

MPG1™
Manual Pressure Generator/Controller
for Hydraulic Pressure
Operation and Maintenance Manual



High pressure liquids and gases are potentially hazardous. Energy stored in these liquids and gases can be released unexpectedly and with extreme force. High pressure systems should be assembled and operated only by personnel who have been instructed in proper safety practices.

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ABOUT THIS MANUAL



This manual provides the user with the information necessary to operate an MPG1 Manual Pressure Generator/Controller. It also includes additional information provided to help you optimize MPG1 use and take full advantage of its many features and functions.



For those of you who “don’t read manuals”, go directly to section 2.3 to set up your MPG1. Then go to section 3.2. This will get you running quickly with minimal risk of causing damage to yourself or your MPG1. Then... when you have questions or start to wonder about all the great features you might be missing, get into the manual!

Manual Conventions



(CAUTION) is used throughout the manual to identify user warnings and cautions.



(NOTE) is used throughout the manual to identify operating and applications advice and additional explanations.

NOTES



1. INTRODUCTION

1.1 PRODUCT OVERVIEW

The **DHI** Manual Pressure Generator/Controller for hydraulic pressure (MPG1) provides a compact and easy to use system for manually generating, setting and finely adjusting pressures between atmosphere and 200 MPa (30 000 psi) in closed volumes. MPG1 is a standard pressure generation and control component for working with **DHI** PG7302 piston gauges or liquid operated RPM4 reference pressure monitors.

1.2 SPECIFICATIONS

Pressure Range:	MPG1-200M: Atmosphere to 200 MPa (30 000 psi)
Variable Volume Displacement:	MPG1-200M: 11 cc (0.7 in ³)
Variable Volume Stroke	15.2 cm (6 in.)
Reservoir Capacity	362 cc (22.1 in ³)
Pressure Connections:	DH 500 (DH500 is a gland and collar type fitting for ¼ in. (6 mm) coned and left hand threaded tube. DH500 is equivalent to AE F250C, HIP HF4, etc.)
Operating fluid	Any non-corrosive oil, water, water/alcohol. Inquire about other fluids
Dimensions:	260 mm x 144 mm x 410 mm (WxHxD) (10.2 in. x 5.7 in. x 16.1 in.) (see Section 1.4) Variable volume handle span: 457 mm (18 in.)
Weight:	20 kg (44 lbs.)



Due to a policy of continual product improvement all specifications are subject to change without notice.

1.3 LOCATION OF THE COMPONENTS

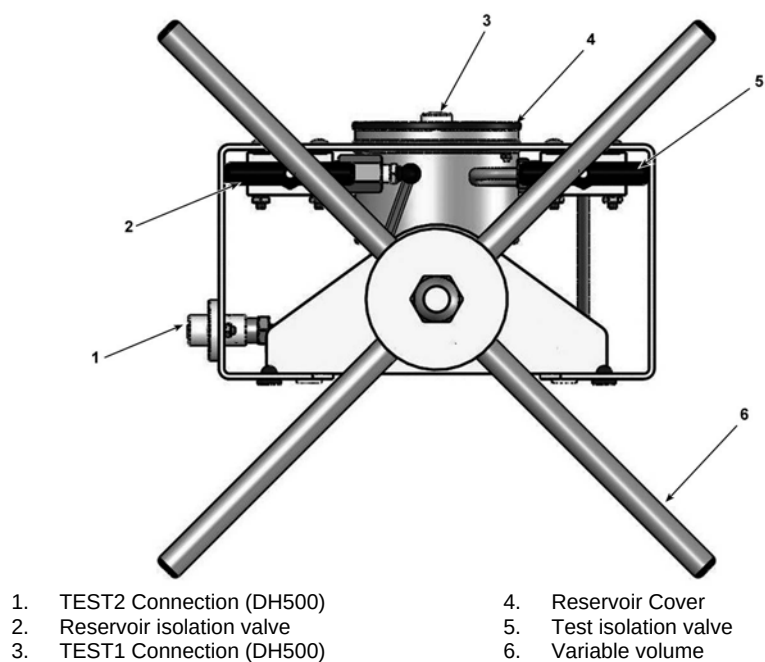


Figure 1. Front View

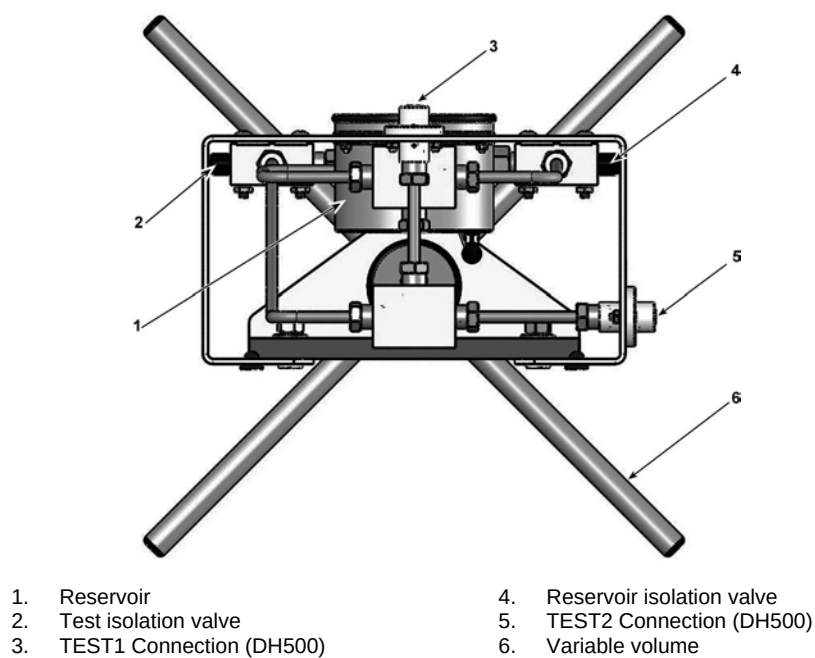


Figure 2. Rear View

1.4 DIMENSIONAL SCHEMATICS

All dimensions are in millimeter [mm]

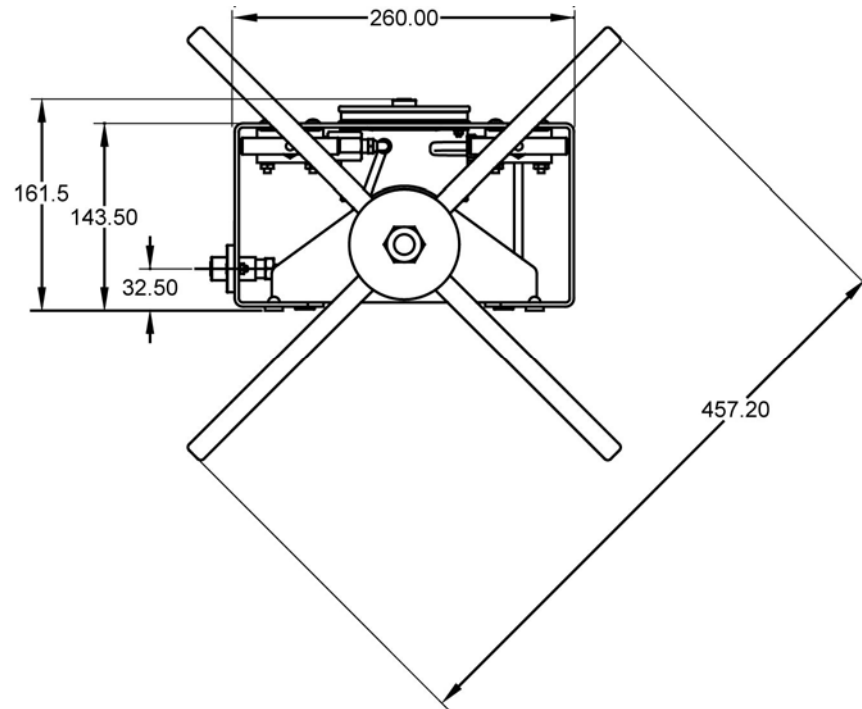


Figure 3. Front View with Dimensions

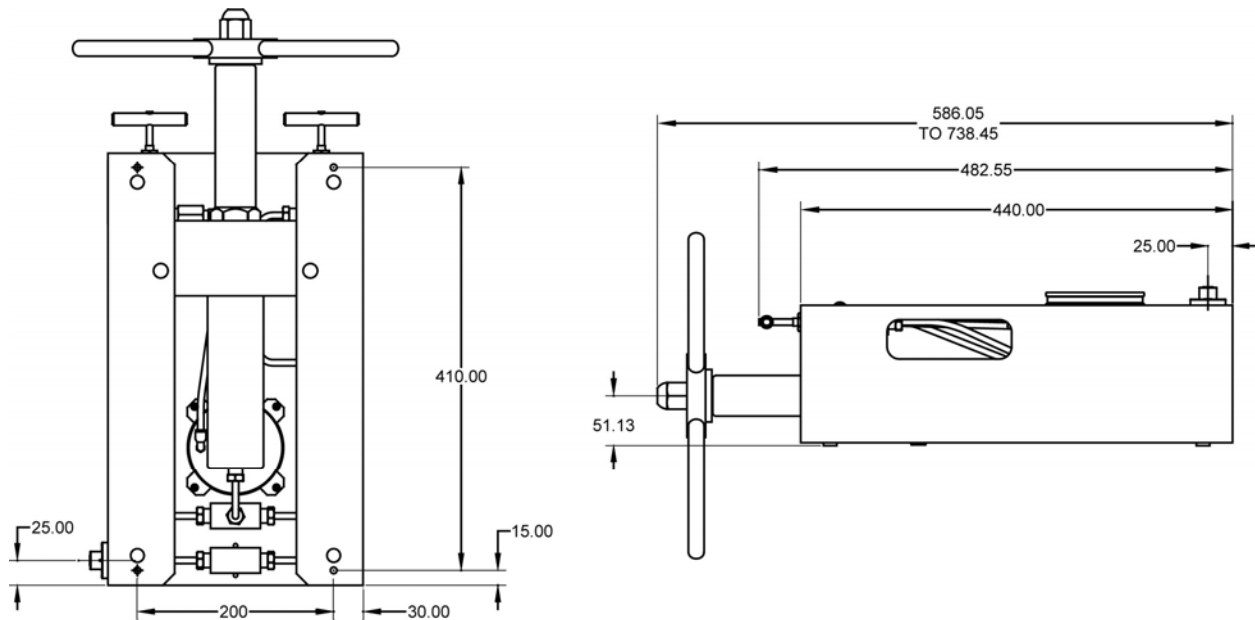
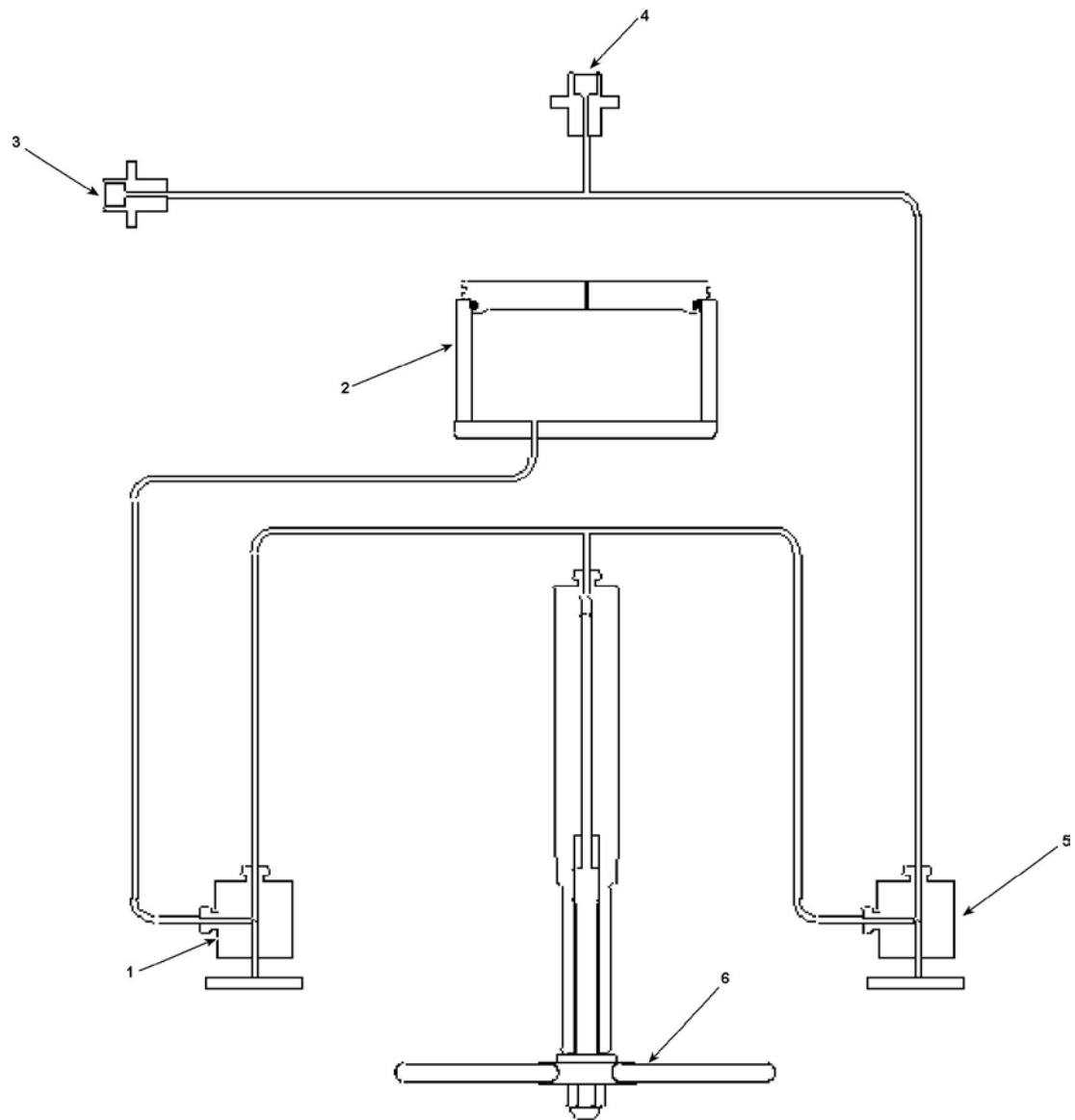


Figure 4. Bottom and Side Views with Dimensions

1.5 SYSTEM SCHEMATIC



- 1. RESERVOIR ISOLATION valve
- 2. Reservoir
- 3. TEST2 connection

- 4. TEST1 connection
- 5. TEST ISOLATION valve
- 6. Variable volume

Figure 5. System Schematic



2. INSTALLATION

2.1 UNPACKING AND INSPECTION

MPG1 is delivered, along with its standard accessories, in a corrugated container held in place by expandable foam.

The MPG1 is delivered with its valves closed and the variable volume (VV) fully screwed in. The reservoir and the MPG1 plumbing are free of fluid.

Remove MPG1 and its accessories from the shipping container and remove each item from its protective bag.

Check that all items are present and have no visible signs of damage.

Table 1. MPG1 Parts List

DESCRIPTION	PART #
MPG1-200M instrument	402122
Accessories including:	
1 ea. Plug, DH500	100285
1 Operation and Maintenance Manual	550134

2.2 SITE REQUIREMENTS

There are two main site requirements for installing the MPG1:

- MPG1 should be installed on a stable surface to which the MPG1 housing can be anchored using the mounting holes in the bottom of the housing. This is to hold the MPG1 firmly in place when turning the variable volume, particularly at high pressures and to avoid applying the torque from variable volume rotation to the tubing and fittings which may be connected to the MPG1.
- As the variable volume handles are wider than the MPG1 housing, the MPG1 needs to be mounted so that the handles hang over the edge of the mounting surface, for example over the front of a work bench.

2.3 INITIAL SETUP



High pressure fluids are potentially hazardous. Energy stored in pressurized fluids can be released unexpectedly and with extreme force. High pressure systems should be assembled and operated only by personnel who have been instructed in proper safety practices.

To set up the MPG1 for operation, proceed as follows:

- ❶ Anchor the MPG1 to a stable working surface using the mounting holes on the bottom of the MPG1 platform. The mounting hole diameter is 6.6 mm (0.26 in.) suitable for M6 or 1/4 in. screws. If mounting to a wood bench top, use of threaded inserts and machine screws is recommended.
 - ❷ Connect the TEST1 and/or TEST2 port to the system into which pressure is to be generated and controlled. All MPG1 pressure connections are DH500 female (DH500 is a gland and collar type fitting for 1/4 in. (6 mm) coned and left hand threaded tube. DH500 is equivalent to AE F250C, HIP HF4, etc.). If a TEST port is not being used, plug it using a DH500 plug supplied in the MPG1 accessories.
-



ALWAYS use external tubing and fittings rated for pressures equal to or greater than the maximum pressure which MPG1 will be used to generate.



DH500 F fittings are delivered with disposable, orange, plastic dummy plugs installed. These are NOT intended to hold high pressure. They should be removed and replaced with appropriate fittings or stainless steel plugs before high pressure operation. Each dummy plug carries a DH500 collar. Remove and retain the collar for use in connecting to the mating tube.

- ❸ Fill the fluid reservoir: Close the RESERVOIR ISOLATION valve. Remove the reservoir cover by lifting it off gently. Pour the desired fluid into the reservoir. Do not overfill. MPG1 is tested with a low viscosity, fluorinated liquid and should be free of significant fluid residue as delivered.
- ❹ Prime and leak check pressurized system (see Section 3.2).



3. OPERATION

3.1 GENERAL OPERATING PRINCIPLES AND INFORMATION

3.1.1 OVERVIEW

See Section 1.5, Figure 5.

MPG1 is used to manually generate and adjust liquid pressure from atmosphere to 100 MPa (15 000 psi) or 200 MPa (30 000 psi) using two valves and a variable volume. Fittings for connecting to a device or system under test are located on the top and rear left side of the instrument housing. A reservoir holds a supply of fluid.

3.1.2 VALVES

The RESERVOIR ISOLATION and TEST ISOLATION valves are manually operated needle valves.

The RESERVOIR ISOLATION valve isolates the reservoir from the pressurized circuit. It is opened to fill the variable volume with fluid and to open the pressurized circuit to atmosphere (vent).

The TEST ISOLATION valve isolates the TEST1 and TEST2 ports from the rest of the MPG1 circuit. It can be used to isolate the variable volume and reservoir from the pressurized test system, for example, if it becomes necessary to refill the variable volume with fluid when it reaches end of stroke. As the valve needle displaces fluid when it is operated, it can also be used as a very fine variable volume for very fine pressure adjustment.

3.1.3 VARIABLE VOLUME (VV)

The variable volume (VV) is a piston-cylinder type screw press. Rotating the variable volume handle, moves the piston in or out decreasing or increasing the volume and therefore increasing or decreasing pressure.

The VV is used to generate and adjust pressure in the system to which MPG1 is connected when the TEST ISOLATION valve is open. The torque necessary to rotate the VV handle is proportional to the pressure in the variable volume.

Generally, the starting position of the VV when beginning to generate pressure from atmosphere is with the piston fully retracted (handles rotated maximum CCW) so that the full stroke of the VV is available to fill the test system and generate pressure.

During operation, if the VV runs out of stroke, the TEST ISOLATION and RESERVOIR ISOLATION valves can be used in sequence to allow the variable volume to be refilled without releasing the pressure on the TEST1 and TEST2 port (see Section 3.2.3).



The maximum operating pressure of the variable volume is 200 MPa (30 000 psi) in MPG1-200M. Do not generate pressure greater than the maximum operating pressure.

3.1.4 RESERVOIR

The reservoir is a 362 cc (22.1 in³) acrylic vessel mounted inside the MPG1 housing. It is accessed for filling or cleaning by a friction fit lid through the top of the housing. The reservoir is connected to the RESERVOIR ISOLATION valve by flexible tubing. The reservoir lid can be used to force fluid out of the reservoir into the system connected to the OPG1.

3.2 OPERATION

Operation of the MPG1 can be divided into three common tasks: filling and priming the system under test (See Section 3.2.1); generating and adjusting pressure (see Section 3.2.2); filling or emptying the variable volume while maintaining test system pressure (see Section 3.2.3).

3.2.1 FILLING AND PRIMING THE SYSTEM UNDER TEST

Before attempting to use the MPG1 to generate high pressure, the system to which it is connected should be as free of air as possible. Minimizing the air in the pressurized system increases the effectiveness of the variable volume in generating pressure.

When the MPG1 is first connected to a system to be pressurized or if a new device is connected to the system, proceed as follows to fill and prime the system before attempting to generate high pressure:

- ❶ Connect the MPG1 to the system under test or connect a new device to the system. If possible, leave an open connection or cracked fitting at a high point in the system to be pressurized.
- ❷ Open the RESERVOIR ISOLATION valve and close the TEST ISOLATION valve.
- ❸ Fill the variable volume with fluid from the reservoir by screwing it all the way out (CCW) to its end of stroke.
- ❹ Close the RESERVOIR ISOLATION VALVE and open the TEST ISOLATION valve.
- ❺ Screw in the variable volume (CW) while observing the open point in the test system. When air free liquid comes out of the open point, close the open point. If the variable volume is screwed all the way in before the system is filled, repeat steps ❷ through ❺ as many times as necessary.



The displacement of the variable volume of the MPG1-200M is 11 cc (0.7 in³).

- ❻ Proceed to generate and adjust pressure as desired (see Section 3.2.1).



The reservoir cover may be used to rapidly displace a large volume of fluid from the reservoir into the test system connected to the TEST ports(s). With the RESERVOIR ISOLATION valve closed, remove the reservoir cover. Open RESERVOIR ISOLATION and TEST ISOLATION valves. Then, while holding a finger over the vent hole in the cover, slowly push the cover into position on the reservoir. The cover acts as a "piston", pushing fluid out of the reservoir into the system.

3.2.2 GENERATING AND ADJUSTING PRESSURE

Before attempting to use the MPG1 to generate high pressure, the system to which it is connected should be as free of air as possible. See Section 3.2.1 to fill and prime the test system.

Once the system to which MPG1 is connected, filled and primed, to generate and adjust pressure proceed as follows:

- ❶ Open the RESERVOIR ISOLATION valve, close the TEST ISOLATION valve and back the variable volume all the way out (CCW). This fills the variable volume with fluid and makes the full stroke available to generate pressure.
- ❷ Close the RESERVOIR ISOLATION valve, open the TEST ISOLATION valve. Use the variable volume to increase, decrease and adjust pressure as desired. Note that the TEST ISOLATION needle valve can be used as a mini variable volume for micro pressure adjustment if desired. However, closing the TEST ISOLATION valve completely isolates the test circuit from the main variable volume and the RESERVOIR ISOLATION valve.
- ❸ If the variable volume runs out of stroke when increasing or decreasing pressure, it can be refilled without releasing pressure from the test system. See Section 3.2.3 for instructions.
- ❹ To release pressure from the test system and return pressure to atmosphere, use the variable volume to reduce pressure as desired. For a rapid release to atmosphere and full vent, open the RESERVOIR ISOLATION VALVE. Note that pressure will drop very quickly when the RESERVOIR ISOLATION valve is opened. For a gentle pressure decrease, always use the variable volume.

3.2.3 REFILLING OR EMPTYING THE VARIABLE VOLUME WITHOUT RELEASING TEST PRESSURE

When working high pressure ranges with large test volumes or test volumes that are not fully purged of air, the volume displaced by a single stroke of the variable volume may not be sufficient to generate the maximum pressure desired. Conversely, when lowering pressure the variable volume may run out of stroke before it is desirable to use the RESERVOIR ISOLATION valve to release pressure rapidly. In these cases, the variable volume can be backed off and refilled without releasing the pressure in the test system.

To refill or empty the variable volume without releasing test pressure, proceed as follows:

- ❶ Close the TEST ISOLATION valve. This isolates the test system connected to the TEST ports from the variable volume and the RESERVOIR ISOLATION valve. Note that after refilling the variable volume, the TEST ISOLATION valve will be opened again. At that time, the pressure on both sides of the valve will not be perfectly equal so the pressure in the system connected to the TEST port(s) will change. Consider this possibility before closing the TEST ISOLATION valve. For example, if using a piston gauge, put the piston gauge piston at its bottom stop before closing the TEST ISOLATION valve.
- ❷ Open the RESERVOIR ISOLATION valve. This vents the pressure in the variable volume and connects it to the reservoir.
- ❸ Back out the variable volume (CCW) to fill it or screw it in (CW) to empty it, as desired.
- ❹ Close the RESERVOIR ISOLATION VALVE. DO NOT OPEN THE TEST ISOLATION VALVE YET.
- ❺ Operate the variable volume as needed to generate a pressure equal to the pressure in the system connected to the TEST port(s). This is the pressure that was present on the variable volume before the TEST ISOLATION VALVE was closed in ❶. The pressure may be reasonably approximated by the feel (torque) on the variable volume.
- ❻ Slowly open the TEST ISOLATION valve to equalize the pressure. Proceed to generate and adjust pressure as desired (see Section 3.2.2).

NOTES



4. MAINTENANCE AND ADJUSTMENTS

MPG1 was designed for maintenance free operation. The only recommended regular maintenance is to flush the hydraulic system and replace the operating liquid.

4.1 REPLACING LIQUID AND FLUSHING HYDRAULIC SYSTEM

Regular replacement of MPG1's operating liquid and flushing of the hydraulic system is recommended.

To empty the reservoir, remove the reservoir cover and siphon the bulk of liquid out of the reservoir. Remove the balance of liquid from the system by cycling the variable volume with the TEST1 port plugged and TEST2 port open following the filling and priming procedure described in Section 3.2.1. Collect the used liquid as it comes out of the TEST1 port.

Refill the reservoir with fresh liquid. Pressurize MPG1 by plugging the TEST1 and TEST2 ports, closing the RESERVOIR ISOLATION valve, opening the TEST ISOLATION valve and using the variable volume to generate pressure. Then crack the TEST1 fitting to let fluid out. Screw the variable volume all the way in to empty the variable volume out of the TEST1 port. Repeat until the liquid coming out of the TEST1 port is clean.

NOTES



5. WARRANTY STATEMENT

Except to the extent limited or otherwise provided herein, **DH Instruments, a Fluke Company (DHI)** warrants for one year from purchase, each new product sold by it or one of its authorized distributors, only against defects in workmanship and/or materials under normal service and use. Products which have been changed or altered in any manner from their original design, or which are improperly or defectively installed, serviced or used are not covered by this warranty.

DHI and any of its Authorized Service Providers' obligations with respect to this warranty are limited to the repair or replacement of defective products after their inspection and verification of such defects. All products to be considered for repair or replacement are to be returned to **DHI**, or its Authorized Service Provider, freight prepaid, after receiving authorization from **DHI** or its Authorized Service Provider. The buyer assumes all liability vis-à-vis third parties in respect of its acts or omissions involving use of the products. In no event shall **DHI** be liable to purchaser for any unforeseeable or indirect damage, it being expressly stated that, for the purpose of this warranty, such indirect damage includes, but is not limited to, loss of production, profits, revenue, or goodwill, even if **DHI** has been advised of the possibility thereof, and regardless of whether such products are used individually or as components in other products.

Items returned to **DHI** under warranty claim but determined to not have a defect covered under warranty or to not have a defect at all are subject to an evaluation and shipping charge as well as applicable repair and/or calibration costs.

The provisions of this warranty and limitation may not be modified in any respect except in writing signed by a duly authorized officer of **DHI**.

The above warranty and the obligations and liability of **DHI** and its authorized service providers exclude any other warranties or liabilities of any kind.

Table 2. DHI Authorized Service Providers

DH INSTRUMENTS, A FLUKE COMPANY WWW.DHINSTRUMENTS.COM AUTHORIZED SERVICE PROVIDERS			
COMPANY	ADDRESS	TELEPHONE & FAX	EMAIL
DH Instruments, a Fluke Company	4765 East Beautiful Lane Phoenix AZ 85044-5318 USA	Tel 602.431.9100 Fax 602.431.9559	cal.repair@dhinstruments.com
Ohte Giken, Inc.	Technology Center 258-1 Nakadai Nihari-Gun Ibaraki 300-0133 JAPAN	Tel 0298-55-8778 Fax 0298-55-8700	tohte@ohtegiken.co.jp
DHI Products Technical Service Division	National Institute of Metrology Heat Division Pressure & Vacuum Lab NO. 18, Bei San Huan Donglu Beijing 100013 PR China	Tel 010-64291994 ext 5 Tel 010-64218637 ext 5 Fax 010-64218703	cxcen@mx.cei.go.cn
Minerva Meettechniek B.V.	Chrysantstraat 1 3812 WX Amersfoort the NETHERLANDS	Tel (+31) 33.46.22.000 Fax (+31) 33.46.22.218	info@minervaipm.com