



**Roots**

## 45 URAI-J

Part Number – 74066020



Patented WHISPAIR™ blowers operate with up to 40% less pressure pulsation than conventional blowers, due to the pressure equalizing effect of the WHISPAIR jet design. This design results in longer bearing life, lower vibration, and reduces noise by approximately 5 dBA vacuum and 3 dBA pressure.

- Detachable steel mounting feet
- Rigid one-piece cast iron casing
- Connections in standard pipe sizes
- Straight, precision machined two-lobe impellers
- Splash oil lubricated gears
- Carburized and ground alloy steel spur timing gears
- Anti-Friction gears
- Ground steel shafts

### Also Available in:

- URAI
- URAI-DSL (Dual Splash Lube)
- URAI-J (Whispair)
- URAI-G (Gas)
- URAI-Metric



816-741-0282



### Quick Specs

Flow Range	to 395 CFM
Max ΔPressure	10 PSI
Max ΔVacuum	15" Hg
Maximum RPM	3600
Minimum RPM	848
Max ΔT	225°F
Connection Size	2.5" FPT
Shaft Dia.	0.875"
Min Sheave Dia.	5"
Drive End Lubrication	Grease
Gear End Lubrication	Oil
Oil Sump Gear End Horiz Config	~14.5 oz
Oil Sump Gear End Vert Config	~12.7 oz
Bare Unit Weight	119 lbs
Container	Box
Box Size (L x W x H)	17" x 16" x 12"
Shipping Weight on Skid	~160 lbs
Recommended to Ship Via	Truck



816-741-0282

**Universal RAI Series Blowers Parts List  
2-1/2" – 5" Gear Diameter**

(Refer to drawing #64720023)

Item #	Part Name	Qty.
1	Headplate Gear End	1
2	Headplate Drive End	1
3	Gearbox	1
4	Timing Gears	2
5	Cover-Blind (Plug Opening)	1
7	Gasket, Gear Box	1
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing, Ball	3
15	Bearing, Roller	1
16	Pin, Dowel	4
17	Gear Nut	2
19	Key	1
21	Plug, Pipe	3
23	Screw Hex	6
25	Breather (Plug Vent)	1
26	Screw, Hex	*
27	Seal, Lip Bearing	4
31	Screw, Hex, Nylock	4
32	Screw, Hex	6
33	Seal Lip-Drive	1
34	Clamp Plate	2
35	Foot	2
37	Fitting, Grease	2
38	Fitting, Relief	2
39	Washer Mounting	4
40	Screw Socket	2
42	Screw Hex	2

\*Quantities vary by blower.

**Table 2 - Recommended Oil Grades**

Ambient* Temperature °F (°C)	ISO Viscosity No.
Above 90° (32°)	320
32° to 90° (0° to 32°)	220 in which the
0° to 32° (-18° to 0°)	150
Below 0° (-18°)	100

\*Ambient temperature is defined as the temperature of the space blower and drive are located.

**Due to sludge build-up and seal leakage problems, the Roots recommendation is DO NOT USE Mobil SHC synthetic oils in ROOTS blowers.**

- When servicing drive end bearings of a AIR (Not the blower), use the specified and recommended Shell Darina SD 2 NLGI #2 product code 5067628.
- Lithium based greases are not compatible with specified and recommended Shell Darina SD 2 grease used when assembling the blower. **Lithium based grease is not approved for any ROOTS blowers.**

**Repair Kits**

Repair kits are bundled with the parts you need to complete a standard repair. It is more cost effective to buy a repair kit than to purchase individual parts. However, if you need parts not listed in the kit, it is recommended that you call Pathfinder Systems for parts pricing.

**P/N 651080RK Kit without Gears for 42, 45, 47 URAI, URAI-DSL, URAI-J, URAI-J-DSL, URAI-Metric, URAI-DSL-Metric**

Item	Qty	4" Kit Description	P/N
5	1	PLUG,OPENING for 2.4411	12957004
7	2	GSKT,GRBX 4 URAI TS9003	62757021
14	3	BRG,BALL	10987040
15	1	BRG,ROLLER	10222036
17	2	NUT,HEX ESNA 3/4-16	10319009
27	4	SEAL,LIP(VITON) 1 SFT	10005158
31	4	SCR,CAP HEXH NYL 1/4-20X	11540003
33	1	SEAL,LIP for GREASE LUBE	12091010
33A	1	SEAL,LIP for DSL	T20082002

**P/N 651070RK Kit with Gears for 42, 45, 47 URAI, URAI-DSL, URAI-J, URAI-J-DSL, URAI-Metric, URAI-DSL-Metric**

Item	Qty	4" Kit Description	P/N
4	1	GEAR,ASSY 4 URAI T/B	63865021
5	1	PLUG,OPENING for 2.4411	12957004
7	2	GSKT,GRBX 4 URAI TS9003	62757021
14	3	BRG,BALL	10987040
15	1	BRG,ROLLER	10222036
17	2	NUT,HEX ESNA 3/4-16	10319009
27	4	SEAL,LIP(VITON) 1 SFT	10005158
31	4	SCR,CAP HEXH NYL 1/4-20X	11540003
33	1	SEAL,LIP for GREASE LUBE	12091010
33A	1	SEAL,LIP for DSL	T20082002

**ROOTS® Synthetic Oil: ISO-VG-320 Grade**

	Part Number
Quart	13106004
Gallon	13106005
Case (12 qts)	13106007

**ROOTS® Synthetic Oil: ISO-VG-220 Grade**

	Part Number
Quart	13106001
Gallon	13106002
Case (12 qts)	13106008

**ROOTS® Synthetic Oil: ISO-VG-150 Grade**

	Part Number
Quart	13106020
Gallon	13106021
Case (12 qts)	13106023
5 Gallon Pail	13106022
55 Gallon Drum	13106025

**ROOTS® Synthetic Oil: ISO-VG-100 Grade**

	Part Number
Quart	13106011
Gallon	13106012
Case (12 qts)	13106014
5 Gallon Pail	13106013
55 Gallon Drum	13106016

NOTES:

A- INSTALL ITEM #20 (SCREW) IN ASSEMBLY

B- SEE OPERATING MANUAL IRB-180 FOR LUBRICATION INSTRUCTION

C- 2-1/2, 3-1/2, & 4" REQ'D SOC. HD. ON G.E. ONLY

E- REQ'D ON 22 & 42 ONLY

F- NUT TO BE TORQUED TO:

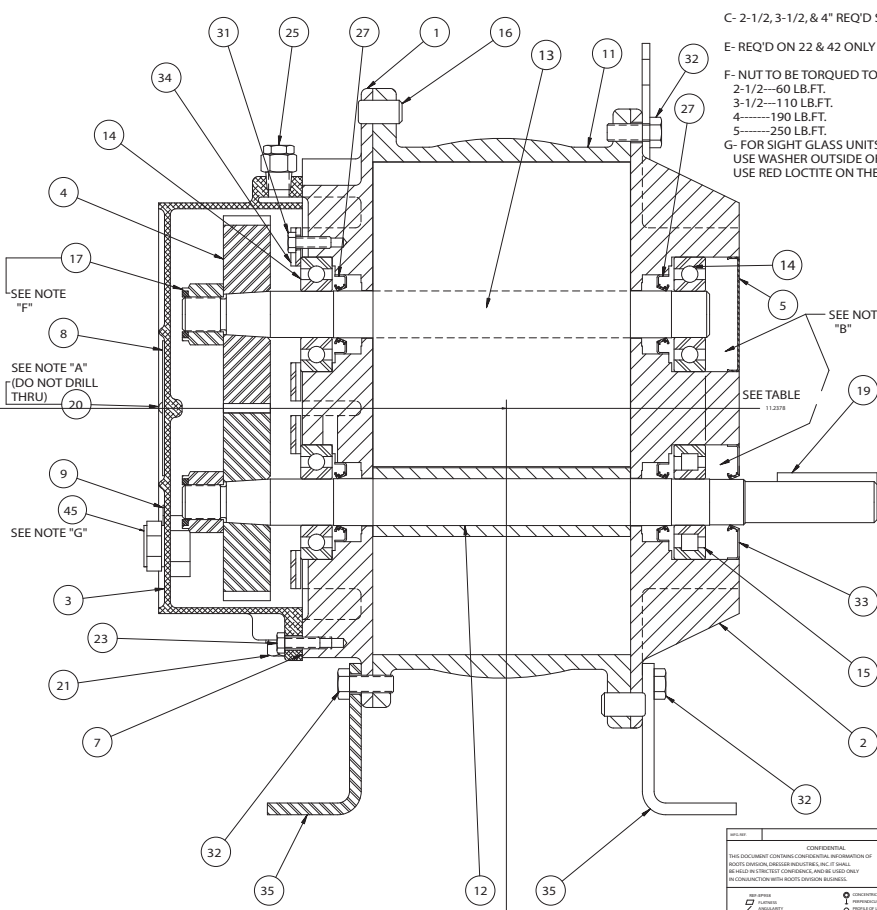
2-1/2---60 LB.FT.

3-1/2---110 LB.FT.

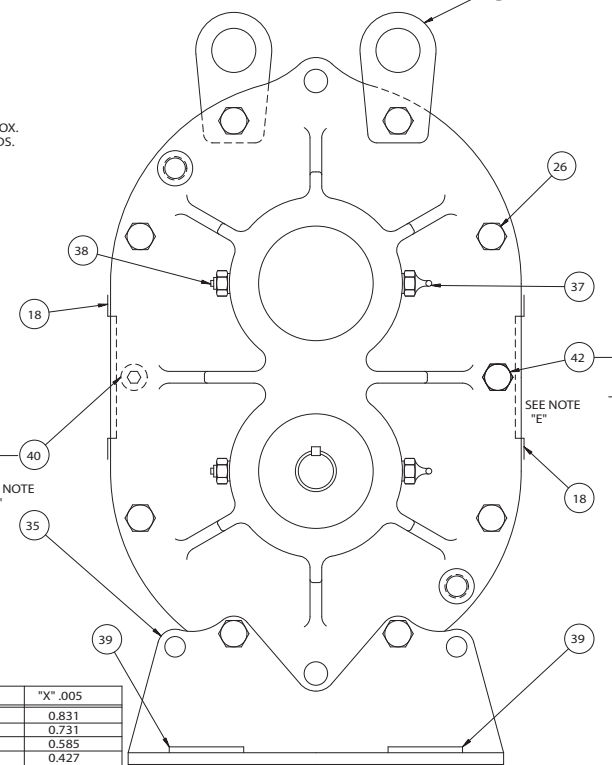
4---190 LB.FT.

5---250 LB.FT.

G- FOR SIGHT GLASS UNITS ONLY. USE WASHER OUTSIDE OF GEARBOX. USE RED LITTE ON THE THREADS.



SIZE	"X" .005
5	0.831
4	0.731
3-1/2	0.585
2-1/2	0.427



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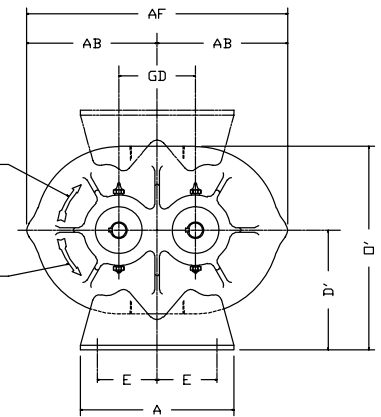
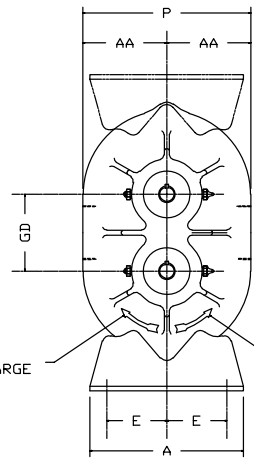
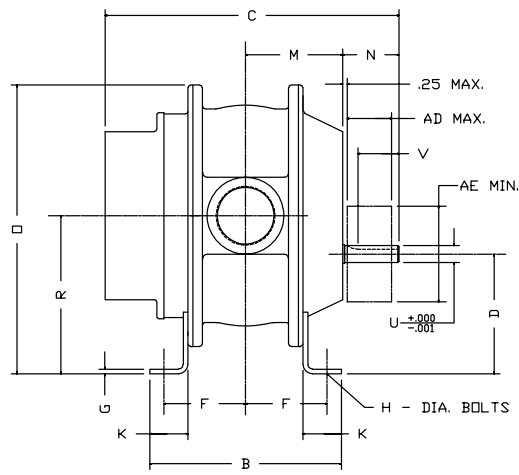
**SECTIONAL ASSEMBLY**  
 2-1/2 THRU 5" U-BAL BLOWERS  
 TAPER ROSE GEARS

**DRESSER**  
 Roots  
 DRESSER ROOTS, DRESSER, INC.  
 INDUSTRIAL, TX

64720023 REV J

FRAME	APPROX. OIL CAPACITY	
	VERTICAL	HORIZONTAL
2-1/2	3.4 FL. OZ.	6.1 FL. OZ.
3-1/2	8.5 FL. OZ.	16 FL. OZ.
4	12.7 FL. OZ.	22.8 FL. OZ.
5	16.0 FL. OZ.	27.6 FL. OZ.

No. REQ'D.	PART NAME	PATT. No. PART No.	MAT'L.



W - INLET & DISCHARGE  
 AD - SHEAVE WIDTH  
 AE - SHEAVE DIAMETER

ALL DIMENSIONS IN INCHES

# UNIVERSAL<sup>®</sup> RAI BLOWER

FRAME SIZE	GD	A	B	C	D	D'	E MIN.	E MAX.	F MIN.	F MAX.	G	H	K	M	N	O	O'	P	R	U	KEYWAY	W NPT.	V	AA	AB	AD	AE	AF	APPROX. WT. LBS
22	2.5	5.13	5.00	9.75	3.75	3.75	1.50	2.00	2.00	2.00	.25	.38	1.25	2.63	2.50	9.63	6.88	6.25	5.00	.625	.188x.094	1"	1.81	3.13	4.63	1.75	4.00	9.25	32
24	"	"	7.00	11.75	"	"	"	"	3.00	3.00	"	"	"	3.63	"	"	"	"	"	"	"	2"	"	"	"	"	"	"	43
32	3.50	7.25	6.75	11.25	5.00	5.00	2.50	2.88	2.56	2.81	.25	.44	1.75	3.38	2.44	12.81	8.88	7.75	6.75	.750	.188x.094	1-1/4"	1.63	3.88	6.06	1.91	5.00	12.13	69
33	"	"	7.63	12.13	"	"	"	"	3.00	3.25	"	"	"	3.81	"	"	"	"	"	"	"	2"	"	"	"	"	"	"	74
36	"	"	10.00	14.63	"	"	"	"	4.18	4.44	"	"	"	5.00	2.56	"	"	"	"	"	"	2-1/2"	1.75	"	"	"	"	"	102
42	4.00	8.00	7.25	13.00	6.25	6.25	3.00	3.13	2.50	3.13	.31	.44	2.00	3.68	3.18	15.06	10.63	8.75	8.25	.875	.188x.094	1-1/2"	2.31	4.38	6.81	2.31	5.00	13.63	88
45	"	"	10.00	15.50	"	"	"	"	3.56	4.25	"	"	"	5.06	2.94	"	"	"	"	"	"	2-1/2"	2.13	"	"	"	"	"	109
47	"	"	11.75	17.63	"	"	"	"	4.63	5.38	"	"	"	5.94	3.31	"	10.50	8.50	"	"	"	3"	2.50	4.25	"	"	"	"	128
53	5.00	10.50	8.38	15.38	6.25	6.75	3.50	3.50	3.18	3.68	.25	.50	1.88	4.50	3.68	17.38	11.88	10.25	8.75	1.125	.25 x.125	2-1/2"	2.75	5.13	8.63	3.06	6.00	17.25	143
56	"	"	11.00	17.50	"	"	"	"	4.25	5.00	"	"	"	5.81	3.38	"	12.25	11.00	"	"	"	4"	2.50	5.50	"	"	"	"	170
59	"	"	14.00	21.00	"	"	"	"	6.00	6.50	"	"	"	7.31	3.88	"	"	"	"	"	"	4"	3.00	"	"	"	"	"	204

MFG. REF.	CONFIDENTIAL	DATE	8/29/84
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REF: EP938	REVISION ON 'C' FROM 18.00 TO 17.50	APP. FCR	
⊖ CONCENTRICITY	D UPDATED TITLE BLOCK 9/25/91	DBV	
□ FLATNESS	C CORRECTED FRAME 36 REM 8/14/90	SCALE	
∠ ANGULARITY	B ADDED FRAME 32 RVE 6/22/90	CAD FILE / DIRECTORY	
∥ PARALLELISM	A REV. FRAM 59 REM 6/9/88		
⊕ TRUE POSITION			
— STRAIGHTNESS			
⊙ PERPENDICULARITY			
— PROFILE OF LINE			
— PROFILE OF A SURFACE			
∅ DIAMETER			
✓ FINISH IN MICRO INCHES /PARTS/XXAD 62795a21			

DO NOT SCALE FOR DIMENSIONS  
 ALL DIMENSIONS SHOWN IN BRACKETS ( ) ARE MILLIMETERS

ORDER No.

## ASSY DIM 22-59 URAI VH

ROOTS DIVISION  
 DRESSER EQUIPMENT GROUP  
 A HALLIBURTON COMPANY  
 CONNERSVILLE, IN USA

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED  
 FINISHED DIMENSIONS  
 TWO PLACE DECIMALS 000--.005 FRACTIONAL--1/64  
 THREE PLACE DECIMALS 0000--.005

62795021

REV E

## ROOTS™ UNIVERSAL RAI-J® WHISPAIR™ ROTARY POSITIVE BLOWERS

Frames 33J thru 56J

### BASIC BLOWER DESCRIPTION

Patented Universal RAI-J® WHISPAIR™ blowers are heavy duty rotary units in a compact, sturdy design, engineered for continuous service when operated within speed and vacuum/pressure ratings.

The basic model features a cast iron casing with a computer-designed cast relief for noise and shock suppression, carburized and ground alloy steel spur timing gears secured to steel shafts with a taper mounting and locknut, and cast iron involute impellers. Oversized anti-friction bearings are used, with a cylindrical roller bearing at the drive shaft to withstand V-belt pull. Detachable rugged steel mounting feet permit easy in-field adaptability to either vertical or horizontal installation requirements.

The Universal RAI-J® incorporates grease lube on the drive end and splash lube on the gear end. ROOTS' exclusive "figure-eight" gearbox design improves oil distribution to maximize bearing and gear life.

### LOWER AIR PULSATION

Patented WHISPAIR™ blowers operate with up to 40% less pressure pulsation than conventional blowers, due to the pressure equalizing effect of the WHISPAIR™ jet design.

In conventional blowers, as the impeller opens up to the outlet port, the higher pressure air in the discharge line rapidly expands into the lower pressure pocket

formed by the impeller and the blower case. The resulting shock wave strikes the advancing surface of the impeller at near-sonic velocity. Four pressure pulses occur during each revolution, transmitting shock loads to the gear and bearings.



### LONGER BEARING LIFE

The pre-pressurization of the low pressure pocket through the WHISPAIR™ jet cavity smooths the pulsations, resulting in less shock being transmitted through the impellers to the bearings, providing longer bearing life.

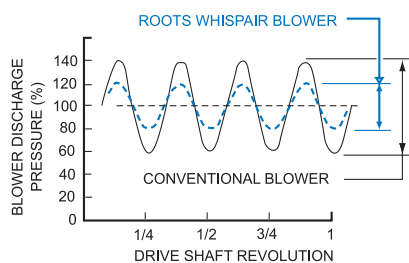
### LOWER VIBRATION

The reduction in the magnitude of the pressure pulsation results in smoother operation.

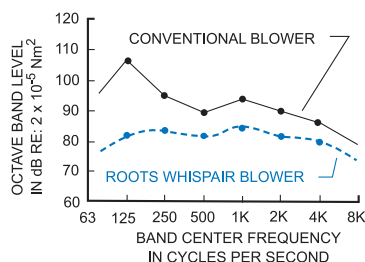
### LOWER NOISE

The pressure pulses, inherent in the rotary-lobe design, are also the major source of blower noise. The rapid backflow of air into the blower from the discharge line, four times per revolution, results in high noise levels in a conventional blower. The WHISPAIR™ jet design controls the backflow of air into the blower, reducing noise by approximately 5 dBA vacuum, 3 dB pressure.

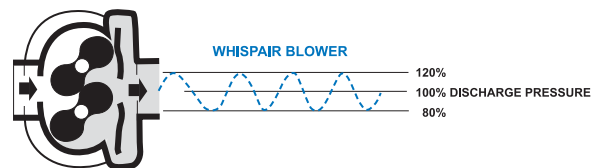
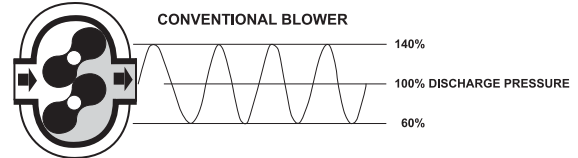
PEAK-TO-PEAK PRESSURE PULSE



TYPICAL BLOWER NOISE CURVE



PRESSURE PULSES



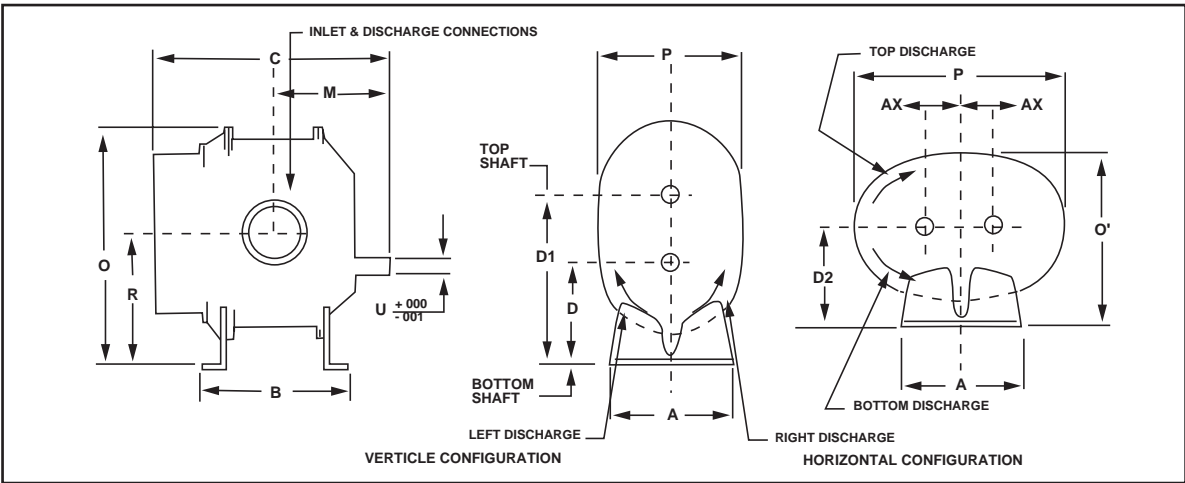
Roots

## PERFORMANCE TABLE: ROOTS Universal URAI-J

Frame Size	Speed	4 PSI		5 PSI		6 PSI		7 PSI		8 PSI		9 PSI		10 PSI		12 PSI		13 PSI		VACUUM DATA		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	INHG	CFM	BHP
33UJ	1750	75	1.9	71	2.4	67	2.9	64	3.3	61	3.8	58	4.3	56	4.7	51	5.7			13	53	3.0
	2950	149	3.3	145	4.1	141	4.9	138	5.7	135	6.5	132	7.3	130	8.1	125	9.7			15	119	5.9
	3550	186	4.1	182	5.0	178	6.0	175	6.9	172	7.9	169	8.8	167	9.8	162	11.7			15	156	7.2
36UJ	1750	132	3.2	126	3.9	121	4.7	117	5.5											14	95	5.4
	2950	254	5.5	249	6.8	244	8.1	239	9.4											15	212	9.8
	3550	316	6.7	310	8.3	305	9.9	300	11.5											15	273	11.9
45UJ	1750	161	3.8	155	4.7	150	5.6	145	6.6	140	7.5	136	8.4	132	9.3					14	121	6.4
	2950	306	6.7	300	8.2	295	9.8	290	11.3	285	12.9	281	14.4	277	16.0					16	253	12.5
	3550	379	8.2	373	10.1	368	12.0	363	13.9	358	15.7	354	17.6	349	19.5					16	326	15.2
47UJ	1750	215	5.0	208	6.2	201	7.4	195	8.6											14	165	8.4
	2950	407	8.8	399	10.8	392	12.9	386	14.9											15	348	15.4
	3550	502	10.9	495	13.3	488	15.8	482	18.3											15	444	18.8
56UJ	1170	196	4.6	188	5.7	182	6.9	175	8.0	170	9.1	164	10.2	159	11.4	150	13.6			14	146	7.8
	1750	324	7.0	316	8.7	310	10.4	304	12.1	298	13.8	292	15.5	287	17.2	278	20.5	273	22.2	15	266	12.6
	2850	567	12.2	560	15.0	553	17.7	547	20.5	541	23.2	536	26.0	530	28.7	521	34.2	517	37.0	16	501	22.4

NOTES: 1. Performance based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.  
2. Vacuum ratings based on inlet air at standard temperature of 68° F, and specific gravity of 1.0.

## OUTLINE DRAWING & DIMENSIONAL TABLE: ROOTS Universal URAI-J



FRAME	A	A'	B	C	D	D1	D2	M	O	O'	P	P'	R	U	INLET DISCH.	AX	WGT
33UJ	7.25	7.25	7.63	12.13	5.00	8.50	5.00	6.25	12.81	10.00	10.00	12.13	6.75	.750	2.0 NPT	1.75	84
36UJ	7.25	7.25	10.00	14.63	5.00	8.50	5.00	7.56	12.81	10.50	11.00	12.13	6.75	.750	2.5 NPT	1.75	112
45UJ	8.00	8.00	10.00	15.50	6.25	10.25	6.25	8.00	15.06	12.25	12.00	13.63	8.25	.875	2.5 NPT	2.00	119
47UJ	8.00	8.00	11.75	17.63	6.25	10.25	6.25	9.25	15.06	12.25	12.00	13.63	8.25	.875	3.0 NPT	2.00	138
56UJ	10.50	10.50	11.00	17.50	6.25	11.25	6.75	9.19	17.38	14.00	14.00	17.25	8.75	1.125	4.0 NPT	2.50	190

## DESIGN AND CONSTRUCTION FEATURES

1. Detachable steel mounting feet
2. Rigid one-piece cast iron casing
3. Anti-friction bearings
4. Splash oil lubricated spur timing gears
5. Connections in standard pipe sizes
6. Ground steel shafts
7. Straight, precision machined two-lobe impellers



Roots

S-33A93  
September 2003

### Dresser ROOTS

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### Dresser ROOTS

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Connersville, IN 47331  
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Fx: 765-827-9266

### Dresser ROOTS

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Fx: +44-1484-422668

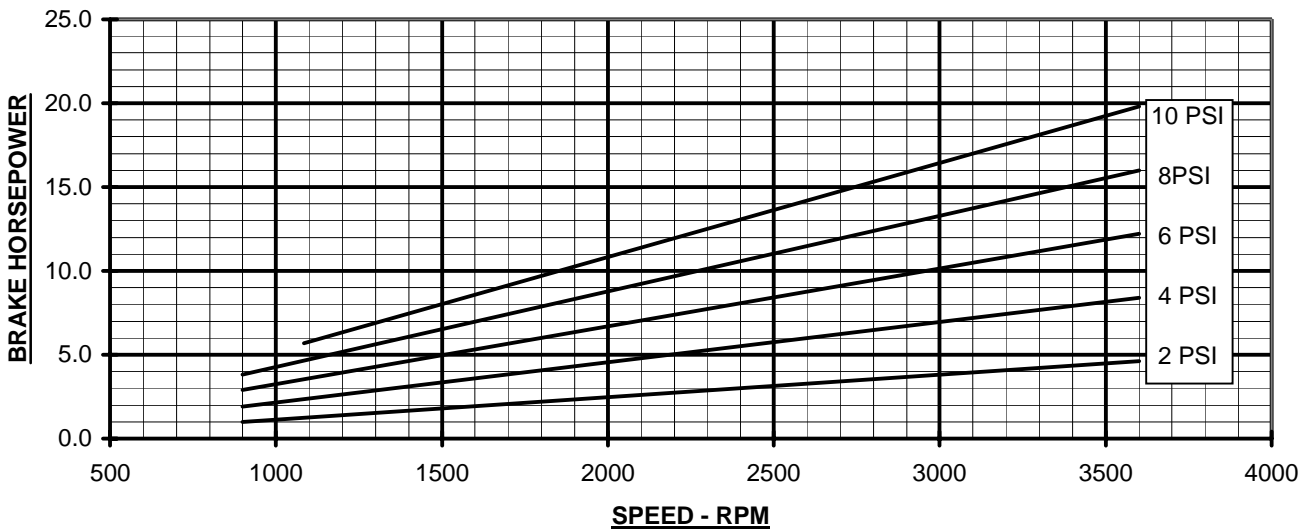
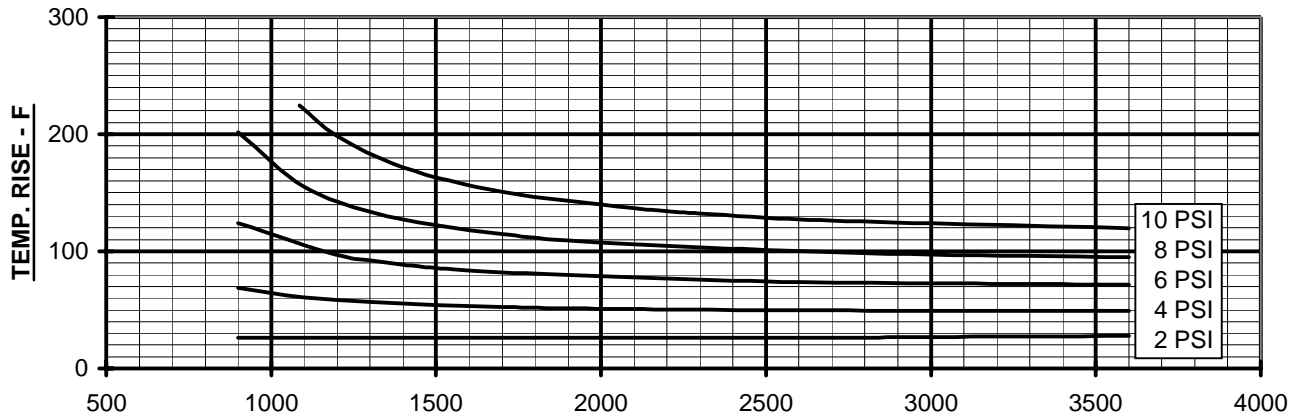
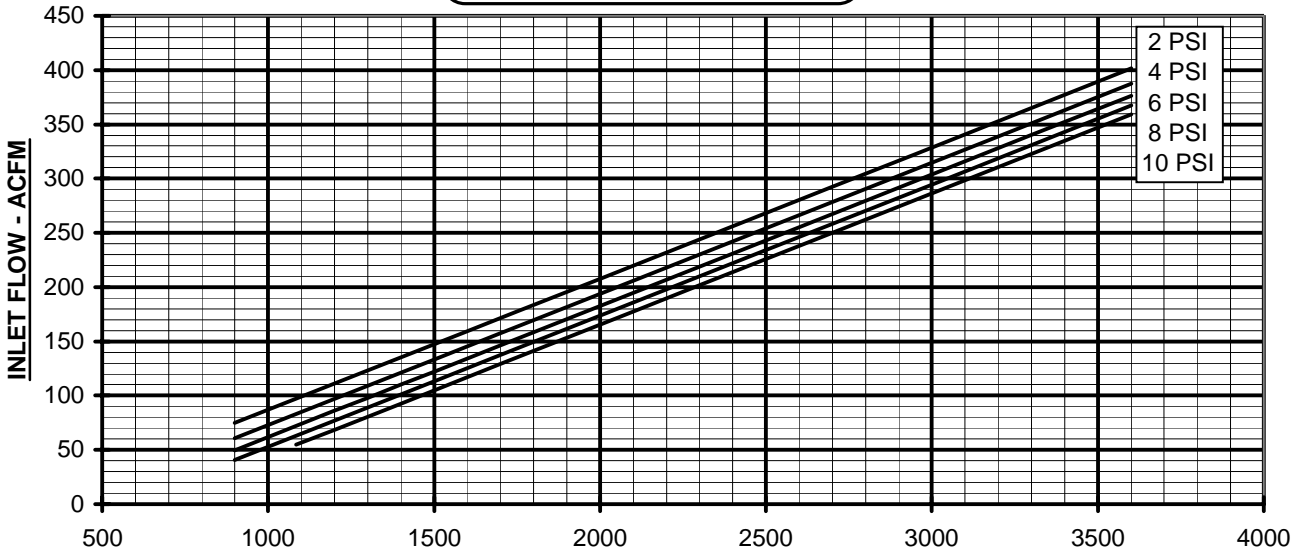
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PERFORMANCE BASED ON AIR,  
 INLET AT 14.7 PSIA & 68°F  
 DECEMBER 2004

**PRESSURE PERFORMANCE**  
**FRAME 45 U-RAI**  
 MAX. PRESSURE RISE = 10 PSI  
 MAX. SPEED = 3600 RPM





**VACUUM PERFORMANCE**  
**FRAME 45 U-RAI**  
 MAX. VACUUM = 16" HG  
 MAX. SPEED = 3600 RPM

PERFORMANCE BASED ON AIR,  
 INLET AT 68°F  
 DISCHARGE PRESSURE = 30" HG ABS.  
 DECEMBER 2004

