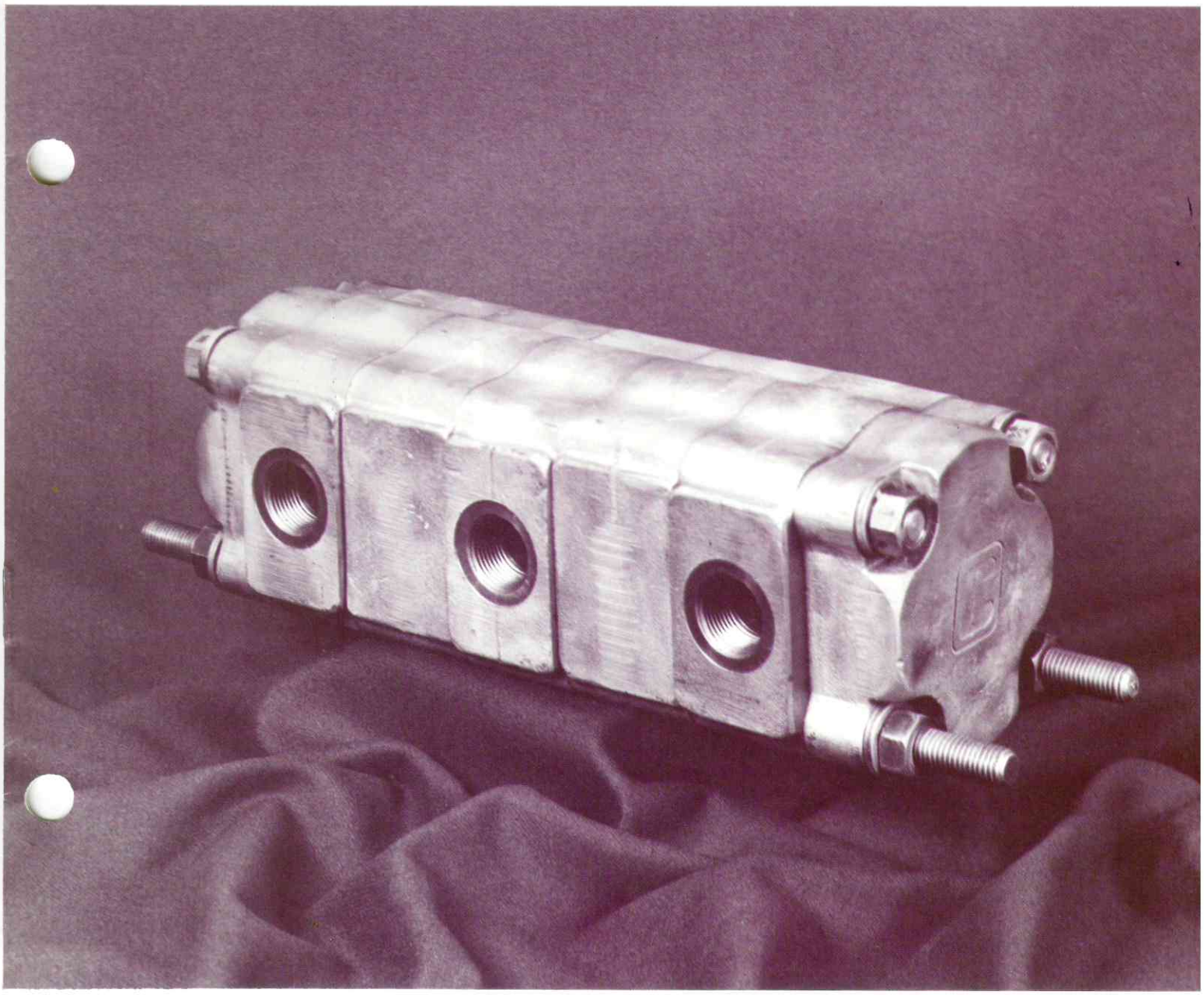
Oil Hydraulic Flow Dividers and Intensifiers

FD 30™
FD 50™
FD 75™

Commercia Intertech



a unique component that works when required and only to the extent necessary

Commercial's rotary flow dividers/pressure intensifiers are extremely versatile components which, when properly applied, will save on installation and operating costs, increase circuit versatility, offer convenience, and improve pump life. This catalog describes the FD30, 50, and 75 models which are assembled from standard heavy-duty gear pump components available throughout the world. Ideal applications are:

1. As flow equalizers to synchronize the operation of multiple cylinders or motors.
2. As flow dividers to distribute the pump flow according to the requirements of each system.
3. As pressure intensifiers to increase the pressure available to a particular system beyond the pump's relief valve setting or to reduce the time at which the pump must operate at maximum pressure.

Rotary flow dividers/pressure intensifiers offer advantages often overlooked when designing a hydraulic circuit. They are unique components which can be considered to "float" in the hydraulic circuit, working only when required, and then, only to the extent necessary. Unlike variable orifice types, rotary flow dividers operate on the principle that fluid horsepower input equals fluid horsepower output, less, of course, the small efficiency loss of the unit. If the pressure at an outlet port is lower than the inlet pressure, the low pressure section of the rotary flow divider acts as a motor. The energy expended across the motor is not wasted in generating heat but is applied through the interconnecting shaft to do work in the other sections.

The total output flow is equal to the input flow. Each section's output is in proportion to the gear width of the section. As a flow equalizer, each section has equal gear widths.

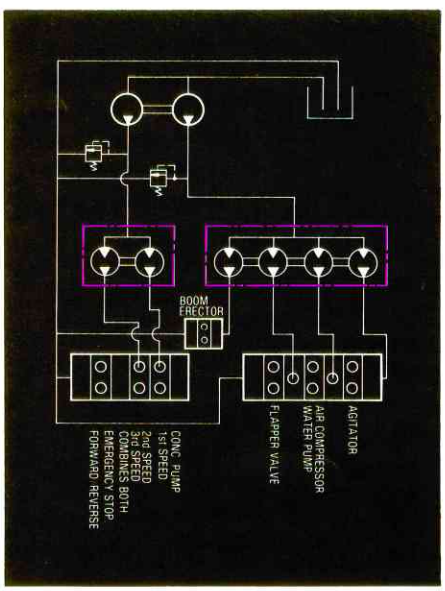
Rotary flow dividers operate automatically. No pilot signals or other devices are necessary to initiate their operation.

The economic advantages of rotary flow dividers/pressure intensifiers is best illustrated by the components they eliminate. Expensive multi-drive gear boxes, multiple pumps, and extensive plumbing and fittings can be replaced by a single pump and a flow divider remotely mounted in any convenient location. Problems, common in feeding multiple pumps, are eliminated because flow dividers are pressure-charged. Rotary flow dividers can be mounted in any position and, because they are self-lubricating, require no maintenance. No external drain lines or shafts are required. Extended studs are provided for easy mounting.

porting

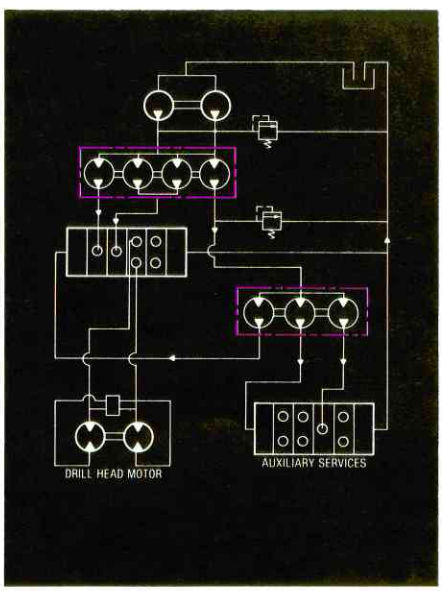
Standard porting of the FD30, 50, and 75 flow dividers is through the gear housing or bearing carrier. Porting through the port end covers is available on special request.

Two studs extend from each end of the flow divider for easy mounting.



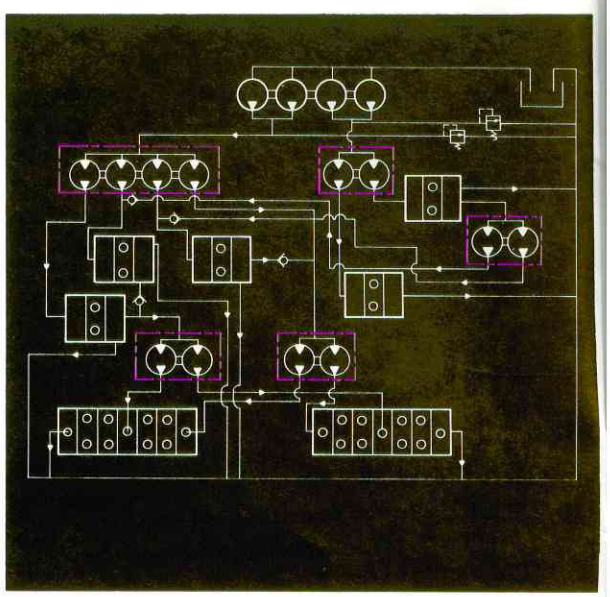
Concrete Pump

Concrete circuit pump providing intermittent high pressure and some speed variation. The two-section flow divider works in pressure intensification and speed control mode, the four-section flow divider simply splits flow to machine services.



Drill Rig (Fire Resistant Fluid)

Flow division is combined with a variable speed drill operation. Two primary flows go to the drill motor, third flow feeds auxiliary services, fourth flow is further divided to supply additional machine services including drill rod screwing and unscrewing.



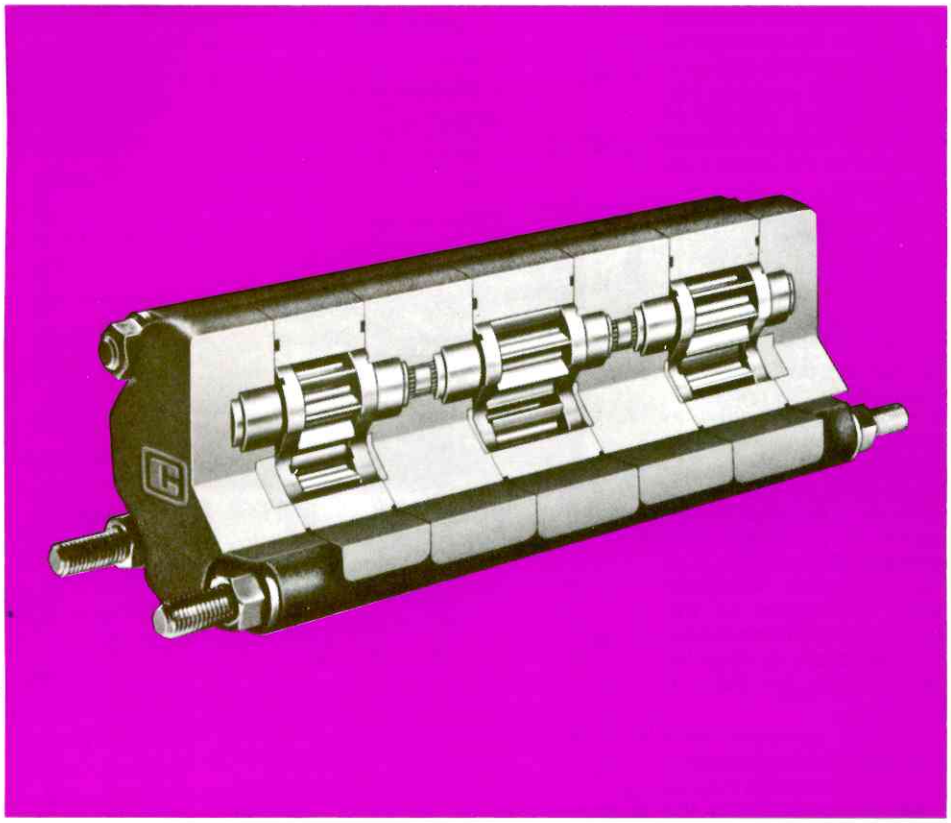
Mining Machine

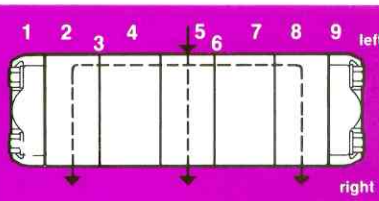
Use of flow dividers and mid-inlet valves on this mining machine circuit give maximum utilization of power as well as eliminating the need for a complex and costly gearbox driven, multiple pump unit.

how to specify and code

NOTE: In accordance with our policy of continuing product development, we reserve the right to change specifications shown in this catalog without notice.

Commercial's FD30™, FD50™, and FD75™ flow dividers are manufactured under one or more of the following patents: United States, 3,421,769; Great Britain, 1,028,735, and 1,157,170; Canada, 781,832; Australia, 401,461; German Federal Republic, 1,601,709; France, 1,428,763 and 1,521,300; Italy, 746.701; and Sweden, 320,855.



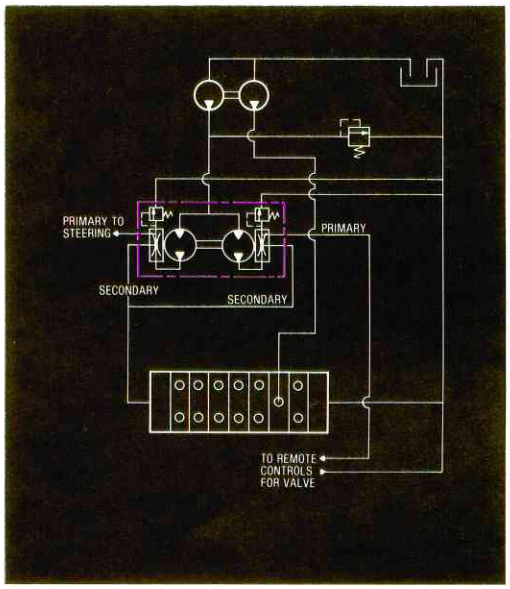


The full assembly code combines individual codes for port end covers, gear housings, and bearing carriers as selected to do the job you require. Here is an example of the procedure:

FD50B Flow Divider

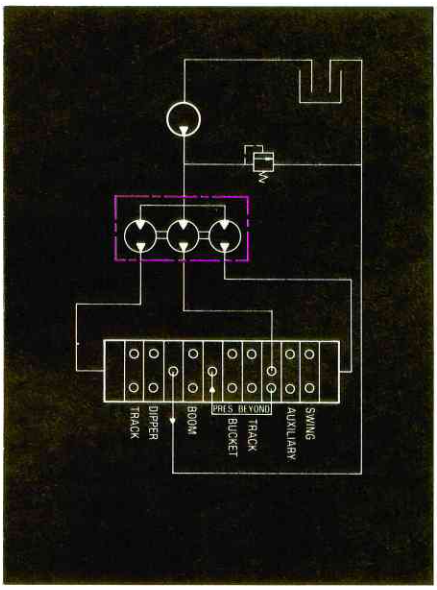
Assembly Code:
FD50B BY OD12-1E OJ25-1E UD10 BY

Flow Divider	FD
Series	50
Model	B
1. Port End Cover	BY
2. Gear Housing	OD12
3. Connecting Shaft (Not Shown)	1
4. Bearing Carrier	E
5. Gear Housing	OJ25
6. Connecting Shaft (Not Shown)	1
7. Bearing Carrier	E
8. Gear Housing	UD10
9. Port End Cover	BY



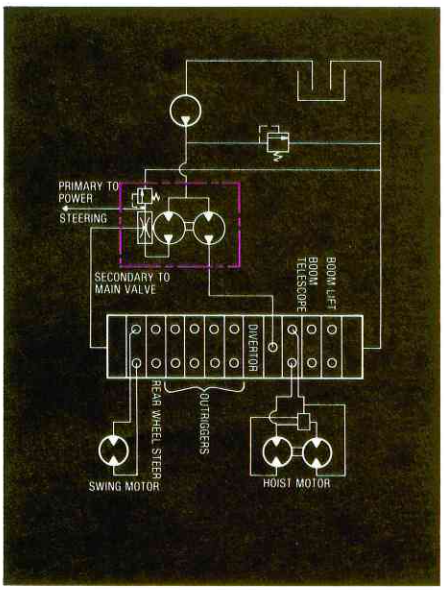
Container Handler

Flow divider with priority outlet valves assures constant, independent flow to two essential services on container sideloaders — steering and remote control circuit. Other flows supply lifting and auxiliary services.



Excavator

Excavator circuit using the special features of flow divider and mid-inlet sections in valve to give intermittent high pressures to essential machine services.



Telescopic Crane

Flow divider with a priority outlet valve combine to guarantee power to steering circuit. Second flow provides two-speed lifting. Secondary flow of priority valve helps supply auxiliary services.

performance data

Flow dividers operate most efficiently with gear sizes of 1" or larger and at speeds from 700 to 1300 rpm. Therefore, when sizing a flow divider, it is important to keep these two points in mind. It is also good practice to avoid specifying flow dividers with all $^1/_2$" or $^3/_4$" gears.

Whenever possible, position the inlet port nearest the largest gear unit. Normally, the largest gear section should be in the center of the unit.

Applications involving gear rotational speeds below 400 rpm, or exceeding 1300 rpm and/or 175 bar/2500 psi should be referred to Technical Service Department.

how to select the proper flow divider

First, assume your circuit requires a pump output of 55 gpm to be split into 25, 18 and 12 gpm.

From the output graphs, you will see that:

1. The 2" — FD30 gears produce about 1600 rpm at 25 gpm. This is above the recommended operating speed.
2. The 2" — FD50 gears, at 25 gpm, operate at an acceptable speed of about 1200 rpm. By checking across the 1200 rpm band on the output chart, you find that $1^1/_2$" and 1" gear sections will supply the other required flows of 18 and 12 gpm.

The FD75 could also be considered with 2", $1^1/_2$" and 1" gears operating at about 900 rpm.

The specific application requirements, along with unit size, weight and price differences, would determine whether the FD50 or 75 would be the better choice.

pressure intensification

Any rotary flow divider has the potential for pressure intensification.

Consider the following example of a pump supplying flow to a two section (equal gear width) flow divider. There is relief protection between the pump and flow divider but no relief at the output of either flow divider section.

Figure 1 shows both flow divider outputs pressurized to 2000 psi. They may be driving motors, cylinders, etc. The input pressure is also 2000 psi*. Figure 2 shows one flow divider section taken off load for whatever reason, but the second section is still working at 2000 psi. The input pressure has dropped to 1000 psi because of the law of conservation of energy which reduces to the basic flow divider equation:

$$(TGW \times Pin) = (GW_1 \times P_1) + (GW_2 \times P_2)$$

or

$$Pin = \frac{(Gw_1 \times P_1) + (GW_2 \times P_2)}{TGW}$$

Where TWG = Total Gear Width

Note that the pressure (Pin) on the input side of the unit (1000 psi) has now been intensified to 2000 psi at P_2. If there is no relief protection at P_2, that section potentially can go to 5000 psi, if the load demands it, because the input pressure can rise to the relief valve setting of 2500 psi. This is an undesirable situation. **Adequate relief valve protection on the discharge side of each flow divider section is necessary to keep intensification within the limits of the unit.**

*The above numbers were used for illustrative purposes only. The actual input pressure may be 100 to 200 psi higher than the theoretical values shown because of ineffeciencies.

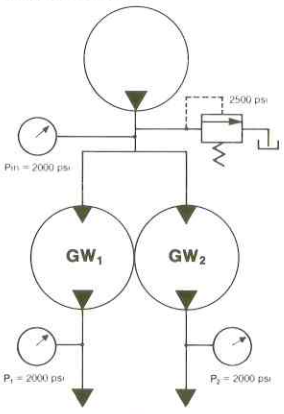


Figure 1

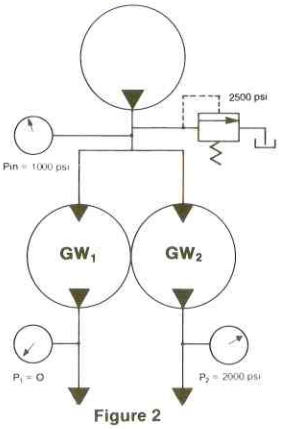
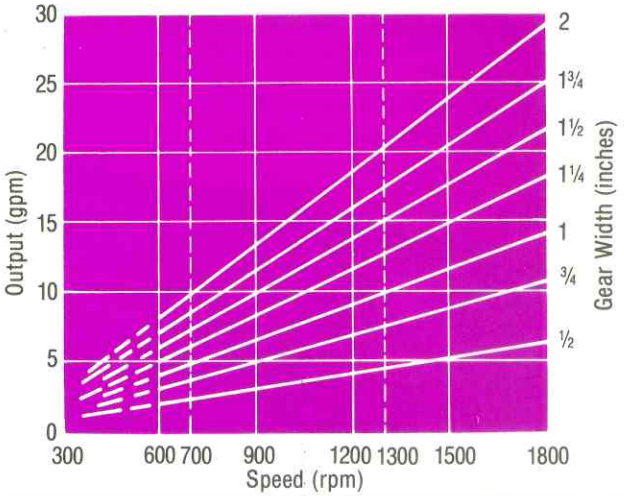


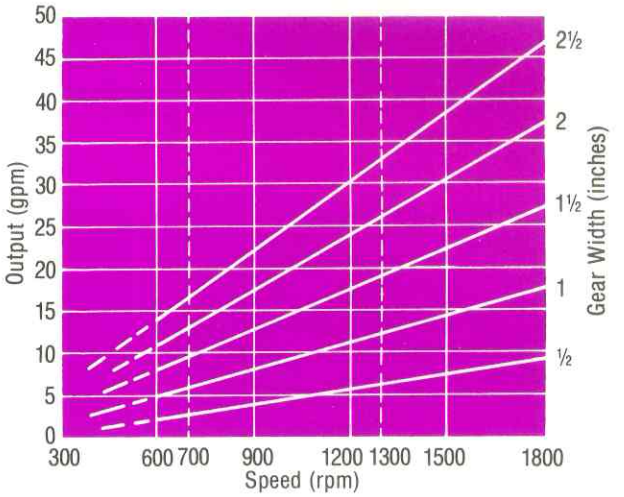
Figure 2

output flow

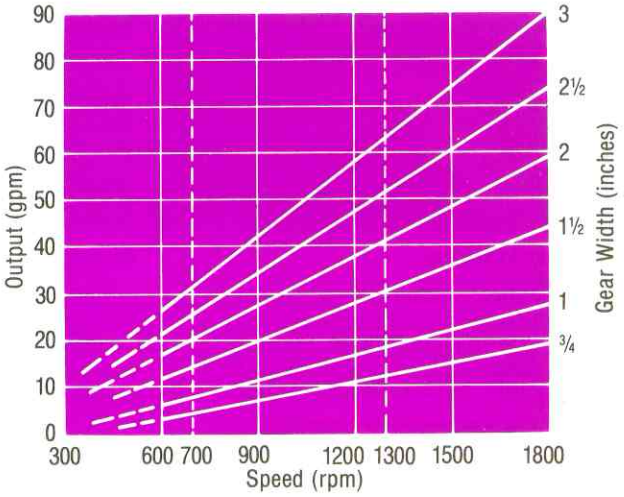
FD30™



FD50™



FD75™

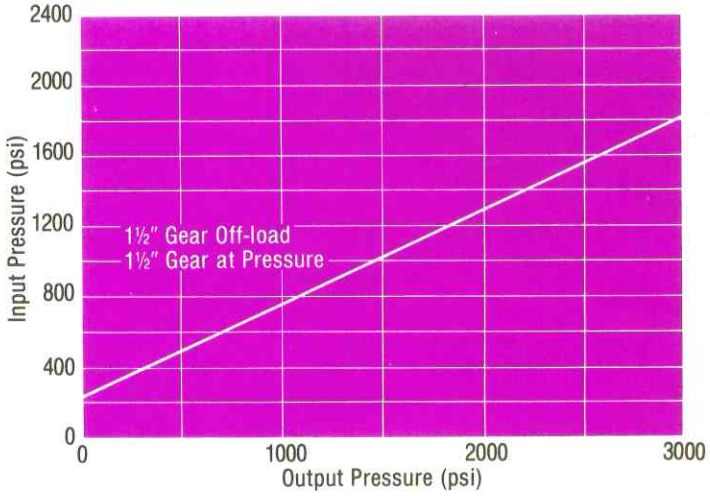


pressure intensification

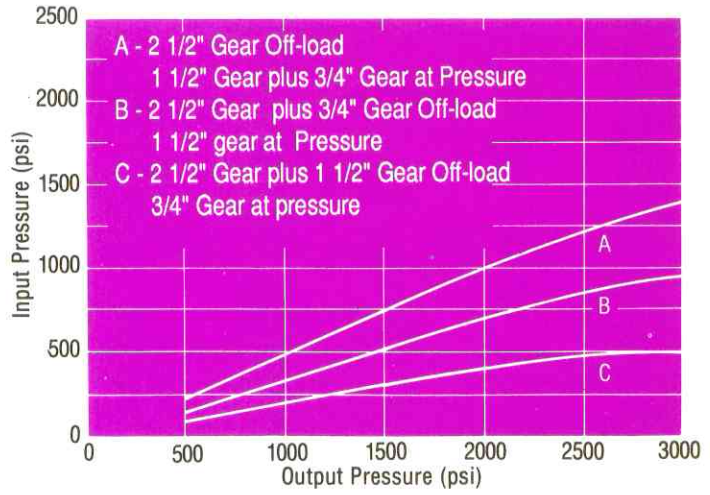
Average output flow • U.S. Gallons per Minute
• British Imperial Gallons per Minute
• Litres per Minute

Speed rpm	Gear Width (inches) ½	¾	1	1¼	1½	1¾	2
600	2 1.5 7.5	3 2.5 11	4 3.5 15	5 4 19	6 5 22.5	7 6 26.5	8 6.5 30.5
900	3 2.5 11	5 4 19	6.5 5.5 24.5	8 6.5 30.5	10 8.5 38	12 10 45.5	13.5 11 51
1200	4 3.5 15	7 6 26.5	9 7.5 34	11.5 9.5 43.5	14 11.5 53	16 13.5 60.5	18.5 15.5 70
1500	5 4 19	8 6.5 30.5	11.5 9.5 43.5	14.5 12 55	17.5 14.5 66	20.5 17 77.5	23.5 19.5 89
1800	6 5 22.5	10.5 8.5 39.5	14 11.5 53	18 15 68	21.5 18 81.5	25 21 94.5	29 24 110
2100	7 6 26.5	12.5 10.5 47.5	16.5 13.5 62.5	21 17.5 79.5	25 21 94.5	29.5 24.5 112	34 28.5 129

Speed rpm	Gear Width (inches) ½	¾	1	1¼	1½	1¾	2	2¼	2½
600	2 1.5 7.5	3.5 3 13	5 4 19	6.5 5.5 24.5	8 6.5 30.5	9.5 8 36	11 9 41.5	12.5 10.5 47.5	14 11.5 53
900	4.5 3.5 17	6 5 22.5	8.5 7 32	10.5 8.5 39.5	13 11 49	15 12.5 57	17.5 14.5 66	20 16.5 75.5	22 18.5 83.5
1200	6 5 22.5	9 7.5 34	12 10 45.5	15 12.5 57	18 15 68	21 17.5 79.5	24 20 91	27 22.5 102	30 25 114
1500	8 6.5 30.5	11.5 9.5 43.5	15 12.5 57	19 16 72	23 19 87	27 22.5 102	31 26 117	35 29 132	39 32.5 148
1800	9.5 8 36	14 11.5 53	18 15 68	23 19 87	27.5 23 104	32.5 27 123	37.5 31 142	42 35 159	47 39 178
2100	11 9 41.5	16 13.5 60.5	21.5 18 81.5	27 22.5 102	32.5 27 123	38.5 32 146	44 36.5 167	49.5 41 187	55 46 208



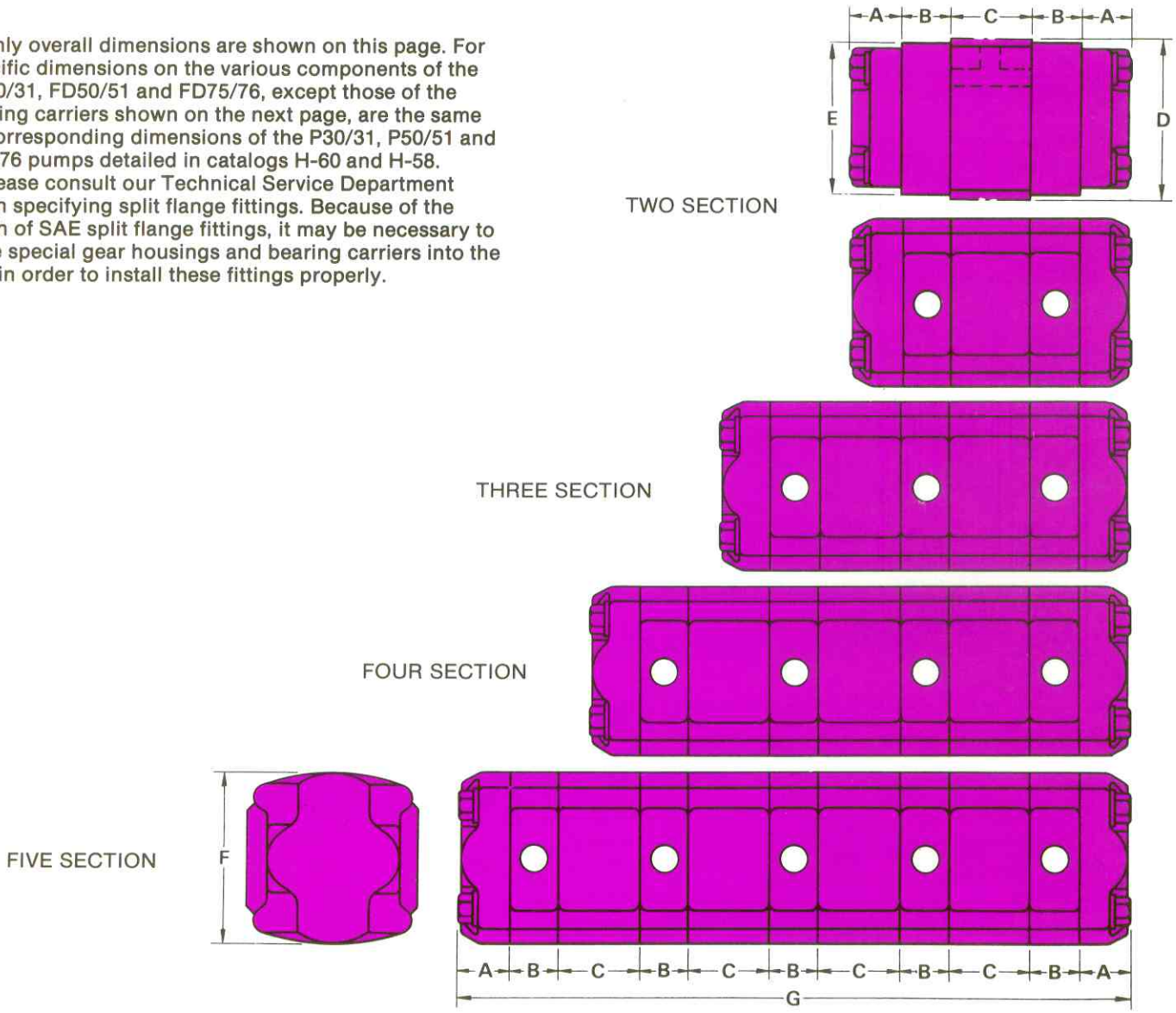
Speed rpm	Gear Width (inches) ¾	1	1¼	1½	1¾	2	2¼	2½	2¾	3
600	3 2.5 11	6 5 22.5	9 7.5 34	11.5 9.5 43.5	13.5 11 51	16.5 13.5 62.5	18.5 15.5 70	21 17.5 79.5	23 19 87	26 21.5 98.5
900	7 6 26.5	11 9 41.5	15 12.5 57	19 16 72	23 19 87	27 22.5 102	30 25 114	34 28.5 129	38 31.5 144	42 35 159
1200	11 9 41.5	17 14 64.5	22 18.5 83.5	27 22.5 102	32 26.5 121	37.5 31 142	42 35 159	48 40 182	52.5 43.5 199	58 48.5 220
1500	15 12.5 57	22 18.5 83.5	29 24 110	35.5 29.5 134	41.5 34.5 157	48 40 182	54.5 45.5 206	61 51 231	67 56 254	74 61.5 280
1800	19 16 72	27.5 23 104	35.5 29.5 134	43.5 36 165	51 42.5 193	59 49 223	66 55 250	74 61.5 280	81.5 68 308	90 75 341
2100	22 18.5 83.5	33 27.5 125	42 35 159	51.5 43 195	60 50 227	69.5 58 263	78 65 295	87 72.5 329	96.5 80.5 365	106 88.5 401



dimensional data

Only overall dimensions are shown on this page. For specific dimensions on the various components of the FD30/31, FD50/51 and FD75/76, except those of the bearing carriers shown on the next page, are the same as corresponding dimensions of the P30/31, P50/51 and P75/76 pumps detailed in catalogs H-60 and H-58.

Please consult our Technical Service Department when specifying split flange fittings. Because of the width of SAE split flange fittings, it may be necessary to code special gear housings and bearing carriers into the unit in order to install these fittings properly.



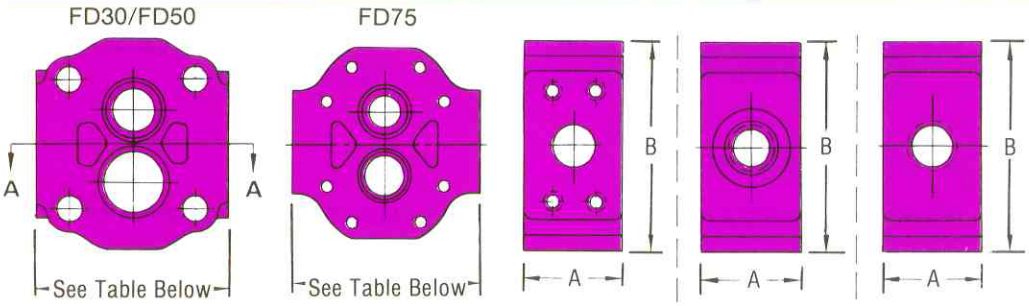
Model	A	B	C	D	E	F	G Two Section	G Three Section	G Four Section	G Five Section
FD30	44.4 1.75	19.0 .75 + Gear Width	63.5 2.50	131.8 5.19 to 146.0 5.75	134.9 5.31 to 138.1 5.44	136.5 5.37	190.5 7.50 + Gear Widths	273.0 10.75 + Gear Widths	355.6 14.00 + Gear Widths	438.2 17.25 + Gear Widths
FD50	44.4 1.75	19.0 .75 + Gear Width	73.0 2.88	131.8 5.19 to 146.0 5.75	134.9 5.31 to 171.4 6.75	152.4 6.00	200.0 7.88 + Gear Widths	292.1 11.50 + Gear Widths	384.2 15.12 + Gear Widths	476.3 18.75 + Gear Widths
FD75	50.8 2.00	25.4 1.00 + Gear Width	76.2 3.00	187.3 7.38 to 200.0 7.88	190.5 7.50 to 193.7 7.62	200.0 7.88	228.6 9.00 + Gear Widths	330.2 13.00 + Gear Widths	431.8 17.00 + Gear Widths	533.4 21.0 + Gear Widths

bearing carriers

This catalog contains codes for most widely used models only. Complete codes for assembling all configurations are readily available from our sales representatives.

FD30™ /FD50™ /FD75™

dimensional data shown in mm / inches



Model	A	B
FD30	63.5 / 2.50	136.5 / 5.38
FD50	73.0 / 2.88	152.4 / 6.00
FD75	76.2 / 3.00	200.0 / 7.88

FD30/FD50/FD75 CODE SELECTION

Section A-A (back / front)	Port Size (inches) Left	Port Size (inches) Right	Split Flange Ports Width mm / inches FD30	FD50	FD75	Split Flange Ports Code SAE / Metric	Straight Thread Ports Width mm / inches FD30	FD50	FD75	Straight Thread Ports Code SAE / Metric	Pipe Thread Ports Width mm / inches FD30	FD50	FD75	Pipe Thread Ports Code NPT / BSPP
	NONE	NONE	131.8 / 5.19	131.8 / 5.19	187.3 / 7.38	B / B	131.8 / 5.19	131.8 / 5.19	187.3 / 7.38	B / B	131.8 / 5.19	131.8 / 5.19	187.3 / 7.38	B / B
	NONE	NONE	131.8 / 5.19	131.8 / 5.19	187.3 / 7.38	E / E	131.8 / 5.19	131.8 / 5.19	187.3 / 7.38	E / E	131.8 / 5.19	131.8 / 5.19	187.3 / 7.38	E / E
	1	NONE	144.5 / 5.69	144.5 / 5.69	198.5 / 7.81	J / T	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	F / Q	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	M / X
	1¼	NONE				K / V				G / R				N / Y
	1½	NONE				L / W				H / S				P / Z
	NONE	¾	144.5 / 5.69	144.5 / 5.69	198.5 / 7.81	GR / TR	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	GJ / QJ	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	BX / DG
	NONE	1				MT / FM				BK / ML				KZ / DF
	NONE	¾	144.5 / 5.69	144.5 / 5.69	198.5 / 7.81	FD / KT	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	JH / BZ	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	CV / DM
	NONE	1				JG / RP				PC / MK				NK / MN
	1	¾	142.9 / 5.62	142.9 / 5.62	196.9 / 7.75	HR / VR	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	HJ / SJ	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	GX / FG
	1¼	¾				PR / WR				MJ / XJ				HX / SG
	1½	¾				QR / XR				RJ / ZJ				RX / XG
	1¼	1				NT / QM				PK / PL				LZ / GF
	1½	1				RT / VM				RK / QL				TZ / MF
	1	¾	142.9 / 5.62	142.9 / 5.62	196.9 / 7.75	GD / PT	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	PH / PZ	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	GV / NM
	1¼	¾				MD / QT				RH / QZ				MV / PM
	1½	¾				PD / ZT				WH / YZ				NV / TM
	1¼	1				PG / TP				QC / QK				TK / QN
	1½	1				RG / ZP				VC / SK				ZK / TN
	1	¾	142.9 / 5.62	142.9 / 5.62	196.9 / 7.75	WL / FP	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	MC / CP	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	VG / HP
	1	¾	142.9 / 5.62	142.9 / 5.62	196.9 / 7.75	ZL / GP	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	SC / DP	146.0 / 5.75	146.0 / 5.75	200.0 / 7.88	WG / LP