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:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Input</td>
</tr>
<tr>
<td>X0</td>
<td>Start value of input</td>
</tr>
<tr>
<td>X1</td>
<td>Elbow value of input</td>
</tr>
<tr>
<td>X2</td>
<td>End value of input</td>
</tr>
<tr>
<td>Y</td>
<td>Output DC Voltage / DC Current</td>
</tr>
<tr>
<td>Y0</td>
<td>Start value of output DC</td>
</tr>
<tr>
<td>Y1</td>
<td>Elbow value of output DC</td>
</tr>
<tr>
<td>Y2</td>
<td>End value of output DC</td>
</tr>
<tr>
<td>Rn</td>
<td>Rated value of output burden</td>
</tr>
<tr>
<td>Fn</td>
<td>Nominal Frequency</td>
</tr>
</tbody>
</table>
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 (Un):**
- Nominal input Voltage (AC RMS) (PT Secondary range) 100 V ≤ Un ≤ 500 V-L
- Nominal Frequency F_n 25 Hz to 65 Hz (Optional - 400Hz)
- Nominal input Voltage burden < 0.6 VA per phase at Un

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

**Nominal Current Input (In):**
- Nominal input Current (AC RMS) (CT Secondary range) 1 A ≤ In ≤ 5 A
- Nominal Frequency F_n 25 Hz to 65 Hz (Optional - 400Hz)
- 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).

**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 0.30 ≤ (X2/Rated Power) ≤ 1.3 • √3 • Un • In
  (For single phase Rated Power=Un /√3 • In)
  (For Three phase Rated Power=√3 • Un • In)

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

**Measuring Output Y (Single or Optional Dual):**

<table>
<thead>
<tr>
<th>Output type</th>
<th>Load independent DC Voltage , DC Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On site selectable through DIP switches.</td>
</tr>
<tr>
<td>Load independent DC output</td>
<td>Unipolar 0...20mA / 4...20mA OR 0...10V.</td>
</tr>
<tr>
<td></td>
<td>Bipolar -20mA...0.....+20mA OR -10V....0....+10V</td>
</tr>
</tbody>
</table>

**Output burden with DC current output Signal**
0 ≤ R ≤ 15V/Y2

**Output burden with DC voltage output Signal**
Y2/(2 mA) ≤ R ≤ ∞
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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
60V…300 VAC-DC ± 5% or 24V…60V VAC-DC ± 10%
40 to 65 Hz

AC Auxiliary supply frequency range
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

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)

<table>
<thead>
<tr>
<th>Linear characteristics:</th>
<th>Bent characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C= (\frac{1-Y0}{Y2-X0}) or C=1</td>
<td>C= (\frac{Y1-Y0}{X1-X0} \times \frac{X2}{Y2}) or C=1</td>
</tr>
<tr>
<td>For X0 ≤ X ≤ X1</td>
<td>For X1 ≤ X ≤ X2</td>
</tr>
</tbody>
</table>

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 ± 1% With DC current output signal
Rn = Y2 / 1 mA ± 1% With DC voltage output signal

Miscellaneous
Acc. to IEC / EN 60688

Version: L 17/12/13
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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
± 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
EN 60 068-2-1/2/3 Cold, Dry, Damp heat
EN 60 068-2-1/-2/-3
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></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></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</td>
</tr>
<tr>
<td></td>
<td>UL2</td>
</tr>
<tr>
<td></td>
<td>UL3</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Auxillary Power supply</td>
<td>~, +</td>
</tr>
<tr>
<td></td>
<td>~, -</td>
</tr>
<tr>
<td>Measuring output - 1</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>-</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</td>
</tr>
<tr>
<td></td>
<td>I1'</td>
</tr>
<tr>
<td></td>
<td>I2</td>
</tr>
<tr>
<td></td>
<td>I2'</td>
</tr>
<tr>
<td></td>
<td>I3</td>
</tr>
<tr>
<td></td>
<td>I3'</td>
</tr>
<tr>
<td>Measuring output - 2</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
### Terminal Details

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Input V</td>
</tr>
<tr>
<td>4</td>
<td>Output-1</td>
</tr>
<tr>
<td>8</td>
<td>UL1</td>
</tr>
<tr>
<td>11</td>
<td>UL2</td>
</tr>
<tr>
<td>13</td>
<td>UL3</td>
</tr>
<tr>
<td>14</td>
<td>AUX</td>
</tr>
</tbody>
</table>

### Dimensions

- **Width**: 78.5 mm
- **Height**: 65.5 mm
- **Depth**: 100.9 mm
- **Overall Size**: 106.5 mm

*Fig 2.* Input V

*Fig 3.* (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 load-independent current

<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>

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.

![](Fig_4.png)

![](Fig_5.png)
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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

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

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

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**Ordering Information :** Optional Versions

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**Sr.No.** | **Transducer parameter** | **Ordering Code**
---|---|---
1 | Input Signal | P
| Active Power | Q
| Reactive Power | S
| Apparent Power | 
| *Network supported :* | 
| 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/ Phase angle** | PF | PA

| *Network supported :* | 
| Single phase/ | 1P2W
| 3 phase 4 wire balanced load | 4WB
| 3 phase 3 wire balanced load | 3WB
| (U1211) 3 phase balanced load | 3WB - U12
| (U1311) 3 phase balanced load | 3WB - U13
| (U2311) 3 phase balanced load | 3WB - U23
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#### Frequency of Input (50 Hz / 60 Hz)
- **F**

#### Auxiliary Supply
- High Aux (60V...300 VAC-DC): **H**
- Low Aux (24V...60 VAC-DC): **L**

#### Output 1
- **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**

**Optional factory set ranges**
- **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**

#### Output 2
- **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**

**Optional factory set ranges**
- **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**

#### LCD display module
- **D**
- Without Display: **Z**

#### RS-485 module
- With RS-485: **R**
- Without RS-485: **Z**

#### PRKAB 601 module
- With PRKAB 601: **PR**
- Without PRKAB 601: **Z**

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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.**