Q SERIES

OVERVIEW AND TECHNICAL DATA

DAVID BROWN HYDRAULICS

AT A GLANCE - THE DAVID BROWN Q SERIES PUMP RANGE

QR SERIES *Spur Gears*				**QS SERIES** *Helical Gears*			
MODEL	**DISPLACEMENT** cm^3/rev (cu.in/rev)	**RATED PRESSURE** bar (psi)	**PEAK PRESSURE** bar (psi)	**MODEL**	**DISPLACEMENT** cm^3/rev (cu.in/rev)	**RATED PRESSURE** bar (psi)	**PEAK PRESSURE** bar (psi)
R4016	16 (0.975)	250 (3625)	280 (4060)	**S4016**	16.0 (0.975)	250 (3625)	280 (4060)
R4019	19 (1.158)	250 (3625)	280 (4060)	**S4023**	22.2 (1.341)	250 (3625)	280 (4060)
R4023	23 (1.402)	250 (3625)	280 (4060)	**S4027**	26.1 (1.585)	250 (3625)	280 (4060)
R4027	27 (1.646)	250 (3625)	280 (4060)	**S4032**	30.9 (1.884)	250 (3625)	280 (4060)
R4032	32 (1.951)	250 (3625)	280 (4060)	**S4037**	35.8 (2.183)	250 (3625)	280 (4060)
R4038	38 (2.317)	250 (3625)	280 (4060)	**S4042**	40.6 (2.476)	210 (3045)	235 (3408)
R4045	45 (2.746)	250 (3625)	280 (4060)	**S5045**	43.5 (2.652)	250 (3625)	280 (4060)
R4053	53 (3.23)	210 (3045)	235 (3408)	**S5051**	49.3 (3.006)	250 (3625)	280 (4060)
R4060	60 (3.66)	180 (2610)	200 (2900)	**S5060**	58.0 (3.537)	250 (3625)	280 (4060)
R5045	45 (2.746)	250 (3625)	280 (4060)	**S5070**	67.7 (4.128)	250 (3625)	280 (4060)
R5053	53 (3.231)	250 (3625)	280 (4060)	**S5085**	82.2 (5.012)	210 (3045)	235 (3408)
R5063	63 (3.841)	250 (3625)	280 (4060)	**S6083**	80.3 (4.896)	250 (3625)	280 (4060)
R5073	73 (4.451)	250 (3625)	280 (4060)	**S6097**	93.8 (5.720)	250 (3625)	280 (4060)
R5085	85 (5.183)	250 (3625)	280 (4060)	**S6113**	109.3 (6.665)	250 (3625)	280 (4060)
R5100	100 (16.098)	210 (3045)	235 (3408)	**S6132**	127.6 (7.780)	250 (3625)	280 (4060)
R5120	120 (7.317)	180 (2610)	200 (2900)	**S6155**	149.9 (9.140)	210 (3045)	235 (3408)
R6100	100 (6.098)	250 (3625)	280 (4060)	**S7155**	149.9 (9.140)	250 (3625)	280 (4060
R6117	117 (7.134)	250 (3625)	280 (4060)	**S7180**	174.1 (10.615)	250 (3625)	280 (4060)
R6137	137 (8.354)	250 (3625)	280 (4060)	**S7208**	201.1 (12.262)	250 (3625)	280 (4060)
R6160	160 (9.756)	250 (3625)	280 (4060)	**S7248**	239.8 (14.622)	250 (3625)	280 (4060)
R6187	187 (11.402)	210 (3045)	235 (3408)				
R6220	220 (13.415)	180 (2610)	200 (2900)				

Note: Theoretical flow rate = $\frac{(cm^3/rev \times rev/min)}{1000}$ litre/min

= (.00433 x cu.in/rev x rev/min) US gal/min

Q SERIES PUMPS - MODEL NUMBERS*

Front or single pump | Rear pump (omit for single pumps) | Front or single port configuration | Rear port configuration (omit for single pump)

R1A4016R4016A12A1K1A1K1AA

Gear type
R = spur
S = helical

1 = design mark

Shaft seals
A = seal and wiper
C = seal wiper, seal with tell-tale

Frame size
4, 5, 6, 7

Gear type
R = spur
S = helical

Frame size
4, 5, 6, 7

Displacements

R Series	DISPLACEMENT cm³/rev	DISPLACEMENT in³/rev
R4016	16.0	0.975
R4019	19.0	1.158
R4023	23.0	1.402
R4027	27.0	1.646
R4032	32.0	1.951
R4038	38.0	2.317
R4045	45.0	2.746
R4053	53.0	3.230
R4060	60.0	3.660
R5045	45.0	2.746
R5053	53.0	3.231
R5063	63.0	3.841
R5073	73.0	4.451
R5085	85.0	5.183
R5100	100.0	6.098
R5120	120.0	7.317
R6100	100.0	6.098
R6117	117.0	7.134
R6137	137.0	8.354
R6160	160.0	9.756
R6187	187.0	11.402
R6220	220.0	13.415

S Series	DISPLACEMENT cm³/rev	DISPLACEMENT in³/rev
S4016	16.0	0.975
S4023	22.2	1.341
S4027	26.1	1.585
S4032	30.9	1.884
S4037	35.8	2.183
S4042	40.6	2.476
S5045	43.5	2.652
S5051	49.3	3.006
S5060	58.0	3.537
S5070	67.7	4.128
S5085	82.2	5.012
S6083	80.3	4.896
S6097	93.8	5.720
S6113	109.3	6.665
S6132	127.6	7.780
S6155	149.9	9.140
S7155	149.9	9.140
S7180	174.1	10.615
S7208	201.1	12.262
S7248	239.8	14.622

Drive Shafts

Code	Description	Frame Sizes			
A	5/8" - SAE A spline	4			
E	5/8" - SAE A parallel	4			
B	7/8" - SAE B spline	4	5		
F	7/8" - SAE B parallel	4			
Q	1" - SAE BB spline	4	5		
H	1" - SAE BB parallel	4	5		
C	1.1/4" - SAE C spline		5	6	7
G	1.1/4" - SAE C parallel		5	6	7
T	1.1/2" - SAE CC spline			6	7
N	1.1/2" - SAE CC parallel			6	7
D	1.3/4" - SAE D spline				7
P	1.3/4" - SAE D parallel				7
	See page number	12	20	28	35

Mounting Flanges

Code	Description	Frame Sizes			
1	2 bolt SAE A	4			
2	2 bolt SAE B	4	5		
3	4 bolt SAE B	4	5		
4	2 bolt SAE C	4	5	6	
5	4 bolt SAE C	4	5	6	7
7	4 bolt SAE D				7
	See page number	13	21	29	36

* Use this chart to compile standard dual and double pump model numbers. For special features and for triple and quadruple pumps please consult your David Brown representative.

Before ordering please check that the pump will be operated within quoted parameters and that drive shaft "pD" factors are not exceeded. See page 38.

Rotation
1 2 3 4
from shaft end
A = anti-clockwise
C = clockwise

See port options below

4 Outlet port sizes *see pages 15, 23,*

Port Code	Port Size
A	1/2
B	3/4
D	1
E	1.1/16
F	1.1/4
H	1.1/2
J	1.5/8
K	2

3 Outlet port type *see pages 15, 23, 31 & 37*

Code	Description
1	SAE split flange - metric bolts 3000 psi rating
2	SAE split flange - UNC bolts
3	BSP.P thread
4	SAE UNF o-ring thread

2 Inlet port sizes *see pages 15, 23, 31 & 37*

Port Code	Port Size	Port Code	Port Size
A	1/2	H	1.1/2
B	3/4	J	1.5/8
C	7/8	K	2
D	1	L	2.1/2
E	1.1/16	M	3
F	1.1/4	N	4
G	1.5/16		

1 Inlet port type *see pages 15, 23, 31 & 37*

Code	Description
0	No port
1	SAE split flange - metric bolts 3000 psi rating
2	SAE split flange - UNC bolts
3	BSP.P thread
4	SAE UNF o-ring thread

Inlet port positions *see pages 14, 22, 31 & 37*

Code	Description	Single Pump	Double Pump	Dual Pump
A	Inlet port in front section	✓	✓	
B	Separate inlet ports		✓	
C	Common inlet port			✓

Number of pump sections

Code	Description
1	1 pump section
2	2 pump sections
3	3 pump sections
4	4 pump sections

THE DAVID BROWN Q SERIES SUPER-QUIET PUMP RANGE

In response to market needs, the QR and QS ranges have been developed to combine very high efficiencies with very low noise levels while retaining the rugged simplicity of well-proven hydraulic gear pumps.

Both series are of cast iron construction and high quality steel gears are supported by hydrodynamic plain (bush) bearings which are lubricated by a system which draws cool fluid from the inlet port.

QR spur gear pumps are designed for minimum pressure ripple while the QS Series features patented helical gears which reduce ripple and noise levels even further.

The pumps will work to peak pressures up to 280 bar (4060 psi) and careful attention to inlet porting enables most pumps to run at up to 3000 rev/min.

QR SERIES PUMP EFFICIENCIES COMPARE WITH THE VERY BEST SPUR GEAR PUMPS WHILE NOISE GENERATION IS REDUCED TO NEW LOW LEVELS.

QS SERIES HELICAL GEAR PUMPS - FOR REALLY NOISE CRITICAL APPLICATIONS - RETAIN THE HIGH EFFICIENCY LEVELS OF THE QR SERIES BUT GENERATE EVEN LOWER NOISE DUE TO PRESSURE RIPPLE REDUCTIONS OF UP TO 75%.

Q SERIES

QR SERIES

Advanced spur gears
for
Low Noise Levels

QS SERIES

Patented helical gears
for
Very low Noise Levels

High pressure ratings - 280 bar (4060 psi)

Wide speed range 450 - 3000 rev/min

Wide range of sizes - 16 to 240 cm^3/rev (1 to 14.6 cu.in/rev)

Very high efficiencies - up to 98% volumetric at 250 bar (3625 psi)

Long-life plain bearings

Up to 100°C (212°F) operation

Compact size

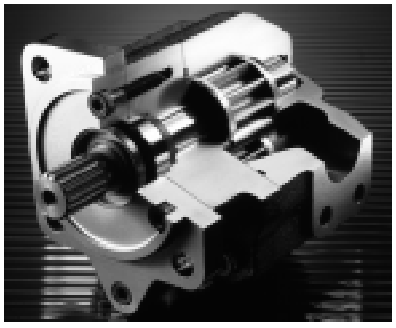
Wide range of drives and ports

Cast iron construction

Suitable for rigorous mobile applications

Multiple pumps on one shaft

Shared inlet ports on multiple pumps



OPERATING PARAMETERS

Q Series pumps are designed to provide high performance levels and long life when operated within the parameters shown. For operation outside these parameters please consult your David Brown Hydraulics representative.

Maximum outlet port pressures	- see Page 4.	
Inlet port pressures	- see below.	
Speed Range	Q4	450 - 3000 rev/min
	Q5	450 - 3000 rev/min
	Q6	450 - 2750 rev/min
	Q7	450 - 2400 rev/min
Temperature	Minimum at start-up	-40°C (-40°F)
	Maximum continuous	+80°C (+176°F)
	Maximum intermittent	+100°C (+212°F)
Viscosity	Maximum at start-up	2000 mm^2/sec (9,000 SSU)
	Maximum continuous	250 mm^2/sec (1150 SSU)
	Minimum continuous	10 mm^2/sec (60 SSU)
	Optimum	15-25 mm^2/sec (78-124 SSU)
Fluid Cleanliness	To ISO4406 solid contaminant	
	Start-up period	21/17
	Maximum in service	19/15
	Optimum	16/11
	Maximum water	0.1%
Fluid Velocity	Maximum in INLET line	2.5 m/sec (8 ft/sec)
	Recommended in INLET line	1.5 m/sec (5 ft/sec)
Shaft Loads	Maximum end load	250 N (56 lb)
	Maximum radial load	500 N (112 lb)
Fluids	All data is quoted for mineral oils HM and HV. For fire resistant and environmentally aware fluids please contact your David Brown representative.	
Moments of Inertia	See page 11, 19, 27, 34	
Rotation	Clockwise or Anti-clockwise viewed from shaft end (not reversible).	

INLET CONDITIONS

It is essential that pumps are installed so that they can always fill with fluid.

'Q' Series pump inlet porting is designed to facilitate full volume fill but the following machine design recommendations should be followed.

- **Never run pumps dry - particular care should be taken to open any shut-off valves.**
- **Use large diameter pipes and fittings and avoid sharp bends and long lengths.**

  Fluid velocity should not exceed 2.5 m/sec (8.0 ft/sec) calculated by:

  $V = \frac{21.22Q}{D^2}$ m/sec where V = velocity (m/sec), Q = flow rate (l/min), D = bore diameter (mm)

  $V = \frac{0.408Q}{D^2}$ ft/sec where V = velocity (ft/sec), Q = flow rate (US gal/min), D = bore diameter (inches)

- **If possible mount the pump below the lowest level of fluid in the tank. If necessary prime the pump on start-up.**
- **Ensure that inlet lines are airtight.**

Particular care should be taken where high speeds and/or high fluid viscosities are involved.

As a general rule pressure at the pump inlet should not be less than 0.8 bar absolute (6" Hg) at normal viscosity of

David Brown Hydraulics' Engineers will be pleased to advise on any installation

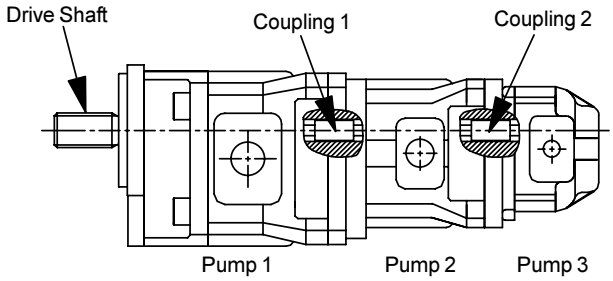
Q SERIES MULTIPLE PUMPS

Both R Series and S Series pumps of the same or different frame sizes may be connected together to form multiple (double, triple or even quadruple) pumps driven by the same shaft.

IT IS ALSO POSSIBLE TO MOUNT ALUMINIUM PUMPS FROM THE 'A' SERIES RANGE TO "R" AND "S" SERIES PUMPS. PLEASE CONSULT YOUR DAVID BROWN HYDRAULICS' REPRESENTATIVE.

Multiple pump combinations may be limited by the torque capacity of the drive shaft and couplings.
The torque factors listed below must not be exceeded.

Torque factor T = pD where p = outlet pressure, D = displacement.



For a triple pump, for example

$T_{shaft} = p_1 D_1 + p_2 D_2 + p_3 D_3$

$T_{coupling\ 1} = p_2 D_2 + p_3 D_3$

$T_{coupling\ 2} = p_3 D_3$

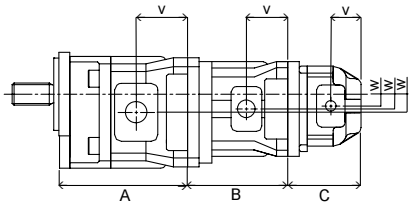
(p_1, p_2 and p_3 are maximum simultaneous pressures)

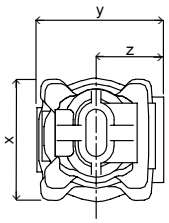
The T values must not exceed those shown in the table below

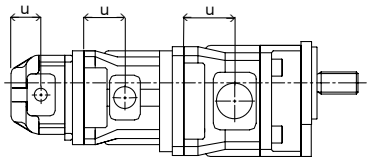
		T = pD MAXIMUM	
CODE	**SHAFT TYPE**	**bar x cm³/rev**	**psi x cu.in/rev**
A	SAE 'A' 5/8" spline	5,200	4,600
E	SAE 'A' 5/8" parallel	5,200	4,600
B	SAE 'B' 7/8" spline	14,226	12,590
F	SAE 'B' 7/8" parallel	14,226	12,590
Q	SAE 'BB' 1" spline	22,450	19,869
H	SAE 'BB' 1" parallel	22,450	19,869
C	SAE 'C' 1.1/4" spline	45,565	40,325
G	SAE 'C' 1.1/4" parallel	45,565	40,325
T	SAE 'CC' 1.1/2" spline	86,950	76,950
N	SAE 'CC' 1.1/2" parallel	86,950	76,950
D	SAE 'D' 1.3/4" spline	121,400	107,439
P	SAE 'D' 1.3/4" parallel	121,400	107,439
	Coupling Q4-Q4	11,250	9,956
	Coupling Q5-Q4	11,250	9,956
	Coupling Q5-Q5	21,250	18,806
	Coupling Q6-Q4	11,250	9,956
	Coupling Q6-Q5	21,250	18,806
	Coupling Q6-Q6	40,000	35,400
	Coupling Q7-Q4	11,250	9,956
	Coupling Q7-Q5	21,250	18,806
	Coupling Q7-Q6	40,000	35,400
	Coupling Q7-Q7	62,000	54,870

Q SERIES MULTIPLE PUMPS - MAJOR DIMENSIONS

These drawings give a quick reference to the overall dimensions of the QR and QS Series pumps.
Multiple pumps are shown made up of individual sections connected together. The 'dual' type housing is not depicted.







	u (inlets)		v (outlets)		w		x		y		z	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
QR4/QS4	46.0	1.8	53.0	2.0	21.0	0.8	140.0	5.5	130.0	5.2	65.0	2.5
QR5/QS5	54.5	2.1	72.5	2.8	26.0	1.0	166.0	6.5	180.0	7.1	94.0	3.7
QR6/QS6	68.6	2.7	90.1	3.5	32.0	1.3	196.0	7.7	201.0	7.9	107.0	4.2
QS7	104.5	4.1	104.5	4.1	39.5	1.6	239.0	9.4	254.5	10.0	133.5	5.3

Pump lengths: Single = A **Double = A+C** **Triple = A+B+C**

R SERIES	A		B		C	
	mm	in	mm	in	mm	in
R4016	145	5.7	115	4.5	115	4.5
R4019	147	5.8	118	4.6	118	4.6
R4023	150	5.9	121	4.8	121	4.8
R4027	154	6.1	124	4.9	124	4.9
R4032	158	6.2	128	5.0	128	5.0
R4038	163	6.4	133	5.2	133	5.2
R4045	169	6.6	139	5.5	139	5.5
R4053	175	6.9	146	5.7	146	5.7
R4060	181	7.1	151	5.9	151	5.9
R5045	178	7.0	144	5.7	144	5.7
R5053	182	7.2	148	5.8	148	5.8
R5063	187	7.4	154	6.1	154	6.1
R5073	193	7.6	159	6.3	159	6.3
R5085	199	7.8	166	6.5	166	6.5
R5100	207	8.1	174	6.8	174	6.8
R5120	218	8.6	185	7.3	185	7.3
R6100	220	8.7	182	7.2	182	7.2
R6117	226	8.9	188	7.4	188	7.4
R6137	233	9.2	195	7.7	195	7.7
R6160	241	9.5	203	8.0	203	8.0
R6187	251	9.9	213	8.4	213	8.4
R6220	263	10.4	225	8.9	225	8.9

S SERIES	A		B		C	
	mm	in	mm	in	mm	in
S4016	151	5.9	121	4.8	121	4.8
S4023	158	6.2	129	5.1	129	5.1
S4027	163	6.4	134	5.3	134	5.3
S4032	169	6.6	139	5.5	139	5.5
S4037	175	6.9	145	5.7	145	5.7
S4042	181	7.1	151	5.9	151	5.9
S5045	188	7.4	154	6.1	154	6.1
S5051	192	7.6	159	6.3	159	6.3
S5060	199	7.8	166	6.5	166	6.5
S5070	207	8.1	173	6.8	173	6.8
S5085	218	8.6	185	7.3	185	7.3
S6083	226	8.9	188	7.4	188	7.4
S6097	234	9.2	196	7.7	196	7.7
S6113	242	9.5	204	8.0	204	8.0
S6132	251	9.9	213	8.4	213	8.4
S6155	263	10.4	225	8.9	225	8.9
S7155	~	~	~	~	~	~
S7180	~	~	~	~	~	~
S7208	~	~	~	~	~	~
S7248	~	~	~	~	~	~

~ Please consult your David Brown Hydraulics' representative.

***Note** when mounting Q4 to Q6 add 18 mm to dimensions B and C.

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