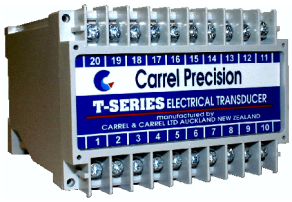
# T-VA APPARENT POWER TRANSDUCER




The C&C T-VA power transducer converts ac current and voltage signals into a load independent dc signal proportional to the apparent power (VA) flowing in the input circuit. This signal is capable of driving a number of independent instruments.

The unit conforms to IEC 688. In addition it meets 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.

The T-VA(H) VA-hour transducers are a combined T-VA power transducer and T-INTP integrator in a common housing and give simultaneous VA and VA-hour outputs. This does not apply to 3 element 4 wire unbalanced load transducers which, because of limited space in the enclosure 100, are supplied as two separate units with the T-INTP integrator in enclosure 55.

## 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. The current signal is processed by a true rms converter, while the voltage signal is rectified and averaged (voltage signal is almost always sinusoidal even if current waveforms are distorted). Each pair of current and voltage signals is mathematically multiplied together to produce a product signal proportional to apparent power (VA) and independent of current wave form 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 sign is always positive irrespective of direction of power flow. The output may be safely open circuited or short circuited.

## TRANSDUCER SELECTION

VA transducers are available to suit the type of supply and load being measured and can be determined from the chart below.

| **SINGLE PHASE** | T-1VA1(H) | |
|---|---|---|
| **THREE PHASE** | Balanced load | Unbalanced load |
| Balanced supply without neutral | T-1VA3(H) | T-2VA3(H) |
| Balanced supply with neutral | T-1VA3(H)<br>T-1VA4(H) | T-3VA4 |
| Unbalanced supply without neutral | T-2VA3(H) | T-2VA3(H) |
| Unbalanced supply with neutral | T-3VA4 | T-3VA4 |

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.

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# TECHNICAL DATA VA 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 |
| **Overload capacity** | 2 x $I_{nom}$ continuous<br>20 x $I_{nom}$ for 3 seconds |
| **Max crest factor** | 5 |
| **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 |
| **Max crest factor** | 5 |
| **Burden per circuit** | 1mA |
| **Overload capacity** | 2 x $V_{nom}$ continuous<br>3 x $V_{nom}$ for 10 seconds |

**OUTPUT**

| | |
|---|---|
| **Type** | Linear proportional to apparent power (always positive) |
| **Standard nominal outputs**<br>(**others on request)** | 0-10mA<br>0-20mA<br>4-20mA<br>0-5V<br>0-10V |
| **Specified accurate range** | 0-120% |
| **Maximum load** | <750 ohms (0-20mA, 4-20mA)<br><1500 ohms (0-10mA)<br>>2000 ohms (voltage output) |
| **Ripple** | <1% pk to pk |
| **Response time** | <250ms 0-90%<br><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** | < +/-0.5% over specified range |
| **Temperature influence** | < +/-0.25% over range from -10°C to +50°C |
| **Frequency influence** | < +/-0.05% per Hz |
| **Influence of power factor** | None |

**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

**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 1 to IEC 688 +/-1.0% of $P_{rated}$
(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

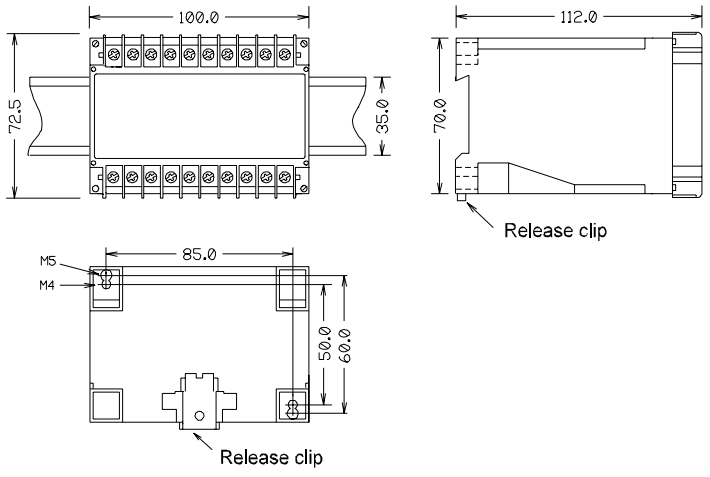
**HOUSING** Self extinguishing grey polycarbonate to IP40 snap mounting on top hat rail DIN EN 50022-35 or surface mount using M4 or M5 screws on two opposite corners.

**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
Single or 3 phase measurement
Supply type (eg 3 wire, 4 wire etc)
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 VA section, mA or volts
Output of integrator section, VA-hour per pulse
Output relay, open collector or opto-coupler
Auxiliary supply voltage

# HOUSING DIAGRAM



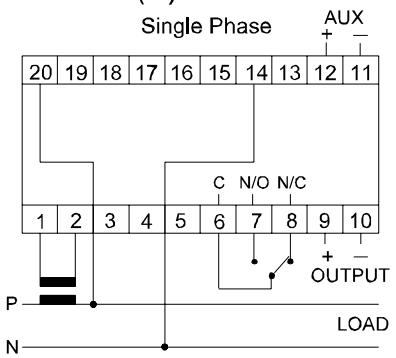
**CONNECTIONS**

Please note that the connections shown are for both the VA and the combined VA/VA-Hr transducers (except T-3VA4). Where an integrator is fitted the connections to the relay contacts are as shown. Otherwise there are no relay connections.

Please note that any deviation from the correct connections may cause large errors in the output signal.

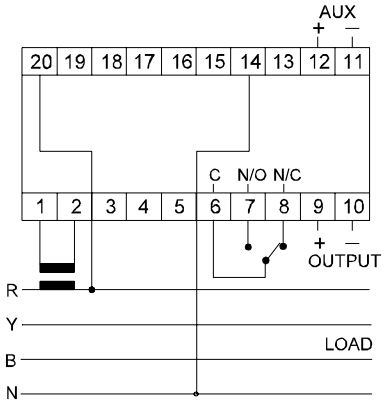
## Model T-1VA1(H) VA/VA-hr Transducer

Single Phase



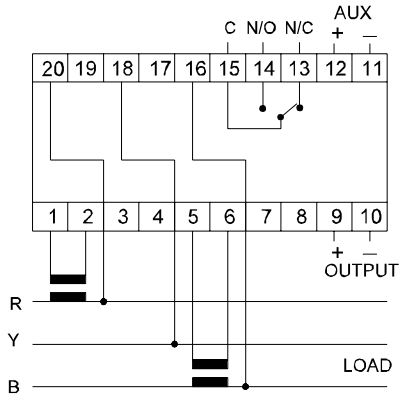

## Model T-1VA4(H) VA/VA-hr Transducer

3 Phase 4 Wire Balanced Load



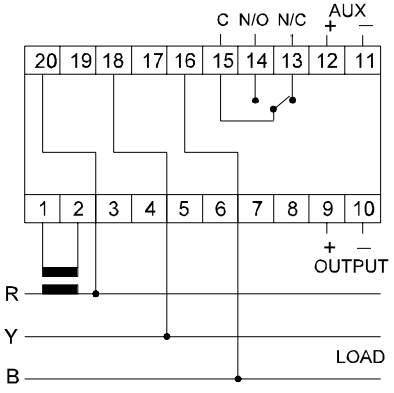

## Model T-2VA3(H) VA/VA-hr Transducer

3 Phase 3 Wire Unbalanced Load




## Model T-1VA3(H) VA/VA-hr Transducer

3 Phase 3 wire Balanced Load




## Model T-3VA4 VA Transducer

3 phase 4 Wire Unbalanced Load