Type VPV5 Combination Watt-Var Transducer

Load Independent Output
¼ % Accuracy Class

2 1/2 ELEMENT-3 PHASE 4 WIRE
WATT DC OUT
COMMON - VAR DC OUT
-

FOR THE DIRECTION OF FLOW SHOWN, WATT OUTPUT IS POSITIVE AND LAGGING VAR OUTPUT IS POSITIVE
Application

The VPV5 watt-var transducer is designed for data collection and the telemetry systems. It is a high accuracy device designed for industrial and utility systems. It offers savings in installation and space costs in that current and voltage connection can be made to a single device which will provide simultaneous outputs representing true watts and vars. The output is bi-directional and can be used by indicating or recording instruments, computers, data systems or for remote indication. Any load resistance up to 10,000 ohm can be accommodated with a constant current output of 1 ma dc at full rated watt or var input.

Operation

These transducers employ the time-division multiplication principle. The measuring circuitry generates a train of pulses whose height is proportional to current and whose length is proportional to voltage. The area of each pulse is proportional to the power flowing within the duration of each pulse. There are many pulses per cycle. Integrating these pulses, therefore, yields a rate of flow of power. The circuitry presents this in the form of a proportional dc signal.

Var measurement is obtained through an internal R-C network that shifts the potential circuits 90 degrees.

To obtain both Watt and Var operation from the same input circuitry synchronous switches are employed to switch the multiplier circuits to the Watt amplifier or the Var amplifier at a speed of 2000 Hz. The standard RC filter smooths the output.

The Watt and Var amplifiers are separate constant current 2 stage amplifiers having a common terminal in their outputs and working from one power supply.

Features

Westinghouse is a major supplier of the apparatus and the systems which control electrical power systems. They are, consequently, especially knowledgeable of the actual needs in the accessories for such systems.

Time-Division Multiplier

This circuitry employs the time-division principle and complementary MOS integrated circuits for superior accuracy, linearity and stability.

Printed Circuit Construction

All components are mounted on printed circuit boards of a glass-epoxy. This material possesses great strength; it does not support fungus growth; it has a high resistance to damage due to a re-soldering of parts during repair or modification under field conditions. All circuit boards are accessible for repair. This is especially important in the case of the power supply and amplifier board which is exposed to externally-caused damage from accidental misconnection to sources beyond the level of the inherent protective circuitry.

Plug-in Integrated Circuits

All amplifiers and multipliers are IC’s for consistency in performance with plug-in mounting for convenience in servicing. Frit-seal designs are used for greater reliability.

Convertible Power Supply

Terminals are provided to allow the use of a separate source for the internal power supply. Jumpers may be used to adjacent terminals in order to draw power from the measured circuit.

Amplifier Protective Circuit

The output amplifier is protected from damage due to inadvertently applied voltages or induced surges on the output leads. The amplifier can withstand the application across its terminals of a surge equivalent to the SWC test.

Radio-Frequency By-Pass

Each transducer contains by-pass circuitry to give the device a relatively high immunity to radio frequency interference (RFI).

Mounting

Dimensions and terminal connections have been chosen to approximate those common in the industry. These units may be substituted for most competitive units without a major change in cable arrangement.

Terminal Blocks

Molded terminal blocks with #8-32 screws to accept wire sizes up to #12 in lugs to 11/32 width.
### Standard Specifications

<table>
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<tr>
<th>Application</th>
<th>3 PH-3W</th>
<th>3 PH-4W</th>
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<tbody>
<tr>
<td>Catalog Number</td>
<td>VPV56A1246</td>
<td>VPV56 A1256</td>
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<tr>
<td>No. of Elements</td>
<td>2</td>
<td>2½</td>
</tr>
<tr>
<td>Requirement</td>
<td>Balanced Voltage</td>
<td></td>
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#### 3 PH. Watts-Vars Input
- For Rated Output (R.O.): 1000 1500
- 1 PH. Test Watts-Vars input: 500 375

<table>
<thead>
<tr>
<th>Requirement</th>
<th>120 Volts</th>
<th>5 Amps</th>
<th>60 HZ.</th>
<th>120 Volts</th>
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<tr>
<td>Rated Voltage</td>
<td></td>
<td></td>
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<tr>
<td>Rated Current</td>
<td></td>
<td></td>
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<tr>
<td>Frequency</td>
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</table>

#### Power Supply
- Rated Output: 0±1 MA DC Watts
- ±0.1% Typical

#### Accuracy (% Rated Output)
- ±0.25 Worst Case

#### Output Load
- 0-10000 OHMS

#### Output Compliance
- 10 Volts Min.

#### DC Output Adjustment
- ±10%

#### Zero Adjustment
- Not Required

#### Voltage Range
- 0-150 Vac

#### Voltage Overload
- Continuous 180 Vac

#### Potential Circuit Burden
- 0.12 VA/EL., 1.0 P.F. @ 120V.

#### Current Range
- 0-6.25 Amps.
- With Linearity 10 Amps
- Overload Continuous 25 Amps
- Overload 10 Sec. 100 Amps
- Overload 1 Sec. 500 Amps

#### Current Circuit Burden
- 0.10 VA/EL., 1.0 P.F. @ 5A

#### Response Time (To 99%)<n>-
- <400 ms

#### Output Ripple Peak to Peak
- <0.05% R.O.

#### Temperature Range
- ±20°C To ±65°C

#### Temperature Coefficient
- ±0.05%/°C Watt
- ±0.01%/°C Var

#### Power Factor Range
- 0 Lead to 0 Lag

#### Dimensions
- See Outline Dwg.
- 1800 Vac

#### Dielectric Test Isolation
- Between Circuits and
- Between Circuits and Case
- IEEE SWG Test
- IEEE Std. 472-1974
- 85-135 Vac
- 60 HZ
- 3.25 Watt Burden @ 120 V

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**Type VPV-5, 2 Element – 3 Phase 3 Wire**

For the Direction of Flow Shown, Watt Output is Positive and Lagging Var Output is Positive.

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[Diagram of Type VPV-5, 2 Element – 3 Phase 3 Wire]

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**Type VPV-5, 2½ Element – 3 Phase 4 Wire**

For the Direction of Flow Shown, Watt Output is Positive and Lagging Var Output is Positive.

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[Diagram of Type VPV-5, 2½ Element – 3 Phase 4 Wire]
Outline Drawing - Dimensions in Inches (Millimeters)

<table>
<thead>
<tr>
<th>Transducer Type</th>
<th>Terminal in Position Number</th>
<th>Terminal Screw</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPV5 — 3 Wire El. Watt-Var</td>
<td>1-2-3-4-5-6-7-8-9-10-12-13-16</td>
<td>.164 - 32</td>
</tr>
<tr>
<td>VPV5 — 4 Wire 2½ El. Watt-Var</td>
<td>1-2-3-4-5-6-7-8-9-10-11-12-13-14-16</td>
<td>.164 - 32</td>
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<tr>
<td>VPV5 — 5 Wire 2 El. Watt-Var</td>
<td>1-2-3-4-5-6-7-8-9-10-11-12-13-14-16</td>
<td>.164 - 32</td>
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Decimal Dimensions are in Inches
Dimensions in () are Millimeter Equivalent

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