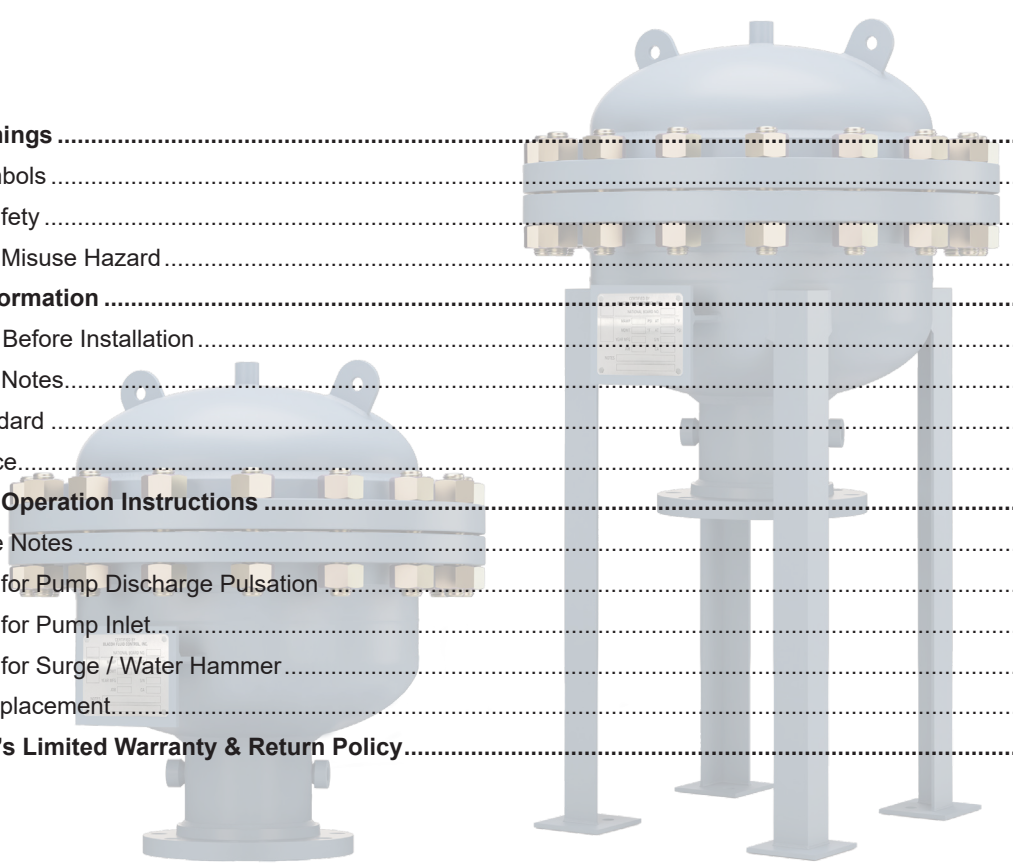




Installation and Operation Manual

The background of the table of contents features three pulsation dampeners of different sizes. One is a small 15-gallon model on the left, a medium 25-gallon model in the center, and a large 37-gallon model on the right. They are all light blue with yellow accents on the top flange.

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All dampeners manufactured by BLACOH use pressure bodies made in the USA to ensure quality. Prior to shipment, each and every dampener is factory pressure tested to assure proper function and leak-free operation.

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SAFETY Warnings

Dampeners should only be installed, operated and repaired by experienced and trained professional mechanics. Read and observe all instructions and safety warnings in this Manual before installing, operating or repairing dampeners.

Safety Symbols

The following symbols indicate cautions, warnings and notes that must be observed for safe and satisfactory installation, operation and maintenance of dampener.

-  **WARNINGS** Danger of serious injury or death could occur if these warnings are ignored.
-  **CAUTIONS** Equipment damage, injury or death could occur if these cautions are not observed.
-  **NOTES** Special instructions for safe and satisfactory installation, operation and maintenance.

General Safety

- Observe all safety symbols in installation and operation instructions.
- The internal dampener pressure will equal the maximum fluid pressure of the system in which it is installed.
- **DO NOT** exceed maximum allowable working pressure (MAWP) specified on dampener serial tag or marked on dampener. If missing, **DO NOT** use dampener without consulting distributor or factory for maximum pressure rating.
- Always make sure safety shutoff valves, regulators, pressure relief valves, gauges, etc. are working properly before starting system or assembly.
- Verify dampener model received against purchase order and shipper.
- Before starting a system or assembly make certain the discharge point of the piping system is clear and safe, and all persons have been warned to stand clear.
- **DO NOT** put your face or body near dampener when the system or assembly is operating or dampener is pressurized.
- **DO NOT** operate a dampener that is leaking, damaged, corroded or otherwise unable to contain internal fluid, air or gas pressure.
- **DO NOT** pump incompatible fluids through dampener. Consult distributor or factory if you are not sure of the compatibility of system fluids with dampener materials.
- Dampeners are designed to operate with compressed air or clean dry Nitrogen **only**. Other compressed gases have not been tested and may be unsafe to use. **DO NOT USE OXYGEN.**
- Always shut off air supply, remove internal dampener pressure and shut dampener isolation valve before performing dampener maintenance or repair.
- Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.
- **Static spark can cause an explosion resulting in severe injury or death. Ground dampeners and pumping system when pumping flammable fluids or operating in flammable environments.**

Equipment Misuse Hazard

General Safety

DO NOT misuse dampener, including but not limited to over-pressurization, modification of parts, using incompatible chemicals, or operating with worn or damaged parts. **DO NOT** use any gases other than compressed air or clean dry Nitrogen to charge dampener. **DO NOT USE OXYGEN.** Any misuse could result in serious bodily injury, death, fire, explosion or property damage.

Over-Pressurization

Never exceed the maximum pressure rating for the dampener model being used. Maximum allowable working pressure (MAWP) is specified on dampener serial tag or marked on dampener. Maximum allowable working pressure (MAWP) is rated at 70°F (21°C) unless specified otherwise on unit.


Temperature Limits

DO NOT exceed the operating temperature limits for the body and/or elastomer materials being used. Excessive temperature will result in dampener failure. For temperature limits, refer to the "Temperature Limits" section of this Manual. Temperature limits are stated at zero psi/bar.

Installation and Startup Hazards

Install dampener before charging or pressurizing. **DO NOT** start system or assembly without first charging or pressurizing dampener. Failure to charge may result in damage to the bladder or bellows.

GENERAL Information

-  For safe and satisfactory operation of dampener read all safety warnings, caution statements and this complete Manual before installation, startup, operation or maintenance.

Temperature & Pressure Hazard

Temperature and pressure reduce the strength and chemical resistance of plastic, metal, elastomers and PTFE.

Charging / Pressurization

Charge or pressurize dampener with compressed air or clean dry Nitrogen only. **DO NOT USE OXYGEN.**





Dampener Bladder/Bellows Failure






Dampeners utilize a bladder or bellows to separate system fluid from the air supply or gas charge. When failure occurs, system fluid may be expelled from the air valve. Always perform preventive maintenance and replace bladder/bellows before excessive wear occurs. O-rings for PTFE bellows and gaskets for Stainless Steel metal bellows cannot be reused.

Maintenance Hazards






Never overtighten fasteners. This may cause leakage of system fluid and damage to dampener body. Bolts should not be reused as re-torquing reduces bolt strength. **After dampener maintenance or disassembly, use new fasteners and torque fasteners according to specification on dampener tag. If missing, consult distributor or factory for torque specifications.**

Must Read Before Installation


-  **DO NOT** use Oxygen to charge dampener. Use compressed air or clean dry Nitrogen only.
-  **DO NOT** exceed maximum allowable working pressure (MAWP) specified on dampener serial tag or marked on dampener.
-  Turn pump off and remove all pressure from system prior to dampener installation.
-  Always wear safety glasses and other appropriate safety equipment when installing, charging or repairing dampener.

-  **Danger of static spark!** Grounding precautions must be considered when dampener is used in flammable or explosive environments.
-  ATEX models must be grounded (earthed) before operation.
-  **DO NOT** operate a dampener that is leaking, damaged, corroded or otherwise unable to contain internal fluid, air or gas pressure.
-  Temperature, pressure and chemicals affect the strength of plastic, elastomer and metal components.
-  Many plastics lose strength rapidly as temperature increases. Consult factory if in doubt.

Installation Notes

-  Dampening of flow pulsations can only be effective if a minimum of 5 to 10 psi (0.4 to 0.7 bar) back pressure downstream of dampener is available. A BLACOH back pressure valve may be required downstream of dampener, except when dampener is used as an inlet stabilizer for the inlet side of the pump.
-  It is recommended that a BLACOH pressure relief valve be installed in all pump systems to ensure compliance with pressure limits on system equipment.
-  To avoid possible damage to bladder/bellows from a system pressure test:
 - Adjustable and Chargeable models** — charge dampener to 80% of the system test pressure prior to test.
 - Automatic model** — prior to test, dampener must be equipped with a constant source of compressed air with pressure equal to or greater than system test pressure.
 - Inlet Stabilizer model** — maximum pressure test 30 psi (2.0 bar), charge to 20 psi (1.3 bar) for system pressure test.
-  Install dampener as close to the pump discharge/inlet or quick closing valve as possible. Dampener installation should be no more than ten pipe diameters from pump discharge/inlet or quick closing valve.
-  It is recommended that an isolation valve be installed between the dampener and system piping.

ATEX Standard

-  Certain models made for the European market are intended for use in potentially explosive atmospheres and meet the requirements of ATEX directive 2014/34/EU. These models have the AT designation at the end of the part number, comply with ISO 80079-36, and have an ATEX rating of II 2GD Ex h IIB T4 Gb Db. AT models have a grounding lug and must be grounded (earthed) before operation.


Maintenance

-  **Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.**

Dampeners require very little maintenance. There is no need for lubrication with bladders or bellows.


Elastomeric bladder replacement should be part of a preventive maintenance program. Dampeners used in conjunction with diaphragm pumps should have the bladders replaced at least every second time the diaphragms in the pump are replaced. As with any pumping system, wear is dependent on many factors including material, temperature, chemicals, fluid abrasiveness and system design. This suggested maintenance program may need to be adjusted according to specific applications.


Periodic inspection of the dampener and fasteners should be conducted to visually check for signs of over-pressurization, fatigue, stress or corrosion. Body housings and fasteners must be replaced at first indication of deterioration.

-  **CAUTION! Replace nut and bolt fasteners at each reassembly with fasteners of equal grade/strength value. DO NOT reuse old nuts and bolts.**

After the initial torque of fasteners, bolts may lose strength when re-torqued. Failure to replace both nuts and bolts upon each vessel reassembly will void the product warranty given by the manufacturer and the manufacturer will have no liability whatsoever for any vessel failure or malfunction.

Where dampeners are used in corrosive environments, nut and bolt fasteners should be regularly inspected and replaced with nut and bolt fasteners of equal grade/strength value if corrosion is observed. Failure to conduct such regular inspections and replacement will void the product warranty given by the manufacturer and the manufacturer will have no liability whatsoever for any vessel failure or malfunction.

-  **IMPORTANT!** After maintenance or disassembly, use new fasteners and torque fasteners according to specification on dampener tag. If missing, consult distributor or factory for specifications.

-  **DO NOT** use dampener if the fasteners (nuts and bolts) are corroded. Check for fastener corrosion frequently, especially in atmospheres containing salt or corrosive chemicals, or if dampener leakage has occurred.

Installation & Operation Instructions

- ⓘ **SurgeShield™ dampener models are not suitable for use as inlet stabilizers (suction stabilizers) in suction lift applications.**
- ⓘ Turn pump off and remove all pressure from system prior to dampener installation.
- ⚠ Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.
- ⚠ Use compressed air or clean dry Nitrogen to charge dampener. **DO NOT USE OXYGEN.**
- ⚠ **DO NOT exceed maximum allowable working pressure (MAWP) specified on dampener nameplate.** If missing, consult distributor or factory for specifications.
- ⚠ **Dampener must be installed in a vertical, upright position.**
- ⚠ **Prior to installation, remove inlet threaded connection plastic plugs used for shipping and replace with appropriate permanent plugs or connections.**
- ⚠ **Dampener installation must include adequate and properly secured supports sufficient for dampener size and weight to ensure safety and prevent damage to piping and other equipment.**
- ⚠ **DO NOT weld supports, fittings or equipment to dampener. Consult factory for options.**
- ⚠ Always wear safety glasses and other appropriate safety equipment when installing, charging or repairing dampener.
- ⚠ Read and observe all safety warnings and instructions in this Manual before installation, operation or repair.
- ⚠ **IMPORTANT! After maintenance or disassembly, use new fasteners and torque fasteners according to specifications in Bladder Replacement section below.**
- ⚠ **ASME Stamp Units:** Dampener housings must remain permanently paired; parts are not interchangeable and cannot be replaced. Prior to disassembly, mark housings to ensure original parts are paired and reassembled as received from factory.
- ⚠ Before performing a system pressure test, dampener must be charged with 80% of system test pressure to avoid possible damage to bladder/bellows.

Pre-Charge Notes

- ⓘ **NOTE: Dampener can be pre-charged with compressed air up to a maximum pressure of 150 psi (10.3 bar). If maximum pressure will exceed 150 psi (10.3 bar), dampener must be pre-charged with Nitrogen only. DO NOT USE OXYGEN.**

Pre-charge pressure should be checked at least monthly as gas molecules will diffuse through bladders/bellows, the speed of which depends on the material, temperature and pressure. Checks must occur when no system pressure is present or inaccurate readings will be recorded. If temperature is above 72°F (22°C) and/or pressure is over 300 psi (20.6 bar), checks should be performed more frequently. **To prevent pre-charge loss through the fill valve, always replace the fill valve cap after charging.** A proper gas charge is the key to dampener effectiveness and bladder/bellows life.

Installation for Pump Discharge Pulsation

Step 1 Installation Position

Install the dampener in a **vertical, upright position** as close to the pump discharge as possible to absorb the pulse at its source and before any downstream equipment such as risers, valves, elbows, meters or filters. Dampener installation should be no more than ten pipe diameters from pump discharge. If using a flexible connector on the discharge side of the pump between the pump and system piping, the dampener should be installed at the pump discharge manifold. The flexible connector should be attached to the dampener's tee and system piping (Figure 1).

Step 2 Charging and Startup (see Pre-Charge Notes)

Chargeable models do not require a permanent air line connection. Dampener can be pre-charged with compressed air up to a maximum pressure of 150 psi (10.3 bar). If maximum pressure will exceed 150 psi (10.3 bar), dampener must be pre-charged with Nitrogen only. Use a hand pump, Nitrogen tank or air compressor to charge dampener. **DO NOT USE OXYGEN.** Charging kits are available from BLACOH.

Prior to starting the pump, pre-charge the dampener to approximately 80% of expected system pressure and replace fill valve cap. **DO NOT USE OXYGEN.** The pre-charge pressure in the dampener must always be lower than pump discharge pressure. Generally, pulsation is most effectively minimized when the gas pre-charge is 80% of system pressure. Start the pump to generate system pressure. The dampener charge pressure may need to be adjusted up or down to be most effective in reducing pulsation. **NOTE:** The most effective method to set the proper dampener charge is to install a pressure gauge downstream of the dampener and adjust the dampener to minimize needle movement on the gauge.

Once system pressure is in contact with the bladder/bellows, the gas charge will be compressed to the system pressure and the dampener gauge will read the system pressure, not the initial charge pressure. Once working pressure is achieved adjustment may be necessary. Gradually increase or decrease the gas charge in the dampener by bleeding or filling through the gas valve. Allow the system to respond to each adjustment (this may take a minute or two) before making further adjustments.

Installation for Pump Inlet

ⓘ **SurgeShield™ dampener models are not suitable for use as inlet stabilizers (suction stabilizers) in suction lift applications.**

Step 1 Installation Position

Install the dampener **in a vertical, upright position** as close to the pump inlet as possible and after any upstream equipment such as risers, valves, elbows, meters or filters. Dampener installation should be no more than ten pipe diameters from pump inlet. If using a flexible connector on the inlet side of the pump between the system piping and pump, the dampener should be installed on a tee at the pump inlet manifold. The flexible connector should be attached to the dampener's tee and system piping (Figure 1). A compound pressure gauge should be installed upstream of the dampener to aid in proper dampener adjustment.

Step 2 Charging and Startup (see Pre-Charge Notes)

Chargeable models do not require a permanent air line connection. Dampener must be pre-charged with compressed air or Nitrogen using a hand pump, Nitrogen tank/bottle or compressor. **DO NOT USE OXYGEN.** Charging kits are available from BLACOH.

Positive Inlet Pressure: Pre-charge the dampener with 50% of the static system pressure realized at the pump inlet. Start the pump to generate working pressure. Minor pressure adjustments may be required. Allow the system to respond to each adjustment (this may take a minute or two) before making further adjustments.

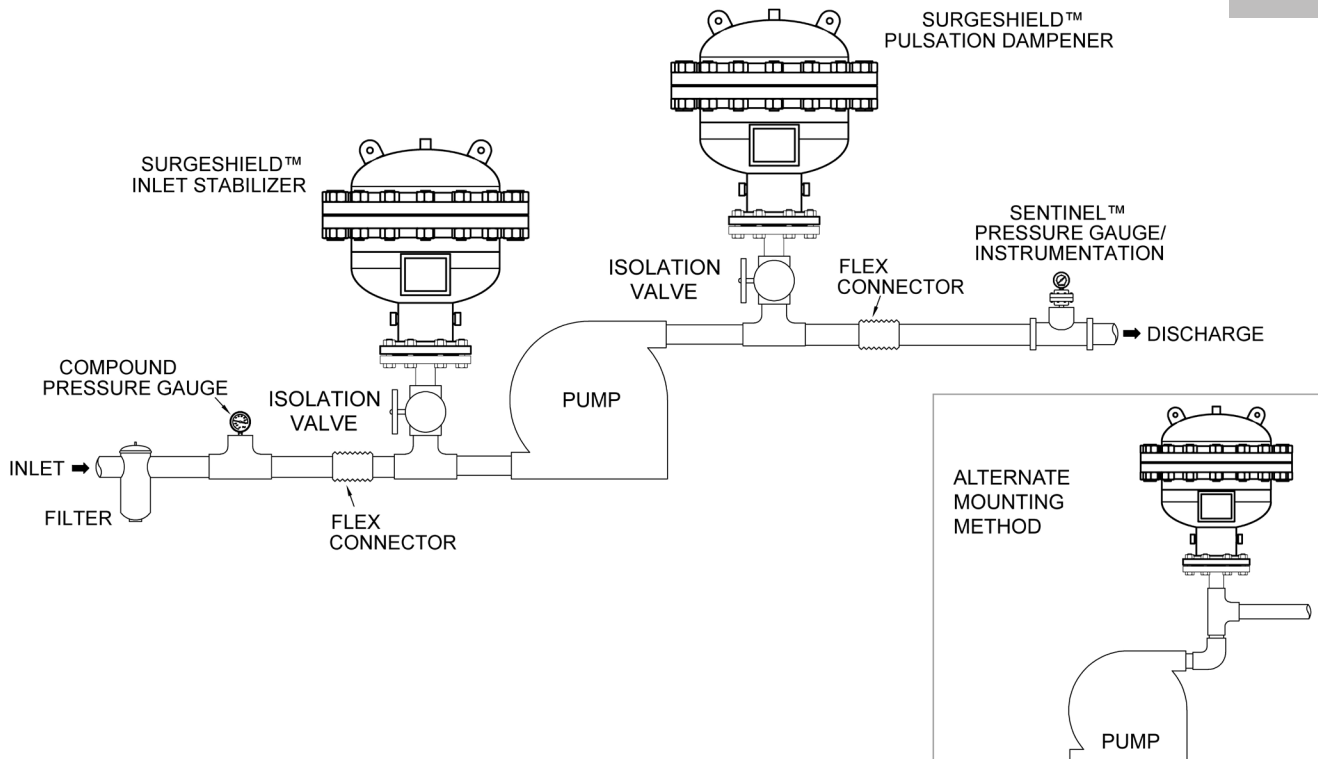


Figure 1

Installation for Surge / Water Hammer

⚠ The following instructions are intended for dampeners used for surge/ water hammer caused by devices installed downstream of the pump. Consult factory for dampeners used for surge/water hammer caused by rapid pump startup/shutdown.

Step 1 Installation Position

Install the dampener **in a vertical, upright position** as close as possible to and before the device causing the water hammer pressure spike (Figure 2). For example, if a quick closing valve is causing water hammer, install the dampener on a tee or elbow as close as possible upstream of the valve. Dampener installation should be no more than ten pipe diameters from the valve. **It is advisable to install an isolation valve between the dampener inlet and the mounting tee so maintenance and pressure checks can be done while the system is operating.**

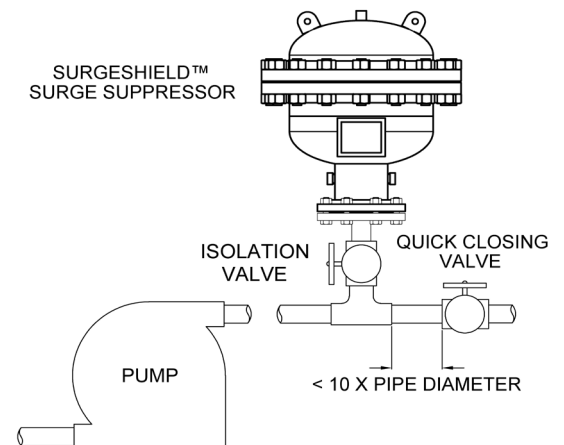


Figure 2

Step 2 Charging and Startup (see Pre-Charge Notes)

Chargeable models do not require a permanent air line connection. Dampener can be pre-charged with compressed air up to a maximum pressure of 150 psi (10.3 bar). If maximum pressure will exceed 150 psi (10.3 bar), dampener must be pre-charged with Nitrogen only. Use a hand pump, Nitrogen tank or air compressor to charge dampener. **DO NOT USE OXYGEN.** Charging kits are available from BLACOH.

The dampener must be pre-charged **after** installation but prior to system operation. The only method to get an accurate pressure charge in the dampener is to charge it prior to system startup or with a closed isolation valve at the dampener inlet. For surge/water hammer caused by devices installed downstream of the pump, pre-charge the dampener with 80% of expected system pressure. **DO NOT USE OXYGEN.** A fill valve similar to a Schrader type tire valve but designed for suppressors is mounted to the top of the dampener. Replace fill valve cap after charging dampener and recheck dampener charge every month.

Bladder Replacement






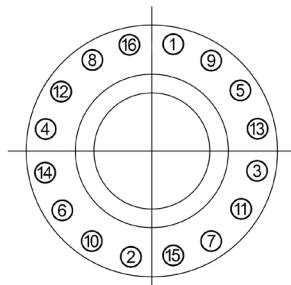
-  **Read and observe all safety warnings and instructions in this Installation and Operation Manual before dampener installation, operation or repair.**
 -  **Remove all pressure from dampener AND pumping system before disassembly, removal or maintenance.**
 -  **IMPORTANT! Replace nut and stud fasteners at each reassembly with fasteners of equal grade/strength value. DO NOT reuse old nuts and studs. Fasteners may lose strength when re-torqued. Warranty voided for failure to replace both nuts and studs when reassembling.**
 -  **ASME Stamp Units:** Dampener housings must remain permanently paired; parts are not interchangeable and cannot be replaced. Prior to disassembly, mark housings to ensure original parts are paired and reassembled as received from factory.
 -  Before performing a system pressure test, dampener must be charged with 80% of system test pressure to avoid possible damage to bladder/bellows.
1. Disassemble dampener by removing fasteners securing wetted and non-wetted housings. Make sure all components are clean and free of corrosion. Order replacement parts as needed.
 2. Remove and discard the old elastomeric bladder. Install the new elastomeric bladder into the wetted housing (bottom) of the dampener with the bottom of the bladder in the down position so that it fits within the wetted housing with the open end facing up.
 3. Reassemble dampener by securing the non-wetted housing (top) to the wetted housing (bottom). Lubricate new studs and secure dampener assembly with new nuts and studs. The gap between the non-wetted and wetted housings must remain even all around the unit. **DO NOT reuse old nuts and studs. New nuts and studs must be of equal grade/strength value.**
 4. Tighten studs in a criss-cross pattern as shown in Figure 3 according to the torque specifications below.
 5. To reinstall dampener, refer to the installation and operation instructions in this Installation and Operation Manual.

Figure 3



Stud Tightening Pattern

Torque Specifications		
Stud Ø	Stud Material	Torque
1-1/8"	Stainless Steel (lubricated)	201 ft-lb
	Carbon Steel (lubricated)	750 ft-lb

Manufacturer's Limited Warranty & Return Policy

Details regarding warranty and return policy are available on Blacoh's website at Blacoh.com

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