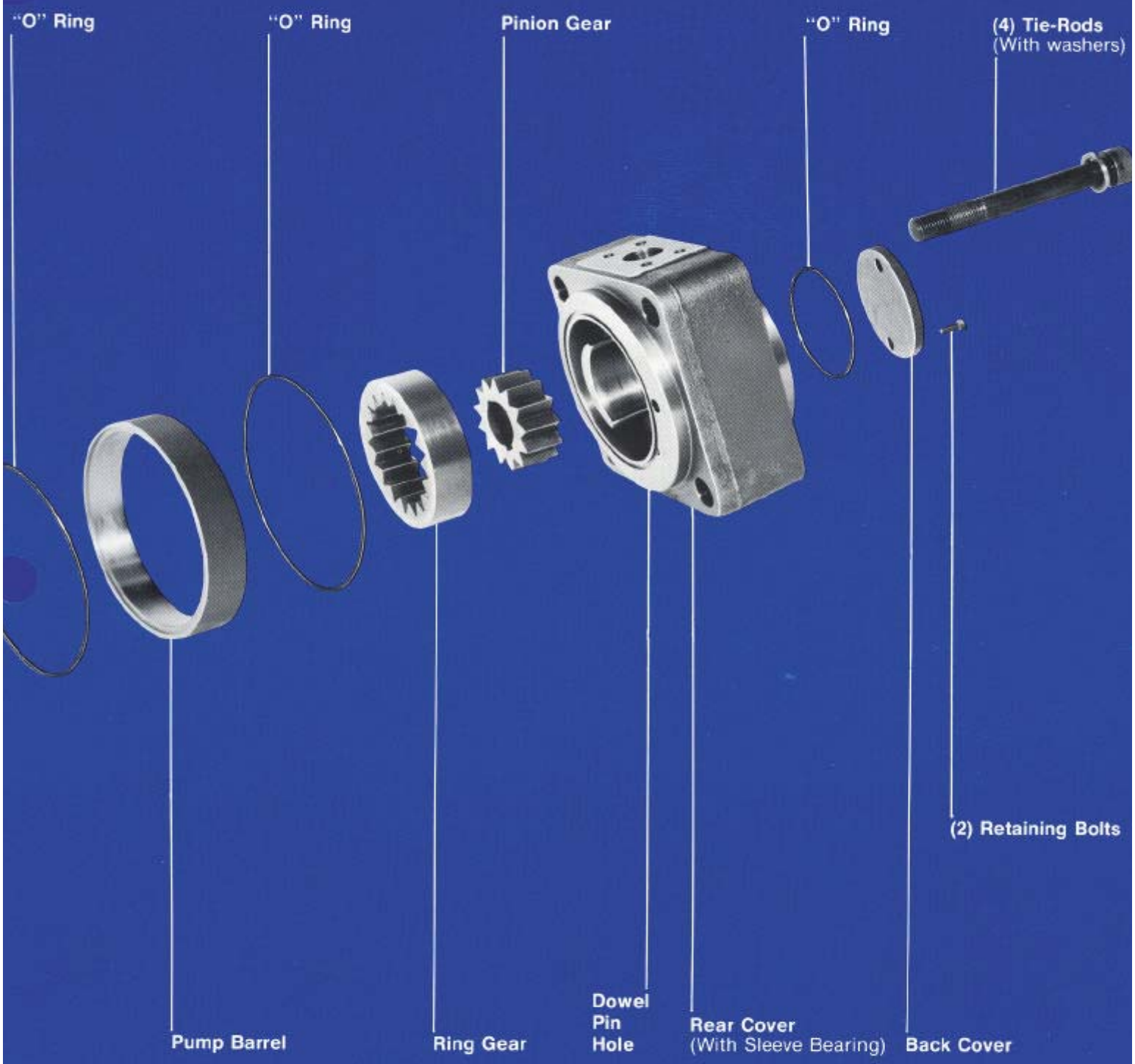
Not only are there fewer parts, but because of the unique design principle—there's less wear on these parts when compared to conventional pumps with the same pressure ratings.



MULTI-STAGING PRINCIPLE

Exploded View of CIG





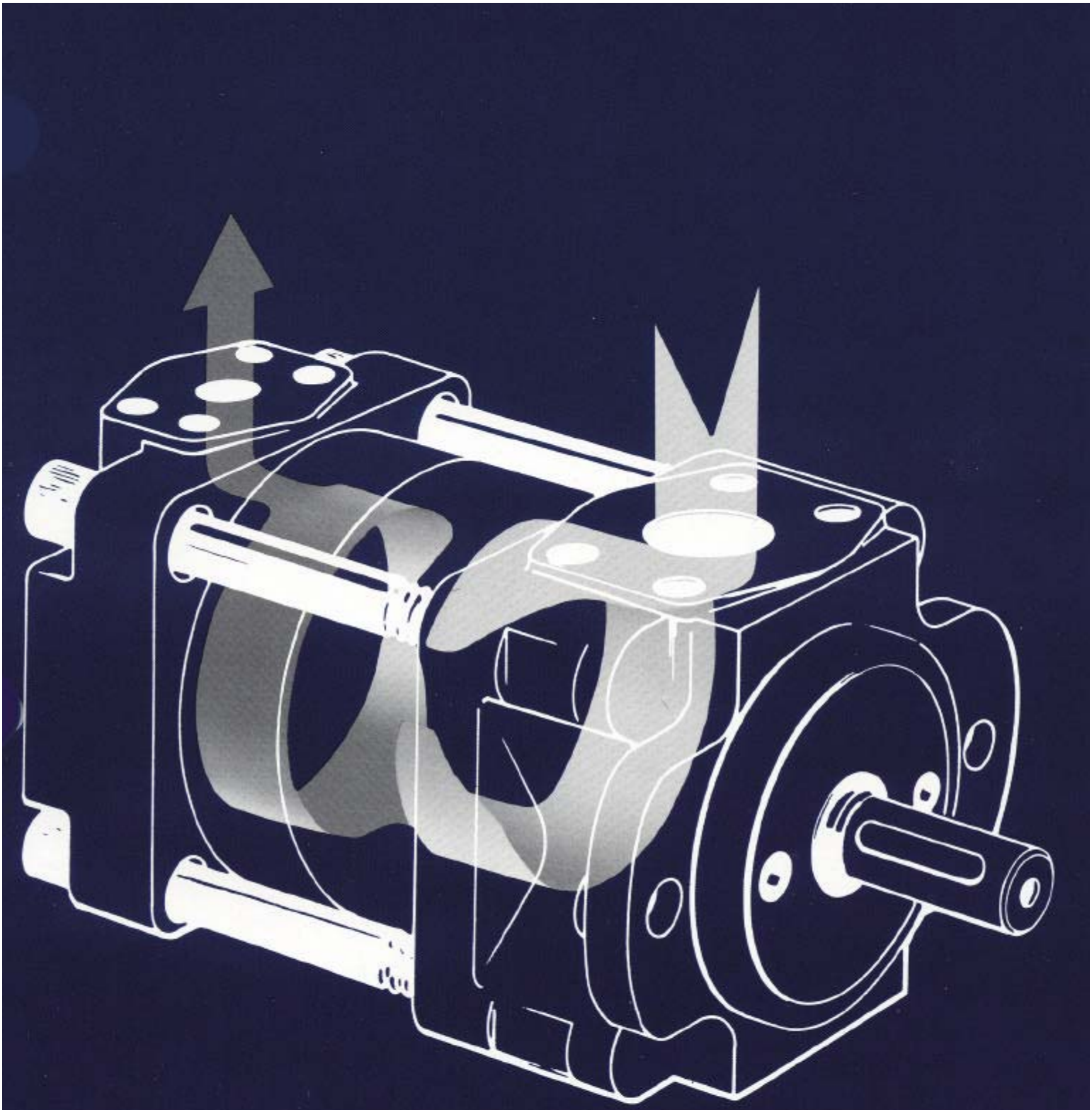
CIG

Model Shown is a CIG 53 63

Material Specifications

of CIG
Single and Double Pumps

FRONT & REAR COVERS — DUCTILE IRON
BACK COVER — ALUMINUM
SEAL HOUSING — ALUMINUM
INTERMEDIATE HOUSING — DUCTILE IRON
(Two-stage Pumps only)
RING GEAR — PEARLITIC GRAY IRON
PINION GEAR — STEEL (NITRIDED)
SHAFT — STEEL (NITRIDED)
PUMP BARREL — STEEL
(Two-stage pumps only)
O-RINGS — VITON
SHAFT SEALS — VITON INNER SEAL, BUNA OUTER SEAL
SLEEVE BEARINGS — TEFLON COATED BRONZE
INTERMEDIATE FLANGE — DUCTILE IRON
(Double-pumps only)



Shown is the typical flow path of a two-stage CIG.

CIG Series Single Pump Configurations

CIG-X1 is a single-stage pump for lower pressure applications, with continuous pressure up to 1000 psi and peak pressures up to 1150 psi. Flows are available from 3 gpm to 125 gpm in 18 different models.

CIG-X2 is a single-stage pump for medium pressure applications with continuous and/or peak pressures up to 2500 psi. Flows are available from 1 gpm to 115 gpm in 18 different models.

CIG-X3 is a two-stage pump for high pressure applications with continuous pressures up to 4000 psi and peak pressures up to 4600 psi. Flows are available from 1 gpm to 115 gpm in 18 different models.

Single Pump Model Key: **CIG** **42** **020** **R/L** **I/D** **P/W**

Series

Frame Size
(2, 3, 4, 5, 6, 8)

*Pressure Rating
1 = 1000/1150 psi (Single Stage)
2 = 2500/2500 psi (Single Stage)
3 = 4000/4600 psi (Two Stage)

Nominal Displacement
In CM^3/ Rev.

R—CW Rotation (Standard)
L—CCW Rotation

I Internal Drain (Standard)
D—External Drain For High Suction Pressure and Low Viscosity

P—Petroleum Base Fluids (Standard)
W—Low Viscosity Fluids Modification

*Additional stages are available for higher pressures or lower viscosity fluids.

Notes:

1. Standard single units are supplied with clockwise rotation, Viton and buna shaft seals, internal drain, petroleum base design, and Viton "O" rings.
2. Modifications for low viscosity fluids include sealed ball bearing and external drain.
3. Viton shaft seals are available for phosphate ester fire resistant fluids.
4. Couplings, foot-mounting brackets, and flange-mounting brackets are available from IMO Pump Division upon request.

CIG Single Series Pumps Are Available in Three Basic Pressure Ranges, Six Frame Sizes, Twenty-One Different Displacements, Fifty-Four Single Pump Models.

CIG PRESSURE RANGE				X1			X2		X3		X2 & X3
CONT. RATED PRESSURE				1000 PSI			2500 PSI		4000 PSI		
PEAK PRESSURE *1				1150 PSI			2500 PSI		4600 PSI		
DISPLACEMENT PER REV.	*2 DELIVERY GPM AT RATED PRESS.										
	At 1750 RPM										
In.*3	x1	x2	x3	MODEL NUMBER	HP*3	SHAFT RPM MAX / MIN	MODEL NUMBER	HP*3	MODEL NUMBER	HP*3	SHAFT RPM MAX / MIN
.31		1.4	1.6				22005	3.9	23005	5.9	5700/1150
.38		2.0	2.2				22006	4.4	23006	7.3	5700/1150
.48		2.7	2.8				22008	5.6	23008	9.0	5700/1150
.61	3.7	3.2	3.5	21010	2.8	4500/1150	32010	7.4	33010	11.5	4500/ 900
.77	4.9	4.4	4.7	21012	3.6	3600/1150	32012	9.0	33012	14.5	4500/ 900
.95	6.2	5.6	5.9	21016	4.5	2900/1150	32016	11.1	33016	17.9	4500/ 900
1.24	7.9	7.1	7.5	31020	5.9	3600/ 900	42020	14.4	43020	23.4	3600/ 700
1.53	10.1	9.1	9.6	31025	7.3	2900/ 900	42025	17.6	43025	29.0	3600/ 700
1.97	13.3	12.0	12.6	31032	9.2	2300/ 900	42032	23.0	43032	37.2	3600/ 700
2.39	16.2	13.8	15.4	41040	11.2	2900/ 700	52040	27.8	53040	45.0	2900/ 600
3.08	21.2	19.5	20.2	41050	14.6	2300/ 700	52050	36.0	53050	58.2	2900/ 600
3.87	27.2	25.0	25.8	41063	18.3	1800/ 700	52063	45.0	53063	73.2	2900/ 600
4.89	34.4	31.4	32.5	51080	23.1	2300/ 600	62080	57.5	63080	92.4	2300/ 500
6.16	43.6	40.2	41.5	51100	29.1	1800/ 600	62100	71.5	63100	116.3	2300/ 500
7.60	54.5*9	50.8	52.0	51125	35.5*9	1450/ 600	62125	89.5	63125	143.8	2300/ 500
9.93	71.1	67.0	68.0	61150	47.0	1800/ 500	82160	114.0	83160	187.6	1800/ 400
12.26	88.6*9	82.0	84.0	61200	57.3*9	1450/ 500	82200	142.0	83200	232.	1800/ 400
15.18		103.0	105.0				82250	176.0	83250	287.	1800/ 400
	At 1150 RPM										
15.18	72.5			61250	47.5	1150/ 500					
19.85	95.1			81315	62.0	1450/ 400					
24.52	118.0			81400	76.0	1150/ 400					
30.36	147.0*9			81500	93.0*9	900/ 400					

Notes:

*1. Peak pressure is defined as a Duty Cycle not to exceed Continuous Rated Pressure for more than 20 seconds per minute.

*2. Delivery is at Continuous Rated Pressure and Fluid Viscosity at 140 SSU.

*3. H.P. Consumption is at Continuous Rated Pressure at stated RPM and Fluid Viscosity of 140 SSU.

4. For viscosity of less than 70 SSU, and more than 1500 SSU, please contact IMO Pump Division.

5. Suction Pressure—7 psig maximum. (For suction pressure in excess of 7 psig, add D modification.)
   Suction Lift—5" Hg to 7" Hg Vacuum at typical operating speeds of 1750 and 1150 RPM, respectively.

6. Maximum continuous operating temperature is 180 degrees F.

7. Recommended inlet filtration for standard hydraulic fluid is 74 Micron.
   A return line filtration of 10 Micron is recommended.

8. For operating conditions not in the parameters above, contract IMO Pump Division.

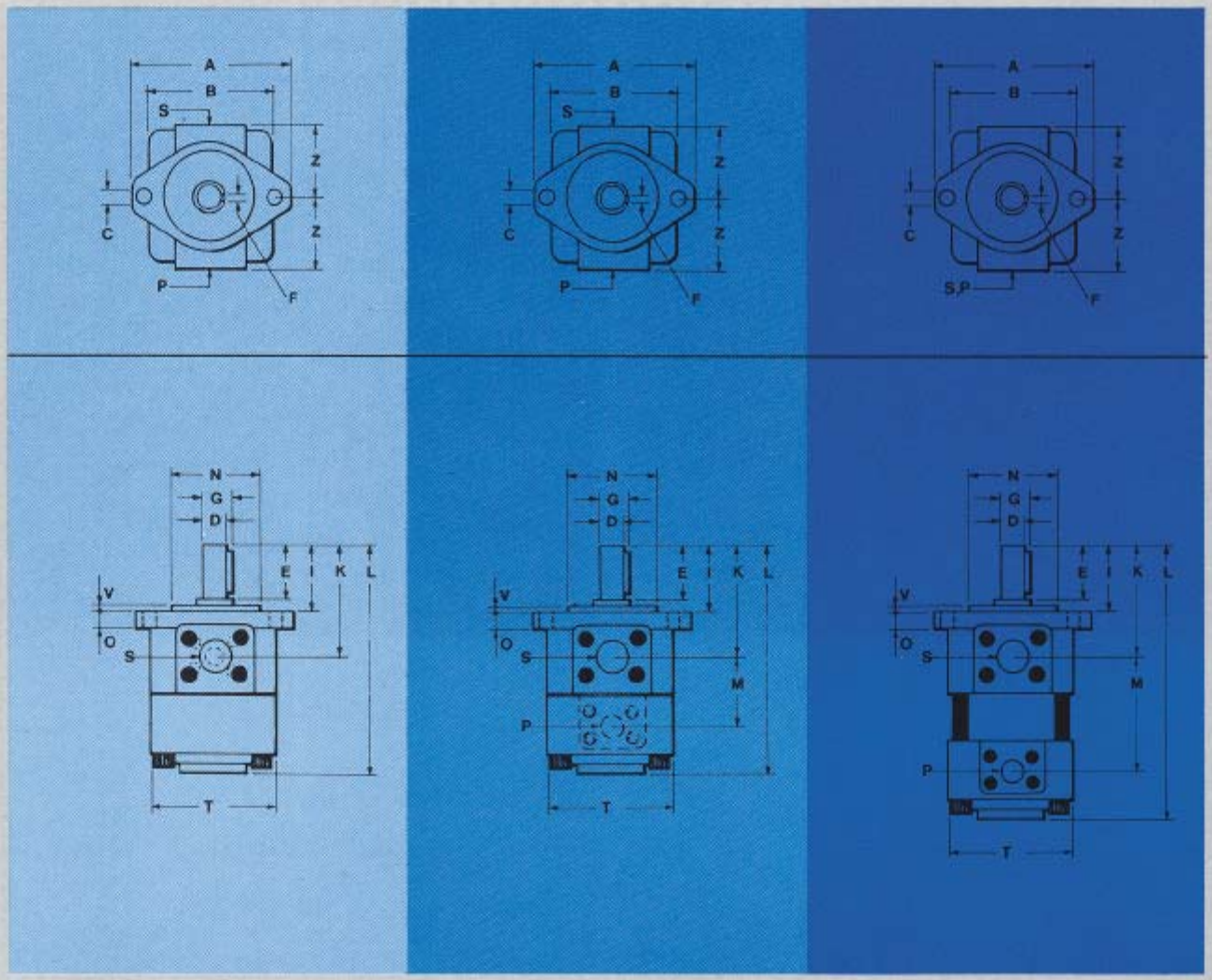
*9. Inlet must be pressurized to 10 psi to operate at these speeds.

CIG Single Pump Dimensional Drawings

DRAWING A
CIG X1 X
1000 psi (CONT.)
1150 psi (PEAK)

DRAWING B
CIG X2 X
2000 psi (CONT.)
2300 psi (PEAK)

DRAWING C
CIG X3 X
4000 psi (CONT.)*
4600 psi (PEAK)*



S = Suction Port **P = Pressure Port**

***NOTE:** For services above 3000 psig, it is recommended that a discharge port socket weld adapter package (5000 psig service) be purchased with each pump. Each socket weld adapter package, available from IMO Pump Division consists of a socket weld adapter, Viton O-ring, socket head capscrews (Grade 5 or better) and spring washers. Flange sizes, order symbol number and capscrew prestress torque values are listed below:

FLANGE SIZE (INCH)	½	¾	1	1¼	1½	2
ORDER SYMBOL	Q24027X1	Q34027X1	Q44027X1	Q54027X1	Q64027X1	Q84027X1
CAPSCREW PRESTRESS TORQUE VALUE LBS. FT.	20	50	50	67	118	118
TORQUE VALUES ARE FOR CAPSCREWS LUBRICATED WITH LIGHT OIL						

CIG Single Pump Dimensions

FRAME SIZE		2			3			4			5			6			8		
PUMP TYPE CIG		21	22	23*3	31	32	33*3	41	42	43*3	51	52	53*3	61	62	63*3	81	82	83*3
DIMENSIONAL DRAWING		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
SUCTION PORT*2 SAE 4-BOLT		1"			1¼"			1½"			2"			2½"			3"		
PRESS. PORT*2 SAE 4-BOLT		½"			¾"			1"			1¼"			1½"			2"		
A		4.65		118	5.19		132	6.69		170	8.34		212	10.51		267	12.99		330
B	SAE	3.937		*1	4.173		106	5.748		146	7.125		181	9.015		229	11.024		*1
C		.355		9	.433		11	.551		14	.709		18	.866		22	1.024		26
I		1.735		44	1.968		50	2.677		68	3.622		92	3.622		92	4.606		117
K		2.994		76	3.462		88	4.409		112	5.670		144	6.024		153	7.560		193
L	(INCHES)	6.50		7.88	7.72		9.49	9.49		11.69	11.81		14.57	13.54		17.08	16.77		21.34
	(METRIC)	165		200	196		241	241		297	300		370	344		434	426		542
M	(INCHES)	0	2.08	3.47	0	2.48	4.25	0	2.99	5.12	0	3.62	6.38	0	4.33	7.87	0	5.55	10.07
	(METRIC)	0	53	88	0	63	108	0	76	132	0	92	162	0	110	200	0	141	256
N	(SAE)	2.480 / 2.478		*1	3.250 / 3.248		(SAE A)	4.000 / 3.998		(SAE B)	5.000 / 4.998		(SAE C)	6.500 / 5.998		(SAE D)	7.874 / 7.872		*1
O		.47		12	.47		12	.63		16	.79		20	.95		24	1.18		30
T		3.74		95	4.53		115	5.70		145	7.09		180	8.82		224	10.87		276
V		.236		6	.236		6	.275		7	.275		7	.275		7	.354		9
Z		1.97		50	2.36		60	2.95		75	3.66		93	4.53		115	5.55		141
D		.7874		20	.9850		25	1.2598		32	1.5748		40	1.9685		50	2.5590		65
D	(TOL.)	+.00035 / -.00016		+.009 / -.004	+.00035 / -.00016		+.009 / -.004	+.00043 / -.00020		+.011 / -.005	+.00043 / -.00020		+.011 / -.005	+.00043 / -.00020		+.011 / -.005	+.00047 / -.00027		+.012 / -.007
E		1.417		36	1.653		42	2.283		58	3.228		82	3.228		82	4.134		105
F		.236		6	.315		8	.394		10	.472		12	.551		14	.708		18
G		.886		22.5	1.102		28	1.378		35	1.693		43	2.106		53.3	2.716		69
WGT.	LB.	15	15	19	25	25	33	47	47	62	90	90	117	165	165	227	320	320	440
	KG.	6.5	6.5	8.5	11.5	11.5	15	21.5	21.5	28	41	41	53	75	75	103	145	145	200

PUMP BODY

SHAFT

ENGLISH DIMENSIONS = INCHES
METRIC DIMENSIONS = MILLIMETERS

NOTES:

*1. There is NO SAE standard existing on this Dimension for Pump Frame Sizes 2 and 8.

*2. SAE 4-Bolt Port Pads have UNC (inch) Bolt Threads as follows:

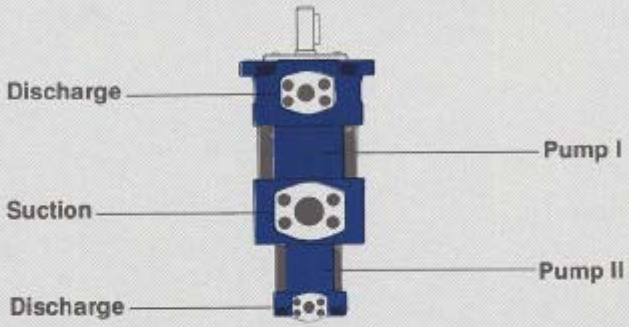
PORT SIZE:	½"	¾"	1"	1¼"	1½"
BOLT THREADS:	5/16"-18x1½"	⅜"-16x1½"	⅜"-16x1¾	7/16"-14x2"	½"-13x2½"
PORT SIZE:	2"	2½"	3"	3½"	4"
BOLT THREADS:	½"-13x2½"	½"-13x2¾"	⅝"-11x3"	⅝"-11x2½	⅝"-11x2¼"
Flange Connections With Bolts Are Available From IMO Pump Divison Upon Request					

*3 See Note on Page 12.

CIG Double Pump Configurations

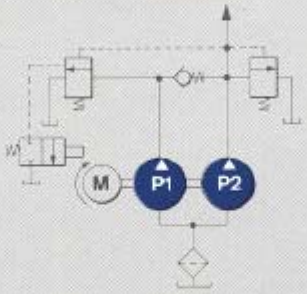
CIG Double Pumps consist of two hydraulically independent working pumps placed on a common drive shaft. Each pump has a separate outlet port while both share a common suction port located in the center of the pump.

TYPICAL DOUBLE PUMP CONFIGURATION



High-low pump configurations are typical for hydraulic pressures and other applications where optimum flow and pressure build-up for a given work cycle is required. A high-low pump circuit essentially consists of a hydraulic circuit that can either combine the total output of both pumps or by-pass one outlet to the tank. A typical circuit consists of a check valve and an unloading valve. Other hydraulic system elements would be a solenoid valve and a pressure relief valve.

TYPICAL DOUBLE PUMP CONFIGURATION



Double Pump Model Key: CIG 51 080/33 012 R/L I/D/E P/W

- Series
- Frame Size (2,3,4,5,6,8)
- *Pressure Rating
  - 1 = 1000/1150 (Single Stage)
  - 2 = 2500/2500 (Single Stage)
  - 3 = 4000/4600 (Two Stage)
- Nominal Displacement In CM^3/Rev.
- Frame Size (2,3,4,5,6,8)
- *Pressure Rating
  - 1 = 1000/1150 (Single Stage)
  - 2 = 2500/2500 (Single Stage)
  - 3 = 4000/4600 (Two Stage)
- Nominal Displacement In CM^3/Rev.
- R—CW Rotation (Standard)
  L—CCW Rotation
- I—Internal Drain (Standard)
  D—External Drain For High Suction Pressure
  E—External Drain For Low Viscosity and Normal Suction Pressure
- P—Petroleum Base Fluids (Standard)
  W—Low Viscosity Fluids Modification.

*Additional Stages are available for higher pressures or lower viscosity fluids.

NOTES:

1. Standard double-pumps are supplied with clockwise rotation, Viton and buna shaft seals, internal drain, petroleum base design, and Viton "0" rings.
2. Modifications for low viscosity fluids include sealed ball bearing and external drain.
3. Viton shaft seals are available for phosphate ester fire resistant fluids.
4. Couplings, foot-mounting brackets, and flange-mounting brackets are available from IMO Pump Division upon request.

CIG Double Pump Selection Table . . . 1,377 Possible Choices.

Code Numbers in Table Refer to Applicable Dimensional Drawings for a Given Double Pump (Request Separately)*1

PUMP II

PUMP I (SHAFT-END)	GPM AT 1750 RPM	CONTINUOUS PRESSURE (PSI)	TYPE CIG	1.82 2.37 3.12		3.8 5.0 6.4			8.3 10.5 13.8			16.7 22.0 28.0			35.4 45.0 56.0			73.0 90.0 113.0			*2 99.0 122.0 118.0	MAXIMUM SHAFT H.P. AT 1750 RPM
				2500	4000	1000	2500	4000	1000	2500	4000	1000	2500	4000	1000	2500	4000	1000	2500	4000	1000	
				5 6 8	5 6 8	10 12 16	10 12 16	10 12 16	20 25 32	20 25 32	20 25 32	40 50 63	40 50 63	40 50 63	80 100 125	80 100 125	80 100 125	160 200 250	160 200 250	160 200 250	315 400 500	
1.82 2.37 3.12	2500	22	5 6 8	222																		
	4000	23	5 6 8	232	233																	16
8.8 5.0 6.4	1000	21	10 12 16	212	213	211																
	2500	32	10 12 16	322	323	321	322															
	4000	33	10 12 16	332	333	331	332	333														32
8.3 10.5 13.8	1000	31	20 25 32	312	313	311	312	313	311													
	2500	42	20 25 32	422	423	421	422	423	421	422												
	4000	43	20 25 32	432	433	431	432	433	431	432	433											63
16.7 22.0 28.0	1000	41	40 50 63	412	413	411	412	413	411	412	413	411										
	2500	52	40 50 63	522	523	521	522	523	521	522	523	521	522									
	4000	53	40 50 63	532	533	531	532	533	531	532	533	531	532	533								125
35.4 45.0 56.0	1000	51	80 100 125	512	513	511	512	513	511	512	513	511	512	513	511							
	2500	62	80 100 125	622	623	621	622	623	621	622	623	621	622	623	621	622						
	4000	63	80 100 125	632	633	631	632	633	631	632	633	631	632	633	631	632	633					250
73.0 90.0 113.0	1000	61	160 200 250	612	613	611	612	613	611	612	613	611	612	613	611	612	613	611				
	2500	82	160 200 250							822	823	821	822	823	821	822	823	821	822			
	4000	83	160 200 250							832	833	831	832	833	831	832	833	831	832	833		500
*2 99.0 122.0 118.0	1000	81	315 400 500							812	813	811	812	813	811	812	813	811	812	813	811	

NOTES:

*1. All available CIG Double Pumps are designated by the corresponding number of the dimensional drawings, available upon request.

*2. Delivery in GPM is for 1175 for CIG-81-315 and CIG-81-400 and 900 RPM for CIG-81-500

(Pump I must always be equal to or larger than Pump II with respect to frame size.)

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