60 GDS Helpsheet

Hardware

ELD, STDv2 & ADVv4 Controller Comparison

1. Introduction

GDS have a number of pressure controllers available, with the accuracy of each greatly depending on the client's testing requirements. The relevant uses range from commercial-based to high accuracy research-based applications. These include the Enterprise Level Controller, the Standard Controller v2 (introduced in 2010), and the Advanced Controller v4 (Introduced in May 2019).

2. Controller comparison

The Enterprise Level Digital Pressure Controller (ELDPC) was developed with the commercial sector in mind. It has a reduced size compared to any other controller in the GDS range, which makes it ideally suited for life in a commercial testing laboratory. The controller functions with the application of a rolled ballscrew, of relevant accuracy, with a simple linear guide and production gearbox. The ELDPC is suitable for applications, which require a maximum pressure capacity of 1000kPa. The resolution of pressure measurement is 1 kPa and volume resolution is 1 cu mm. It takes advantage of a full speed USB 2.0 interface and therefore, is controlled directly from the computer. The volumetric capacity is a nominal 200cc.

The Standard Digital Pressure Controller (STDDPC) v2 was designed for use as a general purpose laboratory pressure source and volume change gauge. It is aimed at applications such as undergraduate teaching and commercial/production testing where a higher pressure is required. The controller makes use of a general purpose rolled ballscrew, with a simple linear guide and production gearbox. Pressure resolution up to 0.1kPa, volume resolution is 1 cu mm, volume accuracy is 0.25% of the reading, pressure accuracy is 0.15% FRO. It takes advantage of a full speed USB 2.0 interface and therefore, is controlled directly from the computer. The volumetric capacity is a nominal 200cc.

The Advanced Digital Pressure Controller (ADVDPC) v4 is designed for research work. It is suitable for high accuracy applications such as postgraduate and post-doctoral projects and to support GDS advanced systems. The complete construction is designed for the highest quality, the ballscrew is a precision ground screw, the gearbox and linear guides are high precision and the pressure cylinder is bright nickel plated. The volumetric capacities are 200cc (pressure ranges between 0.1 and 4 MPa) and 1000 cc (for pressure ranges up to 2 MPa). It has pressure accuracy of 0.1% FRO and volume accuracy of better than 0.1. Resolution on pressure in enhanced precision is 0.1 kPa, volume accuracy is 0.1% of reading, with a volume resolution of 0.1 cu.mm. The ADVDPC, like the ELDPC and STDDPC is interfaced via USB.

Note: High Pressure Controllers: GDS have a range of high pressure advanced controllers (up to 100MPa) that maintain the accuracy of the advanced range. With wetted materials, stainless steel and aluminium bronze, these controllers are even more highly corrosion resistant than the ELDPC, STDDPC and ADVDPC controllers. GDS also manufacture a high pressure Hastelloy controller for use with highly corrosive fluids (HPDPC-H). The HPDPC-H is available from 0.1-64MPa. All wetted parts are made from Hastelloy C-276, with seals utilizing carbon filled PTFE and FFKM O-rings. Volume resolution is increased to 0.01mm^3 to cope with extremely slow rates of flow often required in petrochemical applications.

3. Summary

The ELDPC controller is approximately **20% cheaper** than the STDDPC controller and is suitable for commercial laboratory environments which only require a maximum pressure capacity of 1000 kPa.

The STDDPC controller is about **40% cheaper** than the ADVDPC controller and is suitable for general purpose pressure control and volume change measurements, in teaching and production laboratories.

The ADVDPC controller is about **40% more expensive** than the STDDPC controller and is suitable for precise control and measurement of pressure and volume change, in all applications including research laboratories.

Figure 1 shows an example of pressure seek performance characteristics between each controller (set to 800 kPa and increased by 100 kPa, full triaxial cell). Note: data should be used as a guide only as performance will change with size of triaxial cell, stiffness of cell, compressibility of the fluid etc.

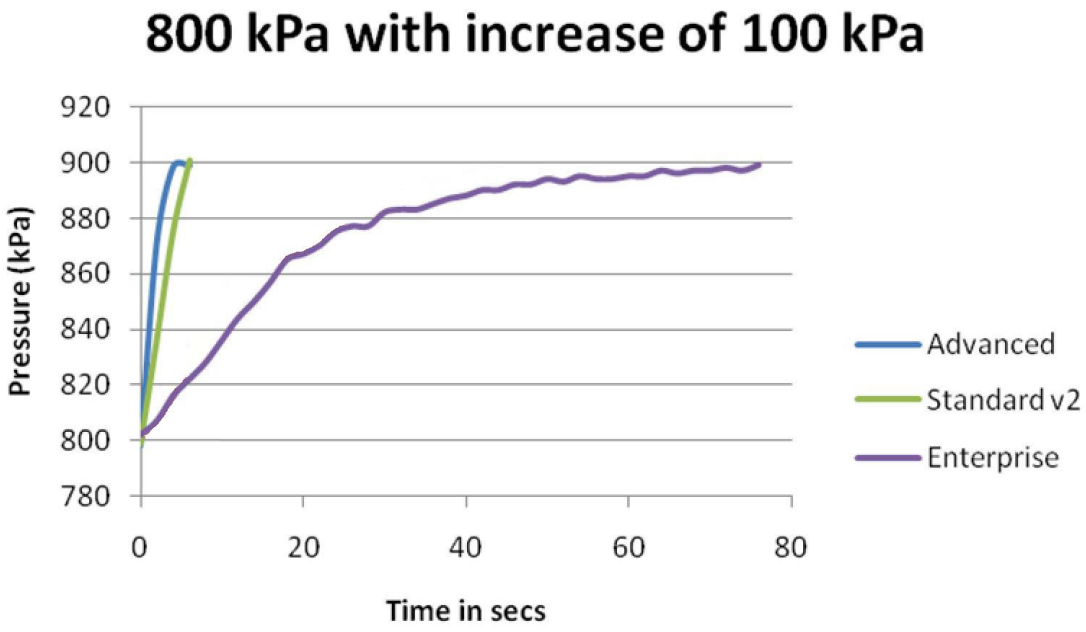

Figure 1. Performance comparison of all available GDS controllers

The key differences between the ELDPC, the STDDPC and the ADVDPC controllers are detailed in Table 1 below. Table 2 shows the specifications of the previous v1 STDDPC and v3 ADVDPC controllers.

Table 1. Enterprise Level (ELDPC), Standard (STDDPC), and Advanced (ADVDPC) pressure/volume controllers comparison chart

Feature	ELDPC Pressure/Volume Controller	STDDPC Pressure/Volume Controller v2	ADVDPC 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 20 kg (empty) 64-100MPa 25 kg (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

Table 2. Previous, Standard v1 (STDDPC), and Advanced v1 (ADVDPC) pressure/volume controllers comparison specifications.

Feature	STD pressure/volume controller	ADV pressure/volume controller
Pressure Range	1, 2, 3, 4 MPa	0.1, 0.2, 0.4, 0.8, 1, 2, 4, MPa
Pressure Accuracy	0.15% FRO	Better than 0.1% FRO
Pressure Resolution	1 kPa	1 kPa
Resolution of logging via software	1 kPa	0.2 kPa (2000 kPa device)
Pressure calibration	One point calibration (FRO)	Multipoint calibration, certified with table.
Volumetric range	200 cc	200 cc, 1000 cc (2 MPa only)
Resolution (volume)	1 mm^3 (0.001 cc)	0.5 mm^3
Volumetric accuracy	Better than 0.25%, calculated	Better than 0.1%, certified
Resolution of control	1 kPa	0.5 kPa (2000 kPa device)
Ball screw	Rolled – lead error 100 µm in 330 mm	Ground – lead error 25 µm in 330 mm
Linear guide	Rolled – error unspecified	Ground – running parallelism error 20 µm in 500 mm
Gearbox	Class C	Class A, precision
Interface options	RS232 Option for analogue outputs of pressure and	RS232 or IEEE - 488
RFM Compatible	No	No
Material and finish of pressure cylinder	Brass, painted	Brass, bright nickel plated and polished
Size (mm)	600 x 230 x 195	860 x 230 x 220 (2 MPa) 860 x 230 x 230 (1000 cc) 860 x 230 x 260 (32 MPa) 860 x 230 x 330 (64 MPa)
Weight	14 kgf	20 - 25 kgf
Electrical supply (universal)	85 VAC to 260 VAC; 120 to 370 VDC 47 – 440 Hz	85 VAC to 260 VAC; 120 to 370 VDC 47 – 440 Hz