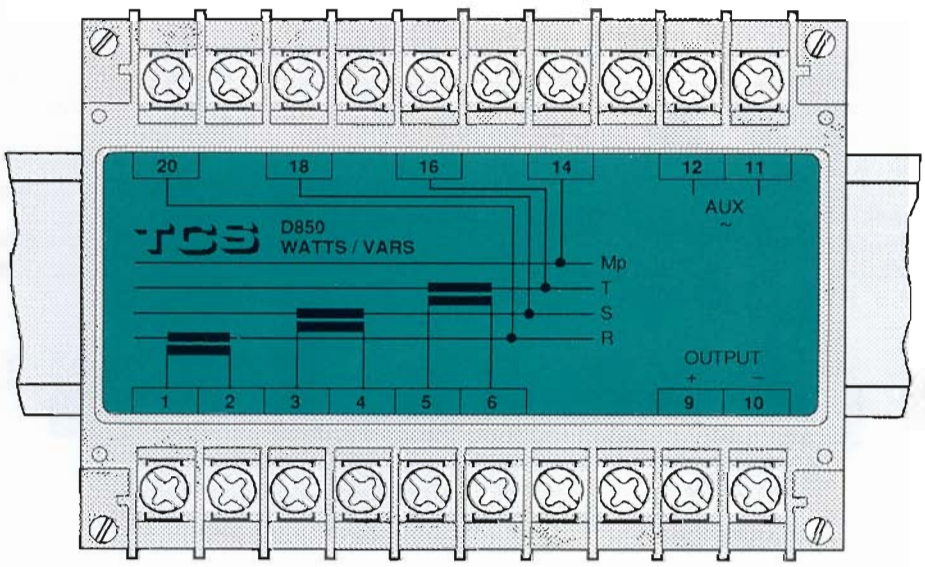
EUROTHERM
PROCESS
AUTOMATION

D850

AC power transducer



product
specification

Star Features

* Watt and Var measurement
* Accuracy Class 0.5% (watts)
* Frequency Independent (watts)
* Isolated
* Suitable for single or three phase, balanced or unbalanced load systems.

Introduction

D850 power transducers are a range of devices that provide 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.

This facility is useful not only for OEMs and to reduce spares holdings but also allows the use of CTs and VTs, in addition to direct connection, without the need for lengthy and expensive re-calibration procedures. Accuracy is maintained by this method eliminating the need for expensive test equipment.

The D850 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.

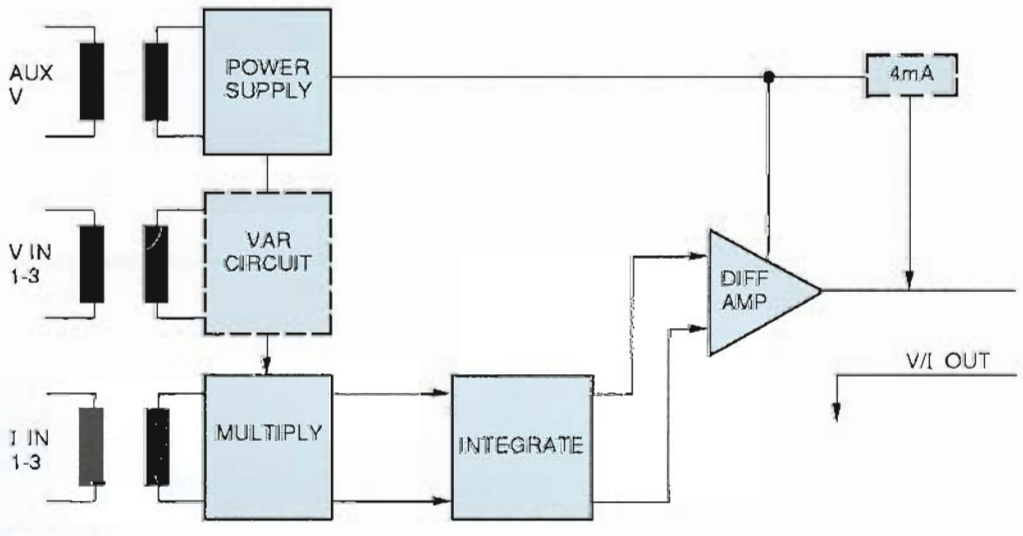
Outputs available include voltage and current with true and 'live' zero and are suitable for driving analogue meters, digital instruments, computer inputs, process control and energy management systems. The design ensures low burden on the line being measured and therefore these transducers can be self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

All units are housed in a flame retardant polycarbonate case (DIN 43604) and may be mounted either on a DIN rail (DIN 46277) or to a wall or bulkhead.

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 which 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.

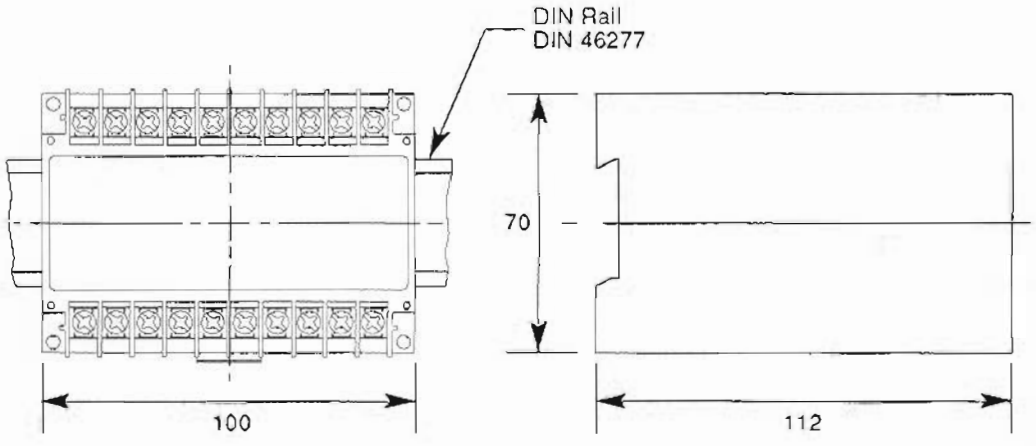


WATT/VAR TRANSFORMER
BLOCK DIAGRAM

Specification

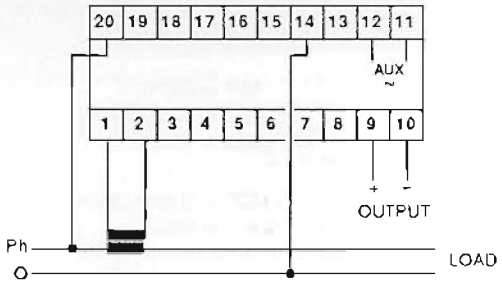
	WATT	VAR
INPUTS:		
Voltage	100-440V	100-440V
Overload	120% (110% for 440V)	120% (110% for 440V)
Current	1A or 5A	1A or 5A
Burden	0.8VA	0.8VA
Overload	200% continuous (4 times rated for 15 secs.)	200% continuous (4 times rated for 15 secs.)
Frequency	45-65Hz 400Hz	45-65Hz 400Hz
OUTPUTS:		
	0-1mA 0-5mA 0-10mA 0-20mA 4-20mA 0-10V	0-1mA 0-5mA 0-10mA 0-20mA 4-20mA 0-10V
DRIVE CAPABILITY		
Current output:	10V	10V
Voltage output:	20mA	20mA
ACCURACY: (mid-program)	Class 1.0%	Class 1 5%
MULTIPLICATION ERROR:	<0.2%	<0.2%
POWER FACTOR:	0.1	0.1
POWER FACTOR ERROR:	0.1%/0.1PF	0.1%/0.1PF
TEMPERATURE RANGE:	–10 to +60°C	–10 to +60°C
TEMPERATURE DRIFT:	0.03%/°C	0.03%/°C
RESPONSE TIME:	300ms approx	300ms approx
AUXILIARY SUPPLY:	110, 240V ±20% 415V +15% –20%	110, 240V ±20% 415V +15% –20%
WEIGHTS (approx):	350-700gm	350-700gm

Housing Details

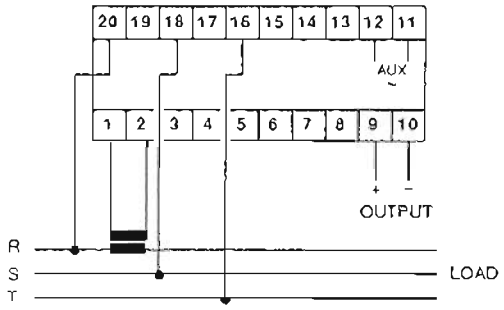


Dimensions in mm

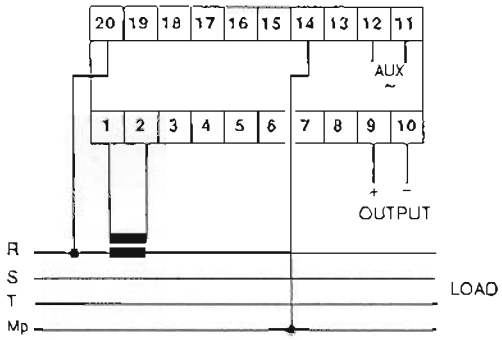
Connection & Installation



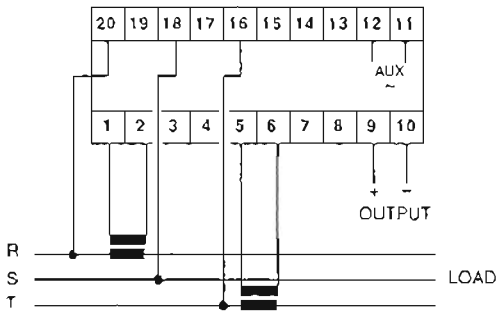
WATTS
SINGLE PHASE LOAD



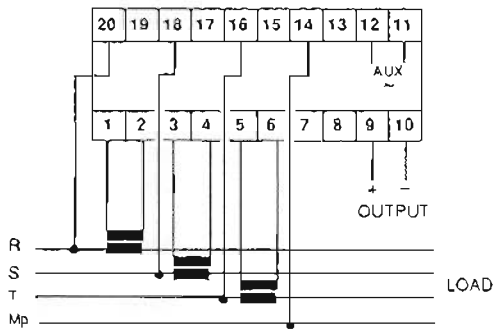
WATTS
3 PHASE 3 WIRE
BALANCED LOAD



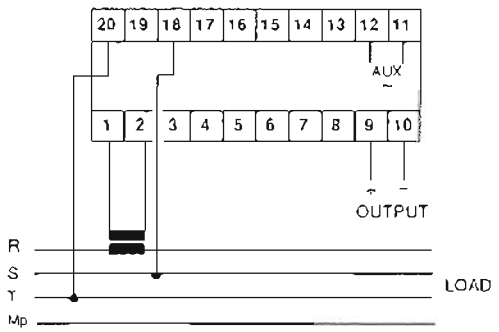
WATTS
3 PHASE 4 WIRE
BALANCED LOAD



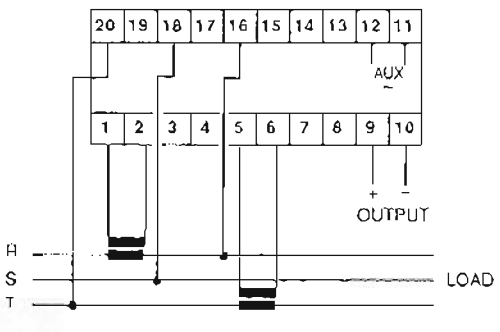
WATTS
3 PHASE 3 WIRE
UNBALANCED LOAD



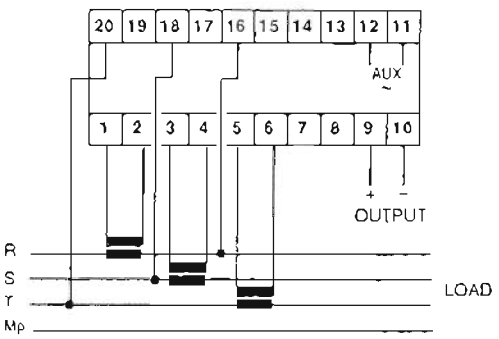
WATTS
3 PHASE 4 WIRE
UNBALANCED LOAD



VARS
3 PHASE 3 WIRE OR 4 WIRE
BALANCED LOAD



VARS
3 PHASE 3 WIRE
UNBALANCED LOAD



VARS
3 PHASE 4 WIRE
UNBALANCED LOAD

WARNING: Current Transformers MUST NOT be open circuited on load.
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.

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

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

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

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

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
	220/240	5	625	1953
	380/415	5	1000	3125
3ph 3w bal	100/110	1	100	313
R — S —T	220/240	1	200	625
	380/415	1	333	1042
	100/110	5	500	1563
	220/240	5	1000	3125
	380/415	5	1667	5208
3ph 4w bal	380/415	1	375	1171
R — S —T				
	380/415	5	1875	5859
3ph 3w or 4w unbal	100/110	1	100	313
R — S —T	220/240	1	200	625
	380/415	1	333	1042
	100/110	5	500	1563
	220/240	5	1000	3125
	380/415	5	1667	5208

Ordering Information

Description		Order Code
AC Power Transducer		D850
Transducer Type:	(a) Active power (watts) (b) Reactive power (vars)	WATT VAR
Electrical System:	(a) Single phase (WATT only) (b) Three phase	1PH 3PH
Type (three phase only):	(a) 3 Wire (b) 4 Wire	3W 4W
Load (three phase only):	(a) Balanced (b) Unbalanced (2 or 3 element)	B U
Voltage Input (for direct connection): VT Ratio	100-440V specify value e.g 240V OR e.g. 13.8kV:100V	240V 13.8kV:100V
Current Input (for direct connection): CT Ratio	(a) 1A (b) 5A OR e.g. 100A:5A	1A 5A 100A:5A
Calibrated Power (CP):	Specify value e.g. 2.5kW	2.5kW
Frequency:	(a) 45-65Hz (WATT only) (b) 400Hz (WATT only) (c) 50Hz (VAR only) (d) 60Hz (VAR only)	45-65Hz 400Hz 50Hz 60Hz
Output Type		OP
Range and Units:	(a) 0-1mA into 10K (b) 0-5mA into 2K (c) 0-10 mA into 1K (d) 0-20 mA into 500R (e) 4-20mA into 500R (f) 0-10V into 2K	0-1mA 0-5mA 0-10mA 0-20mA 4-20mA 0-10V
Auxiliary Supply		AUX
Range:	(a) 110V (b) 240V (c) 415V	110V 240V 415V
Labelling:	(a) Blank (b) Tagging	— T

Examples: D850/WATT/1PH/-/-/240V/1A/240W/45-65Hz/OP/0-1mA/AUX/-
D850/WATT/3PH/4W/U/13 8kV:100V/100A:5A/725W/45-65Hz/OP/4-20mA/AUX/T

Issue 2/C July 1992

Part Number HA 079978 U001

EUROTHERM PROCESS AUTOMATION

EUROTHERM PROCESS AUTOMATION LIMITED

SOUTHDOWNVIEW WAY, WORTHING, WEST SUSSEX BN14 8NN

TELEPHONE +44 (0) 1903 205277 FAX: +44 (0) 1903 233902 TELEX: 87437