Method 5 – Isokinetic Metering Console

Part # 0028

User Manual
May, 2008

Questions? Contact us at 800-223-3977 or online at http://www.cleanair.com/equipment/Express/main.html
Isokinetic Control Console – Method 5

Console Serial Number

__________________________
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IMPORTANT!!!

BEFORE YOU BEGIN READ THIS!!!

READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE USING THIS SYSTEM!

SAVE THESE INSTRUCTIONS!!!

• To Avoid Accidents…
  ✓ Keep your work area clean and well lit.
  ✓ Keep bystanders away.
  ✓ Exercise common sense.

• Electrical Safety…
  ✓ Do not operate in combustible environments.
  ✓ DO NOT operate these products when wet or in water.
  ✓ ALWAYS be sure that the components of this system are running with the correct voltage (120V).
  ✓ Never remove a grounding prong or modify a plug.
  ✓ Do not abuse the power cord or plug.

• Personal Safety…
  ✓ The parts of this system are heated in excess of 500 degrees Fahrenheit. Use caution when handling your equipment during and after a test.
  ✓ Stay alert and watch what you are doing.
  ✓ Dress appropriately. Wear the appropriate personal safety devices.

• Equipment Maintenance…
  ✓ Clean Air Express can not ensure that our Method 5 meter is compatible with any other systems. See http://www.cleanair.com or call (800) 223-3977 for more information.
  ✓ Maintenance and repairs should be performed by one of Clean Air Express's trained technicians.
Customer Feedback

Clean Air Engineering takes pride in our quality products and services. We strive to provide the highest quality products and services in the industry. We realize the importance of end user input in the continual improvement of our products and services. Customer feedback is of paramount importance. **We encourage your feedback with any suggestions or problems that can help us improve our performance.** A customer feedback form is available online at [http://www.cleanair.com/About/feedback.html](http://www.cleanair.com/About/feedback.html). To emphasize our commitment to quality products and complete customer satisfaction, Clean Air Engineering’s manufacturing division, CAE Express, offers what we feel is the best and most comprehensive warranty in the environmental industry.
1 Safety
Safety should always be considered first, and proper safety procedures should be followed.

1.1 Weight and Bulk
The Isokinetic Control Console weighs approximately 70 pounds (32 kg) and has dimensions of 17.5” x 12” x 27” (445mm x 305mm x 686mm). It includes handles to make the system easier to lift and carry. However, remember to use good lifting technique in order to avoid injury. Two persons should be utilized if necessary. Do not attempt to carry the weight yourself if you do not feel comfortable doing so.

1.2 Pump Cleaning
When flushing the pump, a nonflammable flushing solvent should be used. **WARNING!!** Do NOT use kerosene, gasoline or any other flammable liquid to flush the pump!! Harmful vapors can result in personal injury or damage to the pump itself.

1.3 Electrical Shock
The system is powered by a standard 120 VAC line, meaning potentially fatal shocks are possible. It is no more dangerous than many household appliances in this regard; however, care must be taken to avoid shock. Before performing any maintenance or removing the back cover, **turn off and unplug the console** from the 120 VAC line. Be sure that the correct voltage is used in order to help prevent accidents.
2 Principles of Operation

The Isokinetic Control Console is designed to sample a gas stream. The system should be set up to extract the sample at the same rate that the gas flows from the stack. The gases are extracted through a probe and then through a heated filter chamber where a majority of the particulate is removed. The hot gases then travel through a series of chilled impingers where condensates are removed and the gases are cooled and dried before pumping. This console is suitable for EPA methods 4, 5, 5I, 6, 8, 8A, 13, 17, 23, 26, 29, and many more (with proper accessories). Access to the wiring and other components of the control box is achieved by removing the back panel of the unit. Access to the pump box is gained by removing the front panel.

2.1 Gases Analyzed

- Method 4 – Water vapor content
- Method 5 – Particulate matter
- Method 6 – Sulfur Dioxide
- Method 8 – Sulfuric Acid Mist
- Method 13 - Fluoride
- Method 17 – In stack particulate
- Method 23 – Dioxin and Furan
- Method 26 – Halides and Halogens
- Method 29 – Metals Emissions
2.2 System Components
Requires 120 V. See Figure 1 on the following page.

- (1) – Dual 8" incline manometer
- (2) – Manometer leveling wheel
- (3) – Circuit breaker switches
- (4) – Timer
- (5) – Dry gas meter index
- (6) – 6 channel temperature indicator
- (7) – Temperature controllers for probe and filter
- (8) – Thermocouple plug input bank
- (9) – Power connections
- (10) – Umbilical Amphenol connection
- (11) – Vacuum pump connections
- (12) – Pitot tube connections
- (13) – Umbilical connection
- (14) – Vacuum gauge
- (15) – Fine flow adjustment knob
- (16) – Coarse flow adjustment knob
- (17) – IGS rotometer
- (18) – IGS sample connection
- (19) – Flow clamp (positive leak check tube)
- (20) – Power cord
Figure 1

- (1) Dual Incline Manometer
- (2) Manometer leveling wheel
- (3) Switches
- (4) Timer
- (5) Dry Gas Meter Index
- (6) 6 Channel Temp. Indicator
- (7) Temperature Controllers
- (8) Thermocouple Inputs
- (9) Power Connections
- (10) Umbilical Amphenol Connections
- (11) Vacuum Pump Connections
- (12) Pitot Tube Connections
- (13) Umbilical Connection
- (14) Vacuum Gauge
- (15) Fine Control Adjustment
- (16) Coarse Control Adjustment
- (17) IGS Rotometer
- (18) IGS Sample Connection
- (19) Flow Clamp
- (20) Power Cord

Isokinetic Control Console – Method 5
2.3 System Operation

2.3.1 Description of Controls

• **AC Power Connections (9):** transfer power to the vacuum pump and an auxiliary device.
  
  **NOTE:** The vacuum pump must be connected to the “pump” outlet

• **Amphenol Connection (10):** provides power to the probe heater and filter oven

• **Coarse Control Adjustment (16):** opens and closes the sample line

• **Dry Gas Meter (5):** displays the volume of gas flowing through the internal diaphragm pump; one revolution equal 0.1 cubic feet of gas. The index indicator accumulates and displays the total gas volume. (see Figure 2)

• **Fine Control Adjustment (15):** When coarse control is open, this is used to fine-tune the gas flow rate through the system. Turn clockwise to open.

• **IGS Collection (18):** sample collection system designed to simultaneously collect a representative gas sample for the analysis of O2, CO2, and CO. Connect the sample collection bag to the ¼” fitting beneath the flow meter and adjust to the desired setting.

**WARNING!!:** The IGS system works off the orifice exhaust. Some agencies may not allow this type of sampling for compliance testing.

• **Temperature Indicator (6):** displays the temperature of each point on the selector switch.

• **Manometer (1):** indicates the DP (red oil) and DH (yellow oil). The DP gauge measures the differential stack pressure, from 0” to 8” of water, via the S-Type Pitot tube from the probe. The DH gauge measures the pressure drop across the outlet side of the dry gas meter.

• **Pitot Line Connections (12):** the connections to the positive and negative side of the Pitot tube lines in the umbilical cable assembly. Be certain to match the sample probe positive and negative with the meter console’s positive and negative.
• **Switches (3):**
  o *Power Switch:* The 15 Amp double pole circuit breaker switch, provides power to the control unit
  o *Pump Switch:* the 10 Amp circuit breaker switch, provides power to the vacuum pump
  o *Valve Switch:* Activates the solenoid that bypasses the DH column on the incline manometer. Useful for zeroing DH while running the pump. At high flow rates the switch will help prevent oil from discharging from the manometer.
  o *Leak Check Switch:* Activates solenoid that makes it possible to leak check the positive side of the meter console. To perform a leak check do the following
    1.) **Unplug the unit.** Remove rear door.
    2.) Slide copper elbow off of the orifice and plug orifice with the rubber stopper supplied.
    3.) Plug the unit in. Turn the main power switch (3) on.
    4.) Turn the valve switch (3) ‘off’ and the leak check switch (3) ‘on.’
    5.) **Close the coarse valve (16).**
    6.) Remove the elbow fitting on the low side of the manometer yellow gauge oil column. Replace with the extra fitting that is provided with the unit. DO NOT attach tubing to the new fitting, its purpose is simply to vent the manometer.
    7.) Withdraw the tubing from the upper right hand corner of the console, a white flow clamp should be attached (19).
    8.) Blow into this tube to pressurize the dry gas meter. The amount of pressure is registered on the manometer yellow gauge oil column. The system should be pressurized to 17.5 cm on the manometer (1), mark this point with a piece of tape. The white flow clamp should be closed. If no leaks are present the manometer oil will remain steady. If not, leaks should be located and fixed before testing.

• **Timer (4):** displays minutes and seconds. A backup battery is provided in case of power failure. Timer will not actuate unless the timer switch is turned on.
• **Temperature Controllers (7):** The programmable temperature controllers regulate the temperature of the sampling probe and the filter assembly oven. The controllers are set to operate at 250 degrees Fahrenheit (120°C). To change this set point use the following steps: (see Figure 3)

1.) Press the select button (3-2). 250°F will be displayed.
2.) Use the up and down buttons (3-1) to change the set point
3.) Re-autotune your equipment to the new set point
4.) Press both the up and down controls (3-1) simultaneously until AUT appears
5.) Press the select button (3-2) and hold. NO will appear
6.) Press the up and select buttons (3-1, 3-2) simultaneously until YES appears. Release
7.) The controller will autotune to the new set point. The display will flash TUNE
8.) Autotuning is complete when the flashing stops

![Figure 3](image)

2.3.2 **Meter Control Console Initial Set-up**

1.) Locate a level surface that can support the meter box console and pump box. Adjust the manometer leveling wheel to 'zero' the manometer
2.) Connect the vacuum pump to the control console as follows:
   a. Plug the male power plug into the connection marked "pump."
   b. Connect the vacuum and pressure hoses into the fitting marked "vacuum" and "pressure." The letters "V" and "P" are stamped into the fitting of each pump hose to differentiate them. Be sure that the connections are snapped into place. To check lightly tug on the connections; they should not come apart.
3.) Connect the umbilical as follows:
   a. Connect the sample line into the fitting marked “sample inlet.”
   b. Connect the Pitot Lines into the fittings marked “Pitot + and -” Be sure to match the signs.
   c. Connect the Amphenol plug into the green 4 pin fittings.
d. Connect the male thermocouple plugs into the thermocouple input bank. Be sure to match the descriptions.

2.3.3 Modular Sample Unit

See Figure 4

1.) Attach the probe onto the probe support arm (4-1) and tighten into place. Connect the two Pitot lines.
2.) Connect the sample line onto the end (or optional male fitting) of the umbilical adapter
3.) Connect the Amphenol cable to the green four pin socket (4-2)
4.) Insert the male thermocouple plug into the female socket marked “filter” (4-3)
5.) Connect the female thermocouple with the male plug labeled 4 (4-5) on the impinger outlet (4-4).
3 Routine Maintenance and Inspection

**CAUTION!!** – Do NOT disassemble this product outside the specifications of this manual! For internal maintenance and for the annual recalibration contact Clean Air Express.

### 3.1 Pump Maintenance

**Materials needed:**
- Gast Model no. 0523-V3 G21DX ¼ HP motor
- **Nonflammable** flushing solvent
- A 3/8 inch socket
- A 3/16 inch hex key wrench
- Brass hammer
- Spark gap feeler gage or .002” (0.05 mm) shim stock
- Teflon tape
- Clean rags
- Lubricating Oil:
  - Ambient temperatures below freezing: 5 parts SAE #10 to 1 part kerosene
  - Ambient temperatures from 32°F-100°F (0ºC-38ºC): SAE #10
  - Ambient temperature above 100°F (38ºC)
- Replacement parts as needed

#### 3.1.1 Pump Assembly Definitions

- **End Plate (5-3):** See Figure 5. Metal plate attached to the end of the pump motor with six indented hex washer ¼ - 20 screws.
- **Fittings:** Plumbing that connects the inlet and outlet jars to the body of the pump.
- **Intake Filter Assembly (5-2) (99370):** See Figures 5 and 6.
  - Jar 9948SJ
  - Felt Filters (6-2) 99481 / 99482
  - Oil Wick (6-1) 9948W
  - Cover Gasket 9948SG
  - Attachment Bracket
  - Brass Elbow
  - Motor Oil
- **Muffler Assembly (5-1) (9973L):** See Figure 5.
  - Jar 9948LJ
  - Felt Filter 99481 / 99482
  - Cover Gasket 9948LG
  - Attachment Bracket and Arm
3.1.2 Preventative Maintenance
Periodic checks of the oil and muffler jars are mandatory. When air testing is complete the pump should be flushed with a nonflammable flushing solvent. Use the following procedure:

- **Take apart and flush the pump**
  - Remove the pump cover
  - Remove the oiler jar (5-2)
  - Remove the felt filter and oil wick
  - Connect the outlet hose to a waste container

**Body** (7-3): See Figure 6. Metal plate that is attached to the front of the motor with two ¼ - 20 socket cap screws.

**Rotor** (7-1): See Figure 6. Rotates and contains the four vanes.

**Vane** (7-2) **(9937RV)**: See Figure 6.
Moving pieces of molded fiber. This is conjunction with the rotor causes the vacuum action of the pump.
• While the pump is running squirt flushing solvent into the hole in the inlet jars cap.
• Let the pump run for 1-3 minutes or until 1 inch (25 mm) of dirty flushing solvent accumulates in the muffler jar (5-1).

**Lubrication**
• Squirt a small amount of clean pump oil into the inlet opening after the cleaning. Run the pump to circulate the new oil and allow any remaining solvent to evaporate

**Reassembly**
• Clean the oil wick and felt filter. Be sure the wick is bent slightly in the direction of the arrow on the top of the oiler jar.
• Check and replace the cover gasket (9948SG) of the Oiler jar as needed.
• Fill the jar to the oil line with the correct oil. To ensure a good seal put a layer of Teflon tape around the threads on the jar. Put the intake filter assembly jar back on the pump.
• Empty and clean the muffler assembly jar.
• Check and replace the muffler assembly jar cover gasket as needed (9948LG)
• Clean or replace the muffler filter (99481 / 99482) and jar (9948LJ).
• To ensure a good seal put a layer of Teflon tape around the threads on the jar.
• Replace the pump cover.

### 3.1.3 Six month maintenance

**Take apart and flush the pump**
• Remove the pump cover
• Remove the oiler jar (5-2)
• Remove the felt filter and oil wick
• Remove the muffler jar (5-1). Take out the felt filter for cleaning. Replace the jar. Clean the felt filter with flushing solvent and set aside.
• Connect the outlet hose to a waste container
• Tip the pump on its side.
• While the pump is running squirt flushing solvent into the hole in the inlet jars cap.
• Let the pump run for 1-3 minutes or until 1 inch (25 mm) of dirty flushing solvent accumulates in the muffler jar. Empty and clean the muffler jar.
• Remove the end plate (5-3)
• Cleaning
  - Clean the end plate
  - Take off the pump body (7-3) and clean
  - Examine the parts for wear, replace as needed.
  - Slide the vanes (7-2) out of the rotor (7-1). Clean and replace if needed. It is recommended that if one vane needs a replacement, that they should all be replaced.

• Lubrication
  - When the parts are all clean or replace a thin sheet of oil is placed before reassembly.
  - Reinsert the vanes. Be sure they are properly positioned. The curved edge of the vane will be placed to match the curve of the rotor.

• Gapping the Rotor
  - Place the body over the rotor. Tighten the screws in such a way that the body can still be moved with light taps from a brass hammer.
  - Adjust the gap by placing a .002” (0.05mm) shim between the rotor and body. Tighten the screws
  - Turn the rotor to be sure the clearance is uniform. Make adjustments if necessary.

• Reassembly
  - Put the lightly oiled body back on the pump motor and tighten.
  - Inspect and check inlet and outlet fittings. Replace Teflon tape as needed.
  - Clean or replace the oil wick (6-1) and felt filter (6-2). Be sure the wick is bent slightly in the direction of the arrow on the top of the oiler jar at 3/8 of an inch.
  - Check and replace the cover gasket (9948SG) of the Oiler jar as needed.
  - Fill the jar to the oil line with the correct oil. To ensure a good seal put a layer of Teflon tape around the threads on the jar. Put the intake filter assembly jar back on the pump.
  - Empty the muffler filter assembly. Clean or replace the muffler filter (99481 / 99482) and jar (9948LJ) if necessary. The filter should be replaced after one year of weekly use.
  - Check and replace the muffler assembly jar cover gasket as needed (9948LG).
  - Let the pump run to allow any traces of flushing solvent to evaporate
  - Clean the muffler jar assembly. To ensure a good seal put a layer of Teflon tape around the threads on the jar.
  - Replace the pump cover.
3.2 Maintenance Outside the Pump

General cleanliness will extend the life of your equipment. The outside of the console can be safely cleaned with window cleaner or soapy water. Always check the inside for oil leaks, tubing damage, and wire damage. It is also recommended that the unit is returned to CleanAir Express annually for recalibration and maintenance. All tubing will be replaced (932511), a full electrical test will be performed, and the system will be recalibrated. Yearly recalibration is necessary.

3.3 Other Maintenance Issues

For any other maintenance issues, concerns, or questions, please contact Clean Air Express at (800)-223-3977. Clean Air Express can also be reached by mail at 212 N. Woodwork Lane Palatine, IL 60067; by fax at (847)-991-8924 or on the web at http://www.cleanair.com/equipment/Express/main.html
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause(s)</th>
<th>Fix</th>
</tr>
</thead>
</table>
| Pump motor fails to start or slows down when load is present | Tripped circuit breaker  
Bad wires  
Incorrect power  
Unit is too cold | Reset circuit breaker  
Examine wires  
Check for correct voltage  
Bring unit to room temp. |
<p>| Pump stalls                                  | Pump is dirty or foreign matter has entered the pump.                            | Disconnect pump’s pressure and vacuum lines from the meter console. Remove pump intake filter assembly (5-2). Shoot a small amount of solvent (Carbo-sol) into the air inlet while the pump is running to flush the pump. Continue to flush until it runs freely. Squirt clean oil into the inlet to lubricate the vanes (7-2). Empty the exhaust jar of the muffler assembly (5-1). Reassemble jar assemblies |
| Tapping sound from pump assembly             | Insufficient clearance in the pump                                               | The pump needs to be regapped. See the six month maintenance section (page 14) |
| Pump motor is overheating                    | Too much friction due to insufficient clearance                                  | The rotor needs to be regapped. See the six month maintenance section. An adequate substitute for a feeler gage is a piece of cellophane tape. (about .002” or .05 mm). |
| No oil getting to the pump for lubrication   | 🔄 CAUTION!! – If the pump is not properly lubricated it can cause damage to the pump. Always be sure that there is a sufficient amount of oil in the Oiler jar. | Take apart and reassemble the Oiler jar (5-2), making sure that the wick (6-1) is not too far in. Be sure there is a sufficient amount of oil. Temperature can also affect the rate of lubrication. |</p>
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause(s)</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign matter in the pump</td>
<td>Disconnect pump’s pressure and vacuum lines from the meter console. Remove pump intake filter assembly (5-1). Shoot a small amount of solvent (Carbo-sol) into the air inlet while the pump is running to flush the pump. Continue to flush until it runs freely. Squirt clean oil into the inlet to lubricate the vanes (6-2). Empty the exhaust jar of the muffler assembly (5-1). Reassemble. The pump head may have to be removed in order to dispose of foreign matter.</td>
<td></td>
</tr>
<tr>
<td>Manometer cannot be zeroed</td>
<td>Not enough oil in the manometer</td>
<td>Add more oil to the manometer as needed (0058R., 0058Y).</td>
</tr>
<tr>
<td>Manometer rises instead of falling when pump is turned on</td>
<td>Pressure and vacuum hoses are most likely switched.</td>
<td>Check the hoses. Switch if necessary</td>
</tr>
<tr>
<td>Heated probe or filter does not warm</td>
<td>Bad connection</td>
<td>Check all connections Replace relay (9129)</td>
</tr>
</tbody>
</table>
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Isokinetic Control Console – Method 5
# Isokinetic Control Console – Method 5

## Clean Air Engineering

### Parts List

#### Isokinetic Control Console

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Parent Part #: 0028

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UM</th>
<th>TYPE</th>
</tr>
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<tbody>
<tr>
<td>0028F</td>
<td>M-5 Meter Box Face Plate</td>
<td>1.0</td>
<td>EA</td>
<td>A</td>
</tr>
<tr>
<td>0028D</td>
<td>Dry Gas Meter Sub Assembly</td>
<td>1.0</td>
<td>EA</td>
<td>A</td>
</tr>
<tr>
<td>0028C</td>
<td>M-5 Meter Box Chassis (assy)</td>
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<td>0028PMP</td>
<td>M-5 Meter Box Pump Box Assy</td>
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<td>0028FB</td>
<td>Meter Box Fuse Bracket (Sub) Assembly</td>
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Sub Part #: 0028C
M-5 Meter Box Chassis

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<tr>
<td>9512</td>
<td>Male Elbow 3/8&quot;T-1/4&quot; MNPT Brass</td>
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<tr>
<td>99312</td>
<td>Meter Box Chest Front Panel</td>
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<tr>
<td>99313</td>
<td>Meter Box Chest Rear Panel</td>
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<td>EA</td>
<td>R</td>
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<tr>
<td>99314</td>
<td>Meter Box Chest Outer Shell</td>
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<td>9721</td>
<td>Rubber Grommet 3/8&quot; x 1/2&quot;</td>
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<td>EA</td>
<td>R</td>
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<tr>
<td>9935</td>
<td>M5 Meter Box Chest Handles</td>
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<td>Compressing Spring</td>
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<td>Manometer 8&quot; Dual Incline</td>
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<td>EA</td>
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<td>9952</td>
<td>Clamp (Pinch Style)</td>
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<td>9100M</td>
<td>QC Manometer Male</td>
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<td>R</td>
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<td>9100F</td>
<td>Female QC Manometer</td>
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<td>R</td>
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<td>9950</td>
<td>Finishing Plug</td>
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<td>EA</td>
<td>R</td>
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<tr>
<td>9511</td>
<td>Insert 3/8&quot; OD-1/4&quot;ID X 1/16&quot; Wall SS</td>
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<td>EA</td>
<td>R</td>
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<tr>
<td>9524</td>
<td>Rubber Stopper</td>
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<td>00028</td>
<td>Manometer Adjustment Plates</td>
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<td>Series 50 Slide Latch</td>
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### Parts List

#### Sub Part #: 0028D
**Dry Gas Meter Sub Assembly**

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<th>DESCRIPTION</th>
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**Meter Box Fuse Bracket**

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Sub Part #: **0028PMP**
M-5 Meter Box Pump Box Assembly

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## Parts List

**CLEAN AIR ENGINEERING**  
**SUMMARIZED BOM**  
**ISOKINETIC CONTROL CONSOLE**  
**PAGE 4**

Sub Part #: **0028F**  
M-5 Meter Box Face Plate Assembly (1)

**Type:** A

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### Isokinetic Control Console – Method 5

**Parts List**

**CLEAN AIR ENGINEERING**  
**SUMMARIZED BOM**  
**ISOKINETIC CONTROL CONSOLE**  
**PAGE 5**

Sub Part #: **0028F**  
M-5 Meter Box Face Plate Assembly (2)  
Type: **A**

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Isokinetic Control Console – Method 5

Parts List

- **Vanes** 9937RV
- **Oiler Jar Assembly** 9937O
- **Muffler Jar Assembly** 9973L
- **Cover Gasket** 9948LG
- **Felt Filters** 99481/99482
- **Exhaust Jar** 9948LJ
- **Felt Filters** 99481/99482
- **Oil Wick** 9948W
- **Oiler Jar Cover Gasket** 9948SG
- **Pump Oil** 9937O
Isokinetic Control Console – Method 5

- Manometer Oil 0058R., 0058Y
- Manometer 00588
- Temperature Controllers 91301
- Power Cord 9110
- Amphenol Connection 9418
- Power Connections 9141A

Parts List
Parts List

- Isokinetic Control Console – Method 5

- Clear polyethylene tubing 932511
- Dry Gas Meter 9922
- Relays 9129
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