Westinghouse

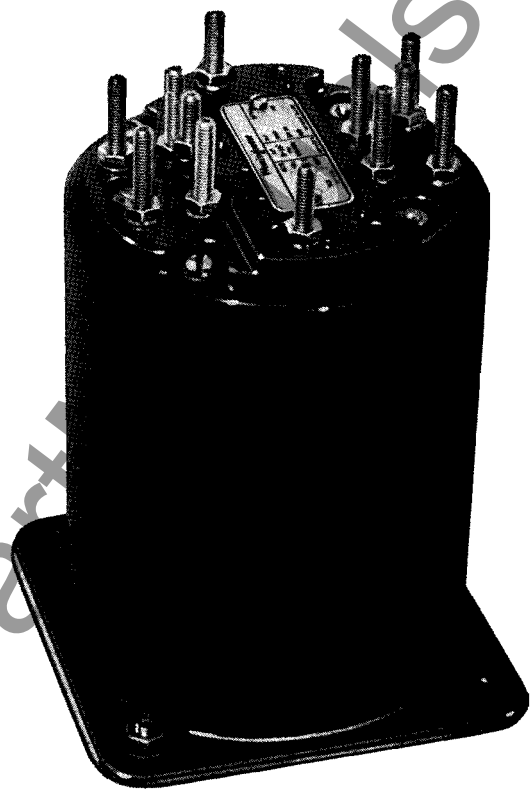
Watt Transducer Type VP-840

For Converting ac Watts to dc Voltage

For the Measurement of Ac Watts, Using the "Hall Effect" Transducer
The Westinghouse type VP-840 transducer may be used for any application requiring a dc voltage output from an ac wattage input. This dc output may be applied to conventional permanent magnet, moving coil dc indicating instruments, dc recorders, potentiometric recorders and similar "null" balance devices, data processing units and kindred computer circuitry, control initiating relays, telemetering systems, etc.

The output of the transducer is directly proportional to the ac wattage input, being virtually unaffected by other variables, within the limits of the specifications.

When used with standard Westinghouse indicating instruments, the performance of the combination exceeds the rigid requirements of ANSI Instrument Specifications C-39.1.



Features
Completely Solid-State

No Thermal Elements

Virtually Instantaneous Response

High Overload Capacity: Current circuits will withstand up to 50 times instantaneous overload and 100% continuous overload.

Application
Two types of watt transducers are available, an unfiltered unit and a unit equipped with a filter circuit, which reduces the ac ripple content of the output to within 0.5%.

The filtered unit is especially suitable for operation with telemetering transmitters high gain amplifiers and potentiometric recorders, where the ac ripple could adversely affect their operation. It is designed to operate into relatively high impedance loads of 50,000 ohms or higher normally encountered in this type of measurement and control.

When totalization of the outputs of several watt transducers is required, the filtered unit should be used with the outputs connected in series. This unit is also equipped with potentiometers in the output, permitting adjustment of the output from 0 to 110% of rating.

The unfiltered unit is designed to operate into a 50 ohm load resistance. At rated input the single phase transducer delivers 1 milliampere at 50 millivolts into a 50 ohm load, and the polyphase unit delivers

2 milliamperes at 100 millivolts into a 50 ohm load. This unit is ideally suited for use with a permanent magnet moving coil indicating or recording instrument and is similar to the unit used in the type KP-241 switchboard indicating wattmeter.

The unfiltered unit may be used with most any type of switchboard, panel or recording instrument, having a full scale rating of 50 millivolts and 1 milliampere (single phase unit) or 100 millivolts and 2 milliamperes (polyphase units). In applications where lead resistance is a problem, switchboard type instruments can be supplied, equipped with a calibrating rheostat mounted in the base of the instrument, providing external adjustment of circuit resistance.

A separately mounted filter unit type VF-876 is available for use with the unfiltered transducer, which reduces the ac ripple to within 0.5%. This is a universal filter and does not include the 50 ohm load. This resistance must be added across the transducer output.

In applications using a single phase transducer, where power reversal may occur, a modified unit is available, including special circuitry to maintain rated accuracy with power flow in either direction. A 1% error with reverse operation is possible.

July, 1974
Supersedes DB 43-840 pages 1-4, dated December, 1962
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Construction

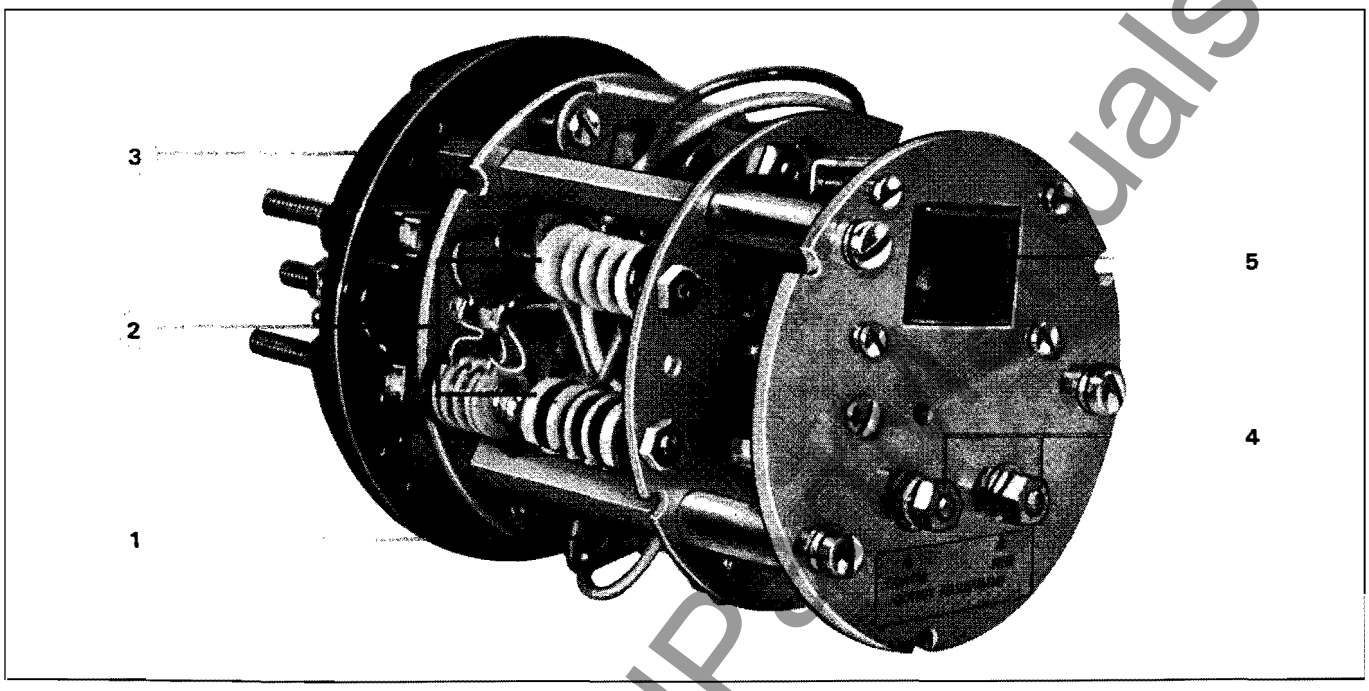

Figure 1

① **Input Potential Transformers**

② **Input Potential Limiting Resistors**

③ **Molded Base With Terminals**

④ **Output Potentiometers (When Supplied)**

⑤ **Filter Circuit Inductor (When Supplied)**

The transducer is a completely solid-state device, operating on the familiar "Hall effect" principle (see "operation").

Extremely high accuracy and reliable performance are assured by the careful selection of all components, using the highest quality obtainable, coupled with excellent craftsmanship and rigid quality control standards.

The entire mechanism is housed in a rugged steel case of the same type used in Westinghouse type K-241 switchboard instruments. The case provides effective shielding from external magnetic fields. It is finished in attractive flat black baked on enamel. The unit may be mounted on any flat surface with two mounting screws.

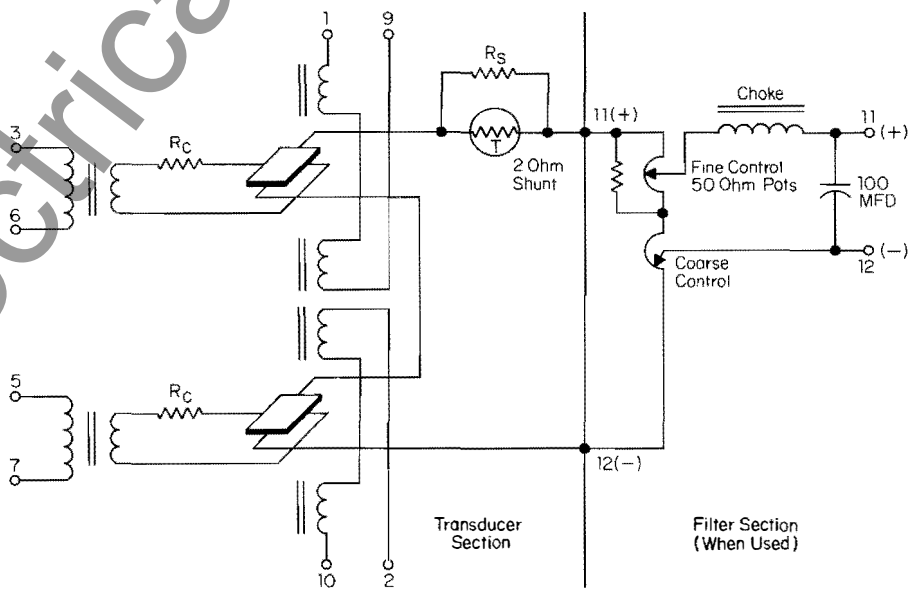

Figure 2 – Internal Schematic for Two-Element Unit

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Operation

Operation of the VP-840 watt transducer depends on the "Hall effect" principle.

Referring to Figure 3, current (I) produces a proportional flux (⌀) in the air gap of the laminated core in which the Hall crystal is located. Simultaneously, current (I_1) directly proportional to voltage (V), flows through the Hall crystal. The "Hall effect" produces a voltage (E) across opposite sides of the crystal. Voltage (E) is proportional to the product of the instantaneous value of the flux (⌀) perpendicular to the crystal and current (I) through it.

The average value of the output voltage is proportional to (I) x (V) x cos ⌀, where ⌀ is the phase angle between I and V. Therefore, this output is directly proportional to watts input.

Figure 3 shows the circuit for a single-element transducer. In the case of a two-element transducer for polyphase applications, the outputs of two single-element circuits are added in series internally.

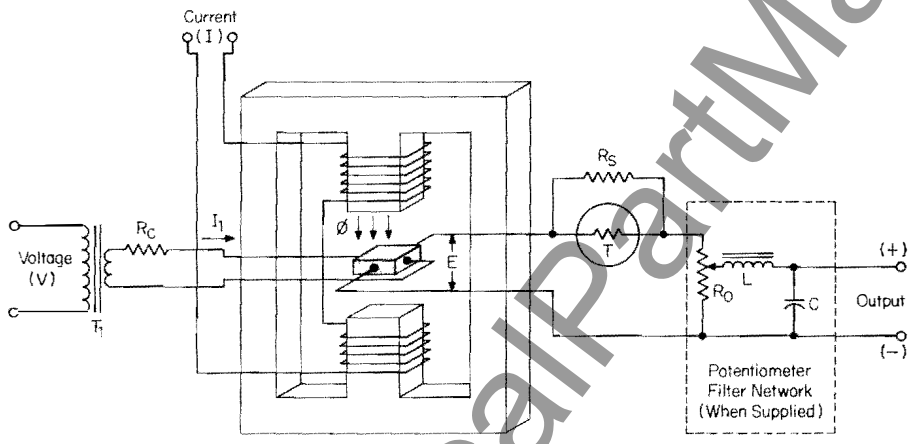

Figure 3

Legend:
I = Line current
V = Line voltage
⌀ = Flux caused by line current (I)
T_1 = Voltage circuit step-down transformer
I_1 = Voltage circuit current
R_C = Voltage circuit current limiting resistor
R_S & T = Temperature compensating network
R_O = Output Circuit potentiometer
E = Hall output voltage
L, C = Filter network components

Specifications

Accuracy
±0.5% of standard rated output at standard reference conditions.

Temperature Influence (Typical)
±1.0% of standard rated output over the temperature range from 0 to 65 degrees centigrade.

Response Time
Without Filter: A few microseconds.
With Filter: 200 milliseconds.

Insulation Test
Between Independent Circuits: 1800 volts.
From Terminals to Case: 2600 volts.

Weight
Net: 2 to 3½ pounds.
Shipping: 5 to 7 pounds.

Burden (Per Element)
Current Coils at Rated Current: 2 va at 20% power factor.
Potential Circuit at Rated Voltage: 1 va at unity power factor.

Power Factor Influence
±1% of standard rated output at 50% lead or lag.

Standard Ratings
5 Amperes, 120 Volts, 60 Hertz①

	Ac Input Watts	Dc Output mV②
Single phase	500	50
Polyphase 2-element	1000	100
Polyphase 2½-element	1500	100

① Other current ratings are available, from 50 milliamperes to 10 amperes. Input watts are proportional to current and potential ratings.

② The filtered type VP-840 transducer is equipped with potentiometers, which permit adjustment of the output from 0% to 110%.

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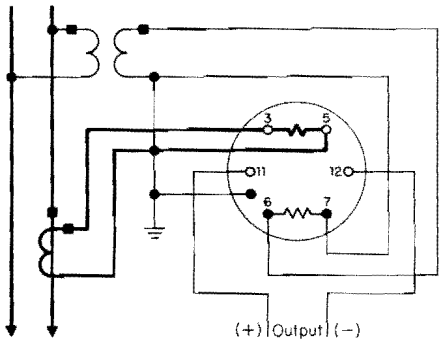
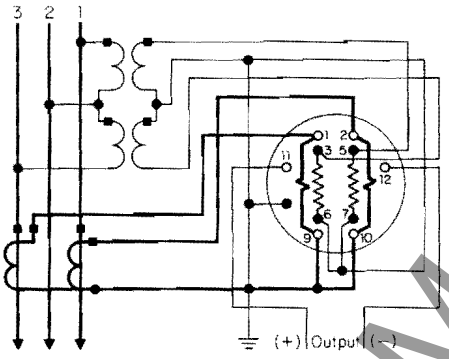
External Wiring Diagrams With Current and Potential Transformers

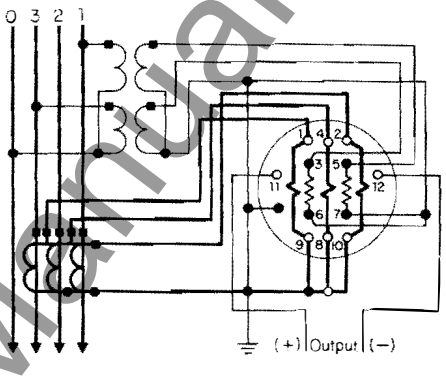
Single Phase



3 Phase, 3 Wire (2 Current Coil)

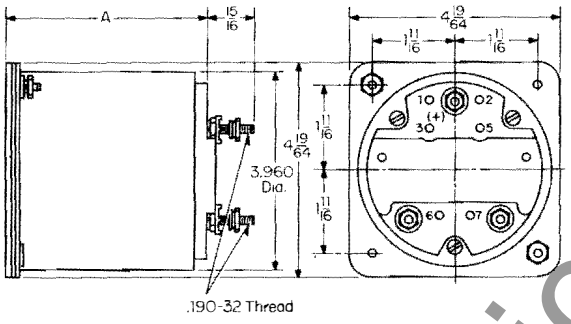


3 Phase, 4 Wire (3 Current Coil)

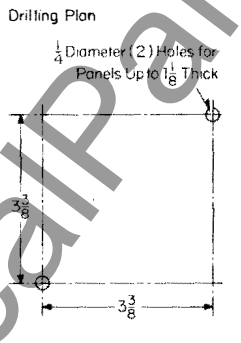


Outline Dimensions and Drilling Plan

VP-840 Watt Transducer

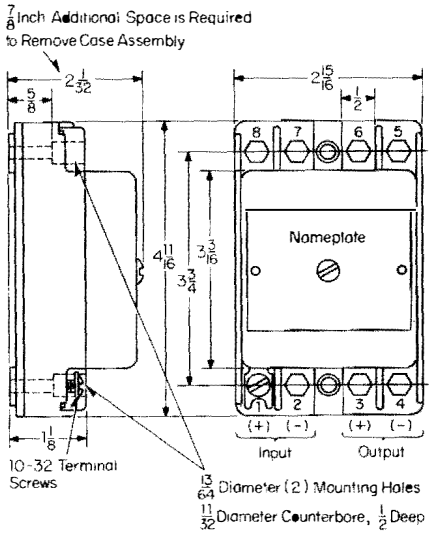


Drilling Plan



	Dimension "A"	Terminals in Position Number
Single element, with or without filter	3.906	3-5-6-7-11-12
Double element, with filter, 2cc	5.484	1-2-3-5-6-7-9-10-11-12
Double element, with filter, 3cc	5.484	1-2-3-4-5-6-7-8-9-10-11-12
Double element, without filter, 2cc	3.906	1-2-3-5-6-7-9-10-11-12
Double element, without filter, 3cc	3.906	1-2-3-4-5-6-7-8-9-10-11-12

VF-876 Filter Unit



Further Information:

Prices and Ordering Information: Price List 43-840

Application: Application Data 43-840

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Relay-Instrument Division, Newark, N. J.
Printed in USA