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# GPR200D



**Gas Pressure Regulator for Differential Pressure**

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# 1 introduction


## 1.1 general product description

The GPR200D is designed to manually set and adjust gas pressures between atmosphere and 20 MPa in high line differential applications. For this the GPR200D has 2 integrated variable volumes and a ball valve to open and close hi & lo side of the test circuit .

GPR200D is designed as the the standard pressure control component for working with the STM-dpg-5 high line differential deadweight tester, but its universal character makes it applicable for other test setups.

## 1.2 specifications

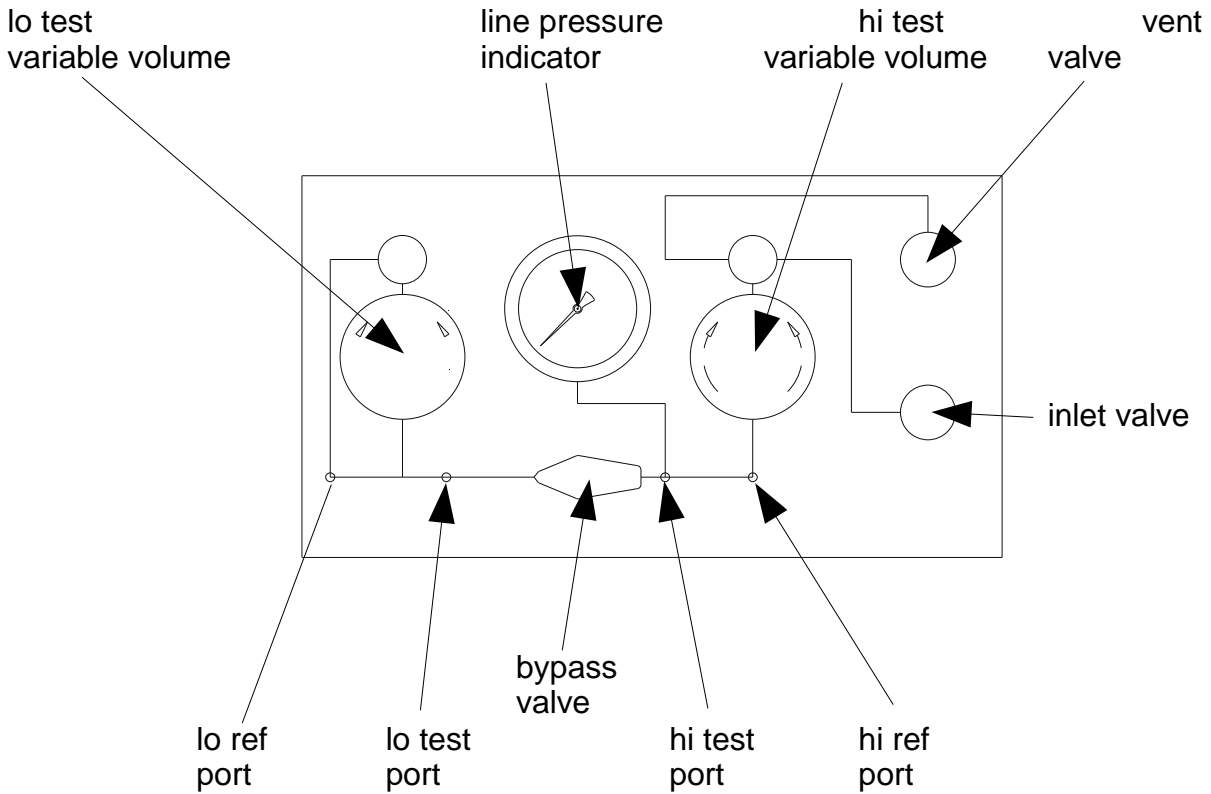
pressure range	0 .. 20	MPa g
differential pressure range	0 .. 100	kPa d
max. supply pressure	20	MPa g
pressure connections	¼" BSP female <sup>1</sup>	
enclosure	painting aluminium RAL7035	
length x width x depth	354 x 182 x 360	mm
weight	10	kg

 GPR200D is equipped with equalization variable volumes which automatically equalize when the differential pressure exceeds 1 MPa d

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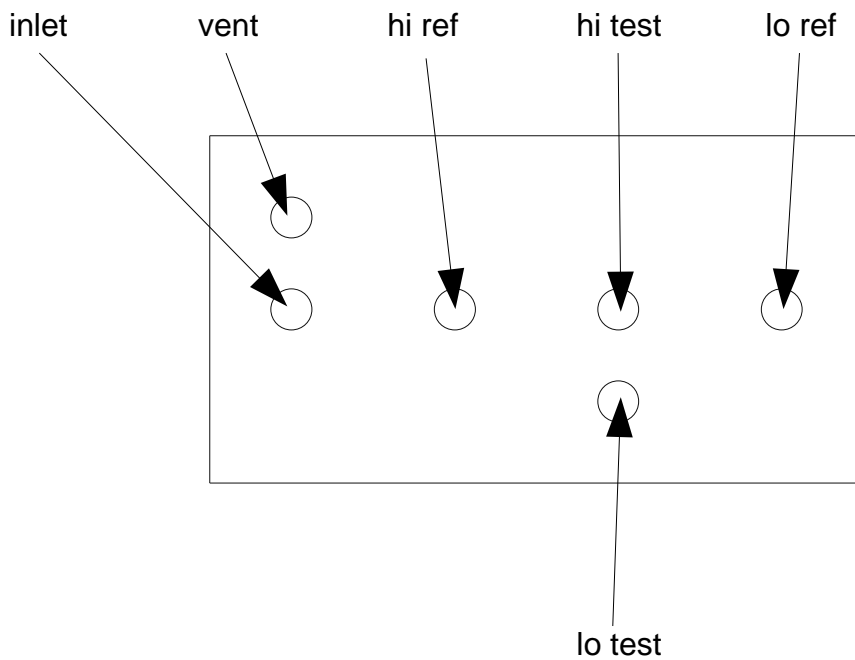
1 on request MM quick connectors can be supplied

### 1.3 front panel



**!** GPR200D is either configured with test ports on the front - or on the back panel, this should be defined on purchase order description.

#### 1.3.1 rear panel



## 2 installation

### 2.1 as received

The GPR200D is sealed in plastic and packed in an export quality carton box. When opening the box, check the contents against the scope of delivery.

### 2.2 site requirements

The GPR200D should be placed as close as possible to the pressure reference (like the STM-dpg-5) and the DUT<sup>2</sup>. A separate interconnection hardware kit for connecting the controller to the rest of the world is available.

Preferable pressure source is a Nitrogen class 5.0 bottle with pressure reducer. Although the GPR200D can handle 20 MPa inlet pressure directly, more predictable pressure control is achieved when the inlet pressure can be regulated to just above the DUT maximum pressure.

### 2.3 setup

If the interconnection hardware kit was purchased with the GPR200D, use it to make the connections to DUT and pressure reference. For more details a reference to the kit instruction sheet is made.

All GPR200D pressure connections are 1/4" BSP female. Therefore, a 1/4" BSP male adaptor is

needed to make each of the connections. BSP connections can either be sealed with a metal ring or elastomere manchette ring.

- Connect the SUPPLY port to a suitable source of clean nitrogen
- Connect the REF HI and REF LO ports to the hi and lo reference devices. For example the MASTER and SLAVE STM-dpg-5 platforms.
- Connect the TEST HI and TEST LO ports to the device under test hi and lo sides.
- The VENT port may be connected to a tube with internal diameter > 4 mm connected to atmosphere outside the direct working environment, but in normal operation this is not obligatory due to the small amount of nitrogen consumption.

**!** do not plug or shut off the VENT port.

## 3 operating GPR200D

### 3.1 operating principle

GPR200D manually controls line pressure and differential pressures from atmosphere to 20 MPa through the use of valves, two variable volume (VV) pumps, a bypass valve and a pressure gauge. Fittings for an outside source of pressure, connections to hi and lo reference and test devices and a vent port are located on the rear panel.

The bypass valve is used to connect the hi and lo sides together when setting high line pressures and to isolate one side from the other when setting differential pressures.

The test inlet valve is connected directly to the reference and test connection(s) and the high pressure chamber of the variable volume. Opening this valve, regardless of the position of the bypass valve, will result in an increase of pressure in the test system when pressure is applied to the valve.

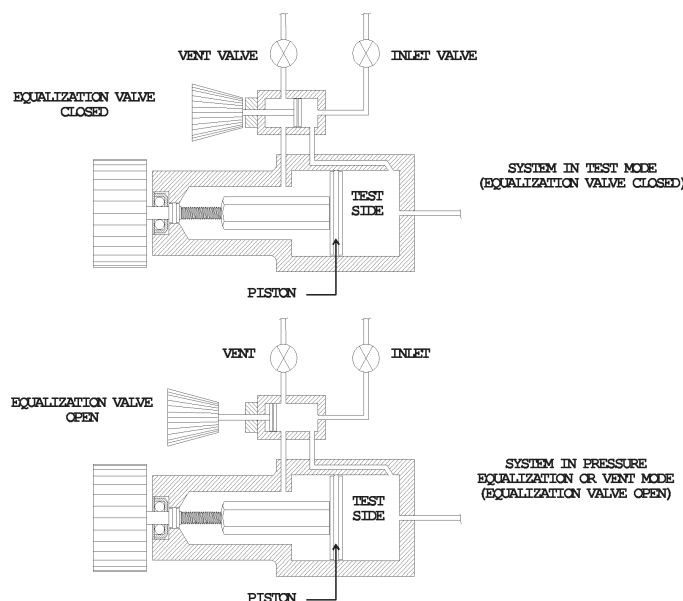


**Especially if the bypass valve is closed, this may result in an overpressure condition of the test instrument. Please use caution when operating the test inlet valve. Always check the bypass valve setting to avoid accidentally setting differential pressure much higher than desired.**

### 3.2 subassemblies

#### 3.2.1 variable volume

There are separate variable volumes on the hi and lo sides of GPR200D. The variable volume (VV) is a cylinder whose volume distribution is adjusted by rotating a knob that moves an internal piston. Attached to the top of the VV is a push/pull equalization valve that is designed to isolate the low side from the high side of the piston as well as provide protection to the unit itself in certain situations.



The VV is used to adjust the pressure (and/or piston position when used with a deadweight tester) by rotating the knob to change the TEST side volume with the equalization valve closed. Before operating the INLET or VENT valve, always open the equalization valve to avoid causing excessive differential pressure across the VV piston. To open the equalization valve, pull it outward; to close, push it inward.

**!** The equalization valve stem is relatively fragile, so make sure to operate the valve gently.

When using the VV, it is useful to put its piston in the optimum position based on the intent of use. Under most operating conditions, the piston is placed in its mid-stroke position (about 30 rotations). This will allow for equal movement, forward and backward, of the piston.

When a maximum increase or decrease of pressure is required, especially at low pressures, place the VV knob at the stop limit (either clockwise for maximum decrease in pressure or counter-clockwise for maximum pressure increase).

The VV is designed to operate with a maximum differential pressure of 150 psi (1 MPa) across the piston. When the differential pressure across the piston exceeds 150 psi (1 MPa) positive on the TEST side, the equalization valve will automatically open reducing the differential pressure to zero. This is a safety feature intended to prevent damage to the VV. The value of 150 psi (1 MPa) is factory set and cannot be changed. The variable volume is not protected internally against differential overpressure positive on the back (KNOB) side of the piston. Never vent pressure externally of the GPR200D or operate the VENT valve without opening the VV equalization valves.

### 3.2.2 valves

Two types of valves (needle and ball) are used in the GPR200D. Two needle valves are used to control large changes between pressures. A ball valve acts as the bypass valve that isolates the hi and lo sides of the system.

- Operating the SUPPLY or VENT valve may change the system pressure quickly by an amount that is largely relative to the differential pressure range in which you are working.
- !** ● Operate the SUPPLY and/or VENT valve very carefully when the BYPASS valve is closed.
- Be sure to open the BYPASS valve before using the SUPPLY or VENT valve to adjust the line pressure.

### 3.2.3 analog pressure indicator

There is a zero to 200 bar dial gauge connected to the hi side test pressure circuit. The gauge has a dual function :


- As a safety device since it is important for the operator to know the value of system pressure at all times.
- As a means to assist the operator in setting pressure.

**!** The pressure gauge is connected to the hi side of the GPR200D. It indicates the pressure throughout the system when the bypass valve is open. It indicates only the hi side pressure when the bypass valve is closed.

### 3.3 vent the GPR200D

This procedure applies when using GPR200D on both channels to set differential pressures at elevated line pressures :


- close the SUPPLY valve
- open both hi and lo VV pressure equalization valves (pull knob outward)
- open the HI/LO BYPASS valve
- open the VENT valve.

 Opening an equalization valve may result in a sudden change in the test pressure. Ensure conditions are such that this either does not happen or that its effects are inconsequential.

### 3.4 setting an elevated line pressure

This procedure applies when using GPR200D on both channels to set differential pressures at elevated line pressures.


All procedures instruct the operator to open the equalization valve prior to opening the SUPPLY valves. This is a safety precaution.

 It is possible to adjust the pressure in the test circuit using the SUPPLY or VENT valve without opening the variable volume equalization valve. However, this should be done only when the operation of the system and the necessary precautions are understood by the operator.

#### 3.4.1 increase line pressure

1. open the HI/LO BYPASS valve
2. open both variable volume equalization valves (pull knob outward)
3. carefully operate the SUPPLY valve to admit pressure until the approximate desired line pressure is reached
4. place lo VV piston at appropriate position and close its equalization valve (push knob inward)
5. adjust VV knob until desired line pressure is obtained (or until the piston floats when connected to a deadweight tester)
6. to set a differential pressure after setting a line pressure
7. to set another, higher, line pressure, repeat step 1 or 6 above; to set a lower line pressure, see next section

Opening an equalization valve may result in a sudden change in the test pressure. Ensure conditions are such that this either does not happen or that its effects are inconsequential.

 Maximum differential pressure across the VV piston is 150 psi (1 MPa). Differential pressures above 150 psi (1 MPa) on the TEST side will automatically open the equalization valve.



### 3.4.2 decrease line pressure

1. open the HI/LO BYPASS valve
2. open both variable volume equalization valves (pull knob outward)
3. carefully operate the VENT valve to exhaust pressure until the approximate desired pressure is reached
4. place lo VV piston at appropriate position and close its equalization valve (push knob inward)
5. adjust VV knob until desired line pressure is obtained (or until the piston floats when connected to a deadweight tester)
6. to set a differential pressures after setting a line pressure, see next section
7. to set another, lower, line pressure, repeat step 1 or 6 above
8. to set a higher line pressure, see previous section

Opening an equalization valve may result in a sudden change in the test pressure. Ensure conditions are such that this either does not happen or that its effects are inconsequential.



Maximum differential pressure across the VV piston is 150 psi (1 MPa). Differential pressures above 150 psi (1 MPa) on the TEST side will automatically open the equalization valve.

### 3.5 setting a differential pressure at elevated line pressure

After pressurising both the HI and the Lo side of the system, a differential pressure can be created.

1. close HI/LO BYPASS valve
2. place HI VV piston at appropriate position and close its equalization valve (push knob inward)
3. adjust HI VV knob until desired differential pressure is obtained (or until the piston floats when connected to a piston gauge)  
if desired, the LO VV knob may also be adjusted, for example to maintain a deadweight tester piston in float position and/or to maintain the line pressure.
4. If the HI VV reaches end of stroke before the desired differential pressure is set, open the VV's equalization valve and adjust it to an appropriate start position, then use the SUPPLY or VENT valve to admit or exhaust pressure. Be sure to open the HI VV equalization valve before operating the SUPPLY or VENT valve. Then close the equalization valve and resume use of the VV.  
If the lo VV reaches end of stroke before the desired differential pressure is set, try opening the VV's equalization valve, adjusting it to a suitable start position and using it again. If this does not achieve the desired result, the only solution is to open the HI/LO BYPASS valve to admit or exhaust pressure using the SUPPLY or VENT valve. This will cause the differential pressure to go to zero. Be sure to open both VV equalization valves before operating the SUPPLY or VENT valve.
5. repeat Steps 3 and 4 for additional differential pressure increments, as desired.

Maximum differential pressure across the VV piston is 150 psi (1 MPa). Pressures above 150 psi (1 MPa) will automatically open the equalization valve.

**!** *Closing the hi/lo bypass valve isolates one side of the device under test (dut) from the other. When the BYPASS valve is closed, Take care to avoid accidentally setting larger differential pressure than desired. Exercise special care if it is necessary to operate the SUPPLY or VENT valve as these can cause large pressure changes to occur quickly.*

*Operating the supply or vent valve may result in a sudden change in the test pressure. Ensure conditions are such that this either does not happen or that its effects are inconsequential.*

### **3.6 use the GPR200D to regulate line pressures only**

To use the GPR200D to regulate line pressure only use the HI side. Connect to the HI TEST port (and HI REF port if needed). Close the HI/LO BYPASS valve. Then use the SUPPLY and VENT valves and the HI VV as if setting line pressures.

#### **3.5.1 increase line pressure**

1. close HI/LO bypass valve.
2. close VENT valve
3. open HI VV pressure equalization valve (pull knob outward)
4. place HI VV piston at appropriate position
5. open SUPPLY valve until the approximate desired pressure is reached. Care should be taken not to overrange the maximum test pressure.
6. close HI VV equalization valve (push knob inward).
7. adjust HI VV knob until desired pressure is obtained (or until the piston floats when connected to a deadweight tester)
8. to continue increasing pressures, repeat steps 3 through 7 above.

**!** *Opening the equalization valve may result in a sudden change in the test pressure. Ensure conditions are such that this either does not happen or that its effects are inconsequential.*

Maximum differential pressure across the VV piston is 150 psi (1 MPa). Pressures above 150 psi (1 MPa) will automatically open the equalization valve

### 3.5.2 decrease line pressure

1. open HI VV pressure equalization valve(pull knob outward)
2. place HI VV piston at appropriate position
3. open VENT valve until the approximate desired pressure is reached
4. close hi VV equalization valve (push knob inward)
5. adjust VV knob until desired pressure is obtained (or until the piston floats when connected to a deadweight tester)
6. to continue decreasing pressures, repeat steps 1 through 5 above

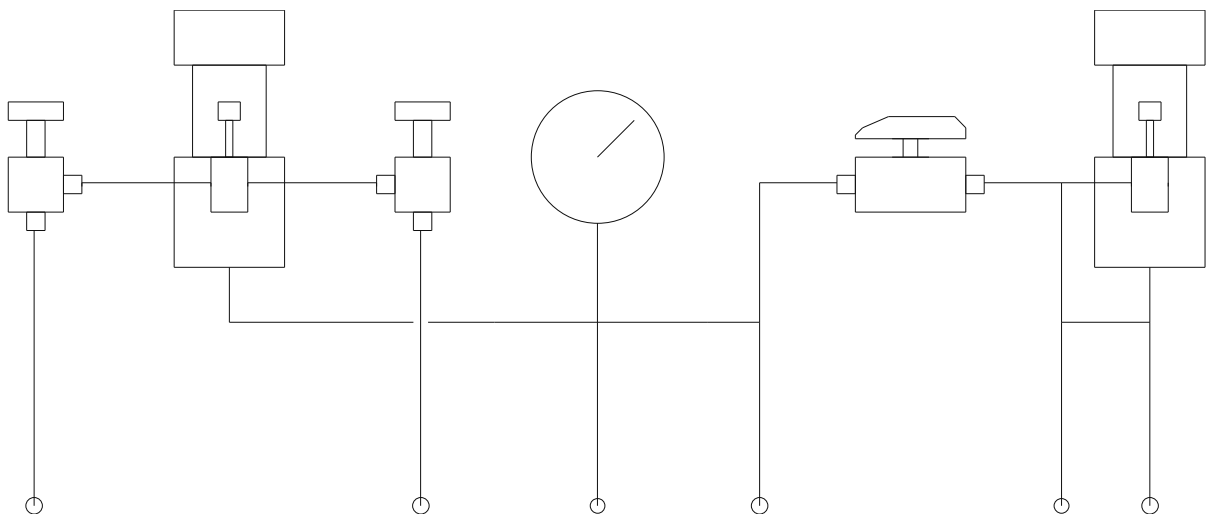
Opening the equalization valve may result in a sudden change in the test pressure. Ensure conditions are such that this either does not happen or that its effects are inconsequential.



Maximum differential pressure across the VV piston is 150 psi (1 MPa). Pressures above 150 psi (1 MPa) will automatically open the equalization valve

## 4 maintenance

GPR200D is configured from standard components which are maintenance free. In case of failure of one of the sub-assemblies please contact the manufacturer for repair instructions.





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