

# YUASA Battery (EUROPE) GmbH

## Operating Instructions for

### Valve-Regulated Lead Acid Batteries

#### Battery Ranges:

#### NP-NPH-NPL-EN-SWL-RE-NPW-REW



|                             |  |
|-----------------------------|--|
| • Battery type:             |  |
| • Number of battery blocks: |  |
| • Number of cells:          |  |
| • Nominal Voltage:          |  |

|                           |       |
|---------------------------|-------|
| Placed into operation by: | Date: |
|---------------------------|-------|

|  |  |
|--|--|
|   | • Observe these instructions and keep them located nearby the battery for future reference! Work on the battery should only be carried out by qualified personnel!   |
|   | • Do not smoke! Do not use any naked flame or other sources of ignition. Explosion and fire hazards are present!   |
|   | • While working on batteries, wear protective eye-glasses and clothing! Observe the accident prevention rules as well as EN 50272-2:2001!  |
|   | • Any acid splashes on the skin or in the eyes must be flushed with plenty of water immediately. Then seek medical assistance. Acid splashes on clothing should be rinsed out with water!  |
|    | • Explosion and fire hazard, avoid short circuits! Caution! Metal parts of the battery are always alive, therefore do not place items or tools on the battery!   |
|   | • Electrolyte is strongly corrosive and acidic. In normal working conditions the contact with electrolyte is nearly impossible; electrolyte may leak from the vent valves in case of over charging the battery or in case of mechanical damage to the container. In case of any contact with electrolyte please flush with water abundantly and get in touch with a physician. |
|   | • Batteries/cells are heavy! Ensure adequate mounting security and always use suitable handling equipment for transportation!  |
| <b>Non-compliance with operation instructions, repairs made with other than original parts, or repairs made without authorisation (e.g. opening of valves) render the warranty void.</b> |  |
|   | <b>Disposal of Batteries</b><br>Batteries marked with the recycling symbol should be processed via an authorised recycling agency. By agreement, they might be returned to the manufacturer. Batteries must not be mixed with domestic or industrial waste.  |

Valve-regulated lead acid batteries consist of cells that are fitted with pressure relief valves which cannot be opened without destruction. Water addition is not allowed.

### 1. Installation and Initial Operation

Check all batteries for mechanical damage, correct polarity and firmly seated connectors. Ensure the charger is switched off before being connected to the battery (please check the polarity – pos. pole to pos. terminal). Switch the charger on and start charging according to chapter 2.3.

### 2. Operation

For the installation and operation of these batteries, EN 50272-2:2001 is mandatory. Battery installation should be made such that a temperature difference between individual units does not exceed 3K.

#### 2.1 Ventilation

Hydrogen gas can be released via pressure relief valves. It will form an explosive mixture in air when the concentration exceeds 4 % volume. It is mandatory to ensure sufficient ventilation of the battery. The necessary air flow must be calculated according to EN 50272-2:2001.

Please note that the minimum distance between the battery blocks must be 5 mm in order to allow for sufficient air circulation.

#### 2.2 Discharge

The cut-off voltage applied in accordance with the discharge current must not be below the specified value. The depth of discharge must not be greater than the nominal capacity. Recharge has to be applied immediately after complete or partial discharge. Leaving the battery in a discharged condition for a long period of time can be damaging to performance and life.

#### 2.3 Charging

All charging methods with limited values according to EN 50272-2:2001 are applicable. Alternating currents from the output of the charger/rectifier lead to an additional temperature increase in the battery with possible damages (see chapter 2.6).

#### 2.3.1 Standby Parallel Operation and Buffer Operation

In this case, the load, direct current source and battery are connected in parallel permanently.

In this application, the source of the direct current is able to supply the maximum load current and the battery charging current. The battery only supplies current if the direct current source fails. During buffer operation, the load current temporarily exceeds the nominal current of the direct current source. During this period, the battery serves as power supply. The battery is not fully charged at all times. However, the float-charge voltage provides sufficient recharge current.

#### 2.4 Float Charging

Charging devices complying with regulations according to EN 50272-2:2001 must be used. A voltage of 2,275 VPC  $\pm$ 1% at 20°C is to be set for batteries of the ranges NP, NPH, NPL, SWL, RE, NPW, REW. For EN, the float charge voltage is 2,26 VPC  $\pm$ 1% at 20°C.

#### 2.5 Supplementary and Equalising Charge

In order to achieve the maximum service life of the batteries, supplementary charge is recommended before initial operation if

- the batteries have been stored for more than 6 months,
- after 9 months from date of production,
- if the open circuit voltage (OCV) is less than 2,1 VPC.

Batteries with an OCV  $\leq$  2,0 VPC must not be charged anymore and must be disposed.

For the battery ranges NP, NPH, NPL, SWL, RE, NPW, REW, supplementary charge is to be applied according to the following values:

| Storage period from date of production | Charge voltage at 20 °C | Charge Time        |
|--|-------------------------|--------------------|
| Less than 9 months                     | 2,275 VPC               | More than 72 hours |
| Up to 1 year                           | 2,35 VPC                | 48 - 144 hours     |
| 1 - 2 years                            | 2,35 VPC                | 72 - 144 hours     |

For the battery range EN, supplementary charge is to be applied according to the following values:

| Storage period from date of production | Charge voltage at 20 °C | Charge Time        |
|--|-------------------------|--------------------|
| Less than 9 months                     | 2,26 VPC                | More than 72 hours |
| Up to 1 year                           | 2,31 VPC                | 48 - 144 hours     |
| 1 - 2 years                            | 2,31 VPC                | 72 - 144 hours     |

Batteries which are installed into a battery system later, as replacement, and are kept at normal float charge, do not require equalising charge.

#### 2.6 Alternating Currents

During recharge up to 2,35 VPC according to chapters 2.3 and 2.5, the effective value of the alternating current is, for a short time, permitted to reach 0,2 C(A). After recharge and standby / float charging during standby parallel operation or buffer operation, the effective value of the alternating current must be less than 0,05 C(A).

## 2.7 Charging Currents

During float charge or buffer operation without recharging state, the charging current is not limited. The charging current should range at approx. 0,1 C (A).

## 2.8 Temperature

The recommended operation temperature range for VRLA batteries is 10–30°C (best 20°C ±5K). Higher temperatures reduce the battery service life. All technical data published by Yuasa refer to an ambient temperature of 20°C. Lower temperatures reduce the available capacity. A maximum operational temperature of 50°C must not be exceeded; the average operational temperature must not exceed 40°C.

## 2.9 Temperature-Related Charging

The float charge voltage of 2,275 VPC ±1% (i.e. 2,26 VPC ±1% for the EN range) refers to a temperature of 20°C ±5°C. Temperature-compensated charging is necessary in order to avoid overcharge at higher temperatures and undercharge at lower temperatures. The recommended temperature compensation factor is –3 mV/cell/°C.

| Temperature °C | Float charge voltage [VPC] for the battery ranges NP, NPL, NPH, SWL, RE, NPW, REW | Float charge voltage [VPC] for the battery range EN |
|----------------|---|---|
| -10            | 2,36  | 2,35  |
| 0              | 2,33  | 2,32  |
| 10             | 2,30  | 2,29  |
| 20             | 2,275   | 2,26  |
| 30             | 2,24  | 2,23  |
| 40             | 2,21  | 2,20  |

Do not undertake boost-charge with temperatures higher than 20°C.

## 2.10 Electrolyte

The electrolyte is diluted sulphuric acid and is absorbed in a glass-matt separator.

## 3. Battery Maintenance and Control

Keep the battery clean and dry in order to avoid leakage currents. The plastic parts of the battery should be cleaned with water only without any detergent. Yuasa forbids the use of any organic cleaning agents.

The following values have to be recorded every 12 months:

- Temperature: ambient and battery
  - Voltage of battery system and all blocks
  - (Visual) checking of connections for tightness
- Besides a general visual checking, the following values have to be recorded every 6 months:
- Temperature: ambient and battery
  - Standby / float charge voltage

## 4. Tests

Tests are to be carried out according to EN 50272:2001. In order to ensure to have a reliable power supply, the entire battery should be exchanged at the end of the expected service life.

## 5. Operational Faults

If any operational faults occur at the battery or at the charging device, please call your after-sales service immediately. The recorded data according to chapter 3 will facilitate finding the cause of failure. Regular maintenance checks agreed in a service contract simplify trouble shooting.

## 6. Decommissioning and Storage

To store or decommission batteries for a longer period, they should be fully charged and stored in a dry and frost-free place. In order to avoid damage to the batteries, supplementary charges as described in chapter 2.5 should be carried out regularly.

## 7. Transport

Yuasa VRLA batteries are classified as non-dangerous goods for transport via road, rail or plane (according to ADR 2005, ADR/RID 2005, GGVE, GGVS and IATA) if they are protected against short-circuit, slipping, dropping or physical damage during transportation. For damaged / leaking battery containers of VRLA batteries, the respective exception clauses are valid.

## 8. Warranty

Warranty claims require maintenance according to our instructions. In case of warranty claims, Yuasa

has to be supplied with the following data:

- All maintenance records
- Yuasa claim report containing the following data: production code of the battery, number of batteries that are damaged, explanatory statements for the claim, order acknowledgement or invoice ref. no. from Yuasa.

Please ask the Yuasa team for the form sheet "claim report".

Yuasa might ask for the return of defective batteries for analysis of the claim and for professional disposal. However, return of defective batteries shall only be effected after clearance with Yuasa.

| Battery Type                        | C <sub>20</sub> [Ah] to 1,75 VPC | C <sub>10</sub> [Ah] to 1,75 VPC | Terminal           | Torque   |
|-------------------------------------|----------------------------------|----------------------------------|--------------------|----------|
| NP0.8-12                            | 0,8                              | 0,74                             | JST                | –        |
| NP1-6                               | 1,0                              | 0,9                              | Faston 4,8 mm      | –        |
| NP1.2-6 / NP1.2-12                  | 1,2                              | 1,1                              | Faston 4,8 mm      | –        |
| NP2-12                              | 2,0                              | 1,9                              | Faston 4,8 mm      | –        |
| NP2.3-12                            | 2,3                              | 2,1                              | Faston 4,8 mm      | –        |
| NP3.2-12                            | 3,2                              | 3,0                              | Faston 4,8 mm      | –        |
| NP4-6 / NP4-12                      | 4,0                              | 3,7                              | Faston 4,8 mm      | –        |
| NP7-12(L)                           | 7,0                              | 6,5                              | Faston 4,8/6,35 mm | –        |
| NP12-6 / NP12-12                    | 12                               | 11,1                             | Faston 6,35 mm     | –        |
| NP17-12I                            | 17                               | 15,7                             | M5                 | 2-3 Nm   |
| NP24-12I / NPL24-12I                | 24                               | 22,2                             | M5                 | 2-3 Nm   |
| NP38-12I / NPL38-12I                | 38                               | 35,2                             | M5                 | 2-3 Nm   |
| NP65-12I / NPL65-12I <sup>1 2</sup> | 65                               | 60,1                             | M6                 | 4-5,5 Nm |
| NPL78-12IFR <sup>1</sup>            | 78                               | 72,2                             | M8                 | 5-6 Nm   |
| NPL100-12 <sup>1</sup>              | 100                              | 92,5                             | Bolt nut M10       | 14-18 Nm |
| NPL130-6IFR <sup>1 2</sup>          | 130                              | 120,3                            | M6                 | 4-5,5 Nm |
| NPL200-6 <sup>1</sup>               | 200                              | 185                              | Bolt nut M10       | 14-18 Nm |
| NPH2-12                             | 2,0                              | 1,9                              | Faston 4,8 mm      | –        |
| NPH5-12                             | 5,0                              | 4,7                              | Faston 6,35 mm     | –        |
| SWL750                              | 25                               | 23,4                             | M5                 | 2-3 Nm   |
| SWL1100                             | 40,6                             | 40,2                             | M5                 | 2-3 Nm   |
| SWL1850 <sup>1 2</sup>              | 74                               | 67                               | M6                 | 4-5,5 Nm |
| SWL1850-6FR <sup>1 2</sup>          | 148                              | 134                              | M6                 | 4-5,5 Nm |
| SWL2250FR <sup>1</sup>              | 86                               | 78                               | M8                 | 5-6 Nm   |
| SWL2500FR <sup>1</sup>              | 92                               | 91                               | M6                 | 4-5,5 Nm |
| RE5-12                              | 5,0                              | 4,7                              | Faston 6,35 mm     | –        |
| RE7-12(L)                           | 7,0                              | 6,5                              | Faston 4,8/6,35 mm | –        |
| RE12-12                             | 12                               | 11,2                             | Faston 6,35 mm     | –        |
| REW28-12                            | 5,0                              | 4,7                              | Faston 6,35 mm     | –        |
| NPW/REW45-12                        | 7,5                              | 7,0                              | Faston 6,35 mm     | –        |
| EN80-6 <sup>1</sup>                 | 86                               | 80                               | Stud M8            | 6 Nm     |
| EN100-4 / EN100-6 <sup>1</sup>      | 108                              | 100                              | Stud M8            | 6 Nm     |
| EN160-4 / EN160-6 <sup>1</sup>      | 172                              | 160                              | M8                 | 6 Nm     |
| EN320-2 <sup>1</sup>                | 344                              | 320                              | M8                 | 6 Nm     |
| EN480-2 <sup>1</sup>                | 516                              | 480                              | M8                 | 6 Nm     |

If the a.m. torques are exceeded seriously, the battery terminals may be damaged.

<sup>1</sup> Batteries are to be lifted by at least two people or by means of a mechanical lifting aid!

<sup>2</sup> Batteries must not be installed permanently suspended by their handles!

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