AC Power Transducers

Watts • VAR • Q • VA • WR • WQ

Watts: A measure of power or work being done. In an AC circuit, current multiplied by voltage multiplied by the cosine of the phase angle between current and voltage. Differing loads cause current to lag or lead voltage by some angle in degrees, which causes the power consumed (watts) to be less than the product of the voltage times current.

VAR: Current and voltage that does no work. A Volt-Ampere Reactance is essentially the opposite of a watt. VAR is the product of voltage multiplied by current in opposite quadrants. They increase as the phase angle increases and can be either leading (to the high side of the center zero based output) or lagging (to the low side of zero).

Q: A measure of reactive power. Permits calculation of VAR-hours to be recorded with one counter in a positive direction between 0.866 leading and zero lagging, which is within the typical power factor range of electrical equipment.

VA: Voltage times current. Also known as "apparent power."

Standard Features:

- 0.2% of reading accuracy
- <0.005%/°C temperature coefficient
- Low burden
- Transient protected
- Voltage, current, and process outputs
- Electronic multipliers — over 200 real time multiplications of Volts times Amps per cycle for accurate conversions of even the most distorted waveforms
- Exceptional long-term stability
- 1, 1-1/2, 2, 2-1/2, and 3 element versions
- Self-powered or externally powered
- ABS DIN rail or metal surface mount cases
- Isolated outputs on combined transducers

Specifications

Accuracy (@ 25°C ±2°C)

Watt: $\frac{0.19\% \text{ of reading}}{\text{Cos}\Theta}$ ±0.01% of full scale

VAR: $\frac{0.19\% \text{ of reading}}{\text{Sin}\Theta}$ ±0.01% of full scale

Q: $\frac{0.19\% \text{ of reading}}{\text{Cos}(\Theta\text{-}60°)}$ ±0.01% of full scale

VA: 0.19% of reading ±0.01% of full scale

Long Term Drift: <0.2%/year non-cumulative

Temperature Range
Operating: -20°C to +70°C
Storage: -40°C to +75°C

Temperature Coefficient: ≤0.005%/°C

Operating Humidity: 0-95% non-condensing

Output Ripple Peak: ≤0.5% peak

Power Factor Range: Watt or VAR, any; Q, 0.866 lead to 0 lag

Operating Frequency: Nominal ±10% in accordance with IEC 688

Standard Calibration: Watt/Q is uni-directional, VAR/VA is bi-directional, unless otherwise specified

Dielectric Test: 2,000 Vrms for 1 minute; 2,400 Vrms for 1 second

Transient/Surge Test: ANSI C37.90a (IEEE 472) BEAMA 219

Response Time: ≤200 msec to 90%, ≤400 msec to 99%

Calibration: Full scale, ±10% standard; Zero, ±2% standard

UL Approved Models: W10000, W10004, W15000, W20000, W20004, W25000, W25004, W30000, W30004, DW10000, DW10004, DW15000, DW15004, DW20000, DW20004, DW25000, DW25004, DW30000, DW30004, R10000, R10004, R15000, R15004, R20000, R20004, R25000, R25004, R30000, R30004, DR10000, DR10004, DR15000, DR15004, DR20000, DR20004, DR25000, DR24004, DR30000, DR30004

Potential Table

OPTION	NOMINAL INPUT	POTENTIAL RANGE WITH ACCURACY (SELF-POWERED)	POTENTIAL RANGE WITH ACCURACY (EXTERNAL-POWERED)	MAXIMUM BURDEN AT NOMINAL INPUT	POTENTIAL OVERLOAD CONTINUOUS
0	100 - 120 V	85 - 150 V	10 - 150 V	0.1 VA *	180 V
1	63 - 69 V	50 - 90 V	10 - 90 V	0.1 VA *	100 V
2	208 - 240 V	170 - 300 V	20 - 300 V	0.1 VA *	350 V
3	460 - 480 V	325 - 575 V	30 - 575 V	0.1 VA *	700 V
4	575 - 600 V	425 - 750 V	40 - 750 V	0.1 VA*	900 V
5	265 - 277 V	170 - 300 V	20 - 300 V	0.1 VA*	350 V
6	333 - 347 V	325 - 575 V	30 - 575 V	0.1 VA*	700 V

* Self-powered units have a burden of < 3 VA across either ΦA-N, or ΦA-ΦB.

Current Table

OPTION	INPUT	OVER-RANGE WITH ACCURACY	MAXIMUM BURDEN	OVERLOAD CONTINUOUS	OVERLOAD 10 SEC/HOUR	OVERLOAD 1 SEC/HOUR
0	0 - 5 A	10 A	0.5 VA	15 A	30 A	200 A
1	0 - 1 A	2 A	0.5 VA	3 A	6 A	100 A
2	0 - 2 A	4 A	0.5 VA	6 A	12 A	150 A
3	0 - 10 A	20 A	0.5 VA	30 A	50 A	300 A

Output Table

OPTION	RANGE FULL SCALE	OUTPUT LOADING	COMPLIANCE OR MAXIMUM CURRENT
0	0 ± 1 mA	0 - 10,000 Ohms	± 11 V
1	0 ± 3 mA	0 - 3,300 Ohms	± 11 V
2	0 ± 5 mA	0 - 2,000 Ohms	± 11 V
3	0 ± 10 mA	0 - 1,000 Ohms	± 11 V
4	4 - 20 mA	0 - 750 Ohms	15 V
5	0 ± 100 mV	20 Ohms - ∞	5 mA
6	0 ± 1 V	200 Ohms - ∞	5 mA
7	0 ± 5 V	1,000 Ohms - ∞	5 mA
8	0 ± 10 V	2,000 Ohms - ∞	5 mA
9	1 - 5 V	1,000 Ohms - ∞	5 mA

Standard Calibration of Watts, VAR, Q, or VA Per Element

A \ V	100 - 120 V	60 - 69 V	208 - 240 V	460 - 480 V	575 - 600 V	265 - 277 V	333 - 347 V
0 - 5 A	500	325	1,000	2,000	2,500	1,000	1,500
0 - 1 A	100	65	200	400	500	200	300
0 - 2 A	200	130	400	800	1,500	400	600
0 - 10 A	1,000	650	2,000	4,000	5,000	2,000	3,000

Application Table

APPLICATION AND CONNECTION	NUMBER OF ELEMENTS	MODEL NUMBER SERIES				RESTRICTIONS	
		WATT	VAR	Q	VA	VOLTAGE	CURRENT
1 PHASE, 2 WIRE	1	DW10XXX	DR10XXX	DQ10XXX	DVA10XXX	NONE	NONE
1 PHASE, 3 WIRE	1	DW10XXX	DR10XXX	DQ10XXX	DVA10XXX	NONE	NONE
1 PHASE, 3 WIRE	1½	DW15XXX	DR15XXX	DQ15XXX	DVA15XXX	NONE	NONE
3 PHASE, 3 WIRE	1½	DW15XXX	DR15XXX	DQ15XXX	DVA15XXX	BALANCED	NONE
3 PHASE, 3 WIRE	2	DW20XXX	DR20XXX	DQ20XXX	DVA20XXX	NONE	NONE
3 PHASE, 3 WIRE	2½	DW25XXX	DR25XXX	DQ25XXX	DVA25XXX	NONE	NONE
3 PHASE, 4 WIRE	2½	DW25XXX	DR25XXX	DQ25XXX	DVA25XXX	BALANCED	NONE
3 PHASE, 4 WIRE	3	DW30XXX	DR30XXX	DQ30XXX	DVA30XXX	NONE	NONE

Available Models – AC Power Transducers

To Order, Specify:

A. ENCLOSURE

Extruded Aluminum Metal, Surface Mount	(no prefix)
ABS DIN, Rail Mount	D

B. MODEL

Watt	W
VAR	R
Q	Q
VA	VA
Watt/VAR*	WR
Watt/Q	WQ

C. CONFIGURATION

1 Element	10
1-1/2 Element	15
2 Element	20
2-1/2 Element	25
3 Element	30

D. INPUT NOMINAL VOLTAGE (Reference Potential Table)

100 - 120 V	0
63 - 69 V	1
208 - 240 V	2
460 - 480 V	3
575 - 600 V	4
265 - 277 V	5
333 - 347 V	6
Special	X

E. INPUT CURRENT (Reference Current Table)

0 - 5 A	0
0 - 1 A	1
0 - 2 A	2
0 - 10 A	3
0 - 25 A	4
Special	X

F. OUTPUT (Reference Output Table)

0 ± 1 mA (0 - 10,000 Ohms)	0
0 ± 3 mA (0 - 3,300 Ohms)	1
0 ± 5 mA (0 - 2,000 Ohms)	2
0 ± 10 mA (0 - 1,000 Ohms)	3
4 - 20 mA (0 - 750 Ohms)	4
0 ± 100 mV (2,000 Ohms min.)	5
0 ± 1 V (2,000 Ohms min.)	6
0 ± 5 V (1,000 Ohms min)	7
0 ± 10 V (2,000 Ohms min)	8
1 - 5 V (1,000 Ohms min)	9
Special	X

Note: 4 - 20 mA units are uni-directional. If a bi-directional unit is required, use output designator X and state.

G. SUFFIX (If Applicable)

25 - 125% Calibration Adjustment	A
50 Hz	C
400 Hz	D
External Power, 85 - 150 VAC	E
External Power, 170 - 300 VAC	F
4 - 20 mA Two-Wire Loop Output	T
DC Aux Power (Please Specify)	K
Case Ground Terminal①	G
Special Calibration or Option	X

① Metal case models only.

SPECIAL CALIBRATION INSTRUCTIONS

Please specify: 1. CT Ratio; 2. PT Ratio; 3. Desired Full scale Calibration in kW, kVAR, kQ, or kVA.

EXAMPLE: DW-25-0-0-3-E-X is the ordering code for a Watt Transducer in a DIN rail mount case, 2-1/2 element, 100-120 V input voltage, 0-5 A input current, 0 ± 10 mA output, 85-150 VAC external power, special calibration.

See pages 31 - 33 for connections.