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® VS/VSD 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® VS/VSD natural gas booster skid package. Your GasCube VS/VSD 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 VS/VSD series is designed to raise the incoming pressure of natural gas to a level that is adequate to operate the gas appliance. The GasCube VS/VSD 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 VS/VSD 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 VS/VSD 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.

GasCube VS/VSD Nameplate Example

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>800000 J16</th>
</tr>
</thead>
<tbody>
<tr>
<td>System No.</td>
<td>0325.5 VS</td>
</tr>
</tbody>
</table>

Manufactured under the following Registered Trademarks: 82,801; 652,701; 134,026; 341,418; 1,348,270; 959,254; 3,800,672

Use Original Factory Parts & Service

The Spencer Turbine Company, Windsor, CT 06095
800-232-4321 860-688-8361
www.spencerturbine.com

Made in U.S.A. Plate No. PLN90167

Gas Booster Nameplate Example

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>800000 J16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td>GL-035-1/2-R</td>
</tr>
</tbody>
</table>

Manufactured under the following Registered Trademarks: 62,801; 652,701; 134,026; 341,418; 1,348,270; 959,254; 595,313; 7,218,205; 7,218,285

Use Original Factory Parts & Service

The Spencer Turbine Company, Windsor, CT 06095
800-232-4321 860-688-8361
www.spencerturbine.com

Made in U.S.A. Plate No. PLN90051
Product Description

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

At the heart of the GasCube VS/VSD 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. The Spencer gas booster configuration is our unique standard overhung (SOH) design, which has the impeller(s) mounted directly on the motor shaft.

The GasCube VS/VSD 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 VS/VSD package installations.
- Inspect all openings for tools and foreign matter before connecting accessories or piping.
- Perform all installation and operating procedures with care, following safe-work practices to avoid accidents and damage.
- Avoid climbing on or over the GasCube VS/VSD equipment; use proper staging and ladders for exterior machine access.
- Be sure isolation pads are placed beneath the GasCube VS/VSD skid.
- GasCube VS/VSD 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.
- Do not operate the gas booster where there is an ambient temperature below 32 °F (0 °C) and above, 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 plug valve, to avoid motor overloading.
- Use only genuine Spencer parts for repairs and service. Contact Spencer Service at 800.232.4321, Ext. 259 or Ext. 217 or email servicesdept@spencer-air.com.

IV. Handling and Storage

Each Spencer gas booster is carefully balanced and tested at the factory. For optimum performance, the GasCube VS/VSD 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 VS/VSD assembly can be lifted and relocated with a forklift. Always use lifting equipment rated for the loads involved.

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

Foundation
A level concrete floor is recommended, although any flat level surface that can support the machine weight is satisfactory. The GasCube VS/VSD 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 VS/VSD skid, these should be hand-tightened only.

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

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

1. Piping
The Spencer GasCube VS/VSD 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 VS/VSD 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 VS/VSD components and anchored adequately to prevent movement away from the GasCube VS/VSD 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 / or gas, be sure to either by-pass or disconnect the GasCube VS/VSD gas booster. High pressure gas will seriously damage the components.
Caution: The GasCube VS/VSD package is factory leak-tested and is gastight at time of shipment. Transportation at jobsite and installation may cause looseness at the skid piping joints. The GasCube VS/VSD package should be leak-tested at 3 psig after piping installation. Isolation valves to Gauges, Flow Switch, and Discharge Pressure Transducer should be in shut-off mode during pressure test.

2. Flexible Connectors
Caution: Connected piping should not be hard piped to the GasCube VS/VSD package. Expansion joints are supplied on both the inlet and outlet to create a flexible isolating gap between the GasCube VS/VSD package and piping.
3. Plug Valves
The inlet and outlet plug valves are used to isolate the GasCube VS/VSD gas booster from the gas line if maintenance is necessary. The 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 VS/VSD package inlet to prevent reverse flow.

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

5. Electrical Installation
NOTE: All wiring and electrical adjustments or installations 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 VS/VSD 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 VS/VSD package VFD has thermal overload protection as well as true low-voltage protection.

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

6. Motor
Rotation
The GasCube VS/VSD 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 a UL listed, explosion proof, inverter-duty 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 center.

VI. Operation and Adjustments

Startup Precautions
IMPORTANT NOTE: Before operating a new GasCube VS/VSD 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
- Are the isolation plug valves 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 VS/VSD package must have adequate system resistance at all times to avoid operation at or near free delivery (wide open). Overloading the GasCube VS/VSD 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 VS/VSD package on overload.

GasCube VS/VSD 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 VS/VSD package.

Once GasCube VS/VSD Package has been properly connected to the natural gas line with the control panel energized and the plug valves wide open, the GasCube VS/VSD package can now be started. After starting, verify the pressure set point on the discharge gauge reading. The VFD Controller will increase the RPM if Discharge Pressure is low and slowdown as the RPM reaches the pressure set point. The VFD Controller will maintain set point by slowing and increasing the frequency as needed. Take care to set the rated pressure correctly. Do not exceed rated motor capacity. Check final settings after operating temperature is achieved, typically after one-half hour.

VII. Maintenance

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

Replacement Parts

Refer to the appropriate GasCube VS/VSD 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 in unnecessary delays. When in doubt, consult the Spencer Aftermarket Sales Department for further information.

When ordering parts, furnish the following:

- GasCube VS/VSD package serial and system numbers.
- Gas booster serial and model numbers.
- Motor horsepower.
- Part nomenclature – refer to applicable diagrams starting on page 8, identify SYS Number and item description.
- Form number of this manual – Form GC_VS/VSD.

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.
VIII. GasCube VS/VSD System Dimensions

GasCube 21 VS – Simplex Series

NOTES:
1. All dimensions are in inches (mm).
2. Flanged inlet/outlet connections are to ANSI B16.5 125#/150# drilling.
3. Flanged inlet/outlet connection bolt holes straddle their natural centerlines.
4. Approximate Weight: 700 lbs.
5. 3 feet clearance is recommended around GasCube for maintenance service.
6. Spencer may make adjustments and dimensional changes to equipment designs based on market trends and requirements.

Foundation Plan A-A

Control Panel Mounting Locations
GasCube 20 VS – Simplex Series

NOTES:
1. All dimensions are in inches (mm).
2. Flanged inlet/outlet connections are to ANSI B16.5 125#/150# drilling.
3. Flanged inlet/outlet connection bolt holes straddle their natural centerlines.
4. Approximate Weight: 850 lbs.
5. 3 feet clearance is recommended around GasCube for maintenance service.
6. Spencer may make adjustments and dimensional changes to equipment designs based on market trends and requirements.

Control Panel Mounting Locations

Foundation Plan B-B

Multistage 20" Diameter Casing 3" Diameter Pipe
GasCube VS System Part No.
SYS0501.5VS and SYS1001.5VS

The Spencer Turbine Company • 600 Day Hill Road, Windsor, CT 06095 USA • TEL 800.232.4321 • 860.688.8361 • www.spencerturbine.com
NOTES:
1. All dimensions are in inches (mm).
2. Flanged inlet/outlet connections are to ANSI B16.5 125#/150# drilling.
3. Flanged inlet/outlet connection bolt holes straddle their natural centerlines.
4. Approximate Weight: 1173 lbs.
5. 3 feet clearance is recommended around GasCube for maintenance service.
6. Spencer may make adjustments and dimensional changes to equipment designs based on market trends and requirements.

Control Panel Mounting Locations
IX. Troubleshooting Guide

If your GasCube VS/VSD 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.

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A Full Line of GasCube Series and Hermetic Gas Boosters

Optional enclosure available for inclement weather installations or sound abatement requirements.

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

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.
Spencer Products and Services

Industrially rated products offering effective solutions for air and gas handling applications

- Multistage centrifugal blowers
- Single-stage centrifugal blowers
- Hermetic blowers
- Regenerative blowers
- High-speed turbo blowers
- Modular central vacuum systems
- Mobile or stationary integrated vacuum units
- Separators and dust collectors

Complementary accessories with single source convenience and compatibility

- Standard and custom electrical control panels – UL, CUL Listed and CE compliance available
- Comprehensive selection of tubing, fittings, vacuum hose, valves and tools
- Valves, gauges, couplings, shrink sleeves, vibration isolators and other system components

Comprehensive engineering and other customer support services

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

Global organization 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.

GasCube® is a registered trademark of The Spencer Turbine Company.