Power Line Transducers

Instrument
Division

Data sheet No.: PLT/10/11

DESCRIPTION

AE Transducers convert various electrical power line parameters viz. Voltage, Current, Frequency, Power Factor, Active power, Reactive power, Apparent power into DC current or voltage output. The output of transducer is independent of load impedance. These are used in various electrical, thermal, chemical & other power plants to monitor processed data either locally or from remote using various devices such as indicating meters, data loggers, recorders, SCADA systems.

These transducers can also be used as external units in conjunction with analog or digital indicators.

FEATURES

- Open & short circuit protected.
- Current and Voltage output are independent of load impedance.
- Suitable for panel as well as DIN – RAIL mounting.

ELECTRICAL SPECIFICATIONS

- TYPE : DC or AC : 1Ph / 3Ph -1EL / 3Ph - 2EL - 3W / 3Ph - 3EL - 4W
- INPUT PARAMETER : DC : Voltage, Current
  AC : Voltage, Current, Watt, Var, VA, Frequency, Power Factor
- INPUT PARAMETER RANGE ™
  - VOLTAGE : DC : 500V, AC : 500V
  - CURRENT : DC : 5A (for higher ranges: 50 – 300mV ext. Shunt) , AC : 1A / 5A.
  - FREQUENCY : 50 / 60Hz ±5Hz., 400Hz ± 20Hz.(Any other Frequency on request).
  - POWER FACTOR: 0.5 (Lag) – Unity – 0.5 (Lead)
  - POWER : Please specify.
- OUTPUT RANGE : Single Output / Dual Output

RANGE :

♦ CURRENT :	0-1mA	0-5mA	0-10mA	0-20mA	4-20mA	10 - 0 - 10mA
MAX. LOAD	10kΩ	2kΩ	1kΩ	500Ω	500Ω	1kΩ

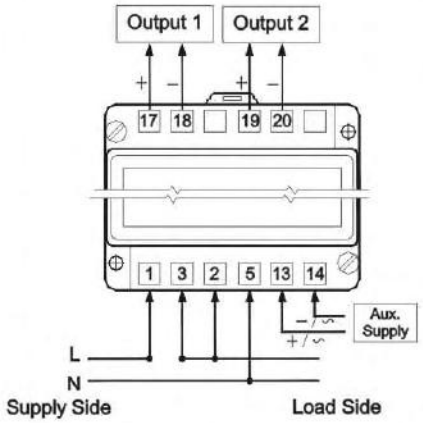
♦ VOLTAGE :	0 – 1V	0 – 5V	0 – 10V	1 – 5V	2 – 10V	10 - 0 - 10V
MIN. LOAD	500Ω	2.5kΩ	5kΩ	2.5kΩ	5kΩ	5kΩ

- ACCURACY : ± 0.5% of full scale for Voltage, Current, Watt, Var, VA, Power Factor
  ± 0.2% of centre frequency for Frequency Transducer.
- AUX. SUPPLY : 63.5V, 110V, 220V, 230V, 240V, 380V, 415V, 440V AC (for ±10%V, 50 / 60Hz).
  24V, 48V, 110V, 220V DC (for ± 10%V).
- VA BURDEN : For VOLTAGE ≤ 2, For CURRENT ≤ 0.5, For AUX. SUPPLY ≤ 4
- RIPPLE : Maximum 0.5% of the span.
- OVERLOAD CAPACITY
  - VOLTAGE cont. : 120% of nominal
    short time (10 sec) : 150% of nominal
  - CURRENT cont. : 120% of nominal
    short time (3 sec) : 10 times of nominal
- RESPONSE TIME : 300 m. sec.
- OPEN CKT. VOLTAGE : 22V max.
- IMPULSE VOLTAGE : 5kV, 1.2 / 50 µsec. (0.5j)
- INSUL$^{N.}$ RESISTANCE : Greater than 20M ohms at 500V DC
- DIELECTRIC TEST : 2kV RMS for 1 minute. (4kV on request)
- OPERATING TEMP. : 0°C to 55°C.
- STORAGE TEMP. : -20°C to 70°C
- HUMIDITY : Up to 95% RH
- CONFORMS TO : I.S.12784 / I.E.C. 688.

TYPICAL WIRING SYSTEM

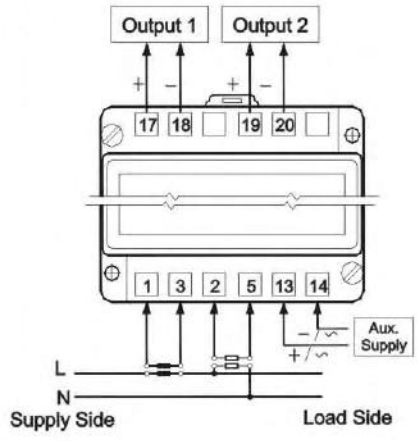
PD1 TRANSDUCER
CURRENT / VOLTAGE / FREQUENCY / POWER FACTOR

WITHOUT CT / PT



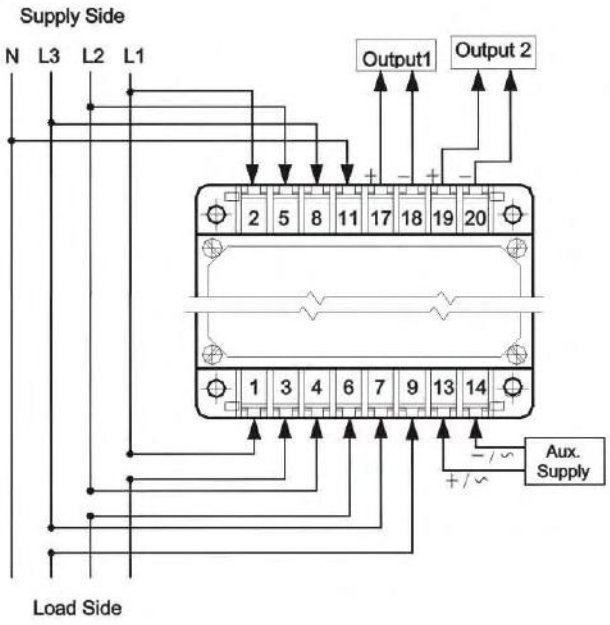
- For Single phase Power Factor terminal no.5 to be replaced by terminal no.11 for Netural connections.
- For 3 Phase-1 Element-Power Factor terminal no.2 & 5 to be replaced by terminal no.5 & 8respectively forL2 & L3 connection.

WITH CT / PT

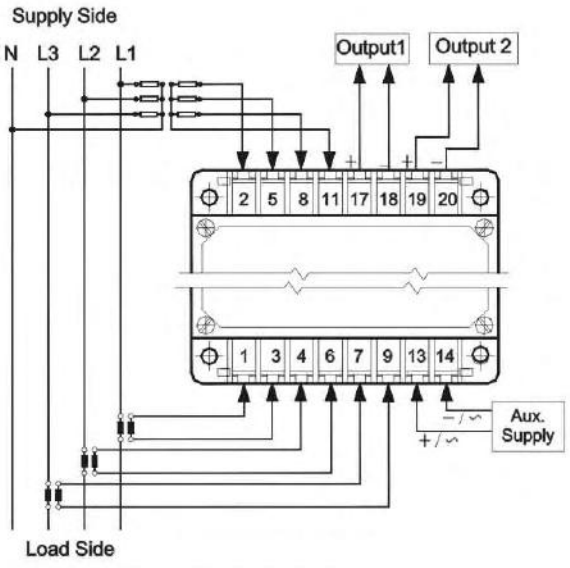


PD3 TRANSDUCER
WATT / VAR / VA

WITHOUT CT / PT

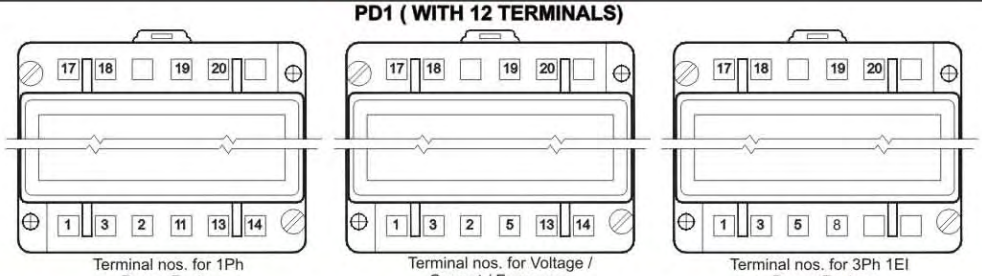


WITH CT / PT



TERMINAL CONNECTIONS

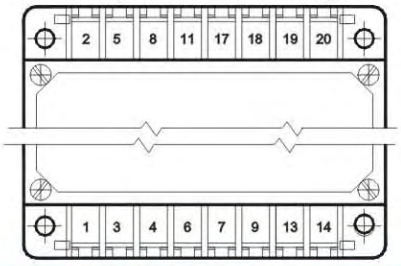
PD1 (WITH 12 TERMINALS)



Terminal nos. for 1Ph Power Factor | Terminal nos. for Voltage / Current / Frequency | Terminal nos. for 3Ph 1El Power Factor

TRANSDUCER TYPE	OUTPUT TYPE	OUTPUT TERMINALS	INPUT TERMINALS		
			VOLTAGE	CURRENT	AUX.SUPPLY
DC CURRENT	SINGLE	17 – 18	NIL	mV / A +ve = 1 m/V A –ve = 3	13 – 14
	DUAL	17–18, 19 – 20			
DC VOLTAGE	SINGLE	17 – 18	V +ve = 2 V –ve = 5	NIL	13 – 14
	DUAL	17–18, 19 – 20			
AC CURRENT	SINGLE	17 – 18	NIL	1S = 1, 1L = 3	13 – 14
	DUAL	17–18, 19 – 20			
AC VOLTAGE	SINGLE	17 – 18	L1 = 2 N / (L2) = 5	NIL	13 – 14
	DUAL	17–18, 19 – 20			
FREQUENCY	SINGLE	17 – 18	L1 = 2 N / (L2) = 5	NIL	13 – 14
	DUAL	17–18, 19 – 20			
	ANALOG METER	17 – 18			
1PH POWER FACTOR	SINGLE	17 – 18	L = 2 N = 11	1S = 1, 1L = 3	13 – 14
	DUAL	17–18, 19 – 20			
3PH 1EL POWER FACTOR	SINGLE	17 – 18	L2 = 5 L3 = 8	1S = 1, 1L = 3	
	DUAL	17–18, 19 – 20			

PD3 (WITH 16 TERMINALS)



TRANSDUCER TYPE	OUTPUT TYPE	OUTPUT TERMINALS	INPUT TERMINALS		
			VOLTAGE	CURRENT	AUX.SUPPLY
3PH-3EL-4W WATT / VAR / VA	SINGLE	17 – 18	L1 = 2 L2 = 5 L3 = 8 N = 11	1S = 1, 1L = 3 2S = 4, 2L = 6 3S = 7, 3L = 9	13 – 14
	DUAL	17–18, 19–20			
	ANALOG METER	17 – 18			
	DIGITAL METER	17 – 18			
3PH-2EL-3W WATT / VAR / VA	SINGLE	17 – 18	L1 = 2 L2 = 5 L3 = 8	1S = 1, 1L = 3 3S = 7, 3L = 9	13 – 14
	DUAL	17–18, 19–20			
	ANALOG METER	17 – 18			
	DIGITAL METER	17 – 18			
1PH WATT / VA	SINGLE	17 – 18	L = 2 N = 11	1S = 1, 1L = 3	13 – 14
	DUAL	17–18, 19–20			
	ANALOG METER	17 – 18			
	DIGITAL METER	17 – 18			

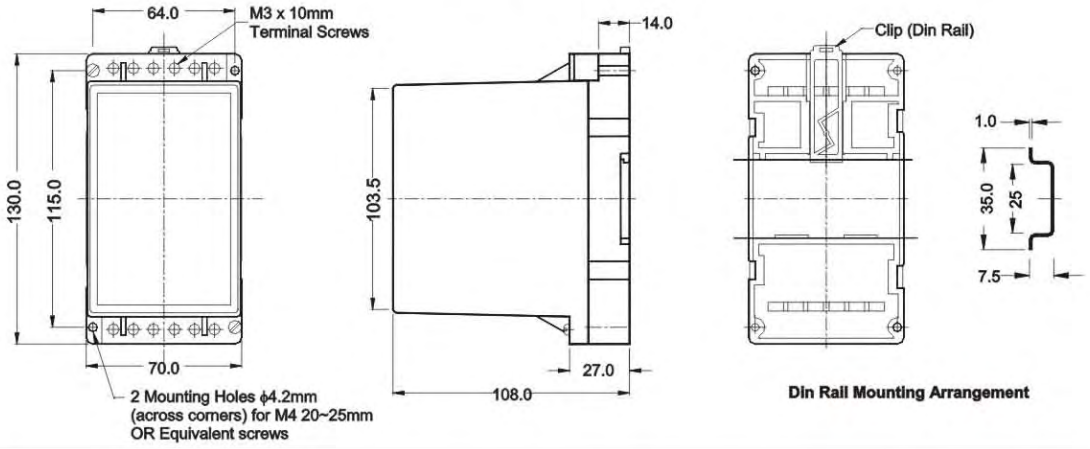
TRANSDUCERS MODEL PD1	ACCURACY
DC / AC VOLTAGE / CURRENT	±0.5% with single / dual output
FREQUENCY	±0.2% with single / dual output, ±1.0% of centre frequency when supplied along with analog meter
POWER FACTOR 1PH / 3PH – 1ELE 3P-3E-4W on request	±0.5% with single / dual output

TRANSDUCERS MODEL PD3	ACCURACY
POWER 3PH-3ELE-4W WATT/ VAR / VA 3PH-2ELE-3W WATT / VAR / VA 1PH WATT / VA	±0.5% with single / dual output ±0.5% / ±1.0% when supplied along with digital meter ±1.0% / ±1.5% when supplied along with analog meter

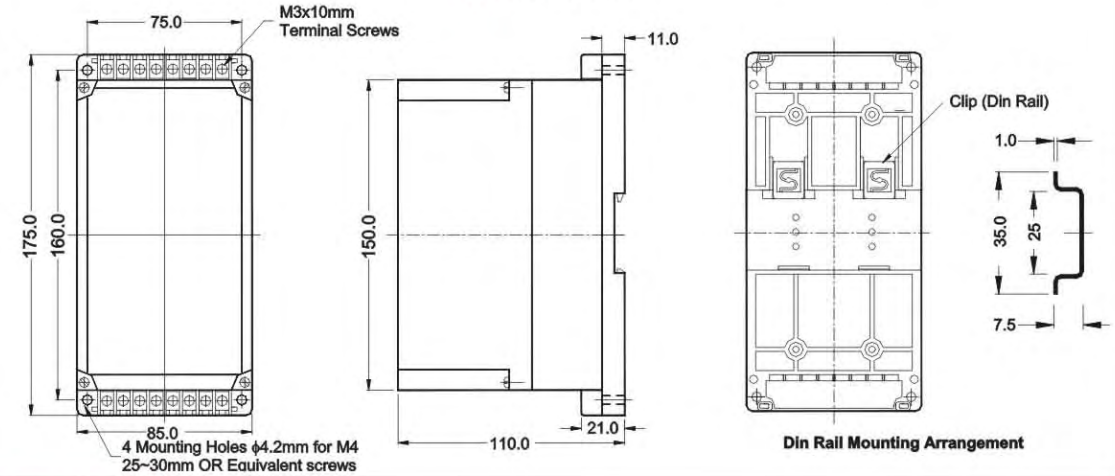
Note :
1. TRUE RMS sensing Voltage & Current Transducers are available on request - Crest Factor up to 3.
2. Transducers with specification other than mentioned above can be supplied subject to technical feasibility.
3. In dual output Transducers, the output are available in two types-with & without isolation between these outputs
4. Self-powered AC Voltage, Current, Frequency, PF & Power Transducers are available on request.
   a. Self – powered Voltage Transducer operates from 5% of input signal.
   b. Self-powered Current Transducer operates from 2% of Input signal.
   c. Self-powered Frequency, Power & Power Factor transducer operates on ±10% rated voltage.

MECHANICAL SPECIFICATIONS:

Model PD1



Model PD3



Ordering information

1) Type
2) Input Parameter
3) ™ Corresponding Input Range
4) Output Range
5) Aux. Supply
6) CTR (if any)
7) PTR (if any)

New uT series

Instrument Division

Single Phase Transducer

Data sheet No.: 1PH uT/10/11

DESCRIPTION

AE Transducers converts various electrical parameters viz. VOLTAGE(V), CURRENT(I), FREQUENCY(F) ,POWER FACTOR(PF), ACTIVE POWER (P), REACTIVE POWER (VAR) & APPERENT POWER (VA) into DC Current or DC Voltage output. The transducer gives galvanically isolated and load independent output. These are used in various electrical, thermal, chemical & other power plants to monitor processed data either locally or from remote using various devices such as indicating meters, data loggers, recorders, SCADA systems. These transducers can also be used as external unit in conjunction in analog or digital indicators.

FEATURS

- 0.2 accuracy class
- Open & short circuit protection.
- Two galvanically isolated Outputs.
- Standard DC Current & voltage output are independent of load impedance.
- Small dimensions & Suitable for DIN-RAIL as well as Wall mounting.
- Continuous conversion of RMS current or voltage without constant component

APLICABLE STANDARDS

IS 12784	Electrical measuring Transducer for converting a.c. electrical quantities into DC electrical quantity - specifications. Transducer for general applications.
IEC 60 688	Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals.

ELECTRICAL SPECIFICATIONS

- TYPE : uT series
- INPUT PARAMETER : AC: Voltage, Current & Frequency, Power Factor and Phase Angle.
- INPUT PARAMETER RANGES
  - VOLTAGE : AC: 0 - 600V.
  - CURRENT : AC: 1A/5A, 0-10A.
  - FERQUENCY : 50 / 60 Hz, ±10%.
  - POWER FACTOR : 0.5 lag - unity - 0.5 lead.
- OUTPUT RANGES : Single output / Dual output
  Voltage O/P load capacity : 20mA
  Current O/P Burden Voltage : 20V

CURRENT	0-1mA	0-5mA	0-10mA	0-20mA	4-20mA
MAX. LOAD RESISTANCE	15 KΩ	4 KΩ	2 KΩ	1KΩ	1KΩ

VOLTAGE	0-1V	0-5V	0-10V
MIN. LOAD RESISTENCE	50 Ω	250 Ω	500 Ω

New uT series

Single Phase Transducer

- ACCURACY : ±0.2 % of full scale for Voltage, Current and power factor
  ±0.5 % of full scale for Active Reactive and Apparent Power.
  ±0.2 % of center frequency.
- AUX. SUPPLY : 85 – 265 V AC/DC,
- VA BURDEN : For Voltage ≤ 0.1, For Current ≤0.2, For AUX Supply ≤ 3.
- RIPPLE : Max 0.5% of span

INPUT OVERLOAD CAPACITY

Measured Quantity	No. of applications	Duration of one application	Interval between Two successive applications
$2 \times I_N$	Continues	----------	----------
$10 \times I_N$	5	15 sec.	5 minute
$40 \times I_N$	1	1 sec.	----------
$1.5 \times U_N$	Continues	----------	----------
$2 \times U_N$	10	10 sec.	10 sec.
$4 \times U_N$	1	2 sec.	----------

- RESPONSE TIME : 300 msec.
- DIAELECTRIC TEST : 4 kV RMS for 1 minute.
- IMPULSE VOLTAGE : 5 kV 1.2/50 µsec.
- INSULATION RESI. : Greater than 20M ohm at 500V DC.
- O/P ISOLATION : 500V RMS (2kV optional).

INSTALLATION DATA

- MECHANICAL DESIGN : 110 X 44 X 93(h) mm
- MATERIAL OF HOUSING : Top Cover : ABS, Base : Polycarbonate
- MOUNTING : DIN Rail Mounting (Optional Wall mounting).
- ELECTRICAL CONNECTIONS : 6 + 6 Fixed 6mm pitch
- WEIGHT : 200 gm
- CROSS SECTION OF WIRE : 2.5 sq.mm.

EVIRNOMENTAL CONDITIONS

- OPERATING TEMP : 0°C to $+55^{\circ}$C.
- STORAGE TEMP. : -20°C to $+70^{\circ}$C.
- HUMIDITY : Up to 95% RH non condensing

MECHANICAL SPECIFICATIONS:-

- Size : 140 X 44 X 80mm
- Terminals : total 12 Nos. Max.
- Terminal Type : Cage Clamp
- Mounting Options : 35 mm DIN Rail / Wall Mount with 2 Screws

Ordering Information for **µ-T Series Transducer.**

Product Type Marking for uTxxx

No. of Phases (X)	Input Type (X)	Output Type (X)	Auxilliary Supply (X)
1- Single Phase	1- 1-VAC input	1- Single Voltage o/p	1- External Auxilliary Suppy
	2- IAC input	2- Dual Voltage o/p	2- Self Powered
	3- Power Factor	3- Single Current o/p	
	4- Frequency	4- 4-Dual Current o/p	
	5- W(Active Power)		
	6- Var (Reactive Power)		
	7- VA(Apperent Power)		
	8- DC Voltage		
	9- DC Current		

For output specification refer output ranges (electrical specification table)

Programmable Multifunction Transducer (PMT-9)

Instrument Division

Data sheet No.: PMT-9 /10/11

The PMT-9 Multifunction Programmable Transducer measures the several variables of an electric power system and process them to produce 4 analog output signals. 2 digital output signals are available for signaling the limits or energy metering pulses. The limits of the outputs can be set by individual measurand or logically combine up to three measurands.
the principle of measuring is Dedicated DSP Controller for best calculation of Power, RMS values and Energy.

The PMT-9 is equipped with USB serial port interface through which using the corresponding software one can connect, program, or access and execute useful ancillary funcions. The ancillary functions include a power system check, provision for displaying the measured variably on a PC monitor, the simulation of the outputs for test purposes and a facility for printing name plates.

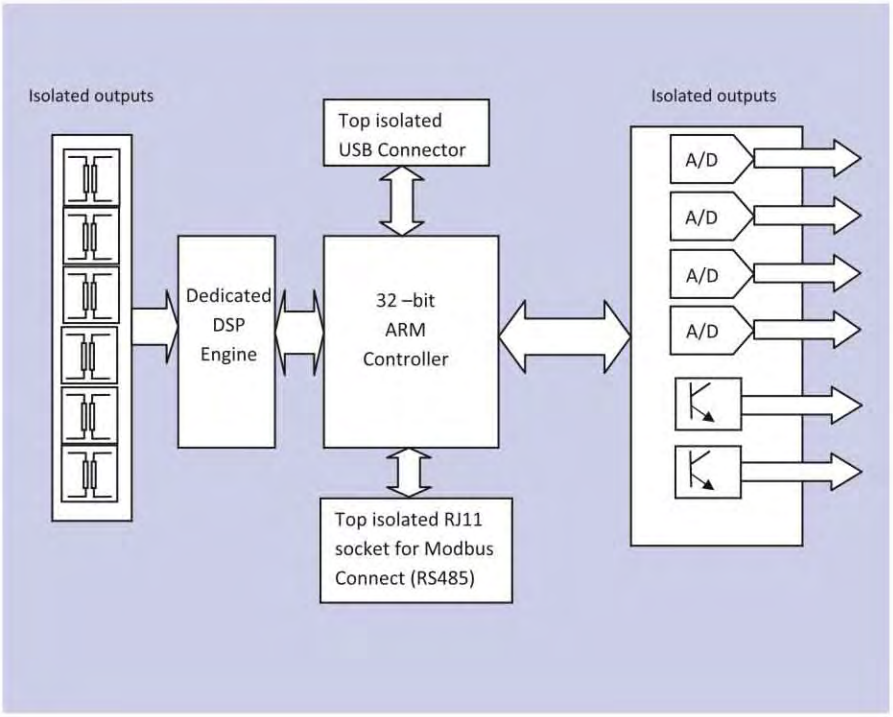
PMT-9 also equipped with a RS 485 bus interface (MODBUS®). The RS 485 interface enables the user to determine the number of variables to be supervised (up to the maximum available). The levels of all internal energy meters that have been configured can also be viewed. Provision is made for programming the PMT-9 via the bus. A standard EIA 485 interface can be used, but there is no dummy

Features

Simultaneous measurement of several variables of a heavy-current power system / Full supervision of an asymmetrically loaded four wire power system, rated current 1 to 6 A, rated voltage 57 to 400V (phase-to-neutral) or 100 to 693 V (phase-to-phase)For all heavy-current power system variables

- Fully Programmable CT and PT Ratio.
- 4 analogue outputs
- 2 Digital Outputs
- Conversion of a current to a voltage output or vice versa is also possible without any hardware change.
- Input voltage up to 693 V (phase-to-phase)
- Universal analogue outputs (programmable)
- High accuracy: U/I 0.2% and P 0.25% (under reference conditions)
- 12 integrated energy meters.
- Windows software with password protection for programming, data analysis, power system status simulation, acquisition of meter data and making settings
- AC/DC power supply / Universal
- Compact in size.
- Provision for either snapping the transducer onto top-hat rails or securing it with screws to a wall or panel
- Rated Burden Resistor up to 1 KΩ for 20 mA.

Functional Block Diagram:



Programmable Multifunction Transducer (PMT-9)

Instrument Division

Applicable Standards:

EN 60688	:	Electrical measuring transducers for converting AC electrical variables into analog and digital signals
IS 12784	:	Electrical measuring transducers for converting ac Electrical Quantities into dc Electrical quantities - specification.
IEC 1010 or EN 61010	:	Safety regulations for electrical measuring, control and laboratory equipment
IS 61000-4-2, 3, 4, 6	:	Electromagnetic compatibility for industrial- process measurement and control equipment
DIN 40 110	:	AC quantities
DIN 43 807	:	Terminal markings
IS 9000 part 1	:	Basic environmental testing procedures, vibration, sinusoidal
EN 55011	:	Electromagnetic compatibility of data processing and telecommunication Equipment Limits and measuring principles for radio interference and information equipment
IS 14697	:	AC static Transformer operated Watt-hour and VAR-Hour Meters (classes 0.5s)

Symbols\Abbreviations Used

Symbols	Meaning
X	Measured variable
X0	Lower limit of the measured variable
X1	Break point of the measured variable
X2	Upper limit of the measured variable
Y	Output variable
Y0	Lower limit of the output variable
Y1	Break point of the output variable
Y2	Upper limit of the output variable
U	Input voltage
Ur	Rated value of the input voltage
U 12	Phase-to-phase voltage L1 – L2
U 23	Phase-to-phase voltage L2 – L3
U 31	Phase-to-phase voltage L3 – L1
U1N	Phase-to-neutral voltage L1 – N
U2N	Phase-to-neutral voltage L2 – N
U3N	Phase-to-neutral voltage L3 – N
UM	Average value of the voltages (U1N + U2N + U3N) / 3
I	Input current
I1	AC current L1
I2	AC current L2
I3	AC current L3
Ir	Rated value of the input current
IM	Average value of the currents (I1 + I2 + I3) / 3
IMS	Average value of the currents and sign of the active power (P)
Ø	Phase-shift between current and voltage
F	Frequency of the input variable
Fn	Rated frequency
P	Active power of the system P = P1 + P2 + P3
P1	Active power phase 1 (phase-to-neutral L1 – N)
P2	Active power phase 2 (phase-to-neutral L2 – N)
P3	Active power phase 3 (phase-to-neutral L3 – N)
Q	Reactive power of the system Q = Q1 + Q2 + Q3
Q1	Reactive power phase 1 (phase-to-neutral L1 – N)
Q2	Reactive power phase 2 (phase-to-neutral L2 – N)
Q3	Reactive power phase 3 (phase-to-neutral L3 – N)
S	Apparent power of the system S = $\sqrt{(I1^2+I2^2+I3^2)}+\sqrt{(V1^2+V2^2+V3^2)}$
S1	Apparent power phase 1 (phase-to-neutral L1 – N)
S2	Apparent power phase 2 (phase-to-neutral L2 – N)
S3	Apparent power phase 3 (phase-to-neutral L3 – N)
Sr	Rated value of the apparent power of the system
PF	Active power factor cosØ = P/S
PF1	Active power factor phase 1 cosØ1 = P1/S1
PF2	Active power factor phase 2 cosØ2 = P2/S2
PF3	Active power factor phase 3 cosØ3 = P3/S3
QF	Reactive power factor sin Ø = Q/S
QF1	Reactive power factor phase 1 sin Ø1= Q1/S1
QF2	Reactive power factor phase 2 sin Ø 2= Q2/S2
QF3	Reactive power factor phase 3 sin Ø 3= Q3/S3
LF	Power factor of the system LF = sgnQ · (1 – □PF□)
LF1	Power factor phase 1 LF1 = sgnQ1 · (1 – |PF1|)
LF2	Power factor phase 2LF2 = sgnQ2 · (1 – □PF2□)
LF3	Power factor phase 3LF3 = sgnQ3 · (1 – □PF3□)
c	Factor for the intrinsic error
R	Output load
Rn	Rated burden
H	Power supply
Hn	Rated value of the power supply
CT	c.t. ratio
VT	v.t. ratio

Programmable Multifunction Transducer (PMT-9)

Technical data:

Inputs

Input variables:

U,U1N,U2N,U3N,U12,U23,U31,UM,
I,I1,I2,I3,IM,IMS,
P,P1,P2,P3,Q,Q1,Q2,Q3,S,S1,S2,S3,
PF,PF1,PF2,PF3,QF,QF1,QF2,QF3,LF,LF1,LF2,LF3

Measuring ranges

Measurand	Initial Value	Final Value
U	0 ≤ X0 ≤ 0.9* X2	0.8*Ur ≤ X2 ≤ 1.2* Ur
I	0 ≤ X0 ≤ 0.8*X2	0.5*Ir ≤ X2 ≤ 1.5*Ir
P,Q,S	– X2 ≤ X0 ≤ 0.8 *X2	0.3 ≤ X2 / Sr ≤ 1.5
PF,QF	– 1 ≤ X0 ≤ (X2 – 0.5)	0 ≤ X2 ≤ 1
F	45Hz ≤ X0≤ (X2-2)	(X0+2) ≤ X2≤ 65Hz

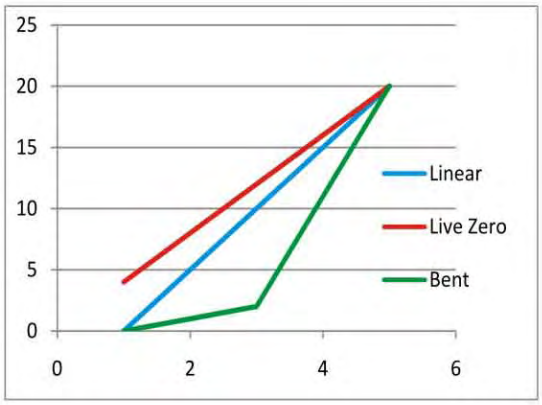
Waveform : Sinusoidal
Rated frequency : 50…60 Hz

Continuous thermal ratings of inputs:

Current circuit : 8 A
Voltage circuit : 480 V single-phase AC system
800 V three-phase system

Short-time thermal rating of inputs

Input variable	Number of inputs	Duration Of overload	Interval between Two overloads
Current circuit			
10 A	10	10s	10s.
50 A	5	3s	5min.
Voltage circuit			
1Ø AC system 600 V (L-N)	10	10s	10s
3Ø AC system 1200 V (L-L)	10	10s	10s

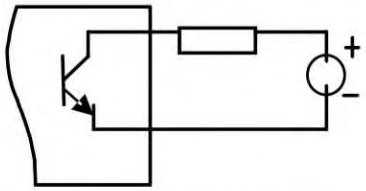


Outputs:

4 analog outputs following the corresponding process variable programmed through the software. These signals can be set in various patterns like Linear, live zero, bent. The outputs A, B, C and D may be either short or open-circuited. They are electrically insulated from each other and from all other circuits (floating). All the full-scale output values can be reduced subsequently using the programming software, subjective a supplementary error results. Conversion of a current to a voltage output or vice versa is also possible without any hardware change.

Output signal	Initial value X0	Final value X2
DC current (Linear) (Live zero)	Y0 = 0 0 ≤ Y0 ≤ 0.2 * Y2	Y2 = 20 mA 1 mA ≤ Y2 ≤ 20 mA
DC voltage	0≤ Y0 ≤ 0.2 * Y2	1 V ≤ Y2 ≤ 10 V
Bent Characteristics (applicable to both Voltage and Current Output) (X0 + 0.015 * X2) ≤ X1 ≤ 0.985 * X2 Y0 ≤ Y1 ≤ Y2		

Digital outputs, pulse outputs, limit outputs



Type of contact : Open collector
Pulse duration : ≥ 80 ms
Interval : ≥ 80 ms
Power supply : 8 … 40 V
Output current : ON 10 … 27 mA
OFF ≤ 2 mA

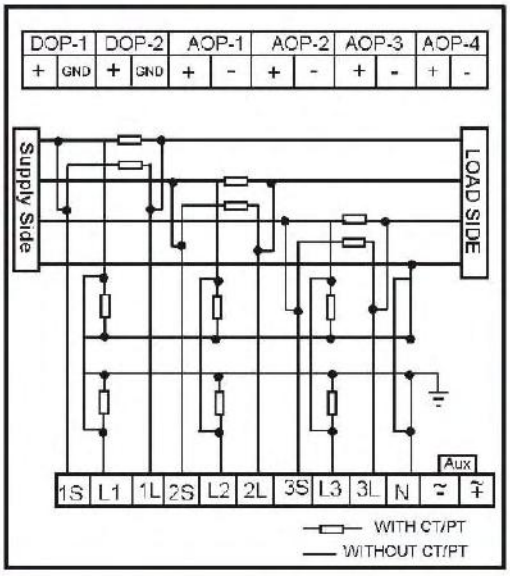
Programmable Multifunction Transducer (PMT-9)

Instrument Division

Electrical connections

Connection	Terminal No.	Connection	Terminal No.
V_R	2	(ANALOG O/P)A+	13
VY	5	(ANALOG O/P)A -	14
VB	8	(ANALOG O/P)B+	15
N	10	(ANALOG O/P)B -	16
IR	1	(ANALOG O/P)C+	17
IR'	3	(ANALOG O/P)C -	18
IY	4	(ANALOG O/P)D+	19
IY'	6	(ANALOG O/P)D -	20
IB	7	(DIGITAL O/P)E+	21
IB'	9	(DIGITAL O/P)E -	22
AUX	11	(DIGITAL O/P)F+	23
AUX	12	(DIGITAL O/P)E -	24

Wiring Diagram



Environmental

Working Temperature	:	0 to +60°C
Storage	:	-10 to +70 deg c
Relative Humidity	:	0 to 95% non condensing
Vibration	:	+/- 1g, 10 to 150Hz

Safety

Protection Class	:	Class II
IP Rating	:	IP20
Over Voltage Cat	:	Cat III
Surge Test	:	6KV, 12/50us, 5WS
HV Test	:	I/p to O/p isolation 2 kV (4 kV optional) o/p to o/p isolation 500V (2 kV optional) Communication Interface (USB / RS485) to all circuit 2KV

MODBUS

BUS Interface	:	RS485
Terminal	:	RJ11 socket over Top
Max. Distance	:	1200Mtr.
No. Of Bus Stations	:	Upto 248 including Master.
Dummy load	:	Not required

USB Connector :

USB Female B-Type Connector.
Software CD containing Driver and Windows based Software for Configuration of PMT-9 is also supplied along with the Box Pack.