Ziegler *mfm 3410*

Digital Multifunction Instrument

## Single Phase(1-PH)

Digital Volts, Amps & Frequency Indicator

Installati on & Operatin g Instructio ns

1. Introduction

The Instrument is a panel mounted 96x 96mm DIN Quadratic Digital metering system for the measurement& display of basic electrical parameters like AC Voltage, AC Current, Frequency, kVA, Ampere Demand and kVA Demand. The instrument integrates accurate measurement technology (All Voltage& Current measurements are True RMS upto 15th Harmonic) with3 line4 digits Ultra high brightness LED display.
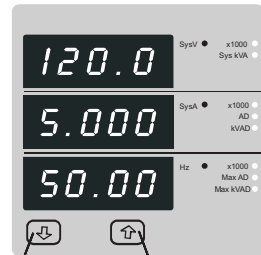
The instrument can be configured and programmed at site for the following: PT Primary, CT Primary, CT Secondary (5A or 1A)

The front panel has two push buttons through which the user may scroll through the available measurement readings, reset the demand readings and configure the product.

Down Key   Up Key

TABL E 1:

| Measure d Parameters	Units of measurement
System Voltage	Volts
System Current	Amps
Frequency	Hz
System Apparent Power	kVA
Total System Current Demand	AD
Total System kVA Demand	kVAD
Maximum Total System Current Demand	Max AD
Maximum Total System kVA Demand	Max kVAD

2. MeasurementRead ing Screens

In normal operation the user is presented with one of the measurement reading screens out of available 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".
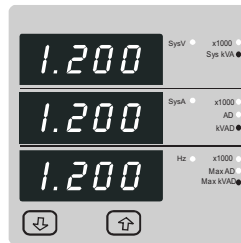
Screen 1: System screen
(System Voltage, System Current, Frequency)
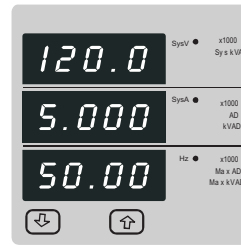
Screen 2 : Ampere Demand
Max Ampere Demand
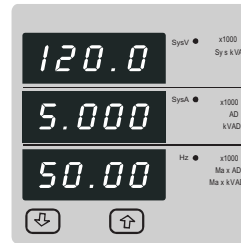
Screen 3 : Apparent Power,
kVA demand and Max. kVA demand


3. Programming

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

To access the set-up screens press and hold the" ⬇ Down" and " ⬆ Up" Key simultaneously for5 seconds. This will take the User into the Password Protection Entry Stage (Section 3.1).

3.1. Passwor d 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 selectinga four digit number other than 0000, setting a password of 0000 disables the password protection.
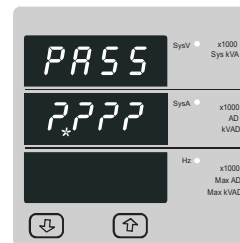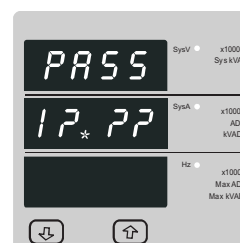

Enter Password, prompt for first digit.
(* Denotes that decimal point will be flashing).

Press the "⬇Down" key to scroll the value of the first digit from0 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).

Press 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.

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 from0 through to 9, the value will wrap from9 round to 0.

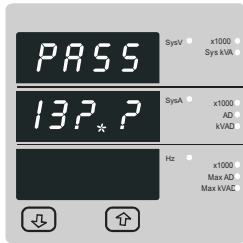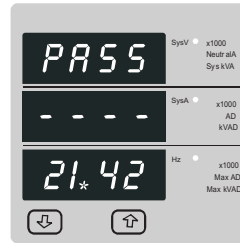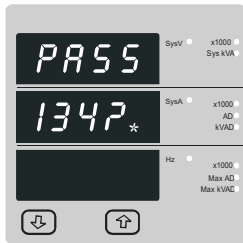Press the "⬆ Up" key to advance to Up digit.

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 from0 through to 9, the value will wrap from 9 round to 0.
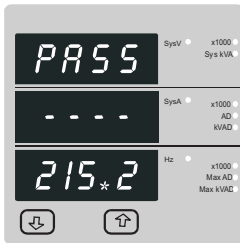
Pressing the "⬆ Up" key advances the operation to the Up digit and sets the second digit, in this case to "1"

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 from0 through to 9, the value will wrap from9 round to 0.
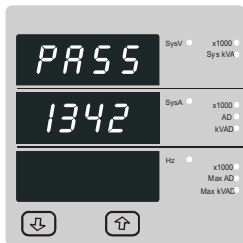
Press the "⬆ Up" key to advance to verification of the password.

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 from0 through to 9, the value will wrap from9 round to 0.

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


Enter Password, fourth digit entered, awaiting verification of the password.
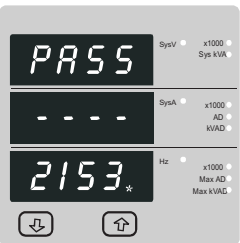
New/ Change Password, third digit entered, prompting for fourth digit. (* denotes that decimal point will be flashing).

Pressing the "⬇ Down" key will scroll the value of the fourth digit from0 through to 9, the value will wrap from 9 round to 0.
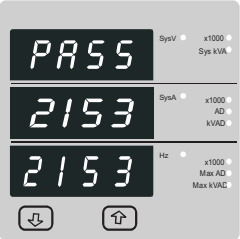
Pressing the "⬆ Up" key advances the operation to the "New Password Confirmed" and sets the fourth digit, in this case to "3".
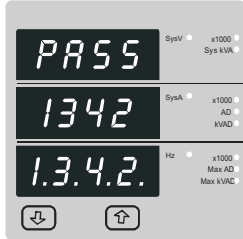
Password confirmed.
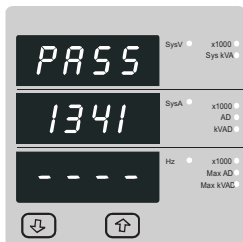Pressing "⬇ Down" key will advance to the "New/ change Password" entry stage.

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

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).

Password Incorrect.
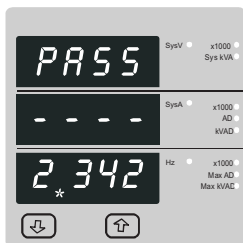The unit has not accepted the Password entered.
Pressing the "⬇ Down" key will return to the Enter Password stage.

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 from0 through to 9, the value will wrap from9 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"
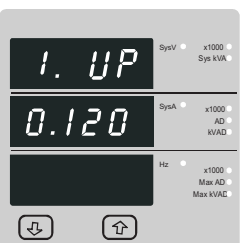
3.2 Set Up Screens

3.2.1. Potential Transformer Primary Value

The nominal full scale voltage which will be displayed as the Line to Neutral. This screen enables the user to display the line to neutral 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.
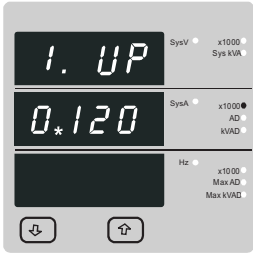
Potential Transformer Digit Edit

1. UP
SysV x1000 Sys kVA

0.*120
SysA x1000● AD kVA☐

Hz x1000 Max AD Max kVA☐

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 360 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.

2. UP
SysV x1000 Sys kVA

0.120
SysA x1000● AD kVA☐

0.120
Hz x1000 Max AD Max kVA☐

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.)

Note: 0.120 kV i.e. 120V $_{L-N}$ for 4W
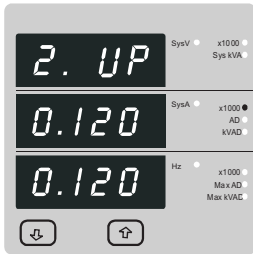120V $_{L-L}$ fpr 3W

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)

2. AP
SysV x1000 Sys kVA

0.*005
SysA x1000● AD kVA☐

Hz x1000 Max AD Max kVA☐
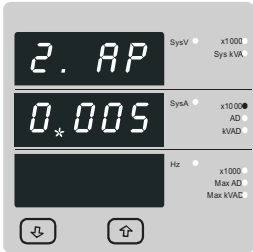
Pressing the " ⬇ Down" key will enter the "Current Transformer Primary Value Edit" mode. This will scroll the value of the most significant digit from 0 through to 9, unless the presently displayed Current Transformer Primary Value together with the Potential Transformer Primary Value results in a maximum power of greater than 360 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 360 MVA refers to 120% of nominal current and 120% of nominal voltage, i,e, 250 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.
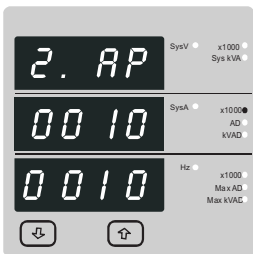
2. AP
SysV x1000 Sys kVA

0010
SysA x1000● AD kVA☐
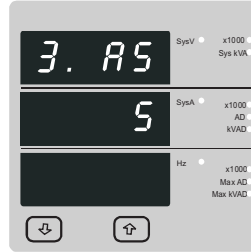
0010
Hz x1000 Max AD Max kVA☐

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

3. AS
SysV x1000 Sys kVA

5
SysA x1000 AD kVA☐

Hz x1000 Max AD Max kVA☐

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 Demand Integration Time 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

3. AS
SysV x1000 Sys kVA

5
SysA x1000 AD kVA☐

5
Hz x1000 Max AD Max kVA☐
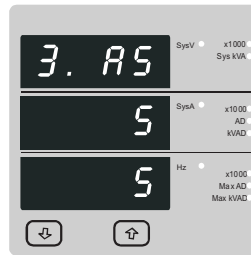
This screen will only appears following an edit of CT secondary value.

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 Demand Integration time Edit menu. (See section 3.2.4)

3.2.4. Demand Integration Time

This screen is used to set the time taken for maximum demand readings. The value displayed represents time in minutes. Integration periods of 8, 15, 20 or 30 minutes can be selected.

4.d.i.t.
SysV x1000 Sys kVA

8
SysA x1000 AD kVA☐

Hz x1000 Max AD Max kVA☐
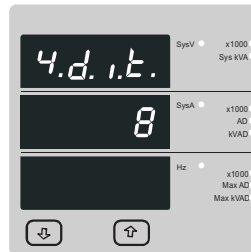
Pressing " ⬆ Up" key accepts the presents value and advances to the "Demand Reset" menu. (See section 3.2.5).

Pressing the " ⬇ Down" key will enter the "Demand Integration Time Edit" mode and scroll the value through the values available.

Pressing the " ⬆ Up" key advances to the "Demand Integration Time Confirmation" menu.

As the unit advances to the Up screen the unit demands are reset.

4.d.i.t.
SysV x1000 Sys kVA

8
SysA x1000 AD kVA☐

8
Hz x1000 Max AD Max kVA☐
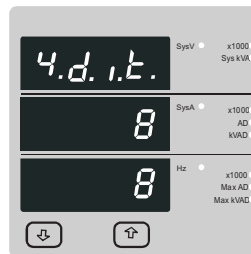
Demand Integration Time Confirmation.

This screen will only appear following an edit of the Demand Integration Time.

If the time shown is not correct, pressing the" ⬇ Down" key will return to the "Demand Integration Time Edit" stage by blanking the bottom line of the display.
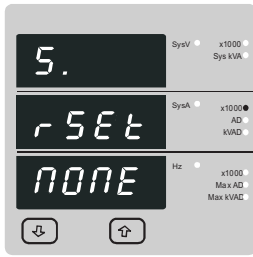
Pressing " ⬆ Up" key sets the displayed value and will advance to the "Demand Reset" menu. (See section 3.2.5)

3.2.5. Demand Reset

The following screens allow the user to reset the Demand and Maximum Demand readings.

Note: Resetting the Demand will automatically reset the Maximum Demands (MaxAD and MaxkVAD).
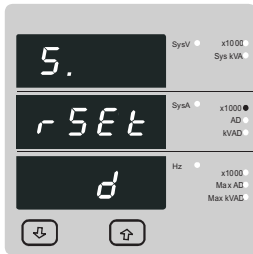

Reset (None)

Pressing "⬆ Up" key returns the product to measurement reading screens.

Pressing the " ⬇ Down" key will enter the "Reset Parameter Select" mode and scroll the "value" through the parameters None and d wrapping back to None.
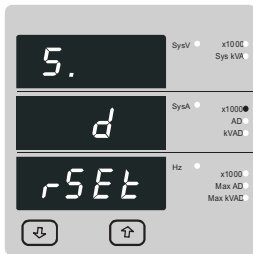
Pressing the " ⬆ Up" key will not reset demand and return to measurement reading screens.

Reset parameters select, (Reset Demands)

The user has scrolled through to the "d" (Demands) value.

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


Reset Demands Confirmation.

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

Pressing the " ⬆ Up" key resets the Demand readings and returns the product to measurement reading screens.

4. 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.
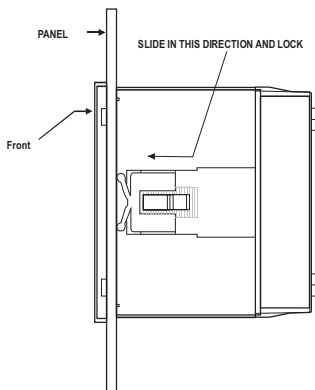
As the front of the enclosure conforms to IP54 it is protected from water spray from all directions, additional protection to the panel may be obtained by the use of an optional panel gasket. The terminals at the rear of the product should be protected from liquids.

The instrument should be mounted in a reasonably stable ambient temperature and where the operating temperature is within the range -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.


4.1 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.

4.2 Case Dimension and Panel Cut Out

MAX PANEL THICKNESS 0.18",5mm
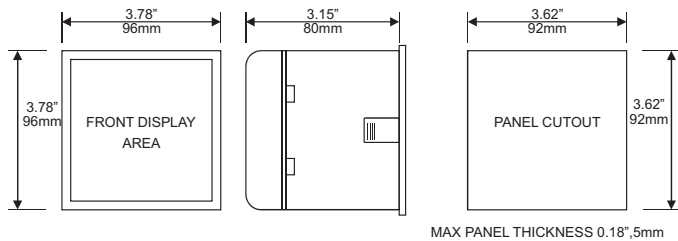
4.3   Wiring

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.

4.4   Auxiliary Supply

Meter 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.
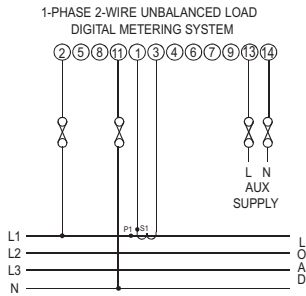
4.5 Fusing

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

4.6 Earth/Gro und Con nections

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

5 Connection Diagrams

1-PHASE 2-WIRE UNBALANCED LOAD
DIGITAL METERING SYSTEM

6. Specification

Syst em

Single Phase

Inpu ts

Nominal inputvoltage	57.7V $_{L-N}$ to 277V$_{L-N}$
Maxconti nuous input voltage	120% of Rated Value
Maxshortdurati on input voltage	2x Rated Value (1s application repeated 10times at 10s intervals)
Nominal inputvoltageburden	0.2VA approx. perphase
Nominal inputcurrent	1A / 5A AC rms programmable at site
Maxconti nuous inputcurrent	120%of Rated Value
Nominal inputcurre nt burden	0.6VA approx. perphase
Max sho rt duration current input	20 x Rated Value (1s application repeated 5 times at5 min. intervals)
SystemCTprimaryvalues	Std. Values upto 4kA (1 or 5 Amp secondaries)

Auxiliary

Standard nominal a.c.supply voltages	110V AC 230V AC 380V AC
a.c.supplyvoltagetolerance	+20%/ -15 % of Rated Value
a.c.supplyfrequ ency range	45to66 Hz
a.c.supplyburden	4VA

Operatin g Measurin g Ranges

Voltage	5 .. 120% of Rated Value
Current	5 .. 120% of Rated Value
Frequency	40 .. 70 Hz

Accuracy

Voltage	± 0.5% of range(50 .... 100% of Rated Value)
Current	±0.5% of range (10 .... 100% of Rated Value)
Frequency	0.15% of mid frequency
System Apparent power (VA)	± 0.5% of range (10 .... 100% of Rated Value)

Referenc e condition s for Accuracy

Reference temperature	23^{0}C ± 2$\overset{0}{C}$
Input frequency	50 or 60 Hz ± 2%
Input waveform	Sinusoidal (distortion factor 0.005)
Auxiliary supply voltage	Rated Value ± 1%
Auxiliary supply frequency	Rated Value ± 1%

Nomina l rang e of use of influenc e quantitie s for measurands

Voltage	50 .. 120% of Rated Value
Current	10 .. 120% of Rated Value
Input frequency	Rated Value ±1 0%
Temperature	0to 50$\overset{0}{C}$
Auxiliary supply voltage	Rated Value ± 10%
Auxiliary supply frequency	Rated Value ±1 0%
Temperature Coefficient (For Rated Value range of use 0...50^{0}C)	0.025% / ^{0}C for Voltage(50 ... 120% of Rated Value) 0.05% /$\overset{0}{C}$ 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.

Disp lay

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

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

Isolat ion

Dielectric voltage withstand test between circuits and accessible surfaces	2.2 kV RMS 50 Hz for1 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

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.