

hibon®

Roots Type Packaged Blower

PSB S2H32, PSB S2H42, PSB S2H52

**Installation, Maintenance and
Operating Manual**

CE

19423385/IST/20

⚠ WARNING:
Please read this manual carefully
before operating the Blower Unit.



PNÖSO PNÖMATİK ve SOĞUTMA SANAYİ LTD. ŞTİ.

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CERTIFICATE No. : 19423385/IST/20



SGS

EC-ATTESTATION CERTIFICATE
AT-ONAY SERTİFİKASI

Date/Place of Issue : 21.02.2020/ İstanbul
Sertifika Yayın Tarihi/Yer

Valid Until : 21.02.2025
Sertifika Geçerlilik Tarihi

Name of Applicant : PNÖSO PNÖMATİK VE SOĞUTMA SANAYİ LTD.ŞTİ.
Başvuru Sahibi AOSB 10028 SOK NO 3 Çiğli – İZMİR / Turkey

Name of Manufacturer : PNÖSO PNÖMATİK VE SOĞUTMA SANAYİ LTD.ŞTİ.
Üretici AOSB 10028 SOK NO 3 Çiğli – İZMİR / Turkey

Description of Product : ROOTS TYPE PACKAGED BLOWER
Ürün Tanımı Ruts Tipi Paket Blower

Model(s) : # PSB S2H32, PSB S2H42, PSB S2H52. #
Model(ler)

Assessment Performed : Conformity to Annex I's Applicable Paragraphs of
Uygulanan Değerlendirme 2006/42/EC Machinery Directive & 2014/35/EU Low Voltage Directive. 2006/42/AT Makina Emniyeti Yönetmeliği Ek-I Gerekliliklerine Uygunluk & 2014/35/AB Belirli Gerilim Sınırları İçin Tasarlanan Elektrikli Ekipman İle İlgili Yönetmeliği.

Standard(s) / Standart(lar) : # EN ISO 12100:2010, EN 60204-1:2018, EN 1012-2:1996+A1:2009 . #
Base of Assessment : In the opinion of SGS the submitted technical file TR-MD-19423385-1
Değerlendirme Dayanağı satisfies the requirements of the Machinery Directive 2006/42/EC Annex-VII. TR-MD-19423385-1 Numaralı Teknik Dosya, 2006/42/AT Makina Emniyeti Yönetmeliği Ek-VII Gerekliliklerini Karşılıcağı SGS Tarafından Saptanmıştır.

Assessor ID No. / Denetçi No : TR-EE-S01
Date/Place of Assessment : 20.02.2020 / İzmir – Turkey
Değerlendirme Tarihi/Yer

Test reports in technical file TR-MD-19423385-1 are reviewed and found to be acceptable. The certificate is valid as long as the relevant directives and harmonised standards written above are current. The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.

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CE

This EC-Attestation Certificate is only valid for the equipment and configuration described in conjunction with the data detailed above. It refers only to the sample submitted to SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş. for testing and certification. Any modifications made to the product shall immediately be reported to SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş. office in order to examine whether this certificate remains valid.

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For and on behalf of
SGS Supervise Gözetme Etüd
Kontrol Servisleri A.Ş.

Müge OKUMUS

SGS Supervise Gözetme Etüd Kontrol Servisleri A.Ş.

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D.Cem BATUHAN

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SGSPAPER
19423385



1. INTRODUCTION

1.1. Scope and definitions

This manual provides installation, operation and maintenance instruction for the Ingersoll Rand Pressure Blower and Vacuum Exhauster pumping equipment. You must use this equipment as specified in this manual.

Read this manual before attempting to install and operate this equipment. Important safety information which is highlighted as WARNING and CAUTION instruction. You must obey this 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 following IEC warning labels appear on the pump:



Warning refer to accompanying documentation.



Warning hot surfaces.



Warning danger of injury from rotating parts.



Warning noise level exceeds 80dbA.

The units used throughout this manual conform to the SI international system of units of measurement .

1.2. Pressure Blower/ Vacuum Exhauster

The Ingersoll Rand Pressure Blower package is designed for use in applications requiring high volumetric air flow at a low differential pressure. The package can be supplied as a blower, where positive pressure is supplied to the process, or as an exhauster, where vacuum pressure is applied to the process. This package comprises a positive displacement blower, driven by a timing or Vee belt drive, connected to a motor and mounted on a common base frame, which may be housed within an acoustic enclosure. Additional system components such as intake filters, unloading valve and silencers can be specified according to the application.

Tables 1 and 2 detail the performance characteristics for medium and high pressure blowers in Unit sizes 0 and 00.

1.3. System configuration

Depending upon your application and requirements, the system supplied to you will be configured with a various options and accessories. The exact configuration of your system is defined by the model number, which is prefixed with the letters PB. The part number matrix is shown on the Declaration of Conformity located on the inside cover of this manual.

1.4. System components

The following sub-sections describe various components and options that may be specified via the standard matrix. Some of these components may not be fitted to your system.

Note: It is possible that non-standard options may also be fitted. Description of the non-standard equipment will be contained in the supplementary instructions supplied with the system.

1.4.1. Blower

The blower is a two or three lobe positive displacement machine manufactured in cast iron. There are a number of capacities available, the correct choice depends upon your application.

1.4.2. Blower base/silencer unit

The blower base incorporates a primary silencer, additional optional silencer stages may also be supplied with the package depending upon the system configuration.

1.4.4. Suction filter

The suction filter acts as an air intake filter and sound attenuator. A disposable filter cartridge removes particulates that would otherwise cause premature wear within the pump.

1.4.5. Silencer (vacuum package)

The exhaust silencer system is comprised of up to three stages. The primary stage is mounted directly to the outlet of the pump, normally within the acoustic enclosure. The secondary stage is mounted downstream of the primary silencer, in the exhaust line. The final stage is an exhaust snubber, located at the end of the exhaust line.

1.4.6. Motor

The electric motor is mounted on the base frame and transmits power to the pump through a pulley and drive belt arrangement. The size of motor fitted to the package will depend upon the desired flowrate of pumped gas and the working pressure differential (inlet and exhaust).

CAUTION

If the pumping application changes e.g. the pressure or flow conditions change, it is important to ensure that the pump and motor power requirements do not exceed their design limits.

1.4.7. Drive

The pump has an indirect drive arrangement. The drive comprises of pulleys mounted to both the motor and pump shafts. Depending upon the blower model, a set of Vee belts or timing belts transmit the power from the motor to the pump.

1.4.8. Non-return valve

The non-return valve ensures that there is no reversal in gas flow when the pump is shut down. The valve is a wafer type with a polymer or metal hinge.

1.4.9. Pressure relief valve

The pressure relief valve ensures that the discharge pressure does not exceed the design limits. It is not a pressure control valve and must not be adjusted to perform this function.

The relief valve is factory pre-set to 10% above your specified discharge pressure.

CAUTION

Do not attempt to adjust the pressure relief valve setting as this may damage the equipment.
Adjustment must only be performed qualified by Ingersoll Rand service personnel.

1.4.11. Additional standard components

Other optional components such as pressure gauge, flexible pipeline connections and anti-vibration mounts may also be supplied.

1.4.12. Instrumentation/options

- Unloading valve

Various gauges and switches may also be fitted to the package. □

- • Enclosure temperature switch
- Inlet temperature gauge
- Discharge pressure switch
- Suction vacuum switch
- Blocked filter switch
- Two set point pressure switch
- Discharge temperature switch and/or gauge

1.5. Limits of use

1.5.1. Performance limits

The following table defines the performance limits for each size of blower that may be installed in this equipment.

| SIZE | REV min1 | | P1 (mbar) | | P2- P1(mbar) | P2/P1 | T1(°C) | | T2- T1(°C) | T2- T1(°C) |
|-------|----------|------|-----------|--------|-----------------|-------|--------|-----|---------------|---------------|
| | MAX | MIN | MAX | MIN | MAX | MAX | MAX | MIN | MAX | MIN |
| S2H22 | 4800 | 1400 | PO+1500 | PO-500 | 700 | 2 | 50 | -25 | 145 | 125 |
| S2H31 | 3800 | 1400 | PO+1500 | PO-500 | 950 | 2 | 50 | -25 | 145 | 125 |
| S2H32 | 3800 | 1400 | PO+1500 | PO-500 | 700 | 2 | 50 | -25 | 145 | 125 |
| S2H42 | 3600 | 1400 | PO+1500 | PO-500 | 620 | 2 | 50 | -25 | 145 | 125 |
| S2H52 | 3000 | 1400 | PO+1500 | PO-500 | 620 | 2 | 50 | -25 | 145 | 125 |
| NX2 | 4800 | 1200 | PO+1500 | PO-500 | 1100 | 2 | 50 | -25 | 145 | 125 |
| NX3 | 4200 | 1200 | PO+1500 | PO-500 | 1050 | 2 | 50 | -25 | 140 | 120 |

PO: Atmospheric pressure
P1: Blower inlet absolute pressure
P2: Blower outlet absolute pressure

T1: Blower inlet temperature
T2: Blower outlet temperature
REV MIN: Minimum speed needed for lubrication

Table 3 - Performance Limits

1.5.2. Operational limits

This equipment is not designed or licensed for use in hazardous applications or environments. □

Operation of the equipment outside the specified pressure or flow characteristics may cause serious damage to the pump and motor.



WARNING

Do not use this equipment for pumping toxic, explosive or dangerous gases.

CAUTION

Do not allow fluids or liquid to enter the pump as this will cause permanent damage.

CAUTION

Do not re-circulate gases from the exhaust to the inlet. Otherwise the gas temperature rise will causing the pump to seize.

2. TECHNICAL DATA

2.1. Operating and storage conditions

| | |
|--|----------------------------------|
| Ambient (environmental) temperature: | |
| Operating range | -10 °C to 40 °C |
| Storage range | -30 °C to 70 °C (non condensing) |
| Maximum allowable temperature within enclosure | 50 °C |
| Maximum humidity in operation | 90% |

2.2. Physical data

Dimensions

| Unit Size | 1 | | | 2 | | | | |
|---------------------------|-------|-------|-------|-------|-------|-------|------|-----|
| Power kW | 4 | 7.5 | 7.5 | 11 | 15 | 22 | 18.5 | 37 |
| Mass(kg)without enclosure | 110 | 150 | 160 | 220 | 260 | 370 | 410 | 440 |
| Blower type | S2H22 | S2H31 | S2H32 | S2H32 | S2H42 | S2H52 | NX2 | NX3 |

Table 4 Silent Flow Plus Package mass and power

2.3. Services

Electrical supply

Motor: see the Unit rating plate
 Enclosure fan: see the fan motor rating plate

2.4. Interface

Inlet connection Exhaust connection: see table 5 see table 5

2.5. Performance

see table 1,2 & 3

2.6. Noise level

The following values are free field measurements:

A-weighted decibels 95 dBA

2.7. Vibration

System vibration level < 18 mms^{-1}

2.8. Legislation and standards

The standards and legislation with which this equipment complies are listed in full on the Declaration of Conformity on the inside cover of this manual.



3. INSTALLATION

3.1. Safety



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.



WARNING

This equipment must be positioned under good lighting conditions.

- A suitably trained technician must install this equipment.
- Ensure that the installation technician is familiar with the safety procedures which relate to the pumped gases
- Safely route and secure all cables, hoses and pipes during installation, so that people cannot trip over them.
- Vent and purge the process system before you start installation work.
- Check that all the required components are available and of the correct type before you start.
- Isolate the other components in the process system from the electrical supply so that they cannot be operated accidentally.
- The sound power level of systems supplied without an acoustic enclosure may exceed 95dbA under certain conditions. When approaching unenclosed units or if opening doors on systems supplied with acoustic enclosures always wear ear defenders.
- If necessary, contact Ingersoll Rand or your supplier for advice on isolation-valves, or other components suitable for your application and system design.

Consult the Safety Information booklet, publication number P400-40-100 for further advice on safety issues.

3.2. System design considerations

The inlet and exhaust pipe diameter must be equal too or greater than those on the unit.

| Unit Size | 1 | 2 |
|----------------------|------|------|
| Inlet connection | DN50 | DN80 |
| Discharge connection | | |

Table 5 Process connections

It is recommended that an outlet isolation valve and a pressure gauge fitted in the exhaust line will enable the pressure relief valve to be periodically tested.

3.3. *Unpack and inspect*

CAUTION

The pump lubricating oil is drained before shipping.
Ensure that both pump casings are charged with oil before operating this equipment.



WARNING

All lifting operations must utilise Identified lifting points or lugs and appropriate lifting equipment.

1. Use a forklift truck or overhead crane and slings to place the unit in a convenient position.
2. Remove the plastic wrap which covers the unit. If the unit has an enclosure, remove the side panels to allow access to the 4 holding down bolts.

Note: For overseas export the palatalised unit will be fully enclosed with removable plywood panels. Please keep the panels for re-packing if return shipment for service or repair may be required in the future.

3. Inspect the equipment. If any of the components are damaged, notify your supplier and the carrier in writing within three days; state the item number of the unit together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the unit if it is damaged.
4. Check that you have received all the ordered items. If any of these items is missing, notify your supplier in writing within three days.
5. If the pump is not to be used immediately, replace the packing materials. Store the pump in suitable conditions as described in Section 6.1.

3.3.1. Lifting philosophy

If the shipping crate/pallet is to be positioned by crane it may be lifted whilst on its pallet by using straps slung underneath and with a spreader frame or bars overhead to prevent compression loads on the enclosure.

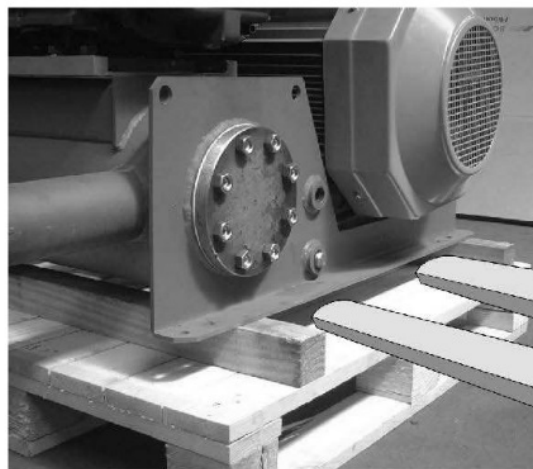


Figure 5 Lifting the unit without an enclosure fitted

To remove the unit from its pallet:

- If an acoustic enclosure is fitted, remove the two side panels • Release the 4 holding-down bolts attaching the base frame to the pallet cross-members
- Using a fork-lift truck or overhead crane, lift the package as shown in Figures 5 or 6

3.4. Foundation requirements

The unit must be mounted on a solid base. Prepare a concrete foundation at least 150mm thick with outside dimensions at least the same as that of the unit. The foundation surface is to be level and flat to within 2mm.

3.5. Locating the unit

If the unit is to be mounted indoors, ensure that there is sufficient space around the equipment to remove the inspection panels, the pump and motor. Ensure that there is sufficient room ventilation, especially if the unit's intake is supplied by room air. The total room ventilation air flow required is calculated as: $Q_v = Q_b + N_o \times 30$

Where:

Q_v = Room volumetric flow rate ($m^3 h^{-1}$) of replacement room air required per hour

Q_b = Pump volumetric flow rate ($m^3 h^{-1}$) see tables 1 and 2 (only applicable if unit consumes room air)

N_o = Total power in kW of all motors installed in the room.

Note: The room air velocity should not exceed $4m s^{-1}$

3.6.1. Unit with an acoustic enclosure

1. Lift the unit as described in section 3.3.1
2. Position and level the unit centrally on the prepared foundations
3. Locate the four anchor bolt-holes in the cross-members of the base frame

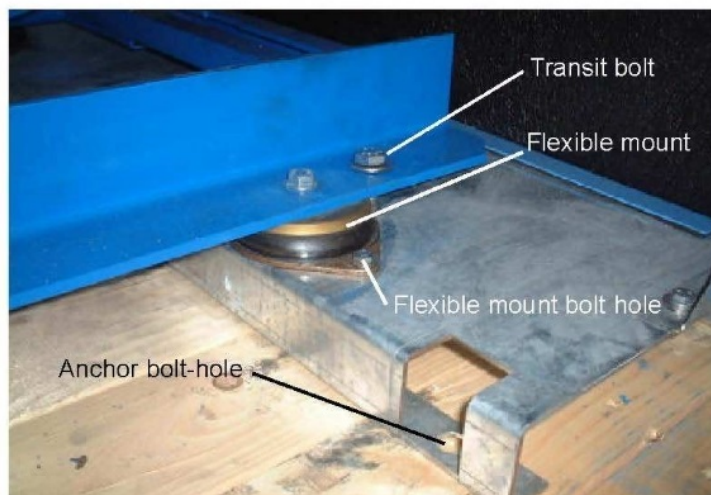


Figure 8 - Bolting down arrangement

4. Drill the foundation using the anchor bolt-hole locations as a template and fit 4 off 12mm diameter x 100 mm long expanding bolts with large diameter washers
5. Remove the 4 off transit bolts situated adjacent to the flexible mounts
6. Connect the unit inlet (if a piped inlet) and outlet connections to the system pipework

CAUTION

Do not allow loads to be transmitted from the process pipework to the unit's inlet or outlet connections.

7. Fill the pump casings with oil (ref section 5.6)
8. Check the drive belt tension (ref section 5.3)

3.6.2. Unit without an enclosure

1. Lift the unit as described in section 3.3.1. Fit the four off flexible mounts enclosed in the unit packaging using the M8 hexagon machine screws and washers provided.
2. Position and level the unit centrally on the prepared foundations
3. Drill the foundation using the flexible mount bolt-holes as a template and fit 8 off 6mm diameter x 50 mm long expanding bolts with large diameter washers.
4. Connect the unit inlet (if a piped inlet) and outlet connections to the system pipework.

CAUTION

Do not allow loads to be transmitted from the process pipework to the unit's inlet or outlet connections.

5. Fill the pump casings with oil (ref section 5.6)
6. Check the drive belt tension (ref section 5.3)

3.7. Electrical installation

The installation of this equipment must be performed by skilled technicians familiar with current E.U. and local electrical regulations. The user must ensure that the electrical installation of the package fulfils the requirements of EN 60204-1.



WARNING

Ensure that the electrical installation of the unit conforms with your local and national safety requirements. Ensure all incoming power is connected through a mains isolation switch.

A cable bulk-head gland plate is fitted on the rear panel of the acoustic enclosure providing a secure cable entry location. A common frame earth (ground) bond is fitted to this unit, ensure that it is connected to the facility earth. Ensure also that the blower and ventilation fan motors are connected to the common frame earth.

Note: There are no electrical controls fitted to this unit. It is the customer's responsibility to ensure that the correct hardware and cables are used.

Protection devices and switches shall be so designed and connected as to be "fail safe". Start/stop devices shall be easy to operate, be clearly marked in accordance with EN 418, or IEC 417. The user shall ensure provision of over current protection of the power circuit. The safety system shall be so designed so as not to give rise to a hazardous situation in the case of disturbances such as:

- Short circuit
- External impacts
- Variations in supply voltage
- Electromagnetic fields (see EN 61326)
- Earthing faults.

After a stop caused by the safety devices, restart shall only be possible by the intentional operation of a manual reset. In the case of the loss or partial loss of main or auxiliary power, the compressor shall be brought to a safe condition by the safety system.

3.7.1. Motor connection

Connect the electrical supply from the isolator to the pump motor as described below.

1. Remove the cover from the motor terminal box.
2. Fit a suitable strain relief cable-gland and nut to the entry hole, then pass the supply cable through the cable-gland and tighten the gland. The cable-gland you use must be rated to provide seal protection of IP55 (in IEC 529) or better to the terminal-box.
3. Ensure that the links are correctly configured for your installation.

Note: Configuration details are supplied inside the motor terminal box.

4. Connect the phase conductors of the supply cable to the terminals. We recommend that you use ring crimp connectors.
5. Connect the earth (ground) wire to the earth (ground) terminal. We recommend the use of ring crimp connectors. Check that a motor to frame ground bond is installed and connected.
6. Tighten the cable-gland nut strain-relief screws.
7. Refit the terminal box cover. 8. Check the direction of rotation is correct by momentarily starting the motor.

Note: The rotation direction arrow is located on the pump, above the drive shaft pulley.

3.7.4. Over current protection

Separate and appropriately rated over current protection devices for the blower and enclosure fan motors must be provided and installed by the user.

Note: Refer to the Unit/motor rating plates to confirm the exact voltage and current requirements for motors supplied with

4. OPERATION

4.1. Introduction

This unit is not supplied with a electrical control box or motor starters. The following sections only provides a guide for the correct operation of this unit. Some of the components are optional and may not be fitted to your system, or additional components may be supplied as non-standard options.

If in doubt, please refer to Ingersoll Rand applications specialists for further information or guidance.



WARNING

Before starting the unit, ensure that the enclosure panels and drive belt guards are in position and secured.

CAUTION

Some surfaces of the package (such as the discharge line) may become very hot during normal operation. Ensure that additional guarding is fitted as necessary to prevent accidental skin contact.

4.2. Pre-start conditions

- a) Check pump oil level (both end cases). See section 5.6
- b) Check drive belt tension. See section 5.3
- c) Electrical power and control is available
- d) Process line isolation valves are open

4.3. Normal start sequence (initial operation)

1. Connect to the process and make sure that the valves are opened. If the machine suction side is piped, it is advisable that a metal inlet strainer is fitted on the suction side during system commissioning. The strainer will trap any debris and impurities that might come through the process lines (see figure 10). After 15 minutes of initial operation, clean the strainer and after a further 24 hours, remove it and replace with a spacer.

Note: An Inlet strainer or spacer is not normally provided with the standard package. Please contact Ingersoll Rand sales if you require either these items.

2. Start the enclosure fan motor (if fitted) and then start the blower motor

4.4. Normal running

- Check that the unloading valve closes after approximately 30 seconds (if supplied)
- Check that the pressure relief valve is not opening under normal conditions
- Check that the suction filter gauge indicator does not show red

4.5. Shutdown sequence

1. Stop the blower motor.
2. After a further 10 minutes, stop the enclosure ventilation fan motor.
3. Isolate from the process system (if appropriate).

4.6. Alarm conditions

The following alarm conditions may be applicable to your system. Any alarm condition should illuminate a warning lamp or shutdown the unit, as required.

- Enclosure temperature switch activated
- Inlet filter switch activated
- Vacuum or pressure switch activated
- Discharge temperature switch activated

4.7. Emergency stop

An emergency stop button should be provided within your control circuit. Activation of the emergency stop should remove all power from the unit and prevent the unit from being re-energised until a manual reset button is pressed.

5. MAINTENANCE

The following routine maintenance schedule should be adopted to maintain the unit in full operating condition. Major servicing of the component parts (i.e. pump overhaul) will require the component to be removed from the unit; the instructions for such procedures are outside of the scope of this manual and it is advised that any such activity is performed by Ingersoll Rand service personnel.



WARNING

There are no safety interlocks on the cabinet panels. Ensure that the electrical supply is isolated and locked out, before starting any maintenance work.

5.1. Safety information



WARNING

Please follow the safety instructions given below.

Observe the following guidelines when carrying out maintenance on your unit:

- Ensure that maintenance is performed by a suitably trained technician. Obey your local and national safety requirements.
- Ensure that the installation technician is familiar with the safety procedures which relate to the pumped gases.
- Check that all the required parts are available and are of the correct type before you start work.
- Isolate the pump and other components from the electrical supply so that they cannot be operated accidentally.
- Allow the pump to cool (so that it is at a safe temperature for skin contact) before you start maintenance work.
- If cleaning becomes necessary for any reason, ensure that only non-flammable solutions are used. Avoid the use of solvents which may congeal and obstruct internals, or lead to corrosion.

5.2. Maintenance plan

More frequent maintenance may be required if the unit is used to pump abrasive gases and vapours, or if the pump is operated continuously at the extremes of its performance or environment limits. If necessary, adjust the maintenance plan according to your experience.

| Operation | Frequency | Refer to section |
|--|----------------------|------------------|
| Check the belt tension | first 30 minutes | 5.3 |
| Check condition of the belts | first 24hrs | 5.5 |
| Check the oil levels | weekly | 5.6 |
| Check the inlet filter is not blocked | weekly | check gauge |
| Drain and replace the pump oil | first 200hrs / 2 wks | 5.7 |
| Check condition of the drive belts and tension | 1000hrs / 6 wks | 5.5 |
| Check the enclosure air vents are not blocked | 1000hrs / 6 wks | visual |
| Test the pressure relief valve | 1000hrs / 6 wks | 5.9 |

Table6 Maintenance plan

| | | |
|--|--------------------|------------------------|
| If the discharge temp > 120oC drain and replace the blower oil | 4000hrs / 6 months | 5.7 |
| Grease the drive belt tension rod | 8000hrs / yearly | n/a |
| Check drive pulleys for wear | 8000hrs / yearly | visual |
| Drain and replace the blower oil | 8000hrs / yearly | 5.7 |
| Replace filter cartridges | yearly | 5.8 |
| Inspect the non return valve | yearly | 5.10 |
| Replace drive belts | yearly | 5.5 |
| Inspect acoustic foam | yearly | 5.11 |
| Replace pump bearings and seals and gaskets(Standard service) | 3 years | Contact Ingersoll Rand |

Table 6 Maintenance plan

5.3. Check drive belt tension

For units fitted with high pressure blowers, the drive belts are maintained under the correct tension by the weight of the motor. As the V-belts wear it will be necessary to periodically back-off the spacer locking nuts (4) on the tension rod to provide additional wear clearance (see figure 11 - left hand view)

5.12. Fault finding

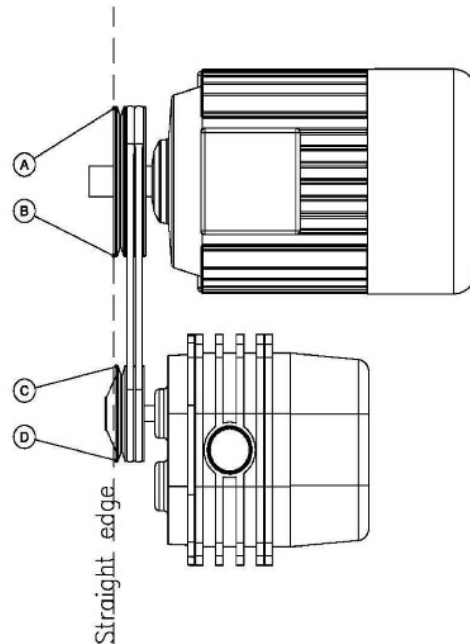
The following table provides a guide to solving some common problems .

| Symptom | Possible cause | Action |
|---------------------------------------|--|---|
| The machine fails to start or seizes. | The rotors are touching. Considerable overload applied to machine. Foreign matter has entered the machine. Machine seized. Belt alignment defective. | Visually check for signs of damage. Check pressure and temperature. Inspect condition of rotors and casing. Return to Ingersoll Rand Service centre Check and re-adjust. Refer to section5.3/5.4 |
| Machine emits high noise. | Rotors touching. Excessive gear clearance. Excessive bearing clearance. Rotors unbalanced. | Visually check for signs of damage. Consult Ingersoll Rand Service. Consult Ingersoll Rand Service. Carryout complete rotor/housing cleaning. Check clearances. |
| Machine overheating. | Suction filter blocked Excessive differential pressure. Oil level or viscosity too high. Clearance between rotors or rotors and casings excessive . Cover vent blocked. Defective fan. | Clean or replace filter. Refer to section5.8 Check valve circuit and calibration. Refer to section 5.9 Replace oil or readjust level. Refer to section 5.6 Consult Ingersoll Rand Service. Clean. Repair/replace fan. |
| Oil in gas stream. | Oil level too high. Sealing rings deteriorated. | Re-establish normal level after purging. Refer to section5.6 Consult Ingersoll Rand Service |
| Shaft seals leak | Lip seal damaged | Consult Ingersoll Rand Service |

Table 8 Fault finding

5.4. Drive pulley alignment

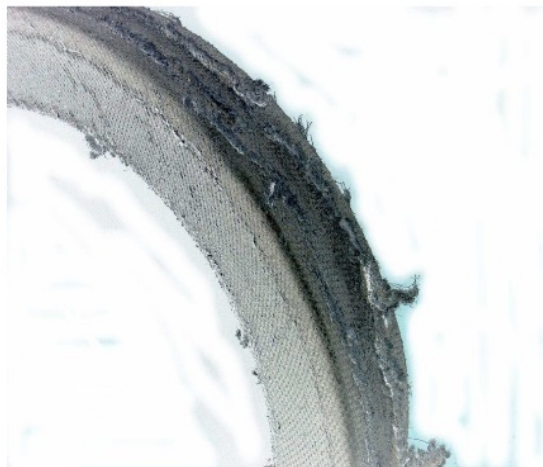
Visually check that the motor and pump pulleys are correctly aligned using a long straight edge or steel rule. Alignment is correct when all points A,B,C,D touch the straight edge. It is also important that the pulleys are positioned as close as possible to the motor and pump casings, to avoid excessive loads on the shaft bearings. If necessary, correct the misalignment by adjusting the motor.



5.5. Drive belt inspection

Visually inspect the drive belts for signs of wear. If any of the belts show significant wear or are cracked replace all the belts as a complete set.

To replace the drive belts, remove the locking nuts and spring tension nut on the tension rod. Lift the motor mounting plate and remove the belts. Fit a new set of belts and refit the locking nuts and tension spring.



| | | |
|--|---|---|
| Low volume flow | Suction Filter blocked. Pump operating outside its specified duty Clearances have become excessive due to wear. | Clean or replace filter. Refer to section 5.8Consult Ingersoll Rand Sales Visually check for signs of damage. Return to Ingersoll Rand Service centre |
| Absorbed power too high. | Pump operating outside its specified duty Differential pressure has increased due to blocking of suction filter | Consult Ingersoll Rand Sales Replace filter. Refer to section5.8 |
| After stopping the blower runs in reverse. | Non-return valve defective. | Replace valve |

Table 8 Fault finding

5.6. Check oil levels

The pumps have two oil cases, one at the drive end and one at the non drive end (except on the S2H22-52 series which are grease lubricated at the drive end). The oil levels should be checked when the pump is not running. The normal level should be the middle of the sight glass. Use HIBON LUBE or an equivalent synthetic oil.

| Blower type | Drive end oil capacity (litres) | Non drive end oil capacity (litres) |
|-------------|---------------------------------|-------------------------------------|
| S2H22 | Grease ⁽¹⁾ | 0.3 |
| S2H31 | Grease ⁽¹⁾ | 0.6 |
| S2H32 | Grease ⁽¹⁾ | 0.6 |
| S2H42 | Grease ⁽¹⁾ | 0.9 |
| S2H52 | Grease ⁽¹⁾ | 1.5 |
| NX2 | 0.8 | 1.25 |
| NX3 | 0.8 | 1.25 |

⁽¹⁾ Use Mobil Mobil Temp SHC100 grease

Table 7 Oil case capacities

Note: Ingersoll Rand Material Safety Data Sheets for some of the oils and greases referenced in this publication are available upon request

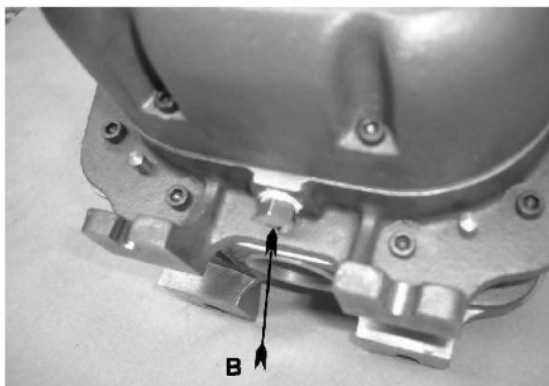
5.7. Pump oil draining



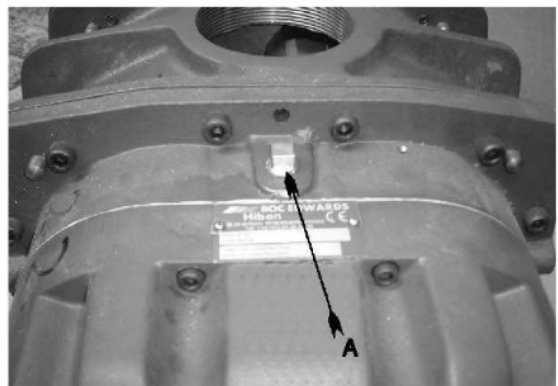
WARNING

Allow the pump to cool to room temperature before draining the oil.

- Unscrew the filler plug
- Unscrew the drain plug (for pump models NX remove the drain cap and screw in the drain pipe until the piston seal lifts and the oil flows out)
- Drain the oil into a suitable container
- Replace the drain plug
- Fill with correct grade of oil to mid-way on the indicator glass
- Replace filler plug

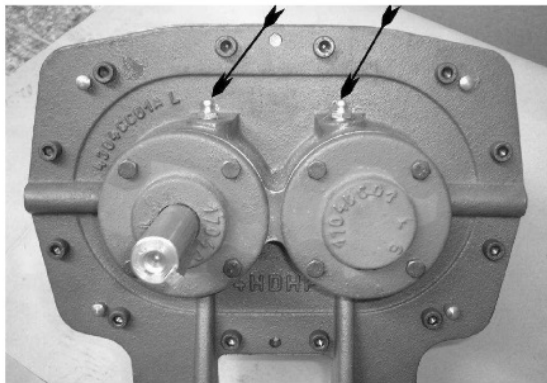


S2H2252 Series non-drive end drain plug



S2H Series non-drive end fill plug

Figure 14 Blower oil filling and drain points



- A Filling plug
 - B Drain plug
 - C Oil level sight glass
 - E Grease filling point
- S2H2252 Series drive end grease points

Figure 14 Blower oil filling and drain points

5.8. Filter cartridge replacement

5.8.1. Pressure blower

Remove the filter cartridge and refit the new cartridge as shown below.



Remove the wing-nut, lift off the canister. Remove and refit the new filter element as shown.

5.9. Testing the pressure relief valve

To test the pressure relief valve the process line should be fitted with an exhaust isolation valve and pressure gauge. With the unit running, slowly close the isolation valve until the pressure relief valve begins to lift. Check that the pressure gauge reading matches the pressure relief valve setting. The relief valve pressure setting is factory set at 10% above the specified discharge pressure (see the unit's rating plate for discharge pressure).

5.10. Inspection of the non-return valve

Disconnect the process line and remove the non-return valve. Visually inspect the valve seat and check the operation of the hinged flap. Replace if there are any signs of cracking or damage to the hinge or flap.

6. STORAGE AND DISPOSAL

6.1. Storage

In order to maintain a satisfactory service life of the unit, the following procedures should be adopted during storage:

1. Prepare the system for storage by:
 - Wipe clean and dry all surfaces especially those where condensation may have formed
 - Inspect the pump for oil leakage and cap all openings with covers or blanks
2. Store the unit in a dry, even temperature compound or in an air conditioned and humidity controlled environment.

For storage more than six weeks:

1. Fill the pump end casings with protection oil (see table 9) up to the sight glass and turn the machine over manually a few revolutions.
2. Spray protection oil into the compression chamber, after removing the inlet filter cartridge.
3. Turn the machine over a quarter-turn every two weeks to prevent degradation of the bearings.
4. When removing the unit from storage inspect the equipment, including panel seals, for signs of deterioration, renew any defective parts.

Before re-commissioning, drain the pump end casings of the protective oil and clean the compression chamber with a suitable solvent. Refill the pump end casings with fresh lubricating oil.

| External parts | Internal parts |
|----------------------|----------------------------|
| Mobil Mobilarma 778 | Mobil Mobilarma 523 or 524 |
| Esso Rust ban 324 | Esso Lub MZ20W/20 |
| Shell V Product 9703 | Shell Ensis motor oil 20 |

Table 9 Protection oils

6.2. Disposal

Dispose of the pump, deposits removed from the pump, used pump oil, grease, used filter elements and any components safely and in accordance with all local and national safety and environmental requirements.



WARNING

Care must be taken if disassembling the pump or disposing of used components. In particular, care should be taken with fluoro elastomer products (e.g. seals) which may have decomposed as the result of being subjected to high temperatures. Care must be taken to ensure that components that have been exposed to oil must be disposed of as hazardous waste.

7. SPARES AND ACCESSORIES

7.1. Introduction

Ingersoll Rand products, spares & accessories are available from Ingersoll Rand companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, Switzerland, UK, USA and a worldwide 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 number of your equipment
- Unit serial number
- Item number and description of parts



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