Before using this equipment, read, understand and follow all instructions in the Operator’s Manuals provided with this equipment. If the user and/or assistants cannot read or understand the warnings and instructions, the employer of the user and/or assistants must provide adequate and necessary training to ensure proper operation and compliance with all safety procedures pertaining to this equipment. If Operator’s Manuals have been lost, please visit www.marco.us, or contact Marco at 563.324.2519 for replacements. Failure to comply with the above warning could result in death or serious injury.
Company Profile
Since 1944, Marco has developed a strong tradition of providing innovative and reliable products and services to the surface preparation and protective coatings industries. We are the world’s premier provider of Abrasives, Blasting Equipment, Coating and Painting Equipment, Engineered Systems, Rental Equipment, Safety Equipment, Service, and Repair.

Through innovative designs and a total commitment to quality, Marco manufactures products that increase production rates, create a safer workplace, and reduce maintenance costs. Marco’s industry experience, manufacturing capabilities, legendary customer service, product availability, logistics services, and technology leadership is your assurance that we deliver high quality products and services, providing the best value to you, our customer.

The Marco Difference

- **Industry Experience** – With Marco on your team, you have access to expertise which can only come from decades of industry leadership. We have organized our engineering department, production specialists, customer operations, and safety support into a “Center of Competence.” As a Marco customer, you have access to hundreds of years of cumulative experience related to your operations.

- **Manufacturing Excellence** – Marco is a U.S. based, ISO 9001:2008 certified manufacturer of equipment for the Surface Preparation and Protective Coatings industries. Marco’s engineers benchmark the industry to ensure that we design and manufacture superior products that set the “Gold Standard” for performance, safety, and quality.

- **Legendary Customer Service** – Marco’s legendary customer service team is staffed by friendly, highly-trained individuals who are focused on providing the highest level of product support, order accuracy, and customer satisfaction.

- **Product Availability** – We stock over 10,000 SKU’s and have over 45 shipping locations to serve North American and International markets for all major brands of blasting and painting equipment. As the largest provider of surface preparation and protective coatings equipment in the world, our inventory levels and product availability are unmatched.

- **Logistics Services** – Marco’s in-house logistics team is dedicated to moving your shipment anywhere in the world. We move over 14,000 truckloads every year, allowing you to save on freight costs by leveraging our buying power. Lower your process costs with a single invoice, which includes product and freight.

- **Technology Leadership** – Our website provides: Operator’s Manuals, Part Numbers and Schematics Guides, MSDS information, and Features, Advantages, and Benefits Guides, providing access to information 24/7. Our Extranet application allows you to receive quotes and place orders online. Our Intranet maintains a complete record of your purchase history to assist with ongoing support of your existing equipment and future purchasing decisions.

Vision Statement
Marco is the world’s premier provider of Abrasives, Blasting Equipment, Coating and Painting Equipment, Engineered Systems, Rental Equipment, Safety Equipment, Service, and Repair.

Mission Statement
Marco provides strong leadership and innovation to the surface preparation and protective coatings industries. We dedicate our efforts to the continuous improvement of our products, services, processes, people, and most importantly, the quality of our customer’s experience.

Quality Policy
Marco is committed to providing superior quality in the design, manufacturing, distribution, rental, service, and repair of our products. Our ISO 9001:2008 certification extends throughout all operations in all locations. Continuous improvement of our processes and supply chain integration comprise the core of our business strategy for delivering exceptional quality and value in all Marco products and services.

Management Philosophy
We are a company dedicated to the success of every customer and associate. We discuss, debate, challenge, measure, and test our ideas. We will be boundless and limitless in our passion to improve. Through sound leadership and dedicated associates, we will ensure a long term, profitable future for Marco, our associates, customers, and suppliers.
TABLE OF CONTENTS

Company Profile ........................................... 1
Operating Instructions ................................. 9
  Description .............................................. 9
  Operational Requirements .......................... 9
  Initial Setup .......................................... 9
  Operating Instructions ............................... 13
Application Table ...................................... 14
Abrasive Recommendations Table .............. 14
Troubleshooting ......................................... 15
Maintenance Schedule Quick Reference Chart.. 16
Maintenance ............................................... 17
  Disassemble and Assemble Flange Wear Sleeve... 17
  Disassemble and Assemble Entry Nozzle ....... 17
  Disassemble and Assemble Rear Seal Assembly... 17
  Disassemble and Assemble Spindle Tube and Bearings... 17
Part Numbers and Schematics Guide ......... 19
  Blastmaster® Tornado Internal Pipe Blasting Tool... 19
OPTIONAL ACCESSORIES ......................... 21
  Tornado Scissor Carriage for 8" – 17" I.D. Pipe ... 21
  Tornado Pipe and Wheel Carriage for 12" – 36" I.D. Pipe... 22
  Tornado Pipe and Wheel Carriage for 40" – 60" I.D. Pipe ... 23
  2" Tornado Large Rotating Head Assembly ... 24
Limited Warranty ........................................ 26
  Disclaimer of Warranty ............................. 26
  Exclusive Remedy for Warranty Claims ......... 26
  Limitation of Remedies ............................. 26

DEFINITION OF TERMS

⚠️ DANGER
This is an example of danger. This indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠️ WARNING
This is an example of a warning. This indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠️ CAUTION
This is an example of a caution. This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It can also be used to alert against unsafe practices.

NOTICE
This is an example of a notice. This indicates policy or practice directly related to safety of personnel or protection of property.
HAZARD IDENTIFICATIONS

WARNING

Failure to comply with ANY WARNING listed below could result in death or serious injury.

- OSHA sets exposure limits to protect workers from exposure to respirable crystalline silica, 29 CFR 1910.1053. Airborne dust could increase the exposure levels beyond permissible limits. Breathing dust containing silica could cause silicosis, a fatal lung disease. Breathing dust during abrasive blasting operations, post-blast cleaning operations, and/or servicing equipment within the abrasive blasting area may expose an individual to conditions that could cause asbestosis, lead poisoning and/or other serious or fatal diseases. Harmful dust containing toxic material from abrasives or surfaces being abrasive blasted can remain suspended in the air for long periods of time after abrasive blasting has ceased. A NIOSH-approved, well-maintained, respirator designed for the specific operation being performed must be used by anyone abrasive blasting, handling or using the abrasive, and anyone in the area of the dust.

- Contact NIOSH and OSHA offices to determine the proper respirator for your specific application. The air supplied to the respirator must be at least Grade D quality as described in Compressed Gas Association Commodity Specification G-7.1 and as specified by OSHA Regulation 1910.134. Ensure air filter and respirator system hoses are not connected to non-air sources or in-plant lines that may contain nitrogen, oxygen, acetylene or other non-breathable gases. Before removing respirator, use an air monitoring instrument to determine if the atmosphere is safe to breathe.

- You must comply with all OSHA, local, City, State, Province, Country and jurisdiction regulations, ordinances and standards, related to your particular work area and environment. Keep unprotected individuals out of the work area.

- Abrasive blasting operators must receive thorough training on the use of abrasive resistant attire which includes: supplied-air respirator, abrasive blasting suit, safety shoes, gloves, ear protection and eye protection. Protect the operator and bystanders by complying with NIOSH and OSHA Safety Standards.

- Inspect all equipment for wear or damage before and after each use. Failure to use Original Equipment Manufacturer repair parts and failure to immediately replace worn or damaged components could void warranties and cause malfunctions.

- OSHA requires abrasive blasting nozzles be equipped with an operating valve, which shall be designed to be held open only by continuous hand pressure and shall close immediately upon release of hand pressure (i.e., a "deadman" control). The valve shall not be modified in any manner that would allow it to remain open without the application of continuous hand pressure by the operator. Failure to comply with the above warning could result in release of high speed abrasive and compressed air resulting in death or serious injury. OSHA 29CFR 1910.244(b)

- Point the abrasive blasting nozzle only at the surface being abrasive blasted. Never point the abrasive blasting nozzle or abrasive stream at yourself or others.

- Unless otherwise specified, maximum working pressure of abrasive blasting pots and related components must not exceed 150 psi. Exceeding maximum working pressure of 150 psi could cause the abrasive blasting pot and components to burst. Failure to comply with the above warning could result in death or serious injury.

- Never weld, grind or drill on the abrasive blasting pot (or any pressure vessel). Doing so will void ASME certification and manufacturer’s warranty. Welding, grinding or drilling on the abrasive blasting pot (or any pressure vessel) could weaken the vessel causing it to burst. Failure to comply with the above warning could result in death or serious injury. (ASME Pressure Vessel Code, Section VIII, Division 1)

- This equipment is not intended for use in any area that might be considered a hazardous location, as described in the National Electric Code NFPA 70, Article 500. Use of this equipment in a hazardous location could cause an explosion or electrocution.

- Never attempt to move an abrasive blasting pot containing abrasive. Never attempt to manually move abrasive blasting pots greater than 6.5 cubic foot capacity. Always use at least two capable people to manually move an abrasive blasting pot on flat, smooth surfaces. A mechanical lifting device must be used if an abrasive blasting pot is moved in any other manner.
HAZARD IDENTIFICATIONS

**WARNING**

Failure to comply with ANY WARNING listed below could result in death or serious injury.

- This product is not for use in wet environments. Always use a Ground Fault Interrupter Circuit (GFIC) for all electrical power source connections. Use of this product in wet environments could create a shock or electrocution hazard.

- Frozen moisture could cause restrictions and obstructions in pneumatic control lines. Any restriction or obstruction in the pneumatic control lines could prevent the proper activation and deactivation of the remote control system, resulting in the release of high speed abrasive and compressed air. In conditions where moisture may freeze in the control lines an antifreeze injection system approved for this application can be installed.

- Do not cut, obstruct, restrict or pinch pneumatic control lines. Doing so could prevent the proper activation and deactivation of the remote control system, resulting in the release of high speed abrasive and compressed air.

- Use of Marco remote control switches with other manufacturer’s remote control systems could cause unintended activation of remote control systems resulting in the release of high speed abrasive and compressed air. Only Marco remote control switches should be used with Marco remote control systems.

- Always be certain to have secure footing when abrasive blasting. There is a recoil hazard when abrasive blasting starts that may cause user to fall and misdirect the abrasive stream at operator or bystander.

- Never use an abrasive blasting pot or attachments as a climbing device. The person could slip and fall. The abrasive blasting pot could become unstable and tip over.

- For equipment manufactured by entities other than Marco, you must consult the Original Equipment Manufacturer operator’s manuals, information, training, instructions and warnings, for the proper and intended use of all equipment.

- Flammable fumes, such as solvent and paint fumes in the work area can present an ignition or explosion hazard if allowed to collect in adequate concentrations. To reduce conditions that could result in a fire or an explosion, provide adequate ventilation, eliminate all ignition or spark sources, keep the work area free of debris, store solvents and solvent contaminated rags in approved containers, follow proper grounding procedures, do not plug/unplug power cord or turn on/off power switches when flammable fumes are present, keep a working fire extinguisher or provide another fire suppression system in the work area. Cease all operations and correct condition if a spark or ignition source is identified during operation.

- Always depressurize the entire system, disconnect all power sources and lockout/tagout all components before any maintenance or troubleshooting is attempted. Failure to comply with the above warning could cause electrical shock and inadvertent activation of equipment resulting in death or serious injury.

- Moving parts can present an area where crushing, pinching, entanglement or amputation may occur. Do not place body parts or foreign objects in any area where there are moving parts.

- Surfaces of heated supply tanks, drums and/or lines as well as the adjoining plumbing may become hot during normal use. Do not touch these heated surfaces without proper protection. Deactivate and allow sufficient time for all surfaces to cool before attempting any maintenance.

- High-pressure fluid from gun, hose leaks, or ruptured components can pierce skin and can cause a serious injury that may result in amputation. Do not point gun or spray tip at anyone or at any part of the body. Keep clear of any leaks or ruptures. Depressurize the entire system before attempting cleaning, inspecting, or servicing equipment.

- Exposure to toxic fluids or fumes may occur during the normal operation of this system. Before attempting to fill, use, or service this system, read SDS’s to know the specific hazards of the fluids you are using. Always use proper Personal Protective Equipment when attempting to fill, use, or service this system.

- The use of this product for any purpose other than originally intended or altered from its original design is prohibited.

- Never hang objects from the abrasive blasting pot handle. Doing so may cause the abrasive blasting pot to become unstable and tip over.
HAZARD IDENTIFICATIONS

**CAUTION**

Failure to comply with ANY CAUTION listed below may result in minor or moderate injury.

- Static electricity can be generated by abrasive moving through the abrasive blasting hose causing a shock hazard. Prior to use, ground the abrasive blasting pot and abrasive blasting nozzle to dissipate static electricity.
- High decibel noise levels are generated during the abrasive blasting process which may cause loss of hearing. Ensure appropriate Personal Protective Equipment and hearing protection is in use.

**NOTICE**

Failure to comply with ANY NOTICE listed below could pose a hazard to personnel or property.

- See Air & Abrasive Consumption Chart for estimated abrasive consumption rates and required air flow (cubic feet per minute). Your system must meet these minimum requirements to ensure proper function and performance.
- Always use abrasive that is dry and properly screened. This will reduce the potential for obstructions to enter the remote control system, abrasive metering valve and abrasive blasting nozzle.
- Moisture build-up occurs when air is compressed. Any moisture within the abrasive blasting system will cause abrasive to clump, clogging metering valves, hoses and nozzles. Install an appropriately sized moisture separator at the inlet of the abrasive blasting system. Leave the moisture separator petcock slightly open to allow for constant release of water. If insufficient volume of air exists and petcock is unable to be left open (at all times) petcock should be opened frequently to release water.
- To reduce abrasive intrusion in the air supply hose, depressurize the abrasive blasting pot before shutting off air supply from compressor.
- Inspect abrasive blasting nozzle before placing into service. Damage to abrasive blasting nozzle liner or jacket may occur during shipping. If you receive a damaged abrasive blasting nozzle, contact your distributor immediately for replacement. Abrasive blasting nozzles placed into service may not be returned. Abrasive blasting nozzle liners are made of fragile materials and can be damaged by rough handling and striking against hard surfaces. Never use a damaged abrasive blasting nozzle.
- Abrasive blasting at optimal pressure for the abrasive used is critical to productivity. Example: For an abrasive with an optimal abrasive blasting pressure of 100 psi at the abrasive blasting nozzle, one pound per square inch of pressure loss will reduce abrasive blasting efficiency by 1.5%. A 10 psi reduction in air pressure will cause a 15% loss of efficiency. Use a Needle Pressure Gauge to identify pressure drops in your system. Consult with your abrasive supplier for the requirements of your abrasive.
- Replace abrasive blasting nozzle if liner or jacket is cracked or damaged. Replace abrasive blasting nozzle if original orifice size has worn 1/16” or more. Determine abrasive blasting nozzle wear by inserting a drill bit 1/16” larger than original size of abrasive blasting nozzle orifice. If the drill bit passes through abrasive blasting nozzle, replacement is needed.
Failure to comply with ANY NOTICE listed below could pose a hazard to personnel or property.

- See Air & Abrasive Consumption Chart for estimated abrasive consumption rates and required air flow (cubic feet per minute). Your system must meet these minimum requirements to ensure proper function and performance.
- When it comes to air & abrasive mixtures, more is not necessarily better. Optimum abrasive blasting efficiency takes place when a lean air & abrasive mixture is used. To correctly set the abrasive metering valve, begin with the valve fully closed and slowly increase the amount of abrasive entering the airstream. As you increase the abrasive flow, watch for a “blue flame” at the exit of the abrasive blasting nozzle. Faster cutting, reduced abrasive consumption and lower clean up costs, are benefits of the “blue flame”.
- Abrasive blasting at optimal pressure for the abrasive used is critical to productivity. Example: For an abrasive with an optimal abrasive blasting pressure of 100 psi at the abrasive blasting nozzle, one pound per square inch of pressure loss will reduce abrasive blasting efficiency by 1.5%. A 10 psi reduction in air pressure will cause a 15% loss of efficiency. Use a Needle Pressure Gauge to identify pressure drops in your system. Consult with your abrasive supplier for the requirements of your abrasive.

Inspect abrasive blasting nozzle before placing into service. Damage to abrasive blasting nozzle liner or jacket may occur during shipping. If you receive a damaged abrasive blasting nozzle, contact your distributor immediately for replacement. Abrasive blasting nozzle liners are made of fragile materials and can be damaged by rough handling and striking against hard surfaces. Never use a damaged abrasive blasting nozzle.

<table>
<thead>
<tr>
<th>Nozzle Orifice</th>
<th>Pressure at the Nozzle (PSI)</th>
<th>Air (in cfm), Abrasive &amp; Compressor Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 2 (1/8”)</td>
<td>50: 11 13 15 17 18 20 25 28</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 67 77 88 101 112 123 152 170</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 2.5 3 3.5 4 4.5 5 5.5 6.2</td>
<td></td>
</tr>
<tr>
<td>No. 3 (3/16”)</td>
<td>50: 26 30 33 38 41 45 55 62</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 150 171 196 216 238 264 319 357</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 6 7 8 9 10 10 12 13</td>
<td></td>
</tr>
<tr>
<td>No. 4 (1/4”)</td>
<td>50: 47 54 61 68 74 81 98 110</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 268 312 354 408 448 494 608 681</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 11 12 14 16 17 18 22 25</td>
<td></td>
</tr>
<tr>
<td>No. 5 (5/16”)</td>
<td>50: 77 89 101 113 126 137 168 188</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 468 534 604 672 740 812 982 1100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 18 20 23 26 28 31 37 41</td>
<td></td>
</tr>
<tr>
<td>No. 6 (3/8”)</td>
<td>50: 108 126 143 161 173 196 237 265</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 668 764 864 960 1052 1152 1393 1560</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 24 28 32 36 39 44 52 58</td>
<td></td>
</tr>
<tr>
<td>No. 7 (7/16”)</td>
<td>50: 147 170 194 217 240 254 314 352</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 896 1032 1176 1312 1448 1584 1931 2163</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 33 38 44 49 54 57 69 77</td>
<td></td>
</tr>
<tr>
<td>No. 8 (1/2”)</td>
<td>50: 195 224 252 280 309 338 409 458</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 1160 1336 1512 1680 1856 2024 2459 2754</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 44 50 56 63 69 75 90 101</td>
<td></td>
</tr>
<tr>
<td>No. 10 (5/8”)</td>
<td>50: 308 356 404 452 504 548 663 742</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 1875 2140 2422 2690 2973 3250 3932 4405</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 68.5 79.5 90 100.5 112 122 146 165</td>
<td></td>
</tr>
<tr>
<td>No. 12 (3/4”)</td>
<td>50: 432 504 572 644 692 784 948 1062</td>
<td>Air (cfm), Abrasive (lbs/hr), Compressor Horsepower</td>
</tr>
<tr>
<td></td>
<td>60: 2672 3056 3456 3840 4208 4608 5570 6238</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100: 96 112 127 143 154 174.5 209 236</td>
<td></td>
</tr>
</tbody>
</table>

*Abrasive consumption is based on abrasive with a bulk density of 100 lbs per Cubic Foot
“THE BIG PICTURE”
DAILY PRE-OPERATION CHECKLIST

Daily Pre-operation Checklist

☐ 1. Abrasive
☐ 2. Air Compressor
☐ 3. Air Hose Couplings & Gaskets
☐ 4. Air Hose
☐ 5. Safety Cable
☐ 6. Ambient Air Pump*
☐ 7. Breathing Air Filter
☐ 8. CO Monitor
☐ 9. Breathing Line
☐ 10. Climate Control Device
☐ 11. Abrasive Blasting Suit
☐ 12. Gloves
☐ 13. Abrasive Blasting Nozzle
☐ 14. Lighting System*
☐ 15. Abrasive Blasting Nozzle Holder
☐ 16. Remote Control Switch
☐ 17. Supplied-Air Respirator
☐ 18. Control Line
☐ 19. Abrasive Blasting Hose
☐ 20. Abrasive Blasting Hose Couplings & Gaskets
☐ 21. Abrasive Metering Valve
☐ 22. Remote Control System
☐ 23. Moisture Separator
☐ 24. Abrasive Blasting Pot Exhaust Muffler
☐ 25. Abrasive Blasting Pot
☐ 26. Abrasive Blasting Pot Screen
☐ 27. Abrasive Blasting Pot Lid
☐ 28. Aftercooler*

* Optional or alternative device. Ask your Marco Representative for more details.

Abrasive – Select the correct Abrasive (1) for the application. Review the SDS (Safety Data Sheet) to ensure the correct PPE (Personal Protective Equipment) and Environmental Controls have been selected and are in place.

Air Compressor – Select an Air Compressor (2) of adequate size to support all equipment requirements. Refer to “Air & Abrasive Consumption Chart” for Abrasive Blasting Nozzle (13) air consumption requirements. Before connecting Air Hose (4), sample the air being produced by the air compressor (2) to ensure it is free of petroleum contaminants.

Air Hose, and Air Hose Couplings & Gaskets – Select Air Hoses (4) of sufficient size to support all subsequent volumetric requirements and with a sufficient PSI (pound per square inch) rating. Inspect all Air Hoses (4), and Air Hose Couplings & Gaskets (3) for damage or wear. Repair or replace damaged or worn components.

Abrasive Blasting Hose, Abrasive Blasting Hose Couplings & Gaskets, and Abrasive Blasting Nozzle Holder – Select an Abrasive Blasting Hose (19) that has an inner diameter 3 to 4 times larger than your Abrasive Blasting Nozzle (13). Inspect Abrasive Blasting Hose (19), Abrasive Blasting Hose Couplings & Gaskets (20), and Abrasive Blasting Nozzle Holder (15) for damage or wear. Repair or replace damaged or worn components.

Safety Cables – Install a Safety Cable (5) at each Abrasive Blasting Hose (19), and Air Hose (4) connection points.

Aftercooler and Moisture Separator – Ensure Aftercooler (28) is positioned on stable ground. Keep petcock drain of Moisture Separator (23) slightly open during use. Drain both devices after each use.

Supplied-Air Respirator, Breathing Line, Breathing Air Filter, Climate Control Device, CO Monitor, Ambient Air Pump – You MUST consult the Operator’s Manual supplied with your Respiratory Equipment (6, 7, 8, 9, 10, 17) for ALL applicable instructions and warnings. Inspect all Respiratory Equipment components for damage or wear. Repair or replace damaged or worn components.

Abrasive Blasting Suit and Gloves – Select an abrasive-resistant Abrasive Blasting Suit (11) that is slightly oversized to allow ease of movement and allows air to flow around your body. Select abrasive-resistant Gloves (12) with a tight fit and a long cuff that overlaps the sleeve of the Abrasive Blasting Suit (11).

Abrasive Metering Valve and Abrasive Blasting Pot – Confirm Abrasive Blasting Pot (25) is positioned on stable ground. Inspect Abrasive Blasting Pot (25) and Abrasive Metering Valve (21) for damage or wear. Repair or replace damaged or worn components.

Abrasive Blasting Pot Screen and Abrasive Blasting Pot Lid – Always use an Abrasive Blasting Pot Screen (26) when filling Abrasive Blasting Pot (25) with Abrasive (1) to prevent debris from entering the Abrasive Blasting Pot (25). Remove Abrasive Blasting Pot Lid (27) before operating the Abrasive Blasting Pot (25). Install Abrasive Blasting Pot Lid (27) after use to protect the Abrasive Blasting Pot's (25) interior.

Remote Control System, Remote Control Switch, Control Line, – Inspect Remote Control System (22) and Control Line (18) for damage or wear. Repair or replace damaged or worn components. Ensure Control Line (18) fittings connected to the Remote Control System (22) are tight and free of leaks. Ensure Remote Control Switch (16) is functioning properly. Consult Remote Control Switch Operator’s Manual for applicable instructions.


Lighting System – Ensure the Lighting System (14) is connected to a proper power supply before use.
OPERATING INSTRUCTIONS

Description

The Blastmaster® Tornado Internal Pipe Blasting Tool is used as part of an abrasive blasting system to clean internal surfaces of pipe and tubing ranging in size from 8” to 60” I.D. An internal pipe blasting tool replaces a standard abrasive blasting nozzle for cleaning the inner surface of pipe and tube. The tool is designed to accelerate and direct the air and abrasive mixture through two blast nozzles attached to a rotating work head. As the head rotates, the air and abrasive mixture is propelled to the inner surface of the pipe or tube, efficiently removing containments, rust, and coating. Typical applications include blast booths, blast yards, offshore platforms, oil refineries, pipelines, storage tanks, and water towers.

Operational Requirements

• Proper air supply to provide from 225 CFM — 540 CFM at a maximum of 150 psi (See Application Table).
• Well screened dry abrasive (See Abrasive Recommendation Table).

The following may cause safety hazards or reduced performance:

• Improper installation and/or maintenance of components.
• Improper air supply pressure.

Initial Setup

• Blastmaster® Tornado Internal Pipe Blasting Tool requires a customer supplied connecting tube. The connecting tube is a length of 1-1/4” pipe that is positioned between the blasting hose and the Blastmaster® Tornado Internal Pipe Blasting Tool. It is always recommended that connecting tube length is same length as pipes that are being abrasive blast cleaned. Threads at both ends of longer pipe tube must be 1-1/4-11.5 NPT. Two NTC-1 threaded couplings are supplied to fit the connecting tube to the Tornado tool and an existing blast hose coupling.
• Blastmaster® Tornado Internal Pipe Blasting Tool comes with two 1/4” tungsten carbide Blast Nozzles (1). It is also supplied with the 3/4” small Rotating Head (2). Should it be necessary to run the coarse thread long venturi blast nozzles, use the 2” Tornado Large Rotating Head Assembly.

Note:
In order to run the long venturi coarse thread blast nozzles with the large rotating head, a minimum pipe internal diameter of 40” is recommended.

Note: The rotating heads are designed to be used without rubber nozzle washers. Only use thread sealant for thread sealing between the nozzle threads and the rotating head threads. The use of nozzle washers, or modifications to the rotating head, may result in tool malfunction or shortened tool life.

• To fit the Tornado assembly in the optional adjustable scissor carriage:
  • Slide the back end of the Tornado tool into the expanded carriage, through the Front Collar (4) and into the Rear Collar (5).

Note: The rear collar should be located in front of the Breather Vent Holes (3) on the seal retainer body, DO NOT block the vent holes.

• To fit the Tornado assembly in the optional adjustable scissor carriage:
  • Slide the back end of the Tornado tool into the expanded carriage, through the Front Collar (4) and into the Rear Collar (5).

Note: The rear collar should be located in front of the Breather Vent Holes (3) on the seal retainer body, DO NOT block the vent holes.

• Tighten the two Set Screws (6) on the rear collar.
• Adjust the carriage to suit the internal diameter of the pipe by expanding the carriage scissor mechanism and tighten the two set screws on the front collar.
• Check that the Rotating Head (2) spins freely.
OPERATING INSTRUCTIONS

Initial Setup (Cont.)

To fit the Tornado assembly in the large and medium range carriages:

- Slide the back end of the Tornado tool into the larger Front Carriage Body (1).
- Position the front of the body flush with the front face of the centrifugal speed limiter housing (2).

Note: The body should be located in front of the Breather Vent Holes (3) on the seal retainer body, DO NOT block the vent holes.

- Tighten the two Screws (4) to fix the Front Carriage Body (1) to the tool.
- Fit the smaller Rear Carriage Body (8) to the Connecting Tube (5) which should be positioned to prevent excess bowing of the connecting tube and angular misalignment of the coupled connections.
- Tighten the two Screws (7) to fix the Rear Carriage Body (8) to the tool.
- Fit the appropriate Leg Assemblies (6) to the Front Carriage Body (1) and Rear Carriage Body (8). Adjust so that the Tornado tool and the Connecting Tube (5) are centered within the pipe, and also check that the wheel assemblies are in line with the direction of travel.

Note: The large and mid-range carriages track best when set up in a “Y” configuration, with one leg pointing down.

WARNING
Always depressurize the entire system, disconnect all power sources and lockout/tagout all components before any maintenance or troubleshooting is attempted. Failure to comply with the above warning could cause electrical shock and inadvertent activation of equipment resulting in death or serious injury.

WARNING
Moving parts can present an area where crushing, pinching, entanglement or amputation may occur. Do not place body parts or foreign objects in any area where there are moving parts.
Operating Instructions

Operating Instructions are limited to instructions found in Original Equipment Manufacturer’s Operator’s Manuals. Please refer to all literature included with your Blastmaster® Tornado Internal Pipe Blasting Tool at time of delivery. If this literature is unavailable, please contact Marco for a replacement before use.

**Before use:**

- Inspect components for damage. Replace any damaged components before use.
- Ensure all connections are tight and secure before use.

**After use:**

- When abrasive blasting is concluded, inspect components for wear or damage. Replace as necessary.

1) Connect the connecting tube to Tornado tool using two Threaded Tank Couplings (1).
2) Connect blast hose to tool assembly.
3) Place complete tool assembly inside entrance of pipe; avoid any impact on deflection tip against pipe wall.
4) Pressurize blast pot and begin a test blast to ensure abrasive to air mixture is set to maximum performance via abrasive metering valve.

*Note: A rich mixture of abrasives to air ratio will result in premature wear to tool components.*

5) While tool is at pipe entrance, determine that you have optimum abrasive flow setting and perform a small test blast to observe how fast tool assembly should travel within pipe for desired cleaning result.

6) To commence production, push complete tool assembly to end of pipe that is to be blast cleaned. Start blast cleaning process and slowly retract tool towards pipe entrance point. Do not start blasting process from pipe entrance as this will create a build-up of abrasive media which can create tool and collars to jam within pipe.

7) Pipes that require an extensive blast cleaning process may need multiple passes. If after examination of the pipe it is determined a second blast is required it is recommended that any excessive spent abrasives be cleaned and removed from the pipe ID.

*Note: If it is necessary to remove the tool from the entrance of the pipe being blasted, ensure the blasting process has stopped and that the pressure blast pot has been depressurized.*
### APPLICATION TABLE

<table>
<thead>
<tr>
<th>Pipe ID</th>
<th>Nozzle Size</th>
<th>Rotating Head</th>
<th>Carriage Type</th>
<th>Compressed Air Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>8” — 12”</td>
<td>1/4”</td>
<td>Small</td>
<td>Small Range Scissor</td>
<td>225 CFM</td>
</tr>
<tr>
<td>12” — 20”</td>
<td>5/16”</td>
<td>Small</td>
<td>Mid Range</td>
<td>375 CFM</td>
</tr>
<tr>
<td>24” — 36”</td>
<td>3/8”</td>
<td>Small</td>
<td>Mid Range</td>
<td>540 CFM</td>
</tr>
<tr>
<td>40” — 60”</td>
<td>3/8”</td>
<td>Large</td>
<td>Large Range</td>
<td>540 CFM</td>
</tr>
</tbody>
</table>

*Note: We recommend a minimum compressed air supply of at least 50% higher than the nozzle requirement listed above.*

*Note: Ensure that the blast nozzle selection is matched to the compressed air volume. The use of undersized nozzles will severely damage the Tornado tool.*

### ABRASIVE RECOMMENDATIONS TABLE

The following list recommends the maximum abrasive sizes to be used with the Blastmaster® Tornado Internal Pipe Blasting Tool.

<table>
<thead>
<tr>
<th>Abrasive Type</th>
<th>Maximum Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garnet</td>
<td>#20/40</td>
</tr>
<tr>
<td>Steel Grit</td>
<td>SAE G25</td>
</tr>
<tr>
<td>Steel Shot</td>
<td>SAE S230</td>
</tr>
</tbody>
</table>
### TROUBLESHOOTING

If Blastmaster® Tornado Internal Pipe Blasting Tool does not function properly, check following:

<table>
<thead>
<tr>
<th>SYMPTOM (Cause)</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No Air or Abrasive exits Blast Tool</strong> (Improper Air Supply, Blastmaster® Tornado Internal Pipe Blasting Tool obstructed, Remote Control System, Damaged Blastmaster® Tornado Internal Pipe Blasting Tool components)</td>
<td>Insufficient air supply. Ensure minimum of 225 CFM is supplied to Blastmaster® Tornado Internal Pipe Blasting Tool.</td>
</tr>
<tr>
<td></td>
<td>Ensure Blastmaster® Tornado Internal Pipe Blasting Tool is clear of obstructions. Clean area and ensure abrasive is free of debris, properly screened and free of moisture.</td>
</tr>
<tr>
<td></td>
<td>Refer to remote control system Operator’s Manual.</td>
</tr>
<tr>
<td></td>
<td>Inspect Blastmaster® Tornado Internal Pipe Blasting Tool for damaged components.</td>
</tr>
<tr>
<td><strong>Rotating Nozzle will not rotate or rotates slowly</strong> (Improper Air Supply, Blastmaster® Tornado Internal Pipe Blasting Tool obstructed, Flanged wear sleeve, Damaged bearings, Rear Compression Spring)</td>
<td>Insufficient air supply. Ensure minimum of 225 CFM is supplied to Blastmaster® Tornado Internal Pipe Blasting Tool.</td>
</tr>
<tr>
<td></td>
<td>Ensure Blastmaster® Tornado Internal Pipe Blasting Tool is clear of obstructions. Clean area and ensure abrasive is free of debris, properly screened and free of moisture.</td>
</tr>
<tr>
<td></td>
<td>Check Flanged Wear Sleeve for abrasive particles embedded, remove and replace.</td>
</tr>
<tr>
<td></td>
<td>Check bearings for damage. Replace damaged bearings.</td>
</tr>
<tr>
<td></td>
<td>Check rear compression spring, if damaged replace.</td>
</tr>
<tr>
<td><strong>Rotating Nozzle rotates too fast</strong> (Worn brake shoes, Rear Compression Spring)</td>
<td>Brake shoes in brake housing are worn out, replace.</td>
</tr>
<tr>
<td></td>
<td>Check rear compression spring, if damaged replace.</td>
</tr>
<tr>
<td><strong>Vibration</strong> (Blast Nozzle obstructed, Blast Nozzle unbalanced)</td>
<td>One blast nozzle is plugged, inspect and clear.</td>
</tr>
<tr>
<td></td>
<td>Blast nozzles out of balance, i.e. one nozzle has worn more than the other or blast nozzles are not of the same type, inspect and replace.</td>
</tr>
</tbody>
</table>

---

**WARNING**

Always depressurize the entire system, disconnect all power sources and lockout/tagout all components before any maintenance or troubleshooting is attempted. Failure to comply with the above warning could cause electrical shock and inadvertent activation of equipment resulting in death or serious injury.

---

**WARNING**

Inspect all equipment for wear or damage before and after each use. Failure to use Original Equipment Manufacturer repair parts and failure to immediately replace worn or damaged components could void warranties and cause malfunctions. Failure to comply with the above warning could result in death or serious injury.

---

**WARNING**

The use of this product for any purpose other than originally intended or altered from its original design is prohibited. Failure to comply with the above warning could result in death or serious injury.

---

Inspect all equipment for wear or damage before and after each use. Failure to use Original Equipment Manufacturer repair parts and failure to immediately replace worn or damaged components could void warranties and cause malfunctions. Failure to comply with the above warning could result in death or serious injury.

---

Inspect all equipment for wear or damage before and after each use. Failure to use Original Equipment Manufacturer repair parts and failure to immediately replace worn or damaged components could void warranties and cause malfunctions. Failure to comply with the above warning could result in death or serious injury.
### TORNADO MAINTENANCE SCHEDULE

Perform inspections at the intervals specified. Repair or replace damaged parts as needed.

<table>
<thead>
<tr>
<th>Item</th>
<th>Maintenance Required</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaskets, Washers and Seals</td>
<td>Inspect all gaskets, washers and seals, it is important to replace these items prior to excessive wear.</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Flange Wear Sleeve</td>
<td>Inspect the front wearing face of the Flanged Wear Sleeve for heavy grooving and abrasive particles embedded in the face, replace if either is evident. Inspect that the sleeve moves freely in and out in the base housing recess, remove and blow out any dust that may have built up.</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Entry Nozzle</td>
<td>Inspect the entry nozzle for wear at the discharge end, and change if worn to less than a 3/32&quot; wall thickness.</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centrifugal Speed Limiter</td>
<td>Inspect the centrifugal speed limiter brake shoe linings for wear and ensure that both brake shoes pivot freely, replace the brake shoes if worn. Inspect the internal braking surface of the housing for grooving and machine or replace if badly grooved.</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Threaded Parts</td>
<td>Carefully check that all threaded parts are securely tightened to avoid gaps and voids, which will create internal turbulence within tool assembly.</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
MAINTENANCE

Disassemble and Assemble Flange Wear Sleeve

1) Depressurize the system.
2) Uncouple the Tornado tool and carriage assembly from the connecting tube.
3) Remove the Tornado tool from the carriage.
4) Remove the four Screws, Spring Washers and Washers (1).
5) Remove the Rear Base Assembly (2) from the Tornado tool body.
6) Inspect the front wearing face of the Flanged Wear Sleeve (3) for heavy grooving and abrasive particles embedded in the face, change if either is evident.
7) Inspect that the sleeve moves freely in and out in the base housing recess, remove and blow out any dust that may have built up.
8) Visually check the Spring (4) to ensure it is in working order.
9) Install parts in reverse order.

Disassemble and Assemble Entry Nozzle

1) Depressurize the system.
2) Uncouple the Tornado tool and carriage assembly from the connecting tube.
3) Remove the Tornado tool from the carriage.
4) Remove the four Screws, Spring Washers and Washers (1) holding the rear base assembly to the body.
5) Loosen the rear Lock Nut (5) and unscrew Entry Nozzle (6) from Base (2).
6) Inspect the entry nozzle for wear at the discharge end, and change if worn to less than a 3/32” wall thickness.
7) Inspect the condition of the Bearing Seal (7), replace if damaged.
8) Install parts in reverse order.

Disassemble and Assemble Rear Seal Assembly

1) Depressurize the system.
2) Uncouple the Tornado tool and carriage assembly from the connecting tube.
3) Remove the Tornado tool from the carriage.
4) Remove the four Screws, Spring Washers and Washers (1) holding the rear base assembly to the body.
5) Remove the Seal Retainer (8).
6) The rear U Seal (9) and Felt Seal (10) are located in the seal retainer.
7) Remove both seals, it is advisable to change both seals if either is worn.
8) Clean the outer face of the rear bearing of any dust residue before reassembly.
9) Install parts in reverse order.

Disassemble and Assemble Spindle Tube and Bearings

1) Depressurize the system.
2) Remove the four Screws, Spring Washers and Washers (1).
3) Remove the Rear Base Assembly (2).
4) Remove the Seal Retainer (8).
5) Remove the four Screws, Spring Washers and Washers (16).
6) Remove the Brake Housing (11).
7) Remove the rear Locking Ring (12).
8) Drive or press the Tube (13) forward through the Body (15).
9) Extract or pull the Bearings (14) from the Body (15).
10) Install parts in reverse order.
MAINTENANCE

Disassemble and Assemble Blastmaster® Tornado Internal Pipe Blasting Tool

External View

Internal View
## PART NUMBERS AND SCHEMATICS GUIDE

**Blastmaster® Tornado Internal Pipe Blasting Tool**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 1</td>
<td>1084070</td>
<td>Blastmaster® Tornado Internal Pipe Blasting Tool</td>
</tr>
<tr>
<td>1</td>
<td>1084082</td>
<td>Tube Casting</td>
</tr>
<tr>
<td>2</td>
<td>1084086</td>
<td>Brake Housing</td>
</tr>
<tr>
<td>3</td>
<td>1084089</td>
<td>Locking Pin (Quantity of Two)</td>
</tr>
<tr>
<td>4</td>
<td>1084087</td>
<td>Specialty Brake with Lining</td>
</tr>
<tr>
<td>5</td>
<td>1084093</td>
<td>Support Ring</td>
</tr>
<tr>
<td>6</td>
<td>1084080</td>
<td>Double Seal Light Bearing (Quantity of Two)</td>
</tr>
<tr>
<td>7</td>
<td>1084081</td>
<td>Main Body</td>
</tr>
<tr>
<td>8</td>
<td>1084088</td>
<td>Locking Ring (Quantity of Two)</td>
</tr>
<tr>
<td>9</td>
<td>1084094</td>
<td>Felt Seal (Quantity of Two)</td>
</tr>
<tr>
<td>10</td>
<td>1084095</td>
<td>U Seal (Quantity of Two)</td>
</tr>
<tr>
<td>11</td>
<td>1084085</td>
<td>Seal Retainer</td>
</tr>
<tr>
<td>12</td>
<td>1084096</td>
<td>Base</td>
</tr>
<tr>
<td>13</td>
<td>1084097</td>
<td>Dowel Pin</td>
</tr>
<tr>
<td>14</td>
<td>1084078</td>
<td>End Locking Nut</td>
</tr>
<tr>
<td>15</td>
<td>1084083</td>
<td>Entry Nozzle</td>
</tr>
<tr>
<td>16</td>
<td>1084084</td>
<td>Bearing Seal</td>
</tr>
<tr>
<td>17</td>
<td>1084098</td>
<td>Wear Sleeve</td>
</tr>
<tr>
<td>18</td>
<td>1084099</td>
<td>Spring</td>
</tr>
<tr>
<td>19</td>
<td>1084100</td>
<td>Screw (Quantity of Two)</td>
</tr>
<tr>
<td>20</td>
<td>1084101</td>
<td>NPT Plug</td>
</tr>
<tr>
<td>21</td>
<td>10AT4</td>
<td>#4 Straight Bore Nozzle, Tungsten Carbide Liner, Aluminum Jacket, 1/4&quot; Orifice</td>
</tr>
<tr>
<td>22</td>
<td>10AT5</td>
<td>#5 Straight Bore Nozzle, Tungsten Carbide Liner, Aluminum Jacket, 5/16&quot; Orifice</td>
</tr>
<tr>
<td>23</td>
<td>10AT6</td>
<td>#6 Straight Bore Nozzle, Tungsten Carbide Liner, Aluminum Jacket, 3/8&quot; Orifice</td>
</tr>
<tr>
<td>22</td>
<td>1084071</td>
<td>Rotating Nozzle Head</td>
</tr>
<tr>
<td>23</td>
<td>1084109</td>
<td>2&quot; Tornado Large Rotating Head Assembly (Optional) (See Fig. 5)</td>
</tr>
<tr>
<td>24</td>
<td>1084090</td>
<td>2-1/2&quot; Round Head Screw (Quantity of Four)</td>
</tr>
<tr>
<td>25</td>
<td>1084104</td>
<td>Spring Washer (Quantity of Eight)</td>
</tr>
<tr>
<td>26</td>
<td>1084105</td>
<td>Screw (Quantity of Four)</td>
</tr>
<tr>
<td>27</td>
<td>1084106</td>
<td>NTC-1 Nylon Threaded Tank Coupling (Quantity of Two)</td>
</tr>
<tr>
<td>28</td>
<td>101V614</td>
<td>Brochure – Blastmaster® Tornado Internal Pipe Blasting Tool</td>
</tr>
<tr>
<td>29</td>
<td>105M614</td>
<td>Features and Specifications Guide – Blastmaster® Tornado Internal Pipe Blasting Tool</td>
</tr>
<tr>
<td>30</td>
<td>106M614</td>
<td>Part Numbers &amp; Schematics Guide – Blastmaster® Tornado Internal Pipe Blasting Tool</td>
</tr>
<tr>
<td>31</td>
<td>1090614</td>
<td>Operator’s Manual – Blastmaster® Tornado Internal Pipe Blasting Tool</td>
</tr>
</tbody>
</table>
PART NUMBERS AND SCHEMATICS GUIDE

Figure 1: Blastmaster® Tornado Internal Pipe Blasting Tool
OPTIONAL ACCESSORIES

Figure 2: Tornado Scissor Carriage for 8” – 17” I.D. Pipe

<table>
<thead>
<tr>
<th>Item#</th>
<th>Part#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1084072</td>
<td>Tornado Scissor Carriage for 8” – 17” I.D. Pipe</td>
</tr>
</tbody>
</table>
OPTIONAL ACCESSORIES

Figure 3: Tornado Pipe and Wheel Carriage for 12" – 36" I.D. Pipe

<table>
<thead>
<tr>
<th>Item#</th>
<th>Part#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1084076</td>
<td>Front Body Collar</td>
</tr>
<tr>
<td>2</td>
<td>1084074</td>
<td>Medium Leg Set</td>
</tr>
<tr>
<td>3</td>
<td>1084077</td>
<td>Rear Body Collar</td>
</tr>
<tr>
<td>4</td>
<td>1084107</td>
<td>5/16&quot; x 26mm Machine Screw Hex Head (Quantity of Ten)</td>
</tr>
</tbody>
</table>
OPTIONAL ACCESSORIES

Figure 4: Tornado Pipe and Wheel Carriage for 40” – 60” I.D. Pipe

<table>
<thead>
<tr>
<th>Item#</th>
<th>Part#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1084108</td>
<td>Tornado Pipe and Wheel Carriage for 40” – 60” I.D. Pipe</td>
</tr>
<tr>
<td>1</td>
<td>1084076</td>
<td>Front Body Collar</td>
</tr>
<tr>
<td>2</td>
<td>1084074</td>
<td>Long Leg Set</td>
</tr>
<tr>
<td>3</td>
<td>1084077</td>
<td>Rear Body Collar</td>
</tr>
<tr>
<td>4</td>
<td>1084107</td>
<td>5/16” x 26mm Machine Screw Hex Head (Quantity of Ten)</td>
</tr>
</tbody>
</table>
OPTIONAL ACCESSORIES

Figure 5: 2” Tornado Large Rotating Head Assembly

<table>
<thead>
<tr>
<th>Item#</th>
<th>Part#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1084102</td>
<td>2” Tornado Large Rotating Head Assembly <em>(For use when blasting 40”–60” pipe)</em></td>
</tr>
<tr>
<td>1</td>
<td>1084110</td>
<td>50mm 2” Contractor Large Rotating Head</td>
</tr>
<tr>
<td>2</td>
<td>1084111</td>
<td>Screw <em>(Quantity of Two)</em></td>
</tr>
<tr>
<td>—</td>
<td>10SN650UN</td>
<td>Blastmaster® Silicon Carbide All Poly Nozzles – #6, 3/8” Orifice <em>(Two Required) (Optional)</em></td>
</tr>
<tr>
<td>DATE</td>
<td>TYPE OF SERVICE</td>
<td>PART NUMBER</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LIMITED WARRANTY

Seller warrants to the original purchaser that the Product covered by this Limited Warranty will remain free from defects in workmanship or material under normal commercial use and service for a period of one year from the date of shipment to the original Purchaser. This Warranty shall not apply to defects arising, in whole or in part, from any accident, negligence, alteration, misuse or abuse of the Product, operation of the Product which is not in accordance with applicable instructions or manuals or under conditions more severe than, or otherwise exceeding, those set forth in the written specifications for the Product, nor shall this Warranty extend to repairs or alterations of the Product and/or any maintenance part by persons other than Seller or Seller’s authorized representatives. This warranty does not apply to accessory items. Further, this Warranty does not apply to damage or wear to the surface finish or appearance of the Product or normal wear and tear to the Product. This Warranty is limited to a purchaser who purchases the Product either directly from the Seller or from one of Seller’s “Authorized Distributors”. An Authorized Distributor is a Seller approved distributor that purchases the Product directly from the Seller for the sole purpose of re-selling the Product at retail, without any use or modifications whatsoever, to an end-purchaser. This warranty is specifically non-assignable and non-transferable.

DISCLAIMER OF WARRANTY

The foregoing Limited Warranty is exclusive and is in lieu of all other warranties, whether oral or written and whether express, implied, or statutory. SELLER HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE AND ALL SUCH OTHER WARRANTIES ARE HEREBY EXCLUDED AND ARE INAPPLICABLE TO THE PRODUCT. Seller makes no warranties or representations of any kind concerning respirators, or equipment modified or altered by persons other than Seller or Seller’s authorized representatives. This warranty does not apply to accessory items. Further, this Warranty does not apply to damage or wear to the surface finish or appearance of the Product or normal wear and tear to the Product. This Warranty is limited to a purchaser who purchases the Product either directly from the Seller or from one of Seller’s “Authorized Distributors”. An Authorized Distributor is a Seller approved distributor that purchases the Product directly from the Seller for the sole purpose of re-selling the Product at retail, without any use or modifications whatsoever, to an end-purchaser. This warranty is specifically non-assignable and non-transferable.

EXCLUSIVE REMEDY FOR WARRANTY CLAIMS

THE SOLE AND EXCLUSIVE REMEDY UNDER THE FOREGOING LIMITED WARRANTY, AND TO THE EXTENT PERMITTED BY LAW, ANY WARRANTY OR CONDITION IMPLIED BY LAW, COVERING THIS PRODUCT SHALL BE, AT THE SELLER’S OPTION, THE REPAIR OR REPLACEMENT, FREE OF CHARGE, F.O.B. POINT OF MANUFACTURE, OF ANY DEFECTIVE PART OR PARTS OF THE PRODUCT THAT WERE MANUFACTURED BY SELLER, AND WHICH ARE RETURNED TO SELLER AT SELLER’S PRINCIPAL PLACE OF BUSINESS, POSTAGE PREPAID BY THE PURCHASER. THIS SOLE AND EXCLUSIVE REMEDY IS CONDITIONED UPON PURCHASER’S PROMPT WRITTEN NOTICE TO SELLER AT SELLER’S PLACE OF BUSINESS THAT A DEFECT HAS BEEN DISCOVERED, TOGETHER WITH A REASONABLY DETAILED DESCRIPTION OF THE DEFECT IN THE PRODUCT, PROOF OF PURCHASE OF THE PRODUCT, AND THE MODEL AND IDENTIFICATION NUMBER OF THE PRODUCT WITHIN THIRTY (30) DAYS AFTER DISCOVERY OF THE DEFECT, OTHERWISE SUCH CLAIMS SHALL BE DEEMED WAIVED. NO ALLOWANCE WILL BE GRANTED FOR ANY REPAIRS OR ALTERATIONS MADE BY PURCHASER OR OTHERS WITHOUT SELLER’S PRIOR WRITTEN CONSENT. IF SUCH NOTICE IS TIMELY GIVEN, SELLER WILL HAVE THE OPTION TO EITHER MODIFY THE PRODUCT OR COMPONENT THEREOF TO CORRECT THE DEFECT, REPLACE THE PRODUCT OR PART WITH COMPLYING PRODUCTS OR PARTS, OR REFUND THE AMOUNT PAID FOR THE DEFECTIVE PRODUCT, ANY ONE OF WHICH WILL CONSTITUTE THE SOLE LIABILITY OF SELLER AND FULL SETTLEMENT OF ALL CLAIMS. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY OBLIGATION GREATER THAN THE ORIGINAL PURCHASE PRICE OF THE PRODUCT UNDER THIS WARRANTY. PURCHASER SHALL AFFORD SELLER PROMPT AND REASONABLE OPPORTUNITY TO INSPECT THE PRODUCT FOR WHICH A CLAIM IS MADE. THE SOLE PURPOSE OF THE FOREGOING STIPULATED EXCLUSIVE REMEDY SHALL BE TO REPAIR OR REPLACE DEFECTIVE PRODUCTS OR COMPONENTS THEREOF, OR TO REFUND PURCHASER THE PURCHASE PRICE THEREOF. THIS STIPULATED EXCLUSIVE REMEDY SHALL NOT BE DEEMED TO HAVE FAILED OF ITS ESSENTIAL PURPOSE SO LONG AS SELLER IS WILLING AND ABLE TO REPAIR OR REPLACE THE DEFECTIVE PARTS OR REFUND THE PURCHASE PRICE IN ACCORDANCE WITH THE TERMS HEREOF. PRODUCTS THAT HAVE BEEN REPAIRED OR REPLACED UNDER THIS WARRANTY DO NOT RECEIVE A NEW WARRANTY AND ARE ONLY COVERED BY THE REMAINING PORTION OF THE ORIGINAL WARRANTY.

LIMITATION OF REMEDIES

The foregoing stipulated exclusive remedy is in lieu of all other remedies for breach of contract, warranty, and/or tort or otherwise. Seller shall not be liable, either directly or indirectly, for any consequential, incidental or special losses or damages of Purchaser, including but not limited to the Purchaser’s expenses for downtime or for making up downtime, damages for which the Purchaser may be liable to other persons and/or entities, damages to property, and injury to or death of any persons and/or any claims for incidental or consequential damages, including but not limited to loss of profits, regardless of whether Seller has been informed of the possibility of such damages. Seller neither assumes, nor authorizes any person to assume for it, any other liability in connection with the sale or use of any Products covered by the foregoing Warranty and Disclaimers, and there are no oral agreements relating to remedies which are collateral to or which affect this limitation.

ADDITIONAL TECHNICAL DATA

The associations listed below offer information, materials and videos pertaining to abrasive blasting and safe operating practices.

- American Society for Testing and Materials (ASTM)
  100 Barr Harbor Drive
  West Conshohocken, PA 19428-2959
  Phone: (610) 832-9585
  FAX: (610) 832-9555
  www.astm.org

- Occupational Safety & Health Administration (OSHA)
  United States Department of Labor
  200 Constitution Avenue
  Washington, DC 20210
  Phone: (800) 321-OSHA
  FAX: (614) 888-0750
  www.osha.gov

- The National Board of Boiler & Pressure Vessel Inspectors
  1055 Crupper Avenue
  Columbus, Ohio 4322
  Phone: (614) 888-8320
  FAX: (614) 888-0750
  www.nationalboard.org

- National Association of Corrosion Engineers (NACE)
  1440 South Creek Drive
  Houston, TX 77084-4906
  Phone: (281) 228-6200
  FAX: (281) 228-6300
  www.nace.org

- The Society for Protective Coatings (SSPC)
  40-24th Street, 8th Floor
  Pittsburgh, PA 15222-4656
  Phone: (412) 281-2331
  FAX: (412) 281-9992
  www.sspc.org

- American National Standards Institute (ANSI)
  1099 L Street, NW, 11th Floor
  Washington, DC 20036
  Phone: (202) 293-8020
  FAX: (202) 293-9287
  www.ansi.org

Blastmaster® Tornado Internal Pipe Blasting Tool
GLOBAL HEADQUARTERS
• 3425 East Locust Street
  Davenport, IA  52803

ph: 800.BLAST.IT (800.252.7848)
ph: 563.324.2519
fax: 563.324.6258

GULF STATES HEADQUARTERS
• 701 East Boulevard
  Deer Park, TX  77536

ph: 800.BLAST.IT (800.252.7848)
ph: 281.930.0905
fax: 281.542.0736

REGIONAL BRANCH OFFICES
• Iowa
  Davenport
• Louisiana
  Gonzales
  Lafayette
• Ohio
  Youngstown
• Texas
  Beaumont
  Corpus Christi
  Deer Park

CONTACT MARCO
800.BLAST.IT
(800.252.7848)
563.324.2519
FAX: 563.324.6258
WWW.MARCO.US
SALES@MARCO.US

Marco® and Blastmaster® are registered trademarks of Marco.
All other brand names or marks are used for identification purposes and are trademarks of their respective owners.