



microDAQ3-16

16 Channel Advanced Pressure Scanner

- **New and advanced use of digital sensor technology.**
- **Unparalleled Data Quality: up to 0.02% of full scale**
- **High speed : 400Hz per channel**
- **Absolute and differential measurements**
- **Compact size**
- **Complete with IEEE 1588 PTPv2 time stamping**
- **Thermally compensated from -20 to 90°C**
- **24 bit ADC per channel**
- **Output over Ethernet (100Mbit TCP / UDP) and CAN**
- **Fully configurable over Ethernet with embedded web server**

The Chell MicroDAQ3-16 is a leap forward in pressure scanning technology. The use of high accuracy digital sensors combined with an advanced processor design results in the most accurate - and most versatile pressure scanner on the market.

The MicroDAQ3-16 will output differential or absolute compensated engineering unit pressure data over Ethernet, CAN, IENA, and EtherCAT (see MicroCAT3) at speeds up to 400Hz per channel.

The MicroDAQ3-16 offers the same performance as the 64 channel version but in a compact and sealed package suitable for demanding applications.

The MicroDAQ3-16 makes use of high accuracy transducers which are combined with two 24-bit ADC's per port - one for pressure and one for temperature. This precise temperature measurement allows the MicroDAQ3 to almost entirely compensate for thermal effects over its wide operating range.

The MicroDAQ3-16 makes use of all the technology that Chell has developed with its MicroDaq and nanoDaq range such as embedded web server, IEEE 1588 PTP time stamping, CAN and hardware trigger.

General

Differential ranges available	1, 2.5, 5, 7, 10, 17, 35, 55, 103, 207 and 310 kPa
Number of channels	16
Maximum Acquisition Speed (measurements / channel / second)	400

Data Output

Output type	CAN and Ethernet (TCP/IP & UDP), IENA
Ethernet Specification	100Mbit TCP/IP or UDP (user configurable)
CAN Specification (DC Powered version only)	2.0B

Performance

System Accuracy	See table below
Absolute Ranges	160 kPa and 400 kPa
Calibrated absolute pressure range (differential range \leq 8 psid)	14 kPa to 160 kPa (2.0 psia to 23.2 psia)
Calibrated absolute pressure range (differential range $>$ 8 psid)	14 kPa to 400 kPa (2.0 psia to 58 psia)
Line pressure limitation	None - as long as all measured pressures are within absolute pressures above
Proof Pressure (all ranges)	Ranges \leq 8 psid :50 psig (64.5 psia), Ranges $>$ 8 psid:90 psig (105 psia)
Output Resolution	16 bit or \pm range / 65536
System Resolution	24 bit

Mechanical

Dimensions (width x depth x height in mm)	See drawing below
Weight (Valved / non-valved)	36g
Enclosure Sealing	IP67
Measurement ports	1.0 mm (0.04") bulged tubulations

Power Supply

Input supply	8-30 VDC
Power consumption	1VA Max
Electrical Connector	Female 9-way micro-miniature 'D' type (suggested mate : Glenair MWDM2L-9PS - solder cup version)

Environment

Operating Temperature Range	-40 to +90°C
Compensated Temperature Range	0 to +90°C (optional -20 to +90°C)
Storage Temperature Range	-40 to +90°C
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 DO160F section 7 (40g 11 m/s)
Maximum relative humidity	95% at 50°C (non-condensing)

Timing / Data Synchronisation

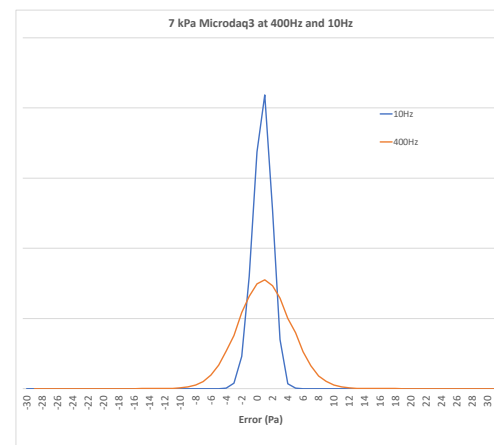
Time Stamping	IEEE 1588 PTPv2
Time Stamping Resolution	1 μ s
Hardware Trigger (DC powered version only)	5 V TTL pulse, maximum 400 Hz, minimum 2 Hz

microDAQ3 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

For more details on how the performance specifications are derived, please see our application notes on the subject.



Differential Ranges

Differential Range (+/-) ¹		Max Absolute Range ²	Output Resolution (Pa)	Standard Deviation (Pa) ³	Error (95% Confidence)	
					±Pa	%FS ⁴
1 kPa	4" water	0.5 to 175kPa	0.03	0.91	1.82	0.2%
2.5 kPa	10" water	0.5 to 175kPa	0.08	0.91	1.82	0.07%
5 kPa	20" water	0.5 to 175kPa	0.15	0.91	1.82	0.04%
7 kPa	1 psi	0.5 to 175kPa	0.21	1.1	2.26	0.03%
10 kPa	1.5 psi	0.5 to 175kPa	0.31	1.25	2.5	0.03%
17 kPa	2.5 psi	0.5 to 175kPa	0.52	1.5	3.0	0.02%
35 kPa	5 psi	0.5 to 175kPa	1	2.01	7.0	0.02%
55 kPa	8 psi	0.5 to 175kPa	1.7	1.71	11	0.02%
-83 kPa to 103 kPa	-12 to 15 psi	0.5 to 400 kPa	3.15	3.0	20	0.02%
-83 kPa to 207 kPa	-12 to 30 psi	0.5 to 400 kPa	6.3	5	40	0.02%
-83 kPa to 300k Pa	-12 to 43.5 psi	0.5 to 400 kPa	9.5	9.0	60	0.02%
For 100 and 150 psi ranges, see 32MD3-HP						
1) Differential range assumes a reference of 1 bar. Reference pressure can vary as long as all measurements are within the Max Absolute Range ² of the transducers. 2) Max absolute range of the transducers. 3) Data collected at 100Hz with an average of 16. 4) %FS values refer to the percentage of the differential range as listed. See above for error definition.						

Absolute Ranges

Absolute Range		Output Resolution (Pa)	Standard Deviation (Pa) ¹	Error (95% Confidence)	
				±Pa	%FS ²
Absolute range for differential ranges up to 55 kPa (8 psi)					
0.5 to 160 kPa	0.07 psia to 23.2 psia	2.24 ³	1.6	30	0.02%
Absolute range for differential ranges of 103, 207 and 300 kPa (15, 30 and 43.5 psi)					
0.5 to 400 kPa	0.07 psia to 58.01 psia	6.1 ³	6	60	0.02%
1) Data collected in accuracy mode with an average of 16 2) %FS values refer to the percentage of the maximum absolute values as listed. 3) Absolute range can be user configured to improve resolution.					

Absolute Transducers - More information and better performance

The microDAQ3 is available with two ranges of absolute sensors; 160kPa and 400 kPa absolute which are used for both the measurement and reference ports. The microDAQ3s are calibrated over their full absolute range (see above) and the absolute output can be configured to suit the use case to optimise the resolution of the 16-bit output.

For differential outputs, the reference ports is subtracted from the measurement ports to provide a differential output. The microDAQ3's are purchased pre-configured for a particular differential range to maximise the resolution of the 16-bit output. Line pressures can be accommodated as long as the range of pressures measured falls within the absolute range of the sensors.

The use of absolute transducers in the microDAQ3 leads to several advantages:

- The ability for the user to switch between differential and absolute measurements.
- Unparalleled differential and absolute measurement performance.
- The ability to output differential measurements **and** the absolute value of the reference removing the need for external barometric transducers.
- The option to output absolute values for all channels and thereby removing the need for a reference all together.
- The lack of an internal reference cavity (and therefore volume) means the scanner responds much faster to changes in reference pressure (for example, changes in altitude) improving data quality.

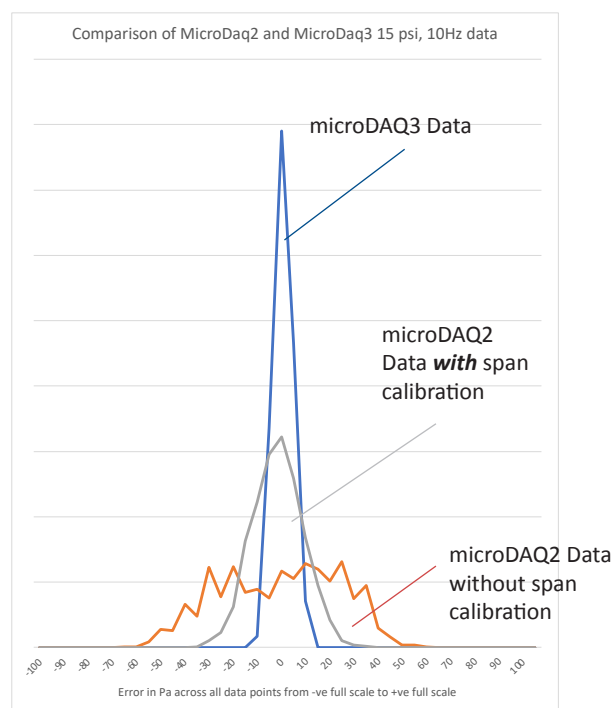
Digital Transducers - A revolution in data quality

The digital transducers used in the microDAQ3 provide unparalleled data quality. When the pressure and temperature output for each transducer are processed with our proprietary thermal compensation routine, the results set a new standard for pressure scanners and a considerable improvement over the microDAQ2 product range.

The histogram opposite shows a 15 psid microDAQ3 when compared to the data from a microDAQ2 which incorporate a digitally thermally compensated (DTC) scanner using conventional analogue transducers.

The microDAQ3 produces superior data to conventional compensated scanners - even when the older scanners are used with on-line calibration!

This performance removes the need for on-line calibration and, in most cases, rezero.



Connecting to the microDAQ3

The microDAQ3 draws on the long history of the microDAQ products and provides the following interfaces:

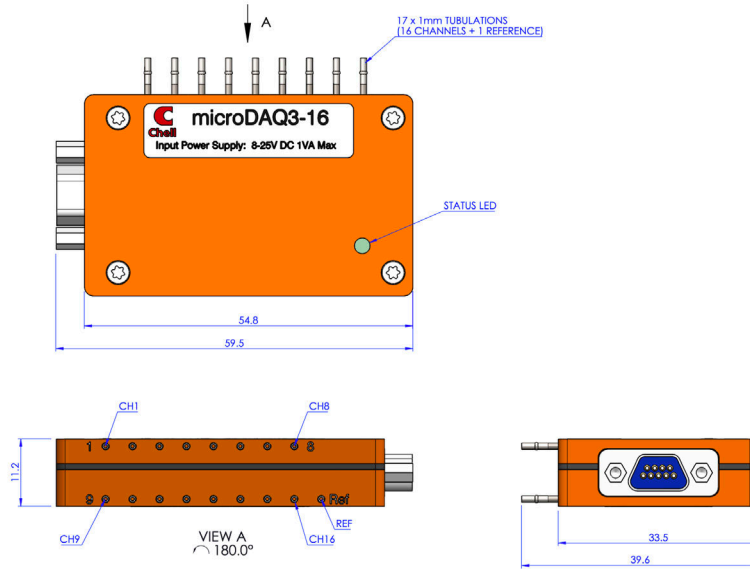
- [1] Ethernet (TCP/IP and UDP)
- [2] CAN (non PoE models only)
- [3] IENA
- [4] EtherCAT (see microCAT products)

Connecting to the microDAQ3 couldn't be easier. The Ethernet comes directly out of the microDAQ3 so the customer can produce their own cables or use a Chell cable. In addition to the cables, we also provide a range of interfaces that simplify the connection further.

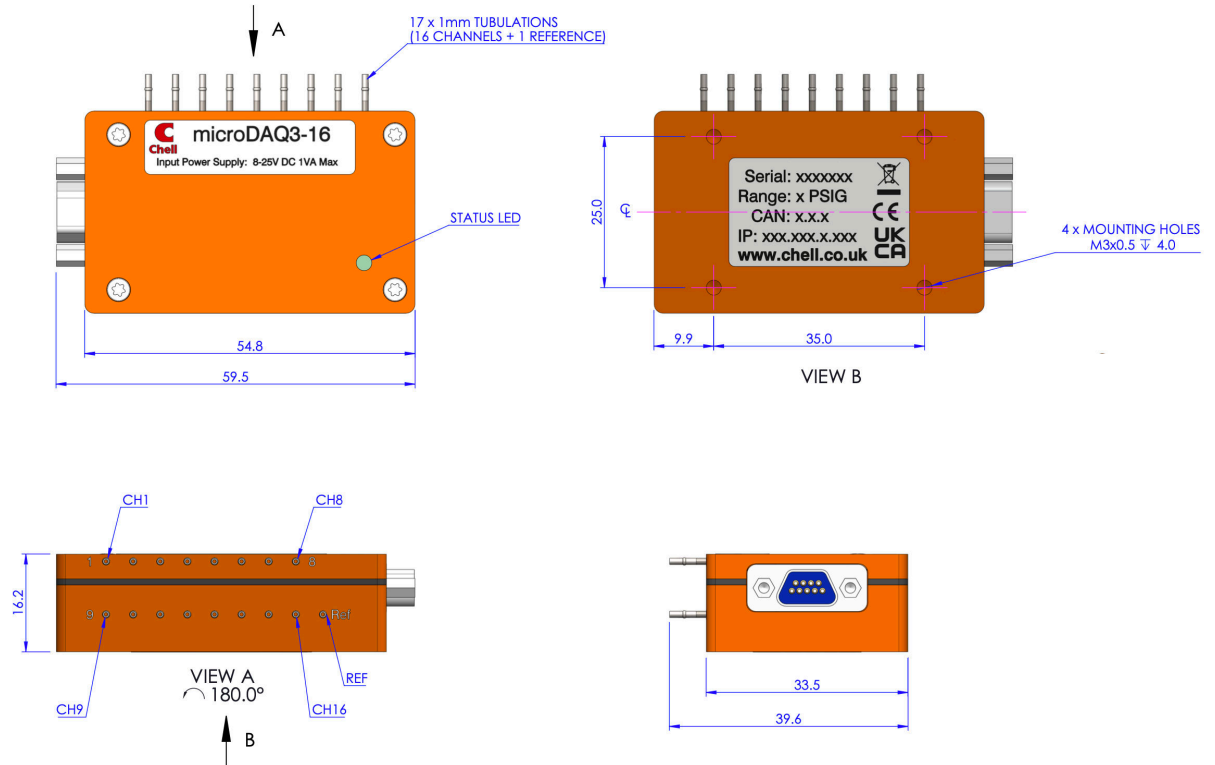
Shown here is the microDAQ-INT-4 which can be used to connect up to 4 Chell scanners together through its in-built Ethernet (or CAN) hub. The microDAQ-INT-4 also has the advantage of being PoE powered (for itself and the scanners connected to it) so it can simply be connected to a PoE enabled switch and the installation is complete!



Standard Version (CC=01)



Mounting Hole Version (CC=02)



Part Number:

16MD3 -AABBCC

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 = 103 kPa (15 psi)
- 10 = 207 kPa (30 psi)
- 11 = 310 kPa (45 psi)

CC = Mounting Features

- 01 = None
- 02 = 4 x M3 mounting holes (increased width)

BB = Calibrated Temperature Range

- 01 = 0 to 90°C
- 02 = -20 to 90°C