Schweizerische Eidgenossenschaft
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Swiss Federal department of the Environment,
Transport, Energy and Communications (DETEC)

Swiss Federal Office of Energy (SFOE)

ENERGY MEASUREMENT OF SINGLE-PHASE UPS DEVICES

28 NOVEMBER 2007

Laboratory:

S.A.L.T. Laboratory, Ringstrasse, 7000 Chur, Switzerland (www.salt.ch)

Measurements carried out by:

Bush Energie GmbH, Rebweg 4, 7012 Felsberg, Switzerland (www.bush-energie.ch)

and

University of Applied Sciences HTW Chur, Ringstrasse, 7000 Chur

(www.fh-htwchur.ch

Authors

Eric Bush, eric.bush@bush-energie.ch

Max Schalcher, max.schalcher@fh-htwchur.ch

Thomas Bruggmann, thomas.bruggmann@fh-htwchur.ch

Peter Kühne, peter.kuehne@fh-htwchur.ch

Stefan Kammermann, stefan.kammermann@fh-htwchur.ch

Date of publication (German version): 23 November 2007

Prepared on behalf of the Swiss Federal Office of Energy (SFOE), “Electricity” research programme

Mühlestrasse 4, CH-3063 Ittigen

Postal address: CH-3003 Bern

Phone +41 31 322 56 11 / Fax +41 31 323 25 00

www.bfe.admin.ch

SFOE project supervisor: Roland Brüniger, roland.brueniger@R-BRUENIGER-AG.CH

SFOE sector head: Felix Frey, felix.frey@bfe.admin.ch

SFOE TP no.: 6940

SFOE account no.: 55300900

SFOE project no.: 101928

SFOE contract no.: 152378

Copies available from: www.energieforschung.ch / www.electricity-research.ch

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1. Zusammenfassung

Im vorliegenden Messprojekt konnten 46 einphasige USV-Geräte im Leistungsbereich von 350VA bis 3000VA in Bezug auf den Wirkungsgrad und den Energieverbrauch ausgemessen werden.

Die Klassifizierung in VFD-, VI- und VFI-Geräte sowie die Durchführung der Messungen wurde nach IEC 62040-3 mit ohmscher und nichtlinearer Last vorgenommen.

Wie erwartet weisen die VFD-Geräte den besten Wirkungsgrad auf, gefolgt von den VI- und den VFI-Geräten.

Die Wirkungsgrade bei 50%, 75% und 100% der Nennbelastung unterscheiden sich nur wenig und liegen mehrheitlich über 90%. Dagegen fällt der Wirkungsgrad deutlich ab bei einer Belastung von 25% (zum Teil unter 80%).

Bei den Standby-Verlusten (eingeschaltet, ohne Last) gibt es grosse Unterschiede, die sich nur zum Teil durch die unterschiedliche Technologie der verschiedenen USV-Geräteklassen erklären lassen.

Im Vergleich zum Code of Conduct für USV-Geräte mit einer Leistung grösser 10kVA schneiden die leistungsmässig kleinen Geräte relativ gut ab, vor allem dank geringem Aufwand für die Kühlung.

2. Abstract

In this project, 46 single-phase UPS devices in the power range from 350 VA up to 3000 VA could be measured with regard to efficiency and energy consumption.

The classification into VFD, VI and VFI devices and the performance of the measurements were carried out in accordance with IEC 62040-3 with resistive and non-linear loads.

As expected, the VFD devices showed the best efficiency level, followed by VI and VFI devices.

The efficiency rate at 50%, 75% and 100% of the nominal power differs only slightly, and in most cases exceeds 90%. However, at a load of 25% the efficiency decreases considerably (in individual cases to below 80%).

There are large differences in the area of standby losses (switched on, without load) which can only partly be explained by the different technologies of the various types of UPS devices.

Compared to the Code of Conduct for UPS devices with a power of more than 10 kVA, the devices with lower power compare relatively well, especially because of the small power demands for cooling.

3. Résumé

L'objet du présent projet était de mesurer le rendement et la consommation énergétique de 46 onduleurs monophasiques ASI (système d'alimentation sans interruption), répartis dans une gamme de puissance allant de 350 VA à 3000 VA.

Le classement en appareils DVF (dépendants des voltages et fréquences), IV (indépendants des voltages) et IVF (indépendants des voltages et fréquences), ainsi que la réalisation des mesures ont été effectués d'après le standard IEC 62040-3 avec charges ohmiques et charges non linéaire.

Comme prévu, les appareils IVF présentent le meilleur rendement, suivi par les appareils IV et IVF.

Le degré d'efficacité à 50%, 75% et 100% de la charge nominale ne diffère que peu et se situe en majorité au dessus de 90%. En revanche, une charge de 25% provoque une nette diminution de l'efficacité (dans certains cas en-dessous de 80%).

Les mesures de déperditions en mode stand-by (branché, sans charge) laissent apparaître de grandes différences. La variété des technologies employées par les systèmes ASI n'expliquent que partiellement ce phénomène.

Comparés au Code of Conduct concernant les onduleurs ASI d'une puissance supérieure à 10 kVA, les appareils de moindre puissance affichent des résultats relativement bons, surtout grâce à leur moindre demande en refroidissement.

4. Abbreviations used in this document

Abbreviation	In full	Comments
UPS	**U**ninterruptible **p**ower **s**upply	
VFI	**V**oltage **f**requency **i**ndependent	
VI	**V**oltage **i**ndependent	
VFD	**V**oltage **f**requency **d**ependent	
AVR	**A**utomatic **v**oltage **r**egulator	Regulates the output voltage of a UPS device

5. Background and objectives

UPS (uninterruptible power supply) devices are used for increasing the availability of IT, communications, medical and other equipment. They are primarily used as a means of protecting equipment against problems relating to the power supply, including brown-outs and power cuts, and for reducing harmonic distortion. Detailed knowledge of the requirements and quality of the equipment and power supply forms the basis for the optimised and economical use of UPS devices (cf. Fact sheet on the optimised use of UPS devices, SFOE 2005).

The SFOE has been campaigning for a number of years now for the definition of principles for implementing a voluntary European agreement (Code of Conduct for UPS devices in the power range above 10 kVA).

For UPS devices in the power range below 10 kVA the idea is to develop a corresponding label in cooperation with the EU. For this purpose, an overview of the consumption levels of devices currently available on the market is an essential requirement.

The aim of this project was to carry out around 40 measurements on typical UPS devices. For this purpose the consumption characteristics of the most important devices (single-phase, up to 6 kVA) in terms of quantity were measured and evaluated in the most important operating modes. The objective here was to present as reliable and comprehensive a picture as possible of the energy consumption of single-phase UPS devices.

6. Principles

6.1 UPS devices

Due to the constant increase in the number of PCs and servers in networks, the ever increasing demands placed on availability on the one hand and the resulting higher risk of power cuts and disturbances in the liberalised electricity market on the other hand, ever more importance is being attached to protecting the power supply for such equipment.

UPS devices are a suitable solution for protecting the supply of electricity to critical equipment for a limited period of time.

In accordance with EN-50091-1, a UPS device is a power supply unit with energy storage that protects the supply of the required load without interruption in the event of a power failure.

A UPS device is switched between the power supply and the equipment to be protected. Its core component is its batteries, which maintain the supply of electricity to the connected equipment for a certain amount of time if the mains supply should be interrupted.

Different types of UPS devices are available to suit the many differing demands and protection requirements. UPS devices can basically be classified into three categories.

Classification of UPS devices:
The categories described below are based on IEC Standard 62040-3, which defines UPS devices on the basis of their characteristics. This standard is strongly oriented on the output voltage, since securing its constancy and quality is the most important criterion a UPS device has to meet.

There are three classification levels:

Level 1: Degree of dependence of the UPS output on the mains supply in normal operating mode

Level 2: The form of the voltage curve of the UPS output

Level 3: Dynamic tolerance curves of the UPS output

Level 1: Dependence of UPS output on mains supply

Table 1: Code level 1

Previous designation	Designation according to IEC 62040-3 **Code**	Explanation
Offline Ready mode Stand-by mode Passive on-line mode	**VFD** “Voltage and frequency dependent”	Output voltage is dependent on fluctuations in supply voltage and supply frequency if no components such as transformers, EMV filters or varistors are installed for improvement purposes.
Mains interactive Line interactive Single conversion Active on-line mode	**VI** “Voltage independent”	Output voltage is dependent on supply frequency and is processed via active or passive regulators within certain thresholds.
Online Double conversion Uninterrupted conversion	**VFI** “Voltage and frequency independent“	Output voltage is independent of all fluctuations in supply and frequency, and in accordance with the relevant IEC Standard it is regulated electronically.

Operating principles of offline (VFD) UPS devices
In normal operating mode, offline UPS devices transfer the current directly from the input to the output. They only provide protection in the event of a power failure. They are able to block certain (high-frequency) disturbances, depending on the input filter. The connected equipment must be able to tol-

erate a switching time of several milliseconds. As load, the most suitable devices are those equipped with power supply units with primary clock pulses (e.g. PCs).

If the supply voltage is within the permissible tolerance, it is transferred to the output via the change-over switch, and the batteries are thus charged. In the event of a disturbance in the power supply, the control unit switches to battery operation. The current inverter is activated and its output voltage is supplied to the UPS output with the aid of the change-over switch. At the same time the mains supply is cut off.

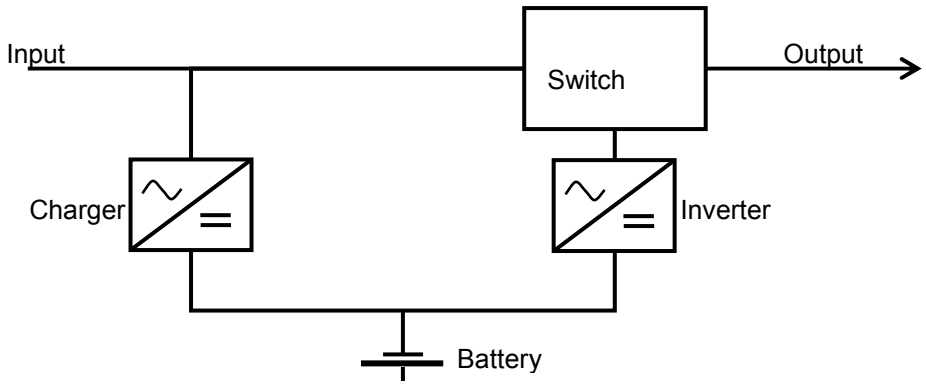


Fig. 1: Offline UPS device (VFD)

With offline UPS devices the output voltage is the same as the input voltage. All disturbances and fluctuations on the input side are passed on to the equipment. And the output frequency is the same as the input frequency. Frequency fluctuations are not adjusted. Switching times are relatively lengthy (several milliseconds). During battery operation the voltage curve is usually stepped. There are no switching times when changing from battery to mains operation.

Operating principles of mains interactive (VI) UPS devices
Mains interactive UPS devices function in a similar way to offline devices. Voltage fluctuations are adjusted on a step-by-step basis.

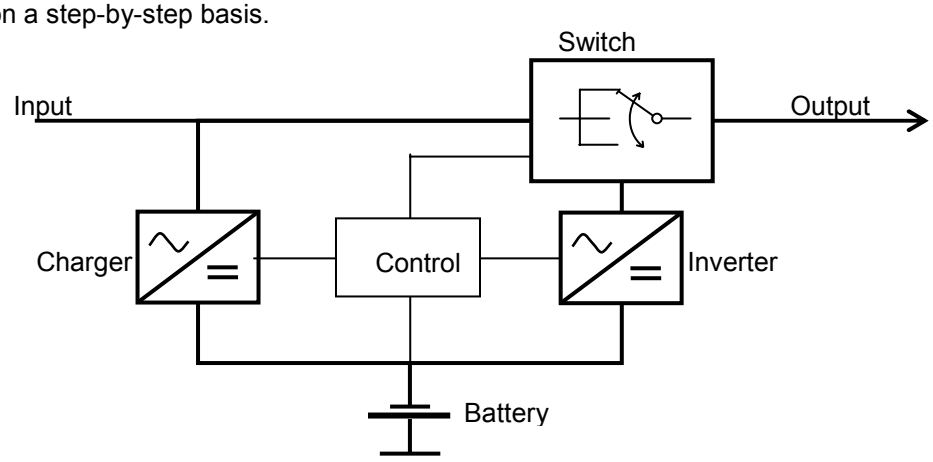


Fig. 2: Mains interactive UPS device (VI)

Trapezoid or sinusoid curves are available as forms of output curve. Voltage regulation is carried out step by step. The output frequency is the same as the input frequency and frequency fluctuations are not adjusted. In the same way as with offline UPS devices, switching times are approx. 2 to 4 milliseconds. There are no switching times when changing from battery to mains operation.

Operating principles of online UPS devices (VFI)
As genuine uninterrupted converters in accordance with EN 50091-1, online UPS devices are equipped with dual power converters. A rectifier at the input (AC/DC converter) converts alternating

current into direct current. With direct current, the battery is charged and the energy is provided that is subsequently required for the inverter. The inverter (DC/AC converter) converts the direct current into alternating current. Since the output voltage is obtained solely from the output of the inverter, this permits operation that is free of disturbances and is independent of the quality of the main supply (no switching in the event of a disturbance).

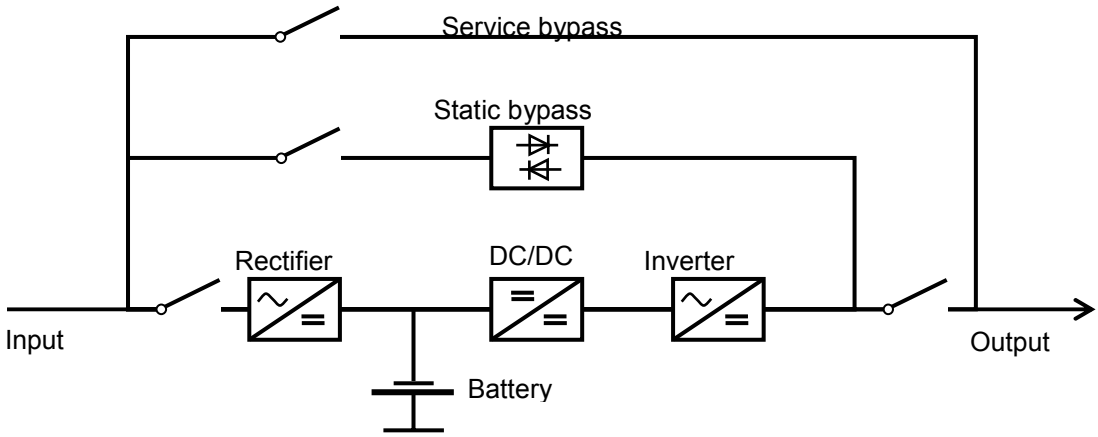


Fig. 3: Online UPS device (VFI)

Input and output are galvanically separated. In the event of an overload or defective inverter the static bypass automatically switches the connected equipment to the mains. Automatic return switching only takes place if the load has been reduced accordingly or the inrush current has dropped. All connected equipment can continue to be supplied with power, without interruption, via a service bypass while the UPS device is disconnected from the mains for maintenance purposes. Output voltage and output frequency are independent of disturbances on the input side. There are no switching times when changing from mains to battery operation.

Level 2: Voltage curve form of the UPS output
Level 2 classifies the curve form of the output voltage relatively roughly, in each case in both operating modes (mains and battery operation).

Table 2 Code level 2

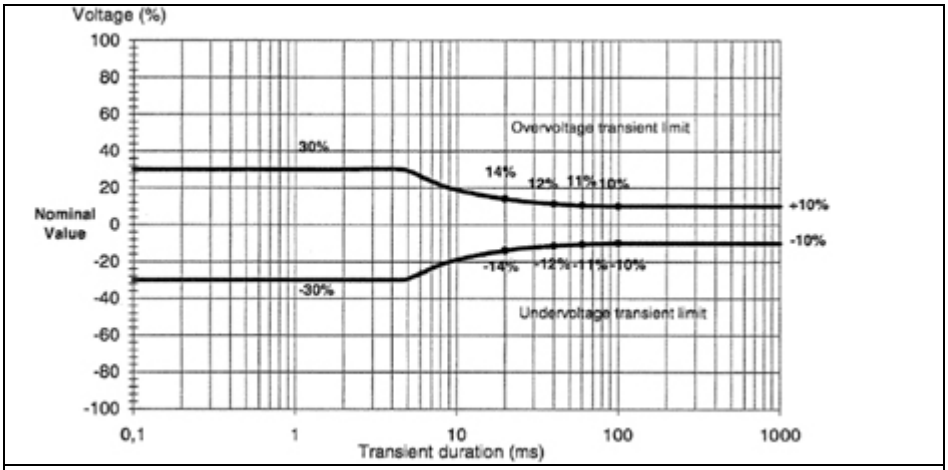
Code		Comments
Mains operation	Battery operation	
S	S	**Sinusoid**: distortion factor D < 0.08 (IEC 61000-2-2) at all linear and non-linear reference loads
X	X	**Non-sinusoid**: D > 0.08 at non-linear reference load (trapezoid form)
Y	Y	**Non-sinusoid**: also exceeds the thresholds of IEC 61000-2-2 (incremental)

Especially with VFD or VI UPS devices in the low power range (< 1000 VA) the voltage curve form in battery operation can be rectangular or trapezoid, i.e. it deviates significantly from the sinusoid form. This is not suitable for all equipment.

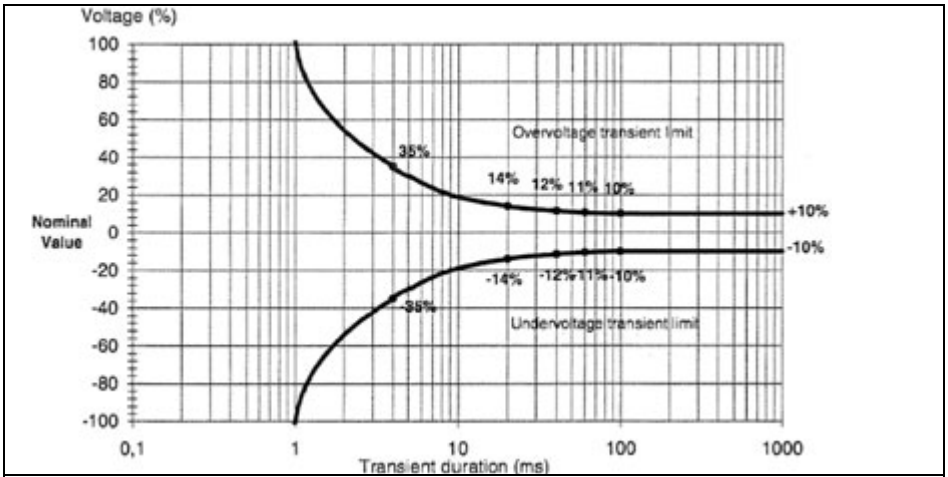
Level 3: Dynamic tolerance curves of the UPS output

Critical applications always require a strictly sinusoid voltage. The highest requirements in terms of quality of output voltage are specified through the definition of the maximum permissible dynamic deviations from sinusoid voltage.

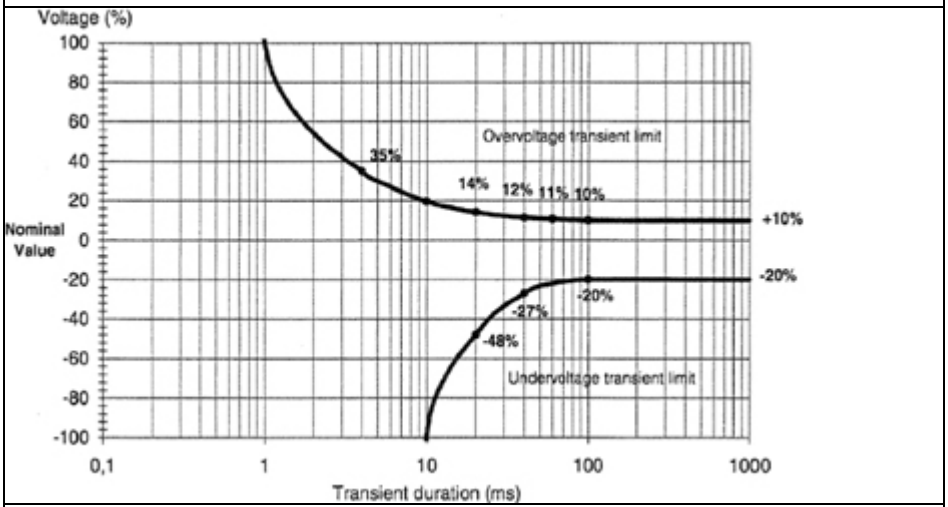
A distinction is made between 3 tolerance categories with the respective tolerance curves:



Class 1



Class 2



Class 3

The code for output tolerance curves comprises three digits that correspond to three different typical dynamic cases in operation:

1st digit: Tolerance with change of operating mode, e.g. mains, battery, bypass operation

2nd digit: Tolerance with load increases with linear load in mains and battery operation

3rd digit: Tolerance with load increases with non-linear load in mains and battery operation

Full classification code:
The full UPS device classification code is thus as follows:

Dependence on output from mains	Distortion of output curve form	Tolerance of output voltage
VFI	SS	111
VI	SX	122
VFD	XY	333

Table 3: Classification code

This three-part code represents a useful and detailed description of the characteristics of a UPS device.

6.2 PROCUREMENT OF DEVICES

A variety of manufacturers and distributors of UPS devices in Switzerland were contacted for the purpose of obtaining models for carrying out measurements. In most cases this concerned representatives of the industry that were also contacted directly by the Swiss Federal Office of Energy (SFOE), and a number of other potential suppliers were also contacted.

Company	**Contact**	**Product**
ALMAT AG	B. Kessler	ALMAT
ATC Frech & Cie	V. Garapic	AROS
APC Switzerland / Gutor Electronic GmbH	J. Ruders	American Power Corporation
GE Consumer & Industrial SA	G. Andrighetti	General Electric
MGE UPS Systems	L. Racciatti	MGE
Rotronic AG	M. Werner	APC,
Service Net AG	P. Niggli / I. Gentsch	Ally, Megaline, NeWave, ..
Sicon Socomec AG	O. Saladin / Kaufmann	Modulys
NeWave SA	R. Molteni	NeWave
Online	P. Jaberg	Online-USV

Most of the representatives who were contacted showed a great deal of interest in the project and were happy to supply us with UPS devices for measurement purposes. The project team wishes to express its sincerest thanks to the above companies and persons for their kind co-operation.

7. Measurements

7.1 METHODOLOGY

Registration of devices:
The devices on which tests were to be carried out were registered and classified by type (VFI, VI, VFD) in accordance with IEC 62040-3. In each case the standard battery set was used.

Preparations:
Each device was connected to the power supply (230 V / 50 Hz) in “power on” mode for a period of more than 12 hours. The aim here was to ensure that the batteries were fully charged, which is a prerequisite for accurate power measurement.

Performance of measurements:
The power measurements were carried out in stand-by and normal operation. In the case of 11 devices equipped with manual bypass mode, the consumption levels at 50% and 100% were recorded.

One measuring device was used for the power requirement and one for the power output. A level was obtained from the mathematical average of three consecutive measurements. Then the measuring devices were exchanged and the process was repeated. The result is then the mathematical average of the two previously obtained readings.

An electronically stabilised 4 kVA alternating current source was used in order to provide a constant input voltage.

In accordance with IEC Standard 62040-3, Appendix E, the load was initially prepared for measurement of the non-linear load with a separate measuring device. After checking the 230 V / 50 Hz mains supply, the load was then switched to the output of the device to be tested.

The load in normal operating mode was raised in four stages from 25 percent to 100 percent of the nominal apparent power (SN). For control purposes the maximum load of each device was also determined. As a rule, this is slightly higher than the maximum load (SN) indicated in the specifications.

In the active power range with the same four stages (25% to 100%), the load was adjusted directly.

The following arrangement was used for carrying out the measurements (depicted in diagram form):

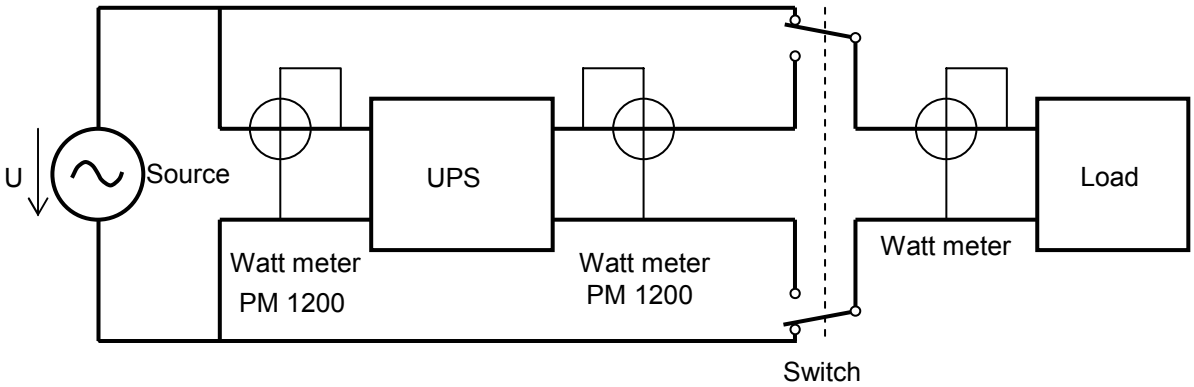


Fig. 4 Measurement structure

Source:	Stabilised 230 V / 50 Hz mains supply, Pacific Smart Source 140-ASX
Watt meter:	PM 1200 manufactured by Voltech
UPS:	Tested UPS device
Switch:	For adjusting load (25%, 50%, 75%, 100%)
Load:	Resistive or non-linear load as per IEC 62040-3

7.2 OPERATING MODES

Standby
Standby refers to the operating mode without load. Most UPS devices also consume power in “power-off” mode (= UPS device is switched off). In this mode only the accumulator is supported, while all LEDs, interfaces and displays are switched off.

If the UPS device is switched on, the power requirement increases for regulation and the various displays and LEDs.

Normal mode
In normal mode the UPS device operates with a load. Losses from the device arise in the power electronics, regulation, ventilation and displays.

Bypass mode
In bypass mode the UPS device is bypassed, i.e. input and output are directly connected to one another. This status occurs if, for example, there is a fault in the UPS device or if it needs to be serviced (e.g. change of batteries, switching to another UPS device).

Measurement of power requirement
The power requirements were measured at the input and output of each UPS device using two PM1200 devices manufactured by Voltech. These devices permit the measurement of active, idle and apparent power ratings and the power factor from a current and voltage measurement up to a maximum frequency of 100 kHz. The error factor for the readings is less than 1 percent.

The measured levels (current, voltage, active power) can be recorded simultaneously with the aid of a hold function. The data can then be read and entered into the corresponding table.

7.3 CALCULATION OF EFFICIENCY

EN 62040-3, paragraph 3.3.19 stipulates that the performance of a UPS device is calculated as follows:

Ratio of active output to active input power under specified operating conditions, without an exchange of energy with the accumulator.

Equation: $$\eta = \frac{P_{Ausgang}}{P_{Eingang}}$$

7.4 MEASUREMENT RESULTS

The following diagrams depict the evaluations of the measurement results in the form of graphs.

The corresponding tables and measurement data, together with all additional evaluations, are presented in the appendix.

a) VI UPS devices

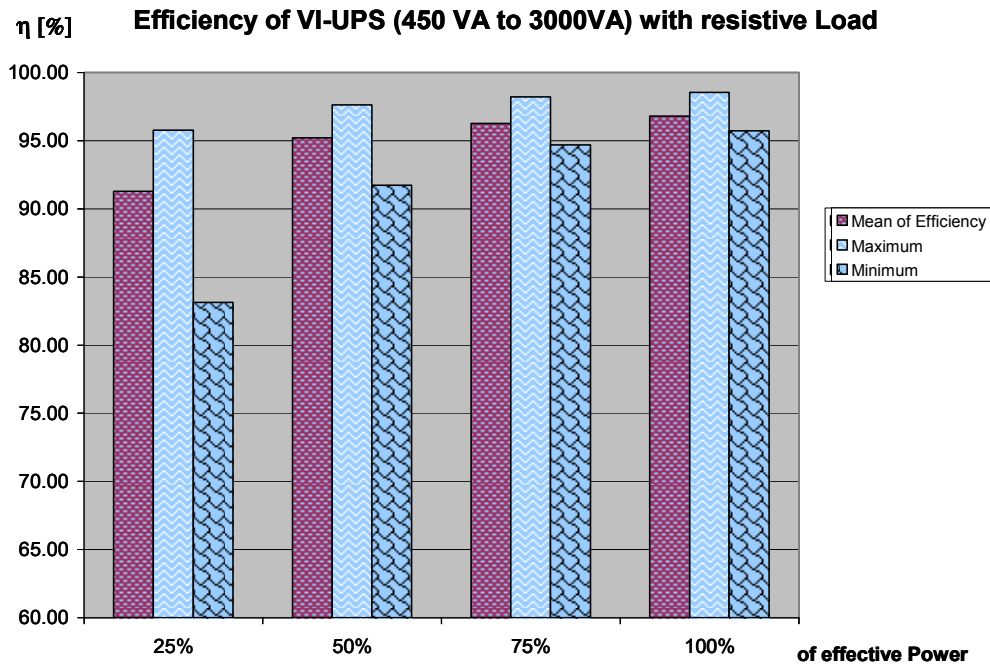


Fig. 5 Efficiency of VI UPS devices with resistive load in the 450 VA to 3000 VA range

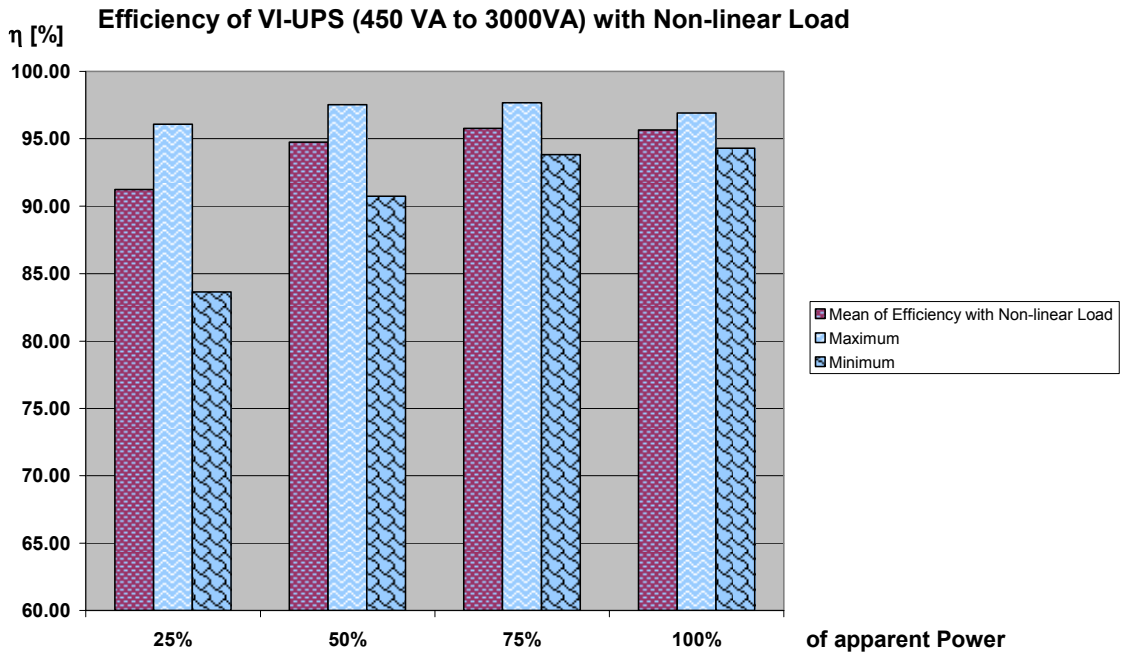


Fig. 6 Efficiency of VI UPS devices with non-linear load in the 450 VS to 3000 VA range

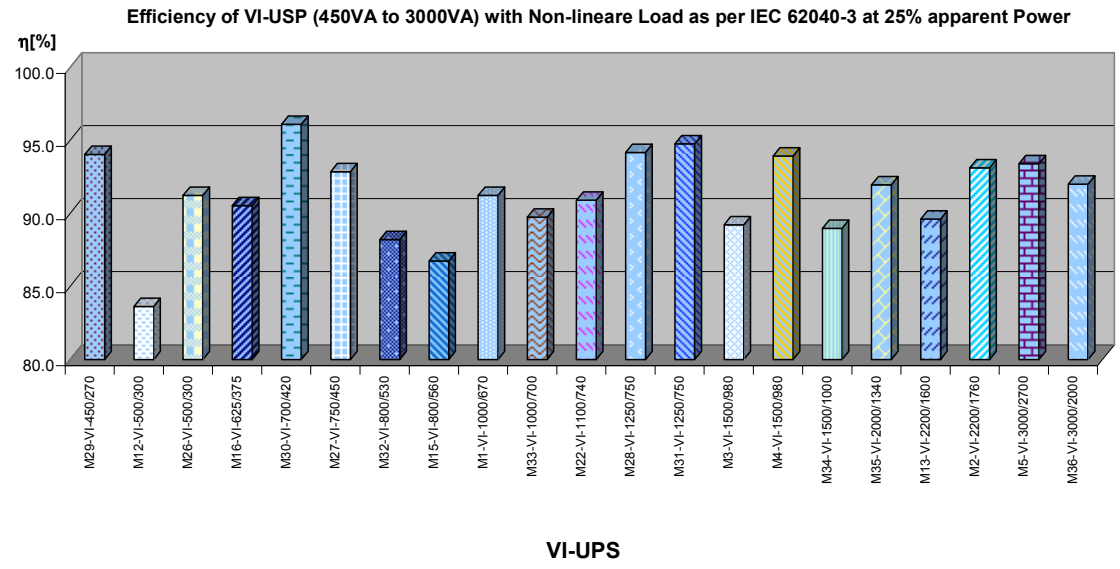


Fig. 7 Efficiency of VI UPS devices at 25% non-linear load

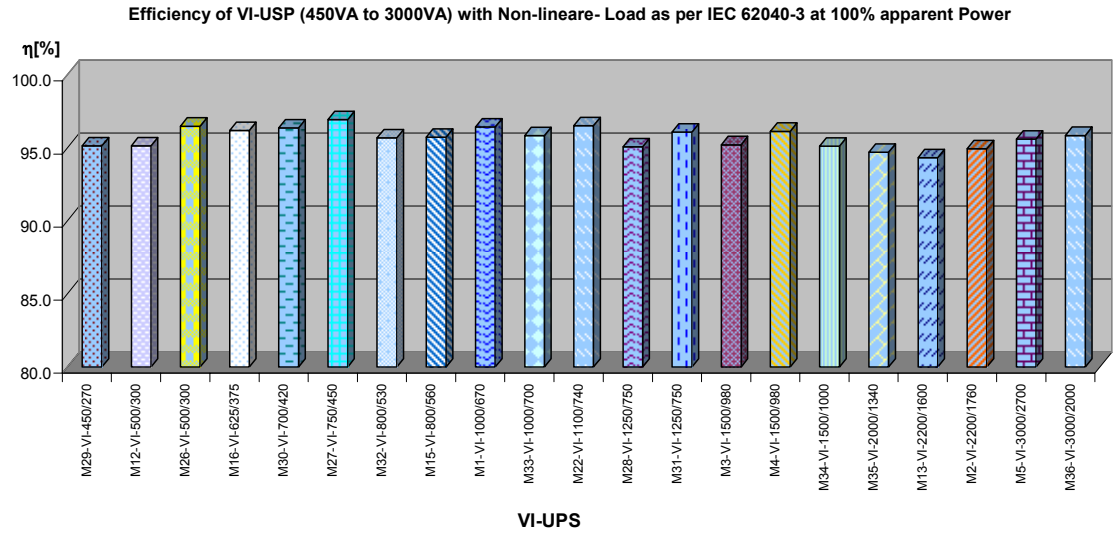


Fig. 8 Efficiency of VI UPS devices at 100% non-linear load

b) VFI devices

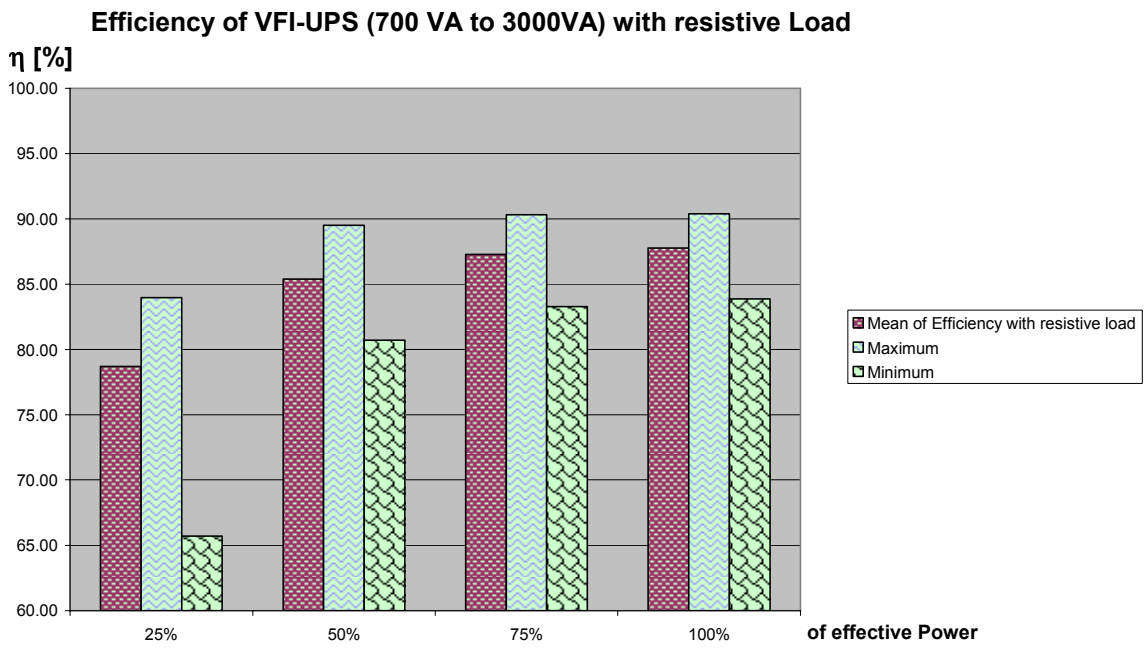


Fig. 9 Efficiency of VFI UPS devices with resistive load in the 480 W to 2400 W range

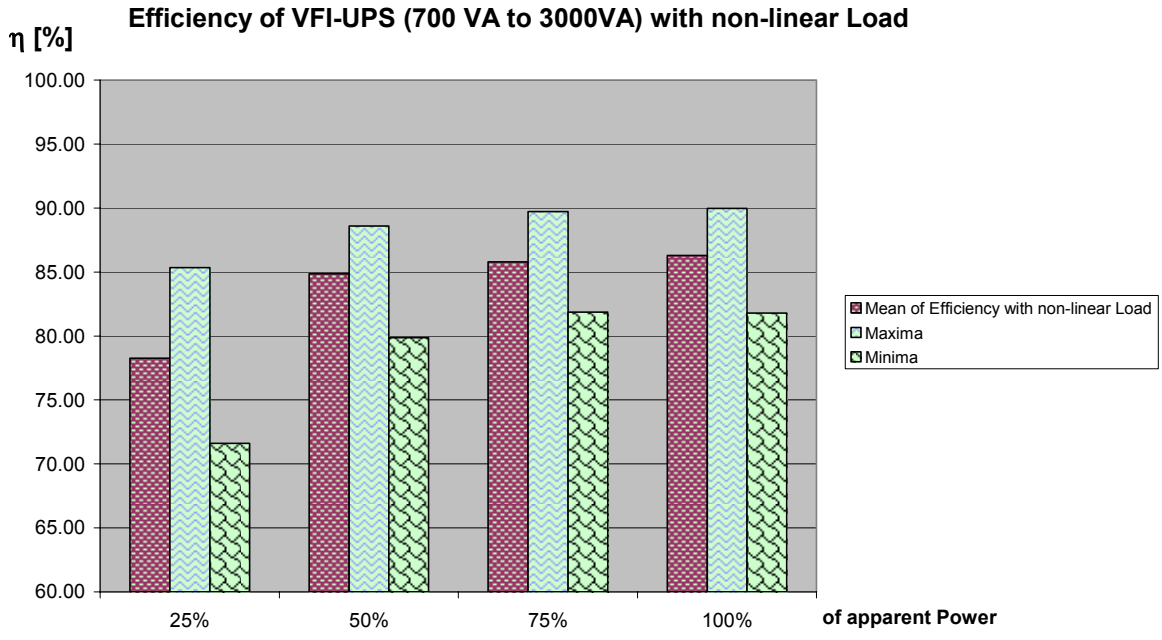


Fig. 10 Efficiency of VFI UPS devices with non-linear load in the 700 VA to 3 kVA range

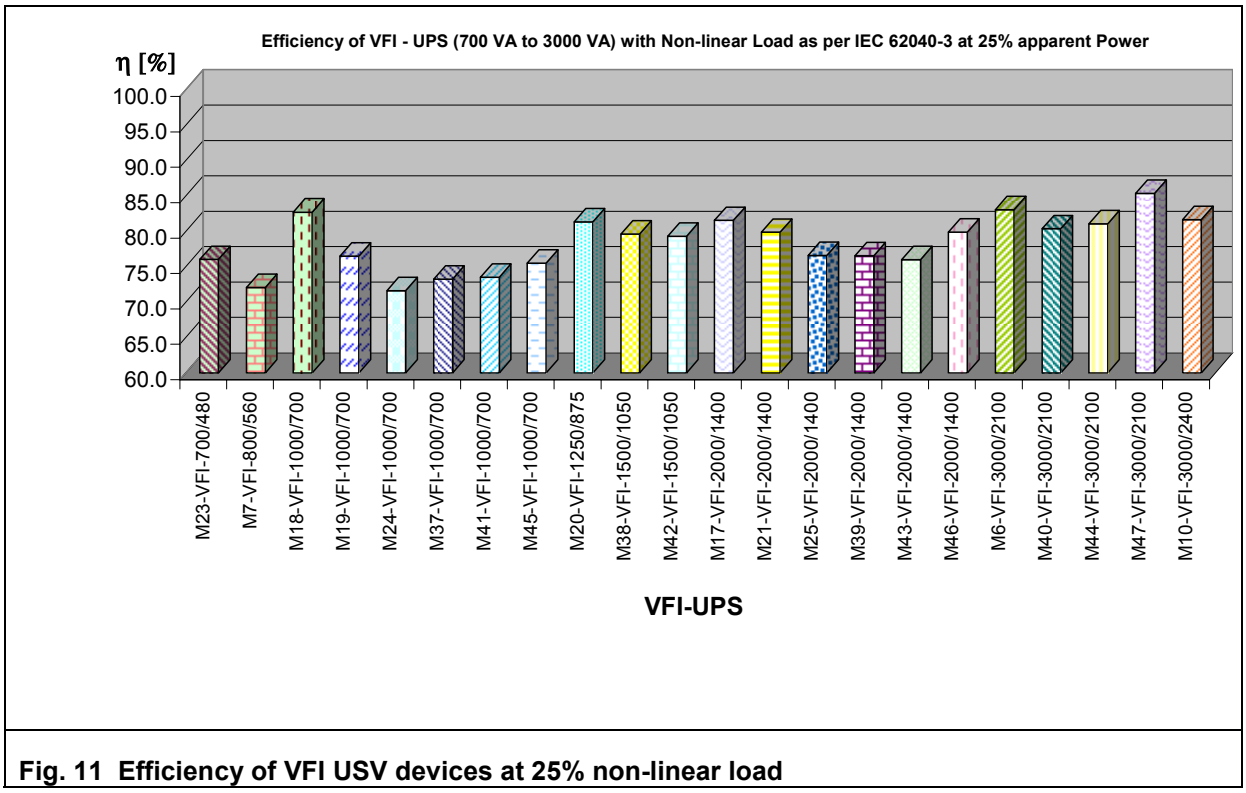


Fig. 11 Efficiency of VFI USV devices at 25% non-linear load

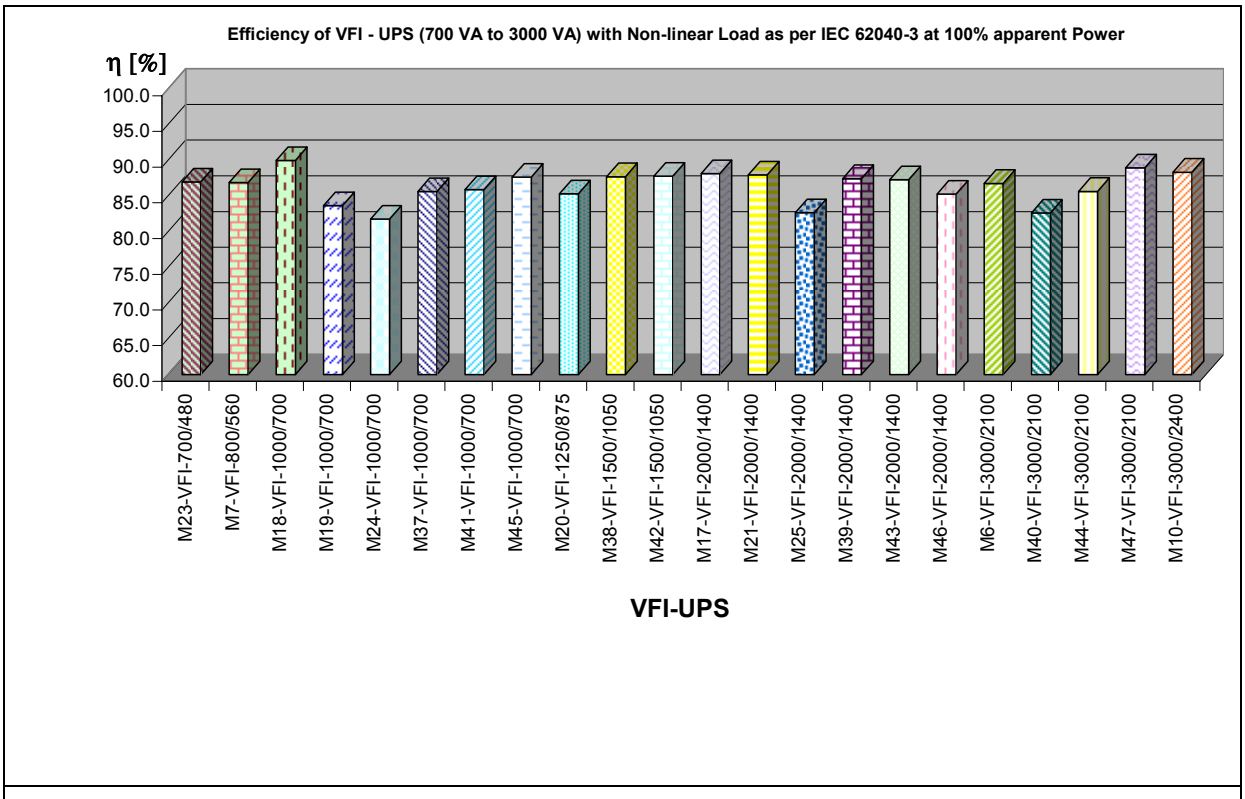


Fig. 12 Efficiency of VFI UPS devices at 100% non-linear load

c) VFD devices

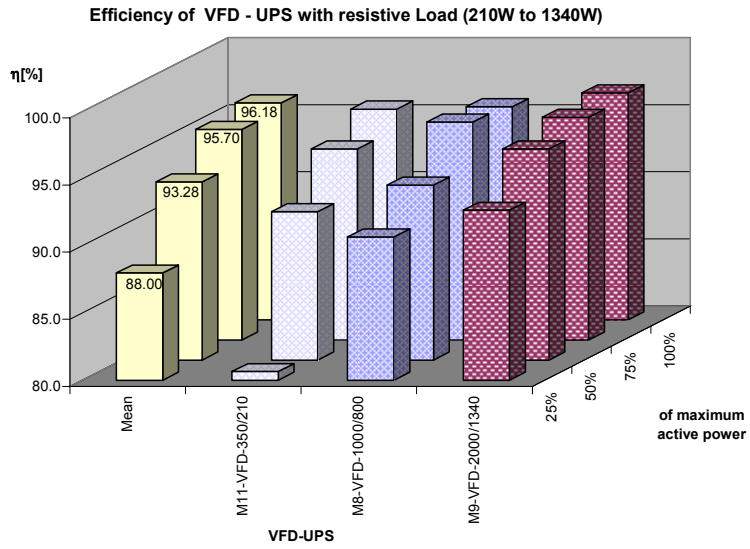


Fig. 13 Efficiency of VFD UPS devices with resistive load in the 210 W to 1340 W range

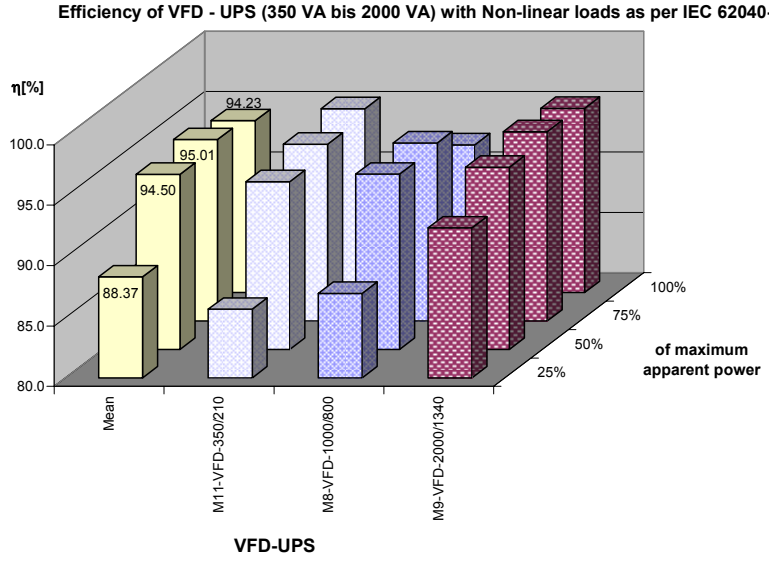


Fig. 14 Efficiency of VFD UPS devices with non-linear load in the 350 VA to 2 kVA range

d) Standby losses in bypass and normal operating mode

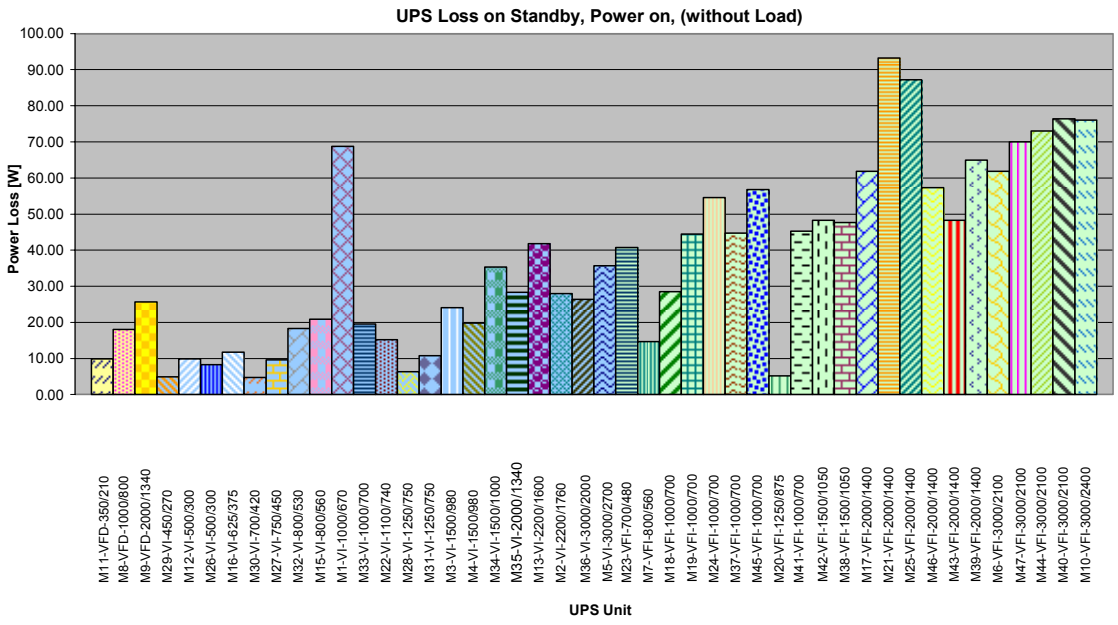


Fig. 15 Standby losses in normal mode

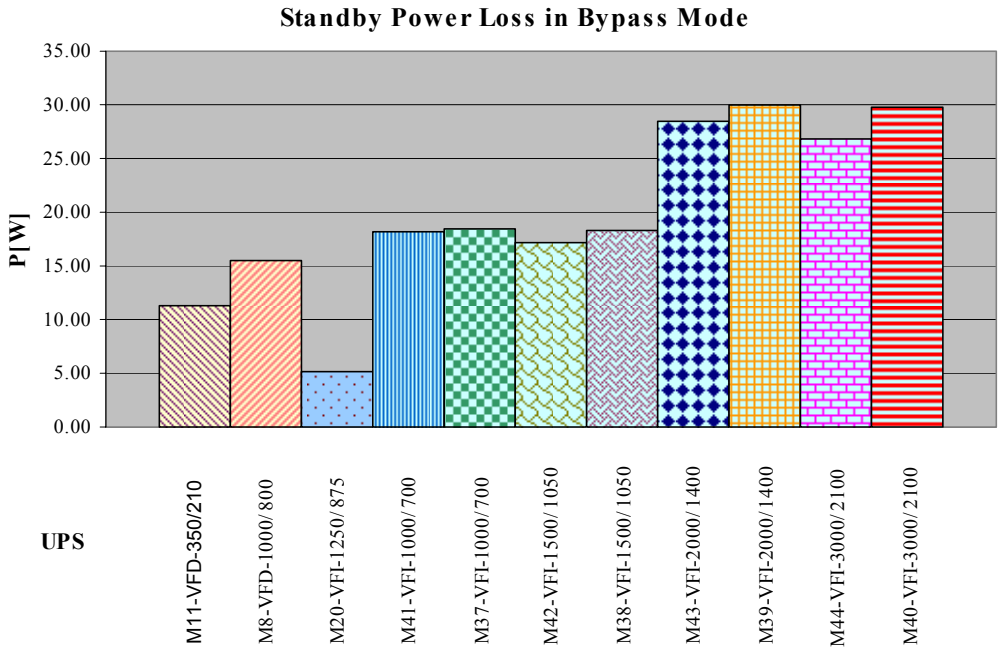


Fig. 16 Standby losses in bypass mode

e) Losses, all UPS devices

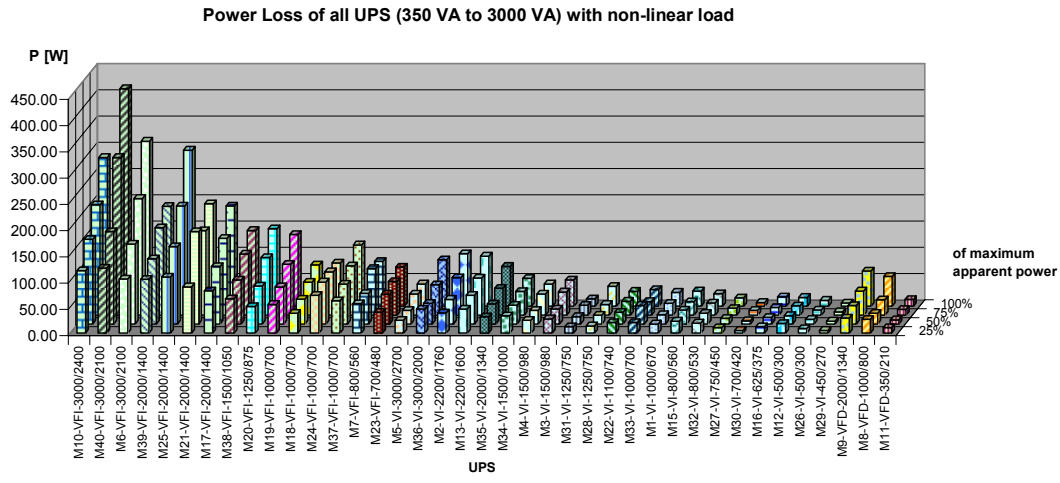


Fig. 17 Power losses, all UPS devices with non-linear load in the 350 VA to 3000 VA range

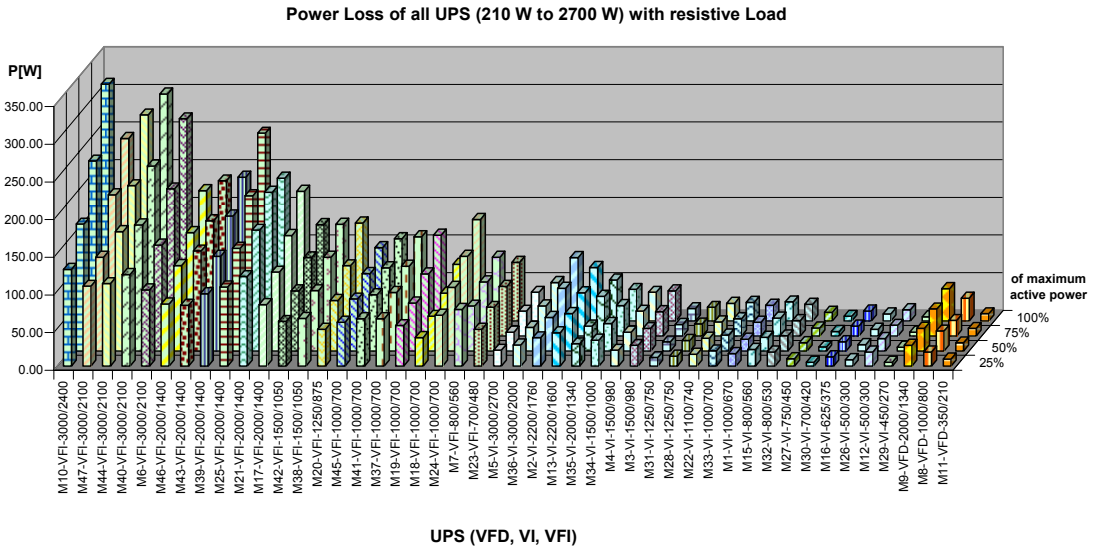


Fig. 18 Power losses, all UPS devices with resistive load in the 210 W to 2700 W range

Power loss = difference between active input and active output power.

This increases with larger systems as well as with higher loads.

8. Discussion of results

8.1 GENERAL FINDINGS

47 UPS devices were measured. One of these had a defect, and although it was also measured the results were not taken into account.

Quality of output voltage and degree of protection against interruptions to the power supply come at a price: efficiency declines with higher quality and greater protection. Thus the efficiency of VFD and VI devices is higher than that of VFI devices, and this is mainly attributable to the higher adjustment, control and monitoring requirements.

Measurements revealed that there is still scope for improvement with some devices.

As expected, losses in VFI devices were greater than in the other two types, resulting in an approximately 10 percent lower level of efficiency.

Since only 3 VFD devices were available for measurement, the corresponding findings are less relevant than those obtained with the other categories (21 VI and 22 VFI devices).

It should be noted that the power levels tend to be lower for VI devices, whereas VFI devices tend to operate in the range above 1 kVA.

8.2 EFFICIENCY

Efficiency can be expected to increase with larger systems, and this proved to be the case with VFI devices, but not with VI devices, for which the efficiency was found to remain at a constantly high level at full load throughout the entire 0.5 kVA to 3 kVA range.

In terms of efficiency, VFD devices indicated a similar behaviour to that of VI devices. In both cases, the degree of efficiency was around 95 percent at full load, and this changed very little with the size of the system.

At partial load it was observed that the variation of readings was greater than at full load. This indicates that, for certain devices, there is still room for improvement with respect to efficiency.

Devices from the same manufacturer tended to display very similar efficiency levels. From this it may be deduced that the switches and/or the strategy deployed for activating the power semiconductors (regulators, rectifiers and converters), together with the used components, have a decisive influence on efficiency and power losses.

From an energy efficiency point of view it is best to choose a VI device, and to only opt for a VFI device if a completely uninterrupted power supply is essential. With VFD devices the interruption time is often too long, and for this reason these models are seldom put into use.

8.3 CODE OF CONDUCT

The existing Code of Conduct[1] is applicable to devices in the range above 10 kVA, and therefore cannot be used as a reference for UPS devices in the range up to 3 kVA. We would nonetheless like to refer to this document here in order to be able to apply it to smaller systems for comparison purposes.

The Code of Conduct1 specifies efficiency criteria for four load levels (25%, 50%, 75%, 100%) with linear and non-linear load.

All VI UPS devices meet the criteria of the Code of Conduct at 100% load, and at partial loads only a handful of devices fail to meet the respective criteria. In this category the question therefore arises

[1] Code of Conduct on energy efficiency and quality of AC uninterruptible power supply (UPS) devices. Version 1.0a, Annex B, pp. 7 ff, Ispra, 22 December 2006

whether the Code of Conduct needs to be adjusted (or tightened up) for larger-scale systems, since in line with expectations the level of efficiency should be higher with larger systems.

With respect to VFD devices, it is questionable whether useful conclusions can be drawn from the results, since only three devices were measured.

VFI UPS devices behaved as expected, though some of them met the Code of Conduct criteria for the 10 kVA range.

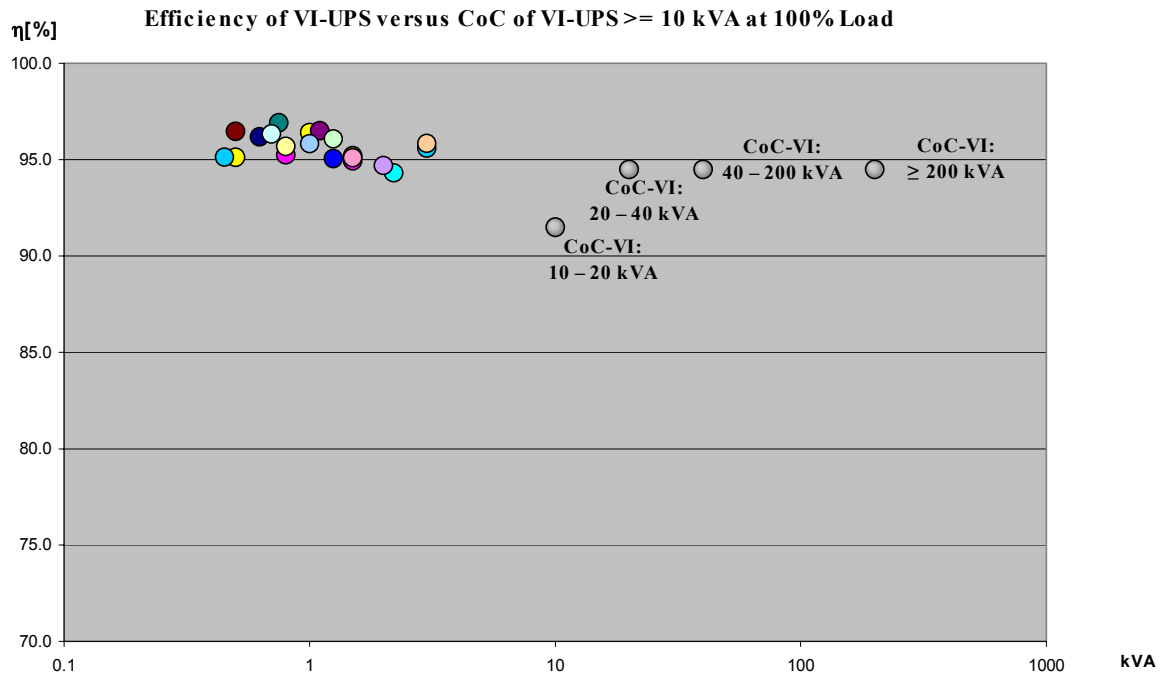


Fig. 19: Efficiency of VI UPS devices at 100% load compared with the Code of Conduct criteria

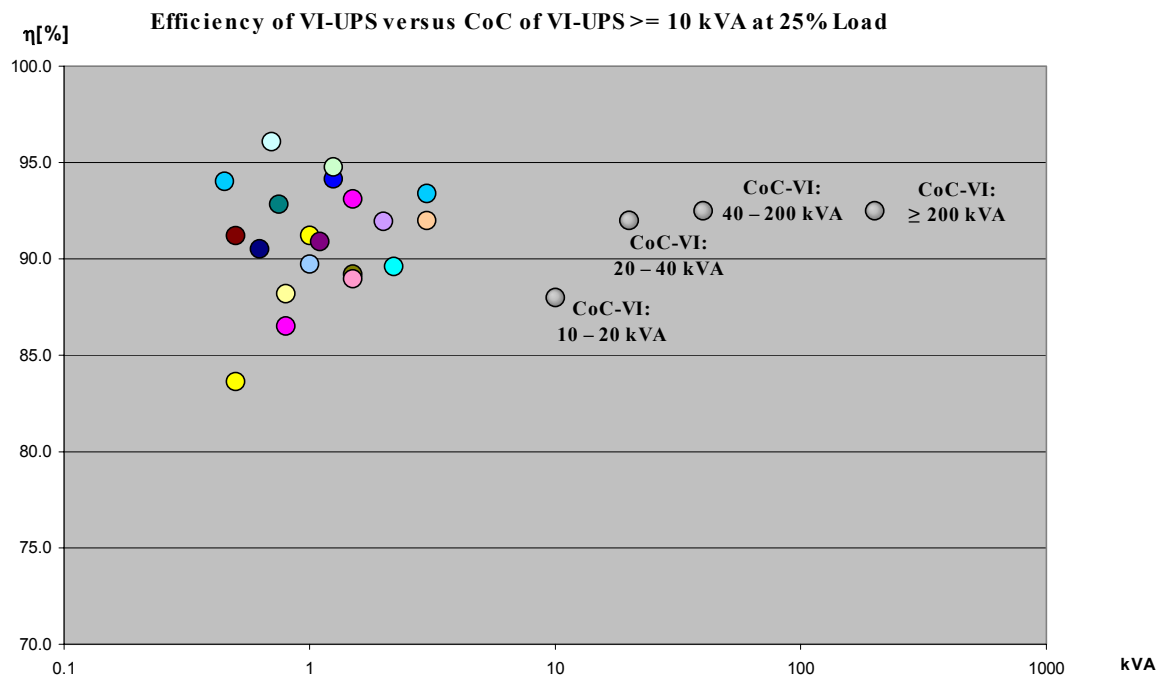


Fig. 20: Efficiency of VI UPS devices at 25% load compared with the Code of Conduct criteria

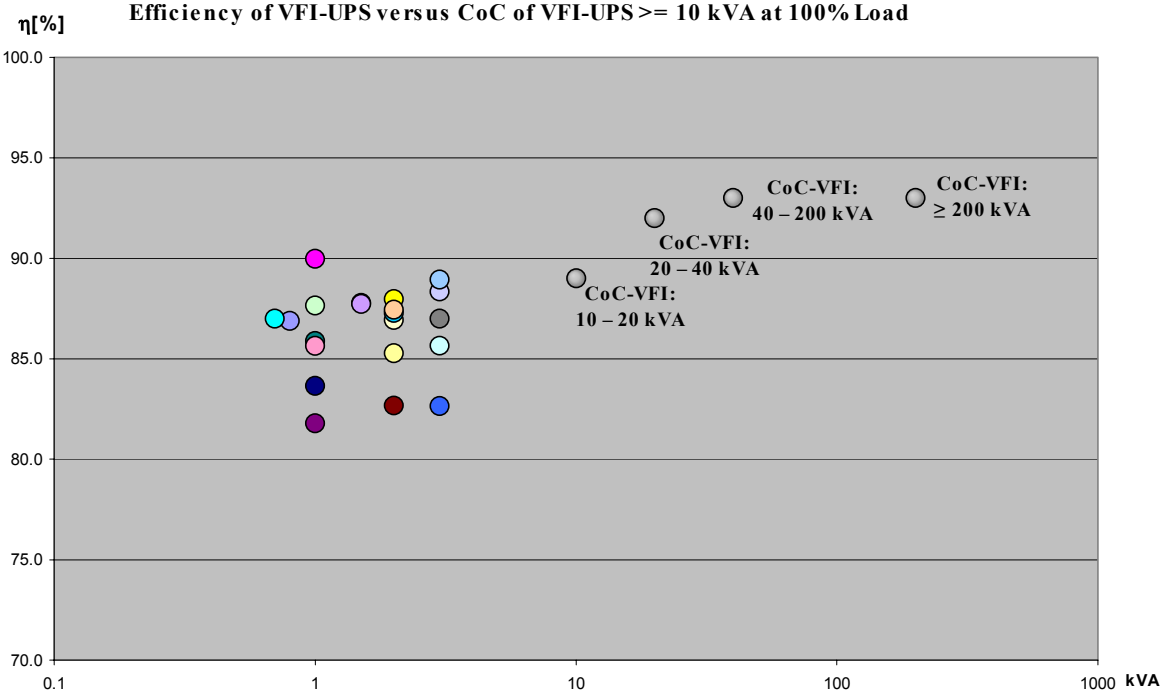


Fig. 21: Efficiency of VFI UPS devices at 100% load compared with the Code of Conduct criteria

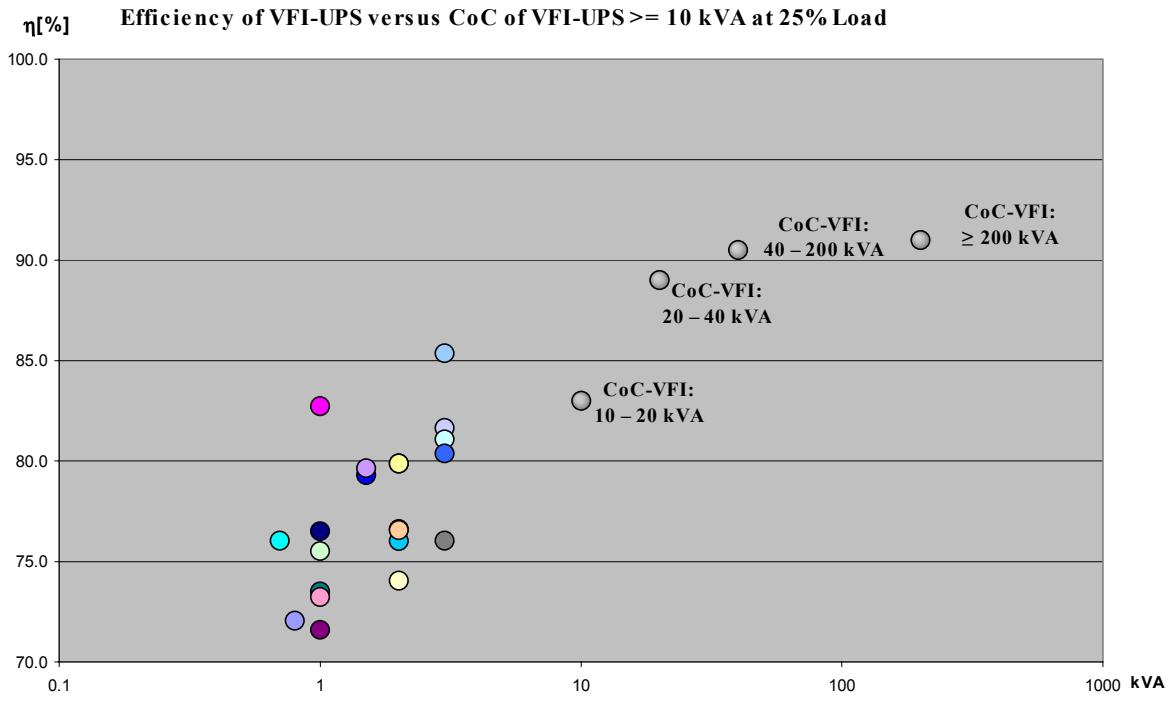


Fig. 22: Efficiency of VFI UPS devices at 25% load compared with the Code of Conduct criteria

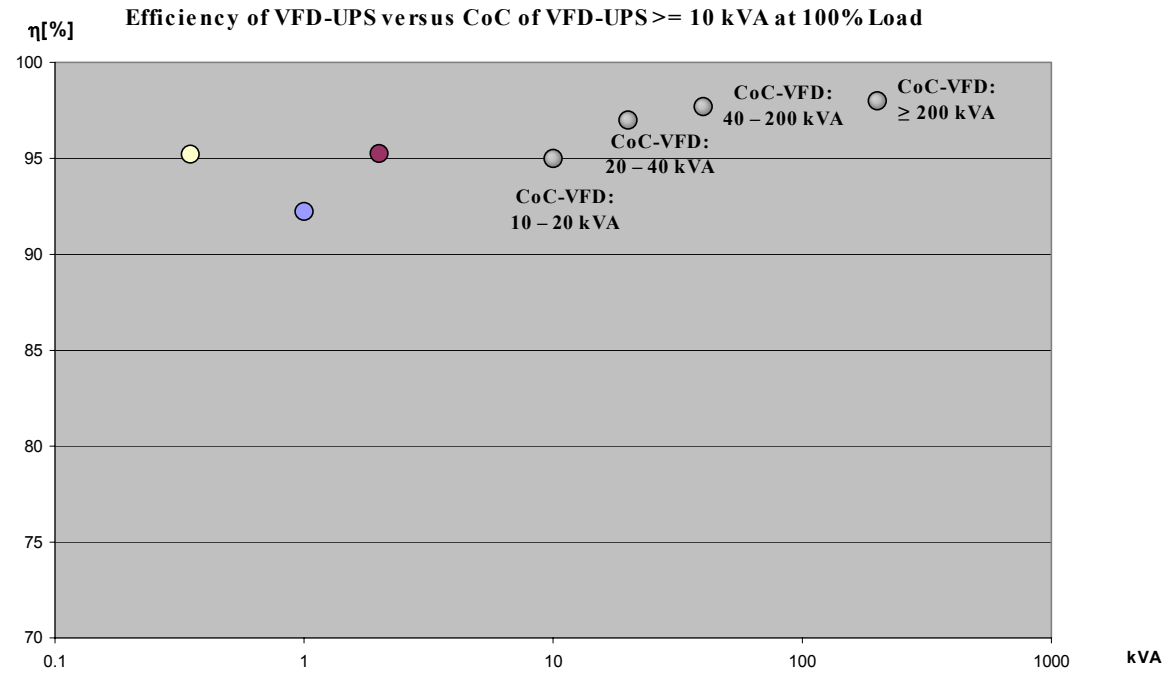


Fig. 23: Efficiency of VFD devices at 100% load compared with the Code of Conduct criteria

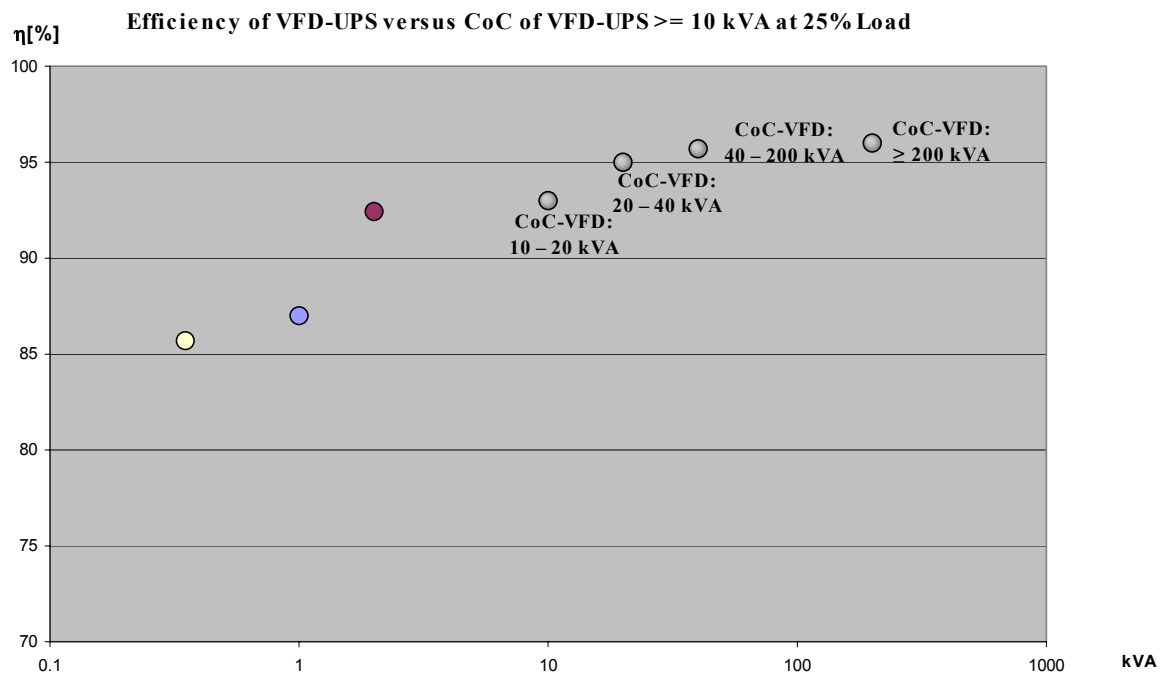


Fig. 24: Efficiency of VFD UPS devices at 25% load compared with the Code of Conduct criteria

9. Appendix

9.1. Links to Internet addresses

http://www.ruoss-kistler.ch/frameload.htm?http://www.ruoss-kistler.ch/Handel/Hilfe/usv_Lexikon.htm

UPS glossary (FAQs) prepared by Rouss-Kistler

http://www.errepi.de/de/prinzip.htm

ERREPI unterbrechungsfreie Stromversorgungen GmbH – principles of UPS technology

http://www.aegpss.de/vorschau/USV/PDF/VDE2002.pdf

Classification of UPS devices by operating behaviour in accordance with the new standard governing UPS products (IEC 62040-3)

http://www.adpos-ups.de/deutsch/pdf/adpos_produkt-news_dez04.pdf

Peter Michael Kohn, independent energy measurement expert

New classification of UPS devices in accordance with IEC 62040-3

http://www.bfe.admin.ch/php/modules/enet/streamfile.php?file=000000008997.pdf&name=000000250069_lang.pdf

Schnyder Ingenieure AG, Bösch 23, 6331 Hünenberg

Formulation of a code of conduct for UPS devices

Final report, November 2005

9.2. REFERENCES

[1] Siegbert Hopf, USV-Klassen, Funkschau, 2004, Heft 15, Seiten 53 und 54 (*article on categories of UPS devices, published in "Funkschau", no. 15, pages 53 and 54*)

[2] Swiss standard EN 62040-3, Uninterruptible Power Supply Systems,

Part 3: Methods for specifying efficiency and testing requirements

(German version, EN 62040-3:2001)

[3] Code of Conduct on energy efficiency and quality of AC uninterruptible power supply devices,

Ispra, 22 December 2006

9.3. ADDITIONAL EVALUATIONS

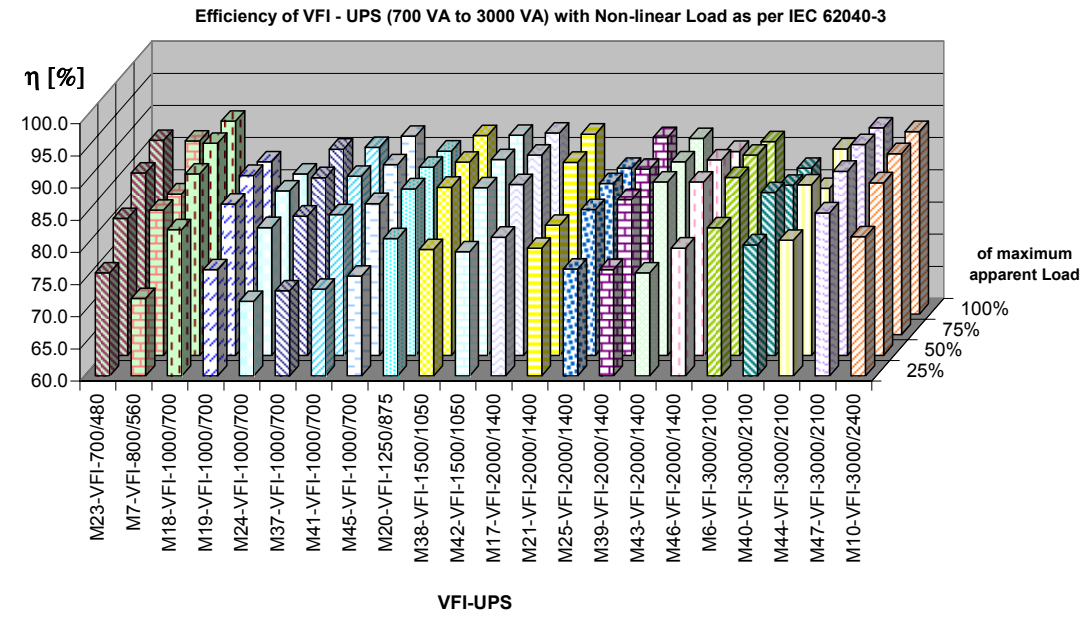


Fig. 25 Overview of efficiency of VFI UPS devices with non-linear load (excluding M14, which was faulty)

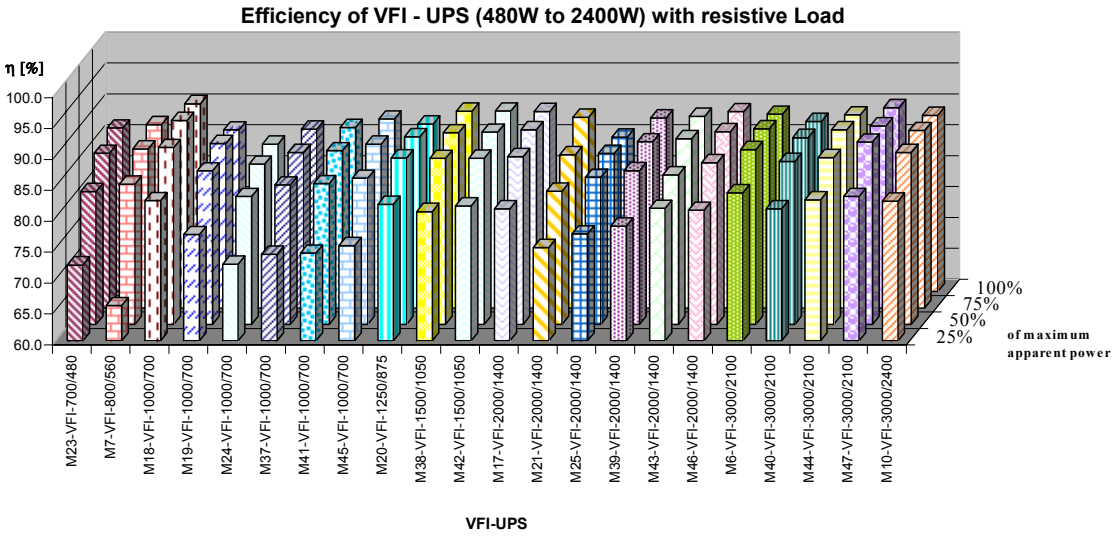


Fig. 26 Overview of efficiency of VFI UPS devices with resistive load

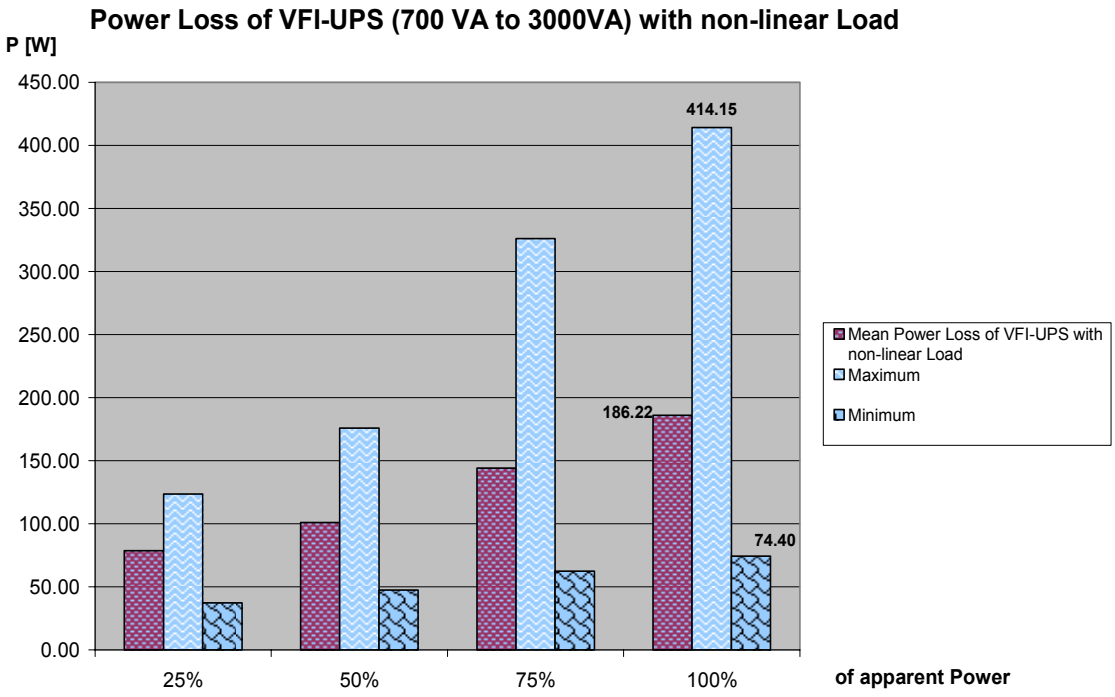


Fig. 27 Evaluation of absolute power loss of VFI devices

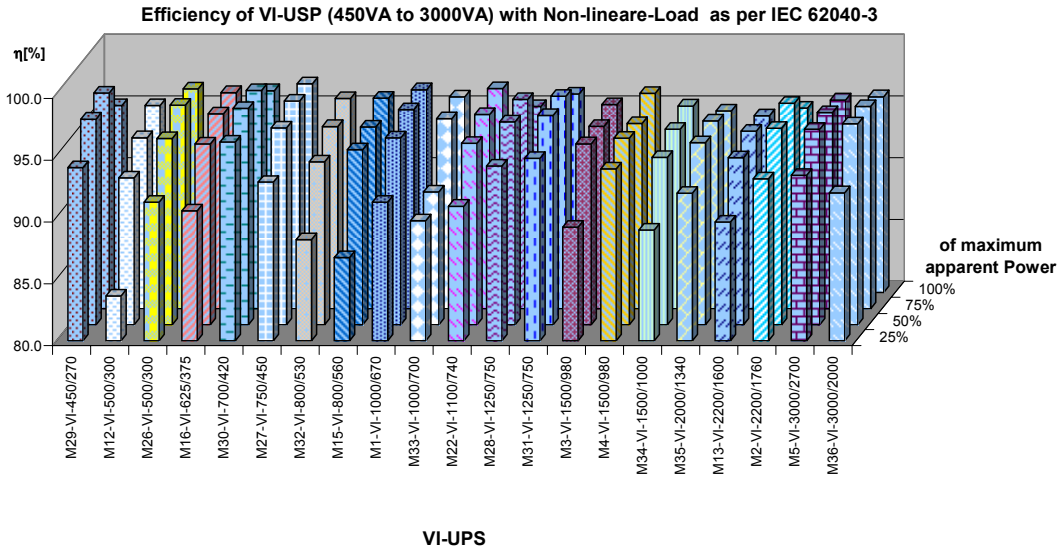


Fig. 28 Overview of efficiency of VI UPS devices with non-linear load

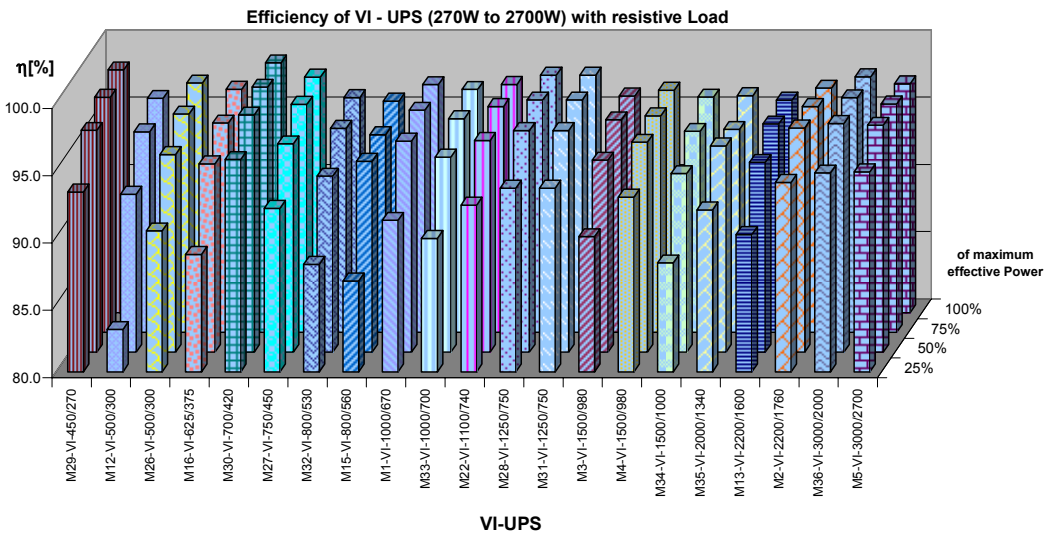


Fig. 29 Overview of efficiency of VI UPS devices with resistive load

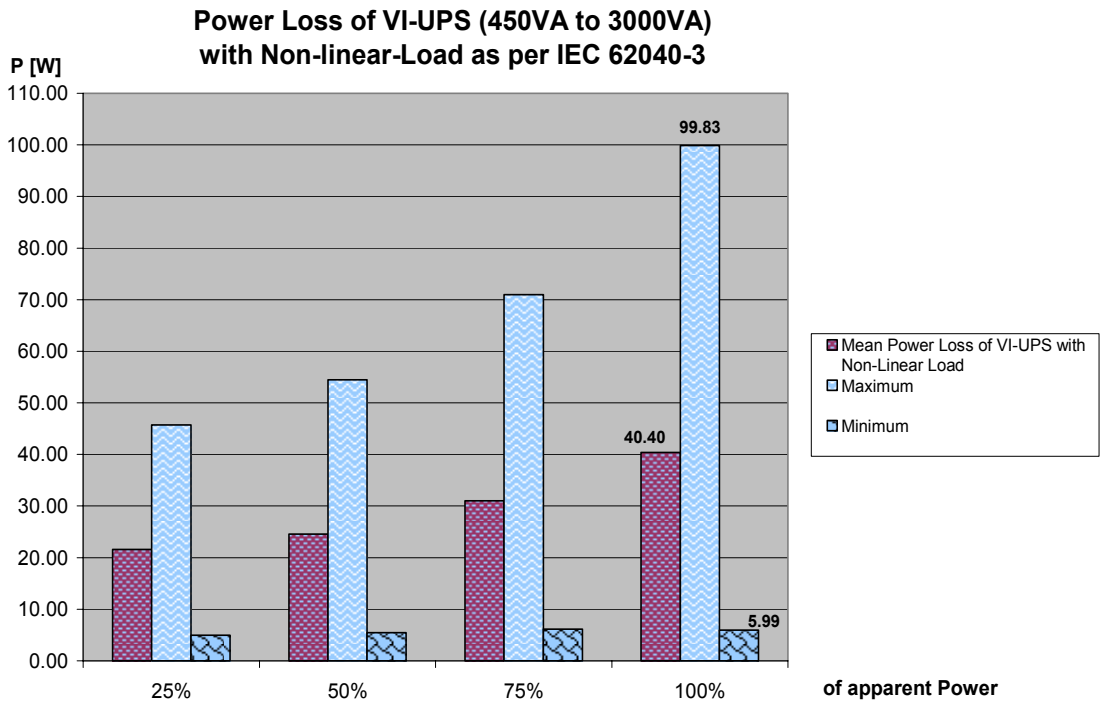


Fig. 30 Evaluation of absolute power loss of VI devices

9.4. TABLE OF MEASUREMENTS 21 VI-UPS

Table 3 Models M1 and M3

Hersteller:								Prüfdatum:	19.05.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz	Imax 4.5A						26.5	
Leistung:	1000 VA	670 W	Klasse	VI-SS-111		Line Interactive		Rel. Feuchte [rH]	
Modell-Nr:	**M1-VI-1000/670**							33	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	231.2	0.840	0.740	187.6	171.2	16.42	91.2
		50%	P_N	231.5	230.7	1.584	1.507	363.3	347.5	15.75	95.7
		75%	P_N	231.3	230.0	2.282	2.206	525.7	507.3	18.38	96.5
		100%	P_N	231.1	229.4	2.973	2.898	685.5	664.5	20.95	96.9
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.7	231.2	1.175	1.099	194.9	177.8	17.11	91.2
		50%	S_N	231.4	230.6	2.206	2.146	368.0	350.0	17.95	95.1
		75%	S_N	231.2	230.1	3.421	3.360	569.5	547.3	22.20	96.1
		100%	S_N	231.0	229.4	4.551	4.411	730.8	704.6	26.23	96.4
	Maximum output current	λ:=	0.73	231.0	229.2	4.980	4.403	774.9	740.5	34.42	95.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			221.7	Unom	0.472		35.66	0	68.78	

Hersteller								Prüfdatum:	07.05.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							24	
Leistung:	1500 VA	980 W	Klasse:	VI-SS-111		Line Interactive		Rel. Feuchte [rH]	
Modell-Nr:	**M3-VI-1500/980**							32	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	226.6	225.4	1.2122	1.0914	273.2	246	27.2	90.0
		50%	P_N	225.3	223.7	2.307	2.189	519.3	489.5	29.8	94.3
		75%	P_N	225.2	223.3	3.414	3.298	768.7	736.3	32.4	95.8
		100%	P_N	223.6	221.2	4.569	4.438	1021.2	981.3	39.9	96.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	223.5	222.4	1.7842	1.7011	250.2	223.2	27	89.2
		50%	S_N	221.3	220.7	3.508	3.433	534.4	505.8	28.6	94.6
		75%	S_N	222.5	220.4	5.255	5.137	841.7	797.6	44.1	94.8
		100%	S_N	221	218.5	6.29	6.16	1033.6	984	49.6	95.2
	Maximum output current	λ:=	0.73	220.8	218.2	6.88	6.745	1135	1080.8	54.2	95.2
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			222.1	Unom	0.18	0	24.11	0	24.11	

Table 4 Models M2 and M4

Hersteller								Prüfdatum:	17.04.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							26.5	
Leistung:	1500 VA	980 W	Klasse:	VI-SS-111		Line Interactive		Rel. Feuchte [rH]	
Modell-Nr:	**M4-VI-1500/980**							33	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	233	232.1	1.3	1.2	299	278	21	93.0
		50%	P_N	230.3	228.6	2.46	2.37	566	541	25	95.6
		75%	P_N	230.1	228	3.67	3.56	844	811	33	96.1
		100%	P_N	230	227.1	4.74	4.64	1090	1052	38	96.5
	Non-lineare-Load as per IEC 62040-3	25%	S_N	232.5	230.9	2.48	2.4	395	371	24	93.9
		50%	S_N	232.5	230.7	3.25	3.19	531	505	26	95.1
		75%	S_N	230.8	228.5	4.74	4.65	797	757	40	95.0
		100%	S_N	230.4	227.4	6.32	6.15	1085	1043	42	96.1
	Maximum output current	λ:=	0.73	220.8	218.2	6.88	6.745	1135	1080.8	54.2	95.2
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			230.6	Unom	0.208	0	19.81	0	19.81	

Hersteller:								Prüfdatum:	21.05.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz	Imax 16A						26.5	
Leistung:	2200VA	1760 W	Klasse:	VI-SS-111		Line Interactive		Rel. Feuchte [%rH]	
Modell-Nr:	**M2-VI-2200/1760**							33	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.4	230.9	2.091	1.934	474.7	446.6	28.15	94.1
		50%	P_N	230.9	229.9	4.010	3.875	921.4	890.5	30.83	96.7
		75%	P_N	230.4	228.9	5.987	5.819	1376.1	1331.6	44.50	96.8
		100%	P_N	229.8	227.8	7.997	7.794	1835.7	1774.7	61.00	96.7
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.5	231.0	2.542	2.420	416.7	387.9	28.72	93.1
		50%	S_N	231.0	230.1	4.932	4.823	817.2	783.7	33.52	95.9
		75%	S_N	230.4	229.1	7.463	7.340	1222.4	1181.1	41.28	96.6
		100%	S_N	229.8	227.9	9.925	9.716	1639.4	1556.3	83.10	94.9
	Maximum output current	λ:=	0.71	229.4	227.2	11.988	11.808	1982.0	1914.9	67.13	96.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.6	Unom	0.443		27.99	0	27.99	

Table 5 Models 15 und 16

Hersteller:								Prüfdatum:	03.07.2007
Typ:					Normalmode	Sinus		Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz	Imax 5A			Batteriemode	Rechteck		23.7	
Leistung:	625 VA	375 W	Klasse	VI-SY-311		Line Interactive		Rel. Feuchte	
Modell-Nr:	**M16-VI-625/375**							39	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	222.8	222.4	0.492	0.437	109.5	97.1	12.36	88.7
		50%	P_N	222.7	222.0	0.916	0.863	204.0	191.7	12.30	94.0
		75%	P_N	222.2	221.2	1.335	1.260	296.4	283.2	13.20	95.5
		100%	P_N	221.4	220.2	1.770	1.719	391.5	378.2	13.30	96.6
	Non-lineare-Load as per IEC 62040-3	25%	S_N	221.8	221.6	0.765	0.726	124.6	112.7	11.81	90.5
		50%	S_N	221.8	221.1	1.479	1.440	234.4	221.8	12.60	94.6
		75%	S_N	220.2	220.2	2.188	2.147	345.4	330.8	14.60	95.8
		100%	S_N	221.5	220.2	2.918	2.876	458.4	440.9	17.50	96.2
	Maximum output current	λ:=	0.71	221.3	220.2	3.338	3.301	531.6	515.8	15.80	97.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			222.4	Unom	0.059		11.76	0	11.76	
Surge Protected Output		50%	P_N	222.8	222.3	0.917	0.864	204.0	192.0	12.01	94.1
	Resistive load	100%	P_N	221.6	220.8	1.775	1.722	393.3	380.2	13.10	96.7
	Non-lineare-Load as per IEC 62040-3	50%	S_N	221.8	221.4	1.489	1.449	235.4	222.8	12.60	94.6
		100%	S_N	221.4	220.6	2.950	2.906	460.5	444.4	16.10	96.5
	Maximum output current	λ:=	0.73	220.4	219.0	4.692	4.622	760.0	739.6	20.40	97.3
	Asymmetrical non-linear load as per IEC 62040-3	keine Begrenzung bei 130% Last									
	Standby			222.7	Unom	0.057		11.30		11.30	

Hersteller:								Prüfdatum:	04.07.2007
Typ:								Temperatur [°C]	
Spannung:	230V							24	
Leistung:	800VA	560W	Klasse	VI-SX-311		Voltage Independent		Rel. Feuchte [%r.H.]	
Modell-Nr:	**M15-VI-800/560**			VI-SS-111				32	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	222.4	222.1	0.868	0.650	166.2	144.2	22.04	86.7
		50%	P_N	222.2	221.8	1.454	1.288	308.6	290.6	18.00	94.2
		75%	P_N	221.8	221.0	2.072	1.932	450.8	426.9	23.90	94.7
		100%	P_N	221.8	220.6	2.696	2.566	591.3	566.0	25.30	95.7
	Non-lineare-Load as per IEC 62040-3	25%	S_N	223.4	223.2	1.093	0.922	166.7	144.2	22.48	86.5
		50%	S_N	223.4	222.9	1.966	1.834	309.4	282.6	26.80	91.3
		75%	S_N	223.6	222.8	2.852	2.737	458.0	432.7	25.30	94.5
		100%	S_N	223.8	222.4	3.757	3.652	605.4	576.6	28.80	95.2
	Maximum output current	λ:=	0.70	221.6	220.1	4.220	4.120	668.4	638.0	30.40	95.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			222.5	Unom	0.450		20.87	0	20.87	

Table 6 Models 12 und 13

Hersteller:								Prüfdatum:	09.07.2007			Hersteller:								Prüfdatum:	06.07.2007					
Typ:								Temperatur [°C]				Typ:									Temperatur [°C]					
Spannung:	220-240 V 50/60 Hz	Imax 5A							24.2			Spannung:	220-240 V 50/60 Hz	Imax 16A							21.7					
Leistung:	500VA	300 W	Klasse	VI-SY-333		Gem Kata		Rel. Feuchte [%r.H.]				Leistung:	2200VA	1600 W	Klasse:	VI-SS-111			Line Interactive		Rel. Feuchte [%rH]					
Modell-Nr:	M12-VI-500/300					VI-SS-333			41			Modell-Nr:	M13-VI-2200/1600								33					
Parameters				Meassurements								Parameters				Meassurements										
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]		Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]			
Normal mode	Resistive load	25%	P_N	221.7	221.6	0.498	0.408	108.6	90.3	18.32	83.1	Normal mode	Resistive load	25%	P_N	224.2	223.0	2.018	1.811	447.6	403.7	43.90	90.2			
		50%	P_N	221.3	221.3	0.898	0.822	198.3	181.9	16.41	91.7			50%	P_N	224.6	222.6	3.754	3.565	841.4	791.7	49.70	94.1			
		75%	P_N	221.5	220.7	1.262	1.199	278.6	264.4	14.20	94.9			75%	P_N	223.9	221.2	5.668	5.477	1266.3	1209.0	57.30	95.5			
		100%	P_N	221.6	220.6	1.652	1.587	365.0	350.1	14.90	95.9			100%	P_N	223.0	219.5	7.570	7.378	1685.7	1614.8	70.90	95.8			
	Non-lineare-Load as per IEC 62040-3	25%	S_N	222.7	222.6	0.605	0.608	108.8	91.0	17.81	83.6		Non-lineare-Load as per IEC 62040-3	25%	S_N	222.8	222.0	2.621	2.500	439.7	394.0	45.70	89.6			
		50%	S_N	223.2	222.7	1.185	1.145	196.4	180.4	15.96	91.9			50%	S_N	222.1	220.6	5.129	5.016	839.9	785.4	54.50	93.5			
		75%	S_N	222.8	222.2	1.751	1.711	287.0	269.3	17.70	93.8			75%	S_N	222.0	219.5	7.672	7.562	1251.8	1181.4	70.40	94.4			
		100%	S_N	223.0	222.2	2.290	2.254	341.3	324.6	16.65	95.1			100%	S_N	220.4	216.9	10.308	10.201	1673.4	1578.2	95.20	94.3			
	Maximum output current	λ:=	**0.65**	223.0	222.2	2.290	2.254	341.3	324.6	16.70	95.1		Maximum output current	λ:=	0.73	220.2	216.2	10.926	10.697	1782.9	1682.5	100.40	94.4			
	Asymmetrical non-linear load as per IEC 62040-3												Asymmetrical non-linear load as per IEC 62040-3													
	Standby			222.2	Unom	0.107		9.87	0	9.87			Standby	P-On		224.6	Unom	0.325		41.83	0	41.83				
													Standby	P-Off		224.6		0.325		38.7	0	38.68				

Table 7 Models 22 and 5

Hersteller:								Prüfdatum:	10.07.2007			Hersteller:								Prüfdatum:	18.05.2007					
Typ:								Temperatur [°C]				Typ:									Temperatur [°C]					
Spannung:	220-240 V 50/60 Hz	Imax 4.5A							23.9			Spannung:	220-240 V 50/60 Hz							alte Bezeichnung:	26					
Leistung:	1000 VA	670 W	Klasse	VI-SY-111			Line Interactive		Rel. Feuchte [%rH]			Leistung:	3000 VA	2700W	Klasse	VI-SS-111			Line Interactive		Rel. Feuchte [%rH]					
Modell-Nr:	M22-VI-1100/740								32			Modell-Nr:	M5-VI-3000/2700								42					
Parameters				Meassurements								Parameters				Meassurements										
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]		Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]			
Normal mode	Resistive load	25%	P_N	224.3	223.8	0.914	0.845	204.6	189.0	15.60	92.4	Normal mode	Resistive load	25%	P_N	224.033	223.333	3.254	3.06983	723.633	686.333	37.3	94.8			
		50%	P_N	224.2	223.2	1.754	1.685	392.8	376.0	16.80	95.7			50%	P_N	223.417	221.8	6.31567	6.15083	1408.83	1364.33	44.5	96.8			
		75%	P_N	224.0	222.7	2.528	2.239	575.0	556.5	18.50	96.8			75%	P_N	222.55	220.05	9.3395	9.17133	2077	2014	63	97.0			
		100%	P_N	223.3	221.3	3.438	3.364	767.6	744.2	23.40	97.0			100%	P_N	221.367	254.183	12.7383	12.5525	2817.67	2733.5	84.1667	97.0			
	Non-lineare-Load as per IEC 62040-3	25%	S_N	224.8	224.2	1.298	1.251	216.0	196.4	19.65	90.9		Non-lineare-Load as per IEC 62040-3	25%	S_N	223.417	222.75	3.67233	3.45583	577.733	539.583	38.15	93.4			
		50%	S_N	224.6	223.7	2.538	2.490	420.5	398.2	22.30	94.7			50%	S_N	222.55	221.317	6.86917	6.73233	1127.78	1080.8	46.9833	95.8			
		75%	S_N	224.4	223.0	3.744	3.698	613.0	586.8	26.20	95.7			75%	S_N	223.417	218.633	10.5567	10.4215	1715	1644.05	70.95	95.9			
		100%	S_N	224.2	222.4	5.018	4.982	806.8	778.6	28.20	96.5			100%	S_N	218.517	215.5	14.197	14.3275	2264.83	2165	99.8333	95.6			
	Maximum output current	λ:=	0.70	224.0	222.1	5.285	5.250	842.6	812.6	30.00	96.4		Maximum output current	λ:=	0.72	218.933	215.783	14.6063	14.4608	2338.17	2238	100.167	95.7			
	Asymmetrical non-linear load as per IEC 62040-3												Asymmetrical non-linear load as per IEC 62040-3													
	Standby			224.3	Unom	0.096		15.21	0	15.21			Standby			221.7	Unom	0.472		35.66	0	35.66				

Table 8 Models 26 and 27

Hersteller:								Prüfdatum:	22.08.2007			Hersteller:								Prüfdatum:	23.08.2007					
Typ:								Temperatur [°C]				Typ:									Temperatur [°C]					
Spannung:	230/220-240 V 50/60 Hz								26.6			Spannung:	230/220-240 V 50/60 Hz								22.6					
Leistung:	500 VA	300 W	Klasse	VI			Line Interactive		Rel. Feuchte [%rH]			Leistung:	800VA	530 W	Klasse	VI			Line Interactive		Rel. Feuchte [%rH]					
Modell-Nr:	M26-VI-500/300								31			Modell-Nr:	M27-VI-750/450								34					
Parameters				Meassurements								Parameters				Meassurements										
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]		Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]			
Normal mode	Resistive load	25%	P_N	231.6	231.4	0.382	0.340	86.9	78.6	8.3	90.5	Normal mode	Resistive load	25%	P_N	231.6	231.3	0.546	0.494	124.0	114.3	9.7	92.2			
		50%	P_N	231.6	231.2	0.697	0.657	160.5	152.0	8.6	94.7			50%	P_N	231.5	231.0	1.033	0.982	237.5	226.8	10.8	95.5			
		75%	P_N	231.5	230.8	1.111	0.981	235.3	226.4	8.9	96.2			75%	P_N	231.4	230.6	1.516	1.469	349.4	338.7	10.7	96.9			
		100%	P_N	231.4	230.6	1.354	1.316	312.6	303.4	9.2	97.1			100%	P_N	231.3	230.3	2.004	1.959	462.5	451.0	11.6	97.5			
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	231.4	0.582	0.545	95.8	87.4	8.4	91.2		Non-lineare-Load as per IEC 62040-3	25%	S_N	231.5	231.2	0.852	0.806	139.6	129.6	10.0	92.8			
		50%	S_N	231.4	231.0	1.117	1.082	182.8	173.8	9.0	95.1			50%	S_N	231.4	230.8	1.652	1.612	270.9	259.9	11.0	95.9			
		75%	S_N	231.5	230.6	1.640	1.607	270.6	261.0	9.6	96.5			75%	S_N	231.3	230.4	2.436	2.394	399.9	387.1	12.8	96.8			
		100%	S_N	231.4	230.6	2.216	2.183	313.2	302.1	11.1	96.5			100%	S_N	231.0	229.8	3.318	3.277	501.9	486.4	15.5	96.9			
	Maximum output current	λ:=	0.70	224.0	222.1	5.285	5.250	842.6	812.6	30.0	96.4		Maximum output current	λ:=	0.71	231.0	229.7	3.453	3.402	571.5	553.8	17.8	96.9			
	Asymmetrical non-linear load as per IEC 62040-3												Asymmetrical non-linear load as per IEC 62040-3													
	Standby			231.7	Unom	0.078	0.000	8.2	0.0	8.2			Standby			231.8	Unom	0.113	0.000	9.6	0.0	9.6				

Table 9 Models 29 and 30

Hersteller:									Prüfdatum:	23.08.2007
Typ:									Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz								26	
Leistung:	450VA	270 W	Klasse	VI		Line Interactive			Rel. Feuchte [%rH]	
Modell-Nr:	**M29-VI-450/270**								32	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	231.5	0.336	0.298	73.8	68.9	4.9	93.4
		50%	P_N	231.6	231.3	0.623	0.593	142.1	137.1	5.0	96.5
		75%	P_N	231.5	231.0	0.910	0.884	209.5	204.2	5.3	97.5
		100%	P_N	231.5	230.8	1.210	1.185	279.0	273.5	5.5	98.0
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	231.4	0.515	0.491	83.3	78.4	5.0	94.0
		50%	S_N	231.4	231.0	0.995	0.975	162.0	156.6	5.5	96.6
		75%	S_N	231.4	230.9	1.470	1.451	241.7	235.5	6.2	97.5
		100%	S_N	231.9	230.8	0.756	0.732	123.1	117.1	6.0	95.1
	Maximum output current	λ:=	0.59	231.3	230.6	2.339	2.333	328.1	320.0	8.1	97.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.110	0.000	4.9	0.0	4.9	

Hersteller:									Prüfdatum:	22.08.2007
Typ:									Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz								23.4	
Leistung:	700VA	270 W	Klasse	VI		Line Interactive			Rel. Feuchte [%rH]	
Modell-Nr:	**M30-VI-700/420**								35	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.6	231.4	0.490	0.459	111.0	106.3	4.7	95.8
		50%	P_N	231.5	231.0	0.939	0.914	216.2	211.0	5.2	97.6
		75%	P_N	231.4	230.7	1.418	1.394	327.3	321.5	5.8	98.2
		100%	P_N	231.2	230.4	1.855	1.832	428.3	422.1	6.2	98.6
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.5	231.2	0.785	0.768	127.3	122.4	5.0	96.1
		50%	S_N	231.4	230.9	1.522	1.505	248.2	242.1	6.1	97.5
		75%	S_N	231.2	230.5	2.311	2.290	383.0	374.1	8.9	97.7
		100%	S_N	231.8	230.6	1.156	1.135	188.5	181.6	6.9	96.3
	Maximum output current	λ:=	0.70	231.1	230.0	3.340	3.328	543.7	533.6	10.1	98.2
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.7	Unom	0.107	0.000	4.7	0.0	4.7	

Table 10 Models 31 and 28

Hersteller:									Prüfdatum:	23.08.2007
Typ:									Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz								27.7	
Leistung:	1250VA	750 W	Klasse	VI		Line Interactive			Rel. Feuchte [%rH]	
Modell-Nr:	**M31-VI-1250/750**			Voltage Independent					30	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	231.3	0.869	0.817	200.1	189.0	11.1	94.4
		50%	P_N	231.5	230.7	1.689	1.641	390.3	378.4	11.9	97.0
		75%	P_N	231.3	230.1	2.517	2.463	581.7	566.4	15.3	97.4
		100%	P_N	231.0	229.3	3.341	3.292	771.2	754.7	16.4	97.9
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	231.2	1.378	1.349	229.3	217.3	12.0	94.8
		50%	S_N	231.3	230.4	2.774	2.748	463.4	449.3	14.1	97.0
		75%	S_N	231.1	229.8	3.976	3.948	662.1	643.5	18.7	97.2
		100%	S_N	231.6	230.6	2.075	2.050	346.7	333.1	13.6	96.1
	Maximum output current	λ:=	0.67	230.8	228.8	6.165	6.144	966.7	937.4	29.3	97.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.105	0.000	10.8	0.0	10.8	

Hersteller:									Prüfdatum:	23.08.2007
Typ:									Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz								23.1	
Leistung:	1250VA	750 W	Klasse	VI		Line Interactive			Rel. Feuchte [%rH]	
Modell-Nr:	**M28-VI-1250/750**			Voltage Independent					40	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	231.2	0.879	0.821	202.5	189.6	12.9	93.6
		50%	P_N	231.5	230.7	1.698	1.641	392.2	378.3	13.9	96.5
		75%	P_N	231.3	229.9	2.519	2.463	582.0	566.1	15.9	97.3
		100%	P_N	231.0	229.3	3.338	3.282	770.3	752.1	18.2	97.6
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	231.2	1.402	1.348	230.9	217.4	13.5	94.2
		50%	S_N	231.4	230.5	2.784	2.730	462.4	445.9	16.6	96.4
		75%	S_N	231.1	229.7	3.998	3.946	663.5	643.2	20.4	96.9
		100%	S_N	231.0	229.4	5.164	5.056	761.5	723.9	37.6	95.1
	Maximum output current	λ:=	0.62	230.9	229.3	5.519	5.469	799.3	771.3	28.1	96.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.049	0.000	6.317	0.000	6.3	

Table 11 Models 32 and 33

Hersteller:									Prüfdatum:	23.08.2007
Typ:									Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz								27.5	
Leistung:	800VA	530 W	Klasse	VI		Line Interactive			Rel. Feuchte [%rH]	
Modell-Nr:	**M32-VI-800/530**								31	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.8	231.4	0.663	0.582	152.9	134.6	18.4	88.0
		50%	P_N	231.5	231.0	1.241	1.156	286.8	266.9	19.9	93.1
		75%	P_N	231.5	230.4	1.822	1.741	421.3	400.9	20.4	95.2
		100%	P_N	231.4	229.9	2.407	2.323	556.2	533.8	22.4	96.0
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.8	231.4	0.922	0.874	160.9	141.9	19.0	88.2
		50%	S_N	231.6	231.0	1.767	1.718	300.1	279.7	20.5	93.2
		75%	S_N	231.4	230.4	2.607	2.559	439.9	416.8	23.2	94.7
		100%	S_N	231.3	230.2	3.403	3.368	540.1	516.8	23.3	95.7
	Maximum output current	λ:=	0.70	231.2	229.8	3.979	3.935	660.2	633.2	27.0	95.9
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			232.0	Unom	0.102	0.000	18.3	0.0	18.3	

Hersteller:									Prüfdatum:	24.08.2007
Typ:									Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz								23.3	
Leistung:	1000VA	700 W	Klasse	VI		Line Interactive			Rel. Feuchte [%rH]	
Modell-Nr:	**M33-VI-1000/700**								31	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	231.3	0.857	0.768	197.4	177.5	19.9	89.9
		50%	P_N	231.6	230.6	1.655	1.567	382.5	361.4	21.1	94.5
		75%	P_N	231.4	230.0	2.390	2.303	552.5	529.7	22.8	95.9
		100%	P_N	231.0	229.2	3.164	3.077	730.5	705.6	24.9	96.6
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.7	231.2	1.130	1.083	195.9	175.7	20.1	89.7
		50%	S_N	231.5	230.7	2.225	2.141	385.5	349.9	35.7	90.8
		75%	S_N	231.2	230.1	3.324	3.277	557.7	532.0	25.7	95.4
		100%	S_N	231.1	229.5	4.499	4.450	747.6	716.4	31.2	95.8
	Maximum output current	λ:=	0.69	231.0	229.2	5.017	4.973	818.7	786.0	32.7	96.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.112	0.000	19.5	0.0	19.5	

Table 12 Models 34 and 35

Hersteller:								Prüfdatum:	28.08.2007
Typ:								Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz							25.7	
Leistung:	1500VA	1000 W	Klasse	VI		Line Interactive		Rel. Feuchte [%rH]	
Modell-Nr:	**M34-VI-1500/1000**							50	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{lOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.5	230.9	1.276	1.096	287.1	252.9	34.2	88.1
		50%	P_N	231.2	230.2	2.358	2.192	540.8	504.3	36.5	93.3
		75%	P_N	230.9	229.3	3.458	3.294	795.4	755.1	40.4	94.9
		100%	P_N	230.6	228.5	4.563	4.414	1049.6	1007.8	41.8	96.0
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.5	231.0	1.695	1.617	296.4	263.7	32.7	89.0
		50%	S_N	231.2	230.1	3.248	3.185	553.3	517.5	35.8	93.5
		75%	S_N	230.8	229.3	4.785	4.720	815.5	770.9	44.6	94.5
		100%	S_N	230.6	228.5	6.278	6.215	1070.3	1017.9	52.5	95.1
	Maximum output current	λ:=	0.69	230.4	228.0	7.383	7.316	1204.9	1144.7	60.1	95.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.346	0.000	35.3	0.0	35.3	

Hersteller:								Prüfdatum:	30.08.2007
Typ:								Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz							25.6	
Leistung:	2000VA	1340 W	Klasse	VI		Line Interactive		Rel. Feuchte [%rH]	
Modell-Nr:	**M35-VI-2000/1340**							42	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{lOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.5	230.7	1.597	1.464	366.9	337.6	29.3	92.0
		50%	P_N	231.2	229.6	3.066	2.939	707.6	674.4	33.2	95.3
		75%	P_N	230.6	228.3	4.634	4.446	1066.9	1014.3	52.6	95.1
		100%	P_N	230.3	227.1	6.110	5.953	1405.9	1351.4	54.5	96.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.4	230.7	2.233	2.173	381.9	351.2	30.8	91.9
		50%	S_N	231.2	229.6	4.258	4.200	720.4	682.5	38.0	94.7
		75%	S_N	230.7	228.4	6.240	6.182	1057.0	1006.2	50.8	95.2
		100%	S_N	230.3	227.1	8.900	8.840	1430.6	1354.7	75.9	94.7
	Maximum output current	λ:=	0.69	230.0	226.5	9.861	9.807	1601.6	1522.3	79.3	95.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.231	0.000	28.340	0.000	28.3	

Table 13 Model 36

Hersteller:								Prüfdatum:	31.08.2007
Typ:								Temperatur [°C]	
Spannung:	230/220-240 V 50/60 Hz							26.4	
Leistung:	3000VA	2000 W	Klasse	VI		Line Interactive		Rel. Feuchte [%rH]	
Modell-Nr:	**M36-VI-3000/2000**			Voltage Independent				30	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{lOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.3	230.6	2.436	2.190	532.4	504.6	27.9	94.8
		50%	P_N	230.7	229.4	4.573	4.399	1039.9	1008.6	31.3	97.0
		75%	P_N	230.1	228.0	6.777	6.625	1550.1	1510.2	39.9	97.4
		100%	P_N	229.6	226.7	9.027	8.889	2065.5	2014.5	51.0	97.5
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.2	230.5	3.542	3.191	566.2	520.8	45.4	92.0
		50%	S_N	230.7	229.3	6.503	6.280	1058.9	1019.4	39.5	96.3
		75%	S_N	230.1	227.9	9.558	9.337	1594.5	1536.6	57.9	96.4
		100%	S_N	229.3	226.7	13.291	13.046	2116.0	2028.0	88.0	95.8
	Maximum output current	λ:=	0.69	229.1	226.1	14.475	14.271	2325.0	2233.5	91.5	96.1
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.7	Unom	0.846	0.000	26.340	0.000	26.3	

9.5. TABLE OF MEASUREMENTS 23 VFI-UPS

Table 14 Models 6 and 10

Hersteller:									Prüfdatum:	17.05.2007
Typ:									Temperatur [°C]	25
Spannung:	200-240 V 50/60 Hz	Imax	13A@230 V	(12.5 A@240V)						
Leistung:	3000 VA	2100 W	Klasse	VFI-SS-111		Online, Double conversion			Rel. Feuchte [%rH]	31
Modell-Nr:	**M6-VFI-3000/2100**									

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	221.7	228.6	2.913	2.304	627.2	526.5	100.7	83.9
		50%	P_N	221.9	226.9	5.424	4.657	1196.4	1056.1	140.3	88.3
		75%	P_N	220.6	225.9	8.039	6.975	1770.1	1575.3	194.8	89.0
		100%	P_N	220.3	225.1	10.8	9.346	2372	2104	268	88.7
	Non-lineare-Load as per IEC 62040-3	25%	S_N	222.1	232.7	2.806	3.211	605.3	502.7	102.6	83.0
		50%	S_N	220.8	231.4	5.601	6.517	1231.1	1079	152.1	87.6
		75%	S_N	220.1	230.9	8.364	9.805	1835.2	1613	222.2	87.9
		100%	S_N	218.7	230.7	10.975	13.042	2373	2059	314	86.8
	Maximum output current	λ:=	0.70	220.2	230.5	11.076	13.042	2426	2100	326	86.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			223.1	Unom	0.493	0	68.78	0	68.78	

Hersteller:									Prüfdatum:	21.05.2007
Typ:									Temperatur [°C]	26
Spannung:	200-240 V 50/60 Hz	Imax:	13A@230	12.5 A@240V						
Leistung:	3000 VA	2400 W	Klasse	VFI-SS-111		Online, Double conversion			Rel. Feuchte [%r.H.	42
Modell-Nr:	**M10-VFI-3000/2400**									

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.1	231.8	3.264	2.632	734.7	606.8	127.9	82.6
		50%	P_N	229.9	231.2	6.030	5.238	1380.4	1212.2	168.25	87.8
		75%	P_N	229.4	231.0	8.974	7.890	2054.0	1822.2	231.8	88.7
		100%	P_N	228.5	230.8	11.987	10.468	2730.0	2416.0	314.0	88.5
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.2	231.7	2.891	3.285	646.7	527.9	118.75	81.6
		50%	S_N	230.4	231.2	5.350	6.551	1223.9	1062.3	161.6	86.8
		75%	S_N	229.8	230.2	7.738	9.815	1770.1	1560.0	210.1	88.1
		100%	S_N	228.9	231.0	10.664	13.102	2428.0	2145.0	283.0	88.3
	Maximum output current	λ:=	0.71	228.9	230.8	10.886	13.328	2479.0	2178.0	301.0	87.9
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby	Power-ON-Mode		231.7	Unom	0.639		76.060		76.060	
	Standby	Power-OFF-Mode		231.8	Unom	0.468		34.270		34.270	

Table 15 Models 17 and 7

Hersteller:									Prüfdatum:	04.07.2007
Typ:									Temperatur [°C]	
Spannung:	208 - 264V 50/ 60 Hz									24.4
Leistung:	2000 VA	1400 W	Klasse	VFI-SS-111					Rel. Feuchte [%r.H.]	
Modell-Nr:	**M17-VFI-2000/1400**									31

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	222.0	232.2	2.060	1.529	436.2	354.9	81.30	81.4
		50%	P_N	221.0	232.2	3.761	3.044	812.0	707.5	104.50	87.1
		75%	P_N	220.6	231.8	5.491	4.580	1194.6	1061.2	133.40	88.8
		100%	P_N	220.4	231.4	7.270	6.102	1583.8	1411.7	172.10	89.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	222.0	232.6	2.056	2.182	436.4	355.9	80.50	81.6
		50%	S_N	221.6	232.3	3.746	4.349	814.2	704.6	109.60	86.5
		75%	S_N	220.6	231.9	5.546	6.540	1208.4	1062.1	146.30	87.9
		100%	S_N	220.4	231.6	7.362	8.734	1606.6	1416.0	190.60	88.1
	Maximum output current	λ:=	0.70	223.1	229.2	8.358	9.984	1823.6	1597.8	225.80	87.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			222.6	Unom	0.523		61.80	0	61.80	
Surge Protected Output		50%	P_N	221.4	220.0	3.368	3.204	736.0	704.6	31.40	95.7
	Resistive load	100%	P_N	220.4	217.4	6.662	6.510	1463.8	1414.8	49.00	96.7
	Non-lineare-Load as per IEC 62040-3	50%	S_N	221.4	219.9	4.698	4.595	754.1	717.8	36.30	95.2
		100%	S_N	220.0	216.7	9.408	9.311	1506.0	1434.4	71.60	95.2
	Maximum output current	λ:=	0.71	219.8	216.4	10.120	10.016	1625.2	1546.4	78.80	95.2
	Asymmetrical non-linear load as per IEC 62040-3	keine Begrenzung bei 130% Last									
	Standby			222.2	Unom	0.606		26.74		26.74	

Hersteller:									Prüfdatum:	28.06.2007
Typ:										Temperatur
Spannung:	220-240 V 50/60 Hz									24.4°C
Leistung:	800VA	560 W	Klasse	VFI-SS-111			double Conversion/ Online			Rel. Feuchte
Modell-Nr:	**M7-VFI-800/560**									27%rH

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.6	229.8	1.116	0.624	218.1	143.2	74.81	65.7
		50%	P_N	231.5	230.0	1.601	1.239	344.4	284.8	59.60	82.7
		75%	P_N	231.2	230.0	2.255	1.870	501.6	430.0	71.60	85.7
		100%	P_N	231.1	229.0	2.885	2.468	649.2	564.8	84.40	87.0
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	230.2	1.007	0.902	199.4	143.7	55.74	72.1
		50%	S_N	231.8	229.2	1.849	1.706	333.3	275.2	58.10	82.6
		75%	S_N	231.4	229.6	2.201	2.534	488.2	399.6	88.60	81.9
		100%	S_N	231.2	229.4	2.874	3.542	648.0	563.0	85.00	86.9
	Maximum output current	λ:=	0.68	230.9	229.2	3.080	3.832	700.4	599.8	100.60	85.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.7	Unom	0.236	0	34.39	0	34.39	
Bypass Mode		50%	P_N	231.6	229.4	1.329	1.240	302.0	284.3	17.70	94.1
	Resistive load	100%	P_N	231.2	228.6	2.538	2.460	584.3	561.8	22.50	96.1
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.6	230.2	1.792	1.692	295.2	259.4	35.85	87.9
		100%	S_N	231.2	229.0	3.643	3.555	595.8	568.8	27.00	95.5
	Maximum output current	λ:=	0.70	231.2	228.9	3.910	3.820	637.4	609.0	28.40	95.5
	Asymmetrical non-linear load as per IEC 62040-3	keine Begrenzung bei 130% Last									
	Standby			231.7	Unom	0.277		14.65		14.65	

Table 16 Models 18 and 19

Hersteller:									Prüfdatum:	06.07.2007
Typ:									Temperatur [°C]	
Spannung:	230 VAC									24.3
Leistung:	1000 VA	700 W	Klasse	VFI-SS-111					Rel. Feuchte [%r.H.]	
Modell-Nr:	**M19-VFI-1000/700**			Bei 100% Last schaltet das Gerät auf Bypass uml						31

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	222.8	229.8	1.143	0.786	234.0	180.6	53.36	77.2
		50%	P_N	223.4	229.2	1.953	1.554	419.2	355.6	63.60	84.8
		75%	P_N	222.6	228.8	2.864	2.327	615.0	532.6	82.40	86.6
		100%	P_N	221.8	228.2	3.770	3.100	821.2	707.4	113.80	86.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	223.4	229.4	1.122	1.118	231.2	176.9	54.32	76.5
		50%	S_N	222.8	228.8	1.993	2.228	430.0	359.0	71.00	83.5
		75%	S_N	222.7	228.7	2.931	3.322	634.4	537.6	96.80	84.7
		100%	S_N	222.8	226.5	3.804	4.306	834.0	697.6	136.4	83.6
	Maximum output current	λ:=	0.72	222.8	226.5	3.804	4.306	834.0	697.6	136.40	83.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby	Power-On		223.5	Unom	0.299		44.42	0	44.42	
	Standby	Power-Off		223.2	Unom	0.146		4.42		4.42	

Hersteller:									Prüfdatum:	06.07.2007
Typ:									Temperatur [°C]	
Spannung:	230 VAC						Flachstecker/ Crimpanschluss			24.1
Leistung:	1000 VA	700 W	Klasse	VFI-SS-111					Rel. Feuchte [%r.H.	
Modell-Nr:	**M18-VFI-1000/700**			schwingt mit nichtlinearer Last						33

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	221.7	230.2	1.135	0.780	216.9	179.4	37.55	82.7
		50%	P_N	221.4	229.8	1.948	1.552	402.4	366.6	45.80	88.6
		75%	P_N	221.6	229.1	2.758	2.318	589.0	532.0	57.00	90.3
		100%	P_N	220.8	229.2	3.590	3.084	782.0	706.9	75.10	90.4
	Non-lineare-Load as per IEC 62040-3	25%	S_N	222.2	230.4	1.130	1.111	216.4	179.0	37.40	82.7
		50%	S_N	222.8	230.0	1.934	2.206	401.2	353.8	47.40	88.2
		75%	S_N	222.6	229.8	2.824	3.317	608.5	546.0	62.50	89.7
		100%	S_N	223.2	229.5	3.548	4.394	779.6	701.4	78.20	90.0
	Maximum output current	λ:=	0.70	223.1	229.6	3.774	4.678	832.4	748.6	83.80	89.9
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			222.2	Unom	0.283		28.47	0	28.47	

Table 17 Models 20 and 21

Hersteller:								Prüfdatum:	09.07.2007
Typ:								Temperatur[°C]	
Spannung:	220-240 V 50/60 Hz								24.1
Leistung:	1250VA	875 W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M20-VFI-1250/875**								40

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{tOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	224.1	229.3	1.257	0.972	271.8	223.1	48.70	82.1
		50%	P_N	223.3	229.0	2.301	1.942	511.4	444.6	66.80	86.9
		75%	P_N	222.9	228.7	3.401	2.902	756.7	663.6	93.10	87.7
		100%	P_N	222.4	228.6	4.536	3.839	1006.8	877.0	129.80	87.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	224.3	229.2	1.254	1.394	270.9	220.4	50.50	81.4
		50%	S_N	223.4	228.8	2.302	2.765	510.6	438.4	72.20	85.9
		75%	S_N	222.6	228.6	3.522	4.172	782.6	673.2	109.40	86.0
		100%	S_N	225.2	227.5	4.478	4.878	1002.5	855.2	147.30	86.3
	Maximum output current	λ:=	0.77	225.2	227.5	4.478	4.878	1002.5	855.2	147.30	86.3
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby	teilweise 0.552 A, 89.02 W		224.4	Unom	0.158	0	5.16	0	5.16	
Bypass Mode		50%	P_N	227.1	226.1	2.096	1.911	474.6	432.1	42.50	91.0
	Resistive load	100%	P_N	226.4	224.4	4.058	3.834	919.6	860.6	59.00	93.6
	Non-lineare-Load as per IEC 62040-3	50%	S_N	227.4	226.0	2.913	2.826	498.7	444.3	54.40	89.1
		100%	S_N	226.0	223.6	5.504	5.426	948.5	857.4	91.10	90.4
	Maximum output current	λ:=	0.71	226.0	223.6	5.504	5.426	948.5	857.4	91.10	90.4
	Asymmetrical non-linear load as per IEC 62040-3	keine Begrenzung bei 130% Last									
	Standby	teilweise 0.552 A, 89.02 W		224.4	Unom	0.158		5.16		5.16	

Hersteller:								Prüfdatum:	08.08.2007
Typ:									Temperatur [°C]
Spannung:	220 - 264V 50/ 60 Hz								25
Leistung:	2000 VA	1400 W	Klasse	**VFI-SS-111**					Rel. Feuchte [%rH]
Modell-Nr:	**M21-VFI-2000/1400**								40

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{tOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	224.4	231.0	1.257	1.547	475.7	357.2	118.50	75.1
		50%	P_N	223.9	230.6	2.301	3.064	867.8	707.6	160.20	81.5
		75%	P_N	223.3	230.2	3.401	4.618	1253.0	1062.4	190.60	84.8
		100%	P_N	223.4	230.0	4.536	6.156	1604.6	1415.2	189.40	88.2
	Non-lineare-Load as per IEC 62040-3	25%	S_N	224.3	231.1	1.254	2.193	437.6	349.5	88.10	79.9
		50%	S_N	222.9	230.6	2.302	4.392	888.7	712.9	175.80	80.2
		75%	S_N	223.3	230.3	3.522	6.568	1215.5	1054.7	160.80	86.8
		100%	S_N	222.6	229.9	4.478	8.756	1617.3	1422.6	194.70	88.0
	Maximum output current	λ:=	0.70	222.7	229.9	4.478	8.985	1690.6	1455.0	235.60	86.1
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			224.6	Unom	0.966	0	93.24	0	93.24	

Table 18 Models 23 and 14

Hersteller:								Prüfdatum:	10.07.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz								24.6
Leistung:	700 VA	490W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M23-VFI-700/480**								32

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{tOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	225.4	232.8	0.837	0.544	175.0	126.4	48.51	72.3
		50%	P_N	225.2	232.0	1.435	1.098	312.6	254.7	57.90	81.5
		75%	P_N	225.1	232.6	1.980	1.606	439.4	373.6	65.80	85.0
		100%	P_N	225.6	231.8	2.574	2.143	574.4	496.6	77.80	86.5
	Non-lineare-Load as per IEC 62040-3	25%	S_N	225.8	232.8	0.836	0.774	164.9	125.4	39.51	76.0
		50%	S_N	227.0	230.7	1.395	1.531	303.2	246.4	56.80	81.3
		75%	S_N	225.2	232.3	1.937	2.294	429.8	365.8	64.00	85.1
		100%	S_N	224.0	232.0	2.586	3.058	571.8	497.4	74.40	87.0
	Maximum output current	λ:=	0.70	224.4	231.8	2.466	3.200	595.0	517.9	77.10	87.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			225.4	Unom	0.242		40.74	0	40.74	

Hersteller:								Prüfdatum:	05.07.2007
Typ:									Temperatur [°C]
Spannung:	230 VAC								24.1
Leistung:	1000 VA	700 W	Klasse	**VFI-SS-111**				defekt bei 100% nichtlinearer	Rel. Feuchte [%r.H
Modell-Nr:	**M14-VFI-1000/750**								33

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{tOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	223.6	230.4	1.305	0.780	281.0	179.7	101.29	64.0
		50%	P_N	224.0	230.2	2.170	1.555	477.4	357.8	119.60	74.9
		75%	P_N	224.9	230.0	3.016	2.314	670.6	532.2	138.40	79.4
		100%	P_N	224.4	229.8	3.915	3.077	870.2	707.0	163.20	81.2
	Non-lineare-Load as per IEC 62040-3	25%	S_N	225.6	230.1	1.324	1.112	283.5	178.4	105.11	62.9
	Elektronik ab 100% nichtlineare Last defekt!	50%	S_N	225.3	230.0	2.258	2.215	478.8	354.2	124.60	74.0
		75%	S_N	224.1	229.6	3.222	3.310	685.2	531.7	153.50	77.6
		100%	S_N	--	--	--	--	--	--	--	--
	Maximum output current	λ:=	--	--	--	--	--	--	--	--	--
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby	Power-On		223.4	Unom	0.517		95.04	0	95.04	

Table 19 Models 24 and 25

Hersteller:								Prüfdatum:	21.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz								23
Leistung:	1000 VA	700W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M24-VFI-1000/700**								40

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{tOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	221.4	230.2	1.116	0.768	244.0	176.6	67.31	72.4
		50%	P_N	221.7	229.7	1.979	1.533	436.0	351.8	84.20	80.7
		75%	P_N	221.2	229.1	2.869	2.299	631.3	525.7	105.65	83.3
		100%	P_N	219.9	228.9	3.812	3.058	834.2	699.5	134.70	83.9
	Non-lineare-Load as per IEC 62040-3	25%	S_N	221.3	229.9	1.120	1.097	244.5	175.1	69.44	71.6
		50%	S_N	220.5	229.6	1.993	2.187	435.7	347.9	87.80	79.8
		75%	S_N	220.0	229.4	2.911	3.293	636.0	523.7	112.35	82.3
		100%	S_N	218.8	228.6	3.943	4.385	857.1	701.0	156.10	81.8
	Maximum output current	λ:=	0.70	220.7	228.7	4.008	4.425	872.0	709.6	162.40	81.4
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			221.5	Unom	0.230	0.000	54.6	0.0	54.59	

Hersteller:								Prüfdatum:	21.08.2007
Typ:									Temperatur [°C]
Spannung:	220-240 V 50/60 Hz								23.1
Leistung:	2000 VA	1400W	Klasse	**VFI-SS-111**				double Conversion/ Online	Rel. Feuchte [%rH]
Modell-Nr:	**M25-VFI-2000/1400**								40

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{tOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	222.2	228.5	2.091	1.549	459.7	355.3	104.45	77.3
		50%	P_N	222.2	228.8	3.800	3.070	838.5	702.5	135.95	83.8
		75%	P_N	221.4	228.4	5.620	4.613	1238.8	1053.1	185.70	85.0
		100%	P_N	220.5	227.6	7.548	6.186	1657.2	1408.3	248.85	85.0
	Non-lineare-Load as per IEC 62040-3	25%	S_N	224.0	229.5	2.063	2.200	455.0	348.6	106.45	76.6
		50%	S_N	222.6	228.9	3.844	4.445	849.2	701.7	147.50	82.6
		75%	S_N	221.5	228.2	5.712	6.598	1257.3	1049.7	207.65	83.5
		100%	S_N	221.1	227.1	7.803	8.851	1715.1	1418.0	297.15	82.7
	Maximum output current	λ:=	0.70	220.7	227.1	7.894	8.938	1731.9	1423.0	308.90	82.2
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			224.1	Unom	0.444	0.000	87.2	0.0	87.23	

Table 20 Models 37 and 38

Hersteller:								Prüfdatum:	24.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							27.5	
Leistung:	1000 VA	700W	Klasse	VFI-SS-111		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	M37-VFI-1000/700							31	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	232.0	1.150	0.770	241.4	178.6	62.79	74.0
		50%	P_N	231.5	232.4	2.006	1.580	444.5	367.0	77.45	82.6
		75%	P_N	231.2	231.7	2.776	2.297	624.5	531.8	92.70	85.2
		100%	P_N	231.0	232.3	3.590	3.026	814.0	702.3	111.70	86.3
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	231.2	1.095	1.004	229.3	167.9	61.37	73.2
		50%	S_N	231.4	232.4	1.876	1.994	414.7	338.6	76.10	81.6
		75%	S_N	231.2	231.9	2.680	3.013	601.0	507.2	93.80	84.4
		100%	S_N	231.0	232.3	3.610	4.157	812.1	695.4	116.65	85.6
	Maximum output current	λ:=	0.68	230.9	231.9	3.886	4.734	876.1	749.3	126.75	85.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.324	0.000	44.7	0.0	44.69	
Bypass Mode		50%	P_N	231.5	229.4	1.658	1.560	379.1	357.6	21.50	94.3
	Resistive load	100%	P_N	231.1	228.3	3.176	3.088	731.6	704.7	26.95	96.3
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.5	229.8	2.245	2.117	370.4	347.3	23.10	93.8
		100%	S_N	231.1	228.6	4.508	4.360	740.2	707.2	33.05	95.5
	Maximum output current	λ:=	0.70	231.0	228.6	4.769	4.596	787.2	740.3	46.95	94.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			232.0	Unom	0.259	0.000	18.4	0.0	18.44	

Hersteller:								Prüfdatum:	29.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							22.6	
Leistung:	1500 VA	1050W	Klasse	VFI-SS-111		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	M38-VFI-1500/1050							53	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.5	232.3	1.551	1.150	330.1	267.1	63.00	80.9
		50%	P_N	231.2	230.6	2.754	2.294	609.0	529.0	80.00	86.9
		75%	P_N	230.9	231.2	4.013	3.427	896.5	792.1	104.45	88.3
		100%	P_N	230.6	230.5	5.296	4.595	1187.3	1058.9	128.35	89.2
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.5	231.3	1.430	1.562	319.1	254.1	64.95	79.6
		50%	S_N	231.1	232.1	2.665	3.131	604.3	520.5	83.88	86.1
		75%	S_N	230.8	231.8	3.953	4.667	881.3	765.1	116.20	86.8
		100%	S_N	230.6	231.9	5.261	6.207	1171.7	1027.9	143.80	87.7
	Maximum output current	λ:=	0.69	230.2	230.9	5.705	6.982	1268.4	1108.0	160.45	87.4
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.415	0.000	47.6	0.0	47.65	
Bypass Mode		50%	P_N	231.3	228.6	2.382	2.274	543.7	519.7	24.05	95.6
	Resistive load	100%	P_N	230.7	227.0	4.766	4.670	1095.9	1059.3	36.60	96.7
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.3	228.4	3.200	3.059	535.9	505.2	30.75	94.3
		100%	S_N	230.6	227.1	6.175	6.050	1044.5	997.2	47.30	95.5
	Maximum output current	λ:=	0.70	230.5	227.2	7.221	7.087	1173.1	1121.6	51.60	95.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.389	0.000	18.3	0.0	18.31	

Table 21 Models 39 and 40

Hersteller:								Prüfdatum:	30.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							25.6	
Leistung:	2000 VA	1400W	Klasse	VFI-SS-111		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	M39-VFI-2000/1400							42	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.4	229.6	2.059	1.530	446.9	351.2	95.75	78.6
		50%	P_N	231.1	228.2	3.690	3.089	830.4	704.8	125.60	84.9
		75%	P_N	230.5	228.9	5.366	4.624	1217.0	1057.7	159.30	86.9
		100%	P_N	230.0	227.1	7.022	6.209	1599.9	1409.5	190.40	88.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.4	228.5	1.985	2.106	437.4	334.9	102.55	76.6
		50%	S_N	231.0	228.4	3.492	4.143	784.6	660.6	124.05	84.2
		75%	S_N	230.6	229.3	5.167	6.237	1164.0	997.8	166.20	85.7
		100%	S_N	230.2	228.1	6.720	8.263	1512.4	1322.5	189.95	87.4
	Maximum output current	λ:=	0.67	230.1	228.2	7.278	9.196	1635.5	1413.2	222.30	86.4
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.459	0.000	65.0	0.0	64.96	
Bypass Mode		50%	P_N	231.1	228.7	3.227	3.081	741.5	704.4	37.15	95.0
	Resistive load	100%	P_N	228.2	226.4	6.373	6.238	1465.3	1411.6	53.65	96.3
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.2	228.9	4.223	4.131	715.0	672.3	42.65	94.0
		100%	S_N	230.4	226.8	8.105	8.022	1387.0	1318.5	68.50	95.1
	Maximum output current	λ:=	0.69	230.2	226.4	9.372	9.277	1524.2	1441.1	83.15	94.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			232.0	Unom	0.405	0.000	30.0	0.0	29.99	

Hersteller:								Prüfdatum:	29.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							26.9	
Leistung:	3000 VA	2100W	Klasse	VFI-SS-111		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	M40-VFI-3000/2100							47	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.1	229.5	3.037	2.306	650.3	529.0	121.30	81.3
		50%	P_N	230.5	227.0	5.499	4.664	1224.8	1057.7	167.15	86.4
		75%	P_N	229.8	227.6	7.947	6.966	1809.8	1584.7	225.05	87.6
		100%	P_N	229.1	226.1	10.630	9.361	2417.5	2116.5	301.00	87.5
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.2	229.6	2.820	3.100	629.6	506.1	123.55	80.4
		50%	S_N	230.6	229.8	5.269	6.266	1194.4	1018.6	175.80	85.3
		75%	S_N	229.9	227.8	7.881	9.227	1789.3	1489.3	300.05	83.2
		100%	S_N	229.2	226.1	10.527	12.233	2386.0	1971.9	414.15	82.6
	Maximum output current	λ:=	0.70	228.2	225.9	11.620	13.980	2628.5	2197.5	431.00	83.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.559	0.000	76.4	0.0	76.43	
Bypass Mode		50%	P_N	230.7	227.3	4.799	4.661	1103.4	1058.9	44.50	96.0
	Resistive load	100%	P_N	229.4	223.1	9.669	9.485	2217.0	2115.0	102.00	95.4
	Non-lineare-Load as per IEC 62040-3	50%	S_N	230.6	227.4	6.265	6.181	1071.5	1014.8	56.70	94.7
		100%	S_N	229.5	223.7	11.893	11.744	2086.5	1939.1	147.45	92.9
	Maximum output current	λ:=	0.71	229.1	222.5	14.053	13.959	2356.5	2197.0	159.50	93.2
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.417	0.000	29.8	0.0	29.78	

Table 22 Models 41 and 42

Hersteller:								Prüfdatum:	17.01.1902
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							0	
Leistung:	1000 VA	700W	Klasse	VFI-SS-111		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	M41-VFI-1000/700							0	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	233.0	1.137	0.773	242.7	180.1	62.63	74.2
		50%	P_N	231.4	232.5	1.952	1.542	433.0	358.4	74.65	82.8
		75%	P_N	230.6	232.2	2.754	2.268	620.1	529.8	90.30	85.4
		100%	P_N	231.0	232.1	3.585	3.030	812.1	702.9	109.25	86.5
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	231.9	1.081	1.005	229.5	168.7	60.82	73.5
		50%	S_N	231.5	232.8	1.882	2.006	417.2	341.5	75.70	81.9
		75%	S_N	231.2	232.6	2.684	3.012	600.0	507.8	92.20	84.6
		100%	S_N	230.9	232.8	3.636	4.197	816.5	701.2	115.30	85.9
	Maximum output current	λ:=	0.72	230.8	231.4	4.030	4.693	905.3	776.5	128.85	85.8
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.324	0.000	45.3	0.0	45.25	
Bypass Mode		50%	P_N	231.5	229.2	1.617	1.520	369.9	348.3	21.60	94.2
	Resistive load	100%	P_N	231.1	228.3	3.170	3.082	730.2	703.3	26.85	96.3
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.5	229.2	2.205	2.083	365.8	341.5	24.30	93.4
		100%	S_N	231.0	228.7	4.512	4.382	739.9	707.2	32.65	95.6
	Maximum output current	λ:=	0.71	231.0	228.7	4.737	4.632	781.1	753.7	27.45	96.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			232.0	Unom	0.254	0.000	18.2	0.0	18.16	

Hersteller:								Prüfdatum:	24.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							27.5	
Leistung:	1500 VA	1050W	Klasse	VFI-SS-111		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	M42-VFI-1500/1050							31	

	Parameters			Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.6	231.1	1.551	1.151	325.0	265.9	59.10	81.8
		50%	P_N	231.2	230.8	2.764	2.296	609.4	529.5	79.90	86.9
		75%	P_N	230.9	230.9	4.021	3.437	897.0	793.3	103.75	88.4
		100%	P_N	230.5	229.9	5.315	4.607	1186.7	1058.8	127.85	89.2
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.5	230.8	1.421	1.557	318.3	252.4	65.85	79.3
		50%	S_N	231.2	231.5	2.663	3.151	605.2	520.6	84.60	86.0
		75%	S_N	230.8	230.5	3.911	4.642	865.8	755.1	110.75	87.2
		100%	S_N	230.5	230.9	5.244	6.196	1162.3	1020.2	142.15	87.8
	Maximum output current	λ:=	0.68	230.4	230.6	5.723	7.047	1266.3	1108.5	157.75	87.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.416	0.000	48.3	0.0	48.35	
Bypass Mode		50%	P_N	231.3	228.3	2.426	2.323	555.0	529.9	25.05	95.5
	Resistive load	100%	P_N	230.6	227.0	4.746	4.662	661.4	642.4	19.00	97.1
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.2	229.0	3.275	3.143	544.2	517.6	26.60	95.1
		100%	S_N	230.6	1222.3	6.199	6.077	1047.0	1001.6	45.45	95.7
	Maximum output current	λ:=	0.68	230.6	227.3	7.262	7.125	1160.9	1107.8	53.05	95.4
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.364	0.000	17.2	0.0	17.15	

Table 23 Models 43 and 44

Hersteller:								Prüfdatum:	29.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							22.6	
Leistung:	2000 VA	1400W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M43-VFI-2000/1400**							53	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.4	230.2	2.013	1.534	433.7	353.1	80.60	81.4
		50%	P_N	230.8	231.2	3.732	3.050	837.5	705.0	132.50	84.2
		75%	P_N	230.5	230.1	5.337	4.603	1211.5	1058.7	152.80	87.4
		100%	P_N	229.9	228.8	7.013	6.170	1596.8	1411.0	185.75	88.4
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.3	229.7	2.007	2.114	444.1	337.6	106.50	76.0
		50%	S_N	231.0	230.0	3.447	4.181	771.8	671.0	100.80	86.9
		75%	S_N	230.6	230.6	5.135	6.236	1157.8	1005.6	152.15	86.9
		100%	S_N	230.1	231.2	6.938	8.398	1562.5	1363.8	198.70	87.3
	Maximum output current	λ:=	0.68	230.7	229.0	7.409	9.227	1674.2	1440.1	234.10	86.0
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.454	0.000	64.4	0.0	64.45	
Bypass Mode		50%	P_N	231.1	228.9	3.215	3.077	739.1	704.1	35.05	95.3
	Resistive load	100%	P_N	230.2	226.7	6.445	6.224	1479.9	1411.9	67.95	95.4
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.2	229.0	4.230	4.151	714.0	675.1	38.85	94.6
		100%	S_N	230.4	226.9	8.129	8.053	1386.9	1321.9	64.95	95.3
	Maximum output current	λ:=	0.69	230.2	226.8	9.218	9.134	1503.3	1428.9	74.40	95.1
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.382	0.000	28.5	0.0	28.46	

Hersteller:								Prüfdatum:	30.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							25.6	
Leistung:	3000 VA	2100W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M44-VFI-3000/2100**							42	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.1	231.1	2.900	2.274	634.4	525.3	109.15	82.8
		50%	P_N	230.4	230.1	5.397	4.601	1216.1	1058.0	158.10	87.0
		75%	P_N	229.9	230.3	7.872	6.896	1786.4	1587.3	199.10	88.9
		100%	P_N	229.2	229.2	10.490	9.228	2387.0	2114.0	273.00	88.6
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.1	231.5	2.867	3.174	633.6	513.7	119.90	81.1
		50%	S_N	230.5	231.5	5.226	6.374	1181.5	1021.9	159.60	86.5
		75%	S_N	229.7	230.7	8.335	9.668	1890.6	1564.4	326.25	82.7
		100%	S_N	229.1	230.3	10.614	12.957	2404.5	2059.5	345.00	85.7
	Maximum output current	λ:=	0.69	228.8	228.9	11.609	14.205	2624.5	2252.0	372.50	85.8
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.509	0.000	73.1	0.0	73.06	
Bypass Mode		50%	P_N	230.6	228.0	4.770	4.641	1097.5	1057.8	39.65	96.4
	Resistive load	100%	P_N	229.4	225.3	9.524	9.401	2184.0	2117.5	66.50	97.0
	Non-lineare-Load as per IEC 62040-3	50%	S_N	230.7	228.5	6.270	6.187	1052.2	1006.5	45.75	95.7
		100%	S_N	229.5	226.0	12.203	12.121	2067.5	1980.2	87.35	95.8
	Maximum output current	λ:=	0.70	228.5	225.6	14.473	14.402	2350.5	2263.5	87.00	96.3
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.8	Unom	0.401	0.000	26.8	0.0	26.82	

Table 24 Models 45 and 46

Hersteller:								Prüfdatum:	24.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							27.5	
Leistung:	1000 VA	700W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M45-VFI-1000/700**							31	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.1	231.0	1.133	0.767	234.9	177.1	57.80	75.4
		50%	P_N	231.9	230.8	1.885	1.530	421.9	352.9	69.00	83.6
		75%	P_N	230.1	230.6	2.721	2.297	612.2	529.5	82.70	86.5
		100%	P_N	233.2	230.5	3.505	3.068	804.2	706.9	97.25	87.9
	Non-lineare-Load as per IEC 62040-3	25%	S_N	232.0	231.0	1.092	1.056	226.3	170.9	55.38	75.5
		50%	S_N	231.9	230.8	1.844	2.100	410.8	343.4	67.40	83.6
		75%	S_N	231.7	230.6	2.622	3.165	593.2	512.7	80.45	86.4
		100%	S_N	232.0	230.5	3.504	4.362	798.8	700.2	98.65	87.7
	Maximum output current	λ:=	0.70	231.6	230.4	3.738	4.637	851.8	746.6	105.20	87.6
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.9	Unom	0.474	0.000	56.9	0.0	56.85	

Hersteller:								Prüfdatum:	30.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							25.6	
Leistung:	2000 VA	1400W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M46-VFI-2000/1400**							42	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	229.8	229.7	2.034	1.538	435.2	353.1	82.15	81.1
		50%	P_N	230.9	229.4	3.615	3.073	817.6	704.5	113.05	86.2
		75%	P_N	233.0	228.9	5.175	4.623	1194.6	1057.7	136.90	88.5
		100%	P_N	227.5	228.4	7.010	6.179	1583.5	1410.8	172.70	89.1
	Non-lineare-Load as per IEC 62040-3	25%	S_N	230.8	229.8	1.991	2.099	423.9	338.6	85.30	79.9
		50%	S_N	230.3	229.4	3.389	4.101	763.6	663.8	99.80	86.9
		75%	S_N	229.8	229.0	5.020	6.140	1140.0	993.4	146.60	87.1
		100%	S_N	227.9	228.6	6.894	8.119	1546.7	1318.9	227.80	85.3
	Maximum output current	λ:=	0.69	227.7	228.4	7.439	9.153	1681.9	1452.8	229.05	86.4
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.5	Unom	0.716	0.000	57.3	0.0	57.34	

Table 25 Model 47

Hersteller:								Prüfdatum:	31.08.2007
Typ:								Temperatur [°C]	
Spannung:	220-240 V 50/60 Hz							26.4	
Leistung:	3000 VA	2100W	Klasse	**VFI-SS-111**		double Conversion/ Online		Rel. Feuchte [%rH]	
Modell-Nr:	**M47-VFI-3000/2100**							30	

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{Out}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	231.7	231.9	2.944	2.282	634.6	529.0	105.65	83.4
		50%	P_N	228.9	231.3	5.275	4.576	1182.9	1058.7	124.20	89.5
		75%	P_N	232.5	230.9	7.717	6.880	1775.3	1588.0	187.25	89.5
		100%	P_N	225.7	230.5	10.538	9.188	2359.5	2117.5	242.00	89.7
	Non-lineare-Load as per IEC 62040-3	25%	S_N	232.9	232.0	2.809	3.192	605.6	516.9	88.65	85.4
		50%	S_N	231.8	231.5	5.080	6.374	1153.0	1021.5	131.45	88.6
		75%	S_N	231.2	231.0	7.613	9.595	1741.9	1560.0	181.95	89.6
		100%	S_N	231.3	230.6	10.032	12.785	2301.0	2046.5	254.50	88.9
	Maximum output current	λ:=	0.67	230.8	230.5	10.997	14.044	2516.5	2182.0	334.50	86.7
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			231.3	Unom	0.873	0.000	70.0	0.0	70.00	

9.6. TABLE OF MEASUREMENTS 3 VFD-UPS

Table 26 Models 8 and 9

Hersteller:									Prüfdatum:			28.06.2007		Hersteller														Prüfdatum:			29.06.2007		
Typ:											Temperatur [°C]			Typ:																	Temperatur [°C]		
Spannung:	220-240 V 50/60 Hz										22.8			Spannung:	220-240 V 50/60 Hz																24		
Leistung:	1000 VA	700 W	Klasse:	VFD Voltage and Frequency Dependent			Line Interactive				Rel. Feuchte [%r.H.]			Leistung:	2000 VA	1340 W	Klasse:	VFD Voltage and Frequency Dependent													Rel. Feuchte [%r.H.]		
Modell-Nr:	**M8-VFD-1000/800**										31			Modell-Nr:	**M9-VFD-2000/1340**																32		
	Parameters										Meassurements				Parameters										Meassurements									
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{lOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]		Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{lOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]											
Normal mode	Resistive load	25%	P_N	231.9	231.4	0.848	0.768	196.0	177.7	18.27	90.7	Normal mode	Resistive load	25%	P_N	231.8	230.6	1.6216	1.5021	373.8	346.4	27.4	92.7											
		50%	P_N	231.6	230.7	1.647	1.507	380.7	354.2	26.50	93.0			50%	P_N	231	229.6	3.069	2.954	708	677.8	30.2	95.7											
		75%	P_N	231.4	230.2	2.384	2.206	550.9	530.2	20.70	96.2			75%	P_N	230.7	228.4	4.562	4.448	1051.8	1016	35.8	96.6											
		100%	P_N	231.2	229.6	3.174	2.898	736.0	705.8	30.20	95.9			100%	P_N	230.2	227.3	6.069	5.958	1396.6	1353.6	43	96.9											
	Non-lineare-Load as per IEC 62040-3	25%	S_N	231.7	231.2	1.213	1.099	201.2	175.1	26.17	87.0		Non-lineare-Load as per IEC 62040-3	25%	S_N	231.6	230.8	2.21	2.166	374.8	346.4	28.4	92.4											
		50%	S_N	231.6	230.8	2.227	2.146	370.2	349.9	20.30	94.5			50%	S_N	231	229.5	4.266	4.216	718.8	683.5	35.3	95.1											
		75%	S_N	231.3	230.2	3.199	3.360	549.6	520.7	28.90	94.7			75%	S_N	230.6	228.6	6.266	6.221	1056.4	1010.6	45.8	95.7											
		100%	S_N	231.1	229.6	4.209	4.411	725.9	669.5	56.40	92.2			100%	S_N	230.1	227.2	8.26	8.196	1412.2	1345.2	67	95.3											
	Maximum output current	λ:=	0.72	231.0	229.4	4.625	4.403	765.5	724.3	41.20	94.6		Maximum output current	λ:=	0.71	230	226.6	9.614	9.556	1611.2	1538	73.2	95.5											
	Asymmetrical non-linear load as per IEC 62040-3												Asymmetrical non-linear load as per IEC 62040-3																					
	Standby			231.8	Unom	0.097	0	18.01	0	18.01			Standby			231.7	Unom	0.21	0	25.66	0	25.66												
Bypass Mode		50%	P_N	231.6	230.8	1.615	1.535	373.8	354.2	19.60	94.8																							
	Resistive load	100%	P_N	231.2	229.7	3.156	3.075	729.2	705.4	23.80	96.7																							
	Non-lineare-Load as per IEC 62040-3	50%	S_N	231.6	230.8	2.234	2.156	372.8	352.6	20.20	94.6																							
		100%	S_N	230.2	230.2	4.294	4.234	708.4	683.2	25.20	96.4																							
	Maximum output current	λ:=	0.64	230.8	229.6	5.804	5.714	932.8	839.8	93.00	90.0																							
	Asymmetrical non-linear load as per IEC 62040-3	keine Begrenzung bei 130% Last																																
	Standby			231.7	Unom	0.086		15.48		15.48																								

Table 27 Model 11

Hersteller:								Prüfdatum:	03.07.2007
Typ:									Temperatur [°C]
Spannung:	220-240 V 50/60 Hz	Imax	5A						24.4
Leistung:	350VA	210 W	Klasse	VFD SY 333					Rel. Feuchte [%r.H.]
Modell-Nr:	**M11-VFD-350/210**								41

Parameters				Meassurements							
	Load			U_{In} [V]	U_{Out} [V]	I_{In} [A]	I_{lOut}[A]	P_{In} [W]	P_{Out} [W]	P_V [W]	η[%]
Normal mode	Resistive load	25%	P_N	223.2	223.4	0.250	0.250	47.5	38.3	9.20	80.6
		50%	P_N	222.8	222.5	0.490	0.490	119.6	108.9	10.69	91.1
		75%	P_N	222.2	222.8	0.730	0.730	172.3	162.4	9.91	94.2
		100%	P_N	222.4	222.3	0.966	0.966	224.2	214.6	9.60	95.7
	Non-lineare-Load as per IEC 62040-3	25%	S_N	222.9	222.8	0.433	0.404	70.9	60.8	10.15	85.7
		50%	S_N	226.0	225.8	0.814	0.790	132.6	124.5	8.10	93.9
		75%	S_N	226.6	226.0	1.196	1.175	198.4	187.7	10.64	94.6
		100%	S_N	226.9	226.2	1.564	1.542	259.2	246.8	12.40	95.2
	Maximum output current	λ:=	0.69	222.2	222.4	1.648	1.625	261.3	249.6	11.70	95.5
	Asymmetrical non-linear load as per IEC 62040-3										
	Standby			223.5	Unom	0.082		9.87	0	9.87	
Surge Protected Output		50%	P_N	222.2	224.2	0.546	0.490	120.5	108.8	11.73	90.3
	Resistive load	100%	P_N	221.6	222.4	1.015	0.966	225.5	215.2	10.30	95.4
	Non-lineare-Load as per IEC 62040-3	50%	S_N	226.2	226.0	0.816	0.793	134.8	125.1	9.69	92.8
		100%	S_N	222.0	222.5	1.570	1.544	250.6	240.0	10.60	95.8
	Maximum output current	λ:=	0.70	222.7	222.0	2.088	2.066	332.6	320.4	12.20	96.3
	Asymmetrical non-linear load as per IEC 62040-3	keine Begrenzung bei 130% Last									
	Standby			223.5	Unom	0.081		11.30		11.30	