



# IMMERSION

## Stainless Steel Immersion, Transmitters

The ACI Transmitter Immersion Series features a two-wire, 4 to 20 mA loop powered output signal with optional three-wire voltage output signal available. All transmitters include Zero and Span adjustments for field calibration and are calibrated using NIST Certified Calibration equipment. We recommend the use of an 18 to 22 AWG shielded cable for all temperature transmitter installations to keep noise from being introduced onto the signal lines. The sensor assemblies are manufactured using Etched Teflon colored lead wires and ACI's proven double encapsulation process to eliminate the effects of moisture on the sensors as well as increased response times from our high quality, thermally conductive epoxy. The immersion sensors "-I" include a welded thermowell but can be ordered without the thermowell "-INW" version. The "-INW" includes a standard 1/2" NPS process thread to be used with a machined thermowell or existing thermowell application. Optional NEMA/IP rated weather proof enclosures and

NIST Calibration Certificates are available when ordering the A/TTM Series transmitters as referenced in the ordering grid on the back of the product data sheet. For best accuracy, ACI recommends the use of the A/TTM Series Matched transmitters which includes a 3 or 5 Point NIST Calibration Certificate, since they include a second calibration step in which the RTD and transmitter are calibrated together as a system.

**Applications:** Chilled Water Systems, Hot Water Systems, Boilers, Pumps, Compressors, Chillers, Cooling Towers, Process Control

**The ACI Transmitter Immersion Series is covered by ACI's Five (5) Year Limited Warranty. The warranty can be found in the front of ACI's Sensors & Transmitters catalog, as well as on ACI's web site, [workaci.com](http://workaci.com).**

**Disclaimer:** Specification of any thermowell and the materials of construction are the sole responsibility of the designer of the system that incorporates the thermowell. Sole responsibility for ensuring compatibility of the process fluid with the system rests with the end user.

### PRODUCT SPECIFICATIONS

<b>Transmitter Supply Voltage   Supply Current:</b>	+8.5 to 32 VDC (Reverse Polarity Protected)   25 mA minimum <b>250 Ohm Load:</b> +13.5 to 32 VDC   <b>500 Ohm Load:</b> +18.5 to 32 VDC
<b>Maximum Load Resistance:</b>	(Terminal Voltage - 8.5 V)   0.020 A
<b>Output Signals:</b>	<b>Current:</b> 4-20 mA (2-Wire Loop Powered) <b>Voltage:</b> 1-5 VDC or 2-10 VDC (3-Wires)
<b>Calibrated Transmitter Accuracy   Linearity<sup>1</sup>:</b>	<b>Temp. Spans &lt; 500°F (260°C):</b> +/- 0.2%   <b>Temp. Spans &gt; 500°F (260°C):</b> +/- 0.5%
<b>Temperature Drift<sup>2</sup>:</b>	<b>Temp. Spans &lt; 100°F (38°C):</b> +/- 0.04%   <b>Temp. Spans &gt; 100°F (38°C):</b> +/- 0.02%
<b>TTM100/TTM1K Certification Points:</b>	<b>3 Point NIST:</b> 20%, 50% & 80% of span   <b>5 Point NIST:</b> 20%, 35%, 50%, 65%, 80% of span
<b>Warm Up Time   Warm Up Drift:</b>	10 Minutes   +/- 0.1%
<b>Operating   Storage Temperature:</b>	-40 to 185°F (-40 to 85°C)
<b>Operating Humidity Range:</b>	0 to 90%, non-condensing
<b>Calibrated Temperature Spans<sup>1</sup>:</b>	<b>Minimum Temp. Span:</b> 50°F (28°C)   <b>Maximum Temp. Span:</b> 500F (260°C)
<b>Matched Calibrated Temperature Spans (A/TTM models) Range:</b>	-45 to 155°C (-49 to 311°F)
<b>Connections   Wire Size:</b>	Screw Terminal Blocks (Polarity Sensitive)   16 AWG (1.31 mm <sup>2</sup> ) to 26 AWG (0.129 mm <sup>2</sup> )
<b>Terminal Block Torque Rating:</b>	0.37 ft-lb (0.5 Nm) nominal
<b>Sensor Type   Sensor Curve   Sensing Points:</b>	Platinum RTD   PTC (Positive Temperature Coefficient)   One
<b>Number Wires   Wire Colors:</b>	Two   <b>A/TT100/TTM100 Series:</b> Brown/Brown   <b>A/TT1K/TTM1K Series:</b> Black/Black
<b>Sensor Output @ 0°C (32°F):</b>	<b>A/TT100/TTM100 Series:</b> 100 Ohms nominal   <b>A/TT1K/TTM1K Series:</b> 1000 Ohms nominal
<b>RTD Class   Accuracy:</b>	+/- 0.06% Class A   ( <b>Tolerance Formula:</b> +/- °C = (0.15°C + (0.002 *  t ))) where  t  is the absolute value of temperature above or below 0°C
<b>Din Standard   Temperature Coefficient:</b>	DIN EN 60751 (IEC 751)   3850 ppm/°C
<b>Sensor Stability:</b>	+/- 0.03% after 1000 Hours @ 300°C (572°F)
<b>Response Time (63% Step Change):</b>	8 Seconds nominal
<b>Sensor Operating Temperature Range:</b>	-40 to 200°C (-40 to 392°F)
<b>Enclosure Specifications (Operating Temperature, Material, Flammability, NEMA/IP Ratings):</b>	"-GD" Enclosure: Galvanized Steel, -40 to 121°C (-40 to 250°F), NEMA 1 (IP10)
	"-PB" Enclosure: ABS Plastic, -30 to 90°C (-22 to 194°F), UL94-HB, Plenum Rated
	"-BB" Enclosure: Aluminum, -40 to 121°C (-40 to 250°F), NEMA 3R
	"-4X" Enclosure: Polystyrene Plastic, -40 to 70°C (-40 to 158°F), UL94-V2, NEMA 4X (IP 66)
<b>Storage Temperature Range:</b>	-40 to 85°C (-40 to 185°F)
<b>Operating Humidity Range:</b>	10 to 90% RH, non-condensing
<b>Probe Diameter   Thermowell Bore Diameter:</b>	0.250" (6.35 mm)   0.260" (6.60mm)

**Note<sup>1</sup>:** Transmitter's calibrated at 71°F (22°C) nominal | **Note<sup>2</sup>:** Temperature Drift is referenced to 71°F nominal calibration temperature





**PRODUCT SPECIFICATIONS CONTINUED**

<b>Probe Material   Thermowell Material:</b>	304 Stainless Steel   304 Stainless Steel
<b>Thermowell Instrument Thread   Process Thread:</b>	1/2" NPS (National Pipe Straight)   1/2" NPT (National Pipe Tapered)
<b>Fitting Material   Flammability Rating:</b>	Polyamide 66 (High Performance Nylon 66)   UL94-HB
<b>Fitting Thread Size:</b>	1/2" NPS (National Pipe Straight) Male Thread
<b>Lead Length   Conductor Size:</b>	14" (35.6 cm)   22 AWG (0.65 mm)
<b>Lead Wire Insulation   Wire Rating:</b>	Etched Teflon (PTFE) Colored Leads   Mil Spec 16878/4 Type E
<b>Conductor Material:</b>	Silver Plated Copper
<b>Product Dimensions   Product Weight:</b>	See table on back of Product Data Sheet
<b>Agency Approvals:</b>	RoHS2, WEEE

**MAXIMUM VELOCITY VS THERMOWELL INSERTION LENGTH MACHINED THERMOWELL**

Straight Shank Insertion Length "U"				Stepped Shank Insertion Length "U"					
Material:	Media Type:	1.0" (25.4 mm)	2.5" (63.5 mm)	8.0" (203.2 mm)	4.0" (101.6 mm)	6.0" (152.4 mm)	12.0" (304.8 mm)	18.0" (457.2 mm)	24" (609.6 mm)
304/316 SS	Air/Gas/Steam <sup>1</sup>	349 ft/s (106.3 m/s)	349 ft/s (106.3 m/s)	71.9 ft/s (21.9 m/s)	109 ft/s (33.2 m/s)	73.6 ft/s (22.4 m/s)	19.4 ft/s (5.9 m/s)	8.8 ft/s (2.7 m/s)	5.2 ft/s (1.6 m/s)
304/316 SS	Water	360 ft/s (109.7 m/s)	360 ft/s (109.7 m/s)	71.9 ft/s (21.9 m/s)	82.2 ft/s (25.1 m/s)	26.9 ft/s (8.2 m/s)	11.3 ft/s (3.4 m/s)	4.7 ft/s (1.43 m/s)	2.5 ft/s (0.8 m/s)

**Note 1:** Values are for Air/Gas/ Steam and similar density media based upon Max pressure of 2900 PSI @ 1000°F (537.8°C) | **Note 2:** Values are for Water (No Glycol or other Chemicals factored in) @ 68 °F (20°C) and max pressure of 5700 PSI. (Calculated to ASME PTC 19.3 TW-2016 Code B31.1) | **Note 3:** 6-24" Machined Thermowells meet ASME PTC 19.3 TW-2016 Code B31.1.

**MAXIMUM PRESSURE VS TEMPERATURE RATINGS TWO-PART FABRICATED | WELDED THERMOWELL**

Material:	70°F (21.1°C)	200°F (93.3°C)	400°F (204.4°C)	600°F (315.6°C)	800°F (426.7°C)	1000°F (537.8°C)	1200°F (648.9°C)
304/316 SS	982 PSI (67.7 Bar)	820 PSI (56.6 Bar)	675 PSI (46.5 Bar)	604 PSI (41.6 Bar)	550 PSI (37.9 Bar)	510 PSI (35.1 Bar)	290 PSI (20.0 Bar)

**MAXIMUM FLUID VELOCITY RATINGS TWO-PART FABRICATED | WELDED THERMOWELL**

Straight Shank Insertion Length "U"				
Material:	Media Type:	2.5" (63.5 mm)	4.0" (101.6 mm)	6.0" (152.4 mm)
304/316 SS	Air/Gas/Steam <sup>2</sup>	169 ft/s (51.5 m/s)	61 ft/s (18.6 m/s)	20 ft/s (6.1 m/s)
304/316 SS	Water	88 ft/s (26.8 m/s)	20 ft/s (6.1 m/s)	10 ft/s (3.05 m/s)

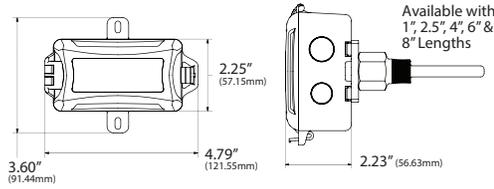
**Note 2:** Values are for Air/Gas/ Steam and similar density media





**DIMENSIONAL DRAWINGS, WEIGHTS**

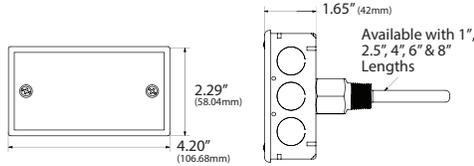
**Plastic Box Enclosure [PB]**



**Plastic Box Enclosure [PB] Weights**

ACI Model #	1.0"	2.5"	4.0"	6.0"	8.0"
A/xx-INW-yy-PB	0.20 lbs. (0.091 kg)	0.24 lbs. (0.109 kg)	0.28 lbs. (0.127 kg)	0.32 lbs. (0.145 kg)	0.36 lbs. (0.163 kg)
A/xx-I-yy-PB	N/A	0.24 lbs. (0.109 kg)	0.60 lbs. (0.272 kg)	0.64 lbs. (0.290 kg)	N/A
A/xx-IM-yy-PB	0.40 lbs. (0.182 kg)	0.58 lbs. (0.263 kg)	0.74 lbs. (0.336 kg)	0.92 lbs. (0.417 kg)	1.15 lbs. (0.522 kg)

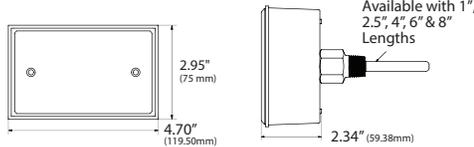
**Galvanized Enclosure [GD]**



**Galvanized Enclosure [GD] Weights**

ACI Model #	1.0"	2.5"	4.0"	6.0"	8.0"
A/xx-INW-yy-GD	0.62 lbs. (0.281 kg)	0.66 lbs. (0.299 kg)	0.70 lbs. (0.318 kg)	0.74 lbs. (0.336 kg)	0.78 lbs. (0.354 kg)
A/xx-I-yy-GD	N/A	0.88 lbs. (0.399 kg)	1.00 lbs. (0.454 kg)	1.04 lbs. (0.472 kg)	N/A
A/xx-IM-yy-GD	0.81 lbs. (0.367 kg)	1.00 lbs. (0.454 kg)	1.16 lbs. (0.526 kg)	1.32 lbs. (0.599 kg)	1.55 lbs. (0.703 kg)

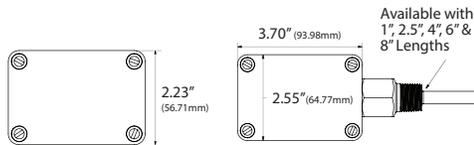
**Bell Box Enclosure [BB]**



**Bell Box Enclosure [BB] Weights**

ACI Model #	1.0"	2.5"	4.0"	6.0"	8.0"
A/xx-INW-yy-BB	0.64 lbs. (0.290 kg)	0.68 lbs. (0.308 kg)	0.70 lbs. (0.318 kg)	0.74 lbs. (0.336 kg)	0.80 lbs. (0.363 kg)
A/xx-I-yy-BB	N/A	1.02 lbs. (0.463 kg)	1.00 lbs. (0.454 kg)	1.04 lbs. (0.472 kg)	N/A
A/xx-IM-yy-BB	0.83 lbs. (0.376 kg)	1.02 lbs. (0.463 kg)	1.16 lbs. (0.526 kg)	1.32 lbs. (0.599 kg)	1.59 lbs. (0.721 kg)

**NEMA 4X Enclosure [4X]**

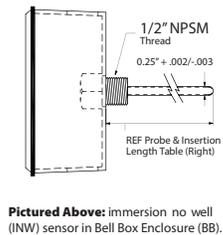


**NEMA 4X Enclosure [4X] Weights**

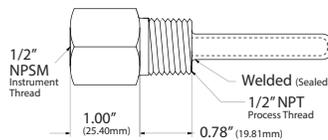
ACI Model #	1.0"	2.5"	4.0"	6.0"	8.0"
A/xx-INW-yy-4X	0.28 lbs. (0.127 kg)	0.32 lbs. (0.145 kg)	0.36 lbs. (0.163 kg)	0.40 lbs. (0.181 kg)	0.44 lbs. (0.200 kg)
A/xx-I-yy-4X	N/A	0.64 lbs. (0.290 kg)	0.68 lbs. (0.308 kg)	0.72 lbs. (0.327 kg)	N/A
A/xx-IM-yy-4X	0.48 lbs. (0.218 kg)	0.66 lbs. (0.299 kg)	0.82 lbs. (0.372 kg)	1.00 lbs. (0.454 kg)	1.27 lbs. (0.576 kg)

N/A = Not Available | xx = Sensor Type | yy = Insertion Length

**PROBE AND INSERTION LENGTH IMMERSION NO WELL**



**Pictured Below:** welded two piece thermowell to show connection and depth reference. Thermowell not included with immersion no well (INW).



**Probe & Insertion Length**

Probe Length	Insertion Length	ACI Part #	Thermowell Part #
3"	2.81" +/- 0.13"	A/xx-INW-1"-yy-zz	A/M1"
4.5"	4.31" +/- 0.13"	A/xx-INW-2.5"-yy-zz	A/2.5" or A/M2.5"
6"	5.81" +/- 0.13"	A/xx-INW-4"-yy-zz	A/4" or A/M4"
8"	7.81" +/- 0.13"	A/xx-INW-6"-yy-zz	A/6" or A/M6"
10"	9.81" +/- 0.13"	A/xx-INW-8"-yy-zz	A/M8"
13"	12.75" +/- 0.13"	A/xx-INW-12"-yy-zz	A/M12"
19"	18.75" +/- 0.13"	A/xx-INW-18"-yy-zz	A/M18"
25"	24.75" +/- 0.13"	A/xx-INW-24"-yy-zz	A/M24"





CUSTOM ORDERING WELDED THERMOWELL		Model # Example:	A/	TT100	I	4"	2	GD	100°F	MODEL #	
			A.	B.	C.	D.	E.	F.	G.		
A. Sensor Series <i>No Selection Required</i>	A/										A/
B. Model Series <i>Select One (1)</i>	TT100 = 100Ω   TTM100 = Matched 100Ω*   TT1K = 1KΩ   TTM1K = Matched 1KΩ*										
C. Configuration <i>Select One (1)</i>	I=Immersion with Welded Thermowell										
D. Insertion Length <i>Select One (1)</i>	2.5" = 2.5" Insertion   4" = 4" Insertion   6" = 6" Insertion										
E. Output Signal <i>Select One (1)</i>	1 = 1 to 5 VDC   2 = 2 to 10 VDC   4 = 4 to 20 mA										
F. Enclosure <i>Select One (1)</i>	GD=Galvanized   PB=Plastic   BB=Aluminum, NEMA 3R   4X=NEMA 4X										
G. Calibration Span	Specify Span in °F or °C (Best Accuracy in 100°F Increments)										

Note\*: For TTM100 or TTM1k part numbers, the default NIST is 3 points | 5 points may be specified by using "-5PTNIST" at the end of any TTM part number.

CUSTOM ORDERING MACHINED THERMOWELL		Model # Example:	A/	TT100	IM	4"	2	GD	100°F	MODEL #	
			A.	B.	C.	D.	E.	F.	G.		
A. Sensor Series <i>No Selection Required</i>	A/										A/
B. Model Series <i>Select One (1)</i>	TT100 = 100Ω   TTM100 = Matched 100Ω*   TT1K = 1KΩ   TTM1K = Matched 1KΩ*										
C. Configuration <i>Select One (1)</i>	IM=Immersion with Machined Thermowell										
D. Insertion Length <i>Select One (1)</i>	1" = 1" Insertion   2.5" = 2.5" Insertion   4" = 4" Insertion   6" = 6" Insertion   8" = 8" Insertion										
E. Output Signal <i>Select One (1)</i>	1 = 1 to 5 VDC   2 = 2 to 10 VDC   4 = 4 to 20 mA										
F. Enclosure <i>Select One (1)</i>	GD=Galvanized   PB=Plastic   BB=Aluminum, NEMA 3R   4X=NEMA 4X										
G. Calibration Span	Specify Span in °F or °C (Best Accuracy in 100°F Increments)										

Note: Machined Thermowells with lengths of 12", 18" and 24" are available and must be ordered separately | See the Machined Thermowells Data Sheet (Accessories). Note\*: For TTM100 or TTM1k part numbers, the default NIST is 3 points | 5 points may be specified by using "-5PTNIST" at the end of any TTM part number.

CUSTOM ORDERING SENSOR ONLY NO THERMOWELL		Model # Example:	A/	TT100	IMW	4"	2	GD	100°F	MODEL #	
			A.	B.	C.	D.	E.	F.	G.		
A. Sensor Series <i>No Selection Required</i>	A/										A/
B. Model Series <i>Select One (1)</i>	TT100 = 100Ω   TTM100 = Matched 100Ω*   TT1K = 1KΩ   TTM1K = Matched 1KΩ*										
C. Configuration <i>Select One (1)</i>	INW = Immersion without Thermowell										
D. Insertion Length <i>Select One (1)</i>	1" = 1" Insertion   2.5" = 2.5" Insertion   4" = 4" Insertion   6" = 6" Insertion   8" = 8" Insertion   12" = 12" Insertion   18" = 18" Insertion   24" = 24" Insertion										
E. Output Signal <i>Select One (1)</i>	1 = 1 to 5 VDC   2 = 2 to 10 VDC   4 = 4 to 20 mA										
F. Enclosure <i>Select One (1)</i>	GD=Galvanized   PB=Plastic   BB=Aluminum, NEMA 3R   4X=NEMA 4X										
G. Calibration Span	Specify Span in °F or °C (Best Accuracy in 100°F Increments)										

Note\*: For TTM100 or TTM1k part numbers, the default NIST is 3 points | 5 points may be specified by using "-5PTNIST" at the end of any TTM part number.





ACCESSORIES ORDERING		
Model #	Item #	Description
NSG Heat Transfer Paste 2 oz.	102595	Thermal Grease, 2 oz. Tube, Silicone Free, -40 to 320°F (-40 to 160°C)
NSG Heat Transfer Paste 16 oz.	140574	Thermal Grease, 16 oz. Jar, Silicon Free, -40 to 390°F (-40 to 198°C)
A/2.5"	128349	2.5" (63.5 mm) Insertion, 304 Stainless, Welded, 1/2" NPT Thermowell
A/4"	128350	4" (101.6 mm) Insertion, 304 Stainless, Welded, 1/2" NPT Thermowell
A/6"	128351	6" (152.4 mm) Insertion, 304 Stainless, Welded, 1/2" NPT Thermowell
A/M1"	128337	1" (25.4 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M2.5"	128338	2.5" (63.5 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M4"	128343	4" (101.6 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M6"	128344	6" (152.4 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M8"	138725	8" (203.2 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M12"	128339	12" (304.80 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M18"	128341	18" (457.20 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M24"	128342	24" (609.6 mm) Insertion, 304 Stainless, Machined, 1/2" NPT Thermowell
A/M2.5" - 316SS	128352	2.5" (63.5 mm) Insertion, 316 Stainless, Machined, 1/2" NPT Thermowell
A/M4" - 316SS	128353	4" (101.6 mm) Insertion, 316 Stainless, Machined, 1/2" NPT Thermowell
A/M6" - 316SS	128354	6" (152.4 mm) Insertion, 316 Stainless, Machined, 1/2" NPT Thermowell
NIST TTM CERT-5PT.	129743	5 Point Calibration & Certificate

ACCESSORIES ORDERING (NIST)	
Model #	Description
-5PTNIST	5 Point Calibration & Certificate for TTM parts

