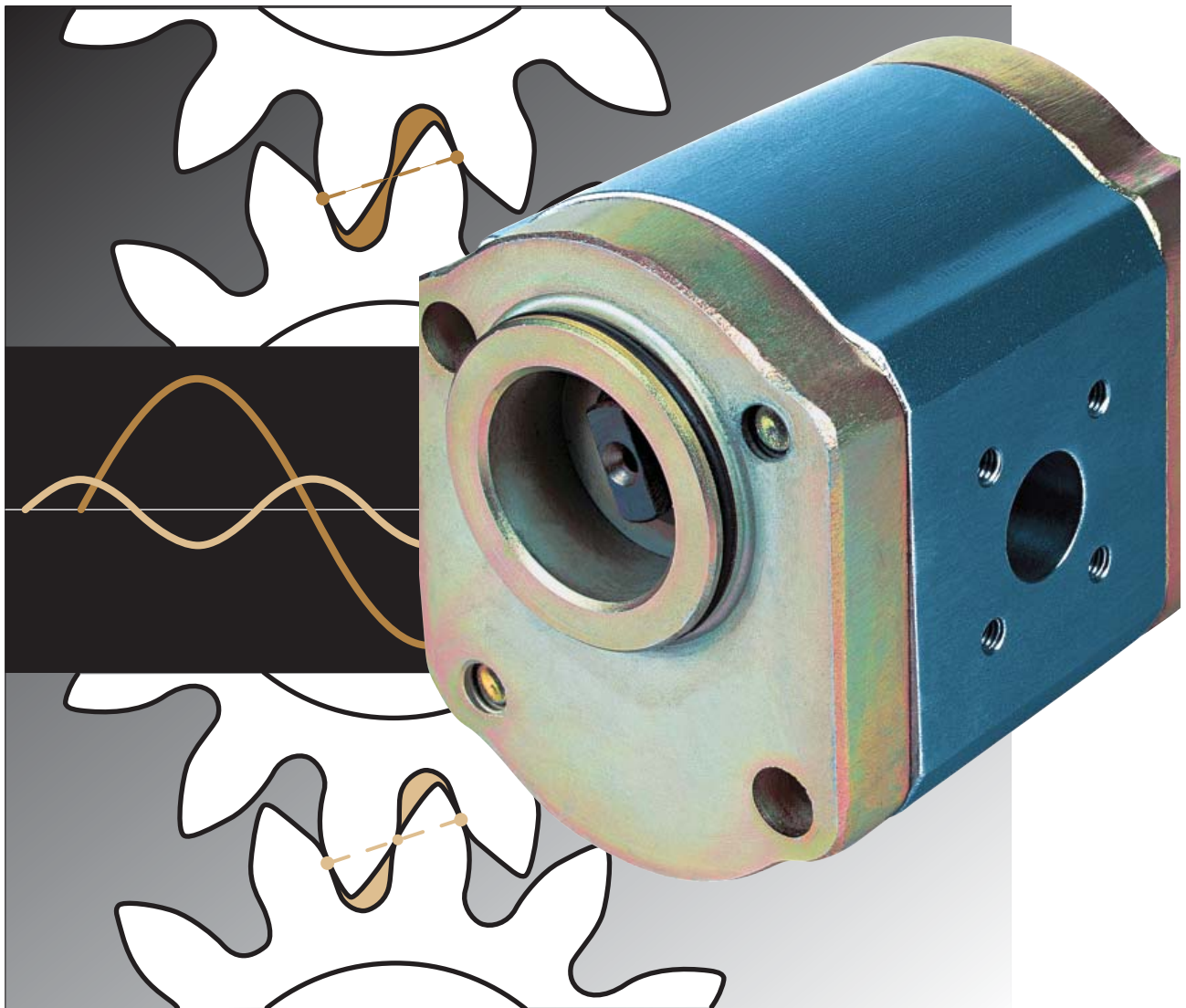


**NEW!**



**CALMA PUMP SERIES**  
**A NEW STANDARD FOR NOISE REDUCTION**





## THE POWER OF CALMA

### Low noise across a wide speed range

Concentric is a specialist in hydraulic gear product technology. The company has a long standing tradition of developing gear products that meet the unique needs of specific markets and applications. In the electric vehicle markets low noise operation across a wide speed range is a key requirement. This capability enables operator comfort and improved control and positioning for various vehicle functions.

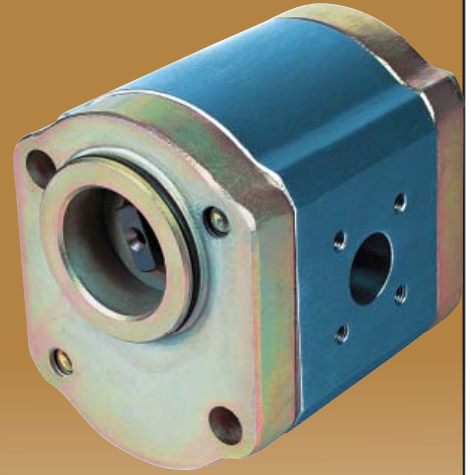
Concentric established itself as a leader in low noise gear products a decade ago when it introduced its WQ series (quiet) gear pump product line featuring dual flank engagement of the gear teeth to reduce the amplitude of the pressure pulsations introduced into the hydraulic system. The size of the pressure pulsation from the pump determines the pump noise levels.

Now Concentric is introducing the Calma Series which sets the new standard for low noise operation. Available in displacements from 6.2cc – 23.7cc the Calma pump's pressure pulsation is minimized to 25%. Calma's efficiency, wide speed range and low noise performance are the result of extensive research and development.

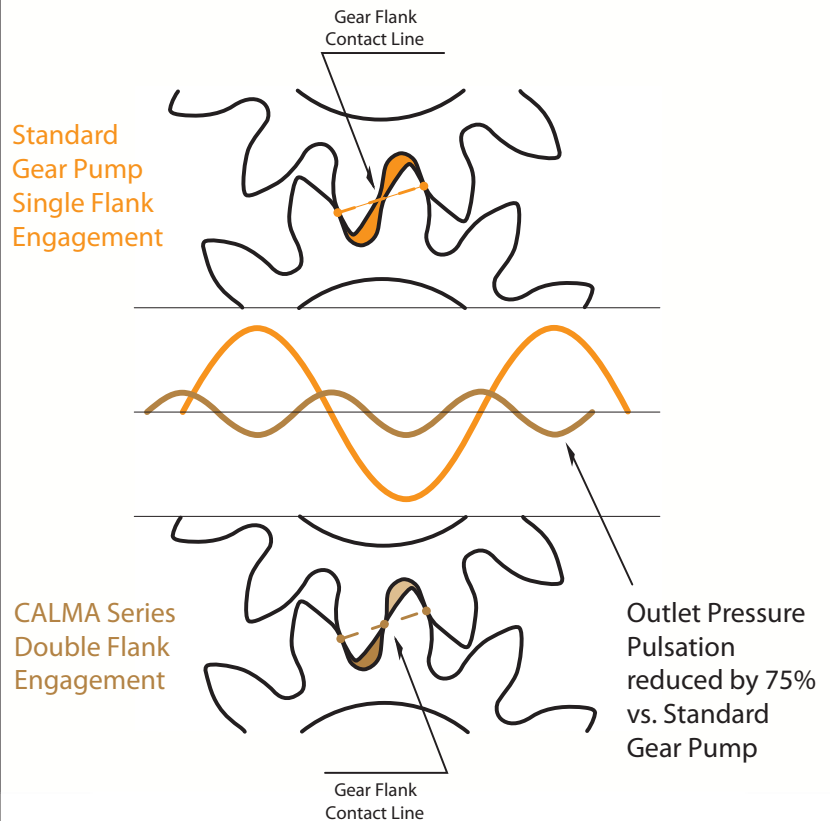
Calma is especially well suited to applications on electric counterbalanced lift trucks, warehouse lift trucks, electric aerial work platforms and other mobile equipment where low noise, low speed and high efficiency are required.

## Calma Pump Features:

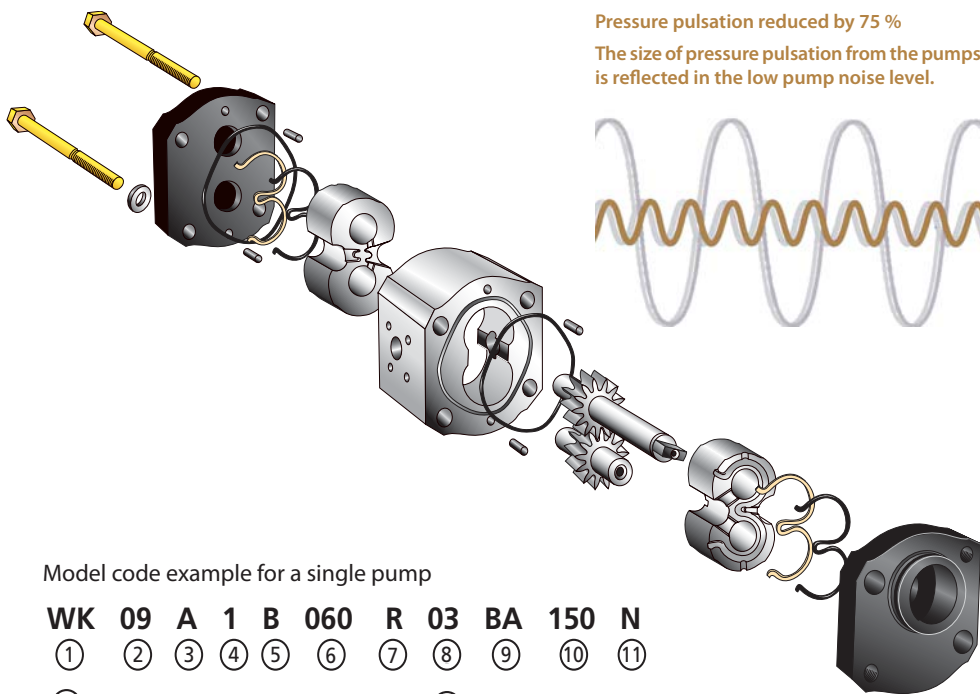
- 97% Typical Volumetric Efficiency
- Wide Speed Range
- Substantial Noise Reduction
- Pressure Pulsation Reduced by 75%
- A newly engineered tooth geometry
- An innovative approach to gear flank engagement
- Reduced trapped oil volume
- Compares favorably with more expensive internal gear pumps on efficiency and low noise operation



## Calma Series vs. Traditional Gear Pump



Pictures above are used with the kind permission of eg: Atlet, BT, Huddig, Scania, Toro and Volvo Construction Equipment. The right to modifications for technical improvements is reserved.



Pressure pulsation reduced by 75 %  
The size of pressure pulsation from the pumps is reflected in the low pump noise level.

Model code example for a single pump

**WK 09 A 1 B 060 R 03 BA 150 N**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

- ① = Type
- ② = Range
- ③ = Design A - Std. Calma Design L - L (WSR)\*
- ④ = # of sections
- ⑤ = Seal material
- ⑥ = Displacement per section
- ⑦ = Rotation
- ⑧ = Mounting flange
- ⑨ = Drive shaft
- ⑩ = Portings
- ⑪ = Valve options

\* L (WSR) Wide operating speed range with low speed capability n=400 rpm at max. operating pressure  $p_2$

## CALMA DESCRIPTION

The key performance features of Calma are its low noise operation over a wide speed range. Like its predecessor the WQ pump Calma is a three piece modular design. The pump body is manufactured from high strength aluminum alloy. The mounting flange and rear cover are of cast iron.

The Calma pumps come in single or multiple configuration of up to four sections.

For optimum strength, gears and shafts are precision machined in one piece. The 13-tooth gear geometry has been optimized for low noise level.

All shaft bearing surfaces are Teflon® coated and designed for long service life. They are continually cooled and lubricated by a controlled flow of fresh oil. This enables operation across a wide speed range at very high loads.

Multiple pumps in the Calma range are very compact. The drive shaft is capable of transmitting high torque even to the rear section. Each section has its own inlet and pressure ports. Single inlet features are optional for 2 and 3 section units.

A wide range of mounting flanges and port sizes are available to meet international standards.

### General data

Displacement (V)	0.378 - 1.446 in <sup>3</sup> /rev (6.2 - 23.7 cc/rev)
Wide Speed Range (WSR) (n)	400 - 4000 rpm
<b>Pressure</b>	
Operating pressure ( $p_2$ )	max. 3625 psi (250 bar)
Operating temperatures (t)	max. 221°F (105°C)
Typical volumetric efficiency	97%
The maximum values for n, $p_2$ and t for a given pump specification may be applied simultaneously.	

### Options

- Mounting flanges - SAE, rectangular and through bolt.
- Shafts - Tang, spline, tapered or straight with key.
- Ports - Thread or flange.
- Rotation - CW or CCW.
- Integrated valves.
- Single inlet for multiple units.

## PERFORMANCE DATA

### Operating pressure range

#### Inlet port:

continuous, minimum	-6 In. Hg.
intermittent, minimum	-10 In. Hg.
maximum	+29.0 In. Hg.

#### Outlet port (See tables on pages 6-10)

### Speed range

**Minimum speed** for all pump sizes is n=500 rpm at maximum operating pressure. L (WSR) Wide operating speed range with low speed capability adds min. speed n=400 rpm at max. operating pressure.

**Maximum speed for single pumps** depends on the pump model in question and can be identified from tables on pages 6-9 for respective models.

**Maximum speed for multiple pumps** is the lowest one specified (See tables on pages 6-9) for any section of the configuration in question.

Noise performance data according to page 5.

### Hydraulic Fluids

The use of HL-or HLP-hydraulic oil according to DIN 51 524 is recommended.

The **permissible viscosity** for all Calma pumps is from 59 to 3465 SSU (10 to 750 cSt). The recommended operating viscosity range is from 74 to 185 SSU (16 to 40 cSt).

The **permissible cold start viscosity** is 9240 SSU (2000 cSt).

We recommend you contact Concentric before using fire resistant or bio-degradable fluids.

**Viscosities** (when operating at above temperature limits) have to remain within the range specified under "Hydraulic Fluids".

### Temperature range

Ambient temperature	min. -13°F (-25°C) max. +176°F (+80°C)
---------------------	---

### Fluid temperature

continuous operation	max. +194°F (+90°C)
intermittent operation	max. +221°F (+105°C)

### Please note

#### Fluid cleanliness

Fluid cleanliness according to ISO 4406/1999[18/14] or better is required in order to assure the pump's high level of efficiency in the long term.

#### Drive arrangement

Flexible couplings are preferred for direct drives. Please contact Concentric for indirect drive requirements. Pumps with outboard side load bearing are available.

#### Mounting position

As required.

#### Symbols

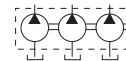
Single pump



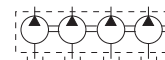
Double pump



Triple pump



Quadruple pump



# Calma Design - Two Versions

## Design Code "A"

### Calma WK9A (Standard Design)

Standard design offers low noise operations within the common operating speed range.

Size Code	Displacement in/rev (cc/rev)	Operating Pressure (P <sub>2</sub> ) psi (bar)	Max. Speed rpm	Min. Speed rpm
060	0.378 (6.2)	3625 (250)	4000	500
080	0.506 (8.3)	3625 (250)	4000	500
110	0.689 (11.3)	3625 (250)	3600	500
140	0.884 (14.5)	3625 (250)	3300	500
160	1.006 (16.5)	3625 (250)	3000	500
190	1.196 (19.6)	3625 (250)	3000	500
230	1.446 (23.7)	3045 (210)	2800	500

- Operating pressure P<sub>2</sub>: max. 20 sec. loaded following 10 sec. minimum unloaded. Pressure rating at min. speed is max. 1450 psi / 100 bar (intermittent).  
 - Operating pressure rating refers to flanged port configuration (3045 psi / 210 bar for threaded ports).  
 - Viscosity: minimum 59 SSU (10 mm<sup>2</sup>/s)

## Design Code "L"

### Calma WK9L (WSR Design)

Wide operating speed range (WSR) offers low noise operation within the common operating speed range as well as additional low speed capability. This design incorporates additional side plates.

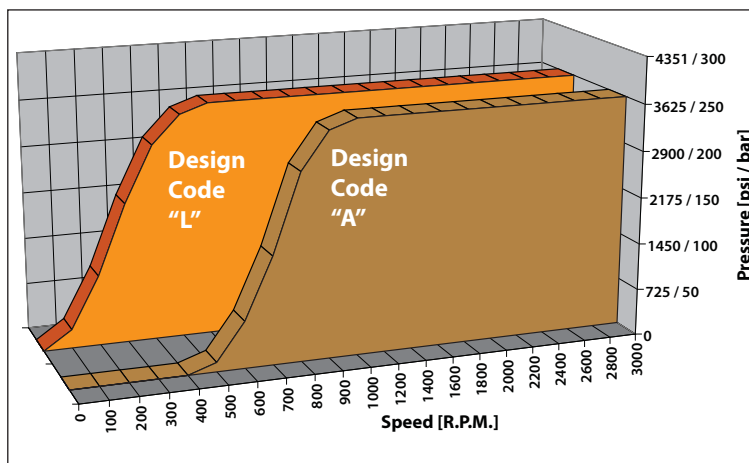
Size Code	Displacement in/rev (cc/rev)	Operating Pressure (P <sub>2</sub> ) psi (bar)	Max. Speed rpm	Min. Speed rpm
060	0.378 (6.2)	3625 (250)	4000	400
080	0.506 (8.3)	3625 (250)	4000	400
110	0.689 (11.3)	3625 (250)	3600	400
140	0.884 (14.5)	3625 (250)	3300	400
160	1.006 (16.5)	3625 (250)	3000	400
190	1.196 (19.6)	3625 (250)	3000	400
230	1.446 (23.7)	3045 (210)	2800	400

- Operating pressure P<sub>2</sub>: max. 20 sec. loaded following 10 sec. minimum unloaded. Pressure rating at min. speed is max. 1450 psi / 100 bar (intermittent).  
 - Operating pressure rating refers to flanged port configuration (3045 psi / 210 bar for threaded ports).  
 - Viscosity: minimum 59 SSU (10 mm<sup>2</sup>/s)

- Wide Operating Speed feature (Design Code "L") offers reduced minimum speed.  
 Valid at P<sub>2</sub> operating pressure, max. 2.5 sec. load duration at 400 rpm.

NOTE - Reduced operating pressure results in longer permissible load duration (> 2.5 sec.) and/or reduced speed < 400 rpm.

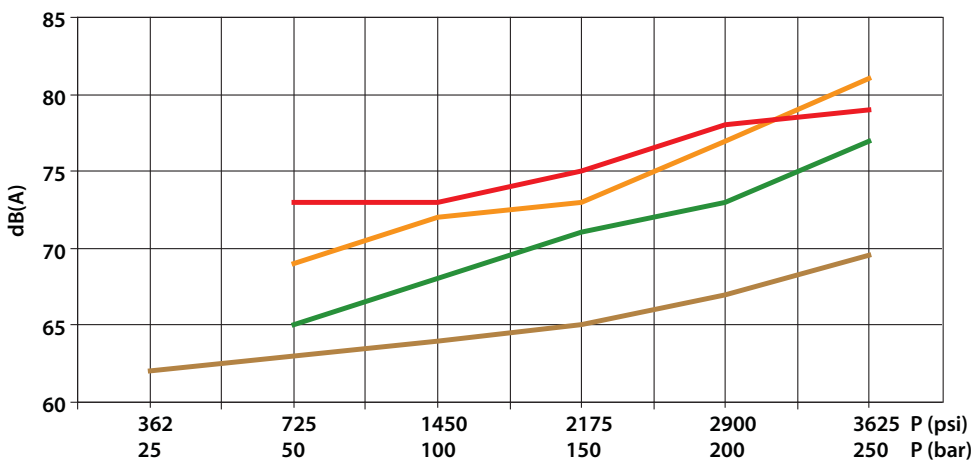
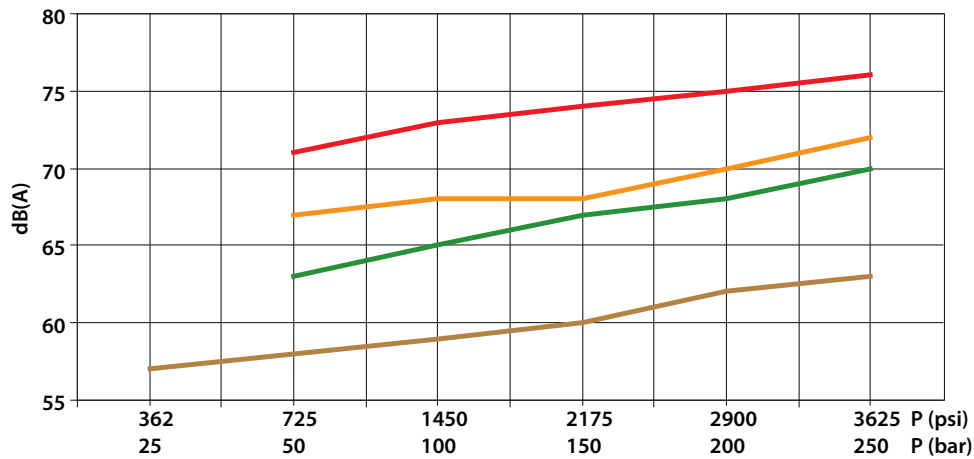
# Permissible Pressure vs. Speed Capability



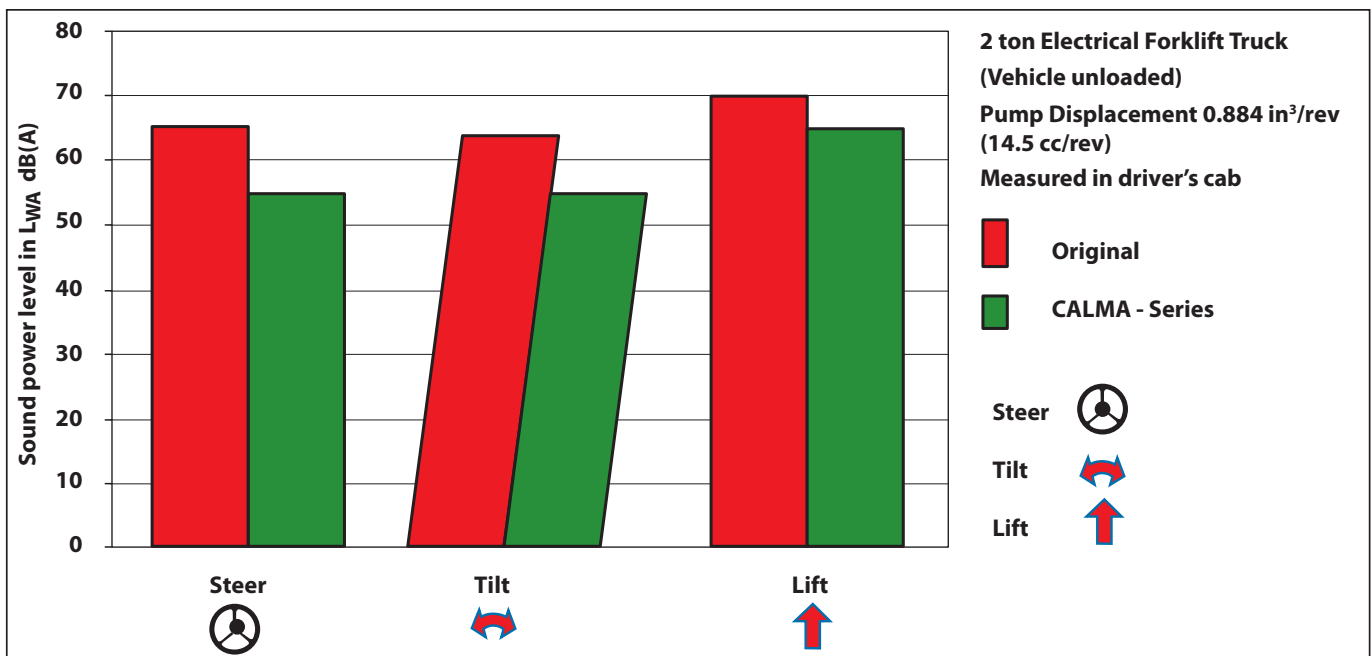
## Concentric offers two different versions of Calma pumps:

- **Code Design "A"**  
**Calma WK9A.** Standard design offers low noise operations within the common operating speed range.
- **Code Design "L"**  
**Calma WK9L.** Wide operating speed range offers low noise operation within the common operating speed range as well as additional low speed performance and efficiency. The **L** option is ideally suited for applications like the steering idle mode on a electrical forklift truck. This design incorporates additional side plates.

# CALMA Sound Power Level in $L_{WA}$

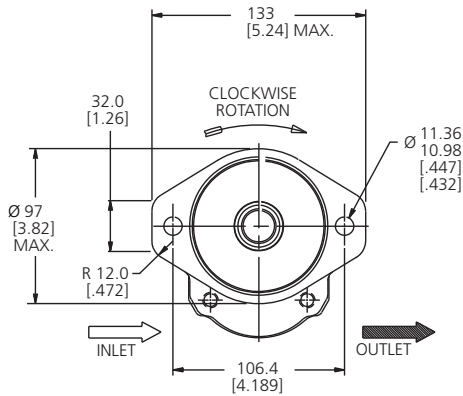


## Sound Comparison

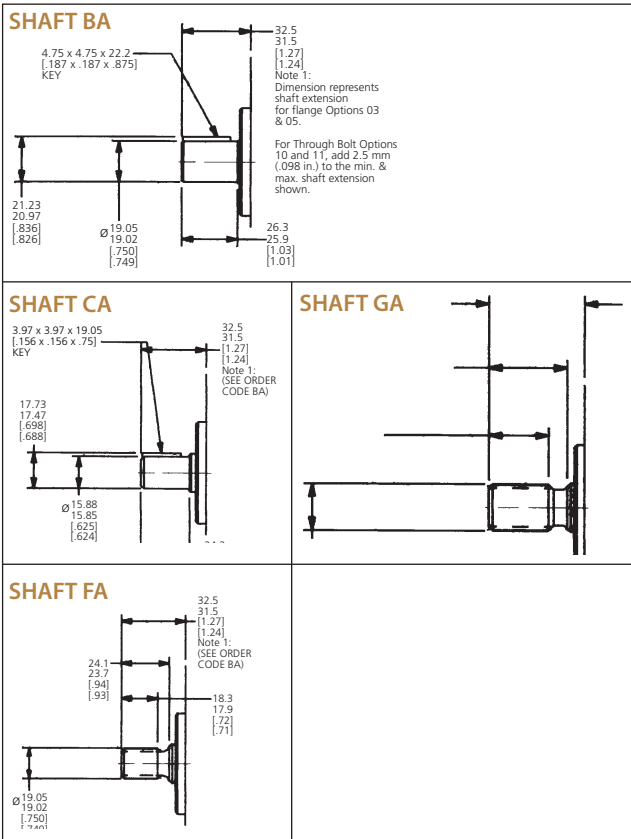
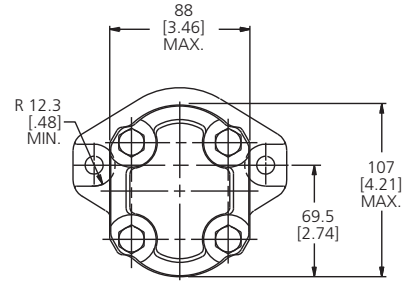
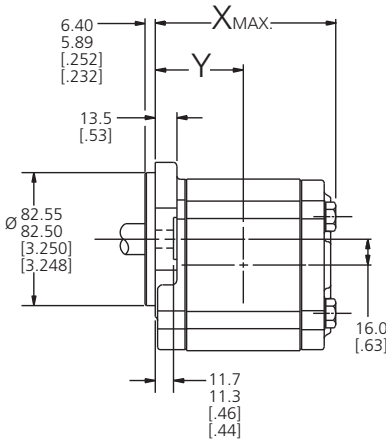




## FLANGE CODE 03 (SAE "A" 2-BOLT)



For counterclockwise rotation, inlet and outlet are reversed.



All shaft options on pages 11 and 12 can be used with this flange option. We have just shown the most commonly used shaft options on the left. Port options available, see page 13 for details.

Model code example for a single pump

**WK 09 A 1 B 080 R 03 FA 101 N**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

- ① = Type WK - Calma Pump
- ② = Range 09 - WK900 Series
- ③ = Design A - Std. Calma  
Design L - L (WSR)\*
- ④ = # of sections  
1 - Single  
2 - Duplex  
3 - Triplex  
4 - Quadruplex
- ⑤ = Seal material B - Buna
- ⑥ = Displacement per section  
(See Code Displ. below)
- ⑦ = Rotation  
R - Clockwise  
L - Counter clockwise
- ⑧ = Mounting flange  
03 SAE A 2-Bolt
- ⑨ = Drive shaft  
BA - SAE A Key Ø 0.75"  
CA - SAE A Key Ø 0.625"  
FA - SAE A Spline 9-Tooth  
GA - SAE A Spline 11-Tooth
- ⑩ = Portings  
(see page 13)
- ⑪ = Valve options N - None

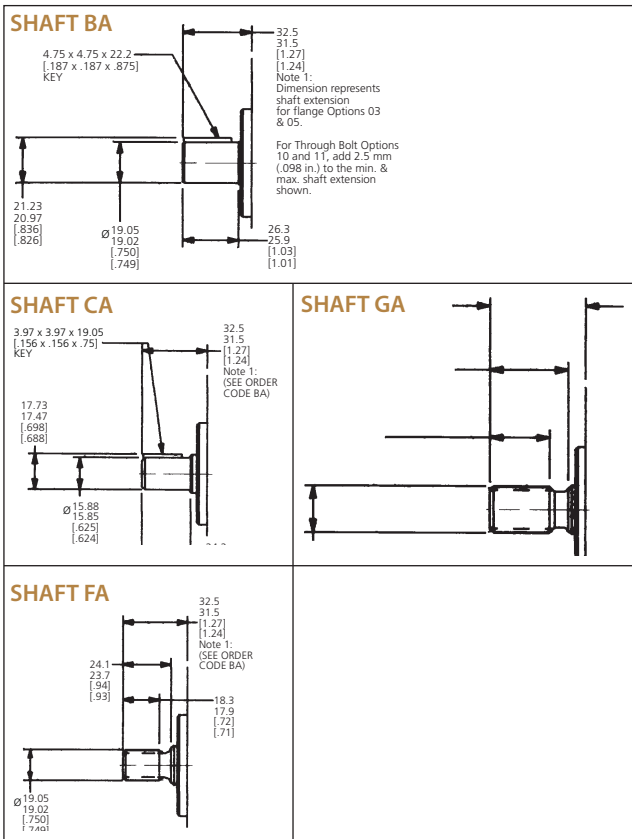
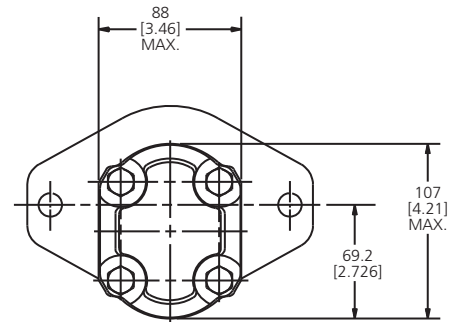
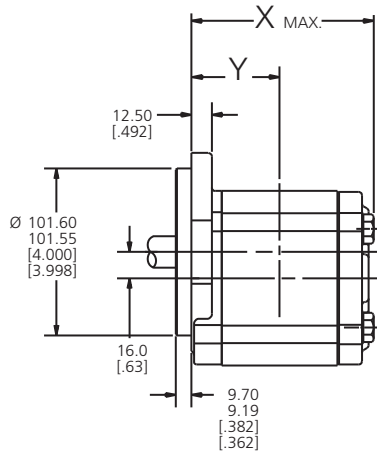
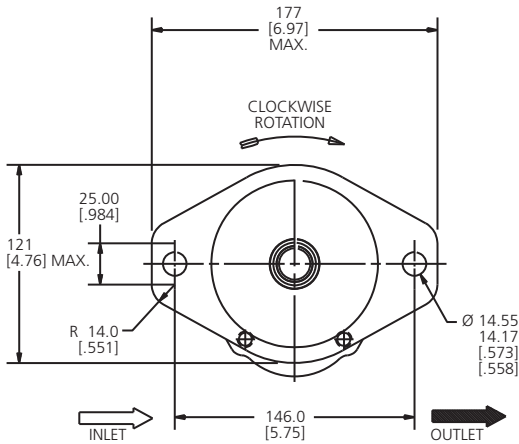
Size Code	Operating pressure P2		Maximum speed		rpm	Dimensions**		Weight (approx.) kg [lbs]
	Displacement cc/rev	in <sup>3</sup> /rev	bar	psi		X max. mm [in]	Y mm [in]	
060 -	6.2	0.378	250	3625	4000	92.7 [3.65]	44.0 [1.73]	3.6 [7.9]
080 -	8.3	0.506	250	3625	4000	95.0 [3.74]	45.5 [1.79]	3.7 [8.1]
110 -	11.3	0.689	250	3625	3600	100.1 [3.94]	47.7 [1.87]	3.8 [8.4]
140 -	14.5	0.884	250	3625	3300	103.9 [4.09]	50.0 [1.97]	4.0 [8.8]
160 -	16.5	1.006	250	3625	3000	107.5 [4.23]	51.4 [2.02]	4.1 [9.0]
190 -	19.6	1.196	250	3625	3000	111.3 [4.38]	53.7 [2.12]	4.2 [9.2]
230 -	23.7	1.446	210	3045	2800	117.2 [4.61]	56.6 [2.23]	4.4 [9.6]

\* Design Code "L" (WSR) Wide operating speed range with low speed capability n=400 rpm at max. operating pressure.

\*\* Displacements greater than 0.915 in<sup>3</sup> (15 cc) adds 0.188 in (4.8 mm) to X-dimension and 0.094 in (2.4 mm) to Y-dimension in L design.



## FLANGE CODE 05 (SAE B 2 BOLT)



All shaft options on pages 11 and 12 can be used with this flange option. We have just shown the most commonly used shaft options on the left. Port options available, see page 13 for details.

Model code example for a single pump

**WK 09 A 1 B 080 R 05 BA 102 N**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

- ① = Type WK - Calma Pump
- ② = Range 09 - WK900 Series
- ③ = Design A - Std. Calma Design L - L (WSR)\*
- ④ = # of sections  
1 - Single  
2 - Duplex  
3 - Triplex  
4 - Quadruplex
- ⑤ = Seal material B - Buna
- ⑥ = Displacement per section (See Code Displ. below)
- ⑦ = Rotation  
R - Clockwise  
L - Counter clockwise
- ⑧ = Mounting flange  
05 SAE B 2-Bolt
- ⑨ = Drive shaft  
BA - SAE A Key  $\varnothing$  0.75"  
CA - SAE A Key  $\varnothing$  0.625"  
FA - SAE A Spline 9-Tooth  
GA - SAE A Spline 11-Tooth
- ⑩ = Portings (see page 13)
- ⑪ = Valve options N - None

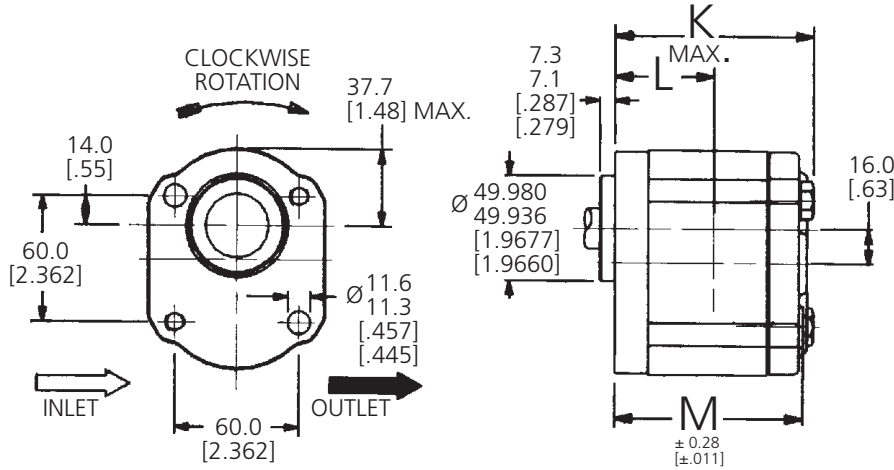
Size Code	Operating pressure P2		Maximum speed		Dimensions**		Weight (approx.) kg [lbs]	
	Displacement cc/rev	in <sup>3</sup> /rev	bar	psi	X max. mm [in]	Y mm [in]		
060 -	6.2	0.378	250	3625	4000	92.7 [3.65]	44.0 [1.73]	3.6 [7.9]
080 -	8.3	0.506	250	3625	4000	95.0 [3.74]	45.5 [1.79]	3.7 [8.1]
110 -	11.3	0.689	250	3625	3600	100.1 [3.94]	47.7 [1.87]	3.8 [8.4]
140 -	14.5	0.884	250	3625	3300	103.9 [4.09]	50.0 [1.97]	4.0 [8.8]
160 -	16.5	1.006	250	3625	3000	107.5 [4.23]	51.4 [2.02]	4.1 [9.0]
190 -	19.6	1.196	250	3625	3000	111.3 [4.38]	53.7 [2.12]	4.2 [9.2]
230 -	23.7	1.446	210	3045	2800	117.2 [4.61]	56.6 [2.23]	4.4 [9.6]

\* Design Code "L" (WSR) Wide operating speed range with low speed capability  $n=400$  rpm at max. operating pressure.

\*\* Displacements greater than 0.915 in<sup>3</sup> (15 cc) adds 0.188 in (4.8 mm) to X-dimension and 0.094 in (2.4 mm) to Y-dimension in L design.



**FLANGE CODES 10 & 11\*\*\***  
**(10 = THROUGH BOLT Ø 50 MM PILOT)**  
**(11 = SAME AS ORDER CODE 10,**  
**BUT OPPOSITE BOLT PATTERN)**



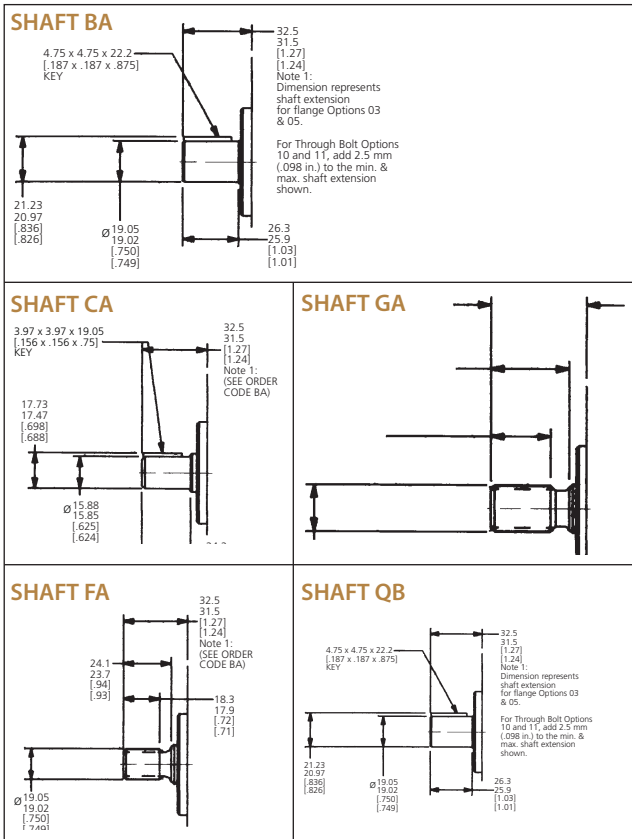
All shaft options on pages 11 and 12 can be used with this flange option. We have just shown the most commonly used shaft options on the left. Port options available, see page 13 for details.

Model code example for a single pump

**WK 09 A 1 B 110 R 10 FA 102 N**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

- ① = Type WK - Calma Pump
- ② = Range 09 - WK900 Series
- ③ = Design A - Std. Calma Design L - L (WSR)\*
- ④ = # of sections  
1 - Single  
2 - Duplex  
3 - Triplex  
4 - Quadruplex
- ⑤ = Seal material B - Buna
- ⑥ = Displacement per section (See Code Displ. below)
- ⑦ = Rotation  
R - Clockwise  
L - Counter clockwise
- ⑧ = Mounting flange  
10 Through Bolt Ø 50 mm pilot  
11 Same as 10, but opposite mounting bolt pattern
- ⑨ = Drive shaft  
BA - SAE A Key Ø 0.75"  
CA - SAE A Key Ø 0.625"  
FA - SAE A Spline 9-Tooth  
GA - SAE A Spline 11-Tooth
- ⑩ = Portings (see page 13)
- ⑪ = Valve options N - None

\*\*\* Cannot be used with Shaft Order Code QB. 100 piece minimum order.



Size Code	Operating pressure P2		Maximum speed		Dimensions			Weight (approx.) kgs [lbs]	
	Displacement cc/rev	in <sup>3</sup> /rev	bar	psi	rpm	K** max. mm [in]	L** mm [in]		M mm [in]
060 -	6.2	0.378	250	3625	4000	90.2 [3.55]	41.5 [1.63]	82.6 [3.25]	3.2 [7.0]
080 -	8.3	0.506	250	3625	4000	92.5 [3.64]	43.0 [1.69]	85.6 [3.37]	3.3 [7.2]
110 -	11.3	0.689	250	3625	3600	97.6 [3.84]	45.2 [1.78]	90.0 [3.54]	3.5 [7.6]
140 -	14.5	0.884	250	3625	3300	101.4 [3.99]	47.5 [1.87]	94.5 [3.72]	3.6 [7.9]
160 -	16.5	1.006	250	3625	3000	105.0 [4.13]	48.9 [1.93]	97.4 [3.84]	3.7 [8.1]
190 -	19.6	1.196	250	3625	3000	108.8 [4.28]	51.2 [2.02]	101.9 [4.01]	3.8 [8.3]
230 -	23.7	1.446	210	3045	2800	114.7 [4.52]	54.1 [2.13]	107.8 [4.24]	4.0 [8.8]

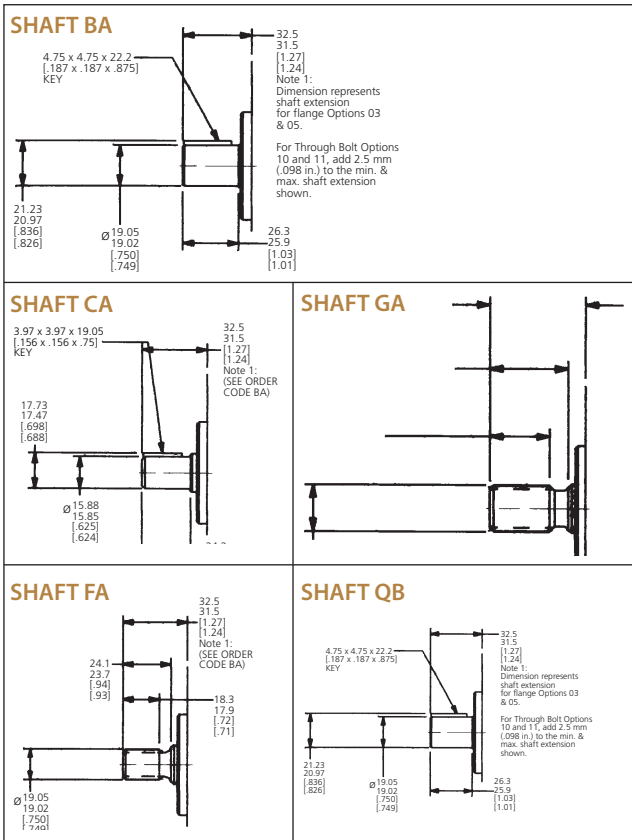
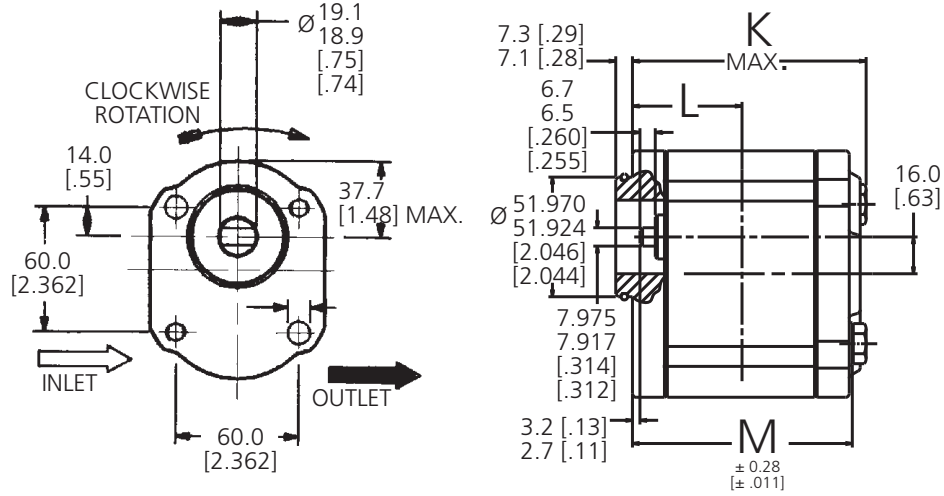
\* Design Code "L" (WSR) Wide operating speed range with low speed capability n=400 rpm at max. operating pressure.

\*\* Displacements greater than 0.915 in<sup>3</sup> (15 cc) adds 0.188 in (4.8 mm) to X-dimension and 0.094 in (2.4 mm) to Y-dimension in L design.





**FLANGE CODES 12 & 13\*\*\***  
**(12 = THROUGH BOLT Ø 52 MM PILOT)**  
**(13 = SAME AS ORDER CODE 12,**  
**BUT OPPOSITE BOLT PATTERN)**



All shaft options on pages 11 and 12 can be used with this flange option. We have just shown the most commonly used shaft options on the left. Port options available, see page 13 for details.

Model code example for a single pump

**WK 09 A 1 B 110 R 12 BA 141 N**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

- ① = Type WK - Calma Pump
- ② = Range 09 - WK900 Series
- ③ = Design A - Std. Calma Design L - L (WSR)\*
- ④ = # of sections  
1 - Single  
2 - Duplex  
3 - Triplex  
4 - Quadruplex
- ⑤ = Seal material B - Buna
- ⑥ = Displacement per section  
(See Code Displ. below)
- ⑦ = Rotation  
R - Clockwise  
L - Counter clockwise
- ⑧ = Mounting flange  
12 Through Bolt Ø 52 mm pilot  
13 Same as 12, but opposite mounting bolt pattern
- ⑨ = Drive shaft  
BA - SAE A Key Ø 0.75"  
CA - SAE A Key Ø 0.625"  
FA - SAE A Spline 9-Tooth  
GA - SAE A Spline 11-Tooth
- ⑩ = Portings  
(see page 13)
- ⑪ = Valve options N - None

\*\*\* Cannot be used with Shaft Order Code QB. 100 piece minimum order.

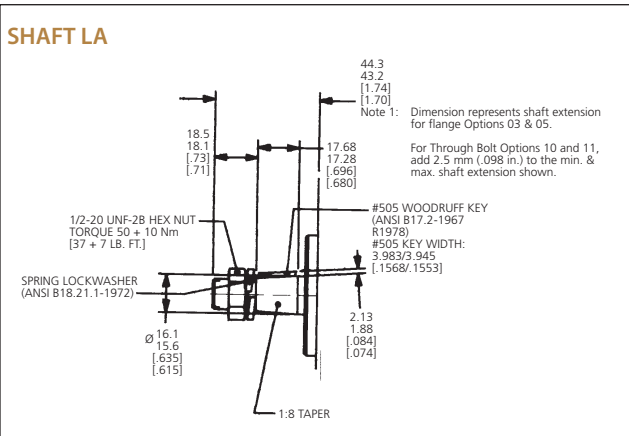
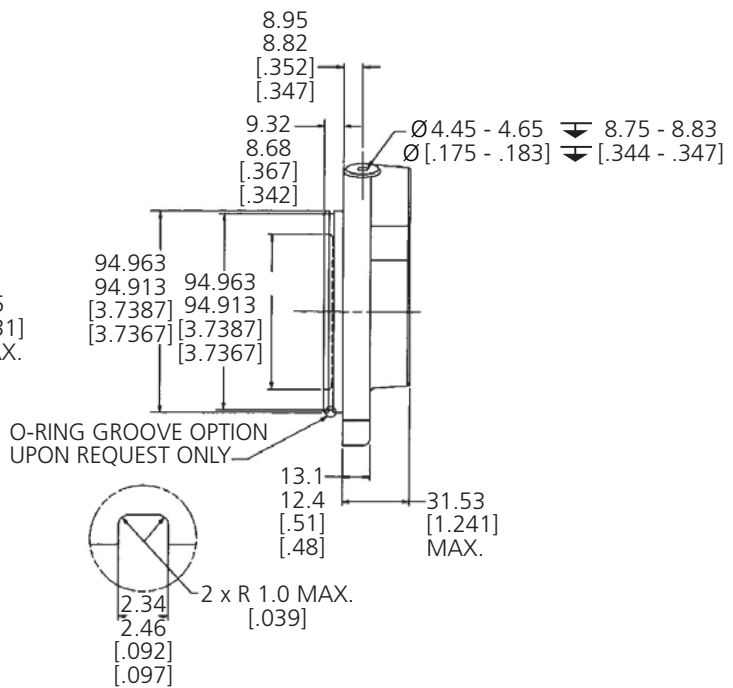
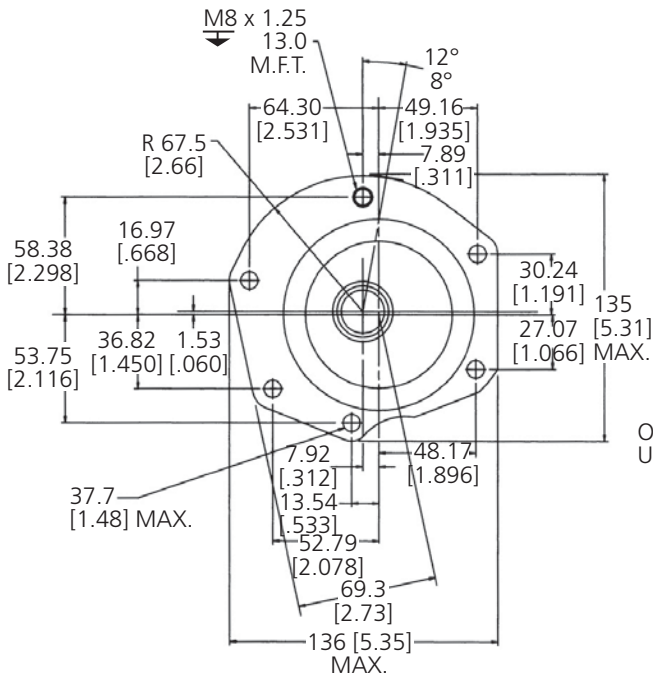
Size Code	Operating pressure P2		Maximum speed		Dimensions			Weight (approx.) kgs [lbs]	
	Displacement cc/rev	in <sup>3</sup> /rev	bar	psi	rpm	K** max. mm [in]	L** mm [in]		M mm [in]
060 -	6.2	0.378	250	3625	4000	90.2 [3.55]	41.5 [1.63]	82.6 [3.25]	3.2 [7.0]
080 -	8.3	0.506	250	3625	4000	92.5 [3.64]	43.0 [1.69]	85.6 [3.37]	3.3 [7.2]
110 -	11.3	0.689	250	3625	3600	97.6 [3.84]	45.2 [1.78]	90.0 [3.54]	3.5 [7.6]
140 -	14.5	0.884	250	3625	3300	101.4 [3.99]	47.5 [1.87]	94.5 [3.72]	3.6 [7.9]
160 -	16.5	1.006	250	3625	3000	105.0 [4.13]	48.9 [1.93]	97.4 [3.84]	3.7 [8.1]
190 -	19.6	1.196	250	3625	3000	108.8 [4.28]	51.2 [2.02]	101.9 [4.01]	3.8 [8.3]
230 -	23.7	1.446	210	3045	2800	114.7 [4.52]	54.1 [2.13]	107.8 [4.24]	4.0 [8.8]

\* Design Code "L" (WSR) Wide operating speed range with low speed capability n=400 rpm at max. operating pressure.

\*\* Displacements greater than 0.915 in<sup>3</sup> (15 cc) adds 0.188 in (4.8 mm) to X-dimension and 0.094 in (2.4 mm) to Y-dimension in L design.



## FLANGE CODE 50 (STANDARD PERKINS 5-BOLT FLANGE)



All shaft options on pages 11 and 12 can be used with this flange option. We have just shown the most commonly used shaft options on the left. Port options available, see page 13 for details.

Model code example for a single pump

**WK 09 A 1 B 060 R 50 FA 140 N**  
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

- (1) = Type WK - Calma Pump
- (2) = Range 09 - WK900 Series
- (3) = Design A - Std. Calma Design L - L (WSR)\*
- (4) = # of sections  
 1 - Single  
 2 - Duplex  
 3 - Triplex  
 4 - Quadraplex
- (5) = Seal material B - Buna
- (6) = Displacement per section (See table below)
- (7) = Rotation  
 R - Clockwise  
 L - Counter clockwise
- (8) = Mounting flange  
 50 Standard Perkins 5-Bolt Flange
- (9) = Drive shaft  
 BA - SAE A Key Ø 0.75"  
 CA - SAE A Key Ø 0.625"  
 FA - SAE A Spline 9-Tooth  
 GA - SAE A Spline 11-Tooth
- (10) = Portings (see page 13)
- (11) = Valve options N - None

\* Design Code "L" (WSR) Wide operating speed range with low speed capability n=400 rpm at max. operating pressure.

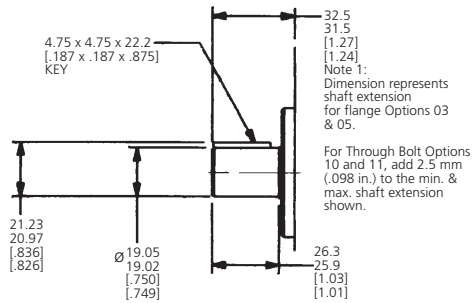
Size Code	Displacement		Operating pressure P2		Maximum speed rpm
	cc/rev	in <sup>3</sup> /rev	bar	psi	
060 -	6.2	0.378	250	3625	4000
080 -	8.3	0.506	250	3625	4000
110 -	11.3	0.678	250	3625	3600
140 -	14.5	0.884	250	3625	3300
160 -	16.5	1.006	250	3625	3000
190 -	19.6	1.196	250	3625	3000
230 -	23.7	1.446	210	3045	2800



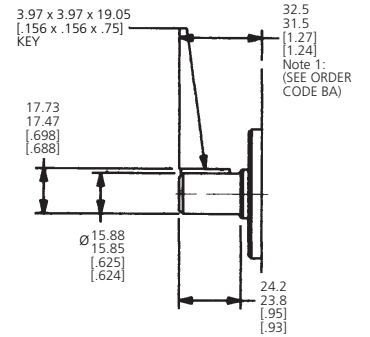
## SHAFT OPTIONS

A critical element which must be considered when specifying a Calma pump for your application is the shaft drive system. Concentric has both the product and the application experience to insure that your Calma pump incorporates the correct shaft for your application. The following depict the 11 standard shaft options for the Calma family. Our flexible manufacturing capabilities can accommodate a wide variety of shaft configurations.

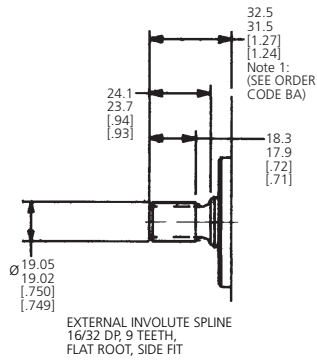
### STRAIGHT SHAFT SAE "A" Ø .75" ORDER CODE BA



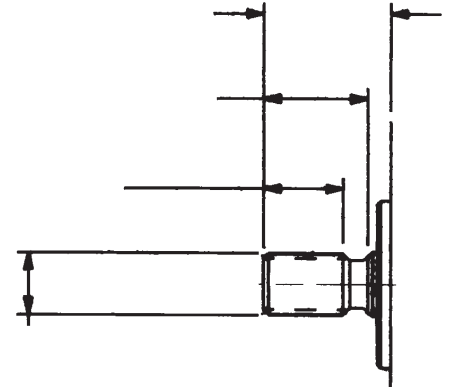
### STRAIGHT SHAFT SAE Ø .625" ORDER CODE CA



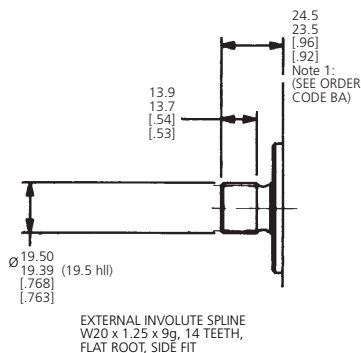
### SAE "A" SPLINE 9-TOOTH ORDER CODE FA



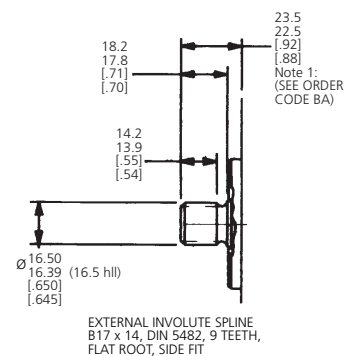
### SAE "A" SPLINE 11-TOOTH ORDER CODE GA



### DIN 5480 SPLINE 14 TOOTH ORDER CODE HA



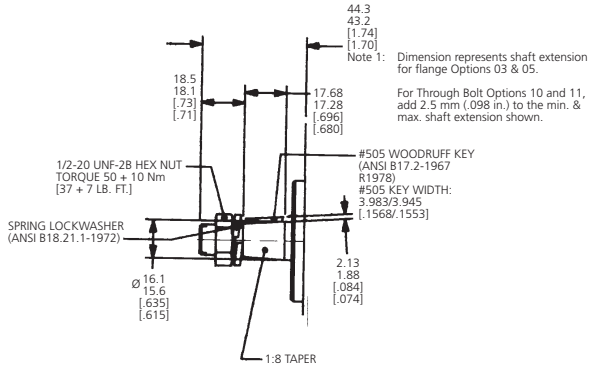
### DIN 5482 SPLINE 9 TOOTH ORDER CODE JA



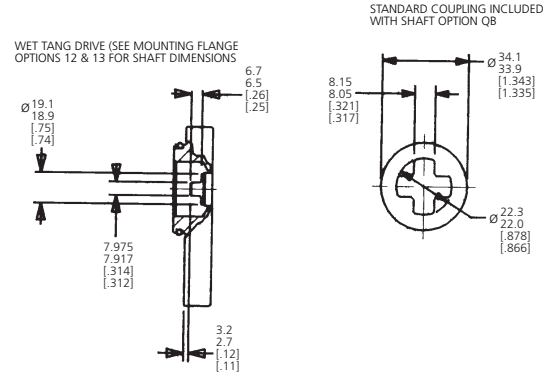


## SHAFT OPTIONS (Cont.)

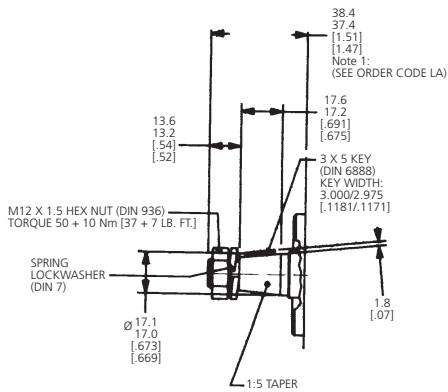
### STRAIGHT SHAFT SAE "A" Ø .75" ORDER CODE LA



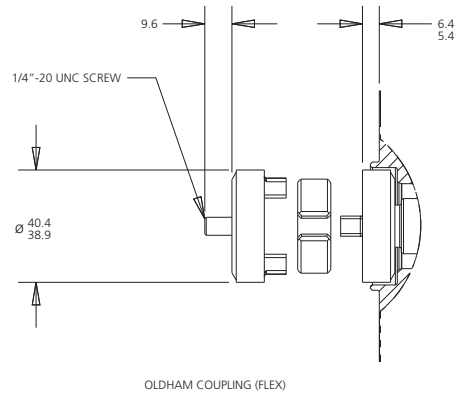
### TANG SHAFT ORDER CODE QB



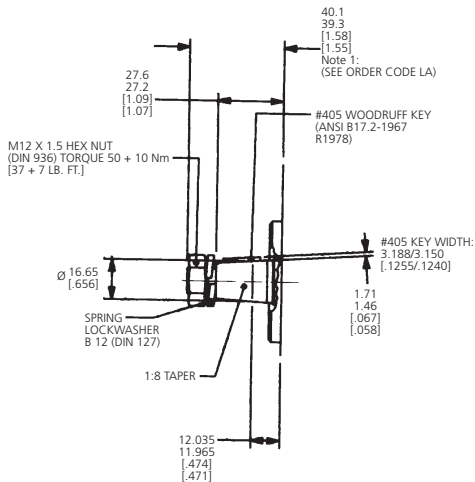
### SAE "A" SPLINE 9-TOOTH ORDER CODE MB



### FLEX COUPLING



### DIN 5480 SPLINE 14 TOOTH ORDER CODE NB



KEY, WASHER AND NUT INCLUDED WITH PUMP, WHERE APPLICABLE.

#### SINGLE SECTION SHAFT LOADING

Max. drive shaft load index "A", see table below.

$$A = (p1 \times V1)$$

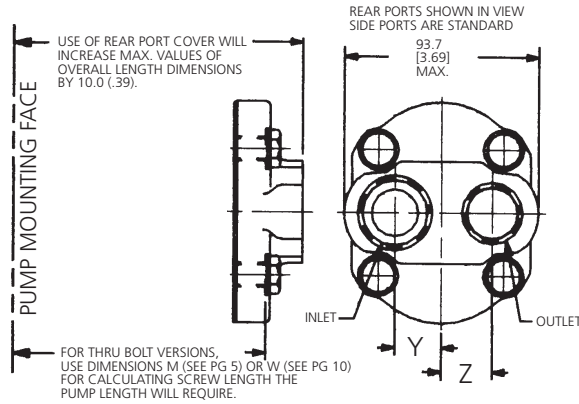
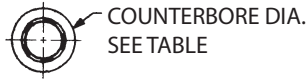
Note: P = actual pressure in psi, V = applicable displacement from Table pages 6-10.

Drive Shaft	Load Index "A"	Drive Shaft	Load Index "A"
BA	9257	HA	10010
CA	5005	JA	5505
FA	4640	QB	4353
GA	8505		



## PORT OPTIONS

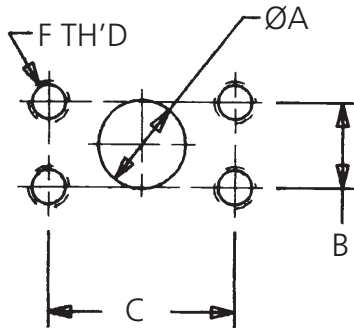
SEE PAGES 6 - 10 FOR DIMENSIONS FROM FLANGE MOUNTING FACE TO PORT CENTERLINE.



The standard size for each type of port is outlined below.

SAE STRAIGHT THREAD PORT PER S.A.E. j514b					INLET [IN]	OUTLET [IN]
DISP. ORDER CODE	SIDE PORT CODE	REAR PORT CODE	PORT SIZE INLET OUTLET	COUNTERBORE DIA. MIN. [IN]	Y ± 0.3 [± .012]	Z ± 0.3 [± .012]
060	101	501	7/8-14 3/4-16	34.14 [1.344] 30.18 [1.188]	20.2 [.795]	20.2 [.795]
080-160	102	502	1-1/16-12 7/8-14	41.28 [1.625] 34.14 [1.344]	20.2 [.795]	20.2 [.795]
190-230	103	503	1-5/16-12 1-1/16-12	48.51 [1.910] 41.28 [1.625]	24.2 [.950]	22.2 [.870]
BSPP STRAIGHT THREAD PORT PER DIN 3852, PART 2						
060-190	121	521	G 3/4 G 1/2	33.0 [1.29] 28.0 [1.10]	20.2 [.795]	20.2 [.795]
230	122	522	G 1 G 3/4	41.0 [1.61] 33.0 [1.29]	24.2 [.950]	22.2 [.870]

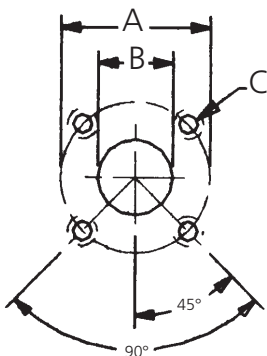
PERFORMANCE ON PAGE 3 REPRESENTS THAT WHICH CAN BE EXPECTED FROM UNITS INCORPORATING FLANGE PORTS.



SEE PAGES 6 - 10 FOR DIMENSIONS FROM FLANGE MOUNTING FACE TO PORT CENTERLINE.

S.A.E. SPLIT FLANGE PER S.A.E. j518c (STANDARD PRESSURE SERIES)						
DISP. ORDER CODE	SIDE PORT CODE	PORT SIZE INLET OUTLET	Ø A [IN]	B [IN]	C [IN]	F TH'D x MIN. FULL TH'D DEPTH
060-190	140	3/4 1/2	19.05 [.750] 12.7 [.500]	22.22 [.875] 17.47 [.688]	47.63 [1.875] 38.1 [1.50]	3/8-16 X 22 [.88] 5/16-18 X 24 [.94]
230	141	1 3/4	25.4 [1.00] 25.4 [1.00]	26.19 [1.031] 22.22 [.875]	52.37 [2.062] 47.63 [1.875]	7/16-14 X 22 [.88] 3/8-16 X 22 [.88]

METRIC SPLIT FLANGE PER ISO/DIS 6162 (35 to 350 BAR SERIES)						
DISP. ORDER CODE	SIDE PORT CODE	PORT SIZE INLET OUTLET	Ø A [IN]	B [IN]	C [IN]	F TH'D x MIN. FULL TH'D DEPTH
060-190	145	19 13	19.05 [.750] 12.7 [.500]	22.22 [.875] 17.47 [.688]	47.63 [1.875] 38.1 [1.50]	M10 X 25 [.984] M8 X 21 [.823]
230	146	25 19	25.4 [1.00] 19.05 [.750]	26.19 [1.031] 22.22 [.875]	52.37 [2.062] 47.63 [1.875]	M10 X 23 [.906] M10 X 25 [.984]



SEE PAGES 6 - 10 FOR DIMENSIONS FROM FLANGE MOUNTING FACE TO PORT CENTERLINE.

EUROPEAN 4-BOLT FLANGE					
DISP. ORDER CODE	SIDE PORT CODE	PORT SIZE INLET OUTLET	Ø A [IN]	B [IN]	F TH'D x MIN. FULL TH'D DEPTH
060-190	150	20 15	40.0 [1.575] 35.0 [1.378]	20 [.78] 15 [.59]	M6 X 13 [.51] M6 X 13 [.51]
230	151	26 18	55.0 [2.165] 55.0 [2.165]	26 [1.02] 18 [.71]	M8 X 13 [.51] M8 X 13 [.51]



## CALMA MULTIPLE PUMPS

The two following parameters are of the utmost importance when selecting multiple pumps and must never be exceeded:

- Drive shaft load index "A" in chart at right.
- Internal coupling load index "K" in Coupling Loading below at right.

In multiple pumps, shaft end section must have largest displacement. Each consecutive section must have displacement equal to or smaller than section preceding.

### MULTIPLE SECTION SHAFT LOADING

Max. drive shaft load index "A", see table below.

for double pump

$$A = (p1 \times V1) + (p2 \times V2)$$

for triple pump

$$A = (p1 \times V1) + (p2 \times V2) + (p3 \times V3)$$

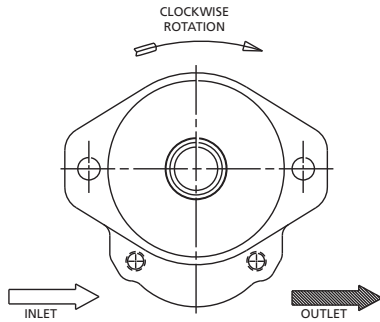
for quadruple pump

$$A = (p1 \times V1) + (p2 \times V2) + (p3 \times V3) + (p4 \times V4)$$

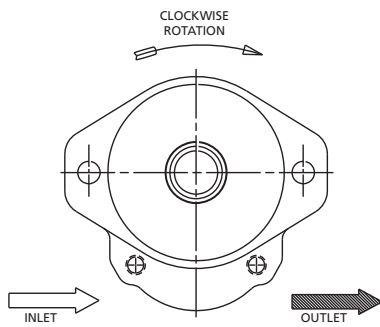
Note: P = actual pressure in psi, V = applicable displacement from Table pages 6-10.

Drive Shaft	Load Index "A"	Drive Shaft	Load Index "A"
BA	9257	HA	10010
CA	5005	JA	5505
FA	4640	QB	4353
GA	8505		

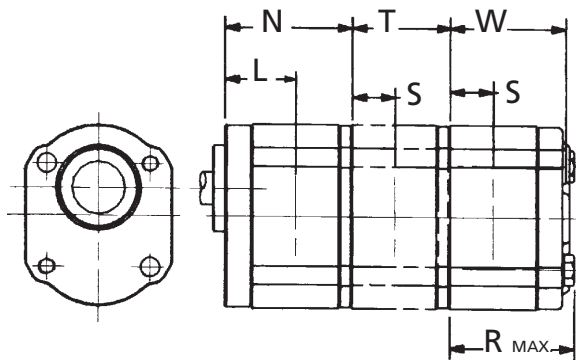
### DOUBLE SECTION / DUAL INLET



### TRIPLE SECTION / TRIPLE INLET



Dimensions N & L are for use with Flange Options 10 thru 13.



### COUPLING LOADING

Max. load index "K" 4640:

for double pump

$$K = (p2 \times V2)$$

for triple pump

$$K = (p2 \times V2) + (p3 \times V3)$$

for quadruple pump

$$K = (p2 \times V2) + (p3 \times V3) + (p4 \times V4)$$

Note: P = actual pressure in psi, V = applicable displacement from Table pages 6-10.

### REDUCED INLET MULTIPLE PUMPS

Reduced inlets provide overall system savings by reducing the cost of redundant inlet hose and fittings. Contact Concentric regarding your reduced inlet multiple pump application.

Concentric multiple pumps are also available with reduced number of inlets. Please contact Concentric for details. Please contact Concentric for pump applications requiring independently sealed sections.

Size	P in Shaft end section	Q in	Weight lbs	R in Rear section	S in	Weight lbs	T in 2nd & 3rd section	Weight lbs	N in A1-section	L in	Weight lbs	
060 -	0.378 in <sup>3</sup>	3.05	1.73	6.8	2.88	1.00	5.9	2.32	3.9	2.95	1.63	5.9
080 -	0.506 in <sup>3</sup>	3.14	1.79	7.0	3.00	1.06	6.1	2.44	4.1	3.07	1.63	5.9
110 -	0.689 in <sup>3</sup>	3.34	1.87	7.4	3.18	1.14	6.6	2.61	4.6	3.24	1.77	6.6
140 -	0.884 in <sup>3</sup>	3.52	1.96	7.7	3.35	1.24	6.8	2.79	4.8	3.42	1.87	6.8
160 -	1.006 in <sup>3</sup>	3.63	2.02	7.9	3.46	1.29	7.0	2.90	5.0	3.53	1.92	7.0
190 -	1.196 in <sup>3</sup>	3.81	2.11	8.1	3.64	1.38	7.4	3.08	5.2	3.71	2.01	7.4
230 -	1.446 in <sup>3</sup>	4.04	2.22	8.5	3.88	1.50	7.7	3.31	5.7	3.94	2.12	7.7

NOTE: Dimensions above are for Design Code "A".

# PUMPS & MOTORS

## Cast Iron Pumps Heavy Duty



### GC Series Pumps

**Displacements**  
0.065 to 0.711 cu. In. (1.06 to 11.65 cc)

### GC Series High/Low Pumps

**High Pressure Displacements**  
0.065 to 0.258 cu. In. (1.06 to 4.22 cc)

**Low Pressure Displacements**  
0.258 to 0.776 cu. In. (4.22 to 12.71 cc)

**Maximum Pressure**  
4,000 psi (276 bar)

**Maximum Speed**  
4,000 rpm



### F12 & F15 Ferra Series Pumps

**F12 Displacements**  
0.976 to 2.502 cu. In. (16 – 41 cc)

**F15 Displacements**  
1.159 to 3.051 cu. In. (19 to 50 cc)

**Maximum Pressure**  
4,000 psi (276 bar)

**Maximum Speed**  
3,600 rpm



### F20/F30 Pumps & F20-LS/F30-LS Load Sense Ferra Series Pumps

**Displacements**  
1.41 to 9.82 cu. In. (23 to 161 cc)

**Maximum Pressure**  
4,000 psi (276 bar)

**Maximum Speed**  
3,600 rpm



### D Series Pumps

**Displacements**  
0.232 to 1.395 cu. In. (3.80 to 22.85 cc)

### D Series High/Low Pumps

**High Pressure Displacements**  
0.465 cu. In. (7.62 cc)

**Low Pressure Displacements**  
0.930 to 1.395 cu. In. (15.24 to 22.86 cc)

**Maximum Pressure**  
3,000 – 4,000 psi (207 – 276 bar)

**Maximum Speed**  
3,600 – 4,000 rpm

## Aluminum Pumps Medium/Light Duty



### W-Series Pumps

**W100 Displacements**  
0.031 to 0.122 cu. In. (0.50 to 2.00 cc)

**W300 Displacements**  
0.049 to 0.347 cu. In. (0.80 to 5.70 cc)

**W600 Displacements**  
0.244 to 0.732 cu. In. (4 to 12 cc)

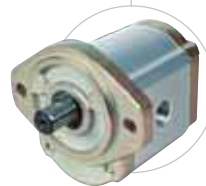
**W900 Displacements**  
0.305 to 1.891 cu. In. (5 to 31 cc)

**W1200 Displacements**  
1.526 to 2.014 cu. In. (25 to 33 cc)

**W1500 Displacements**  
1.159 to 3.051 cu. In. (19 to 50 cc)

**Maximum Pressure**  
4,000 psi (276 bar)

**Maximum Speed**  
500 to 4,000 rpm



### WK900 CALMA Pumps

**Displacements**  
0.305 to 1.648 cu. In. (5 to 27 cc)

**Maximum Pressure**  
3,336 psi (230 bar)

**Maximum Speed**  
4,000 rpm

## Fluid Motors



### Cast Iron

**Displacements**  
0.065 to 9.82 cu. In. (1.06 to 161 cc)

**Speed**  
Up to 10,000 rpm

### Aluminum

**Displacements**  
0.244 to 3.050 cu. In. (4 to 50 cc)

**Speed**  
Up to 4,000 rpm

## Flow Dividers



### GC & D Series

**GC Displacements**  
0.097 to 0.517 cu. In. (1.58 to 8.47 cc)

**D Displacements**  
0.232 to 0.813 cu. in. (3.8 to 13.32 cc)

**Maximum Pressure**  
4,500 psi (310 bar)

**Maximum Input Flow Per Section**  
14 gpm (53 lpm)



Call us for more information

For application assistance or detailed literature on any Concentric product line, call us toll-free: **1-800-572-7867**.

Visit our web site: <http://www.concentricAB.com>

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## PRODUCT RANGE

### HE Powerpacks

12/24/48 VDC 0.3 – 4.5 kW and  
0.75 – 3 kW AC modular power packs

### HE Box Powerpacks

12/24/48 VDC modular powerpacks  
in weatherproof boxes

### Pressure Switches

5 - 350 bar, connecting/disconnecting

### W100 Hydraulic pumps

0,5 - 2,0 cc 227 bar

### W300 Hydraulic pumps

0,8 - 5,7 cc 230 bar

### W600 Hydraulic pumps / motors

3 - 12 cc 276 bar

### W900 Hydraulic pumps / motors

5 - 31 cc/section 276 bar

### Calma The new quiet pumps

6,2 - 23,7 cc/section 250 bar

### WQ900 The quiet pumps

5 - 23 cc/section 230 bar

### WP900X Hydraulic pumps

16 - 31 cc/section 276 bar

### W1500 Hydraulic pumps / motors

19 - 50 cc/section 276 bar

### F12 FERRA Heavy duty pumps

16 - 41 cc/section 276 bar

### F15 FERRA Heavy duty pumps

19 - 50 cc/section 276 bar

### F20/F30 (LS) Hydraulic pumps / motors

23 - 161 cc/section 276 bar

### GPA Internal Gear pumps

1,7 - 63 cc/section 100 bar

### GC Hydraulic pumps / motors

1,06 - 11,65 cc/section 276 bar

### D Hydraulic pumps

3,8 - 22,9 cc/section 207 bar

### H Hydraulic pumps

9,8 - 39,4 cc/section 207 bar

### II-Stage Hydraulic pumps

4,2 - 22,8 cc/section 276 bar

### Rotary Flow Dividers

3,8 - 13,3 cc/section 300 bar

### Transmission pumps

[www.concentricAB.com](http://www.concentricAB.com)



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