

Accutech™

Smart Process Instrumentation

MODEL
AI-1000
Revision 2

Two-Wire “Programmable” Transmitter for: Industrial Thermocouple or RTD Temperature Measurements



Highlights:

- Exceptional speed and accuracy
- Guaranteed measurement stability
- Automatic self-calibration
- Automatic cold-junction compensation
- Digital ambient temperature compensation
- Virtually any Thermocouple or RTD input
- Fast and easy set-up
- No hand-held required
- Competitive pricing
- Total installation flexibility

Description

The Accutech AI-1000 R2 temperature transmitter combines the best features of analog and smart designs. A fast, accurate, versatile and easy-to-use transmitter, it will give immediate, substantial benefits in a wide range of industrial process applications. Capabilities that were once available only in high-priced “Smart” transmitters are now available in the compact, competitively priced AI-1000 R2.

Exceptional long-term stability

Accutech pioneered automatic self-calibration technology, and now makes that same capability available in a compact design. Automatic self-calibration to on-board reference standards increases process measurement reliability and significantly reduces maintenance costs. The digital ambient temperature compensation virtually eliminates ambient temperature drift. The AI-1000 R2 exceeds all transmitters in its price class for long-term stability and ambient temperature stability.

Tremendous versatility

A single AI-1000 R2 transmitter will take virtually any thermocouple or RTD, millivolt or ohm input. The AI-1000 R2 gives you linearized output over the entire usable range of the selected sensor.

You can dramatically reduce inventory and back-up parts. Configure this transmitter exactly the way you want, and re-configure it as your needs change. You do not need to stock two transmitter types — one for field mounting and one for panel mounting — one AI-1000 R2 will do it all!

Optional plug-in display and set-up tool

This unique time and cost-saving feature allows you to program and read directly from any transmitter, without using a hand-held terminal. If you do not need local read-out, once you have completed the programming you can simply unplug the display tool. Take it with you, and program or read any other AI-1000 R2 transmitter if you want.



Three steps to process improvement

Take three steps towards running a smoother, more consistent process.

Step one: Cut measurement errors

The AI-1000 R2 virtually eliminates errors arising from changes in the ambient temperature, errors from long-term drift, errors from non-linearity and errors from electrical noise. Your process will run more consistently when your measurements are more consistent — it's that simple. Use the AI-1000 R2 where you need:

Accuracy: World-class accuracy, right out of the box without on-site calibration.

True 4-Wire RTD measurement automatically corrects for unbalanced field wiring resistance.

On-board automatic self-calibration maintains accuracy in changing ambient temperatures.

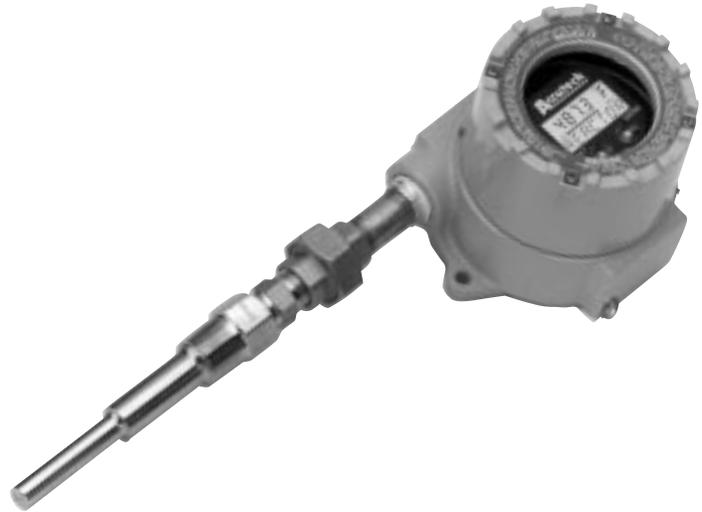
Linearity: Linearized for virtually any thermocouple or RTD sensor input.

Flexibility: Easy to mount — in the field or control room. Easy field-configuration to match any output range needed for changing process requirements.

Step two: Get faster updates

The second step to process improvement is dynamic response. The AI-1000 R2 is the only transmitter of its kind that can give you seven updates per second. This rapid update speed makes you constantly aware of the key parameters that affect your process. Even if your process temperature changes slowly, you will benefit from faster update speeds.

- Whatever your process might be, there is a good chance ambient temperature conditions change faster than your process. The AI-1000 R2 gives you rapid compensation for those ambient changes. Its automatic self-compensation is rated for ambient temperature changes to 20°C per hour.
- Rapid response improves the ability of the transmitter to filter unwanted noise.
- Line voltage and ground isolation potentials also change rapidly. The AI-1000 R2 automatically diagnoses and corrects to keep those unwanted influences to a minimum.



Rugged LEXAN® exterior package for harsh industrial service.

Step three: Install complete measurement systems.

Accutech offers a complete assortment of thermocouples, RTD's, thermowells and housings for head mounting, field mounting and panel mounting applications. Explosion-proof and FM approved assemblies are also available.

Complete Accutech temperature systems can be supplied to industrial users for both critical and non-critical measurements. For your critical applications, use individually calibrated measurement systems. For more information, please refer to the Accutech companion literature on temperature probes and assemblies or call Accutech directly at 1-800-879-6576.



Mount the AI-1000 R2 in your process — wherever you need it.

The unit's compact design and small size allow you more installation options than any other competitive transmitter.

Explosion-proof mounting

Choose from three explosion-proof housings for head-mounting directly onto the thermowell, or remotely mounting on a pipe stand.

XP-FG with DK-2



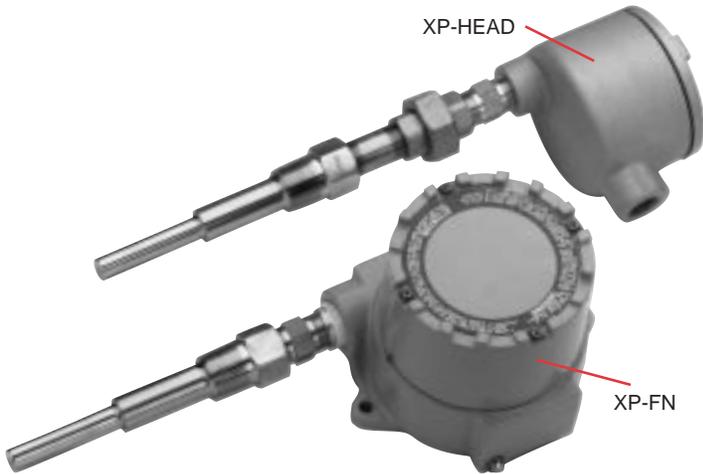
XP-FG with DK-1



The XP-FG housing is shown here with DK-2 and DK-1 displays.

Order FM certified-explosion-proof assemblies if desired.

XP-HEAD

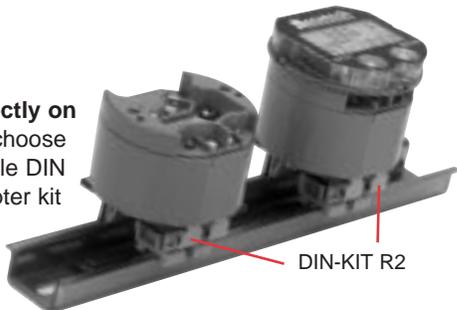


XP-FN

The XP-HEAD and XP-FN housings.

These low-cost housings may be used without displays.

Panel mount directly on a DIN rail. If you choose this option, a simple DIN rail mounting adapter kit is available.



DIN-KIT R2

Weatherproof mounting

For intrinsically safe installations, or where explosion-proof is not required, the WP-HEAD provides a very cost-effective solution.



WP-HEAD

Gang mounting

Various multiple-transmitter enclosures are available. Please consult the factory when your application requires this configuration.



4X-BOX-4

Look inside the AI-1000 R2...

And you will see that it has real guts.

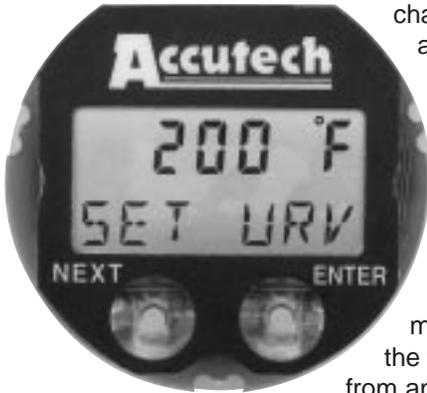
Simplify your application engineering! You will never have to plan every transmitter exactly for each sensor and each measurement range that you are going to need. The AI-1000 R2 lets you change at any time with a simple keypad entry. One size fits all — the versatile, powerful AI-1000 R2 can be easily set up and changed.





Fast, easy set-up

The straightforward design of the AI-1000 R2 immediately gives you complete control over an unparalleled range of options. Initial set-up and any subsequent



changes are as easy as pushing a button. All you do is push ENTER to accept a value or push NEXT for another option. You will not believe how simple it is. Select your sensor and your measurement units; choose the temperature scale

from an open-ended range without minimums or maximums; compensate your values if necessary, and even select another language — **all you do is push "ENTER" to accept a value, or push "NEXT" for another option. You can even program your AI-1000 R2 from your PC.**

Advanced capabilities

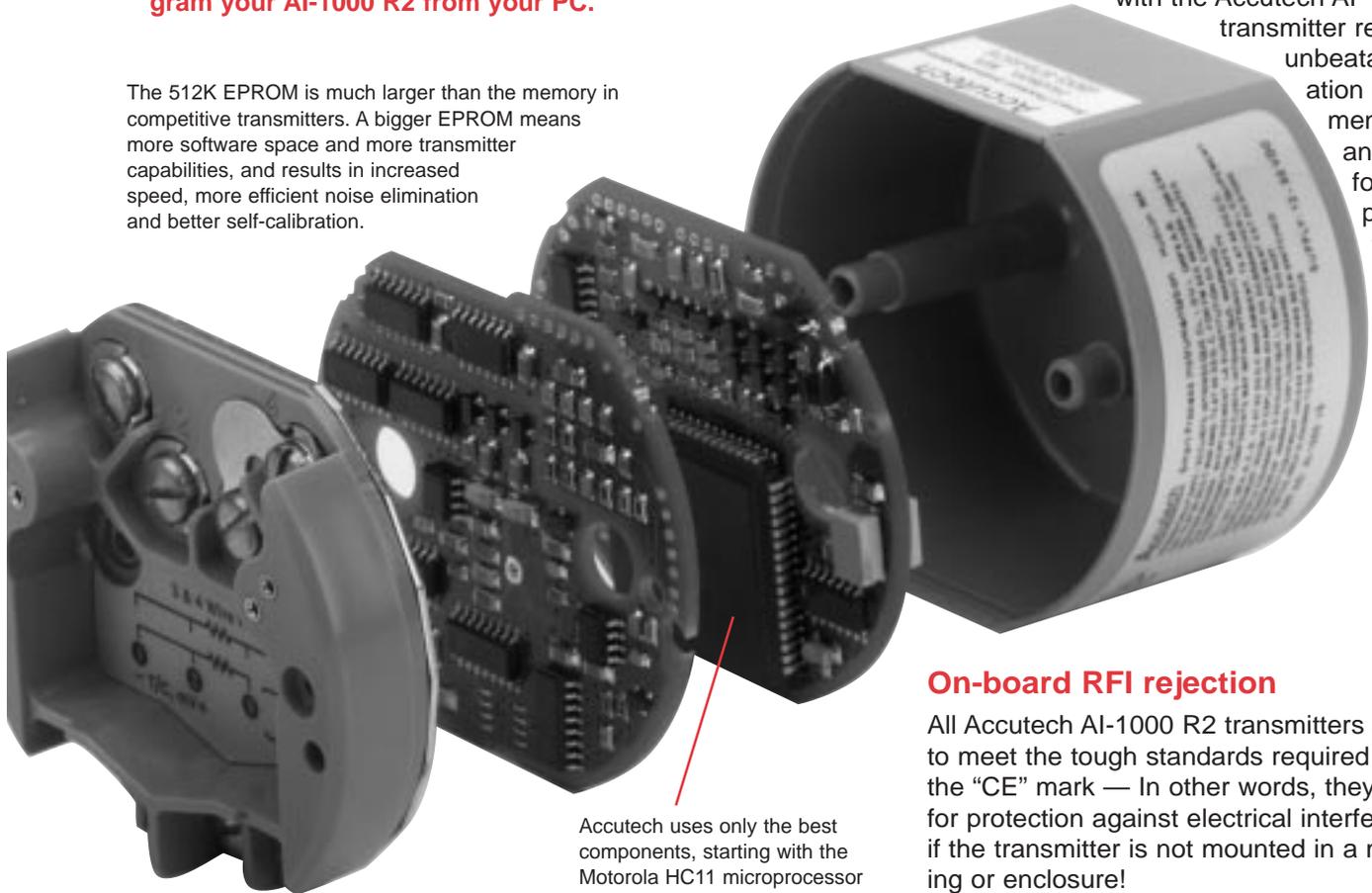
The Accutech AI-1000 R2 performance cannot be matched even with much more expensive transmitters. Advanced capabilities mean better temperature measurements.

Automatic compensation for sensor connection drift

While the AI-1000 R2 can handle a variety of inputs, its greatest benefit is with a 4-wire RTD. You can improve the accuracy and stability of virtually any industrial temperature measurement under 1,000°F with a 4-wire RTD and the AI-1000's true 4-wire RTD measurement capability. Unbalanced sensor resistances can creep unnoticed into two and three-wire sensor connections. Their effect can be very detrimental. The 4-wire measurement technique used in the Accutech AI-1000 R2 automatically compensates for unbalanced sensor lead resistance. The cost of a 4-wire RTD sensor is only slightly higher than the cost of a 3-wire sensor. Using a 4-wire RTD

with the Accutech AI-1000 R2 transmitter results in an unbeatable combination of measurement accuracy and stability for very long periods of time.

The 512K EPROM is much larger than the memory in competitive transmitters. A bigger EPROM means more software space and more transmitter capabilities, and results in increased speed, more efficient noise elimination and better self-calibration.



Accutech uses only the best components, starting with the Motorola HC11 microprocessor family — the same chip family used in transmitters costing three times as much.

You can rely on the AI-1000 R2 to withstand the toughest environments, and still give you all the precision that your process requires.

On-board RFI rejection

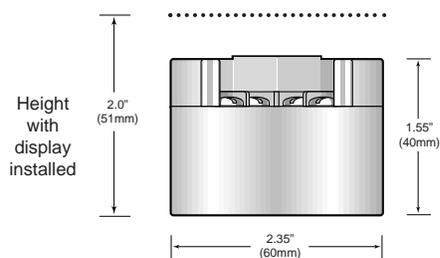
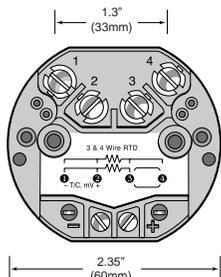
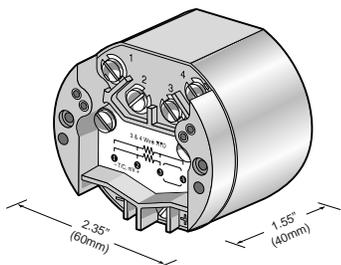
All Accutech AI-1000 R2 transmitters are designed to meet the tough standards required to receive the "CE" mark — In other words, they are certified for protection against electrical interference even if the transmitter is not mounted in a metal housing or enclosure!

Cut your maintenance costs

Guaranteed stability means that you do not have to perform frequent transmitter calibrations. Extending the useful calibration life will slash yearly maintenance costs.

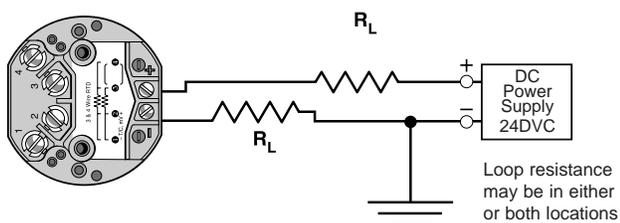
DIMENSIONS

MODEL AI-1000 REV. 2

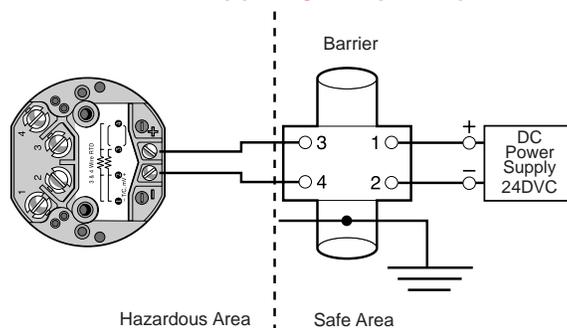


CONNECTIONS

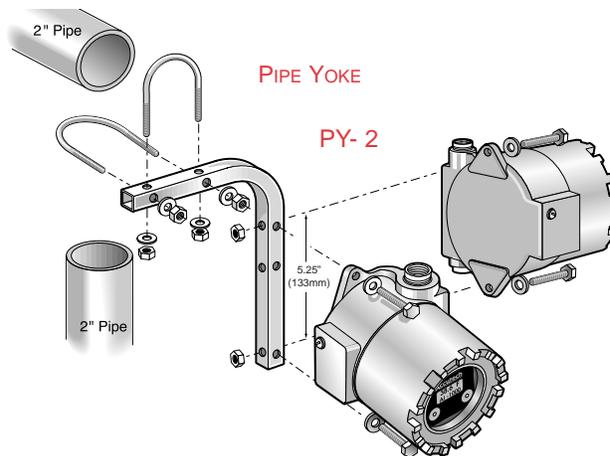
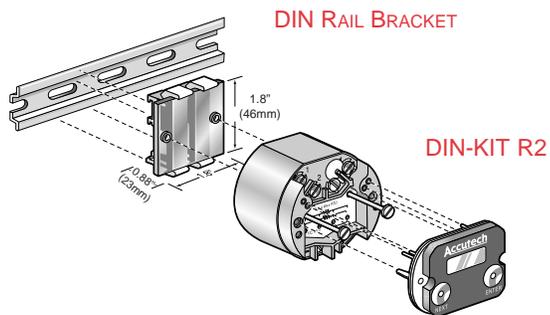
NORMAL INSTALLATION



INTRINSICALLY SAFE INSTALLATION

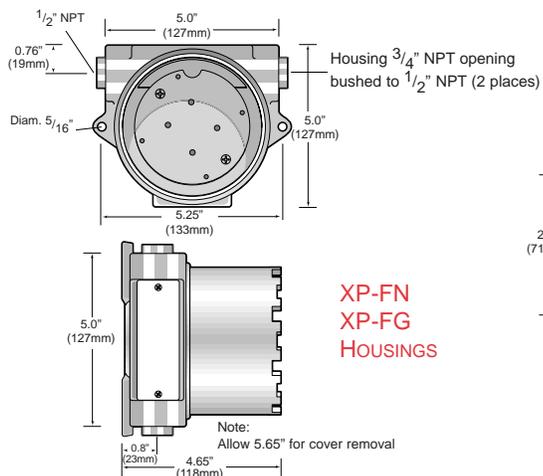


MOUNTING

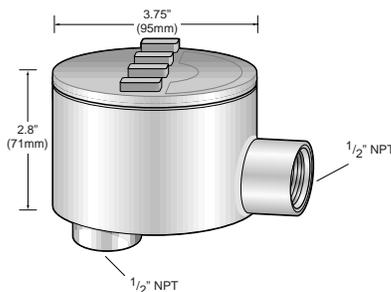


ENCLOSURES

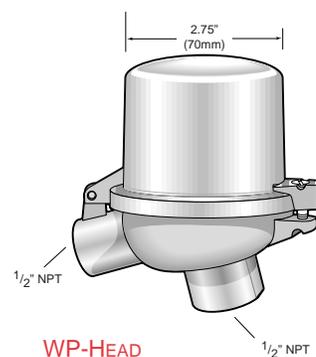
EXPLOSION PROOF HOUSING



XP-HEAD



WEATHER PROOF HEAD



Note:
Allow 5.65" for cover removal

AI-1000 Rev2 SPECIFICATIONS

SENSOR INPUT	RANGE	ACCURACY	RANGE	ACCURACY
Thermocouple Type B	+212 to +3,272°F	±1.08°F	+100 to +1,800°C	±0.6°C
Thermocouple Type C	+32 to +4,208°F	±0.9°F	0 to +2,320°C	±0.5°C
Thermocouple Type E	-58 to +1,832°F	±0.36°F	-50 to +1,000°C	±0.2°C
Thermocouple Type J	-292 to +1,382°F	±0.36°F	-180 to +750°C	±0.2°C
Thermocouple Type K	-292 to +2,282°F	±0.36°F	-180 to +1,250°C	±0.2°C
Thermocouple Type L	-328 to +1,652°F	±0.72°F	-200 to +900°C	±0.4°C
Thermocouple Type N	+32 to +2,192°F	±0.36°F	0 to +1,200°C	±0.2°C
Thermocouple Type R	+32 to +2,912°F	±0.9°F	0 to +1,600°C	±0.5°C
Thermocouple Type S	+32 to +2,822°F	±0.9°F	0 to +1,550°C	±0.5°C
Thermocouple Type T	-238 to +752°F	±0.54°F	-150 to +400°C	±0.3°C
Thermocouple Type U	-148 to +1,112°F	±0.72°F	-100 to +600°C	±0.4°C
100Ω Platinum RTD DIN Curve ($\alpha = 0.00385$)	-328 to +1,562°F	±0.14°F	-200 to +850°C	±0.08°C
100Ω Platinum RTD SAMA Curve ($\alpha = 0.003923$)	-328 to +1,193°F	±0.14°F	-200 to +645°C	±0.08°C
Call Factory for 100Ω Ni, 120Ω Ni, and 10Ω Cu				
Millivolt	-15 to 115mV	±0.006mV		
Ohm	0 to 500Ω	±0.002Ω		



PC Configuration



LINEARIZATION: Thermocouple and RTD linearization to $\pm 0.05^\circ\text{C}$. Custom linearization with 22 point curve via PC program.

OUTPUT: Analog, Two-wire 4 to 20mA

TRANSMITTER ACCURACY: $\pm 0.05\%$ of the millivolt or ohm equivalent input reading, or the value from the Accuracy Table, whichever is greater; plus $\pm 0.05\%$ of the span. For thermocouples, add $\pm 0.5^\circ\text{C}$ (0.9°F) for cold junction effect.

Accuracy includes repeatability, hysteresis and linearity errors as well as ambient temperature effect, A/D conversion error, analog output error, line voltage effects, humidity effect under non-condensing conditions and vibration effect to 2g's & 500Hz.

TRANSMITTER REPEATABILITY: One-half the transmitter accuracy.

COLD-JUNCTION COMPENSATION: Digital self-correcting over the ambient temperature range to within $\pm 0.5^\circ\text{C}$.

OUTPUT RANGING ADJUSTMENTS:

Analog Zero: } { 100% of Sensor range – Noninteracting
Analog Full-Scale: } { Normal or Reverse Acting

AMBIENT TEMPERATURE STABILITY: Self-correcting over the operating temperature range.

LONG TERM STABILITY: Stability deviation per year is less than: (0.025% of output the span +0.05% of the reading)

OPERATING TEMPERATURE RANGE:

-40°C to +85°C -40°F to +185°F Electronics
-20°C to +70°C -4°F to +158°F Display (Full Visibility)
-40°C to +85°C -40°F to +185°F Display (With Reduced Visibility)

STORAGE TEMPERATURE RANGE: -50°C to +85°C, -58°F to +185°F

DAMPING: Factory or PC selectable time constant (63%) from 0 to 32 sec.

FAILSAFE: User settable to 3.6mA or 23mA.

MOUNTING POSITION: No effect on measurement value.

WEIGHT: AI-1000 R2: 6 oz. XP-FN & FG: 2½ lbs. WP-HEAD: 12 oz.

ISOLATION: Input to Output 500VAC

INPUT IMPEDANCE: Greater than 1 MΩ

POWER SUPPLY: The transmitter operates on 12 to 42 VDC (30VDC for I/S installations) with no load. Transmitter is protected against reverse polarity connection.

LOAD LIMITATIONS: Loop resistance including optional display:
 $R(\text{K}\Omega) = (\text{Supply Voltage} - 12 \text{ VDC}) / (23 \text{ mA})$.

ELECTROMAGNETIC COMPATIBILITY (CE COMPLIANCE): Transmitter operates within specification in fields from 80 to 1,000MHz with field strengths to 30V/m. Meets EN 50082-1 Generic Immunity Standard and EN 55011 Compatibility Emissions Standard.

ORDERING INFORMATION: Please order Model AI-1000 R2. Specify custom configuration, options and companion products as desired.

DYNAMIC RESPONSE:

UPDATE RATE: 150 milliseconds (7 times per second), typical.

RESPONSE TO STEP CHANGE: 250 milliseconds, minimum;

1 second, typical.

START-UP TIME: 7 sec. Operation to specification in less than 30 sec.

AMBIENT TEMPERATURE CHANGE: Self-correcting for ambient temperature changes up to 20°C/hr .

INTERCHANGABILITY: Fully interchangeable without field calibration

HAZARDOUS LOCATION CERTIFICATIONS:

Explosion Proof: Explosion Proof Housings available with and without windows; CSA and FM approved for Class I, Div I, Groups B, C, & D; Class II, Div I & II, Groups E, F & G, Class III, and are rated for NEMA 4X and NEMA 7 environments.

Nonincendive: Transmitter is CSA and FM rated nonincendive in Class I, Div II, Groups A,B, C & D; Class II, Div II, Groups F & G, Class III, Div II, CENELEC Ex N IIC T4-T6 certification pending.

Intrinsic Safety: The Intrinsically Safe Rated Model AI-1000 R2 I/S Transmitter is CSA and FM rated Intrinsically Safe for Class I, Div I, Groups A, B, C & D and Class II, Div II Groups E, F, & G, and Class III, Div I, installed in accordance with AIC Drawing 6022588, CENELEC EEx ia IIC T4-T6 Intrinsically Safe certification pending.

OPTIONS:

INTRINSIC SAFETY: Order the AI-1000 R2 I/S

HOUSINGS:

XP-FN: NEMA 7 Explosion-Proof, NEMA 4X Housing
XP-FG: NEMA 7 Explosion-Proof, NEMA 4X Housing w/ Window
XP-HEAD: NEMA 7 Explosion-Proof, Rain-tight Head
WP-HEAD: IP66 Weatherproof Head

DISPLAYS:

DK-1: One-Line Local Display and Keyboard
DK-2: Two-Line Smart Local Display and Keyboard

THERMOWELLS: Order as required. See Accutech Bulletin PROB

SENSORS: Order as required. See Accutech Bulletin PROB

HAZARDOUS AREA SYSTEMS CERTIFICATION: Please consult factory

MOUNTING: PY-2 2" Pipe Yoke for XP-FN & XP-FG housings

DIN-KIT R2 DIN Rail Mounting Adapter

STANDARD CONFIGURATION:

Sensor Input: J Type Thermocouple
LRV (4mA): 40°F Lower Range Value
URV(20mA): 200°F Upper Range Value
Damping: 0 seconds
Output: Linear with Temperature
Fail-safe: Upscale (23mA)

NOTE: Please note that specifications are determined with the factory default software settings or with the various software parameters set to optimize the performance for a given specification.