

# RISH CON - P

POWER / PHASE ANGLE / POWER FACTOR TRANSDUCER

## Application :

The **RISH CON - P** 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.

## Salient Features :

- True RMS measurement.
- Fully **onsite 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.**
- RS485(Modbus)** Communication.
- Wide Auxiliary power supply.  
Accepts any input between 60V-300V AC/DC or 24V-60V AC/DC.
- Output Response Time < 750 ms standard.
- Fast and easy installation on DIN RAIL or onto a wall

## 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).



Fig. 1 RISH CON - P

### 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.

### Symbols and their meaning:

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
R <sub>N</sub>	Rated value of output burden
F <sub>N</sub>	Nominal Frequency



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F-31, MIDC, Satpur, Nashik-422 007, India.  
Tel.: +91 253 2202160, 2202202 Fax : +91 253 2351064  
E-mail : India :- marketing@rishabh.co.in  
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## Technical Specifications:

### Measured Parameter

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

**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

### Nominal Voltage Input( $U_N$ ):

Nominal input Voltage (AC RMS) (PT Secondary range)  $100\text{ V} \leq U_N \leq 500\text{ VL-L}$

PT Primary range 100V to 692 KVL-L

Nominal Frequency  $F_N$  25 Hz to 60 Hz

Nominal input Voltage burden  $< 0.6\text{ VA}$  per phase at  $U_N$

Overload Capacity:  $1.2 * U_N$  continuously,  
 $2 * U_N$  for 1 second, repeated 10 times at 10 minute intervals  
( $U_N$  maximum 300V with power supply powered from measuring input).

### Nominal Current Input( $I_N$ ):

Nominal input Current (AC RMS) (CT Secondary range)  $1\text{ A} \leq I_N \leq 5\text{ A}$

CT Primary range 1 A to 9999 A

Nominal Frequency  $F_N$  25 Hz to 60 Hz

Nominal input Current burden  $< 0.2\text{ VA}$  per phase at  $I_N$

Overload Capacity:  $1.2 * I_N$  continuously,  
 $10 * I_N$  for 3 second, repeated 5 times at 5 minute intervals.  
 $50 * I_N$  for 1 second, repeated 1 times at 1 hour interval (Max 250 A).

### Allowed measuring range end values $X_2$ (calibration factor $X_c$ ):

With single phase AC active/reactive/apparent power  $0.30 \leq (X_2/\text{Rated Power}) \leq 1.3 * U_N / \sqrt{3} * I_N$

With 3-phase AC active/reactive/apparent power  $0.30 \leq (X_2/\text{Rated Power}) \leq 1.3 * \sqrt{3} * U_N * I_N$

(For single phase Rated Power= $U_N / \sqrt{3} * I_N$ )

(For Three phase Rated Power= $\sqrt{3} * U_N * I_N$ )

### Phase Angle & Power Factor measuring Range:

Minimum span  $20^\circ$  to Maximum Span  $360^\circ$

### 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 OR 0...10V.  
Bipolar -20mA...0...+20mA OR -10V...0...+10V

Output burden with DC current output Signal  $0 \leq R \leq 15V/Y_2$

Output burden with DC voltage output Signal  $Y_2/(2\text{ mA}) \leq R \leq \infty$



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Current limit under overload R=0	$\leq 1.25 * Y2$ with current output $\leq 100$ mA with voltage output
Voltage limit under R= $\infty$	$< 1.25 * Y2$ with voltage output $\leq 30$ V with current output
Residual Ripple in Output signal	$\leq 1\%$ pk-pk
Response Time	$< 750$ ms

### Auxiliary Power Supply:

AC/DC Auxiliary Supply	60V... 300 VAC-DC $\pm 5\%$ or 24V...60V VAC-DC $\pm 10\%$
AC Auxiliary supply frequency range	40 to 65 Hz
Auxiliary supply consumption	

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

### 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:	Bent characteristics:
$C = \frac{1 - \frac{Y0}{Y2}}{1 - \frac{X0}{X2}}$ or C=1	For $X0 \leq X \leq X1$ $C = \frac{Y1 - Y0}{X1 - X0} \cdot \frac{X2}{Y2}$ or C=1
	For $X1 \leq X \leq X2$ $C = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}}$ 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 $\Phi$ =1 resp. Sin $\Phi$ = 1

For Phase Angle & Power Factor Transducer:

Reference Value For Phase angle = 90° resp. For power factor = 0.5

Auxiliary supply voltage	At nominal range
Output Load	Rn = 7.5 V / Y2 $\pm 1\%$ With DC current output signal Rn = Y2 / 1 mA $\pm 1\%$ With DC voltage output signal
Miscellaneous	Acc. to IEC / EN 60688

Version: L 29/05/13



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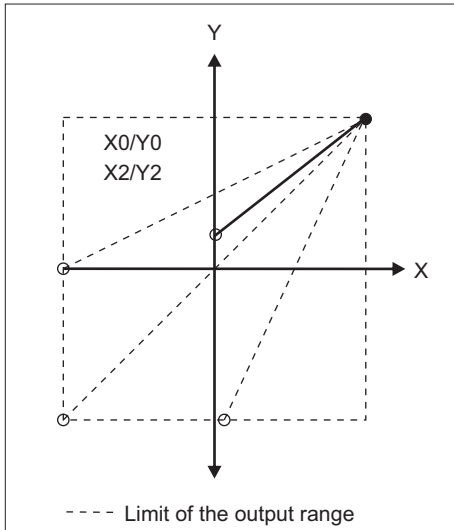
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## Output Characteristics:

Example of setting with Linear Characteristics :

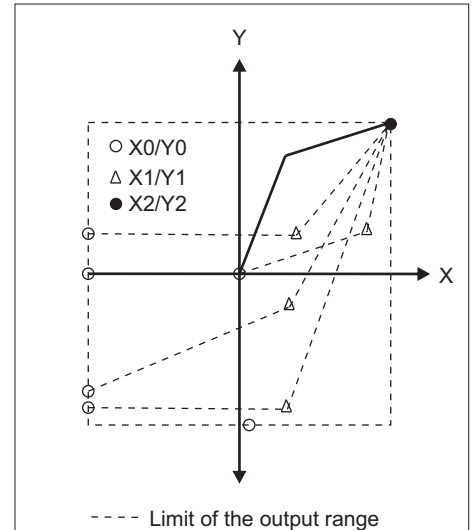


X0 = Start value of input  
Y0 = Start value of output  
X1 = Elbow value of input

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 :



## Additional Error:

Temperature influence  $\pm 0.2\%/10^\circ\text{C}$

## Influence of Variations:

As per IEC / EN 60688 standard.

Output stability < 30 min

## Safety:

Protection Class  
Protection

II (Protection Isolated, EN 61010)  
IP 40, housing according to EN 60 529  
IP 20 ,terminal according to EN 60 529

Pollution degree  
Installation Category  
Insulation Voltage

2  
III  
50Hz,1min. ( EN 61010-1)  
5500V, Input versus outer surface  
3700V, Input versus all other circuits  
3700V, Auxiliary supply versus outer surface and output  
490V, 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,

Mounting position  
Weight

non dripping, free of halogen  
Rail mounting / wall mounting  
Approx. 0.4kg

## Connection Terminal

Connection Element

Conventional Screw type terminal with indirect wire pressure

Permissible cross section  
of the connection lead

$\leq 4.0 \text{ mm}^2$  single wire or  $2 \times 2.5 \text{ mm}^2$  fine wire



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### Environmental:

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

### 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.

### 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

### Electrical Connections:

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

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



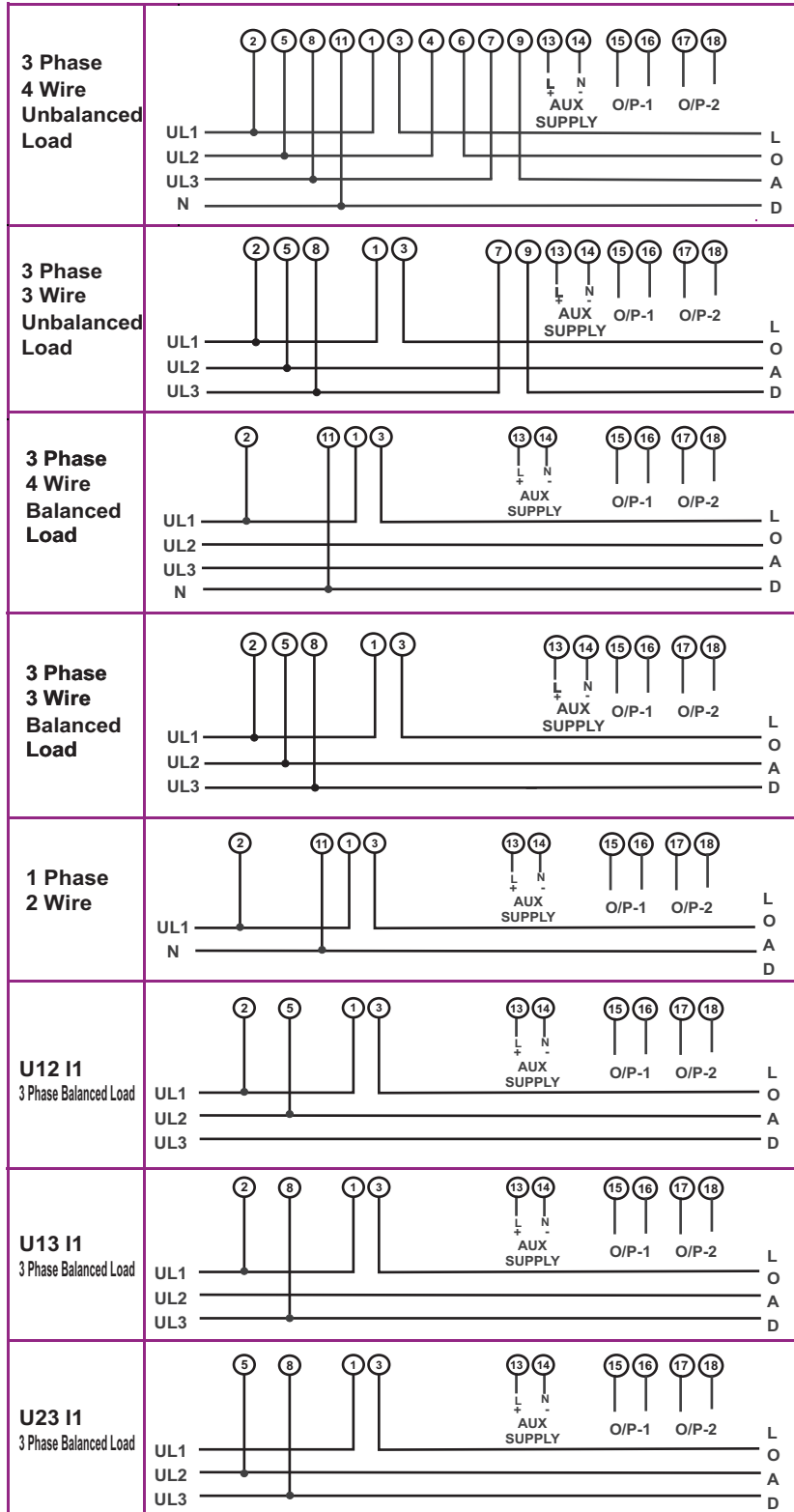
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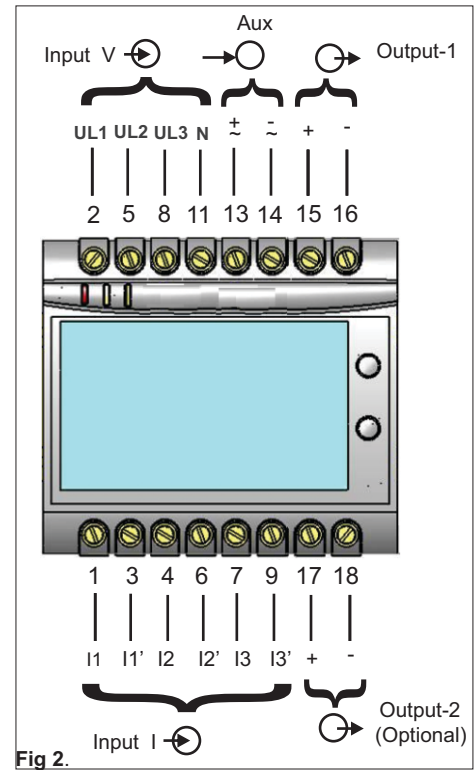
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## Electrical Networks :



## Terminal Details



## Dimensions

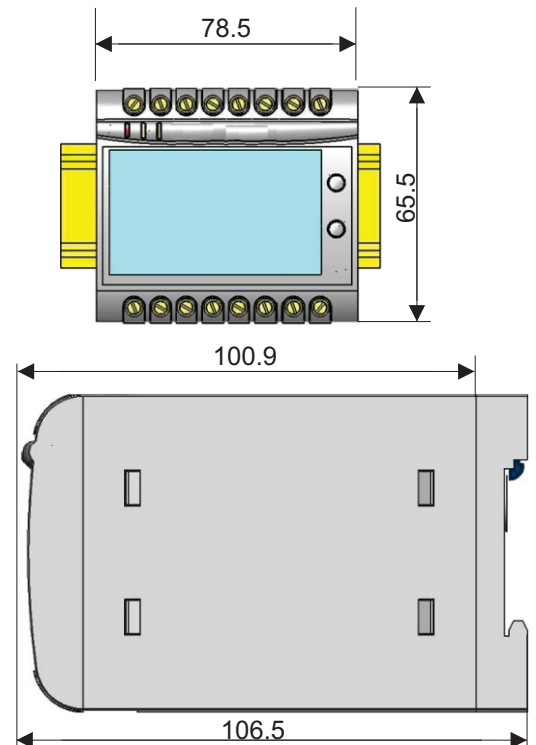


Fig 3. ( All dimensions are in mm.)



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## Programming

(Figs. 4 and 5)

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 available at front of RISH CON Transducers using optional PRKAB601 Adapter.

### 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 ↔ Rish CON Transducer.

The power supply must be applied to transducer before it can

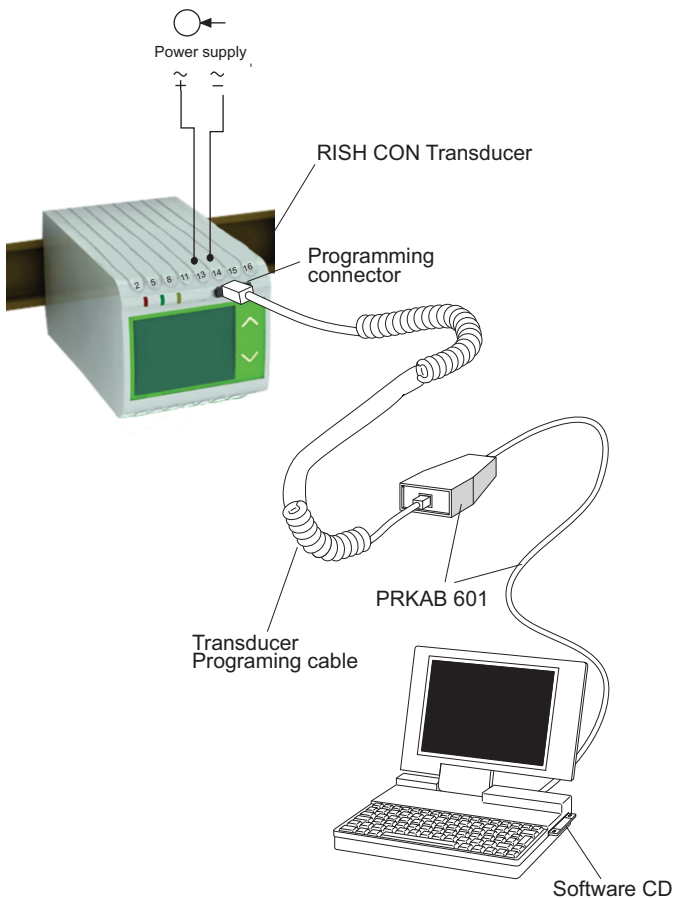


Fig. 4

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 RISH CON Transducers.

### Configuring RISH CON Transducer :

To configure RISH CON Transducer Input / Output one of the three programming methods can be adapted along with mechanical switch setting (DIP switch setting on PCB).

### DIP Switch Setting for OUTPUT :

Type of output (current or voltage signal) has to be set by DIP switch (see Fig.5).

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.

The four pole DIP switch is located on the PCB in the RISH CON Transducer



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

Fig. 5



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## Ordering Information : Standard Version :

Dual Output : P - 4WUB - F - H - O1A1 - O2V1 - D - Z - Z

Single Output : P - 4WUB - F - L - O1A1 - D - Z - Z

Sr.No.	Transducer parameter	Ordering Code
1	<b>Input Signal</b>	
	Active Power	P
	<b>*Network supported :</b> 3 phase 4 wire unbalanced load	4WUB
2	<b>Frequency of Input</b> (50 Hz / 60 Hz)	F
3	<b>Auxiliary Supply</b>	
	High Aux (60V.....300V AC-DC)	H
	Low Aux (24V.....60V AC-DC)	L
4	<b>Output 1 (Standard Ranges)</b>	
	Current = -20.....0.....20 mA	O1A1
5	<b>Output 2 (Standard Ranges)</b>	
	Voltage = -10.....0.....10 V	O2V1
6	<b>With Display</b>	D
7	<b>Without RS-485</b>	Z
8	<b>Without PRKAB 601</b>	Z

**Note:** End value of output can not be changed onsite.

\* Transducer type and network supported are onsite programmable.

## Ordering Information : Optional Versions

Sr.No.	Transducer parameter	Ordering Code	
1	<b>Input Signal</b>		
	Active Power	P	
	Reactive Power	Q	
	Apparent Power	S	
	<b>*Network supported :</b>	Single phase	1P2W
		3 phase 3 wire unbalanced load	3WUB
		3 phase 4 wire unbalanced load	4WUB
		3 phase 4 wire balanced load	4WB
		3 phase 3 wire balanced load	3WB
	Power factor/	PF	
	Phase angle	PA	
	<b>*Network supported :</b>	Single phase/	1P2W
		3 phase 4 wire balanced load	4WB
		3 phase 3 wire balanced load	3WB
		(U12I1) 3 phase balanced load	3WB - U12
(U13I1) 3 phase balanced load		3WB - U13	
(U23I1) 3 phase balanced load		3WB - U23	



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2	<b>Frequency of Input</b> (50 Hz / 60 Hz)	F
3	<b>Auxiliary Supply</b>	
	High Aux (60V....300 VAC-DC)	H
	Low Aux (24V....60 VAC-DC)	L
4	<b>Output 1</b>	
	**Current = -20....20 mA	O1A1
	Current = 0....20 mA	O1A2
	Current = 4....20 mA	O1A3
	**Voltage = -10....10 V	O1V1
	Voltage = 0....10 V	O1V2
	<b>Optional factory set ranges</b>	
	Current = 0....10 mA	O1A4
	Current = 0....5 mA	O1A5
	Current = 0....2.5 mA	O1A6
	Current = 0....1 mA	O1A7
	Voltage = 0....5 V	O1V3
	Voltage = 0....2.5 V	O1V4
	Voltage = 0....1 V	O1V5
5	<b>Output 2</b>	
	Without output 2	O200
	**Current = -20....20 mA	O2A1
	Current = 0....20 mA	O2A2
	Current = 4....20 mA	O2A3
	**Voltage = -10....10 V	O2V1
	Voltage = 0....10 V	O2V2
	<b>Optional factory set ranges</b>	
	Current = 0....10 mA	O2A4
	Current = 0....5 mA	O2A5
	Current = 0....2.5 mA	O2A6
	Current = 0....1 mA	O2A7
	Voltage = 0....5 V	O2V3
	Voltage = 0....2.5 V	O2V4
	Voltage = 0....1 V	O2V5
6	<b>LCD display module</b>	
	With Display	D
	Without Display	Z
7	<b>RS-485 module</b>	
	With RS-485	R
	Without RS-485	Z
8	<b>PRKAB 601module</b>	
	With PRKAB 601	PR
	Without PRKAB 601	Z

## Optional Version Example:

**Q - 3WB - F - H - O1A2 - O1V2 - O2V2- O2A2 - D - R - PR**

Reactive Power transducer, 3 phase 3 wire balanced network ,50/60 Hz nominal input signal, High Aux,

Output1= 0...20mA or 0...10V , Output2= 0...10V or 0...20mA,

With LCD display module , with RS-485 & with PRKAB 601 cable.

**Note:** End value of output can not be changed onsite.

\* Transducer type and network supported are onsite programmable.

\*\*For apparent power, -20...0....20mA or ,-10....0....10V is not applicable.



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