Mud Gun
Operation, Maintenance, & Technical Manual

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<th>Revision Number</th>
<th>Date of Revision</th>
<th>Description of Revision</th>
<th>Revision Author</th>
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<td>DRAFT</td>
<td>8/12/13</td>
<td>Draft</td>
<td>Daniel Vasquez</td>
</tr>
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<td>1</td>
<td>9/16/13</td>
<td>Approved copy</td>
<td>LG</td>
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<td>2</td>
<td>7/24/14</td>
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<td>D. Vasquez</td>
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<td>D. Vasquez</td>
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</table>
# Table of Contents

1.0 SAFETY  
2.0 WARRANTY  
3.0 INSTALLATION PROCEDURE  
4.0 STARTUP PROCEDURE  
5.0 ROUTINE MAINTENANCE  
6.0 TECHNICAL MANUAL CONTENTS  
   6.1 GENERAL DESCRIPTION  
   6.2 GENERAL ARRANGEMENT DRAWING  
7.0 PARTS LIST  
8.0 CERTIFICATION(S)  
9.0 ADDITIONAL DRAWINGS, DIAGRAMS, ETC.  
10.0 CONTACT INFORMATION
1.0 Safety

General safety rules and warnings

This manual contains important information concerning installation, operation, and proper maintenance of your Process Solutions Mud Gun. To prevent injury to personnel or equipment damage, this manual should be read by those responsible for the installation and operation of the PSI Mud Guns. In addition, the safety precautions below should be followed at all times.

1. Always lock-out and isolate power sources before performing any maintenance.
2. Inspect equipment for damages, loose fittings, safety guards (if applicable), and proper installation.
3. Wear proper PPE based on your company's Personal Protective Equipment and Safety procedures.
4. When lifting equipment, ensure proper lift points are used. Use properly rated slings that are capable of handling the equipment.
2.0 Warranty

Warranty Terms and Conditions
The MAX2000®, MAKDADDY®, and Vak® name are registered trade names of Kelbro, Inc dba Process Solutions International (PSI). Their use is reserved by Kelbro, Inc. dba Process Solutions International (PSI) and applicable laws. It shall not be used without permission and written authorization from Kelbro, Inc. dba Process Solutions International (PSI).

Terms of Sale
Any terms and conditions contained in any purchase order or other form of communication from PSI's customers, which are additional to or different from these terms and conditions, shall be deemed rejected by PSI unless expressly accepted in writing by PSI. In general, no modification, amendment, waiver or other change of any of these terms and conditions or attachments hereto, shall be binding on PSI unless expressly accepted in writing by PSI's authorized officers. No course of dealing, usage of trade or course of performance shall be relevant to explain or supplement any of these terms and conditions. If any document issued by any party hereto is sent by facsimile or another form of electronic document transmission, the parties hereto agree that (a) the copy of any such document printed on the facsimile machine or printer of the recipient thereof is a counterpart original copy thereof and is an “writing”, (b) an electronically stored and reproduced copy of any such document shall be deemed to be legally sufficient evidence of the terms of such document for all purposes.

Delivery; Risk of Loss
All sales are F.O.B. PSI's plant or other point of shipment designated by PSI. Shipping dates are estimates only which are not guaranteed and are based upon prompt receipt from Buyer of all necessary shipping and other information. PSI reserves the right to make delivery in installments, all installments to be separately invoice and paid for by Buyer when due per invoice, without regard to subsequent deliveries. Delivery of equipment to a commercial carrier at PSI's plant or other loading pInt shall constitute delivery to Buyer, and any risk of loss and further cost and responsibility thereafter for claims, delivery, loss or damage, including, if applicable, placement and storage, shall be borne by Buyer.

When equipment is delivered by PSI's truck, unloading at Buyer's dock shall constitute delivery to Buyer. Claims for shortages or other errors in delivery must be made in writing to PSI within ten (10) days after receipt of shipment and failure to give such notice shall constitute unqualified acceptance and a waiver of all such claims by Buyer. Claims for loss or damage to equipment in transit by common carrier must be made to the carrier and not to PSI. Freight and handling charges by PSI may not reflect actual freight charges prepaid to the carrier by PSI due to incentive discounts earned by PSI based upon PSI's aggregate volume of freight tendered to a carrier or when a carrier must be used which charges a rate which is different than the rate upon which PSI's freight and handling charges were based. When shipments are delivered in PSI's private trucks, Buyer will be charged an amount approximating the prevailing common carrier rate.

Excusable Delays; Force Majeure
PSI shall not be liable for any ordinary, incidental, or consequential loss or damage as a result of PSI’s delay in or failure of delivery or installation due to (i) any cause beyond PSI’s reasonable control, (ii) an act of God, act of the Buyer, embargo or other government act, authority, regulation or request, fire, theft, accident, strike, slowdown, or other labor disturbance, war, riot, delay in transportation, or (iii) inability to obtain necessary labor, material, components, or facilities. Should any of the aforementioned events of force majeure occur, PSI, at its option, may cancel Buyer's order with respect to any undelivered equipment or extend the delivery date for a period equal to the time lost because of delay. Notice of such election shall be given promptly to Buyer. In the event PSI elects to so cancel the order, PSI shall be released of and from all liability for failure to deliver the equipment, including, but not limited to, any and all claims on behalf of Buyer for lost profits, or any other claim of any nature which Buyer might have. If shipping or progress of the work is delayed or interrupted by Buyer, directly or indirectly, Buyer shall pay PSI for all additional charges resulting therefrom.
**Storage**
If the equipment is not shipped within fourteen (14) days after notification has been made to Buyer that it is ready for shipping, for any reason beyond PSI’s control, including Buyer’s failure to give shipping instructions, PSI may store the equipment at Buyer’s risk and expense in a warehouse or on PSI’s premises, and Buyer shall pay all handling, transportation and storage costs at the prevailing commercial rates promptly following PSI’s submission of invoices for such costs.

**Warranty Period**
PSI warrants the products manufactured under the Kelbro register trade name mentioned above to be free from defects in materials and workmanship and to conform to PSI written specifications for a period of 12 months from the date of manufacture.

**Warranty Remedies**
If, prior to expiration of the foregoing applicable warranty period, any of such products shall be proved to PSI’s satisfaction to be defective or nonconforming, PSI will repair or replace such defective equipment or components thereof, F.O.B. PSI’s plant or other destination designated by PSI, or will refund or provide Buyer with a credit in the amount of the purchase price paid therefore by Buyer, at PSI’s sole option. Buyer’s exclusive remedy and PSI’s sole obligation under this warranty shall be limited to such repair or replacement, F.O.B. PSI’s plant or other destination designated by PSI, or refund or credit by PSI, and shall be conditioned upon PSI’s receiving written notice of any defect within a reasonable period of time (but in no event more than thirty (30) days) after it was discovered or by reasonable care should have been discovered. In no event shall PSI’s liability for such defective or nonconforming products exceed the purchase price paid by Buyer therefore.

**Exclusions**
This warranty does not (i) cover shipping expenses to and from PSI factory or other destination designated by PSI for repair or replacement of defective equipment or any tax, duty, custom, inspection or testing fee, or any other charge of any nature related thereto, nor does it cover the cost of disassembling or removing defective equipment or reassembling, reinstalling, or testing repaired or replaced equipment or finishing the reinstallation thereof, (ii) apply and shall be void with respect to equipment operated in excess of rated capacity or otherwise not in accordance with installation, maintenance, or operating instructions or requirements, to equipment repaired or altered by others than PSI or PSI’s authorized service agencies, or to equipment which was subjected to abuse, negligence, misuse, misapplication accident, damages by circumstances beyond PSI’s control, to improper installation (if by others than PSI), operation, maintenance or storage, or to other than normal use or service, and (iii) apply to equipment or components not manufactured by or for PSI. With respect to equipment or components not manufactured by PSI, PSI's warranty obligations shall in all respects conform and be limited to the warranty actually extended to PSI by its suppliers, but in no event shall PSI’s obligation be greater than those provided under PSI’s warranty set forth in this section.

The foregoing warranties are in lieu of all other express and implied warranties (except title), including, without limitation, the implied warranties of merchantability and fitness for a particular purpose. No employee, representative, or agent of PSI other than an officer of PSI is authorized to alter or modify any provision of this section or to make any guarantee, warranty, or representation, express or implied, orally or in writing, which is contrary to the foregoing.

Any description of the equipment, whether in writing or made orally by PSI or PSI’s agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar material used in connection with Buyer’s order are for the sole purpose of identifying the equipment and shall not be construed as an express warranty. Any suggestions by PSI or PSI’s agents regarding use, application or suitability of the equipment shall not be construed as an express warranty unless confirmed to be such in writing by PSI’s authorized officer.

**Consequential Damage Disclaimer**
PSI's liability with respect to equipment proved to be defective within the warranty period shall be limited to repair, replacement or refund as provided hereof, and in no event shall PSI's liability exceed the purchase price of the equipment involved. Kelbro shall not be subject to any other obligations or liabilities, whether arising out of breach of contract, warranty, tort (including negligence) or other theories of law, with respect to equipment sold or services rendered by PSI, or any undertakings, act or omissions relating thereto. Without limiting the generality of the foregoing, PSI specifically disclaims any liability for property or personal injury damages, penalties, special or punitive damages, damages for lost profits or revenues, loss of use of equipment or any associated equipment, cost of capital, cost of substitute products, facilities or services, downtime, shutdown, or slowdown costs, or for any other types of economic loss, and for claims of Buyer’s customer for any such damages.

PSI shall not be liable for and disclaims all consequential, incidental and contingent damages whatsoever. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under section 2-719 of the uniform commercial code, PSI shall have no liability to Buyer for consequential damages, such as lost profits, lost revenue, damage to other equipment or liability or injury to a third party.

**Indemnification by Buyer**
Buyer shall indemnify, hold harmless, and defend PSI and PSI’s employees and agents from and against any and all damages, liability, claims, losses and expenses (including reasonable attorneys’ fees, court costs, and out-of-pocket expenses) arising out of or resulting in any way from claims by customers of Buyer or third parties against PSI alleging a breach of contract or warranty by PSI to the extent that such damages, liability claims, losses and expenses which may be payable by PSI to Buyer pursuant to the and as limited by PSI’s warranty and damage obligations as contained hereof so as to effectively limit Kelbro’s obligations to customers of Buyer or third parties to those set forth.

**Return of Equipment**
No equipment or part shall be returned to Kelbro without written authorization and shipping instructions first having been obtained from PSI under the company’s Return Policy.

**Return Policy:**
- Client/Customer requests an RMA from Sales Department
- Sales shall issue an RMA with an assigned number along with the Product Warranty information and a quote for replacement cost.
- Client/Customer issues a Purchase Order to PSI (pending evaluation), with the RMA properly filled in.
- Product is returned back to PSI at Client/Customers expense with all RMA documents for reference. If the product is warrantied, then the freight cost will be credited back.
- An evaluation will be conducted to determine warranty status.
- If product is not returned within 30 days of issued RMA, then an invoice will be issued regardless of warranty status.
- A copy of the evaluation is available upon request.
3.0 Installation Procedure

After proper fitting or placement of the equipment, ensure that the power source is isolated and locked out before proceeding.

Check for installation of any safety equipment (if applicable) such as, belt guards, coupling guards, horns, beacons, pull cords, etc.

Mud guns are to be located in the tank corners. The centerline is to be located about 6” off the tank bottom.

1. Check that all threaded fittings are tight.
2. PSI mud guns are outfitted with a 3” 150 lb ANSI flange at the inlet. This flange is to be connected to a matching flange from the feed pump. A gasket must be installed between the flanges to prevent leaking mud.
3. Lubricate the swivels with 3 shots of grease at installation. Use a NLGI no 2 multipurpose grease.
4. Each mud gun requires 100-125 gpm of flow and 75 ft of head at the nozzle.
4.0 Startup Procedure

Once installation is complete, the unit can be started by turning the feed pump on.

The direction of discharge may be modified to suit the operators' requirements by rotating the swivel.

5.0 Routine Maintenance

Use proper lock-out/tag-out precautions when performing maintenance.

The following tasks should be performed periodically:

1. Grease the swivel once a week. Add (2) shots of a multipurpose NLGI no 2 grease.

2. Visually inspect the mud gun assembly for any leaks, loose fittings once a week. Repair as required.

3. Inspect the mud gun jet nozzle for excessive wear. The nozzle has a 5/8” bore when new. The nozzle should be changed when the bore is 7/8” or higher.
6.0 Technical Manual Contents

6.1 General Description

Mud guns are meant to provide supplemental or primary mixing in mud tanks depending on the number being used and the pt size. They are best used in tank corners to keep solids from settling and a mud agitator is placed in the tank center.

DESIGN FEATURES
The following features are included with all PSI low pressure bottom type mud guns:

• Jet Nozzle
A molded replaceable wear resistant polyurethane jet nozzle is used. The bore of the nozzle is 5/8”.

• Swivel
PSI’s standard swivel allows for 360° rotation to allow the operator to optimize the mud guns performance. The swivels are outfitted with a grease fitting to allow for lubrication of the swivels bearings.

• Swivel Adjustment
The swivels are outfitted with a collapsible handle. This allows for adjustment and then collapsing the handle to eliminate a trip hazard.
6.2 General Arrangement Drawing
7.0 Parts List

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<th>ITEM</th>
<th>QTY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>ITEM</th>
<th>QTY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
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<tr>
<td>8</td>
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<td>.125-GZ</td>
<td>GREASE ZERK, 1/8&quot; MNPT</td>
<td>1</td>
<td>2</td>
<td>JPMGSW</td>
<td>SWIVEL, 3&quot; FOR LOW PRESSURE MUD GUNS</td>
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<td>9</td>
<td>3</td>
<td>96/1/2-13X1.2 HHCS, 1/2-13 X 1.25 LG, GRADE 5, ZINC PL</td>
<td>MUD GUN HANDLE PART A</td>
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<td>10</td>
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<td>96/1/2&quot; LW WASHER, 1/2&quot; HELICAL LOCK, ZINC PL</td>
<td>0.375-PLUG PLUG, 3/8&quot; MNPT</td>
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<td>96/1/2&quot; NUT NUT, HEX 1/2-13, ZINC PL</td>
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<td>96/1/2-13X3 HHCS, 1/2-13 X 3 LG, GRADE 5, ZINC PL</td>
<td>97/3 NIPPLE NIPPLE, 3&quot; SCH 40 X 6 LG, TBE</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>1</td>
<td>30/360-10 MUD GUN JET NOZZLE, 5/8&quot; BORE, MOLDED POLYURETHANE, 3&quot; MNPT</td>
<td>3 IN PIPE PIPE, 3&quot; SCH 40, TBE, SEE NOTE FOR LENGTH</td>
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MAIN COMPONENT WEIGHTS (LB/KG)

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<td>3&quot; ELBOW</td>
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<td>SWIVEL</td>
<td>38 / 17.27</td>
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<tr>
<td>3&quot; PIPE</td>
<td>7.58 / 3.45 (PER FT)</td>
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<td>JET NOZZLE</td>
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**FEATURES:**
1. MOLDED POLYURETHANE JET NOZZLE.
2. 360° SWIVEL
3. FOLDING HANDLE

**OPTIONS:**
1. BOTTOM STABILIZER
2. FLANGE CONNECTION AT THE INLET
3. CUSTOM HANDLE LENGTHS
4. STUFFING BOX TO SEAL ENTRY TO THE TANK
5. MECHANICAL SEAL TO SEAL ENTRY TO THE TANK

**PERFORMANCE:**
1. REQ'D HEAD PRESSURE = 75 FT
2. FLOW RATE = 100 GPM
3. MAXIMUM PRESSURE = 250 PSI
4. NOZZLE BORE = 5/8"
8.0 Certification(s)
SEE ATTACHED (if applicable)

9.0 Additional drawings, diagrams, etc.
SEE ATTACHED (if applicable)

10.0 Contact Information
Replacement parts for PSI SUPPLIED equipment can be ordered from Process Solutions International or any of their agents, worldwide. Please include the model number if possible.

To order parts or to receive technical support via telephone, contact Process Solutions International using the information listed below.

Process Solutions International
A Division of Kelbro, Inc.
7519 Prairie Oak Drive
Houston, TX 77086
(281) 893-4774; FAX (281) 893-1027