Ziegler

Redefine Innovative Metering

Operating Manual

Power \ Phase Angle \ Power Factor Transducer

Ziegler Pro - P

POWER \ PHASE ANGLE \ POWER FACTOR TRANSDUCER
Installation & Operating Instructions

Section Contents

1. Introduction

The **POWER \ PHASE ANGLE \ POWER FACTOR TRANSDUCER** is a DIN Rail /Wall mounted 78.5 X 65.5mm Transducer.
The Transducer is used to measure and convert Active, Apparent, Reactive Power, Phase Angle & Power Factor of a Single phase or Three phase AC System with balanced or unbalanced load into an proportional DC current or voltage output signal.

Transducer canbe configured and programmed on site for the following :

PT Primary ,PT Secondary, CT Primary, CT Secondary, Input Characteristics (i.e start, end and elbow value of Input) and Output Characteristics (i.e Voltage or Current and start, end and elbow Value of outputs.)

1.1: LED Indication

LED	LED OPERATING CONDITION	LED OPERATING STATUS
ON	Aux. Supply healthy condition	Green LED continuous ON
O/P 1	Output1 Voltage Output1 Current	Green LED continuous ON Red LED continuous ON
O/P 2	Output2 Voltage Output2 Current	Green LED continuous ON Red LED continuous ON

Table 1: Measured parameters

Measured parameters	Unit of Measurement
Active Power	W
Reactive Power	VAr
Apparent Power	VA
Power Factor	–
Phase Angle	°(DEG)

2. Programming

Programming of transducer can be done in two ways :

2.1. Programming Via Programming port available at front of Transducers using optional PRKAB601 Adapter.
2.2. Programming Via optional RS485(MODBUS)communication port.

2.1: Programming Via Programming port available at front of Transducers using optional PRKAB601 Adapter. .

For programming of Transducer, steps to be followed are

Connections

PC ⟶ PRKAB 601 ⟶ Transd.ucer.
The powersupply must be applied to transducer b e fore it can be programmed.
The Configuration software is supplied on a CD along with software help file .
The programming cable PRKAB601 adjusts the signal level and provides the electrical insulation between the PC and Transducers.
Configuration software can be used to program following parameters

1) PT Ratio.

2) CT Ratio.

3) RS485 Parameters.

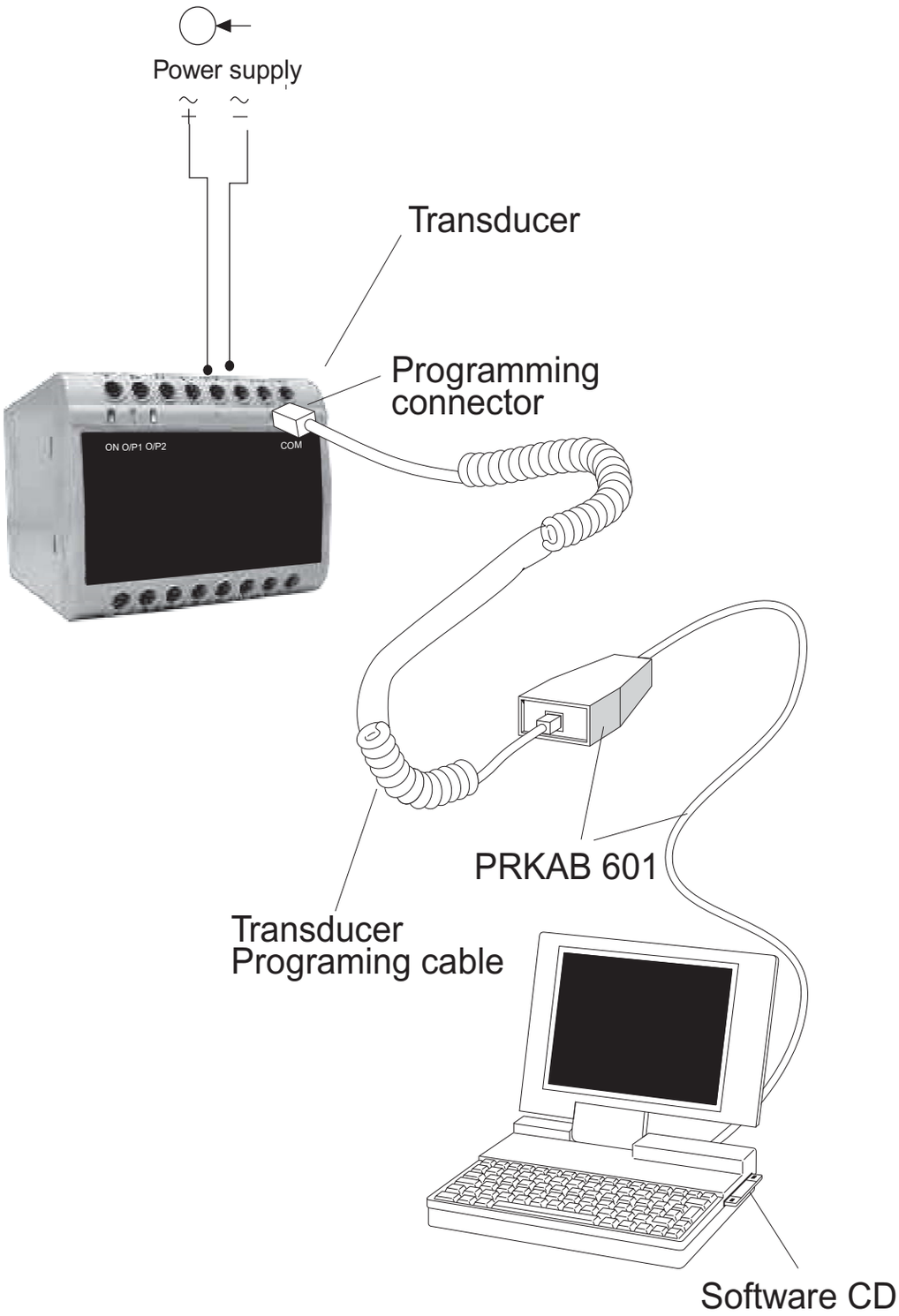
4) Transducer Type.

5) System Type.

6) Output Type (along with DIP switch setting).

7) Input Characteristics.

8) Output Characteristics.


Power supply
Transducer
Programming
connector
ON O/P1 O/P2
COM
PRKAB 601
Transducer
Programing cable
Software CD

2.2 Programming Via optional RS485 (MODBUS) communication port.

(Refer section 3 for programming through MODBUS)

2.2.1: DIP Switch Setting for Changing Output type

The Transducer output type can be changed from DC current to DC voltage depending upon user requirement on site.

To change output type user has to set the transducer output type parameter either to voltage or current along with DIP switch setting.

The transducer output type parameters can be configured using one of the two below given methods.

A) PRKAB 601(optional) : Using PRKAB601 throughTransducer programming port (COM) and using PC based configuration software.

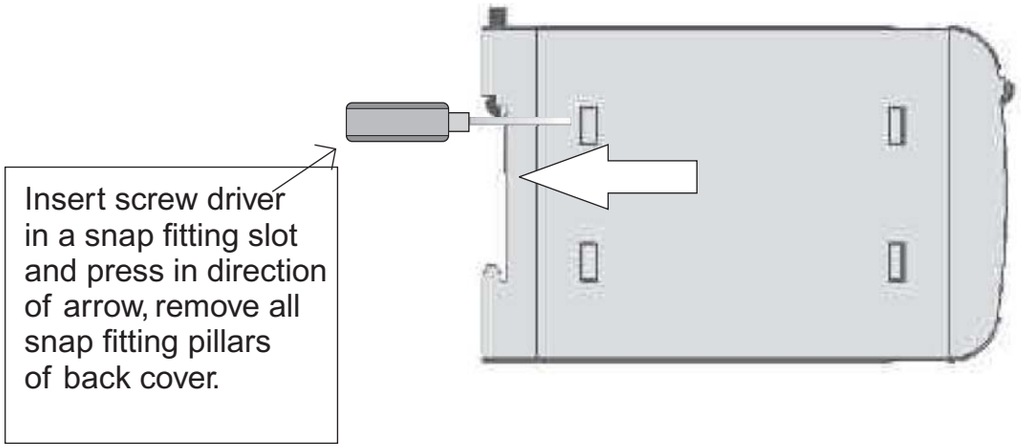
B) Modbus RS 485(optional): Using modbus inter face user can configure the output type refer modbus RS 485 section.

Note: If DIP switch setting is done first and then output type parameter is configured using either of the above three methods then switch OFF -ON the Transducer.

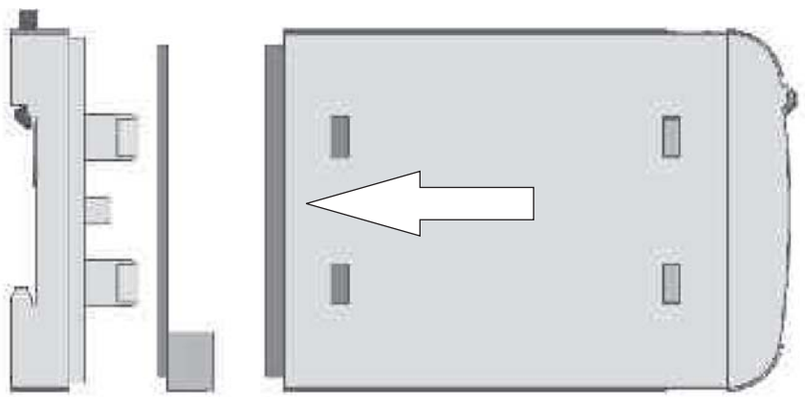
For changing DIP switches follow these steps

1) To change O/P switches from Current to Voltage or vice versa, ensure that transducer should be Electrically dead and all connection wires should be disconnected.

2) Remove the back cover of Transducer by using screw driver.



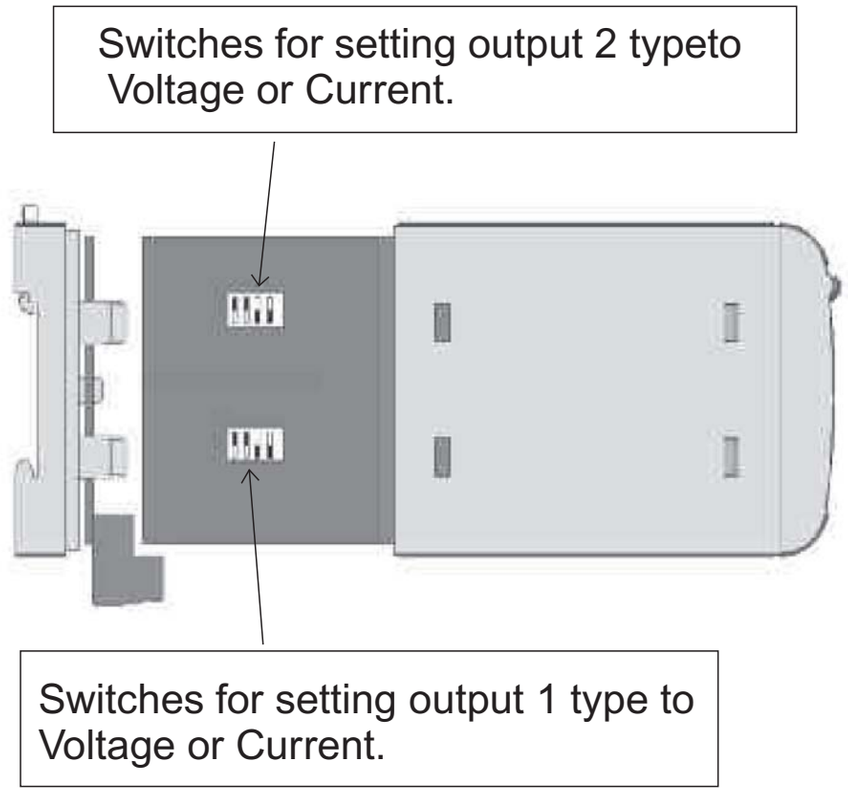
3) Remove the back cover and take the Output card out.



4) Configure the switches for Voltage or Current as shown below.

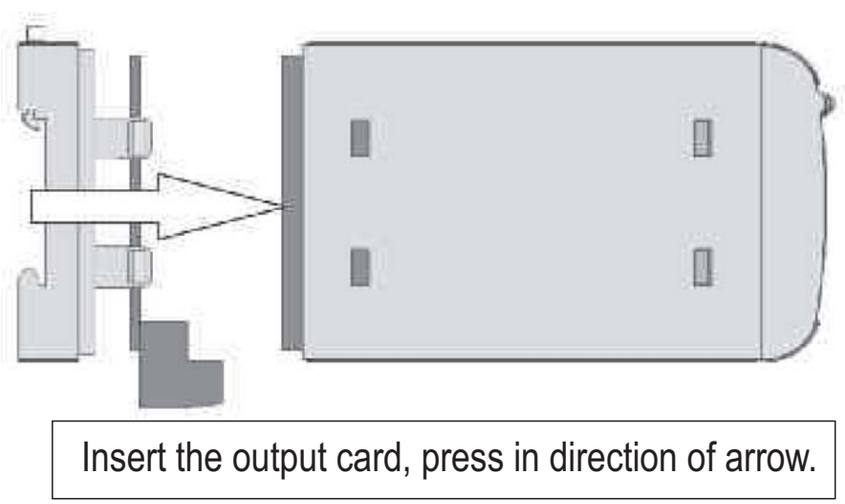
DIP Switch Setting	Type of Output Signal
	load-independent voltage
	load-independent current

Note :
Black portion
in this diagram
indicates switch
position.

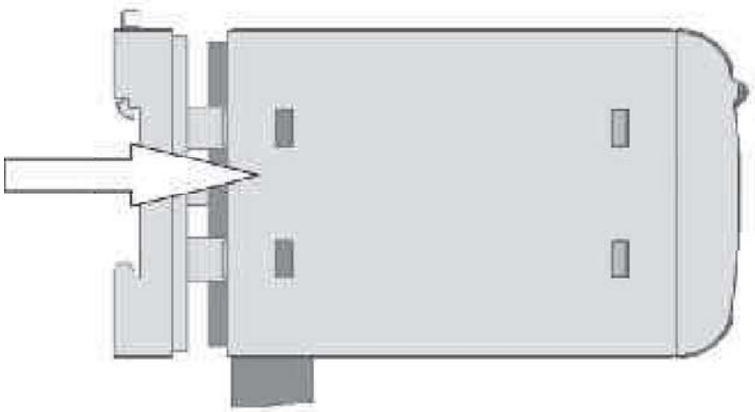


NOTE:
Black portion in above diagram indicate switch position.

5) After changing the switches for desired Output, Insert the Output Card.

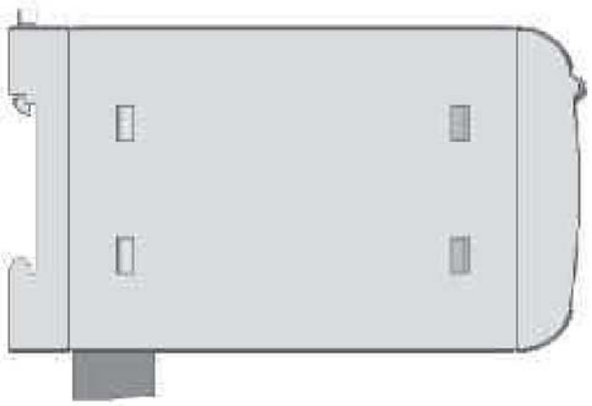


6) After inserting the output card insert the Interface card PCB and back cover.



Insert the Interface card PCB and Back cover, press in direction of arrow.

7) After inserting the Back cover of transducer, transducer is ready for required application.



3. RS 485 (ModBus)

Transducer supports MODBUS (RS485) RTU protocol (2-wire).

Connection should be made using twisted pair shielded cable. All "A" and "B" connections are daisy chained together. The screens should also be connected to the “Gnd” terminal. To avoid the possibility of loop currents,

an Earth connection should be made at one point on the network.Loop (ring) topology does not require any termination load. Line topology may or may not require terminating loads depending on the type and length of cable used. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (1/4 Watt min.) resistor.

RS 485 network supports maximum length of 1.2km. Including the Master, a maximum of 32 instruments can be connected in RS485 network. The permissible address range for Power Tranducer is between 1 and 247 for 32 instruments. Broadcast Mode (address 0) is not allowed.

The maximum latency time of an Transducer is 200ms i.e. this is the amount of time that can pass before the first response character is output.

After sending any query through software (of the Master) , it must allow 200 ms of time to elapse before assuming that the Transducer is not going to respond. If slave does not respond within 200 ms, Master can ignore the previous query and can issue fresh query to the slave.

The each byte in RTU mode has following format:

	8-bit binary, hexadecimal 0-9, A-F 2 hexadecimal characters contained in each 8-bit field of the message
Format of Data Bytes	4 bytes (32 bits) per parameter. Floating point format (to IEEE 754) Most significant byte first (Alternative least significant byte first)
Error Checking Bytes	2 byte Cyclical Redundancy Check (CRC)

Byte format	1 start bit, 8 data bits, least significant bit sent first 1 bit for even/odd parity 1 stop bit if parity is used; 1 or 2 bits if no parity

Communication Baud Rate is user selectable from the front panel between 2400, 4800, 9600, 19200 bps.

Function code :

03	Read Holding Registers	Read content of read /write location (4X)
04	Read input Registers	Read content of read only location (3X)
16	Presets Multiple Registers	Set the content of read / write locations (4X)

Exception Cases : An exception code will be generated when Transducer receives ModBus query with valid parity & error check but which contains some other error (e.g. Attempt to set floating point variable to an invalid value) The response generated will be “Function code” ORed with HEX (80H). The exception codes are listed below

01	Illegal function	The function code is not supported by Power Transducer.
02	Illegal Data Address	Attempt to access an invalid address or an attempt to read or write part of a floating point value
03	Illegal Data Value	Attempt to set a floating point variable to an invalid value

3.1: Accessing 3 X register for reading measured values:

Two consecutive 16 bit registers represent one parameter. Refer table 2 for the addresses of 3X registers (Parameters measured by the instruments).
Each parameter is held in the 3X registers. Modbus Code 04 is used to access all parameters.

Example :

To read parameter,
Active power sum : Start address= 34 (Hex) Number of registers = 02

Note : Number of registers = Number of parameters x 2

Each Query for reading the data must be restricted to 20 parameters or less. Exceeding the 20 parameter limit will cause a ModBus exception code to be returned.

Query :

01 (Hex)	04 (Hex)	00 (Hex)	34(Hex)	00 (Hex)	02(Hex)	30 (Hex)	05 (Hex)
Device Address	Function Code	Start Address High	Start Address Low	Number of Registers Hi	Number of Registers Lo	CRC Low	CRC High

Start Address High : Most significant 8 bits of starting address of the parameter requested.
Start Address low : Least significant 8 bits of starting address of the parameter requested.
Number of register Hi : Most significant 8 bits of Number of registers requested.
Number of register Lo : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter.)
Response: Active Power Sum (4331 W)

01 (Hex)	04 (Hex)	04 (Hex)	45 (Hex)	87 (Hex)	68 (Hex)	B5 (Hex)	B0 (Hex)	D6 (Hex)
Device Address	Function Code	Byte Count	Data Register1 High Byte	Data Register1 Low Byte	Data Register2 High Byte	Data Register2 Low Byte	CRC Low	CRC High

Byte Count : Total number of data bytes received.

Data register 1 High Byte : Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte : Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte : Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte : Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Table 2 : 3 X register addresses (measured parameters)

Address (Register)	Parameter No.	Parameter	Modbus start address Hex	
			High Byte	Low Byte
For Active power				
30053	27	Active power sum	0	34
For Apparent power				
30057	29	Apparent power sum	0	38
For Reactive power				
30061	31	Reactive power sum	0	3C
For Power factor				
30063	32	Power factor average	0	3E
For Phase angle				
30067	34	Phase angle average	0	42

For Diagnosis mode only:

Address (Register)	Parameter No.	Parameter	Modbus start address Hex	
			High Byte	Low Byte
30001	1	voltage 1	0	0
30003	2	voltage 2	0	2
30005	3	voltage 3	0	4
30007	4	current 1	0	6
30009	5	current 2	0	8
30011	6	current 3	0	0A
30043	22	voltage average	0	2A
30047	24	current average	0	2E
30071	36	frequency	0	46
30073	37	VL1-2	0	48
30075	38	VL2-3	0	4A
30077	39	VL3-1	0	4C

3.2: Accessing 4 X register for Reading & Writing:

Each setting is held in the 4X registers .ModBus code 03 is used to read the current setting and code 16 is used to write/change the setting. Refer **Table 3** for 4 X Register addresses.

Example : Reading Device address

Device address : Start address = 0E (Hex) Number of registers = 02

Note :Number of registers = Number of Parameters x 2

Query :

Device Address	01 (Hex)
Function Code	03 (Hex)
Start Address High	00 (Hex)
Start Address Low	0E(Hex)
Number of Registers Hi	00 (Hex)
Number of Registers Lo	02 (Hex)
CRC Low	A5 (Hex)
CRC High	C8 (Hex)

Start Address High : Most significant 8 bits of starting address of the parameter requested.

Start Address low : Least significant 8 bits of starting address of the parameter requested.

Number of register Hi : Most significant 8 bits of Number of registers requested.

Number of register Lo : Least significant 8 bits of Number of registers requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Response: Device address (1)

Device Address	01 (Hex)
Function Code	03 (Hex)
Byte Count	04 (Hex)
Data Register1 High Byte	3F (Hex)
Data Register1Low Byte	80 (Hex)
Data Register2 High Byte	00 (Hex)
Data Register2 Low Byte	00(Hex)
CRC Low	F7 (Hex)
CRC High	CF (Hex)

Byte Count :Total number of data bytes received.

Data register 1 High Byte :Most significant 8 bits of Data register 1 of the parameter requested.

Data register 1 Low Byte :Least significant 8 bits of Data register 1 of the parameter requested.

Data register 2 High Byte:Most significant 8 bits of Data register 2 of the parameter requested.

Data register 2 Low Byte :Least significant 8 bits of Data register 2 of the parameter requested.

(Note : Two consecutive 16 bit register represent one parameter.)

Table 3 : 4 X register addresses

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
40001	1	-	-	-	-
40003	2	Mode selection	R/Wp	00	02
40005	3	System Type	R/Wp	00	04
40007	4	PT Primary	R/Wp	00	06
40009	5	PT Secondary	R/Wp	00	08
40011	6	CT Primary	R/Wp	00	0A
40013	7	CT Secondary	R/Wp	00	0C
40015	8	Device address	R/Wp	00	0E
40017	9	RS 485 Setup	R/Wp	00	10
40019	10	Password	R/Wp	00	12
40021	11	-	-	-	-
40023	12	-	-	-	-
40025	13	-			

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
40027	14	Sim_Output A	Wp	00	1A
40029	15	Sim_Output B	Wp	00	1C
40031	16	Analog O/P Type 1	R/Wp	00	1E
40033	17	Output para select 1	R/Wp	00	20
40035	18	Analog O/P Type 2	R/Wp	00	22
40041	19	Diagonsis Mode	R/Wp	00	28

Explanation for 4 X register :

Address	Parameter	Description
40003	Output Mode Selection	This is used to select the output mode. By setting output in simulation mode user can simulate the output variation without giving input. Normal mode = 1. Simulation mode = 2. **Note:** After power ON / OFF Transducer goes to normal mode
40005	System Type	This is used to select the system type. **For Apparent / Active / Reactive Power Transducer** 1) 3 Phase 3 wire unbalanced = 3. 2) 3 Phase 4 wire unbalanced = 4. 3) Single Phase = 1. 4) 3 Phase 4 wire balanced = 8. 5) 3 Phase 3 wire balanced = 2. **For Phase Angle or Power Factor Transducer** 1) U12 I1(3 Phase 3 wire balanced) = 5. 2) U23 I1 (3 Phase 3 wire balanced) = 6. 3) U31 I1 (3 Phase 3 wire balanced) = 7.

Address	Parameter	Description
		4) Single Phase = 1. 5) 3 Phase 4 wire balanced = 8. 6) 3 Phase 3 wire balanced = 2.
40007	PT Primary	This address allows the user to read and write PT Primary value. The PT Primary value can be set between100 to 692.8 KVLL and also depends upon the per phase 1000 MVA Restriction of power combined with CT Primary.
40009	PT Secondary	This address is used to read and write the PT secondary value in range between 100V to 500V L-L.
40011	CT Primary	This address allows the user to read and write CT Primary value.The maximum settable value is 9999 & also depends on the per phase 1000 MVA Restriction of power combined with PT primary.
40013	CT Secondary	This address is used to read and write the CT secondary value in range between 1A to 5A.
40015	Device Address	This address is used to set the Device Address between 1 to 247.
40017	RS 485 Setup	This address is used to set the Baud rate, Parity, No of Stop bits.
40019	Password	This address is used to set & reset the password. Valid Range of Password can be set is 0000 - 9999 . 1) if password lock is present & if this location is read it will return zero.

Address	Parameter	Description
		2) if pass word lock is absent & if this location is read it will return one. 3)if password lock is present & to disable this lock first send valid password to this location then write "0000" to this location.
40027	Sim_Output A	This address is used to simulate output1. Analog Output 1 can be set to 10% by writing a value1000 and can be set to 100% by writing a value 10000. **Note:** first transducers simulation mode is to be enable using address 40003.
40029	Sim_Output B	This address is used to simulate Output 2. Analog Output 2 can be set to 10% by writing a value1000 and can be set to 100% by writing a value 10000. **Note:** first transducers simulation mode is to be enable using address 40003.
40031	Analog O/P Type 1	This address is used to set the output 1 type as Voltage or Current. Voltage = 1. Current = 2.
40033	Output para Select	This address is used to set the Transducer type as **1)** Active Power = 1. **2)** Apparent Power = 2. **3)** Reactive power = 3. **4)** PF = 4. **5)** Phase Angle = 5.

Address	Parameter	Description
		Note: For system type 3Ph3W unbalance and 3Ph4W unbalance, transducer type such as PF and Phase angle are not applicable where as for system type U12 I1,U23 I1 and U31 I1,Transducer type such as Active power, Reactive power and Apparent power are not applicable.
40035	Analog O/P Type 2	This address is used to set output 2 type as Voltage/Current. Voltage = 1. Current = 2.
40041	Diagnosis Mode	This address is used to set transducer into the Diagonosis or Normal mode. Normal mode = 0 Diagnosis mode =1. **Note:** After power ON / OFF Transducer goes to normal mode

Table 4 : RS 485 Set-up Code

Baud Rate	Parity	Stop Bit	Decimal value
19200	NONE	01	12
19200	NONE	02	13
19200	EVEN	01	14
19200	ODD	01	15
9600	NONE	01	08
9600	NONE	02	09
9600	EVEN	01	10

Baud Rate	Parity	Stop Bit	Decimal value
9600	ODD	01	11
4800	NONE	01	04
4800	NONE	02	05
4800	EVEN	01	06
4800	ODD	01	07
2400	NONE	01	00
2400	NONE	02	01
2400	EVEN	01	02
2400	ODD	01	03

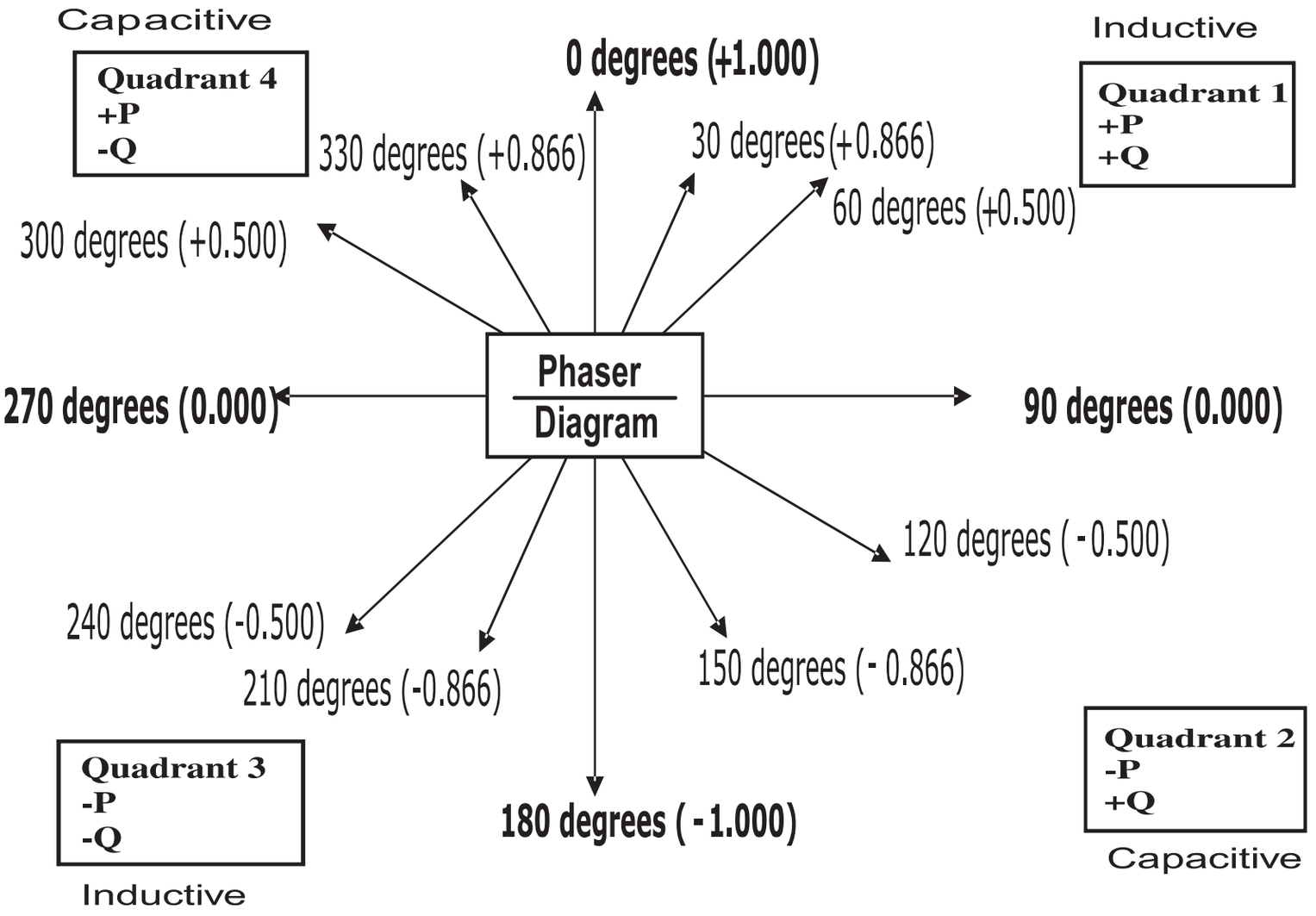
Note :
Codes not listed in the table above may give rise to unpredictable results including loss of communication. Exercise caution when attempting to change mode via direct Modbus writes.

4. Phaser Diagram :

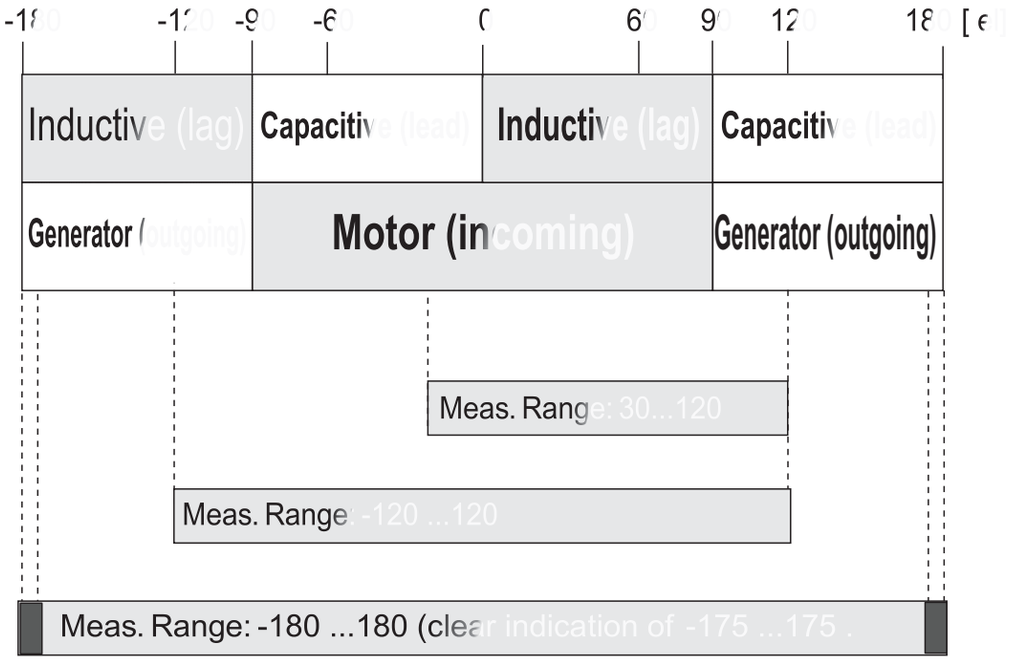
Quadrant 1: 0° to 90°
Quadrant 2: 90° to 180
Quadrant 3: 180° to 270°
Quadrant 4: 270° to 360°

Quadrant	Sign of Active Power (P)	Sign of Reactive Power (Q)	Sign of Power Factor (PF)	Inductive / Capacitive
1	+ P	+ Q	+	L
4	+ P	- Q	+	C
2	- P	+ Q	-	C
3	- P	- Q	-	L

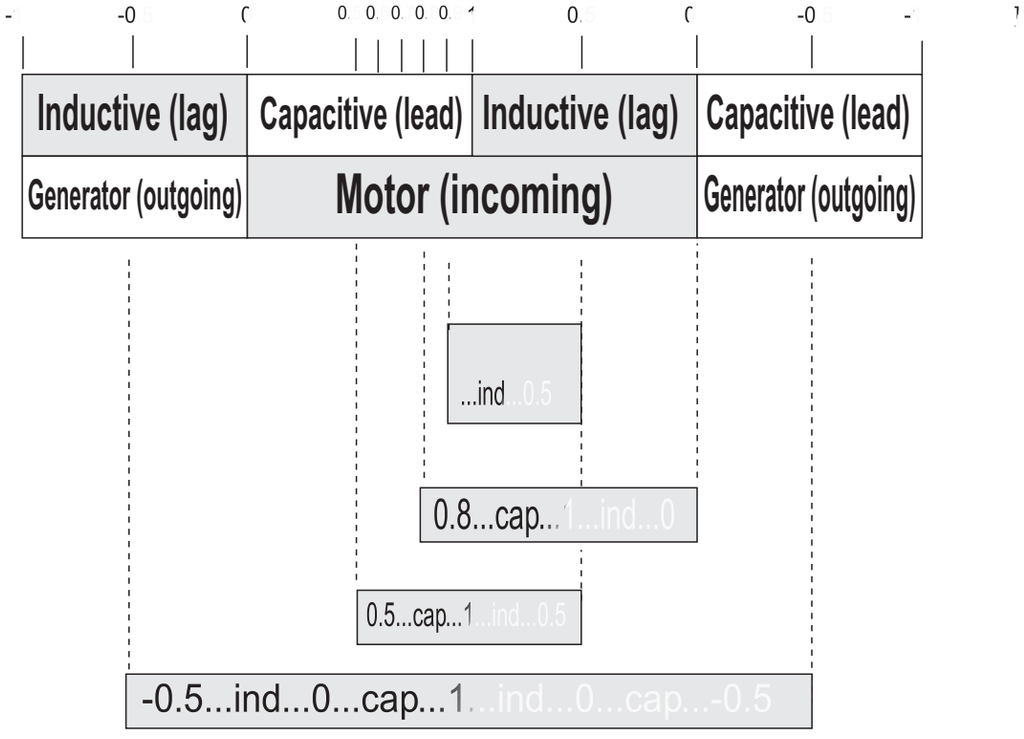
Inductive means Current lags Voltage
Capacitive means Current leads Voltage
Examples of measuring ranges with φ-linear output


Capacitive
Quadrant 4
+P
-Q
0 degrees (+1.000)
Inductive
Quadrant 1
+P
+Q
330 degrees (+0.866)
30 degrees (+0.866)
60 degrees (+0.500)
300 degrees (+0.500)
Phaser
Diagram
270 degrees (0.000)
90 degrees (0.000)
120 degrees (- 0.500)
240 degrees (-0.500)
210 degrees (-0.866)
150 degrees (- 0.866)
Quadrant 3
-P
-Q
180 degrees (- 1.000)
Quadrant 2
-P
+Q
Inductive
Capacitive

Examples of measuring ranges with Phase angle



Examples of measuring ranges with cosφ



5. Installation

Transducer can be mounted either on a top-hat rail or directly on to a wall by a mounting plate.

As the front of the enclosure conforms to IP 40. The terminals of the product should be protected from liquids.

The Transducer should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range 0 to 45^{0}C. Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.

⚠ Caution

1. **In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.**
2. **Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.**
3. **These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.**

5.1: EMC Installation Requirements

This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

1. Screened output and low signal input leads or have provision for fitting RF suppression components, such as ferrite absorbers, line filters etc., in the event that RF fields cause problems.

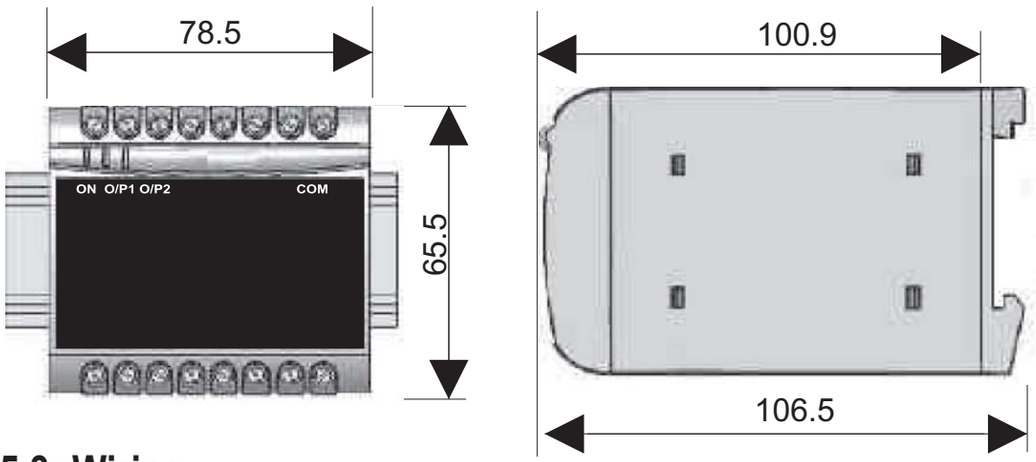
Note: It is good practice to install sensitive electronic instruments that are performing critical functions, in EMC enclosures that protect against electrical interference which could cause a disturbance in function.

2. Avoid routing leads alongside cables and products that are, or could be, a source of interference.

3. To protect the product against permanent damage, surge transients must be limited to 2kV pk. It is good EMC practice to suppress differential surges to 2kV at the source. The unit has been designed to automatically recover in the event of a high level of transients. In extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
   The Current inputs of these products are designed for connection in to systems via Current Transformers only, where one side is grounded.

4. ESD precautions must be taken at all times when handling this product.

5.2: Case Dimension



5.3: Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure. Choice of cable should meet local regulations. Terminal for both Current and Voltage inputs will accept up to 4.0 mm single wire or 2 x 2.5 mm fine wire.

5.4: Auxiliary Supply

Transducer should ideally be powered from a dedicated supply, however it may be powered from the signal source, provided the source remains within the limits of the chosen auxiliary voltage. A switch or circuit,may be used in close proximity to the equipment & within easy reach of the OPERATOR & It shall be marked as the disconnecting device for the equipment.

5.5: Fusing

It is recommended that all voltage lines are fitted with 1 amp HRC fuses.

5.6: Earth/Ground Connections

For safety reasons, CT secondary connections should be grounded in accordance with local regulations.

5.7: Maintenance

No maintenance is required.

6. Specifications :

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
RN = Rated value of output burden
U_N/I_N = Nominal input voltage/current

Measured Parameter — Active Power / Reactive Power / Apparent Power / Power Factor /Phase Angle.

Network Type Supported for Power : Single Phase /
3 phase 3 wire Unbalanced load/
3 phase 4 wire Unbalanced load/
3 3 phase 3 wire balanced load/
3
3 phase 4 wire balanced load.

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

Nominal Voltage Input(U_N):

Nominal input Voltage (AC RMS) (PT Secondary range)	$100\ V \leq U_N \leq 500\ V_{L-L}$
PT Primary range	100V to 692.8 KV_{L-L}
Nominal Frequency F_N	25 to 60 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 But maximum $300V_{L-N}$ with Aux 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 to 60 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(But max 250 A).

Allowed measuring range end values X2 (calibration factor Xc):

With single phase AC Active / Reactive / Apparent Power

[0.3 ≤ (X2 / Rated Power) ≤ 1.3]• (U_N • I_N /。3)

With 3-phase AC Active / Reactive / Apparent Power

[0.3 ≤ (X2 / Rated Power) ≤ 1.3]• (。3 • U_N • I_N)

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

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

Phase Angle & Power Factor measuring Range:

Minimum span 20 to Maximum Span 350

Auxiliary:

AC/DC Auxiliary Supply	60V…….300 VAC-DC ± 5%
AC/DC Auxiliary Supply frequency range	45 to 65 Hz
Auxiliary Supply consumption	≤ 8VA for one output ≤ 10VA for two output

Measuring Output Y(Single or Optional Dual):

Output type Y2	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 ≤ 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 ≤ 60 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

Accuracy :(Acc. to IEC 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)

Linear characteristics:

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

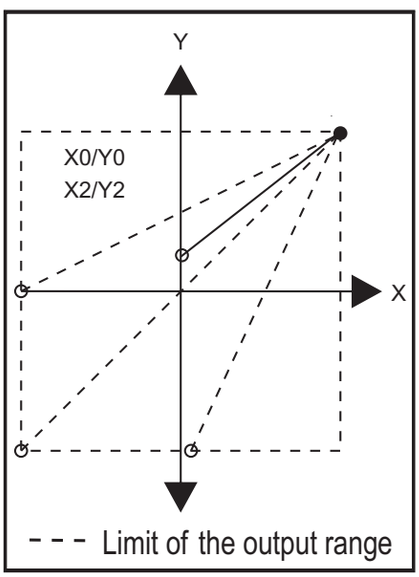
Bent characteristics:

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

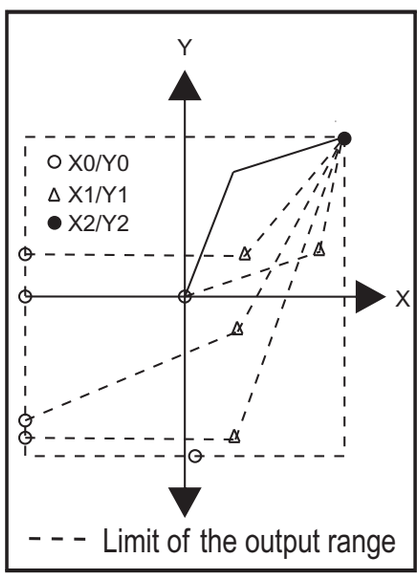
$$\text{For } X1 \le X \le X2 \quad C = \frac{1 - \frac{Y1}{Y2}}{1 - \frac{X1}{X2}} \quad \text{or } C=1$$

Output characteristics:

1) Example of setting with Linear characteristics:



2) 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	<30min

Safety:

Protection	IP 40, housing acording to EN 60 529 IP 20,terminal according to EN 60 529
Pollution degree	2
Installation Category	III
Insulation Voltage	50Hz,1min. (EN 61 010-1 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, non dripping, free of halogen
Mounting position	Rail mounting / wall mounting
Weight	Approx. 0.4kg

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
R_N = Rated value of output burden
U_N/I_N = Nominal input voltage/current

Reference conditions for Accuracy :

For Power Transducer:

Ambient temperature	23°C +/- 1°C
Pre-conditioning	30 min acc. to IEC EN - 60688
Input Variable	Rated Voltage / Rated Current Range
Input waveform	Sinusoidal, Form Factor 1.1107
Input signal frequency	50....60Hz
Active / Reactive / PF	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	Rated Value ±1%
Auxiliary supply frequency	Rated Value ±1%
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 - 60688

Connection Terminal:

Connection Element	Conventional Screw type terminal with indirect wire pressure
Permissible cross section of the connection lead	$\leq$ 4.0 mm^2 single wire or 2 x 2.5 mm^2 Fine wire

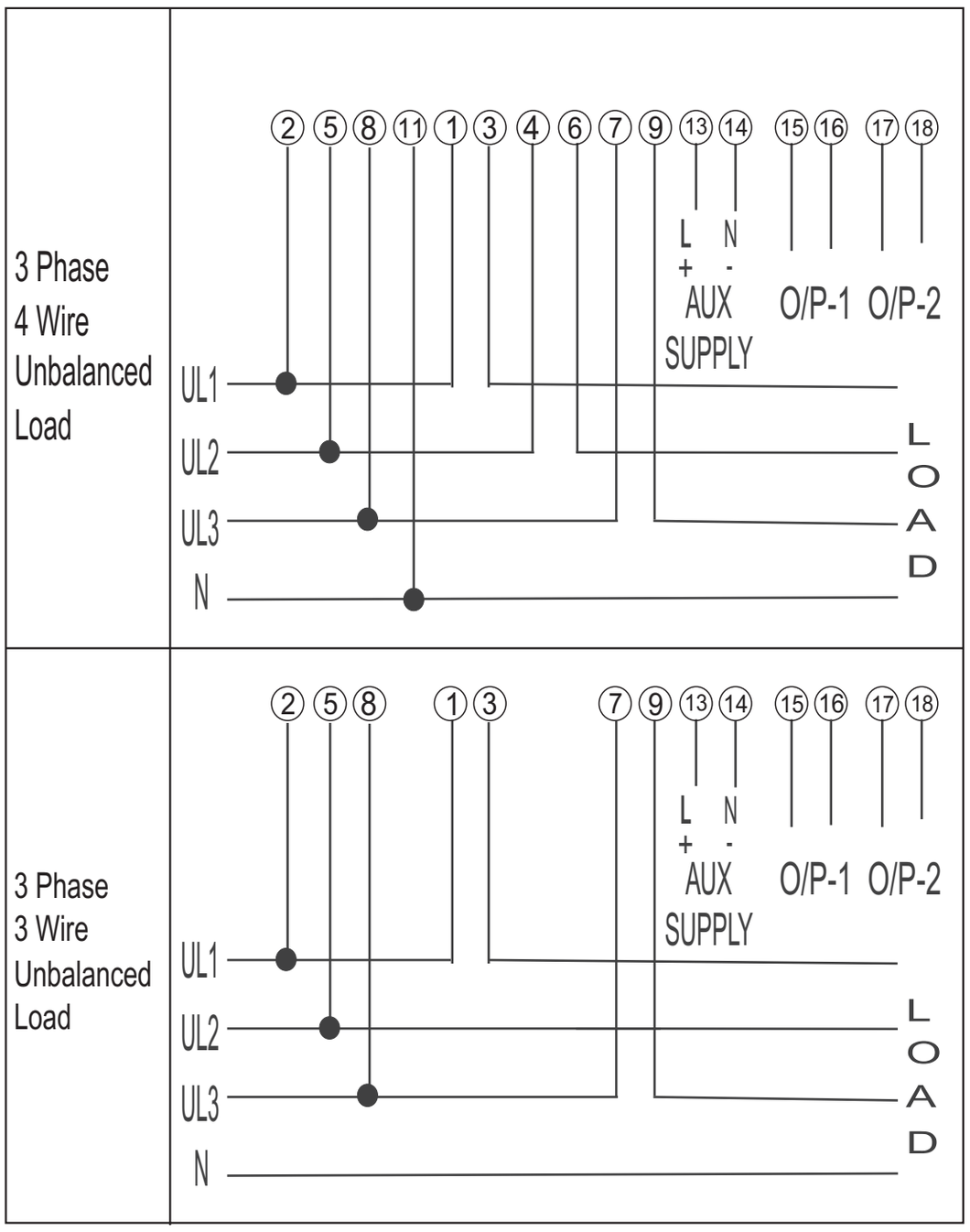
Environmental:

Nominal range of use	0 °C...23 °C... 45 °C(usage Group II)
Storage temperature	-40 °C to 70 °C
Relative humidity of annual	
Mean	$\leq$ 75%
Altitude	2000m max
Location	Indoor use

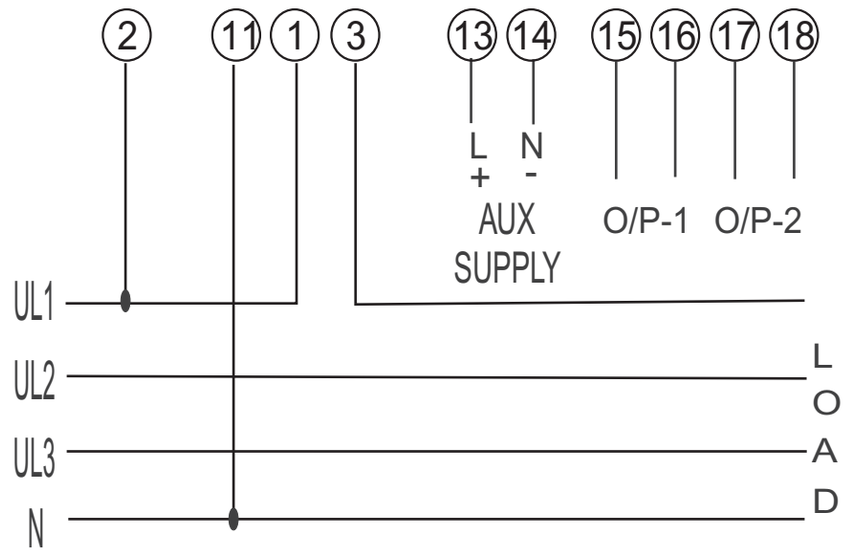
Ambient tests:

IEC 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 61000-4-2/-3/-4/-5/-6	
IEC 61326	Electromagnetic compatibility.

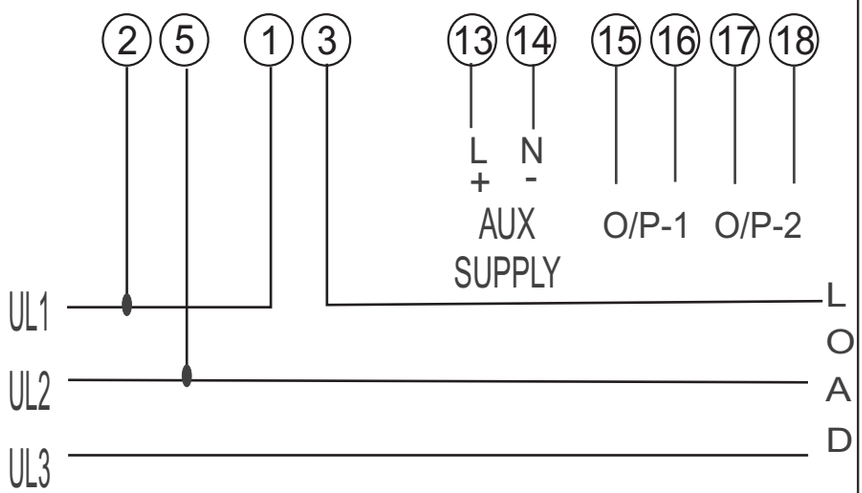
7. Connection Diagram

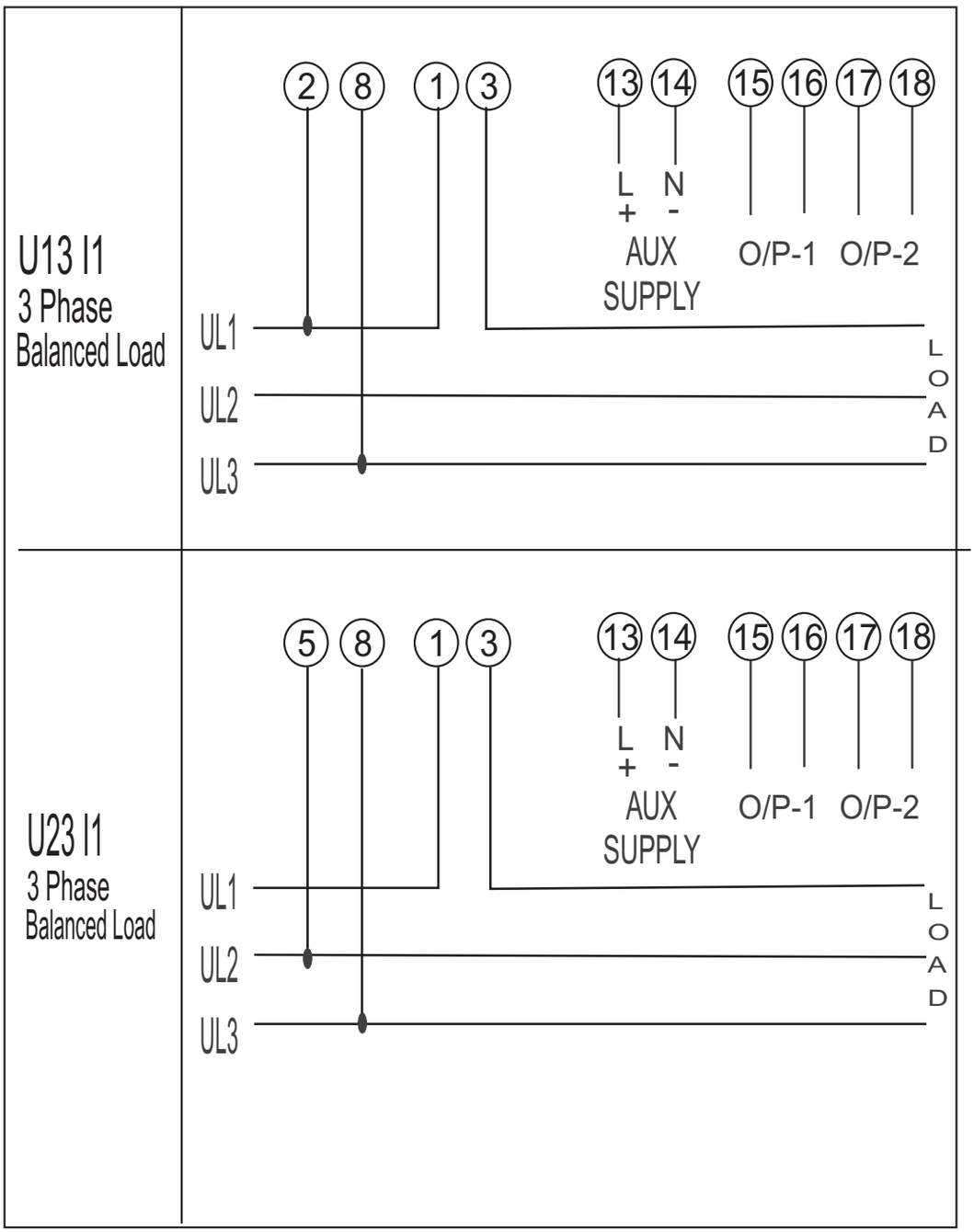


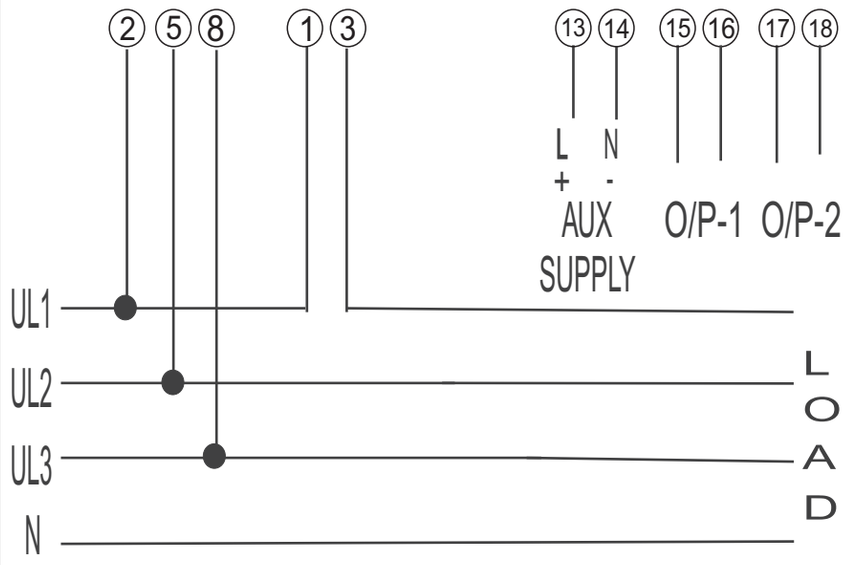
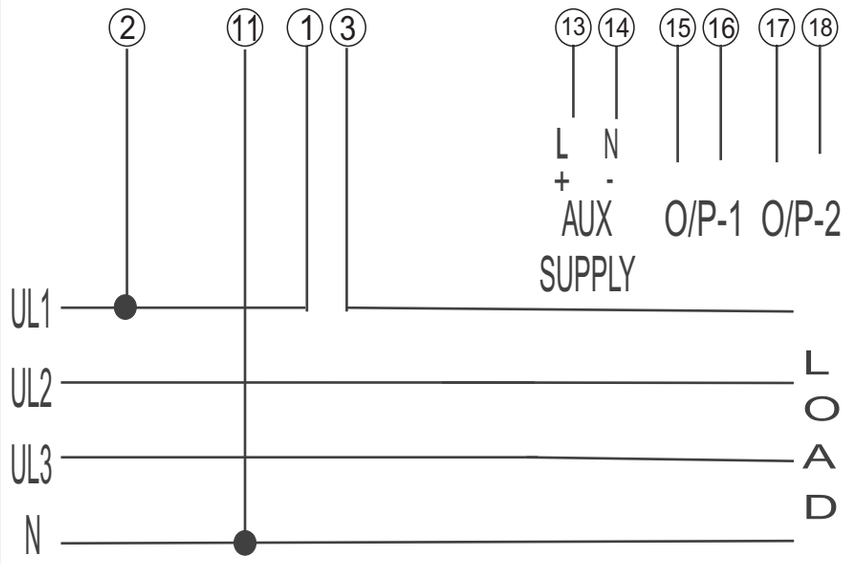
Single Phase

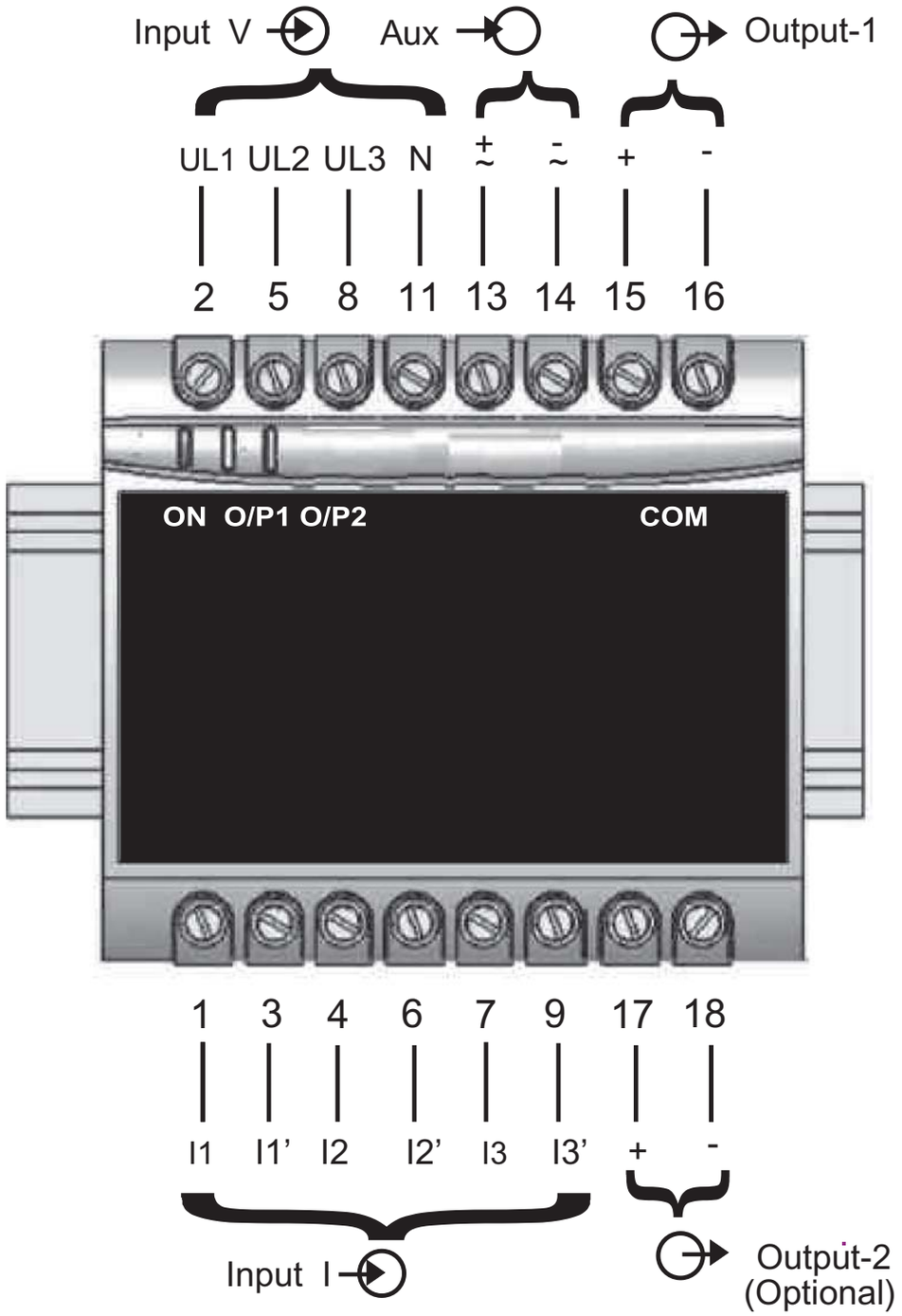


U12 I1
3 Phase
Balanced Load




U13 I1
3 Phase
Balanced Load
2
8
1
3
13
14
15
16
17
18
L
+
N
-
AUX
SUPPLY
O/P-1
O/P-2
UL1
UL2
UL3
LOAD
U23 I1
3 Phase
Balanced Load
5
8
1
3
13
14
15
16
17
18
L
+
N
-
AUX
SUPPLY
O/P-1
O/P-2
UL1
UL2
UL3
LOAD

3 Phase 3 Wire Balanced Load	
3 Phase 4 Wire Balanced Load	

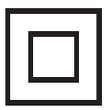

Input V
Aux
Output-1
UL1 UL2 UL3 N
+ -
+ -
2 5 8 11 13 14 15 16
ON O/P1 O/P2
COM
1 3 4 6 7 9 17 18
I1 I1' I2 I2' I3 I3'
+ -
Input I
Output-2
(Optional)

RS-485 Connection

RS-485		
B	A	G

Meaning of symbols on the instrument

Warning concerning a point of danger (Attention:observe documentation)



Equipment protected throught by Double insulation or reinforced insulation

DC voltage /Current

AC/DC voltage

Isolation between input versus all other circuit is 3.7 KV.

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. It is the user's responsibility to determine the suitability of the installation method in the user's field conditions.