RISH Master 3440
Digital Multifunction Instrument with onsite pluggable output options

Application :

RISH Master **3440 THD** measures important electrical parameters in 3 phase and single phase Network & replaces the multiple analog panel meters. It measures electrical parameters like AC current, Voltage, frequency, active energy import & active energy export, Current Demand, kW Demand, kVA Demand and Max Current Demand, Max kW Demand and Max kVA Demand. The instrument has optional output as one pulse output or two pulse output for energy measurement.

Product Features:

On site programmable PT/CT ratios:
It is possible to program primary of external potential Transformer (PT), primary of external Current Transformer (CT) on site locally via front panel keys by entering into Programming mode or remotely via MODBUS (Rs485)

User selectable CT Secondary 5A/1A
The secondary of external Current Transformer (CT) can be programmed on site to either 5A or 1A locally via front panel keys by entering into Programming mode or remotely via MODBUS (Rs485)

User selectable PT Secondary
The secondary of external potential Transformer (PT) can be programmed on locally via front panel keys by entering into Programming mode or remotely via MODBUS (RS485)

User selectable 3 phase 3W or 4W
User can program on site the network connection as either 3 Phase 3 Wire or 4 Wire locally via front panel keys by entering into Programming mode or remotely via MODBUS (RS485). For single phase applications, single phase version is available.

Low back depth:
The instrument has very low back depth (behind the panel) of less than 80 mm in spite of optional features like pulse output

Onsite selection of Auto scroll / Fixed Screen
User can set the display in auto scrolling mode or fixed screen mode locally via front panel keys by entering into Programming mode or remotely via MODBUS (RS485).

Phase reversal indication
The instrument can detect wrong phase sequence or failure of one of the input voltages and displays "phase" error message.

Energy measurement (Import and Export):
Active energy (kWh), Reactive energy (kVArh), Apparent energy (kVAh) & Ampere Hour (kAh). Any of the parameters can be freely assigned to 2 optional pulse outputs.

True RMS measurement
The instrument measures distorted waveform up to 15th Harmonic.

High brightness 3 line 4 digits LED display:
Simultaneous display of 3 Parameters

User selectable Low Current suppression (below 30 mA): User can suppress the readings below 30 mA in the current measurement by onsite programming if required.

Min Max storage of parameters possible
The instrument stores minimum and maximum values for System Voltage and System Current. Every 40 sec minimum and maximum readings are updated.

Number of parameters measured: more than 46
The instrument measures more than 46 electrical parameters of 3 Phase network.

Parameter Screen recall:
In case of power failure, the instrument memorizes the last displayed screen. The displayed screen will get memorized only if user keeps this screen for minimum 40 sec duration before power failure for fixed screen mode.

Total Harmonic Distortion (THD):
The instrument can measures per phase THD of voltage and THD of current.

Energy Count storage:
In case of power failure, the instrument memorizes the last energy count. Every 40 sec, the instrument updates the energy counter in the nonvolatile memory.

Programmable Energy format & Energy rollover count:
Customer can assign the format for energy display on MODBUS (RS485) in terms of W, kW or MW. Additional to this, customer can also set a rollover count from 7 to 14 digits (for W), 7 to 12 digits (for kW) & 7 to 9 digits (for MW), after which the energy will roll back to zero. The above settings are applicable for all types of energy.

Hour Run, ON Hour, Number of Interruptions:
Hour run records the number of hours load is connected. ON Hour is the period for which the auxiliary supply is ON. Number of Interruptions indicates the number of times the Auxiliary Supply was interrupted.

Optional MODBUS (RS485) Output
The optional ModBus output enables the instrument to transmit all the measured parameters over standard MODBUS (RS485).

User Assignable Registers for MODBUS:
Customer can assign MODBUS register address as per his need for faster response time.

Optional Pulse Output (1 or 2 Relay output) / Limit switch
The instrument can be programmed as Pulse output or Limit Switch.
Pulse Output: The optional pulse output is a potential free, very fast acting relay contact which can be used to drive an external mechanical counter for energy measurement.
Limit switch: The instrument will trip the one or two relays if the programmed parameter exceeds the programmed High & Low Limits.

Configuration of the Instrument via MODBUS:
The instrument settings can be configured locally via front panel keys by entering into Programming mode or remotely via MODBUS (Rs485)**.**

Note: The MODBUS communication parameters can only be set locally via front panel keys in the Programming mode.

Optional Analog Outputs (1 or 2 Outputs):
1 or 2 Analog outputs can be programmed from a list of input parameters.

Ethernet Interface (Modbus TCP/IP Protocol)
The optional Ethernet Interface output transmit all the measured parameters on Modbus TCP/IP. Also user can configure their instrument via Ethernet Interface.

Enclosure Protection for dust and water:
conforms to IP 54 (front face) as per IEC60529

Compliance to International Safety standards
Compliance to International Safety standard IEC 61010-1- 2001

EMC Compatibility
Compliance to International standard IEC 61326

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Technical Specifications:

Input Voltage:

Nominal input voltage (AC RMS)	Phase –Neutral	63.5 / 133 / 239.6 / 254V_{L-N}
	Line-Line	110 / 230 / 415 / 440 V_{L-L}
System PT primary values	100VLL to 692kVLL programmable on site.	
Max continuous input voltage	120% of rated value	

Input Current:

Nominal input current	5A AC RMS.
System CT secondary values	1A & 5A programmable on site.
System CT primary values	From 1A up to 9999A (for 1 or 5 Amp)
Max continuous input current	120% of rated value

Auxiliary Supply:

AC Auxiliary Supply	110 V AC -15% / +20%
	230 V AC -15% / +20%
	380 VAC-15% / +20
ACDC Auxiliary Supply	100V… 250 VAC DC +/- 10%
DC Auxiliary Supply	12…..48 VDC +/- 10%
AC Auxiliary supply frequency range	45 to 66 Hz

VA Burden:

Nominal input voltage burden	< 0.2 VA approx. per phase
Nominal input current burden	< 0.6 VA approx. per phase
Auxillary Supply burden	< 4 VA approx OR < 5VA approx with 4-20mA analog output option

Overload Withstand:

Voltage	2 x rated value for 1 second, repeated 10 times at 10 second intervals
Current	20x for 1 second, repeated 5 times at 5 min

Operating Measuring Ranges

Voltage	10… 120% of rated value
Current	5 … 120% of rated value
Frequency	40…70 Hz
Power Factor	0.5 Lag ... 1... 0.8 Lead

Reference conditions for Accuracy:

Reference temperature	23°C +/- 2°C
Input waveform	Sinusoidal (distortion factor 0.005)
Input frequency	50 or 60 Hz ±2%
Auxiliary supply voltage	Rated Value ±1%
Auxiliary supply frequency	Rated Value ±1%
Voltage Range	50... 100% of Nominal Value.
	60... 100% of Nominal Value for THD.
Current Range	10... 100% of Nominal Value.
	20... 100% of Nominal Value for THD.
Power	Cos phi / sin phi = 1 for Active / Reactive Power & Energy.
	10... 100% of Nominal Current &
	50... 100% of Nominal Voltage.
Power Factor / Phase Angle	40... 100% of Nominal Current &
	50... 100% of Nominal Voltage.

Technical Specifications:

Accuracy:

	Accuracy 1.0 (Standard)	Accuracy 0.5 (on request)	Accuracy 0.2 (on request)
Voltage	± 0.5% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Current	± 0.5% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Frequency	± 0.15% of mid frequency	± 0.15% of mid frequency	± 0.15% of mid frequency
Active Power	± 0.5% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Re-Active Power	± 0.5% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Apparent Power	± 0.5% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Active energy (kWh)	± 1.0% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Re Active energy (kVArh)	± 1.0% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Apparent energy (kVAh)	± 1.0% of Nominal value	± 0.5% of Nominal value	± 0.2% of Nominal value
Accuracy of Analog Output	1 % of Output end value	1 % of Output end value	1 % of Output end value
Power Factor	±1% of Unity	±1% of Unity	±1.0% of Unity
Angle	±1% of range	±1% of range	±1% of range
Total Harmonic Distortion	±1%	±1%	±1%

Measurement error is normally much less than the error specified above. Variation due to influence quantity is less than twice the error allowed for reference condition

Influence of Variations:

Temperature coefficient :(for rated value range of use (0…50°C))	0.05%/°C for Voltage (50... 120% of rated value) and 0.05%/°C for Current (10... 120% of rated value)

Display update rate:
Response time to step input   1 sec approx.

Applicable Standards:
EMC	IEC 61326
Immunity	IEC 61000-4-3. 10V/m min – Level 3 industrial low level
Safety	IEC 61010-1-2001 , Permanently connected use
IP for water & dust	IEC60529
Pollution degree:	2
Installation category:	III
High Voltage Test	2.2 kV AC, 50Hz for 1 minute between all electrical circuits

Environmental
Operating temperature	-10 to +55°C
Storage temperature	-20 to +65°C
Relative humidity	0... 90% non condensing
Warm up time	Minimum 3 minute
Shock	15g in 3 planes
Vibration	10... 55 Hz, 0.15mm amplitude

Energy (can be programmed for different energy parameters simultaneously):

Relay contact	1 NO + 1 NC
Switching Voltage & Current for Relay	240 VDC ,5 A

Other Pulse rate divisors (applicable only when Energy on RS485 is in **W**)

10	1 per 10 Wh (up to 3600W),	1 per 10kWh (up to 3600kW),	1 per 10MWh (above 3600 kW)
100	1 per 100Wh (up to 3600W),	1 per 100kWh (up to 3600kW),	1 per 100MWh (above 3600 kW)
1000	1 per 1000Wh (up to 3600W),	1 per 1000kWh (up to 3600kW),	1 per 1000MWh (above 3600 kW)

Pulse duration   60 ms, 100 ms or 200 ms

Above options are also applicable to Apparent & reactive Energy.

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Ampere Hour:

Default pulse rate divisor	CT secondary = 1A Max pulse rate 3600 pulses/Ah *
	CT secondary = 5A Max pulse rate 720 pulses/Ah

Other Pulse rate divisors (applicable only when Energy on RS485 is in **W**):

10	CT secondary = 1A Max pulse rate 3600 pulses/10Ah *
	CT secondary = 5A Max pulse rate 720 pulses/10Ah
100	CT secondary = 1A Max pulse rate 3600 pulses/100Ah *
	CT secondary = 5A Max pulse rate 720 pulses/100Ah
1000	CT secondary = 1A Max pulse rate 3600 pulses/1000Ah *
	CT secondary = 5A Max pulse rate 720 pulses/1000Ah
Pulse duration	60 ms, 100 ms or 200 ms

$$*\text{No. of Pulses} = \frac{\text{Maximum Pulses}}{\text{CT Ratio}}$$

Where, CT Ratio = (CT primary/ CT Secondary)

Limit Output Option:

Limit can be assigned to different measured parameters. It can be configured in one of the four modes given below.

1) Hi alarm & Energized Relay
2) Hi alarm & De-energized Relay
3) Lo alarm & Energized Relay
4) Lo alarm & De-energized Relay

With user selectable Trip point, Hysteresis, Energizing delay and De-energizing delay.

PT Secondary Ranges for Various Input Voltage:

Input Voltage	PT Secondary Settable Range
110V L-L (63.5V L-N)	100V – 120V L-L (57V – 69V L-N)
230V L-L (133V L-N)	121V – 239V L-L (70V – 139V L-N)
415V L-L (239.6V L-N)	240V – 480V L-L (140V – 277V L-N)

Parameter Measurement and Display:

Sr No	Displayed Parameters	3 Phase 4Wire	3Phase 3Wire	Single Phase 2W
1.	System Volts	✓	✓	✓
2.	System Current	✓	✓	✓
3.	Volts L1 – N	✓	✗	✗
4.	Volts L2 – N	✓	✗	✗
5.	Volts L3 – N	✓	✗	✗
6.	Volts L1 – L2	✓	✓	✗
7.	Volts L2 – L3	✓	✓	✗
8.	Volts L3 – L1	✓	✓	✗
9.	Current L1	✓	✓	✗
10.	Current L2	✓	✓	✗
11.	Current L3	✓	✓	✗
12.	Neutral Current	✓	✗	✗
13.	Frequency	✓	✓	✓

Parameter Measurement and Display:

Sr No	Displayed Parameters	3 Phase 4Wire	3Phase 3Wire	Single Phase 2W
14.	System Active Power (kW)	✓	✓	✓
15.	Active Power L1 (kW)	✓	✗	✗
16.	Active Power L2 (kW)	✓	✗	✗
17.	Active Power L3 (kW)	✓	✗	✗
18.	System Re-active Power (kVAr)	✓	✓	✓
19.	Re-active Power L1 (kVAr)	✓	✗	✗
20.	Re-active Power L2 (kVAr)	✓	✗	✗
21.	Re-active Power L3 (kVAr)	✓	✗	✗
22.	System Apparent Power (kVA)	✓	✓	✓
23.	Apparent Power L1 (kVA)	✓	✗	✗
24.	Apparent Power L2 (kVA)	✓	✗	✗
25.	Apparent Power L3 (kVA)	✓	✗	✗
26.	System Power Factor	✓	✓	✓
27.	Power Factor L1	✓	✗	✗
28.	Power Factor L2	✓	✗	✗
29.	Power Factor L3	✓	✗	✗
30.	Phase Angle L1	✓	✗	✓
31.	Phase Angle L2	✓	✗	✗
32.	Phase Angle L3	✓	✗	✗
33.	Import kWh (8 digit resolution)	✓	✓	✓
34.	Export kWh (8 digit resolution)	✓	✓	✓
35.	Import kVArh (8 digit resolution)	✓	✓	✓
36.	Export kVArh (8 digit resolution)	✓	✓	✓
37.	kVAh (8 digit resolution)	✓	✓	✓
38.	KAh (8 digit resolution)	✓	✓	✓
39.	Current Demand	✓	✓	✓
40.	KVA Demand	✓	✓	✓
41.	KW Import Demand	✓	✓	✓
42.	KW Export Demand	✓	✓	✓
43.	Max Current Demand	✓	✓	✓
44.	Max KVA Demand	✓	✓	✓
45.	Max KW Import Demand	✓	✓	✓
46.	Max KW Export Demand	✓	✓	✓
47.	Run Hour	✓	✓	✓
48.	On Hour	✓	✓	✓
49.	Number of Interruptions	✓	✓	✓
50.	Phase Reversal Indication	✓	✓	✓
51.	THD Volts L1-N	✓	✗	✗
52.	THD Volts L2-N	✓	✗	✗
53.	THD Volts L3-N	✓	✗	✗
54.	THD Volts L1-L2	✗	✓	✗
55.	THD Volts L2-L3	✗	✓	✗
56.	THD Volts L3-L1	✗	✓	✗
57.	THD Current L1	✓	✓	✗
58.	THD Current L2	✓	✓	✗
59.	THD Current L3	✓	✓	✗
60.	THD Voltage Mean	✓	✓	✓
61.	THD Current Mean	✓	✓	✓

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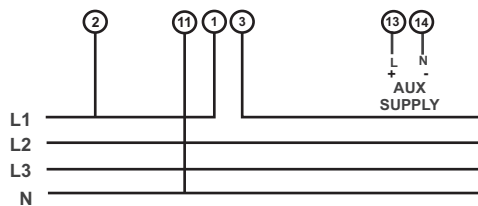
Electrical Connections:

For 3 Phase 4 Wire Unbalanced Load
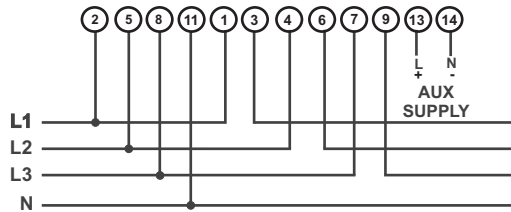
**For 3 Phase 3 Wire Unbalanced Load**
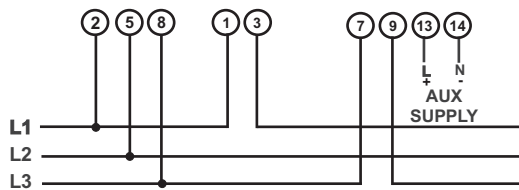
For Single Phase

It is recommended that the wires used for connections to the instrument should have lugs soldered at the end. That is, the connections should be made with Lugged wires for secure connections. The Maximum diameter of the lug should be 7.0 mm and maximum thickness 3.5 mm.

Permissible cross section of the connection wires: <= 4.0 mm^2 single wire or 2 × 2.5 mm^2 fine wire.

Dimensions
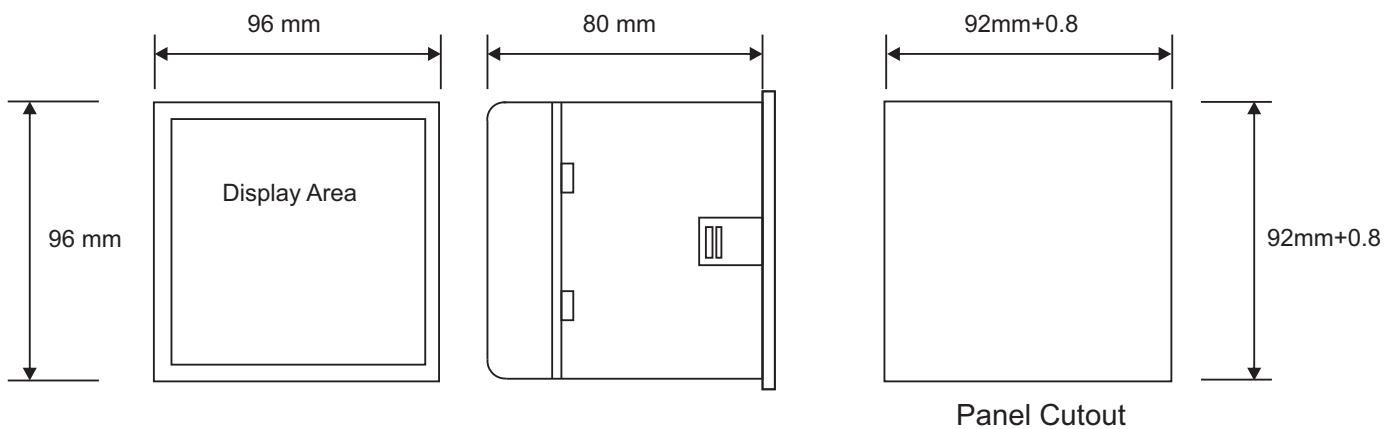
96 mm

80 mm

92mm+0.8

Display Area

96 mm

92mm+0.8

Panel Cutout

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Order Code:

Ordering information	Ordering Code RISH Master 3440
Accuracy Class	
Accuracy 1.0% **(Standard)**	1.0
Accuracy 0.5% **(on request)**	0.5
Accuracy 0.2% **(on request)**	0.2
System Type (Connection network)	
3 Phase (programmable as 4 Wire or 3 Wire on site)	3
1 Phase	1
Input Voltage	
110V L-L (63.5V L-N)	110
230V L-L (133V L-N)	230
415V L-L (239.6V L-N)	415
440V L-L (254V L-N)	440
AC Auxiliary Voltage	
110 V AC -15% / +20%	L
230 V AC -15% / +20%	M
380 VAC-15% / +20 %	H
AC/DC Auxiliary Supply Voltage	
100 – 250V AC/DC +/- 10%	AD
12V… 48V V DC +/- 10 %	D
Communication Interface (Optional):	
MODBUS (RS485) output	R
Ethernet (Modbus TCP/IP) output	E
Communication Option not used	Z
Optional:	
Pulse Output for energy measurement /Limit Switch	
1 Pulse output	S
2 Pulse output	D
Pulse Output option not used	Z
Optional: Analog Outputs	
2 outputs (0-1mA DC each)	1
2 outputs (4-20 mA DC each)	2
Analog Outputs option not used	Z

Order Code Example:

RISH Master 3440 0.2 – 3– 415-AD-R-S-2

RISH Master 3440 Accuracy 0.2**%**, 3 phase(programmable onsite as 4 wire or 3 Wire), 415L-L nominal voltage,100 to 250 ACDC Auxiliary supply, with MODBUS (RS485),with 1 pulse output and 2 Analog Outputs. (No need to specify CT secondary as 5 A or 1 A is programmable on site.)

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Options Avaliable:

Types	AC Aux (110V, 230V, 380V)	100...250VACDC Aux	12…48 VDC Aux
3440			
3440 + 1pulse (1 Limit)	✓	✓	✓
3440 + 2pulse (2 Limit)	✓	✓	✓
3440 + Rs485	✓	✓	✓
3440 + 2 Analog Output	✓	✓	✓
3440 + 1pulse (1 Limit) +Rs485	✗	✓	✓
3440 + 1pulse (1 Limit)+ 2 Analog Output	✗	✓	✓
3440 + 2pulse (2 Limit)+ Rs485	✗	✓	✓
3440 + RS485+ 2 Analog Output	✗	✓	✓
3440 + RS485+1pulse (1 Limit)+ 2 Analog Output	✗	✓	✓
3440 + Ethernet Interface (Modbus TCP/IP)	✗	✓	✗

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