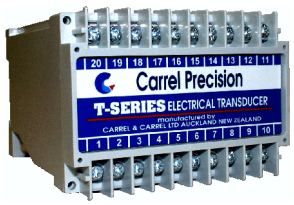
POWER TRANSDUCERS ACTIVE AND REACTIVE

SERIES: T-W WATT • T-V VAR •



The T-W or T-V power transducer converts ac current and voltage signals into a load independent dc signal proportional to active power (watts) or reactive power (vars). This signal is capable of driving a number of independent instruments.

The T-WH and T-VH watt-hour and var-hour transducers are no longer manufactured.

T-1V1 and T-1V4 are no longer manufactured.

METHOD OF OPERATION

The current and voltage signals are passed into the circuit via precision instrument transformers to provide galvanic isolation between the input circuits and the transducer circuitry. Each pair of current and voltage signals is mathematically multiplied together to produce a product signal proportional to true power and independent of wave shape and phase angle. These power signals are combined and averaged to yield a signal which drives an output amplifier capable of overcoming the external load resistance. The output may be safely open circuited or short circuited.

When the dc output signal from the power transducer is fed into the C&C T-INTP integrator it is converted into pulses. The frequency of the pulses is directly proportional to the amplitude of the input. The number of pulses produced is a mathematical integral of the input signal and is used to derive watt-hours and var-hours. The output pulses are normally available in the form of relay contact closures (dry contact), but can also be supplied as open collector or opto-coupler outputs suitable for driving counters, PLCs and computers.

TRANSDUCER SELECTION

Power transducers are available in various types to suit the supply and load being measured and can be determined from the selection chart below.

	WATT WATT-HOUR		VAR VAR-HOUR	
SINGLE PHASE	T-1W1(H)		~~*T-1V1(H)~~	
THREE PHASE	Balanced load	Unbalanced load	Balanced load	Unbalanced load
Balanced supply without neutral	T-1W3(H)	T-2W3(H)	T-1V3(H)	T-2V3(H)
Balanced supply with neutral	T-1W3(H) T-1W4(H)	T-3W4 T-2.5W4	T-1V3(H) ~~*T-1V4(H)~~	T-3V4 T-2.5V4
Unbalanced supply without neutral	T-2W3(H)	T-2W3(H)	N/A	N/A
Unbalanced supply with neutral	T-3W4	T-3W4	N/A	N/A

***Transducer T-1V1(H) and T-1V4(H) are accurate only at the specified frequency of 50 or 60Hz and should only be selected when no other alternative is suitable.*

The nominal apparent power P_{nom} is equal to $V_{nom}\,I_{nom}$ for single phase circuits or $1.73 \times V_{nom}\,I_{nom}$ for three phase circuits. The rated power range of the transducer (P_{rated}) may be set between 25 and 150% of P_{nom}. However, ranges close to P_{nom} will provide the maximum accuracy. When P_{rated} is less than 50% of P_{nom} the accuracy is downgraded.

All units conform to IEC 688. In addition they meet the insulation requirements of IEC 255-5, clauses 5, 6 and 8 as well as the high frequency disturbance test of IEC 255-22-1 for Class III test voltage.

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TECHNICAL DATA - WATT/VAR TRANSDUCER SECTION

INPUT AC current and voltage

CURRENT CIRCUITS

All current circuits are galvanically isolated from one another and from the rest of the circuitry and are suitable for direct connection or current transformer circuits.

Standard inputs 0-I_{nom}	0-1A or 0-5A (others on request)
Frequency range	45-50-55 or 55-60-65Hz (except T-1V1(H) and T-1V4(H) which are nominal +/-0.1Hz)
Overload capacity	2 x I_{nom} continuous 20 x I_{nom} for 3 seconds
Burden per circuit	<0.1VA

VOLTAGE CIRCUITS

The voltage circuitry is galvanically isolated from the rest of the circuitry and is suitable for direct connection or voltage transformers with suitable fault protection (eg fuses).

Nominal input V_{nom}	110V, 230V, 240V, 400V, 415V ac +/-20% (others on request)
Frequency range	45-50-55 or 55-60-65Hz (except T-1V1(H) and T-1V4(H) which are nominal +/-0.1Hz)
Burden per circuit	1mA
Overload capacity **2 x V_{nom} for 10 seconds**	1.5 x V_{nom} continuous

OUTPUT

Type	Linear proportional to power
Standard outputs **(others on request)**	-10 - 0 - +10mA -20 - 0 - +20mA 4-20mA -5 - 0 - +5V -10 - 0 - +10V

All outputs are bipolar and are accurate in both positive and negative senses suitable for power flows in either direction. Note however, that to measure bidirectional power flow with a 4-20mA output, zero power is usually set to 12mA.

Specified accurate range	0-120%
Maximum load	<750 ohms (0-20mA, 4-20mA) <1500 ohms (0-10mA) >2000 ohms (voltage output)
Ripple	<1% pk to pk
Response time	<250ms 0-90% <500ms 0-99%
Safe open circuit voltage	<25V dc
Clamped output on overload	<150%

ERRORS*

Influence of load	< -0.1% from min. to max. load
Linearity error	< +/-0.1% over specified range
Temperature influence	< +/-0.25% over range from -10°C to +50°C
Frequency influence	< +/-0.05% per Hz (except T-1V1(H) and T-1V4(H) which are nominal +/-0.1Hz)
Influence of power factor	< +/-0.25% at 0.5 power factor

**All errors referred to full range as defined by IEC 688*

ISOLATION Galvanic isolation exists between inputs, output and the auxiliary supply circuit

Test voltage	4kV rms 50Hz for 1 minute
Impulse	5kV 1.2/50**µ**s waveforms

TECHNICAL DATA T-INTP INTEGRATOR SECTION

No longer available

OUTPUT Pulse rate proportional to input

(a) Standard relay output

Nitrogen filled relay with AgPd contacts

Rates available	0.01Hz to 2Hz full scale
Pulse width	100ms
Contact ratings	min 10**µ**A/10mV max 60W dc/125VA ac max 220V ac/dc
Mechanical life	100M operations

(b) Counter output - open collector - diode protected

Rates available	0.01Hz to 10Hz full scale
Pulse width	50ms
Maximum load	<100mA, 24V

(c) Opto coupler output

Rates available	0.01Hz to 100Hz full scale
Pulse width	square wave or pulse to suit
Maximum load	<5mA, 30V

ERRORS*

Non-linearity	< 0.1% over specified range
Temperature drift	< +/-80 ppm/ ^{o}C
Long term drift	< +/-0.1% of specified input

**All % errors referred to full range as defined by IEC 688*

ISOLATION

Auxiliary supply to input or output	4kVrms 50Hz for 1 minute
Impulse	5kV 1.2/50**µ**s waveforms

Input/output

Relay	1kV 50Hz for 1 minute (higher on request)
Open collector	not isolated
Opto-coupler	2kV 50Hz for 1 minute

COMMON TECHNICAL DATA

ACCURACY

Class 0.5 to IEC 688
= +/-0.5% of P_{rated} at power factor 1
(see 1st page for definition of P_{rated})

PERMITTED AMBIENT TEMPERATURES

Operating	-10°C - +20°C - +50°C
Storage	-20°C - +70°C

AUXILIARY POWER

24V, 110V, 230V, 240V, 400V, 415V ac +/-20%, 2VA
12V, 24V, 48V, 110V dc +/-20%, 2W

HOUSING

Self extinguishing grey polycarbonate to IP40 snap mounting on top hat rail DIN EN 50022-35 or surface mount using M4 or M5 screws on two opposite corners.

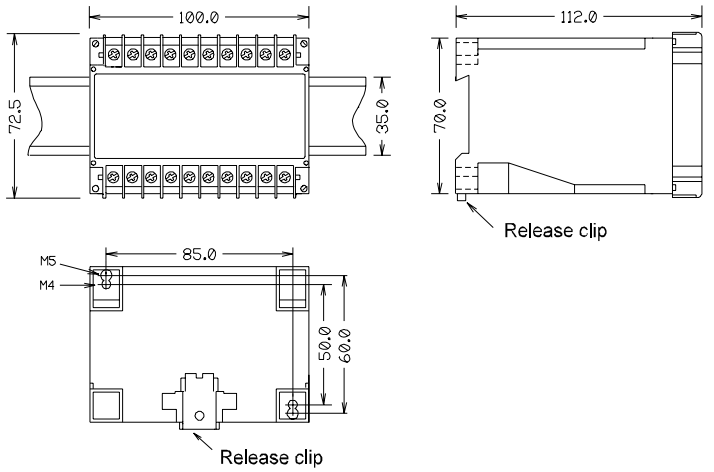
TERMINAL

20 tinned steel pozi-drive M3 screws with captive square washers suitable for 2 x 2.5mm^2 conductors (max). Optional terminal covers raise rating from IP10 to IP20.

ORDERING INSTRUCTIONS

Specify

Model
Watt, var, watt-hour or var-hour
Single or 3 phase measurement
Supply type (eg 3 wire, 4 wire etc)
Frequency
Load, balanced or unbalanced
Nominal voltage input
Nominal current input
Ratio and number of CTs, (if used)
Ratio and number of VTs, (if used)
Nominal power range
Output of power section, mA or volts
Output of integrator section, W-hour or var-hour per pulse
Output relay, open collector or opto-coupler
Auxiliary supply voltage
Other factors (e.g. low power factor)

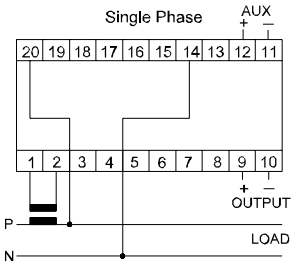


HOUSING DIAGRAM

Connections: *Any deviation from the correct connections may cause large errors in the output signal*

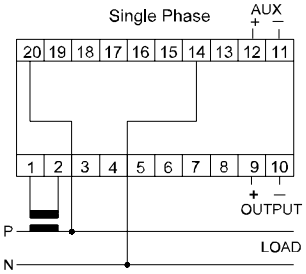
Model T-1W1 Watt Transducer

Single Phase



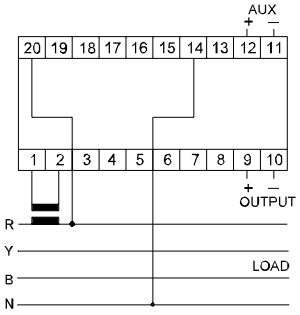
Model T-1V1 var Transducer

Single Phase



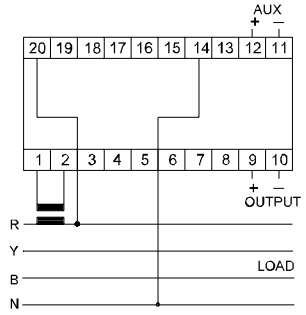
Model T-1W4 Watt Transducer

3 Phase 4 Wire Balanced Load



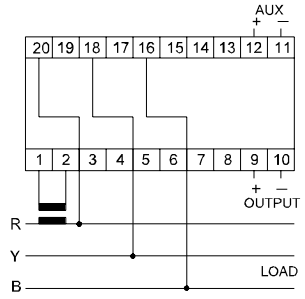
Model T-1V4 var Transducer

3 Phase 4 Wire Balanced Load



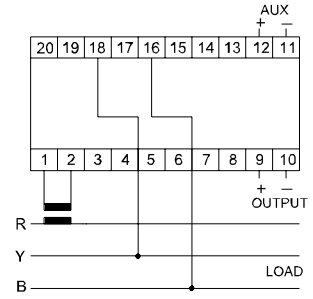
Model T-1W3 Watt Transducer

3 Phase 3 wire Balanced Load



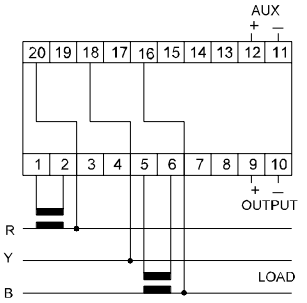
Model T-1V3 var Transducer

3 Phase 3 wire Balanced Load



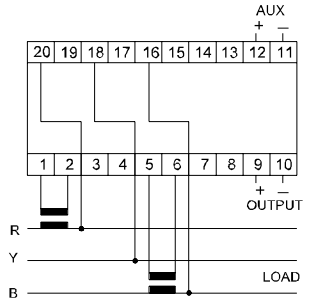
Model T-2W3 Watt Transducer

3 Phase 3 Wire Unbalanced Load



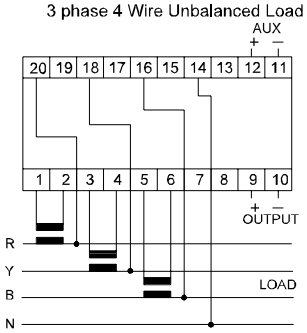
Model T-2V3 var Transducer

3 Phase 3 Wire Unbalanced Load



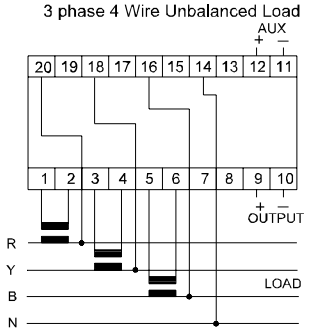
Model T-3W4-2.5W4 Watt Transducer

3 phase 4 Wire Unbalanced Load



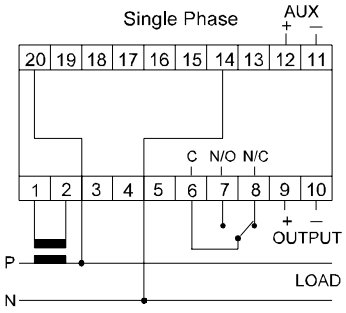
Model T-3V4-2.5V4 var Transducer

3 phase 4 Wire Unbalanced Load



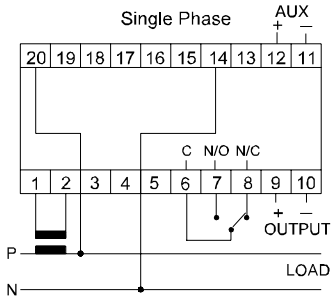
Model T-1W1H W-hr Transducer

Single Phase



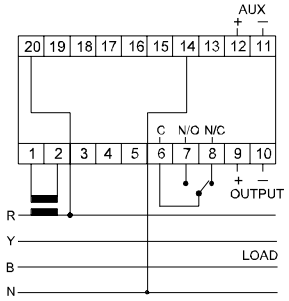
Model T-1V1H var-hr Transducer

Single Phase



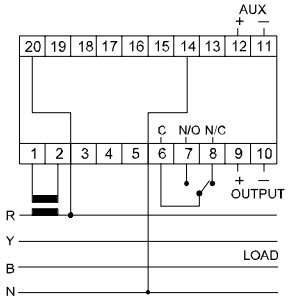
Model T-1W4H W-hr Transducer

3 Phase 4 Wire Balanced Load



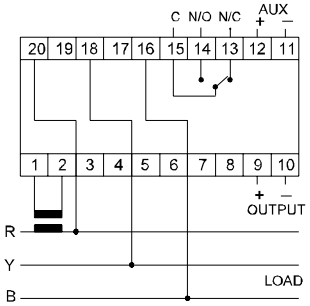
Model T-1V4H var-hr Transducer

3 Phase 4 Wire Balanced Load



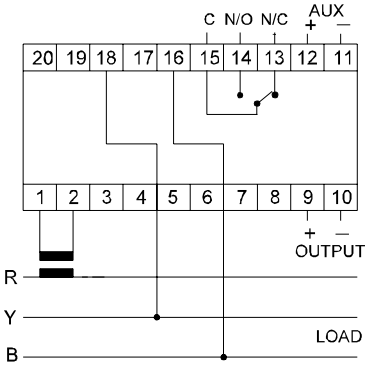
Model T-1W3H W-hr Transducer

3 Phase 3 wire Balanced Load



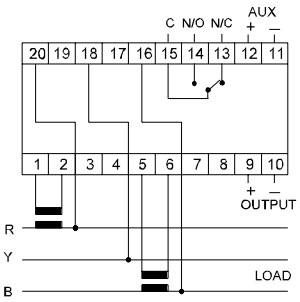
Model T-1V3H var-hr Transducer

3 Phase 3 wire Balanced Load



Model T-2W3H W-hr Transducer

3 Phase 3 Wire Unbalanced Load



Model T-2V3H var-hr Transducer

3 Phase 3 Wire Unbalanced Load