Packer & Grouting System

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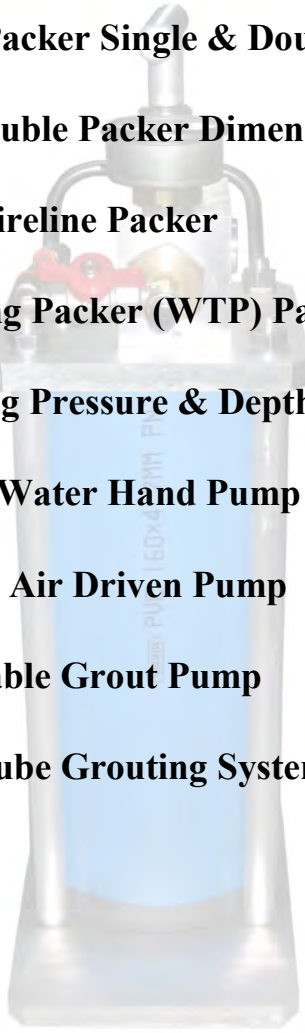

Inflatable Packer Single & Double

Single & Double Packer Dimension

Wireline Packer

Water Testing Packer (WTP) Packer

Packer Working Pressure & Depth Chart

Packer Water Hand Pump

Packer Air Driven Pump

Portable Grout Pump

Double Tube Grouting System

优钻地质材料供应有限公司

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Inflated Single Packers
(28 - 170 mm)

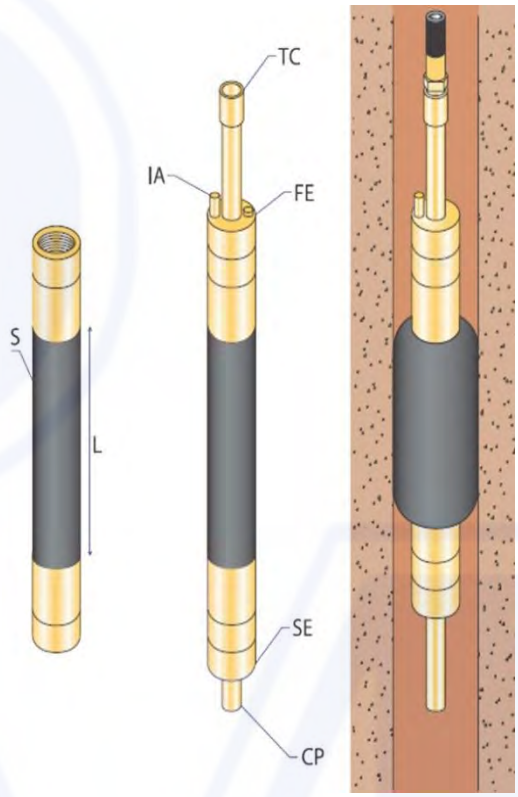
PM manufactures a complete range of inflatable single packers available in nine different diameters from 28 mm up to170 mm. These packers are mainly used for cement grouting, permeability testing…

The basic components of the packers are:

- **The upper fixed end (FE)** equipped with one or two inflation inlets with one adapter.
- **The center pipe (CP)**, made of stainless steel
- **The dilatable element (S)**, mounted with steel fittings on both sides
- **The sliding end (SE)**, equipped, up to 102 mm, with a scraper ring.

All ***PM*** packers are supplied with **inflation adapter IA (quick coupling type).** Cutting ring coupling is also available on request.

The length (L) of the dilatable element depends on the application requirements.



Standard lengths are:

- **L: 300 mm** for 28, 30 and 42 mm packers.
- **L: 500 mm and 1000 mm** for 28, 30, 42, 56, 72, 85 and 102 mm packers.
- **L: 1000 mm** for 130 and 170 mm packers.

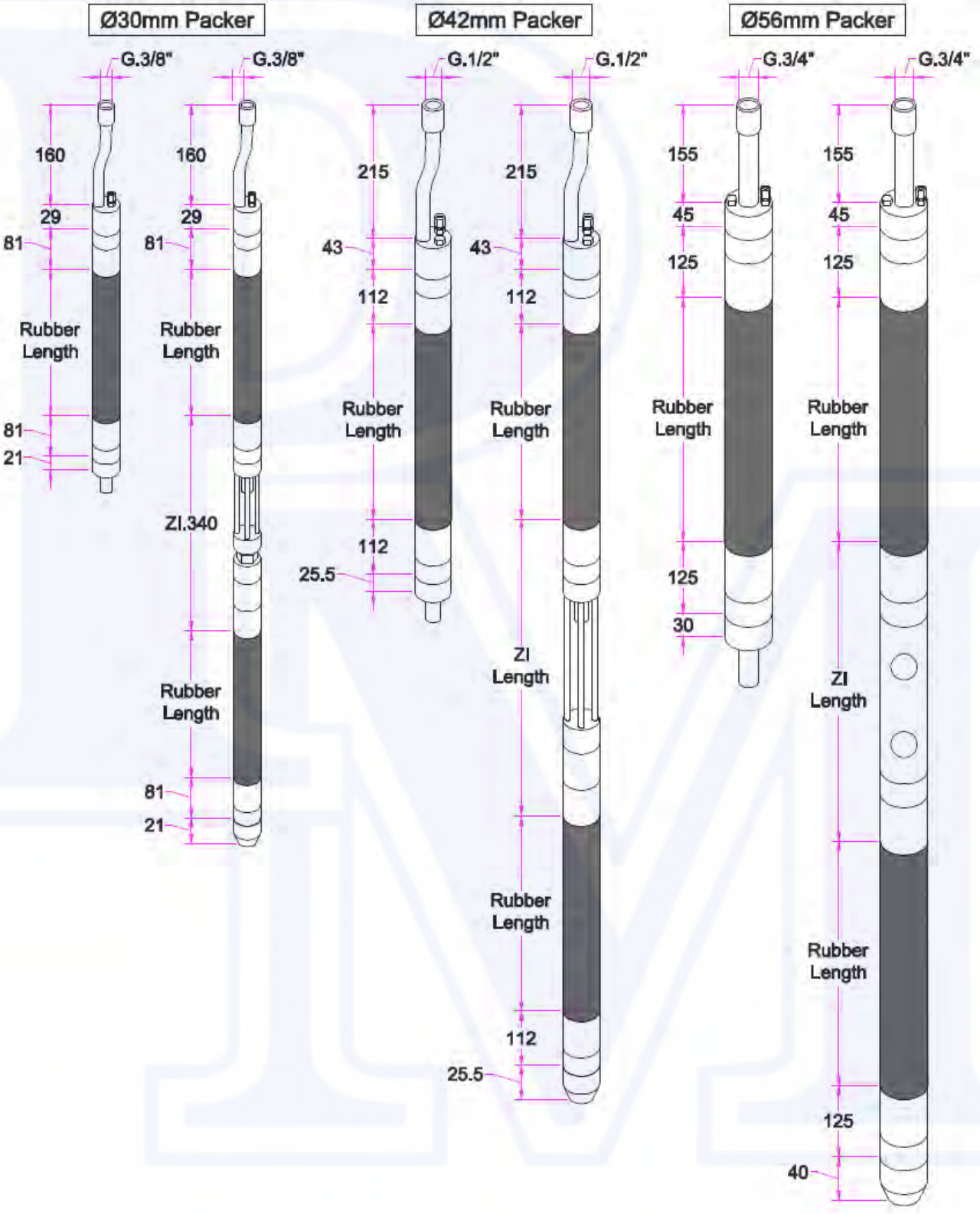
Other lengths are also available on request. These single packers can be easily transformed into ZI double packer.

Main specifications and dimensions of single and double packers

Nominal Diameter (mm)	Connection Upper "TC"	Central Tube "CP" Inner Diameter (mm)	Expansion Max. Diameter (mm)	Bore-hole Max. Diameter (mm)	Inflation Inlet(s)
28	⅜" BSP*	8	55	50	1 x ⅛" BSP
30	⅜" BSP	8	55	50	1 x ⅛" BSP
42	½" BSP	17	98	90	2 x ⅛" BSP
56	¾" BSP	20	125	110	2 x ⅛" BSP
72	1¼" BSP	35	160	150	2 x ⅛" BSP
85	1¼" BSP	35	185	170	2 x ⅛" BSP
102	2" BSP	53	200	190	2 x ⅛" BSP
130	3" BSP	83	270	240	2 x ¼" BSP
170	3" BSP	83	350	330	2 x ¼" BSP

** Optional ¼" connection available on request*

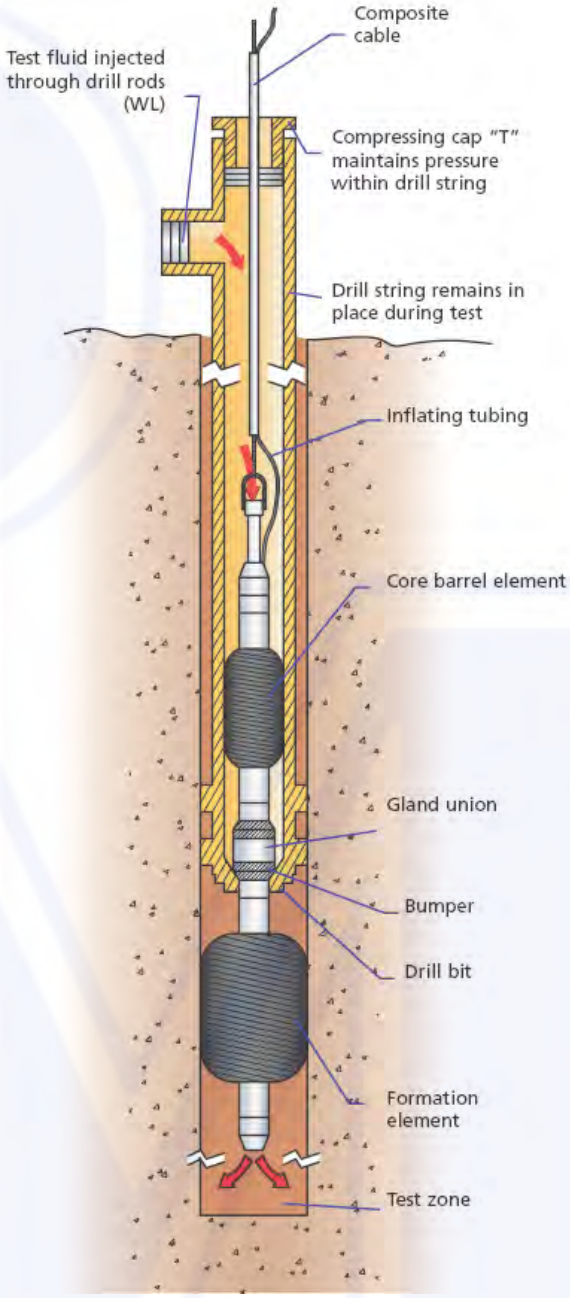
All dimensions and characteristics are indicative only and may be modified without prior notice



Inflated Packers for Wire-Line Core Barrels

This system is an easy way of positioning a PM inflatable packer below the wire-line core bit in open hole for conducting permeability testing.

This packer assembly incorporates a positioning ring which rests on the drilling bit inner shoulder. This positioning ring end can be fitted, on request, with pressure transducer for read out of the "in situ" pressure especially useful for permeability tests. This simple and economical device saves time for the rig operator and is available for al makes of core labels.



Different options are available:

- pressure intake at top of packer
- double packer attachment and extension zone test kits

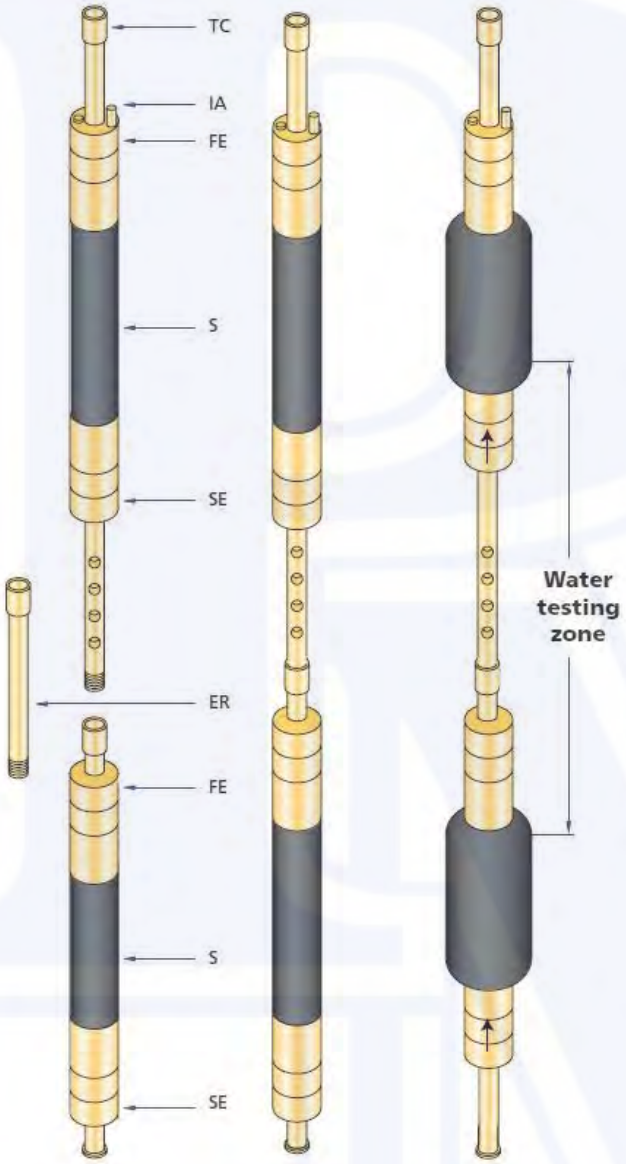
*** Pressure intake option**

Conducting a permeability test

- Remove inner tube assembly.
- Raise drill string off bottom, leaving desired test zone.
- Install seal tee assembly at top of drill string.
- Lower wire line packer assembly.
- Tighten compression cap.
- Connect composite cable to source of compressed fluid.
- Inflate wire line packer.
- Inject water through seal tee assembly wire line rods and packer into the test zone.
- Perform permeability test.
- Deflate wire line packer.
- Remove packer and seal tee assembly.
- Reinsert inner tube assembly.
- Lower drill string and resume drilling

Wire-line core barrels nominal Ø	Bore-hole Ø (mm)	Core-bit ID Ø (mm)	Packer Nominal Ø (mm)	Recommended Max. Working pressure (bar)
N	75.6	47.6	42.0	40
H	96.3	63.5	56.0	35
P	122.3	85.0	72.0	30
S	146.3	102.0	98.0	30

WATER TEST LINE (WTP) DOUBLE PACKER



A double packer «WTP» especially designed for Lugeon and water testing. It is available in sizes from 42 up to 170 mm.

The main components of the double packer type « WTP » are:

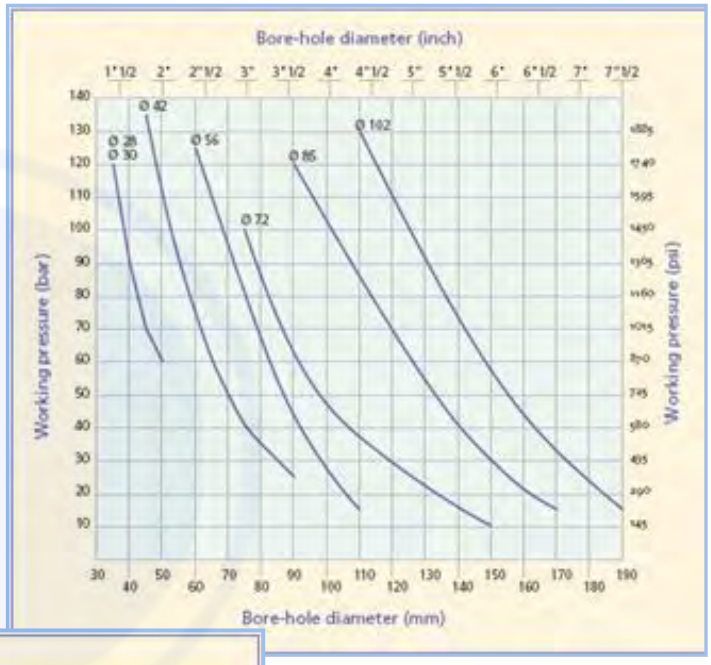
• The upper packer is equipped with one inflation adapter IA and onto the fixed end FE. The tube of the upper packer is perforated in its bottom part. Water testing is conducted by injecting water into the ground through the holes of this perforated tube.

• The lower packer equipped with a fixed end at its top and a central tube. There is no inflation port on the fixed end.

• The two packers are connected together to build the double packer. The distance or test zone between the two packers can be increased in the field easily using an extension tube ER.

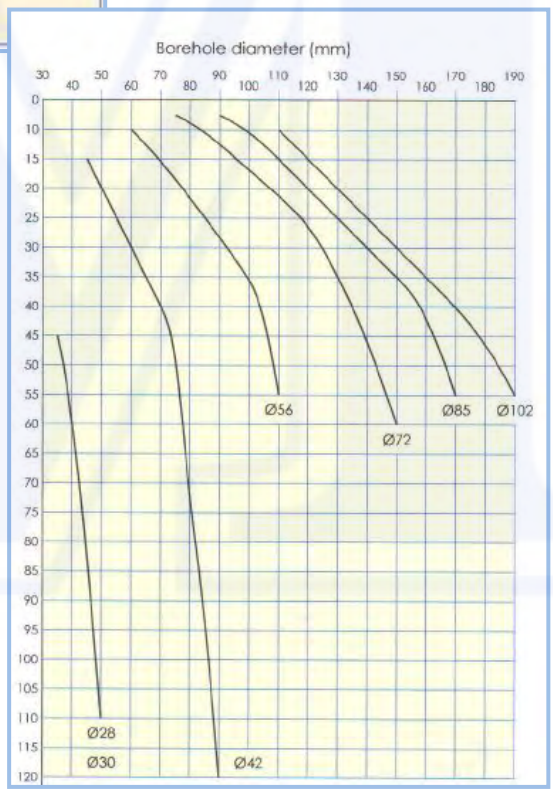
Inflation fluid flows inside these extension tubes to inflate the bottom packer. No outside inflation line is required.

Maximum working pressure for Ø28 to Ø102 mm versus borehole diameter



Maximum working pressure for Ø130 to Ø170 mm versus borehole diameter

Maximum setting depth (m) in a dry hole with water inflation



Inflation Hand Pump Model VHP100

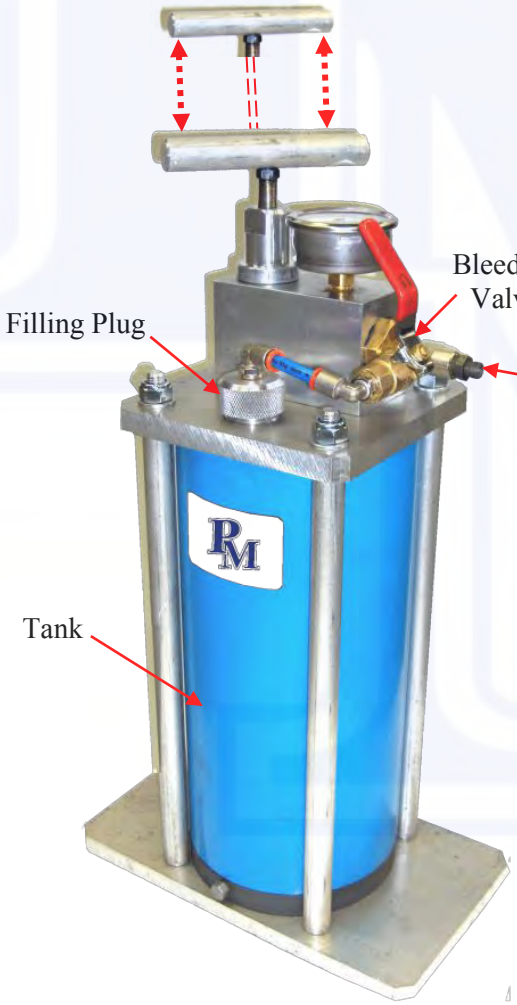
VHP 100 pump is particularly well adapted to the inflation of our packers or to any other application requiring a setting under water pressure.

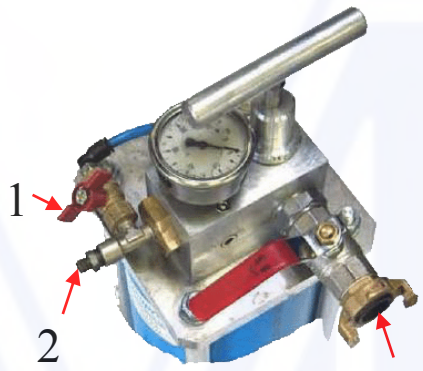
The design of the pump VHP 100 allows the assembly of the option "feeding" which facilitates the filling of large volumes without actuating the pump and a fast pressurization.

Entirely realized out of plastic materials and aluminum, the VHP100 pump does not require any maintenance in particular and is not sensitive to the problem of corrosion often encountered on the working sites.

TECHNICAL DATA

Piston ∅	10mm
Piston Stroke	32mm
Displacement	25cm^3
Maximum Pressure	100bar
Weight	9.5kg
Tank Volume	6 litres
Pressurized Fluid	Eau
Pressure Gauge	0-100bar
Outlet Thread	¼" BSP





1 - Bleeding Valve to the tank
2 - Inflation Adaptor Outlet (1/4" BSP) to Packer
3 - Optional Item: Water Supply Hose Fitting

HOW TO USE A VHP100 HAND PUMP

1°- Remove the filling plug, fill the tank with clean water or glycol and put back the plug on.
2°- Close the bleeding valve and prime the pump with successive vertical movement of the handle.
3°- When the water comes out of the inflation adapter, connect the inflation hose on the pump.
4°- Inflate the packer up to the requested pressure. (Direct reading on the pressure gauge)
5°- When the operation is finished (grouting or water testing), open the bleeding valve.
The gauge displays immediately 0 bar but the packer is still inflated, wait a short time before moving of the packer.
6°- Move the packer
7°- Close the bleeding valve and repeat since 4°

PACKERS INFLATION WITH WATER PUMP MODEL P-160

Double Effect P160-Pump

Premat supplies a large range of air driven pumps. Six pump ratios are available from ratio 10 for output pressure of 70 bar/1025 psi up to ratio 115 for a maximum output pressure of 800 bar/11400 psi. The output pressure is related to the pump ratio multiplied by the air inlet pressure. Our pump ratio 10 is specially well adapted to the inflation of our inflatable packers. Other ratios with working pressure up to 3650 bar/52200 psi are available on request.

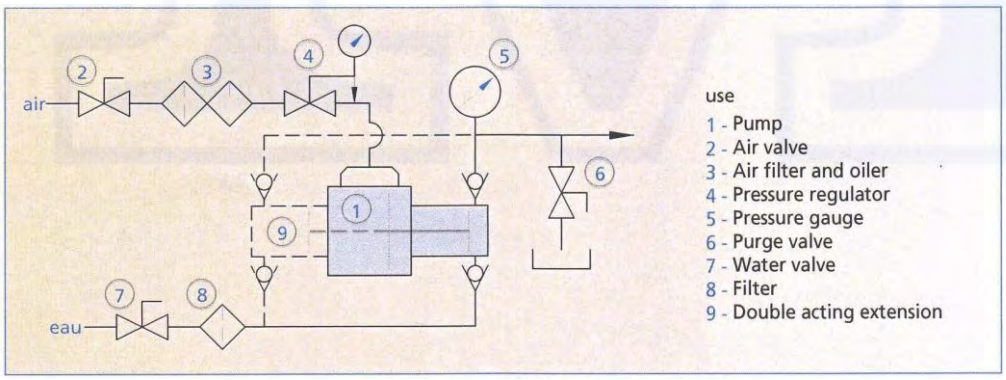
In order to give the best support and service to our customers, these pumps are supplied bare or fully equipped, mounted or not on skids as per your requirements. They are also available in single or double acting configuration. Numerous other applications of these pumps include hydrostatic pressure testing of pipes or sewers, feeding of hydraulic systems, water infusion into coal seams etc.

Set of spare seals and parts are available as well as kits to change the ration of the pump

Single Effect P160-Pump

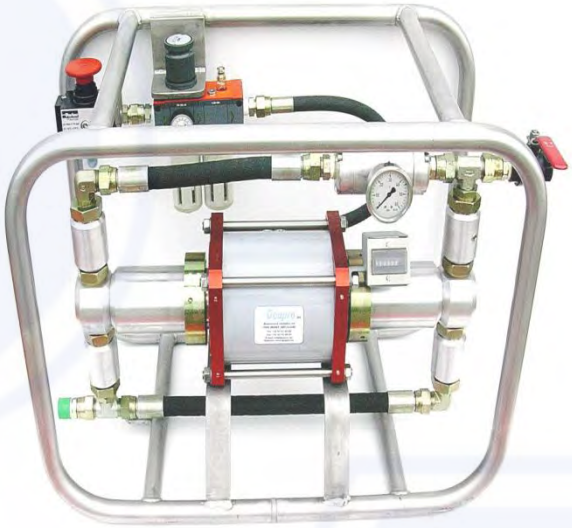
Pump Type	Ratio	Max. Pressure (bar/psi)	Single Acting		Double Acting	
			Flow Max. (L/min)	Volume per cycle (cc)	Flow Max. (L/min)	Volume per cycle (cc)
P160-10	10	70/1025	26.3	98	50	196
P160-20	20	145/2100	13.2	48	25	96
P160-30	30	200/2850	9.5	35.5	18	70.6
P160-40	40	285/4100	6.4	24.5	12.2	49
P160-65	65	450/6400	4.2	15.7	8	31.4
P160-115	115	800/11400	2.4	8.8	4.5	17.6

Principle Sketch/ Components



PORTABLE GROUT PUMP MODEL PGP-35-5

The PGP-35-5 portable grout pump is an air-driven, double acting piston pump specially designed for injection of cement slurry. It is also suitable for use with bentonite mud, water and similar fluids. The pressure output is based on the difference in area between the air piston and the fluid piston. This ratio is 5 for the standard grout pump giving a working pressure up to 35 bar (500 psi) (*) at standard 7 bar (100 psi) air inlet pressure. This pump's light weight and compact dimensions make it ideal for use on work-sites where space restrictions make it extremely difficult or impossible to use heavier equipment.



*The option PGP70-10 Pump is available on request: 1000psi (70bar), 6 gallons (35 litres) per minute

Main Specifications	
Grout Pressure	0-35 bar (0-500psi)*
Inlet Air Pressure	0-7 bar (0-100psi)
Flow Rate	0-45 L/min (12 gallons)
Air Cylinder Diameter	160 mm
Fluid Cylinder Diameter	70 mm
Suitable Fluids	Water, Bentonite Mud, Cement Slurry
Valves	Ball Type
Dimensions	700 x 500 x 400 mm
Pump Skid Assembly Weight	38 kg (84 lbs)
Air Inlet Thread	½" BSP
Fluid Inlet Thread	¾" BSP
Fluid Outlet Thread	¾" BSP
Air Consumption	1,5 m^3/min (16 cfm)
Pumped Volume Per Cycle	0,4 litre (0.11 gallon)

JET GROUTING SYSTEM – DOUBLE TUBE

APPLICATION

Jet Grouting or High Pressure Injection is a ground stabilization technique as well as a sealing method used in soil conditions ranging from loose sediment up to soft rock structures.

In the Jet Grouting process a cement suspension is injected at pressures of 100-600 bar (1,450-8,700 psi) through the jet grouting tooling and into the soil in the drilled hole. The cement suspension mixes with the surrounding soil at the Jet Grouting tool string is slowly rotated and retracted from the hole. The result is a subsurface grout column.

Jet grouting is performed with either single, double or triple tube jet grouting systems.

• A double tube jet grouting system is made up of drill rods that have an inner and outer tube providing two separate paths for injection of the cement suspension and high pressure air in to the soil. The air shrouds the cement stream as they both pass through a special nozzle and reducing the width of the cement stream injected into the soil. This focused jet stream allows better penetration into the surrounding materials resulting in larger diameter and better quality grout columns.

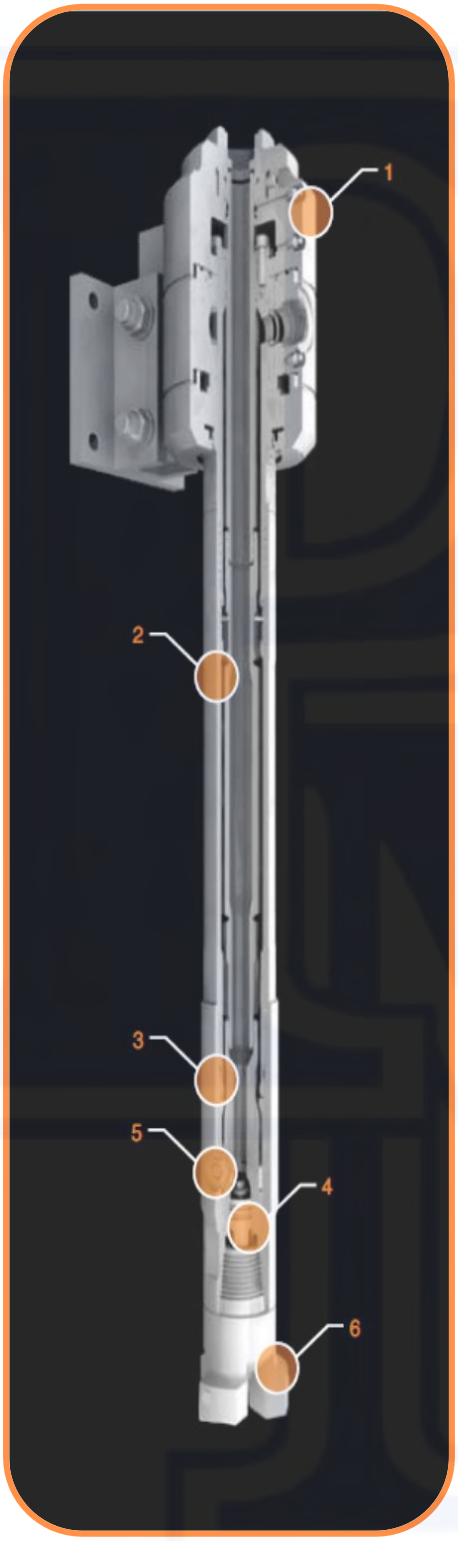
• A triple tube jet grouting system includes a third tube which carries water in addition to the cement and air. This further enhances diameter and quality of the resulting jet grout column.

Jet Grouting tools are designed to withstand high injection pressures using proper materials as well as specialized seals between the rod joints. Above the drill bit is the drill string monitor which houses the injection nozzles as well as the automatic valve which controls flushing and injection. The automatic valve allows regular low pressure flushing through the drill bit while the hole is being drilled. Once high pressure fluids are injected into the drill string the automatic valve closes directing the high pressure flow out through special injection nozzles.

DIAMETER OFFERING

HOLE∅	
88.9mm	
101.6mm	

Courtesy of BOART LONGYEAR



FLUSHING HEAD (1)

Flushing heads for double tube jet grouting systems provide the connection point to the drill string for the flushing media during drilling as well as the high pressure grout and air during grout injection. Flushing heads are mounted to a flushing head carrier which allows the head to move up the mast extension on the rig.

ROD (2)

Double tube jet grouting rods provide the drill string for drill rotation and flushing as well as the path to the nozzles for the high pressure grout injection. Rod ends are constructed of high strength nitrated steel and friction welded to an annealed mid-body. Inner tubes in the dual tube systems are secured inside the outer rod utilizing a circlip or wire fuse connection. Rods come with special seals between rods which resist damage from abrasive grouts and multiple cycles of making and breaking rod joints.

VALVE FASTENER (MONITOR) (3)

The valve fastener (also called a monitor) mounts between the drill rod string and the drill bit. The valve fastener contains the injection nozzles as well as the automatic valve.

AUTOMATIC VALVE (4)

The automatic valve is located within the valve fastener and controls the flow of both low pressure flushing fluids and high pressure grouting media. During the drilling operation the spring-loaded automatic valve allows for flushing fluids to pass out through the drill bit. When high pressure grout is introduced into the drill string the automatic valve will close directing the jet grouting media and air out through the injection nozzles in the valve fastener.

INJECTION NOZZLE (5)

The grout injection nozzles mounted in the valve fastener are the exit point for the high pressure grout into the grouting zone. Injection nozzles are constructed with a tungsten carbide body with a threaded steel base. The nozzles are available with various sizes of a standard round injection orifice or a ribbed injection orifice.

ROTARY BIT (6)

The rotary bit for a single tube jet grouting system mounts below the valve fastener. They are designed for rotary drilling only in overburden. They come in a variety of winged bit designs with tungsten carbide inserts and flushing ports.

Courtesy of BOART LONGYEAR