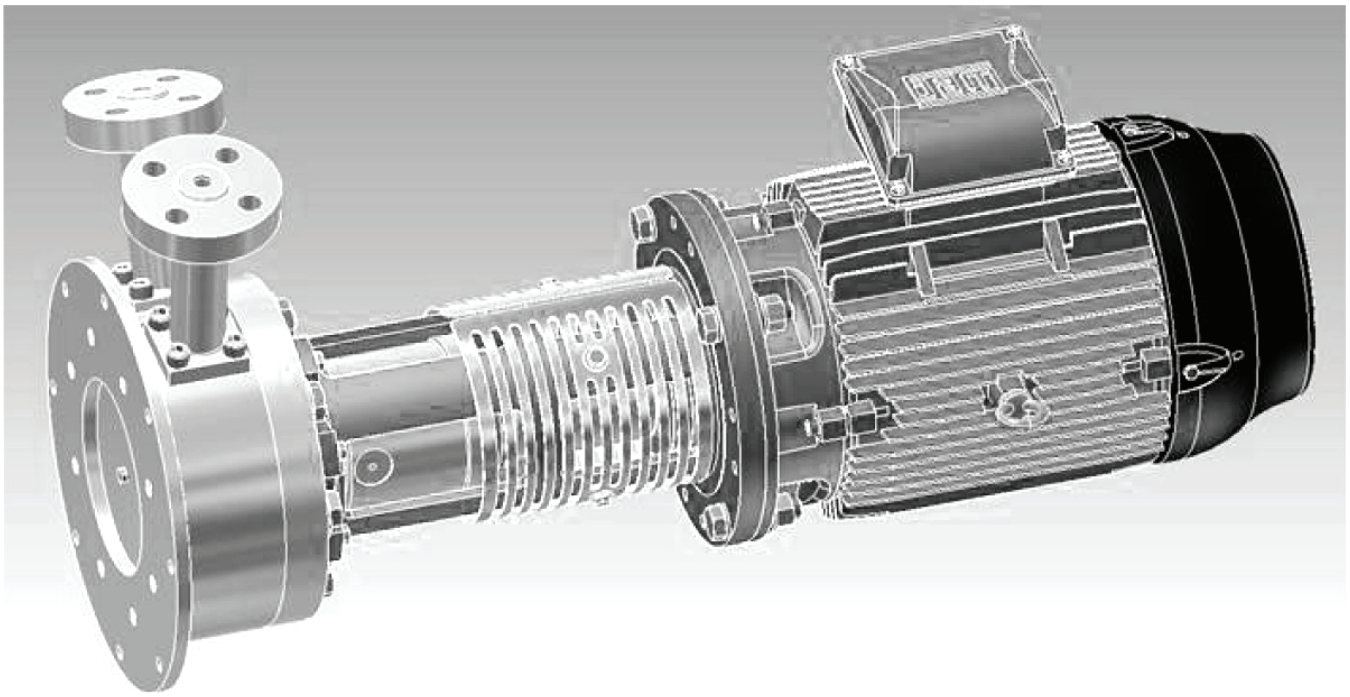
GCU CENTRIFUGAL SEAL GAS BOOSTER HP



CONTENTS

1. Preface

The purpose of this instruction manual is to provide the necessary information for the safe and correct installation, operation and maintenance of the John Crane Centrifugal booster unit.

Users must be competent and have the appropriate skills to carry out the work.

Use of this instruction manual for any other booster unit is prohibited.

This instruction manual is an integral part of the compressor system and should be kept in a suitable location for future reference.

This instruction manual is copyright protected. Questions relating to use, duplication and/or publication of this instruction manual and/or parts thereof must be referred to John Crane (see last page).

Modifying this instruction manual without written permission of the manufacturer is prohibited.

This instruction manual is compiled and maintained with the utmost care. Please contact John Crane (see last page) if this instruction manual is found to be incomplete or incorrect.

2. Declaration of Conformity

Certificate of Conformity COC will be provided, along with the supporting documentation for each booster unit.

3. Description

The HP Gas Conditioning Unit (GCU), or booster unit, is a machine intended for use in an industrial gas process system (see Figure 1).

The booster unit is custom designed, fabricated and tested for a specific gas process application.

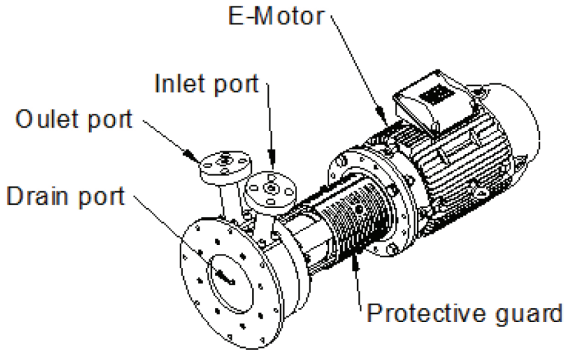
Using the booster outside of the design specifications is prohibited!

The booster unit should not be modified in any way without referring to John Crane (see last page).

The compressor system consists of the following components:

- Strippers
- Impeller
- Compression chamber
- Bearings and seals
- Magnetic coupling
- Electric motor (E-motor)
- Gas inlet port
- Gas outlet port
- Shaft
- Vibration switch
- Temperature probe

FIGURE 1



4. Use in Dry Gas Seal Supply Systems

The booster unit is specifically designed for dry gas seal applications. It helps provide a constant supply of dry and clean seal gas, while the main compressor is in standby conditions, helping to eliminate process contamination, and improve dry gas seal reliability.

In normal compressor operation, seal gas flow is generated by the differential pressure across the compressor from discharge or an intermediate stage. This process gas is filtered, conditioned and supplied to the seal.

During compressor pressurization, start-up, pressurized stand-still, and transient conditions such as recycle and shutdown, differential pressure across the compressor is often not sufficient to provide adequate seal gas flow, and effective operation requirements may not be met, resulting in seal contamination.

In these circumstances, the automatically triggered booster unit will draw process gas from the main compressor, pass it through the gas conditioning unit, and create a clean gas flow into the seal chamber, thereby preventing untreated process gas from contaminating the seal.

5. Function

The function of the booster unit is to create a flow of clean gas to purge contaminated gas away from the seal, by means of an impeller as follows:

- The impeller rotates within a specially designed housing. It is mounted on the main shaft and driven via a magnetic coupling by the electric motor mounted on the top of the unit.
- The rotating motion of the impeller pulls the gaseous medium from the inlet into the compression chamber, where it is circulated around the channels machined into the housings.
- The stripper "strips" the gas from the impellor and directs the flow out of the outlet port. The stripper also forms a barrier between the inlet and outlet connections.
- A vibration probe and a temperature sensor are provided so the satisfactory operation of the unit can be ensured.

6. Safety

The booster unit operates in accordance with the noise rating curve NR85 of ISO R1996 (sound pressure level of 85 dBA at 1kHz, note that NR in Europe is equivalent to the NC curve in USA).

ATTENTION Not following the safety and work instructions in this manual and/or any other applicable procedure, may result in injury to executing staff and/or bystanders, damage to the booster unit or the environment. It can also result in faulty and/or unsafe functioning of the booster unit.

Users must be competent and have the appropriate skills to carry out the work.

Do not touch or work on the booster unit while in operation.

Always check if moving and/or movable parts are properly secured and/or shielded.

Never reach into unshielded movable and/or moving parts and ensure that hair, jewelry and identity tags etc. do not hang loose.

Open flame, fire, open ignition source and smoking is prohibited.

Never obstruct escape routes.

When transporting and handling heavy items such as the booster unit, handle with care, ensure it is adequately restrained and appropriate equipment is used. Also ensure that it is used in accordance with any/all applicable instructions and/or procedures.

When unpacking the booster unit, take appropriate care so as not to damage the unit or cause injury to personnel. Dispose of the packaging materials in an appropriate manner recycling if possible.

Before servicing:

- Isolate the booster unit from any electrical supply in accordance with any/all applicable site instructions and/or procedures.
- Depressurize the booster unit and associated system in accordance with any/all applicable instructions and/or procedures.
- Allow the booster unit to cool so as not to present a hazard.
- Purge the booster unit and/or any part thereof in accordance with any/all applicable instructions and/or procedures.
- Lockout and tag-out the compressor system and/or any part thereof in accordance with any/all applicable instructions and/or procedures.

6.1 Personal protective equipment (PPE)

Always wear appropriate PPE for the task and the environment in which you are working including but not limited to:

- Certified ear protection
- Certified eye protection
- Certified safety footwear
- Certified protective gloves
- Certified protective clothing
- Certified head protection

6.2 Magnetic coupling

Strong magnetic fields can emanate from the permanent magnets in the inner and outer magnetic coupling rotors. This may pose a risk of personal injury or equipment damage.

Personnel wearing medical devices of a mechanical or electrical nature should not work on or near the booster unit.

7. Lifting

Use general assembly drawing for the weight, location of the center of gravity (COG), as well as the location of all lifting points. This information must be used to help ensure the appropriate lifting equipment is used (see Figure 3).

ATTENTION The unit has a high center of gravity. It is necessary to ensure that it is always adequately restrained and supported particularly when lifting and moving the unit.

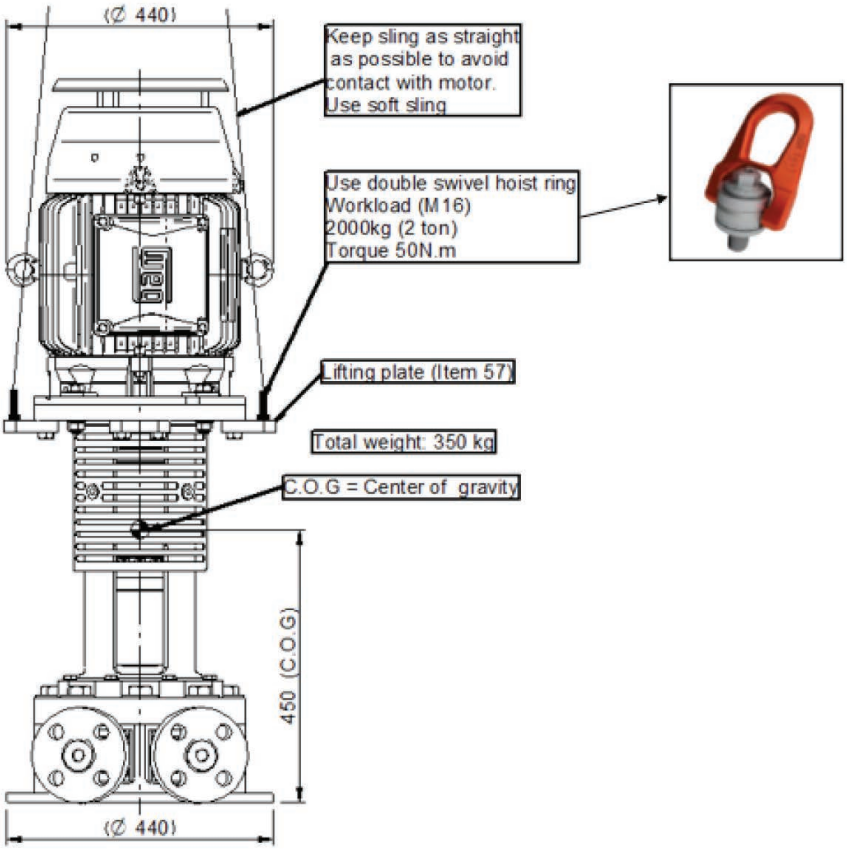
Follow any/all relevant safety instructions in Section 7 before doing the work.

Lifting the booster unit in its packing crate

Each booster unit is mounted on a suitable pallet and housed in a wooden packaging crate. It can be lifted using a suitable forklift truck to support the weight from the bottom of the crate.

Always check each packing crate for damage. If the packing crate is damaged and/or unsealed, safely stop the work and contact John Crane (see last page).

FIGURE 3. Lifting Arrangement of the Booster Unit



8. Storage

Opening of the packaging is not recommended until the unit is required as it is hermetically sealed in a protective bag.

ATTENTION Refer to the following documents when carrying out the work:

- E-motor Installation, Operating and Maintenance manual (IOM)
- Vibration probe and temperature sensor manuals (for further details, see Appendix III and Appendix IV)

8.1 Storage of the crated booster unit

Each booster unit is packaged in a crate and vacuum thermo-welded bag. It can be stored for up to 12 months in this condition.

- Always check each packing crate for damage.
- Store each packaging crate indoors in dry, vibration-free conditions at a temperature above 0 °C.
- When storing the packaging crate outdoors, protect it from rain, sand and/or dust by means of tarpaulins.

If the packing crate is damaged and/or unsealed, safely stop the work and contact John Crane (see last page).

If the maximum storage time is likely to be exceeded please consult John Crane (see last page).

8.2 Unpacking the booster unit

The booster unit is prepared for shipment as follows:

- Openings are capped
- Corrosion sensitive parts are painted with a suitable preservative
- The booster unit is packed and sealed in a protective bag
- It is recommended that the booster unit is not unpacked until it is ready to be fitted onto the unit or system on which it is to operate.
- The wooden crate can be carefully opened using a suitable drill driver. The wooden panels can be individually removed and stored/disposed of as appropriate. The protective supporting materials can be removed, as can the protective wrapping.
- Store any loose bags containing instrumentation/ details separately.
- Ensure the booster unit is mounted in a stable manner and affix the lifting eyes provided.
- Appropriate straps (and additional restraints) should be employed to avoid damage to the motor (see Figure 3).
- Using suitable lifting equipment, begin to take the weight of the booster (to avoid any danger of it falling over).
- Remove the bolts fixing the booster unit to the crate and carefully lift the booster unit away from the wooden palette on which it is mounted.

9. Installing the Booster Unit

Refer to the following documents when carrying out the work: E-motor IOM and instrumentation manuals (for further details, see Appendix III and Appendix IV).

Do no install the booster unit when the ambient temperature is below 5 °F/-15 °C.

9.1 Prepare for the work

- Ensure that the location where the booster unit is to be installed is clean, dry, well ventilated and sufficiently illuminated.
- Ensure that there is enough space to perform any handling with the booster unit and/or any auxiliaries.
- Ensure that the required lifting equipment is available to do the work.
- Ensure any/all packaging is removed, and the booster unit is local to the equipment on which it is to be fitted.

If any of the above preparation conditions are not met, safely stop the work and consult your supervisor.

9.2 Unpack the booster unit

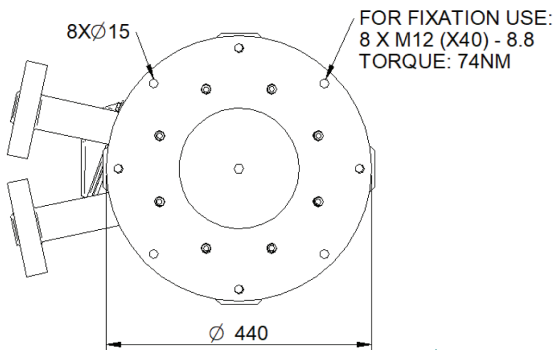
- Open the packaging crate (see Section 9.3).
- Inspect the content of the packaging crate on completeness and or damage.
- Store any/all packages containing non-required spares and/or special tools (see Section 9).
- Remove the plastic bag from the compressor.

If the content of the packaging crate is incomplete and/or damaged, safely stop the work and consult your supervisor.

9.3 Install the compressor system

- Lift the compressor to the position where it is to be installed (see Section 8).
- Fix the compressor into place using 8 x M12 bolts and washers (not supplied), as shown in Figure 4.

FIGURE 4



The unit must be adequately mounted to prevent excessive vibration.

- Connect the pipework to the gas inlet and outlet ports as shown in Figure 5 below.

FIGURE 5

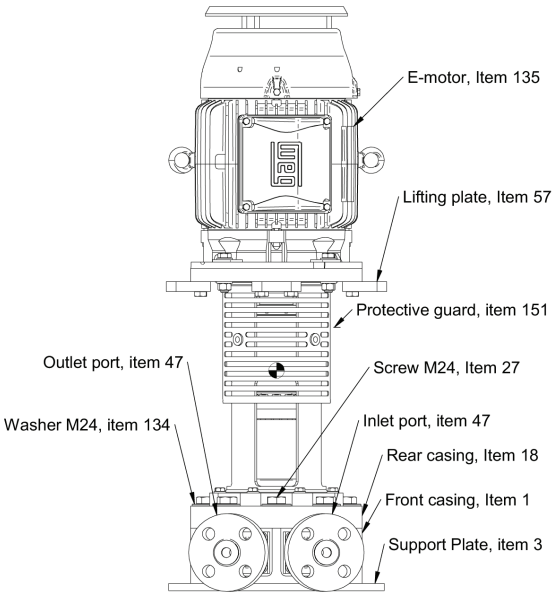


TABLE 1. Booster Unit (Main Parts)

Item	Description	Quantity
1	Front casing	1
3	Plate support	1
18	Rear casing	1
22	O-ring 202.57 IDx5.33	1
25	Vibration probe	1
27	M24 Hex. Head bolt, metric	8
47	Inlet/outlet gas ports	2
134	M24 washers	8
57	Lifting plate	4
133	Bearing temperature sensor	1
135	E-motor	1
151	Protective guard	2
2	Strippers	2
10	Impeller	1
7	Shaft	1

The supplied pipework arrangement must:

- **Avoid significant pressure drops**
- **Avoid inducing loads or moments at compressor gas inlet and outlet connections**
- **Prevent vibrations higher than defined**
- **Avoid the possibility of condensate collection and liquid carry-over**
- **Allow easy removal for maintenance access**

- Connect the E-motor to the main power supply and/or control panel, for further details see E-motor IOM manual. Refer to the E-motor IOM for further details.
- The sense of rotation of the motor and impeller in normal operation is highlighted by arrows on booster case.

9.4 Requirements

Protective guarding

The booster unit contains rotating parts that could potentially cause personal injury during operation if protective guards are penetrated or not correctly installed. Hot surfaces created during operation could potentially burn unprotected skin.

Filtration

For maximum life, only clean and dry gas should be supplied to the booster unit. Gases entering the booster must be filtered. Appropriate filters should be used to limit particles to 5 µm in size.

Tools

For most installations, no special tools are required other than suitable industrial mechanic and electrician tools.

Environment and location

Booster unit should be stored in dry, clean, indoor environment. The operating environment varies with the application and must be checked to ensure that the original design criteria are met.

Information regarding the allowable operating ambient conditions is noted on the booster unit data plate (see Section 4).

The booster unit must be securely bolted down before start-up to prevent accidental movement that could lead to injury or product damage. Installation in areas of high vibration should be avoided. If the booster unit must be installed in an area of high vibration, care must be taken to reduce vibration transferred to the booster.

Suitable space and ventilation must be provided around the booster for airflow, motor cooling, and ease of service.

10. Commissioning

Fit a temporary inlet strainer during commissioning. This strainer can be removed after approximately 50 running hours.

10.1 Booster unit

Ensure the booster unit:

- Is correctly installed and connected
- Auxiliaries are correctly installed and connected
- Gas circuit is purged and not restricted

10.2 Piping connections

The booster unit contains one inlet port and one outlet port (Item 47) as shown in Figure 5. Piping connections must match those provided on the booster. Pipes and fitting must comply with standards or regulation and be suitable for the applicable design temperature and pressure as noted on the data plate.

11. Operation

Verify that flow, pressure and temperature match the operational objectives.

11.1 Starting and operation

ATTENTION Restarting the compressor system without clearance for operation is prohibited. Consult your supervisor for more information.

If your unit is supplied with, or requires the use of a variable frequency drive (VFD), ramp up or ramp down time should be set at a minimum of 5 seconds to prevent excess torque transmission to the magnetic coupling which could result in loss of drive/permanent damage.

If your unit is **not** used with a variable speed driver it requires the use of a soft starter. Ramp up or ramp down time should be set at a minimum of 5 seconds to prevent excess torque transmission to the magnetic coupling which could result in loss of drive/permanent damage.

The start-up using a direct-on-line (DOL) connected e-motor shall be submitted for John Crane's review and approval.

Restart the booster unit by following the instructions in Sections 10.4, 11.1 and 11.2.

11.2 Stopping and decommissioning the booster unit

- The booster unit is stopped by turning off the E-motor.
- The unit must be electrically isolated and tagged out before working on it.
- The unit must be depressurized and suitably purged before working on it.

The booster unit may contain a hazardous gaseous medium!

The user must ensure safe decommissioning following applicable standards and any local risk assessments and safe work methods as required.

11.3 Control of dry gas seal supply

In order to deliver the required flow to dry gas seals, the booster unit must build enough pressure rise (boost) to overcome the pressure drop in the seal gas supply system. Hence, piping restrictions, should be kept to a minimum.

Operation of the booster unit is based on the normal seal gas flow requirements for the dry gas seal: control logic should be used to start the booster unit and open a control valve bypass when the compressor is under pressure and low seal gas flow is identified. The booster unit should continue operating until enough discharge pressure is generated by the compressor to provide its own seal gas flow.

Seal gas panel designers may use various means of controlling seal gas flow, this may include a flow transmitter to control the variable frequency drive (VFD) via a programmable logic controller (PLC).

The booster unit is normally incorporated into a seal gas supply system. It is important that flow through the seal gas supply system does not cause the booster unit to freewheel (rotate because of the gas flow) when it is not in operation. If this occurs, it will result in premature failure of the booster unit bearings.

11.4 Noise emission

Hearing protection is recommended when working near the booster unit, especially when sound levels exceeds 80 dBA.

11.5 Allowable temperature limits

It is the responsibility of the user to ensure that specified operating limits as detailed on the data plate are not exceeded, see Section 4.

The housing and the motor surfaces must be freely exposed to the atmosphere to allow for proper cooling.

11.6 Depressurization

The depressurization of the booster must be limited to a rate of 20 bar per minute to avoid damage to the booster sealing elements and bearing lubrication.

12. Service

The safety notes refer to the system supplied. They can never be exclusive, and must be used in connection with the relevant safety regulations for the machine, auxiliary equipment, plant and sealed product.

Before doing any service work:

Disconnect all electrical power from the E-motor, instrumentation switches and auxiliary electrical equipment (electric and gas circuit).

Ensure that gas inlet and discharge connections of process gas are isolated. When handling hazardous or corrosive gases, ensure that the system has been properly purged and vented.

Consult the drawings supplied in this manual and read instructions before starting any dismantling work.

It is essential when working on the booster unit to avoid introducing dust or dirt particles into the gas path.

If the compressor installation is open to the weather, then precautionary measures should be taken to avoid moisture ingress into the exposed booster unit. If there is any doubt about on-site conditions when carrying out a major overhaul of this booster unit, then the unit should be moved away to a convenient workshop.

12.1 Drain port

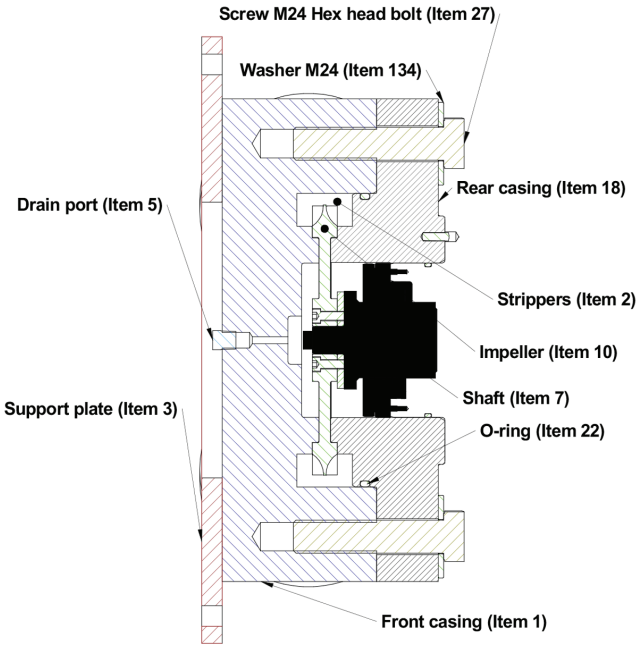
The casing is provided with a drain port (Item 5 as shown in Figure 6) to drain off any liquid. If there is a high risk of condensate formation due to the condition of the process gas, the casing should be drained off before any starting operation.

The condensate drain port is provided with a plug sealed with Pipe Sealant.

For convenience, the connection could be equipped with a permanent drain connection connected via suitable tubing and a drain valve to atmosphere. If advice is needed for installation, contact John Crane (see last page).

Do not remove the drain plug if the unit is hot or is pressurized.

FIGURE 6. Detailed Description of the Compressor Items



12.2 Impeller

Refer to the following documents when carrying out the work:

- Table 1: Main Parts
- Appendix II: Torque Table and Spare Parts

The following items are required when carrying out the work:

- Standard tooling, swivels M16
- Torque wrench
- Assembly lubricant for bolting, as shown in Figure 6, (ex: Kluber paste 46 MR 401). Use only on Item 27 (M24 Hex head bolts)
- Assembly lubricant for O-ring, Item 22 as shown in Figure 6 (ex: Kluber paste 46 MR 401)

Before starting work

- Disconnect all electrical power from the E-motor, instrument switches and auxiliary electrical equipment (electric and gas circuit).
- Ensure that gas inlet and discharge connections of process gas are isolated. Ensure that the system has been properly purged and vented.

Disassembly of the booster unit away from the front casing Item 1 as shown in Figure 6 (head lifting).

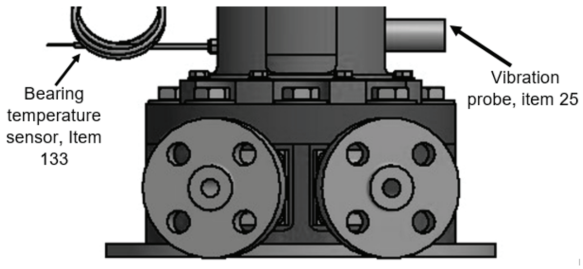
- Loosen and remove the fixing bolts (screws Items 27 and washers Items 134, as shown in Figure 6) from the rear cover (Item 18, as shown in Figure 6).
- Place swivels (M16) in the lifting plates (Item 57, as shown in Figure 5) to guide and support the booster unit when pushing out the rear cover.
- Screw the swivels in the threaded holes of the rear cover (Item 18).

- Lift the booster unit in vertical manner away from the front casing by use of appropriate lifting equipment (see Section 8) connected to the swivels (M16) attached to the lifting plates (Item 57).
- Place the booster unit onto a stable and supported work bench (see the data plate as shown in Section 4 for details about the weight of the booster unit).
- Check the impeller condition and the compression chamber for any contamination, mechanical damage, wear or corrosion.
- Check that the impeller (Item 10 as shown in Figure 6) rotates freely within its casing.
- Check the axially and radial run out of the impeller (maximum allowable is 0.03 mm).
- Replace the O-ring (Item 22), shown in Figure 6 as required.

Reassembly of the booster unit into the front casing (Item 1)

- Lightly lubricate the O-ring (Item 22) with the assembly lubricant and remove any excess.
- Lift the booster unit into place using appropriate lifting equipment and the swivels provided.
- Reinstall the washers (Item 134) and the fixing screws (Items 27) as shown in Figure 6 and tighten them to the required torque (see torque table in Appendix II).
- Re-connect all instrumentation: vibration probe (Item 25) and bearing temperature sensor (Item 133) as shown in Figure 7. For further details, see Appendix IV.

FIGURE 7



The booster unit is sealed when it leaves the factory. If the front casing – Item 1 – or any other part which will be pressurized by the process gas is removed from the unit, then a pressureised leak test should be carried out with a clean dry inert gas (bottled Nitorgen for example).

To carry out this the inlet and outlet ports should be blanked off and the unit pressurized statically to 210 bar for 5 minutes. During this period all joints should be inspected and sprayed with a soapy water based leakage detector. If no leakage can be detected then the unit can be put in service. If leakage is detetected then this must be rectified or the unit returned to John Crane.

12.3 Instrumentation

Refer to the following documents when carrying out the work:

- Table 1: Booster Main Parts
- Appendix I: Booster Unit Description and Dimensions
- Appendix II: Torque Table and Spare Parts

Standard tooling is required when carrying out the work.

Before beginning any work

- Disconnect all electrical power from the E-motor, instrument switches and auxiliary electrical equipment (electric and gas circuit).
- Ensure that gas inlet and discharge connections of process gas are isolated. Ensure that the system has been properly purged and vented.
- Disassembly of the instrumentation
- Remove the vibration probe shown in Figure 7 (Item 25) the specification of the vibration probes can differ between individual machines
- Remove the bearing temperature sensor shown in Figure 7 (Item 133).

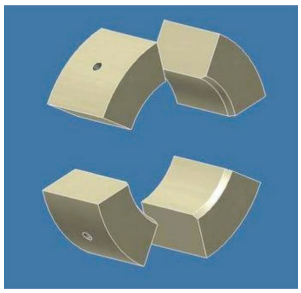
Reassembly

- Re-connect all instrumentation: Vibration switch (Item 25) and bearing temperature sensor (Item 133). For further details, see instrumentation manuals (Appendix III and Appendix IV).
- Reconnect all electrical power from the E-motor, instrument switches and auxiliary electrical equipment (electric and gas circuit) as required.

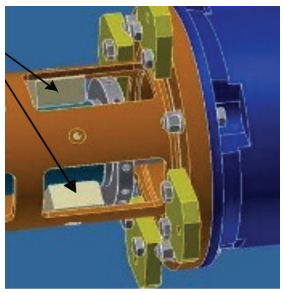
Disassembly of the Electric motor from the booster

- Remove the Safety Guard from the unit (Item 151) by releasing the screws (Item 152).

FIGURE 8



4 coupling guide blocks (supplied)



Blocks in position

- Place the 4 coupling guide blocks shown above into position between the coupling rotor and lantern (Figure 9, Item 19) as shown above and fix into position with the Guard bolts (Item 152 removed above).

It is vital to ensure these blocks are in place BEFORE removing or fitting the motor unit from the main body of the booster. The magnetic coupling has a strong attraction between the rotor and the stator. Failure to use these guide blocks will almost certainly damage the coupling "can" requiring replacement.

- Screw suitable eye bolts into the threaded holes provided in the flange of the electric motor and affix suitable strops and hoist.

- Ensure the guide blocks are fitted between the mag coupling rotor and the lantern. The 4 off motor fixing nuts and bolts can now be removed with the washers (Figure 9, Items 33, 65 and 49) – see Figure 9, section H-H below.
- With these removed the motor can be very carefully lifted away from the main body of the unit for inspection.
- If any further disassembly of the unit is required, then it should be returned to John Crane as parts are easily damaged.

Reassembly of the E-motor/coupling assembly onto the booster unit

- Ensure the 4 coupling guides (Item 146) are fitted to the lantern (Item 19) with the screws (Item 152) from the safety guard (Item 151) see 3D view in the removal section below (the coupling guides could be already in place after disassembly).
- Ensure the motor is supported using the eye bolts, fitted to a suitable strop and hoist as outlined above.
- Lift the E-motor/rotor assembly in to position vertically above the end of the lantern (Item 19). Carefully lower/guide the motor and outer rotor into the unit checking the vertical alignment as the two assemblies are engaged with each other.
- NOTE - there is a small clearance between the magnetic coupling and the Can, and it is easily damaged during this operation. Also, there is a strong attraction between the magnets as the unit is lowered into position.
- Engage the motor with the lantern ring during the final part of this operation and ensure the motor is fully home.
- Install the fixing bolts (Items 33, 49 and 65, see view H-H) and tighten them at the nominal torque (see torque list).
- Check if the outer rotor (Item 143) on the canister and the impeller rotate freely inside the compressor by rotating the cooling ring (Item 31) with a steel bar ø10 mm.
- Pay attention: Remove the Coupling-guides – they must not be left in position when the unit is rotated.
- Install the safety guards (Item 151) by fixing the screws (Item 152), see 3D view below.

13. Maintenance

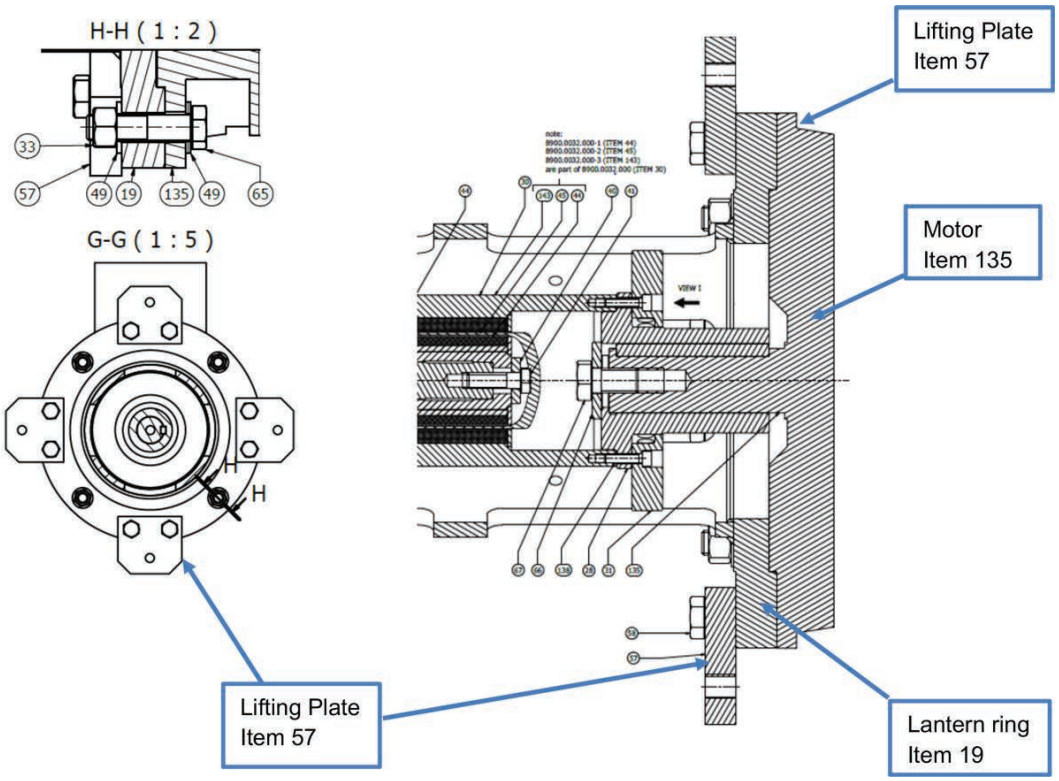
The unit is designed for 5 years intermittent (2000 start/stop) operation, dependent on motor limitations (e.g. 3 starts per hour) the unit will "start on demand" even prolonged standby.

It is required that maintenance beyond that outlined above is performed by qualified John Crane personnel.

14. Limited Warranty

John Crane warrants that the booster unit to be free from defects in material and workmanship at time of shipment. The warranty covers replacement of all parts proving faulty owing to detective materials, design or workmanship up to 36 months from the date of delivery to the customer or 24 months from the date of putting into operation (whichever occurs earlier).

FIGURE 9. Sectional Drawing Showing Motor Mounting, Lifting and Coupling Arrangement



APPENDIX I. Booster unit description and dimensions

All dimensions shown are in mm.

FIGURE I.a

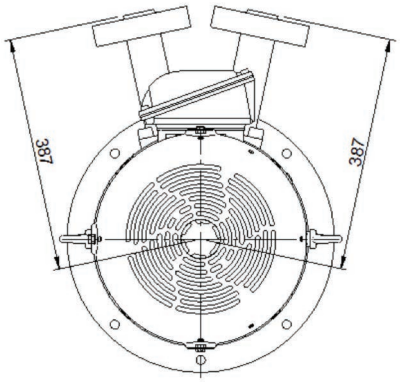
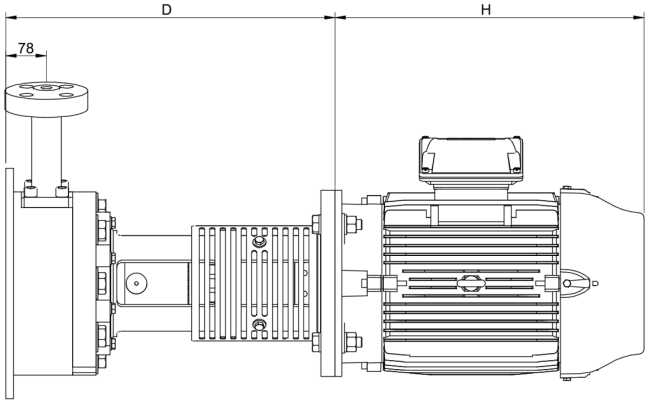


TABLE 2. Booster Unit Dimensions

GCU SGB HP Variant	D (mm) Compressor Height	H (mm) E-motor Height
NEMA	631	See E-motor IOM
ATEX	658	See E-motor IOM

FIGURE I.b



APPENDIX II. Torque table and spare parts

TABLE 3. Tightening Torque

Item	Description	Class	Number	Torque
27	SCREW HM24-110	12.9	8	780

TABLE 4. Recommended Spares List for Compressor Inspection

Parts	Items	Quantity
Screw M24 hex. head bolt, metric (casing)	27	8
Washer M24(casing)	134	8
Loctite 243	N/A	50ml

APPENDIX III. Vibration sensor

The unit is supplied with a 2-wire 4-20 mA Seismic velocity transmitter either an ATEX or NEMA compliant as specified–details can be supplied on request.

FIGURE III

ATEX compliant vibration sensor
Parts list–(Item 25) 0089.0000.030
Article number 8900.0109.000 Vibration transmitter (ATEX certified)

NEMA compliant vibration sensor
Parts list–(Item 25) 0089.0000.020
Article number 8900.0108.000
Vibration transmitter (NEMA certified)

- Units will be provided with an explosion proof conduit elbow in accordance with the specified standards.
- Wiring diagrams and instrument details will be provided in a separate instrument information pack
- Supply voltage–24v nominal intrinsically safe
- Alarm condition–2 mm/s
- Trip/Shutdown condition–3 mm/s

APPENDIX IV. Temperature sensor

The unit is fitted with a 2 wire PT100 temperature sensor inserted into the bearing casing.

It can be used to monitor the booster bearing temperatures to confirm the satisfactory operation of the unit.

- Recommended alarm condition–160 °C
- Recommended trip condition–170 °C for 5 minutes
- Recommended shutdown condition–180 °C

FIGURE IV.a

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Europe
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Tel: 44-1753-224000
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Middle East & Africa
United Arab Emirates
Tel: 971-481-27800
Fax: 971-488-62830

Asia Pacific
Singapore
Tel: 65-6518-1800
Fax: 65-6518-1803

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice. It is dangerous to smoke while handling products made from PTFE. Old and new PTFE products must not be incinerated. ISO 9001 and ISO14001 Certified, details available on request.

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