



Yuasa Battery Europe Ltd
SAFETY DATA SHEET
 Valve Regulated Lead-Acid (VRLA) Battery

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1. PRODUCT IDENTIFICATION

PRODUCT IDENTIFICATION:	Valve Regulated Lead-Acid (VRLA) Battery
CLASSIFICATION:	Battery, wet, non-Spillable electric storage Substance classification: UN 2800
PRODUCT CODES:	EN & ENL, NP, NPC, NPH, NPL, NPW, RE, REC, REW, SWL, TEV, UXH, UXL, Yucel Series of Industrial VRLA Batteries
USAGE / APPLICATIONS:	<u>Some common uses</u> Standby: Telecoms; UPS; alarm and security systems; emergency lighting; utility switching Cyclic: Golf Trolleys, portable tools, portable lighting, wheelchairs, remote telemetry Energy storage: Photovoltaic energy systems (PVES); wind turbines
MANUFACTURER / SUPPLIER	Yuasa Battery Europe Ltd, Unit 22, Rassau Industrial Estate, Ebbw Vale, NP23 5SD United Kingdom
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2. COMPOSITION / INFORMATION ON INGREDIENTS

Components	Risk Phrases ¹	Description	Approximate % By Wt. or Vol.	Symbol	CAS No.
Plate Grid	R23 R25	Lead	30 to 40	Pb	7439-92-1
		Metallic lead, lead alloys			
		Calcium	< 0.1	Ca	7440-70-2
		Tin	< 2	Sn	7440-31-5
Active materials	R23 R24 R25	Lead Dioxide	35 to 45	Pb.O ₂	1309-60-0
		Barium compound	< 1.5	Ba	7440-39-3
Battery Electrolyte	R21 R22 R35 R36 R37 R38 R49	Dilute Sulphuric Acid	10 to 20	H ₂ .SO ₄	7664-93-9
Case Material		Standard Grade, UL94:HB • ABS (Acrylonitrile-Butadiene-Styrene Copolymer)	5 to 10		9003-56-9
		Flame Retardant (FR) Grade, UL94:V0 • ABS (Acrylonitrile-Butadiene-Styrene Copolymer) • Tetrabromobisphenol-A-diglycylether, with tribromophenol • Antimony trioxide	5 to 10 < 0.1 < 0.01		9003-56-9 40039-98-8 1309-64-4
Separator Material		Absorbent Glass Matt (AGM) Separator (100% Borosilicate Glass Microfibre)	2 to 5		

Inorganic lead and battery electrolyte (Dilute Sulphuric Acid) are the main components of VRLA batteries. Other substances may be present but in small amounts dependant on battery type. Contact Yuasa Battery UK Ltd for further information.

3. HAZARDS IDENTIFICATION

Components		
VRLA Battery	Mechanical	VRLA Batteries can be heavy. Correct manual handling techniques and/or mechanical lifting aides (e.g. Fork Lift Truck) must be used.
	Electrical	VRLA Batteries can contain large amounts of electrical energy which can give very high discharge currents and severe electrical shock if the terminals are short circuited.
	Chemical	<ul style="list-style-type: none"> The VRLA Battery presents no chemical hazards during the normal operation provided the recommendations for handling, storage, transport and usage are observed. VRLA Batteries emit hydrogen gas which is highly flammable and will form explosive mixtures in air from approx 4% to 76%. This can be ignited by a spark at any voltage, naked flames or other sources of ignition. If the battery is broken and the internal components exposed, hazards may exist which require careful attention.
Plate Grids and Active materials	<ul style="list-style-type: none"> Metallic lead, lead alloys and Lead inorganic compounds: Lead poisoning is usually caused by inhalation of minute particles of lead fume and dust, which are absorbed by 	

¹ See heading 16 for full text of each Risk phrase.



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	<p>the blood stream from the lungs and deposited in the bone marrow.</p> <ul style="list-style-type: none"> • Lead is only slowly released from the bones and thus has an accumulative effect causing chronic poisoning. • TOXIC by ingestion or inhalation of dust, vapour or fume • May cause harm to the unborn child • Harmful by inhalation and if swallowed • Danger of cumulative effects
Battery Electrolyte	Severe IRRITATION and DAMAGE to internal tissues if swallowed, IRRITATION of eyes and skin and may cause BURNS and DERMATITIS.
Case Material	Standard Grade, UL94:HB & Flame Retardant (FR) Grade, UL94:V0. No hazard in normal use. Material can burn in a fire with toxic smoke and decomposition products.
Separator Material	The fibres may cause IRRITATION to skin or eyes upon exposure, and to internal tissues if inhaled or swallowed

4. FIRST AID MEASURES FOR ACUTE EXPOSURE

This information is of relevance only if the VRLA Battery has suffered damage, is broken and persons have direct contact with the internal components.

Components		Action
Plate Grids and Active materials	Inhalation:	Remove the person from exposure to fresh air. Seek advice from a medical doctor
	Ingestion	Wash out mouth with water and give plenty of water to drink. Do not induce vomiting. Seek advice from a medical doctor
	Skin Contact:	Wash off with plenty of water and soap to prevent accidental ingestion or inhalation
	Eye Contact:	Immediately irrigate with eyewash solution or clean water, holding the eyelids apart for at least 10 minutes. Then take the person to hospital.
Battery Electrolyte		<u>SPEED IS ESSENTIAL. OBTAIN IMMEDIATE MEDICAL ATTENTION.</u>
	Inhalation:	Remove the person from exposure to fresh air. If the person continues to feel unwell seek advice from a medical doctor.
	Ingestion	Wash out mouth with water and give plenty of water to drink. Do not induce vomiting. If the person continues to feel unwell seek advice from a medical doctor.
	Skin Contact:	Drench with large quantities of water. Remove contaminated clothing. Continue to wash the affected area for at least 10 minutes. Seek advice from a medical doctor
	Eye Contact:	<u>SPEED IS ESSENTIAL. OBTAIN IMMEDIATE MEDICAL ATTENTION.</u> Immediately irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Then take the person to hospital.
Case Material	Inhalation:	Material can burn in a fire with toxic smoke and decomposition products. Upon inhalation of decomposition products, keep patient calm, remove to fresh air, and seek advice from a medical doctor. If a large quantity is inhaled take the person to hospital. <u>Note to physician:</u> Treat according to symptoms (decontamination, vital functions), no known specific antidote.
	Ingestion	Wash out mouth with water and give plenty of water to drink. Do not induce vomiting. If the person continues to feel unwell seek advice from a medical doctor.
	Skin Contact:	Areas affected by molten material should be quickly placed under cold running water and a sterile protective dressing applied. Seek advice from a medical doctor.
	Eye Contact:	May cause irritation or injury due to mechanical action and traces of Battery Electrolyte. Irrigate thoroughly with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Then take the person to hospital.
Separator Material	Inhalation:	Remove patient from exposure to fresh air. If irritation persists, seek advice from a medical doctor
	Ingestion	Wash out mouth with water and give plenty of water to drink. Do not induce vomiting. If the person continues to feel unwell seek advice from a medical doctor.
	Skin Contact:	After contact with skin, wash immediately with plenty of soap and water. If irritation persists, seek advice from a medical doctor
	Eye Contact:	In case of contact with eyes, rinse immediately with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Then take the person to hospital.



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5. FIRE-FIGHTING AND EXPLOSION HAZARD MEASURES

Components		
VRLA Battery		<ul style="list-style-type: none"> VRLA Batteries emit hydrogen gas which is highly flammable and will form explosive mixtures in air from approx 4% to 76%. This can be ignited by a spark at any voltage, naked flames or other sources of ignition. Batteries in use will be part of an electrical circuit and must be isolated from the power source before attempting to put out a fire. Switch the power OFF before disconnecting the batteries from the power source. Damaged batteries may expose negative plates (grey) colour, which may ignite if allowed to dry out. These plates may be wetted down with water after the battery has been removed from all electrical circuits.
	Suitable Extinguisher types:	CO ₂ ; Foam; Dry Powder.
	Unsuitable Extinguisher types	Water extinguishers must never be used to put out an electrical fire.
	Hazardous decomposition products:	Carbon monoxide, Sulphur Dioxide, Sulphur Trioxide, lead fume and vapour, toxic fumes from decomposition of battery case materials.
	Special protective equipment for fire fighters:	Full face visor or safety goggles; respiratory protective equipment or self-contained breathing apparatus; full acid resistant protective clothing must be worn in fire fighting conditions.

6. ACCIDENTAL RELEASE MEASURES

This information is of relevance only if the VRLA Battery has suffered damage and is broken.

Components		
VRLA Battery		VRLA batteries are designed not to leak under normal conditions.
Plate Grids and Active materials	Personal Precautions:	Use of heavy-duty gloves is recommended
	Clean-up Methods:	Solid lead may be picked up and recycled. Active material waste should be cleaned up and the area washed.
	Environmental Precautions:	Do not allow to enter a watercourse. Exposed lead materials must be placed in an inert sealed container (e.g. self-seal plastic bag) for disposal, see Section 13.
Battery Electrolyte:	Personal Precautions:	Ensure suitable, acid resistant, personal protective clothing (including respiratory protection) is worn during removal of spillages.
	Clean-up Methods:	
	Small spillages:	Absorb spillages. Wash the spillage area with water.
	Large spillages:	Electrolyte leakage should be absorbed onto dry sand, earth, sawdust or other inert material and must not be allowed to enter any drains or sewage system. Neutralise the electrolyte using soda ash, sodium bicarbonate, sodium carbonate or calcium carbonate powder and then wash the area thoroughly with water. Collect absorbed material and place in an inert sealed container (e.g. self-seal plastic bag) for disposal, see Section 13.
Case Material:	Clean-up Methods:	Sweep and/or shovel up. Collect contaminated material and place in an inert sealed container for disposal, see Section 13.
Separator Material:	Clean-up Methods:	Sweep and/or shovel up. Collect contaminated material and place in an inert sealed container for disposal, see Section 13.

Note: If appropriate refer to 8 and 13

7. HANDLING AND STORAGE

Components		
VRLA Battery	Storage	<p>Store batteries in a cool, well ventilated area with a solid, impervious surface, and adequate containment in the event of accidental acid spillage.</p> <p>Store under a roof and protect against adverse weather conditions including rain, snow and other sources of water.</p> <p>Storage of large quantities of VRLA batteries may require approval from local environmental protection agency and/or local water authorities.</p> <p>Pallets of VRLA Batteries are heavy. Store at ground level or in lower levels of storage systems (e.g. racking).</p> <p>Take special care in dry conditions to avoid the risk of electrostatic discharges.</p> <p>Protect against physical damage and exposure to organic solvents and other incompatible materials.</p>



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		Store batteries in their original packaging wherever possible. When batteries are removed from their original packaging (e.g. for transportation of small quantities), ensure new packaging protects the batteries from damage and risk of short circuit of the terminals.
Handling:		Only trained operators should be allowed to handle VRLA batteries. Mechanical lifting aides (e.g. FLT) may be required to move large batteries.
End-of-Life (EC WEEE Regulations)		Ensure batteries are removed from equipment at end of life and collected for recycling by an approved contractor.
Installation:		Refer to EN 50272-2:2001, Safety requirements for secondary batteries and battery installations – Part 2 Stationary batteries.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

Components		
VRLA Battery	Personal Precautions:	<p>When there is no evidence of damage or visible traces of liquid (electrolyte) or solid deposits on the batteries they may be handled safely without extra personal protective equipment.</p> <p>Ensure electrical insulation equipment is used when installing batteries. (e.g. insulated mats and covers; insulated tools)</p> <p>Remove ALL metallic objects from the person when working with VRLA Batteries: e.g. Jewellery (rings, watches, bracelets, necklaces), pens, torches, etc.</p> <p>Where there are any signs of damage or liquid (electrolyte) or solid deposits, rubber gloves and acid resistant clothing must be worn when handling the batteries and affected packaging to protect against the effects of any electrolyte that may be present.</p> <p>If it is suspected that free electrolyte is present, then safety glasses must be worn, and if large amounts are present, chemical goggles or face shield should be used.</p>

9. PHYSICAL AND CHEMICAL PROPERTIES

Components			
VRLA Battery	<ul style="list-style-type: none"> The main components are listed in item 2 above. The undamaged product is a manufactured item in an inert plastic (ABS) case, which will burn if subjected to high temperatures or sources of ignition. Some battery types are made with Flame Retardant ABS cases, see technical specification. These batteries carry the suffix 'FR' after the battery type; e.g. NP24-12FR Batteries emit hydrogen gas, which is highly flammable and forms explosive mixtures in air, see Section 5. 		
Plate Grids and Active materials	Appearance	Safety-related data	
	<i>Form</i>	Solid	
	<i>Colour</i>	Grey or brown	
	<i>Odour</i>	Odourless	
		<i>Solidification point</i>	327 °C
		<i>Boiling point</i>	1740 °C
		<i>Solubility in water</i>	Very low (0.15mg/l)
		<i>Solubility in acid or alkaline solutions</i>	Yes, dependant on the strength of solution.
		<i>Density (at 20°C)</i>	11.35 g/cm ³
		<i>Vapour pressure (at 20°C)</i>	N.A.
Battery Electrolyte:	<i>Form</i>	Liquid	
	<i>Colour</i>	Colourless	
	<i>Odour</i>	Odourless	
		<i>Solidification point</i>	-35 to -60 °C
		<i>Boiling point</i>	Approx 108 to 114 °C
		<i>Solubility in water</i>	Complete
		<i>Density (at 20°C)</i>	Variable up to 1.350 g/cm ³
		<i>Vapour pressure (at 20°C)</i>	N.A.
Case Material:	Appearance	Safety-related data	
	<i>Form</i>	Solid	
	<i>Colour</i>	Grey or black	
	<i>Odour</i>	Slight Odour	
		<i>Softening point</i>	> 100 °C (DIN 53460)
		<i>Flash Point</i>	>330 °C
	<i>Solubility in water</i>	Insoluble	
	<i>Solubility in other solvents</i>	Soluble in polar solvents, aromatic solvents, chlorinated hydrocarbons.	
	<i>Density (at 20°C)</i>	1.07-1.4 g/cm ³ (DIN 53479)	
	<i>Vapour pressure (at 973°C)</i>	1mm Hg	
Separator Material:	<i>Form</i>	Fibrous material	
	<i>Colour</i>	White	
	<i>Odour</i>	Odourless	
		<i>Solidification point</i>	N/A
		<i>Boiling point</i>	N/A
		<i>Solubility in water</i>	Insoluble
	<i>Density (at 20°C)</i>	N/A	
	<i>Vapour pressure (at 20°C)</i>	N/A	







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10. STABILITY AND REACTIVITY

Components		
VRLA Battery		Within the operational temperature range -20 to +50 °C the undamaged product is stable.
Plate Grids and Active materials:	Materials to Avoid:	Powdered lead reacts violently with fused ammonium nitrate and sodium acetylide. Reacts violently when in contact with chlorine trifluoride.
Battery Electrolyte:	Hazardous Reactions	<ul style="list-style-type: none"> Dilution of the higher concentrated grades with water may liberate excessive heat. Highly reactive with metals and organic materials. On contact with metals, may generate hydrogen which forms explosive mixtures with air. Destroys organic materials such as cardboard, wood, textiles, etc. Vigorous reaction with sodium hydroxide and alkalis.
	Hazardous Decomposition Product(s):	Sulphur oxides
Case Material:	Conditions to Avoid:	To avoid thermal decomposition, do not overheat. Starts to decompose at temperatures >275°C.
	Materials to Avoid:	Powerful oxidising agents.
	Thermal degradation products:	Monomers, other degradation products, traces of hydrogen cyanide.
Separator Material:		<ul style="list-style-type: none"> Stable material. Incompatible with Hydrofluoric acid and concentrated Sodium Hydroxide. No hazardous polymerisation expected.

11. TOXICOLOGICAL INFORMATION

Components		
VRLA Battery		This information does not apply to the undamaged VRLA Battery. It is of relevance if the battery is broken and the components are released to the environment. Exposure limits may vary according to national law and regulations.
Plate Grids: Metallic lead, lead alloys.	Toxicity 	<ul style="list-style-type: none"> Toxic by ingestion or inhalation Chronic poison Lead is a poison that affects virtually every system in the body Symptoms include fatigue, headaches, constipation, aching bones and muscles, gastrointestinal tract disturbances and reduced appetite Blood lead levels of 80 µg/dl and above have been associated with both acute and chronic effects of lead poisoning
Active materials: Lead dioxide.	Toxicity 	<ul style="list-style-type: none"> Toxic by ingestion or inhalation Chronic poison Chronic exposure to lead compounds may lead to a build-up of lead in the body, giving rise to a variety of health problems, including anaemia, kidney and liver damage, impaired eyesight, memory loss and CNS² damage
Battery Electrolyte:	Dilute Sulphuric Acid  	Corrosive, the more concentrated solutions can cause serious burns to the mouth, eyes and skin Harmful by ingestion and through skin contact
	Inhalation:	Mist is a severe irritant to the respiratory tract. Fluid build up on the lung (pulmonary oedema) may occur up to 48 hours after exposure and could prove fatal
	Ingestion:	Will immediately cause severe corrosion of and damage to the gastrointestinal tract
	Skin Contact:	Causes severe chemical burns
	Eye Contact:	Risk of serious damage to eyes. Causes severe burns. May cause prolonged or permanent damage or even total loss of sight. Mist will cause irritation

² CNS = Central Nervous System








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Case Material:		According to information available the product is not harmful to health provided it is correctly handled and processed according to the given recommendations.
Separator Material:		Based on animal implantation and epidemiologic studies glass microfibres are thought to have some limited carcinogenic potential and as such are designated as Group 2B materials (IARC, US). The material should be treated as a category 3 carcinogen (Europe). Limited evidence of carcinogenic effect.

12. ECOLOGICAL INFORMATION

Components VRLA Battery		This information does not apply to the undamaged VRLA Battery. It is of relevance if the battery is broken and the components are released to the environment.
Plate Grids and Active materials:	Metallic lead, lead alloys and Lead dioxide.	Chemical and physical treatment is required for the elimination of lead from water. Waste water containing lead must not be disposed of in an untreated condition.
	Ecotoxicity: 	<ul style="list-style-type: none"> The general classification for Lead compounds, R50/53 does not apply to Battery Lead Oxide Tests in 2001 and 2005 have concluded that Battery Lead Oxide is NOT toxic for the environment; neither R50 nor R50/53 nor R51/53. Risk Phrase R52/53 (Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment) applies to Battery Lead Oxide.
	Risk Phrase R52/53 Effect in the aquatic environment:  	<ul style="list-style-type: none"> Toxicity for fish: 96 h LC 50 > 100 mg/l Toxicity for daphnia: 48 h EC 50 > 100 mg/l Toxicity for alga: 72 h IC 50 > 10 mg/l
Battery Electrolyte:	Ecotoxicity:  	<ul style="list-style-type: none"> In order to avoid damage to the sewerage system, the acid has to be neutralised by means of soda ash, sodium bicarbonate or sodium carbonate before disposal. Ecological damage is possible by change of pH. The electrolyte solution reacts with water and organic substances, causing damage to flora and fauna. The electrolyte may also contain components of lead that can be toxic to aquatic environments.
	Persistence and Degradation:	Remains indefinitely in the environment as sulphate.
Case Material:	Elimination information:	No data available: insoluble in water
	Behaviour and environmental fate:	Due to the consistency of the product, and its insolubility in water, it will apparently not be bio-available.
Separator Material:		No data available: insoluble in water Not thought to pose any risk to the environment.

13. DISPOSAL CONSIDERATIONS

Components VRLA Battery	Europe:	<ul style="list-style-type: none"> Spent (used) VRLA Batteries are subject to the requirements of the Batteries Directive 2006/66/EC (on batteries and accumulators and waste batteries and accumulators). Spent (used) VRLA Batteries MUST be sent for recycling through an authorised contractor at the end-of-life. The WEEE Directive 2002/96/EC (Waste Electrical and Electronic Equipment) applies. Spent (used) VRLA Batteries MUST be removed from equipment at end-of-life.
	Worldwide:	<ul style="list-style-type: none"> VRLA batteries contain inorganic lead compounds and sulphuric acid which are damaging to the environment. Spent (used) batteries must be disposed of in an environmentally friendly manner in accordance with local national laws and regulations.
Plate Grids and Active materials:		<ul style="list-style-type: none"> Metallic lead and active materials (Lead Oxides) must be recycled. Disposal must be carried out in accordance with the European Hazardous Waste Directive 91/689/EEC (until end of 2010), then Directive 2008/98/EC
Battery Electrolyte:	Europe	<ul style="list-style-type: none"> Disposal must be carried out in accordance with the European Hazardous Waste Directive 91/689/EEC (until end of 2010), Thereafter, Directive 2008/98/EC on the protection of the environment through criminal law
	Worldwide	<ul style="list-style-type: none"> Disposal should be in accordance with local, state or national legislation.

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Case Material:		<ul style="list-style-type: none"> Do not dispose of this product into sewers, any ocean or water area in order to prevent marine animals and birds from ingesting. Recycling is encouraged. Disposal by controlled incineration or source landfill in accordance with local national laws and regulations may be acceptable.
Separator Material:		<ul style="list-style-type: none"> Constitutes a special waste by virtue of hazardous substance content. Dispose of via approved landfill site. Disposal by controlled source landfill in accordance with local national laws and regulations may be acceptable.

14. TRANSPORT INFORMATION



Components		
VRLA Battery	Land Transport	Land Transport (ADR / RID) <ul style="list-style-type: none"> UN N^o: UN2800 Classification ADR / RID: Class 8 Proper Shipping Name: BATTERIES, WET, NON-SPILLABLE electric storage Packing Group ADR: not assigned Tunnel code: E ADR / RID: New and spent (used) batteries are exempt from all ADR / RID (special provision 598)
	Sea Transport	Sea transport (IMDG Code) <ul style="list-style-type: none"> UN N^o: UN2800 Classification: Class 8 Proper Shipping Name: BATTERIES, WET, NON-SPILLABLE electric storage Packing Group: III EmS: F-A, S-B Non-spillable batteries meet the requirements of Special Provision 238; they are therefore exempt from all IMDG codes and are not regulated for sea transport.
	Air Transport	Air Transport (IATA-DGR) <ul style="list-style-type: none"> UN N^o: 2800 Classification: Class 8 Proper Shipping Name: BATTERIES, WET, NON-SPILLABLE electric storage Packing Group: III <u>Special Provision A48</u>: Packaging test are not considered necessary <u>Special Provision A67</u>: Yuasa's VRLA batteries meet the requirements of Packing Instruction 872. The battery has been prepared for transport so as to prevent: <ol style="list-style-type: none"> A short-circuit of the battery's terminals by packaging in a strong and sturdy carton box; AND/OR The battery has been fitted with an insulating cover (made from ABS) which prevents contact with the terminals. Unintentional activation is thus prevented The words "NOT RESTRICTED" and the Special Provision (SP) number must be indicated on all shipping documents <ul style="list-style-type: none"> <u>Special Provision: A164</u>: The battery has been prepared for transport so as to prevent: <ol style="list-style-type: none"> Short-circuit of the battery's terminals by packaging in a strong and sturdy carton box; AND/OR The battery has been fitted with a cover (made from ABS) which prevents contact with the terminals Unintentional activation is thus prevented
	All methods of transport	Do not place VRLA batteries inside sealed enclosures. VRLA Batteries emit hydrogen gas which is highly flammable and will form explosive mixtures in air from approx 4% to 76%. This can be ignited by a spark at any voltage, naked flames or other sources of ignition.



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15. REGULATORY INFORMATION

Components	
VRLA Battery	Required Markings:
	 <p>Crossed-out wheeled bin indicating "SEPARATE COLLECTION" for all batteries and accumulators. Not to be disposed of with general domestic, commercial or industrial waste. Ref: The Batteries Directive 2006/66/EC</p>
	<p>Pb</p> <p>The Pb symbol indicates the heavy metal content of the battery and enables the lead-acid battery to be sorted for recycling. Ref: The Batteries Directive 2006/66/EC.</p>
	 <p>The International Recycling Symbol, required by law in many countries world-wide to facilitate the identification of secondary batteries and accumulators for recycling. Ref: IEC 61429 : 1995, Marking of secondary cells and batteries with the International Recycling Symbol ISO 7000-1135.</p>

16. OTHER INFORMATION

Components	
VRLA Battery	<p>To ensure the safe use of VRLA Batteries supplied by Yuasa Battery (UK) Ltd., the following precautions must be observed:</p> <ul style="list-style-type: none"> • Only trained, competent personnel, who have received special instructions for the hazards and risks, should be allowed to handle VRLA Batteries. • Never short-circuit battery terminals, since sparks and arcs produced can injure personnel and are a fire and explosion hazard. • VRLA Batteries emit hydrogen gas which is highly flammable and will form explosive mixtures in air from approx 4% to 76%. Never install VRLA Batteries in a gas-tight enclosure, whether during storage, transport or usage. • Batteries must always be charged on a voltage-regulated charging system with adequate ventilation provided to avoid the build-up of ignitable gases and to promote good heat dissipation. • Do not charge VRLA Batteries above + 50 °C, discharge or store above + 60 °C. • Under extreme conditions of charging equipment malfunction and/or battery failure, high voltage and high temperature conditions may occur causing the evolution of Hydrogen Sulphide (H₂S) gas, which is toxic. If detected by its odour of rotten eggs (at extremely low concentrations), switch off the charging equipment, evacuate all personnel from the area and ventilate well. Seek advice before attempting to re-start charging.
Risk Phrases	R21 Harmful in contact with skin
	R22 Harmful if swallowed
	R23 Toxic by inhalation
	R24 Toxic in contact with skin
	R25 Toxic if swallowed
	R35 Causes severe burns
	R36 Irritating to eyes
	R37 Irritating to respiratory system
	R38 Irritating to skin
	R49 May cause cancer by inhalation
	R52 Harmful to aquatic organisms
	R53 May cause long-term adverse effects in the aquatic environment