Spencer® GasCube®
Natural Gas Booster
Skid Package

Installation, Operation and Maintenance Instructions

Important
This manual contains information you need for handling, installing, operating and maintaining your new equipment correctly, to ensure trouble-free operation and long service life. Read and become familiar with it before installation of your Spencer GasCube® skid package. Following these instructions will help you realize its full potential of efficient service and extended lifespan and will help avoid any damage that could void your warranty.
I. Introduction

Welcome as a Spencer customer and owner of a new GasCube® natural gas booster skid package. Your GasCube package incorporates exclusive Spencer engineering technology, based on more than a century of leadership in air and gas handling equipment design and manufacture.

Spencer’s GasCube series is designed to raise the incoming pressure of natural gas to a level that is adequate to operate the gas appliance. The GasCube package is a compact skid mounted unit with all accessories necessary to safely increase your natural gas pressure to the desired level. All components except the check valve are factory assembled, skid mounted, tested and designed for years of uninterrupted service.

This manual contains the information you need for handling, installing, operating and maintaining your new equipment correctly, to ensure trouble-free operation and long service life. Please read it thoroughly. Illustrations and instructions contained herein apply to low and high capacity GasCube natural gas booster skid packages. If you need assistance in determining which model you have, please consult your Spencer representative.

Please refer to the red metal nameplates affixed to your equipment and record the GasCube package serial and system numbers located on the package base and the gas booster machine serial and model numbers located on the machine casing, in the boxes on the front cover of this manual. Having this information easily accessible will help in communication with the factory and the Spencer sales representative when discussing your specific equipment.
Product Description

The standard components of a GasCube package include a UL Listed Spencer natural gas booster, a UL Listed 508A control panel for automatic operation, isolation valves, expansion joints, gauges, and a recirculation loop. Larger capacity GasCube models include a gas to air intercooler and automatic valve in the recirculation loop.

At the heart of the GasCube package design is a UL Listed, centrifugal, hermetically sealed leaktight gas booster designed for handling natural gas. The gas booster increases the pressure of the incoming gas by guiding it from one stage to the next through diffusers.

The Spencer gas booster configuration is our unique standard overhung (SOH) design, which has all the impellers mounted directly on an extended motor shaft.

The GasCube package components are securely mounted with hardware and accessories on a common skid ready to be wired to local power and piped to natural gas piping in accordance with local and national codes.

II. Limited Warranty

We warrant that this product will be free from defects in material and workmanship for a period of 18 months from the date of shipment or 12 months from the date of startup, whichever comes first. Within the warranty period, we shall repair or replace, F.O.B. our factory or approved repair facility, such products that are determined by us to be defective.

This warranty will not apply to any product that has been subjected to misuse, negligence or accident, or misapplied or improperly installed. This warranty will not apply to any product that has been disassembled, repaired or otherwise altered by any persons not authorized by the Spencer Service Department.

The guarantees of the motor, control and component manufacturers govern the extent of our guarantee on such equipment. Warranty work on motors, controls and components must be authorized by Spencer and must be performed in an authorized shop as designated by the motor, control and component manufacturers. The Spencer Turbine Company reserves the right to invoice all expenses incurred when repairs are made in the field at the specific request of a customer.

For complete Conditions of Sales, refer to Spencer Form 706.

III. Safety Precautions and Operating Guidelines

- Read and follow all instructions in this manual. If you have any questions, consult your Spencer representative.
- Use appropriately rated lifting equipment for installation, removal or disassembly of heavy components.
- Remove inlet and outlet pie-plate covers, silica gel bags and crating materials prior to GasCube package installations.
- Inspect all openings for tools and foreign matter before connecting accessories or piping.
• Perform all installation and operating procedures with care, following sound safe-work practices to avoid accidents and damage.
• Avoid climbing on or over the GasCube equipment; use proper staging and ladders for exterior machine access.
• Be sure isolation pads are placed beneath the GasCube skid.
• GasCube packages include flexible connectors on inlet and outlet flanges to isolate piping loads from the gas booster.
• Ensure that piping and accessories such as check valves are properly installed and fastened.
• Allow only qualified electricians to work on electrical equipment.
• Lock electrical circuits open and tag them during servicing of equipment.
• Check motor rotation as instructed in Section V. Installation – GasCube Setup – 6. Motor.
• Do not operate the gas booster where there is an ambient temperature above 104 °F (40 °C), unless it has been designed for such conditions.
• Operate the gas booster with sufficient restriction at all times, i.e., piping system connected or throttling valve (plug valve), to avoid motor overloading.
• Do not allow the gas booster operation in surge (unstable low flow) or damage may result.
• Use only genuine Spencer parts for repairs and service. Contact Spencer Service at 800-232-4321 or send email to service@spencer-air.com.

IV. Handling and Storage

Each Spencer gas booster is carefully balanced and tested at the factory. For optimum performance, the GasCube package must be handled with care during unloading and installation.

When you receive the shipment, immediately check the equipment for damage; file any claims with the shipper and notify Spencer immediately.

Lifting and Moving

Moving of this equipment should be performed or directed by experienced riggers using accepted rigging practices and safety precautions. The GasCube assembly can be lifted and relocated with a forklift. Always use lifting equipment rated for the loads involved.

CAUTION: Only lift the GasCube package by the slots in the package base. Do not use piping or frame to lift.

Storage

IMPORTANT NOTE: Complying with all of the required storage provisions noted below will preserve your warranty.

If a GasCube package is stored for an extended period before use or between uses, protect it from dampness, dirt and vibration in a clean, dry area. Suspend bags of silica gel desiccant in the inlet and outlet. Cover the entire GasCube package if possible. At a minimum, cover the inlet and outlet openings to keep out foreign matter.

Unpacking

1. Uncrate the GasCube package, saving all literature, boxes and parts.
2. Remove inlet and outlet pie-plate covers and all packing materials.
3. Use the packing slip to check off and confirm the presence of all ordered components.
4. Read any instructional and warning labels on the machine before you begin installation and operation.

V. Installation

IMPORTANT NOTE: If any problems are encountered during installation or startup, consult your local Spencer representative.

Location

CAUTION: Do not locate the GasCube package where it will be subject to ambient temperatures below 32 °F (0 °C) or above 104 °F (40 °C) during operation, unless the equipment is specially designed for operation outside of this range.

The Spencer GasCube package may be installed indoors or outdoors, preferably under cover. When choosing an indoor location, be sure there is sufficient ventilation to allow unrestricted airflow to the gas booster. Leaving several feet of space around the GasCube package will also provide ease of servicing once the unit is installed and operating.

Foundation

A level concrete floor is recommended, although any flat level surface that can support the machine weight is satisfactory. The GasCube base should be placed level on the furnished isolation pads or equivalent. Each pad must be shimmed, if necessary, to ensure that it is carrying its share of the load. If lag bolts and nuts are used to anchor the GasCube skid, these should be hand-tightened only.

NOTE: Spencer does not recommend grouting of the GasCube package.

GasCube Setup

CAUTION: Make sure GasCube inlet and outlet ports
are unobstructed before connecting piping to blower.

1. Piping

The Spencer GasCube package contains at its heart a Gas Booster Series GL that is UL Listed as suitable for installation in accordance with the provisions of the National Electric Code, NFPA No. 70, and the National Fuel Gas Code, NFPA No. 54, for natural gas only.

All piping connected to the GasCube package should be sized to minimize friction loss. All system joints must be gastight.

All piping must be properly aligned and supported to avoid stress on the GasCube components and anchored adequately to prevent movement away from the GasCube package caused by gas pressure. Flexible connectors must be used to connect piping to the gas booster.

Caution: If the piping system is to be leak tested using high-pressure air/gas, be sure to either bypass or disconnect the GasCube gas booster. High-pressure gas will seriously damage the components. The GasCube package test pressure must not exceed 5 psig.

Caution: The GasCube package is factory leaktested and is gastight at time of shipment. Shipping and installation may cause looseness at the skid piping joints. The GasCube package should be leaktested at 3 psig with the gauges and low pressure switch isolated using the gauge and switch isolation valves mounted on the unit.

2. Flexible Connectors

Caution: Connected piping should not be hard piped to the GasCube package. Expansion joints are supplied on both the inlet and outlet to create a flexible isolating gap between the GasCube package and piping.

3. Plug Valve

The plug valves are used to isolate the GasCube gas booster from the gas line if maintenance is necessary. The plug valves may also be used as a throttling valve to regulate volume and/or pressure if piping resistance is not sufficient in preventing overloading of the motor.

4. Inlet Check Valve (Shipped Loose)

Caution: The supplied check valve must be installed in the gas line prior to the GasCube package inlet to prevent reverse flow.

The check valve is shipped loose and must be installed horizontally prior to the inlet of the GasCube package. If not installed horizontally, it will not function properly.

5. Electrical Installation

NOTE: All wiring and electrical adjustments or installa-
tions must be done by a qualified electrician in accordance with the National Electrical Code and local codes.

CAUTION: The electrical service at the installation site must supply the voltage stamped on the gas booster nameplate. Be sure to operate the unit at the correct voltage. This will help prevent damage to GasCube components and possible voiding of the warranty.

In making electrical connections, follow the provided wiring instructions, which are located inside the enclosure door of the control panel. Be sure to follow the wiring diagram that coincides with the incoming power voltage and phase for your installation.

Wire should be of ample capacity to ensure that proper voltage is maintained at the motor terminals while starting and running. It is important to use proper starting equipment. The GasCube package starter has thermal overload protection as well as true low-voltage protection.

Your GasCube package is shipped with a Sequence of Operations manual specific to your GasCube package control panel. The manual can be located inside the enclosure door of the control panel.

6. Motor

Rotation

The GasCube package must be wired correctly to rotate the gas booster in the right direction. To check rotation, turn off the gas. Then, unthread the plug on the 1” NPT half-coupling rotation inspection port at the top of the hermetic gas booster casing. You can then verify that the rotation of the motor shaft is the same as what is shown on the Rotation Arrow Plate on the gas booster casing. Be sure to reseal the plug with UL Listed thread sealant, and leaktest prior to putting into operation.

CAUTION: Be sure that the plug in the rotation inspection port is properly sealed after you replace it.

Ball Bearings

The motor ball bearings in the gas booster have been designed specifically for the function they must perform. Impeller loads, both radial and thrust, are carried by the motor bearings.

Motors

Spencer Gas Booster Series GL incorporate an explosion proof motor suitable for Class 1, Group D environments. The motors are also equipped with thermal overload protection (thermostats).

Lubrication

The motor bearings are factory lubricated and sealed. Additional lubrication is not required. The gas booster must be disassembled if both front and back motor bearings are to be replaced. Consult factory for repair procedure. To maintain the gas booster UL Listing, be sure to have the repair performed by a Spencer-authorized UL repair
VI. Operation and Adjustments

Startup Precautions

IMPORTANT NOTE: Before operating a new GasCube package for the first time, review the installation and setup procedures to be sure that no steps have been overlooked.

1. Installation Check List
   • Is there any damage from transportation or installation?
   • Is the package level?
   • Have all packing, shipping materials and tools been removed?
   • Have inlet and outlet pie-plate covers been removed?
   • Are isolation pads in place?
   • Is the piping connected and supported?
   • Are flexible connectors in place between the gas booster and piping?
   • Is the check valve properly installed?

2. Operational Checks
   • Is the isolation valve open or properly positioned?
   • Is the system ready for gas delivery?
   • Has motor rotation been checked?
   • Is the control panel properly wired?
   • Is the control panel energized?
   • Have maintenance and operations personnel been notified?

Caution: The GasCube package must have adequate system resistance at all times to avoid operation at or near free delivery (wide open). Overloading the GasCube booster motor will damage it. The facility gas equipment should impose proper resistance (See Section VIII. Troubleshooting Guide). The Control Panel has been programmed to shut down the GasCube package on overload.

GasCube Startup

Caution: Upon energizing the Control Panel, please allow approximately one minute before starting the gas booster. The time will allow proper loading of the PLC software that has been programmed specifically for the intended GasCube package.

Once the GasCube package has been properly connected to the natural gas line with the control panel sufficiently energized and the plug valves wide open, the GasCube package can now be started. After starting, quickly assess the current draw of the motor. If necessary, adjust the system load or throttling valve (plug valve) until the desired flow is reached, being careful not to operate in surge or to exceed the full rated motor capacity. Initially, gas boosters will temporarily develop more differential pressure and take more power. Check final settings after operating temperature is achieved, typically after one-half hour. If the throttling valve (plug valve) was used in adjusting the system load, it should be fixed at this point to prevent further opening and possible overloading of motor.

Surge (Low Flow)

CAUTION: Do not operate the GasCube package in surge (unstable low flow range). Spencer’s warranty does not cover damage to the gas booster caused by operating in surge.

Surge is destructive because it is accompanied by excessive temperatures and aerodynamic forces that will ultimately cause mechanical failure. A gas booster in surge produces a rush or pulsating rhythmic air sound caused when airflow into or out of the gas booster is restricted. In addition to its characteristic noise, surge may be detected by power or pressure fluctuations. A surge condition can be eliminated by increasing the gas flow through the system or to the supplied recirculation loop. Surge control devices are supplied with every GasCube package and factory preset and should not need modification. See pages 8-14 for specific details of your model.

If surge is detected after startup in a GasCube package equipped with a manual recirculation loop system, the surge control system can be modified by opening the recirculation loop valve in 5 degree increments until the surge condition is eliminated.

If surge is detected after startup in a GasCube package equipped with a motor actuated valve and heat exchanger in the recirculation loop system, the recirculation loop valve will automatically open until the surge condition is eliminated.

If an overload is detected after startup in a GasCube package, the recirculation loop valve will automatically close until the overload condition is eliminated.

VII. Maintenance

WARNING: FOR SAFETY, DISCONNECT AND LOCK OUT ELECTRICAL POWER BEFORE PERFORMING ANY MAINTENANCE.

Replacement Parts

Refer to the appropriate GasCube package diagram in this manual for replacement part names and numbers. When ordering parts, it is necessary to provide full information about your Spencer equipment. When reading nameplates, be sure that you obtain the correct information and record it on the cover of this manual. This will serve as your reference for facilitating replacement-part orders.

Remember, the more complete your information, the quicker your order will be processed. Incomplete information will result
VIII. Troubleshooting Guide

If your GasCube package is not delivering rated pressure, but motor is not overloaded, check the following:

1. Correct and reversed rotation will produce two different delivery pressures, the higher pressure indicating correct rotation.
2. Interior parts clogged with dirt.
3. Piping too small and causing high frictional loss (only applies where pressure is checked at end of piping).
4. Lower specific gravity of gas than shown on nameplate.
5. High inlet gas temperature.

If your gas booster is not delivering rated pressure and/or motor is overloaded, check the following:

1. Wrong voltage connections.
2. Unit handling more than rated volume because of:
   - Leaks in piping.
   - Orifices too large.
   - Too many orifices.
3. Higher specific gravity than on nameplate.
4. Intake gas temperature too low.

in unnecessary delays. When in doubt, consult the Spencer Aftermarket Sales Department for further information.

When ordering parts, furnish the following:

- GasCube package serial and system numbers.
- Gas booster serial and model numbers.
- Motor horsepower.
- Part nomenclature — refer to the applicable diagram (pages 8-14) and locate the needed item by its number and name.
- Form number of this manual — Form GC

Equipment Service

Spencer provides prompt, courteous factory and field service for all its machines. To determine the nature of the disorder and the best way to correct it, service personnel will be dispatched to your location. A Purchase Order in advance will facilitate your service request; however, we will proceed on verbal orders in an emergency.

Our service personnel will determine if your Spencer warranty covers your required repairs. If the required work is not covered, we accept Visa, MasterCard and American Express charges as well as other forms of payment.

NOTE: Spencer products returned to the factory must be sent freight prepaid and accompanied by a Return Service Order (RSO) issued by the Spencer Service Department after we receive your Purchase Order. Service costs will be quoted after inspection and the work will be performed upon written acceptance of the quotation.

Material Safety Data Sheets

Spencer is committed to ensuring the safety of its employees. If Spencer equipment has been exposed to potentially hazardous contaminants or if Spencer service personnel could be exposed to a potentially hazardous field environment, a Material Safety Data Sheet (MSDS) is required (a) prior to dispatching Spencer service personnel or (b) before receipt of any equipment for factory service. If special precautions are necessary to work on the equipment, contact the Spencer Service Manager. Please be sure to have all relevant Material Safety Data Sheets (MSDS) on hand for Spencer’s reference during servicing and repairs.

Emergency Service

Emergency service calls after normal working hours are routed through our voice mail system at 800-232-4321. A Spencer service representative will return your call promptly.

Service and Operating Assistance

Spencer representatives are always available to help customers achieve maximum equipment performance and reliability. Likewise, Spencer service personnel will provide on-site instruction in proper procedures during field service calls to avoid a recurrence of the problem encountered.
GasCube Series 21 without Heat Exchanger

Single-stage 20" Diameter Casing, 3" Diameter Pipe

GasCube System Part No.'s: SYS90145, SYS90146, SYS90147, SYS90148, SYS90149, SYS90155, SYS90156, SYS90157, SYS90158, SYS90159, SYS90250, SYS90251, SYS90252, SYS90253, SYS90254, SYS90260, SYS90261, SYS90262, SYS90263, SYS90264

Notes:
1. All dimensions are in inches.
2. Inlet and outlet connections are 3" flange – 150# drilling.

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GasCube Series 21 without Heat Exchanger

Single-stage 20" Diameter Casing, 4" Diameter Pipe

GasCube System Part No.'s: SYS90150, SYS90151, SYS90152, SYS90153, SYS90154, SYS90255, SYS90256, SYS90257, SYS90258, SYS90259

Notes:
1. All dimensions are in inches.
2. Inlet and outlet connections are 4" flange – 150# drilling.

GasCube Skid Package: SYS90__________

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GasCube Series 20 without Heat Exchanger

Multistage 20” Diameter Casing, 4” Diameter Pipe

GasCube System Part No.’s: SYS90160, SYS90161, SYS90162, SYS90163, SYS90164, SYS90165, SYS90166, SYS90167, SYS90168, SYS90169, SYS90170, SYS90171, SYS90172, SYS90173, SYS90174, SYS90175, SYS90176, SYS90177, SYS90181, SYS90182, SYS90183, SYS90184, SYS90185, SYS90186, SYS90190, SYS90191, SYS90192, SYS90193, SYS90194, SYS90195, SYS90265, SYS90266, SYS90267, SYS90268, SYS90269, SYS90270, SYS90271, SYS90272, SYS90273, SYS90274, SYS90275, SYS90276, SYS90277, SYS90278, SYS90279, SYS90280, SYS90281, SYS90282, SYS90286, SYS90287, SYS90288, SYS90289, SYS90290, SYS90291, SYS90295, SYS90296, SYS90297, SYS90298, SYS90299, SYS90300

Notes:
1. All dimensions are in inches.
2. Inlet and outlet connections are 4” flange – 150# drilling.

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GasCube Series 24 without Heat Exchanger
Multistage 24" Diameter Casing, 6" Diameter Pipe
GasCube System Part No.'s: SYS90178, SYS90179, SYS90180, SYS90187, SYS90188, SYS90189, SYS90283, SYS90284, SYS90285, SYS90292, SYS90293, SYS90294

Notes:
1. All dimensions are in inches.
2. Inlet and outlet connections are 6" flange – 150# drilling.

Outlet Inlet
GasCube System Part No.'s: SYS90178, SYS90179, SYS90180, SYS90187, SYS90188, SYS90189, SYS90283, SYS90284, SYS90285, SYS90292, SYS90293, SYS90294

GasCube Skid Package: SYS90_________

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Notes:
1. All dimensions are in inches.
2. Inlet and outlet connections are 6" flange – 150# drilling.

GasCube System Part No.'s: SYS90196, SYS90197, SYS90198, SYS90208, SYS90209, SYS90210

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<tr>
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GasCube Series 20 with Heat Exchanger

Multistage 20" Diameter Casing, 4" Diameter Pipe

GasCube System Part No.'s: SYS90199, SYS90200, SYS90201, SYS90202, SYS90203, SYS90204, SYS90205, SYS90206, SYS90207, SYS90211, SYS90212, SYS90213, SYS90214, SYS90215, SYS90216, SYS90217, SYS90218, SYS90219, SYS90223, SYS90224, SYS90225, SYS90226, SYS90227, SYS90228

1. All dimensions are in inches.
2. Inlet and outlet connections are 4" flange – 150# drilling.

---

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<th>ITEM</th>
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<td>GAG90077</td>
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<td>VLV90561</td>
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<td>4</td>
<td>EXP90067</td>
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GasCube Series 24 with Heat Exchanger
Multistage 24" Diameter Casing, 4" Diameter Pipe

GasCube System Part No.'s: SYS90220, SYS90221, SYS90222, SYS90229, SYS90230, SYS90231, SYS90232, SYS90233, SYS90234, SYS90235, SYS90236, SYS90237, SYS90238, SYS90239, SYS90240, SYS90241, SYS90242, SYS90243, SYS90244, SYS90245, SYS90246, SYS90247, SYS90248, SYS90249

Notes:
1. All dimensions are in inches.
2. Inlet and outlet connections are 4" flange – 150# drilling.

GasCube Skid Package: SYS90

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<td>4&quot; PLUG VALVE(402)</td>
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<td>4</td>
<td>EX900067</td>
<td>4X9 FACE TO FACE EXP</td>
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<td>EXP90002</td>
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Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet

Outlet
A GasCube Series 21 package equipped with a pre-engineered PLC control panel with monitor, heat exchanger, recirculation loop and manual valve.

The High Capacity Series UL Listed Gas Boosters can boost pressure levels by as much as 83 inches WC, with volumes up to 240,000 ICFH.

The Low Capacity Series UL Listed Gas Boosters can boost pressure levels by as much as 9 inches WC, with volumes up to 12,000 ICFH.

A GasCube Series 21 with a Spencer UL Listed Low Capacity Series hermetic gas booster and optional UPS for uninterrupted power supply.

The compact footprint of GasCube Series 20, 21 and 24 packages can easily be moved with a pallet jack and fits through most conventional doorframes.
Industrially rated products offering effective solutions for air and gas handling problems:

- Multistage centrifugal blowers
- Single stage centrifugal blowers
- Gas boosters and hermetic gas boosters
- Regenerative blowers
- Modular central vacuum systems
- Mobile or stationary integrated vacuum units
- Separators and dust collectors
- Custom-engineered products with special materials for extreme temperatures and pressures

Complementary accessories with single source convenience and compatibility:

- Standard and custom electrical control panels – UL, CUL Listed and C.E. Compliant available
- Valves, gauges, couplings, shrink sleeves, vibration isolators and other system components
- Comprehensive selection of tubing, fittings, vacuum hoses, valves and tools

Comprehensive engineering and other customer support services:

- The industry’s largest complement of technical specialists in air and gas handling technology
- Worldwide parts and service organization
- Application research and testing facility

Worldwide organization of sales representatives and distributors offering:

- Product selection, installation and operation assistance
- Comprehensive system design services
- Follow-up services and troubleshooting

For the name and telephone number of your local Spencer Representative, call 800-232-4321 or email marketing@spencer-air.com

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