



Petersen
Products Company

Multi-Flex® Inflatable Plug

Instruction Manual

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WARNING

Read and understand before using Petersen Inflatable Plugs!
Failure to comply may result in property damage, serious injury or death!
These instructions must be available to all users. Train all personnel for proper use.

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Important Safety Instructions

Safety is Everyone's Responsibility



WARNING

Extremely high forces are involved in many pipeline-plugging situations that may cause injury or even death. Forces increase dramatically as pressure and pipe diameter increase. Extreme care is required to ensure the safe use of any Inflatable Plug.

- All inflatable plugs must be anchored adequately.
- Do not use inflatable devices as the primary protection for personnel downstream.
- Debris or protrusions into the pipeline can damage a seal or reduce the pressure rating. NEVER use a test pressure greater than the capacity of the weakest pipe or component in the system.
- Consult qualified personnel if you cannot calculate the risks or forces involved.
- Do not exceed the pressures on the plug label.
- Never use equipment when a failure could result in injury or significant property damage. Inflatable devices may not be used as the primary protection for personnel downstream.
- Because of the many possible variables, these general instructions must be adapted by an engineer for each specific project. Instructions and training must be provided to all plug users and workers on the job.

Personnel Safety



CAUTION

Keep all personnel away from the plug end area.

- Wear required PPE including but not limited to eye protection, helmet, hearing protection.
- Follow all confined space safety controls. Confined space authorization, air monitor, and ventilation may be required.

Safety Inspections

- Thoroughly inspect the inflatable plug for abrasions, cuts, or physical damage. Clean the plug if required.
- If outside a pipe, do not inflate an inflatable plug greater than 5 psi or above 5% of rated pressure.
- Gather all required tools. Have all personnel ready when installing and removing any type of inflatable plug.
- Verify that the air line connections and hoses are not damaged or leaking.
- Use two accurate calibrated pressure gauges to measure the pipeline head pressure.
- Prepare to equalize pressure on both sides of the inflatable plug before installation **and** removal.
- Use two accurately calibrated pressure gauges that agree to monitor the inflation pressure.
- Verify that the pipeline flow is stopped.

Contact the project engineer or Petersen if needed. Safety is the highest priority.

Common Anchoring Methods

- Use a strongback outside the pipe.
- Drill anchor points into tunnel walls.
- Weld anchor lugs into the pipe.
- Petersen can make an anchor ring with set screws to fit with your Inflatable Plug.

Pre-Work Inspection

The Petersen Multi-Flex® Inflatable Plugs can be used for multiple pipeline systems and may require a variety of tools. Verify all required tools and equipment are available.



WARNING

Read and understand instructions before using Petersen Inflatable devices. Failure to comply may result in property damage, serious injury, or death.



Safety

Survey the work area for unsafe conditions. Verify all people have read the Product Labels, Scope of Work, and instructions developed specific to the project.



NOTE

Petersen recommends inspecting the Inflatable Plugs after every use. Covers can be damaged when inserting into a hot tap. Often Inflatable Plugs can be refurbished and recertified by Petersen Products to like-new condition or set interval to match quality standards.

Contact Petersen to confirm the suitability of the Inflatable Plug if needed.

Guidelines for the Inflatable Plug



Note

Keep all personnel away from the Inflatable Plug during inflation.

- Never inflate an Inflatable Plug outside of a pipe.
- Never exceed the maximum inflation pressure rating for the Inflatable Plug.
- Control and monitor the plug inflation at a safe distance.
- Use two accurate gauges to monitor the head pressure.
- Inspect the air line connections and hoses for any possible physical damage or leaks.

Calculating the Head Pressure

Calculate the required head pressure to confirm effective and safe plugging. Follow these guidelines to calculate the head pressure:

1. $F = P * S$

- Force F on the plug is the plug slipping force.
- Pressure P measured as water column height must be converted to a force over area format for the equation above.
- S is the cross-sectional area

2. Round pipes only: the cross-sectional area S is determined by:

- $S = \pi r^2$
- Where $\pi \approx 3.14159$ (approximate) and r (radius) = $\frac{1}{2}$ the pipe inside diameter.

Example:

- Water column 10 m (32.8 ft) high, converts to a back pressure of 98.0 kPa (14.5 psi).

3. The configuration or liquid surface area does not affect pressure, only elevation. The pressure is multiplied by the pipe/plug diameter to arrive at the plug slipping force.

- Pressures exerted on a plug are the same for liquid, water, or air.
- 68.9 kPa (10 psi) of water = 68.9 kPa (10 psi) air.
- Pressures from gasses (e.g., air, nitrogen) are compressible and more dangerous than water.
- Gas will expand to its original atmospheric volume upon release. Discharging a slipping plug will have much greater force.

Inserting the Inflatable Plug



Note

Never exceed the maximum rated head pressure for the Inflatable Plug measured at the Pipe Invert.

1. Clean the pipe before inserting the plug. Remove any dirt or debris.
2. If needed, use a Kevlar or Protective Sleeve available from Petersen before installing.
3. Stop the pipeline flow. Verify that the pressure is equalized from both sides.
4. Insert the Inflatable Plug completely so that it is fully supported by the pipeline. Molded rubber inflatable plugs expand in diameter and axially.
Note: The Inflatable Plug must be inserted at least one pipeline diameter beyond the end of the Pipe.
5. Verify that there no sharp edges or protrusions that may damage the plug.
6. Equip an anchor or support to adequately secure the Inflatable Plug
7. Evacuate from the plug area, open end of the pipeline or manhole when the plug is holding back pressure.

Inflating the Plug



Note

Inflate the Inflatable Plug at least twice the Pipeline Pressure. Do not exceed the Rated Pressure.

Air or Inert Gas Inflation

- Use the Gauge to verify Head Pressure Readings.
- Purge the Pressure Monitor Hose of water for accurate Gauge readings.
- Molded rubber plugs must be inflated up to the rated pressure to properly expand the rubber.

Water Inflation



Note

Calculate the actual inflation pressure at the invert.

- Petersen recommends using water inflation with larger and high-pressure plugs. Water is not compressible and reduces damage if a possible issue occurs.
- Use the estimated volume of water and monitor the inflation pressure for over filling.
- Do not exceed the inflation pressure on the rated plug.
- Remove air from the system as the Inflatable Plug fills with water.

Monitoring the Inflation Pressure



Note

Never exceed the inflation pressure on the rated plug. Measure readings at the pipeline invert.



Note

Verify that all air is expelled from the pressure monitoring hose for accurate readings.

- Add 9.79 kPa per meter (0.433 psi per foot) the gauge connection is above the pipeline invert.
Note: Usually $\frac{1}{2}$ the pipe diameter for end inflation plugs.
- Each Inflatable Plug requires an inflation hose. Plugs with two ports require a separate monitoring hose.
- Petersen recommends using a Low Pressure Alarm to monitor pressure. If the pressure drops below the setpoint, the alarm will sound.

Deflating the Plug

Air or Inert Gas Deflation



NOTE

Do not pull on the Inflation Hose to remove the Inflatable Plug.

- Disconnect the air source and open any valve on the Inflatable Plug.
- Petersen recommends using a Vacuum Generator to deflate larger Inflatable Plugs.

Water Deflation

- Disconnect the water source from the Inflatable Plug.
- Connect the hose to the water outlet.
- Verify that the water outlet hose drains into a tank or area that can collect the drained water.
- Monitor and track the output as needed.

Removing the Plug

- Carefully remove the Inflatable Plug only after it is completely deflated.

Plug Storage and Cleaning

1. Before and after each use, clean the plug and inspect for surface tears, cuts, or any other damage.
2. Clean with mild soap and water.
3. The plug can be inflated for cleaning and inspection. Do not exceed the lesser of 5% of the plugs rated pressure.
4. Do not allow the plug to remain in sunlight for long periods of time to prevent damage.
5. Verify that the plug is empty of water and dry prior to storage in a dry location.
6. Keep the instructions with the plug.

Do not use the product if there is significant wear or damage or return to Petersen for repair and recertification.

Call Petersen with any questions or suggestions relating to the use of any Petersen product



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