

2023 v2 0

AP25-3CO

DIN Rail Smart Energy Meter for Single and Three Phase Electrical Systems

1 Introduction

This document provides operating, maintenance and installation instructions. This unit measures and displays the characteristics of Single Phase Two Wire (1P2W), Three Phase Three Wire (3P3W) and Three Phase Four Wire (3P4W) networks. The measuring parameters include Voltage (V), Current (A), Frequency (Hz), Power (kW/KVA/KVAr), Powe Factor (PF), Imported, Exported and Total Energy (kWh/kVArh). The unit also measures Maximum Demand Current and Power, this is measured over preset periods of up to 60 minutes

This particular model accommodates 1A or 5A Current Transformers and can be configured to work with a wide range of CTs. It also comes with a complete comms capability with built in Pulse and RS485 Modbus RTU outputs, configuration is password protected.

This unit can be powered from a separate auxiliary supply (AC or DC). Alternatively, it can be powered from the monitored supply by linking the voltage reference and neutral reference in to terminals 5 & 6 (Please refer to wiring diagram)

1.1 Unit Characteristics

The AP25-3CO can measure and display:

- Phase to Neutral Voltage and THD% (Total Harmonic Distortion) of all Phases
- Line Frequency
- · Current, Maximum Demand Current and Current THD% of all Phases
- Power, Maximum Power Demand and Power Factor
- · Imported, Exported & Total Active Energy
- Imported, Exported & Total Reactive Energy
- The unit has a Password-Protected set up menu for:
- Changing the Password
- System Configuration 1P2 . 3P3W. 3P4W.
- · Demand Interval Time
- Beset for Demand Measurements
- · Pulsed Output Duration

1.2 Current Transformer Primary Current

This unit requires configuring to operate with the app opriate curren transformer(s), the optional secondary currents are 1A or 5A. It is programmed by inputting the ratio (CT Primary divided by the CT Secondary). It can be used on primary currents up to 6000A.

On the MID Version, you can only program the CT Rate ONCE.

1.3 RS485 Serial – Modbus RTU

This unit is compatible with remote monitoring through RS485 Modbus RTU. Set-up screens are provided for configuring the RS485 port. Refers to section 4.8.

1.4 Pulsed Outputs

The AP25-3CO has Two Pulsed Outputs that can be set for active (kWh) or reactive (kVArh) energy. Terminals 11 & 12 have a fixed output of 3200imp/kWh. erminals 9 & 10 are configurable within the setup menu

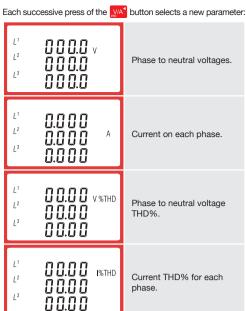
2 Start Up Screens



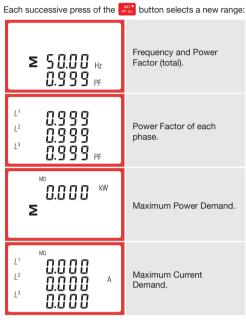
The first sc een lights up all display segments and can be used as a display check.

The second screen indicates the firmwa e installed in the unit and its build number.

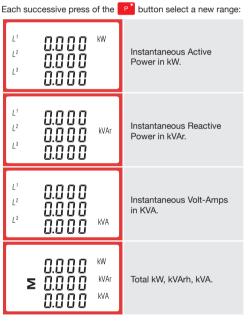
3.1 Voltage and Current



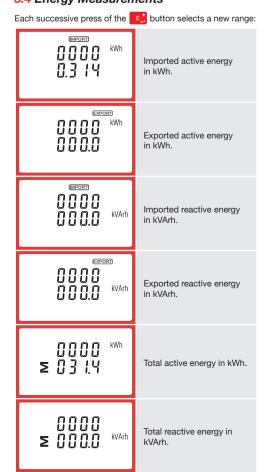
3.2 Frequency and Power Factor and Demand



3.3 Power



3.4 Energy Measurements



4 Set Up

To enter set up mode, hold the E button for 3 seconds, until the password screen appears

PR55 0000	The set up is password- protected so you must enter the correct password (default '1000') before processing.	
PR55	If an incorrect password is entered, the display will show:	
Err	PASS Err (Error)	
To exit the set up menu, hold the 💹 for 3 seconds, the		

measurement screen will display.

4.1 Set up Entry Methods

Some menu items, such as Password and CT, require a four-digit number entry while others, such as supply system, require selection from a number of menu options

4.1.1 Menu Option Selection

1. Use the price and pri buttons to scroll through the different options of the set up menu.

2. Hold the E button for 3 seconds to confirm your selection

3. If an item flashes, then it can be adjusted by the prize and P buttons.

4. Having selected an option from the current layer, hold the button for 3 seconds to confirm your selection

5. Having completed a parameter setting, hold the button for 3 seconds to return to a higher menu le

6. On completion of all setting-up, hold the VA button for 3 seconds, the measurement screen will then be restored.

4.1.2 Number Entry Procedure

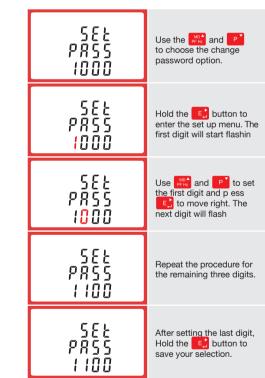
When setting up the unit, some screens require the entering of a number. In particular, on entry to the setting up section, a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

The current digit to be set flashes and then can be adjusted using the ^{MOA} and ^P buttons.

2. Press the E button to more right to the next digit.

3. After setting the last digit, hold the E button for 3 seconds to save your selection

4.2 Change Password



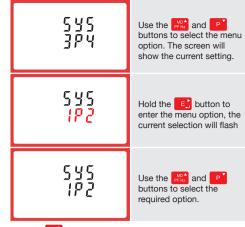
Hold the MA button for 3 seconds to exit the set up menu.

4.3 DIT (Demand Integration Time)

This sets the period (in minutes) in which the Current and

4.4 Supply System

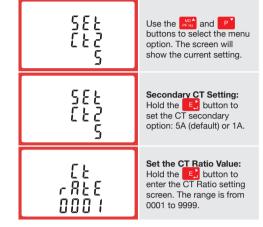
The unit has a default setting of 3 Phase 4 Wire (3P4W). Use this section to set the type of electrical system.



Hold the E button to confirm your adjustment. Hold th button for 3 seconds to exit the set up menu.

4.5 CT Configuration

The CT options set the Secondary Current (CT2 5A or 1A) of the Current Transformer (CT) that are used with the meter.

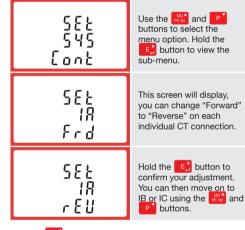


The CT Rate is the CT Primary divided by the CT Secondary. For Example: 200/5A Current Transformers - 200÷5=40, so the CT Rate would be 0040 and the CT2 would be 5.

On the MID Version, you can only program the CT Rate ONCE.

4.5.1 CT Reversal

If the CT connections are incorrectly wired, they can be reversed through the "Set System Continued" menu:



Hold the **MA** button for 3 seconds to exit the set up menu.

4.6 PT

The PT option sets the Secondary Voltage (PT2 100-500V) of the Voltage Transformer (PT) that may be connected to the meter.





The interface performs a self-test and indicates the result if the test passes.

*After a short delay, the screen will display active energy measurements.

3 Measurements

The buttons operate as follows

V/A

PF Hz

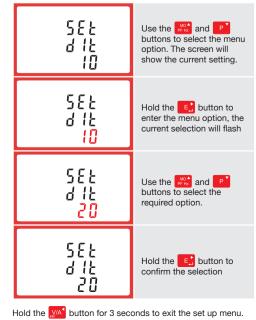
"Left" (press) or "Escape" (hold 3sec) button. MD 🔺 Select the Frequency and Power factor display screens. In Set-up Mode, this is the "Up" (press) button.

Selects the Voltage and Current display screens. In Set-up Mode, this is the

Select the Power display screens. P In Set-up Mode, this is the 'Down" (press) button.

Select the Energy display screens. In Set-up mode, this is the "Right" (press) or "Enter" (hold 3sec) button.

Power readings are integrated for maximum demand measurement. The options are off: 5: 10: 15: 30 or 60 minutes.

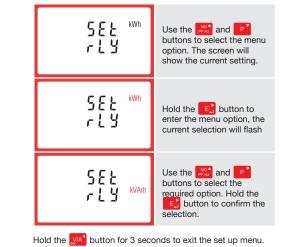


UUU I 0001 to 9999.

The PT Rate is the PT Primary divided by the PT Secondary. For Example: Voltage Transformer - 11000÷110=100, so the PT Rate would be 0100 and the PT2 would be 110.

4.7 Pulsed Output

Use this section to configu e the Pulsed Output Type. Units: kVArh (default): kWh.



Please note the register is 9999999.9 display over two lines

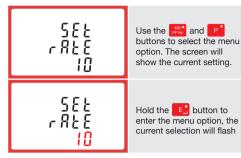
4.7.1 Pulse Rate

You can configu e the number of pulses to relate to a defined amount of Total Energy.

Please note there are limitations that need to be factored in when setting the pulsed output. This is based upon the relay output only being able to pulse 2 times per second.

For example, If the CT is set to 500/5A on a Single Phase network this would generate (500Ax230V=115,000 / 1000) 115kWh which is 31W per second. A setting of 10IMP/kWh (10 pulses per kWH) would generate 3 pulses per second. This will exceed the 2 pulse per second limitation.

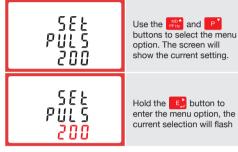
Pulse settings: 1 Pulse per: 10W (0.01) / 100W (0.1) / 1000W/1kWh (1) / 10kWh (10) / 100kWh (100) /1000kWh (1000)



Use the with and without to choose the desired pulse rate. To save the new setting, hold the circle button for 3 seconds until the selection stops flashing

4.7.2 Pulse Duration

The energy monitored can be active or reactive and the pulse width can be selected as 200, 100 or 60mS.

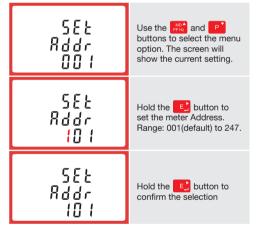


Use the we and P buttons to choose the desired pulse rate. To save the new setting, hold the E button for 3 seconds until the selection stops flashing

4.8 Communication

The RS485 port can be used for communication using Modbus RTU Protocol. To configu e the Modbus settings, such as Address and Baud Rate, this is also done within the Password-protected set up menu

4.8.1 RS485 Address



Use the Rest and Rest buttons to choose the necessary number, then press the St button to move along to the next number. To save the new setting, hold the St button for 3 seconds until the selection stops flashing

4.8.2 Baud Rate

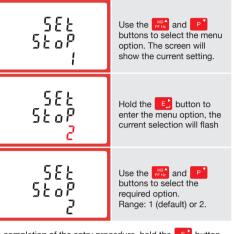
585 5803 9.5 *	Use the Product and P buttons to select the menu option. The screen will show the current setting.

4.8.3 Parity

582 P871 8080	Use the P and P buttons to select the menu option. The screen will show the current setting.
582 2871 8081	Hold the E , button to enter the menu option, the current selection will flash
582 PR-1 NONE	Use the the better and the buttons to select the required option. Range: None (default), Odd or Even.

completion of the entry procedure, hold the for 3 seconds until the selection stops flashing

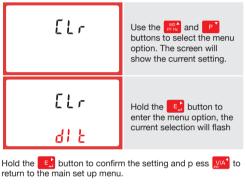
4.8.4 Stop bits



On completion of the entry procedure, hold the for 3 seconds until the selection stops flashing

4.9 CLR

The meter provides a function to reset the maximum demand value of current and power.



5 Specifications

5.1 Measured Parameters

The unit can monitor and display the following parameters of a Single Phase Two Wire (1P2W), Three Phase Three Wire (3P3W) or Three Phase Four Wire (3P4W) system.

5.1.1 Voltage and Current

- Phase to Neutral Voltages 100-289V AC
- (not for 3P3W supplies). Phase to Phase Voltages 173-500V AC
- (3 Phase supplies only).
- Percentage Total Voltage Harmonic Distortion (V %THD) for each Phase to Neutral (not for 3P3W supplies)
- Percentage Total Voltage Harmonic Distortion (V% THD) between Phases (3 Phase supplies only)
- · Current %THD for each Phase

5.1.2 Power factor and Frequency and Max. Demand

- Frequency in Hz Instantaneous power;
- Power 0-3600 MW

5.3 Accuracy

Voltage	0.5% of range maximum
Current	0.5% of nominal
Frequency	0.2% of mid-frequency
Power factor	1% of unity (0.01)
Active power (W)	±1% of range maximum
Reactive power (VAr)	±1% of range maximum
Apparent power (VA)	±1% of range maximum
Active energy (Wh)	Class 1 IEC 62053-21
 Reactive energy (VARh) 	±1% of range maximum
 Total harmonic distortion 	1% up to 31st harmonic
 Response time to step input 	1s, typical, to >99% of

ypical, to >99% of final eading, at 50 Hz.

5.4 Auxiliary Supply

Two-way fixed connector with 2.5mm² stranded wi e capacity. 85-275V AC 50/60Hz ±10% or 120-380V DC ±20% Consumption <2W 10VA.

5.5 Interfaces for External Monitoring

- Three interfaces are provided: RS485 communication channel that can be programmed for Modbus RTU protocol
- Relay output indicating real-time measured energy. (configurable
- Pulse output 3200IMP/kWh (not configurable

The Modbus configuration (baud rate etc.) and the pulse relay output assignments (kW/kVArh) are configu ed through the set-up screens.

5.5.1 Pulse Output

Opto-coupler with potential free SPST-NO Contact (Contact rating 5-27V DC / Max current input: Imin 2mA and Imax 27mA DC). The pulse output can be set to generate pulses to represent kWh or kVArh.

Ra te can be set to generate 1 pulse per: 0.01 = 10 Wh/VArh 0.1 = 100 Wh/VArh 1 = 1 kWh/kVArh 10 = 10 kWh/kVArh

100 = 100 kWh/kVArh

Pulse width 200/100/60 mS.

5.5.2 RS485 Output for Modbus RTU

For Modbus RTU, the following RS485 communication parameters can be configu ed from the set-up menu:

Baud rate: 2400, 4800, 9600, 19200, 38400

Parity: none (default) / odd / even

Stop bits: 1 or 2

RS485 Network Address: 3 digit number - 001-247

Modbus " Word order Hi/Lo byte order is set automatically to normal or reverse. It cannot be configu ed from the set-up menu.

5.6 Reference Conditions of Influence Quantities

Influence Quantities a e variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions

- Ambient temperature Input waveform Input waveform
- Auxiliary supply voltage
- Auxiliary supply frequency Auxiliary supply waveform (if AC)
 - Sinusoidal (distortion factor < 0.05) Terrestrial flu

23°C ±1°C

50 or 60Hz ±2%

factor < 0.005)

Nominal ±1%

Nominal ±1%

-25°C to +55°C*

-40°C to +70°C*

non-condensing

Sinusoidal (distortion

Magnetic field of exte nal origin

5.7 Environment

- · Operating temperature Storage temperature Relative humidity
- Altitude Warm up time

Vibration

Shock

Up to 3000m 1 minute 10Hz to 50Hz, IEC 60068-2-6, 2g

0 to 95%,

30g in 3 planes

72 x 94.5 mm (WxH)

DIN rail (DIN 43880)

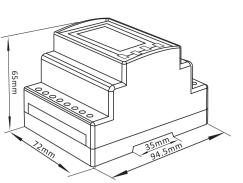
Self-extinguishing UL

per DIN 43880

IP51 indoor

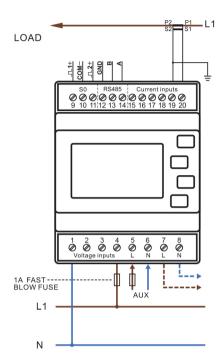
94 V-0

6 Dimensions

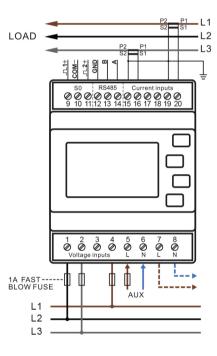


7 Installation

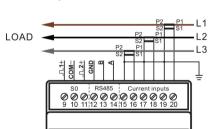
7.1 Single phase two wires

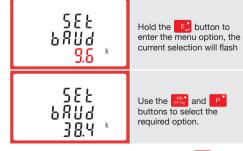


7.2 Three phase three wires



7.3 Three phase four wires





On completion of the entry procedure, hold the E button to confirm the setting

- Reactive power 0-3600 MVAr
- Volt-amps 0-3600 MVA
- · Maximum Demand Power since last reset
- Power factor
- · Maximum Neutral Demand Current, since the last reset (for Three Phase supplies only)

5.1.3 Energy Measurements

- Imported/Exported active energy 0 to 9999999.9 kWh
- 0 to 9999999.9 kVArh Imported/Exported reactive energy

0 to 9999999.9 kWh

0 to 9999999.9 kVArh

- Total active energy
- Total reactive energy

5.2 Measured Inputs

Voltage inputs through 4-way fixed connector with 2.5mm² stranded wire capacity. Single Phase Two Wire (1P2W), Three Phase Three Wire (3P3W) or Three Phase Four Wire (3P4W) unbalanced. Line frequency measured from L1 Voltage or L3 Voltage. Three current inputs (six physical terminals) with 2.5mm² stranded wire capacity for connection of external CTs. Nominal rated input current 5A or 1A AC RMS.

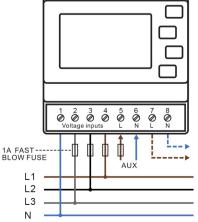
Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.

5.8 Mechanics

DIN rail dimensions	
Mounting	
Sealing	
Material	

5.9 Declaration of Conformity

We, Sifam Tinsley Instrumentation LTD, declare under our sole responsibility as the manufacturer that the poly phase multifunction electrical energy meter "AP25-3CO" correspond to the production model described in the EC-type examination certificate and to the equirements of the Directive 2004/22/ EC EC type examination certificate number 0120/SGS0209. Identifcation number of the NB 0120.



Sifam Tinsley Instrumentation Ltd, 1 Warner Drive, Springwood Industrial Estate, Braintree, Essex CM7 2YW Customer Service: 01376 335 271 | www.sifamtinsley.co.uk | Specifications a e subject to change without notice

