Uninterruptible Power System (UPS), THYRIC 5000 Series

Satoru Oishi,
Yasushi Watanabe,
Jun'ichi Watanabe,
Hisakazu Baba

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Abstract

In order to deliver high-quality power supply to our customers, we have been supplying Uninterruptible Power Systems (UPS) for a long time. We recently released a new type of 200V class UPS, THYRIC 5000 Series, in order to meet the markets need for higher efficiencies.

The new model realized greatly improved performance of more than 40% of elimination of losses (compared with our former products) and efficiency gain. This model met the requirements of voltage transient characteristics in accordance with the JEC-2433: 2003 Class 1.

In addition to the above, the replacement cycle has been improved in order to extend the operational life of its parts. Ease of maintenance has also been improved by using the monitoring function through Web brouser and optional reporting function via Internet mail services.

1　Preface

In our IT-oriented society, there is a significant rise of data volume and the importance of data over the world and the need for data management is becoming crucial. In addition, there is an increase in our level of awareness after experiencing the Great East Japan Earthquake in 2011.

People now believe that since "there is no absolute stable power of the grid, we may need to secure an in-house emergency power generation system." Such a belief has influenced the rising needs for Uninterruptible Power Systems (UPS).

With the rise of environmental awareness, the market shows an increased demand for environmentally conscious and high-efficient UPS.

This paper introduces a new type of 200V class UPS, Meiden THYRIC 5000 Series featuring improved performance and ease of maintenance to meet the charging market needs.
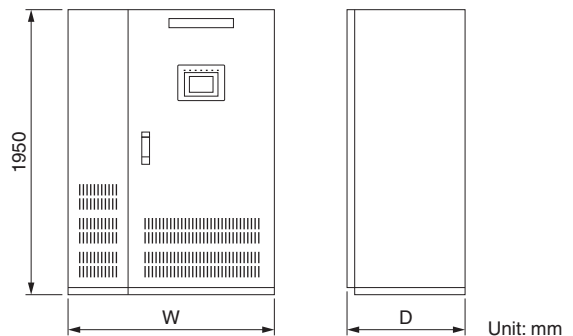
2　Specifications of THYRIC 5000 Series

Fig. 1 shows an external view and **Fig. 2** shows the outline drawing and external dimensions. **Table 1** shows external dimensions and mass. **Table 2** shows equipment specifications and capacities.

Fig. 1　THYRIC 5000

An external appearance of THYRIC 5000 is shown.

1950

W　　D　　Unit: mm

Fig. 2　External Image of THYRIC 5000

An external image of THYRIC 5000 UPS is shown. Characters W and D in this diagram correspond to those in **Table 1**.

Table 1 External Dimensions and Mass of THYRIC 5000

External dimensions and mass of the UPS main body are shown for THYRIC 5000 Series.

Capacity (kVA)	W (mm)	D (mm)	Mass (kg)
20	600	800	800
30	600	800	850
50	800	900	900
75	800	900	1100
100	900	900	1200
150	1100	900	1500
200	1200	900	1800
250	1400	1000	2000
300	1400	1000	2200

3 Features of THYRIC 5000 Series

Compared with our conventional model, THYRIC 3800 Series, the new product series features are introduced below.

3.1 Improvement of Efficiency and Performance

As a result of changing the control system and the main circuit configuration, we improved the loss level at more than 40% and realized an efficiency of the highest class in this industry. **Fig. 3** shows the efficiency curve of THYRIC 5000.

In regard to performance, the requirements of

Table 2 Specifications of THYRIC 5000 Series and Capacity Lineups

Specifications of THYRIC 5000 Series are shown.

| Item		Specifications	Remarks
Rated output capacity		20, 30, 50, 75, 100, 150, 200, 250, 300kVA	
AC input	Configuration	3-phase 3-wire	
	Rated voltage	200V・210・220V	For voltages other than those on the left, a transformer is installed on input side.
	Rated frequency	50Hz/60Hz	
	Permissible voltage deviation range	±10%	
	Permissible frequency deviation range	±5%	
	Input current distortion factor	Max. 3%	With rated I/O
Bypass	Configuration	3-phase 3-wire	
	Rated voltage	200, 210, 220V	
AC output	Configuration	3-phase 3-wire	
	Rated voltage	200, 210, 220V	
	Rated frequency	50Hz or 60Hz	
	Voltage control range	Rated voltage ±5%	
	Rated power factor	0.7 (lagging)〜1.0 Rated: 0.8/0.9	Within rated kW at power factor 0.9 or above
	Inverter overload	125% for 10 minutes, 150% for 1 minute	110% for 30 minutes
	Voltage accuracy	±1.0%	
	Voltage transient response	±2% Sudden change in AC power (±10%)	Conforming to JEC-2433: 2003 Class 1
		±2% Loss・return of AC power	
		±5% Sudden change in load (0⇔100%)	
		±5% Output changeover (Bypass⇔UPS)	
	Transient recovery	30ms Max.	
	Voltage unbalance*	2% at unbalanced load	
	Frequency accuracy	±0.01%	With internal oscillation
	External sync range	±1.5%	Setting possible at ±1.0〜5.0% (optional)
	Voltage THD	2.0% Max. (for linear load) 5.0% Max. (for 100% non-linear load)	
Installation environment	Cooling system	Forced air	
	Installation place	Indoors	
	Altitude	1000m or below	
	Ambient temperature / Relative humidity	0〜40℃ / 15〜90%	

Note: ∗ Voltage unbalance＝$\dfrac{\text{Max. output voltage} - \text{Min. output voltage}}{\text{Mean output voltage}}$

output voltage transient characteristics in accordance with the JEC-2433: 2003 Class 1. **Fig. 4** shows the voltage transient characteristics.
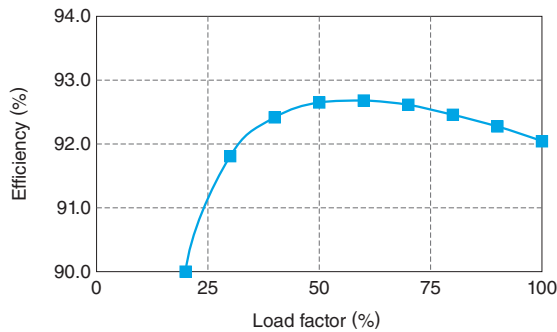
Fig. 3 Efficiency Curve of THYRIC 5000 (150kVA)

The relationship between UPS and load factor is shown.
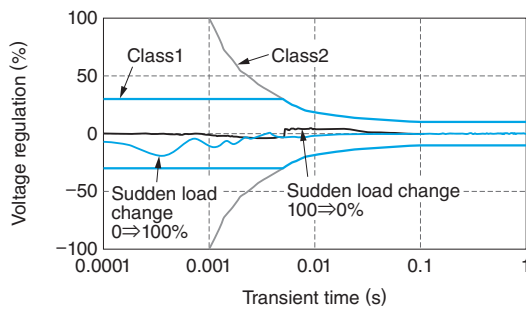
Fig. 4 Voltage Transient Characteristics

The voltage transient characteristic stated in JEC-2433: 2003 is compared with the characteristic of THYRIC 5000 Series. This diagram indicates that THYRIC 5000 meets the requirements of Class 1 if there is a sudden load change of 0 → 100%.

3.2 Compact Design

For the 250kVA and 300kVA models, the panel width has been reduced by 40% (compared with our conventional models) through the innovation of its parts.

3.3 Reduction of Parts Replacement Cost

In response to the market needs, the replacement cycle term for key parts has been improved. The cooling fan replacement is expected only once during the expected UPS life (15 years) and the control source unit and electrolytic condenser do not require replacement.

3.4 Improvement of Data Communication Functions

By adapting the data communication terminal (optional) for THYRIC 5000 Series, a variety of remote monitoring functions have become available.

Fig. 5 shows an illustration for functions at the data communication terminal. Data communication between UPS and the data communication terminal is supported by a serial transmission system (RS485). The data communication terminal is connected with an external PC through the Ethernet. Each function is explained below.
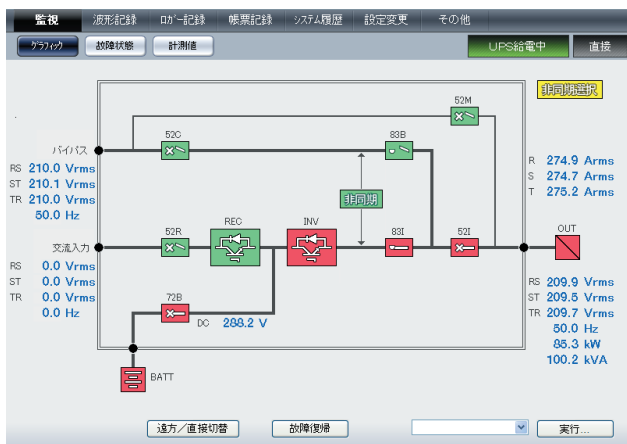
3.4.1 Monitoring Function

For the purpose of monitoring, it is possible to check the state of equipment and failures as well as values of telemetry. Monitoring is based on the three
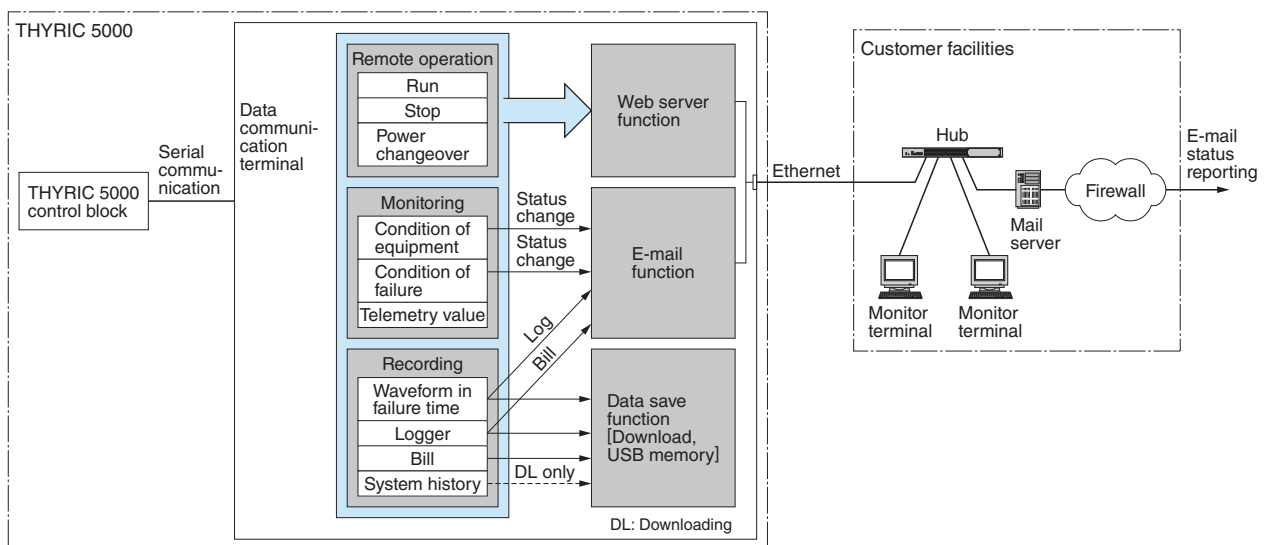

Fig. 5 Illustration on Functions at the Data Communication Terminal

Possible functions are shown when a data communication terminal is used and the data becomes available. This terminal provides various functions such as supervisory control by using a Web browser (IE, etc.), e-mail, data save (downloading via web-server, storage of data in USB memory), and others.

Gaining access to the data terminal through a Web browser, supervisory control can be carried out. At the main screen, the state of equipment operation and telemetry values in their respective blocks can be checked.

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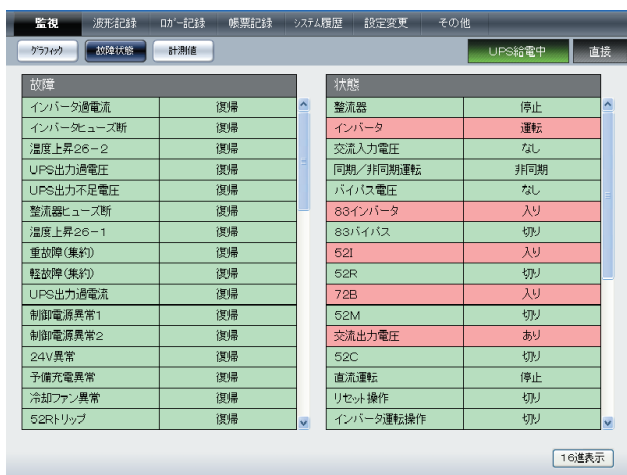
By clicking "Error Status" at the main screen of the data communication terminal, this kind of screen will appear. The detailed conditions of equipment failure and its status can be checked from these screens.

essential screens (see **Fig. 6**) including a typical Single Line Diagram (SLD) of the main circuit, the list-of-failures screen (see **Fig. 7**), and the telemetry screen. In the SLD screen, telemetry values and presence of any failure can be examined. In addition, the state of equipment can be identified in symbol colors (ON: red, OFF: green). In the list-of-failures screen, a failure in equipment and also the operational state of the UPS can be confirmed.

3.4.2 Recording Function

It is possible to save waveforms at the time of a failure as well as logged data, records of bills, and history of system operation.

（1） Waveforms at the time of a failure

A maximum of 16 log and trace files can be saved.

（2） Data logger function

When the preset condition for data recording changes, the preset telemetry data are recorded for duration of the preset time.

（3） Billing function

Three types of bills can be established in the format of daily report, monthly report, and annual report.

（4） Function for history of system operation

Equipment operation, the occurrence of failures, and a history of system operation can be reviewed in a time serial mode.

3.4.3 Function of Remote Operation

Run, stop, and operation changeover （UPS power feeding ⇔ bypass power feeding） can be performed on a website. This operation is possible on the main screen （see **Fig. 6**）.

3.4.4 Function of Mail Transmission

As shown in the illustration of **Fig. 5**, conditions of equipment and errors can be emailed at the time of a status change. Likewise, logged data and records of bills can be transmitted for recording.

Since the monitoring of objects like the equipment status and errors can be set up arbitrarily, it is possible to receive the event notice e-mail limited to only the specific status changes. The mail encoding system is a general UTF-8 format.

3.4.5 Function of Data Save

It is possible to back up the data of bills, recorded waveforms, etc. saved at the data terminal with an externally connected USB memory. Manual data downloading is also possible through the website.

4　Postscript

This paper introduced the features of the new type of 200V class UPS, the THYRIC 5000 Series. Compared with the conventional series （THYRIC 3800）, we had many positive results such as the improvement of efficiency and maintainability, footprint reduction, and enhancement of remote monitoring functions.

We will continue to make further efforts to improve system reliability and work on other innovations so that our products can meet the needs of our customers.