

ENGINEERING  
TOMORROW



Product Line Overview

**Danfoss Water-Cooled Third Generation Brakes**

Airflex® Product Line





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# Water Cooled Third Generation Brake

## Description



The Danfoss water-cooled tensioning brakes achieve industry-leading, high-energy absorbing, dynamic braking. The revolutionary third generation brakes incorporate an improved internal design and increased water flow allowing for improved fluid dynamics with better energy dissipation characteristics. The third generation water cooled brake is available with Danfoss' dual piston design (WCBD3) and with Danfoss' air and water cooled combination style brake (WCSB3).

### Features and Benefits

- Highest HP in class - 1000 HP per disc offers faster tripping time and the potential to downsize the brake in the same application
- More robust design for demanding applications eliminates copper cracking seen in competitive units
- Self supporting brake eliminates costly support brackets
- Higher coolant flow with 60% lower pressure drop
- Robust PTFE tape seal eliminates leakage
- Corrosion resistance standard on all WCSB3 and WCBD3 brakes
- Retrofits to existing WC brake mounting
- Easier maintenance and wear adjustments, no machining is required for friction or wear plates
- ABS/CDS agency approval

### Applications

- Drawworks
- Mooring Winches
- Dynamometers
- Paper Mills
- Steel Service Centers



### WCBD3 Description

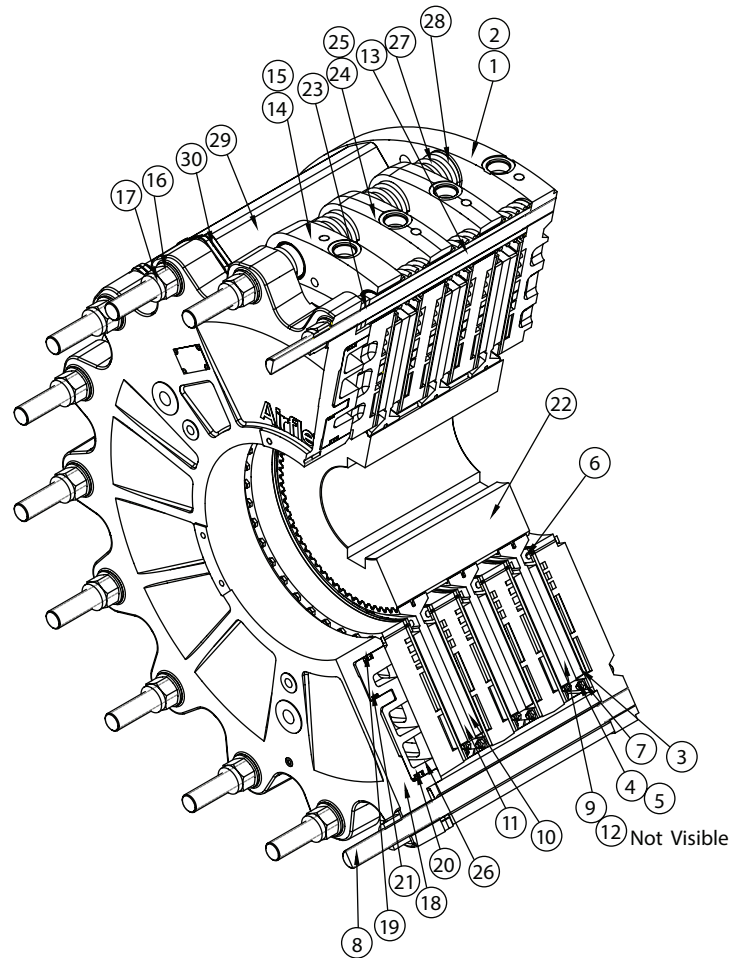
The dual piston water cooled tensioning brakes allow precise control for severe, high energy or continuous slip applications while providing 50 percent more energy capability than traditional WCBD. The patented dual piston provides a wide range of applied tension with greater control, allowing machine operators increased efficiency and reliability.

### WCSB3 Description

Designed for dynamic tensioning, static holding and emergency stopping, these units eliminate the need for multiple braking systems, providing significant cost savings and system simplification.

# WCBD3

## Component Parts



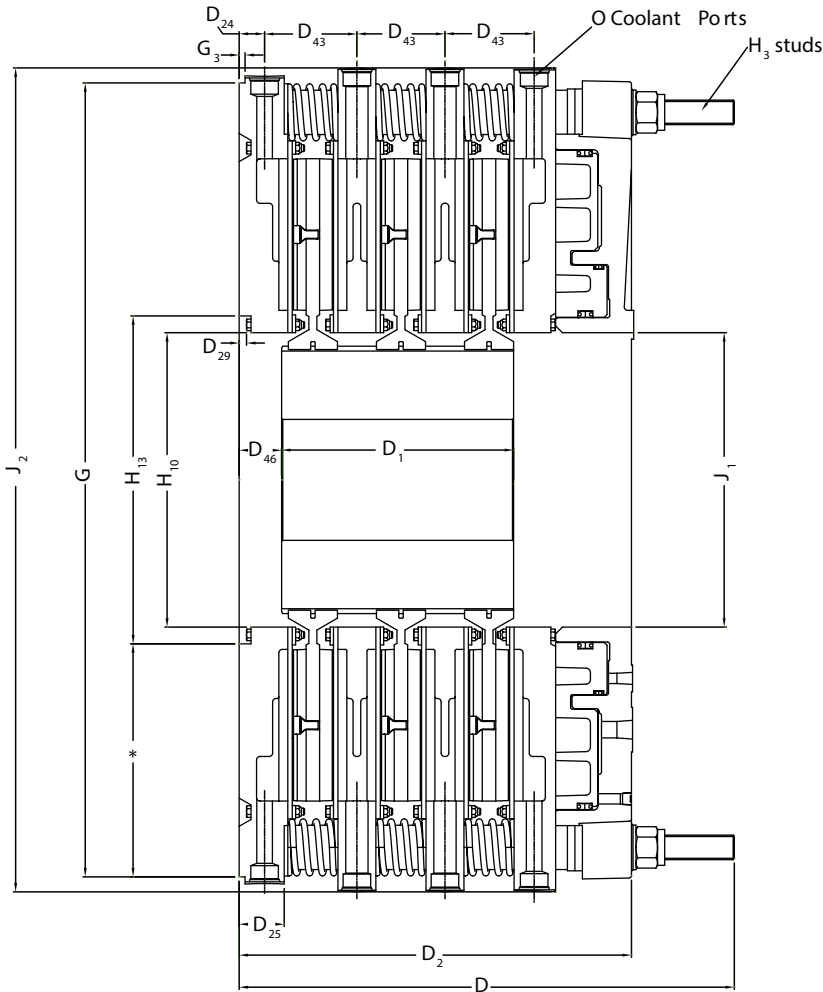
Item	Description
1	Mounting Flange Sub-Assembly
2	Mounting Flange
3	Wear Plate
4	Hex Head Screw
5	Locknut
6	Inner Support Ring
7	Outer Support Ring
8	Stud
9	Friction Disc Sub-Assembly
10	Friction Disc
11	Friction Disc Core
12	Flat Head Screw
13	Clamp Tube
14	Pressure Plate Sub-Assembly
15	Pressure Plate
16	Flat Washer

Item	Description
17	Lock Nut
18	Cylinder
19	Inner Seal
20	Outer Seal
21	Intermediate Seal
22	Gear
23	Clamp Tube Wear Spacer
24	Reaction Plate Sub-Assembly
25	Reaction Plate
26	Piston
27	Release Spring
28	Release Spring Spacer
29	Support Beam
30	Support Beam Wear Spacer

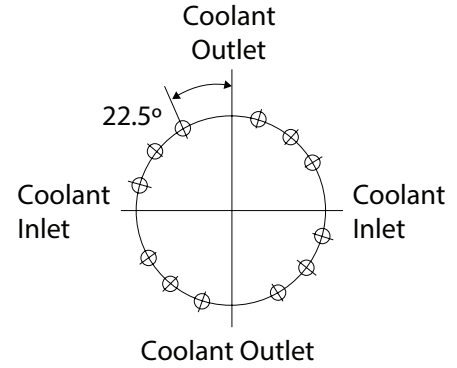
Note: Three disc unit shown. Other multi-disc units are similar. Items 23, 24, 25, 28 and 30 are not required for single disc units.

# WCBD3 Elements

## Dimensional Data



### Mounting Bolt Circles ①



### 36WCBD3

12-1.062 (27,0) Dia. Holes based on 16 Equally Spaced Holes on a 42.000" (1 066,8) BC

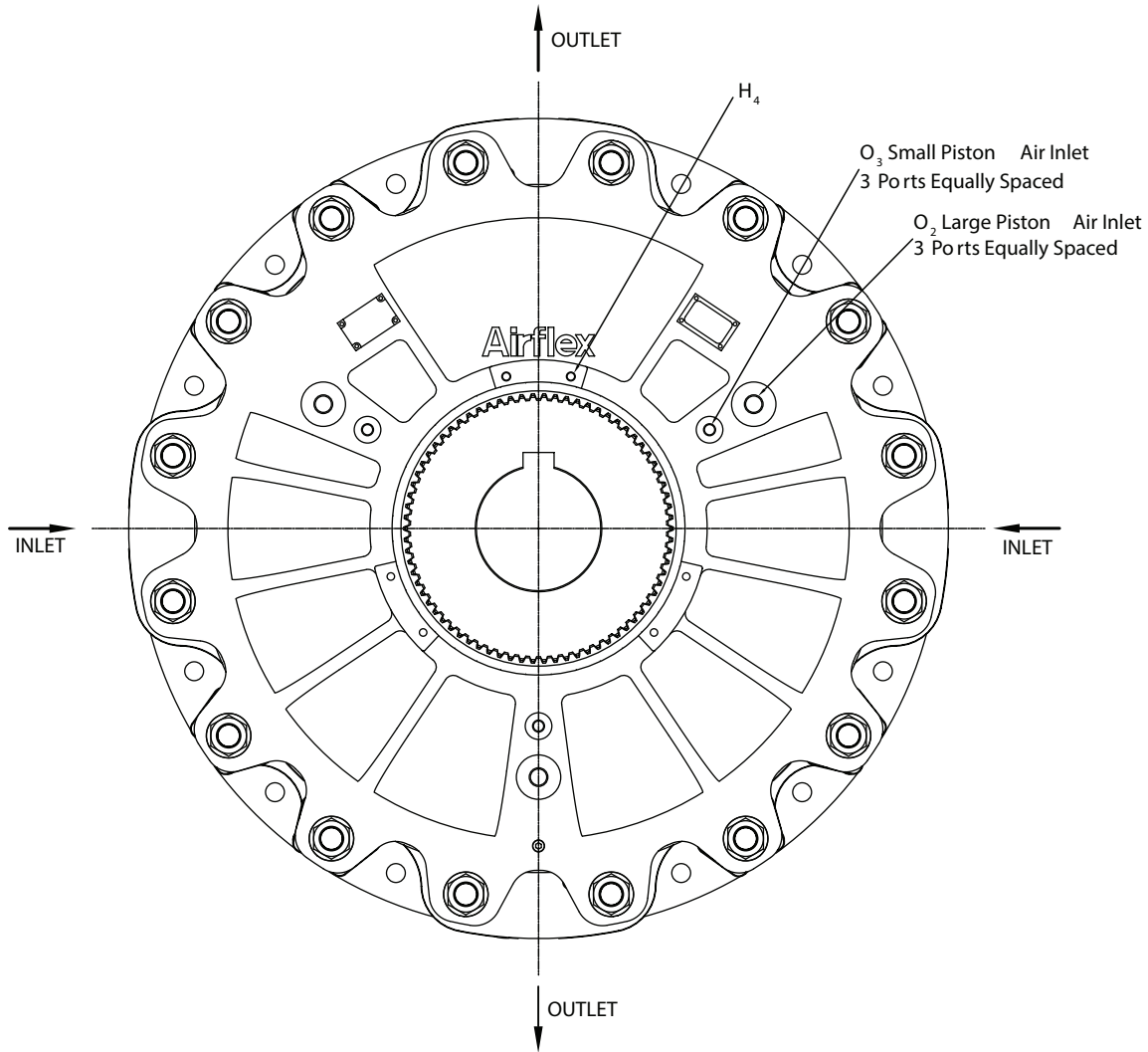
\*Note: Customer's mounting plate must provide rigid support and contact for this length.

English	in							No.	Size	Bolt Circle - in	No.	Size	Bolt Circle - in	
136WCBD3	1.43	2.53	0.38	5.17/ 4.94/ 5.00	2.38	44.498	0.33	16	1 3/8-6NC2	42.000	6	3/8-16NC2	17.500	16.50
236WCBD3														
336WCBD3														
436WCBD3														
Size	$D_{24}$	$D_{25}$	$D_{29}$	$D_{43}^{15}$	$D_{46}$	$G^2$	$G_3$	$H_3$ Studs			$H_4$ Aux Mount			$H_{10}$
136WCBD3	36.3	64.3	9.7	131.3/ 125.5/ 127	60.5	1130.25	8.38	16	1 3/8-6NC2	1066.80	6	3/8-16NC2	444.5	419.1
236WCBD3														
336WCBD3														
436WCBD3														
SI	mm							No.	Size	Bolt Circle - mm	No.	Size	Bolt Circle - mm	

Please refer to additional notes on pages 8 and 9.

# WCBD3 Elements

## Dimensional Data



in			Size	Bolt Circle - in	Size	Bolt Circle - in	in			No.	Size	in.	
18.378	16.5	46.42	NPT 3/4-14	28.00	NPT 3/8-18	28.00	15.50	5.00	12.11	8	ORB SAE-20	5.63	10.63
							21.75	9.00	17.05	12	ORB SAE-20	7.62	10.75
							27.75	13.00	21.99	16	ORB SAE-20	7.25	10.88
							34.50	18.00	26.92	20	ORB SAE-20	8.00	10.88
H <sub>13</sub> <sup>3</sup>	J <sub>1</sub>	J <sub>2</sub> <sup>5</sup>	O <sub>2</sub> Large Piston Air Inlet Ports		O <sub>2</sub> Small Piston Air Inlet Ports		D	D <sub>1</sub>	D <sub>2</sub>	O Coolant Ports		Bore Range <sup>4</sup>	
												Min	Max
466.8	419.10	1179.1	NPT 3/4-14	711.2	NPT 3/8-14	711.2	393.7	127.0	307.6	8	ORB SAE-20	143	270
							552.5	228.6	433.1	12	ORB SAE-20	194	273
							704.9	330.2	558.5	16	ORB SAE-20	194	276
							876.3	457.2	683.8	20	ORB SAE-20	203	276
mm			Size	Bolt Circle - mm	Size	Bolt Circle - mm	mm			No.	Size	mm	

# WCBD3 Elements

## Technical Data



English				lb-in @ 80 PSI			hp	GPM	in <sup>3</sup>			
136WCBD3	146572AE	416538	417019	295000	223000	71000	1000	100	590	9.4E-04	2.9E-02	98
236WCBD3	146573AE	416536	417023	590000	446000	143000	2000	200	1180	2.4E-04	1.4E-02	196
336WCBD3	146574AE	416535	416435	885000	670000	214000	3000	300	1770	1.1E-04	9.3E-03	294
436WCBD3	146575AE	416537	416495	1180000	893000	286000	4000	400	2360	5.9E-05	7.2E-03	392
Size	⑥ Part Number	Gear Part Number	CR Gear Part Number	Torque Rating ⑦			⑧ Thermal Rating	⑨ Water Flow	Water Volume	Pressure Drop Coefficient ⑩		New
				Both Pistons	Large Piston	Small Piston				C <sub>1</sub>	C <sub>2</sub>	Both P
136WCBD3	146572AE	416538	417019	33331	25196	8022	750	380	9.67	4.5E-06	5.3E-04	4.61
236WCBD3	146573AE	416536	417023	66661	50391	16157	1490	760	19.3	1.2E-06	2.6E-04	3.21
336WCBD3	146574AE	416535	416435	99992	75700	24179	2240	1140	29.0	5.3E-07	1.7E-04	4.82
436WCBD3	146575AE	416537	416495	133322	100895	32314	2980	1510	38.7	2.8E-07	1.3E-04	6.42
SI				Nm @ 5,5 bar			kW	dm <sup>3</sup> /mn	dm <sup>3</sup>			

### Notes:

- To ensure proper cooling, the inlet ports must be located at the 3 and 9 o'clock positions. The outlet ports must be located in the 12 and 6 o'clock positions.
- Tolerance: 36WCBD3 +0.000/-0.005 in. (+0,00/-0,13 mm)
- Tolerance: +0.003/-0.000 in. (0,08/-0,00 mm)
- Maximum bore size are based on 2 flat keys, allowable gear hub stresses and torque ratings at 80 psi (5,5 bar).
- Maximum diameter of "as cast" surfaces.
- Basic part number only. Order gear separately.
- Exact torque rating is dependant upon applied pressure. Maximum allowable pressure is 150 psi (10,3 bar).++
- Based on a 70°F (21°C) fresh water inlet temperature and a maximum 50°F (28°C) rise between inlet and outlet. The maximum allowable outlet temperatures are 150°F (65°C) for fresh water; 165°F (74°C) for 70/30 and 60/40 water glycol mixes; and 170°F (77°C) for 50/50 water glycol mixes. See detailed cooling requirements in the WCB11080 IOM.
- To insure proper cooling, inlet ports must be at the 3 + 9 o'clock positions and outlet ports must be at the 12 + 6 o'clock positions. Flow rates shown are for fresh water. Flow rates for water glycol mixes must increase to achieve the ratings in the Thermal Rating column. Maximum pressure allowable in the water cavity is 40 psi (40 psi inlet statically, 40 psi average dynamically). See detailed cooling requirements in the WCB11080 IOM.
- Based upon a continuous slip velocity of 4500 fpm (22,9 mps).

++ Maximum allowable pressure for some larger units may be less due to 2.5x10<sup>6</sup> in-lbs torque limit.

# WCBD3 Elements

## Technical Data



in <sup>3</sup>					in <sup>3</sup>	RPM		lbs		in		lb ft <sup>2</sup>		
441	74	334	24	107	337	475	700	2330	427	6.2	4.4	4720	368	
539	148	408	47	131	673	475	700	3070	819	8.8	6.7	6170	727	
637	223	482	71	154	1009	475	700	3780	1210	11.3	9.0	7560	1090	
734	297	556	95	178	1345	475	700	4530	1640	13.9	11.5	9060	1460	
Worn	New	Worn	New	Worn	Lining Wear Volume	Max. Speed		Weight		Center <sup>12</sup> of Gravity		Inertia		
Applied Air (WC) Engaging Volume <sup>15</sup>						Pistons	Large Piston Only	Small Piston Only	Housing	Disc & Gear	Housing	Disc & Gear	Housing	Disc & Gear
10	11	10	11	10										
7.23	1.21	5.47	0.39	1.75	5.5	475	700	1060	194	157	112	199	15.5	
8.83	2.43	6.69	0.77	2.15	11.1	475	700	1390	371	224	170	260	30.6	
10.44	3.66	7.9	1.16	2.52	16.6	475	700	1710	549	287	229	319	45.9	
12.03	4.87	9.11	1.56	2.92	22.1	475	700	2050	744	353	292	382	61.5	
dm <sup>3</sup>					dm <sup>3</sup>	RPM		kg		mm		kg m <sup>2</sup>		

### Notes continued:

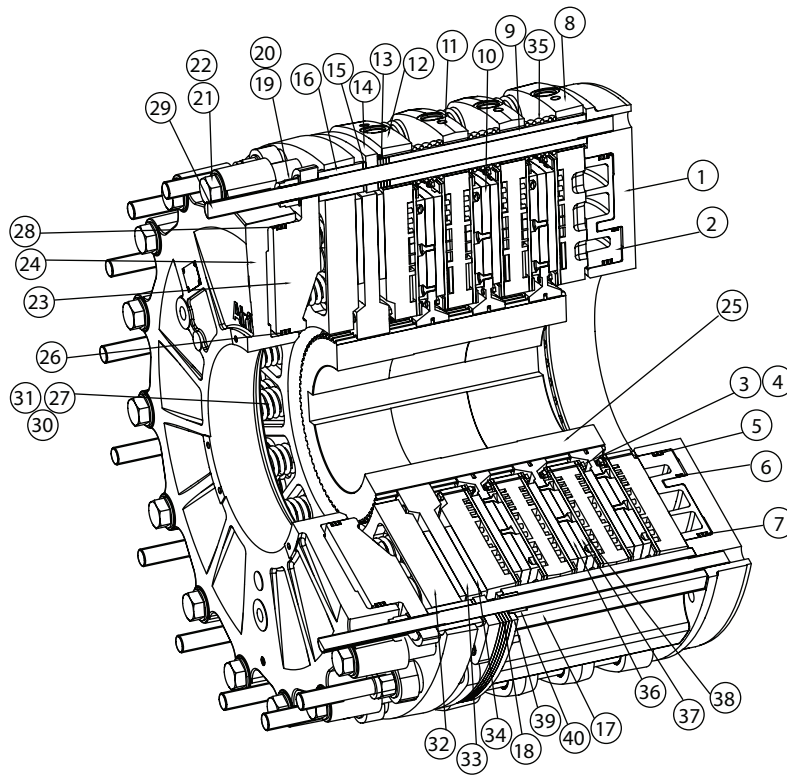
- Maximum freewheeling velocity is 7500 fpm (38,1 mps).
- Located from mounting flange surface.
- Absolute volume of cylinder at contact with new and worn friction discs.
- Pressure drop coefficient based on maximum pressure drop across brake.
- Flexible connection must be used on ports. Dimension is nominal for the new, air off condition.

$$\text{Pressure Drop} = C_1 \times \text{Flow}^2 + C_2 \times \text{Flow}$$



# WCSB3

## Component Parts



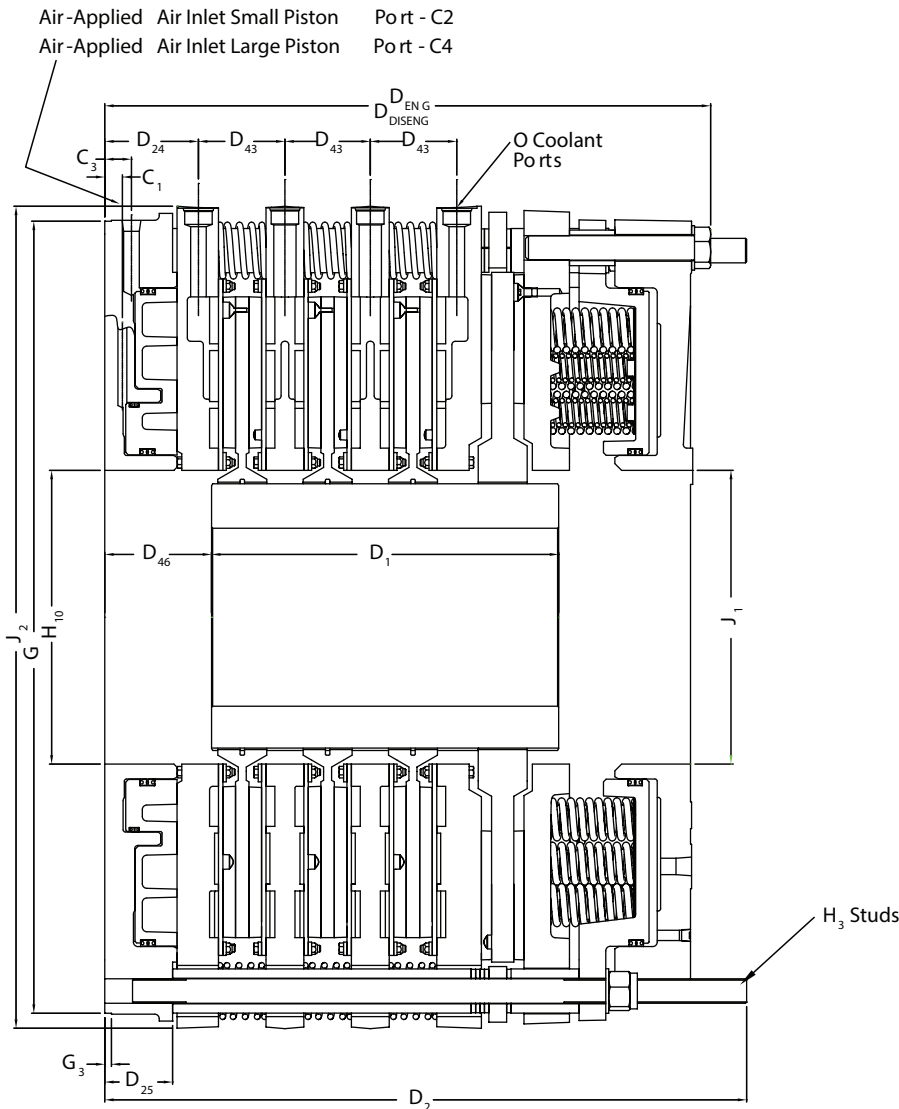
Item	Description
1	Mounting Flange/Cylinder
2	Air-Applied Piston
3	Hex Head Screw
4	Locknut
5	Air-Applied Inner Seal
6	Air-Applied Intermediate Seal
7	Air-Applied Outer Seal
8	Water-Cooled Pressure Plate
9	Clamp Tube
10	Water-Cooled Friction Disc Assembly
11	Reaction Plate
12	End Plate
13	Wear Spacers
14	Stop Plate
15	Wear Spacer
16	Clamp Tube
17	Support Beam
18	Wear Spacer
19	Self Locking Nut
20	Flat Washer
21	Hex Head Screw
22	Flat Washer
23	Spring Housing

Item	Description
24	Cylinder
25	Gear
26	Spring-Applied Inner Seal
27	Spring Retainer
28	Spring-Applied Outer Seal
29	Stud
30	Inner Spring
31	Outer Spring
32	Spring-Applied Pressure Plate
33	Air-Cooled Solid Disc
34	Air-Cooled Friction Disc
35	Release Spring
36	Water-Cooled Friction Disc Core
37	Water-Cooled Friction Disc
38	Wear Plate
39	Wear Spacer Retainer
40	Alignment Bushing

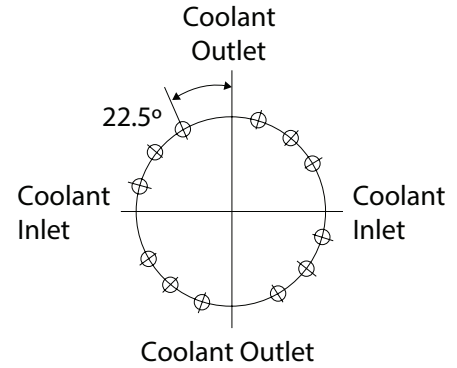
Note: The above cross-section shows a unit with 3 water-cooled friction disc assemblies. For units with one water-cooled friction disc assembly, item 11 is not required.

# WCSB3 Elements

## Dimensional Data



### Mounting Bolt Circles 6



### 36WCSB

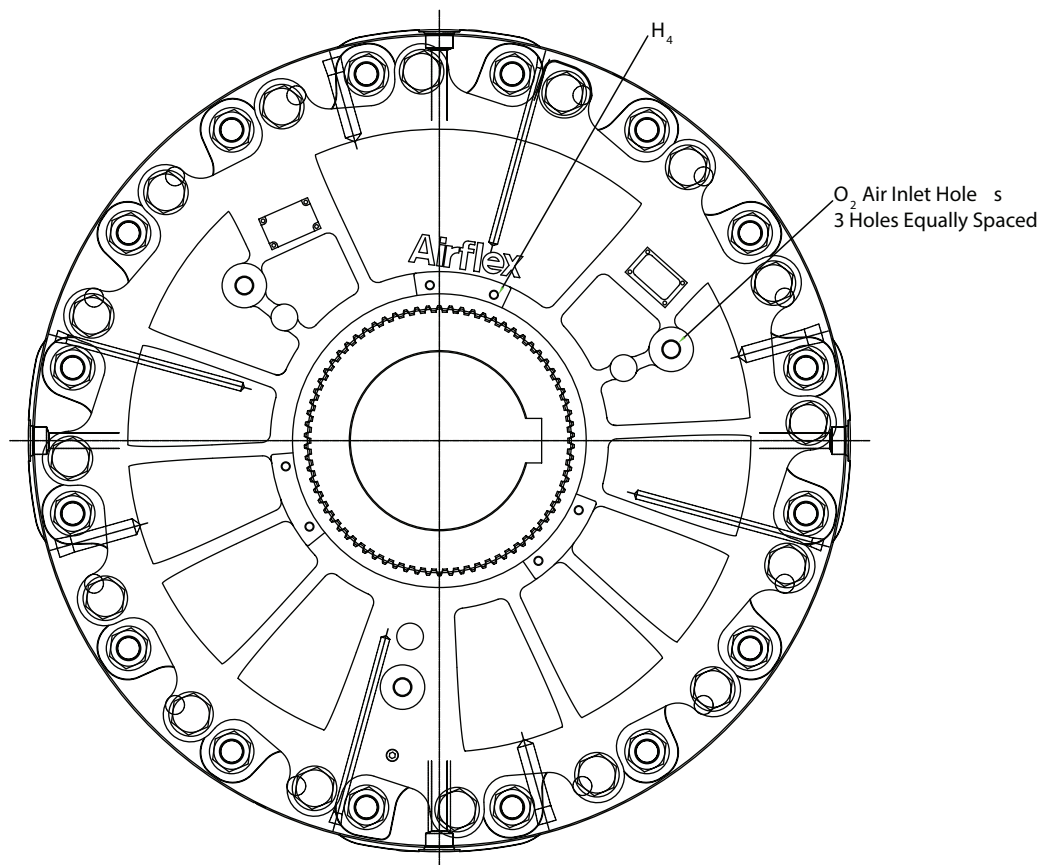
12-1.062 (27,0) Dia. Holes based on 16 Equally Spaced Holes on a 42.000" (1066,8) BC

English	in	Size	in	Size	in						No.	Size	Bolt Circle - in	No.
436WCSB3	0.99	NPT 3/8-18	1.50	NPT 3/4-14	5.24	3.81	4.86/4.80	6.00	44.498	0.38	16	1 3/8-6NC2	42.000	6
Size	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	D <sub>24</sub>	D <sub>25</sub>	D <sub>43</sub> <sup>14</sup>	D <sub>46</sub> <sup>13</sup>	G <sup>12</sup>	G <sub>3</sub>	H <sub>3</sub> Studs			
436WCSB3	25.1	NPT 3/8-18	38.1	NPT 3/4-14	133.1	96.8	123.4/121.9	152.4	1130.20	9.7	16	1 3/8-6NC2	1066.80	6
SI	mm	Size	mm	Size	mm						No.	Size	Bolt Circle - mm	No.

Please refer to additional notes on pages 14 and 15.

# WCSB3 Elements

## Dimensional Data



Size	Bolt Circle - in	in			Size	Bolt Circle - in	in				No.	Size	In	
3/8-16NC2	17.500	16.50	16.50	46.42	NPT 3/4-14	28.000	19.50	36.06	34.58	34.04	16	ORB SAE-20	11.250	11.375
<b>H<sub>4</sub> Aux Mount</b>		<b>H<sub>10</sub></b>	<b>J<sub>1</sub></b>	<b>J<sub>2</sub></b>	<b>O2 Air Inlet Ports</b>		<b>D<sub>1</sub></b>	<b>D<sub>2</sub></b>	<b>D<sub>Eng</sub></b>	<b>D<sub>Diseng</sub></b>	<b>O Coolant Ports</b>		<b>Min Bore Range</b>	<b>Max Bore Range</b>
3/8-16NC2	444.5	419.1	419.1	1179.1	NPT 3/4-14	711.2	495.3	915.9	878.3	864.6	16	ORB SAE-20	285.8	288.9
Size	Bolt Circle - mm	mm			Size	Bolt Circle - mm	mm				No.	Size	mm	

# WCSB3 Elements

## Technical Data



English			lb-in @ 80 PSI			lb-in	lb-in	lb-in	hp	PSI			GPM
436WCSB3	146576AE	417099	1389000	1055640	333360	1969000	2107000	2514000	3000	7	8	20	300
Size	Part Number	CR Gear Part Number	Air Applied (WC) Dynamic Torque Rating			Spring Applied (WC+AC) Dynamic	Spring Applied (WC+AC) Static	Maximum (WC+AC) Dynamic Torque	WC Thermal Rating	Parasitic Pressure (WC)			Water Flow
			Both Pistons	Large Piston	Small Piston					Both Pistons	Large Piston	Small Piston	
436WCSB3	146576AE	417099	156818	119182	37636	222300	237880	283831	2240	0.48	0.55	1.38	1140
SI			Nm @ 5,5 bar			Nm	Nm	Nm	kW	bar			dm <sup>3</sup> /min

### Notes:

- Basic part number only. Gear must be ordered separately.
- Torque is based on a spring set release pressure of 120 psi and the maximum amount of apply springs. To decrease release pressure, springs can be removed. The maximum number of springs follows: 36WCSB3 - 128 (64 outer Springs and 64 inner springs).
- Exact torque rating is dependent upon applied pressure. Maximum allowable air-applied pressure is 150 psi. Torque limit qualifier  $2.5 \times 10^{-6}$  in-lb.
- Based upon a 70°F (21°C) fresh water inlet temperature and a 50°F (28°C) temperature rise between inlet and outlet. See cooling requirements.
- Maximum torque results when 120 psi is applied to the air-applied side and the spring-applied side is fully set simultaneously. If air pressure is lost, the torque will drop to the spring-applied static torque.
- Absolute volume of cylinder at contact with new and worn friction discs. Worn volume assumes one wear spacer thickness of wear.
- Coefficients are based on the maximum pressure drop across the individual water cavities of the brake.

$$\text{Pressure Drop} = C_1 \times \text{Flow}^2 + C_2 \times \text{Flow}$$

# WCSB3 Elements

## Technical Data



in <sup>3</sup>		in <sup>3</sup>		RPM		in <sup>3</sup>						lbs		in		lb ft <sup>2</sup>	
1770	1.1E-04	9.3E-03	1009	475	700	294	637	223	482	71	154	6195	1590	16.6	15.9	12750	1620
Water Volume	Pressure Drop Coefficient ⑦		WC Lining Wear Volume	Max. Speed		New	Worn	New	Worn	New	Worn	Weight		Center of Gravity ⑨		Inertia	
	C <sub>1</sub>	C <sub>2</sub>		⑩	⑪	Applied Air (WC) Engaging Volume ⑥						Housing	Disc & Gear	Housing	Disc & Gear	Housing	Disc & Gear
				Slip	Free-wheeling	Both Pistons		Large Piston Only		Small Piston Only							
29	5.3E-07	1.7E-04	16.6	475	700	4.82	10.44	3.66	7.9	1.16	2.52	2810	721	422	404	537.3	68.3
dm <sup>3</sup>		dm <sup>3</sup>		RPM		dm <sup>3</sup>						kg		mm		kg m <sup>2</sup>	

### Notes continued:

8. To insure proper cooling, the inlet port must be at the 3+9 o'clock positions and the outlet ports must be at the 12+6 o'clock positions.
9. Located from the mounting flange surface.
10. Based upon a continuous slip velocity of 4500 fpm (22,9 mps).
11. Maximum freewheeling velocity is 7500 fpm (38,1 mps).
12. Tolerance for the 36WCSB3 is +0.000/-0.005 in. (+0,00/-0,13 mm).
13. Tolerance ±0.030 in. (±0,76 mm).
14. Flexible connection must be used on ports. Dimension is nominal for new spring applied condition.

Data shown is subject to change.  
Please consult factory for current dimensional data.

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