Instruction Manual

Series 2000 and S2H22-53 Blowers

Ingersoll Rand

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I INTRODUCTION

I.I Scope and definitions

This manual provides installation, operation and maintenance instructions for the Ingersoll Rand Series 2000 and S2H22-53 Blowers, abbreviated to "blowers" in the remainder of this manual. You must use the blower as specified in this manual.

Read this manual before you install the blower. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.

WARNING

Warnings are given where failure to observe the instruction could result in injury or death to people.

CAUTION

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

The units used throughout this manual conform to the SI international system of units of measurement. Equivalent values in imperial units are also included.

An identification and rating plate will be fitted to the top of the blower body casing, or to the gear cover. This plate provides specific details about the blower, such as its Item Number and so on.

The following warning and other symbols are on the blower:

Warning – refer to accompanying documentation.

Warning – hot surfaces.

1.2 Description

Refer to Figure 2. The Series 2000 and S2H22-53 blowers are positive displacement blowers, cooled by ambient air circulation.

The blowers are supplied in 'bareshaft' form. You must connect your own coupling or belt drive system (see Section 3.7) to the drive shaft in order to operate the blower.

The blowers are available in two different versions:

- 'H' version blowers, which are installed horizontally, and provide for a vertical gas flow through the blower.
- 'V' version blowers, which are installed vertically, and provide for a horizontal gas flow through the blower.

S2H/V blowers have BSP inlet and outlet connections and S2H/VN blowers have NPT inlet and outlet connections (see Section 2.6 and Figure 3).

Refer to Section 2.8 for the Item Numbers of the different blower versions.

1.3 Applications

All of the blowers are suitable for pressure or vacuum operation.

The blowers are suitable for pumping/compressing ambient air, and non-flammable gases, gas mixtures and dusts. The blowers are **not** suitable for pumping/compressing flammable or pyrophoric gases, gas mixtures and dusts.

The materials of construction of the blowers are specified in Section 2.7. Before you use the blower, you must ensure that these materials are compatible with the gases and vapours which you will pump/compress or which may exist in the external atmosphere.

You must ensure that your blower is suitable for your application.

If you have any doubts as to the suitability of the blower for your application, contact your supplier or Ingersoll Rand for advice.

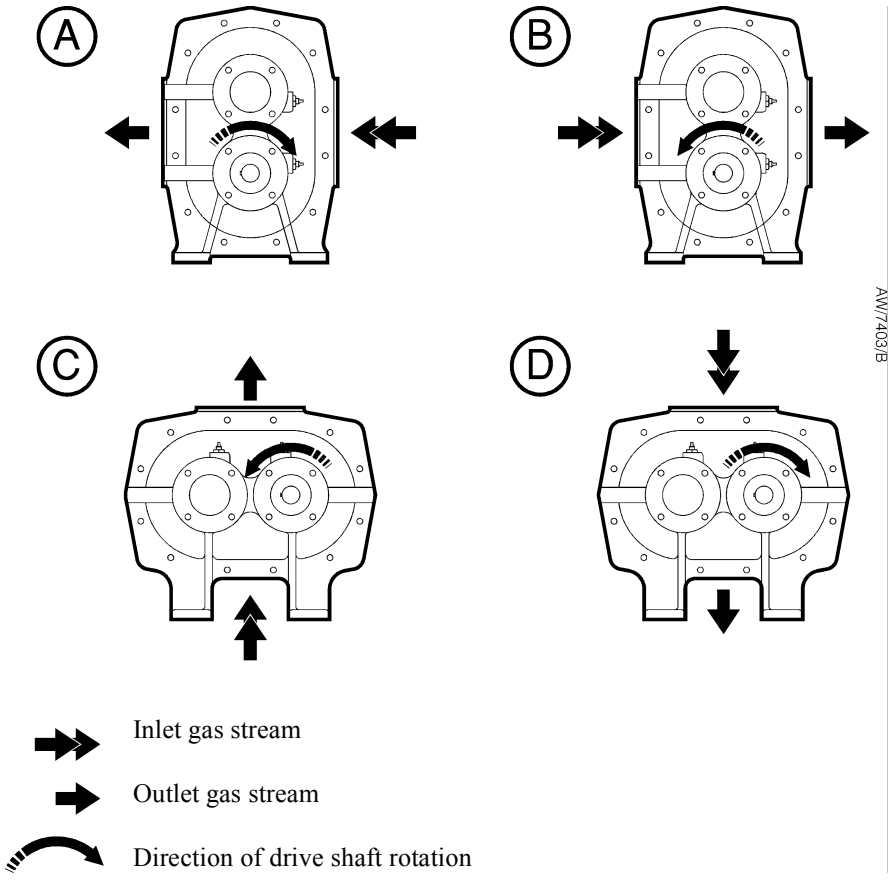
1.4 Principle of operation

The Series 2000 and S2H22-53 blowers are positive displacement blowers, which incorporate a pair of two-lobe contra-rotating rotors. One of the rotors is driven by the drive shaft. The other rotor is maintained in the correct phase relation by oil lubricated timing gears in the gear cover.

As the rotors turn, gas which enters the inlet is trapped in the chambers which form between the rotors and the body casing, and is eventually forced out of the blower at the discharge (outlet).

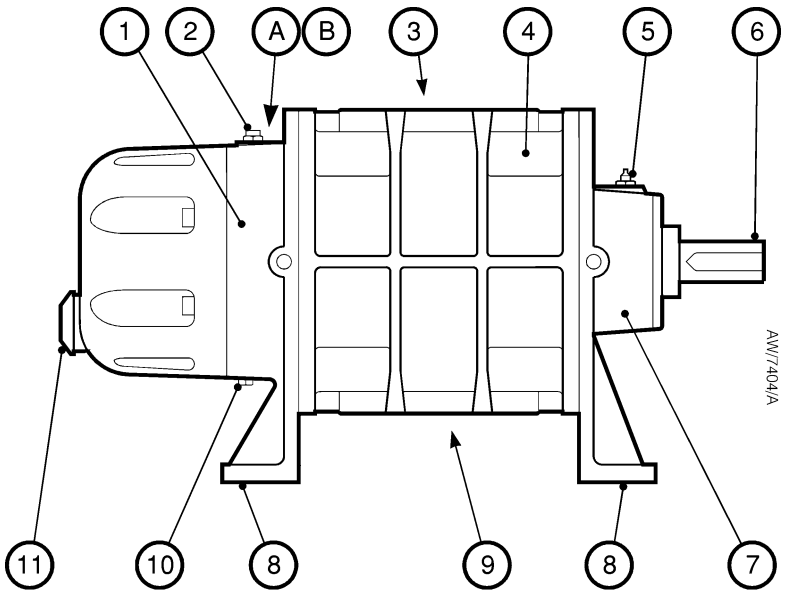
The rotors can operate (rotate) in either direction. The direction of gas flow through the blower is therefore determined by the direction of rotation of the drive shaft, as shown in Figure 1.

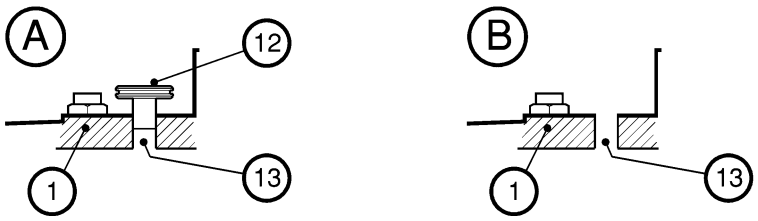
You must ensure that your drive system (connected to the drive shaft) is correctly configured for your system design.



A Vertical orientation: clockwise rotation
B Vertical orientation: anticlockwise rotation
C Horizontal orientation: anticlockwise rotation
D Horizontal orientation: clockwise rotation

Figure 1 – Orientations and directions of gas flow through the blowers





A Gear cover vent configuration
B Alternative gear cover vent configuration

1. Gear cover
2. Oil filler plug
3. Inlet/outlet
4. Body casing
5. Bearing greasing points (2 off)
6. Drive shaft
7. Bearing cover
8. Mounting feet
9. Inlet/outlet
10. Oil drain plug
11. Oil-level sight-glass
12. External vent filter
13. Gear cover vent port

Figure 2 – Components of the blower

2 TECHNICAL DATA

2.1 Operating and storage conditions

Ambient operating temperature range	-20 to 40 °C, -4 to 104 °F
Ambient storage temperature range	-20 to 80 °C, -4 to 176 °F
Maximum ambient operating humidity	90%
Maximum operating altitude *	1000 m, 3280 ft

* The blowers may be suitable for operation at higher operating altitudes, depending on your installation and application: contact your supplier or Ingersoll Rand for advice.

Table 1 – Operating and storage conditions

2.2 Performance

Performance data is shown in Tables 3 to 13 (page 6 to page 16).

Notes: The "given pressures" specified in Tables 3 to 13 are the differential pressures across the blower (that is, the differential pressures between the blower inlet and outlet).

The "r.p.m./r min^{-1}" rotation speeds specified in Tables 3 to 13 are provided for information only, to identify blower performance at the specified speed. During operation, the rotation speed of the blowers need not be limited to these specified speeds.

The maximum vacuum values given in Tables 3 to 13 are for a flow through the blower. You must not exceed these values. otherwise the blower may be damaged and/or seize.

2.3 Mechanical data

Dimensions					
S2H22-53H/V blowers	See Figure 3				
Series 2000H/V blowers	See Figure 4				
Mass	**S2H22H/V**	**S2H23H/V**	**S2H31H/V**	**S2H32H/V**	**S2H33H/V**
	19 kg 41.9 lb	21 kg 46.3 lb	34 kg 74.9 lb	38 kg 83.8 lb	48 kg 105.8 lb
	S2H41H/V	**S2H42H/V**	**S2H43H/V**	**S2H51H/V**	**S2H52H/V**
	50 kg 110.2 lb	60 kg 132.3 lb	73 kg 160.9 lb	95 kg 209.4 lb	102 kg 224.9 lb
	S2H53H/V				
	121 kg 266.8 lb				
	2022H/V	**2023H/V**	**2031H/V**	**2032H/V**	**2033H/V**
	15 kg 33.1 lb	16 kg 35.3 lb	30 kg 66.1	32 kg 70.5	39 kg 86.0 lb
	2041H/V	**2042H/V**	**2043H/V**	**2051H/V**	**2052H/V**
	44 kg 97.0 lb	51 kg 112.4 lb	62 kg 136.7 lb	86 kg 189.6 lb	96 kg 211.6 lb

Table 2 – Mechanical data

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	300 mbar 3 x 10^4 Pa		400 mbar 4 x 10^4 Pa		500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		700 mbar 7 x 10^4 Pa		830 mbar 8.3 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1400	14.0	0.45	-	-	-	-	-	-	-	-	-	-	300 *	10	0.40
2600	49.0	0.80	45.0	0.89	41.0	1.10	38.0	1.30	35.0	1.60	-	-	410 §	35	1.20
3800	84.0	1.20	80.0	1.30	76.0	1.60	73.0	1.90	70.0	2.60	67.0	3.10	500 ‡	60	2.15
5000	119.0	1.60	114.0	2.20	111.0	2.60	107.0	3.00	101.0	3.40	101.0	3.90	500 ‡	95	2.50
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	4 psig		6 psig		8 psig		10 psig		11 psig		12 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
2300	24.2	0.96	20.9	1.09	18.0	1.45	-	-	-	-	-	-	8.9	6	0.54
3200	39.6	1.33	36.2	1.52	33.4	2.02	30.9	2.53	29.7	2.78	-	-	12.1	21	1.20
4100	55.0	1.61	51.6	1.94	48.8	2.59	46.2	3.24	45.1	3.57	42.0	4.20	15.0	38	2.00
5000	70.4	2.08	67.0	2.37	64.1	3.16	61.6	3.95	60.5	4.35	59.4	5.23	15.0	56	3.35

* = 3 x 10^4 Pa § = 4.1 x 10^4 Pa ‡ = 5 x 10^4 Pa

Table 3 – Performance data: S2H22 and 2022 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	150 mbar 1.5 x 10^4 Pa		200 mbar 2 x 10^4 Pa		250 mbar 2.5 x 10^4 Pa		300 mbar 3 x 10^4 Pa		350 mbar 3.5 x 10^4 Pa		482 mbar 4.82 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1850	71.4	0.69	65.9	0.84	61.0	0.95	56.5	1.05	52.5	1.16	-	-	300 *	50	1.20
2900	132.0	1.08	127.0	1.31	122.0	1.48	118.0	1.65	113.0	1.82	100.0	2.75	474 §	87	2.62
3950	193.0	1.47	188.0	1.79	183.0	2.02	179.0	2.25	174.0	2.47	170.0	3.70	474 §	147	3.65
5000	254.0	1.86	249.0	2.26	244.0	2.55	239.0	2.84	235.0	3.13	225.0	4.50	474 §	211	4.55
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	2 psig		3 psig		4 psig		5 psig		6 psig		7 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1850	42.0	0.92	38.7	1.13	35.9	1.27	33.2	1.41	30.9	1.55	-	-	8.90	29.4	1.61
2900	77.6	1.45	74.7	1.76	71.7	1.98	69.4	2.21	66.4	2.44	58.8	3.69	14.00	51.2	3.51
3950	113.5	1.97	110.5	2.40	107.6	2.71	105.3	3.02	102.3	3.31	100.0	4.96	14.00	86.4	4.89
5000	149.4	2.49	146.4	3.03	143.5	3.42	140.5	3.81	138.2	4.20	132.3	6.03	14.00	124.1	61.0

* = 3 x 10^4 Pa § = 4.74 x 10^4 Pa

Table 4 – Performance data: S2H23 and 2023 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		700 mbar 7 x 10^4 Pa		800 mbar 8 x 10^4 Pa		950 mbar 9.5 x 10^4 Pa		1000 mbar 1 x 10^5 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1300	33.0	1.60	-	-	-	-	-	-	-	-	-	-	300 *	37	1.10
2200	102.0	2.70	95.0	3.15	90.0	3.65	-	-	-	-	-	-	400 §	91	2.20
3300	183.0	4.15	179.0	4.90	172.0	5.50	166.0	6.10	157.0	7.15	153.0	7.20	542 ‡	148	4.60
4000	237.0	5.00	232.0	5.85	226.0	6.80	221.0	7.50	215.0	8.80	211.0	9.00	542 ‡	200	5.40
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	6 psig		8 psig		10 psig		12 psig		14 psig		15 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1300	27.0	1.86	-	-	-	-	-	-	-	-	-	-	8.9	22	1.47
2200	60.0	3.20	58.0	4.02	53.0	4.89	-	-	-	-	-	-	11.8	54	2.95
3300	106.0	4.85	106.0	6.17	100.0	7.37	97.0	8.18	93.0	9.58	90.0	9.65	16.0	88	6.17
4000	141.0	5.90	136.0	7.37	133.0	9.05	129.0	10.05	127.0	11.80	124.0	12.06	16.0	118	7.24

* = 3 x 10^4 Pa § = 4 x 10^4 Pa ‡ = 5.42 x 10^4 Pa

Table 5 – Performance data: S2H31 and 2031 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	300 mbar 3 x 10^4 Pa		400 mbar 4 x 10^4 Pa		500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		700 mbar 7 x 10^4 Pa		827 mbar 8.27 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1600	100.0	1.55	91.0	1.85	83.0	2.32	76.0	2.78	-	-	-	-	400 *	72	1.9
2400	179.0	2.32	170.0	2.78	162.0	3.48	155.0	4.17	148.0	4.87	-	-	470 §	138	3.3
3200	257.0	3.09	249.0	3.71	241.0	4.64	234.0	5.56	227.0	6.49	220.0	7.70	500 ‡	211	4.6
4000	336.0	3.87	327.0	4.64	319.0	5.79	312.0	6.95	306.0	8.11	300.0	9.60	500 ‡	285	6.0
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	4 psig		6 psig		8 psig		10 psig		11 psig		12 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1600	60.0	1.97	53.0	2.57	47.0	3.43	-	-	-	-	-	-	12.0	43	2.55
2400	107.0	2.96	99.0	3.86	93.0	5.14	88.0	6.43	85.0	7.07	-	-	14.0	82	4.42
3200	153.0	3.95	146.0	5.14	139.0	6.86	134.0	8.57	131.0	9.43	129.4	10.32	15.0	125	6.17
4000	199.0	4.94	192.0	6.43	186.0	8.57	180.0	10.70	178.0	11.80	176.0	12.87	15.0	168	8.04

* = 4 x 10^4 Pa § = 4.7 x 10^4 Pa ‡ = 5 x 10^4 Pa

Table 6 – Performance data: S2H32 and 2032 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	150 mbar 1.5 x 10^4 Pa		200 mbar 2 x 10^4 Pa		250 mbar 2.5 x 10^4 Pa		300 mbar 3 x 10^4 Pa		350 mbar 3.5 x 10^4 Pa		483 mbar 4.83 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1300	152.0	1.22	142.0	1.53	132.0	1.80	124.0	2.07	116.0	2.34	-	-	300 *	100	2.05
2200	305.0	2.06	295.0	2.58	285.0	3.04	277.0	3.49	269.0	3.95	259.0	5.80	474 §	210	5.80
3100	458.0	2.90	448.0	3.64	438.0	4.28	430.0	4.92	422.0	5.57	419.0	7.90	474 §	365	8.00
4000	612.0	3.75	601.0	4.69	592.0	5.52	583.0	6.35	575.0	7.19	575.0	10.00	474 §	520	10.10
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	2 psig		3 psig		4 psig		5 psig		6 psig		7 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1300	89.0	1.53	83.0	2.05	75.0	2.59	69.0	3.09	63.0	3.61	-	-	8.9	59	2.75
2200	179.0	2.59	173.0	3.54	165.0	4.39	159.0	5.24	153.0	6.11	152.0	7.77	14.0	123	7.77
3100	269.0	3.66	263.0	4.99	255.0	6.19	249.0	7.38	243.0	8.62	247.0	10.59	14.0	215	10.72
4000	360.0	4.94	353.0	6.45	345.0	7.98	339.0	9.52	333.0	11.10	338.0	13.40	14.0	306	13.54

* = 3 x 10^4 Pa § = 4.74 x 10^4 Pa

Table 7 – Performance data: S2H33 and 2033 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		700 mbar 7 x 10^4 Pa		800 mbar 8 x 10^4 Pa		950 mbar 9.5 x 10^4 Pa		1000 mbar 1 x 10^5 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1350	71.0	2.27	63.0	2.73	-	-	-	-	-	-	-	-	380 *	65	2.00
2100	157.0	3.54	149.0	4.24	142.0	4.95	135.0	5.66	-	-	-	-	400 §	180	3.15
2850	243.0	4.80	235.0	5.76	228.0	6.72	221.0	7.68	210.0	9.40	205.0	10.00	542 ‡	220	5.70
3600	329.0	6.06	321.0	7.27	313.0	8.49	307.0	9.70	295.0	11.80	280.0	12.10	542 ‡	300	7.00
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	6 psig		8 psig		10 psig		12 psig		14 psig		15 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1350	46.0	2.52	39.0	3.36	-	-	-	-	-	-	-	-	11.2	38	2.68
2100	96.0	3.92	90.0	5.23	83.0	6.64	79.0	7.59	-	-	-	-	11.8	106	4.22
2850	147.0	5.32	140.0	7.10	134.0	9.01	130.0	10.29	124.0	12.40	121.0	13.40	16.0	129	7.64
3600	198.0	6.72	191.0	8.97	184.0	11.38	181.0	13.00	173.0	15.70	165.0	16.22	16.0	176	9.38

* = 3.8 x 10^4 Pa § = 4 x 10^4 Pa ‡ = 5.42 x 10^4 Pa

Table 8 – Performance data: S2H41 and 2041 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	300 mbar 3 x 10^4 Pa		400 mbar 4 x 10^4 Pa		500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		650 mbar 6.5 x 10^4 Pa		700 mbar 7 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1350	170.0	2.46	156.0	3.08	144.0	3.85	133.0	4.61	127.0	4.96	120.0	5.30	400 *	124	3.20
2100	316.0	3.83	301.0	4.79	289.0	5.98	278.0	7.18	269.0	7.69	260.0	8.20	425 §	250	5.30
2850	461.0	5.20	447.0	6.50	434.0	8.12	423.0	9.74	417.0	10.77	410.0	11.80	542 ‡	380	9.50
3600	606.0	6.56	592.0	8.20	579.0	10.30	568.0	12.30	564.0	13.25	560.0	14.20	542 ‡	520	11.40
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	4 psig		6 psig		7 psig		8 psig		9 psig		10 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1350	100.0	3.30	90.0	4.13	85.0	5.16	81.0	5.67	-	-	71.0	7.10	11.8	73	4.29
2100	186.0	5.13	175.0	6.42	170.0	8.02	167.0	8.82	160.0	9.91	153.0	10.99	12.6	147	7.10
2850	271.0	6.97	259.0	8.71	255.0	10.88	252.0	11.97	247.0	13.89	241.0	15.82	16.0	223	12.73
3600	356.0	8.79	343.0	11.00	340.0	13.81	337.0	15.15	333.0	17.09	329.0	19.03	16.0	306	15.28

* = 4 x 10^4 Pa § = 4.25 x 10^4 Pa ‡ = 5.42 x 10^4 Pa

Table 9 – Performance data: S2H42 and 2042 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	150 mbar 1.5 x 10^4 Pa		200 mbar 2 x 10^4 Pa		300 mbar 3 x 10^4 Pa		350 mbar 3.5 x 10^4 Pa		400 mbar 4 x 10^4 Pa		482 mbar 4.82 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1350	305.0	2.00	300.0	2.35	280.0	3.50	265.0	4.00	260.0	4.20	250.0	5.60	400 *	220	4.70
2100	520.0	3.00	503.0	3.85	485.0	5.30	480.0	6.15	475.0	7.00	450.0	8.70	474 §	410	8.00
2850	725.0	4.00	715.0	5.00	700.0	7.05	685.0	8.00	670.0	9.00	650.0	11.70	474 §	580	10.75
3600	930.0	5.05	920.0	6.50	900.0	9.25	885.0	10.50	880.0	11.80	865.0	14.80	474 §	815	14.20
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	2 psig		3 psig		4 psig		5 psig		6 psig		7 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1350	179.0	2.68	176.0	3.15	165.0	4.69	156.0	5.36	153.0	5.63	147.0	7.51	11.81	129	6.30
2100	306.0	4.02	296.0	5.16	285.0	7.10	282.0	8.24	279.0	9.38	265.0	11.66	14.00	241	10.72
2850	426.0	5.36	420.0	6.70	412.0	9.45	403.0	10.72	394.0	12.06	382.0	15.68	14.00	341	14.41
3600	547.0	6.77	541.0	8.71	529.0	12.40	520.0	14.08	517.0	15.82	509.0	19.84	14.00	479	19.03

* = 4 x 10^4 Pa § = 4.74 x 10^4 Pa

Table 10 – Performance data: S2H43 and 2043 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		700 mbar 7 x 10^4 Pa		800 mbar 8 x 10^4 Pa		950 mbar 9.5 x 10^4 Pa		1000 mbar 1 x 10^5 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1150	159.0	3.80	150.0	4.52	142.0	5.28	-	-	-	-	-	-	400 *	136	3.30
1600	260.0	5.40	250.0	6.29	242.0	7.34	234.0	8.39	224.0	10.50	-	-	500 §	220	5.60
2050	360.0	6.72	351.0	8.06	342.0	9.41	334.0	10.70	320.0	13.10	315.0	13.50	542 ‡	300	8.00
2500	460.0	8.20	451.0	9.83	442.0	11.50	434.0	13.10	428.0	15.90	422.0	16.60	542 ‡	400	9.85
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	6 psig		8 psig		10 psig		12 psig		14 psig		15 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1150	100.0	4.18	91.0	5.58	83.0	7.08	-	-	-	-	-	-	11.8	80	4.42
1600	159.0	5.82	147.0	7.76	142.0	9.84	132.0	11.60	-	-	-	-	14.8	129	7.51
2050	215.0	7.45	203.0	9.94	201.0	12.61	189.0	14.90	188.0	17.56	185.0	18.10	16.0	176	10.72
2500	279.0	9.09	273.0	12.10	260.0	15.42	246.0	18.20	252.0	21.31	248.0	22.25	16.0	235	13.20

* = 4 x 10^4 Pa § = 5 x 10^4 Pa ‡ = 5.42 x 10^4 Pa

Table 11 – Performance data: S2H51 and 2051 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	300 mbar 3 x 10^4 Pa		400 mbar 4 x 10^4 Pa		500 mbar 5 x 10^4 Pa		600 mbar 6 x 10^4 Pa		750 mbar 7.5 x 10^4 Pa		900 mbar 9 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1200	310.0	3.90	296.0	4.85	283.0	5.95	260.0	7.10	-	-	-	-	400 *	260	5.50
1800	510.0	5.85	500.0	7.90	485.0	9.40	460.0	11.00	415.0	13.20	385.0	16.00	542 §	430	9.90
2400	710.0	7.80	698.0	10.00	684.0	11.95	650.0	14.45	600.0	17.20	580.0	21.80	542 §	610	13.60
3000	910.0	9.85	902.0	12.40	886.0	15.15	850.0	18.00	800.0	22.20	775.0	26.80	542 §	810	16.80
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	4 psig		6 psig		7 psig		9 psig		11 psig		13 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1200	182.0	5.23	178.0	6.50	166.0	7.98	158.0	9.83	-	-	-	-	11.8	153	7.37
1800	300.0	7.84	300.0	10.59	285.0	12.60	279.0	15.24	244.0	17.69	226.0	21.45	16.0	253	13.27
2400	417.0	10.46	419.0	13.40	402.0	16.02	395.0	20.02	353.0	23.06	341.0	29.22	16.0	359	18.23
3000	535.0	13.20	541.0	16.62	521.0	20.31	516.0	24.93	470.0	29.76	456.0	35.92	16.0	476	22.52

* = 4 x 10^4 Pa § = 5.42 x 10^4 Pa

Table 12 – Performance data: S2H52 and 2052 blowers

r.p.m./ r min^{-1}	Throughput ($m^3 h^{-1}$) and absorbed power (kW) at given pressure												Maximum vacuum		
	150 mbar 1.5 x 10^4 Pa		200 mbar 2 x 10^4 Pa		300 mbar 3 x 10^4 Pa		350 mbar 3.5 x 10^4 Pa		400 mbar 4 x 10^4 Pa		500 mbar 5 x 10^4 Pa				
	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	$m^3 h^{-1}$	kW	mbar	$m^3 h^{-1}$	kW
1350	689	4.05	671	5.16	641	7.31	620	8.38	695	9.55	672	12.23	474 *	510	11.23
1725	912	5.17	894	6.6	864	9.34	840	10.7	850	12.23	835	15.52	474 *	740	14.36
2100	1135	6.3	1107	8.0	1087	11.4	1065	13.0	1050	14.85	1040	19.02	474 *	980	18.02
2850	1591	7.82	1567	10.44	1547	15.44	1520	17.53	1500	20.52	1480	25.74	474 *	1425	24.69
r.p.m./ r min^{-1}	Throughput (cfm) and absorbed power (h.p.) at given pressure												Maximum vacuum		
	2 psig		3 psig		4 psig		5 psig		6 psig		7 psig				
	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	cfm	h.p.	inch hg	cfm	h.p.
1350	405	5.43	395	6.92	376.9	9.8	365	11.23	409	12.8	395.1	16.39	14.0	300	15.05
1725	536	6.93	526	8.85	508	12.52	494	14.34	500	16.39	491	20.8	14.0	435	19.25
2100	667	8.45	651	10.72	639.2	15.28	626	17.43	617	19.91	611.5	25.5	14.0	576	24.15
2850	936	10.48	921	13.99	910	20.70	894	23.50	882	27.51	870.2	34.50	14.00	838	33.10

* = 4.74 x 10^4 Pa

Table 13 – Performance data: S2H53 blowers

2.4 Noise and vibration data

Note: The noise and vibration data values given below are maximum values, with pipelines connected to the blower inlet and outlet. The actual values will depend on the installation and the operating conditions.

Noise level: dB(A)	95 dB(A)
Vibration level	18 mm s^{-1}, 0.71 inches s^{-1}

Table 14 – Noise and vibration data

2.5 Lubrication data

Recommended grease Recommended oil	Mobil Temp SHC 100 grease Winter/summer oil Mobil SHC 630					
Oil capacity	**S2H22H** 0.3 litres 0.08 US gal	**S2H23H** 0.3 litres 0.08 US gal	**S2H31H** 0.6 litres 0.16 US gal	**S2H32H** 0.6 litres 0.16 US gal	**S2H33H** 0.6 litres 0.16 US gal	**S2H41H** 0.9 litres 0.24 US gal
	S2H42H 0.9 litres 0.24 US gal	**S2H43H** 0.9 litres 0.24 US gal	**S2H51H** 1.5 litres 0.40 US gal	**S2H52H** 1.5 litres 0.40 US gal	**S2H53H** 1.5 litres 0.40 US gal	
	S2H22V 0.16 litres 0.04 US gal	**S2H23V** 0.16 litres 0.04 US gal	**S2H31V** 0.32 litres 0.08 US gal	**S2H32V** 0.32 litres 0.08 US gal	**S2H33V** 0.32 litres 0.08 US gal	**S2H41V** 0.48 litres 0.13 US gal
	S2H42V 0.48 litres 0.13 US gal	**S2H43V** 0.48 litres 0.13 US gal	**S2H51V** 0.8 litres 0.21 US gal	**S2H52V** 0.8 litres 0.21 US gal	**S2H53V** 0.8 litres 0.21 US gal	
Grease capacity	**S2H22H** 3.3 g 0.12 oz	**S2H23H** 3.3 g 0.12 oz	**S2H31H** 3.9 g 0.14 oz	**S2H32H** 3.9 g 0.14 oz	**S2H33H** 3.9 g 0.14 oz	**S2H41H** 5.3 g 0.19 oz
	S2H42H 5.3 g 0.19 oz	**S2H43H** 5.3 g 0.19 oz	**S2H51H** 7.5 g 0.26 oz	**S2H52H** 7.5 g 0.26 oz	**S2H53H** 7.5 g 0.26 oz	
	S2H22V 3.3 g 0.12 oz	**S2H23V** 3.3 g 0.12 oz	**S2H31V** 3.9 g 0.14 oz	**S2H32V** 3.9 g 0.14 oz	**S2H33V** 3.9 g 0.14 oz	**S2H41V** 5.3 g 0.19 oz
	S2H42V 5.3 g 0.19 oz	**S2H43V** 5.3 g 0.19 oz	**S2H51V** 7.5 g 0.26 oz	**S2H52V** 7.5 g 0.26 oz	**S2H53V** 7.5 g 0.26 oz	

Table 15 – S2H22-53H/V lubrication data

Recommended grease	Medium soft NLG1.2 high speed ball and roller bearing grease				
Recommended oil *	SAE 10W (-40 to 0 °C, -40 to 32 °F)				
	SAE 20 (0 to 38 °C, 32 to 100 °F)				
	SAE 40 (38 to 163 °C, 100 to 325 °F)				
Oil capacity	**2022H** 0.28 litres 0.07 US gal	**2023H** 0.28 litres 0.07 US gal	**2031H** 0.57 litres 0.15 US gal	**2032H** 0.57 litres 0.15 US gal	**2033H** 0.57 litres 0.15 US gal
	2041H 0.85 litres 0.22 US gal	**2042H** 0.85 litres 0.22 US gal	**2043H** 0.85 litres 0.22 US gal	**2051H** 1.42 litres 0.37 US gal	**2052H** 1.42 litres 0.37 US gal
	2022V 0.14 litres 0.04 US gal	**2023V** 0.14 litres 0.04 US gal	**2031V** 0.28 litres 0.07 US gal	**2032V** 0.28 litres 0.07 US gal	**2033V** 0.28 litres 0.07 US gal
	2041V 0.42 litres 0.11 US gal	**2042V** 0.42 litres 0.11 US gal	**2043V** 0.42 litres 0.11 US gal	**2051V** 0.71 litres 0.19 US gal	**2052V** 0.71 litres 0.19 US gal
Grease capacity	**2022H** 3.3 g 0.12 oz	**2023H** 3.3 g 0.12 oz	**2031H** 3.9 g 0.14 oz	**2032H** 3.9 g 0.14 oz	**2033H** 3.9 g 0.14 oz
	2041H 5.3 g 0.19 oz	**2042H** 5.3 g 0.19 oz	**2043H** 5.3 g 0.19 oz	**2051H** 7.5 g 0.26 oz	**2052H** 7.5 g 0.26 oz
	2022V 3.3 g 0.12 oz	**2023V** 3.3 g 0.12 oz	**2031V** 3.9 g 0.14 oz	**2032V** 3.9 g 0.14 oz	**2033V** 3.9 g 0.14 oz
	2041V 5.3 g 0.19 oz	**2042V** 5.3 g 0.19 oz	**2043V** 5.3 g 0.19 oz	**2051V** 7.5 g 0.26 oz	**2052V** 7.5 g 0.26 oz

* The recommended oil depends on the blower discharge temperature range.

Table 16 – 2022-2052H/V lubrication data

2.6 Connections

Inlet/outlet	**S2H22H/V** $1^1/_4$ inch BSP	**S2H23H/V** 2 inch BSP	**S2H31H/V** $1^1/_2$ inch BSP	**S2H32H/V** 2 inch BSP	**S2H33H/V** 3 inch BSP
	S2H41H/V 2 inch BSP	**S2H42H/V** 3 inch BSP	**S2H43H/V** 4 inch BSP	**S2H51H/V** $2^1/_2$ inch BSP	**S2H52H/V** 4 inch BSP
	S2H53H/V 4 inch BSP				
	S2H22H/VN 1 inch NPT	**S2H23H/VN** 2 inch NPT	**S2H31H/VN** $1^1/_4$ inch NPT	**S2H32H/VN** 2 inch NPT	**S2H33H/VN** $2^1/_2$ inch NPT
	S2H41H/VN $1^1/_2$ inch NPT	**S2H42H/VN** $2^1/_2$ inch NPT	**S2H43H/VN** 3 inch NPT	**S2H51H/VN** $2^1/_2$ inch NPT	**S2H52H/VN** 4 inch NPT
	S2H53H/VN 4 inch NPT				
	2022H/V $1^1/_4$ inch BSP	**2023H/V** 2 inch BSP	**2031H/V** $1^1/_2$ inch BSP	**2032H/V** $2^1/_2$ inch BSP	**2033H/V** 3 inch BSP
	2041H/V 2 inch BSP	**2042H/V** 3 inch BSP	**2043H/V** 4 inch BSP	**2051H/V** $2^1/_2$ inch BSP	**2052H/V** 4 inch BSP

Table 17 – Connections data

2.7 Materials of construction

S2H22-53H/V blowers	
Body casing	EN GJL 200 cast iron
End covers	EN GJL 200 cast iron
Rotors	EN GJS 400-15 ductile iron
Shafts	EN GJS 400-15 ductile iron
Gears	817 M 40 carbon steel
2022-2052H/V blowers	
Body casing	GG 25 cast iron
End covers	GG 25 cast iron
Rotors	GG 25 spheroidal cast iron
Shafts	G 17227.42 Cr Mo S4 spheroidal cast iron
Gears	G 1.6582.34 Cr Ni Mo 6 alloy steel
Gaskets	CAFF (Klingerit®)
Main lip seals	Viton®
Shaft lip seals	Nitrile rubber

Table 18 – Construction materials data

, Klingerit is a registered trademark of Klinger AG.
Viton is a registered trademark of Dupont.

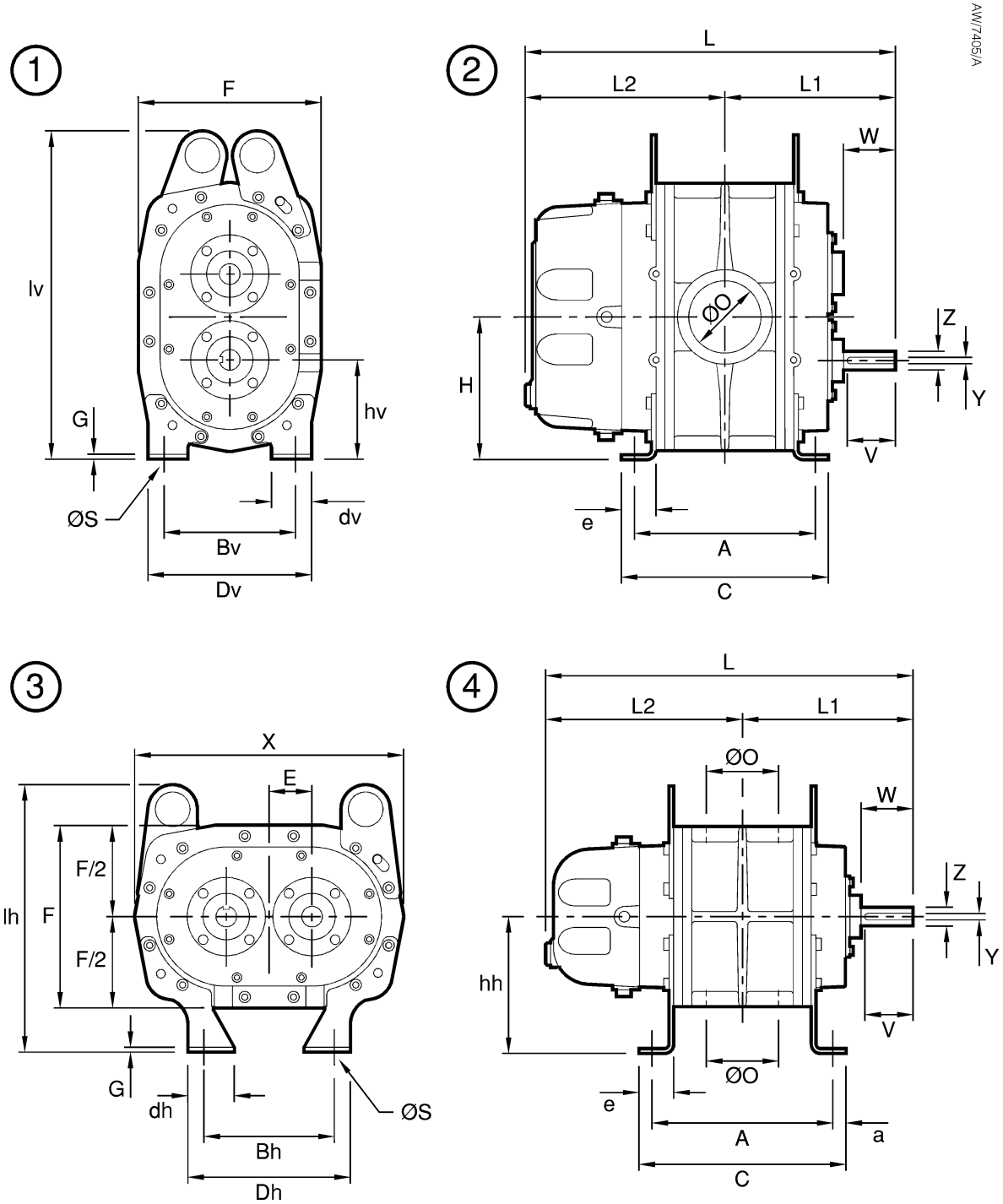
Key	Dimensions: mm (inches)										
	S2H22	**S2H23**	**S2H31**	**S2H32**	**S2H33**	**S2H41**	**S2H42**	**S2H43**	**S2H51**	**S2H52**	**S2H53**
A	101 (3.98)	152 (5.98)	134 (5.27)	156 (6.14)	223 (8.78)	153 (6.02)	210 (8.27)	273 (10.75)	178 (7.01)	229 (9.01)	330 (12.99)
Bv	75 (2.95)	75 (2.95)	128 (5.04)	128 (5.04)	128 (5.04)	152 (5.98)	152 (5.98)	152 (5.98)	178 (7.01)	178 (7.01)	178 (7.01)
Bh	102 (4.01)	102 (4.01)	146 (5.75)	146 (5.75)	146 (5.75)	152 (5.98)	152 (5.98)	152 (5.98)	178 (7.01)	178 (7.01)	178 (7.01)
C	127 (5.00)	178 (7.00)	170 (6.69)	192 (7.56)	259 (10.20)	183 (7.20)	240 (9.45)	303 (11.93)	216 (8.50)	267 (10.51)	368 (14.49)
Dv	130 (5.12)	130 (5.12)	165 (6.50)	165 (6.50)	165 (6.50)	190 (7.48)	190 (7.48)	190 (7.48)	230 (9.05)	230 (9.05)	230 (9.05)
Dh	140 (5.51)	140 (5.51)	184 (7.24)	184 (7.24)	184 (7.24)	190 (7.48)	190 (7.48)	190 (7.48)	230 (9.05)	230 (9.05)	230 (9.05)
dv	45 (1.77)	45 (1.77)	45 (1.77)	45 (1.77)	45 (1.77)	47 (1.85)	47 (1.85)	47 (1.85)	57 (2.24)	57 (2.24)	57 (2.24)
dh	40 (1.57)	40 (1.57)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	67 (2.64)	67 (2.64)	67 (2.64)
E	35 (1.38)	35 (1.38)	44.5 (1.75)	44.5 (1.75)	44.5 (1.75)	51 (2.01)	51 (2.01)	51 (2.01)	63.5 (2.50)	63.5 (2.50)	63.5 (2.50)
e	31.5 (1.24)	31.5 (1.24)	40.5 (1.59)	40.5 (1.59)	40.5 (1.59)	40 (1.57)	40 (1.57)	40 (1.57)	46 (1.81)	46 (1.81)	57 (2.24)
F	152 (5.98)	152 (5.98)	194 (7.64)	194 (7.64)	194 (7.64)	212 (8.35)	212 (8.35)	212 (8.35)	260 (10.24)	260 (10.24)	264 (10.39)
G	4 (0.16)	4 (0.16)	4 (0.16)	4 (0.16)	4 (0.16)	5 (0.20)	5 (0.20)	5 (0.20)	6 (0.24)	6 (0.24)	6 (0.24)
H	124 (4.88)	124 (4.88)	159 (6.26)	159 (6.26)	159 (6.26)	165 (6.50)	165 (6.50)	165 (6.50)	203 (7.99)	203 (7.99)	203 (7.99)
hv	89 (3.50)	89 (3.50)	114 (4.49)	114 (4.49)	114 (4.49)	114 (4.49)	114 (4.49)	114 (4.49)	139.5 (5.49)	139.5 (5.49)	140 (5.51)
hh	95 (3.74)	95 (3.74)	127 (5.00)	127 (5.00)	127 (5.00)	159 (6.26)	159 (6.26)	159 (6.26)	178 (7.01)	178 (7.01)	178 (7.01)
Iv	280 (11.02)	280 (11.02)	335 (13.19)	335 (13.19)	335 (13.19)	379 (14.92)	379 (14.92)	379 (14.92)	465 (18.31)	465 (18.31)	465 (18.31)
Ih	216 (8.50)	216 (8.50)	264 (10.39)	264 (10.39)	264 (10.39)	312 (12.28)	312 (12.28)	312 (12.28)	368 (14.49)	368 (14.49)	368 (14.49)
L	260 (10.24)	311 (12.24)	314 (12.36)	336 (13.23)	402 (15.83)	380 (14.96)	437 (17.20)	501 (19.72)	479 (18.86)	530 (20.87)	649 (25.55)
L1	113 (4.57)	139 (5.47)	146 (5.75)	157 (6.18)	190 (7.48)	173 (6.81)	202 (7.95)	234 (9.21)	196 (7.72)	222 (8.74)	302 (11.88)
L2	147 (5.79)	172 (6.77)	168 (6.61)	179 (7.05)	212 (8.35)	207 (8.15)	235 (9.25)	267 (10.51)	283 (11.14)	308 (12.13)	347 (13.66)
O *	$1^1/_4$	2	$1^1/_2$	2	3	2	3	4	$2^1/_2$	4	4
O †	1	2	$1^1/_4$	2	$2^1/_2$	$1^1/_2$	$2^1/_2$	3	$2^1/_2$	4	4
S∅	10 (0.39)	10 (0.39)	10 (0.39)	10 (0.39)	10 (0.39)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	13 (0.51)
V	34 (1.34)	34 (1.34)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)
W	38 (1.50)	38 (1.50)	60 (2.36)	60 (2.36)	60 (2.36)	61 (2.40)	61 (2.40)	61 (2.40)	60 (2.36)	60 (2.36)	60 (2.36)
X	222 (8,74)	222 (8,74)	283 (11.14)	283 (11.14)	283 (11.14)	313 (12.32)	313 (12.32)	313 (12.32)	387 (15.24)	387 (15.24)	387 (15.24)
Y §	$^3/_{16}$	$^3/_{16}$	$^3/_{16}$	$^3/_{16}$	$^3/_{16}$	$^1/_4$	$^1/_4$	$^1/_4$	$^5/_{16}$	$^5/_{16}$	$^5/_{16}$
Z §	0.625	0.625	0.75	0.75	0.75	0.875	0.875	0.875	1.125	1.125	1.125

* BSP: inches (S2H/V blowers)

† NPT: inches (S2H/VN blowers)

§ Inches only

Figure 3 – S2H22-53H/V blower dimensions: key



1. S2H22-53V blowers: end view
2. S2H22-53V blowers: side view
3. S2H22-53H blowers: end view
4. S2H22-53H blowers: side view

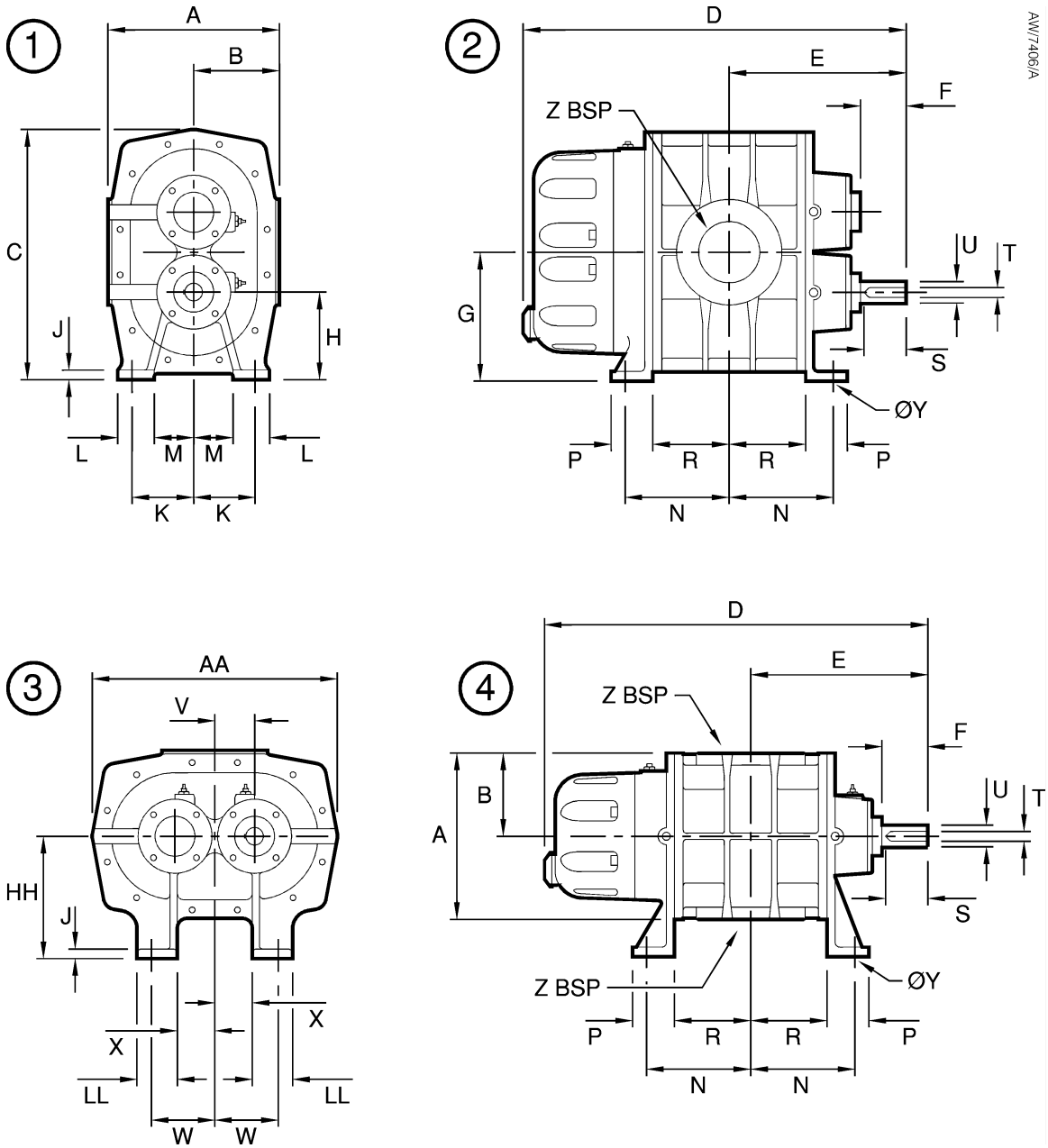
Figure 3 – S2H22-53H/V blower dimensions

Key	Dimensions: mm (inches)									
	2022	**2023**	**2031**	**2032**	**2033**	**2041**	**2042**	**2043**	**2051**	**2052**
A	152 (5.98)	152 (5.98)	194 (7.64)	194 (7.64)	194 (7.64)	213 (8.38)	213 (8.38)	216 (8.50)	200 (7.87)	264 (10.39)
AA	222 (8.74)	222 (8.74)	283 (11.14)	283 (11.14)	283 (11.14)	314 (12.36)	314 (12.36)	314 (12.36)	387 (15.24)	387 (15.24)
B	76 (2.99)	76 (2.99)	97 (3.82)	97 (3.82)	97 (3.82)	106.5 (4.19)	106.5 (4.19)	108 (4.25)	130 (5.12)	130 (5.12)
C	235 (9.25)	235 (9.25)	300 (11.81)	300 (11.81)	300 (11.81)	322 (12.68)	322 (12.68)	322 (12.68)	397 (15.63)	397 (15.63)
D	260 (10.24)	315 (12.40)	315 (12.40)	340 (13.38)	405 (15.94)	385 (15.16)	440 (17.32)	505 (19.88)	480 (18.90)	535 (21.06)
E	113 (4.45)	138 (5.43)	146 (5.75)	157 (6.18)	191 (7.52)	173 (6.81)	202 (7.95)	233 (9.17)	197 (7.75)	222 (8.74)
F	42 (1.65)	42 (1.65)	60 (2.36)	60 (2.36)	60 (2.36)	52 (2.05)	62 (2.44)	62 (2.44)	60 (2.36)	60 (2.36)
G	124 (4.88)	124 (4.88)	159 (6.26)	159 (6.26)	159 (6.26)	165 (6.50)	165 (6.50)	165 (6.50)	203 (7.99)	203 (7.99)
H	89 (3.50)	89 (3.50)	114 (4.49)	114 (4.49)	114 (4.49)	114 (4.49)	114 (4.49)	114 (4.49)	140 (5.51)	140 (5.51)
HH	95 (3.74)	95 (3.74)	127 (5.00)	127 (5.00)	127 (5.00)	159 (6.26)	159 (6.26)	159 (6.26)	178 (7.01)	178 (7.01)
J	9 (0.35)	9 (0.35)	13 (0.51)	13 (0.51)	13 (0.51)	13 (0.51)	13 (0.51)	13 (0.51)	16 (0.63)	16 (0.63)
K	38 (1.50)	38 (1.50)	64 (2.52)	64 (2.52)	64 (2.52)	76 (2.99)	76 (2.99)	76 (2.99)	89 (3.50)	89 (3.50)
L	45 (1.77)	45 (1.77)	60 (2.36)	60 (2.36)	60 (2.36)	48 (1.89)	48 (1.89)	48 (1.89)	57 (2.24)	57 (2.24)
LL	40 (1.57)	40 (1.57)	54 (2.13)	54 (2.13)	54 (2.13)	54(2.13)	54(2.13)	54(2.13)	67 (2.64)	67 (2.64)
M	19 (0.75)	19 (0.75)	22 (0.87)	22 (0.87)	22 (0.87)	48 (1.89)	48 (1.89)	48 (1.89)	57 (2.24)	57 (2.24)
N	51 (2.01)	76 (2.99)	67 (2.64)	78 (3.07)	111 (4.37)	76 (2.99)	105 (4.13)	137 (5.39)	89 (3.50)	114 (4.49)
P	38 (1.50)	38 (1.50)	51 (2.01)	51 (2.01)	51 (2.01)	51 (2.01)	51 (2.01)	51 (2.01)	57 (2.24)	57 (2.24)
R	26 (1.02)	51 (2.01)	35 (1.38)	46 (1.81)	80 (3.15)	42 (1.65)	70 (2.75)	102 (4.01)	51 (2.01)	76 (2.99)
S	35 (1.38)	35 (1.38)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)	54 (2.13)
T *	3/16	3/16	3/16	3/16	3/16	1/4	1/4	1/4	5/16	5/16
U *	0.625	0.625	0.75	0.75	0.75	0.875	0.875	0.875	1.125	1.125
V	35 (1.38)	35 (1.38)	44.5 (1.75)	44.6 (1.75)	44.5 (1.75)	51 (2.01)	51 (2.01)	51 (2.01)	53.5 (2.11)	63.5
W	51 (2.01)	51 (2.01)	73 (2.87)	73 (2.87)	73 (2.87)	76 (2.99)	76 (2.99)	76 (2.99)	89 (3.50)	89 (3.50)
X	30 (1.18)	30 (1.18)	38 (1.50)	38 (1.50)	38 (1.50)	41 (1.61)	41 (1.61)	41 (1.61)	48 (1.89)	48 (1.89)
Y	10 (0.39)	10 (0.39)	11 (0.43)	11 (0.43)	11 (0.43)	12 (0.47)	12 (0.47)	12 (0.47)	13 (0.51)	13 (0.51)
Z §	1 1/4	2	1 1/2	2 1/2	3	2	3	4	2 1/2	4

* Inches only

§ BSP: inches

Figure 4 – 2022-2052H/V blower dimensions: key



1. 2022-2052V blowers: end view
2. 2022-2052V blowers: side view
3. 2022-2052H blowers: end view
4. 2022-2052H blowers: side view

2.8 Item Numbers

Blower	Item Number	Blower	Item Number
S2H22H	HB2000022	S2H22V	HB2010022
S2H23H	HB2000023	S2H23V	HB2010023
S2H31H	HB2000031	S2H31V	HB2010031
S2H32H	HB2000032	S2H32V	HB2010032
S2H33H	HB2000033	S2H33V	HB2010033
S2H41H	HB2000041	S2H41V	HB2010041
S2H42H	HB2000042	S2H42V	HB2010042
S2H43H	HB2000043	S2H43V	HB2010043
S2H51H	HB2000051	S2H51V	HB2010051
S2H52H	HB2000052	S2H52V	HB2010052
S2H53H	HB2000053	S2H53V	HB2010053
S2H22HN	HB2500022	S2H22VN	HB2510022
S2H23HN	HB2500023	S2H23VN	HB2510023
S2H31HN	HB2500031	S2H31VN	HB2510031
S2H32HN	HB2500032	S2H32VN	HB2510032
S2H33HN	HB2500033	S2H33VN	HB2510033
S2H41HN	HB2500041	S2H41VN	HB2510041
S2H42HN	HB2500042	S2H42VN	HB2510042
S2H43HN	HB2500043	S2H43VN	HB2510043
S2H51HN	HB2500051	S2H51VN	HB2510051
S2H52HN	HB2500052	S2H52VN	HB2510052
S2H53HN	HB2500053	S2H53VN	HB2510053
2022H	HH2000022	2022V	HH2000022
2023H	HH2000023	2023V	HH2010023
2031H	HH2000031	2031V	HH2010031
2032H	HH2000032	2032V	HH2010032
2033H	HH2000033	2033V	HH2010033
2041H	HH2000041	2041V	HH2010041
2042H	HH2000042	2042V	HH2010042
2043H	HH2000043	2043V	HH2010043
2051H	HH2000051	2051V	HH2010051
2052H	HH2000052	2052V	HH2010052

Table 19 – Item Numbers

3 INSTALLATION

CAUTION
Ingersoll Rand will accept no liability or warranty claims if your installation includes any modifications or additions to the blower without the prior written approval of I, or if the blower is incorrectly installed.

3.1 Installation safety

WARNING
Obey the safety instructions listed below and take note of appropriate precautions when you install the blower.

- A suitably trained and supervised technician must install the blower.
- Ensure that debris and dust does not get into the blower when you install it.
- Check that all of the required components and tools are available and of the correct type before you start to install the blower.
- Where applicable, use suitable new gaskets/seals to connect the blower into your system. Do not reuse old gaskets/seals.
- If you will fit the blower into an existing system, disconnect the power from the drive system before you start installation, so that the drive system cannot be operated accidentally.

3.2 System design

Your system must be suitably designed for correct operation of the blower. Note that:

- You must design suitable pipelines to fit the blower inlet/outlet connections. Refer to Section 2.6 and to Figures 3 and 4 for the dimensions of the blower inlet and outlet connections.
- Your system design must ensure that, when the blower is in its final operating location, you can see the oil-level sight-glass and can access the oil filler and drain plugs, and the bearing greasing points.
- Your system design must ensure that the blower cannot be operated with the inlet or outlet pipelines obstructed.

We also recommend that your system incorporates an emergency stop facility which, once activated, must be manually reset before the blower can be operated again.

Also note the following when you design your system:

- We recommend that you incorporate a filter in the inlet pipeline to the blower, to prevent the entry of particles or debris into the blower.
- The blower must be level (within 15° in any of the horizontal mounting axes) for correct operation.
- We recommend that you incorporate silencers, to attenuate the pulsations in the inlet/outlet gas streams.
- There must be sufficient free space around the blower, for adequate cooling-air circulation.
- If required, install your own acoustic enclosure around the blower. If you do install such an enclosure, ensure that there is sufficient space for cooling-air flow around the blower: see above.

3.3 Unpack and inspect

WARNING

Use suitable lifting equipment to move the blower. If you do not, you can injure yourself or damage the blower. Refer to Section 2.3 for the mass of the blower.

1. Use a suitable fork-lift truck or pallet truck to move the blower, on its pallet, close to where you will install it:
   - On S2H blowers, attach the lifting equipment to the lifting bolts on the blower. (The number of lifting bolts fitted depends on the blower model.)
   - On 2000 series blowers, fit slings under the gear cover and under the bearing cover, then attach the lifting equipment to the slings.
2. Remove all packing materials and protective covers and check the blower. If the blower is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the blower together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the blower if it is damaged.
3. Check that you have received the items listed in Table 20. If any item is missing, notify your supplier in writing within three days
4. Look at the blower rating and identification plate and check that the blower is suitable for use in your system. If the blower is not suitable for use in your system, do not continue to install the blower: contact your Supplier or Ingersoll Rand.

If the blower is not to be used immediately, replace the protective covers. Store the blower in suitable conditions, as described in Section 6.1.

Quantity	Description	Check
1	Blower	☐
*	Gear cover oil	☐

* If you have ordered oil, you will receive sufficient quantity of the correct oil to fill the blower: see Section 2.5.

Table 20 – Checklist of items

3.4 Locate the blower

WARNING

Use suitable lifting equipment to move the blower. If you do not, you can injure yourself or damage the blower. Refer to Section 2.3 for the mass of the blower.

Ensure that the operating location is clean and free from debris and oil.

You must ensure that when the blower is in its required operating location, all of the mounting feet are in the same plane, flat on the mounting platform. The platform must be firm and level, with a maximum flatness deviation less than 0.2 mm m^{-1}.

Do **not** use shims or spacers under the mounting feet to level the blower.

Use the following procedure to locate the blower:

1. Use the lifting equipment to move the blower to its required operating location: use the method given in Step 1 of Section 3.3.
2. Disconnect your lifting equipment from the blower.
3. Fit suitable bolts through the fixing holes in the mounting feet (Figure 2, items 8), to secure the blower in position.

3.5 Connect the blower

3.5.1 Introduction

Take note of the following when you connect the blower into your system:

- For optimum performance, ensure that the system pipelines connected to the blower are as short as possible.
- Support your system pipelines and other components, to prevent loading of the inlet and outlet ports on the blower.
- Incorporate flexible components in your system, to minimise noise and vibration.
- Where necessary, use gaskets/seals which are compatible with the gases which will be pumped/compressed, and with the operating conditions.
- The leak tightness of your system connections must be in accordance with the requirements of your applications.

3.5.2 Connect the blower into your system

Use the following procedure to connect the blower into your system:

1. Use a suitable gasket/seal to connect your inlet pipeline to the blower inlet (Figure 2, item 3 or 9).
2. Use a suitable gasket/seal to connect your outlet pipeline to the blower outlet (Figure 2, item 3 or item 9).

3.6 Fill the blower with oil

CAUTION
Ensure that you use the correct grade of oil and that the oil level is correct. If you do not, the blower may be damaged during operation, or its performance may be affected.

Before you commission and operate the blower, you must fill the gear cover (Figure 2, item 1) with oil: refer to Section 5.4.

3.7 Fit the drive/transmission

WARNING

Your drive and transmission system design must ensure that the maximum blower rotational speeds specified in Section 2.2 cannot be exceeded.

WARNING

You must fit suitable guards to protect people from rotating/ moving parts.

You must use a suitable coupling or a belt drive and transmission system to connect your drive to the blower.

Your drive and transmission system design must ensure that the radial and axial loadings on the blower drive shaft are as low as possible. The radial and axial loadings **must** be below the maximum loadings specified in Table 21 (page 29).

Connect the components of the drive and transmission system to the blower drive shaft (Figure 2, item 6) as described in the manufacturer's instructions supplied with the components.

3.8 Check the direction of rotation

WARNING

If you remove a guard during the following procedure, ensure that you do not come into contact with the shaft, the coupling/belt or the drive system when you operate the blower. If you do, you may be injured by the rotating components.

CAUTION

Ensure that the blower rotates in the correct direction. If it does not, your system will not operate correctly.

After you have connected the drive/transmission, check the direction of rotation of the blower as follows:

1. If necessary (that is, to make it easier to see the blower drive shaft), temporarily remove any guard over the drive coupling or belt.
2. Refer to Figure 2. Watch the blower drive shaft (6) while you start up the blower (refer to Section 4.2), then shut down the blower (refer to Section 4.3) after two seconds or so.
3. Check that the blower drive shaft (6) rotated correctly in the expected direction. (This depends on your application and installation configuration: see Section 1.4.)
4. If the direction of rotation was incorrect:
   - Check the installation of the drive and transmission system and reconfigure as appropriate.
   - Perform the direction of rotation check from Step 2 again, to ensure that the blower now rotates in the correct direction.
5. If you have removed the guard over the drive coupling or belt (as in Step 1 above), refit the guard.

Blower	Maximum loadings: N *		Maximum loadings: lbf *	
	Radial	Axial	Radial	Axial
S2H22/23H/V	260	28	58.4	6.2
S2H31/32/33H/V	500	55	112.4	12.3
S2H41/42/43H/V822	770	84	173.1	18.8
S2H51/52/53H/V	1490	16	334.9	3.5
2022/2023H/V	260	28	58.4	6.2
2031/2032/2033H/V	500	55	112.4	12.3
2041/2042/2043H/V	770	84	173.1	18.8
2051/2052H/V	1490	16	334.9	3.5

* These are the maximum loadings that can be applied to the **end** of the drive shaft.

Table 21 – Maximum drive shaft loadings

3.9 Commission the blower

CAUTION
Commission the blower as described below before you operate the blower as described in Section 4.

After you have installed the blower, use the following procedure to commission it and prepare it for subsequent operation:

1. Ensure that any valves in the inlet and outlet pipelines are open.
2. Engage your drive and transmission system to start the blower.
3. Operate the blower, with no gas load, for at least 15 minutes. During this time:
   - Monitor the external surfaces of the blower and check for 'hot spots' (that is, areas which are unusually hot).
   - If any hot spots persist at the end of the 15 minutes, contact your supplier or Ingersoll Rand for advice.
4. Continue to operate the blower with a representative gas load, and check that the pump operates correctly and provides the required performance.

   If necessary, refer to Section 5.10 if any fault conditions occur.
5. Disengage your drive and transmission system to stop the blower.

The blower is now ready for normal operation.

4 OPERATION

CAUTION
Ingersoll Rand will accept no liability or warranty claims if your blower is used on applications or in a way prohibited in this manual, or not specified in this manual.

4.1 General operational safety

WARNING
Obey the safety instructions and precautions listed below. If you do not, there may be a risk of injury or death to people, or damage to the blower.

- Do not operate the blower when the cooling-air flow around the blower is restricted (see Section 3.2). If you do, the blower may overheat.
- Do not operate the blower with the blower inlet or outlet ports open to the atmosphere. If you do, your fingers or other parts of your body or clothing may get trapped, and you may be injured by the rotating mechanisms in the blower.
- Do not operate the blower with the guards removed from the blower drive shaft, the coupling/belt or the drive system. If you do, your fingers or other parts of your body or clothing may get trapped, and you may be injured by the rotating components.
- Prevent accidental contact with the hot blower, and do not place flammable materials on the blower. During operation, the temperature of external parts of the blower can exceed 70 °C (158 °F).
- Never disconnect any of the connecting pipelines (for example, the pipeline connected to the inlet) when the blower is operating.
- Do not expose any part of your body to vacuum. If you do, you may be injured.
- During pressure operation, prevent accidental contact with the discharged (outlet) gas stream. This gas stream may be at high pressure and can be hot and cause burn injury.
- Do not attempt to use the blower to pump/compress liquids. The blowers are not designed for this application.
- Where necessary (for example, if you have not fitted an acoustic enclosure), wear suitable ear defenders. The pump can be noisy during operation (refer to Section 2.4).

4.2 Start-up

1. Check the oil-level in the blower: refer to Section 5.4.
2. Ensure that any valves in the inlet and outlet pipelines are open.
3. Engage your drive and transmission system to start the blower.

You can now use the blower as required in your application.

4.3 Shut-down

Disengage the drive and transmission system to stop the blower.

5 MAINTENANCE

5.1 Safety information

WARNING

Obey the safety instructions given below and take note of appropriate precautions. If you do not, you can cause injury to people and damage to equipment.

- A suitably trained and supervised technician must maintain the blower. Obey your local and national safety requirements.
- Ensure that the maintenance technician is familiar with the safety procedures which relate to the gases pumped/compressed by the system in which the blower is installed.
- Allow the blower to cool to a safe temperature before you start maintenance work.
- Isolate the blower from the drive system so that it cannot be operated accidentally.
- Recheck the blower rotation direction (see Section 3.8) if the drive and transmission system has been disconnected and then reconnected.
- Take care to protect inlet/outlet port sealing faces from damage.
- Do not reuse seals/gaskets if they are damaged.
- Do not touch or inhale the thermal breakdown products of fluorinated materials which may be present if the blower has been heated to 260 °C (500 °F) and above. These breakdown products are very dangerous. Fluorinated materials in the blower include seals. The blower may have overheated if it was misused, if it malfunctioned or if it was in a fire. Ingersoll Rand Material Safety Data Sheets for fluorinated materials used in the blower are available on request: contact your supplier or Ingersoll Rand.
- Check the leak tightness of the system connections after maintenance work is complete if you have connected or disconnected the blower inlet or outlet joints. The leak tightness of the system connections must be in accordance with the requirements of your applications.

5.2 Maintenance plan

Note: The maintenance frequencies given in Table 22 are based on a maximum blower usage of 2000 hours per year. If your blower usage exceeds this, you must adjust the maintenance frequencies for your blower accordingly

The plan in Table 22 (page 33) details the maintenance operations required to maintain the blower in normal operation. Instructions for each operation are given in the section shown.

When you maintain the blower, use Ingersoll Rand spares: refer to Section 7.3.

Operation	Frequency	Refer to Section
Inspect the oil-level sight-glass	Weekly	5.3
Check the oil-level	Weekly	5.4
Inspect the system installation	Monthly	5.5
Relubricate the bearings	3 Monthly	5.6
Change the oil	Yearly	5.7
Clean/replace the gear cover vent/filter	When necessary	5.8
Overhaul the blower	5 yearly or when necessary	5.9

Table 22 – Maintenance plan

5.3 Inspect the oil-level sight-glass

Refer to Figure 2. Look at the oil-level sight-glass (11) on the gear cover (1):

- If the sight-glass is dirty, use a suitable cloth to wipe it clean.
- If the sight-glass is damaged (that is, scratched, cracked or corroded), or if there are signs of oil leakage from the sight-glass, you must replace it: contact your supplier or Ingersoll Rand.

5.4 Check the oil level

CAUTION
Ensure that you use the correct grade of oil and that the oil level is correct. If you do not, the blower may be damaged during operation, or its performance may be affected.

Refer to Figure 2 and use the following procedure to check the oil level in the gear case. The oil level is correct when it is just below the centre line of the sight-glass (11).

1. Refer to Figure 2. Look at the oil level in the sight-glass (11) on the gear cover (1):
   - If the oil level is not visible in the sight-glass, or is too far below the centre line of the sight-glass, continue at Step 2 to add more oil.
   - If the oil level is above the centre line of the sight-glass, drain oil from the blower until the level is correct: refer to Section 5.7.
2. Remove the oil filler-plug (2) from the filler port on the top of the gear cover (1).
3. Pour new oil of the correct type (see Section 2.5) through the filler port and into the end cover until the oil-level is just below the centre line of the sight-glass. If the oil level goes above the centre line of the sight-glass, drain oil from the blower until the level is correct: refer to Section 5.7.
4. Refit the oil filler-plug (2) to the filler port on the top of the gear cover (1).

5.5 Inspect the system installation

Note: Where possible, we recommend that you investigate the cause of any damage or corrosion, and implement corrective measures to prevent any future damage of components.

Use the following procedure to inspect the system connections:

1. Inspect all of the system pipelines and connections and check that they are not damaged or corroded and that they are sufficiently leak-tight. Repair or replace any damaged or corroded component and seal any leak found.
2. Inspect the drive/transmission system and adjust, repair or replace as necessary: refer to the manufacturer's instructions supplied with your drive/transmission system.

5.6 Relubricate the bearings

CAUTION
Ensure that you use the correct type of grease to relubricate the bearings (see Section 2.5) as described below. If you do not, the blower may be damaged during operation, or its performance may be affected.

Refer to Figure 2. There are two greasing points (5) on the bearing cover (7), one for each rotor bearing. Use the following procedure to relubricate the bearings:

1. Use a suitable tool (such as a grease gun or syringe) to force new grease through one of the the greasing points and into the bearing, until used grease is ejected through the vent (a cast slot in the cap next to the greasing point).
2. Use the method in Step 1 to force new grease into the other greasing point.
3. Use a suitable lint-free cloth or rag to wipe the used grease (ejected from the vents) off of the blower. Dispose of the cloth/rag and used grease: refer to Section 6.2.

5.7 Change the oil

CAUTION
Ensure that you use the correct grade of oil and that the oil level is correct. If you do not, the blower may be damaged during operation, or its performance may be affected.

1. Refer to Figure 2. Remove the oil filler-plug (2) from the filler port on the gear cover (1).
2. Place a suitable container under the drain plug (10). The container must have a maximum capacity as specified in Tables 15 and 16.
3. Remove the oil drain plug (11), and allow the oil to drain from the blower into the container.
4. Refit the oil drain plug (11).
5. Dispose of the oil: refer to Section 6.2.
6. Fill the gear cover with new oil of the correct type and grade: refer to Section 3.6.

5.8 Clean/replace the gear cover vent/ filter (when necessary)

Refer to Figure 2. The gear cover vent port (13) may be fitted with an external vent filter (12), as shown in detail A. Alternatively, the vent port (13) may be open, as shown in detail B.

If there is oil in the gas stream from the blower, the gear cover vent port or the vent filter may be blocked:

- If your blower has an external vent filter, you must replace it: contact your supplier or Ingersoll Rand.
- If the vent port has no filter: check that the port is clear and unobstructed.

5.9 Overhaul the blower

The blower must be regularly overhauled, as specified in Table 22. As part of the overhaul, the bearings in the blower must be replaced.

We recommend that you contact your supplier or Ingersoll Rand to arrange for an overhaul of the blower.

5.10 Fault finding

A guide to fault conditions and their possible causes is provided in Table 23 to assist you in basic fault finding.

If you are unable to rectify a fault when you use this guide, call your supplier or your nearest Ingersoll Rand Service Centre for advice.

Note: If you have been approved to carry out strip-down, repair and reassembly of your blower, refer to the Service Manual supplied separately for detailed procedures.

Symptom	Check	Action
The blower will not start, or seizes during operation.	Are the rotors touching ?	Check the rotor clearances and adjust as necessary.
	Has the blower been overloaded ?	Check the required operating conditions and specified performance of the blower (see Section 2).
	Has debris or foreign material entered the blower ?	Strip down, clean and repair the blower as necessary.
	Is the drive/transmission system faulty ?	Check that your drive and transmission system is operating correctly, and that it is correctly fitted to the blower: refer to Section 3.7 and to the manufacturer's instructions.
The blower is noisy during operation.	Are the rotors touching ?	Check the rotor clearances and adjust as necessary.
	Are the gear and/or bearing clearances incorrect ?	Check the clearances and adjust as necessary.
	Are the rotors unbalanced ?	Clean the rotors and rotor housing, then check the rotor clearances and adjust as necessary.
The blower overheats.	Is the inlet filter blocked ?	Clean or replace the filter.
	Is the oil level too high, or has the incorrect grade of oil been used ?	Check the oil level (refer to Section 5.4) or drain the blower and fill with the correct grade of oil (refer to Section 5.7).
	Has the incorrect type of grease been used ?	Relubricate the bearings with the correct type of grease (refer to Section 5.6).
	Are the rotor or rotor/casing clearances incorrect ?	Contact your supplier or Ingersoll Rand for advice.
	Is there inadequate clearance around the blower ?	Ensure that there is sufficient clearance around the blower to provide for free circulation of ambient cooling air.
	Does your enclosure provide inadequate cooling ?	If you have fitted an acoustic enclosure around the blower: • Ensure that the enclosure cooling vents/louvres are unobstructed. • Ensure that the enclosure cooling/extraction fan is operating correctly. • Ensure that there is sufficient clearance for cooling-air flow around the blower: refer to Section 3.2.

Table 23 – Fault finding

Symptom	Check	Action
There is oil in the gas stream from the blower.	Is the oil level too high ?	Check the oil level and if necessary drain oil from the blower: refer to Section 5.4.
	Have the sealing rings failed ?	Contact your supplier or Ingersoll Rand for advice.
	Is the gear cover vent/filter blocked ?	Clean or replace the vent/filter as necessary: refer to Section 5.8.
Oil leaks from the drive shaft.	Have the lip seals failed ?	Inspect the lip seals and replace if necessary.
There is a low volume flow through the blower.	Is the inlet filter blocked ?	Clean or replace the filter.
	Is the blower worn or damaged ?	Contact your supplier or Ingersoll Rand for advice.
	Is the blower unsuitable for your application ?	If necessary, redesign your system to comply with the capabilities of the blower, or fit a different blower which provides the necessary performance.
Absorbed power is too high.	Is the blower unsuitable for your application ?	If necessary, redesign your system to comply with the capabilities of the blower, or fit a different blower which provides the necessary performance.
	Is the inlet filter blocked ?	Clean or replace the filter.
The blower rotates in reverse direction when you stop it.	Is the non-return valve defective ?	If you have fitted a non-return valve in your outlet pipeline, check that the non-return valve operates correctly. Repair or replace as necessary.
-	-	If you have made the checks/actions as described above and you still cannot identify the cause of a fault, or if you cannot rectify a fault, contact your supplier or Ingersoll Rand for advice.

Table 23 – Fault finding (Continued)

6 STORAGE AND DISPOSAL

6.1 Storage

6.1.1 Preparation

1. Shut down the blower as described in Section 4.3.
2. If necessary, disconnect the drive and transmission system from the blower drive shaft: refer to the manufacturer's instructions supplied with your transmission system.
3. If necessary, purge your system and the blower with dry air, and disconnect the blower from your system pipelines.
4. If you will store the blower for longer than six weeks, refer to the additional requirements in Section 6.1.2.
5. Place and secure protective covers over the blower inlet and outlet connections.
6. Use suitable lifting equipment to move the blower to its storage area: refer to Section 3.4.
7. Store the blower in clean, dry conditions in a well-ventilated place that is free from vibration or shocks

6.1.2 Preparation for long-term storage

If the blower is to be stored for longer than six weeks:

1. Drain the oil from the blower: refer to Section 5.7.
2. Fill the gear cover with a suitable protective oil (see Table 24): use the method in Section 5.4.
3. Relubricate the bearings: refer to Section 5.6.
4. Turn the blower drive shaft by hand through three or four revolutions, to turn the blower and prevent seizure.
5. Spray a suitable protective oil (see Table 24) through the inlet/outlet and into the blower.
6. If required, spray a suitable protective oil (see Table 24) on the bare metal surfaces of the blower inlet and outlet flanges, to inhibit corrosion.

During storage, every 14 days or less, turn the blower drive shaft by hand through at least one quarter of a revolution, to turn the rotors and prevent seizure or degradation of the bearings.

External components	Internal components
Rust Ban 324 (Esso)	Mobilarma 523/524 (Mobil)
V Product 9703 (Shell)	Esso Lub MZ 20E/20 (Esso)
Mobilarma 778 (Mobil)	Ensis Motor Oil 20 (Shell)

Table 24 – Suitable protective oils

6.1.3 Preparation for use after long-term storage

When the blower is required for use after storage:

1. Drain the protective oil from the gear cover, then fill the gear cover with new oil: refer to Section 5.7.
2. Relubricate the bearings: refer to Section 5.6.
3. Where possible (see Note below), use a suitable cleaning solution (such as alcohol or white spirit) to clean the rotors:
   - Moisten a suitable clean, lint-free cloth with the cleaning solution, and clean the parts of the rotors which are visible through the inlet port.
   - Turn the blower drive shaft as necessary to access the other rotors.
4. Prepare and install the blower as described in Section 3.

Note: The small size of the inlet/outlet ports on some of the blowers means that you may not be able to clean the rotors of these blowers as described above.

6.2 Disposal

Safely dispose of the blower, used oil, used grease, cleaning materials, and any components in accordance with all local and national safety and environmental requirements.

Take particular care with the following:

- Used oil or grease that has been contaminated with dangerous substances.
- Cleaning materials that have been contaminated with dangerous substances.
- Components that have been contaminated with dangerous substances.

7 SERVICE AND SPARES

7.1 Introduction

Ingersoll Rand products, spares and accessories are available from Ingersoll Rand companies in Belgium, Brazil, China, France, Germany, Israel, Italy, Japan, Korea, Singapore, United Kingdom, U.S.A and a world-wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Ingersoll Rand training courses.

Order spare parts and accessories from your nearest Ingersoll Rand company or distributor. When you order, state for each part required:

- Model and Item Number of your equipment
- Serial number
- Item Number and description of part.

7.2 Service

Ingersoll Rand products are supported by a world-wide network of Ingersoll Rand Service Centres. Each Service Centre offers a wide range of options including: equipment decontamination; service exchange; repair; rebuild and testing to factory specifications. Equipment which has been serviced, repaired or rebuilt is returned with a full warranty.

Your local Service Centre can also provide Ingersoll Rand engineers to support on-site maintenance, service or repair of your equipment.

For more information about service options, contact your nearest Service Centre or other Ingersoll Rand company.

7.3 Spares

The spares available for the blowers are shown in Table 25 (page 41).

Note that:

- The minor repair kits contain seals and associated gaskets.
- The major repair kits contain bearings, seals and associated gaskets

Spare	Item Number
Winter/Summer Mobil SHC 630 oil: 2 litres (0.53 US gal)	LUB1000002
Winter/Summer Mobil SHC 630 oil: 5 litres (1.32 US gal)	LUB1000005
Minor repair kits	
S2H22, S2H23, 2022, 2023	H2020MISK
S2H31, S2H32, S2H33, 2031, 2032, 2033	H2030MISK
S2H41, S2H42, S2H43, 2041, 2042, 2043	H2040MISK
S2H51, S2H52, S2H53, 2051, 2052	H2050MISK
Major repair kits	
S2H22, S2H23, 2022, 2023	H2020MASK
S2H31, S2H32, S2H33, 2031, 2032, 2033	H2030MASK
S2H41, S2H42, S2H43, 2041, 2042, 2043	H2040MASK
S2H51, S2H52, S2H53, 2051, 2052	H2050MASK

Table 25 – Spares