**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).

**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.

<table>
<thead>
<tr>
<th>Symbols and their meaning:</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>X0</td>
</tr>
<tr>
<td>X1</td>
</tr>
<tr>
<td>X2</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>Y0</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Y1</td>
</tr>
<tr>
<td>Y2</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Rn</td>
</tr>
<tr>
<td>Fn</td>
</tr>
</tbody>
</table>

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Subject to change without Notice
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 V ≤ U_N ≤ 500 V-L

PT Primary range
100 V to 692.8 KVL-L

Nominal Frequency F_N
25 Hz to 65 Hz

Nominal input Voltage burden ≤ 0.6 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
(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 ≤ I_N ≤ 5 A

CT Primary range
1 A to 9999 A

Nominal Frequency F_N
25 Hz to 65 Hz

Nominal input Current burden ≤ 0.2 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 X2 (calibration factor Xc):**
With single phase AC active/reactive/apparent power
0.30 ≤ (X2/Rated Power) ≤ 1.3 • U_N /√3 • I_N

With 3-phase AC active/reactive/apparent power
0.30 ≤ (X2/Rated Power) ≤ 1.3 • √3 • U_N • I_N

(For single phase Rated Power=U_N /√3 • I_N)

(For Three phase Rated Power=√3 • U_N • I_N)

**Phase Angle & Power Factor measuring Range:**
Minimum span 20° to Maximum Span 360°

**Measuring Output Y (Single or Optional Dual):**
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
0 ≤ R ≤ 15V/Y2

Output burden with DC voltage output
Y2/(2 mA) ≤ R ≤ ∞
RISH CON - P
POWER \ PHASE ANGLE \ POWER FACTOR TRANSDUCER

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

Auxiliary Power Supply:
AC/DC Auxiliary Supply
AC Auxiliary supply frequency range 60V…300 VAC-DC ±5% or 24V...60V VAC-DC ± 10%
Auxiliary supply consumption

<table>
<thead>
<tr>
<th>Range</th>
<th>Maximum Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>60V…300 VAC-DC</td>
<td>≤ 8 VA for Single output</td>
</tr>
<tr>
<td>24V…60 VAC-DC</td>
<td>≤ 5 VA for Single output</td>
</tr>
</tbody>
</table>

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 TRANSUCER 0.5°C

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

<table>
<thead>
<tr>
<th>Linear characteristics</th>
<th>Bent characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>C= \frac{Y1 - Y0}{X2 - X0} or C=1</td>
<td>C= \frac{Y1 - Y0}{X2 - Y2} or C=1</td>
</tr>
</tbody>
</table>

For X0 ≤ X ≤ X1

For X1 ≤ X ≤ X2

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

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

Subject to change without Notice
Output Characteristics:

Example of setting with Linear Characteristics:

\[
\begin{array}{c}
X_0 = \text{Start value of input} \\
Y_0 = \text{Start value of output} \\
X_1 = \text{Elbow value of input} \\
Y_1 = \text{Elbow value of output} \\
X_2 = \text{End value of input} \\
Y_2 = \text{End value of output}
\end{array}
\]

Limit of the output range

\[
\Delta X_0/Y_0 \rightarrow \Delta X_1/Y_1 \rightarrow \Delta X_2/Y_2
\]

Example of setting with bent Characteristics:

\[
\begin{array}{c}
X_0 = \text{Start value of input} \\
Y_0 = \text{Start value of output} \\
X_1 = \text{Elbow value of input} \\
Y_1 = \text{Elbow value of output} \\
X_2 = \text{End value of input} \\
Y_2 = \text{End value of output}
\end{array}
\]

Limit of the output range

Additional Error:

Temperature influence: ± 0.2%/10°C

Influence of Variations:

As per IEC / EN 60688 standard.

Output stability: < 30 min

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 III

Insulation Voltage 1min. (EN 61010-1)

7700V DC, Input versus outer surface

5200V DC, Input versus all other circuits

5200V DC, Auxiliary supply versus outer surface and output

690V DC, 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 Rail mounting / wall mounting

Weight Approx. 0.4kg

Connection Terminal

Connection Element Conventional Screw type terminal with indirect wire pressure

Permissible cross section of the connection lead ≤ 4.0 mm² single wire or 2 x 2.5 mm² fine wire
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

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
IEC 1000-4-2/-3/-4/-5/-6
EN 55 011 Electromagnetic compatibility.

LED Indication:

<table>
<thead>
<tr>
<th>ON LED</th>
<th>Aux.supply healthy condition</th>
<th>Green LED continuous ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>O/P1 LED</td>
<td>Output1 voltage selection</td>
<td>Green LED continuous ON</td>
</tr>
<tr>
<td>O/P2 LED</td>
<td>Output1 current selection</td>
<td>Red LED continuous ON</td>
</tr>
<tr>
<td>O/P2 LED</td>
<td>Output2 voltage selection</td>
<td>Green LED continuous ON</td>
</tr>
<tr>
<td>O/P2 LED</td>
<td>Output2 current selection</td>
<td>Red LED continuous ON</td>
</tr>
</tbody>
</table>

Electrical Connections:

<table>
<thead>
<tr>
<th>Connection</th>
<th>Terminal details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Voltage Input</td>
<td>UL1 2</td>
</tr>
<tr>
<td></td>
<td>UL2 5</td>
</tr>
<tr>
<td></td>
<td>UL3 8</td>
</tr>
<tr>
<td></td>
<td>N 11</td>
</tr>
<tr>
<td>Auxiliary Power supply</td>
<td>~, + 13</td>
</tr>
<tr>
<td></td>
<td>~, - 14</td>
</tr>
<tr>
<td>Measuring output - 1</td>
<td>+ 15</td>
</tr>
<tr>
<td></td>
<td>- 16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connection</th>
<th>Terminal details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Current Input</td>
<td>I1 1</td>
</tr>
<tr>
<td></td>
<td>I1' 3</td>
</tr>
<tr>
<td></td>
<td>I2 4</td>
</tr>
<tr>
<td></td>
<td>I2' 6</td>
</tr>
<tr>
<td></td>
<td>I3 7</td>
</tr>
<tr>
<td></td>
<td>I3' 9</td>
</tr>
<tr>
<td>Measuring output - 2</td>
<td>+ 17</td>
</tr>
<tr>
<td></td>
<td>- 18</td>
</tr>
</tbody>
</table>
## Electrical Networks:

### Terminal Details

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input V</td>
<td>Aux</td>
</tr>
<tr>
<td>Output 1</td>
<td></td>
</tr>
<tr>
<td>Output 2</td>
<td>(Optional)</td>
</tr>
</tbody>
</table>

#### Dimensions

- **Width:** 78.5 mm
- **Height:** 65.5 mm

**Fig. 2:** (All dimensions are in mm.)
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

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

<table>
<thead>
<tr>
<th>DIP Switch Setting</th>
<th>Type of Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON 1234</td>
<td>load-independent current</td>
</tr>
<tr>
<td>ON 1234</td>
<td>load-independent voltage</td>
</tr>
</tbody>
</table>

Fig. 5
### 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

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

**Note:** End value of output can not be changed onsite. 
* Transducer type and network supported are onsite programmable.

### Ordering Information: Optional Versions

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Transducer parameter</th>
<th>Ordering Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input Signal</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td>Active Power</td>
<td>Q</td>
</tr>
<tr>
<td></td>
<td>Apparent Power</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td><em>Network supported:</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Single phase</td>
<td>1P2W</td>
</tr>
<tr>
<td></td>
<td>3 phase 3 wire unbalanced load</td>
<td>3WUB</td>
</tr>
<tr>
<td></td>
<td>3 phase 4 wire unbalanced load</td>
<td>4WUB</td>
</tr>
<tr>
<td></td>
<td>3 phase 4 wire balanced load</td>
<td>4WB</td>
</tr>
<tr>
<td></td>
<td>3 phase 3 wire balanced load</td>
<td>3WB</td>
</tr>
<tr>
<td></td>
<td>Power factor/Phase angle</td>
<td>PF/PA</td>
</tr>
<tr>
<td></td>
<td><em>Network supported:</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Single phase</td>
<td>1P2W</td>
</tr>
<tr>
<td></td>
<td>3 phase 4 wire balanced load</td>
<td>4WB</td>
</tr>
<tr>
<td></td>
<td>3 phase 3 wire balanced load</td>
<td>3WB</td>
</tr>
<tr>
<td></td>
<td>(U1211) 3 phase balanced load</td>
<td>3WB - U12</td>
</tr>
<tr>
<td></td>
<td>(U1311) 3 phase balanced load</td>
<td>3WB - U13</td>
</tr>
<tr>
<td></td>
<td>(U2311) 3 phase balanced load</td>
<td>3WB - U23</td>
</tr>
</tbody>
</table>
### Frequency of Input (50 Hz / 60 Hz)

**F**

### Auxiliary Supply

- **High Aux (60V...300 VAC-DC)**
  - **Current** = -20,...20 mA
  - **Current** = 0...20 mA
  - **Current** = 0...20 mA
  - **Voltage** = 0...10 V
  - **Voltage** = 0...10 V

- **Low Aux (24V...60 VAC-DC)**
  - **Current** = 0...5 mA
  - **Current** = 0...5 mA
  - **Current** = 0...2.5 mA
  - **Current** = 0...2.5 mA
  - **Voltage** = 0...10 V
  - **Voltage** = 0...10 V
  - **Voltage** = 0...2.5 V
  - **Voltage** = 0...2.5 V
  - **Voltage** = 0...1 V
  - **Voltage** = 0...1 V

### Output 1

- **Current** = -20,...20 mA
- **Current** = 0...20 mA
- **Current** = 4...20 mA
- **Voltage** = -10...10 V
- **Voltage** = 0...10 V

### Optional factory set ranges

- **Current** = 0...10 mA
- **Current** = 0...5 mA
- **Current** = 0...2.5 mA
- **Current** = 0...2.5 mA
- **Voltage** = 0...10 V
- **Voltage** = 0...10 V

### Output 2

- **Without output 2**
- **Current** = -20,...20 mA
- **Current** = 0...20 mA
- **Current** = 4...20 mA
- **Voltage** = -10...10 V
- **Voltage** = 0...10 V

### Optional factory set ranges

- **Current** = 0...10 mA
- **Current** = 0...5 mA
- **Current** = 0...2.5 mA
- **Current** = 0...2.5 mA
- **Voltage** = 0...10 V
- **Voltage** = 0...10 V

### LCD display module

- **With Display**
- **Without Display**

### RS-485 module

- **With RS-485**
- **Without RS-485**

### PRKAB 601 module

- **With PRKAB 601**
- **Without PRKAB 601**

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**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.**