Chell - 2416

16 Channel Advanced Pressure Scanner

- **Unparalleled Data Quality: up to 0.02% of full scale**
- **24 bit synchronous acquisition across all channels**
- **Multi-range and in field transducer replacement**
- **Electric 3 position shuttle valve (run-cal-purge)**
- **Purge gas pressure measurement**
- **Thermally compensated from 0 to 90°C (-20 to 90°C optional) with optional internal heaters**
- **High speed : 1kHz per channel**
- **Absolute and differential measurements**
- **Power-over-Ethernet**
- **Complete with IEEE 1588 PTPv2 time stamping**
- **2 x 24 bit ADC per channel (pressure and temperature)**
- **Output over Gbit Ethernet (TCP/IP and UDP), Chell native protocol, Modbus, Netscanner® protocol, iDDS and IENA**
- **Quick-disconnect measurement couplings available**
- **Fully configurable over Ethernet with embedded web server**

The Chell 2416 is a 16 channel industrial pressure scanner. Like the microDAQ products and the 2432, the 2416 makes use of high accuracy digital absolute transducers to give unparalleled performance - even in the most demanding environments.

The 2416 has been designed to give the user all the desirable features of a modern pressure scanner. These include a 3 position electric shuttle valve, digital transducers with pressure and temperature measurement per port, simultaneous acquisition across all channels and an unrivalled set of output interfaces to suit most installations.

The Chell 2416 will output differential or absolute temperature compensated engineering unit pressure data over Ethernet with the Chell native protocol, Modbus, IENA, and iDDS at speeds up to 1kHz per channel.

For integration into existing facilities, it also features a Netscannner® emulation mode where a significant subset of the Netscanner commands are supported.

The Chell 2416 incorporates an electrically driven shuttle valve for purge and re-zero - therefore removing the need for high pressure supply lines associated with other scanners. The 2416 will also measure and control the purge gas flow removing the need for external valving. The shuttle valve features positional feedback, current sensing on the motor and a count of the number of shuttles to help with planning maintenance requirements. The valve life is tested to 10,000 cycles.

External measurement connectors are made via the 5/16-24 SAE ‘O’ ring bosses. This gives the user the flexibility to specify 1/8” double ferrule compression fittings or AS205 quick disconnects. In addition, these fitting can be added to two 8-channel quick disconnect plates.

The 2416 has a smart power supply which is compatible with a DC supply and PoE. The 2416 will always use a DC supply if it senses one - otherwise it will negotiate with a PoE enabled switch for power - simplifying integration.

The 2416 is available with an optional software controlled internal heater (no increase in case size). This will increase the internal temperature to 20°C when using PoE and 25°C when using 28 VDC supply. It is recommended that the internal temperature is above 0°C when moving the internal purge/cal valve.

Chell Instruments Ltd.
Folgate House, Folgate Road, North Walsham, Norfolk NR28 0AJ England

Tel: +44 (0)1692 500555 | Fax: +44 (0)1692 500088
sales@chell.co.uk | www.chell.co.uk

General		
Differential ranges available	1, 2.5, 5, 7, 10,17, 35, 55, 105, 210 and 300, 700, 1000, 2750, 5000, 7000 kPa	
Number of channels	16 common differential or 8 channels true differential plus reference and purge	
Maximum acquisition speed (measurements / channel / second)	1kHz per channel (200 for iDDS output)	
Data Output		
Output types	Gbit Ethernet (TCP/IP & UDP), Chell, Modbus and Netscanner protocols, IENA and iDDS	
Ethernet Specification	10 / 100/ 1000 Base-T TCP/IP or UDP (user configurable)	
Performance		
System Accuracy		See table below
Line pressure effect		Negligible
Overpressure / Proof Pressure (gauge) (Pressure before damage to sensor or change to calibration)	Ranges 1 kPa to 300 kPa : Ranges 700 kPa to 2750 kPa : Ranges 5000 kPa to 7000 kPa :	1.5 MPa (15 bar) 4.5 MPa (45 bar) 10 MPa (100 bar)
Case Burst Pressure (gauge) (Exceeding this pressure may cause loss of containment and structural damage)	Ranges 1 kPa to 2750 kPa : Ranges 5000 kPa to 7000 kPa :	7 Mpa (70 bar) 10 Mpa (100 bar)
Output Resolution		16 or 32 bit
System Resolution		24 bit
Mechanical		
Dimensions (width x depth x height in mm)		241 x 89 x 115
Weight		3.5 kg
Enclosure Sealing		IP67 with one way safety valve fitted
Measurement ports	5/16”-24 SAE O ring boss with 1/8” double ferrule compression fitting or Chell AS205 QDC. 1.0 and 1.6mm tubulations via mating QDC plate.	
Cal and reference ports	5/16”-24 SAE O ring boss with 1/8” double ferrule compression fitting or AS205	
Purge port	5/16”-24 SAE O ring boss with 1/4” double ferrule compression fitting	
Maximum purge pressure	7 bar gauge	
Purge Flow	40 SLPM at 1 bar purge, 60 SLPM at 2 bar purge and 120 SLPM at 3 bar	
Power Supply		
DC Power	18 to 32 VDC with smart sensing power supply 10W MAX (25W with heaters) Typical current = 0.2A at 24VDC (1.2A with internal heaters)	
PoE Specification	IEEE 802.3at (Type 1 and 2) 25W	
Electrical Connector	09-49-15KPT06FS	
Environment		
Operating Temperature Range	0 to +90°C (-20/-25ºC to +90C with internal heaters)	
Compensated Temperature Range	0 to +90°C (-20/-25ºC to +90C with internal heaters with valve operation)	
Optional compensated Temperature Range	-20 to +90°C (-40/-45ºC to +90C with internal heaters without valve operation)	
Storage Temperature Range	-55 to +90°C	
Internal heater performace (FF=03,04)	+20°C ΔT when used with PoE, +25°C ΔT when used with 28VDC supply	
Ambient Pressure	100 mbar abs (52,000 ft) to 2.5 bar abs	
Vibration	Engine standard vibration test to DO160E category S, curve W with duration of 1 hr/axis. Fan blade (20 g 2 kHz)	
Shock	Fan blade out to DO160G section 7 (40g 11 m/s)	
Radiated emissions	MIL-STD-461-E*: RE102 (Space)	
* This product should not be used for safety critical application and should not be relied upon to protect against loss of life or material damage		
Timing / Data Synchronisation		
Time Stamping		IEEE 1588 PTPv2
Time Stamping Resolution		1µs
Hardware Trigger		5 V TTL pulse, maximum 1 kHz, minimum 2 Hz

2416 Accuracy - A Metrology Approach

The performance and flexibility of the microDAQ3 calls for a detailed and transparent approach to specifying its accuracy. The table below details the resolution, standard deviation and errors with 95% confidence (2 x sigma). The error figure below includes all the contributions from:

- Limit of accuracy (linearity)
- Repeatability
- Stability (noise)
- Long term drift (12 months)
- Thermal errors from 0 to 90°C (optionally -20 to 90°C)
- Resolution limitations
- Line pressure effects

Differential Range (+/-)[1]			Max Absolute Range[2]	Standard Deviation (Pa)[3]	Error (95% Confidence)	
					±Pa	%FS[2]
1 kPa	10mb	4.02" water	1to 175kPa	0.91	1.82	0.2%
2.5 kPa	25mb	10.05" water	1 to 175kPa	0.91	1.82	0.07%
5 kPa	50mb	20.1" water	1 to 175kPa	0.91	1.82	0.04%
7 kPa	70mb	1.015 psi	1 to 175kPa	1.1	2.26	0.03%
10 kPa	100mb	1.45 psi	1 to 175kPa	1.25	2.5	0.03%
17 kPa	170mb	2.47 psi	1 to 175kPa	1.5	3.0	0.02%
35 kPa	350mb	5.08 psi	1 to 175kPa	2.01	7.0	0.02%
55 kPa	550mb	7.977 psi	1 to 175kPa	1.71	11	0.02%
-83 kPa to 105 kPa	-830mb to 1.05 bar	-12 to 15.22 psi	1 to 400 kPa	3.0	20	0.02%
-83 kPa to 210 kPa	-830mb to 2.1 bar	-12 to 30.46 psi	1 to 400 kPa	5	40	0.02%
-83 kPa to 300k Pa	-830mb to 3.0 bar	-12 to 43.5 psi	1 to 400 kPa	9.0	60	0.02%
-83 kPa to 700 kPa	-830mb to 7.0 bar	-12 to 101.53 psi	1.5 to 1140 kPa	20	300	0.04%
-83 kPa to 1000 kPa	-830mb to 10 bar	-12 to 145.03 psi	1.5 to 1140 kPa	30	400	0.04%
-83 kPa to 2750 kPa	-830mb to 27.5 bar	-12 to 398.9 psi	15 to 3 MPa	60	1100	0.04%
-83 kPa to 5000 kPa	-830mb to 50.0 bar	-12 to 725.27 psi	15 to 7 Mpa	150	2000	0.04%
-83 kPa to 7000 kPa[4]	-830mb to 70 bar	-12 to 1015.36 psi	15 to 7 Mpa	200	2750	0.04%

1) Differential range assumes a reference of 1 bar. Reference pressure can vary as long as all measurements are within the absolute range of the transducers.
2) %FS values refer to the percentage of the differential range as listed.
3) Data collected at 100Hz with an average of 16 and after re-zero.
4) Provisional

Absolute Range		Output Resolution (Pa)	Standard Deviation (Pa)[1]	Error (95% Confidence)	
				±Pa	%FS[2]
Absolute range for differential range up to 55 kPa					
1.0 to 160 kPa	1.45 psia to 23.2 psia	2.24	1.6	50	0.03%
Absolute range for differential range of 105, 220 and 300 kPa					
1.0 to 400 kPa	1.45 psia to 58.01 psia	6.1	6	80	0.02%
Absolute range for differential range of 700 and 1035 kPa					
15 to 1140 kPa	2.17 psia to 165 psia	17	100	800	0.07%
Absolute range for differential range of 2750 kPa					
15 to 3000 kPa	2.17 psia to 435 psia	46	400	1000	0.03%
Absolute range for differential range of 5000 and 7000 kPa					
15 to 7000 kPa[3]	2.17 psia to 1015 psia	107	600	2000	0.03%

1) Data collected at 100Hz with an average of 16 and after re-zero.
2) %FS values refer to the percentage of the maximum absolute values as listed.
3) Provisional
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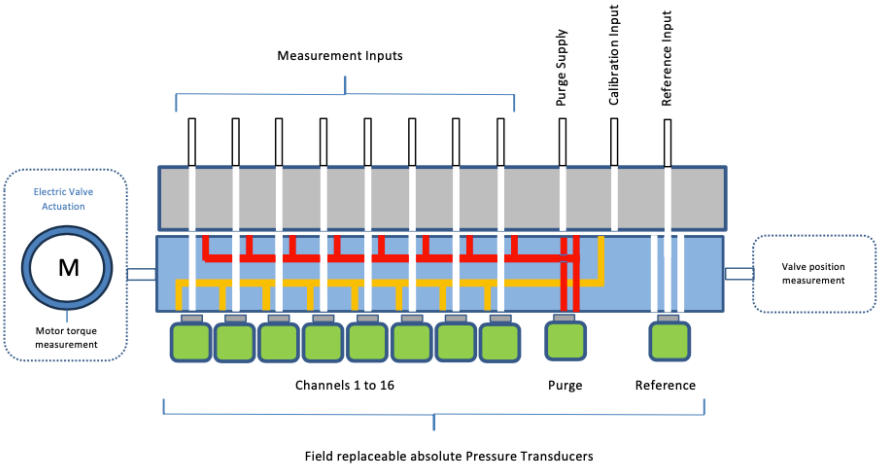
Digital Transducers - A revolution in data quality

The digital transducers used in the 2416 provide unparalleled data quality. Each channel has two 24 bits ADCs - one for pressure and one for temperature. When the pressure and temperature output for each transducer are processed with our proprietary thermal compensation algorithm, the results set a new standard for pressure scanners and a considerable improvement over the earlier scanner products.

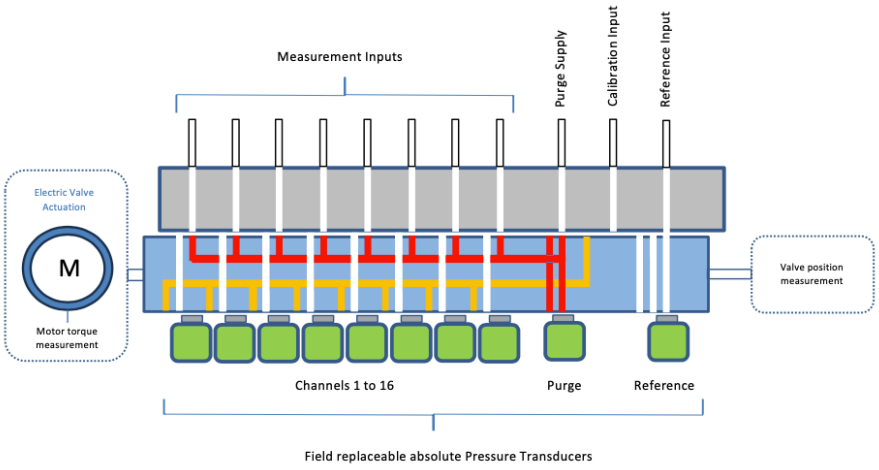
2416 Electric Shuttle Valve

Run Mode



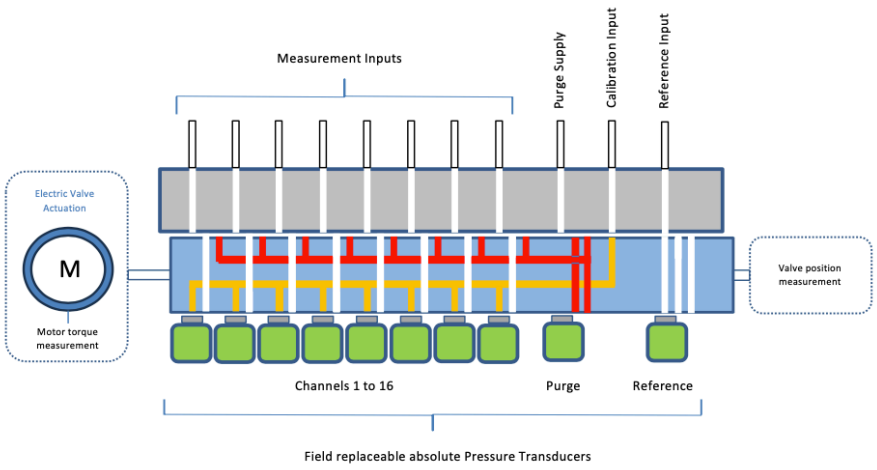
Here each measurement input is connected to its transducer. The purge supply and calibration input are positively shut-off. The purge supply pressure can be monitored.

Purge Mode



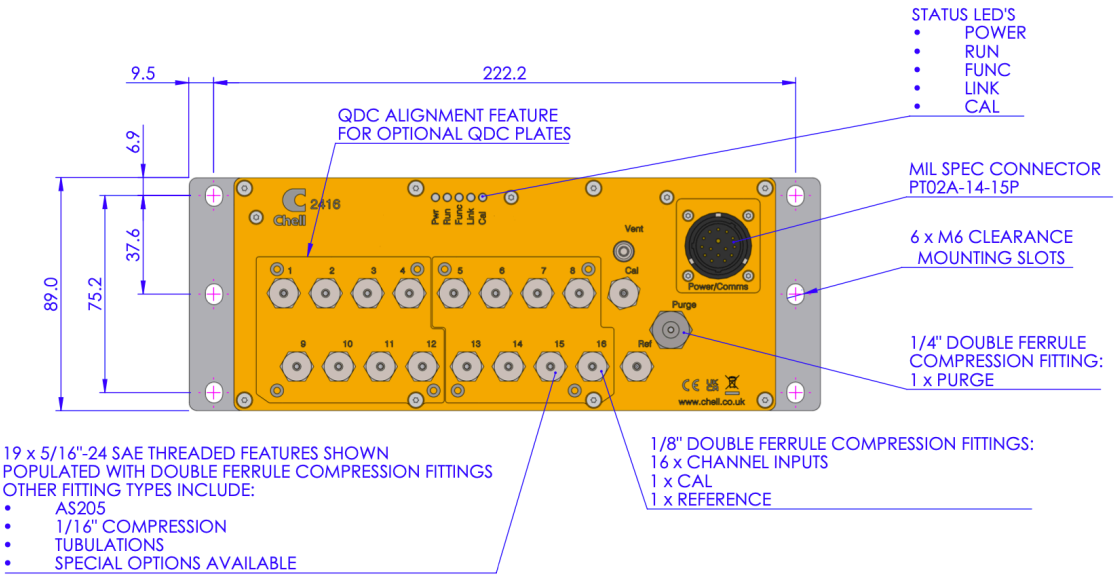
In purge mode, all the measurement lines are connected to the purge supply. The purge pressure can also be measured by the purge transducer. The transducers are isolated and the calibration input is shut-off.

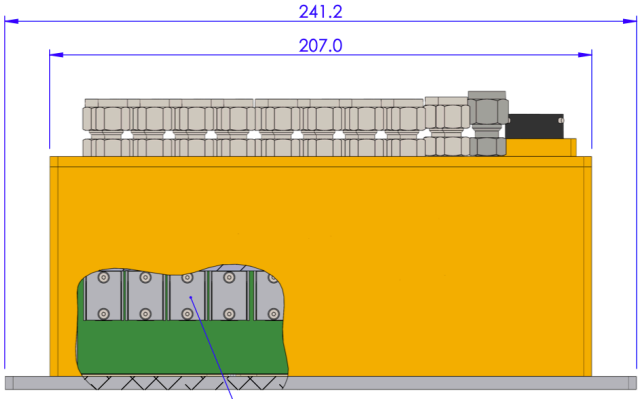
Cal Mode

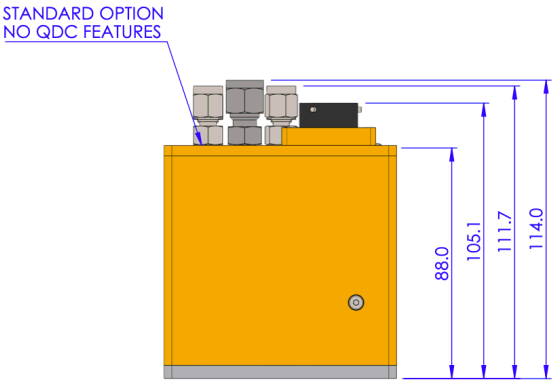


In cal mode, all the transducers are connected to the calibration input. The measurement lines are isolated and the purge supply is positively shut-off.

2416 Dimensions







Part Number:

2416 -AABBCCDDEEFF

AA = Range
01 = 1 kPa (4” water)
02 = 2.5 kPa (10” water)
03 = 5 kPa (20” water)
04 = 7 kPa (1 psi)
05 = 10 kPa (1.5 psi)
06 = 17 kPa (2.5 psi)
07 = 35 kPa (5 psi)
08 = 55 kPa (8 psi)
09 = 105 kPa (15 psi)
10 = 210 kPa (30 psi)
11 = 300 kPa (43. psi)
12 = 700 kPa (100 psi)
13 = 1000 kPa (150 psi)
14 = 2750 kPa (400 psi)
15 = 5000 kPa (750 psi)
16 = 7000 kPa (1000 psi)

BB = Measurement Ports
00 = No mating Connectors
01 = 1/8” double ferrule compression fittings
02 = AS205
03 = 1/8” double ferrule compression fittings on 2 x quick disconnect plates
04 = AS205 on 2 x quick disconnect plates
05 = 1.0mm (0.040”) bulged tubulations on 2 x quick disconnect plates
06 = 1.6mm (0.063”) bulged tubulations on 2 x quick disconnect plates

CC = Interface / Supply
01 = 09-49-15KPT06FS (MIL-DTL-26482 14-15P)

DD = Service ports
01 = 5/16” - SAE O-ring boss
02 = 1/8” double ferrule compression fittings (1/4” for purge)
03 = AS205 quick disconnect

EE = Interface Types
01 = Chell Interface, Modbus, IENA and NetScanner® emulation
02 = Chell Interface, Modbus, IENA, NetScanner® emulation and DDS

FF = Compensated Temperature Range
01 = 0 to +90°C
02 = -20 to +90°C
03 = 0 to +90°C with internal heater
04 = -20 to +90°C with internal heater