

ST-2A Digital Indicator

FEATURES

- Benchtop indicator able to measure up to 3 parameters; pressure, temperature, voltage or current
- Interchangeable pressure modules with pressure ranges from 0.25 in. H₂O up to 10,000 psi
- Measurement accuracy +/- 0.1%, 0.05% or 0.025% of span
- RS232 serial communication
- [Traceable calibration certificate](#) included with base and modules



ST-2A
Digital Indicator

SPECIFICATIONS

Available Pressure Measurement Accuracies:	AQS-1 Module Type: ±0.06% (0.07%) or 0.1% of span AQS-2 Module Type: ±0.025%, 0.05% or 0.1% of span
Display:	Standard: Alphanumeric LCD, 0.37-inch height, 2 lines, 16 characters/line Optional: Backlit LCD
Display Resolution:	±0.002% of span, 60,000 counts (max)
Display Update Rate:	130 ms (nominal) with one sensor installed
Engineering Units:	psi, in. H ₂ O, in. Hg, ftSW, bar, mbar, kPa, MPa, mm Hg, cm H ₂ O, mm H ₂ O and kg/cm ² and any single user-programmable engineering unit
Damping:	Programmable averaging from zero through 16 consecutive readings
Standard Operating Range:	32 °F to 120 °F (0 °C to 49 °C)
Compensated Range:	20 °F to 120°F (-7 °C to 49 °C)
Reference Temperature:	70 °F ±3 °F
Standard Temperature Effect:	0.004% of span per degree Fahrenheit over the compensated range
Optional Extended Temperature Compensation:	AQS-2 Quick-Select™ modules are available calibrated to maintain rated accuracy over the 20 °F to 120 °F (-7 °C to 49 °C) compensated temperature range.
Storage Temperature:	-4 °F to +158 °F (-20 °C to 70 °C)
Electrical Sourcing:	24 Vdc at 25 mA
Electrical Measurement Specification::	Input (volts) Accuracy: 0/10 Vdc ±0.025% of span 0/30 Vdc ±0.10% of span Input (mA) Accuracy: 0/20 mA ±0.03% with of span
Temperature Effects	±0.001% of span per °F over the compensated range (Reference temp. 70 °F ± 3 °F)
Electrical Measurement:	

KEY BENEFITS

- Measurement flexibility of interchangeable Quick- Select™ calibrator modules
- Built in functions including leak detect, flow measurement and datalogging

SPECIFICATIONS CONTINUED

Weight: ST-2A Base unit:	3.0 lb (1.4 kg)
Housing:	Molded, high-impact ABS case
Electrical Connections:	Standard banana jacks
Optional Battery Power Supply:	5 "AA" nicads with built-in charger or 5 "AA" alkaline (nonrechargeable)
Portable (Battery) Operation:	20 hours with optional backlight off, 2 hours with backlight on
External Power Supply:	AC adaptor 9 Vdc, 500 mA
Warm-up:	5 minutes for rated accuracy (maximum), 30 minutes for complete stability
RS232 Serial Interface	With 9-pin D type at 300, 1200, 2400, 9600 baud.
Field Calibration:	Calibration module and proper pressure and electrical standards are required
Optional Data Logging Capacity:	Standard measurements: 714 records Date/time stamped measurements: 384 records Provides prompts for storage of calibration history information, including instrument tags As Found/As Left data and corresponding ambient temperature

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STANDARD FUNCTIONS

- Built in Loop power supply to power device under test (optional).
- Percent Error Function can be used when calibrating pressure transducers. Calculations are performed by the ST-2A eliminating potential for human errors. This function enables the user to program the full scale range and electrical output of the transducer under test, and will display the actual pressure and electrical output readings as well as a percentage value comparing the actual output to the theoretical output.
- Leak Detect provides the ability to detect and quantify leaks in terms of pressure decay over time. In the pressure decay over time mode the unit will monitor the desired pressure vessel for the programmed time interval and, at the end of the monitoring time period, display the measured change in pressure.
- Switch Test Function the system can be used to test pressure and temperature switches. On board firmware provides the ability to verify switch trip points, reset point and to test the dead band of a pressure switch.
- Data Logging (Optional) Log up to 714 records on internal memory

ORDERING CODE	Example:	ST2H	1	B	X	D1	X	XNH
Power Supply								
1 - 110 Vac/60 Hz		ST2H1						
2 - 220 Vac/50 Hz								
3 - 100 Vac/60 Hz								
Display								
N - No backlight								
B - With Backlight				B				
Standard Temperature								
X					X			
Datalogging								
DX - No logging								
D1 - With logging						D1		
Approvals								
X - No approvals							X	
Options								
X - No options								X
N - NiCad battery pack (rechargeable)								N
A - Alkaline battery pack (non-rechargeable)								
H - Carry handle								H
L - Loop power supply								
P - Panel mounting bracket								

AQS-1 and AQS-2 Pressure Modules

FEATURES

- Low pressure modules ranges from 0.25 in. H₂O (IWC) to 200 in. H₂O (IWC), accuracy ±0.1% to ±0.06% of span, variable capacitance sensor, for use with clean dry gas media
- Medium/high pressure modules 5 to 10,000 psi, accuracy ±0.1% to ±0.025% of span, 316 Stainless steel isolated sensor, for use with media compatible with 316 Stainless steel
- Gauge, absolute, differential and compound ranges available
- Temperature compensated 20 °F to 120 °F

PRODUCT SPECIFICATIONS:

AQS-1 Low Pressure Modules:

Pressure Types:	Differential and compound
Available Ranges:	0.25 to 200 in. H ₂ O see range table
Available Accuracies:	±0.06% of span (0/1-0/200 in. H ₂ O) ±0.07% of span (0/0.25-0/0.5 in. H ₂ O) ±0.1% of span
Compensated Temperature Range:	20 °F to 120 °F (-7 °C to 49 °C)
Temperature Effect:	±0.004% of span per °F over compensated range from reference temperature range of 70 °F (±3 degrees)
Repeatability:	±0.01% of span (range 0/1 in. H ₂ O or higher) ±0.02% of span (range below 1.0 in. H ₂ O)
Sensitivity:	±0.002% of span (typical)
Under / Overpressure Capability:	-15 to 50 psi
Maximum Static (line) Pressure:	100 psi
Process Connection:	1/8 NPT Female (STD.)
Media Compatibility:	Clean, dry, non-conductive, non-corrosive gas

PRODUCT SPECIFICATIONS:

AQS-2 Medium High Pressure Modules:

Pressure Types:	Gauge, absolute, compound and vacuum
Available Ranges:	5 to 10,000 psi see range table
Available Accuracies:	±0.025%, ±0.05% or ±0.1% of span (10,000 psi only offered in psig and ±0.1% accuracy)
Compensated Temperature Range:	20 °F to 120 °F (-7 °C to 49 °C)
Temperature Effect:	Standard: ±0.004% of span per °F over compensated range from reference temperature range of 70 °F (±3 degrees) Optional: Enhanced Accuracy Option — No additional error due to ambient temperature from 20 °F to 120 °F
Sensitivity:	±0.002% of span (typical), ±0.001 of span (max)
Repeatability:	±0.01% of span
Overpressure Compatibility:	200% for ranges to ≤ 1,000 psi 150% for ranges > 1,000 psi
Process Connection:	1/8 NPT Female (STD.) Optional pressure connections, 1/8 NPT Female NPT with flush out port, welded VCR® compatible fitting with standard finish (5,000 psi max)
Media Compatibility:	Any medium compatible with 316 Stainless steel isolation; 10,000 psi range only available with 17-4 PH® / 316 Stainless steel
Optional:	Clean to ASME B40-100 Level IV (not marked for oxygen service)

Data Sheet

AQS-1 Low Pressure Quick-Select™ Pressure Modules

ORDERING CODE	Example:	AQS	1	C	A	C	INWC	5.0	A
Model									
AQS - Low pressure Quick-Select™ calibrator module		AQS							
Sensor Type									
1- Capacitive Sensor			1						
Accuracy									
B - ±0.1% Accuracy									
C - ±0.06% Accuracy (for ranges 1.0 in. H ₂ O and higher)				C					
C - ±0.07% Accuracy (for ranges 0.5 in. H ₂ O and lower)									
Media Compatibility									
A - Non-isolated sensor, clean dry gas only					A				
Pressure Type									
C - Compound						C			
D - Differential									
Pressure Units									
INWC - In. H ₂ O							INWC		
Pressure Range Differential									
0.25 - IWC (in. H ₂ O)								NOTE 1	
0.5 - IWC (in. H ₂ O)								NOTE 1	
1.0 - IWC (in. H ₂ O)									
2.0 - IWC (in. H ₂ O)									
3.0 - IWC (in. H ₂ O)									
5.0 - IWC (in. H ₂ O)								5.0	
10 - IWC (in. H ₂ O)									
15 - IWC (in. H ₂ O)									
25 - IWC (in. H ₂ O)									
50 - IWC (in. H ₂ O)									
100 - IWC (in. H ₂ O)									
150 - IWC (in. H ₂ O)									
200 - IWC (in. H ₂ O)									
Pressure Range Compound									
0.125 - IWC (in. H ₂ O)								NOTE 1	
0.25 - IWC (in. H ₂ O)								NOTE 1	
0.5 - IWC (in. H ₂ O)								NOTE 1	
1.0 - IWC (in. H ₂ O)									
1.5 - IWC (in. H ₂ O)									
2.5 - IWC (in. H ₂ O)									
5.0 - IWC (in. H ₂ O)									
7.5 - IWC (in. H ₂ O)									
12.5 - IWC (in. H ₂ O)									
25 - IWC (in. H ₂ O)									
50 - IWC (in. H ₂ O)									
75 - IWC (in. H ₂ O)									
100 - IWC (in. H ₂ O)									
Inlet Fitting									
A - 1/8 NPT Female									A
Note (1) Accuracy is +/- 0.07% of span									
Consult factory for additional pressure units and ranges									

Data Sheet

AQS-2 Quick-Select™ Medium High Pressure Modules

ORDERING CODE	Example:	AQS	2	C	I	C	PSI	30	A
Model		AQS							
AQS - Medium high pressure module		AQS							
Sensor Type									
2- Piezoresistive sensor			2						
Accuracy									
B - ±0.1% Accuracy (STD.)									
C - ±0.05 % Accuracy (STD.)				C					
D - ±0.025 % Accuracy (STD.)									
F - ±0.1% Enhanced temperature compensation 20 °F to 120 °F									
G - ±0.05% Enhanced temperature compensation 20 °F to 120 °F									
H - ±0.025% Enhanced temperature compensation 20 °F to 120 °F									
Media Compatibility									
I - Isolated 316 Stainless steel wetted parts					I				
W - Cleaned to ASME B40.100 level IV NOT marked for O ₂ service									
Pressure Type									
G - Gauge									
A - Absolute									
V - Vacuum									
C - Compound						C			
Pressure Units									
PSI - psi							PSI		
Pressure Range - Gauge and absolute (all ranges include 316 stainless steel isolation)									
5 psi									NOTE 1
10 psi									
15 psi									
20 psi									
25 psi									
30 psi								30	
50 psi									
60 psi									
100 psi									
150 psi									
200 psi									
250 psi									
300 psi									
500 psi									
600 psi									
1000 psi									
1500 psi									
2000 psi									
2500 psi									
3000 psi									
5000 psi									
6000 psi									
7500 psi									
10000 psi									NOTE 1
Pressure Range - Vacuum									
5 psi									
10 psi									
15 psi									
(Note 1) Gauge pressure only. Accuracy +/-0.1% of span. Consult factory for additional pressure units and ranges.									

Data Sheet

AQS-2 Quick-Select™ Medium High Pressure Modules

ORDERING CODE (continued)	Example:	AQS	2	C	I	C	PSI	30	A
Pressure Range - Compound									
10 - ±10 psi									
V15 - ±15 psi									
V30 - ±15/30 psi									
V60 - ±15/60 psi									
Inlet Fitting									
A - 1/8 NPT internal									
B - 1/8 NPT internal with flush port									
C - G-British standard thread									
D - G-British standard thread with flush port									
Consult factory for additional pressure units and ranges, (Note 1) Gauge pressure only and 0.1% accuracy only									

AQS-RTD Modules

FEATURES

- Measures temperature with most RTD probes
- Supports 2, 3 and 4 - wire RTDs
- Displays measurement for Fahrenheit, Celsius, Kelvin Rankine and ohms
- Easy configurability to meet application

PRODUCT SPECIFICATIONS

Following specification is based on use of 4 wire RTD probe; accuracy does not include contribution from RT

RTD TEMPERATURE MODULE Part Number AQS-RT1

Used with RTD Probe Type	Measurement Range and Accuracy	Resolution*
Pt100 (385 & 392)	-200 to 550 °C: ±0.15 °C	0.01 °C or °F
Ni 120	-80 to 260 °C: ±0.1 °C	0.1 °C or °F
Cu 10	-70 to 150 °C: ±0.6 °C	0.1 °C or °F
Ohms	±0.01% reading ±0.02 ohms	0.004 ohms

RTD TEMPERATURE MODULE Part Number AQS-RT2

Pt1000	-200 to 550 °C: ±0.15 °C	0.01 °C or °F
Ohms	±0.01% reading ±0.02 ohms	0.004 ohms

* Select from 1, 0.1, 0.01 and 0.001 degrees or ohms. Resolution for a given probe is dependent on the output of the probe. Maximum resolution is 1 part in 100,000 of full scale ohms Select from 1, 0.1, 0.01 and 0.001 degrees or output for the probe.

Temperature Error:

Better than ±0.0005% of reading per degree Fahrenheit from a reference temperature of 70 °F ±3 °F

Input Receptacle:

TA4F type RTD connector

HOW TO ORDER RTD PROBES

Probes are all 4 wire RTDs with 304 stainless steel sheath and a TA4F electrical connector for compatibility with AM2-RT1 interface modules. They are provided in DIN Class A accuracy.

Part No.	Description
840X010-01	Pt100 (385), 0.125 diameter, 12 inch length, handle and 5 foot coiled cable
840X010-02	Pt100 (385), 0.25 diameter, 12 inch length, handle and 5 foot coiled cable
840X010-05	Pt100 (385), 0.125 diameter, 6 inch length, handle and 5 foot coiled cable
840X010-06	Pt100 (385), 0.25 diameter, 6 inch length, handle and 5 foot coiled cable
840X010-11	Pt100 (385), 0.125 diameter, 8 inch length, handle and 5 foot coiled cable
840X010-03	Pt100 (385), 0.125 diameter, 12 inch length, 10 foot straight extension lead with plug (no handle)
840X010-04	Pt100 (385), 0.25 diameter, 12 inch length, 10 foot straight extension lead with plug (no handle)
840X010-07	Pt100 (385), 0.125 diameter, 6 inch length, 10 foot straight extension lead with plug (no handle)
840X010-08	Pt100 (385), 0.25 diameter, 6 inch length, 10 foot straight extension lead with plug (no handle)
828X136-01	TA4F mating connector for use with HM2-RT1 module and user supplied RTD probe

AQS-TC1 Thermocouple Temperature Modules

FEATURES

- Allows ST-2A to measure temperature with a thermocouple
- Pre-programmed to accept 8 most common thermocouple types
- Displays measurement for Fahrenheit, Celsius, Kelvin Rankine and millivolts
- Reference junctions: automatic internal or manual external

PRODUCT SPECIFICATIONS:

THERMOCOUPLE TEMPERATURE MODULE Part Number AQS-TC

Unit of Measure (selectable):

°C, °F, °K, °R and millivolts

Reference Junction (selectable):

Automatic Mode: The AQS-TC1 module incorporates an internal resistor/thermistor based reference junction, which may be selected for use in the temperature readout mode.

Manual Mode:

An external reference junction may be used in place of the internal junction. External reference junctions may be applied in the temperature or direct millivolt readout modes.

Resolution Reading in Temperature Units (selectable):

1, .1 or .01 degrees. "Auto" mode selection that allows the ST-2A to automatically configure the readout to the highest significant resolution (resolution closest to the tolerance) for the thermocouple type selected.

Resolution Reading in Millivolts:

.001 millivolts

Thermocouple Connection (to interface module):

Requires a "miniature thermocouple connector" (Omega type SMP), specifically matched to the thermocouple type to be used. These connectors may be purchased as an accessory under the following part numbers: (see how to order thermocouple connector table)

SYSTEM ACCURACY (READING IN TEMPERATURE UNITS):

Includes the base unit and AQS-TC1 interface module. (Does not include inaccuracy of the thermocouple device. Consult thermocouple manufacturer or ANSI MC96.1 for thermocouple accuracy specifications. Typical inaccuracies range from ±1 to ±2. °C.)

Conversion Factors to convert °C specifications to other units of measure:

To convert from C to F; $F = (1.8 \times C) + 32$

To convert from C to K; $K = C + 273.15$

To convert from C to R; $R = (1.8 \times C) + 427.6$

Additional thermocouple information on the following page.

HOW TO ORDER THERMOCOUPLE CONNECTOR

Part No.	Description
828X161-01	Type J Connector
828X161-02	Type K Connector
828X161-03	Type T Connector
828X161-04	Type E Connector
828X161-05	Type R Connector
828X161-06	Type S Connector
828X161-07	Type B Connector
828X161-08	Type N Connector

Thermocouple probes to be provided by customer

AQS-TC1 Thermocouple Temperature Modules

Thermocouple Type	Measurement Range (°C)	Accuracy @ 25 °C (Not Including Internal Reference Junction)	Accuracy @ 25 °C (Including Internal Reference Junction Expressed as ± °C)	Max Additional Error Due to Ambient Temperature Deviation From 25 °C Expressed as Additional °C Deviation from 25 °C
J	-151 to -210	0.7	1.1	0.02
	1200 to -150	0.3	0.4	0.01
K	-201 to -240	1.5	2.2	0.05
	-101 to -200	1.0	1.5	0.03
	-999 to -100	0.5	0.8	0.02
T	-250 to -201	1.5	2.2	0.05
	-200 to -101	0.8	1.2	0.03
	-100 to 400	0.5	0.8	0.02
E	-250 to -201	1.2	2.0	0.04
	-200 to -101	0.6	1.1	0.02
	-100 to 400	0.3	0.6	0.01
R & S	-50 to 299	3.4	3.6	0.10
	300 to 1768	1.2	1.3	0.04
B	100 to 199	14.0	14.0	0.44
	200 to 499	5.0	5.0	0.16
	500 to 999	3.0	3.0	0.08
	1000 to 1820	1.2	1.2	0.04
N	-250 to -226	4.3	5.7	0.14
	-225 to -101	2.1	2.8	0.07
	-100 to 1300	1.0	1.4	0.02

AMBIENT TEMPERATURE EFFECT:

To calculate, multiply degrees deviation from 25 °C times the value listed in the far right column of the listed table. Only applied when using the internal reference junction, within the ambient window of 0-50 °C.

TO CALCULATE TOTAL SYSTEM/MEASUREMENT ACCURACY:

Accuracy = System Accuracy @ 25 °C + System Ambient Temperature Effect + Inaccuracy of Thermocouple Device

SYSTEM ACCURACY (BASED ON DIRECT MILLIVOLT READING FROM THERMOCOUPLE):

Includes the base unit and AQS-TC1 interface module. (Does not include inaccuracy due to the thermocouple device. Reference junction not applicable to direct millivolt readings.)

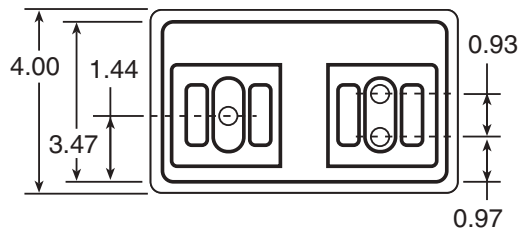
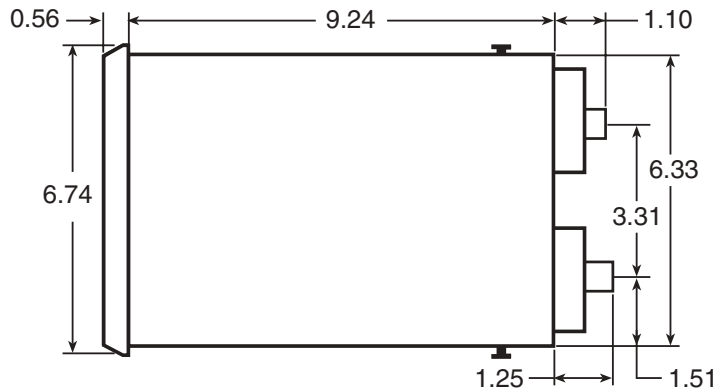
Input Range of Module	Accuracy @ 25 °C	Max. Additional Error Due to Ambient Temperature Deviation From 25 °C. Expressed As Additional Millivolt Error Per Each °C Deviation From 25 °C
10 to 100 mV	±0.01 to 100 mV	.001

Data Sheet

ST-2A Digital Indicator

DIMENSIONS

For reference only, consult Ashcroft for specific dimensional drawings



ADDITIONAL ACCESSORIES

Item	Part Number	Description
RS 232 Accessories	838X011-01	Cable assembly, connects base unit to computer with a 9 point serial port.
	838X012-01	Adapter, converts connector on cable (838X011-01) to 25 pin type connector on personal computer.
Test Leads	836X115-02	Test leads with miniature banana jacks, alligator clips and miniature to standard banana jack adapter.
Power Supplies	831X016-01	AC adapter to run system off line power (110 Vac, 60 Hz)
	831X016-02	AC adapter to run system off line power (100 Vac, 60 Hz)
	831X016-03	AC adapter to run system off line power (220 Vac, 50 Hz)
	8361176-01	1.5 volt NiCad battery (5 required)
Other quick select modules	840X009-01	For base unit calibration, provides quick access to pins inside module bay
	AQS-XS	"System Protection" module to fill unused module bay in single module applications.