01 Universal Measuring Instruments

UNIVERSAL MEASURING INSTRUMENTS

Universal measuring instruments are applied for measuring, recording and monitoring of electrical values in low and middle voltage networks.

The measurement is rated for 1 and 3 phase systems with or without neutral. These instruments are featuring high accuracy, compact design, and measuring of harmonic currents / voltages for all phases.

Universal measuring instruments replace up to 15 other devices, such as ammeters, voltmeters, voltmeter-switches, power meters (kW, kVA, kvar und cos phi), active / reactive power counters, harmonic analysers, measuring converters, hour counters, etc.

Therefore the costs for the planning, installation, wiring and storage can be significantly reduced in comparison to analogue measuring instruments.

Universal Measuring Instruments

TNM 96 VAF-O - Multimeter

- True RMS measurement
- On site Programmable
- Low Back Depth
- 3 Line ultra bright LED Display
- Run hours / On hour indication

TNM96 VAF-O measures important electrical parameters in 3 phase 4 Wire, 3 phase 3 Wire and 1 phase Network and replaces the multiple analog panel meters. It measures electrical parameters like AC Voltage, AC Current, Frequency and many more. The instrument also has an optional limit switch.

Produt Features

True RMS measurement

Measures distorted waveform up to 15th Harmonic.

Onsite programmable

- Onsite Programable System Configuration 3PH4W / 3PH3W and Single phase.
- Onsite Programable CT ratios and PT ratios

3 line 3 digits Ultra Bright LED display

Simultaneous display of 3 different parameters.

Run Hour, ON Hour, Number of Interruptions

Run Hour 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.

RPM Measurement

The instrument display rotation per minutes for generator applications. Number of poles can be set on site depending upon application requirement.

Storage of Parameters possible

The instrument stores minimum and maximum values for System Voltage, System Current, Run Hour, ON Hour and number of Interrupts. Every 60 sec stored values are updated.

Low Back Depth

The instrument has very low back depth (behind the panel) of less than 55 mm.

Parameter Screen recall

In case of power failure, the instrument memorizes the last displayed screen.

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.

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- 2010.

EMC Compatibility

Compliance to International standard IEC 61326.

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Technical Specifications

Input Voltage		
Nominal input voltage (AC RMS)		100 VL-L - 500 VL-L (57.7 VL-N - 290 VL-N)
System PT primary values		100 VLL to 799 kVLL programmable on site.
System PT secondary values		100 VLL to 500 VLL programmable on site.
Max continuous input voltage		120% of Nominal value
Input Current		
Nominal input current		1A / 5A AC RMS
System CT primary values		From 1A up to 799 kA programmable on site.
System CT secondary values		1A / 5A Programmable at site.
Max continuous input current		120% of Nominal value
Auxiliary supply		
External Auxiliary		40 V – 300V AC-DC (± 5 %) or 20 V – 40V AC / 20 V – 60V DC
Aux supply frequency		45 to 65 Hz range
VA Burden		
Nominal input voltage burden		< 0.3 VA approx. per phase
Nominal input current burden		< 0.2 VA approx. per phase
Auxiliary Supply burden		< 4 VA approx
Operating Measuring Ranges		
Current		5... 120% of Nominal value
Voltage		10... 120% of Nominal value
Frequency		45 - 65 Hz
Reference conditions for Accuracy		
Reference Temperature		23°C +/- 2°C
Input Frequency		50/60 Hz ±2%
Current		10... 100% of Nominal value
Voltage		20... 100% of Nominal value
Auxiliary Supply Voltage		Nominal Value ±1%
Auxiliary Supply Frequency		Nominal Value ±1%
Accuracy		
Voltage		±1.0% of Nominal Value
Current		±1.0% of Nominal Value
Frequency		±0.5% of Mid Frequency
Overload withstand		
Voltage		2 x Nominal value for 1 second, repeated 10 times at 10 second intervals
Current		20x Nominal value for 1 second, repeated 5 times at 5 min intervals
Influence of variations		
Temperature coefficient		0.05%/°C
Applicable standards		
EMC		IEC 61326
Immunity		IEC 61000-4-3. 10V/m min – Level 3 industrial Low level
Safety		IEC 61010-1-2010 , Permanently connected use
IP for water and dust		IEC60529
Pollution degree		2
Installation category		III
High Voltage Test		
	3510V AC r.m.s,	for 1 minute between Enclosure Vs Power supply + All measuring input Power supply Vs All measuring input
	2210V AC r.m.s,	for 1 minute between Input Voltage Vs Input Current Input Current Vs Input Current
Display update rate		
Response time to step up		1 sec approx.
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... 150 ... 10 Hz, 0.15mm amplitude

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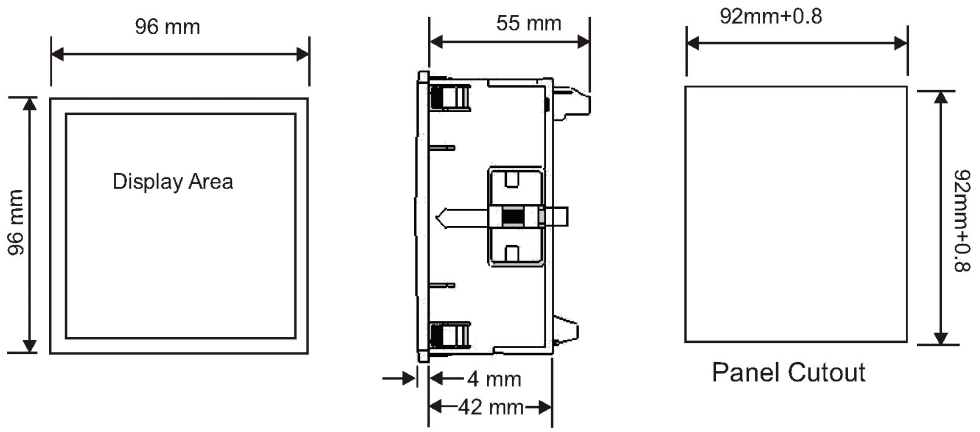
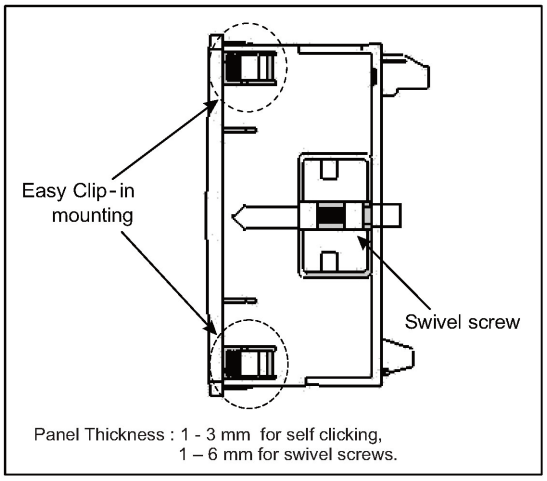
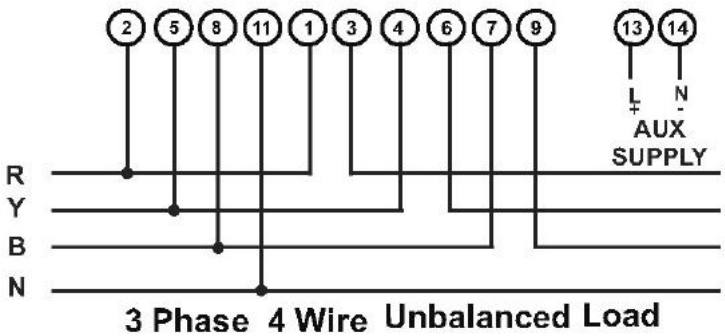
Dimensions:

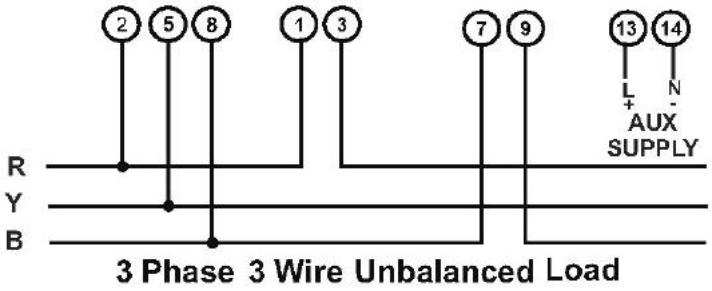


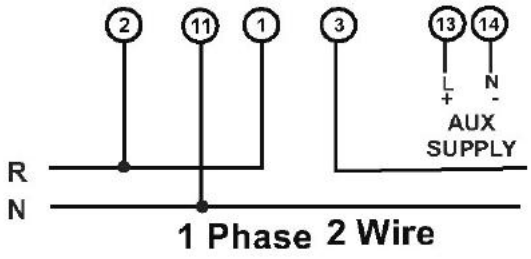
Installation:



Electrical connections:







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No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire	1 Phase 2 Wire
1.	System Voltage	●	●	-
2.	Voltage L1 - N	●	-	●
3.	Voltage L2 - N	●	-	-
4.	Voltage L3 - N	●	-	-
5.	Voltage L1 - L2	●	●	-
6.	Voltage L2 - L3	●	●	-
7.	Voltage L3 - L1	●	●	-
8.	System Current	●	●	-
9.	Current L1	●	●	●
10.	Current L2	●	●	-
11.	Current L3	●	●	-
12.	Frequency	●	●	●
13.	RPM	●	●	●
14.	Max (System Voltage/ System Current)	●	-	●
15.	Min (System Voltage/ System Current)	●	-	●
16.	Hour Run	●	-	●
17.	ON Hour	●	●	●
18.	Number of auxiliary interrupt	●	-	●

●: Available - : Not available

Order Information:

Model: TNM96 VAF-O

System Type (connection network)

3 Phase (programmable as 4 Wire or 3 Wire on site)

or 1 Phase

Auxiliary supply voltage

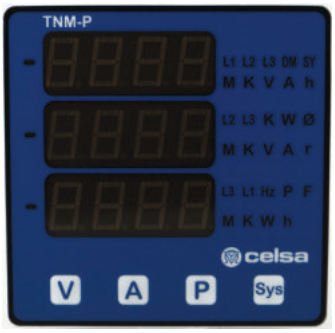
40 - 300 V AC DC + 5%

or 20 - 40 V AC / 20 - 60 V DC

Order Example:

TNM96 VAF-O, 3Phase 3Wire, with auxiliary supply: 40V - 300V AC/DC ± 5%.

TNM 96P - Multimeter



- Fast and Easy Installation on panel with self clicking
- True RMS measurement
- 3 Line 4 Digits ultra bright LED Display (up to 9999)
- On site Programmable CT/PT Ratios
- User selectable CT Secondary 1A/5A
- User selectable PT Secondary from 100 VLL to 500 VLL
- User selectable 3ph3wire / 3ph4wire / single phase Network
- Two auxillary Power Supply available 40V – 300V AC/DC or 12V - 48V DC.
- Storage of MIN / MAX values
- Measurement and Display of RPM, Run hours, On hours, No. of interruption

The TNM96P measures important electrical parameters in 3 phase 4 Wire and 3 phase 3 Wire Network and replaces the multiple analog panel meters. It measures electrical parameters like AC Voltage, AC Current, Frequency, Active, Reactive, Apparent Power and many more.

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 via front panel keys by entering into Programming mode.

User selectable CT Secondary 5A/1A

The secondary of external Current Transformer (CT) can be programmed on site to either 5A or 1A using front panel keys.

User selectable PT Secondary

The secondary of external Potential Transformer (PT) can be programmed on site from 100VLL to 500VLL using front panel keys.

Onsite selection of Auto scroll / Fixed Screen

User can set the display in auto scrolling mode or fixed screen mode using front panel keys.

Low back depth

The instrument has very low back depth (behind the panel) of less than 55 mm.

True RMS measurement

The instrument measures distorted waveform up to 15th Harmonic.

RPM Measurement

The instrument display rotation per minutes for generator applications. Number of poles can be set on site depending upon application requirement.

3 line 4 digits LED display

Simultaneous display of 3 Parameters.

User selectable 3 phase 3Wire or 4Wire or Single phase Network

User can program on site the network connection as either 3 Phase 3 Wire or 4 Wire or single phase network using front panel keys.

In case of self powered TNM 96P only either 3 Phase 4 wire or single phase network are available.

Storage of parameters possible

The instrument stores minimum and maximum values for System Voltage, System Current, Run Hour, ON Hour and number of Interrupts.
Every 60 sec stored values are updated.

Four function keys

Using the four function key, it is possible to go desired parameter screen instantly.

Enclosure Protection for dust and water

Conforms to IP 50 (for front face) and IP 20 (for back) as per IEC60529.

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EMC Compatibility

Compliance to International standard IEC 61326.

Interference Emission	IEC 61326-1 : 2005, Class A
Interference Immunity	IEC 61326-1 : 2005
Electrostatic discharge (ESD)	IEC 61000-4-2 – 4kV/8kV contact/air.
EM Field	IEC 61000-4-3 – 10 V/m (80 MHz to 1 GHz) – 3 V/m (1.4 GHz to 2 GHz) – 1 V/m (2 GHz to 2.7 GHz)
Burst	IEC 61000-4-4 – 2 kV (5/50 ns, 5 kHz)
Surge	IEC 61000-4-5 – 1 kVLL / 2 kVLN.
Conducted RF	IEC 61000-4-5 – 3 V (150 kHz to 80 MHz)
Rated Power Frequency magnetic Field	IEC 61000-4-8 – 30 A/m
Voltage dip	IEC 61000-4-11 – 0% during 1 cycle. – 40% during 10/12 cycles. – 70% during 25/30 cycles.
Short interruptions	IEC 61000-4-11 – 0% during 25/30 cycles. 25 cycles for 50 Hz test. 30 cycles for 50Hz test.

Technical Specifications

Input Voltage	
Nominal input voltage (AC RMS)	Phase –Neutral 290V L-N , Line-Line 500V L-L
Max continuous input voltage	150% of rated value
Nominal input voltage burden	< 0.3 VA approx. per phase (For external auxiliary meter)
System PT secondary values	100VLL to 500VLL programmable on site.
System PT primary values	100VLL to 692kVLL programmable on site.
Input Current	
Nominal input current	5A AC RMS
System CT secondary values	1A and 5A programmable on site.
System CT primary values	From 1A up to 9999A (for 1 or 5 Amp)
Max continuous input current	150% of rated value
Nominal input current burden	< 0.2 VA approx. per phase
Auxiliary supply	
External Auxiliary	40 V – 300V AC/DC (± 5 %)
DC Auxiliary supply	12V - 48V DC
Self powered	Input voltage range from 80 to 100% of the rated value (Self powered meter is available only in 3Phase 4 Wire and Single Phase network. Auxiliary input is derived from Phase 1 (R phase)
Frequency range	45 to 65 Hz
VA burden	Approx. 3 VA
DC burden	3V
Overload withstand	
Voltage	2 x rated value for 1 second, repeated 10 times at 10 second intervals
Current	20x rated value for 1 second, repeated 5 times at 5 min intervals
Operating Measuring Ranges	
Voltage Range With External Aux	10 ... 120% of rated value
Voltage Range With Self Power	80 ... 120% of rated value
Current Range	10 ... 120% of rated value
Frequency	45... 65 Hz
Power Factor	0.5 Lead ... 1 ... 0.5 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	20 ... 100% of nominal value
Current Range	10 ... 100% of nominal value
Power	Cos phi = 1 for active power / Sin phi = 1 for reactive power 10... 100% of nominal current and 20... 100% of nominal voltage
Power Factor / Phase Angle	40... 100% of nominal current and 20... 100% of nominal voltage

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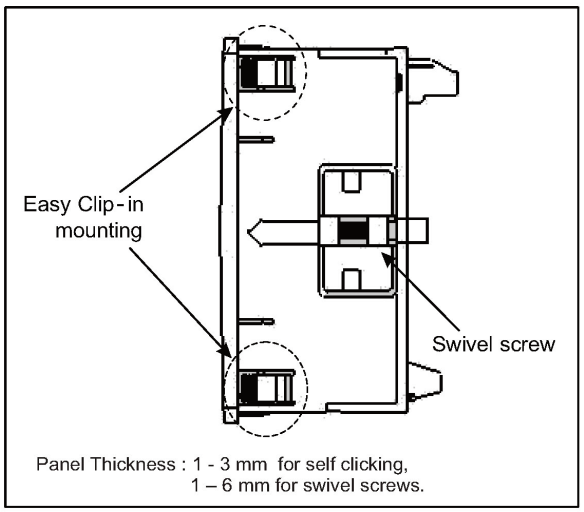
Accuracy		
Voltage		± 1.0 % of nominal value
Current		± 1.0 % of nominal value
Frequency		0.5% of mid frequency
Active power		± 1.0 % of nominal value
Re-active power		± 1.0 % of nominal value
Apparent power		± 1.0 % of nominal value
Power factor		2.0% of Unity
Phase angle		2.0% of range
Measurment error is normally much less than error specified above. Variation due to influence quantity is less tha twice the error allowed for reference condition.		
Influence of Variations		
Temperature coefficient (for rated value range of use (0...50°C)		0.025%/°C for Voltage 0.05%/°C for Current
Display update rate		
Response time to step input		1 sec approx.
Applicable Standards		
EMC		IEC 61326-1: 2005
Safety		IEC 61010-1-2001 , Permanently connected use
IP for water and dust		IEC60529
Pollution degree		2
Installation category		III
High Voltage (for 1 minute)	Test 3510V AC r.m.s	Enclosure Vs Power supply + All measuring input Power supply Vs All measuring input
	2210V AC r.m.s,	Input Voltage Vs Input Current Input Current Vs Input Current
Environmental		
Operating temperature		0 +50°C
Storage temperature		-25 to +70°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
Enclosure:		
Front		IP50
Back		IP20
Dimensions and Weights:		
Bezel size		96mm x 96mm DIN 43 718
Panel cut-out		92 +0.8mm x 92 +0.8mm
Overall depth		55mm
Panel thickness		1 - 3mm for self clicking, 1 - 6mm for swivel screws
Weight		320gr. approx.

Installation:



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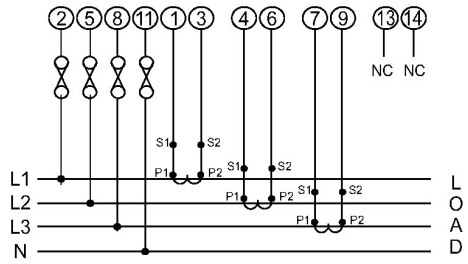
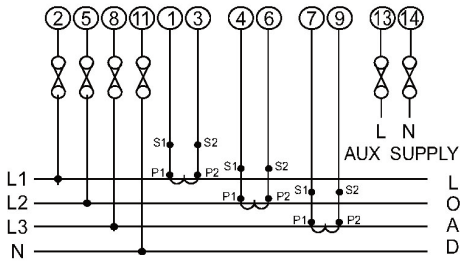
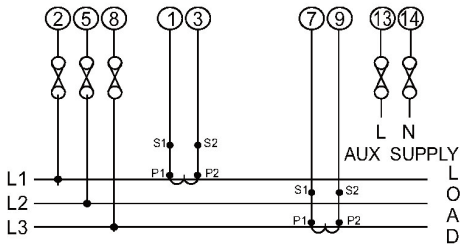
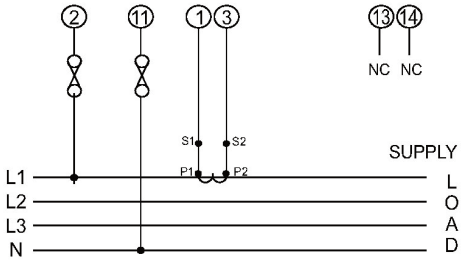
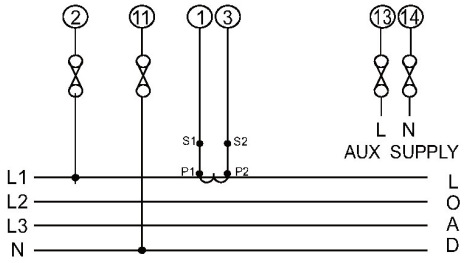
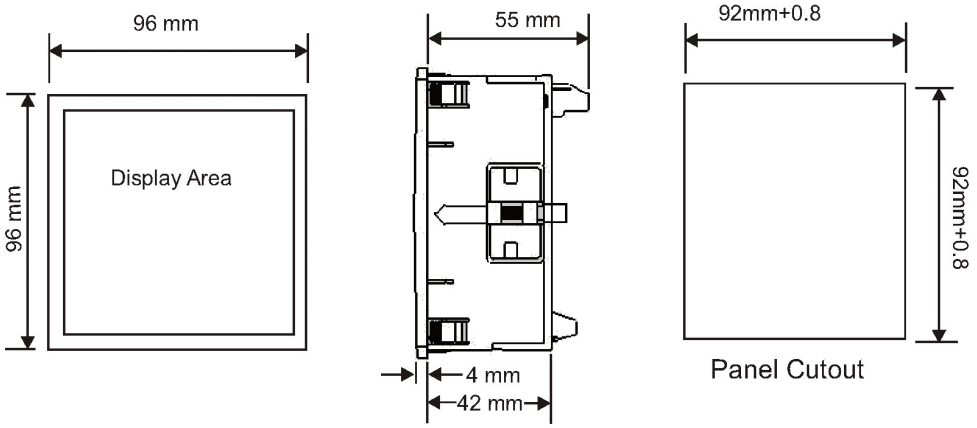
Electrical connections:

	Self Powered Aux	External Powered Aux
3 Phase 4 Wire Unbalanced Load		
3 Phase 3 Wire Unbalanced Load	Not Applicable	
1 Phase 2 Wire		

Dimensions:



Parameter measurement and display:

No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire	1 Phase 2 Wire
1.	System Voltage	●	●	●
2.	System Current	●	●	●
3.	Voltage L1 - N	●	-	●
4.	Voltage L2 - N	●	-	-
5.	Voltage L3 - N	●	-	-
6.	Voltage L1 - L2	●	●	-
7.	Voltage L2 - L3	●	●	-
8.	Voltage L3 - L1	●	●	-
9.	Current L1	●	●	●
10.	Current L2	●	●	-
11.	Current L3	●	●	-
12.	Frequency	●	●	●
13.	System Active Power (kW)	●	●	●
14.	Active Power L1	●	-	●
15.	Active Power L2	●	-	-
16.	Active Power L3	●	-	-
17.	System Re-active Power (kVar)	●	●	●
18.	Re-active Power L1	●	-	●
19.	Re-active Power L2	●	-	-
20.	Re-active Power L3	●	-	-
21.	System Apparent Power (kVA)	●	●	●
22.	Apparent Power L1	●	-	●
23.	Apparent Power L2	●	-	-
24.	Apparent Power L3	●	-	-
25.	System Phase Angle	●	●	●
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.	RPM	●	●	●
34.	Max (System Voltage/ System Current)	●	●	●
35.	Min (System Voltage/ System Current)	●	●	●
36.	Hour Run	●	●	●
37.	ON Hour	●	●	●
38.	Number of auxiliary interrupt	●	●	●

●: available - : Not available

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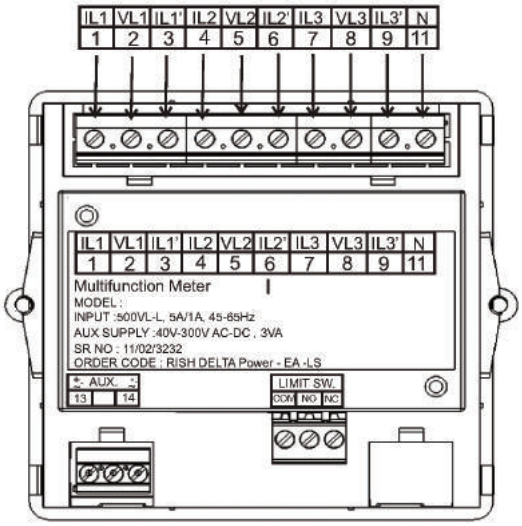
Rear connection:



Order Information:

Model: TNM96P

Auxiliary supply

Self Aux*

or 40 V – 300V AC/DC

or 12 V – 48V DC

Order Example:

TNM96P, auxiliary supply 40V – 300V AC/DC)

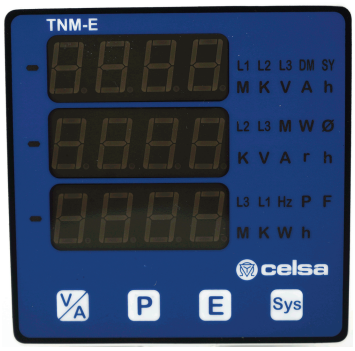
*NOTE: Self Auxiliary meter is available only in 3Phase 4 Wire and Single Phase network.

Auxiliary input is derived from Phase 1 (R phase).

In case of external auxiliary meter all three networks are available

(3Phase 4Wire / 3Phase 3Wire / Single Phase)

TNM 96E - Multimeter



- Fast and Easy Installation on panel with self clicking.
- True RMS measurement.
- 3 Line 4 Digits ultra bright LED Display (up to 9999).
- On site Programmable CT/PT Ratios.
- User selectable CT Secondary 1A/5A.
- User selectable PT Secondary from 100 VLL to 500 VLL.
- User selectable 3ph3wire / 3ph4wire / single phase Network.
- Programmable Energy format and Energy rollover count
- Wide auxillary Power Supply which can accept any input between 40V – 300V AC/DC or 12V – 48V DC.
- Storage of MIN / MAX values.
- Measurement and Display of RPM, Run hours, On hours, No. of interruption.
- Optional: MODBUS (RS485) Communication / Pulse output

TNM96E measures important electrical parameters in 3 phase 4 Wire and 3 phase 3 Wire Network and replaces the multiple analog panel meters. It measures electrical parameters like AC Voltage,AC Current, Frequency, Active, Reactive, Apparent Power, Import and Export Energy and many more.

Products 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 via front panel keys by entering into Programming mode.

User selectable CT Secondary 5A/1A

The secondary of external Current Transformer (CT) can be programmed on site to either 5A or 1A using front panel keys.

User selectable PT Secondary

The secondary of external Potential Transformer (PT) can be programmed on site from 100VLL to 500VLL using front panel keys.User can set the display in auto scrolling mode or fixed screen mode using front panel keys.

Low back depth

The instrument has very low back depth (behind the panel) of less than 55 mm.(Without output option).

Four function keys

Using the four function key, it is possible to go desired parameter screen instantly.

Demand Measurement

Measures and Displays Current Demand, kVA Demand, kW Import Demand, kW Export Demand. Any of the parameters can be assigned to optional Limit switch.

True RMS measurement

The instrument measures distorted waveform up to 15th Harmonic.

Energy Measurement (Import and Export)

Active Energy (kWh), Reactive Energy (kVArh), Apparent Energy (VAh). Any of the parameters can be assigned to optional Pulse output.

Programmable Energy format and 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 depending on the energy format, after which the energy will roll back to zero.

Optional: 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.

-

Optional MODBUS (RS485) Output

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

Configuration of Instrument via MODBUS

The instrumentsetting can be configured locally via front panel keys by entering into the programming mode or remotely via MODBUS (RS485).

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

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Storage of parameters possible

The instrument stores minimum and maximum values for System Voltage, System Current, Run Hour, ON Hour and number of Interrupts. Every 60 sec stored values are updated.

3 line 4 digits LED display

Simultaneous display of 3 Parameters.

RPM Measurement

The instrument display Rotation per minutes for generator applications. Number of poles can be set on site depending upon application requirement.

Energy Count Storage

In case of power failure, the instrument memorizes the last energy count. Every 1 min, the instrument updates the energy counter in the non-volatile memory.

User selectable 3 phase 3Wire or 4Wire or Single phase Network

User can program on site the network connection as either 3Phase 3 Wire or 4 Wire or single phase network using front panel keys.
In case of self powered TNM96-E only either 3 Phase 4 wire or single phase network are available.

Onsite selection of Auto scroll / Fixed Screen

User can set the display in auto scrolling mode or fixed screen mode using front panel keys.

Enclosure Protection for dust and water

Conforms to IP 50 (for front face) and IP 20 (for back) as per IEC60529.

EMC Compatibility

Compliance to International standard IEC 61326.

Interference Emission :	IEC 61326-1 : 2012
Interference Immunity :	IEC 61326-1 : 2012, Table 2
Electrostatic discharge	
contact/air.(ESD):	IEC 61000-4-2 – 4kV/8kV
EM Field :	IEC 61000-4-3 – 10 V/m (80 MHz to 1 Ghz)
	– 3 V/m (1.4 Ghz to 2 GHz)
	– 1 V/m (2 GHz to 2.7 GHz)
Burst :	IEC 61000-4-4 – 2 kV (5/50 ns, 5 kHz)
Surge :	IEC 61000-4-5 – 1 kVLL / 2 kVLN.
Conducted RF :	IEC 61000-4-5 – 3 V (150 kHz to 80 MHZ
Rated Power Frequency	
magnetic Field :	IEC 61000-4-8 – 30 A/m
Voltage dip :	IEC 61000-4-11
	– 0% during 1 cycle.
	– 40% during 10/12 cycles.
	– 70% during 25/30 cycles.
Short interruptions cycles :	IEC 61000-4-11
	– 0% during 25/30 cycles.
	25 cycles for 50 Hz test.
	30 cycles for 60 Hz test.

Technical Specifications

Input Voltage	
Nominal input voltage (AC RMS)	Phase –Neutral 290V L-N , Line-Line 500V L-L
Max continuous input voltage	120% of rated value
Nominal input voltage burden	< 0.3 VA approx. per phase (For external auxiliary meter)
System PT secondary values	100VLL to 500VLL programmable on site.
System PT primary values	100VLL to 692kVLL programmable on site.
Input Current	
Nominal input current	5A / 1A AC RMS
System CT secondary values	1A and 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
Nominal input current burden	< 0.2 VA approx. per phase
Auxiliary supply	
External Aux	40 V – 300V AC-DC (± 5 %)
DC Auxiliary Supply	12V – 48V DC
Self powered	input voltage range from 80% to 100% of Rated value. (Self powered meter is available only in 3Phase 4 Wire and Single Phase network.) Auxiliary input is derived from Phase 1 (R phase)
Frequency range	45 to 65 Hz
VA burden	< 4 VA Approx.
Overload withstand	
Voltage	2 x rated value for 1 second, repeated 10 times at 10 second intervals
Operating measuring ranges	
Voltage Range With External Aux	10... 120% of rated value
Voltage Range With Self Power	80... 120% of rated value
Current Range	10 ... 120% of rated value
Frequency	45...65 Hz.
Power Factor	0.5 Lead ... 1 ... 0.5 Lag.

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	20... 100% of Nominal Value.
Current Range	10... 100% of Nominal Value.
Power	Cos phi / sin phi = 1 for Active / Reactive Power and Energy. 10... 100% of Nominal Current and 20... 100% of Nominal Voltage. Power Factor / Phase Angle 40... 100% of Nominal Current and 20... 100% of Nominal Voltage.
Accuracy	
Voltage	±1.0% of Nominal Value.
Current	±1.0% of Nominal Value.
Frequency	0.5% of mid frequency
Active Power	±1% of Nominal Value.
Re-Active Power	±1% of Nominal Value.
Apparent Power	±1% of Nominal Value.
Active Energy	± 1 %
Reactive Energy	± 1 %
Apparent Energy	± 1 %
Power Factor	2 % of Unity
Phase angle	2 % of range
Measurement error is normally much less than error specified above. Variation due to influence quantity is less than twice the error allowed for reference condition.	
Limit Switch (Relay)	
Switching Voltage and Current for Relay	240 VDC ,5 A (1NO+1NC)
Influence of variations	
Temperature coefficient (for rated value range of use (0...50°C)	0.025%/°C for Voltage 0.05%/°C for Current
Display update rate	
Response time	to step input 1 sec approx.
Applicable Standards	
EMC Immunity	IEC 61326-1: 2012, Table 2
Safety	IEC 61010-1-2001 , Permanently connected use
IP for water and dust	IEC60529
Safety	
Pollution degree	2
Installation category	III
High Voltage Test	4.7 kV DC, 50Hz for 1 minute between Aux. and measuring inputs
Environmental	
Operating temperature	0 to +50°C
Storage temperature	-25°C to +70°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
Enclosure	
Front	IP 50.
Back	IP 20.
Dimensions and Weights	
Bezel size	96 mm x 96 mm DIN 43 718.
Panel cut-out	92 +0.8 mm x 92 + 0.8 mm.
Overall depth	55 mm.(without output option)
Panel Thickness	1 - 3 mm for self clicking, 1 – 6 mm for swivel screws.
Weight	320 gm. Approx.(with output option)

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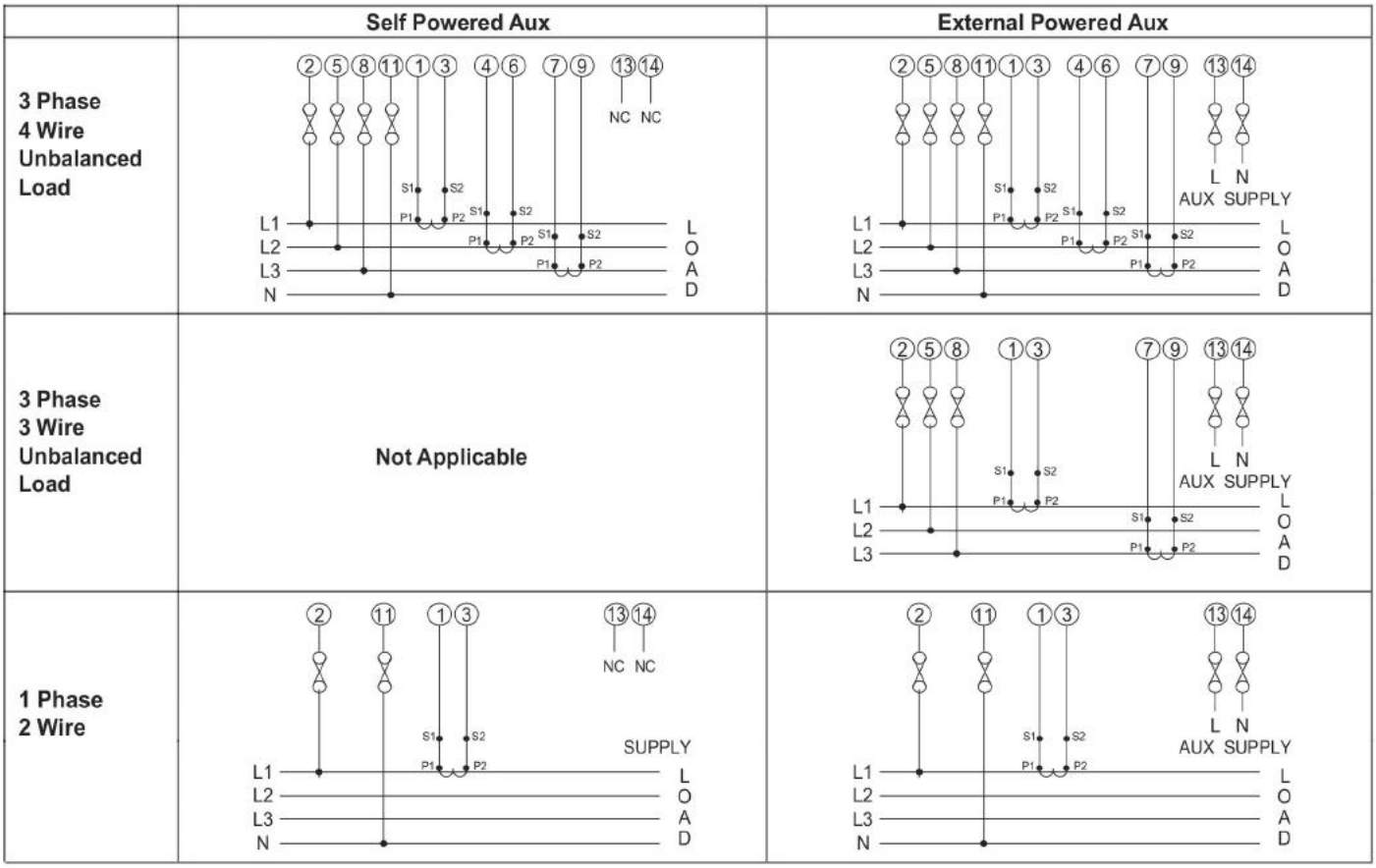
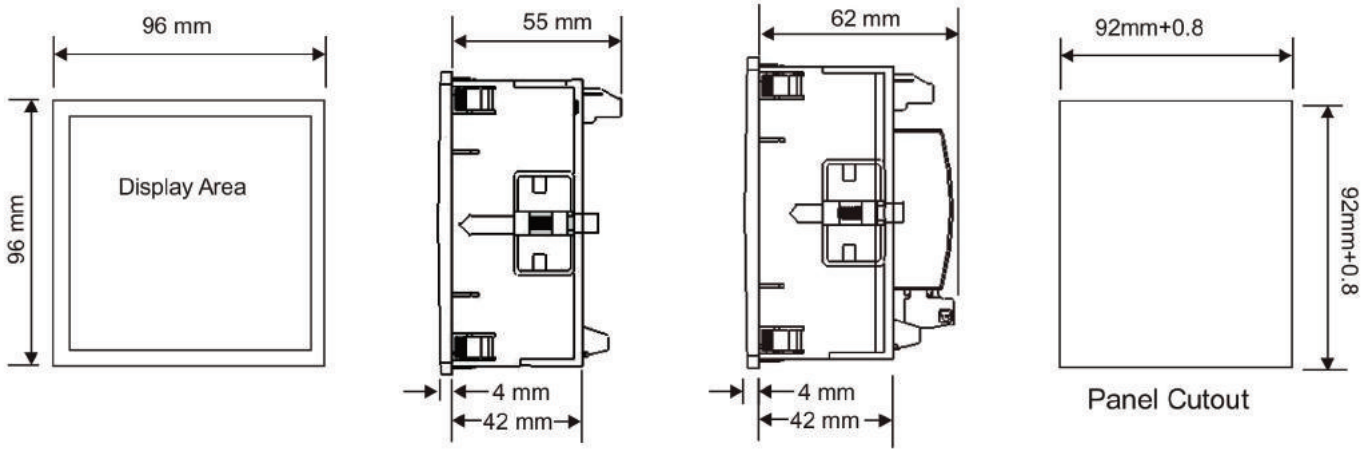
Pulsed Output Option	
Energy (can be programmed for different energy parameters simultaneously):	
Relay contact	(1NO+1NC)
Switching Voltage and current for Relay	240 VDC ,5 A
Default pulse rate divisor 1 per Wh (up to 3600W) , 1 per kWh (up to 3600kWh) , 1 per MWh (above 3600kW) ,	
Other Pulse rate divisors (applicable only when Energy on RS485 is in W)	
10 1 per 10 Wh (up to 3600W) ,	1 per 10 kWh (up to 3600kWh) , 1 per 10 MWh (above 3600kW) ,
100 1 per 100 Wh (up to 3600W),	1 per 100 kWh (up to 3600kWh) , 1 per 100 MWh (above 3600kW) ,
1000 1 per 1000 Wh (up to 3600W) ,	1 per 1000 kWh (up to 3600kWh) , 1 per 1000 MWh (above 3600kW) ,
Pulse Duration : 60 msec, 100 msec, 200 msec. Above options are also applicable to Apparent and Reactive Energy.	

Electrical connections:



Dimensions:



UNIVERSAL MEASURING INSTRUMENTS

No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire	1 Phase 2 Wire
1.	System Voltage	●	●	●
2.	System Current	●	●	●
3.	Voltage L1 - N (Phase voltage for single phase)	●	-	●
4.	Voltage L2 - N	●	-	-
5.	Voltage L3 - N	●	-	-
6.	Voltage L1 - L2	●	●	-
7.	Voltage L2 - L3	●	●	-
8.	Voltage L3 - L1	●	●	-
9.	Current L1 (Phase voltage for single phase)	●	●	●
10.	Current L2	●	●	-
11.	Current L3	●	●	-
12.	Frequency	●	●	●
13.	System Active Power (kW)	●	●	●
14.	Active Power L1 (phase power for single phase)	●	-	●
15.	Active Power L2	●	-	-
16.	Active Power L3	●	-	-
17.	System Re-active Power (kVar)	●	●	●
18.	Re-active Power L1 (phase power for single phase)	●	-	●
19.	Re-active Power L2	●	-	-
20.	Re-active Power L3	●	-	-
21.	System Apparent Power (kVA)	●	●	●
22.	Apparent Power L1 (phase power for single phase)	●	-	●
23.	Apparent Power L2	●	-	-
24.	Apparent Power L3	●	-	-
25.	System Phase Angle	●	●	●
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.	Active energy Import (kWh)	●	●	●
34.	Active energy Export (kWh)	●	●	●
35.	Reactive energy Import (kVArh)	●	●	●
36.	Reactive energy Export (kVArh)	●	●	●
37.	Apparent energy (kVAh)	●	●	●
38.	RPM	●	●	●
39.	Max (System Voltage/ System Current)	●	●	●
40.	Min (System Voltage/ System Current)	●	●	●
41.	Hour Run	●	●	●
42.	ON Hour	●	●	●
43.	Number of auxiliary interrupt	●	●	●
44.	Current Demand	●	●	●
45.	kVA Demand	●	●	●
46.	kW Demand Import	●	●	●
47.	kW Demand Export	●	●	●
48.	Max Current Demand	●	●	●
49.	Max kVA Demand	●	●	●
50.	Max kW Demand Import	●	●	●
51.	Max kW Demand Export	●	●	●

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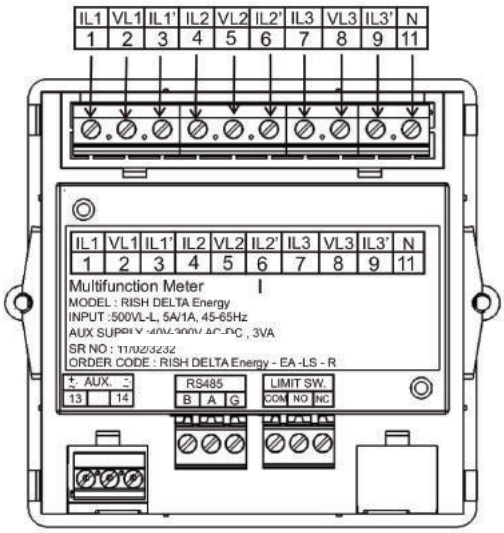
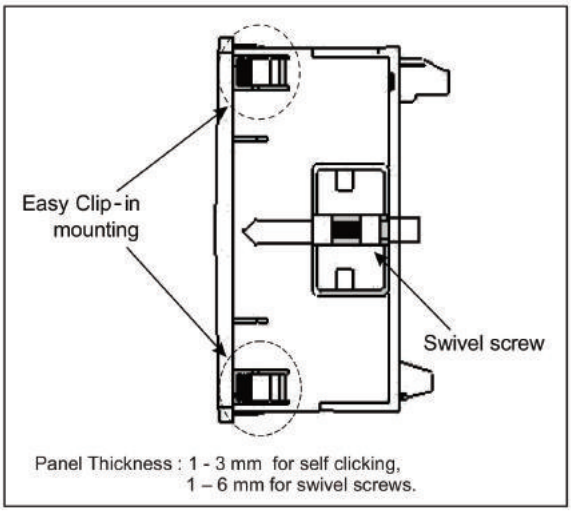
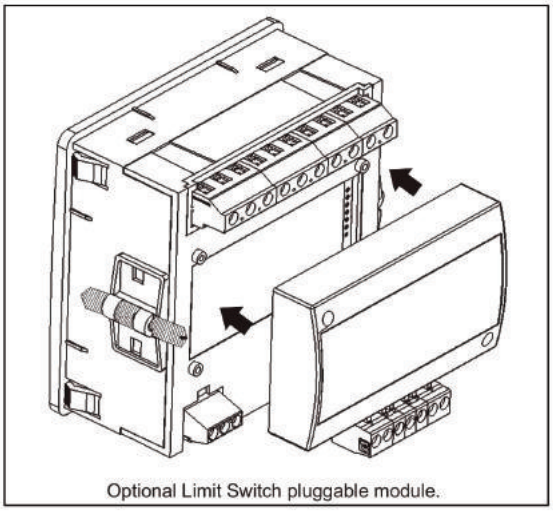
Rear connection:



Installation:

Easy Clip in Installation on Panel.





Order information:

Model: TNM96E

Auxiliary Supply

	Self Aux*
or	40 V – 300V AC/DC
or	12 V – 48V DC

Optional

	With Pulse output (Limit switch)
or /and	Output MODBUS (RS485)

Order example:

TNM96E, external aux (40V - 300V AC/DC), with pulse and MODBUS output.

* Note:

Self auxiliary meter is available only in 3Phase 4Wire and Single Phase network. Auxiliary input is derived from 1 Phase (R phase).

In case of external auxiliary meter all three networks are available (3Phase 4Wire / 3Phase 3Wire / Single Phase)

TNM 3440

- True RMS measurement.
- 3 Line 4 Digits ultra bright LED Display .
- On site Programmable CT/PT Ratios.
- User selectable CT Secondary 1A/5A.
- User selectable 3ph3wire / 3ph4wire .
- Storage of MIN / MAX values.
- Measurement and Display of RPM, Run hours, On hours, No. of interruption.
- Optional: MODBUS (RS485) Communication / Pulse output / Analogue output

TNM3440 measures important electrical parameters and replaces the multiple analog panel meters. It measures electrical parameters like AC current, Voltage, frequency, active energy import and 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).

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) and 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.

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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.

Programmable Energy format and 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) and 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

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.

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).

Optional Analog Outputs (2 Outputs)

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

Technical Specifications

Input Voltage		
Nominal input voltage (AC RMS)		Phase –Neutral 57.7 - 346 VL-N / Line-Line 100 - 600 V L-L
System PT primary values		100VLL to 692kVLL programmable on site.
System PT secondary values		100VLL to 600VLL programmable on site.
Max continuous input voltage		120% of rated value
Input Current		
Nominal input current		1A / 5A AC RMS.
System CT secondary values		1A and 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		
Auxiliary Supply		60 - 300 V AC DC
	or	12 - 60 V AC DC (on request)
AC Auxiliary supply frequency range		45 to 66 Hz
VA Burden		
Nominal input voltage burden		< 0.35 VA approx. per phase
Nominal input current burden		< 0.3 VA approx. per phase
Auxiliary Supply burden		< 5 VA approx
	or	< 7 VA approx with 4-20mA analog output or Ethernet 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 and Energy. 10... 100% of Nominal Current and 50... 100% of Nominal Voltage.
Power Factor / Phase Angle		40... 100% of Nominal Current and 50... 100% of Nominal Voltage.
Accuracy		
		Class 0.2S
Voltage		± 0.2% of Nominal value
Current		± 0.2% of Nominal value
Frequency		± 0.15% of mid frequency
Active Power		± 0.2% of Nominal value
Re-Active Power		± 0.4% of Nominal value
Apparent Power		± 0.2% of Nominal value
Active energy (kWh)		± 0.2% of Nominal value
Re Active energy (kVArh)		± 0.5% of Nominal value
Apparent energy (kVAh)		± 0.2% of Nominal value
Accuracy of Analog Output		1 % of Output end value
Power Factor		±1.0% of Unity
Angle		±1% of range
Total Harmonic Distortion		±1%
Note:- Measurement error is normally much less than the error specified above. Variation due to influence quantity is less than twice the error allowed forreference condition		
Influence of variations		
Temperature coefficient : (for rated value range of use (0...50°C))		0.025%/°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.

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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 and 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 and 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 and reactive Energy.			
Ampere hour			
Default pulse rate divisoe		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	
		*No. of Pulses = $\frac{\text{Maximum Pulses}}{\text{CT Ratio}}$	
		Where, CT Ratio = (CT primary/ CT Secondary)	

UNIVERSAL MEASURING INSTRUMENTS

No.	Parameter	3 Phase 4 Wire	3 Phase 3 Wire
1.	System Voltage	●	●
2.	System Current	●	●
3.	Voltage L1 - N	●	-
4.	Voltage L2 - N	●	-
5.	Voltage L3 - N	●	-
6.	Voltage L1 - L2	●	●
7.	Voltage L2 - L3	●	●
8.	Voltage L3 - L1	●	●
9.	Current L1	●	●
10.	Current L2	●	●
11.	Current L3	●	●
12.	Neutral current	●	-
13.	Frequency	●	●
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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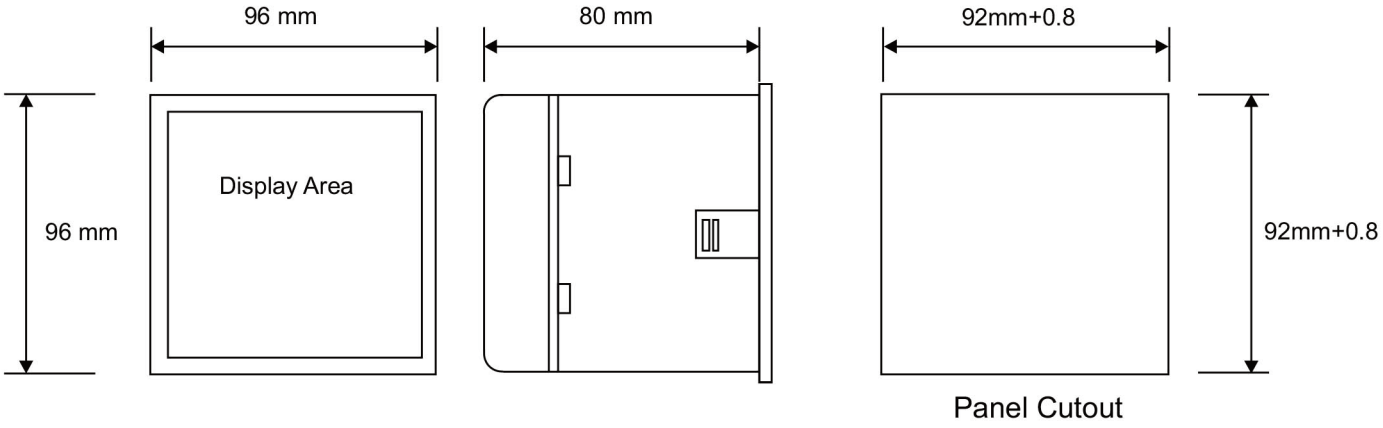
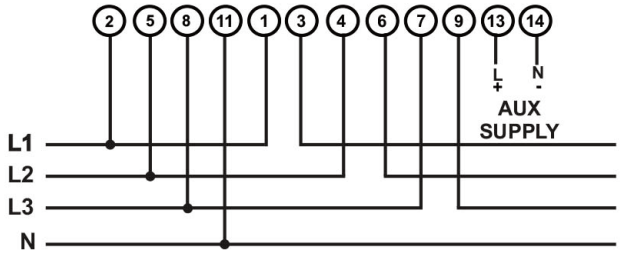
Dimensions:

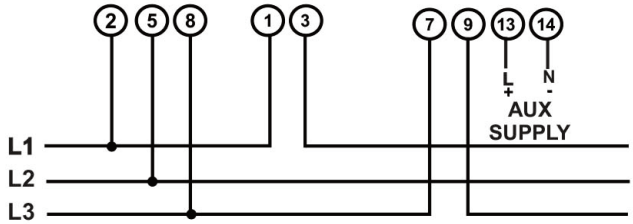


Electrical connections:

For 3 Phase 4 Wire Unbalanced Load



For 3 Phase 3 Wire Unbalanced Load



It is recommended that the wires used for connections to the instrument should have lugs soldered at the end. That is, the connectionsshould 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 mm2 single wire or 2 × 2.5 mm2 fine wire.

Ordering Information

Model: TNM3440
Accuracy class 0.2S
Input: 100 - 600V L-L
Auxiliary supply
100 550V AC DC
or 12 - 60V AC DC (on request)
Optional
RS485 + 2 Pulse output
or RS485 + 1 Pulse output + 2 Analog output
or Ethernet
or Option not used

Order Example:

TNM3440, Accuracy 0.2S, 100 - 600V , Aux: 100 - 550V AC DC

TNM96-ETN-II - Power Quality and Energy Powermeter

TNM96-ETN-II energy powermeter is a compact, highly accurate 0.2% (0.1% optional), three-phase powermeter, especially designed to meet the needs of power and energy measurement in any electrical installation for monitoring the parameters of electrical network.

TNM96-ETN-II includes history data logging and supports standard communication protocols BACnet and Modbus with simple integration into building management systems over RS485 and ethernet TCP/IP communication.

An indispensable tool for the building engineer, it aids efficient use of electricity by showing power factor, max and min demand, current in neutral line, harmonics up to 64th , periodic energy and very important safety tool - a leakage current.

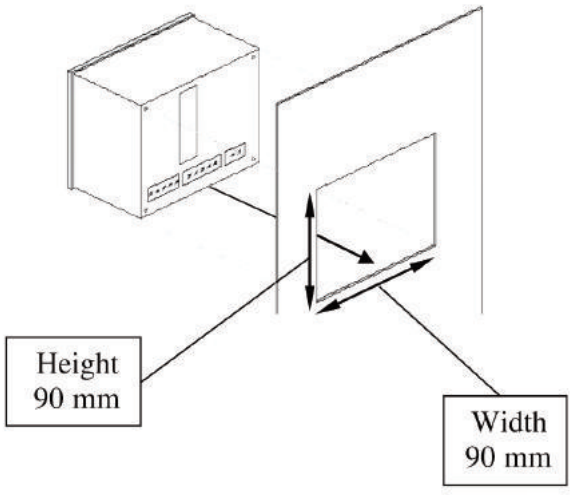
Technical Data

3 phase / 1 phase	yes
Accuracy	0.2% (optional 0.1%)
Sampling rate	1600 sample per cycle
Digital In / out	2 / 1
Harmonic resolution	64
Graphical display of the harmonics measurements	yes
Harmonic distortion	I-THD, U-THD
Waveform	Display only
Leakage (residual) current	yes
Simple operated menus	yes
Multilingual support	yes
Data logging	yes, up to 6 months
Build in T.O.U Energy meter	yes
Alarms	yes
Alarm log	yes
Minimum / Maximum	yes
History log for MIN/MAx values	yes
RS485 Communication Port Modbus	yes
Ethernet (TCP/IP) Modbus and BACnet	only TCP model
BACnet TCP/IP protocol	only TCP model
BACnet MS/TP protocol	yes
Web browser capacibility	only TCP model
LCD graphical display type	High resolution color LCD display
Display resolution	320x240 pixels
Fast trends	yes
Current transformers supported	5A / 1A / 0.333V
Power requirements	90 ∞ 250 VAC 110 ∞ 280 VDC
Frequency	50 / 60 Hz
Consumption	8 VA
Mounting	Frontal panel mounting
Dimensions (HxWxD)	96 x 96 x 80 mm
Weight	650 gr.
Environmental	Operation: -20 ∞ 70°C Storage: -20 ∞ 80°C Humidity: 0 ∞ 95 RH% non condensing
Measurement ranges	Voltage: 0 - 515 VAC Voltage(with transformer): up to 99999 KV Current (with transformer) : up to 99999 KA Maximum Input Voltage : 1000V Maximum Input Current : 6A
Measurement type	True RMS
Standard Approvals	EN62052-11, EN62053-22, EN62053-23, CE,UL61010, EN61000 -3-2, EN61000 -3-3, BTL

Measurement and Display values

Measurement Parameter	**Display range**
Current	0.001 - 99999 KA
Neutral current (calculated)	0.001 - 99999 KA
Voltage L-N	0.001 - 99999 KV
Voltage L-L	0.001 - 99999 KV
Frequency (Hz)	45.001 - 65.001 Hz
Active power total/phase	0.000 W - 99999 MW
Reactive power total/phase	0.000 VAR - 99999 MVAR
Apparent power total/phase	0.000 VA - 99999 MVA
Power factor (cap./ ind)	-1.000 ÷ 1.000
Active total/phase	0.001 WH - 99999999 MWH
Reactive total/phase	0.001 VARH - 99999999 MVARH
Apparent total/phase	0.001 VAH - 99999999 MVAH
Harmonic THD V/I	0.000 - 100%
Partial Harmonic V/I	0.000 - 100%
Operating hour meter	99999 - HH:MM:SS
Measurement Parameter	**Measuring in direct connection**
Current	0.001 - 6A
Neutral current (calculated)	0.001 - 6A
Voltage L-N	0.000 - 550V
Voltage L-L	0.000 - 950V
Frequency (Hz)	45.001 - 65.001 Hz
Power factor (cap./ ind)	-1.000 ÷ 1.000

Mechanical mounting:



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TNM160 - Energy meter and Electrical powermeter

- Simple installation - DIN Rail mounted

TNM160 energy powermeter is a compact, multi functional, multi channel, three\single-phase powermeter, especially designed to meet the stringent needs of power and energy measurement in any electrical installation up to 1 or 2 sets of three phase energy meters, or up to 6 single phase.

TNM160 includes history data logging up to 6 months and supports standard communication protocols BACnet and Modbus with simple integration into building management systems over RS485 or Ethernet TCP.

An indispensable tool for the building engineer, it aids efficient use of electricity by showing power factor, max. and min demand an current in neutral line.

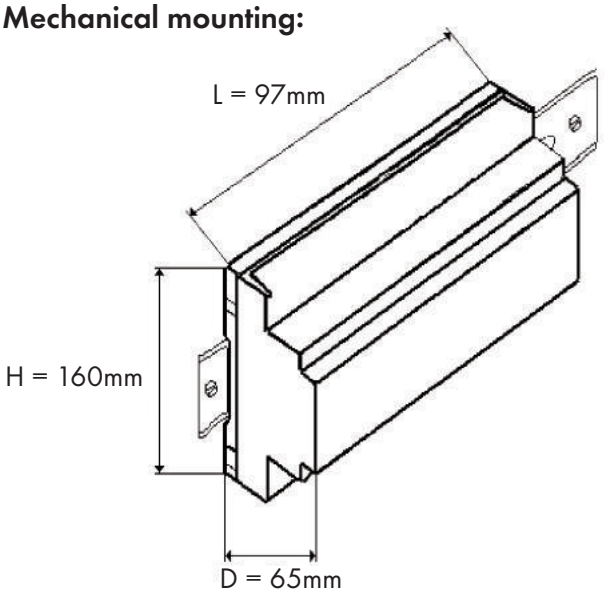
Technical Data

3 phase / 1 phase	up to 1or 2 sets / up to 6
Accuracy	0.2%
Sampling rate	1600 sample per cycle
Digital In / out	- / -
Harmonic resolution	32
Simple operated menus	yes
Multilingual support	yes
Data logging	yes, up to 6 months
Build in T.O.U Energy meter	yes
RS485 Communication Port Modbus	yes
Ethernet (TCP/IP)	yes
BACnet TCP/IP protocol	yes
BACnet MS/TP protocol	yes
Web browser capacibility	yes
LCD graphical display type	color display
Display resolution	320x240 pixels
Display of Waveform and baragph	yes
Current transformers supported	5A / 1A
Power requirements	90 ∾ 250 VAC 110 ∾ 280 VDC
Frequency	50 / 60 Hz
Consumption	6 VA
Mounting	DIN Rail mounting
Dimensions (HxWxD)	160 x 97 x 65 mm
Weight	550 gr.
Environmental	Operation: -20 ∾ 70°C Storage: -20 ∾ 80°C Humidity: 0 ∾ 95 RH% non condensing
Measurement ranges	Voltage: 0 - 550 VAC Voltage(with transformer): up to 999999999 KV Current (with transformer) : up to 99999999 KA Maximum Input Voltage : 1000V Maximum Input Current : 6A Supported current sensors: 1A / 5A
Measurement type	True RMS
Standard Approvals	EN62052-11, EN62053-22, EN62053-23, CE, UL61010, EN61000 -3-2, EN61000 -3-3, BTL

Measurement and Display values

Measurement Parameter	**Display range**
Current	0.001 - 99999 KA
Neutral current (calculated)	0.001 - 99999 KA
Voltage L-N	0.001 - 99999 KV
Voltage L-L	0.001 - 99999 KV
Frequency (Hz)	45.001 - 65.001 Hz
Active power total/phase	0.000 W - 99999 MW
Reactive power total/phase	0.000 VAR - 99999 MVAR
Apparent power total/phase	0.000 VA - 99999 MVA
Power factor (cap./ ind)	-1.000 ÷ 1.000
Active total/phase	0.001 WH - 99999999 MWH
Reactive total/phase	0.001 VARH - 99999999 MVARH
Apparent total/phase	0.001 VAH - 99999999 MVAH
Measurement Parameter	**Measuring in direct connection**
Current	0.1 - 6A
Voltage L-N	0.1 - 550V
Voltage L-L	0.1 - 950V
Frequency (Hz)	45 - 65 Hz
Power factor (cap./ ind)	-1.000 ÷ 1.000

Mechanical mounting:



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TNM230 - Energy meter and Electrical powermeter

- Simple installation - DIN Rail mounted

TNM230 energy powermeter is a compact, multi functional, multi channel, three\single-phase powermeter, especially designed to meet the stringent needs of power and energy measurement in any electrical installation up to 8 sets three phase channels or up to 24 single phase engery meters

TNM230 includes history data logging up to 6 months and supports standard communication protocols BACnet and Modbus with simple integration into building management systems over RS485 or Ethernet TCP.

An indispensable tool for the building engineer, it aids efficient use of electricity by showing power factor, max. and min demand an current in neutral line.

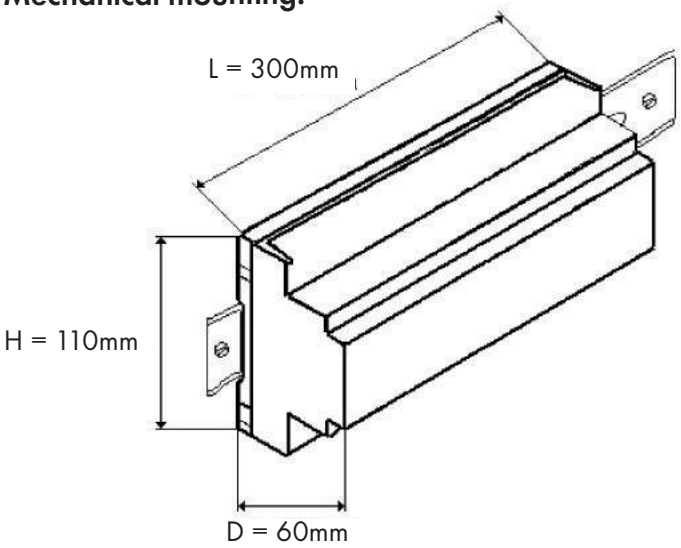
Technical Data

3 phase / 1 phase	up to 8 sets / up to 24
Accuracy	0.2%
Sampling rate	1600 sample per cycle
Digital In / out	- / -
Harmonic resolution	32
Simple operated menus	yes
Multilingual support	yes
Data logging	yes, up to 6 months
Build in T.O.U Energy meter	yes
RS485 Communication Port Modbus	yes
Ethernet (TCP/IP)	yes
BACnet TCP/IP protocol	yes
BACnet MS/TP protocol	yes
Web browser capacibility	yes
LCD graphical display type	color display
Display resolution	320x240 pixels
Display of Waveform and baragph	yes
Current transformers supported	5A / 1A
Power requirements	90 ∾ 250 VAC 110 ∾ 280 VDC
Frequency	50 / 60 Hz
Consumption	11 VA
Mounting	DIN Rail mounting
Dimensions (HxWxD)	110 x 300 x 60 mm
Weight	1.250 gr.
Environmental	Operation: -20 ∾ 70°C Storage: -20 ∾ 80°C Humidity: 0 ∾ 95 RH% non condensing
Measurement ranges	Voltage: 0 - 550 VAC Voltage(with transformer): up to 999999999 KV Current (with transformer) : up to 99999999 KA Maximum Input Voltage : 1000V Maximum Input Current : 6A Supported current sensors: 1A / 5A
Measurement type	True RMS
Standard Approvals	EN62052-11, EN62053-22, EN62053-23, CE, UL61010, EN61000 -3-2, EN61000 -3-3, BTL

Measurement and Display values

Measurement Parameter	**Display range**
Current	0.001 - 99999 KA
Neutral current (calculated)	0.001 - 99999 KA
Voltage L-N	0.001 - 99999 KV
Voltage L-L	0.001 - 99999 KV
Frequency (Hz)	45.001 - 65.001 Hz
Active power total/phase	0.000 W - 99999 MW
Reactive power total/phase	0.000 VAR - 99999 MVAR
Apparent power total/phase	0.000 VA - 99999 MVA
Power factor (cap./ ind)	-1.000 ÷ 1.000
Active total/phase	0.001 WH - 99999999 MWH
Reactive total/phase	0.001 VARH - 99999999 MVARH
Apparent total/phase	0.001 VAH - 99999999 MVAH
Measurement Parameter	**Measuring in direct connection**
Current	0.1 - 6A
Voltage L-N	0.1 - 550V
Voltage L-L	0.1 - 950V
Frequency (Hz)	45 - 65 Hz
Power factor (cap./ ind)	-1.000 ÷ 1.000

Mechanical mounting:



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TNM300 - Energy meter and Electrical powermeter

- Simple installation - DIN Rail mounted

TNM300 energy powermeter is a compact, multi functional, multi channel, three\single-phase powermeter, especially designed to meet the stringent needs of power and energy measurement in any electrical installation:

- Up to 12 sets of three phase energy meters or
- Up to 36 singles phaser enger meters or
- Up to 36 digital Inputs

TNM300 includes history data logging up to 4 months and supports standard communication protocols BACnet and Modbus with simple integration into building management systems over RS485 or Ethernet TCP.

An indispensable tool for the building engineer, it aids efficient use of electricity by showing power factor, max. and min demand an current in neutral line.

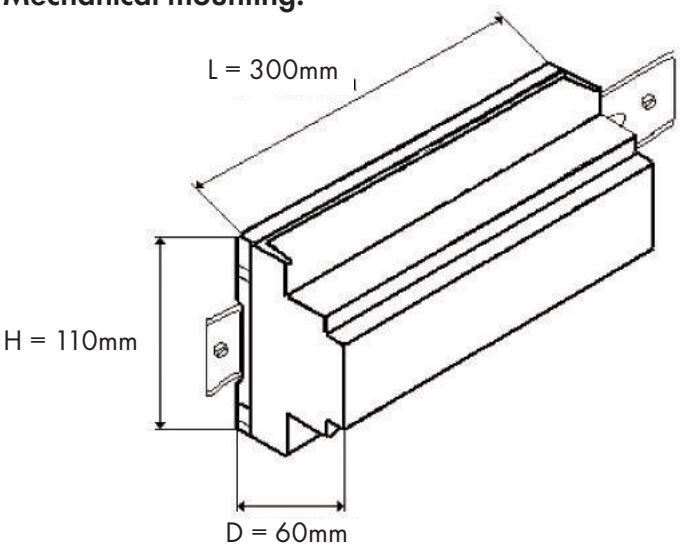
Technical Data

3 phase / 1 phase	12x / 36x
Accuracy	0.2%
Sampling rate	1600 sample per cycle
Digital In / out	- / -
Harmonic resolution	32
Simple operated menus	yes
Multilingual support	yes
Data logging	yes, up to 6 months
Build in T.O.U Energy meter	yes
RS485 Communication Port Modbus	yes
Ethernet (TCP/IP) Modbus and BACnet	yes
BACnet TCP/IP protocol	yes
BACnet MS/TP protocol	yes
Web browser capacibility	yes
LCD graphical display type	text LCD display / color display
Display resolution	4x40 characters / 320x240 pixels
Current transformers supported	5A / 1A / 0.333V
Power requirements	90 ∞ 250 VAC 110 ∞ 280 VDC
Frequency	50 / 60 Hz
Consumption	11 VA
Mounting	DIN Rail mounting
Dimensions (HxWxD)	110 x 300 x 60 mm
Weight	1.250 gr.
Environmental	Operation: -20 ∞ 70°C Storage: -20 ∞ 80°C Humidity: 0 ∞ 95 RH% non condensing
Measurement ranges	Voltage: 0 - 550 VAC Voltage(with transformer): up to 999999999 KV Current (with transformer) : up to 99999999 KA Maximum Input Voltage : 1000V Maximum Input Current : 6A Supported current sensors: 0.333V /1A / 5A / 63A / 0.1A
Measurement type	True RMS
Standard Approvals	EN62052-11, EN62053-22, EN62053-23, CE, UL61010, EN61000 -3-2, EN61000 -3-3,BTL

Measurement and Display values

Measurement Parameter	**Display range**
Current	0.001 - 99999 KA
Neutral current (calculated)	0.001 - 99999 KA
Voltage L-N	0.001 - 99999 KV
Voltage L-L	0.001 - 99999 KV
Frequency (Hz)	45.001 - 65.001 Hz
Active power total/phase	0.000 W - 99999 MW
Reactive power total/phase	0.000 VAR - 99999 MVAR
Apparent power total/phase	0.000 VA - 99999 MVA
Power factor (cap./ ind)	-1.000 ÷ 1.000
Active total/phase	0.001 WH - 99999999 MWH
Reactive total/phase	0.001 VARH - 99999999 MVARH
Apparent total/phase	0.001 VAH - 99999999 MVAH
Measurement Parameter	**Measuring in direct connection**
Current	0.1 - 6A
Voltage L-N	0.1 - 550V
Voltage L-L	0.1 - 950V
Frequency (Hz)	45 - 65 Hz
Power factor (cap./ ind)	-1.000 ÷ 1.000

Mechanical mounting:



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