K-FACTOR
THE VOLTAGE YOU NEED

Trasformatori elettrici
Stabilizzatori di tensione
Convertitori di Frequenza
UPS, Inverter, Alimentatori

Variatori di tensione monofase

Serie VAM-N – VAT-N – VAT…M – VAT…MR10

Istruzioni per l'uso e la manutenzione

Single phase a.c. power supply

VAM-N – VAT-N – VAT…M – VAT…MR10 range

Use and maintenance

DANGER

LEGGERE ATTENTAMENTE IL MANUALE PRIMA DI UTILIZZARE QUESTA APPARECCHIATURA

Conservate questo manuale in un luogo accessibile per future necessità

You should read this manual to be able to use your regulator for a longer time
Please keep the user's manual in an easily accessible place for future reference

DANGER

L'UTILIZZO E LA INSTALLAZIONE DI QUESTA APPARECCHIATURE SONO RISERVATI A PERSONALE QUALIFICATO

INSTALLATION AND USE OF THIS EQUIPMENT FOR SKILLED PERSONNEL ONLY

DANGER

L'APERTURA DI QUESTA APPARECCHIATURA E' POTENZIALMENTE PERICOLOSA, CHIAMATE L'ASSISTENZA PRIMA DI COMPIERE QUALSIASI MANOVRA DI APERTURA

Please do not make any operation you are unsure about, otherwise your device may get damaged, please call our technical service before opening the unit

WARNING

DANGEROUS VOLTAGE IS PRESENT INSIDE THE EQUIPMENT. DISCONNECT THE STABILISER BEFORE OPENING THE DOORS. INSTALLATION MUST BE PROVIDED BY A QUALIFIED OPERATOR. USE ONLY ISOLATED AND PROFESSIONAL TOOLS

CE

RoHS compliant

Nota: Questo manuale si riferisce al modello per tensione di rete 400/230V. Per altri paesi, con le medesime caratteristiche, gli stabilizzatori sono fornibili con tensione di rete 380/220V o 415/240V o altre a richiesta. Controllate che la tensione nominale dell'apparecchio corrisponda a quella del paese dove viene installato.

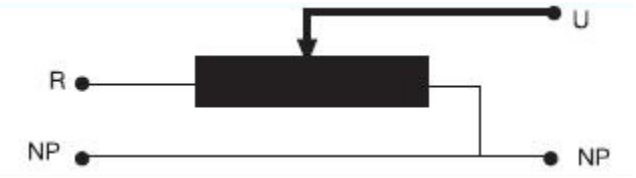
Warning: this handbook refers to the model for network voltage of 400/230V. For other countries, under the same characteristic, stabilisers are supplied with rated voltage 380/220V or 415/240V. Check that the rated voltage on the plate of the apparatus is conforming to the country network one and to the installation of the stabiliser.

Indice

1. Caratteristiche meccaniche del prodotto

versione 2:20A

versione 26:60A



Autotrasformatori variabili serie VAMxxF-1N
MONOFASE, modello chiuso - **Ingresso:** 230V AC 50/60Hz **Uscita:** 0-250V Vac

TYPE	Corrente	MAX	dimensioni mm			peso
	A	KVA	L	P	H	KG
VAM04F-1N	4	1.0	360	230	230	13
VAM06F-1N	6	1.5	360	230	230	16
VAM08F-1N	8	2.0	360	230	230	17
VAM10F-1N	10	2.5	360	230	230	19
VAM14F-1N	14	3.5	360	250	250	22
VAM18F-1N	18	4.5	360	250	250	26
VAM20F-1N	20	5.0	360	250	250	27
VAM26F-1N	26	6.5	500	590	380	47
VAM30F-1N	30	7.5	500	590	380	50
VAM40F-1N	40	10	500	590	380	54
VAM50F-1N	50	12.5	500	590	380	74
VAM60F-1N	60	15	500	590	380	82
VAM80F-1N *	80	20	500	590	380	86

DOTAZIONI INCLUSE DI SERIE
Interruttore ingresso
Interruttore magnetotermico protezione in uscita
Voltmetro digitale con lettura tensione uscita
Amperometro digitale
Morsetti serrafllo uscita 2P+T
Cavo alimentazione (o morsetti ingresso oltre 30 A)
Lampada spia presenza rete
Manopola regolazione tensione con quadrante
* VAM80F-1N privo di voltmetro/amperometro

Variatori di tensione trifase serie VAT – regolazione manuale (il colore potrebbe variare)

VERSIONE 2 : 20 A VERSIONE 26 : 60 A

Autotrasformatori variabili serie VATxxF-3N trifase, modello chiuso **Ingresso:** 400V AC 50/60Hz **Uscita:** 0-435V PRESA CENTRALE SU RICHIESTA						
TYPE	**Corrente A**	**MAX VA**	**dimensioni mm**			**peso KG**
			L	**P**	**H**	
VAT04F-3N	**4**	**3.000**	250	350	750	40
VAT06F-3N	**6**	**4.500**	250	350	750	49
VAT08F-3N	**8**	**6.000**	250	350	750	52
VAT10F-3N	**10**	**7.500**	250	350	750	59
VAT14F-3N	**14**	**10.500**	250	350	750	70
VAT18F-3N	**18**	**13.500**	250	350	750	80
VAT20F-3N	**20**	**15.000**	250	350	750	81
VAT26F-3N	**26**	**19.500**	600	600	1140	140
VAT30F-3N	**30**	**23.500**	600	600	1140	150
VAT40F-3N	**40**	**30.000**	600	600	1140	160
VAT50F-3N	**50**	**37.500**	600	600	1140	220
VAT60F-3N	**60**	**45.000**	600	600	1140	245
VAT80F-3N	**80**	**60.000**	120	60	1140	345
VAT100F-3N	**100**	**75.000**	120	60	1140	460
VAT120F-3N	**120**	**90.000**	120	60	1140	510
VAT160F-3N	**160**	**120.000**	120	60	1140	535

DOTAZIONI INCLUSE DI SERIE
Interruttore ingresso
Interruttore magnetotermico (O FUSE) protezione in uscita
Strumento multifunzione lettura tensione di fase e concatenata – corrente – potenza apparente, tensioni minime e massime
Morsettiera ingresso e Morsetti serrafllo uscita 3P+N+T fino a 20A
Morsettiera ingresso / uscita da 26 A dietro il pannello posteriore del prodotto
Lampada spia presenza rete su ogni fase
Manopola regolazione tensione con quadrante

2. Specifiche tecniche

VERSIONE MONOFASE

Tensione di ingresso:	230Vac
Frequenza ingresso:	50Hz ±5%
Tensione uscita:	0 : 250Vac
Potenza uscita:	da 1kVA a 20kVA
Frequenza Uscita:	50Hz ±5%
Regolazione:	manuale
Rendimento	> 98%
Temperature di esercizio	-5°C : +40°C
Altitudine massima	fino a 1000m.s.l.m. senza riduzione di potenza
Umidità relativa	95% senza condensa
Rumorosità	< 50dB a 1m.

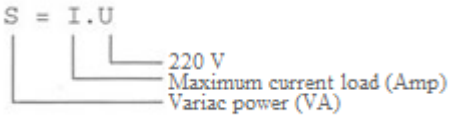
VERSIONE TRIFASE

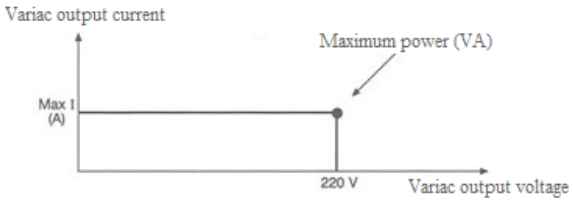
Tensione di ingresso:	400Vac + N
Frequenza ingresso:	50Hz ±5%
Tensione uscita:	0 : 435Vac + N
Potenza uscita:	da 3KVA a 120kVA
Frequenza Uscita:	50Hz ±5%
Regolazione:	manuale
Rendimento	> 98%
Temperature di esercizio	-5°C : +40°C
Altitudine massima	fino a 1000m.s.l.m. senza riduzione di potenza
Umidità relativa	95% senza condensa
Rumorosità	< 50dB a 1m.

3. Tecnologia dei regolatori

I variatori di tensione monofase e trifase utilizzano autotrasformatori variabili di alta qualità con spazzole in grafite e movimento manuale. Lo scorrimento della spazzola sui contatti dell'autotrasformatore toroidale consente la variazione assolutamente lineare della tensione di uscita, tramite la manopola posta sul frontale o nella parte superiore. I variatori della serie VAM-N/VAT-N sono dotati di interruttore in ingresso e interruttore automatico in uscita, voltmetro (su ogni fase a partire dai modelli trifase 26 A) e amperometro digitale con lettura della corrente in uscita (su ogni fase per le versioni trifase), cavo di alimentazione per i modelli monofase fino a 10 A, morsettiera in ingresso per le potenze superiori, lampada presenza rete. L'uscita è proposta con morsetti serrafilo frontali per il collegamento del carico, o con morsettiera nei modelli trifase da 26 A.

CALCOLO TECNICO





Esempio:
S = 10A x 220V = 2200VA (2.2kVA)

Si prega di non superare la corrente di uscita variac massima determinata anche in caso di variazioni della tensione di uscita del variac, a causa dell'avvolgimento del variac realizzato con rame della stessa sezione lungo l'intero avvolgimento.

4. Caratteristiche elettriche

Con tensione di ingresso 230V (o altre su richiesta), o 400V+N per le versioni trifase, la tensione di uscita può essere regolata, tramite la manopola da 0 a 250V c.a. (0:435V trifase) o altre tensioni su richiesta. Verificate sulla targa del prodotto le tensioni nominali di ingresso e uscita.

Importante: nel caso la tensione di ingresso uscisse dai limiti sopra indicati, il variatore di tensione può essere danneggiato o avere un assorbimento a vuoto anomalo.

5. Comandi e strumentazione

Modelli monofase

Sul pannello frontale sono presenti, a seconda dei modelli
- interruttore in ingresso
- spia presenza rete
- manopola di regolazione della tensione in uscita
- interruttore automatico in uscita
- strumento a due display per la lettura della tensione e della corrente in uscita
- morsetti serrafilo fase neutro e terra

Sul retro dell'apparecchio si trova il cavo di alimentazione, se presente, o la morsettiera di ingresso.

Modelli trifase

6. Istruzioni per l'installazione e l'utilizzo

Estrarre l'unità dall'imballaggio prestando attenzione al foglio di garanzia. Controllare che l'interruttore automatico sia spento.

Modelli monofase

L'alimentatore è dotato di un cavo di alimentazione o di una morsettiera composta da:
a) due morsetti contrassegnati INPUT 230V (o 220V o 240V). Se si trova una spina, collegarla alla presa a muro. Non utilizzare adattatori, non tagliare o sostituire la spina in dotazione.
b) uno o due morsetti di terra
c) due morsetti contrassegnati OUTPUT 0:250V

Modelli trifase

L'alimentatore è dotato di una morsettiera composta da:
a) tre morsetti contrassegnati INPUT 400V (o 380V o 415V). Se si trova una spina, collegarla alla presa a muro. Non utilizzare adattatori, non tagliare o sostituire la spina in dotazione. b) uno/due terminali NEUTRO per ingresso/uscita (necessario neutro)
c) uno o due terminali di terra
d) tre terminali contrassegnati OUTPUT 0:435V

Ruotare la manopola in posizione “0”
Collegare la tensione di linea ai terminali contrassegnati INPUT
NOTA: È SEMPRE NECESSARIO COLLEGARE IL MORSETTO DI NEUTRO AL NEUTRO DI RETE, PER EVITARE VARIAZIONI INDESIDERATE DELLE TENSONI DI FASE IN CASO DI SQUILIBRIO DEL CARICO, ANCHE DOVUTO ALLA COMPONENTISTICA INTERNA, O DI TENSIONI DI RETE GIA’ NON EQUILIBRATE.
Collegare il carico ai terminali contrassegnati OUTPUT. Se i terminali sono sul lato anteriore è possibile collegare il carico a proprio piacimento.

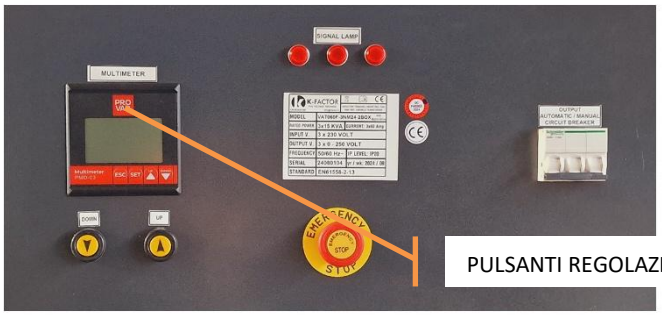
Verificare che la potenza del carico non superi il valore nominale dello stabilizzatore (riportato sulla targhetta). Si consiglia di utilizzare l'alimentatore per un massimo del 70-75% della potenza nominale.
Verificare che l'apparecchio sia posizionato in un ambiente arieggiato e lontano da fonti di calore.
Non appoggiare carte o oggetti sullo stabilizzatore. Il raffreddamento potrebbe risentirne.
Accendere l'apparecchio tramite l'interruttore automatico prima di accendere il carico.
Controllare il display: quando l'interruttore è -in- viene visualizzata la tensione di ingresso; in out- viene visualizzata la tensione di uscita. Ora è possibile con la manopola spostare i valori della tensione di uscita da 0 a 250 Vac.
Se un interruttore di uscita è disponibile sull'unità, è possibile accenderlo in questa fase o quando la tensione di uscita è ancora a "0" per aumentare gradualmente la tensione al carico.
Se è disponibile un amperometro, è possibile leggere la corrente di uscita.

Il variatore di tensione VAM/VAT può essere acceso anche sotto carico a qualsiasi valore di tensione, a condizione che l’assorbimento di corrente del carico non superi il valore di targa e che la corrente di inserzione non superi il 200% del valore di targa.
E' possibile ora, attraverso la manopola apposita variare il punto della regolazione ottenendo valori di tensione variabili tra 0 e 250Vca monofase o tra 0 e 435Vac trifase. La rotazione in senso ORARIO incrementa la tensione, in senso ANTIORARIO la diminuisce. La scala graduata riportata intorno alla manopola è indicativa, verificare il valore effettivo della tensione erogata sul voltmetro a pannello.

7. Versione motorizzata

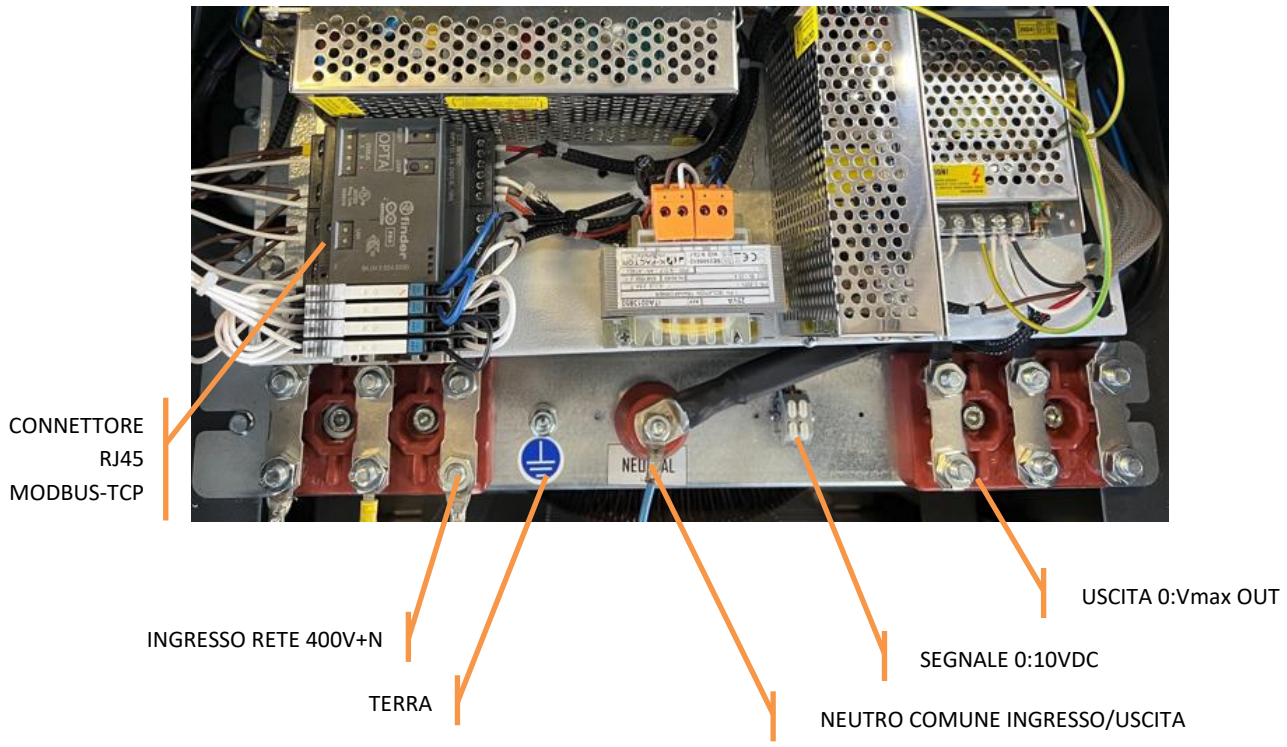
REGOLAZIOVerificare la tensione desiderata sullo strumento in dotazione.

8. Versione motorizzata con regolazione R10



La versione con regolazione R10 consente di utilizzare alternativamente un comando a pannello (potenziometro) o un segnale remoto, analogico o digitale.
Sul pannello frontale è predisposto un deviatore per la selezione della modalità remota o locale.
Con il deviatore in posizione “LOCAL”, è possibile regolare la tensione tramite il potenziometro multigiri in dotazione. La regolazione a 10 step proporzionali consente approssimativamente di regolare la tensione in percentuale da 0 al 100% della tensione nominale di uscita.

Con il deviatore in posizione “REMOTE” è possibile effettuare la regolazione dell’uscita inviando un segnale analogico 0:10Vdc al morsetto dedicato. L’uscita ottenuta sarà approssimativamente proporzionale al segnale in ingresso. Si consiglia tuttavia un circuito di retroazione se si vuole controllare con maggiore precisione l’uscita, alzando il segnale analogico se la tensione risulta bassa rispetto a quella impostata, o viceversa abbassando il valore del segnale analogico qualora la tensione risulti alta.
Il sistema è predisposto per autoregolarsi stabilizzando la tensione al valore impostato, con un errore previsto di ca. 1.5% a fondo scala.



Aprire il pannello posteriore per avere accesso alle connessioni di potenza e di regolazione.
Collegare un segnale analogico 0:10Vdc al morsetto marcato “0:10Vdc” ed inviare un segnale variabile in relazione alla tensione che si vuole ottenere. Il sistema si regolerà gradualmente verso la tensione desiderata.
Con il deviatore in posizione “REMOTE”, è possibile effettuare la regolazione 0:Vmax tramite modbus-TCP, utilizzando i seguenti comandi:

```
****Setup connection OPTA ****
Port: COM13
Download first sketch: COM12
Baudrate: 38400
Frame: N, 8, 1
Address: 247
Timeout: 1000


****MODBUS TCP****
IP ADDRESS: 192.168.100.80
DNS: 192.168.100.81
GATEWAY: 192.168.100.81
SUBNET: 255.255.255.0
TCP PORT: 502


Setpoint con potenziometro
Tipo dato: BOOL
Funzione: 0X01 Read coils
Indirizzo: 3
false = uso modbus
true = potenziometro

Setpoint con percentuale da modbus
Tipo dato: UINT
Funzione: 0x03 Read holding register
Indirizzo: 20109

Ratio trasformatore
Tipo dato: UINT
Funzione: 0x03 Read holding register
```

Indirizzo: 20110

Tensione letta in uscita (convertita)
Tipo dato: UINT
Funzione: 0x06 Write Single Register
Indirizzo: 20111

9. Manutenzione periodica

Il prodotto è stato progettato in modo da non richiedere interventi di manutenzione anche per lunghi periodi. Occorrerà comunque accertarsi che l'apparecchio non si trovi in locali polverosi o in ambienti con vapori aggressivi, ed inoltre che sia lontano da fonti di calore. Periodicamente si avrà cura di togliere la polvere dell'avvolgimento dell'autotrasformatore nella parte di scorrimento delle spazzole di contatto, utilizzando un pennello a setole morbide. Non usare olio o solventi chimici.

10. In caso di assistenza

La ditta confida in una completa collaborazione della Clientela al fine di migliorare il proprio servizio.
E' possibile contattare l'assistenza tecnica esclusivamente tramite e-mail a service@kfactor.it o whatsapp (solo messaggi) al +39-3518052001.

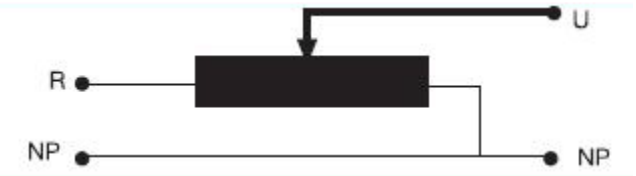
Ricordiamo alcuni dati da riconoscere prima di interpellare il ns servizio tecnico:
a. Modello della macchina.....
b. Numero di matricola.....
c. Acquistato da..... il .....
d. Tipo di carico.....
e. Assorbimento inserito .....
(rilevabile sulle targhe di caratteristiche degli apparecchi)
f. Difetto riscontrato.....
In caso di restituzione per riparazione, allegare sempre alla macchina una lettera citando i dati richiesti, insieme all'imballo originale ed in PORTO FRANCO.

Summary

1. Mechanical specification

2:20A version

26:60A version



VAMxxF-1N variable autotransformers
SINGLE PHASE, closed type - **input:** 230V AC 50/60Hz **output:** 0-250V Vac

TYPE	Current	MAX	dimensions mm			weight
	A	KVA	W	D	H	KG
VAM04F-1N	4	1.0	360	230	230	13
VAM06F-1N	6	1.5	360	230	230	16
VAM08F-1N	8	2.0	360	230	230	17
VAM10F-1N	10	2.5	360	230	230	19
VAM14F-1N	14	3.5	360	250	250	22
VAM18F-1N	18	4.5	360	250	250	26
VAM20F-1N	20	5.0	360	250	250	27
VAM26F-1N	26	6.5	500	590	380	47
VAM30F-1N	30	7.5	500	590	380	50
VAM40F-1N	40	10	500	590	380	54
VAM50F-1N	50	12.5	500	590	380	74
VAM60F-1N	60	15	500	590	380	82
VAM80F-1N *	80	20	500	590	380	86

STANDARD FITTINGS
Input circuit breaker
output circuit breaker
Voltmeter with output voltage reading
Digital A-meter
Output screw terminals 2P+earth
Supply cord (or input terminals from 30A up)
Input voltage signal light
Regulation knob + dial
* VAM80F-1N has no V-meter or A-meter

Three phase VAT range variable transformers – manual regulation (colours may vary)

2 : 20 A rating

26 : 60 A rating

VATxxF-3N variable transformers Three phase, closed type
Input: 400V AC 50/60Hz **Output:** 0-435V
Center tap available on request

TYPE	Current A	MAX VA	dimensions mm			weight KG
			W	D	H	
VAT04F-3N	4	3.000	250	350	750	40
VAT06F-3N	6	4.500	250	350	750	49
VAT08F-3N	8	6.000	250	350	750	52
VAT10F-3N	10	7.500	250	350	750	59
VAT14F-3N	14	10.500	250	350	750	70
VAT18F-3N	18	13.500	250	350	750	80
VAT20F-3N	20	15.000	250	350	750	81
VAT26F-3N	26	19.500	600	600	1140	140
VAT30F-3N	30	23.500	600	600	1140	150
VAT40F-3N	40	30.000	600	600	1140	160
VAT50F-3N	50	37.500	600	600	1140	220
VAT60F-3N	60	45.000	600	600	1140	245
VAT80F-3N	80	60.000	120	60	1140	345
VAT100F-3N	100	75.000	120	60	1140	460
VAT120F-3N	120	90.000	120	60	1140	510
VAT160F-3N	160	120.000	120	60	1140	535

STANDARD FITTINGS
Input circuit breaker
Automatic output circuit breaker
Digital multimeter with output phase-phase and phase-N voltage, current, apparent power and min/max voltage reading
Output screw terminals 3P+neutral+earth
Input/output terminals from 26 A
Input voltage signal light
Regulation knob + dial

2. Electrical Specification

SINGLE PHASE TYPE

Input voltage:	230Vac
Input frequency:	50Hz ±5%
Output voltage:	0 : 250Vac
Rated power:	from 1000VA to 20kVA
Output frequency:	50Hz ±5%
Regulation:	manual
Efficiency:	> 98%
Ambient temperature	-5°C : +40°C
Altitude	up to 1000m without derating
Relative humidity	95% without condensation
Audible noise	< 50dB a 1m.

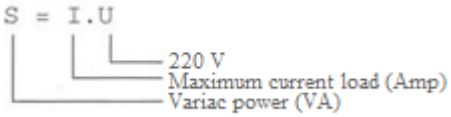
THREE PHASE TYPE

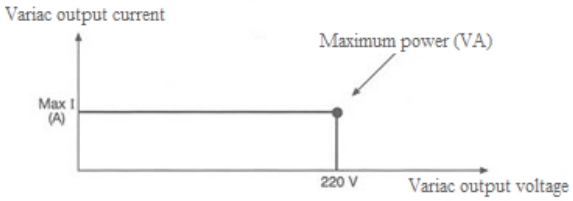
Input voltage:	400Vac+N
Input frequency:	50Hz ±5%
Output voltage:	0:435Vac + N
Rated power:	from 3kVA to 120kVA
Output frequency:	50Hz ±5%
Regulation:	manual
Efficiency:	> 98%
Ambient temperature	-5°C : +40°C
Altitude	up to 1000m without derating
Relative humidity	95% without condensation
Audible noise	< 50dB a 1m.

3. Technology of the regulators

The single or three phase variable AC power supplies made by k-factor operates through a high quality toroidal variable transformer moved by a knob or by a gear motor. A carbon brush slides on the contact surface of the toroidal transformer allowing a gradual and continuous variation of the output voltage. In case of a manual regulation this is operated by a knob placed on the front or on the upper side of the unit, otherwise the motor is moved by two push buttons (up-down). According to different models the variable power supplies are fitted with input and/or output circuit breaker, digital V-meter, digital A-meter and front terminals for the connection of the load.

TECHNICAL CALCULATION





Example:
S = 10A x 220V = 2200VA (2.2kVA)

Please do not exceed the determined maximum variac output current even in case of variations of the variac output voltage, due to the variac winding made of copper of the same cross-section along the entire winding.

4. Electrical specification

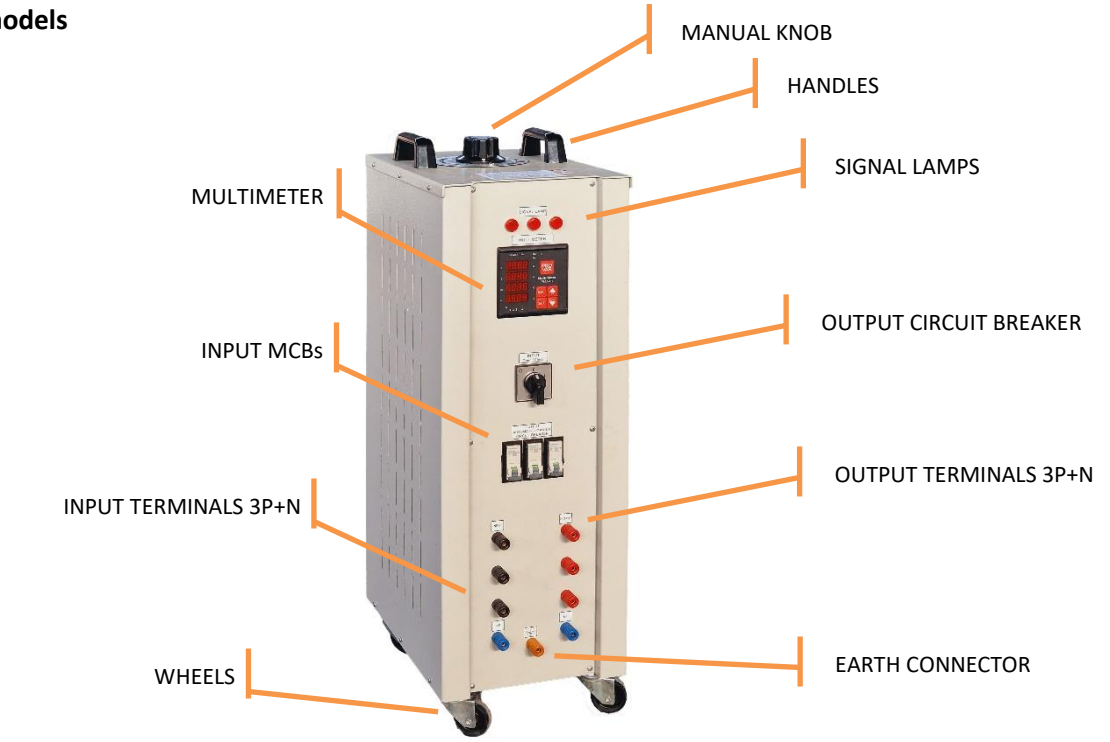
With an input voltage of 230VAC (± 6% or others on request) for single phase models and 400Vac for the three phase models, output voltage can be regulated through a knob (or through push buttons for motorized models) from 0 to 250Vac, from 0 to 435Vac for three phase or others on request (220Vd.c. or others on request for DC output). Please verify the rated input and output voltages on the rating label.

Important: if input voltage goes over the rated minimum / maximum limit (usually ±6%) the variable transformer could be damaged. Or could have a high no-load current absorption.

5. Instruments and commands

The following instruments/fitting can be seen on a VAM/VAT products according to different models:
- input automatic circuit breaker (marked INPUT MCB - INGRESSO)
- output voltage regulation knob (or up-down push buttons)
- Output circuit breaker
- Mains signal lamp
- Two displays A / V meter for the output voltage reading
- Output terminals for the load power supply (L – N – Earth)

Three phase models



6. Installation and use.

Pick the unit from its packing taking care to the guarantee sheet. Check that the circuit breaker is off.

Single phase models

The power supply is provided with a supply cord, or with a terminal board consisting of:
a) two terminals marked INPUT 230V (or 220V or 240V). If you find a plug please connect the plug to the wall socket. Do not use adaptors, do not cut or replace the provided plug.
b) one or two earth terminals
c) two terminals marked OUTPUT 0:250V

Three phase models

The power supply is provided with a terminal board consisting of:
a) three terminals marked INPUT 400V (or 380V or 415V). If you find a plug, please connect the plug to the wall socket. Do not use adaptors, do not cut or replace the provided plug.
b) one / two NEUTRAL terminal (s) for input/output (neutral is needed)
c) one or two earth terminals
d) three terminals marked OUTPUT 0:435V

Turn the knob to position “0”
Connect the line voltage to the terminals marked INPUT
NOTE: IT IS ALWAYS NECESSARY TO CONNECT THE NEUTRAL TERMINAL TO THE MAINS NEUTRAL, TO AVOID UNWANTED VARIATIONS IN THE PHASE VOLTAGES IN THE EVENT OF LOAD IMBALANCE, EVEN DUE TO INTERNAL COMPONENTS, OR MAINS VOLTAGES THAT ARE ALREADY UNBALANCED.
Connect the load to the terminals marked OUTPUT. If terminals are on the front side you can connect the load at your convenience.

Check that the power of the load does not exceed the rated value of the stabiliser (shown on the rating plate). It is advisable using the power supply for a maximum of 70-75% of the rated power.
Check that the apparatus is placed in airy ambient and far from heat sources.
Do not place papers or objects on the stabiliser. The cooling can suffer.
Turn on the apparatus using the automatic circuit breaker before turning on the load.
Check the display: when the switch is -in- it is visualized the input voltage; in out- it is visualized the output voltage.
Now it is possible with the knob to move the output voltage values from 0 to 250Vac.
If an output circuit breaker is available on the unit, you can switch it on at this stage, or when output voltage is still to “0” in order to gradually increase voltage to the load.
If an A-meter is available you may read the output current.

The VAM/VAT voltage regulator can also be switched on under load at any voltage value, provided that the load current absorption does not exceed the plate value and that the insertion current does not exceed 200% of the plate value.
It is now possible, through the appropriate knob, to vary the regulation point obtaining variable voltage values between 0 and 250Vac single-phase or between 0 and 435Vac three-phase. Rotating CLOCKWISE increases the voltage, ANTICLOCKWISE decreases it. The graduated scale shown around the knob is indicative, check the actual value of the voltage supplied on the panel voltmeter.

7. Motorized version

The motorized version replaces the adjustment made via knob or steering wheel with a motor powered by direct voltage. To adjust the voltage, use the two up / down buttons. Check the desired voltage on the instrument provided.

OUTPUT VOLTAGE ADJUSTMENT PUSH BUTTONS

8. Motorized version with R10 regulation

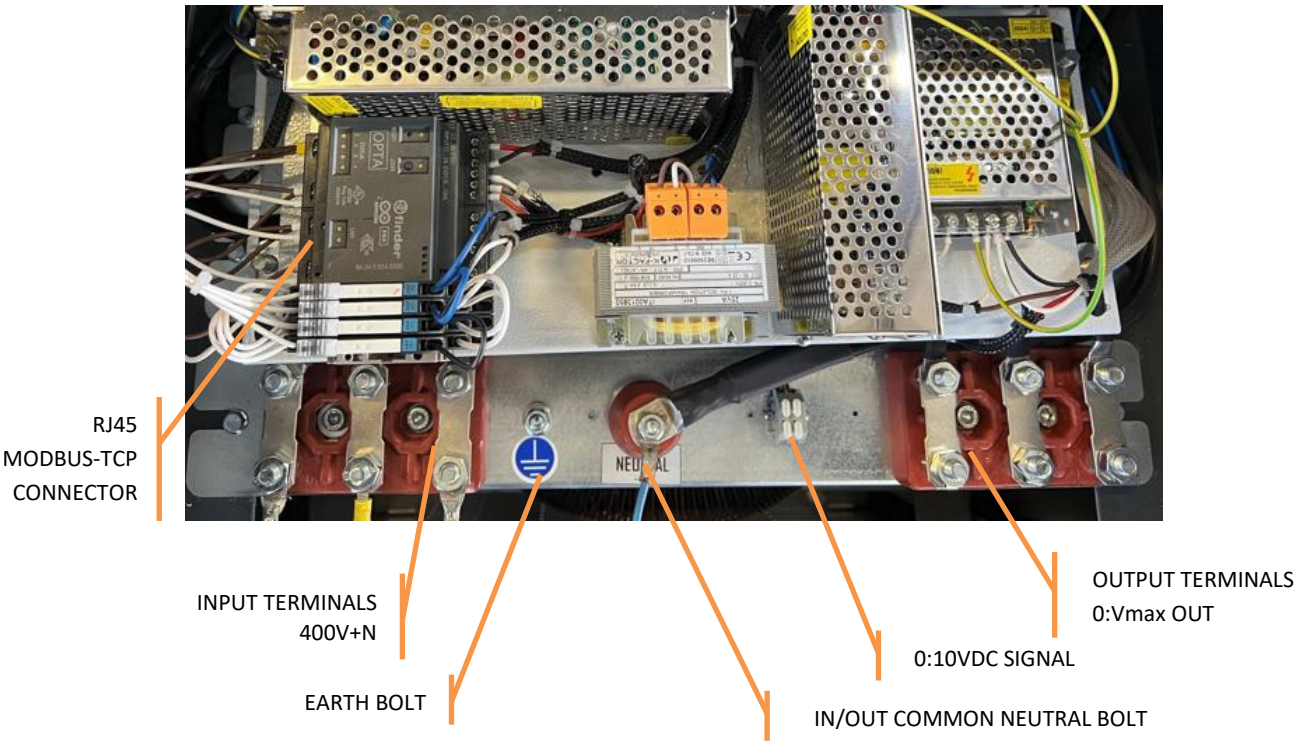
The version with R10 regulation allows you to use either a panel control (potentiometer) or a remote signal, analog or digital. A switch is provided on the front panel to select remote or local mode.
With the switch in the “LOCAL” position, you can adjust the voltage using the multi-turn potentiometer provided. The 10-step proportional regulation allows you to approximately adjust the voltage as a percentage from 0 to 100% of the nominal output voltage.

REMOTE / LOCAL SWITCH

OUTPUT VOLTAGE ADJUSMENT POTENTIOMETER

With the switch in the “REMOTE” position, it is possible to adjust the output by sending a 0:10Vdc analog signal to the dedicated terminal. The output obtained will be approximately proportional to the input signal. However, a feedback circuit is recommended if you want to control the output more precisely, raising the analog signal if the voltage is low compared to the set value, or vice versa, lowering the value of the analog signal if the voltage is high.

The system is designed to self-regulate by stabilizing the voltage at the set value, with an expected error of approximately 1.5% at full scale.



Open the rear panel to access the power and regulation connections.
Connect a 0:10Vdc analog signal to the terminal marked “0:10Vdc” and send a variable signal in relation to the voltage you want to obtain. The system will gradually adjust towards the desired voltage.
With the switch in the “REMOTE” position, it is possible to perform the 0:Vmax regulation via modbus-TCP, using the following commands:

```
****Setup connection OPTA ****
Port: COM13
Download first sketch: COM12
Baudrate: 38400
Frame: N, 8, 1
Address: 247
Timeout: 1000


****MODBUS TCP****
IP ADDRESS: 192.168.100.80
DNS: 192.168.100.81
GATEWAY: 192.168.100.81
SUBNET: 255.255.255.0
TCP PORT: 502


Setpoint con potenziometro
Tipo dato: BOOL
Funzione: 0X01 Read coils
Indirizzo: 3
false = uso modbus
true = potenziometro

Setpoint con percentuale da modbus
Tipo dato: UINT
Funzione: 0x03 Read holding register
Indirizzo: 20109
```

Ratio trasformatore
Tipo dato: UINT
Funzione: 0x03 Read holding register
Indirizzo: 20110

Tensione letta in uscita (convertita)
Tipo dato: UINT
Funzione: 0x06 Write Single Register
Indirizzo: 20111

9. Maintenance

- The power supply must not work in dusted ambient or in presence of chemical corrosive material.
- Do not clean the surface of the apparatus with aggressive products. Do not use oils or chemical solvents.
- Do not use the circuit breaker of the stabiliser as general switch of the user's apparatus. This operation could damage the power supply.

Do not lay things, books or something else on the top of the stabiliser, avoid placing it near heat sources.

If you follow the warning above, the stabiliser does not need a maintenance for several years. Meanwhile, it is suggested to periodically open the unit cleaning the brush contact surface with a very light sandpaper or using a paintbrush. Never use and liquids or oils to clean the contact surface or to improve the electrical contact.

K-FACTOR
THE VOLTAGE YOU NEED

OUTPUT METER OF SINGLE PHASE MODELS UP TO 50 A

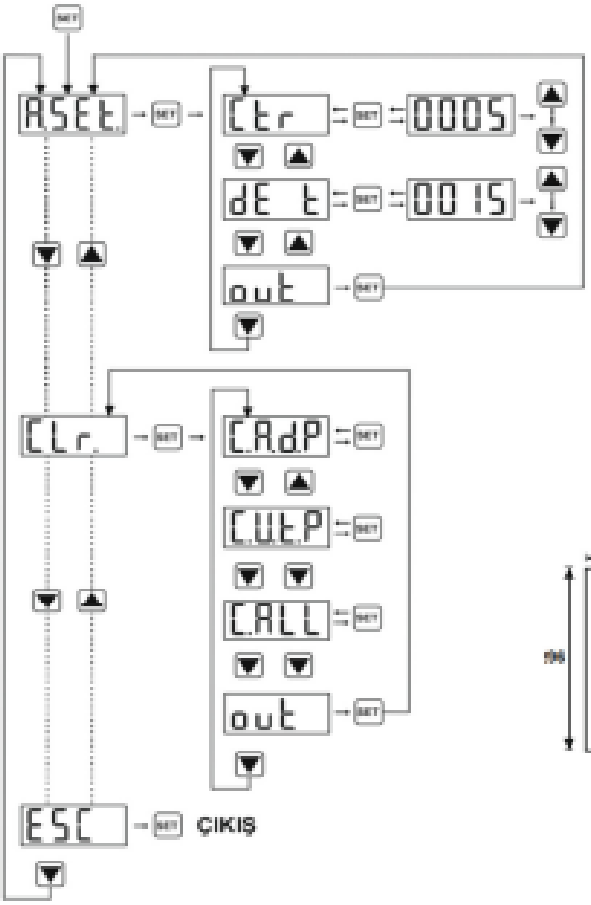
PVAM-01-72 / PVAM-01-96

DIGITAL VOLTAMMETER USER MANUAL

PRO VAR

General: They are devices produced to measure the value of the current (A.C.) passing through a system in RMS, to keep and display the demand and maximum demand values in memory, as well as to continuously display the voltage value of that line and to keep the max and min values in memory.

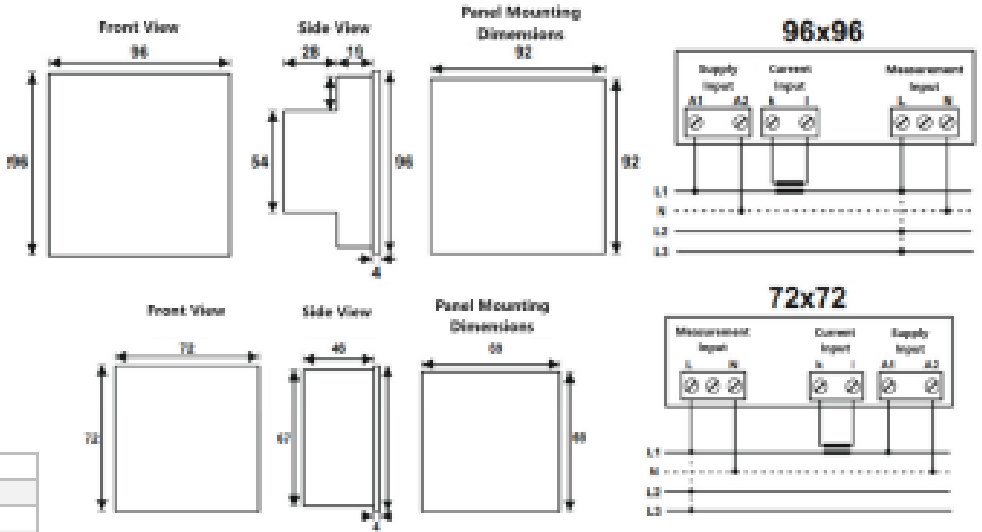
Operation: Make the connections of the device as specified in the connection diagram. The ammeter must be connected before the load to be measured in the system.



You can enter the setting menu by pressing the SET Key for 3 seconds.

'A.SEt' menu is the menu where Ammeter settings are made. It is entered by pressing the SET button.
'dE t' is the menu where the demand time period is set. The menu is entered by pressing the SET button. The desired time interval can be set between 1 - 60 minutes.
By selecting the **'out'** option, the Ammeter setting menu is exited. The **'A.SEt'** menu appears on the screen again. By pressing the DOWN key, you can access the **'Clr'** menu.
'Clr' is the menu where the stored values are deleted. You can enter this menu by pressing the SET button.
'CAdP' is the menu where ammeter demand and maximum demand values are reset. Deletion is confirmed when the SET key is pressed. If it is not confirmed for 5 seconds, it returns to the main screen.
'CutP' is the menu where Voltmere max and min value measurement records are deleted. Deletion is confirmed when the SET key is pressed. If it is not confirmed for 5 seconds, it returns to the main screen.
The setting menu is exited with the **'Esc'** option.

If you press the lower button on the main screen, demand information will appear on the screen for 5 seconds, and if you press the upper button, max demand information will appear on the screen for 5 seconds.



Operating Voltage	: 36 – 265 VAC / DC ±%10
Operating Range	: Un x (0,9 – 1,1)
Operating Frequency	: 45 – 65 Hz.
Power Consumption	: 3 – 6 VA
Current Measurement Range	: 5/5 – 10000/5 (except for 50,120,300)
Voltage Measurement Range	: 10–720 V AC
Measurement Accuracy	: ±%1
Protection Class	: IP 54 (Front Panel)
	: IP 20 (Box)
Device Protection Class	: Double insulation
Operating Temperature	: -5°C .....+ 50°C
Humidity	: Maximum %90
Operating Altitude	: <2000 m
Mounting Type	: Panel, Front
IK Code	: IK08
Dimensions	
PVAM-01-96	: 96x96x51 mm
PVAM-01-72	: 72x72x50 mm
Panel Mounting Dimensions	
PVAM-01-96	: 92x92 mm
PVAM-01-72	: 69x69 mm

WARNINGS AND PRECAUTIONS

The device is only suitable for indoor and panel type installation.

Before energizing the device, make sure that the mounting and wiring are done as shown in the connection diagram and in a way that does not cause contact problems. The device must be energized within the limit values in the technical specifications table. Otherwise, the device's supply protection circuit and voltage / current measurements may be disrupted.

Connections to the device should only be made by authorized persons. Make sure that all power is cut off before making the connection.

The warranty of the device is 2 (two) years. Never open the inside of the device. In case of malfunction, contact only through the dealer or directly to the factory technical service. Otherwise, the warranty of the device will be void.

Clean the device only with a dry cloth after turning off the power. Do not use solvents or alcohol-like substances.

⚠ SAFETY

Connect a switch or circuit breaker between the mains and device supply inputs.
This switch or circuit breaker should be in an easily accessible place close to the device.
It is stated that this switch or circuit breaker will be used to disconnect the device from the mains.
These conformities must be checked by technical personnel.

K-FACTOR
THE VOLTAGE YOU NEED

OUTPUT METER OF SINGLE PHASE MODELS OVER 50 A

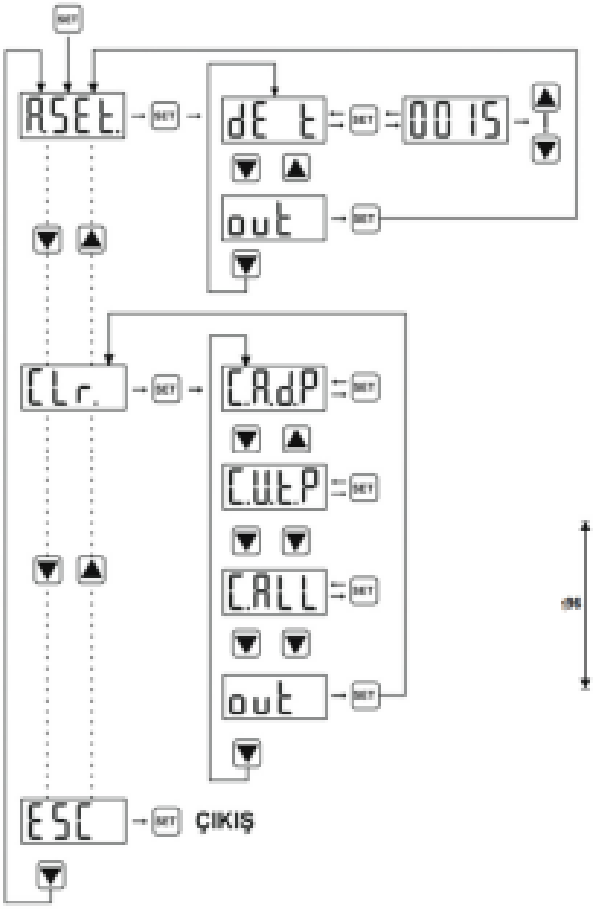
PVAM-01-72-50A / 120A / 300A
PVAM-01-96-50A / 120A / 300A

PRO VAR®

DIGITAL VOLTAMMETER USER MANUAL

General: They are devices produced to measure the value of the current (A.C.) passing through a system in RMS, to keep and display the demand and maximum demand values in memory, as well as to continuously display the voltage value of that line and to keep the max and min values in memory.

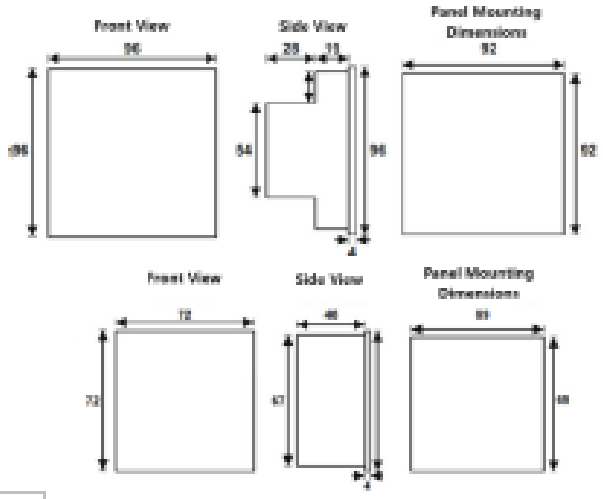
Operation: Make the connections of the device as specified in the connection diagram. The ammeter must be connected before the load to be measured in the system.

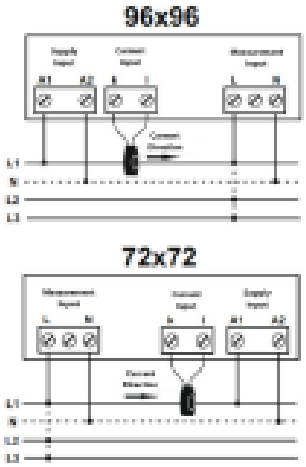


You can enter the setting menu by pressing the SET Key for 3 seconds.

'A.SEt' menu is the menu where Ammeter settings are made. It is entered by pressing the SET button
'dE t' is the menu where the demand time period is set. The menu is entered by pressing the SET button. The desired time interval can be set between 1 - 60 minutes.
By selecting the **'out'** option, the Ammeter setting menu is exited. The **'A.SEt'** menu appears on the screen again. By pressing the DOWN key, you can access the **'Clr'** menu.
'Clr' is the menu where the stored values are deleted. You can enter this menu by pressing the SET button.
'CAdP' is the menu where ammeter demand and maximum demand values are reset. Deletion is confirmed when the SET key is pressed. If it is not confirmed for 5 seconds, it returns to the main screen.
'CutP' is the menu where Voltmere max and min value measurement records are deleted. Deletion is confirmed when the SET key is pressed. If it is not confirmed for 5 seconds, it returns to the main screen.
The setting menu is exited with the **'Esc'** option.

If you press the lower button on the main screen, demand information will appear on the screen for 5 seconds, and if you press the upper button, max demand information will appear on the screen for 5 seconds.





Operating Voltage	: 36 – 265 VAC / DC ±%10
Operating Range	: Un x (0,9 – 1,1)
Operating Frequency	: 45 – 65 Hz.
Power Consumption	: 3 – 6 VA
PVAM-01-72/96-50	: 0 – 50A AC (PCT-50)
PVAM-01-72/96-120	: 0 – 120A AC (PCT-120)
PVAM-01-72/96-300	: 0 – 300A AC (PCT-300)
Voltage Measurement Range	: 10–720 V AC
Measurement Accuracy	: ±%1
Protection Class	: IP 54 (Front Panel)
	: IP 20 (Box)
Device Protection Class	: Double Insulation
Operating Temperature	: 5°C .....+50°C
Humidity	: Maximum %90
Operating Altitude	: <2000 m
Mounting Type	: Panel, Front
IK Code	: IK08
Dimensions	
PVAM-01-96	: 96x96x51 mm
PVAM-01-72	: 72x72x50 mm
Panel Mounting Dimensions	
PVAM-01-96	: 92x92 mm
PVAM-01-72	: 69x69 mm

WARNINGS AND PRECAUTIONS

The device is only suitable for indoor and panel type installation.

Before energizing the device, make sure that the mounting and wiring are done as shown in the connection diagram and in a way that does not cause contact problems. The device must be energized within the limit values in the technical specifications table. Otherwise, the device's supply protection circuit and voltage / current measurements may be disrupted.
Connections to the device should only be made by authorized persons. Make sure that all power is cut off before making the connection.

The warranty of the device is 2 (two) years. Never open the inside of the device. In case of malfunction, contact only through the dealer or directly to the factory technical service. Otherwise, the warranty of the device will be void.

Clean the device only with a dry cloth after turning off the power. Do not use solvents or alcohol-like substances.

⚠ SAFETY

Connect a switch or circuit breaker between the mains and device supply inputs.
This switch or circuit breaker should be in an easily accessible place close to the device.
It is stated that this switch or circuit breaker will be used to disconnect the device from the mains.
These conformities must be checked by technical personnel.

The precautions described above are for the safety of you and your business. The manufacturer cannot be held responsible for any undesirable situations that may occur if it is not implemented.

K-FACTOR
THE VOLTAGE YOU NEED

OUTPUT METER OF THREE PHASE MODELS

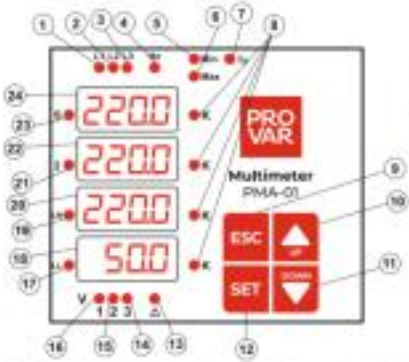
PMA-01

Digital Multimeter

User Manual

PRO VAR®

General Description: PMA Series Multimeters are microprocessor controlled devices designed and manufactured to measure current, voltage, frequency, apparent power, maximum and minimum voltage, current demand and current maximum demand values in 3-phase systems and to display the measured parameters on the screen.



1. This LED turns on when there is a voltage of 30 V or more on the L1 Line.
2. This LED lights up when there is a voltage of 30 V or more on the L2 Line.
3. This LED lights up when there is 30 V or more voltage on the L3 Line.
4. This LED lights up during frequency display.
5. This LED lights up during the minimum values display.
6. This led lights up during maximum values display.
7. This led lights up during current demand display.
8. If the value shown on the screens is in kilos, this LED lights up.
9. The ESC key is used to exit any menu without storing it or to return to the upper menu from the memorized menu.
10 – 11. Up and down arrow keys are used to monitor the measurements on the main screen, to increase and decrease while entering the value and to navigate the menu.
12. The SET button is used to enter the menu, save the digit while entering the value, move to the right digit and memorize the assigned values.
13. If the connection type is triangle (delta), this LED lights up.
14 – 15 – 16. Whichever voltage value is shown on the lowest screen, the LED of that phase lights up.
17. If the Phase-Phase voltage value is shown on the bottom screen, this led lights up.
18 – 20 – 22 – 24. These are the screens where the measured values and menu information are shown.
19. If the Phase-Neutral voltage value is shown on the lowest screen, this LED lights up.
21. If current information is shown on the screens, this LED lights up.
23. If Apparent power information is shown on the screens, this LED lights up.

Monitoring the measurements on the main screen:

When the device is energized for the first time, the current information of the three phases is shown on the main screen. On the lowest screen, the voltages are shown sequentially in 3-second periods. During voltage display, the led of that phase number is on, whichever phase value is displayed. Each time the down arrow key is pressed, the following values can be viewed on the screens: Phase-Neutral voltages and Frequency - Phase-Phase voltages - Minimum voltage values - Maximum voltage values - Current demand values - Current maximum demand values - Apparent power values.

Entering the menu and settings:

If the SET button is pressed for 2 seconds on the main screen, the user menu is entered. In this menu, the following settings can be made in order.

Current transformer ratio:

If the 'Ctr rate' SET button is pressed on the Current Transformer ratio setting screen, the setting menu is entered. The rate in use will appear on the lower display with the left leading digit flashing. The first digit of the desired value is entered by using the up and down arrow keys. By pressing the SET button, one moves to the right digit. After all values are entered, they are memorized with the SET button. The ESC key can be used to exit without making changes or to return to the upper or main menu. Current Transformer ratio can be entered between 1 and 2000 (5/5 and 10000/5).

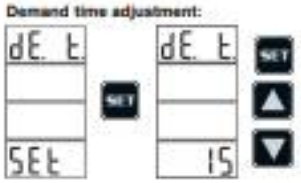
Example: If the current transformer ratio is desired to be entered as 800/5, the ratio should be set to 160.

Voltage transformer ratio

If the 'Utr rate' SET button is pressed on the Voltage Transformer ratio setting screen, the setting menu is entered. On the lower two displays, the rate in use will appear with the left leading digit flashing. The first digit of the desired value is entered by using the up and down arrow keys. By pressing the SET button, one moves to the right digit. After all values are entered, they are memorized with the SET button. The ESC key can be used to exit without making changes or to return to the upper or main menu.

Voltage Transformer ratio can be entered between 0.1 and 4000.0.

Demand time adjustment:

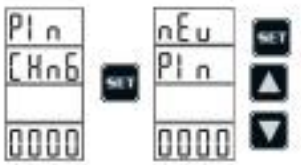


If the 'dE.t' SET button is pressed on the demand time setting screen, the setting menu is entered. On the lower display, the left first digit of the demand time value in use will flash. The first digit of the desired value is entered by using the up and down arrow keys. By pressing the SET button, one moves to the right digit. After all values are entered, they are memorized with the SET button. The ESC key can be used to exit without making changes or to return to the upper or main menu.

Demand time can be adjusted between 1 and 60 minutes.

Pin settings:

It is the menu where pin (password) settings can be made, pin protection can be made active or passive and the password can be changed. If the SET button is pressed while on the 'Pin SET' screen, the device will first ask for a password. The factory default password is '0000'. The password is entered using the up and down arrow keys. 'Pin ACt oFF' will appear on the screen. If pin protection is to be activated, 'Pin ACt on' is made using the up or down arrow keys and stored with the SET key.

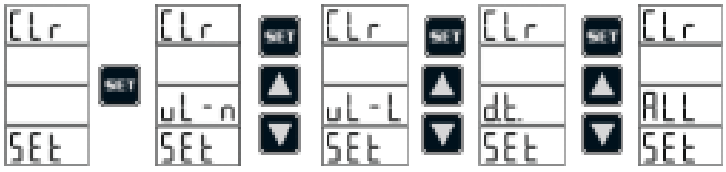


It is the pin (password) change menu. After entering the pin menu, the 'Pin CHnG' screen is reached with the up and down arrow keys and this menu is entered with the SET key. 'nEw Pin' will appear on the screen. The desired new pin is entered using the up and down arrow keys and memorized with the SET key. ESC key can be used to exit without setting or to return to the upper or main menu.

Connection settings menu:

It is the menu where the connection type is set. If the SET button is pressed while on the 'Connect Set' screen, this menu is entered. 'Connect Star' (star connection) will appear on the screen. One of the star or triangle (Connect dLtA) connection is selected by using the up and down arrow keys and the selection is memorized with the SET key. The ESC key can be used to exit without making a selection or to return to the upper or main menu.

Clear settings menu:



It is the menu where deletion settings are made. In this menu, there are submenus for deleting Phase-Neutral maximum and minimum values, deleting Phase-Phase maximum and minimum values, deleting demand values and deleting all values. If the SET button is pressed while on the 'CLr Set' screen, the delete menu is entered. The values to be deleted are displayed by using the up and down arrow keys, and if the SET key is pressed, that submenu is entered. 'No' and 'YES' options will appear on the screen. The selection is marked by using the up and down arrow keys and memorized with the SET key. In order to delete all values, the 'CLr ALL' submenu must be entered, the 'YES' option must be checked and SET must be set.

Factory reset menu:

This is the menu where all set values are deleted and the factory settings (Current transformer ratio, Voltage transformer ratio, demand time and connection type) are returned. If the SET button is pressed while on the 'dFLt Set' screen, the factory reset menu is entered. The device will ask for a pin at login. After entering the password as described above, 'dFLt no' and 'dFLt YES' options appear on the screen. If the factory settings are to be restored, the 'dFLt YES' screen is displayed by using the up and down arrow keys and the factory settings are reset with the SET key.

Operating Voltage	**: 45 – 265 VAC / DC ±%10**
Operating Range	**: Un x (0,9 – 1,1)**
Operating Frequency	**: 45 – 65 Hz.**
Power Consumption	**: 3 – 6 VA**
Measurement Input Power Cons.	**: < 0,5 VA**
Current Measurement Rang	**: 50 mAAC – 5,5 AAC**
Voltage Measurement Rang	**: 10 – 300 VAC (L-N)**
	: 20 – 520 VAC (L-L)
Current Transformer Ratio	**: 1 – 2000 (10000/5)**
Voltage Transformer Ratio	**: 1.0 – 4000.0**
Measurement Accuracy	
Voltage	**: %1**
Current	**: %1**
Frequency	**: %1**
Apparent Power	**: %2**
Protection Class	**: IP54 (Front Panel)**
	: IP20 (Body)
Device Protection Class	**: Double Insulation**
Operating Temperature	**: -25°C .....+70°C**
Humidity	**: Maximum %90**
Operating Altitude	**: <2000 m**
Panel Connection Type	**: Front**
Connection Type	**: 3P3W (Delta), 3P4W (Star)**
IK Code	**: IK08**
Supply Terminal Cable Cross Section	**: Max 2,5 mm²**
Voltage Terminal Cable Cross Section	**: Max 2,5 mm²**
Current Terminal Cable Cross Section	**: Max 2,5 mm²**
Weight	**: 238 gr**
Dimensions	**: 96 x 96 x 51 mm**
Panel Mounting Dimensions	**: 92 x 92 mm**

WARNINGS AND PRECAUTIONS

The device is only suitable for indoor and panel mounting.

Before energizing the device, make sure that the assembly and wiring is done as shown in the connection diagram and in a way that does not cause contact problems. The device must be energized between the limit values in the technical specifications table. Otherwise, the supply protection circuit of the device, voltage / current measurements may be broken.

Connections of the device should only be made by authorized persons. Make sure that all power is cut off before the connection is made.

The warranty of the device is 2 (two) years. Never open the inside of the device. In case of malfunction, please contact the factory technical service only through the dealer or directly. Otherwise, the warranty of the device will be void.

Clean the device only with a dry cloth after turning off the power. Do not use solvents or alcohol-like substances.

SAFETY

Connect a switch or circuit breaker between the mains and device supply inputs.

This switch or circuit breaker should be in an easily accessible place close to the device.

It is stated that this switch or circuit breaker will be used to disconnect the device from the mains.

These conformities should be checked by technical personnel.

The precautions described above are for the safety of you and your business. The manufacturer cannot be held responsible for undesirable situations that may occur if it is not applied.

Technical Data Label Explanations:

A1 – A2..... Supply Voltage Input

N:..... Neutral Input

L 1:..... Line 1 Voltage Input

L 2:..... Line 2 Voltage Input

L 3:..... Line 3 Voltage Input

⧈ ..... Double Insulation

Un:..... Supply Voltage Range

Fr:..... Supply Frequency Range

k 1:..... Line 1 Current Input

I 1:..... Line 1 Current Output

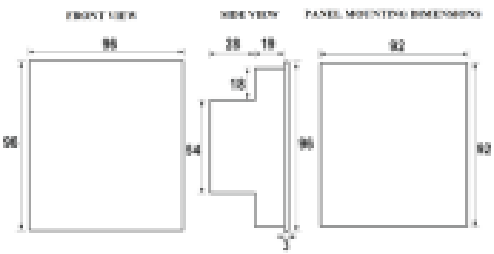
k 2:..... Line 2 Current Input

I 2:..... Line 2 Current Output

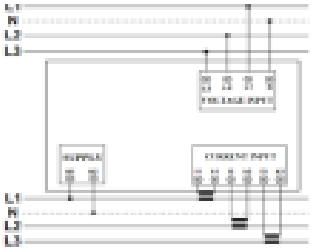
k 3:..... Line 3 Current Input

I 3:..... Line 3 Current Output

DEVICE AND PANEL MOUNTING DIMENSIONS



CONNECTION DIAGRAM



Factory set values:

Current Transformer Ratio.....0001

Voltage Transformer Ratio.....0001.0

Connection Type.....Star

User PIN 0000

Demand Time.....15 min

CONDIZIONI GENERALI DI GARANZIA SUI PRODOTTI

L'apparecchio come ogni suo componente è stato sottoposto ad accurati collaudi ed è garantito per un periodo di 12 mesi dalla data di acquisto o non oltre 13 mesi dalla data di spedizione. Per data di acquisto si intende quella indicata sulla fattura o ricevuta fiscale rilasciata dal venditore. Per garanzia si intende la sostituzione o riparazione gratuita dei componenti riconosciuti dalla ditta produttrice inefficienti o difettosi di fabbricazione. Per l'intervento in garanzia, l'apparecchio deve essere consegnato o inviato franco di porto al servizio di assistenza più vicino, allegando lettera con dati apparecchiatura descritti nel paragrafo precedente. Il trasporto avverrà a rischio e pericolo dell'acquirente. L'apparecchio riparato in garanzia verrà restituito all'acquirente appena possibile e a sue spese e rischio. Sono escluse dalla garanzia le rotture accidentali, distruzioni o folgorazioni da eventi naturali, i danni provocati da incuria, uso ed installazione errati, impropri o non conformi alle avvertenze riportate. La garanzia decade qualora l'apparecchio sia stato manomesso o riparato da personale non autorizzato o abbia subito interventi per vizi o verifiche di comodo. E' esclusa la sostituzione dell'apparecchio o il prolungamento della garanzia in caso di intervento. E' escluso altresì il risarcimento di danni diretti o indiretti di qualsiasi natura a persone, cose o animali per l'uso e la sospensione d'uso dell'apparecchio.

MODALITA' GARANZIA ON CENTER

La durata della garanzia è 12 mesi dalla data della fattura. In ottemperanza alle normative europee è previsto lo scambio parti. I costi di riparazione sono inclusi. La macchina o parte danneggiata, qualora il cliente riesca ad inviare la sola parte e sia possibile per essa la riparazione senza pregiudicare il funzionamento complessivo della macchina, deve essere spedita a K-factor srl previo accordo con il Supporto Tecnico (service@kfactor.it). Al ricevimento della stessa verrà inviata al Cliente, con i tempi dovuti alla disponibilità della parte presso il magazzino, la macchina o parte riparata o sostituita secondo le modalità indicate di seguito.

La Garanzia decade se il cliente esegue operazioni diverse da quanto indicato sul manuale d'uso.

La Garanzia decade in seguito a problemi o danneggiamenti derivanti da un uso non corretto del prodotto, da imperizia o scarsa conoscenza delle procedure e delle metodologie di utilizzo.

ASSISTENZA BASE (disponibile su tutte le macchine)

In caso di problemi va inviata una mail a service@kfactor.it descrivendo il problema stesso. Il Supporto Tecnico risponderà nel più breve tempo possibile.

In caso il Cliente identifichi una parte guasta ed il Supporto Tecnico autorizzi l'invio, può smontare e spedire la parte a K-factor srl.

Nel caso il cliente preferisca che il guasto sia gestito da K-factor srl ed il Supporto Tecnico abbia autorizzato l'invio, può spedire a K-factor srl la macchina nell'imballo originale con la relativa dotazione. In ogni caso le spese di spedizione verso e da K-FACTOR SRL sono entrambe a carico del Cliente.

SERVICE PACK (in opzione)

Il Service Pack è un'opzione a pagamento che va richiesta al momento dell'acquisto e dà diritto ad una serie di opportunità rispetto all'Assistenza Base.

In caso di problemi il Cliente può telefonare a K-FACTOR SRL chiedendo del Supporto Tecnico e descrivendo il problema stesso.

In caso il Cliente identifichi una parte guasta ed il Supporto Tecnico autorizzi l'invio, può smontare e spedire la parte a K-FACTOR SRL.

Nel caso il cliente preferisca che il guasto sia gestito da k-factor srl ed il Supporto Tecnico abbia autorizzato l'invio, può spedire a k-factor srl la macchina nell'imballo originale con la relativa dotazione.

In ogni caso le spese di spedizione verso e da K-factor srl sono entrambe a carico di k-factor srl.

GUARANTEE

This guarantee is offered as an extra benefit and does not affect your legal rights.

All the voltage stabilisers and line conditioners are guaranteed by the Company for one year against faulty material or workmanship. If any part is found to be defective in this way within the first twelve months from the purchase date, we or our authorised service agents, we will replace or at our option repair that part without any charge for materials or labour, provided that the appliance has been used only in accordance with the instruction provided with each stabiliser and that it has not been connected to an unsuitable electricity supply, or subjected to misuse, neglect or damage or modified or repaired by any person not authorised by us.

The correct electricity supply voltage and frequency is shown on the rating plate on the appliance. This guarantee is normally available only to the original purchaser of the appliance, but the company will consider written applications for transfer.

Should any defect arise in any voltage stabilisers or line conditioners a claim under guarantee become necessary, the appliance should be carefully packed and returned to your local service agent. This copy of the guarantee should be attached to the appliance. Guarantee is applied only if the equipment is returned F.O.T. our factory. No technical intervention may be claimed for any reason at the place of installation under guarantee.

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