Ziegler *mfm 3430*

Digital Multifunction Instrument

Single Phase (1-PH)

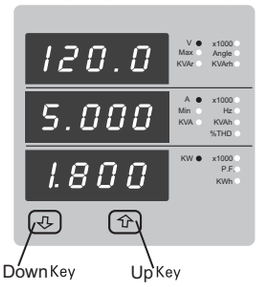
Single Phase Multi-function Digital Meter
Installation & Operating Instructions

Section **Contents**

30731_Rev .B/ 12/2011 E1R0

1 .Introduction

The **Ziegler** *mfm* **3430** is a panel mounted 96 x 96mm DIN Quadratic Digital metering system for the measurement important electrical parameters like AC Voltage, AC Current, Frequency, Power, Energy (Active / Reactive / Apparent) . The instrument integrates accurate measurement technology (Voltage& Current measurements are True RMS up to 15th Harmonic) with 3 line 4 digits Ultra high brightness LED display.



Ziegler *mfm* **3430** can be configured and programmed at site for the following : PT primary CT Primary, CT Secondary (5A or 1A).

The front panel has two push buttons through which the user may scroll through the available measurement readings ,reset the energy (Import/Export) Min/Max (System Voltage and System Current) and configure the product.

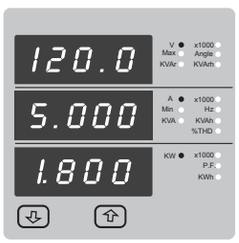
TABLE 1:

Measured Parameters	Units of measurement
System Voltage	Volts
System Current	Amps
Frequency	Hz
Active Power	Kwatts
Reactive Power	KVAr
Apparent Power	KVA
Power Factor	
Phase Angle	Degree
Active Import Energy (8 Digit resolution)	kWh
Active Export Energy (8 Digit resolution)	kWh
Reactive Import Energy (8 Digit resolution)	kVArh
Reactive Export Energy (8 Digit resolution)	kVArh
Apparent Energy (8 Digit resolution)	kVAh
V1 THD	%
I1 THD	%

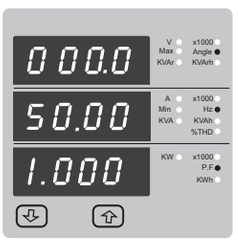
2 .Measurement Reading Screens

In normal operation the user is presented with one of the measurement reading screens out of several screens .These screens may be scrolled through one at a time in incremental order by pressing the"⇧" Up key "and in decremental order by pressing "⇩" Down key."

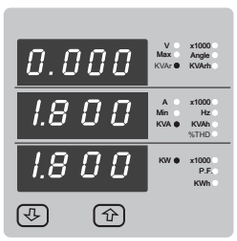
Screen 1 : System screen (System Voltage ,System Current , System Active Power)



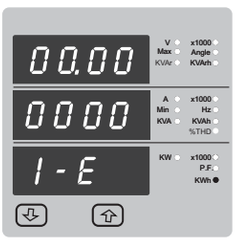
Screen 2 : Phase Angle ,Frequency, Sys. Power Factor



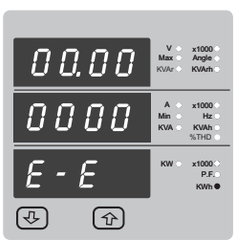
Screen 3 : System Power (Reactive, Apparent ,Active)



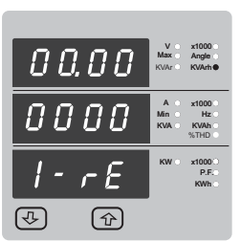
Screen 4 : Active Energy(Import)



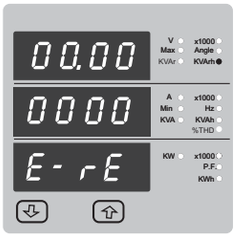
Screen 5 : Active Energy (Export)



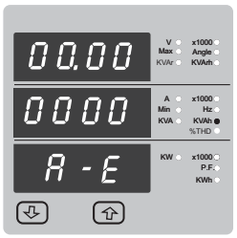
Screen 6 : Reactive Energy(Import)



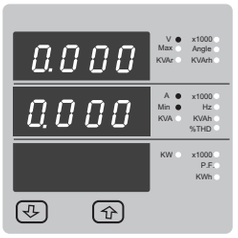
Screen 7 : Reactive Energy(Export)



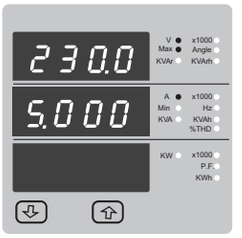
Screen 8 : Apparent Energy



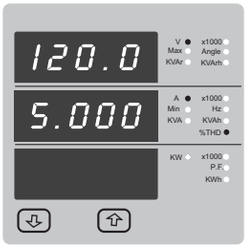
Screen 9 : Min Sys Voltage & Current



Screen 10 : Max Sys Voltage& Current



Screen 11 : Voltage & Current % THD



3 .Programming

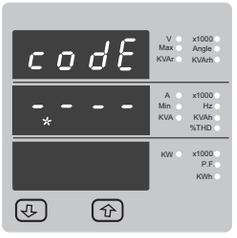
The following sections comprise step by step procedures for configuring the 3430 for individual user requirements.

To access the set-up screens press and hold the“ Down ”and“ Up” Key simultaneously for 5 seconds .This will take the User into the Password Protection Entry Stage (Section 3.1).

3.1 .Password Protection

Password protection can be enabled to prevent unauthorised access to set-up screens ,by default password protection is not enabled.

Password protection is enabled by selecting a four digit number other than 0000, setting a password of 0000 disables the password protection.

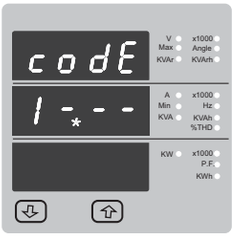


Enter Password ,prompt for first digit.
(*Denotes that decimal point will be flashing).

Press the “ Down ”key to scroll the value of the first digit from 0 through to 9 ,the value will wrap from 9 round to 0.

Press the “ Up ”key to advance to next digit.

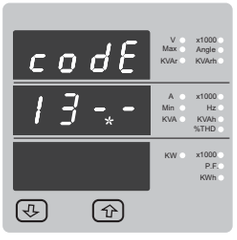
In the special case where the Password is“ 0000 ”pressing the“ Up ”key when prompted for the first digit will advance to the“ Password Confirmed ”screen.



Enter Password ,first digit entered ,prompt for second digit.
(*Denotes that decimal point will be flashing).

Use the “ Down ”key to scroll the value of the second digit from 0 through to 9 ,the value will wrap from 9 round to 0.

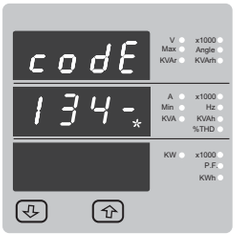
Press the “ Up ”key to advance to next digit.



Enter Password ,second digit entered ,prompt for third digit.
(*Denotes that decimal point will be flashing).

Use the “ Down ”key to scroll the value of the third digit from 0 through to 9 ,the value will wrap from 9 round to 0.

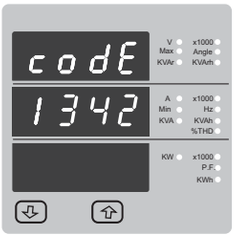
Press the “ Up ”key to advance to next digit.



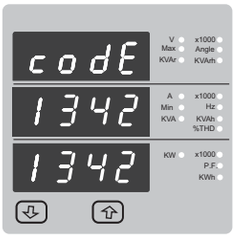
Enter Password ,third digit entered ,prompt for fourth digit.
(*Denotes that decimal point will be flashing).

Use the “ Down ”key to scroll the value of the fourth digit from 0 through to 9 ,the value will wrap from 9 round to 0.

Press the “ Up ”key to advance to verification of the password.

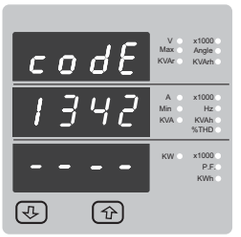


Enter Password ,fourth digit entered ,awaiting verification of the password.



Password confirmed.
Pressing “ Down ”key will advance to the“ New / change Password ”entry stage.

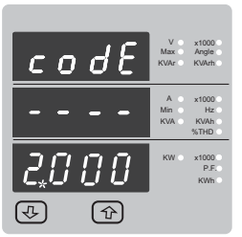
Pressing the“ Up ”key will advance to the Set up screen .(See section 3.2).



Password Incorrect.
The unit has not accepted the Password entered.

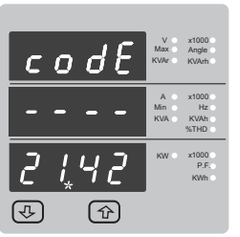
Pressing the" Down "key will return to the Enter Password stage .

Pressing the“ Up ”key exits the Password menu and returns operation to the measurement reading mode.



New / Change Password
(*Decimal point indicates that this will be flashing).
Pressing the “ Down ”key will scroll the value of the first digit from 0 through to 9 ,the value will wrap from 9 round to 0.

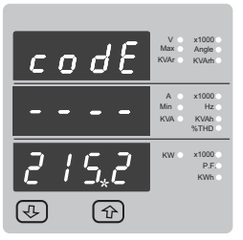
Pressing the “ Up ”key to advance the operation to the next digit and sets the first digit ,in this case to“ 2”



New / Change Password ,first digit entered ,prompting for second digit .(*Decimal point indicates that this will be flashing).

Pressing the “ Down ”key will scroll the value of the second digit from 0 through to 9 ,the value will wrap from 9 round to 0.

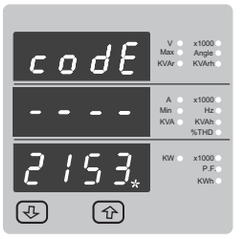
Pressing the “ Up ”key to advance the operation to the next digit and sets the second digit ,in this case to“ 1”



New / Change Password ,second digit entered , prompting for third digit .(*decimal point indicates that this will be flashing).

Pressing the “ Down ”key will scroll the value of the third digit from 0 through to 9 ,the value will wrap from 9 round to 0.

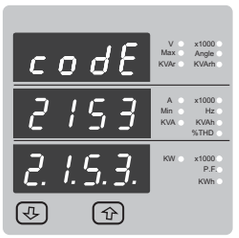
Pressing the “ Up ”key to advance the operation to the next digit and sets the third digit ,in this case to“ 5”



New / Change Password ,third digit entered ,prompting for fourth digit .(*denotes that decimal point will be flashing).

Pressing the ⇩" Down "key will scroll the value of the fourth digit from 0 through to 9 ,the value will wrap from 9 round to 0.

Pressing the ⇧" Up "key to advance the operation to the" New Password Confirmed "and sets the fourth digit , in this case to" 3."



New Password confirmed.

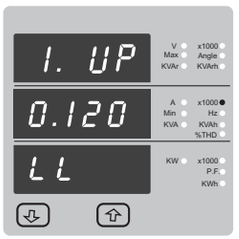
Pressing the ⇩" Down "key will return to the "New/Change Password."

Pressing the ⇧" Up "key will advances to the Set up screen.(see section 3.2).

3.2 Set Up Screens

3.2.1 .Potential Transformer Primary Value

The nominal full scale voltage which will be displayed as the L - L.
This screen enables the user to display the line to line voltage inclusive of any transformer ratios the values displayed represent the voltage in kilovolts (note the x1000 enunciator).

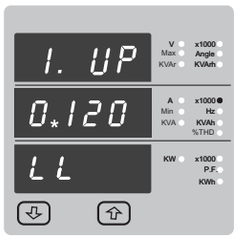


Pressing the ⇧" Up "key accepts the present value and advances to the" Current Transformer Primary Value edit "menu. (See Section 3.2.2)

Pressing the ⇩" Down "key will enter the" Potential Transformer Primary Value Edit "mode.

Initially the" multiplier must be selected ,pressing the " Down "key will move the decimal point position to the right until it reaches #. # # # after which it will return to .# # # .#

Pressing the ⇧" Up "key accepts the present multiplier (decimal point position) and advances to the "Potential Transformer Digit Edit "mode.



Potential Transformer Digit Edit

Pressing the ⇩" Down "key will scroll the value of the most significant digit from 0 through to 9 unless the presently displayed Potential Transformer Primary Value together with the Current Transformer Primary Value ,previously set ,would result in a maximum power of greater than 666.6 MVA in which case the digit range will be restricted.

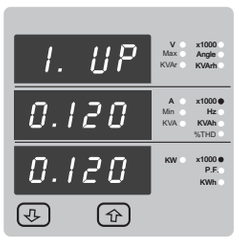
Pressing the ⇧" Up "key accepts the present value at the cursor position and advances the cursor to the next less significant digit.

The PT Primary value can be set from 100V L-L to 692.8kV L-L.

Note : the flashing decimal point indicates the cursor position ,a steady decimal point will be present to identify the scaling of the number until the cursor position coincides with the steady decimal point position .At this stage the decimal point will flash.

When the least significant digit has been set pressing the ⇧" Up "key will advance to the "Potential Transformer Primary Value Confirmation "stage.

Screen showing display of 0.120 kV i.e .120 Volts indicating steady decimal point and cursor flashing at the" hundreds of volts "position.



Note : 0.120 kV i.e .120 V_{L-L}

Potential Transformer Primary Value Confirmation

This screen will only appear following an edit of the Potential Transformer Primary Value.

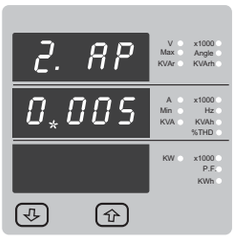
If the scaling is not correct ,pressing the ⇩" Down " key will return to the" Potential Transformer Primary Value Edit "stage.

Pressing the ⇧" Up "key sets the displayed value and will advance to the Current Transformer Primary Value (See section 3.2.2)

3.2.2 .Current Transformer Primary Value

The nominal Full Scale Current that will be displayed as the Line currents .This screen enables the user to display the Line currents inclusive of any transformer ratios ,the values displayed represent the Current in Amps.

Pressing the ⇧" Up "key accepts the present value and advances to the Current Transformer Secondary Value (See section 3.2.3).



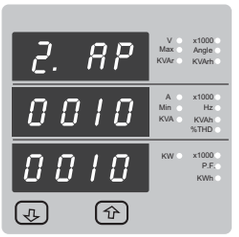
Pressing the ⇩" Down "key will enter the" Current Transformer Primary Value Edit "mode .This will scroll the value of the most significant digit from 0 through to 9 , unless the presently displayed Current Transformer Primary Value together with the Potential Transformer Primary Value results in a maximum power of greater than 666.6 MVA in which case the digit range will be restricted ,the value will wrap .Example :If primary value of PT is set as 692.8kV (max value) then primary value of Current is restricted to 1157A.

Pressing the ⇧Up "key will advance to the next less significant digit .(*Denotes that decimal point will be flashing).

The" Maximum Power "restriction of 666.6 MVA refers to 120 %of nominal current and 120 %of nominal voltage ,i.e ,462.9 MVA nominal system power.

When the least significant digit had been set ,pressing the ⇧" Up "key will advance to the "Current Transformer Primary Value Confirmation "stage.

The minimum value allowed is 1 ,the value will be forced to 1 if the display contains zero when the ⇧"Up "key is pressed.



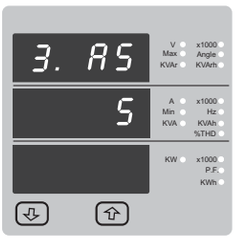
Current Transformer Primary Value Confirmation.

This screen will only appear following an edit of the Current Transformer Primary Value

If the scaling is not correct ,Pressing the ⇩" Down "key will return to the" Current Transformer Primary Value Edit" stage with the most significant digit highlighted (associated decimal point flashing) and the bottom line of the display will be blanked.

Pressing the ⇧" Up "key sets the displayed value and will advance to the" Current Transformer Secondary Value Edit "menu .(See section 3.2.3).

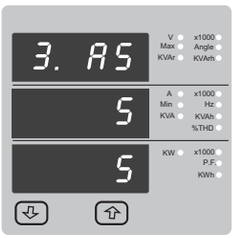
3.2.3 .Current Transformer Secondary Value



This screen is used to set the secondary value for Current Transformer .Secondary value" 5 "for 5A or "1 "for 1A can be selected .Pressing ⇧" Up "key accepts the present value and advances to the Pulse Rate edit menu (See section 3.2.4) .

Pressing the ⇩" Down "key will enter the CT Secondary value edit mode and scroll the value through the values available.

Pressing the ⇧" Up "key will advance to the CT Secondary value confirmation.



CT Secondary value confirmation

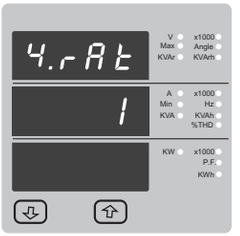
This screen will only appears following an edit of CT secondary value.

If secondary value shown is not correct ,pressing the Down key will return to CT secondary edit stage by blanking the bottom line of the display.

Pressing ⇧" Up "key sets the displayed value and will advance to Pulse Rate Edit menu. (See section 3.2.4)

3.2.4 .Pulse Rate

This screen applies to the Relay Output option only .The screen allows user to set the energy pulse rate divisor .Divisor values can be selected through 1,10,100,1000.



Pressing ⇧" Up "key accepts the presents value and advances to the" Reset"menu (See section 3.2.5).

Pressing the ⇩" Down "key will enter the" Pulse rate divisor Edit "mode and scroll the value through the values 1,10,100, 1000 wrapping back to 1.

Pressing the ⇧" Up "key advances to the" Pulse rate Divisor Confirmation "menu.

Pulse Rate Divisor Confirmation.

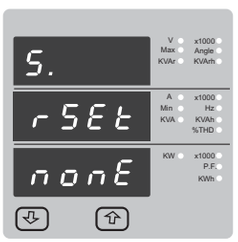
This screen will only appear following an edit of the Pulse rate divisor.

If the Pulse rate shown is not correct ,pressing the ⇩" Down "key will return to the" Pulse rate divisor Edit "stage by blanking the bottom line of the display.

Pressing ⇧" Up "key sets the displayed value and will advance to the" Reset "menu.
(See section 3.2.5)

3.2.5 .Resets

The following screens allow the users to reset the all Energy , Lo(Min) ,hi(Max).

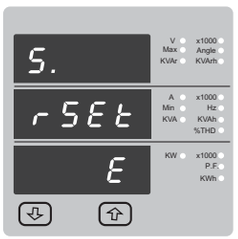


Reset (None)

Pressing ⇧" Up "key advances to Pulse Duration menu. (see section 3.2.6).

Pressing the ⇩" Down "key will enter the" Reset option "mode and scroll the value" through the option and wrapping back to None.

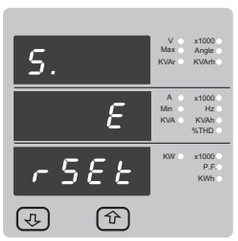
Pressing ⇧" Up "key will not reset and will advance to Pulse Duration menu.(See sec.3.2.6)



Reset option select ,(Reset Energy)

The user has scrolled through to the" E "Energy value.

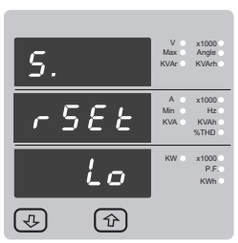
Pressing ⇧" Up "key will select the value and advance to the" Reset Energy Confirmation "Mode.



Reset Energy Confirmation.

Pressing the ⇩" Down "key will re-enter the" Reset option "mode.

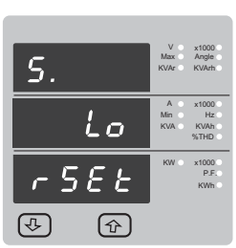
Pressing ⇧" Up "key resets the all Energy parameters and advances to the Pulse Duration
(see section 3.2.6.)



Reset option select ,(Reset Lo)

The user has scrolled through to the" Lo "(Min)

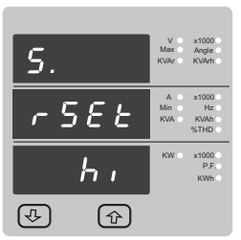
Pressing ⇧" Up "key will select the value and advance to the" Reset Lo Confirmation "Mode.



Reset Lo Confirmation

Pressing the ⇩" Down "key will re-enter the "Reset option Select mode.

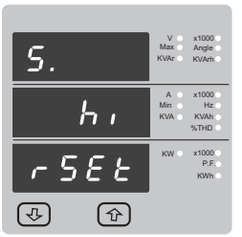
Pressing ⇧" Up "key resets the Lo (Min) readings and advances to the Pulse Duration
(see section 3.2.6).



Reset option select, (Reset Hi)

The user has scrolled through to the" Hi "(Max)

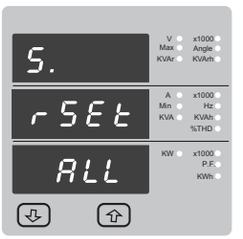
Pressing ⇧" Up "key will select the value and advance to the" Reset Hi Confirmation "Mode.



Reset hI (Max) Confirmation.

Pressing the ⇩ Down "key will re-enter the "Reset option Select mode.

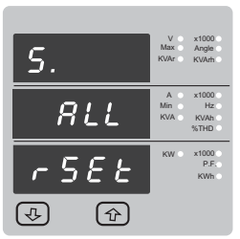
Pressing ⇧ Up "key resets the hI (Max) readings and advances to the Pulse Duration
(see section 3.2.6).



Reset option select ,(Reset ALL)

The user has scrolled through to the" ALL. "

Pressing ⇧" Up "key will select the value and advance to the" Reset ALL Confirmation "Mode.

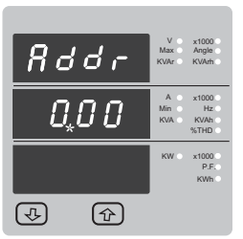


Reset ALL Confirmation.

Pressing the ⇩" Down "key will re-enter the "Reset option Select mode.

Pressing ⇧" Up "key resets ALL the readings and advances to the Pulse Duration
(see section 3.2.6).

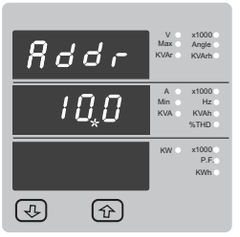
3.2.6 Address Setting: This screen applies to the RS 485 output only . This screen allows the user to set RS485 address for instruments



The range of allowable address is 1 to 247.

Enter Address ,prompt for first digit.
(*Denotes that decimal point will be flashing).

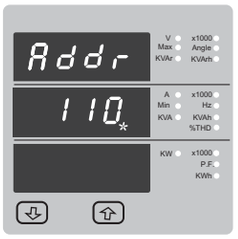
Press the ⇩" Down "key to scroll the value of the first digit
Press the ⇧" Up "key to advance to next digit.



Enter Address ,first digit entered ,prompt for second digit
(*Denotes that decimal point will be flashing).

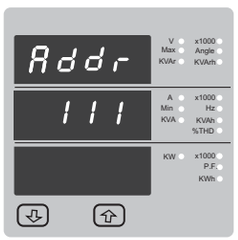
Use the ⇩ " Down "key to scroll the value of the second digit

Press the ⇧" Up "key to advance to next digit.



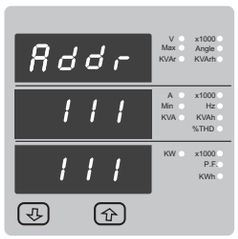
Enter Address ,second digit entered ,prompt for third digit (*Denotes that decimal point will be flashing).

Use the ⇩" Down "key to scroll the value of the third digit



Enter Address for third digit.

Press the⇧" Up "key to advance to Address confirmation Screen.



Address confirmation Screen.

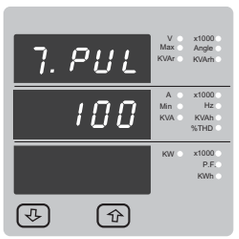
This Screen confirms the Address set by user.

Press the⇧" Up "key to advance to next Screen "Pulse Duration" (3.2.7)

3.2.7 Pulse Duration :

This screen applies to the Relay Pulsed output only .

This screen allows the user to set Relay energisation time in milliseconds.

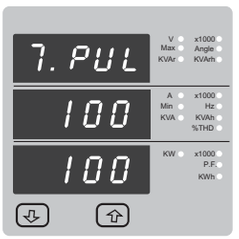


Pulse Duration Edit.

Pressing⇧" Up "key accepts the present value and advance to the Auto scroll menu(see section 3.2.8).

Pressing the ⇩ " Down "key will enter the" Pulse Duration Edit "mode and scroll the value through 60 ,100 ,200 and wrapping back to 60.

Pressing the⇧" Up "key will select the value and advances to" Pulse Duration Confirmation."



Pulse Duration Confirmation.

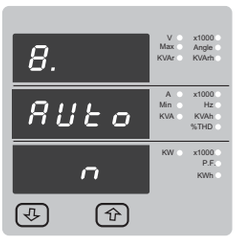
This screen will only appear following an edit of the Pulse duration.

pressing the ⇩" Down "key will re-enter the" Pulse Duration Edit "mode.

Pressing⇧" Up "key set displayed value and will advance to Auto scroll menu (see section 3.2.8)

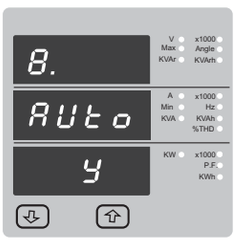
3.2.8 Auto Scrolling:

This screen allows user to enable screen scrolling.



Auto scrolling Edit.

Pressing ⇧" Up "key accepts the present status and advance to the Low Current noise cutoff (see section 3.2.9).

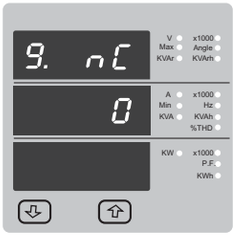


Pressing the ⇩" Down "key will enter the" Auto Screen Scrolling Edit "and toggle the status' Yes 'and' No.'

Pressing the ⇧" Up "key will select the status displayed and advance to the Low Current noise cutoff (see section 3.2.9).

3.2.9 .Low Current noise cutoff.

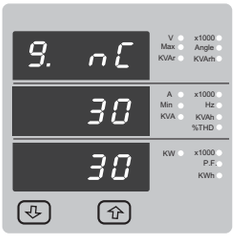
This screen allows the user to set Low noise current cutoff in mA.



Low current cutoff Edit.

Pressing ⇧" Up "key accepts the present value and advance to Assignment of energy to pulse output 1

Pressing the ⇩" Down "key will enter the" Low current noise cutoff Edit "mode and scroll the" Value "through 0 & 30 and wrapping back to 0 .Setting 30 will display measured currents as 0 below 30 mA.



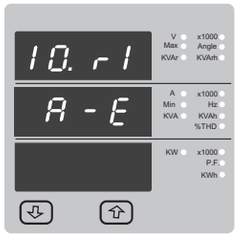
Low current noise cutoff Confirmation.

pressing the ⇩" Down "key will re-enter the" Low current Noise cutoff Edit "mode.

Pressing⇧" Up "key set displayed value and will advance to Assignment of energy to pulse output1 . (See section 3.2.10)

3.2.10 .Assignment of Energy to pulse output 1:

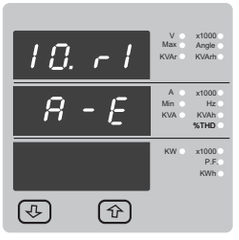
This screen allows the user to assign pulse output1 to energy



Pressing⇧" Up "key accepts the present setting and advance to" Assignment of Energy to Pulse Output 2" (see section 3.2.11).

Pressing the ⇩" Down "key will enter into edit mode and scroll through the energy setting

A - E : Apparent Energy
I - E : Import Energy (Active)
E - E : Export Energy (Active)
I - rE : Import Reactive Energy
E - rE : Export Reactive Energy



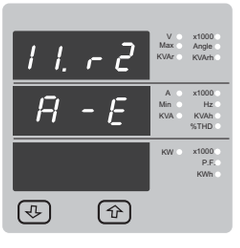
Pulse output1 confirmation:

Pressing ⇩ " Down "key will be re-enter into edit mode.

Pressing the⇧" Up "key will set the value and advances to the" Assignment of Energy to pulse output 2"(see section 3.2.11).

3.2.11 .Assignment of Energy to pulse output 2:

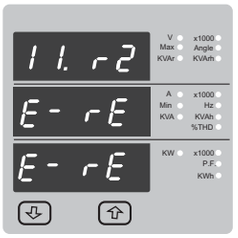
This screen allows the user to assign pulse output 2 to energy



Pressing⇧" Up "key accepts the present setting and advance to" RS 485 Baud Rate)"see section 3.2.12.(

Pressing the ⇩" Down "key will enter into edit mode and scroll through the energy setting

A - E : Apparent Energy
I - E : Import Energy (Active)
E - E : Export Energy (Active)
I - rE : Import Reactive Energy
E - rE : Export Reactive Energy



Pulse output 2 confirmation:

Pressing " Down "key will be re-enter into edit mode.

Pressing the " Up "key will set the value and advances to the" RS 485 Baud Rate"(see section 3.2.12).

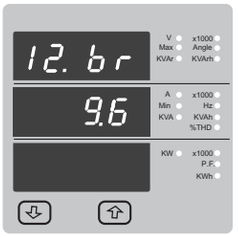
Analog output 1 Confirmation:

Pressing the " Down "key will re-enter the " Analog output 1 Edit "

Pressing the " Up "key sets the displayed value and will advance to the Analog output 2 selection (see section 3.2.15)

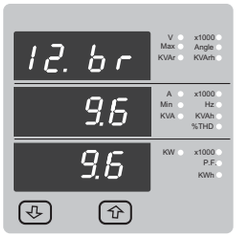
3.2.12 RS 485 Baud Rate:

This screen allows the user to set Baud Rate of RS 485 port. The values displayed on screen are in k baud..



Pressing " Up "key accepts the present value and advance to the Parity Selection (see section 3.2.13).

Pressing the " Down "key will enter the" Baud Rate Edit "mode and scroll the value through 2.4 ,4.8 ,9.6 , 19.2 and back to 2.4



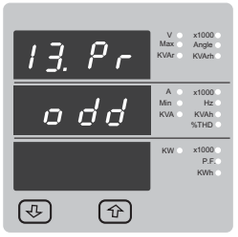
RS 485 Baud Rate confirmation:

Pressing " Down "key will be re-enter into Baud Rate Edit mode.

Pressing the " Up "key will select the value and advances to the Parity Selection) see section 3.2.13.(

3.2.13 RS 485 Parity Selection:

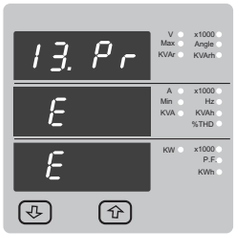
This screen allows the user to set Parity & number of stop bits of RS 485 port .



Pressing " Up "key accepts the present value and advance to the Analog output 1 selection (see section 3.2.14).

Pressing the " Down "key will enter the" Parity & stop bit Edit "mode and scroll the value through

odd : odd parity with one stop bit
no 1 : no parity with one stop bit
no 2 : no parity with two stop bit
E : even parity with one stop bit



RS 485 Parity confirmation:

Pressing " Down "key will be re-enter into Parity Edit mode.

Pressing the " Up "key will set the value and advances to the Analog Output 1 Selection (see section 3.2.14).

3.2.14 Analog Output 1 Selection : (Optional)

This screen is for analog output 1 only . It allows the user to set analog output 1 to corresponding measured parameter . Refer table " Parameter for Analog output."

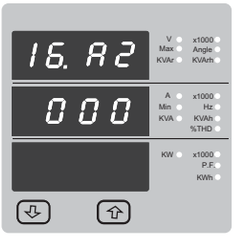
Pressing " Up "key accepts the present value and advance to the Analog output 2 selection (see section 3.2.159).

Pressing the " Down "key will enter the " Analog output 1 Edit " mode and scroll the values ,as per Table "Parameter for Analog output"

Pressing the " Up "key advance to the Analog output 1 confirmation screen.

3.2.15 Analog Output 2 Selection : (Optional)

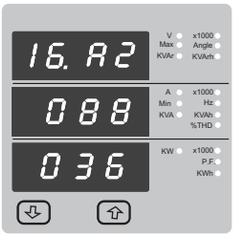
This screen is for analog output 2 only . It allows the user to set analog output 2 to corresponding measured parameter . Refer table " Parameter for Analog output."



Pressing " Up "key accepts the present value and return to measurement screen.

Pressing the " Down "key will enter the " Analog output 2 Edit " mode and scroll the values ,as per Table "Parameter for Analog output"

Pressing the " Up "key advance to the Analog output 2 confirmation screen.



Analog output 2 Confirmation:

Pressing the " Down "key will re-enter the " Analog output 2 Edit "

Pressing the " Up "key sets the displayed value and will return to measurement screen.

4 .Analog Output (optional) :

This module provides two d.c .isolated outputs. There are two output options

1) Two 0 - 1mA outputs , internally powered.
2) Two 4 - 20mA outputs , internally powered.

The 0- 1mA output module has an 0V return on each end of the 4 way connector (Please refer section 10 for connection details)

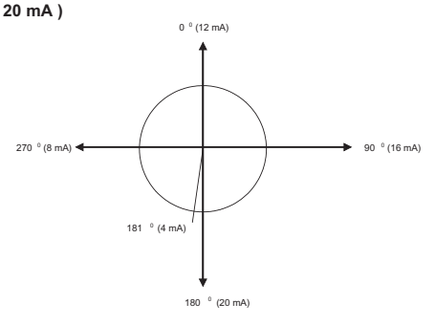
On both modules the output signals are present on pins A1 & A2.

These outputs can be individually assigned to represent any one of the measured and displayed Parameters.

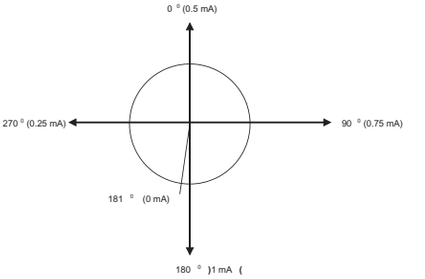
All settlings are user configurable via the user interface screen .See Analog o/p selection (section 3.2.14 & 3.2.15) for details .

*Note : Refer diagrams

(4- 20 mA)



(0 - 1 mA)



Parameter for Analog output:

Parameter No.	Parameter	3P 4W	3P 3W	Range
0	None	✓	✓	0 - 100 %
1	System Volt	✓	✓	0 - 100 %
4	System current	✓	✓	0 - 100 %
7	W1	✓	X	0 - 120 %
10	VA1	✓	X	0 - 120 %
13	VAr1	✓	X	0 - 120 %
16	*PF1	✓	X	180°/ 0 / -180°
19	*PA1	✓	X	180°/ 0 / -180°
36	Freq.	✓	✓	45 to 66 Hz

5 .RS 485 (ModBus) Output :

3430 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 3430 is between 1 and 247 for 32 instruments .Broadcast Mode (address 0) is not allowed.

The maximum latency time of an 3430 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 200ms of time to elapse before assuming that the 3430 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.

Register Addresses :

Two consecutive 16 bit registers represent one parameter .Refer table below for the addresses of 3X registers and addresses for the parameters measured by the instruments.

Accessing 3 X register for reading measured values :
Each parameter is held in the 3X registers .Modbus Code 04 is used to access all parameters .
1 Word =16 bit register

To read parameter
1) Volts 3 : Start address =04 (Hex) No of words = 02

2) Current 3 :Start address = 0A (Hex) No of words = 02

Each Query for reading the data must be restricted to 40 parameters or less .Exceeding the 40 parameter limit will cause a ModBus exception code to be returned.

Table : for Reading the Measured Parameters from 3430:

Address (Register)	Parameter No.	Parameter	Modbus Start Address Hex	
			High Byte	Low Byte
30001	1	Volts 1	00	0
30007	4	Current 1	00	6
30013	7	W1	00	C
30019	10	VA1	00	12
30025	13	VAR1	00	18
30031	16	PF1	00	1E
30037	19	Phase Angle 1	00	24
30043	22	Volts Ave	00	2A
30045	23	Volts Sum	00	2C
30047	24	Current Ave	00	2E
30049	25	Current Sum	00	30
30053	27	Watts Sum	00	34
30057	29	VA Sum	00	38
30061	31	VAr Sum	00	3C
30063	32	PF Ave	00	3E
30067	34	Phase Angle Ave	00	42
30071	36	Freq	00	46
30073	37	Wh Import	00	48
30075	38	Wh Export	00	4A
30077	39	VARh Import	00	4C
30079	40	VARh Export	00	4E
30081	41	VAh	00	50
30133	67	Volts Ave Max	00	84
30135	68	Volts Ave Min	00	86
30141	71	Current Ave Max	00	8C
30143	72	Current Ave Min	00	8E
30207	104	V1 TH(%)	00	CE
30213	107	I1 THD(%)	00	D4

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 3430 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 3430
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

Accessing 4 X register for Reading **&** Changing the setting inside 3430 :
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.

Address (Register)	Parameter No.	Parameter	Read / Write	Modbus Start Address Hex	
				High Byte	Low Byte
40007	4	Sys Voltage	Read only	00	06
40009	5	Sys Current	Read only	00	08
40011	6	Sys Type	Read Only	00	0A
40013	7	Pulse Width	Read / Write	00	0C
40015	8	Energy Reset	Write only	00	0E
40021	11	Mod Addr.	Read only	00	14
40023	12	Pulse Divisor	Read / Write	00	16
40025	13	Min Reset	Write only	00	18
40027	14	Max Reset	Write only	00	1A
40029	15	Analog Out 1 -Para Sel	Read / Write	00	1C
40031	16	Analog Out 2 -Para Sel	Read / Write	00	1E
40037	19	Sys Power	Read Only	00	24
40041	21	Word Order	Write Only	00	28

Explanation for 4 X register:

Address	Parameter	Description
40007	System Voltage	This address is read only and displays System Voltage
40009	System Current	This address is read only and displays System Current
40011	System Type	This address is read only and displays System type . 1 = 1 Phase 2 Wire 3 = 3 Phase 4 Wire. Writing any other value will return error.
40013	Pulse Width of Relay	This address is used to set pulse width of the Pulse output . Write one of the following values to this address: 60 :60 ms 100 :100 ms 200 :200 ms
40015	Reset Energy Counter	This address is used to reset the Energy Counter . Write zero value to this register to reset the energy counter . Writing any other value will return an error.
40021	Instrument Address	This address is read only & display instrument address between 1 to 247 .
40023	Pulse Divisor	This address is used to set pulse divisor of the Pulse output . Write one of the following values to this address: 1 :Divisor 1 10 :Divisor 10 100 :Divisor 100 1000 : Divisor 1000 Writing any other value will return an error.
40025	Min - Reset	This address is used to reset the Min parameters value . Write Zero value to this register to reset the Min parameters . Writing any other value will return an error.
40027	Max - Reset	This address is used to reset the Max parameters value . Write Zero value to this register to reset the Max parameters . Writing any other value will return an error.
40029	Analog Out 1-Para Set	This address is used to set the parameter for Analog Output 1. Write one of the parameter no .As per the options given in Table for Analog Output Parameters. Writing any other value will return an error.
40031	Analog Out 2-Para Set	This address is used to set the parameter for Analog Output 2.. Write one of the parameter no .As per the options given in Table for Analog Output Parameters. Writing any other value will return an error.
40037	Sys Power	System Power is the maximum system power based on the values of system type, system volts and system current.
40041	Word Order	Word Order controls the order in which 3430 receives or sends floating - point numbers -:normal or reversed register order . In normal mode, the two registers that make up a floating point numbers are sent most significant bytes first. In reversed register mode , the two registers that make up a floating point numbers are sent least significant bytes first. To set the mode ,write the value' 2141.0 'into this register- the instrument will detect the order used to send this value and set that order for all ModBus transaction involving floating point numbers.

6 .Pulse output option

The pulse output gives pulses at the rate proportional to the measured energy.
There are two options available,
1 (One Pulse Output : Relay 1 can be configured either to Active) Import / Export (energy or Reactive (Import / Export) energy or Apparent energy .

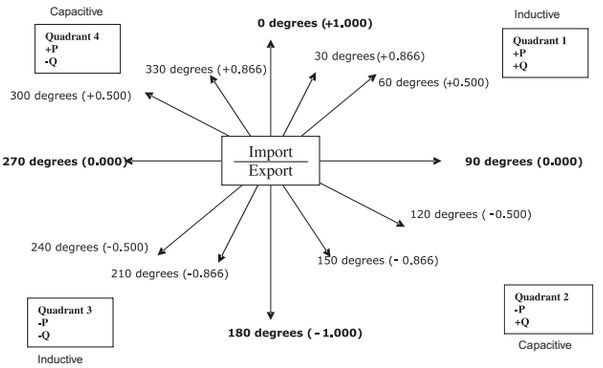
2 (Two Pulse Output : Here it is possible to assign Relay 1 and Relay 2 to Active (Import / Export) energy or Reactive (Import / Export) energy or Apparent energy .

The pulse divisor and pulse width(duration) can be configured .When two pulse outputs are fitted ,they share a common divisor value and pulse width .

NOTE:
If system power is selected in W then default pulse rate is 1 pulse per Wh (upto 3600W) .
If the system power is scaled in kW then default pulse rate is 1 pulse per kWh (upto 3600 kW) .If the system power is over 3600 kWh then pulse rate is 1 pulse per MWh.

7 .Phaser Diagram: Refer the diagram for explanation

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



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

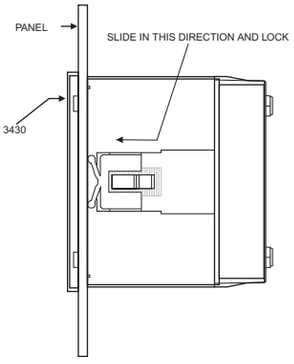
Inductive means Current lags V oltage
Capacitive means Current leads V oltage

When 3430 displays Active power(P)with " + " (positive sign) , the connection is " Import ".

When 3430 displays Active power(P)with " - " (negative sign) ,the connection is " Export. "

8 .Installation

Mounting is by four side clamps ,slide the side clamps through side slot till side clamp gets firmly locked in a groove (Refer fig.) Consideration should be given to the space required behind the instrument to allow for bends in the connection cables.



As the front of the enclosure conforms to IP54 it is protected from water spray from all directions ,additional protection to the panel may be obtained by the use of an optional panel gasket .The terminals at the rear of the product should be protected from liquids.

The 3430 should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -10 to 55°C -10 to 55 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.

8.1 EMC Installation Requirements

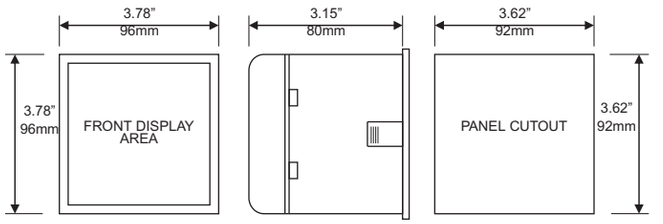
This product has been designed to meet the certification of the EU directives when installed to a good code of practice for EMC in industrial environments, e.g.

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.

8.2 Case Dimension and Panel Cut Out



MAX PANEL THICKNESS 0.18,"5mm

8.3 Wiring

Input connections are made directly to screw-type terminals with indirect wire pressure .Numbering is clearly marked in the plastic moulding .Choice of cable should meet local regulations .Terminal for both Current and Voltage inputs will accept upto $3mm^2$ x 2 diameter cables.

Note : It is recommended to use wire with lug for connection with meter

8.4 Auxiliary Supply

3430 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.

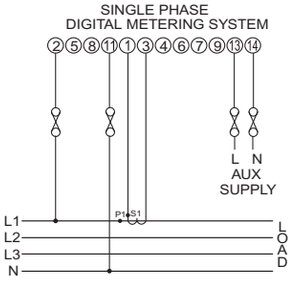
8.5 Fusing

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

8.6 Earth/Ground Connections

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

9.0 Connection Diagrams



10 .Specification:

System 1 Phase 2 Wire

Inputs	
Nominal input voltage	57.7 V_{L-N} to 277V_{L-N}
Max continuous input voltage	120 %of Rated Value
Max short duration input voltage	2 x Rated Value (1s application repeated 10 times at 10s intervals)
Nominal input voltage burden	0.2VA approx .per phase
Nominal input current	1A / 5A AC rms programmable at site
Max continuous input current	120 %of Rated Value
Nominal input current burden	0.6VA approx .per phase
Max short duration current input	20 x Rated Value (1s application repeated 5 times at 5 min. intervals)
System CT primary values	Std .Values 1 to 9999A (1 or 5 Amp secondaries)

Auxiliary

Standard nominal a.c .supply voltages	110V , 230V, 380V AC, 100 - 250V AC or DC
a.c .supply voltage tolerance	+20- / % 15 % of Rated Value
a.c .supply frequency range	45 to 66 Hz
a.c .supply burden	4.5V A
d.c .supply burden	3W

Operating Measuring Ranges

Voltage	5 .. 120 % of Rated Value
Current	5 .. 120 % of Rated Value
Frequency	40 .. 70 Hz
Power Factor	0.5 Lag ... 1 ... 0.8 Lead

Accuracy

Accuracy 1.0:

Voltage	±0.5 % of range .
Current	±0.5 % of range .
Frequency	0.15 %of mid frequency
Active Power	±0.5 % of range .
Re -Active Power	±0.5 % of range.
Apparent Power	±0.5 % of range.
Active Energy	±1.0 % of range.
Re - Active Energy	±1.0 % of range.
Apparant Energy	±1.0 % range.
Power Factor	±1 % of unity.
Angle	±1 % of range
Analog Output	±1 % of Output end value
Total Harmonic Distortion	±1 %

Accuracy 0.5:

Voltage	±0.5 % of range .
Current	±0.5 % of range .
Frequency	0.15 %of mid frequency
Active Power	±0.5 % of range .
Re -Active Power	±0.5 % of range.
Apparent Power	±0.5 % of range.
Active Energy	±0.5 % of range.
Re - Active Energy	±0.5 % of range.
Apparant Energy	±0.5 % range.
Power Factor	±1 % of unity.
Angle	±1 % of range
Analog Output	±1 % of Output end value
Total Harmonic Distortion	±1 %

Accuracy 0.2:

Voltage	±0.2 % of range .
Current	±0.2 % of range .
Frequency	0.15 %of mid frequency
Active Power	±0.2 % of range .
Re -Active Power	±0.2 % of range.
Apparent Power	±0.2 % of range.
Active Energy	±0.2 % of range.
Re - Active Energy	±0.2 % of range.
Apparant Energy	±0.2 % range.
Power Factor	±1 % of unity.
Angle	±1 % of range
Analog Output	±1 % of Output end value
Total Harmonic Distortion	±1 %

Reference conditions for Accuracy :

Reference temperature	23°C ± 2°C
Input frequency	50 or 60Hz ± 2%
Input waveform	Sinusoidal (distortion factor 0.005)
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

Nominal range of use of influence quantities for measurands

Voltage	50 .. 120 % of Rated Value
Current	10 .. 120 % of Rated Value
Input frequency	Rated Value ± 10%
Temperature	0 to 50°C
Auxiliary supply voltage	Rated Value ± 10%
Auxiliary supply frequency	Rated Value ± 10%
Temperature Coefficient (For Rated value range of use 0 ...50°C)	0.025 / %°C for Voltage (50..120 %of Rated Value) 0.05 / %°C for Current (10..120 %of Rated Value)
Error change due to variation of an influence quantity	2 * Error allowed for the reference condition applied in the test.

Display

LED	3 line 4 digits . Digit height 11mm
Update	Approx .1 seconds

Controls

User Interface	Two push buttons

Standards

EMC Immunity	IEC 61326 10V/m min-Level 3 industrial low level electromagnetic radiation environment IEC 61000-4-3.
Safety	IEC 61010-1 , Year 2001
IP for water & dust	IEC 60529

Isolation

Dielectric voltage withstand test between circuits and accessible surfaces	2.2 kV RMS 50 Hz for 1 minute between all electrical circuits

Environmental

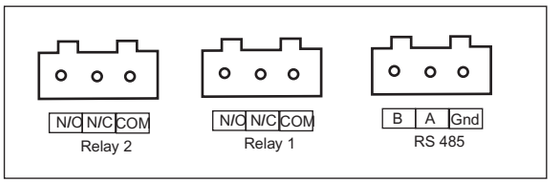
Operating temperature	-10 to 55 °C
Storage temperature	-20 to+ 65°C
Relative humidity	0 .. 90 % RH
Warm up time	3 minute (minimum)
Shock	15g in 3 planes
Vibration	10 .. 55 Hz, 0.15mm amplitude
Enclosure (front only)	IP 54 as per IEC 60529

11 .Connection for Optional Pulse Output / RS 485 / Analog Output :

Enclosure	
Style	96mm x 96mm DIN Quadratic
Material	Polycarbonate Housing, Self extinguish & non dripping as per UL 94 V-0
Terminals	Screw-type terminals
Depth	>80 mm
Weight	0.620 kg Approx.
ModBus (RS 485) Option:	
Protocol	ModBus (RS 485)
Baud Rate	19200 , 9600 , 4800 or 2400 (Programmable)
Parity	Odd or Even ,with 1 stop bit, Or None with 1 or 2 stop bits
Analog Output Option:	
Linear	0 ... 1mA dc into 0 - 2 kohm Uni-directional ,internally powered.
	4 ... 20mA dc into 0 - 500 ohm Uni-directional ,internally powered.
Pulse output Option (1 or 2 Relay):	
Relay	1NO + 1NC
Switching Voltage & Current	240VDC , 5Amp.
Default Pulse rate Divisor	1 per Wh (up to 3600W), 1 per kWh (up to 3600kW), 1 per MWh (above 3600 kW)
Pulse rate Divisors	Programmable on site
10	1 per 10Wh (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	60ms , 100ms or 200ms

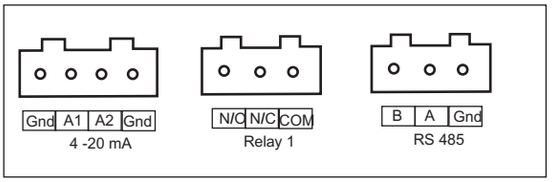
Note : Above conditions are also applicable for Reactive & Apparent Energy.

Pulsed Output + RS 485 (rear view of 3430)

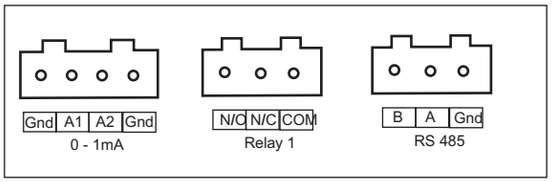


Analog Output + Pulsed Output + RS 485 (rear view of 3430)

1) Analog Output 4 -20mA + 1 Pulsed Output + RS 485



2)Analog Output 0 -1mA + 1 Pulsed Output + RS 485



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