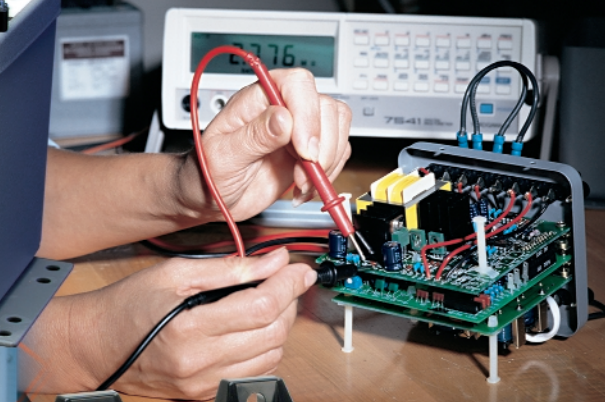




YOKOGAWA

# POWER TRANSDUCER CATALOG





## PRODUCT OVERVIEW

Yokogawa's JUXTA "AC POWER SERIES" transducers (2469 & 2489) are rugged metal case designs for utility and industrial applications. Most models are UL recognized under File E60579 and exceed IEEE472/ANSI C37.90.1 Surge Withstand Capability test. The "SWC" test assures maximum protection from damaging line transients caused by switchgear operation or lightning strikes upstream on the system.

Typically, power transducers provide a reliable and accurate analog DC output proportional to the AC input from the secondary of potential and / or current transformers in switchgear or control enclosures. The output is usually linked to remote monitoring equipment such as meters, recorders, PLC's, SCADA systems, Energy Management Systems, etc. Usually, 0.5% accuracy is adequate for most industrial monitoring needs. Our 2469 meets this requirement. Most power utility applications, however, require a higher level of accuracy. Our 2489 series, with 0.2% accuracy, is recommended for such applications.

The plastic case power transducers (2370 & 2460 series) offer versatility and compactness when panel space is tight. The 2460 series can be mounted on a DIN rail, along with relays and terminal blocks, to maximize space and provide the ultimate in flexibility to the panel designer. The 2370 series has the same height and width as the DIN rail mount, but has two mounting feet which only require two drill holes and half the space of most metal case transducers. Both of these models offer 0.5% accuracy and come in one uniform case size from AC Amps to 3P4W Watts or Vars.

Both of these products evolved from Yokogawa's original 2280 series Power Line Transducer design which is broadly accepted throughout the world. For information on the 2281 through 2289 models, please request bulletin 2280-E from Yokogawa on our reply card inserted in the catalog.

Yokogawa offers a complete line of transducers for expansion, retrofit or upgrade of your power system. We hope the specification data and associated information in this catalog will provide all that is needed to make our transducers your choice for reliable power monitoring in your plant or equipment design.

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## JUXTA AC CURRENT TRANSDUCERS

### 1) GENERAL

The 2469 and 2489 AC Average Current transducers produce an analog DC signal output corresponding to the average value of the AC input. The true RMS versions always require external power and produce an analog DC output corresponding to the true RMS value of the input signal.

### 2) SPECIFICATIONS

Model #	2469	2489
Input Current	0-1 Amp AC or 0-5 Amp AC	
Input over range capability	200% of rated input continuous 1000% of rated input for 5 seconds	
Input Burden	<0.2VA per element	
Rated outputs	0-1mADC into 10 kΩ max. load; 10VDC output compliance 4-20 mADC into 750Ω max. load; 15VDC output compliance	
Accuracy 10-100% of rated input	0-1mADC=±0.5% of full scale 4-20mADC=±0.5% of span	0-1mADC=±0.2% of full scale 4-20mADC=±0.2% of span
External calibration adjustment	Zero: ±1% minimum(AHD only) Span: ± 2% minimum	Zero: ±5% minimum(AHD only) Span: ± 10% minimum
Response time	<400 milliseconds(0-99% of output)	
Output ripple	0.3% of span peak-to-peak max.	0.5% of span peak-to-peak max.
Isolation	2500 VAC input to output, power and case 2000 VAC aux. power to output and case (AHD and TRMS) 500 VAC output to case	
Surge Withstand Capability	IEEE472/ANSI C37.90.1 - 1989, JIS C1111(5KV, 1.2 x 50 microseconds)	
Insulation resistance	>10 megohm / 500VDC input/output/power/case	
Operating temperature	-20°C to +60°C	
Operating humidity	0 - 90% relative humidity (non-condensing)	
Temperature effect	± 250 PPM / °C of span	± 140 PPM / °C of span
External magnetic field	< 0.2% at 400 AT/m	
Input frequency range	50 - 500 Hz < 0.2% effect on accuracy	
Influence of frequency	< 0.2%, 45-65 Hz, fundamental through 9th harmonic (TRMS models only)	
Weight	TRMS = 900g, 0-1mA = 358g, 4-20mA = 897g, 3 in 1 = 1100g	
Shock	< 0.2% after 50G, 3 Axis and 6 repetitions	
Vibration	< 0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3 Axis	
UL Recognition	File # E60579	

### 3) STANDARD MODELS

0-5 Amp AC, 60 HZ input	2469 (0.5% Accuracy)	2489 (0.2% Accuracy)
AVG./0-1 mA output / self powered	246921-380-AFA-0	248921-380-AFA-0
TRMS / 0-1mA output / 120V aux. power	246931-380-AFA-1	248931-380-AFA-1
AVG./4-20mA output / 120V aux. power	246921-380-AHD-1	248921-380-AHD-1
TRMS / 4-20mA / 120V aux. power	246931-380-AHD-1	248931-380-AHD-1
3 in 1 / 0-1mA output / self-powered	246923-380-AFA-0	248923-380-AFA-0

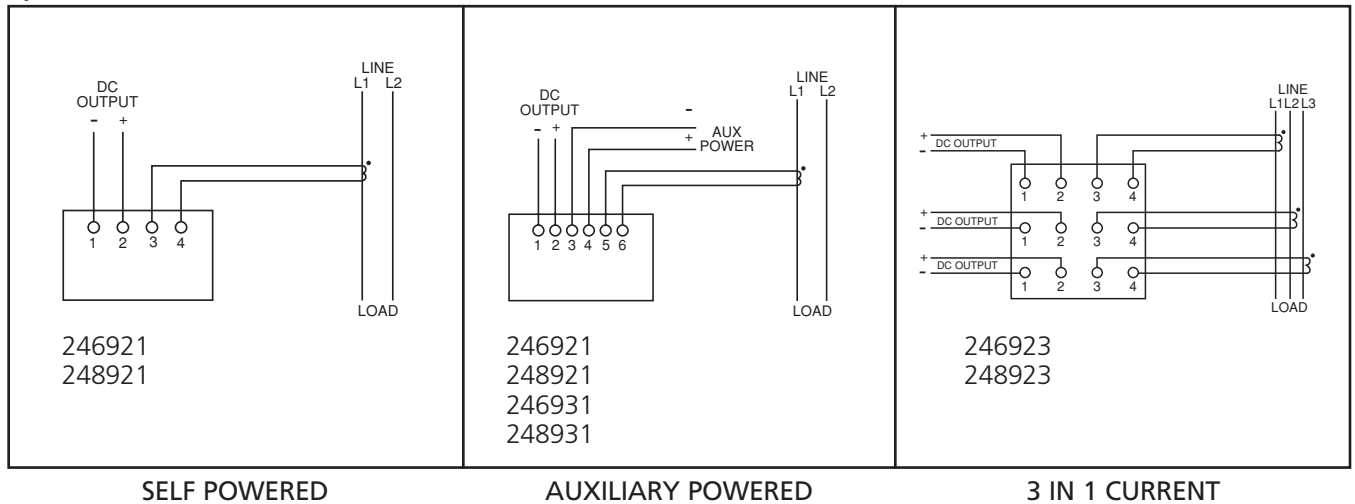
NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.  
Auxiliary power supply options <5.0 VA burden.

## JUXTA AC CURRENT TRANSDUCERS

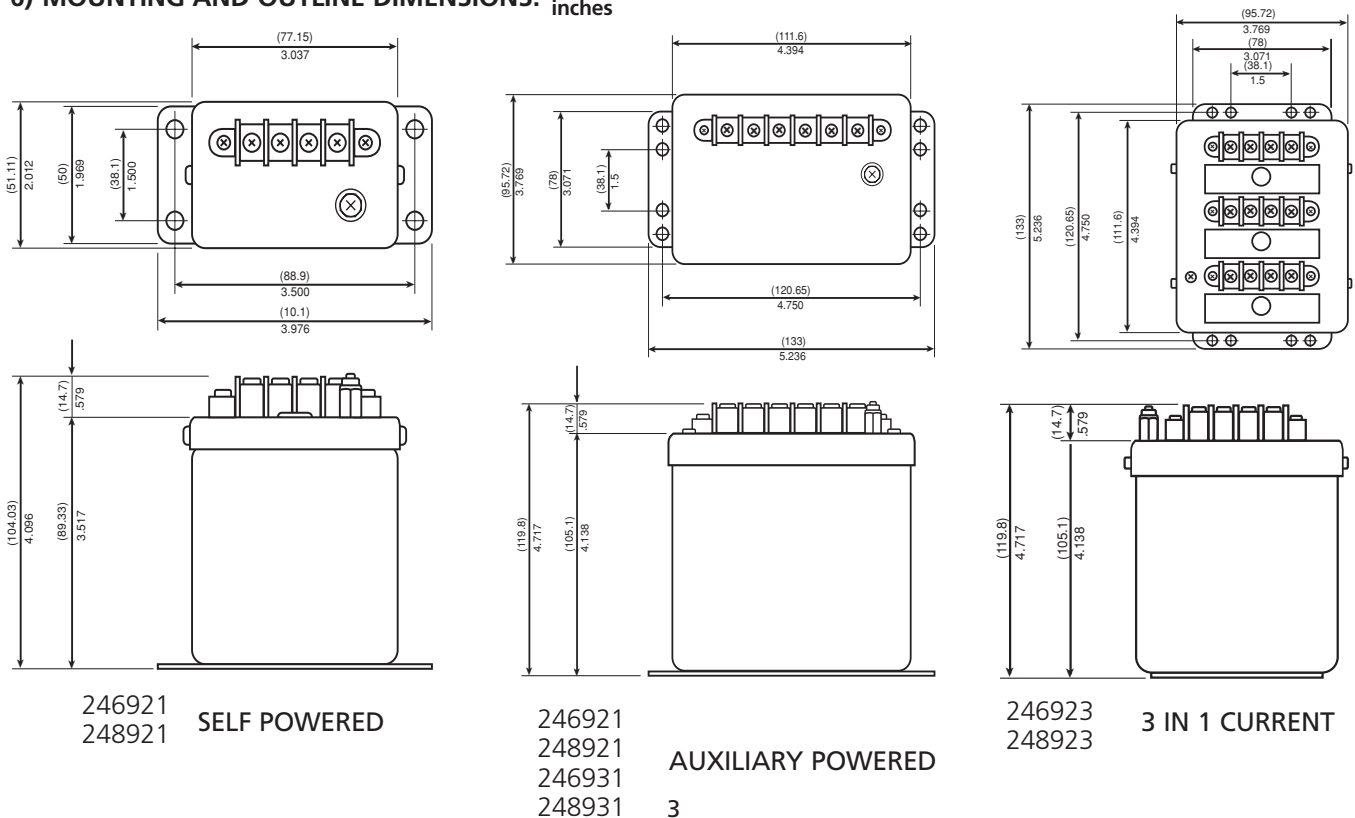
4) ORDER FORMAT 2469 / 89 (1) - (2) (3) - (4) - (5)

Model#	(1) Transducer function	(2) Input	(3) Input frequency	(4) Output	(5) Aux. power
2469	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">21</span> Average current	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">37</span> 0-1 Amp AC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">0</span> 60 Hz	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">AFA</span> 0-1 mADC (21 & 23 only)	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">0</span> Input powered
2489	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">23</span> 3 in 1 Avg. current	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">38</span> 0-5 Amp AC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">1</span> 50 Hz	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">AFA</span> 0-1 mADC (TRMS only)	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">1</span> 85-135 VAC
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">31</span> True RMS current		<span style="background-color: #0056b3; color: white; padding: 2px 5px;">2</span> 50/60 Hz		
			<span style="background-color: #0056b3; color: white; padding: 2px 5px;">4</span> 400 Hz		
			<span style="background-color: #0056b3; color: white; padding: 2px 5px;">5</span> Other	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">AHD</span> 4-20 mADC (21 & 31 only)	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">2</span> 170-264 VAC

### 5) CONNECTION DIAGRAMS FOR CT INPUT



### 6) MOUNTING AND OUTLINE DIMENSIONS: (mm) inches



JUXTA AC VOLTAGE TRANSDUCERS

**1) GENERAL**

The 2469 and 2489 AC Average Voltage transducers produce an analog DC signal output corresponding to the average value of the AC input. The true RMS versions always require external power and produce an analog DC output corresponding to the true RMS value of the input signal.

**2) SPECIFICATIONS**

Model #	2469	2489
Input Voltage	0-150 VAC or 0-300 VAC	
Input over range capability	120% of rated input continuous	
Input Burden (Averaging models)	150 VAC: <1.8VA / element; 300 VAC: <3.6VA / element	
Input Burden (true RMS models)	150 VAC: <0.8VA; 300 VAC: <1.6VA	
Rated outputs	0-1mADC into 10 kΩmax. load; 10VDC output compliance 4-20 mADC into 750Ω max. load; 15VDC output compliance	
Accuracy 10-100% of rated input	0-1mADC=±0.5% of full scale 4-20mADC=±0.5% of span	0-1mADC=±0.2% of full scale 4-20mADC=±0.2% of span
External calibration adjustment	Zero: ±1% minimum(AHD only) Span: ±2% minimum	Zero: ±5% minimum(AHD only) Span: ±10% minimum
Response time	<400 milliseconds(0-99% of output)	
Output ripple	0.3% of span peak-to-peak max.	0.5% of span peak-to-peak max.
Isolation	2500 VAC input to output, power and case 2000 VAC aux. power to output and case(AHD + TRMS) 500 VAC output to case	
Surge Withstand Capability	IEEE472/ANSI C37.90.1 - 1989, JIS C1111(5KV 1.2 x 50 microseconds)	
Insulation resistance	>10 megohm / 500VDC input/output/power/case	
Operating temperature	-20°C to +60°C	
Operating humidity	0 - 90% relative humidity (non-condensing)	
Temperature drift	± 250 PPM / °C of span	± 140 PPM / °C of span
External magnetic field	< 0.2% at 400 AT/m	
Input frequency range	50 - 500 Hz < 0.2% effect on accuracy	
Influence of frequency	< 0.2%, 45-65 Hz, fundamental through 9th harmonic (TRMS models only)	
Weight	TRMS = 900g, 0-1mA = 358g, 4-20mA = 897g, 3 in 1 = 1100g	
Shock	< 0.2% after 50G, 3 Axis and 6 repetitions	
Vibration	< 0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3Axis	
UL Recognition	File # E60579	

**3) STANDARD MODELS**

0-150 VAC, 60 HZ input	2469 (0.5% Accuracy)	2489 (0.2% Accuracy)
AVG./0-1 mA / self powered TRMS / 0-1mA / 120V aux. power AVG./4-20mA / 120V aux. power TRMS / 4-20mA / 120V aux. power 3 in 1 / 0-1mA output / self-powered	246922-330-AFA-0 246932-330-AFA-1 246922-330-AHD-1 246932-330-AHD-1 246924-330-AFA-0	248922-330-AFA-0 248932-330-AFA-1 248922-330-AHD-1 248932-330-AHD-1 248924-330-AFA-0

NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options. Auxiliary power supply options <5.0 VA burden.

## JUXTA DC TO DC ISOLATORS

### 1) GENERAL

The 2469 series DC to DC isolator provides an isolated analog output proportional to the DC voltage or current input. Standard inputs are 50mVDC and 1 mADC. Auxiliary power is required to power the DC to DC isolator. Other DC inputs and power options are available on special order from Yokogawa.

### 2) SPECIFICATIONS

Model #	2469 (0.5% accuracy)
Input signal ranges	0-50mVDC and 0-1mADC are standard
Input impedance	Varies with input current or voltage
Input burden	< 1 mADC
Output compliance	10 VDC
Accuracy 10-100% rated input	± 0.5% of full scale
Span adjustment	± 5% minimum
Zero adjustment	± 5% minimum
Response time	< 500 milliseconds (0-99% of output)
Isolation	2600 VAC input to output, power and case 1000 VAC aux. power to output and case 1000 VAC output to case
Surge withstand capability	IEEE472/ANSI C37.90.1-1989 SWC TEST
Operating temperature	0° C to +40° C
Operating humidity	20 - 90% relative humidity (non-condensing)
Weight	908g (2 lbs.)
Auxiliary Power Supply	115V AC ±10%, 5.0 VA Burden

### 3) STANDARD MODELS

Model # Description	Input / Output Relationship
246911-001-AFA-1 / DC Voltage input	0-50mVDC / 0-1mADC
246911-001-AHD-1 / DC Voltage input	0-50mVDC / 4-20mADC
246911-001-VMT-1 / DC Voltage input	0-50mVDC / 0-10VDC
246912-101-AFA-1 / DC Current input	0-1mADC / 0-1mADC
246912-101-AHD-1 / DC Current input	0-1mADC / 4-20mADC
246912-101-VMT-1 / DC Current input	0-1mADC / 0-10VDC

J U X T A   A C   W A T T   T R A N S D U C E R S

**1) GENERAL**

The 2469 and 2489 AC Watt transducers produce an analog output equal to the Watts measured by the input. The typical calibration is 500 Watts / element for 120V and 5A AC transformer secondary inputs.

**2) SPECIFICATIONS**

Model #	2469	2489
<b>Current input / range</b>	0-1 Amp AC or 0-5 Amp AC 10 to 200% of rated input   0-200% of rated input	
<b>Current input over range capability</b>	200% of rated input continuous 1000% of rated input for 5 seconds	
<b>Current input burden</b>	< 0.2VA per element	
<b>Voltage inputs and range:</b> Input powered range Auxiliary powered range	<b>120V</b> 100-135VAC 0-120% rated input	<b>240V</b> 200-264VAC 0-120% of rated input
<b>Voltage input burden per element</b>	< 0.5VA < 1.0VA	< 0.3VA < 0.6VA
<b>Sustained Voltage input overrange</b>	150% of rated input without damage (Auxiliary powered only)	
<b>Rated outputs</b>	0 to ±1mADC into 10kΩ max. load; 10VDC output compliance 4-20 mADC into 750Ω max. load; 15VDC output compliance	
<b>Accuracy</b>	0 ± 1mADC = 0.5% of full scale 4-20mADC = 0.5% of span	0±1mADC = ±0.1% rdg. ± 0.05%FS 4-20mADC = ±0.2% of span
<b>Output calibration / element</b>	<b>120VAC:</b> 1 Amp = 0-100 Watts; 5 Amp = 0-500 Watts <b>240VAC:</b> 1 Amp = 0-200 Watts; 5 Amp = 0-1000 Watts	
<b>External calibration adjustment</b>	Zero: ± 1% minimum Span: ± 2% minimum	Zero: ± 5% minimum Span: ± 10% minimum
<b>Response time</b>	< 400 milliseconds (0-99% of output)	
<b>Output ripple</b>	0.3% of span peak-to-peak max.	0.5% of span peak-to-peak max.
<b>Isolation</b>	2500 VAC input to output, power and case 2000 VAC aux. power to output and case 500 VAC output to case	
<b>Surge Withstand Capability</b>	IEEE472/ANSI C37.90.1 - 1989, JIS C1111 (5KV 1.2 x 50 microseconds)	
<b>Insulation resistance</b>	> 10 megohm / 500VDC input/output/power/case	
<b>Operating temperature</b>	-20°C to +60°C	1mA (-20°to+70°C), 4-20mA(-20°to+60°C)
<b>Operating humidity</b>	0 - 90% relative humidity (non-condensing)	
<b>Temperature effect</b>	±250 PPM / °C of span	1mA ±50FS, 4-20mA ±75span (PPM/°C)
<b>External magnetic field</b>	< 0.2% at 400 AT/m	
<b>Influence : unbalanced currents / phase interaction / Power Factor</b>	<0.5%	<0.2%
<b>Influence of frequency</b>	<0.25%, 45-65 Hz, fundamental through 9th harmonic	
<b>Weight</b>	1200g (2.65 lbs.)	
<b>Shock</b>	<0.2% after 50G, 3 Axis and 6 repetitions	
<b>Vibration</b>	<0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3 Axis	
<b>UL Recognition</b>	File # E60579	

**3) STANDARD MODELS**

120 VAC, 5AAC, 60 Hz, input powered	2469 (0.5% Accuracy)	2489 (0.2% Accuracy)
Watt 1P2W, 0-1mA output (1 Element)	246951-540-AFA-0	248951-540-AFA-0
Watt 1P2W, 4-20mA output (1 Element)	246951-540-AHD-0	248951-540-AHD-0
Watt 3P3W, 0-1mA output (2 Element)	246953-540-AFA-0	248953-540-AFA-0
Watt 3P3W, 4-20mA output (2 Element)	246953-540-AHD-0	248953-540-AHD-0
Watt 3P4W, 0-1mA output (2½ Element)	246954-540-AFA-0	248954-540-AFA-0
Watt 3P4W, 4-20mA output (2½ Element)	246954-540-AHD-0	248954-540-AHD-0
Watt 3P4W, 0-1mA output (3 Element)	246955-540-AFA-0	248955-540-AFA-0
Watt 3P4W, 4-20mA output (3 Element)	246955-540-AHD-0	248955-540-AHD-0

NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.  
Auxiliary power supply options <5.0 VA burden.



J U X T A   A C   V A R   T R A N S D U C E R S

**1) GENERAL**

The 2469 and 2489 AC VAR transducers produce an analog output equal to the VARS measured by the input. The typical calibration is 500 VARS / element for 120V and 5A AC transformer secondary inputs.

**2) SPECIFICATIONS**

Model #	2469	2489
Current input / range	0-1 Amp AC or 0-5 Amp AC 10 to 200% of rated input	
Current input over range capability	200% of rated input continuous 1000% of rated input for 5 seconds	
Current input burden	< 0.2VA per element	
Voltage inputs and range: Input powered range Auxiliary powered range	<b>120V</b> 100-135VAC 0-120% rated input	<b>240V</b> 200-264VAC 0-120% of rated input
Voltage input burden per element	< 0.5VA	< 1.0VA
Sustained Voltage input overrange	150% of rated input without damage (Auxiliary powered only)	
Rated outputs	0 to ±1mADC into a 10kΩ max. load; 10VDC output compliance 12±8mADC into a 750Ω max. load; 15VDC output compliance	
Accuracy	0 ± 1mADC = ±0.5% of full scale 12±8mADC = ±0.5% of span	0±1mADC = ±0.1% rdg. ± 0.1%FS 12±8mADC = ±0.2% of span
Output calibration / element	<b>120VAC:</b> 1 Amp = 0-100 VARS; 5 Amp = 0-500 VARS <b>240VAC:</b> 1 Amp = 0-200 VARS; 5 Amp = 0-1000 VARS	
External calibration adjustment	Zero: ± 1% minimum Span: ± 2% minimum	Zero: ± 5% minimum Span: ± 10% minimum
Response time	< 400 milliseconds (0-99% of output)	
Output ripple	0.3% of span peak-to-peak max.	0.5% of span peak-to-peak max.
Isolation	2500 VAC input to output, power and case 2000 VAC aux. power to output and case 500 VAC output to case	
Surge Withstand Capability	IEEE472/ANSI C37.90.1 - 1989, JIS C1111 (5KV 1.2 x 50 microseconds)	
Insulation resistance	> 10 megohm / 500VDC input/output/power/case	
Operating temperature	-20°C to +60°C	
Operating humidity	0 - 90% relative humidity (non-condensing)	
Temperature effect	±250 PPM / °C of span	1mA ±50FS, 4-20mA ±80span (PPM/°C)
External magnetic field	< 0.2% at 400 AT/m	
Influence : unbalanced currents / phase interaction / Power Factor	<0.5%	<0.2%
Weight	1200g (2.65 lbs.)	
Shock	<0.2% after 50G, 3 Axis and 6 repetitions	
Vibration	<0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3 Axis	
UL Recognition	File # E60579	

**3) STANDARD MODELS**

120 VAC, 5AAC, 60 Hz, input powered	2469 (0.5% Accuracy)	2489 (0.2% Accuracy)
VAR 1P2W, ±1mA output (1 Element)	246961-540-AFB-0-M	248961-540-AFB-0-M
VAR 1P2W, 12±8mA output (1 Element)	246961-540-AHF-0-M	248961-540-AHF-0-M
VAR 3P3W, ±1mA output (2 Element)	246963-540-AFB-0-M	248963-540-AFB-0-M
VAR 3P3W, 12±8mA output (2 Element)	246963-540-AHF-0-M	248963-540-AHF-0-M
VAR 3P4W, ±1mA output (2½ Element)	246964-540-AFB-0-M	248964-540-AFB-0-M
VAR 3P4W, 12±8mA output (2½ Element)	246964-540-AHF-0-M	248964-540-AHF-0-M
VAR 3P4W, ±1mA output (3 Element)	246965-540-AFB-0-M	248965-540-AFB-0-M
VAR 3P4W, 12±8mA output (3 Element)	246965-540-AHF-0-M	248965-540-AHF-0-M

NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.  
Auxiliary power supply options <5.0 VA burden.



JUXTA COMBINATION WATT/VAR TRANSDUCERS

**1) GENERAL**

The 2469 and 2489 combined WATT/VAR transducers produce an analog output equal to the WATTS and VARS measured by the input.

**2) SPECIFICATIONS**

Model #	2469	2489
Current input / range	0-1 Amp AC or 0-5 Amp AC 10 to 200% of rated input	
Current input over range capability	200% of rated input continuous 1000% of rated input for 5 seconds	
Current input burden	< 0.2VA per element	
Voltage inputs and range: Input powered range Auxiliary powered range	<b>120V</b> 100-135VAC 0-120% rated input < 0.5VA	<b>240V</b> 200-264VAC 0-120% of rated input < 1.0VA
Voltage input burden per element	< 0.3VA	< 0.6VA
Sustained Voltage input overrange	150% of rated input without damage (Auxiliary powered only)	
Rated outputs	0 to ±1mADC into a 10kΩ max. load; 10VDC output compliance 4-20 mADC into 750Ω max. load; 15VDC output compliance	
Accuracy: 0 ± 1mA output Watts 0 ± 1mA output VARS 4-20mA output	±0.5% of full scale ±0.5% of full scale ±0.5% of span	± 0.1% of reading. ± 0.05% full scale ± 0.1% of reading. ± 0.1% full scale ± 0.2% of span
External calibration adjustment	Zero: ± 1% minimum Span: ± 2% minimum	Zero: ± 5% minimum Span: ± 10% minimum
Response time	< 400 milliseconds (0-99% of output)	
Output ripple	0.3% of span peak-to-peak max.	0.5% of span peak-to-peak max.
Isolation (Watt & VAR outputs are not isolated from each other)	2500 VAC input to output, power and case 2000 VAC aux. power to output and case 500 VAC output to case	
Surge Withstand Capability	IEEE472/ANSI C37.90.1 - 1989, JIS C1111 (5KV 1.2 x 50 microseconds)	
Insulation resistance	> 10 megohm / 500VDC input/output/power/case	
Operating temperature	-20°C to +60°C	
Operating humidity	0 - 90% relative humidity (non-condensing)	
Temperature effect	±250 PPM / °C of span	1mA = W ± 50FS, V ±75span (PPM/°C)
External magnetic field	< 0.2% at 400 AT/m	
Influence : unbalanced currents / phase interaction / Power Factor	<0.5%	<0.2%
Influence of frequency	<0.25%, 45-65 Hz, fundamental through 9th harmonic (Watt only)	
Weight	1200g (2.65 lbs.)	
Shock	<0.2% after 50G, 3 Axis and 6 repetitions	
Vibration	<0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3 Axis	
UL Recognition	File # E60579	

**3) STANDARD MODELS**

120 VAC, 5AAC, 60 Hz, input powered	2469 (0.5% Accuracy)	2489 (0.2% Accuracy)
W/V 1P2W, 0±1mA output (1 Element)	246941-540-AFB-0-M	248941-540-AFB-0-M
W/V 1P2W, 4-20mA output (1 Element)*	246941-540-AHD-0-M	248941-540-AHD-0-M
W/V 3P3W, 0±1mA output (2 Element)	246943-540-AFB-0-M	248943-540-AFB-0-M
W/V 3P3W, 4-20mA output (2 Element)*	246943-540-AHD-0-M	248943-540-AHD-0-M
W/V 3P4W, 0±1mA output (2½ Element)	246944-540-AFB-0-M	248944-540-AFB-0-M
W/V 3P4W, 4-20mA output (2½ Element)*	246944-540-AHD-0-M	248944-540-AHD-0-M
W/V 3P4W, 0±1mA output (3 Element)	246945-540-AFB-0-M	248945-540-AFB-0-M
W/V 3P4W, 4-20mA output (3 Element)*	246945-540-AHD-0-M	248945-540-AHD-0-M

NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.

\*VAR outputs for "AHD" are 12±8 mADC (see output options on next page).

Auxiliary power supply options <5.0 burden.

**JUXTA POWER FACTOR TRANSDUCERS**

**1) GENERAL**

The 2469 and 2489 Power Factor transducers have an analog output corresponding to 1- Cosine of the phase angle of the input current relative to the input voltage signal. The analog output will indicate leading or lagging Power Factor by its direction from center which would be either 0 mA or 12mA based on output selection.

**2) SPECIFICATIONS**

Model #	2469	2489
Current input / range	0-1 Amp AC or 0-5 Amp AC 10 to 200% of rated input	
Current input over range capability	200% of rated input continuous 1000% of rated input for 5 seconds	
Current input burden	< 0.2VA per element	
Voltage inputs and range: Input powered range Auxiliary powered range	<b>120V</b> 100-135VAC 0-120% rated input	<b>240V</b> 200-264VAC 0-120% of rated input
Voltage input burden per element	< 0.5VA	< 1.0VA
Sustained Voltage input overrange	150% of rated input without damage (Auxiliary powered only)	
Rated outputs	±1mADC into a 10kΩ max. load; 10VDC output compliance 4-12-20 mADC into a 750Ω max. load; 15VDC output compliance	
Accuracy	±0.01 Power Factor	
Output calibration	0-1-0 Power Factor or 0.5-1-0.5 Power Factor	
External calibration adjustment	Zero: ± 1% minimum Span: ± 2% minimum	Zero: ± 5% minimum Span: ± 10% minimum
Response time	< 400 milliseconds (0-99% of output)	
Output ripple	0.3% of FS peak-to-peak max.	0.5% of FS peak-to-peak max.
Isolation	2500 VAC input to output, power and case 2000 VAC aux. power to output and case 500 VAC output to case	
Surge Withstand Capability	IEEE472/ANSI C37.90.1 - 1989, JIS C1111 (5KV 1.2 x 50 microseconds)	
Insulation resistance	> 10 megohm / 500VDC input/output/power/case	
Operating temperature	-20°C to +60°C	
Operating humidity	0 - 90% relative humidity (non-condensing)	
Temperature effect	±500 PPM / °C of span	±150 PPM / °C of span
External magnetic field	< 0.2% at 400 AT/m	
Influence of input Voltage	<1% of span	Aux. Pwr.±0.01 max.±20% rated V. Self pwr.±0.01 max. in range of Aux. Pwr
Influence of input Current	<2% of span	<0.02 PF for 20-200% rated input current
Low current detection	<4% of rated current	4% of rated input
Weight	1000g (2.2 lbs.)	
Shock	<0.2% after 50G, 3 Axis and 6 repetitions	
Vibration	<0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3 Axis	
UL Recognition	File # E60579	

**3) STANDARD MODELS (0-1-0 PF)**

120 VAC, 5AAC, 60 Hz, input powered	2469	2489
PF- Single phase / ±1mA output	246971-540-AFB-0-P	248971-540-AFB-0-P
PF- Single phase / 12±8mA output	246971-540-AHF-0-P	248971-540-AHF-0-P
PF- 3P3W balanced / ±1mA output	246973-540-AFB-0-P	248973-540-AFB-0-P
PF- 3P3W balanced / 12±8mA output	246973-540-AHF-0-P	248973-540-AHF-0-P
PF- 3P4W balanced / ±1mA output	246974-540-AFB-0-P	248974-540-AFB-0-P
PF- 3P4W balanced / 12±8mA output	246974-540-AHF-0-P	248974-540-AHF-0-P

NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.  
Auxiliary power supply options <5.0 VA burden. 14

## JUXTA PHASE ANGLE TRANSDUCERS

### 1) GENERAL

The 2469 and 2489 Phase Angle transducers have an analog output corresponding to the phase angle of the input current relative to the input voltage signal. The analog output will indicate leading or lagging Phase Angle by its direction from center which would be either 0 mA or 12mA based on output selection.

### 2) SPECIFICATIONS

Model #	2469	2489
Current input / range	0-1 Amp AC or 0-5 Amp AC 10 to 200% of rated input	
Current input over range capability	200% of rated input continuous 1000% of rated input for 5 seconds	
Current input burden	< 0.2VA per element	
Voltage inputs and range: Input powered range Auxiliary powered range	<b>120V</b> 100-135VAC 0-120% rated input	<b>240V</b> 200-264VAC 0-120% of rated input
Voltage input burden per element	< 0.5VA	< 1.0VA
Sustained Voltage input overrange	150% of rated input without damage (Auxiliary powered only)	
Rated outputs	±1mADC into a 10kΩ max. load; 10VDC output compliance 4-12-20 mADC into a 750Ω max. load; 15VDC output compliance	
Accuracy	±2° Phase Angle	±1° Phase Angle
Output calibration	60°- 0°- 60° Phase Angle or 90°- 0°- 90° Phase Angle	
External calibration adjustment	Zero: ± 1% minimum Span: ± 2% minimum	Zero: ± 5% minimum Span: ± 10% minimum
Response time	< 400 milliseconds (0-99% of output)	
Output ripple	0.3% of FS peak-to-peak max.	0.5% of FS peak-to-peak max.
Isolation	2500 VAC input to output, power and case 2000 VAC aux. power to output and case 500 VAC output to case	
Surge Withstand Capability	IEEE472/ANSI C37.90.1 - 1989, JIS C1111 (5KV 1.2 x 50 microseconds)	
Insulation resistance	> 10 megohm / 500VDC input/output/power/case	
Operating temperature	-20°C to +60°C	
Operating humidity	0 - 90% relative humidity (non-condensing)	
Temperature effect	±500 PPM / °C of span	±80 PPM / °C of span
External magnetic field	< 0.2% at 400 AT/m	
Influence of frequency	<0.2%, 45 - 65 Hz, fundamental through 9th harmonic	
Influence of input Voltage	<0.5°	<0.5° ±20% rated Voltage input (aux.pwr.) <0.5° in range af aux. pwr. (int. pwr. model)
Influence of input Current	<1.0°	<1° for 20-200% rated input current
Low current detection	N/A	4% of rated input
Weight	1000g (2.2 lbs.)	
Shock	<1° after 50G, 3 Axis and 6 repetitions	
Vibration	<1° after 16.7 Hz, 4 mmp-p 1 hour, 3 Axis	
UL Recognition	File # E60579	

### 3) STANDARD MODELS (±90° PA)

120V, 5A, 60 Hz, ±90°, input powered	2469 (±2° Accuracy)	2489 (±1° Accuracy)
PA- Single phase / ±1mA output	246976-540-AFB-0-P	248976-540-AFB-0-P
PA- Single phase / 12±8mA output	246976-540-AHF-0-P	248976-540-AHF-0-P
PA- 3P3W balanced / ±1mA output	246977-540-AFB-0-P	248977-540-AFB-0-P
PA- 3P3W balanced / 12±8mA output	246977-540-AHF-0-P	248977-540-AHF-0-P
PA- 3P4W balanced / ±1mA output	246978-540-AFB-0-P	248978-540-AFB-0-P
PA- 3P4W balanced / 12±8mA output	246978-540-AHF-0-P	248978-540-AHF-0-P

NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.  
Auxiliary power supply options <5.0 VA burden.



JUXTA FREQUENCY TRANSDUCERS

**1) GENERAL**

The 2469 and 2489 Frequency transducers have an analog output corresponding to the frequency of the AC input voltage. These transducers are capable of high accuracy measurement over various frequency ranges.

**2) SPECIFICATIONS**

Model #	2469	2489
<b>Voltage inputs and range:</b> Input powered range Auxiliary powered range	120V: 100 - 135 VAC, 240V: 200 - 264 VAC ±20% of rated voltage	
<b>Voltage input burden</b>	120VAC <0.1 VA; 240VAC <0.2 VA	
<b>Rated outputs</b>	±1mADC into a 10kΩmax. load; 10VDC output compliance 4-12-20 mADC into 750Ω max. load; 15VDC output compliance	
<b>Accuracy: ±2, 5, 10, 25 Hz deviation ±0.5, 1 Hz deviation</b>	±1% of input span ±2% of input span	0-1mADC=±0.1% of input span 0-1mADC=±0.2% of input span 4-20mADC=add±0.1% to accuracy
<b>External calibration adjustment</b>	Zero: ±1% minimum Span: ±2% minimum	Zero: ±5% minimum Span: ±10% minimum
<b>Response time</b>	<400 milliseconds (0-99% of output)	
<b>Output ripple</b>	0.3% of span peak-to-peak max.	0.5% of span peak-to-peak max.
<b>Isolation</b>	2500 VAC input to output, power and case 2000 VAC aux. power to output and case 500 VAC output to case	
<b>Surge Withstand Capability</b>	IEEE472/ANSI C37.90.1 - 1989, JIS C1111(5KV 1.2 x 50 microseconds)	
<b>Insulation resistance</b>	>10 megohm / 500VDC input/output/power/case	
<b>Operating temperature</b>	-20°C to +60°C	
<b>Operating humidity</b>	0 - 90% relative humidity (non-condensing)	
<b>Temp. effect: ±2, 5, 10, 25 Hz deviation ±0.5, 1 Hz deviation</b>	± 250 PPM / °C of span ± 500 PPM / °C of span	±25ppm of center frequency(60Hz±5Hz) ±5ppm of center frequency(60Hz±0.5Hz) For 4-20mADC multiply ppm x 1.4
<b>External magnetic field</b>	< 0.2% at 400 AT/m	
<b>Harmonics</b>	Fundamental through 9th harmonic	
<b>Weight</b>	1000g (2.2 lbs.)	
<b>Shock</b>	< 0.2% after 50G, 3 Axis and 6 repetitions	
<b>Vibration</b>	< 0.2% after 16.7 Hz, 4 mmp-p 1 hour, 3Axis	
<b>UL Recognition</b>	File # E60579	

**3) STANDARD MODELS**

120VAC, 60 Hz, input powered	2469	2489
Freq. ± 1.0 Hz deviation, 0-1mA output	246982-320-AFA-0	248982-320-AFA-0
Freq. ± 1.0 Hz deviation, 4-20mA output	246982-320-AHD-0	248982-320-AHD-0
Freq. ± 2.0 Hz deviation, 0-1mA output	246983-320-AFA-0	248983-320-AFA-0
Freq. ± 2.0 Hz deviation, 4-20mA output	246983-320-AHD-0	248983-320-AHD-0
Freq. ± 5.0 Hz deviation, 0-1mA output	246984-320-AFA-0	248984-320-AFA-0
Freq. ± 5.0 Hz deviation, 4-20mA output	246984-320-AHD-0	248984-320-AHD-0

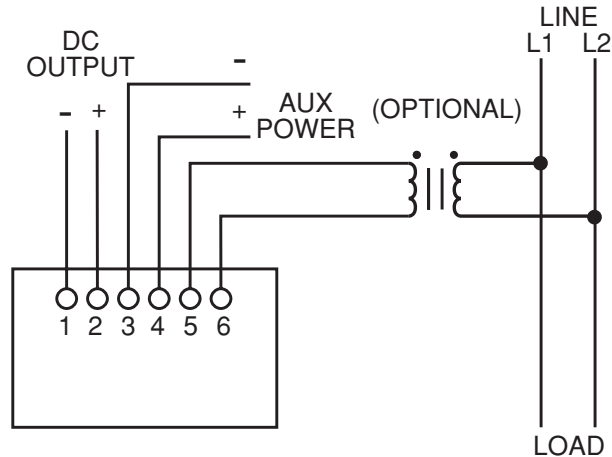
NOTE: See order format on next page for additional ratings, frequency calibrations, power-up and output options.  
Auxiliary power supply options <5.0 VA burden.

# JUXTA FREQUENCY TRANSDUCERS

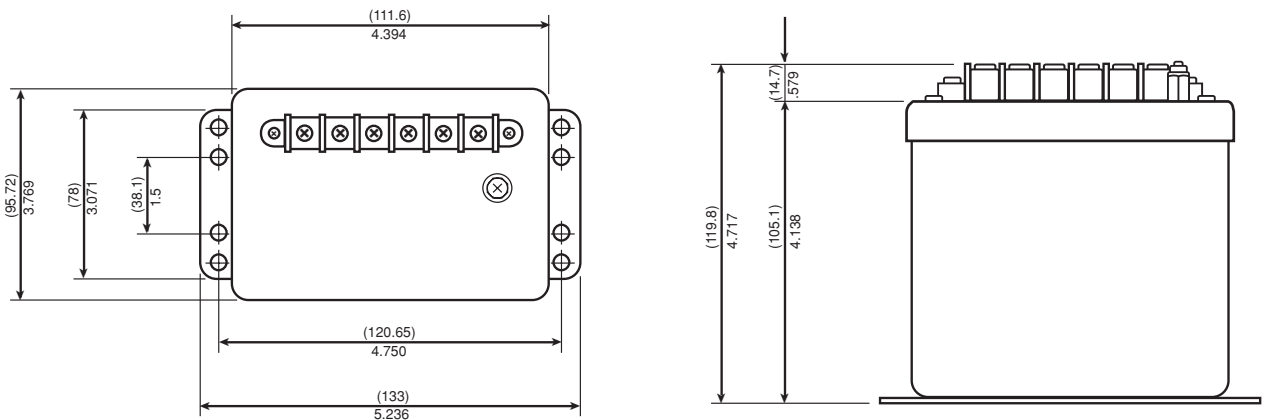
4) ORDER FORMAT 2469 / 89    -       -    -   

Model#	(1) Transducer function	(2) Input	(3) Input frequency	(4) Output	(5) Aux. power
2469	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">81</span> ± 0.5 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">32</span> 120 VAC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">0</span> 60 Hz	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">AFA</span> 0-1 mADC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">0</span> Input pwr'd
2489	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">82</span> ± 1 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">35</span> 240 VAC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">1</span> 50 Hz	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">AFB</span> 0 to ±1mADC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">1</span> 120 VAC
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">83</span> ± 2 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">35</span> 240 VAC		<span style="background-color: #0056b3; color: white; padding: 2px 5px;">AHD</span> 4-20 mADC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">2</span> 240 VAC
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">84</span> ± 5 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">32</span> 120 VAC		<span style="background-color: #0056b3; color: white; padding: 2px 5px;">35</span> 240 VAC	
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">84</span> ± 5 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">32</span> 120 VAC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">1</span> 50 Hz		
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">85</span> ± 10 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">32</span> 120 VAC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">3</span> 55 Hz		
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">85</span> ± 10 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">35</span> 240 VAC			
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">86</span> ± 25 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">32</span> 120 VAC	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">4</span> 400 Hz		
	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">86</span> ± 25 Hz deviation	<span style="background-color: #0056b3; color: white; padding: 2px 5px;">35</span> 240 VAC			

## 5) CONNECTION DIAGRAMS



## 6) MOUNTING AND OUTLINE DIMENSIONS: (mm) inches



**1) GENERAL**

The 2371-2378 and 2461-2468 series of power transducers combine high performance with compact size. Most of these transducers are self powered except DC to DC isolators and True RMS Amps and Volts which require auxiliary power. Accuracy of 0.5% is standard in both the foot mount and DIN rail models. They are constructed of flame resistant molded black ABS resin material; and operating temperature is 0-40°C (20-80% RH, non-condensing). Storage temperature is -10 to +50°C. Weight <.5Kg (1.1lbs.)



2461-2468 DIN rail mount



2371-2378 foot mount

**2) SPECIFICATIONS**

Transducer function		Model#	code	Rated inputs	*Rated outputs/external load resistance	Accuracy @23±3°C	Output ripple	Response time	Frequency range	Power consump.	Auxiliary power
DC / DC Isolator (Photocoupler isolation)	2371 or 2461	00	00	0 - 50 mVDC 0 - 5 VDC 0 - 10VDC 0 - 25VDC 0 - 65VDC 0 - 1mADC	0 - 1mADC / 10kΩ 0 - 5mADC / 2kΩ 4 - 20mADC / 500Ω 0 - 10mVDC / 10kΩ 0 - 5VDC / 1kΩ 0 - 10VDC / 2kΩ	±0.5% of span	N / A	0.5 sec.	DC	~1mA + aux. pwr. 1.9VA	120VAC ±10%
			00	1 AAC	0 - 1mADC / 10kΩ 0 - 5mADC / 2kΩ	±0.5% of span	1% p-p max.	1 second	45-65 Hz	1 VA	not req'd
AC Voltage/Current (Mean value rect.)	2372 2462	00	5 AAC 150 VAC	0 - 5VDC / 5kΩ 0 - 1mADC / 2kΩ	±0.5% of span	1% p-p max.	0.5 sec.	45-10kHz	0.5 VA+ Aux. pwr. 2 VA	120VAC ±10%	
AC Voltage/Current (True RMS rect.)	2374 or 2464	00	300 VAC	0 - 10VDC / 2kΩ 0 - 1mADC / 10kΩ 4 - 20mADC / 500Ω	±0.5% of span	1% p-p max.	0.7 sec.	45-65 Hz	V = 3VA A = 1VA	not req'd	
Power (Watts)	1P2W	2375 2465	10	120V / 1 AAC	0 - 10VDC / 2kΩ	±0.5% of span	1% p-p max.	0.5 sec.	45-65 Hz	V = 2.5VA A = 0.1VA	not req'd
	1P3W		20	120V / 5 AAC	0 - 1mADC / 10kΩ						
	3P3W		30	240V / 1 AAC	0 - 5mADC / 2kΩ						
	3P4W		40	240V / 5 AAC	4 - 20mADC / 500Ω						
Reactive Power (VARs)	1P2W	2376 2466	10	120V / 1 AAC	± 10 VDC / 2kΩ	±0.5% of span	1% p-p max.	0.5 sec.	45-65 Hz	V = 2.5VA A = 0.1VA	not req'd
	1P3W		20	120V / 5AAC	± 1mADC / 10kΩ						
	3P3W		30	240V / 1AAC	± 5mADC / 2kΩ						
	3P4W		40	240V / 5AAC	4 - 20mADC / 500Ω						
Phase Angle	1P2W	2377 2467	10	120V / 1AAC	± 10 VDC / 2kΩ	±2°	1% p-p max.	2 seconds	45-55 Hz	1.5VA	not req'd
	1P3W		20	120V / 5AAC	± 1mADC / 10kΩ						
	3P3W		30	240V / 1AAC	± 5mADC / 2kΩ						
	3P4W		40	240V / 5AAC	4 - 20mADC / 500Ω						
Frequency	2378 2468	01	120V/45-55Hz 240V/45-55Hz	0 - 10VDC / 2kΩ	±0.1 Hz	.1%p-p max.	2 seconds	45-55 Hz	1.5VA	not req'd	
		02	120V/55-65Hz 240V/55-65Hz	0 - 1mADC / 10kΩ 0 - 5mADC / 2kΩ	±0.2Hz			55-65 Hz			
		03	120V/45-65Hz 240V/45-65Hz	4 - 20mADC / 500Ω				45-65 Hz			

\*See next page for additional outputs.



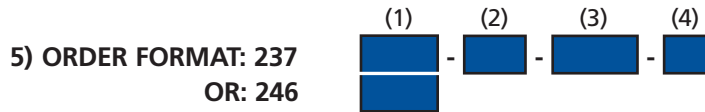
**PLASTIC CASE MINIATURE TRANSDUCERS**

**3) GENERAL SPECIFICATIONS**

Overrange capability	Dielectric strength between:	Insulation resistance between:
Current input: 1000% of rated input for 5 sec.	1) Input terminals & case - 2600VAC for 1 minute	1) All terminals and ground terminal
Voltage input: 150% of rated input for 5 sec.	2) Input & output terminals - 2600VAC for 1 minute	2) Input/output/ground term./auxiliary pwr.
	3) Aux. pwr. term. & input term./case-2600VAC for 1 min.	-----
	4) Output terminals and case - 1000VAC for 1 minute	Is greater than 100 Megohm at 500VDC

**4) STANDARD MODELS (AC AMPS, VOLTS, WATTS, VARS, PHASE ANGLE)**

Input	Output	DIN Rail	Foot Mount	Input	Output	DIN Rail	Foot Mount
5A AC (AVG)	1mA	246300-36-AFA	237300-36-AFA	Watt 3P4W	1mA	246540-46-AFA-N	237540-46-AFA-N
5A AC (TRMS)	1mA	246400-36-AFA-2	237400-36-AFA-2	(120V, 5A)	4-20mA	246540-46-AHE-N	237540-46-AHE-N
	4-20mA	246400-36-AHE-2	237400-36-AHE-2	VAR 3P3W	±1mA	246630-46-AFB-M	237630-46-AFB-M
150V AC (AVG)	1mA	246300-32-AFA	237300-32-AFA	(120V, 5A)	4-20mA	246630-46-AHE-M	237630-46-AHE-M
150V AC (TRMS)	1mA	246400-32-AFA-2	237400-32-AFA-2	VAR 3P4W	±1mA	246640-46-AFB-M	237640-46-AFB-M
	4-20mA	246400-32-AHE-2	237400-32-AHE-2	(120V, 5A)	4-20mA	246640-46-AHE-M	237640-46-AHE-M
Watt 3P3W	1mA	246530-46-AFA-N	237530-46-AFA-N	PA 3P3W	±1mA	246730-46-AFB-P	237730-46-AFB-P
(120V, 5A)	4-20mA	246530-46-AHE-N	237530-46-AHE-N	(120V, 5A)	4-20mA	246730-46-AHE-P	237730-46-AHE-P



**237 = Foot mount**  
**246 = DIN rail**

(1) Transducer function

<b>100</b>	DC / DC isolator
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<b>200</b>	AC Amp or Volt (Mean value)
<b>300</b>	AC Amp or Volt (RMS value)
<b>400</b>	AC Amp or Volt (True RMS)

xx\*(select one)

<b>5XX*</b>	Watt	<b>10</b>	1P2W	<b>45</b>	AC 120V / 1A
<b>6XX*</b>	VAR	<b>20</b>	1P3W	<b>46</b>	AC 120V / 5A
<b>7XX*</b>	Phase Angle	<b>30</b>	3P3W	<b>47</b>	AC 240V / 1A
		<b>40</b>	3P4W	<b>48</b>	AC 240V / 5A

xx\*(select one)

<b>8XX*</b>	Frequency	<b>01</b>	45-55 Hz	<b>37</b>	AC 120V
		<b>02</b>	55-65 Hz	<b>38</b>	AC 240V
		<b>03</b>	45-65 Hz		

(2) Rated inputs

<b>01</b>	DC 50mV
<b>02</b>	DC 1V
<b>03</b>	DC 5V
<b>04</b>	DC 10V
<b>05</b>	DC 25V
<b>06</b>	DC 65V
<b>21</b>	DC 1mA

<b>32</b>	AC 150V
<b>34</b>	AC 300V
<b>35</b>	AC 1A
<b>36</b>	AC 5A

(3) \*\*Rated outputs

<b>AFA</b>	0-1mADC
<b>AFX</b>	0-5mADC
<b>AFB</b>	± 1mADC
<b>AFZ</b>	± 5mADC
<b>AHE</b>	4 - 20mADC
<b>VGZ</b>	0 - 10mVDC
<b>VLS</b>	0 - 5VDC
<b>VMT</b>	0 - 10VDC
<b>VHB</b>	± 10mVDC
<b>VLU</b>	± 5VDC
<b>VLY</b>	± 6VDC
<b>VMS</b>	± 10VDC
<b>VME</b>	4.5-6.5VDC

(4) Auxiliary power

<b>2</b>	120 VAC 50/60 Hz
<b>4</b>	240 VAC 50/60 Hz
Only required for function 100 DC/DC & 400 TRMS	

Polarity (Watt/VAR/PA only)

<b>N</b>	No polarity (Watt only)
<b>P</b>	-Lag to +Lead
<b>M</b>	-Lead to +Lag

\*\* Outputs available by transducer function:

FUNCTION	CODE#	AFA	AFX	AFB	AFZ	AHE	VGZ	VLS	VMT	VHB	VLU	VLY	VMS	VME
	OUTPUT	1mA	5mA	±1mA	±5mA	4-20mA	10mV	5V	10V	±10mV	±5V	±6V	±10V	4.5-6.5V
100 DC / DC isolator		X	X	-	-	X	X	X	X	-	-	-	-	-
200 AC Amp / Volt		X	X	-	-	-	-	-	-	-	-	-	-	-
300 AC Amp / Volt		X	-	-	-	-	X	X	-	-	-	-	-	-
400 AC Amp / Volt		X	X	-	-	X	X	X	X	-	-	-	-	-
5XX Watt		X	X	-	-	X	X	X	X	-	-	-	-	-
6XX VAR		-	-	X	X	X	-	-	-	X	X	-	X	-
7XX Phase Angle		-	-	X	X	X	-	-	-	X	-	X	-	-
801 / 802 Frequency		X	X	-	-	X	X	-	X	X	-	-	-	-
803 Frequency		X	X	-	-	X	X	X	X	-	-	-	-	X