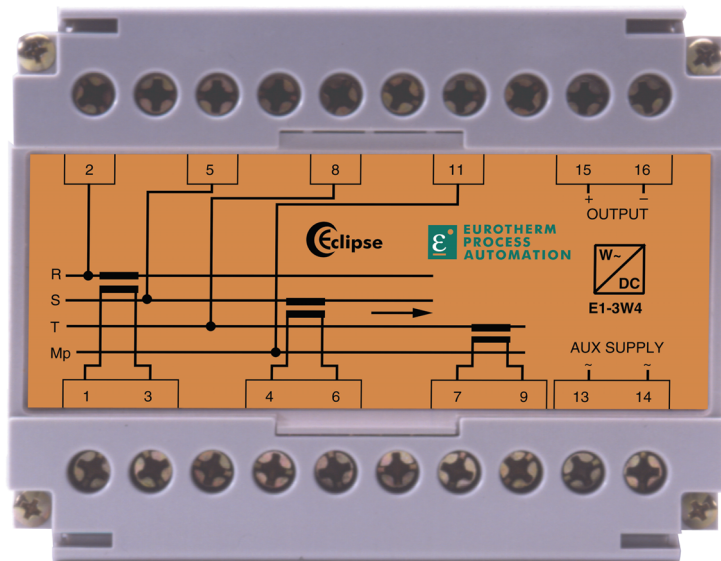


ECLIPSE

SERIES

AC Power Transducer Product Data



EUROTHERM

CONTROLS
DATA MANAGEMENT
PROCESS AUTOMATION

ECLIPSE SERIES AC POWER TRANSDUCERS

- **Watt and Var measurement**
- **Accuracy Class 0.5**
- **Frequency independent**
- **Isolated**
- **Suitable for single or three phase, balanced or unbalanced load systems.**

INTRODUCTION

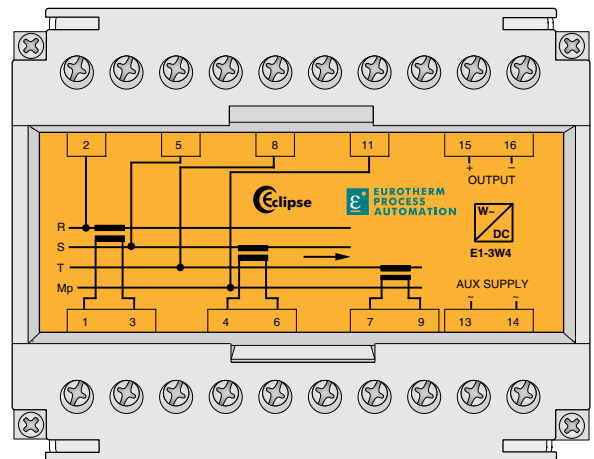
The series E1 Watt and Var transducers are a range of devices that provides a dc output signal proportional to the measured power input. The output can represent 'true' power in watts ($VI\cos\phi$) or reactive power in vars ($VI\sin\phi$) and is isolated from inputs by internal transformers.

The Eclipse range is designed for use with both single and three phase systems with both balanced and unbalanced loads. Available in one, two and three element configurations, these units are suitable for all measurement methods.

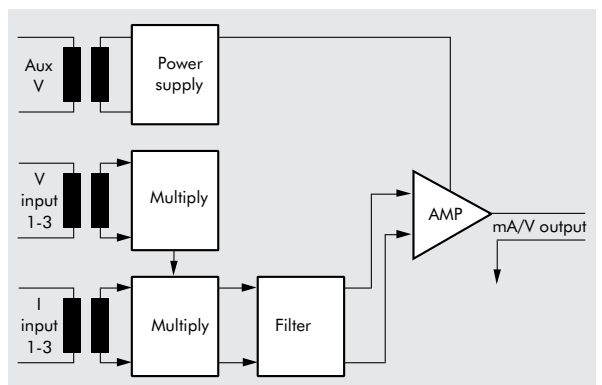
FUNCTIONAL DESCRIPTION

The measured ac voltage and current are isolated by the input transformers and are used to fire a bistable circuit to produce a pulse train. The height of the pulse is proportional to the instantaneous voltage and the width to the instantaneous current. These pulses are then integrated and the resultant differential voltage is proportional to the instantaneous value of power ($VI\cos\phi$). The output amplifier then provides a constant voltage or current output that is proportional to input power. The var transducer operates in an identical manner except that the input voltage is phase shifted by 90° . The output is then proportional to reactive power ($VI\sin\phi$).

A single element is used for single and three phase, three wire balanced load systems. For other systems, (e.g. three phase, four wire unbalanced), two or three elements are utilised to provide accurate and meaningful results.

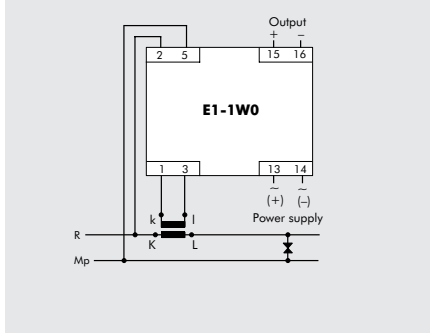


Outputs available include voltage and current with true and 'live' zero and are suitable for driving analogue meters, digital instruments, computer inputs, process control and energy management systems. The design ensures low burden on the line being measured and therefore these transducers can be self powered by the internal connection of the auxiliary supply to the measured voltage circuit.

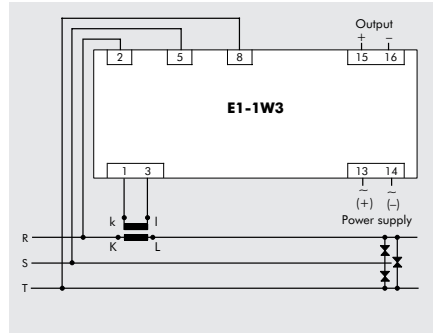


Watt/Var transformer

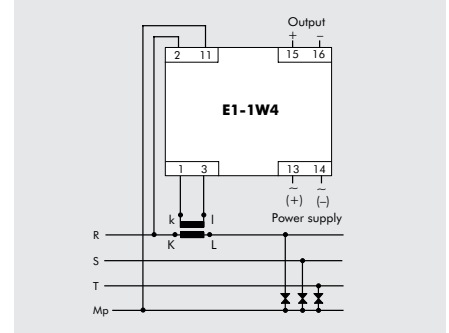
CONNECTION AND INSTALLATION



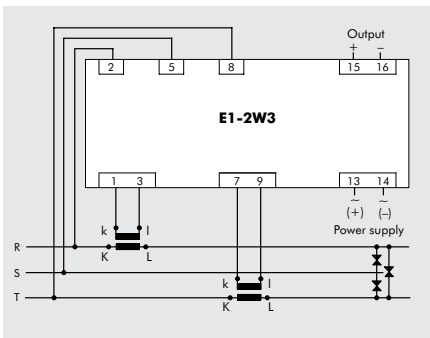
Single phase



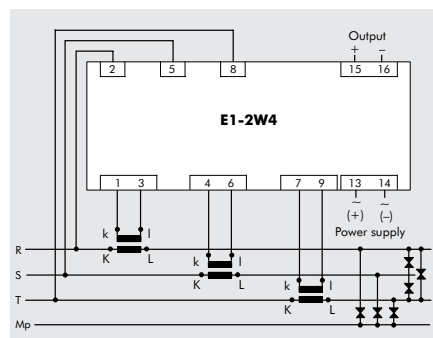
3Ph 3W balanced load



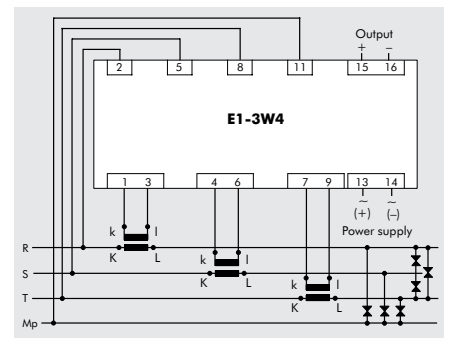
3Ph 4W balanced load



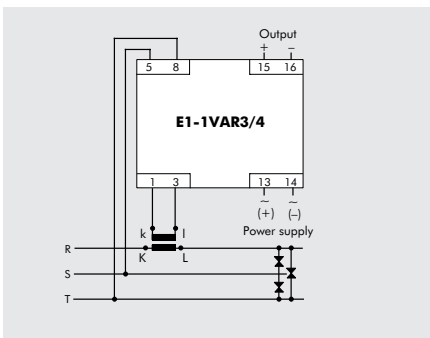
3Ph 3W unbalanced load



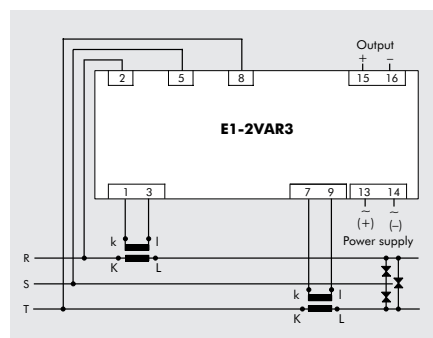
3Ph 4W unbalanced load



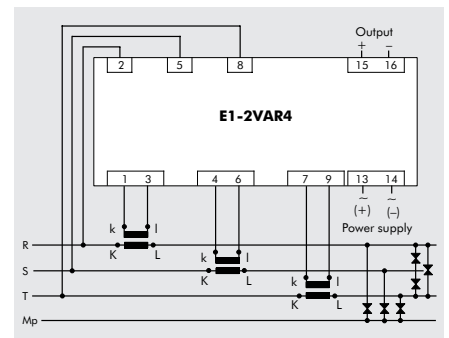
3Ph 4W unbalanced load



3Ph 3W balanced load



3Ph 3W unbalanced load



3Ph 4W unbalanced load

WARNING: Current transformers MUST NOT be open circuited on load. It is recommended that the transducer is housed in an enclosure (eg control panel) that does NOT allow unauthorised access as high voltages can be present on the terminals.

The voltage inputs may be direct or VT connected and one side of the VT secondary should be earthed. We recommend that the voltage inputs and power supply are fused. Current inputs may be direct or CT connected and for safety reasons one side of the CT secondary should be earthed.

It is recommended that the transducer is housed in an enclosure (e.g. Control Panel) that does NOT allow unauthorised access as high voltages can be present on the terminals. The power supply should be fused.

STANDARDS

CE Conforms to EMC Directive 89/336/EEC amended by 93/68/EEC and Low Voltage Directive 72/23/EEC

BS EN 60688:1992	Designed to comply with Electrical measuring transducers for converting ac electrical quantities to analogue or digital signals.
IEC414:1979	Safety, high voltage insulation
IEC521:1988	Impulse voltage 5kV waveform 1,2/50uS
IEC255-21-1/3	High frequency disturbance 2.5kV common, 1kV series mode
EN50081-2	Emissions:- Industrial
EN50082-2	Immunity:- Industrial

SPECIFICATIONS

Inputs

Voltage range:	0-120% Vn 0.2VA
Optimum range:	90-110%
Voltage overload:	120% continuous 150% 10 sec
Current consumption:	Approx 1.0VA
Current overload:	× 2 cont × 10 for 5 secs × 20 for 1 sec
Frequency:	45-65Hz, 400Hz

Outputs

	0-1mA into 10kΩ max
	0-10mA into 1kΩ max
	0-20mA into 500Ω
	4-20mA into 500Ω max
	0-10V into 2kΩ min
Overall accuracy:	Class 0.5
Current error:	0.03% (0-150% In)
Voltage error:	0.05% (± 10% Vn)
Multiplication error:	Better than 0.2%
EMC (one off peak)	-10% vertical @ 375MHz
Power factor:	0-1
Power factor error:	0.08%/0.1 PF max
Isolation test:	2kV for 1 minute

Drive capability

Voltage:	10V
Current:	20mA

General specifications

Temperature range:	-10 to +60°C
Temperature coefficient:	0.02%/°C
Ripple:	<1% peak-to-peak
Stability:	±0.05% per annum non-accumulative
Response	0-90% in 800mS
Storage temperature	-40 to 70°C
Humidity:	up to 90% non-condensing

Mechanical

Weight:	430gm (E1-1W0, E1-1W4, E1VAR3/4) 700gm (E1-1W3) 730gm (E1-2W3, E1-2VAR3) 735gm (E1-2W4, E1-2VAR4) 820gm (E1-3W4)
Dimensions:	55W × 70H × 114D mm (E1-1W0, E1-1W4, E1VAR3/4) 100W × 70H × 114Dmm (E1-1W3, E1-2W3, E1-2W4, E1-2VAR3, E1-2VAR4, E1-3W4)
Housing:	Moulded grey ABS plastic case self extinguishing to VDE0304 Degree 1, with moulded polycarbonate terminal assembly. The case is snap mounting on top-hat rail DIN 4677-3 (CENELEC EN 50-022). On the 55mm wide housing, screw mounting is only available on request. On other sizes of housing, it is standard.

PROGRAMMING

All transducers have a direct ratio of calibrated power (CP) to actual measured power (MP). This ratio is the product of the CT and VT ratios being used. Thus if a CT only is being used:

$$CP = MP \times \frac{CT\ SEC}{CT\ PRIM}$$

where CP = calibrated power
 MP = measured power
 CT SEC = output of secondary of CT
 CT PRIM = primary of CT

EXAMPLE: Three phase, four wire unbalanced load system

V = 415V
 MP = 500kW
 CT ratio = 1000/5A

$$CP = 500kW \times 5/1000 = 2.5kW$$

This is within the range of 1667 to 5208 watts given below for a 415V, 5A unit.

A system using both CT and VT needs to take into account the VT ratio in addition to the CT ratio as shown below:

$$CP = MP \times \frac{VT\ SEC}{VT\ PRIM} \times \frac{CT\ SEC}{CT\ PRIM}$$

EXAMPLE: Three phase three wire unbalanced system

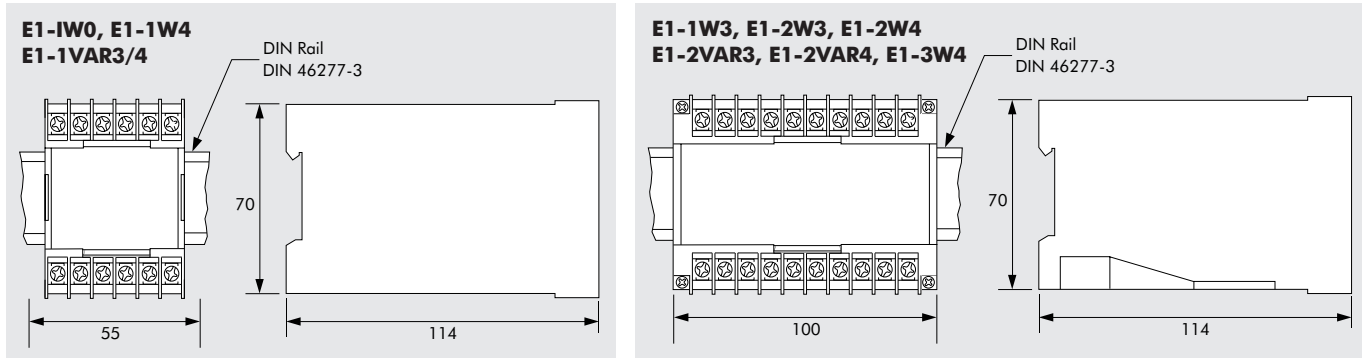
MP = 2MW
 VT ratio = 13.8kV/100V
 CT ratio = 75/5A

$$CP = 2,000,000 \times 100/13800 \times 5/75 = 966W$$

This is within the range of 500 to 1563 watts given below for a 100V, 5A unit.

System	Volts	AMPS	Min power (W)	Max power (W)
Single phase	100/110	1	50	156
R-Mp	220/240	1	125	391
	380/415	1	200	625
	100/110	5	250	781
R-S-T	220/240	5	625	1953
	380/415	5	1000	3125
	100/110	1	100	313
3ph 3w bal	220/240	1	200	625
	380/415	1	333	1042
	100/110	5	500	1563
R-S-T	220/240	5	1000	3125
	380/415	5	1667	5208
	380/415	1	375	1171
3ph 4w bal	380/415	5	1875	5859
	100/110	1	100	313
	220/240	1	200	625
R-S-T	380/415	1	333	1042
	100/110	5	500	1563
	220/240	5	1000	3125
3ph 3w or 4w unbal	380/415	5	1667	5208

HOUSING DETAILS



ORDERING INFORMATION

AC power transducer

Base unit	Power range (kW)	System voltage	Input frequency	Current input	O/P range & units	Auxiliary supply	Options
E1-1W3	3000	415V	50Hz	5A	4-20mA	24V	-

Example

Base unit	Code
Active power	
Single phase (~)	E1-1W0
3 phase 3 wire balanced (3~1E)	E1-1W3
3 phase 4 wire balanced (3N~1E)	E1-1W4
3 phase 3 wire unbalanced (3~2E)	E1-2W3
3 phase 4 wire unbalanced (3N~2E)	E1-2W4
3 phase 4 wire unbalanced (3N~3E)	E1-3W4
Reactive power	
3 phase 3 wire balanced (3~1E)	E1-1VAR3
3 phase 4 wire balanced (3N~1E)	E1-1VAR4
3 phase 3 wire unbalanced (3~2E)	E1-2VAR3
3 phase 4 wire unbalanced (3N~2E)	E1-2VAR4
Power range (W)	
Calibrated power in watts*	Please specify
System voltage (line-to-line)†	
110V	110V
220V	220V
230V	230V
240V	240V
380V	380V
400V	400V
415V	415V

Input frequency (fn)	Code
45-65Hz	50Hz
400Hz	400Hz

Current input	
1A (direct)	1A
5A (direct)	5A
10A (special) (direct)	10A

Output range and units	
0-1mA	0-1mA
0-10mA	0-10mA
0-20mA	0-20mA
4-20mA	4-20mA
0-10V	0-10V

Auxiliary supply	
110V ± 20%	110V
230 ± 20%	230V
400 ± 20%	400V
24V dc	24V

Options	
4kV isolation tested	
Accuracy class 0.2	

* Please see page 5 for allowable ranges of calibrated power
 † Line-to-line volts = $\sqrt{3}$ × line to neutral volts

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