Technical Data Sheet

Theta 30P

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File No. E471457

Theta 30P is a compact, multi-function panel mount power quality monitor, which measures, calculates and displays major electrical parameters of three phase power system

Special Features

- True RMS measurement.
- Fully on site programmable input voltage range & input current range
- On Site Configurable as Active / Reactive / Apparent Transducer / Phase Angle / Power Factor .
- Onsite selectable output type(DC current / DC voltage).
- Single or Dual output.
- Accuracy Class 0.2 (IEC / EN 60688) for Power .
- Accuracy Class 0.5 (IEC / EN 60688) for Phase Angle / Power Factor.
- Seven Segment LCD Display.
- RS-485 (Modbus) Communication

Application

Theta 30P The transducer is used to measure and convert active, reactive, apparent power, Phase angle & Power Factor of a Single-phase or Three-phase AC system with balanced or unbalanced load into a proportional **load independent DC current or voltage output** signal.

Product Features

Measuring Input	AC Voltage/ Current input signal , sine wave or distorted wave form.
Analog Output (Single or dual)	Isolated analog output which can be set to voltage or current output onsite.
Accuracy	Output signal accuracy **class 0.2** as per International **IEC / EN 60688** Standard.
Programmable Input / Output	The Transducer can be programmed onsite using front key & display or through programming port (COM) or through RS 485.

LED Indication	LED indication for power on and output type. (Current output : Red LED, Voltage output : Green LED).
Display Module (Optional)	Optional 7 segment LCD display with backlit & keypad. For displaying measured parameter & onsite configuration of Input/output.
RS485 Communication (Optional)	Optional RS485 communication is available. For reading measured parameter & onsite configuration of input/output.

Technical Specifications

Accuracy (Acc. to IEC / EN 60688)

Reference Value	Output end Value Y2 (Voltage or Current)
Basic Accuracy for power transducer	0.2*C
Basic Accuracy for Phase Angle & Power Factor transducer	0.5*C

Factor C (The highest value applies if calculated C is less than 1, then C=1 applies)

Linear characteristics

$$C=\frac{1-\frac{Y0}{Y2}}{1-\frac{X0}{X2}} \text{ or } C=1$$

Bent characteristics:

For $X0 \le X \le X1$ $C=\frac{Y1-Y0}{X1-X0}\cdot\frac{X2}{Y2}$ or $C=1$

For $X1 \le X \le X2$ $C=\frac{1-\frac{Y1}{Y2}}{1-\frac{X1}{X2}}$ or $C=1$

Reference conditions for Accuracy

For Power Transducer	
Ambient temperature	23°C +/- 1°C
Pre-conditioning	30 min acc. to IEC / EN 60688
Input Variable	Voltage Rated / Current Rated
Input waveform	Sinusoidal, Form Factor 1.1107
Input signal frequency	50 or 60Hz
Active / Reactive factor	Cos Φ=1 resp. Sin Φ = 1

Phase Angle & Power Factor Transducer
Reference Value For Phase angle = 90° resp. For power factor = 0.5

Symbols and their meanings

X	Input Apparent / Active/Reactive Power Factor / Phase Angle
X0	Start value of input
X1	Elbow value of input
X2	End value of input
Y	Output DC Voltage / DC Current
Y0	Start value of output DC Voltage / DC Current
Y1	Elbow value of output DC Voltage / DC Current
Y2	End value of output DC Voltage / DC Current
RN	Rated value of output burden
FN	Nominal Frequency

Reference conditions for Accuracy

Output Load	Rn = 7.5 V / Y2 ± 1% Rn = Y2 / 1 mA ± 1%	With DC current output signal With DC voltage output signal
Miscellaneous	Acc. to IEC / EN 60688	

Technical Specifications

Nominal Voltage Input(U_N)

Nominal input Voltage (PT Secondary range)AC RMS)	100 V ≤ UN ≤ 500 VL-L
PT Primary range	100V to 692 KVL-L
Nominal Frequency FN	25 Hz to 60 Hz
Nominal input Voltage burden	< 0.6 VA per phase at UN
Overload Capacity	1.2 * UN continuously, 2*UN for 1second, repeated 10 times at 10 minute intervals (Un maximum 300V with power supply powered from measuring input).

Nominal Current Input(I_N)

Nominal input Current (AC RMS) (CT Secondary range)	1 A ≤ IN ≤ 5 A
CT Primary range	1 A to 9999 A
Nominal Frequency FN	25 Hz to 60 Hz
Nominal input Current burden	< 0.2 VA per phase at IN
Overload Capacity	1.2 * IN continuously, 10* IN for 3 second, repeated 5 times at 5 minute intervals. 50* IN for 1 second, repeated 1 times at 1 hour interval(Max 250 A).

Measuring Output Y(Single or Optional Dual)

Output type	Load independent DC Voltage , DC Current On site selectable through DIP switches.
Load independent DC output	Unipolar 0…20mA / 4…20mA / 0…1mA OR 0…10V Bipolar -20mA....0....+20mA OR -10V....0....+10V
Output burden with DC current output Signal	0 ≤ R ≤ 15V/Y2
Output burden with DC voltage output Signal	Y2/(2 mA) ≤ R ≤ ∞
Current limit under overload R=0	≤ 1.25 * Y2 with current output ≤ 100 mA with voltage output
Voltage limit under R=∞	< 1.25 * Y2 with voltage output ≤ 30 V with current output
Residual Ripple in Output signal	≤ 1% pk-pk
Response Time	< 750 ms

Measured Parameter

Active Power / Reactive Power / Apparent Power / Power Factor /Phase Angle.

Allowed measuring range end values X2 (calibration factor Xc)	
With single phase AC active/reactive/apparent power	0.30 ≤ (X2/Rated Power) ≤1.3 • UN /√3 • IN
With 3- phase AC active/ reactive/apparent power (For single phase Rated Power=UN /√3 • IN) (For Three phase Rated Power=√3 • UN • IN)	0.30 ≤ (X2/Rated Power) ≤1.3 • √3 • UN • IN

Phase Angle & Power Factor measuring Range

Minimum span 20° to Maximum Span 360°

Measuring Output Y(Single or Optional Dual)

Output type	Load independent DC Voltage , DC Current On site selectable through DIP switches.
Load independent DC output	Unipolar 0…20mA / 4…20mA / 0…1mA OR 0…10V Bipolar -20mA....0....+20mA OR -10V....0....+10V
Output burden with DC current output Signal	0 ≤ R ≤ 15V/Y2
Output burden with DC voltage output Signal	Y2/(2 mA) ≤ R ≤ ∞

Auxiliary Power Supply

AC/DC Auxiliary Supply	60V… 300 VAC-DC ± 5% or 24V...60V VAC-DC ± 10%
AC Auxiliary supply frequency range	40 to 65 Hz

Auxiliary supply consumption

60V...300 VAC-DC	≤ 8VA for Single output ≤ 10VA for Dual output
24V...60 VAC-DC	≤ 5 VA for Single output ≤ 6 VA for Dual output

Additional Error

Temperature influence	± 0.2%/10°C

Influence of Variations

As per IEC / EN 60688 standard. Output stability	< 30 min

Technical Specifications

Network Type Supported by Power transducer
Single Phase / 3 phase 3 wire Unbalanced / 3 phase 4 wire Unbalanced 3 phase 3 wire balanced / 3 phase 4 wire balanced

Network Type Supported by Power Factor & Phase Angle
Single Phase / (U12 I1) 3 Phase Balanced load (U13 I1) 3 Phase Balanced load / (U23 I1) 3 Phase Balanced load 3 phase 3 wire balanced / 3 Phase 4 wire Balanced load

Safety	
Protection Class	II (Protection Isolated, EN 61010)
Protection	IP 40, housing according to EN 60 529 IP 20 ,terminal according to EN 60 529
Pollution degree	2
Installation Category Insulation Voltage	III 1min. (EN 61010-1) 7700VDC, Input versus outer surface 5200VDC, Input versus all other circuits 5200VDC, Auxiliary supply versus outer surface and output 690VDC, Output versus output versus each other versus outer surface.

Installation Data	
Mechanical Housing	Lexan 940 (polycarbonate) Flammability Class V-0 acc. To UL 94, self extinguishing, non dripping, free of halogen
Mounting position Weight	Rail mounting / wall mounting Approx. 0.4kg

Connection Terminal	
Connection Element	Conventional Screw type terminal with indirect wire pressure
Mounting position Weight	Rail mounting / wall mounting Approx. 0.4kg
Permissible cross section of the connection lead	≤ 4.0 mm² single wire or 2 x 2.5 mm² fine wire

Ambient tests	
EN 60 068-2-6	Vibration
Acceleration	± 2 g
Frequency range	10....150...10Hz,
Rate of frequency sweep	1 octave/minute
Number of cycles	10, in each of the three axes
EN 60 068-2-7	Shock
Acceleration	3 x 50g 3 shocks in each direction
EN 60 068-2-1/-2/-3	Cold, Dry, Damp heat
IEC 1000-4-2/-3/-4/-5/-6 EN 55 011	Electromagnetic compatibility.

Environmental	
Operating temperature	0°C...23°C...45°C(usage Group II)
Storage temperature	-40 °C to 70 °C
Relative humidity of annual mean	≤ 75%
Altitude	2000m max

Electrical Connections		
Connection	Terminal details	
Measuring Voltage EN 55 011	UL1 UL2 UL3 N	2 5 8 11
Auxilliary Power supply	~ , + ~ , -	13 14
Measuring output - 1	+ -	15 16

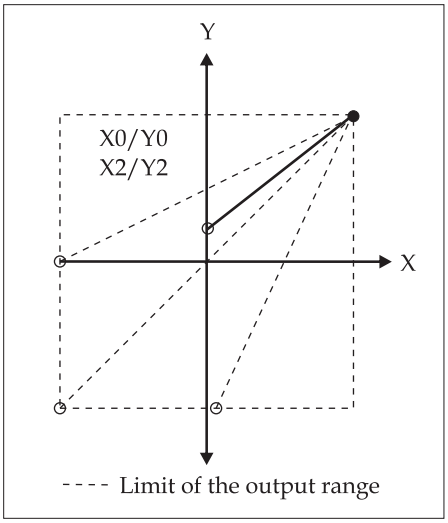
Electrical Connections		
Connection	Terminal details	
Measuring Current Input	I1 I1' I2 I2' I3 I3'	1 3 4 6 7 9
Measuring output - 2	+ -	17 18

LED Indication		
ON LED	Aux.supply healthy condition	Green LED continuous ON
O/P1 LED	Output1 voltage selection	Green LED continuous ON
	Output1 current selection	Red LED continuous ON
O/P2 LED	Output2 voltage selection	Green LED continuous ON
	Output2 current selection	Red LED continuous ON

Technical Specifications

Output Characteristics

Example of setting with Linear Characteristics

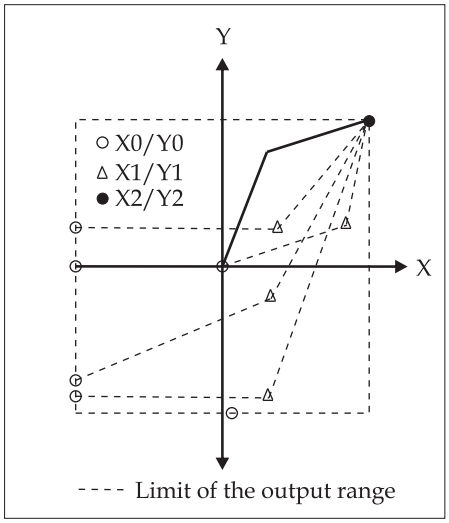


X0 = Start value of input
Y0 = Start value of output
X1 = Elbow value of input

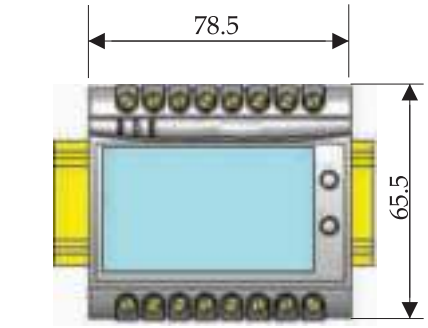
Y1 = Elbow value of output
X2 = End value of input
Y2 = End value of output

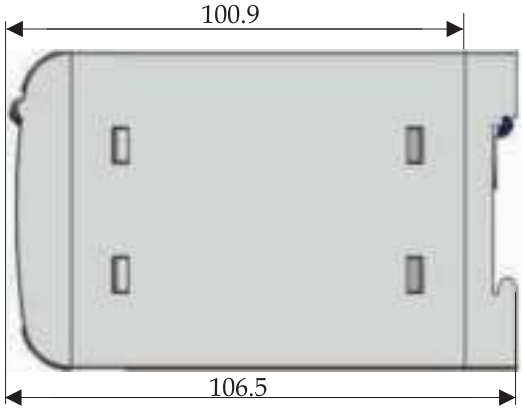
Note: End value(Y2) of output cannot be changed onsite.

Example of setting with bent Characteristics



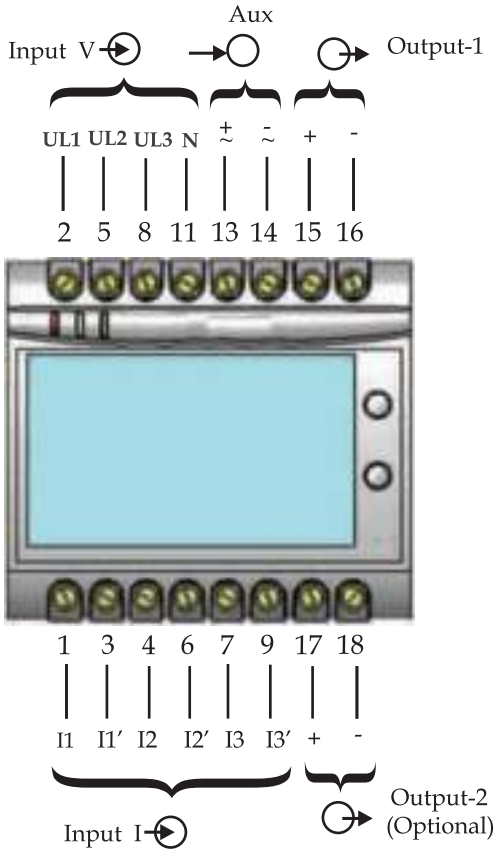
Dimensions



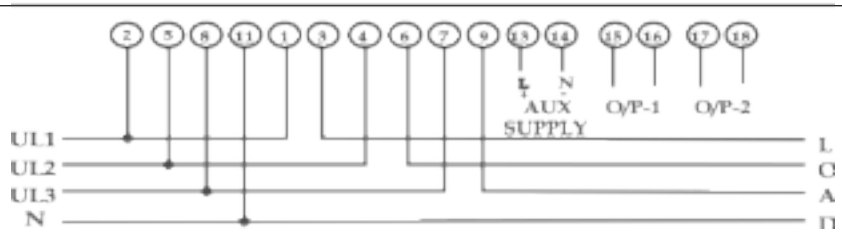
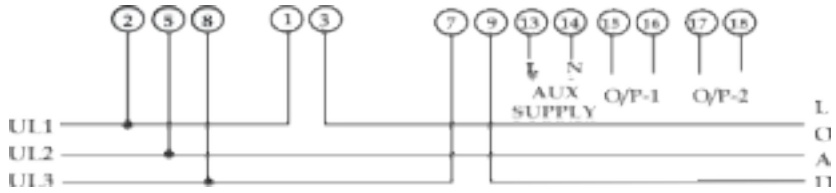
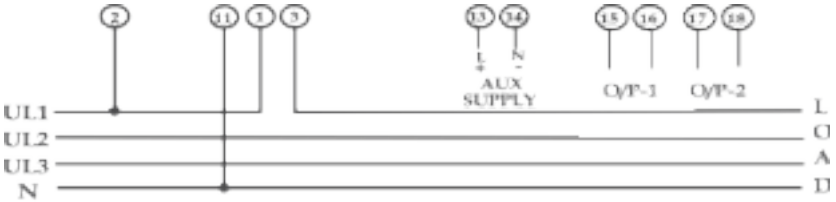
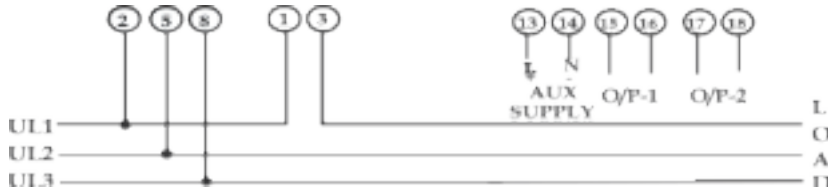
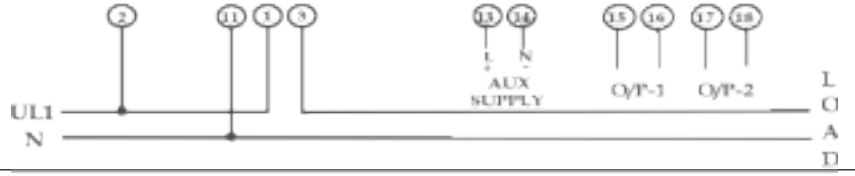
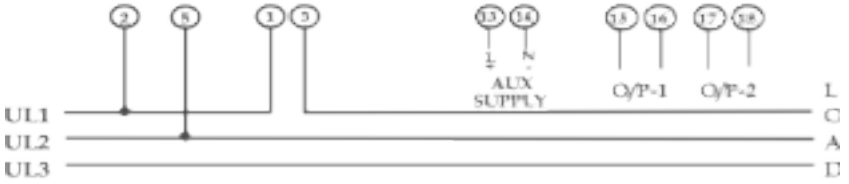
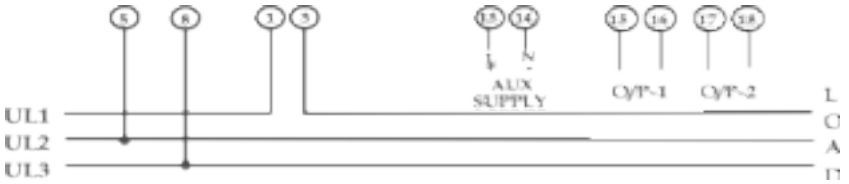


(All dimensions are in mm.)

Terminal Details



Electrical Networks

3 Phase 4 Wire Unbalanced Load	
3 Phase 3 Wire Unbalanced Load	
3 Phase 4 Wire Balanced Load	
3 Phase 3 Wire Balanced Load	
1 Phase 2 Wire	
U12 I1 3 Phase Balanced Load	
U13 I1 3 Phase Balanced Load	
U23 I1 3 Phase Balanced Load	

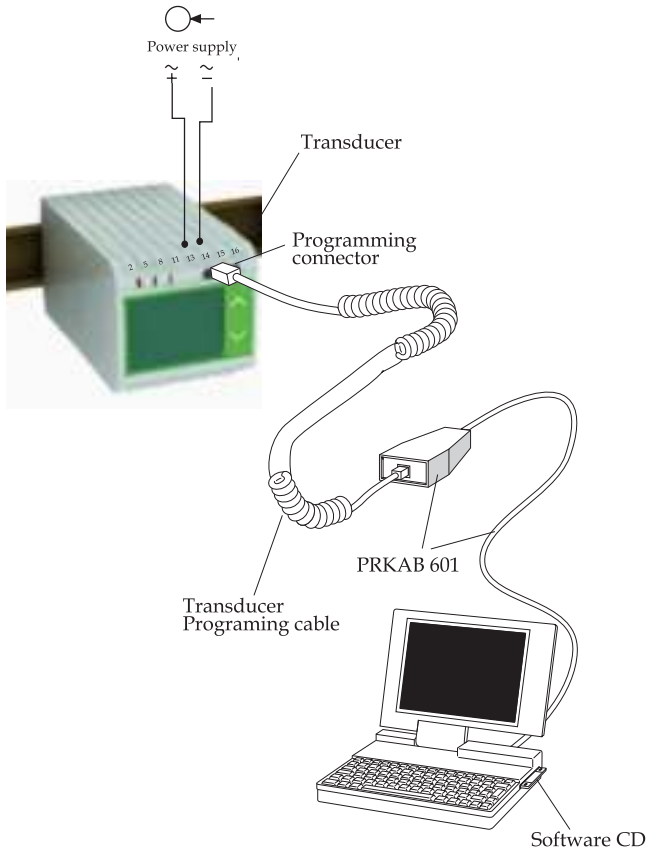
Programming

Programming of transducer can be done in three ways	1) Programming Via Front LCD & two keys. 2) Programming Via optional RS485(MODBUS) communication port. (Device address, PT Ratio, CT Ratio, Transducer type, Password, communication parameter, Output Type & simulation mode can be programmed). 3) Programming Via Programming port using PR-KAB is available
Programming Via Programming port (COM)	A PC with RS 232 C interface along with the programming cable PRKAB601 and the configuration software are required to program the transducer.
The connections between	PC⟷PRKAB 601⟷Theta 30P Transducer. The power supply must be applied to transducer before it can The Configuration software is supplied on a CD. The programming cable PRKAB601 adjusts the signal level and provides the electrical insulation between the PC and Theta 30P Transducers.
Configuring Theta 30 P Transducer	To configure Theta 30 P Transducer Input / Output one of the three programming methods can be adapted along with mechanical switch setting (DIP switch setting on PCB).

The four pole DIP switch is located on the PCB in the Theta 30 P Transducer

DIP Switch Setting	Type of Output Signal
	load-independent current
	load-independent voltage

DIP Switch Setting for OUTPUT	Type of output (current or voltage signal) has to be set by DIP switch For programming of DIP switch the user needs to open the transducer housing & set the DIP switch located on PCB to the desired output type Voltage or Current. Output range changing is not possible with DIP switch setting. Refer below Fig. 5 for DIP switch setting.



Ordering Information

Product Code	TT30-	X	X	XX	XX	X	X	X	X	X	00
Product Type	Active Power Active P	P									
	Reactive Power Reactive Q	Q									
	Apparent Power Apparent S	S									
System Type	1P2W		1								
	3WUB		2								
	4WUB		3								
	4WB		4								
	3WB		5								
	3WB-U12		6								
	3WB-U13		7								
	3WB-U23		8								
Input Range	100-500V			8F							
Input Current	1/5A				75						
Power Supply	60-300U					H					
	24-60U					F					
Output	1 O/P 1O						1				
	2 O/P 2O						2				
Display Module	With Display							D			
	Without Display WD							Z			
RS485 Module	With RS-485 485								R		
	Without RS-485								Z		
Prog. Cable	With PRKAB 601 PRK									C	
	Without PRKAB 601									Z	