

GDS Pressure/Volume Controller Range (1MPa to 100MPa)

The GDS Pressure/Volume Controllers are microprocessor-controlled syringe pumps for the precise regulation and measurement of fluid pressure and volume change. GDS pressure controllers are available in different models which cover a range of maximum pressures, volumetric capacities, accuracies and wetted materials. While traditionally GDS pressure controllers have been used for supplying highly accurate pressures and measured volumes to soil testing applications, they may be used in any laboratory situation where demands for tightly controlled pressures occur. GDS pressure controllers can be controlled through pressure, volume, and flow rate modes, all from software or via the Smart Keypad.



Enterprise Level Pressure/Volume Controller (ELDPC)

The Enterprise Level Pressure Controller is designed to give a highly competitive entry point in to the GDS pressure controller range. It is only available in one configuration and is the perfect plug and play pressure source.

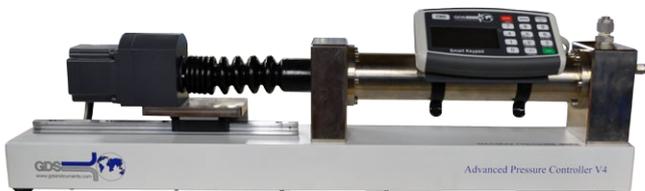
Pressure Accuracy 0.25% FRO. Working pressure range: 1MPa
Volumetric Accuracy: 0.4%. Volumetric capacity: 200cc



Standard Pressure/Volume Controller (STDDPC)

The Standard Pressure Controller is a step up from the ELDPC in terms of the accuracy class and configurations. While operationally similar, the maximum pressure ranges can be specified up to 4MPa. Maximum flow rates are enhanced as are the resolutions for pressure and volume measurement. The optional remote feedback of external pressure transducers increases control flexibility.

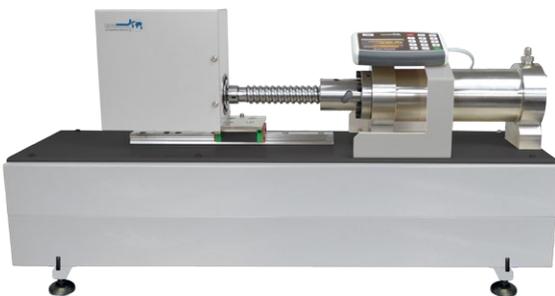
Pressure Accuracy 0.15% FRO. Working pressure range: 1-4MPa
Volumetric Accuracy: 0.25%. Volumetric capacity: 200cc



Advanced Pressure/Volume Controller (ADVDP)

The Advanced Pressure Controller is the highest accuracy pressure controller available from GDS. Available in multiple pressure ranges and volumetric capacities (1000cc up to 2MPa). All components in the ADVDP are of the highest quality from ground ballscrews to handmade gearboxes to reduce backlash and increase accuracy.

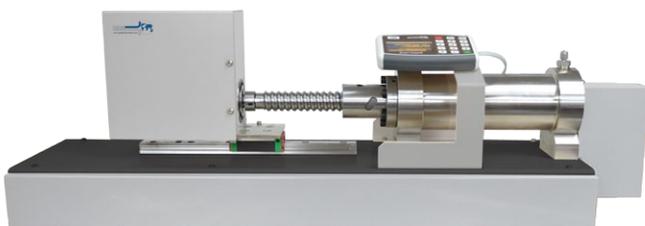
Pressure Accuracy 0.1% FRO. Working pressure range: 0.1-4,MPa
Volumetric Accuracy: 0.1%. Volumetric capacity: 200cc,
(1000cc available at <2MPa)



Advanced High Pressure/Volume Controller (HPDPC)

The High Pressure Advanced controllers maintain the accuracy of the advanced range, and push the pressures higher. With wetted materials, stainless steel and aluminium bronze, it is even more corrosion resistant than the other pressure controller ranges.

Pressure Accuracy 0.1% FRO. Working pressure range: 8-100MPa
Volumetric Accuracy: 0.1%. Volumetric capacity: 200cc



HPDPC-H Hastelloy Version for use with highly corrosive fluids

The GDS HPDPC-H is available for use with harsh environment fluids in all pressure ranges. All wetted parts are made from Hastelloy C-276 with seals utilizing carbon filled PTFE and FFKM o-rings. Volume resolution is increased to 0.01mm³ to cope with extremely slow rates of flow often required in petrochemical applications.

Pressure Accuracy 0.1% FRO. Working pressure range: 0.1-64MPa
Volumetric Accuracy: 0.1%. Volumetric capacity: 200cc

How does it work?

Liquid (normally deaerated water) in a cylinder is pressurised and displaced by a piston moving in the cylinder. The piston is actuated by a ball screw turned in a captive ball nut by an electric motor and gearbox that move rectilinearly on a ball slide (see Fig. 1).

Pressure is measured by an integral solid state transducer. Control algorithms are built into the onboard microprocessor to cause the controller to seek to a target pressure or step to a target volume change. Volume change is measured by counting the steps of the incremental motor.

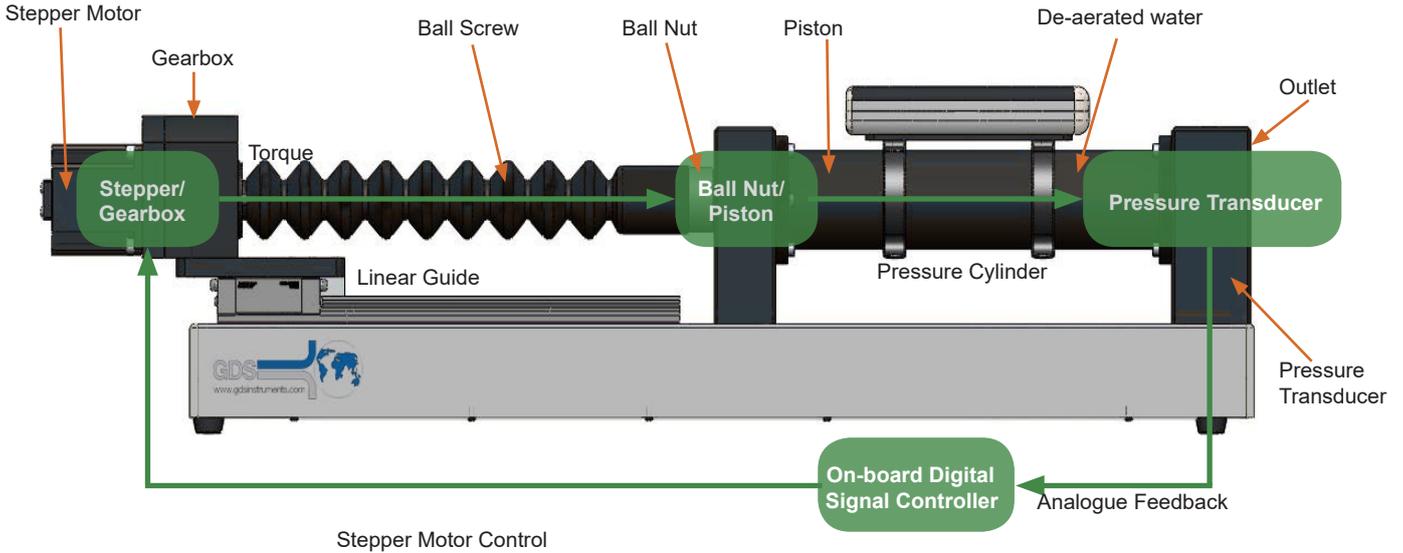


Fig. 1 Schematic of a GDS Standard Level Controller and the extra features of a Digi RFM

How do you use it?

Via a PC: Compatible with the GDSLAB software suite, this windows based application will allow you to operate the device. In its simplest form, a display window shows the current pressure and volume.

Using a Smart Keypad

Simply plug the Smart Keypad into the Controller and the Smart Keypad will automatically recognise the controller and display the current pressure and volume.

Key Features:

Benefits to the User:

Single connection to electrical power:	GDS pressure controllers do not rely on lab air supplies.
USB and Smart Keypad user interfaces:	The GDS pressure controllers can be controlled directly from a computer using the USB 2.0 interface or the Smart Keypad. Using the Smart Keypad, the controller can be configured as a completely stand-alone device.
Pressure is measured by an integral pressure transducer. Volume change is measured by counting the steps of the incremental motor:	Accurate measurements of pressure and volume as both are measured locally to the controller.
Self-protecting and can be programmed to protect any attached equipment:	Full confidence that the equipment is inherently safe and can never be over-ranged.
Measurement of change in volume with no requirement for a separate volume change device:	Controllers are an ideal back-pressure source.
All controllers are designed to run using liquids. GDS have an ADVDP (1000cc) specifically designed for use with Air:	Controllers can be used with a large range of media.

Choosing the right controller:

Enterprise Level, Standard, & Advanced Pressure/Volume Controllers Comparison Chart

Feature	ELDPC Pressure/Volume Controller	STDDPC Pressure/Volume Controller v2	ADVDPD Pressure/Volume Controller v4	HPDPC and HPDPC-H Pressure/Volume Controller
Pressure range:	1 MPa	1, 2, 3, 4 MPa	0.1, 0.2, 0.4, 0.8, 1, 2, 4 MPa	8, 16, 32, 64, 70, 100 MPa
Pressure accuracy:	0.25% FRO	0.15% FRO	Better than 0.1% FRO	Better than 0.1% FRO
Pressure resolution:	1 kPa	0.1 kPa (1MPa) 1kPa (2MPa-4MPa)	0.1 kPa	1 kPa
Resolution of logging via software:	1 kPa (1000 device)	0.1 kPa (1 MPa) 1kPa (2MPa-4 MPa)	0.1 kPa (2000 kPa device)	1 kPa
Pressure calibration:	One point calibration (FRO)	One point calibration (FRO)	Multipoint calibration, certified with table	Multipoint calibration, certified with table
Volumetric range:	200 cc	200 cc	200 cc, 1000 cc (<2 MPa only)	200 cc
Resolution (volume):	1 mm ³ (0.001 cc)	1 mm ³ (0.001 cc)	0.1 mm ³	0.1mm ³ (optional 0.01mm ³)
Volumetric accuracy:	0.4% measured	Better than 0.25%, calculated	Better than 0.1%, certified	Better than 0.1%, certified
Resolution of control:	1 kPa	0.1 kPa (1 MPa) 1 kPa (2 MPa-4 MPa)	0.1 kPa (2000 kPa device) 0.1 kPa (>2000 kPa device)	1 kPa
Ball screw:	Rolled – lead error 100 µm in 330 mm	Rolled – lead error 100 µm in 330 mm	Ground – lead error 25 µm in 330 mm	Ground – lead error 25 µm in 330 mm
Linear guide:	Rolled – error unspecified	Rolled – error unspecified	Ground – running parallelism error 20 µm in 500 mm	Ground – running parallelism error 20 µm in 500 mm
Gearbox:	Class C	Class C	Class A precision	Class A precision
Interface options:	USB	USB	USB	USB
DigiRFM Compatible	No	Yes	Yes	Yes
Material and finish of pressure cylinder:	Brass, painted	Brass, painted	Brass, bright nickel plated and polished	8,16,32 Brass 64,70,100 Stainless Steel (All HPDPC-H controllers made from Hastelloy)
Size (mm):	500 x 100 x 125	620 x 100 x 140	670x100x190 (4MPa/200cc) 670x100x190 (2MPa/1000cc)	860x230x260 (8-32 MPa) 860 x 230 x 330 (64 MPa)
Weight:	5.5 kg (empty)	10.2 kg (empty)	0-4MPa 17 kg (empty)	8-32MPa 20kg (empty) 64-100MPa 25kg (empty)
Electrical supply (universal):	100-240V AC, 50-60Hz, 0.7A. Max Consumption: 20W. Typical Consumption: <12W	100-240V~1.6A MAX, 50- 60Hz	85 VAC to 260 VAC; 47 – 440 Hz	100-240V AC, 50-60Hz, 0.7A. Max Consumption: 20W. Typical Consumption: <12W

Optional: Digital Remote Feedback Module (Digi RFM)

Normally, the feedback to the main control circuit board comes from the internal pressure transducer. However, this input could come from a different source, such as a remote transducer. GDS has developed this into an elegantly engineered enhancement which is the Remote Feedback Module (RFM).

The RFM (see Fig.3) enables the output of an external transducer to be measured and displayed by the controller. It also enables the piston action to be controlled from the feedback of the external transducer. Both the internal pressure transducer and the external transducer readings are displayed and transmitted over the computer interface. Benefits of the Digi RFM include:-

- Precision when regulating from the external transducer, as it can be positioned closer to the experiment.
- Can increase the accuracy of the application by choosing a transducer closer to the range of the experiment.
- Can be used with wet wet differential pressure transducer to increase the accuracy and measurement, e.g. for precise control between back pressure and cell pressure for accurate measurement and control of effective stress.



Fig. 3 Optional Digi RFM

Alternatives/Options



Pneumatic Controller

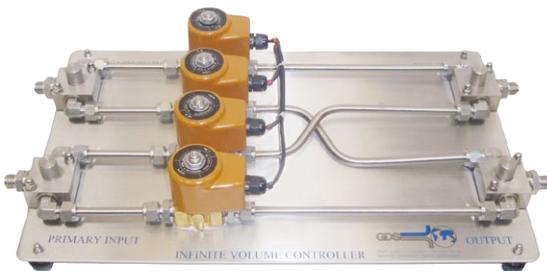
The GDS pneumatic controller is an economical source of computer controlled regulated air pressure control. The controller regulates an external pressure source such as a compressor or compressed air cylinder to provide a controlled output pressure.

The control of the valves is via the Serial bus (RS232) from the PC and software.



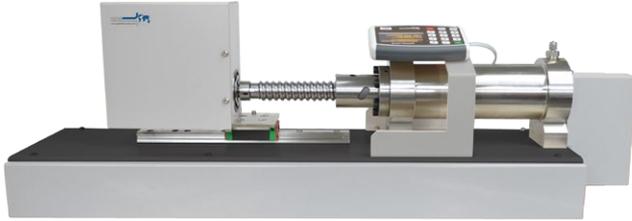
High Pressure Gaseous Controller

The GDS High Pressure Gaseous controller (HPGC) has been designed to effectively replace manual regulators within systems. The HPGC is capable of setting pressures and controlling pressure ramps while recording the pressure via built-in high accuracy pressure transducers. Additional pressure transducers can also be added to the system if required.



Infinite Volume Controller

The GDS Infinite Volume Controller (IVC) is designed to remove constraints of volume capacity such that a test can continuously flow fluid under pressure control or volume control. When using a single pressure/volume controller, once the volumetric capacity of the barrel has been reached (either 100% full or 100% empty), the user is required to manually fill or empty the controller accordingly. By connecting two GDS pressure/volume controllers in parallel, the IVC system automatically switches between them when they run out of volume thus providing a seamless supply of pressure with unlimited volume capacity.



Advanced High Pressure/Volume Controller - Corrosive Fluid Version (HPDPC-H)

The GDS High Pressure Syringe Pumps are positive displacement pumps that have been developed from the proven pressure controller range that GDS Instruments have been making for over 40 years. The HPDPC-H version has been enhanced with features that are ideal for core testing and reservoir analysis. These include flow rate control, enhanced resolution and the use of high corrosion resistance Hastelloy. With the ability to operate in pressure, volume or flow control modes, either directly from the keypad or remotely via software, the HPDPC-H is a versatile and simple to use pump.

All wetted metallic parts made from Hastelloy C-276 with seals utilising Carbon filled PTFE and FFKM o-rings. This provides a highly corrosion resistant version for use with aggressive fluids that can be present in deep cores.

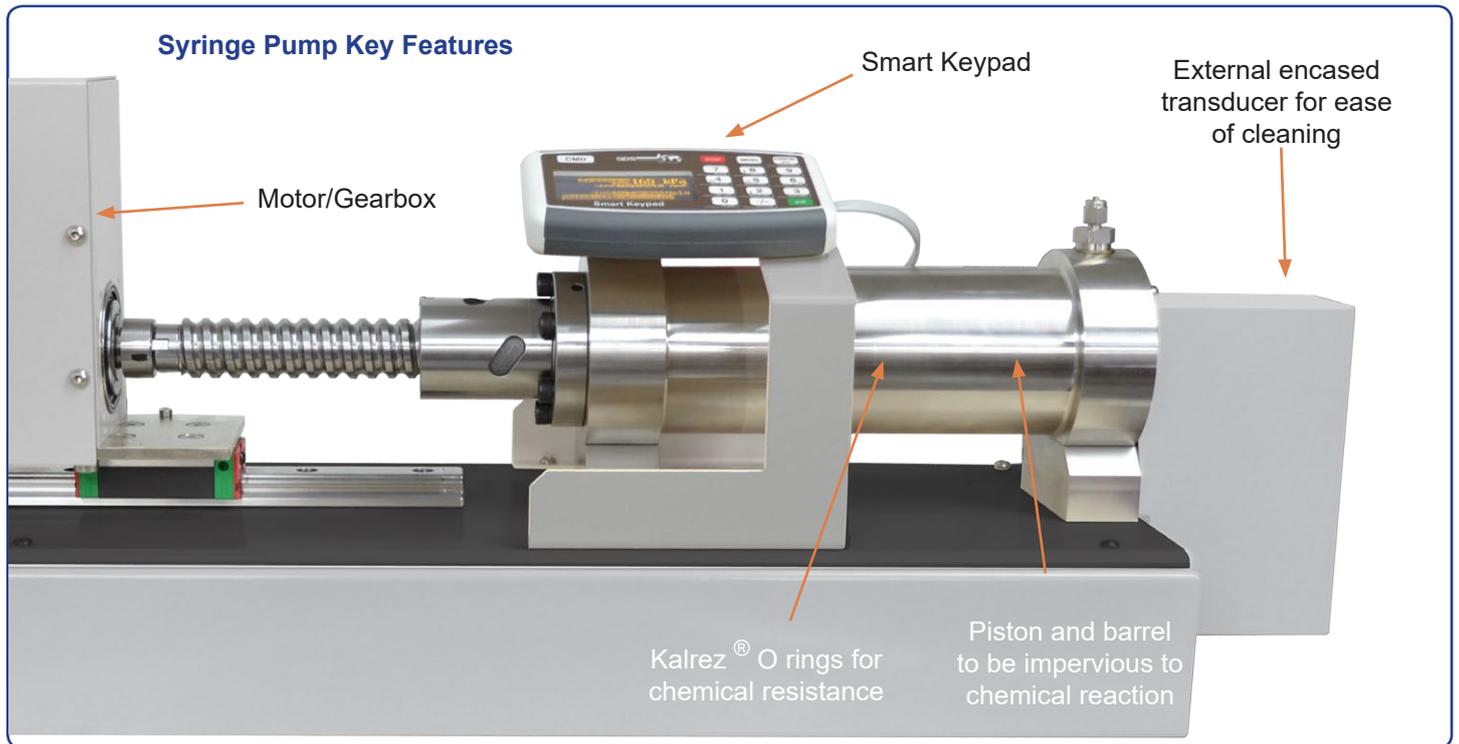
Key Features:

Benefits to the User:

Hastelloy barrel, piston and transducer:	A superalloy, Hastelloy has outstanding resistance to highly oxidizing and reducing agents, making it a great choice for severe corrosive environments.
5 part composite carbon filled PTFE seals and FFKM o-rings:	Corrosion resistant seals way beyond what any rubbers can resist.
Bi-metallic anti-abrasive aluminium-bronze guidance ring:	Although all wetted parts of the controller are Hastelloy, the important components that are required to ensure free running and long life of the controller are still designed in around the Hastelloy components.
Increased resolution of volume change as standard:	The increased resolution allows extremely slow flow rates to be resolved.
Externally mounted Hastelloy/ceramic pressure transducer:	Being externally mounted means it can be easily flushed/cleaned.
Controllers can be used with different fluids:	Suitable for a wide range of applications in varied fields like petrochemical applications, EOR, reaction feed, alternative fuels, biomass, etc.

Performance Specifications

Pressure	Working Range	up to 64MPa
	Accuracy	0.1% FRO
	Resolution	1 KPa
Volume	Capacity	200 mL
	Accuracy	0.1% measured valve ($\pm 5\text{mm}^3$ below 100 kPa)
	Resolution	0.0001 ml
Flow	Minimum Rate	0.00001ml/min
	Maximum Rate	22.5ml/min
	Accuracy	0.5%
Expected Seal Life (Water)	Greater than 2 years	



Syringe Pump Applications:

The GDS Hastelloy High Pressure Syringe Pump can handle fluids of various substances and viscosities like liquefied gases, viscous fluids, pastes and slurries, as well as hazardous and corrosive materials.

The HPDPC-H can be used as advanced fluid delivery and control tools in a variety of applications in academic/research, energy, chemical and petrochemical, pharmaceutical and other fields. Indicative applications of the HPSP are:

- Supercritical fluid applications in materials production
- Reaction feed
- Enhanced Oil Recovery (EOR), reservoir engineering and other petrochemical applications
- Core flow analysis
- Alternative fuels, biomass

The HPDPC-H can be customised to meet the specific requirements of your application.

