Ziegler *mfm 3420*

Digital Multifunction Instrument

Ziegler *mfm 3420* - **Single Phase**

Single Phase Digital Volts, Amps, Frequency & Energy Indicator

Installation & Operating Instructions

1. Introduction

The **Ziegler** *mfm 3420* is a panel mounted 96 x 96mm DIN Quadratic Digital metering system for the measurement & display of basic electrical parameters like AC Voltage, AC Current, Frequency, Import energy and Export energy.
The instrument integrates accurate measurement technology (All Voltage & Current measurements are True RMS upto 15th Harmonic) with 3 line4 digits Ultra high brightness LED display.
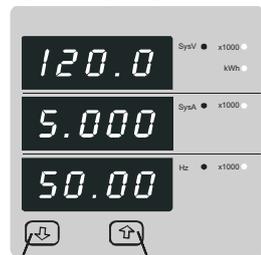
Ziegler *mfm 3420* can be configured and programmed at site for the following : PT Primary, CT Primary, CT Secondary (5A or 1A)

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
Import Energy (8 Digit resolution)	kWh
Export Energy (8 Digit resolution)	kWh

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 ata 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, Frequency)
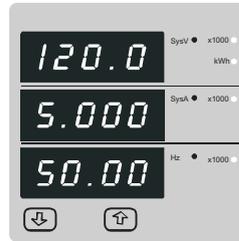
Screen 2 : Import Energy
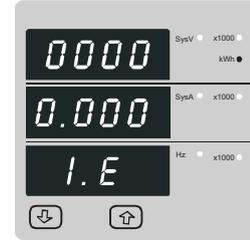
Screen 3 : Export Energy
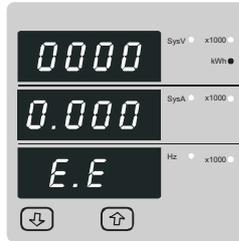
Screen 4 : Max. System voltage andcurrent

Screen 5 : Min Sys Voltage & Current

3. Programming

The following sections comprise step by step procedures for configuring the **Ziegler** *mfm 3420* 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 Up 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 from9 round to 0.

Press the "⬆ Up" key to advance to Up digit.
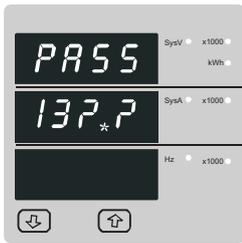
PASS
137.7

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 Up digit.

PASS
1347.

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.

PASS
1342

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

PASS
1342
1.3.4.2.

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).

PASS
1341
- - - -

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.

PASS
- - - -
2.342

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 advances the operation to the Up digit and sets the first digit, in this case to "2"

PASS
- - - -
21.42

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 advances the operation to the Up digit and sets the second digit, in this case to "1"

PASS
- - - -
215.2

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 advances the operation to the Up digit and sets the third digit, in this case to "5"

PASS
- - - -
215.3

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 advances the operation to the "New Password Confirmed" and sets the fourth digit, in this case to "3".

PASS
2153
2153

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 will be displayed, inclusive of any transformer ratios.
The values displayed represent the voltage in kilovolts (note the x1000 enunciator).

1. UP
0.120
Ln

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.

1. UP
0.120
Ln

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 120 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 Up less significant digit.
(* Denotes that decimal point will be flashing).

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.
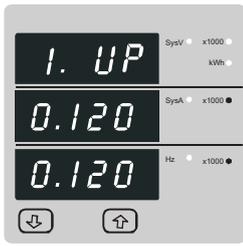
Potential Transformer Primary Value Confirmation

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 with the digits flashing indicating that the multiplier (decimal point position) should be selected.

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 120 MVA in which case the digit range will be restricted, the value will wrap. Example: If primary value of PT is set as 400kV (max value) then primary value of Current is restricted to 0208A.

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

The "Maximum Power" restriction fo 120 MVA refers to 120% of nominal current and 120% of nominal voltage, i.e, 83.333 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
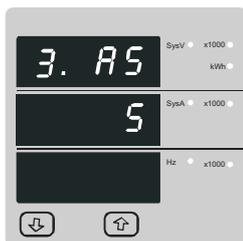
This screen is used to set the secondary value for Current Transformer. Secondary value "5" for 5A or "1" for 1A can be selected. Pressing "⬆ Up" key accepts the present value and advances to the Pulse Rate edit menu (See section3.2.4).

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)
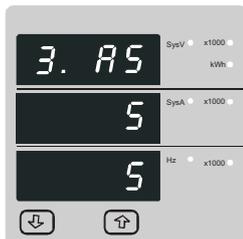
3.2.4. Pulse Rate

This screen applies to the Relay Output option only. The screen allows user to set the kWh pulse rate divisor. Divisor values can be selected through 1,10,100,1000.
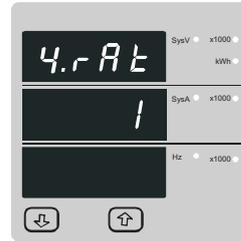
Pressing "⬆ Up" key accepts the presents value and advances to the "Reset"menu (See section 3.2.5).

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 DivisorCo nfirmation" menu.
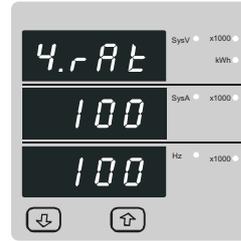
Pulse Rate Divisor Confirmation.

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 Energy(Import/Export), Lo(Min), hI(Max) and all readings.
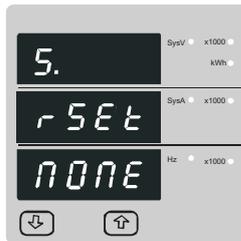
Reset (None)

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

Pressing the "⬇ Down" key will enter the "Reset Parameter select" mode and scroll the value" through the parameters and wrapping back to None.

Pressing "⬆ Up" key will not reset and will advance to Pulse Duration menu.(See sec.3.2.6)
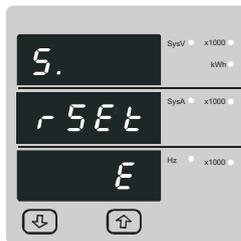
Reset parameters select, (Reset Energy)

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.
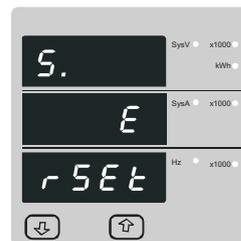
Reset Energy Confirmation.

Pressing the "⬇ Down" key will re-enter the "Reset Parameter select" mode.

Pressing "⬆ Up" key resets the Energy(Import/Export) and advances to the Pulse Duration (see section 3.2.6.)
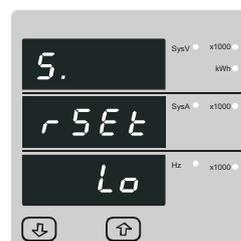
Reset parameters select, (Reset Lo)

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

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

5. Lo rSEt
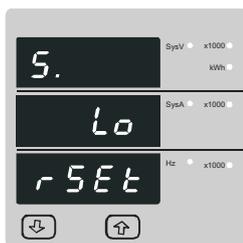
Reset Lo Confirmation

Pressing the "⬇ Down" key will re-enter the "Reset Parameter Select mode.

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

5. rSEt hi

Reset parameters 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.

5. hi rSEt
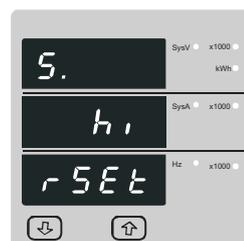
Reset hi (Max) Confirmation.

Pressing the "⬇ Down" key will re-enter the "Reset Parameter Select mode.

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

5. rSEt ALL

Reset parameters 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.

5. ALL rSEt

Reset ALL Confirmation.

Pressing the "⬇ Down" key will re-enter the "Reset Parameter Select mode.

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

3.2.6. Pulse Duration

This screen applies to the Relay Pulsed output only.

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

6. PUL 60
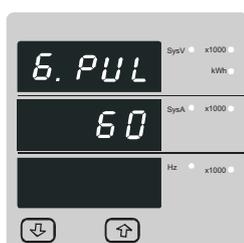
Pulse Duration Edit.

Pressing "⬆ Up" key accepts the present value and advance to the Auto scroll menu (see section 3.2.6).

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".

6. PUL 100 100

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 3.2.7).

3.2.7. Auto Scrolling

This screen allows user to enable screen scrolling.

7. AUto n
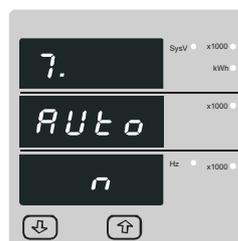
Auto scrolling Edit.

Pressing "⬆ Up" key accepts the present status and advance to the Display update rate menu (see section 3.2.8).

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 advances to "Display update rate" screen (see section 3.2.8)

7. AUto y
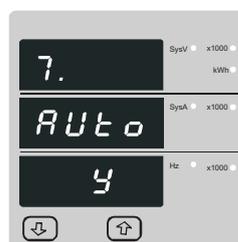
Auto scrolling Confirmation.

pressing the "⬇ Down" key will re-enter the "Auto scroll Edit" mode.

Pressing "⬆ Up" key set displayed value and will advance to Display update rate menu (See section 3.2.8)

3.2.8. Display update rate

This screen allows the user to set display update time in seconds. Default time is 1 second.

8. drt 1

Display update rate Edit.

Pressing "⬆ Up" key accepts the present value and advance to Low current noise cutoff menu. (see section 3.2.9).

Pressing the "⬇ Down" key will enter the "Display update rate Edit" mode and scroll the value through 1, 2, 3, 4,5 and wrapping back to 1.

8. drt 5 5
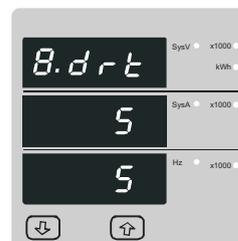
Display update rate Confirmation.

pressing the "⬇ Down" key will re-enter the "Display Update rate Edit" mode.

Pressing "⬆ Up" key set displayed value and will advance to Low current noise cutoff menu. (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.

9. nC 0
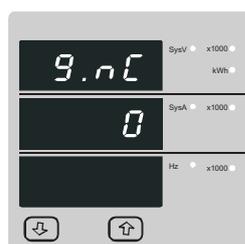
Low current cutoff Edit.

Pressing "⬆ Up" key accepts the present value and advance to Assignment of Pulsed output to Import or Export energy (see section 3.2.10)

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. This setting will display currents as 0 below 30 mA.
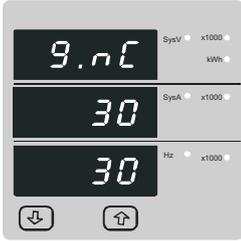
Low current noise cutoff Confirmation.

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 Pulsed output to Import or Export Energy menu. (See section 3.2.10)

3.2.10. Assignment of pulsed output to Import or Export Energy

This screen allows the user to assign pulse output1 and pulse output2 to Import or Export energy and vice versa.
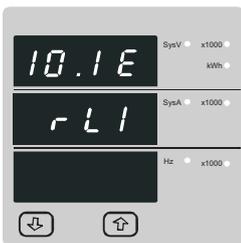
Assignment of Pulsed output

Pressing "⬆ Up" key accepts the present Pulsed output and advance to measurement screens. (see section 2).

Pressing the " ⬇ Down" key will enter the "Assignment of pulsed output" mode and will toggle Rl1 and Rl2. Assigning RL1 for Import energy will automatically assign RL 2 for Export energy and vice-versa.
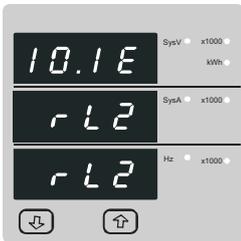
Assignment of pulsed output confirmation.

pressing the "⬇ Down" key will re-enter the "Assignment of Pulsed output" mode.

Pressing " ⬆ Up" key set the pulsed output2 to Import energy and pulsed output1 to Export Energy and will advance to measurement screens. (See section 2)

4. Pulse output option

The pulse output gives pulses at the rate proportional to the measured active energy kWh. There are two options available,
1) One Pulse Output: Relay 1 can be configured either to Import Active energy or Export Active energy.
2) Two Pulse Output: Here it is possible to assign Import Active energy either to Relay1 or Relay 2. Then accordingly Export Active energy is configured automatically to the corresponding relay.

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.

5. 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.
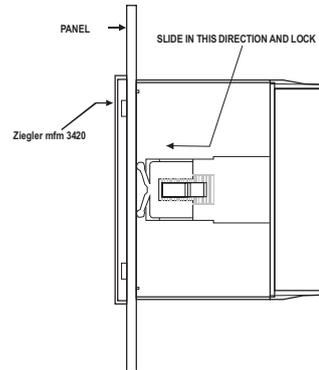
As the front of the enclosure conforms to IP54 it is protected from water spray from all directions, additional protection to the panel may be obtained by the use of an optional panel gasket. The terminals at the rear of the product should be protected from liquids.

The **Ziegler** *mfm 3420* should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -10 to 55^{0}C . Vibration should be kept to a minimum and the product should not be mounted where it will be subjected to excessive direct sunlight.

Caution

1. In the interest of safety and functionality this product must be installed by a qualified engineer, abiding by any local regulations.

2. Voltages dangerous to human life are present at some of the terminal connections of this unit. Ensure that all supplies are de-energised before attempting any connection or disconnection.

3. These products do not have internal fuses therefore external fuses must be used to ensure safety under fault conditions.

5.1 EMC Installation Requirements

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

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

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

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

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

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

5.2 Case Dimension and Panel Cut Out
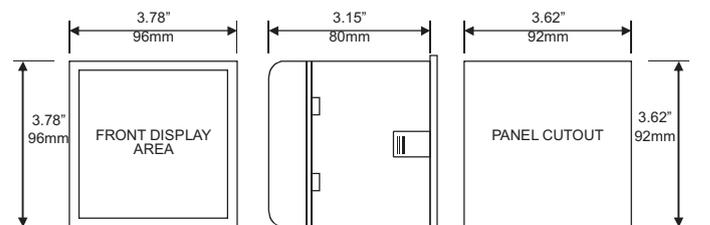
MAX PANEL THICKNESS 0.18",5mm

5.3 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.

5.4 Auxiliary Supply

Ziegler *mfm 3420* 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.

5.5 Fusing

It is recommended that all voltage lines are fitted with1 amp HRC fuses.

5.6 Earth/Ground Connections

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

6 Connection Diagrams
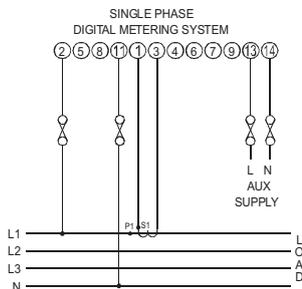
7. Specification

System   Single Phase

Inputs

Nominal inputvoltage	57.7V $_{L-N}$ to 277V$_{L-N}$
Max continuous input voltage	120% of Rated Value
Max short duration input voltage	2x Rated Value (1sappli cation repeated 10 times at 10s intervals)
Nominal input voltage burden	0.2VA approx.
Nominal inputcurrent	1A / 5A AC rms programmable at site
Max continuous inputcurrent	120%of Rated Value
Nominal input current burden	0.6VAappro x.
Max short duration current input	20 x Rated Value (1s application repeated 5 times at 5 min. intervals)
System CT primary values	Std. Values upto 4kA (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	4.0 VA
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

Voltage	$\pm$ 0.5 % of range(50 ... 100% of Rated Value)
Current	$\pm$ 0.5 % of range (10 ... 100% of Rated Value)
Frequency	0.15% of mid frequency
Active Energy (Import/Export)	$\pm$ 1% as per IEC 62053-21 Active P.F. (0.866 ... 1 ... 0.866) (Import/Export)

Reference conditions for Accuracy:

Reference temperature	23$\overset{\circ}{C}$ $\pm$2$\overset{\circ}{C}$
Input frequency	50 or 60Hz $\pm$ 2%
Input waveform	Sinusoidal (distortion factor 0.005)
Auxiliary supply voltage	Rated Value $\pm$ 1%
Auxiliary supply frequency	Rated Value $\pm$ 1%

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 $\pm$ 10%
Temperature	0to 50$\overset{\circ}{C}$
Auxiliary supply voltage	Rated Value $\pm$ 10%
Auxiliary supply frequency	Rated Value $\pm$ 10%
Temperature Coefficient (For Rated value range of use 0... 50^{0}C)	0.025% /$^{\circ}$C for Voltage (50..120% of Rated Value) and 0.05% /$\overset{\circ}{C}$ 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 minimum. Can be programmed up to 5 sec.

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 $^{\circ}$C
Storage temperature	-20 to +65℃
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

Enclosure

Style	96mmx 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.

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

8. Connection for Optional Pulse Output

Relay1   Relay2

NO NC C   NO NC C