

# DIGITAL POWER METER OF PROGRAMMABLE



## FEATURES

- Accuracy 0.25% F.S. (watt, var, power factor)
- Wide switchable readout range
- Dielectric strength 2KVac (input/output/power)
- Surge test 4KV (1.2 x 50μs)
- High stability & Dimension small

## 1. MODEL: PF-M - - - - -

NO	Input Type	NO	Input Unit	NO	Input Voltage (range)	NO	Input Current (range)	NO	Input Frequency	NO	Output Voltage	NO	Output Current	NO	Aux. Power
WW	Watt	1	1Ø2W	1	0-120V (85-150V)	1	0-1 A (0-1.2A)	A	50 Hz	11	DC 0-1V	21	DC 0-1 mA	1	AC 110/220V(50/60Hz)
VV	Var	3	3Ø3W	2	0-240V (180-300V)	2	0-5 A (0-6A)	B	60 Hz	12	DC 0-5 V	22	DC 0-5 mA	2	DC 24V
PF	Power Factor	4	3Ø4W	3	0-400V (320-480V)	9	SPECIFIED	C	400 Hz	13	DC 1-5 V	23	DC 0-10 mA	3	DC 48V
PA	Phase Angle	9	SPECIFIED	9	SPECIFIED			D	SPECIFIED	14	DC 0-10 V	24	DC 0-20 mA	4	DC 110V
									• Frequency ±10%	16	DC 2-10V	25	DC 4-20 mA	5	DC 220V
										19	SPECIFIED	29	SPECIFIED	6	AC 90~260V
														9	SPECIFIED
															• ±20% of rate, less 3.5VA for AC input
															• ±20% of rate, less 3W for DC input
															• Less 3.5VA for AC switching input

## 2. Specification

- Aux. power supply : AC110 & 220 ±20% (50 or 60Hz)  
(Optional DC 24V or 48V or 110V or 220V switching AC 100~240V±10%)
- Measuring accuracy : 0.25% F.S. (watt, var, phase angle)  
0.25% F.S. ±0.25° (Power Factor)  
(-0.3~1, 0.3-1)
- Temp. coefficient : 100ppm/°C (0-50°C)
- Input burden : ≤ 0.2VA (Voltage); ≤0.2VA (Current)
- Max. input over : 3 x rated continuous (Current)  
2 x rated continuous (Voltage)
- Sampling time : 3 cycles/sec.
- Display : Red high efficiency LEDs high 14.22mm (0.56")
- Output ripple (p-p) : < 0.1% F.S.
- Response time : ≤ 300ms (0-90%)
- Output drive capability : ≤ 10mA for voltage mode  
≤ 10V for current mode
- Dielectric strength : 2KVac/1 min. (power/input/output)
- Surge test : ANSI C37.90/1974, DIN-IEC255-4  
impulse voltage 4KV (1.2x50μs)
- Operating condition : 0~50°C (20 to 90% RH non-condensed)
- Storage condition : 0~70°C (20 to 90% RH non-condensed)

## 3. Standard analog calibration table (SAC)

Model		Element connection	Standard analog calibration (Watts or Vars)					
Watts	Vars		V = 120V		V = 240V		V = 400V	
			1A	5A	1A	5A	1A	5A
PW1	PV1	1Ø2W	100	500	200	1K	400	2K
PW3	PV3	3Ø3W	200	1K	400	2K	800	4K
PW4	PV4	3Ø4W	300	1.5K	600	3K	1.2K	6K

## 4. Outside dimension and connection diagram

Input range span (GAIN) selection

Span setting % =  $\sum N$

N% 1 2 4 8 10 20 40 80

P 1 2 3 4 5 6 7 8 OFF ON

(Status off = enable, All poles off  $\sum n = 165\%$   
All poles on  $\sum n = 0\%$ )

## 5. Programming formula

- DR: display range
- SAC: standard analog calibration
- PR: PT ratio
- CR: CT ratio
- Y: percent output (0-100%)

- DR = PR x CR x SAC
- Span → X = [DR/200]%

# DIGITAL POWER METER OF PROGRAMMABLE

## 6. Application

### ▲ Example 1: PF-PWW1-12B

Input range ..... (PR = 110V/110V = 1)  
(1ø2W, 60Hz) (CR = 100A/5A = 20)  
(SAC = 500W)

Display range ..... (DR = PR x CR x SAC  
= 1 x 20 x 500W  
= 10000W)

• (Span) X = (10000/200)% = 50%

• X → 

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

 ON  
OFF  
(P<sub>5</sub>-P<sub>7</sub>-off & the rest on → ΣN = 50%)

• Setting decimal point all off

### ▲ Example 2: PF-PWW3-12B

Input range ..... (PR = 69KV/115V = 600)  
(3ø3W, 60Hz) (CR = 1000A/5A = 200)  
(SAC = 1KW)

Display range ..... (DR = PR x CR x SAC  
= 600 x 200 x 1KW  
= 120.00MW)

• (Span) X = (12000/200)% = 60%

• X → 

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

 ON  
OFF  
(P<sub>5</sub>-P<sub>7</sub>-off & the rest on → ΣN = 60%)

• Setting decimal point "3" on

### ▲ Example 3: PF-PWW4-32B

Input range ..... (PR = 440V/440V = 1)  
(3ø4W, 60Hz) (CR = 1000A/5A = 200)  
(SAC = 6KW)

Display range ..... (DR = PR x CR x SAC  
= 1 x 200 x 6KW  
= 1200.0KW)

• (Span) X = (12000/200)% = 60%

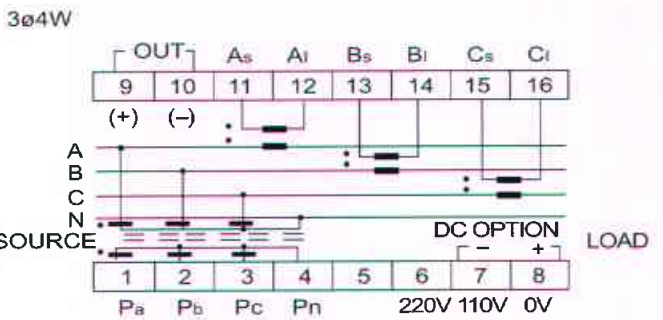
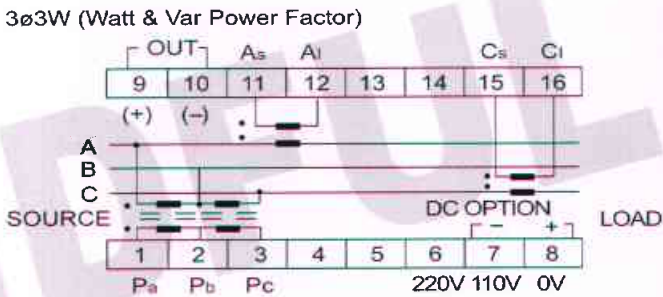
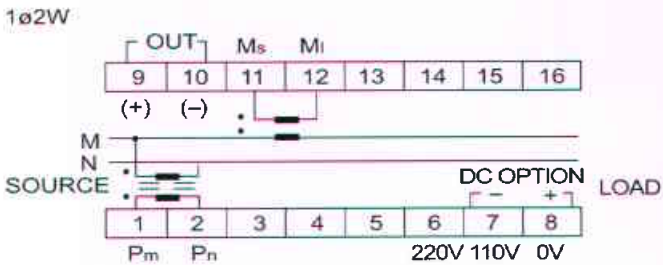
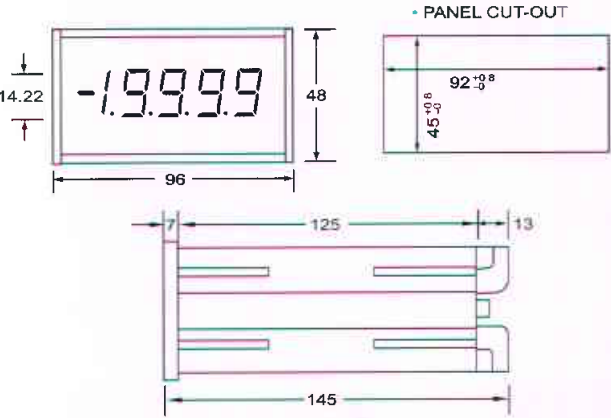
• X → 

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

 ON  
OFF  
(P<sub>6</sub>-P<sub>7</sub>-off & the rest on → ΣN = 60%)

• Setting decimal point "4" on

## 7. Outside dimension and connection diagram





# MICROPROCESS WATT & WATTHOUR (VAR & VARHOUR) CONTROLLER METER



## FEATURES

- Programmable rate 0 to 9999 digit (watt or var), 0 to 99999999 digit (watthour or varhour)
- Accuracy 0.25% F.S.
- Programmable time base (1, 60, 3600 second)
- Programmable scale factor (0.0001 to 9999.9999)
- Decimal point can be modified
- Dual alarm, compare hysteresis function
- 15 bit DAC analog output function
- Dielectric strength 2KVac (input/output/power)
- Surge test 4KV (1.2x50µs)

1. MODEL: PF-M           ☒ X=0 (non alarm) X=1 (one alarms) X=2 (two alarms)

NO	Input Type	NO	Input Unit	NO	Input Voltage (range)	NO	Input Current (range)	NO	Input Frequency	NO	Output Voltage (current)	NO	Aux. Power
WWH	Watt/Watthour	1	1Ø2W	1	0-120V (85-150V)	1	0-1 A (0-1.2A)	A	50 Hz	N	None	1	AC 110/220V
VVH	Var/Varhour	3	3Ø3W	2	0-240V (180-300V)	2	0-5 A (0-6A)	B	60 Hz	F	DC 1-5 V	2	DC 24V
		4	3Ø4W	3	0-400V (320-480V)	9	SPECIFIED	C	400 Hz	H	DC 0-10 V	3	DC 48V
		9	SPECIFIED	9	SPECIFIED			0	SPECIFIED	P	DC 0-20 mA	4	DC 110V
										Q	DC 4-20mA	5	DC 220V
										G	1 Pulse/WH	6	AC 90~260V
										R	SPECIFIED	9	SPECIFIED
													• Less 5.5VA for AC switching input • ±20% of rate, less 4.5W for DC input

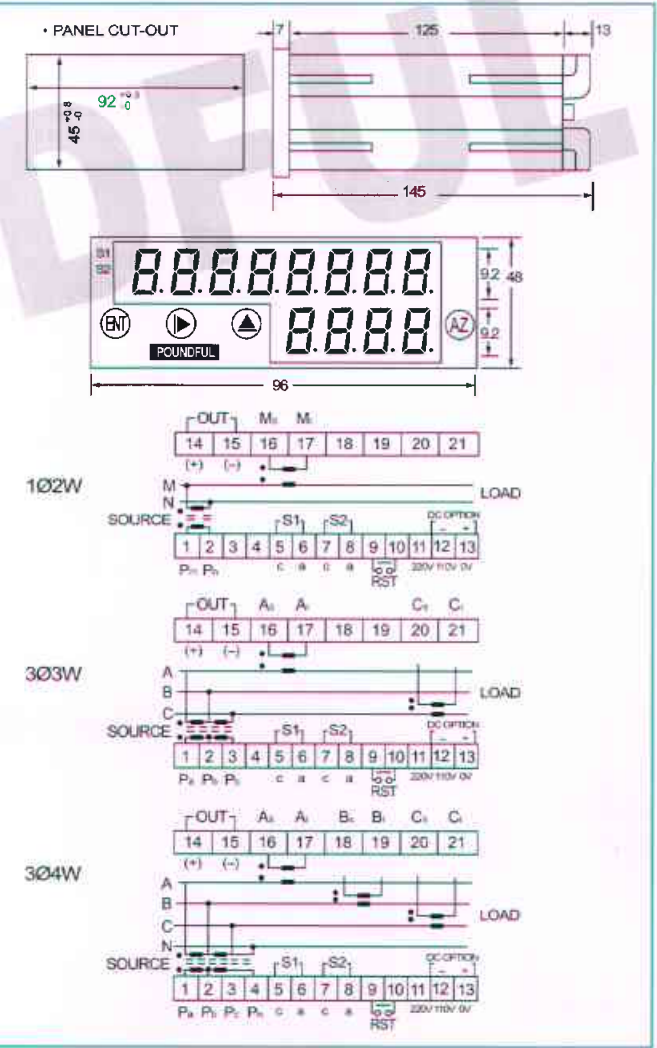
## 2. Specification

- Aux. power supply : AC110 & 220V ± 20% (50 or 60Hz) ≤ 4.5VA (Optional DC24, 48, 110, 220V, AC/DC 110/220V) switching AC 100~240V±10%
- Measuring accuracy : 0.25% F.S. (23 ±5°C)
- Readout (compare) range : "0" to "9999" adjustable (watt) "0" to "99999999" adjustable (watt hour) ≤ 0.2VA (Voltage); ≤ 0.2VA (Current)
- Input burden : 3 x rated continuous (Current) 2 x rated continuous (Voltage)
- Max. input over : 3 x rated continuous (Current) 2 x rated continuous (Voltage)
- Compare hysteresis range : "0" to "99" adjustable
- Alarm action : "Hi" to "Lo" adjustable (watt)
- Relay contact output : AC 250-3A, DC 30V-5A
- Parameter setting : Touch switches
- Temp. coefficient : 100ppm/°C (0-50°C)
- Display : Red high efficiency LEDs high 9.2mm (0.36")
- Analog output resolution : 15 bit DAC
- Output ripple (p-p) : < 0.1% F.S.
- Response time : ≤ 300ms (0-90%)
- Output drive capability : ≤ 10mA for voltage mode ≤ 10V for current mode
- Dielectric strength : 2Kvac/1 min. (power / input / output)
- Surge test : ANSI C37.90/1974, DIN-IEC255-4 impulse voltage 4KV (1.2x50µs)
- Operating condition : 0~50°C (20 to 90% RH non-condensed)
- Storage condition : 0~70°C (20 to 90% RH non-condensed)
- Memory type : Non-volatile EEPROM memory

## 3. Standard analog calibration table (SAC)

Model		Element connection	Standard analog calibration (Watts or Vars)					
			V = 120V		V = 240V		V = 400V	
Watts	Vars		1A	5A	1A	5A	1A	5A
WWH1	VVH1	1Ø2W	100	500	200	1K	400	2K
WWH3	VVH3	3Ø3W	200	1K	400	2K	800	4K
WWH4	VVH4	3Ø4W	300	1.5K	600	3K	1.2K	6K

## 4. Outside dimension and connection diagram



MICROPROCESS WATT & WATTHOUR (VAR & VARHOUR) CONTROLLER METER



FEATURES

- Resolution of 5 digits rate and 10 digits totalizer simultaneously
- Accuracy 0.25% F.S.
- Automatic, external, or button totalizer reset
- Decimal point can be modified
- Programmable time base (1,60,3600 seconds)
- Programmable scale factor (0.00001 to 19999.99999)
- Dielectric strength 2KVac (input / output / power)
- Four alarms with hysteresis and delay functions (optional)
- 16 bit DAC analog output type can be modified (optional)
- RS485/ RS232 communication with Modbus RTU mode (optional)

1. MODEL: PF-M

NO	Input Type	NO	Input Unit	NO	Input Voltage	NO	Input Current	NO	Analog Output	NO	Alarm	NO	Pulse	NO	Communication (Modbus RTU)	NO	Aux. Power
WWHA	Watt/Watthour	1	102W	1	0-120V (85-150V)	1	0-1A (0-1.2A)	See analog output table	0	None	0	None	0	None	1	AC 100~240V	
VVHA	Var/Varhour	3	303W	2	0-240V (180-300V)	2	0-5A (0-6A)		1	1 Alarm	1	Relay	1	RS485	2	DC 24~70V	
		4	304W	3	0-400V (320-480V)	9	SPECIFIED		2	2 Alarms	2	Open Collector	2	RS232	3	AC/DC 24V	
		9	SPECIFIED	9	SPECIFIED				3	3 Alarms					4	DC 110V	
									4	4 Alarms*					5	DC 220V	
														9	SPECIFIED		≤ 15VA for AC ≤ 10W for DC

\*Pulse output unavailable if 4 alarms specified

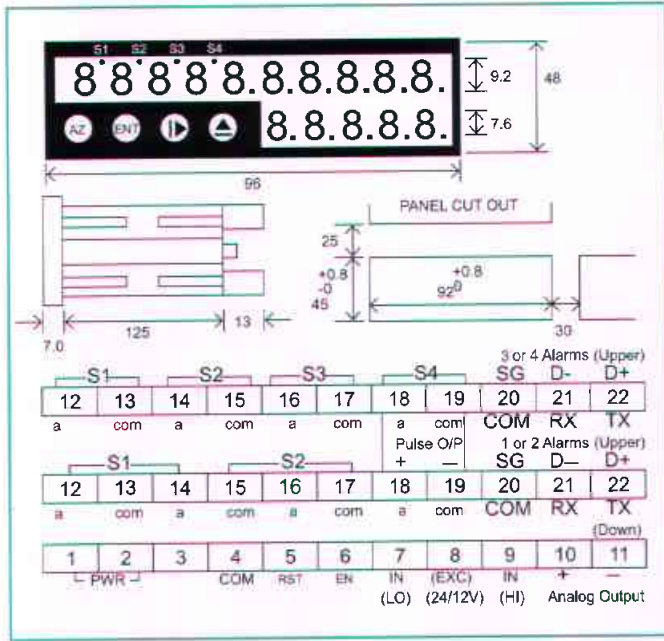
2. Specification

- Aux. power supply : AC 100~240V ± 10% 50/60 Hz  
DC 24~70V ± 10%  
AC/DC 24 ± 10%  
DC 110V ± 10% , DC 220V ± 10%
- Measure accuracy : 0.25% F.S. (23 ± 5°C )
- Input burden : ≤ 0.2VA (Voltage); ≤ 0.2VA (Current)
- Readout (compare) : "0" to "24999" adjustable (Watt / Var)  
"0" to "1999999999" adjustable (Watthour / Varhour)
- Alarm selection : Watt / Var and Watthour / Varhour can be modified
- Compare hysteresis range : "0" to "999" adjustable
- Alarm action : "Hi" or "Lo" adjustable
- Alarm relay contact output : AC 250V/ 3A DC 30V/5A
- Analog output type : Watt / Var or Watthour / Varhour can be modified
- Analog output resolution : 16 bit DAC (isolating)
- Output drive capability : ≤ 20mA for voltage mode  
≤ 14V for current mode
- Output ripple ( p-p ) : ≤ 0.1% F.S.
- Response time : < 250 ms (0-90 %)
- Pulse relay contact output : DC 100V / 0.5A ≤ 10VA
- Pulse open collector : ≤ DC 30V / 40mA
- Communication address : 2400, 4800, 9600, 19200 BPS
- RTU Data format : < 8,N,1>, < 8,N,2>, < 8,E,1>, < 8,O,1>
- Communication address : "1" to "247" can be modified
- Parameter setting : Touch switches
- Memory type : Non-volatile EEPROM
- Dielectric type : 2KVac/1min. (power / input / output)
- Temp. coefficient : 100ppm/°C (0-50°C)
- Operating condition : 0~50°C (20~90% RH non-condensed)
- Storage condition : 0~70°C (20~90% RH non-condensed)

4. Analog output table

X	Output Range	O/P Range 1-2-3-4-5-6	O/P Mode 7-8
0	SPECIFIED	switching status	on=1 off=0
1	0 ~ 1V	1-0-1-1-1-0	1-1
2	0 ~ 5V	1-0-1-0-1-0	1-1
3	1 ~ 5V	1-1-1-0-1-1	1-1
4	0 ~ 10V	1-1-0-1-0-0	1-1
5	2 ~ 10V	1-1-1-1-0-1	1-1
6	0 ~ 1mA	0-1-1-1-1-0	0-0
7	0 ~ 10mA	1-0-1-0-1-0	0-0
8	0 ~ 20mA	1-1-0-1-0-0	0-0
9	4 ~ 20mA	1-1-1-1-0-1	0-0

5. Dimension and connection diagram



3. Standard Analog Calibration Table(SAC)  
See Page 68



# MULTI-FUNCTION DIGITAL POWER METER



## FEATURES

- True-RMS measurement for input waves
- Multi-measurement for various power systems
- Minimum and Maximum function
- Compact size: 96mm x 96mm
- Harmonic and THD display in basic version
- 4 quadrants energy display

## 1. MODEL: PFM - DPM

NO	Input Current	NO	OUTPUT1	NO	OUTPUT2	NO	OUTPUT3	NO	OUTPUT4	NO	Digital Communication	NO	Aux. Power
1	0-1A	N	None	N	None	N	None	N	None	N	None	1	AC 100~240V±10%
5	0-5A	A	Relay	A	Relay	A	Relay	A	Relay	A	RS485	2	DC 120~330V±10%
9	SPECIFIED	B	Reed Relay	B	Reed Relay	B	Reed Relay	B	Reed Relay	B	RS232	9	SPECIFIED
		C	Open Collector	C	Open Collector	C	Open Collector	C	Open Collector				
		D	0/4-20mA	D	0/4-20mA	D	0/4-20mA	D	0/4-20mA				

Note: Reed Relay and Open Collector are Pulse Output.

## 2. Specification

- Accuracy
  - Current :  $\pm 0.25\%$  F.S., True RMS
  - Voltage :  $\pm 0.25\%$  F.S., True RMS
  - Active and Apparent Power :  $\pm 0.5\%$  F.S.
  - Reactive Power :  $\pm 1.0\%$  F.S.
  - Power :  $\pm 0.5\%$  F.S.
  - Power Factor :  $\pm 1.0\%$
  - Frequency :  $\pm 0.02\text{Hz}$
- Frequency Range : 45-65Hz
- Temp. Coefficient : 100ppm/°C (0~50°C)
- Update Period : 1 second
- Voltage Measurement
  - Direct : 0-700Vac (Phase/Phase)
  - 0-400Vac (Phase/Neutral)
  - Via PT : Up to 400KV(Primary)
- Current Measurement
  - Primary : Up to 10000A
  - Secondary : 1 or 5 A
- Max. Input over
  - Current Related Input : 3 x rated continuous
  - 10 x rated 30 sec
  - 25 x rated 3 sec
  - 50 x rated 1 sec
  - Voltage Related Input : 2 x rated continuous
- Input Burden
  - Voltage :  $\leq 0.1\text{VA}$
  - Current :  $\leq 0.2\text{VA}$
- Harmonic Analysis : Up to 15<sup>th</sup> harmonic
- THD display : Up to 31<sup>st</sup> harmonic
- Power Consumption
  - 90~240VAC :  $\leq 10\text{VA}$
  - 120~330VDC :  $\leq 10\text{W}$
- Digital Input
  - Input Operate Type : Logic Level 0 : Open Terminal
  - Logic Level 1 : Short Terminal with DI\_COM
  - Min. Operate time : 20msec
- Relay : C Form 220VAC/30VDC 3A
- Pulse Output
  - Signal Type : Reed Relay or open collector
  - Pulse Rate :  $< 5\text{Hz}$
- Reed Relay : A Form 100VDC 0.5A  $\leq 10\text{VA}$
- Open Collector :  $\leq 30\text{VDC } 40\text{mA}$
- 0/4-20mA Output
  - Load Resistance : 600 $\Omega$
  - Response Time : 1s
  - Output Ripple(p-p) :  $\leq 0.1\%$  F.S.
- Communication
  - RS485 : 2 or 3 wires half duplex
  - RS232 : 3 wires half duplex
  - Protocol : Modbus RTU mode
  - Speed : 2400/4800/9600/19200/38400
- Operating Temperature : 0~55°C (20~95% non-condensed)
- Storage Temperature : -10~70°C (20~95% non-condensed)
- Display Type : High luminosity LCD display
- Standards Compliance
  - Dielectric Strength : DIN-IEC 688 (2KVac50/60Hz/1min)
  - Impulse Test : IEC 255-4 (5KV 1.2x50 $\mu\text{s}$ )

# MULTI-FUNCTION DIGITAL POWER METER

Parameter	Accuracy ( %FS)	Resolution	Range
Volts	± 0.25%	4 Digits	0.000 V ~ 780.0 KV <sup>*1</sup>
Amps & Amps Demand	± 0.25%	4 Digits	0.000 A ~ 10.00 KA <sup>*1</sup>
KW & KW Demand	± 0.5%	4 Digits	0.000 W ~ 780.0 MW <sup>*1</sup>
KVAR & KVAR Demand	± 0.5%	4 Digits	0.000 VAR ~ 780.0 MVAR <sup>*4</sup>
KVA & KVA Demand	± 0.5%	4 Digits	0.000 VA ~ 780.0 MVA <sup>*5</sup>
KWH	± 0.5%	8 Digits	0.0000 ~ 99,999,999 KWH
KVARH	± 0.5%	8 Digits	0.0000 ~ 99,999,999 KVARH
KVAH	± 0.5%	8 Digits	0.0000 ~ 99,999,999 KVAH
Power Factor	± 1.0%	0.01	± 0.00 ~ 1.00
Frequency	± 0.02Hz	0.01Hz	45.00 ~ 65.00 Hz
Volts THD <sup>*6</sup>	± 2.5%	0.1%	0.0 ~ 100.0%
Amps THD <sup>*6</sup>	± 2.5%	0.1%	0.0 ~ 100.0%

<sup>\*1</sup> Reads in Kilovolts over 1000V

<sup>\*2</sup> Reads in Kiloamps over 1000A

<sup>\*3</sup> Reads in Kilowatts over 1000W and Megawatts over 1000KW

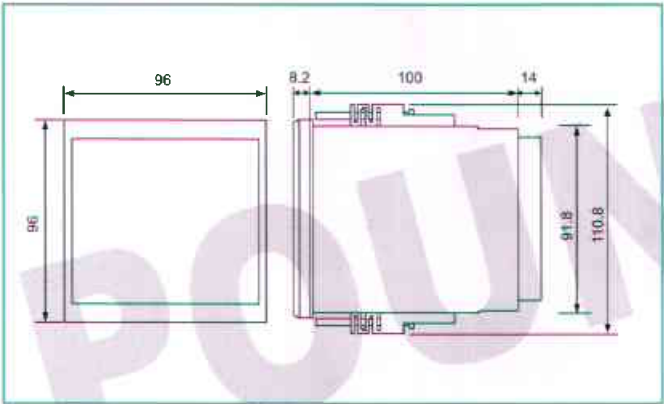
<sup>\*4</sup> Reads in Kilovars over 1000VAR and Megavars over 1000KVAR

<sup>\*5</sup> Reads in KiloVA over 1000V and MegaVA over 1000KVA

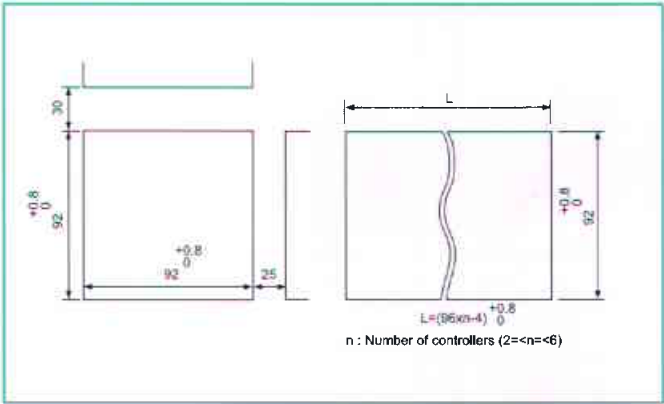
<sup>\*6</sup> THD: Total Harmonic Distortion

### 3. Dimension: (Unit: mm)

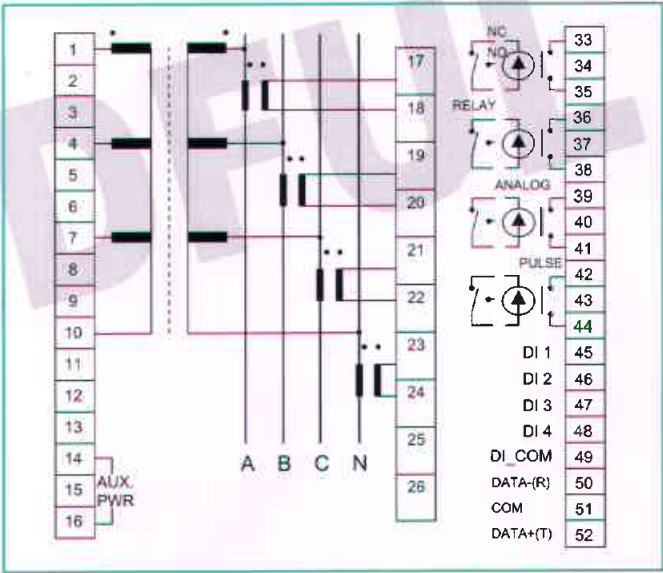
#### Outside dimension



#### Panel CUT-OUT



### 4. Terminal connection



# AC CURRENT & VOLTAGE TRANSDUCER (self-powered)



## FEATURES

- Measuring & Conversion : DIN-IEC 688
- Dielectric Strength : DIN-IEC 688  
2KVac 50 / 60Hz / 1 minute
- Impulse Test : ANSI C37.90a / 1974,  
IEEE 587 / 1983,  
IEC 255-4, 5KV (1.2 x 50 $\mu$ s)
- Surge test (ring wave) : IEC 255-4 (2.5KV-0.25ms / 1MHz)

## 1. MODEL: PF - PAN

NO	Input Unit	NO	Input Type	NO	Input Rating (range)	NO	Frequency	NO	Output Voltage	NO	Output Current
1	1 unit	A	Voltage	1	AC 0~150V (30~150V)	A	50Hz	11	※ DC 0-1 V	21	DC 0-1mA
3	3 units	C	Current	2	AC 0~300V (60~300V)	B	60Hz	12	※ DC 0-5 V	22	DC 0-5mA
				3	AC 0~500V (100~500V)	C	400Hz	13	※ DC 0-10 V	23	DC 0-10mA
				4	AC 0~1A	• Frequency ±10%		19	※ SPECIFIED	24	DC 0-20mA
				5	AC 0~5A			※ For Voltage Input Type Only			

## 2. Specification

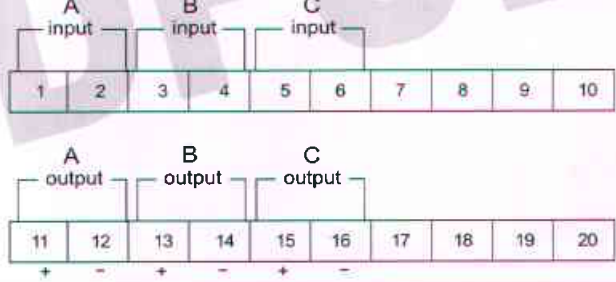
- Accuracy : 0.25% F.S. (RMS) (23 $\pm$ 5°C)
- Temp. coefficient : 100ppm/°C (0-50°C)
- Input burden :  $\leq 0.2$ VA
- Maximum input over : Current related input: 3 x rated continuous  
10 x rated 30 sec., 25 x rated 3 sec.,  
50 x rated 1 sec.  
Voltage related input: maximum 2 x rated  
continuous
- Response time :  $\leq 250$ ms (0-90%)
- Output ripple (p-p) :  $< 0.1\%$  F.S.
- Output drive capability :  $\leq 10$ mA for voltage mode  
 $\leq 10$ V for current mode
- Dielectric strength : 2KVac/1 min. (Input/output/case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4  
impulse voltage 5KV (1.2 x 50 $\mu$ s)
- Operating condition : 0-55°C (20 to 90% RH non-condensed)
- Storage condition : 0-70°C (20 to 90% RH non-condensed)
- Power Supply : No auxiliary power required

## 4. Terminal connection

### PAN-1 (1 unit)

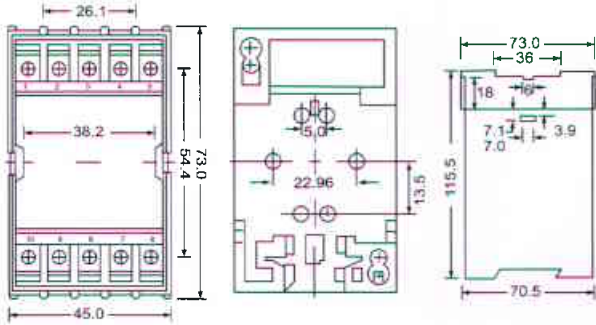


### PAN-3 (3 units)

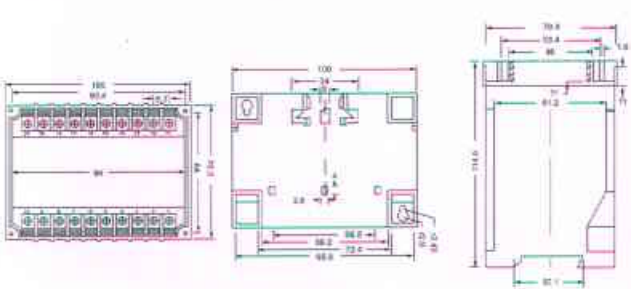


## 3. Dimension: (Unit: mm)

### PAN-1



### PAN-3





# AC CURRENT & VOLTAGE TRANSDUCER



## FEATURES

- Measuring & Conversion : DIN-IEC 688
- Dielectric Strength : DIN-IEC 688  
2KVac 50 / 60Hz / 1 minute
- Impulse Test : ANSI C37.90a / 1974,  
IEEE 587 / 1983,  
IEC 255-4, 5KV (1.2 x 50 $\mu$ s)
- Surge test (ring wave) : IEC 255-4 (2.5KV-0.25ms / 1MHz)

## 1. MODEL: PF - PA - [Color] - [Color] - [Color] - [Color]

NO	Input Unit	NO	Input Type	NO	Input Rating (range)	NO	Frequency	NO	Output Voltage	NO	Output Current	NO	Aux.Power
1	1 unit	A	Voltage (RMS)	1	AC 0~120V (0~150V)	A	50Hz	11	DC 0-1 V	21	DC 0-1mA	1	AC 110/220V(50/60Hz)
3	3 units	B	Voltage (TRMS)	2	AC 0~240V (0~300V)	B	60Hz	12	DC 0-5 V	22	DC 0-10mA	2	DC 24V
		C	Current (RMS)	3	AC 0~400V (0~480V)	C	400Hz	13	DC 1-5 V	23	DC 0-20mA	3	DC 48V
		D	Current (TRMS)	4	AC 0~1A (0~1.2A)	0	SPECIFIED	14	DC 0-10 V	24	DC 4-20mA	4	DC 110V
		0	SPECIFIED	5	AC 0~5A (0~6A)			15	DC 2-10 V	29	SPECIFIED	5	DC 220V
				9	SPECIFIED			19	SPECIFIED			6	AC 90~260V
												9	SPECIFIED

• TRMS only PA1

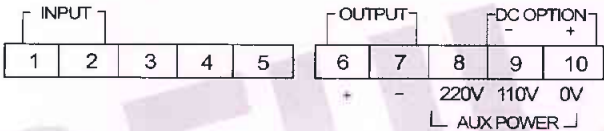
• Frequency  $\pm 10\%$

## 2. Specification

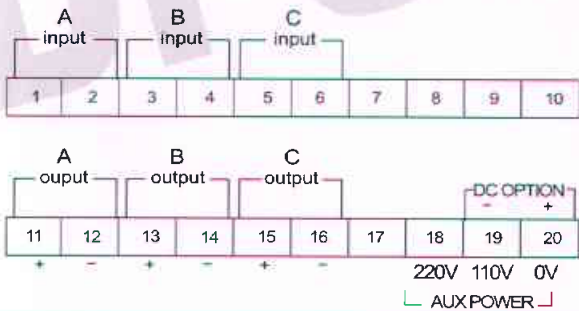
- Accuracy : 0.1% F.S. (TRMS) (23 $\pm$ 5 $^{\circ}$ C)  
0.25% F.S. (RMS) (23 $\pm$ 5 $^{\circ}$ C)
- Temp. coefficient : 100ppm/ $^{\circ}$ C (0-50 $^{\circ}$ C)
- Input burden :  $\leq 0.2VA$  (voltage)  $\leq 0.2VA$  (current)
- Maximum input over : Current related input: 3 x rated continuous  
10 x rated 30 sec., 25 x rated 3 sec.,  
50 x rated 1 sec.  
Voltage related input: maximum 2 x rated continuous
- Response time :  $\leq 250ms$  (0-90%)
- Output ripple (p-p) :  $< 0.1\%$  F.S.
- Output drive capability :  $\leq 10mA$  for voltage mode  
 $\leq 10V$  for current mode
- Dielectric strength :  $\leq 2KVac/1$  min. (Input/output/aux. power/ case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4  
impulse voltage 5KV (1.2 x 50 $\mu$ s)
- Operating condition : 0~55 $^{\circ}$ C (20 to 95% RH non-condensed)
- Storage condition : 0~70 $^{\circ}$ C (20 to 95% RH no-condensed)
- Power Supply : AC 110V/220V  $\pm 20\%$  (50/60Hz)  
 $\leq 2VA$  (PA1),  $\leq 3.5VA$  (PA3)  
(Optional DC24V, DC48V, DC110V, DC220V  $\pm 20\%$ )

## 4. Terminal connection

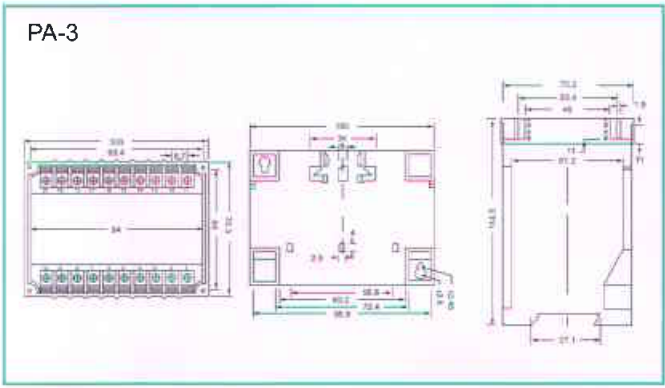
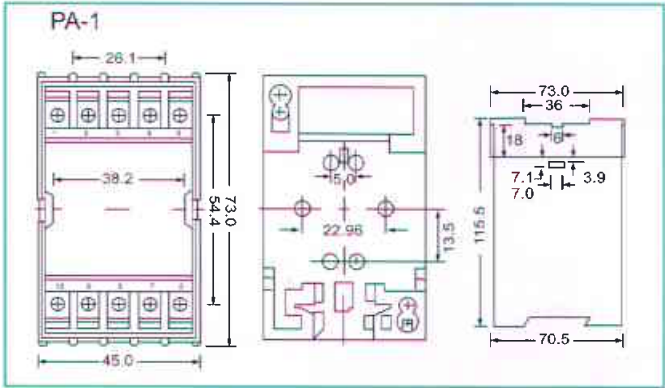
### PA-1 (1 units)



### PA-3 (3 units)



## 3. Dimension: (Unit: mm)





# FREQUENCY TRANSDUCER



## FEATURES

- Measuring & Conversion : DIN-IEC 688
- Dielectric Strength : DIN-IEC 688  
2KVac 50 / 60Hz / 1 minute
- Impulse Test : ANSI C37.90a / 1974,  
IEEE 587 / 1983,  
IEC 255-4, 5KV (1.2 x 50μs)
- Surge test (ring wave) : IEC 255-4 (2.5KV~0.25ms / 1MHz))

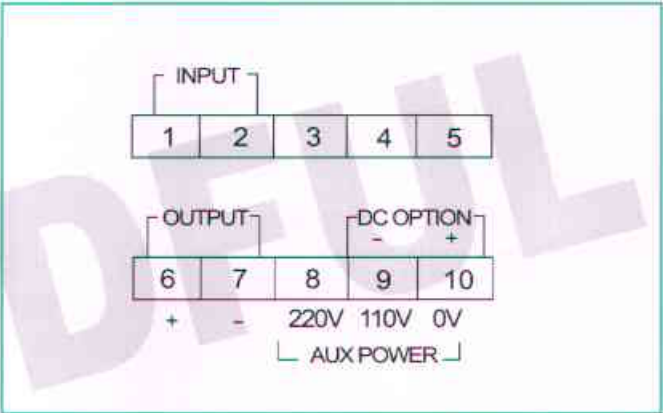
## 1. MODEL: PF - PF - - -

NO	Input Frequency	NO	Output Voltage	NO	Output Current	NO	Aux.Power
A	45-55Hz	11	DC 0-1 V	21	DC 0-1 mA	1	AC 110/220V(50/60Hz)
B	55-65Hz	12	DC 0-5 V	22	DC 0-10mA	2	DC 24V
C	45-65Hz	13	DC 1-5 V	23	DC 0-20mA	3	DC 48V
O	SPECIFIED	14	DC 0-10 V	24	DC 4-20mA	4	DC 110V
• Sensing voltage		15	DC 2-10 V	29	SPECIFIED	5	DC 220V
AC 30-600V		19	SPECIFIED			6	AC 90~260V
						9	SPECIFIED

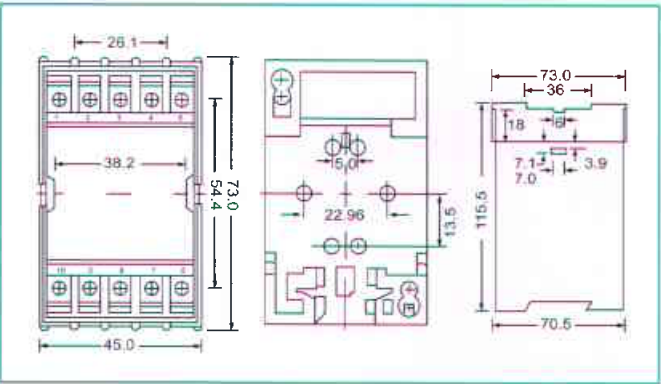
## 2. Specification

- Accuracy : 0.1% F.S. (23±5°C)
- Temp. coefficient : 50 ppm/°C (0-50°C)
- Input burden : ≤0.2VA
- Maximum input over : maximum 2 x rated continuous
- Response time : ≤250ms (0~90%)
- Output ripple (p-p) : <0.1% F.S.
- Output drive capability : ≤10mA for voltage mode  
≤10V for current mode
- Dielectric strength : 2KVac/1 min. (input/output/aux.  
power/case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4  
impulse voltage 5KV (1.2 x 50μs)
- Operating condition : 0~55°C (20~95% RH non-condensed)
- Storage condition : 0~70°C (20~95% RH non-condensed)
- Power supply : AC 110V/220V ±20% (50/60Hz)≤2VA  
(Optional DC24V, DC48V, DC110V,  
DC220V±20%)

## 4. Terminal connection



## 3. Dimension: (Unit: mm)



# WATT & VAR TRANSDUCER



## FEATURES

- Measuring & Conversion
- Dielectric Strength
- Impulse test
- Surge test (ring wave)

DIN-IEC 688  
DIN-IEC 688  
2 KVac 50/60Hz/1 minute  
ANSI C37.90a/1974,  
IEEE 587/1983,  
IEC 255-4, 5KV(1.2x50μs)  
IEC 255-4  
(2.5KV-0.25ms/1 MHz)

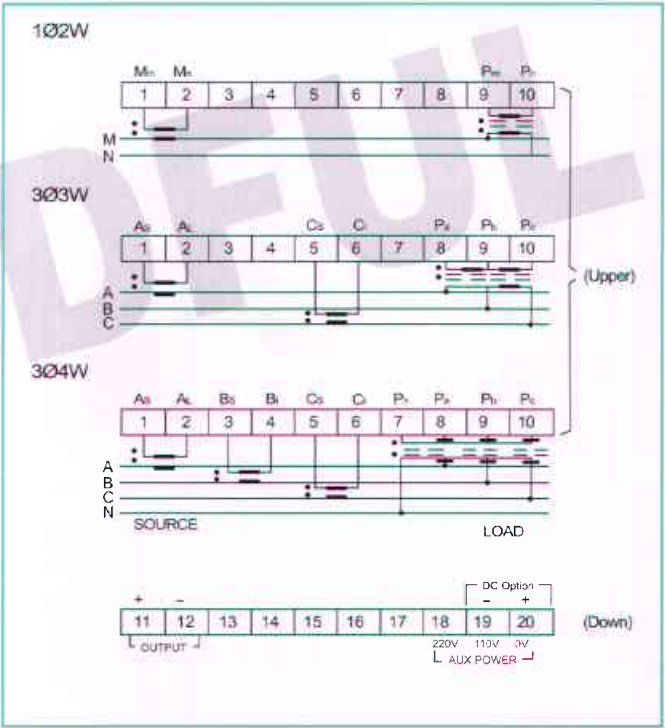
## 1. MODEL: PF-P

NO	Type	NO	Input Unit	NO	Voltage Rating (range)	NO	Current Rating (range)	NO	Frequency	NO	Output Voltage	NO	Output Current	NO	Aux.Power
W	Watt	1	1Ø2W	1	0-120V (85-150V)	1	0-1 A (0-1.2A)	A	50 Hz	11	DC 0-1 V	21	0-1mA	1	AC 110/220V(50/60Hz)
V	Var	3	3Ø3W	2	0-240V (180-300V)	2	0-5 A (0-6A)	B	60 Hz	12	DC 0-5 V	22	0-10mA	2	DC 24V
		4	3Ø4W	3	0-400V (320-480V)	9	SPECIFIED	C	400 Hz	13	DC 1-5V	23	0-20mA	3	DC 48V
		9	SPECIFIED	9	SPECIFIED			0	SPECIFIED	14	DC 0-10 V	24	4-20mA	4	DC 110V
									• Frequency±10%	15	DC 2-10 V	29	SPECIFIED	5	DC 220V
										19	SPECIFIED			6	AC 90~260V
														9	SPECIFIED

## 2. Specification

- Accuracy : 0.25% F.S. (23 ±5°C))
- Temp. coefficient : 100ppm/°C (0-50°C)
- Input burden : ≤ 0.2VA (Voltage)  
≤ 0.2VA (Current)
- Maximum input over : Current related input: 3 x rated continuous,  
10 x rated 30sec, 25 x rated 3 sec,  
50 x rated 1 sec  
Voltage related input: maximum  
2 x rated continuous
- Response time : ≤ 250ms (0-90%)
- Output ripple (p-p) : < 0.1% F.S.
- Output drive capability : ≤ 10mA for voltage mode  
≤ 10V for current mode
- Dielectric strength : 2KVac/1 min. (input/output/aux. power/case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4 impulse voltage 5KV (1.2x50μs)
- Operating condition : 0~50°C (20 to 95% RH non-condensed)
- Storage condition : 0~70°C (20 to 95% RH non-condensed)
- Power supply : AC 110V/220V ±20% (50/60Hz)≤3.5VA  
(Optional DC24V, DC48V, DC110V, DC220V±20%)

## 4. Terminal Connection



Model		Element connection	Standard analog calibration (Watts or Vars)					
Watts	Vars		V = 120V		V = 240V		V = 400V	
			1A	5A	1A	5A	1A	5A
PW1	PV1	1Ø2W	100	500	200	1K	400	2K
PW3	PV3	3Ø3W	200	1K	400	2K	800	4K
PW4	PV4	3Ø4W	300	1.5K	600	3K	1.2K	6K

## 3. Dimension: See Page-99 Transducer Dimension



# WATTHOUR & VARHOUR TRANSDUCER



## FEATURES

- Measuring & Conversion
- Dielectric Strength
- Impulse test
- Surge test (ring wave)

DIN-IEC 688  
DIN-IEC 688  
2 KVac 50/60Hz/1 minute  
ANSI C37.90a/1974,  
IEEE 587/1983,  
IEC 255-4, 5 KV(1.2x50µs)  
IEC 255-4  
(2.5KV-0.25ms/1 MHz)

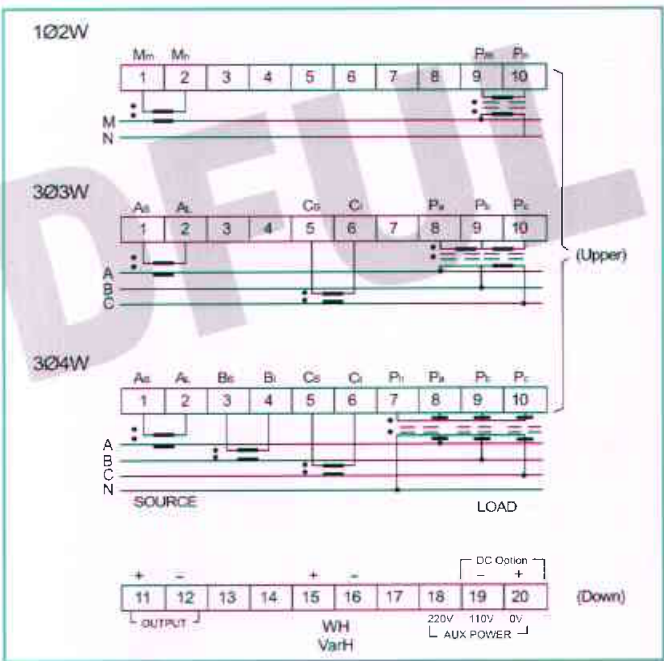
## 1. MODEL: PF-P [Color Code]

NO	Type	NO	Input Unit	NO	Voltage Rating (range)	NO	Current Rating (range)	NO	Frequency	NO	Output Pulse	NO	Aux. Power
WH	WATT	1	1Ø2W	1	0-120V (85-150V)	1	0-1 A (0-1.2A)	A	50 Hz	1	1wh or varh/count	1	AC 110/220V(50/60Hz)
VH	VAR	3	3Ø3W	2	0-240V (180-300V)	2	0-5 A (0-6A)	B	60 Hz	2	10wh or varh/count	2	DC 24V
		4	3Ø4W	3	0-400V (320-480V)	9	SPECIFIED	C	400 Hz	3	100wh or varh/count	3	DC 48V
		9	SPECIFIED	9	SPECIFIED			0	SPECIFIED	4	1000wh or varh/count	4	DC 110V
									• Frequency±10%	9	SPECIFIED	5	DC 220V
												6	AC 90~260V
												9	SPECIFIED

## 2. Specification

- Accuracy : 0.25% F.S. (23 ±5°C)
- Temp. coefficient : 100ppm/°C (0-50°C)
- Input burden : ≤ 0.2VA (Voltage)  
≤ 0.2VA (Current)
- Maximum input over : Current related input : 3 x rated continuous,  
10 x rated 30sec, 25 x rated 3 sec,  
50 x rated 1 sec  
Voltage related input: maximum  
2 x rated continuous
- Response time : ≤ 250ms (0-90%)
- Output ripple (p-p) : < 0.1% F.S.
- Output of WH or VarH : Open collector type, max. 50V/30mA or  
reed relay DC100V/0.5A ≤10VA
- Dielectric strength : 2KVac/1 min. (input/output/aux.  
power/case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4  
impulse voltage 5KV (1.2x50µs)
- Operating condition : 0~50°C (20 to 95% RH non-condensed)
- Storage condition : 0~70°C (20 to 95% RH non-condensed)
- Power supply : AC 110V/220V ±20% (50/60Hz)≤3.5VA  
(Optional DC24V, DC48V, DC110V,  
DC220V±20%)

## 4. Terminal Connection



Model		Element connection	Standard analog calibration (Watts or Vars)					
Watts	Vars		V = 120V		V = 240V		V = 400V	
			1A	5A	1A	5A	1A	5A
PWH1	PVH1	1Ø2W	100	500	200	1K	400	2K
PWH3	PVH3	3Ø3W	200	1K	400	2K	800	4K
PWH4	PVH4	3Ø4W	300	1.5K	600	3K	1.2K	6K

## 3. Dimension: See Page-99 Transducer Dimension

# WATT WATTHOUR & VAR VARHOUR TRANSDUCER



## FEATURES

- Measuring & Conversion
  - Dielectric Strength
  - Impulse test
  - Surge test (ring wave)
- DIN-IEC 688  
DIN-IEC 688  
2 KVac 50/60Hz/1 minute  
ANSI C37.90a/1974,  
IEEE 587/1983,  
IEC 255-4, 5KV(1.2x50µs)  
IEC 255-4  
(2.5KV-0.25ms/1 MHz)

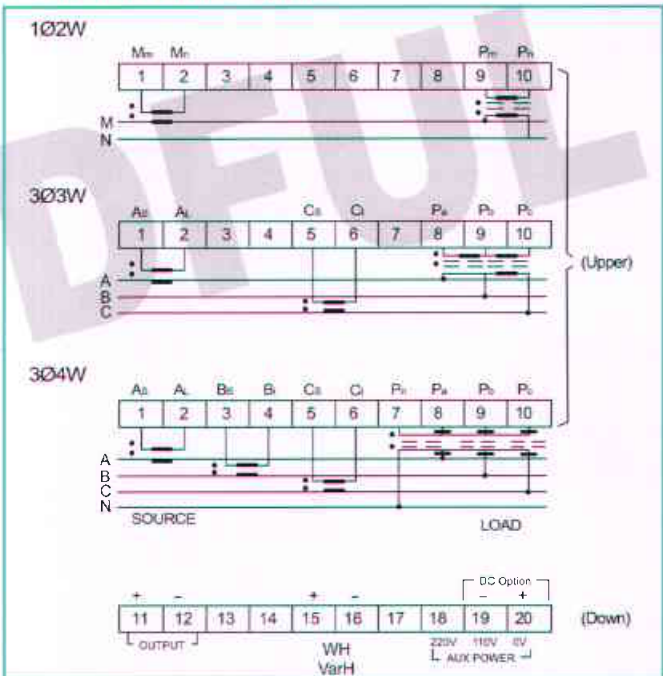
## 1. MODEL: PF-P [Color Code] - [Color Code] - [Color Code] - [Color Code]

NO	Type	NO	Input Unit (range)	NO	Voltage Rating (range)	NO	Current Rating	NO	Frequency Voltage	NO	Output Current	NO	Output	NO	Output Pulse	NO	Aux. Power
WWH	WATT	1	1Ø2W	1	0-120V (85-150V)	1	0-1 A (0-1.2A)	A	50 Hz	11	DC 0-1 V	21	0-1mA	1	1wh or varh/count	1	AC 110/220V(50/60Hz)
VVH	VAR	3	3Ø3W	2	0-240V (180-300V)	2	0-5 A (0-6A)	B	60 Hz	12	DC 0-5 V	22	0-10mA	2	10wh or varh/count	2	DC 24V
		4	3Ø4W	3	0-400V (320-480V)	9	SPECIFIED	C	400 Hz	13	DC 1-5V	23	0-20mA	3	100wh or varh/count	3	DC 48V
		9	SPECIFIED	9	SPECIFIED			D	SPECIFIED	14	DC 0-10 V	24	4-20mA	4	1000wh or varh/count	4	DC 110V
									Frequency±10%	15	DC 2-10 V	29	SPECIFIED	9	SPECIFIED	5	DC 220V
										19	SPECIFIED					6	AC 90-260V
																9	SPECIFIED

## 2. Specification

- Accuracy : 0.25% F.S. (23 ±5°C)
- Temp. coefficient : 100ppm/°C (0-50°C)
- Input burden : ≤ 0.2VA (Voltage)  
≤ 0.2VA (Current)
- Maximum input over : Current related input : 3 x rated continuous, 10 x rated 30sec, 25 x rated 3 sec, 50 x rated 1 sec  
Voltage related input: maximum 2 x rated continuous
- Response time : ≤ 250ms (0-90%)
- Output ripple (p-p) : < 0.1% F.S.
- Output drive capability : ≤ 10mA for voltage mode  
≤ 10V for current mode
- Output of WH or VarH : Open collector type, max. 50V/30mA or reed relay DC100V/0.5A≤10VA
- Dielectric strength : 2KVac/1 min. (input/output/aux. power/case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4 impulse voltage 5KV (1.2x50µs)
- Operating condition : 0~50°C (20 to 95% RH non-condensed)
- Storage condition : 0~70°C (20 to 95% RH non-condensed)
- Power supply : AC 110V/220V± 20% (50 /60Hz) ≤ 3.5VA (Optional DC24V, DC48V, DC110V, DC220V ± 20%)

## 4. Terminal Connection



Model		Element connection	Standard analog calibration (Watts or Vars)					
Watts	Vars		V = 120V		V = 240V		V = 400V	
			1A	5A	1A	5A	1A	5A
PWWH1	PVVH1	1Ø2W	100	500	200	1K	400	2K
PWWH3	PVVH3	3Ø3W	200	1K	400	2K	800	4K
PWWH4	PVVH4	3Ø4W	300	1.5K	600	3K	1.2K	6K

## 3. Dimension: See Page-99 Transducer Dimension



# POWER FACTOR (COS $\theta$ ) TRANSDUCER



## FEATURES

- Measuring & Conversion DIN-IEC 688
- Dielectric Strength DIN-IEC 688  
2 KVac 50/60Hz/1 minute
- Impulse test ANSI C37.90a/1974,  
IEEE 587/1983,  
IEC 255-4, 5KV(1.2x50 $\mu$ s)
- Surge test (ring wave) IEC 255-4  
(2.5KV-0.25ms/1 MHz)

## 1. MODEL: PF-PPF - - - / DN

NO	Input Unit (range)	NO	Voltage Rating (range)	NO	Current Rating	NO	Frequency	NO	Output Voltage	NO	Output Current	NO	Aux.Power
1	102W	1	0-120V (85-150V)	1	0-1 A (0-1.2A)	A	50 Hz	11	DC 0-1V	21	DC 0-1mA	1	AC 110/220V(50/60Hz)
3	303W	2	0-240V (180-300V)	2	0-5 A (0-6A)	B	60 Hz	12	DC 0-5V	22	DC 0-10mA	2	DC 24V
4	304W	3	0-400V (320-480V)	9	SPECIFIED	C	400 Hz	13	DC 1-5V	23	DC 0-20mA	3	DC 48V
9	SPECIFIED	9	SPECIFIED			0	SPECIFIED	14	DC 0-10V	24	DC 4-20mA	4	DC 110V
							• Frequency $\pm$ 10%	15	DC 2-10V	29	SPECIFIED	5	DC 220V
								19	SPECIFIED			6	AC 90-260V
												9	SPECIFIED

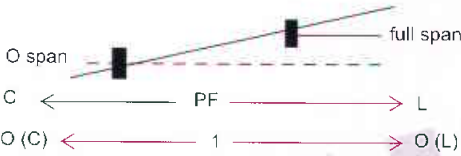
## Calibration: Dn

D1: 0.5(C) to 1 vs  
0 to full span output

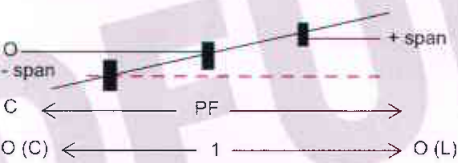
D2: 0(C) to 1 vs  
0 to full span output

D3: 0.5(C) to 1 to 0.5(L) vs  
0 to 1/2 span to full span output

D4: 0(C) to 1 to 0(L) vs  
0 to 1/2 span to full span output



Note: (C): capacitive load (L): inductive load



Note: (C): capacitive load (L): inductive load

## 2. Specification

- Accuracy : 0.25% F.S. $\pm$ 0.25 $^\circ$  (23 $\pm$ 5 $^\circ$ C)
- Temp. coefficient : 100ppm/ $^\circ$ C (0-50 $^\circ$ C)
- Input burden :  $\leq$  0.2VA (Voltage)  
 $\leq$  0.2VA (Current)
- Maximum input over : Current related input : 3 x rated continuous,  
10 x rated 30 sec, 25 x rated 3 sec,  
50 x rated 1 sec  
Voltage related input: maximum  
2 x rated continuous
- Response time :  $\leq$  250ms (0-90%)
- Output ripple (p-p) :  $<$  0.1% F.S.
- Output drive capability :  $\leq$  10mA for voltage mode  
 $\leq$  10V for current mode
- Dielectric strength : 2KVac/1 min. (input/output/aux.  
power/case)
- Surge test : ANSI C37.90a/1974, DIN-IEC 255-4  
impulse voltage 5KV (1.2x50 $\mu$ s)
- Operating condition : 0~50 $^\circ$ C (20 to 95% RH non-condensed)
- Storage condition : 0~70 $^\circ$ C (20 to 95% RH non-condensed)
- Power supply : AC 110V/220V  $\pm$  20% (50/60Hz)  $\leq$  3.5VA  
(Optional DC24V, DC48V, DC110V,  
DC220V  $\pm$  20%)

## 3. Dimension: See Page-99 Transducer Dimension

## 4. Terminal Connection

